

State of California  
California Regional Water Quality Control Board  
Lahontan Region

Technical Review of  
County Sanitation Districts of  
Los Angeles County  
Lancaster and Palmdale Project  
Schedules

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# **1 INTRODUCTION**

## **1.1 BACKGROUND**

Los Angeles County Sanitation Districts Nos. 14 and 20 (Districts) have two projects for construction or expansion of two wastewater treatment projects in the cities of Lancaster and Palmdale. The objectives for each project are similar: to receive municipal sanitary wastewater, treat to tertiary levels, store in reservoirs during specific times of the year, and then pump for irrigation on agricultural lands.

The two projects have distinctly different activity groups and will be discussed separately in this report.

## **1.2 OBJECTIVE**

ERM was retained to conduct a technical review of the schedules for the two projects. The review primarily focused on the technical activities related to the completion of the projects, with a view to assessing the reasons for, and the reasonableness of, the differences in the length of time necessary for completion of the projects as initially proposed by the District compared to the completion dates currently scheduled.

## **DISCUSSION OF PALMDALE PROJECT AND DESIGN-AWARD-CONSTRUCTION SCHEDULE**

The Palmdale Water Reclamation Plant Project Phase V includes the expansion of an additional 15 million gallons per day (MGD) treatment system (incorporating nitrification/denitrification) to meet the demands of a growing population in the District No. 20 service area. It is projected that population growth in the area will increase by as much as 84% by 2025. Additionally, the project includes construction of tertiary filters and associated chlorination. The Palmdale project also includes an enhanced Effluent Management System (EMS) project phase. The Palmdale service area is considered to be a closed basin; meaning that there is no river or outlet from the area. Therefore, District No. 20 must rely solely on effluent management methods to handle the treated wastewaters from the Palmdale Wastewater Reclamation Plant (PWRP). These methods would include reuse, evaporation, and percolation. As part of the effluent management, the project includes construction of storage reservoirs, force main piping and associated pump stations.

Effluent management for PWRP is currently accomplished through agricultural irrigation above agronomic rates and agricultural reuse operations located northeast of the plant property on land leased from Los Angeles World Airports (LAWA). LAWA acquired this land for an airport (not yet constructed) during the 1970s. This resulted in the PWRP sites being completely surrounded by LAWA property. From 1981 to 2002, LAWA contracted with the District to be the primary user of all plant effluent as a source of irrigation water for farmers that leased its land. In 2000, the Regional Water Quality Control Board, Lahontan Region (Regional Board), revised the Waste Discharge Requirements (WDRs) for the PWRP. The District was ordered to take action on suspected groundwater nitrate contamination attributed to past land application and agricultural practices. Specifically, the District was required to submit a Farm Management Plan (FMP), Effluent Disposal Plan (EDP), and Corrective Action Plan (CAP) by January 2001. These three plans proposed measures that would lessen the impact of nitrogen to the groundwater. In meeting the recommendations made by the FMP, the District entered into a 20-year lease agreement with LAWA in 2002, making the District primarily responsible for the 2,680-acre EMS. This arrangement has facilitated the expansion of agricultural operations and reduced the amount of nitrogen reaching the groundwater.

The FMP also recommended that agronomic rates be used for crop irrigation, a strategy that cannot be fully implemented without adding reservoir capacity for winter storage for recycled water. Thus, the proposed construction of storage reservoirs is a necessary component of the current project. Land application and agricultural irrigation above

agronomic rates are no longer acceptable under the revised WDRs and are being phased out.

The primary objective of the Cleanup and Abatement Order (CAO) and Cease and Desist order (CDO) was for the District to address the excess nitrogen in the treated water from the facility, and the winter storage of treated water, and to develop a program to maximize effluent management and minimize land spreading.

In response to these issues and quality concerns, the Regional Board adopted CAO No. R6V-2003-056, November 2003, and CDO No. R6V-2004-039 (CDO), October 2004. The CAO requires the District and LAWA to clean up and abate the elevated nitrate levels identified in the groundwater beneath the Effluent Management System (EMS). The CDO supersedes the abatement portion of the CAO and imposes a timeline for implementing various abatement measures. Specifically, the CDO requires the District to eliminate land application and agricultural irrigation above agronomic rates of treated effluent by October 15, 2008. It also requires that, by November 15, 2009, the District must comply with requirements to prevent the discharge of nitrogenous compounds to the groundwater at levels that create a condition of pollution or violate the 1994 Water Quality Control Plan for the Lahontan Region (1994 Basin Plan) water quality objectives.

Abatement will be achieved in two phases. The first phase involves expanding agricultural reuse operations at the EMS to fully utilize the currently leased site and interim improvements to the treatment process to remove additional nitrogen compounds. In addition, by the end of 2005, all land application areas were planted with a crop when effluent is applied. These areas will be irrigated at agronomic rates wherever possible, but will exceed agronomic rates when necessary. This will significantly reduce the amount of nitrates potentially reaching the groundwater, since the nitrates remaining in the recycled water will act as a fertilizer and be taken up by the crops as nutrients. This is a key component of the groundwater remediation effort.

