Sustainable Remediation Forum (SURF)
SURF 19: January 31 and February 1 and 2, 2012
San Diego, California

SURF 19, "Share the Vision Towards a Sustainable Future," was held in San Diego, California on January 31 and February 1 and 2, 2012. SURF members that participated in the three-day meeting are listed in Attachment 1 along with their contact information. The meeting marked the 19th time that various stakeholders in remediation—industry, government agencies, environmental groups, consultants, and academia—came together to develop the ability to use sustainability concepts in remedial decision-making. Previous meeting minutes are available at http://www.sustainableremediation.org/library/meeting-minutes/.

Day 1

The meeting began with Mike Rominger (meeting facilitator) welcoming participants and thanking the meeting's many sponsors and the University of California – San Diego (UCSD) for providing a venue for the meeting. Sponsors for the meeting were as follows: AECOM; Geosyntec Consultants; Haley & Aldrich; Hunton & Williams; Langan Engineering & Environmental Services; Opper & Varco; Procopio, Cory, Hargreaves, & Savitch; Republic Services; SCS Engineers; and Terra Systems.

Mike discussed meeting logistics, ground rules, nonconfidentiality assumptions, export control laws, and antitrust issues. In addition, he thanked current SURF sponsors for supporting the organization. Members interested in sponsorship opportunities should contact Brandt Butler, SURF Treasurer (treasurer@sustainableremediation.org).

Day 1 presentations and subsequent discussions are summarized in the subsections below. Attachments 2 through 10 contain the presentation slides for Day 1 of the meeting.

Opening Keynote Address

Dave Woodruff (Director, Sustainability Solutions Institute at UCSD) presented the keynote address, highlighting the work of the Sustainability Solutions Institute and the transformational changes needed in human societies to address future environmental challenges. The Institute is an inter-departmental organization that facilitates environmental and sustainability research, education, and community outreach. Through the Institute, operations staff and faculty collaborate on mission-critical activities, and students are linked into the process as well. Dave presented selected examples of sustainable projects on campus (see Attachment 2). UCSD has achieved 75% waste diversion, generates 80% of its own power, and has reduced energy consumption by 20%. Despite these institutional successes, Dave said that his challenge is to train the next generation to put these and other sustainable activities into practice outside of the university. He said that many students today understand that humans have exceeded the planet's biocapacity since the 1970s and are ahead of their parents and professors in appreciating the significance of this situation. Dave told the audience that we are on the verge of the sixth great mass extinction and that many large animal species may disappear in the next few decades. Habitat for diversity is also decreasing (e.g., coral reefs 40% degraded; forests, wetlands, mangroves are 60% to 90% gone), and life-sustaining ecological services are threatened. Dave provided the following five reasons for hope: (1) the human population growth rate is declining,

(2) humans are beginning to understand that they are part of nature and not immune to natural processes, (3) a new conservation ethic is developing that recognizes the planetary costs of human behavior, (4) there is a growing understanding of why sustaining nature is in our own self-interest, and (5) a societal transformation to sustainability is occurring. Dave ended his presentation by asking participants to think about the word "bioneering" (i.e., the interventive genetic and ecological management of species, communities, and ecosystems in a post-natural world) in addition to the traditional approach of seeking control of nature through engineering. Presentation slides are provided in Attachment 2.

Sustainable Remediation – What is it?

Dave Ellis (DuPont) set the stage for participants who were not familiar with sustainable remediation. He began his presentation with the following quote from Albert Einstein: "The significant problems we face cannot be solved at the same level of thinking we were at when we created them." He said that sustainable remediation is aimed at changing the way we think and act. Dave provided his view of the current status of sustainable remediation, highlighting the work of SURF in the U.S. and the United Kingdom (SuRF-UK). He said that SuRF-UK issued guidance, with regulatory approval, that includes possible sustainability indicator categories that cover all aspects of the triple bottom line (i.e., environmental, social, economic). Although the guidance covers a broader definition of sustainable remediation than the U.S., Dave emphasized that every country and culture will make its own sustainability decisions based on need. He presented common myths about sustainable remediation and said that sustainable remediation assessments are not expensive, do not take a lot of extra time, and do not solely consider carbon dioxide. Dave ended his presentation by encouraging participants to become an active member of SURF. Presentation slides are provided in Attachment 3.

No discussions occurred after the presentation.

Shedding Light on Environmental Health Assessment

Dimitri Deheyn (UCSD Scripps Institution of Oceanography) presented the challenges of assessing environmental toxicity and described an emerging method used to assess sublethal neurotoxicity and the bioavailability of trace elements associated with sediment particles. Dimitri began his presentation by describing the illusion created by anthropocentric values (e.g., murky water is toxic) and emphasized that these values are not an ecologically relevant assessment of environmental quality. Rather, an environmental quality assessment should clearly identify the end-beneficiary of the health assessment and consider ecologically relevant endpoints. To demonstrate these points, Dimitri presented a case study of the San Diego Bay involving the use of luminous brittlestars. Brittlestars were transplanted in cages in sediment; results in murky water locations (i.e., back of the Bay) showed neurotoxicity levels below expectations. Conversely, brittlestars in clear water (i.e., mouth of the Bay) showed high neurotoxicity, sometimes leading to death. To clarify results, contaminant bioavailability and dissolved organic material levels were studied. Sediment bioavailability results indicated that trace element concentrations were greater at the mouth of the Bay compared to the back of the Bay where total chemical load levels are greater. Thus, contaminant bioavailability and dissolved organic material levels are essential to determining ecosystem health. Dimitri ended his presentation by stressing the importance of using various scales of biological organization and time when performing an environmental health assessment. Although the short assay tests performed provided toxicity levels, longer studies provide additional important information (e.g., the relationship between response sensitivity and ecological relevance). Presentation slides are provided in Attachment 4.

No discussions occurred after the presentation.

San Diego International Airport: The Green Build Project

This case study of the San Diego International Airport was presented in two parts: Paul Manasjan (San Diego County Regional Airport Authority) provided an overview of the remediation performed on a portion of the airport property, and Steve McCabe (AECOM) described the ongoing re-development. A brief chronology of sustainability efforts at the airport is provided in Attachment 5.

Paul provided participants with a brief background of the airport, which is the busiest single runway in the U.S. The airport serves over 17 million passengers annually and its size averages four to six times smaller than airports with similar passenger numbers. In need of structurally sound property for expansion, the airport evaluated the options of re-developing the former Naval Transport Command landfill site. The site had been acquired by the airport in 2003 and was used by the U.S. Navy in the 1950s and 1960s to dispose of burn ash and trash. Two alternatives were considered: construction of a bridge over the trash or landfill removal and backfilling. Paul described the methods, benefits, and cost of both alternatives. The landfill removal and backfilling alternative was selected, and an environmental impact report was developed to address the challenges associated with the remediation, including traffic issues (e.g., maximum of 100 trucks per day), air quality, and the relocation of major utilities. A timeline of remediation milestones and photographs of the dewatering and excavation operations are provided in Attachment 5.

Steve described the re-development of the site, which involved a 465,000 square foot expansion. Green build concepts were required through a Memorandum of Understanding issued by the California Attorney General. The following items were incorporated into the design: landside power and preconditioned air, solar panels, and cool pavements. The project is currently in the construction phase, and green construction methods and equipment are being used. Steve ended his presentation with artist renderings of the terminal, arrivals curb, and concourses. Construction is scheduled to be complete in 2013. Presentation slides are provided in Attachment 5.

No discussions occurred after the presentation.

How Relationships Enhance Sustainable Projects

Angela Driscoll (Vulcan Materials Company) highlighted the three aspects of sustainability (i.e., environmental, social, and economic) through the following three case studies:

- Colton Dunes (Colton, California)
  This 40-acre property contains a substantial portion of the largest remaining contiguous block of habitat for the endangered Delhi Sands Flower-Loving Fly. Vulcan Materials partnered with the Riverside Land Conservancy, the U.S. Fish and Wildlife Service, and academics from local institutions to complete the restoration. The property now flourishes with native plant material and serves as a habitat for the endangered fly and

other wildlife as well. Another outcome of the project was the establishment of a mitigation bank, which will serve as an ongoing funding mechanism for site maintenance.

- Fish Creek (Irwindale, California)
  This project involved returning a creek to its premining location and recreating its high-quality aquatic and riparian habitat. A multi-disciplinary task force composed of leading technical experts was created to ensure that the restored creek would be self sustaining. By partnering with the community and other stakeholders, including Sierra Club and the U.S. Army Corps of Engineers, over 400 permits were obtained in six months. Although the community exhibited a lack of trust toward prior mining operations, this project and the partnerships forged serve as the first step in a long-term relationship.
- Master Planned Urban Communities (San Diego, California)
  Vulcan Materials brought together the City of San Diego, community members, and property owners to evaluate the reclamation of a former quarry that operated from 1937 to 2006. Activities included managing impacted soil and vegetating slopes and barren areas. Plans for the 230-acre site include 900,000 square feet of retail and office space; 4,800 apartments, condominiums, attached and single-family homes; a civic center; and a shopping and entertainment district.

Angela ended her presentation by emphasizing the importance of relationships when completing reclamation projects. She said that inclusiveness builds trust and respect, learning occurs through sharing, and projects that engage stakeholders are more likely to include all three aspects of the triple bottom line of sustainability. Presentation slides are provided in Attachment 6.

After the presentations, participants asked questions about the economics of the case studies presented and sustainability metrics or indicators used by Vulcan Materials. Since 2008, Vulcan Materials has been tracking sustainability efforts through matrices. Current and past sustainability reports are available at http://www.vulcanmaterials.com/social.asp?content=sustainoverview-reporting.

Panel Discussion: Sustainable Remediation and Re-Development

A panel discussion was held and focused on how remediation and re-development practitioners can work more closely together. Richard Opper, Partner at Opper & Varco, moderated the discussion. The following panelists participated in the discussion:

- Eric Crockett
  Eric is the Manager of the Redevelopment and Housing Division for the City of Chula Vista, which is the second largest city in San Diego County. He has been a member of the California Redevelopment Associations' Brownfield Committee since 2003 and has participated in the formation of legislation and regulations that help facilitate the re-development of former brownfield properties.
- Marcela Escobar-Eck
  Marcela is a Principal at Atlantis Group, LLC and has over 25 years of experience in the land use and development field.
- Lenny Siegel
  Lenny is the Executive Director of the Center for Public Environmental Oversight, an

organization that promotes and facilitates public participation in the oversight of environmental activities. In 2011, Lenny received the U.S. Environmental Protection Agency's (USEPA's) Citizen Excellence in Community Involvement Award. The award is given for outstanding achievements in the field of environmental protection and for demonstrating community involvement and leadership during the site cleanup process.

Panelists presented case studies that demonstrate the successes that can be achieved when remediation and re-development practitioners work together. The case studies are summarized below; presentation slides are provided in Attachment 7.

- Liberty Station (Marcela Escobar-Eck)
  This project involved the re-development of a former Naval Training Center into a mixed use community. It is the only re-development project area that exists because of the base closure process. In 1993, the U.S. Navy announced that it was closing the Naval Training Center in San Diego, California. By 1997, the military left the facility, leaving behind all sorts of furniture and fixtures (e.g., mattresses, desks). The City of San Diego created a 27-member commission to determine what to do with the site, as well as develop a detailed plan. The area outlined in red on the site schematic in Attachment 7 was transferred to the City of San Diego, and the remaining property (some of the most economically viable areas) was transferred to the U.S. Marines for military housing. The re-development project involved complicated land exchange issues, coastal restrictions, historic restrictions on building demolition, and air traffic restrictions. Materials were recycled or reused when possible. Thirteen years later, portions of the property continue to be developed.

- Chula Vista Bayfront (Eric Crockett)
  The Chula Vista Bayfront site on the San Diego Bay represents the largest development opportunity in California south of San Francisco. Implementation of the Chula Vista Bayfront Master Plan is designed to transform Chula Vista's underused industrial bayfront landscape into a thriving residential and world-class waterfront resort destination. In May 2010, the environmental impact report was unanimously approved and involved no litigation, primarily due to the collaborative effort between the City of Chula Vista, Port of San Diego, environmental community, and neighboring property owners. For example, an agreement was signed with a neighboring property owner, Goodrich Aerostructures, to facilitate the possible location of residential development near Goodrich's existing manufacturing operations. Part of the agreement establishes guidelines for vapor intrusion, foundation construction, and grading. The agreement also supports the continued cleanup of environmental contaminants from historic manufacturing operations on the property by providing monetary compensation for enhanced environmental remediation and energy efficiency measures. When completed, more than 40% of the project area (230 acres) will be dedicated to parks, open space, and habitat restoration and preservation. Over 130 new acres will be parks and open spaces that allow public access and use. The visitor-serving amenities and mixed uses will be clustered in the Harbor District to reduce impact on environmentally sensitive areas.

- MEW and Naval Air Station Moffett Field Superfund Sites (Lenny Siegel)
  Community involvement and participation at two Superfund sites, Middlefield-Ellis-Whisman (MEW) and Moffett Field, have proven to be a great force in achieving sustainable remediation and re-development. A regional plume underneath the sites is

nearly ½ mile wide and almost two miles long. Beginning in 1986, responsible parties removed contaminated soil, operated soil vapor extraction systems, and installed groundwater extraction and treatment systems. In 2002, the USEPA recognized the threat of vapor intrusion from the plume and two other groundwater contamination sites in the area. Hundreds of people attended a community meeting in early 2003, stimulating a new series of investigations. In 2009, the USEPA found that the existing remedies for the plume were not protective and developed a new Record of Decision for vapor intrusion. Working with the community, commercial property owners, and responsible parties, the USEPA is developing a strategy for accelerated groundwater remediation in portions of the plume. The community is suggesting that the new feasibility study and remedy selection for the plume focus on the following areas that represent the reasons for cleaning up in the first place:

- Areas containing a high concentration mass
- Areas that continue to be a source
- Areas that reduce the need for long-term vapor intrusion mitigation
- Areas where the detectable plume encroaches on residential areas, schools, and other sensitive land uses

Specific questions from participants and responses are summarized briefly below.

- ❒ Consideration of Sustainability
  One participant asked why sustainability was considered in the Liberty Station and Chula Vista Bayfront projects. Marcela said that sustainability was initially considered in the Liberty Station project as a way to reduce costs, but social responsibility quickly followed. Eric said that sustainability was integrated after receiving public comments on the Chula Vista Bayfront site plans and after realizing that community concerns could be addressed without sacrificing the financial viability of the project.

- ❒ Money Sources
  One participant asked about the source of the money used to finance the projects presented. Eric said that the Chula Vista Bayfront is a $2 billion effort, with about $10 million for remediation costs; he believes that these remediation costs are nominal compared to infrastructure costs. Lenny said that, in his experience, most of the money comes from property reuse. Marcela emphasized the need to break loose from traditional financing mechanisms, encourage developers to take risks, and use creative ways to cobble together money or find money. Eric commented on the issue of liability and risk, stating that the Polanco Act provides immunity for developers and protects their liability. As such, he believes the most significant challenge of re-development is how to address developers' and lenders' liability issues.

- ❒ Sea Level Rise
  One participant asked whether sea level rise was considered in the Chula Vista Bayfront and Liberty Station projects. Eric said that sea level rise was considered (based on currently available data) in the environmental impact report for the Chula Vista Bayfront site. Marcela said that sea level rise was not part of the discussion when the Liberty Station project was initiated in 1993.

- ❒ Construction Materials and Operations
  Participants discussed the value of reusing construction materials in a purposeful way, particularly locally because of the lack of availability of native materials in San Diego County. One participant said that natural sources of aggregate will be depleted in the next 10 to 15 years. Panelists and participants seemed to agree that sustainability concepts are starting to be integrated more and more into the construction industry and that retooling operations should be a priority to create the most significant impact on the sustainability of activities.
- ❒ Re-Development in Challenging Locations
  One participant asked panelists for advice for people owning property in areas without a high real estate market. Panelists suggested collaborating with the surrounding community to brainstorm about the aspects that make the area unique, emphasizing reinvention and the different aspects of value. One panelist cited ecotourism as an example of reinvention that captures the tourism dollar back into specific communities and areas of low real estate value.

Panelists and participants seemed to agree that when responsible parties, environmental groups, and community groups work together, expectations can be discussed and clarified, thereby contributing to project's success.

Lunch Keynote Address

Over lunch, Scott Peters (Port of San Diego) discussed how sustainability has evolved within the public agencies of San Diego.

Sustainable Remediation: An International Review

Paul Nathanail (University of Nottingham) discussed the dimensions and key players of sustainability. He presented the three common dimensions of sustainability (i.e., environmental, social, economic) and emphasized a fourth dimension—institutional. The institutional dimension, where policies are formulated and regulated, can either foster sustainability or kill the concept in its infancy. Because sustainable concepts require a change in thinking, a long-term perspective and creativity are necessary within institutional organizations, including governments. Paul defined the key players of sustainability as the payer (e.g., problem holder, responsible party, polluter), policy maker, and payee (i.e., professional advisor). He urged participants to remember that sustainable remediation is most effective and successful when the payer is willing, the policy maker approves, and the payee can deliver the solutions necessary.

Paul also provided participants with an update of SURF efforts in Australia and the UK. He said that sustainable remediation in Australia is approaching the point where regulators are encouraging practitioners to "just do it." Paul highlighted the differences in the laws between the UK and the U.S. The new secondary legislation underpinning the contaminated land regime in England allows for a sustainability appraisal in those very few sites where it is difficult to determine if regulatory intervention is required based on the risk assessment alone. In such cases, societal, environmental, and economic factors can be considered to help resolve whether or not intervention will result in a net benefit. Presentation slides are provided in Attachment 8.

No discussions occurred after the presentation.

Panel Discussion: Regulatory Perspectives

A panel discussion was held and focused on regulatory perspectives of sustainable remediation. Chuck Pryatel, Vice President of SCS Engineers and former Manager of the Site Assessment and Mitigation Department of the San Diego Department of Environmental Health, moderated the discussion. The following panelists participated in the discussion:

- Malcolm Weiss
  Malcolm is a Partner at Hunton & Williams law firm in Los Angeles, where he represents clients before local, regional, state and federal agencies in permitting projects, enforcement actions, and compliance matters. Following law school, he began his career at the USEPA Headquarters in Washington, D.C.
- Julie Chan
  Julie is a California Professional Geologist and Chief of Cleanup and Land Discharge Branch of the San Diego Regional Water Quality Control Board. Julie has over 20 years of experience in the field of water rights and water quality regulation.
- Paul Hadley
  Paul is a Senior Hazardous Substances Engineer with the California Department of Toxic Substances Control (DTSC). He is a member of the DTSC's Green Remediation Team and is a charter member of SURF.

Malcolm began the panel discussion by quickly reviewing the basic tenants of green and sustainable remediation and highlighting the differences between the two. He summarized the USEPA Region IX *Greener Cleanups Policy* for participants and reviewed the business case for green remediation. Malcolm ended his presentation with the following quote from the 1987 Brundtland Report: "[Sustainable] development…meets the needs of the present without compromising the ability of future generations to [meet] their own needs." Presentation slides are provided in Attachment 9.

Julie discussed her organization's policy (Resolution No. 92-49) that incorporates the concept of sustainability. She said that once the "hot spots" of contamination are cleaned up, the cost-benefit ratio for cleanup becomes asymptotic. For this reason, the policy requires that alternate cleanup levels result in the best water quality that is "reasonable" and include a "total values involved analysis" (i.e., triple bottom line elements of sustainability). Julie told participants about a few case studies where sustainable concepts were integrated, one of which resulted in active treatment of the contamination. Another case study used the GeoTracker, which is the Water Boards' data management system for managing sites that impact groundwater, especially those that require groundwater cleanup. The public and secure portals in the tool retrieve records so that users can view integrated data sets from multiple State Water Board programs and other agencies. Data are viewed in relationship to streets, satellite imagery, and terrain map views. GeoTracker is publicly available and helps eliminate the surprises that developers encounter when re-developing cleaned up properties. Julie believes that the tool also allows regulators to more comfortably close sites with contamination remaining on-site.

Paul discussed the Interstate Technology & Regulatory Council (ITRC) project in the area of risk assessment, which involved presenting a hypothetical yet realistic site to risk assessors in eight states across the U.S. The hypothetical site involved simple environmental challenges, and risk assessors were asked to determine the amount of soil that would fail the state's criterion. Responses ranged from "none" to "all." Paul said that the same data set was provided to environmental consultants and academics and resulted in a similar broad range of responses. He believes it is not possible to begin discussing sustainability in light of such a broad range of responses related to cleanup. Paul said significant work must be done in identifying how a "problem" is identified for which a "solution" should be developed. This basic upgrade would, in and of itself, improve efficiency, which translates to an improvement in the sustainability of the overall cleanup.

Specific questions from participants and responses are summarized briefly below.

- ❒ Changes Needed in Regulatory Landscape
  One participant asked panelists what changes are needed in the regulatory landscape to achieve sustainable remediation. Julie believes that a shift is occurring, beginning with the DTSC's 2009 symposium. Malcolm does not believe that regulators can dictate methodology (i.e., sustainable remediation vs. remediation) and said that sustainability concepts are difficult to integrate at sites where parties are adversarial.
- ❒ Acceptability of Sustainable Remediation among Colleagues
  One participant asked if the panelists' regulatory colleagues were accepting of sustainable remediation. Julie said that her job is to motivate the change in culture in her organization. She said that the California EPA is about to publish a low-threat underground storage tank case closure policy that will also change the culture. (The policy was adopted on May 1, 2012 after the meeting; visit http://www.swrcb.ca.gov/ust/lt_cls_plcy.shtml for more information.)
- ❒ Advocation of State-Level Policy
  Another participant asked Julie if SURF should push for a policy at the state level for integration of sustainability during the feasibility study phase of the remediation process. Julie responded simply "yes." She recommended using the program environmental impact report required by the California Environmental Quality Act (CEQA) as a guide.
- ❒ Communication
  One participant challenged regulators to provide details about how sustainable remediation efforts within regulatory agencies (e.g., the DTSC's 2009 *Interim Advisory for Green Remediation*) are being implemented and pushed down to the staff level. Julie said that the Regional Water Quality Boards use DTSC's guidance, but believes that responsible parties (vs. regulatory agencies) will promote sustainability concepts in their remediation projects. Malcolm compared the debate raging today about sustainable remediation to the debate about environmental auditing in the 1980s. He believes that once case studies are communicated, sustainable remediation will take on a life of its own.

PG&E's Programmatic Sustainable Remediation Guidance

Sharron Reackhof, Pacific Gas & Electric Company (PG&E), and Karin Holland (Haley & Aldrich) presented a guidance document that was developed to incorporate sustainable remediation practices and principles across PG&E's portfolio. The guidance expanded the DTSC's 2009 *Interim Advisory for Green Remediation*. Presentation slides are provided in Attachment 10.

Karin presented detail about the guidance, which was developed to provide a standardized approach to sustainable remediation that promoted an ongoing, iterative thought process. Karin described the Green Remediation Evaluation Matrix that was originally developed by the DTSC and modified for this project. The matrix itself is a Microsoft Excel® spreadsheet with supporting documentation that serves as a central data management system and is completed for each activity (e.g., feasibility study, design, and implementation). Karin described how to complete a simplified matrix. First, the project team identifies and determines the most important sustainability stressors and best management practices for the project and activities. Then, criteria are developed for each stressor, and an evaluation is performed. Based on the evaluation, activity-specific ratings of “low,” “moderate,” and “high” result and, based on these ratings, project-specific sustainability ratings can be generated (i.e., platinum, gold, silver).

Sharron presented the status of the project, saying that the guidance was rolled out to PG&E project managers in August 2011. A decision was made to document current conditions at approximately 60 sites. As project managers learned the process, they began to appreciate being able to demonstrate and track sustainability successes on projects (highlighted on Slide 19 of Attachment 10). PG&E plans to roll out the guidance to its remaining sites and is looking to its project managers and environmental consultants to embrace the guidance. Sharron said that her organization may collaborate with the DTSC and make a presentation to DTSC project managers. She ended her presentation by encouraging participants to use the guidance so that they can truly understand the details. Paul Hadley (California DTSC) added that the metrics associated with the guidance are the most helpful, saying that it is difficult to determine what to measure at a grand scale that can be applied at the site scale.

After the presentation, one participant asked how the guidance has changed either a project’s outcome or the approach of a project manager. Sharron said that project managers are discussing their projects with each other and getting creative. Teams are sitting down and walking through every step, striving for success, and having discussions that they weren’t having before the guidance was developed. A participant who uses the guidance agreed and added that the guidance allows the remediation professional to think about the future of the project and potential future data gaps. A year from now, Sharron believes that PG&E will have strong sustainable remediation case studies as a result of documenting projects as they progress.

Additional discussions focused on the level of effort needed. Sharron said that project managers are required to follow the guidance regardless of the level of effort involved, but noted that completion of the matrix for an activity should not take more than a couple of hours.

Panel Discussion: How Can Professional Organizations Work Together?

A panel discussion was held and focused on how different professional organizations can work together to help advance sustainable remediation. Stephanie Fiorenza (BP) moderated the discussion. The following panelists participated in the discussion:

- Peter Binney, Institute for Sustainable Infrastructure (ISI)
  Peter serves as the National Director of Sustainable Infrastructure for ISI, which is a nonprofit organization structured to develop and maintain a sustainability rating system for civil infrastructure in the U.S. The group evaluated 900 different sustainability tools and reviewed benchmark programs around the world in the hopes of finding or creating an effective way of applying objectivity to sustainability. A suite of tools was developed,

along with a rating system that includes a process for third-party ratings. More information about the organization is available at www.sustainableinfrastructure.org.

- Paul Favara, SURF
  Paul served as the President of SURF in 2011. SURF was initiated in 2006 to promote the use of sustainable practices during remedial action activities with the objective of balancing the three aspects of the triple bottom line. It became an official nonprofit organization in 2010. The mission of SURF is to maximize the overall environmental, societal, and economic benefits from the site cleanup process by advancing the science and application of sustainable remediation, developing best practices, exchanging professional knowledge, and providing education and outreach. More information about the organization is available at www.sustainableremediation.org.
- Chuck Pryatel, San Diego Environmental Professionals (SDEP)
  Chuck is a member of the SDEP, which consists of scientists, engineers, lawyers, and other professionals interested in the environment. The SDEP was founded in the late 1980s in response to the growing number of environmental requirements so that environmental professionals could educate themselves about the requirements. Currently, the SDEP is an education group that focuses on advancing the science of the environmental work they do. More information about the organization is available at www.sdep.org.
- Glen Schmidt, American Society of Landscape Architects (ASLA)
  Glen serves as a Trustee of the San Diego Chapter of ASLA. The mission of ASLA is to lead, educate, and participate in the careful stewardship, wise planning, and artful design of cultural and natural environments. In 2005 through coordination with the U.S. Green Building Council and others, the organization developed a voluntary, 250-point national rating system and set of performance benchmarks for sustainable landscapes in areas with or without buildings. The system fills the gap left by LEED (Leadership in Energy and Environmental Design) and addresses areas such as the use of re-developing brownfields, soil restoration, water conservation, use of recycled materials and native vegetation, and sustainable construction and land maintenance approaches. More information about the ASLA is available at www.asla.org.

Panel members spoke individually about the ways that the organizations represented could work together to advance sustainable remediation. In their responses, all panelists mentioned the overlap in the missions of all organizations represented and the similar themes present in their work. All panelists also seemed to agree that continuing to develop and collect best management practices and share lessons learned would help the organizations collectively reach a more common theme.

Discussions among panelists and participants were lively and are summarized below.

- Communication
  One participant asked panelists how to broadcast a consistent message with all of the different sustainable remediation tools and guidance available. Paul responded that each panelist's professional organization needs to decide the best tool or guidance for their organization. Currently, panelists' professional organizations do not have established linkages with each other; Paul suggested that SURF could help create more formalized linkages. Peter reflected on the lessons learned from his recent experience judging a

statewide engineering project award from a sustainability standpoint. He said that he questioned the project managers about how they achieved such high numeric scores for sustainability. According to Peter, the project managers said that they did not use a process and described the projects as developing from a "Eureka!" moment. Peter said that we are not yet approaching projects from a process or proscriptive approach and emphasized the importance of building intuitive knowledge by working with communities and sharing case studies.

- Process vs. Rating System
  One participant mentioned the ITRC's work, which found that implementation of sustainable remediation is site specific and, as such, is most influenced by the process and stakeholders. The participant believes that the challenge is the conversion factor and asked how one could account for a subjective conversion factor for a local entity. Paul acknowledged the challenge of this issue, especially for remediation projects which typically involve many variables. The participant suggested that, for remediation, the process should be emphasized rather than the rating system and everything should be evaluated in the context of site-specific challenges.
- Common Language vs. Common Narrative and Discussions
  One participant emphasized the importance of common language within the field of sustainable remediation. He asked if there is a way to shape our language so that processes (vs. results) are communicated, which may help during collaboration with regulators. Paul suggested international and U.S. SURF members convene to discuss the issue and form a consensus. Peter said that when ISI performed its benchmarking, there was uniformity in recognition for technically adequate solutions without adverse impact. The divergence occurred based on location and type of project. Based on these observations, Peter recommended building case studies so that people can get an intuitive feel at the project level. He does not think that SURF is ready for a lexicon yet. He acknowledged that sustainable remediation remains an immature field and recommended having a common narrative and common discussions.

Day 2

The second day of the meeting began with Paul Favara, 2011 SURF President, remarking on the organization's accomplishments over the last year. He reminded participants about the following three papers published by SURF and commended members on their work:

- *Framework for Integrating Sustainability into Remediation Projects*
- *Guidance for Performing Footprint Analyses and Life Cycle Assessments*
- *Metrics for Integrating Sustainability Evaluations into Remediation Projects*

Paul ended his remarks by encouraging members to participate in a technical initiative or committee, saying that participation is a great way to network and be on the leading edge of sustainable remediation thought.

Day 2 presentations and subsequent discussions are summarized in the subsections below. Attachments 11 through 16 contain the presentation slides for Day 2 of the meeting.

SURF Student Chapter Competition

Michelle Crimi (Clarkson University) presented a proposal for a SURF Student Chapter Competition to facilitate student education, research, and innovation in sustainable remediation. The competition would engage students in a remediation problem during which students would be expected to design sustainable solutions to the problem and present the solutions to remediation professionals. The remediation designs would be presented to a panel of judges, and awards would be distributed to one or more student chapters. Michelle provided an overview of how the competition aligns with SURF's mission and outlined the benefits to SURF and the remediation community. Presentation slides are provided in Attachment 11.

After the presentation, one participant asked about the background of the Clarkson University students participating in SURF. Michelle said that current SURF student chapter members are primarily undergraduate environmental engineering students and graduate environmental science and engineering students. To integrate a broader background of students, she suggested a course for the competition so that students who do not need design credits could receive credit for the course.

Based on discussions after the presentation, participants seemed to like the idea of a student chapter competition.

Environmental Management Systems and GSR: The Missing Link

Erica Becvar, Air Force Center for Engineering and the Environment (AFCEE), and Karin Holland (Haley & Aldrich) presented how the synergies between an environmental management system (EMS) and green and sustainable remediation (GSR) can be leveraged to increase the integration of sustainability elements in restoration projects. Presentation slides are provided in Attachment 12.

Karin began the presentation by providing an overview of the basics of an EMS and describing the relationship between an EMS and GSR. An EMS is a systematic and iterative process that involves the major steps of (1) plan, (2) do, (3) check, and (4) act (slide 4 in Attachment 12 details the activities involved in these steps). Karin described the mutual principles between an EMS and GSR, which includes identifying impacts, setting objectives and targets, implementing a sustainability program and associated training and communication, monitoring progress, taking corrective and preventative actions as necessary, and documenting results. Both an EMS and GSR align with the SURF mission and are embedded in SURF's technical initiatives, which are process based, systematic and iterative, holistic, collaborative, and transparent.

Erica continued the presentation by providing an overview of the Air Force's GSR initiative and the current barriers to institutionalizing GSR within the Air Force restoration program. She said that using an EMS helps to overcome some of these barriers by tracking metrics and providing language for GSR requirements in contracts. On the flip side, as an Air Force base is implementing its EMS, the sustainable benefits from the restoration program are not being integrated. Using specific activities as examples, Erica explained how the benefits of GSR can, through an EMS, contribute to an Air Force base's effort to reduce or eliminate environmental impacts and achieve the base's sustainability goals. She ended the presentation by recommending that participants incorporate GSR into their organization's EMS so that GSR will become institutionalized, contribute to global sustainability goals, promote innovation in other areas, and achieve whole system sustainability.

Discussions were brief and focused on the role of the contractor in the process. Erica said that activities performed by contractors on Air Force bases are legally required to be conducted in accordance with Air Force environmental policy, base-managed aspects, and within the context of the base's EMS. In this way and specifically for GSR, contractors can contribute to meeting a sustainability goal (e.g., 20% water reduction) by way of the base's EMS.

Adaptation Planning at the Port of San Diego

Cody Hooven (Port of San Diego) presented the Port's efforts in managing risks related to climate change. With long planning horizons (i.e., 2050-2100), Cody emphasized the need for multi-jurisdictional cooperation to achieve the following five milestones: (1) conduct vulnerability assessment and prioritize actions, (2) adopt climate mitigation and adaptation plan, (3) implement strategies, and (4) measure progress and evaluate the plan. She said that vulnerabilities have been assessed, and results show flooding from sea level rise as the primary vulnerability for the Port. As a result, sea level rise was assessed quantitatively through GIS analysis, and impacts to land use, stormwater, and natural resources were identified. Using local models and state guidance, the predicted sea level rise was determined, and the risk and consequences of flooding in relation to Port operations were identified. More information about the Port's efforts is available at http://www.portofsandiego.org/climate-mitigation-and-adaptation-plan.html.

Cody also described a regional effort, which involves the development of a sea level rise adaptation strategy for San Diego Bay. The regional strategy provides a broad analysis of vulnerabilities and recommends 10 actions to build the resilience of community assets. Additional information about the regional strategy is available at http://www.icleiusa.org/climate_and_energy/ Climate_Adaptation_Guidance/san-diego-bay-sea-level-rise-adaptation-strategy-1/san-diego-bay-sea-level-rise-adaptation-strategy. Cody ended her presentation by listing the remediation sites that may be affected by flooding as a result of sea level rise. Presentation slides are provided in Attachment 13.

Discussions focused on the specifics of the expected sea level rise and the progress of other ports in California in relation to this issue. Cody said that the sea level is expected to rise 18 inches by 2050, but local mean sea levels and storm events could increase this number. In addition, she said that the Ports of Los Angeles and San Francisco are also beginning to look at the importance of sea level rise.

SURF 2012 Elections

Elections for expired SURF Board and At-Large positions were held in January; results were announced at the meeting as follows:

- President: Karin Holland, Haley & Aldrich
- Vice President: Nick Garson, The Boeing Company
- Secretary: Karina Tipton, Brown and Caldwell
- At-Large Members
  - Angela Fisher, GE Global Research
  - Stewart Abrams, Langan Engineering and Environmental Services

- Mike Miller, CDM Smith

The following individuals will continue to support SURF until their terms expire:

- Treasurer: Brandt Butler, URS Corporation
- At-Large Members
  - Curt Stanley, Shell Global Solutions
  - Dan Watts, New Jersey Institute of Technology (retired)
- Past President: Paul Favara, CH2M HILL

Greenwashing, Green Puffing, and the Green Sheen—What to Avoid

Ann Marie Mortimer (Hunton & Williams) presented an overview of greenwashing and highlighted the Federal Trade Commission (FTC) guidance on advertising as it relates to this issue. Ann Marie began her presentation by describing greenwashing as any type of consumer-facing communication that inflates the benefits of an act, product, or practice. She encouraged participants to watch the film available at http://www.thegreenwashersfilm.com/about.html to learn more about the basics of greenwashing. Through references and statistics, Ann Marie highlighted the disconnect between sustainability reporting and public confidence in reporting. She believes the public's push for transparency and the FTC's guidance on advertising has helped to highlight the need for meaningful metrics to avoid the risks of greenwashing. The FTC's guidance addresses consumer perception and substantiation. Ann Marie encouraged participants to think more broadly than products and emphasized that greenwashing can apply to a statement made about an act, a product, or a company. Because litigation related to sustainability reports and exaggeration has increased, Ann Marie recommended the following:

- Review all public statements related to any green claims, including related to sustainability and global climate change for accuracy, balance, and fairness.
- Conduct a thorough audit and risk assessment of the accuracy of what is said and omitted from sustainability statements or other green representations.
- Review hard metrics and promised goals for achievability (i.e., don't over-promise).
- Centralize sustainability communications outside of the public relations department.

She ended her presentation by listing the following "don'ts" to avoid greenwashing: don't be vague; don't make claims based on hidden tradeoffs; don't make claims based on the "lesser of two evils;" don't rely on faulty, isolated, or suspect data; and don't exaggerate, guess, or outright fib. Presentation slides are provided in Attachment 14.

Discussions focused on the different certifications available and their varying meaningfulness and reliability. Although the third-party requirement of certification is evolving and cottage industries are being created to address the issue, Ann Marie believes that the degree of reliance and competence varies greatly.

Sustainable Infrastructure and Rating Systems

Peter Binney (ISI) presented a sustainable infrastructure rating system (envision™) that provides a framework for evaluating and rating the community, environmental, and economic benefits of infrastructure projects. The system was developed collaboratively through the Zofnass Program for Sustainable Infrastructure at the Harvard Graduate School of Design and ISI and assesses infrastructure in the areas of energy, water, waste, transportation, landscape, and information. The goal of the rating system is to allow an individual to be credentialed as a professional with a higher level of knowledge regarding sustainability or allow a project to be acknowledged for exceptional sustainability performance. Peter provided an overview of the architecture of the web-based tool, which includes a matrix evaluation of different aspects associated with quality of life, leadership, resource allocation, natural world, and climate and risk. Sixty criteria reflecting triple bottom line attributes are used in the evaluation to determine performance (i.e., improved, enhanced, superior, conserving, and restorative). Peter demonstrated how the tool is used through computer screenshots. The tool is currently being beta tested in the marketplace; Peter encouraged participants to use the tool, test it, and provide feedback. More information about the tool is available at www.sustainableinfrastructure.org. Presentation slides are provided in Attachment 15.

Participants seemed interested in the tool and asked the following questions:

- Use in Project Planning Phase
  One participant asked if the tool could be used before the design phase of a project. Peter replied yes and said that it is during the planning phase that the tool can be used most effectively (e.g., working with community).
- Challenge of Scale
  One participant asked about the effectiveness of using the tool to score smaller projects. Peter said that the tool has built-in flexibility to allow specific project areas to be eliminated, thereby customizing the process to site-specific considerations.
- Worker Safety
  In response to a question from one participant, Peter said that worker safety is included in the quality of life section of the tool.
- Investment Needed
  One participant asked about the investment needed to become certified. Peter said that individuals obtaining certification must have a Bachelor's degree and three years of professional experience or the equivalent. Candidates must take a 75-question exam that involves general sustainability questions, specific sustainability questions, and questions about the mechanics of the tool itself. After December 2013, a written and oral exam will be necessary.

Committee and Initiative Breakout Sessions

SURF members continue to work on efforts that will further the mission of the organization. At this meeting, breakout sessions were held for the following committees and technical initiatives: Academic Outreach, Integration of Sustainable Remediation and Sustainable Re-Development, and Communications and Outreach. Members can access the latest work and activities of these groups by visiting the Collaboration Area under the Member Resources menu on the SURF web site. Members interested in joining an initiative or committee should contact the group's leader, which is provided at http://www.sustainableremediation.org/committees/.

- Academic Outreach
  This group met to discuss the SURF Student Paper Competition at Battelle in 2012, academic contact database, a proposed SURF academic outreach newsletter, webinars, hot research topics, and a value proposition for academics. Presentation slides are provided in Attachment 16.
- Integration of Sustainable Remediation and Sustainable Re-Development
  This group met to discuss their work on a perspective paper that will be published later this year describing the initiative and its importance. Following the release of the paper, the group plans to provide guidance for practitioners to better integrate sustainability iteratively throughout the remediation and re-development process. This guidance might be in the form of workshops, a longer paper, or webinars.
- Communications and Outreach
  This group met to map the synergies and partnerships that currently exist within SURF membership. A list of professional organizations will be created as a means of building membership. The group is considering developing a webinar highlighting sustainable remediation case studies, with a potential webinar geared specifically for the regulatory community. Presentation slides are provided in Attachment 16.

During one of the breakout sessions, one participant suggested a new technical initiative aimed at voluntary industry reporting of green and sustainable remediation in overall sustainability reporting.

Day 3

At the beginning of Day 3, participants shared their "a-ha" moments from the first two meeting days. Responses are listed in Attachment 17.

Day 3 presentations and subsequent discussions are summarized in the subsections below. Attachments 18 through 25 contain the presentation slides for Day 3 of the meeting.

Sustainable Application to Full-Scale Remediation Results in Water Conservation

Patrick Keddington (Haley & Aldrich) presented a case study involving the integration of sustainability elements into the design of a groundwater pump-and-treat system at a site in Huntington Beach, California. Patrick acknowledged the unsustainable aspects associated with pump-and-treat systems in general and explained that, based on site-specific conditions, pump and treat was identified as the preferred remedial approach. Based on feasibility testing, water conservation was identified as a priority for integration into the system design. Patrick presented the solutions implemented to meet the remedial sustainable objectives, which highlighted the flexibility within the design to adjust for long-term changes and potential future beneficial reuses for water. He ended his presentation by reviewing the economic, environmental, and social benefits associated with the design, such as the offset in capital investment within three to five years, the reduction in greenhouse gas emissions by 110 metric tons per year, the decrease in net demand of water by about 80,400 gallons per day, and the approximate 50% reduction in dependence on local water resources. Presentation slides are provided in Attachment 18.

After the presentation, participants asked questions about the analysis of reused water and the additional time needed to include sustainability aspects in the design. Patrick said that water reused on-site was analyzed for tentatively identified compounds, among other constituents. He said that planning and working with the agencies involved took a couple of months.

Cinderella Story: The Rags to Riches Tale of a California State Park

Maile Smith (Northgate Environmental Management) presented a case study that involves restoration of a tidal marsh habitat and creation of recreation areas and an educational center at a California state park. The project is being implemented iteratively in three phases, with the first phase involving wetland restoration completed in just five months. Although the general plan for restoration of the natural areas of the park was developed in 1987 before the buzzword of "sustainability" was prevalent, the plan language fits into the narrative of a Tier 1 sustainability assessment. Restoring the 12-acre tidal wetland habitat included removing and sequestering contaminated soil and debris, removing invasive species, and restoring habitat diversity. The Tier 1 assessment of this phase included a qualitative evaluation of construction traffic-related air quality and noise impacts, stakeholder acceptance, and time to project completion and returning the site to productive use. Maile described the project as a stakeholder success story. All plant material was grown by environmental education students, who will continue planting 40,000 shrubs in the area over the next few years. The project is generating jobs for local businesses and providing learning opportunities for volunteers and youth groups. Most of the funding does not originate with the responsible party and, as such, funding and approvals require the collaboration of government agencies, regulators, philanthropists, foundations, and community groups. In addition, the project served as a catalyst for additional recreational and open space projects in the area. Presentation slides are provided in Attachment 19.

Discussions focused on the collaborative decision making necessary for project success. Maile said that community groups funneled key issues and concerns through one stakeholder group. She commended the California Parks Foundation in delivering timely, factual information about the project. Maile acknowledged that the project was an easy sell to the local community.

Sustainable Remediation Rating Initiative

Dick Raymond (Terra Systems) presented an update on this new initiative, which is aimed at determining if an adequate business case exists for developing and applying a site rating and professional certification system for sustainable remediation. Dick said that the group has begun investigating the Institute for Sustainable Infrastructure's envision™ tool (see Attachment 15 for details). Three site owners and one consulting/contracting firm have agreed to try the tool. Based on their feedback, the group will determine if SURF can dovetail sustainable remediation into the tool and, if so, will submit a proposal to the SURF Board of Trustees to establish an alliance with the Institute. Presentation slides are provided in Attachment 20.

Discussions focused on the importance of this information and the difference between the envision™ tool and other sustainable remediation tools already available. Dick agreed with one participant who stressed the need to share envision™ tool information with members of the ASTM team working on green and sustainable remediation standards. He explained that sustainable remediation tools currently available (e.g., SiteWise™, SRT™) filled a need at a time when remediation practitioners were using Microsoft Excel® calculators to perform sustainability assessments, but said that the scope of the envision™ tool is broader than the environmental aspects in which existing tools focus.

Schedule and Regulatory Effects on Project Sustainability

Christopher Gale (Geosyntec Consultants) presented a case study involving a sustainability assessment of a selected remedy and alternate remedies at a chlorinated solvent site in Lynwood, California. The schedule constraints associated with the project, which were driven by legal issues, required consideration of fast-acting technologies for cleanup. Sustainability assessments were performed using the SRT™ to determine the most effective technology or combination of technologies at the site. Assessment results showed that, in general, enhanced in situ bioremediation is more sustainable for treating groundwater impacts than electrical resistance heating and soil vapor extraction. Because of the accelerated schedule for cleanup at this site, electrical resistance heating was used to treat contaminants in the source zone. A combination of soil vapor extraction and enhanced in situ bioremediation were selected as the remedy for treatment of the plume. Without the rapid schedule required at this site, the selected remedy would have been a combination of soil vapor extraction and enhanced in situ bioremediation for the source area and plume. Christopher said that although the project traded sustainability for achieving remediation on a faster schedule, the increase in "cost" remains less than other technologies. He ended his presentation by providing insights gained while using the SRT™ for this project. Presentation slides are provided in Attachment 21.

Discussions focused on the sustainability of the project despite the accelerated schedule and the comparison of sustainable remediation assessment tools. One participant mentioned that accelerating a cleanup project because of a time constraint does not make the project unsustainable. In fact, it allows the development of the site for future use, which is sustainable. Another participant agreed, saying that the project might not be the greenest case study, but it is sustainable. She commended Christopher for presenting a case study that showed constraints.

Brainstorming Session

SURF's Past President, Paul Favara, and SURF's President, Karin Holland, led participants in a brainstorming session to answer the following questions:

- What should SURF do differently?
- What should SURF actually do?

Responses are provided in Attachment 22.

