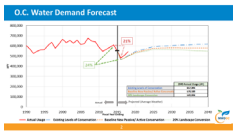
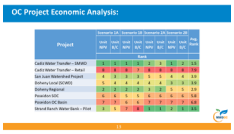
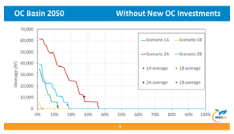
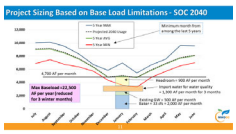
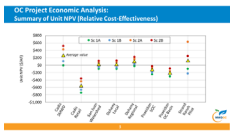














2018 OC Reliability Study – Draft Report

Water Advisory Committee of Orange County (WACO)

October 5, 2018

Why the 2018 Water Reliability Study

Changed Conditions and Need for 2018 Study

- MET financially committed to WaterFix, assumed operational date 2035
- MET completed detailed feasibility report on Carson IPR project
- Newer set of global climate models (GCMs) indicate:
  - Future temperatures will be significantly greater than GCMs used in 2016 Study
  - Future precipitation will have significantly more variability & average values greater than those used in 2016 Study
- Implementation of Bureau of Reclamation's Draft Drought Contingency Plan for Colorado River results in greater MET shortages
- Several local Orange County projects have advanced
- Additional work completed on evaluating emergency needs in South Orange County (SOC)

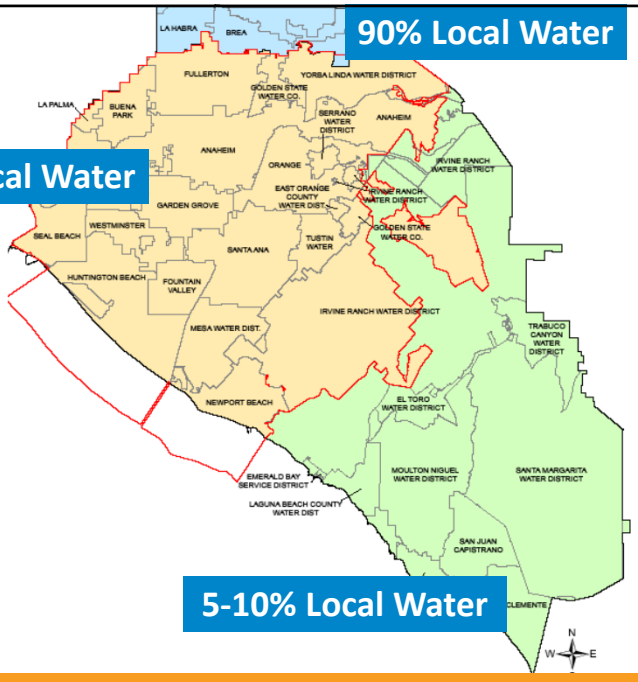
Objectives for 2018 OC Study

NOT DICTATING MEMBER AGENCY DECISIONS

1) Provide unbiased, factual analysis of projects and the benefits they provide for decision-making purposes
2) Develop new planning scenarios, reflecting changed conditions for MET reliability (assumes WaterFix and newer climate models)
3) Determine new water **supply** gaps (reliability curves) for OC Basin and SOC areas under new planning scenarios
4) Determine new water **system** (emergency) gap for SOC based on newer assumptions on emergency water demand needs
5) Estimate cost-effectiveness of OC local projects in meeting supply reliability needs (Basin and SOC) and system reliability needs (SOC)

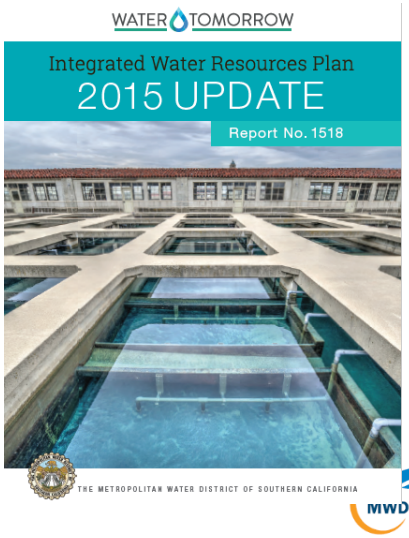
Three Study Areas in OC

Reliability evaluations are conducted for three regions within OC because the dependence on local groundwater sources varies considerably



What it takes to evaluate our existing water supply reliability

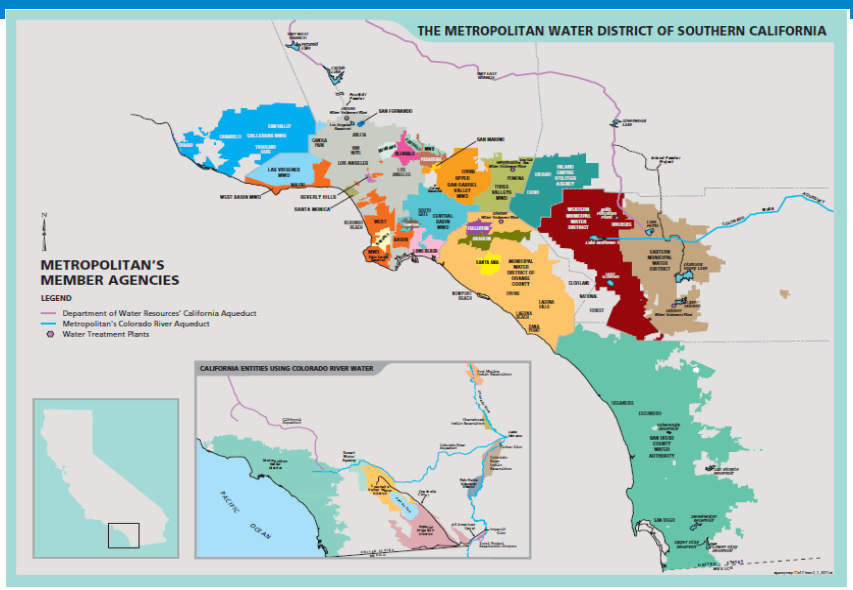
- What supply investments will MET make? What will they cost?
- How will MET supplies from the State Water Project and Colorado River Aqueduct perform over time?
- MET's member agencies supply options
- What will demands do over time?
- MET's Water Supply Allocation Plan (WSAP) & "Extraordinary Supplies"
- Potential Climate Change impacts
- MET's Rate's over time
- Need for local supplies in Orange County



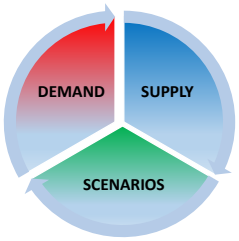
MET's Integrated Resources Plan (IRP)

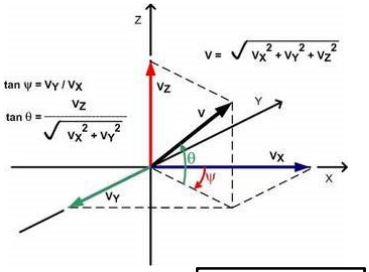
MUNICIPAL WATER DISTRICT OF ORANGE COUNTY (MWDOC)

We are part of Metropolitan Water District of Southern California (MET) - we appoint 4 of 37 directors to the MET Board



Supply Reliability Analysis Process





DEMAND, SUPPLY & SCENARIOS → RELIABILITY MODELLING & GAPs → NEW OC WATER PROJECTS → PROJECT FINANCIAL EVALUATIONS → SYSTEM INTEGRATION

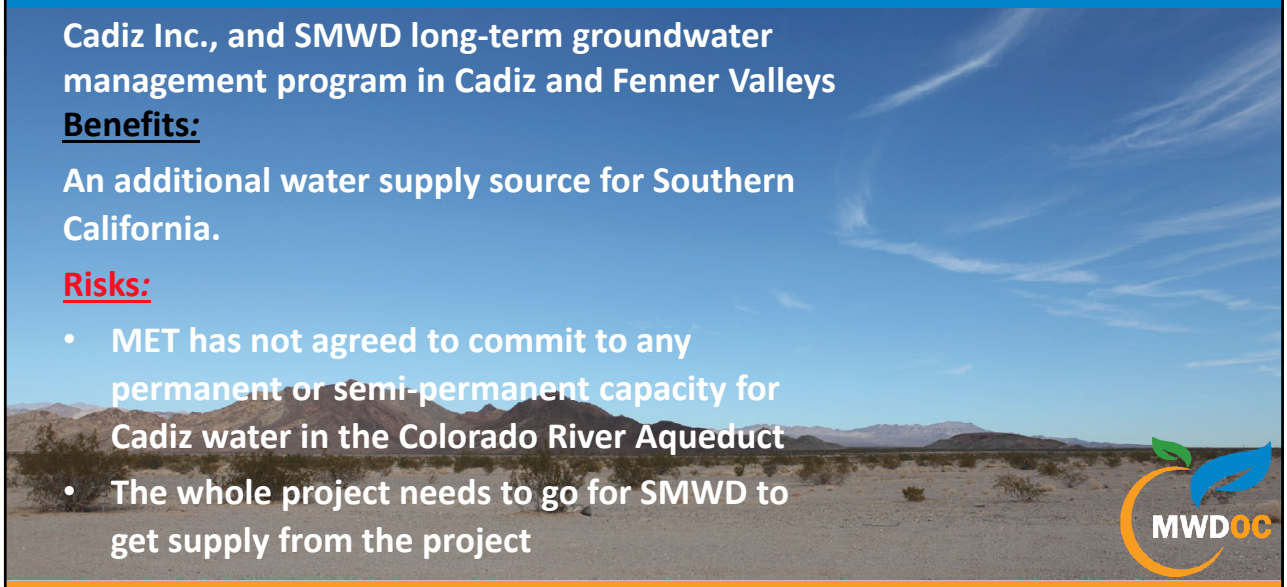
94 Hydrologies
Probability & Volume of Supply Shortages

