HDWD Preliminary Value Engineering Study Report - HDWD Collection Systems, August 2008

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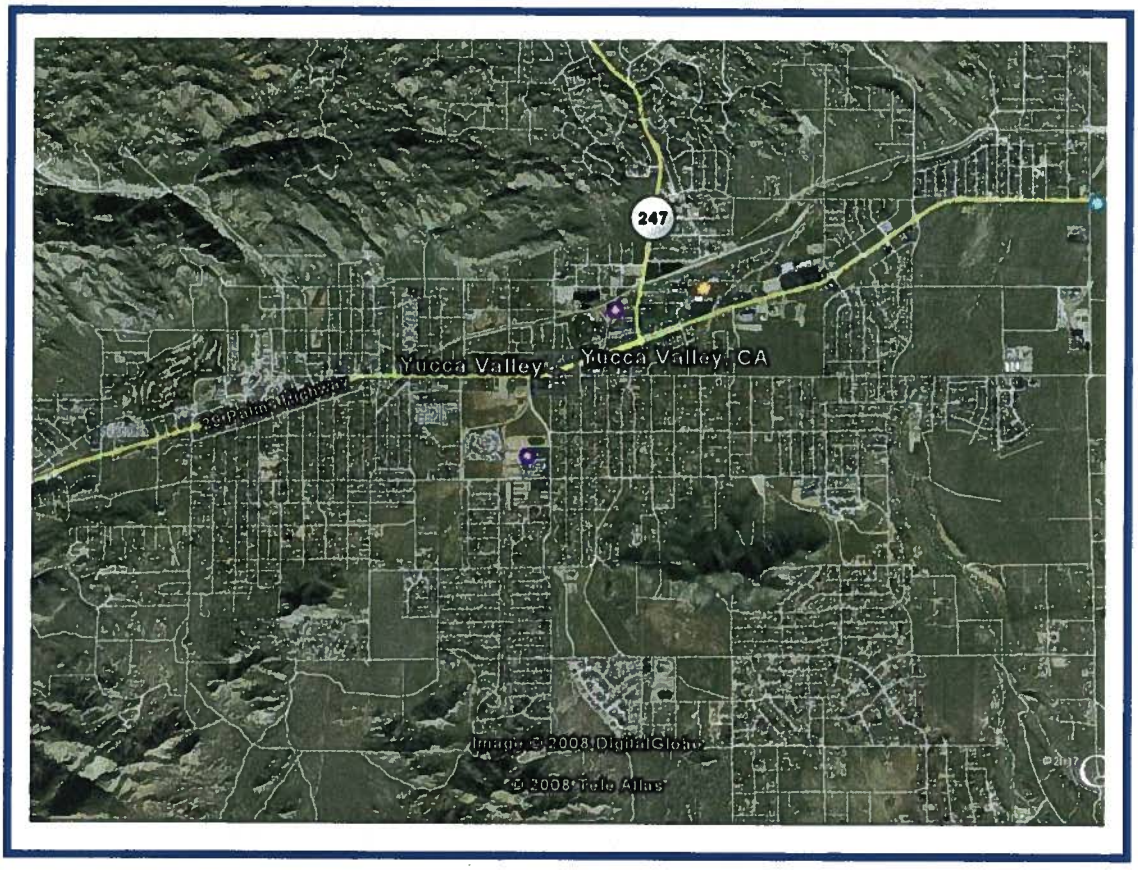
Preliminary Value Engineering Study Report



HDWD Collection Systems

Task Order No. 122

VMS
Value Management Strategies, Inc.

August 2008

Prepared by

Value Management Strategies, Inc.

VMS

Value Management Strategies, Inc.
"Value Leadership"

R. Terry Hays, CVS-Life
President

Date: August 29, 2008

To: Joseph Glowitz, District Engineer - Project Manager
Hi-Desert Water District
55439 29 Palms Highway
Yucca Valley, CA 92284

Subject: Preliminary Value Engineering Study Report (Task Order 122)
HDWD Collection Systems

Value Management Strategies, Inc. is pleased to submit this Preliminary Value Engineering Study Report for the referenced project. This report summarizes the results and events of the study conducted June 2-5, 2008, at HDWD Offices in Yucca Valley, California.

Once you have reviewed the report we can meet to discuss with the designer what should be implemented into the design of the system. I will contact you in late September 2008 to determine how you would like to proceed.

We enjoyed working with you on this study and look forward to the VE Study on the Wastewater Treatment Plant.

Sincerely,

Value Management Strategies, Inc.

R. Terry Hays, CVS-Life
Team Leader

Copy: Eric Trimble

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PRELIMINARY

INTRODUCTION

This Value Engineering (VE) Report documents the results of the study conducted by the Hi-Desert Water District (HDWD or District) and Montgomery Watson and facilitated by Value Management Strategies, Inc. The subject of the study was the Hi-Desert Wastewater Collection Systems in the Town of Yucca Valley in San Bernardino County, California.

The focus of the VE study was Phase 1 of the collection system, although the impacts of the VE recommendations for Phases 2 and 3 were also calculated for the VE alternatives. For this reason all costs were calculated in 2008 dollars and not escalated. The current estimate for Phase 1 is $69,300,000 in 2008 dollars. The cost escalated to 2010 dollars is estimated at $73,500,000.

VE ALTERNATIVES

The VE team developed eleven alternatives for improvement of the project. From these alternatives, two strategies or combinations of alternatives were developed for consideration. The first strategy revises the collection system concept and the second strategy refines the current concept. Several VE alternatives are shared in both strategies. Two alternatives, 9 and 11, are not included in either strategy. Alternative 7 suggests adding laterals to the property line into the budget. Alternative 11 suggests deleting sewers on the northern mesa from Phase 3.

Strategy 1 includes Alternative 10, plus 3, 5, 6, 7, and 8, and is based on a completely new collection system concept utilizing a pressure/gravity/low pressure hybrid system. This new collection system strategy expands Phase 1 to include areas from Phase 3 that are older and near the water extraction wells on the west side of town. This area can easily include three mobile home parks including over 230 units. The collection system at each of these locations is already tied together and each has their own leach field. In addition, this revised concept would permit smaller and shallower collection systems and not require Phase 1 to bare the total burden of the key infrastructure elements. This supports the "pay as you go" concept. In addition, the added flow from the west side of town can help to provide a more predictable flow to the plant during initial operation. The combination of these alternatives would reduce the engineering cost estimate $25,500,000.

Strategy 2 is a refinement of the current system design and incorporates a total of eight of the developed alternatives (Alternatives 1, 2, 3, 4, 5, 6, 7, and 8). These alternatives refine the size and material (HDPE) used for the collection system and improve constructibility of the system. The HDPE pipe also reduces the risk of leaks from the trunk line, impacting the aquifer. The combination of these alternatives would reduce the engineering cost estimate $18,000,000.

INTRODUCTION

INTRODUCTION

This Value Engineering (VE) Report documents the results of the study conducted by the Hi-Desert Water District (HDWD or District) of the Town of Yucca Valley and Montgomery Watson and facilitated by Value Management Strategies, Inc. The subject of the study was the first phase, or the collection system portion, of the Water Reclamation Project of the District within San Bernardino County, California. The VE Study was conducted June 2-5, 2008 at the District offices in Yucca Valley, California.

PROJECT DESCRIPTION

This project was initiated at the request of the District in an effort to address the collection of wastewater in the Town of Yucca Valley, California. The District provides water service for the Town of Yucca Valley and nearby areas. The town currently depends almost entirely on septic tanks and leach fields for disposal of wastewater. The Colorado River Basin Regional Water Quality Control Board (RWQCB) suspects that leachate from the commercial and residential septic tank systems are degrading groundwater quality in the area. They are requiring that a wastewater collection, treatment, and disposal system be constructed. As a result, the District is currently in the process of implementing a program to construct and operate the required facilities. The wastewater collection system component is Phase 1 of the Water Reclamation Project and is the subject of this report.

Phase 1 of the Water Reclamation Project will initially provide sewer collection and treatment for the central portion of the Town of Yucca Valley, which includes the core business area. This initial phase is anticipated to handle an annual average flow of 1 million gallons per day (mgd) of wastewater and replace what is currently being discharged to septic tanks. This area has been specifically chosen due to its higher density and its potential greater impact on potable water supply wells. In the future, if the Phase 1 facilities do not adequately protect the groundwater quality, or if the RWQCB requires more areas to be sewered, the collection, treatment, and disposal facilities will be expanded to collect an additional 1 mgd of sewage. Phase 2 includes the secondary expansion of the collection and treatment facilities to 2 mgd, while Phase 3 is expected to collect an additional 2 mgd wastewater flow for a total system capacity of 4 mgd.

The current estimate for baseline Alternative 1 of the Phase 1 portion of the Water Reclamation Project is $73,500,000.

PROJECT NEED AND PURPOSE

This project is needed to protect the potable water aquifer by reducing nitrates entering the aquifer from septic systems in Yucca Valley. The project purpose is to develop a collection system with primary emphasis on the commercial core area (Phase 1) to support Water Reclamation Facility operations.

VE STUDY OBJECTIVES

The VE Study was intended to focus on alternatives that would help to finalize the scope of the project and identify cost saving alternatives that would help provide a fundable project and satisfy the local stakeholders. In addition, any alternatives that would help reduce or mitigate the project risks would be beneficial.

VALUE METRICS

The Value Metrics process is an integral part of the Value Engineering Process. This process provides the cornerstone of the VE process by providing a systematic and structured means of considering the relationship of a project's performance and cost as they relate to value. Project performance must be properly defined and agreed upon by the stakeholders at the beginning of the VE study. The performance attributes and requirements developed are then used throughout the study to identify, evaluate, and document alternatives.

As the VE team develops alternatives, the performance of each is rated against the original design concept. Changes in performance are always based upon the overall impact to the total project. Once performance and cost data have been developed by the VE team, the net change in value of the VE alternatives can be compared to the original design concept. The resulting Value Matrix provides a summary of these changes and allows a way for the Project Development Team (PDT) to assess the potential impact of the VE alternatives on total project value.

In conjunction with the VE team, the PDT identified and defined the performance attributes and requirements, and then developed the rating scale to measure performance. Performance requirements represent essential, non-discretionary aspects of project performance. Performance attributes represent those aspects of a project's scope and schedule that may possess a range of potential values.

Performance Attributes

The following are the key project performance attributes used in this VE Study:

- Initial Operations
- Regulatory Compliance
- Political Feasibility
- Construction Impacts
- Expandability
- Operating Costs
- Long-Term Maintainability

REPORT STRUCTURE

The results of the VE Study and supporting study information are organized into the following sections of this report.

1. **Executive Summary:** Overview of the VE Study results.
2. **Introduction**: Overview of the project, objectives of the study, and key project performance or risk information.
3. **VE Alternatives**: Detailed documentation of all VE Alternatives.
4. **Project Analysis**: Documentation of the analysis of the project using the various VE techniques.
5. **Project Description**: Information provided to the VE team that formed the basis of the scope of the study. Key drawings and the cost estimate of the original concept are also included.
6. **Idea Evaluation**: Documentation of the ideas generated for this project and the evaluation of these ideas.
7. **VE Process**: Documentation of the VE Process, Study Agenda, and participants.

VE TEAM

The VE team included:

R. Terry Hays	Value Management Strategies, Inc.	VE Team Leader
Eric Trimble	Value Management Strategies, Inc.	Assistant VE Team Leader
Don Bunts	Water 3 Engineer	Sanitation Engineer
Graham Fraser	Fraser Engineers	Sanitation Engineer
Charles O'Neil	Consolidated Construction Management	Civil Engineer
Paul Johnson	Johnson Management Group	Civil Engineer

Key Contacts for this project include:

Joseph Glowitz	Hi-Desert Water District	Project Manager
Ed Muzik	Hi-Desert Water District	General Manager
Ajit Bhamrah	Montgomery Watson	Project Manager
Jeff Mohr	Montgomery Watson	Designer

VE ALTERNATIVES

INTRODUCTION

The results of this study are presented as individual alternatives to the original concept.

VE ALTERNATIVES

Each alternative consists of a summary of the original concept, a description of the suggested change, a listing of its advantages and disadvantages, a cost comparison, change in performance, and a brief narrative comparing the original design with the alternative. Sketches, calculations, and performance measure ratings are also presented.

The cost comparisons reflect a comparable level of detail as in the original estimate. A life cycle benefit-cost analysis for major alternatives is included where appropriate.

VE STRATEGY

VE Studies result in a number of VE alternatives being developed. While it is possible for all ideas to be implemented, typically these are a combination of some of the alternatives that may provide the best solution for the project. This is due to the fact that some alternatives may be competing ideas, different ways to address the same issue, or some alternatives are developed to answer a question raised by a decision maker or to resolve an open issue and found not to be beneficial to the ultimate project. As a result of these factors, the VE team develops a VE Strategy that represents their opinion of the best combination of alternatives for the project to assist the decision makers in their evaluation of the VE alternatives. The VE Strategy is based on factors that include improved performance, likelihood of implementation, least community impact, cost savings, or any combination of project's performance attributes. This information is a guide and is not intended to reject the other alternatives from project stakeholder consideration. The rationale for not including these alternatives in the recommended VE Strategy is discussed in the Executive Summary.

The VE Strategies for this project could provide significant initial cost savings. The first strategy is a completely new collection system concept utilizing a pressure/gravity/low pressure hybrid system (Alternative 10, plus 3, 5, 6, 7, and 8). The second strategy is a refinement of the current system design and incorporates a total of eight of the developed alternatives (Alternatives 1, 2, 3, 4, 5, 6, 7, and 8). These two strategies, as well as other combinations of individual alternatives, should provide the District and the community of Yucca Valley with several value-improving options. In addition, the VE team included Alternative 9, which is a cost estimate correction, for consideration.

SUMMARY OF VE ALTERNATIVES *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
Number	**Description**	**Potential Initial Savings** **Phase 1** **Phase 2** **Phase 3**	**Performance**
1	Reduce 36-Inch Pipe to 24-Inch Pipe for Main Trunk Line and Reduce Upstream Sizes Accordingly	$2,132,000 $0 $1,343,000	+13%
2	Utilize HDPE with SD11 Minimum Thickness for Trunk Sewer	$1,712,000 $0 $528,000	+9%
3	Maximize Spacing Between Manholes	$2,175,000 $2,212,000 $3,277,000	+1%
4	Utilize Submersible Pumps at Pump Stations	$2,178,000 $0 $0	+1%
5	Eliminate One Sack Slurry from Pipe Installation	$2,480,000 $3,278,000 $4,638,000	+1%
6	Recycle Asphalt Paving	$275,000 $280,000 $414,000	+1%
7	Eliminate Hauling and Export of Excess Excavation Material	$216,000 $220,000 $325,000	+1%
8	Utilize Trench Box in lieu of Shoring	$3,899,000 $4,044,000 $5,974,000	+1%
9	Include Lateral Connections to Property Line in Cost Estimate and Main Contract	($7,470,000) Estimate Correction	+9%
10	Refine Phase 1 Area and Utilize Pressure/Gravity/Low Pressure Hybrid System	$14,508,000 $1,842,000 $17,804,000	+32%

SUMMARY OF VE ALTERNATIVES *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
Number	**Description**	**Potential Initial Savings** **Phase 1** **Phase 2** **Phase 3**	**Performance**
11	Delete Work on Northern Mesa from Phase 3	$0 $0 $37,254,000	+3%

SUMMARY OF VE STRATEGIES

Strategy No.	Strategy Description	Initial Cost Savings	Change in Performance	Change in Value
1	New Collection Concept (10, plus 3, 5, 6, 7, 8)	$23,500,000	+33%	+110%
2	Refinement of Current Concept (1, 2, 3, 4, 5, 6, 7, 8)	$16,087,000	+18%	+64%

OTHER CONSIDERATIONS

The VE team generated several design suggestions for consideration by the Project Development Team. These items represent ideas that are relatively general in nature, and are listed below.

DS-11 Have a capacity surcharge for water users to offset cost of groundwater protection (Creative Idea #12)

Because all of the District users will not be put on sewer, but will enjoy the benefits of an improved water supply, a surcharge would be placed on all water users. This could be based on the number of acre feet being returned to the groundwater basin, on the nitrates that are being removed, or some similar identified benefit to the water customers.

DS-12 Develop recycled water system (Creative Idea #18)

By developing a recycled water system, the District could provide recycled water to the few larger users within the service area and divert the groundwater that is used there for potable use. This would also reduce the amount of recycled water that may be viewed as "recharge" by the Regional Water Quality Control Board (RWQCB) and thereby reduce the quantity of potable water that may be required to be purchased to meet blending requirements.

DS-13 Plan future phase with own trunk line to Water Reclamation Facility (Creative Idea #2)

The area in the southern portion of the District could have a west to east interceptor installed that would direct the flows from this area to the proposed Water Reclamation Facility. The southerly area is at an elevation that provides sufficient fall to allow the intercepted wastewater to flow by gravity to the Water Reclamation Facility. By doing this it reduces the size of the interceptor that needs to be installed during the first phase, reduces the size of the lift station required for the first phase, and reduces the size of the force main that will be required downstream of the lift station. The southern east-west interceptor will not require any additional pipe as there already would need to be a pipeline installed in the selected alignment to pick up the properties that would be served regardless. The increase in pipe diameter will not be prohibitive, as it is anticipated the largest size would either be a 12-inch or 15-inch diameter. The concept of "pay as you go" would work well with this scenario, as the costs incurred if this phase were to be constructed would most likely be related to new construction and can be shouldered by the new developments.

DS-14 Utilize multiple construction contracts (Creative Idea #20 – see complete write up)

Although not specifically stated, it would appear that the designer's intent would be that the initial construction contract for the collection system be one contract. The design suggestion is to utilize multiple construction contracts for the initial construction of the collection system. This could provide more opportunity for local contractor participation and possibly a more rapid completion of the collection system. This approach would also allow for more areas to be brought on line in a shorter time period.

DS-15 Separate contract for private property work (Creative Idea #21 – see complete write up)

The connections and details of the connections from the existing residential and commercial septic systems or package treatment systems are not mentioned in elements of the current design or in the assumed contracting scenarios for the project. The design suggestion is to provide schematic design of the

connections from the laterals of the collection system to the existing septic tanks or to an existing package treatment system and provide District administered contracts for these connections, including the work that may be done on private property.

DS-16 Develop standards and pre-qualify contractors to provide connections to residential customers (Creative Idea #15 - see complete write up)

The project needs to have connections to the system provided as soon as possible. The commercial customers are expected to provide the largest flows, but the residential customers will be the largest number of connections, and the residential flows will be important in providing minimum flows to the collectors and in equalizing flows at the plant. The residential customers will need some assistance in contracting and executing their connections to the system. As a minimum, they need to know what it is that they are expected to do, what standards they must meet, and who can do the work for them.

