Sustainable Remediation Forum (SURF)
SURF 31: March 2-3, 2016

SURF 31 was held at Parsons Headquarters in Pasadena, California on March 2 – 3, 2016 and focused on "Climate Change and Resiliency within Remediation." Individuals that participated in the meeting, along with contact information, are listed in Attachment 1. Meeting minutes are posted for members at www.sustainableremediation.org. Members can log in and access the minutes by clicking "SURF Meeting Minutes" under "Member Resources."

Day 1

The meeting began with John Simon reviewing meeting logistics, ground rules, nonconfidentiality assumptions, export control laws, and antitrust issues. He thanked current SURF sponsors for supporting the organization. (Members interested in sponsorship opportunities should contact the SURF Treasurer at treasurer@sustainableremediation.org.) Presentation slides for Day 1 are provided in Attachments 2 through 12.

Welcome Remarks

Virginia Grebbien, Parsons' Corporate Chief of Staff, provided welcome remarks. With the belief that words matter and have power, Virginia defined resiliency and stated that the term's definition shows the complexity of climate change and remediation. She emphasized the forward thinking that is necessary when addressing these topics. At a wastewater program in San Francisco, the infrastructure plan was modified to account for climate change impacts. Flexibility was integrated by combining green infrastructure elements with gray infrastructure. The result is a better, more robust system for community at the same cost. Virginia encouraged participants to develop interesting and creative solutions to the problems we face.

Keynote

Lara Hansen, Chief Scientist and Executive Director of EcoAdapt, provided the keynote. The goal of her presentation was to empower participants to evaluate the implications of climate change on remediation. Through case studies, Lara showed that when climate change is not explicitly considered in remediation planning, near-term efforts can be undermined and long-term goals will be unachievable. Presentation slides are provided in Attachment 2.

Lara explained that sustainability requires adaptation (i.e., limiting the effects of current and committed climate change on human and natural systems). She described adaptation as a continuum, beginning with resistance (i.e., how to stop change from happening), resilience (i.e., how to make existing processes continue to function and obtain desirable results), and response (i.e., how to accelerate or move remediation). For each of these approaches, five overlying tenants exist:

1. Protect adequately and appropriately for a changing world.

2. Reduce non-climate stressors that are exacerbated by or exacerbate the effects of climate change.
3. Manage for uncertainty.
4. Reduce the rate and extent of local and regional climate change.
5. Reduce the rate and extent of global climate change.

Lara presented emerging examples of how these factors are being considered, including tools and methodologies, and encouraged participants to integrate these factors more broadly to create better long-term outcomes for remediation efforts.

Discussions after the presentation focused on how climate change (e.g., changing precipitation patterns, sea level rise, extreme weather and heat) can undermine remediation and affect toxicity, how natural attenuation models do not incorporate climate change effects, and how human responses to climate change are often not considered in remediation planning.

Adaptation of Superfund Remediation to Climate Change

Anne Dailey [U.S. Environmental Protection Agency (USEPA), Office of Superfund Remediation and Technology Innovation] provided an overview of climate change vulnerability analyses to the USEPA's Superfund program and identified potential adaptation measures that could be incorporated to increase the resiliency of cleanups. Presentation slides are provided in Attachment 3.

As background, Anne provided a brief synopsis of federal and USEPA climate change issues, directives, and adaptive planning. She explained that the existing Superfund process for planning and implementing remediation provides the structure to both consider potential climate change impacts and take action (as warranted) to increase remedy resilience. Exposure and sensitivity assessments can be used during any phase of the Superfund process to evaluate the site-specific vulnerability of a remedy. Anne outlined the phases and provided elements and resources to consider when addressing climate impacts throughout the Superfund process. She provided case studies of adaptation at Superfund sites that were recently affected by extreme drought and a major weather event. Anne ended her presentation by directing participants to resources for more information, such as this **website**.

Building Resilience-LA

The USGBC's Los Angeles Chapter is leading the development of a guide for implementing resilience practices in an integrative way within existing facilities. The guide will help organizations evaluate risks, build community, and manage for change in ways that make sense for the bottom line and the public good. Heather Rosenberg (USGBC) introduced participants to the challenges of dealing with risk and uncertainty and discussed solutions that provide both short- and long-term benefits. Presentation slides are provided in Attachment 4.

Heather said that disasters provide an opportunity to learn about how people are interconnected and where fault lines exist in our social and economic environments. She presented the following lessons that have been learned from disasters:

- Disasters are expensive.
- Vulnerable populations have the hardest time recovering.
- Government can be quickly overwhelmed.
- Neighbors become first responders.
- Communities may need to survive without city infrastructure.
- Social cohesion is critical.

Heather defined resilience as "the capacity to adapt and thrive in the face of stressors and shocks." She provided an overview of the USGBC program, Building Resilience-LA, which is designed to achieve multiple goals in a variety of domains (e.g., water, energy, food). At a city-owned former fire station in South Central Los Angeles, the USGBC is partnering with a nonprofit organization named SCOPE (Strategic Concepts in Organizing and Policy Education) (SCOPE) on a community resilience pilot project. The former fire station is being designed to have green infrastructure and will serve as the epicenter of the neighborhood resilience hub and an emergency center. It is an integrated approach to resilience at the local and neighborhood scale and is designed to use every opportunity to solve as many problems as possible without overburdening the system. Heather ended her presentation by making the business case for preparedness, emphasizing the value and benefits of the program even if a disaster does not strike.

After the presentation, Heather answered participants' questions. Her responses are below.

- Integrating resilience into existing facilities is an emerging practice. ISO 22301:2012 is a management systems standard for business continuity management that is designed to help organizations be better prepared and more confident to handle disruptions of any type.

- Increased vegetation is one of the most important strategies for reducing the effects of climate change locally.

- It is important to understand risk and vulnerabilities and then select strategies that have greatest value.

- The U.S. Army Corps of Engineers' restoration project of the Los Angeles River is a good example of the resilience design criteria presented. The river runs through diverse and underserved communities and plans are underway to add layers of social cohesion as part of the restoration.

Resiliency Assessment for Buildings, Infrastructure, and Remediation Projects

Randy Britt (Parsons) presented information to help identify infrastructure resilience needs and develop implementation strategies for resiliency plans. In addition, he demonstrated the link of resilience in buildings and infrastructure to the impact on remediation projects and described the potential for external shocks and stressors to create environmental issues. Presentation slides are provided in Attachment 5.

The main goals of a resiliency assessment are to identify the strengths, deficiencies, and corrective measures that will minimize the impact of climatic and disruptive events on critical systems that protect public health, safety, and economies. Randy noted that emergency response planning is only one component of climate adaptation and resiliency (CA&R) planning. He reviewed the role of the remediation project manager in the process, outlining the following steps:

- Assemble an expert team, including adaptation risk analysts, emergency response professionals, engineers of all types, facility managers, hazard assessment specialists, meteorologists, regulatory affairs specialists, risk managers, seismic experts, and construction managers.
- Conduct risk and vulnerability assessments to:
  - Estimate the likelihood of an event that will have severe consequences.
  - Determine the frequency of prior events.
  - Assess recent improvements that may provide new protections.
  - Capture specific lessons learned.
  - Identify critical points that need to be addressed prior to next event.
- Conduct a hazard assessment to identify the region’s historical hazards and assess the historical frequency and estimate the potential for significant change.
- Identify critical facilities by focusing on the impact of operational downtime and critical functions (e.g., command centers, emergency power).
- Conduct a life-span analysis to identify planned or unplanned obsolescence, determine structural integrity, and assess damage from prior events or age.
- Develop, maintain, and manage adaptation strategies that analyze and recommend options for relocation, abandonment, and divestiture.

- Use low-impact development designs and construction methods (e.g., recycled materials, waste minimization).

A Framework for Climate Change Resiliency Assessments

Brandt Butler (AECOM) presented a framework for assessing the risks, options, and implementation strategies of addressing climate change that are applicable to remediation sites. He emphasized that the framework is conceptual and focuses on different questions that lead to better and more robust answers. Presentation slides are provided in Attachment 6.

Brandt described the framework, which consists of the following six steps:

1. Review science (identify sea level rise scenarios and select tools).
2. Assess vulnerability (exposure, sensitivity, and adaptive capacity).
3. Assess risk (likelihood, consequence, and prioritization).
4. Plan adaptation (strategies, adaptive capacity, and thresholds).
5. Implement adaptive measures.
6. Monitor adaptive capacity and thresholds.

He described the application of the framework for San Francisco City and County to help incorporate sea level rise into capital planning. Observed and predicted ranges of sea level rise in the area vary dramatically, and storm surges and waves can increase with sea level rise. A typical modeling approach using 100-year storm surge scenarios resulted in only four mapped scenarios in which the trigger points were difficult to identify and prioritize. Instead, a model using multiple scenarios was used so that exposure and vulnerability were defined at a detailed scale to allow for prioritization and adaptation planning.

Brandt ended his presentation by encouraging participants to include climate change resiliency as long-term protectiveness criteria during remedy selection and five-year reviews (for existing remedies), and evaluate potential remedial measures and design to facilitate future implementation.

In response to participants' questions, Brandt discussed the importance of "ground-truthing" inundation maps. The information from these maps ultimately is integrated into the ranking process as part of the vulnerability assessment. One participant suggested that the secondary impacts of climate change (vs. direct impacts only), such as impacts to access for adjacent facilities, should also be considered in vulnerability assessments.

2016 Board of Trustees Introduction

Maile Smith (SURF Past President) introduced the results of the 2016 election for the Board of Trustees that were announced at the end of January. The 2016 Board of Trustees are as follows:

- John Simon, President
- Barbara Maco, Vice President
- Tammy Rabideau, Secretary
- Keith Aragona, Treasurer
- Paul Hadley, At-Large
- Colleen Liddell, At Large
- Kristin Mancini, At Large
- Rick Wice, At Large
- Gerlinde Wolf, At Large

Aaron Thom was elected as an At Large member of the Board, but was unable to complete his term. Gerlinde Wolf replaced him on the Board after the meeting. For a list of past Board members, click here. An updated organization chart is provided in Attachment 7.

SURF 2016 Strategic Planning

John Simon (SURF President) and Barbara Maco (SURF Vice President) presented the results of a recent SURF member survey. The survey was designed to obtain input from SURF membership about the future activities and focus of SURF. Next steps were presented and include finalizing SURF's priorities, identifying SURF Board and member leaders for priorities, and developing an action plan. Presentation slides are provided in Attachment 8.

After the presentation, participants voted for their preferred future SURF activities. Results are provided in the table below.

Concept	Votes
Partner with another organization/conference.	16
Beef up case studies and mine case study database to determine footprint baselines for different remedial actions.	16
Expand our role to be a think tank organization.	14
Identify, quantify, and communicate the value of sustainable remediation to stakeholders beyond SURF's membership (policy makers, CFOs, community groups) and/or start public acceptance initiative to educate public about sustainable remediation.	14
Hold quarterly webinars and record SURF meeting presentations for webinars.	13
Provide training to members on performing sustainable remediation assessments, including LCA, social aspects, etc., and/or hold annual international SURF convention that provides real training and results in a SURF certificate.	11
Write remediation resilience white paper.	9
Create databases of GSR technologies and products.	8

Rework direction of the Academic Outreach Initiative.	7
Develop certification program.	4
Get outside opinions about sustainable remediation from focus group, led by a neutral facilitator, with the goal of developing action plan.	4
Awards	0

Panel Discussion:
Are You Ready for the Next Disaster?

This panel discussion, facilitated by Barbara Maco (SURF Vice President) explored the legal and insurance implications of climate change impacts on contaminated sites, as well as the regulatory and risk management challenges associated with climate variability on completed or future remediation projects. Panelists touched on the roles that auditing and reporting play in transparency and risk management and how climate change concerns have already impacted projects from legal, insurance, and policy perspectives.

Panelists Sam Unger (Los Angeles Regional Water Quality Control Board), Bill Wick (Wactor & Wick), Greg Schilz (JLT Specialty USA), and Doug Hileman (Douglas Hileman Consulting) provided introductory remarks, as summarized below.

- Sam focused on the effects of climate change on groundwater basins and, in turn, groundwater quality. Increased drought conditions and decreased snowpack will contribute to decreases in groundwater levels and recharge. Remediation systems that are designed to remove contaminant mass from the top of the water table will need to be re-engineered and modified to incorporate this changing condition. Sam also discussed the challenges associated with evaluating climate change effects on a site-specific scale, valuing water resources, and performing cost-benefit analyses. Presentation slides are provided in Attachment 9.

- Bill provided a summary of the legal framework for contaminated site liability, including federal and state statutes. He reviewed the liabilities associated with various potentially responsible parties within Superfund and the three defenses available. Defenses of an “act of God” and “act of war” are limited to a rare and unforeseen set of circumstances. For third-party defenses, the landowner must take reasonable steps to stop a continuing release; prevent a threatened future release; and prevent or limit human, environmental, or natural resource exposure. Presentation slides are provided in Attachment 10.

- Greg provided an overview of the state of the insurance market, including recent trends and emerging risks. Approximately 30 markets now offer pollution liability products, with some traditional markets taking a step back from certain risks (e.g., heavy industrial property use, brownfield redevelopment). He summarized the key aspects of pollution legal liability insurance, cost cap insurance, and contractor's pollution liability insurance. Greg ended his remarks by highlighting the environmental exposure of company directors and officers. He believes there will be an increase in the frequency of actions against directors and officers with respect to pollution liabilities. Presentation slides are provided in Attachment 11.

- Doug presented the likely questions and potential obstacles associated with climate change and its impacts on the operations, reporting, and auditing of remediation programs. At the end of his presentation, he suggested an approach that includes using risk assessment, management, and reporting frameworks that are familiar to executive management; developing an inventory of aspects, impacts, and risks as well as a list of possible questions and impediments; considering a broad range of stakeholders and triple bottom line considerations; identifying and leveraging benefits for everyone; and exploring avenues for risk transfer. Presentation slides are provided in Attachment 12.

Initial discussions focused on Sam's perspectives. Sam acknowledged that some remediation professionals are responding to potential climate change impacts in remediation plans, but stated that this approach is not the norm.

Additional discussions focused on how auditors address environmental liability cost estimates and "just in case" scenarios. Doug said that auditors frown on contingencies because the money associated with them can become slush funds. The primary goals when estimating environmental liability is to provide substantiation and consistency year after year.

Panelists provided closing remarks on the following question: For your area of expertise, what elements should SURF undertake?

- Bill emphasized the need to mitigate potential risks associated with climate change and consider these risks in the context of insurance. He provided some examples of situations in which those liable are not shielded from liability (e.g., No Further Action decision).

- Greg recommended SURF address the uncertainties of third-party toxic tort sooner rather than later. Insurance carriers do not have any type of risk or exclusion with regard to climate change.

- Doug suggested continuing to think in these terms and communicate more effectively by trying different messaging and different communication methods.

- From a societal level, contaminated sites affect all of us. In that vein, Sam recommended that SURF consider funding a model similar to the UST model. In the big picture, he believes there will be fewer individual responsible party issues and more blanket funding needed.

Day 2

The meeting began with a recap of participant's "takeaways" from Day 1. Presentation slides for Day 2 are provided in Attachments 13 through 18.

Sustainability and Resilience Converge

Nurit Katz (University of California – Los Angeles) and John Onderdonk (California Institute of Technology) explored the role universities play as living laboratories for sustainability and resilience and how universities and cities are collaborating in regional planning. No presentation slides were used; instead, Nurit and John provided their ideas in a conversational format.

John said the general discourse about sustainability tends to focus on sustainability as an endpoint, with the same goal for many different things. He believes that sustainability and resiliency are characteristics of more complex systems. John said that we will need to change our historical approach of developing simple solutions that may not account for geographical differences and the like. Instead, approached should focus on characteristics so that flexibility can be achieved. Nurit agreed and emphasized the intertwining and overlapping of sustainability and resilience. John discussed temporal and spatial scales and the need for more balance. He believes it is difficult for us to consider long temporal scales because we are so accustomed to thinking about short-term sustainable opportunities (i.e., today, tomorrow, and next quarter). The main challenge is for organizations to consider both scales and timeframes.

Both presenters provided examples of how sustainability and resilience are applied at their universities.

- Caltech considers itself a national laboratory with a university attached. Although still in the initial phases, the university is developing a strategic energy resources plan that will evaluate existing resources and implement integrate water reuse and treatment. Caltech plans to evaluate its sustainability objectives now to further develop utility, energy, water, and risk management standards. At the same time, long-term planning will need to balance economic viability. John spoke later about the importance of situational intelligence and the role that data play in understanding the current state.

- Similar resilience planning practices are underway at UCLA. Resilience planning is helping organizations be sufficiently nimble to respond to emergency situations. This type of thinking ultimately creates an organization that is flexible enough to respond to challenges by advancing communication systems and technologies. Often resilience planning focuses on local infrastructure, but UCLA learned from a 2014 flood event that planning communication is equally important.

After the presentation, participants asked questions about the social aspects of sustainable solutions and student engagement:

- Social Aspects of Sustainable Solutions
  Nurit suggested making the sustainable choice the easy choice. She said there is always a cultural component and the desire to want to change behavior. For example, a "Dorm to Dorm" energy competition created an opportunity for students to understand their footprint and then change their behaviors voluntarily.

- Student Engagement
  Nurit said that UCLA has both university-funded and independent, student-led sustainability programs. John said funds for these efforts at Caltech are accessed from an endowment with a request of a guarantee for return. Nurit explained how her office established a council and acts as a nexus to bring students together on the topic. In 2007, students voted to create a green initiative fund. The fund's projects include a roof-top solar array, a music concert fueled by bikes, and student gardens.

Incorporating Climate Change Adaptation into Remediation Design and Implementation

Shannon O'Connell and Carrie Crozier (both Parsons) provided a framework for climate adaptation and resilience evaluations and plan development for remediation projects. There has been a growing movement within the environmental industry to develop more sustainable approaches in environmental remediation. Carrie and Shannon explained three case studies that incorporated resilience practices into remedial design and implementation: dual-phase extraction, site assessment and remediation, and air sparge and soil vapor extraction. Shannon and Carrie said that resilience can be incorporated into remediation projects by (1) developing a resilience plan at project onset, (2) projecting potential impacts of climate change, (3) evaluating both risks and opportunities, and (4) continually reassessing and updating resiliency plans. In California, regulatory drivers (e.g., discharge permit renewals include request for resiliency plans) exist. Presentation slides are provided in Attachment 13.

Discussions after the presentation focused on responsible parties' interest in resiliency. Participants discussed the lack of interest and believe that only a catastrophic event would drive remediation responsible parties to develop resiliency. The interest of responsible parties may grow when economic benefits (e.g., profiting from redeveloped land, avoiding disaster costs, reducing insurance premiums) can be gained.

Additional discussions focused on integrating sustainably and resiliency factors into constructability as projects are built. One participant added that the practice of engineering needs to develop guidance that includes climate change considerations. Another participant reminded everyone that the insurance industry hasn't defined the risks adequately. He said millions of dollars are spent when reacting and responding to a disaster and, at some point, incentives should be used to advance upfront investment.

Applications for Microbial Extracts to Address Climate Change Challenges

Mike Harding (Geosyntec Consultants) and Doug Oram (ETIC Engineering) presented their ideas on various applications of microbial extracts and how these applications fit into the context of climate change. Presentation slides are provided in Attachment 14.

Fortified microbial extracts (FME) can rapidly biodegrade hydrocarbons in soil and water under severe environmental conditions, and FME-controlled production has no adverse toxic effect on the environment and can biodegrade a broad range of chemical classes. FME is used in the environmental remediation and storm water industry in applications such as:

- Soil and water remediation by direct biodegradation
- Phytoremediation amendment
- Microbial amendment for soil stabilization

Mike presented two field studies conducted on highly weathered and compacted soils contaminated with crude and motor oils. There was reduction of motor oil and crude oil of 78% and 37%, respectively, after 240 days.

At the Intersection of Sea Level Rise and Waste Management

Randy Brandt (Geosyntec Consultants) presented sea-level rise and its related impacts on closed waste management units. Randy's presentation stressed the importance of ensuring that wastes or contaminated material contained within closed areas are not released and human or ecological receptors are protected as sea level and climate conditions change. Presentation slides are provided in Attachment 15.

Randy defined climate change as a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Change in average weather conditions or in the time variation of weather around longer-term average conditions are all evidence of climate change.

Randy summarized USEPA's draft 2012 document, *Climate Change Adaptation Plan*. In this document, USEPA concludes that changing climatic conditions and rising sea levels could compromise the protectiveness of hazardous waste site remedies. As a result, USEPA proposes vulnerability analyses and adaptation plans be incorporated throughout the cleanup process.

Randy presented a case study that evaluated the potential effects of climate change and sea-level rise on three inactive waste management units. The evaluation included assessing and projecting sea-level rise, assessing vulnerabilities, and including future adaptive management measures. Because the model does not include local conditions, understanding the local environment is paramount. For example, when sea level rises in Florida the porosity of limestone results in an approximate 1:1 ratio of sea-level rise to groundwater rise. Randy also reminded participants to consider the impact of salt-water intrusion on water quality along coastal areas.

Panel Discussion:
Building Resilience into Remediation and Redevelopment Planning

This panel discussion, facilitated by Dion Jackson (University of Southern California), explored how ecosystem resilience planning requires ecosystem-scale planning. The challenge with ecosystem resilience planning is that it often involves project-scale planners operating in a vacuum without systems-scale environmental information. Obtaining systems-scale environmental information requires building consensus among multiple stakeholders (e.g., agencies, regulators, advocates).

Panelists Hilda Blanco (University of Southern California), Anne Dailey (U.S. Environmental Protection Agency), and Mike Antos (Santa Ana Watershed Project Authority) provided introductory remarks, as summarized below.

- Hilda's presentation focused on the growing importance of urban sustainability and resilience because of climate change. She believes that new challenges call for new methods and provided an overview of four methods in urban planning that could be applicable to remediation and redevelopment. Examples of potential uses for natural capital valuation, life-cycle analysis, climate change adaptation planning, and California's EnviroScreen Tool were presented. Presentation slides are provided in Attachment 16.

- Anne presented two case studies to demonstrate how to improve resilience so that climate change does not affect the protectiveness of the remedy. In one of the case studies presented, sea-level rise and storm surge were considered during remedial design development at a Superfund site with contaminated sediment. Resilience was incorporated into the design after discussions with the local port authority. Presentation slides are provided in Attachment 17.

- Mike presented ideas of how to engage the community, describing the concepts of collaborative environmental governance and transitional management. These concepts reflect a move to more of an ecosystem approach when conducting our work. To demonstrate the effectiveness of these concepts, Mike presented a case study of a project in Greater Los Angeles County. The two primary goals of the project were to (1) develop tools for understanding the diversity of challenges and characteristics of communities in the region and (2) identify critically needed projects for the county as a guide and describe the efforts. For more information about the case study, see the presentation slides in Attachment 18.

Initial discussions focused on the importance of gathering all stakeholders at the table to listen and engage with them (versus presenting to them and employing one-way communication). Anne noted the importance of including individuals with education expertise (e.g., curriculum development) when bringing your ideas to the public and recommended using the community coordinator role at EPA as a resource in community planning.

Attachment 1

SURF 31 Participant Contact Information

SURF 31: March 2-3, 2016
Participant Information

Name	Affiliation	Phone Number	Email
Adams, Kathy	Writing Unlimited, LLC	(302) 438-3764	kadams2@comcast.net
Alms, Michael	Growing Solutions, Inc	(541) 343-8727	michael@growingsolutions.com
Antos, Mike	Santa Ana Watershed Project Authority	(951) 354-4238	mantos@sawpa.org
Aragona, Keith	Haley & Aldrich, Inc.	(734) 887-8402	karagona@haleyaldrich.com
Blanco, Hilda	University of Southern California	(213) 821-7273	hblanco@usc.edu
Brandt, Randy	Geosyntec Consultants	(510) 285-2736	rbrandt@geosyntec.com
Bruning, Sue	Cascade	(206) 795-5369	sbruning@cascade-env.com
Burton, Lindsay	ExxonMobil Environmental Services Company	(856) 224-2618	lindsay.f.burton@exxonmobil.com
Butler, Paul Brandt	AECOM	(610) 832-3575	brandt.butler@aecom.com
Carroll, Dan	Kleinfelder	(858) 736-6415	dcarroll@kleinfelder.com
Coughlin, Rose	Northgate Environmental Management	(510) 839-0688	adriana.machado@ngem.com
Crozier, Carrie	Parsons	(626) 440-2747	carrie.crozier@parsons.com
Dailey, Anne	US Environmental Protection Agency	(703) 347-0373	dailey.anne@epa.gov
Erickson-Mulanax, Emerald	Farallon Consulting	(425) 295-0825	eerickson@faralloncconsulting.com
Favara, Paul	CH2M	(352) 384-7067	pfavara@ch2m.com
Firth, Michael	The ELM Group Inc.	(215) 794-6920	mfirth@elminc.com
Galloway, Nicky	Northgate Environmental Management, Inc.	(510) 839-0688	nicky.galloway@ngem.com
Hadley, Paul	California DTSC (retired)	(530) 601-8666	hadley1304@aol.com
Hansen, Lara	EcoAdapt	(206) 201-3834	Lara@EcoAdapt.org
Harding, Michael	Geosyntec Consultants	(619) 379-5116	hawkeye157@aol.com
Hasegan, Diana	GHD	(206) 552-9351	diana.hasegan@ghd.com
Healy, Erin	Anchor QEA	(978) 996-3054	ehealy@anchorqea.com
Hileman, Douglas	Douglas Hileman Consulting LLC	(818) 416-6403	djhileman@gmail.com
Hudelson, Pete	Boeing	(425) 373-8828	peter.m.hudelson@boeing.com
Jackson, Dion	USC Center for Economic Development	(310) 704-3679	dljackso@usc.edu
Katz, Nurit	UCLA	(818) 384-9493	nkatz@facnet.ucla.edu
Kessel, Lowell	CERES Corporation	(714) 709-3683	lowell@cerescorporation.com

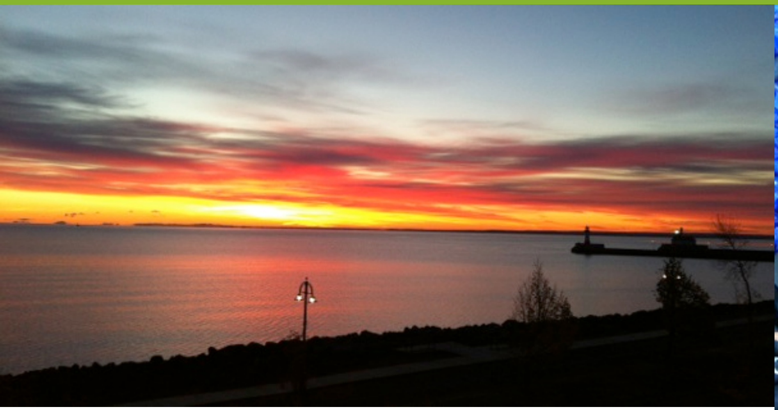
Kruger, Dawn	Parsons	(312) 930-5283	dawn.kruger@parsons.com
Lefton, Kyle	LA Metro	(213) 922-2206	leftonk@metro.net
Maco, Barbara	WACTOR & WICK LLP	(510) 205-0416	BarbaraMaco@ww-envlaw.com
Makerov, Mike	BNSF	(909) 289-1893	mike.makerov@bnsf.com
Mancini, Kristin	ARCADIS	(415) 335-0796	kristin.mancini@arcadis.com
Maserejian, Jack	Envirocon, Inc.	(617) 981-5507	jmaserejian@envirocon.com
McCorkle, John	Cardno	(206) 269-0104	John.mccorkle@cardno.com
McManus, Terry	Groundwater & Environmental Services (GES), Inc.	(925) 459-4656	tmcmanus10@yahoo.com
Meyers, Mark	Anchor QEA, LLC	(201) 739-4066	mmeyers@anchorqea.com
Miller, Mike	CDM Smith	(617) 452-6295	millerme@cdmsmith.com
Moore, Samuel	Battelle Memorial Institute	(614) 424-6129	MooreSB@battelle.org
Nair, Deepti	Battelle	(510) 846-5935	naird@battelle.org
O'Connell, Shannon	Parsons	(626) 374-8438	Shannon.oconnell@parsons.com
Onderdonk, John	Caltech	(626) 395-4724	john.onderdonk@caltech.edu
Opper, Richard	Opper & Varco LLP	(619) 417-6899	ropper@envirolawyer.com
Oram, Douglas	ETIC Engineering	(925) 768-2497	doram@eticeng.com
Rabideau, Tammy	Tetra Tech	(734) 476-4647	tammy.rabideau@tetratech.com
Raymond, Dick	Terra Systems, Inc.	(302) 798-9553	draymond@terrasystems.net
Rosenberg, Heather	USGBC-LA	(323) 610-3754	hrosenberg@usgbc-la.org
Saum, Lindsey	University of California Riverside	(513) 833-1616	lsaum001@ucr.edu
Schilz, Greg	JLT Specialty USA	(415) 819-6585	gregory.schilz@jltus.com
Simon, John	Gnarus Advisors	(703) 298-3603	jsimon@gnarusllc.com
Smith, Maile	Northgate Environmental Management, Inc.	(408) 202-4829	maile.smith@ngem.com
Stanford, Jeffrey	TRC	(213) 213-9404	tstanford@trcsolutions.com
Stewart-Harmon, Karin	Remedial Construction Services, Inc.	(949) 556-7223	Karin.harmon@reconservices.com
Tanzil, Dicksen	Golder Associates	(281) 821-6868	dtanzil@golder.com
Thom, Aaron	ExxonMobil	(832) 544-3413	aaron.thom@exxonmobil.com
Tipton, Karina	Brown and Caldwell	(201) 574-4719	ktipton@brwncald.com

Tunks, John	CH2M	(720) 286-5271	john.tunks@ch2m.com
Tychon, Marisa	The Boeing Company	(562) 797-1335	marisa.k.tychon@boeing.com
Unger, Samuel	California Regional Water Qulity Control Board, Los Angeles	(213) 576-6605	samuel.unger@waterboards.ca.gov
Venkatasubramanian, Sowmya	Parsons	(626) 440-6025	Sowmya.Venkat@parsons.com
Waldron, Kyle	Tesoro	(907) 529-0297	Kyle.A.Waldron@tsocorp.com
Wice, Rick	Tetra Tech	(412) 298-5922	rick.wice@tetratech.com
Wick, William	Wactor & Wick LLP	(510) 465-5750	bwick@wwq-envlaw.com
Willis, Derrick	Northgate Environmental Management, Inc.	(510) 839-0688	derrick.willis@ngem.com
Wolf, Gerlinde	AECOM	(585) 490-0987	gerlinde.wolf@aecom.com

Attachment 2
Implications of Climate Change in Contaminated Site Remediation




Implications of Climate Change in Contaminated Site Remediation



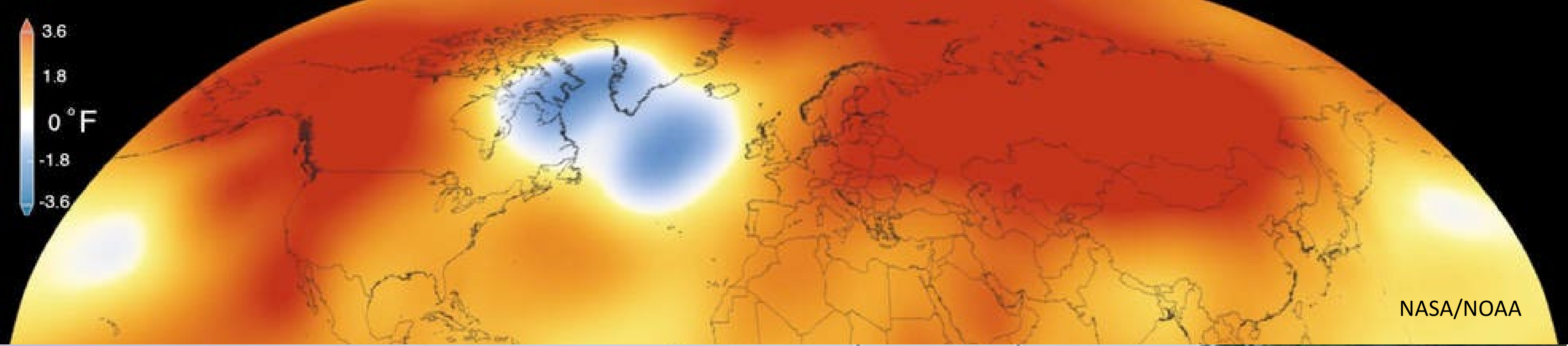
Lara Hansen, Ph.D.
Chief Scientist & Executive Director
& Eric Mielbrecht, M.S.

SURF 31 – Pasadena – March 2, 2016

EcoAdapt™
Meeting the challenges of climate change

“The future ain’t what it used to be.”

-Yogi Berra



Basic Climate Change Impacts

Climate change affects contaminants

Aspects of contaminated site remediation that will be affected by climate change:

Toxicity

- Amount of contaminant (due to use or conditions)
- Form of contaminant

Exposure

- Availability
- Uptake

Sensitivity

- Organism response changes

Transport and Fate

- Changes in environmental mobility
- Degradation/transformation can change

Efficacy

- Existing practice less effective due to changes

Climate can undermine remediation

Changing Precipitation Patterns

→ flooding: mobilization

→ drought: oxidation of soils, ↓ dilution, lack of water for treatment

Sea Level Rise

→ erosion

→ site inundation

Extreme weather

→ scour

→ flooding

Extreme Heat

→ changing use of sites by wildlife

→ increased volatility

→ melting permafrost

Fire

→ spread of contaminants

→ damage to site infrastructure

PHYSICAL IMPACTS

Climate can undermine remediation

Soil Treatment

Bioremediation: bacterial activity may change
Landfarming/landspreading: flooding

Groundwater Treatment

Altered rates of recharge and extraction

Removal of contaminated material

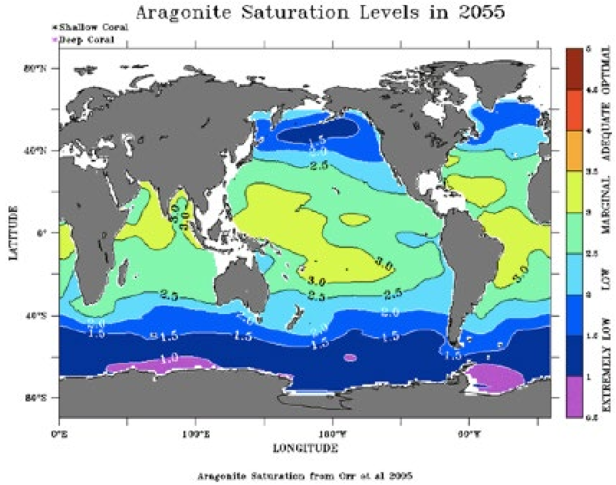
May be hard to contain with extreme weather, flooding or sea level rise

Engineered in situ solutions

Soil washing: insufficient water limits
Soil extraction: warmer temperatures may help
Natural attenuation: models not climate informed, rates may be incorrect
Incineration: emissions allowances may change

PHYSICAL IMPACTS

Climate change affects toxicity



Decreasing pH

→ increased toxicity
→ increased sensitivity of species due to pH stress
→ altered transformation rates

Increasing Temperature

→ increased toxicity
→ decreased DO
→ increased species sensitivity due to heat stress & associated conditions

Altered precipitation patterns

→ wetter: more run-off, greater dilution, increased mobility
→ drier: increased volatility, less dilution
→ altered degradation rates (physical, microbial)

Extreme weather

→ similar to wetter

Human responses to climate change

→ increased use of some chemicals
→ conflicting solutions and changing land use demands

TOXICOLOGICAL IMPACTS

Adaptation: What can be done?

Mitigation

Reducing the root cause of climate change through reducing greenhouse gas emissions

Adaptation

Limiting the current and committed effects of climate change on human and natural systems

Sustainability Requires Adaptation

Site remediation practice should plan for changing and future condition to remain successful for the long-term (i.e., Sustainable)

Adaptation: The 3 Rs

Resistance **Resilience** **Response**

Adaptation: 5 Tenets

1. Protect adequately and appropriately for a changing world

2. Reduce non-climate stressors that are exacerbated by or exacerbate the effects of climate change

3. Manage for uncertainty

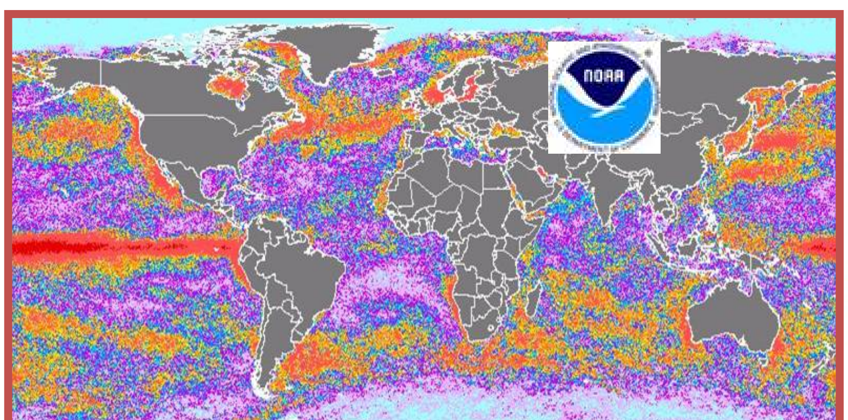
4. Reduce the rate and extent of local and regional climate change

5. Reduce the rate and extent of global climate change

1) Protect adequately & appropriately for a changing world

Site remediation require Temporal/Climate Aware Thinking

- Refugia
- Gradients (Elevational)
- Heterogeneity
- Gene flow/Connectivity
- Inclusion of other changes in adjacent habitat



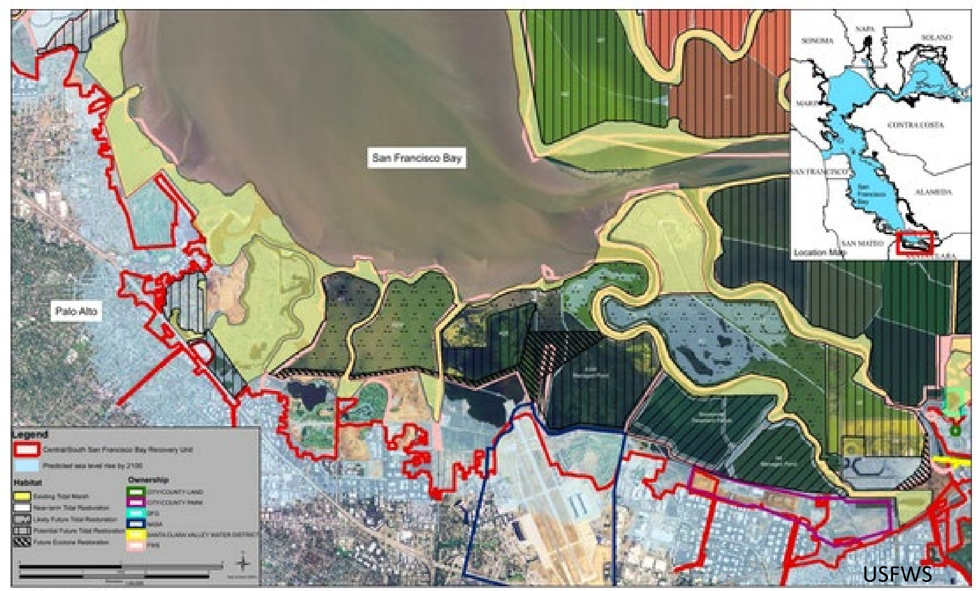
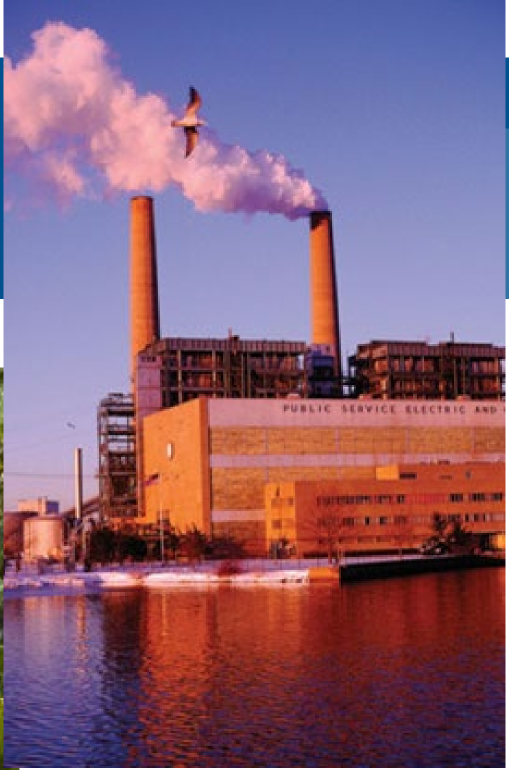


Figure III-21. Segment O

2) Reduce non-climate stressors



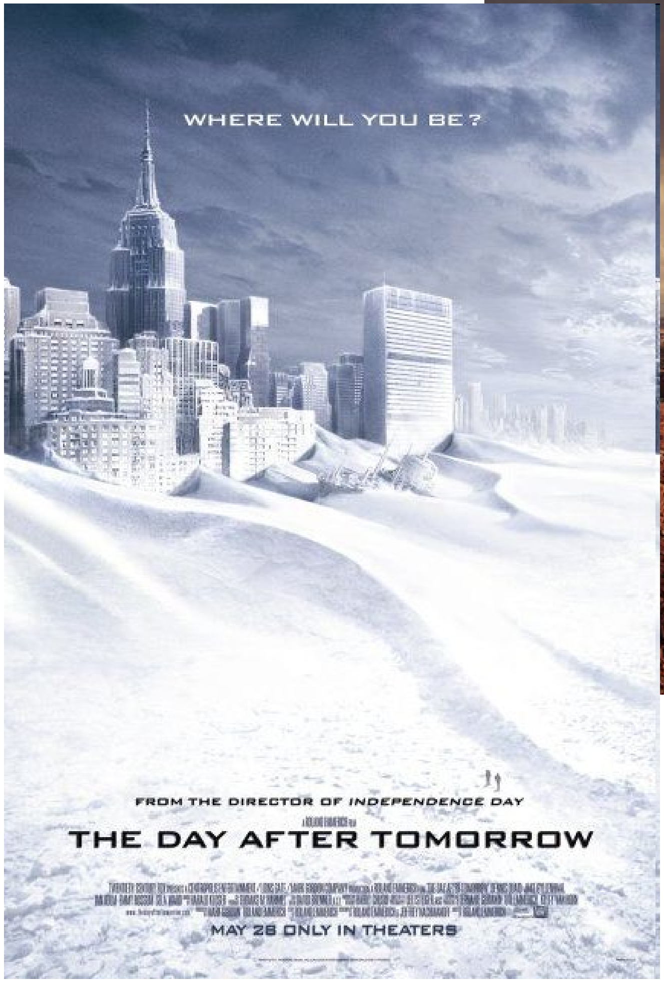
Pollution & Habitat Degradation

Invasive & Pest Species

Agriculture & Habitat Fragmentation

Unsustainable Harvest

3) Manage for Uncertainty



4) Reduce local and regional climate change

Michael S. Quinton, National Geographic

5) Reduce Greenhouse Gas Emissions

Resilience options have limits, some systems are very limited

Polar habitat, high elevation habitat, floodplains, oceans…

Climate Savvy Site Remediation

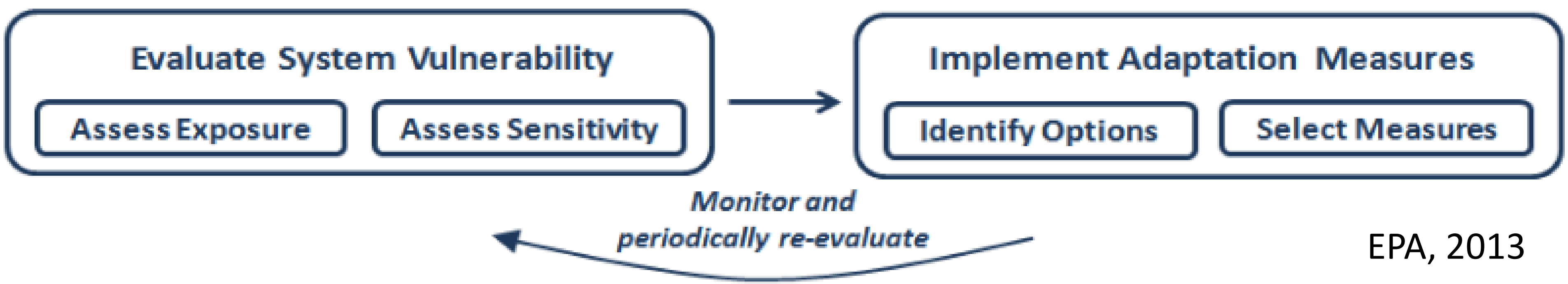
Without climate change being explicitly considered in a remediation plan,

near term efforts may be undermined and long-term goals will be unachievable.

SUSTAINABILITY

Vulnerability = Sensitivity + Exposure – Adaptive Capacity

- **↓ Sensitivity: Control sensitive features at the site**
- **↓ Exposure: Allow the site to experience less change**
- **↑ Adaptive Capacity: Prepare the site and design a treatment regime for change**

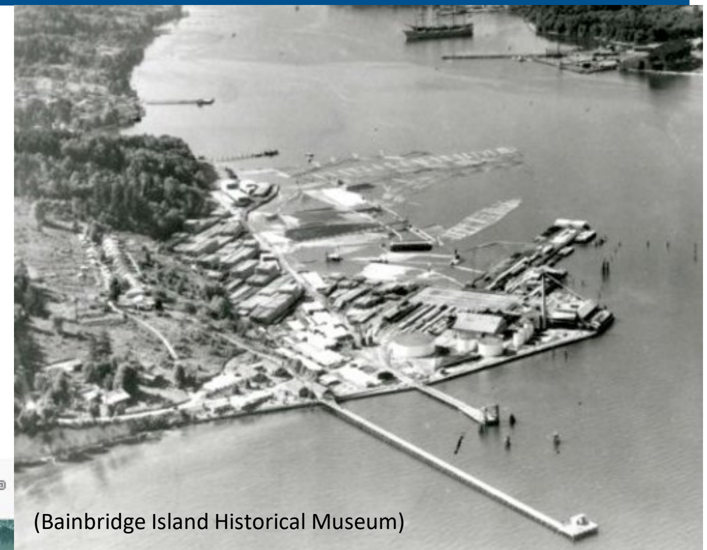


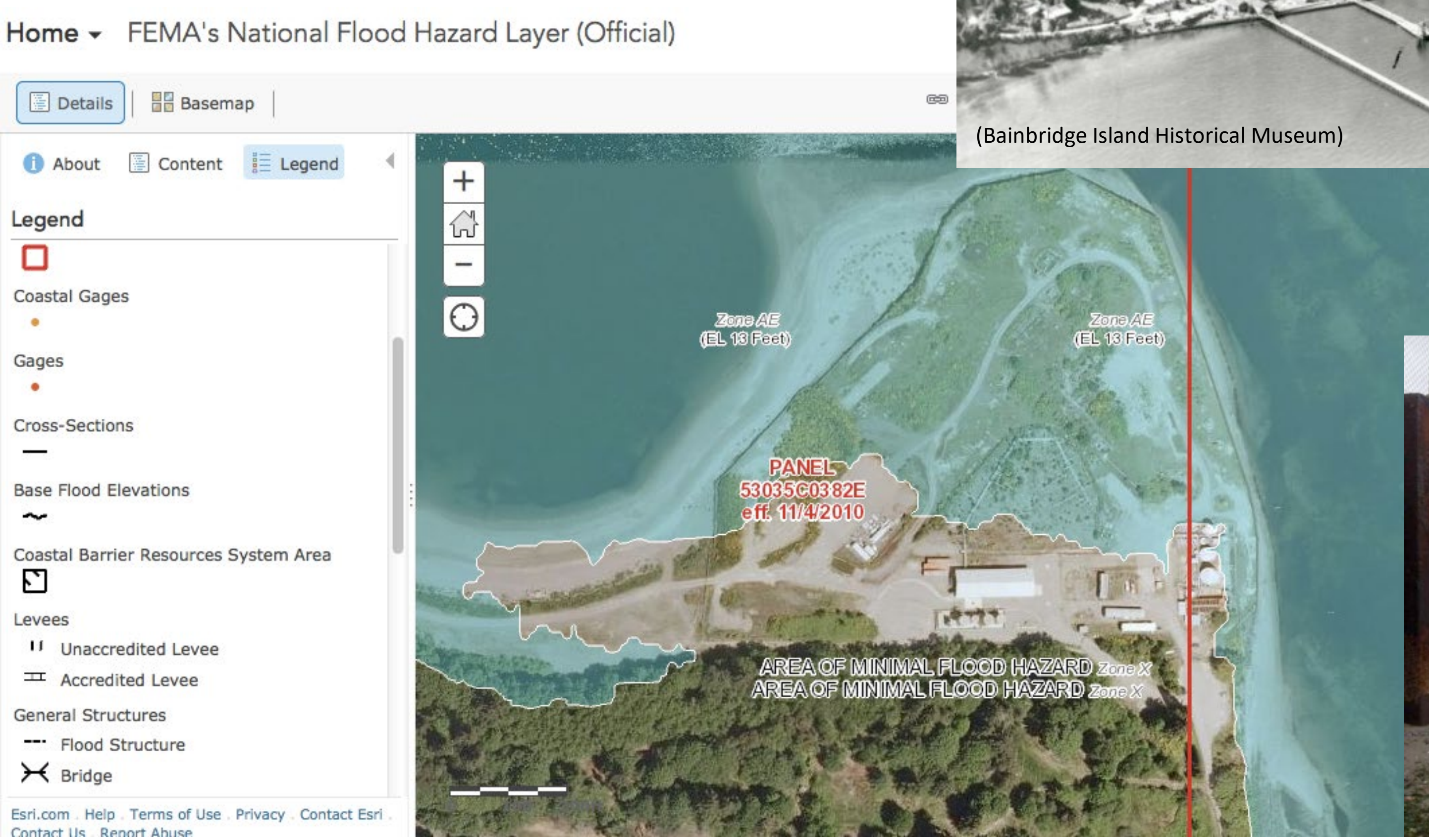
EPA, 2013

Climate Savvy Site Remediation

Wyckoff Creosote Plant

Resistance= Barrier to Maintain Condition


(Bainbridge Island Historical Museum)



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Climate Savvy Site Remediation

cake
Climate Adaptation Knowledge Exchange

Enter Keywords

CASE STUDIES | VIRTUAL LIBRARY | DIRECTORY | TOOLS | COMMUNITY

R E S I L I E N C E

Home | Case Studies

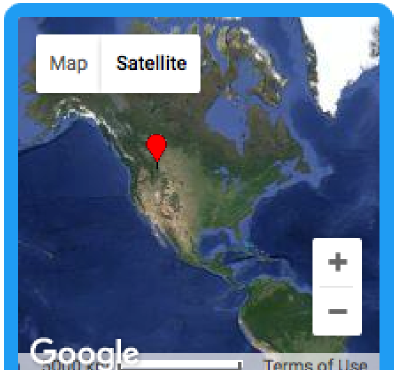
Protecting the Local Economy from Climate Impacts in the Clark Fork River Basin

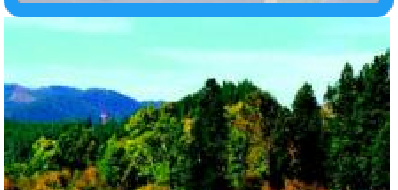
PRINT | DOWNLOAD

By: EcoAdapt and Freshwater Future
December 03, 2013

ShareThis

Resilience = Modified flow and sediment management





Project Summary/Overview

Reverend Maclean explains trout fly fishing to his sons, Norman and Paul, in *A River Runs Through It* as "an art that is performed on a four-count rhythm between ten and two o'clock." This art is big business in Montana—the Department of Fish, Wildlife, and Parks estimated that Missoula County alone generated $30.2 million in fishing revenue in 2005. As temperatures warm and habitat conditions change, trout populations are predicted to decline precipitously over the next century. The Clark Fork Coalition, a non-profit organization dedicated to protecting and restoring the Clark Fork River basin, is taking action to help this iconic Montana species persevere under changing climate conditions.

