CONSTRUCTION MANAGEMENT OF THE SAINT LOUIS RIVER/INTERLAKE/DULUTH TAR REMEDIATION PROJECT, SEDIMENT OU, DULUTH, MINNESOTA

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ABSTRACT

This paper will present the Construction Mangement and Program Management planning and execution at the Saint Louis River/Interlake/Duluth Tar (SLRIDT) remediation project, Sediment Operable Unit. It will describe the use of fixed price/fixed scope contracts and design-build contracts for the various components of this $60 million multi-year contaminated sediments remediation project. In addition, techniques used to track progress and costs against a cost-loaded base schedule and Earned Value will be described.

The SLRIDT site is a former steel mill and coke-making operation (closed in 1962) on the St. Louis River, approximately four river miles upstream of Lake Superior. The site includes approximately 255 acres of land and river embayments, wetlands and shipping slips. The aquatic portion of the site is approximately 90 acres. Onsite sediments are contaminated primarily with Polycyclic Aromatic Hydrocarbons (PAHs). The project requires a combination of dredging and *in situ* capping along with the construction of an on-site contained aquatic disposal (CAD) facility for the dredged sediments. Approximately 800 people live within one mile of the site. The Minnesota Pollution Control Agency (MPCA) is the lead regulatory agency for the project.

Hard Hat Services (HHS) provides management services for the private corporate Responsible Parties including constructability reviews, pre-qualification and bid-phase services, and on-site construction administration and management.

The first year of the project has been completed, including:

1. The construction of a 2,000 foot long sheet pile wall
2. Placement of about 190,000 CY of sand for capping and surcharging
3. Placement of 11 acres of a non-woven geotextile activated carbon reactive core mat
4. The construction of an 18,800 CY rock dike with a geosynthetic clay liner

The contracting approach and schedule for 2007, 2008 and 2009 will be described.

Keywords: Dredging, capping, project management, scheduling, SLRIDT

INTRODUCTION

The Saint Louis River/Interlake/Duluth Tar (SLRIDT) remediation project is a complex, multi-year, multi-million dollar undertaking that involves construction of in-water structures, contaminated sediment dredging, capping, and on-site disposal of the removed sediments. In any such complex project, *Planning* before the project, *Managing* that plan during the project execution, and *Monitoring* the plan to ensure compliance, are steps that help ensure project success. This paper describes the techniques used to Plan, Manage and Monitor the SLRIDT project on behalf of the Responsible Parties (RPs, or Owners) undertaking the response action.We call this technique PM^2 ™.

The first year of the project has been successfully completed. The dredging, covering, capping and site restoration portions of the project are scheduled to be completed in 2007, 2008 and 2009.

