

CHAPTER 10

CIP Elements



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10.1 Introduction

The ROMP includes a coordinated Capital Improvement Design and Construction program including, at a minimum, cost estimates, schedules and a recommended project delivery and funding strategy for implementation of resulting projects and integration with the PCMWD Capital Improvement Program (CIP). ROMP capital projects are primarily regulatory driven and include specific costs associated with meeting more stringent requirements for effluent discharges into the Santa Cruz River from the WRC and the Ina Road WRF. Other capital projects include various wastewater treatment and conveyance projects necessary to repair and replace existing infrastructure, as well as wastewater treatment and conveyance projects to provide the capacity to serve forecasted demand in the PCRWRD's Non-Metro service area. This chapter discusses the major construction elements and cost of the PCRWRD CIP including:

ROMP Projects

- Santa Cruz Interceptor Phase IV
- Water Reclamation Facility (32-mgd total)
- Ina Road WRF (50-mgd total)

Other Capital Projects (Non-ROMP)

- Electrical System Modifications
- Conveyance System Augmentation
- Outlying Facilities Expansions
- Support Facilities

Construction and labor costs are on the basis of the year 2006 and must be escalated to the cost when the services or construction is provided.

The following assumptions provided in the ROMP Study were incorporated to accomplish the evaluation of the engineering alternatives.

- Both plants achieve regulated nutrient removal utilizing the Bardenpho treatment process.
- The Water Reclamation Campus consists of four independent 8 MGD Bardenpho trains.
- Design Bid Build is used as a basis for scheduling. Scheduling may change if another method is selected.
- Construction costs do not change regardless of project delivery method.
- Base costs were based upon tankage volumes, blower requirements and pumping sizes that were determined and rolled up to a process level in the ROMP Study.
- Design and construction procurement requires 6 months and includes the following components.
 - Develop Request for Proposal
 - Advertising
 - Selection
 - Award
- The Water Reclamation Campus construction contract must be awarded by December 2010.

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- The Ina Road facility construction contract must be awarded by January 2011.
- Startup and testing for both facilities requires 6 months and must begin no later than 6 months prior to the respective facility's compliance date.
- The Water Reclamation Campus is to be online and compliant no later than January 30, 2015.
- The Ina Road facility is to be online and compliant no later than January 30, 2014.

10.2 Base Case

At an estimated cost of \$501 million (2006 dollars), an initial alternative, termed the Base Case, included concurrent construction of a 32-mgd Water Reclamation Campus near the existing Roger Road facility and 50-mgd expansion/upgrade of the current Ina Road WRF. Disinfection for the Base Case alternative was achieved via filtration and ultraviolet technology. The estimated \$501.6 million included the following elements.

- Santa Cruz Extension Phase IV – \$22.4M
- Water Reclamation Campus – \$235.2M
- Ina Road WRF – \$244.0M

A general description of the facility, elements that make up the facility and the costs of the elements for the Base Case are summarized below.

10.2.1 Santa Cruz Extension Phase IV (ROMP)

The recommended route for the plant interconnect pipeline is approximately 5 miles in length and varies in size from 54 inches to 66 inches in diameter. Costs developed for the Santa Cruz Extension do not include right-of-way acquisition or easement costs, or any cost to relocate existing utilities during construction segments of the sludge force main, which may be in the pipeline alignment.

<u>Project Element</u>	<u>Costs (in 2006 \$)</u>
■ Santa Cruz Extension Phase IV (1 or 2 projects)	\$ 19.0 million
■ Engineering Services (design and office/field services during construction)	<u>\$ 3.4 million</u>
Total	\$ 22.4 million