Incorporating Sustainable Development Principles

Jonathan Smith (Shell Global Solutions) presented how his company incorporates sustainable development principles into soil and groundwater projects. Jonathan provided a brief overview about Shell and its commitment to sustainable development. He said that sustainable remediation efforts within the company are consistent with those of the company's existing Soil and Groundwater Policy and Advocacy Team. The vision of this team includes "protecting the environment through sustainable, risk-based approaches." Shell is implementing its sustainable remediation efforts through this program, which defines sustainable remediation using all three aspects of the triple bottom line (i.e., environmental, economic, social). Sustainability is incorporated into remediation projects in a tiered approach. While describing the tiers, Jonathan emphasized the need to "keep it simple," stating that Tier 3 sustainable remediation assessments are only necessary for large and complex projects. Shell is following the advice of SuRF-UK, which recommends to "…use the simplest tier that produces a robust management decision." Jonathan ended his presentation by saying that sustainable remediation supplements (vs. replaces) the existing risk-based approach to remediation challenges within the company. Presentation slides are provided in Attachment 23.

After the presentation, one participant commended Shell for including the protection of human health under the social aspects of sustainability. In response to another question, Jonathan said that flexibility is built into the program to allow the use of new guidance and tools as they evolve.

Sustainability Evaluation of a Pump-and-Treat Remedy

Assaf Rees (AECOM) presented a sustainability evaluation of a pump-and-treat remedy using the AFCEE tools SRT™ and CleanSWEEP (Clean Solar and Wind Energy in Environmental Programs). The evaluation was performed in the remedial design phase to achieve the following:

- Refine the design to reduce the environmental footprint.
- Evaluate the potential use and reuse of treated water.
- Identify best management practices for construction and operations, maintenance, and monitoring.
- Obtain a baseline footprint calculation for future remediation process optimization.
- Compare the environmental footprints of effluent discharge options.

Assaf provided an overview of the site-selected remedy and showed how improving the site conceptual model refined the remedy and reduced the uncertainty during remediation implementation. He introduced SRT™ and used computer screenshots to show the development of metrics for this project. Assaf showed a comparison of three effluent discharge options. SRT™ results show that 100% discharge to the storm drain minimizes the environmental impacts of the groundwater remedy and that future process optimization should focus on the advanced oxidation process treatment module (i.e., ultraviolet light and hydrogen peroxide).

CleanSWEEP, a new Microsoft Excel-based tool developed by the AFCEE, assesses the potential to switch from nonrenewable energy to renewable energy to power remediation systems. It also evaluates the potential of using renewable energy based on a site's location away from the power grid. Through computer screenshots, Assaf showed how this tool was used to compare obtaining 100% vs. 50% energy from renewable sources. Assaf ended his presentation by promoting the tools available as a way to help meet the current demand for green and sustainable evaluations. Presentation slides are provided in Attachment 24.

Discussions were long and lively and are summarized below.

- Sanitary Sewer Discharges
  One participant cited a December 2000 USEPA report (EPA 600/r_01/034) that indicated significant sanitary sewer leakage back into the environment. He reminded participants to be cautious of sanitary sewer disposal.

- Credits and Footprints
  One participant suggested that Assaf take a credit for avoiding emissions as part of the green remedy and remove the anticipated emissions from the environmental footprint.
- Green vs. Sustainable
  One participant questioned whether the evaluation presented was green or sustainable. He said that if the reuse of the site does not change, the project is green remediation because of the lack of social elements. Another participant disagreed, saying that safety elements are included in the social aspects of sustainability.
- Metrics
  One participant expressed concern that a predetermined basket of metrics has been developed that address parameters such as carbon reduction and energy reduction. He believes that consensus has not been reached on the indicators that need to be developed. If evaluation tools are used merely because they are available, key elements may be missed in the process. Another participant disagreed and emphasized the weighting of parameters as the key to a successful evaluation. He said that the tool helps perform the evaluation, but believes that *how* the results are used based on site-specific elements is paramount.

Brown to Green: Returning Contaminated Property to Productive Use

Dave Laney (SCS Engineers) presented a case study in which green and sustainable remediation technologies were used at a brownfield site, resulting in new, productive, and green uses for the site. The site is a creosote pit located in Flagstaff, Arizona. Because of a required three-month completion schedule, the preferred remedy was excavation and disposal off-site, backfilling with native soil, and vegetation with a native seed mix. Dave explained the process of requesting proposals for green remediation that were consistent with the USEPA's *Principles for Greener Cleanups* (2009) and included best management practices. The request for proposal allowed contractors to select their own approach, which led to innovation. Dave outlined the benefits of the use of green remediation, which ranged from reducing miles driven, fresh water use, and raw material use to creating a positive image of the City of Flagstaff. The City is refining the re-development plan for the site and adjacent property to include an urban trial, construction of commercial and retail buildings, bus transfer facilities, and an open air retail space. Presentation slides are provided in Attachment 25.

After the presentation, one participant commented that this case study is the best example of best management practices that he has seen. One participant asked for details about the number and responses of contractors to the request for proposal. Dave said that four to six contractors bid on the job and all seemed comfortable with the idea of green remediation. Some already had experience in the field. One participant suggested that SURF engage contractors more often in its meetings.

Future Meetings

Future SURF meetings are listed below. Information regarding the details of the meetings is posted on the SURF web site. If you are a SURF member and would like to help plan or host an upcoming meeting, contact Mike Rominger (meeting facilitator) (see Attachment 1 for contact information).

- SURF 20: July 24-26, 2012, Colorado State University, Fort Collins, Colorado
- SURF 21: December 12-13, 2012, National Academy of Science, Washington, DC

ATTACHMENTS

Attachment 1
SURF 19 Participant Contact Information

SURF 19 Participant Contact Information

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Attachment 2
Opening Keynote Address

Sustainably Remediation Forum
at UC San Diego
January 31, 2012

David S. Woodruff
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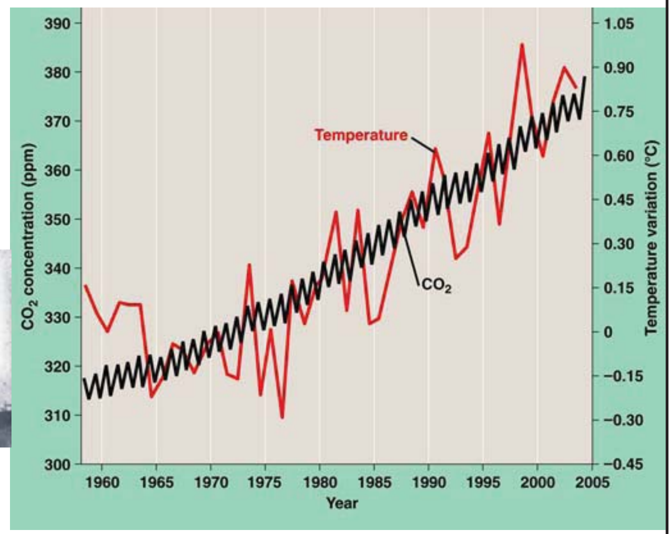
Sustainability Solutions Institute for interdepartmental research, education, outreach and campus-as-a-test-bed activities in environmental sustainability.

Roger Revelle (1909 – 1991)

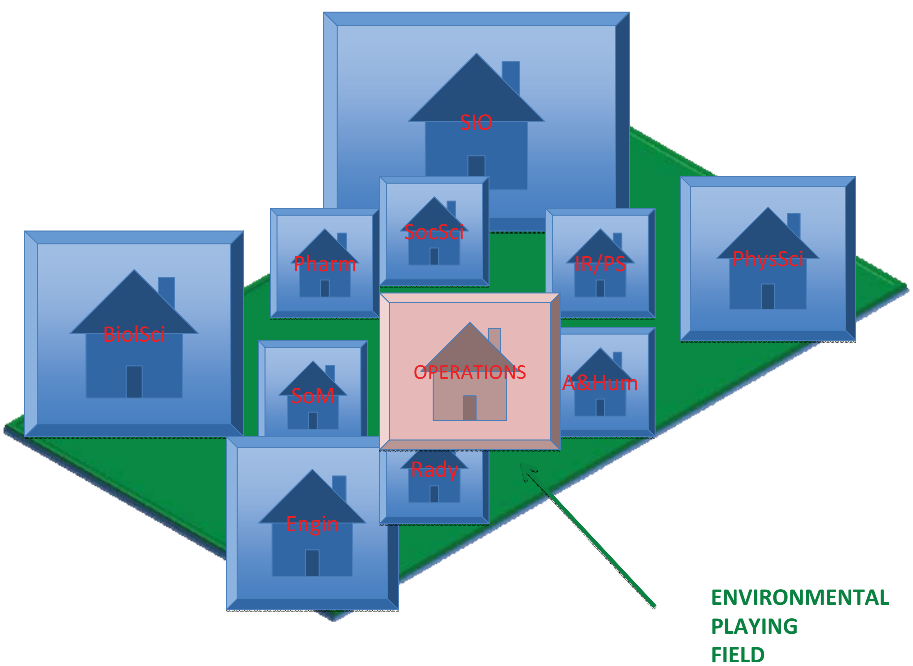
Oh, the things we can do! Change atmosphere…

Keeling Curve

1958 - 2005



CO_2: 2/3 from fossil fuels and 1/3 from deforestation



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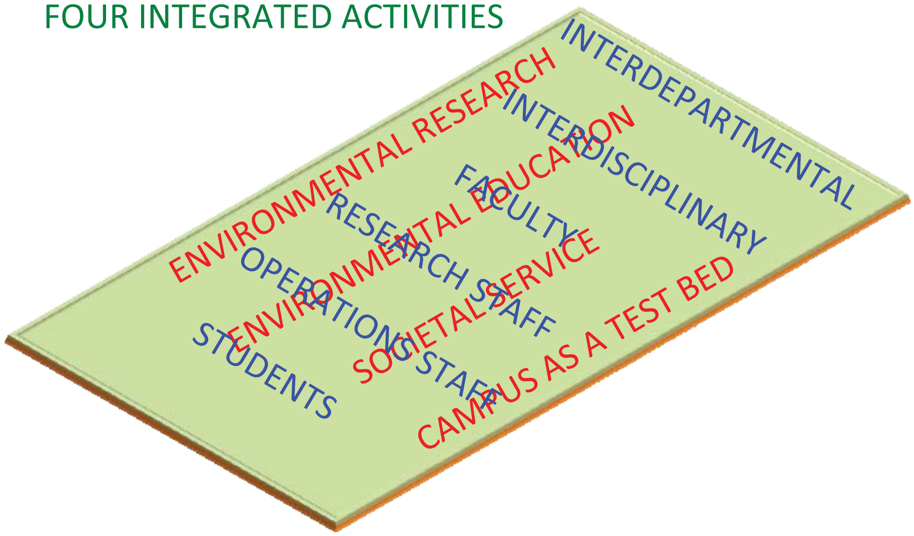
BIODIVERSITY
TRANSPORTATION
ATMOSPHERE
SEA LEVELS
ECOLOGICAL SERVICES
CAMPUS OPERATIONS
BUILT ENVIRONMENT
ECOREFUGEES
RENEWABLE ENERGY

FOUR INTEGRATED ACTIVITIES

ENVIRONMENTAL RESEARCH
ENVIRONMENTAL EDUCATION
SOCIETAL SERVICE
CAMPUS AS A TEST BED

FOUR INTEGRATED ACTIVITIES

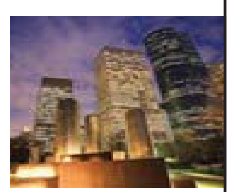


Sustainability Resources Center

Sustainability Solutions Institute

Current Projects

- Saving the Venice lagoon
- Natural ventilation of commercial buildings
- Algal and bacterial fuels
- Renewable energy generation/storage



- Water conservation (campus to global)
- Pacific Rim Universities' Sustainability & Climate Change workgroup

- Greenovation Forums
- Terrestrial carbon accounting
- Campus Climate Action Plan

THE CAMPUS AS A LIVING LABORATORY FOR SUSTAINABILITY SOLUTIONS

Campus Quick Facts

With a daily population of over 45,000, UC San Diego is the size and complexity of a small city.

UC San Diego Operates a 42 MWpeak Microgrid

13 million sq. ft. of buildings

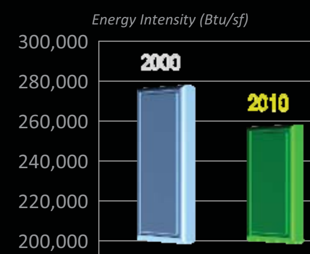
Self generate 80% of annual demand

- 30 MW natural gas Cogen plant
- 2.8 MW of Fuel Cells
- 1.2 MW of Solar PV installed, additional 2 MW

Energy Efficiency

Continue to be a Leader in Carbon Reduction and Energy Efficiency

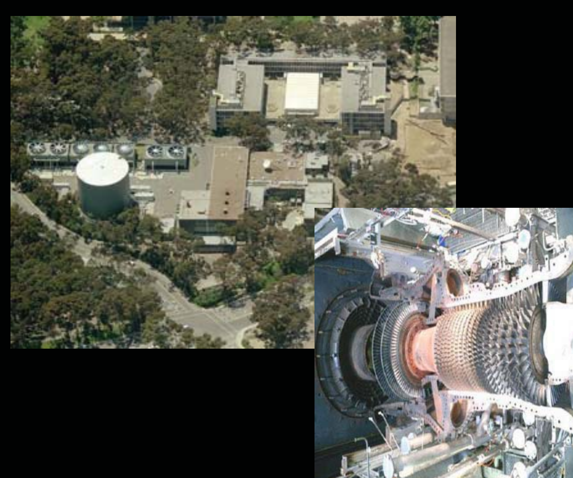
Completed $60M in energy retrofits reducing energy use by 20% or 50M kWh/yr, saving UCSD $12M / year



Cogeneration

Central Utility Plant cogenerates 80% of campus power

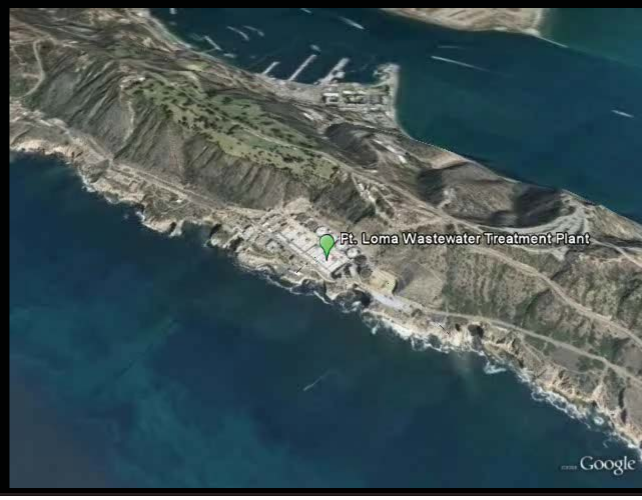
- 30 MW capacity,
- 2 natural gas and 1 steam turbine
- Reduces annual electric costs by $8M.



Deploying Fuel Cells

2.8 megawatt methane powered Fuel Cell completed Fall 2011

Waste Methane provides an economic, renewable energy resource with a net CO_2 reduction



Deploying Solar Power

- Become one of the Leading University Sites in the World for Solar Energy
- We used 3rd party ownership to install first 1.2MWs of PV
- Currently installing 830 kW of campus owned PV at 5 sites.




Advanced Energy Storage

UCSD's goal is to shift 20% of its load from on-peak to off- peak periods by 2011

A 3.8M gallon Thermal Energy Storage already shifts 14% of our load daily

installation of 11.2 MWh of Energy Storage for UCSD's renewable energy production

Applying Green Building Practices

UCSD will achieve a *minimum* of LEED Silver on all new construction and renovation projects

UCSD has 5 LEED certified buildings (100,000 SF), 24 more projects in progress:

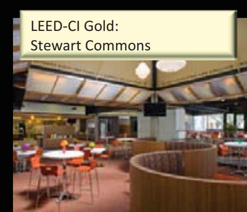
- 18 LEED-NC
- 3 LEED-EBOM
- 3 LEED-CI

LEED-EB Silver:
Campus Services Complex

LEED-NC Certified:
Scripps Seaside Forum

LEED-CI Gold:
Mesa Childhood Center

LEED-CI Gold:
Stewart Commons



Environmentally Preferable Purchasing

Require Environmentally Preferable Purchasing for all campus supplies and services to reduce effect on human health and the environment.

- E-procurement system w/ paperless processes
- Energy Star Rating for all electronics
- Consolidated shipments to minimize packaging
- Specify Green Seal cleaning products when possible

Recycling & Waste Diversion

UCSD will achieve 75% waste diversion by 2012 and zero-waste by 2020.

- All compostable utensils in restaurants
- 75% diversion of all construction waste
- Fleet recycles all tires, batteries and oil

Zero Waste campus by 2020

Alternative Transportation

a cost effective strategy for purchasing the cleanest and most efficient vehicles reasonably available

- 300 electric carts
- 60 hybrid vehicles
- 5 Nissan Leafs
- B20 Biodiesel
- 13 CNG vehicles
- UCSD Fleet one of greenest in country

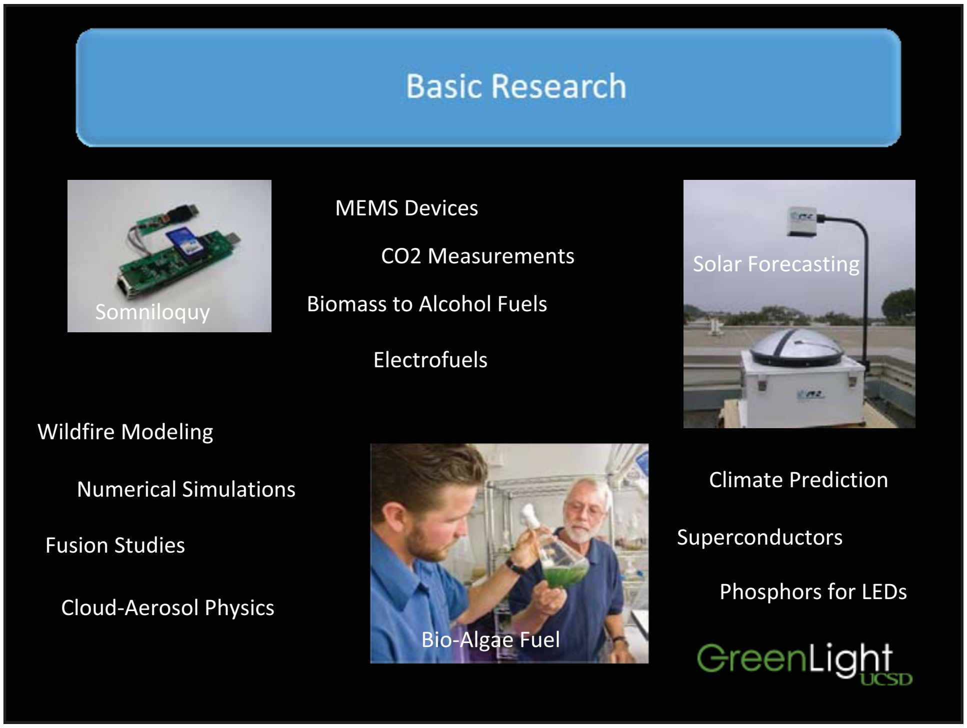



Student Involvement

Students are integral to the Sustainability process

- Research
- Operations
- Project Internships



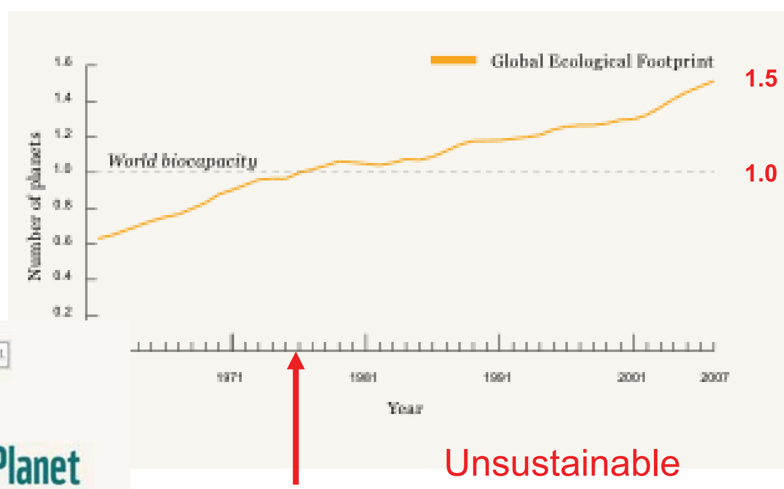

Basic Research
Somniloquy
MEMS Devices
CO2 Measurements
Biomass to Alcohol Fuels
Electrofuels
Solar Forecasting
Wildfire Modeling
Numerical Simulations
Fusion Studies
Cloud-Aerosol Physics
Bio-Algae Fuel
Climate Prediction
Superconductors
Phosphors for LEDs
GreenLight UCSD

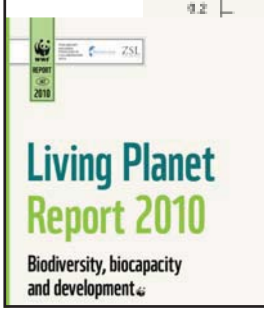

Partnership Support is Essential
ecotality NORTH AMERICA
ecomagination
Sullivan Solar Power
Leading the Solar Energy Revolution
SANYO
viridityenergy
Center for Sustainable Energy CALIFORNIA
Sapphire Energy
POWER ANALYTICS
Soitec
OSIsoft.
BERKELEY LAB
climate savers smart computing
Climate Registry
FuelCell Energy
BORREGO SOLAR
cisco
NSF
SDGE
Sempra Energy
WELLS FARGO
NATIONAL INSTITUTES OF HEALTH
the green grid
EPRI ELECTRIC POWER RESEARCH INSTITUTE
envision solar
QUALCOMM
Chicago Climate Exchange
Sun microsystems
CLEAN TECH San Diego
SAN DIEGO STATE UNIVERSITY

Living the ecological lie:

ghost acreage supports an unsustainable lifestyle and diminishes the future for those living in areas from which the resources are taken

Humanity's ecological footprint 1961 – 2007





Unsustainable ecological overshoot

www.footprintnetwork.org

One species has irrupted on the planet
A species that sought to control nature

State of the World

Forests, wetlands, mangroves all half gone
grasslands 70% degraded

Lakes acidified, water contaminated

Oceans polluted, overharvested, turning sour

Coral reefs 40% degraded

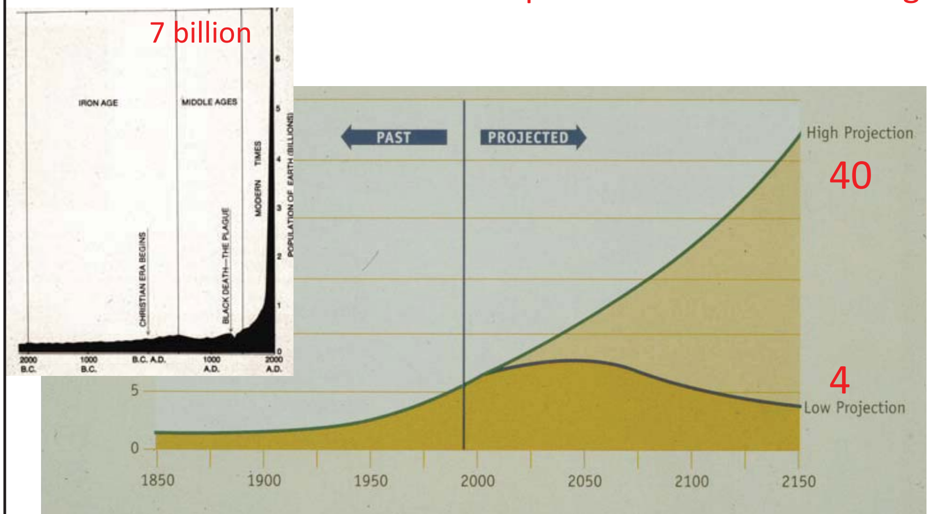
Atmosphere warming 2–3°C

Ecosystem services threatened

Biodiversity: onset of the sixth great mass extinction
Half the big animals will be gone in the next few hundred years

FIVE REASONS FOR HOPE

1st reason for hope: Growth rate declining

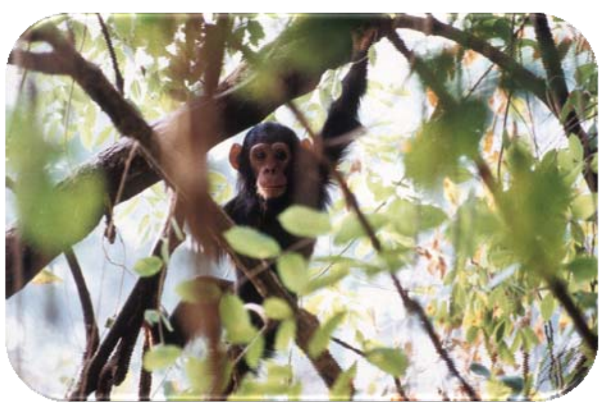


Future dependent on population projections

Second reason for hope: Changing paradigms

3rd reason for hope: Conservation ethics

Fourth reason for hope: an improved understanding of what it means to be human



The biodiversity crisis brings into clear relief the paradox of human existence

Sustainability & stewardship
require transformational changes in human societies

Bioneering – the interventive genetic and ecological management of species, communities and ecosystems in a post-natural world

Our futures depend on human numbers
and resource use
and climate change
AND REMEDIATION

WELCOME TO THE ANTHROPOCENE

Sustainability is not just about mitigation or adaptation

it is about the greatest societal transformation humans have ever experienced let alone orchestrated.

Resilient People, Resilient Planet: ***A future worth choosing***
The report of the UN Secretary-General's High-level Panel on Global Sustainability
2012

C. Creating employment opportunities

79. As the economy becomes greener, however, there is huge scope for generating decent jobs in sectors that contribute to maintaining or restoring the environment, from renewable energy and retrofitting energy-efficient technologies into the built environment to sustainable waste management and **environmental remediation**. The global environmental goods and services sector is expected to be worth up to $800 billion by 2015.

Attachment 3
Sustainable Remediation – What is it?

Sustainable Remediation
What is it?

David E. Ellis, Ph.D.
DuPont Corporate Remediation Group

SURF
January 31, 2012

The significant problems we face cannot be solved at the same level of thinking we were at when we created them.
Albert Einstein

Why Are We Here?

To better protect human health and the environment

Because remediation programs cost too much and don't perform

Because remediation can do real environmental damage

Because we can and should make better decisions

Remediation Today

When Will Remediation Be Done?

What is Sustainable Remediation?

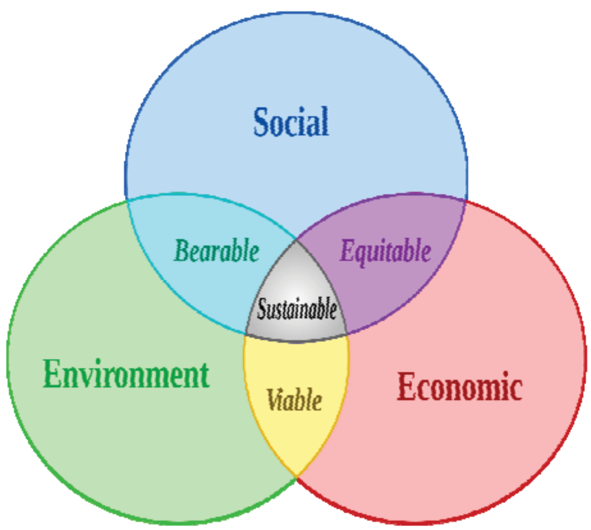
SURF:

"Sustainable remediation is broadly defined as a remedy or combination of remedies whose net benefit on human health and the environment is maximized through the judicious use of limited resources"

UK EA & SURF UK:

"The practice of demonstrating, in terms of environmental, economic and social indicators, that the benefit of undertaking remediation is greater than its impact and that the optimum remediation solution is selected through the use of a balanced decision-making process"

Sustainable Remediation



International Sustainable Remediation

United Kingdom***	**United States****
Brazil*	**Australia***
NICOLE*	**Canada***
Italy	**Netherlands**
EU Common Forum	**Austria**
China	**France**
Japan	

Sustainable Remediation Principles

In fulfilling our obligation to remediate sites to be protective of human health and the environment we will embrace sustainable approaches to remediation that provide a net benefit to the environment.

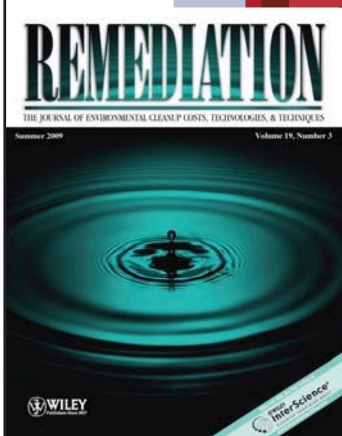
To the extent possible, our approaches will:

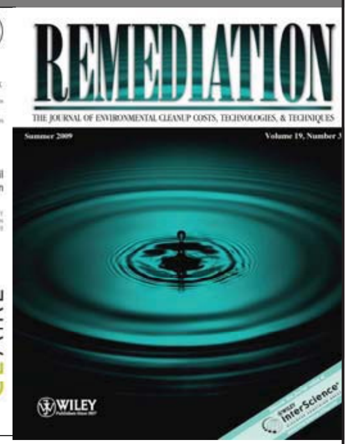
- Minimize or eliminate energy consumption or the consumption of other natural resources
- Reduce or eliminate releases to the environment, especially to the air
- Harness or mimic a natural process
- Result in the reuse or recycling of land or otherwise undesirable materials
- Encourage the use of remedial technologies that permanently destroy contaminants

What Do The US Regulations Say?

Green Remediation

Sustainable Remediation Recent Progress





SURF:
Sustainable Remediation Special Issue

SURF UK & EA:
Sustainable Remediation Framework

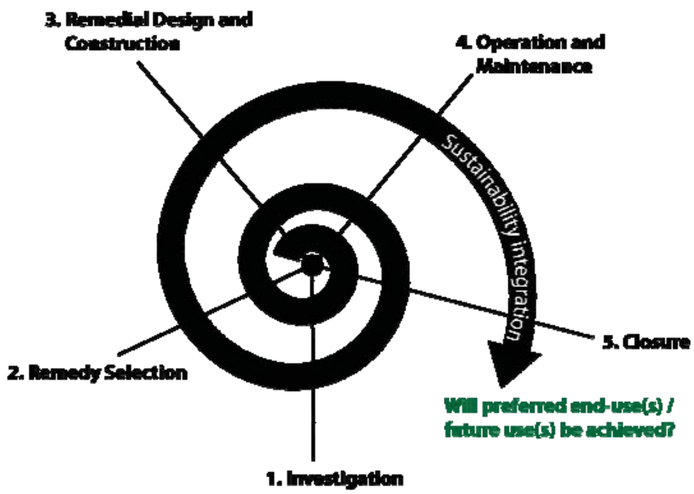
SURF:
Sustainable Remediation Framework

Where Are We Heading?

To remediation that provides a net environmental benefit

To more efficient and effective remediation

Sustainable Remediation Frameworks



SURF UK Regulatory Framework

Possible sustainable remediation indicator categories

Environmental	Social	Economic
1. Impacts on air (including climate change; 2. Impacts on soil; 3. Impacts on water; 4. Impacts on ecology; 5. Use of natural resources and generation of wastes; 6. Intrusiveness.	1. Impacts on human health and safety; 2. Ethical and equity considerations; 3. Impacts on neighbourhoods or regions; 4. Community involvement and satisfaction; 5. Compliance with policy objectives and strategies; 6. Uncertainty and evidence.	1. Direct economic costs and benefits; 2. Indirect economic costs and benefits; 3. Employment and capital gain; 4. Gearing; 5. Life-span and 'project risks'; 6. Project flexibility.

(Courtesy of SURF UK)

15

Worker Safety Matters

16

Unsustainable Remediation

(Courtesy of SuRF UK)

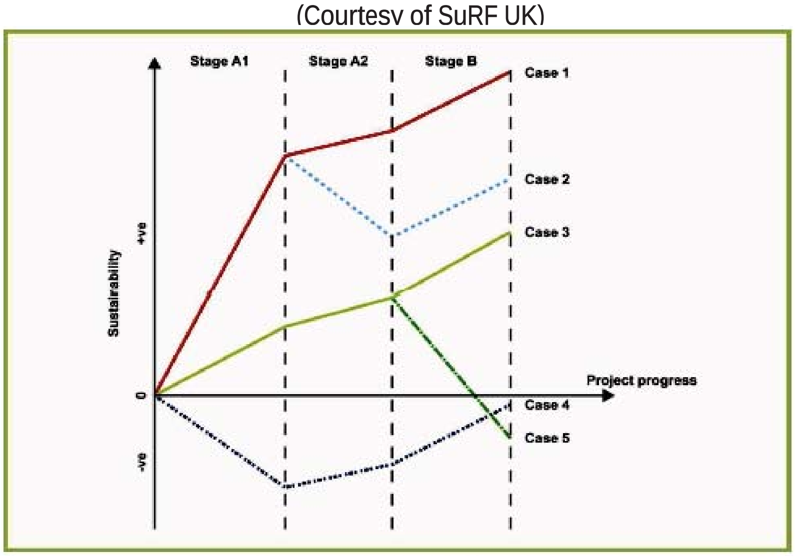


Figure 3.3: Illustrative effect of decisions made at different stages on overall sustainability of brownfield regeneration.

REMEMBER:
Sustainable Remediation Is Still Being Refined

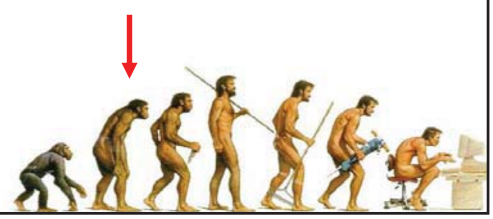
Common Myths About Sustainable Remediation

- **The analysis is expensive**
- **The analysis takes a lot of extra time**
- **You spend a lot more on the remediation**
- **It is all about CO_2**

19

Sustainable Remediation Observations

- **Only remedies that are fully protective of human health and the environment should be considered.**
- **Considering all three sustainability aspects changes our thought process. It's not just about carbon!**
- **Sustainability is important throughout the entire restoration process.**
- **Cooperation is essential.**
- **Things are evolving.**



20

Discussion

"If you don't know where you are going, you might end up someplace else"

Yogi Berra

Attachment 4
Shedding Light on Environmental Health Assessment

Shedding light on environmental health assessment

Dimitri D. Deheyn
University of California, San Diego
Scripps Institution of Oceanography

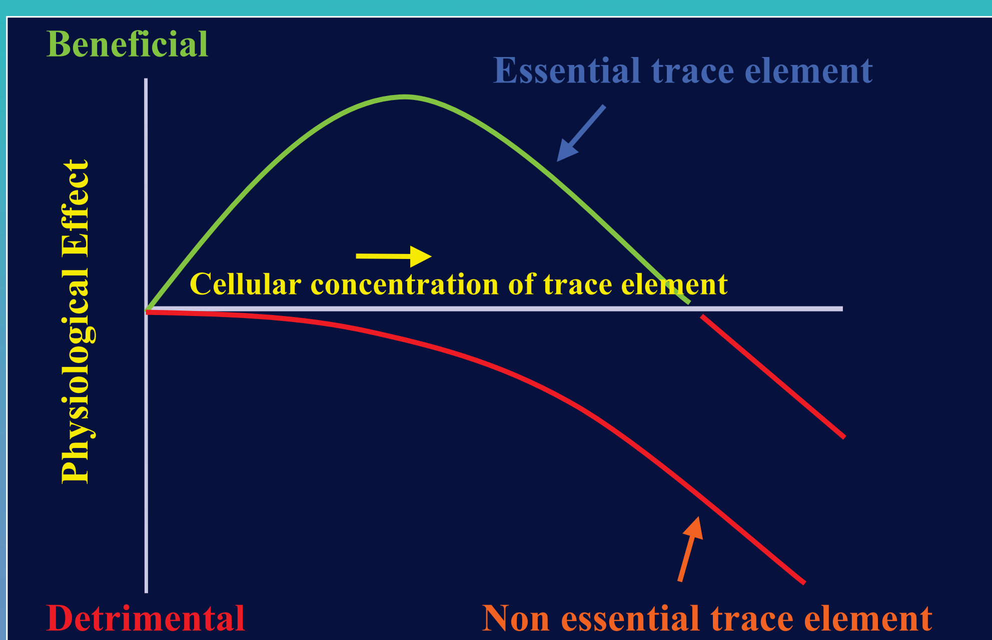
ddeheyn@ucsd.edu

Sustainable Remediation Forum, January 31, 2012

The challenges of assessing environmental toxicity

Contaminants can have both beneficial or detrimental effects on cells/organisms

- The case of trace elements -



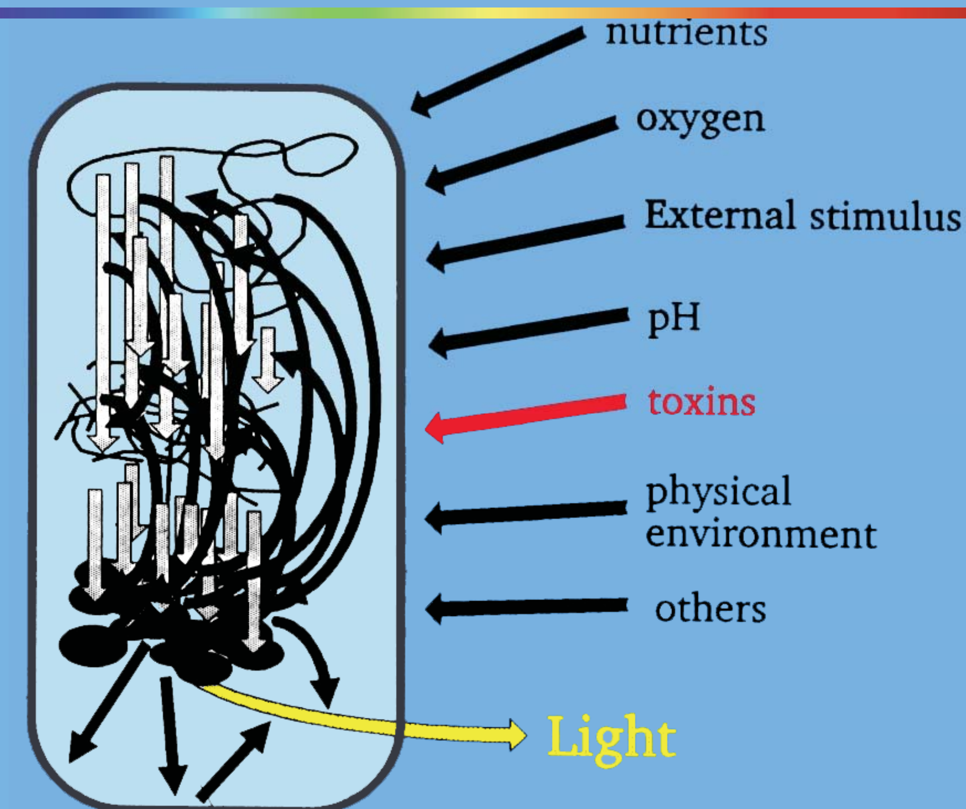
How to “interrogate” organisms on whether their surrounding environment is toxic?

Evaluation commonly based on a battery of tests using EC_{50} (or LC_{50})

LC50: (**L**ethal **C**oncentration **50**) is the concentration of a chemical which kills 50% of a sample population

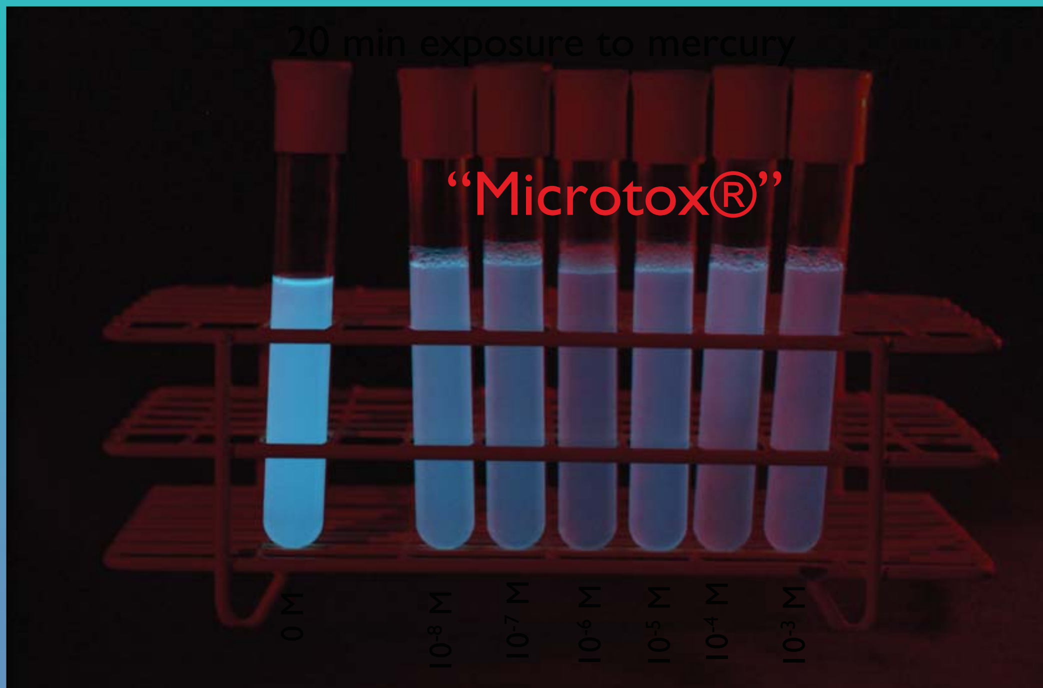
•For EC_{50} (or LC_{50}), the endpoint is death

Microtox® is an EPA-approved bioassay that uses the decrease in bioluminescence from bacteria as a sensor of toxicity



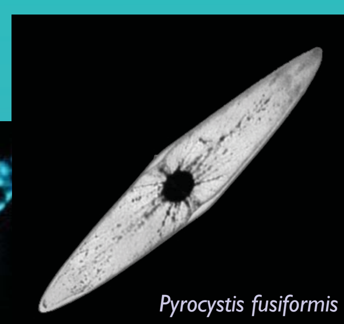
(Wood & Gruber 1996)

Bacteria bioluminescence decreases following metal exposure

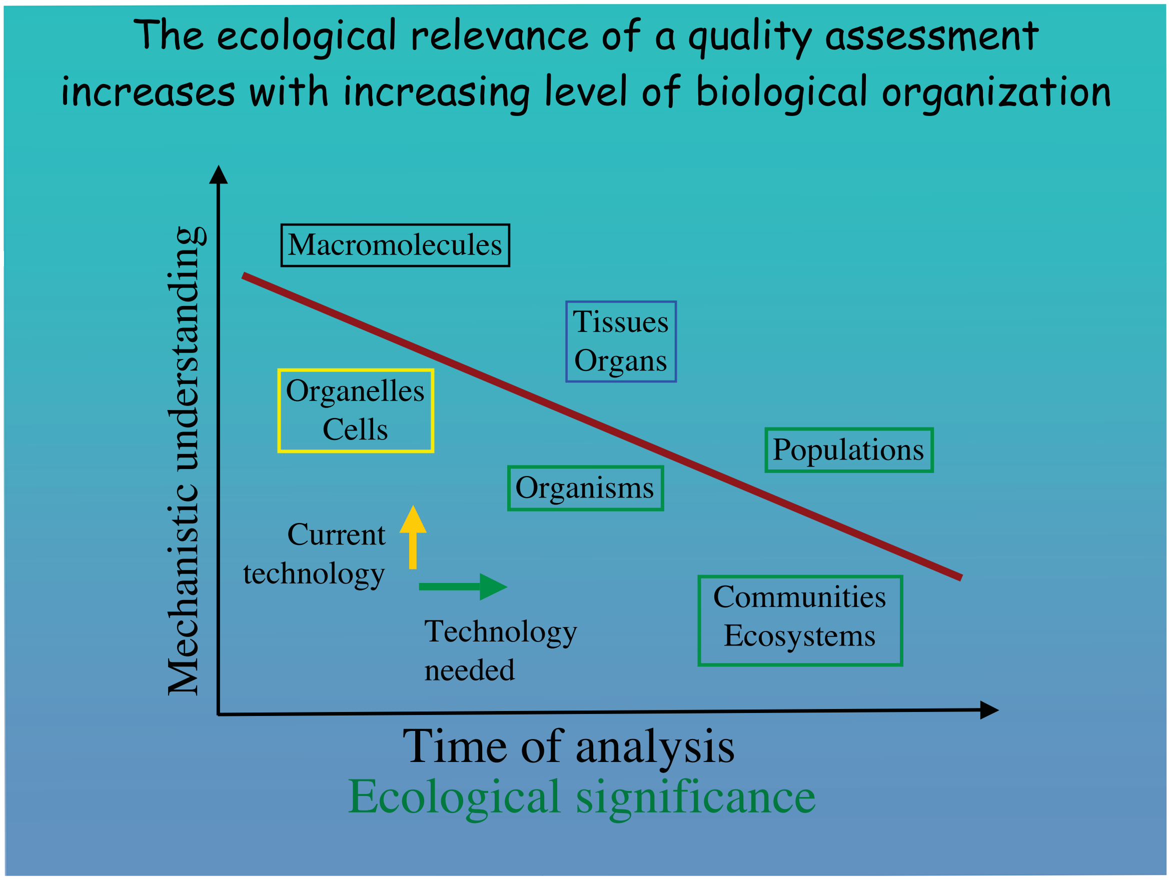


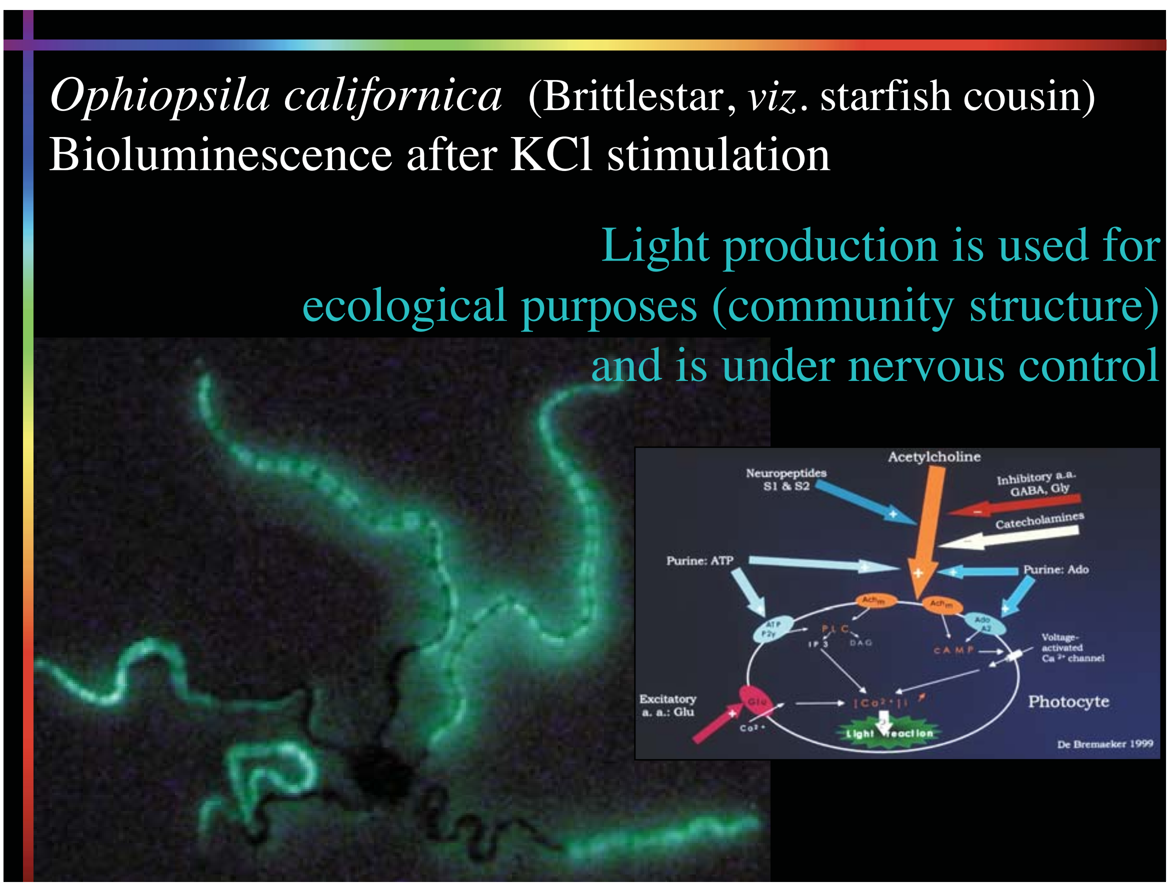
Use of luminous dinoflagellates to assess water toxicity

First cultures established more than 50 years ago



QwikLite®, AssureControls Inc.


