Safe, Clean Water Program

Fiscal Year 2021-2022

WASC Review Sheet

Project Name	
Project Lead	
Total SCW Funding Requested	
Phases for which SCW Funding is being requested	

Question	Yes/No	Notes
Does this project assist in achieving compliance with MS4 permit? If Yes, explain how.		
Does the project provide DAC benefits (refer to the ordinance for definition)? If Yes, explain how.		
Does the project provide benefits to the municipality? If Yes, explain how.		
Does the project prioritize nature-based solutions? If Yes, explain how.		
Does this meet the goals of the program stated in the ordinance (refer to Section 18.04)		
Does the project/scientific study have a nexus to stormwater and urban runoff capture and pollution reduction? If yes, explain how.		

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WASC Review Sheet

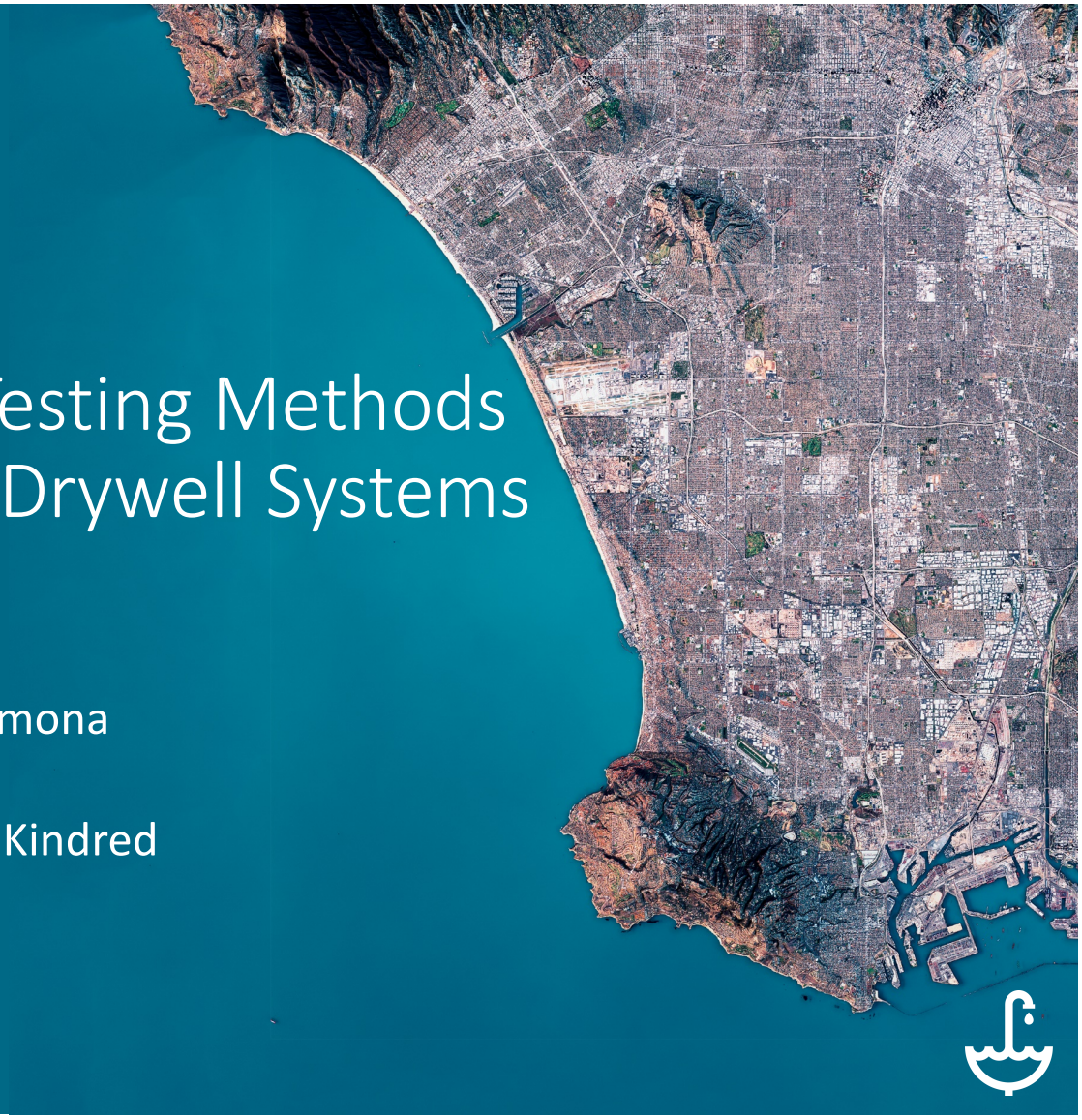
Question	Yes/No	Notes
What is the plan for community engagement and what efforts have been made to date?		
What is the anticipated CEQA and permitting needs and how is this incorporated in the cost and schedule?		
Why is this the best location for this type of project?		
Were other alternatives considered? Why is this the best solution?		
How was the Project developed? (ie IRWMP/EWMP process, community engagement, etc…)		
If awarded partial funding by the WASCs, could the project fulfill their stated scope and benefits? If not funded, would the WASC lose the opportunity to fund this project at future rounds?		
General Notes (and follow up questions regarding any topic in the feasibility study/project submittal)		
Public Comments		