The second phase, which includes the construction of wastewater treatment and effluent management facilities necessary to reduce nitrates that may potentially reach groundwater to acceptable levels, is part of the current project.

Primarily, the CDO requires the plant to limit the concentration of nitrogen in the effluent to 28 milligrams per liter (mg/L) and terminate land spreading of treated wastewater containing nitrogen.

The Palmdale project is partially funded by the state of California. Release of the funds is contingent upon approval of the final approved

environmental permit by the Regional Board. Advertising of bids for construction can not be initiated until the funds are approved.

### Schedule Evaluation

The proposed sequence of events is somewhat complicated, but essentially the District submits a permit request and design to the Regional Board for review. Assuming approval, essentially the District then acquires a loan commitment from the state for funding. The project is then advertised, bids reviewed, and contracts awarded. Construction of the facility is then completed and startup occurs.

The sequence of events after permit approval is fairly straightforward. Extracted from the Palmdale Gantt chart (Feb 07) are the following.

Design Phase - Treatment Plant Expansion					
1200	Preliminary Design Assessment	53	0	01MAR05 A	12MAY05 A
1210	Final Design Stage Five Plant Expansion	517	212	27OCT05 A	30OCT07
1215	Stage Five Plant Expansion Design Complete	0	0		30OCT07
1220	SWRCB Review/Approve Final Design	20	20	31OCT07	27NOV07
1224	District's Board - Submit Agenda Item	0	0		14NOV07
1225	District Board Approval to Advertise	0	0		28NOV07
1230	Advertise and Receive Bids	40	40	29NOV07	28JAN08
1235	Review Bids	12	12	26JAN08	13FEB08
1236	SWRCB Issues ATA	15	15	26JAN08	18FEB08
1239	District's Board - Submit Agenda Item	0	0		13FEB08
1240	District Board Award -Contract	0	0		27FEB08
1255	Contract/Bonds/Insurance	12	12	28FEB08	17MAR08
1260	Baseline Schedule Preparation	40	40	27FEB08	23APR08
1265	Issue Notice to Proceed (Stage Five)	0	0		23APR08
Regulatory Permits - TP Expansion / Eff. Mgmt.					
1520	Prepare ROWD (TP Expansion & Eff. Mgmt)	55	0	02OCT06 A	04JAN07 A
1525	Submit ROWD to RWQCB	0	0		05JAN07
1530	RWQCB Review	100	89	16DEC06 A	10MAY07
1535	RWQCB Issue Revised WDR for TP Exp & Eff. Mgmt	0	0		10MAY07
1599	Secure Environmental Permits - Effluent Mgmt	90	90	06FEB08	11JUN08
Construction - Treatment Plant Expansion					
1730	Construction of Treatment Plant	776	776	24APR08	25APR11
1740	Treatment Plant Startup	0	0		25APR11
1760	Testing Period	63	63	25APR11	25JUL11
1770	Treatment Plant Fully Operational	0	0		25JUL11

Design Phase - Effluent Management					
1810	Prepare RFP for Geotechnical Investigation	30	0	29DEC05 A	08FEB06 A
1815	Release RFP and Receive Bids	20	0	09FEB06 A	08MAR06 A
1820	District Board - Submit Agenda Item to Award	0	0		08MAR06 A
1825	District Board - Approve Award of Contract	0	0		22MAR06 A
1828	Secure Right of Entry (ROE)	85	0	08DEC05 A	31JUL06 A
1829	Contracting for Geotechnical Investigation	28	0	23MAR06 A	01MAY06 A
1830	Geotechnical Investigation	130	0	02MAY06 A	02NOV06 A
1835	Design Effluent Management	515	255	29DEC05 A	31DEC07
1840	Effluent Management Design Complete	0	0		31DEC07
1845	SWRCB Review/Approve Final Design	20	20	02JAN08	29JAN08
1850	District's Board - Agenda Item	0	0		09JAN08
1855	District Board Approval to Advertise	0	0		23JAN08
1860	Advertise and Receive Bids	40	40	23JAN08	19MAR08
1865	Review Bids	12	12	19MAR08	04APR08
1870	SWRCB Issues ATA	15	15	19MAR08	09APR08
1875	District's Board - Submit Agenda Item	0	0		09APR08
1880	District Board Award -Contract	0	0		23APR08
1885	Contract/Bonds/Insurance	12	12	23APR08	09MAY08
1890	Baseline Schedule Preparation	40	40	23APR08	18JUN08
1895	Issue Notice to Proceed (Effluent Management)	0	0		18JUN08
Construction - Effluent Management					
1900	Construction for Force Main	376	376	18JUN08	01DEC09
1910	Complete Force Main	0	0		01DEC09
1920	Construction for Pump Stations	376	376	18JUN08	01DEC09
1930	Complete First Pump Station	0	0		01DEC09
1940	Construction for First Storage Reservoir	376	376	18JUN08	01DEC09
1941	Tie-in Pump Station, Force M and First Stor Res	41	41	01DEC09	29JAN10
1943	Begin Filling First Storage Reservoir	0	0		01FEB10
1944	Continued Construction of Second Pump Station	120	120	01DEC09	20MAY10
1945	Continued Construction of Rem Stor Reservoirs	140	140	01DEC09	18JUN10
1950	Complete Remaining Storage Reservoirs	0	0		18JUN10
1960	Complete Second Pump Station	0	0		20MAY10

