

**Final Report
Santa Monica Canyon Low Flow Diversion**

INTRODUCTION

Background

In May 1996, the Santa Monica Bay Restoration Project released the findings of an epidemiological study that examined the adverse impact of swimming near storm drains¹. The study found positive associations between adverse health effects and proximity to storm drains and also between adverse health effects and presence of enteric viruses or high bacterial indicators. Santa Monica Canyon was one of the three storm drains selected for this epidemiological study (Figure 4-1). The study concluded that there is an increased risk of a relatively broad range of symptoms caused by swimming in ocean water at beaches covered in the study, particularly at areas close to the storm drains where indicator densities increase. Therefore, results demonstrated that people swimming in ocean water near storm drain outlets have an increased risk of contracting certain illnesses.

Following the release of this study, The City Los Angeles (City) assessed the need to implement a low-flow diversion program to re-route the flow from the major storm drains into Santa Monica Bay to the sewer. As part of this effort the water quality near the Santa Monica Canyon Storm drain outlet was observed and there were occasional exceedances of bacteriological standards. The City of Los Angeles conducted a study to examine the sources and evaluate alternative solutions.

A number of alternatives were investigated including diverting dry weather runoff to the sewer, chemical treatment (i.e., chlorine), ozone treatment, and ultraviolet treatment. After considering each alternative, diverting to the sewer system was selected because it is a proven effective method, and is relatively low in construction cost. It is also the best option to remove significant amount of bacterial pollutants from the storm drain runoff, improve the water quality of Santa Monica Bay, and meet the requirements of the recently adopted Santa Monica Bay Bacteria TMDL for Dry Weather. The diverted flow would be discharged to the sewer and eventually treated at the Hyperion Treatment Plant. Construction of the diversion facility began in late 2002 and was completed in December 2002. Operation of the facility commenced in April 2003.

Facility Description

The storm drain discharges into Santa Monica Bay across Will Rogers State Beach in an open concrete lined channel running between West Channel Road and Entrada Drive (Figure 4-2). Its watershed covers an area of 10,147 acres; 98% is within the City of Los Angeles and the remaining is within the City of Santa Monica. The purpose of this project was to divert dry weather runoff from the storm drain channel before discharging into the Santa Monica Bay.

The scope of work consisted of the construction and operation of a low flow diversion facility, a proven effective control method and technology that will prevent all pollutants

¹ Santa Monica Bay Restoration Project. 1996. An Epidemiological Study of Possible Adverse Health Effects of Swimming in Santa Monica Bay.

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from the storm drain system from flowing into the Santa Monica Bay during dry weather seasons. The facility is located on West Channel Road, near the intersection with Short Street.

Flow is diverted from the storm drain channel via a concrete berm constructed along the channel floor. Diverted flow first enters a trash well for pre-screening of trash and other floatables, then travels to the pump well. At the pump well, flow is pumped to the sanitary sewer, which in turn is conveyed to the Hyperion Treatment Plant. The diversion structure includes a trash well to collect trash and debris, a pump well for pumping out diverted flow, a concrete valve box for controlling flow directions and an instrumentation panel for control switches. A sluice gate is included in the trash well to control flow from the drain during maintenance. System controls are set to shut the entire system down on high and low water levels in the pump well (Figures 4-3 & 4-4).

PROJECT IMPLEMENTATION

Construction of the diversion facility began in late 2002 and final closeout was completed in June 2003. The table below lists deliverables previously submitted, followed by a discussion of each of the project tasks:

| Task | Deliverable by Subtask # | Date Submitted |
|---|---|-----------------------|
| Task 1. Project Management | | |
| Subtask 1.2 | Quarterly Progress Report | 01/10/04 |
| Subtask 1.5 | Contract Summary Form | 07/10/02 |
| Subtask 1.6 | Subcontract Documentation | 07/10/02 |
| Subtask 1.7 | Project Survey Form | 01/10/04 |
| Task 2. State and Local Permitting | | |
| Subtask 2.1 | CEQA Documentation | 12/01/01 |
| Subtask 2.2 | Secure Environmental Clearances and Permits | 04/10/03 |
| Task 3. Quality Assurance Project Plan | | |
| Subtask 3.1 | QAPP | 1/10/03 |
| Task 4. Project Engineering | | |
| Subtask 4.1 | Final Plans and Specifications | 10/10/01 |
| Subtask 4.2 | Award Board Report | 07/10/02 |
| Task 5. Project Implementation | | |
| Subtask 5.1 | Project Construction | 12/30/02 |
| Subtask 5.2 | Start-Up | 04/15/03 |
| Subtask 5.3 | Construction Management | 04/15/03 |
| Task 6. Reporting | | |
| Subtask 6.1 | Monitoring and Reporting Plan | 01/10/04 |
| Subtask 6.2 | Draft Final Report | 01/10/04 |
| Subtask 6.3 | Final Report | 04/10/04 |