Project Background

In 1908, the Milltown Dam—intended to supply hydroelectricity to nearby sawmills—was built on the Clark Fork River in Montana. But with the dam just months old, a record flood changed everything. Prior to 1908, the Clark Fork watershed was extensively mined for minerals

CASE STUDIES

Search Case Studies

Enter Keywords SEARCH

or Browse All Case Studies

Project Documents

- ClarkForkStoryRS.pdf

Related Virtual Library Documents

- Low Flows Hot Trout: Climate Change in the Clark Fork Watershed

Related Case Studies

- Low Flows and Hot Trout: Dealing with the Effects of Climate Change in the Clark Fork Watershed

Related Tools

- Great Lakes Climate Adaptation Toolkit

Submit a Case Study

Climate Savvy Site Remediation

Laysan Island "Dead Zone"

- Carbofuran (carbamate pesticide) contamination in upper beach sand
- Dynamic and inaccessible location
- Potential risk is high (highly toxic to birds)
  - Laysan teal, Laysan duck, Hawaiian monk seal

➢ Contaminated area dug up and removed from island

Response = Complete Removal

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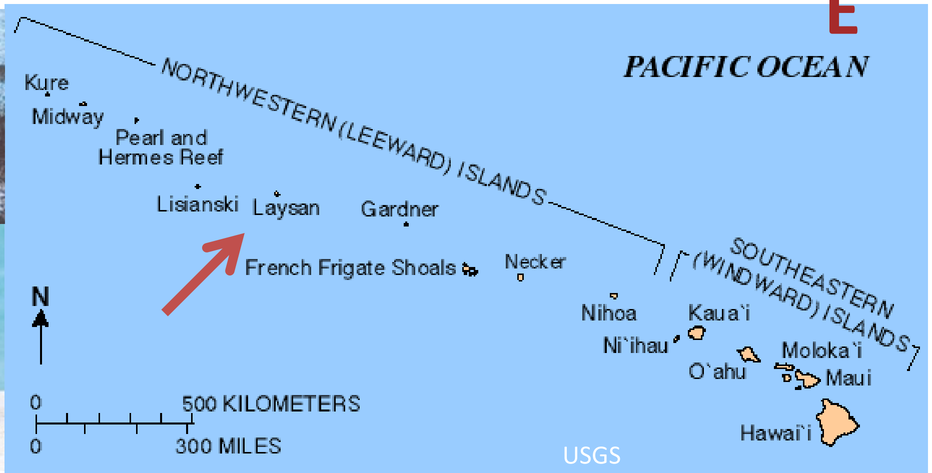


Climate Savvy Site Remediation

Superfund Climate Change Adaptation: Information Sources

Temperature	Precipitation	Wind	Sea Level Rise	Wildfires	Information Resources and Type of Information Available for Applicable Impact
Climate Change Impacts					
♦	♦		♦		EPA Climate Change Indicators in the United States website • Information on "weather and climate" indicators relating to temperatures, precipitation and drought as well as extreme oceanic, snowfall and ice scenarios
♦	♦	♦	♦		EPA Climate Resilience Evaluation & Awareness Tool (CREAT) website • Desktop application providing a framework for organizing climate data and a process for identifying threats, vulnerable assets, and adaptation options; CREAT-based maps illustrate scenarios at a 1/2-degree lat/long scale (32 x 32 miles) for hotter/drier or warmer/wetter conditions and at a county scale for storm surge indundation and hurricane strike frequency
	♦				EPA National Stormwater Calculator website • Desktop application to estimate rainwater and runoff frequency based on soil types, drainage, topography, precipitation, evaporation and future climate change scenarios
	♦				Federal Emergency Management Agency (FEMA) Flood Map Service Center website • Floodplain maps

Emerging Ideas

- Linking risk assessment and climate change vulnerability assessment processes

  “Some important topics that could be characterized as “cumulative risk,” such as global climate change, are beyond the scope of this report.”

  -U.S. EPA. Framework for Cumulative Risk Assessment. 2003

- Adding temporal markers to site remediation plans that include climate monitoring

- Building capacity for site remediation professionals through adaptation training and resources

cake
Climate Adaptation
Knowledge Exchange

Additional Resources

National Stormwater Calculator

Assorted Technical Fact Sheets:

Landfill, Groundwater and Sediment (2014)

EcoAdapt™
Meeting the challenges of climate change

State of Adaptation Program

Conduct a research assessment of adaptive remediation

Awareness to Action

Learn how to apply adaptation to your own remediation efforts

Climate Adaptation Knowledge Exchange (CAKEx.org)

Find examples of adaptation online

Adaptation Consultation

Get help applying adaptation to remediation

National Adaptation Forum

Continue this conversation with other sectors

Need Help?

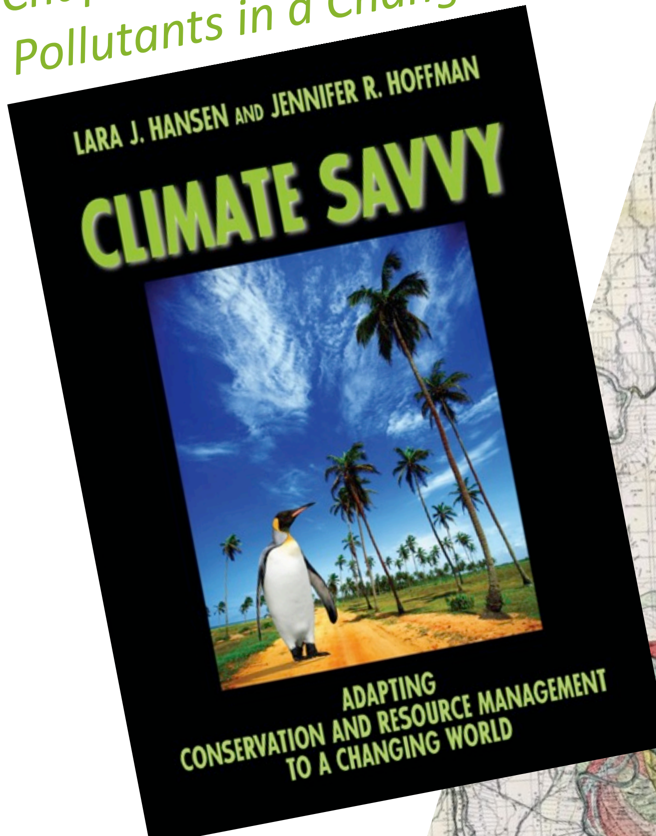
Lara Hansen

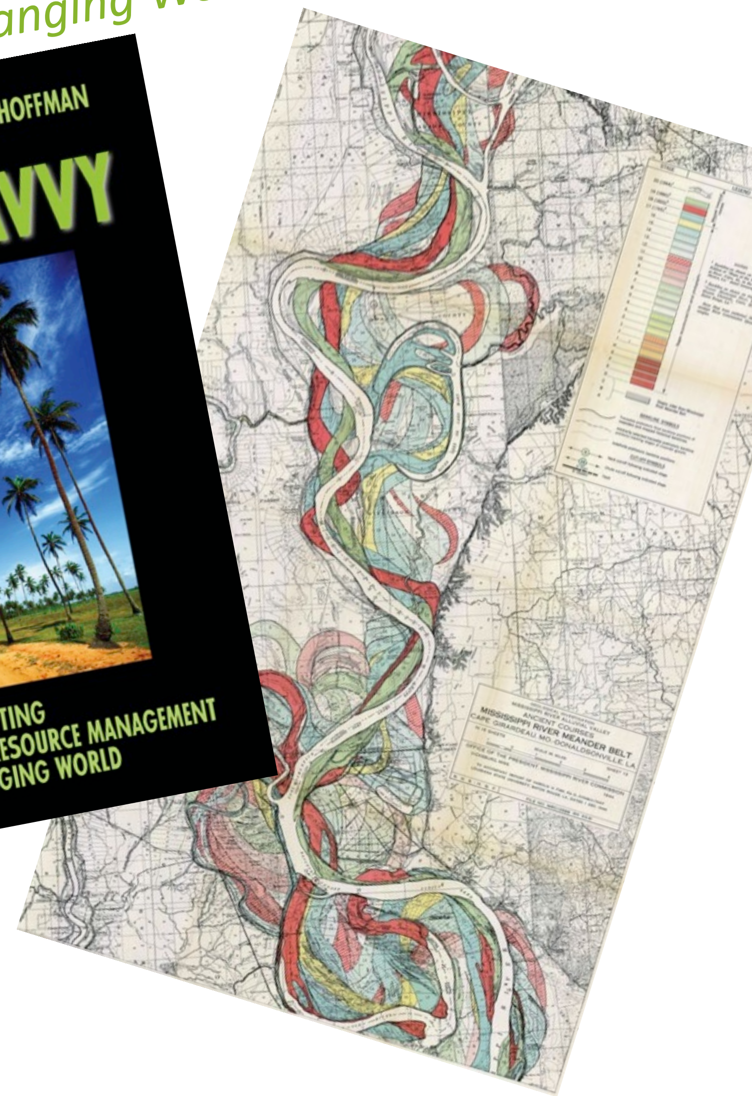
Lara@EcoAdapt.org

Learn more at

EcoAdapt.org

Chapter 14: Regulating Pollutants in a Changing World





EcoAdapt™

Meeting the challenges of climate change

Attachment 3

Adaptation of Superfund Remediation to Climate Change

Adaptation of Superfund Remediation to Climate Change

Anne D. Dailey

U.S. Environmental Protection Agency

Office of Superfund Remediation and Technology Innovation

Sustainable Remediation Forum

March 2, 2016

Topics

- Federal and EPA-wide Priority
- Potential Issues
- Superfund Adaptation Strategy
- Case Studies
- Key Points/Resources

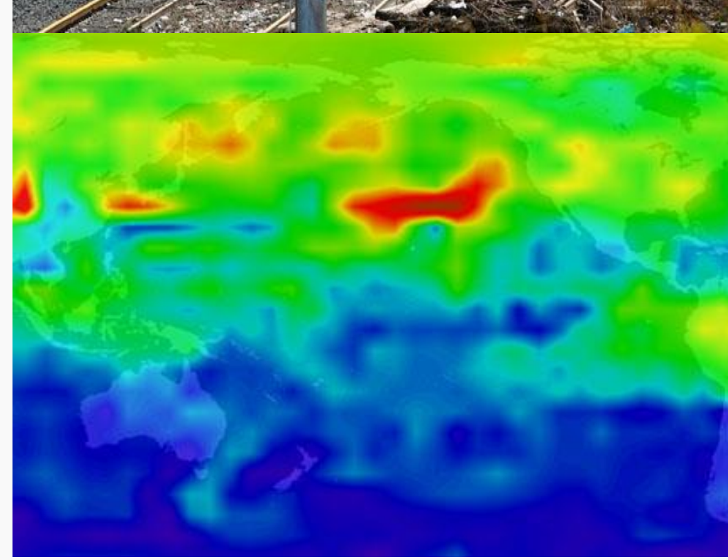


Image credit: U.S. Global Change Research Program (www.globalchange.gov)

Background

- The *USEPA Policy Statement on Climate Change Adaptation* (2011) directed each national program office and region to develop a climate change adaptation implementation plan

- Executive Order (EO)13653 (2013) directed each federal agency to evaluate climate change risks and vulnerabilities to manage the effects of climate change on the agency's mission and operations in both the short and long-term

- Final EPA Climate Adaptation Implementation Plans (2014)

- EO 13690 – Federal Flood Risk Management Standard (2015)

Potential Climate Change Impacts

Key potential climate change impacts agreed upon by climate experts and included in EPA's Climate Change Adaptation Plan are:

Increased extreme temperatures	Sustained changes in average temperature	Sea level rise
Decreased permafrost in Arctic regions	Decreased precipitation days, increasing drought intensity	Increased heavy precipitation events
Increased flood risk	Increased frequency and intensity of wildfires	Increased intensity of hurricanes

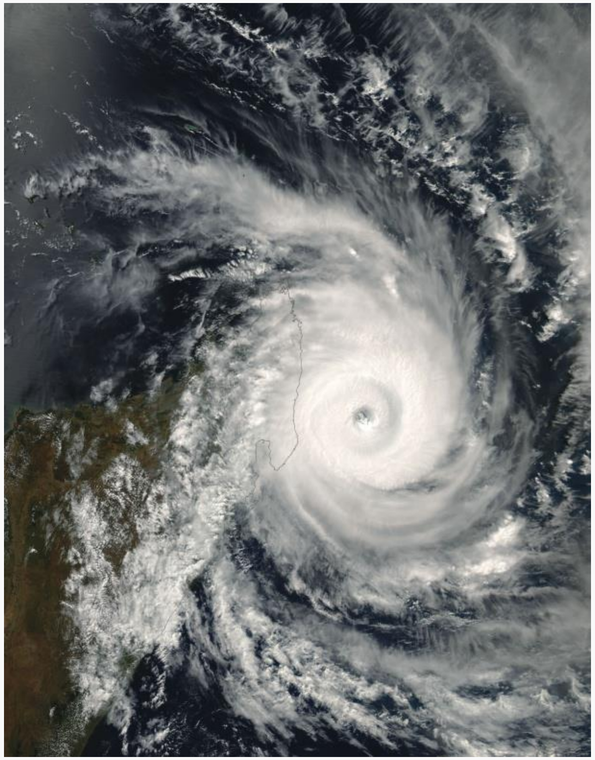


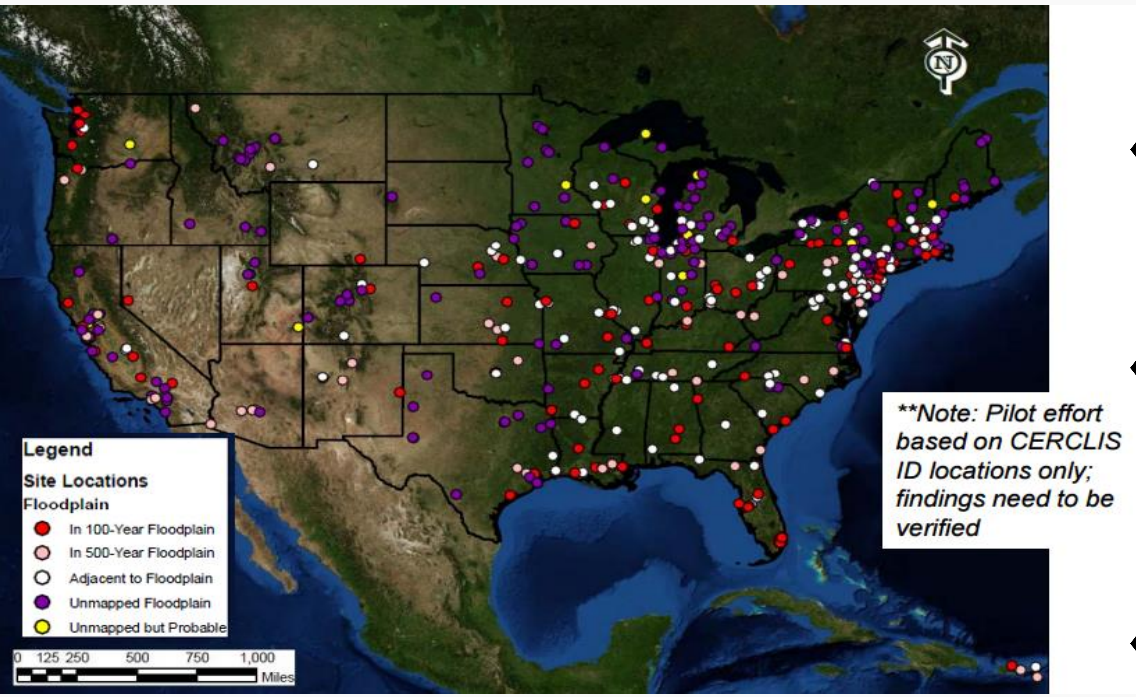
Image credit: U.S. Global Change Research Program (www.globalchange.gov)

EPA Region 9
Potential Climate Change Impacts

- Air temperatures will increase;
- Precipitation may decrease in some areas;
- Storm events may be more severe;
- Oceans will become more acidic and warm; and
- Sea level will rise.

Source: EPA Region 9 Climate Change Adaptation Implementation Plan (2014)

Potential Climate Change Issues at Superfund Sites



Superfund sites near and within 100 & 500 Year Floodplains (using CERLIS ID location)

- Climate change impacts may compromise some remedies used to clean up contaminated sites
- Some remedies anticipated to operate for more than 30 years, sometimes more than 100 yrs.
- Extraction and treatment of contaminated groundwater, a common remedy, carries a high infrastructure cost
- Onsite containment of waste,, may be vulnerable to mobilization

U.S. EPA Office of Solid Waste and Emergency Response[1] Climate Change Adaptation Implementation Plan (2014)

- The Agency's mission is to protect human health and the environment
- Communities with potential environmental justice concerns may be located in areas more likely to be impacted by climate change. The Superfund process may consider climate change and potential environmental justice concerns.
- Climate change adaptation within the Agency and broader federal government
- Agency and program budget constraints

1 - EPA Office of Solid Waste and Emergency Response (OSWER) is now the EPA Office of Land and Emergency Management (OLEM)

The Good News!

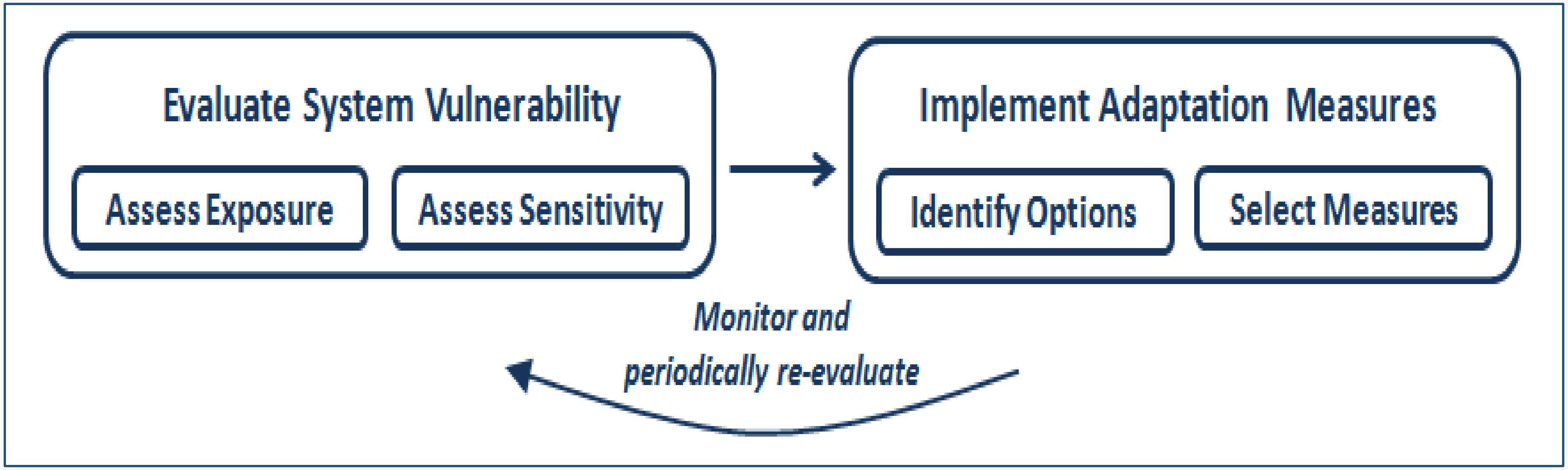
The **existing Superfund process** for planning and implementing contaminated site cleanups provides structure to:

- Consider potential climate change impacts and
- take action, as warranted, to increase remedy resilience.

Superfund Strategy to Assure Resilience

1) Evaluate site-specific vulnerability of a remedy through:
   - Exposure assessment
   - Sensitivity assessment
2) Implement adaptation measures, where warranted, to increase resilience of the remedy, as appropriate under CERCLA
   - Identification of options
   - Selection of suitable adaptation measures
3) Monitor all cleanup projects and periodically re-evaluate the need to modify existing measures or take additional measures

Climate Change Adaptation Management



From EPA, 2014. Climate Change Adaptation Technical Fact Sheet.

Superfund Project Manager's Role

- Understand climate change issues near the Superfund site
- Understand potential vulnerabilities
  - Existing or planned remediation systems
- Implement adaptation/mitigation measures
  - More options during earlier stages of cleanup
- Monitor and update as needed

Climate Change Considerations: All Major Phases of Superfund Process

- Remedial Investigation/Feasibility Study
  - Nature and extent of contamination
  - Human and ecological risks
  - Develop and screen remedial alternatives
- Remedy selection
- Remedy design
- Remedial action
- Post Construction

Remedial Investigation/Feasibility Study

- Consider climate change when:
  - Assessing the nature and extent of the contamination and associated risk
  - Developing and updating conceptual site model
  - Evaluating remedial alternatives, developing remedial design and considering long-term stewardship
- Use best available data and models
- Confer with local/regional experts
  - For example, nearby port authority

Remedy Selection

- Use best available guidance, data and other resources
- Consider climate change impacts as part of remedy alternative evaluation and selection
- Incorporate consideration of:
  - Exposure to potential climate change impacts
  - Remedy vulnerabilities
  - Adaptation and mitigation measures

Remedial Design/Remedial Action

- Consider site vulnerabilities and adaptation measures
- Consider:
  - Below ground components
  - At and above ground components
  - Site operations and infrastructure
- Incorporate in design and implementation
  - For example, elevate electrical panels, armor containment, etc.
- Consider long-term stewardship

Post Construction

- Operation and maintenance (may be oversight role)
  - Monitor remedy for climate change related vulnerabilities
  - Emergency operations and response plans
  - Record management

- Five-Year Reviews
  - Evaluate remedy implementation/performance to determine protectiveness
    - Is the remedy functioning as intended?
    - Are the assumptions, data and cleanup levels still valid?
    - Is there new information that could call into question protectiveness of the remedy?
  - If issues, may need updated O&M Plan or remedy decision

Climate Change and EPA Enforcement

- EPA Office of Solid Waste and Emergency Response (OSWER) Climate Change Adaptation Plan[1] (2014) includes a provision addressing ”enforcement concerns related to climate change issues, and to develop tools that address climate change policy questions as well as site-specific issues.”
- EPA’s Office of Land and Emergency Management (OLEM) and Office of Site Remediation Enforcement (OSRE) are partnering on an ongoing basis.
- EPA is considering model language for settlements and orders to address potential climate change impacts in a cleanup context.
- Agency is also developing climate change-related enforcement approaches

1 - EPA Office of Solid Waste and Emergency Response (OSWER) is now the EPA Office of Land and Emergency Management (OLEM)

Purity Oil Sales Superfund Site
Fresno, CA

- Groundwater table dropped 16+ feet over the past 5 years (due to drought and agricultural pumping)
- EPA and Responsible Parties saw opportunity to aggressively remove contamination from newly-exposed vadose zone
- SVE sped up cleanup and prevented further migration of contaminants to groundwater
- SVE has so far removed 780 lbs. of chlorinated VOCs (orders of magnitude greater than the mass removed by the pump-and-treat system)

Treatment facility

Stormwater retention basin – facility in distance

Source: Patricia Bowlin, U.S. EPA Region 9

American Cyanamid Superfund Site
Bridgewater, New Jersey

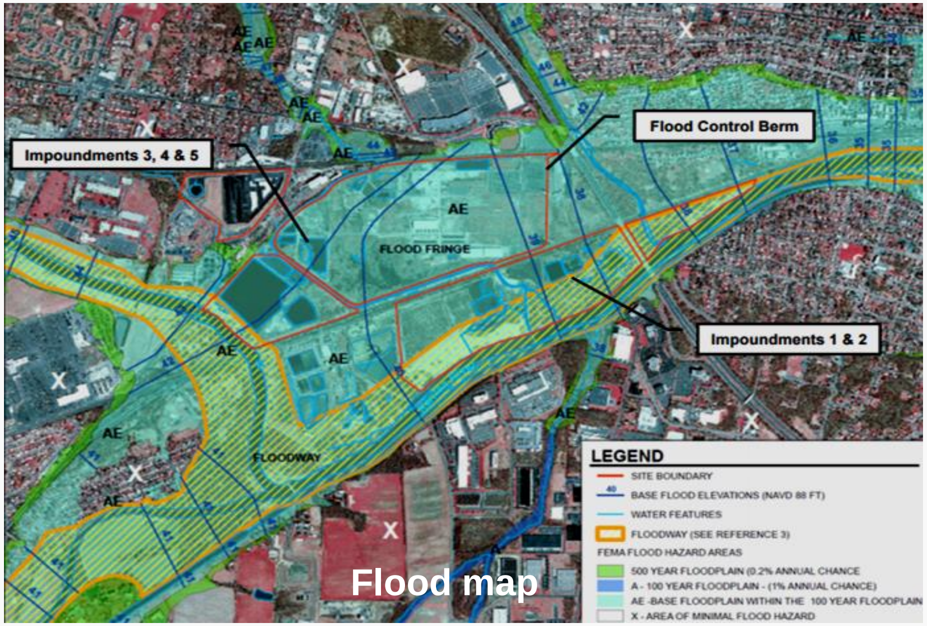
Primary Hazard: Floods

Rationale: 435-acre site located along the Raritan River had significant flooding in 2011 due to Hurricane Irene

Adaptation Measures:

- Elevated critical electrical controls
- Installed submersible pumps in bedrock wells to maintain hydraulic control during future floods
- Reinforced earthen berms surrounding contaminated waste impoundments
- Requiring future capping systems to be designed to withstand a 500-year flood event

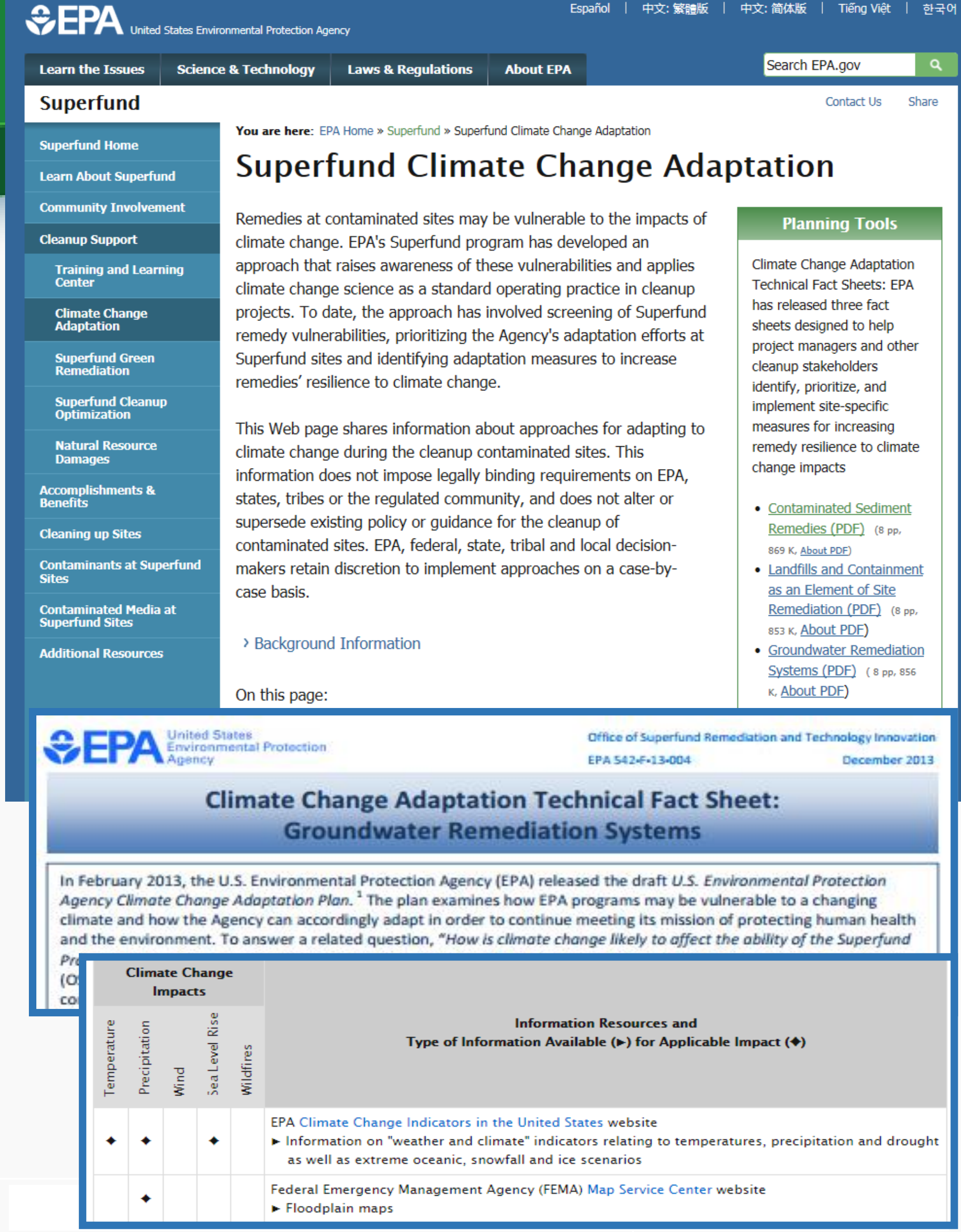
Elevated electrical controls



Source: Joseph Battipaglia, U.S. EPA Region 2

Information Resources

- Potential impacts of climate change on the Superfund Program
- Adaptation in the Superfund Program
- Planning and implementation tools:
  - Links to resources for evaluating site-specific vulnerabilities
  - Technical fact sheets on the most vulnerable types of remedies
  - Examples of adaptation measures taken at Superfund sites



http://www.epa.gov/superfund/superfund-climate-change-adaptation

Key Points

- Federal and EPA priority to address climate change
- Existing Superfund process provides structure to consider climate change vulnerability and adaptation
- Earlier the better
- Luck favors the prepared
- Check available resources

Resources

- EPA Main Climate Change Webpage:
  http://www.epa.gov/climatechange/

- EPA Superfund Climate Change Webpage:
  http://www.epa.gov/superfund/superfund-climate-change-adaptation

- EPA HQ Superfund Climate Change Contacts:
  - Anne Dailey, dailey.anne@epa.gov; 703-347-0373
  - Carlos Pachon, pachon.carlos@epa.gov; 703-603- 9904
  - Marc Thomas, thomas.marc@epa.gov; 202-566-0791

- EPA Region 9 Climate Change Contact:
  - Suzanne Marr; marr.suzanne@epa.gov; 415-972-3468

Attachment 4
Building Resilience-LA

BUILDING RESILIENCE-LA

How to survive and thrive in a changing world

Heather Joy Rosenberg
SURF 31 – Pasadena
March 2, 2016


THE FOLLOWING PREVIEW HAS BEEN APPROVED FOR
ALL AUDIENCES
BY THE MOTION PICTURE ASSOCIATION OF AMERICA, INC.
THE FILM ADVERTISED HAS BEEN RATED
PG-13
PARENTS STRONGLY CAUTIONED
Some Material May Be Inappropriate for Children Under 13
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VIOLENCE, DRINKING, LANGUAGE,
BLOOD AND GORE, SOME THEMATIC ELEMENTS,
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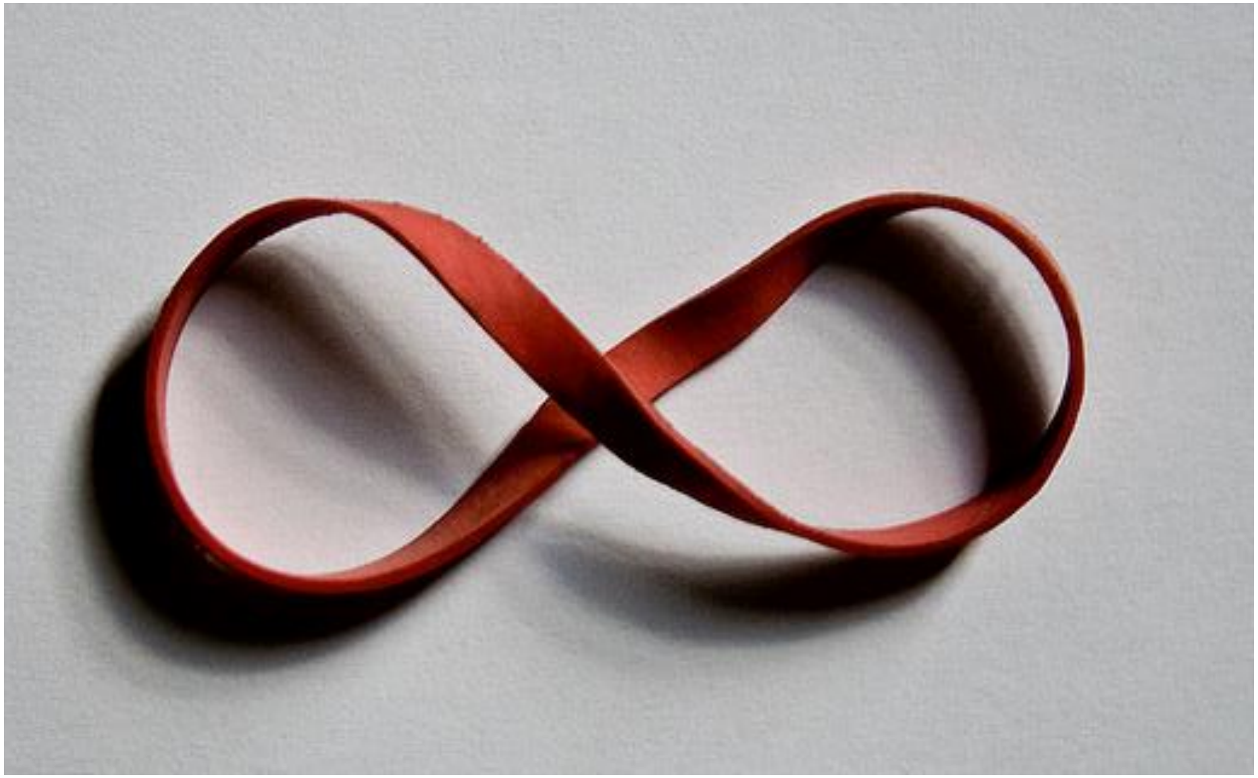
Lessons Learned from Disasters

- **Disasters** are expensive
- **Vulnerable populations** have hardest time recovering
- **Government** can be quickly overwhelmed
- **Neighbors** become first responders
- **Communities** may need to survive without city infrastructure
- **Social cohesion** is critical

Can we prepare for disasters in ways that make life better today?

How can we leverage the building community on the path to resilience?

Resilience: The capacity to adapt and thrive in the face stressors and shocks.

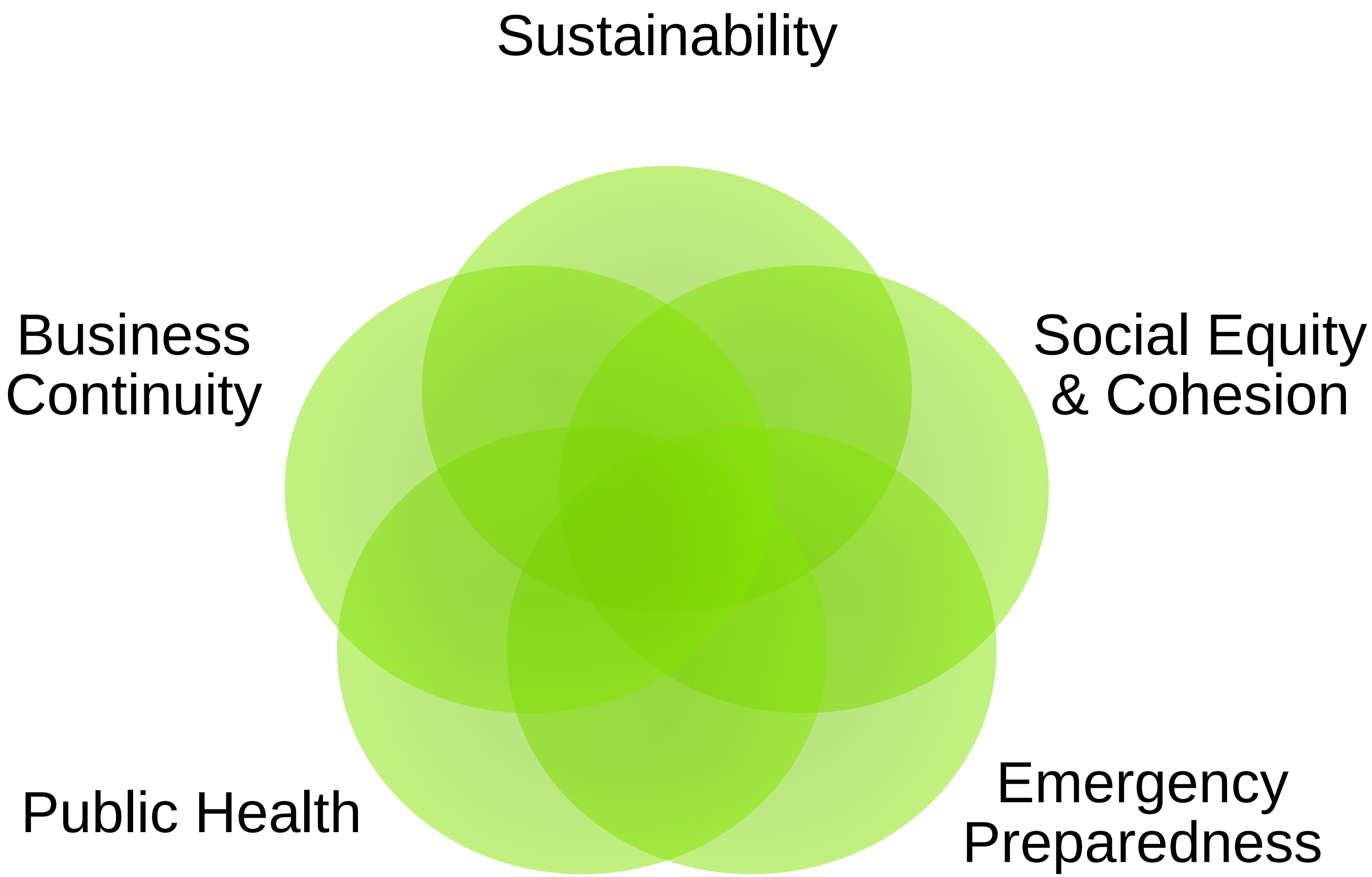


The Resilient Design Principles

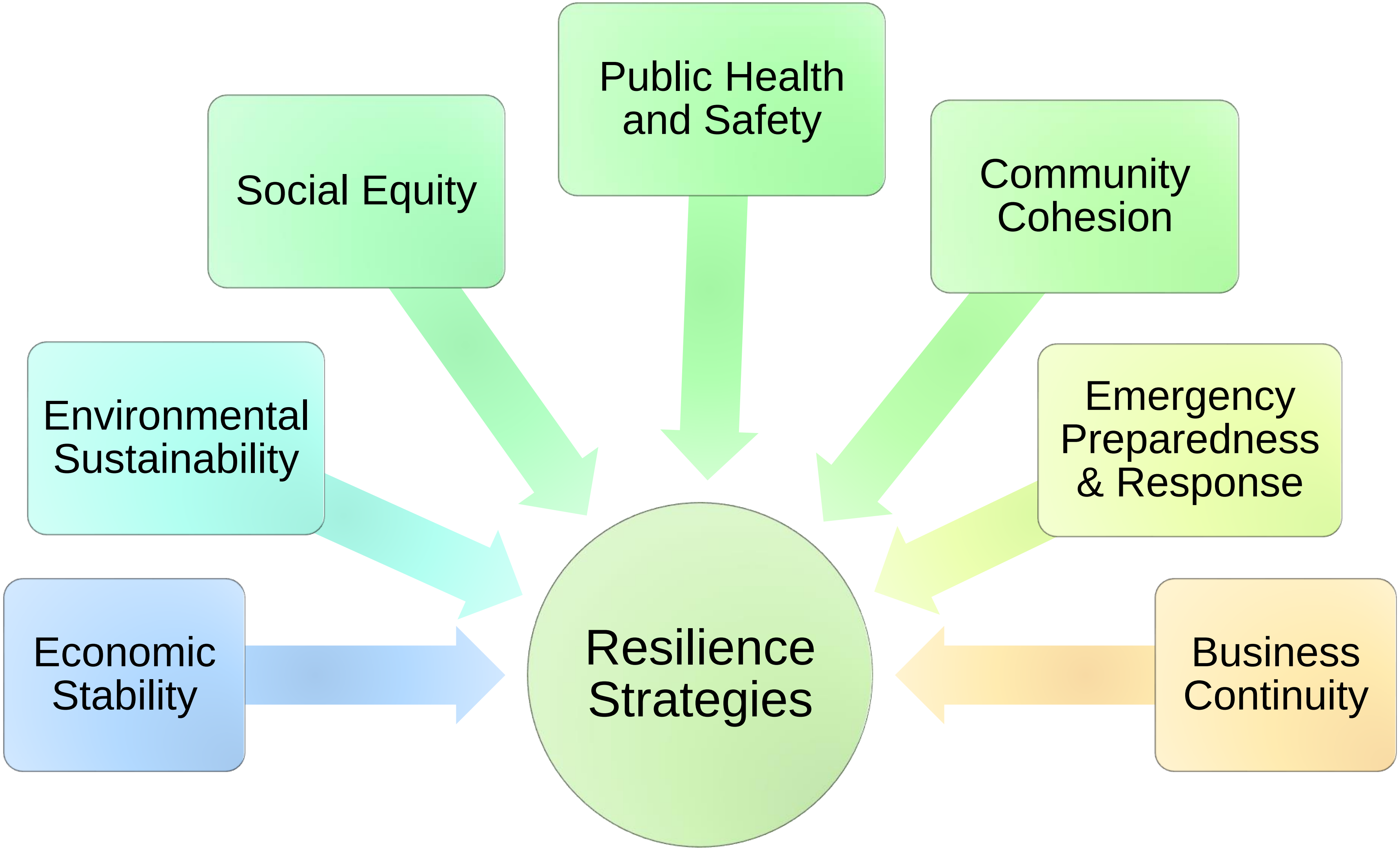
- Resilience transcends **scales**.
- Resilient systems provide for **basic human needs**.
- **Diverse** and **redundant** systems are inherently more resilient.
- **Simple, passive, and flexible** systems are more resilient.
- **Durability** strengthens resilience.
- **Locally available**, renewable, or reclaimed resources are more resilient.
- Resilience **anticipates interruptions** and a dynamic future.
- Find and promote resilience in **nature**.
- **Social equity** and community contribute to resilience.
- Resilience is **not absolute**.

-Resilient Design Institute

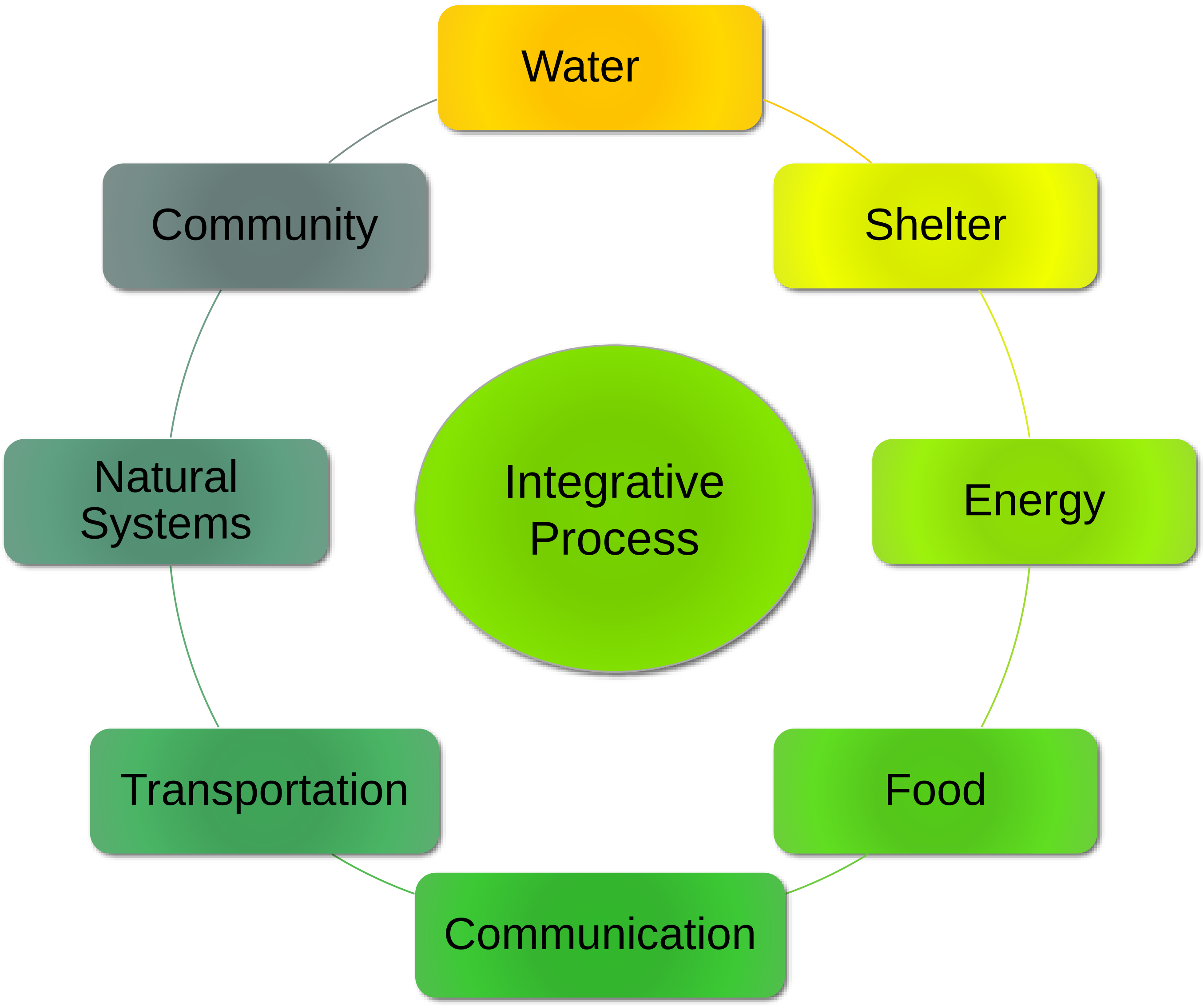
Building Resilience-LA



Achieving Multiple Goals



Social, Physical and Economic Resilience



Case Study: SCOPE

SCOPE STRATEGIC COMMUNITY AGENDA

What does this look like?

Making the Business Case

$1 in preparedness is worth at least $4 in recovery

- Co-benefits:
  - Risk management
  - Business continuity
  - Reduced insurance rates
  - Brand recognition & PR
  - Employee health and wellbeing
  - Reduced utility bills
  - Ability to capture opportunities as they arise

Questions?

Heather Joy Rosenberg
hrosenberg@usgbc-la.org

Attachment 5
Resiliency Assessment for Buildings, Infrastructure, and Remediation Projects

Resiliency Assessments for Buildings, Infrastructure, and Remediation Projects

Randy Britt, LEED AP | Director of Sustainability

SURF 31 – Pasadena – March 2, 2016

What is Resiliency?

Resiliency is the capability of a system to:

- Recognize, anticipate, and defend against the changing shape and timing of risk **before** adverse consequences occur
- Provide the ***adaptive capacity*** to recover quickly
- Withstand major disruptions with acceptable levels of degradation and recovery within acceptable time frames, costs, and risks
- ***Adaptive capacity*** is commonly defined as the capacity of a system to adapt if the environment where the system exists is changing

Background

- Climate adaptation and resiliency (CA&R) planning is the next emerging practice in the sustainability space
- Climate change is occurring regardless of the source, as evidenced by:
  - Ocean level rise at specific points on US Coastlines
  - Average temperature increases throughout the Southwest
  - Recurring massive snowstorms in the Northeast
  - Climatic events like Super-storm Sandy that increase the threat to human life, health, property, and infrastructure
- Resource conservation and environmental protection are more important than ever

Assessment Goals

- The main goals are to identify strengths, deficiencies, and corrective measures that will minimize the impact of climatic and significantly disruptive events on critical systems that protect public health, safety, and economies in key areas:
  - Remediation projects
  - Utilities
  - Transportation/fueling stations/oil storage
  - Data centers
  - First responders (fire/police/hospitals)
  - Shoreline protection
  - Defense

Emergency Response Planning is Not CA&R Planning

- Emergency response planning is one component of CA&R planning
- Emergency response primarily addresses what should be done after an event
- CA&R planning addresses the prudent protection of infrastructure, critical facilities, and functions before an event occurs

Entities Most Likely to Benefit

- Municipal
  - States, cities, counties
  - Public transportation
- Large commercial and industrial facility owners
- Utilities: electric, water, natural gas
- Federal: DOD, EPA, USPS, GSA, DOT
- Large remediation projects

Focal Points: Utilities

- Protect and upgrade vital infrastructure assets
  - Generation/transmission/ distribution
  - Water wells, reservoirs, aquifers, and aqueducts
  - Stormwater and sewer systems
  - Fuel refineries/storage and pumping stations
  - Data and customer service centers
  - Telecom

Focal Points: Transportation

- Highways and roads
- Bridges and tunnels
- Railways
- Airports/traffic control
- Harbors/marinas
- Fuel and oil storage
- Gas stations

Focal Points: Defense, Security, and Fire Protection

- Air bases
- Naval stations
- Data centers
- Command centers
- Police stations
- Fire stations

The Role of the Remediation Project Manager

- Assemble an expert team
- Conduct assessments
- Develop implementation strategies
- Become familiar with sustainable remediation project designs, and ensure their implementation
- Utilize available resiliency assessment tools

An Expert Team is Required

- Adaptation risk analysts
- Emergency response professionals
- Engineers
  - Electrical
  - Mechanical
  - Civil
  - Structural
  - Geologists
  - Hydrologists
  - Environmental
- Facility managers
- Hazard assessment specialists
- Meteorologists
- Program managers
- Regulatory affairs specialists
- Risk managers
- Seismic experts
- **Construction managers**

Conducting Risk and Vulnerability Assessments

- Estimate the likelihood of a major climate or significant disruptive event that may have severe consequences
- Determine the frequency of prior events
- Assess recent improvements that may provide new protections
- Capture specific lessons learned
- Identify critical points that need to be addressed prior to the next event

Increased Flood Risk in NYC

Conducting Hazard Assessments

- Identify the region's historical hazards
  - Hurricanes and tornadoes
  - Super-storms
  - Earthquakes
  - Brushfires
  - Floods or storm surges
  - Temperature extremes
  - Extreme rainfall or snowfall
  - Terrorism

- Assess the historical frequency and estimate the potential for significant change in the future

Identifying Critical Facilities

- Focus on what makes that site or facility critical
- Identify impact of operational downtime for varying periods
- Identify critical functions:
  - Command centers
  - Data centers/telecom rooms
  - Emergency power
  - Main switchgear
  - HVAC systems

Conduct a Life-span Analysis

- Confirm the length of time the site or facility has been operational
- Estimate how much longer the site can continue serving its functionality
- Determine if there are future plans for the site
- Perform analyses for:
  - Planned or unplanned obsolescence
  - Structural integrity
  - Damage from prior events or age

Developing Adaptation Strategies

- Maintain and manage
- Protect and strengthen; site hardening
- Improve redundancy
- Analyze and recommend options for:
  - Relocation
  - Abandonment
  - Divestiture

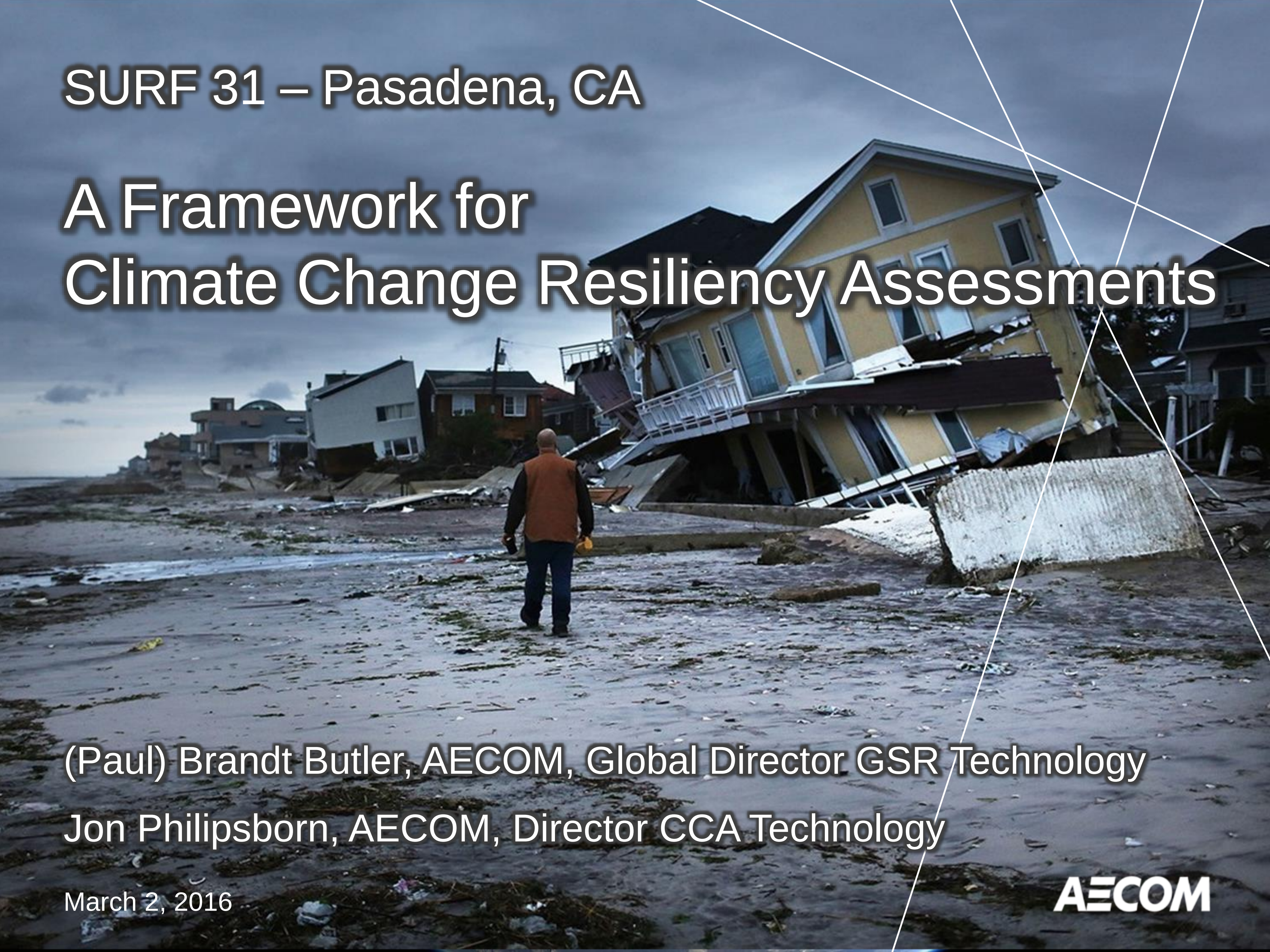
Utilizing Low-impact Development Designs

- Prioritize targets to maximize the use of available funds
- Utilize low-impact development design and construction methods
- Use materials that are recycled or have high recyclable content
- Minimize waste during construction, and recycle construction materials

Questions?

