



Optimization Part 3: Management & Monitoring Approach

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Presentation Overview

▶ Management & Monitoring Approach

- **Case Studies**
 - Case Study #1: Portsmouth Naval Shipyard
 - Case Study #2: Brunswick Eastern Plume
- **Summary**

Management & Monitoring Approach Development

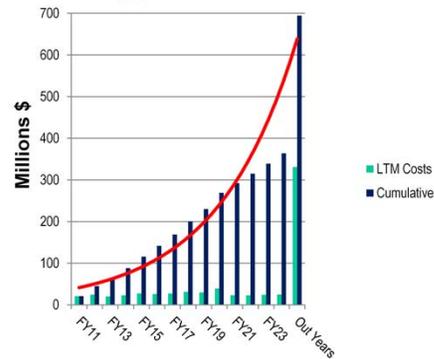
- Long Term Management Costs Larger Part of Program

- Approach Developed for

- Sites with Long Term Monitoring
- Mature Sites
 - Large Amount of Sampling Data
 - Benefit from Optimization Efforts

- Benefits of standardized format

- Ensure Key Elements are Included
- Document Sampling Strategy
- Document Sampling Methods
- Document Land Use Controls
- Reduce Future Cost
- Support Contracting Actions
- Support Development of Five Year Reviews



Source: NAVFAC NORM Database Spring 2011

Often the long term management is top concern for our sites.

Once the Decision Documents have been signed, the Remedies are in place, the sampling has been designed and the plan approved it is time to take a break!

The LTM is going to be a larger portion of the clean up program as sites move into the long term management phases and the overall cumulative cost is significant.

The Approach provides a way to communicate the benefits

What is a “Management and Monitoring Approach”?

- **Recommended format for Long Term Monitoring Reports**

- Typically replaces annual report
- Provides necessary information for developing the reports
- Has potential to meet the requirements of a Graded SAP
- **Applicability**
 - Sites with monitoring as part of the remedy
 - Navy sites
 - BRAC
 - ER’N
 - MRP

- **Living Document**

- Second generation
- Refinements captured

Developed as a way to prepare more thorough annual monitoring reports that give the reader an overall understanding of the site.

This Approach was developed to share a particularly well received document that helped a site significantly reduce the sampling and allowed the team to understand what was going on at the site and what still needed to be done to meet the decision document requirements.

The approach was tested and shared with many and the comments and improvements resulted in the second generation of the approach being shared now.

Implementing the Approach

- **Based on ROD Toolkit format**

- **Left column**

- Information recommended
 - Helpful hints

- **Right column**

- Examples

- **Elements**

- Examples and guidelines
 - Not “Fill in the Blank”

- **Living Document**

- Refinements captured



Site-Specific Implementation of the Approach

- **Interactive Approach**

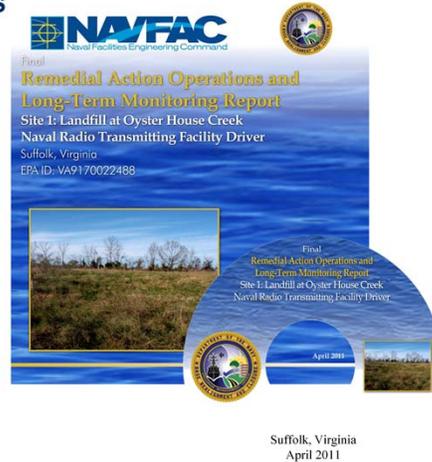
- Uses a whole PDF file with bookmarks
- Electronic file easily used
- Powerful communication tool
- Well received

- **Non-Interactive**

- Contains all elements
- Hard copy

- **Flexibility in Implementation**

- Right size for complexity of site
- Use appropriate elements



It can be interactive

HTML is not recommended for the report but can be used to present the data if that level of effort is needed.

PDF format with bookmarks works to link the reader to the specific graphs and photos or additional documents/information highlighted in the report

Great way to share information with the team of regulators and stakeholders.

It also provides a format for the regulators to share with their agency to gain approval or acceptance.

It can be as interactive or as simple as desired.

Flexible!!!!

Executive Summary

- Key Recommendations
- Changes
 - CSM
 - Monitoring approach
- Summary
 - Findings
 - Recommendations
 - Implementation status of past recommendations

Executive Summary

Monitoring and Management Requirements	Rounds 5 through 9 Findings	Future Recommendations
Landfill and Wetland Inspections	All the landfill components and the wetland remain in good condition and no major repairs have been identified. Remedy is functioning as intended.	Reduce inspection frequency from semiannually to annually. Continue inspections while waste remains in place.
Settlement and Slope Stability Surveys and Seep Surveys	Settlement was within predicted limits. No relevant seeps were observed.	Reduce survey frequency from semiannually to annually. Continue inspections while waste remains in place.
Institutional Control Inspections	Institutional controls are in-place to prohibit intrusive activities and groundwater use.	Continue annual inspections while waste remains in place.
Landfill Gas Monitoring	All gas monitoring results are less than the National Institute of Occupational Safety and Health (NIOSH) guideline of 0.45 percent methane. Methanogenesis is unlikely due to the type of waste within the landfill.	Discontinue monitoring.
Groundwater Monitoring	Only metals were detected at concentrations exceeding conservative risk-based screening levels. All metals concentrations were less than the site-specific action levels. These results indicate that there are no chemicals migrating offsite at concentrations that pose unacceptable risks to human health or the environment. There have not been substantially higher metals in total and dissolved analysis. Trends were generally stable and concentrations are not likely to increase to greater than action levels in the next 5 years. No organics have been detected at JW-13B, which was installed to monitor potential migrations of organics, or the shallower well (JW-13D) since Round 5.	Reduce analytical suite from PAHs, total and dissolved metals and TSS to only total metals. Reduce sampling frequency for metals from semiannually to once every five years. Eliminate JW-13B from monitoring well network. Continue groundwater monitoring until 30 years is complete.