The ecological relevance of a quality assessment
increases with increasing level of biological organization
Mechanistic understanding
Macromolecules
Tissues
Organs
Organelles
Cells
Populations
Organisms
Current
technology
Technology
needed
Communities
Ecosystems
Time of analysis
Ecological significance


Ophiopsila californica (Brittlestar, *viz*. starfish cousin)
Bioluminescence after KCl stimulation
Light production is used for
ecological purposes (community structure)
and is under nervous control
Acetylcholine
Neuropeptides
S1 & S2
Inhibitory a.a.
GABA, Gly
Catecholamines
Purine: ATP
Purine: Ado
Voltage-
activated
Ca²⁺ channel
Excitatory
a. a.: Glu
Photocyte
Light reaction
De Bremaeker 1999

The capacity to produce light is a sensitive bioassay to assess sub-lethal toxicity

Reagents of light production are involved in detoxification processes acting as anti-oxidants quenching ROS and free radicals

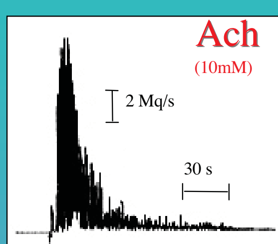
Bioluminescence reaction (oxidation)

$+ O_2$ → Oxidized luciferin + Light → Ecological function

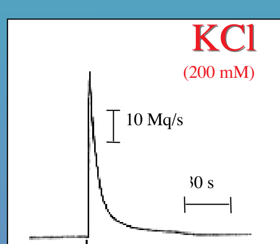
+ ROS → Modified luciferin → Biochemical function, Detoxification

Bioluminescence characteristics of brittlestars

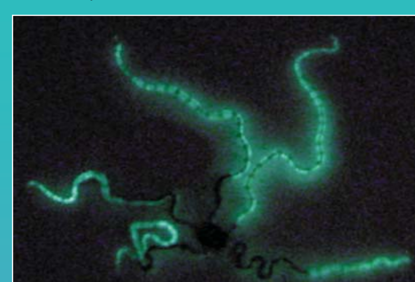
Original records

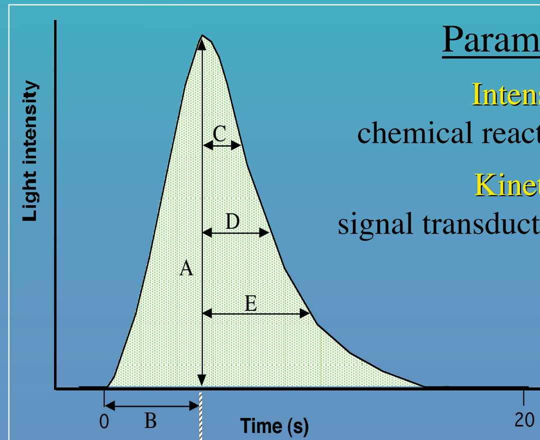


Neuro-stimulated potential of bioluminescence



Total chemical potential of bioluminescence





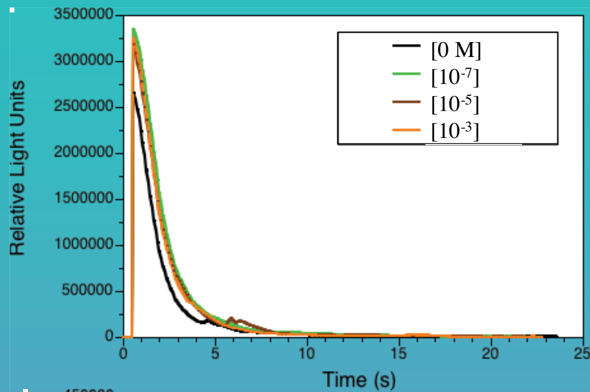
Parameters

Intensity
chemical reaction potential

Kinetics
signal transduction efficiency

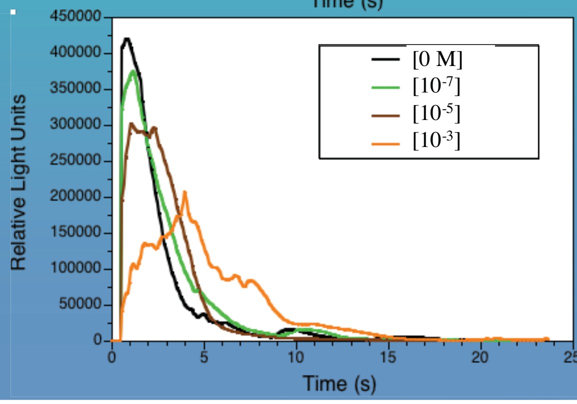
(Deheyn et al. 1997)

Effect of trace elements on bioluminescence potential



No effect

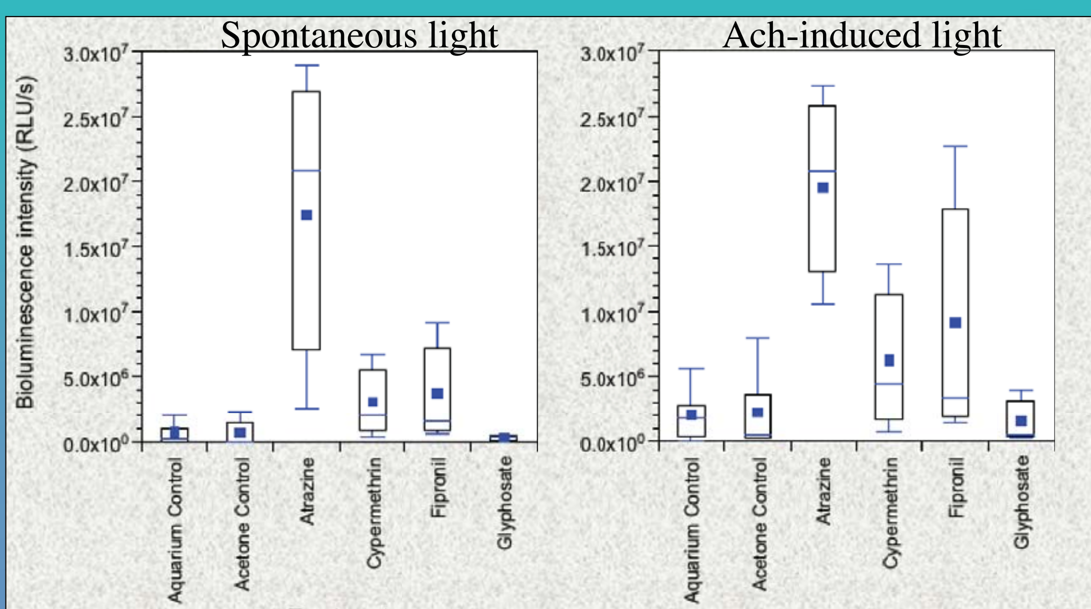
e.g., Al, Mn, Cr



Decreased intensity and slower kinetics

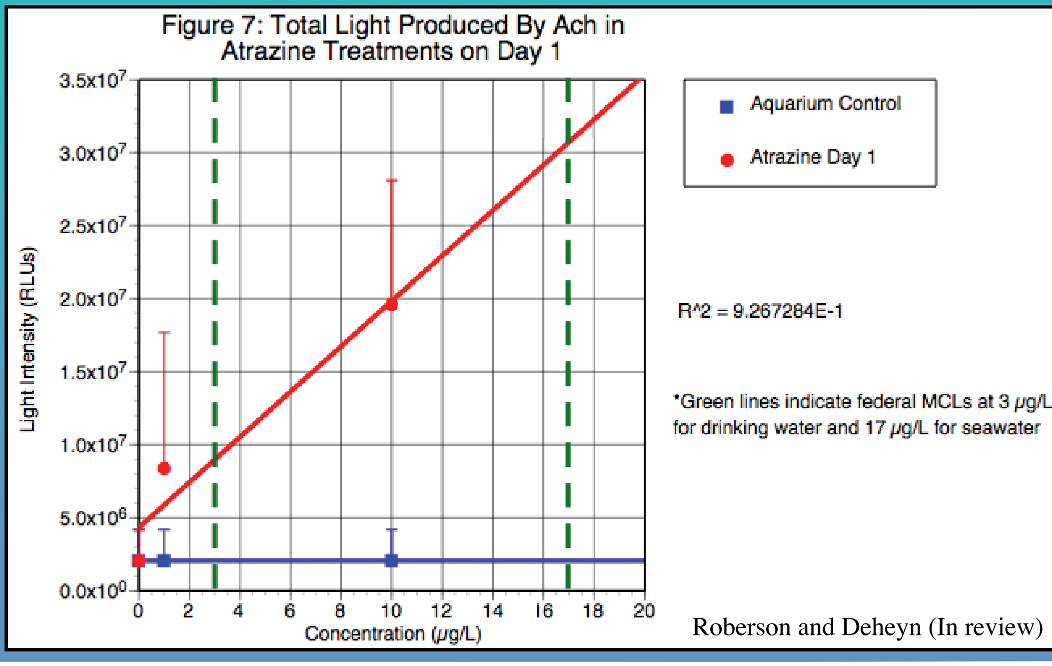
e.g., Cd, Cu, Hg

Bioluminescence assay able to distinguish between pesticides acting through neuro-toxicity vs biochemical pathway (amino acid production) impairment



Roberson and Deheyn (In review)

Brittlestar bioluminescence bioassay indicates neuro-toxicity below EPA recommended levels for drinking water and seawater



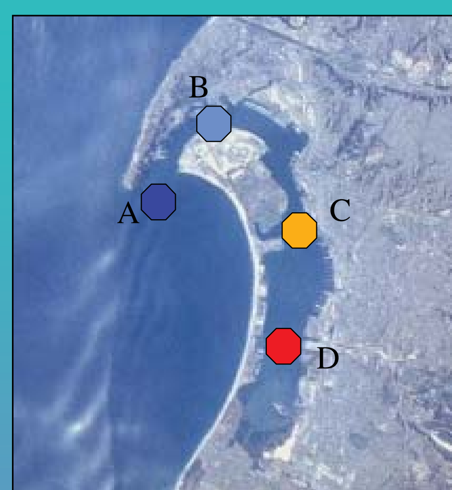
Is murky water really dirty water?

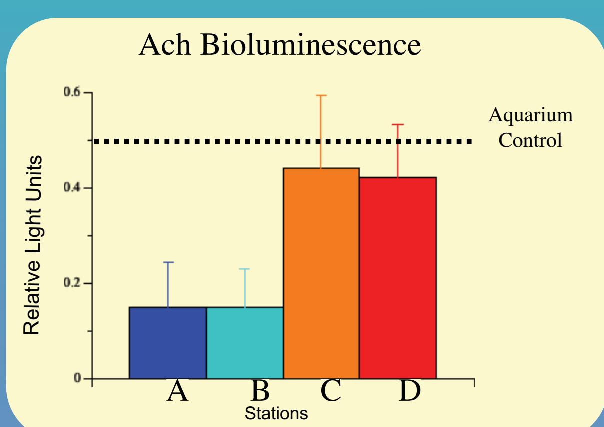
Is clear water really clean water?

Bioavailability of trace elements in San Diego Bay

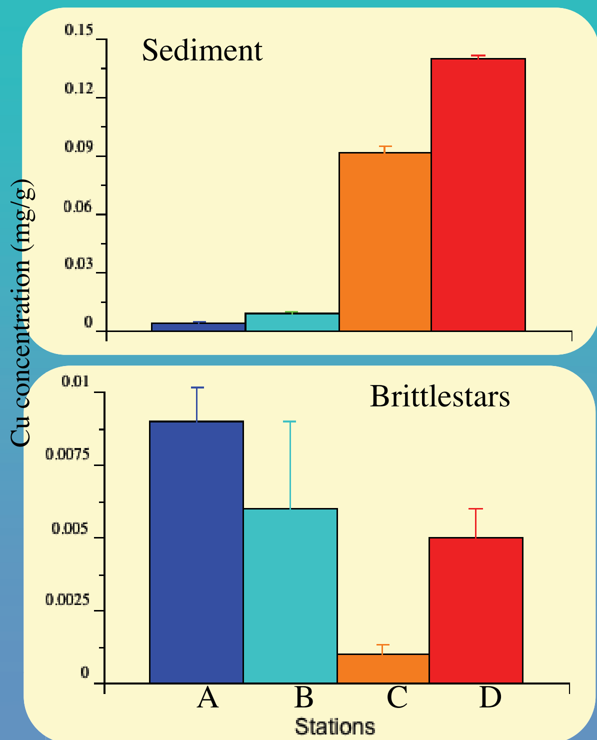
Transplant of brittlestars and sediment in dialysis bag

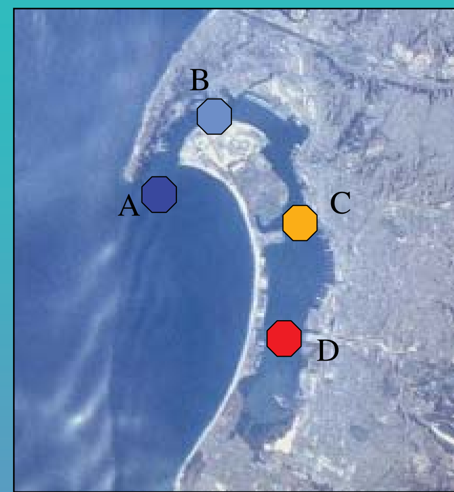
Bioluminescence decreases at the mouth of the Bay, indicative of sub-lethal neuro-toxicity





Opposite trends in copper sediment concentration and accumulation in brittlestars





Bioavailability of trace elements greater at mouth than back of Bay

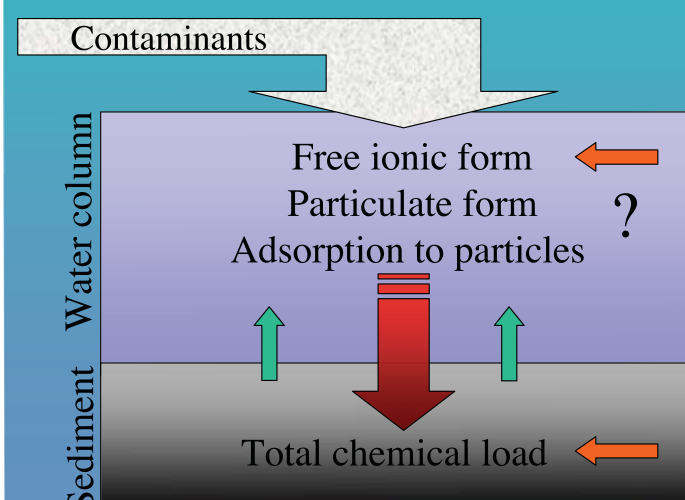
Contamination of brittlestars occurs mainly through sea water

Deheyn and Latz, 2006 Chemosphere

Ecological pathway of contaminants

Once dissolved in seawater, contaminants tend to adsorb to particles that sink and accumulate in sediment

The seafloor can therefore be a natural sink for contaminants, or a potential source of contamination, depending on leachability and bioavailability characteristics

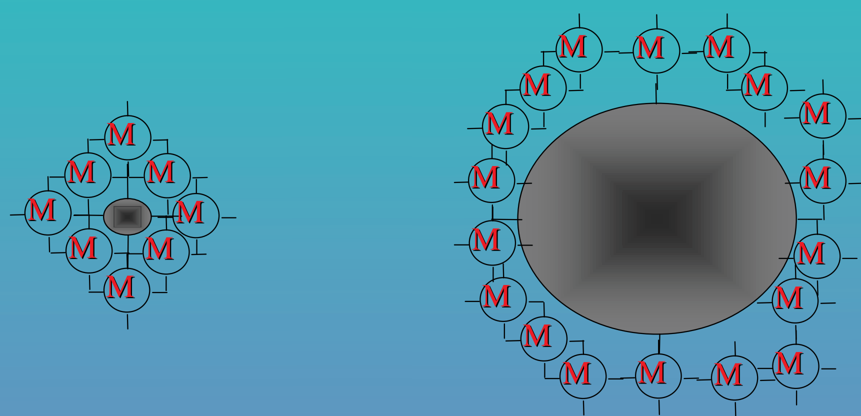


Leachability
Bioavailability

Parameter most commonly used as proxy for environment health

Bioavailability increases with larger grain size

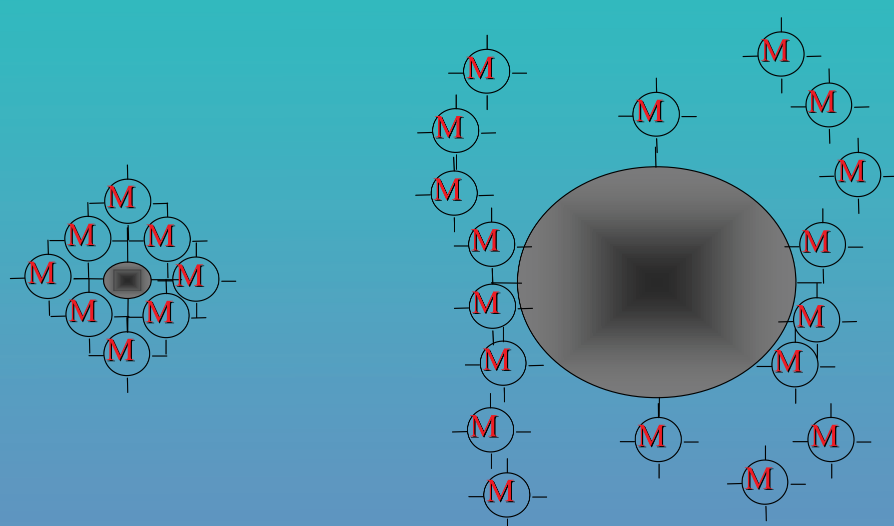
Grain particle   M Metal ion   Charges, ligands



The smaller the grain the stronger the adsorption forces, thus the chemical is less bioavailable (and vice versa)

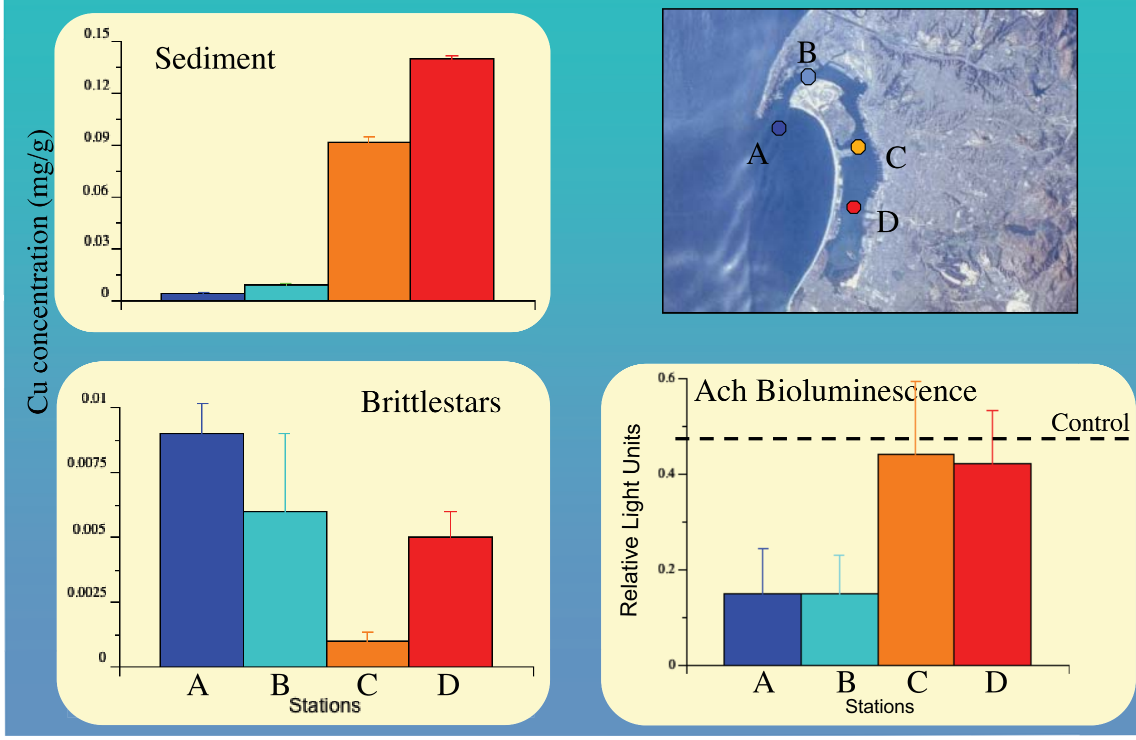
Small grain size = stronger adsorption, lower bioavailability

Large grain size = weaker adsorption, greater bioavailability



Grain particle   M Metal ion   Charges, ligands

Bioluminescence decreases at the mouth of the Bay, indicative of sub-lethal neuro-toxicity



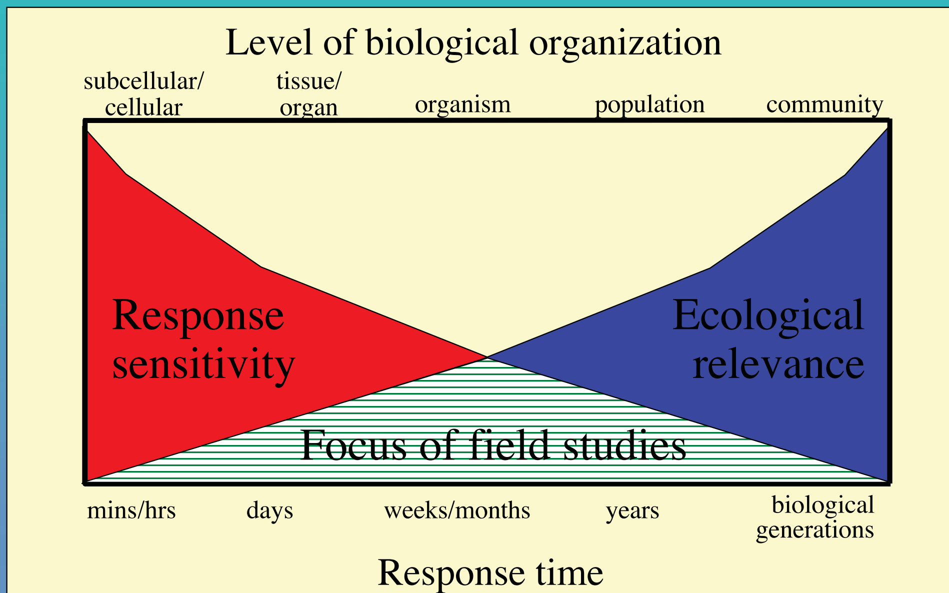
Contaminants are *ecologically relevant* only when *significant* amounts of them enter the organisms and the food chain, independently of the total amount present in the environment

(which is, however, currently used as proxy for health)

"All substances are poisons:
there is none which is not a poison;
The right dose differentiates
a poison and a remedy"

Paracelsus (1493-1541)

An ecologically relevant environmental quality assessment results from the delicate balance between the duration of monitoring, the biological characteristic(s) being monitored, and laboratory versus field study



Take-home message

- Reference to anthropocentric values (e.g., murky water is toxic) can lead to *illusion* and not ecologically relevant assessment of environmental quality
- Environmental quality assessment should clearly identify the end-beneficiary of the health assessment, and consider ecologically relevant endpoints
- Bioavailability of contaminants (sediment grain size) and levels of dissolved organic material are essential in addressing health of the ecosystem
- Environmental health assessment should be a multi-disciplinary effort at various scales of biological organization and time

Acknowledgment

The San Diego Foundation
UCSD Environmental Sustainability Initiative (now SSI)

Dr. Michael Latz

Kim Hoyt, Jeanne BenVau, Magali Porrachia, and many helpful undergraduate students for lab and field work

Attachment 5
San Diego International Airport:
The Green Build Project

SURF 19
SUSTAINABLE REMEDIATION FORUM

San Diego International Airport

THE GREEN BUILD PROJECT

A Case Study in Landfill Remediation and Sustainable Redevelopment

JANUARY 31, 2012

Paul Manasjan

SAN DIEGO COUNTY REGIONAL AIRPORT AUTHORITY

Steve McCabe

AECOM

San Diego Int'l Airport

Busiest single runway in Nation

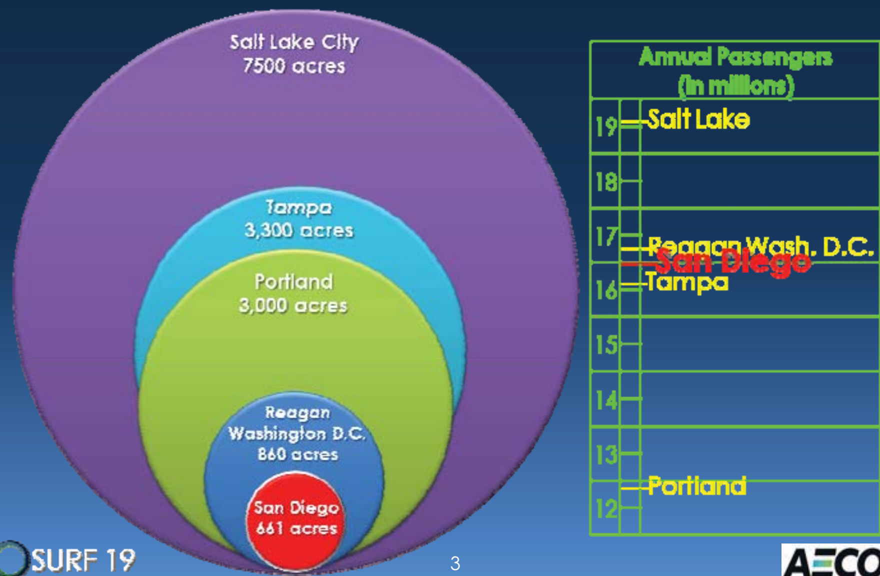
17 million passengers annually

Contributes $10 billion annually to local economy

Confined to 661-acre footprint

Average of 4-6 times smaller size than airports with comparable passengers loads

Airport Size Comparisons



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Airport Authority's Sustainability Commitments

2008
- Adopted Sustainability Policy
- MOU with Attorney General to address air emissions

2009
- Adopted industry (ACI-NA) Environmental Goals
- Joined GRI Airports Sector Working Group

2010
- Implemented Air Quality Management Plan
- Commenced "The Green Build" terminal expansion

2011
- Airport Vehicle Rebate Program for taxis & shuttles
- Achieved LEED Gold & Energy Star for existing building

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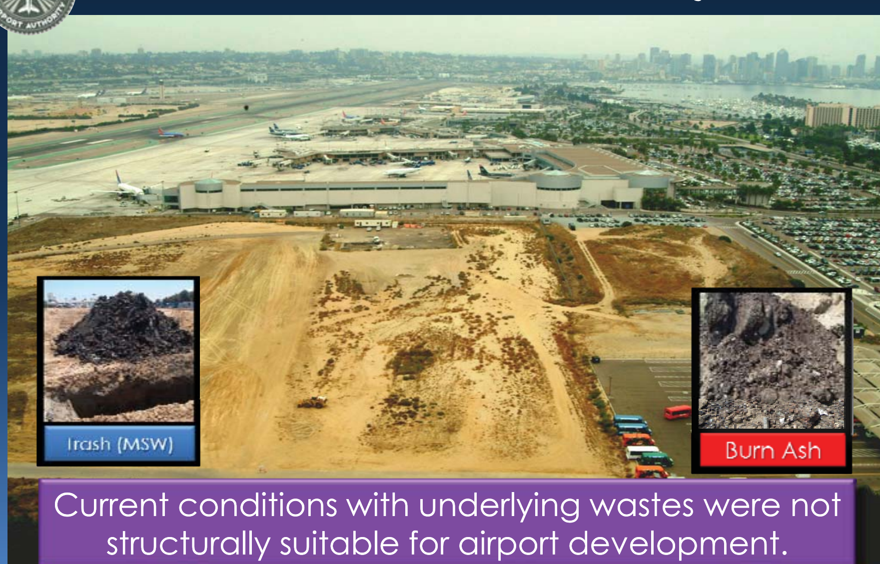
Former NTC Landfill Site

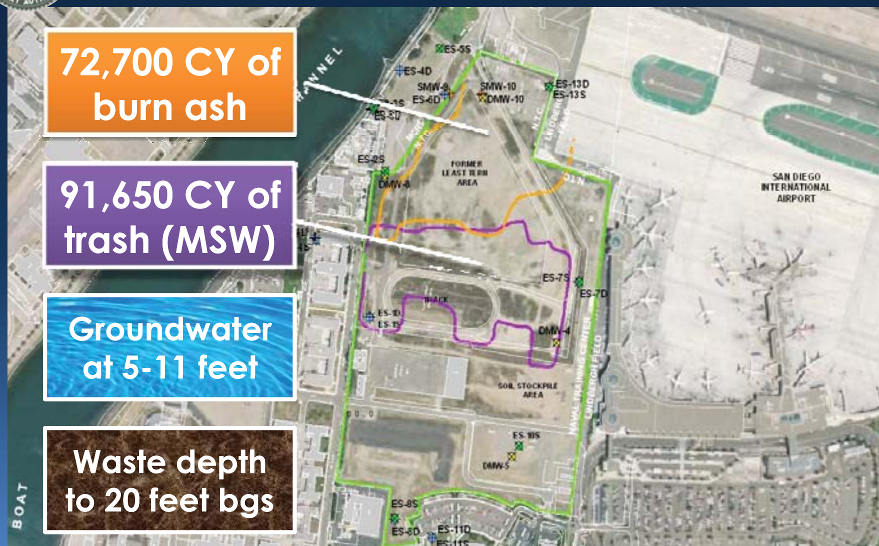
- Used by Navy from 1950-1971 as disposal site.
- Operated as burn dump until mid-1960s, then as trench fill for Naval housing MSW until 1971.
- Property transferred to Port in 2000 (and Airport in 2003).

Landfill Remediation Project



Current conditions with underlying wastes were not structurally suitable for airport development.

Landfill Waste Types



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Alternatives Considered

Alternative 1	Alternative 2
Bridge Over Trash	Landfill Remediation
Method	
Construct reinforced concrete underpinning to support apron and structures.	Remove municipal solid waste and burn ash, dispose at regulated landfills, and provide engineered backfill.
Benefit	
❶Provides structurally sound alternative for development.	❶Provides stable sub-grade for future Airport development. ❷Removes environmental liability by removing contamination and potential pollutant sources.
Cost	
$70,900,000	$49,500,000

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Landfill Project Challenges

Traffic/Circulation

Traffic study completed / truck routes identified, maximum 100 trucks per day, addressed in EIR.

Air Quality

Odors, dust and human health risk assessment completed, air monitoring, dust control, odor control addressed in the specifications.

Utilities

Relocation of major utilities, identification of new easements, coordination of construction with SDGE, protection of existing City sewer lines.

SDGE

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Landfill Project Milestones

Landfill Remediation and Community Health & Safety Plans approved by regulators (RWQCB, LEA, APCD)

Draft EIR published, public comments received and addressed. Final EIR prepared for Board Certification on December 12, 2007.

NTC Landfill Design and Bidding Complete for:
- **Phase 1** Utility Contract
- **Phase 2** Remediation Contract

"The Green Build" project commences

2005	2006	2007	2008	2009	2010

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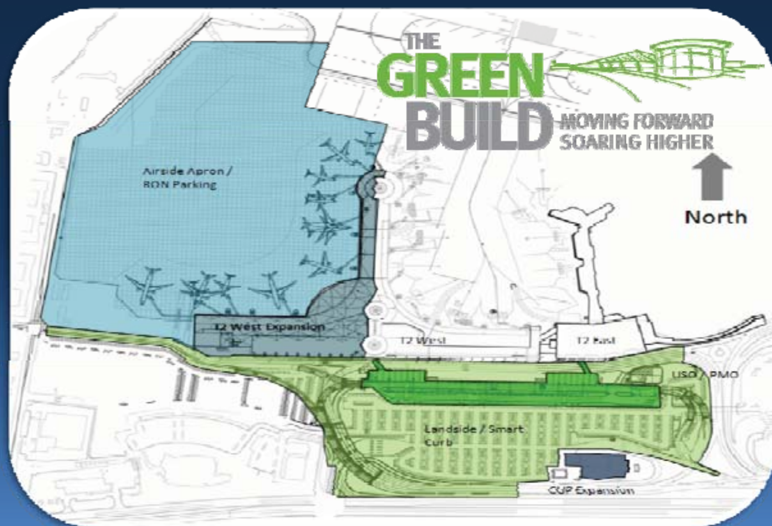
Landfill Remediation Project

Landfill Remediation Project

Program Site Overview



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Redevelopment Site – 2008

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Redevelopment Site Groundbreaking 2009

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Redevelopment Site - 2010

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Redevelopment Site - 2011

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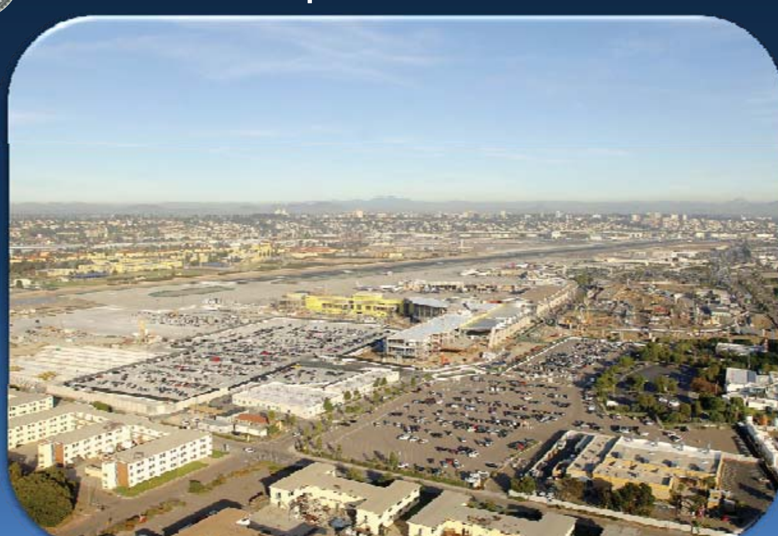
Redevelopment Site - Today



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Construction Progress Photos

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19

Construction Progress Photos

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20

CA Attorney General - MOU

- Reduction in Aircraft On-the-Ground Energy Usage
  - Landside Power & Preconditioned Air
- Reduction of Landside Energy Usage
- Use of Green Materials & Sustainable Design
  - Cool Roofs (or Solar Panels)
  - Cool Pavements
  - LEED Silver or Better
- Use of Green Construction Methods & Equipment
  - Emissions Monitoring
  - Idling Equipment
  - Use of Alternative Fuels (B20)

LEED Certification

CATEGORY	Contract 1 (Terminal)			Contract 2 (Landside)			Select Highlights
	Yes	Maybe	No	Yes	Maybe	No	
Sustainable Sites	8	1	5	7	1	6	SS Credit 3 - Brownfield development: Due to the NTC contamination and landfill remediation effort
Water Efficiency	3	0	2	3	0	2	WE Credit 3.1 - Water Use Reductions: Both contracts are tracking over a 30% Reduction of water usage.
Energy & Atmosphere	3	7	7	7	1	9	EA Credit 1 - Optimize Energy Performance: Contract 2 is tracking a 21% energy reduction
Materials & Resources	6	1	6	4	2	7	Both Contracts are tracking over 75% construction waste diverted from landfill and to use 20% recycled material on the project
Indoor Environmental Quality	11	0	4	10	3	2	Both Contracts are using Low-Emitting Materials for Adhesives & Sealants, Paints & Coatings, Carpet Systems, and Composite wood & Agrifiber
Innovation & Design Processes	5	0	0	5	0	0	The Green Build is currently planning an educational outreach program for sustainability in the new facility
	36	**9**	**24**	**36**	**7**	**26**	

Sunset Cove Exterior

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Sunset Cove Interior

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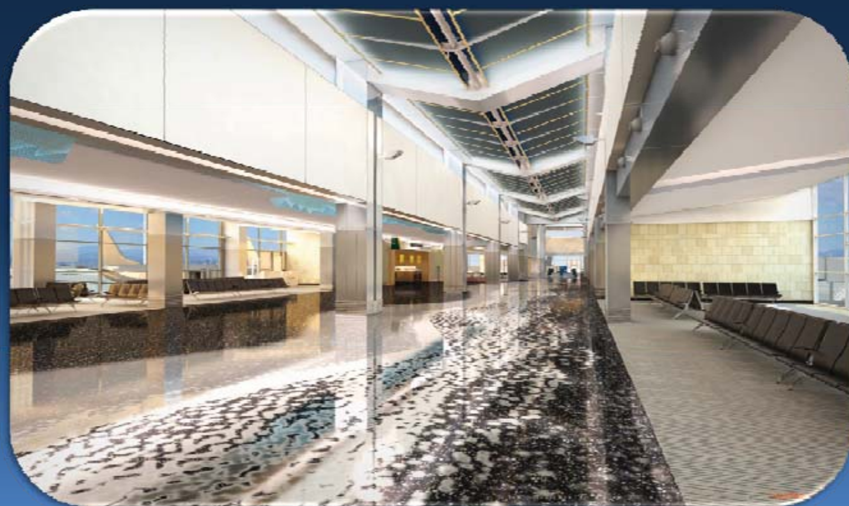
North Concourse Flooring



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Central Concourse

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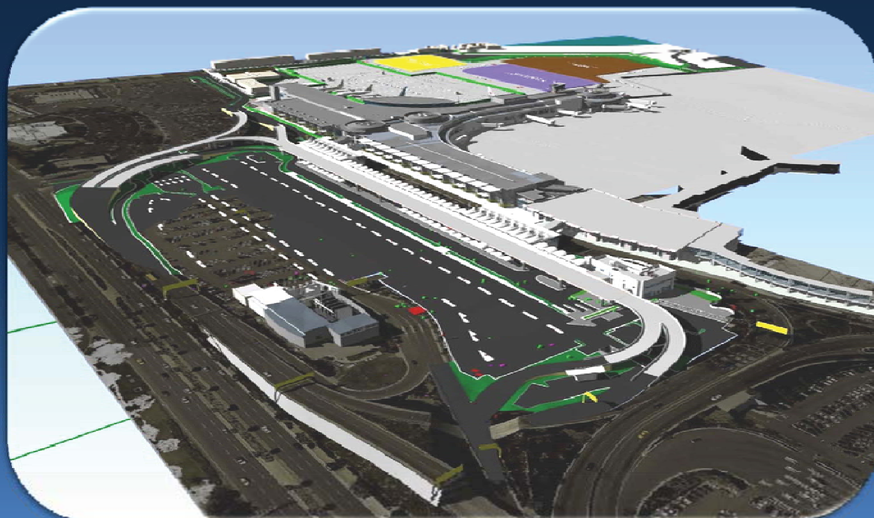
Elevated Departure Roadway



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27

Terminal Animation

Arrivals Curb

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Smart Curb Pavilion

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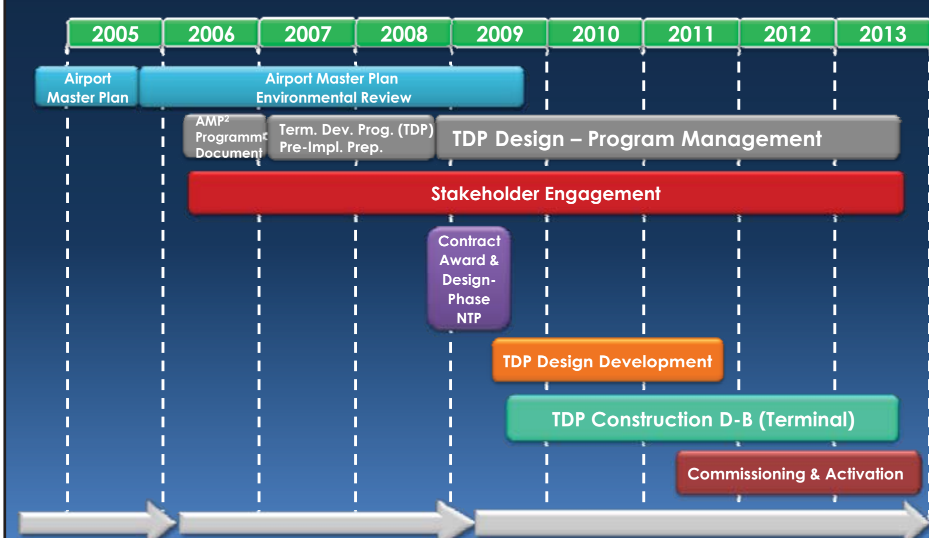
USO/PMO Building

Schedule



Scheduled Completion: 2013

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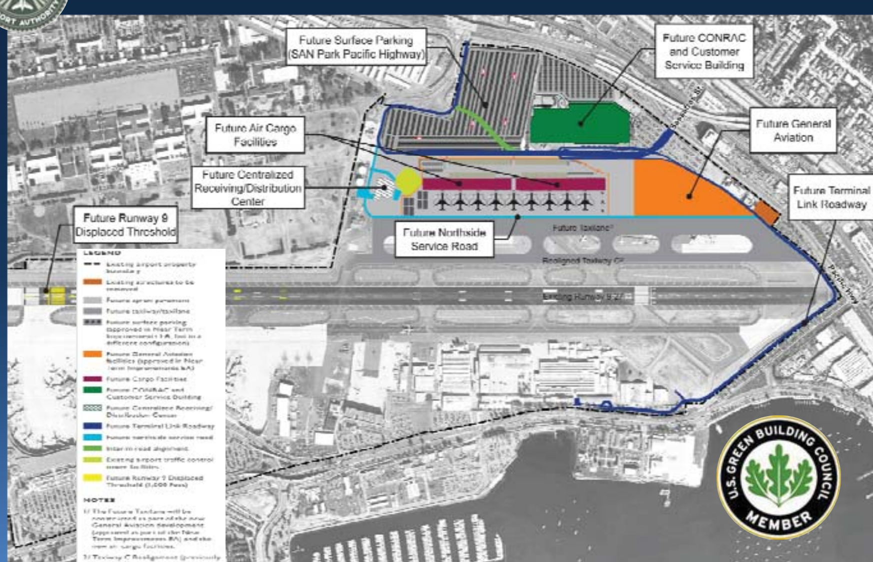
Future Development Plans



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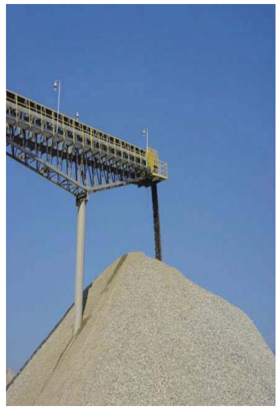
Attachment 6
How Relationships Enhance Sustainable Projects

How Relationships Enhance Sustainable Projects



Presented by:
Angela Driscoll, Vulcan Materials Company, Western Division

Vulcan
Materials Company
Western Division

Who is Vulcan Materials Company?

Vulcan Materials is the nation's largest producer of construction aggregates - the crushed stone, sand, gravel and other construction aggregates. These materials help to provide housing opportunities, ease traffic congestion, and improve critical infrastructure.

Vulcan Materials has become well known for its innovative land reclamation projects. Each project strives to leave behind lands reclaimed for use and enjoyment by future generations.

Vulcan
Materials Company
Western Division

RELATIONSHIPS
Why it's Critical to our Business Success?

