MONITORING DREDGED MATERIAL PLACEMENT OPERATIONS AT THE HISTORIC AREA REMEDIATION SITE AND THE SHARK RIVER ARTIFICIAL REEF SITE DURING THE KILL VAN KULL #6 CONTRACT, October 2002 – December 2003

Prepared by:

Science Applications
International Corporation
Admiral's Gate
221 Third Street
Newport, RI 02840

Prepared for:

U.S. Army Corps of Engineers
New York District, Operations Division
26 Federal Plaza
New York, NY 10278-0090

November 2003

Contract No. GS-35F-4461G
SAIC Project No. 01-0440-04-5449-500
SAIC Report No. 654

TABLE OF CONTENTS

LIST OF FIGURES

Page

1.0 OBJECTIVES

During the Kill Van Kull #6 project, SAIC provided Automated Disposal Surveillance System (ADISS) technical support services under separate contracts to the dredging contractor, Bean-Stuyvesant, LLC, and to the monitoring agency, U.S. Army Corps of Engineers, New York District (NYD). ADISS was employed to monitor the placement of dredged material at the Historic Area Remediation Site (HARS) and at the Shark River Artificial Reef Site (Figure **1**). Under contract to Bean-Stuyvesant, SAIC provided the equipment, software and technical expertise to maintain the systems and process the data. For NYD the objectives were to:

- Provide real-time placement and draft information, including load misplacement and scow leakage alarms;
- Acquire, process and submit information concerning potential misplaced material events;
- Post the Inspector logs and Transportation Planning List (TPL) on the web site;
- Provide the placement grid used on the ADISSPlay vessel guidance system.

SAIC provided monitoring services to Bean-Stuyvesant and NYD for the previous KVK #1 project (SAIC 2001 and 2002a). Initial development of ADISS during the 1997 Capping Project preceded introduction of ADISSPlay, the helmsman display and vessel guidance system. The present ADISS/ADISSPlay monitoring system was managed by SAIC for NYD placing dredged material within the HARS and the Shark River Artificial Reef Site, and the installation and maintenance of the system on the dredge scows and tugboats occurred under separate contract with Bean-Stuyvesant.

In addition to hardware installation and maintenance, services included the daily monitoring of data transmitted via cellular telephone from the tugboats. The transmitted ADISS information was processed and made available to NYD via the ADISS web site, hosted at the SAIC Newport, RI facility. As ADISS data were received, they were processed for placement locations at the HARS and Shark River Artificial Reef Site grids and entered into the ADISSWeb (Internet Map Server) database. NYD personnel accessed the ADISSWeb plots posted on the web site, http://www.adiss-afiss.com/. Plots and copies of the Inspector logs and TPL checklists were also provided on the web site to NYD for analysis.

The objectives of this project were based upon previous project experiences and Bean-Stuyvesant and NYD needs. The requirement for daily monitoring was met by posting telemetered ADISS data on the Internet using ADISSWeb. The position and draft data acquired from the ADISS installations were also provided on the Internet at http://www.adiss-afiss.com/ for public outreach.

SAIC programmed the placement grids for the KVK #6 project (Figure 1) on the ADISSPlay system for vessel guidance. The NYD provided the grid coordinates and dimensions to SAIC for this purpose.

