MISSION
NAVFAC Environmental Restoration delivers sustainable, innovative, cost effective remediation solutions with stakeholder engagement, to protect human health and the environment, maintain regulatory compliance, and maximize reuse of DON assets to support the warfighter.

VISION
NAVFAC Environmental Restoration is the recognized Federal leader for responsive, best value, and sustainable remediation solutions.

Navy's Approach to Green and Sustainable Remediation

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NAVFAC HQ
E2S2 Conference
May 9-12, 2011

Report Documentation Page

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Presentation Outline

- **Introduction**

Incorporating GSR Strategies Into Navy Response Actions

Tools and Tracking

Examples of GSR at Navy Installations

Summary

Introduction

- **GSR considers non-traditional impacts**
- **Incorporate GSR into cleanup within the NCP framework**
- **Remain focused on cleanup goals, budget, and RIP/RC dates**
- **Navy Policy requires optimization at the remedy selection, design, and RA-O phases and being updated to include GSR**
- **Navy Optimization Workgroup currently developing GSR Guidance**
- **Updated Optimization Policy and GSR guidance document expected to be finalized Spring 2011**

Presentation Outline

Introduction

- **Incorporating GSR Strategies Into Navy Response Actions**
- **Optimization Framework**
- **Overview of GSR Related Updates to Navy Policy**
- **GSR Guidance Document**

Tools and Tracking

Examples of GSR at Navy Installations

Summary

Incorporating GSR Strategies Into Navy Response: Optimization Framework

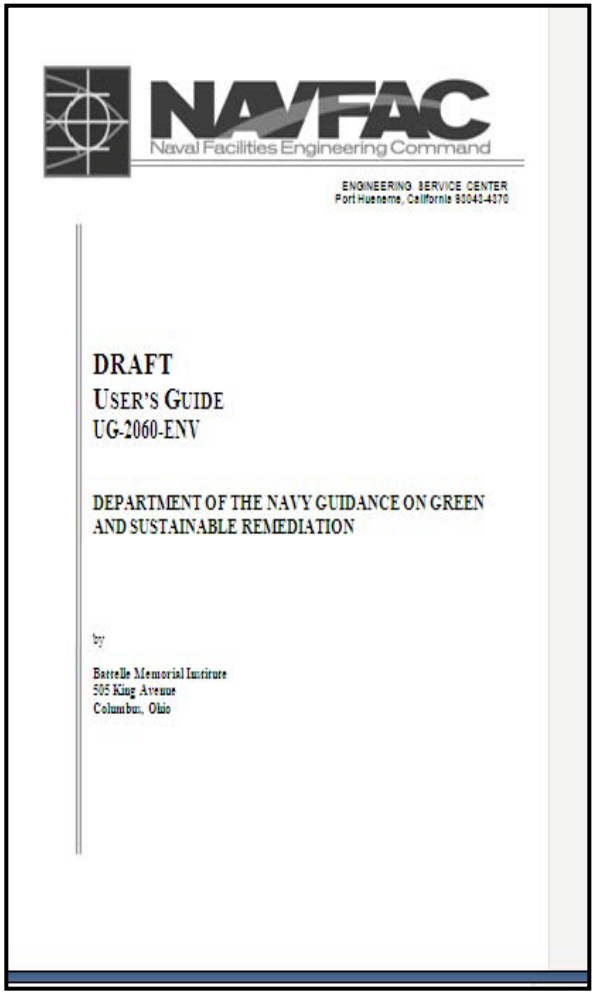
Optimization Objectives:

- **Select appropriate remedies/technologies**
  - **Technologies that fail to meet established performance objectives and remedies are not sustainable**
- **Optimize the remedy**
  - **An optimized remedy is a green and sustainable remedy**
- **Understand the footprint of the remedy**
  - ***Remedy footprint* is meant to include adverse impacts on environmental media and society that are a direct or indirect consequence of performing the remedial action.**

Overview of GSR Related Updates to Optimization Policy

- **Navy Policy expanded to include:**
  - **Optimization includes GSR: Evaluate opportunities during all ER Program phases**
  - **Conduct a remedy footprint analysis using the SiteWise tool**
  - **GSR metrics shall be incorporated into the review of the CERCLA Nine-Criteria**
  - **Optimization Tracking to include GSR Metrics**

