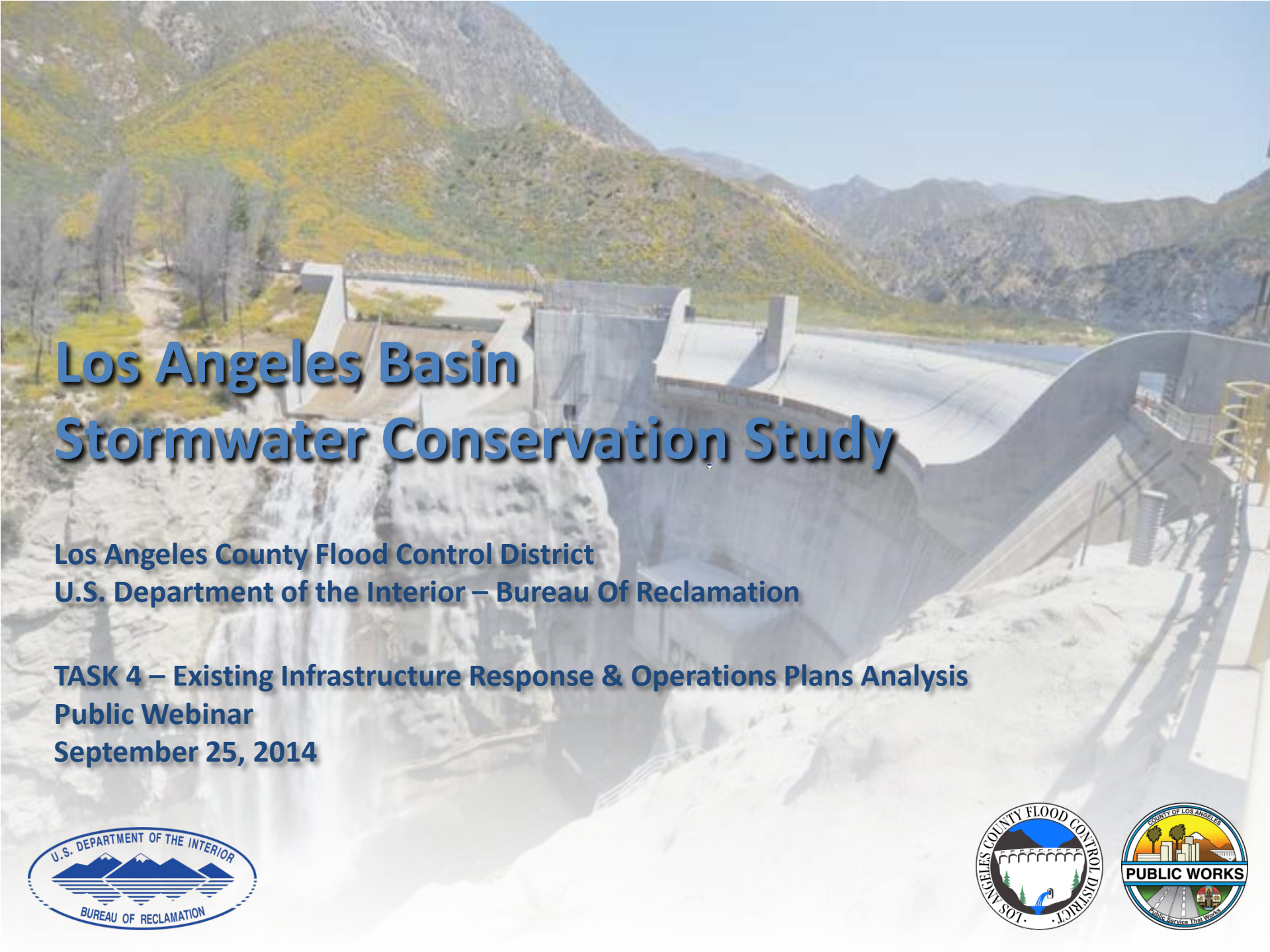


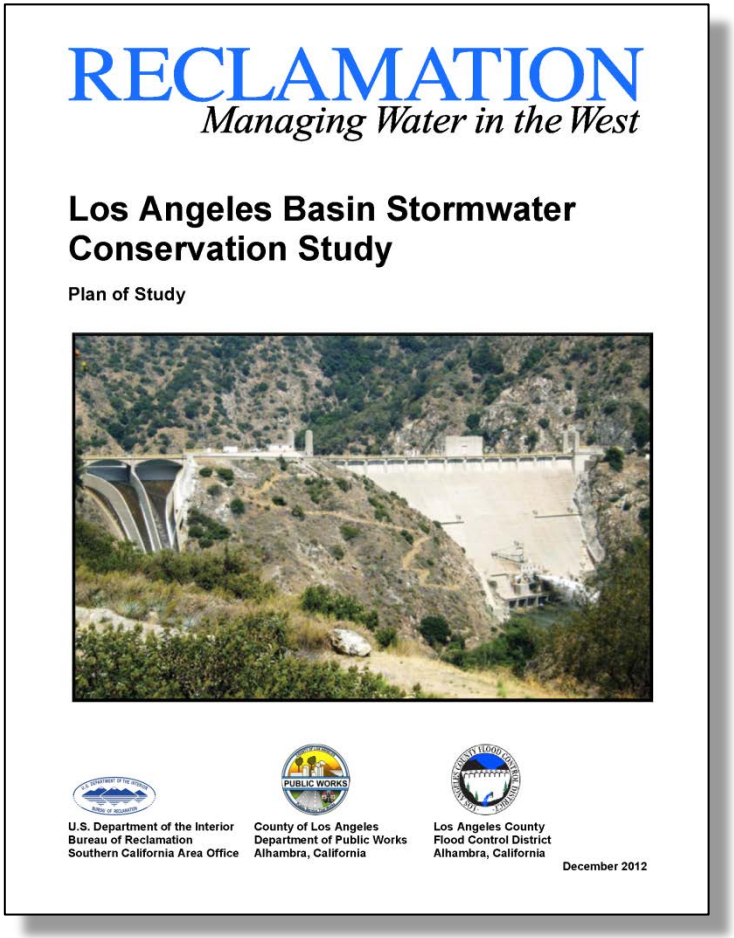
Los Angeles Basin Stormwater Conservation Study

Los Angeles County Flood Control District
U.S. Department of the Interior – Bureau Of Reclamation

TASK 4 – Existing Infrastructure Response & Operations Plans Analysis
Public Webinar
September 25, 2014

Overview

- **Study Background**
- **Progress Update / Schedule**
- **Task 4 Findings**
  - Dams
  - Spreading Grounds
  - Channel Outlets
- **Next Steps**



Study Partnership

Collaboration between »

- Los Angeles County Flood Control District
- U.S. Department of the Interior – Bureau of Reclamation

Cost Estimate » $2.4 million

Study Length » 3 Years

- Completion in December 2015
- Task 4 Started January 2014

Study Objectives

Study Objectives

1) Evaluate existing water conservation under future conditions
2) Evaluate potential new facilities and operational changes for a future climate

Methodology

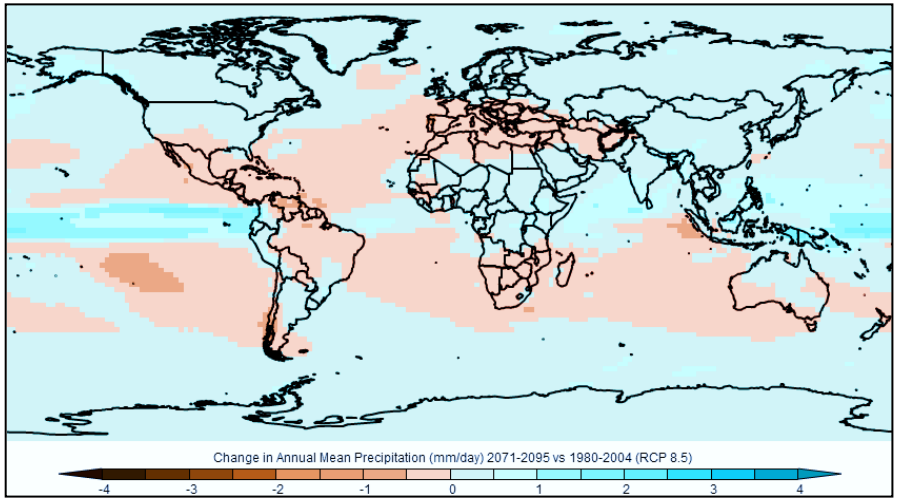
- Detailed scientific, engineering & economic analyses
- Coordinating with existing & proposed planning efforts
- Developing partnerships & stakeholder involvement

