

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION**

CEASE AND DESIST ORDER NO. R4-2012-0077
REQUIRING THE

CITY OF AVALON
IN LOS ANGELES COUNTY

TO CEASE AND DESIST DISCHARGING WASTE
IN VIOLATION OF REQUIREMENTS IN
REGIONAL BOARD ORDER NO. R4-2008-0028
(NPDES PERMIT NO. CA0054372)
AND
STATE BOARD ORDER NO. 2006-0003-DWQ
AND TO IMPLEMENT
THE TOTAL MAXIMUM DAILY LOAD (TMDL)
FOR AVALON BEACH
ESTABLISHED HEREIN

WHEREAS the California Regional Water Quality Control Board, Los Angeles Region (hereinafter Regional Board), finds that:

1. This Order serves a dual function, requiring the City of Avalon to cease and desist discharging waste in violation of requirements in Regional Board Order No. R4-2008-0028 and State Board Order No. 2006-0003-DWQ and to implement actions to achieve wasteload allocations assigned to the City's discharges of waste and pollutants. This latter function serves to address the Clean Water Act section 303(d) water quality impairment listing for bacteria at Avalon Beach. As such, this Order contains all of the required elements of a Total Maximum Daily Load (TMDL). According to the State Water Resources Control Board's (State Water Board) "Water Quality Control Policy for Addressing Impaired Waters" (State Water Board Resolution No. 2005-0050, p. 5), "[w]hen an implementation plan [TMDL] can be adopted in a single regulatory action, such as a permit, a waiver, or an enforcement order, there is no legal requirement to first adopt the plan through a basin plan amendment. The plan [TMDL] may be adopted directly in that single regulatory action." This Order acts as a single regulatory action to establish and implement a TMDL for bacteria at Avalon Beach (Avalon Beach Bacteria TMDL).
2. The City of Avalon (owner and hereinafter Discharger) owns the Avalon Wastewater Treatment Facility (hereinafter Facility or Avalon WTF), a Publicly Owned Treatment Works. The Avalon WTF is located at 123 Pebbly Beach Road, Avalon. The Facility was formerly operated by United Water Environmental Services Inc. whose contract expired on February 25, 2011. As of February 25, 2011, Environ Strategy Consultants, Inc. operates the Facility under a service contract with the City of Avalon. The Avalon WTF and appurtenant sanitary sewer wastewater collection system operates under Order No. R4-2008-0028, National Pollutant Discharge Elimination System (NPDES) Permit No. CA0054372, and was previously subject to Order No. R4-2002-0094 (NPDES Permit No. CA0054372) from June 14, 2002 to June 19, 2008. The collection system is also subject to State Water Board Order No. 2006-0003-DWQ, *Statewide General Waste Discharge Requirements for Sanitary Sewer Systems* (SSO WDR) and State Water Board Order No.

WQ-2008-0002-EXEC, *Adopting Amended Monitoring and Reporting Requirements for the SSO WDR (SSO MRP Amendment)*.

3. The Discharger's collection system serves a population of approximately 3,800 residents and consists primarily of residential customers and some commercial customers. The Discharger's service area covers approximately 1.4 square miles. The Discharger's collection system includes 11 miles of gravity sewers, 1.25 miles of force mains, an unknown length of lower laterals and 2 pump stations.
4. On October 28, 2010, EPA Region 9, accompanied by the Regional Board and the State Attorney General's Office, conducted an inspection at the City of Avalon to determine compliance with the requirements under the SSO WDR. The inspection report is attached (See Exhibit 1).
5. On February 23, 2011, the Regional Board issued a Notice of Violation (NOV) to the Discharger (See Exhibit 2 – attached). The NOV was issued to address alleged violations of the California Water Code associated with six (6) sanitary sewer overflows (SSOs) that occurred from the Discharger's collection system at various locations between January 1, 2005 and February 23, 2011. The table "City of Avalon SSOs" included in the NOV (Exhibit 2) has been modified due to subsequent responses from the Discharger.
6. On November 22, 2011, the Regional Board issued Investigative Order No. R4-2011-0182 to the Discharger regarding alleged violations of the Water Code associated with one (1) SSO that occurred from the Discharger's collection system upstream of the Pebbly Beach lift station.
7. The total number of SSOs has been adjusted to six (6) and the total volume discharged and not recovered due to these events is now 49,050 gallons (See Exhibit 3 – attached).
8. The alleged SSOs occurred as a result of the Discharger's failure to adequately identify and address collection system problems. Specifically, four (4) SSOs were due to poor operation and maintenance resulting in the failure of pump station control systems and two (2) were due to operator error; one resulting from a lift station pump being left in manual mode and one resulting from a storm drain pump system being left in manual mode.
9. On March 10, 2011, the final report "Avalon Bay Water Quality Improvement Project, Catalina Island, California" (Avalon Bay Study), Grant, Stanley B., et al. (2011) was submitted to the City of Avalon and the State Water Board (See Exhibit 4 – relevant portions attached).
10. The Avalon Bay Study found, "[a] number of lines of evidence indicate that shallow groundwater...may be contaminated with sewage..." and concluded, "[o]verall, these data support the hypothesis that sewage-contaminated shallow groundwater is discharged to Avalon Bay...Furthermore, evidence is presented that the seepage face...is contaminated with sewage markers."
11. Raw sewage contains microbial pathogens known to be harmful to public health including: bacteria: campylobacter, E. coli, vibrio cholera, salmonella, S. typhi, shigella, Yersinia; parasites: cryptosporidium, entamoeba, giardia; and viruses: adenovirus, astrovirus, noravirus, echovirus, enterovirus, reovirus, rotavirus.

12. Raw sewage can cause illness including abdominal cramps, vomiting, diarrhea, high fever, and dehydration. Additionally, it can cause disease such as gastroenteritis, salmonellosis, typhoid fever, pneumonia, shigellosis, cholera, bronchitis, hepatitis, aseptic meningitis, cryptosporidium, amoebic dysentery, giardiasis, and even death.
13. Raw sewage can also cause environmental impacts such as a loss of recreation and can be detrimental to aquatic life support, can result in organic enrichment, and can also result in exposure to floatables often contained in sewage.
14. Provisions C.1 and C.2 of the SSO WDR prohibit any SSO that results in a discharge of untreated or partially treated wastewater to waters of the United States, or creates a nuisance as defined in Water Code § 13050(m). In addition, Provisions D.3 and D.8 of the SSO WDR require the Discharger to take all feasible steps to eliminate SSOs and to properly manage, operate, and maintain all parts of the collection system.
15. Similarly, Order No. R4-2008-0028 (NPDES Permit No. CA0054372), states, in Section III.B, "The bypass or overflow of untreated wastewater to surface waters or surface water drainage courses is prohibited..." and requires the Discharger, in Attachment D, Section I.D., *Standard Provisions*, "at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this Order.
16. The reported SSOs occurred as a result of the Discharger's failure to take all feasible steps to prevent and reduce SSOs and has failed to properly manage, operate, and maintain all parts of the collection system. As a result, there is a continuing threat of future SSOs to surface waters in violation of the Water Code and the federal Clean Water Act, the Discharger's NPDES Permit and the SSO WDR.
17. As of the issuance of this Order, the Discharger has taken a number of steps to address collection system issues identified herein. The Discharger is in the process of expending \$5.7 million in improvements to its collection system. The improvements include, among others: conducting a CCTV survey of the entire collection system, creating a GIS map of the collection system, conducting various repairs/rehabilitation of the collection system, implementing spill training, installing a Computer Maintenance Management System (CMMS), developing a Sanitary Sewer Management Plan (SSMP), and developing a Sewer Improvement Master Plan.
18. Water Code section 13301 authorizes the Regional Board to issue a Cease and Desist Order when it finds that a discharge of waste is taking place, or threatening to take place, in violation of requirements or discharge prohibitions prescribed by the Regional Board or State Water Board.
19. Water Code section 13267 authorizes the Regional Board to require any person who discharged, discharges, or is suspected of having discharged or discharging, within its region, to furnish technical or monitoring program reports in connection with any action relating to any requirement authorized by Division 7 of the Water Code.
20. This Cease and Desist Order (Order) requires the Discharger to submit reports and technical information pursuant to Water Code section 13267. The reports and technical information required herein are necessary to assist system management and implementation of necessary corrective measures to reduce and eliminate SSOs and

