ST LOUIS FUSRAP
A STRATEGY FOR SUCCESS

M. Lyerla, B. Fox, J. Chinnock, A. Haase, S. Wojinski, M. Bretz
Stone & Webster, Incorporated
110 McDonnell Blvd, Hazelwood, MO

S. Cotner, L. Dellorco D. Mueller S. Roberts
US Army Corps of Engineers, St. Louis District
8945 Latty Avenue, Berkeley, MO

Doug Overmohle
US Army Corps of Engineers, Kansas City District
601 East 12th Street, Kansas City, MO

ABSTRACT

In October 1997, Congress transferred the Formerly Utilized Sites Remedial Action Program (FUSRAP) from the Department of Energy (DOE) to the United States Army Corps of Engineers (USACE). FUSRAP addresses contamination generated by activities of the Manhattan Engineering District and the Atomic Energy Commission during the 1940's and 50's in support of the nation's nuclear weapons development program. The USACE Operation Order for FUSRAP gave responsibility for remediation of five sites in Missouri and Illinois to the USACE-St. Louis District. The principal site is the St. Louis Airport Site (SLAPS), which involves the removal, transportation, disposal, and restoration of approximately 28 acres and 245,000 bank cubic yards (bcy) of contaminated soils.

This paper will focus on the progress and achievements in removal action efficiencies of the SLAPS team. This team consists primarily of the USACE and Stone & Webster, Incorporated.

The SLAPS property is approximately 17 miles northwest of downtown St. Louis, Missouri. Located in Northern St. Louis County, SLAPS is bordered by a major thoroughfare to the north and Coldwater Creek to the west. Lambert-St. Louis International Airport is to the south of SLAPS and a Boeing manufacturing complex is located to the east.

When USACE was assigned the SLAPS project, their first task was to build federal, state and local consensus for an interim cleanup standard so that they could begin work on the site prior to the release of the Record of Decision. Working with site regulators and the local public, the USACE efforts led to the development of an Engineering Evaluation/Cost Analysis (EE/CA) for site stabilization that was approved within 6 months. Site sampling and remedial design followed approval of the EE/CA, and the on-site removal action began in October of 1998.

Over the last three government fiscal years, the SLAPS removal action has experienced an annual increase in material excavated, transported, and disposed for a constant fiscal year budget.

The USACE and Stone & Webster have improved and streamlined site communications as well as optimizing labor and resources through a process of continuous improvement. These improvements have saved time and effort which equates to cost savings. The savings have been reinvested into the site and allowed more work to be accomplished than originally planned. Since the USACE was assigned stewardship for remediation of the site, one third of the property has been remediated without incident, and the average cost of removal of 1 cubic yard (cy) of material has dropped 60%. Success at SLAPS is defined as exceeding the original plan and performing more work safely, on time, and within budget.