Outcome

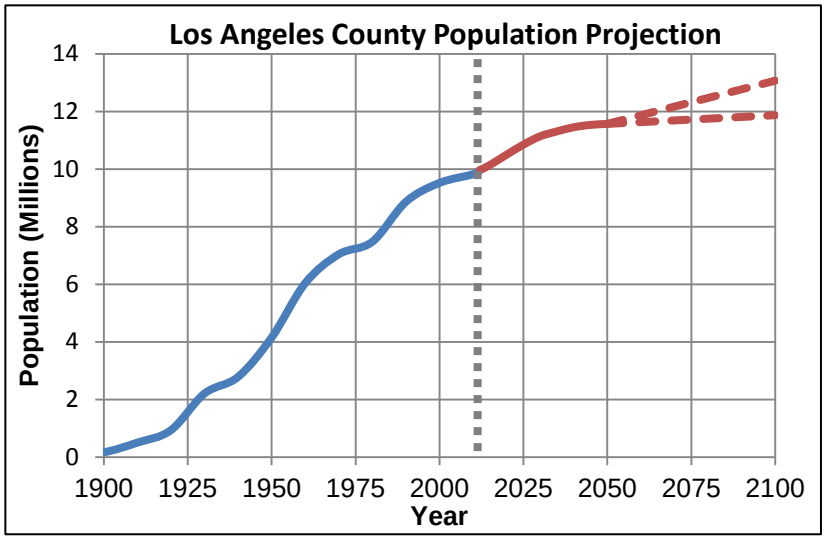
- ***Tool for future planning by LACFCD and other local partners***