associated violations; to ensure that wasteload allocations established in this Order are being achieved; and to ensure compliance with this Order. The burden, including costs, of the reports required by this Order bear a reasonable relationship to the need for the reports and the benefits obtained therefrom.

21. This Order is an enforcement action and, as such, is exempt from the provisions of the California Environmental Quality Act (Public Resources Code § 21000 et seq.) in accordance with California Code of Regulations section 15321.
22. The Regional Board notified the Discharger and interested persons of its intent to consider adoption of this Order, and provided an opportunity to submit written comments and appear at a public hearing. The Regional Board, in a public hearing, heard and considered all comments.
23. The requirements in the Order are intended to meet or exceed requirements contained in the SSO WDR. To the extent that this Order conflicts with the SSO WDR, this Order supersedes and controls (See SSO WDR Provision D.2. (iv)). This Order does not, however, relieve the Discharger of any of its obligations to comply with the SSO WDR in situations where that requirement is not in conflict with or controlled by a more specific requirement in this Order.

Total Maximum Daily Load (TMDL)

24. Avalon Beach is currently listed on the 2008/2010 Clean Water Act section 303(d) impaired waters list as impaired due to indicator bacteria.
25. The Clean Water Act requires states to establish a priority ranking for impaired waters and to develop and implement Total Maximum Daily Loads (TMDLs) to resolve impairments. 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 elements of a TMDL are described in 40 Code of Federal Regulations (CFR) sections 130.2 and 130.7 and Clean Water Act section 303(d), as well as in guidance developed by the United States Environmental Protection Agency (USEPA). A TMDL is also required to account for seasonal variations and include a margin of safety to address uncertainty in the analysis.
26. This Order addresses the bacteria listing for Avalon Beach and contains all of the required elements of a TMDL. According to the State Water Board's "Water Quality Control Policy for Addressing Impaired Waters" (State Water Board Resolution No. 2005-0050, p. 5), "[w]hen an implementation plan [TMDL] can be adopted in a single regulatory action, such as a permit, a waiver, or an enforcement order, there is no legal requirement to first adopt the plan through a basin plan amendment. The plan [TMDL] may be adopted directly in that single regulatory action." This Order acts as a single regulatory action to establish and implement a TMDL for bacteria at Avalon Beach (Avalon Beach Bacteria TMDL).

Environmental Setting

27. Avalon Beach is located in Los Angeles County, in the City of Avalon on Santa Catalina Island. The City of Avalon is approximately 22 miles south/southwest of the Los Angeles Harbor breakwater, and encompasses roughly 2.67 square miles. Avalon has

approximately 3,800 residents and the average annual visitor count was 905,823 for the period 2004-2006.

28. The primary industry on Santa Catalina Island is tourism. The City of Avalon is a recreational destination for boaters, fisherman, divers, beachgoers, and other ocean oriented visitors. Residents and visitors use the local beaches year-round for recreational uses.

Problem Identification

29. The Water Quality Control Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Los Angeles Region Basin Plan or Basin Plan) lists the following beneficial uses for Santa Catalina Island: Water Contact Recreation (REC-1); Non-Contact Water Recreation (REC-2); Navigation (NAV); Commercial and Sport Fishing (COMM); Marine Habitat (MAR); Wildlife Habitat (WILD); Preservation of Biological Habitat (BIOL); and Rare, Threatened, or Endangered Species (RARE). Potential Uses include: Municipal and Domestic Supply (MUN); Spawning, Reproduction, and/or Early Development (SPWN); and Shellfish Harvesting (SHELL). REC-1 and REC-2 are recreational uses that often occur in the nearshore areas of Avalon Bay, including Avalon Beach. Chronic exceedances of fecal indicator bacteria water quality objectives have a direct impact on these recreational uses.
30. As stated in the Basin Plan, water quality objectives are intended to protect the public health and welfare and to maintain or enhance water quality in relation to the designated existing and potential beneficial uses of the water. Fecal indicator bacteria, including total coliform, fecal coliform and enterococcus, are used to indicate the likelihood of pathogens in surface waters. Water quality objectives for fecal indicator bacteria are set forth in Chapter 3 of the Los Angeles Region Basin Plan.
31. Swimming in waters with elevated bacterial indicator densities has long been associated with adverse health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities (USEPA 2009; Haile et al. 1999).
32. A study funded by a Proposition 13 Clean Beaches Initiative (CBI) grant investigated the presence and causes of fecal indicator bacteria (FIB) impairment in Avalon Bay. The study found: (1) the shallow groundwater underlying downtown Avalon is contaminated with high concentrations of FIB; (2) markers of human fecal contamination are present in the shallow groundwater underlying downtown Avalon, and in the water column in Avalon Bay; (3) FIB concentrations in the Bay water and sediments are highest in ankle depth water, and decrease with increasing water depth; (4) tidal mixing within the Bay is sufficient to dilute (within a couple of hours) any non-continuous source of pollution.
33. A recent study conducted by the Southern California Coastal Water Research Project (SCCWRP), UC Berkeley, the Orange County Sanitation District and Heal the Bay further assessed the risk of swimming-related illnesses following exposure to waters with elevated bacteria densities at three beaches: Doheny Beach in Dana Point, Surfrider Beach in Malibu and Avalon Beach. These studies examined new techniques for measuring fecal indicator bacteria and examined the utility of other species of bacteria as indicators of human health risk. These studies have not yet been published.

