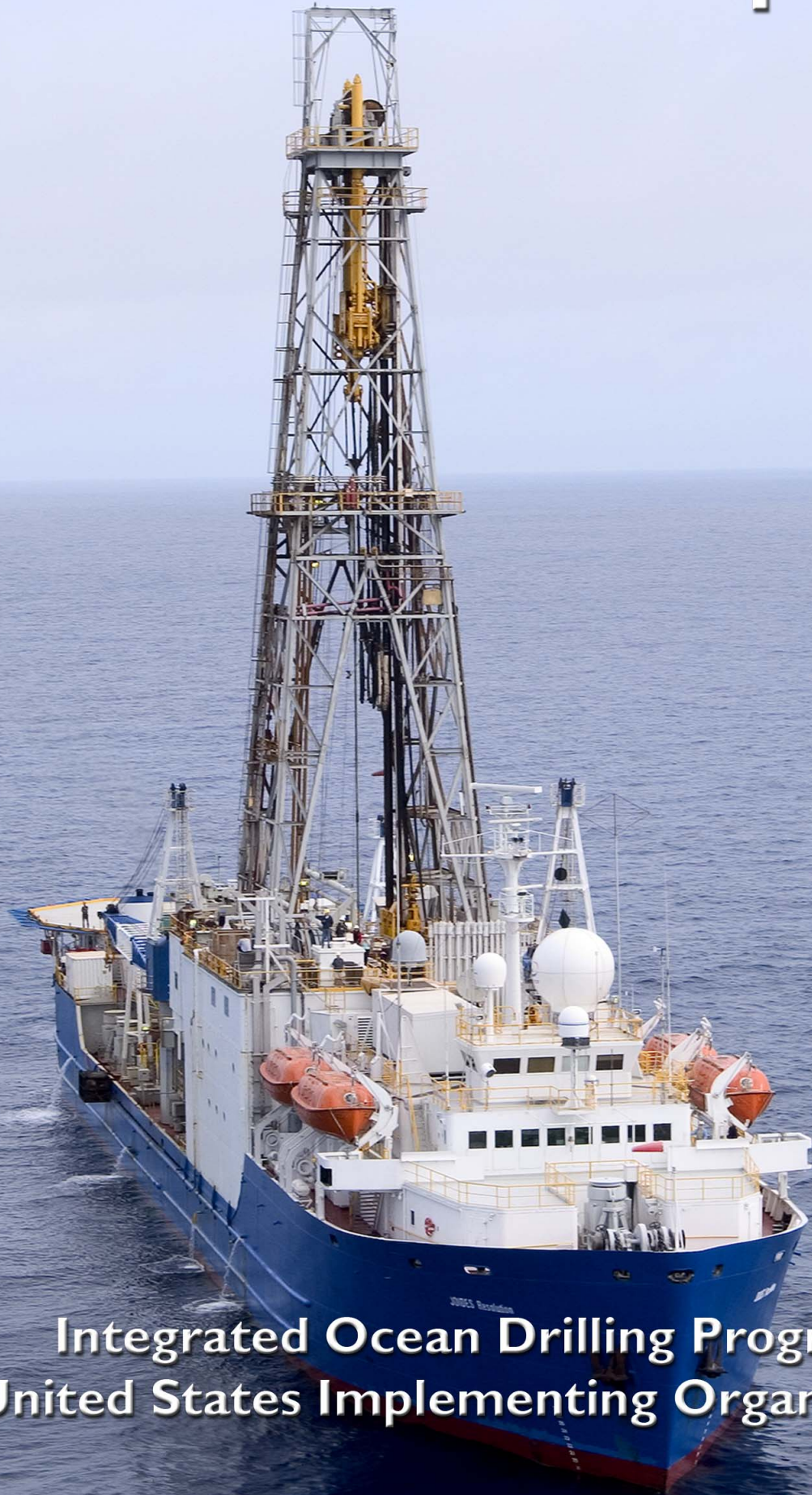


# FY04 Annual Report



Integrated Ocean Drilling Program  
United States Implementing Organization



# **FY04 Annual Report**

## **Integrated Ocean Drilling Program United States Implementing Organization JOI Alliance**

Joint Oceanographic Institutions, Inc.  
Lamont-Doherty Earth Observatory  
Texas A&M University