Evaluation of Infiltration Testing Methods for Design of Stormwater Drywell Systems

Scientific Studies Program

California State Polytechnic University, Pomona

Presentation by: Dr. Ali Sharbat, Mr. Scott Kindred



Study Overview

Summary of Study:

- Evaluate infiltration test methods for sizing drywell systems
- Evaluate drilling, well construction, and well-development methods
- Identify appropriate correction factors for design
- Develop protocol for drywell testing that balances cost, complexity, and accuracy

Why?

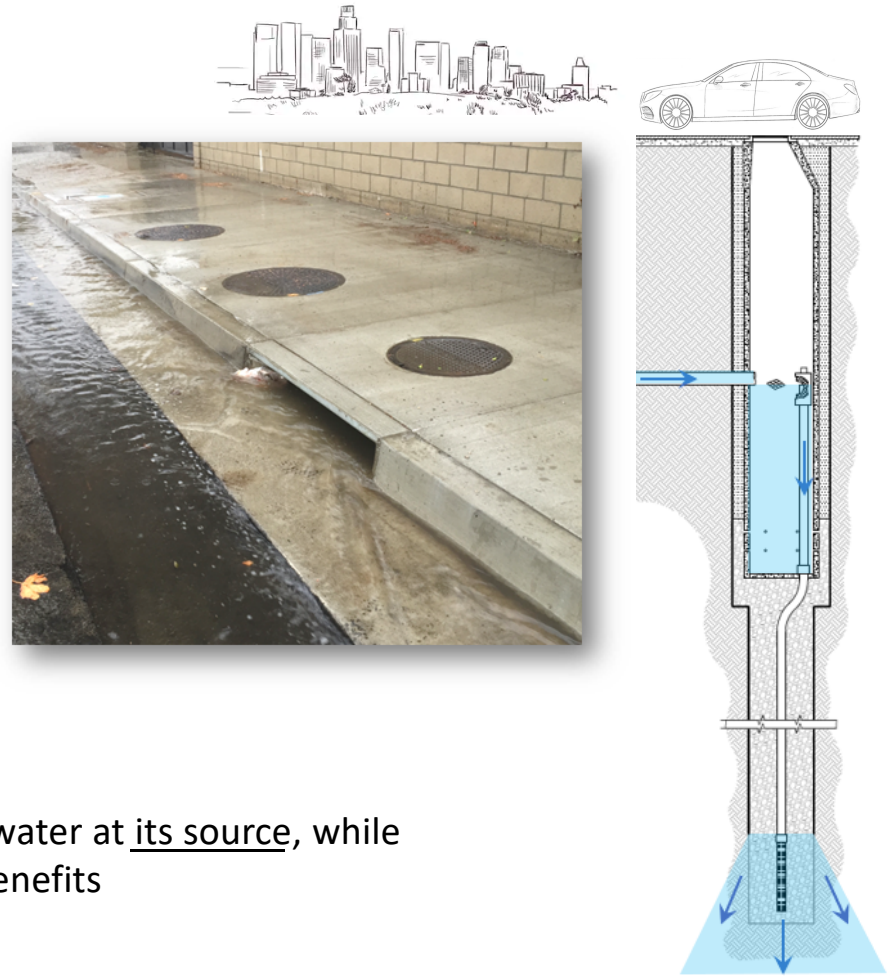
- Commonly used testing methods tend to underestimate drywell performance
- Stormwater treatment volume (ac-ft/yr) may be under-estimated
- Drywell systems may be oversized and more expensive than necessary

Outcome

- Updated testing and design approach for drywells in LA County

Nexus to Stormwater, & Urban Runoff Capture, & Pollution Reduction

- Stormwater infiltration is critical to the region's stormwater management, water quality, and water supply goals.
- Stormwater drywells provide an efficient and effective means of reducing urban runoff and restoring hydrologic conditions.
- Recharging groundwater with urban runoff means more local groundwater as a source for water supply.