3

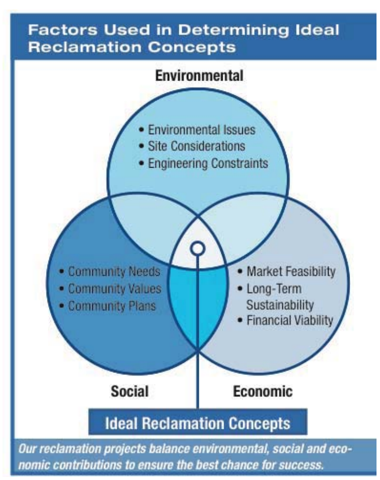
- Objective – Create Sustainable Value for all Stakeholders
- Guides Our Business Conduct
  - Working with Internal Teams
  - Working with Community
  - Working with Agencies/Elected
- Primary Focus: Reclamation

Vulcan Materials Company
Western Division

Demonstrating Sustainability through Reclamation

4

- Definition
- Each project situation is unique
- Guided by three primary factors:
  - Physical and Environmental setting
  - The Social-Cultural Context
  - Economic setting
- Success requires Relationship Building



Vulcan Materials Company
Western Division

Three Successful Reclamation Projects

5

- Colton Dunes
- Fish Creek Restoration
- Master Planned Urban Communities

Vulcan Materials Company Western Division

COLTON DUNES A Partnership to Protect a Fly

6

- In 1993 the Delhi Sands Flower-Loving Fly (DSFLF) was emergency listed as an endangered species.
- Our Colton Dune property contained a substantial portion of the largest remaining contiguous bloc of habitat for the DSFLG
- This initiated our relationship with the Riverside Land Conservancy and the U.S. Fish and Wildlife Service.

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COLTON DUNES
Challenges & Solutions

7

- CHALLENGES
  - 40-acre agricultural field dominated by dense weeds and non-native grass
  - Potential loss of topsoil from frequent high winds if weeds removed
  - Soil unsuitable to support native plants
  - Site required debris removal & trespass management
- SOLUTIONS
  - Partnership enlisted academic partners including University of California, Riverside's Center for Conservation Biology and Department of Entomology, San Diego State University's Soil Ecology and Restoration Group
- RESULT
  - May 2009 - Site restoration complete, flourishing with native plants, while providing refuge for additional species and wildlife

Vulcan Materials Company Western Division

COLTON DUNES
Why it Works

8

- Partnering to establish a Mitigation Bank
- Interdisciplinary Approach to restoration and management
- Using the expertise of both external and internal ecologists, entomologists, soil scientists, and restoration ecologists

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FISH CREEK
Stream Restoration

9

- Goal was to return the Creek to its pre-mining location and to recreate its high-quality aquatic and riparian habitat

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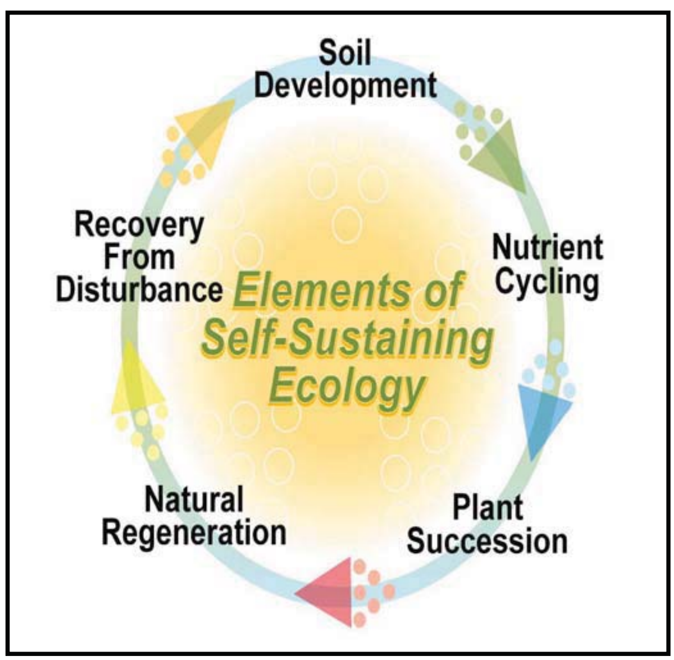
FISH CREEK
Task Force & Outreach

10

- Created a multi-disciplined task force made up of leading technical experts
- Was able to obtain 404 permit within 6 months
- Worked with community partners including Sierra Club, Think River, Rivers & Mountain Conservancy and U.S Army Corps of Engineers



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FISH CREEK
First Step in Long Term Relationship

11

- Controversial mining operation located above the stream
- Vulcan was unknown to community
- No trust in community for prior mining operators
- Eventually Vulcan's application to modify its operation was approved by the City
- Referendum challenge defeated by 2 to 1 margin

Vulcan Materials Company
Western Division

Master Planned Communities
Quarry "Built" San Diego

12

- Vulcan's two Mission Valley facilities are located in San Diego
- Mining operations began in 1937 and concluded in early 2006
- Created relationship with City of San Diego, community members and property owners to evaluate reclamation of the site

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Master Planned Communities Quarry "Built" San Diego

13

- The second Mission Valley site is currently being reclaimed
  - Created a Soils Management Plan to manage the reclamation of impacted soils that were found related to past industrial activities
  - Undertook large scale fill operation as part of a land reclamation plan to restore property for viable use
  - Vegetated slopes and barren areas to prevent pollutants from escaping during storm events
  - In the process of establishing a state of the art ready mixed concrete production plant east of Qualcomm entrance

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CIVITA Master Planned Urban Community

14

- Reclaimed Quarry
- Being developed by Sudberry
  - Overall size: 230 acres
  - Plan includes 900,000 square feet of retail and office space
  - 4,800 new apartments, condominiums, attached and single-family homes
  - Civic center and shopping/entertainment district

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Why Relationships Matter

- Inclusiveness builds trust and respect
- Learning through sharing
- Project becomes much more enhanced – projects are more likely to have social, economic and environmental attributes

Vulcan Materials Company
Western Division

Attachment 7
Panel Discussion: Sustainable Remediation and Re-Development

Sustainable Remediation And Redevelopment – A Panel Discussion

Moderator – Richard G. Opper
Opper & Varco, LLP

Panel –
Marcela Escobar-Eck
Atlantis Group
Eric Crockett
City of Chula Vista
Lenny Siegel
Center for Public Environmental Oversight

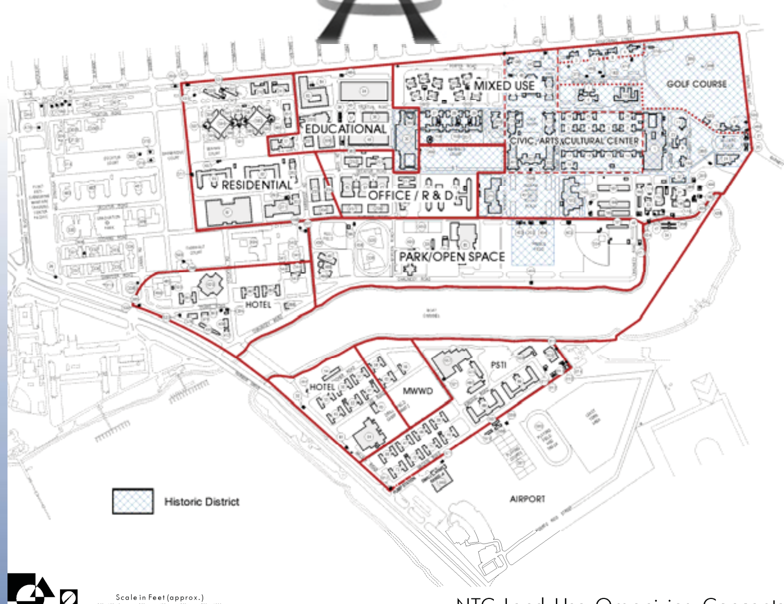
N T C

Liberty Station

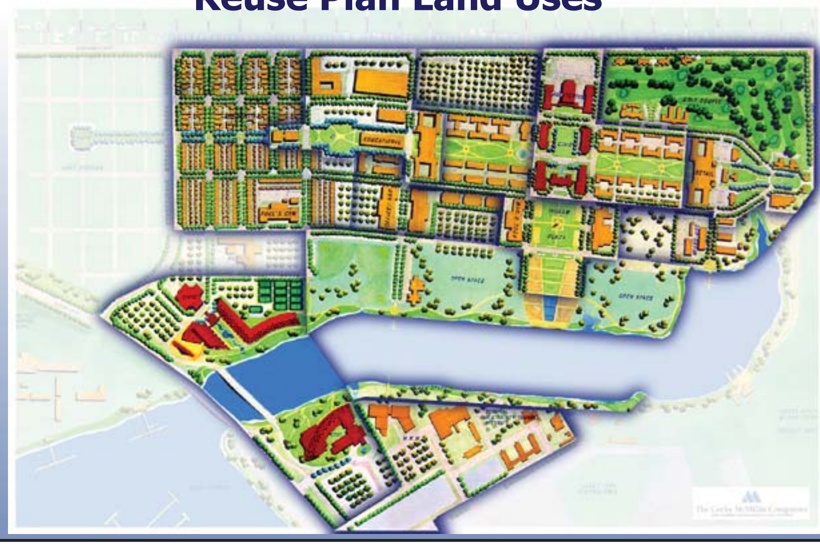
(former Naval Training Center)

SURF Conference
January 2012

N T C



Reuse Plan Land Uses



Chula Vista Bayfront Redevelopment Project Area

FIGURE 1

Moffett Field, California

Attachment 8
Sustainable Remediation: An International Review

Sustainable remediation: an international review

Professor Paul Nathanail
University of Nottingham &
Land Quality Management Ltd

paul@lqm.co.uk
@cpnathanail

Some numbers

- 3
- 3
- 16
- 1
- 2A
- 23

3 dimensions of sustainability appraisal

- Environmental
- Social
- Economic

- Institutional

3 P's

- P----
- P-----
- P----

3 Players

- P----
- P-----
- P----

3 P's

- Payer (problem holder; responsible party; polluter)
- P-----
- P----

3 P’s

- Payer (problem holder; responsible party; polluter)
- Policy maker
- P----

3 P’s

- Payer (problem holder; responsible party; polluter)
- Policy maker
- Payee (professional advisor)

Paradigm shifts

a change from one way of thinking to another

- Eureka!
- The printed word
- Newton's falling apple
- Einstein's mind games
- Plate tectonics
- Sustainability

16 possible triple junction geometries

10

Evolution of Triple Junctions

DAN P McKENZIE
W. JASON MORGAN

A precise version of the hypothesis of sea floor spreading (Hess, 1962; Dietz, 1961) has recently been suggested. This new formulation (McKenzie and Parker, 1967; Morgan, 1968a; Le Pichon, 1968; Isacks et al., 1968) requires that all aseismic areas of the Earth's surface move as rigid spherical caps and for this reason it is often called "plate tectonics." The instantaneous relative motion of any two plates on the surface of a sphere can be represented by a rotation about an axis, and so problems of present day tectonics reduce to determining the plate boundaries and relative rotation vectors of all plates on the Earth's surface. There are various methods of obtaining such information. If two plates are separating and new oceanic crust is being generated, the rate can be obtained from the magnetic lineations (Vine, 1966; Pitman et al., 1968), which can also be used to map the plate boundaries (Vine, 1966). Where the ridge axis is offset by transform faults the relative motion vector must be parallel to the strike of the faults (Wilson, 1965c). The most general method of mapping plate boundaries, however, is by their seismicity (Isacks et al., 1968; Barazangi and Dorman, 1969), and earthquakes can also be used to measure the direction (McKenzie and Parker, 1967; Isacks et al., 1968; Sykes, 1967) and magnitude (Brune, 1968) of the relative velocity between the two plates involved. The agreement between these methods is striking, especially in oceanic areas (Isacks et al., 1968), and demonstrates that aseismic regions are indeed rigid. It is now clear that the principal features of ridges, trenches and transform faults are a direct consequence of the relative motion of rigid plates.

There are two main reasons why plate tectonics does not yet provide a complete theory of global tectonics. The first is that the mechanism by which the motions are maintained is still unknown, though it now seems that some form of thermal convection can provide

From *Nature*, v. 224, p. 125–133, 1969. Reprinted with permission of the authors and Macmillan Journals, Ltd.

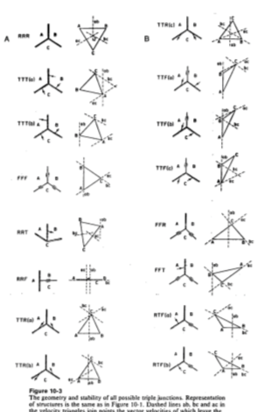
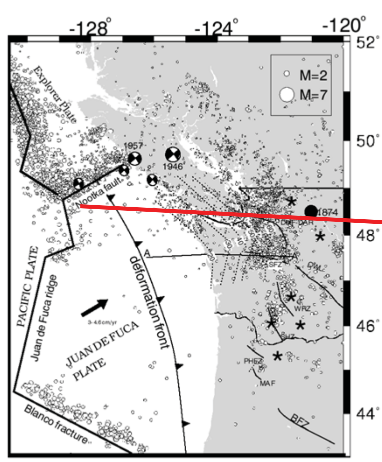


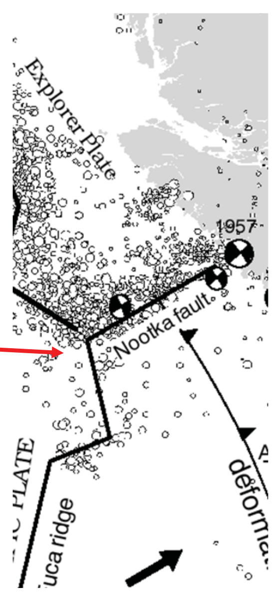
Figure 10-3
The geometry and stability of all possible triple junctions. Representation of structures is the same as in Figure 10-1. Dashed lines ab, bc and ac in the velocity triangles join points the vector velocities of which leave the geometry of AB, BC and AC, respectively, unchanged. The relevant junctions are stable only if ab, bc and ac meet at a point. This condition is always satisfied by RRR; in other cases the general velocity triangles are drawn to demonstrate instability. Several of the examples are speculative

McKenzie and Morgan, 1969

Only 1 triple junction works for Sustainable Remediation

rrr – triple junction





Australia

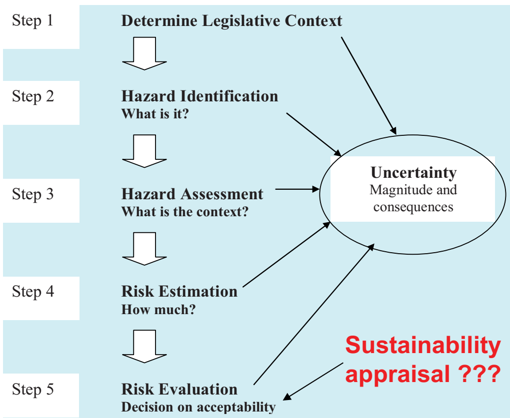
- SuRF Australia
- Approaching a NIKE moment!

Australia

- SuRF Australia
- Approaching a NIKE JUST DO IT moment!

Risk based contaminated land management

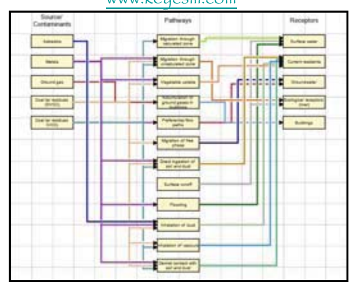
The process



After McCaffrey, Street & Nathanail 2007
SNIFFER UK CC02

The method: conceptual site model

www.keycsm.com



Comparing contaminant concentrations against assessment criteria is an asymmetric test

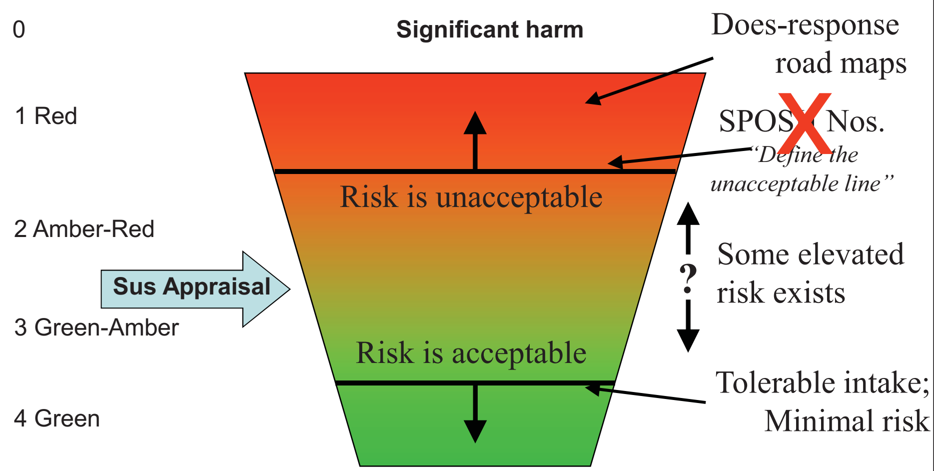
Planning (PPS 23) & draft NPPF
Developer/ planning system has to prove site is safe, fit for use and cannot be determined under Part 2A

Part 2A Environmental Protection Act (SPOSH)
Local Authority has to prove significant possibility of significant harm

Limbo dancing: the aim is to get **UNDER** the **LOW** bar

High Jump: the aim is to get **OVER** the **HIGH** bar

Levels of risk ‘human’ world



Planning policy framework

- If it’s not sustainable development it doesn’t get the green light

3 P's

- Payer (problem holder; responsible party; polluter)
- Policy maker
- Payee (professional advisor)

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@cpnathanail #surf19

Attachment 9
Panel Discussion: Regulatory Perspectives

HUNTON & WILLIAMS

GREEN REMEDIATION STRATEGIES

Of Course it Makes Sense!

MALCOLM C. WEISS

PARTNER
Hunton & Williams LLP

HUNTON & WILLIAMS

Malcolm Weiss

- Hunton & Williams, Partner
- 25+ Years of Practice
- U.S. EPA in Washington, D.C.
- 4 years with a national environmental engineering consulting firm

Contact Info:

mweiss@hunton.com

213 532-2130

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Insert
image here

Background

Superfund Green Remediation Strategy

September 2010

Green remediation is the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprints of cleanup actions.

Avoid collateral damage to the environment

EPA's current Strategy and related updates are available online at:
Superfund & Green Remediation
http://www.epa.gov/superfund/greenremediation

U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response
Office of Superfund Remediation and Technology Innovation

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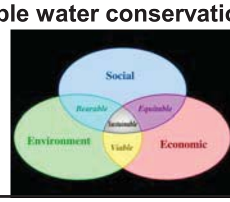
Basic Ideas

- **Include language in remedial design, and remedial action procurements to specify green products and practices**
- **Maximize renewable energy use and increase energy efficiency**
  - **Integrate alternative fuels**
  - **Encourage best operational practices (i.e., engine idle reduction)**
- **Reduce natural resource use when conducting remedial actions**
  - **Identify additional uses of materials or energy otherwise considered waste**
- **Track and increase potable water conservation, reuse treated water, and recharge aquifers**



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"Green Up the Cleanup"

- Green remediation focuses on the environmental footprint of Superfund response actions.
- The broader realm of site sustainability examines environmental issues, but also includes social and economic aspects typically addressed by site users and local/regional communities.

the great gateway GREEN-UP PART OF THE GREAT AMERICAN CLEANUP

6

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Areas of Consideration

- **Energy**
- **Air and atmosphere**
- **Water**
- **Land and ecosystems**
- **Materials and waste**

7

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EPA Region IX Policy

GREENER CLEANUPS POLICY - EPA REGION 9

Background

As part of our mission to protect human health and the environment, EPA is committed to using effective and environmentally sustainable strategies to restore contaminated land for beneficial uses. EPA's cleanup programs already promote sustainability by removing health threats from toxins left in the environment by previous unsustainable industrial practices. However, with consideration and planning, additional sustainability benefits often can be achieved when a cleanup action is performed. The Region 9 Greener Cleanups Policy is intended to ensure that sustainability is considered in cleanups by establishing a preference for using strategies, practices and technologies that reduce the environmental footprint of Superfund and RCRA cleanups.

Policy

While first meeting all statutory and regulatory requirements of Superfund and RCRA, **EPA Region 9 will strive to integrate sustainability practices into its cleanup actions.** This policy establishes a **preference for use of a range of practices, strategies and technologies to support the implementation of greener cleanups**.

- Reduce air emissions, including greenhouse gas emissions, by using clean diesel technology and alternative fuels.
- Conserve natural resources and energy through efficient energy use and by using renewable energy technologies.
- Minimize overall virgin material use and waste generation as well as reuse and recycle existing resources.
- Minimize toxics in materials and products.
- Minimize impacts to water quality and water resources by water conservation and efficiency measures.

These sustainability practices will be evaluated in light of the site-specific situation at each cleanup site. Sustainability will be incorporated where determined appropriate into Superfund and RCRA cleanups performed by EPA or under EPA oversight. Not all strategies will be appropriate in every case. Cleanups that do not satisfy threshold requirements for protectiveness, or do not meet other site-specific cleanup objectives, are not considered to be "greener cleanups" under this policy.

Sustainability strategies and technologies should be evaluated at every stage of the cleanup process to achieve the greatest level of benefit. In implementing this policy, project managers are encouraged to consider the application of lifecycle analysis tools. These tools can help account for the manufacture, use, and transport of materials, products, equipment and wastes associated with all phases of a cleanup. Region 9 will continue to pursue emerging sustainability technologies and strategies to expand the scope of opportunities at Superfund and RCRA cleanups.

Issued on: September 14, 2009
By:

Keith Takata, Director
Superfund Division

Jeff Scott, Director
Waste Management Division

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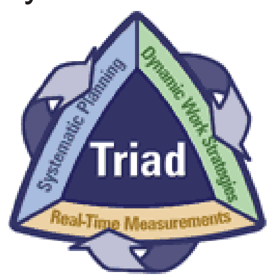
The Business Case for Green Remediation

- Reduce overall clean up costs
- Creates less secondary waste
- Generate less waste that is costly to handle
- Public relations benefits
- Avoid/reduce future liability



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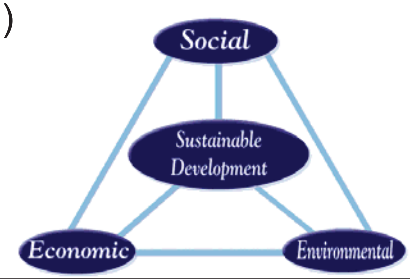
Conclusion

- "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
  - *Our Common Future*, aka the Brundtland Report (1987)



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Discussion

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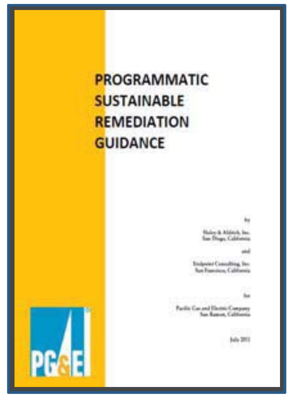
11

Attachment 10
PG&E's Programmatic Sustainable Remediation Guidance

PG&E's Programmatic Sustainable Remediation Guidance


PROGRAMMATIC SUSTAINABLE REMEDIATION GUIDANCE

Sharron Reackhof – PG&E

Karin Holland – Haley & Aldrich, Inc.

1

Collaboration

PG&E

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

HALEY & ALDRICH

Endpoint. Strategy. Science. Sustainability.

2

The Path of Collaboration

2009

Mar.: PG&E MGP Pilot

Feb.: DTSC Symposium

Dec.: DTSC's Interim Advisory Released

2010

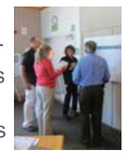
Apr.: PG&E and DTSC start developing guidance

May: 1st Core Team Meeting

2011

June: Guidance (1st version) complete

Aug.: Training for PG&E PMs and Key Contractors

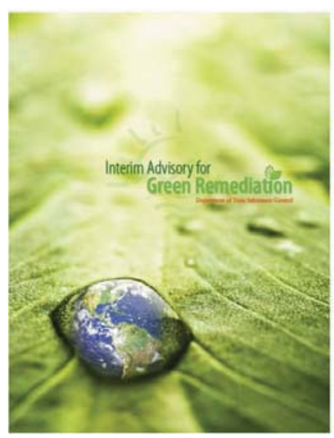


Oct.: Briefing to DTSC Executive Leadership Team

3

Guidance Objectives

- **Standardized** approach
- **Ongoing, iterative** thought process
- Project **life cycle** coverage
- Aligned with **DTSC's Interim Advisory**



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Attributes

- Dynamic, living
- Comprehensive
- User-friendly
- Flexible
- Minimal imposition
- Compliant

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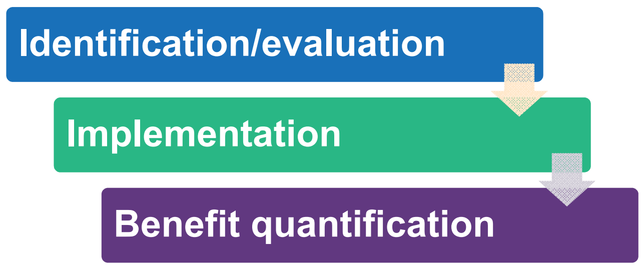
Sustainability Team Members

6

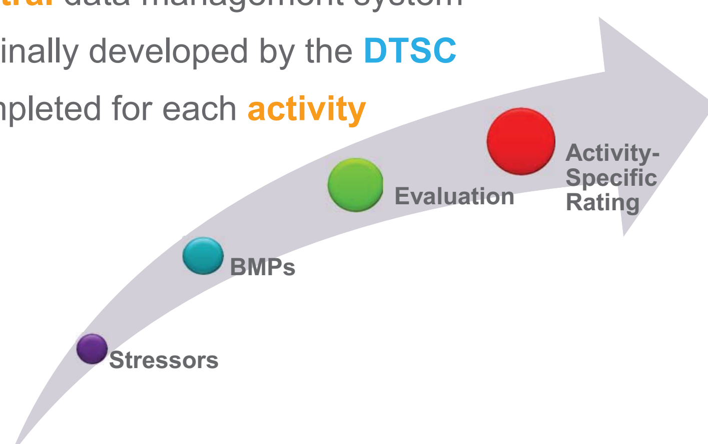
Framework

- Standard approach for **Best Management Practices (BMPs)**

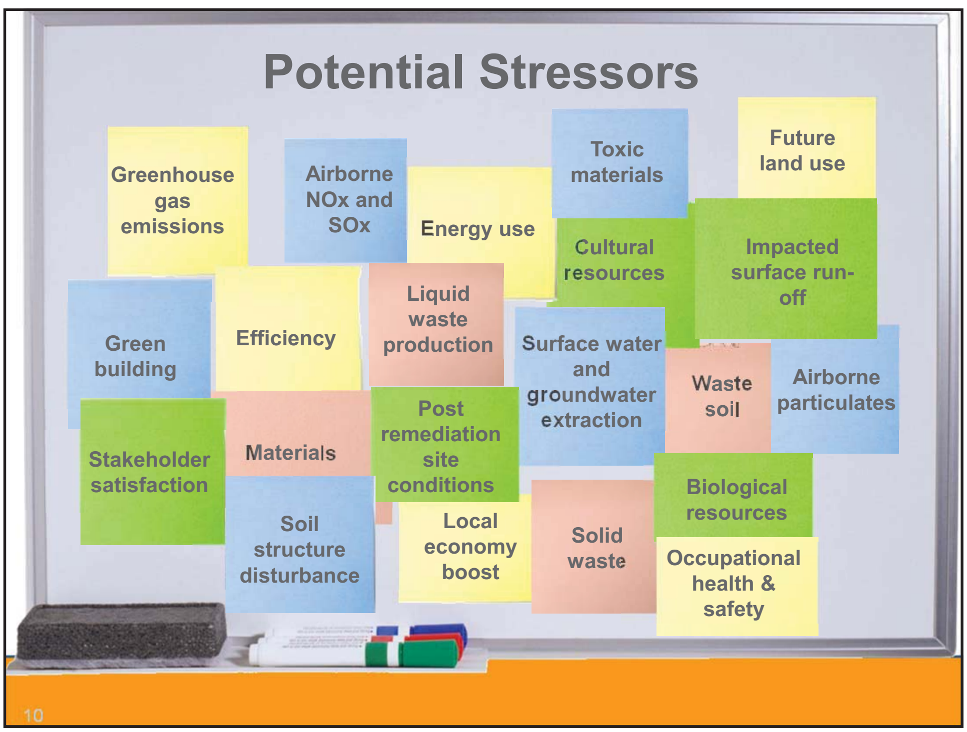


The GREM

- **Central** data management system
- Originally developed by the **DTSC**
- Completed for each **activity**

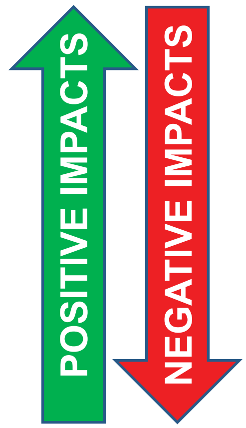


Stressors	Best Management Practices	Metric	Calculation Result	Standardized Result
Greenhouse Gas Emissions	Remote sensing technology	Metric tons of CO_2 e / cubic yards of impacted media	0.009	LOW
Liquid Waste Production	Use of CPT to reduce liquid waste generated	% reduction in liquid waste production	5 percent	LOW
Stakeholder Satisfaction	Adaptability and flexibility into Work Plans	Number of unresolved complaints	5	HIGH
Local Economy Boost	Use of local contractors whenever possible	% of project expenditure providing local economy boost	7 percent	MODERATE
Occupational Health and Safety	Experienced field staff. Safety first culture.	Accidents requiring treatment beyond first aid	0	LOW
			Rating:	LOW



BMP Selection

- **Project-** and **activity-specific**
- Reduce **negative** impacts
- Enhance **positive** impacts
- BMPs implemented **before** evaluation



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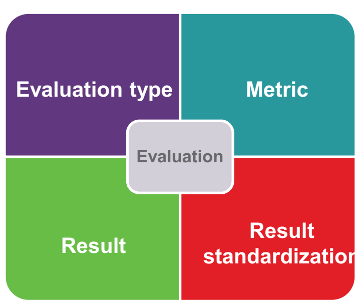
Evaluation

- **Focused** evaluation for selected stressors
- Evaluation **components**:



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Results Standardization

- **Combines** stressor-specific results
- Sustainability impact **scores**:

13

Activity-Specific Rating

- Proportion of "**Low**", "**Moderate**", and "**High**" scores

Score Combinations	Rating
3 Low's, 1 Moderate, 1 High	Low
2 High's and 2 Low's	Moderate
2 High's and 2 Moderate's	High
2 Moderate's and 2 Low's	Moderate

14

Stressors	Best Management Practices	Metric	Calculation Result	Standardized Result
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Occupational Health and Safety	Experienced field staff. Safety first culture.	Accidents requiring treatment beyond first aid	0	LOW
			Rating:	LOW

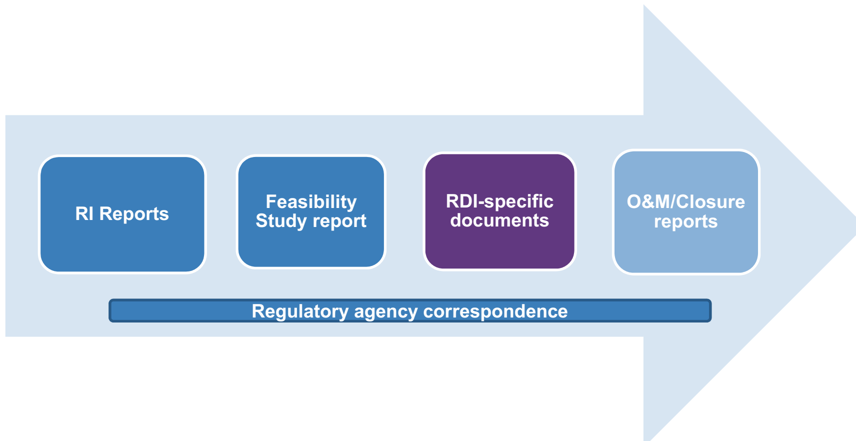
Project-Specific Sustainability Rating

Proportion of "**Low**" activity-specific sustainability ratings

- **Platinum:** Proportion of "Low" scores > 70 %
- **Gold:** 70% > Proportion of "Low" scores > 55%
- **Silver:** 55% > Proportion of "Low" scores > 45%

16

Incorporation into Project Documents



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Status of Implementation

18

Portfolio-Wide Cumulative Sustainability Benefits (to 3Q 2011)

PG&E sites participating: **59**

Cumulative Benefits (30 June 2011):

- GHG emission reductions: **809 metric tons**
- Offsite waste reductions: **3,603 tons recycled**
- Reductions in liquid IDW: **549,337 gallons**
- Reductions in soil IDW: **2,075 tons**
- Local economy boost: **$ 7.1M**
- Stakeholder satisfaction: **99%**
- Reduction in energy use: **15,000 KWh**

19

Sustainability Benefits Equivalencies

Metric	Benefit	Equivalency
GHG emission reductions	809 metric tons	**159** average sized passenger vehicles driving for one year
Offsite waste reductions	3,603 tons	**1,817** average annual households' waste production
Reductions in liquid IDW	549,337 gallons	**14** average annual households' water use
Reductions in soil IDW	2,075 tons	**1,051** average annual households' waste production
Local economy boost	$ 7.1M	**$12.1M** in beneficial ripple effects **169** full-time jobs created for a year
Reduction in energy use	15,000 KWh	**17** light bulbs (100W) working non-stop for a year

20

Next Steps

Attachment 11
SURF Student Chapter Competition

New Academic Outreach Technical Initiative
SURF Student Chapter Competition

Michelle Crimi
Clarkson University
Scott McDonough
AECOM

SURF Student Chapter Competition

- **Co-Leaders:**
  Scott McDonough (AECOM)
  Michelle Crimi (Clarkson)

  Team:
  TBD
- **MISSION:** Facilitate student education, research, and innovation in sustainable remediation.
- **BRIEF DESCRIPTION**: A SURF Student Chapter Competition (the SURF Competition) would engage students in a remediation problem during which students would be expected to design sustainable solutions to that problem and present those solutions to remediation professionals.
- The remediation designs would be presented to a panel of judges and awards would be distributed to one or more student chapters.

SURF Student Chapter Competition

Prior to Competition

1. Research current student design competitions
2. Develop Basis of Competition Memorandum that describes:
   - Relevant features discovered during research of other student design competitions;
   - The intent of the SURF Competition;
   - The structure and duties of those charged with oversight of the SURF Competition; and
   - The structure of the components of the SURF Competition (i.e., who, what, where, when, and how)
3. Develop Competition rules and marketing materials
4. Market the Competition

During/Following Competition

1. Engage students in Competition
2. Provide professional support/sponsorship to student chapters
3. Assess and improve Competition

SURF Student Chapter Competition

- **INITIATIVE ALIGNMENT WITH SURF MISSION**:
- The Competition aligns with all four bullets listed in the SURF Mission Statement. Specifically, this initiative will promote the:
  – Advancement of the science and application of sustainable remediation through focused sustainable design considerations within each student chapter submission;
  – Development of best practices focused on sustainable design considerations through student chapter lessons learned;
  – Exchange of professional knowledge through student chapter mentorship; and
  – Education and outreach to students and universities through SURF Competition promotion and awareness

BENEFIT TO SURF & REMEDIATION COMMUNITY:

- The Competition will offer promotion of SURF throughout soon to be professionals and has the potential to lead to innovative solutions to remediation problems presented by students

Task and Timelines (TBD)

Task	Timeline	Responsibility
1.) Solicit initiative team members from SURF membership		Scott McDonough & Michelle Crimi
2) Initiative team conference call and solicit comments on initiative proposal		Full team
3) Finalize initiative proposal and submit to Technical Initiatives Committee Lead & SURF Board for approval		Scott McDonough & Michelle Crimi
Pending approval of the Initiative by SURF Board…		
4.) Research current student design competitions		Full team
5) Consolidate research and draft Basis of Competition Memorandum		Full team
7) Basis of Competition Memorandum submitted to Technical Initiatives Committee		Full team & Technical Initiatives Committee
8) Basis of Competition Memorandum finalized for publication		Full team
9) Draft Competition rules and marketing materials		Full team
10) Market Competition		Full team
11) Hold Competition		Full team
12) Asses Competition Results and conformance with mission		Full team & Technical Initiatives Committee

Attachment 12
Environmental Management Systems and GSR:
The Missing Link

Environmental Management Systems and GSR – The Missing Link

Erica Becvar, AFCEE
Karin Holland, Haley & Aldrich

U.S. AIR FORCE

AFCEE

HALEY & ALDRICH

1

Outline

- What are Environmental Management Systems (EMS)
- Relationship between an EMS and GSR
- Air Force (AF) example
- Conclusions/recommendations
- Questions

2

What is an EMS?

- **Formal, certifiable, systematic framework**:
  - Sustainability impacts
  - Objectives/targets
  - Environmental program
  - Continuous improvement
- **Broad implementation:**
  - Different organization types
  - Requirement for federal agencies
  - Global reach

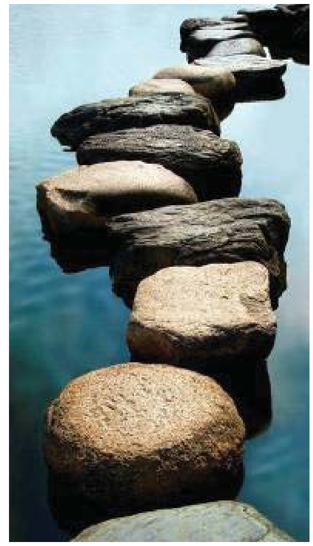
3

Systematic and Iterative Process

4

Continual Improvement

- EMS **framework** improvements
- More **areas** included
- More **activities**, **products**, **processes** covered
- More **impacts** addressed
- **Supply chain** impacts better managed



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EMS Benefits

- Reduced **environmental footprint**
- Incorporates **sustainability goals**
- **Regulatory compliance**
- Enhanced **stakeholder** relations
- Significant **cost savings**:
  - Increased efficiency
  - Decreased permitting costs

6

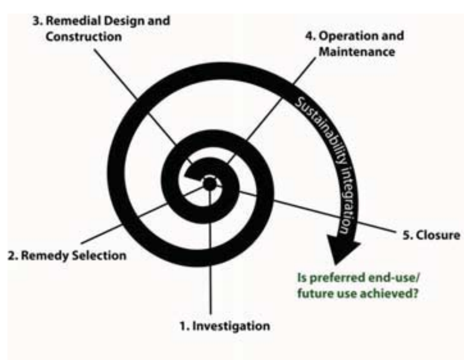
EMS and GSR Mutual Principles

- Identify **aspects** and **impacts**
- Set **objectives** and **targets**
- Implement **sustainability program**
- Provide **training**
- Set up **communication channels**
- **Monitor progress**
- Take **corrective** and **preventative** actions
- **Document** results

7

Relevance to SURF

- Aligned with our **mission**!
- Embedded in our **technical initiatives**:
  - Process-based
  - Systematic and iterative
  - Holistic
  - Collaborative
  - Transparent
- Supports our **metrics toolbox**



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AF GSR Initiative

- **Broad-ranging** initiative
- Multiple **sustainability impacts** addressed
- Implementation supported by **numerous tools**
- Included in **contracts**
- Various **case studies**

9

Current Barriers to Institutionalizing GSR

- No **consistent approach** for GSR integration
  - GSR efforts often **uncoordinated**
- Benefits not often included in AF **sustainability programs**
- No **legally driven** requirements

10

AF EMS State in Relation to Restoration

- EMS **standardizes, established**, **mandated** and **endorsed**
- However until recently:
  - Only **superficially** covered restoration programs
  - **Did not incorporate GSR**
  - EMS and GSR fairly **independent**

11

GSR and EMS Synergies

How benefits of GSR can, through EMS, contribute to base's effort to reduce or eliminate impact on environment:

- From **restoration** activities, **identify significant aspects, impacts** on environment to reduce/eliminate
- Generate **objectives & targets** to achieve reduction/ elimination of environmental impacts
- Institute **operational controls** to reach targets and objectives
- Through **management review**, check progress to achieve targets and objectives
- **Key benefit of GSR and EMS connection**: Tie reductions/ eliminations /achievements to overall installation/campus/ company goals (*e.g.*, SSPP)

12

Integration of GSR into the AF EMS

- Recognition that :
  - EMS and GSR have many **synergies**
  - An EMS can **formalize** and **manage** GSR
  - EMS can be **contractual umbrella** for requiring sustainable remediation

- AF EMS **flexible**:
  - Scope can easily be **broadened**
  - Ties GSR into other environmental programs, **asset management**

➢AF EMS now **explicitly covers** GSR

13

Example of EMS and GSR Synergies

Performance-based Remediation Contracts

1. Scope & Policy

2. Planning (or "Plan")
- Establish Statement of Objectives (SOO)
- Incorporate GSR into environmental aspects, targets, and objectives
- Incorporate emerging requirements
- Cross-functional interaction is key

3. Implementation and Operation (or "Do")
- Conduct remedial action
- Implement operational controls to meet SOO goals and control/mitigate/prevent negative impacts to environment
- Train personnel on EMS and managed aspects
- Effectively communicate
- Conduct emergency preparedness and response as needed

4. Checking (or "Check")
- Monitor and measure remedial action progress on SOO and managed aspects
- Verify compliance
- Root cause analysis
- Implement corrective, preventative action as needed

5. Management Review (or "Act")
- Review progress to determine if going to meeting targets and objectives in SOO action
- Recommend adjustments/improvements
- Implement changes to "plan" phase as needed

14

Steps to Integrate GSR into AF EMS

- **Rapid improvement event (RIE)** targeting GSR/EMS actions
- Insert EMS language into remediation **contracts** (performance-based contracts key challenge)
- Target restoration participation in **cross-functional teams**
  - Include GSR targets & objectives in installation aspects
  - **Build bridges** between restoration and other programs (*e.g.*, compliance, haz mat/waste, P2, safety, occ. health, etc.)
- **Standardize** EMS aspects, impacts, and activities across AF
- Use **standard, communication Internet tool** (eDASH) to monitor progress on targets and objects

Conclusions

- An EMS provides a **consistent** yet **flexible** process:
  - Can be **customized** to restoration
  - Enables better GSR **management**
  - Anticipated **cumulative sustainability improvements**
  - GSR may contribute to bases **sustainability goals**
  - **Bridges gaps** between restoration and other environmental programs

16

Recommendations

- **Incorporate GSR into your organization's EMS!**

➢GSR will become institutionalized

➢GSR may contribute to global sustainability goals

➢GSR may promote innovation in other areas

➢Whole system sustainability will be demonstrated

17

18

Attachment 13
Adaptation Planning at the Port of San Diego

Adaptation Planning at the Port of San Diego

Sustainable Remediation Forum:
UCSD, February 1, 2012

Cody Hooven
Senior Environmental Specialist

Unified Port of San Diego

Outline

- Port Goals and Process
- Climate Change Adaptation Component of CMAP
- Regional Adaptation Strategy

2

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Port of San Diego Background

3

Port Goals

- Key Planning Goal: Provide a tool for streamlining GHG evaluation for future CEQA (California Environmental Quality Act) processes
  - Revised CEQA Guidelines have a specified approach
  - Focus is on greenhouse gas (GHG) emission reductions
  - Some recent Plans adding Climate Adaptation
- Additional Goals:
  - Achieve GHG reductions on District tidelands
  - Address adaptation issues – recent CA planning issue

4

CMAP Development Process

Stage 1: Development of CMAP

GHG Mitigation

1. Baseline & Future Emission Inventories
2. Review & Categorize Mitigation Measures
3. Set Goals
4. Specify Mitigation Measures to Achieve Goals
5. Tracking Methods

Climate Change Adaptation

1. Existing Conditions
2. Port Vulnerabilities
3. Port Prioritization of Actions
4. Port Implementation Strategies

Stage 2: Draft CMAP

Stage 3: Final CMAP

Stage 4: CEQA Process

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Climate Adaptation for a Port: Considerations

- Climate adaptation planning is a new concept
  - New paradigm that manages risks related to climate change
- Different approach than former planning process
  - Departure from relying solely on historical info
  - Emphasis on future planning
- Long planning horizon – 50yr and 100yr
- No "low-hanging fruit" for adaptation (unlike GHG)
- Requires multi-jurisdictional coordination

6

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Stakeholder involvement, public process

- Typical process at Port and for Plans under CEQA
- Involves a more focused technical advisory group
  - Port's Climate and Energy Work Group
  - Meeting at key milestones steps
- Involves public participation during development
  - Website
  - Email notices
  - Public Meetings

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CEQA Process

- CEQA Guidelines: be adopted in a public process following environmental review
- Guidance from the Office of Planning and Reseach
- Preparation of environmental documents
- Further public involvement
- Most entities preparing Mitigated Negative Declarations

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Climate Adaptation Component

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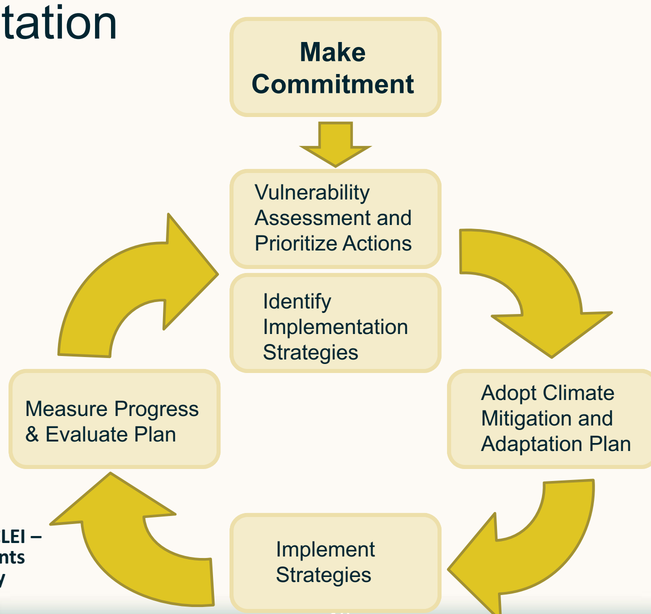
Five Milestones for Climate Adaptation



Adapted from ICLEI – Local Governments for Sustainability

10

Key Vulnerabilities

- Quantitative sea-level rise (SLR) impacts
  - Land Use (Port and tenant activities)
  - Stormwater
  - Natural Resources
  - Other (e.g. goods movement, safety, etc.)
- Qualitative Summary of Vulnerabilities
  - Temperature Increases
  - Other Impacts
    - Peak energy demand reduction
    - Water conservation
    - Increased erosion

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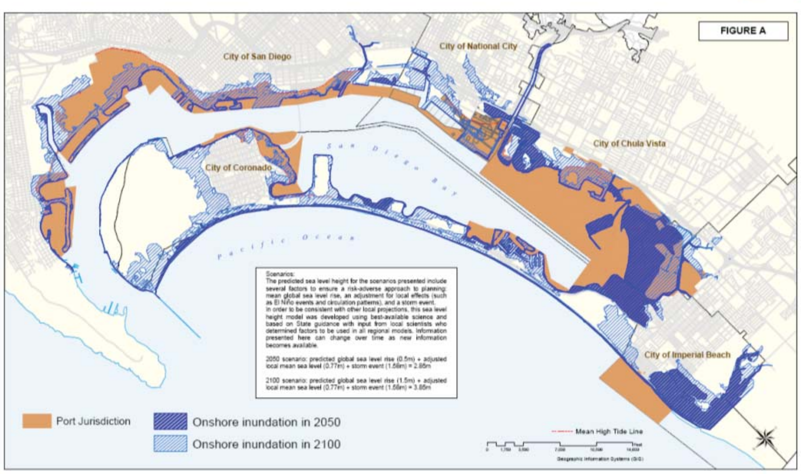
SLR 2050 and 2100 Port-wide Map



San Diego Bay Sea Level Rise in 2050 and 2100

12

Likelihood

LIKELIHOOD RATINGS		
Almost certain	5	Expect this event almost annually. Highly likely (>90% probability).
Probable	4	Expect this event several times by 2050/2100. Likely to occur (50-90% probability).
Possible	3	Expect this event to possibly occur once by 2050/2100. Not very likely, but still appreciable chance of occurring (10-50%).
Unlikely	2	Event hasn't occurred yet, but could occur at some time by 2050/2100. Unlikely but not negligible (1-10%).
Rare	1	Event has occurred in other regions of the world, but only in exceptional circumstances. Not expected to occur near the Port (<1%).