Contract OCE-0352500

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## DEDICATION



The JOI Alliance dedicates this FY04 Annual Report of the U.S. Implementing Organization, our first in IODP, to the memory and contributions of our friend and colleague Brian Jonasson. Brian was the Manager of the Tools and Analytical Services Department at IODP-USIO Science Services, Texas A&M University, when he was tragically killed in an automobile accident on 18 January 2005. Brian had worked with tireless enthusiasm and dedication in support of the goals of scientific ocean drilling for 8 years (ODP: 1997–2003; IODP: 2003–2005), making many invaluable engineering contributions to the program's ability to make hole and recover core. These enhancements will certainly benefit IODP for many years. As a friend and colleague, Brian will be missed and long remembered.





JOIDES Resolution

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## EXECUTIVE SUMMARY

In FY04, the goals of the United States Implementing Organization (USIO), and the tasks and deliverables for which the USIO is responsible, can be neatly partitioned into three major endeavors: (1) mobilizing the *JOIDES Resolution* in preparation for the commencement of Phase 1 riserless drilling in the new era of the Integrated Ocean Drilling Program (IODP); (2) planning for expeditions scheduled in FY04 and in early FY05, as well as executing FY04 expeditions; and (3) developing and commencing the process to achieve an enhanced riserless scientific ocean drilling capability with the leasing and conversion of a riserless vessel for Phase 2 riserless drilling.

After months of planning, mobilization of the *JOIDES Resolution* began in Gamagori, Japan, on 1 June 2004, when the riserless vessel went on contract with the USIO and JOI Alliance staff members joined the riserless vessel, loaded necessary equipment, and began the task of making the laboratories and the network functional. The JOI Alliance staff continued work on the laboratories and network during a 17 day transit across the Pacific Ocean. When the *JOIDES Resolution* arrived in Astoria, Oregon, USA, more than 40 truckloads of equipment were waiting for the riserless vessel, and, during a 9 day port call, mobilization tasks were completed and the riserless vessel departed for Expedition 301 (Juan de Fuca Hydrogeology). During Expedition 301, we successfully conducted one of the most complex hole completions and instrument installations attempted during the 30 year history of scientific ocean drilling. The expedition was followed by a long transit to St. John's, Newfoundland, Canada, during which time the retrieval and replacement of sampling devices in two ODP holes were successfully accomplished (Expedition 301T [Costa Rica Hydrogeology]). The success of these two expeditions owes a great deal to the teamwork exhibited by the scientific parties and the JOI Alliance staff as they worked together from the accelerated and compressed initial planning stages to instrument installation. Moreover, a great deal was learned and these lessons will be factored into the planning and implementation process when expeditions like this are scheduled in the future.

Throughout FY04, a vast majority of the JOI Alliance staff were focused on the mobilization of the *JOIDES Resolution* and support of scheduled expeditions. In parallel with these activities, a few JOI Alliance staff members devoted time to preparing and planning for the acquisition and refurbishment of a riserless drilling vessel for IODP-USIO Phase 2 operations. As part of this planning, a Project Execution Plan, which outlined the preliminary statement of work and timetable for the acquisition and conversion effort, was developed and delivered to the National Science Foundation (NSF) for review, a market survey of vendor equipment was conducted, and an invitation to tender to assess drilling vessel contractors' willingness to bid on this future work was executed. These planning documents and information gathering efforts were essential to the development of the Request for Proposals (RFP) to

provide a Scientific Ocean Drilling Vessel (SODV) that was released near the end of the fiscal year.

Mobilizing a riserless vessel, implementing scientific drilling expeditions throughout the global ocean, and making plans for a next-generation riserless drilling vessel are challenging tasks under the best of circumstances, but in FY04 these endeavors had to be integrated with requirements and conditions associated with the commencement of a new 10 year chapter of scientific ocean drilling, as well as the escalation of fuel prices.