Key Considerations

- Climate Change
- Population growth

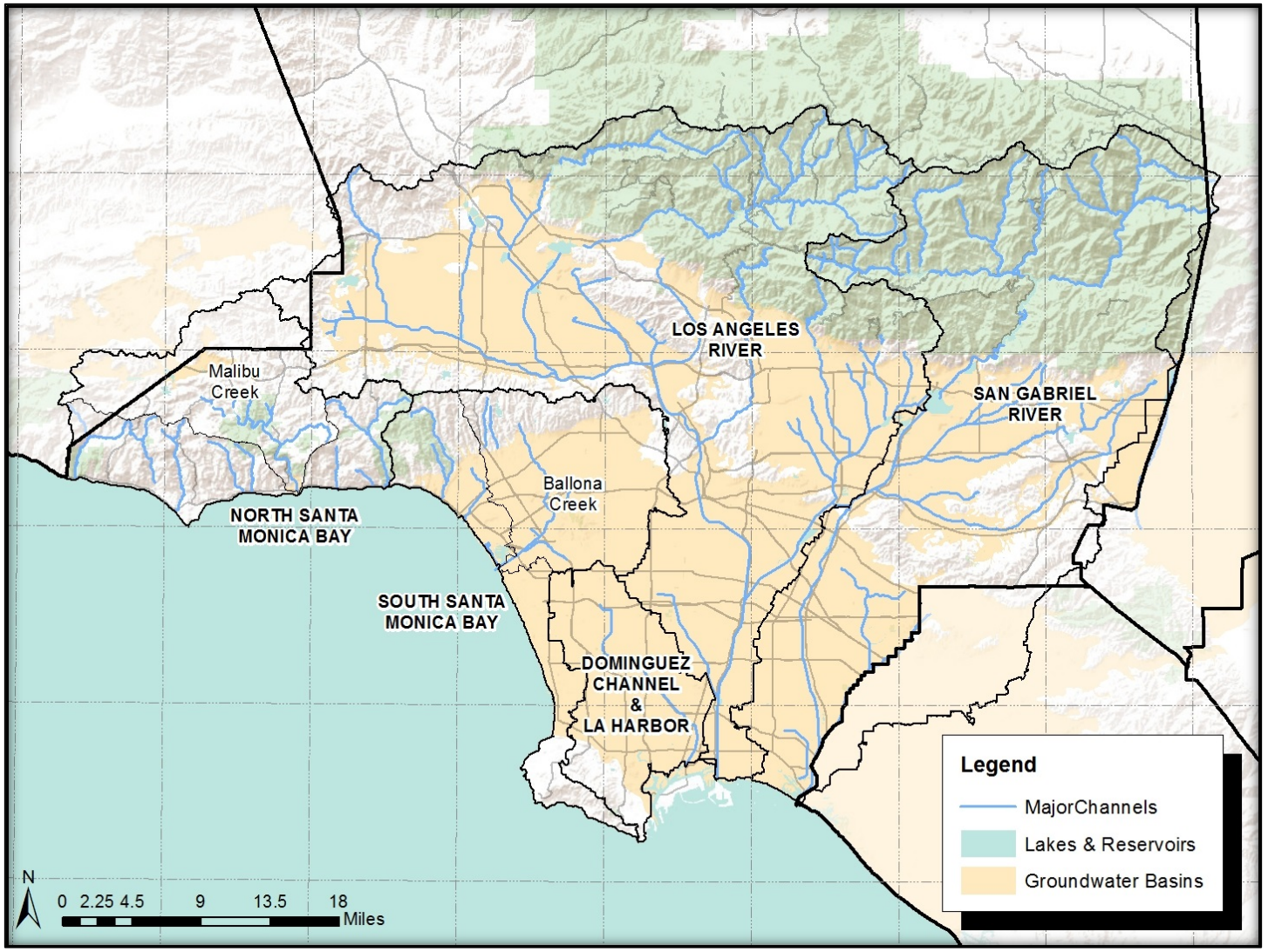


USGS - CMIP5 Global Climate Change Viewer

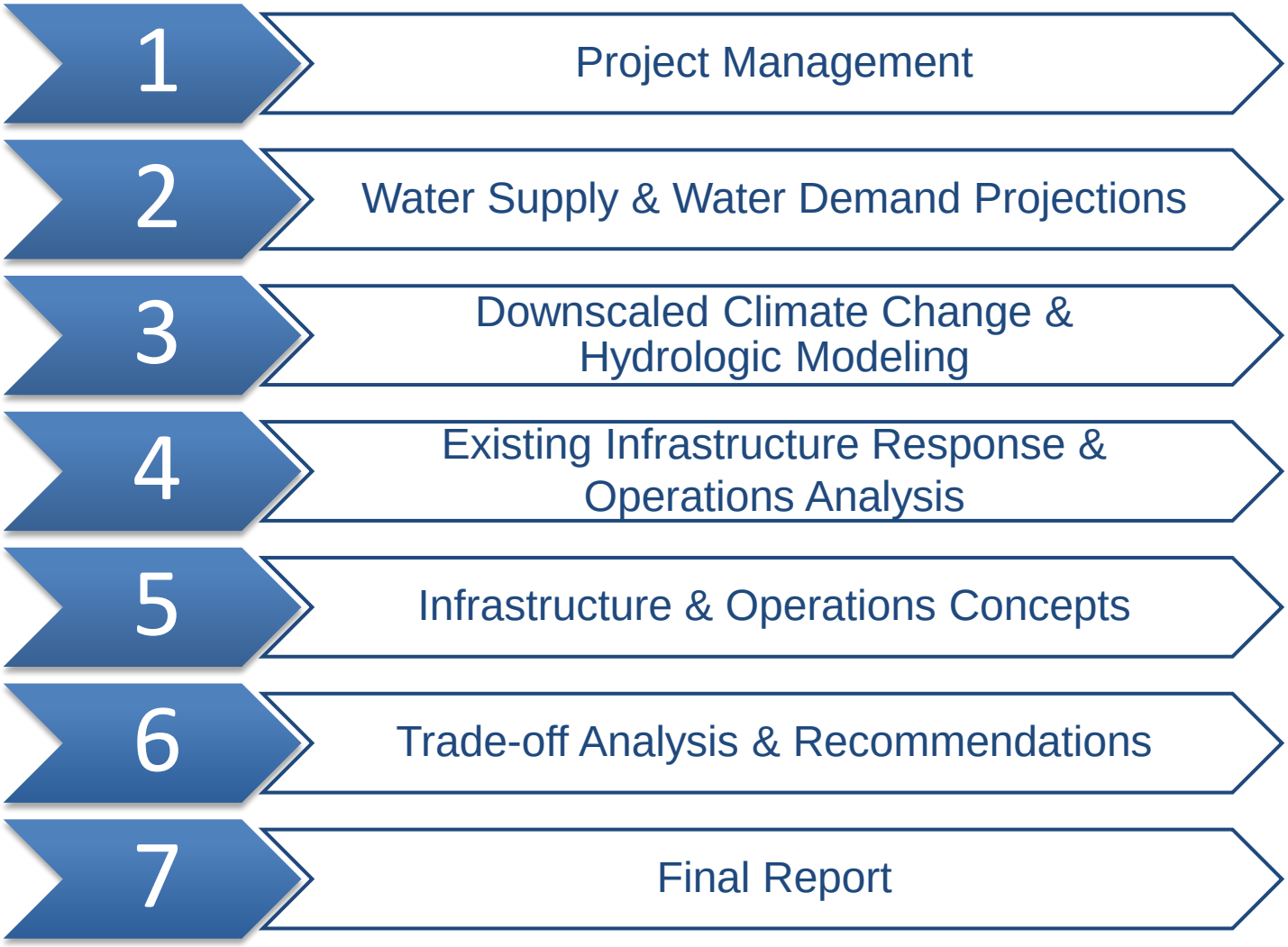


California Department of Finance, - State and County Population Projections

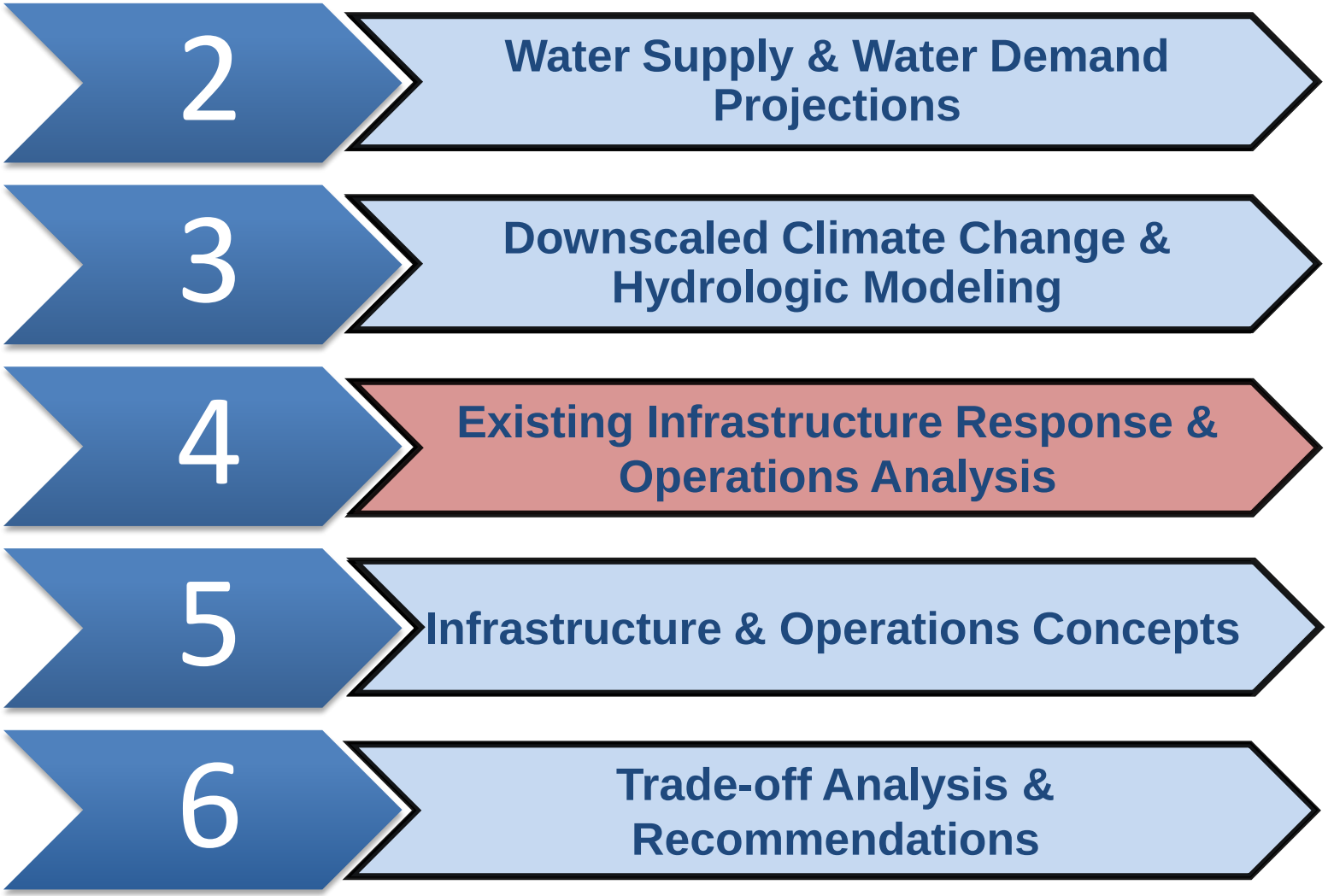
Study Area


LOS ANGELES RIVER
Malibu Creek
SAN GABRIEL RIVER
Ballona Creek
NORTH SANTA MONICA BAY
SOUTH SANTA MONICA BAY
DOMINGUEZ CHANNEL & LA HARBOR
Legend
MajorChannels
Lakes & Reservoirs
Groundwater Basins
N
0 2.25 4.5 9 13.5 18
Miles

Study Tasks


1
Project Management
2
Water Supply & Water Demand Projections
3
Downscaled Climate Change & Hydrologic Modeling
4
Existing Infrastructure Response & Operations Analysis
5
Infrastructure & Operations Concepts
6
Trade-off Analysis & Recommendations
7
Final Report