Attachment 6

A Framework for Climate Change Resiliency Assessments



SURF 31 – Pasadena, CA

A Framework for Climate Change Resiliency Assessments

(Paul) Brandt Butler, AECOM, Global Director GSR Technology

Jon Philipsborn, AECOM, Director CCA Technology

March 2, 2016

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Order of Presentation

- Sustainable Remediation and Climate Change Resiliency
  - Picking up from SURF 30
- Step-wise Framework
- GSR-CCA Path Forward

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GSR meets CCR

… It's not sustainable, if it doesn't work

Climate Change is *Real*

- Rising sea level
- Changing hurricane frequency and intensity
- Changing precipitation patterns
- Changing temperature patterns
- Changing in winter storm frequency and intensity

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Climate Change Mitigation and Adaptation fits with Sustainable Remediation

- Mitigation for Reduced Emissions
  - GSR during remedial selection, design and construction
  - GSR during O&M
    - Baseline emissions assessment
    - Remedial Process Optimization (RPO)
- Adaptation for Increased Resiliency
  - Tiered screening of facilities for vulnerability ranking
  - Detailed assessment of a highly-vulnerable facilities
  - Life-cycle focus

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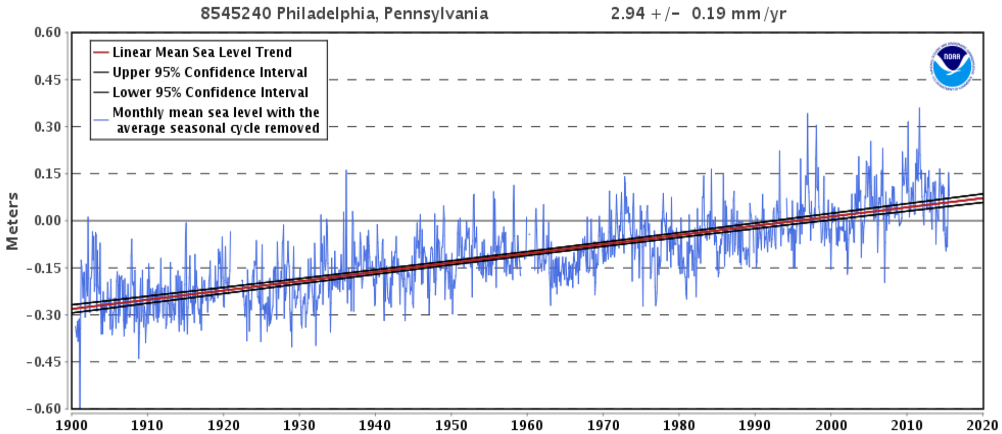
FEMA Maps and “Sliders”

- NOAA – Sea Level Trends
  - http://tidesandcurrents.noaa.gov/sltrends



- FEMA - 100 and 500 year Flood Maps

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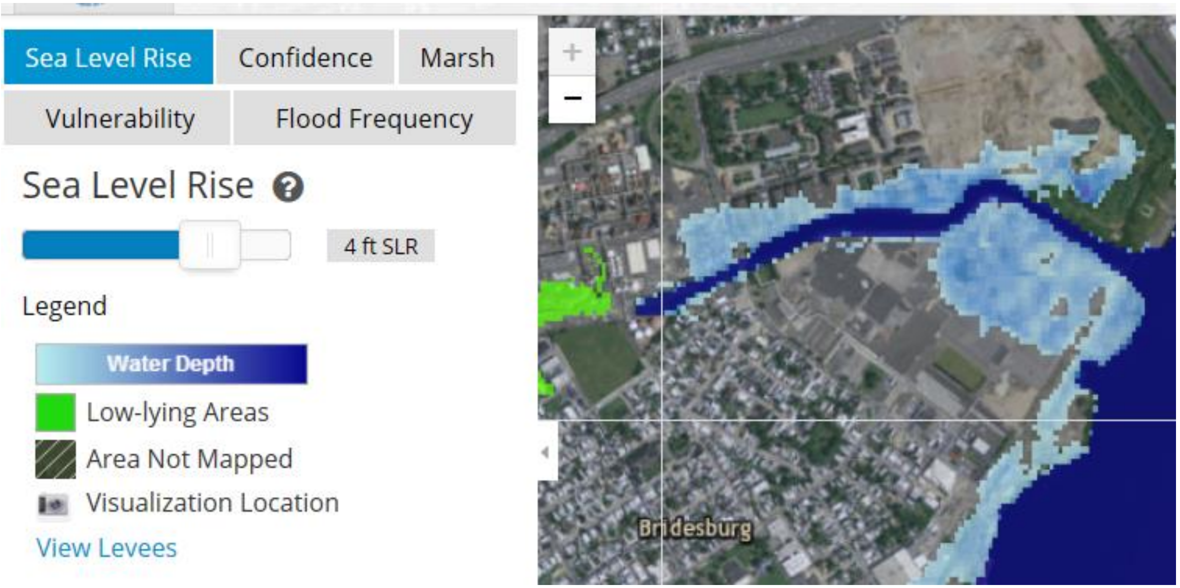
Climate Change Adaptation – Tier 1: Existing Tools

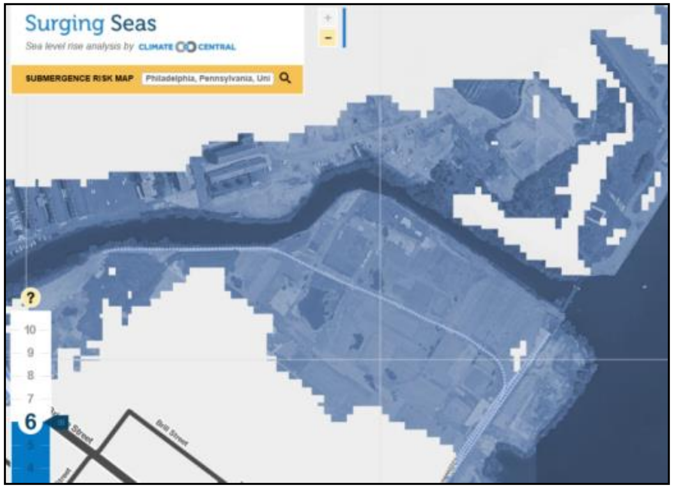
- NOAA
  - Sea Level Rise

  http://coast.noaa.gov/slr/



- Sea Level Rise +

  http://ss2.climatecentral.org/
  - Social Vulnerability
  - Ethnicity
  - Population



Tier 2 – Detailed Assessment of Vulnerable Sites

- Details matter
  - Infrastructure on-site and off-site
  - Localized flood patterns
  - Storm surge behavior
- And more …

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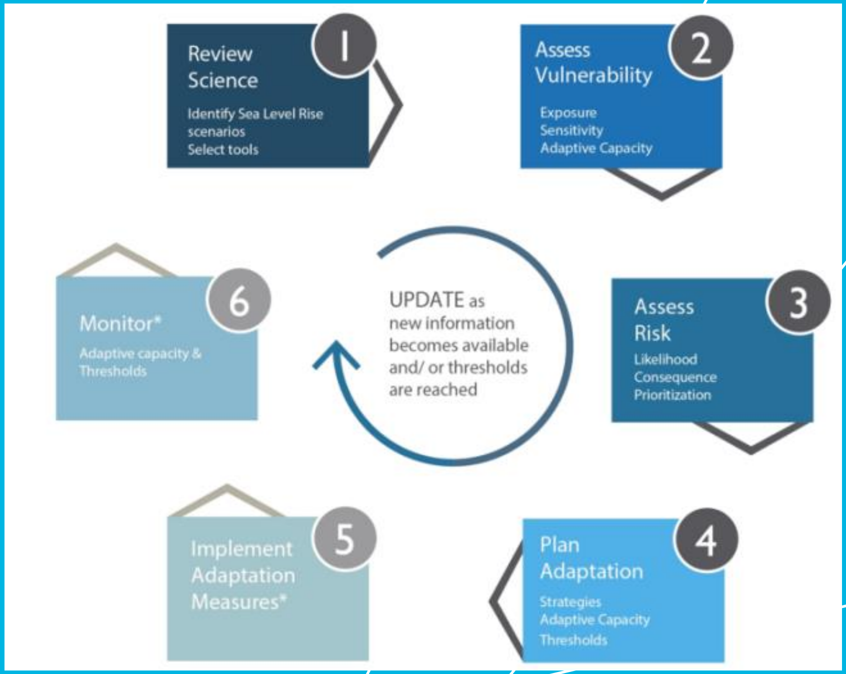
Step-wise Framework

1. Review Science
2. Assess Vulnerability
3. Assess Risk
4. Plan Adaptation
5. Implement
6. Monitor



1. Review Science

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Actionable Science

A Newly Developed Definition:

Actionable science provides data, analyses, projections, or tools that can support management of the risks and impacts of climate change.

It is ideally co-produced by scientists and decision makers and creates rigorous and accessible products to meet the needs of stakeholders.

Source: Federal Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS)

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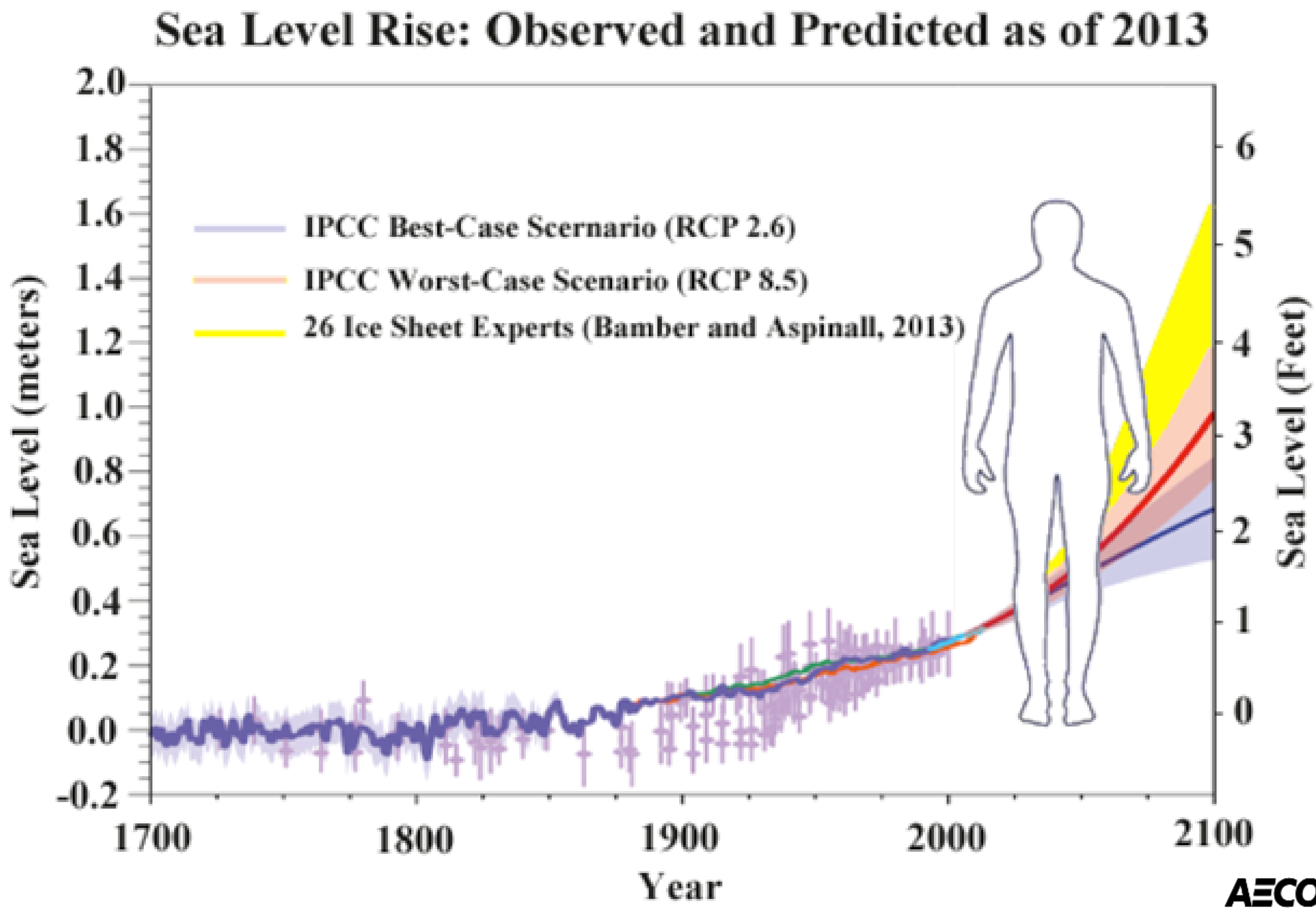
Inter-governmental Panel on Climate Change(IPCC) Ranges – Worst Case is not Worst Case



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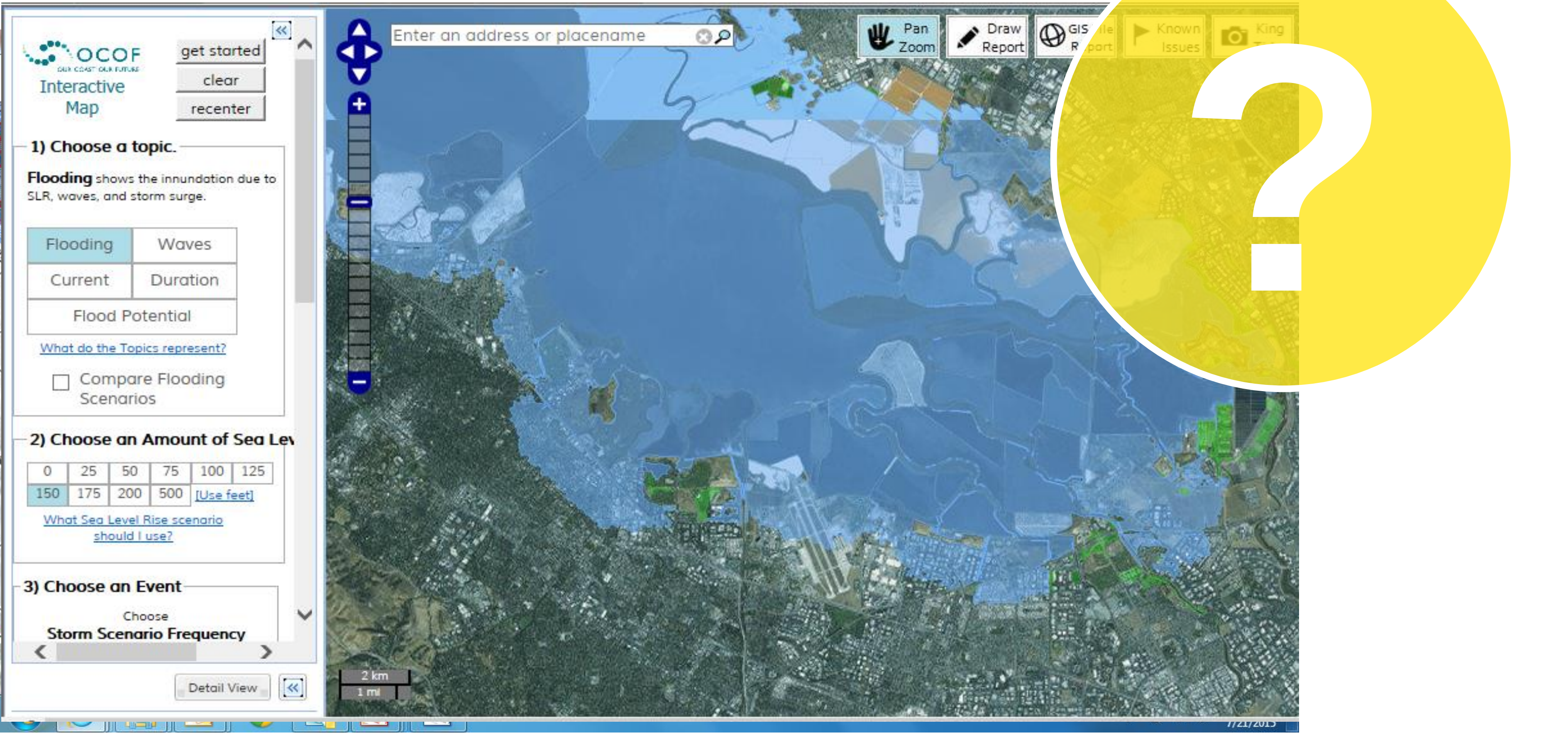
Getting Started - Many Tools

Regional and Local Studies



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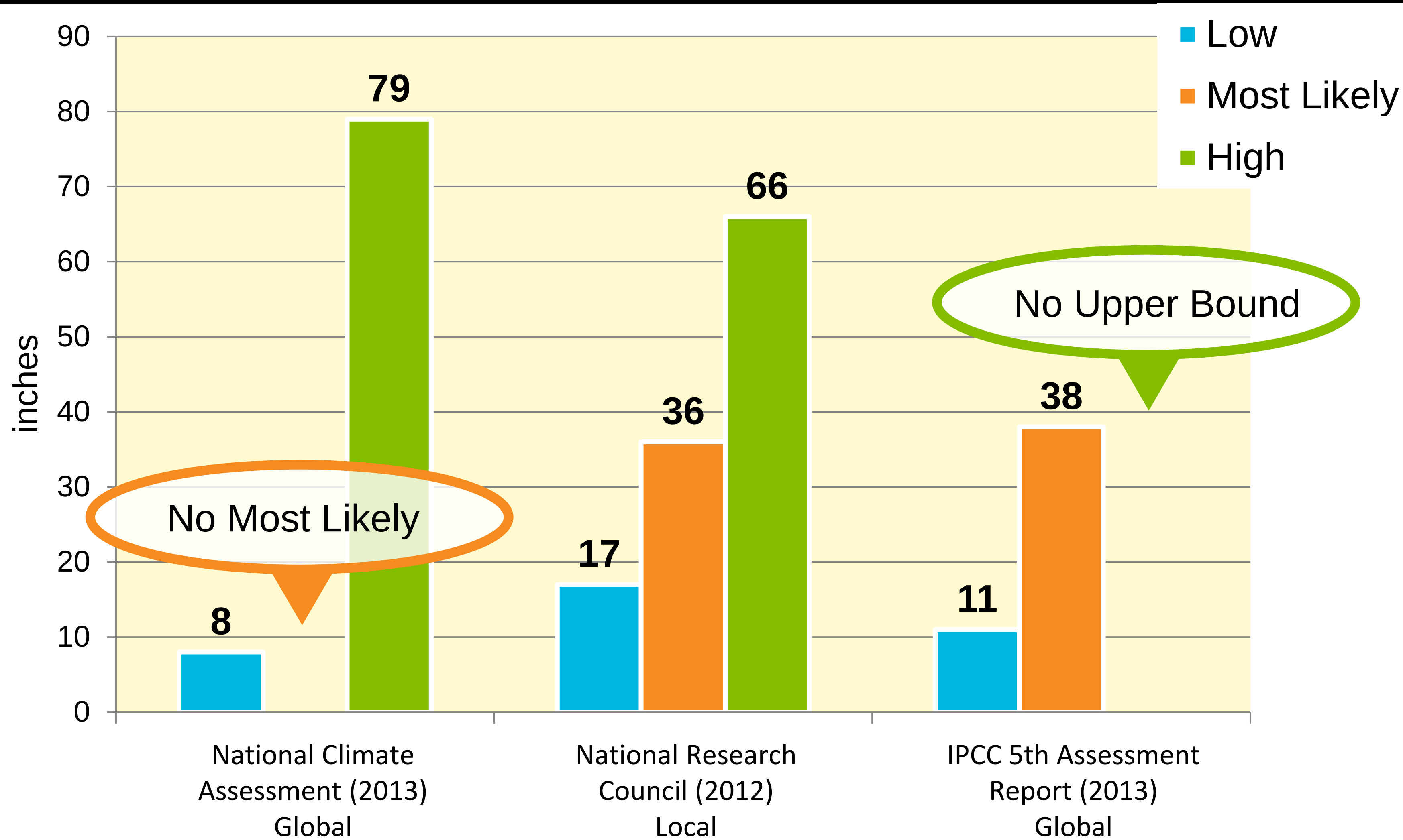
Range of Ranges - Expected Sea Level Rise by 2100



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Beyond Sea Level Rise – Storm Surge and Waves

- Storm surge can dramatically increase the inland extent of inundation
- Waves can threaten shorelines with damaging force
- Both can increase in severity with sea level rise

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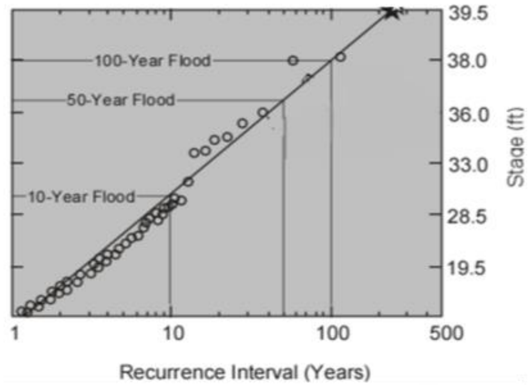
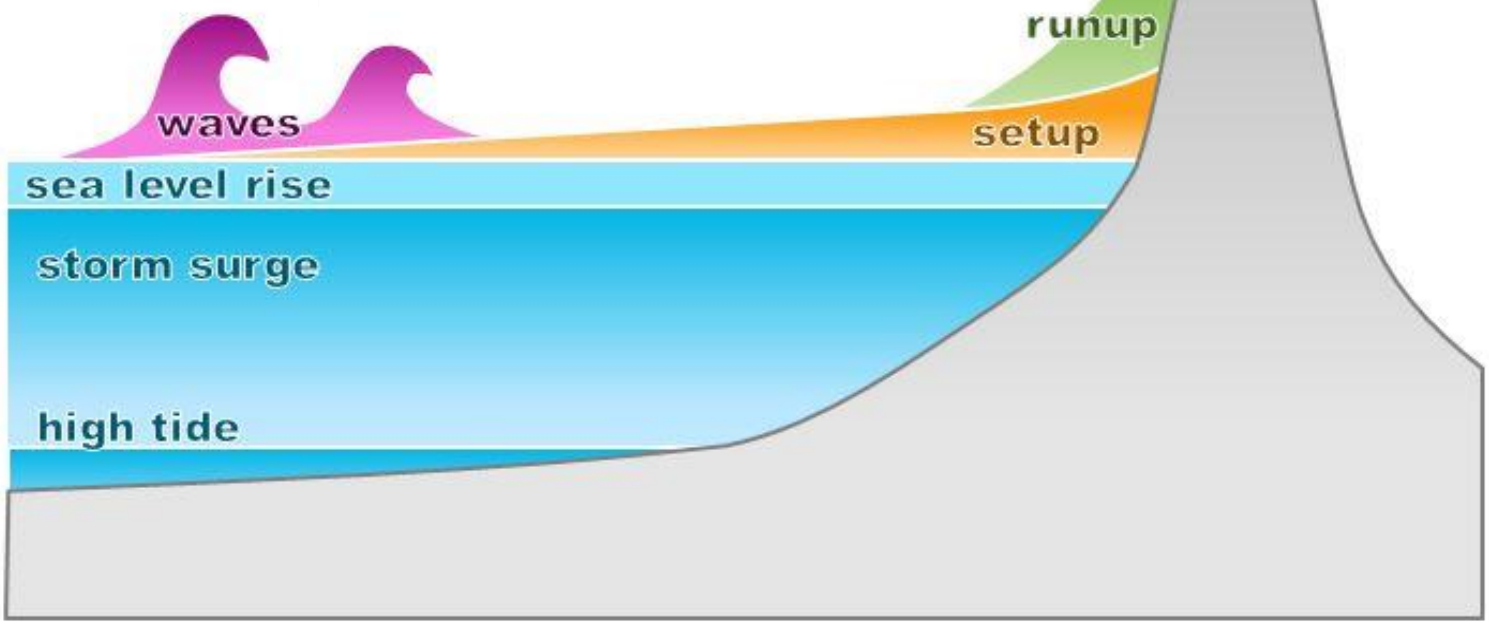
Sea Level Rise + Storm Surge + Waves





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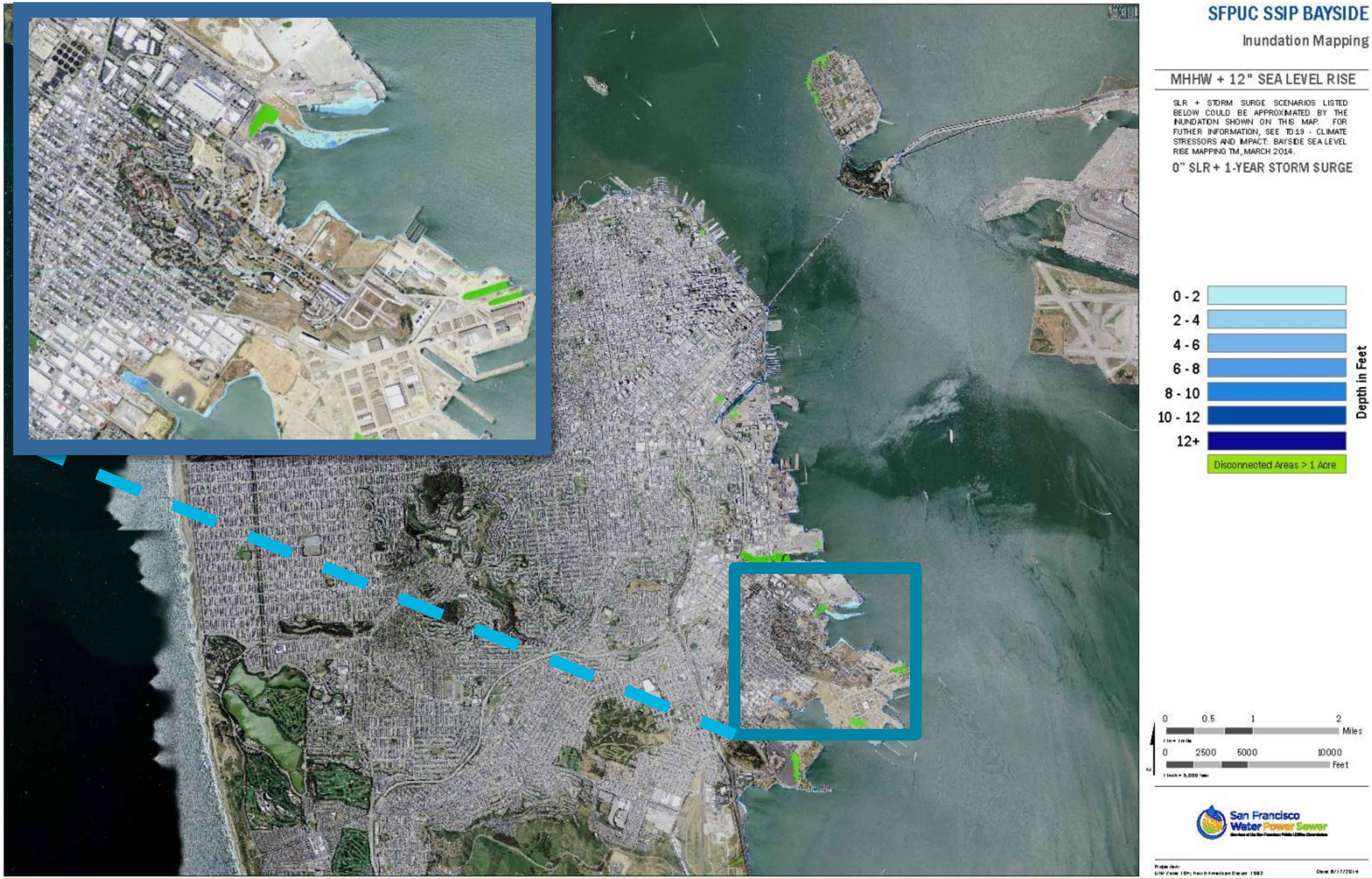
Flood Inundation Maps

- Actionable Science meets the real world
- Case Study: OneSF - San Francisco City and County
  - http://onesanfrancisco.org/wp-content/uploads/Guidance-for-Incorporating-Sea-Level-Rise-into-Capital-Planning.pdf

Typical vs. Multiple Flood Inundation Scenarios

- Typical
  - 2050 Conditions
    - Sea Level Rise
    - 100-yr Storm Surge + Sea Level Rise
  - 2100 Conditions
    - Sea Level Rise
    - 100-yr Storm Surge + Sea Level Rise
  - Finding
    - 4 mapped scenarios
    - Hard to identify trigger points and prioritize

- Multiple Scenario
  - 10 scenarios
    - 6” Sea Level Rise increments
  - 8 storm surge scenarios
    - 1-year to the 500-year
  - 40+ possible combinations
  - Finding
    - Defines exposure and vulnerability at a detailed scale
    - Rich source of granularity for prioritization and adaptation planning



High Tide + 12" Sea Level Rise

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High Tide + 36" Sea Level Rise

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High Tide + 66" Sea Level Rise

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High Tide + 66" Sea Level Rise + 100-Year Storm Surge

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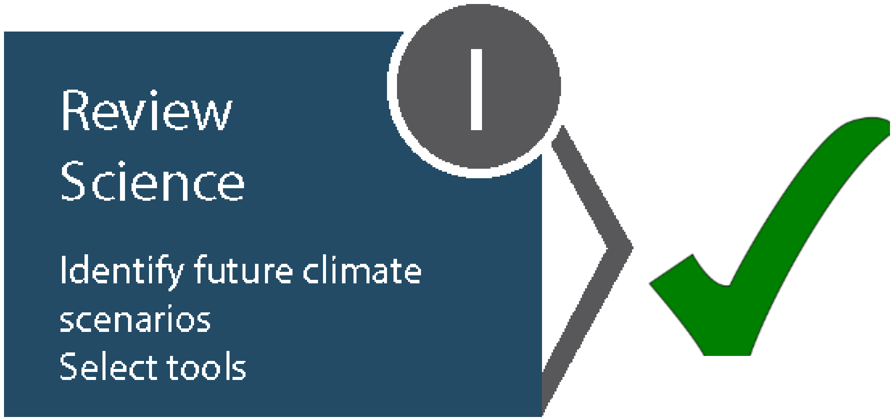
Best Practices – Review Science



- Select “actionable” sea level rise projections
- Select multiple sea level rise scenarios
- Include storm surge and wave hazards in assessments

2. Assess Vulnerability

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Asset Vulnerability

- Evaluate Exposure
  - Degree to which an asset is exposed (e.g., depth of flooding due to sea level rise, wave run up and/or storm surge)
  - Compile GIS Inventory of existing assets
- Assess Sensitivity
  - Degree to which an asset is affected (e.g., temporary flooding causes minimal impact, or results in complete loss of asset or shut-down of operation)
- Determine Adaptive Capacity
  - Ability of an asset to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or cope with the consequences

Preliminary screening for potentially vulnerability assets

Exposure

- How soon (when)
- How much (depth)?
- How often (frequency)

Sensitivity

- How quickly can the asset recover?
- Temporary vs permanent impact?

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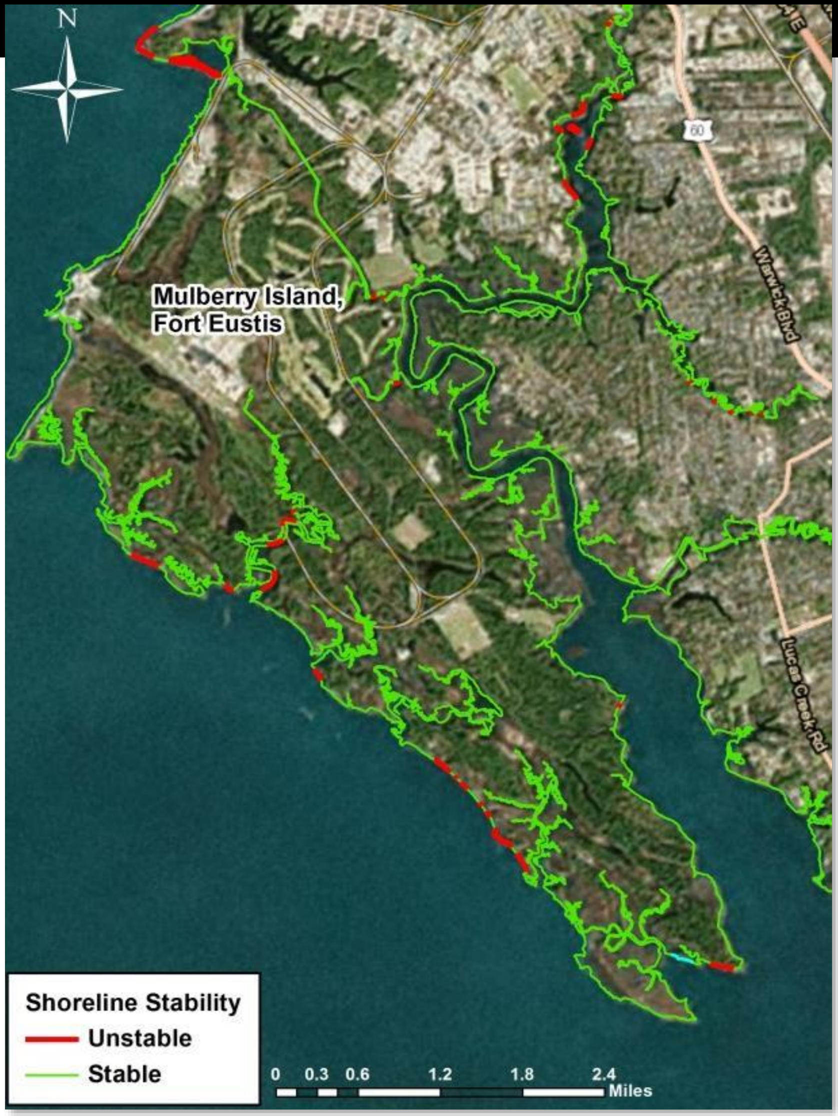
Vulnerability of Cultural Resources



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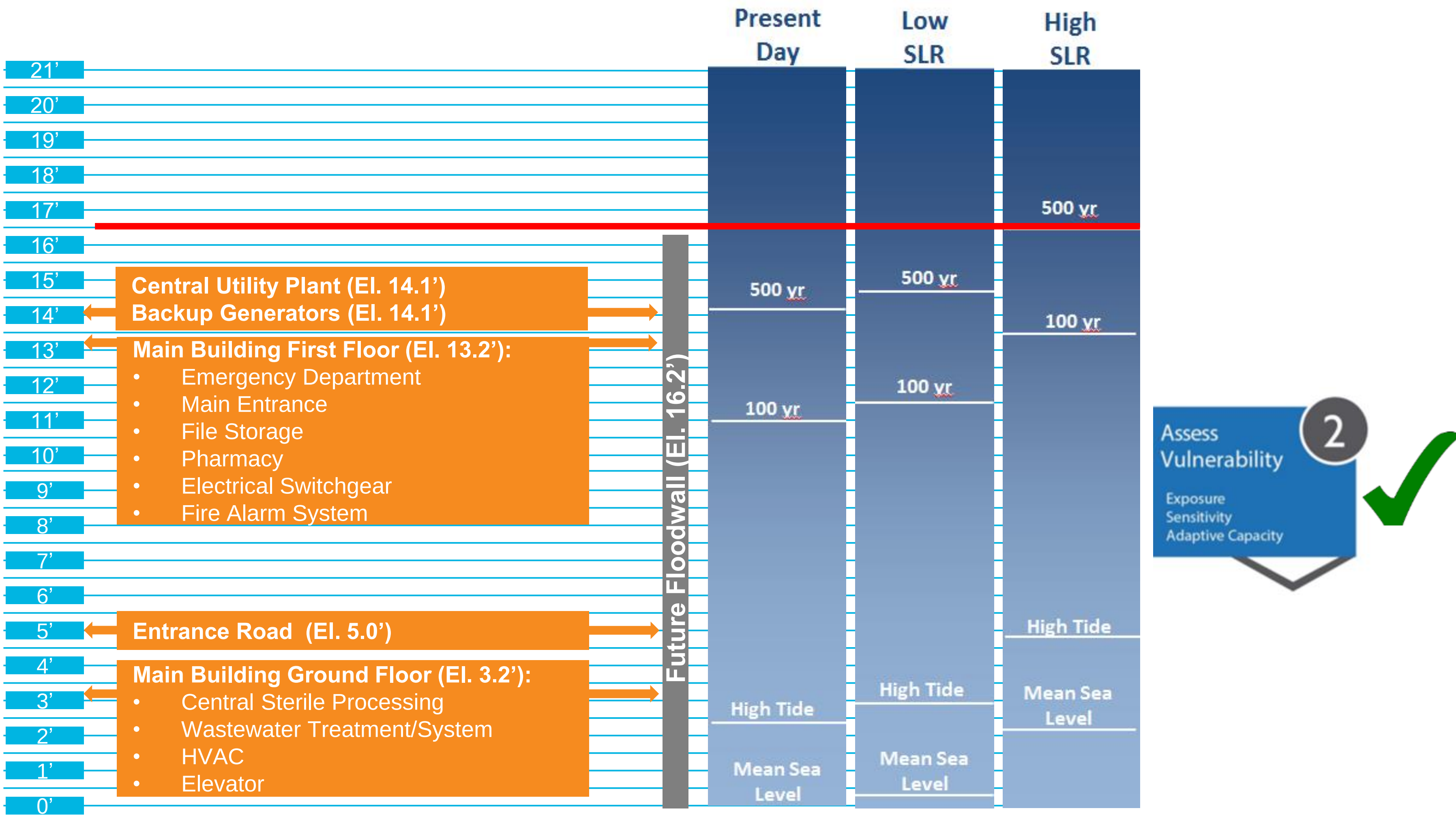
Know your vulnerabilities



3. Assess Risk

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Rank Damage, Disruption, Cost

Damage

- What is the level of damage?
- Can it be repaired? Replaced?
- Is there a threat to public health and safety?

Disruption

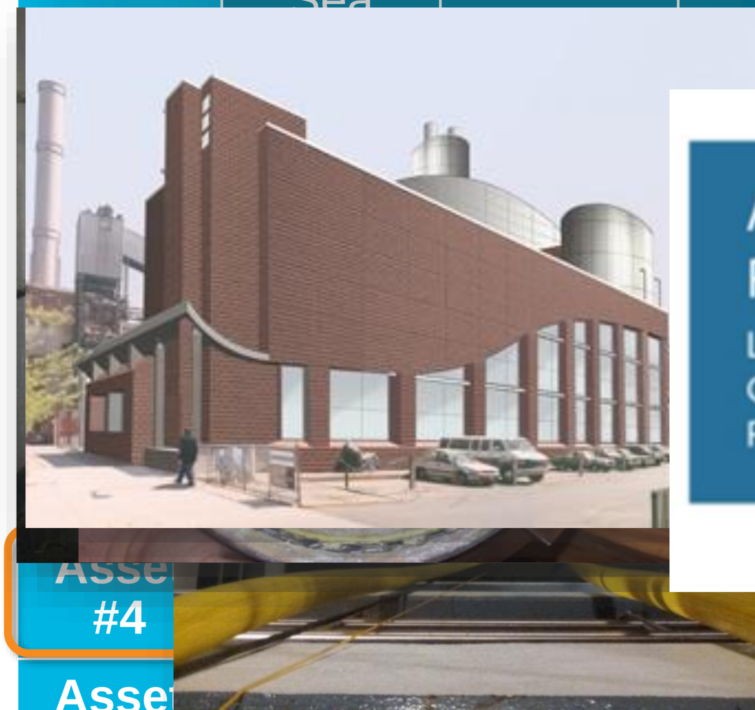
- Is there a disruption in service?
- If yes, how long (e.g., hours, days, weeks?)

Cost

- What is the cost to repair or replace?
- What are the economic (or health and safety) costs associated with disruption?
- Are there additional secondary costs (e.g., costs to other sectors)?

Risk Assessment Ranking

	Damage		Cost (Repair/Replace)		Disruption		Total Score
	Sea				Sea	Storm Surge	
						N/A	N/A
						High (3)	6
						Low (1)	6
Asse #4						High (3)	15
Asse #5	High (3)	High (3)	Low (1)	Med (2)	Low (1)	Low (1)	11



- Pump station inundated by

below

te

- 2-years to complete all repairs needed

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4. Plan Adaptation and Mitigation Strategies

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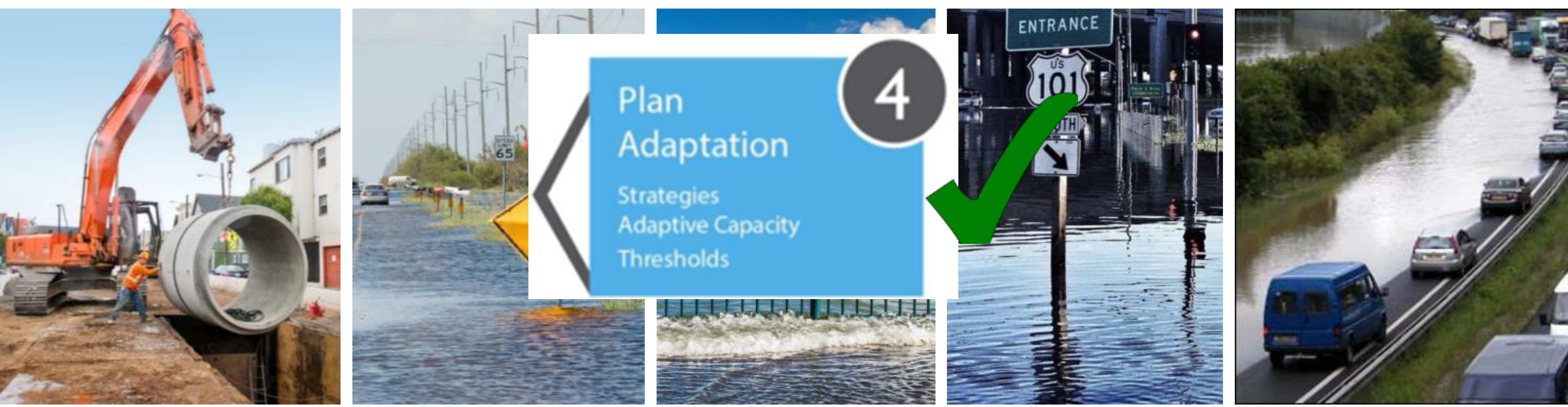
Apply Hazard Mitigation Strategies to Critical Assets

Potential Hazard Mitigation Strategies

- **Structural** measures (i.e., relocation, raising structures, retrofit)
- **Non-structural** measures (i.e., policy changes, operational modifications)
- **Asset-specific** measures (i.e., focused on singular critical asset)
- **Regional** measures (i.e., measures that benefit multiple assets and/or multiple stakeholders



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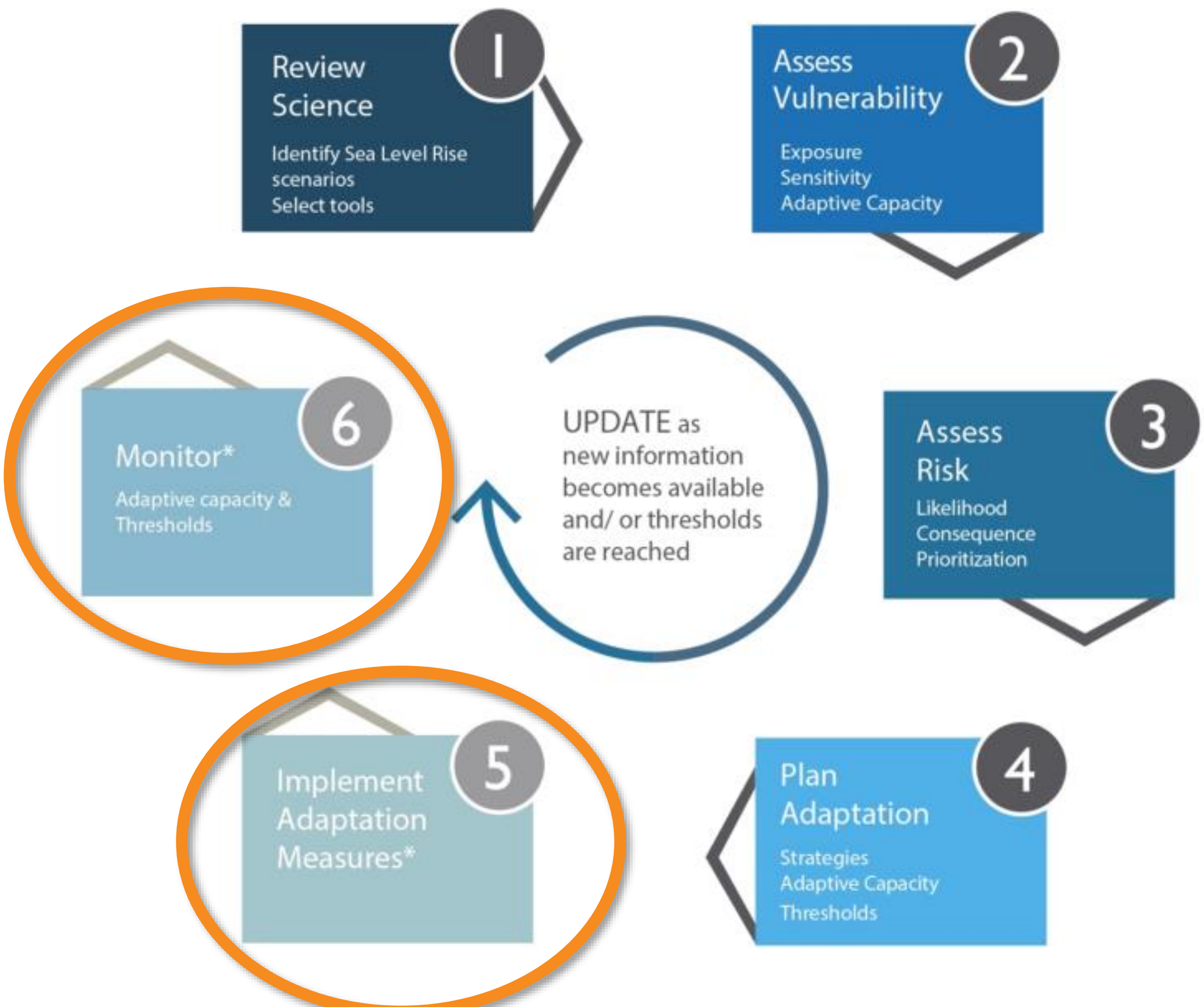
5 and 6. Implement Measures, Monitor, and Adapt



Path Forward

GSR and CCR

- Remedy Selection and 5 Year Reviews
  - Include climate change resiliency as long-term protectiveness criteria
- Remedial Design → O&M
  - Evaluate potential strategies (measures) and design to facilitate future implementation
  - Monitor and implement measures as needed
- Continue SURF focus
  - Battelle tracks
  - Agency collaboration
  - White Paper

GSR and CCR

- Remedy Selection and 5 Year Reviews
  - Include climate change resiliency as long-term protectiveness criteria
  - Identify thresholds for future adaptation planning
- Remedial Design → O&M
  - Evaluate potential strategies (measures) and design to facilitate future implementation
  - Monitor and implement measures as needed
- Continue SURF focus
  - Battelle tracks
  - Agency collaboration
  - White Paper

… thank you!

… What are your questions and comments?