Task 1 – Project Management and Administration

Subtask 6.3

This project's preliminary engineering and design work were completed prior to contract execution between the City of Los Angeles and the State. For the most part, reporting activities focused on construction activities and project close out. The project team, consisting of project engineers, project management, and construction management, met on a monthly basis to discuss work progress and identify and resolve any potential delays in project schedule. Completion of the project was slightly delayed due to a minor delay in the receipt of the California Coastal Commission Permit, which required additional mitigation requirements from the Department of Fish & Game (DFG) as part of permit requirements.

Task 2 – State and Local Permitting

The project received CEQA Exemption on April 16, 2001. Following some minor delays (as explained above), this project finally received the CCC Permit on October 16, 2002.

Task 3 – Quality Assurance Project Plan

The City of Los Angeles, on January 10, 2003, submitted to the SWRCB the Quality Assurance Project Plan (QAPP). The QAPP discussed the monitoring process and sampling procedures for the project once the low flow diversion facility comes on-line. Included in the QAPP were the sampling protocols, the ELAP certified lab where the samples were analyzed, and frequency of sampling.

Task 4 – Project Engineering

The final plans and specifications were submitted to the SWRCB on October 10, 2001. The low flow diversion facility is designed to diverted dry weather urban runoff from the Santa Monica Canyon storm drain system into the sewer for subsequent treatment at the Hyperion Treatment Plant located in Marina del Rey. The diversion facility is designed to divert a maximum flow of 3.5 million gallons per day. During the dry weather season from April 2003 to October 2003, well over 160 million gallons of highly polluted urban runoff have been diverted for treatment that would otherwise have discharged into the Santa Monica Bay.

Task 5 – Project Implementation

Construction of the low flow diversion facility was essentially completed in December 2002. The facility has been in operation since April 2003 without problems.

Task 6 – Draft and Final Report

This draft report was submitted in January 2004. This report is the last task of the project.

RESULTS

Pollutant Load Removal

The diversion facility has been in operation since April 2003 and removed well over 160 million gallons of runoff from the Santa Monica Canyon storm drain during its first year in operation. Samples were collected on a monthly basis following start up of the facility. The table below quantify the pollutant loading for each constituent.

| MONTH | Flow gallons | Ni (lbs) | Pb (lbs) | Cu (lbs) | Zn (lbs) | E. Coli (Count) | Enterococcus (count) | Total Coliforms (count) |
|-----------|--------------|----------|----------|----------|----------|-----------------|----------------------|-------------------------|
| May | 19,003,680 | 0.476 | 2.064 | 7.939 | 9.368 | 9.4E+11 | 3.9E+11 | 1.6E+13 |
| June | 31,673,160 | 1.588 | 3.440 | 3.705 | 15.085 | 7.4E+12 | 1.6E+12 | 4.7E+13 |
| July | 34,367,760 | 1.149 | 3.733 | 3.446 | 7.466 | 1.4E+12 | 1.0E+12 | 2.3E+13 |
| August | 30,803,680 | <0.489 | 3.346 | 25.994 | 12.868 | 1.1E+13 | 1.4E+13 | >2.8E+13 |
| September | 32,281,200 | 1.349 | 3.506 | 15.104 | 10.789 | 5.6E+12 | 1.0E+13 | 2.9E+14 |
| October | 16,140,600 | 0.447 | 1.461 | 5.237 | 5.215 | 2.3E+12 | 2.3E+12 | 3.9E+13 |
| Total | 164,272,180 | <5.456 | 17.551 | 61.426 | 60.791 | 2.9E+13 | 2.9E+13 | >4.4E+13 |

Based on this data, the Santa Monica Canyon Low Flow Diversion Facility has remove significant bacterial discharges from Santa Monica Bay. During the first dry weather sampling period, the facility removed over 29 trillion of fecal coliform bacteria and over 40 trillion total coliform bacteria.

