- **Board of Directors**
  Engineering and Capital Programs Committee

July 8, 2008 Board Meeting

9-3

Subject

Options for Weymouth Oxidation Retrofit Program Schedule

Description

The current schedule for construction completion of the Weymouth ORP has been adjusted from late 2010/early 2011 to 2014 in order to minimize construction risk associated with multiple overlapping contracts and to complete high priority rehabilitation work. At its April 2008 meeting, the Engineering and Capital Programs Committee concurred with the revised schedule and requested staff return with additional information on construction challenges at Weymouth, an alternative to accelerate the ORP on-line date, and Metropolitan's strategy to comply with regulations in the interim until ozone is on-line. The Weymouth ORP is categorized as a water quality project within Metropolitan's Capital Investment Plan (CIP).

Background

The F. E. Weymouth Water Treatment Plant was placed into service in 1941 with an initial capacity of 100 million gallons per day (mgd). The plant was expanded twice to its current capacity of 520 mgd. The Weymouth plant delivers a blend of waters from the Colorado River Aqueduct (CRA) and State Water Project (SWP) to Metropolitan's Central Pool portion of the distribution system.

In April 2005, Metropolitan's Board authorized final design of the Weymouth ORP, which will add the ozonation process to the Weymouth plant. The ozone facilities will be located in the southeast portion of the Weymouth plant site and will include a liquid oxygen storage facility; ozone generation building; ozone contactors; an ozone off-gas destruct system; electrical switchgear building and switchyard; chemical storage and feed facilities; hydraulic conduits, including relocation of the plant inlet conduit; ancillary systems; and general site improvements. To support the ozonation process, new chemical storage and feed facilities for sodium hydroxide, sulfuric acid, sodium hypochlorite, and hydrogen peroxide will be constructed. Additionally, a new rail spur will be constructed to allow for new rail delivery of sodium hydroxide and sulfuric acid, as well as improved rail delivery of liquefied chlorine gas. These facilities and the contractor work areas will extend throughout much of the Weymouth plant.

In December 2005, Metropolitan's Board authorized the procurement of ozone generation equipment for the Weymouth plant. The ozone equipment consists of ozone generators, power supply units, liquid oxygen storage and feed equipment, ozone off-gas destruct equipment, and a complete ozone control system. The ozone generation equipment has been fabricated and has been delivered to a temporary storage warehouse in Ontario, California. The liquid oxygen storage tanks are temporarily being held in the manufacturer's fabrication facility in Minnesota. All of this equipment will be delivered in the future to the Weymouth ORP construction contractor for installation at the Weymouth plant.

In the fiscal year 2006/07 CIP, the planned completion date for the Weymouth ORP was December 2010, which was consistent with board direction provided in July 2005. During development of the capital program for the fiscal year 2007/08, staff assessed a number of factors that influence implementation of the Weymouth ORP program, and recommended that the program be staged over a longer period of time. The primary reasons to stage the work are to permit needed rehabilitation projects at the Weymouth plant to move forward more quickly and to minimize the risk of interferences between multiple construction contractors working simultaneously in common areas of the plant. Metropolitan would implement a strategy to continue to meet all drinking water regulations during the interim period until ozone is on-line. As a result of staff's assessment, the date

incorporated into the fiscal year 2007/08 CIP for completion of Weymouth ORP construction is late 2014. Projects are currently underway which reflect this planned completion date, and are described below. This approach is referred to as the Current Staged Schedule and is described below.

Key Considerations for Weymouth ORP Construction Schedule

In December 2006, the Weymouth plant was removed from service for the first time since 1988 to perform inspections, maintenance, and repairs. The inspections revealed issues such as spalled concrete and corroded reinforcing steel in the filter outlet conduit; leaking 12-foot-diameter plant inlet valves on the La Verne Pipeline, the Yorba Linda Feeder, and the Junction Structure bypass; and leaking finished water reservoir gates. Several new projects are underway to address the rehabilitation work identified during the inspections. Staff's recommendation is that this rehabilitation work, along with other repair and rehabilitation projects already identified at the Weymouth plant, be prioritized and move forward quickly in order to maintain reliable water deliveries from the plant. Many of these new projects will entail repair of concrete and replacement of aged equipment during future full-plant shutdowns. Because the amount of shutdown work has increased considerably, two separate plant shutdowns are recommended to ensure that the work can be completed and the plant brought back on-line within each ten-day shutdown window. Staff plans each future plant shutdown in coordination with our member agencies in order to minimize shutdown impacts.