**Systems Integration Management:** The JOI Alliance system integration management model, which collaboratively links the institutional components that comprise the USIO—Joint Oceanographic Institutions, Inc. (JOI), Lamont-Doherty Earth Observatory (LDEO) of Columbia University, and the College of Geosciences, Texas A&M University (TAMU)—was successfully incorporated during FY04, and we are pleased with the outcomes, which include better utilization of resources and more efficient and collaborative program plan development and implementation. Establishing this new management model and creating these cross-functional teams necessitated a change in culture, requiring time and effort to institute a new way of doing business. The JOI Alliance chose to phase in the creation of the teams during the first 6 months of FY04 so that this transition to a new integrated management model would be seamless, proving beneficial from the very start. In addition to creating a new JOI Alliance management model, important changes took place at the institutional level that were designed to better support

scientific riserless drilling activities. At JOI, a permanent Director of Ocean Drilling was hired to oversee USIO activities, and at TAMU, the science operator reorganized the staffing structure so that the functional departments were better configured to support the scientific deliverables for which the USIO is responsible. LDEO was well configured to support IODP objectives, so no significant changes were made to that organization’s management model. However, at a variety of team meetings throughout the JOI Alliance during FY04, all staff members were briefed on the role of the USIO in IODP, the ways in which the JOI Alliance was going to function in support of IODP, and the reasons why IODP was a new and different chapter in scientific ocean drilling with new requirements and expectations.

**Expedition Planning:** Because the scheduling of FY04 and FY05 riserless drilling expeditions for the *JOIDES Resolution* was not confirmed until approximately the start of FY04, the JOI Alliance was faced with a very abbreviated engineering, scientific, and logistical planning cycle for the legs scheduled in the last quarter of FY04 and the first quarter of FY05 (see table below). The majority of the expeditions (i.e., Expedition 301 and Expeditions 304 and 305 [Oceanic Core Complex Foundation, Atlantis Massif]) were particularly challenging in terms of their scientific goals and the preplanning and engineering requirements that were necessary to support these goals. Preliminary meetings were held in the late fall of FY04 to clarify and refine scientific objectives so that the JOI Alliance support staff could rigorously plan, cost out the expeditions, and procure the equipment needed to support them. However,

Cruise		Port of origin	Dates
Transit		Gamagori, Japan	1–20 June 2004
Mobilization		Astoria, Oregon	20–27 June 2004
Juan de Fuca Hydrogeology	301	Astoria, Oregon	27 June–20 August 2004
Costa Rica Hydrogeology/Transit	301T	Astoria, Oregon	20 August–25 September 2004
North Atlantic Climate 1	303	St. John’s, Newfoundland	25 September–17 November 2004
Oceanic Core Complex 1	304	Ponta Delgada, Portugal	17 November 2004–8 January 2005
Oceanic Core Complex 2	305	Ponta Delgada, Portugal	8 January–2 March 2005
North Atlantic Climate 2	306	Ponta Delgada, Portugal	2 March–25 April 2005

plans continued to evolve through the winter of FY04 as the scientific requirements were better understood and engineering designs were finalized for the hydrogeology investigation on Expedition 301 (Circulation Obviation Retrofit Kit [CORK]-II, umbilicals for sampling, and casing string) and the deep crustal penetration on Expeditions 304 and 305 (hammer drill, reentry cone, and casing string). The long-lead-time equipment (e.g., procurement and fabrication) needed to support the scheduled expeditions could not be ordered until after engineering hole completion designs were finalized, creating a very compressed schedule for the acquisition of equipment necessary to support Expedition 301. The JOI Alliance was able to mobilize all the necessary equipment in time for Expedition 301, but some equipment was delivered from vendors just days before the *JOIDES Resolution* was scheduled to sail.