Potential New OC Local Projects

OC Project Summary for Water Supply

Project	Online Date	Yield (AFY)	Supply Project	System Emergency	Extraordinary Supply
Cadiz Water Bank – SMWD	2020	5,000	Yes		
Cadiz Water Bank – Retail	2020	5,000	Yes		
San Juan Watershed Project	2022	9,480	Yes	Yes	
Doheny Local (SCWD)	2021	5,321	Yes	Yes	
Doheny Regional	2026	10,642	Yes	Yes	
Poseidon SOC	2023	15,964	Yes	Yes	
Poseidon OC Basin	2023	36,164	Yes	Yes	
Groundwater Emergency	2022	Scalable		Yes	
IRWD SOC Regional Interconnection	Existing/ Expansion	Under Study		Yes	
Strand Ranch Water Bank - Pilot	2019	5,000		Some	Yes
Santa Ana River Conservation & Conjunctive Use Program (SARCCUP)	2019	36,000 AF of Storage, 12,000 AFY			Yes

Cadiz Water Bank (SMWD and Retail)



Cadiz Inc., and SMWD long-term groundwater management program in Cadiz and Fenner Valleys

Benefits:

An additional water supply source for Southern California.

Risks:

- MET has not agreed to commit to any permanent or semi-permanent capacity for Cadiz water in the Colorado River Aqueduct
- The whole project needs to go for SMWD to get supply from the project

Cadiz Water Bank Terms for SMWD

For SMWD as Co-Developer:	$2020	
Base Allotment (+10,000 AF Option at Retail Rate)	5,000	AFY
Base (Water Supply) & Operating Costs	$308	/AF
MET Wheeling Rate	$547	/AF
Capital Recovery Charge - Cadiz	$220	/AF
Delivered Cost of Untreated Cadiz Water to Baker	$1,075	/AF
Baker Incremental Treatment Charge	$200	/AF
Cost of Treated Cadiz Water (SMWD Rate)	$1,275	/AF

Assumptions:

1. Water Supply Cost at $190/AF escalates at 3% for future
2. Water O&M Cost at $118/AF escalates at 2.72% for future
3. Capital Recovery Charge not escalated
4. Treatment for SMWD's 5,000 AFY uses incremental Baker WTP cost of $200, escalated at 3% for future

Cadiz Water Bank Terms – for others (Retail)

Cadiz Retail:	$2020	
Additional Retail Amount	5,000	AFY
Base (Water Supply) & Operating Costs	$561	/AF
MET Wheeling Rate	$547	/AF
Capital Recovery Charge - Cadiz	$220	/AF
Delivered Cost of Untreated Cadiz Water to Baker	$1,328	/AF
MET Water Treatment Charge	$323	/AF
Cost of Treated Cadiz Water (SMWD Rate)	$1,651	/AF

Assumptions:

1. Water Supply Cost at $443/AF escalates at 3% for future
2. Water O&M Cost at $118/AF escalates at 2.72% for future
3. Capital Recovery Charge not escalated
4. Treatment for Retail of 5,000 AFY uses MET treated water rate

Strand Ranch Pilot Program

Drought protection (insurance) program for **extraordinary supply** water from IRWD Water Bank.

Term: 7 years fixed (no "opt out") provision

Amount: 5,000 AF

Charges: $25 per AF annually ($125,000 per year)
$5,000 One-time Set Up Fee

Cost to Call Water:

Actual Cost of Water
Actual Recovery Cost Charges
Fixed Capital Facility Use Fee
MET Exchange Fee

Strand Ranch Pilot Program

Benefits:

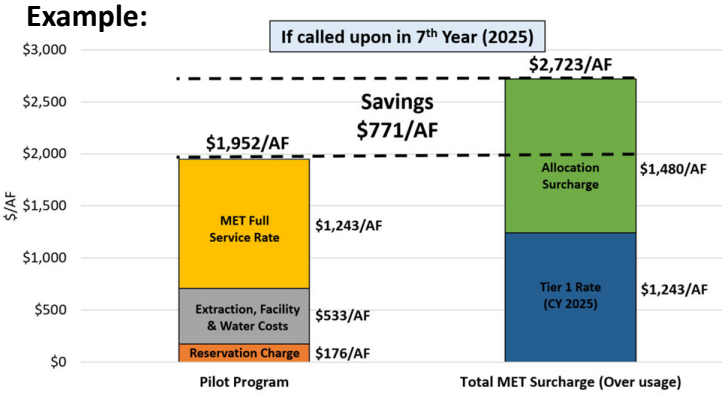
Extraordinary supply priced below MET water with allocation surcharge

- 28% less than the MET surcharge (Savings ≈ $3.85 million on 5,000 AF)
- Cost savings Pilot program vs. MET allocation surcharge ≈ $771/AF.

Risks:

- If option is not exercised then Reservation Charges are forgone ($125,000/Yr. x 7yrs = $880,000)

Example:



(1) MET actually has a two-tier surcharge for agencies going over their allocation. The first tier is for agencies exceeding the allocation by up to 15% (which is shown above). Under the MET WSAP, agencies exceeding their allocation by more than 15% incur an even higher surcharge (an additional $1480 is added).

*** Recovery Cost estimate based upon 3% escalation rate**

Strand Ranch Pilot Program Over 7 Years

Big question in the original evaluation of the Pilot Program was "will it be needed over 7 years"?

- Used 2030 reliability results for SOC as a proxy for "need" over next 7 years:
  - Even though the "need" is relatively low, if limited to one 5,000 AF call over the 7 years, the project costs look high compared to benefits.
  - The project improves with up to two calls over the 7-year period.
  - This was used in the project evaluation.
- Additional analysis needed for evaluation of the project out to 2035 or 2040

San Juan Watershed Project

Project proposes to increase capture and storage of urban runoff & stormwater, optimize use of recycled water for reuse, and augment San Juan Basin groundwater supplies

Phase I: Capture stormwater & urban runoff - 700 AFY (Avg) potable water

Benefits: Provides an additional local water resource and greater utilization of existing assets (CSJC GWRP).

Risks: Production uncertainty due to annual rainfall amounts and future climate hydrology.

Phase	Startup Year	Capital Cost	Yield (AFY)	Cost/AF in Startup Yr. $
Phase I	2019	$23.3 M	700	$2,198*
Phase II	2022	$92.6 M	6,120	$1,581
Phase III	2022	$32.3 M	2,660	$1,200
Total Project	2022	$148.5 M	9,480	$1,521

* Phase I Cost/AF can be considered interim or startup costs

San Juan Watershed Project

Phase II: Introduce recycled water to the creek - 6,120 AFY

Benefits: Recycled water is a sustainable & reliable local supply source.

Risks:

- Regulations for IPR and/or DPR are not complete.
- Project costs assume recycled water can be recharged without treatment in excess of tertiary treatment levels.
- Sufficient basin detention time may not be available.
- Rubber dam permits may be difficult.
- Additional recycled water required above current levels may be limited.

Phase III: Live stream recharge of recycled water - 2,660 AFY

Benefits: Same as Phase II

Risks: Same as Phase II

Doheny Seawater Desalination – Local by South Coast

SCWD proposed ocean water desalination facility at Doheny Beach (Phase 1)

- Initial capacity up to 5 MGD.
- Potential for future expansions up to 15 MGD.
- Sizing used in analysis:
- 5 mgd at 95% load factor = 4.75 mgd (5,321 AFY) for comparison purposes with Poseidon HB Project

Doheny Local	Startup Year	Capital Cost	Yield (AFY)	Cost/AF in Startup Yr. $
Phase 1 - 5 MGD	2021	$107.2 M	5,321	$1,623

Benefits: A reliable, locally controlled and drought-proof water supply source.

Risks: Slant well technology is a new technology that has been only been tested at a pilot scale at Doheny Beach and Cal Am.

Doheny Seawater Desalination – Local by South Coast

Assumptions:

1. Capital Finance Rate: SCWD 5 MGD Project (2021)
   - Analyzed at 3% Capital Finance rate, over 30 years.
   - $10 M DWR grant,
   - MET LRP Funding ($475/Yr. for 15 Yrs.) included.
   - Note: Lower Cost SRF funding & other grants (BOR) may be available, but were not included in analysis.
2. Energy costs escalated annually at 2.6%
3. Cost/AF includes annual O&M costs calculated (in 2021) to be $491/AF. O&M costs for SCWD 5 MGD Project (2021) were escalated annually at a rate of 2%.
4. Costs include oversizing of some components for future expansions.

