EXECUTIVE SUMMARY

DRAFT PRELIMINARY ENGINEERING REPORT
CITY OF LAS VEGAS WATER SYSTEMS IMPROVEMENT PROJECT

INTRODUCTION

Since its inception in 1881, the City of Las Vegas (the City) municipal water supply system has experienced water shortages. In response to water shortages, the City has taken the following actions.

- Since the summer of 2000, the City has imposed water restrictions.
- Since 2008 the City has had to supplement its surface water supply by pumping groundwater using the City's emergency Taylor Well Number 4 (TW #4) full-time.
- On June 21, 2010, the City adopted Ordinance Number 09-18, requiring its citizens and businesses to comply with prescribed water conservation regulations.
- On April 8, 2011, The City Council adopted Resolution 11-21, declaring emergency drought conditions.

Suspecting that these symptoms were indicative of deeper problems, the City commissioned an overall one-year engineering analysis of its water systems – from water capture all the way through waste disposal. This document presents the results of that analysis. This is the first time an all-encompassing report of this type has been compiled for the City's water system in its 100+ year history.

Results indicate that the inherited water systems are exceedingly aged, have suffered from decades of neglect, and are insufficiently sized to properly serve the needs of the community.

OBJECTIVE

The goal of the analyses is to address the City's requirement to ***reliably*** deliver ***sufficient*** water at acceptable ***quality*** for ***years-to-come*** in a ***cost constrained*** environment. The City's failure in each of these five dimensions is evident by the water systems deficiencies pointed out in this document.

- "***Reliably***" means that the water must be delivered to customers through most adverse circumstances. The main reliability issues are insufficient storage, facility decay, and single points of failure.
- "***Sufficient***" means the City must find and legally collect a large enough volume water for customer needs. The main sufficiency issues are too few rights, insufficient wet water at sources, and waste.
- "***Quality***" means adherence to state and federal health standards as well as customer aesthetic values. The main quality issues are stagnant water in pipes and water treatment plant shortfalls.

- "***Years-to-Come***" means today's actions or uses can not impair grandchildren's needs. The main years-to-come issues are aquifer drainage, dependence on a dwindling river, and unknown groundwater production.
- "***Cost Constrained***" means limitations to grants, loan interest rates, and lack of subsidies to or from other City functions. The main cost constraint issues are insufficient customer pricing and the national economy.

RESULTS

The analyses show that the City is failing, or at severe risk of failing, in each of these five dimensions. It should be noted that any solution to one dimension should not inadvertently harm the other dimensions. Besides identifying the problems, the engineering analysis team sought, identified, and evaluated over 32 remedial actions.

Recommended actions are merely the "winners" in of a numerical-based ranking system contest among a vast number of alternatives based upon a standardized ranking process. The analysis team is recommending only the very best, most cost-effective, highest ranking 32 actions. Details of the ranking process and descriptions of the "non-winners" are included in the Preliminary Engineering Report (PER). The project costs for the 32 recommended actions is an estimated $123 million.

All $123 million worth of the recommended actions presented by the analysis team are necessary to bring the systems up to a reasonable level of competence. With sufficient funds, all the actions ought to be started immediately; however the City may not be financially so endowed. The City therefore requested a phased approach identifying priority needs that must be implemented immediately (1-5 year period), recommendations that can be implemented at a later time (5-15 years), and considerations for the long-term (15-40 years). Thus if all recommendations are not funded in their entirety; as funds are made available the City can and should start the next Priority set of actions sooner than is indicated.

The time to implement the major Priority 1 Actions (first phase) is upon us now. The Priority 1 recommendations are to resolve critical system deficiencies for an estimated total cost of $53.9 million. All Priority 1 actions should be started as soon as possible. However; since simultaneous initiation of all Priority 1 actions might be administratively taxing, we have developed a detailed sequence for start-up of individual Priority 1 actions based upon our engineering judgment.

QUALIFIERS

The analysis team understands that the set of recommended actions is expensive. However; the analysis team believes they are far less expensive than the consequences of not implementing them.

In addition to the engineering recommendations, a funding strategy that includes state/federal grant acquisition, water revenue bonding, and upwardly revised pricing of delivered water should accompany this PER. There are actions which should be handled through the ongoing revenue stream from customer rates and there are some actions that will certainly require grant and bonding actions.

While a vigorous conservation program to reduce customer demand is a relatively low cost means of mitigating the severity of water shortfalls, their nature and details are outside the scope of this engineering analysis report. However; such conservation programs are highly recommended and are already in full force.