Tables are a great method to share complicated information in a simple to read and understand format.

Include Key Recommendations

Changes at the Site

Summary to document findings, recommendations, implementation of past recommendations. Allows the RPM to share when a recommendation has been put in place or the reasons for not implementing (time to design, funding, regulatory concerns or disapproval)

Introduction



1. Introduction

This Remedial Action Operations and Long-Term Monitoring (LTM) Report presents the (Round 16) groundwater and ecological monitoring activities completed at Site 1, Landfill at Oyster House Creek for Naval Radio Transmitting Facility (NRTF) Driver, located in Suffolk, Virginia facility). The LTM at Site 1 is required in accordance with the selected remedy identified in 1 Record of Decision (ROD) signed in September 1997. This Remedial Action Operations report was prepared by the Naval Facilities Engineering Command (NAVFAC) for submission to the Virginia Department of Environmental Quality (VDEQ).

1.1 Objective

The LTM being conducted at Site 1 evaluates whether contamination has migrated outside the boundary and if the selected remedy—Institutional Controls (ICs) (site restrictions with L remains protective of human health and the environment.

The objectives of this report are to:

- Present the results for Round 16 of Site 1's LTM Program
- Evaluate these results through trend analysis of all 16 rounds of data collected over the 12 years
- Better define metrics used to evaluate whether Remedial Action Objectives (RAOs) have been met at the site
- Present an exit strategy for LTM at Site 1 and describe the site's progress toward closure

1.2 Organization

The LTM Report is organized as follows:

- Section 1 – Introduction
- Section 2 – Site Background

DECLARATION

Site Name and Location
Site 1, Landfill at Oyster House Creek
Naval Radio Transmitting Facility Driver
Suffolk, Virginia

Statement of Basis and Purpose
This decision document presents the selected remedy for Site 1, Radio Transmitting Facility (NRTF) Driver that was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for Site 1.

The State of Virginia Department of Environmental Quality (DEQ) and the United States Environmental Protection Agency (USEPA) Region III support the selected remedy.

Assessment of the Site
Actual or threatened releases of hazardous substances from Site 1, if not addressed by implementing the response actions selected in this Record of Decision (ROD), may present a potential threat to public health, welfare, or the environment.

Description of the Selected Remedy
The selected remedy is Remedial Action Alternative (RAA) No. 2 - Institutional Controls with Long-Term Monitoring.

Under the Institutional Controls with Long-Term Monitoring Alternative, institutional controls in the form of site restrictions would be implemented in the vicinity of Site 1, west of monitoring well MW-01/GW-03 (see Figure 4), to restrict the future disturbance and/or development of the site, and the use of the shallow aquifer. Implementation of this alternative through site restrictions would eliminate exposure pathways to potential human receptors such as future potential residents or construction workers.

Long-term monitoring would be performed to further evaluate shallow groundwater contamination and migration. Monitoring would also be conducted to further assess potential ecological risks and impacts. Long-term monitoring would involve periodic sampling of shallow groundwater, sediment, and fish. The sampling of fish will be completed as part of a base-wide ecological monitoring program. A Long-Term Monitoring Program (LTMP) Work Plan will be prepared as part of the design phase of this remedial action. The LTMP Work Plan also will include the following emergency closure phase: an inspection plan; a preparedness and prevention plan; and a contingency/emergency procedures plan.

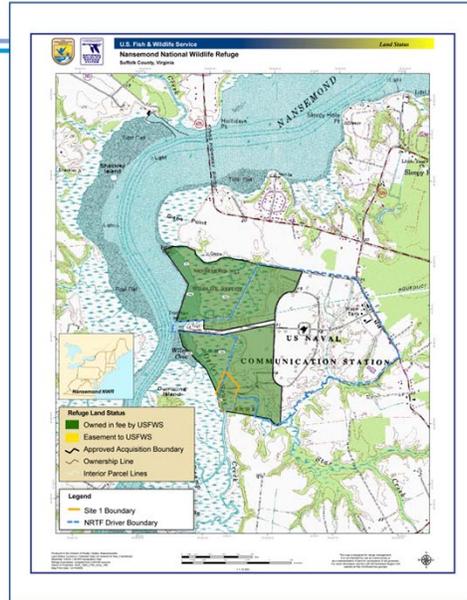
The introduction should provide the reader the basic information about the site.

It is a good place to bookmark or link to the actual decision document. Don't feel the need to include the entire document in the report.

Get the reader to the key areas in the report and provide the information on where to find the complete document in the Admin Record or Project Files.

Describe Your Site

- Name
- Location
- History
- Current and future use
- Physical characteristics
- Tools
 - Discussions
 - Maps
 - Photos



Conceptual Site Model (CSM) – All the Bells and Whistles

FIGURE 4 (Enlarge) (View as PDF) (Historical CSM [1970])
Conceptual Site Model - NRTF Driver Site 1, Landfill at Oyster House Creek



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RITS 2012: Optimization Part 3 – MMA

The CSM is critical

Understanding and communicating what is going on at the site and the historical information is very important.

