Chapter 1. General Introduction

Treated effluent from the City of San Diego's Point Loma Wastewater Treatment Plant (PLWTP) is presently discharged to the Pacific Ocean through the Point Loma Ocean Outfall (PLOO) according to requirements set forth in National Pollutant Discharge Elimination System (NPDES) Permit No. CA0107409, Order No. R9-2009-0001. This Order was adopted by the San Diego Regional Water Quality Control Board (RWQCB) on June 10, 2009 and became effective August 1, 2010. The Monitoring and Reporting Program (MRP) included in this order defines the requirements for ambient receiving waters monitoring in the region off Point Loma, San Diego. This includes sampling design and frequency, compliance criteria, types of laboratory analyses, and data analysis and reporting guidelines. The main objectives of the Point Loma ocean monitoring program are to provide data that satisfy NPDES permit requirements, demonstrate compliance with California Ocean Plan (Ocean Plan) provisions, detect dispersion and transport of the waste field (plume), and identify any environmental changes that may be associated with wastewater discharge via the outfall.

Background

The City of San Diego (City) began operation of the PLWTP and original ocean outfall off Point Loma in 1963, at which time treated effluent (wastewater) was discharged approximately 3.9 km offshore at a depth of about 60 m. From 1963 to 1985, the plant operated as a primary treatment facility, removing approximately 60% of the total suspended solids (TSS) by gravity separation. The City began upgrading the process to advanced primary treatment (APT) in mid-1985, with full APT status being achieved by July of 1986. This improvement involved the addition of chemical coagulation to the treatment process, which resulted in an increased TSS removal of about 75%. Since 1986, treatment has been further enhanced with the addition of several more sedimentation basins, expanded aerated grit removal, and refinements in chemical treatment. These enhancements have resulted in lower mass emissions from the plant. TSS removals are now consistently greater than the 80% permit requirement. Finally, the City began testing disinfection of PLWTP effluent using a sodium hypochlorite solution in September 2008 following adoption of Addendum No. 2 to previous Order No. R9-2002 0025. These chlorination activities continued throughout 2010.

Additional changes occurred in the early 1990s when the outfall was extended approximately 3.3 km further offshore in order to prevent intrusion of the wastewater plume into nearshore waters and to increase compliance with Ocean Plan standards for water-contact sports areas. Construction of the outfall extension was completed in November 1993, at which time discharge was terminated at the original 60-m site. The outfall presently extends approximately 7.2 km offshore to a depth of about 94 m, where the pipeline splits into a Y-shaped multiport diffuser system (i.e., wye). The two diffuser legs extend an additional 762 m to the north and south, each terminating at a depth of about 98 m.

The average daily flow of effluent through the Point Loma outfall in 2010 was 157 mgd, ranging from a low of 140 mgd in July to a high of about 394 mgd in December. Overall, this represents about a 2.6% increase from the average flow rate of 153 mgd in 2009. TSS removal averaged about 88% in 2010, with a total mass emissions of approximately 8006 mt/yr compared to 6774 mt/yr in 2009 (see City of San Diego 2011a).

Receiving Waters Monitoring

Prior to 1994, the City conducted an extensive ocean monitoring program off Point Loma surrounding the original 60-m discharge site. This program was subsequently modified and expanded with the construction and operation of the deeper outfall.

Data from the last year of regular monitoring near the original inshore site are presented in City of San Diego (1995a), while the results of a 3-year "recovery study" are summarized in City of San Diego (1998). From 1991 through 1993, the City also conducted a "pre-discharge" study in the vicinity of the new site in order to collect baseline data prior to the discharge of effluent in these deeper waters (City of San Diego 1995a, b). Results of NPDES mandated monitoring for the extended PLOO from 1994 to 2009 are available in previous annual receiving waters monitoring reports (e.g., City of San Diego 2010). In addition, the City has conducted annual region wide surveys off the coast of San Diego since 1994 either as part of regular South Bay outfall monitoring requirements (e.g., City of San Diego 1999, 2011b) or as part of larger, multi-agency surveys of the entire Southern California Bight (SCB). The latter include the 1994 Southern California Bight Pilot Project (Allen et al. 1998, Bergen et al. 1998, 2001, Schiff and Gossett 1998) and subsequent Bight'98 and Bight'03 programs in 1998 and 2003, respectively (Allen et al. 2002, 2007, Noblet et al. 2003, Ranasinghe et al. 2003, 2007, Schiff et al. 2006), as well as the current Bight'08 regional monitoring survey that began during the summer of 2008 (Bight'08 Coastal Ecology Committee 2008). Such large-scale surveys are useful for characterizing the ecological health of diverse coastal areas and may help to identify and distinguish reference sites from those impacted by wastewater or stormwater discharges, urban runoff, or other sources of contamination.