Brandt Butler
Director - GSR
610.832.3575
brandt.butler@aecom.com

Jon Philipsborn
Director – CCA
678.808.8874
jon.philipsborn@aecom.com

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Attachment 7
Updated SURF Organizational Chart

SURF Organization

Board of Trustees

Officers:

John Simon, President; Barbara Maco, Vice President;
Tammy Rabideau, Secretary; Keith Aragona, Treasurer

At-Large:

Paul Hadley, Colleen Liddell, Kristin Mancini, Aaron Thom, Rick Wice

Meeting Facilitator: Philip Beere
Technical Editor: Kathy Adams, Writing Unlimited

Auditor: Frank Brulenski, Smart Devine
Legal Support: Dawn Monsen Lamparello, K&L Gates

Membership
SURF Secretary

Technical Initiatives
Paul Favara
Karin Holland

- **Case Studies**
  Amanda McNally
- **Social Aspects of SR**
  Melissa Harclerode
  Kristin Mancini

Meetings & Programs
Kristin Mancini

Communications
Maile Smith
Jake Torrens

- **Social Media**
  Emerald Erickson-Mulanax
- **Newsletter**
  Gerlinde Wolf

Finance
SURF Treasurer

Education & Outreach
Stephanie Fiorenza
Rick Wice

- **Government Outreach**
  Buddy Bealer
  Stephanie Fiorenza
- **Academic Outreach**
  Keith Aragona
  Dick Raymond

Nominations
Open

Board | Committee | Initiative | Working Group | Functional Support

Attachment 8

SURF 2016 Strategic Planning

SURF 2016 Strategic Planning

Member Survey Results & Next Steps
SURF 31

John Simon, President
Barbara Maco, Vice President

SURF Mission

Maximize the overall environmental, societal, and economic benefits from the site cleanup process by:

- Advancing the science and application of sustainable remediation (SR)
- Developing best practices
- Exchanging professional knowledge
- Providing education and outreach

SURF Overview

About SURF

- Founded in 2006
- Incorporated as a non-profit in 2010
- Collaborate with International SURF organizations
- Life cycle sustainability perspective: environmental, social, and economic pillars

Members

- Industry
- Government
- Regulators
- Vendors
- Academics
- Consultants
- NGOS

Sponsors

- GOLD: Boeing, BP CH2M, DuPont, Shell.
- SILVER: AECOM, Amec Foster Wheeler, CDM Smith, Haley & Aldrich, Langan Engineering, Terra Systems
- BRONZE: Envirocon, ExxonMobil, Tetra Tech

SURF
SUSTAINABLE REMEDIATION FORUM

Guidance and Publications

- Sustainable Remediation White Paper—Integrating Sustainable Principles, Practices, and Metrics Into Remediation Projects (2009)
- Framework for Integrating Sustainability into Remediation Projects (2011)
- Guidance for Performing Footprint Analysis and LCA for the Remediation Industry (2011)
- Metrics for Integrating Sustainability Evaluations into Remediation Projects (2011)
- Sustainable Remediation Panel (Remediation Journal, quarterly Q&A

SURF SUSTAINABLE REMEDIATION FORUM

Guidance and Publications

- Integrating Remediation and Reuse to Achieve Whole-System Sustainability into Remediation Projects (2013)
- Groundwater Conservation and Reuse at Remediation Sites (2013)
- Integrating Groundwater Conservation and Reuse into Remediation Projects (2014)
- Integrating the Social Dimension in Remediation Decision-Making: State of the Practice and Way Forward (2015)

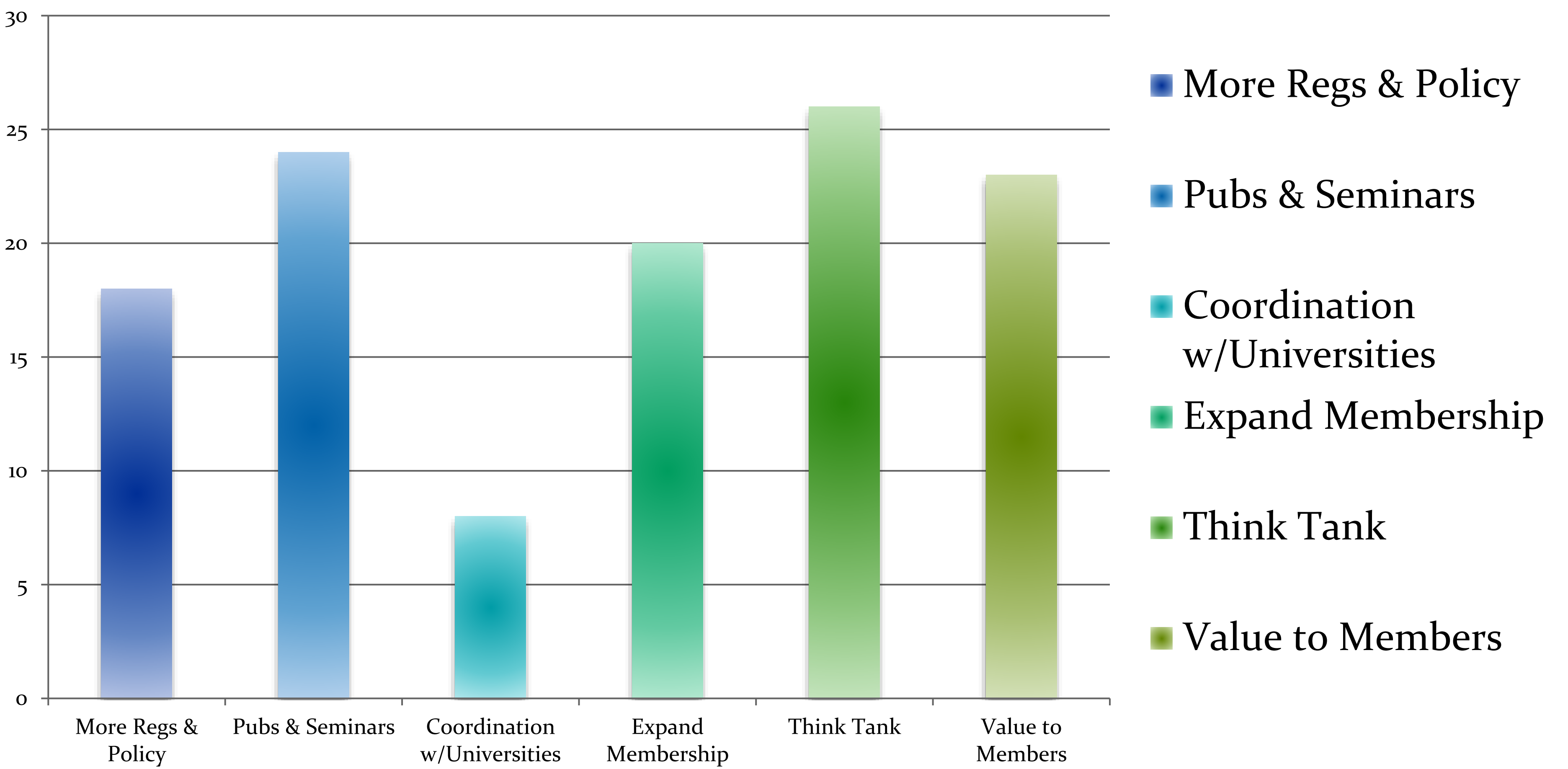
SURF
SUSTAINABLE REMEDIATION FORUM

SURF Conferences

- Exploring the Energy/Water Nexus
- Building Public and Private Partnerships for Sustainable Remediation
- Societal Perspectives in Sustainable Remediation
- Sustainability in Action/Case studies
- Sustainable Communities: Economics of Cleaning Brown to Green
- International SURF Initiatives; Global Sustainability

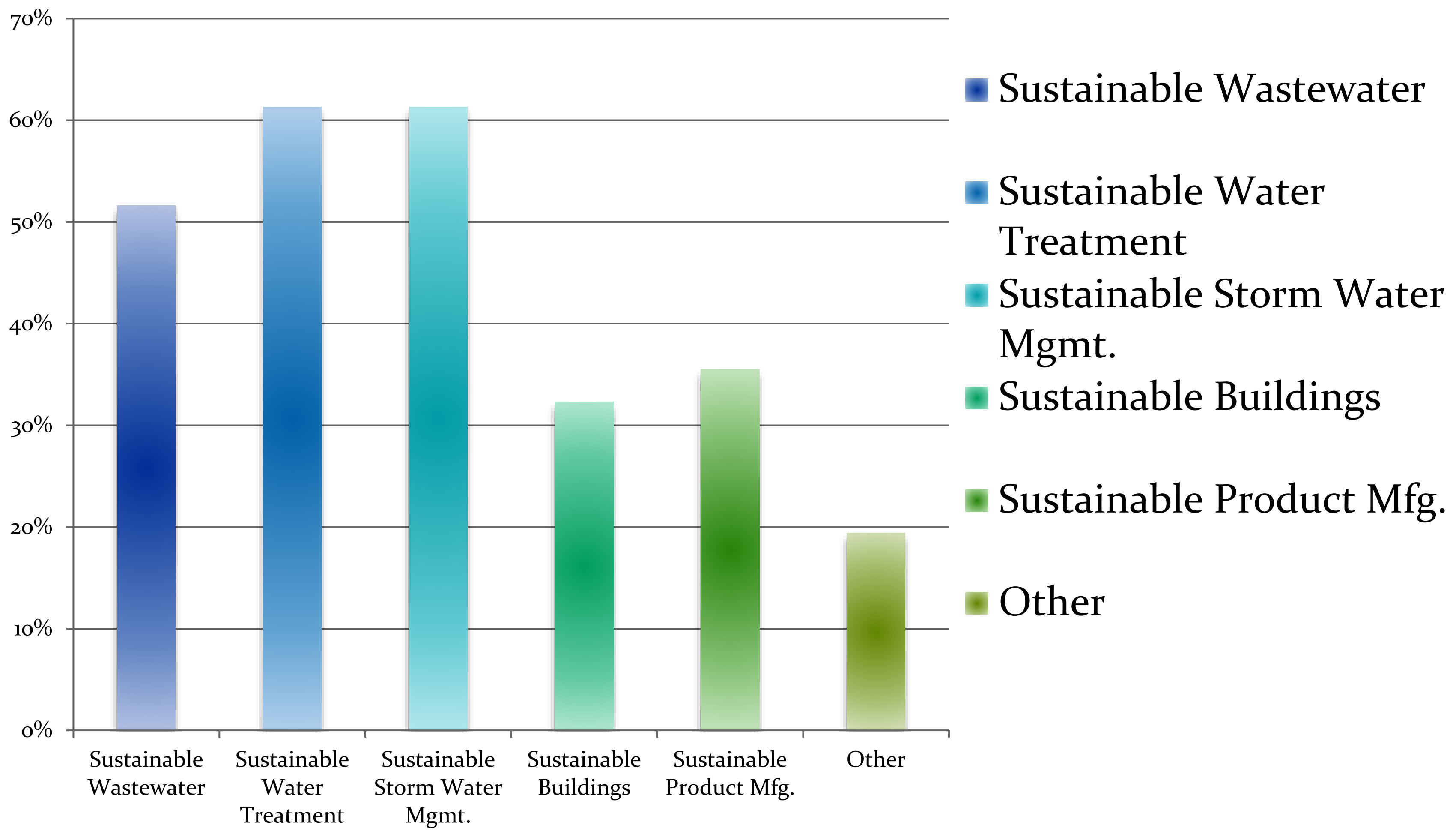
SURF
SUSTAINABLE REMEDIATION FORUM

Q 1: Most Important to SURF's future Success?

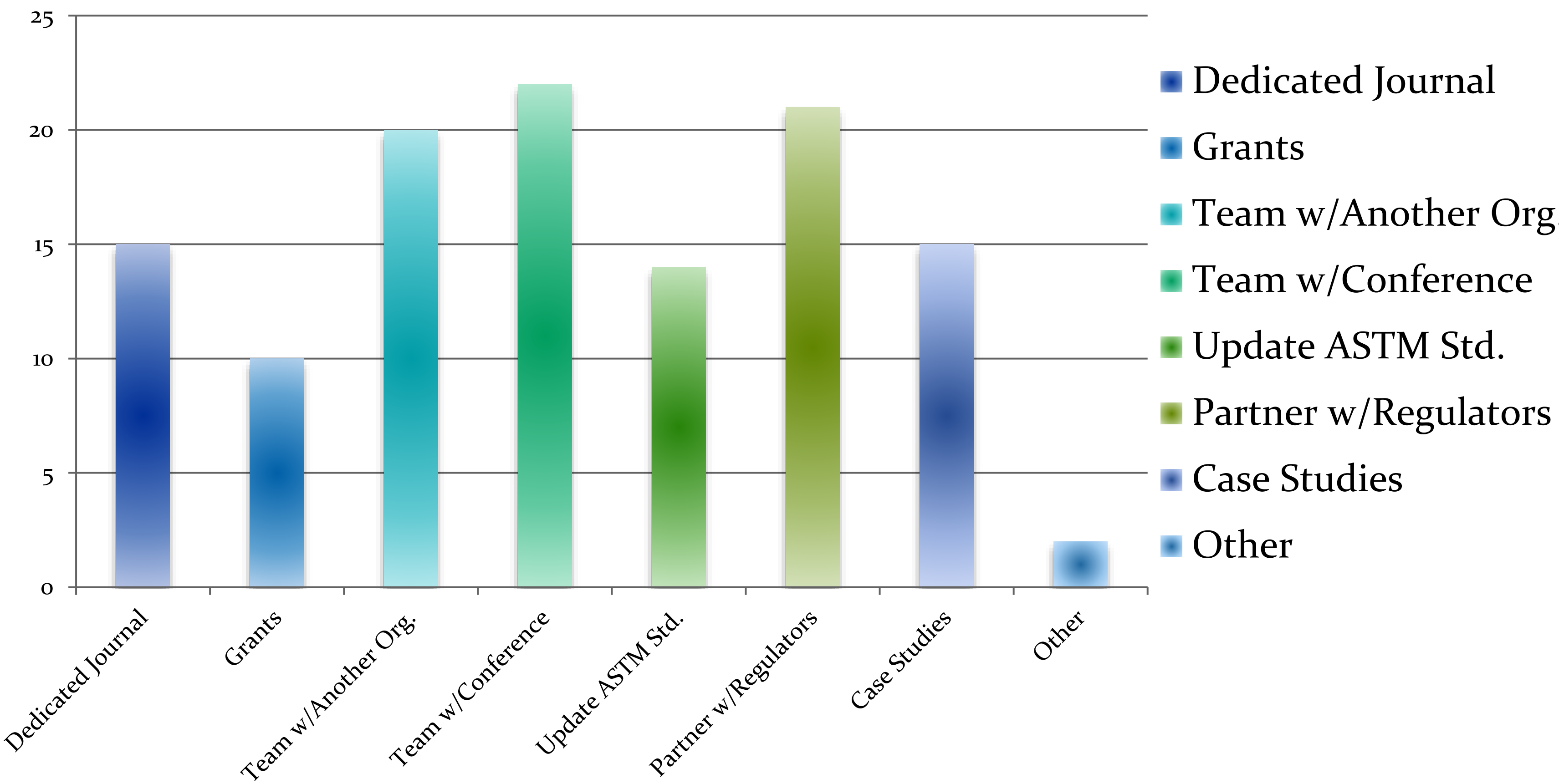


Graph shows Sum of # of 1st and 2nd top responses

Q2: Topics of Interest?

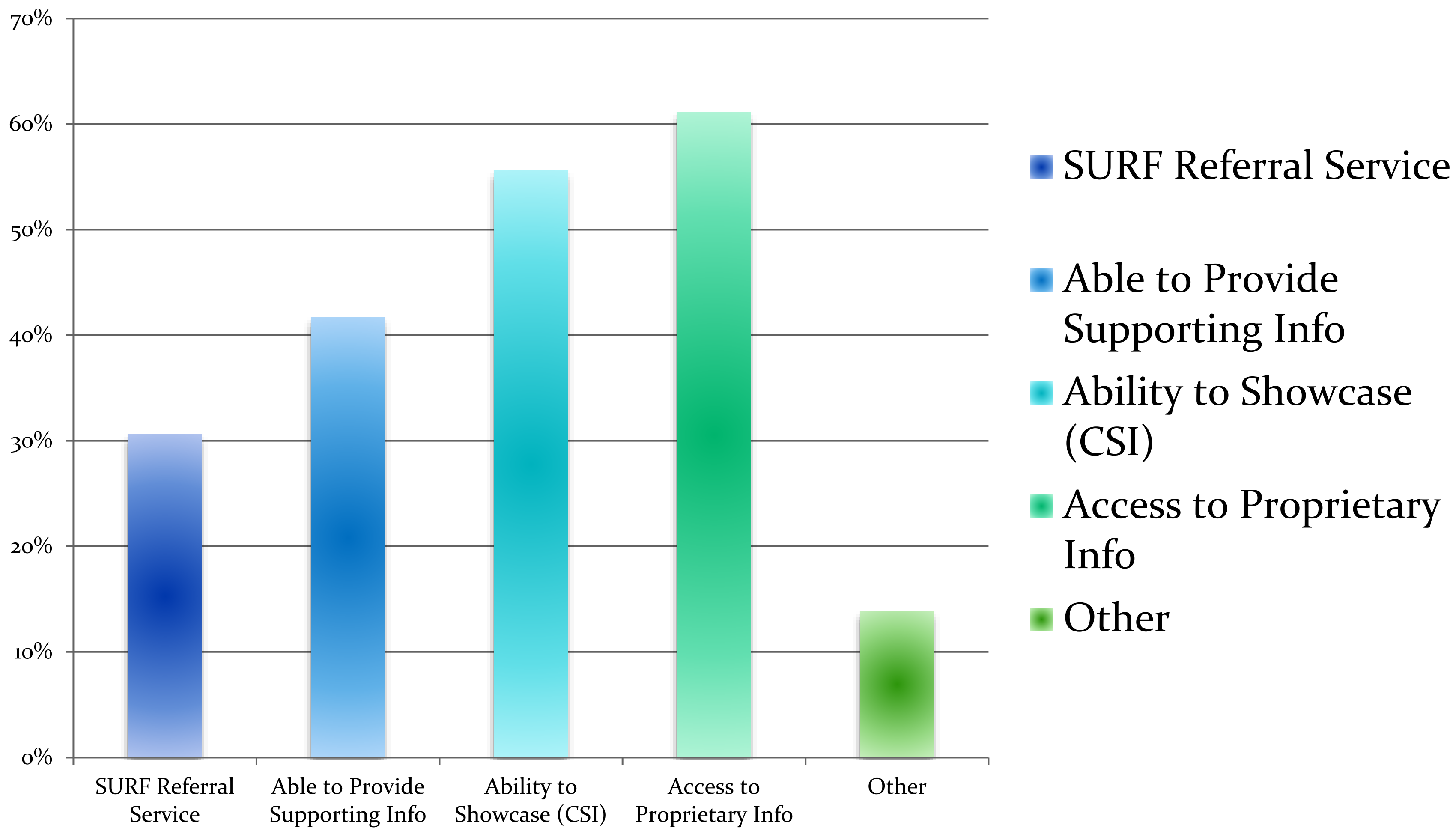


Q 3: Expanding SURF's reach

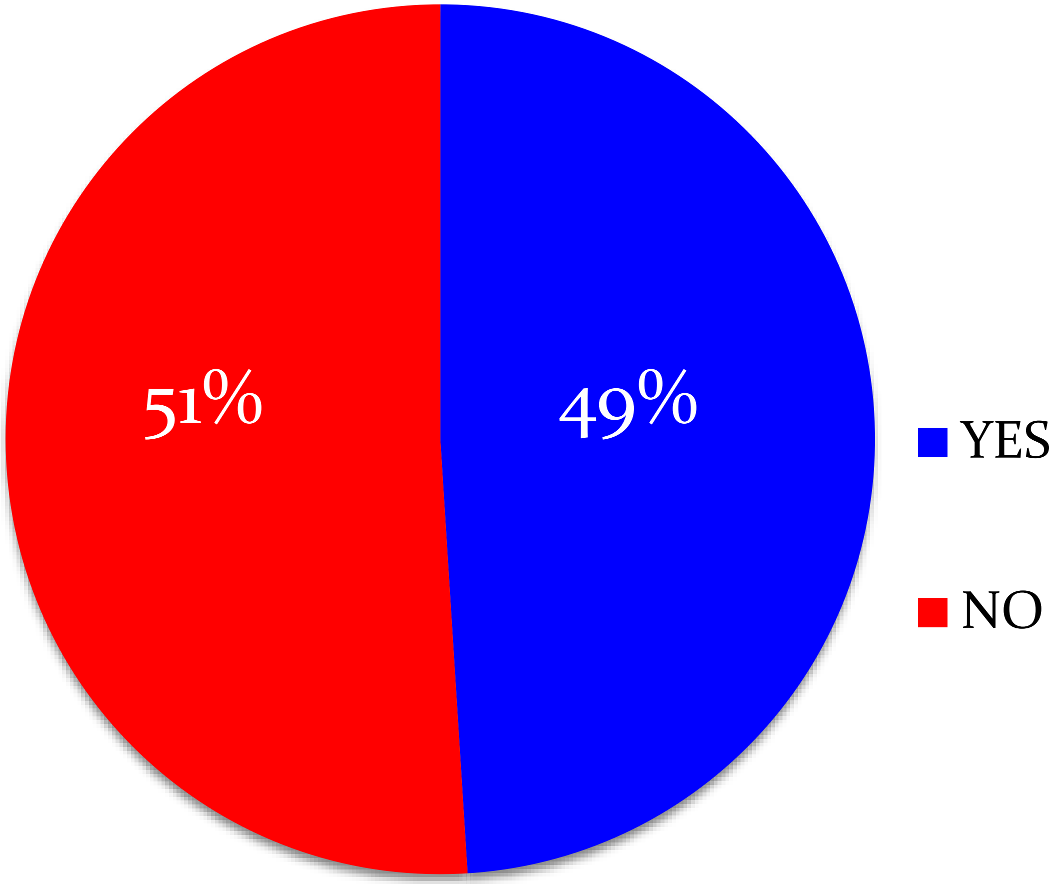


Graph shows Sum of # of 1st and 2nd top responses

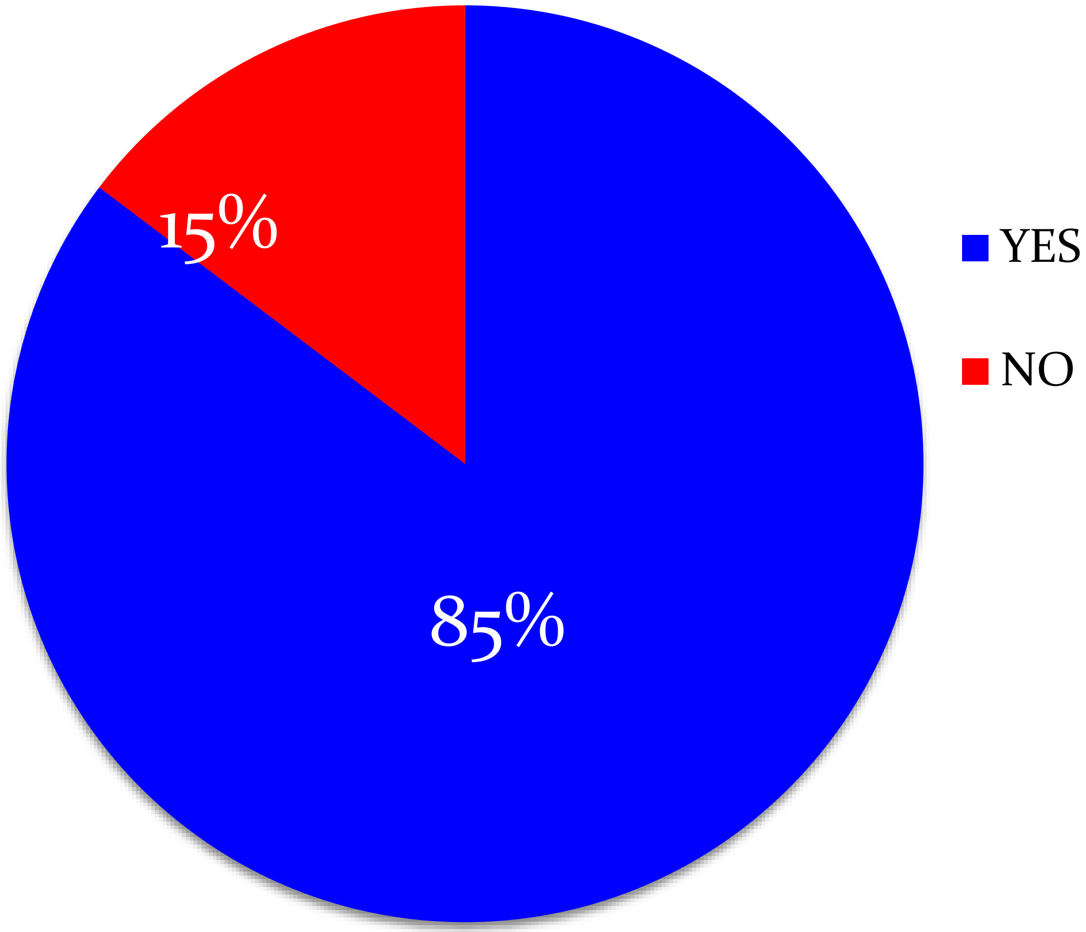
Q4: Demonstrating Value to Mgmt/Company?



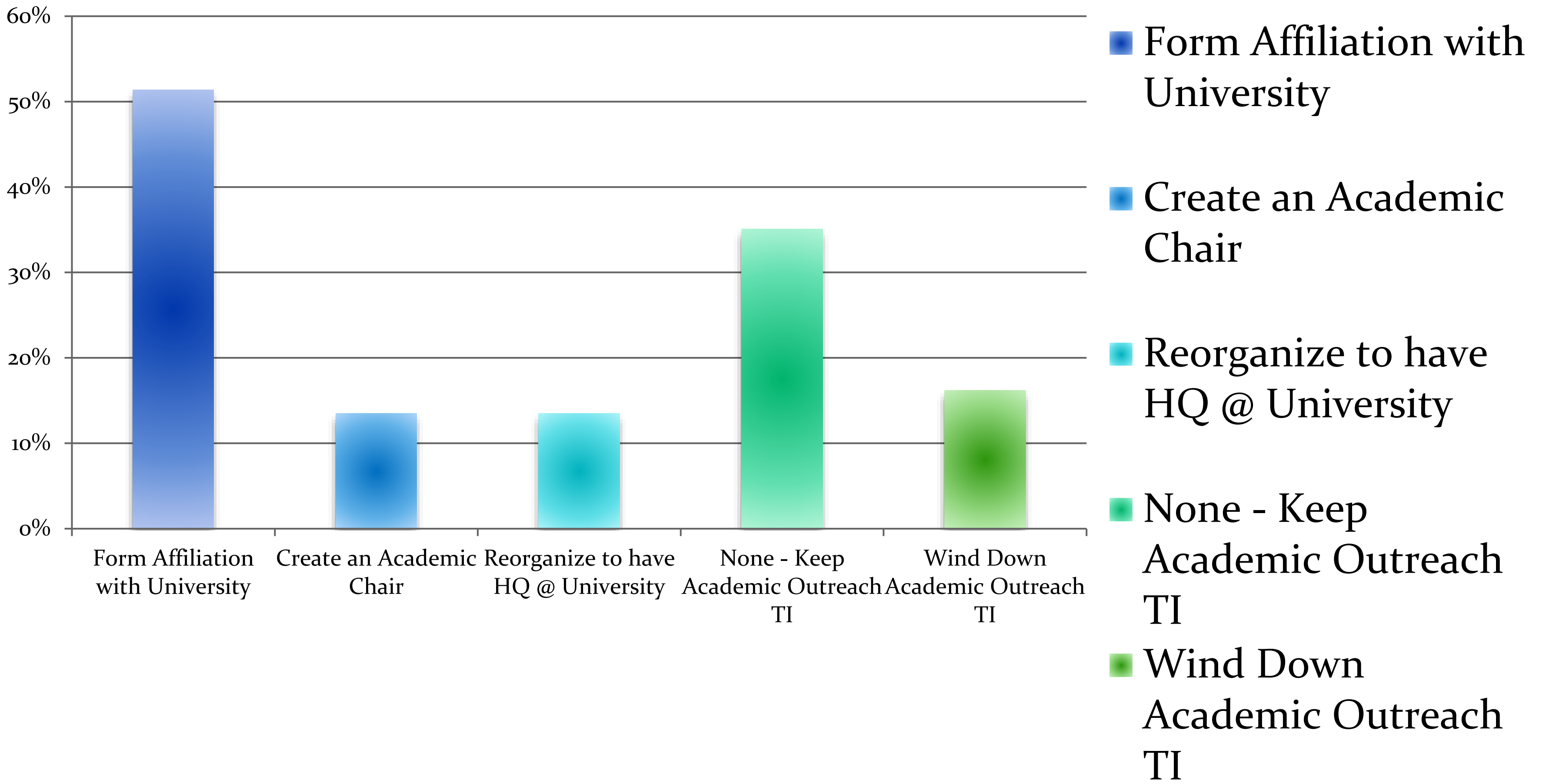
Q5: Would you like to see a SURF Technical Advisory Committee?



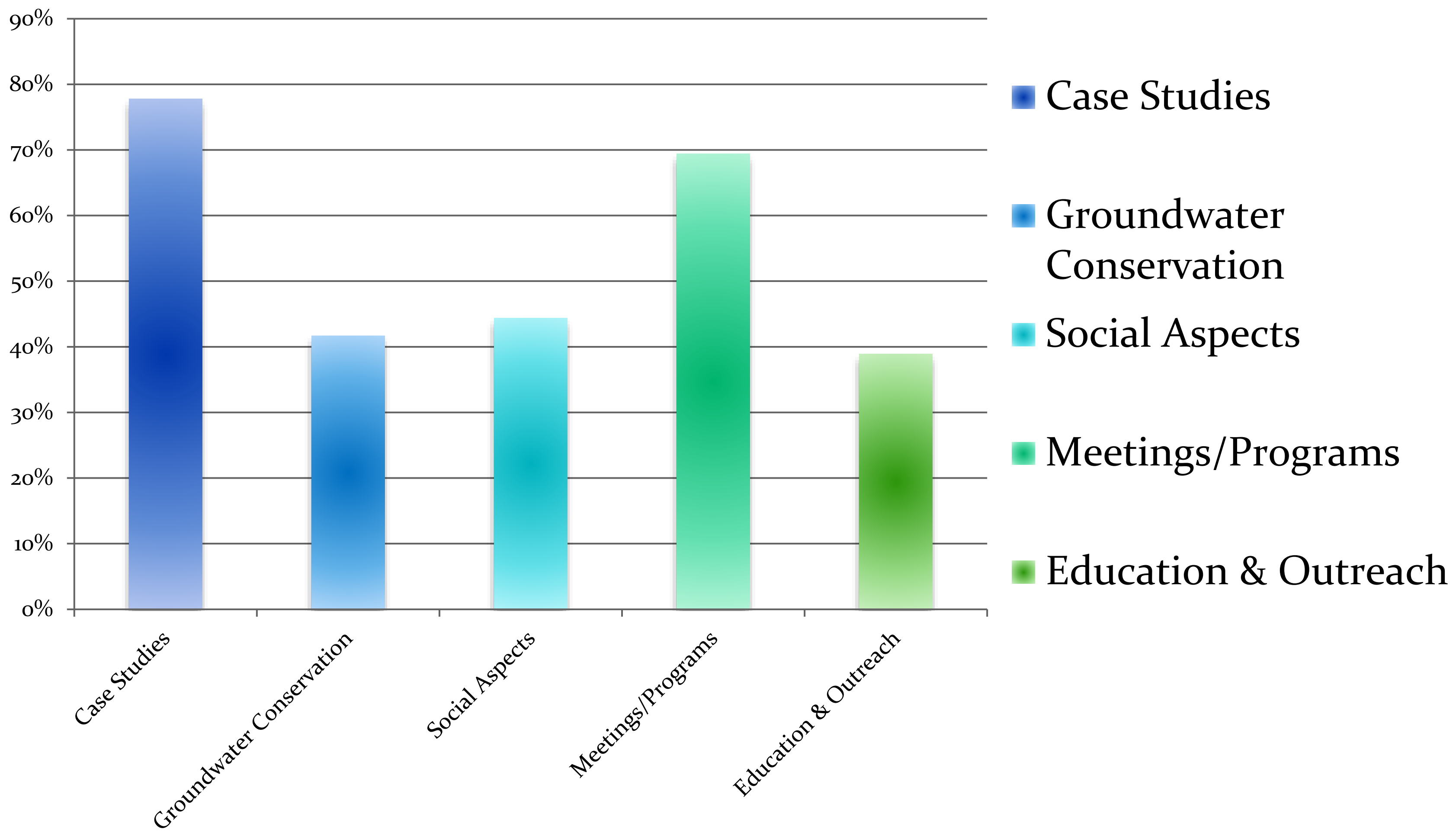
Q6: Should SURF Engage a Professional Facilitator to Help with Future Direction?



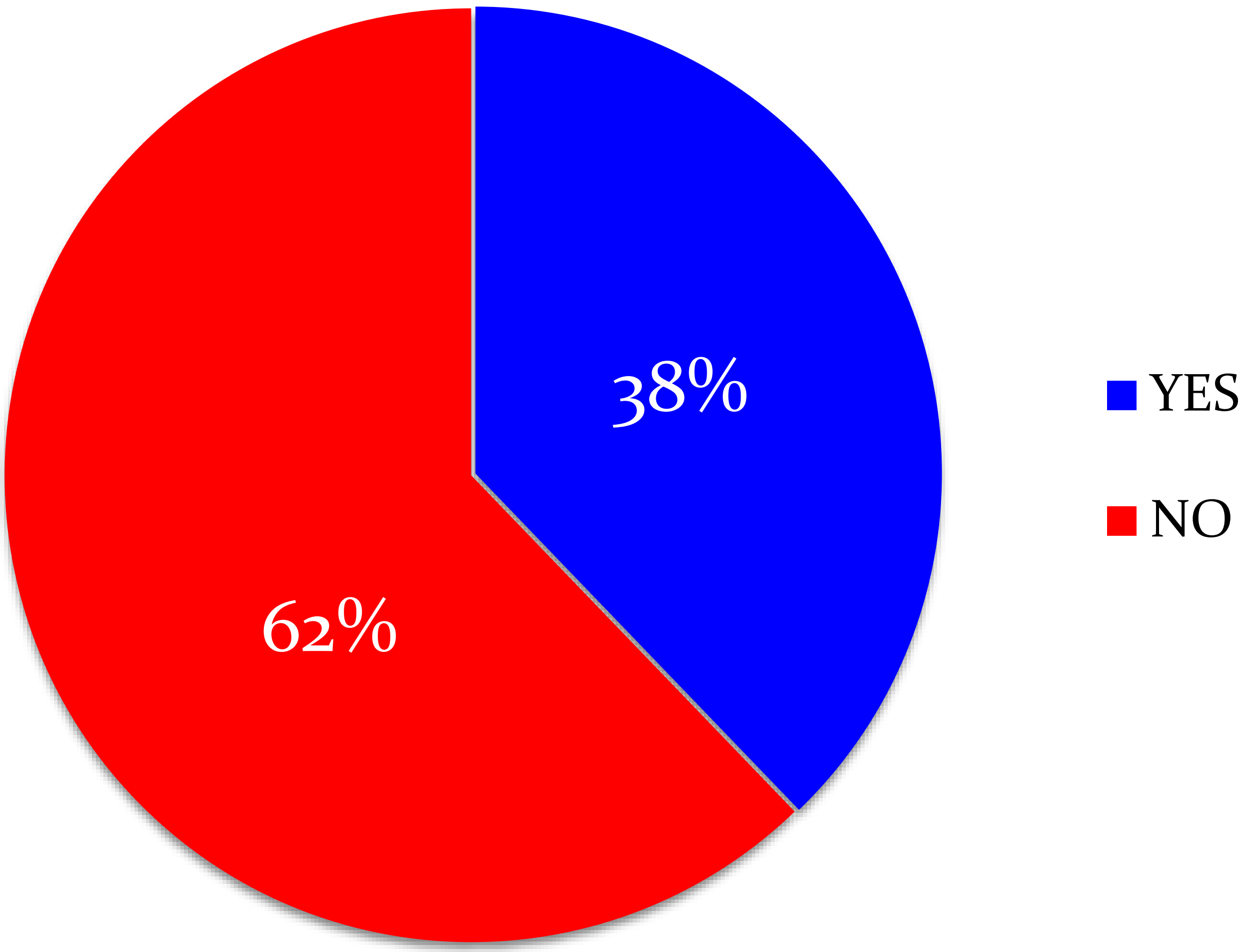
Q7: Working with Academia?



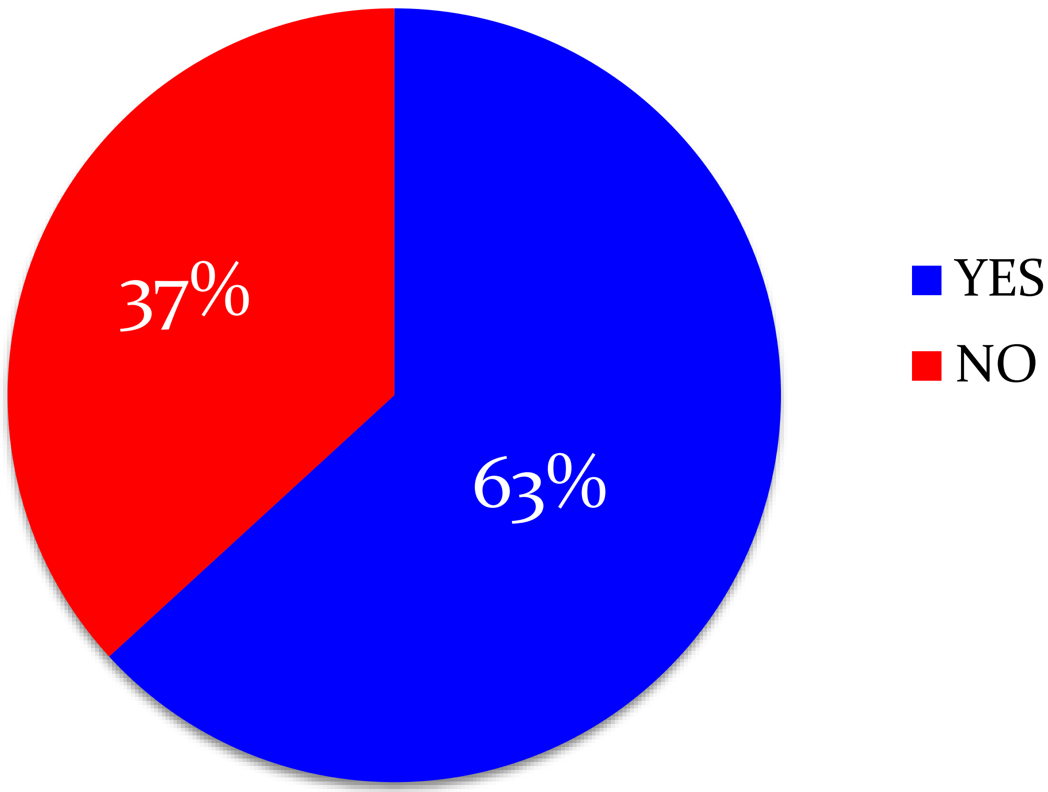
Q8: Most Valuable Current Initiatives?



Q9: Mentor a graduate student/special project?

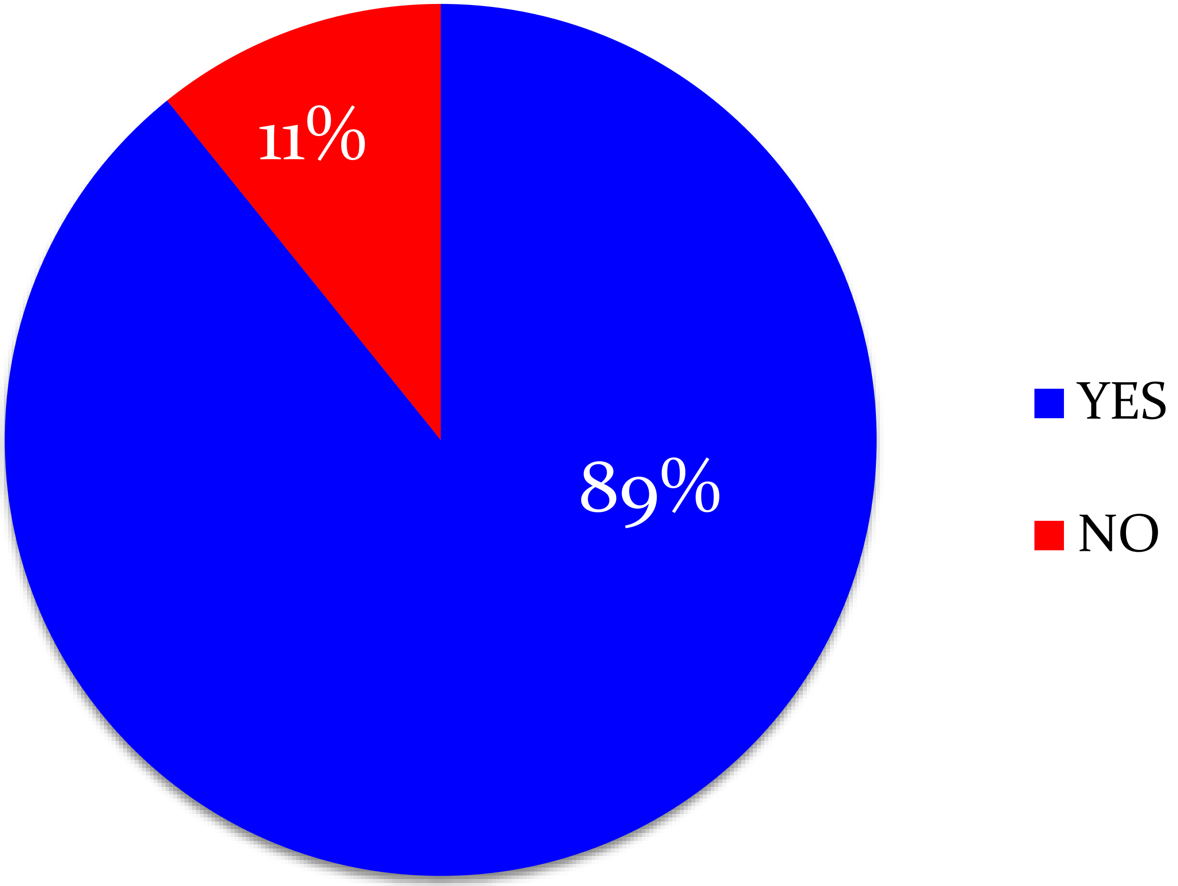


Q10: Professional SR Certification?

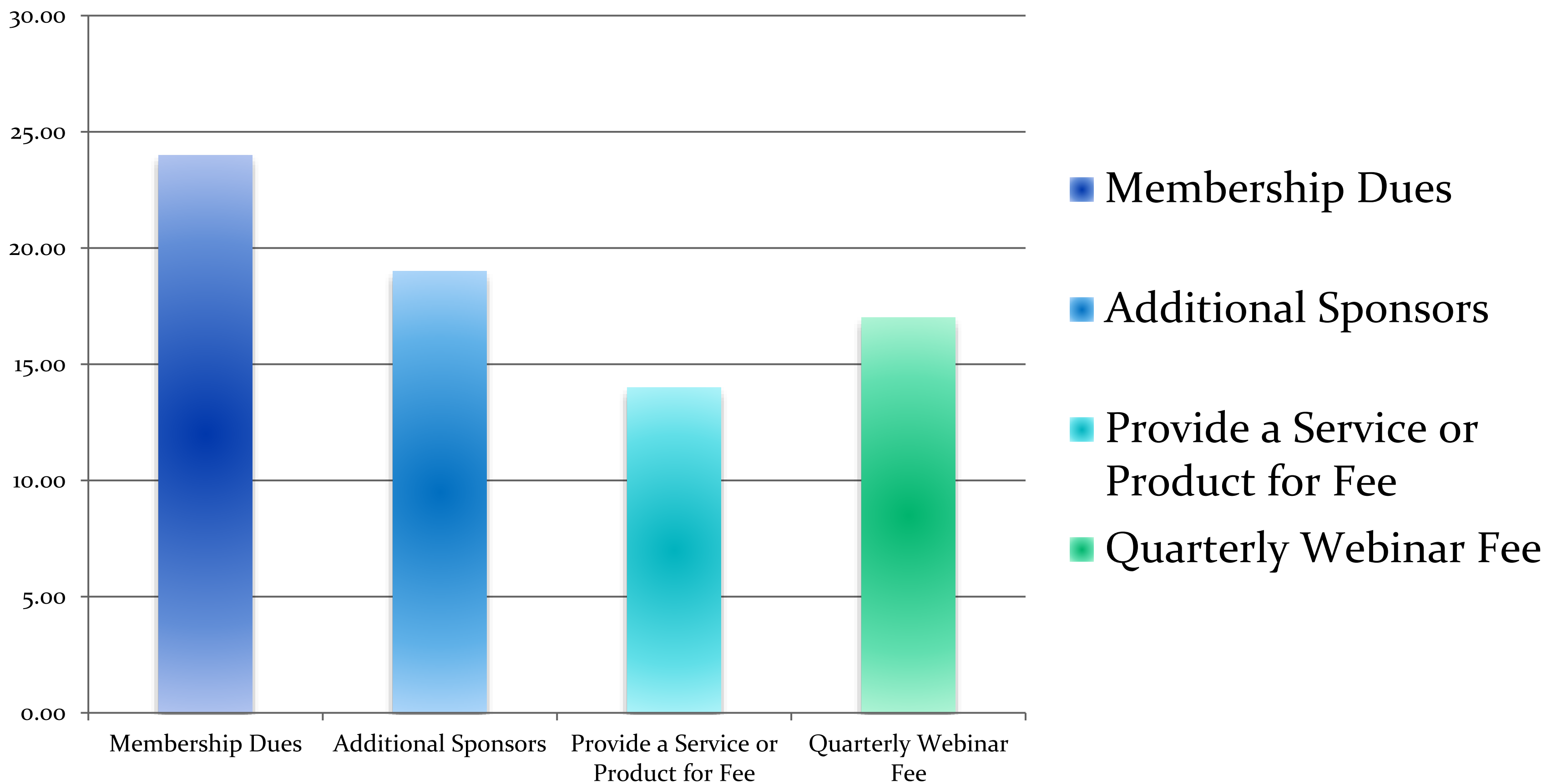


If yes, 56% would pursue the certification

Q11: Free Quarterly Webinar?

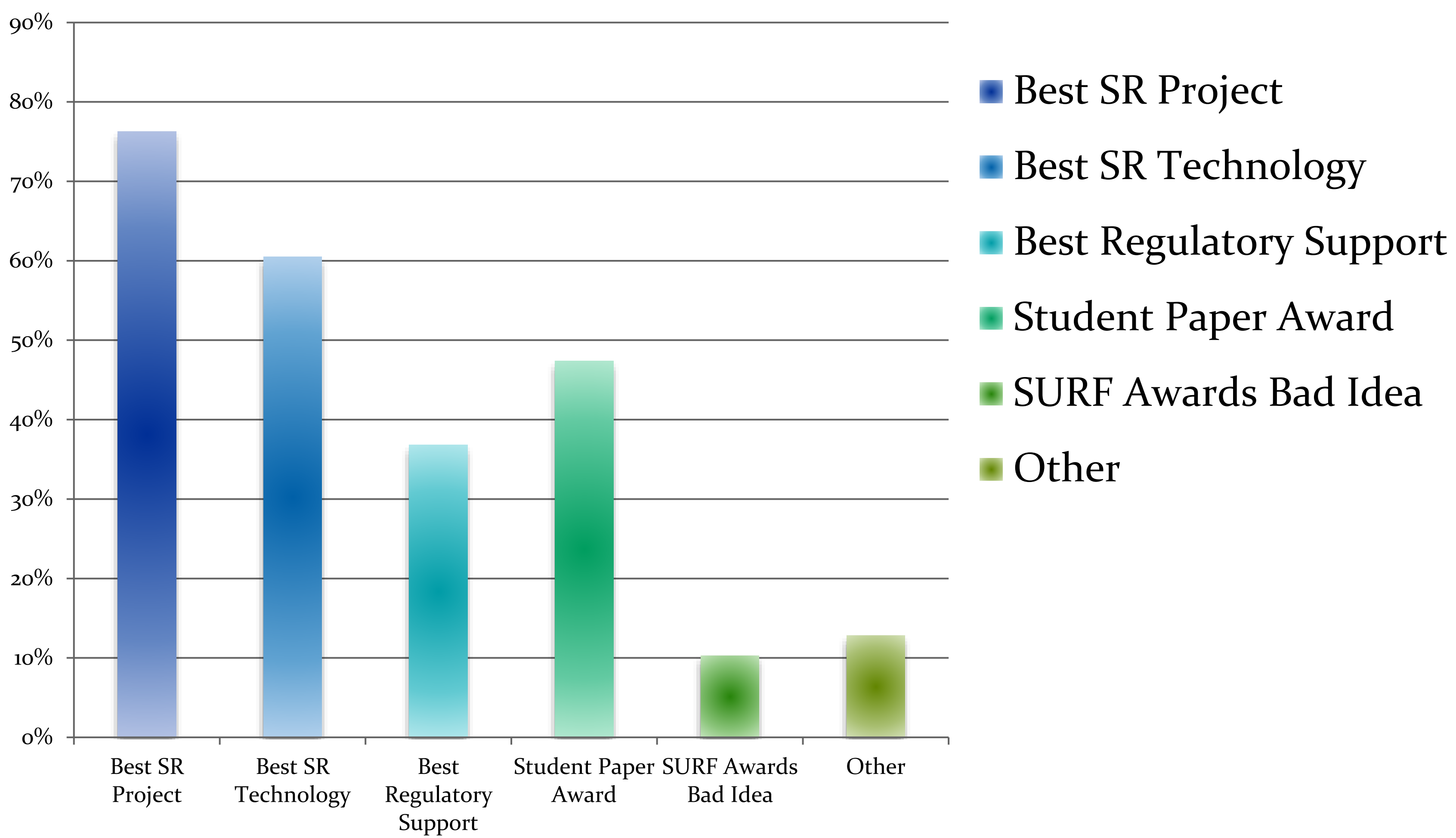


Q12: Best ways to raise $?



Graph shows Sum of # of 1st and 2nd top responses

Q13: SURF Awards? Categories?



Advancing SR & SURF

- Other ideas?

- Next steps
  - Finalize priorities
  - ID SURF Board & member leads
  - Action plan & implementation reporting

Thank you!

SURF
SUSTAINABLE REMEDIATION FORUM

Attachment 9

Panel Discussion: Are You Ready for the Next Disaster?

Climate Change and Site Cleanup under
California Water Board Practices
Sam Unger

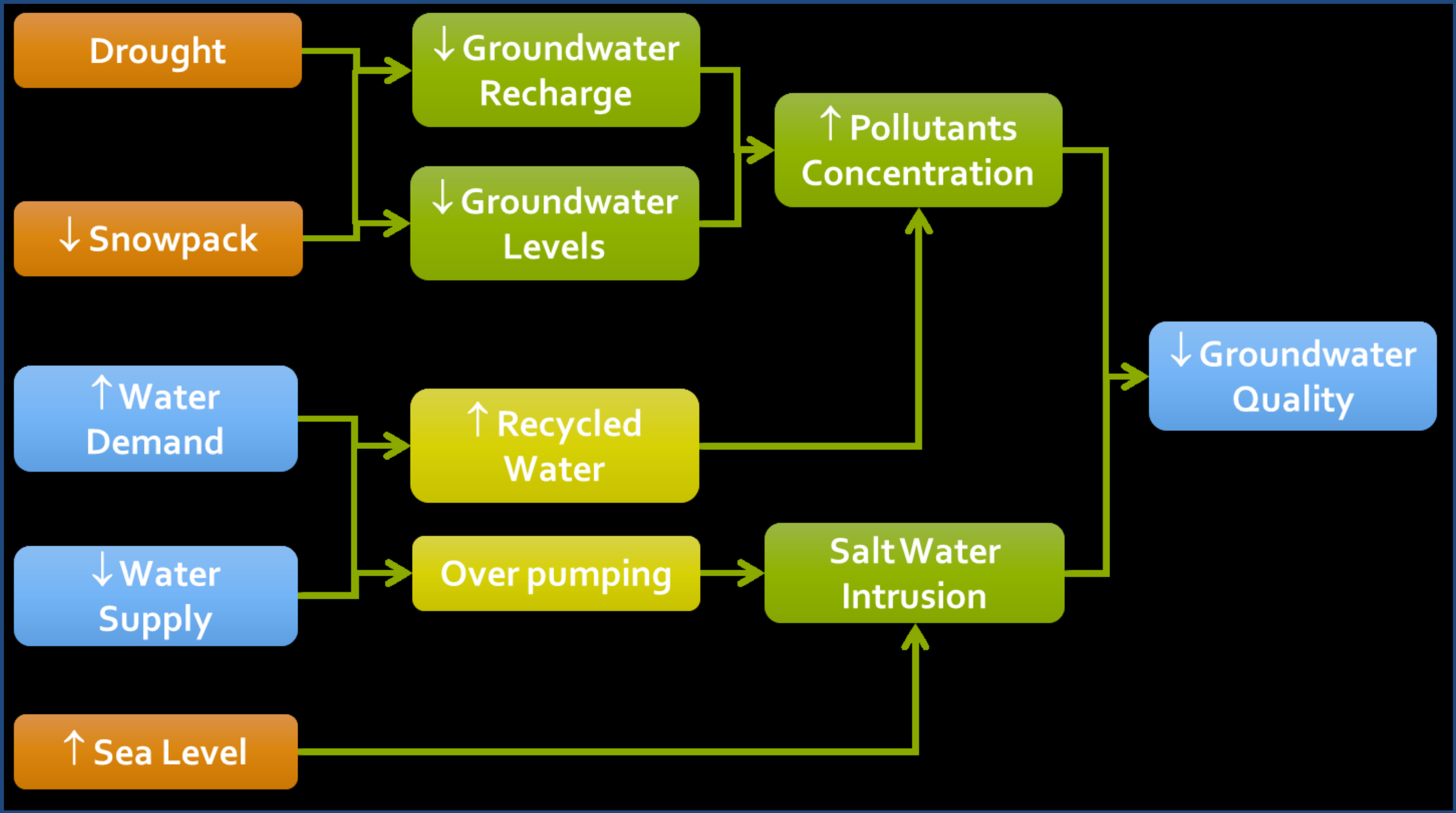
Climate Change and Site Cleanup under California Water Board Practices

Samuel Unger, P.E.
Los Angeles Water Board
SURF Conference
March 2, 2016

Site Cleanup Authorities and Guidance

- Water Code Section13267
- Water Code Section 13304
- Health and Safety Code
- State Board Resolution 92-49

Climate Change Effects on Groundwater Quality



Climate Change and Site Cleanup

- Challenges in Evaluating Climate Change effects on a Site specific scale.
- Challenges in Valuing Water Resources
- Challenges in Developing cost benefit analyses

Attachment 10
Panel Discussion: Are You Ready for the Next Disaster?

Summary of the Legal Framework for Contaminated Site Liability
William Wick

SURF 31 – Pasadena, CA – March 2, 2016

Are You Ready for the Next Disaster? Legal and Insurance Implications of Climate Change Impacts on Your Contaminated Site

SUMMARY OF THE LEGAL FRAMEWORK FOR CONTAMINATED SITE LIABILITY

WILLIAM D. WICK

WACTOR & WICK LLP
ENVIRONMENTAL ATTORNEYS

Sources of U.S. Environmental Law & Control

Concurrent federal, state, local jurisdiction

- Statute-based law
- Federal Statutes
  - **Superfund/CERCLA (Comprehensive Environmental Response, Compensation and Liability Act)**
  - **Resource Conservation & Recovery Act**

Sources of U.S. Environmental Law & Control

Toxic Substances Control Act

Clean Water Act

Clean Air Act

Endangered Species Act

National Environmental Policy Act

State Statutes

Hazardous Substance Account Act

Hazardous Waste Control Law

Sources of U.S. Environmental Law & Control

CERCLA PRPs (Liable for Cleanup)

- **Current Owner**
  Strictly liable
- **Current Operator**
  Ditto
- **Past Owner ("at the time of disposal")**

Sources of U.S. Environmental Law & Control

- **Past Operator ("at the time of disposal")**
- **"Arrangers" for Disposal**
- **Transporters**

Sources of U.S. Environmental Law & Control

CERCLA “Defenses”

- **“Act of God”**
- **“Act of War”**
- **Third Party (with No Contractual Relationship)**

Sources of U.S. Environmental Law & Control

Special Third-Party Defenses

- **Innocent Purchaser**
- **Bona Fide Prospective Purchaser**
- **Contiguous Property Owner**

Sources of U.S. Environmental Law & Control

For third party defenses, landowner must take reasonable steps to:

- Stop any continuing release
- Prevent any threatened future release
- Prevent or limit human, environmental, or natural resource exposure to any hazardous substance released on or from property owned by that person

Contractual Allocation of Cleanup Risk Allowed

Parties to a transaction can allocate liabilities for remediation costs between themselves (*e.g.*, a seller might indemnify a buyer for preexisting conditions, or vice-versa).