Major Study Tasks

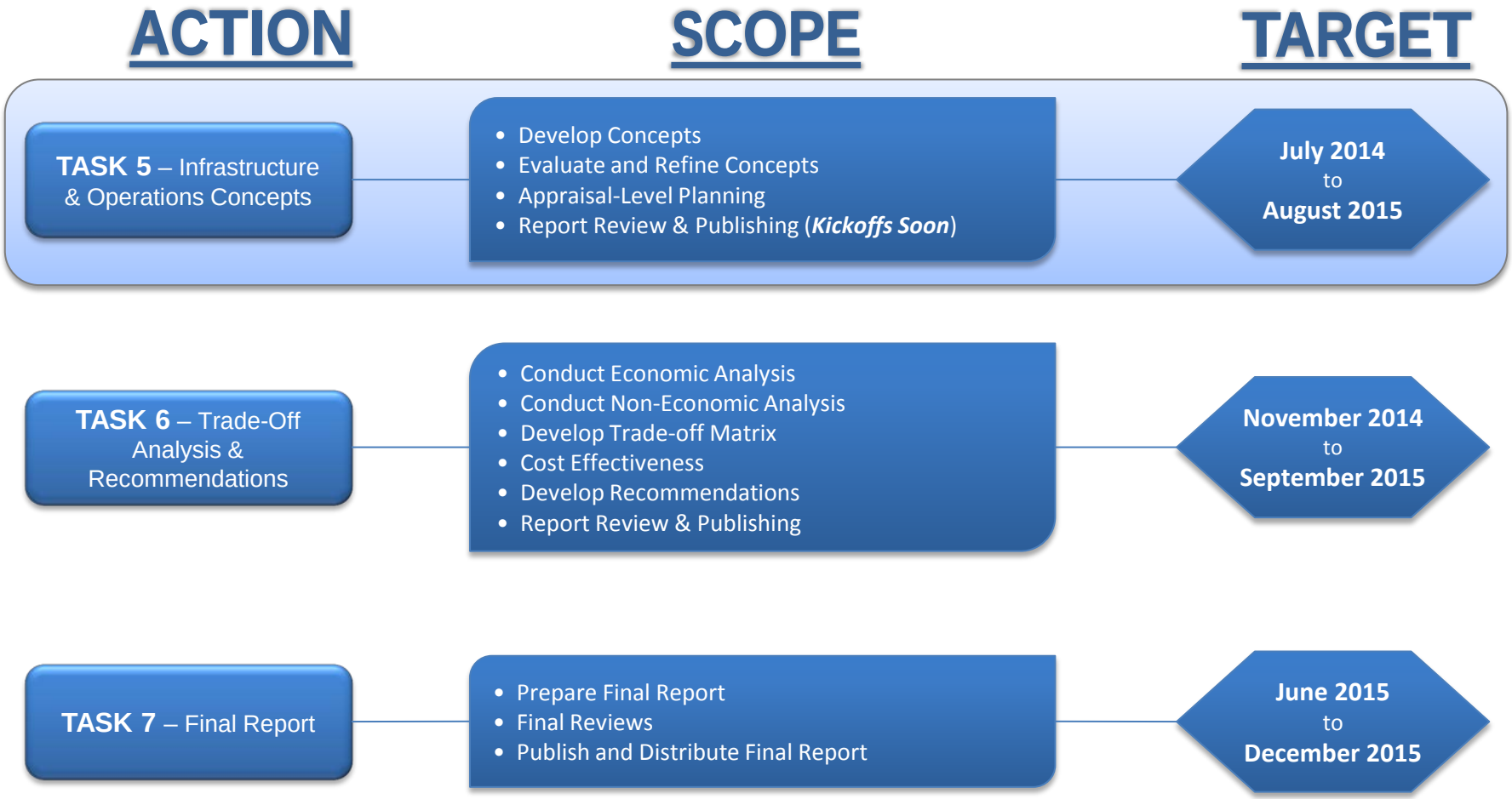


Study Schedule

ACTION	SCOPE	TARGET
TASK 1 – Study Project Management	• General oversight and project guidance • Study Task Facilitation/Coordination • Study Outreach (***Ongoing***)	**January 2013** to **December 2015**
TASK 2 – Water Supply & Demand Projections	• Water Supply & Demand Literature Review • Supply Analysis • LACFCD Water Conservation System Contributions • Report Review & Publishing (***In Progress***)	**March 2014** to **November 2014**
TASK 3 – Downscaled Climate Change & Hydrologic Modeling	• Downscaled Climate Change [illegible] • Hydrologic [illegible] • Report [illegible] (***Complete***)	**February 2013** to **December 2013**
TASK 4 – Existing Infrastructure Response & Operations Plans Analysis	• Response to Current Climate • Response to Future Climate • Report Review & Publishing (***Review Draft Report***)	**September 2013** to **September 2014**

COMPLETE

Study Schedule

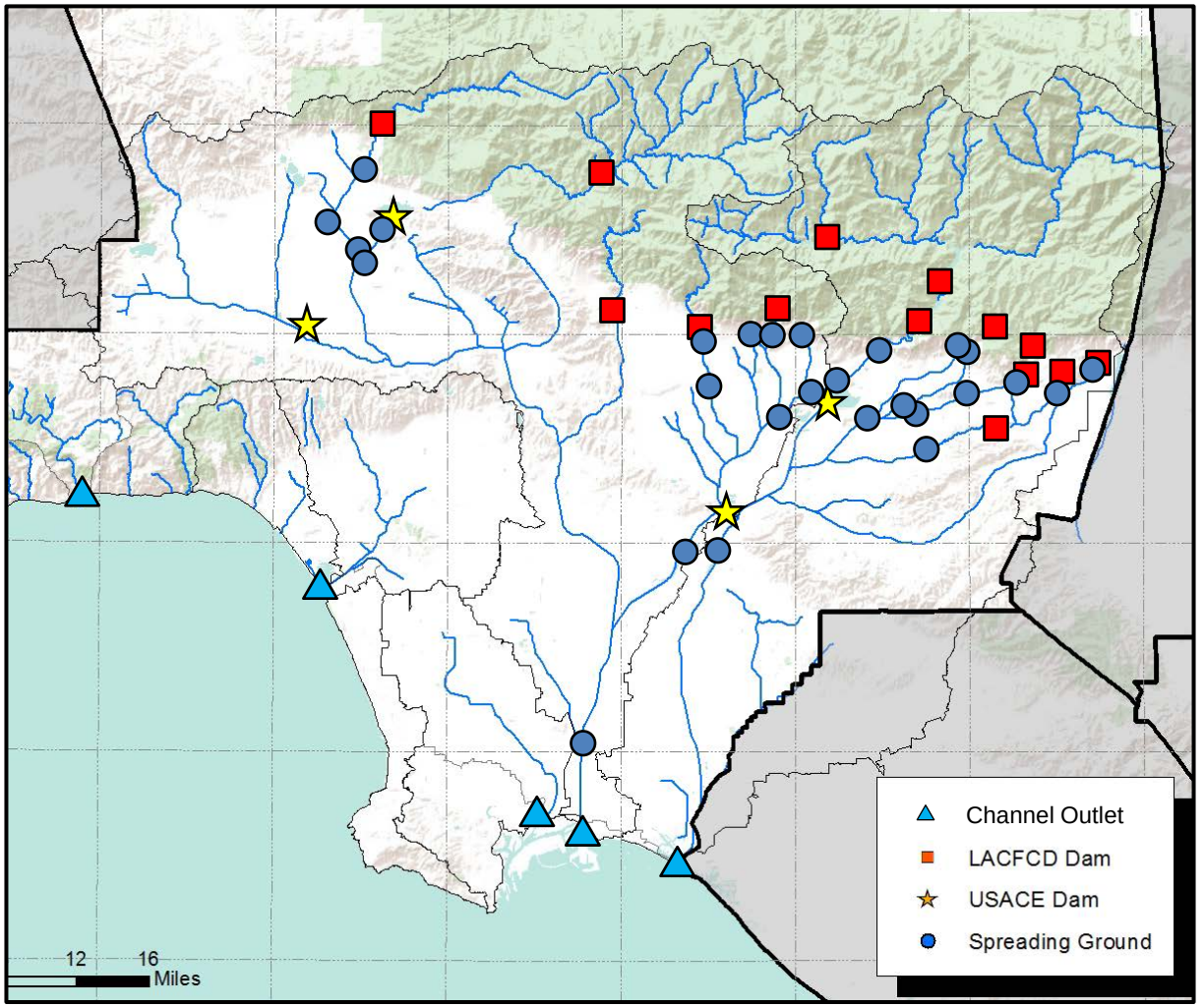


Task 4 Overview

- **Existing Infrastructure**
- **Task 4 Subtasks**
  - **Task 4.1 – Analyze Response to Current Climate**
    - Investigate existing water conservation and flood control facilities
  - **Task 4.2 – Analyze Response to Future Climate**
    - Assess existing facilities under future climates
- **Dam Methodology & Results**
- **Spreading Ground Methodology & Results**
- **Channel Outlet Methodology & Results**

Existing Infrastructure

- **18 Dams**
  - 14 LACFCD
  - 4 Army Corps
- **26 Spreading Grounds**
- **5 Major Channel Outlets**



Task 4 Subtasks

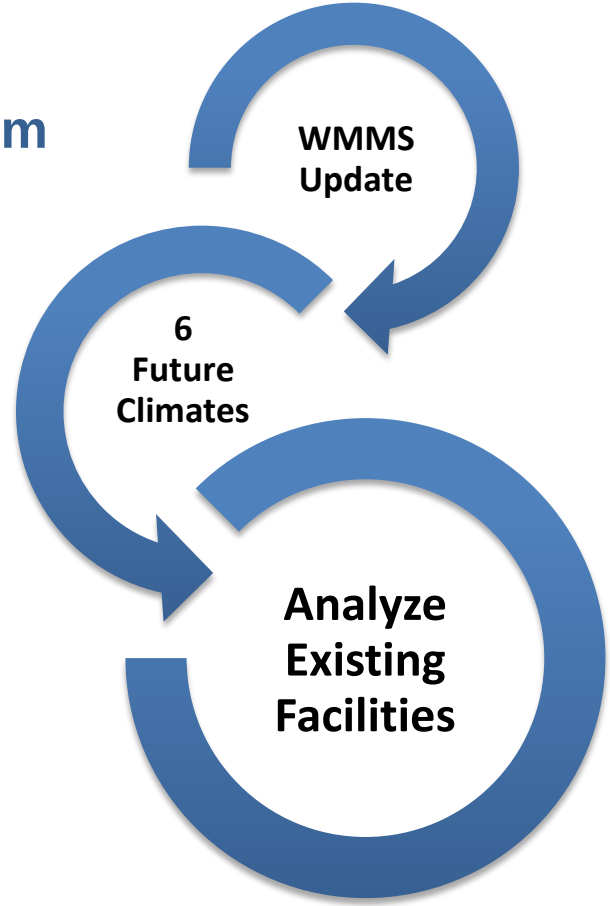
- **Task 4.1 – Analyze Response to Current Climate**
  - Investigate existing water conservation and flood control facilities
    - Use current operation guidelines & existing capacities
    - Review and update existing WMMS facility models
  - Analyze current climate results for stormwater