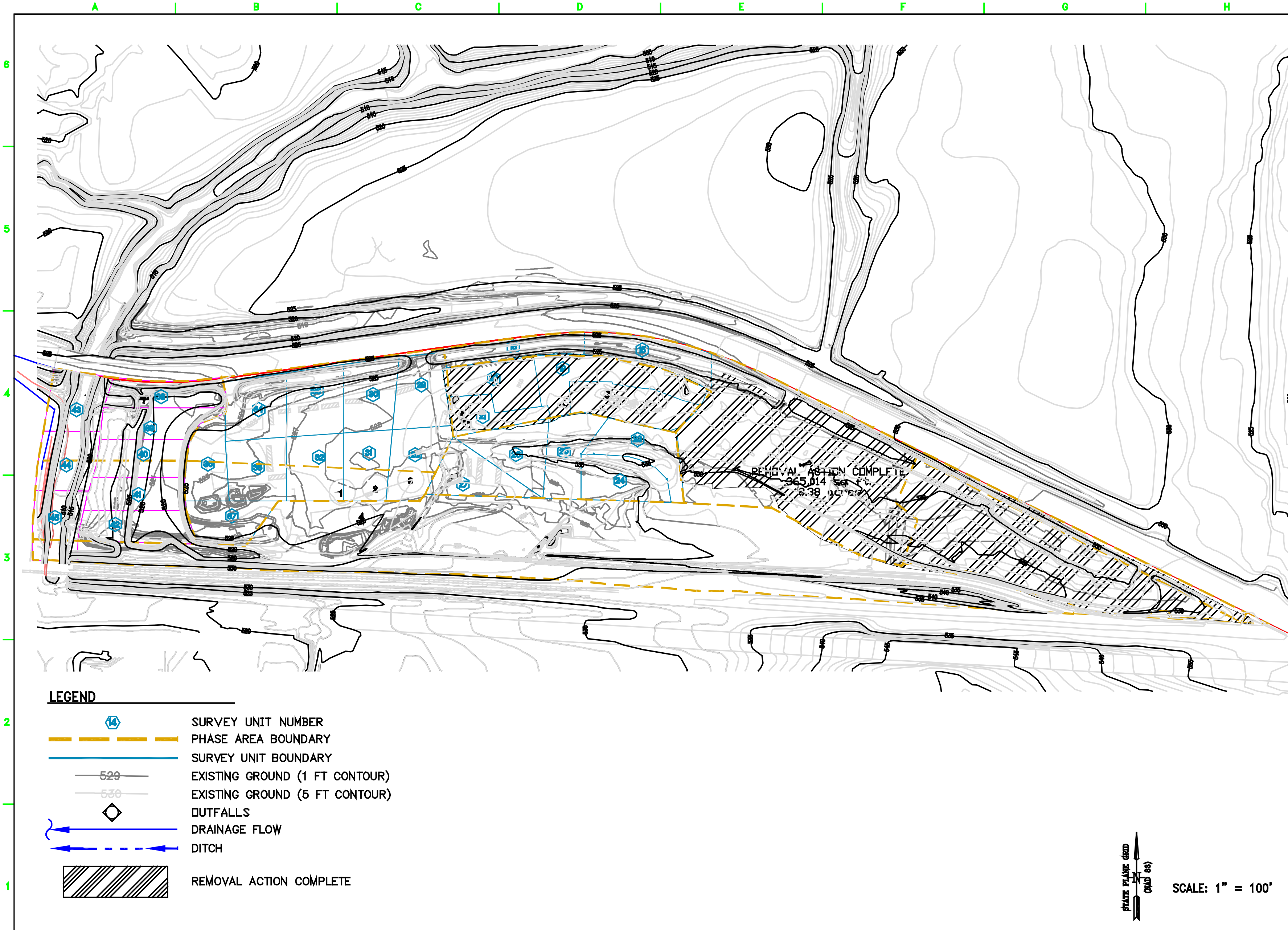
INTRODUCTION

The St. Louis Airport Site (SLAPS) is located adjacent to Lambert-St. Louis International Airport in northern St. Louis County. From 1946 to 1966, SLAPS was used to store radioactive residues from a downtown St. Louis uranium processing facility. The residues were removed during 1966 and 1967 and the site was remediated to the standards of the time. Over the last 30 years, numerous radiological surveys and investigations have been conducted at the SLAPS. As a result of the surveys and investigations, SLAPS was designated for cleanup under the Formerly Utilized Sites Remedial Action Program (FUSRAP) in the early 1980's and was placed on the Comprehensive Environmental Responsibility, Compensation, and Liability Act's National Priorities List in the late 1980's. Actual cleanup of SLAPS began in the late1990's and continues today.

The St. Louis District US Army Corps of Engineers (USACE), its contracted architect/engineer firm, and Stone & Webster (the Removal Action contractor) collectively make up the SLAPS Team. The SLAPS Team has developed and implemented a strategy for success that has contributed to almost one-third of the SLAPS Removal Action (RA) remediated to the unrestricted-use criteria at an approximately $255 / cy savings over previous removal actions undertaken at the site. The strategy, orchestrated by the SLAPS Team though USACE stewardship, requires the pursuit of continuous improvement in all aspects of the job.

Before implementing the strategy, the SLAPS Team reviewed numerous supporting factors and limitations for the site. From this review, essential elements for success were developed so that the Team could begin to implement the foundation for the strategy. The strategy implemented at SLAPS accounts for the technical approach, the management process to both control the work and measure progress, and final disposition of the contaminated soils.

According to the FUSRAP, success at SLAPS is defined as approval of the Post Remedial Action Reports for the individual investigative areas (IAs) at the site signifying the completion of the removal action. Toward that end, more than 150,000 cubic yards (cy) of contaminated material have been removed from 8.4 acres of SLAPS to date (see Figure 1), and progress continues toward the ultimate goal of site closeout. The removal cost to date is only $73 million dollars, which equates to $490/cy of contaminated material removed. Compared to the original DOE projected cost of $745/cy, the current cost savings are impressive. According to the SLAPS Team, success is defined as safely accomplishing more work on time and within the allocated budget.