The current sampling area off Point Loma extends from the shoreline seaward to a depth of about 116 m and encompasses an area of approximately 184 km^2 (Figure 1.1). Fixed sites are generally arranged in a grid surrounding the outfall and are monitored in accordance with a prescribed sampling schedule. Results of relevant quality assurance procedures for the receiving waters monitoring activities are included in the City's Environmental Monitoring and Technical Services (EMTS) Division Laboratory Quality Assurance Report (City of San Diego 2011c). Data files, detailed methodologies, completed reports, and other

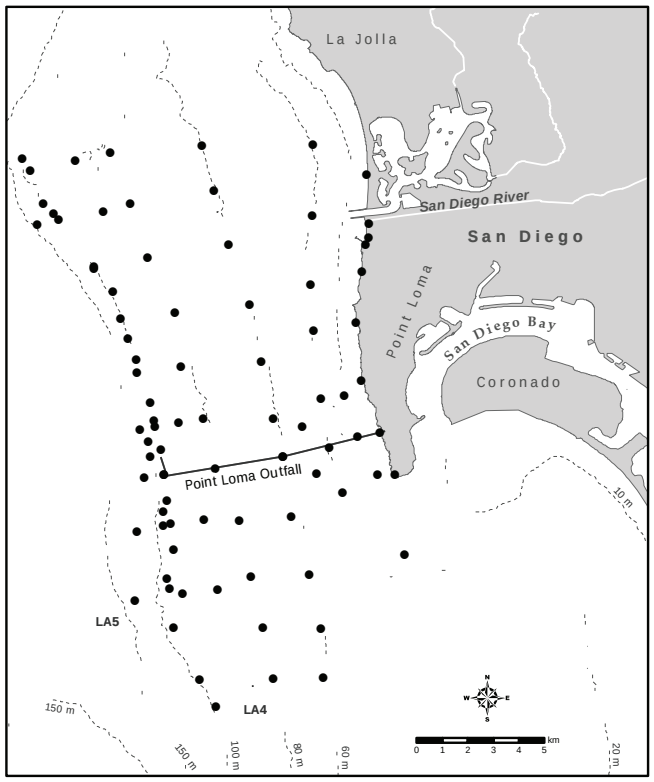

Figure 1.1
Receiving waters monitoring stations for the Point Loma Ocean Outfall Monitoring Program.

pertinent information submitted to the RWQCB and United States Environmental Protection Agency (USEPA) throughout the year are available online at the City's website (www.sandiego.gov/mwwd/environment/oceanmonitor.shtml).

In addition to the above activities, the City participates in or supports other projects relevant to assessing ocean quality in the region. One such project involves satellite and aerial monitoring of the San Diego/Tijuana coastal region that is jointly funded by the City and the International Boundary and Water Commission (USIBWC) (Svejkovsky 2011). A long-term study of the Point Loma kelp forest funded by the City is also being conducted by scientists at the Scripps Institution of Oceanography (SIO), while the City also participates with a number of other agencies to fund aerial surveys of all the major kelp beds from San Diego and Orange Counties (MBC Applied Environmental Sciences 2010). Finally, the current MRP includes plans to perform adaptive or special strategic process studies as determined by the City

in conjunction with the RWQCB and USEPA. Such studies have included a comprehensive scientific review of the Point Loma ocean monitoring program (SIO 2004), a large-scale sediment mapping study of the Point Loma and South Bay coastal regions (Stebbins et al. 2004), and an ongoing study of deep benthic habitats of the continental slope off San Diego (Stebbins and Parnell 2005). Additional work in these deeper habitats is ongoing with a final report expected in late 2011. In 2004 the City also began sampling at the recovery stations mentioned above as part of a long-term annual assessment project of benthic conditions near the original outfall discharge site. In addition, a multi-phase project is currently underway to examine the dynamics and strength of the thermocline and local currents of the receiving waters off Point Loma as well as the dispersion behavior of the PLOO wastewater plume (Storms et al. 2006, Dayton et al. 2009, Parnell and Rasmussen 2010).