DS-17 Identify private service lateral in total project cost (Creative Idea #40 - see complete write up)

The details and costs of the connections from the existing residential and commercial septic systems or package treatment systems are not mentioned in elements of the current design or cost estimates. The design suggestion would identify the costs of the private sector service laterals and include these costs as an element of the total project costs. This will be important to have during the public awareness so that the customers do not feel the District is "hiding" costs.

DS-18 Analyze nitrogen loading to determine amount of treatment required (Creative Idea #9)

The current design only appears to consider a fixed nitrate level for the effluent quality. Working with the RWQCB it would appear to be more prudent to determine the mass nitrogen loading the groundwater basin can accept. This may allow for a higher nitrogen concentration in the effluent which most probably will result in lesser treatment requirements and a corresponding reduction in the cost to construct. Allowing and realizing the benefit for some nitrogen removal in the soil layer that the water will pass through into the groundwater basin should be considered while in negotiations with the regulating entities.

DS-19 Incorporate milestones in the specifications to limit construction impact (Creative Idea #19)

The construction impact to local businesses can be reduced by limiting the time a contractor can construct in front of local businesses without incurring liquidated damages. This can be done by limiting the amount of open trench or storing of materials that impacts businesses and by adding interim completion dates with milestones in critical areas.

DS-20 Locate the two main faults on plans and incorporate into design (Creative Idea #23 - see complete write up)

There are two known faults in the valley that are known to cross the collection system. These faults may be the subject of seismic events that could have an impact on the system. Currently, the plans do not acknowledge these faults and there is no special design provided for any additional protection of the pipelines at the crossing of these areas.

DS-21 Perform a scour study to determine appropriate depth of sewer (Creative Idea #42)

The depth of the sewer crossing the various washes is critical in determining the overall depth of the remainder of the collections system, as well as the depth of the influent pump stations that are needed.

Performing a scour study will allow for a more exact design and also serve as additional protection for the District to reduce the potential of damage to the sewer should the pipe be installed too shallow.

DS-22 Incorporate Uniform Plumbing Code (UPC) for private property work, including abandoning septic tanks (Creative Idea #29)

Suggest that the method used for abandoning the septic tanks reference the UPC, as this is included in this reference and will reduce the reinventing of the wheel.

DS-23 Coordinate town street paving program with sewer work (Creative Idea #30)

Work with the Town of Yucca Valley to determine if they have developed a street paving/repaving program. If such a program exists, try to coordinate the installation of the sewer in the same timeframe as the repaving work is being accomplished. This would result in some savings relating to the pavement, as well as reduce the potential of cutting a trench in a newly paved/repaved road.

DS-24 Develop policy permitting residential properties greater than one acre to remain on septic (Creative Idea #31)

The larger lots appear to be located in the south where it may not be cost effective to require the installation of sewer. By formalizing the ability, but not the certainty of using septic on one acre or larger lots, it would reduce the pressures that may come to bear by developers in the more densely zoned inner core area. This would formally require all those that are looking to develop on smaller lots, those typically associated with overloading the groundwater basin assimilative capacity, to connect to the new regional sewer system.

DS-25 Utilize agency bid and pre-purchase to ensure standard if grinder pumps are required (Creative Idea #32)

Grinder pumps and certain other components that can be standardized should be purchased in advance. This would eliminate the potential of late delivery or getting many different types of grinder pumps in the system and reduce potential system downtime or secondary pumping. As components wear out, the standard pumps could be sold to local plumbers or installed by the District.

DS-26 Perform a cost estimate by a professional cost estimator (Creative Idea #43)

When decisions are driven by cost estimates, there needs to be an independent third-party estimate to provide a check on the engineers' estimate. Cost estimators can sometimes not be familiar enough with local conditions or costs that are unique to a certain project to include all the costs. Other times cost estimators may build contingency into every phase of the estimate and make the costs unrealistically high and result in the project not gaining public acceptance. These potential project risks can be covered by a third-party estimate.

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
FUNCTION:	Transport Wastewater	**IDEA NO.** 44	**NUMBER** 1
TITLE:	Reduce 36-Inch Pipe to 24-Inch Pipe for Main Trunk Line and Reduce Upstream Sizes Accordingly		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original design concept utilizes 36-inch pipe for the main trunk lines.

ALTERNATIVE CONCEPT:

The alternative concept is to utilize 24-inch pipe in lieu of 36-inch pipe for the main trunk lines and would reduce the upstream trunk lines sizes accordingly.

ADVANTAGES:

- Smaller pipe size would allow for easier installation
- Meets required flow demand

DISADVANTAGES:

- None apparent

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 10,975,000	$ 0	$ 5,380,000	$ 16,355,000
Alternative Concept	$ 8,843,000	$ 0	$ 4,037,000	$ 12,880,000
Savings	$ 2,132,000	$ 0	$ 1,343,000	$ 2,132,000

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
Improved	*No Change*	*Improved*	*Improved*	*No Change*	*Improved*	*No Change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
TITLE:	Reduce 36-Inch Pipe to 24-Inch Pipe for Main Trunk Line and Reduce Upstream Sizes Accordingly	**NUMBER** 1	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

Initial design is very conservative with respect to ultimate flow in the trunk lines. Reducing the size will meet ultimate flow demands and improve flow characteristics in the trunk lines in the early years of operations. The large pipes with low flow would have the potential to go septic with low initial operations. Installation costs increase significantly as pipe diameter increases.

Assume:

- 24-inch trunk lines are reduced to 18-inch
- 30-inch trunk lines are reduced to 24-inch
- 36-inch trunk lines are reduced to 30-inch

PROJECT MANAGEMENT CONSIDERATIONS:

Designer should validate and optimize pipe sizes based on latest flow requirements.

PERFORMANCE MEASURES *HDWD Collection Systems*			VMS Value Management Strategies, Inc.
TITLE: Reduce 36-Inch Pipe to 24-Inch Pipe for Main Trunk Line and Reduce Upstream Sizes Accordingly		**NUMBER** 1	**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations Reduces the potential for the system to go septic with low flows in large pipes during initial operation.	Rating	1	4
	Weight	7	7
	Contribution	7	28
Regulatory Compliance No significant change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility Reduces the potential for early operational complaints in the business core.	Rating	5	6
	Weight	25	25
	Contribution	125	150
Construction Impacts Reduced pipe size reduces construction time and impacts to the community.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No significant change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs Reduces the potential for cleaning the system until daily flow increases to keep the system properly flushed.	Rating	4	5
	Weight	18	18
	Contribution	72	90
Long-Term Maintainability No significant change for long term, some improvement in short term.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**639**
Net Change in Performance:			**+13%**

ASSUMPTIONS and CALCULATIONS
HDWD Collection Systems

VMS Value Management Strategies, Inc.

TITLE:	Reduce 36-Inch Pipe to 24-Inch Pipe for Main Trunk Line and Reduce Upstream Sizes Accordingly	NUMBER 1	PAGE NO. 4 of 4

		Original Cost				Alternative 1.0 Cost			
		Avg. Depth	Unit Cost	Amount	Total	Avg. Depth	Unit Cost	Amount	Total
Phase 1									
Trunks									
18"		12'	290.50	0	0	12'	290.50	7,170	2,082,885
24"		12'	387.15	7,170	2,775,866	12'	387.15	5,916	2,290,379
30"		12'	472.42	5,916	2,794,837	12'	472.42	9,461	4,469,566
36"		12'	571.20	9,461	5,404,123	12'	571.20	0	0
	Phase 1 Total				10,974,825				8,842,830
	Phase 1 Savings								2,131,995
Phase 2									
Trunks									
18"		12'	290.50	0	0	12'	290.50	0	0
24"		12'	387.15	0	0	12'	387.15	0	0
30"		12'	472.42	0	0	12'	472.42	0	0
36"		12'	571.20	0	0	12'	571.20	0	0
	Phase 2 Total				0				0
	Phase 2 Savings								0
Phase 3									
Trunks									
18"		12'	290.50	0	0	12'	290.50	13,897	4,037,079
24"		12'	387.15	13,897	5,380,224	12'	387.15	0	0
30"		12'	472.42	0	0	12'	472.42	0	0
36"		12'	571.20	0	0	12'	571.20	0	0
	Phase 3 Total				5,380,224				4,037,079
	Phase 3 Savings								1,343,145
	Total Project Cost				16,355,049				12,879,909
	Total Project Cost Savings								3,475,140

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Transport Wastewater	**IDEA NO.** 11, 13	**NUMBER** 2
TITLE: Utilize HDPE with SD11 Minimum Thickness for Trunk Sewer		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original design concept utilizes vitrified clay pipe or ductile iron in trunk sewer locations.

ALTERNATIVE CONCEPT:

The alternative concept is to utilize high-density poly-urethane (HDPE) for trunk sewers (SD11 minimum).

ADVANTAGES:

- No joints
- More flexible – seismic survivability
- Eliminates degradation of groundwater through potential joint leaks
- Able to reduce pipe size due to reduced friction in the pipes

DISADVANTAGES:

- Fewer contractors with experience
- Temperature expansion and contraction are factors to consider during construction

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 10,975,000	$ 0	$ 5,380,000	$ 16,355,000
Alternative Concept	$ 9,263,000	$ 0	$ 4,852,000	$ 14,115,000
Savings	$ 1,712,000	$ 0	$ 528,000	$ 2,240,000

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
No Change	*Improved*	*No Change*	*Improved*	*No Change*	*No Change*	*Improved*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
TITLE: Utilize HDPE with SD11 Minimum Thickness for Trunk Sewer	**NUMBER** 2	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

Pipe joint reliability is an important factor to insure that infiltration/exfiltration does not impact the pipeline reliability. Joint leaks could contaminate the groundwater and offset any benefit of the new sewer trunk line. The HDPE joints can be welded above ground and provide an easier construction method that insures joint integrity. The flow characteristics of HDPE are superior to other products and could be downsized. Current prices for HDPE were obtained from P&F Distributors (909-596-6887 - Mark) and were found to be similar to other pipe materials when escalated 15%. The HDPE price is related to oil prices and construction activity. Currently, oil prices have increased and construction activity has declined. Due to the current price fluctuations, a cost comparison showed no savings and is not included. The HDPE pipe can however be recommended on the basis that it provides a safer and more reliable system that may be able to be designed for a shallower depth.

PROJECT MANAGEMENT CONSIDERATIONS:

None required.

PERFORMANCE MEASURES *HDWD Collection Systems*			
TITLE: Utilize HDPE with SD11 Minimum Thickness for Trunk Sewer	**NUMBER** 2		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No significant change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance Reduces the potential for leeks over the groundwater aquifer.	Rating	7	8
	Weight	21	21
	Contribution	147	168
Political Feasibility No significant change.	Rating	5	5
	Weight	25	25
	Contribution	125	125
Construction Impacts Faster installation, reduced community impacts.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No significant change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No significant change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability More durable material, reduced pipe friction should reduce frequency of cleaning.	Rating	4	6
	Weight	11	11
	Contribution	44	66
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**618**
Net Change in Performance:			**+9%**

ASSUMPTIONS and CALCULATIONS
HDWD Collection Systems

VMS Value Management Strategies, Inc.

TITLE: Utilize HDPE with SD11 Minimum Thickness for Trunk Sewer

NUMBER	PAGE NO.
2	4 of 4

		Original Cost				Alternative 2.0 Cost			
		Avg. Depth	Unit Cost	Amount	Total	Avg. Depth	Unit Cost	Amount	Total
Phase 1									
Trunks									
18"		12'	290.50	0	0	12'	349.15	7,170	2,503,406
24"		12'	387.15	7,170	2,775,866	12'	387.15	5,916	2,290,379
30"		12'	472.42	5,916	2,794,837	12'	472.42	9,461	4,469,566
36"		12'	571.20	9,461	5,404,123	12'	571.20	0	0
	Phase 1 Total				10,974,825				9,263,351
	Phase 1 Savings								1,711,475
Phase 2									
Trunks									
18"		12'	290.50	0	0	12'	349.15	0	0
24"		12'	387.15	0	0	12'	387.15	0	0
30"		12'	472.42	0	0	12'	472.42	0	0
36"		12'	571.20	0	0	12'	571.20	0	0
	Phase 2 Total				0				0
	Phase 2 Savings								0
Phase 3									
Trunks									
18"		12'	290.50	0	0	12'	349.15	13,897	4,852,138
24"		12'	387.15	13,897	5,380,224	12'	387.15	0	0
30"		12'	472.42	0	0	12'	472.42	0	0
36"		12'	571.20	0	0	12'	571.20	0	0
	Phase 3 Total				5,380,224				4,852,138
	Phase 3 Savings								528,086
	Total Project Cost				16,355,049				14,115,488
	Total Project Cost Savings								2,239,561

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Provide Access	**IDEA NO.** 22	**NUMBER** 3
TITLE: Maximize Spacing Between Manholes		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The current design utilizes 715 manholes in the Phase 1, Alternative 1 concept.

ALTERNATIVE CONCEPT:

The alternative concept would position manholes at longer intervals where possible and would require approximately 393 manholes in total for Phase 1. Other phases would also be able to be reduced.

ADVANTAGES:

- Reduces construction costs
- Minimizes potential stormwater inflow points
- Reduces maintenance costs

DISADVANTAGES:

- None noted

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 4,833,000	$ 4,915,000	$ 7,281,000	$ 17,029,000
Alternative Concept	$ 2,658,000	$ 2,703,000	$ 4,004,000	$ 9,365,000
Savings	$ 2,175,000	$ 2,212,000	$ 3,277,000	$ 7,664,000

Performance Attribute Impacts						
Initial Operations	**Regulatory Compliance**	**Political Feasibility**	**Construction Impacts**	**Expandability**	**Operating Costs**	**Long-Term Maintainability**
No Change	*No Change*	*No Change*	*Improved*	*No Change*	*No Change*	*No Change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		
TITLE: Maximize Spacing Between Manholes	**NUMBER** 3	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

By using smaller diameter pipes and materials with better flow characteristics, the manhole spacing can be reduced by approximately 50%. Adding back 10% for additional grade changes would reduce the quantity of necessary manholes from 715 to 393. This alternative would also eliminate maintenance costs and potential odor problems that would be associated with the extra manholes.

PROJECT MANAGEMENT CONSIDERATIONS:

Validate that the capability of sewer cleaning equipment can handle longer reaches as proposed here.

PERFORMANCE MEASURES *HDWD Collection Systems*			
TITLE: Maximize Spacing Between Manholes	**NUMBER** 3		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No significant change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance No significant change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility No significant change.	Rating	5	5
	Weight	25	25
	Contribution	125	125
Construction Impacts Reduces added construction to install manholes.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No significant change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No significant change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability Should not impact future maintenance costs as spacing would be within capabilities of cleaning equipment.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**575**
Net Change in Performance:			**+1%**

	Original Concept Cost			VE Alternative 3.0 Cost			
	Unit Cost	Quantity	Total	Unit Cost	Quantity	Total	*Savings*
Manholes							
Phase 1	6,760.00	715	4,833,400	6,760.00	393	2,658,370	2,175,030
Phase 2	6,760.00	727	4,914,520	6,760.00	400	2,702,986	2,211,534
Phase 3	6,760.00	1,077	7,280,520	6,760.00	592	4,004,286	3,276,234
Total			17,028,440			9,365,642	7,662,798

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Pump Wastewater	**IDEA NO.** 27	**NUMBER** 4
TITLE: Utilize Submersible Pumps at Pump Stations		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Based on the $5,000,000 cost estimate and traditional practice for wastewater pumping stations in the 8 mgd size range, it is presumed that the Influent Pumping Station near the corner of SR 62 and Indio Avenue is a wet pit/dry pit design. This concept utilizes a large concrete wet well substructure with a separate below-ground pump and motor room with electrical controls, switchgear, etc. above ground.

ALTERNATIVE CONCEPT:

The alternative concept is to construct a single below-ground chamber for the wet well with the pumps and motors submerged in the wastewater. The pump and motor are close coupled.

ADVANTAGES:

- Significant cost savings resulting from the reduced size of the below-ground reinforced concrete structure by eliminating the dry pit chamber
- Less complexity because of the need to keep the dry pit from flooding and to make the dry pit safe and accessible for maintenance and operations staff
- Safer since personnel cannot easily go below ground level; pumps with motors have to be completely removed if maintenance or replacement is required
- Drive shafts between the pumps and motors are eliminated

DISADVANTAGES:

- Pumps with motors have to be completely removed if maintenance or replacement is required
- Motor has to be removed with the pump for pump maintenance
- The equipment removal system has to be heavier to remove both pump and motor at the same time

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 5,178,000	$ 0	$ 4,100,000	$ 9,278,000
Alternative Concept	$ 2,000,000	$ 0	$ 1,000,000	$ 3,000,000
Savings	$ 3,178,000	$ 0	$ 3,100,000	$ 6,278,000

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
No Change	*No Change*	*No Change*	*Improved*	*No Change*	*No Change*	*No Change*

DISCUSSION / JUSTIFICATION:

Close coupled submersible sewage pumps, such as manufactured by Flygt, are a proven reliable solution to the pumping of raw sewage over a wide range of capacities and heads. The use of the wet well/dry well approach is favored by the larger wastewater agencies where design decisions are heavily influenced by O&M personnel responsible for pump maintenance since the pump can be worked on without removing it from below ground. This inconvenience is made even less attractive since submersible pumps have been sitting in sewage and requires hose down and cleaning before it can be worked on. However, typically the need for maintenance and hence removal is very infrequent, perhaps many years.

In agencies where cost is a significant factor, close coupled submersible pumps are the preferred option.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

PERFORMANCE MEASURES *HDWD Collection Systems*			
TITLE: Utilize Submersible Pumps at Pump Stations	**NUMBER** 4		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No significant change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance No significant change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility No significant change.	Rating	5	5
	Weight	25	25
	Contribution	125	125
Construction Impacts Easier to construct.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No significant change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No significant change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability No significant change.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**575**
Net Change in Performance:			**+1%**

ASSUMPTIONS and CALCULATIONS
HDWD Collection Systems

VMS Value Management Strategies, Inc.

TITLE: Utilize Submersible Pumps at Pump Stations

NUMBER	PAGE NO.
4	4 of 4

	Original Concept Cost			VE Alternative 4.0 Cost			
	Unit Cost	**Quantity**	**Total**	**Unit Cost**	**Quantity**	**Total**	***Savings***
Pump Stations							
Phase 1	5,178,000	1	5,178,000	2,000,000	1	2,000,000	3,178,000
Phase 2	0	0	0	0.00	0	0	0
Phase 3	2,050,000	2	4,100,000	500,000	2	1,000,000	3,100,000
Total			9,278,000			3,000,000	6,278,000

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Install Pipe	**IDEA NO.** 33	**NUMBER** 5
TITLE: Eliminate One Sack Slurry from Pipe Installation		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original concept utilizes a 200 psi CLSM design (one sack slurry) on the 8-inch laterals and 10-inch collector pipelines.