The CSM can be as complicated or as simple as needed to communicate the key information but a picture is worth a thousand words and can convey a lot of information in an easy to understand and easy to share fashion

Highlight the risks and include that information particularly important

Include links to photos – helps with restricted sites or where it is difficult to describe what the site looks like.

Historical Information can provide a clear understanding of why the site requires actions and what led to it being part of the clean up program. Also keeps the focus on what you are cleaning up and why

Key Documents

- Previous investigations
- Actions
- Decision documents
- Agreements
- Include
 - Title
 - Objectives
 - Key findings
 - Specific section ID
 - Administrative Record #

4. SITE 3 LTM			
TABLE 4-1 Site 3 - Previous Investigations and Remedial Actions			
Pre-ROD Previous Investigation	Date	Activities	Admin. Record No.
Initial Assessment Study (IAS) (WAR)	1983	Site 3 was identified as a waste disposal site; however, no further assessment was recommended. USEPA requested an additional investigation to determine whether hazardous substances were present.	001511
Site Inspection (Halliburton/NUS)	1991	Soil, groundwater, and sediment were evaluated. SVOCs, particularly polycyclic aromatic hydrocarbons (PAHs), were detected in the surface soil (0 to 2 ft) near the reported location of the former sawmill and at the treatment area. PAHs were detected in the surface and subsurface (15 to 17 ft bgs) soil, and groundwater within the surficial aquifer.	000331
Remedial Investigation (Rt) (Baker)	1996	Evaluated the nature and extent of contamination. VOCs (particularly fuel constituents) and SVOCs (primary PAHs) were detected in groundwater within the surficial and Castle Hayne aquifers. SVOCs were identified in both the surface and subsurface soil, particularly within the creosote treatment area. The human health risk assessment (HHRA) identified potential risks to future residential children and adults due to exposure to the following SVOCs in groundwater: benzo(a)pyrene, benzo(a)anthracene, dibenzofuran, phenanthrene, and acenaphthalene.	001699 and 001700
FS (Baker)	1996	Following an evaluation of remedial alternatives for both soil and groundwater, the following two-part alternative was selected: Source removal with onsite biological treatment of PAH-contaminated subsurface soils. Monitored natural attenuation (MNA) with LUCs for groundwater. – Prevent exposure to contaminated groundwater.	001721
Post-ROD Previous Investigations	Date	Activities	Admin Record No.
LTM	1998	LTM monitoring begins.	NA
Treatability Study (Baker)	1998	Biological treatment of PAH-contaminated subsurface soil was tested. The study indicated that biological treatment was not effective.	NA
Amended ROD (DoN)	2000	Based on the results of the 1998 Treatability Study, the remedy was amended to remove biological treatment of soils. Soil excavation with offsite disposal was chosen to address source removal at this site.	NA

This format was developed from the ROD Tool Kit and will be repeated in a Five Year Review Tool currently under development.

Remedial Objectives and Cleanup Levels

TABLE 3
Summary of Remedial Action Objectives – NRTF Driver Site 1, Landfill at Oyster House Creek

Risk	RAO	Remedy Component	Metric/Cleanup Level	Expected Outcome
Landfill materials	Prevent future potential exposure to landfill materials	LUCs (site restrictions on intrusive activities, land use and development)	Maintain LUCs into foreseeable future and confirmation of protectiveness during periodic inspections and Five-Year Reviews	Current land use (landfill with vegetative soil cover)
SVOCs in shallow groundwater	Prevent future potential exposure to contaminated shallow groundwater and monitor plume migration	LTM for shallow groundwater LUCs (site restrictions to prohibit withdrawal of groundwater and residential use)	Conduct LTM until 30 years Maintain LUCs into foreseeable future and confirmation of protectiveness during periodic inspections and Five-Year Reviews	Deed Restrictions (waste will not be used)
PCBs in fish tissue	Prevent future potential exposure to contaminated fish tissue	LTM for fish tissue	Conduct LTM until 30 years	

TABLE 2
Summary of Cleanup Levels – NRTF Driver Site 1, Landfill at Oyster House Creek

Contaminant of Concern	Cleanup Level	
	Groundwater (µg/L)	Fish Tissue (µg/kg)
Aroclor-1260	0.5	50
1,2-Dichlorobenzene	600	N/A
1,4-Dichlorobenzene	75	N/A
1,2,4-Trichlorobenzene	70	N/A
2,4,6-Trichlorophenol	6.1*	N/A

* Groundwater cleanup level is the RSL since no MCL is available
µg/L = micrograms per liter
µg/kg = micrograms per kilogram

State the clean up goals so that the reader can understand.

Older Decision Documents may not have well defined

Facilitates discussion with the regulators BEFORE the Navy believes we have completed all the required actions and are ready to close.

Rather know of difference of opinions or interpretations early in the process so they can be addressed.

Some clean up goals numbers are difficult to trace back to the regulations or decision when they were originally developed. Call it out here so it is clear.