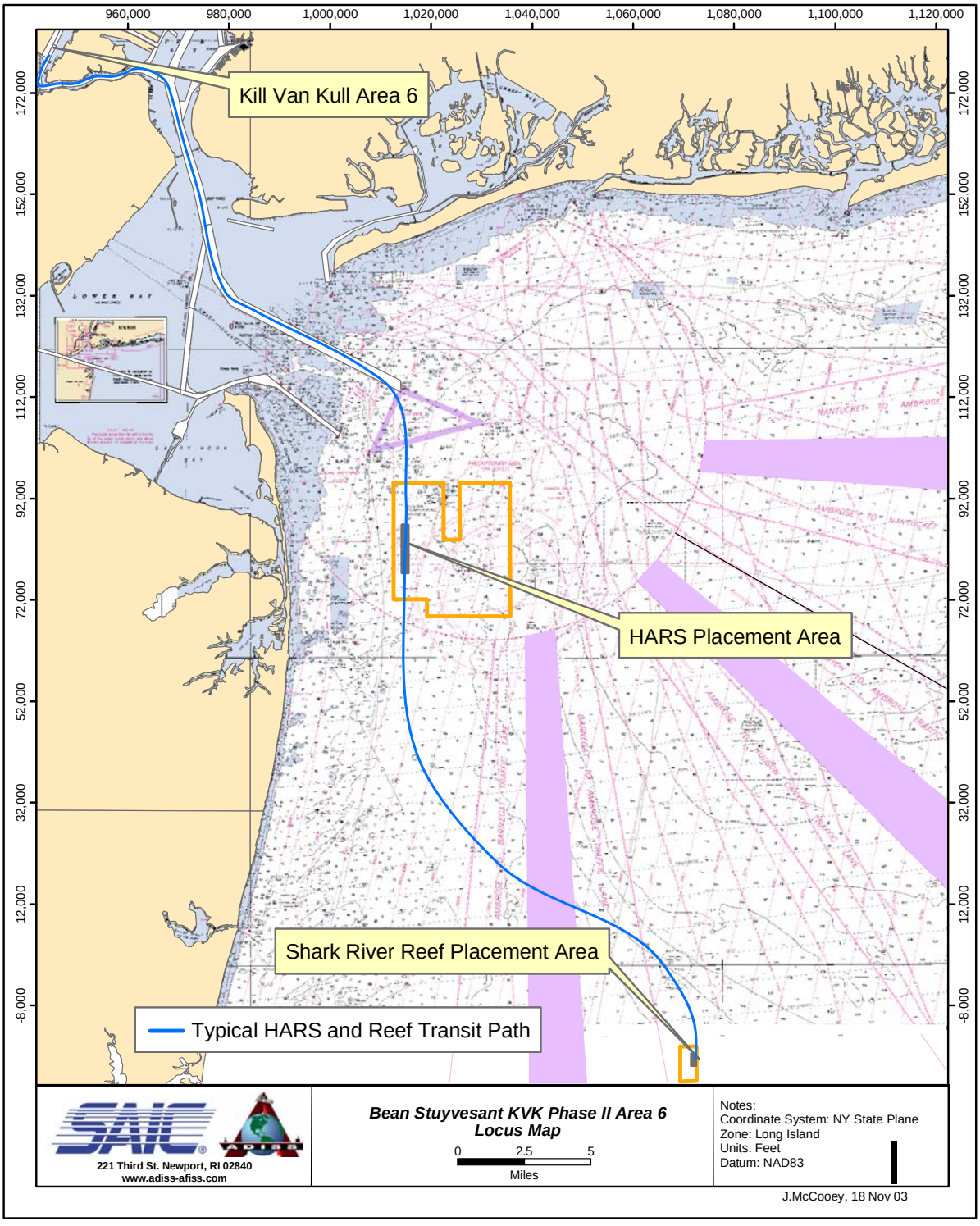

Figure 1. Kill Van Kull #6 placement at the Historic Area Remediation Site and the Shark River Artificial Reef Site.

2.0 SYSTEM DESCRIPTION

ADISS was composed of a DGPS positioning (Wide Area Augmentation System [WAAS] enabled), draft recording unit and a spread-spectrum transceiver for data telemetry from the scow to the towboat. Aboard the boat, ADISSPlay consisted of a helmsman display, telemetry, and an Inspector database program. The combined ADISS/ADISSPlay system was adapted for monitoring placement operations at the HARS from previous experience at other disposal areas. ADISS/ADISSPlay data containing completed trips were telemetered via cell phone from the tugs to the SAIC Newport facility for processing and analysis. Processed data were posted on ADISSWeb for viewing by both NYD and Bean-Stuyvesant.

Prior to the KVK #6 project, an alternative method of tracking scow transits and dredged material placements at the HARS and the artificial reef sites was instituted (SAIC 2002b). In the event that communications failed with the ADISS unit installed on the scow, the inspector would be able to switch to an alternate that estimated the scow position from the tugboat GPS unit and the layback distance to the towed scow. The alternative program, ADISSLt, could be used to track the scow until the problem was solved before the next transit took place. In addition to utilizing the ADISSLt program, the inspector was instructed to notify SAIC of the problem, so corrective action could be taken in a timely manner.