ALTERNATIVE CONCEPT:

The alternative concept is to eliminate the one sack slurry from the pipelines.

ADVANTAGES:

- Reduces export
- Reduces cost

DISADVANTAGES:

- Additional testing would be required

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 37,859,000	$ 49,461,000	$ 69,756,000	$ 157,076,000
Alternative Concept	$ 35,379,000	$ 46,183,000	$ 65,118,000	$ 146,680,000
Savings	$ 2,480,000	$ 3,278,000	$ 4,638,000	$ 10,396,000

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
No Change	*No Change*	*No Change*	*Improved*	*No Change*	*No Change*	*No Change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		
TITLE: Eliminate One Sack Slurry from Pipe Installation	**NUMBER** 5	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

The surface native soils down to the pipeline are sands and sandy silts that can be used for backfill that will not damage the pipe. The backfill specifications could be modified to cover in the event of encountering an occasional stone.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

PERFORMANCE MEASURES *HDWD Collection Systems*			
TITLE: Eliminate One Sack Slurry from Pipe Installation	**NUMBER** 5		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance No change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility No change.	Rating	5	5
	Weight	25	25
	Contribution	125	125
Construction Impacts Reduces export and import work during construction.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability No change.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**575**
Net Change in Performance:			**+1%**

ASSUMPTIONS and CALCULATIONS
HDWD Collection Systems

VMS Value Management Strategies, Inc.

TITLE: Eliminate One Sack Slurry from Pipe Installation

NUMBER	PAGE NO.
5	4 of 4

Alternative 5 - Eliminate One Sack Slurry

	Per Estimate	Phase 1	Phase 2	Phase 3	Total
Length of Pipe	753,043				
CY Excavation	97,600				
CLSM Fill	83,236				
CLSM to Pipe Length Factor (CY/LF)	0.11				
Export to Pipe Length Factor	0.02				
8" pipe w/ CLSM		167,106	240,351	347,942	
10" pipe w/ CLSM		21,511	8,898	4,733	
Phase 1, 2 and 3 Export Quantities Saved Estimate		184,845	244,264	345,622	
Cost of Export 10 Miles ($.50/mi x 10)		$ 5.00	$ 5.00	$ 5.00	
Export Cost Savings		$ 924,223	$ 1,221,320	$ 1,728,108	
CLSM Cost Savings	at $75/CY	$ 1,556,090	$ 2,056,304	$ 2,909,569	

8" and 10" Gravity Sewer				
Original Estimate	$ 37,858,929	$ 49,460,804	$ 69,755,913	157,075,646
VE Alternative	$ 35,378,615	$ 46,183,180	$ 65,118,237	146,680,032
Savings	$ 2,480,314	$ 3,277,624	$ 4,637,676	10,395,614

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Demo/Repair Paving	**IDEA NO.** 34	**NUMBER** 6
TITLE: Recycle Asphalt Paving		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original design requires the hauling of asphalt paving 10 miles off site for disposal.

ALTERNATIVE CONCEPT:

The alternative concept would recycle asphalt paving and use where possible on site.

ADVANTAGES:

- Reduces export and construction costs

DISADVANTAGES:

- None, since only considering the savings from hauling 10 miles to disposal

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 275,000	$ 280,000	$ 414,000	$ 919,000
Alternative Concept	$ 0	$ 0	$ 0	$ 0
Savings	$ 275,000	$ 280,000	$ 414,000	$ 919,000

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
No Change	*No Change*	*No Change*	*Improved*	*No Change*	*No Change*	*No Change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		
TITLE: Recycle Asphalt Paving	**NUMBER** 6	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

Used asphalt is a hazardous material unless used in a roadbed. The estimator has assumed that the removed asphalt needs to be hauled 10 to 20 miles for disposal. The specifications should require recycling and use of the asphalt as road base or blended back into an asphalt mix where it would have some value.

The base cost of asphalt to be removed in the base estimate looks excessive since only 1/3 of the streets in Yucca Valley are paved. This quantity needs to be checked before the cost estimate is finalized. We are only considering that the savings is the asphalt hauling at this stage with the understanding that the quantity is incorrect.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

PERFORMANCE MEASURES *HDWD Collection Systems*			
TITLE: Recycle Asphalt Paving	**NUMBER** 6		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No significant change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance No significant change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility No significant change.	Rating	5	5
	Weight	25	25
	Contribution	125	125
Construction Impacts Reduce time to export and import material.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No significant change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No significant change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability No significant change.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**575**
Net Change in Performance:			**+1%**

Phase 1

- The total pipe footage in Phase 1, Alternate 1 is 250,200 LF.
- The average volume per LF allowed in the estimate is .11 CY/LF.
- 250,200 LF x .11 CY/LF x 2 tons x 10 miles = 550,440 ton miles
- 550,440 ton miles x $.50/ton mile = $275,220 savings

Phase 2

- The total pipe footage in phase one alternate one is 254,334 LF.
- The average volume per LF allowed in the estimate is .11 CY/LF.
- 254,334 LF x .11 CY/LF x 2 tons x 10 miles = 559,535 ton miles
- 559,535 ton miles x $.50/ton mile = $279,770 savings

Phase 3

- The total pipe footage in phase one alternate one is 376,687 LF.
- The average volume per LF allowed in the estimate is .11 CY/LF.
- 376,687 LF x .11 CY/LF x 2 tons x 10 miles = 828,710 ton miles
- 828,710 ton miles x $.50/ton mile = $414,355 savings

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Remove Earth	**IDEA NO.** 38	**NUMBER** 7
TITLE: Eliminate Hauling and Export of Excess Excavation Material		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original design concept specifies the disposal of earthwork off site.

ALTERNATIVE CONCEPT:

The alternative concept would utilize excess earthwork to improve the project by leveling low spots and to improve and control drainage.

ADVANTAGES:

- Reduces cost and community impact

DISADVANTAGES:

- Requires locating disposal areas on site

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 240,000	$ 244,000	$ 361,000	$ 845,000
Alternative Concept	$ 24,000	$ 24,000	$ 36,000	$ 84,000
Savings	$ 216,000	$ 220,000	$ 325,000	$ 761,000

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
No Change	*No Change*	*No Change*	*Improved*	*No Change*	*No Change*	*No Change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
TITLE: Eliminate Hauling and Export of Excess Excavation Material	**NUMBER** 7	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

The current cost estimate includes hauling excess excavation to a disposal sit within 10 miles of the project. On shallow depth utility projects any excess excavation is usually used to level up right-of-way or to solve drainage problems on the site. In other cases it is used up in compaction. Investigation of the site needs to be made to see if any excess could be used to the advantage of the owner. We are only calculating the disposal cost savings.

PROJECT MANAGEMENT CONSIDERATIONS:

Need to ensure use for material is identified in the design.

PERFORMANCE MEASURES *HDWD Collection Systems*			
TITLE: Eliminate Hauling and Export of Excess Excavation Material	**NUMBER** 7		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance No change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility No change.	Rating	5	5
	Weight	25	25
	Contribution	125	125
Construction Impacts Reduces impact of trucks hauling excavated material 10+ miles during construction.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability No change.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**575**
Net Change in Performance:			**+1%**

Phase 1

On Alternative 1 there is approximately 32,000 CY of excess material. Assuming 90% can be used on the site. Cost is based on $.50/ton mile x 10 miles.

Phase 2 and Phase 3

Use the ratio of CY Exaction / Length of Pipe from Phase 1 and apply that to get excavation quantities for Phases 2 and 3.

Cost calculations are provided below.

	Phase 1	Phase 2	Phase 3
Length of Pipe	250,200	254,334	376,687
CY Excavation	32,000		
Excavation to Pipe Length Factor	0.128		
Phase 2 and 3 Export Estimate		32,529	48,177
10% Export	3,200	3,253	4,818
CY to Tons Factor	1.50	1.50	1.50
CY Export - Original Concept	48,000	48,793	72,266
CY Export - VA Alternative	4,800	4,879	7,227
Cost of Export 10 Miles ($.50/mi x 10)	$ 5.00	$ 5.00	$ 5.00
Original Estimate	240,000	243,965	361,330
VE Alternative	24,000	24,397	36,133
Savings	216,000	219,569	325,197

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Install Pipe	**IDEA NO.** 37	**NUMBER** 8
TITLE: Utilize Trench Box in lieu of Shoring		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original design specifies shoring in trenches to provide protection during installation of pipe.

ALTERNATIVE CONCEPT:

The alternative would utilize a trench box in lieu of shoring to provide trench cave-in protection.

ADVANTAGES:

- Reduces cost
- Increases construction safety and time

DISADVANTAGES:

- None apparent

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 5,800,000	$ 5,977,000	$ 8,829,000	$ 20,606,000
Alternative Concept	$ 1,901,000	$ 1,933,000	$ 2,855,000	$ 6,689,000
Savings	$ 3,899,000	$ 4,044,000	$ 5,974,000	$ 13,917,000

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
No Change	*No Change*	*No Change*	*Improved*	*No Change*	*No Change*	*No Change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
TITLE: Utilize Trench Box in lieu of Shoring	**NUMBER** 8	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

Most utility contractors own and are familiar with the operating characteristics and safety requirements of trench boxes. Shoring is done by specialty contractors and is used primarily in tight construction footprints. The safest, most economical, and shortest construction time can be accomplished with trench boxes.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

PERFORMANCE MEASURES *HDWD Collection Systems*			
TITLE: Utilize Trench Box in lieu of Shoring	**NUMBER** 8		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance No change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility No change.	Rating	5	5
	Weight	25	25
	Contribution	125	125
Construction Impacts Reduces construction time and impact to community.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability No change.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**575**
Net Change in Performance:			**+1%**

Trench Box Cost

Trench Box @$50/hour; Backhow @ $250/hour; Operator @ $80/hour = $380/hour

Production Rate = 50 feet/hour

Cost = $380/hour divided by 50 feet/hour = $7.60/foot

In Alternate 1, Phase 1

Shoring = $5,800,000

Average Shoring Cost = $23.50/LF

Trench Box Cost = $7.60/LF x 250,200 LF = $ 1,901,520

Savings = $5,800,000 - $1,901,000 = $3,899,000

In Alternate 1, Phase 2

Phase 2 Shoring Cost = 254,334 LF x Average Shoring Cost = $23.50/LF = $5,976,849

Trench Box Cost = $7.60/LF x 254,334 LF = $ 1,932,938

Savings = $5,977,000 - $1,933,000 = $4,044,000

In Alternate 1, Phase 3

Phase 3 Shoring Cost = 375,687 LF x Average Shoring Cost = $23.50/LF = $8,828,645

Trench Box Cost = $7.60/LF x 375,687 LF = $ 2,855,221

Savings = $8,829,000 - $2,855,000 = $5,974,000

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
FUNCTION:	Connect Laterals	**IDEA NO.** 39	**NUMBER** 9
TITLE:	Include Lateral Connections to Property Line in Cost Estimate and Main Contract		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The cost estimates provided thus far do not seem to include any defined allowance for the laterals that need to be installed from the collection piping to the property line.

ALTERNATIVE CONCEPT:

In other alternatives being evaluated, the cost estimates are being reviewed with the expectation that a more clearly defined expected project cost can be developed. This analysis provides an estimate of the cost of the piping that runs from the collection pipe to the property line; this cost to be added to what will be a more carefully defined cost of the collection pipeline, with the intent of resulting in better definition of the overall project cost estimate.

ADVANTAGES:

- The District would have more confidence in the project cost and be better able to evaluate alternatives

DISADVANTAGES:

- The completed project cost estimate would not have as many multiple conservative considerations and may require adjustments as changes are made

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 0	$ 0	$ 0	$ 0
Alternative Concept	$ 7,470,000	$ TBD	$ TBD	$ 7,470,000
Savings	$ (7,470,000)	$ TBD	$ TBD	$ (7,470,000)

Performance Attribute Impacts						
Initial Operations	**Regulatory Compliance**	**Political Feasibility**	**Construction Impacts**	**Expandability**	**Operating Costs**	**Long-Term Maintainability**
No change	*No change*	*Improved*	*No change*	*No change*	*No change*	*No change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
TITLE:	Include Lateral Connections to Property Line in Cost Estimate and Main Contract	**NUMBER** 9	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

The portion of the laterals that will connect the homes or businesses to the new collection system that is in the streets or right-of-way for the sewer line must be installed as part of the construction of the sewer mains and must be considered as part of the cost of the sewer system. The businesses or residences that will connect to the system cannot be held responsible for the cost of the lateral or of the work that would be required to install the lateral to the main if the lateral was not installed with the main.

The project cost estimate currently available is presented as based on "current information and assumptions" and having a relatively high amount of potential variance. In such an estimate it must be assumed that all of the elements of the work are included, even if not specifically noted, the inclusion being by the use of pricing units or values assumed to include definable but agreed currently smaller and less defined than other elements. These items would be included by the use of higher or more variable unit prices for the other defined elements of the work.

In connection with other analysis items of this review, a review of the estimate is being made in an effort to more carefully define the probable construction cost with the potential of showing that the cost may be considerably less that can be shown by the current estimate.

The cost of the laterals, that is, the lateral pipe from the sewer main to the property line, is not included as an itemized line item of the current estimate. If the estimate is to be examined and more carefully considered, unit prices or estimates are to be applied, the cost of smaller but identifiable and significant items such as the laterals need to be estimated and included as an add item offsetting what is expected to be some lower costs of other portions of the project.

PROJECT MANAGEMENT CONSIDERATIONS:

Need to develop a position regarding the inclusion of this item.

PERFORMANCE MEASURES *HDWD Collection Systems*			VMS Value Management Strategies, Inc.
TITLE: Include Lateral Connections to Property Line in Cost Estimate and Main Contract		**NUMBER** 9	**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No significant change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance No significant change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility Maintain credibility for the project budget and estimate as it reduces the potential for unexpected costs to arise.	Rating	5	7
	Weight	25	25
	Contribution	125	175
Construction Impacts No significant change.	Rating	4	4
	Weight	8	8
	Contribution	32	32
Expandability No significant change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No significant change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability No significant change.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**617**
Net Change in Performance:			**+9%**

- The number of customers (equated to the number of laterals to be installed) identified in the total Phase 1 "customers by land use type" is given as 1,714. There are other alternatives being discussed that may change this number, so for the purpose of this alternative 1,800 laterals will be used. There are 5,788 customers identified for the total project.
- The street widths, paving widths, street improvements, and location of the main relative to the width and paving has not been evaluated for this discussion. An assumed average distance from collection main to property line of 20 feet has been used in this estimate, but assuming, on the average, that the pavement is only 10 feet long perpendicular to the length of the main.
- The quantities of excavation and backfill and pavement removed and replaced is based on an average depth to the lateral of 6 feet, being somewhat deeper at the main and lesser at the property line, perhaps as little as 3 feet deep at the property line if it is known that a pumped discharge from the customer will be provided.
- The work is estimated as if the excavation would be open cut with 1:1 side slopes. The paving quantity deducts a 2-foot distance that would be part of the re-paving for the main.

Estimated Cost for Each 20-Foot Lateral

Labor	$980
Equipment	$380
Materials	$210
Subcontractor – Paving	$1,640
Total Cost	$3,210
Allowances for Contractor's Markups	$800
Contractor's Bond and Insurances	$140
Total Construction Bid Cost per Lateral	$4,150
To be Included in Project Cost for 1,800 Laterals	$7,470,000

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
FUNCTION:	Transport Wastewater	**IDEA NO.** Various	**NUMBER** 10
TITLE:	Refine Phase 1 Area and Utilize Pressure/Gravity/Low Pressure Hybrid System		**PAGE NO.** 1 of 9

ORIGINAL CONCEPT:

The original concept consists of a south and a north gravity backbone system sized to accommodate future wastewater flows for ultimate build-out capacity of the entire District. Phase 1, however, only includes the south gravity major collector/trunk system which begins at the west end as a 10-inch diameter pipe at approximately Fox Trail and runs east along Santa Fe Trail, 0.5 miles along SR 62 then flowing north-east generally parallel to the Yucca Wash, then again along SR 62 for a mile to a proposed pumping station near the intersection of Indio Avenue and SR 62 opposite Paradise Valley.

The trunk sewer/collector system progressively increases in diameter from 10-inch to 36-inch diameter at the pumping station. The 36-inch portion of trunk system and the pumping station is planned to be sized for 8 mgd average dry weather flow. The pumping station then lifts all of the wastewater 80 feet through a 0.75-mile force main to the headworks of the plant.

ALTERNATIVE CONCEPT:

The alternative concept is to extend this initial project boundary further west to incorporate the older part of town which is over the potable water aquifer used by the District. To incorporate the areas that have the greatest influence on the potential nitrate loading of the aquifer, which are also the areas with older septic systems, this alternative proposes a hybrid collection system. This hybrid system is used to match the topographic features of the areas and maximize the flow collected while minimizing construction costs in such that it reaches the proposed plant headworks with reduced pumping volume and energy consumption.

The alignment lies south of SR 62 along alleyways and streets such as Yucca Trail and/or Pueblo Trail as shown in the attached figure. The system utilizes four categories of wastewater collection types for cost efficiency as appropriate to the topography and the properties being served. The four categories are: 1) tradition gravity sewer collection per the original concept, 2)intermediate pumping stations and force mains, 3) low pressure sewer (LPS) systems utilizing grinder pumping units pumping through small diameter shallow pipes, and 4) simple "pump-up" systems for those properties which cannot gravity flow to the nearby gravity trunk.

This system would be optimized for ultimate build-out within the Phase 1 design area with only limited portions of the collection system and pump stations sized to accommodate flows from future phases. Future phases would generally utilize its own optimized collection system for delivering wastewater to near the Water Reclamation Facility.

The alternative concept serves the three mobile home parks to the northwest of the District's Main Office where several of the District's water extraction wells are located.