Remedy Implementation and Evaluation

- Introduce remedy
 - Remedy component
 - Implementation
 - Expected outcome

2--DECISION SUMMARY

TABLE 6
Expected Outcomes

Risk		RAO	Remedy Component	Metric	Expected Outcomes		
Human Health	Ecological						
Shallow Groundwater							
Ingestion of and dermal contact with groundwater under future potable use scenario; inhalation of vapors in shallow groundwater in an open excavation for future construction workers	No exposure pathway	Reduce concentrations of COCs in the source area and the downgradient plume to remediation goals (MCLs) through treatment to the maximum extent practicable within a reasonable amount of time	ERD	Monitor shallow groundwater COC concentrations to confirm reduction of total COC concentrations to below 500 µg/L and plume stabilization	Elimination of source area and prevention of downgradient migration of plume	Removal of LUCs	
			Performance Monitoring	Monitor shallow groundwater COC concentrations to confirm the natural degradation process until concentrations are at or below cleanup levels (MCLs)			
	Prevent exposure to Site 11a groundwater and groundwater emissions until concentrations of COCs have been reduced to levels that allow for unlimited use and unrestricted exposure			LUCs	Periodic inspection of the site to confirm adherence to LUCs until shallow groundwater COCs are at or below their respective cleanup levels (MCLs)	Achieve unlimited use and unrestricted exposure	Removal of LUCs
				LTM	Monitor shallow groundwater COC concentrations to evaluate the potential for vapor intrusion until concentrations are at or below cleanup levels (MCLs)		

U.S. Navy

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Ties each remedy component to the risk it is to address

Stresses the differences between human health and ecological risks and the related actions

Provides a clear link to the expected outcome and the way it would be measured to determine if it is effective or completed.

Land Use Controls

- Describe Land Use Controls
- Objectives of the Controls
- Document Compliance

Site Inspection Checklist
Site 7: Aquifer Use Controls
Site Location: Camp Lejeune, North Carolina

Site Description:
 This site is located in the southeast portion of the installation. It covers approximately 20 acres and is located in the south of the main base. The site is used for the storage of hazardous waste and is currently being used for the storage of hazardous waste and is currently being used for the storage of hazardous waste. The site is used for the storage of hazardous waste and is currently being used for the storage of hazardous waste. The site is used for the storage of hazardous waste and is currently being used for the storage of hazardous waste.

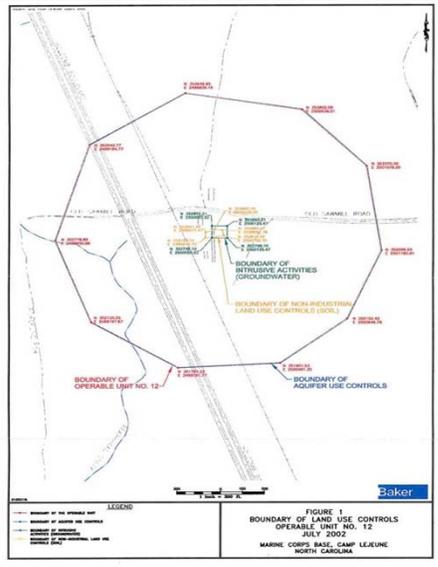
Inspection Objectives:

1. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.
2. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.
3. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.
4. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.
5. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.

Inspection Results:

Item	Yes	No
1. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5. To determine if any evidence of illegal activities (e.g., unauthorized access, dumping, burning, etc.) is observed on the installation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

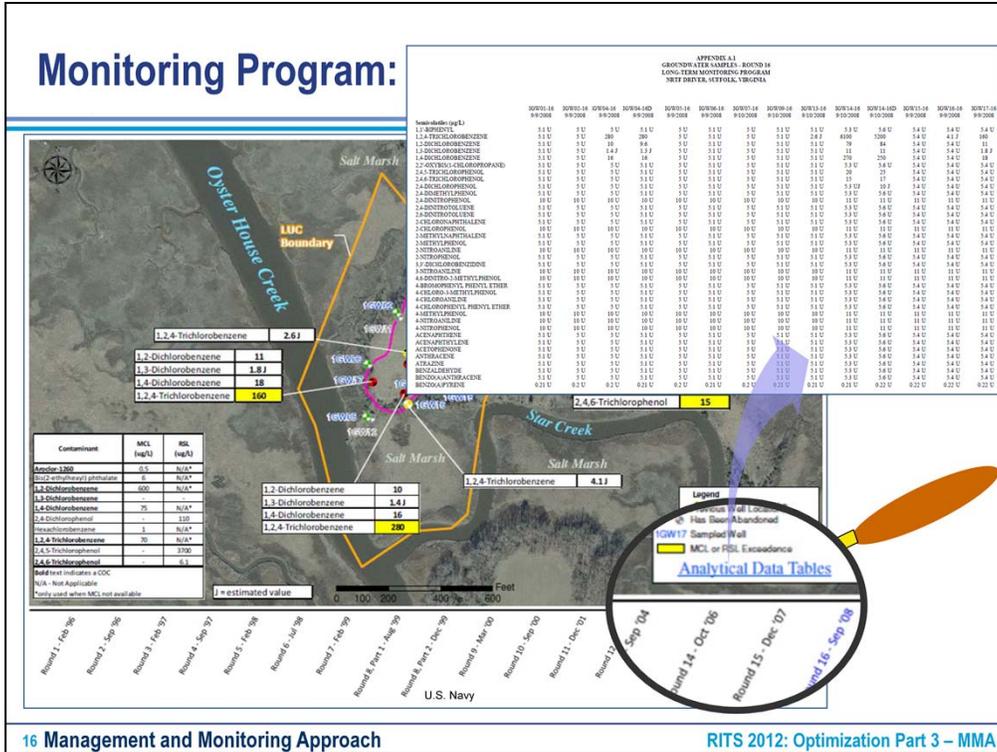
Remarks:
 Fence in southeast corner damaged from fallen trees.
 Repair fence.



This information is very important for RPMs to understand and track.

This section was developed to provide a location to document inspections and link any plats or agreements so the information is easy to find and compliance can be documented.