Over the past four years, Metropolitan staff has gained valuable construction management experience while overseeing the Skinner plant's major construction program. With multiple contracts exceeding $381 million in value, the Skinner construction program has been both challenging and successful. During the peak of that major construction program, over 660 contractor personnel were working on-site, while the plant remained operating at above-peak capacity. In order to meet the aggressive program schedule, a large construction labor force shared a congested work area. This overlap led to inefficiencies in construction methods, increased risk for change orders, and increased potential for plant operational disruptions. Staff anticipates even more severe challenges at the older Weymouth plant. The presence of a large construction crew on-site makes it more difficult to maintain access for chemical deliveries and other operational needs on the small Weymouth plant site. During the original planned period of Weymouth ORP construction, at least 12 other construction projects were also scheduled at the plant. These other projects include several equipment repair projects, upgrade of the plant's obsolete electrical system, upgrade of the La Verne shops, and a new water quality pilot plant facility.

With the addition of projects resulting from the December 2006 Weymouth plant inspections and knowledge gained from the recent Skinner plant construction program, staff recommended that the Weymouth plant projects be staged to address the urgently needed repair and rehabilitation projects before commencing the main ORP construction project. To expedite relocation of the plant inlet conduit (which must be re-routed to the new location of the ozone contactors) and the needed rehabilitation work, in December 2007, Metropolitan's Board authorized final design of three "ORP predecessor" rehabilitation projects: the Plant Inlet Conduit Relocation and Rapid Mix Systems; Electrical Upgrades; and Fire & Domestic Water Systems Upgrades. In June 2008, Metropolitan's Board awarded a construction contract to modify the Weymouth plant's coagulant and polymer feed systems. This work is also a necessary predecessor project to the Weymouth ORP. Construction of the Weymouth Coagulant Tank Farm Modifications project, the Weymouth Inlet Conduit Relocation and Rapid Mix Systems project, the Fire & Domestic Water Systems Upgrades, and portions of the Electrical Upgrades project, must be completed in order to begin operation of the new basin inlet conduit and the ozonation facilities.

Weymouth ORP Schedule Options

Based on the current status of the ORP predecessor projects that are presently underway at the Weymouth plant, staff has developed a staged schedule and an alternative schedule with overlapping major construction contracts. These two schedules for constructing the Weymouth ORP are shown in **Attachment 1**. The staged schedule is currently in progress.

<u>Current Staged Schedule (2014 completion)</u>

Based on the key considerations, the Weymouth ORP will be constructed in two stages to be complete in 2014, consistent with the approach followed at Metropolitan's four other treatment plants. (See **Attachment 1**, page 1).

The first stage consists of high-priority rehabilitation projects such as the plant Electrical Upgrades, and ORP predecessor projects including the Weymouth Coagulant Tank Farm Modifications and the Plant Inlet Conduit Relocation and Rapid Mix Systems. The Plant Inlet Conduit Relocation and Rapid Mix Systems project will be advertised for bids in early 2009, and construction is scheduled to be completed in November 2010. Metropolitan's Board awarded a contract to construct the Coagulant Tank Farm Modifications in June 2008, and construction is scheduled to be completed in November 2010. The Electrical Upgrades project will be advertised for bids in the second quarter of 2009 and construction is scheduled to be completed in mid-2011.

The second stage of the current program consists of the main Weymouth ORP contract. Construction completion is planned for late 2014. This option is currently being implemented by staff, and is consistent with Metropolitan's fiscal year 2008/09 CIP.

The needed rehabilitation work at the Weymouth plant has been prioritized to move forward as quickly as possible. This option has a lower risk for interferences between contractors, and as a result has the lower risk of construction claims or delays. Metropolitan has an opportunity to advance the ORP construction schedule by approximately nine months. If construction of the Plant Inlet Conduit Relocation and Electrical Upgrades projects has advanced sufficiently, the main Weymouth ORP contract would be advertised for bids by early 2010, and construction could advance by approximately nine months and be completed in early 2014.