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 2 Cost	Total Cost
Original Concept	$ 69,324,000	$ 55,533,000	$ 88,955,000	$ 213,812,000
Alternative Concept	$ 54,816,000	$ 53,691,000	$ 71,151,000	$ 179,658,000
Savings	$ 14,508,000	$ 1,842,000	$ 17,804,000	$ 34,154,000

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
Improved	*Improved*	*Improved*	*No Change*	*No Change*	*Improved*	*No Change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
TITLE:	Refine Phase 1 Area and Utilize Pressure/Gravity/Low Pressure Hybrid System	**NUMBER** 10	**PAGE NO.** 2 of 9

ADVANTAGES:

- Reduces capital cost because of shallower trench depths and smaller diameter piping
- A "pay as you go" project within the District's financial capability
- Meets the purpose and need of the project
- Backbone piping/pumping system appropriately sized
- Supports CEQA process in that alternative concepts must be presented
- Eliminates the proposed $5 million pump station at SR 62 and Indio Avenue
- Eliminates groundwater pollution and nitrate loading from the area near the District's wells with older septic systems
- Eliminates potential longitudinal encroachments along SR 62
- Reduces easement/right-of-way acquisition along SR 62
- No longer in the wash embankments, eliminating potential pipe washouts due to bank erosion
- Facilitates staged construction and multiple contractors
- Reduces traffic impacts during construction
- Reduces street restoration
- Reduces construction time
- Reduces Phase 1, Phase 3, and Total Project Costs
- Increases Phase 1 flows
- Increases ability to get more flow earlier to the plant

DISADVANTAGES:

- The core trunk backbone system is optimized for Phase 1 potential ultimate build-out flows, so future facilities and costs are needed for future phases
- Although the SR 62/Indio Avenue pumping station is eliminated, this alternative includes three smaller lower head pumping station/force main systems
- If a LPS system is utilized, it requires a small grinder pumping unit and discharge pipelines located on private property; power costs are provided by the property owner; other issues due to these facilities being on private property require special District policies than in a traditional collection system.
- Increases Phase 2 cost

DISCUSSION / JUSTIFICATION:

A major concern with the original concept is that a single solution is presented. For purposes of meeting the CEQA regulations through the EIR process, several alternatives will need to be presented and the environmental parameters evaluated. Failure to properly address this process during the planning/ preliminary design/master planning process will likely cause the project to stall. This entire process can take up to 18 months.

The original concept was to construct the backbone trunk systems (south and north gravity trunks) to accommodate the flows generated by the ultimate build-out population of the District of 80,000. This translates to approximately 8 million gallons per day of average flow. The approximate current population of the entire District is 26,000. Phase 1 is expected to eventually generate 1 mgd flow to the plant. Early flows could be as low as 250 gpd. Such relatively low flows in sewers sized for much larger flows in the distant future would cause odor forming solids deposition in the sewers and require high maintenance to keep free of solids deposition.

Current estimates suggest that full build-out of the District is unlikely to occur within the typical useful economic life of the sewerage system. Hence, a less ambitious and more practical approach is recommended which meets the District's financial capability while meeting the project's purpose and need for the immediate and near future. In addition, this "pay as you go" approach defines a more politically and environmentally acceptable project.

A major objective of the project is to reduce the Nitrate load to the aquifer. The recommended project is more effective in meeting this important objective since it serves three high density trailer parks consisting of over 225 trailers located near the District's wells northwest of the District's Main Offices. The original concept did not include this major, and most immediate, source of groundwater pollution from the leach fields associated with these trailer parks.

Designing the system for the appropriate lower flows enables the trunk and collector piping to be constructed with smaller diameter piping. Similarly, pumping station capacity is also reduced. Indeed, the alternative concept eliminates the $5,000,000 pumping station at SR 62 and Indio Avenue. However, the alternative concept included several much smaller lower capacity and head pumping stations costing in the order of $500,000 each. The other major factors affecting collection system construction costs include depth of burial and pavement restoration. The original concept had an average depth of about 15 feet much through paved streets, whereas the proposed alternative uses much shallower pipelines located to a great extent in unpaved alleyways.

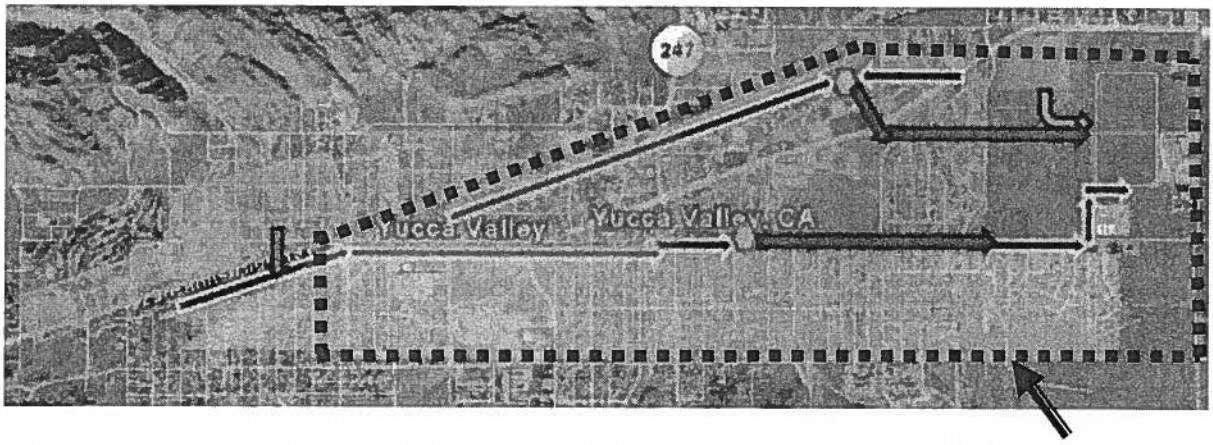
Caltrans does not permit longitudinal encroachments along any of the State's right-of-ways, including SR 62. The original concept included some 1.5 miles of trunk sewer along or adjoining SR 62. Hence, many easements and much property restoration would be required to construct the trunk. In contrast, none of the alternative alignment is located in or adjoining SR 62. Other benefits of the alternative concept are reduced traffic impacts during construction, reduced street restoration, and reduced overall construction time.

A feature of the alternative concept is the use of LPS systems as an alternative to traditional gravity, where appropriate, to provide flexibility and reduce costs for certain properties to be able to connect to the main core trunk system. Small grinder pumping units located on private property pump through 1 1/4-inch to 3-inch diameter shallow depth pipelines. These pipelines can be connected together to form a network system or pump directly into a trunk sewer. Power costs are provided by the property owner. Other issues due to these facilities being on private property will require special District policies.

PROJECT MANAGEMENT CONSIDERATIONS:

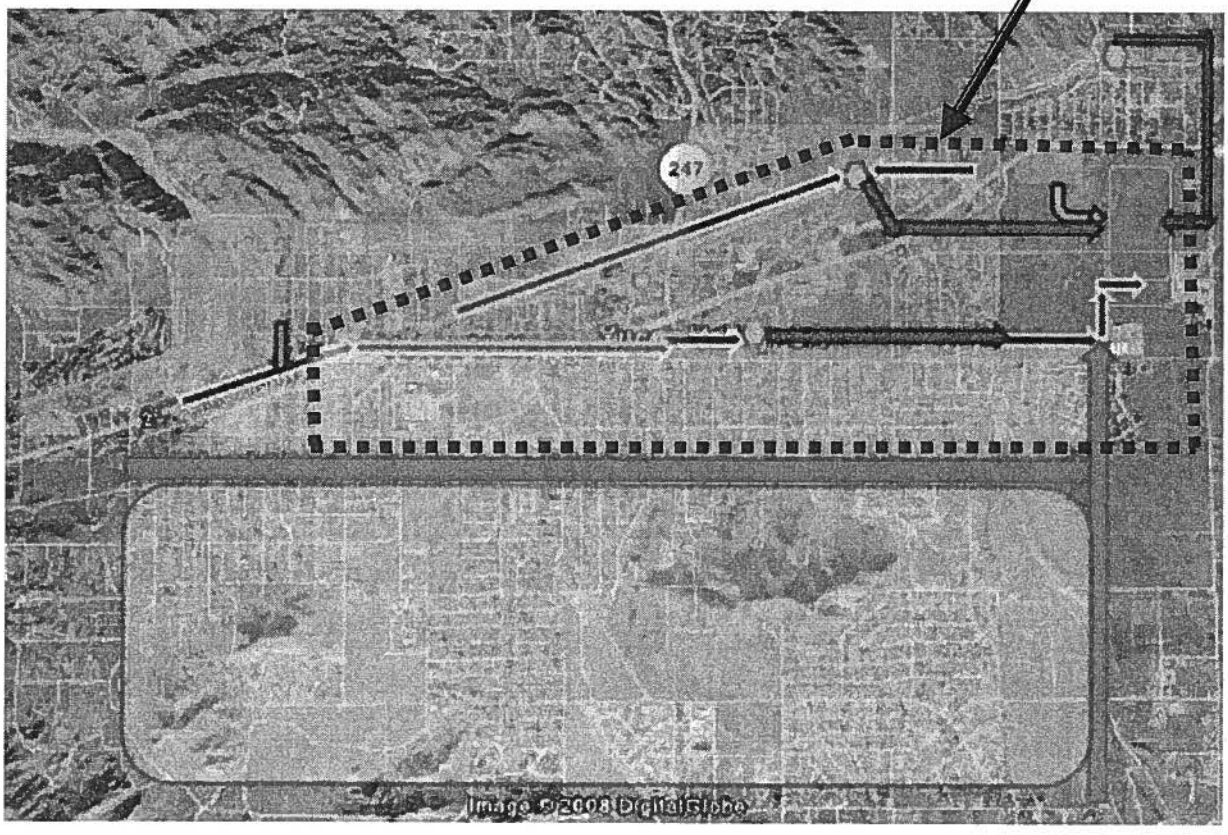
None noted.

Hybrid System – Initial Service Area

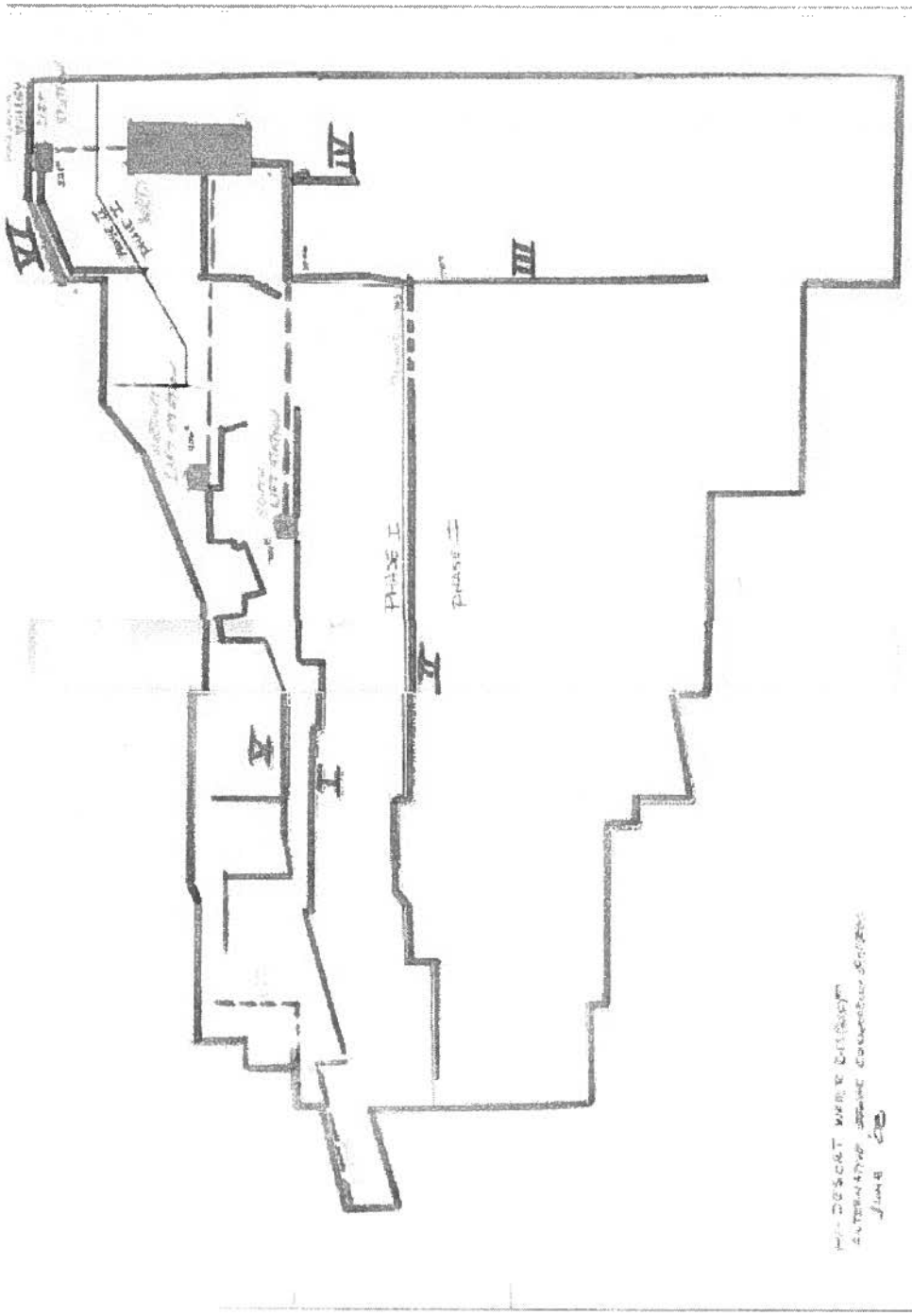


Approximate Limits of Original Phase 1

Hybrid System – Future Additional Service Area



Key Collection Systems Trunk Lines with Refined Phase 1



PERFORMANCE MEASURES *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
TITLE: Refine Phase 1 Area and Utilize Pressure/Gravity/Low Pressure Hybrid System		**NUMBER** 10	**PAGE NO.** 6 of 9
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations 233 properties can be brought online at startup to provide improved predictable flow to the plant.	Rating	1	5
	Weight	7	7
	Contribution	7	35
Regulatory Compliance Addresses area that is having a significant impact on the water quality in Phase 1 rather than Phase 3.	Rating	7	9
	Weight	21	21
	Contribution	147	189
Political Feasibility Better satisfies "pay as you go" concept. Does not place all the burden of main trunk on Phase 1. Includes key areas on west side of town, including Districct offices in Phase 1.	Rating	5	8
	Weight	25	25
	Contribution	125	200
Construction Impacts No significant changes other than more work in Phase 1.	Rating	4	4
	Weight	8	8
	Contribution	32	32
Expandability Satisfies all future phase needs.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs Provides more flow in Phase 1. This should reduce operating cost per user. Easier to operate the plant with more reliable flow.	Rating	4	6
	Weight	18	18
	Contribution	72	108
Long-Term Maintainability No significant change. Total of three smaller pump stations instead of four.	Rating	4	4
	Weight	11	11
	Contribution	44	44
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**748**
Net Change in Performance:			**+32%**

Phase 1

- Area of Phase 1 is increased to the west to include the three trailer parks near Kickapoo Trail.
- Include 2,000 LF of 8-inchmains to accommodate added Phase 3 areas into Phase 1 that are near new trunk lines.
- Three smaller pump stations (submersible type) will be included in Phase 1 and the main pump station (dry well) deleted. In lieu of one pump station serving the west side of town, a LPS system serving the three trailer parks as the collection system for these areas already exists.
- Assume added 15% savings in installation of collection system due to shallower depth of excavation (could be much greater as original concept trunk lines are generally much deeper than indicated in cost estimate).
- Manholes are adjusted at the same ration of manholes to length of sewer as the original concept.

	Original Cost				Alternative 10.0 Cost - Phase 1			
	Avg. Depth	**Unit Cost**	**Amount**	**Total**	**Avg. Depth**	**Unit Cost**	**Amount**	**Total**
Force Mains								
6"	6'	194.30	636	123,575	6'	194.30	0	0
8"	6'	203.00	0	0	6'	203.00	16,750	3,400,250
16"	6'	280.55	4,159	1,166,807	6'	280.55	0	0
Main								
8"	8'	197.40	167,106	32,986,724	8'	197.40	187,106	36,934,724
Major Collectors								
8"	0	197.40	0	0	8'	167.79	16,300	2,734,977
10"	12'	226.50	21,511	4,872,242	12'	192.53	4,075	784,539
12"	12'	238.40	14,766	3,520,214	12'	202.64	4,650	942,276
15"	12'	291.50	10,393	3,029,560	12'	247.78	10,550	2,614,026
18"	12'	290.50	9,082	2,638,321	12'	246.93	0	0
Trunks								
24"	12'	387.15	7,170	2,775,866	12'	387.15	0	0
27"	12'	429.79	0	0	12'	365.32	3,650	1,333,408
30"	12'	472.42	5,916	2,794,837	12'	472.42	0	0
36"	12'	571.20	9,461	5,404,123	12'	571.20	0	0
Manholes		6,760.00	715	4,833,400		6,760.00	647	4,371,422
Pipe & Manhole Subtotal				**64,145,668**				**53,115,623**
Pump Stations					**Pump Stations**			
Main PS		5,178,400		5,178,400	South PS	700,000		700,000
Paradise Valley PS		0		0	Airport PS	500,000		500,000
West Side PS		0		0	West Side PS	500,000		500,000
Pump Stations Total				5,178,400				**1,700,000**
Total				69,324,068				**54,815,623**
Savings								**14,508,446**

Phase 2

- The trunk line to serve the southern slope will replace the 8-inch mains on this alignment and half of a 10-inch main in the area.
- Paradise Valley Pump Station would be added in this area.
- Assume added 15% savings in installation of collection system due to shallower depth of excavation.
- Manholes are adjusted at the same ration of manholes to length of sewer as the original concept.

	Original Cost - Phase 2				Alternative 10.0 Ph 2 Cost			
	Avg. Depth	**Unit Cost**	**Amount**	**Total**	**Avg. Depth**	**Unit Cost**	**Amount**	**Total**
Force Mains								
6"	6'	194.30	1,839	357,318	6'	194.30	0	0
8"	6'	203.00	0	0	6'	203.00	8,000	1,624,000
16"	6'	280.55	0	0	6'	280.55	0	0
21" Tunnel						750.00	750	562,500
Main								
8"	8'	197.40	240,351	47,445,287	8'	197.40	192,251	37,950,347
Major Collectors								
8"	8'	197.40	0	0	8'	167.79	27,500	4,614,225
10"	12'	226.50	8,898	2,015,397	12'	192.53	4,950	952,999
12"	12'	238.40	3,245	773,608	12'	202.64	5,100	1,033,464
15"	12'	291.50	0	0	12'	247.78	3,550	879,601
18"	12'	290.50	0	0	12'	246.93	3,500	864,238
21"					12'		3,500	0
Trunks								
24"	12'	387.15	0	0	12'	387.15	0	0
30"	12'	472.42	0	0	12'	401.56	0	0
36"	12'	571.20	0	0	12'	472.42	0	0
						571.20		
Manholes		6,760.00	731	4,941,560		6,760.00	697	4,709,486
Pipe & Manhole Subtotal				**55,533,170**				**53,190,860**
Pump Stations					**Pump Stations**			
Main PS		0		0	Paradise Valley PS		500,000	500,000
Paradise Valley PS		0		0		0	0	0
West Side PS		0		0		0	0	0
Pump Stations Total				**0**				**500,000**
Total				**55,533,170**				**53,690,860**
Savings								**1,842,310**

Phase 3

- Mains (street sewers) and 10-inch collectors and 24-inch trunk line reduced by amount shifted to Phase 1 (20,000 LF, 2733 LF, and 13,897 respectively).
- Paradise Valley Pump Station removed – shifted to Phase 2.
- West Side Pump Station removed – shifted to Phase 1.
- 6-inch and 8-inch force mains removed (included as needed in Phase 1 and 2).

