Imported vs. Local Water Supplies: the planning decisions facing Southern California Water Agencies

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Executive Summary and Conclusions

The 2010 Urban Water Management Plans (UWMP) of the eleven largest Metropolitan Water District of Southern California (MWD) member agencies were analyzed, with a focus on imported supply reliance and development of local supply options. The costs of local supply projects were collected from various agencies. If available the unit cost ($/AF) is compared to the current price of imported water as an exercise to see if cost is playing a significant role in the agencies' choice to reduce their reliance on imported water from the Bay-Delta and Colorado River (Figure 3). From this analysis the following conclusions were made:

- All 11 of the MWD Member Agencies plan to diversify their supply portfolio by developing additional local supplies. For example, each agencies' UWMP called for an increase in recycled water supply between now and 2035.
- Almost all of the agencies plan to reduce the percent of their total supply that is imported from MWD by 2035.
- Several agencies plan to reduce the total amount of water that is purchased from MWD between now and 2035; they are LADWP, West Basin, and Long Beach. SDCWA plans to reduce their absolute amount between now and 2020 (Table 1).
- The local supply alternatives that agencies are developing include: conservation/efficiency, water recycling, groundwater treatment, advanced urban runoff management, stormwater management, water transfers and desalination.
- The planning decisions shown in the UWMP are a necessary step towards reducing reliance on imported water; but it is the implementation of these plans that matters. LADWP has the most progressive and diverse plan, but there are challenges in implementation that need to be overcome by the agency in order to have the desired effect.
- The current cost per AF for treated Tier 1 MWD water has a base cost of $769 plus the associated fixed costs; the Readiness-to-Serve Charge and the Capacity Charge. For example, LADWP is paying $912/AF for their 2010-2011 supply after incorporating the fixed costs they are responsible for.
- Unit costs for agencies current and planned local supplies were not readily available. Some agencies had done extensive analysis on the costs of their supply tools, others were only able to quantify capital or investment costs, and some lacked the ability to share cost analysis completely. UWMPs could be enhanced by requiring this information.
- The cost of local supplies varies substantially depending on the tool. There are few tools beyond efficiency and conservation programs that fall below the current cost of MWD water, but many alternatives that cost between $1000-$2000/AF.
- The decision to develop local supplies is not solely based on costs. The projects being developed by Southern California agencies are justified by considering the projected rate increase of MWD water and the increased reliability of the local supplies. The local supplies in this report do not overwhelmingly show cheaper options, but their costs are approaching that of MWD water now and in the future. Therefore, investing in alternative supplies can provide cost stability for water agencies, in comparison with the more uncertain costs of imported supplies.

Purpose

The last few years have been especially tumultuous in terms of water supply reliability in California. There was a state-wide drought that combined with environmental protections for the Bay-Delta system, which impacted exports in order to help a crashing system. The Colorado River also endured a record-setting decade long drought, while experiencing increased demands from other water users on the system. And finally, climate scientists suggest that reduced flows in the Bay-Delta watershed are likely, and are nearly certain in the Colorado River watershed. This report serves to summarize information about the efforts of Southern California water agencies to adapt to these events by diversifying their water supplies and reducing their reliance on imported water. The report also summarizes the cost of various water supply alternatives in California, both local and imported. With a focus on Southern California urban water agencies, the goal of this report is to give an overview of the some of the decisions facing Urban Water agencies, and how cost plays a role in determining their future water portfolios.

Southern California Urban Water Management Plans (UWMP)

Every five years urban water agencies are required to develop Urban Water Management Plans (UWMP), and lay out their supply and demand projections for the future. Southern California agencies rely heavily on imported water from the San Francisco Bay-Delta, the Colorado River and the Owens Valley (Los Angeles Aqueduct). These imported supplies have historically represented the majority of many of the supply plans in this region. In recent years imported supplies have become increasingly more expensive and less reliable, due to several factors, including climate and hydrology, additional environmental protections and increased demand from other water users (e.g. on the Colorado River).

The first step of this analysis included investigating whether the decrease in reliability of imported water translates to a change in planning behavior for Southern California Water agencies. The 2010 UWMPs of MWD's eleven largest member agencies were analyzed for their planning strategies. These eleven agencies purchased approximately 90% of MWD's total sales in FY 2009-2010[1], so the planning decisions they make will have significant impacts.

The imported supply from MWD in 2010 is compared to the planned imported supply for 2035 (the farthest date of the planning period in the UWMP). The projected supply was pulled from the Supply Reliability Tables for an average year in the finalized UWMP. Some numbers were adjusted in order to make the methodology more consistent and the numbers more comparable. For example, Eastern Municipal Water District's (EMWD) projected 2035 purchases from MWD did not incorporate the planned local supplies. Most other agencies did. In order to make these numbers comparable, the projected planned local supplies were calculated as a reduction in what would otherwise have been MWD purchases. This adjustment reflected language in the UWMP that any planned supplies would "supplement imported supplies and improve reliability for EMWD and the region[2]". Additionally, some agencies planned for substantial surpluses. If appropriate the surplus was used as a reduction in imported supplies. This adjustment was made because it was made clear that local supply water would be developed as a "first" priority and any surplus would result in decreased imported water purchases[3]. The percentage of the agencies supply portfolio that was imported from MWD is than compared between the current and future periods (Table 1). Another interesting difference between UWMP is that only a handful of agencies calculate conservation as a supply source. For the purposes of this report, if conservation was included as a

[1] MWD Water Report 2010
[2] Eastern 2010 UWMP, pg 32
[3] Personal communication with Karly Gaynor, Western MWD

supply in the agencies UWMP than it was calculated in Table 1; otherwise it was not considered. Some agencies percent reliance on MWD would change if conservation was included. See Appendix 1 for a more details on each agency's planning projections.