Palmdale Treatment Plant Expansion Phase & Effluent Management Phase contains the following summary timelines, as contained in the Feb 07 version of the schedule.

Advertise Bids / Review Bids ..... 3.2 months

Contract Set ..... 2.5 months

Construction of Treatment Plant..... 36 months

Startup of Treatment Plant..... 3 months

Construction of Force Mains ..... 17.5 months

Construction of First Pump Station ..... 17.5 months

Construction of First Storage Reservoir ..... 17.5 months

ERM researched a number of sources to verify the typical durations or timelines for the various activities comprising a municipal wastewater treatment plant project. For example in 1998, the American Society of Civil Engineers and Water Environment Federation published “Design of Municipal Wastewater Treatment Plants – WEF Manual of Practice No. 8”. This publication sets forth the range of typical durations of the various activities comprising the design and construction of the typical wastewater project. Additionally, ERM has 64 offices in North America and contacts with a number of large and small municipal groups that conduct similar projects. The schedule of Representative Durations set forth below was provided to these groups for comment. Generally, the response was that the durations are representative of municipal wastewater projects.

ERM also is involved with a large number of industrial wastewater projects worldwide. Industrial projects are not constrained by some of the facility planning, multiple bidding or contract award requirements, but the technical (design and construction) element durations are very similar.

The following is a summary of those timelines:

Representative Durations for Activities within Municipal Wastewater Treatment Projects. (These times can vary depending upon the complexity of the project.)

<i>Activity</i>	<i>Duration, Months</i>
Facilities Planning	8 - 12
Regulatory Approval	2 - 3
Preliminary Design	5 - 6
Value Engineering	1 - 2
Final Design	7 – 10
<b>Total Design</b>	<b>23 - 33</b>
Regulatory Approval	2 - 3
Bidding	2 - 3
Contract Award	1 - 2
Construction	30 - 38
Start-Up	2 – 5
<b>Total Construction/Startup</b>	<b>32 - 43</b>



The Feb 07 schedule outlines a completion date of July 2011 for treatment facilities. The October 2004 schedule outlines a completion date of November 2009. This is a difference of 20 months.

Analysis of the two Palmdale schedules highlights the following major differences.

	Oct 04 Schedule	Feb 07 Schedule
Design	28 months	33 months
Construction & Startup	24 months	39 months
Total	52 months	72 months

The Palmdale schedules for the treatment facilities illustrate a difference of approximately 20 months for the design and construction/startup activity sets, which is nearly the difference in the completion schedules (20 months). The “industry standard” for the activity sets on similar municipal wastewater treatment projects is 55 – 76 months.

The design time sets take into account the activities for permit request, review and approval. The difference is 5 months for these activities on the schedules.

Other project activity sets could be examined, but the majority of the activities are contained within the design and construction activity sets time frames.

Please note the following pages for comparison of the extractions from the two schedules.

# Palmdale Wastewater Reclamation Plant Project Schedules

## Oct 04 Schedule

Design Phase		
1200	Preliminary Design Assessment	70d
1210	Environmental Survey / Mitigation	60d
1220	Geotechnical Investigation	60d
1230	Preliminary Design	60d
1240	50% Design	80d
1250	90% Design	80d
1260	Final Design	80d
1270	Final Design Submitted to Regional Board	0
1280	Regional Board Review of Final Design	40d
1290	Comments on Final Design from Regional Board	0
1300	Revisions to Final Design	60d
1310	Preparation of Plans	60d

Permitting		
1500	Revised WDRs Issued by Regional Board	0
1510	Groundwater Monitoring Plan Issued by R.B.	0
1520	Anti Degradation Analysis	250d
Advertise, Bid, and Award Construction Contract		
1600	Board Approval to Advertise	0
1610	Advertise and Receive Bids	20d
1620	Review Bids	15d
1630	SWRCB Review of Bids	20d
1640	SWRCB Authorization to Award Contract	0
1660	Board Award of Contract	10d
Construction and Startup		
1700	Baseline Schedule	40d
1710	Contract/Bonds/Insurance	30d
1720	Prepare Land	80d
1730	Construction	310d
1740	Testing	60d
1750	Startup	0