	Original Cost - Phase 3				Alternative 10.0 Phase 3 Cost			
	Avg. Depth	**Unit Cost**	**Amount**	**Total**	**Avg. Depth**	**Unit Cost**	**Amount**	**Total**
Force Mains								
6"	6'	194.30	1,879	365,090	6'	194.30	0	0
8"	6'	203.00	4,157	843,871	6'	203.00	0	0
16"	6'	280.55		0	6'	280.55		0
Main								
8"	8'	197.40	347,942	68,683,751	8'	197.40	327,942	64,735,751
Major Collectors								
10"	12'	226.50	4,733	1,072,025	12'	226.50	2,000	453,000
12"	12'	238.40	0	0	12'	238.40	0	0
15"	12'	291.50	4,077	1,188,446	12'	291.50	4,077	1,188,446
18"	12'	290.50	0	0	12'	290.50	0	0
Trunks								
24"	12'	387.15	13,897	5,380,224	12'	387.15	0	0
30"	12'	472.42	0	0	12'	472.42	0	0
36"	12'	571.20	0	0	12'	571.20	0	0
Manholes		6,760.00	1,077	7,280,520		6,760.00	706	4,773,718
Pipe & Manhole Subtotal				**84,813,925**				71,150,914
Pump Stations					**Pump Stations**			
Main PS		0		0	South PS	0		0
Paradise Valley PS		2,579,600		2,579,600	Airport PS	0		0
West Side PS		1,561,200		1,561,200	West Side PS	0		0
Pump Stations Total				**4,140,800**				**0**
Total				**88,954,725**				**71,150,914**
Savings								**17,803,811**

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Install Pipe	**IDEA NO.** 33	**NUMBER** 11
TITLE: Delete Work on Northern Mesa from Phase 3		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

In Phase 3 of the original concept, the area north of Yucca Valley that is in the Hi-Desert Water District is included in the sewer project.

ALTERNATIVE CONCEPT:

Eliminate this area from the sewer project.

ADVANTAGES:

- Reduces cost
- Reduces work in an area that does not contribute to the aquifer problem

DISADVANTAGES:

- Need to explain to others why this is not included
- Need to recalculate ultimate plant size and phasing of capacity

COST SUMMARY	Phase 1 Cost	Phase 2 Cost	Phase 3 Cost	Total Project Cost
Original Concept	$ 0	$ 0	$ 75,964,000	$ 75,964,000
Alternative Concept	$ 0	$ 0	$ 38,710,000	$ 38,710,000
Savings	$ 0	$ 0	$ 37,254,000	$ 37,254,000

Performance Attribute Impacts						
Initial Operations	**Regulatory Compliance**	**Political Feasibility**	**Construction Impacts**	**Expandability**	**Operating Costs**	**Long-Term Maintainability**
No Change	*No Change*	*No Change*	*Improved*	*No Change*	*No Change*	*Improved*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*	VMS Value Management Strategies, Inc.	
TITLE: Eliminate one sack slurry from pipe installation	**NUMBER** 11	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

This area on the mesa north of town does not contribute to the problem with the aquifer. During the phone conversation with the resource agency on the first day of the VE Study, they stated that they were not concerned about the effluent coming from this area. They were concerned about the valley area. The homes on the mesa are on large lots and low density. The cost per property to install a collection system from this area will be high.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

PERFORMANCE MEASURES *HDWD Collection Systems*			
TITLE: Eliminate one sack slurry from pipe installation	**NUMBER** 11		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Initial Operations No change.	Rating	1	1
	Weight	7	7
	Contribution	7	7
Regulatory Compliance No change.	Rating	7	7
	Weight	21	21
	Contribution	147	147
Political Feasibility No change.	Rating	5	5
	Weight	25	25
	Contribution	125	125
Construction Impacts Reduces construction work.	Rating	4	5
	Weight	8	8
	Contribution	32	40
Expandability No change.	Rating	10	10
	Weight	14	14
	Contribution	140	140
Operating Costs No change.	Rating	4	4
	Weight	18	18
	Contribution	72	72
Long-Term Maintainability Reduces the amount of system to maintain.	Rating	4	5
	Weight	11	11
	Contribution	44	55
	Rating		
	Weight		
	Contribution		
Total Performance:		**567**	**586**
Net Change in Performance:			**+3%**

ASSUMPTIONS and CALCULATIONS *HDWD Collection Systems*	VMS Value Management Strategies, Inc.	
TITLE: Eliminate one sack slurry from pipe installation	**NUMBER** 11	**PAGE NO.** 4 of 4

Assume a 50% reduction in 8-inch street sewers and 40% reduction in manholes in the Phase 3 collection area.

Original Concept

8-inch street sewer cost	$68,684,000
Manholes	$7,280,000
Total	**$75,964,000**

Alternative Concept

8-inch street sewer cost	$34,342,000
Manholes	$4,368,000
Total	**$38,710,000**
Savings	**$37,254,000**

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Connect Laterals	**IDEA NO.** 20	**NUMBER** DS-14
TITLE: Utilize Multiple Construction Contracts		**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

Although not specifically stated, it would appear that the designer's intent would be that the initial construction contract for the collection system be one contract.

ALTERNATIVE CONCEPT:

Provide for multiple construction contracts for the initial construction of the collection system. This could provide more opportunity for local contractor participation and possibly a more rapid completion of the collection system.

ADVANTAGES:

- More contractors would be able to bid on the project and expected lower overall bid price due to the competition
- Potential participation from local contractors

DISADVANTAGES:

- Multiple contracts to administer
- Multiple contractors working in multiple locations, added (but shorter duration) disruption to traffic and inconvenience to public

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value User Cost	Net Present Value
Original Concept	$	$	$	$
Alternative Concept	$	$	$	$ Design
Savings	$	$	$	$ Suggestion

Performance Attribute Impacts						
Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
Improved	*No Change*	*Improved*	*Decreased*	*Improved*	*No Change*	*No Change*

DISCUSSION / JUSTIFICATION:

The current project plans and the estimate for the work of constructing the sewer collection system, pump stations, and manholes shows a total cost for the first phase of the system to be $70,000,000.

The construction market in Southern California, as well as most of the nation, is somewhat depressed. Certainly the private housing construction market is down. Contractors that usually do not bid on Public Works projects may now be bidding projects like the proposed sewer collection system in the Public Works arena. These construction market conditions can change rapidly. For instance, less than a year ago large public agencies found that their larger projects had only one or two bidders; some agencies were forced to re-schedule their bid advertisements to attract bidders who had bid schedule conflicts.

$70,000,000 is a large project. In the current market there may be more contractors who would bid on a project of this size, but the economic conditions may well mean that some of these contractors could not bond the level of work that they might have been bondable a few years ago. In any case, breaking the collection system contract into smaller parts would undoubtedly mean that there would be more competition in the bidding and lower total bid cost for the work.

The suggestion is to provide plans and specifications such that the collection system contract is broken into smaller contracts, probably three or four. These would still be large contracts and would attract large contractors capable of manning the work and completing the project in a timely manner. The size of the contracts still may be too large for immediate area local contractors, but it might be expected that Coachella Valley pipeline contractors should be interested, perhaps depending on the bid time, construction market, and the contracting conditions imposed in the contract documents.

Other contract breakdown suggestions might be to provide a contract for only the pump station work and other smaller contracts for portions of the sewer main and collectors.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

Proposed scope of Construction Contracts – utilizing the existing design, the October 2002 plans, not considering other alternatives suggested:

Contract 1 – The lift station and the force main from the lift station to the plant site and the trunk sewer line from the lift station along Paxton Road to the flood control channel, including collectors and mains associated with this area.

Contract 2 – The trunk sewer line starting at Paxton Road, along the south bank of the flood control channel through the airport area and again along the south bank of the flood control channel to the end of the south portion of the trunk sewer at Palm Avenue and Antelope Trail. This would include the collectors and mains associated with this area.

Contract 3 – The trunk sewer line along the north side of the flood control channel starting at Paxton Road to the westerly end of the north trunk sewer line at Acoma Trail. This would include the collectors and mains associated with this area.

Utilizing the cost estimate data provided and the piping sizes shown on the October 2002 plans, these three contracts would have probable costs of :

Contract 1 - $17,000,000

Contract 2 - $24,000,000

Contract 3 - $28,000,000

Of course there would be an infinite number of possible variable ways to break down the project into contracts. A breakdown such as described and the resulting contract amounts would give a series of "nice sized" contracts for bidding. One would expect a good level of competition and a reasonable number of bidders.

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Separate Contracts	**IDEA NO.** 21	**NUMBER** DS-15
TITLE: Separate Contract for Private Property Work		**PAGE NO.** 1 of 2

ORIGINAL CONCEPT:

The connections and details of the connections from the existing residential and commercial septic systems or package treatment systems are not mentioned in elements of the current design or in the assumed contracting scenarios for the project.

ALTERNATIVE CONCEPT:

Provide schematic design of the connections from the laterals of the collection system to the existing septic tanks or to an existing package treatment system and provide District administered contracts for these connections, including the work that may be done on private property.

ADVANTAGES:

- Connections made and flows provided to the collection system and plant probably as expeditiously as possible
- Work done would be to more carefully controlled standards
- Many of the connections could be done in connection with the completion of the collection system, avoiding multiple disruptions at a single site
- Any parts of this work that might be eligible for grants or financed funding would be properly documented as would be required for the funding

DISADVANTAGES:

- District would assume liability for work on private property and the responsibility to satisfy the property owners as to the work done and the repairs to damaged or removed appurtenances on the property
- Some customers may wish to provide for the connections themselves or may resist the Public Agency excursions onto their property

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value User Cost	Net Present Value
Original Concept	$	$	$	$
Alternative Concept	$	$	$	$ Design
Savings	$	$	$	$ Suggestion

Performance Attribute Impacts

Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
Improved	*Decreased*	*No Change*	*Improved*	*No Change*	*No Change*	*Improved*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
TITLE: Separate Contract for Private Property Work	**NUMBER** DS-15	**PAGE NO.** 2 of 2

DISCUSSION / JUSTIFICATION:

One of the considerations in the construction and startup of the collection system and the treatment plant is the fact that initial flows will be very low. The rapid connection of the commercial and residential customers is imperative to providing flows reasonably adequate to operate the system. If the connections are left to the individuals, either the residential customers or the commercial customers, the connections will undoubtedly be delayed as long as possible, only those with problems where the new connection is their solution to their problems can be expected to act expeditiously.

It is suggested that the District provide for separate contracts for this work, having a contractor under contract with the District perform the work of connection of each of the existing septic or package treatment systems to the new collection facilities.

- This work would be approached in small increments. That is a contract may he based on a fairly large number of connections, the work would probably be done in increments of a City block or two at a time, perhaps 10 to 20 connections in an increment.
- The contract for the work may be based on a series of unit price items: price per connection to the sewer, per foot of connector pipe, price for septic system closure, unit rates for labor and equipment of several anticipated types.
- The incremental group of connections would be administered by a District resident inspector who would provide interface with the business or resident, calculate the quantities of work, provide agreement on the hours to be charged to each connection, and provide inspection for the work done.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.	
FUNCTION:	Connect Laterals	**IDEA NO.** 15	**NUMBER** DS-16
TITLE:	Develop Standards and Pre-Qualify Contractors to Provide Connections for Residential Customers		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The connections and details of the connections for residential customers have not been addressed in any formal manner.

ALTERNATIVE CONCEPT:

Realizing that the connections to the residential customers are a real cost to the project, at least in its impact on the constituents, some thought needs to be given to the details and method of contracting for the work. The contracting, as a minimum, should include construction standards and perhaps some listing of pre-qualified contractors who are familiar with the area, the type of work, and the requirements of the project.

ADVANTAGES:

- By having some standards in place earlier in the project, the beginning of the work of the connections would be expedited resulting in flows to the plant and decreasing startup problems due to low flows in the system
- Residential customers would have a starting point in providing for their connection to the collection system

DISADVANTAGES:

- Some residential customers may wish to provide for the connections themselves or by means or persons not anticipated by any preset standards
- The District may wish to distance itself from these connections to minimize any liability for improvements on private property

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value User Cost	Net Present Value
Original Concept	$	$	$	$
Alternative Concept	$	$	$	$ Design
Savings	$	$	$	$ Suggestion

Performance Attribute Impacts						
Initial Operations	**Regulatory Compliance**	**Political Feasibility**	**Construction Impacts**	**Expandability**	**Operating Costs**	**Long-Term Maintainability**
Improved	*Improved*	*Improved*	*Decreased*	*No Change*	*No Change*	*Improved*

DISCUSSION / JUSTIFICATION:

The project needs to have connections to the system provided as soon as possible. The commercial customers are expected to provide the largest flows, but the residential customers will be the largest number of connections and the residential flows will be important in providing minimum flows to the collectors and in equalizing flows at the plant. The residential customers will need some assistance in contracting and executing their connections to the system. As a minimum, they need to know what it is that they are expected to do, what standards they must meet, and who can do the work for them.

What is involved in customer connections to the system?

The lateral from the collection system would be placed as part of the collection system. The residential customer would be required to:

1. Provide for the excavation and backfill, pipe materials, and labor to connect from their existing septic system to the lateral at their street property line.
2. Provide for closure of their old septic system in accordance with the requirements of the Uniform Plumbing Code.
3. Restore improvements damages or removed by the requirements of items 1 or 2 above. Many of these items would be optional to the home owner, except in cases where an unsafe condition may be caused by the delay in restoration or improvements where a building permit may be involved in the restoration.

What requirements need to be specified for the work involved in the customer connections?

1. The work of connecting to the laterals needs to be done to District specified standards, either standards that may exist or by reference to standards specifications, such as the SSPWC "Green Book". This should be required even where the work is on private property or at least for a minimum distance from the point of connection to the lateral.
2. The proper closure of the septic system must be in accordance with the plumbing code and a requirement of the connection permit. The inspection of the closure work must be a part of the permit closeout process.
3. Improvements that may be effected should be noted as part of the permit process to provide some basis for evaluation of conditions that may exist by virtue of the improvements not being restored and to clearly indicate situations that may require separate (City) permits for demolition or reconstruction or additions to the improvements.
4. The work of the connection to collection system and the closure of the existing septic system should be done by an appropriately licensed contractor. Restoration improvements should be done by qualified persons consistent with code or permit requirements.

One of the biggest issues for an individual residential customer is their determination of who can do the work for them. It is proposed that the District provide a process where contractors could be listed as pre-qualified contractors that have shown an interest in the work, have previously become somewhat familiar with the requirement of the work, and after some investigation by the District are reasonably known to be capable of doing the work, either for individual residential customers or a group of residential customers.

DISCUSSION / JUSTIFICATION (Continued):

Considerations on prequalification of contractors:

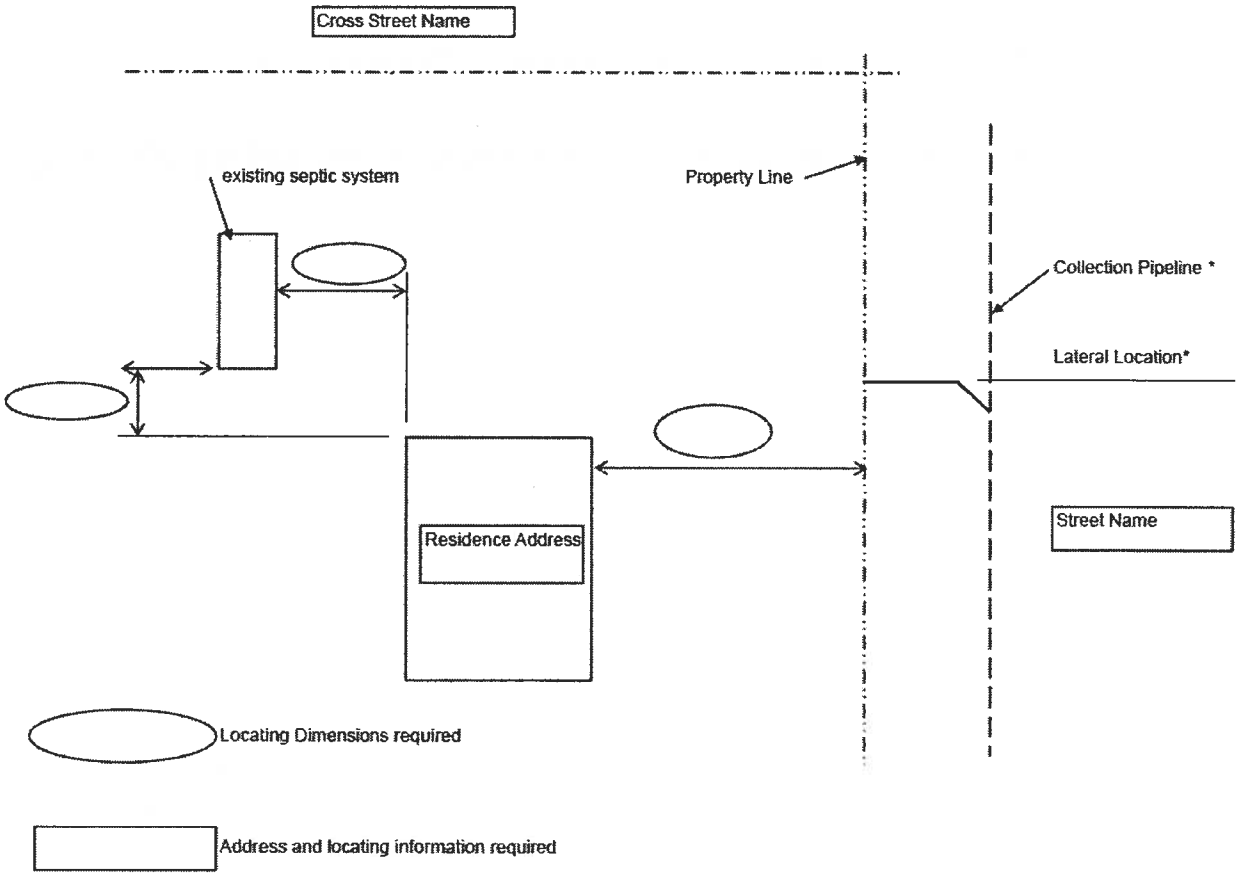
1. Contractors must be licensed by the California State Contractor's Board in the class determined appropriate for the work (C-Plumbing).
2. Contractors having employees must have their employees covered by workman's compensation insurance.
3. Contractor should have a policy of liability insurance.
4. Contractors should have a reasonable safety record. This record can, in cases where the contractor has employees covered by workman's compensation insurance, be verified by their "Experience Modification Record" (EMR) which should be available from their insurance carrier. In the case of very small employers, setting a standard for this may be difficult, however.
5. The pre-qualified contractors should provide certificates of the above mentioned insurances on file with the District.
6. Determination of financial capability of the contractor may be difficult. If any part of the contract is to be held by the District, the contractor would be required to post a labor and material bond.
7. Providing other requirements for pre-qualifying contractors may be difficult. The District needs to avoid subjective determinations of who may be qualified. It may be desired that these contractors be "local", but a determination that local means Yucca Valley or San Bernardino County would usually require a finding of fact or necessity to be enforceable.
8. Those contractors proposed to be pre-qualified should be willing to become reasonably familiar with the general requirements of the work - the District's standards, the permit process, and the inspection requirements.