13

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Consequence

Risk by function *	Consequence rating				
	1	2	3	4	5
Working Port	No impact or slight reduction of operations in specific areas.	Limited short-term (hours) interruptions to operations causing slight delays.	Increased medium-term (days) interruptions to operations. Damage to buildings, property, cargo, or equipment.	Longer term (months) loss of operations. Major damage to buildings, property, cargo, or equipment.	Permanent loss of operations.
Green Port	No loss of natural habitats or ecosystem services.	Disruption or damage to natural habitat components that is both short-term temporary (hours), and that is likely to be reversible (including habitats and/or native species that are not rare, nor threatened, nor endangered). No net loss of ecosystem services. **	Disruption or damage to natural habitat components that is both medium-term temporary (days) and that is likely to be reversible with restoration and/or conversion (including habitats and/or native species that are not rare, nor threatened, nor endangered). **	Disruption to or loss of natural resource components that is both long-term (months) and that is likely to be reversible with restoration and/or conversion (including habitats and/or native species that are not rare, nor threatened, nor endangered). **	Probable permanent and irreversible loss of natural resource components (including habitats and/or native species that are not rare, nor threatened, nor endangered). **

Risk Matrix

		CONSEQUENCE				
		1	2	3	4	5
LIKELI-HOOD	5	Medium	High	Very high	Very high	Very high
	4	Medium	Medium	High	Very high	Very high
	3	Low	Medium	Medium	High	Very high
	2	Low	Low	Medium	Medium	High
	1	N/A	Low	Low	Medium	Medium

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Adaptation Strategies

#	Adaptation Strategies	Benefits	Constraints	Impact Factors
		(PO) Port Operations		
PO1	Move existing and design new cargo storage facilities out of vulnerable areas.	Reduces risk of damage to cargo or delays in goods flow.	May adversely impact current operations. Moving existing operations potentially costly.	SLR
PO2	Obtain flood insurance to avoid liability of damaged goods.	Reduces financial risks.	Reduces direct financial risks, but does not directly adapt operations to future conditions.	SLR, STORM, FLOOD
PO3	Update emergency response plans to account for increased potential for energy black-outs in summertime and increased flooding due to SLR and storm intensification. Assess potential for flash floods to impact emergency services and local distribution networks.	Reduces disruption in work flow and potential cargo damage; improves safety		SLR, STORM, FLOOD, TEMP, HEATWV

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Regional Effort – Sea Level Rise Adaptation Strategy for San Diego Bay

- ICLEI Local Governments for Sustainability – lead
- Multi-jurisdictional
- Toolbox – recommendations to address certain impacts, vulnerabilities, sectors, or timeframes

BEACH NOURISHMENT
Expanding beach depth, replenishing beach sand, and constructing or expanding sand dunes provides spatial/passive buffering from high sea levels.

WETLANDS
Wetlands provide flood water storage, buffers from storms and erosion control. They are also particularly sensitive and will "naturally" shift upland with the increasing salinity and water depth that results from sea level rises.

17

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Regional Effort – Adaptation Strategy

- Contaminated Sites Primary Vulnerabilities
  - Hazardous waste sites are highly vulnerable to major flooding events as storage tanks in the area could be moved, or motors and pumps could be impaired
- Low to moderate vulnerability – strict regulatory process and high standards
  - 2050 – limited exposure, 2100 – several sites of concern
- Strategies
  - Conduct targeted assessment of areas of concern
  - Ensure that new remediation BMPs are designed to be resilient to 2100 scenarios

18

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Remaining Steps of Our Plan

- Adaptation
  - Finalize prioritization of actions using risk metric
  - Describe implementation strategies
- GHG Mitigation
  - Specify goal(s)
  - Describe mitigation measures to help achieve goal
  - Develop tracking methods
- Draft CMAP Report

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19

Thank You

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Regional Adaptation Strategy report can be found on The San Diego Foundation's website: www.sdfoundation.org

Unified Port of San Diego

Attachment 14
Green Washing, Green Puffing, and the Green Sheen –
What to Avoid

HUNTON& WILLIAMS

Greenwashing, Green Puffing and the Green Sheen – What to Avoid

Ann Marie Mortimer

Partner
Hunton & Williams LLP
February 1, 2012

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HUNTON& WILLIAMS

What is Greenwashing (& related sins)?

- Term coined in 1986 in reference to the hotel industry practice of encouraging reuse of towels as a green initiative, despite the fact that little or no effort was being made to reduce energy waste
- Broadly greenwashing, green puffing and the green sheen refer to the practice of inflating stated green benefit of an act, product or practice, typically for the purpose of achieving a public relations or profits goal.

2

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How Green is Your Green?

-Courtesy of The Greenwashers Film

3

HUNTON& WILLIAMS

Green, Green. . .Everywhere. . .

- Virtual explosion in green claims – 81% of public states they will buy green despite economy;
- Exponential jump in "green" claims including: natural, biodegradable, eco-friendly, non-toxic, carbon-neutral, sustainable and certified green
- In recent national survey, of 1,018 consumer products bearing 1,753 green claims all but one made at least one claim that exaggerated the stated green benefits

4

HUNTON& WILLIAMS

The Green Score Card: Say What You Mean, Mean What You Say

- 80% Global Fortune 250 disclose sustainability performance through sustainability or corporate responsibility reports;
- 45% uptick globally in sustainability reporting;
- In the United States, 78 out of the 100 largest companies issue sustainability reports;
- In the UK and Japan, 99 out of the 100 largest companies issue sustainability reports;
- Only 16% of Americans believe green advertising claims can be effectively self regulated.

5

HUNTON& WILLIAMS

Poor Disclosure Track Record And Public Distrust Provide Backdrop For Green Disclosure Risk

- Despite push for standardization and voluntary compliance with climate change and GHG disclosures, a 2009 survey of nearly 6,400 annual filings by Standard & Poor's 500 companies found that 73.6% of the 2008 filings failed to mention climate change at all;
- Despite increase in voluntary disclosures, the quality of those disclosures in industries most likely impacted (electric utilities, coal, oil/gas and insurance) was largely rated as "limited" or "poor"; (25% Americans believe coal is a renewable resource);
- Corresponding with these inadequate disclosures, the public reports a strong mistrust of corporate disclosure policies on climate change, with 82% responding they "somewhat" to "strongly" distrusted corporate sponsored information on climate change.

6

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Disclosure Risks In An Evolving Regulatory World

- Green Puffing: False advertising and marketing claims
- Green Washing: *Kasky v. Nike,* 27 Cal.4th 939 (2002) (manufacturer's statements about labor practices constitutes commercial speech subject to false advertising and unfair competition law)
- SEC/Investor related disclosure claims:
  - Feb. 8, 2010, SEC publishes interpretive guidance requiring climate change disclosure in many contexts, including annual reports filed with the SEC and as part of the registration process for public's offerings of securities.

  FTC Green Guidelines:
  - Voluntary standards adopted as legal standards in some states; prohibits exaggeration, comparative or otherwise and requires substantiation.
- THE CHALLENGE: Push for greater transparency, standardization of climate change disclosures, development of meaningful metrics to capture and report climate change information, adequate assessment and disclosure of climate and sustainability related risk, avoid greenwashing and related sins.

7

HUNTON& WILLIAMS

FTC Guidance on Advertising: Two Step Inquiry for Ad Claims

1. Consumer Perception: Is there a material representation that a reasonable consumer could construe? If so…
2. Substantiation: Does the advertiser have competent and reliable evidence to substantiate its claims?

8

HUNTON & WILLIAMS

Environmental Marketing Claims

- Substantiation requires competent and reliable scientific evidence
- Should not be presented in a manner that overstates the environmental attribute or benefit
- Remember "marketing" can be any consumer facing communication, whether or not "selling" in the traditional sense.

9

HUNTON & WILLIAMS

Enforcement & Litigation Outlook

- Increase in "green" claims on products and services and lack of guidance regarding recent trends is likely to result in more enforcement and litigation
- A tightening regulatory environment coupled with multiple stakeholders demanding environmental stewardship require coordination, transparency and accuracy.

10

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The Got Green "Do's"

- DO review all public statements related to any green claims, including related to sustainability and global climate change for accuracy, balance and fairness;
- DO conduct a thorough audit and risk assessment of the accuracy of what is said and omitted from sustainability statements or other green representations;
- DO review hard metrics and promised goals for achievability (DON'T over-promise);
- DO centralize sustainability communications outside of the PR Department

11

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The Got Green "Don'ts"

- **DON'T** be vague;
- **DON'T** make claims based on hidden trade-offs;
- **DON'T** make claims based on the "lesser of 2 evils"
- **DON'T** rely on faulty, isolated or suspect data;
- **DON'T** EXAGGERATE, GUESS OR OUTRIGHT FIB

12

Navigating Disclosure Risks

- Stay current and informed internally and externally;
- Assess existing knowledge base and disclosure practices;
- Distinguish between the aspirational and the actual;
- Conduct a thorough audit and risk management of the accuracy of what is said and omitted from all public statements related to green claims, climate change and sustainability;
- Ensure consistency between climate risk and opportunity disclosures in SEC filings and other pubic disclosures, including sustainability and climate change reports and marketing materials.

13

Attachment 15
Sustainable Infrastructure and Rating Systems

Sustainable Infrastructure and Rating Systems

Peter D Binney, PE

Technical Lead, ISI

VP, Merrick & Co.

Rating Systems for Horizontal Infrastructure

- Recognized gap in market for a sustainability rating system for horizontal infrastructure (transportation, water, energy ….);
- LEED is an accepted standard for certain building envelopes but not generally applicable to horizontal infrastructure;
- ASCE Sustainability Initiative launched to provide industry with resources and tool kit to support practitioners and owners in developing more Sustainable approaches;
- Identified "Best in Class" globally and built framework around UK's CEEQUAL program and FIDIC's PSM II approach;
- ASCE, ACEC and APWA created non-profit corporation (Institute for Sustainable Infrastructure) to "own" systems;
- www.sustainableinfrastructure.org

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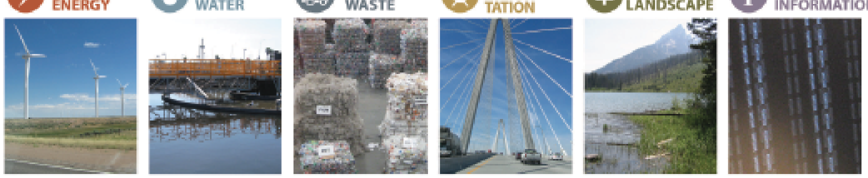
- **501 (c) (3) Partnership Founding Partners**
  - APWA Center for Sustainability
  - ASCE Committee on Sustainability
  - ACEC Green Scorecard
- **ISI Formation**
  - National Benchmark for Sustainable Infrastructure
  - Sustainable Civil Infrastructure Projects
- **Focus –** Project Performance Certification Using Infrastructure Rating System
  - Sustainable Professional Accreditation
  - Education and Training

ISI Presentation 3

What Infrastructure Categories Does the Rating System Assess?



ENERGY
- geothermal
- hydroelectric
- nuclear
- coal
- natural gas
- oil/refinery
- wind
- solar
- biomass
- other

WATER
- potable water distribution
- capture and storage
- water reuse
- stormwater management
- flood control
- other

WASTE
- solid waste
- recycling
- hazardous waste
- collection and transfer
- other

TRANSPORTATION
- airports
- roads/highways
- bike/pedestrians
- railways
- public transit
- ports
- waterways
- other

LANDSCAPE
- public realm
- parks
- ecosystem services
- other

INFORMATION
- telecommunications
- internet /phones
- satellites
- data centers
- sensors
- other

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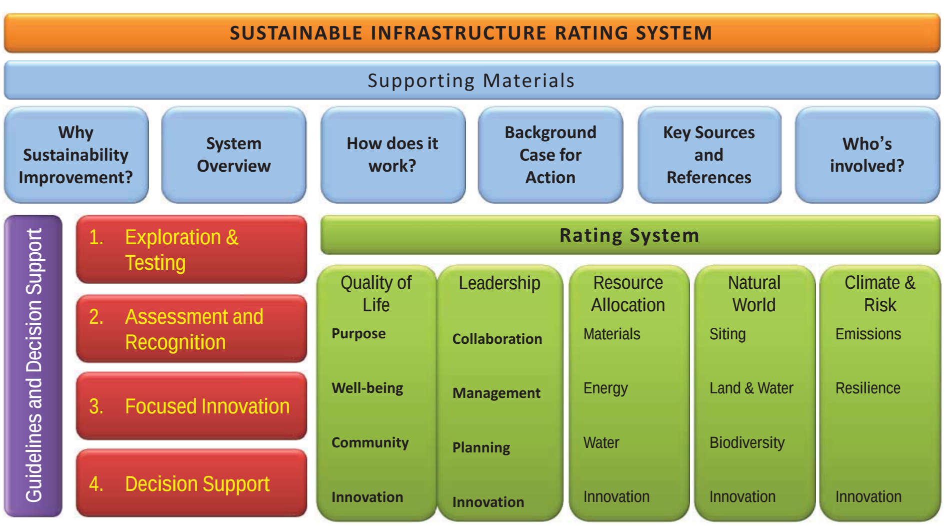
ISI Presentation 4

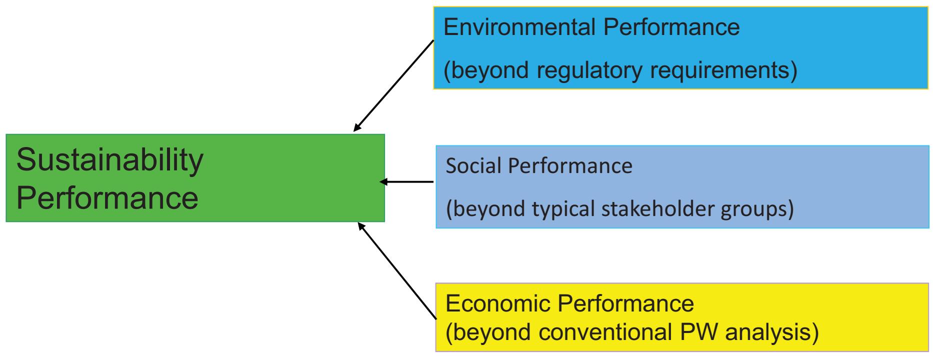
ISI Core Products and Services

- Sustainable Infrastructure Rating System - **envision™**
- Sustainable Professional (ISI SP) Assessor's Accreditation
- Credentialer Training and Third Party Verification
- Credentialing of Project Performance - Awards and Recognition Program
- Interface with Owners, A/E, Agencies, Practitioners, Stakeholders…
- Communications/Education on Rating System

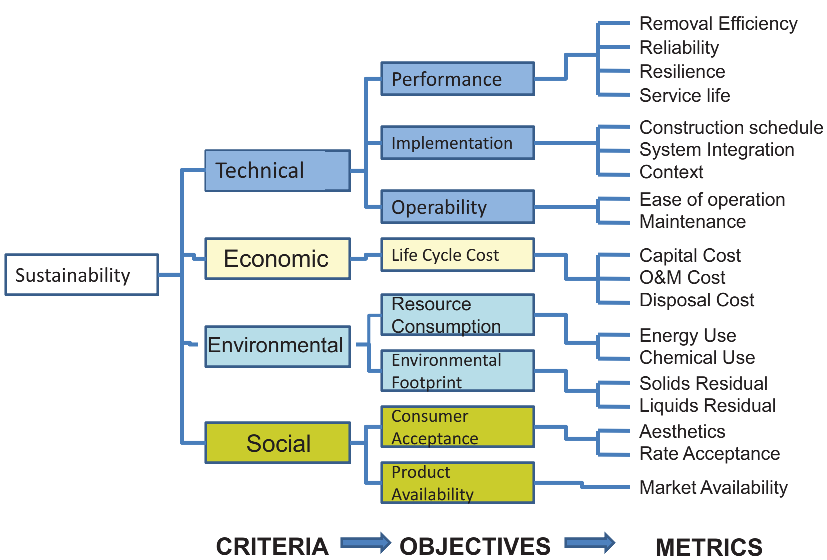
Web-based Tool: System Architecture



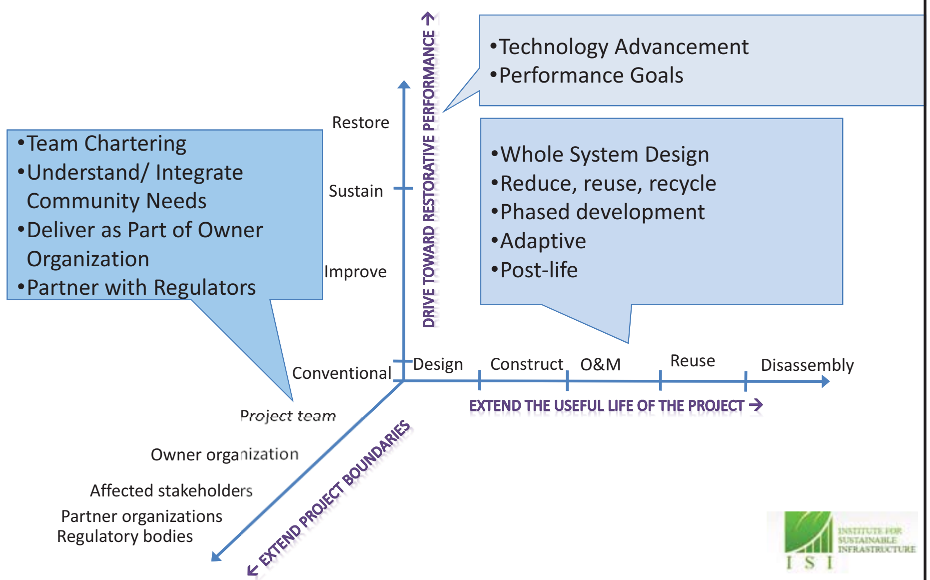
Sustainability Performance Goals



Sustainability Mapping



Sustainability Through Project Delivery



ISI Presentation 9

Framework of Rating Tool

- Matrix evaluation of 5 Sections, 60 Criteria (reflect triple bottom line attributes) and performance achievement
- Narrative guidance manual
- A Sustainability “Score” and road map
- Supports consideration of performance achievement (higher efficiency) as well as process improvement (pathway to supportable and effective approaches)
- Peer review ongoing
- Feedback and input from agencies, owners, practitioners, activists, academics who are using tool kit to enhance system

ISI Presentation 10

Constructing the Rating System

- Should be relevant, supportive, usable and productive
  - E-version, interactive, instructive, outcome-based, process-supportive, outputs
- Should be scalable according to complexity and size
  - Stage 1 – checklist and self assessment
  - Stage 2 – comprehensive consideration of multiple criteria and core system
  - Stage 3 – focused project assessment (+ operations, existing facilities)
  - Stage 4 – multi-attribute, complex, contested, TBL balancing
- Agencies, owners, consultants, communities (+/-) should be able to use approach to reach consensus through informed decision making

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Project Credits

QUALITY OF LIFE

QL1.1 Community Quality of life
QL1.2 Stimulate Sustainable Growth
QL1.3 Local Skills
QL2.1 Public Health and Safety
QL2.2 Noise and Vibration
QL2.3 Light Pollution
QL2.4 Mobility and Access
QL2.5 Alternative Transportation Modes
QL2.6 Site Accessibility
QL3.1 Historic and Cultural
QL3.2 Views, Local Character
QL3.3 Public Space
QL0.0 Innovation

LEADERSHIP

LD1.1 Effective Leadership
LD1.2 Sustainability Management System
LD1.3 Collaboration
LD1.4 Stakeholder Involvement
LD2.1 By-Product Synergy
LD2.2 Integration
LD3.1 Long Term Monitoring and Maintenance
LD3.2 Regulatory/ Policy Conflicts
LD3.3 Extend Useful Life
LD0.0 Innovation

RESOURCE ALLOCATION

RA1.1 Embodied Energy
RA1.2 Procurement
RA1.3 Recycling
RA1.4 Regional Materials
RA1.5 Divert Waste
RA1.6 Reduce Material Export
RA1.7 Deconstruction
RA2.1 Reduce Energy Consumption
RA2.2 Renewable Energy
RA2.3 Monitor Energy Systems
RA3.1 Water Availability
RA3.2 Water Consumption
RA3.3 Monitor Water Systems
RA0.0 Innovation

NATURAL WORLD

NW1.1 Prime Habitat
NW1.2 Wetlands Surface Water
NW1.3 Prime Farmland
NW1.4 Geologic Hazards
NW1.5 Floodplains
NW1.6 Steep Slopes
NW1.7 Greenfields
NW2.1 Storm water
NW2.2 Pesticides
NW2.3 Water Contamination
NW3.1 Biodiversity
NW3.2 Invasive Species
NW3.3 Disturbed Soils
NW3.4 Maintain Water Functions
NW0.0 Innovation

CLIMATE AND RISK

CR1.1 Greenhouse Gas Emissions
CR1.2 Air Pollutants
CR2.1 Climate Threat
CR2.2 Traps and Vulnerabilities
CR2.3 Long-term Adaptability
CR2.4 Short-term Hazards
CR2.5 Heat Islands
CR0.0 Innovation

Five Degrees of Performance

- Improved - *Performance that is at/ above conventional*
- Enhanced - *Indications that superior performance is within reach.*
- Superior - *Sustainable performance that is noteworthy.*
- Conserving - *Performance that has achieved essentially zero impact.*
- Restorative - *Performance that restores natural or social systems.*

envision™

Sustainable Infrastructure Rating System

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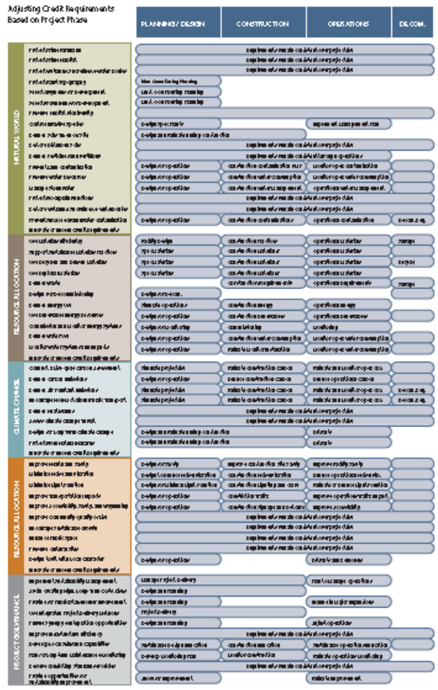
For Access to Website:

www.sustainableinfrastructure.org

Project Phases

Metrics will change as project moves from planning through design, construction and repurposing



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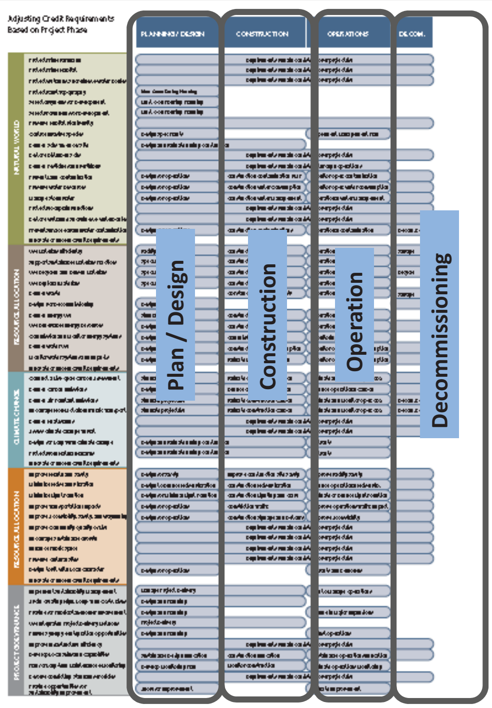
Sustainability Indicators and Metrics Change



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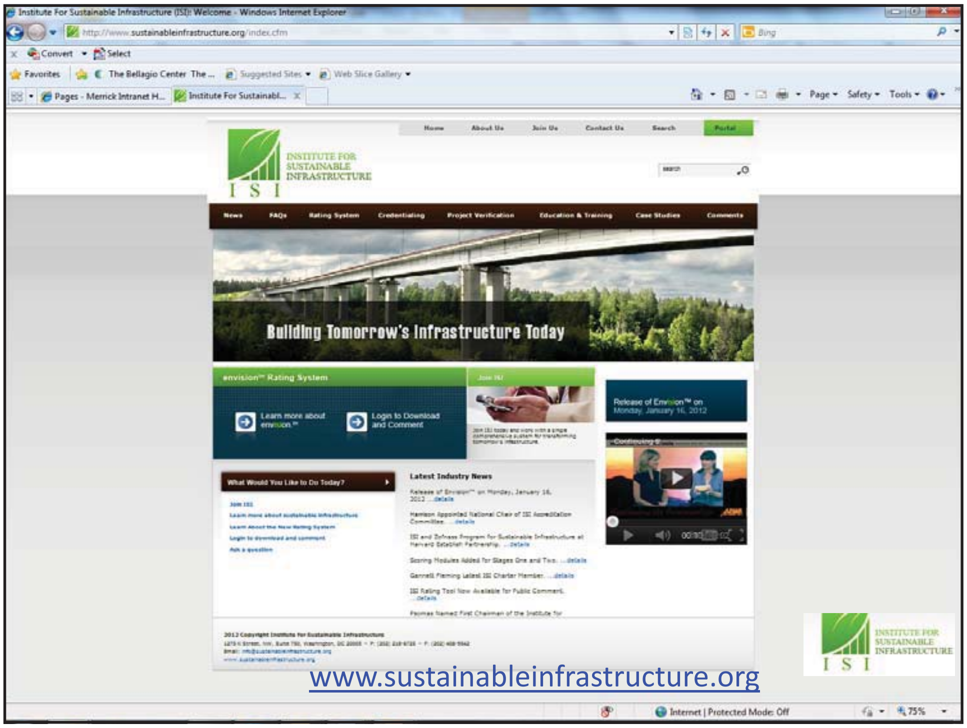
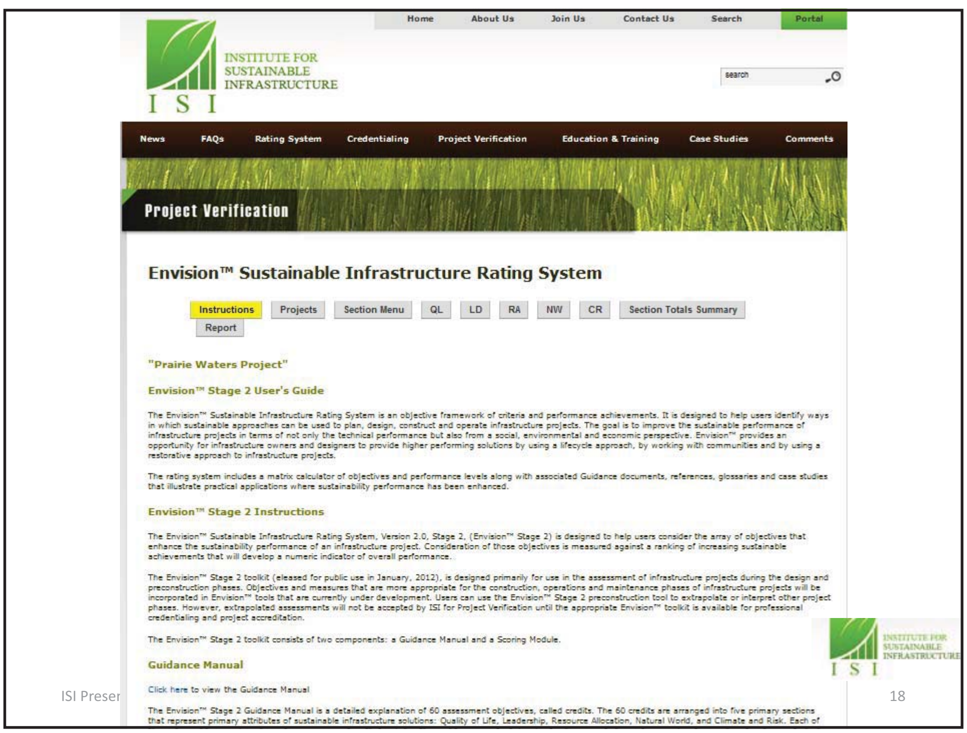

Building Tomorrow's Infrastructure Today
www.sustainableinfrastructure.org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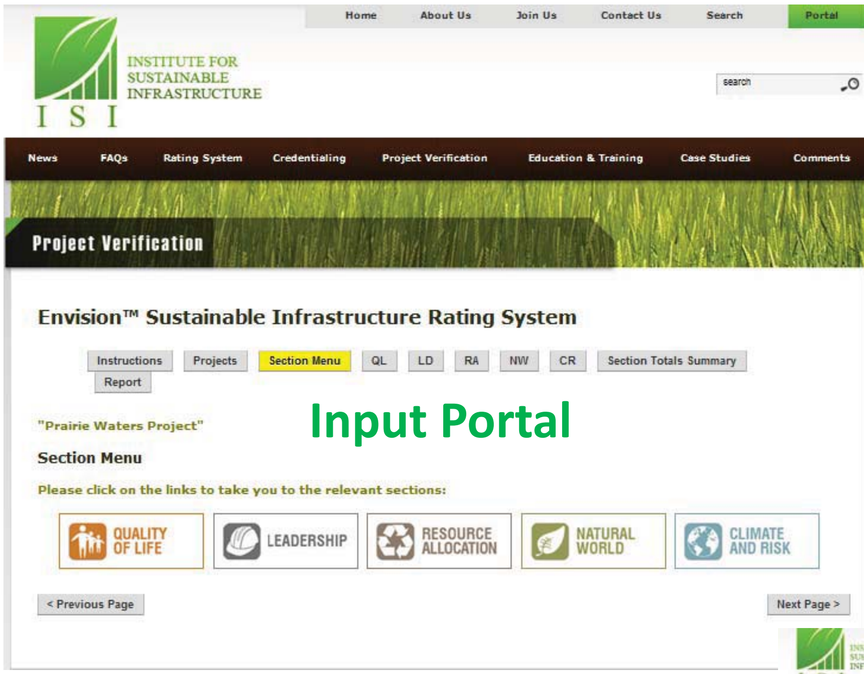
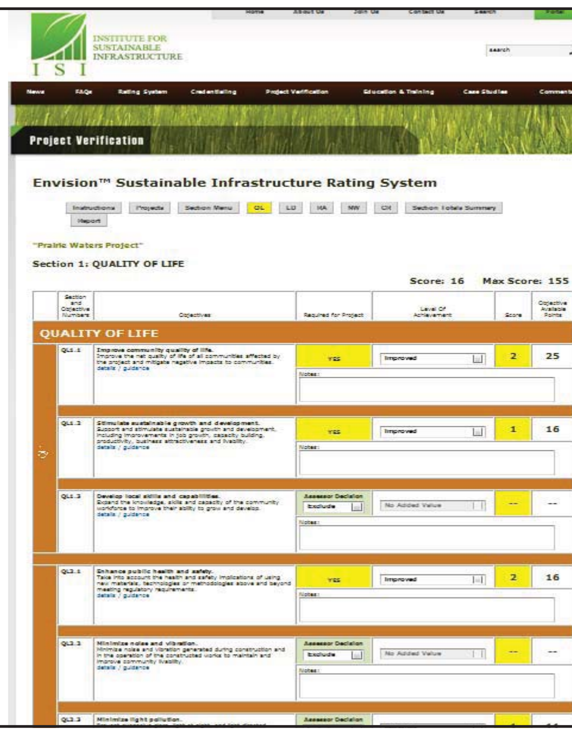
INSTITUTE FOR SUSTAINABLE INFRASTRUCTURE
I S I
News
FAQs
Rating System
Credentialing
Project Verification
Education & Training
Case Studies
Comments
Project Verification
Envision™ Sustainable Infrastructure Rating System
Instructions
Projects
Section Menu
QL
LD
RA
NW
CR
Section Totals Summary
Report
"Prairie Waters Project"
Envision™ Stage 2 User's Guide
The Envision™ Sustainable Infrastructure Rating System is an objective framework of criteria and performance achievements. It is designed to help users identify ways in which sustainable approaches can be used to plan, design, construct and operate infrastructure projects. The goal is to improve the sustainable performance of infrastructure projects in terms of not only the technical performance but also from a social, environmental and economic perspective. Envision™ provides an opportunity for infrastructure owners and designers to provide higher performing solutions by using a lifecycle approach, by working with communities and by using a restorative approach to infrastructure projects.
The rating system includes a matrix calculator of objectives and performance levels along with associated Guidance documents, references, glossaries and case studies that illustrate practical applications where sustainability performance has been enhanced.
Envision™ Stage 2 Instructions
The Envision™ Sustainable Infrastructure Rating System, Version 2.0, Stage 2, (Envision™ Stage 2) is designed to help users consider the array of objectives that enhance the sustainability performance of an infrastructure project. Consideration of those objectives is measured against a ranking of increasing sustainable achievements that will develop a numeric indicator of overall performance.
The Envision™ Stage 2 toolkit (eleased for public use in January, 2012), is designed primarily for use in the assessment of infrastructure projects during the design and preconstruction phases. Objectives and measures that are more appropriate for the construction, operations and maintenance phases of infrastructure projects will be incorporated in Envision™ tools that are currently under development. Users can use the Envision™ Stage 2 preconstruction tool to extrapolate or interpret other project phases. However, extrapolated assessments will not be accepted by ISI for Project Verification until the appropriate Envision™ toolkit is available for professional credentialing and project accreditation.
The Envision™ Stage 2 toolkit consists of two components: a Guidance Manual and a Scoring Module.
Guidance Manual
Click here to view the Guidance Manual
The Envision™ Stage 2 Guidance Manual is a detailed explanation of 60 assessment objectives, called credits. The 60 credits are arranged into five primary sections that represent primary attributes of sustainable infrastructure solutions: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. Each of
ISI Preser
18



Input Portal

ISI Presentation

Scoring Module



ISI Presentation

20

Envision Tool Portal

« Guidance Manual Home

Guidance Manual

QL1.1 IMPROVE COMMUNITY QUALITY OF LIFE

INTENT:
Improve the net quality of life of all communities affected by the project and mitigate negative impacts to communities.

METRIC:
Measures taken to assess community needs and improve quality of life while minimizing negative impacts.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(2) Internal focus. The project team has located and reviewed the most recent and relevant community planning information. Some, but not systematic outreach to stakeholders and decision makers has taken place. Some relatively easy, but not particularly important or meaningful changes made to the project. No significant adverse community effects are caused by the project (A, B, C)	**(5) Community linkages.** More substantive efforts to locate, review, assess and incorporate the needs, goals and plans of the host community into the project. Most potential negative adverse impacts of the project on the host community are reduced or eliminated. Key stakeholders are involved the project decision-making process. (A, B, C)	**(10) Broad community alignment.** All relevant community plans are reviewed and verified through stakeholder input. The project team works to achieve good project alignment with community plans, recognizing that the scope of the project is a limiting factor. Potential negative impacts on nearby affected communities are reduced or eliminated. (A, B, C)	**(20) Holistic assessment and collaboration.** The project makes a net positive contribution to the quality of life of the host and nearby affected communities. The project team makes a holistic assessment of community needs, goals and plans, incorporating meaningful stakeholder input. Project meets or exceeds important identified community needs and long-term requirements for sustainability. Remaining adverse impacts are minimal, mostly accepted as reasonable tradeoffs for benefits achieved. The project has broad community endorsement. (A, B, C)	**(25) Community renaissance.** Through rehabilitation of important community assets, upgraded and extended access, increased safety, improved environmental quality and additional infrastructure capacity, the project substantially reinvigorates the host and nearby communities. Working in genuine collaboration with stakeholders and community decision-makers, the project owner and the project team scope the project in a way that elevates community awareness and pride. Overall quality of life in these communities is markedly elevated. (A, B, C, D)

DESCRIPTION

This credit addresses the extent to which the project contributes to the quality of life of the host community: the community in which the constructed works is situated and directly affects. This determination is based on how well the project team has identified and assessed community needs, goals and objectives, and incorporated them into the project. Relevant community plans are assumed to be a viable expression of those needs, goals, objectives and aspirations. In a real sense, they are the community's expression of their desired quality of life.

Instructions | Projects | Section Menu | QL | LD | RA | NW | CR | Section Totals Summary | Report

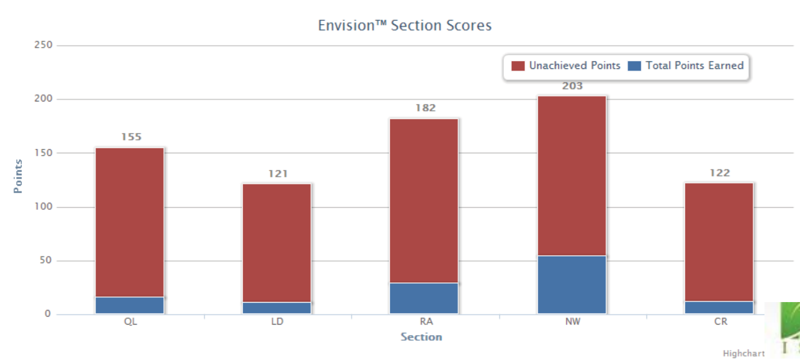
Section 1 choices updated.

"Prairie Waters Project"

Scoring Summary

Section Totals Summary

Section	Maximum Possible Score	Section Points	Innovation Points	Total Points Earned
QL	155	11	5	16
LD	121	10	1	11
RA	182	29	0	29
NW	203	46	8	54
CR	122	12	0	12
Total Project Points	783	108	14	122



< Previous Page | Next Page >

22

Project Verification

Envision™ Sustainable Infrastructure Rating System

Instructions | Projects | Section Menu | QL | LD | RA | NW | CR | Section Totals Summary | Report

"Prairie Waters Project"

Report Output

Report (All Sections)

See only Notes

	Section and Objective Numbers	Objectives	Required/ Applicable?	Level Of Achievement	Score	Max Available Points
QUALITY OF LIFE						
QL1	QL1.1	**Improve community quality of life.** Improve the net quality of life of all communities affected by the project and mitigate negative impacts to communities.	REQUIRED	Improved	2	25
			Notes:			
	QL1.2	**Stimulate sustainable growth and development.** Support and stimulate sustainable growth and development, including improvements in job growth, capacity building, productivity, business attractiveness and livability.	REQUIRED	Improved	1	16
			Notes:			
	QL1.3	**Develop local skills and capabilities.** Expand the knowledge, skills and capacity of the community workforce to improve their ability to grow and develop.	EXCLUDE	------	--	--
			Notes:			
	QL2.1	**Enhance public health and safety.**	REQUIRED	Improved	2	16

Professional Accreditation

- Professionals can seek training and accreditation in broad sustainability principles for infrastructure;
- Various training opportunities in sustainability;
- ISI will accredit users competence in applying envision™ tools;
- Information and application on ISI website –
  - Provisional Credentialing in 2012 and 2013
  - Available after March 2, 2012
  - Requires passing a multi-choice exam
  - Fee schedule on ISI website

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Project Credentialing

- Use envision™ to enhance project performance;
- Can do self assessments, interactive planning and learning with web resources;
- Owners may apply for recognition of sustainable achievements;
- Credentialing of sustainable performance through third party verification – (Stage 2 and higher applications);
- Professional standards requirements for accredited sustainability professionals and verifiers;

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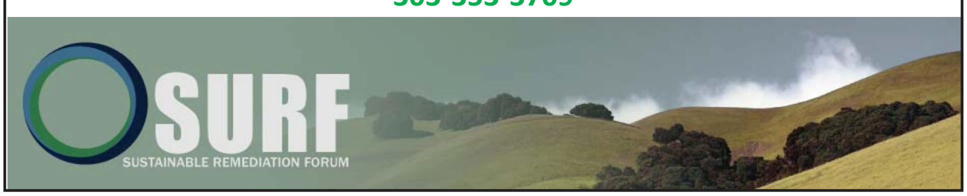
ISI Presentation 25

For Further Information

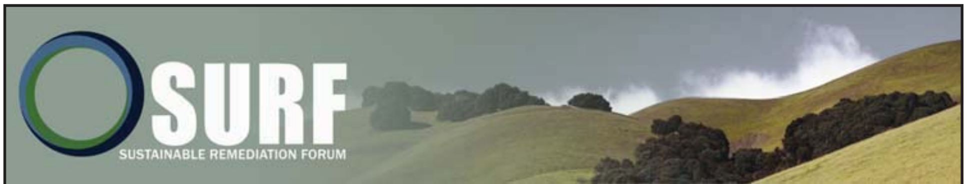
www.sustainableinfrastructure.org

Peter Binney
peter.binney@merrick.com
303-353-3709



Attachment 16
Committee and Initiative Breakout Sessions

Academic Outreach



SURF 19 Academic Outreach Initiative (AOI) Update

Mike Miller, CDM Smith

Pamela Dugan, Carus Corporation

AOI Mission Statement

Mission: to encourage academic participation in SURF as a means to promote the organization, establish linkages, and foster research and innovation in the field of sustainable remediation.

Presentation Summary

- Battelle 2012 student paper competition
- Academic contact database
- AOI newsletter
- Webinars
- Hot research topic development
- *Value proposition for academics*
- *New SURF student chapters!*
- *Proposal: New Technical Initiative (Clarkson U.)*

Battelle - Monterey

Battelle 2012 student paper competition

- 10 papers received
- Papers contained elements of sustainability
- None focused on sustainable remediation
- Academic Outreach Database will useful to recruit student papers in future

Academic Outreach Newsletter (in process)

- Purpose –
  - Advertise SURF efforts
  - Recruit new members
  - Support student chapters
  - Highlight research with a sustainable remediation component
  - Encourage student participation in SURF-sponsored competitions
- Frequency –
  - Quarterly
- Target Audience
  - Academia (professors and students)
  - Research organizations
  - SURF members & student chapters

Academic Outreach Database (in process)

Last Name	First Name	Institution	Email Address	Areas of Research	Link to Academic Program or Areas of Research
Abriola	Linda	Tufts	Linda.Abriola@tufts.edu	Characterization and reme	http://engineering.tufts.edu/about/deansoffice/dean.htm
Allen-King	Richelle	SUNY-Buffalo	richelle@geology.buffalo.edu		
Annable	Michael	University of Florida	annable@ufl.edu		
Ashton	Weslynne	Illinois Institute of Technology	washton@iit.edu	Green business developm	http://www.stuart.iit.edu/graduateprograms/ms/environmentalmanageme
Bedient	Phil	Rice University	bedient@rice.edu		
Borden	Bob	North Carolina	rcborden@eos.ncsu.edu		
Brusseau	Mark	University of Arizona	brusseau@cals.arizona.edu		
Capiro	Natalie	Tufts University	natalie.capiro@tufts.edu	Environmental biotechnolo	http://engineering.tufts.edu/cee/impes/personnel_files/personnel.html
Comfort	Steve	University of Nebraska	scomfort@unlnotes.unl.edu	Passive in situ treatment t	http://snr.unl.edu/aboutus/who/people/faculty-member.asp?pid=21
Crimi	Michelle	Clarkson University Insititute for a Sust	mcrimi@clarkson.edu	In situ remediation of cont	http://www.clarkson.edu/ise/index.html
Cummings	Jim	EPA	Cummings.James@epamail.epa.gov		
DeMond	Avery	University of Michigan	averyd@umich.edu		
Falta	Ron	Clemson	faltar@exchange.clemson.edu		
Finneran	Kevin	Clemson	ktf@clemson.edu		
Gardner	Kevin	University of New Hampshire	kevin.gardner@unh.edu		
Hatfield	Kirk	University of Florida	khatf@ce.ufl.edu		
Illangasakare	Tissa	Colorado School of Mines	tillanga@mines.edu	Vapor intrusion, modeling	http://cesep.mines.edu/
Johnson	Paul	Arizona State	paul.c.johnson@asu.edu		
Kueper	Bernie	Queens University	kueper@civil.queensu.ca		
LeBron	Carmen	NAVFAC	carmen.lebron@navy.mil		
Lee	Eung Seok	Ohio University	leee1@ohio.edu		
Looney	Brian	SRNL	brian02.looney@srnl.doe.gov		
McCray	John	Colorado School of Mines	jmccray@mines.edu	Potential release and trans	http://ese.mines.edu/people/faculty/mccray.html
Naugle	Alex	CA Waterboard	anaugle@waterboards.ca.gov		
Parker	Beth	Guelph	bparker@uoguelph.ca		
Parker	Jack	University of Tennessee	jparker@utk.edu		
Reddy	Krishna	University of Illinois Chicago	kreddy@uic.edu	Green and sustainable ren	http://www.uic.edu/labs/geotech/
Sale	Tom	Colorado State University	tsale@engr.colostate.edu		
Semprini	Lewis	Oregon State	lewis.semprini@oregonstate.edu		
Shapiro	Allen	USGS	ashapiro@usgs.gov		
Siegrist	Robert	Colorado School of Mines	siegrist@mines.edu	ISCO, coupling remedial te	http://ese.mines.edu/people/faculty/siegrist.html
Shouakar-Stash	Orfan	Waterloo	orfan@uwaterloo.ca		
Spengler	John	Harvard University	spengler@hsph.harvard.edu	Sustainability and Environ	http://www.extension.harvard.edu/degrees-certificates/sustainability-env
Sudicky	Ed	Waterloo	sudicky@sciborg.uwaterloo.ca		
Wood	Lynn	EPA	wood.lynn@epa.gov		

Hot Research Topic Development (In Process)

Topic: Who/what/where is doing interesting research around remediation?