Water quality samples were collected at the pump well of the facility. Because the entire flow gets diverted, there is no effluent flow to collect samples. Rather, the performance of the system is evaluated through mass emission quantification, by multiplying influent concentration with the amount of flow diverted, as shown above.

Shoreline Water Quality

The City of Los Angeles, Environmental Division (EMD) conducts daily sampling of total coliform, and fecal coliform (or E. Coli) and weekly sampling of Enterococcus at shoreline near the Santa Monica Storm Drain outlet. To evaluate the performance of the low flow diversion facility, the 2002 and 2003 water quality sampling results are tabulated below for comparison.

Monthly Average

| Month | Fecal Coliform/E. Coli* | | Enterococcus | | Total Coliform* | |
|-----------|-------------------------|------|--------------|------|-----------------|-------|
| | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 |
| May | 58 | 80 | 40 | 27 | >292 | >1260 |
| June | 138 | 33 | 276 | 25 | >526 | 278 |
| July | 104 | 17 | 56 | 10 | >299 | 42 |
| August | 150 | 56 | 199 | 31 | >305 | 81 |
| September | 76 | 16 | 19 | 50 | >191 | 66 |
| October | 90 | 62 | 53 | 13 | >618 | 98 |

*There was a change in methodology after 12/02/02 to the Chromogenic Substrate method, which tested for E. Coli (instead of fecal coliform) and for total coliform. This data is reported as MPN/100mL rather than CFU/100mL.

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The data above demonstrates a marked improvement in the bacterial levels with respect to all three parameters. Furthermore it is observed that for 2003 there are no exceedances of the AB 411 standards. The AB-411 standards require that a single sample shall not exceed 10,000 total coliform bacteria per 100-mL, or 400 fecal coliform bacteria per 100-mL, or 104 enterococcus bacteria per 100-mL, or 1,000 total coliform bacteria per 100-mL, if the ratio of fecal/total coliform bacteria exceeds 0.1.

Water quality assessment of the Bay can also be determined by looking at the Beach Report Card (BRC) issued by Heal the Bay. During the 2002 dry weather, Will Rogers State Beach at the shoreline at the outlet of the Santa Monica Canyon storm drain received a grade of F. During the summer of 2003, following start up and operation of the diversion facility, this same reach received a B grade. The grading system used by Heal the Bay is based on the AB-411 standards. Additional information regarding the BRC rating can be found at Heal the Bay website at www.healthebay.org.

In May, 2001, prior to the construction of the low-flow diversion, a sewage spill resulted in the closure of the beach. Following the installation of the low flow diversion, there has not been any beach closure. A warning sign placed on the storm drain outlet cautions from swimming close to the storm drain outlet. The sign has remained to safeguard against occasional overflows for the period that the low-flow diversion is not operating.

CONCLUSION

The diversion facility has been in operation since April 2003 and has removed over 29 trillion of fecal coliform bacteria and over 40 trillion total coliform bacteria. This has resulted in an upgrade from an F to a B in Heal the Bay's BRC. Additionally, sampling data shows a year-over-year improvement of water quality during the dry season when the facility is in operation.

Based on the sampling results and the amount of flow diverted, the diversion facility proves to be highly effective in reducing bacterial pollution discharges to Santa Monica Bay. This project has proven successful in preventing urban generated pollutants from discharging into local receiving waterbodies, thereby reducing health risk to swimmers and improving the water quality. The low flow diversion facility has shown to be a viable management measure in reducing non-point source pollution.

Diversion can completely stop the flow of polluted urban runoff from reaching the ocean or other receiving water body during dry weather. This, in essence, can be looked at as 100% treatment. The same cannot be said for a conventional "treatment" process. Furthermore, the facility is designed and constructed to allow diversion outside the AB 411 season, i.e., divert low flow year-round except during rain events. Currently, the facility is operating only during the summer months, but the City is presently pursuing EPA approval, as well as addressing other regulatory, technical and contractual issues for year round diversion of dry weather flow.