U.S. Army Corps of Engineers
ST. LOUIS DISTRICT

U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

FUSRAP

STONE & WEBSTER ENVIRONMENTAL TECHNOLOGY & SERVICES

Designed by: XXXXXX | Date: XXXXXX
Drawn by: M. GREWE | Date: 07/04/01
Reviewed by: C. REITER | Date: 07/04/01
Approved: T. SCHLESSER | Date: 07/04/01
File Name: site-map-survey-units-07-03-01

Symbol	Description	Date	Approved
	ORIGINAL ISSUE	07/04/01	

Revisions

ST. LOUIS AIRPORT SITE
ST. LOUIS, MISSOURI

SLAPS REMOVAL ACTION STATUS

Contract Number: DACA45-98-D-0007
Delivery Order Number: KC01
Project Number: 08803.300
Drawing Number:
Figure 1

BACKGROUND

Brief History of the Site

SLAPS is approximately 17 miles northwest of downtown St. Louis, MO, in the cities of Hazelwood and Berkeley, MO adjacent to the Lambert-St. Louis International Airport. The 28-acre SLAPS property is made up of three parcels currently owned by the City of St. Louis. SLAPS was originally acquired by the Manhattan Engineer District (MED) in 1946 to store residues and scrap from uranium processing efforts in downtown St. Louis. Over time residues migrated from the site by air and water to nearby properties and a creek, which drains the site. In 1966 and 1967 most of these residues were sold to various uranium reprocessing facilities and removed from SLAPS. The remaining on-site structures were razed and buried on the property. A major portion of the SLAPS property was conveyed to the City of St. Louis in the 1960's by the Atomic Energy Commission (AEC -successor to the MED).

During radiological investigations conducted by the Department of Energy (DOE – the AEC's successor) from 1976 to 1978, contamination above acceptable levels was found on the site and in ditches adjacent to the site. Subsequent investigations found contamination in Coldwater Creek, the main site drainage located directly west of SLAPS. In 1984, Congress directed the DOE to reacquire SLAPS and use the property to permanently dispose of the contaminated materials from SLAPS and other nearby FUSRAP removal actions. However, the City of St. Louis did not agree to the proposal and would not allow the sale of the land back to the DOE. In 1985, DOE installed a Gabion wall along Coldwater Creek at the West End of the site to temporarily reduce the flow of contaminants from the site into the creek.

Additional site investigations conducted by the DOE throughout the late 1980's and early 1990's found buried deposits of uranium (U)-238, radium (Ra)-226 and thorium (Th)-230, at depths of up to 25 feet below ground surface. These contaminates of concern have radionuclide concentrations ranging from background to 5,600 pCi/g Ra-226, 37,780 pCi/g Th-230 and 1,700 pCi/g U-238. Non-radiological contaminants of concern related to the uranium processing were present, however they are primarily co-located with and to date have been addressed by removal of the radionuclides. The results of these investigations led to the addition of SLAPS to the Comprehensive Environmental Response, Compensation, and Liability Act's National Priorities List. Additionally, the DOE signed a Federal Facilities Agreement with the United States Environmental Protection Agency Region VII that included specific timetables for the cleanup. DOE prepared and released a limited scope Engineering Evaluation/Cost Analysis (EE/CA) in 1997 to finally begin cleanup at the site.

The first step in the DOE approach to cleaning up SLAPS called for the installation of a 7,000 cubic yard plug at the West End of the site. The purpose of the plug was to reduce the flow of contaminants from the site into Coldwater Creek. Prior to this action being completed, Congress transferred the program to USACE.

Upon assumption of the site from Congress, the USACE took a different approach to the management of the site and remedial action strategy. First, the USACE completed an EE/CA and Responsiveness Summary for the St. Louis Airport Site (1) so they could begin stabilizing the site. Under this EE/CA, the USACE subsequently installed an on-site rail spur to allow the site to load approximately 1,100 cubic yards (cy) of material a day, an increase of 600 cy from the off-site spur that had previously been used by DOE. Second, a Sedimentation Basin was installed to capture and test surface water runoff from the majority of the site. After the infrastructure and water management tools were in place, the USACE began to stabilize the site by the removal of the most contaminated material from the east moving toward the creek. The RA began in fiscal year 1998 and is scheduled to complete in fiscal year 2008 (2).