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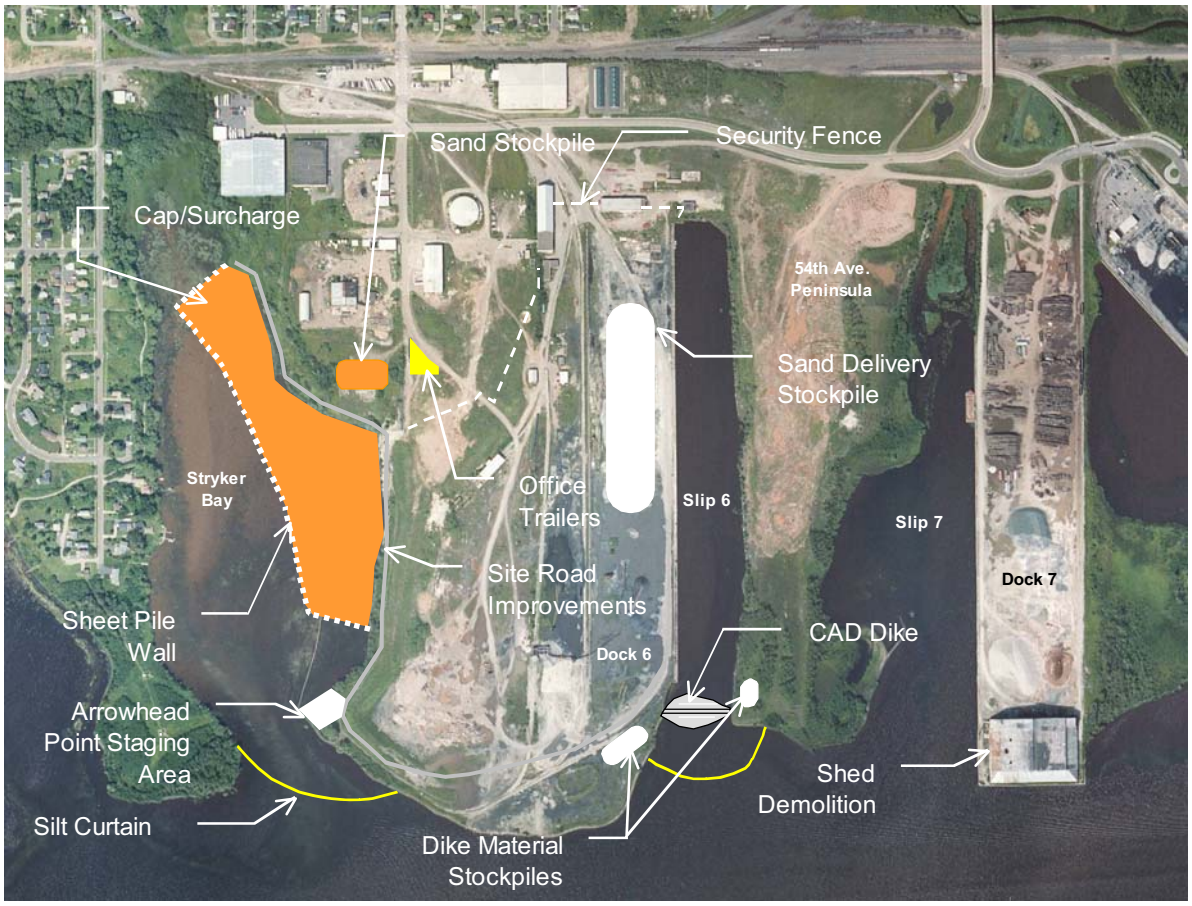

Figure 1. SLRIDT Site with 2006 construction activities.

PLAN

The planning step of PM^2 ™ is critical – especially with a complex project, with multiple entities responsible for different portions of the project. The planning for the SLRIDT project addressed the elements described below.

Project Organization

The team responsible for project implementation, as well as critical assignments and organizational structure, was defined. Roles and responsibilities were detailed in the Project Management Plan (PMP) as well as lines of communication. The SLRIDT team includes XIK Corporation (the lead RP), Service Engineering Group (Owner's Engineer for Construction Quality Assurance and Engineering support), Hard Hat Services (Owner's Representative, Project Manager), and JPG Group (Community Relations services).

Response Action (RA) Scope of Services

The detailed scope of the RA is contained in the Remedial Design/Response Action Plan (RD/RAP) document developed by XIK and approved by the MPCA. Project planning included definition of the project boundaries, and Response Action requirements.