## Feb 07 Schedule

Design Phase - Treatment Plant Expansion					
1200	Preliminary Design Assessment	53	0	01MAR05 A	12MAY05 A
1210	Final Design Stage Five Plant Expansion	517	212	27OCT05 A	30OCT07
1215	Stage Five Plant Expansion Design Complete	0	0		30OCT07
1220	SWRCB Review/Approve Final Design	20	20	31OCT07	27NOV07
1224	District's Board - Submit Agenda Item	0	0		14NOV07
1225	District Board Approval to Advertise	0	0		28NOV07
1230	Advertise and Receive Bids	40	40	29NOV07	28JAN08
1235	Review Bids	12	12	28JAN08	13FEB08
1236	SWRCB Issues ATA	15	15	28JAN08	18FEB08
1239	District's Board - Submit Agenda Item	0	0		13FEB08
1240	District Board Award -Contract	0	0		27FEB08
1255	Contract/Bonds/Insurance	12	12	28FEB08	17MAR08
1260	Baseline Schedule Preparation	40	40	27FEB08	23APR08
1265	Issue Notice to Proceed (Stage Five)	0	0		23APR08
Regulatory Permits - TP Expansion / Eff. Mgmt.					
1520	Prepare ROWD (TP Expansion & Eff. Mgmt)	55	0	02OCT06 A	04JAN07 A
1525	Submit ROWD to RWQCB	0	0		05JAN07
1530	RWQCB Review	100	89	18DEC06 A	10MAY07
1535	RWQCB Issue Revised WDR for TP Exp & Eff. Mgmt	0	0		10MAY07
1599	Secure Environmental Permits - Effluent Mgmt	90	90	06FEB08	11JUN08
Construction - Treatment Plant Expansion					
1730	Construction of Treatment Plant	776	776	24APR08	25APR11
1740	Treatment Plant Startup	0	0		25APR11
1760	Testing Period	63	63	25APR11	25JUL11
1770	Treatment Plant Fully Operational	0	0		25JUL11

ERM was asked to examine the specific time schedules for the District's design and construction of the pump stations and the force main on the Palmdale Project.

The pump station and force main design times were not separately outlined in the latest District schedule. It is presumed that they were included in the 515 days (103 weeks or 24.5 months) for the design of the Effluent Management. It is difficult to imagine that the design effort for force mains, pumps stations and storage reservoirs would require over two-year time. There may have been integration of geotechnical investigations into the design and that might contribute to some of the extended schedule. Since the design was not segregated, assumptions had to be made.

The District's construction of the force mains was outlined to be 17.5 months. Construction of the pumps stations was outlined to be 17.5 months.

ERM contacted several construction firms to get their estimation of the time required to construct the Palmdale force mains and pump stations. In both cases it was difficult to determine why the construction would require 17.5 months. It would have been expected that 12 months construction time would be the maximum time required for either the force mains or pumps stations.

### **DISCUSSION OF LANCASTER PROJECT AND DESIGN-AWARD-CONSTRUCTION SCHEDULE**

The Lancaster Water Reclamation Plant Project (LWRP) Stage V includes the expansion to 18 million gallons per day (MGD) treatment system capacity (incorporating nitrification/denitrification) to meet the demands of growing population in the service area. The Lancaster project also includes construction of tertiary filters and associated chlorination, and the construction of storage reservoirs, piping and associated pump stations.

It is projected that population growth in the District No. 14 service area will increase by as much as 105% by the year 2020. The Lancaster project also includes an enhanced Effluent Management System project phase.

Effluent from the LWRP that is not used for agricultural irrigation or conveyed to Apollo Park is discharged to Amargosa Creek which flows into Piute Ponds behind a constructed dike, upstream of Rosamond Dry Lake.

Discharges of effluent from the LWRP to Piute Ponds cause seasonal (winter) effluent-induced overflows to Rosamond Dry Lake.

The primary objective of the CDO was for the District to eliminate the effluent-induced overflows from Piute Ponds to Rosamond Dry Lake by October 1, 2008. The CDO also outlined "Interim Standards" which were and are intended to gradually reduce the treated wastewater to Piute Ponds. The Interim Standards outlined the objectives and potential actions to be taken by the District to achieve compliance.

Part of the Interim Standards was the integration of a 1 MGD Membrane Bioreactor (MBR) tertiary wastewater treatment plant. The District had funded the evaluation of the technology for application on District-wide wastewater reuse systems. It was decided to place the evaluation system at the LWRP. The 1 MGD MBR plant was completed and started up in late 2006 is now being integrated into the Interim Standards compliance plan.

