

**Welcome**

**Case Study on Remediation at a Sediment Site in Northern California with Radium-226 and Heavy Metal Contamination, including Use of SCM Technology to Expedite Remediation at the Source**

**Seaplane Lagoon Site, former Naval Air Station Alameda, Alameda, California**  
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**Key Optimizations**

This radiological sediment remediation highlights a number of optimizations that are applicable to sediment projects:

- Life cycle planning from pre-remediation through maximum re-use
- Firm fixed price contract with unit price options
- Additional pre-work plan sediment sampling
- Early and continued coordination with regulators
- Efficient, data-based design and field operations
- Tracking performance metrics (dredging and processing)

**Presentation Topics**

- Site Location
- Site History
- Source Control
- Pre-Work Plan Sampling
- Coordination with Regulators/Work Plan Preparation
- Facility Design/Construction
- Dredging
- Post-dredge Sediment Sampling
- On-Shore Sediment Processing/Re-Use/Disposal
- Property Transfer for Beneficial Re-use

**Site Location**

Seaplane Lagoon is an ~110 acre partially enclosed lagoon on former Naval Air Station Alameda in CA.





**Site Location**

Endangered species were considered during the remediation planning. The site location required dredging to be scheduled outside the least tern nesting season.




**Site History**

Originally used by Pan-American China Clipper seaplanes (1930s), Navy seaplanes (bottom right) later flew in and out of Seaplane Lagoon during World War II missions.






### Site History

- From the 1940s to 1975, wastewater from maintenance operations was discharged into Seaplane Lagoon via stormwater outfalls. The base was closed in 1997.
- The Navy's investigation and assessment of sediments in Seaplane Lagoon showed that remediation was necessary.
- Contaminants in the sediment included Ra-226 (from radioluminescent, i.e. glow-in-dark, paints), cadmium, chromium, lead, polychlorinated biphenyls (PCBs), and DDT (pesticides dichlorodiphenyl-trichloroethane [DDT]), dichlorodiphenyl-dichloroethane [DDD], and dichlorodiphenyl-dichloroethene [DDE]).

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### Site History

Primary source of the sediment contamination was maintenance activities for aircraft within Building 5 (~16 acres); Ra-226 paint was used on compasses and plane and ship instrument faces.



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### Source Control

- Source control is implementing measures to isolate contaminant sources and prevent post-remediation re-contamination of the sediment; project conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
- Source control addressed the following:
  - Building 5 and the drain lines beneath the building
  - Stormwater lines outside the building that entered the northeast (NE) and northwest (NW) corners of the lagoon via outfalls

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### Source Control

- Building 5 and the drain lines beneath the building:
  - The source of contaminants in the drain lines entering the lagoon (primarily Building 5) was isolated prior to the Seaplane Lagoon sediment remediation.
  - Subsequently grouted the lines beneath the building and conducted surface contamination monitor (SCM) surveying during the Building 5 remediation of radiological contamination.
  - Use of the SCM (gas proportional detector for alpha and beta particles) in Building 5 significantly expedited identification of radiological contamination and confirmation of clean-up (cost-efficient).

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### Source Control

Building 5 is an approximately 1 million square foot building with no power; the SCM was able to efficiently survey the first floor and identify contamination very quickly:

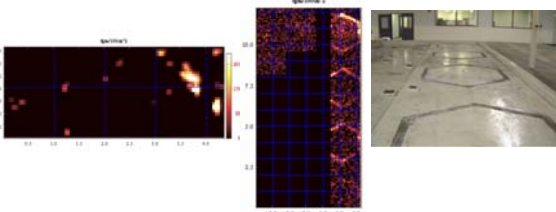
- A 180 cm detector will cover an area 6 times faster than a 30 cm detector (all other parameters being equal).
- Added benefits come from the equipment's sensitivity and ability to process data and provide color graphic images.

State of California regulators praised SCM use and immediate identification of contamination.

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### Source Control

SCM Color Graphic Images of Radiological Contamination:  
 Left: Building 5 Ra-226 paint room contamination;  
 Right: Another project showing contamination beneath pads (SCM image, center, and photo to right)



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**Source Control**

The Building 5 radiological remediation included use of a recently developed SCM model with:


- electronics package replaced with small computer chips
- computers with faster, more powerful systems (e.g. SurfacePro)
- battery power instead of AC and
- a weight less than one-third the weight of the older model SCM.

This results in significantly greater ease of use in the field; it was very efficient in this 2-story building with no electricity.

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**SCM at Work at Source**

SCM Surveying Hangar Floor (left); SCM ~30 feet from floor, surveying I-beams and ceiling (right)




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**Source Control**

Stormwater lines outside the building that entered the NE and NW corners of the lagoon via outfalls:

- Drain Line G (NE corner of lagoon) hydrojetted and surveyed; video confirmed removal of contamination (innovative); subsequent No Further Action Record of Decision for Line G.



- NW Drain Line F (most contaminated) and outfall were removed/replaced.