Doheny Seawater Desalination – Regional

Potential expansion(s) of Local Desalination facility up to 15 MGD (at 95% load factor)

- Phase 2 expansion to 9.5 MGD (10,642 AFY)
- Phase 3 expansion to 14.25 MGD (15,963 AFY)

Doheny Regional	Startup Year	Capital Cost	Yield (AFY)	Cost/AF in Startup Yr. $
Phase 2 - 5 MGD Expansion	2026	$74.5 M	5,321	$1,712
Phase 3 - 5 MGD Expansion	2030	$73.7 M	5,321	$1,648

Benefits: A reliable, locally controlled and drought-proof water supply source.

Risks: Integration issues need to be resolved

Doheny Seawater Desalination – Regional

Assumptions:

1. Capital Finance Rate: SCWD 5 MGD Project (2021)
   - Phases 2 & 3 - Expansions (2026 and 2030) analyzed at 4%, amortized over 30 years.
   - MET LRP Funding ($475/Yr. for 15 Yrs.) included.
2. Energy costs escalated annually at 2.6%
3. Cost/AF includes annual O&M costs for Phases 2 & 3 Expansions (2026 & 2030) escalated annually at a rate of 3% after startup.
4. Phase 2 includes regional interconnections with JTM & WIP pipelines.

Poseidon Seawater Desalination

Proposed ocean water desalination facility in Huntington Beach

- Capacity 50 MGD (56,000 AFY)

	Startup Year	Capital Cost (1)	Yield (AFY)	Cost/AF in Startup Yr. $
North OC	2023	$1,041.1 M	36,163	$2,183
South OC	2023	$433.4 M	15,963	$2,119
City of HB	2023	$0	3,360	95% of MET Rate

(1) Capital costs were estimated based on July 2018 OCWD Board Presentation

Benefits: A reliable, drought-proof water supply source.

Risks:

- Ability to secure MET LRP Program funding.
- Currently the project is delayed due to required environmental permit renewals and the new State Ocean Plan Amendments.

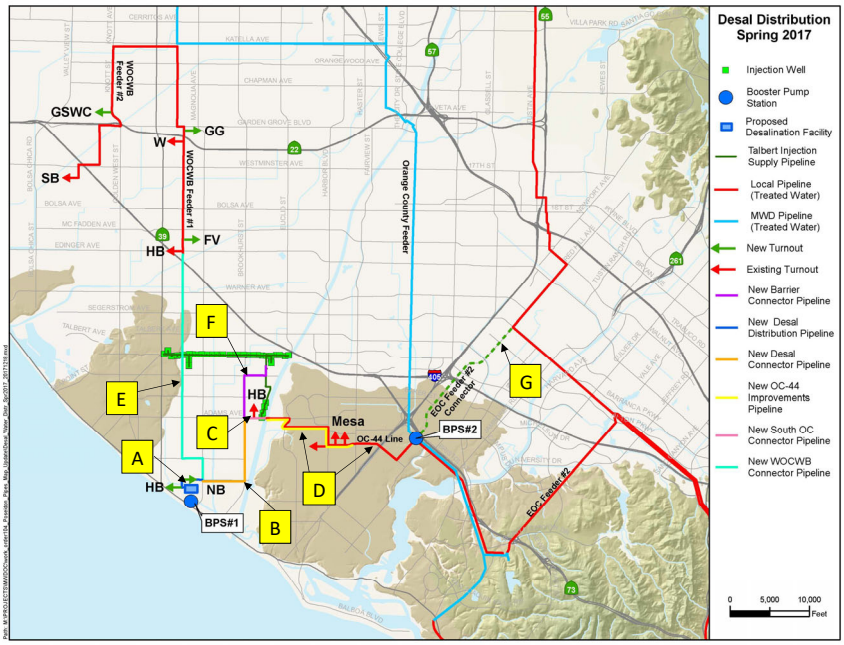
Poseidon Seawater Desalination

Assumptions:

1. MET LRP funding ($475/Yr. for 15 Yrs.) is included.
2. Cost per AF includes annual Plant and Pipeline O&M costs.

Costs & Escalation Rates	Plant	North OC Pipelines	South OC Pipeline
Capital Finance Rate (over 30 yrs)	4.86%	4.0%	4.0%
Energy Costs/AF (in Startup Year 2023)	$376		
Plant Energy Cost Escalation Rate	2.5%		
O&M Costs/AF (in Startup Year 2023) Includes energy lift	$545	$31	$62
O&M Cost Annual Escalation Rate	2.0%	2.6%	2.6%

Poseidon Seawater Desalination Integration Schematic



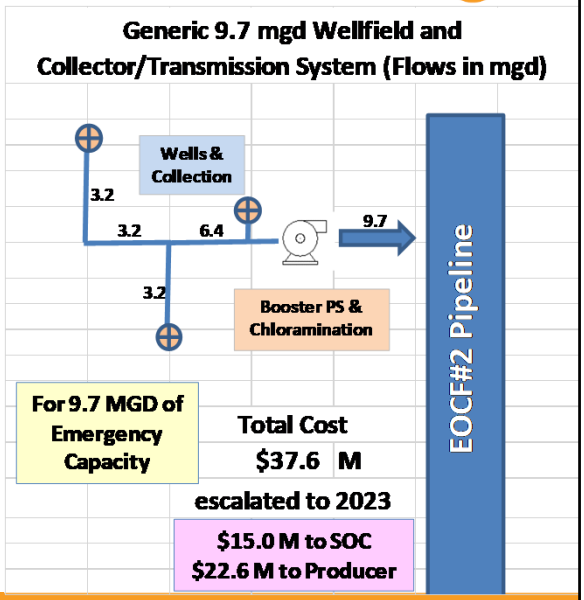
Costs Estimated for Integration of Poseidon Water

Key to Poseidon Integration Schematic				
		22.05 cfs to SOC & 49.95 cfs to OCWD		
		Capital Cost in Millions 2023 Dollars		
Segment	Description	Total	Basin Cost	SOC Cost
A & B	Hamilton & Brookhurst Pipelines 4,000' of 48" and 14,200' of 48"	$31.8	$19.7	$12.1
C	SOC Connector to OC-44 2,300' of 30" or 36"	$2.9	$1.0	$1.9
D	Parallel to OC-44 16,000 ' of 14" or 20"	$11.4	$3.8	$7.5
D	Buy-In to existing OC-44 Line	$4.1	$1.3	$2.7
E	Pipeline to WOCWB Feeders 32,000' of 27"	$49.0	$49.0	$0.0
F	Pipeline to Barrier 8,000' of 30"	$122.0	$122.0	$0.0
G	EOCF#2 Connector 19,500' of 24" or 30" includes booster pump, flow control facility, chloramination & connection to EOCF#2	$36.5	$0.0	$36.5
Total		$257.6	$196.9	$60.7
Numbers may be affected by rounding; assumes 5.0 cfs goes directly to Huntington Beach				

Emergency Groundwater

- Conceptual at this time; similar to MET's Conjunctive Use Program
- Wells can be used by Producer's until needed by SOC during emergency
- Cost sharing & other terms to be determined
- Max SOC need = 27 MGD (42 cfs); depends on IRWD System evaluation
- As an example, assumes SOC Pays:
  - 1/3 cost of wells
  - Full cost of booster pump station & connection to pipeline
  - Full cost of replacement water + 5% losses
  - $100 per AF fee to OCWD

Still evaluating ability of IRWD system to provide supplies



System (emergency) NEEDS

What is Water Reliability?

System Reliability

- How reliable is your system (can demands be met) under different emergency situations?

Supply Reliability

- How often are you short water supplies and how much are you short (Mandatory Reductions)

MET Seismic Performance Expectations Estimated Outage Durations

Facility	Maximum Considered Earthquake
Metropolitan – CRA (Colorado River Aqueduct)	2-6 months
Dept. of Water Resources – SWP (State Water Project East & West Branches)	**6-24+ months**
Metropolitan - Conveyance & Distribution Pipelines	1 week to 3 months
Metropolitan - Treatment Plants	1-2 months (Partial flow) Up to 6 months (Full capacity)

60 days without MET

Summary of Emergency Reliability Needs in MGD for SOC for 60 days Assumes NO Emergency Capacity from the SOC Interconnection

	Recovery Needs MGD(1)	Recovery Needs MGD(2)
El Toro WD	0.3	1.7
Laguna Beach CWD	---	---
Moulton Niguel WD	6.7	9.7
San Clemente	3.5	4.5
San Juan Capistrano	2.7	2.0
Santa Margarita WD	4.1	6.2
South Coast WD	2.6	3.3
Trabuco Canyon WD	---	---
Total	20.0	27.5

SOC needs between 20.0 & 27.5 mgd assuming NO capacity is available through the SOC Interconnection