Radian International, Inc. initiated the removal action work at SLAPS in October 1998, and in five months approximately 32,750 cy of material were removed and shipped for disposal. In April 1999, Stone & Webster replaced Radian as the RA contractor and took over the removal action at SLAPS. After preparing site infrastructure and developing project documents and plans, Stone & Webster resumed shipping under USACE direction in July 1999. To date, Stone & Webster has successfully removed over 143,000 cy of material and shipped over 1,695 railcar loads for disposal.

USACE STEWARSHIP

The St. Louis Airport Site, as is common for all removal actions, is not a "one size fits all" approach. Hence, establishing realistic and achievable goals and obtaining a team approach has proven to be critical for success. The SLAPS Team staffs the proper mix of disciplines to execute the issues related to the program. The benefit of the Team is clear; the ability to have the right people in the right place at the right time is invaluable.

At SLAPS, Team members are all equals and are all responsible for developing and executing the most effective solutions for the challenges presented.

Oversight Committee Concerns and Public Perceptions

One of the many challenges in any removal action is the accountability to the public, and the St. Louis FUSRAP work at SLAPS is no exception. The St. Louis Oversight Committee consists of a broad base of community representatives who are a sounding board for the public on FUSRAP. Established in 1997, the Committee's mission remains to identify and evaluate remedial action alternatives for the cleanup and disposal of the St. Louis FUSRAP Sites and to petition the DOE/USACE to pursue a cleanup strategy that is environmentally acceptable and responsive to public health and safety concerns. Upon transfer of FUSRAP from the DOE to USACE, the St. Louis Oversight Committee was concerned that the transfer would result in the loss of the corporate Government memory of the program. The Committee felt this would be taking a giant step back from the progress that had been made.

While the St. Louis Oversight Committee recognized that the DOE was making progress at the FUSRAP sites, public perception was decidedly negative toward DOE efforts. Immediately after the transfer of the program a local weekly publication declared that: "Official foot dragging has been going on for decades…Failure to inform the public and act in a timely manner has been the hallmark of this case…and Every conceivable agency – local, state and federal – was left out of the loop” (3).

The pathway to success for the St. Louis FUSRAP Team quickly became clear. To resolve issues of trust and credibility that had affected the site, the team needed to:

(a) Reach consensus on issues between the government, state, and public;
(b) Recognize the value of all stakeholder opinions, and
(c) Communicate what is and is not possible at the site.

In the last four years the USACE and its Contractors have developed and maintained good working relationships with the St. Louis Oversight Committee and the public.

Safety for the Public and the Worker

Safety of human health and the environment is essential to accomplishing the RA at SLAPS. Safety is paramount in all operations and remains a big part of the USACE stewardship of the property. Workers are protected by appropriate personal protective equipment as well as monitoring dose measurements that document any exposure, or lack of exposure. The SLAPS Team also captures, tests, and if necessary, treats all surface water that falls on contaminated areas of the site. Additionally, data collected from on and off-site groundwater wells assist in determining any possible impact of contaminants to the aquifer that lies below the site.

External exposure monitoring of site personnel is accomplished using thermoluminecent dosimeter (TLD) badges worn by occupational workers. Internal monitoring is assessed through collection and analysis of air samples as well as a comprehensive bioassay program. These monitoring activities provide data for calculations on occupational exposure to ionizing radiation. These calculations include external radiation exposure received and internal exposure due to the potential intake of radioactive materials into the body.

One of the challenges at SLAPS was to provide protection to the public as well as the workforce conducting the RA. SLAPS sits on a busy thoroughfare in the middle of a congested part of the city, and public protection is a big concern. To address this issue, the SLAPS Team decided that perimeter and general air monitoring systems would be used along with personnel breathing zone samplers for workers to monitor potential dose problems. Since the number one hazard on this site is inhalation of dust particles, strict controls on dust emissions are enforced 24 hours a day.

To date, external exposures received by SLAPS personnel during all SLAPS activities were below the 0.010 rem sensitivity of the TLD badges used to monitor this source of exposure. Occupational external exposures received by all individuals have been recorded as 0.000 rem. The results demonstrate compliance with applicable regulatory requirements of Title 10 of the Code of Federal Regulations (10 CFR).