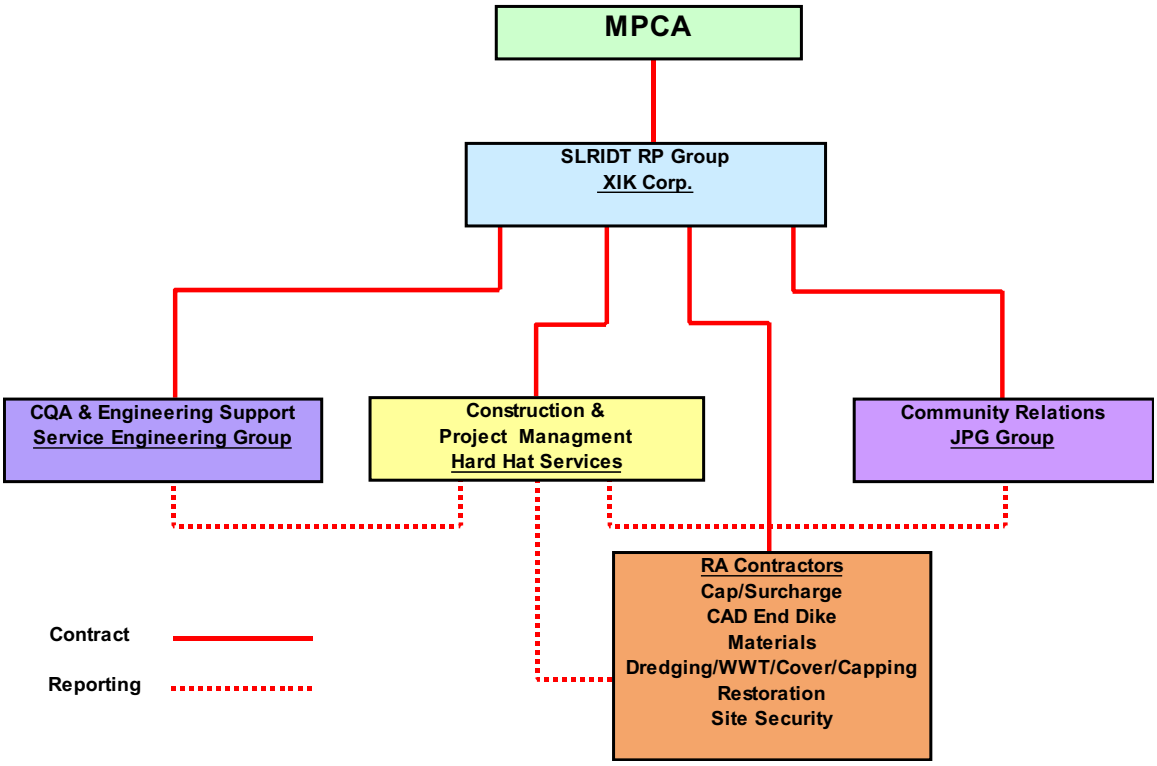

Figure 2. Project organization chart.

Contracting

The approach taken for the SLRIDT project was to break the work into logical groupings based upon the geographic portion of the project site (Stryker Bay, Slip 6/CAD, Slip 7), the sequence of the work (which construction year), and the type of work (dredging, capping, dike construction, wastewater treatment, site restoration/mitigation). The objective was to divide the work in such a way as to generate the maximum amount of competition in the bidding/proposal process. The work was divided into the following contracts:

1. 2004 Aggregate Supply
2. Stryker Bay Cap/Surcharge (including the sheet pile wall)
3. Slip 6/CAD End Dike
4. Dredging/Wastewater Treatment/Covering/Capping (including the on-shore wetland excavations)
5. Site Restoration (including the Tallas Island Mitigation project and CAD capping)

Fixed Price/Fixed Scope type contracts were used in each case. The design-build contracting approach has been used where appropriate (for the Dredging/Wastewater Treatment/Covering/Capping contract) to benefit from contractor knowledge and consolidate project responsibilities and risks with the contractor where possible.

A Request for Qualifications was initially issued to determine which contractors were interested, experienced, and financially capable of performing the various elements of the work. Pre-qualified contractors were then invited to bid/propose on the various contracts. Every effort was made to conduct a fair and open process including an invited site walk, sharing responses to all contractor questions, and the issuing of RFB/RFP Addenda documents to all participants. The Bid/Proposal forms were designed to reflect the desired Schedule of Values that would be used to determine payment percentages during construction. A draft contract was attached to each RFB/RFP so that contractors fully understood the basis for their bid or proposal. Careful attention was paid to describing the division of responsibilities between the RPs and the contractor, so that a firm basis for the proposal could be made.

The Stryker Bay Cap/Surcharge and Slip 6/CAD End Dike contracts were signed with Envirocon and Marine Tech respectively, and completed in 2006 (except for a small amount of capping in Stryker Bay). Aggregate supply for 2006 was negotiated directly with the owner of Dock 6 (Hallett Dock Company) to deliver sand by ship to the dock. A small amount of capping in Slip 7 was also performed in 2004 under a Time & Materials contract to take advantage of sand available from navigational dredging in the area. The Dredging/Wastewater Treatment/Covering/Capping contract has been signed with Shaw E & I, with work beginning in Spring 2007. The Restoration contract will be advertised in 2007.