Overall, the emphasis needs to be to make it as easy as possible for the residential customer to begin using the new collection system. The District requirements, the pre-qualified contractors, and the permit process need to be resident friendly. A permit application, which has the District's requirements attached and the application itself requesting a minimum level of information, should be developed. Information related to the location of the collection system and lateral being provided by the District. In cases where the pre-qualified contractor is indicated and the resident location information has been provided, would need only time for a District representative to review the collection system as-builts to confirm locations before issuing the permit.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

Residential Connection Application



* collection system information provided by District.

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Connect Laterals	**IDEA NO.** 40	**NUMBER** DS-17
TITLE: Identify Private Service Laterals in Total Project Cost		**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

The details and costs of the connections from the existing residential and commercial septic systems or package treatment systems are not mentioned in elements of the current design or cost estimates.

ALTERNATIVE CONCEPT:

The design suggestion would identify the costs of the private sector service laterals and include these costs as an element of the total project costs.

ADVANTAGES:

- Provides a total project cost that more nearly includes and identifies all elements of the work

DISADVANTAGES:

- Project total cost will be at higher levels than previously indicated

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value User Cost	Net Present Value
Original Concept	$	$	$	$
Alternative Concept	$	$	$	$ Design
Savings	$	$	$	$ Suggestion

Performance Attribute Impacts						
Initial Operations	**Regulatory Compliance**	**Political Feasibility**	**Construction Impacts**	**Expandability**	**Operating Costs**	**Long-Term Maintainability**
No Change	*Improved*	*Decreased*	*No Change*	*No Change*	*No Change*	*No Change*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
TITLE: Identify Private Service Laterals in Total Project Cost	**NUMBER** DS-17	**PAGE NO.** 2 of 3

DISCUSSION / JUSTIFICATION:

The current project design information identifies the "Number of Customers by Land Use Type" for Phase 1 as 1,714 customers and for the three identified phases as 5,788. Undoubtedly, the details of many of these will be substantially the same; there is similarly no doubt that each one will be different from the next. There has been no itemized attempt to identify the cost of the private sector portion of the cost of connecting into the systems, the variability of the installations being one deterrent to any attempts. It is recognized that the private sector work is a (necessary) part of the project. For evaluation of the total cost of all elements of the project there should be some attempt to identify these private sector costs and make a summary cost of the private work available for inclusion in the project total cost considerations.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

- The most typical installation would be for a residential customer, having a septic tank and being on the high side of the street so that the connection would be "normal" for gravity flow into the lateral provided as part of the sewer main system. A 4-inch pipe would be used; a reasonable distance from the property line lateral to the point of connection to the existing house sewer would be 60 feet at a depth of 3 to 6 feet. The septic system would have to be uncovered, pumped out and filled. Restorations would be a great variable, but likely would include some concrete walks or drives, but any shrubs, fences, or other demolition or restorations would be disregarded in these estimates.

- Residential customers that are on the low side of the street where their house sewer connection point lies below the elevation of the sewer lateral would have to include a pumped discharge from the connection point. Manufactured pump, sump, float, and systems are available and are assumed in these estimates. A 2-inch pipe would be used at a depth of 3 feet, but with the same 60-foot distance assumed. Electrical connection to the pump system would be included in the estimate. The septic system would have to be uncovered, pumped out, and filled. Restorations would be a great variable, but can be minimized by routing the pumped line away from certain items.

- Commercial customers could have greater variability of connections, some perhaps needing larger piping, larger pump systems, and having septic systems or package plants that would be more costly than usual to decommission. Removals of existing paving or driveways and restorations would be expected to be higher than would be assumed for residential customers. Costs would be included for traffic plates, barricades, and additional protection for the public.

Applying reasonable cost units for the work at an average installation and assuming a breakdown between the gravity connections and the pumped connections, the identified cost of the private sector service laterals as given for the Land Use Customer Type for the Phase 1 project would be estimated as follows:

Residential Customers (all densities)	- gravity connections 1040 @ $4,800 =	$4,992,000
	- pumped connections 432 @ $5,600 =	$2,419,200
Commercial Customers	- gravity connections 100 @ $8,800 =	$880,000
	- pumped connections 52@ $12,300 =	$639.600
Others - Public, Parks, Schools	- assumed all gravity 39@ $8,800 =	$343,200
Total identified cost of private sector connections to laterals =		$9,274,000

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
FUNCTION: Transport Wastewater	**IDEA NO.** 23	**NUMBER** DS-20
TITLE: Locate the Two Main Faults on Plans and Incorporate Into Design		**PAGE NO.** 1 of 2

ORIGINAL CONCEPT:

There are two known faults in the valley that are known to cross the collection system. These faults may be subject of seismic events that could have an impact on the system. Currently, the plans do not acknowledge these faults and there is no special design provided for any additional protection of the pipelines at the crossing of these areas.

ALTERNATIVE CONCEPT:

Locate these two main faults on the project plans and provide appropriate special design of the piping at the fault areas for additional protection of the system in the case of a significant seismic event.

ADVANTAGES:

- Additional reliability of the system

DISADVANTAGES:

- Additional cost pertinent to the protection provisions provided

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value User Cost	Net Present Value
Original Concept	$	$	$	$
Alternative Concept	$	$	$	$ Design
Savings	$	$	$	$ Suggestion

Performance Attribute Impacts						
Initial Operations	Regulatory Compliance	Political Feasibility	Construction Impacts	Expandability	Operating Costs	Long-Term Maintainability
Decreased	*Improved*	*Improved*	*Decreased*	*No Change*	*No Change*	*Improved*

VALUE ANALYSIS ALTERNATIVE *HDWD Collection Systems*		VMS Value Management Strategies, Inc.
TITLE: Locate the Two Main Faults on Plans and Incorporate Into Design	**NUMBER** DS-20	**PAGE NO.** 2 of 2

DISCUSSION / JUSTIFICATION:

There are the two known fault lines crossing the alignment of the new collection system. If a seismic event were to occur along one of these faults, the ground motion or displacement could cause damage to the collection system piping, manholes, or pump stations. The worst case effect would be a leakage or flow of the sewage from the collection system. Depending on the exact nature of the event and damage to the piping there may or may not be immediate evidence of the conditions. The current system design and some of the proposed alternatives have several different types of piping, each with different capabilities of withstanding strong motion or displacements. As a minimum, locating these faults and specifying the most resistant piping for use in these areas seems prudent. Depending on the exact location and details of the piping at these crossings, more detailed provisions could be provided, perhaps as extensive as providing specially designed or purchased flex joints on each side of the fault area and including additional manholes or junction structures with gates to stop the flow in case of a failure of the pipe and provisions for temporary pumping across the ruptured area.

Any of the provisions provided may not be sufficient in the case of a particularly strong motion event or an event of direction against a weaker axis of the system. The determination of the location of the faults and the review of conditions of the system design at these locations seems appropriate with evaluation of the alternatives to be made on a cost and risk basis.

PROJECT MANAGEMENT CONSIDERATIONS:

None noted.

PROJECT ANALYSIS

SUMMARY OF ANALYSIS

The following analysis tools were used to study the project:

- Key Project Factors
  - Project Issues
  - Critical Risks
  - Site Visit Observations
  - Project Drivers
- Cost Model
- Function Analysis / FAST Diagram
- Value Metrics
  - Performance Attributes
    - Definitions
    - Matrix
    - Rating Scale
  - Value Matrix
    - Rationale for Performance Ratings
      - Original Concept
      - Strategy 1 – New Collection Concept
      - Strategy 2 – Refinement of Current Concept
    - Performance Rating Matrix
      - Original Concept and VE Strategies

KEY PROJECT FACTORS

The first day of the study included meetings with the project stakeholders and a site visit. The following summarizes key project issues, site visit observations, and project drivers identified during these sessions.

PROJECT ISSUES

The following are some of the issues and concerns associated with the project:

- Determine the exact problem to be solved.
- Need to optimize phasing areas with regards to initial costs and operating costs.
- Optimal number of customers to solve the problem (mix of commercial and residential).
- Restricting the number of pump stations.
- Determine trunk line size and depth.
- Funding issues for some property owners to connect.
- Wastewater treatment plant ultimate plant design size.
- Determine user costs (UC/C)
    - Rate
    - Capacity buy-in
    - Connection

CRITICAL RISKS

The following risks were listed by the VE team:

- Regulatory agencies have not fully defined requirements and expectations.
- Department of Health comment on discharge required versus area being served.
- Ability to get sufficient grants to support project.
- Ability to control project costs.
- Operational energy prices on construction costs.

SITE VISIT OBSERVATIONS

The following issues and concerns were listed by the VE team following the site visit:

- Why is the area on the plateau north of town included in the future project phases and ultimate plant capacity planning?
- Need to focus on areas that have the greatest impact on groundwater quality first.

- Forcing all flow through one pump station increases operational cost and risk.
- Areas with significant flows and directly adjacent to water wells are not included in Phase 1.

PROJECT DRIVERS

The VE team identified the following list of project aspects that are determining the size, shape, extent, and nature of respective and specific project features throughout the project. The VE team used this list as a precursor to function analysis to identify the controlling factors that led the design team and project stakeholders to the various project specifics indicated in the project documents.

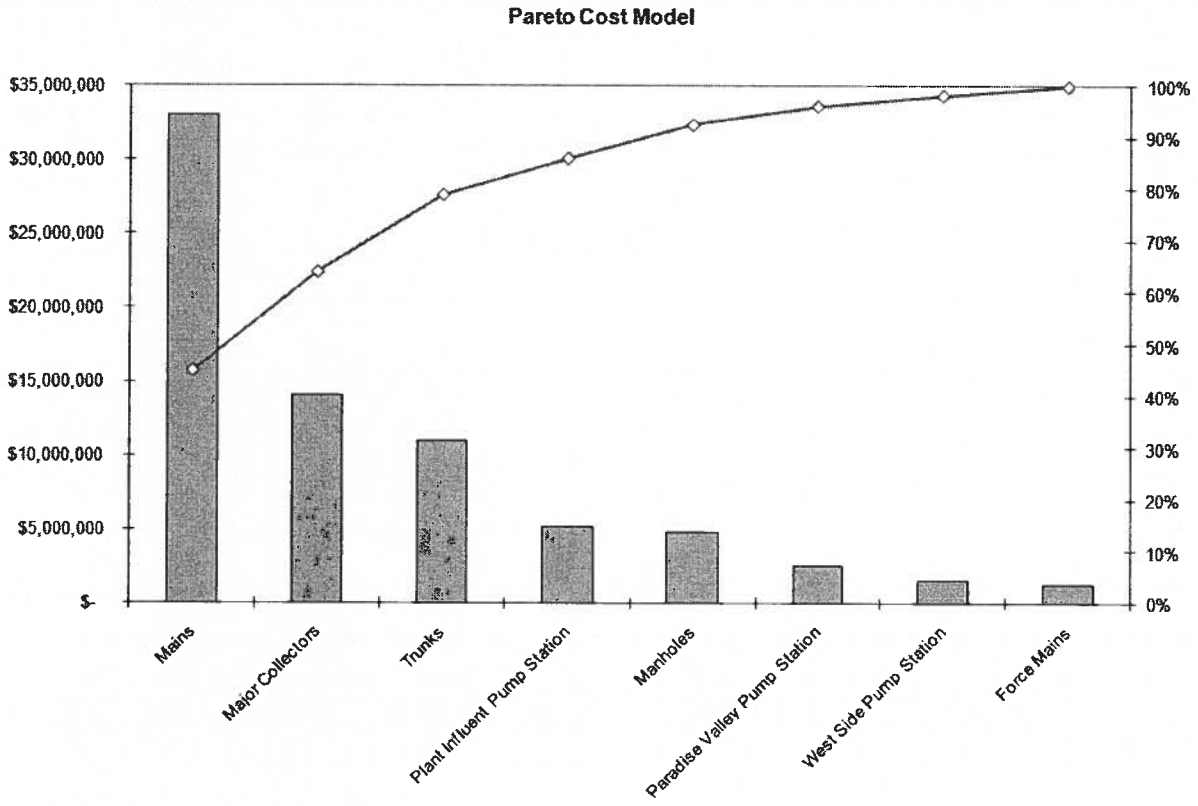
The main items listed below are the drivers, constraints, or issues being addressed by the project.

- Design of main trunk and pump station to handle ultimate 8 mgd flow
- Phase 1 area content and how this will impact revenue
- Size and depth of main collection system
- Size and location of pump station

COST MODEL

The VE Team Leader prepared a cost model from the cost estimate of the preferred alternative. The model was organized to identify the major construction elements or trade categories, the originally estimated costs, and the percent of total project cost for the significant cost items.

The cost models show the cost drivers for the project and were used to guide the VE team during the VE Study. Two cost models were developed. The fist model arranges the cost by functional area (main, collectors, pump stations, etc.). The second model displays project cost by work element (earthwork, paving, pipes, etc.).



PARETO COST MODEL *HDWD Collection Systems*			
Cost Item	**Cost**	**% of Total**	**Cumulative %**
Mains	$ 32,986,724	45%	45%
Major Collectors	$ 14,060,336	19%	64%
Trunks	$ 10,974,825	15%	79%
Plant Influent Pump Station	$ 5,178,400	7%	86%
Manholes	$ 4,833,400	7%	93%
Paradise Valley Pump Station	$ 2,580,000	4%	96%
West Side Pump Station	$ 1,561,200	2%	98%
Force Mains	$ 1,290,382	2%	100%
TOTAL	**$ 73,465,267**	**100%**	**100%**

PARETO COST MODEL - COLLECTION DETAIL

HDWD Collection Systems

Cost Item		Cost	% of Total	Cumulative %
Earthwork	$	17,230,881	23%	23%
Road Pavement Repair	$	13,924,299	19%	42%
Pipe and Fittings	$	8,872,406	12%	55%
Shoring	$	5,482,928	7%	62%
Demolition	$	5,412,239	7%	69%
Utility Support and Encasement	$	5,299,143	7%	77%
Plant Influent Pump Station	$	5,178,400	7%	84%
Manholes	$	4,833,400	7%	90%
Paradise Valley Pump Station	$	2,580,000	4%	94%
Traffic Control	$	2,014,401	3%	97%
West Side Pump Station	$	1,561,200	2%	99%
Site Preparation	$	995,796	1%	100%
TOTAL	**$**	**73,385,093**	**100%**	**100%**

FUNCTION ANALYSIS / FAST DIAGRAM

Function analysis was performed and a Function Analysis System Technique (FAST) Diagram was produced, which revealed the key functional relationships for the project. This analysis provided a greater understanding of the total project and how the issues, project cost, and function requirements are related.

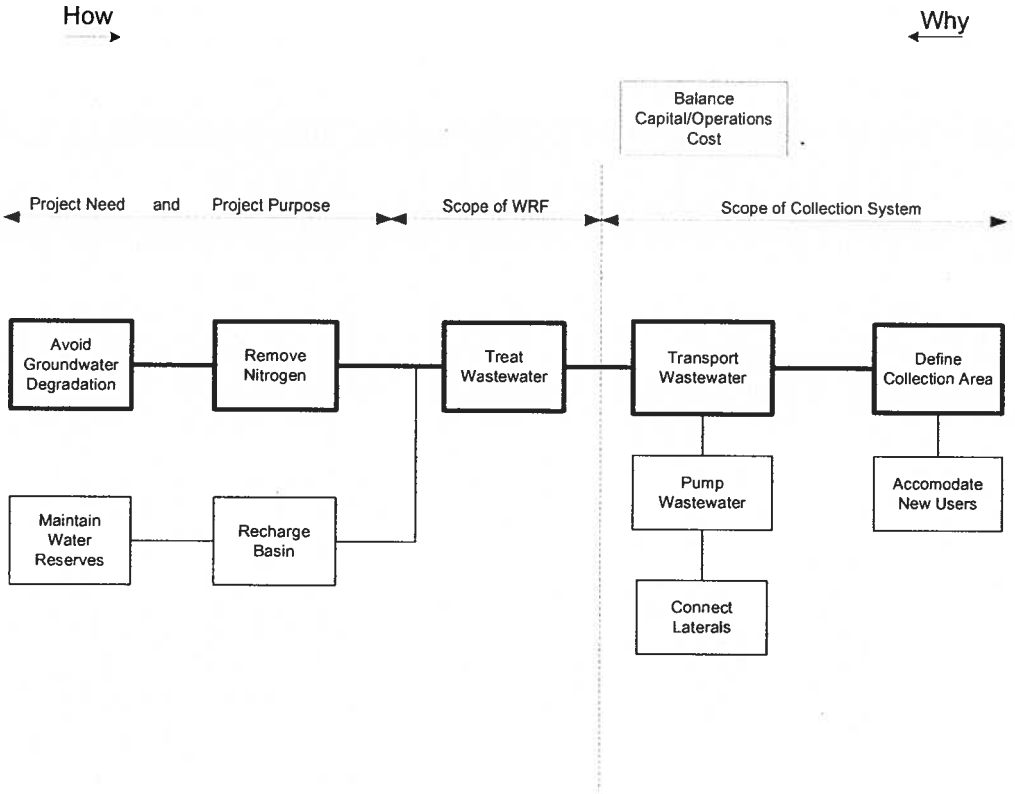
The FAST diagram arranges the functions in logical order so that when read from left to right, the functions answer the question "How?" If the diagram is read from right to left, the functions answer the question "Why?" Functions connected with a vertical line are those that happen at the same time as, or are caused by, the function at the top of the column (a "When?" relationship).

The FAST Diagram f5or this project shows *Transport Wastewater* as the basic function and *Treat Wastewater* as the Higher Order Function. Key secondary functions include *Pump Wastewater* and *Connect Laterals*. This provided the VE team with an understanding of the project design rationale and which functions offer the best opportunity for Cost or Performance improvement.

Functions

- Define Collection Area
- Transport Wastewater
- Pump Wastewater
- Treat Wastewater
- Connect Laterals
- Balance Capital and Operating Costs
- Accommodate New Construction

FAST Diagram
Hi-Desert Water District
Collection System



VALUE METRICS

The Value Metrics process is an integral part of the VE Process. This process provides the cornerstone of the VE process by providing a systematic and structured means of considering the relationship of a project's performance and cost as they relate to value. Project performance must be properly defined and agreed upon by the stakeholders at the beginning of the VE Study. The performance attributes and requirements developed are then used throughout the study to identify, evaluate, and document alternatives.