34. In 1999 the County of Los Angeles began testing Avalon Bay for fecal indicator bacteria during the summer season (April 1-October 31) in accordance with Health and Safety Code section 115880 (AB411 legislation). These test results frequently exceed the minimum bacteriological standards for public beaches, and as a result beaches in Avalon have been frequently posted as unsuitable for water contact recreation.
35. Avalon Bay has experienced numerous beach postings and poor report card grades from Heal the Bay since AB411 monitoring was initiated in 1999. Based on studies conducted, the fecal indicator bacteria impairment along the shoreline in Avalon Bay appears to originate directly at the shoreline. One closure of the beaches occurred in May 2004 due to a sewage spill. In 2004, approximately 20 percent of the samples taken exceeded water quality standards, which led to beach postings. In 2005, approximately 25 percent of the samples exceeded, and in 2006 approximately 28 percent of the samples exceeded. Most of the exceedances occurred at the sampling site located in the middle of the Avalon Bay shoreline.

Table 1: Number of Days Exceeding Single Sample Water Quality Objectives at Avalon Beach Monitoring Sites (April 2000-June 2009)

Station ID	Station Description	Single Sample Exceedance Days		
		Summer* Dry Weather**	Winter*** Dry Weather	Wet Weather****
DPH 117	1/3 of the way between storm drain & the Green Pleasure Pier	56	N/A	5
DPH 118	2/3 of the way between storm drain & the Green Pleasure Pier	76	N/A	6
DPH 119	1/3 of the way between the Green Pleasure Pier & Busy Bee Rest.	136	N/A	7
DPH 120	2/3 of the way between the Green Pleasure Pier & Busy Bee Rest.	78	N/A	4
DPH 121	Between the Busy Bee Restaurant and Tuna Club	52	N/A	5

Notes: N/A = No data are available for winter dry weather.

*Summer is defined as the period from April 1 - October 31, per AB411 legislation.

**Dry Weather is defined as non-wet weather.

***Winter is defined as the period from November 1 - March 31.

****Wet Weather is defined as any day with 0.1 inch of rain and the following 3 days.

Table 2: Exceedances of Geometric Mean Water Quality Objectives at Avalon Beach Monitoring Sites by Season (April 2000-June 2009)

Station ID	Constituent	Geometric Mean Exceedances				
		April – May	June	July	August	September – October
DPH 117	Total Coliform	0	0	0	0	1
	Fecal Coliform	0	0	1	0	1
	<i>enterococcus</i>	4	1	2	1	5
DPH 118	Total Coliform	0	0	1	0	1
	Fecal Coliform	1	2	2	0	1
	<i>enterococcus</i>	5	2	3	0	5
DPH 119	Total Coliform	1	1	1	0	1
	Fecal Coliform	6	3	2	2	6
	<i>enterococcus</i>	9	3	3	2	7
DPH 120	Total Coliform	0	0	0	0	1
	Fecal Coliform	1	0	1	1	1
	<i>enterococcus</i>	8	2	2	1	5
DPH 121	Total Coliform	1	0	1	0	1
	Fecal Coliform	0	0	1	0	1
	<i>enterococcus</i>	2	1	2	0	2

Notes: No data are available for the November to March period. Geometric mean only calculated when at least five (5) samples were available during the time period.

Numeric Targets

36. Chapter 3 of the Basin Plan sets forth water quality objectives to protect beneficial uses. The bacterial objectives in the Basin Plan are based on four bacterial indicators and include both geometric mean limits and single sample limits. The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine water to protect the water contact recreation beneficial use. These targets are the most appropriate indicators of public health risk in recreational waters. The Basin Plan objectives that serve as the numeric targets for this TMDL are:

Geometric Mean Limits

Total coliform density shall not exceed 1,000/100 ml.

Fecal coliform density shall not exceed 200/100 ml.

Enterococcus density shall not exceed 35/100 ml.

Single Sample Limits

Total coliform density shall not exceed 10,000/100 ml.

Fecal coliform density shall not exceed 400/100 ml.

Enterococcus density shall not exceed 104/100 ml.

Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-total coliform exceeds 0.1.

37. These objectives are generally based on acceptable health risk for marine recreational waters of 19 illnesses per 1,000 exposed individuals as set by the US EPA (US EPA, 1986). The targets apply throughout the year. The final compliance point for the targets is

the point at which the discharge initially mixes with the receiving water where there is a freshwater outlet (i.e., MS4 outfall or freshwater drainage) to the beach, or at ankle depth at beaches without a freshwater outlet, and at surface and depth throughout Avalon Bay.

38. Implementation of the above numeric targets is achieved using a 'reference system/anti-degradation approach' or strict application of the single sample objectives. As required by the Clean Water Act and Water Code, Basin Plans set forth the beneficial uses of waters of the state, water quality objectives to protect those uses, and an anti-degradation policy, collectively referred to as water quality standards. The Basin Plan also includes programs of implementation to achieve the water quality standards. This TMDL and its associated waste load allocations, which are part of this Order and may be incorporated into other relevant permits, are the vehicles for implementation of these standards.
39. The 'reference system/anti-degradation approach' means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within the Los Angeles Region, a certain number of daily exceedances of the single sample bacteria objectives are permitted in wet weather and during dry weather from November 1st to March 31st. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site and (2) there is no degradation of existing bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the single sample objectives. These implementation procedures may only be used within the context of a TMDL addressing discharges from municipal separate storm sewer systems (MS4s) and non-point source discharges. These implementation provisions do not apply to NPDES discharges other than MS4 discharges. The geometric mean targets may not be exceeded.
40. For the single sample targets, each existing monitoring site is assigned an allowable number of exceedance days for three time periods (1) summer dry-weather (April 1 to October 31), (2) winter dry-weather (November 1 to March 31), and (3) wet-weather (defined as days with 0.1 inch of rain or greater and the three days following the rain event.)

Single Sample Allowable Exceedances

	Allowable Exceedance Day* (Daily sampling)
Summer Dry Weather	0
Winter Dry Weather	9
Wet Weather	17

*The allowable exceedance day is defined as the number of days a location is allowed to exceed any of the single sample targets based on the observed exceedance rate of the reference beach, Leo Carrillo Beach, and the number of wet days during the 90th percentile storm year observed at Avalon School Meteorological Station. Over 63 years of precipitation data was available from the Avalon School Meteorological Station. A storm year is defined as the period from November 1st, typically the beginning of the wet season, through October 31st. See Appendix A for the Avalon School Rainfall Data Chart.

Source Analysis

41. Leaks from the sewage collection system are a significant source of elevated bacterial indicator densities to Avalon Beach during dry and wet weather. In addition, there are municipal separate storm sewer system (MS4) discharges located along Avalon's beaches that may be contributing to fecal bacteria pollution.
42. Based on the results of the studies conducted through the CBI grant, sewage contaminated shallow groundwater may contribute to high concentrations of FIB along the shoreline in Avalon Bay through two mechanisms: (1) the transport of shallow groundwater into the Bay by tidal exchange, and/or (2) by the addition of growth factors (organic carbon, nutrients, low salinity) that facilitate the growth of environmentally adapted strains of FIB in foreshore sands.

