OWOW Santa Ana River Watershed Planning Framework

Section 1 – Introduction and Background

Introduction

The Santa Ana Watershed Project Authority (SAWPA), as the regional watershed planning group for the Santa Ana River Watershed, has been facilitating efforts to develop a watershed planning framework to guide water resource managers for the immediate future through the year 2030. To date, this has resulted in the development of the *One Water One Watershed Plan* (OWOW Plan). The genesis of this name is the recognition of the need for stakeholders across the watershed to develop an integrated water resource plan, where all types of water (local surface and groundwater, imported water, stormwater, and treated wastewater effluent) are viewed in a comprehensive, integrated manner as a single water resource. Completed in 2010, the OWOW Plan created a compelling vision for a more sustainable future where water resources are used most efficiently for both human needs and for the environment. The strategies and guidance from the OWOW plan provide the foundation for the implementation of new projects and programs to manage water in a more sustainable manner. This document establishes recommendations for the next steps for integrated water resource management in the Santa Ana River Watershed.

The OWOW planning process has been identified as a tool for better management of water resources through a system-wide approach that corrects and removes barriers to managing water in a more holistic manner. Harvard University's Kennedy School of Government selected the program as one of the 25 most innovative programs in the Country. In the first round of project funding through the OWOW program, the bar for projects was raised by asking agencies to collaborate more closely, ensuring that their constituencies received multiple benefits that were regional in nature. Our approach to this first round of funding was driven by a compressed timetable. Despite these constraints, the selection process was more transparent, objective, and deliberative than had been attempted before.

The intent of this White Paper is to build on the promise of OWOW and of the first round of funding. The projects funded in the first round were excellent and provided great value to the watershed, but they should be viewed as "bright spots" scattered across the landscape of the watershed. Raising the bar further for us all to engage in an even more systemic approach will allow watershed champions to emerge, and teams identify ways to construct a detailed program or work plan addressing each of the watershed-based concepts developed in the planning process. The next round of funding can be used to fund more "bright spots" or it can be leverage for the broader, more integrated 21st century paradigm envisioned in the OWOW Plan. Other recommended next steps include prioritization of the infrastructural and watershed sustainability guidance projects and programs, team roles and responsibilities, preparation of conceptual designs, and developing interagency support. Refer to Section 4 of the White Paper for more detail.

Multiple agency cooperation is a powerful approach to watershed planning and program/project implementation. The intent of this approach is to address the need for funding (through grants) to enable agencies to budget for time and resources dedicated to new and/or innovative agreements that would not otherwise be realized. If all those with an interest in water take a broader view, this watershed approach can also create opportunities for local agencies to help shape the implementation of actions that restore hydraulic functionality, solve problems, and provide long-term sustainability.

Background

The OWOW Plan provided a blueprint for integrated water resources management in the watershed for at least the next 30 years. The use of the term "integrated" ascribes multiple meanings to the concept of water resource management. Not only does it carry the obvious meaning of managing the available sources of water contributing to the watershed in a more cost-effective, efficient manner to minimize waste, but it also means considering multiple watershed needs when managing water resources. In this regard, integrated water resource management means coupling the management of the water with the need for preserving or restoring habitat and the environment. In addition, integration also means that individual jurisdictions working collaboratively with their watershed neighbors in order to pool resources, enables the individual jurisdiction the ability to provide more water benefits with fewer local resources simply because the collaborative effort addresses multiple, rather than singular, goals. This economy of operation is especially important in today's environment of scarce resources where simply extracting a new source of water using an expensive, single purpose project that is not integrated into the watershed system is prohibitively expensive, and likely to face significant opposition from those bearing the brunt of the project's often unintended consequences. Our mandate is to leverage limited financial resources to create a more sustainable future through linking all water management activities through the calculus of watershed planning where benefits can be maximized for all. We only succeed using this model if all members of the watershed community are invested in a process where we leverage our knowledge and financial resources to make dramatic paradigm shifts in water management.

The impetus for integrated water resources management is the recognition that the following major threats will limit our abilities to manage water in a more traditional, single purpose manner:

- Variable drought conditions in northern California and the Colorado River Watershed, the primary sources of imported water to the Santa Ana River Watershed.
- A lack of predictability of future water imports from the San Joaquin-Bay Delta and Colorado River Watershed.
- Continued population growth and development that puts further stress on the natural hydrology of the watershed, and increases the need to further stretch water supplies for these future residents.
- Climate change and its associated hydrologic variability.

The OWOW Plan is this watershed's 30,000 foot bird's-eye view to answer these threats. The Plan envisions a region where all stakeholders in water take an active rather than passive role in creating a watershed that:

- Is sustainable, drought-proofed and salt-balanced by 2030[i].
- Protects its water resources and uses water efficiently.
- Supports economic and environmental viability.
- Mitigates and adapts to a changing climate.
- Corrects environmental justice deficiencies.
- Minimizes interruptions to natural hydrology.
- Creates a new water ethic at both institutional and personal levels.

Led by the Steering Committee comprised of County Supervisors (3), mayors of major watershed cities (3), water board members (2), and representatives from the environmental, regulatory, and business

community (3), regional experts representing various technical disciplines (also known as Pillars), ranging from water supply and quality to climate change and environmental justice, prepared the OWOW Plan that identifies numerous opportunities for implementation of water resource projects that support this vision. These project opportunities are consistent with the Guiding Principles established through the OWOW Plan development process (Table 1). The Guiding Principles, goals and objectives, strategies, targets, and evaluation criteria were created and adopted in 2011 by the Steering Committee, Pillars, and stakeholders as part of the OWOW IRWMP development. These Guiding Principles and associated goals and objectives, strategies, targets, and evaluation criteria provided the basis for prioritizing and funding projects using State grant funds, when such financial incentives for integrated projects become available. The Steering Committee provided oversight on the initial disbursement of a portion of $114 M of Proposition 84, Chapter 2 funding, and has begun to plan for the selection of additional projects for funding incentives.

Throughout the Santa Ana River watershed, many agencies have aggressively moved forward in addressing these challenges. These early adaptors have represented new ways of thinking, have changed past practices in order to meet the new challenges, and can be viewed as "bright spots" across the watershed of the new 21st century thinking.

Table 1. Examples of "Bright Spot" Projects

Agency Name	Project/Program
Eastern Municipal Water District Irvine Ranch Water District	Sustainable Water Rates
Orange County Water District Orange County Sanitation District	Ground Water Replenishment System
Inland Empire Utilities Agency San Bernardino County Flood Control District	Storm Water Capture and Ground Water Replenishment
Western Municipal Water District San Bernardino Valley Municipal Water District	Stormwater Capture in Flood Facilities

Path Forward

Although the OWOW Plan identifies numerous specific projects that implement the OWOW vision, the need exists to continually develop high level watershed management concepts that, when implemented, create the opportunity to make significant strides in efforts to make this watershed fully sustainable from a water resource perspective within a 30-year planning horizon. Accordingly, this document takes a look at this future by envisioning water resource management from a high level watershed perspective to identify concepts, that if adopted and implemented, would serve every water agency by improving the system that delivers water, manages stormwater, and treats wastewater. Inherent in this effort is the need to understand where we are today, and identify where we collectively want to be, as a watershed, in the future. Accordingly, it is necessary to first describe systemic impairments to the sustainable operation of water resources in the Santa Ana River Watershed, and then identify specific actions to remedy those impairments to achieve the OWOW vision. Throughout this effort, it has been important to remain cognizant of the realities identified as follows:

1. Our watershed's economy has contracted and is changing. In a forecast by Beacon Economics, it is not likely to recover to a healthy level until later in this decade. Utilities are significantly impacted by local, statewide, and national conditions. Yet the need for providing and/or improving services, while at the same time meeting environmental and regulatory demands, remains the same. There also is a need to ensure that disadvantaged and tribal communities are able to access basic levels of services that are provided by the utilities.

2. Our historical way of planning, financing and implementing projects for public benefit is not sustainable with this new economy. A new approach to planning and managing our water resources using new technologies is needed now. Future projects require a new economic construct and will require extensive leveraging of resources. Sharing intellectual and financial resources is challenging, but it allows project proponents to avoid redundancies and obtain economies of scale, making each public dollar provide more than one benefit to the community.

3. Many local projects will continue to be implemented with local and regional financing, but regional projects that provide broader, integrated benefits are more economical and sustainable. The gap between Regional projects, and projects focused on the capital improvement plan of a single agency, must be evaluated at an appropriate level, the watershed level, and regional projects must be developed in order for us to reach our sustainability goals.

4. Several environmental justice issues within the Watershed were identified early in the OWOW process. First, direct community impacts from groundwater contamination from industrial operations have occurred primarily in the upper watershed. This sort of contamination should be addressed as a local issue before contaminant plumes spread and the issue becomes regional in nature. Addressing such issues early not only protects water supply for the community living in the area of contamination, it also provides cost savings by avoiding the cost of regional cleanup efforts. Similar issues arise in areas where groundwater and surface waters are impacted by leaking septic systems located in some high density, lower income communities where sewer services are not available. Here again, regional water quality issues can be avoided through implementation of projects to correct an environmental justice issue. Some lower income areas of the Watershed are served by small water companies lacking resources to upgrade infrastructure and provide up-to-date treatment technologies for waste. In these areas, the community lacks the resources and, in some cases, the expertise to upgrade systems. Disadvantaged areas located within larger districts with greater resources are not impacted in this way. Finally, communication continues to be an environmental justice issue. Language barriers and a reliance on "word of mouth" communications limit communication avenues available to provide reliable, factual information to a community.