Although Expedition 301 was a success, some mistakes were identified, and the JOI Alliance is working with the IODP science advisory committees and IODP Management International, Inc. (IODP-MI), to create a proposal review and evaluation process that allows for a 24 month expedition planning cycle to ensure that there is sufficient time to define an expedition's science requirements, thereby providing adequate time for engineering design and analytical tool and wireline sensor requirements to be identified and for requirements to be budgeted, procured, and, if appropriate, tested.

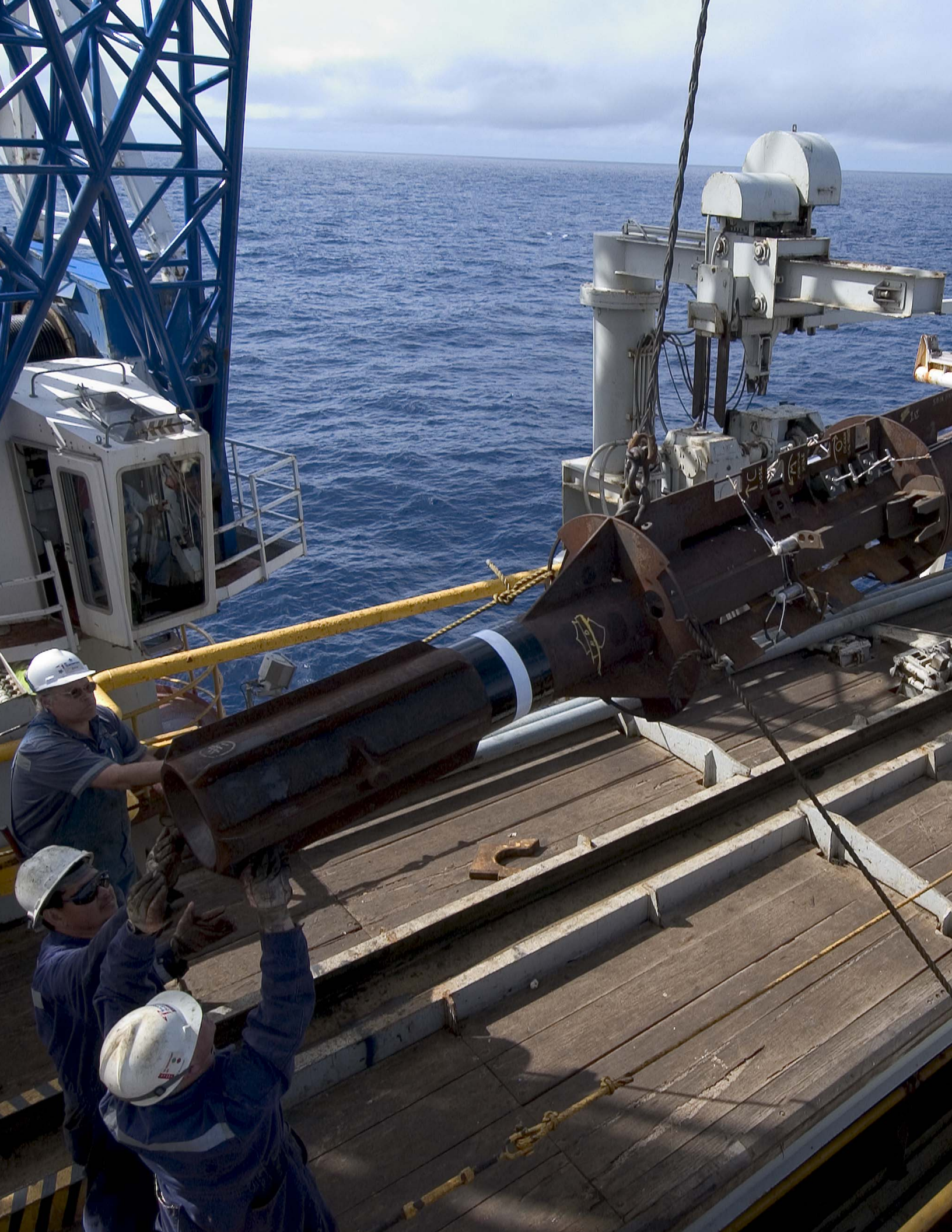
**Ancillary Science Activities:** In addition to the shortened expedition planning cycle for FY04 expeditions, an opportunity arose in the third quarter of FY04 to insert a short scientific exercise of 3 days following the culmination of Expedition 301, when the *JOIDES Resolution* was in transit from Astoria to St. John's. The goal of this exercise, named Expedition 301T, was to recover sampling devices left in two existing holes during