Linkage Analysis, Allocations and Margin of Safety

43. The data assessment and source analysis show that: (a) bacterial exceedences at Avalon Beach originate at the shoreline; (b) tidal mixing within the Bay is sufficient to dilute (within a couple of hours) any non-continuous source of pollutants; and (c) the likely significant source of bacteria at Avalon Beach is the sewage contaminated shallow groundwater.
44. The Regional Board finds that a TMDL for bacteria can be implemented by reducing the bacteria loaded to Avalon Beach from leaks in the sewage collection system and any contributions from the MS4. The Regional Board finds, based on the technical documentation, that a single regulatory action through a cease and desist order can be used to establish and implement the Bacteria TMDL.
45. Depending on the type of discharge, the City of Avalon is assigned waste load allocations (WLAs) expressed as either the number of daily or weekly sample days that may exceed the single sample targets identified under "Numeric Target" at a monitoring site or the bacterial density. Waste load allocations are expressed as either allowable exceedance days or bacterial density because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection.
46. For the WLAs expressed as allowable exceedance days, the allowable number of exceedance days for monitoring sites for each time period is based on the lesser of two criteria (1) exceedance days in the designated reference system and (2) exceedance days based on historical bacteriological water quality at the monitoring site. This ensures that shoreline bacteriological water quality is at least as good as that of a largely undeveloped system and that there is no degradation of existing shoreline bacteriological water quality.
47. For each monitoring site, allowable exceedance days of the single sample numeric targets are established for three time periods. These three periods are:
 - Summer dry weather (April 1 to October 31)
 - Winter dry weather (November 1 to March 31)
 - Wet weather days (defined as days of 0.1 inch of rain or more plus three days following the rain event).
48. The City of Avalon is the sole responsible jurisdiction. The City of Avalon is responsible for complying with WLAs at monitoring locations impacted by discharges of stormwater and

non-stormwater from the MS4 and its Publicly Owned Treatment Works (POTW) and collection system. The City's POTW discharges to the Pacific Ocean.

49. The WLAs assigned to discharge from the POTW is zero (0) allowable exceedances of the bacterial density limits in the receiving waters for all time periods.
50. The WLAs assigned to discharges of urban runoff and stormwater from the MS4 are as follows for each compliance monitoring point, based on daily sampling*:
 - (a) Zero (0) allowable exceedance days of the single sample numeric targets during summer dry weather
 - (b) Nine (9) allowable exceedance days of the single sample numeric targets during winter dry weather
 - (c) Seventeen (17) allowable exceedance days of the single sample numeric targets during wet weather

*Allowable exceedance days are scaled according to sampling frequency. If weekly sampling is conducted, one (1) allowable exceedance day is provided during winter dry weather, and three (3) allowable exceedance days are provided during wet weather throughout the year.
51. The waste load allocations for the geometric mean targets for both discharges from the POTW and the MS4 are zero (0) allowable exceedances of the geometric mean of the bacterial density for each fecal indicator bacteria, at each compliance monitoring point.
52. Since all stormwater and urban runoff to Avalon Beach is regulated as a point source, load allocations of zero (0) days of allowable exceedances for non-point sources are set in this TMDL for each time period. The load allocation for the geometric mean targets is also zero (0) exceedances of the geometric mean bacterial density.
53. A margin of safety has been implicitly included through several conservative assumptions, such as the assumption that no dilution takes place between the discharge and where the discharge initially mixes with the receiving water (the compliance point), and that bacterial degradation rates are not fast enough to affect bacteria densities in the receiving water.

Seasonal Variations and Critical Conditions

54. TMDLs must include consideration of critical conditions and seasonal factors. Seasonal variations are addressed by developing separate waste load allocations for urban runoff, stormwater and nonpoint source discharges for three time periods (summer dry-weather, winter dry-weather and wet-weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators.

There is currently no monitoring during the winter; though it is likely to be the critical condition based on beach monitoring at other beaches in the Los Angeles Region. The critical condition for bacteria loading is during wet weather, when historic monitoring data for the reference beach indicate greater exceedance probabilities of the single sample bacteria objectives than during dry weather. To more specifically identify a critical condition within wet weather, in order to set the allowable exceedance days, the 90th percentile storm year in terms of wet days is used as the reference year. Selecting the 90th percentile year avoids a situation where the reference system is frequently out of compliance. It is expected that because the City will be planning for the 'worst-case' scenario, there will be fewer exceedance days than the maximum allowed in drier years.

Implementation

55. This TMDL will be implemented by establishing a schedule in this Order.
56. The City of Avalon shall conduct daily or systematic weekly sampling at the initial point of mixing with the receiving water at all MS4 outfalls, at existing monitoring stations, and at other designated monitoring stations to determine compliance. The targets shall apply at existing or new monitoring sites, with samples taken at ankle depth. Samples collected at ankle depth shall be taken on an incoming wave. At locations where there is a freshwater outlet, during wet weather, samples should be taken as close as possible to the initial point of mixing with the receiving water, and no further away than 10 meters down current of the storm drain or outlet. At locations where there is a freshwater outlet, samples shall be taken when the freshwater outlet is flowing into the surf zone. If the number of exceedance days is greater than the allowable number of exceedance days, the City shall be out of compliance with the TMDL.
57. In addition, the City of Avalon may conduct a study to determine the relative bacterial loading from all sources, including anthropogenic and non-anthropogenic sources. Once this study is completed, the Regional Board may adjust the WLAs based on the rate of exceedance due to non-anthropogenic sources, if appropriate, based on the study.
58. This Order is an action taken for the protection of the environment and, as such, is exempt from the provisions of the California Environmental Quality Act in accordance with California Code of Regulations, title 14, section 15321.
59. Any person aggrieved by this action of the Regional Water Board may petition the State Water Board to review the action in accordance with Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at:
http://www.waterboards.ca.gov/public_notices/petitions/water_quality or will be provided upon request.

AUTHORITY – LEGAL REQUIREMENTS

60. Section 13301 of the California Water Code provides that:

“When a regional board finds that a discharge of waste is taking place, or threatening to take place, in violation of requirements or discharge prohibitions prescribed by the regional board or the state board, the board may issue an order to cease and desist and direct that those persons not complying with the requirements or discharge prohibitions (a) comply forthwith, (b) comply in accordance with a time schedule set by the board, or (c) in the event of a threatened violation, take appropriate remedial or preventive action. In the event of an existing or threatened violation of waste discharge requirements in the operation of a community sewer system, cease and desist orders may restrict or prohibit the volume, type, or concentration of waste that might be added to that system by dischargers who did

not discharge into the system prior to the issuance of the cease and desist order. Cease and desist orders may be issued directly by a board, after notice and hearing.”

61. This Order requires the Discharger to conduct monitoring and reporting pursuant to California Water Code section 13383, which provides that:

“(a) The state board or a regional board may establish monitoring, inspection, entry, reporting, and recordkeeping requirements, as authorized by Section 13160, 13376, or 13377 or by subdivisions (b) and (c) of this section, for any person who discharges, or proposes to discharge, to navigable waters, any person who introduces pollutants into a publicly owned treatment works, any person who owns or operates, or proposes to own or operate, a publicly owned treatment works or other treatment works treating domestic sewage, or any person who uses or disposes, or proposes to use or dispose, of sewage sludge.