William D. Wick

Wactor & Wick LLP

180 Grand Ave., Suite 950

Oakland, CA 94612

bwick @ww-envlaw.com

510-465-5750 x. 2

Attachment 11

Panel Discussion: Are You Ready for the Next Disaster?

Insurance Solutions- Environmental

Greg Schilz

INSURANCE SOLUTIONS – ENVIRONMENTAL

SURF CONFERENCE

MARCH 2016

POTENTIAL EXPOSURES

- **COMPANIES WITH A FOOTPRINT**
  - Operational (new) liabilities
  - Legacy liabilities (pre)
- **REMEDIATION PROJECTS**
- **CONSTRUCTION PROJECTS**

RESILIANCY AND REMEDIATION

Resiliency is the capacity to absorb external stresses imposed by long-term climate change and short-term extreme weather events.

- How does the insurance market and products take resiliency into consideration?
- Does it make a difference in the risk profile of a remediation project?
- Are there insurance products which cover risks associated with GHG effects?

1 STATE OF THE ENVIRONMENTAL MARKET

STATE OF THE MARKET

Approximately 30 markets now offer Pollution Liability products

- AIG exiting North America, and the Chubb-ACE merging
- Capacity remains abundant, with upwards of $500MM available
- Tailored and flexible policy forms and manuscripted endorsements

Rates

- Relatively steady, though some markets will push for flat to single-digit increases upon renewal
- Transactional exposures will vary in scope for limits, policy terms, and coverage spectrum

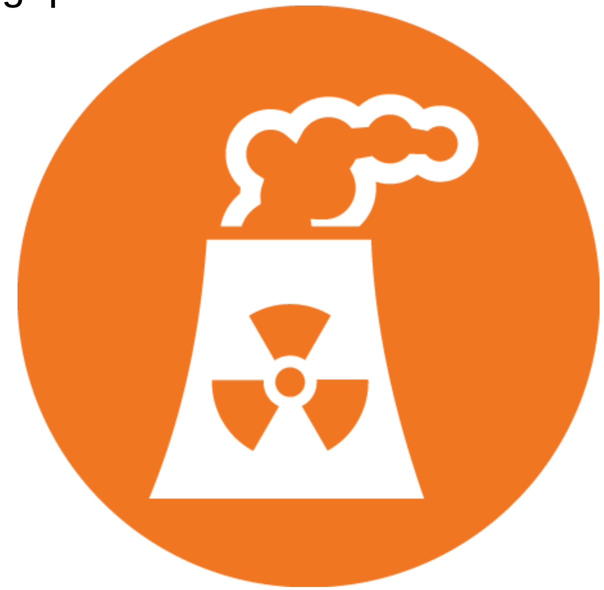
Policy Coverage and Enhancements

- Stand-alone carriers offer limits up to $50MM each incident, $50MM aggregate
  - Excess limits are available up to $500MM if requested
- Policy terms of up to 10 years for pre-existing (historical) and new conditions
- Excess of indemnity-structure is available from a handful of A-rated markets
- Tiered retentions, in addition to aggregate and maintenance, are recommended based on severity of exposure
- Policies can be assigned to property purchasers, although not recommended; instead, we would suggest new buyers be added to the policy as additional insureds

STATE OF THE MARKET (CONT.)

Some traditional markets have taken a step back from certain risks

- Redevelopment, particularly Brownfields
- Heavy industrial property use
- USTs greater than 20 years old
- Policy term greater than 3-years
- “New” entrants into the market have filled this gap



Recent Trends and Emerging Risks

- Vapor Intrusion
- Drinking Water Quality
- Named storm peril
- Virus and bacteria (i.e. Ebola, Norovirus)
- Bedbugs
- Biological Agents / Substances, Medical Waste
- Bioterrorism
- Nanotechnology
- Cyber threat (pollution controls)
- Licensed Environmental Professional / State Voluntary Cleanup Programs

2 ENVIRONMENTAL INSURANCE SOLUTIONS

ENVIRONMENTAL INSURANCE SOLUTIONS

1. POLLUTION LEGAL LIABILITY / ENVIRONMENTAL IMPAIRMENT LIABILITY

2. COST CAP INSURANCE

3. CONTRACTOR'S POLLUTION

POLLUTION LEGAL LIABILITY

- Clean-up costs for any onsite or offsite contamination
- Third-party liability claims including:
  - Property damage
  - Bodily injury
  - Natural resource damages
  - Business interruption and loss of rental income due to pollution conditions
- Defense costs are included within the limit of liability
- Non-owned disposal sites where hazardous materials and wastes from the site are taken
- Transportation (first and third-party) of materials to and from the insured property

POLLUTION LEGAL LIABILITY
(CONT.)

- Mold Coverage
  - Remediation costs and third-party liability coverage
  - Lead-based paint and asbestos-containing materials and cleanup in soil and groundwater
- Illicit abandonment (aka “midnight dumping”)
- Emergency response
- Crisis response management costs – public relations management costs

COST CAP INSURANCE

- Cost Cap coverage is offered by AXIS and Beazley
- AXIS's program is designed primarily for owners
  - Coverage also includes a Protective Professional Indemnity coverage enhancement, in addition to the cost overrun protection, i.e. negligence of client's contractor or consultants for 1st/3rd party claims
  - Coverage for cost overruns associated with an approved Remedial Action Work Plan; coverage to remediate known pollutants and newly identified pollutant

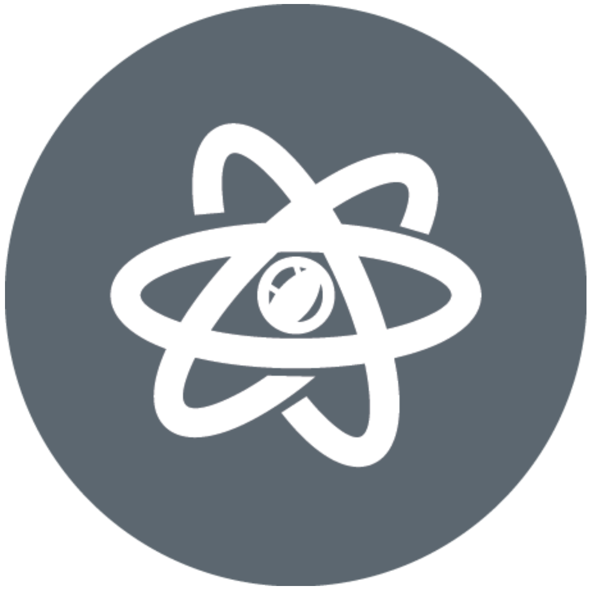
- Beazley's program is focused on contractors, for a Guaranteed Fixed Price Remediation (GFPR) contract.
  - Coverage includes: indemnification for cost overruns associated with an approved remedial action workplan, and will address scheduled activities for the workplan regarding;
  - increased constituents,
  - greater length of time to address constituents,
  - greater volumes discovered of the known constituents;
  - coverage will not exceed ten (10) years

CONTRACTOR'S POLLUTION LIABILITY

- Costs associated with third-party liability claims alleging damages from client's contracted / covered operations at the site that in turn result in pollution incidents / events. This would include:
  - Remediation expenses / cleanup costs
  - Property damage
  - Bodily injury
  - Natural resource damages
- Defense costs are included within the limit of liability
- Non-owned disposal sites where hazardous materials and wastes from the site are taken
- Coverage for claims arising out of spills during transportation (first and third-party) of materials to and from the job site
- Mold / legionella pneumophila, etc. as a result of contracting operations are included
- Can include Errors & Omissions, as well as Protective Indemnity

DIRECTORS' & OFFICERS'
ENVIRONMENTAL EXPOSURE

- **2012** – Ontario Ministry Of Environment (MOE) issued remediation orders to Northstar Aerospace; however, because of concerns about Northstar's ability to reimburse the MOE for cleanup costs
- **October 28, 2013** – 12 former directors and officers of bankrupt Northstar Aerospace agreed to pay $4.75MM to environmental regulators to remediate contamination
- Standard D&O insurance excludes coverage for all loss "arising out of" the actual or alleged discharge of pollutants , with limited giveback for securities and shareholders claims as well as defense costs under Insuring Agreement A; this does not cover for remediation expenses on-site or off-site
- Given the severity of some losses, potential for bankruptcy and public opinion, there will likely be an increase in frequency of actions against D&O's in the future with respect to pollution liabilities
- Freedom Industries case developing in US courts



3 ABOUT JLT AND YOUR JLT TEAM

WHO IS JLT?
GROUP AND SPECIALTY OVERVIEW

JLT Group, one of the world's five largest global brokers, is a leading provider of insurance, reinsurance and employee benefits related advice, brokerage and associated services.

$15B+
Premium Placed

10,600+
People

135
Countries
Where local insurance solutions are provided via the JLT International Network

Jardine Lloyd Thompson Group plc	
42%	Owned by conglomerate Jardine Matheson
$66B+	Current total assets of Jardine Matheson
$4B+	Market cap

JLT Specialty USA, a division of JLT Group, specializes in:

- Industries of aerospace, construction, energy, entertainment and hospitality, financial institutions, marine, private equity, real estate, technology, among others
- Products of cyber/errors and omissions (E&O), management liability, environmental liability, and credit, political, and security risk, among others
- We have successfully hired over 175 individuals with unmatched experience and expertise from 9 different brokers, as well as legal and financial firms
- Substantial interest continues with our differentiated model: Over 400 applicants in queue

JLT Specialty USA	
175+ People	**12** Cities

JLT SPECIALTY USA
GREGORY SCHILZ

Gregory Schilz
Executive Vice President

@ Gregory.Schilz@jltus.com

415.819.6585

Gregory Schilz is an Executive Vice President and the JLT USA Environmental Leader. Prior to joining JLT Specialty USA, Greg Schilz was a Managing Director at Aon Risk Solutions since 2006, where he was the national sales leader for the Aon Environmental Services Group and managed the West Region Environmental Practice.

From 2002 to 2006, Schilz was a Partner at Breitstone & Co. Ltd., and Marsh where he started his career in 1987. He managed the west region for both firms and was responsible, nationwide, for designing and building environmental insurance programs and analyzing environmental loss exposures.

Most recently he's been working with PE firms with innovative solutions to assist in the acquisition and or disposition process. Schilz received a B.S. in Business Administration from San Francisco State University.

About JLT

Jardine Lloyd Thompson (JLT) is the world's leading specialty focused provider of insurance, reinsurance, and employee benefits related advice, brokerage and associated services. We provide our clients with deep specialist knowledge, advocacy, tailored advice, and service excellence. Our 10,600 experts worldwide are focused on our client industries and are supported by the second largest international placement network with unparalleled capabilities and resources in 135 countries.

JLT Specialty USA is the U.S. platform of the leading specialty business advisory firm, Jardine Lloyd Thompson Group. Our experts have deep industry and product experience serving leading US and global firms. Our key to client success is our freedom to be creative, collaborative, and analytical while challenging conventions, redefining problems, creating new analytical insights, and exploring new boundaries to deliver solutions for each client's unique business and risks.

www.jltus.com

Attachment 12

Panel Discussion: Are You Ready for the Next Disaster?

Climate Change, Remediation, and Resiliency:
Enterprise, Reporting, and Auditing Perspectives
Douglas Hileman

Climate Change, Remediation, and Resiliancy: Enterprise, Reporting, and Auditing Perspectives

Presented by
Douglas Hileman, CRMA, CPEA
Douglas Hileman Consulting LLC
to
Sustainable Remediation Forum (SURF) 31
Pasadena, CA
March 2, 2016

Agenda

1) Premises & Drivers
2) Climate Change: Applicability to Remediation
3) Likely Questions/ Obstacles
4) Observations & Suggestions

This information has been prepared by Douglas Hileman Consulting LLC ("DHC") for general information purposes. It does not constitute consulting services or advice.

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Parties seeking advice should consult with counsel, consultants, or other suitable resources familiar with their particular circumstances.

DHC Disclaimer

I. Premises

- Climate change is the defining environmental issue of our era.
- Climate change is not only an “environmental” issue, it is also economic and social.
- 196 countries signed an agreement on Climate Change in Paris – December 2015
- If everyone/ everything else should be considering climate change, why not remediation?
- After we consider it, what do we do?

ılting, LLC

Big Picture Drivers: Management, Reporting, Auditing

Reporting frameworks: more of them
- Global Reporting Initiative
- Carbon Disclosure Project
- Industry codes of conduct
- Sustainability Accounting Standards Board
- Supply chain

Reporting framework: adopting more business & financial principles
- Materiality
- Risk-based approach

Management systems: following suit - New ISO 14001 – risk-based
Line blurring between financial & non-financial: conflict minerals; anti-slavery
Securities & Exchange Commission (SEC) Guidance for discussion of climate change risk in 10-K (Feb. 2010)

COSO Internal Controls Framework
Wait!!! What are "controls"?

COSO Internal Controls Cube
Categories of controls: across the top
Components of controls are the layers

Sarbanes-Oxley 404: Financial auditors assess internal controls over financial reporting.

S-O 302: CEO, CFO etc. – internal certifications quarterly re: internal controls over Operations, Reporting and Compliance

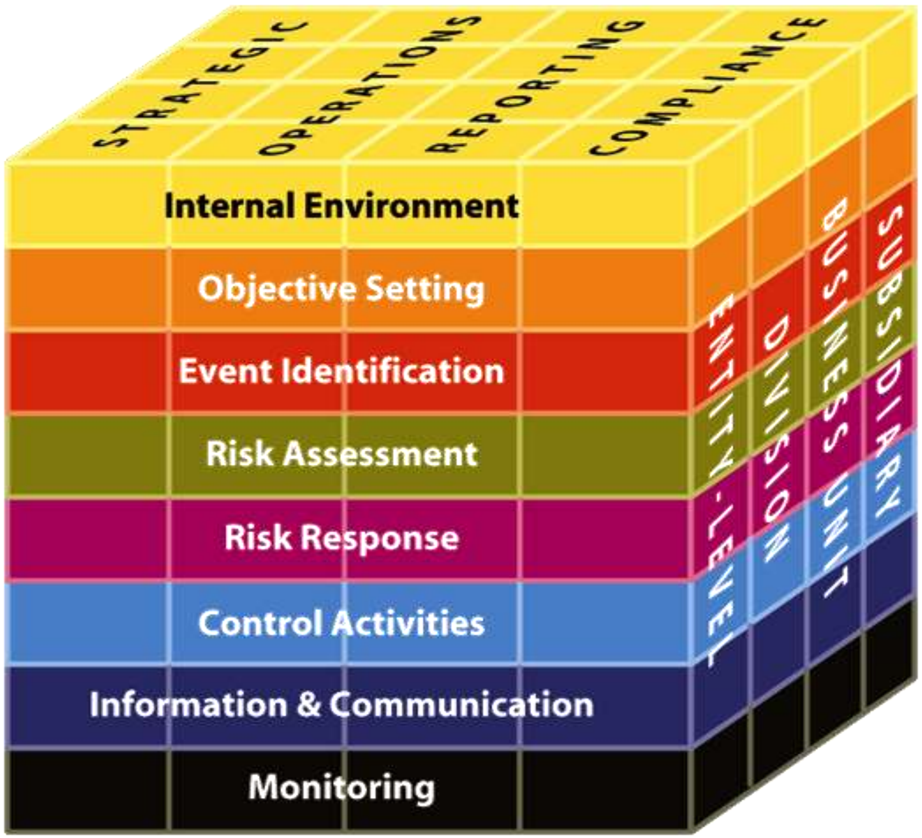
COSO: Committee of Sponsoring Organizations; see www.coso.org

What are the Risks?
Wait!!! What <u>is</u> "risk"?

The COSO Enterprise Risk Management Cube

<u>Categories</u> of risk: across the top

<u>Components</u> of ERM Programs are the layers

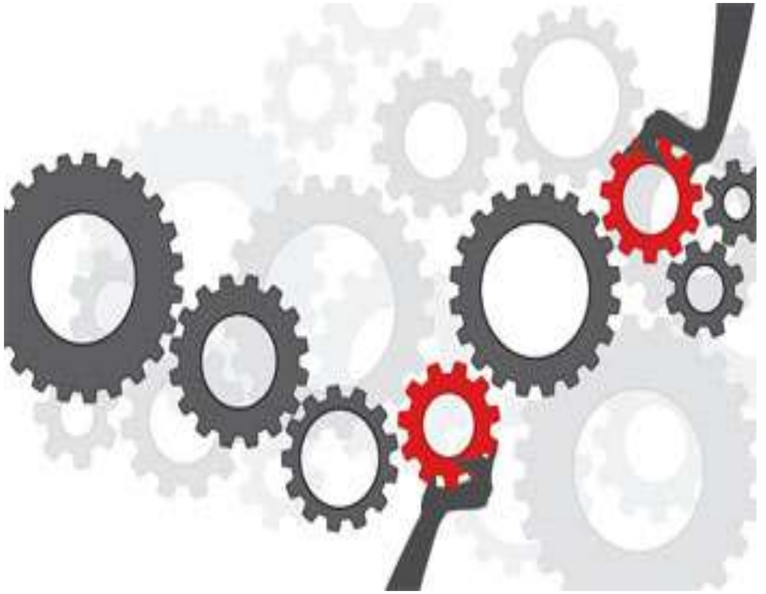


Categories of Enterprise Risk: Doug's Expanded View

Operations	Compliance	Reporting
Traditional		
In-House	Statutory Regulatory	Financial
AND….		
Supply Chain Joint Ventures & Collaborators Contracted/ Gig workers Value Chain	Contractual Industry standard Company commitment	Non-Financial

2. Climate Change: Applicability to Remediation

1) Design & Legal Parameters
2) Operations, Reporting and Auditing



Design & Legal Parameters of Remediation Programs

- What happens if the water table drops 25 feet while we are remediating groundwater?
- If neighbors/ landowners must conserve water (or pay a penalty), should we continue to pump & discharge more water than their entire usage every year?
- What provisions should we make for extended, extreme heat events?
- If the public is asked to curtail electricity usage during extreme heat, can/ should we?
- The Soil Vapor Extraction system started off removing 1 pound of material per hour. Now it removes 1 pound of material per month. Has the risk-benefit equation changed (electricity usage, GHG emissions, impact (and types of impact) on the community?

Operations, Reporting, and Auditing of Remediation Programs

- What are the GHG emissions?
- What is Scope 1, 2, and 3? And for whom?
- If we wanted to reduce GHG emissions, how would we do it?
- Can we have a carbon-neutral remediation project?
- Who gets reports?
- Who checks/ verifies data?

3. Likely Questions - and Potential Obstacles?

- What risks are posed by extreme weather events?
  - Are the risks operational? Compliance? Financial?
  - And to whom?
- How does GHG emissions reporting (or other Sustainability reporting) get built into project management and budgeting?
- If it costs more to be carbon-neutral, who would pay? Who would derive the benefits?

Likely Questions – and Potential Obstacles *(cont'd.)*

- What if considerations of climate change point to decisions contrary to the prevailing regulatory code, enforceable instrument, or technical status quo?
- How is public comment solicited and evaluated?
- What stakeholder engagement is appropriate?
- Are there tools to support this?

Likely Questions – and Potential Obstacles *(cont'd.)*

- If climate adaptation is the better answer, are there different winners and losers?
  - Should the losers be compensated?
  - How much, how, when, and by whom?
- Who pays for this?

4. Doug's Suggestions

Begin the journey through the obstacle course.

You are in distinguished company.

This means there is room for improvement – and the benefits that go with it.

Doug's Suggestions *(cont'd.)*

- Apply risk-based principles throughout project life cycle
- Use frameworks (risk assessment, management, reporting) that are familiar to executive management. ("We have to learn their language; they will not learn ours.")
- Develop inventory of aspects, impacts, and risks
- Develop list of possible questions, impediments
- Broad consideration of stakeholders, and Triple Bottom Line goals
- Establish ownership, roles, responsibilities

Doug’s Suggestions *(cont’d.)*

- Begin with what you’ve got
- Report – internal/ external
- Make everything “audit-ready” (if you report it, you’d better be able to back it up)
- Identify / leverage benefits for everybody
- Explore avenues for risk transfer

Closing Thoughts

Start at the top.
Start in the field.
Start in the middle.
Better yet: all of the above.

It's up to US.

Doug Hileman: Bio Excerpts

- Operations, corporate compliance (Environmental, Health, Safety)
- EHS compliance audits (1978)
- RCRA program development; corporate compliance; Superfund research & due diligence (early 1980s)
- Phase 1s, Remedial Investigations, Remediation, Air Toxics Surveys (late 1980s)
- Remediation & transactions: contracts; contract audits
- Environmental Impairment Liability Insurance assessments; insurance coverage assessments and litigation support (1990s)
- EHS mgmt. systems, transactions, insurance risk assessments, EHS risk oversight for owners, financial institutions, investors (1990s)

Doug Hileman: Bio Excerpts

- Wrote first Sustainability report (2002)
- PwC (2002 – 08): financial audit support; internal audit; enterprise risk management; non-financial reporting systems, controls
- DHC (2008 – present): Sustainability risk assessments; EHS support; SOPs; conflict minerals (including Independent Private Sector Audits on file at SEC)
- IIA: LA Board (Advocacy); Professional Issues Committee (global)

Experience in all four "lines of defense"
Per Inst. Of Internal Auditor's "Three Lines of Defense" Position Paper

Contact Information

Douglas Hileman, CRMA, CPEA
Douglas Hileman Consulting LLC
www.douglashileman.com

Mobile: 818 416 6403
doug@douglashileman.com
djhileman@gmail.com

White papers, resources on websites
Find me on Linked In

For conflict minerals, see also: www.DFCMAudit.com

Attachment 13

Incorporating Climate Change Adaptation into Remediation Design and Implementation

Incorporating Climate Change Adaptation into Remediation Design and Implementation

Sustainable Remediation Forum – Pasadena - March 3, 2016

Introduction

- Remediation and Drought
  - Case Study 1: Dual Phase Extraction
  - Case Study 2: Site Assessment and Remediation
  - Case Study 3: Air Sparge and Soil Vapor Extraction
- Concept of Climate Change and Adaptation/Resilience
- Incorporating Resilience Practices into Remediation Design and Implementation
- Commentary of Future Market and Industry Influences

Droughts Are Regional Events

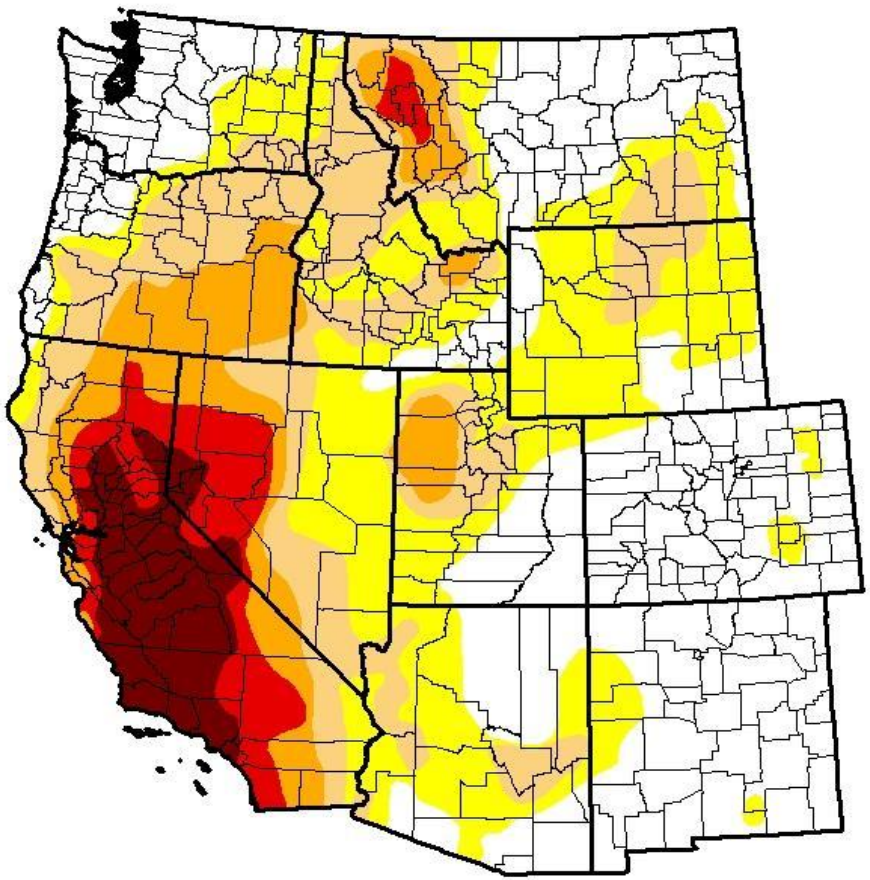
U.S. Drought Monitor

West

February 9, 2016

(Released Thursday, Feb. 11, 2016)

Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	38.22	61.78	37.15	19.90	10.79	5.55
Last Week 2/2/2016	37.77	62.23	38.46	21.39	11.69	5.70
3 Months Ago 11/10/2015	27.94	72.06	53.31	38.65	21.46	6.85
Start of Calendar Year 12/29/2015	33.17	66.83	45.07	29.30	15.92	6.85
Start of Water Year 9/29/2015	22.77	77.23	57.81	42.42	26.50	7.62
One Year Ago 2/10/2015	30.41	69.59	52.65	30.63	17.10	6.96

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

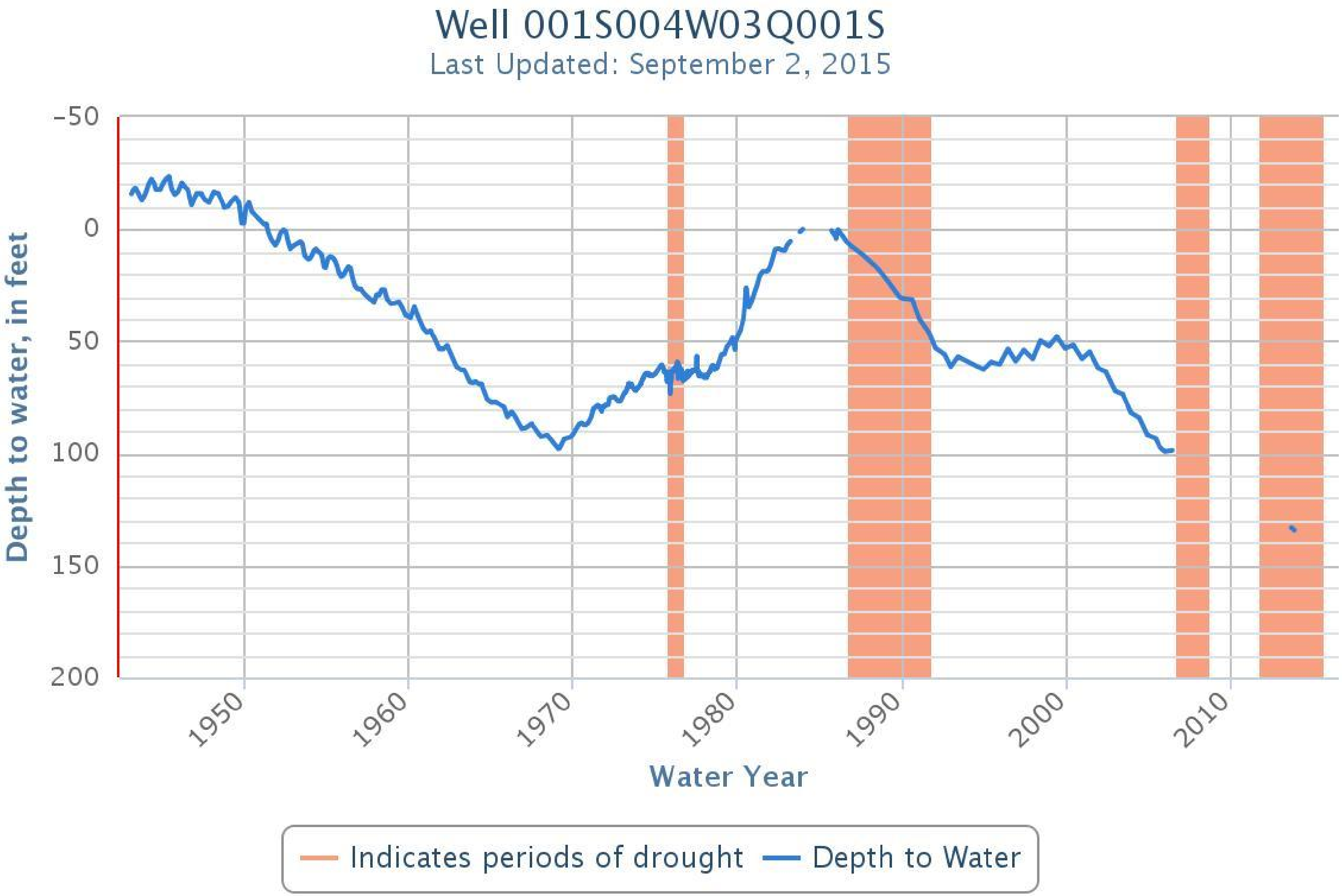
Anthony Artusa

NOAA/NWS/NCEP/CPC

USDA National Drought Mitigation Center

http://droughtmonitor.unl.edu/

Southern California Groundwater since 1940



Source: USGS, http://ca.water.usgs.gov/data/drought/groundwater.html

Case Study 1: Dual Phase Extraction

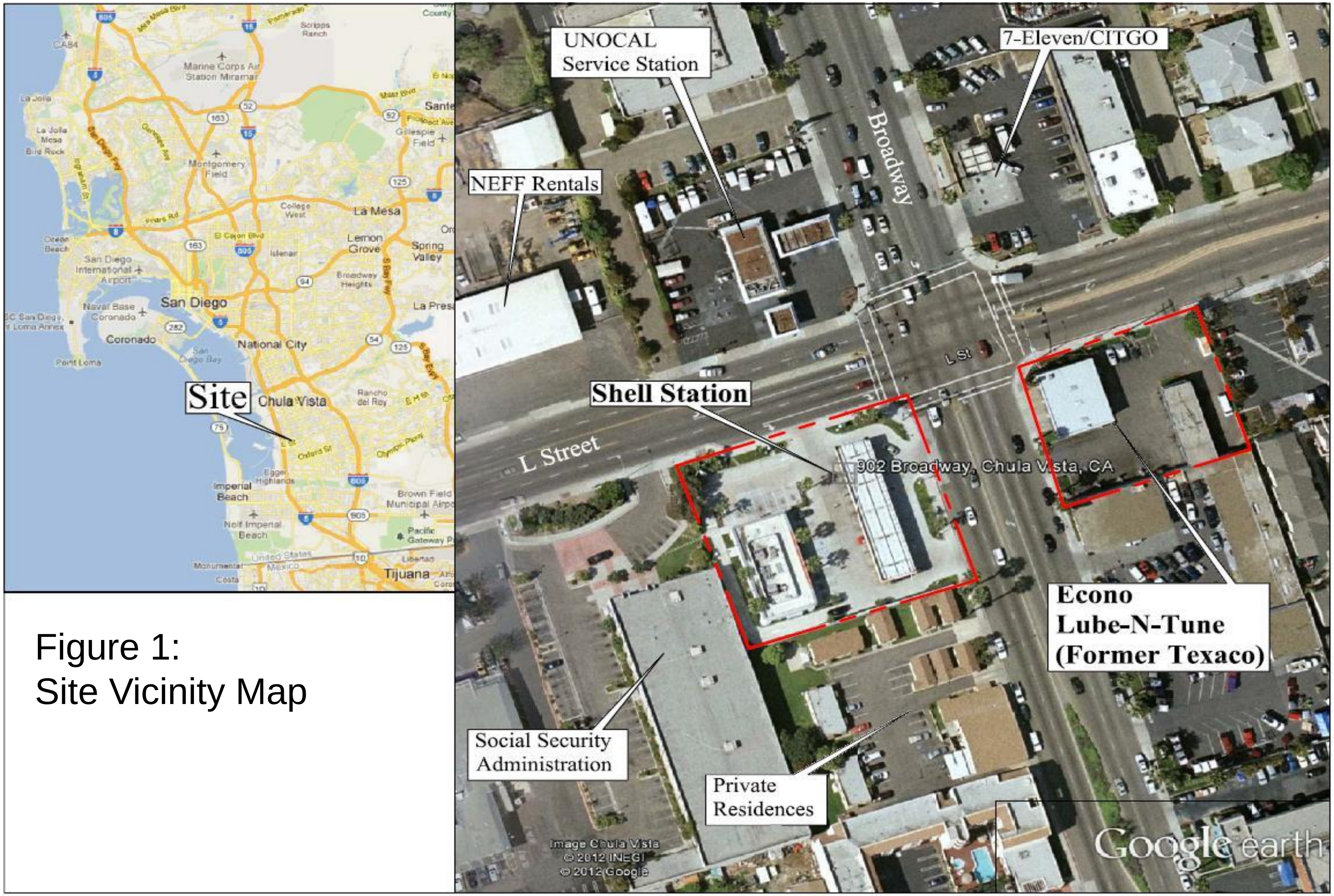
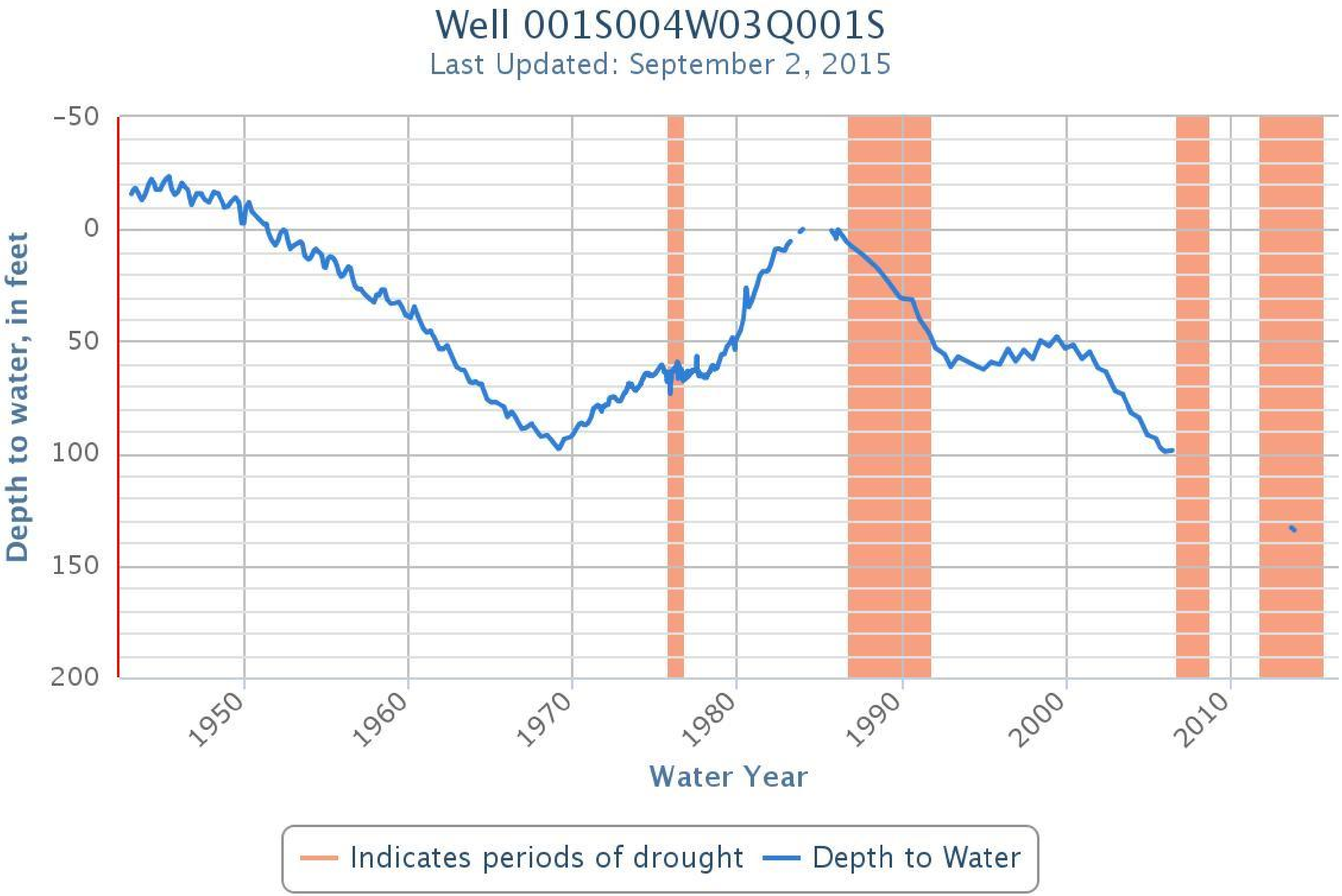


Figure 1:
Site Vicinity Map

Case Study 1: Dual Phase Extraction

Southern California Groundwater since 1940



Source: USGS, http://ca.water.usgs.gov/data/drought/groundwater.html

Case Study 1: Dual Phase Extraction

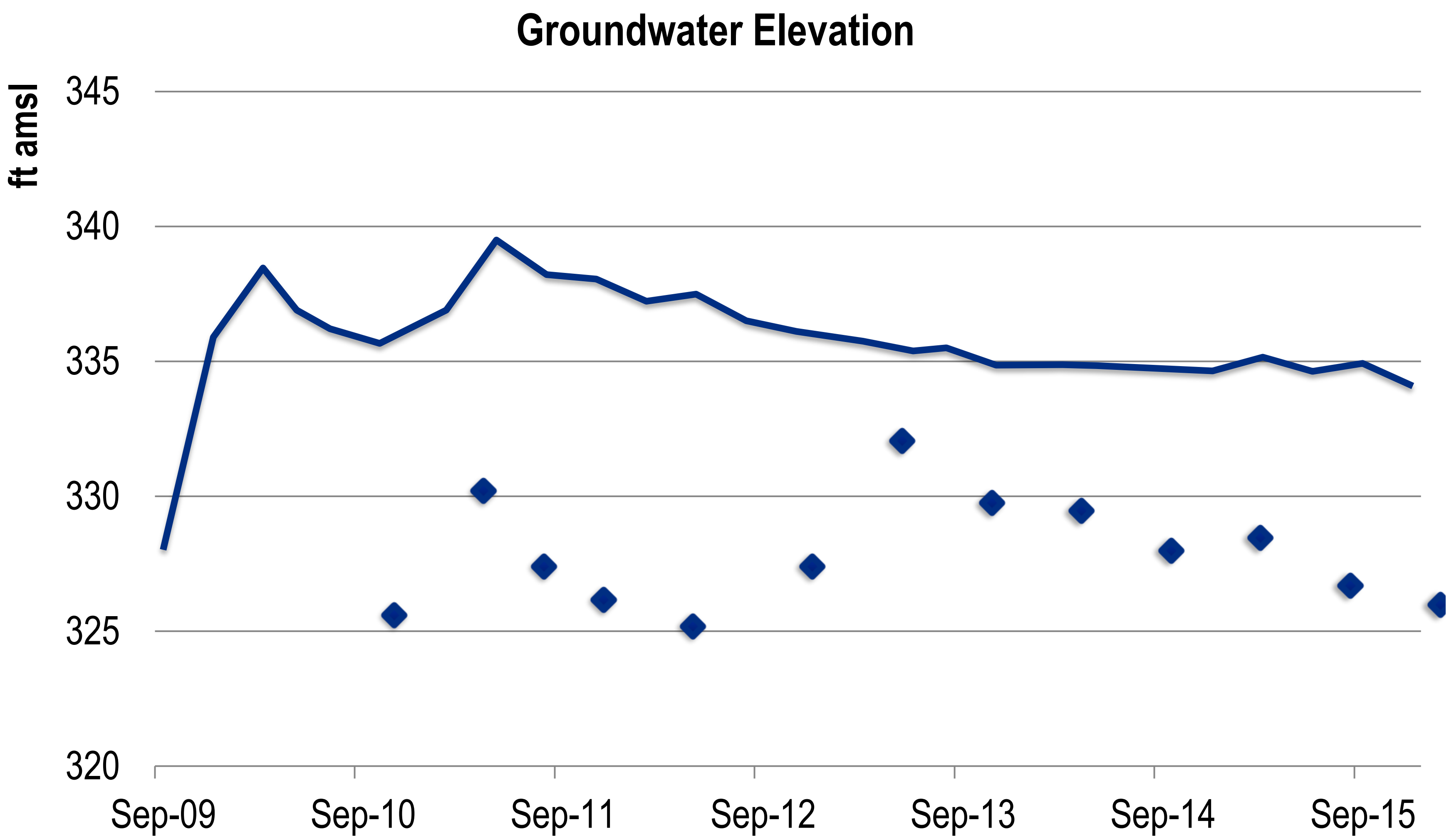
- Remedial goals:
  - Remove SPH
  - Treat source zone to prevent future SPH

Case Study 1: Summary

- Historical low groundwater elevation at the Site allows for efficient use of SVE to treat source zone
- Groundwater extraction system used for SPH recovery and minimal water extraction
  - Reduces pump and treat volume
  - Reduces risk of mobilizing off-site plumes

Case Study 2: Site Assessment

Case Study 2: Site Assessment



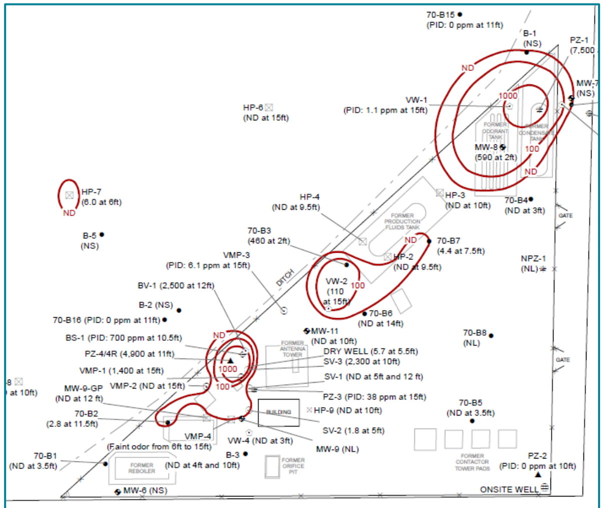
Case Study 2: Summary

- Drought conditions can reduce available data when wells and surface water are dry
- Remediation choices may be impacted by reduced groundwater availability

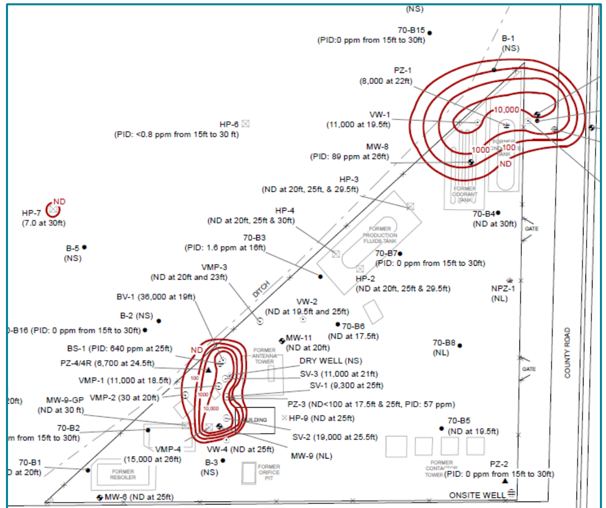
Case Study 3: Air Sparging and Soil Vapor Extraction

- Natural gas processing site (1960s - current)
  - Active site with numerous pipelines
- Groundwater table steadily decreasing 30 - 55 ft bgs

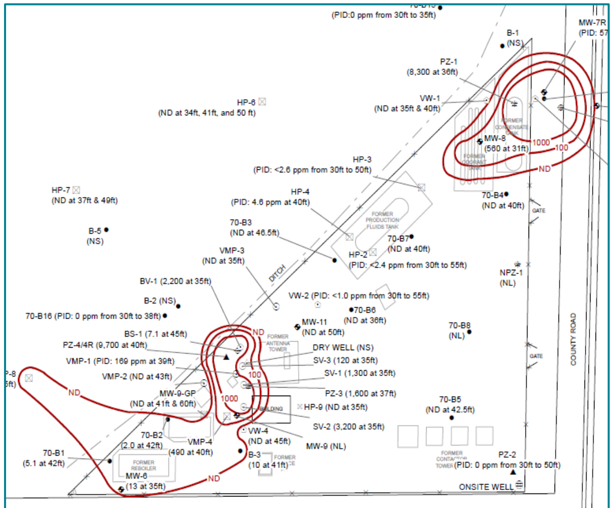
TPHd in Soil



0-15 ft bgs

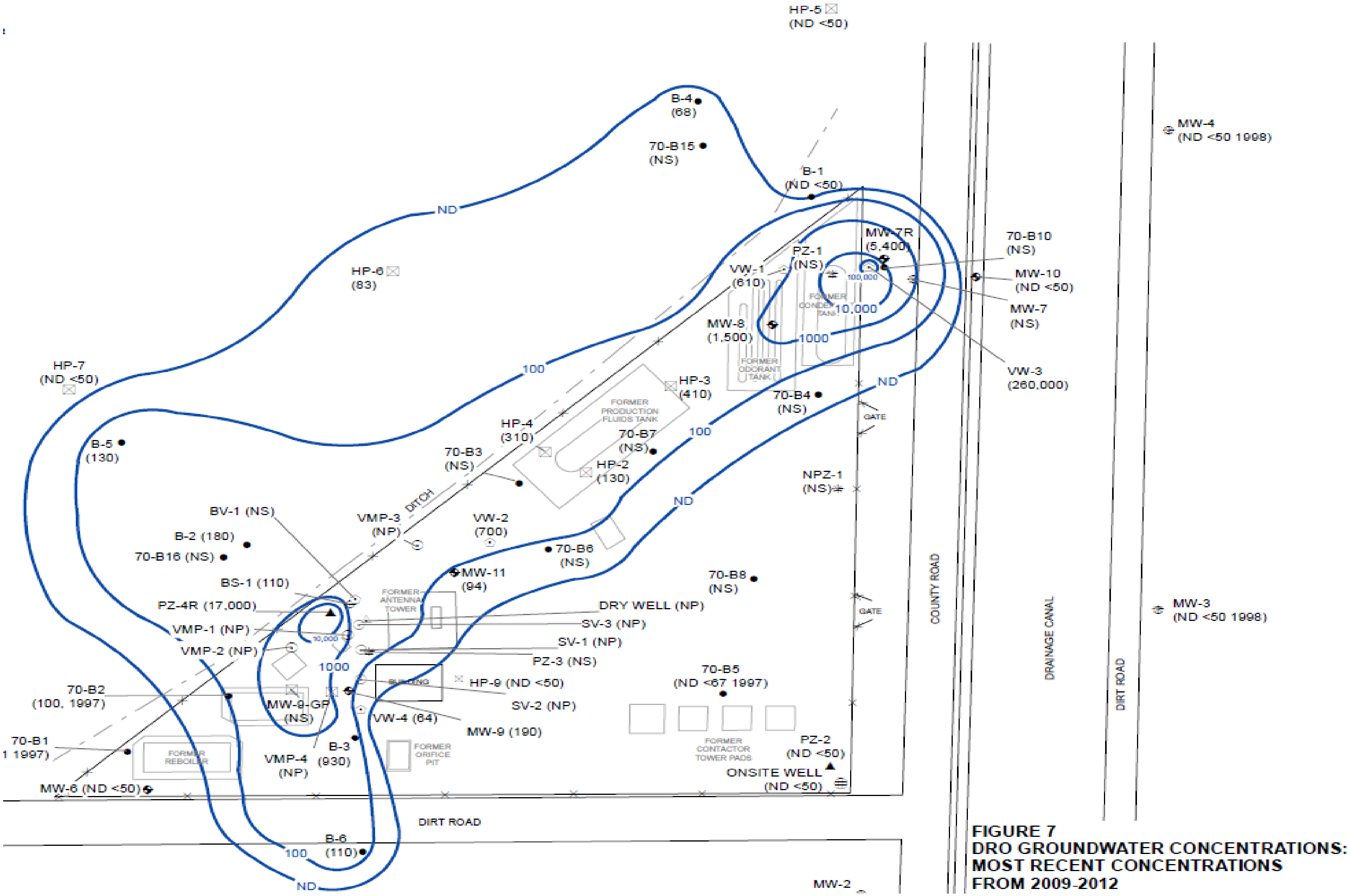


15-30 ft bgs



30-45 ft bgs

TPHd in Groundwater



Case Study 3: Air Sparging and Soil Vapor Extraction

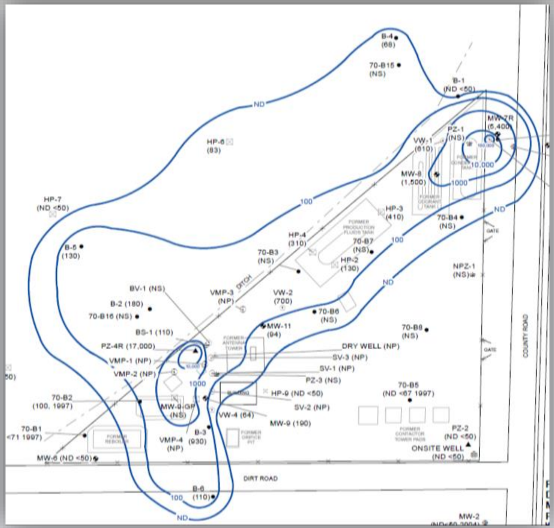
- Soil Vapor Extraction
  - GW level declined
  - Smear zone exposed
- Air Sparging
  - Saturated zone COC
  - Oxygen for smear zone biodegradation
- AS/SVE Optimization
  - Focus on most impacted SVE wells
  - Adjust flow on AS wells

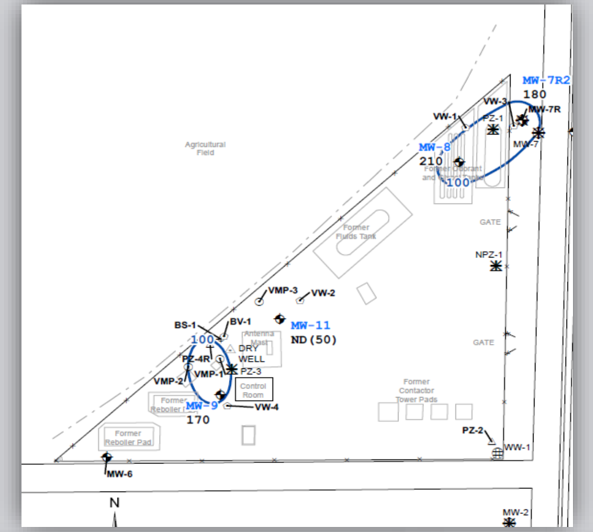
Case Study 3: Air Sparging and Soil Vapor Extraction

- Transition to Bioventing from SVE
  - Heavy range of diesel dominates
  - Polar compounds appear
  - SVE rebound test → Bioventing
- Transition to Biosparging from Air Sparging
  - Heavy range of diesel dominates
  - Focus on more biodegradation than volatilization
  - Keep similar ROI
  - Reduce flow rate → Biosparging

Case Study 3: Conclusions

- SVE removed COCs more efficiently as groundwater level declined
- Air sparging used to treat light range DRO in groundwater
- Transition to bioventing implemented when heavy range DRO dominates





PARSONS

Drought Condition Pros

- Increased smear zone size presents opportunity for efficient soil vapor extraction
- With proper optimization less energy intensive remediation methods may be employed as remediation progresses

Drought Condition Cons

- Data collection points may be limited
- Assessment of hydrophilic compounds may become a challenge
- Remediation choices may be limited
- Need to plan for end of drought

Climate Change and Adaptation/Resilience

- Beyond the point of preventing climate change
- Need to plan for projected impacts
- Be positioned to adapt to changing conditions
- USGBC-LA Definition of Resilience:

  "The capacity of individuals, organizations, and communities to adapt and thrive in the face of stressors and shocks."

  - Shocks: major storms, earthquakes, tsunamis
  - Stressors: crumbling infrastructure, public health issues, poverty.

Incorporating Resilience Practices into Remediation

- Remediation project lifecycles can be 20+ years
- Incorporate resilience into remediation by:
  - Developing a resilience plan at project onset
  - Projecting potential impacts of climate change
  - Evaluating both risks and opportunities posed
  - Continually reassess and update resilience plans
- Resilience measures will be particularly pertinent in remedy selection and O&M
- Take into account many aspects beyond site boundaries (e.g. energy availability, climate)

Future Market and Industry Influences?

- New standard practice
- An aspect of risk management; may be driven by
  - Internal corporate risk
    - Already the case in other industries
  - Regulators
    - OSWER's Climate Change Adaptation Implementation Plan
  - Insurance providers
  - Remediation practitioners?

Attachment 14

Applications for Microbial Extracts to Address Climate Change Challenges

APPLICATIONS FOR MICROBIAL EXTRACTS TO ADDRESS CLIMATE CHANGE CHALLENGES

3 March 2016

ETIC ENGINEERING

Compost and Compost Extracts

- Compost applied directly 100 lb >> 10’ x 10’ area.
- Compost extracts – aerobic and anaerobic.
- Fortified Microbial Extracts (FME) 100 lb >> 20 acres.

ETIC ENGINEERING

What is FME?