5. Variability and uncertainty of future water supplies drives the need for developing regional integrated solutions to water resource management. All water, regardless of source or origin, must be treated as a single resource; accordingly, the efforts to pursue within-watershed management of resources must be intensified and expanded.

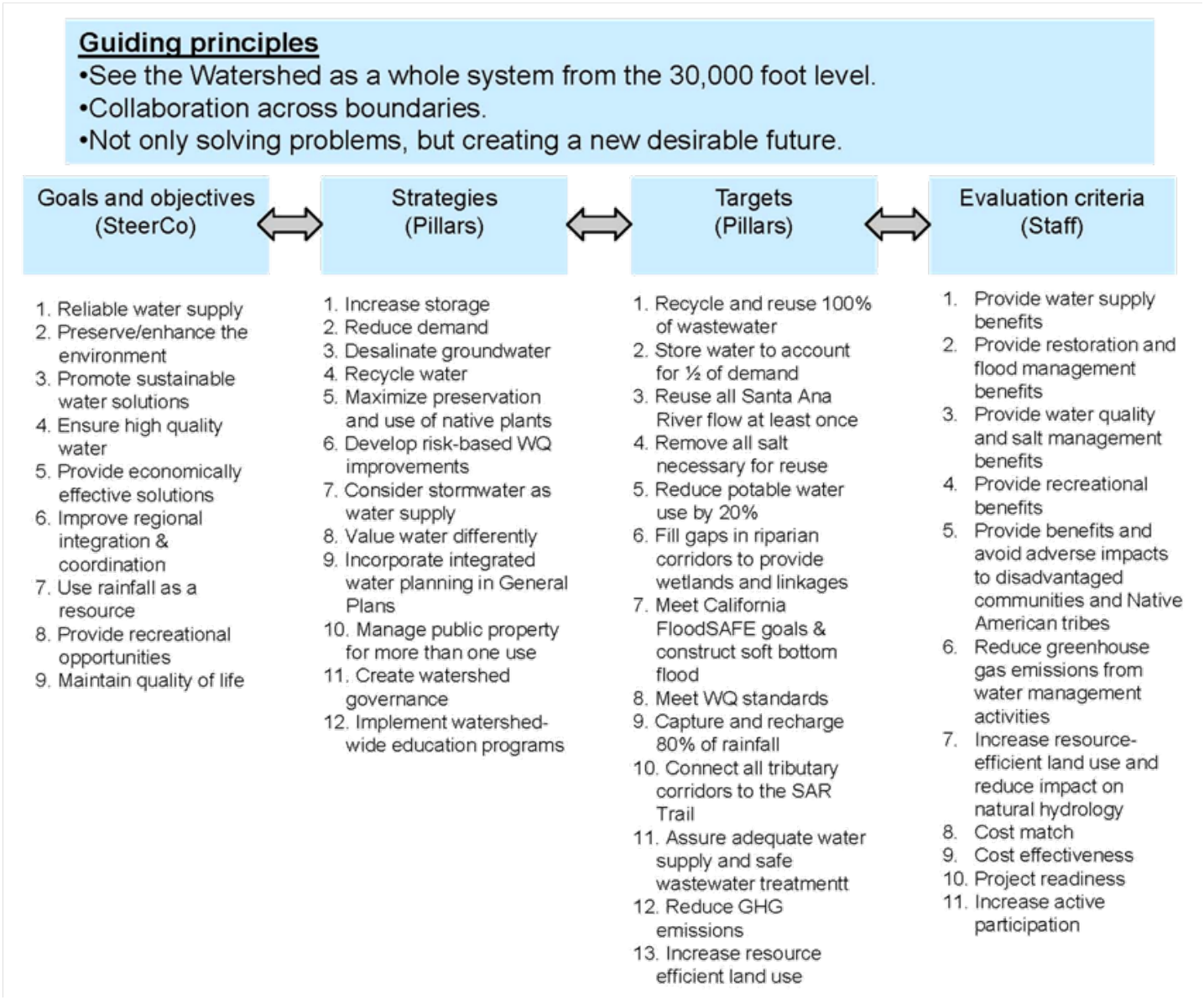

Table 2. Guiding Principles for the identification and prioritization of water resource projects in the OWOW Plan (SAWPA 2011)

6. Solutions to Bay-Delta issues are needed to establish long-term water supply reliability and environmental sustainability in the Bay-Delta. However, the timeframe for completion of Bay-Delta improvements exceeds the 2030 horizon for implementation of the OWOW Plan. Parallel efforts to address long-term sustainability in the Bay-Delta and Santa Ana Watershed are essential. Therefore, we continue to support Bay-Delta solutions while taking ownership of our own region to implement affordable local and regional watershed solutions.

7. We must move expeditiously from short-term to long-term thinking with regard to water resource management. Sustainability and reliability will be measured by decades. What we collectively do in this decade will establish the foundation for the future. Specifically, to achieve success three to four decades out requires aggressive intent to implement solutions in this decade.

8. There is a need to step back and look at the watershed as a whole, identify what needs to be accomplished, and then work with regulators to ensure that regulatory requirements do not become a hindrance to common sense solutions that enhance water resource sustainability and limit our ability to address system-wide issues.

These realities underlie the purpose and content of this paper. In subsequent sections, we first describe the impairments or barriers that, in our view, must be overcome to achieve the OWOW vision. We then provide concepts or remedies that can address these impairments and move the OWOW vision forward. In the development of these remedies, we sought to identify solutions that:

- Create a culture at various jurisdictional or organizational levels that not only enhance the sustainability of water resources, but result in collaborative solutions to regional water resource issues.

- Have additive or cumulative impacts on water resource management issues such that implementation of a watershed concept addresses multiple water resource issues, providing multiple watershed benefits.

- Rather than a result that just moves funds from one area to another, move to support economic sustainability by solving common problems with less effort through collaboration with other jurisdictions. This is especially important in DACs, as there is an opportunity to not only build projects, but also economic capacity.

- Does not interfere with local decision-making or replace local planning efforts; instead, it is our goal to create a landscape where local jurisdictions want to participate in regional solutions because doing so resolves local problems.

Section 2 - Remedying the Impairments – Watershed-based Concepts

The leaders of the OWOW pillar groups, as well as three well-respected experts in water policy and project implementation acting as facilitators, described the spatial, temporal, regulatory, economic, political, and physical barriers that impair the ability to implement watershed-based concepts to support a regional approach to water resource management that supports the vision articulated in the OWOW Plan. These impairments are well known and acknowledged by water resource practitioners. The OWOW process provides a mechanism to overcome these barriers when stakeholders in a watershed-based project can clearly identify the tangible benefits that will be received through participation in such a project. Stakeholder engagement is critical to the success of any project. It is even more critical in DAC-based projects.

The purpose of this section is to identify key examples of watershed-based water resource management concepts that, when implemented throughout the watershed as a single project or series of interconnected projects, can provide tangible, measurable benefits by removing impairments. These watershed-based concepts are ideas vetted by the Pillar groups that target a particular water resource management need, and in addressing that need provide significant additional benefits, e.g., habitat restoration and increased habitat connectivity and improvements to the environment. . We include two types of concepts: (1) those that require implementation of capital projects; and (2) those that are programmatic and focus on establishment of regional management practices or policies that increase sustainability of existing resources. Following a discussion of how these concepts were developed, the following sections provide descriptions of each of the watershed-based concepts proposed for consideration in the Santa Ana River Watershed. Where appropriate, we also have included at least one example project that illustrates the concept in action.

OWOW Pillars

- Beneficial Use Assurance
- Disadvantaged & Tribal Community
- Energy & Environmental Response
- Government Partnerships
- Low Impact Development Planning
- Multi-Hazard Preparation
- Natural Resource Stewardship
- Operational Efficiency & Water Transfers
- Water Resource Optimization
- Water Use Efficiency

Process for Development of Watershed-based Concepts

In 2010, SAWPA developed the OWOW Plan to establish a vision for water resource management in the Santa Ana River Watershed. This effort was led by the OWOW Steering Committee and Pillars, representing different areas of water resource expertise. In 2011, SAWPA began efforts to take this vision to the next level by initiating a series of meetings that provided opportunity for the Pillar Leaders to focus in on the key water resource management needs in the watershed and to identify high-level watershed concepts for further development. This effort started with identification of six watershed-based or system-wide strategies as follows:

- Increase Water Use Efficiency
- Regional Water Quality Enhancement
- Water Banking and Intra-Regional Transfer
- Salt Export & Groundwater Management
- Stormwater Capture and Off-River Storage
- Disadvantaged Community Infrastructure Enhancement
- Water Recycling
- Land Use Practice

From these broader strategies, the following 12 concept level system-wide projects and programs were developed.