Incorporating GSR Strategies Into Navy Response: GSR Guidance Document 2011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DRAFT
USER'S GUIDE
UG-2060-ENV

DEPARTMENT OF THE NAVY GUIDANCE ON GREEN AND SUSTAINABLE REMEDIATION

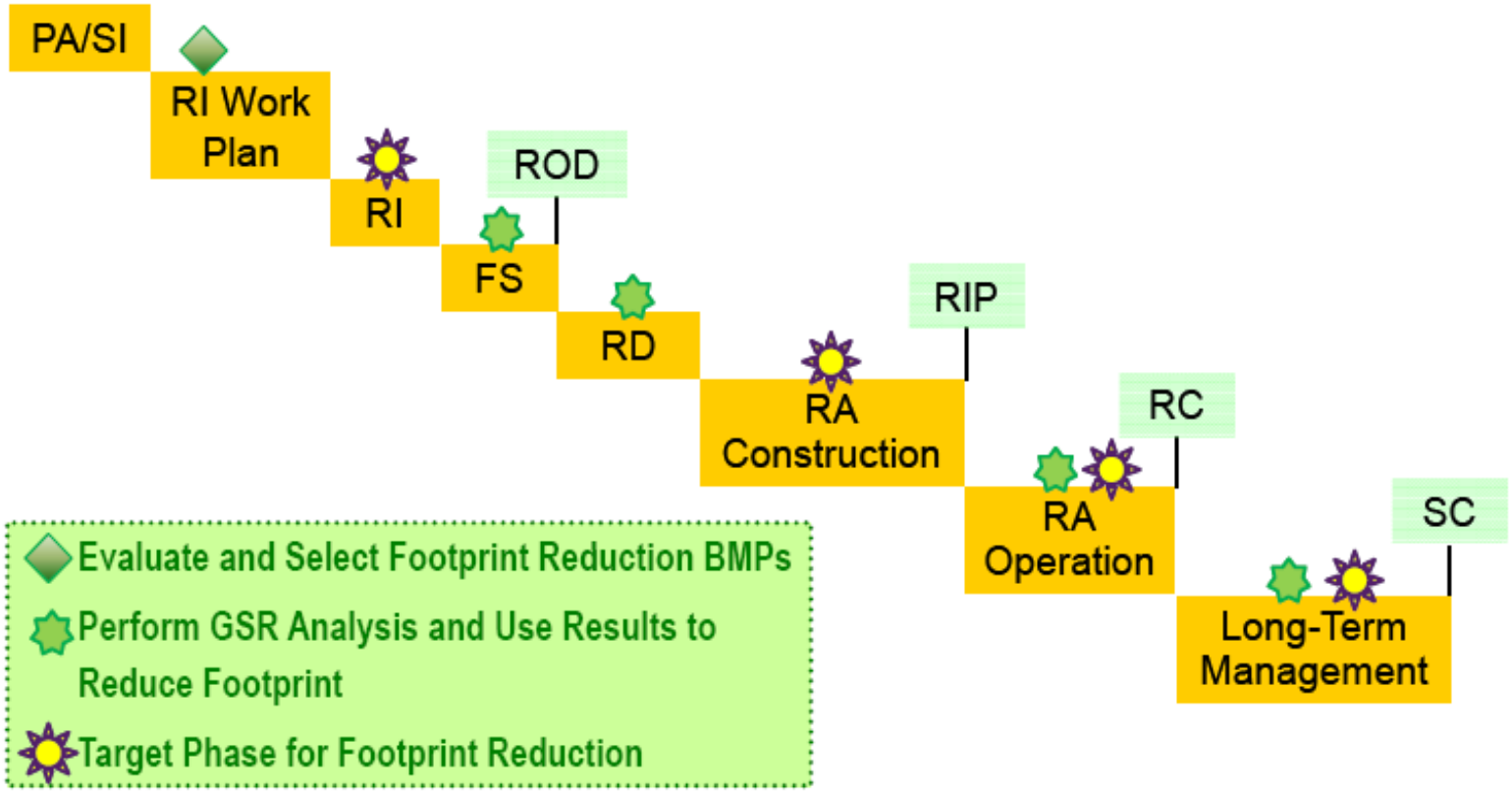
by

Battelle Memorial Institute
505 King Avenue
Columbus, Ohio

- **GSR Metrics (Section 2.0)**
- **Metric Calculation Methods and Tools (Section 3.0)**
- **GSR during Site Characterization (Section 4.0)**