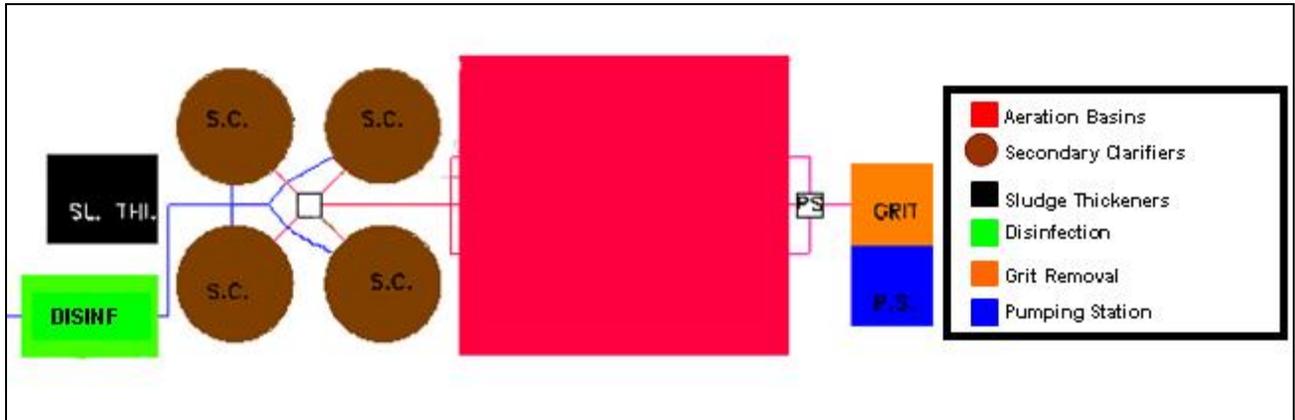
10.2.2 Water Reclamation Campus (ROMP)

Recommendations for the WRC are to construct a new 32-mgd wastewater treatment facility using Bardenpho technology to meet the stringent standards imposed by the Arizona Department of Environmental Quality. The existing facilities would be demolished after commissioning the new operation. A conceptual layout of the proposed WRC is shown in **Figure 10-1**.

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**Figure 10-1
Water Reclamation Campus Conceptual Layout**



10.2.3 Treatment Processes/Systems

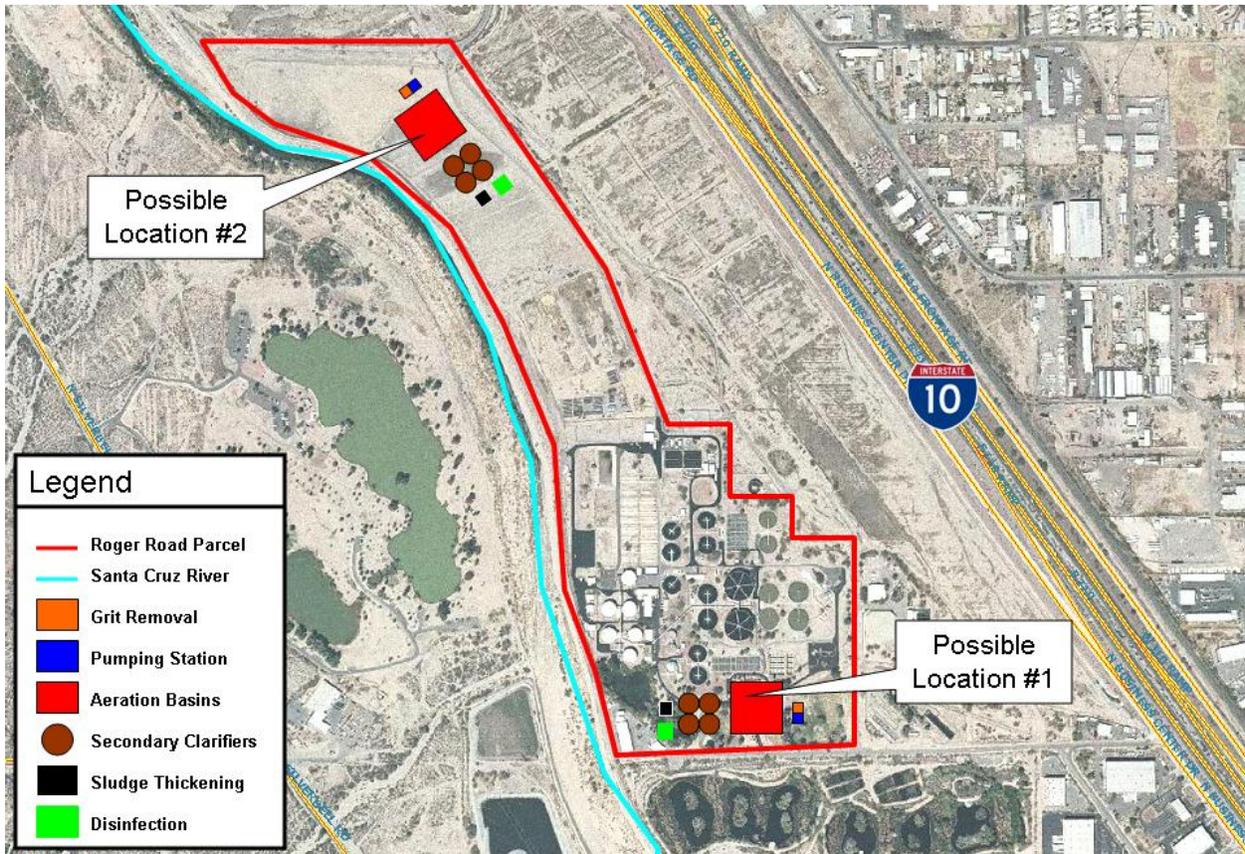
The new WRC is comprised of the major construction elements and estimated costs below. Costs are based on 2006 labor and construction dollars.