Monitoring Program:



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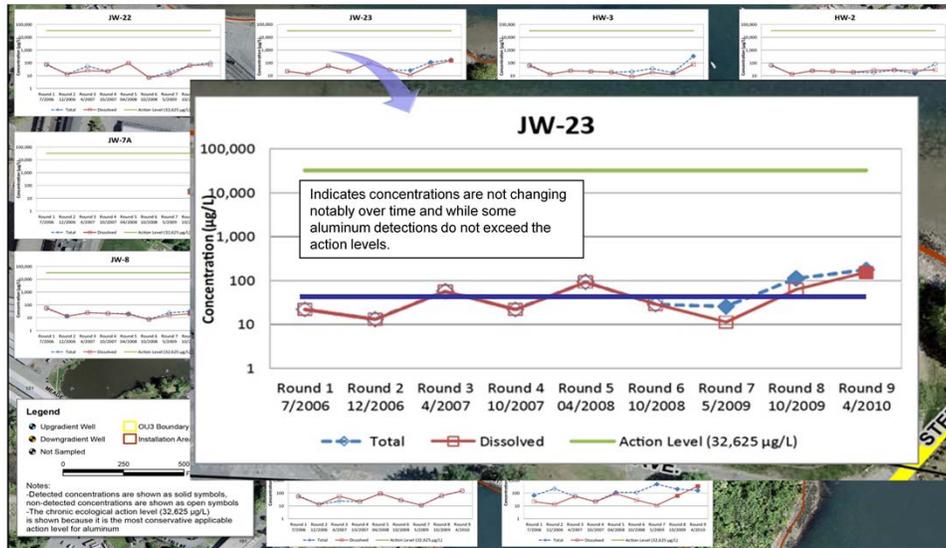
Presenting the data is important

Lots of data from many rounds of sampling, can be shown on a pop up block format to show exceedances for each round of sampling as shown here

If more lab data is desired (non-detects, detection limits, data flags – bookmark to the sample results showing the full list of parameters

Transparent to reader and promotes trust that the document is not hiding anything from the reader. Full disclosure

Data Analysis: Trend Charts



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Data over Time

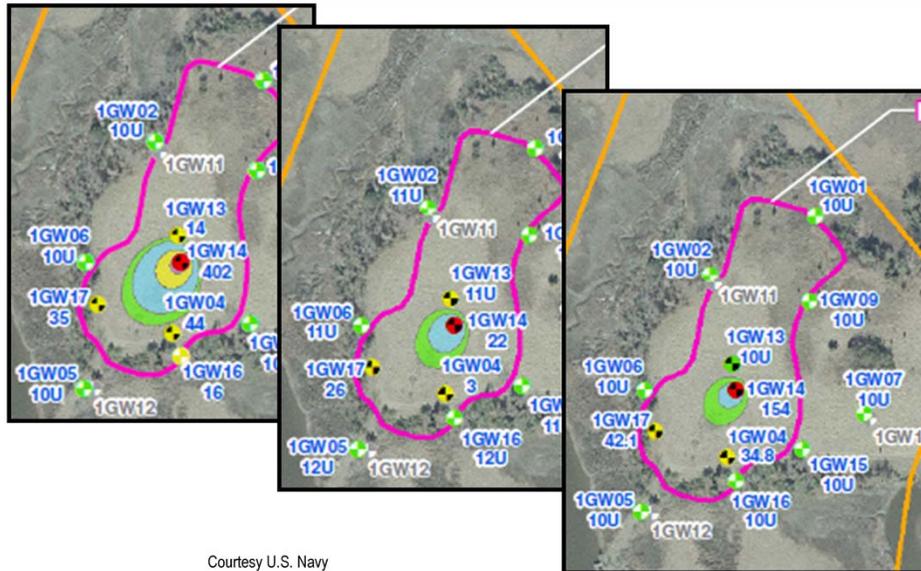
Green line is the Project Remediation Goal or Project Action Limit

Blue line is the trend line

Red Line represents actual data from each sampling event

Text box includes a discussion on what the graph is showing. Allows interpretations to be captured and any additional information on what is shown can be captured here

Data Evaluation: Monitored Natural Attenuation



Courtesy U.S. Navy

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The same approach of showing changes over time can be applied to plume maps

Indicates plume is getting smaller and the concentrations are decreasing over time

Plume is relatively stable

Plume is not leaving the site boundaries

Could help in drawing a conclusion that only down gradient wells need to be sampled as sentinel wells and recommend that the frequency be decreased

Optimization: Documentation

7 Optimization

LTM at Site 7 was evaluated in the 2009 LTM Optimization Update, using MAROS, which recommended the following (CH2M HILL, 2009c):

- Sample all monitoring locations on an annual basis using PDBs.
- Reduce the number of monitoring wells utilized for LTM, by discontinuing sampling of 9 Wk (GW23, GW24-3, GW25, GW40, and GW45) in the North area and 8 wells (GW11, GW05, RW, GW08, GW09-1, GW39, GW51, GW58, and GW78) in the South area. Install two surficial aquifer and two deep aquifer wells to fully delineate the radial and downgradient portion of the plumes.
- Monitor potential migration by adding recently installed monitoring well MW83W local hydraulically downgradient from the site to the annual monitoring event.
- Monitor potential migration to the north by adding recently installed monitoring wells MW81 and MW82W to the annual monitoring event.

These recommendations will be implemented during the next annual LTM. Additionally, based on recommendation from the Five-Year Review, groundwater COCs and remedial goals were updated to reflect current cleanup levels optimization.