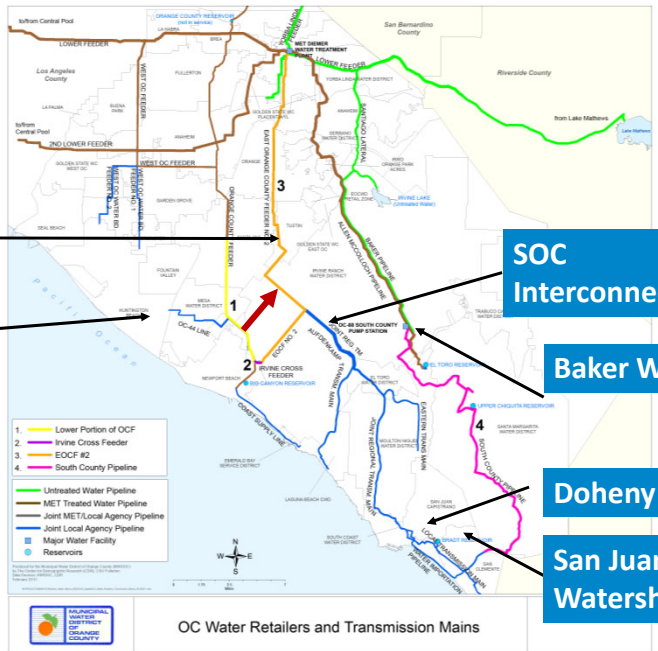
A study is underway to examine the ability of the SOC Interconnection to extend or expand deliveries to SOC

(1) 75% of annual average "normalized" 2017-18 demand
(2) 2040 indoor usage at 55 gpcd + 2040 CII demands

System Reliability Projects Being Discussed

Groundwater

Poseidon Water



SOC Interconnection

Baker WTP

Doheny Water

San Juan Watershed

Evaluating the System Reliability of New Local Projects

Evaluation Metric (EM) – uses Present Value Analysis for the following:

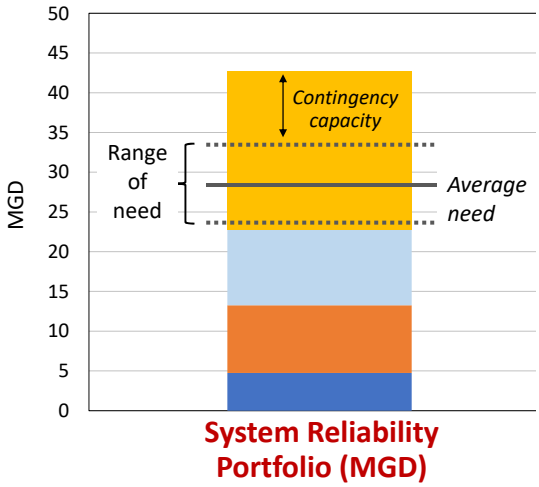
System Reliability EM = Benefit = Avoided annual MET water purchases **MINUS** Cost = local project capital and O&M costs over life of project, **DIVIDED** by project capacity (MGD). ***Positive numbers are better than negative numbers.***

Ranking of SOC Local Projects for System Reliability

Project	Max Capacity (MGD)	EM (2) 1A	EM 1B	EM 2A	EM 2B	Average EM	Project Ranking (3)
Doheny Local (SCWD)	4.75	-$5.9	-$2.8	-$5.6	-$1.0	-$3.8	4
Doheny Regional	9.50	-$3.0	$0.3	-$2.7	$2.3	-$0.8	1
San Juan Watershed Project	8.50	-$5.1	-$2.3	-$4.9	-$0.6	-$3.2	3
Poseidon SOC	14.25	-$10.3	-$7.0	-$10.0	-$5.0	-$8.1	5
Emergency Groundwater (1)	9.70	-$2.3	-$2.3	-$2.3	-$2.4	-$2.3	2

1) This project is scalable to fill remaining system reliability need.
2) Represents avoided discounted MET water purchases for different water rate scenarios LESS discounted project costs, DIVIDED by emergency capacity (MGD) = $/MGD. Positive numbers indicate that project is cheaper than purchasing MET water over the life of project. Negative numbers indicate that project is more expensive than purchasing MET water.
3) Ranking is based on average EM between four scenarios, converted to a rank score from 1 (best) to 5 (worst).

SOC Portfolio for System Reliability



- Three most cost effective base loaded local projects form the base
  - Doheny Local
  - San Juan Watershed
  - Doheny Regional
- Additional capacity added with Emergency Groundwater Projects
- Opportunity to build contingency capacity with emergency groundwater

Supply NEEDS

Evaluating Supply Reliability of New Local Projects

- **Evaluation Metric (EM) – uses Present Value Analysis for the following**
- **Uses reliability curves to determine years and amounts of shortages**

Supply Reliability EM =	*When there are no expected water shortages*, EM is avoided annual MET water purchases **DIVIDED** by local project costs (capital and O&M) over life of project; BUT *during water shortages,* EM is avoided annual MET water purchases **PLUS** avoided drought allocation surcharge, **DIVIDED** by local project costs. ***A ratio near or greater than 1.0 is better than a ratio less than 1.0.***

Supply Reliability

Supply Reliability during dry years is needed for long-term economic vitality and quality of life

For SOC and OC Basin:

Annual total water demand

less

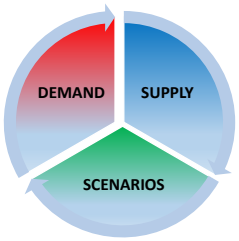
Existing water supplies and expected MET water supplies during wet, normal and dry hydrologic periods

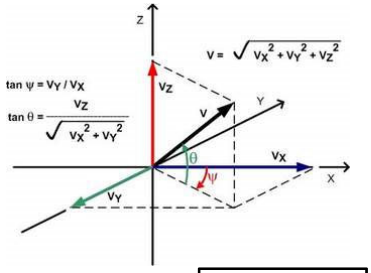
equals

Need for New Local Projects, Extraordinary Supplies, Basin Management, and/or Demand Curtailment

NOTE: Many Local Water Projects in SOC Provide Both System and Supply Reliability

Supply Reliability Analysis Process





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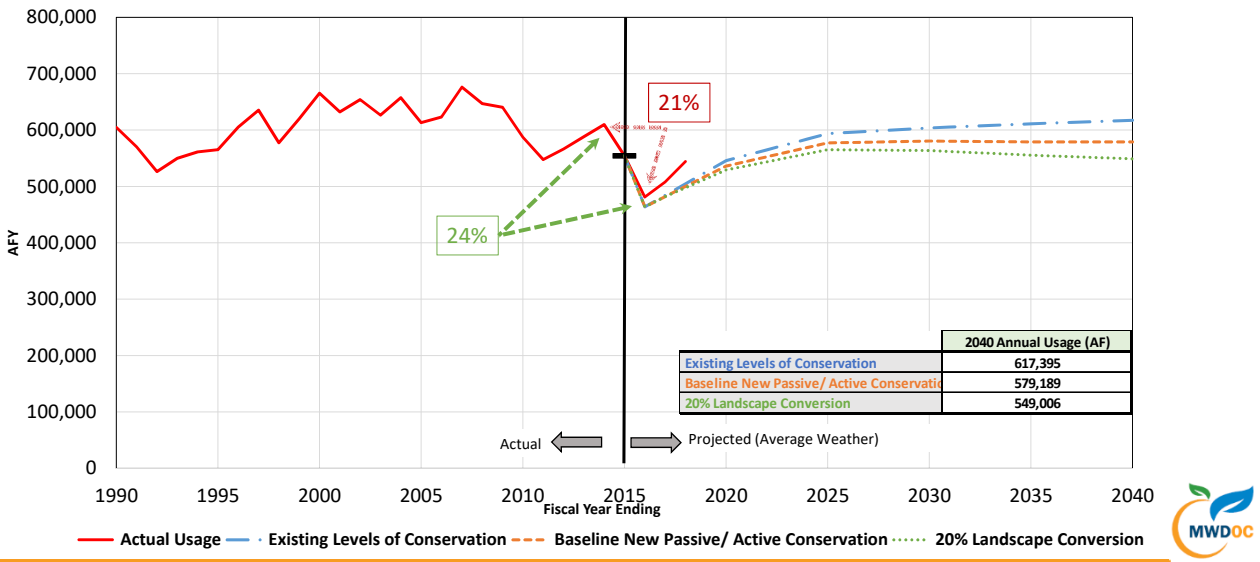
94 Hydrologies
Probability & Volume of Supply Shortages

O.C. Water Demand Forecast



CMIP5 RCP8.5 Climate Models and Impacts on Supplies

GCMs with minimal impacts on SWP and *no* impacts on CRA

GCMs with *moderate* impacts on either CRA or SWP supplies (but not both)

GCMs with *significant* impacts on both CRA & SWP supplies

MINIMAL Climate Change

SIGNIFICANT Climate Change

Used for 2018 OC Study Scenarios

NEW Supplies Included Under the Various Scenarios (1,000's of AF per Year)

New Supplies Above MET's Current	Scenario 1A	1B	2A	2B
WaterFix (approved by MET Board)	440	440	440	440
CRA Transfers (base loaded)	100	100	100	100
LRP (base loaded)	88	88	88	88
Carson IPR (base loaded)	0	168	0	168
More LRP (base loaded)	0	0	74	74
More CRA Transfers (dry year)	0	0	80	80
SWP Transfers (dry year)	0	150	150	150
More SWP Transfers (dry year)	0	0	0	150
Regional Surface Reservoir (dry year)	0	0	0	400
Total Base Loaded and Dry Year	**628**	**946**	**932**	**1,650**