This report presents the results of all regular receiving waters monitoring activities conducted as part of the Point Loma ocean monitoring program in 2010. The major components of the monitoring program are covered in the following chapters: Oceanographic Conditions, Water Quality, Sediment Conditions, Macrobenthic Communities, Demersal Fishes and Megabenthic Invertebrates, and Bioaccumulation of Contaminants in Fish Tissues. A glossary of technical terms is included.

Literature Cited

Allen, M.J., S.L. Moore, K.C. Schiff, S.B. Weisberg, D. Diener, J.K. Stull, A. Groce, J. Mubarak, C.L. Tang, and R. Gartman. (1998). Southern California Bight 1994 Pilot Project: V. Demersal Fishes and Megabenthic Invertebrates. Southern California Coastal Water Research Project, Westminster, CA.

Allen, M.J., A.K. Groce, D. Diener, J. Brown, S.A. Steinert, G. Deets, J.A. Noblet, S.L. Moore, D. Diehl, E.T. Jarvis, V. Raco-Rands, C. Thomas, Y. Ralph, R. Gartman, D. Cadien, S.B. Weisberg, and T. Mikel. (2002). Southern California Bight 1998 Regional Monitoring Program: V. Demersal Fishes and Megabenthic Invertebrates. Southern California Coastal Water Research Project. Westminster, CA.

Allen, M.J., T. Mikel, D. Cadien, J.E. Kalman, E.T. Jarvis, K.C. Schiff, D.W. Diehl, S.L. Moore, S. Walther, G. Deets, C. Cash, S. Watts, D.J. Pondella II, V. Raco-Rands, C. Thomas, R. Gartman, L. Sabin, W. Power, A.K. Groce, and J.L. Armstrong. (2007). Southern California Bight 2003 Regional Monitoring Program: IV. Demersal Fishes and Megabenthic Invertebrates. Southern California Coastal Water Research Project. Costa Mesa, CA.

Bergen, M., S.B. Weisberg, D. Cadien, A. Dalkey, D. Montagne, R.W. Smith, J.K. Stull, and R.G. Velarde. (1998). Southern California Bight 1994 Pilot Project: IV. Benthic Infauna. Southern California Coastal Water Research Project, Westminster, CA.

Bergen, M., S.B. Weisberg, R.W. Smith, D.B. Cadien, A. Dalkey, D.E. Montagne, J.K. Stull, R.G. Velarde, and J.A. Ranasinghe. (2001). Relationship between depth, sediment, latitude, and the structure of benthic infaunal assemblages on the mainland shelf of southern California. Marine Biology, 138: 637–647.

Bight'08 Coastal Ecology Committee. (2008). Southern California Bight Regional Marine Monitoring Survey (Bight'08) Coastal Ecology Workplan. Southern California Coastal Water Research Project, Costa Mesa, CA. [available at www.sccwrp.org]

City of San Diego. (1995a). Receiving Waters Monitoring Report for the Point Loma Ocean Outfall, 1994. City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

City of San Diego. (1995b). Outfall Extension Pre-Construction Monitoring Report (July 1991–October 1992). City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

City of San Diego. (1998). Recovery Stations Monitoring Report for the Original Point Loma Ocean Outfall (1991–1996). City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

City of San Diego. (1999). San Diego Regional Monitoring Report for 1994–1997. City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

City of San Diego. (2010). Annual Receiving Waters Monitoring Report for the Point Loma Ocean Outfall, 2009. City of San Diego Ocean Monitoring Program, Public Utilities Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

City of San Diego. (2011a). 2010 Annual Reports and Summary: Point Loma Wastewater Treatment Plant and Point Loma Ocean Outfall. City of San Diego, Public Utilities Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