The change in reliance on MWD water varied, but the majority (seven) of agencies decreased their reliance; while two increased their reliance, and two showed little to no change (1%). The agencies that plan to reduce the percentage of their supply that is MWD imported water by more than 1% are Calleguas, Inland Empire, LADWP, Long Beach, SDCWA, West Basin, and Western. In addition LADWP, West Basin, and Long Beach are decreasing their absolute value of imported water, despite possible increases in population and demand. Between these three agencies there is a total reduction in MWD purchases of 141,380 AF purchased in 2035. Interestingly SDCWA shows an absolute reduction in imports between now and 2020, and then they are projected to increase again. Beyond 2021, SDCWA is evaluating how to further reduce demands on MWD through projects that were not included as part of the supply, but once verified will be included in their resource mix[4].

It is important to note that 2010 was a dry year in which MWD was in a shortage allocation and member agencies were forced to lower their purchases of imported water. If another year was used as a comparison, there may have been a different trend in reliance but 2010 was chosen to get the most recent picture of agencies activities.

	Current (2010) MWD Import		**Projected (2035) MWD Import**			
Agency Name	**AF**	**% of Total Supply**	**AF**	**% of Total Supply**	**Change in AF imported**	**Change in % MWD**
Calleguas MWD (F)	100,769	73%	128,105	63%	27,336	-9%
Central Basin MWD (D)	72,360	24%	72,360	25%	0	1%
Eastern MWD (F)	91,600	59%	187,100[5]	62%	95,500	3%
Inland Empire (IEUA) (F)	54,934	25%	85,978[6]	22%	31,044	-3%
LADWP (F)	263,875	48%	168,027	24%	**-95,848**	-24%
Long Beach (F)	22,237	35%	11,929	17%	**-10,308**	-18%
MWDOC (F)	220,132	45%	250,519	44%	30,387	-1%
SDCWA (F)	286,000	53%	323,838	41%	37,838	-12%
Three Valleys (F)	69,748	55%	91,197	59%	21,449	5%
West Basin (F)	104,985	67%	69,761	40%	**-35,224**	-27%
Western MWD (F)	131,228	86%	132,829[7]	76%	1,601	-10%
Total MWD Imported	1,417,868		1,521,643		103,775	

Table 1: Current and future planned MWD imports for top eleven member agencies. Quantity expressed both in terms of total AF and percentage of imported water in total supply portfolio. (F) Indicates a Final UWMP, (D) indicates a Draft. All 2035 numbers are values indicated in the Supply Reliability Analysis for an Average Year. 2010 values are actual values.

[4] Personal communication with Dana Friehauf, SDCWA
[5] This value incorporates planned supplies for 2035, 39100 AF, therefore reducing demand for imported water by that amount.
[6] IEUA has projected surpluses for 2035 of over 84 TAF. According to personal communication with Ryan Shaw, this surplus doesn't necessarily reflect further reduction in MWD imports.
[7] This value is the amount of MWD water available minus the projected surplus, the UWMP states that any surplus will result in a reduction of demand for MWD water. Personal communication with Karly Gaynor, Western MWD

The total amount of MWD water being imported to the region by these eleven agencies is planned to increase by about 7% between now and 2035. Alternatively, the proportion on MWD sales these eleven agencies represent will decrease between now and 2035 (Figure 1). According to MWD's 2010 RUWMP, they are projecting a total regional demand for their water of 1,826,000 AF in 2035[8]. The individually calculated projected demands of the largest MWD agencies represents only 83% of MWD's projected sales, as opposed to the 90% they represented in the FY 09-10. The other agencies would either need to substantially increase their reliance on MWD or the projected demand MWD is making over-calculates the regions dependence. This report did not analyze the City of Santa Monica's UWMP; however, that MWD member agency has adopted a policy of eliminating its purchases of imported water entirely – and becoming entirely reliant on local supplies by 2020.[9]

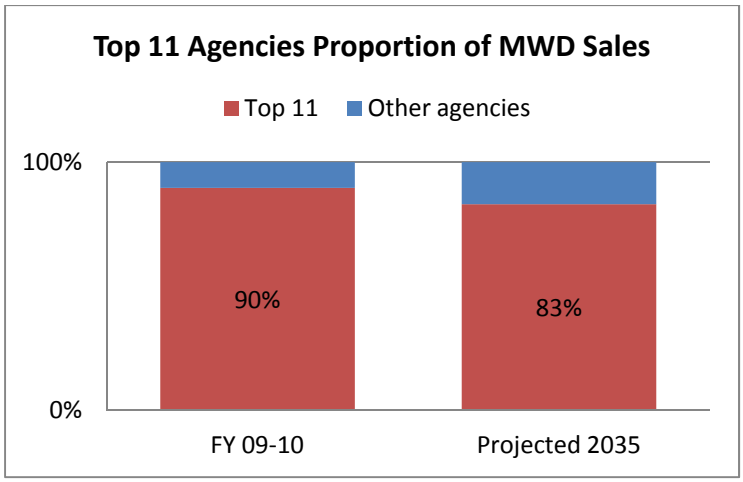

Figure 1: Proportion of MWD sales the 11 largest agencies represent, in FY 09-10 and projected in 2035.