In conjunction with the VE team, the Project Stakeholders identified and defined the performance attributes and requirements, and then developed a rating scale to measure performance. Performance requirements represent essential, non-discretionary aspects of project performance. Performance attributes represent those aspects of a project's scope and schedule that may possess a range of potential values.

The original (baseline) design concept is first evaluated relative to each of the performance attributes based upon a 0 to 10 rating scale. A "0" represents performance that is unacceptable while a "10" represents the highest desired level of performance. Typically, a standard comparative scale is used that measures all VE alternatives against the baseline design concept. Once the attributes have been rated, the relative importance of each attribute in meeting the project's purpose and need is determined using the paired comparison method. This process yields relative weightings which are used as modifiers in rating the relative performance of the original design concept.

As the VE team develops alternatives, the performance of each is rated against the original design concept. Changes in performance are always based upon the overall impact to the total project. Once performance and cost data have been developed by the VE team, the net change in value of the VE alternatives can be compared to the original design concept. The resulting Value Matrix provides a summary of these changes and allows a way for the PDT to assess the potential impact of the VE alternatives on total project value.

The rationale for the numerical rating change for each alternative in each strategy is developed. The Value Matrix shows the numerical change for each performance measure and alternative strategy. The Total Performance is calculated by multiplying the attribute weight by the performance rating for each performance measure of either the original concept or VE Strategy.

The following pages summarize the results of the Value Metrics process for this VE Study:

- Performance Attribute Definitions
- Performance Attribute Matrix
- Value Matrix
- Rationale for Change in Performance

PERFORMANCE ATTRIBUTES

Prior to beginning the VE Study, the VE Team Leader met with project stakeholders to discuss project performance. The following performance attributes were identified as being of critical importance in meeting the project's need and purpose.

Performance Attributes for Yucca Valley Collection System	
Performance Attribute	**Definition**
Initial Operations	An assessment of the challenges to operating and maintaining the system until a reliable flow can be transmitted through the system and to the plant.
Regulatory Compliance	An assessment of how well the design satisfies the regulatory agencies overseeing this project.
Political Feasibility	An assessment of how well the design can be supported by the local community that will be paying for the system.
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts related to water quality, air quality, soil erosion, and local flora and fauna.
Expandability	An assessment of how well the system can be expanded to meet the planned ultimate flows in Yucca Valley.
Operating Costs	An assessment of how the design will effect the operating costs of the system.
Long-Term Maintainability	An assessment of the long-term maintainability of the collection system.

Performance Attribute Matrix

The performance attribute matrix was used to determine the relative importance of the performance attributes for the project. The project owner, design team, and stakeholders evaluated the relative importance of the performance attributes that would be used to evaluate the creative ideas. These attributes were compared in pairs, asking the question: "An improvement to which attribute will provide the greatest benefit to the project relative to need and purpose?" The letter code (e.g., "a") was entered into the matrix for each pair. After all pairs were discussed they were tallied (after normalizing the scores by adding a point to each attribute) and the percentages calculated.

The Performance Attribute Matrix is shown below. The definitions and measurement scales for each criterion are included on the following pages.

PERFORMANCE ATTRIBUTE MATRIX ***HDWD Collection Systems and Phasing***	**VMS, Inc.**

								TOTAL	%
Initial Operations	**A**	B	C	A	E	F	G	2.0	7%
Regulatory Compliance	**B**	C	B	B	B	B		6.0	21%
Political Feasibility	**C**	C	C	C	C			7.0	25%
Construction Impacts	**D**	E	F	G				1.0	4%
Expandability	**E**	F	E					4.0	14%
Operating Costs	**F**	F						5.0	18%
Long-Term Maintainability	**G**							3.0	11%
								28.0	100%

VALUE MATRIX

Value Matrix permits the comparison of competing strategies of value alternatives by organizing the data developed for the performance attributes into a matrix format in order to yield value indices. Value alternatives are compared to the baseline project for the all attributes in order to compare and contrast the potential for value improvement. The matrix is essential for understanding the relationship of cost, performance, and value of the project baseline and VE concepts. Comparing the performance and cost suggests which alternatives are potentially as good as, or better than, the project baseline concept in terms of overall value. Comparison at the value index level suggests which alternatives have the best functionality per unit cost, or provides the project with the "best value." However, in this case, the cost varies widely and needs to be refined, so the team focused on meeting the performance requirements and satisfying the need and purpose for the project.

The following discusses how the design alternatives meet the performance requirements of the project, and the matrix at the end of this section shows the rating given for each performance alternative. The total performance score is shown at the bottom of that matrix. Each alternative developed as part of the VE Study was rated to compare against the appropriate Design Alternative and the percent change in performance is relative to that alternative, but the total score can be used as a comparison of all alternatives, those developed by both the Design Team and VE team.

Rating Rationale: **Original Concept – Phase1**

Performance Attribute	Rationale for Rating
Initial Operations	Initial low volumes and large-sized pipes will cause settling problems - regular flushing will be required.
Regulatory Compliance	West end of town is not yet included, which is located over wells.
Political Feasibility	Even for the commercial core the public buy-in may be difficult.
Construction Impacts	Main trunks and stations are off main streets, but individual property connections will be challenging.
Expandability	Current design incorporates entire District flows.
Operating Costs	Pipes and stations are sized too large for initial flow, as well as the depth may be excessive.
Long-Term Maintainability	Large trunk lines will drive maintenance issues.

Rating Rationale:	**VE Strategy 1 – Phase 1**
New Collection Concept:	**Alternative 10.0 plus 3.0, 5.0, 6.0, 7.0, 8.0**

Performance Attribute	Rationale for Rating
Initial Operations	233 properties can be brought online at startup to provide improved predictable flow to the plant.
Regulatory Compliance	Addresses area that is having a significant impact on the water quality in Phase 1 rather than Phase 3.
Political Feasibility	Better satisfies "pay as you go" concept. Does not place all of the burden of the main trunk on Phase 1. Includes key areas on west side of town, including District offices in Phase 1.
Construction Impacts	Reduces impacts of construction on community. Could use multiple contracts for various pieces of this work.
Expandability	Satisfies all future phase needs.
Operating Costs	Provides more flow in Phase 1. This should reduce operating cost per user. Easier to operate the plant with more reliable flow.
Long-Term Maintainability	No significant change.

Rating Rationale: **VE Strategy 2 – Phase 1**

Refinement of Current Concept: **Alternative 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0**

Performance Attribute	Rationale for Rating
Initial Operations	Reduces the potential for the system to go septic with low flows in large pipes during initial operation.
Regulatory Compliance	Reduces potential for leaks in collection system over aquifer.
Political Feasibility	Reduces the potential for early operational complaints in the business core.
Construction Impacts	Reduces construction time and impacts to the community.
Expandability	Satisfies all future phase needs.
Operating Costs	Reduces the potential for cleaning the system until daily flow increases to keep the system properly flushed.
Long-Term Maintainability	Reduced pipe diameter and HDPE in trunk line reduces the potential for the material to go septic in the early years of operation and reduces frequency of cleaning in the long term.

PERFORMANCE ATTRIBUTE MATRIX - Preliminary *HDWD Collection Systems and Phasing*	VMS, Inc.

Attribute	Attribute Weight	Concept	Performance Rating 1	2	3	4	5	6	7	8	9	10	Total Performance
Initial Operations	7	Original Concept	1										7
		VA Strategy 1					5						35
		VA Strategy 2				4							28
Regulatory Compliance	21	Original Concept							7				147
		VA Strategy 1									9		189
		VA Strategy 2								8			168
Political Feasibility	25	Original Concept					5						125
		VA Strategy 1								8			200
		VA Strategy 2						6					150
Construction Impacts	4	Original Concept								8			32
		VA Strategy 1									9		36
		VA Strategy 2									9		36
Expandability	14	Original Concept										10	140
		VA Strategy 1										10	140
		VA Strategy 2										10	140
Operating Costs	18	Original Concept				4							72
		VA Strategy 1						6					108
		VA Strategy 2					5						90
Long-Term Maintainability	11	Original Concept				4							44
		VA Strategy 1				4							44
		VA Strategy 2					5						55

OVERALL PERFORMANCE	Total Performance	% Perf. Improve.	Total Cost	Value Index (Performance / Cost)	% Value Improvement
Original Concept	567		63.9	8.873	
VA Strategy 1	752	33%	40.4	18.61	110%
VA Strategy 2	667	18%	45.9	14.53	64%

PROJECT DESCRIPTION

INTRODUCTION

The VE Study focuses on Phase 1 of the Water Reclamation Project of the Hi-Desert Water District (HDWD or District) and addresses the collection of wastewater in the Town of Yucca Valley, California. The District provides water service for the Town of Yucca Valley and nearby areas. The town currently depends almost entirely on septic tanks and leach fields for disposal of wastewater. The Colorado River Basin Regional Water Quality Control Board (RWQCB) suspects that leachate from the commercial and residential septic tank systems are degrading groundwater quality in the area. They are requiring that a wastewater collection, treatment, and disposal system be constructed. As a result, the District is currently in the process of implementing a program to construct and operate the required facilities. The wastewater collection system component is Phase 1 of the Water Reclamation Project and is the subject of this report.

PROJECT DESCRIPTION

Phase 1 of the Water Reclamation Project will initially provide sewer collection and treatment for the central portion of the Town of Yucca Valley, which includes the core business area. This initial phase is anticipated to handle an annual average flow of 1 million gallons per day (mgd) of wastewater and replace what is currently being discharged to septic tanks. This area has been specifically chosen due to its higher density and its potential greater impact on potable water supply wells. In the future, if the Phase 1 facilities do not adequately protect the groundwater quality, or if the RWQCB requires more areas to be sewered, the collection, treatment, and disposal facilities will be expanded to collect an additional 1 mgd of sewage. Phase 2 includes the secondary expansion of the collection and treatment facilities to 2 mgd, while Phase 3 is expected to collect an additional 2 mgd wastewater flow for a total system capacity of 4 mgd.

Ultimate build-out in the District's service area could be as high as 8 mgd, but that would not occur until the distant future. The District depends entirely on wells for water supply. Because the natural yield of the groundwater basin is substantially less than demands, the District purchases State Water Project water from the Mojave Water Agency to supplement groundwater through recharge basins. The two primary sources of water to the groundwater basin in the area, therefore, are the imported water and leachate from septic tanks. Because much of the wastewater will now be diverted to the new Water Reclamation Facility rather than septic tanks, the District has decided that all treated effluent will be diverted to groundwater recharge. There will be no direct reuse of recycled water.

INFORMATION PROVIDED TO THE VE TEAM

The following project documents were provided to the VE team for their use during the study:

- Narrative Project Description, Sections 1-4, Montgomery Watson, March 5, 2008
- Hi-Desert Water District Water Reclamation Projects Vale Engineering Presentation June 2, 2008
- Wastewater Rate Study and Capacity Charge Study: Data from Engineering Studies, June 2, 2008

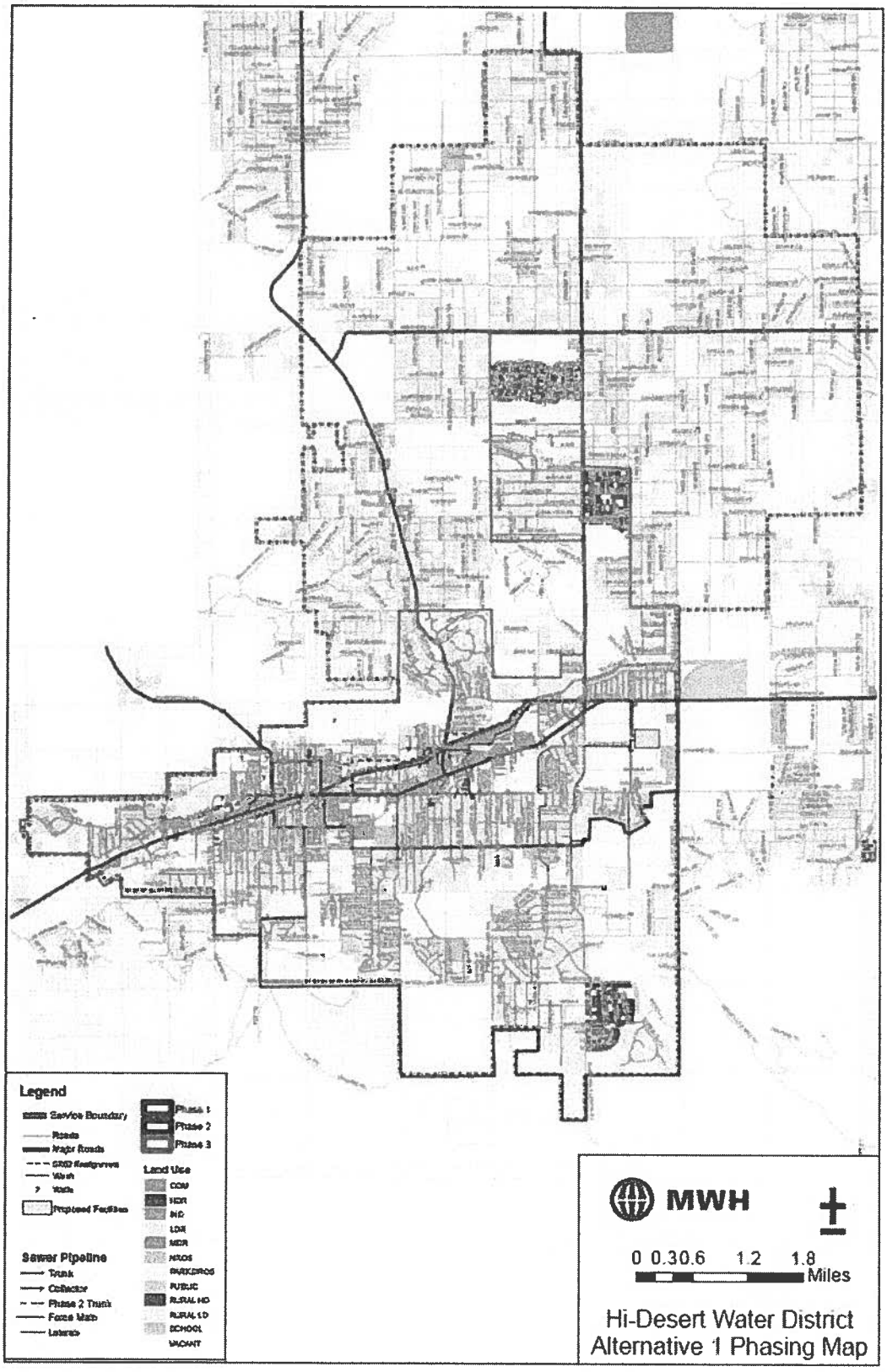
- Hi-Desert Water District – Wastewater Project Monthly Report, May 2008, Volume 2, No. 4
- Hi-Desert Water Reclamation Facility Stakeholder Issues Matrix, June 2, 2008
- Hi-Desert Water District Alternative Phasing Maps, Montgomery Watson
- Hi-Desert Water District Project Schedule, May 31, 2008
- Hi-Desert Water District Issues & Discussion Topics, June 2, 2008
- Hi-Desert Water District Wastewater Collection Facilities Phase 1 – Trunk Sewer Line Design Drawings, Montgomery Watson, October 17, 2002
- Cost Estimate, Montgomery Watson, May 30, 2008

PROJECT DRAWINGS

The Hi-Desert Water District Wastewater Collection Facilities Phase 1 – Trunk Sewer Line drawings and area maps were provided to the team. A drawing of the phasing plan is included on the following page.

PROJECT COST ESTIMATE

The project cost estimate is included at the end of this section.


Legend
Service Boundary
Roads
Major Roads
Wash
Proposed Facilities
Phase 1
Phase 2
Phase 3
Land Use
CGM
HDR
MD
LDR
MDR
PARK/PROS
PUBLIC
RURAL MD
RURAL LD
SCHOOL
VACANT
Sewer Pipeline
Trunk
Collector
Phase 2 Trunk
Force Main
Laterals
MWH
0 0.30.6 1.2 1.8
Miles
Hi-Desert Water District
Alternative 1 Phasing Map

Yucca Valley Sewer Collection System Phase 1 Cost Estimate

	Avg. Depth	Unit Cost	Amount	Total
Force Mains				
6"	6'	194.30	636	123,575
8"	6'	203.00	0	0
16"	6'	280.55	4,159	1,166,807
Main				
8"	8'	197.40	167,106	32,986,724
Major Collectors				
10"	12'	226.50	21,511	4,872,242
12"	12'	238.40	14,766	3,520,214
15"	12'	291.50	10,393	3,029,560
18"	12'	290.50	9,082	2,638,321
Trunks				
24"	12'	387.15	7,170	2,775,866
30"	12'	472.42	5,916	2,794,837
36"	12'	571.20	9,461	5,404,123
Manholes		6,760.00	715	4,833,400
Pipe & Manhole Subtotal				**64,145,668**
Pump Stations		**Plant Influent**	**Paradise Valley**	
Sitework & Earthwork		360,000	252,000	612,000
Structural Concrete		800,000	500,000	1,300,000
Building		1,300,000	600,000	1,900,000
Pipe, Valves & Fittings		620,000	280,000	900,000
Mechanical & Pumps		1,240,000	410,000	1,650,000
Electrical		592,400	335,000	927,400
Instrumentation		266,000	202,600	468,600
Pump Station Subtotal		**5,178,400**	**2,579,600**	**7,758,000**
Phase 1 Total				**71,903,668**

Pump Stations	**West Side**	
Sitework & Earthwork	252,000	
Structural Concrete	300,000	
Building	300,000	
Pipe, Valves & Fittings	180,000	
Mechanical & Pumps	170,000	
Electrical	188,200	
Instrumentation	171,000	
Pump Stations Subtotal	**1,561,200**	**9,319,200**
Phase 1 Total		**73,464,868**

IDEA EVALUATION

INTRODUCTION

The ideas generated by the VE team are carefully evaluated, and project-specific attributes are applied to each idea to assure an objective evaluation.

PERFORMANCE ATTRIBUTES

The VE team used the paired comparison method to prioritize the key performance attributes for this project:

- Initial Operations
- Regulatory Compliance
- Political Feasibility
- Construction Impacts
- Expandability
- Operating Costs
- Long-Term Maintainability

The team enlisted the assistance of the stakeholders and designers (when available) to develop these attributes so that the evaluation would reflect their specific requirements.

EVALUATION PROCESS

The VE team, as a group, generated and evaluated ideas on how to perform the various functions. The idea list was grouped by function or major project element.

The team compared each of the ideas with the original concept for each of the performance attribute to determine whether it was better than, equal to, or worse than the original concept. The team reached a consensus on the ranking of the idea. High-ranked ideas would be developed further; low-ranked ones would be dropped from further consideration.

IDEA EVALUATION FORMS

All of the ideas that were generated during the creative phase using brainstorming techniques were recorded on the following Idea Evaluation forms. These ideas were discussed and the advantages and disadvantages of each were listed.