<u>Project Element/System</u>	<u>Costs (in 2006 \$)</u>
■ Demolition and Removal	\$ 17.3 million
■ Influent Screening Facilities	\$ 3.1 million
■ Influent Grit Facilities	\$ 2.1 million
■ Odor Control	\$ 11.6 million
■ Aeration Tanks	\$ 73.4 million
■ Final Clarifiers	\$ 20.3 million
■ Disinfection (UV + Filtration)	\$ 23.1 million
■ Sludge Thickening and Dewatering Facilities	\$ 2.3 million
■ Sludge Transfer Pump Station	\$ 2.1 million
■ Site Work	\$ 0.7 million
■ Paving	\$ 0.8 million
■ Architectural	\$ 14.0 million
■ Fence	\$ 0.2 million
■ Irrigation/Landscaping	\$ 0.5 million
■ Engineering	\$ 25.7 million
■ Contingency	\$ 38.1 million
Total	\$ 235.2 million

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Two possible locations for siting the new WRC in a location allowing the existing Roger Road facility continued operation until the new facility is in operation are shown in **Figure 10-2**.

Figure 10-2
Two Future Possible Locations for the New Water Reclamation Campus



A third possible location parallels the Santa Cruz River at the northeastern most edge of PCRWRD's parcel.

10.2.4 Ina Road WRF (ROMP)

Ina Road WRF will have onsite facilities upgraded and expanded to meet the regulatory and growth needs of Pima County over the next 25-years. The wastewater treatment process will be based on Bardenpho technology to meet the stringent standards imposed by the Arizona Department of Environmental Quality. The plant will be expanded to 50-mgd by adding a new Bardenpho treatment train. This expansion will occur by replacing the current 25-mgd HPO process with two new 12.5-mgd Bardenpho trains utilizing the existing clarifiers to their greatest ability, and converting the 12.5-mgd BNRAS train to the Bardenpho process.

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The plant will handle and treat the solids from both the WRC and the Ina Road WRF. In the near-term, Pima County wastewater treatment operations will process a Class B biosolids. These solids will be distributed from the Ina Road plant. In the future, the plant may produce a Class A biosolids which also would be distributed from Ina Road. Cost and space requirements for Class A biosolids is based on the thermophilic anaerobic digestion technology. The new wastewater treatment plant facilities at Ina Road WRF are shown on **Figure 10-3**.



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**Figure 10-3
Ina Road WRF Conceptual Layout**



Legend:

- | | |
|---------------------------------------|---|
| 1. Existing Warehouse | 15. Existing Chlorination Buildings |
| 2. Existing Administration Building | 16. Existing Digesters |
| 3. Existing Primary Clarifiers | 17. New Digesters |
| 4. Existing Blower Building | 18. Existing Sludge Thickeners |
| 5. New Primary Clarifiers | 19. Existing Vacuum Filtration Building |
| 6. New Aeration Tanks | 20. Existing Activated Sludge Reactor |
| 7. Existing Aeration Tanks | 21. Existing Oxygen Production |
| 8. New Sludge Thickeners | 22. Existing Centrifuge Building |
| 9. Existing Secondary Clarifiers | 23. Extension to Centrifuge Building |
| 10. New Secondary Clarifier | 24. New GBT Thickening Building |
| 11. Existing Headworks | 25. Existing Sludge Storage Basin |
| 12. Existing Chlorine Contact Basin | 26. New Disinfection Facilities |
| 13. Existing Energy Recovery Building | 27. Pima County Industrial Waste |
| 14. Existing Training Center | 28. Tucson Water Facilities (not shown) |

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10.2.5 Treatment Processes/Systems

The expanded and upgraded Ina Road WRF is comprised of the major construction elements and estimated costs below. Costs are based on 2006 labor and construction dollars.