Since worker exposures have been below regulatory concern thus far, the potential for external exposure of the public is remote. Internal exposure to members of the public is based on air monitoring on the perimeter of SLAPS. The regulatory limit of permissible exposure to members of the public is 0.05 rem per year internal exposure (4). Compliance is demonstrated by showing that the annual average concentration of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in the regulations.

The USACE has put considerable effort into its relations with the St. Louis Oversight Committee and other stakeholders. This nurtured relationship, combined with the concern and effort the USACE exhibits maintaining a safe work area for SLAPS personnel and the surrounding public, shows that the USACE takes its stewardship seriously. This attitude also abounds in the entire SLAPS Team strategy for success.

STRATEGY FOR SUCCESS

The SLAPS Team was faced with developing a dynamic strategy for success that addressed the many challenges presented. Several supporting factors have built the foundation for successful strategies at SLAPS, and once the elements of the strategy were identified they had to be incorporated into the work.

Supporting Factors and Technical Limitations

Some of the innovative supporting factors within the SLAPS strategy include the SLAPS Team development, active participation by the government, identifying and addressing the limiting factors, and the implementation of continuous improvement. The aforementioned SLAPS Team remains the starting point for all strategic development, and the Team is committed to working together to find the best solutions for any challenges they face.

USACE became an active participant in the development of the SLAPS Team. Active participation in the execution of cost reimbursable contract work is a relatively new approach for both the Government, who traditionally performs more of an oversight role of firm fixed price contracts, and the Contractor, who views the Government in its oversight role. Active participation ensures that the Government (the USACE, in this case), along with other members of the Team, is involved in the daily decision-making process. By incorporating the broad base of experience within the decision-making process, solutions generated during on-site discussions meet the needs of all Team members.

In the process of planning the efforts at SLAPS, it was important to identify the limiting factors that would govern the progress of the work. The SLAPS project has many technical limitations, some of which are unique. One common limitation is that new treatment technology options have not been viable for this site since the contamination at the site is not homogeneously distributed. This limits the available approaches for the RA. Also, site topography is relatively flat and drainage around the area is poor. Water management becomes a critical factor in this situation.

Initially, another limiting factor for the site was the layout and location of the rail siding. The original rail spur used for SLAPS was actually located off of the SLAPS property. This spur held a maximum of six gondola railcars in a loading position, and all materials bound for loadout had to be transported to the rail spur by truck across public roadways. The USACE installed an on-site rail spur that allowed 17 gondola railcars to be spotted with 12 in a loading position. Rail access was no longer a limiting factor with the ability to load over 1100 cy per day.

A unique challenge that limits the work at SLAPS is its location within the flight path for Lambert – St. Louis International Airport. All work conducted at SLAPS must be approved by the Federal Aviation Authority (FAA) and a permit must be acquired for each new phase of work. Any changing conditions or operations require additional permitting. FAA permitting can be time consuming and cumbersome as the FAA can dictate equipment and methodology restrictions.

Along with the FAA permitting requirements, being in the flight path also means the site cannot establish artificial lighting such as parking lights, equipment lights and the like. This limits work to daytime operations only. To address this challenge, the SLAPS team varies the work schedule to work longer days during the summer to take advantage of the increased daylight.

Height restrictions enforced by the FAA dictate what kind of equipment can be used as well as what type of operations can be conducted. These restrictions must be considered during the design phase prior to permit applications. In addition to all of this, high winds coming off the airport runway can hinder railcar-loading operations to the point of occasional shutdowns.

All variables considered, the most limiting factor to the progress at SLAPS is the available funding levels. The expanded rail siding could accommodate a throughput of over 2000 shipments per year. This level of production would have allowed the RA to be completed in only a few years. However, such an effort would cost in excess of $60 million per year, which was not available in the funding levels for the project or the program. The Congressionally funded FUSRAP annual funding profile is set at a constant $140 million for the foreseeable future. The St. Louis FUSRAP portion of that funding is approximately $50 million per year with $27 million per year slated for SLAPS. Therefore it was determined that the available funding was the most limiting factor in planning the project. All planning is based on funding levels with the capacity to increase production without re-tooling the project should additional funds become available.

One method available to the SLAPS Team to reduce the impact of the limitation of funds is to perform work more efficiently. By continually assessing how the project is performing against its stated goals and finding ways to improve, the funding impacts can be reduced. Continuous improvement is the buzzword for this process. Continuous improvement is the alignment of the individual and group goals of the entire site staff with the collective project goals. This thought process was derived by SLAPS personnel who recognized the need to improve site communications and processes to optimize the resources on-site. Under the concept of continuous improvement, the Team establishes standards in the execution of daily tasks, grades the effort, and distributes the results site wide. In striving to improve their grade, team members continually improve site operations, which generally results in cost reductions that can be applied to additional shipments.