- 24-hour aerobic process.
- Macro and micro nutrients added.
- Bioreactor process increases the concentration of microorganisms by 2-5 orders-of-magnitude.
- Source of compost can increase diversity and population of microorganisms.

Safety Considerations

- Composts and extracts can easily be screened to eliminate issues of concern.
- Parameters to monitor:
  - Toxicity testing –Chronic and Acute
  - Pathogen testing
  - Metals testing
- Industrial sources of FME have been shown to be safe.

Historical Uses of FME

Historical uses of FME has been in the agricultural industry and are diverse:

- For the reduction of synthetic fertilizer use and fertilizer in runoff from farms, golf courses, and parks.
- Enhanced flavor profile, bean quality, and disease suppression for coffee production.
- Enhancement of protein in pasture grass that results in the increase of protein and fat content of milk.
- Disease suppression for cocoa production.
- Enhancement of water infiltration and retention in soil that can result in as much as a 30% reduction in water use.
- Enhanced flavor profile of premium wine grapes.
- Accelerates breakdown of plant materials after harvest returning carbon and nutrients back to the soil.

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Possible uses of FME in the environmental remediation and storm water industries:

- Soil and water remediation by direct biodegradation.
- As an amendment for phytoremediation:
  - Enhancing plant/tree health and vitality.
  - Degrading contaminants before reaching plant roots.
- As a microbial amendment for soil stabilization to promote:
  - Germination.
  - Plant establishment.
  - More robust root structure.
  - Healthy soil environment to support the overall ecosystem.

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FME Soil Laboratory Test Results

Enhanced biodegradation of the following contaminants of concern has been observed:

- Pesticides and herbicides
  - Atrazine
  - Heptachlor
- Hydrocarbons
  - Gasoline
  - BTEX
  - MTBE and TBA
  - Diesel
  - Motor Oil
  - Crude Oil
- PAHs
  - Benzo(a)anthracene
  - Benzo(b)fluoranthene
  - Benzo(a)pyrene
  - Naphthalene
- Explosives
  - 2,4-DNT
  - 2,4,6-TNT
  - HMX
  - RDX

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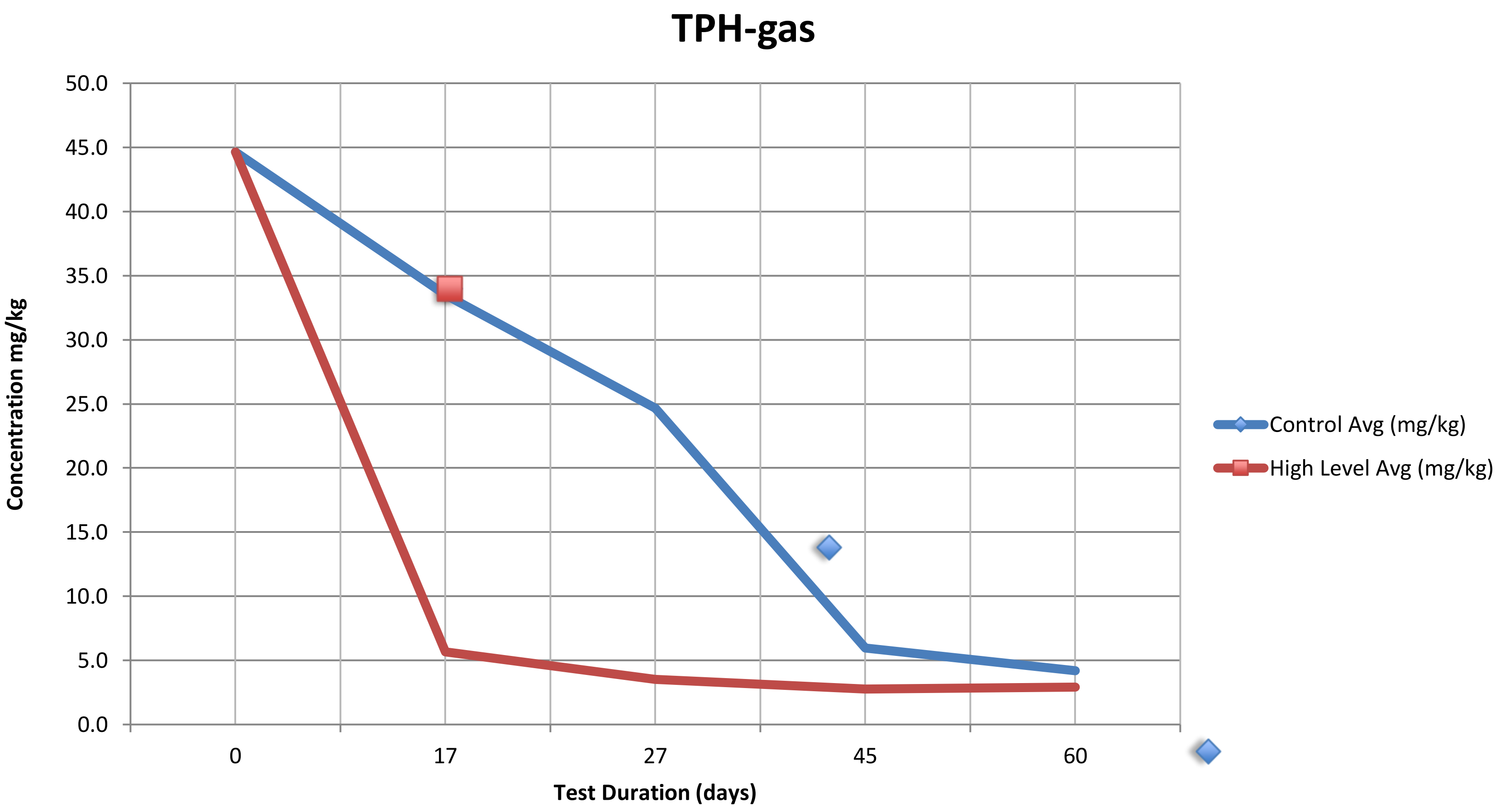
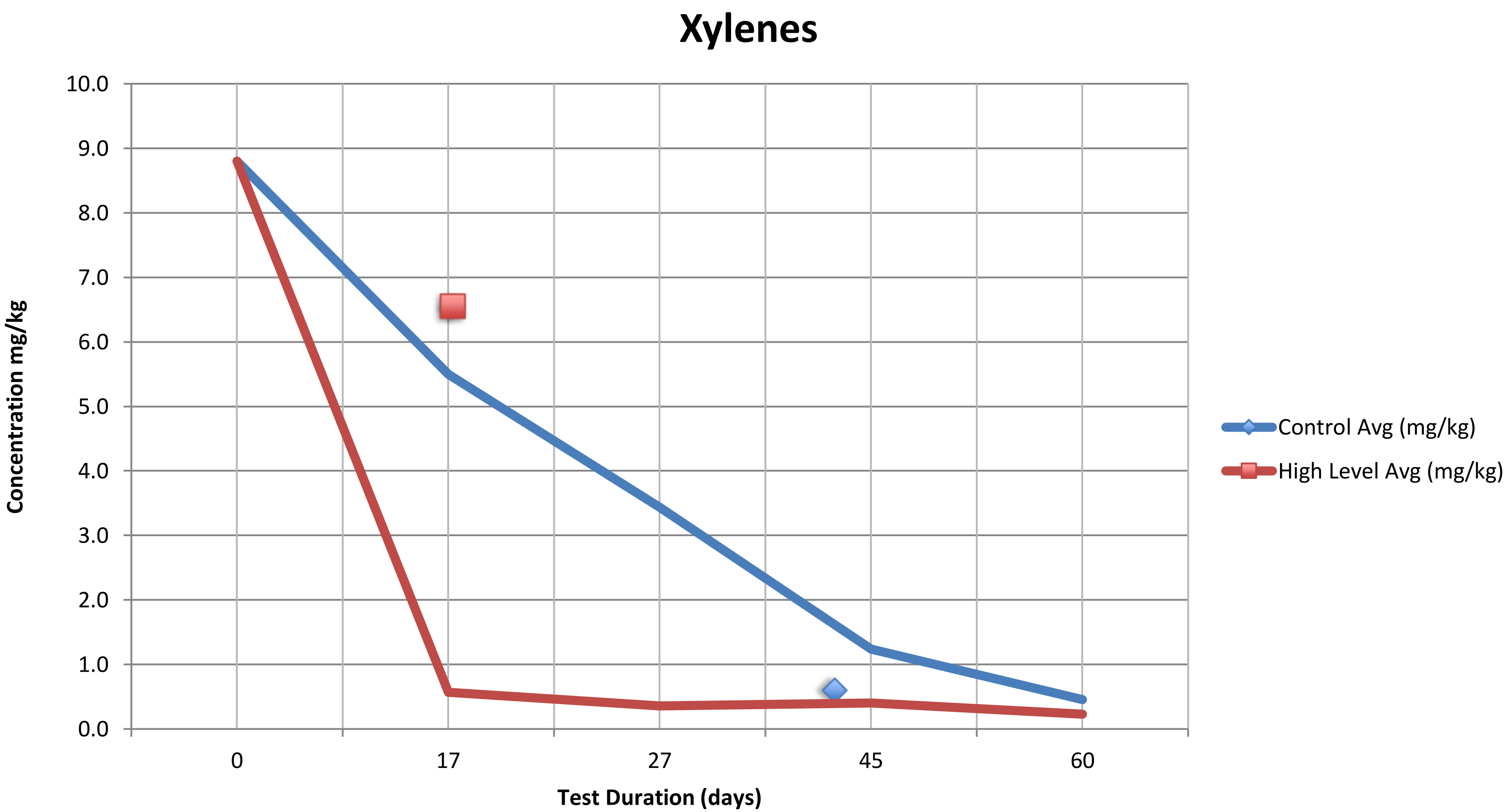
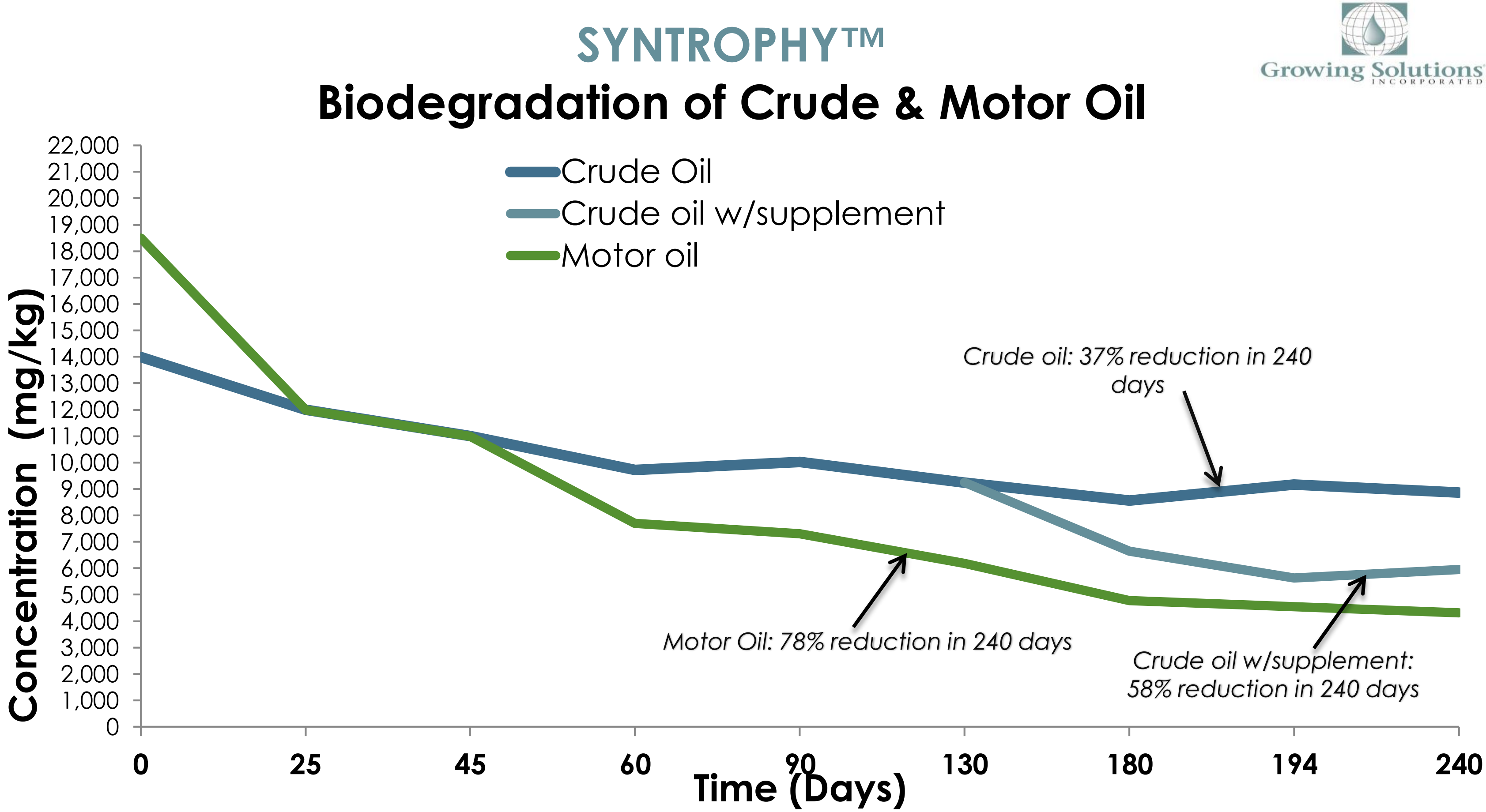
Laboratory Results



Laboratory Results



Field Trial Hydrocarbon Results



Growing Solutions INCORPORATED

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Laboratory and Field Trial Results Summary

- Light hydrocarbon distillate mixtures and components such as gasoline and BTEX are rapidly biodegraded.
- Crude and motor oil trials conducted on highly weathered and compacted soils.
- The reduction of motor oil and crude oil is 78% and 37% respectively after 240 days.
- Crude oil degradation was accelerated by addition of a supplement designed to support microbial growth and act as a co-solvent for hydrocarbons.

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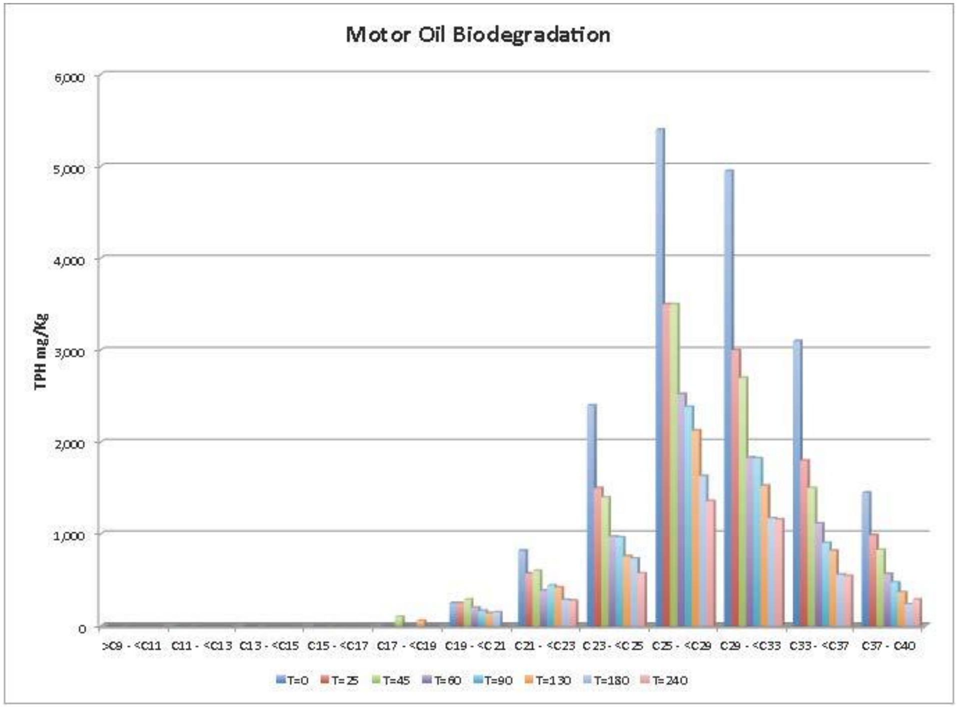
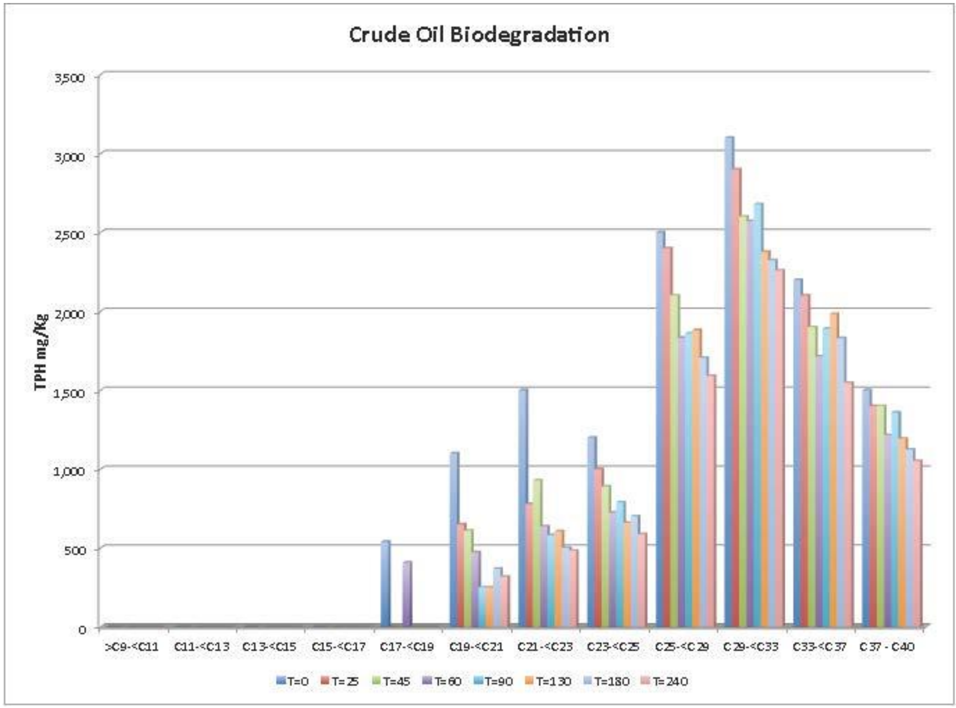
Cont'd: Laboratory and Field Trial Results Summary

- The supplement was added to the crude oil trial at day 112 which increased the amount of degradation to 58% relative to 37% realized without the supplement.
- Accelerated degradation due to supplement addition indicates:
  - Limited physical access of microbes and hydrocarbons.
  - Supported by a treatability test using production well water (discussed below).
- Comparison of field degradation rates:
  - FME
  - Other

Hydrocarbon Carbon Fraction Reductions (TPH-mo and TPH-co)





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Cont'd: Hydrocarbon Carbon Fraction Reductions (TPH-mo and TPH-co)

- Quantitation of the hydrocarbon mixtures was divided between 12 carbon chain length fractions ranging from C9 through C40.
- Percent reduction within the different fractions over 240 days ranged from 17% to 67%.
- As expected, the percent reduction decreases for longer chain length hydrocarbons.
- There is reduction across the whole range of hydrocarbon chain length fractions.

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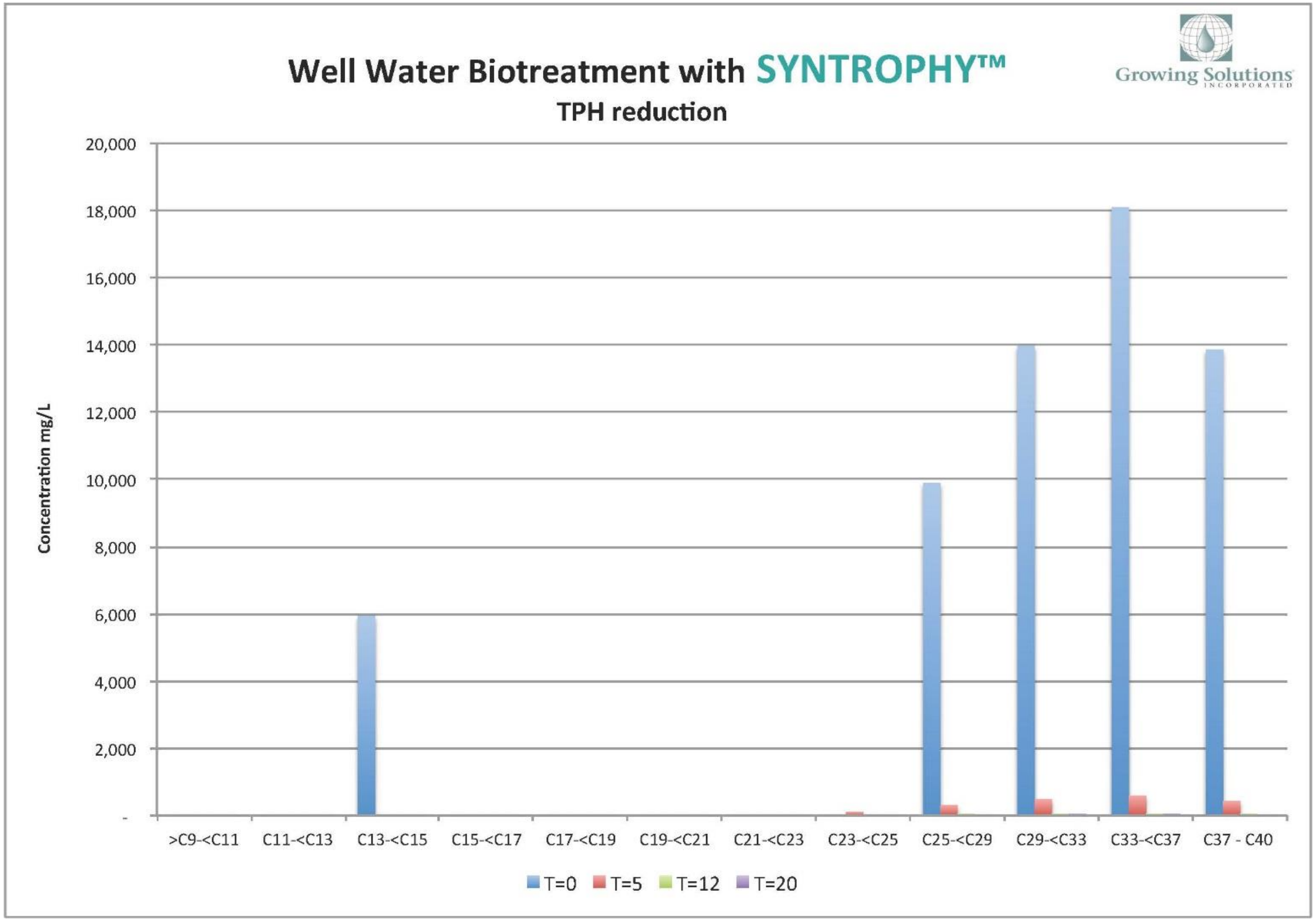
Use of FME to Treat Oil and Natural Gas well Production Water



Cont'd: Use of FME to Treat Oil and Natural Gas well Production Water

- FME bacteria can survive full strength production water containing high concentrations of salinity (18,500 mg/L) and dissolved/free-phase hydrocarbons.
- Overall reduction of hydrocarbons was 96.8% at 5 days.
- Hydrocarbon reduction by carbon fraction showed relatively uniform reduction of all carbon chain length fractions at 5 days.
- Overall reduction of hydrocarbons was 99.8% at 20 days.
- Overall hydrocarbon reduction by volatilization and biodegradation by naturally occurring microbes in the well water without addition of FME was 54% at 20 days.
- Competition between FME and naturally occurring bacteria does not seem to significantly reduce the efficiency of the FME bacteria.

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Sustainability through use of FME

- Aerobic processing of manure eliminates methane production.
- Recycling of nutrients and carbon rather than making continued synthetic fertilizer additions.
- Reduced fertilizer usage by more efficient plant uptake reducing fertilizer infiltration and volatilization rates.
- Addition of microorganisms to damaged or low organic soil enhances plant health supporting local ecosystem.
- Biodegradation of COCs reducing methane production and sequestering of carbon in soil matrix.
- Reduction of carbon footprint relative to dig-and-haul.
- Making contaminated soil usable relative to landfilling.

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Summary

- FME increases the microbial content of compost vastly increasing the area or volume of coverage.
- Controlled production of FME will have no adverse toxic effect on the environment.
- FME can biodegrade a broad range of chemical classes.
- FME can rapidly biodegrade a broad range of hydrocarbons in soil and water even under severe environmental conditions.
- We are looking for projects to quantify efficacy and sustainably metrics for use of FME.

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Contact

- Doug Oram
  ETIC Engineering
  925-768-2497
  doram@eticeng.com

- Michael Alms
  Growing Solutions
  808-937-9175
  michael@growingsolutions.com

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Attachment 15
At the Intersection of Sea Level Rise and Waste Management

Geosyntec consultants

At the Intersection of Sea Level Rise and Waste Management

Sustainable Remediation Forum

3 March 2015

Geosyntec.com
engineers | scientists | innovators

Presentation Overview

- The Science of Climate Change and Sea Level Rise
- Impacts from Sea Level Rise on near shore waste management units
- SLR Management Strategy
  - ✓ SLR Parameters
  - ✓ Vulnerability Assessment
  - ✓ Adaptive Management Strategy
- Future Challenges

Climate Change(Wikipedia):

…a change in the statistical distribution of weather patterns when that *change lasts for an extended period of time* (i.e., decades to millions of years).

Evidence of Climate Change:

…a change in average weather conditions (e.g., temperature, precipitation, wind), or in the time variation of weather around longer-term average conditions (i.e., more or fewer extreme weather events).

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Causes of Climate Change

Natural causes:

- Solar radiation
- Biologic activity
- Plate tectonics
- Gravity changes associated with orbital patterns

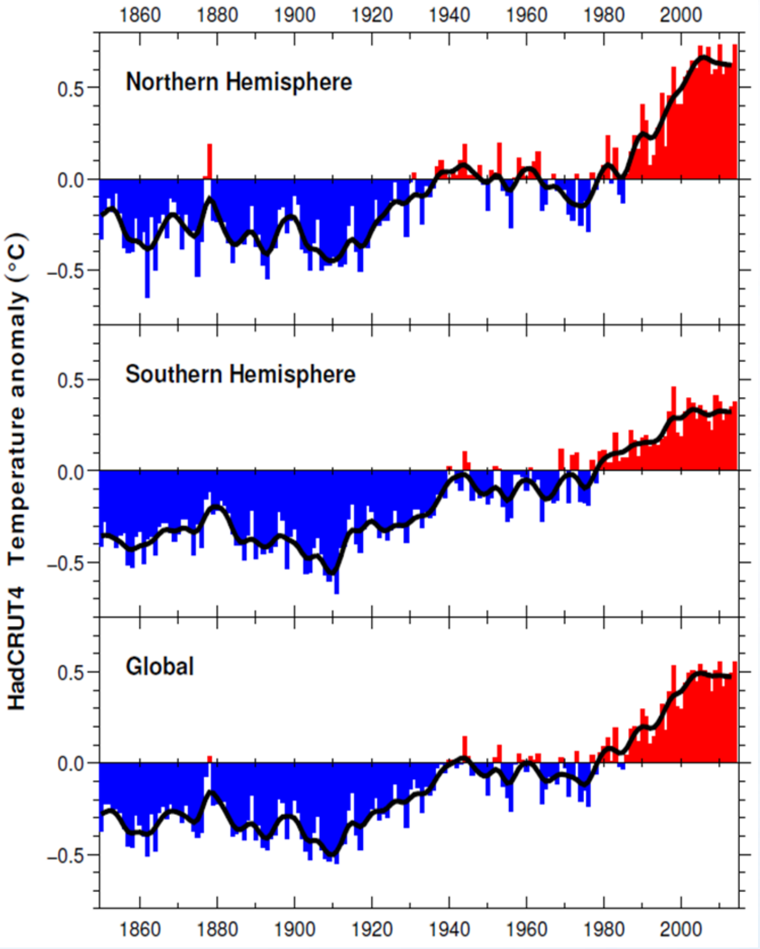
Anthropogenic causes:

- Deforestation
- Gas and particulate emissions from combustion processes
- Use of chemical aerosols

There is a strong, credible body of evidence, based on multiple lines of research, documenting that climate is changing (average temperatures are rising) and that these changes are ***to some extent*** caused by human activities.

Drivers for Climate Change

- Natural and man-induced changes in atmospheric greenhouse gases are causing average global temperatures to increase
  - ✓ Carbon Dioxide
  - ✓ Methane
  - ✓ Ozone
  - ✓ Nitrous oxide
  - ✓ Water vapor



www.cru.uea.ac.uk

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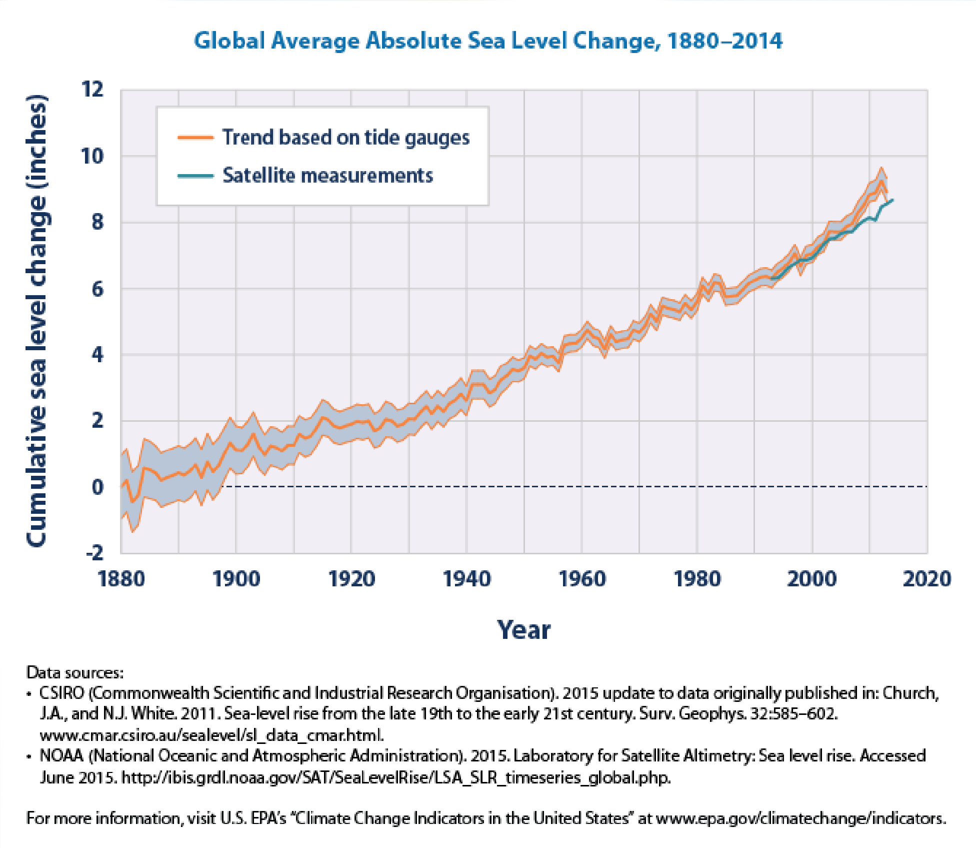
Climate Change and Sea Level Rise

- As average global temperature increases, sea level rises
  - Glaciers melt and drain into the oceans
  - Sea water heats and expands
  - Weather patterns change dropping more precipitation into the oceans



http://www.epa.gov/climatechange/science/indicators/oceans/sea-level.html, Public Domain, https://commons.wikimedia.org/w/index.php?curid=40890722

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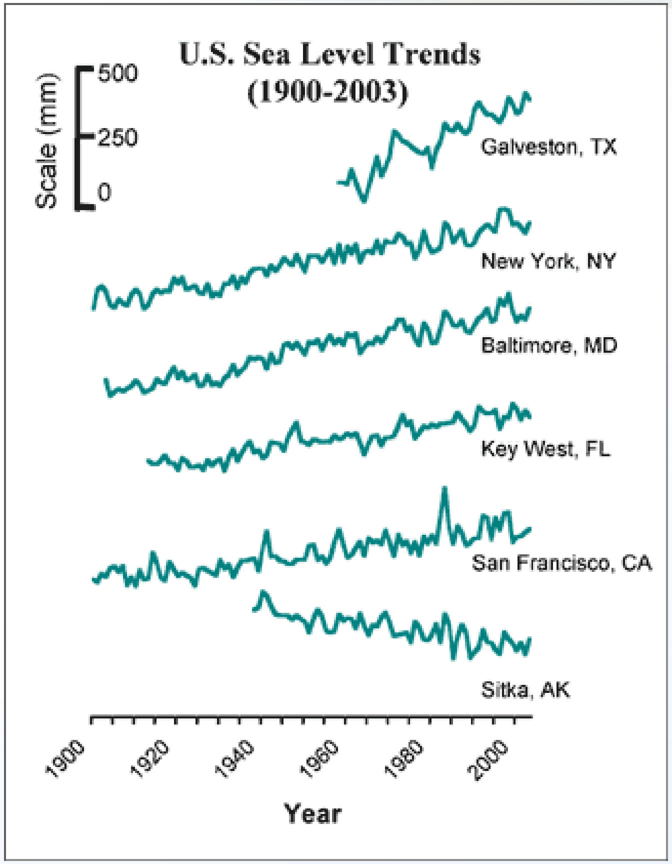
Sea Level Rise Behavior

- Sea level rise magnitude varies with geographic location
  - ✓ Exposed coastline
  - ✓ Bays and estuaries
  - ✓ Deltas (river-ocean confluence)



Public Domain, https://commons.wikimedia.org/w/index.php?curid=8016879

So What?

- *U.S. Environmental Protection Agency Climate Change Adaptation Plan (USEPA, June 2012 Draft)*.
  - ✓ Plan concludes that changing climatic conditions and rising sea level could **compromise the protectiveness** of hazardous waste site remedies
  - ✓ **Vulnerability analyses and adaptation plans** must be incorporated throughout the cleanup process, including feasibility studies, remedial designs and remedy performance reviews
  - ✓ Due to wide variability in climate conditions, the process is most effective through use of a **site-specific strategy**

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Waste Management Unit Closure at an Industrial Facility

CASE STUDY

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Background

- Three abandoned and inactive waste management units require closure
- Northern portion of Industrial facility
- Close proximity to San Francisco Bay
- Sacramento River confluence with San Francisco Bay
- Regional Water Quality Control Board is regulator
- No formal regulatory policy regarding sea level rise

Technical Resources

- NRC 2012
- CO-CAT 2013
- Bay Conservation and Development Commission
- Army Corps of Engineers
- National Oceanic and Atmospheric Administration

bcdc @50

The National Academies of SCIENCES · ENGINEERING · MEDICINE

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SLR Assessment Strategy

SLR Projection

- Define SLR Projection Curves using technical references
- Identify local tide gauging stations/data
- Adjust SLR projections to reflect local conditions

Vulnerability Assessment

- Identify Climate factors that may impact facility
- Identify nature, frequency, and magnitude of impacts
- Identify impacts

Adaptive Management

- Identify baseline mitigation
- Develop Operation, Maintenance, and Monitoring Plan
- Refine SLR Projections

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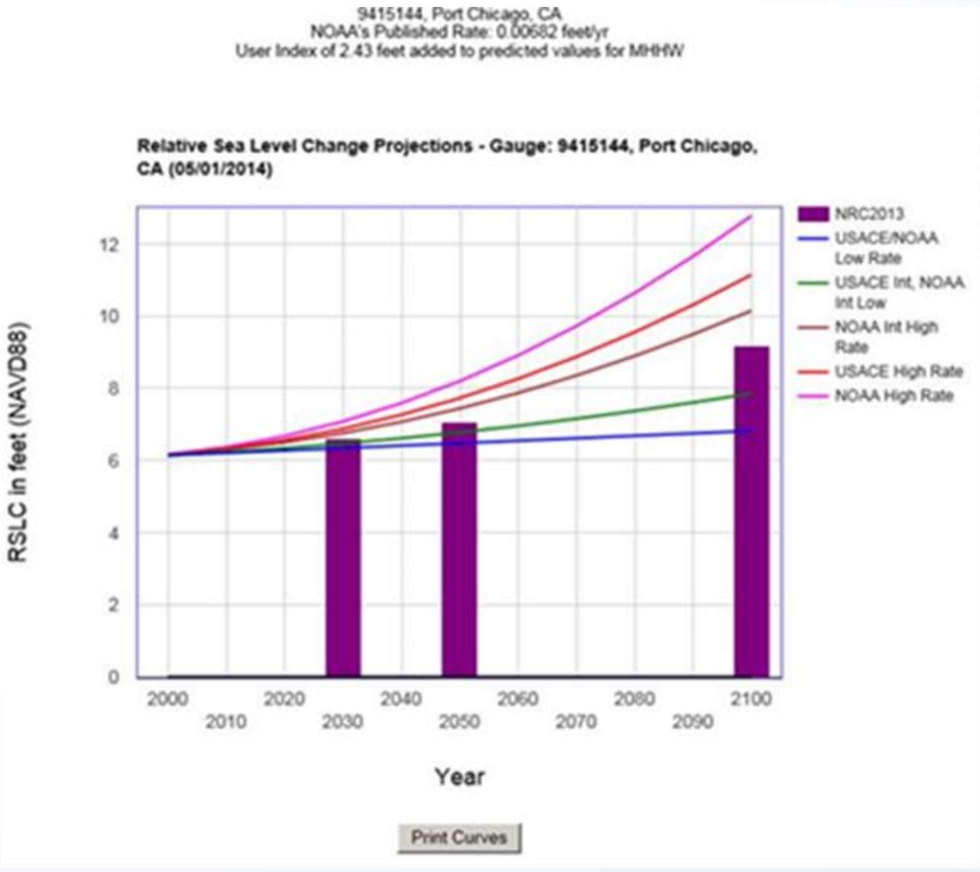
SLR Projections – Published Values

- Identify local and site-specific parameters that define basis for SLR at shoreline adjacent to the Facility
- Reputable SLR estimates by ACOE, NOAA, NRC in ACOE Calculator
- Estimates of SLR are location-specific and vary widely



http://www.corpsclimate.us/ccaceslcurves.cfm

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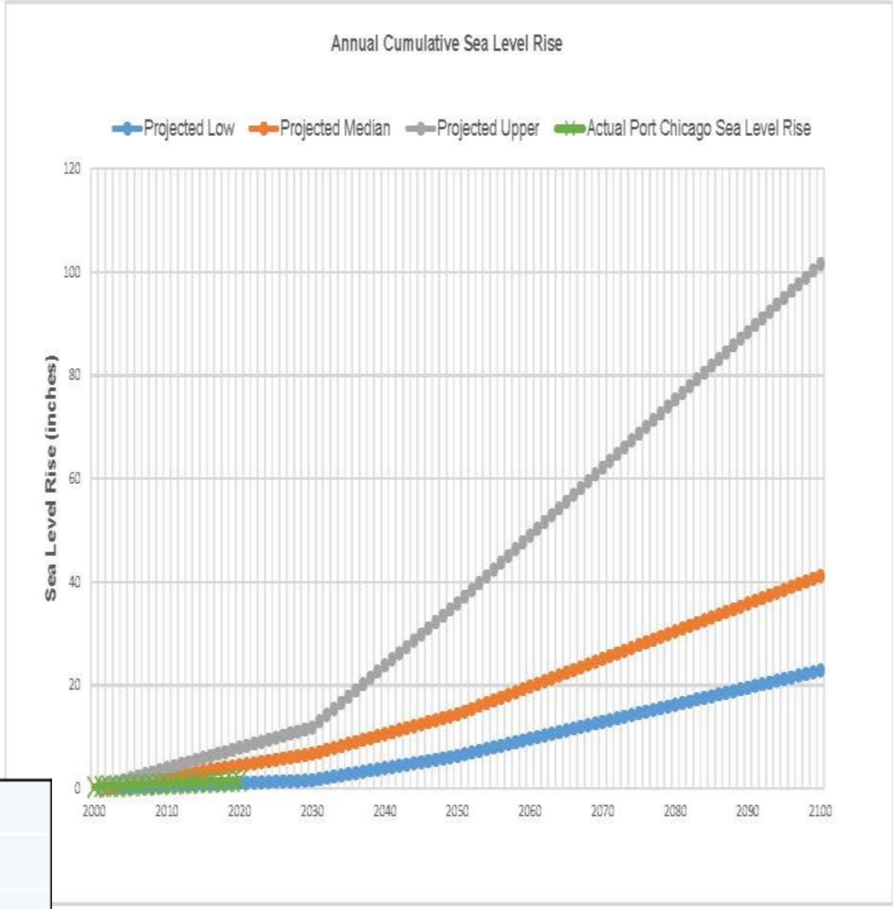
SLR Projections – Local Values

- Baseline benchmark - year 2000
- 15 years of actual data
- Mean sea level has risen 1.2 inches at local station
- Local data correlates well with the lower range of the NRC projections



Time Period	NRC 2012 (English)	
	Projection	Range
2000 – 2030	5.7 ± 2 in	1.7 – 11.7 in
2000 – 2050	11 ± 3.6 in	4.8 – 23.9 in
2000 – 2100	36.2 ± 10 in	16.7 – 65.5 in

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SLR Projections – Design Basis

- SLR parameters for closure design based on the lower range of the NRC projections (later contested by agency)
- Closure designs based on 2050 predicted parameters
- Adaptive strategies for 2050-2100 predictions

YEAR	SLR PARAMETER(1)		
	(MSL Elevation in inches)	(MSL Elevation in feet)	(NGVD29 Elevation in feet)
2000 (baseline)	42.48	3.54	4.82
2015 (Actual)	43.68	3.64(2)	4.92
2030 (Projected)	46.18	3.85	5.13
2050 (Projected)	49.88	4.14(3)	5.42
2100 (Projected)	68.68	5.72	7.00

(1): Elevation is relative to the year 2000 MSL benchmark where the year 2000 MSL elevation is zero feet (0 feet)
(2): MSL measured at the Port Chicago tide gauge station.
(3): Recommended SLR design elevation for WMU closure alternatives.

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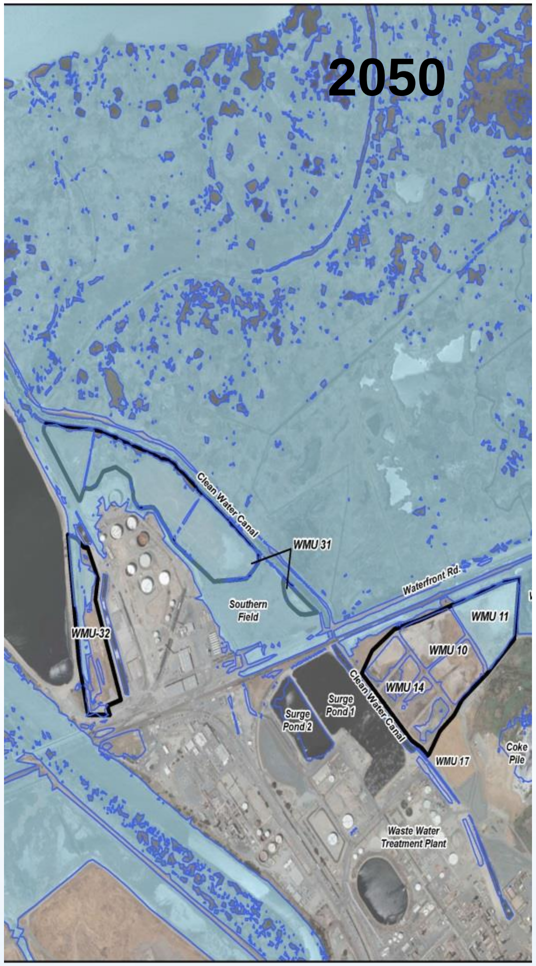
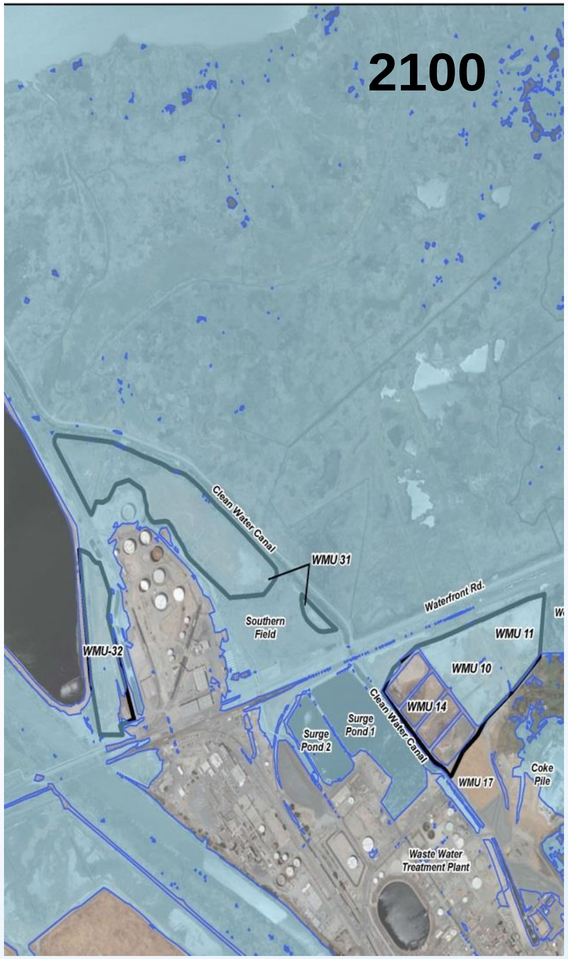
Vulnerability Assessment

- Analysis of vulnerability of the closed WMUs to direct and consequential effects of SLR
- Factors considered as part of closure alternative evaluation:
  - ✓ Inundation (permanent effect from rising sea level)
  - ✓ Flooding (temporary effect from rainfall, high tide, El Niño events)
  - ✓ Groundwater (rising groundwater with sea level rise)
- Other factors
  - ✓ Wave impacts
  - ✓ Tsunamis

Vulnerability Assessment





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Vulnerability Assessment

- Identify magnitude and frequency of possible events

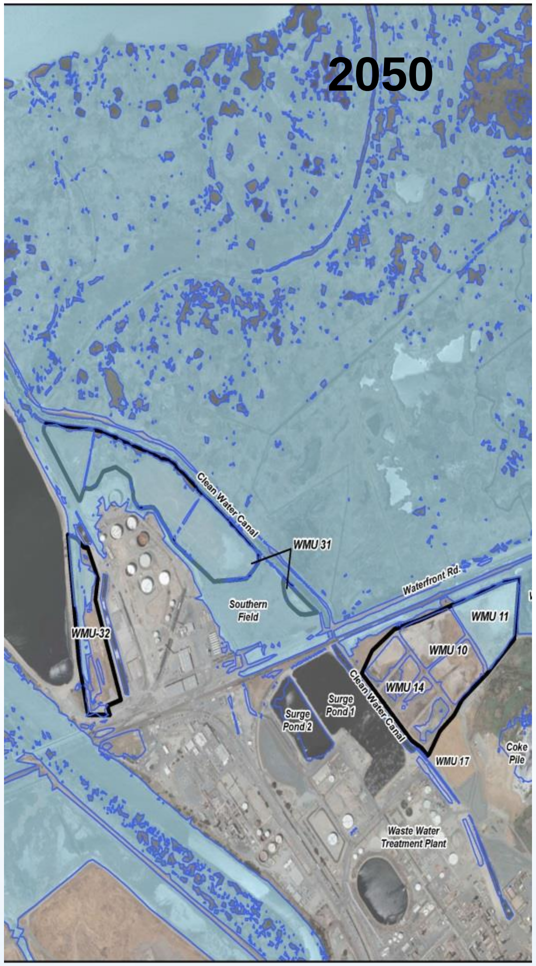
Year	MHHW Elevation (inches)	NAVD88 100 yr Flood Elevation (feet)	King Tide Increase (feet)	El Niño Average Increase (feet)	100 yr Flood (feet above MHHW)	Worst Case Scenario (NAVD88 Elev)
2000	0	10				
2015	3.36	10	1.04	0.75		
2030	5.7	10.48	1.04	0.75		
2050	11	10.92	1.04	0.75	3.85	12.7
2100	36.2	13.02	1.04	0.75	3.85	14.8
Freq			5x/yr	1x/7yr	1x/100yr	

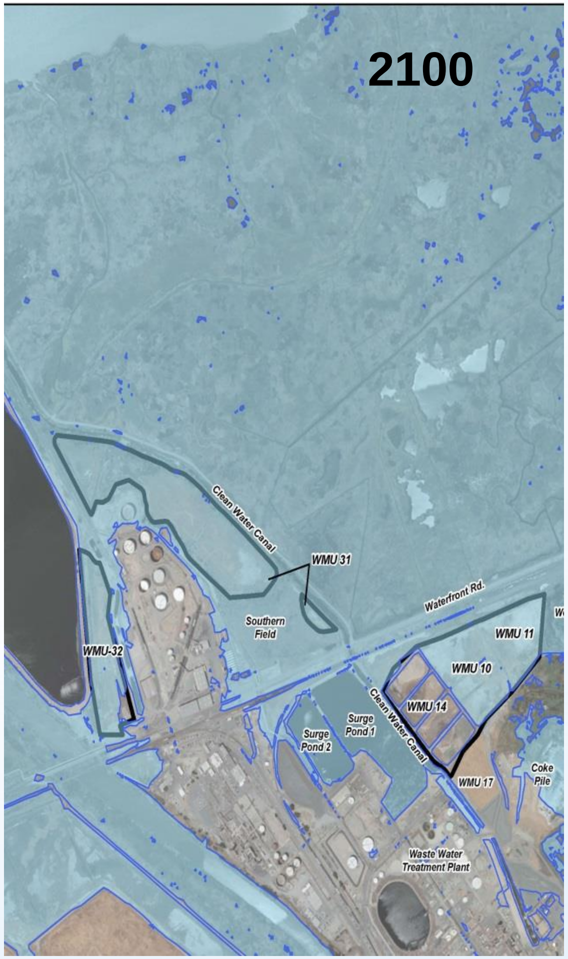
- Groundwater Impacts?

Vulnerability Assessment

- Consider the potential of impacts from worst case condition on waste within the unit
  - ✓ Can closure components become damaged?
  - ✓ Can waste become mobilized?
  - ✓ Will protectiveness be compromised?
  - ✓ Can closure components be designed to be adaptable?
  - ✓ How will groundwater-sea level interactions affect closure components?