Under the current program, Metropolitan will continue to be able to reliably meet all primary drinking water regulations during the interim period before the ozonation facilities are operational. To ensure compliance with the regulations, plant staff would first adjust the levels of treatment chemicals (sulfuric acid and coagulants) as needed. Adjusting these chemicals will minimize the production of disinfection by-products when treating higher blends from the SWP. Another strategy for compliance would be to temporarily increase the blend of CRA water (resulting in a corresponding temporary increase in total dissolved solids) to reduce the level of disinfection by-products. It is important to note that this blend restriction would not substantially affect the total amount of SWP supplies that could be treated by Metropolitan, because more SWP could be diverted to and treated at the Diemer and Skinner plants in the interim. Staff is confident that this water quality strategy will ensure compliance with primary drinking water regulations until ozone is on-line.

Acceleration Alternative – Overlapping Major Construction Contracts Schedule (late 2012 completion)

Under this alternative, the construction completion date for the Weymouth ORP would be advanced by two years to December 2012 (**Attachment 1**, page 2). To achieve this schedule, the Coagulant Tank Farm Modifications and Electrical Upgrades projects would proceed as currently scheduled. Efforts underway on the separate Plant Inlet Conduit Relocation project would be halted. This inlet conduit work would be incorporated into the Weymouth ORP construction package for joint bidding and construction. The Weymouth ORP would be advertised for bids in the first quarter of 2009, and planned construction completion would be in December 2012. The duration of ORP construction would be reduced by three months.

Overlap of the three large ORP-related construction contracts on the Weymouth plant site would occur from approximately late 2009 to mid-2011. The Electrical Upgrades project includes the construction of underground duct banks throughout the facility and the replacement of several unit power centers that provide power to key process equipment. Close coordination between Metropolitan staff and the Electrical Upgrades contractor will be required to maintain plant reliability during construction. The Plant Inlet Conduit Relocation project includes construction of an underground 13-foot by 15-foot concrete conduit along the length of a primary plant access way, and construction of rapid mix facilities adjacent to the treatment basins and chemical tank farms. Coordination with this contractor will be necessary to ensure accessibility for chemical deliveries and for personnel to their worksites. During construction of the main Weymouth ORP contract, a large construction work force will be on-site and the entire south side of the facility will be under construction. This overlap of large construction efforts at an operating facility is likely to lead to interferences and potential conflicts between contractors, with resulting claims and delays. This alternative therefore has a significantly higher risk of contractor claims than the current schedule and higher potential for plant operational disruptions. Based on Metropolitan's recent experience with the large construction program at the Skinner plant, staff recommends avoiding overlap of major construction contracts whenever possible.

Further, since the construction duration for the main ORP contract has been shortened, this alternative has a higher likelihood of contractor schedule delays. With this alternative, ORP construction at the Diemer plant would be completed in mid-2012 while ORP construction at the Weymouth plant would be completed in late 2012. Both plants would require full plant shutdowns in the same year, which could impact Metropolitan's member agencies. This alternative has the more challenging execution and shutdown planning requirements of the two schedules, and the higher risk construction effort. As a result of these considerations, staff is proceeding on the current schedule and will endeavor to accelerate program tasks as appropriate.

See **Attachment 2** for the Location Maps.