7.1 Summary for NORM

Site 7 is in the RA-O phase and 2009 (CH2M HILL, 2009c) and 13 monitoring. The cost for the monitoring is approximately \$110,000. The potential implementation of optimization could result in potential cost savings of approximately \$10,000 per year implemented. Actual cost savings will be updated as part of the Round 13 optimization.

Optimization View - Version 4.6.1109.2700

Round: Phase: Optimization Review Conducted By:

Review End Date: End Date Description:

Remove Cost in Dollars	Pre Cost Avoided	Pre Implementation Cost
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0

Review Description Details:

Recommendations of Review:

Total VOC Removal vs Total Remedial Cost

Total Remedial Cost (\$)	Total VOCs (µg/L)
\$0	~10000
\$100	~18000
\$110	~16000
\$120	~14000
\$130	~12000
\$140	~10000
\$150	~8000
\$160	~6000
\$170	~4000
\$180	~2000
\$190	~1000

NORM = The Navy "Normalization of Data" Database

NORM needs data for Optimization

Goal is to provide the RPM information they can directly use to complete the NORM Optimization Module.

Get the info while it is fresh

Optimization: Tools

Optimization Tools: Sitewise™

Sitewise™ - series of excel spreadsheets used to calculate the environmental footprint of remediation in terms of sustainability metrics

Metrics that are calculated with the Sitewise™ tool include:

- Energy consumption
- Greenhouse gases emitted
- Criteria air pollutants emitted
- Water impacts
- Worker safety

Key Uses:

- Identifies tradeoffs and synergies associated with varying optimization and management and monitoring approaches
- Identifies and prioritizes methods to reduce the footprint of Remedial Action/Operation and Monitoring
- Incorporates Green and Sustainable Remediation metrics into site closure strategy
- Applies to any phase of the remediation
- Supports team risk management decisions

Optimization Tools: MAROS

Monitoring and Remediation Optimization Software (MAROS) - low cost, user friendly, and simple monitoring optimization software that provides:

Statistical Trend Analysis

- Evaluates data trends for individual wells/constituents of concern (COCs) using Mann-Whitney and Linear Regression

COC Analysis

- Identifies most appropriate COCs for evaluation based on toxicity, frequency, and mobility

Moment Analysis

- Analyzes plume mass and spread of plume over time
- Evaluates both source and tail stability of the plume

Power Analysis

- Evaluates data trends and sampling frequency
- Provides well by well recommendations for reducing sampling frequency for specific COCs

Redundancy Analysis

- Evaluates the need for specific sample locations using Delaunay Triangulation
- Identifies new sample locations needed to delineate the plume boundary

Key Uses:

- Evaluates well by well for optimization of monitoring network for analytes
- Evaluates benefits for potential additional well locations
- Evaluates plume stability and data trends

Use software-specific data entry windows and Microsoft Excel or Microsoft Access data tables to import information

Comprehensive output summary includes site details and optimization recommendations

Redundancy Analysis identifies recommended sampling locations

MAROS Site Results

Project: 2008 LHA Update User Name: CDRH/MLL
 Location: 10011010 State: North Carolina

Use Database Site and Data Assumptions

Parameter	Value	Default
Remediation and Plume Information <td></td> <td></td>		
Remediation Method	3.00 kg	Default: 3.00 kg
Control Point Depth	100 ft	Default: 100 ft
Control Point Area	100 ft²	Default: 100 ft²
Number of Wells	1	Default: 1
Number of Wells Area	1	Default: 1
Number of Wells Depth	100 ft	Default: 100 ft

5. Compliance Monitoring/Remediation Optimization Results

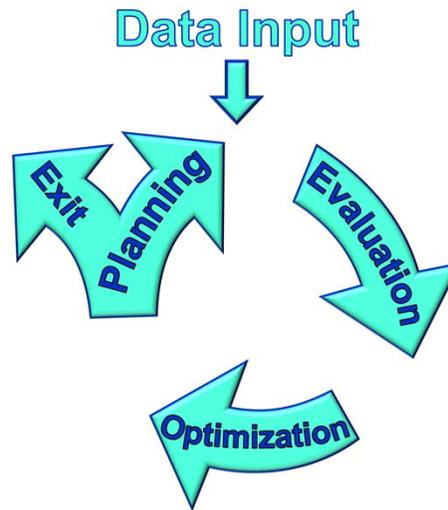
Well	Well Name	Level	Sampling Frequency	Sampling Method	Sampling Location
001	001	1	1	1	1
002	002	1	1	1	1
003	003	1	1	1	1
004	004	1	1	1	1
005	005	1	1	1	1

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Site Closeout Strategy

- Understand goals
- Use decision trees
- Team agreement
- Stakeholder acceptance



So important

Data IN only helps if there is evaluation then optimization

Then really look at the data, are you ready to say all actions are complete...