Schedule

Contract negotiations, procurement, permitting, mobilization, site preparation, construction, and installation, completion dates are all critical pieces of any effective schedule. Since the schedule is designed to track throughout the project, project planning included making a baseline schedule that was realistic and achievable. The schedule planning required determining the sequencing of the various work elements, considering the need to complete certain elements first (the CAD End Dike to create the CAD before starting dredging, for example), and considering the limited construction season in Duluth. This schedule allows for progress to be compared to this baseline schedule as the project elements are completed to determine if the work is being completed on time. The schedule has enough specificity to define milestones, but also enough flexibility to be able to shift non-critical tasks for project efficiency. The schedule was based upon a list of tasks, or Work Breakdown Structure that defined the work elements for each project area. Primavera P3 software was used to create and track the project progress.

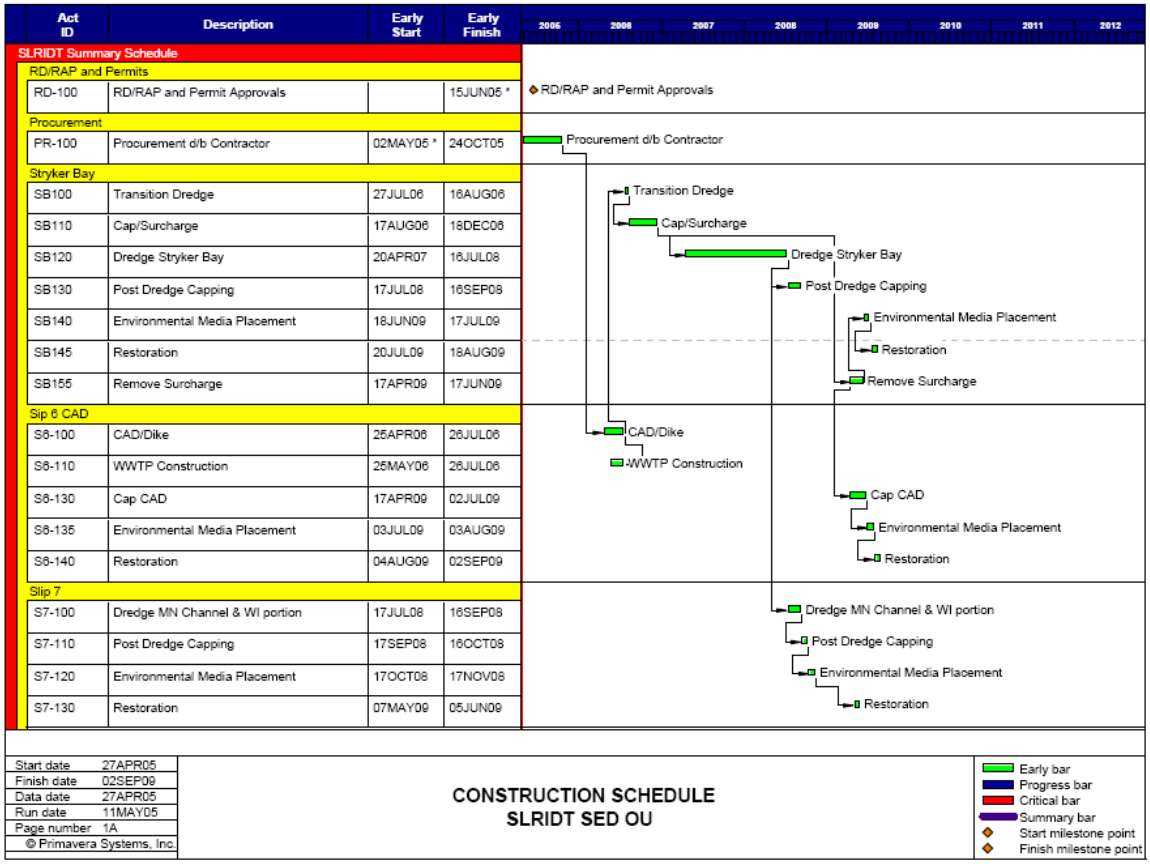

Figure 3. SLRIDT schedule.