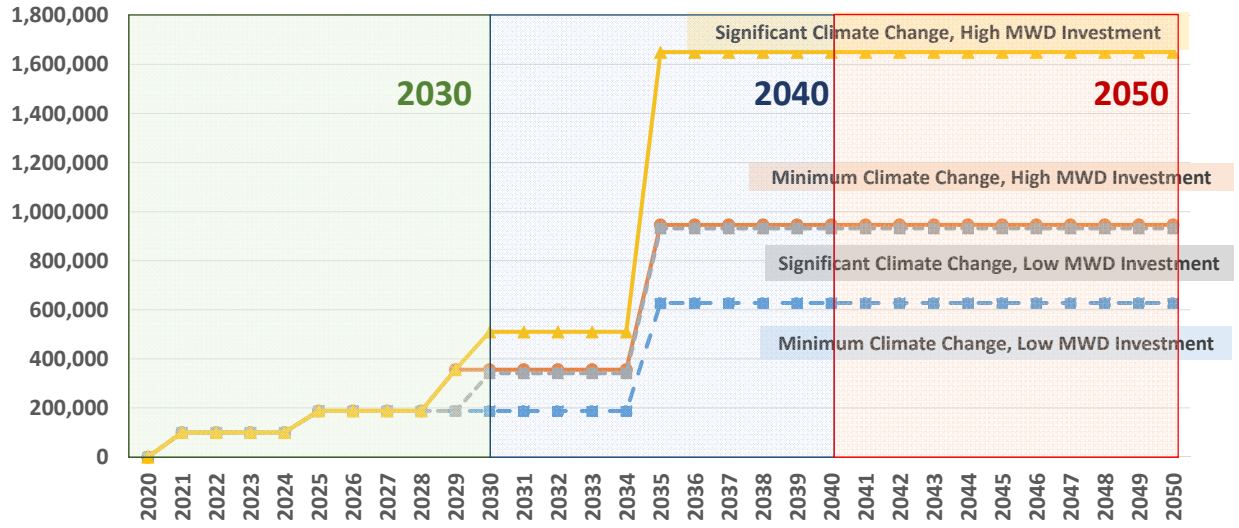
Scenario 1: Minimal Climate Change

Scenario 2: Significant Climate Change

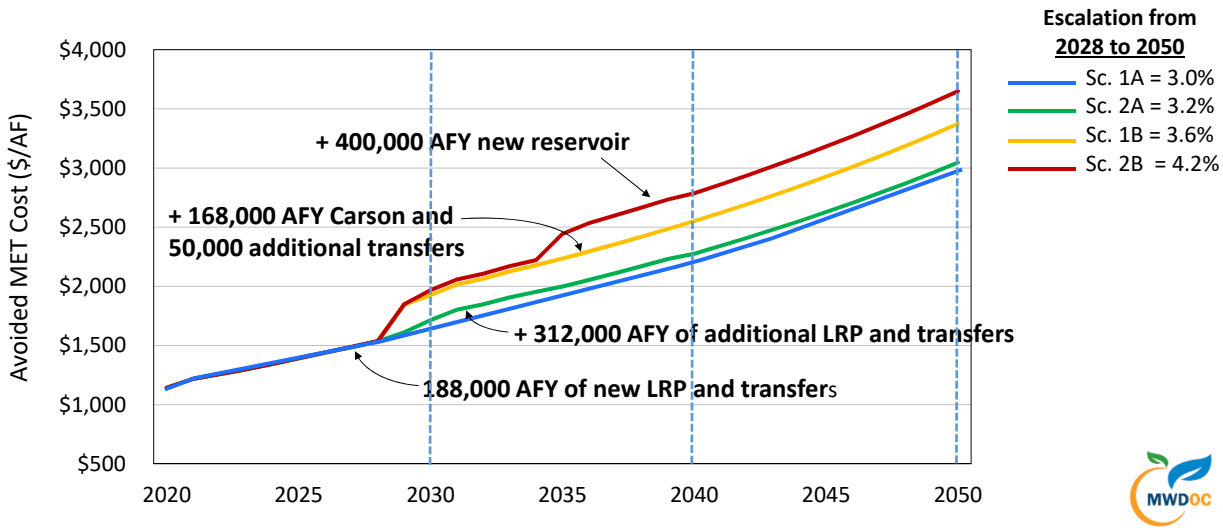
Level A Investments: Low Cost

Level B Investments: High Cost

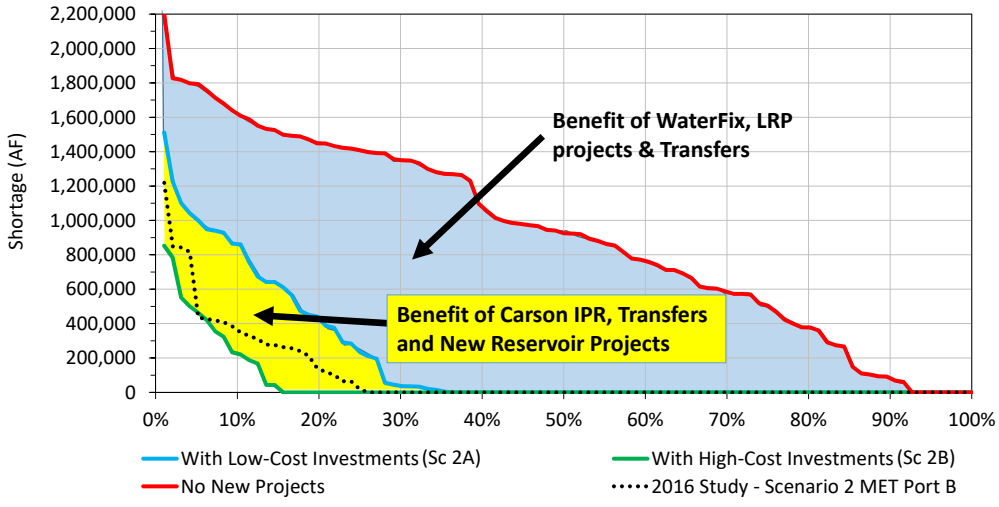
NEW MET Supplies - Combination of Transfers, Local Projects, Carson IPR, WaterFix, & Additional Surface Reservoir (for Sc 2B) in AF per Year



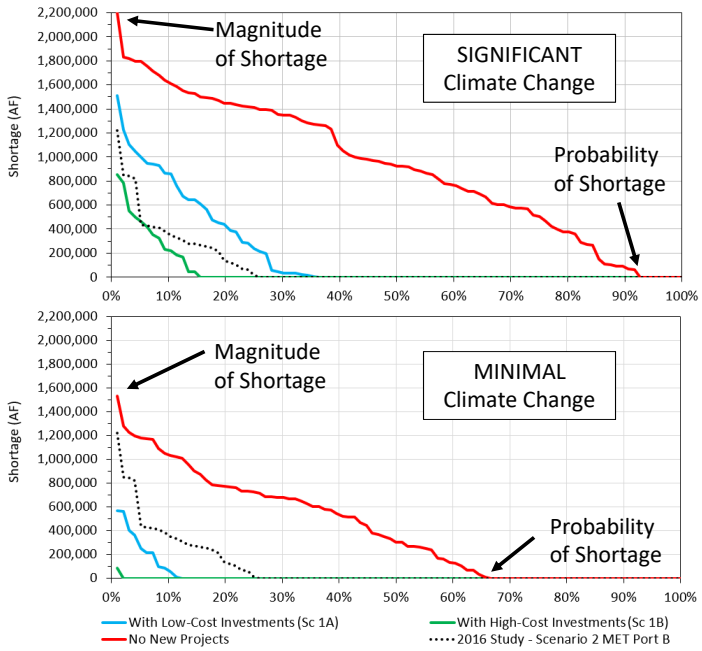
MET Rate Projections by Planning Scenario
(MET Tier 1 Treated Rate + MWDOC RTS/Capacity charge)



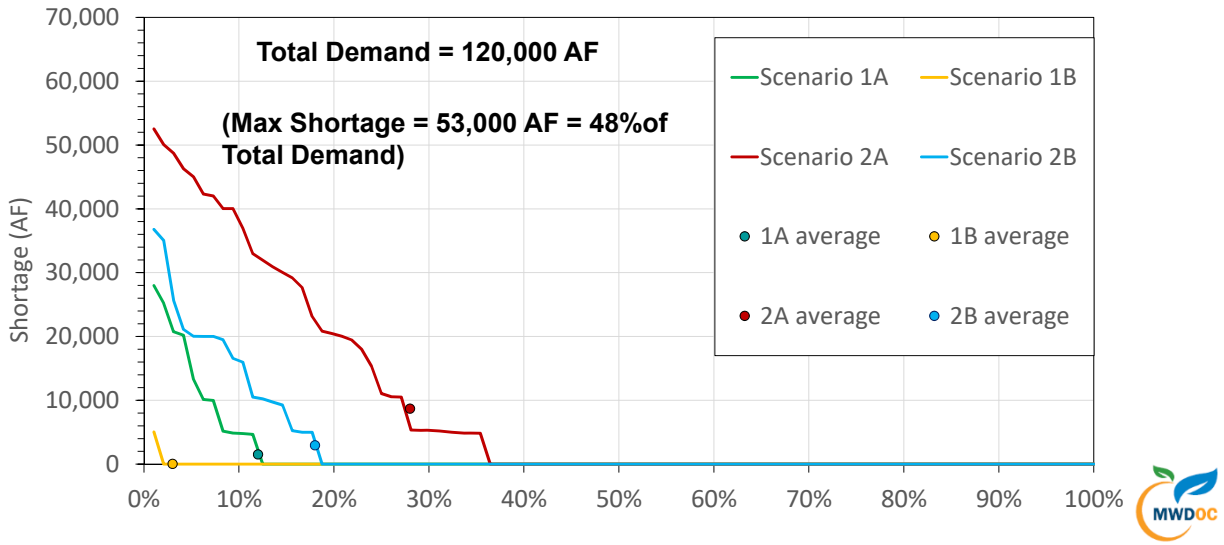
MET Supply Gaps
With Significant Climate Change Impacts in 2050