Vulnerability Assessment





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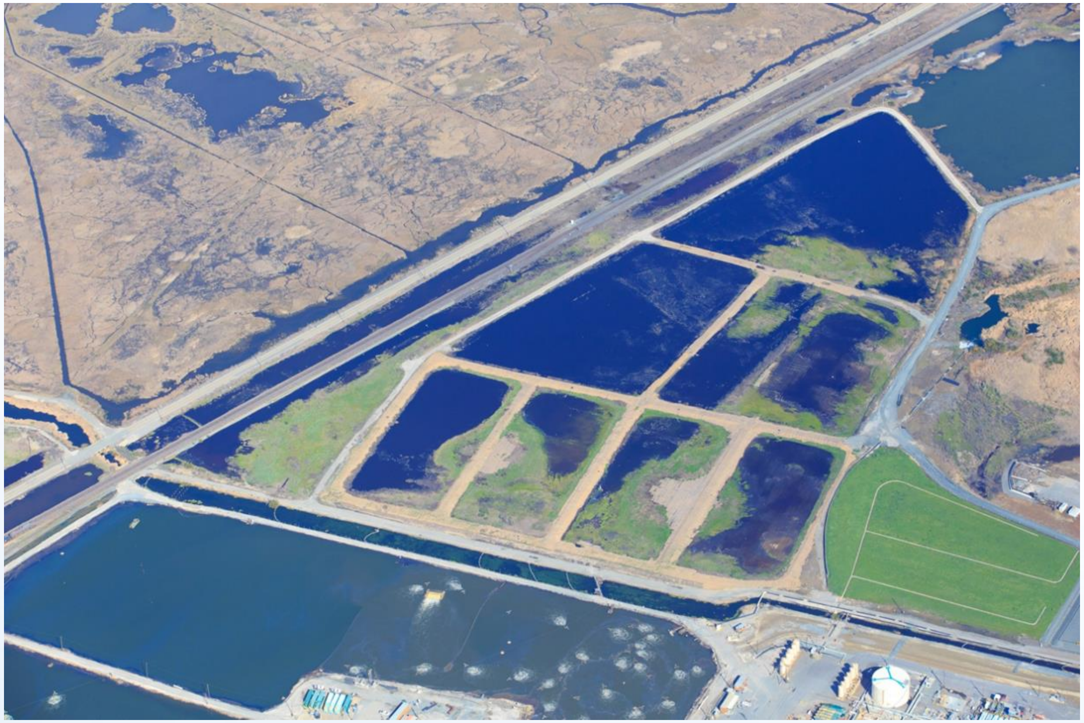
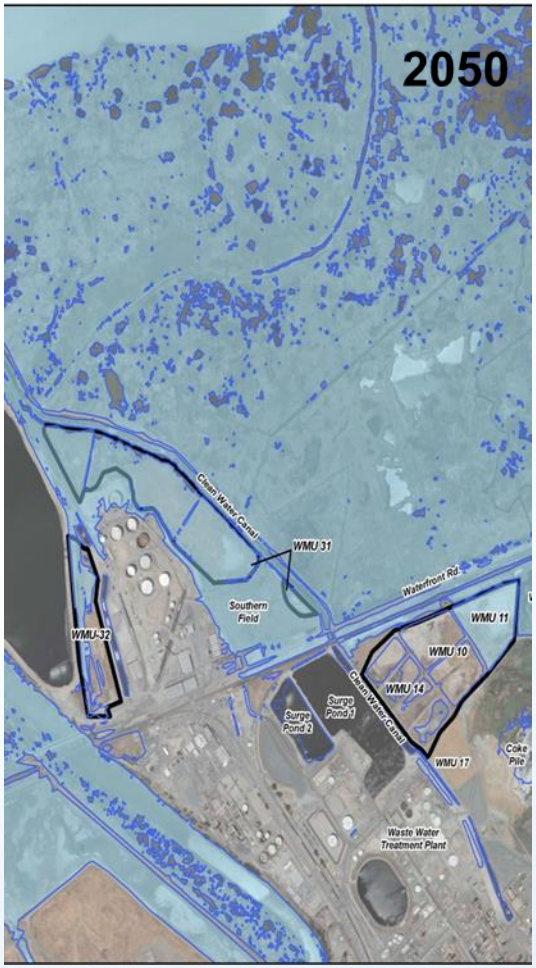
Fact vs. Fiction

2030





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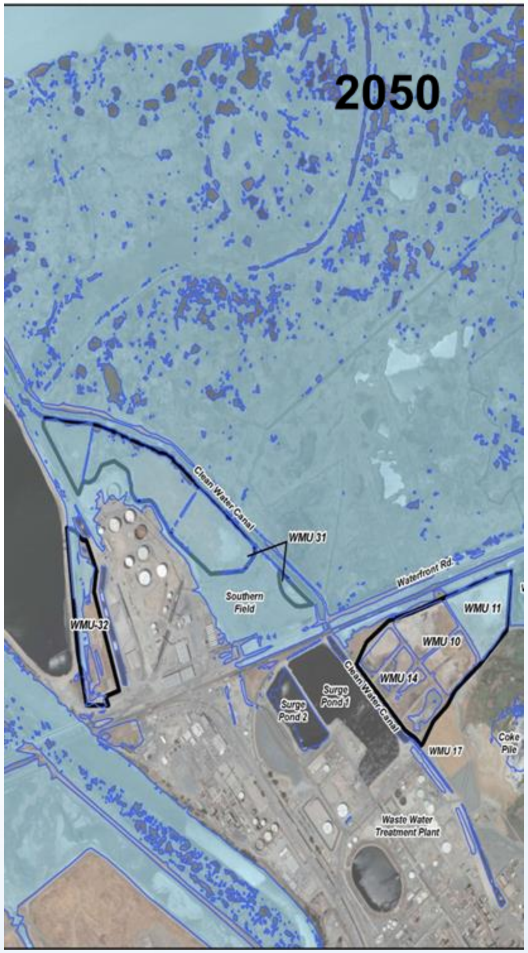
Fact vs. Fiction

2030



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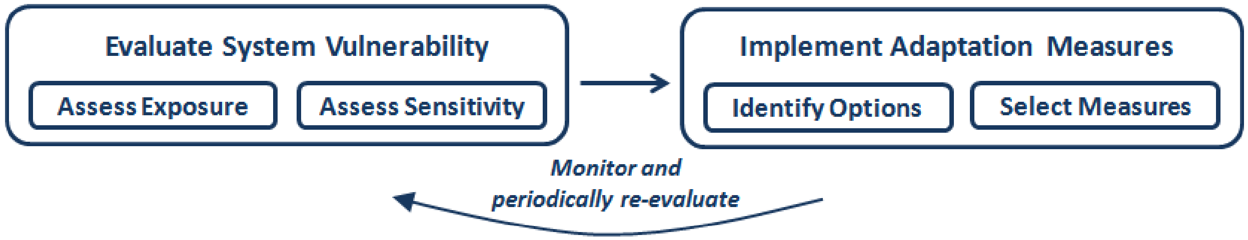
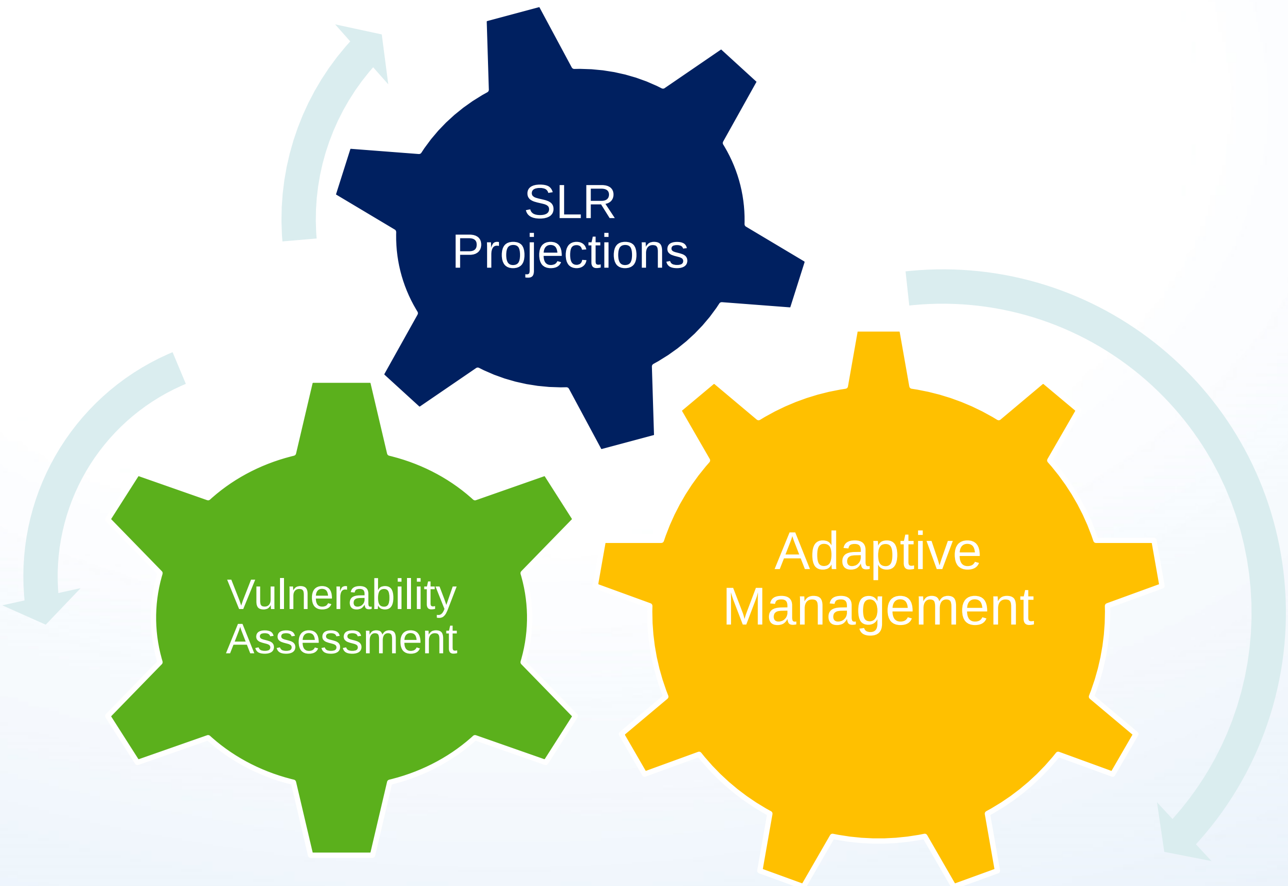
Adaptive Management Strategy

- Estimates of SLR highly variable and large uncertainty exists in long-term predictions
- Closure alternatives designed to accommodate predicted SLR for the year 2050
- After 2050, adaptively manage and mitigate any effects of SLR on the closed units
- Monitoring of SLR conducted every 5 years and mitigation measures implemented as necessary

Figure 1. Climate Change Adaptation Management



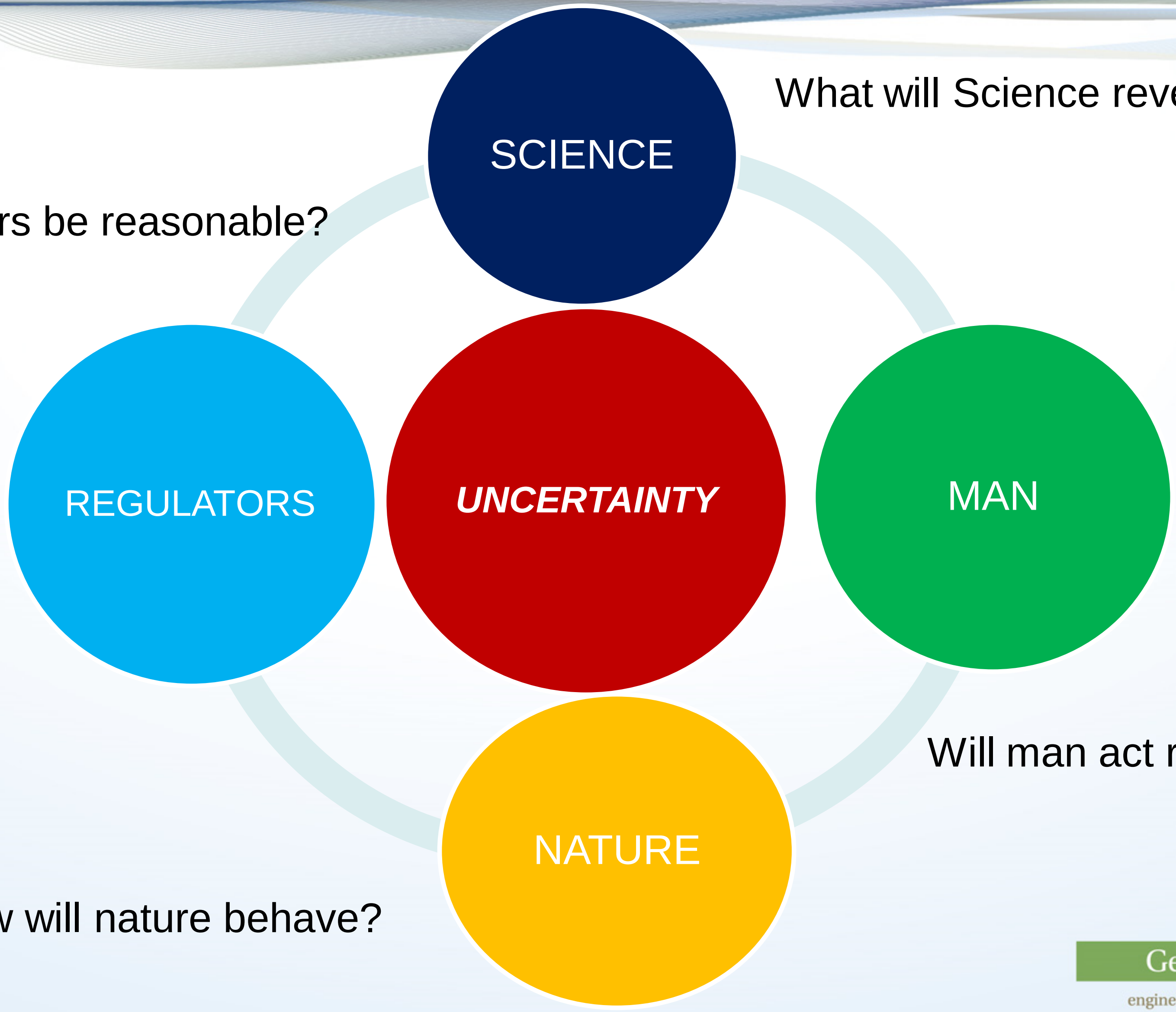
Adaptive Management Strategy



Future Challenges

What will Science reveal?

Will regulators be reasonable?



Will man act responsibly?

How will nature behave?

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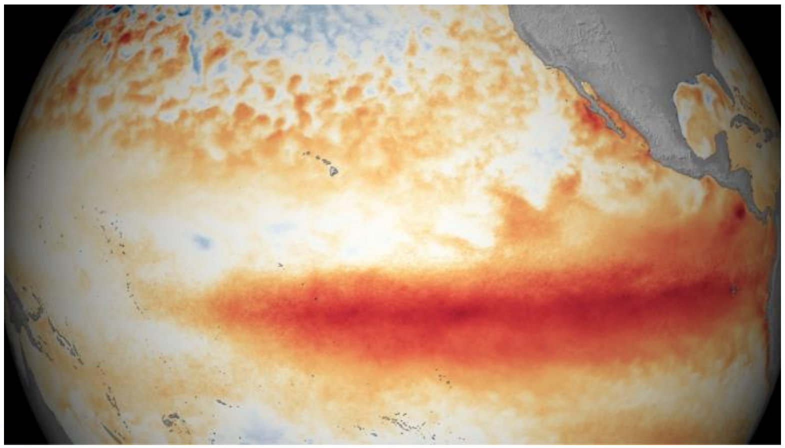
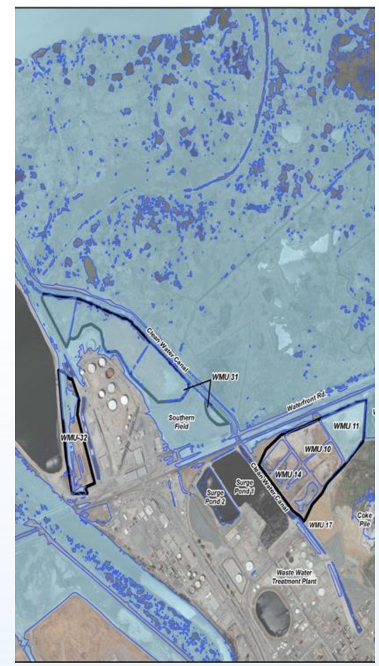
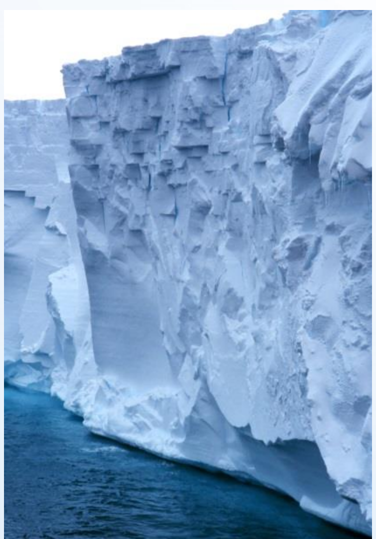
Lessons Learned

- SLR projections have a wide range of values
- SLR projections need to be validated by local conditions
- Vulnerability assessments should consider higher probability events and reasonable occurrences
- Mitigation should be based on 2050 conditions with a monitoring plan to identify actual conditions

QUESTIONS




Clean Water Canal
WMU 31
Waterfront Rd.
Southern Field
WMU-32
WMU 11
WMU 10
WMU 14
Surge Pond 1
Surge Pond 2
Clean Water Canal
WMU 17
Coke Pile
Waste Water Treatment Plant



About the Author

Mr. Brandt is a Principal with Geosyntec Consultants, based out of the San Francisco, California office. He is a California Professional Geologist with over 30 years' experience in hydrogeology with special emphasis on environmental and hazardous waste issues related to Brownfield Redevelopment projects. He has provided regulatory compliance and development-related environmental solutions for oil refineries, military installations (active and closed), chemical manufacturing plants, hard rock and aggregate mines, landfills, hazardous waste land treatment units, surface impoundments, waste piles, underground storage tanks, and non-point source areas of contamination. He is adept at developing creative and cost effective remediation and site closure strategies to meet objectives of project stakeholders, including responsible parties, regulatory agencies, developers, planners, and the public. He has particular experience with devising strategies to integrate site remediation with land development activities, supporting an end-state vision which emphasizes reduced overall life-cycle environmental cost and liability exposure.

Attachment 16

Panel Discussion: Building Resilience into Remediation and Redevelopment Planning

Future Methods in Urban Planning Applicable in Remediation and Redevelopment Contexts

Hilda Blanco

USC Price
School of Public Policy

Future Methods in Urban Planning Applicable in Remediation and Redevelopment Contexts

Prof. Hilda Blanco
Center for Sustainable Cities
Price School of Public Policy
University of Southern California
hblanco@usc.edu

SURF 31, Pasadena
March 3rd, 2016

Outline

- Growing importance of urban sustainability, resilience in the face of climate change
- New challenges call for new methods
- Focus on 4 methods and examples of their potential uses in remediation and redevelopment
  - Natural capital valuation
  - Life cycle analysis
  - Climate change adaptation planning
  - California's EnviroScreen Tool
- Conclusion

Sustainability and Urban Planning

- Urbanization:
  - As of 2008, majority of people in world lived in urban areas
    - More than 82% of people in North America live in urban areas (95% in California)
- Urbanization
  - Major contemporary phenomenon increasing sustainability challenges
  - Urban Planning vital for managing :
    - Land use, densities, character of built environment, parks and open space, public infrastructure and facilities
- Sustainability (3E) challenges
  - From standpoint of climate change (Environment)
    - Focus on urban areas essential
      - To mitigate GHGs
      - Given the concentration of population, where adaptation efforts must focus
  - From standpoint of Economics
      - Pricing resources, especially natural resources
      - Accounting for the different costs of policies
  - From the standpoint of Equity
      - Taking into account environmental justice issues

Valuing Natural Capital

- Realization on part of environmental economists (Costanza, Daly) a major reason Nature not properly valued because we have failed to quantify Nature's services—ecosystem services
- First, identify these services
- Second, identify ways to evaluate the costs of such services
- E.g., take groundwater
  - How much would it cost if the groundwater resource is depleted or requires remediation

Until Recently, Pricing Natural Capital Elusive

- This is changing:
  - new valuation approach that enables comparisons with traditional forms of capital out of the Natural Capital Project at Stanford and U. of Minnesota
- Recent article by Fenichel et al. (PNAS 2016) illustrates the approach
  - Applied to losses of the High Plains Aquifer in Kansas from 1996-2005 to crop farming with an estimate of $1.1 billion loss
  - Methodology likely to be increasingly used

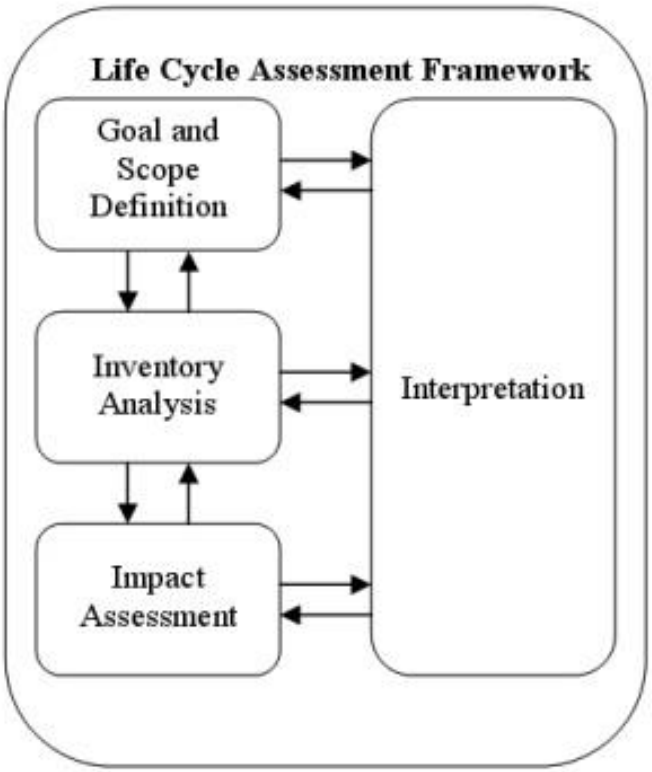
Fenichel, Eli P., Joshua K. Abbott, Jude Bayham, Whitney Boone, Erin MK Haacker, and Lisa Pfeiffer. “Measuring the Value of Groundwater and Other Forms of Natural Capital.” *Proceedings of the National Academy of Sciences*, 2016, 201513779.

In future

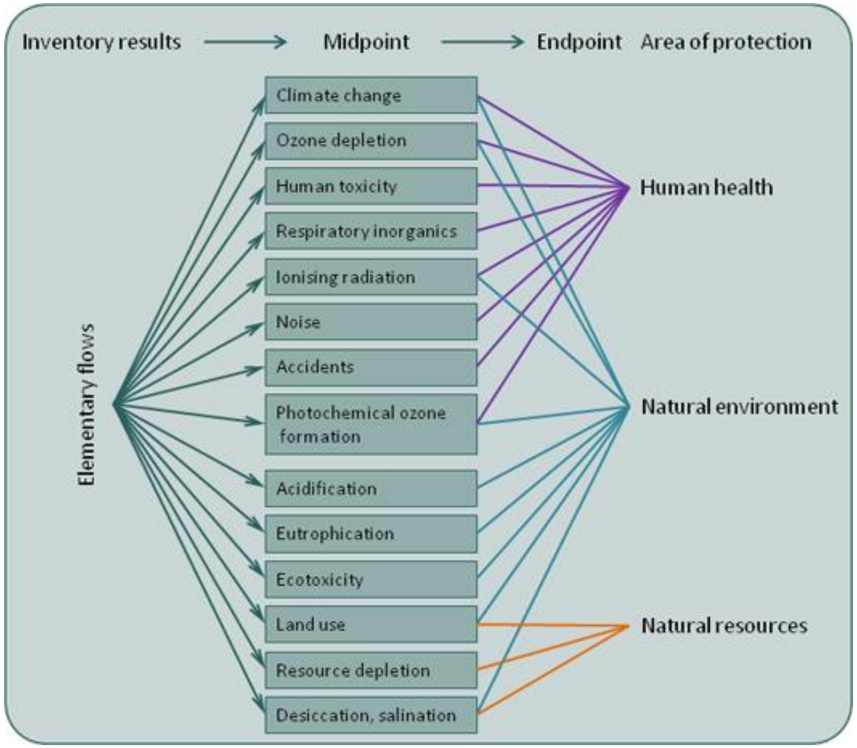
- Planners/analysts would set a value for the ecosystem services that a community relies on
- Development or redevelopment assessed on the basis of whether the development provides benefits to community and compensates for the loss or deterioration of an ecosystem service
- This type of valuation likely to become increasingly important in determining the basis for brownfields and Superfund monetary settlements

Life Cycle Analysis

LCA internationally standardized (ISO14040ff)



Assessment phase focuses on various indicators of environmental harms



Source of figures: European Commission, Joint Research Center, European Platform for Life Cycle Assessment, http://eplca.jrc.ec.europa.eu/?page_id=43

In future

- Already, EPA has a Greener Cleanup Standard Initiative for contaminated site cleanups.
  - Collaborated with ASTM International to develop a standard (E2893-13)
    - Uses BMPs to reduce environmental footprint of cleanup activities
  - Not required, voluntary
  - Not LCA

Climate Change Adaptation Planning

- Major climate change impacts that vary by region
  - Increased temperatures
  - Sea level rise
  - Changes in precipitation:
    - in Southwest, loss of snowcap, drier conditions
  - Increase in extreme events, e.g., hurricanes, flooding, heatwaves, wildfires

- Potential changes to hazardous substance releases and spills:
  - ↑ threatened infrastructure:
    - Pipelines;
    - oil and chemical storage facilities;
    - wastewater treatment plants,
    - hazardous waste sites,
    - contaminated sites

Source: Rohr, Jason R., Philip Johnson, Christopher W. Hickey, Roger C. Helm, Alyce Fritz, and Sandra Brasfield. "Implications of Global Climate Change for Natural Resource Damage Assessment, Restoration, and Rehabilitation." *Environmental Toxicology and Chemistry* 32, no. 1 (2013): 93–101.

In future

- Climate change planning, especially downscaled regional projections providing more specific temperature, SLR and other impacts
  - Incorporated into the natural resource damage assessment process to take into account increasing likelihood of spills, releases of hazardous substances from storage facilities and mobilization of pollutants from contaminated sites
  - Increasing injury assessment
    - Scale of injury
    - Changing the scope of restoration processes

California’s EnviroScreen

- California’s EnviroScreen Tool (2014, OEHHA)
  - A tool that combines by census tract,
    - Environmental hazards and vulnerable populations
  - Aimed to identify disadvantaged communities in the State (SB 535) for benefits under CA’s Greenhouse Gas Reduction Fund

CalEnviroScreen

Pollution Burden

- Ozone concentrations
- PM2.5 concentrations
- Diesel PM emissions
- Pesticide use
- Drinking water contaminants
- Toxic releases from facilities
- Traffic density
- Cleanup sites (½)
- Groundwater threats (½)
- Hazardous waste (½)
- Impaired water bodies (½)
- Solid waste sites and facilities (½)

×

Population Characteristics

- Children and elderly
- Low birth-weight births
- Asthma emergency department visits
- Educational attainment
- Linguistic isolation
- Poverty
- Unemployment

=

CalEnviroScreen Score

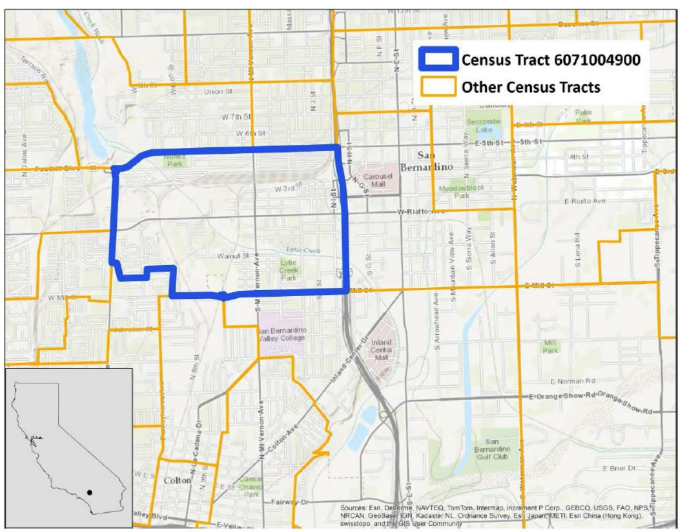
Source : California EPA and Office of Environmental Health Hazard Assessment, Oct. 2014, p. 12; http://oehha.ca.gov/ej/ces2.html

CalEnviroScreen

EXAMPLE CENSUS TRACT: INDICATOR RESULTS AND CALENVIROSCREEN SCORE

One example census tract in San Bernardino was selected to illustrate how an overall CalEnviroScreen score is calculated using the California Communities Environmental Health Screening Tool. Shown below are:

- An area map for the census tract and surrounding tracts.
- Tables for the indicators of Pollution Burden and Population Characteristics with percentile scores for each of the indicators.
- A table showing how a CalEnviroScreen score was calculated for the example area, using CalEnviroScreen 2.0.



Exposure Indicators							
Indicator	**Ozone** (conc.)	**PM2.5** (conc.)	**DieselPM** (emissions)	**Pesticide Use** (lbs/sq. mi.)	**Toxic Releases** (RSEI toxicity-weighted releases)	**Traffic** (density)	**Drinking Water** (index)
Raw Value	0.79	12.31	23.35	0	851.4	1484.8	533.17
Percentile	98.47	74.24	71.47	0	63.31	73.41	83.86

Environmental Effects Indicators					
Indicator	**Cleanup Sites** (weighted sites)	**Groundwater Threats** (weighted sites)	**Hazardous Waste Facilities/ Generators** (weighted sites)	**Impaired Water Bodies** (number of pollutants)	**Solid Waste Sites/Facilities** (weighted sites and facilities)
Raw Value	21.3	5.75	0.73	1	0
Percentile	84.44	24.74	82.19	15.12	0

Sensitive Population Indicators			
Indicator	**Children (<10) and Elderly (>65)** (percent)	**Asthma** (rate per 10,000)	**Low Birth Weight** (percent)
Raw Value	25.9	104.45	0.05
Percentile	62.88	97.13	36.24

Socioeconomic Factor Indicators				
Indicator	**Educational Attainment** (percent)	**Linguistic Isolation** (percent)	**Poverty** (percent)	**Unemployment** (percent)
Raw Value	54	26.1	70.5	19.84
Percentile	95.05	89.35	94.39	92.90

Source: California EPA and Office of Environmental Health Hazard Assessment, Oct. 2014, p. 14,15

CalEnviroScreen Uses Today

Calculation of CalEnviroScreen Score for tract 6071004900

	Pollution Burden		Population Characteristics	
	Exposures (7 indicators)	Environmental Effects[a] (5 indicators)	Sensitive Populations (3 indicators)	Socioeconomic Factors (4 indicators)
Indicator Percentiles	98.47	+ (0.5 × 84.44)	62.88	95.05
	+ 74.24	+ (0.5 × 24.74)	+ 97.13	+ 89.35
	+ 71.47	+ (0.5 × 82.19)	+ 36.24	+ 94.39
	+ 0.0	+ (0.5 × 15.12)		+ 92.90
	+ 63.31	+ (0.5 × 0.0)		
	+ 73.41			
	+ 83.86			
Average Percentile	568 ÷ (7+(0.5 × 5)) = 59.79		567.94 ÷ 7 = 81.13	
Scaled Component Scores (Range 0 – 10)	(59.79 ÷ 82. 49[b]) × 10 = 7.25		(81.13 ÷ 96. 22[c]) × 10= 8.43	
CalEnviroScreen Score	7.25 × 8.43 = 61.12 (61.12 is in the top 5% of CalEnviroScreen census tracts statewide)			

[a] Indicators from the Environmental Effects component were given half the weight of the indicators from the Exposures component.
[b] The tract with the highest average percentile for Pollution Burden in the state had a value of 82.49.
[c] The tract with the highest average percentile for Population Characteristics in the state had a value of 96.22.

- A portion of California's cap and trade proceeds funding dedicated to low-income communities
  - S.B. 535 (2012): California Global Warming Solutions Act of 2006: Greenhouse Gas Reduction Fund
    - 25% of GGRF to be allocated to programs that benefit disadvantaged communities and 10% to programs located in such communities directly
- CalEnviroScreen identifies disadvantaged communities

In future

- CalEnviroScreen can become the basis for
  - Prioritizing clean-ups of contaminated sites or hazards in a region
  - Determining injury assessment

Concluding Remarks

- Brief introduction to 4 methods that contribute to urban sustainability
  - Only life-cycle assessment well known in the remediation and redevelopment community
  - Incorporating the impacts of climate change into development and remediation processes increasingly important
  - CalEnviroScreen, a source of funds for redevelopment, applicable to remediation processes
  - Natural capital valuation—acceptance of new valuation method still to come, but in future, nature’s capital will likely play growing role in development decisions

Attachment 17
Panel Discussion: Building Resilience into Remediation and Redevelopment Planning

Building Resilience into Superfund Cleanup Planning
Anne Dailey

Panel Discussion:
Building Resilience into Superfund Cleanup Planning

Anne D. Dailey

U.S. Environmental Protection Agency

Office of Superfund Remediation and Technology Innovation

Sustainable Remediation Forum

March 3, 2016

Topics

- Background
- Superfund Approach
- Resources to Improve Resilience
- Case Studies
- Key Points/Resources

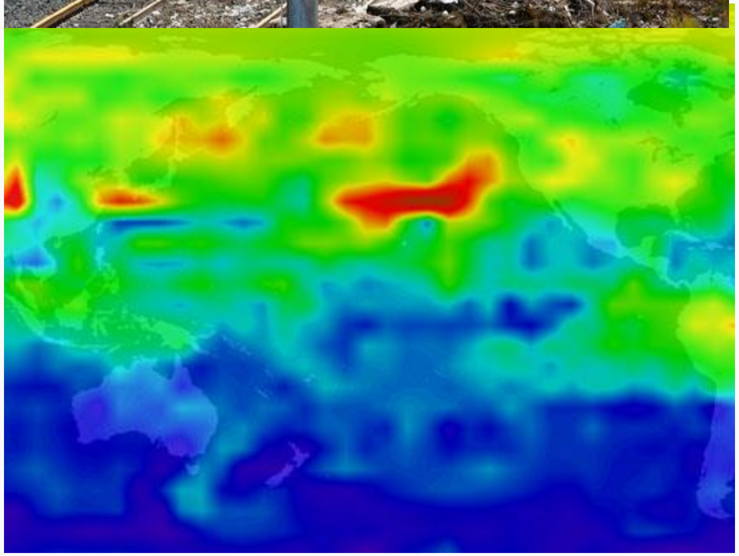


Image credit: U.S. Global Change Research Program (www.globalchange.gov)

Basic Question

“How may climate change affect the ability to achieve the mission and strategic goals?”

Basic Question for Project Manager

“How may climate change affect protectiveness of the remedy, and what should be done to improve resilience?”

Background

- The *USEPA Policy Statement on Climate-Change Adaptation* (2011) directed each national program office and region to develop a climate change adaptation implementation plan by June 2013

- Executive Order 13653 (2013) directed each federal agency to evaluate climate change risks and vulnerabilities to manage the effects of climate change on the agency's mission and operations in both the short and long-term

- June 2014 EPA released:
  - EPA Climate Change Adaption Implementation Plan
  - Specific adaptation implementation plan for each region/office
  - See: http://www3.epa.gov/climatechange/adaptation/programs.html

EPA Region 9
Potential Climate Change Impacts

- Air temperatures may increase;
- Precipitation may decrease in some areas;
- Storm events may be more severe;
- Oceans will become more acidic and warm; and
- Sea level will rise.

Source: EPA Region 9 Climate Change Adaptation Implementation Plan (2014)

Key Definitions*

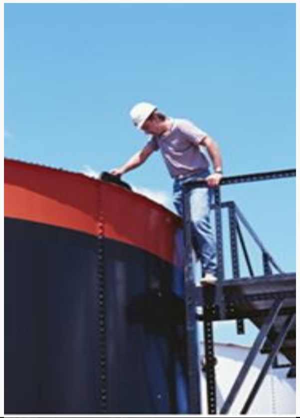
- **Adaptation:** Adjusting to minimize negative effects and take advantage of new opportunities.

- **Mitigation:** A human intervention to reduce the human impact on the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks.

- **Resilience:** A capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.

*http://www.epa.gov/climatechange/glossary.html

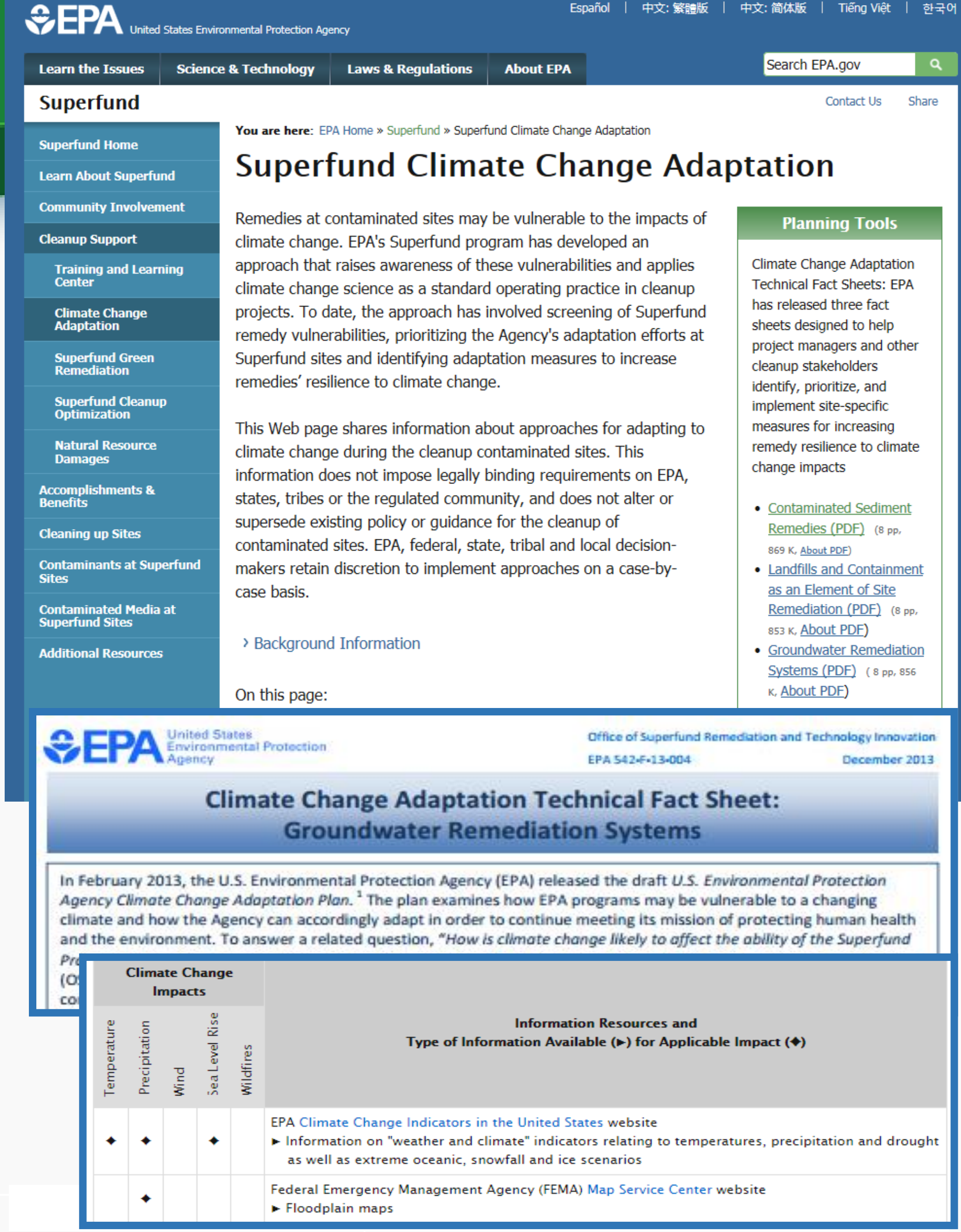
Major Phases in Superfund Remedial Process



- Remedial Investigation/Feasibility Study
  - Nature and extent of contamination
  - Human and ecological risks
  - Develop and screen remedial alternatives
- Remedy selection
- Remedy design
- Remedial action
- Post Construction

Information Resources

- Potential impacts of climate change on the Superfund Program
- Adaptation in the Superfund Program
- Planning and implementation tools:
  - Links to resources for evaluating site-specific vulnerabilities
  - Technical fact sheets on the most vulnerable types of remedies
  - Examples of adaptation measures taken at Superfund sites



http://www.epa.gov/superfund/superfund-climate-change-adaptation

Atlantic Wood Industries, Inc.
Superfund Site
Portsmouth, VA

- **Contaminants:** metals, VOCs, PAHs, creosote, dioxin, pentachlorophenol
- Listed on NPL in 1990
- **Risks:** sea level rise, storm surge
- **Adaptation to increase remedy resilience:** During remedial design and discussions of bulkhead plans, incorporated resilience into design based on issues facing local port authority

Source: Randy Sturgeon, EPA Region 3

Purity Oil Sales Superfund Site
Fresno, CA

- Groundwater table dropped 16+ feet over the past 5 years (due to drought and agricultural pumping)
- Opportunity to aggressively remove contamination from newly-exposed vadose zone under existing cleanup plan
- Soil vapor extraction (SVE) sped up cleanup and prevented further migration of contaminants
- SVE has so far removed 780 lbs. of chlorinated VOCs (orders of magnitude greater than the mass removed by the pump-and-treat system)

Treatment facility

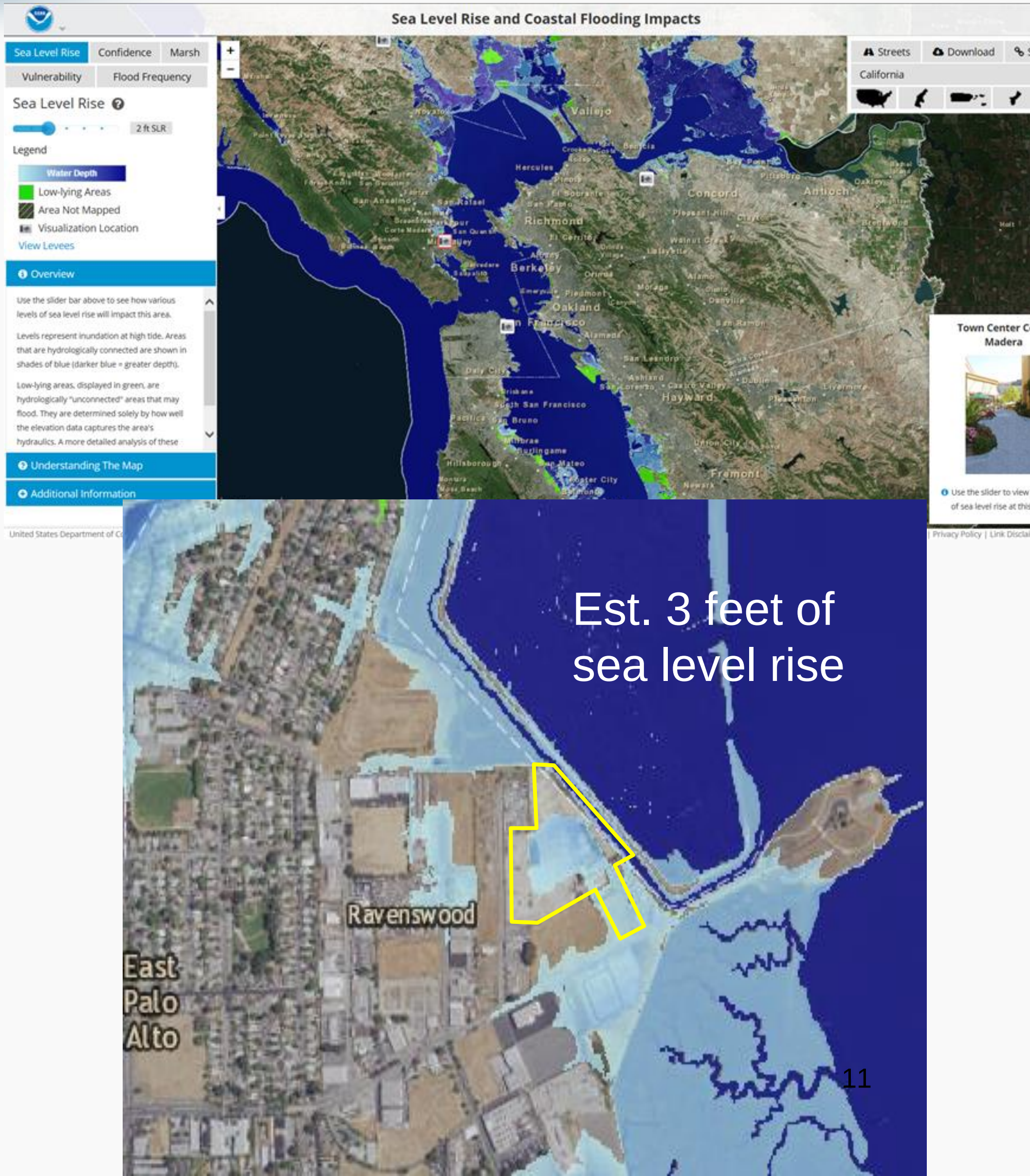
Stormwater retention basin – facility in distance

Source: Patricia Bowlin, U.S. EPA Region 9

RCRA Sites Climate Adaptation and Hazard Map

- Identify RCRA sites that may be subject to climate and other hazards
  - Sea level rise a: 0-6 feet
  - Flooding: 100 and 500 year floods
  - In Wildfire High Risk area
  - Extreme temperature: Increasing annual highs
  - Seismic risk
- Evaluate sites by cumulative hazards and run different scenarios

Source: Laurie Amaro, EPA Region 9



In Summary

- Federal and EPA priority to address climate change
- Existing Superfund process provides structure to consider climate change vulnerability and adaptation
- Earlier the better -- luck favors the prepared
- Use best available resources and tools

Resources

- EPA Main Climate Change Webpage:
  http://www.epa.gov/climatechange/

- EPA Superfund Climate Change Webpage:
  http://www.epa.gov/superfund/superfund-climate-change-adaptation

- EPA HQ Superfund Climate Change Contacts:
  - Anne Dailey, dailey.anne@epa.gov; 703-347-0373
  - Carlos Pachon, pachon.carlos@epa.gov; 703-603- 9904
  - Marc Thomas, thomas.marc@epa.gov; 202-566-0791

- EPA Region 9 Climate Change Contact:
  - Suzanne Marr; marr.suzanne@epa.gov; 415-972-3468

Attachment 18

Panel Discussion: Building Resilience into Remediation and Redevelopment Planning

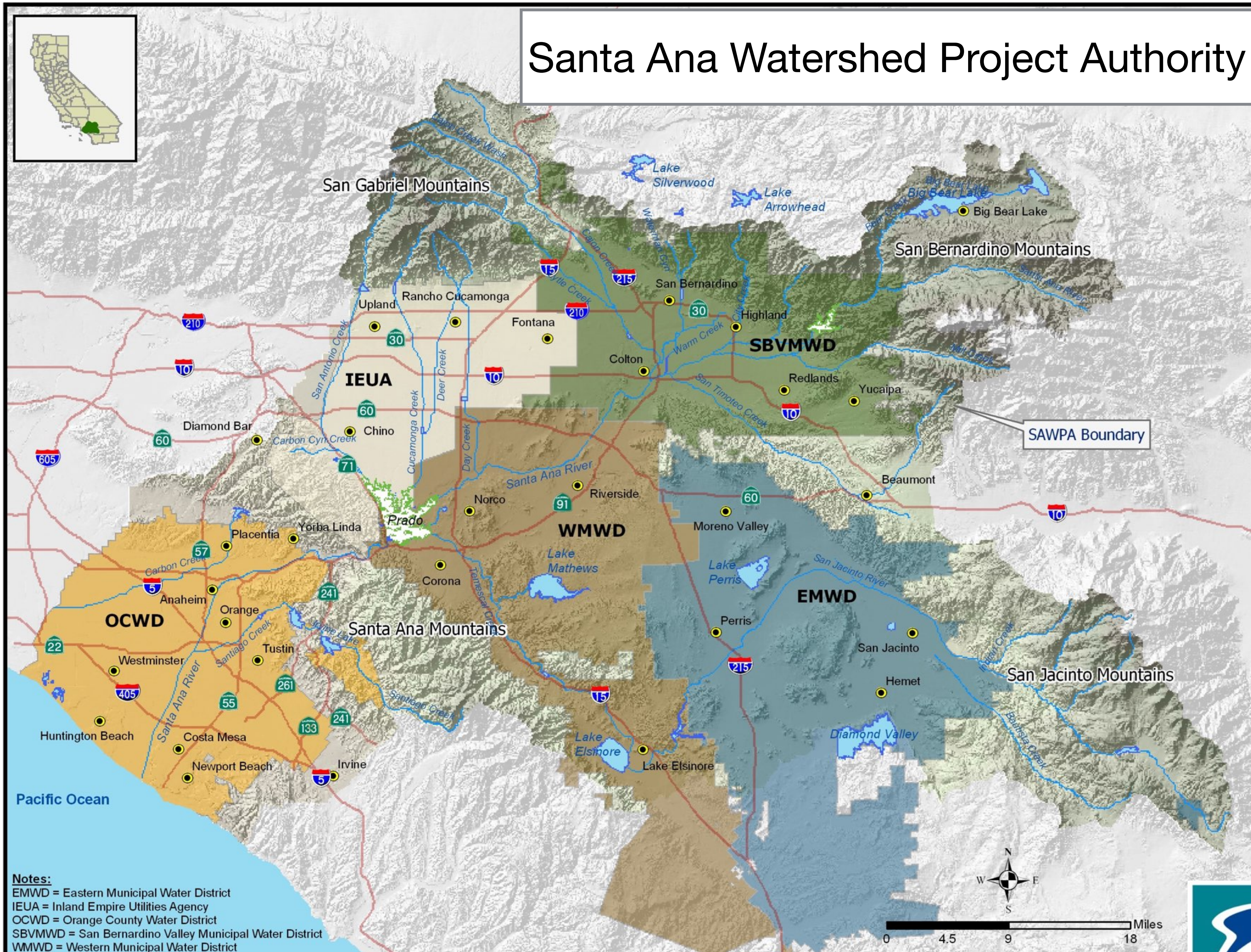
Integrating Engagement

Mike Antos

Integrating Engagement

Sustainable Remediation Forum #31
March 2, 2016 - Pasadena, CA

Mike Antos, Ph.D. - @mikeantos
Santa Ana Watershed Project Authority



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(Social) Resilience

- Most frequently a conceptual frame around infrastructure and technical systems
- More importantly though it is a social concept describing people and communities
    - Larger than & contains the built environment

Value

- Exchange Value
- Use Value
- Our Values…

California's Integrated Regional Water Management Program

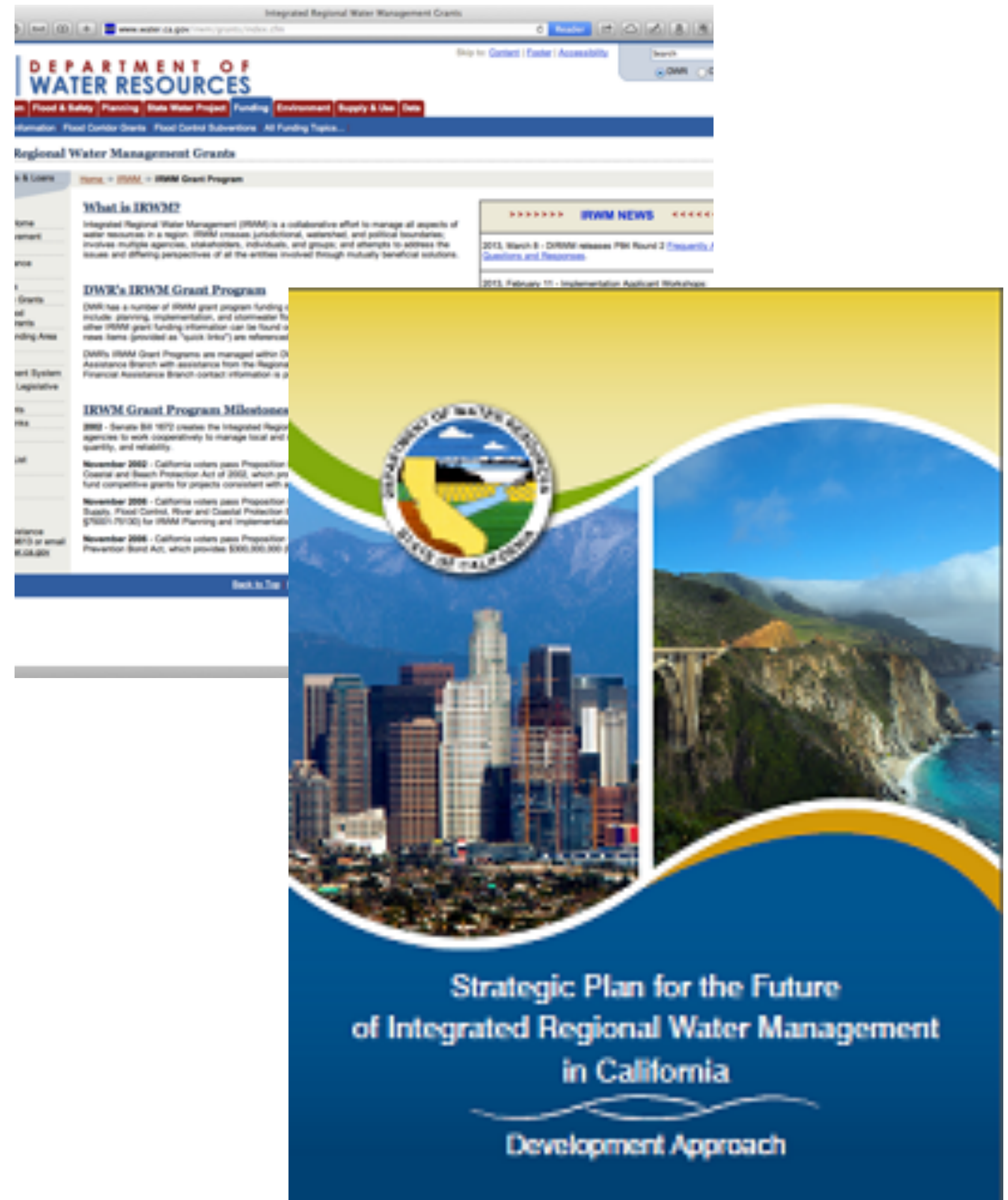
Water Code §79501. The people of California find and declare that it is necessary and in the public interest to... (d) **Establish and facilitate integrated regional water management systems** and procedures to meet increasing water demands due to significant population growth that is straining local infrastructure and water supplies.

Integrated Regional Water Management Planning Act:

- CWC §10531(a): …It is the intent of the Legislature to **encourage local agencies to work cooperatively to manage** their available local and imported water supplies to improve the quality, quantity, and reliability of those supplies.
- CWC §10531(c): The implementation of the Integrated Regional Water Management Planning Act of 2002 will facilitate the development of integrated regional water management plans, thereby **maximizing the quality and quantity of water available** to meet the state's water needs by **providing a framework for local agencies to integrate programs and projects** that protect and enhance regional water supplies.