- Stormwater Infiltration reduces and treats stormwater at its source, while delivering environmental, social, and economic benefits

Study Location

- **Watershed to be Studied:**
  - Upper Los Angeles River Watershed

- **Study Location:**
  - Locations will be further chosen from both existing and proposed drywell locations in parks of the City and County of Los Angeles

Study Details

Study Goals

- Evaluate infiltration test methods
- Develop protocol for drywell testing and design
- Reduce cost of stormwater management

Watershed Benefits

- More accurate project planning
- More groundwater recharge for less money
- More accurate stormwater treatment volume estimates

❖ **Stormwater Infiltration is a cost-effective, resilient approach to managing wet weather impacts, that provides many community benefits**

Need for Study (Problem Statement)

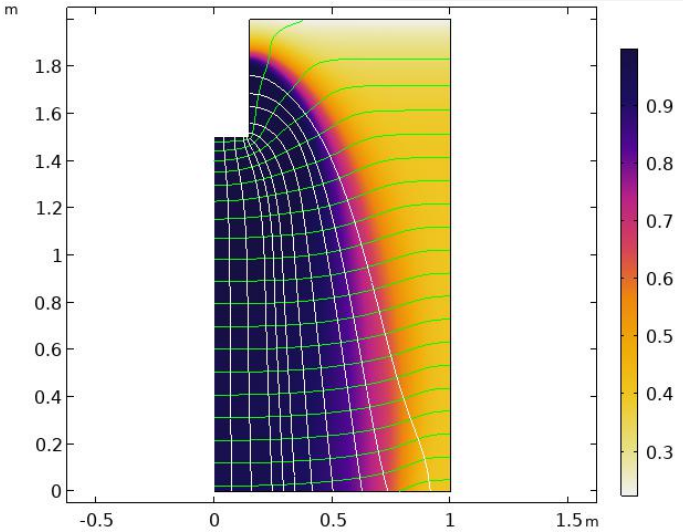
- Existing test methods vary in depth, diameter, duration, and drilling equipment, which leads to high variation in results:
  - County of LA GS200.2 – Drywell Test Method
  - Boring Percolation Tests - Falling or Constant Head Test
  - Full-scale “test” to obtain actual performance for final design
- "Percolation rate" doesn't represent drywell performance very well
- Drilling and construction of test facilities may result in clogging, and underestimate drywell performance
- Current drywell sizing approaches cannot correct for the high variation in test results.
- Groundwater recharge volumes could be under-estimated.

❖ Drywell projects could be potentially over-sized.

City of LA (North Hollywood)
full-scale drywell test

Scope of Work

- **Task 1: Characterize Range of Typical Soil Types and Hydrogeologic Settings**
- **Task 2: Literature Review and Numerical Analysis of Infiltration Testing Methods that are Suitable for Drywell Design**
- **Task 3: Planning the Field Program**
- **Task 4: Drilling and Field Infiltration Testing**
- **Task 5: Outreach and Engagement**
- **Task 6: Documentation and Reporting**



Similar Studies

- This study would be the first of its kind by conducting deep infiltration field testing specific to drywell design.

- Results of other studies might be partially helpful to this study; e. g., Infiltration testing study in Puget Sound, WA, currently underway:
  - Led by Scott Kindred and City of Tacoma
  - Addresses both shallow and deep infiltration testing, less focused on drywells
  - NEP-funded, WA State Dept. of Ecology oversight

Cost & Schedule

Phase	Description	Cost	Completion Date
Task 1	Soil and Hydrogeologic Characterization	$16,864	12/15/2021
Task 2	Literature Review and Numerical Analysis	$30,170	03/15/2022
Task 3	Field Planning	$35,170	05/15/2022
Task 4	Drilling and Field Infiltration Testing	$285,923	09/15/2022
Task 5	Outreach and Engagement	$13,864	10/15/2022
Task 6	Documentation and Reporting	$33,864	10/15/2022
TOTAL		**$554,684**	

Funding Request

WASC	Year 1	Year 2	Year 3	Year 4	Year 4
CSMB	-				
LLAR	-				
LSGR	-				
NSMB	-				
RH	-				
SCR	-				
SSMB	-				
ULAR	$554,684				
USGR	-				
TOTAL	**$554,684**				

Our Team

➢ California State Polytechnic University, Pomona (Cal Poly Pomona)

- Ali Sharbat, Ph.D., P.E.
- Mehrad Kamalzare, Ph.D., P.E.
- Yasser Salem, Ph.D., P.E.