Ocean Drilling Program (ODP) Leg 205 and to replace the recovered instruments with new sensor strings. Fortunately, the fabrication of the new sensor packages was done by a third party that worked in collaboration with our engineers; however, this was another engineering requirement that had to be accommodated within a compressed planning cycle, and the resulting effort stretched our engineers who support downhole tool installation.

**Fuel Prices:** Fuel prices were volatile in FY04, and the overall trend during the year was for prices to increase approximately \$200 per metric ton over the IODP-USIO FY04 Program Plan forecast of \$268 per metric ton. The *JOIDES Resolution* had fueling opportunities in Gamagori, Astoria, Panama City, Panama, and St. John's, and we tried to be strategic in our purchases, buying only the volumes of fuel that we needed for safe and prudent operations and taking on extra fuel when the fuel prices were in our favor. Nevertheless, with fuel prices ranging from \$378 to \$448 per metric ton throughout the year, we experienced an increase in fuel costs of approximately \$900,000 over what was originally budgeted. Savings were found in other platform operation cost centers throughout the JOI Alliance and by freezing new positions at TAMU to offset this increase. In addition, the FY04 budget was increased in the third and fourth quarters to offset an escalation in operating costs of which fuel was a major factor.

Although the JOI Alliance had to deal with challenges associated with the transition to IODP and all the related complexities, the JOI Alliance successfully mobilized the *JOIDES Resolution*, implemented scientific riserless drilling operations, and set in motion a process to acquire and refurbish a riserless drilling vessel for IODP-USIO Phase 2 operations.









# SCIENTIFIC AND OPERATIONAL HIGHLIGHTS

## Mobilization

Preparatory to initiating the IODP-USIO drilling program, the Texas A&M Research Foundation (TAMRF) signed a letter of agreement with Transocean for the services of the *JOIDES Resolution*. The vessel was placed into service for IODP effective at 0000 hours on 1 June 2004. Subsequent negotiations lead to a contract with Transocean being signed on 8 June 2004.

Before operations could begin, it was necessary to mobilize and reoccupy the vessel, which was alongside Pier 4 in Gamagori. The goal of the mobilization effort was to prepare the riserless vessel and laboratories for the resumption of scientific drilling. The mobilization effort began with the acceptance and reoccupation of the vessel in Gamagori. On 1 and 2 June 2004, all incoming air and surface freight (mostly laboratory instruments, computers, and related equipment) were loaded. Once equipment and technical staff members were aboard, the vessel departed on an approximately 17 day transit to Astoria. During the transit across the Pacific Ocean, the technical staff prepared the information and technology infrastructure, equipped the laboratories, and calibrated/tested the newly installed instruments.

One of the first tasks was to reinstall laboratory equipment on the *JOIDES Resolution* that had been removed during the ODP demobilization. After that task was completed, the staff ensured that the shipboard laboratories were operational and stocked with adequate supplies and that the necessary coring equipment was ready for shipboard operations. Tasks that were executed by the technical support staff included

- performing physical counts in all storerooms and laboratories
- inspecting and testing computer network cables in the lab stack and bridge deck offices to a gigabyte standard
- setting up and calibrating the multisensor track (MST)
- installing and testing new computer programs in the paleomagnetism laboratory
- entering vessel locations of government-owned property into the property database
- installing the microbiology pumps
- mounting unistruts in the lower tween deck core refrigerator
- setting up the thin section laboratory
- replacing the fluorescent lights in the core laboratory with full-spectrum units
- restocking the library with books and reference materials
- inspecting, testing, and inputting data into the Janus database

The *JOIDES Resolution* also needed to be outfitted for information technology (IT) operations with workstations, servers, printers, a

plotter, and network and satellite equipment. This major effort began in early FY04 and continued through the port call in Astoria. A complete assessment of the computer and network infrastructure was performed to determine what equipment and software were required for Phase I. This task was successfully completed during the first quarter of the fiscal year and was followed by the acquisition of needed equipment, which included 51 new Windows and Macintosh workstations, 3 new tape drives, 59 new monitors, 10 new laser printers, 4 new bar code printers, a new 42 inch color plotter, and a new DVD duplicator.