The District had contracted for the design and build (D/B) of the MBR system by the equipment vendor. The District struggled with getting the required design and equipment information from the vendor, which contributed to the schedule delays. Since the MBR system was integral to compliance with the Interim Standards, the District should have applied more pressure on the vendor to submit the required information and accelerate the completion schedule. In my experience in working with equipment vendors for over 30 years, they are great at building their equipment, but the installation of the system on-site and integration into a

complex schedule are not their strength. In retrospect, the District should have controlled the project, purchased the equipment from the vendor, conducted the required engineering, and contracted the installation. This would have saved them the resulting heartache and potentially made the MBR available to integrate into the treatment and diversion of tertiary wastewaters.

Additionally, the construction of the permanent ponds (storage reservoirs) and integration into the planning and management of the wastewater under the Interim Standards could have been a more prominent focus. While there were delays due to factors out of the District's control (i.e. Mohave Squirrels), the design and construction could have been advanced.

### Schedule Evaluation

The proposed sequence of events is somewhat complicated, but essentially the District submits a permit request and design to the Regional Board for review. Assuming approval, the District then acquires a loan commitment from the state for funding. The project is then advertised, bids reviewed, and contracts awarded. Construction of the facility is then completed and startup occurs.

As with the Palmdale Project, the sequence of events after permit approval is fairly straightforward. Extracted from the Lancaster Gantt chart (Jan 07) are the following for the CAS and Tertiary Facilities, which would represent the 'heart' of the project for completion.

CAS, TERTIARY FACILITIES & AG SITE						
ENVIRONMENTAL STUDIES AND REGULATORY PERMITTING						
8010	Cultural Resources Surveys	52	0	20JUN05 A	31AUG05 A	52
8015	Prepare/Submit Preliminary ROWD to RWQCB	20	0	21APR05 A	18MAY05 A	20
8016	RWQCB Review Preliminary ROWD	22	0	18MAY05 A	27JUN05 A	29
8020	Prepare Addendum	268	0	27JUN05 A	06JUL05 A	267
8021	Prepare Addendum 2	270	0	27JUN05 A	11AUG06 A	282
8030	Prepare Addendum 3	270	0	27JUN05 A	25AUG06 A	303
8040	RWQCB Review Addendums & Revise WDR	51	48	01DEC06 A	13MAR07	22
8050	RWQCB Issues Revised WDR	0	0		14MAR07	0
DESIGN						
8200	Preliminary Design (incl. 30% VE)	210	0	16JUN04 A	05APR05 A	210
8210	Final Design (incl. 70% VE)	376	0	20APR05 A	29SEP06 A	376
8220	Submit Final Design to SWRCB	20	0	02OCT06 A	30OCT06 A	21
8230	SWRCB Review/Approve Final Design	95	72	31OCT06 A	13APR07	45
8239	District's Board - Submit Agenda Item	0	0		11OCT06 A	0
8240	Board Approval to Advertise	0	0	25OCT06 A		0
8250	Advertise & Receive Bids	40	40	16APR07	06JUN07	0
8255	Review Bids/Submit Bids to SWRCB	12	12	11JUN07	26JUN07	0
8260	SWRCB Issues ATA	15	15	27JUN07	16JUL07	0
8265	District's Board - Submit Agenda Item	0	0		18JUL07	0
8270	Board Award of Contract	0	0		18JUL07	0
8275	Baseline Schedule Preparation	40	40	19JUL07	12SEP07	0
8280	Contract/Bonds/Insurance	12	12	19JUL07	03AUG07	0
8290	Issue Notice to Proceed	0	0		12SEP07	0
CONSTRUCTION						
8400	Construction (36 Months)	775	775	13SEP07	10SEP10	0
8410	CAS & Tertiary Facilities Completed	0	0		10SEP10	0
8420	Start-Up Period	36	36	13SEP10	01NOV10	0
8430	Tertiary Effluent to Ag/Storage	0	0		01NOV10	0

Lancaster Treatment Plant Expansion Phase & Effluent Management Phase contains the following summary timelines, as contained in the Jan 07 version of the schedule.

Advertise Bids / Review Bids .....	3.2 months
Contract Set .....	2.5 months
Construction of Treatment Plant.....	36 months
Startup of Treatment Plant.....	2.9 months

ERM researched a number of sources to verify the typical durations or timelines for the various activities comprising a municipal wastewater treatment plant project. For example, in 1998 the American Society of Civil Engineers and Water Environment Federation published “Design of Municipal Wastewater Treatment Plants – WEF Manual of Practice No. 8.” This publication sets forth the range of typical durations of the various activities comprising the design and construction of the typical wastewater project. Additionally, ERM has 64 offices in North America and contacts with a number of large and small city and municipal groups that conduct similar projects. The schedule of Representative Durations set forth below was provided to these groups for comment. Generally, the response was that the durations are representative of municipal wastewater projects.