A description of the ADISS system was available in the report of the prototype system (SAIC 1998a), and the ADISSPlay system, including the Inspector log function was described in a letter report (SAIC 1998b). Both systems have undergone extensive changes with advances in technology to increase the reliability of recording and transmitting data. Since the previous KVK projects, a second version of ADISS (V-2) was developed, which utilized a more reliable DGPS receiver and stored the data with less power. The new DGPS receiver was the Garmin Model 16 DGPS (WAAS-enabled). DGPS position and pressure data were recorded with a Persistor CF-1 PCMCIA recorder. Data were transmitted to the tugboat with spread-spectrum, frequency hopping Freewave radio modems. Power for ADISS was provided with an internal 12 amp-hour battery recharged by a 10-watt solar panel, allowing ADISS to operate automatically to record the transit and placement locations at the HARS and Shark River Artificial Reef Site.

The ADISSPlay system was modified to include the TPL checklist of items necessary for the successful shipping of each scow load to the HARS and Shark River Artificial Reef Site. Exceptions to the list were noted by the inspector at different phases of each transit, and a record was transmitted to ADISSWeb for display at the end of each placement.

The method of transmitting the data from the tugs to SAIC was also modified during the last month of the project to enhance the reliability and timeliness of sending the ADISS, Inspector log and TPL information. All data was sent in '.txt' format by FTP with a simple graphic user interface to show the inspector the information had been sent successfully. Along with the ADISSPlay data, the interface also transmitted the time of the logged entries and transmission activities, creating a document trail for further analysis by NYD.

The new transmission method eliminated the use of PC Anywhere™, and resulted in quicker reporting. All trip data were submitted within 60 minutes of each placement, which resulted in automatically posting the data on the Internet within 2 hours. Previous trip reporting had been sporadic, because PC Anywhere™ did not display transmission failures. Consequently, the inspectors were unaware the data had not been sent for multiple trips, and reporting was delayed.

Another ADISSPlay modification to provide the helmsman with the correct trip number was tested and instituted during the final days of the KVK #6 project. The method, suggested in the Passenger Ship Terminal report (SAIC, 2003a), and demonstrated during the Refined Sugar project (SAIC, 2003b), included the transmittal of trip numbers assigned by a computer located in the SAIC Newport facility. This change eliminated potential confusion as to trip sequence, which became paramount on the KVK #6 project with its multiple tugs and inspectors, where inspectors had irregular watches and poor communication between tugs.

ADISSWeb was also modified during the KVK #6 project to display the number of loads placed in the target cell at the Shark River Artificial Reef Site. The management tool tracked the number of loads and totaled the volumes of dredged material deposited in each cell, enabling NYD to direct subsequent placements and avoid overfilling the cells.

The ROCDMP program previously created by NYD to model the depths created from artificial reef site construction was converted to Visual Basic™, and run with ADISS data input during the final days of the project. The output of the model run was a grid file, which was plotted over existing bathymetric survey data acquired in April 2003 under separate contract.

During the KVK #6 project, the Internet display of placement events was maintained to monitor daily disposal activities without visiting the installations to retrieve the stored data for each event. The cellular telephone data transmissions received from ADISSPlay were automatically plotted and posted on the ADISS web site using ADISSWeb.

Figure 2 shows the ADISSWeb display of data available at http://www.adiss-afiss.com/.

The purpose of remote reporting was to provide NYD with a means of detecting leaking scows and potential misplacements outside the permitted area quickly without deploying technical personnel to recover the data. Automated subroutines checked the incoming data, and broadcast e-mail alarms if they exceeded the pre-set thresholds for placement or leakage. E-mail warnings consisted of a notification of trip number, date and time. NYD personnel could then query the ADISS web site for misplacement times and positions, as well as plots of position and vessel draft during transit. The automatically processed data were unconfirmed until checked for accuracy by SAIC. Unconfirmed data, automatically posted on the web site prior to the QA checks were labeled as preliminary data. The label was removed from the display once the data were checked for accuracy. By monitoring the Internet, leaking scows and misplacements could be quickly confirmed by NYD, and a solution could be reached with the dredging contractor.

After the completion of the project, SAIC produced plots of the transit and draft data, which were posted on the web site for public outreach. In addition to the graphics, access to this report was made available to the public on the ADISS web site in '.pdf' format.