At the commencement of mobilization, IT staff inspected network equipment left on board at the end of ODP; dismantled, cleaned, reassembled, and tested all network switches; and planned for installation and testing of the computer and network equipment during the transit. In preparation for this task, all new equipment and equipment transferred from ODP was prepared and shipped to Gamagori prior to the start date. This included two upgraded Novell servers, upgraded Sun workstations, disk storage arrays, and a cluster of SUN SOLARIS servers.

During the transit to Astoria, all IT equipment and software were installed, tested, and readied for Expedition 301: the very small aperture terminal (VSAT) satellite communications system was reconfigured for additional throughput, as well as the appropriate routing separation of the IODP-USIO network and the Transocean ship network; the USIO data network was tested, repaired, and certified for proper operation; and all required equipment and software was installed. During the Astoria port call, the fiber optic backbone of the data network was cleaned and certified by a telecommunications contractor.

To provide global data management and communications services on board the riserless vessel, the level of satellite (VSAT) services used on the *JOIDES Resolution* during ODP was reestablished. During the first half of the fiscal year, USIO staff members gathered specifications and requirements for the system and issued a RFP/request for quotes in March 2004. The vendor, Rignet, was selected in early April 2004. With a

very short time frame to ship and install a satellite dish and attendant equipment prior to the mobilization, it was decided to use existing equipment already installed on the *JOIDES Resolution*. Arrangements were made with the satellite space segment provider to provide a total of 256 kb bandwidth of service to the riserless vessel, of which the USIO would use 192 kb and Transocean would use 64 kb. Additionally, access from the riserless vessel to the Internet was established as part of the TAMU campus network.

The Transocean drilling crew was also busy during the transit, performing routine maintenance, installing hardware upgrades, and preparing for the Astoria port call. Activities of note that were performed:

- The bulk inlet strainers and chemical lines were serviced.
- The top drive umbilical hydraulic and air lines were replaced.
- 31.9 short tons of sepiolite into a prehydrated solution in mud pits 5 and 6 were mixed up.
- The drawworks brake band was replaced.
- The mixing gun and mud pump lines were flushed with soluble oil.
- The drawworks chain was inspected and serviced.
- Certified high-pressure relief discs were added to the mud pump lines.
- A blocked section of piping in the bulk supply line was removed, cleared, and replaced.
- A reentry cone was assembled and placed in the moon pool.
- Upgrades were performed on the cement manifold system in accordance with previously noted engineering recommendations.
- Mounting racks were fabricated in the upper sack storage to accommodate a set of Griffen Vector drilling jars and shock sub.

During the Astoria port call, drill pipe, casing, and expedition-specific hardware and equipment were loaded. More than 40 truckloads of tubular goods were delivered to Astoria for loading. Drill pipe loaded in Astoria included 130 joints of 5 1/2 inch pipe, 408 joints of S-135 pipe, and 348 joints of S-140 pipe. Drill collars, bits, and bulk material were also loaded, as well as casing, CORK-II assemblies,