ERM also is involved with a large number of industrial wastewater projects worldwide. Industrial projects are not constrained by some of the facility planning, multiple bidding or contract award requirements, but the technical (design and construction) element durations are very similar.

The following is a summary of those timelines:

Representative Durations for Activities within Municipal Wastewater Treatment Projects. (These times can vary depending upon the complexity of the project.)

<i>Activity</i>	<i>Duration, Months</i>
Facilities Planning	8 - 12
Regulatory Approval	2 - 3
Preliminary Design	5 - 6
Value Engineering	1 - 2
Final Design	7 – 10
<b>Total Design</b>	<b>23 - 33</b>

Regulatory Approval	2 - 3
Bidding	2 - 3
Contract Award	1 - 2
Construction	30 - 38
Start-Up	2 – 5

**Total Construction/Startup 32 - 43**

The January 07 schedule outlines a completion date of November 2010. The October 2004 schedule outlines a completion date of October 2008. This is a difference of 25 months.

Analysis of the two schedules highlights the following major differences.

	Oct 04 Schedule	Jan 07 Schedule
Design	22 months	26 months
Construction & Startup	24 months	39 months
Total	46 months	65 months

The Lancaster schedules illustrate a difference in approximately 19 months for the design and construction/startup activity sets, which is nearly the difference in the completion schedules (25 months). The 'industry standard' for the activity sets on similar municipal wastewater treatment projects is 55 – 76 months.

The design time sets take into account the activities for permit request, review and approval. The Oct 04 schedule outlines 6 months for the permit application, review, and approval. The Jan 07 schedule outlines 17 months for the same permit activity. This is a difference of 11 months.

Other project activity sets could be examined, but the majority of the activities are contained within the design and construction activity sets time frames.

Please note the following pages for comparison of the extractions from the two schedules.

# Lancaster Wastewater Reclamation Plant Project Schedules

## Oct 04 Schedule

CAS & TERTIARY TREATMENT FACILITIES		
8000	PERMITS (DFG)	120d
8010	ENVIRONMENTAL STUDIES (SQUIRRELS)	80d
8030	PREPARE ROWD (PROCESS CHANGE DESIGN)	20d
8040	SUBMIT ROR/ROWD TO RWQCB	1d
8050	RWQCB RVW ROWD & REVISE WDR	93d
8060	RWQCB ISSUES REVISED WDR	1d
<b>DESIGN</b>		
8070	PRELIMINARY DESIGN (INCL. 30% VE)	165d
8080	FINAL DESIGN (INCL. 70% VE)	275d
8090	SUBMIT FINAL DESIGN TO SWRCB (BY 4-1-06)	1d
8100	SWRCB RVW/APPROVE FINAL DESIGN	20d
8110	BOARD APPROVAL TO ADVERTISE	1d
8120	ADVERTISE & RECEIVE BIDS	20d
8130	SWRCB REVIEW OF BIDS	19d
8140	SWRCB AUTHORIZATION TO AWARD	1d
8150	BOARD AWARD OF CONTRACT (BY 7-1-06?)	1d
8160	CONTRACT/BONDS/INSURANCE	15d
8170	ISSUE NOTICE TO PROCEED (BY 7-1-06?)	1d
<b>CONSTRUCTION</b>		
8180	CONSTRUCTION/STARTUP	493d
8190	STAGE 5 LANCASTER WRP EXPANSION COMPLETE	0

## Jan 07 Schedule

ENVIRONMENTAL STUDIES AND REGULATORY PERMITTING						
8000	Mohave Ground Squirrel Surveys	131	0	01MAR05 A	31AUG05 A	131
8015	Prepare/Submit Preliminary ROWD to RWQCB	20	0	21APR05 A	18MAY05 A	20
8018	RWQCB Review Preliminary ROWD	22	0	18MAY05 A	27JUN05 A	29
8020	Prepare Addendum	268	0	27JUN05 A	06JUL05 A	267
8024	Prepare Addendum 2	270	0	27JUN05 A	11AUG06 A	283
8030	Prepare Addendum 3	270	0	27JUN05 A	25AUG06 A	303
8040	RWQCB Review Addendums & Revise WDR	51	48	01DEC06 A	13MAR07	22
8050	RWQCB Issues Revised WDR	0	0		14MAR07	0
<b>DESIGN</b>						
8200	Preliminary Design (incl. 30% VE)	210	0	16JUN04 A	05APR05 A	210
8210	Final Design (incl. 70% VE)	376	0	20APR05 A	29SEP06 A	376
8220	Submit Final Design to SWRCB	20	0	02OCT06 A	30OCT06 A	21
8230	SWRCB Review/Approve Final Design	95	72	31OCT06 A	13APR07	45
8239	District's Board - Submit Agenda Item	0	0		11OCT06 A	0
8240	Board Approval to Advertise	0	0	25OCT06 A		0
8250	Advertise & Receive Bids	40	40	16APR07	06JUN07	0
8255	Review Bids/Submit Bids to SWRCB	12	12	11JUN07	26JUN07	0
8260	SWRCB Issues ATA	15	15	27JUN07	16JUL07	0
8265	District's Board - Submit Agenda Item	0	0		16JUL07	0
8270	Board Award of Contract	0	0		16JUL07	0
8275	Baseline Schedule Preparation	40	40	19JUL07	12SEP07	0
8280	Contract/Bonds/Insurance	12	12	19JUL07	03AUG07	0
8290	Issue Notice to Proceed	0	0		12SEP07	0
<b>CONSTRUCTION</b>						
8400	Construction (36 Months)	775	775	13SEP07	10SEP10	0
8410	CAS & Tertiary Facilities Completed	0	0		10SEP10	0
8420	Start-Up Period	36	36	13SEP10	01NOV10	0
8430	Tertiary Effluent to Ag/Storage	0	0		01NOV10	0