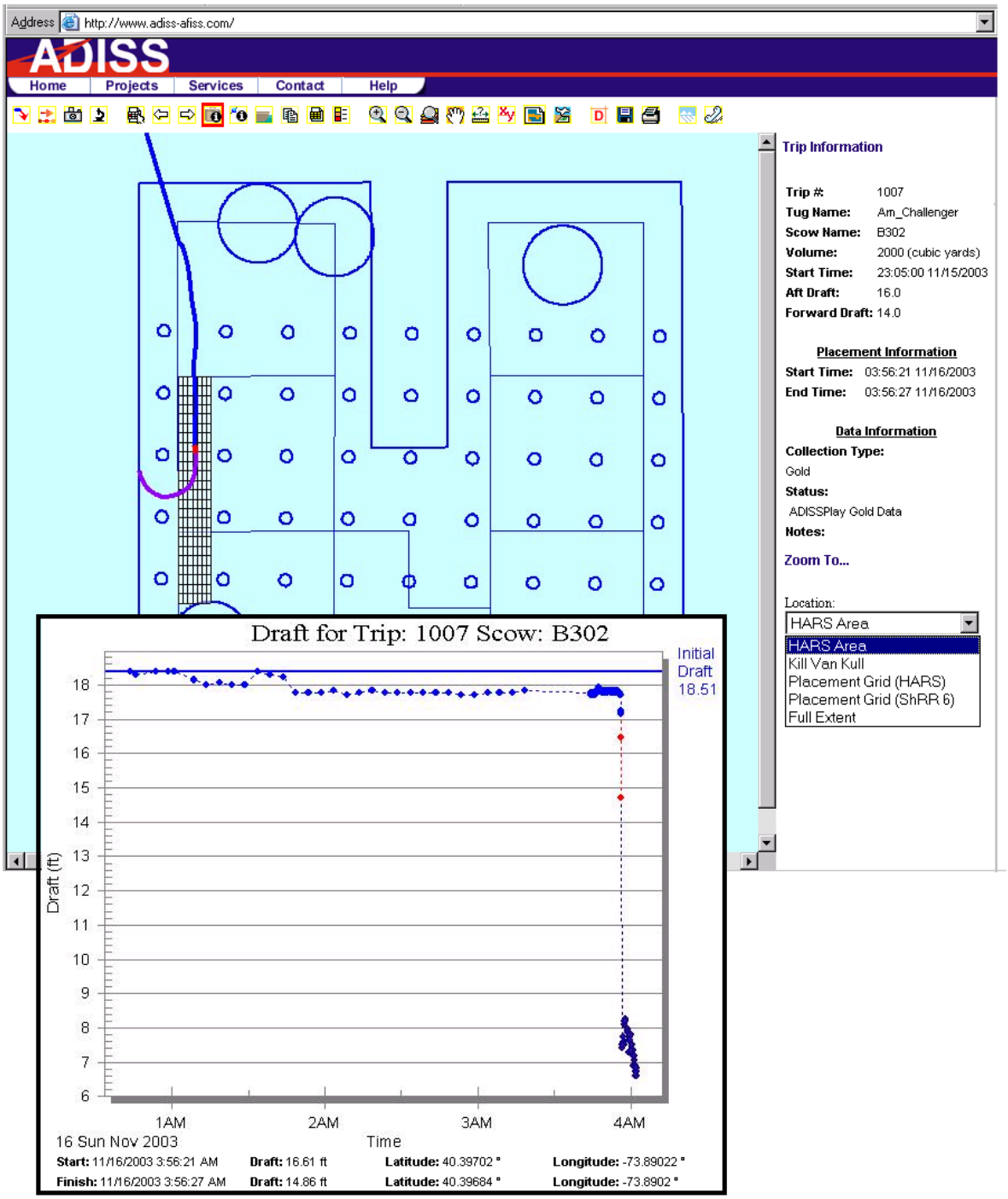

Figure 2. ADISS position and draft information displayed for viewing on ADISSWeb.

3.0 FIELD SERVICES AND DATA PROCESSING

The KVK #6 project began on October 9, 2002, when Bean-Stuyvesant shipped the first load of improvement dredge material to the HARS. ADISS units were installed aboard six scows: *B-301, B-302, B501, B-502, GL-32* and *GL-33*. ADISSPlay units were installed aboard nine tugs, *American Champion, American Challenger, Barney Turecamo, Bridget McAllister, Bruce McAllister, Iona, Katherine, McAllister Girls* and *Sea Bull,* over the course of the fourteen-month project, which ended December 18, 2003.