Academics-Institutions doing interesting research	Hyperlink to information
Terry Collins TAML - Institute for Green Science Carnegie Mellon	http://www.chem.cmu.edu/groups/collins/about/about.html
Paul Stamets Fungal Remediation (i.e., Mycoremediation)	http://www.fungi.com/mycotech/index.html
Waterloo - in-situ work John Cherry, Beth Parker, Neil Thomson	http://www.environmental.uwaterloo.ca/
Golder - stabilization /solidification mixture	
Stanford and UMBC upal gosh, luthy	http://www.ce.stanford.edu/faculty/luthy/
Stamet	http://www.claire.co.uk/index.php?option=com_resource&controller=article&article=11
medical school community health programs	
inter-disciplinary programs - U of Wash Env Management program on climate change	
ILLEI (Via Robert Armstead)	http://www.wrscompass.com/content/?section=462&section2=483&section3=584&p
ASU - mass flux - P. Johnson	https://webapp4.asu.edu/directory/person/31726
Rice U - Pedro Alvarez	http://alvarez.rice.edu/
Tom Sales CSU - back diffusion	http://www.engr.colostate.edu/ce/facultyintros/Sale.shtml
Narom Gerhard - ???	
Queen's University Bernie Kueper	http://www.civil.queensu.ca/Research/Environmental/Bernard-H-Kueper/
MSU - soil organic carbon studies ; "Daycent" model used in farming studies	
Economics: Duke doing rural and urban evaluations of biomass	
Elizabeth Edwards - U of Toronto	http://chem-eng.utoronto.ca/~biodegraders/
Bob Borden - NC State	
Todd Halihan - Ok State	http://geology.okstate.edu/index.php?option=com_content&task=view&id=95&Itemid=1
Larry Murdoch - Clemson	http://www.clemson.edu/ces/departments/eees/people/facultydirectory/murdoch.html
Jerry Schnoor - U of Iowa, CEE ("Sustainability Tax")	http://www.cee.engineering.uiowa.edu/Faculty/schnoor.php
Derrick Lovley - U Mass microbiology	http://www.bio.umass.edu/micro/faculty/lovley.html
Georgia Tech - Spyros Pavlastathis - anaerobic degradation of quat	http://people.ce.gatech.edu/~spavlost/
David Freedman - Clemson ; bioremediation of CT, CF under high	http://www.clemson.edu/ces/departments/eees/people/facultydirectory/freedman.htm
Stanford - Luthy - sediment in-situ	http://www.stanford.edu/group/luthygroup/people.htm
Bruce Rittmann - ASU biodesign	http://www.biodesign.asu.edu/people/bruce-rittmann
U of New Hampshire - Kevin Gardner: sediment in-situ	http://www.unh.edu/civil-engineering/dr-kevin-gardner
Jackie Quinn - U of Central Florida	http://www.spacetechhalloffame.org/inductees_07_EmulsifiedZero-Valentiron.html
U of Florida - phyto reduction; mass flux meter development (Mike A	http://www.ees.ufl.edu/homepp/annable/
Missouri Science and Technology - Curt Elmore ; wind-powered res	http://campus.mst.edu/cee/faculty/pages/elmore.html
Groundwater Consortia: U of Waterloo, Queens, U of Colorado (Joh	http://www.gwconsortium.org/
Environmental/Resource Economics Depts: UCB, MIT, UNC (Jack	http://www.sph.unc.edu/?option=com_profiles&Itemid=1891&profileAction=ProfDetail&
Tom Borch - CSU - soil/crop	http://soilcrop.colostate.edu/borch/home.html
Chuck Shackleford - CSU - Geotech/environmental	http://www.cwi.colostate.edu/CSUWaterFaculty/?WF_ID=109
Ulli Mayer - UBC Canada -	http://www.eos.ubc.ca/public/people/faculty/U.Mayer.html
Tissa Illangasakare and John Spears - Colorado School of Mines	http://inside.mines.edu/~jspear/research.html http://hydrology.mines.edu/fac
Martin Tielbaard - Rock Tenn Solvay Process - research on activated bacterial sludge from paper industry	
Eric Lui - Syracuse U - Dept of CEE	http://www.ecs.syr.edu/faculty/lui/
Andrea Costello - RIT	http://www.rit.edu/fa/ritgreen/
Harvard - Online grad degree in sustainability and env mgmt Georg	http://www.extension.harvard.edu/environmental-sustainability/default.jsp
STAR David Major	http://star.siremlab.com/team.php
Steve Comfort University of Nebraska	http://snr.unl.edu/aboutus/who/people/faculty-member.asp?pid=21
ES Lee Ohio University	http://www.ohio.edu/geology/lee/
Michelle Crimi - Clarkson University	http://www.clarkson.edu/ehs/faculty-pages.html

Academic Value Proposition "What's in it for me"?

What can SURF do for students/professors?

1. Networking
2. Research facilitation/discussion
3. Participation in SURF meetings
4. Scholarships
5. Research funding
6. Paper competitions
7. Resume repository
8. Provide access to field sites

What can students/professors do for SURF?

1. Help define the future of the remediation field
2. Increase the presence of SURF at other conferences
3. Assistance with the creation of documents and provide alternate perspectives
4. Provide academic collaboration for proposals

NEW SURF STUDENT CHAPTERS FORMING!

- Clarkson University (Prof. Michelle Crimi)
- Colorado School of Mines (Prof. Kathryn Lowe)
- Univ. of Illinois-Chicago (Prof. Krishna Reddy)

Established chapters:

- Colorado State University (Prof. Tom Sale)
- Syracuse University (Dean Kathleen Joyce)

SURF STUDENT CHAPTER UPDATE

- Colorado School of Mines
  - Paperwork submitted, 11 members, 30 students on email list
  - Two field trips in collaboration with CSU (Argo Mines, Rocky Flats)
- Colorado State University
  - SURF 20 Summer 2012
- Clarkson University
  - Chapter forming, new initiative - SURF Student Chapter Competition
- Syracuse University
  - New faculty advisor

Communications and Outreach

COMMUNICATIONS AND OUTREACH

SUSTAINABLE REMEDIATION FORUM

SURF

Accomplishments and Objectives

- SURF website
- Communications Policy and guidelines
- All communications to membership
- Short and long versions of "Who is SURF?" presentation
- Connection to Clu-In website

- Increase committee volunteers
- Develop webinar series
- Improve communications at SURF meetings (phone and web connectivity, clarity)
- And…?

SURF

Attachment 17
A-HA Moments

A-HA MOMENTS

- Impressed by Peter Binney's tool for evaluating sustainability infrastructure because it includes the social considerations of sustainability, which is a challenging aspect to address and measure.
- We have traction….it's a movement!
- Amazed at how far we've come…light years away from where we started.
- Would like routine update on SURF organizations. We should reach out to them and update them on our progress. Feel we haven't taken advantage of collaborative opportunities.
- Leverage existing work (like Peter Binney's tool) to help us with heavy lifting.
- Interesting to hear sustainability aspect formalized and bring substance to what it means (first timer…real eye opener for him).
- Liked the communication and collaboration aspect, but surprised that more local regulatory folks did not participate.
- Different perspective to see U.S. approach vs. UK approach. Seems like more of a regulatory barrier in U.S. than the UK and there doesn't seem to be as much interaction between stakeholders/interested parties (participant from University of Nottingham).
- Great experience (student chapter participant).
- So many organizations are trying to do the right thing. Impressed with Air Force sustainability effort. Need to get left hand to talk to the right. Army National Guard has joint effort with Arizona State University; he is trying to get everyone merged and unified as we move forward. There are so many areas for improvement, especially with power globally in areas like Iraq and Afghanistan. Please continue to pound on the drum with the U.S. Department of Defense.
- Really enjoyed Julie's presentation on Day 1. Showed a willingness to look at the code with a fresh pair of eyes. Encourages us to start playing with what sustainable remediation looks like. Need to learn how to use the concepts of sustainable remediation, and we're only going to get it right by trying it out and sharing our experiences. Need to encourage Julie to talk to her colleagues; foster the relationship and look for like-minded people around the country as you move about the country with your different meetings (participant from University of Nottingham).

Attachment 18
Sustainable Application to Full-Scale Remediation Results in Water Conservation

Sustainable Application to Full-Scale Remediation Results in Water Conservation

2 February 2012

Patrick Keddington, PE
Haley & Aldrich, Inc.

Jennifer Wiley, PG
The Boeing Company

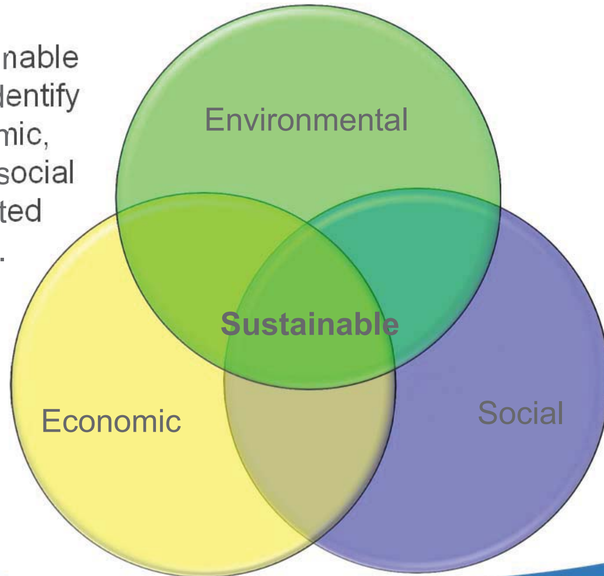
Introduction

- Site Background
- Methods
- Results and Discussion

2 Haley & Aldrich, Inc.

Sustainable Remediation

Objectives for sustainable remediation are to identify and balance economic, environmental, and social benefits of the selected remedial technology.



Site Background

Site Background

- Located in Huntington Beach, California
- Facility developed for aerospace manufacturing
- Adjacent to residential and commercial developments
- Regionally limited water resources

Site Background

- Site investigation conducted
  - VOCs identified in groundwater
- Feasibility studies preformed
  - Conservation of water identified as priority for pump and treat system.
- Pilot test data collected and evaluated
  - Multiple technologies tested
- Pump and treat was identified as the preferred remedial approach

Incorporating Sustainable Remediation

Incorporating Sustainable Remediation

- Planning
- Risk Evaluation
- Regulatory Acceptance
- Design and Implementation

Planning

- Two available methods for water conservation were identified:
  - Pump and treat system optimization
  - Beneficial use of treated water
- Added facility operators to list of stakeholders
- Water audit conducted to identify water uses at facility

Risk Evaluation

- Human health risk evaluation conducted
- Explored potential risk pathways
- Used conservative assumptions
  - High concentration end for range for anticipated residual VOCs
  - All VOCs partition

Regulatory Acceptance (Share the Vision!)

Agency perspective may change:

- SARWQCB – Lead agency involved in a bigger picture
- Water Districts – Cooperating with water conservation project, not just water use project
- Sanitation District – Industrial discharge permits need to be modified

11 Haley & Aldrich, Inc.

Design and Implementation

Remedial Objectives:

- Reduce on-site worker risk or occupant risk
- Achieve plume containment and mass reduction goals
- Comply with discharge permit requirements

Objectives added by Sustainable Goals:

- Reduce community risk
- Minimize use of natural resources
- Incorporate flexibility into design for long-term adjustments and potential future beneficial uses

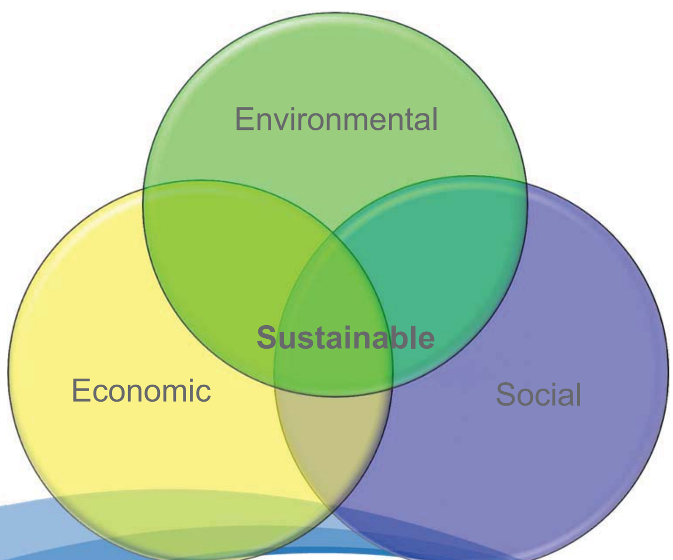
12 Haley & Aldrich, Inc.

Design and Implementation

Solution to meet remedial sustainable objectives:

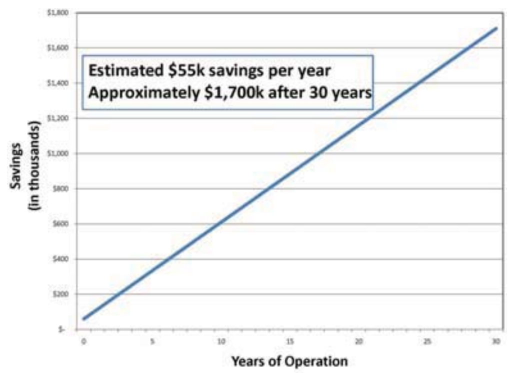
- Segregation of water with relatively "high" and "low" concentrations
- Two conveyance and treatment processes
- Water transfer system to cooling towers
- Robust controls and back-up water supply to cooling towers
- Flexibility for other potential water uses

Results and Conclusions



Economic Benefits

- Portion of capital investment offset by regulatory incentive programs
- Capital investment offset in 3 to 5 years due to cost savings in water purchase.
- After return of capital investment, future years operational costs are lower for 25+ years.



Environmental Benefits

- Decreased energy use by using two treatment processes:
  - GAC treatment (low energy)
  - Oxidation (high energy)
- Water conservation
  - Overall decrease in net demand of water (approximately 80,400 gallons per day)
- Greenhouse gas emissions:
  - Reduced by 110 metric tons per year

Social Benefits

- Approximate 50% reduction in dependence on local water resources
- Increased self-reliance on water resources
- Assists local agencies in meeting goals in reducing industrial process demand on potable water

Conclusions

- Sustainable remediation can be effectively and economically implemented for long-term remediation programs with short-term return on capital investment.
- This can be achieved through:
  - Up-front planning
  - Collaborating with regulators and stakeholders; and
  - Establishing treatment goals and design criteria that incorporate sustainable remediation principles.

Questions?

Attachment 19
Cinderella Story: The Rags to Riches Tale of a California State Park

northgate

CINDERELLA STORY: THE RAGS TO RICHES TALE OF A CALIFORNIA STATE PARK

L. Maile Smith, Axel Rieke – Northgate Environmental Management, Inc.

SURF 19, UC San Diego
February 2, 2012

Outline

- Unrecognized attributes
- Unjust oppression, neglect, obscurity
- Fairy godmothers
- Remarkable fortune
- Unfortunate setback
- Triumphant reward

Project Objectives

Site Overview

Implementation

Challenges & Successes

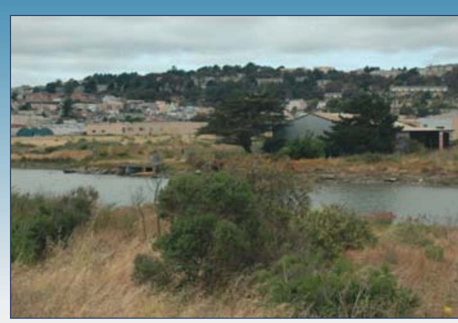
Project Vision

- CPSRA General Plan (1987): restoration of natural areas
- Regional goal: restoring native habitats along SF bay front
- Restoration of tidal marsh habitat, recreation, educational center
- Better balance of environmental/societal/ economic impacts and benefits

3

Project Overview

- Centerpiece of plan to create a 34-acre wetland and park in the Candlestick Point State Recreation Area
- Will be the largest contiguous wetland area in SF and California's first urban state park

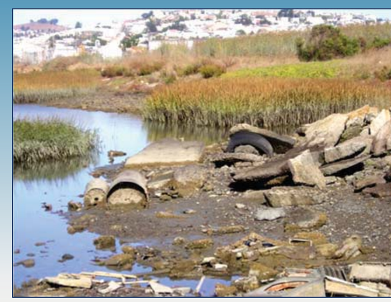


- Funding and approvals required the collaboration of government agencies, regulators, philanthropists, foundations, and community groups

4

Project Objectives

- Protection of ecological and human health and safety
- Regulatory and stakeholder acceptance
- Cleanup goals:
  - wetlands: mean concentrations = near-ambient concentrations for San Francisco Bay sediments
  - uplands: direct contact or recreational ESLs according to designed land use



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Stakeholders

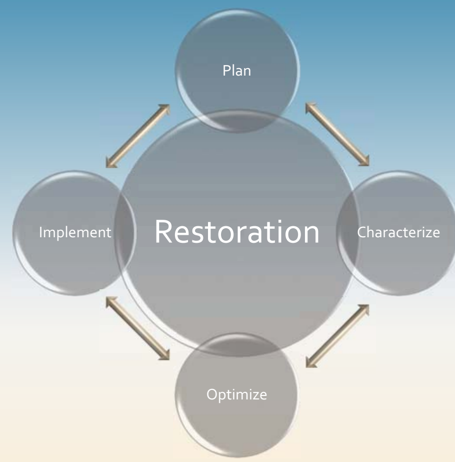
- California Department of Parks and Recreation (property owner)
- California State Parks Foundation (funding "wrangler")
- City/County of San Francisco Departments, Redevelopment Agency
- San Francisco Bay Regional Water Quality Control Board
- US Army Corps of Engineers
- Bay Conservation and Development Commission
- Bay Area Air Quality Management District
- Philanthropists
- Immediate and local community
  - Bayview/Hunters Point neighborhoods
  - Community and environmental organizations
    - Arc Ecology, Alliance for a Clean Water Front, Bayview Hunters Point Community Advocates, Clean Water Fund, Golden Gate Audubon Society, Literacy for Environmental Justice, University of San Francisco
- Site workers

6

Integration of Remediation/Restoration

A plan is visualized, then…

1. Initial design
2. Stakeholder involvement
3. Investigation
4. Characterization (CSM)
5. Update design
6. Construct/restore
7. Repeat 4 through 6 as necessary
    - don’t forget stakeholders



Site Overview

- Upland area developed with buildings, pavement (20%); filled urban land, bay land, and tidal flats (80%)
- Open space areas vegetated with ruderal (non-native) species
- Identified as “PCB hot spot”; lead and nickel in soil
- Property used for import fill/debris, light industrial/commercial development (auto salvage/wrecking yard), utility corridor, collection of storm/sanitary overflow

Site Overview

- Removal of historic bay fill
- Functioning tidal marsh
- Nursery areas for fish, benthic organisms
- Transitional, upland buffers
- Two bird nesting islands
- Portion of the Bay Trail
- Passive public-use areas
- Environmental interpretive center

9

Site Overview

- Construction, not remediation
  - Plans & specs defined soil management
- Project initiated before SR frameworks existed
- In making remediation decisions, “Tier 1” type of evaluation performed: qualitative evaluation of significant impacts
  - Construction traffic-related AQ/noise, stakeholder acceptance, time to completion/returning site to productive use, time to reach remedial objectives, ecosystem “values”
  - Assessment of functions and values attributed to wetlands conducted as part of the wetland restoration plan

10

Environmental/ecologic impacts and influences

Influences/benefits

- Restore tidal wetland habitat (12 acres)
- Remove/sequester contaminated soils, debris
- Restore habitat diversity
- Remove invasive species
- Improve soil and water conservation
- Catalyst for further cleanup activities within Yosemite Slough and vicinity

Impacts

- Erosion (runoff, dust)
  - mitigation: silt fences during excavation, covered stockpiles, enforced construction limit of disturbance; all until construction complete
- AQ impacts
- Waste generation
  - 9K tons anticipated; 20K tons of concrete/debris actualized

11

Societal impacts and influences

Influences/benefits

- Expanded open space (ethical and equity consideration, dense urban area)
- Recreational trails, linked to regional trails
- Amenity services (enhances local living conditions by the provision of an attractive environment)
- All plant material grown at CPSRA by students in environmental education program; native plant materials collected locally
- Health and safety (physical hazards)
- Catalyst for other recreational, open space opportunities along the Bayview/Hunters Point shoreline

Impacts

- Construction traffic, noise
- Land use restrictions

12

Economic impacts and influences

Influences/benefits

- Employment: local jobs, volunteers, youth groups, local businesses
- Direct/indirect economic costs/benefits
  - Increased visitor use of park
  - Decrease in costs related to City responding to illegal dumping
  - Remediation = indirect economic benefits

Impacts

- Costly and complex funding (most NOT coming from RP)
  - Wildlife Conservation Board/State Coastal Conservancy, Association of Bay Area Governments, Bay Conservation Development Commission, City/County of San Francisco, BART, the Richard and Rhoda Goldman Foundation, EPA Region 9-San Francisco Bay Water Quality Improvement Fund/San Francisco Estuary Partnership, the S.D. Bechtel, Jr. Foundation, the San Francisco Foundation, the Barkley Fund, and the California Department of Parks and Recreation
  - CSPF has raised $14.3 million for the first phase of construction
  - Phase 2 = $10M, Phase 3 = $5M

13

Remediation/Restoration

- Phase I ESA, Phase II characterization
- Three phases of restoration
  - Remediation / soil management in all three
  - Completed simultaneously or in series, dependent on the availability of funding
- Environmental mitigation approach
  - Soil Screening Criteria
  - Cover Design
  - Soil Handling
  - Soil Treatment
- Restoration plans/specs

14

Initial Design

- Analysis of existing conditions, constraints, and opportunities at the site; regional habitat goals; cost and technical feasibility of alternatives
- CSM: traditional elements (COPCs, media, exposure pathways and receptors, current/future site use) + land reuse, natural resource conservation and restoration, stakeholder benefits
- Risk assessment

15

Current Design

- Primary objective: recycling/reusing soil, other materials onsite
  - TPH and PAHs biotreated onsite
  - Lead stabilized/disposed, nickel lined/capped
- Reduce transportation needs, fill import/export
- Training or job opportunities for local community
- Improve storm water, recharge quality
- Collaborative decision-making, community events

16

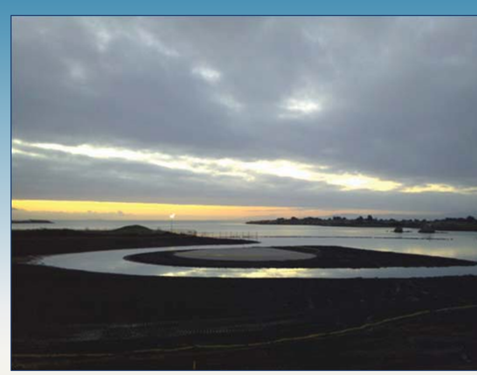
Challenges

- Funding: no possibility of increasing the budget
  - Contingency plan: limited COs to 10%
- Cut/fill budget
  - More debris than anticipated
  - Budget constraints limited off-haul/import
- Highly visible project, extremely involved local community
  - Environmental justice concerns re: AQ impacts, economic opportunities
  - Redundant AQ mitigation monitoring
- Budget impacts to collaborative decision-making
  - Regulator furloughs limited quick turn-around
    - Positive: Contractors bid aggressively ($4M below engineer's estimate)

17

Restoration Progress

- First phase complete
- Achievements and successes
  - Funding/decision-making took longer than anticipated, but construction schedule accelerated
  - 2 years → 5 months
  - Tidal barrier breached!
  - 7 acres of new tidal marsh



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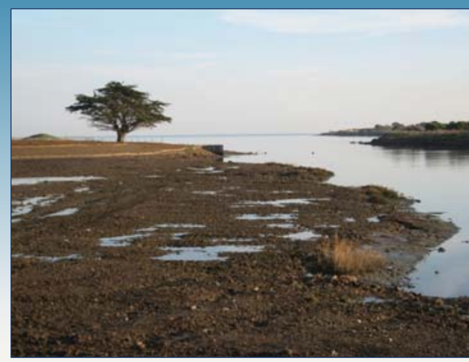
Restoration Progress

- Infiltration/SW quality improved; erosion/sediment runoff minimized
- Risk pathways eliminated; post-construct. AQ improved (respirable lead in dust)
- Biodiversity improved; non-native species removed, revegetated with locally-grown native plants



- K-12 environmental science, public participation education
- First steps towards becoming a model urban park

19

Next Steps

- Yosemite South restoration
  - 13 acre restoration, 5 acres of wetlands, cost: $10M
- Interpretive center, parking, trails, picnic tables, restrooms, lawns, cost: $4M
- Risk management plan
  - Erosion control, long-term O&M for wetland and upland cover

- Annual monitoring/reporting for five years
  - Performed by Park staff and volunteers, overseen by qualified wetlands biologist
- Ongoing economic and public outreach influences
- **Success: Site functions as typical bay tidal marsh habitat**

20

For More Information

- maile.smith@ngem.com
- CPSRA General Plan and Draft EIR:
  - http://www.parks.ca.gov/pages/21299/files/CPSRA_GP_EIR.pdf
- Project Page:
  - http://bairwmp.org/projects/candlestick-point-state-recreation-area-yosemite

21

Attachment 20
Sustainable Remediation Rating Initiative

SR Rating Initiative

Mission

- Determine if an adequate business case exists for developing and applying a site rating and professional certification system applicable to sustainable remediation, and, if so, develop and implement such a system.

Objectives

- <u>Phase I Objective</u> Research existing sustainability site rating and professional certification systems and develop a whitepaper discussing those systems as well as the business case for establishing and applying such a system applicable to sustainable remediation.
- <u>Phase II Objective</u> Develop a sustainable remediation site rating and professional certification system.

Objectives (cont.)

- <u>Phase III Objective</u> Implement the sustainable remediation site rating and professional certification system. (As a precursor to this objective, consider implementing a pilot program prior to full-fledged implementation.)

Status

- Developed list of available rating tools.
- Started to investigate ISI's "Envision" tool.

Proposed Next Steps

- Investigate/test drive the ISI Envision tool.
  - 4 firms have agreed to try the tool and 1 firm tentative.
    - 3 site owners
    - 2 consulting/contracting firms
- Determine if SURF can dovetail SR into Envision.
- Proposal to the SURF Board to set up an alliance with ISI.

Proposed Next Steps (Cont.)

- Formalize SURF SR component of Envision
- Education
- OTHER?????????????????

Attachment 21
Schedule and Regulatory Effects on Project Sustainability

Schedule and Regulatory Effects on Project Sustainability

Sam Williams, Christopher Gale,
Matthew Vanderkooy, Michaye McMaster

Sustainability, a Function of Technology Used

- Schedule
  - Reduced Timeline, Use a Faster Technology
    - ➢ Sustainability?
- Regulatory
  - No Off-Site Migration, Use Hydraulic Containment (Active vs. Passive?)
    - ➢ Sustainability?

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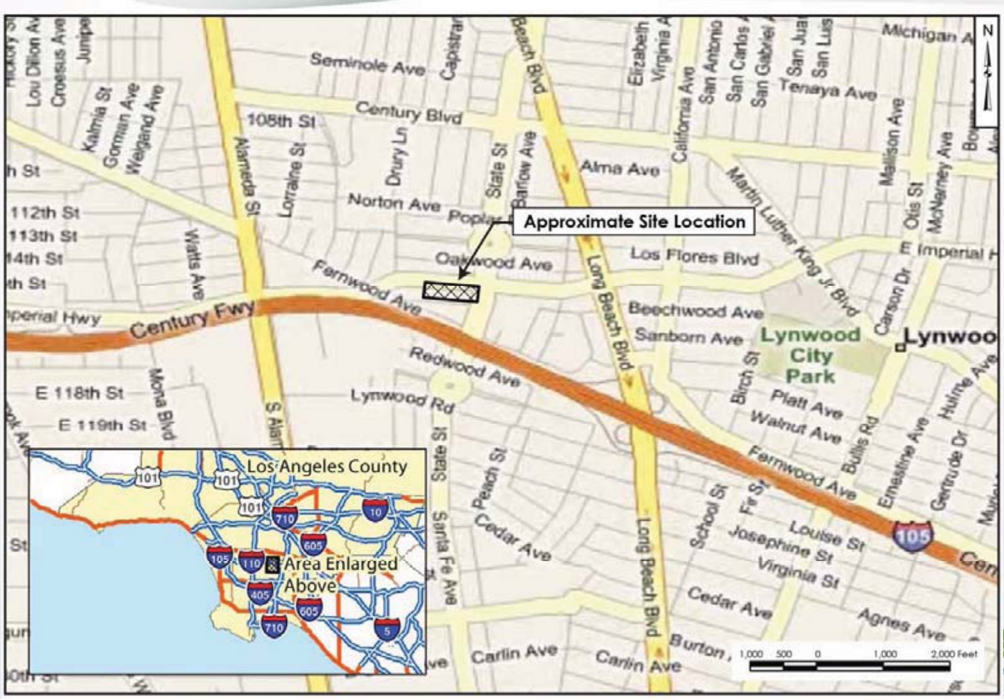
Focus of Attention

- Lynwood, CA
  - Site Characterization
  - Schedule Constraints
- Tools to Assess Sustainability
- Sustainability Analysis of:
  - Selected Remedy
  - Alternate Remedies (not considering schedule)

Site Background
Fuels/Chlorinated Solvent Site



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Site Background Contamination Impacts

← Soil and Groundwater Impacts

Soil Vapor → Impacts

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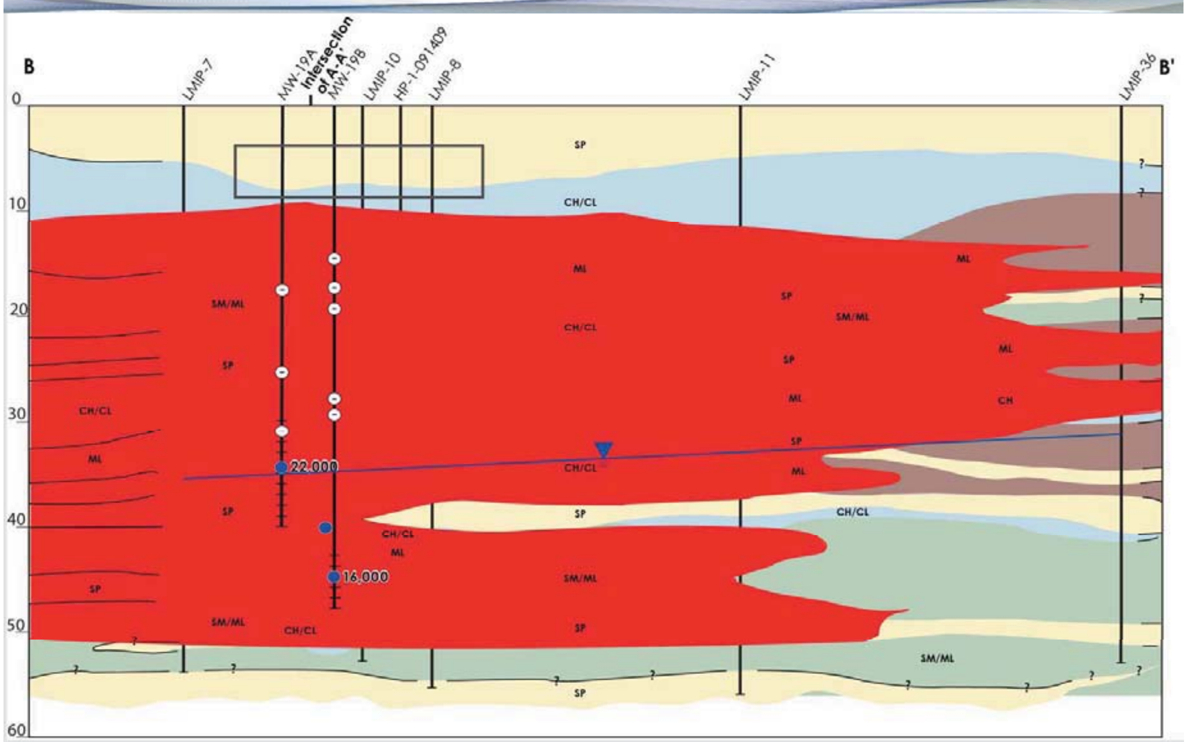
Site Background Source Zone



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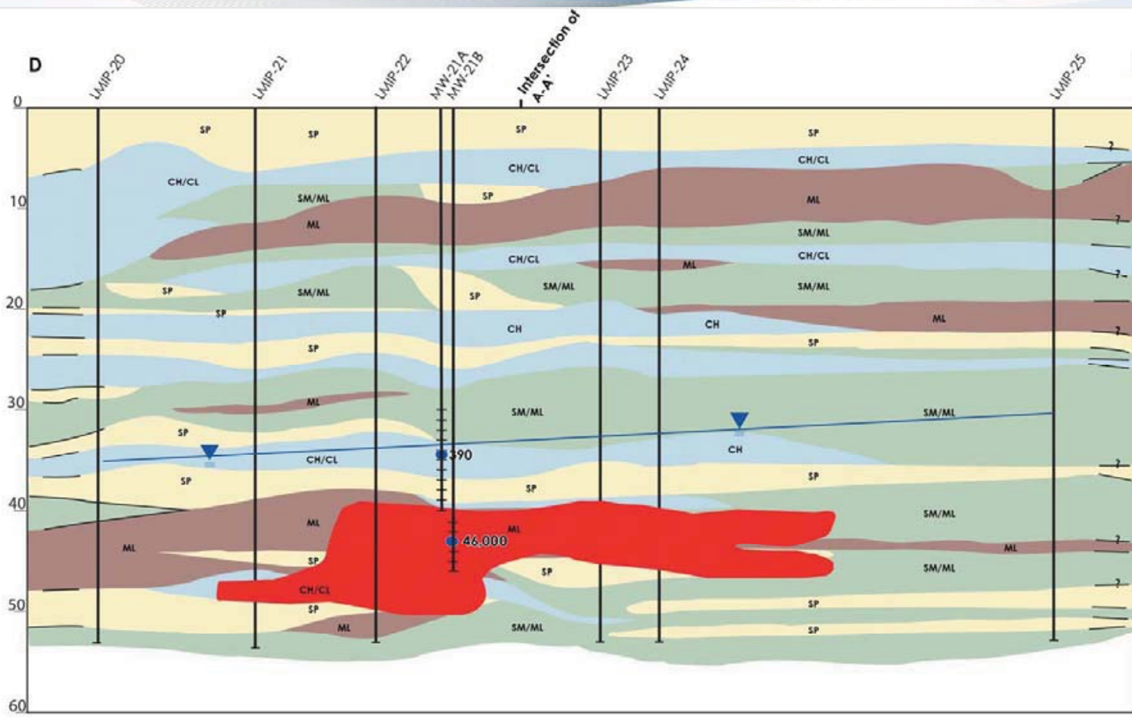
Site Background Downgradient Plume



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Site Background

- Schedule Constraints (Driven by Legal Issues)
  1. Central and Eastern Areas → 1 year to clean up*
  2. Western Area → 2 years to clean up*

*from start of remediation activities

**Misc., permitting took 1.5 yrs; Didn't affect remedy selection → Didn't affect sustainability.

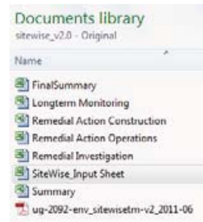
→Need A Fast Acting Technology.

- Effect on Sustainability?
- Use Tools to evaluate

Tools to Evaluate Sustainability

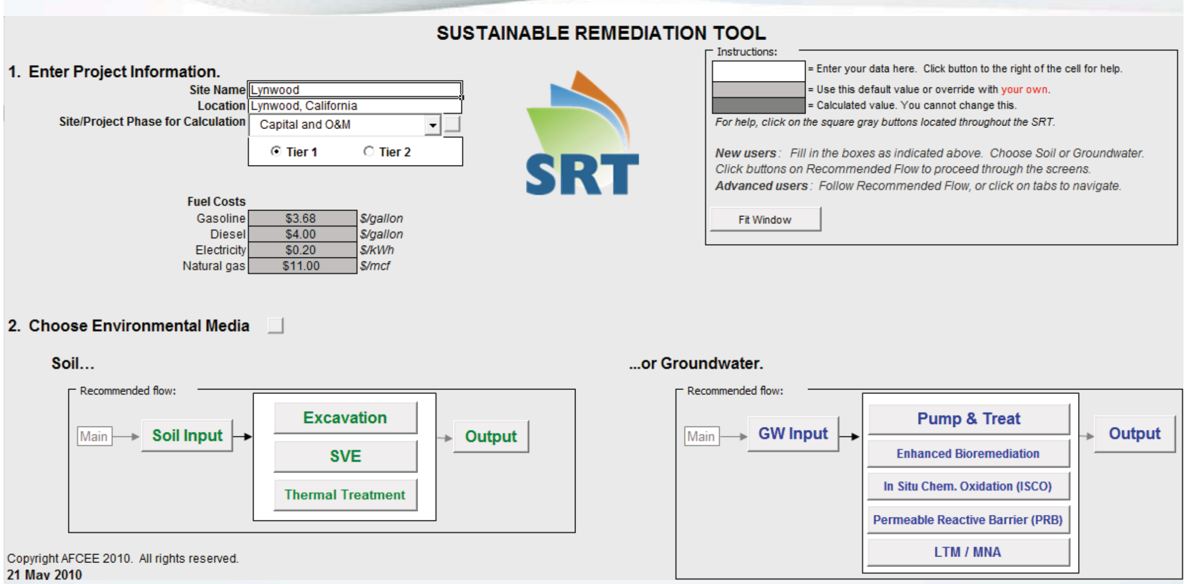
- SimaPro by PRe Consultants
  - Detailed, ~$5,700 USD min.

- SiteWise™
  - Free, greater time commitment



- SRT
  - Free, Easier to Use,
    Order Of Magnitude Determinations

Tools to Evaluate Sustainability



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Tools to Evaluate Sustainability

SOIL/SOURCE INPUT

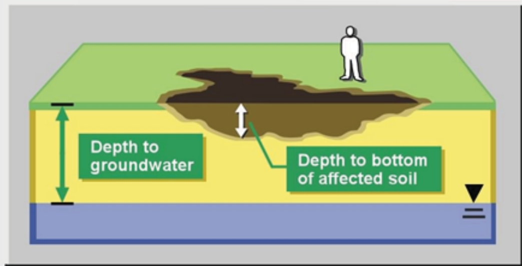
Lynwood
Lynwood, California

Area of Affected Soil	3525	ft^2
Depth to Top of Affected Soil	10	ft
Depth to Bottom of Affected Soil	50	ft
Depth to Groundwater	35	ft
Soil Type	Silt	
Contaminant Class	CVOCs	
Max Concentration	100000	mg/kg
Typical Concentration	800	mg/kg
Contaminant mass	11,000.	lbs
Calculate natural resource service?	○ Yes ⦿ No	

Instructions:
- = Enter your data here. Click button to the right of the cell for help.
- = Use this default value or override with your own.
- = Calculated value. You cannot change this.

Paste Tier 2 Example
Clear Soil Inputs

Recommended flow:
You are here
Main → Input → Next: Choose Technologies (☐ Excavation, ☐ Soil Vapor Extraction, ☑ Thermal Treatment, >>) → Results



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Tools to Evaluate Sustainability

EXCAVATION - TIER 1

Lynwood
Lynwood, California
CAPITAL and O&M

Design for Managing Soil

Airline miles flown by project team (total miles for all travelers)	0	miles over proj lifetime
Average Distance Traveled by Site Workers per one-way trip	20	miles one-way
Trips by Site Workers during construction	80	# over project lifetime
Trips by Site Workers after construction	50	# over project lifetime
Distance to Disposal (one-way)	50	miles
Type of Disposal	Hazardous	
Volume of affected soil	3,000,000.	cu ft
Volume of affected soil	111,112.	cu yd
Total hours to excavate	2,700.	person-hours
Number of loads for disposal	12,000.	#
Total miles driven for disposal	1,200,000.	miles
Total hours for fill dirt placement	1,100.	hours
Number of loads of fill dirt	12,000.	#
Total miles driven for fill	240,000.	miles

Instructions:
- = Enter your data here. Click button to the right of the cell for help.
- = Use this default value or override with your own.
- = Calculated value. You cannot change this.

Restore Defaults
Show Inputs

Recommended flow:
You are here
Main → Input → Technology Design (☑ Excavation, ☑ Soil Vapor Extraction, ☑ Thermal Treatment, <<, >>) → Results

Materials and Consumable Amounts used for Metrics

Diesel	190,000.	gal
Gasoline	350.	gal

Technology Cost

Capital	57,000,000.	$
O&M	n/a	$

Project-specific Metrics (Add & Subtract/Offsets)

○ Yes ⦿ No

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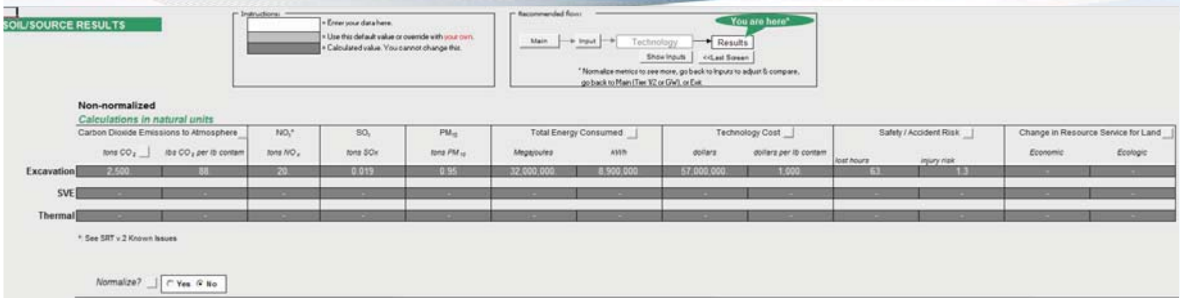
Tools to Evaluate Sustainability



- Output:
  - Tons
    - CO_2
    - NO_X
    - SO_2
    - PM_{10}
  - Energy Consumed (All Types)
  - Capital Cost (Technology)
  - Safety/Accident Risk
  - Change in Resource Service for Land

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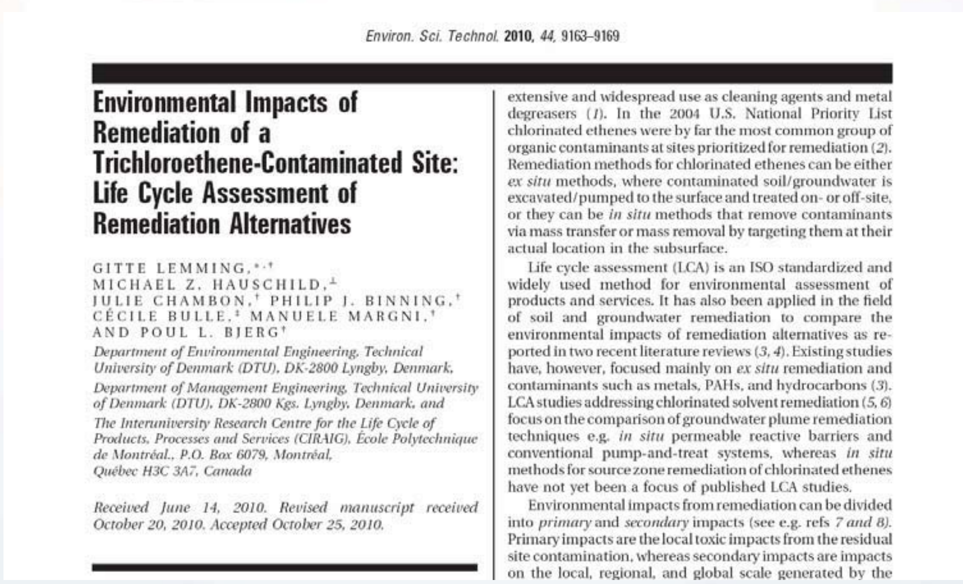
Lemming et al., vs. SRT



Environ. Sci. Technol. **2010**, *44*, 9163–9169

Environmental Impacts of Remediation of a Trichloroethene-Contaminated Site: Life Cycle Assessment of Remediation Alternatives

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extensive and widespread use as cleaning agents and metal degreasers (*1*). In the 2004 U.S. National Priority List chlorinated ethenes were by far the most common group of organic contaminants at sites prioritized for remediation (*2*). Remediation methods for chlorinated ethenes can be either *ex situ* methods, where contaminated soil/groundwater is excavated/pumped to the surface and treated on- or off-site, or they can be *in situ* methods that remove contaminants via mass transfer or mass removal by targeting them at their actual location in the subsurface.

Life cycle assessment (LCA) is an ISO standardized and widely used method for environmental assessment of products and services. It has also been applied in the field of soil and groundwater remediation to compare the environmental impacts of remediation alternatives as reported in two recent literature reviews (*3, 4*). Existing studies have, however, focused mainly on *ex situ* remediation and contaminants such as metals, PAHs, and hydrocarbons (*3*). LCA studies addressing chlorinated solvent remediation (*5, 6*) focus on the comparison of groundwater plume remediation techniques e.g. *in situ* permeable reactive barriers and conventional pump-and-treat systems, whereas *in situ* methods for source zone remediation of chlorinated ethenes have not yet been a focus of published LCA studies.