DOCUMENTATION

This PER document and the attached technical reports detailing the recommended actions have been structured to meet the guidelines for "Preliminary Engineering Report" as presented in the U.S Department of Agriculture Rural Utilities Service document with a 40-year planning horizon beginning 2010 and extending to 2050. This entire package enables the City to proceed immediately to seek needed funding and/or to begin detailed design for each of the actions.

THE SYSTEM

As depicted in Figure ES-1, the City's water system has a chain of components, each really needing work. Ninety percent (90%) of the City's water supply comes from diversion of the Gallinas River. Surface water flows to two City-owned reservoirs and to the City's leased portion of Storrie Lake. As needed, reservoir water is processed through the water treatment plant and then sent into a network of pipes for distribution to City users. The other 10% of the City's water supply comes from one groundwater well that feeds into the same network of pipes. After customer use, the sewage is piped to the wastewater treatment plant, from which most effluent is returned to the river and a small fraction is used to irrigate parks and ballfields.

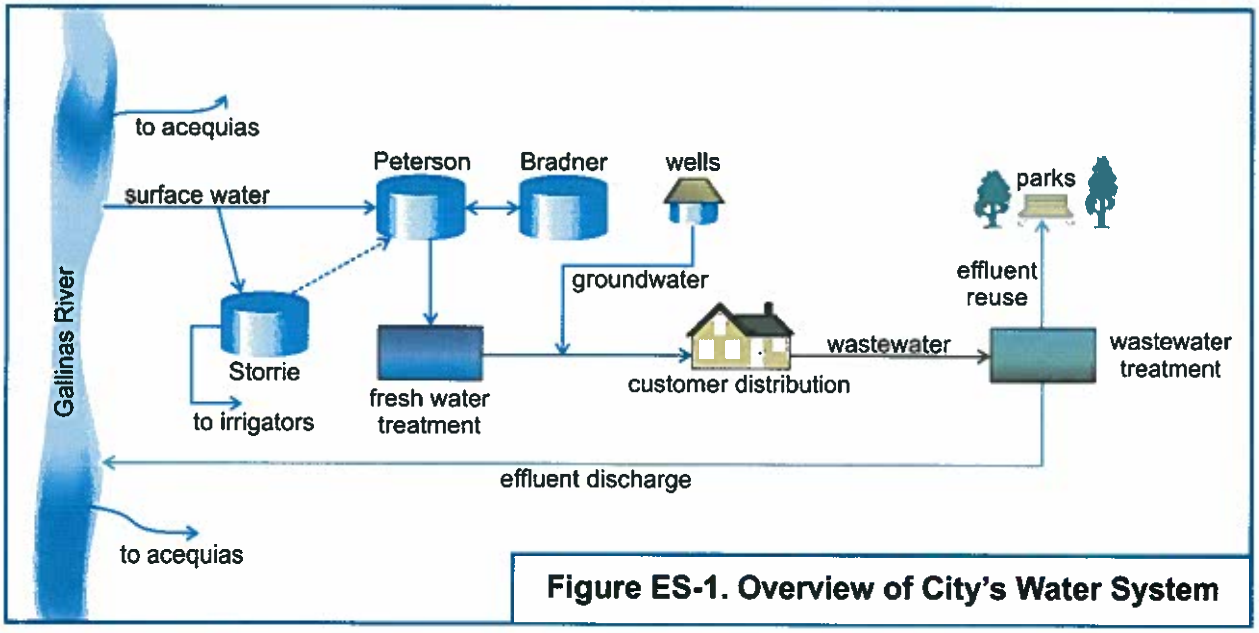

Figure ES-1. Overview of City's Water System

PROCESS

The engineering analysis team consisted of eight separate subcontractors. As shown in Figure ES-2, the City assigned portions of the engineering analysis process to the most appropriate professional engineers. The subsystems were the raw water subsystem (surface water gathering, conveyance and storage), finished water subsystem (surface water treatment and distribution), groundwater systems (wells and aquifers) and effluent system (sewage, wastewater treatment and effluent reuse).