<u>Project Element/System</u>	<u>Costs (in 2006 \$)</u>
■ New Influent Screening Facilities	\$ 0.9 million
■ Odor Control	\$ 13.3 million
■ Primary Clarifiers	\$ 10.5 million
■ Aeration Tanks	\$ 62.1 million
■ Final Clarifiers	\$ 9.2 million
■ Disinfection	\$ 43.1 million
■ Sludge Thickening and Dewatering Facilities	\$ 10.2 million
■ Sludge Digestion Facilities	\$ 15.0 million
■ Site Work	\$ 0.5 million
■ Paving	\$ 0.6 million
■ Architectural	\$ 12.1 million
■ Irrigation/Landscaping	\$ 0.2 million
■ Engineering	\$ 26.6 million
■ Contingency	<u>\$ 39.7 million</u>
Total	\$ 244.0 million

10.3 Electrical Service Modifications (Non-ROMP)

The electrical service to the Ina Road facilities consists of multiple feeds from the local power utility and from onsite power generation which utilize biogas and/or natural gas. The existing 37.5 mgd is powered from Tucson Electric Power. The waste heat is utilized for digester and heat cooling requirements. Cost to unify the utility power services and upgrade the onsite power generation systems are to be included in the upgrade and expansion of the facilities at the Ina Road WRF.

In addition, costs to provide back-up power service to the new WRC are required by regulations and will need to be included with the construction of the new facilities.

Costs for the electrical utility power systems modifications at the WRC and Ina Road WRF are:

<u>Ina Road WRF Project Elements</u>	<u>Costs (in 2006 \$)</u>
■ Ina Road Power Unification	\$ 3.0 million
■ Ina Road Power Upgrade & Expansion	\$ 5.0 million
■ Ina Road Power Generation Upgrades	\$ 16.0 million
■ Engineering for Ina Road Electrical	\$ 4.0 million
<u>WRC Project Elements</u>	
■ Back-up Power	\$ 6.0 million
■ Engineering for Electrical	<u>\$ 1.0 million</u>
Total	\$ 35.0 million

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10.4 Conveyance System Augmentation (Non-ROMP)

The conveyance system serving the Roger Road WRF and Ina Road WRF were evaluated for capacity augmentation over the next 25-years. This does not include costs for conveyance system rehabilitation based on recent condition assessments or the costs for odor control enhancements required in the conveyance system.

Based in forecast population growth and per capita contribution, there are a number of sewer segments within the existing conveyance network that will require augmentation. The augmentation is not required immediately, but will be required over time. The forecast for sewer augmentations and the year by which the work should begin are provided below. Costs are based on 2006 labor and construction dollars, and include an engineering allowance of 15 percent and a contingency of 30 percent.

<u>Project No.</u>	<u>Project Year</u>	<u>Description (Manhole to Manhole)</u>	<u>Total Costs (in 2006 \$)</u>
■ 1	2020	4636-30A to 4190-05A	\$4.35 million
■ 2	2015	6036-21 to 3979-101	\$0.74 million
		3919-101 to 8031-01	\$1.32 million
■ 3	2020	8635-11 to 8635-10	\$0.31 million
■ 4	2010	5627-08A to 9907-49	\$2.76 million
■ 5	2015	8130-01 to 1779-02	\$0.45 million
		9917-20 to 9910-21	\$3.95 million
		5667-01 to 5662-01	\$3.31 million
		1779-02 to 5667-01	\$1.21 million
		9910-21 to 9910-19	\$0.40 million
■ 6	2010	8149-05 to 1726-29	\$2.30 million
		3983-05 to 8149-05	\$0.48 million
		1726-29 to 1726-26	\$0.87 million
		1726-26 to 1726-19	\$2.35 million
■ 7	2015	4630-09 to 4630-02	\$0.73 million
■ 8	2010	1751-09 to 1751-01	\$2.57 million
■ 9	2010	8626-01 to 6804-15A	\$0.04 million
■ 10	2020	9521-02 to 9549-05	\$0.46 million
■ 11	2010	1708-22 to 6804-15A	\$1.57 million

Costs of sewer augmentation by 5-year periods are:

<u>Year</u>	<u>Construction Costs</u>	<u>Engineering Costs</u>	<u>Contingency Costs</u>	<u>Total Costs (in 2006 \$)</u>
2010	\$8.93 million	\$1.34 million	\$2.67 million	\$12.94 million
2015	\$8.36 million	\$1.25 million	\$2.50 million	\$12.11 million
2020	\$3.54 million	\$0.53 million	\$1.05 million	\$5.12 million

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10.5 Non-Metro Facilities Expansion (Non-ROMP)

Service areas owned and operated by the County in Non-Metro facilities are experiencing rapid population growth. Many of these facilities will require expansion over the next 25 years. Lagoon treatment systems will remain providing the County with backup treatment capabilities. The expansion program is summarized below. Estimated costs for these facilities are not provided in the summary below.