ADISS/ADISSPlay successfully monitored 99.9% of all 983 placements. Trip #107 was not recorded with either ADISS or ADISSPlay. SAIC was not notified of the problem, and the inspector did not utilize the ADISSLt alternative. ADISSLt was used successfully by the inspectors to record 16 trips. Eleven of the 16 ADISSLt trips occurred because of battery recharging problems (terminal corrosion), and some of the others were due to scow swaps with the KVK #5 project. Unless the grid coordinates were changed by SAIC to match each project, scows loaded with material from another project could not be tracked in the six-second mode for placement. Generally, SAIC was notified prior to the equipment swaps, and made the changes to the ADISS program remotely through the Internet. Occasionally, the call came too late. Then the scow could not track in the six-second mode, so the ADISSLt mode was used by the inspector. ADISSLt estimated the scow position from the tug GPS and the layback distance to the scow. Without draft information, ADISSLt depended on input from the inspector to mark a placement event. Once the scow problems were corrected by SAIC engineers, ADISSPlay was reset to its default values, and the scows were tracked normally from ADISS signals.

A total of five trips were recovered from data stored within the ADISS units, because of ADISSPlay computer failures or software problems. Raw ADISS data was recovered from the scows through the cellular links with other tugs, and processed manually at the SAIC Newport facility before they were displayed on the Internet.

Data recovery rates from previous KVK projects were 92-98% (SAIC, 2002a, 2002c and 2002d).

Plots of each placement and draft record are available on the ADISS web site http://www.adiss-afiss.com/, and can be accessed by choosing a trip number. All show the accurate placement within the designated grids, except for trip #336, which occurred outside the HARS. Figure 3 is a plan-view of all 956 recorded trips to the HARS, and Figure 4 summarizes the 27 trips to the Shark River Artificial Reef Site. The improvement material dredged from the KVK #6 project did not contain significant volumes of water, and dry loads of material placed at the HARS and Shark River Artificial Reef Site were the norm.

The ROCDMP model results for the Shark River Artificial Reef Site (Figure 5) are plotted with the ADISS data from 27 trips over bathymetric survey data acquired in April 2003. Since the placement of the 27 loads from the KVK #6 project took place after April, the results show the estimated position and volume of deposited material over the seafloor. Data acquired from a future bathymetric survey would confirm these modeling results and those within the grid from the KVK #5 placements.