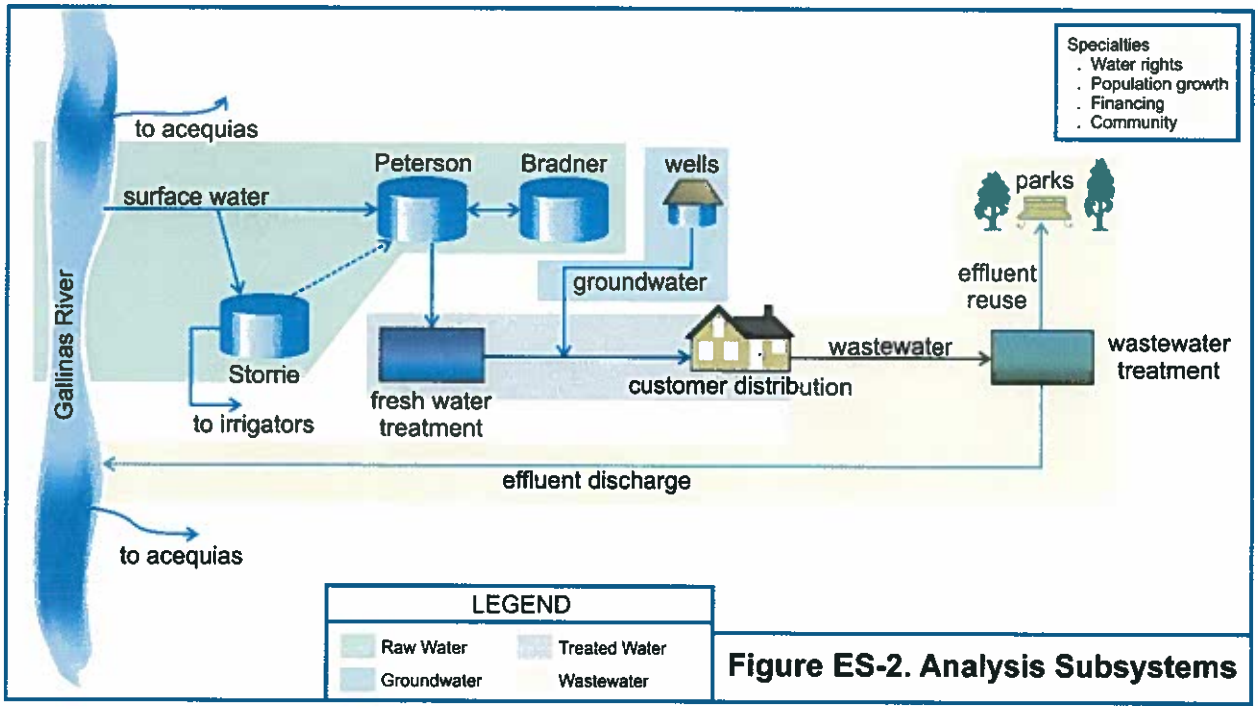

Figure ES-2. Analysis Subsystems

Besides the subsystems, separate entities with specialized expertise were assigned to address water rights issues, population projections, funding approaches and overall PER integration. Community expertise was obtained through three well-publicized public presentations.

KEY PROBLEM AREAS

The analyses revealed problems or weak links across the system, quite a few of which were already known or suspected by the City. Each part of the chain to reliably deliver sufficient water at an acceptable quality for years-to-come in a cost constrained environment has several weak links, summarized below.

- Surface Water Supply: The bulk of the City's water supply is from surface flows originating from the Gallinas River. Drought conditions have critically limited the concept of long term reliance on this surface water source alone.

- Surface Water Storage Facilities: Two of the City-owned surface water reservoir dams, Peterson and Bradner, have been classified by the New Mexico Office of the State Engineer as high hazard dams and do not meet that agency's current safety regulations. Accessible storage volume comprises roughly 36% of the City's annual municipal water demand and is insufficient to consistently satisfy municipal water demand.
- Groundwater Supply: The Taylor Well field located southwest of the City provides groundwater from only one well. Unpredictability of groundwater production in this area limits the concept of long term reliance on this source alone to make up for surface water loss due to drought.
- Water Treatment: The City, by providing drinking water to its citizens, is obligated to provide safe drinking water and to provide public health protection by maintaining water quality in compliance with USEPA drinking water standards. Disinfection byproducts and complaints of taste and odor are evidence of impact to the City's water quality.
- Water Distribution: Two of the City's three finished water storage tanks need to be drained, thoroughly inspected, cleaned, and rehabilitated, as they are at risk of failure if work is not done. Distribution lines are aging, and leaking and dead-end lines should be interconnected to address water quality issues and adequate fire flow protection.
- Treated Effluent Reuse: Expansion of the City's effluent reuse program for seasonal irrigation of parks and ballparks will ensure conservation of the City's valuable treated drinking water currently used to irrigate City parks.

RECOMMENDED ACTIONS

The set of recommended actions was chosen to improve the strength of the entire water system chain for the City. As noted above, ideally all recommendations should be initiated today. More realistically, and at the City's request, the analysis team grouped recommended actions into Priority Action (levels) 1, 2, and 3 for corresponding with 1-5 year, 5-15 year, and 15-40 year implementation time frames. The key recommended actions in each priority group, along with estimated capital costs, are listed below.