(b) The state board or the regional boards may require any person subject to this section to establish and maintain monitoring equipment or methods, including, where appropriate, biological monitoring methods, sample effluent as prescribed, and provide other information as may be reasonably required.

(c) The state board or a regional board may inspect the facilities of any person subject to this section pursuant to the procedure set forth in subdivision (c) of Section 13267.”

IT IS HEREBY ORDERED, in accordance with Water Code §§ 13267, 13301 and 13383, that the Discharger shall cease and desist from discharging and threatening to discharge wastes, in violation of State and Regional Board orders and shall comply with the following provisions of this Order:

I. Operations and Maintenance (O&M) Program

1. **SSO Reduction Plan:** By June 30, 2012, the Discharger shall prepare an SSO Reduction Plan. The SSO Reduction Plan shall include: (1) an analysis of historical SSOs (location, cause, maintenance history, and available closed circuit television (CCTV) data); (2) review of existing maintenance activities and practices; and (3) recommendations for changes to sewer cleaning methods, tools, and schedules to achieve full compliance with Prohibitions C.1 and C.2 of the SSO WDR, which prohibit any SSO that results in a discharge of untreated or partially treated wastewater to waters of the United States, or creates a nuisance as defined in Water Code § 13050(m). By June 30, 2013, the Discharger shall commence implementation of the recommendations in the SSO Reduction Plan, and shall periodically review and revise the strategy implemented as appropriate and necessary to achieve full compliance with the SSO WDR. Such review and revision shall be reported in the Annual SSO Reports and may also be taken in conjunction and coordination with review and revision of the Discharger’s SSMP that is required in the SSO WDR and in Section VIII of this Order.
2. **SSO Reporting Timeframes:** The Discharger shall meet the reporting requirements outlined in the SSO MRP Amendment, including but not limited to reporting Category 1 and 2 SSOs to the Online SSO System as soon as possible but no later than 3 business days after the Discharger is made aware of the SSO (SSO MRP Amendment Provisions A.4 and 5).
3. **SSO Record Keeping:** The Discharger shall meet the record keeping requirements outlined in the SSO MRP Amendment, including but not limited to the following:

- (a) Maintain individual SSO records for a minimum of five years from the date of the SSO (SSO MRP Amendment Provision B.1);
 - (b) Make all records available for review upon State or Regional Board staff's request (SSO MRP Amendment Provision B.3); and
 - (c) Retain records of all SSOs, such as, but not limited to: service call records and complaint logs of calls received by the Discharger, SSO calls, SSO records, steps that have been taken and will be taken to prevent the SSO from recurring and a schedule to implement those steps, work orders, work completed, and a list and description of complaints from customers or others from the previous 5 years (SSO MRP Amendment Provision B.5).
4. SSO Training: The Discharger shall continue to provide training on a regular basis for staff in sanitary sewer system operations and maintenance, and require contractors to be appropriately trained.
 5. Computerized Maintenance Management System: By June 30, 2012, the Discharger shall provide documentation that a Computerized Maintenance Management System (CMMS) has been obtained either by the Discharger or by the Discharger's contract operator. The CMMS shall be used in conjunction with the Discharger's GIS database to track and make readily available to relevant Discharger's employees and contractors information concerning SSO history, sewer line cleaning, and other information necessary to plan system operation and maintenance and capital improvements. By June 30, 2012, the Discharger shall begin full use of the CMMS for SSO-related activities, including logging and tracking incoming SSO complaints, generating SSO-related work orders, and scheduling gravity, force main and pump station maintenance activities.
 6. System-Wide Cleaning Program: By June 30, 2012, the Discharger shall develop and commence implementation of a system-wide cleaning program for the gravity sewers in its collection system that details all cleaning activities deemed necessary to reduce or prevent future SSOs. The cleaning program shall include: (1) preventative cleaning of problem gravity sewer segments (SSO hot spots) including the lower laterals maintained by the Discharger, to prevent recurring SSOs; (2) an initial system-wide proactive cleaning of all gravity sewers within the next 3 years; (3) condition-based proactive cleaning of all gravity sewers with a cleaning cycle not to exceed 10 years for any specific gravity sewer; and (4) cleaning activities including visual and closed circuit television (CCTV) inspections to be scheduled and tracked via the CMMS by the Discharger.
 7. Root Control Program: By June 30, 2013, the Discharger shall develop and implement a root control program. The program shall be implemented as appropriate and necessary to achieve full compliance with the SSO WDR. The root control program shall utilize cleaning results and CCTV inspection data to identify gravity sewers with significant root intrusion and shall control root intrusion in those gravity sewers with significant levels of root intrusion using mechanical root removal and/or chemical root control.
 8. FOG Control Program: By June 30, 2013, the Discharger shall develop and implement a Fats, Oil and Grease (FOG) Blockage Control Program. The program shall be implemented as appropriate and necessary to achieve full compliance with the SSO WDR.

The FOG Control Program may use a combination of sewer cleaning, source control, and/or public education/outreach.

9. Illicit Discharges Elimination Program: The Discharger shall develop and implement a program to detect and eliminate illicit discharges. By June 30, 2013, the Discharger shall complete and document results of smoke testing of the portions of its collections system identified in the System Evaluation and Capacity Assurance Plan (discussed in greater detail below in Paragraph 12) as having the most significant Inflow & Infiltration (I&I) and as being most appropriate for smoke testing. The Discharger shall require private property owners to eliminate illegal drainage connections or defective laterals and will eliminate any inappropriate cross-connections in Discharger owned facilities identified during smoke testing.

By June 30, 2013, the Discharger shall adopt an ordinance, or amend existing ordinances, to provide the Discharger with the requisite authority to eliminate illicit discharges and shall take reasonable enforcement efforts under said ordinance(s) to eliminate identified illicit discharges. The Discharger shall take reasonable enforcement actions against any violators and maintain records to document any such enforcement actions.

10. Condition Assessment: By June 30, 2013, the Discharger shall complete a condition assessment of 100% of its collection system including force mains. The condition assessment shall be based on CCTV inspection and employ a system for ranking the condition of sewer pipes that meets National Association of Sewer Service Companies (NASCO), or other industry-accepted standards. The Discharger shall use the results of the CCTV inspection and condition assessment to identify and prioritize collection system deficiencies requiring repair, rehabilitation and replacement and shall incorporate identified sewer repair, rehabilitation and replacement projects into the Capital Improvement Plan (CIP) (defined below) based on the ranking and resulting prioritization. The Discharger shall develop and implement a schedule for re-inspection of all gravity sewer lines based on the condition of such lines.

Completion of the condition assessment by June 30, 2013 requires that the Discharger attempt CCTV inspection and ranking of every segment of the collection system. For segments where full segment inspection is precluded, the Discharger shall develop a plan and schedule to repair or replace and fully re-inspect each blocked segment and shall implement the plan in accordance with the time frames set forth in the schedule.

11. Overflow Emergency Response Plan: By June 30, 2012, the Discharger shall develop and implement an overflow emergency response plan.