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**Source Control**

Line G Hydrojetting



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**Pre-Work Plan Sampling**

- Pre-Work Plan sampling of sediment is critical in minimizing remediation costs, especially for radiological sites, where higher activity sediment then can be managed separately to minimize the volume of low-level radioactive waste (LLRW) for disposal.
- Sampling prior to work plan issuance enables:
  - further delineation of the areas and depths for remediation, including the higher concentration areas
  - optimization of the dewatering pad and facility design
  - a work plan that accurately reflects the upcoming remediation

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**Coordination with Regulators/ Work Plan Preparation**

- It is important to work with the regulatory agencies early in the planning process (before submittal of the Draft Work Plan) and often. Need to include that coordination support in scope of work for contractor.
- Inclusion of the agencies in planning facilitates:
  - Better relations in a teaming environment - builds trust
  - Early input to avoid surprises after submittal of the Draft Work Plan that could affect schedule and/or cost
  - Expedited agency concurrence on the work plan
  - Regulatory agency concurrence that the remediation was successfully completed

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### Facility Design/Construction

The site plan shows the layout of the remediation facility, including the location of the lagoon and various construction areas. A legend in the bottom left corner identifies different types of construction and materials. The lagoon is labeled 'SEATTLE LAGOON'.

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### Facility Design/Construction

- Design of the dewatering pad included a separate dewatering pad for the NW area sediments from the part of the lagoon area with higher concentrations of contaminants (per pre-work plan sampling).
- The dewatering pads and associated facilities were located close to the lagoon, and the facility work area was laid out for maximum efficiency.
- The dredge contractor designed a special dredge bucket to more efficiently dredge in the dense sediment of the lagoon where there was significant cable and large debris.

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### Facility Design/Construction

The photographs show the construction of the remediation facility. The top left photo shows a large concrete pad being laid out. The top right photo shows a large area of the facility under construction. The bottom left photo shows a large area of the facility under construction. The bottom right photo shows a large area of the facility under construction.

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### Dredging - Areas

The site plan shows the areas to be dredged in the lagoon. The plan is divided into several areas, with labels indicating the specific areas to be dredged. The areas are labeled 'AREA A TO BE DREDGED TO 11 FT', 'AREA B TO BE DREDGED TO 11 FT', and 'AREA C TO BE DREDGED TO 11 FT'.

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### Dredging - Details

- Sediments were dredged from the NE corner of the lagoon and processed prior to the start of the NW corner dredging. Reasons:
  - No dredging during least tern nesting season
  - Dredged less contaminated sediment in NE corner of the lagoon first
- Sunken barge was removed before start of NW area dredging.
- Sediments dredged from the part of the NW remediation area with higher contaminant concentrations were placed in a separate dewatering pad to enable efficiencies in processing and minimize disposal costs.

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### Dredging – Barge Removal

Barge removed; 66 tons of metal scanned and recycled; ready for scanning (bottom right)

The photographs show the removal of a sunken barge. The top left photo shows a large barge being lifted out of the water. The top right photo shows a large pile of metal debris. The bottom right photo shows a large area of the facility under construction.

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**Dredging - Special Bucket**



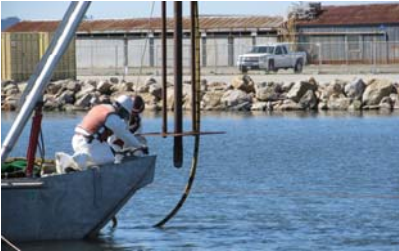
**Dredging – Large Items**

Concrete mooring blocks (left), 1943 anchor, and landing gear (right) removed from lagoon



**Post-dredge Sediment Sampling**

Post-dredge sampling results confirmed completion of the NE area remediation. Results for the NW area indicated that further dredging was necessary in a limited area.



**On-Shore Sediment Processing/ Re-Use/Disposal**

- Sediment processing included dewatering, radiological surveying, systematic sampling, and re-use or disposal.
- Used SAM940 during Seaplane Lagoon remediation for field isotope identification of point sources; the RadEYE SPRD is an advancement that provides more data, can identify more isotopes, runs on batteries, and is the size of a pager.
- Optimizations included maximizing re-use/recycling for both the removed sediment and wastewater.

**On-Shore Sediment Processing/ Re-Use/Disposal**

Sediment Processing (below and right)  
- Compass recovered (bottom right)



**On-Shore Sediment Processing/ Re-Use/Disposal**

Seaplane Lagoon Northeast Remediation Area:

- 68 tons of waste recycled
- 36 tons of metal recycled
- All wastewater was treated on-site and either re-used for dust control or discharged back into Seaplane Lagoon.
- Materials that could be radiologically surveyed were surveyed to minimize LLRW, which reduced the Navy's LLRW disposal costs.
- Approximately 76,490 cubic yards of sediment was non-hazardous and not impacted and was re-used in the cap for an on-site landfill. This reduced the carbon footprint vs. transportation off-site and significantly reduced costs for cap material for this on-site Navy landfill.

**On-Shore Sediment Processing/  
Re-Use/Disposal**


Seaplane Lagoon Northwest Remediation Area:

- 55 tons of waste recycled
- 128 tons of metal recycled (66 tons of total from sunken barge)
- All wastewater was treated on-site and either re-used for dust control or discharged back into Seaplane Lagoon. For the NW area, about 412,000 gallons of treated water was re-used for dust control.
- The sediment was placed in separate dewatering pads based on pre-work plan sampling results to minimize LLRW. Materials that could be radiologically surveyed were surveyed to minimize LLRW, which reduced LLRW disposal costs.
- Approximately 33,550 cubic yards of sediment was non-hazardous and not impacted and was re-used in the cap for an on-site landfill. This reduced the carbon footprint vs. transportation off-site and significantly reduced costs for cap material for this on-site Navy landfill.

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**Property Transfer for  
Beneficial Re-use**

Remedial action completion report was approved by the regulatory agencies and Seaplane Lagoon was transferred to the City of Alameda in April 2016.



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