Roy L. Wolfe 6/23/2008
Roy L. Wolfe *Date*
Manager, Corporate Resources

Jeff Kightlinger 6/24/2008
Jeffrey Kightlinger *Date*
General Manager

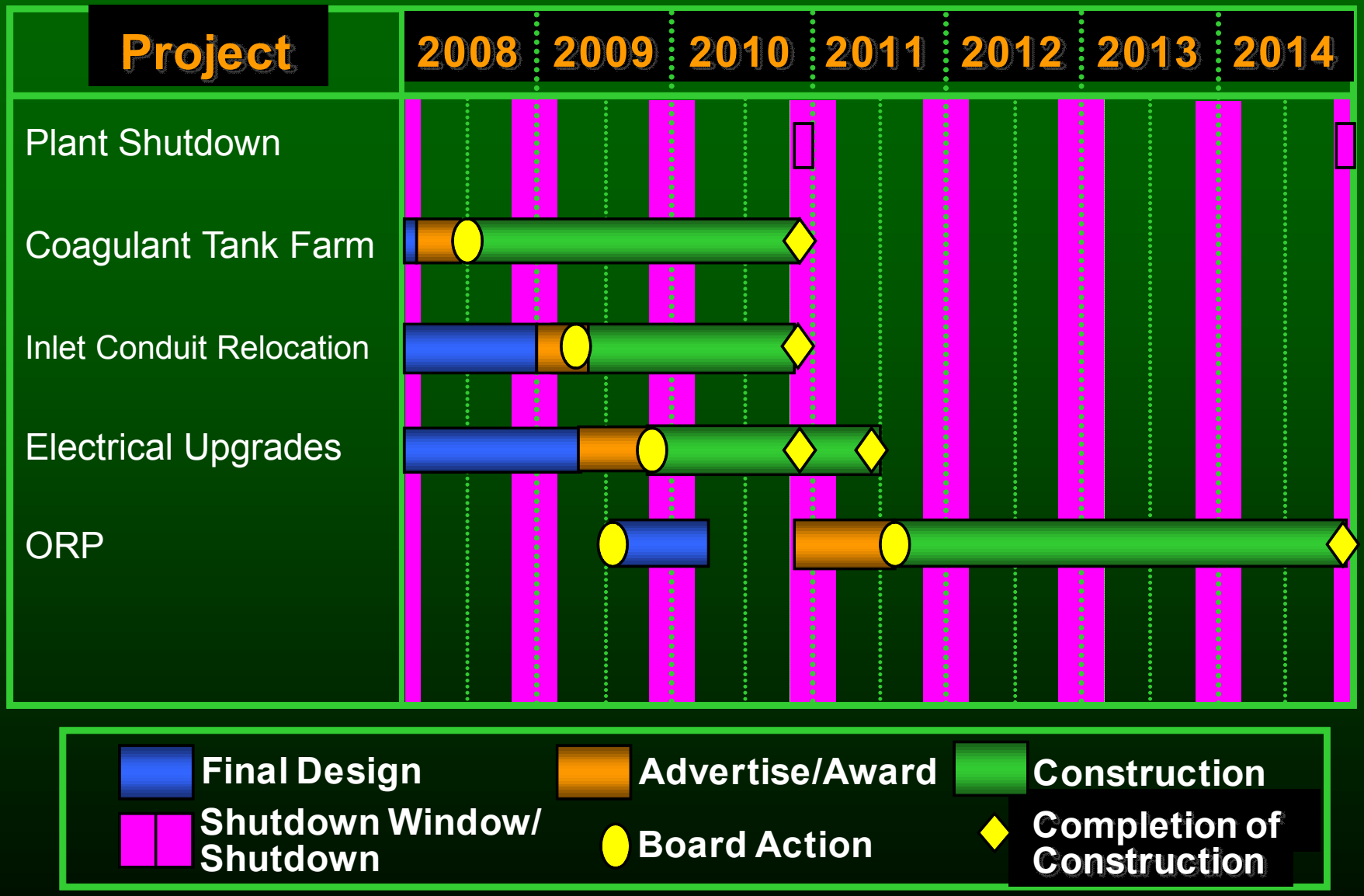
Attachment 1 – Schedule Alternatives

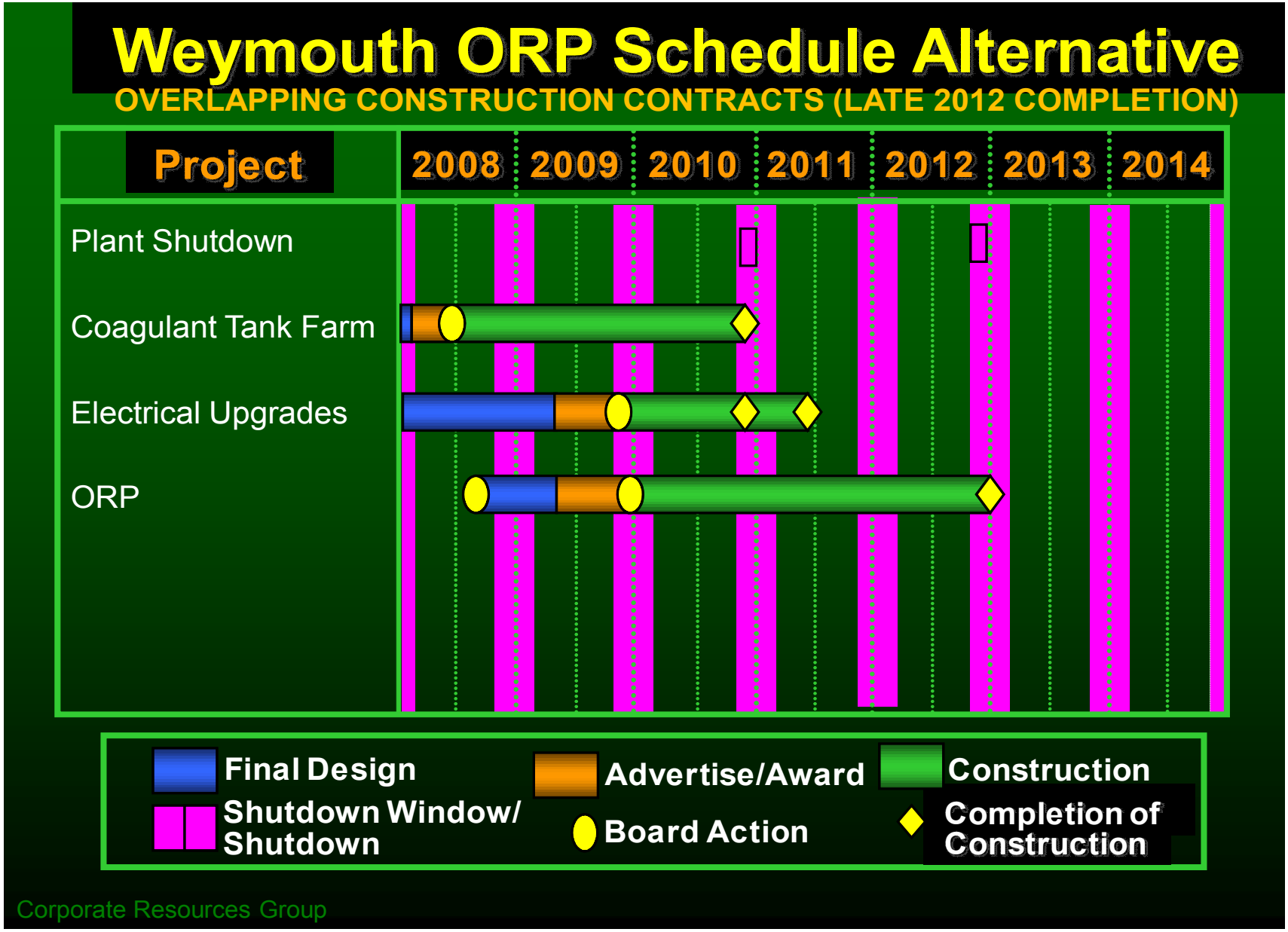
Attachment 2 – Location Maps

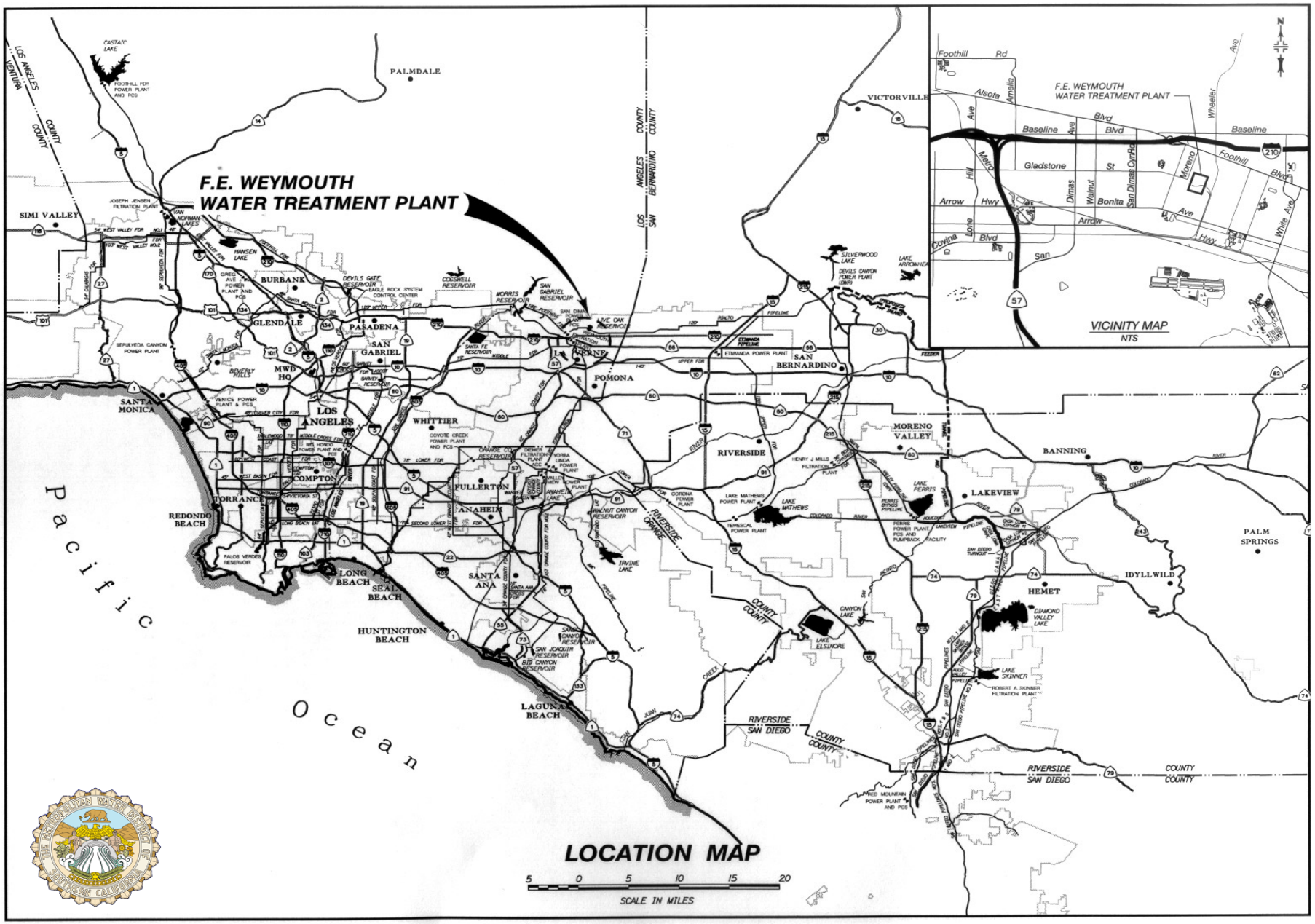
BLA #6185

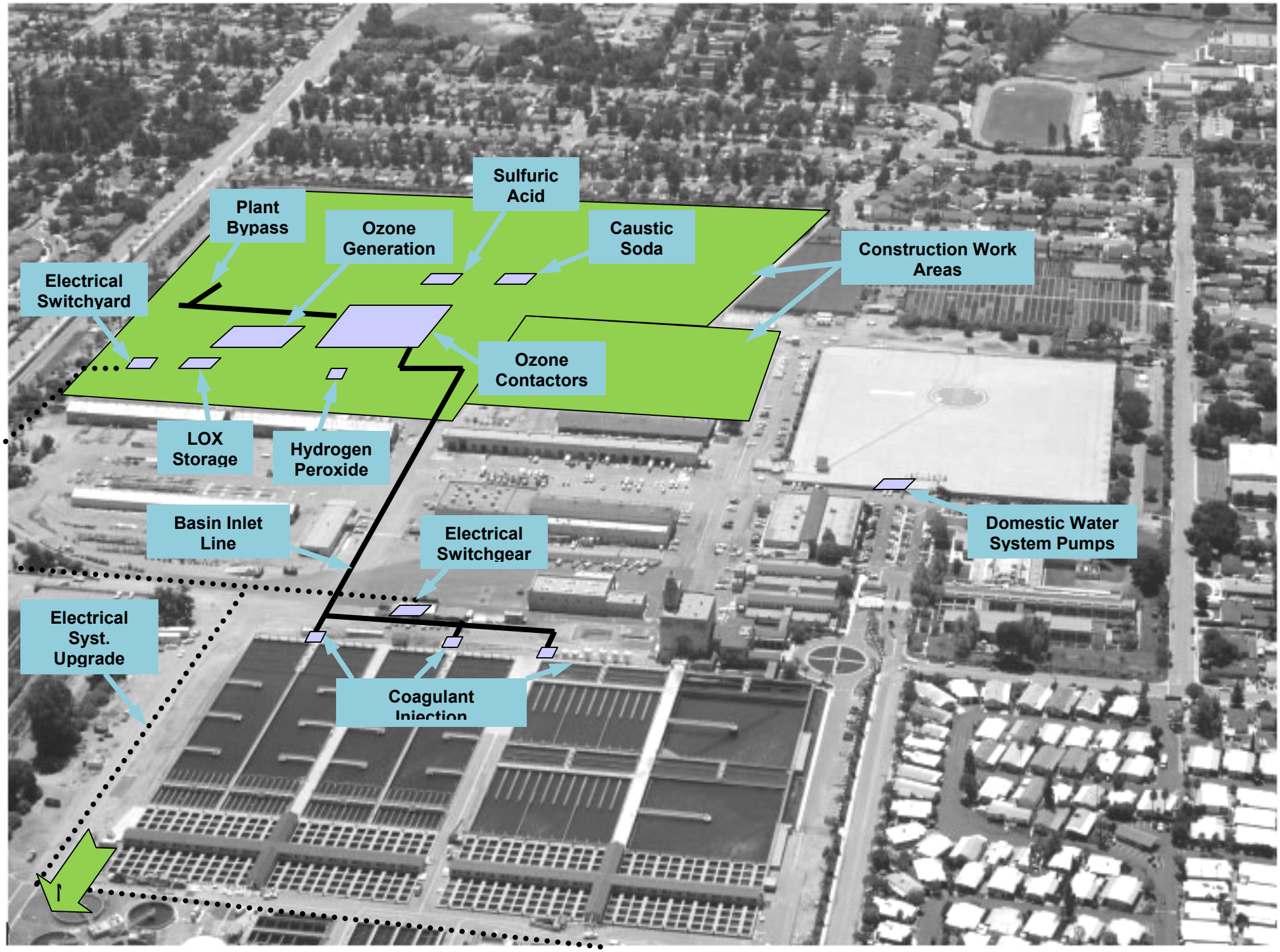
Weymouth ORP Schedule