Cost

The project schedule was loaded with the project budget established for each task. The project budget was prepared with engineer's estimates and unit rates from other projects of a similar nature. This created a total project cost curve versus time that is tracked against actual project costs each month.

Risk Management

Planning for risks created by contractor actions were made by including insurance requirements in the RFB/RFP documents, and in the resulting contract agreements. The insurance requirements include Comprehensive General Liability, Contractor Pollution Liability, Automobile Liability, Marine Liability and Umbrella Liability coverages. The limits of the coverages have been set depending upon the contract amount and the nature of the work by each contractor. In addition, each contractor is required to provide the Owners with performance and payment bonds in an amount of 100% of the contract price.

Other project risks include air emissions and site security. There are a number of residences near the work area, and there is a risk of the release of certain PAH compounds to the air (particularly naphthalene). The Project Manager, Owner's Engineer and the MPCA developed a contingency plan to implement in the event of an air release above the limits in the Record of Decision (ROD). The contingency plan defines which project team member is to be notified first, procedures for determining the severity of the air emissions, and actions to be taken based upon the severity analysis. A decision flow chart was developed and agreed upon by all parties to be used in the event of any air release during the RA. Further, the project site is in a large geographic area, and several existing businesses are in an area that must be used to access the work areas. As such, the Project Manager is responsible for overall site security, including fencing, signage and other elements, but each contractor is responsible for security in its work area.

Health and Safety

All CERCLA remediation projects involve some inherent Health and Safety risks, and a well-developed Health and Safety Plan (HSP) is essential for implementation. For the SLRIDT project, each contractor is responsible for developing a site-specific HSP for its portion of the work including an activity hazard analysis of the work and other elements in accordance with OSHA regulations. Each contractor is also responsible for daily tailgate safety meetings and any required worker safety monitoring.

Communications

Planning for project communications is a critical element in a complete plan. The SLRIDT project has established various levels of communication including daily safety meetings with each contractor, weekly progress meetings with each contractor, written weekly reports from each contractor, and weekly written progress reports to the RPs.

Construction Quality Assurance

The CQA process was defined during the planning stages of the project, and a Construction Quality Assurance Plan was prepared and made part of the approved RD/RAP. The Owner's Engineer is responsible for monitoring construction and certifying that construction quality standards have been met, and that payment amounts claimed by the contractors are accurate.

Regulatory Compliance

The SLRIDT project requires compliance with several permits, including the MPCA, the Wisconsin DNR, the Minnesota DNR, the U.S. Army Corps of Engineers and the City of Duluth. These permits require approval of specific means and methods in advance of commencing the work, as well as meeting permitting requirements.

These planning elements are contained in the Project Management Plan (PMP) for the SLRIDT project that was prepared in the fall of 2004. All entities with responsibility for managing the project team had input to the plan and approved it. The PMP defines how project modifications or changes will be implemented and documented. The

PMP is not a set of plans and specifications, but rather is a clear, well-defined, concise document that is used throughout the project to manage the job.

MANAGE

With the PMP defined, discussed, and agreed upon by all the project team members, project management becomes a matter of implementing the plan. If the PMP and the time spent planning is "filling the toolbox", then the management step of PM^2 ™ is a matter of "using the tools."

Training

One of the first tasks was to train those individuals who will have to implement the project on the specific requirements of the PMP or other plan. The HSP may require that project personnel have HAZWOPER training (OSHA 1910.120). The management team made certain that contractors were aware of the training requirements.

Communicating

Consistently communicating and revisiting the plan has been part of the overall management process. Management of the plan includes updating the schedule, accruing costs for work performed, documenting quality control, tracking submittals and other deliverables, auditing safety and environmental compliance. Communications is a key element of the management process. Managing the overall communications between the project team has included:

- Setting up conference calls and taking minutes
- Scheduling meetings, developing agendas and producing minutes
- Serving as liaison for communications with the regulators
- Participating in monthly Community Work Group meetings
- Producing daily work reports and monthly status reports
- Maintaining the project files
- Keeping Owners updated on public relations issues

By openly communicating, the opportunity to share information and focus on key milestones or deliverables has been maximized. In addition, web site updates have been used as an effective way to communicate between the project team members and the public, the Owner and regulatory agencies.