ERM was asked to examine the specific time schedules for the District's design and construction of the storage reservoirs and the 1 MGD Membrane Bioreactor (MBR) system.

The storage reservoirs design times, as outlined in the Jan 07 schedule, are:

Preliminary Design ..... 8.8 months  
Final Design ..... 13.8 months  
Redesign based on RWQCB Order ..... 6 months

The total time outlined by the District for design of the storage reservoirs was 28.6 months.

Construction of the storage reservoirs, as outlined in the Jan 07 schedule, is:

Stage 5 Construction (Reservoirs 1 & 2) ..... 24 months  
Stage 5 Construction (Reservoirs 3 & 4) ..... 30 months

The total construction time for the four (4) storage reservoirs was outlined to be 30 months.

ERM has an internal group which provides remediation and construction services. Additionally, an external environmental construction firm that provides design and support services for remediation and others projects was queried about the design and construction times for storage reservoirs. Both groups design and construct retention or reservoir ponds in multiple states in the southeast and U.S. They were given the typical size of the storage reservoirs and design specifics from the District's drawings (i.e. height of berm, concrete slope details, etc.) It was also assumed that these reservoirs would be lined, as perhaps a worse case. While there may be issues that are included and addressed in the design stage, it is still the basic design of a retention pond. Once the design for one is completed, the variables for the others can be easily integrated for the design of the others and producing design documents. In fact the details for one will be relatively the same for the others.

A time estimate for the design of the storage reservoirs (excluding any times for review, permitting, etc.) would be 12.6 months. An estimate for the construction of the storage reservoirs (excluding any times for review, permitting, etc.) would be 18.4 months. This assumes that ponds 1 & 2 (or 3 & 4) construction activities would be concurrent. Also added was some contingency into these times for the normal unexpected delays due to weather, etc.

ERM was asked to examine the specific time schedules for the District's design and construction of the 1 MGD Membrane Bioreactor (MBR) system.

The MBR system design times, as outlined in the Jan 07 schedule, are:

Prepare/Submit Design and District's Review	183 days (36.6 weeks)
District Review and approval of Design	10 days (2 weeks)
Completed MBR Design/submittals	17 days(3.4 weeks)
Construction of MBR	152 days (30.4 weeks)

The total time outlined by the District for design/construction of the MBR system was 17.2 months.

These are timelines provided by Siemens (USFilter) for a similar 1 MGD Design/Build Project:

1. Engineering design ..... 8 to 10 weeks from PO
2. Fabrication drawings ..... 10 to 14 weeks
3. Equipment orders ..... 1 week
4. Equipment delivery ..... 16 weeks
5. Construction supervision/installation .. 20 to 24 weeks
6. Start-up and commission ..... 4 weeks

ERM acquired information from one source (USFilter) that estimated approximately 59 to 69 weeks, depending on the project specifics, would be required for the design and construction of a similar size MBR system (including 16 weeks for equipment delivery). According to USFilter the total time for design/construction schedule would be 48 weeks. This compared to the District's outlined schedule of 72 weeks for the same activity.

## **SUMMARY & CONCLUSIONS**

The Palmdale and Lancaster project schedules have significantly shifted after nearly two years of work on the projects. It appears that the major change is the extension of the construction activities schedule projection, with the design activities schedule also contributing to the delay.

### Palmdale Project

The Palmdale treatment facilities project was originally projected to have a design activity time frame of 28 months. In the Feb 07 schedule, the design time frame is 33 months. The "industry standard" for design (assuming all activities) is 23 - 33 months. Therefore the projected times in both schedules would be considered reasonable.

The Palmdale treatment facilities project was originally projected to have a construction activity time frame of 24 months. In the Feb 07 schedule, the construction time frame is 39 months. The "industry standard" for construction/ startup is 32 – 43 months. The original time frame of 24 months would be an under-estimate, while the later projected 39 months would be more representative.