Environmental impacts from remediation can be divided into *primary* and *secondary* impacts (see e.g. refs *7 and 8*). Primary impacts are the local toxic impacts from the residual site contamination, whereas secondary impacts are impacts on the local, regional, and global scale generated by the

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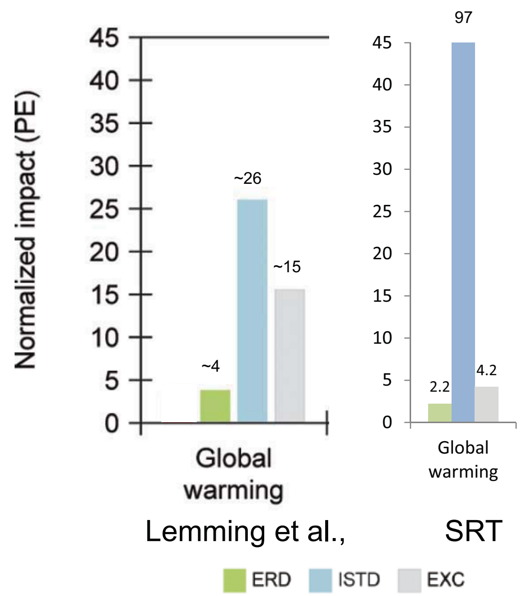
Lemming et al., vs. SRT

- Agree on absolute ranking
- Disagree on magnitude and relative difference
- Future work – Investigate source of disagreement

- Acronyms
  - ERD → Enhanced Reductive Dechlorination
  - ISTD → In-Situ Thermal Desorption
  - EXC → Excavation



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Remedial Alternative Sustainability Analysis

- Problem → Really Rapid Schedule

- Decision
  - Source Area → ERH
  - Plume → SVE and EISB

- Alternative (Less Rapid Schedule)
  - Source Area → SVE and EISB
  - Plume → SVE and EISB

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Selected Remedy
Source Zone ERH

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Selected Remedy
Electrical Resistance Heating (ERH)

	ERH Source Zone
CO_2 (tons)	1,700
NO_X (tons)	9.9
SO_2 (tons)	18.0
PM_{10} (tons)	3.4
Energy (kWh)	7,500,000
Total Cost (USD)	$2,400,000

- ERH Inputs
  - Area: 3,525 ft^2
  - Electrodes: 84 (21 Locations)
  - Recovery Wells: 15
  - Thermal Oxidizer
  - Duration: 120 days

- Vapor Treatment method affects sustainability.
- G.E.O Technology used, but SRT only offers Activated Carbon or Thermal Oxidizer
- Vendor calculations and literature suggest G.E.O. is more sustainable than Thermal Oxidizer

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ERH, EISB

- EISB Inputs
  - Combined Area: 76,200 ft^2
  - Injection Wells: 330
  - EVO: 14,850 gallons

	ERH Source Zone	EISB West, Central
CO_2 (tons)	1,700	279
NO_X (tons)	9.9	0.7
SO_2 (tons)	18.0	0.2
PM_{10} (tons)	3.4	0.0
Energy (kWh)	7,500,000	308,000
Cost (USD)	$2,400,000	$1,000,000

- Notes:
  1. Doubling EVO injected raises CO_2 to 453 tons. Additional CO_2 is from production, shipping, and degradation of EVO.

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Selected Remedy SVE

- SVE Inputs
  - Combined Area: 56,000 ft^2
  - Number of Wells: 39
  - Activated Carbon
  - Duration:
    - West: 1.5 years
    - Central and East: 6 months

	ERH Source Zone	EISB West, Central	SVE West, Central, East
CO_2 (tons)	1,700	279	560
NO_X (tons)	9.9	0.7	0.7
SO_2 (tons)	18.0	0.2	0.5
PM_{10} (tons)	3.4	0.0	0.1
Energy (kWh)	7,500,000	308,000	810,000
Cost (USD)	$2,400,000	$1,000,000	$1,600,000

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Selected Remedy Values Combined

	ERH Source Zone	EISB West, Central	SVE West, Central, East	Combined ERH + EISB + SVE
CO_2 (tons)	1,700	279	560	2,539
NO_X (tons)	9.9	0.7	0.7	11.2
SO_2 (tons)	18.0	0.2	0.5	18.7
PM_{10} (tons)	3.4	0.0	0.1	3.5
Energy (kWh)	7,500,000	308,000	810,000	8,618,000
Cost (USD)	$2,400,000	$1,000,000	$1,600,000	$5,000,000

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Alternative Source Zone Remedy

No ERH in Source

Use only EISB & SVE

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Selected & Alternative Source Zone Remedies

	ERH Source Zone	EISB Source Zone	SVE Source Zone	Combined Source Zone EISB + SVE
CO_2 (tons)	1,700	77	320	397
NO_X (tons)	9.9	0.1	0.8	0.9
SO_2 (tons)	18.0	0.0	1.2	1.2
PM_{10} (tons)	3.4	0.0	0.2	0.2
Energy (kWh)	7,500,000	69,000	750,000	819,000
Cost (USD)	$2,400,000	$100,000	$1,400,000	$1,500,000

- Inputs EISB
  - 3,600 ft^2
  - 40 wells
  - 5,000 Gallons EVO
- Inputs SVE
  - 3,600 ft^2
  - 21 wells
  - 5 years

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Selected & Alternative Source Zone Remedies

	ERH Source Zone	EISB Source Zone	SVE Source Zone	Combined Source Zone EISB + SVE	Difference
CO_2 (tons)	1,700	77	320	397	**-1,303**
NO_X (tons)	9.9	0.1	0.8	0.9	**-9.0**
SO_2 (tons)	18.0	0.0	1.2	1.2	**-16.8**
PM_{10} (tons)	3.4	0.0	0.2	0.2	**-3.2**
Energy (kWh)	7,500,000	69,000	750,000	819,000	**-6,681,000**
Cost (USD)	$2,400,000	$100,000	$1,400,000	$1,500,000	**-$900,000**

Conclusion:
Less Rapid Schedule → Greater Sustainability, Costs Less

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Site Wide All Tech. Plus Inputs

- **Methods** → 100,000 ft^2, $0.18 kWh
  - **Selected Remedy**→ ERH + EISB + SVE
  - **Alternative Remedy** → EISB + SVE
  - **EISB** → 450 Injection wells, 40,000 gallons EVO
  - **Pump and Treat** → 30 well, 15 years, 20 gpm, Air Stripper
  - **In Situ Chemical Oxidation** → 319 Injection Points, 2 Applications
  - **Excavation** → Hazardous Waste, ship 50 miles.
  - **SVE Thermal Oxidizer** → 325 wells, 1 year
  - **SVE Activated Carbon** → 325 wells, 1 year
  - **Electrical Resistive Heating** → 1,588 electrodes + recovery wells
  - **Thermal Conductive Heating** → 2,326 heater wells, 776 producer wells

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Site Wide All Tech. Plus Metrics

- **Metrics**
  - **Tons CO_2**
  - **Tons NO_X, SO_2, PM_{10}**
  - **Capital Cost (USD)**
  - **Energy Usage (kWh)**
  - **Capital and Energy Cost ($0.18 kWh, USD)**

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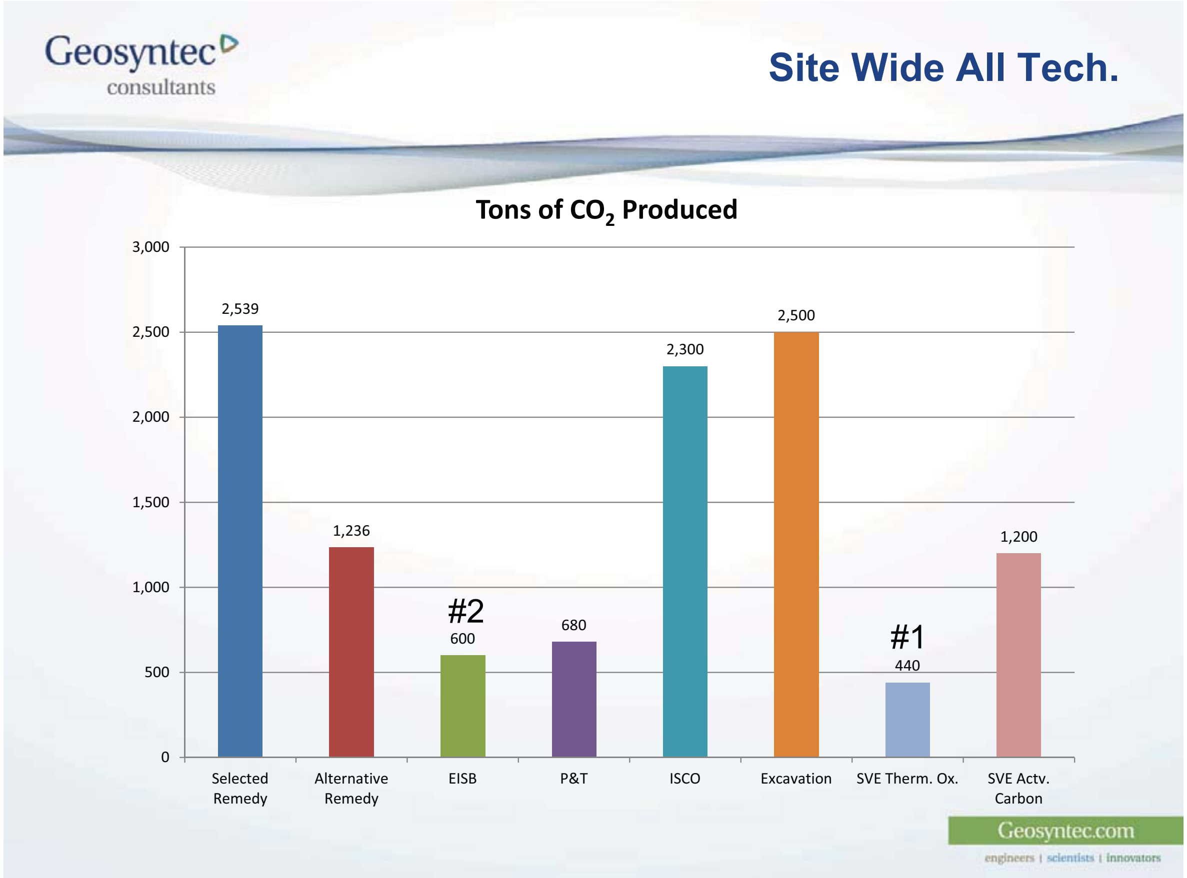
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Site Wide All Tech.
Tons of CO_2 Produced
3,000
2,500
2,000
1,500
1,000
500
0
2,539
1,236
#2
600
680
2,300
2,500
#1
440
1,200
Selected Remedy
Alternative Remedy
EISB
P&T
ISCO
Excavation
SVE Therm. Ox.
SVE Actv. Carbon
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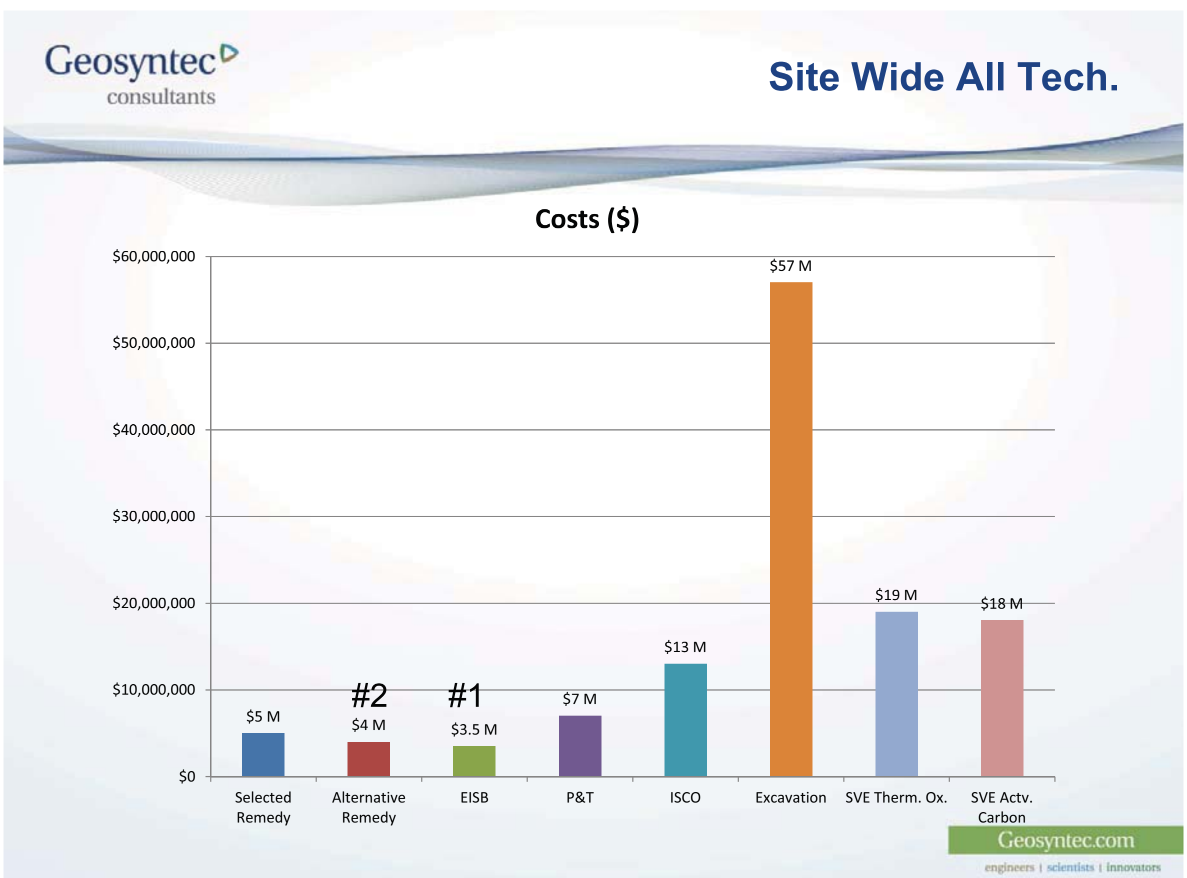
Geosyntec consultants
Site Wide All Tech.
Costs ($)
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$0
$5 M
#2
$4 M
#1
$3.5 M
$7 M
$13 M
$57 M
$19 M
$18 M
Selected Remedy
Alternative Remedy
EISB
P&T
ISCO
Excavation
SVE Therm. Ox.
SVE Actv. Carbon
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Site Wide All Tech. Conclusions

- Conclusions:
  - Where Possible EISB is More Sustainable for Groundwater Impacts
  - Regulatory and Scheduling can Drive Remedy Selection
    - Try Combination of Technologies
    - Use Least Sustainable Technology In Smaller Regions (ERH)
    - Use More Sustainable Technology Where Possible (EISB)
  - Lynwood, CA Site;
    - Schedule Forced ERH Usage in Source Zone
    - Broad EISB and SVE helped improve Sustainability
    - SRT may overestimate ERH's unsustainability

How does this Evaluation help the Client?

- Validates technology selection as suitable for meeting schedule and sustainable goals
- Traded sustainability for achieving remediation on a faster schedule but the increase in 'cost' is still less than other technologies
- SRT
  - Will estimate schedule to complete
  - Doesn't automatically optimize a sustainable approach given constraints
    - User must implement and iterative approach; takes more time
  - Results are impacted by user input (more subjective) and should viewed as such, *i.e.*:
    - Change amount of EVO used; Shorten Remediation Time frame
  - Sensitivity analysis varying critical parameters necessary
    - 'Error bars' for technologies sustainability metrics may often overlap.

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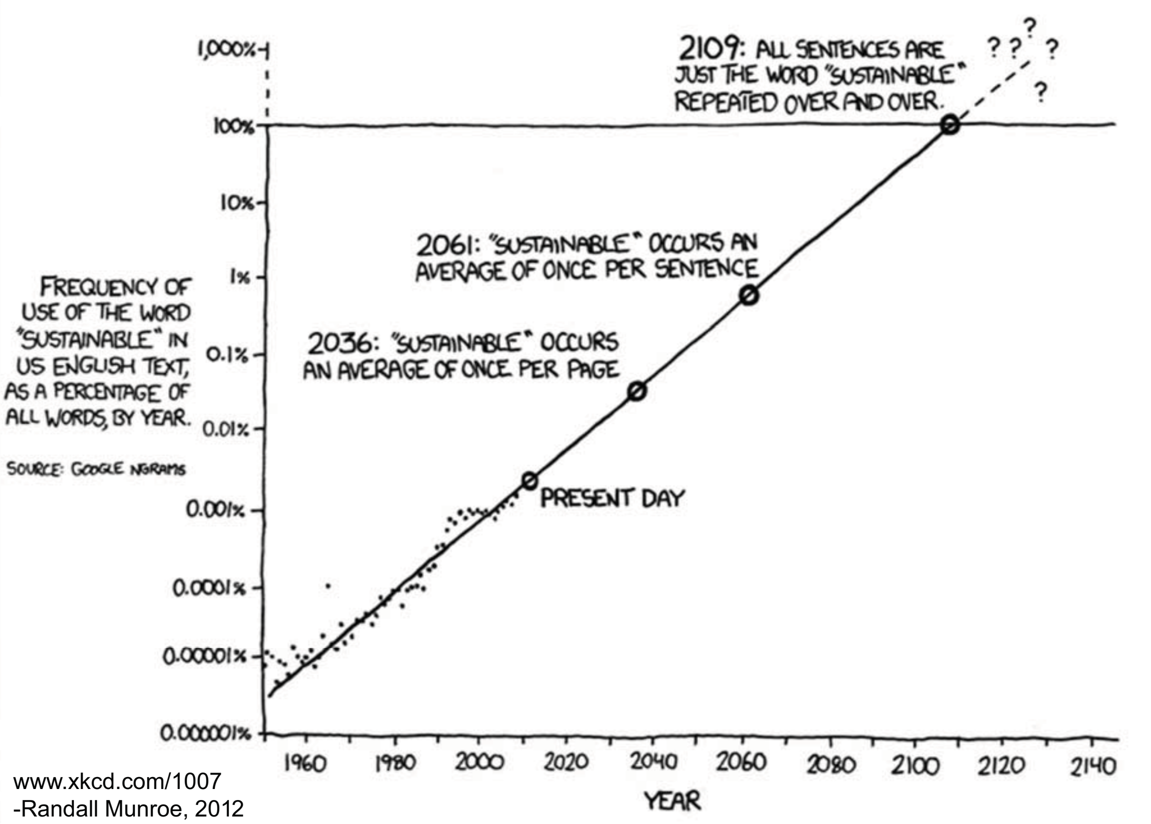
Summary

- Currently available tools
  - Caution should be applied because:
    - Forced input fields appear to generate cost inaccuracies (e.g., energy cost caps and well installation method costs)
    - Some tools seem to have substantially higher CO2 emissions for given technologies (need to investigate why)
    - There is no ranking/or weighting of the factors as they relate to global sustainability (e.g., is CO2 the 'worst' offender and should it have a higher weighting?)
  - Moving from Primary to Secondary to Tertiary Impacts
    - Primary Impacts (e.g., toxicity) are not evaluated in SRT
    - Secondary Impacts determined by technology Selection
    - Tertiary Impacts
      - Assumes full remediation
      - Calculates Increase of Economic Value and Natural Resource Services



www.xkcd.com/1007
-Randall Munroe, 2012

THE WORD "SUSTAINABLE" IS UNSUSTAINABLE.

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Thanks!

Questions?

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Attachment 22
Brainstorming Session Responses

BRAINSTORMING

What should SURF do differently?

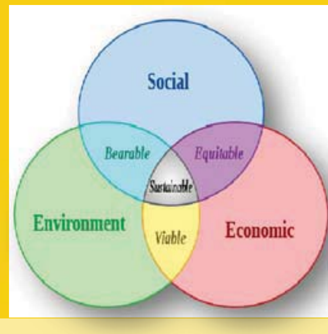
1. Reach out to regulators, EPA, local agencies at meetings.
2. Have meetings in agency buildings or military buildings.
3. Effectively and efficiently harness volunteer energy.
4. Invite more professors.
5. Spend afternoons practicing sustainable remediation thinking with problem site.
6. Ask professors to get students to c0me to meetings and possible have professors provide credit to students.
7. Engage more social and economic resources.
8. Express metrics of accomplishments in Princeton wedge model.
9. Collaborate and announce meetings at other professional meetings.
10. Have more three day meetings.
11. Host 20-30 minute breakfast on first day for new timers.
12. Give summary of last SURF meeting at beginning of meeting.
13. Serve bagels.
14. Reinterpret existing regulations the way Julie did.
15. Tweet more!
16. Create a Facebook page.
17. Use LinkedIn page.

What should SURF actually do?

1. Influence and foster consistency for sustainability.
2. Provide more remediation case studies.
3. Provide more examples where sustainable remediation was a tipping point in the remediation.
4. Give webinars to regulators.
5. Foster research.
6. Connect the dots between the various organizations…be the glue.
7. Get into curricula into academia.
8. Convince the developer community that sustainable development will deliver highest and best use.
9. Give guest lectures for university courses.
10. Lead or drive the reinterpretation of current regulations.
11. Provide a consistent framework for case studies.
12. Give guest lectures at current student chapters.
13. Provide case studies to other organizations and review of tools.
14. Provide write-ups in professional journals.
15. Actively pursue alliances with other organizations/societies.

Attachment 23
Incorporating Sustainable Development Principles

Incorporating sustainable development principles in Shell's soil and groundwater projects



Professor Jonathan Smith
Shell Global Solutions (UK), Thornton, UK

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Content

- Introduction to Shell
- Sustainable Development and Shell
- What does Shell mean by ‘sustainable remediation’?
- How do sustainability considerations fit into Shell’s existing risk-based framework for soil and groundwater?
- Implementing Sustainable Remediation in Shell

Take-away Messages

- Shell has clear and long-standing sustainable development commitments.
- Sustainable Remediation is consistent with these principles for S&GW activities:
    - incorporates Economic, Environmental and Social factors;
- Shell is implementing Sustainable Remediation through its SGW programme effective January 2012.

About Shell

Recognised for technical innovation and mega-project delivery

Employs 93,000 people in more than 90 countries

Committed to social and environmental sustainability

Producing the equivalent of 2,300 barrels of oil every minute

Shell

Partners in innovation with Ferrari F1 team

Active in alternative energies as biofuels and wind

One of the world's best known brands

Selling transport fuel to some 10 million customers a day

Our commitment to sustainable development

- For us, sustainable development means **helping meet the world's growing energy needs in economically, environmentally and socially responsible ways**
- This includes the choices we make about our portfolio and products, and the way we run our operations
- We included our commitment to contribute to sustainable development in our Business Principles:

"Long-term profitability is essential…"

"…balancing short and long term interests…"

"…integrating economic, environmental and social considerations into business decision-making…"

"…reduce the environmental impact of our operations, products and services…"

"…be good neighbours… manage the social impacts of our activities… enhance benefits to local communities…"

"…regular dialogue and engagement with our stakeholders is essential…"

The Shell SGW Policy & Advocacy Team Vision

Vision

No harm to people, protecting the environment through *sustainable*, risk-based approaches, based on internationally accepted protocols and procedures

Mission

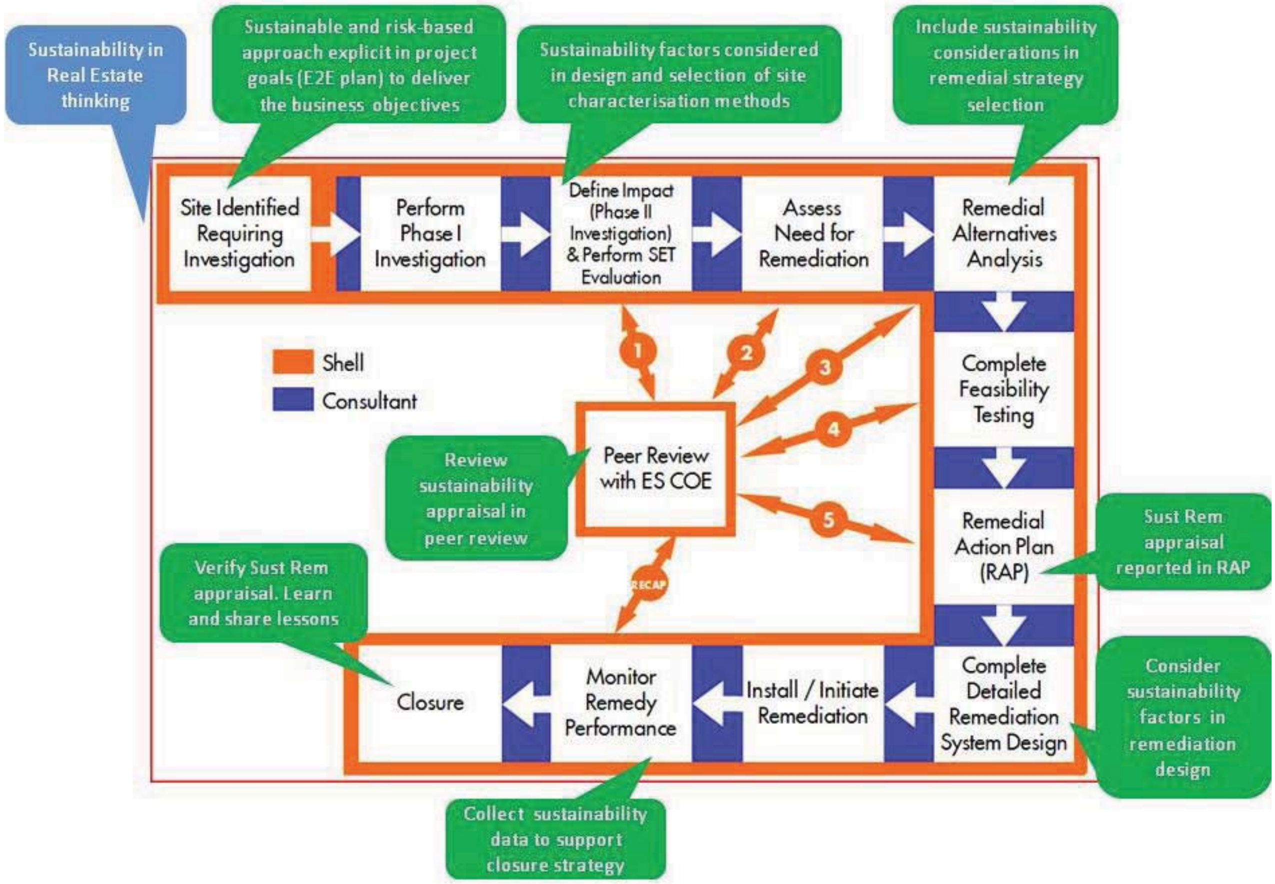
- **Drive to reduce liabilities while protecting human health, safety and environment – increasing value**
- **Engage with stakeholders* to incorporate *sustainable* and risk based approaches into regulatory frameworks, mindsets and practices**
- **Work with stakeholders* to maintain Shell's reputation**

*stakeholders are both internal and external

Sustainable Remediation definition adopted

- '*the practice of demonstrating, in terms of **environmental, economic** and **social** indicators, that the benefit of undertaking remediation is greater than its impact and that the optimum remediation solution is selected through the use of a balanced decision-making process*' [SuRF-UK, 2010]
- Definitions and descriptions developed in the USA (SURF, ITRC), Australia, and Europe (NICOLE) are not substantively different

Sustainable Remediation in the SGW Delivery Model



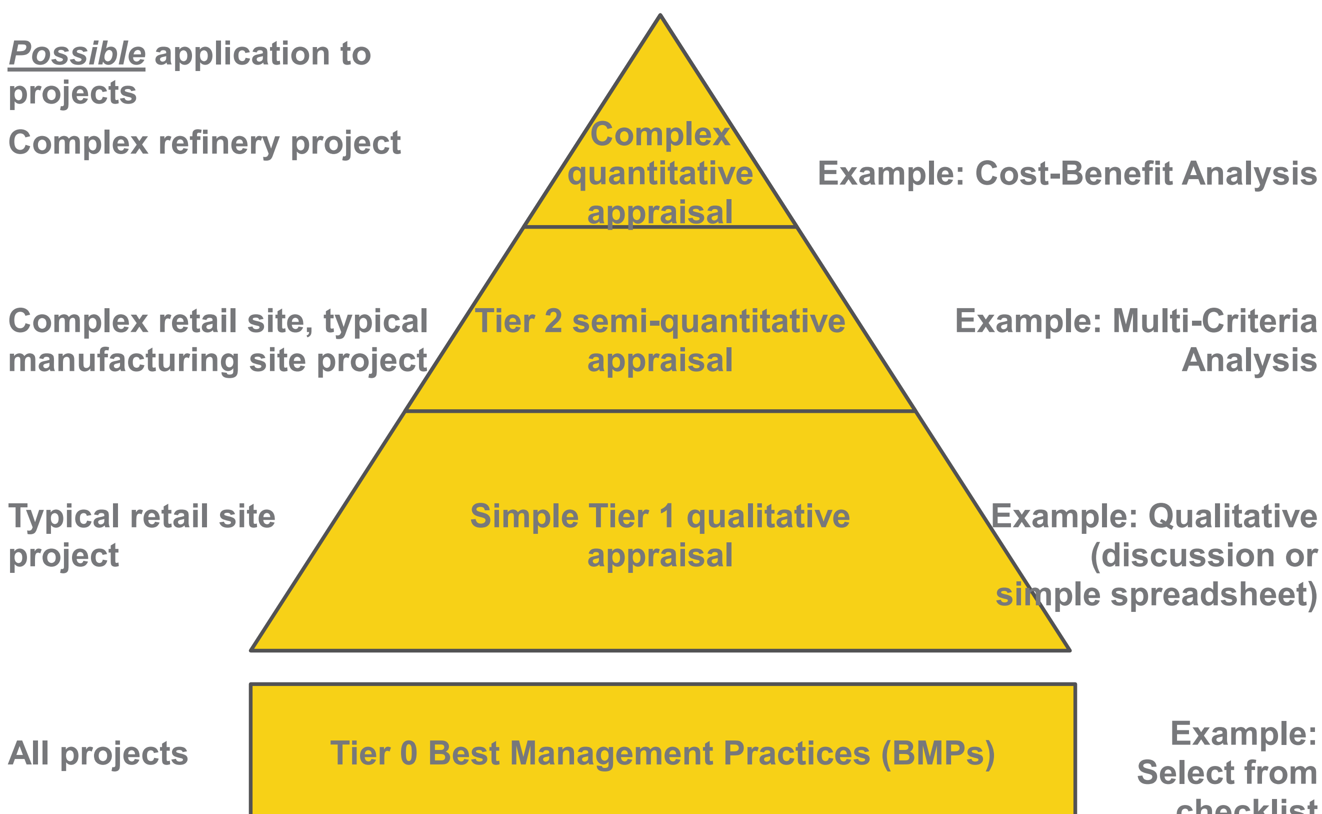
SGW Delivery model

- Operations in >90 countries
- Global programme managed within Shell Environmental Services (DS)
  - Define business objectives
  - Set performance-based goals
- Framework consultants (8)
  - act for Shell regionally
  - see project from start to closure
  - given freedom to consult
- Technical Assurance Peer Review process by Shell Global Solutions
  - Key touch points
  - Technical quality and reliability of solution

Approach to implementing Sustainable Remediation

- Apply Best Management Practices to all projects (Tier 0)
  - Simple. Checklist-based. Capture easy wins.
    - Site characterisation (e.g., drill in safe locations; minimise multiple mobilisations)
    - Remediation operation (e.g., avoid plant idling; treat and reuse excavated soils; limit vehicle movements through residential areas)
- Sustainability appraisal to:
  - Select best strategy to meet business objectives
  - Select best remedial technique to deliver remedial strategy
- Adopt tiered sustainability appraisal framework (Tier 1 – 3).
  - Supplements existing risk-based assessment and management
  - Incorporate into the existing GESS Delivery Model (Horseshoe)
  - KEEP IT AS SIMPLE

Tiered approach to SR appraisal



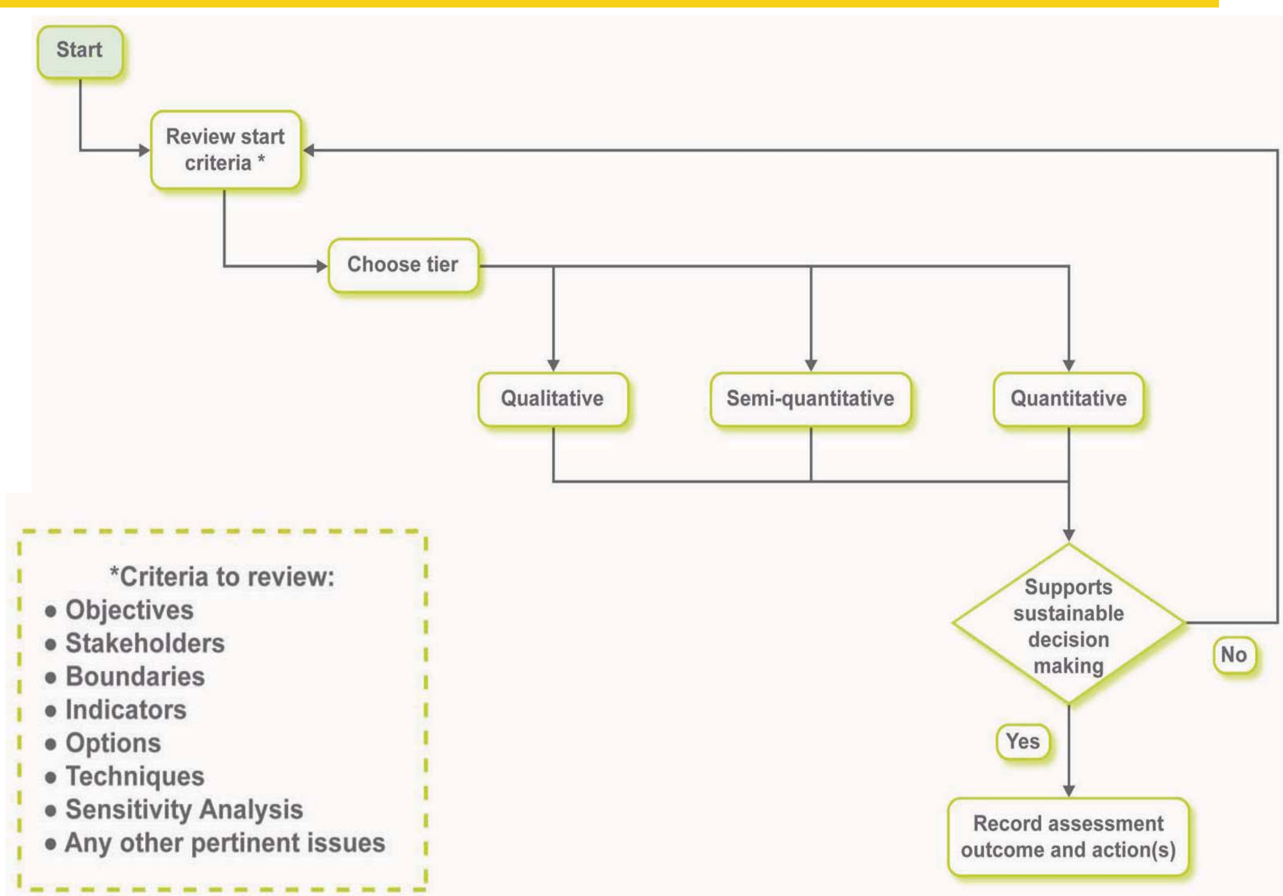
Tier 0 – Best Management Practices

- Checklist of Best Management Practices (BMPs)
- Select and apply *relevant* BMPs in project design and operation

Example BMPs for soil and groundwater remediation

Environment	Society	Economy
Minimise CO_2 emissions – avoid idling of plant	Comply with 'no harm to people' and achieve GOAL ZERO	Focus on getting the right solution first time
Minimise water use	Minimise road-miles driven	Avoid multiple mobilisations
Re-use excavated soils or secondary aggregates where fit-for-purpose	Direct vehicle movement away from residential areas	Combine remediation works with other earthworks and site development
Minimise volume of waste sent to landfill	Prevent and/or minimise exposure to noise, dust and vibration	Adopt a sustainable procurement policy
Proper storage of remediation products / recovered fluids	Minimise disturbance to neighbours, particularly outside normal working hours	Minimise duration of active-remediation. Combine with MNA in treatment-train.

Tiered Sustainability Appraisal (Tiers 1-3)



Sustainable Remediation Indicator Categories

Environmental	Social	Economic
Air	Human health & safety	Direct economic costs & benefits
Soil & ground conditions	Ethics & equality	Indirect economic costs & benefits
Groundwater & surface water	Neighbourhoods & locality	Induced economic costs & benefits
Ecology	Communities & community involvement	Employment & employment capital
Natural resources & waste	Uncertainty & evidence	Project life-span & flexibility

[after SuRF-UK, Nov 2011]

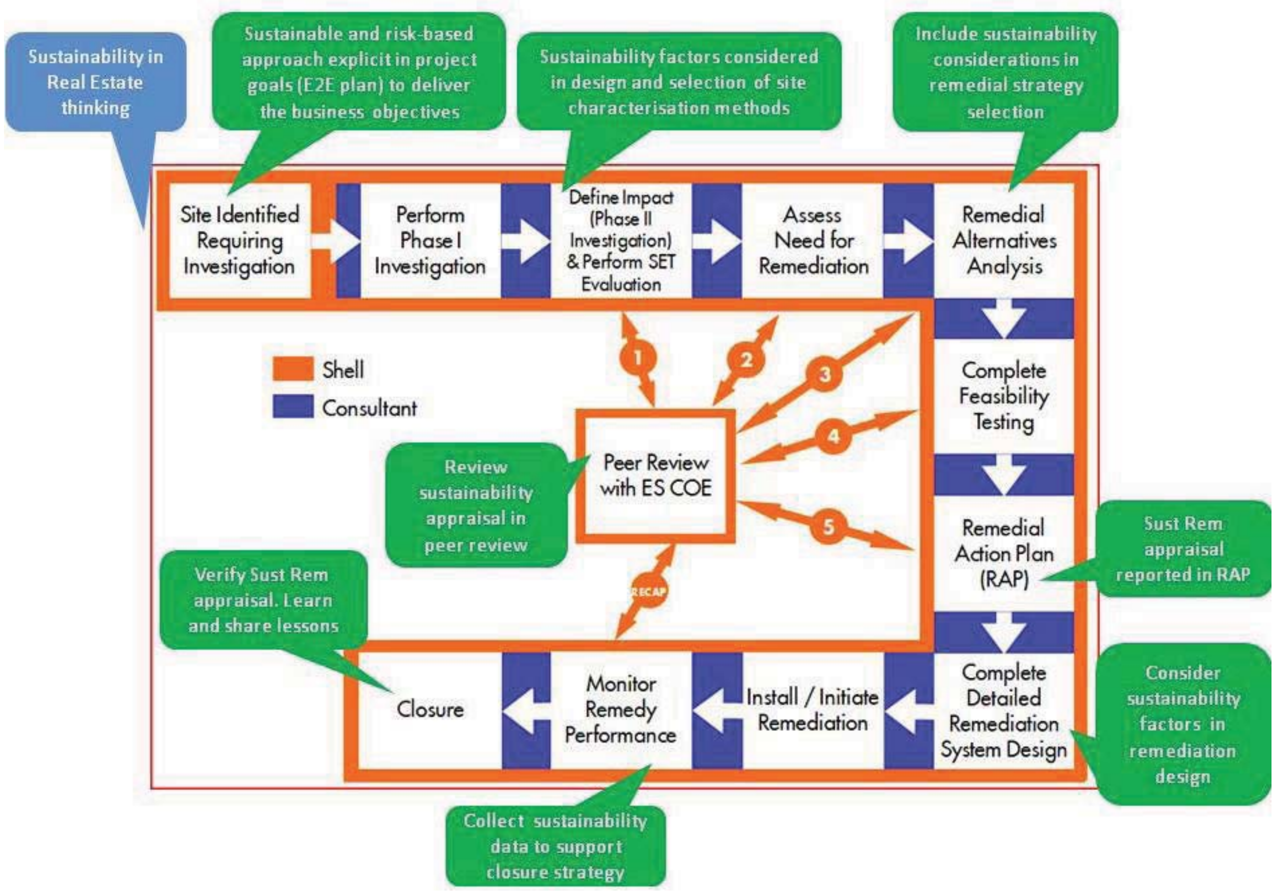
Implementation plan for SR in Shell's SGW projects

Action	Date
Development of international SR frameworks / standards SURF (2009, 2011); SuRF-UK (2010, 2011); SuRF-Aus/NZ (2010); NICOLE (2011); ITRC (2011)	COMPLETE
Development of international SR frameworks / standards ASTM SR Standard; [ASTM Green Rem Standard]; SuRF-Canada; SuRF-NL	IN PROGRESS
Develop SR indicator sets SuRF-UK, Nov 2011	COMPLETE
Develop / locate SR tools Public: USAFCEE SRT; SiteWise. Shell: SRAT (ß-version)	COMPLETE

Implementation plan for SR in Shell's SGW projects

Action	Date
Incorporate sustainability considerations into E2E plans / business objectives for **new projects**	1 January 2012
Undertake sustainable remediation appraisal to aid closure of **existing projects** (*at project manager discretion*)	1 January 2012
Apply relevant Tier 0 BMPs to new projects	1 January 2012
Training for project manager, consultant, peer reviewer on Tier 1-3 appraisal	During Q1 2012
Undertake Tier 1 – 3 sustainability appraisals in Remedial Alternatives Analysis	From Q2 2012
SR implementation effectiveness review	Q3 2012
SR programme success review	Q3 2013

Sustainable Remediation in the SGW Delivery Model



Conclusions

- Sustainable remediation is consistent with Shell's corporate approach to Sustainable Development;
- Shell staff & consultants have helped to draft the new international protocols;
- SR supplements (not replaces) the existing risk-based approach;
- Sustainability appraisal should:
  - adopt a tiered approach, using holistic (Env, Econ, Soc) indicators
  - be kept simple.
    - SuRF-UK: 'Use the simplest tier that produces a robust management decision'
    - Complex SR appraisals only necessary for large and complex projects
    - Should NOT add significant time / cost to most projects
- Across the global portfolio, SR should add value to Shell by:
  - achieving better, more sustainable remediation;
  - encouraging regulatory acceptance of risk-based solutions;
  - improving Shell's reputation

Attachment 24
Sustainability Evaluation of a Pump-and-Treat Remedy

Sustainability Evaluation of a P&T Remedy using SRT™ and CleanSWEEP

SURF 19, San Diego, February 2, 2012

Assaf A. Rees, P.E.
Eric Lang, P.E.
Mark Riley, P.E.