Fortunately, there have been no recent beach closure postings. However, in 2001 a sewage spill in May caused the closing of this beach for the months of May and June, and subsequent months were receiving low grades in Heal the Bay's BRC. An advantage to diversions is that they can potentially catch a sewer spill that is discharged into an upstream portion of the storm drain and divert it back into the sewer system

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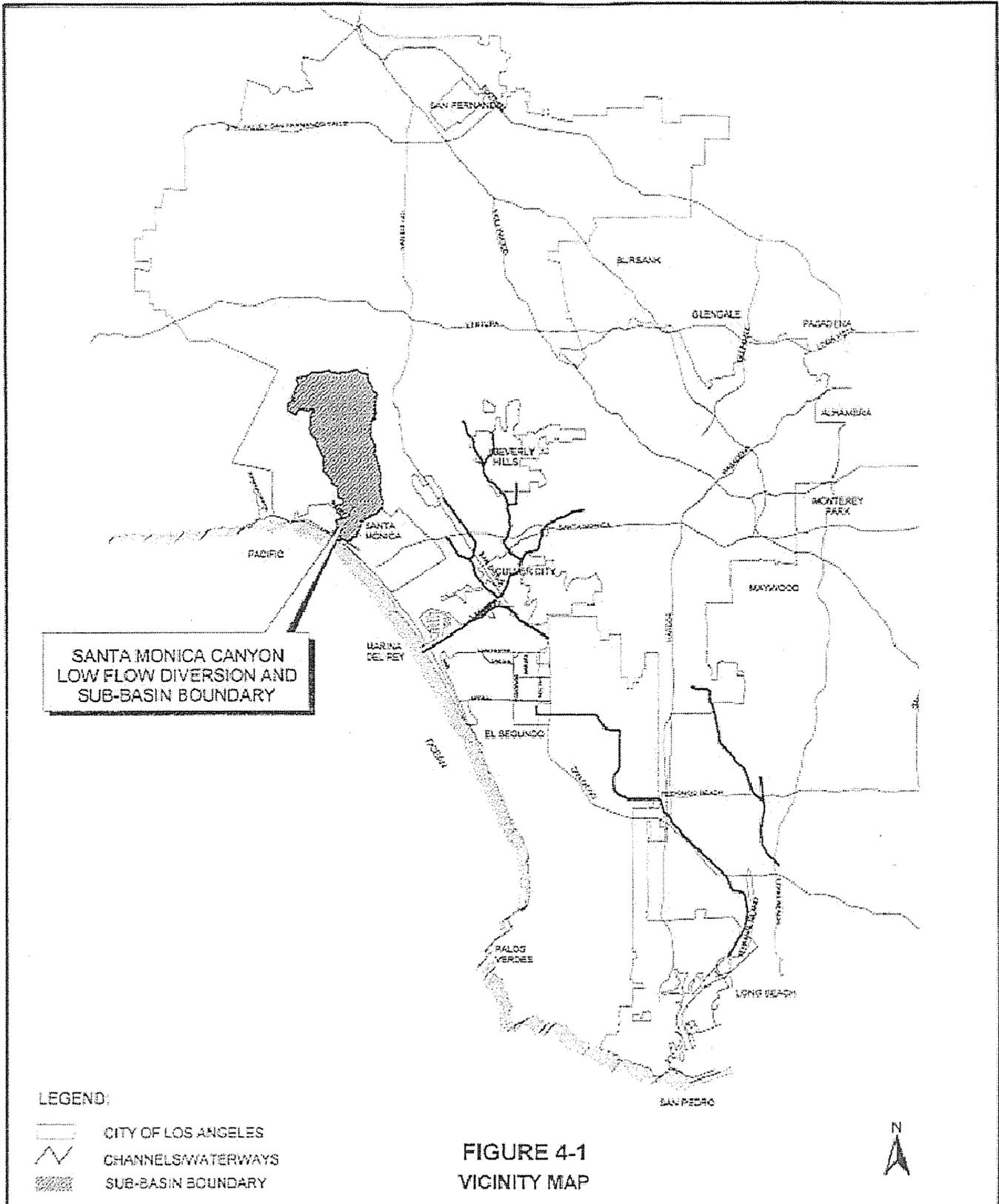
before it reaches the beach. Perhaps the sewage spill in 2001 that caused the closing of the beach could have been avoided if there was a diversion facility.