- **GSR during Remedy Selection (Section 5.0)**
- **GSR during Remedial Design and Construction (Section 6.0)**
- **GSR during Remedial Action – Operation and Long Term Monitoring (Section 7.0)**
- **General Footprint Reduction Methods (Section 8.0)**

Incorporating GSR Strategies Into Navy Response: Remedial Process

Applying GSR Throughout the Remedial Process



Presentation Outline

Introduction

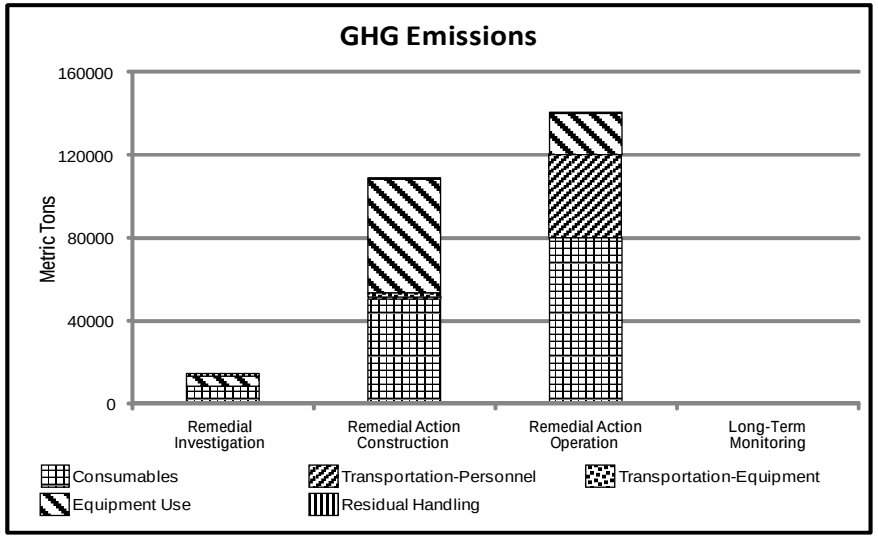
Incorporating GSR Strategies Into Navy Response