So why are agencies making this decision? In the texts of the UWMPs it is a mainly expressed as a strategy to increase reliability. The following quotes are from 2010 UWMP of various agencies. (For more UWMP quotes see Appendix 2)

> *"Historically, West Basin's primary supply source was imported water from MWD. However, given recent concerns over future reliability of these imported supplies, West Basin has been increasing its development of local supplies. (West Basin UWMP 1-13)"*

> *"Imported surface supplies are highly variable due to climate and hydrology, and they are also subject to environmental restrictions. To diversify its water supply portfolio, LADWP has made and will continue to make significant investments in groundwater, recycled water, stormwater capture and water conservation. These local water supplies tend to be more reliable than imported water because they have less variability due to climate, weather, and environmental restrictions. And by investing in these local supplies, the City's urban environment is protected and enhanced." (LADWP UWMP pg.221)*

> *"Similar to creating a balanced investment portfolio in order to reduce risk, Central Basin plans to further diversify its water resource mix during the next 25 years with the expansion of the recycled water system, increased conservation efforts along with groundwater storage opportunities, Central Basin's dependence on*

[8] MWDSC RUWMP, Table 2-8
[9] http://switchboard.nrdc.org/blogs/bnelson/building_rivers_-_santa_monica.html .

imported sources will continue to decrease with the expansion of these alternative resources." (Central Basin UWMP pg 3-1)

As discussed above, recent events have raised questions about the long-term reliability of Southern California imported supplies. In an attempt to see how recent events affect Urban Water planning, the 2005 UWMP of MWD's two largest customers, SDCWA and LADWP, were examined to see if there has been a change in their planning strategies. For LADWP, their 2005 plan has not changed significantly in terms of projected purchases of MWD water; they were planning reducing reliance in 2005 as well. What did change were the tools to accomplish this, desalination was part of their 2005 plan and was not included in 2010. Additionally, they significantly increased groundwater recharge plans. On the other hand SDCWA's 2010 plan added the Poseidon Desalination Project to their supplies, as opposed to their 2005 plan which included desalination as a Member Agency tool and had smaller potential yields. In addition SDCWA has smaller projected demands in their 2010 UWMP for the future as a result of increased conservation.

Leaders in Reducing Reliance on Imported Supplies

A reduction in reliance on MWD was not an across the board planning trend for the member agencies, some are leaders in this regard while others lag behind.

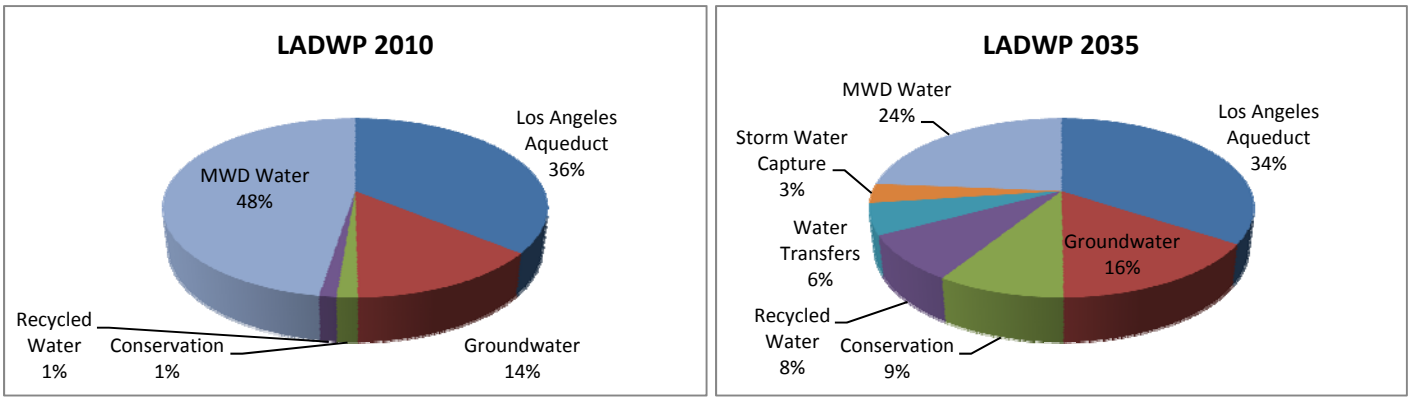

Figure 2: LADWP's supply portfolio, in 2010 and planned for 2035 from UWMP

The most obvious leader is LADWP, with not only a large overall decrease in percentage supply decrease (28%), but a large decrease in total AF of water imported from MWD in 2035. It is important to note that Los Angeles has its own imported water supply that comes from the Eastern Sierras through the Los Angeles Aqueduct, unlike some other agencies who rely entirely on MWD for water that isn't developed locally. But it is LADWP's commitment to a very diverse portfolio of water supplies, that makes it a leader and able to significantly reduce its reliance on MWD water from the Bay-Delta and Colorado River. Between now and 2035 LADWP has plans to increase local groundwater, recycled water, stormwater capture, and conservation efforts (Figure 2). While LADWP has the most progressive UWMP in terms of diversification of supply and reduction of reliance on MWD water, the importance lies in the plans implementation. There are obstacles associated with making these plans a reality that have already began to show themselves, including large capital investments and necessary rate increases.