- Sustainable Water Rate Allocations
- Multi-Use Flood Control Corridor Projects
- Water Banking and Transfer Projects
- Sediment Transfer Program
- Forest First Program Incentives
- Off-River Storage Projects and Supply Credits
- Public Utility Corridor Stormwater Capture and Treatment
- Modified Watershed Brine Management System

- Efficient Water Use Retrofits and Guidebook
- Water Industry Energy Use Reduction Incentive Program
- Regional Land Use Planning Guidebook and Model Ordinances
- Regional Urban Runoff Management Fund
- Regional Habitat Conservation GAP Planning

As shown above, implementation of any of the projects/programs can lead to multiple, integrated benefits that in turn support other projects/programs concepts. For example, implementation of projects that support the stormwater and off-river storage can also provide regional water quality enhancement, support salt export and groundwater management efforts, and create opportunities for water banking and intra-regional water transfers. DACs should be included in the concept level system wide projects and programs.

Water Resource Infrastructure Projects

The OWOW process involved exhaustive research and historical documentation of the region's infrastructure. The watershed's current condition is reflective of the convergence of the natural water systems and the water development history of the region. This history began with the pre 1800's grazing of cattle and other animals through the early settlements, and the development of emerging agricultural activities utilizing the diversion of easily available surface waters. As development of all types intensified, more dependable irrigation resources were developed as well as associated water rights. Later emphasis was placed on the protection of water quality as it found its path from tributaries to major rivers, and acknowledged natural delivery sources.

This water development history has formed much of our regulatory policy and delivery infrastructure that we rely on today. A new approach will be necessary to adjust to yet another cycle of regional growth, aging infrastructure, and economic and energy challenges to the region.

Multi-Use Flood Control Corridor Projects

Regulatory policy, at almost all government levels, is focused on infrastructure related to our need to protect life and property threatened by large volumes of water or debris resulting from our flash flood indicative Mediterranean climate. Changing weather conditions resulting from climate change are likely to increase the intensity of these storms while decreasing the frequency. The Santa Ana River Watershed has experienced catastrophic flooding in the 1860's and 1930's that resulted in wholesale changes in land development patterns in the region. In fact, the oft-reported Arc Storm planning scenario used by the USGS has historical links to the floods of the 1860's in the Santa Ana River Basin. The resulting flood control system, begun with Prado Dam in the late 1930's, was designed to move water quickly from the region. Often, this rapid movement of water to other areas was accomplished with hard levees and in some cases, hard bottomed channels. However, in the Santa Ana River Watershed, aggressive advocacy by local citizens resulted in redesign of flood control projects leaving 80% of the Santa Ana River soft-bottomed. Studies have shown that a great deal of recharge occurs within channels, and this volume could be increased by increasing water retention time in specific reaches. A reoperation of the flood control system to protect life and property, as well as maximize recharge has been accomplished at the Prado Dam and is envisioned at the Seven Oaks Dam. However, there is much channel and recharge capacity still available in the system.

This is coupled with realization that our river levee (barrier) construction has aged and been weakened over long years of use, and is in need of repair and replacement. In addition, bed degradation in the upper river has left the levee toe exposed in a number of places. Systemic reinvestment, including re-visiting the operations manuals for the entire river could produce increased flood control capacity, as well as water deposition. In some areas, this reconsideration of operations strategy also could address some

incompatibilities with current flood and habitat management within the channel. Native riparian vegetation is well suited to periodic flooding and the vegetated areas may help regulate flows so that recharge may be increased and habitat connectivity preserved.

The OWOW Region has long been the recipient of new and re-developed flood control dams, as well as a federally funded Santa Ana Main Stem project for the Santa Ana River to address the flooding threat, but there are continuing additional needs that still need to be studied and explored. The recognition of flood control needs for the regional development still planned and envisioned by the region's cities and county will be balanced with the environmental habitat and sustainable realities and needs, and also be called upon to incorporate water re-use and treatment, as well as conservation and storage within its system of flood control. This challenge and need will be met in part by the region's system of governments seeking collaborative planning and funding of infrastructure development that provides both mutual benefits and cost sharing in development. Communities and their agencies will be stressed as they work with the Storm Water Regulations, Water Quality TMDL's and budgets, leaving opportunities for yet additional collaborative planning that will translate into longer term development projects that yield usable water and mutual benefit sharing. Currently, there are no plans in place to deal with DACs with regard to ARK storm scenarios. This needs to be addressed.

At a conceptual level, a multi-use flood control corridor project may include the streams and tributaries along the Santa Ana River and even the Santa Ana River itself. Interest has been expressed in establishing rafting recreational use along the lower reaches of the Santa Ana River. Existing park or greenways along these waterways may be evaluated for recharge capabilities to capture the first flush rainfall for percolation and replenishment of groundwater basins. The use of rubber dams along the floodway that can be quickly inflated and deflated may allow storm flows to be retained and redirected to available lands adjacent to the flood control facilities for recharge and replenishment. Such dams have been used extensively by OCWD to capture stormwater flowing in the Santa Ana River for recharge. A similar project has been designed and is under CEQA review for the upper Santa Ana River as it passes through the City of Riverside. The idea of expanding the use of existing flood control retention or detention facilities for water supply augmentation is not new. In the Chino Basin, over 25 flood control retention basins were retrofitted to allow multi-use of imported water and recycled water recharge when seasonal storm control functions were not needed. Further retrofits of these same areas for recreational use such as parks and publically accessible open space are also possibilities.

Water Banking and Transfer Projects

Water banking is broad term used to describe a process by which the holders can place water to a water storage entity that can then allocate the water for purchase by water agencies—in either local or distant locations—that are experiencing a need that they are unable to fulfill. The practice protects the original water rights of the stakeholder while accommodating the temporary needs of water agencies experiencing a shortage. Our region has a tremendous volume of available storage and could be well served by numerous banking agreements. For example, the Chino Basin has an estimated unused storage capacity of 439,000 acre feet of which 150, 00 are allocated and 290,000 acre feet are unallocated, as noted in the 2009 Santa Ana Integrated Watershed Plan. Likewise, the Bunker Hill Basin in San Bernardino has an unused capacity of 90,000 acre-ft of which 50,000 are allocated and 40,000 acre feet are unallocated. This is of similar magnitude to the Diamond Valley Lake, Metropolitan Water District's newest reservoir, with a capacity of less than a million acre feet.

Making use of this volume of storage will allow for increased indirect potable reuse and additional stormwater capture. Both of these local sources of water potentially decrease dependence on imported water and most importantly, store the water in the local areas. Water deliveries from sources located outside the region easily could be interrupted by catastrophic storm or earthquake events. However, the

development of local water supplies does not preclude the use of storage capacity to store imported water when it is available. This "base loading" of the State Water Project (SWP) water during surplus years allows the region to make use of State project deliveries, but not be dependent upon them when the water is needed for other consumptive or environmental uses. One of the impediments to base loading is the high cost of SWP water during wet years when customers do not need it. A restructuring of SWP rates may provide more incentive for customers to purchase SWP water in wet years when it is plentiful, and store it for later use during drought.

From a narrow perspective, water banking in our region benefits a portion of our watershed's population. On average, the region uses about 60% groundwater and that groundwater is pumped from specific basins, but there are water resource managers that are nearly 100% dependent upon imported water resources and have little groundwater storage available to them. Investments in stormwater collection or infrastructure projects outside their region where groundwater storage capacity is available could allow these districts to store water elsewhere for later use in another part of the watershed. These investments would require careful monitoring and agreements, ensuring that all parties receive benefit, but ensure that the region's storage capacity is put to its maximum use.

In order to make maximum use of the region's groundwater storage capacity the infrastructure to deliver water from areas of storage to areas of use must be available. This level of infrastructure planning exceeds what has been done previously and supposes that water resources can be delivered throughout the watershed from locally derived and stored sources. These delivery systems are most likely conventional interconnections between existing water systems making a local system regional in nature. However, the Santa Ana River and its tributaries have been used in the past for water deliveries. And as discussed earlier, the flood control system has available capacity for water transfer much of the year.

Project proponents of water banking and transfer projects on a system wide scale would need to review the inventory of groundwater basins and water delivery infrastructure in the general proximity of their services areas as a first step. An inventory of groundwater basin conjunctive use potential in the Santa Ana Watershed was evaluated by MWDSC's part of a 2007 assessment for their service area. One challenge to implementing new storage projects is that several of the basins are adjudicated and any new proposals for storage or water banking projects proposed by parties outside of the judgments would require agreements within the framework of the judgments.

Data on existing water delivery infrastructure to or from groundwater basins also may be readily available to MWDSC as part of existing conjunctive use agreements. New projects that transfer water into groundwater basins with surplus basin capacity can be defined. Significant potential for banking within the watershed exists based on the very large groundwater basins in Bunker Hill, Chino Basin, and Orange County Basin. Several underutilized basins due to water quality challenges include the Riverside, Arlington, Hemet-San Jacinto, Temescal Valley, and West San Jacinto Basins. It should be noted that some of these basins have more capacity than others. New or existing wells would be needed to pump water in times of need for delivery to water use agencies based on conjunctive use storage agreements. Joint use agreements of existing delivery pipeline across water agencies to avoid having to build new facilities also may be included under this conceptual project area.

Sediment Transfer Program

There are many benefits associated with managing sediment within the Watershed. With Seven Oaks and Prado Dam, sediment transfer will provide a longer usable life of the dams for flood control purposes. The costs of raising a dam again in the future have large economic and social implications. Some of the impacts include the cost of construction, purchase of property that will lie within the new flood zone and the relocation of infrastructure.