The body of the PER document and the associated technical reports address the recommendations, as well as the currently non-recommended alternatives in detail.

PRIORITY 1 WATER SYSTEM IMPROVEMENTS

All of these Priority 1 actions should start immediately. However, initiating that many actions on the same day might present some administrative difficulties, so they are listed in a sequence to begin work in an orderly fashion. In our engineering judgment, among the many critical actions in need of immediate implementation, the most urgent actions are those that address the severely limited storage capacity and the lack of diversity in water sources, while the next most urgent are those that are directed at preventing or mitigating risk of system facility failures.

The most urgent Priority 1 actions are those that address the severely limited storage capacity and the lack of diversity in water sources. The following five Priority 1 actions, in order of descending urgency, and including regulatory requirement considerations, are:

• Optimize Groundwater Production from Taylor Well Field	$ 9,400,000
• Peterson Dam Expansion and Dam Safety Improvements	$ 19,400,000
• Raw Water Conveyance System Improvements	$ 11,800,000
• Bradner Dam Engineering Stability Analysis	$ 100,000
• Water Treatment Plant Oxidation	$ 3,500,000

The next most urgent are those that are directed at preventing or mitigating system facility failures. The remaining five Priority 1 actions, also in order of our judgment of descending urgency, are:

• Water Treatment Plant Building Repairs	$ 200,000
• Annual Leak Repair and Replacement[1]	$ 3,300,000
• Rehabilitate/Inspect Water Storage Tanks	$ 1,100,000
• Finished Water Distribution Improvements	$ 1,500,000
• Finished Water Distribution (Grand Ave. Loop Lines)	$ 400,000
• Expansion of Existing Treated Effluent Reuse System	$ 3,200,000

[1] *Total 5-year capital cost to replace or repair all leaking lines*

Total Cost Estimate for Priority 1 Recommendations	*$53,900,000*

PRIORITY 2 WATER SYSTEM IMPROVEMENTS

The following recommendations could be implemented at a later time, and rely on completion of Priority 1 improvements. All of Priority 2 recommendations is integral to consistent system reliability.

• Pump Station to Convey Water to Peterson Reservoir	$ 1,600,000
• Obtain Groundwater from area West of Taylor Well Field	$ 6,300,000
• Water Distribution Loop Lines, Fire Flow Improvements	$ 9,100,000
• Water Treatment Plant Improvements	$ 120,000
• Rehabilitate Bradner Dam	$ 5,100,000
• Install Impervious Liners at Bradner and Peterson Dams	$ 4,100,000
• Annual Leak Repair and Replacement[1]	$ 10,000,000

[1] *Total 10-year capital cost to replace or repair all leaking lines*

Total Cost Estimate for Priority 2 Recommendations	*$ 36,300,000*

PRIORITY 3 WATER SYSTEM IMPROVEMENTS

The following long term improvements to the water system recommended by the analysis team and are based on current knowledge and projections for population growth and water use. They were selected from a vast array of alternatives that were evaluated and are not for immediate implementation; the associated trade-off decisions are described in the individual sector reports. Future conditions may give the City cause to re-assess the following alternatives and put them to a higher priority than they have today. Costs for long-term considerations are included in consultant technical reports.

• Implement Desalination of TW-7 Brackish Groundwater	$ 8,900,000
• Bradner Reservoir Water Quality Fill Pipe	$ 1,500,000
• Obtain Groundwater from Areas East of Taylor Well Field	$ 15,300,000
• Water Treatment Plant Expansion	$ 5,100,000
• Supervisory Control and Data (SCADA) System	$ 2,300,000
Total Cost Estimate for Priority 3 Recommendations	*$ 33,100,000*

LONG-TERM ALTERNATIVES

Those elements of the PER that discuss far-reaching alternative actions to improve and diversify water resource assets did not make the cut to recommended actions but should not be "lost in the shuffle". The following alternatives may become desirable as time goes on, and may indicate paths for further negotiation, permitting, and/or research. These alternative actions are listed below.

• Implement Effluent/Shallow Groundwater Exchange	$2.7-5.5 M
• Import Groundwater from other Basins	$7.7-11.5 M
• Use of Lake Isabel Lake David /Storrie Lake-Storage/Source	$22.7-29.9 M
• Storage in McAllister Lake	$22.8 M
• Utilize Effluent All Year, pump to McAllister or Storrie Lake	$1.3-3.9 M
• Utilize Effluent All Year, store for use by Acequias	$4.8 M