II. System Evaluation and Capacity Assurance Plan

12. By June 30, 2013, the Discharger shall complete an updated System Evaluation and Capacity Assurance Plan (SECAP). The SECAP shall be developed in accordance with Provision D.13(viii) of the SSO WDR and comply with the following requirements:
 - (a) The SECAP shall evaluate the performance of the Discharger's collection system under existing and future dry weather and wet weather flows.
 - (b) The SECAP shall identify basins within the Discharger's collection system with the most extensive I&I.

- (c) The SECAP shall identify any bottlenecks in the collection system which lack sufficient capacity to convey sewage flows through the collection system and to the Avalon WTF during peak wet weather conditions. The SECAP shall identify any areas where increases in pipeline size, I&I reduction programs, and increases and redundancy in pumping capacity are needed using commercially available hydraulic computer modeling designed specifically to evaluate collection system hydraulic flow and capacity.
- (d) The SECAP shall include a hydraulic analysis that includes calculation for all sewer lines and all pump stations of estimated dry weather wastewater flow and estimated peak wet weather wastewater flow. Findings of the hydraulic analysis shall be presented on a GIS system map or other database.
- (e) The SECAP shall identify projects to eliminate any identified capacity deficiencies and to reduce I&I.
- (f) The SECAP must be reviewed and approved by a professional engineer registered in the State of California.

III. Capital Improvement Plan

- 13. The Discharger shall prepare and implement a Capital Improvement Plan (CIP) based to the extent possible on the results of the condition assessment conducted pursuant to Paragraph 10 of the Order and the SECAP, required above in Paragraph 12. The CIP shall be developed in accordance with Provisions D.13(iv)(c) of the SSO WDR.
 - (a) By June 30, 2013, the Discharger shall complete a CIP that includes: (1) projects identified in the SECAP to address capacity deficiencies; (2) projects identified in the SECAP to reduce I&I; and (3) repair, rehabilitation or replacement projects identified to address collection system deficiencies detected during the collection system condition assessment. The CIP shall include a schedule for implementing the projects contained in the CIP.
 - (b) The Discharger shall implement the CIP in accordance with the schedule contained therein.
 - (c) The Discharger shall update the schedules in the CIP as project implementation occurs and priorities change to meet established goals and to ensure proper management of infrastructure assets. The Discharger shall provide such updates as appropriate in its Annual SSO Report.
 - (d) The Discharger shall annually post on its website a CIP tracking report that indicates the status of all projects listed in the CIP.

IV. Financial Plan

- 14. By June 30, 2013, and annually thereafter, the Discharger shall develop a 10-year Financial Plan and by December 31, 2013, a 20 year Financial Plan. Each shall evaluate: (1) the costs of implementing the tasks required by the SSO WDR and this Order; (2) current and projected future resources available to implement such tasks; and (3) whether

the Discharger's current wastewater rates need to be increased to ensure adequate financial resources to implement such tasks. The Discharger shall provide periodic updates and/or amendments to these financial plans as necessary to achieve the tasks required by the SSO WDR and this Order.

V. Private Sewer Service Lateral Program

15. If the SECAP concludes that the Discharger's collection system does not have adequate capacity and identifies repair or replacement of private laterals as a cost-effective measure for addressing capacity-related problems, the Discharger shall develop and implement a private sewer lateral replacement program to reduce the addition of I&I from defective private sewer laterals. By December 31, 2013, the Discharger shall present to its city council for adoption an ordinance requiring: (1) testing of private sewer laterals (portion of a lateral from the building foundation to the property line, or in some cases extending to the sewer main line that the private property owner is responsible for maintaining) upon sale of property, a major remodel (>\$75,000), and any remodel that adds a bathroom or significant plumbing fixtures; (2) replacement of defective private sewer laterals by a specified deadline; and (3) evidence from landowner that defective private sewer laterals has been repaired, rehabilitated, or replaced as condition to closing or the Discharger's sign-off on a permit.

VI. Training

16. By June 30, 2012, the Discharger shall complete an assessment of the competency of its collection system staff and develop a plan to provide training to collection system operation and maintenance (O&M) personnel. The training assessment and program shall include but not be limited to the following:
 - (a) The Discharger shall assess all collection system O&M personnel (from line staff through supervisor) to determine current abilities and compare against the actual technical skill sets needed to competently perform collection system O&M duties. The assessment shall be based on the personnel's current needs as compared to what the personnel can actually do and is expected to do per the job description.
 - (b) Based on the results of the assessment, the Discharger shall identify deficiencies and make the appropriate adjustments to job descriptions and/or training plan for each collection system O&M personnel.
 - (c) No later than December 31, 2012, the Discharger shall commence implementation of the training plan developed for each O&M personnel.
 - (d) Training provided to O&M personnel shall include but not be limited to classroom, drills/practice of SSO response events including procedures for properly notifying, documenting and reporting all SSOs to comply with the SSO WDR and SSO MRP Amendment, including but not limited to training to ensure proper documentation and reporting of SSO start time, ongoing SSO spill rate, SSO end time, estimation of SSO volume and amount recovered, and completion of proper documentation of all work activities related to SSO response and corrective action taken, workshops, online courses and self-paced courses.

- (e) The Discharger shall report on the progress of its training program in the Annual SSO Reports required by Paragraph 24 of this Order for calendar years 2012 through 2015, at a minimum.

VII. SSMP Certification, Communication and Audit

- 17. By June 30, 2012, a copy of the Discharger's current SSMP and any future revisions to the SSMP must be publicly available in the Discharger's office and posted in the Discharger's internet website.
- 18. Beginning June 30, 2012, the Discharger shall communicate at a minimum on an annual basis with the public by placing information on the Discharger's website about the development, implementation and performance, and costs of its SSMP. The communication must provide the public the opportunity to provide input and comments to the Discharger as the SSMP is revised and implemented. The Discharger shall document its communication program in its SSMP.
- 19. By June 30, 2014, the Discharger shall revise and re-certify the SECAP element of the SSMP into the California Integrated Water Quality System (CIWQS).
- 20. By June 30, 2013, the Discharger shall revise and re-certify the Operation and Maintenance Program element of the SSMP in CIWQS.
- 21. By June 30, 2014, the Discharger shall present the final revised SSMP to its City Council for approval at one or more public meetings. Within thirty (30) days after the Discharger's City Council approves the final revised SSMP, the SSMP must be publicly available in the Discharger's office and posted on the Discharger's internet website.
- 22. By June 30, 2014, and every five (5) years thereafter, the Discharger shall review, and update as necessary, its SSMP in accordance with Provision D.14 of the SSO WDR. Each update shall be so noted in the SSO Annual Report for that calendar year.
- 23. By March 15, 2013, and every March 15th of each year thereafter, the Discharger shall conduct an annual audit of its SSMP covering the previous calendar year and submit an SSMP Audit Report to the Regional Board. During the Audit, the Discharger shall, at a minimum, review the following information:
 - (a) Collection System Technical Information (SSO "hot spots", number of SSOs, number of preventable SSOs);
 - (b) Financial Information to ensure the collection system has the financial resources to properly carry-out all SSMP elements;
 - (c) Sewer Maintenance Procedures; and
 - (d) Measurable Performance Measures.