Removing sediment from behind our dams will also preserve and create valuable storage volume for water conservation efforts. Water conservation is limited based on storing water at elevations that minimally impact flood control efforts and natural resources. As sediment accumulates behind a dam it reduces the available volume for water conservation.

Replenishment of sediment in areas where excessive erosion has occurred will slow and possibly reverse channel incising that has been occurring since many flood control structures have been constructed. As water enters a basin or is the flow is otherwise slowed the velocity also slows and the sediment settles out. Once the sediment reduced water again increases velocity increases and it has the ability to erode the bed and embankments at an increased rate. Reintroducing sediment below the dam has the potential to slow and possibly reverse this process.

Sediment released below a dam that is carried further downstream will provide replenishment sediment that could replace eroded areas that have compromised critical infrastructure. Two examples include the CA 91 Freeway and the current location of the Inland Empire Brine Line. This replenishment sediment would also preserve stream embankments and critical flood control levees. As the river incises due to the lack of sediment it erodes the embankments and in our watershed, often destroys important wildlife habitat for protected riparian species.

There is also a great need for replenishment sediment in the Santa Ana River for groundwater recharge operations. The Santa Ana River between Imperial Highway and the CA 57 Freeway is one of the lower watershed's primary recharge facilities. As sediment is carried out of the recharge stretch of the river the riverbed coarsens, which reduces the percolation rate for natural groundwater recharge. Coarsening, and subsequent armoring, occurs when the natural sands in the river are washed downstream and no replacement sediment takes the place of the lost sands. Over time the accumulation of these fine sediments create an impermeable layer in the river bottom thereby reducing percolation rates.

The Santa Ana River is also a major source of coastal replenishment sediment or beach sand. While beach replenishment is a regular activity, the full effects of sediment impoundment by Prado Dam have yet to be felt by Orange County coastal communities. Consequences of reduced sediment at the coast will affect private and public properties as well as infrastructure. A sediment starved coast will also have environmental impacts.

Clearly, the management of sediment within the Watershed requires a watershed-wide approach, as much of our sediment, like water, has its origins in the local mountains and foothills. And like water, that sediment is moving toward the ocean, passing through the jurisdiction of numerous agencies.

Forest First Program Projects

The Santa Ana River Watershed contains two large forested areas, the San Bernardino National Forest and the Cleveland National Forest. The steep mountainous San Bernardino Forest roughly serves as the eastern boundary of the watershed and is made up of two units, the San Bernardino Forest proper and the San Jacinto Mountains. This forest provides the headwaters of the Watershed. The Cleveland National Forest is a lower transverse range serving as a demarcation between the upper (Inland Empire) and lower watershed (northern and central Orange County).

In parts of Europe, to ensure a reliable supply of high quality local water, agencies control the headwaters watersheds and manage them to protect water resources. An opportunity for similar management exists within the Santa Ana River Watershed, as the US Forest Service manages approximately 30% of the watershed and all of the headwaters. As the land is already in public ownership, coordinated management can be accomplished much more readily. Over 90% of the watershed's rainfall is deposited on these public lands. As the 2003 fires demonstrated, management decisions made on the forest have a direct impact on the quality and quantity of water available for use downstream.

SAWPA and the Forest Service have created a formal relationship through an MOU that ensures that resource management planning for forest lands includes the interests of the downstream urban areas. This is an important first step in developing the kind of program that benefits the entire watershed. SAWPA and the Forest Service staff have been working together to develop project areas that provide benefit to all interests. This MOU, however, only initiates the dialogue needed for management of the Forest for multiple objectives.

Potential programs or projects related to a Forest First program for the Santa Ana River Watershed include: 1) Hazardous Fuels Reduction; 2) Meadow Restoration; 3) Chaparral Restoration on the Front Country above Recharge Areas; 4) Run-Off Reduction on Roads That Cross Forest Lands, and; 5) Removal of invasive species and restoration of native vegetation The National Forests in southern California are adjacent to some of the most urbanized areas in the nation and as such, are primarily managed for recreation. The forests are used by millions of hikers, campers, mountain bikers, hunters, fisherman, and other outdoor enthusiasts. In addition, the San Bernardino National Forest itself is the most urbanized forest in the nation containing several cities, numerous vacation homes and a number of camps providing opportunities for thousands of day and overnight campers each week. As a result of the urbanization and heavy recreational use, a policy of fire suppression has interrupted the normal, ecologically-sound fire cycle. Many areas on the forest contain dense underbrush and an unnaturally high density of woody plants. These forests are then more susceptible to insects and disease and when fire ultimately occurs, the fires are larger, more damaging and alter the area's ecology. Investigation after the fires of 2003 by SAWPA also showed enormous impacts to water quality and quantity, and to the infrastructure needed to capture local water.

In Colorado, investigations by Denver Water showed that a hazardous fuels reduction program not only would increase ecological richness and provide for increased public safety, it also would increase water volume and quality to the valley below. Denver Water entered into a cost share agreement with the Forest Service where they paid 50% of a $32 M hazardous fuels reduction program on 6,000 acres.

Similar programs exist within the Santa Ana River Watershed, but the size and scope have been limited by funding. The Forest Service and Southern California Edison have partnered in a fuels reduction program to reduce the risk of wildfires in populated areas and along transportation or utility corridors. Reducing the stem density from hundreds of stems per acre to less than 100, not only reduces the risk of catastrophic fire with the associated impacts to water quality and increased sediment loads in the basins located below the forest, it also is indicative that few stems in a forest plot consume significantly less water through evapotranspiration, resulting in more water downstream.

Forest restoration work, such as the thinning, clearing, and the creation of fuel breaks, influence how quickly and intensely a wildfire can burn. After forests have undergone fuels reduction, they may be managed naturally, through controlled burns. Smaller, less severe controlled burn fires also reduce the amount of soil erosion and other impacts to the watershed. Restoration also will help the forests become more resilient and resistant to future insect infestation and disease epidemics, reduce wildfire risks for communities, and improve habitat for fish and wildlife species. More resilient forests also will be more adaptive to the impacts of a changing climate.

Further, fuels reduction may significantly increase water yields and protect water quality. Targeted investment by water agencies in sub-watersheds above where water is diverted or recharged could result in significant yield increases for investors and significant reductions in O & M costs. For example, areas above Seven Oaks Dam have been identified as high risk for catastrophic fire and contain extremely dense stands of vegetation. The Forest Service has completed the required environmental review and with cost share funds could quickly implement the project.

In our Mediterranean climate, much of the rain that falls occurs in relatively few intense storms. Specifically in the Santa Ana River Watershed, nearly 95% of the rainfall occurs in about a 4.5 day period. Collecting this source of water in detention or recharge basins is often difficult because of the enormous volume of water. More storms of lesser intensity would be much easier to manage, but recent climate change modeling indicates that storms will become even more intense.

As much of the total rainfall within watershed lands on the forest and most of that water falls on the top country of the National Forests, projects that attenuate storm flows may be of utility to both water agencies and the flood district, as significant reduction in the flashy nature of rainfall in the region may attenuate the need for additional flood infrastructure downstream. In addition, attenuated flows may reduce damage and sedimentation in downstream debris basins. These basins also are significant recharge areas and recharge low salt, high quality water.

There are numerous meadows in the forest that can fulfill this floodwater attenuation function. Functioning meadow ecosystems capture and hold storm flows, releasing them over a period of months. Nonfunctional meadow ecosystems often are channelized and the flows are much like flows in conventional unlined flood channels. Mapping and planning meadow restoration in areas above detention and retention basins can protect infrastructure below as well as provide a more manageable flow of water into these systems. Rainfall will enter the system over a period of weeks to months rather than over hours.

Other forms of restoration of the forest also have value downstream. As repeated chaparral fires have occurred in areas, which in some cases have not burned in nearly 100 years, the native plant palate has shifted from bush-based chaparral to non-native grasses. These grasses have shallow root systems and a limited ability to hold soil in place even when actively growing. Steep areas located above retention and/or retention basins, have had a shift from deep-rooted chaparral plants to shallow-rooted invasive grasses. In many of these areas, the vegetation is unable to hold the soil in place during periods of intense precipitation. In those cases, the hillside has sloughed off and soil debris has moved downhill into areas where groundwater recharge is expected to occur. Not only does the soil not hold precipitation moderating storm flows, the resulting debris clogs basins and allows water that could otherwise recharge to move downstream to the ocean. The focused restoration of native plants in buffer zones above recharge areas can result in improved habitat, as well as reduced O & M expenses for flood districts, and a net increase of groundwater recharged.

Finally, as roads are constructed and maintained to service the numerous residents of the mountain communities and to provide recreational access to millions of residents in the valleys below, the flow of sediment downstream has increased. Developed transportation corridors effectively collect precipitation and direct it downstream at high velocity. These high velocity flows pick up sediment and move it downstream where it impacts wildlife and directly increases costs for flood control districts. (During the periods when the basins are being cleared of additional sediment, recharge volume is greatly decreased.) Retrofitting a mile of road in the mountains to reduce high-velocity flows can reduce the sediment load up to 10 tons annually in the basins below.