If not then do some planning so the next round of data is also valuable

Avoid Scope creep

Conclusions and Recommendations

- Clearly state
- Bullets or tables
- Decision documents
 - ROD
 - Explanation of significant differences (ESD)
 - Letters of agreement
- Previous recommendations
 - Status of implementation
 - Reasons for non-implementation

Table 1
 Summary of LTM Regulatory Framework, Monitoring Status, and Recommendations
 2009 Long-Term Monitoring Optimization Tech Memo
 MCB Camp Lejeune
 North Carolina

Site	Regulatory Status	Current Monitoring Status	2009 LTMO Recommendations
OU 1, Site 78	ROD 1994, LUCs updated 2002 Groundwater extraction and treatment, LUCs, and LTM	39 monitoring wells, 9 recovery wells VOCs; 5 wells sampled quarterly, remaining wells sampled annually.	31 monitoring wells (27 existing and 4 proposed monitoring wells) and 9 recovery wells. Sample all wells annually for VOCs utilizing PDB sampling technique. The proposed monitoring locations are as follows: One shallow/intermediate nested pair located near IR78-GW43. IR78-GW43 can be used as shallow well if located. A second shallow/intermediate nested pair recommended for installation approximately 200 ft southwest of IR78-GW40 and IR78-GW47. Monitoring well IR78-RW09R was added to program in August 2008 since recovery well IR78-RW09 was damaged and could no longer be sampled.
OU 2, Site 6	ROD 1993, LUCs updated 2002 LUCs, and LTM	Monitoring 8 wells for VOCs (6 shallow monitoring wells and 3 deep monitoring wells) annually.	No recommended changes to LTM program.
OU 12, Site 3	ROD amended 2000 Soil removal and LTM	4 monitoring wells. VOCs, SVOCs, annual sampling.	No recommended changes to LTM program.

Use a table or bullets

Clearly state

Be willing to document recommendations and if not fully implemented document why, May get there in the future.

Presentation Overview

- **Management & Monitoring Approach**

- ▶ **Case Studies**

- **Case Study #1: Portsmouth Naval Shipyard**

- **Case Study #2: Brunswick Eastern Plume**

- **Summary**

Case Study #1 – Interactive Report

- Portsmouth Naval Shipyard
- OU3

- 22 acres
- Landfill
- Mercury disposal area
- Waste oil tanks



Courtesy U.S. Navy

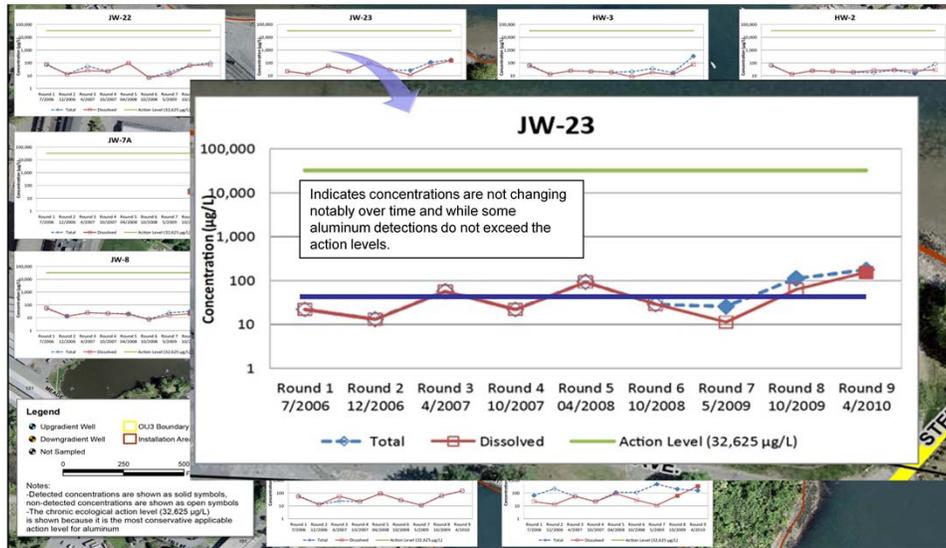
Site that had many years of monitoring

Remedy was in place – landfill covers, removal actions and establishment of wetlands, cap/parking lots, rip rap

Regulators and RAB ready to see the report in the new format

Interested in the way the report provides enough information to really understand the site and the purpose of the actions being taken

Case Study #1: Trend Charts



Trends over time show no reason to believe that the contaminants of concern would be increasing.

Methane sampling NEVER exceeded any limits and was not increasing

Metals were not increasing

Other constituents followed the same trends

Case Study #1: Conclusion and Proposed Recommendations

- **Reduce or cease methane sampling**
- **Reduce frequency of sampling to every 5 years**
- **Reduce the analytes**
 - Take advantage of historical data
 - Recognize site conditions are stable
 - Keep focus on known constituents of concern

Will be presenting the report to the regulators and RAB

Some of the recommendations were considered historically by the team, but the RPM hopes the format and clear presentations will prove helpful when it is pitched to the regulators

The conclusions are supported by the documentation in the report and questions on the reason for methane samples have been answered (is there reason to believe this landfill will have a problem with methane – several years of data say no).

Sample data is consistent with few changes – reduced frequency of sampling to 5 years from 1 (support 5 year review) also document 30 year limit to sampling

Limit analytes to the constituents identified in the decision documents and previous sampling

Case Study #2 : Brunswick Eastern Plume

Objective:

- **Streamline monitoring program**

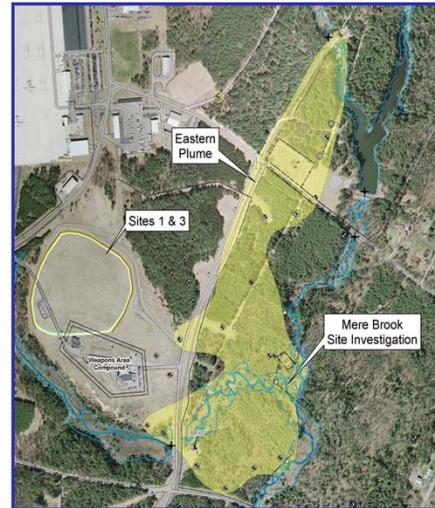
- No reduction in data quality
- Meet monitoring objectives