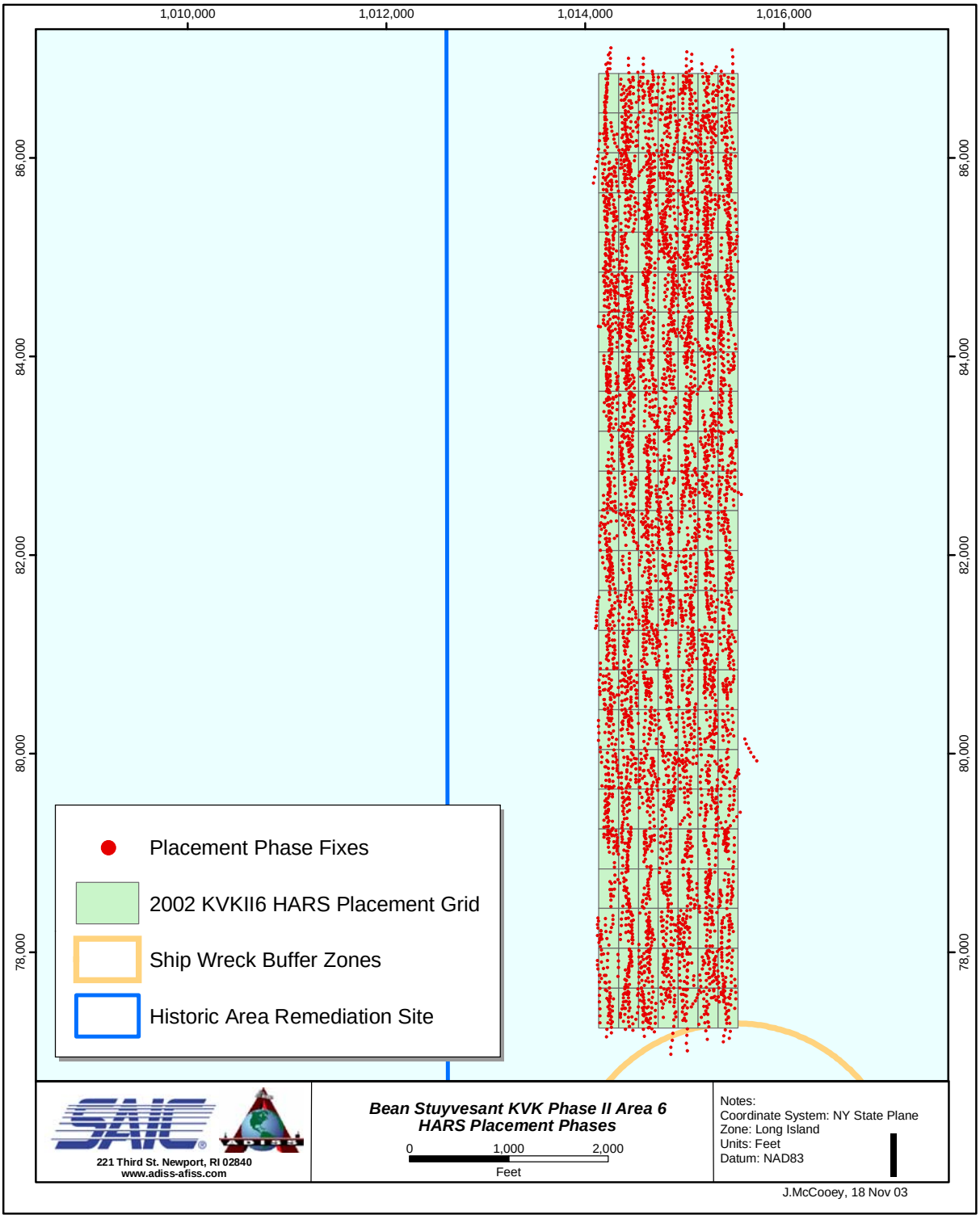

Figure 3. Summary of 956 placements at the Historic Area Remediation Site, Priority Areas #2 and #3 during the KVK #6 project, October 2002 to December 2003.