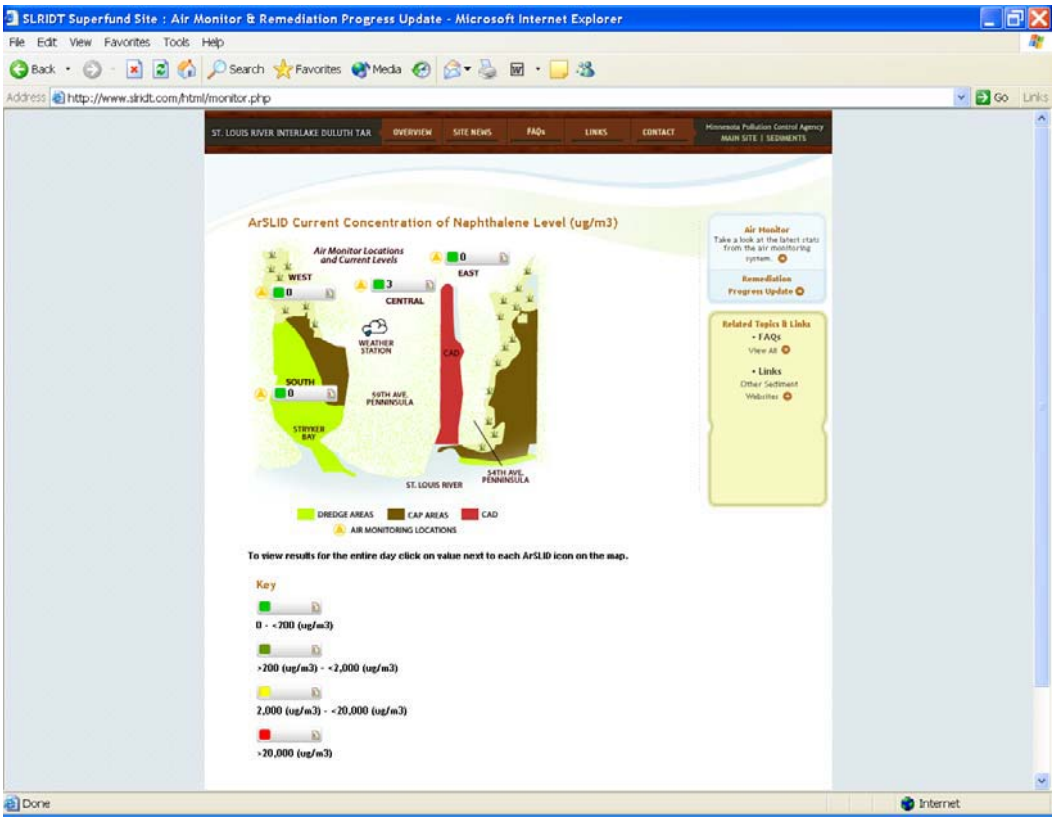

Figure 4. Screen shot of the SLRIDT website.

A communication technique used very effectively on the SLRIDT project in 2006 was the use of a weekly e-mail status report to the Owners with attached photographs. Because the RPs are located in other states, site visits were infrequent.

Meetings

Meetings are a typical way to gather and share information for these kinds of projects. Kick-off meeting(s) with the project team, periodic progress meetings with the Owner and contractors (in many cases these were separate meetings), and non-routine meetings to discuss potential project issues and corrective actions were all used in 2006. At project progress meetings, updates on schedule, budget, quality control, submittals, compliance, safety, and other important aspects of the project were discussed. One very effective way to proactively address project concerns was to look ahead two or three weeks (or more) on the schedule, and make lists of critical items that need to be reviewed at each meeting.