- **Tools & Tracking**
  - **SiteWise™**
  - **NORM**
  - **GSR Portal**

Examples of GSR at Navy Installations

Summary

Tools & Tracking: SiteWise™

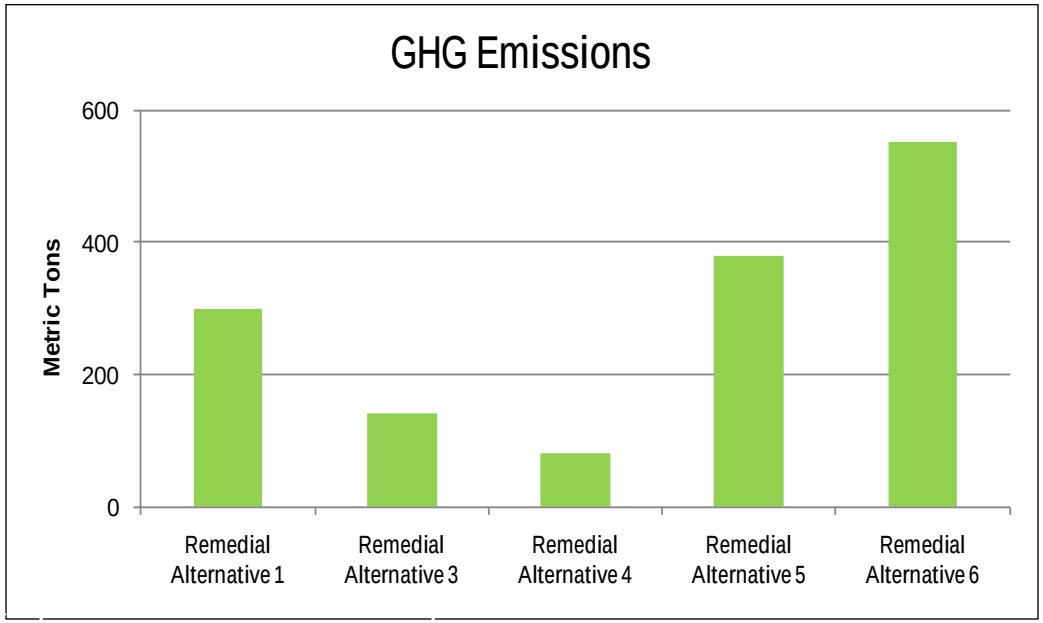


- **A collaborative effort developed by Navy, USACE and Battelle to produce a GSR tool to calculate the environmental footprint of remediation in terms of sustainability metrics.**
- **Free for public use**

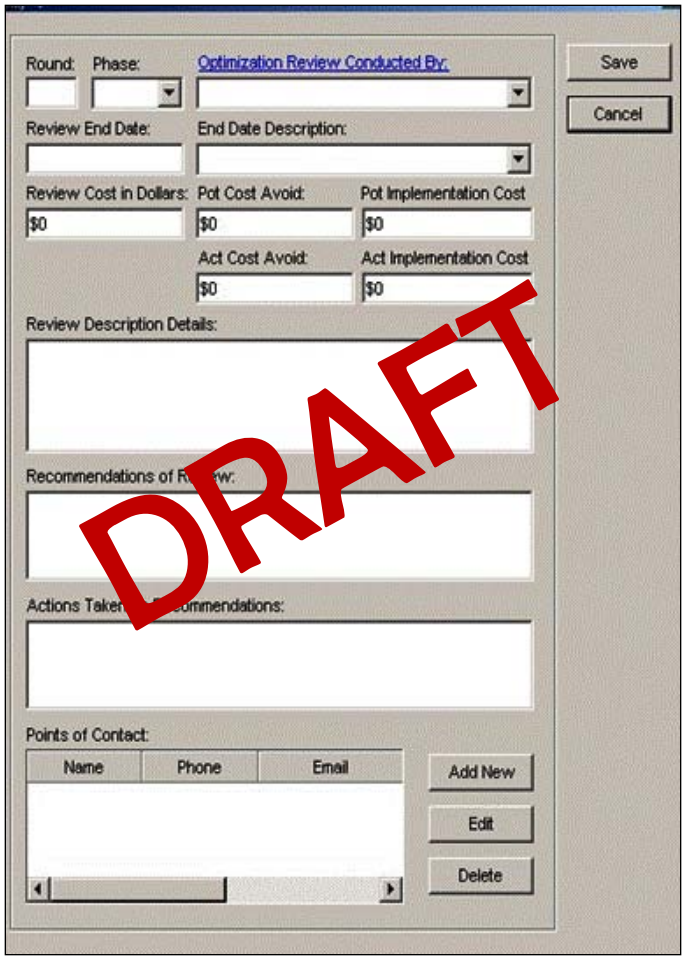
- **A user-friendly streamlined life-cycle analysis (LCA) tool that can be applied to any phase of the remedial action**
  -Considers life-cycle impacts such as emissions due to manufacturing of materials consumed during remedial action
- **Transparent calculations to facilitate review by stakeholders/regulators**

Tools & Tracking: SiteWise™

- **Other tools are also available and can be applied in cases where equipment, materials or metrics are not included in SiteWise™**
- **SiteWise™ was developed to quantify the effects of remedial actions**



Tools & Tracking: NORM Optimization module to include tracking of GSR metrics



Three elements for GSR tracking

1. Identify Green & Sustainable Remediation metrics relevant for environmental footprint of the remedy at this site
2. Briefly describe actions taken to reduce environmental footprint of the remedy
3. Provide estimated % reduction for the following metrics
   - ❑GHG
   - ❑Energy
   - ❑Air Pollutants
   - ❑ Water Usage
   - ❑Waste Generation

Tools & Tracking: Green Sustainable Remediation Web Portal

Resources such as:

- **Guidance documents and standards available on green and sustainable remediation**
- **GSR Fact sheet**
- **Case Studies**
- **Drivers**
- **Tools**
- **Links Federal, State & other organizations related to GSR.**

Access from: *www.ert2.org*

Presentation Outline

Introduction

Incorporating GSR Strategies into Navy Response

Tools and Tracking

- **Examples of GSR at Navy Installations**
  - **NAS Alameda**
  - **NAWS China Lake, Ca**
  - **Yorktown Defense Fuel Supply Point**

Summary

Case Study: NAS Alameda Case Study: Background

- **Naval Air Station closed in 1997, now called Alameda Point**
- **Navy's BRAC PMO San Diego is responsible for remediation of all the sites / OUs.**
- **Sustainability evaluation - remediation alternatives for soil and groundwater at OU 2-C**
- **Battelle conducted the evaluation using SiteWise™**

Case Study: NAS Alameda Case Study : Parameters and Alternative Technologies for Soil Remediation

Parameters:

- **GHG Emissions: CO_2, CH_4, and N_2O as CO_2e**
- **Energy Usage – Electricity and Fuels**
- **Air Emissions - NO_x, SO_x, PM10**
- **Collateral Risk – Fatality and injury from on site remedial activity and off site actions (transportation)**
- **Resources Consumption**
- **Water Usage**

Soil Remediation Alternatives Technologies:

- **S2: 4700 cu yd soil excavation & off site disposal, engineered cap, ICs, &**
- **S3: 23,000 cu yd soil excavation & off site disposal only, ICs, & monitoring**
- **S4: 11,000 cu yd soil excavation & off site disposal, SVE, ICs, & monitoring**

CASE Study: NAS Alameda Case Study: Evaluation Results

GHG Emissions

- **Largest contribution to GHG emissions is CO_2 from fuel consumption for equipment use, and transportation of materials**
- **Alternative S3 has the highest soil excavation volume and GHG emissions ~ 1700 tons**

Collateral Risk

- **S3 has highest injury risk 25×10^{-2}**
- **S3 has highest fatality risk 1.1×10^{-3}**

Energy usage

- **Mostly from transportation fuels**
- **S3 has the highest energy usage due to transport of large quantity of soil**

Air emissions

- **Mostly from heavy equipment & transportation**
- **Largest source is diesel fuel use**
- **S3 has the highest air emissions**

Alternative	GHG Emissions	Energy Usage	Air Emissions	Collateral Risk
S2	Low	Low	Low	Low
S3	High	High	High	High
S4	Medium	Medium	Medium	Medium

Case Study: Solar-Powered Free Product Recovery, Site 44, NAWS China Lake, CA

- **Comparing operation of two types of solar-powered skimmers**
- **Five wells fitted with Abanaki PetroXractor, and five wells fitted with Geotech Solar Sipper skimmers**
- **Vendor estimates that each solar-powered unit saves approximately 0.15 lbs of CO_2 per hour of continuous operation compared to electrical powered units**
- **Both systems have operated effectively for over four months with little maintenance**
- **The passive skimmer system will result in reduced O&M activities compared to the original mobile product recovery system, resulting in additional remedy footprint reductions**