The Discharger shall initiate/direct corrective actions to be taken whenever deficiencies are noted and SSMP improvements are needed. If/when significant changes are made to the SSMP; the Discharger shall update the SSMP in accordance with Provision D.14 of the SSO WDR.

24. By March 15th of each year, the Discharger shall submit an Annual SSO Report covering the previous calendar year. The Annual SSO Report shall: (1) summarize number, volume, general location and causes of SSOs during the reporting period; (2) summarize the sewer system cleaning statistics for the entire system and for hot spots (i.e. number of miles cleaned per year and cleaning frequency); (3) perform a trend analysis showing a comparison of data for the current reporting period with previous years; and (4) provide a status of SSMP development. In addition, starting March 15, 2014, the Annual SSO Report shall include additional items so the Regional Board can evaluate ongoing compliance with this CDO. The additional information includes: (5) based on trend analysis conducted, identify areas of concern in the collection system; (6) provide a list of actions to be taken over the next calendar year to address areas needing improvement including a list of needed capital projects if applicable; (7) provide a list of any capital improvement projects completed during the reporting period to address areas of concern previously identified; (8) document all training received by Discharger's employees during that reporting period in accordance with the Discharger's Training Program.

VIII. Consequences of Non-Compliance

25. If the Discharger fails to comply with the provisions of this Order the Regional Board can take additional enforcement action, which may include the imposition of administrative civil liability pursuant to Water Code sections 13331, 13350 and/or 13268, or referral to the Attorney General. The Executive Officer is authorized herein to refer violations of this Order to the Attorney General to take such legal actions as he or she may deem appropriate.

IX. Total Maximum Daily Load

26. The City of Avalon is required to achieve the following milestones and targets for WLAs assigned to MS4 discharges and nonpoint source discharges: By April 1, 2016, there shall be no allowable exceedances at any locations during summer dry weather (April 1 to October 31) By November 1, 2016, compliance with the allowable number of winter dry-weather exceedance days shall be achieved (November 1 to March 31). By November 1, 2017, compliance with the allowable number of wet-weather exceedance days and geometric mean targets must be achieved.
27. The City of Avalon is required to achieve the following milestones and targets for WLAs assigned to the POTW and its collection system: (a) For discharges from the POTW, there shall be no exceedances of the numeric targets set forth above upon the effective date of this Order. (b) For discharges from the collection system, by June 30, 2015, there shall be no discharge resulting in detectable levels of the fecal indicator bacteria identified as numeric targets as set forth above.
28. The City of Avalon shall submit a report for the Executive Officer's approval by November 30, 2012 describing how it intends to comply with the WLAs. The compliance plan shall include implementation methods, and proposed milestones (i.e., actions and dates) to track progress toward achieving the WLAs per the schedule identified herein.
29. The City of Avalon shall implement the approved compliance plan within 90 days of the Executive Officer approving it.

30. To determine compliance with the WLAs assigned to MS4 and nonpoint source discharges, the City of Avalon must conduct daily or systematic weekly sampling year-round at the initial point of mixing with the receiving water at all MS4 outfalls, at existing monitoring stations, and at other designated monitoring stations to determine compliance. The targets and WLAs apply at existing and new monitoring sites, with samples taken at ankle depth. Samples collected at ankle depth shall be taken on an incoming wave. At locations where there is a freshwater outlet, during wet weather, samples should be taken as close as possible to the initial point of mixing with the receiving water, and no further away than 10 meters down current of the storm drain or outlet. At locations where there is a freshwater outlet, samples shall be taken when the freshwater outlet is flowing into the surf zone. If the number of exceedance days is greater than the allowable number of exceedance days, the City shall be considered out of compliance with the WLAs and/or LAs.

The water quality program shall include at least six sites:

DPH 117 Avalon Beach 100 feet east of the Green Pleasure Pier, Avalon
DPH 118 Avalon Beach 50 feet east of the Green Pleasure Pier, Avalon
DPH 119 Avalon Beach 50 feet west of the Green Pleasure Pier, Avalon
DPH 120 Avalon Beach 100 feet west of the Green Pleasure Pier, Avalon
DPH 121 Avalon Beach East of the Casino Arch at the steps, Avalon
Pebble Beach site across from the pump station

31. If a sampling site is found to be out of compliance with a single sample bacteria objective, the City of Avalon shall sample daily, or as approved by the Executive Officer in the compliance plan, at the sampling site until the samples meet water quality objectives.
32. Total coliform, fecal coliform (*E. coli* may be substituted), and enterococcus must be analyzed by EPA-approved methods including colorimetric methods (e.g. IDEXX).
33. The County of Los Angeles currently conducts monitoring at five sites. The City of Avalon need not repeat sampling that the County already conducts as long as the monitoring is consistent with the requirements of this Order, but the City of Avalon shall report all water quality testing comprehensively.
34. The City of Avalon shall conduct a study to determine the relative bacterial loading from anthropogenic and non-anthropogenic sources, including but not limited to storm drains, boats, birds, the pier, and other sources. The City of Avalon shall submit a proposed schedule and study workplan to the Executive Officer for review prior to commencing the study. Once this study is completed, the Regional Board may adjust the WLAs or LAs, if appropriate, based on the study.
35. The City of Avalon shall conduct a study to determine residence time of indicator bacteria populations in shallow groundwater underlying downtown Avalon and potential methods to reduce the bacteria populations. The City of Avalon shall submit a proposed schedule and study workplan to the Executive Officer for review prior to commencing the study. Once this study is completed, the Regional Board may, if necessary, adjust implementation schedule dates to allow time for implementation actions to address the residual bacterial populations or natural attenuation of the bacterial populations.
36. In addition, the epidemiological study of three beaches: Doheny Beach; Surfrider Beach; and Avalon Beach, or other site-specific study, including but not limited to, a study to

establish a Santa Catalina Island-specific reference beach, may also be used by the Regional Board in the future, to revise targets or allocations.

X. Reopener Provision

37. This Order may be reopened and modified by the Executive Officer to specify the method of determining compliance with the geometric mean or to specify an alternate reference beach as a result of future Basin Plan Amendments.

XI. Reservation of Enforcement Authority and Discretion

38. Nothing in this Order is intended or shall be construed to limit or preclude the Regional Board from exercising its authority under any statute, regulation, ordinance, or other law, including but not limited to, the authority to bring enforcement against the Discharger in response to any SSO event regardless of Discharger's compliance with this Order.

XII. Regulatory Changes

39. Nothing in this Order shall excuse the Discharger from meeting any more stringent requirements that may be imposed hereafter by changes in applicable and legally binding legislation, regulations, or generally applicable state-wide or regional requirements.

I, Samuel Unger, P.E., Executive Officer, do hereby certify that the foregoing is full, true, and correct copy of an order adopted by the Regional Board, on April 5, 2012.