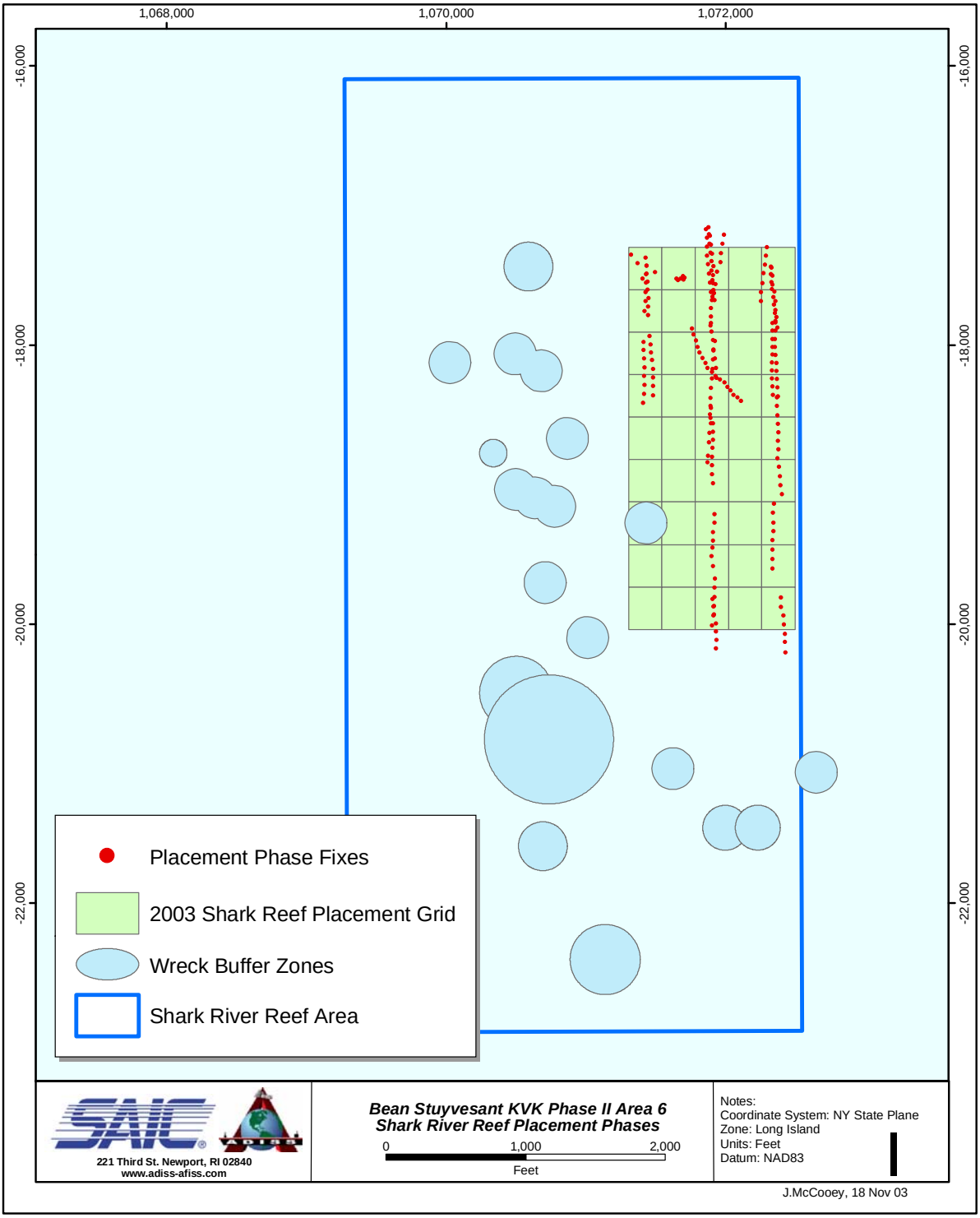

Figure 4. Summary of 27 placements at the Shark River Artificial Reef Site during the KVK #6 project, October 2002 to December 2003.