An additional factor that was not extensively analyzed in this report is the difference in reliance on MWD in dry years. The UWMP for LADWP shows that in a single dry year their reliance on MWD increases to 54% (an increase in 30%) in

2035[10]. On the other hand, SDCWA has 41% reliance on MWD in an average year, and 48% reliance in a dry year for 2035. The ability for agencies to maintain their planned independence across different hydraulic conditions shows additional strength in planning.

Costs of Various Supplies

As imported supplies become increasingly less reliable, it is expected that Southern California water agencies will increasingly invest in alternative supply sources. But reliability isn't the entire story; supply planning decisions are business decisions, so the cost of these locally developed supplies plays a large role in whether or not an alternative is pursued. As in any business decision, a comprehensive analysis of the supply would go beyond unit cost and could include whether it increases reliability, potential avoided costs, availability of external funding, or offsetting revenue. The next step is to look at individual agencies plans for the future, and summarize what supply tools they plan on using to replace MWD water and where available the costs of those tools.

Imported MWD Water

As a starting point for comparison the current base cost of MWD water is $769/AF for Tier 1 treated and $543.5/AF for Tier 1 untreated. In addition to costs per acre foot, member agencies also pay fixed charges to MWD, a Readiness to serve Charge (total of $125 million in 2011) and a Capacity Charge ($7200/cfs in 2011)[11]. For example, in 2011 LADWP faced an average cost of $912/AF when fixed charges were included. An increase in these fixed charges from MWD can also be expected, since 2003 the Readiness to Serve Charge has increased from a total of $80 million to $125 million[12]. The fixed costs faced by the agencies reducing reliance will decrease as the agencies increasing reliance will face larger fixed costs, further increasing the cost of imported water for those agencies.

	2015	2025	2035
Rate per AF	$853-$953	$1,233-$1,601	$1,484-$2,021

Table 2: Cost of MWD imported water. Projected water rates from MWD IRP based on different supply development scenarios.

The issue of future rate increases was addressed in MWD's 2010 IRP. MWD's projected rate increases will vary depending on future actions of MWD. For example, the rate increases that correspond to MWD focusing on "core resources": a delta fix, continued funding of local resource and conservation efforts and anticipated reduction in sales to conservation compliance are on the lower end of the cost range. MWD's plan to create an "Uncertainty Buffer" through several possible strategies of efficiency, incentives for member agencies, and MWD developed supplies creates the high end of the rate range (Table 3)[13].

The above rate increases make large assumptions about the estimated cost and impacts of a Delta Fix. MWD assumes a cost of $2.3 Billion, which includes MWD's share of habitat conservation and conveyance program costs. It also assumes an increase in supply because of the Delta improvements. If one of these assumptions is incorrect there could be an even greater rate increase. In addition to the costs of a Delta Fix, are the increasing short-term energy costs and the

[10] LADWP 2010 UWMP, Exhibit 11E and 11F
[11] MWD's Water Rates and Charges: http://www.mwdh2o.com/mwdh2o/pages/finance/finance_03.html
[12] http://www.mwdh2o.com/mwdh2o/pages/finance/finance_02.html
[13] MWD IRP 2010 Update, Table 4.5, pg 4-7

long-term impacts of expiring SWP energy contracts; any increase in energy costs will have an additional impact on MWD's rates in the future.

Local Supply Tools

The next step was to work with Southern California urban agencies to locate and compile information about the costs of supply alternatives to reliance on traditional imported sources proposed in their UWMPs. These costs can then be compared to tell the economic story of why some water agencies are reducing their reliance on imported water.

This report will focus on the current unit cost ($/AF) of local supplies whenever possible, and will highlight any known discrepancies in cost information. A discussion of reliability and additional benefits is included, but is excluded from unit cost where possible. Some agencies were able to provide an analysis of unit costs, while other agencies were only able to provide us with capital costs/investments in the supplies. Unless otherwise noted all numbers are in 2010 values, so they can be expected to escalate overtime. Local supplies are often subject to financial aid or grant assistance. This report tries to calculate a unit cost before including such incentives. Variation in project costs are expected, every project and region are different and will require different investments. For example, economies of scale will play a role in unit costs of a facility producing 10,000 AF annually versus one producing 50,000 AF annually. Additionally unit costs that are associated with expansion of existing facilities will be more cost effective because they benefit from previously sunk costs. In contrast, large scale projects often come with larger investment risks.

Conservation/Efficiency

Conservation was often treated as a decrease in demand in the UWMPs, and was the tool that was most difficult for agencies to provide cost-estimates for. One of the difficulties of providing cost-estimates of conservation programs as cited by one of the water agencies is that doing individual cost-estimates for each of their many conservation programs is difficult. Additionally it was expressed that, unlike wet-water programs whose production can be metered, measuring the actual water saved from conservation programs is difficult[14].

The emphasis on conservation varies from agency to agency, but all the plans included compliance efforts for the 20% reduction by 2020 required under SB7x7. LADWP provided unit cost for conservation with a range of $75-900, depending on the costs of conservation rebate, hardware installation and incentive programs and their potential water reduction[15]. IEUA was also able to provide detailed costs of their conservation programs. The range of these costs per acre foot is $69-$1094, excluding their pool cover program which costs $3,693/AF[16].