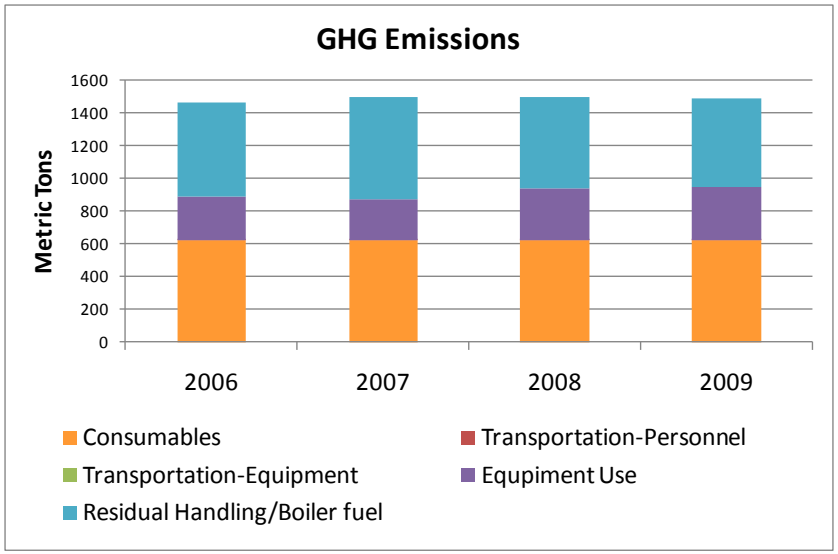
U.S. Navy

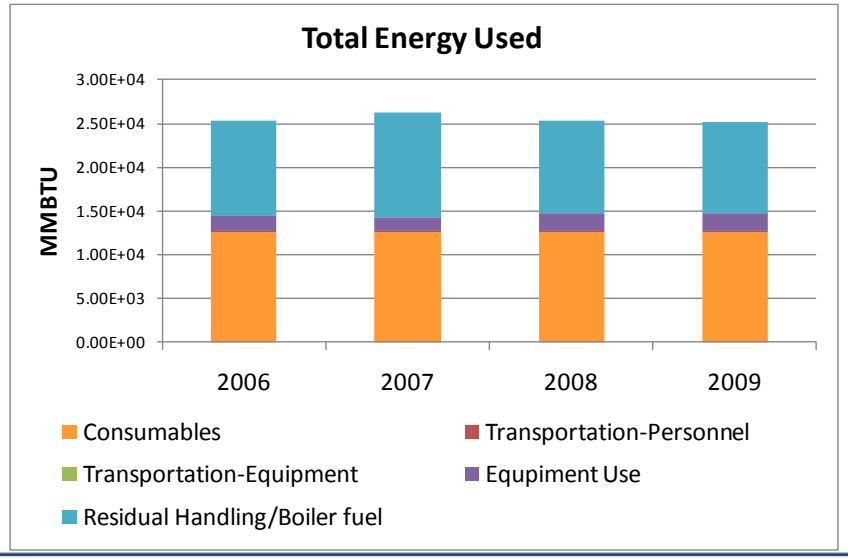
Case Study: Yorktown Defense Fuel Supply Point: GSR Assessment During RA Operation

- **Yorktown Fuel Facility**
  - **Activated in 1918 with 8 USTs**
  - **Used for storage of Navy Special Fuel Oil (NSFO)**
  - **Original NSFO plume estimated at 3-million gallons**
- **Remediation System**
  - **Thermally enhanced free product recovery**
  - **Sub-surface heated with closed loop steam and hot water infiltration**
  - **Product recovery includes 28 trenches and 120 recovery points with skimmer pumps**
- **NSFO Recovery**
  - **Approximately 2,150 gallons per month and over 400,000 gallons cumulative**
  - **Annual operating cost of approximately $950,000**

Case Study: Yorktown Defense Fuel Supply Point: GSR Assessment During RA Operation

- **GSR Assessment performed as part of optimization review**
- **Baseline annual footprint determined total footprint for GHGs, energy, criteria pollutants, water consumption and accident risk**
- **Used results to identify high footprint activities**
  - **Electrical energy for equipment operations (e.g. compressor and pumps)**
  - **Fuel for boiler operation**
  - **Consumables (e.g. chemicals for groundwater treatment)**





Case Study: Yorktown Defense Fuel Supply Point: Next Steps

- **Evaluate footprint reduction methods focusing on the high footprint activities identified in baseline assessment**
- **Integrate footprint reduction methods into optimization recommendations**
- **Objective to minimize life-cycle cost and footprint while meeting RA Objectives**
- **Track footprint reduction in Navy's ER database**

Presentation Outline

Introduction

Incorporating GSR Strategies Into Navy Response

Examples of GSR at Navy Installations

Tools and Tracking

- **Summary**

Summary

- **DON is incorporating GSR throughout the remedial process**
- **Minimize environmental footprint of site cleanups**
- **Navy Optimization workgroup developing resources**
  - **Updating optimization policy**
  - **Developed GSR guidance and updated optimization guidance**
- **Remedy selection provides the greatest opportunity to lower the overall remedy footprint**
- **Promote education and transfer of successful solutions through case studies, tools and tracking**

Questions?