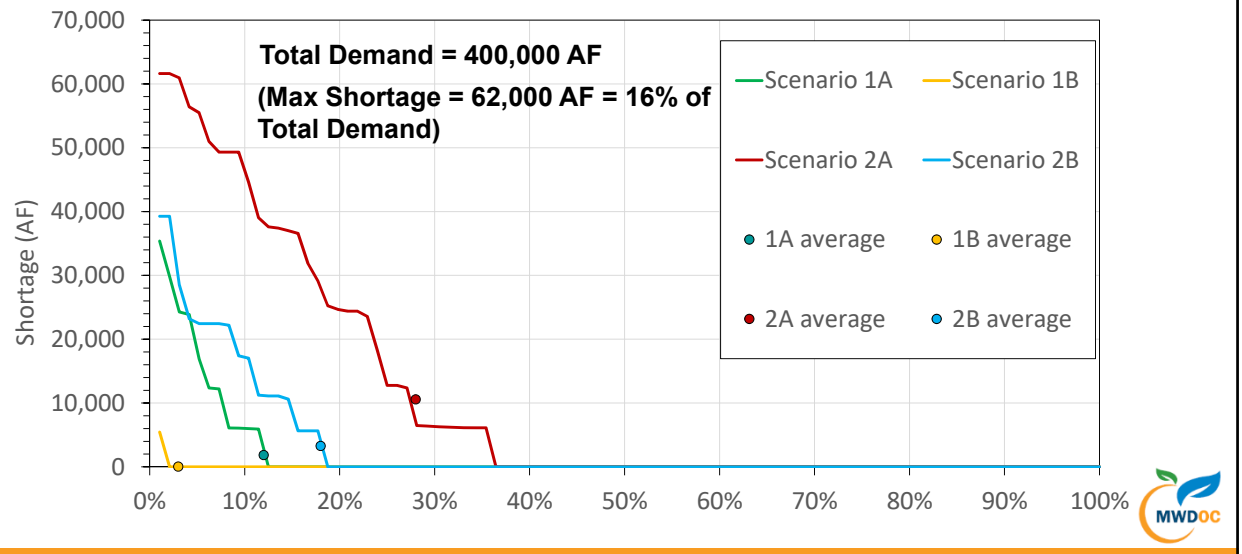
Comparison of MET Supply Gaps in 2050 Under Different Levels of Climate Change



South OC 2050 Reliability Curves Without New OC Investments



OC Basin 2050 Reliability Curves Without New OC Investments



Agencies Can Take Different Paths to be Reliable

- Decide on the role of Demand Curtailment, at what level and frequency
- Account for integration of base loaded supplies, to minimize shutting down projects in low demand months
- Optional Paths:
  1) Base load supplies for the peak shortages (max gap); concern is over-investing
  2) Base load supplies for the average shortages; concern is under-investing
  3) Demand curtailment and use of extraordinary supplies; concern is not as reliable
  4) Middle ground: combinations of demand curtailment for rare events, extraordinary supplies for less rare but significant shortage events, and base loaded supplies for more dependability

SOC Supply – Range of Remaining Gaps after Conservation

Scenario	2030 Max GAP AFY	2040 Max GAP AFY	2050 Max GAP AFY	Max Gap	Conservation at 10%	Remaining GAP
1 A) Minimal Climate Impacts with Low-Cost MET Investments	27,000	24,000	28,000	28,000	12,000	16,000
1 B) Minimal Climate Impacts with High-Cost MET Investments	22,000	0	5,000	22,000	12,000	10,000
2 A) Significant Climate Impacts with Low-Cost MET Investments	57,000	53,000	53,000	57,000	12,000	45,000
2 B) Significant Climate Impacts with High-Cost MET Investments	56,000	26,000	37,000	56,000	12,000	44,000
					Range after conservation	10,000 – 45,000

OC Basin - Range of Remaining Gaps after Conservation

Scenario	2030 Max GAP AFY	2040 Max GAP AFY	2050 Max GAP AFY	Max Gap	Conservation at 10%	Remaining GAP
1 A) Minimal Climate Impacts with Low-Cost MET Investments	56,000	35,000	41,000	56,000	40,000	16,000
1 B) Minimal Climate Impacts with High-Cost MET Investments	22,000	0	5,000	22,000	40,000	0
2 A) Significant Climate Impacts with Low-Cost MET Investments	62,000	62,000	62,000	62,000	40,000	22,000
2 B) Significant Climate Impacts with High-Cost MET Investments	56,000	28,000	39,000	56,000	40,000	16,000
					Range after conservation	0 – 22,000

Potential Local Projects by OCWD NOT included in the modeling

Project	Amount (afy)
CADIZ for OCWD supplies	5,000 to 10,000
West Orange County Well Field	3,000 to 6,000
Prado Dam Operations to 505' year round	≈7,000
Purchasing Upper SAR Watershed Supplies	?
Silting up of Prado Dam (loss of storage)	?
GWRS RO Brine Recovery	5,000 to 10,000
Purchase Land for Additional Replenishment Basins	?
SARCCUP – dry year yield	12,000
Chino Basin Water Bank	?
Capture Urban Runoff/Shallow GW for Recycling	?

? = Amount not available at this time

OC Project Summary for Water Supply

(all projects except Cadiz and Strand Ranch assumed to get LRP funding for 15 years at $475)

Project	Online Date	Yield (AFY)	Startup Year Cost/AF	Year 2030 Cost/AF	Year 2040 Cost/AF	Year 2050 Cost/AF
Cadiz Water Bank – SMWD	2020	5,000	1,275	1,768	2,391	3,236
Cadiz Water Bank – Retail	2020	5,000	1,651	2,165	2,822	3,710
San Juan Watershed Project[1]	2022	9,480	1,521	1,812	2,762	3,258
Doheny Local (SCWD)[1]	2021	5,321	1,623	1,894	2,746	3,224
Doheny Regional[1]	2026	10,642	1,712	1,856	2,281	3,296
Poseidon SOC[1]	2023	15,964	2,119	2,283	3,042	3,398
Poseidon OC Basin[1]	2023	36,164	2,183	2,341	3,177	3,430
Strand Ranch Water Bank - Pilot	2019	5,000				
MET Water – 1A				1,679	2,261	3,029
MET Water – 1B				1,925	2,551	3,373
MET Water – 2A				1,715	2,276	3,045
MET Water – 2B				1,967	2,787	3,649

MET Rate Projections under Scenarios – does not include allocation surcharge

1 – Year LRP funding ends for each project: San Juan Watershed - 2035; Doheny Local - 2036; Doheny Regional - 2041; Poseidon SOC - 2038; Poseidon OC Basin - 2038

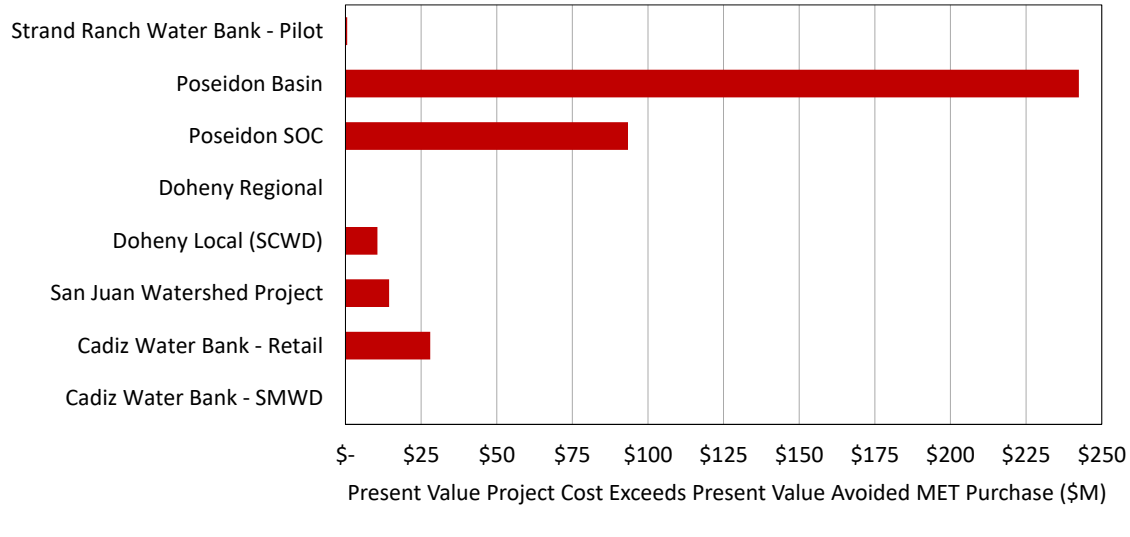
OC Projects Supply Economic Ranking:

NPV = Net Present Value
EM = Evaluation Metric

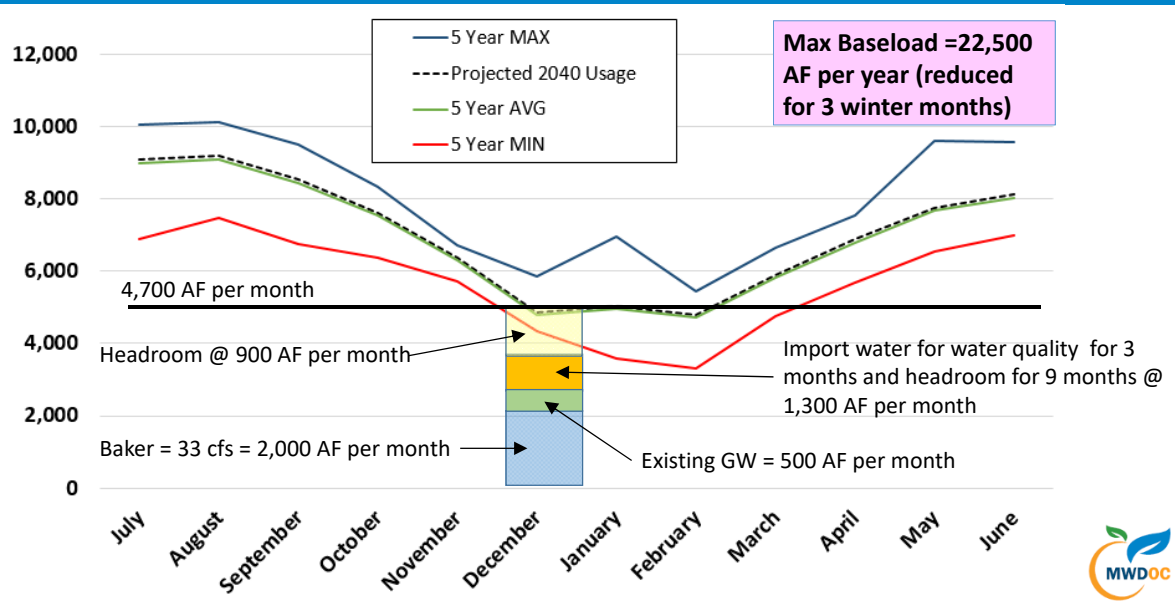
Project	Scenario 1A		Scenario 1B		Scenario 2A		Scenario 2B		Average
	NPV	EM	NPV	EM	NPV	EM	NPV	EM	
	Rank								
Cadiz Water Transfer – SMWD	1	1	2	1	2	3	2	3	**1.9**
Cadiz Water Transfer – Additional	6	6	6	5	6	6	6	6	**5.9**
San Juan Watershed Project	5	3	5	3	3	5	3	5	**4.0**
Doheny Local (SCWD)	4	4	4	4	4	4	4	4	**4.0**
Doheny Regional	3	2	1	2	1	2	1	2	**1.8**
Poseidon SOC	7	7	7	6	7	7	7	7	**6.9**
Poseidon OC Basin	8	8	8	7	8	8	8	8	**7.9**
Strand Ranch Water Bank – Pilot	2	5	3	8	5	1	5	1	**3.8**

Potential Downside Financial Risk for Supplies

Local investment is made, but supply reliability turns out to be good (Scenario 1B)



Project Sizing Based on Base Load Limitations - SOC 2040



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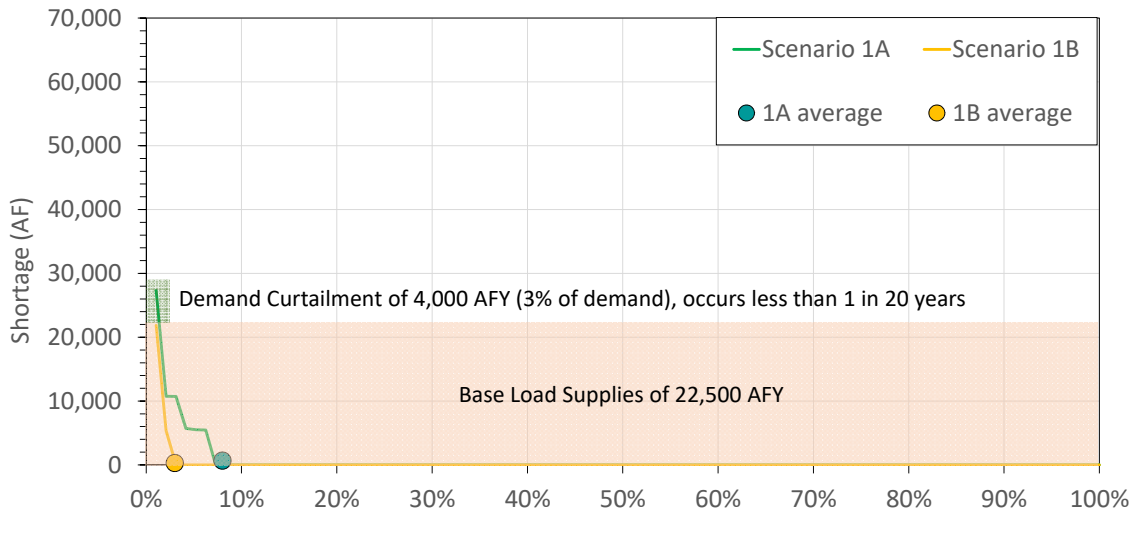
					Range after conservation	10,000 – 45,000

SOC Building Blocks of Reliability Generalized for 2030



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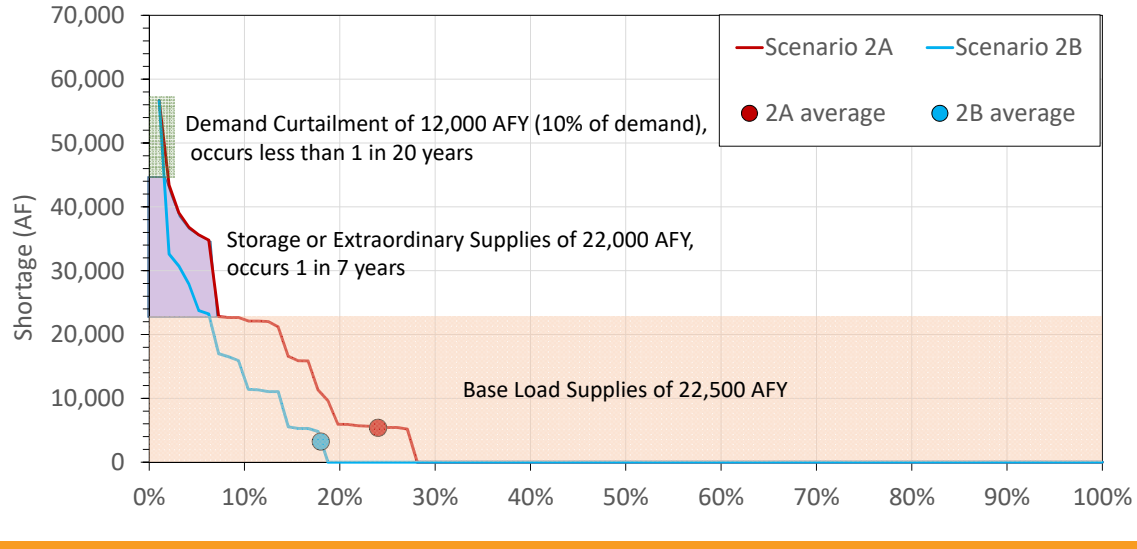
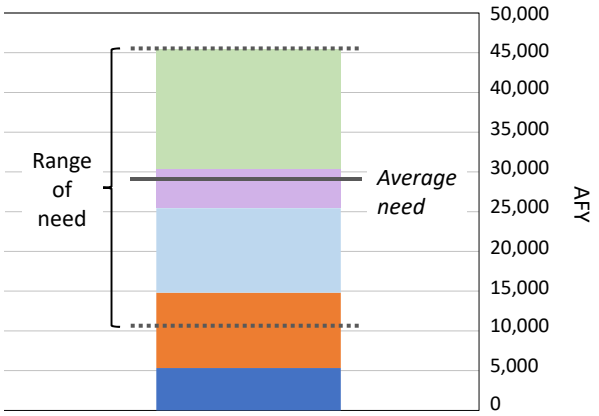