CONTACT

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DEPARTMENT OF PUBLIC WORKS

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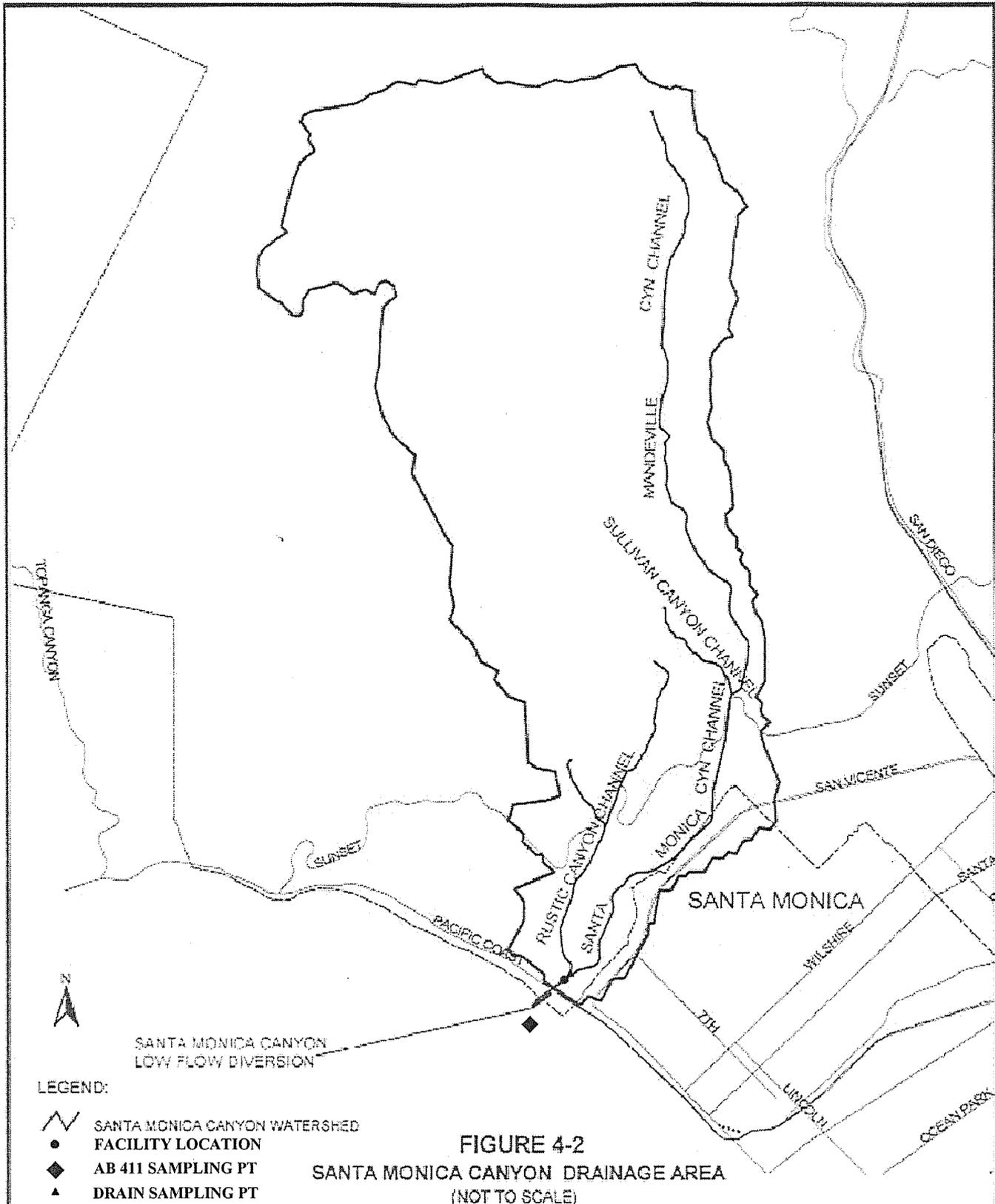


FIGURE 4-2
SANTA MONICA CANYON DRAINAGE AREA
 (NOT TO SCALE)

LEGEND:

-  SANTA MONICA CANYON WATERSHED
-  FACILITY LOCATION
-  AB 411 SAMPLING PT
-  DRAIN SAMPLING PT



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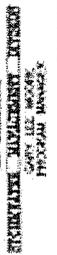
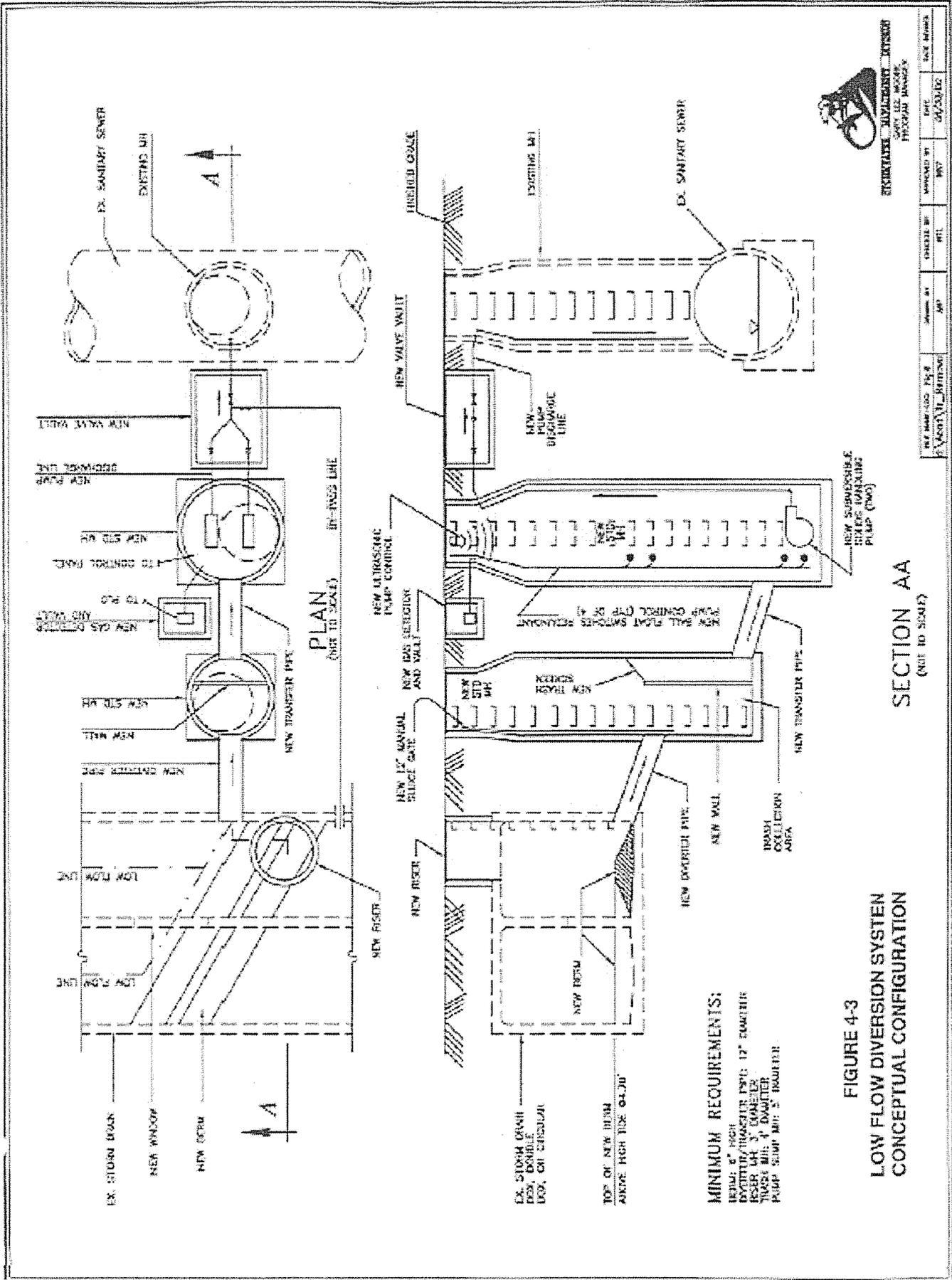
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| PROJECT NUMBER | 04-000000 | | |

SECTION AA
(NOT TO SCALE)