Agency	Unit Cost ($/AF)
LADWP Conservation Programs	$75-900
IEUA Conservation Programs	$69-1094

Table 3: Range of Unit Costs for Conservation Programs

Long Beach has made substantial conservation efforts and credits reduction in per capita demands as the primary reason for being able to reduce reliance on MWD water. Long Beach has individually estimated the cost of several of its conservation programs, including a unit cost of as low as roughly $50/AF (limiting watering landscape to 3 days-per-week) and it weather-based irrigation controller installation program cost of between $173 and $412/AF.

[14] Personal communication with Matthew Lyons, LBWD
[15] LADWP UWMP pg 22
[16] IEUA 2010 Water Use Efficiency Business Plan, pg 62

Water recycling

Investments in water recycling projects are a large part of many water agencies future planning, with every examined UWMP calling for an increase in recycled water supply between now and 2035. The type of investment varies, some recycled water supply is intended for direct irrigation and industrial use, and some is indirect use, achieved by treating wastewater and recharging groundwater basins (GWR).

LADWP Case Study: In the LADWP delivery region, recycled water has a current yield 7,500 AFY. The City has several recycled water projects currently providing recycled water for landscape irrigation, industrial, and commercial uses. LADWP is in the process of developing a Recycled Water Master Plan (RWMP) that should be completed by fall 2011. The RWMP will include Near-Term recycled water projects (projects to be implemented through 2015 to achieve 20,000 AFY of recycled water use), expansion of the non-potable distribution system beyond 20,000 AFY, and groundwater replenishment with advanced treated recycled water. When combined with existing reuse, these options are expected to result in 50,000 AFY of reuse by FY 2029, exclusive of environmental reuse, in-plant reuse, and sales to West Basin MWD[17]. The current plans include both "purple-pipes" projects for irrigation and industrial use and groundwater recharge (GWR). The cost of investment ranges from $700 Million to $1 Billion, depending on the mix of groundwater recharge and irrigation use.[18] The range of project specific recycled water costs is $600-1500/AF[19]. The reason there is a significant cost difference between the options is that some of the infrastructure for indirect GWR is already in place. Developing more direct use projects, known in LADWP as "Purple Pipe Projects", tend to be more expensive on a cost per acre-foot basis compared to GWR because of the installation of piping, pumping stations, and storage tanks[20].These represent 2010 costs, and prices will be higher with financing. When considering both capital and O&M costs to expand the recycled water system to achieve 50,000 AFY, LADWP estimates that the present value per acre-foot of recycled water over a 50-year life cycle analysis results in a blended cost of $1,100 per acre-foot. The RWMP is evaluating how much of their goals can be achieved by groundwater recharge, because there may be some limitations on how much DWP can recharge without encountering regulatory or basin hydraulic issues.

Inland Empire Utilities Agency (IEUA) Case Study: Inland Empire has also made a significant investment in the last ten years on recycled water capital costs, $110 million, and plan on spending just over $50 million in the next ten years on recycled water capital. Unit costs for recycled water couldn't be obtained, but the rates for reclaimed water are currently $115-$145/AF and are scheduled to increase to approximately $300/AF by 2018. IEUA has been very successful in the past at obtaining grants and loans, but as those funding sources are exhausted, recycled water rates will continue to increase to recover costs of production. The current yield in IEUA from recycled water is 17,928 AF, with a projected yield for 2035 of 83,436 AF. That project yield is close in value to the projected demand on imported water for 2035. This is a great example of how a local supply, can be developed to compete with imported water.

San Diego County Case Study: Existing recycled water projects in San Diego County deliver a total of approximately 28,000 AFY of non-potable water. A sampling of the operational costs of the existing projects, including a treatment

[17] LADWP UWMP Chapter 4, Recycled Water
[18] $700 Million for 30,000 AFY by GWR and 20,000 AFY for Irrigation and Industrial Use; $1 Billion for 15,000 AFY by GWR and 35,000 AFY for Irrigation and Industrial Use
[19] LADWP UWMP pg 22
[20] Personal Communication with LADWP, Thomas Erb and James Yannotta

plant and a non-potable distribution system as well as facilities that purchase recycle water from another agency range from $1,259-1,662/AF[21]. Future recycled water projects will include both potable and non-potable supplies, with a significant portion driven by the expansion of non-potable facilities. Two additional projects are under development in San Diego County, one from the City of San Diego[22] and the other as a joint development from the Helix Water District and the Padre Dam MWD. The City of San Diego project is a reservoir augmentation project that is currently in the beginning stages[23]. The unit costs for these two indirect potable-reuse projects are approximately $2,300-2,437 AF[24].

MWDOC Case Study- The Orange County Water District (OCWD) Groundwater Replenishment System (GWRS): In MWDOC, direct non-potable recycled water reuse totaled 39,642 AF in the service area in 2010. The indirect potable water reuse via groundwater recharge and for seawater barriers is currently about 67,000 AFY. These yields are expected to dramatically increase. By 2035, direct non-potable recycled water usage is projected to be 59,597 acre-feet, and the indirect use is expected to reach 102,000 acre-feet by 2015. The groundwater recharge water is produced by the GWRS project which will ultimately supply about 132,000 AF a year if the future envisioned phase of the project is approved and developed. Total recycled water production in MWDOC is projected to increase to 164,071 AFY by 2035 including GWRS production. As a result, 37% of the wastewater generated in the MWDOC service area is anticipated to be recycled - a significant and valuable resource[25].