Establishing a project to quantify the benefits of the forest restoration and maintenance activities for a downstream flood control or stormwater capture agency would be a first essential step. Once these benefits were defined, agreements and potential funding to support the Forest activities could be initiated similar to the steps taken by Denver Water in Colorado. USFS lands contain DACs. They need to be engaged to become effective and meaningful stakeholders, as they can be protectors of the headwaters if engaged.

Off-River Storage Projects and Supply Credits

Off-river storage, utilizing existing detention or modified basins with minimal new infrastructure, is a concept that should be explored in more detail. As regulatory and governing bodies meet and discuss

options related to developing local supply through groundwater replenishment and banking, they should consider opportunities to collect water within the 100-year flood plain adjacent to the Santa Ana River and larger tributaries. Various aspects of these possibilities are already in use and as we have learned, there are numerous areas already identified as mitigation reserve areas, or set asides, that could offer opportunities as a joint use prescription for collecting water for recharge. As regional governments take up the discussion of sharing and benefits, the issues of mitigation land purchases by developers, options will be discussed for reclamation of abandoned groundwater basins and incorporation of park lands adjacent to rivers and drainage areas to divert and store water during heavy rains. Further study will confirm that reconstituted or restored wetlands off river will provide opportunities to capture storm runoff and provide valued natural habitat for listed species and foraging areas to animals in the area. Well designed and planted wetlands create strong opportunities to address water quality.

Under a capture and replenishment program, a City or County could provide a 'New Water Supply' credit as part of the water supply assessment review for new development if it could be shown that a project captured and recovered excess stormwater with such a project that would otherwise have been lost to the ocean. Integrated designs that mimic natural stream morphology, wetland systems, canopy cover, upland habitat, alluvial fan conditions, and other ecological and geomorphic features of the watershed restore or enhance ecological function and value when combined with off-river storage objectives. Seasonal flooding or higher flows during storm events create opportunities to improve habitat through flushing of sediment and flows over the floodplain. Partnerships with resource agencies who are working to recover habitat function and values, along with target species, can be formed to create win-win projects throughout the watershed.

A Water Credit program at a watershed scale could be initiated by a regional water entity or crafted under multiple cities and counties who work together by a mutual agreement, thereby economizing the implementation of replenishment projects and use of the funding received that could be applied to storage.

Public Utility Corridor Stormwater Capture and Treatment Projects

The OWOW process has revealed opportunities to invite new partners to the regional planning process, including those with long utility easements crossing the watershed. For example, operators of our system of highways managed by Cal-Trans have expressed interest in discussing new operational mandates as they move away from the heavy water use and lush vegetation to smart irrigation and native landscaping, and from hard surface and paving of maintained areas of their system to softer ecological alternatives. Included in the discussions, could well be the exploring of new uses such as the use of wide right-of-way areas for capturing and replenishing groundwater basins with sheet flows from the highway systems with input as a collaborative partner. Additionally, there are areas of the transportation system that could allow for water storage for controlled releases and managed replenishment programs. Cal-Trans have been invited to the Pillars discussion to explore partnership and mutually beneficial projects that address regional needs for water and water quality.

Stormwater capture and treatment has been demonstrated to improve water quality through best management practices implemented by transportation agencies. Caltrans, as the leading transportation agency in California, owns easements and right-of-way along its freeways, bridges, and highways—managing stormwater runoff through innovative and proven water quality improvements and retrofits. Within the Santa Ana Watershed, Caltrans infrastructure crosses the Santa Ana River, tributaries, and floodplain from the upper to the lower watershed. Watershed-wide opportunities abound to partner with Caltrans and other transportation agencies to create additional water supply benefits through groundwater recharge, drought tolerant California native landscaping, and water saving sprinkler retrofits. Water savings resulting from groundwater recharge and water conservation improvements throughout the watershed can be linked to incentive programs with agencies surrounding water. For example, if 3,000

acre-feet of water could be saved through water supply related retrofits on just Caltrans easements in a given project area, a water agency could issue credits through "paper water" in exchange for the water conserved or banked at the project site. Education of landscapers—in Spanish—is critical.

Modified Watershed Brine Management System

The Inland Empire Brine Line or Santa Ana Regional Interceptor (SARI) system has been constructed to export salinity from the Inland Empire to a wastewater plant for ocean discharge. Like nearly all watersheds located in arid climates, the management of salt is one of the most important endeavors for water resource managers. In areas where salt is managed, human populations and ecosystems thrive and historically in areas where this management has not occurred, agriculture has failed and cities have collapsed. This brine line system has been an important tool in managing inland groundwater basins and has allowed businesses that produce brine to locate in the Inland Empire. Orange County also benefits through the removal of salinity from the Santa Ana River, providing a reliable level of protection for the quality of its natural water supply and a reduction of dependence upon imported water.

Use of the brine line is currently limited by high pass through costs for treatment and disposal at the coastal treatment facility. In addition, a recent study considering future groundwater desalting and water recycling has shown that there may not be enough pipeline carrying capacity in the current system to support projected flows if all existing and potential groundwater desalting projects, advanced wastewater treatment projects for upstream reuse, and industrial brine discharges eventually were to be implemented. As both desalting and recycling are important components to a local water portfolio, addressing the Inland Empire Brine Line as part of a larger salt management program is crucial for the entire watershed. The Brine Line and other associated salt management efforts allow for multiple reuse of a single water resource, a reduction of dependence on imported water and the ability to further enhance local groundwater storage using all suitable basins within the watershed.

It is assumed that the economy of scale of integrated projects to support brine removal from the region will provide both water resource and financial benefit to the stakeholders where projects managing salt in an individual piece meal fashion are unlikely to provide these benefits. A new business plan for watershed-wide brine management will provide greater financial flexibility for agencies and greater certainty in long-term local water resource development. The business plan would provide the initial platform for generating ideas and concepts supporting specific projects. A number of watershed-wide concepts for brine line management already have been explored, and within the context of a regional salt management plan, deserve serious consideration.

Several options have been considered for improved management of salt within the Santa Ana River Watershed. The first, Brine Line flow reduction via a centralized treatment, is where it is assumed that the ultimate flow in the Brine Line is collected and diverted to a centralized treatment facility. Here, the brine undergoes biological treatment, followed by chemical softening, then high recovery reverse osmosis treatment and disinfection concludes the process. The treated water then is available for use and the reject water continues downstream for treatment and discharge. A wide range of possible variations of flow reduction configurations are available, but close evaluation of this option serves to maximize the volume of water that could be reclaimed, and maximizes the reduction in flow for treatment downstream.

A second and potentially viable option would be to implement further treatment and concentration of brine at individual desalters or facilities, again reducing the volume of brine and increasing the available supply of reusable water closer to the individual desalters.

Another option includes providing incentives to industrial and commercial users, which encourages the use of the existing Inland Empire Brine Line system, or providing pre-treatment for high BOD/ TSS waste and before discharge into the line. The cost of pretreatment may provide an incentive for the highest valued use

of the Brine Line, salt disposal. This could open up the possibility of directly discharging brine to the ocean. Currently, brine in the Brine Line is several times less salty than ocean water and with sufficient pretreatment at the source stream, the brine could be discharged directly to the ocean without any negative impact to the environment, avoiding the cost of downstream secondary treatment. However, the permit requirements for direct ocean discharge potentially could be onerous and time-consuming. Pretreatment is only required of system users, but implementing any or combinations of the above options could significantly reduce the need for future capacity in the Brine Line and treatment and disposal costs.

A final option for the Brine Line assumes that all of the flows in the line would be collected just below Prado Dam, the lowest elevation in the upper watershed, and a separate pipeline would be constructed to transport flows directly to the Salton Sea. Such a line could be upsized to accommodate additional flows. It is assumed that appropriated treatment of the flow would be included prior to discharge into the Salton Sea.

The concept that has been suggested in the last few years is using the Salton Sea as a possible discharge location for brine from desalter water recovery processes. The Salton Sea is California's largest lake at 360 square miles, with a surface elevation at 229 feet below sea level. The annual inflow into the lake is nearly 1.3 million AF. The lake is less than 50 feet deep, and the only outflow from the Salton Sea is by evaporation (nearly 6 feet per year). The salinity of the water in the lake is over 46,000 mg/L, compared to typical 35,000 mg/L salinity for sea water. Salton Sea has had its share of environmental issues, with its continually rising salinity, toxic levels of selenium in the water, and eutrophication due to its high nutrient loadings (nitrogen, sulfur and phosphorus). If brine flow from the Inland Empire Brine Line could be introduced into the Salton Sea, it could be an additional source of lower salinity water that may have some beneficial impacts by replacing water lost to evaporation.

This scenario becomes feasible when consideration is given to the needs for salt management in the Banning Pass area and in the Coachella Valley. Partnerships throughout these regions can maximize brine discharge and spread costs throughout a broader group of stakeholders. Further, treatment costs charged by the downstream Orange County recycling plants for acceptance of Inland Empire Brine Line flows potentially could be reduced or possibly eliminated. With State interests in Salton Sea preservation and dust reduction, the brine flows from the watershed could become the life blood of lake level stabilization.

Preliminary feasibility engineering of this option has commenced by SAWPA and now by the U.S. Bureau of Reclamation. As new partnerships are developed with potential brine customers and possibly the State, the viability of this option as a truly system wide solution will become more readily apparent. This can have a tremendous positive impact on the Coachella Valley, which has many DACs. The Salton Sea is not far from some of the most challenging DACs in the Inland Empire.