Non-Metro Facility

Siting, land procurement, and design must be completed before construction of a new Southland WRF and the existing Non-Metro facilities will be expanded to meet the increasing wastewater flows. The project delivery method for the new construction of the Southland WRF will be CMAR, while all the Non-Metro facility expansions will be Design/Build. The Non-Metro facility expansions and new construction phases are listed by each region below.

- Southwest Region
 - Avra Valley WRF
 - ❖ 2006/2007 Expansion 1 (from 1.2 to 2.2 mgd)
 - ❖ 2008/2009 Expansion 2 (Phase out existing BNROD and start up two new BNROD trains providing a total treatment capacity of 4.0 mgd)

- Southeast Region
 - Corona de Tucson WRF
 - ❖ 2006/2007 Expansion 1 (from 0.3 to 1.3 mgd)
 - ❖ 2018/2019 Expansion 2 (from 1.3 to 2.3 mgd)
 - ❖ 2027/2028 Expansion 3 (from 2.3 to 3.3 mgd)
 - Southland WRF
 - ❖ 2009/2010 New Construction (from 0.0 mgd to 2.0 mgd)
 - ❖ 2010/2011 Expansion 2 (from 2.0 mgd to 3.0 mgd)
 - ❖ 2012/2013 Expansion 3 (from 3.0 mgd to 4.0 mgd)
 - ❖ 2014/2015 Expansion 4 (from 4.0 mgd to 8.0 mgd)
 - ❖ 2022/2023 Expansion 5 (from 8.0 mgd to 12.0 mgd)

- South Region
 - Green Valley WRF
 - ❖ 2011/2012 Expansion 1 (from 4.1 mgd to 6.1 mgd)

- Northwest Region
 - Marana WRF
 - ❖ 2010/2012 Expansion 1 (from 0.5 to 2.0 mgd)

- Mt. Lemmon WRF
 - No change unless changes in area restrictions.

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10.6 Support Facilities (ROMP)

The recommendation is to construct a new centralized laboratory for PCRWRD. Based on the existing limited operating space at Ina Road WRF and the ever increasing load on laboratory services to provide operational and regulatory laboratory tests, the centralized laboratory will be constructed at the WRC. Cost of the new centralized laboratory in 2006 construction dollars is estimated at \$10 million. An additional \$2 million dollars (2006 dollars) are provided for engineering and architectural services to provide design and office and field services during construction. One million dollars (2006 dollars) is provided for contingency.

10.7 Expression of Interest

PCRWRD recognizes the value of engaging the “market” to explore alternative, optimal solutions and delivery methods as a means of implementing portions of the PCRWRD’s Capital Improvement Program. PCRWRD further recognizes that it is through collaboration with those entities that can make available to PCRWRD “world class” innovative solutions that may result in the real cost and time savings while implementing the Capital Improvement Program. To that end, a Request for Expression of Interest was developed.

For those responding to the Request for Expression of Interest, PCRWRD receives certain knowledge that will provide long-term benefits and value to the customers and citizens of Pima County. The submissions shared provided PCRWRD a better understanding of how public private partnership can be used to meet long-term community benefits.

The Request for Expression of Interest and the summary responses to this request are presented in **Appendix J**.

10.8 Summary

Costs of the project elements outlined in the ROMP were developed on the basis of 2006 labor and construction costs. The total cost of the ROMP, which includes the Santa Cruz Extension Phase IV, the WRC and the Ina Road WRF with support facilities, exceeds \$500 million in 2006 dollars. Element costs will be packaged into projects that will be procured, designed, constructed and placed into service over the next 10 to 20 years. In an effort to reduce the capital burden, various engineering alternatives were discussed and six were chosen for further analysis. The construction sequence for the chosen alternatives was reviewed and a modified construction phasing schedule was determined as an option to reduce the capital burden. A summary of the economic analysis of the ROMP engineering alternatives and the packaging and phasing of these projects is presented in Chapter 10. Chapter 12 presents the implementation and financial impacts of the entire PCRWRD CIP.