The GWRS takes treated wastewater from Orange County Sanitation District, treats it, and then injects it into the seawater barrier to help prevent seawater intrusion into the groundwater basin. Additional treated wastewater is percolated into deep aquifers where it eventually becomes part of Orange County's drinking water supply. The current unit cost, including the cost of extraction, is $1299/AF[26]. The GWRS economies of scale that can be achieved due to the amount of water that can be treated and stored in the Orange County groundwater basin plays a large role in the unit cost, it has the highest yield of any other the recycled water projects analyzed for this report.

Agency/Type of Project	Unit Cost ($/AF)
LADWP-Recycled Water Cost Range	$600-1500
LADWP-Blended Cost of Planned Recycled Water Investments	$1100
SDCWA member agencies- Non-Potable Direct Use	$1259-1662
SDCWA member agencies- Indirect Potable Use	$2300-2437
MWDOC- GWRS	$1299

Table 4: Unit Costs for Water Recycling Projects

Groundwater treatment

Improving groundwater management, either through conjunctive management or groundwater treatment, is another key source of local supply for many agencies. In some cases agencies are seeing the benefits of treating once

[21] SDCWA- Unit Cost of New Local Supply Alternatives Sep 15, 2010
[22] http://www.signonsandiego.com/news/2011/jun/30/san-diego-launches-new-water-project/
[23] http://www.sandiego.gov/water/waterreuse/demo/
[24] SDCWA- Unit Cost of New Local Supply Alternatives Sep 15, 2010
[25] MWDOC UWMP, Section 6, Recycled Water
[26] SDCWA- Unit Cost of New Local Supply Alternatives Sep 15, 2010

contaminated groundwater, while others are investing in recharging stormwater, recycled water, or purchased water. The previous sections focused on the costs of recharging storm and recycled water, and this section will focus on groundwater treatment facilities. For example, in Santa Monica a $60 million investment in a groundwater treatment plant has led to a significant increase in locally developed water[27].

Several other agencies are using desalters to treat groundwater that has been contaminated by salt. IEUA is one of the agencies utilizing this source, as well as Otay Water District within San Diego County. IEUA has spent over $150 million over the last 10 years on infrastructure, and plans an additional investment of $100 million dollars to expand the Chino Desalter facilities. The current yield is 26,000 AFY and with expansion projects the Chino Desalter will be producing 40,000 AFY by 2014. IEUA's desalted groundwater water costs approximately $1,000-$1,300/AF[28].

The Otay Water District has also recently made an investment in desalting groundwater. The Rancho Del Rey Well Project will treat about 500 AFY, with reverse osmosis desalination and expects to be operational by 2013. The estimated cost of the treated water is $1500/AF. According to the district the project was initially not considered cost effective, but with the recent increase in the cost of imported water it began to look economically viable[29].

Type of Project	Unit Cost
IEUA- Chino Desalter	$1000-1300
Otay Water District-Rancho Del Rey Well Project	$1500

Table 5: Unit Costs of Groundwater Treatment

Advanced urban runoff management/ Stormwater management

LADWP was the only agency that provided costs and possible yields for advanced urban runoff and storm water management. This is the part of their UWMP supply analysis they have deemed as "potential". A lot more research needs to be done on the unit costs/possible yields of such projects. The plan includes for additional stormwater capture projects to provide for increased groundwater pumping rights in the San Fernando Basin of 15,000 AFY. Additionally, 10,000 AFY of additional conservation from capture and reuse solutions such as rain barrels and cisterns, for a total of 25,000 AFY by 2035. The costs of these projects are highly variable. Centralized stormwater capture can range from $60-300/AF while distributed stormwater capture costs range dependent on projects[30] (Table 6). Stormwater capture will improve long-term groundwater reliability and have other watershed benefits including increased water conservation, improved water quality, open space enhancements, and flood control.

Type of Project	**Unit Cost ($/AF)**
Centralized Stormwater Capture	$60-300
Urban Runoff Plants	$4044
Rain Barrels	$278-2788
Cisterns	$2426
Rain Gardens	$149-1781

Table 6: Unit Costs of Stormwater and Urban Runoff Projects from LADWP UWMP 2010

[27] http://www.smmirror.com/?ajax#mode=single&view=31826
[28] Personal Communication with Ryan Shaw, IEUA July 2011
[29] http://groksurf.com/2011/06/28/otay-water-district-aiming-for-new-local-water-sources/
[30] LADWP UWMP pg 222

Ocean Desalination

Desalination can take a couple of forms. SDCWA has plans to purchase supplies from the Poseidon Desalination Plant, a privately owned plant that is planned to treat ocean water in Carlsbad. The proposed project would have a projected supply yield of 56,000 AFY by 2020, and is estimated to have a unit cost of $1,600/AF. This would be the cost of the water upon being delivered to retail agencies, and was a preliminary unit cost estimate from September 2010[31]. West Basin also has plans for a Desalination facility, and anticipates permitting, financing, and construction a full-scale plant by 2017. They are right now in the demonstration phase, but anticipate the full-scale facility to provide 20,000-112,000 AF annually. The unit cost of this water is estimated between $1265-1700[32].

Type of Project	Unit Cost ($/AF)
SDCWA Poseidon Desalination Plant	$1600
West Basin Desalination Project	$1265-1700
MWDOC Desalination Project	$1300
Long Beach Desalination Research	$1350-2840

Table 7: Unit Costs of Ocean Desalination

It is important to note that cost has played a role in some agencies choosing to exclude or push back planned desalination projects. LADWP had 25,000 AF a year planned from desalination in their 2005 UWMP, but excluded it in 2010 due to costs and permitting issues. Long Beach has invested time and resources into researching the possible desalination opportunities, and concluded that dependent on the type of treatment and size of the plant the cost would be $1350-2840/AF[33]. In light of this, Long beach does not expect to build a desalination plant unless it can be done in an environmentally and financially responsible way, and it is not clear right now to them whether that can be achieved. As a result Long Beach also pushed back desalination plans to the future, with it not showing up in their planning until 2025 (as compared to it showing up much earlier in their 2005 UWMP)[34].