CURRENT STAGED SCHEDULE (2014 COMPLETION)




Weymouth ORP Schedule Alternative
OVERLAPPING CONSTRUCTION CONTRACTS (LATE 2012 COMPLETION)
Project
2008
2009
2010
2011
2012
2013
2014
Plant Shutdown
Coagulant Tank Farm
Electrical Upgrades
ORP
Final Design
Advertise/Award
Construction
Shutdown Window/ Shutdown
Board Action
Completion of Construction
Corporate Resources Group


F.E. WEYMOUTH
WATER TREATMENT PLANT
LOCATION MAP
SCALE IN MILES
5 0 5 10 15 20
VICINITY MAP
NTS
F.E. WEYMOUTH
WATER TREATMENT PLANT
Pacific
Ocean
PALMDALE
VICTORVILLE
SIMI VALLEY
BURBANK
GLENDALE
PASADENA
SAN GABRIEL
MWD HQ
LOS ANGELES
WHITTIER
POMONA
SAN BERNARDINO
RIVERSIDE
MORENO VALLEY
BANNING
LAKEVIEW
PALM SPRINGS
IDYLLWILD
HEMET
SANTA MONICA
TORRANCE
REDONDO BEACH
COMPTON
FULLERTON
ANAHEIM
SANTA ANA
LONG BEACH
SEAL BEACH
HUNTINGTON BEACH
LAGUNA BEACH
LOS ANGELES COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
ORANGE COUNTY
RIVERSIDE SAN DIEGO COUNTY


Sulfuric Acid
Plant Bypass
Ozone Generation
Caustic Soda
Construction Work Areas
Electrical Switchyard
Ozone Contactors
LOX Storage
Hydrogen Peroxide
Basin Inlet Line
Electrical Switchgear
Domestic Water System Pumps
Electrical Syst. Upgrade
Coagulant Injection