Essential Elements

There are essential elements to success at any job and this one is no different. Variables such as timely access to necessary information, choosing the proper tools for the job, and designing the approach will directly drive the production rate of the work.

The availability of real time information for decision making is vital to the success of SLAPS. USACE has established a local laboratory to provide support to the St. Louis FUSRAP work including satellite labs located on each property. This direct support cuts the time normally spent awaiting data results to begin or continue work. To take this support a step further, Stone & Webster has constructed a sample database to manage laboratory data from the point of collection to the final use of the data itself. This data management system allows Stone & Webster to efficiently operate and make timely decisions on the project.

In any RA, the sample results drive the daily decision-making process. It is vital that the data set is reliable and defendable. SLAPS has incorporated the Data Quality Objective (DQO) process to plan all sampling efforts on-site. All samples are tracked from the time of collection to the end use of the data and beyond. The DQOs and the chains of custody are the common thread between all analytical information. The DQO process assists the project planning and budgeting for the current fiscal year and beyond.

In the execution of a project, the availability of information is the essential tool that the managers at all levels use to manage and control the work. At SLAPS, where USACE is an active participant, that availability and accuracy of information is of paramount importance.

Traditionally, management information is thought of as financial in nature and most systems are focused on this. At SLAPS that definition has been extended to include a wide variety of information that is used on a real time basis to control the progress of the work. Some examples of the non-traditional information include samples/data, railcar location, excavation status, etc. All of this information is captured in a series of project files that are contained on a local server made accessible to all SLAPS personnel. USACE personnel on-site are also on the same system and have full access to all project information. This system has allowed not only the timely sharing of information, but has significantly reduced the paper volume that a project normally produces.

Another vital piece of real time information at SLAPS is the verification feedback. USACE contracted Science Applications International Corporation (SAIC) as a third party oversight to the verification process of the work conducted on the FUSRAP St. Louis projects. The SAIC employees are local, familiar with the sites and personnel, supportive and offer quick response times to verification requests. USACE Health Physics personnel also provide valuable input to the entire process.

Choosing the proper tools for the job is another essential element of success. The basic tools of this RA include the earth moving and transportation equipment. Since the transportation of material to the disposal site is one of the largest cost elements of the project; it was necessary to optimize that amount to the lowest cost possible. Stone & Webster conducted a competitive procurement to find a technically responsive transporter that that could do the work for the lowest cost. MHF, Logistics was contracted to support the transportation of the soils shipped from the site for disposal. There are many gondola sizes available, all with different volume and load capacity but with the same gross weight limit of 283,000 lbs. The fleet selected enabled the project to load approximately 218,000 lbs. of soil vs. the previous railroad equipment, which allowed 204,000 lbs. of soil. This decision increased capacity by 7% without increasing freight cost, resulting in the ability to ship and dispose of more soil for the same cost.

Additionally, the SLAPS Team decided to maintain a dedicated fleet of railcars. MHF provided a fleet of 100 new railcars and has supported fleet size increases or decreases as project needs and funding constraints dictate. MHF also provides daily tracking information to SLAPS personnel for the location of each railcar throughout the shipment process.

The process of selecting the individual pieces of earth moving equipment for excavation and loadout involved the review of equipment specifications, service recommendations, life expectancy, etc. to “short list” the specific brands and models of equipment that would meet the project needs. Standard procurement practices were used to procure the equipment. This resulted in the purchase of two pieces of equipment and the long-term lease of three others.

The resulting “spread” is a CAT Challenger 75 tractor towing a 12-cyd scraper, a CAT 980 wheel loader, a CAT 330 excavator, and a CAT D-6 bulldozer. This spread is supported by a 3,500-gallon water truck used for dust control in the contaminated area. The equipment combination allows both bulk and precision excavation to progress simultaneously and has a total production rate in excess of 250 cy per hour, which has proven to be more than adequate for the project. This methodology has fewer pieces of equipment, involves less labor then other methods, and is less impacted by poor site conditions then haul trucks.

Overall design of the approach is another essential element of success. During the planning stages prior to Stone & Webster’s arrival at SLAPS, many operational approaches were evaluated. The idea was to look at several material handling methods to determine the most cost-effective way to complete the RA.