SOC Portfolio for Supply Reliability

- **Four most cost effective local projects build the base**
  - **Doheny Local**
  - **San Juan Watershed**
  - **Doheny Regional**
  - **Cadiz SMWD**
- **Additional capacity added with Storage or Extraordinary Supply Projects**



Supply Reliability Portfolio (AFY)

Doheny Local (SCWD) **San Juan Watershed Project** **Doheny Regional**
Emergency Groundwater **Cadiz SMWD** **Extraordinary Supplies**

OC Basin Supply Gaps with No New OC Projects

Scenario	2030 Max GAP AFY	2040 Max GAP AFY	2050 Max GAP AFY	Max Gap	Conservation at 10%	Remaining GAP
1 A) Minimal Climate Impacts with Low-Cost MET Investments	56,000	35,000	41,000	56,000	40,000	16,000
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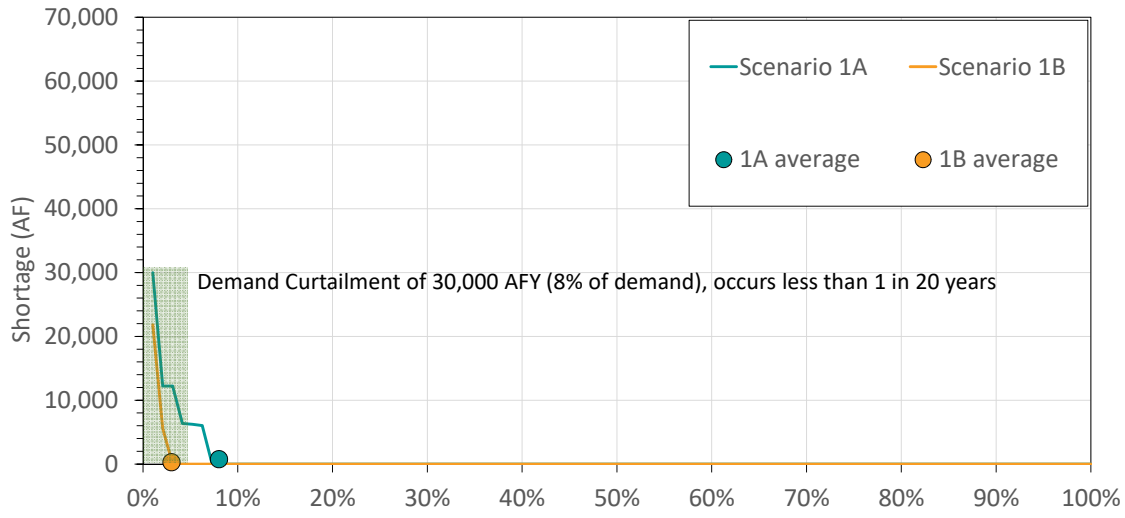
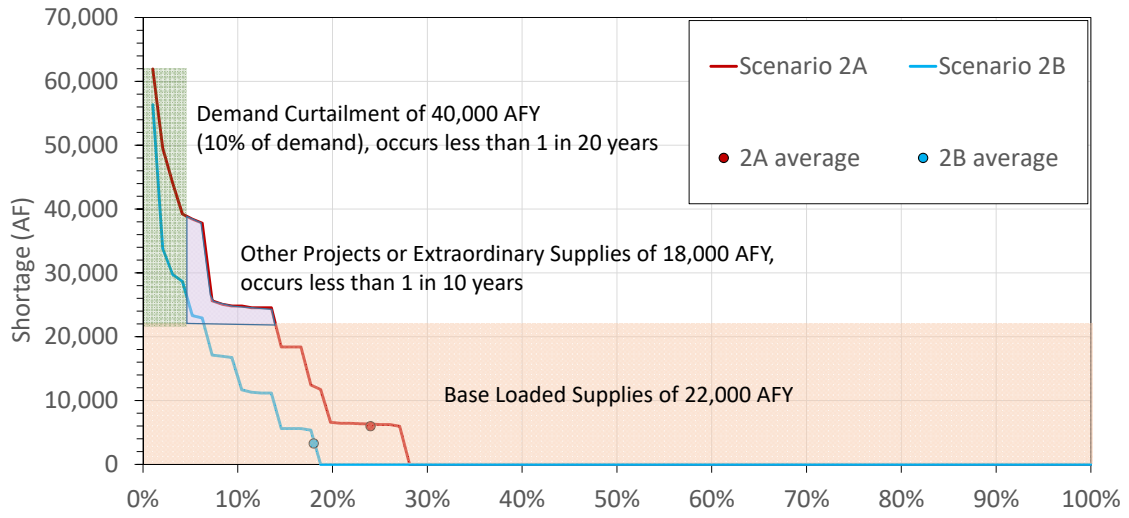


OC Basin Building Blocks of Reliability Generalized for 2030



Primary Findings – 2018 OC Reliability Study

1) Reliability in the OC Basin area, with 10% demand curtailment once every 20 years, is acceptable and there are a number of projects that can improve basin reliability.
2) Emergency supply needs in the event of a MET **system** outage exist today in the South Orange County (SOC) area and is the major driver for new local projects in SOC.
3) SOC needs additional **supply** projects, beyond the emergency supply needs, even with the demand curtailment of 10% every 20 years.
4) There are number of projects that can meet both the emergency and supply reliability needs of SOC but they differ significantly in cost, cost-efficiency, yield and ability to integrate into the existing system.

Primary Findings – 2018 OC Reliability Study

5) The San Juan Watershed Project and the Doheny Project both provide cost-effective annual and emergency supplies. Therefore, they should make up the core reliability improvement strategy in SOC. Collectively, these projects can provide the following supply volumes:

	Supply	System
	Maximum Supply (AFY)	Peak Supply (MGD)
Doheny	15,963	14.25
San Juan Watershed	9,480	8.50
Total	25,443	22.75
Maximum Need	45,000	27.50
Remaining Need	19,557	4.75

Remaining Needs

Recommend 10 to 20 mgd for flexibility

Primary Findings – 2018 OC Reliability Study

6) There are several issues with developing base loaded local supplies:

- **Operational constraints include those ensuring full project delivery during winter month demands and maintaining minimum imported water deliveries to maintain adequate water quality in the distribution system**
- **Local projects can result in the stranding of MET assets**
- **MET's Water Supply Allocation Plan (WSAP) does not provide a 1:1 supply benefit for local projects during allocations**
- **These base load supply issues could be addressed by changes to MET WSAP policies, changes in operations of existing and new supplies during winter months, or by seeking drought protection by way of water storage or extraordinary supplies.**

Primary Findings – 2018 OC Reliability Study

7) Additional study is recommended to determine the appropriate sizing of Doheny and Phases 2 and 3 of the San Juan Watershed projects, reflecting system integration and operational issues during winter months.

8) The Strand Ranch drought protection program was evaluated as a seven year pilot program. MWDOC should use the methods and results available from the 2018 study to further structure the pilot program and to develop terms and conditions for a potentially expanded program with Strand Ranch or other extraordinary supply programs (e.g., SARCCUP). The potential term would extend beyond the start-up of the WaterFix.

Additional Findings – 2018 OC Reliability Study

A. The Carson IPR Project may be the next least cost supply available to the OC Basin, pending final terms and conditions. MWDOC and OCWD should work together to fully evaluate the opportunity.

B. OCWD is pursuing the SARRCUP Project which could provide significant benefits in the form of extraordinary supply. If not needed by the OC Basin, the utilization by others in OC should be evaluated. MWDOC and OCWD should work together on this effort.

C. Given that the Poseidon SOC Project was not cost-effective relative to other SOC options, a full 56,000 AFY Poseidon project for the OC Basin would incur greater system integration costs than included in this study, thereby resulting in lower cost-effectiveness than presented.

Additional Findings – 2018 OC Reliability Study

D. Given the scenarios examined, the Poseidon Project is not cost effective to augment the OC Basin when compared to MET water (including purchases with the allocation surcharge). However Poseidon would be beneficial to OC under the following circumstances:

- **MET implements Poseidon as a regional project**
- **Climate change is even more extreme than the Significant Climate Change Scenarios (low probability) resulting in low reliability from MET, and OC decides to implement the project**
- **OC decides that we want a higher degree of independence from MET and that the Poseidon Project should be implemented in spite of cost impacts.**

Additional Findings – 2018 OC Reliability Study

E. A new 400,000 AF storage reservoir in Southern California will only be beneficial under specific future conditions when there are sufficient supplies available to put into storage and when the additional storage is needed to meet demands. The specific conditions are rare occurrences and it is unlikely that a large reservoir investment would be cost efficient.

F. MWDOC should use the information developed herein to support efforts at MET regarding:

- **The clarity of MET's development and presentation of their IRP for 2020, especially with respect to future investments needed for full reliability under a range of alternatives including adverse climate change.**
- **Need for changes in MET's LRP program and MET's WSAP to provide opportunities for improved drought protection by the Member Agencies.**

Additional Findings – 2018 OC Reliability Study

G. While the 2016 and 2018 study results indicated minimal emergency supply needs for the OC Basin and Brea/La Habra areas, there remains a critical need for backup generators throughout Orange County.

Next Steps

- Continue discussions with agencies
- Comments to November MWDOC P&O Committee; need to submit by October 26
- Work on spin-off efforts from study