MINIMUM REQUIREMENTS:
 HEAD: 6" HIGH
 DOOR/TRANSFER PIPE: 12" DIAMETER
 RISER MH: 3' DIAMETER
 WASH MH: 4" DIAMETER
 PUMP SUMP MH: 5' DIAMETER

FIGURE 4-3
LOW FLOW DIVERSION SYSTEM
CONCEPTUAL CONFIGURATION

LOW FLOW DIVERSION

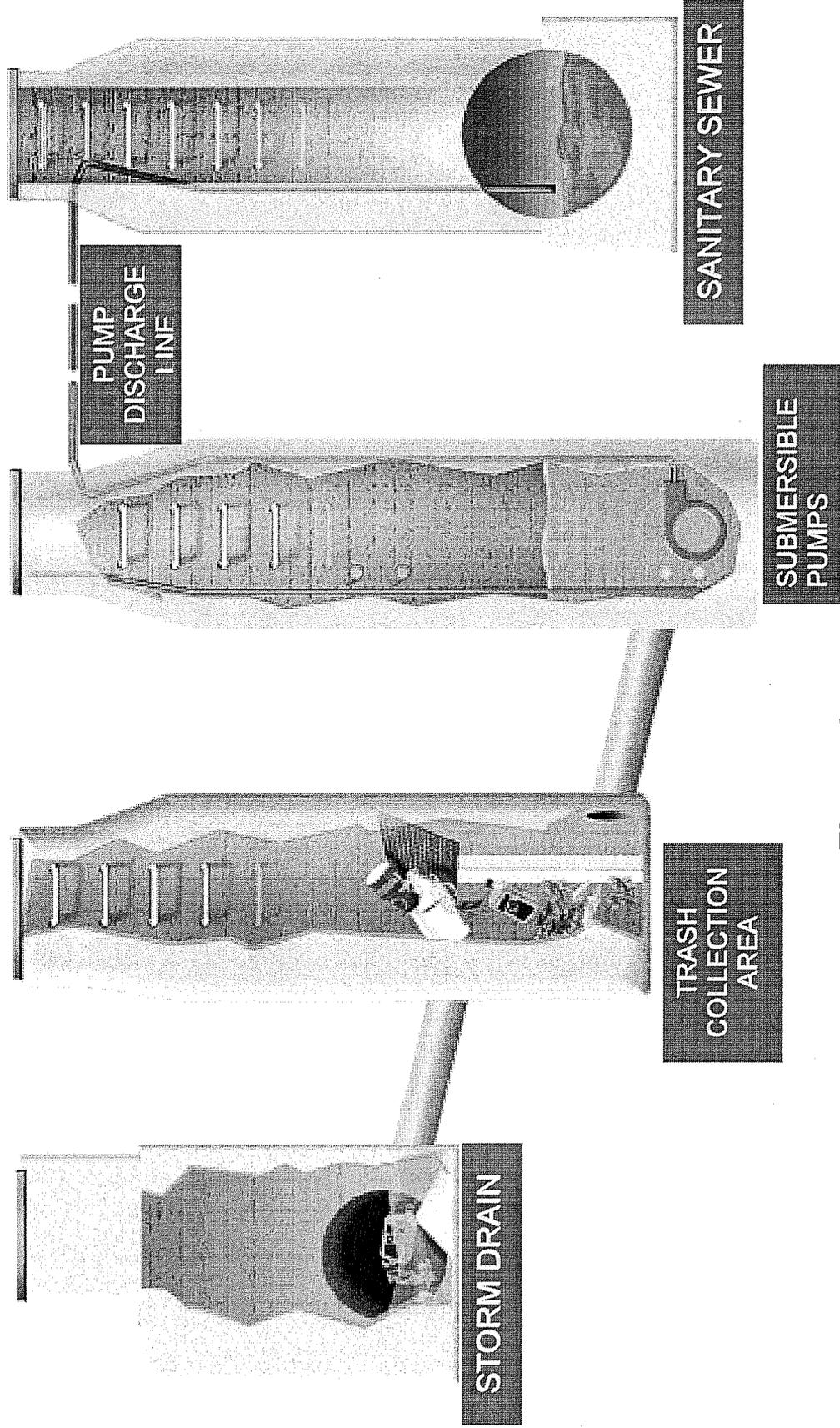


Figure 4