The Palmdale project could not have been designed and constructed (along with all related and required activities) within the original projected schedule. Most projects of this magnitude would have had a number of delays occur as work progressed, but the schedule did not allow for these; it was an unrealistically optimistic project schedule. The revised schedule reflects more appropriate time durations for the required activities.

The entire Palmdale completion schedule has been extended for 20 months. It appears that under-estimation of the construction time required accounts for the majority of that time.

With regards to the construction of the Palmdale force mains and pump stations, the District outlined previous construction times appeared to be excessive. Not more than 12 months should be required for the force mains and 12 months for the pump stations. The District has since determined that these activities can be completed concurrently, as indicated in the most recent schedule.

### Lancaster Project

The Lancaster treatment facilities project was originally projected to have a design activity time frame of 22 months. In the Jan 07 schedule, the design time frame is 26 months. The "industry standard" for design

(assuming all activities) is 23 -33 months. Therefore, the projected times in both schedules would be considered reasonable.

The Lancaster project was originally projected to have a construction activity time frame of 24 months. In the Jan 07 schedule, the construction time frame is 39 months. The “industry standard” for construction/startup is 32 – 43 months. The original time frame of 24 months would be an under-estimate, while the later projected 39 months would be more representative.

The entire Lancaster completion schedule has been extended for 25 months. It would appear that under-estimation of the construction time required accounts for the majority of that time.

As with the Palmdale Project, the Lancaster Project could not have be designed and constructed (along with all related and required activities) within the original projected schedule. Most projects of this magnitude would have had a number of delays occur as work progressed, but the schedule did not allow for these; it was unrealistically optimistic. The revised schedule reflects more appropriate time durations for the required activities.

While there may be related activity sets which complicated the compliance with the CDO’s interim standards for the Lancaster project, these activity sets do not appear to have contributed significantly to the overall completion schedule. The District could have better planned and executed aspects and activities of the overall project to accommodate the Interim Standards (i.e. MBR plant and permanent ponds).

Within the Lancaster Project, two major milestones were defined: the first being the completion of the 21 MGD tertiary treatment plant and compliance with defined discharge standards, and the second being the compliance with the Interim Standards to alleviate discharge of wastewater during the winter months. The Interim Standards would have assisted in approaching the ultimate solution.

Based on our review and analysis, we have concluded that the construction schedules for the Palmdale and Lancaster Projects as initially proposed were unreasonably optimistic, and that the proposed extensions of those specific task activities within the schedules are not unreasonable, especially since they now fall within the industry standards of duration for similar municipal wastewater treatment projects.

With regard to the activities within the project that could have assisted with compliance with the Interim Standards, the District could have provided better management and execution of the MBR and the design and construction of the permanent ponds.

The 1 MGD MBR system was defined as integral to the Interim Standards. The District could have completed the construction and startup of that system within a more reasonable period of time, with appropriate planning and execution. With 183 days for design and 152 days for construction (based on District schedule), both activity sets for the MBR system are of longer duration than would normally be expected. Depending on the project specifics, 59 to 69 weeks would be required for the design and construction of a similar size MBR system (including 16 weeks for equipment delivery). Therefore, according to USFilter, the total time for design/construction schedule for a similar capacity MBR system would be 48 weeks. This compared to the District's outlined schedule of 72 weeks for the same activity set.

The construction of ponds was also defined as integral to the Interim Standards. With 297 days for design and 650 days for construction (based on District schedule), both activity sets for the permanent ponds are of longer duration than would normally be expected.

A time estimate for the design of the storage reservoirs (excluding any times for review, permitting, etc.) would be 270 days (54 weeks or 12.6 months). An estimate for the construction of the storage reservoirs (excluding any times for review, permitting, etc.) would be 396 days (79.2 weeks or 18.4 months). This assumes that ponds 1 & 2 (or 3 & 4) construction activities would be concurrent. Also added was some contingency into these times for the normal unexpected delays due to weather, etc.

It is clear that there are distinct differences of interpretation of probable schedules for specific task activities within the Palmdale and Lancaster projects. It was attempted to understand the rationale for the District's schedule. ERM gathered information on 'industry standards' and actual similar project experience in the technical evaluation of the two project's schedules. The Lancaster and Palmdale Projects have very specific compliance deadlines and requirements. The Lancaster project had interim project deadlines as well.

The intent of this evaluation was to provide guidance on the District's project schedules and specific task activities. It would appear that initially the Districts liberally extended the schedules for the Lancaster MBR plant and storage reservoirs, Palmdale storage reservoirs, and force mains without examining the planning approaches and options to minimize delay. ERM had pointed out that specific task activities could have been completed concurrently or segregated for completion to attempt to meet the compliance requirements. The District's most recent schedules reflect some integration of concurrent schedules tasks.