Maintaining Records

Part of the management for the SLRIDT project includes the maintenance of deliverables, documentation, and submittals. A submittal log is typically kept to track documents, reviews, revisions, and approvals. Project files needed are maintained to ensure proper documentation of project conditions. There's a saying, "He who takes the best notes wins." Certainly that can be true if there are claims or disputes on a project, and maintaining good project records is part of thorough project management.

Reviewing and Updating

Throughout the project, issues have and will arise, and plans may need to be revised and/or updated. Therefore, one of the management tasks undertaken was the periodic review and revision of the PMP or other plan documents (Health and Safety Plan, QC/QA Plan, Risk Management Plan.) In addition, updates and changes necessary to the project PMP or other plans were brought about many times by actively monitoring how each aspect of the project is proceeding.

MONITOR

In order to know how the project is progressing, and whether or not the Plan and Manage steps of PM^2 ™ are effective, the project was monitored. Monitoring is an ongoing process to provide enough relevant information to either document that the project is proceeding according to specific requirements, or develop a corrective action plan for improving the project performance, in whichever area needs such improvement. Schedule and cost monitoring were important tasks during the conduct of the work in 2006. Monitoring on the SLRIDT project also included environmental, quality control and geotechnical.

Schedule

By monitoring the scheduled milestones, the Project Manager could see if the project was on track for scheduled completion. In some instances, progress indicated that completion would be delayed without corrective action on the part of the contractor. By identifying schedule concerns early in the construction season, corrections were made and the work in 2006 was completed on schedule. One objective of monitoring was to determine if the project was on schedule, but costs expended were higher than scheduled for a given milestone. Without effective monitoring, it would not be known whether or not the project objectives (including schedule, cost or risk– not just technical objectives) could or would be met.

Cost Evaluations and Variance Analysis

Each month, actual costs were compared with the cost loaded schedule to determine if the actual costs were tracking the planned costs on PMP schedule. The "Earned Value" is calculated each month by determining the percent complete of each task and relating that percentage to the budgeted cost for that task. A variance is created when the actual cost for a task is different from the Earned Value. A positive variance indicates that the work is being completed below the expected budget to date. A negative variance indicates the opposite. By finding any negative variances early in the construction season, contractors were able to make adjustments to get back in line with the expected budget. For example, if a given task has a budget of $1,000, and is determined to be 40% complete by field inspection in a given month, then the Earned Value for that task is $400. If the costs actually invoiced for the task are a cumulative of $500, then a variance of -$100 exists (a negative variance). This situation would indicate that the contractor is claiming payment for more work than has been completed. By aggregating all task Earned Values and costs, the Project Manager was able to determine if the project as a whole was tracking its schedule and budget properly.

Environmental

Owner's Engineer was responsible for environmental testing during the construction season. Ambient air monitoring was performed at fixed stations around the site and in the nearby neighborhood to determine naphthalene concentrations. Water sampling was also conducted in the river outside of each work zone to determine compliance with standards. In addition, noise and dust monitoring took place on a regular schedule.

Quality Control and Quality Assurance

Owner's Engineer was also responsible for monitoring construction quality and certifying certain elements of the work as it progressed. For example, Owner's Engineer tested all sand and other aggregate materials for compliance with the RD/RAP chemical and gradation requirements. The specified lift thickness in the Stryker Bay Cap/Surcharge area was also monitored by use of drop core sampling after each lift was placed. Owners Engineer also evaluated the bathymetric surveys of the CAD End Dike during construction and at completion.

Figure 5. Drop core sample.

Geotechnical

Due to the nature of the work, geotechnical monitoring of the sediments in Stryker Bay was necessary. Owner's Engineer was responsible for measuring the consolidation in the shallow sediment to determine if the surcharge was effective in compressing the soft sediments. Monitoring of the deep sediments was also undertaken due to low soil strength in certain areas of the sheet pile wall. Vibrating Wire Piezometers were used to measure pore water pressure dissipation to monitor consolidation, and inclinometers are used to monitor any deep soil movement near the sheet pile wall.

SUMMARY

This paper has described the methodology used for Construction Management and Project Management for the SLRIDT project. By Planning, Managing, and Monitoring the SLRIDT project in the manner described, the project is currently on schedule and budget.