- **Task 4.2 – Analyze Response to Future Climate**
  - Assess current operation guidelines & existing capacities under future climates
    - Analyze a range of future climate scenarios
  - Rank facilities for the future climate scenarios

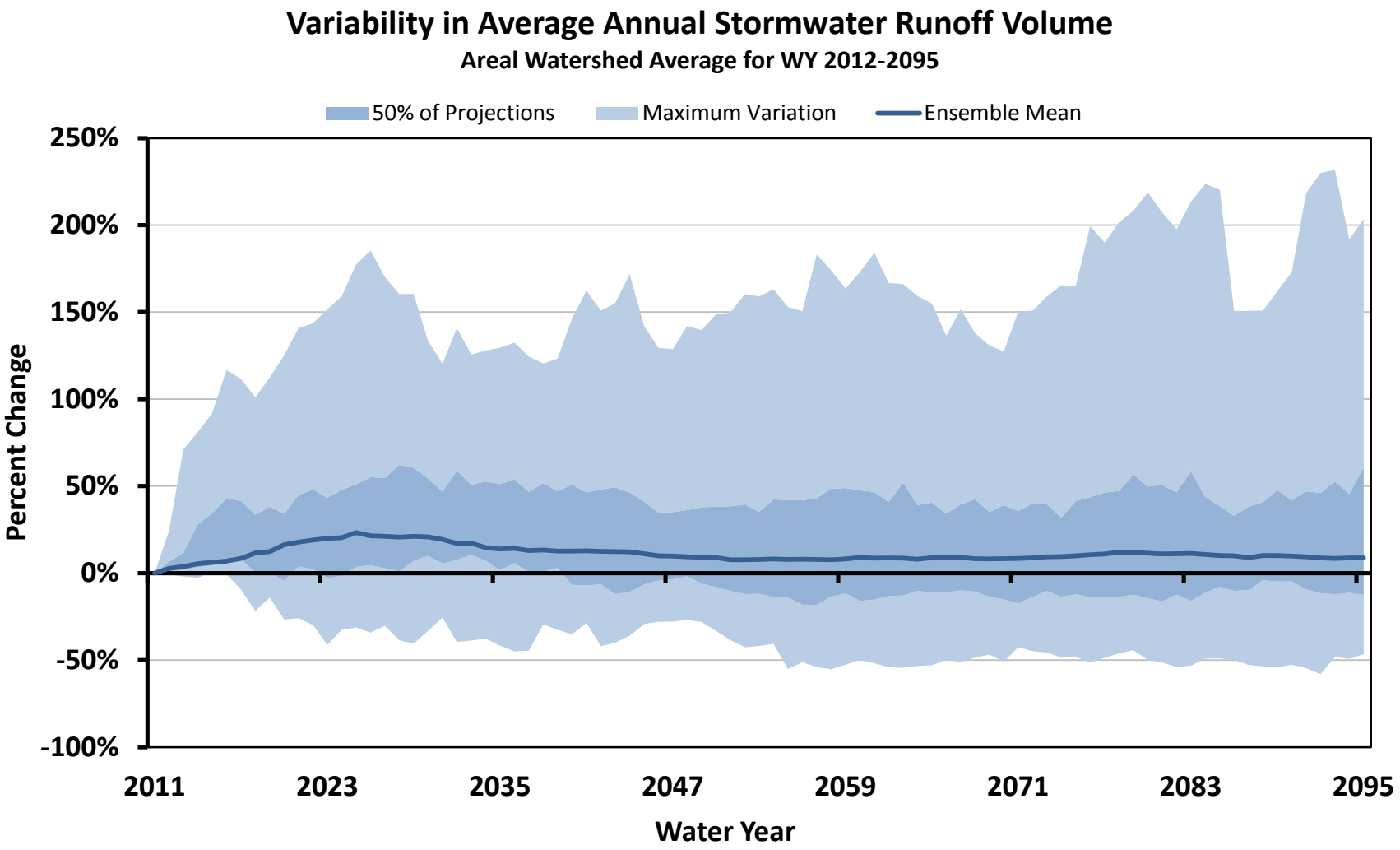
Task 4 Modeling

Watershed Management Modeling System

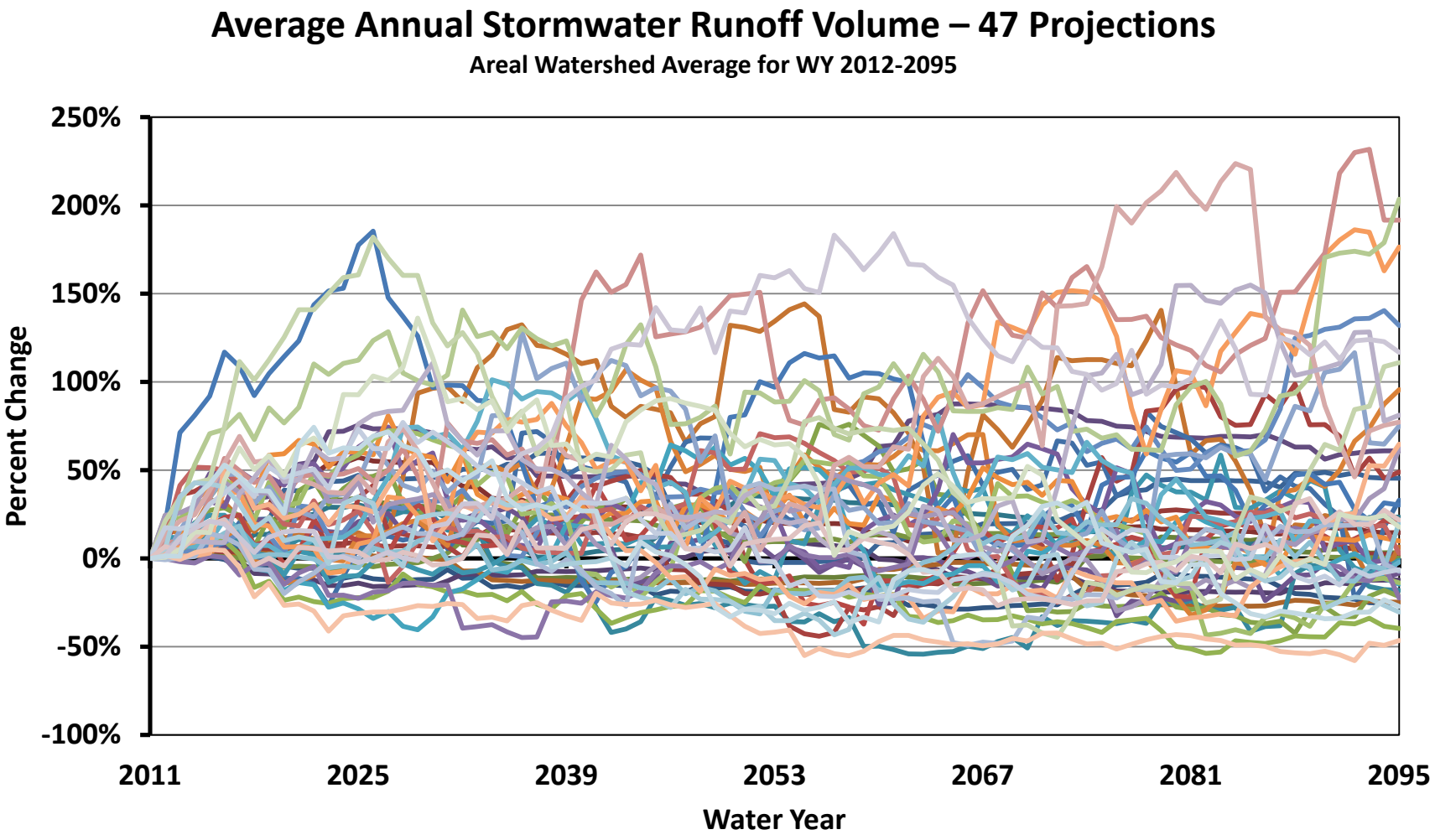
- Historic Hydrology for Existing Conditions
  - Water Year 1987-2000
  - *Baseline Conditions*
- Projected Hydrology for Future Conditions
  - Water Year 2012-2095