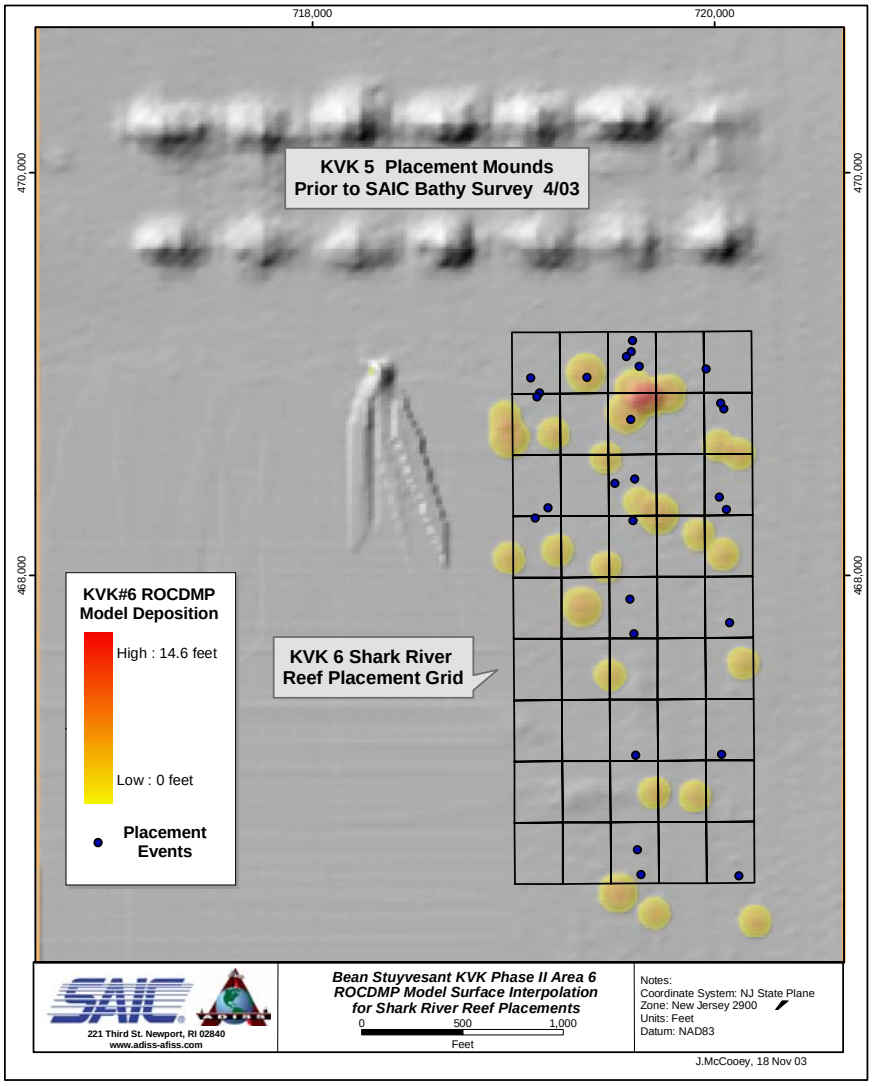

Figure 5. ROCDMP modeling results for 27 placement events at the Shark River Artificial Reef Site predict the location of the material deposited over the seafloor during the KVK #6 project. The model results are highlighted yellow-to-red. (Note: results do not include the contribution of placements made during KVK #5.)

4.0 SUMMARY AND RECOMMENDATIONS

The following summarizes the results of monitoring the placement operations at the HARS and the Shark River Artificial Reef Site during the KVK #6 project:

- ADISS units aboard six scows recorded 98% of all 983 placements, and ADISSPlay aboard nine tugs recorded 99% of all transits to the HARS.

- The ADISS/ADISSPlay-telemetered data provided near real-time updates on the Internet of daily placement activities to NYD using the ADISSWeb program, and the newly instituted means of data transfer utilizing text files and a graphic user interface.

- Transmitted the Inspector log data along with the TPL checklist information were posted on the Internet for display.

- Provided trip numbers from a central computer located at the SAIC Newport facility utilizing two-way cellular communication with the ADISSPlay program installed aboard the towboat.

The following recommendations are suggested to improve HARS and artificial reef site management operations:

- Modify ADISSPlay to allow project grid and parameter switches by the inspector.

- Modify the Inspector log to include the name of the dredge that filled the scow.

- Automatically process ADISS data through ROCDMP, and post results on the web site.

- Modify ADISSWeb to display the bathymetric survey data within each placement grid.

- Acquire and process tug fathometer data from the artificial reef sites, and create a web site display to show depths.

- Create an interface within ADISSWeb to allow adjustments of target cell eligibility.

- Develop the capability to transmit scow leakage and misplacement data via the Low Earth Orbiting (LEO) satellite system.

- Provide a summary of TPL exceptions on ADISSWeb with a query select feature.

5.0 REFERENCES

SAIC. (1998a). New York Disposal Surveillance System: Prototype Description. Report 72 of the New York Mud Dump Site Studies. USACE-WES, Contracts DACW39-94-C-0117. SAIC Report No. 421.

SAIC. (1998b). Letter report to Mr. Brian May, USACE-NYD, presenting the deliverables for the project, ADISS Management Tolls for HARS Disposal Operations. November 1998, from Mr. Steve Pace, Project Manager.

SAIC. (2001). Monitoring Dredged Material Placement Operations at the Historic Area Remediation Site during the Kill Van Kull Contract #1 Project. USACE-CENAN, Contract No. GS-35F-4461G. SAIC Report No. 546.

SAIC. (2002a). Monitoring Dredged Material Placement Operations in the New York Bight during Eight Dredging Projects. USACE-CENAN, Contract No. GS-35F-4461G. SAIC Report No. 576.

SAIC. (2002b). Monitoring Dredged Material Placement Operations at the Historic Area Remediation Site during the Passenger Ship Terminal project. USACE-CENAN, Contract No. GS-35F-4461G. SAIC Report No. 587.

SAIC. (2002c). Monitoring Dredged Material Placement Operations at the Historic Area Remediation Site during the Kill Van Kull Contract 3 project. USACE-CENAN, Contract No. GS-35F-4461G. SAIC Report No. 586.

SAIC. (2002d). Monitoring Dredged Material Placement Operations at the Historic Area Remediation Site during the Kill Van Kull Contract 7 project. USACE-CENAN, Contract No. GS-35F-4461G. SAIC Report No. 614.

SAIC. (2003a). Monitoring Dredged Material Placement Operations at the Historic Area Remediation Site during the Passenger Ship Terminal project. USACE-CENAN, Contract No. GS-35F-4461G. SAIC Report No. 651.

SAIC. (2003b). Monitoring Dredged Material Placement Operations at the Historic Area Remediation Site during the Refined Sugar project. USACE-CENAN, Contract No. GS-35F-4461G. SAIC Report No. 652.