Presentation Content

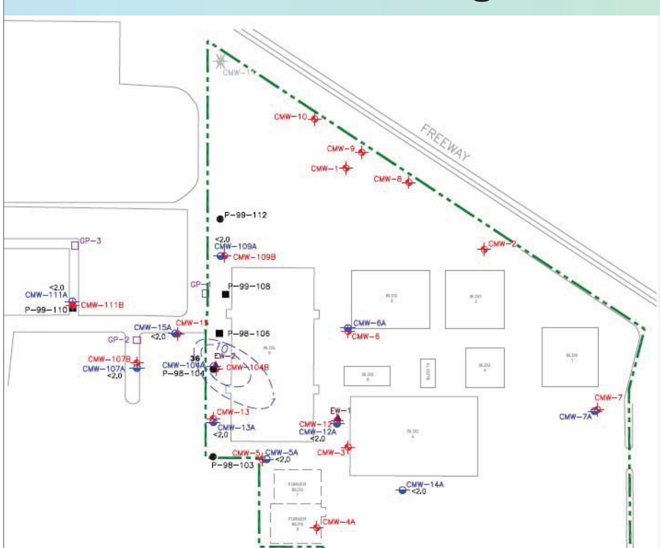
- Purpose of GSR Analysis
- Site Background
- Development of GSR Metrics
- Evaluation of Renewable Energy Options
- GSR-based Recommendations
- Take-Home Message

Purpose of GSR Analysis in Remedial Design Phase

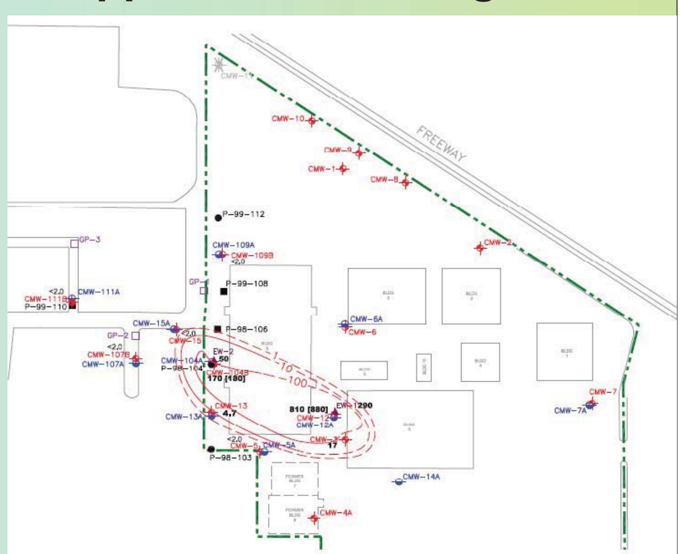
- Refining remedy design set forth in FS/RAP to reduce environmental footprint (ESS, modeling)
- Evaluation of treated water potential use and reuse
- Identification of BMPs for construction and OM&M
- Baseline footprint for future RPO (SRT, CleanSWEEP)
- Comparing footprint for effluent discharge options:
  - Selected remedy: reinjection of 50% of the water
  - Option 1: 100% discharge to the sewer
  - Option 2: 100% discharge to the stormdrain

Site Background – Chlorinated & 1,4-dioxane Plume

Lower water-bearing zone

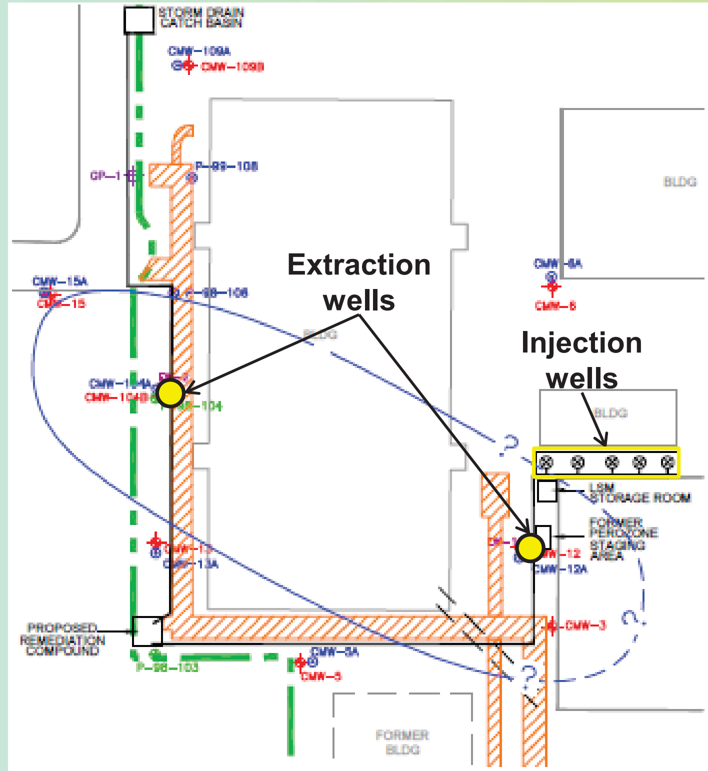


Upper water-bearing zone



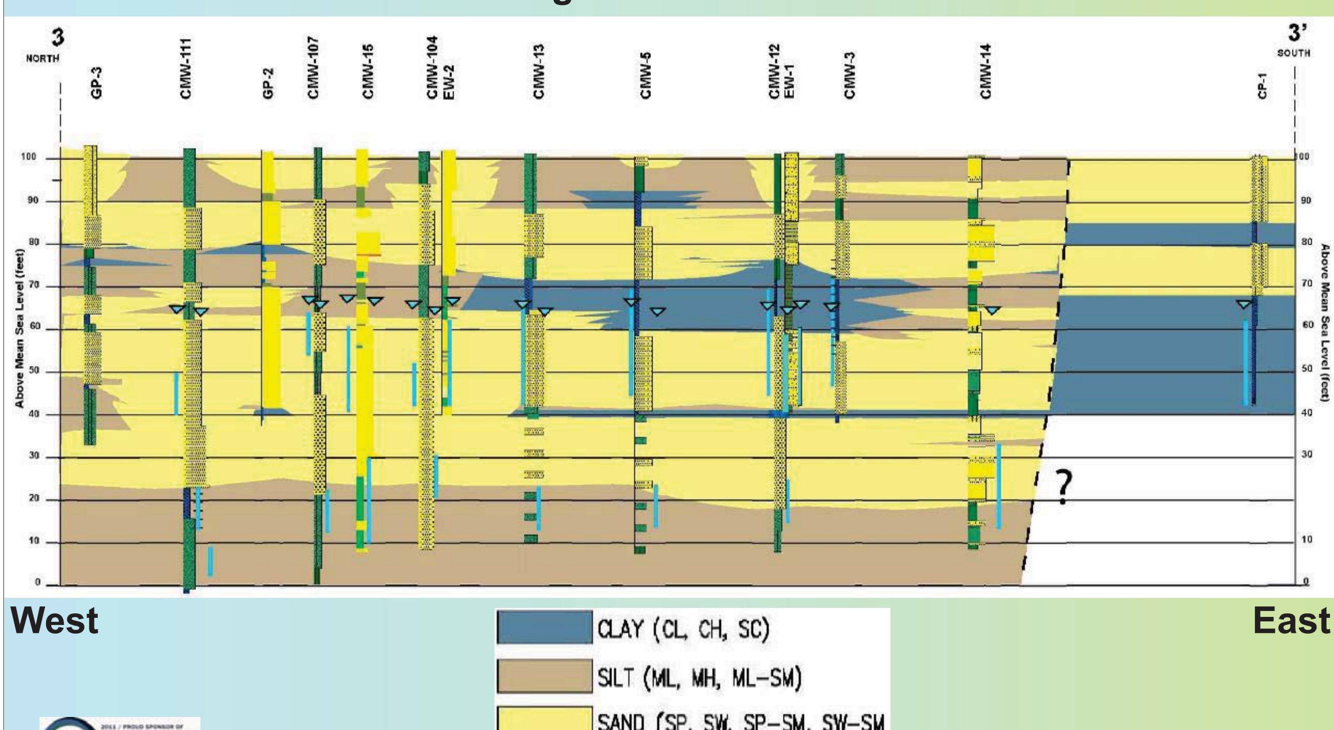
Site Background – Selected Remedy in FS/RAP

- Groundwater Extraction from two wells:
  - Source area
  - Western boundary
- Groundwater treatment using GAC (cVOCs) and AOP (1,4-dioxane)
- Re-injection of 50% of treated water to enhance remedy.



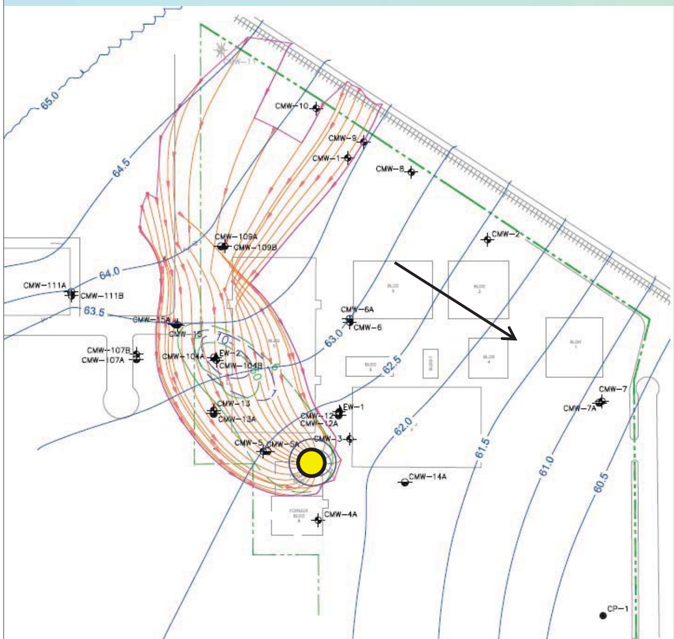
Remedial Design Phase – Revised CSM

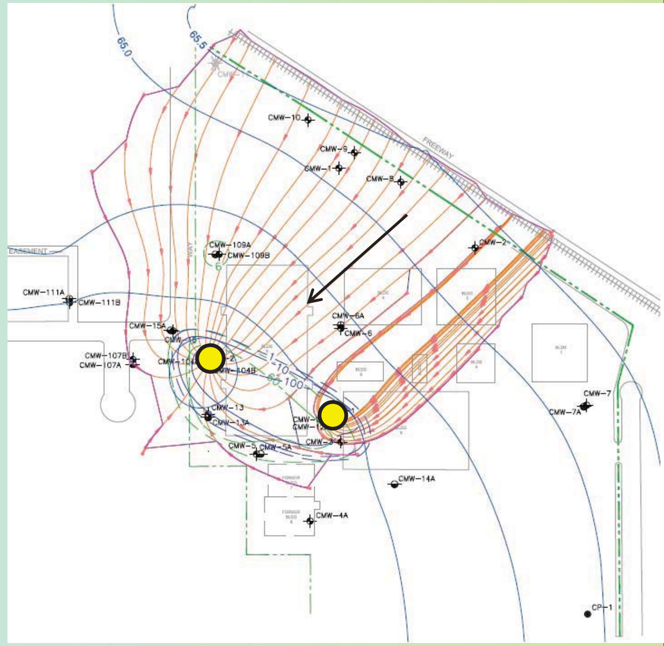
Geologic Cross-Section



Remedial Design Phase – Revised Extraction

Lower water-bearing flow & capture zone **Upper water-bearing flow & capture zone**

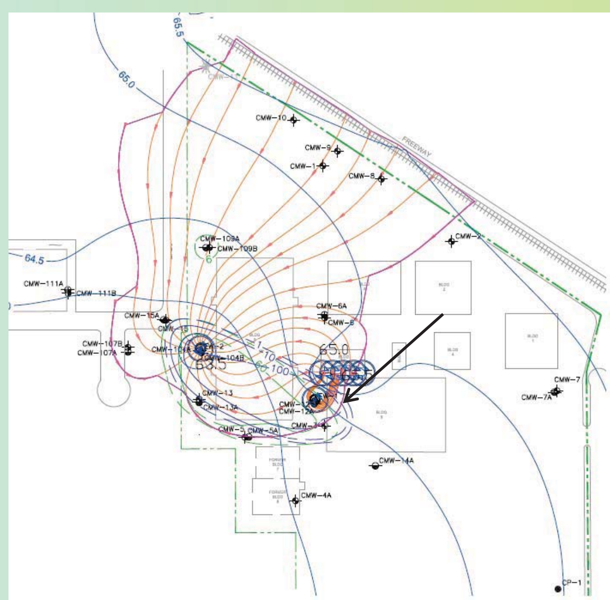




Remedial Design Phase – Revised Remedy

- Groundwater extraction from three wells
- Optimized pumping flow rates (2, 15, and 12 gpm)
- No change to treatment methods
- Re-injection of 50% of treated water would only marginally mound the groundwater.
- Design parameters are available for input into GSR tools

Injection Impact

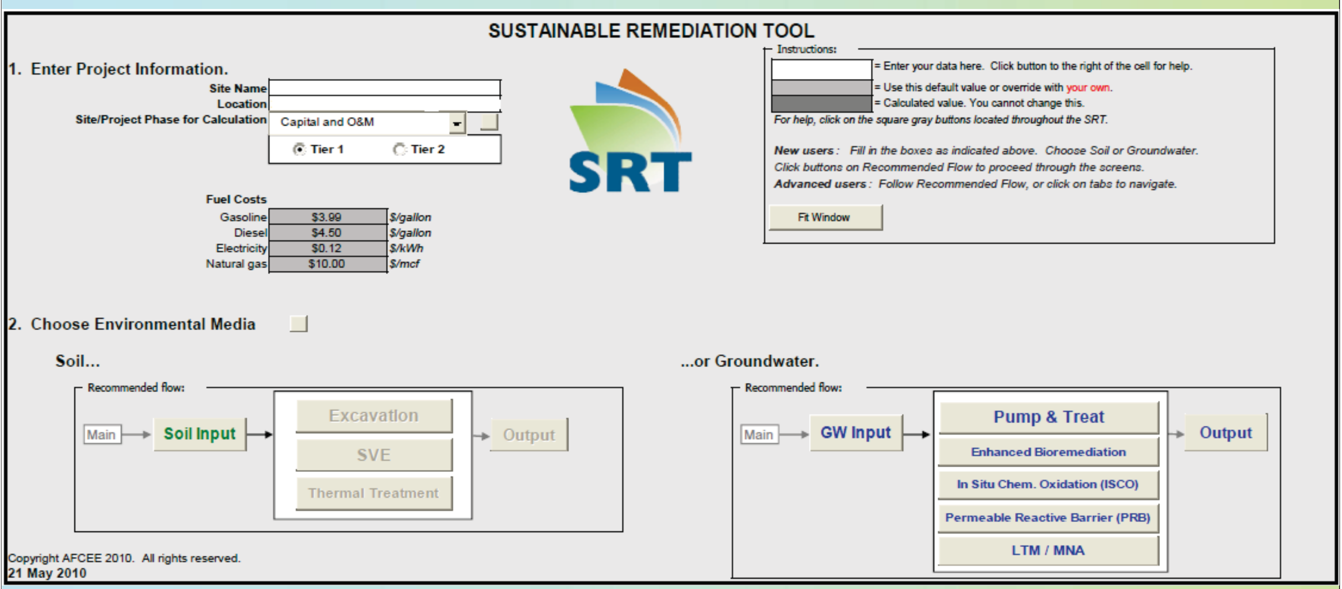


Development of GSR Metrics – SRT Tool

- Excel-based platform, available for free download from AFCEE
- Calculates GSR metrics for various ex-situ and in-situ remediation technologies (SVE, excavation, P&T, ISB, ISCO)
- Tiered approach
  - Tier I – built-in reference values
  - Tier II – significant site-specific customization
- 1 Output screen showing :
  - GSR metrics (GHG emissions, energy use, cost, safety risk, change in resource service
  - Output in a normalized/cost-based format
  - Scenarios to support decision making:
    - ✓ Future carbon offset costs
    - ✓ Changes in energy costs
    - ✓ Stakeholder Roundtable

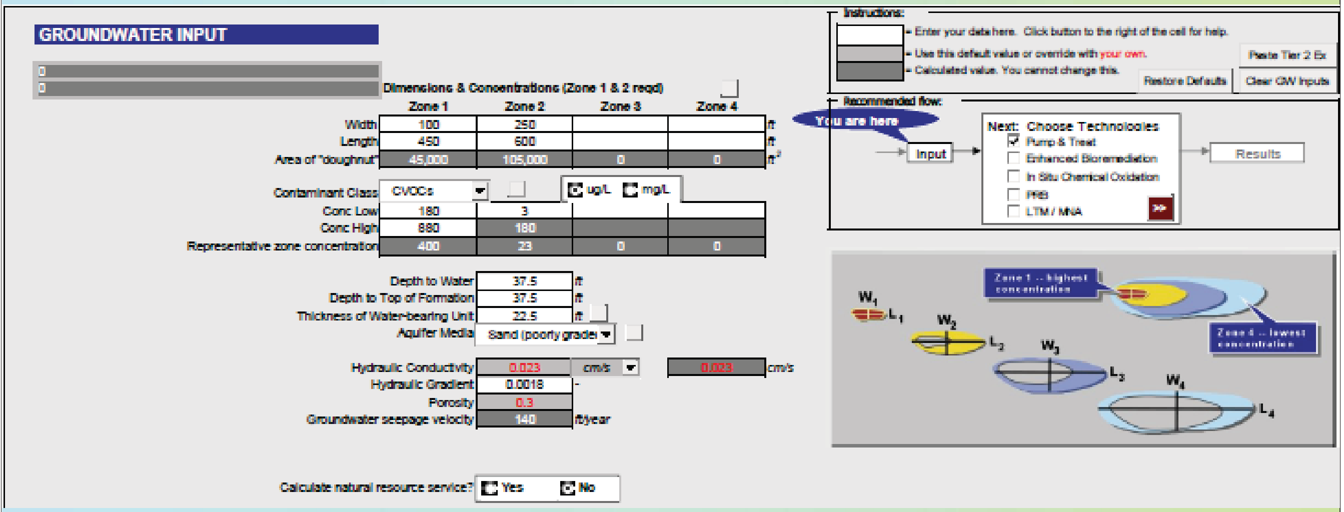
Development of GSR Metrics – SRT

Main Screen



Development of GSR Metrics – SRT

Groundwater Input Screen

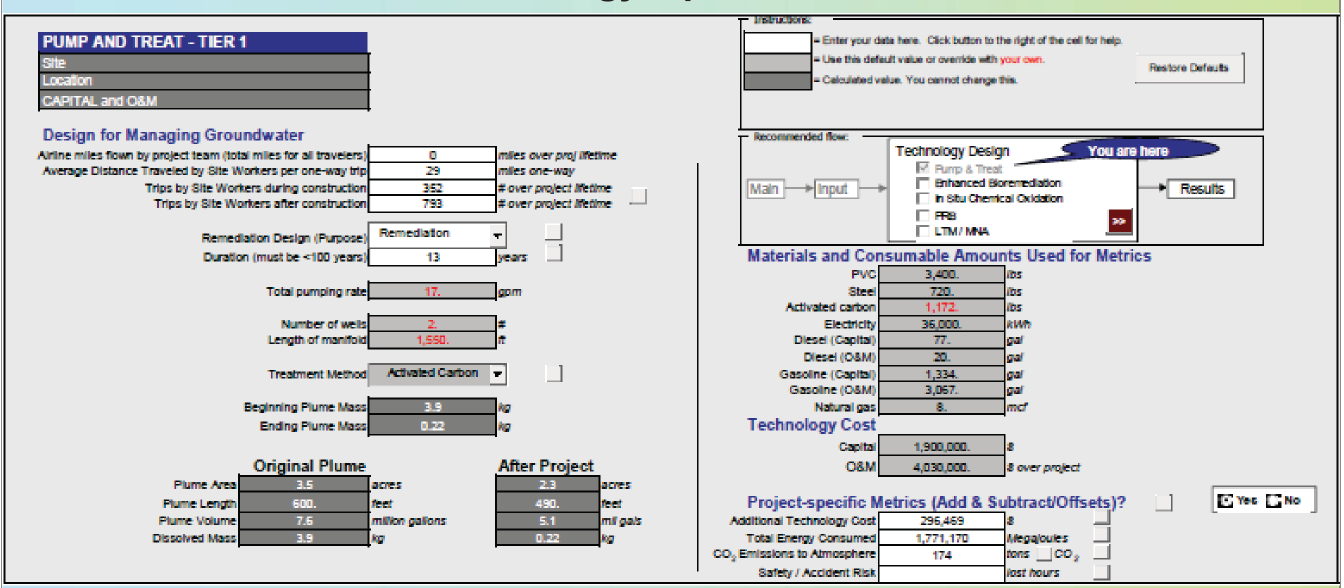


➢ **Separate worksheets for the three discharge options**

➢ **Separate worksheets for upper and lower bearing zones**

Development of GSR Metrics – SRT

Technology Input Screen

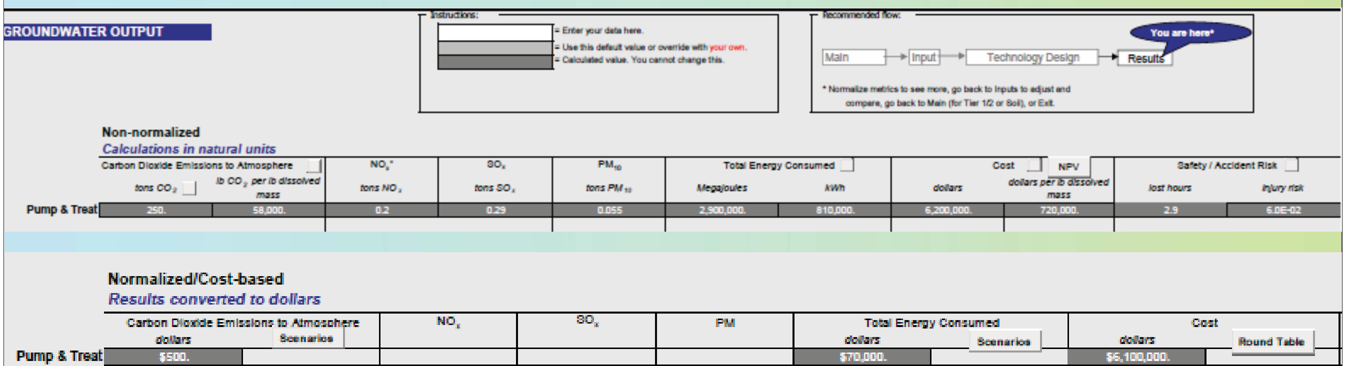


➢ **Separate worksheets for the three discharge options**

➢ **Separate worksheets for upper and lower bearing zones**

Development of GSR Metrics – SRT

Groundwater Output Screen



- Separate worksheets for the three discharge options
- Separate worksheets for upper and lower bearing zones

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GSR Evaluation of Effluent Discharge Options

Metric	Unit	Stormdrain Discharge Scenario			Sewer Discharge Scenario			50% Re-injection Scenario		
		UBWZ	LBWZ	Total	UBWZ	LBWZ	Total	UBWZ	LBWZ	Total
Gas Emission										
CO_2 [1]	tons	250	160	**410**	280	180	**460**	290	170	**460**
NO_x	tons	0.20	0.12	0.32	0.19	0.12	0.31	0.34	0.12	0.46
SO_x	tons	0.29	0.19	0.48	0.29	0.19	0.48	0.54	0.19	0.73
PM_{10}	tons	0.055	0.037	0.092	0.055	0.037	0.092	0.10	0.037	0.137
Total Energy Consumed [2]	kWh	810,000	530,000	**1,340,000**	890,000	580,000	**1,470,000**	940,000	560,000	**1,500,000**
Safety [3]										
Time lost due to injury	hours	2.90	1.50	4.40	3.02	1.59	4.61	2.96	1.54	4.50
Risk of non-fatal injuries	unitless	0.060	0.031	0.091	0.063	0.033	0.096	0.062	0.032	0.094

All values are over the lifetime of the project (i.e., 13 years).

1. Based on the amount of energy and raw materials consumed on- and off-site.
2. All sources of energy consumed during the technology lifecycle, including gasoline, diesel, electricity, and natural gas.
3. Lost time was calculated due to non-fatal injuries resulting from hours worked on the project (on- and off-site) and travel miles for the lifetime of the project.

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Renewable Energy Evaluation – CleanSWEEP Tool

- Excel-based platform, available for free download from AFCEE
- Calculates the economic feasibility and preliminary designs for solar and wind as alternative sources of energy
- The US DoE National Renewable Energy Laboratory (NREL) was relied upon heavily during the development of CleanSWEEP
- Two scenarios are evaluated concurrently per simulation:
  - 100% energy supplied by the electrical grid (baseline scenario)
  - User-defined mix of renewable sources and the electrical grid (renewable scenario).
- Renewable scenarios evaluated for this project:
  - 100% energy from renewable sources
  - 50% energy from renewable sources

Renewable Energy – CleanSWEEP

System Input Screen

Clean Solar and Wind Energy in Environmental Programs (Clean SWEEP)

Tool Reset

Location and System Input Sheet

Los Angeles AFB: Site	Pre-Defined Values		User-Defined Values
Current Year	2011		
Location	Los Angeles AFB		
Zip Code	90009		
Site Name			
Elevation (ft above sea level)	115 ft amsl		157
Is this a new system?	Yes		
If Yes, is grid power available at the system?	Yes		
If No, distance to nearest electrical access (ft)			
Cost to bring in electrical ($)			
System Energy Requirement	Water Components	Air Components	
Flow Rate	29.00 gpm	.00 scfm	
Head/Pressure	80.00 ft	.00 inches H2O	
Total Horsepower of all Equipment	0.976 HP	0.000 HP	17.55 HP
Equipment Power Rating	0.728 kW	0.000 kW	13.245 kW
Energy Consumption	116,026 kWh/yr		
Percent Energy to be Provided by Renewables (%)	100%		
Increasing/Decreasing Energy Requirements (%/year)	0.0% per year		
Is continuous operation required?	Yes		
If no, minimum required operation time (%/year)			
Expected Remedy Duration (years beyond current)	13.00 years		

Renewable Energy – CleanSWEEP

Energy Input Screen

Clean Solar and Wind Energy in Environmental Programs (Clean SWEEP)

Energy Input Sheet

Los Angeles AFB: Site	Pre-Defined Values	User-Defined Values
Grid Energy Detail		
Provider	Los Angeles City of - CA	
Billing Structure	Commercial	
Projected Energy Inflation Rate (%/yr)	3.00%	
Current Year Energy Cost (cents/kWh)	12.45¢/kWh	
Emissions		
NOx (lbs/MWh)	0.62 lbs/MWh	
SOx (lbs/MWh)	0.53 lbs/MWh	
CO2 (lbs/MWh)	724 lbs/MWh	
Incentives/Rebates	$280,640 remedy lifetime	
Renewable Energy Detail		
Solar PV		
Solar Panel Efficiency (%)	15%	
Mount Type	Fixed, Tilt at Latitude	
Potential (kWh/m2/day)	6 kWh/m2/day	
Wind		
Wind Speed Reference Height (m)	50 m	
Reference Wind Speed (m/s)	2.77 m/s	
Maximum Hub Height (m)	10 m	
Wind Regime	Coastal Site	
Surface Obstructions	Cities, forests	

Renewable Energy – CleanSWEEP

Energy Output Screen – 100% Solar Scenario

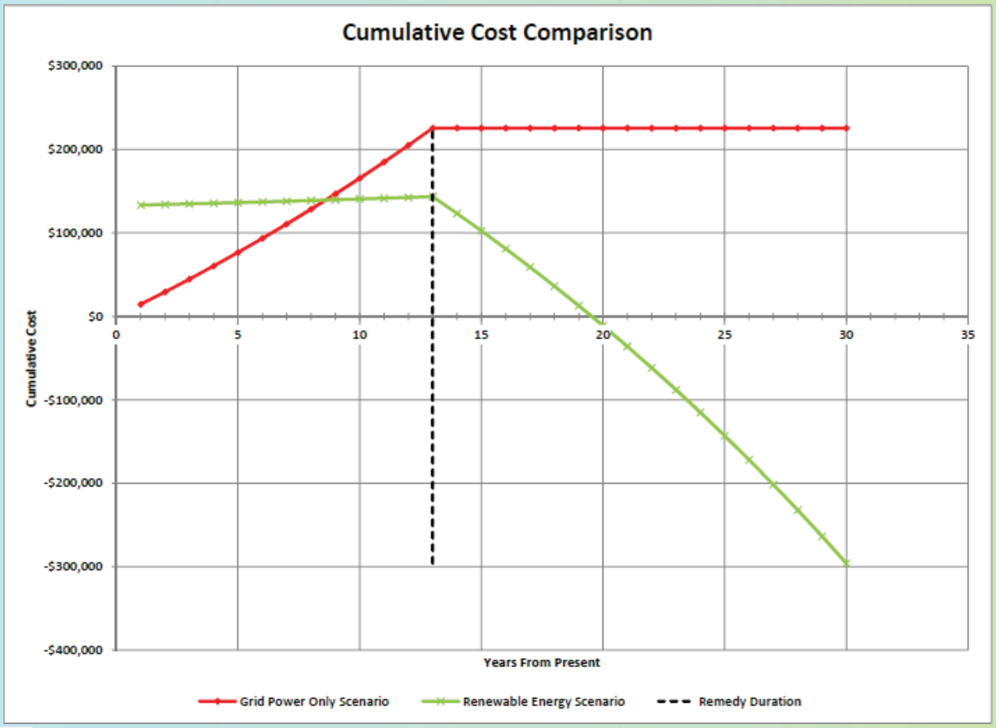
Clean Solar and Wind Energy in Environmental Programs (Clean SWEEP)

Output Data Sheet

Los Angeles AFB: Site	Grid Only (Baseline)	Renewable Energy Scenario		
		Grid	Wind	Solar PV
Energy Overview				
Percentage Desired from Wind or Solar (%)	NA	NA	0%	100%
Energy Requirement - Baseyear (kWh/yr)	116,026 kWh/yr	0 kWh/yr	0 kWh/yr	116,026 kWh/yr
Renewable Energy Power Rating (kW)	NA	NA	NA	52.98 kW
Area Required/System Footprint	NA	NA	NA	470.93 m2
% Energy Provided	100%	0%	0%	100%
Cost Analysis				
Cost per Watt for Renewable ($/kW)	NA	NA	NA	$7,801.99/kW
Capital Cost ($)	$0	$0	NA	$413,349
O&M Cost ($ over remedy lifetime)	NA	NA	NA	$10,872
Energy Cost ($ over remedy lifetime)	$225,652	$0	$0	
Rebates/Incentives ($ over remedy lifetime)	NA	NA	-$280,640	
Total Cost of Option ($ over remedy lifetime)	$225,652	$143,581		
Remedy Lifetime Cost Reduction	NA	$82,071		
Return on Investment	NA	57%		
Simple Payback Period	NA	8 years		
Total Value of Renewable Post Remediation		$439,488		
Sustainability Impacts				
Emissions (Life-Cycle)				
NOx (tons)	508	0	Negligible	Negligible
SOx (tons)	434	0	Negligible	Negligible
CO2 (tons)	593,499	0	0.00	134.01
RECs	0	0	0	3,481

Renewable Energy – CleanSWEEP

Cost Comparison – Grid Vs. 100% Solar Scenario



Renewable Energy – CleanSWEEP

Energy Output Screen – 100% Solar/Wind Scenario

Clean Solar and Wind Energy in Environmental Programs (Clean SWEEP)

Output Data Sheet

Los Angeles AFB: Site	Grid Only (Baseline)	Renewable Energy Scenario		
		Grid	Wind	Solar PV
Energy Overview				
Percentage Desired from Wind or Solar (%)	NA	NA	5%	95%
Energy Requirement - Baseyear (kWh/yr)	116,026 kWh/yr	0 kWh/yr	5,801 kWh/yr	110,225 kWh/yr
Renewable Energy Power Rating (kW)	NA	NA	Insufficient Space	50.33 kW
Area Required/System Footprint	NA	NA	Insufficient Space	447.39 m2
% Energy Provided	100%	0%	5%	95%
Cost Analysis				
Cost per Watt for Renewable ($/kW)	NA	NA	NA	$7,825.07/kW
Capital Cost ($)	$0	$0	NA	$393,843
O&M Cost ($ over remedy lifetime)	NA	NA	NA	$10,329
Energy Cost ($ over remedy lifetime)	$225,652	$0	$0	
Rebates/Incentives ($ over remedy lifetime)	NA	NA	-$280,640	
Total Cost of Option ($ over remedy lifetime)	$225,652		$123,532	
Remedy Lifetime Cost Reduction	NA		$102,120	
Return on Investment	NA		83%	
Simple Payback Period	NA		7 years	
Total Value of Renewable Post Remediation			$417,514	
Sustainability Impacts				
Emissions (Life-Cycle)				
NOx (tons)	508	0	Negligible	Negligible
SOx (tons)	434	0	Negligible	Negligible
CO2 (tons)	593,499	0	0.00	127.31
RECs	0	0	0	3,307

Renewable Energy – CleanSWEEP

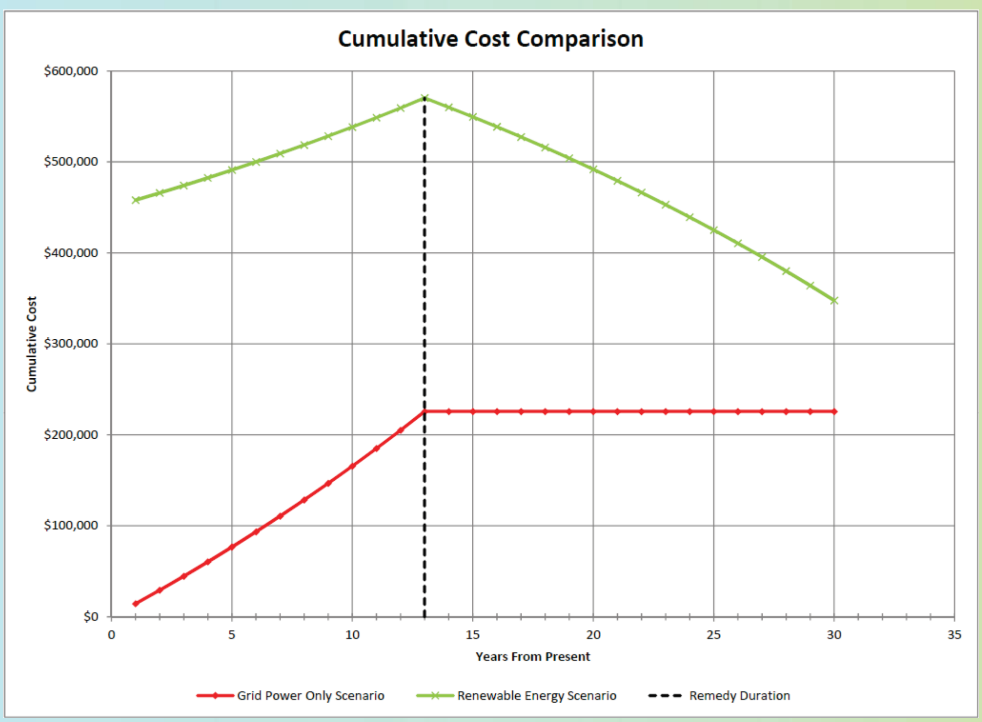
Energy Output Screen – 50% Solar/Wind Scenario

Clean Solar and Wind Energy in Environmental Programs (Clean SWEEP)
Output Data Sheet

Los Angeles AFB: Site	Grid Only (Baseline)	Renewable Energy Scenario: Grid	Renewable Energy Scenario: Wind	Renewable Energy Scenario: Solar PV
Energy Overview				
Percentage Desired from Wind or Solar (%)	NA	NA	5%	95%
Energy Requirement - Baseyear (kWh/yr)	116,026 kWh/yr	58,013 kWh/yr	2,901 kWh/yr	55,112 kWh/yr
Renewable Energy Power Rating (kW)	NA	NA	100.0 kW	25.17 kW
Area Required/System Footprint	NA	NA	Hub Height = 10 m Rotor Diameter =21 m	223.69 m2
% Energy Provided	100%	50%	3%	48%
Cost Analysis				
Cost per Watt for Renewable ($/kW)	NA	NA	$3,882.49/kW	$8,143.81/kW
Capital Cost ($)	$0	$0	$388,249	$204,943
O&M Cost ($ over remedy lifetime)	NA	NA	$1,856	$5,164
Energy Cost ($ over remedy lifetime)	$225,652	$112,826	$0	
Rebates/Incentives ($ over remedy lifetime)	NA	NA	-$142,846	
Total Cost of Option ($ over remedy lifetime)	$225,652	$570,193		
Remedy Lifetime Cost Reduction	NA	-$344,541		
Return on Investment	NA	-60%		
Simple Payback Period	NA	> 30 years (exceeds reasonable lifespan of RE equipment)		
Total Value of Renewable Post Remediation		$222,476		
Sustainability Impacts				
Emissions (Life-Cycle)				
NOx (tons)	508	254	Negligible	Negligible
SOx (tons)	434	217	Negligible	Negligible
CO2 (tons)	593,499	296,749	0.66	63.65
RECs	0	0	132	1,653

Renewable Energy – CleanSWEEP

Cost Comparison – 50% Solar/Wind Scenario



Renewable Energy Evaluation Summary

Metric	Measurement Unit	Grid power (baseline)	100% Solar Power	50% Renewable Power: Grid power (50%)	50% Renewable Power: Solar Power (50%)
System energy requirement	kWh/year	116,026	116,026	58,013	58,013
Power requirement	kW	–	52.98	–	26.49
Roof area required for solar panels	Square meters	–	470.93	–	235.47
Capital cost	$	–	$413,349	–	$215,093
O&M Cost	Total $ over 13 years (remedy lifetime)	–	$10,872	–	$5,436
Rebates and Incentives:					
H.R. 1 U.S. Treasury Grant	$	–	$124,005	–	$64,528
APU Solar Advantage	Total $ over 5 years	–	$156,635	–	$78,318
Total Cost (incl. incentives)	Total $ over 13 years (remedy lifetime)	$225,652	$143,581	$112,826	$77,683
Payback period	Years	–	8	–	9
Value of renewable post remediation	Total $ over 17 years	–	$439,488	–	$219,744

GSR-based Recommendations

- **Pursue the remedy design plan for stormdrain discharge**

  ↓

  minimizes environmental impacts of the groundwater remedy (assuming no additional treatment required to mitigate TDS)
- **Focus future RPO on the AOP treatment module (60%-80% of footprint)**
- **Evaluate further the applicability and economics of using solar power to provide 50% or 100% of the system's power requirement**

  ↓

  Tax and depreciation incentives and rebates?
  Payback period adequate/attractive to the client?

SURF is a Service Mark of the Sustainable Remediation Forum, Inc., a New Jersey non-profit organization.

Take-Home Message

When GSR was in diapers…

- We were learning how to think about sustainability.
- There was a shortage of tools for quantifying sustainability.
- Tools that did exist were not tailored to remediation purposes
- It was difficult and expensive to integrate sustainability into the day to day operations of remediation projects

Take-Home Message

Today…

- Some companies and regulators expect GSR to be part of their projects.
- We are seeing GSR become an added value feature for winning remediation work.
- Multiple tools are available for quantifying sustainability in remediation.
- Tools are user friendly and can be used cost effectively throughout a remediation project.

SURF is a Service Mark of the Sustainable Remediation Forum, Inc., a New Jersey non-profit organization.

Attachment 25
Brown to Green: Returning Contaminated Property to Productive Use

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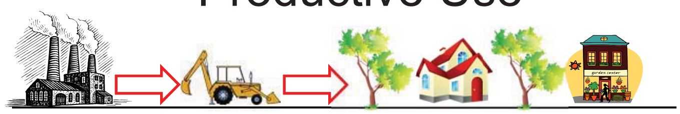
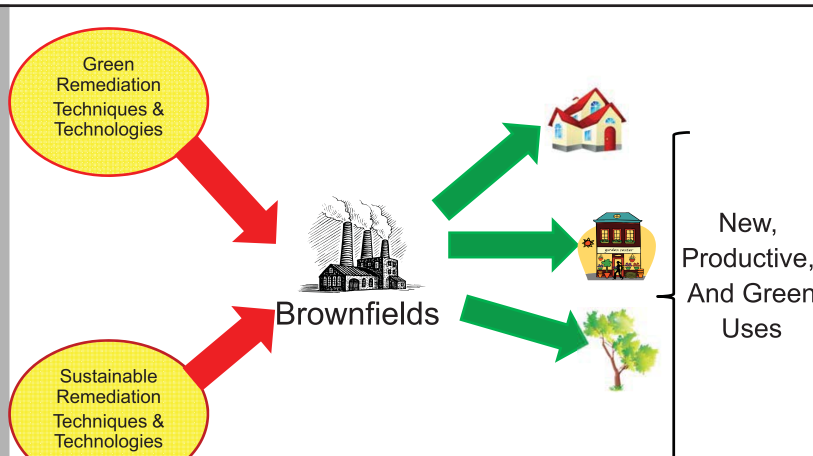
Brown to Green: Returning Contaminated Property to Productive Use



Dave Laney, CHMM
SURF 19
University of California San Diego
February 2, 2012



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Route 66 Creosote Pit
Flagstaff, Arizona

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Route 66 Creosote Pit Flagstaff, Arizona

- Site formerly used circa 1916 by electric utility burning sawdust from local sawmill to produce electricity and steam
- Prior to this time (and for several years afterwards) the site was also used by the railroad
- Main set of tracks for transporting freight between east coast and California
- Rail spur servicing the operation of the onsite utility

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Route 66 Creosote Pit Flagstaff, Arizona

- Main source of contamination: wood preservation vat where railroad ties or poles for electric lines were treated with creosote
- Contamination was within a few feet of the largest natural drainage in the area, the Rio de Flag
- Two major water lines and several old abandoned pipeline intersected the area of contamination
- High visibility

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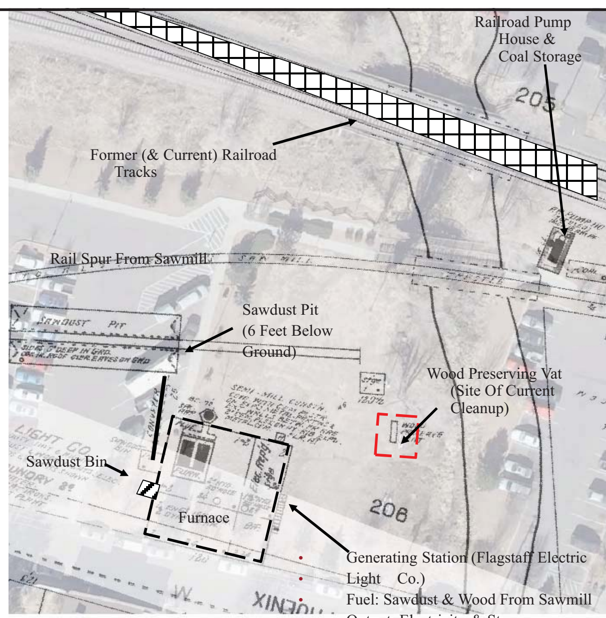

- Generating Station (Flagstaff Electric Light Co.)
- Fuel: Sawdust & Wood From Sawmill
- Output: Electricity & Steam

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Considerations for Remedy Selection Route 66 Creosote Pit

- Creosote very sticky and was distributed preferentially in relatively small soil lenses in an area with a significant amount of clay
- PAHs (main contaminants of concern) are resistant to bioremediation
- Possible presence of perched groundwater

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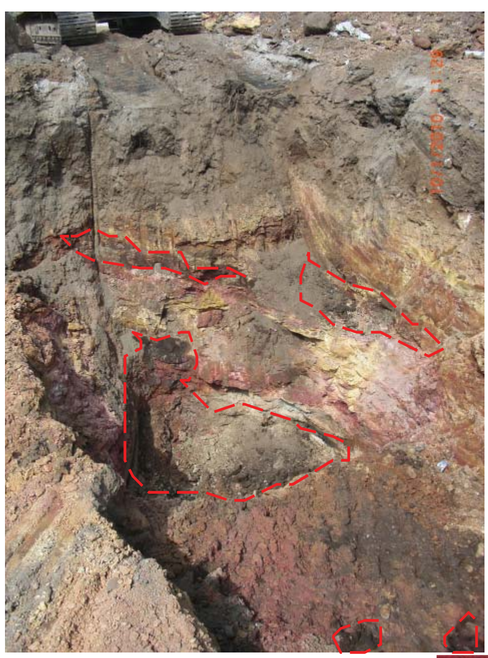

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Considerations for Remedy Selection Route 66 Creosote Pit

- Work financed using EPA Brownfields Cleanup Grant & ARRA Funds
- Preference within the EPA Brownfields program for green remediation
- Well educated, liberal and activist community
- Wanted quick action that would result in creative and long-term beneficial use of the site

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Remedy Selection
Route 66 Creosote Pit

- Performed feasibility study to evaluate:
  - -In-situ treatment
  - -Ex-situ treatment
  - -Excavation & offsite landfilling
- Prepared Analysis of Brownfields Cleanup Alternatives (ABCA)
- Held meetings with local community groups to discuss their preferences

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Preferred Remedy,
Route 66 Creosote Pit
Flagstaff, Arizona

- Excavate contaminated soil
- Haul to local landfill for disposal
- Backfill with native soil
- Vegetate site using native seed mix
- Complete work within 3 months

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EPA Principles for Greener Cleanups

(August 2009)

Principle #1

Consistent with existing laws and regulations, it is EPA (OSWER) policy that all cleanups:

- Protect human health and the environment
- Comply with all applicable laws and regulations
- Consult with communities regarding response action impacts consistent with existing requirements
- Consider the anticipated future use of the site

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EPA Principles for Greener Cleanups

Principle # 2

When selecting and implementing protective cleanup activities:

- Total Energy Use and Use of Renewable Energy (Minimize/Maximize)
- Air Pollutants and Greenhouse Gas Emissions (Minimize)
- Water Use and Impacts to Water Resources (Minimize)
- Materials and Waste Management (Reduce, Reuse and Recycle Material and Waste)
- Land Management and Ecosystem Protection

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Development of Contract Documents

- SCS prepare a Scope of Work that was attached to and incorporated in the Request for Bid and the final contract
- Stated preference for green remediation and consistency with EPA Principles for Greener Cleanup
- Provided a list of potential BMPs for contractor consideration
- Required contractor to document which BMPs they used and the effect of each in reducing environmental footprint

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Green Remediation BMPs Route 66 Creosote Pit

- Reclaimed water for dust control
- Equipment fitted with automatic idle control that shut off engines when not in use
- Low sulfur fuel to reduce emissions
- Local versus regional landfill
- Configured roundtrip for haul trucks so that it included landfill disposal of excavated soil followed immediately by visit to borrow site to pick up backfill and bring it to the site
- Reused soil from existing remodel on Flagstaff Mall
- Chipped tree for use as landscaping material
- Used local equipment, supplies and labor
- Required out of town construction workers to carpool to site

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Benefits of Green Remediation @ Route 66 Creosote Pit Flagstaff, Arizona

- Reduced the miles driven by each haul truck per trip from 160 to 25 and the total miles driven by project haul trucks from 7360 to 1150 miles (84 percent)
- Reduced diesel fuel consumption (a non-renewable fuel) by 1035 gallons.
- Reduced greenhouse gas emissions by more than 20,000 lbs of carbon dioxide equivalents.
- Reduced fresh water use by 10,000 gallons.
- Reduced the use of raw materials in the form of soil for backfill by 869 tons
- Reduced cost

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Benefits of Green Remediation @ Route 66 Creosote Pit Flagstaff, Arizona

- Created positive image of City
- Provided EPA will good opportunity to film Brownfields and ARRA $$ at work (watch for it on website)

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Sustainable Reuse

- City is working with Army Corps of Engineers to install diversion structures for the Rio de Flag on part of the site
- Eliminate flooding in downtown Flagstaff
- Reduce the need for businesses to obtain flood insurance
- Dramatically increase funding for new business, redevelopment of other properties

SCS ENGINEERS

Sustainable Reuse

- City is refining the conceptual redevelop plan for the site and adjacent property that was initially prepared prior to cleanup
- As currently envisioned, portions of the site may also be used for green space and/or a park
- Plan for adjacent properties includes Flagstaff Urban Trail (FUT), construction of more than 33,000 square feet of retail/commercial buildings, mass transit (bus transfer) facilities, and an open air retail space (Shade Tree Allee)

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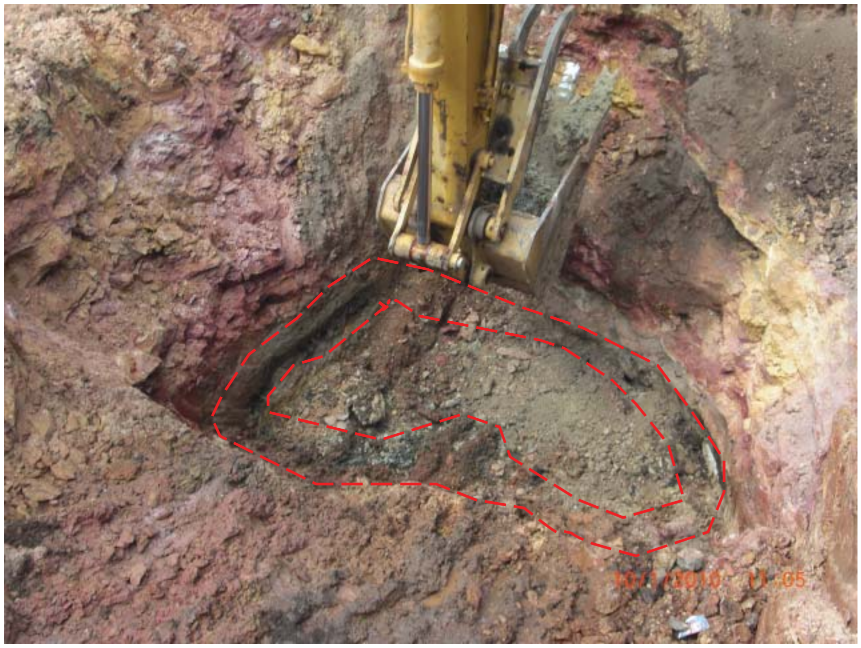
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