Transfers

SDCWA currently engages in what they describe as a large scale conservation and transfer program with the Imperial Irrigation District that sends thousands of acre-feet of conserved water a year to San Diego County. By 2035, SDCWA is planning to receive 200,000 AF of water from this transfer[35]. This water represents a large portion of their supply, and plays a significant role in their ability to reduce purchases from MWD. The cost of the transfer water is $705/AF[36].

Cost Comparisons

> *"In the past, it was more economical for groundwater producers to simply abandon a contaminated well when an alternative supply such as import water was readily available. Today, as import water costs increase and its availability becomes less reliable, these same producers are taking a second look at treatment options and*

[31] What We Need in a Delta Fix, Presentation by SDCWA May 2011
[32] SDCWA- Unit Cost of New Local Supply Alternatives Sep 15, 2010
[33] Long Beach PPT: 2010 Board Presentation on Desalination Research.
[34] Personal Communication with Matthew Lyons, LBWD July 20th 2011
[35] SDCWA 2010 UWMP
[36] SDCWA- Unit Cost of New Local Supply Alternatives Sep 15, 2010

associated costs. In many cases despite the added cost of treatment, the reliability and control over local well water becomes a more attractive alternative." (Three Valleys UWMP pg. 43)

The supply costs of the Southern California Water agencies shown in this report range from $60-4000/AF. The type of project, as well the circumstances of development play a significant role in determining costs. The average cost of the considered supplies is approximately $1600/AF. Conservation and efficiency programs have cost ranges that fall below MWD water, as well as some of the stormwater capture and recycled water projects. Comparing the rest of the projects directly to the current cost of MWD water solely, results in MWD looking affordable (Figure 2). However, several additional factors should be considered, including recent and projected long-term increases in MWD rates, the ability of agencies to accommodate population growth without increasing reliance on Bay-Delta and Colorado River, and the desire of agencies to control and stabilize their rates.