Samuel Unger, P.E.
Executive Officer

Appendix A—Avalon Rain Data

Historical Rainfall Data at Avalon School Meteorological Station from 1947 to 2009

Storm Year ¹	Rain Days ²	Percentile	Storm Year ¹	Wet Days ³	Percentile	Storm Year ¹	Rain (in)	Percentile	Storm Year ¹	Dry Days ⁴	Percentile
1983	39	98.3%	1998	110	100.0%	1978	29.5	100.0%	1968	352	100.0%
1998	39	98.3%	1983	98	98.3%	1983	26.6	98.3%	1972	346	98.3%
1978	36	96.7%	1978	82	96.7%	1980	23.91	96.7%	1961	342	96.7%
1993	34	95.0%	1993	81	95.0%	1995	22.7	95.0%	1959	337	93.4%
1952	31	91.8%	2005	79	93.4%	2005	21.45	93.4%	1970	337	93.4%
2005	31	91.8%	1952	78	91.8%	1958	20.9	91.8%	1977	329	91.8%
1995	30	90.1%	1999	77	90.1%	1998	20.87	90.1%	1948	327	86.8%
1958	28	86.8%	1957	76	88.5%	1993	19.8	88.5%	1964	327	86.8%
1992	28	86.8%	1995	74	86.8%	1969	19.41	86.8%	1971	327	86.8%
1957	26	83.6%	1973	73	85.2%	1952	18.76	85.2%	1960	325	80.3%
1973	26	83.6%	1958	72	83.6%	1986	17.26	83.6%	1967	325	80.3%
1979	25	81.9%	1979	68	80.3%	2001	16.77	81.9%	1988	325	80.3%
1962	23	72.1%	1985	68	80.3%	1966	16.64	80.3%	1990	325	80.3%
1980	23	72.1%	1992	67	78.6%	1973	16.04	78.6%	1954	324	78.6%
1982	23	72.1%	1955	65	75.4%	1962	15.45	77.0%	1966	323	73.7%
1986	23	72.1%	1982	65	75.4%	1975	15.11	75.4%	1997	323	73.7%
1996	23	72.1%	1949	62	73.7%	2003	14.81	73.7%	2008	323	73.7%
1999	23	72.1%	1965	61	72.1%	1979	14.46	72.1%	1991	322	70.4%
1949	22	70.4%	2003	59	70.4%	1992	14.23	70.4%	2004	322	70.4%
1985	21	65.5%	1986	57	68.8%	1967	14.22	68.8%	1956	321	63.9%
2001	21	65.5%	2000	56	67.2%	1960	11.88	67.2%	1963	321	63.9%
2003	21	65.5%	1980	55	62.2%	1984	11.77	65.5%	2006	321	63.9%
1974	20	62.2%	1994	55	62.2%	1954	11.76	63.9%	2007	321	63.9%
1976	20	62.2%	1996	55	62.2%	1956	11.64	62.2%	1969	320	60.6%
1955	19	59.0%	1976	54	60.6%	1957	11.63	60.6%	1981	320	60.6%
2000	19	59.0%	1962	53	57.3%	1997	11.61	59.0%	1950	319	59.0%
1956	18	57.3%	1974	53	57.3%	1982	11.5	57.3%	1951	316	55.7%
1954	17	49.1%	1953	52	52.4%	1994	10.58	55.7%	1989	316	55.7%
1965	17	49.1%	1987	52	52.4%	1955	10.55	54.0%	1984	315	54.0%
1969	17	49.1%	2001	52	52.4%	1974	10.47	52.4%	1975	314	50.8%
1975	17	49.1%	1975	51	47.5%	1965	10.3	50.8%	2002	314	50.8%
1984	17	49.1%	1984	51	47.5%	1971	9.92	49.1%	1953	313	45.9%
1951	16	39.3%	2002	51	47.5%	1985	9.77	47.5%	1987	313	45.9%
1953	16	39.3%	1951	49	44.2%	1991	9.59	45.9%	2001	313	45.9%
1991	16	39.3%	1989	49	44.2%	1950	9.54	44.2%	1962	312	40.9%
1994	16	39.3%	1950	47	42.6%	1953	9.4	42.6%	1974	312	40.9%
2004	16	39.3%	1956	45	37.7%	2008	9.34	40.9%	1976	312	40.9%
2008	16	39.3%	1969	45	37.7%	1996	9.33	39.3%	1980	311	37.7%
1950	15	29.5%	1981	45	37.7%	1988	9.32	37.7%	1996	311	37.7%
1981	15	29.5%	1963	44	31.1%	2009	9.3	36.0%	1994	310	34.4%
1987	15	29.5%	2004	44	31.1%	1968	9.21	34.4%	2000	310	34.4%
1997	15	29.5%	2006	44	31.1%	2004	9.02	32.7%	1986	308	32.7%
2002	15	29.5%	2007	44	31.1%	1989	8.78	31.1%	2003	306	31.1%
2006	15	29.5%	1991	43	27.8%	2000	8.7	29.5%	1965	304	29.5%
1948	14	22.9%	2008	43	27.8%	1981	8.26	27.8%	1949	303	27.8%
1967	14	22.9%	1966	42	24.5%	1977	8.12	26.2%	1955	300	24.5%
1988	14	22.9%	1997	42	24.5%	1951	8.01	24.5%	1982	300	24.5%
1989	14	22.9%	1954	41	19.6%	1963	8	22.9%	1992	299	22.9%
1966	13	18.0%	1960	41	19.6%	1976	7.98	21.3%	1979	297	19.6%
1971	13	18.0%	1988	41	19.6%	1948	7.38	19.6%	1985	297	19.6%
1990	13	18.0%	1967	40	16.3%	1949	6.61	18.0%	1958	293	18.0%
1960	12	11.4%	1990	40	16.3%	2006	6.5	16.3%	1973	292	16.3%
1977	12	11.4%	1948	39	11.4%	1959	6.47	14.7%	1995	291	14.7%
2007	12	11.4%	1964	39	11.4%	1999	6.41	13.1%	1957	289	13.1%
2009	12	11.4%	2009	39	11.4%	1964	6.12	11.4%	1952	288	9.8%
1963	11	8.1%	1971	38	9.8%	1970	6	9.8%	1999	288	9.8%
1964	11	8.1%	1977	36	8.1%	1987	5.76	8.1%	2005	286	8.1%
1959	10	6.5%	1959	28	4.9%	2007	5.01	6.5%	1993	284	6.5%
1970	8	4.9%	1970	28	4.9%	2002	4.9	4.9%	1978	283	4.9%
1961	7	3.2%	1961	23	3.2%	1990	4.8	3.2%	1983	267	3.2%
1968	5	0.0%	1972	20	1.6%	1972	4.18	1.6%	1998	255	1.6%
1972	5	0.0%	1968	14	.0%	1961	3.02	.0%	2009	203	0.0%

¹ A storm year is defined as November 1 to October 31 to be consistent with the periods specified in AB411.

² A rain day is defined as a day with a 0.1" of rain or more.

³ A wet day is defined as a day with a 0.1" of rain or more plus the 3 days following the rain event.

⁴ A dry day is defined as a non-wet day.