City of San Diego. (2011b). Annual Receiving Waters Monitoring Report for the South Bay Ocean Outfall (South Bay Water Reclamation Plant), 2010. City of San Diego Ocean Monitoring Program, Public Utilities Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

City of San Diego. (2011c). EMTS Division Laboratory Quality Assurance Report, 2010. City of San Diego Ocean Monitoring Program, Public Utilities Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

Dayton, P., P.E. Parnell, L.L. Rasmussen, E.J. Terrill, and T.D. Stebbins. (2009). Point Loma Ocean Outfall Plume Behavior Study, Scope of Work. Scripps Institution of Oceanography, La Jolla, CA, and City of San Diego, Metropolitan Wastewater Department, San Diego, CA. [NOAA Award No. NA08NOS4730441]

MBC Applied Environmental Sciences. (2010). Status of the Kelp Beds 2009, San Diego and Orange Counties, Region Nine Kelp Survey Consortium. Final Report, June 2010. MBC Applied Environmental Sciences, Costa Mesa, CA.

Noblet, J.A., E.Y. Zeng, R. Baird, R.W. Gossett, R.J. Ozretich, and C.R. Phillips. (2003). Southern California Bight 1998 Regional Monitoring Program: VI. Sediment Chemistry. Southern California Coastal Water Research Project, Westminster, CA.

Parnell, E. and L. Rasmussen. (2010). Summary of PLOO hydrographic observations (2006–2009). Draft report to City of San Diego Ocean Monitoring Program, Public Utilities Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

Ranasinghe, J.A., D.E. Montagne, R.W. Smith, T.K. Mikel, S.B. Weisberg, D. Cadien, R. Velarde, and A. Dalkey. (2003). Southern California Bight 1998 Regional Monitoring Program: VII. Benthic Macrofauna. Southern California Coastal Water Research Project. Westminster, CA.

Ranasinghe, J.A., A.M. Barnett, K. Schiff, D.E. Montagne, C. Brantley, C. Beegan, D.B. Cadien, C. Cash, G.B. Deets, D.R. Diener, T.K. Mikel, R.W. Smith, R.G. Velarde, S.D. Watts, and S.B. Weisberg. (2007). Southern California Bight 2003 Regional Monitoring Program: III. Benthic Macrofauna. Southern

California Coastal Water Research Project. Costa Mesa, CA.

Schiff, K.C. and R.W. Gossett. (1998). Southern California Bight 1994 Pilot Project: III. Sediment Chemistry. Southern California Coastal Water Research Project, Westminster, CA.

Schiff, K., K. Maruya, and K. Christenson. (2006). Southern California Bight 2003 Regional Monitoring Program: II. Sediment Chemistry. Southern California Coastal Water Research Project, Westminster, CA.

Scripps Institution of Oceanography. (2004). Point Loma Outfall Project, Final Report, September 2004. Scripps Institution of Oceanography, University of California, La Jolla, CA.

Stebbins, T.D. and P.E. Parnell. (2005). San Diego Deep Benthic Pilot Study: Workplan for Pilot Study of Deep Water Benthic Conditions off Point Loma, San Diego, California. City of San Diego, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, and Scripps Institution of Oceanography, La Jolla, CA.

Stebbins, T.D., K.C. Schiff, and K. Ritter. (2004). San Diego Sediment Mapping Study: Workplan for Generating Scientifically Defensible Maps of Sediment Conditions in the San Diego Region. City of San Diego, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, and Southern California Coastal Water Research Project, Westminster, CA.

Storms, W.E., T.D. Stebbins, and P.E. Parnell. (2006). San Diego Moored Observation System Pilot Study Workplan for Pilot Study of Thermocline and Current Structure off Point Loma, San Diego, California. City of San Diego, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, and Scripps Institution of Oceanography, La Jolla, CA.

Svejkovsky, J. (2011). Satellite and Aerial Coastal Water Quality Monitoring in the San Diego/ Tijuana Region. Annual Summary Report, 1 January, 2010 – 31 December 2010. Ocean Imaging, Solana Beach, CA.

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