Watershed Sustainability Guidance and Program Development

Watershed sustainability can be enhanced through the development and adoption of programs and practices that when collectively implemented, serve to enhance water resource management throughout the watershed. The desired outcome of this effort is to establish, where appropriate, common policies (if appropriate, ordinances or codes as well), and information for implementation throughout the watershed. The targeted audience for this sustainability guidance would be primarily governmental jurisdictions; however, consumers also would be targeted where appropriate. This guidance would focus on four areas related to the management of water: efficiency of use, energy needs, land use planning, and regional water management. Each of these guidance elements is described in the following sections.

Sustainable Water Rate Allocation

Some of the first sustainable water rate allocations for water were developed in the Santa Ana River Watershed. Where adopted, they provide nearly immediate water savings of at least 10% on an agency-wide scale. If such rates structures were implemented across the Watershed, saved water becomes available for other uses as well as the watershed's new residents, run-off and resulting costs associated with dry weather flow management are avoided, and costly infrastructure projects can be downsized or avoided.

Sustainable water rate allocations establish a specific target total allocation of water for both indoor and outdoor use. The allocation depends on the number of residents living in a home, the square footage of irrigated landscape, and other factors. The water budget is intended to provide adequate water for household and domestic use, but discourage waste. Water customers who are water efficient are billed at the lowest rates. If a customer, wastes water and exceeds their budget, they are charged progressively higher rates for the amount of water above their budget. Many customers find that when they stay within their budget, they pay lower water bills. Revenues collected from customers using water above their budge are then used to fund programs to reduce water waste and to pay for water to meet the additional demand. This water supply is often more costly, as more economical, local supplies are used first.

Designing a customized water budget for every customer within the service area of a water provider is a technical procedure and requires an extensive education program for customers to understand the new rate structure. A regional program where agencies share expertise and public outreach efforts would prove to be more cost-effective. In addition, tool box materials and checklists can be produced for Board members and the public. An act as simple as changing how customers are billed can result in enormous water savings. The challenge is providing decision makers and the public with the accurate information they need to understand the process.

Efficient Water Use Retrofits and Guidebook

The OWOW Plan discusses the role that increased water use efficiency (WUE) in the watershed can play with regards to supporting the goals of the OWOW vision. WUE pertains to all regular users of water – both the consumer and jurisdictions responsible for management of water on public lands. Conventional projects pertaining to WUE include the installation of weather-based irrigation controllers or high-efficiency nozzles and the removal of turf grass. These types of projects already are being successfully implemented by a number of water agencies within the Santa Ana River watershed, but on an agency by agency scale.

Water agencies are increasingly adopting water budget tiered rates. These agencies are finding that this approach is an effective means to get customers to be conscious of the amount of water being used; however, customers can become frustrated because they do not know specifically *how* to improve their WUE. To resolve this disconnect, it is recommended that OWOW develop a useful consumer outreach tool or Guidance that pertains to the entire watershed, and can be provided free of charge to every water account in the watershed.

The envisioned outreach tool is a well-designed, appealing, easy to understand, informative guidebook. The purpose of the guide is twofold:

- Provide information on how to use water more efficiently with simple easy to use tools; and
- Establish a water ethic that becomes the new norm, especially in the next generation.

Consumers need to know what they are getting for their money and understand the value of water. In addition, consumers need to understand what one drop of water goes through before it gets to their tap, and then where it goes once they have used it. Specifically, consumers need to know the effects of their

actions, being mindful of the creation of wastewater or non-point source pollution runoff and the effects of over-irrigating, etc. Preparation of this Guidance and its use as an outreach tool will assist in developing trust between the consumer and water suppliers, and result in consumers embracing WUE as the norm.

Most project ideas being proposed for OWOW are for various types of capital improvement projects that involve the moving and storing of water supply, or the improvement of water quality, etc. Water use efficiency (WUE) does not fit directly into these types of projects; it instead pertains to the consumer and their behavior. It involves the altering of consumer behavior and attitudes through increasing their knowledge and encouraging an ownership mindset regarding the quality and quantity of the watershed's resources.

However, there is a tremendous value in conventional retrofit projects undertaken on a watershed scale pertaining to WUE such as the installation of weather-based irrigation controllers or high-efficiency nozzles, and removal of turf grass that could provide immediate water benefits and a reduction of run-off. This concept is especially appealing as the greatest water savings regionally is now achieved through efficient outdoor water use. These types of projects are labor-intensive, but can drive unfamiliar novel technologies into general use. In order to make such a program effective and as an adjunct to water agencies adoption of water budget tiered rates, there needs to be a useful consumer tool that pertains to the entire watershed – an outreach tool that can be provided to every water account in the watershed. This now becomes a marketing and information project; unique as compared to what one would consider a conventional OWOW project.

The envisioned tool that is able to provide the information consumers need ideally would be an appealing, well-designed, easy to understand, informative guidebook. The goal of the guidebook will not only be to provide information on how to use water more efficiently, with simple easy to use tools, but also will establish a water ethic as it applies to both conservation and pollution prevention sensitivities. We need to provide information that will develop a trust between the consumer and water suppliers. Once these items are provided, then the consumer will have the resources he or she needs to embrace specific ways to become efficient with their water usage.

Water Industry Energy Use Reduction Incentive Program

High energy costs and compliance with regulations aimed at decreasing the output of greenhouse gases are driving water agencies and other water managers to look at the link between water and energy. The California Global Warning Solutions Act (AB 32) mandates a reduction of greenhouse gas emissions to 1990 levels statewide. It is likely in the OWOW planning horizon that energy costs will continue to increase and push agencies to move further than AB32 mandates.

The major energy costs for water agencies are linked to water wheeling costs and treatment. Initially, reducing the need to move water over long distances and improving water quality entering the potable system is the most efficient way to reduce energy demands by water agencies and to reduce the associated carbon footprint. Locally generated supplies have reduced wheeling costs, and even in cases where additional treatment is required, still often result in a net decrease in carbon production. Increasing the diversity of any agency's water portfolio to include as much local supply as feasible will substantially decrease that agency's carbon footprint.

Newer innovative means of providing power to water projects involving solar, biogas, or wind power can greatly reduce carbon production, but the initial capital cost is often high and the break-even point on the investment is often years in the future. In addition, novel new technologies often require "custom" installation and additional engineering on the front end of the project. However, over the long term, lower O & M costs are expected and these projects will have sustainable energy costs, and therefore, will not be subject to the rising cost and availability of energy resources.

The initial high capital costs of converting to greener sources of energy can be offset by a watershed-wide regional initiative for several reasons. First, as many of the newer energy technologies are built-in, as needed, and in just in time facilities, there may be price advantages to larger group purchases. Similar agencies can work together to scope retrofit projects and capture the advantage of a volume order. Secondly, as there is often specialized design and engineering work needed for these projects, groups of agencies with similar needs can contract for engineering services without the need to "reinvent to wheel " for each application. Finally, installation and start up of these projects can be managed through cooperative master contracts between agencies, as can the contracts for specialized services needed to operate the projects.

This approach can bring these greener energy projects on line sooner, reduce capital costs and reduce green house gas emissions. In order to provide direct incentives for such programs, regional purchase or installation programs could be established using funding sources related to energy use by water resources.

Regional Land Use Planning Guidebook and Model Ordinances

The OWOW Plan describes land use patterns and practices in the Santa Ana River Watershed and identifies "lessons learned" regarding how land use decisions have impacted water resources. This chapter also describes strategies that can improve land use planning and, therefore, positively impact long-term water resource management in the watershed. For example, the discussion includes a summary of the nine water principles established by the *Ahwahnee Water Principles for Resource Efficient Land Use* (2005)1. These principles may be categorized into four key areas: (a) compact community design; (b) natural infrastructure; (c) sustainable site design; and (d) efficient water use. In particular, the first three categories are inextricably tied to regional land use planning. The OWOW Plan also describes the benefits associated with implementation of low impact development (LID) practices throughout the watershed, which provides support for the implementation of these water principles:

> "The potential of LID goes well beyond reducing the volume of polluted stormwater runoff. Stormwater runoff also can be understood as a lost resource…where increasing demand for fresh water requires costly importation of water supplies to sustain ever-growing communities. The goal of LID is to mimic a site's pre-development hydrology…by using design techniques that infiltrate, filter, store, evaporate, capture, and reuse runoff close to the source of rainfall. Through LID practices, both stormwater runoff rates and volume impacts can be managed more successfully than with conventional management practices. LID also benefits water quality…Because stormwater runoff…is a major source of pollutant transport…reducing runoff rate and volume reduces pollutant transport."

Efforts to incorporate LID practices into development activities are ongoing in the watershed through the implementation of Municipal Separate Storm Sewer System (MS4) permits issued to Orange, Riverside and San Bernardino Counties. Organizations, such as the Southern California Stormwater Monitoring Coalition and California Stormwater Quality Association, are working collaboratively to provide guidance on how to incorporate LID practices into development projects.

The establishment of water principles, such as those described above, has provided a good beginning for discussions of water resource sustainability in the watershed. In addition, the implementation of LID practices included as part of development activities is moving forward as required by MS4 permit requirements. However, to fully implement these water principles and LID practices requires additional action. Accordingly, the purpose of this OWOW project is two-fold:

[1] 2005 report developed by the Local Government Commission with support of the State Water Resources Control Board, local elected officials, and state water leaders.