Various operations, such as quarries and highway construction jobs, were reviewed as potential models for SLAPS operations since they had similar long-term, high-volume material handling issues. Each step of the operation, from excavation to loadout, was analyzed for feasibility and production. This resulted in three basic schemes that were expanded upon and considered further.

The schemes were:

- Excavate with an excavator, load into haul trucks, dump at the loadout area, load railcars with a wheel loader or excavator.
- Excavate with an excavator, load onto conveyors, use conveyors to load railcars.
- Excavate and transport to the loadout area with a scraper, loadout with a wheel loader.

Initially, use of conveyors appeared to be a very effective choice, but it was eventually discarded due to the up-front capitol cost, unresolved dust control concerns, and other uncertainties.

The remaining two choices are standard methodologies in the construction industry and are both reliable and flexible. The differentiation is in the cost per yard, which is relative to the length of the haul. The end choice was to use a towed scraper to excavate, transport, and distribute the load on the loadout pad. Railcars could then be loaded using a large wheel loader. An excavator would be used for guided and precision excavation phases to load the scraper that would move the material to the loadout.

Once the foundation for success was established and the essential elements of the work were incorporated into the design process, implementation of the strategy could begin.

IMPLEMENTATION OF THE STRATEGY

Excavation Approach

The excavation approach at SLAPS begins with the detailed development of work plans. Before the design work of each excavation phase begins, all of the historical characterization data is reviewed and evaluated. Data gaps are identified and pre-design investigations (PDI) may be conducted to gather additional information needed for the design work. Based on the data from the historical samples and the PDI, preliminary cut-lines can be demarcated within the design to designate gross excavation versus precision excavation.

The fieldwork typically progresses from gross excavation to precision excavation. Gross excavation allows for the quick removal of bulk soils within the excavation, saving time and effort. Although the design addresses demarcation of the switch from gross excavation to precision excavation, real-time field information from samples and instruments actually guide the operations. The extent of contamination within the excavation is known at all times.

Excavation sequencing is an important part of the design work impacting overall removal rates. Determining the depth of cut-lines allows the team to work efficiently from gross excavation to precision excavation, saving time and eliminating the risk of over excavating. Working from the high ground to the low ground allows the team to control potentially contaminated run-off.

As mentioned previously, water management is a critical factor due to SLAPS topography. If water management techniques are successful, material can be moved at will. The SLAPS Team has defined and implemented engineering controls in the field to effectively manage all water encountered within the excavations (groundwater) as well as water encountered in the form of precipitation (surface water). Water run-off control, water storage, water usage, and water treatment are all vital parts of the water management plan at SLAPS. The ability to manage the water directly dictates the amount of land surface that can be worked at any given time.

Availability of backfill materials also effects the production rate. USACE discovered a nearby quarry that would allow the St. Louis FUSRAP to take unlimited amounts of backfill soil at no charge. The benefit to the quarry was the removal of soils down to bedrock at no cost to them.

This arrangement allowed the Team to investigate and characterize the quarry soils once and bypass the procurement process that would have been necessary for multiple backfill sources. With an unlimited supply of free backfill soils and no additional characterizations or procurements, the project can avoid delays, saving both time and money.

Management Process

The management process at SLAPS started with the initiation of the task order in October 1998 and the strategic planning which laid out the general sequence and parameters for the project. The goal is a streamlined approach that defines and addresses the needs while increasing production rates within the determined budget.

At the beginning of any fiscal year, a baseline schedule is established for the annual allocation. Within this allocation, value-engineering efforts allow the Team to execute additional work and mitigate the effects of the invariable unknowns such as overruns, weather, water, etc., which occur throughout the project. Detail planning precedes the work resulting in a scope, plan, and budget for the year. With a basis for the planned fiscal year work agreed upon by all parties, a common direction and a set of objectives are established and conveyed to all project personnel. Each functional manager is aware of their respective scope, budget and objectives, as well as the big picture for the project. Each is charged with managing their area to meet their goals while supporting the other functional managers in meeting all project objectives.

With the overall framework established, the real work begins. Each manager uses a “look ahead” schedule, a weekly plan and a daily plan as a basis of managing their respective roles. From a collective basis, each department is reviewed weekly for both individual performance and collective interface perspective. A meeting is also held weekly for discussion of progress and issues. A performance report is prepared monthly for the USACE to report cost and progress to date and to forecast the cost at completion.