- **Background:**

- **Monitoring program**
 - Developed with historical data
 - Contamination
 - VOCs decreasing trends
 - 1,4-dioxane decreasing trends

- **Recently installed wells**

- Nature and extent
- Hot spots



Courtesy U.S. Navy

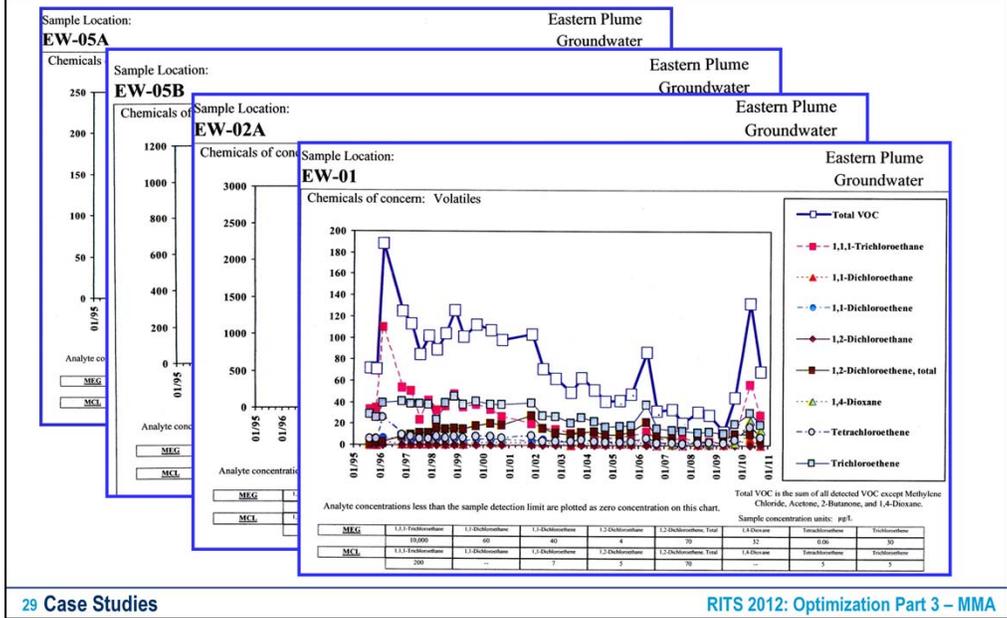
Totally no hyperlinks or bookmarks – Just the facts!!!

The goal was to take action to optimize the sampling at the eastern plume

There was lots of data already gathered on this BRAC site

Important not to reduce quality of the data and had to ensure the DQOs were answered

Case Study #2: Data Trends



As you can see there are several wells with significant data

Case Study #2: Results

- **Success**
- **Regulator and stakeholder buy-in**
- **Continue biannual monitoring of extraction wells and influent/effluent**
- **Reduce monitoring frequency**
 - **Wells with decreasing trends**
 - Biannual to annual
 - **Wells near plume margin**
 - Biannual to every 5 years

30 Case Studies

Shared the data and the format with the regulators and stakeholders

There was acceptance – What's Not to Like????

Comfortable with decisions because the path to the decision was well documented

50% to 70% cost avoidance due to reduced sampling over time

Presentation Overview

- **Management & Monitoring Approach**
- **Case Studies**
 - **Case Study #1: Portsmouth Naval Shipyard**
 - **Case Study #2: Brunswick Eastern Plume**

▶ **Summary**

How to Get Your Hands on the Approach

ERP Management and Monitoring Approach



BRAC Approach

Monitoring Report Template

Report Elements

1. Introduction
 - 1.1 Objective - Introduces the report including the site name, facility, stakeholders, decision documents and cleanup program.
 - 1.2 Table of Contents - Presents the report layout to facilitate readers with content.
2. Selected Results
 - 2.1 Remedial Action Objectives (RAOs) - Indicates the current RAOs developed.
 - 2.2 Site Closure Strategy - Provides a clear path to allow for completion of efforts at the site and reduces the possibility of straying from the agreed to path forward. This section should identify any interim goals, final goals and status of effort to meet those goals.
3. Monitoring Program
 - 3.1 Monitoring Objectives - Data Quality Objectives - Provides clearly stated objectives and questions that the data being gathered will answer.
 - 3.2 Sample Approach - Provides enough detail that the locations, conditions of concern, other parameters to be sampled, frequency, sampling procedures and methods for analysis are understood.
4. Data Evaluation
 - 4.1 Sampling Results - Compiles results from the current round of sampling and appropriate historical data. This section includes figures and tables to clearly show the results of the monitoring efforts.
 - 4.2 Trend Analysis Concentrations of Constituents of Concern - Presents trends to allow reader to readily understand if the site conditions are as anticipated based on the CIM or if there are other conditions that need to be considered. It documents the status of the site to allow for understanding if future the site on the path to closure. Answers the question of whether the RAOs are being met or if the site is moving towards response completion.
 - 4.3 Trend Analysis Costs - Documents historical and current cost to allow for an understanding of the use of limited resources to meet the requirements for the site.
 - 4.4 Optimization and Site Closure Progress - Documents trend paths and routine optimization efforts at the site and captures the history and outcome of optimization. Trend analyses are discussed to document progress towards site closure.
5. Conclusions - Clearly and concisely states conclusions drawn from the trend analysis.



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Conclusions

- **Flexible tool**
- **Appropriate documentation**
- **Easy to read**
- **Facilitates communication with regulators and stakeholders**
- **Tells the whole story**
- **Keeps team focused on end point**
- **Provides a consistent format**