1. Develop a Guidance document that translates these water principles into information that can be incorporated into General Plans to guide regional planning decisions and into zoning codes to put the principles into practice; and

2. Implement a jurisdictional outreach effort to include relevant regional, county and city planning agencies in the development of the Guidance document and develop model ordinances for adoption of the Guidance ideology into General Plans and zoning codes at the local level.

This effort would be closely coordinated with each MS4 principle permittee (and associated co-permittees) in the Santa Ana River Watershed since these permits include requirements to review and, where appropriate, implement actions to incorporate watershed protection principles into the management of stormwater. This requirement includes consideration of changes to existing General Plans and zoning codes.

Regional Urban Runoff Management Fund

Each of the MS4 permits issued in the Santa Ana River Watershed emphasize the use of Low Impact Development (LID) principles (infiltration, evapotranspiration and harvest and use) within new development and significant redevelopment projects but also contain provisions for regional management of stormwater using similar practices, , e.g.:

> The goal of the WQMP is to develop and implement practicable programs and policies to minimize the effects of urbanization on site hydrology, urban runoff flow rates, velocities, duration and time of concentration and pollutant loads. This goal may be achieved through watershed-based structural treatment controls, in combination with site-specific BMPs. All treatment control BMPs should be located as close as possible to the pollutant sources, should not be located within Waters of the U.S., and pollutant removal should be accomplished prior to discharge to waters of the US (emphasis added, San Bernardino County MS4 Permit, excerpted from Section XI.G.3).

Challenges exist with the implementation of regional treatment projects, especially with regard to the stipulation that regional BMPs should be located as close as possible to the pollutant sources. The MS4 permits also allows for the development of an Urban Runoff Fund or mitigation program as alternative approaches to compliance with LID requirements and to support implementation of regional treatment projects. Specifically, the MS4 permits require that specific LID-based criteria be met in the project design. Where these criteria cannot be met, the local Permittee may grant a waiver from some or all LID-based requirements and require participation in an alternative compliance program, e.g., participation in an Urban Runoff Fund or mitigation program. The amount of the contribution or level of participation will depend on the degree to which the project was unable to comply with LID-based criteria. Funds collected are to be used for water quality improvement or other related projects, including, but not limited to:

- Green street projects
- Retrofit of existing development projects
- Retrofit incentive programs
- Regional/sub-regional best management practices
- Stream restoration
- Projects that promote groundwater recharge to increase water supplies
- Other related mitigation projects

Although the Orange, Riverside, and San Bernardino County MS4 permits and stormwater programs provide the opportunity to develop regional treatment projects, which can be supported through contributions to an Urban Runoff Fund (e.g., as part of the requirements associated with new development or re-development activities), no such fund or program designed to accept such funds with the purpose of implementing regional projects has yet been established. In addition, the viability of such projects may be reduced by the requirement to develop regional projects close to the pollutant source rather than allow consideration of locations where water management projects can provide the highest regional benefits.

Establishment of a regional approach to stormwater management that supports the intent of the MS4 permit while providing multiple benefits to water resource management across the watershed has significant value. In addition, creation of a program for the establishment and implementation of an Urban Runoff Fund as an alternative compliance program to site-specific LID implementation supports the opportunity to develop regional stormwater management projects consistent with the OWOW vision. While the MS4 permits allow each county to establish its own Urban Runoff Fund program, significant potential exists for a more holistic approach to water resource management across the watershed if consideration is given to the establishment of a single Urban Runoff Fund that could be managed for the entire watershed. In addition, a watershed-based fund would reduce implementation costs by creating a central authority for collection of fees and disbursement of funds to projects that support water resource sustainability across the watershed.

The purpose of this proposed OWOW project is to establish a watershed-based Urban Runoff Fund to support implementation of the County-administered stormwater management programs. Project activities and outcomes would include:

- Establishing the regulatory basis for a watershed-based program. Existing permit requirements create potential barriers to the use of funds for water resource improvement projects far removed from the development activity. The project would seek to resolve these barriers with regulatory authorities.
- Establishing the legal basis and authority for the establishment and management of a watershed-based Urban Runoff Fund.
- Establishing agreements with as many jurisdictions as possible for participation in a watershed-based program.
- Establishing programmatic elements, including the types of water resource improvement projects that may be funded, criteria for project selection, application requirements, etc.
- If successful, the Urban Runoff fund concept may be expanded to other land uses such as agriculture and open space as quantification of the runoff as a water supply benefit becomes more readily apparent.

Regional Habitat Conservation Gap Planning

Nearly every project proposed to develop local water resources occurs in a wetland or riparian area. In southern California, projects in these areas require consultation on issues related to habitat, and both state and federally-listed endangered species. Development of regional habitat conservation plans allows participants to implement land use decisions consistent with a plan without project-by-project review and case-by-case permitting by the resource agencies. A local, streamlined approach to planning for Endangered/sensitive Species will result in greater economic development certainty and provide for and maintain biological diversity by creating a network of interconnected Conservation Areas In addition to the preservation of species and associated habitats, the Conservation Areas will provide open space and recreational opportunities, which will enhance the quality of life.

The Santa Ana Watershed is partially covered by Habitat Conservation Plans, namely, the Western Riverside County Multispecies Habitat Conservation Plan, Upper Santa Ana River Wash Land Management and Habitat Conservation Plan (HCP), Orange County Central-Coastal Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP), and the San Diego Creek Watershed Special Area Management Plan (SAMP). Watershed proponents can tier-off of habitat planning and guidance provided by HCPs and SAMPs to streamline ESA and listed species requirements, where appropriate.

Projects that affect wetland vegetation communities are required to comply with the applicable regulatory standards related to wetlands functions and values. Many wetland communities (e.g., vernal pools, freshwater marsh, riparian forests, riparian woodlands, riparian scrub, open water, disturbed wetlands, flood channels, river and stream beds) within the Plan Area include areas subject to California Fish and Game Code (CFG Code) Section 1600 et seq. and the federal Clean Water Act (Sections 401, 402 and 404). Such areas will continue to be regulated by state and federal agencies. The U.S. Army Corps of Engineers (ACOE) continues to consult with the USFWS pursuant to Section 7 of the FESA on projects that may affect federally listed species within ACOE jurisdictional wetlands and waters. The CDFG continues to work closely with the Corps, USFWS, and local jurisdictions to ensure that the CFG Code Section 1600 et seq. agreements are consistent with the mitigation required for Covered Species. In addition, other existing regulations related to wetland Habitats, such as the Porter-Cologne Act continue to apply.

Watershed project proponents, in areas without existing plans, can coordinate with permitting agencies early in the development of watershed-related concepts to identify ways to develop coordinated HCPs, SAMPs, and related programmatic permitting approaches to ESA hurdles. Recovery planning for listed species is a priority for resource agencies. Finding linkages between recovery plans and watershed plans can lead to stronger relationships with permitting agencies. Riparian corridors and alluvial fan areas within the watershed can be enhanced to improve habitat for native species—targeting wildlife and plant communities that can be enhanced as part of watershed projects along with flood, water supply, water quality, recreation, and other benefits.

USFWS and DFG, among other resource agencies, continue to work with stakeholders and project proponents to implement habitat plan recommendations and species recovery actions. Joint projects between resource agencies and other entities to address multiple needs that are not covered by existing habitat conservation plan can be developed within the watershed to provide the maximum benefit. In sum, water resource managers gain certainty and control mitigation costs while protecting valuable resources. Functioning riparian corridors in turn, enhance downstream water quality.

Section 3 – Implementing the Vision – Overcoming Traditional Barriers

Water resource management in the Santa Ana River Watershed occurs through an intricate, multi-level array of jurisdictional authorities, each with its own responsibilities at the local, county, or regional level. This complexity has created significant challenges or barriers to successfully achieve, sustainable water resource management. This complexity is not unique to the Santa Ana River Watershed as all urban watersheds function within a complex framework of jurisdictional authority. Through the OWOW process has come the acknowledgement that this complexity exists and that through a system-wide management approach, it is possible to overcome such barriers so that this watershed can take ownership of and move forward with implementing solutions that fulfill the a new vision for the region. The OWOW process based on collaborative removal of watershed impairments can reduce the impact of, and in many cases, remove these barriers.

Barriers to water resource management can be described in various ways. For the purposes of this paper we have identified six key categorical barriers that can be overcome to fully achieve the OWOW vision: Spatial,

Temporal, Regulatory, Economic, Political, and Physical. Although each barrier is discussed separately below, relationships and interconnections exist among these categories.

- ***Spatial Barriers*** –Under traditional schemes, water resources management occurs at varying scales or dimensions in the watershed. Spatially, the watershed is represented by a mosaic of cities and counties that each have their own missions and visions, e.g., General Plans adopted at the County, City or Community level, delineate how their jurisdictions will develop and be managed. This two-dimensional mosaic of jurisdictional authorities creates its own barriers to implementation of watershed-based approaches to water resources management. To complicate matters, a third dimension overlies the city and county framework. This third dimension consists of the regional agencies, e.g., water and wastewater utilities or Councils of Governments that have regional planning responsibilities.