An effort has been made to ensure that all reports have a common basis for information, quality and consistency. For that basis, all cost information is accrual based and uses the Daily Contractors Quality Control Report as the starting point for the resources utilized on the project.

The SLAPS management continues to evaluate the factors directly effecting the production rate on-site, and by implementing the continuous improvement thought process, increased production rates are a never ending goal.

It is important to note that in spite of all of the efforts to increase the removal rate to save time and money, the human factor of the job is not lost. The USACE supports an extensive safety incentive program at the site and all eligible employees celebrate milestones together with shared meals, activities, and gifts. SLAPS continues to be very successful in the effective use of integrated subcontractors as well. All subcontractors on-site are small or disadvantaged businesses. Each and every subcontractor has a meaningful role and makes a solid contribution to the work.

The SLAPS Team experiences a closeness nurtured by all members. USACE personnel maintain offices within the same building as contract personnel. All managers are accessible and willing to listen. Quarterly luncheons allow the Team to get together with the entire workforce and celebrate their successes. These human factors make SLAPS a pleasant working experience which in turn positively effects the overall production rate of site personnel.

Availability and capacity of T&D

Another unique attribute in the implementation of the SLAPS strategy is that the USACE has contracted with two disposal sites for final disposition of contaminated materials. Each disposal facility is unique in that one can take highly contaminated materials, and the other can take low level materials at reduced cost. Based on the levels of contamination noted during the design phase, the volume of soil designated for each facility can be estimated for budget purposes. Actual determination of the appropriate disposal site is based on the results of samples collected from the material prior to loadout. The historical data becomes the backup information. Using real time sample information during loadout negates the need to be overly cautious for material classification. This has resulted in more material being shipped to the less costly facility.

In the fiscal year 2001, a savings of over a half million dollars was realized by shipping soils to the less costly facility based on actual contamination levels. This savings was immediately reinvested into the project for additional work.

RESULTS

The result of the SLAPS Team's successful strategy is cost savings. The savings have been realized at almost every level of the job. Strategies implemented by the SLAPS Team have thus far created the optimal equipment and staff mix and the most effective work schedules. Additionally, the Team has found a supportive transportation contractor and an unlimited backfill source. The members of the SLAPS Team have developed the ability to provide real-time sample information, a responsive local verification team, multiple disposal options, and more. Implementation of the aforementioned strategies adds up to substantial cost reductions across the project.

What this savings means to the SLAPS Team is that more work can be accomplished. All the cost savings that are realized by SLAPS are put back into the project to move more material, develop even better methodologies, or to research potential improvements.

To date the results of the volume removed have been spectacular. In three years over 150,000 cubic yards have been safely excavated, transported, and properly disposed. This volume translates to the release of 8.4 acres of formerly contaminated land for unrestricted use.

WHAT THE FUTURE HOLDS

There are many challenges still ahead for the SLAPS Team. The work at SLAPS continues to move toward difficult areas of the site. Future work will require coordinating with active railroad lines, working next to public roadways and removal action in and around Coldwater Creek.

As the work at SLAPS continues, the Team often contemplates what the future holds. For the same budget each year the project has continually moved more material in each fiscal period. This is without any adjustments to account for inflation factors. It is unclear how long this trend can continue. It seems logical that at some point there will be a plateau effect and the savings will level off. To avoid what seems to be inevitable, the Team continues to look at process improvements. It is most fortunate that the remediation field continues to evolve, and the Team recognizes that a new technology or option could always be right around the corner.

REFERENCES

1. U.S. Army Corps of Engineers (USACE) St. Louis District Office (CEMVS), 1998. *Final Engineering Evaluation/Cost Analysis (EE/CA) and Responsiveness Summary for the St. Louis Airport Site (SLAPS),* St. Louis, MO.
2. Stone & Webster St. Louis Airport Site (SLAPS), FY 2002. *Project Completion Schedule,* St. Louis, MO.
3. C. D. Stelzer; "Nuclear Haste;" *The Riverfront Times,* No. 1000, pp. 18-22, December 3-9, 1997, Hartmann Publishing Co.
4. Code of Federal Regulations, Title 10 - Energy, Chapter I - Nuclear Regulatory Commission, Part 20 - Standards for Protection Against Radiation, Section 1301 - Dose limits for individual members of the public. (10 CFR 20.1301)