IDEA EVALUATION
HDWD Collection Systems

VMS Value Management Strategies, Inc.

Ideas		Performance Attributes							Advantages	Disadvantages	$	Rank
No.	Function	IO	RC	PF	CI	E	OC	LTM				
A-1	Optimize area	+	0	+	+	0	0	+	• Fits what is needed • Politically more acceptable – deflect issues		⇩	4
A-2	Plan future phase with own trunk line to Water Reclamation Facility	+	0	+	-	+	+	+	• Current customers pay less ("pay as you go") • Each phase is size appropriate • Better mechanism for connecting new users	• Potentially costs more for aggregate total build-out (development)	⇩	4
A-3	Add second trunk line on Yucca									• Does not appear feasible as originally conceived		1
A-4a	Utilize low pressure sewer system for commercial core area	+	0	0	+	+	0	0	• The lines can be run anywhere • Can use 2-inch to 6-inch pipe • Can use shallow trenching that follows grade		⇩	4

Ranking Scale:
5 = Significant Value Improvement
4 = Good Value Improvement
3 =Minor Value Improvement
2 = Minor Value Degradation
1 = Significant Value Degradation or Does Not Meet Project Purpose and Need
DS = Design Suggestion

Performance Attributes: **Significant Improvement +2, +1, 0, -1, -2 Significant Degradation**

IO = Initial Operations
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IDEA EVALUATION
HDWD Collection Systems

VMS Value Management Strategies, Inc.

Ideas		Performance Attributes							Advantages	Disadvantages	$	Rank
No.	Function	IO	RC	PF	CI	E	OC	LTM				
A-4b	Utilize gravity/low pressure hybrid system	+	0	+	+	+	0	0	• The lines can be run anywhere • Can use 2-inch to 6-inch pipe • Can use shallow trenching that follows grade		⇩	5
A-5	Reduce depth of gravity sewers	0	0	0	+	0	0	+	• Reduces installation and maintenance costs	• May require additional pumping	⇩	3
A-6	Use multiple pump stations and force main	+	0	-	+	+	-	-	• Minimizes construction costs • Minimizes depth • Greater alignment flexibility • Provides flow equalization	• Increases visibility of system • Increases maintenance with additional pumps • Potential noise and odors	⇩	4
A-7	Incorporate west side of town into Phase 1								• Better protection of extraction well area • See gravity/pressure hybrid or force main alternatives			
A-8	Use series of low pressure sewer along commercial core								• See hybrid system			

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IDEA EVALUATION
HDWD Collection Systems

VMS Value Management Strategies, Inc.

Ideas		Performance Attributes							Advantages	Disadvantages	$	Rank
No.	Function	IO	RC	PF	CI	E	OC	LTM				
A-9	Analyze nitrogen loading to determine amount of treatment required								• System is built to meet nitrogen loading criteria for aquifer	• Need to convince regulators that this is a sufficient solution		DS
A-10	Require low pressure sewage system for select commercial customers to reduce peaking in the sewers and at the plant								• No significant benefits at this stage of design			1
A-11	Use HDPE for trunk sewer - SD11 minimum	+	0	0	+	0	+	+	• No joints • More flexible - seismic survivability • Less friction • Eliminates degradation of groundwater through potential leaks or joints	• Fewer contractors • Temperature expansion and reduction are factors to consider during installation	0	3
A-12	Have a capacity surcharge for water users to offset cost of groundwater protection	0	0	-	0	0	0	0	• Equitably spreads costs over all water customers • Generates cash earlier in life of project	• Potential political resistance	0	3
A-13	Use joint-less collection piping								• See HDPE alternative			

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HDWD Collection Systems

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Ideas		Performance Attributes							Advantages	Disadvantages	$	Rank
No.	Function	IO	RC	PF	CI	E	OC	LTM				
A-14	Realign collection system to minimize inflow through manholes during major rain events											DS
A-15	Develop standards and pre-qualify contractors to provide connections to residential customers								• Provides a design template for user connection			DS
A-16	Use solar power for pump stations								• Not enough information at present design			DS
A-17	Multiple plants	+	0	-	-	+	-	-	• Optimizes collection system • Provides system redundancy	• More visibility • Additional site(s) required	⇩	3
A-18	Develop recycled water system											DS
A-19	Incorporate milestones in the specifications to limit construction impact											DS

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Ideas		Performance Attributes							Advantages	Disadvantages	$	Rank
No.	Function	IO	RC	PF	CI	E	OC	LTM				
A-20	Utilize multiple construction contracts											DS
A-21	Separate contract for private property work								• Consistent quality • Better public relations • Lower cost for quantity	• Prevailing wage project		DS
A-22	Maximize spacing between manholes	0	0	0	0	0	0	+	• Reduces construction costs • Minimizes potential inflow points • Reduces maintenance costs		⇩	3
A-23	Locate the two main faults on plans and design with these in mind							+	• Ensures proper design • Minimizes potential spill			DS
A-24	Utilize protect-in-place trunks at major drainage crossings								• See scour study design suggestion			DS
A-25	Place trunk over major drainage crossings (tied to placement of lift station)											DS

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HDWD Collection Systems

VMS Value Management Strategies, Inc.

Ideas		Performance Attributes							Advantages	Disadvantages	$	Rank
No.	Function	IO	RC	PF	CI	E	OC	LTM				
A-26	Realign trunks to avoid major drainage crossings											DS
A-27	Utilize submersible pumps at pump stations	0	0	+	+	0	0	0	• Reduces initial capital costs • Reduces footprint	• Pump is always in sewage	⇩	4
A-28	Use modular pump stations where feasible								• See multiple pump station alternative			
A-29	Incorporate Uniform Plumbing Code for abandoning septic tanks											DS
A-30	Coordinate City street paving program with sewer work											DS
A-31	Develop policy permitting residential properties greater than one acre to remain on septic											DS
A-32	Utilize agency bid and pre-purchase to ensure standard if grinder pumps are required											DS

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IDEA EVALUATION
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VMS
Value Management Strategies, Inc.

Ideas		Performance Attributes							Advantages	Disadvantages	$	Rank
No.	Function	IO	RC	PF	CI	E	OC	LTM				
A-33	Eliminate one sack slurry from pipe installation	0	0	0	+	0	0	0	• Reduces export • Reduces construction costs	• Increases testing and inspection costs	⇩	4
A-34	Recycle asphalt paving	0	0	0	+	0	0	0	• Reduces export • Reduces construction costs	• Increases testing and inspection costs	⇩	4
A-35	Lift station at corporate yard								• See multiple station alternative			
A-36	Additional WRF at corporate yard								• See multiple station alternative • Reduces size of required collectors	• Will require probable decommissioning of one well		
A-37	Utilize trench box in lieu of shoring	0	0	0	+	0	0	0	• Reduces cost • Increases construction safety • Decreases construction time		⇩	4
A-38	Adjust paving costs								• Estimate is more reflective of design		⇩	4

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OC = Operating Costs
LTM = Long-Term Maintainability

IDEA EVALUATION
HDWD Collection Systems

VMS
Value Management Strategies, Inc.

Ideas		Performance Attributes							Advantages	Disadvantages	$	Rank
No.	Function	IO	RC	PF	CI	E	OC	LTM				
A-39	Include lateral connection to property line in cost estimate and main contract								• Estimate is more reflective of design		⇧	4
A-40	Identify private service lateral in total project cost								• Provides realistic estimate of total project cost			DS
A-41	Place alignments down washes in lieu of the streets	0	0	+	+	0	0	+	• Provides optimum connection • Reduces construction time • Reduces construction costs	• Requires buy-in from San Bernardino County flood control • Requires additional pipe/manhole protection	⇩	4
A-42	Perform a scour study to determine appropriate depth of sewer											DS
A-43	Perform a third-party review of cost estimate											DS
A-44	Reduce 36-inch pipe to 24-inch pipe for main trunk line and reduce upstream sizes accordingly	+	0	+	+	0	+	0	• Reduces cost • Easier installation • Meets required flow demand		⇩	5

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VALUE ENGINEERING PROCESS

INTRODUCTION

Value Engineering (VE) has traditionally been perceived as an effective means for reducing project costs. This paradigm only addresses one part of the value equation, oftentimes at the expense of overlooking the role that VE can play with regard to improving project performance. Project costs are fairly easy to quantify and compare. Performance is not.

VMS has developed a unique methodology using a variety of techniques aimed at identifying, defining, and quantifying ***performance***. This process, ***Value Metrics***, emphasizes the interrelationship between cost and performance and can be quantified and compared in terms of how they contribute to overall value.

Value Metrics provides a standardized means of identifying performance, defining it, evaluating it, and measuring it. Once this has been achieved, and the costs for all value alternatives have been developed, it is a relatively simple matter of measuring value.

Value Metrics is a complimentary system of concepts and techniques developed to compliment and augment the traditional Value Methodology Job Plan. It is not absolutely essential that ***Value Metrics*** be utilized in order to perform a value study; however, it is well worth the additional effort as there are a number of significant benefits that it can convey. ***Value Metrics*** can improve value studies by:

- Building consensus among project stakeholders (especially those holding conflicting views)
- Developing a better understanding of a project's goals and objectives as they relate to Purpose and Need
- Developing a baseline understanding of how the project is meeting performance goals and objectives
- Identifying areas where project performance can be improved through the Value Metrics process
- Developing a better understanding of an alternative concept's effect on project performance
- Developing a deeper understanding of the relationship between performance and cost in determining value
- Using value as the basis for selecting the best project or design concept

The direct and active involvement of the project's stakeholders is at the core of this process. Our skilled team leaders will lead stakeholders through the methodology, using the power of the process to distill subjective thought into an objective language that everyone can relate to and understand. The dialog that develops then forms the basis for the VE team's understanding of the performance requirements of the project and to what degree the current design concept is meeting those requirements. From this baseline, the VE team can focus on developing alternative concepts that will quantify both performance and cost and contribute to overall project value.

VE STUDY FORMAT

Pre-Study

Meaningful and measurable results are directly related to the pre-study work performed. Depending upon the type of study, all or part of the following information needs to be determined during the pre-study phase:

- Clear definition of the current situation and study objectives
- Identification of study team members
- Identification of project stakeholders
- Definition of how stakeholders are impacted by the project
- Identification of key issues and concerns
- Identification of criteria to be used for evaluation of the project (or process) performance
- Development of an independent project cost estimate
- Gather project data and distribute to VE team

In preparation for the VE study, the team leader (CVS) will talk with the owners and stakeholders to outline the VE process, initiate data gathering, refine project scope and objectives, structure the scope and team members and technical specialists, and finalize study plans. Specific deliverables will be provided.

Following the initial planning meeting, the team leader will review the data collected for the project and develop a cost model. The team leader will also consult with the technical specialists to prepare them for the VE study.

VE Study

The VE Job Plan guides the VE team in their search to enhance value in the project or process. VMS follows a seven-phase Job Plan:

1. Information Phase
2. Function Analysis Phase
3. Creative Phase
4. Evaluation Phase
5. Development Phase
6. Presentation Phase
7. Implementation Phase

Information Phase

At the beginning of the VE study, the background and decisions that have influenced the development of the project or process are reviewed and understood. The VE study starts with a meeting with representatives of the stakeholder agencies. Analysis of the project proceeds based on the data provided. The analysis includes reviewing the cost model(s), and becoming familiar with the issues and constraints provided by the stakeholders.

During the information, the unique VMS approach of identifying and measuring project performance criteria is also applied. Specific criteria critical to meeting the project's need and purpose are identified. These criteria are the defined and weighted and then specific, quantifiable scales are developed in order to measure the effectiveness of various design concepts in addressing project performance. The original design concept is first evaluated using this method resulting in an approximation of the design's effectiveness as an expression of value (performance over cost). As the study progresses and the VE team develops alternative concepts, these can be compared against the "value" baseline established for the original concept. Through

this method, a better understanding will be gained of the cost-performance relationships involved in evaluating alternative concepts during the decision making process.

Function Analysis Phase

Development of the functional requirements of a project are key to assuring a stakeholder that the facility will meet the stated criteria. The analysis of these functions in terms of actual cost is a primary element in a VE study. A Function Analysis System Technique (FAST) diagram is developed to help the team better understand the functional relationships of the project. Costs and issues are related to the project functions on the FAST diagram to direct the team to the functions where they should focus their efforts.

Creative Phase

During this phase, the VE team generates as many ideas as possible to provide the necessary functions for the project. Judgment of the ideas is not permitted, and all ideas are recorded.

Evaluation Phase

The VE team, as a group, evaluates each idea with respect to the functional requirements of the project. Each idea is evaluated against specific criteria established by the VE team and stakeholders. Advantages and disadvantages of each idea are recorded.

Once each idea is fully evaluated, the idea is ranked based on a scale of 1 to 5 to prioritize the development of the ideas.

Development Phase

During the development phase, each idea rated 4 or higher is expanded into a workable solution and documented on the VE Alternative forms. Ideas rated as a 3 may be written-up as Design Suggestions, time permitting. The development consists of the alternative concept, impact on facility operation, life cycle cost comparisons, and a descriptive evaluation of the advantages and disadvantages of the alternative. Each alternative is documented with a brief narrative to compare it with the original concept. Cost impacts are also prepared for each alternative.

Presentation Phase

The last step of the VE study is an informal oral presentation of alternatives to the project or process stakeholders. This provides the stakeholders an opportunity to preview the alternatives developed by the VE team, and develop an understanding of the rationale behind them before the draft VE report is published.

WRITTEN REPORT

Following the completion of the VE study, the CVS compiles the information developed during the VE study into the Value Engineering Study Report. This report, documenting the viable alternatives, is provided to the customer in electronic format (pdf file) within the time frame requested, usually within two weeks. It incorporates the alternatives developed during the study and includes an Executive Summary, VE Alternatives, Project Analysis, Project Description, Reconciled Cost Estimate, Idea Evaluation, and VE Process documentation.

VE STUDY FOLLOW-UP

Implementation Phase

After the stakeholders have had an opportunity to review the alternatives identified by the VE team, the VMS team leader will conduct an implementation meeting to discuss the alternatives and resolve appropriate

action for each VE alternative. If necessary, any other VE report edits requested by the representatives will also be made by the VE team leader and a final report in electronic format will be issued. This post-study meeting helps to ensure that savings or process improvements are not lost due to a lack of communication.

VE STUDY AGENDA

Hi-Desert Water District Collection Systems
Yucca Valley, CA

NOTE: Yellow shaded areas indicate meetings involving multiple project stakeholders.

Day 1 – Monday, June 2		
8:00 AM	*Setup*	*VMS Team./Designer*
8:15 AM	*Opening Remarks and Introductions*	*HDWD/VMS*
8:30 AM	*Overview of the VE Study Schedule and Process, and Project Document Overview*	*VMS*
8:45 AM	*Overview of Alternatives and Preliminary Design* ♦ *Need and Purpose* ♦ *Overview of Design Concepts* ♦ *Phasing Plans*	*Montgomery Watson*
10:30 AM	*Break*	
10:45 AM	*Overview of Alternatives and Preliminary Design (Continued)* ♦ *Need and Purpose* ♦ *Overview of Design Concepts* ♦ *Phasing Plans*	*Montgomery Watson*
11:00 AM	*Overview of Performance Measures* ♦ *Overview of Performance Criteria* ♦ *Definitions and Scales* ♦ *Project Performance Rating*	*VMS, Project Stakeholders*
12:00 PM	Lunch	
1:00 PM	Site Visit	
3:00 PM	Function Analysis ♦ Function Identification ♦ FAST Diagram – Correlation of Cost/Function/Performance	VE Team
4:00 PM	Team Brainstorming	VE Team
5:00 PM	Adjourn	
Day 2 – Tuesday, June 3		
8:00 AM	*Rate Study Analysis Presentation*	*Brown and Caldwell*
9:00 AM	Team Brainstorming (Continued)	VE Team
10:45 AM	Idea Evaluation	VE Team
12:00 PM	Lunch	
1:00 PM	Idea Evaluation (Continued)	VE Team
4:00 PM	Assignment of VE Alternatives	VE Team
4:30 PM	Development of VE Alternatives	VE Team
5:00 PM	Adjourn	
Day 3 – Wednesday, June 4		
8:00 AM	Development of VE Alternatives (Continued)	VE Team
12:00 PM	Lunch	
1:00 PM	Development of VE Alternatives (Continued)	VE Team
5:00 PM	Adjourn	
Day 4 – Thursday, June 5		
8:00 AM	Team Assessment of Alternatives	VE Team
10:00 AM	Preparation of VE Presentation	VE Team
12:00 PM	Lunch	
1:00 AM	Preparation of VE Presentation (Continued)	VE Team
2:30 PM	*Presentation of VE Alternatives* ♦ *Overview of VE Study Findings* ♦ *Presentation of Alternative Concepts* ♦ *Discussion of Value Improvements*	*VE Team, HDWD, Montgomery Watson*
4:00 PM	*Adjourn*	

MEETING ATTENDEES
HDWD Collection Systems
TOWN OF YUCCA VALLEY

2008 JUNE								NAME	ORGANIZATION	POSITION	PHONE	EMAIL
PS	2	3	4	5			IM					
X	X	X	X	X				Terry Hays	Value Management Strategies, Inc.	Team Leader	(760) 741-1155	terry@vms-inc.com
	X	X	X	X				Eric Trimble	Value Management Strategies, Inc.	Assistant Team Leader	(206) 706-3055	erict@vms-inc.com
	X	X	X	X				Joseph Glowitz	HDWD	District Engineer - Project Manager	(760) 325-7600	joeg@hdwd.com
	X	X	X	X				Paul Johnson	Johnson Management Group	Civil Engineer	(760) 562-3729	p-ljohnson@earthlink.net
	X	X	X	X				Don Bunts	Water 3 Engineers	Sanitation Engineer	(760) 737-6195	dbunts@water3.com
	X	X	X	X				Graham Fraser	Fraser Engineers / VMS	Sanitation Engineer	(760) 586-6860	fraser1@cox.net
	X	X	X	X				Charles O'Neil	Consolidated Construction Management	Civil Engineer	(510) 208-1720	coneil@consolidatedcm.com
	X							Tom Pavletic	Brown & Caldwell	Municipal Financial Services	(925) 210-2385	tpavletic@brwncald.com
	X	X	X	X				Ed Muzik	HDWD	GM	(760) 228-6269	edm@hdwd.com
	X							Candace Trude	HDWD	CFO	(760) 228-6282	candacet@hdwd.com
	X							Jeff Mohr	MWH	Design Consultant	(626) 568-6299	jeffrey.d.mohr@mwhglobal.com
	X							Bill Warner	Nolte Associates	Design Consultant	(760) 365-7638	bill.warner@nolte.com
				X				Ajit Bhamrah	MWH	Project Manager, Vice President	(626) 796-9141	ajit.s.bhamrah@mwhglobal.com