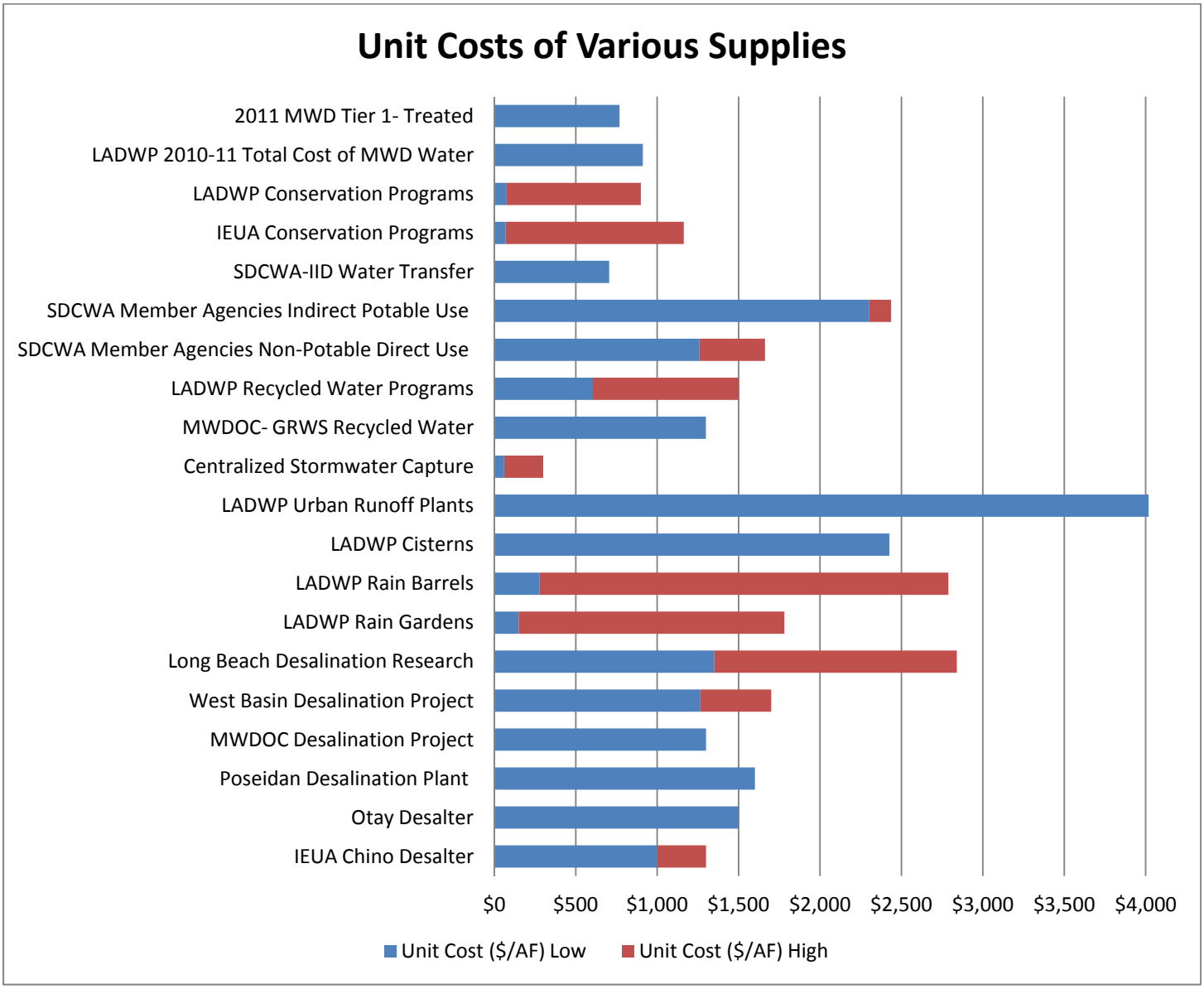

Figure 3: Comparisons of the various costs of supply alternatives.

There are also the possible additional benefits of some of these projects. Stormwater capture and management, provides additional benefits that are not included in these cost estimates, including reducing flood damage and improved water quality. Recycling water reduces costs associated with wastewater disposal and preventing pollution. Recycled water also has many possible uses including habitat restoration. Some of these benefits may directly help finance investments in recycling projects. San Diego County recalculated some of their recycled water costs to incorporate avoided costs, benefits and other revenues. For example, the proposed El Monte Valley GWR recharge project has a net cost of $1400/AF[37], instead of a total unit cost of $2300/AF, after making these adjustments. Other important benefits of local projects include possible reduced energy costs and greenhouse gas emissions, as a result of reduced reliance on energy-intensive imported supplies.

On the other hand there are risks associated to developing local supplies. MWD water is purchased without a need to build infrastructure, or in the case of direct non-potable recycled water, find the customers. Many of these projects require large initial investments, and substantial risk. For example, if a planned facility never reaches intended capacity that the original unit cost may be higher than expected. It seems that conservation and efficiency efforts are the most stable in terms of investment risk, as they require smaller initial investments than large facilities. All of these factors contribute to the current decision making of water planners in Southern California and around the state.

Conclusions

The following conclusions were made from the analysis in this report:

- All 11 of the MWD Member Agencies plan to diversify their supply portfolio by developing additional local supplies. For example, each agency's UWMP called for an increase in recycled water supply between now and 2035.
- Almost all of the agencies plan to reduce the percent of their total supply that is imported from MWD by 2035.
- Several agencies plan to reduce the total amount of water that is purchased from MWD between now and 2035; they are LADWP, West Basin, and Long Beach. SDCWA plans to reduce their absolute amount between now and 2020 (Table 1).
- The local supply alternatives that agencies are developing include: conservation/efficiency, water recycling, groundwater treatment, advanced urban runoff management, stormwater management, water transfers and desalination.
- The planning decisions shown in the UWMP are a necessary step towards reducing reliance on imported water; but it is the implementation of these plans that matters. LADWP has the most progressive and diverse plan, but there are challenges in implementation that need to be overcome by the agency in order to have the desired effect.
- The current cost per AF for treated Tier 1 MWD water has a base cost of $769 plus the associated fixed costs; the Readiness-to-Serve Charge and the Capacity Charge. For example, LADWP is paying $912/AF for their 2010-2011 supply after incorporating the fixed costs they are responsible for.
- Unit costs for agencies current and planned local supplies were not readily available. Some agencies had done extensive analysis on the costs of their supply tools, others were only able to quantify capital or investment costs, and some lacked the ability to share cost analysis completely. UWMPs could be enhanced by requiring this information.
- The cost of local supplies varies substantially depending on the tool. There are few tools beyond efficiency and conservation programs that fall below the current cost of MWD water, but many alternatives that cost between $1000-$2000/AF.

[37] SDCWA- Unit Cost of New Local Supply Alternatives Sep 15, 2010

- The decision to develop local supplies is not solely based on costs. The projects being developed by Southern California agencies are justified by considering the projected rate increase of MWD water and the increased reliability of the local supplies. The local supplies in this report do not overwhelmingly show cheaper options, but their costs are approaching that of MWD water now and in the future. Therefore, investing in alternative supplies can provide cost stability for water agencies, in comparison with the more uncertain costs of imported supplies.

Issues for Further Investigation

The following issues were beyond the scope of this analysis, and would benefit from further investigation.

- The extent to which the 11 plans analyzed in this document are being implemented. During the current recession, there is a great deal of pressure on urban water agency rates and budgets. In some cases, reduced water sales during the recent drought may have added additional pressure on agency budgets. At least one of the agencies analyzed here is making budget decisions that would not fully implement its UWMP in the coming year. http://articles.latimes.com/2011/jul/15/opinion/la-oe-gold-dwp-rate-hike-20110715
- Rate impacts from implanted these plans, as well as the possible rate impacts from not diversifying and continuing reliance on MWD. LADWP is currently proposing new rate hikes that reflect their UWMP goals. http://latimesblogs.latimes.com/greenspace/2011/07/dwp-water-rates.html
- Options to finance UWMP implementation, such as the creation of user fees or a minimum investment requirement in UWMPs for water agencies.
- Options to strengthen these UWMPs, including the agencies making the most ambitious efforts to reduce reliance on imported supplies.
- The extent to which these UWMPs meet California's 20 x 2020 requirements.
- Options for state and federal agencies to strengthen UWMP content and UWMP implementation.
- Options to use IRWMPs to strengthen or implement UWMPs