• Los Angeles County

- TJ Moon, P.E.
- Haris Harouny, P.E.
- William S. Man, P.E.

• City of Los Angeles

- Seth Carr, P.E.
- Majid Sadeghi, Ph.D., P.E.

• Private Consultants

- Scott Kindred, P.E. (Kindred Hydro, Inc., State of Washington)
- John S. Gulliver, Ph.D. (Consulting Engineer)

• Local Drywell Experts

- Geologists, Engineers, and Drywell Contractors

Summary of Benefits

Benefits to Technical Community:

- A refinement of Infiltration Testing Methods: Accurate, Cost-Effective, and accepted by stakeholders
- Drywell Systems that are Appropriately Sized and Cost-Effective

Benefits to LA County Taxpayers:

- Municipalities will get the best value for their investment in stormwater infiltration.
- Accurate sizing and more cost-effective drywell infiltration systems results in better accounting of stormwater treatment volumes (ac-ft/yr).
- Helping the community to meet stormwater management and water-supply objectives faster and cheaper.

Questions?

Scope of Work

- **Task 1: Characterize Range of Typical Soil Types and Hydrogeologic Settings**

  This task will identify and characterize the general types of soils and hydrogeologic settings in the Los Angeles basin that are suitable for drywell infiltration. This information will be used to identify and refine testing methods that will be most effective to support design of drywell infiltration systems in the County and will be based on a literature review and interviews/workshops with local geotechnical and hydrogeologic experts.

- **Task 2: Literature Review and Numerical Analysis of Infiltration Testing Methods that are Suitable for Drywell Design**

  This task will include a literature review to identify proven and well-documented infiltration testing methods that are suitable for drywell design. The methods selected for evaluation will be evaluated by comparing the predicted results with numerical simulations of the tests for the range of soils and hydrogeologic settings typical of the Los Angeles Basin. Only those methods that meet the following criteria will be further evaluated in the field program:

  - A reasonably good fit between the results predicted by the method and results predicted by numerical simulations.
  - Field procedures that are feasible and cost effective using equipment that is commonly used or readily available.
  - Analysis procedures that are simple to perform by geotechnical and hydrogeologic professionals.

  The purpose of the numerical analysis is four-fold:

  - Develop calibrated fitting parameters used to define the shape function (C) For the steady-state BP methods.
  - Validate the proposed analytical methods.
  - Assess how layering and variability might affect the test results.
  - Help design the field tests.

- **Task 3: Planning the Field Program**

  This task will utilize the information provided in the previous tasks to design the field program and includes the following activities:

  - Identify Test Locations
  - Documenting Drilling and Testing Procedures
  - Obtaining Permits, Equipment and Drilling/Testing Contractors

Scope of Work (cont.)

- **Task 4: Drilling and Field Infiltration Testing**

  The general approach for this task is to install and test approximately 12 test wells at three sites to evaluate the following:

  - Diameter of test well (8”, 18”, 48”)
  - Drilling method (hollow-stem auger, bucket auger, flight auger, and non-traditional methods such as sonic drilling)
  - Constant head vs. falling head tests
  - Test duration (i.e. how long or how much water is required to reasonable achieve steady state conditions).

- **Task 5: Outreach and Engagement**

  The purpose of this task is to ensure that potential users of these drywell infiltration testing and design methods are engaged during the study and the methods meets their needs when the work is complete. Outreach and engagement will include:

  - Regular emails to present results and solicit feedback.
  - Workshops with interested stakeholders to present results and solicit feedback.
  - Presentations at conferences and technical meetings.

  Outreach will be targeted at stakeholders such as regulators, municipal stormwater managers, and civil/geotechnical/hydrogeologic professionals that regularly conduct infiltration testing and design.

- **Task 6: Documentation and Reporting**

  Interim reports will be submitted at the conclusion of each task. All the interim reports and field procedures developed in the previous tasks will be compiled and summarized in a single technical report. This technical report will summarize the results of the study and provide an evaluation of the testing methods, including accuracy, feasibility and cost of the field procedures, and simplicity of the analysis techniques. In addition, the report will recommend next steps toward improved infiltration testing and design and include a gap analysis to determine where additional information is needed. This report may be used to develop recommended modifications to GS200 document.

  It is expected that one or more peer-reviewed papers will be produced and submitted to a technical journal for publication. This process will ensure that the study results are subject to technical review.