California's Integrated Regional Water Management Program

"Integrated Regional Water Management (IRWM) is a **collaborative** effort to manage all aspects of water resources in a region. **IRWM crosses jurisdictional, watershed, and political boundaries**; **involves multiple agencies, stakeholders, individuals, and groups**; and attempts to address the issues and **differing perspectives of all the entities involved through mutually beneficial solutions**."

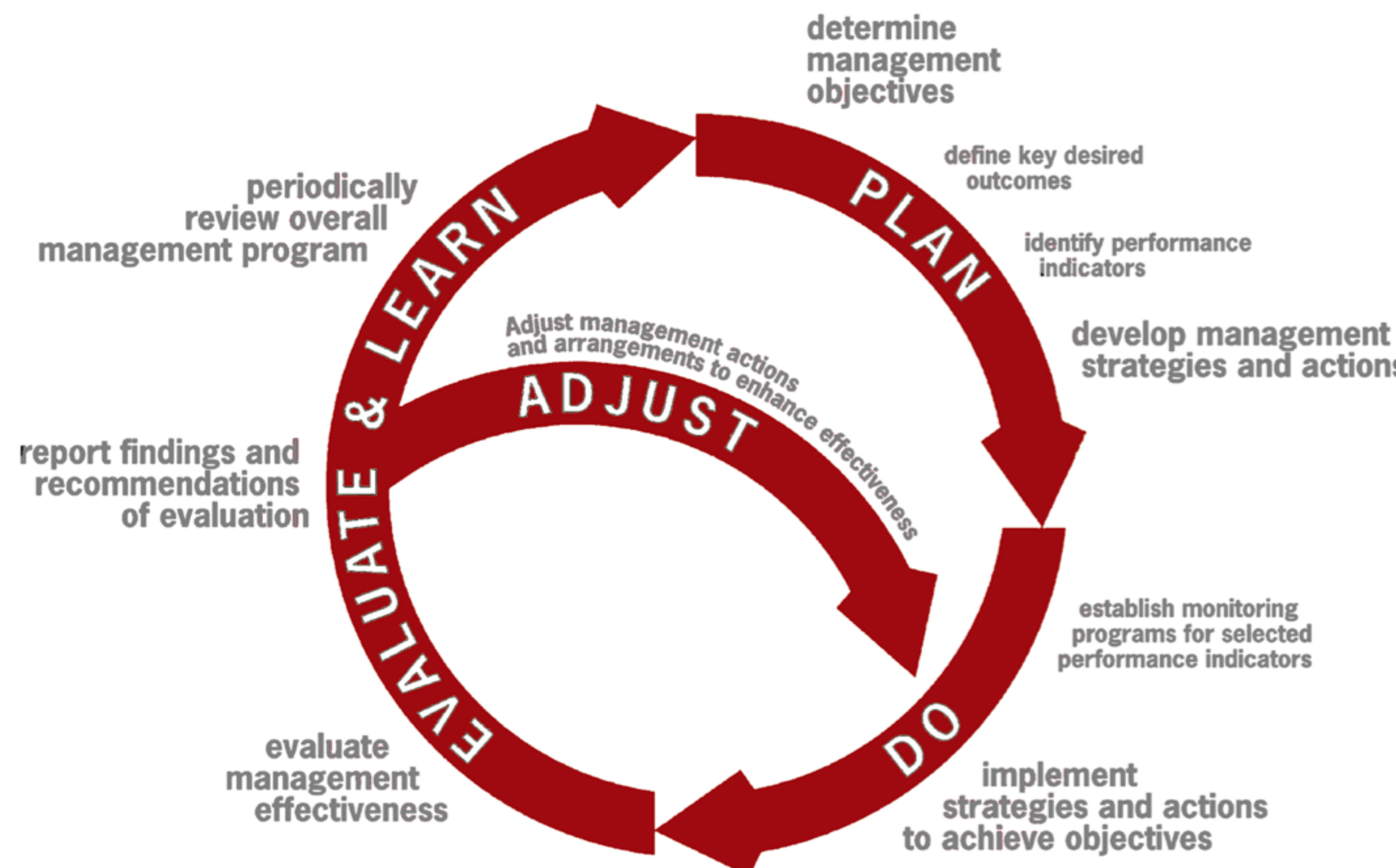


Adaptive Management

- Iterative process whereby management of a system relies on:
  - Planning
  - Acting
  - Monitoring
  - Adjustment

- Is "experimental" in that things are tried, measured, updated and then tried again.

- Fundamentally Includes "stakeholders"



Graphic from: Jones, G. (2009)

Collaborative Environmental Governance

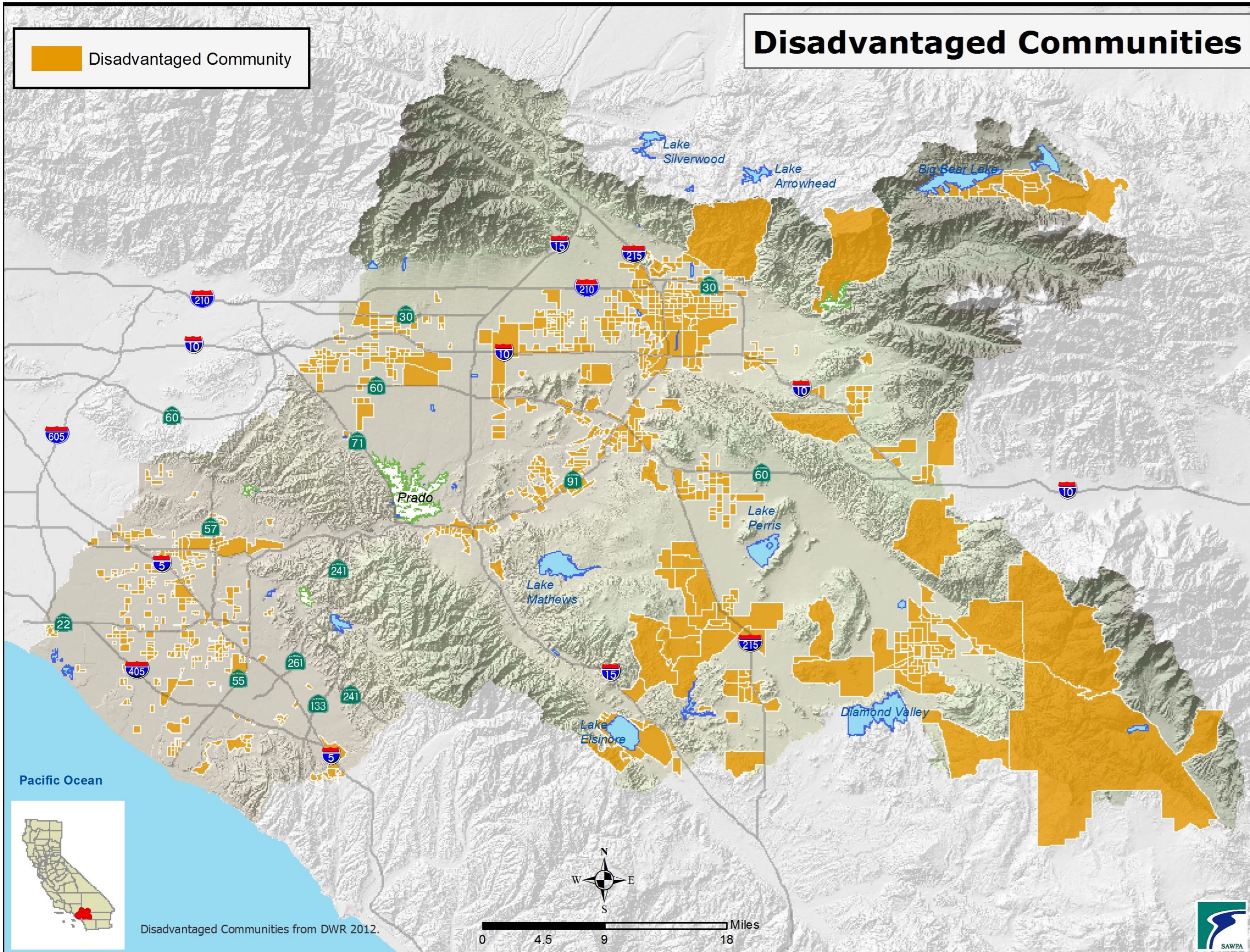
- [An] emerging new governance paradigm in environmental and natural resources management [is]…premised on **a need to reconceptualize management regimes, reconnect with stakeholders**, and redefine what constitutes administrative rationality… *(Durant et. al., 2004)*

- …brings multiple stakeholders together in common forums with public agencies to engage in **consensus-oriented decision making**. *(Ansell & Gash, 2008)*

- ...environmental issues [are] a crisis of governance, or a failure to organize our societies and economies in such a way that they do not harm the environment. As **the process of steering and enabling collective action**, governance has a key role to play in re-organizing society. *(Evans, 2012)*

Transition Management

“System innovation is inexorably linked with institutional change. It cannot be caused by a single variable or event and requires transition management with elements of planning. **It requires replacement of old outcome-based planning with reflexive and adaptive planning.**” *(Kemp and Loorbach, 2003)*


Disadvantaged Communities
Disadvantaged Community
Lake Silverwood
Lake Arrowhead
Big Bear Lake
Prado
Lake Perris
Lake Mathews
Lake Elsinore
Diamond Valley
Pacific Ocean
Disadvantaged Communities from DWR 2012.
N
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18
SAWPA

Disadvantaged Community Engagement Study

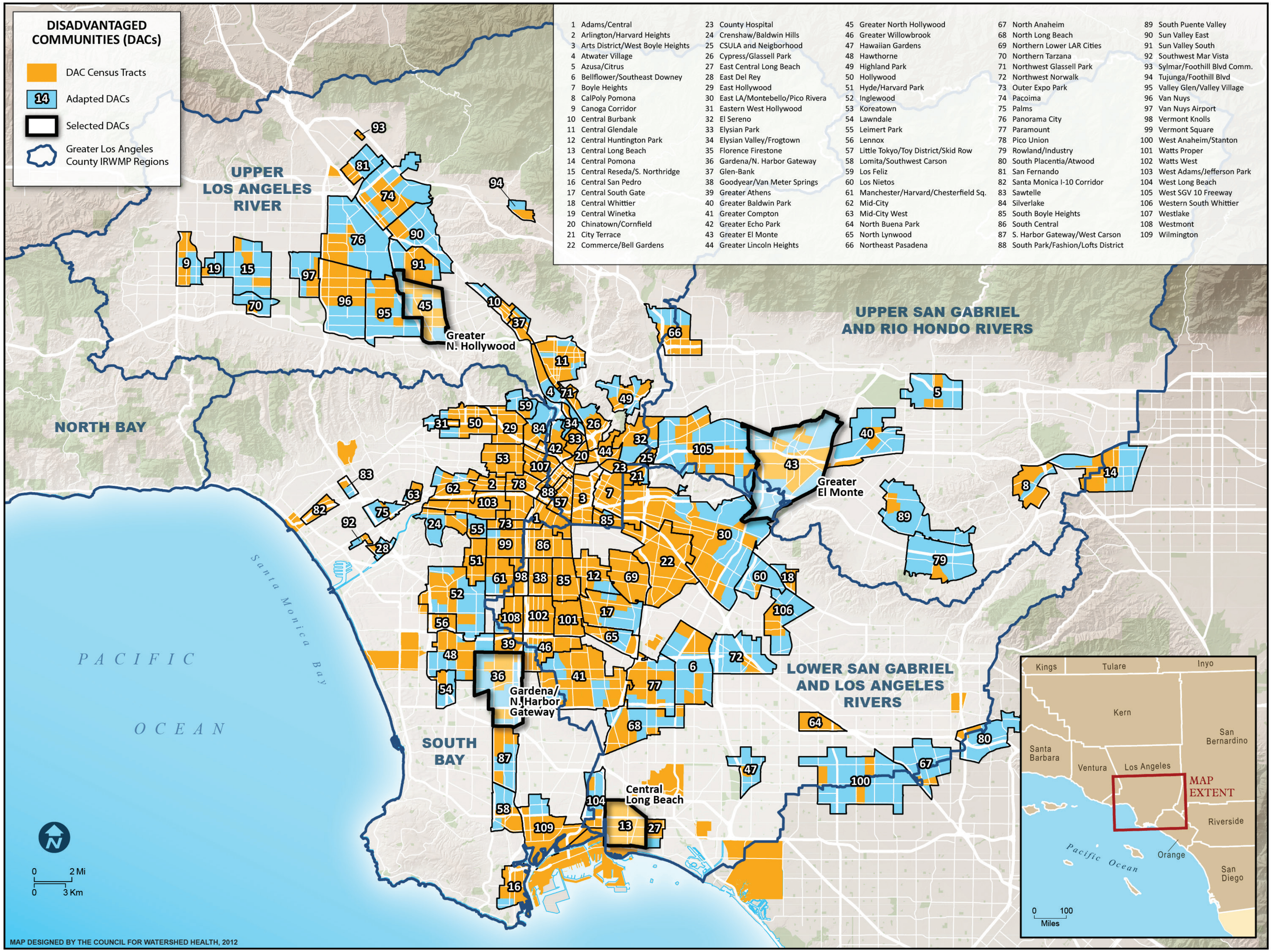
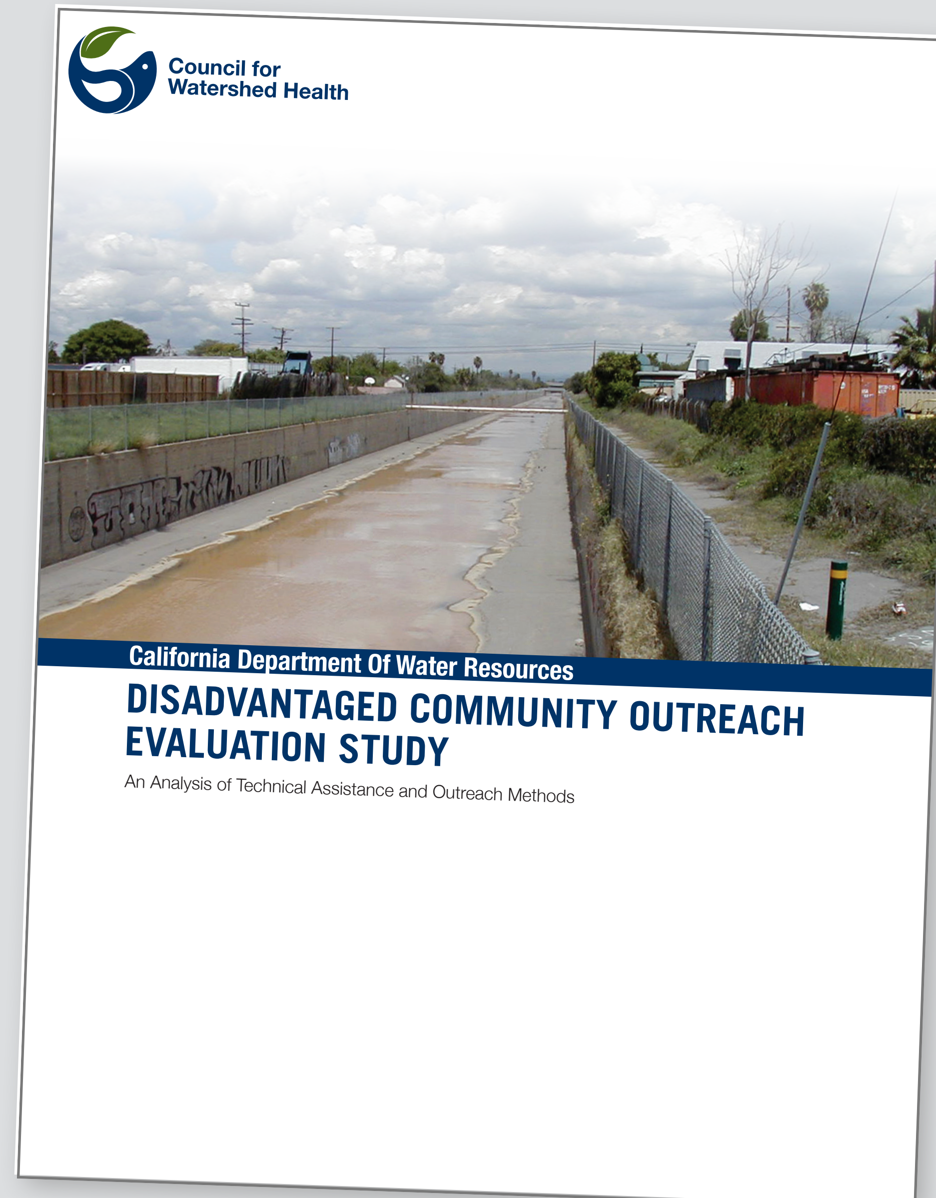


Figure 2. Disadvantaged Communities Map

Greater Los Angeles County Project biography:

- Completed by Council for Watershed Health (www.watershedhealth.org)
  - on behalf of the GLAC IRWM Region
  - 2010 - 2013
- Two primary goals:
  - develop tools for understanding the diversity of challenges and characteristics of communities in the region
  - identify critically needed projects for GLAC



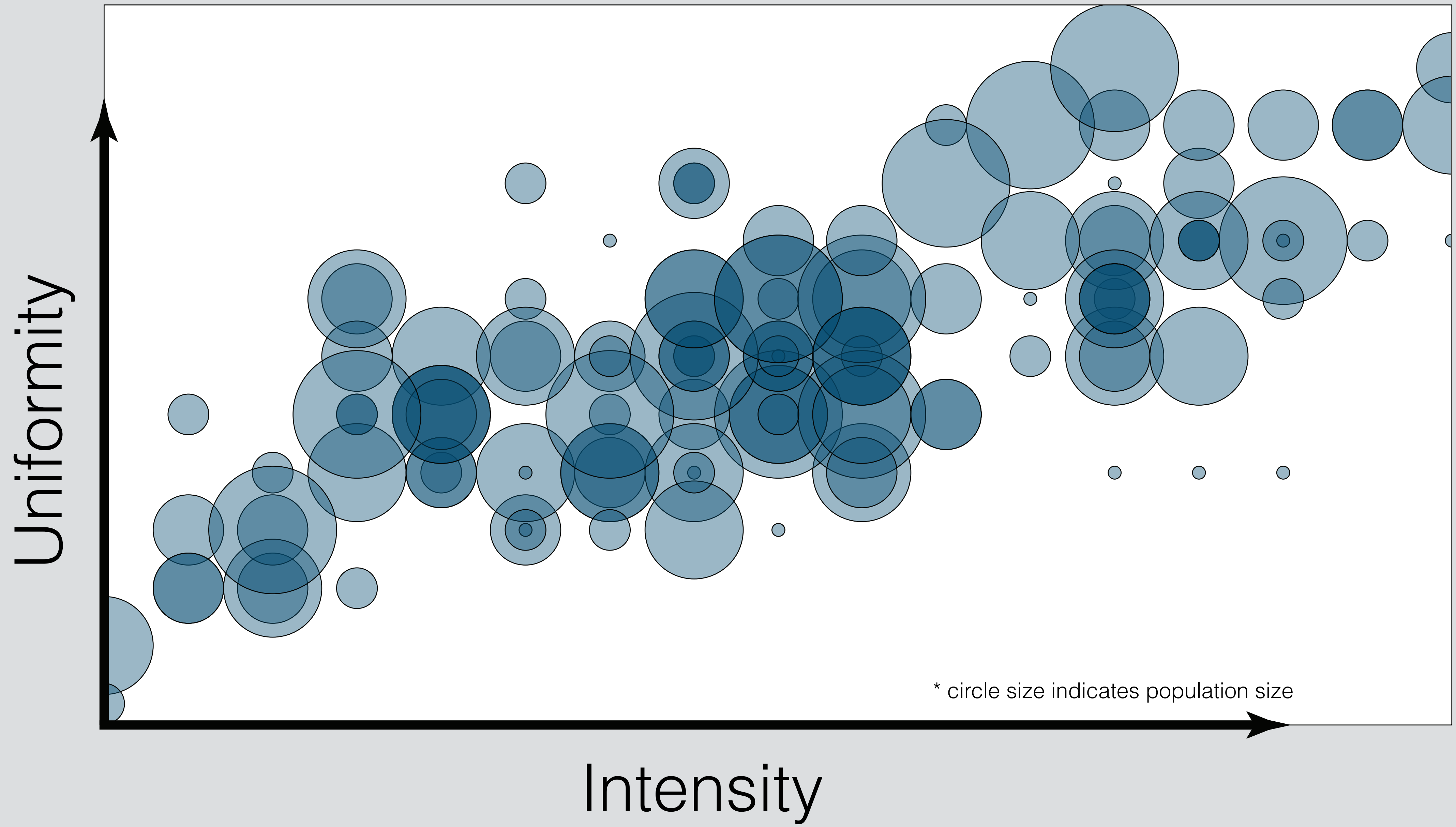
Process of the Study: understanding disadvantage

Multi-indicator analysis

- Size - how many people?
- Uniformity - how similar is the experience of all the people in the community?
- Intensity - to what extent are members of the community experiencing challenges?

Indicator	Metric
Size	*population*
Uniformity	*park accessibility*
	% households meeting DAC threshold
	home ownership
Intensity	*MHI*
	Median household rent
	Population turnover
	Educational Attainment
	Unemployment

Process of the Study: understanding disadvantage



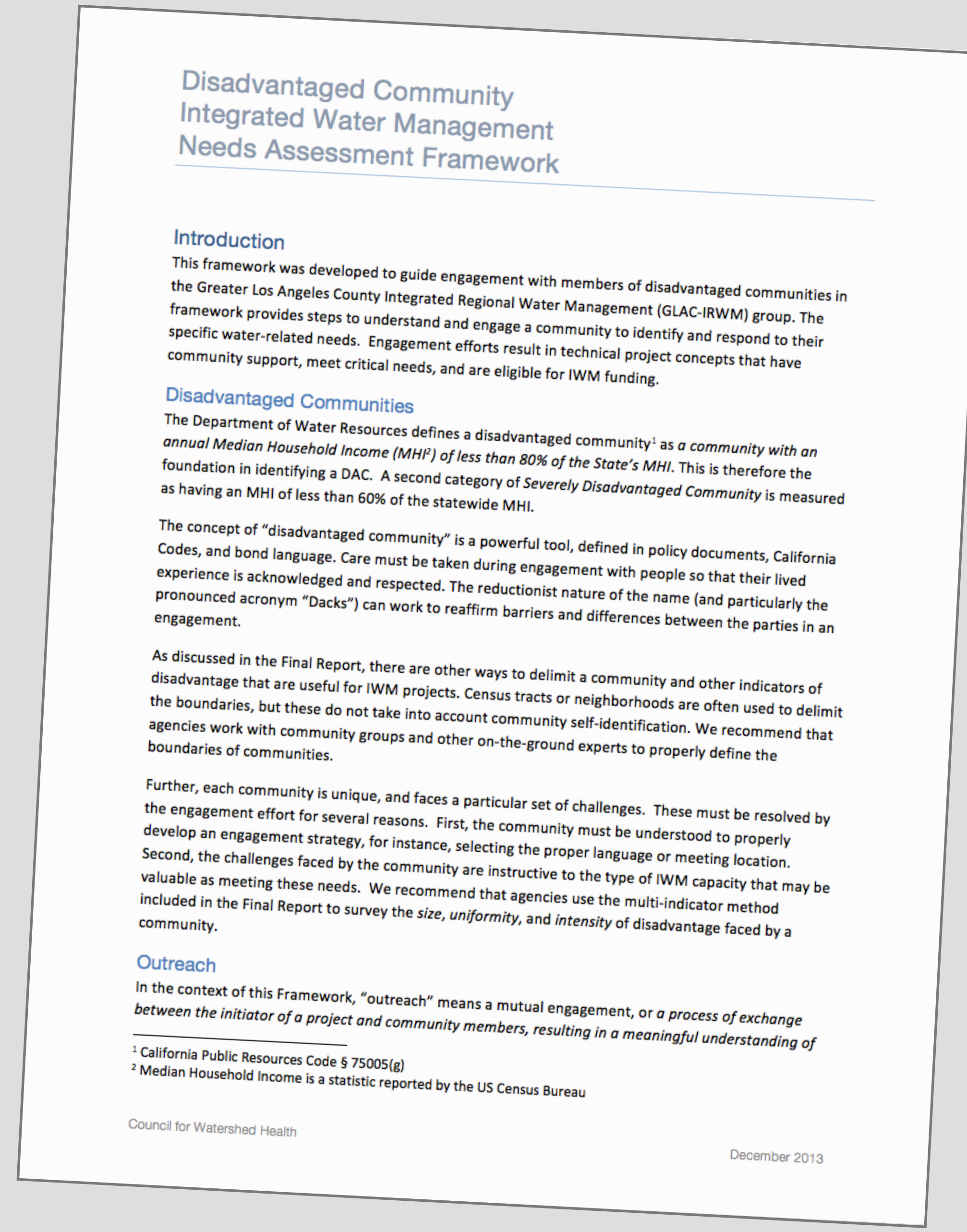
Process of the Study: performing outreach

Figure 5. IRWM Regions and Selected Communities Map

Process of the Study: performing outreach

<u>Needs Assessment Framework</u>

1. Select qualified outreach contractors
2. Conduct stakeholder recon
3. Produce opportunity analysis
4. Generate engagement plan and budget
5. Perform engagement
6. Craft needs assessment report
   - Includes community description, important contacts, and project concepts


Disadvantaged Community
Integrated Water Management
Needs Assessment Framework

Introduction

This framework was developed to guide engagement with members of disadvantaged communities in the Greater Los Angeles County Integrated Regional Water Management (GLAC-IRWM) group. The framework provides steps to understand and engage a community to identify and respond to their specific water-related needs. Engagement efforts result in technical project concepts that have community support, meet critical needs, and are eligible for IWM funding.

Disadvantaged Communities

The Department of Water Resources defines a disadvantaged community[1] as *a community with an annual Median Household Income (MHI[2]) of less than 80% of the State's MHI*. This is therefore the foundation in identifying a DAC. A second category of *Severely Disadvantaged Community* is measured as having an MHI of less than 60% of the statewide MHI.

The concept of "disadvantaged community" is a powerful tool, defined in policy documents, California Codes, and bond language. Care must be taken during engagement with people so that their lived experience is acknowledged and respected. The reductionist nature of the name (and particularly the pronounced acronym "Dacks") can work to reaffirm barriers and differences between the parties in an engagement.

As discussed in the Final Report, there are other ways to delimit a community and other indicators of disadvantage that are useful for IWM projects. Census tracts or neighborhoods are often used to delimit the boundaries, but these do not take into account community self-identification. We recommend that agencies work with community groups and other on-the-ground experts to properly define the boundaries of communities.

Further, each community is unique, and faces a particular set of challenges. These must be resolved by the engagement effort for several reasons. First, the community must be understood to properly develop an engagement strategy, for instance, selecting the proper language or meeting location. Second, the challenges faced by the community are instructive to the type of IWM capacity that may be valuable as meeting these needs. We recommend that agencies use the multi-indicator method included in the Final Report to survey the *size*, *uniformity*, and *intensity* of disadvantage faced by a community.

Outreach

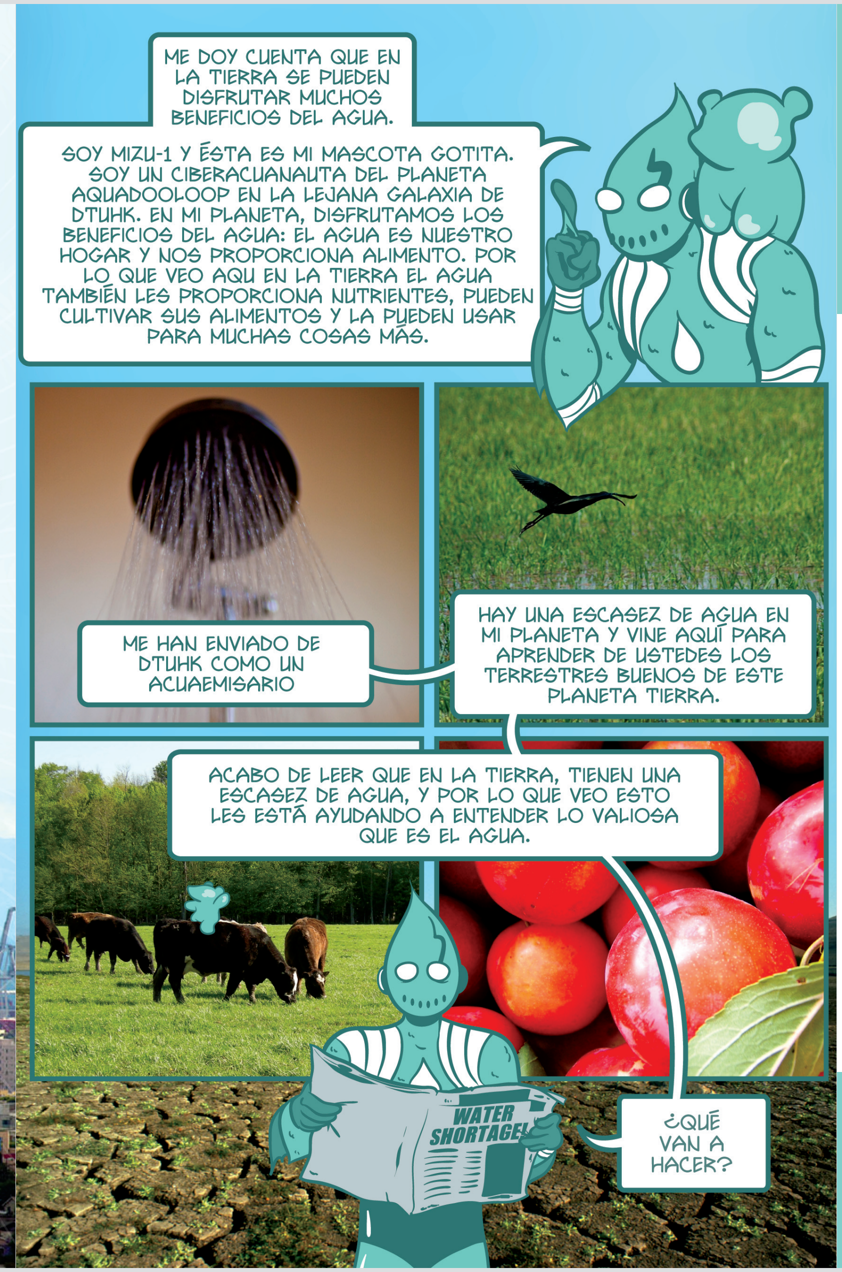
In the context of this Framework, "outreach" means a mutual engagement, or *a process of exchange between the initiator of a project and community members, resulting in a meaningful understanding of*

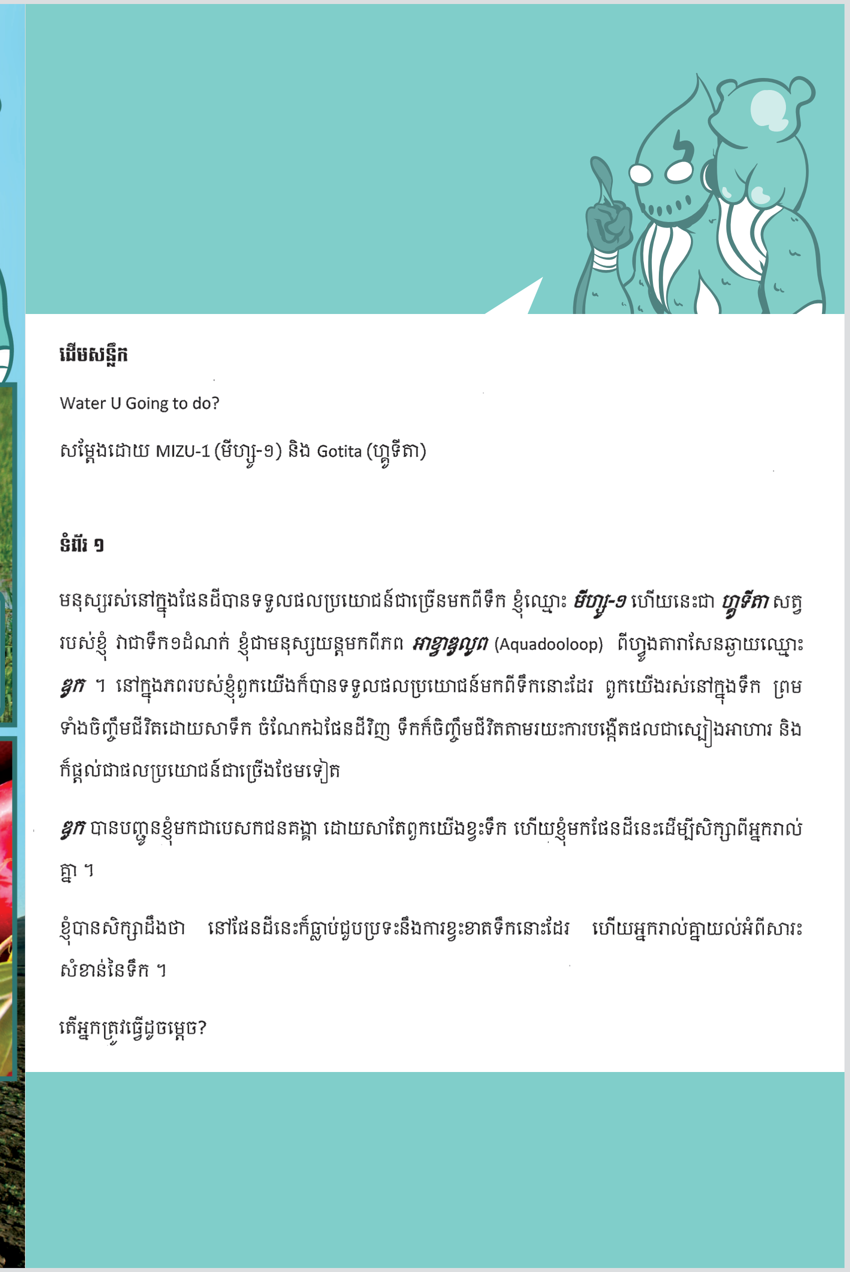
[1] California Public Resources Code § 75005(g)
[2] Median Household Income is a statistic reported by the US Census Bureau

Council for Watershed Health

December 2013

Process of the Study: performing outreach





ដើមសន្លឹក

Water U Going to do?

សម្តែងដោយ MIZU-1 (មីហ្សូ-១) និង Gotita (ហ្គូទីតា)

ទំព័រ ១

មនុស្សរស់នៅក្នុងផែនដីបានទទួលផលប្រយោជន៍ជាច្រើនមកពីទឹក ខ្ញុំឈ្មោះ ***មីហ្សូ-១*** ហើយនេះជា ***ហ្គូទីតា*** សត្វរបស់ខ្ញុំ វាជាទឹក១ដំណក់ ខ្ញុំជាមនុស្សយន្តមកពីភព ***អាខ្វាឌូលូព*** (Aquadooloop) ពីហ្វូងតារាសែនឆ្ងាយឈ្មោះ ***ឌូក*** ។ នៅក្នុងភពរបស់ខ្ញុំពួកយើងក៏បានទទួលផលប្រយោជន៍មកពីទឹកនោះដែរ ពួកយើងរស់នៅក្នុងទឹក ព្រមទាំងចិញ្ចឹមជីវិតដោយសាទឹក ចំណែកឯផែនដីវិញ ទឹកក៏ចិញ្ចឹមជីវិតតាមរយៈការបង្កើតផលជាស្បៀងអាហារ និងក៏ផ្តល់ជាផលប្រយោជន៍ជាច្រើនថែមទៀត

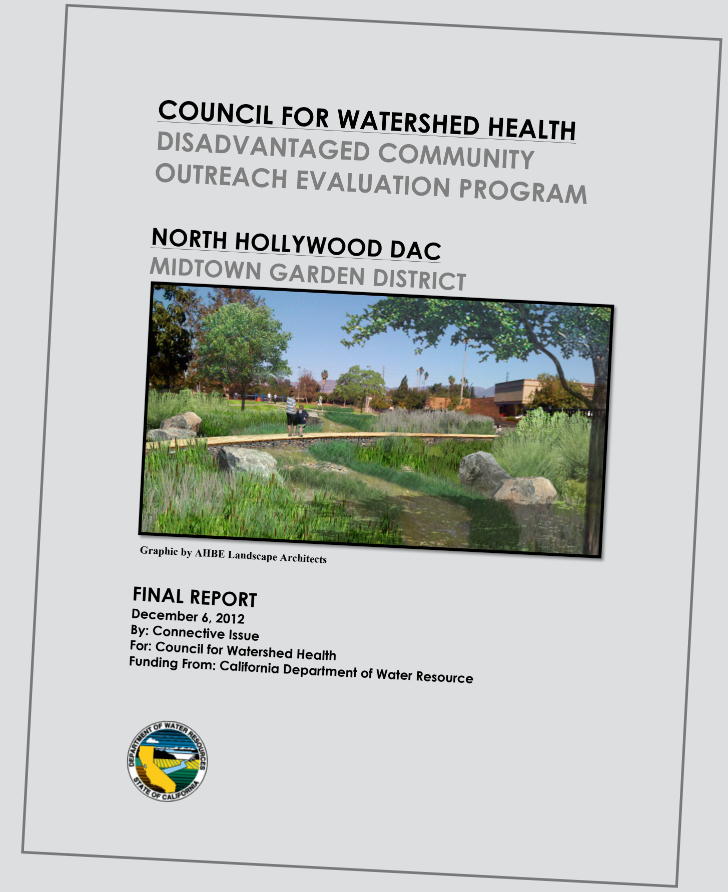
ឌូក បានបញ្ជូនខ្ញុំមកជាបេសកជនគង្គា ដោយសារតែពួកយើងខ្វះទឹក ហើយខ្ញុំមកផែនដីនេះដើម្បីសិក្សាពីអ្នករាល់គ្នា ។

ខ្ញុំបានសិក្សាដឹងថា នៅផែនដីនេះក៏ធ្លាប់ជួបប្រទះនឹងការខ្វះខាតទឹកនោះដែរ ហើយអ្នករាល់គ្នាយល់អំពីសារៈសំខាន់នៃទឹក ។

តើអ្នកត្រូវធ្វើដូចម្តេច?

Process of the Study: performing outreach

- Results from Outreach Contractors
  - Community needs
  - Desired or existing project concepts
- Evaluation by Outreach Contractors
  - Did outreach go as intended?
  - Did the framework work?

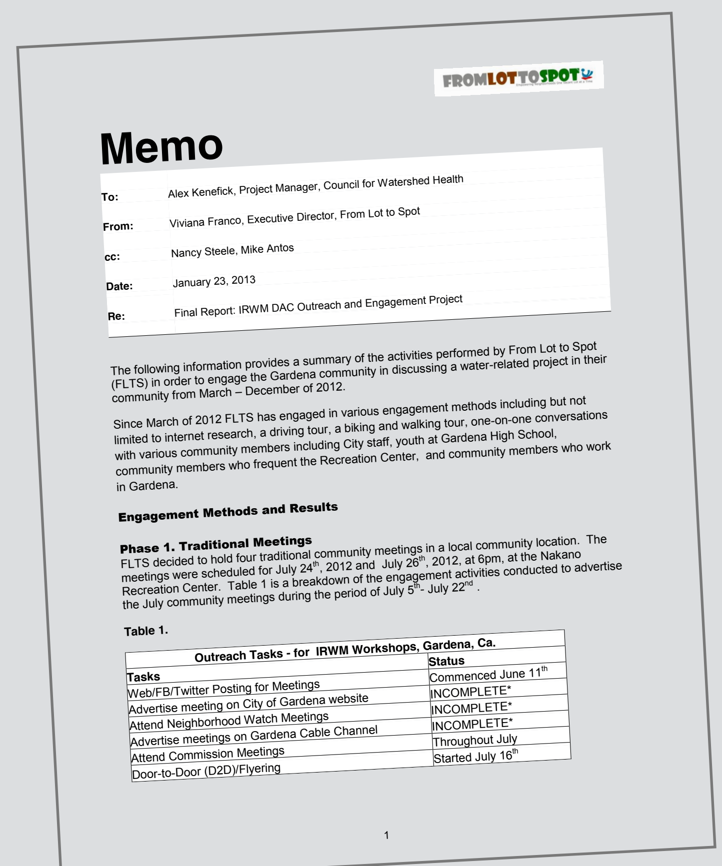


COUNCIL FOR WATERSHED HEALTH
DISADVANTAGED COMMUNITY
OUTREACH EVALUATION PROGRAM

NORTH HOLLYWOOD DAC
MIDTOWN GARDEN DISTRICT

Graphic by AHBE Landscape Architects

FINAL REPORT
December 6, 2012
By: Connective Issue
For: Council for Watershed Health
Funding From: California Department of Water Resource



FROMLOTTOSPOT

Memo

To: Alex Kenefick, Project Manager, Council for Watershed Health

From: Viviana Franco, Executive Director, From Lot to Spot

cc: Nancy Steele, Mike Antos

Date: January 23, 2013

Re: Final Report: IRWM DAC Outreach and Engagement Project

The following information provides a summary of the activities performed by From Lot to Spot (FLTS) in order to engage the Gardena community in discussing a water-related project in their community from March – December of 2012.

Since March of 2012 FLTS has engaged in various engagement methods including but not limited to internet research, a driving tour, a biking and walking tour, one-on-one conversations with various community members including City staff, youth at Gardena High School, community members who frequent the Recreation Center, and community members who work in Gardena.

Engagement Methods and Results

Phase 1. Traditional Meetings
FLTS decided to hold four traditional community meetings in a local community location. The meetings were scheduled for July 24th, 2012 and July 26th, 2012, at 6pm, at the Nakano Recreation Center. Table 1 is a breakdown of the engagement activities conducted to advertise the July community meetings during the period of July 5th- July 22nd .

Table 1.

Outreach Tasks - for IRWM Workshops, Gardena, Ca.	
	Status
Tasks	Commenced June 11th
Web/FB/Twitter Posting for Meetings	INCOMPLETE*
Advertise meeting on City of Gardena website	INCOMPLETE*
Attend Neighborhood Watch Meetings	INCOMPLETE*
Advertise meetings on Gardena Cable Channel	Throughout July
Attend Commission Meetings	Started July 16th
Door-to-Door (D2D)/Flyering	

1

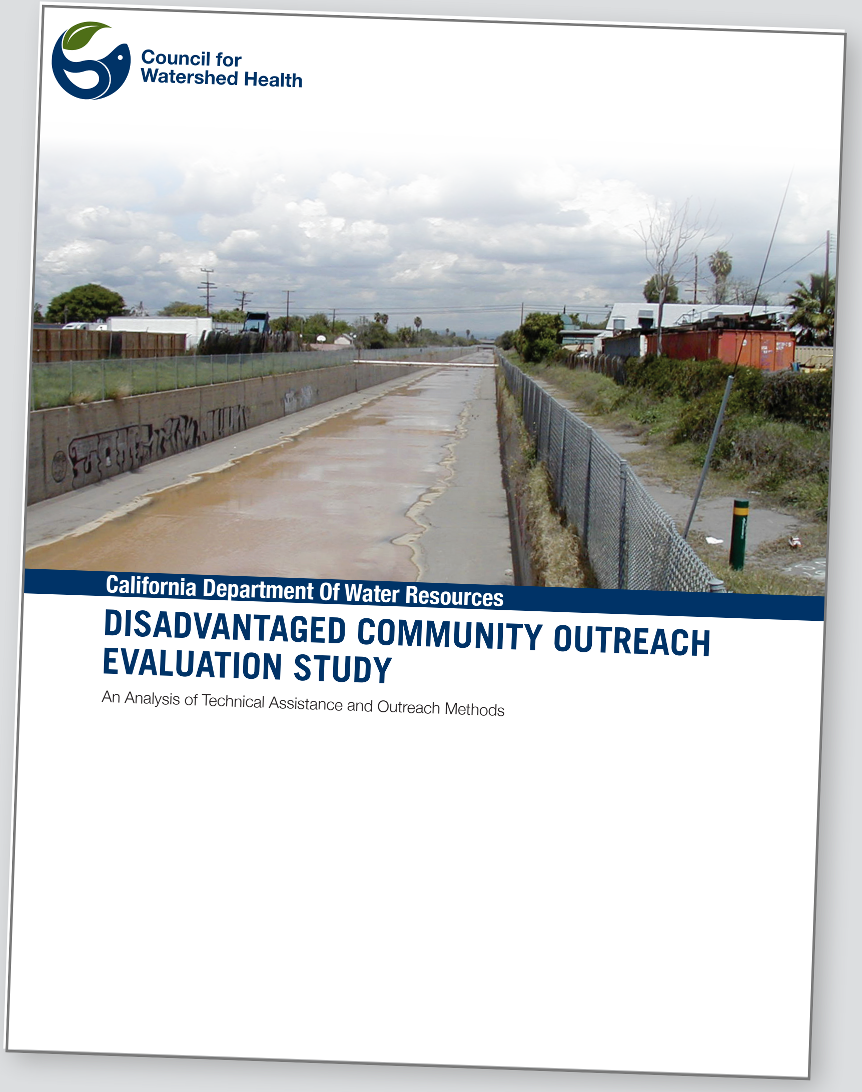
Process of the Study: outreach strategies

- Talking to the Community
  - Sidewalk engagements
  - Neighborhood canvasing
  - Brief surveys
  - Long-form interviews
  - Institutional stakeholder interviews
  - Focus groups
- Partnering
  - Municipal agency meetings
  - Adapting earlier efforts
  - Local NGOs
- Education
  - Water resource facility tours
  - IRWM 101 classes
  - Comic book
  - Mobile water education station

Process of the Study: conclusions

Engagement Model:

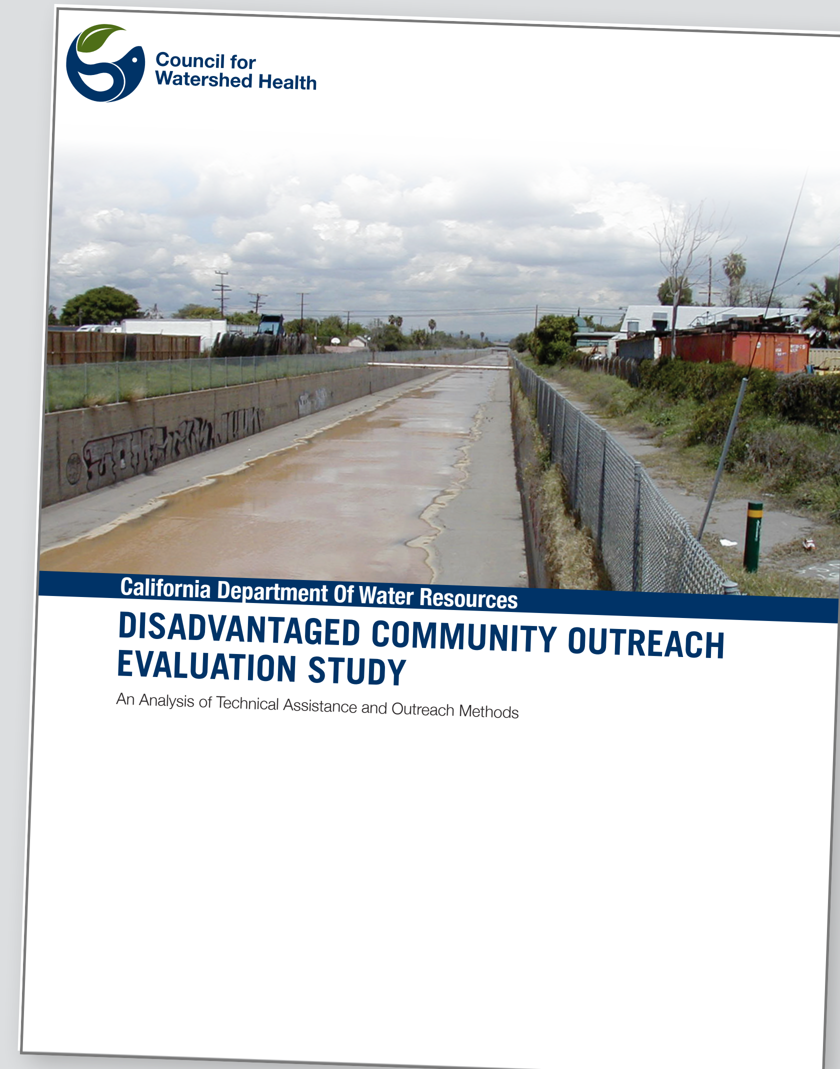
1. Community-Led Engagement
    - Needed: institutions enhance their attentiveness
2. Institution-Led Project Outreach
    - Needed: more individualized engagement strategies
3. Institution-Led Community Needs Assessment
    - Needed: continued commitment to engagement activities



Process of the Study: conclusions

<u>Inclusiveness and Sensitivity:</u>

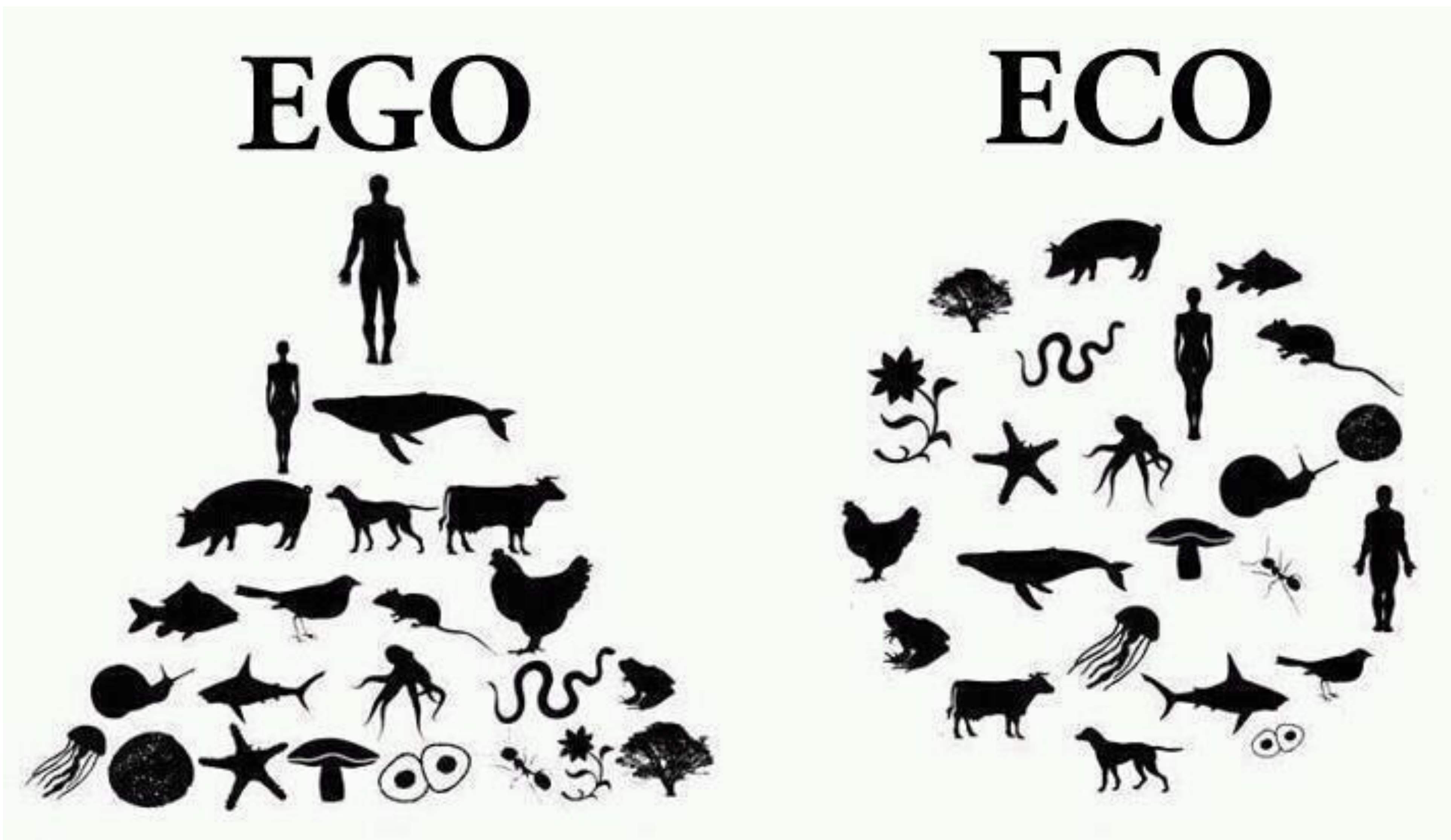
- Experts in communications and community members must develop conscientious language and guidance.
  - “Dacks” reaffirms barriers and differences
  - Reframing from “DACs” to “members of disadvantaged communities” is necessarily part of engagement.



Integrating Engagement

"Engagement" = dialog

"Outreach" = delivery



Thank you

Mike Antos, Ph.D.
Watershed Manager
www.sawpa.org/owow