This complex three-dimensional world of planning, which includes water resource management, can create barriers to the development of watershed-based solutions. However, while each jurisdictional authority has its own legal and fiduciary responsibilities to meet, these authorities do have common water resource needs and often have ultimate management goals that are consistent with the OWOW vision. Consequently, jurisdictional barriers will be overcome when the benefits of implementing watershed-based solutions are clear to local and regional authorities. When the OWOW case is made, then a collaborative approach that creates synergy across jurisdictions will be the optimal approach to achieving these common goals.

- ***Temporal Barriers*** – Governmental planning efforts typically identify both short-term and long-term goals; however, because of increasing demands on public financial resources the short-term needs receive primary focus and needed investments to achieve long-term goals are either deferred or never implemented. This reality creates temporal barriers to the conceptualization, design and implementation of projects that are designed to resolve long-term water resource management issues. This barrier can be made worse by some decision makers who focus on the now rather than the future – an outcome driven by the constant treadmill of elections and constituents or ratepayers expecting immediate fixes to current problems, rather than accepting a careful, long-term view and investment strategy that creates outcomes that benefit future generations.

Overcoming temporal barriers requires that local and regional jurisdictions build a decadal framework into their planning approach; and that this framework be coupled with a collaborative approach to water resource management. For example, if common collaborative goals can be established and supported by multiple jurisdictions, then it will be easier to overcome temporal barriers because of the establishment of long-term commitments. OWOW provides that long term view needed to guide short-term solutions providing long term benefits.

- ***Regulatory Barriers*** – Watershed development and management occurs within the confines of a hierarchical set of federal, state, regional, and local requirements. Regulatory barriers that are organizational in nature occur within this hierarchy. For example, from top to bottom, the specificity and potential for conflict increases, where at the lowest level city ordinances are likely to vary from one jurisdiction to another. Similarly, at the regional or county level, differences in land development, flood control, and regional planning occur. Even at the state level, regulatory barriers can occur because agencies such as the Santa Ana Regional Water Quality Control Board, while having some autonomy regarding how to implement state requirements within its jurisdiction, it must still receive approval by the State Water Resources Control Board.

In addition to the hierarchical or organizational regulatory barriers that develop, programmatic regulatory barriers also exist – and these barriers can be more significant. Water resources management is subject to a myriad of regulatory programs or requirements that may have conflicting purposes behind them. The list is long and includes federal (e.g., Clean Water Act [CWA], Safe Drinking Water Act, National Environmental

Policy Act [NEPA] and Endangered Species Act [ESA]), state (e.g., Porter-Cologne Act and all its associated state level policies) and California Environmental Quality Act [CEQA], California Endangered Species Act (CESA)) laws and regulations, regional or county planning requirements, and city zoning ordinances. With regard to water resource management, superimposed on all the regulatory requirements and these additional regulatory requirements, are the numerous water rights agreements.

OWOW recognizes that regulatory barriers exist and that its goal is not to facilitate wholesale regulatory change. However, OWOW also recognizes that too often important projects can become stalled or, unfortunately, dropped from consideration simply because of "regulatory baggage"; that is a concern that potential regulatory barriers may be too high to overcome and a project is deemed too risky to attempt. Instead, OWOW is taking the approach that regulatory barriers should not be discussed, much less resolved, without first identifying regulatory issues followed by plans to develop compliance strategies that allow projects to move forward. That follows that the best way to overcome the regulatory barriers is to first identify watershed-based concepts that are deemed necessary to achieve the OWOW vision. With these projects defined, it then becomes appropriate to identify the specific regulatory challenges that exist and work with the necessary parties to resolve them. With regards to DACs, it is important that regulators be sensitive to economic constraints and work with DACs to ensure that compliance is attained with minimal adverse impact.

- ***Economic Barriers*** – These are challenging times financially, at all jurisdictional levels. If the economic prognosticators are correct, significant positive improvement in the economic outlook may be years in the future. This reality illustrates well the need to increase jurisdictional coordination and collaboration to solve regional problems. Such collaboration may occur in various forms; from simply pooling financial resources to implementing watershed-based projects that provide regional benefits, to collaborating on the development and implementation of policies that result in savings (e.g., increased conservation to reduce water use, or the establishment of common general planning principles that can reduce energy and water use over the long-term). Increased collaboration also may enhance grant-funding opportunities for state and federal grant funds through a coordinated approach with legislators and funding agencies. More and more, grant fund programs are directing grant awards to projects that involve multiple jurisdictions and yield multiple benefits. As a consequence, one of the keys to overcoming this barrier is jurisdictional collaboration, which provides synergy for obtaining the funding to implement the best ideas. It is important to brief decision makers as to the importance of DAC communities. Too often the DACs are not recognized by decision makers who serve them.

- ***Political Barriers*** – Elected officials who agree to serve as champions for watershed improvement projects, like those suggested in the watershed concepts section of this White Paper, are greatly needed. Similar to the examples of watershed successes in the "Bright Spots" section of this White Paper, significant strides toward a sustainable and drought-proofed watershed were completed with the direction and support of our elected officials. Their effective leadership yielded significant returns on investment by multiple agency agreements and ongoing management and maintenance of the programs and projects.

- ***Physical Barriers*** - Physical barriers including erosion and sedimentation along the Santa Ana River need to be addressed on a watershed wide scale. The dynamics of the watershed sediment system and the impacts on man-made structures must first be thoroughly understood. Next strategies within the context of the current system of water management must be developed to ensure that a more natural hydrologic functionality exists in the system. For example, the Orange County Water District's sediment management pilot project will help address these issues and develop methods for broader sediment management.

Section 4 - From Concept to Reality – Recommended Next Steps for OWOW

Implementation of the Watershed-based Concepts contained herein requires a collaborative multi-jurisdictional effort to be successful. As noted above, two types of efforts are envisioned: (1) implementation of Water Resources Infrastructural Conceptual Projects; and (2) Watershed Sustainability Guidance and Programs. Implementation of infrastructural conceptual projects have both institutional (regulatory, jurisdictional, economic) and technical (planning, design and construction) elements. The biggest challenge to successful implementation is not the technical issues; it is the institutional issues that will be associated with any project. We have the technical skills to build the infrastructure; however, developing the institutional support across the watershed, which is required to actually build the infrastructure, requires substantial work. Developments of Watershed-based Guidance and Programs have similar challenges. From a technical standpoint, we have numerous experts throughout the watershed that have the skills and knowledge to develop the technical elements of the guidance concepts described above. The challenge is making the guidance more than a book on a shelf. On the ground, implementation of the guidance will require a significant focus on the institutional issues.
With these distinctions (technical vs. institutional) in mind, we offer the following recommendations for moving forward:

- Establish metrics for evaluating and prioritizing the infrastructural and watershed sustainability guidance projects and programs. Initially, prioritize focus on only the top infrastructure project and the top watershed guidance concept. Build a successful process with these before attempting to take on all projects simultaneously. The lessons learned from the first and second efforts will provide significant value for subsequent efforts.

- Identify a champion(s) for each concept, one who has the resources to commit to the effort.

- Form teams that are responsible for the various project elements, but led by the project champion(s). Recommended teams and examples of their potential responsibilities could include:

- Financial – This team develops either the means to finance a project or develops economically sound programs to support watershed management activities, e.g., establishment and operation of an Urban Mitigation Fund to support regional stormwater treatment.

- Marketing – Outreach is a key to success of any watershed project. The marketing team would be responsible for developing stakeholder support, preparing outreach materials, and coordinating outreach activities, including arranging for experts from the other teams to attend outreach events to share their knowledge

- Technical – The technical team includes the skill sets needed to design the project or develop the technical aspects of a guidance document. For infrastructure projects, the team would begin with a 10% planning level design, which then would be used by the other teams to initiate their efforts. Once agreement is reached on the planning level concept, the various financial, regulatory, legal and marketing needs can be defined, and the other teams can go to work while the technical team moves forward with design. Similarly, for guidance development, the technical team would first develop the technical framework, methods, or ideas that will comprise the guidance. With that understanding developed, the other teams would go to work to lay the groundwork, where needed, to increase the likelihood of implementation across the watershed.

- Empower the teams to work autonomously with oversight by the champion. The project champion(s) would ensure the work of the various teams is shared as needed.

- Decision makers need to be at the table leading the teams. The staff of the decision makers can certainly do the heavy lifting, but decision makers are needed to drive the process forward, especially when the inevitable speed bumps arise. A commitment to work to the 30% design level will develop project and program concepts that can engage and encourage the input from other potential partners and encourage project development beyond the single purpose project.

- Investing in 30% level design (preliminary design) is helpful to the permitting process as the 10-15% design concepts sometimes leave many unanswered questions for regulators resulting in lower commitment to the project initially due to uncertainty.

- Provide support to champion(s) and their teams by SAWPA, as an integrated regional water management leader, to support the early preliminary design of their projects and/or early stages of the project to improve eligibility for future IRWM grant funding rounds. DACs should have a place at this table.

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[i] Within the context of this document, the words, "sustainable" and "drought-proofed" are defined as able to be maintained; exploiting natural resources without destroying the ecological balance of an area; capable of being continued with minimal long-term effect on the environment; requiring no imported water during drought years (Santa Ana River OWOW, 2011).