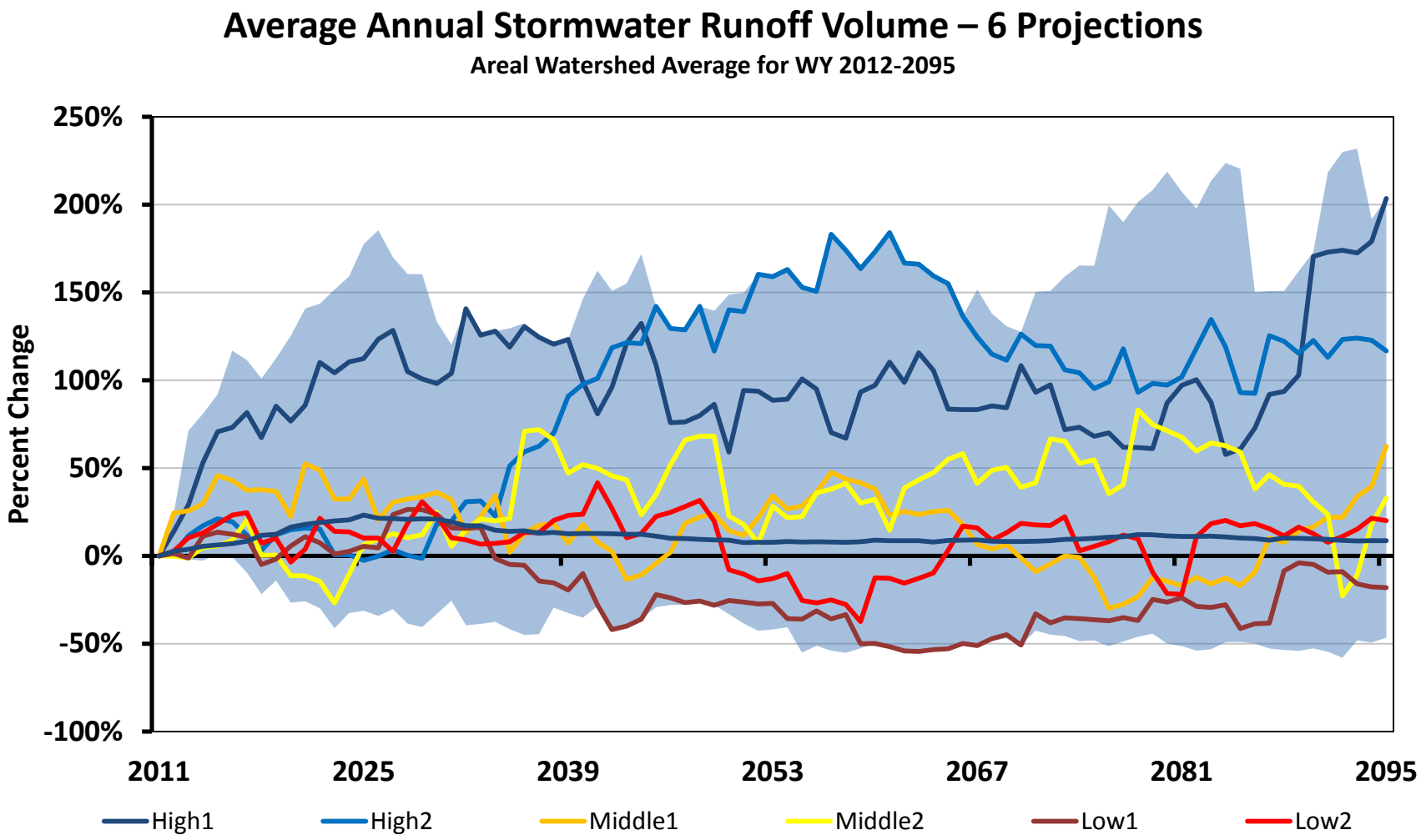
Future Hydrology Projections



Future Hydrology Variability

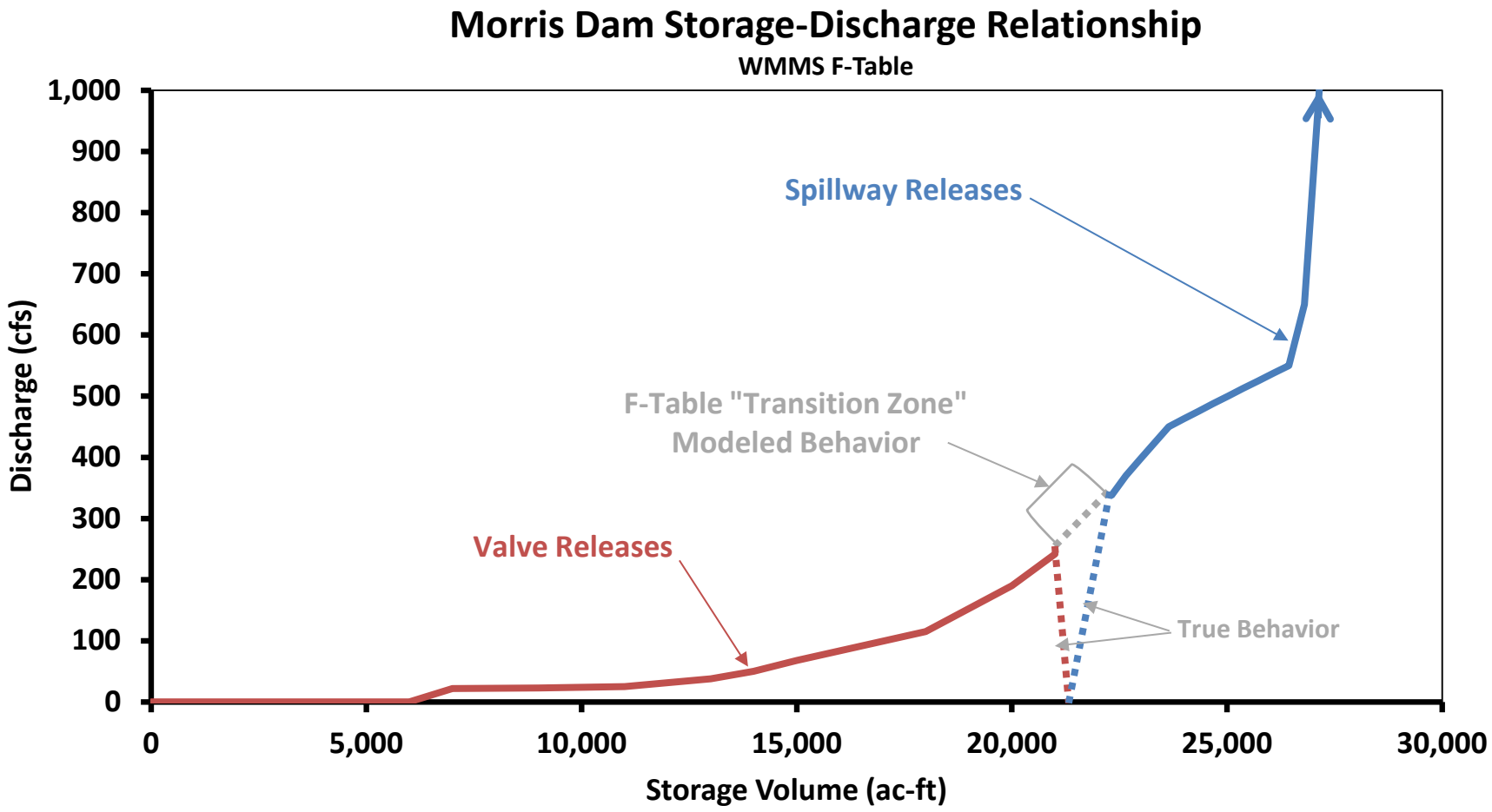


Future Projection Selection



Methodology – Dams/Reservoirs

Review and Update Existing WMMS Dam F-Tables



Dam Metrics & Criteria

Analysis of the dams and reservoirs used four key stormwater metrics to determine their performance:

- Average Annual Volume of Stormwater Captured or Retained
- Average Annual Volume of Stormwater Discharged through Spillway
- Frequency of Spillway Events
- PMF Exceedance Events

Ranking criteria for each of the dams included the following:

D1. Historic capture efficiency

D2. Future capture efficiency

D3. Change in capture efficiency from historic to future

D4. Historic frequency of spillway events

D5. Future frequency of spillway event

Dam Ranking Criteria

$$D1 = \left[\frac{(Average\ Capture\ Volume)_{Historic}}{(Average\ Capture\ Volume)_{Historic} + (Average\ Spillway\ Volume)_{Historic}}\right]$$

$$D2 = Min\left[\frac{(Average\ Capture\ Volume)_{6,Future}}{(Average\ Capture\ Volume)_{6,Future} + (Average\ Spillway\ Volume)_{6,Future}}\right]$$

$$D3 = D1 - D2$$

$$D4 = \left[\frac{(Number\ of\ Spillway\ Events)_{Historic}}{(14\ Historic\ Years)}\right]$$

$$D5 = Max\left[\frac{(Number\ of\ Spillway\ Events)_{6,Future}}{(84\ Future\ Years)}\right]$$

$$Final\ Rank = Average\ [D1, D2, D3, D4, D5]$$

Performance Levels

Performance Level	Performance Description	Prospective Enhancements	Priority
I	• ***High*** Efficiency • ***High*** Resiliency to Climate Change Projections	Potential Exists	Low ↕ High
II	• ***Moderate*** Efficiency • ***Moderate*** Resiliency to Climate Change Projections	Moderate Potential	
III	• ***Low*** Efficiency • ***Low*** Resiliency to Climate Change Projections	High Potential	

Dam Rankings

Table A-2. LACFCD Dams – Final Performance Levels

LACFCD Dams	D1	D2	D3	D4	D5	Average	Level
Big Dalton	1	4	4	1	4	2.8	II
Big Tujunga	13	13	13	10	10	11.8	III
Cogswell	11	11	12	7	7	9.6	II
Devils Gate	12	12	11	13	13	12.2	III
Eaton Wash	9	8	9	14	14	10.8	III
Live Oak	1	2	2	1	2	1.6	I
Morris	14	14	7	8	5	9.6	II
Pacoima	7	7	6	5	6	6.2	II
Puddingstone	1	1	1	1	1	1.0	I
Puddingstone Diversion	5	5	5	12	12	7.8	II
San Dimas	8	9	14	10	11	10.4	II
San Gabriel	10	10	10	9	9	9.6	II
Santa Anita	6	6	8	5	8	6.6	II
Thompson Creek	1	3	3	1	3	2.2	I

Task 4 Results – Dams

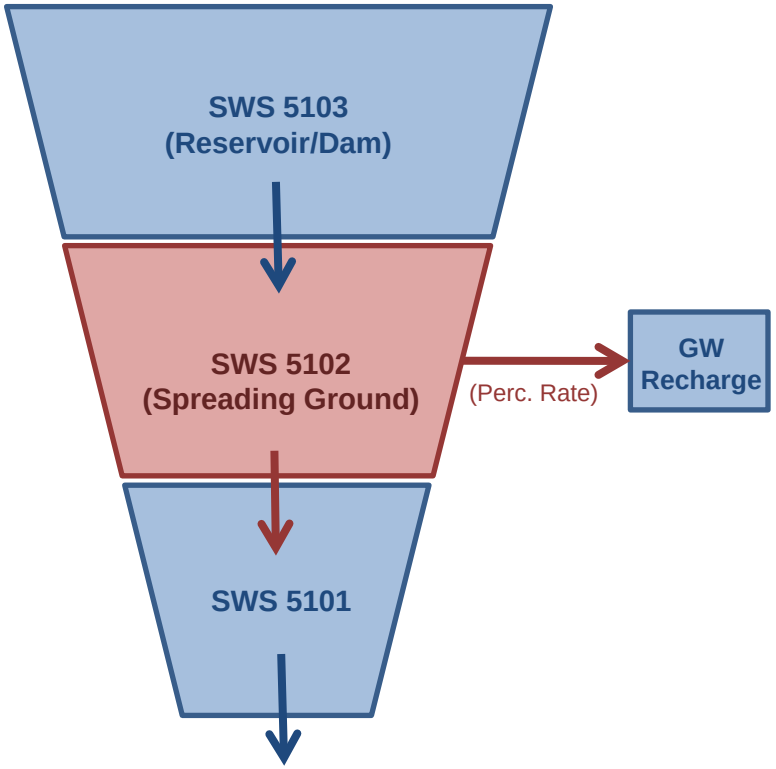
Dams/Reservoirs – Performance Levels					
#	LACFCD Dams	Level	#	LACFCD Dams	Level
1	Big Dalton	II	11	San Dimas	II
2	Big Tujunga	III	12	San Gabriel	II
3	Cogswell	II	13	Santa Anita	II
4	Devils Gate	III	14	Thompson Creek	I
5	Eaton Wash	III			
6	Live Oak	I	#	USACE Dams	Level
7	Morris	II	1	Hansen	II
8	Pacoima	II	2	Santa Fe	II
9	Puddingstone	I	3	Sepulveda	II
10	Puddingstone Diversion	II	4	Whittier Narrows	II

Methodology – Spreading Grounds

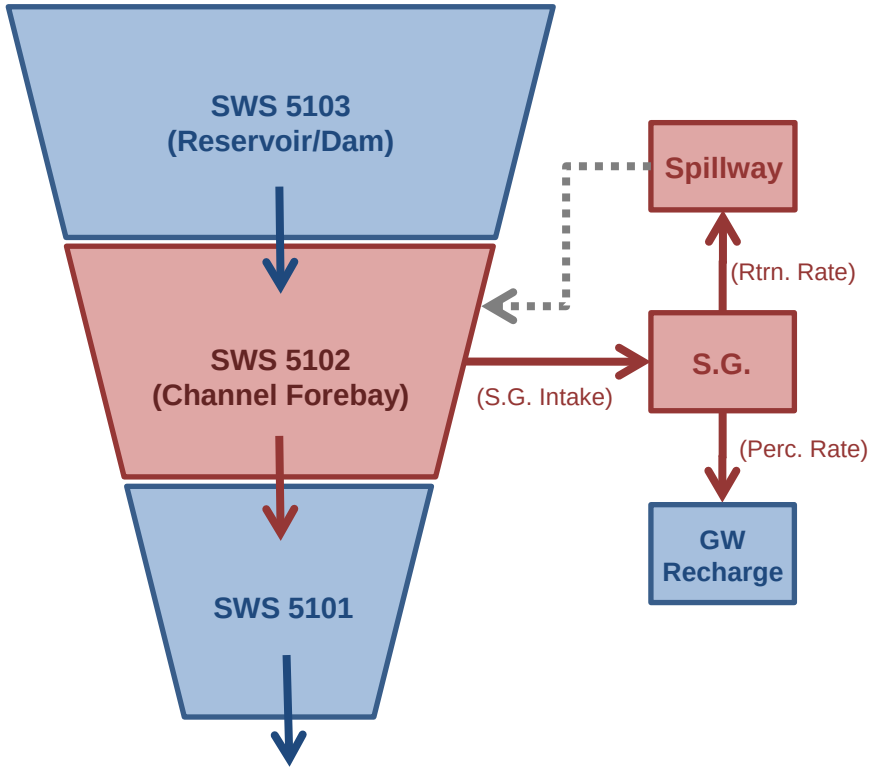
Review and Update Existing WMMS Spreading Ground Model

SWS = Subwatershed *WMMS F-Table*

Current System



Remodeled System



Spreading Ground Metrics & Criteria

Analysis of the spreading grounds used two key stormwater metrics to determine their performance:

- Total Annual Volume of Stormwater Captured
- Total Annual Volume of Stormwater Bypassed

Ranking criteria for each of the dams included the following:

S1. Historic recharge
S2. Historic capture efficiency
S3. Capture volume versus spreading ground wetted area
S4. Capture volume versus spreading ground surface storage volume
S5. Capture volume versus spreading ground percolation rate
S6. Change in future recharge
S7. Change in future capture efficiency
S8. Range of potential capture

Spreading Ground Ranking Criteria

$$S1 = (Average\ Recharge\ Volume)_{Historic}$$

$$S2 = \left[\frac{(Average\ Recharge\ Volume)_{Historic}}{(Average\ Recharge\ Volume)_{Historic} + (Average\ Bypass\ Volume)_{Historic}}\right]$$

$$S3 = \left[\frac{(Average\ Recharge\ Volume)_{Historic}}{(Spreading\ Ground\ Wetted\ Area)}\right]$$

$$S4 = \left[\frac{(Average\ Recharge\ Volume)_{Historic}}{(Spreading\ Ground\ Storage\ Volume)}\right]$$

$$S5 = \left[\frac{(Average\ Recharge\ Volume)_{Historic}}{(Spreading\ Ground\ Percolation\ Rate)}\right]$$

Spreading Ground Ranking Criteria

$$S6 = Max\left[\frac{(Average\ Recharge\ Volume)_{6,Future}}{(Average\ Recharge\ Volume)_{Historic}}\right]$$

$$S7 = Min\left[\frac{(Average\ Recharge\ Volume)_{6,Future}}{(Average\ Recharge\ Volume)_{6,Future}+(Average\ Bypass\ Volume)_{6,Future}}\right]/S2$$

$$S8 = (Exponent\ on\ Stormwater\ Recharge\ Curve)$$

$$Final\ Rank = Average\ [S1, S2, S3, S4, S5, S6, S7, S8]$$

Performance Levels

Performance Level	Performance Description	Prospective Enhancements	Priority
I	• ***High*** Efficiency • ***High*** Resiliency to Climate Change Projections	Potential Exists	Low ↕ High
II	• ***Moderate*** Efficiency • ***Moderate*** Resiliency to Climate Change Projections	Moderate Potential	
III	• ***Low*** Efficiency • ***Low*** Resiliency to Climate Change Projections	High Potential	

Spreading Ground Rankings

Table A-4. Spreading Ground – Final Performance Levels

Spreading Ground	S1	S2	S3	S4	S5	S6	S7	S8	Average	Level
Ben Lomond	9	6	7	11	14	5	20	3	9.4	II
Big Dalton	19	10	13	1	22	17	6	9	12.1	II
Branford	18	11	14	19	2	15	25	13	14.6	II
Buena Vista	24	24	24	24	18	24	2	23	20.4	III
Citrus	15	19	15	12	19	14	19	17	16.3	III
Dominguez Gap	21	25	25	23	1	23	1	25	18.0	III
Eaton Basin	14	14	10	18	16	9	15	8	13.0	II
Eaton Wash	13	9	21	21	13	13	9	11	13.8	II
Forbes	22	18	23	20	15	18	10	18	18.0	III
Hansen/Tujunga	2	4	11	15	23	3	17	4	9.9	II
Irwindale	6	1	3	16	4	2	21	2	6.9	I
Little Dalton	23	17	17	2	24	16	5	16	15.0	II
Live Oak	25	16	18	13	25	19	18	19	19.1	III
Lopez	17	20	22	7	20	20	16	21	17.9	III
Pacoima	8	15	19	14	12	10	14	15	13.4	II
Peck Road	7	7	16	22	5	7	12	6	10.3	II
Rio Hondo	1	3	9	10	9	8	22	5	8.4	I
San Dimas	11	13	6	4	8	11	13	12	9.8	II
San Gabriel Canyon	5	23	12	25	7	25	3	24	15.5	II
San Gabriel Coastal	3	5	2	6	6	12	24	14	9.0	I
Santa Anita	20	22	20	9	11	21	4	20	15.9	II
Santa Fe	4	12	8	8	21	6	8	7	9.3	I
Sawpit	16	8	5	3	17	4	11	10	9.3	I
Sierra Madre	12	2	4	5	10	1	23	1	7.3	I
Walnut	10	21	1	17	3	22	7	22	12.9	II

Task 4 Results – Spreading Grounds

Spreading Ground Facilities – Performance Levels					
#	Spreading Ground	Level	#	Spreading Ground	Level
1	Ben Lomond	II	14	Lopez	III
2	Big Dalton	II	15	Pacoima	II
3	Branford	II	16	Peck Road	II
4	Buena Vista	III	17	Rio Hondo	I
5	Citrus	III	18	San Dimas	II
6	Dominguez Gap	III	19	San Gabriel Canyon	II
7	Eaton Basin	II	20	San Gabriel Coastal	I
8	Eaton Wash	II	21	Santa Anita	II
9	Forbes	III	22	Santa Fe	I
10	Hansen/Tujunga*	II	23	Sawpit	I
11	Irwindale	I	24	Sierra Madre*	I
12	Little Dalton	II	25	Walnut	II
13	Live Oak	III			

Channel Metrics & Criteria

Analysis of the channel outlets used two key stormwater metrics to determine their performance:

- Average Annual Volume of Stormwater Discharged to the Ocean
- Peak Flood Flow Rate

Ranking criteria for each of the outlets included the following:

C1. Change in future discharge

C2. Change in future unit area discharge

C3. Change in future discharge per total discharge

C4. Change in future average peak flow rate

Channel Ranking Criteria

$$C1 = (Average\ Annual\ Discharge)_{Future} - (Average\ Annual\ Discharge)_{Historic}$$

$$C2 = \left[\frac{(Average\ Annual\ Discharge)_{Future} - (Average\ Annual\ Discharge)_{Historic}}{Area\ of\ Watershed}\right]$$

$$C3 = \frac{\left[\frac{Average\ Annual\ Discharge}{5\ Outlet\ Total\ Discharge}\right]_{Future} - \left[\frac{Average\ Annual\ Discharge}{5\ Outlet\ Total\ Discharge}\right]_{Historic}}{\left[\frac{Average\ Annual\ Discharge}{5\ Outlet\ Total\ Discharge}\right]_{Historic}}$$

$$C4 = \left[\frac{Max[(Average\ Peak\ Flow)_{Future}] - (Average\ Peak\ Flow)_{Historic}}{(Average\ Peak\ Flow)_{Historic}}\right]$$

$$Final\ Rank = Average\ [C1, C2, C3, C4]$$

Assessment Levels

Assessment Level	Assessment Description	Stormwater Supply	Watershed Priority
I	• ***Low*** Discharge Volumes to the Ocean	Potential Exists	Low
II	• ***Moderate*** Discharge Volumes to the Ocean	Moderate Potential	↕
III	• ***High*** Discharge Volumes to the Ocean	High Potential	High

Channel Outlet Rankings

Table A-6. Major Channel Outlets – Final Assessment Levels

Major Channel Outlet Metric Rankings						
Location	**C1**	**C2**	**C3**	**C4**	**AVG**	**Level**
Ballona Creek	3	4	2	5	3.50	**II**
Dominguez Channel	1	2	1	2	1.50	**I**
Malibu Creek	2	3	4	1	2.50	**I**
San Gabriel River	4	1	5	3	3.25	**II**
Los Angeles River	5	5	3	4	4.25	**III**

Task 4 Results – Channel Outlets

Channel Outlet Assessment		
#	Channel (Watershed)	Level
1	Ballona Creek	II
2	Dominguez Channel	I
3	Los Angeles River	III
4	Malibu Creek	I
5	San Gabriel River	II

Task 4 Q&A

Big Tujunga Dam

Next Steps

Scoping Sessions / Design Charettes – Fall 2014

- Task 5 – Infrastructure &Operations Concepts
- Develop facility enhancements and/or new concepts

Next Task

- Task 6 – Trade-off Analysis & Recommendations

Contact Information

Los Angeles Basin Stormwater Conservation Study

http://www.usbr.gov/lc/socal/basinstudies/LABasin.html

LACFCD Contact:

Lee Alexanderson, P. E.
County of Los Angeles
Department of Public Works
Los Angeles County Flood Control District
Watershed Management Division
(626) 458-4370
lalexanderson@dpw.lacounty.gov

Reclamation Contact:

Jack Simes, Planning Officer
Department of the Interior
Bureau of Reclamation
Lower Colorado River Region
Southern California Area Office
(951) 695-5310
jsimes@usbr.gov