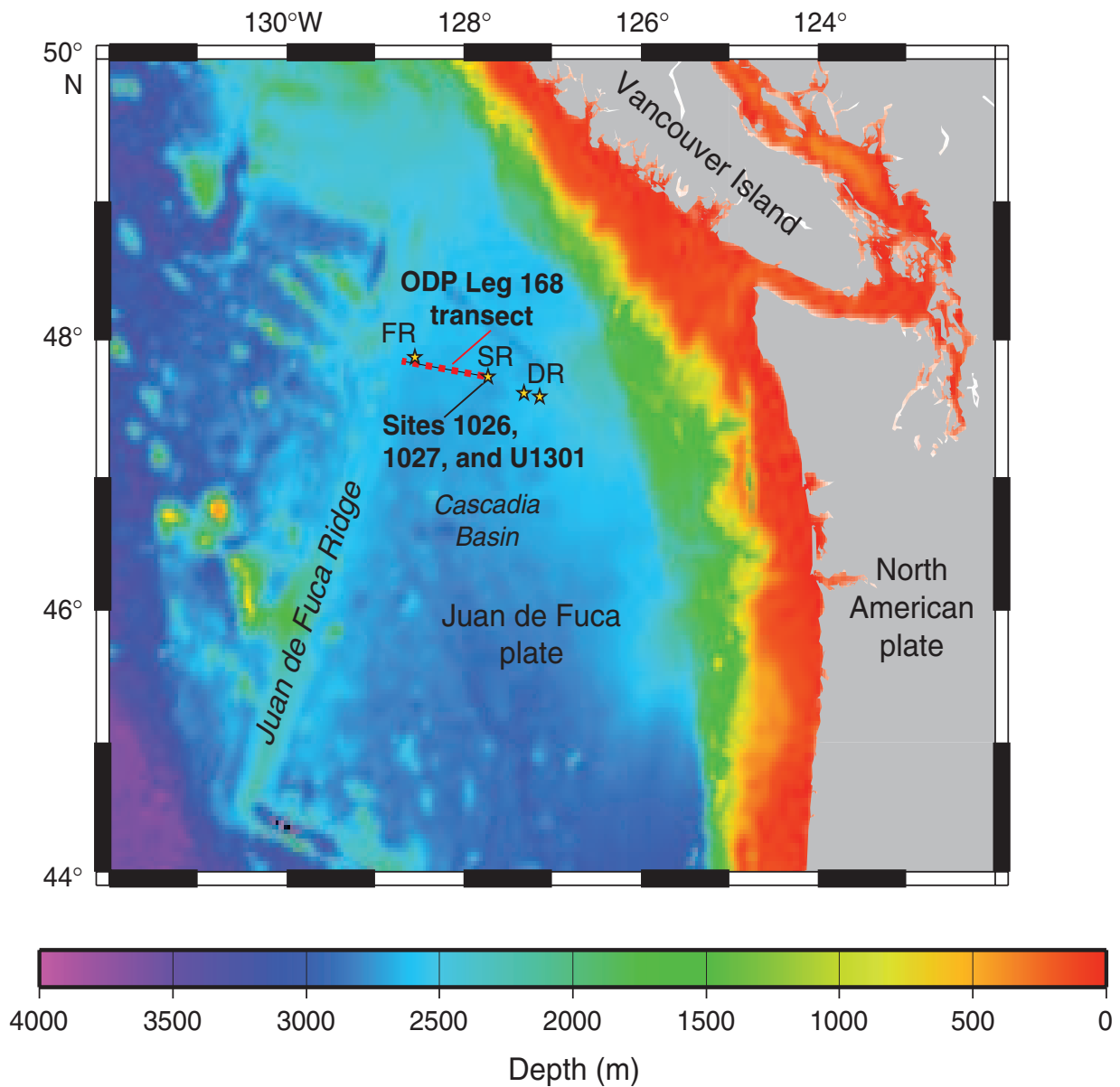


umbilicals, and hoses required for Expedition 301. The Schlumberger logging winch was removed and replaced by a new heave-compensated logging winch. All Schlumberger tools and equipment were loaded and calibrated. A final review of IT systems and services was also conducted during the port call. Loading was completed and the vessel departed on Expedition 301 on 27 June 2004.

## IODP-USIO Expedition 301: Juan de Fuca Hydrogeology

Expedition 301 (see site map below) was among the most complex scientific ocean drilling cruises yet attempted and required substantial commitment of resources and significant precruise planning. The expedition was the first part of a multidisciplinary program designed to (1) evaluate

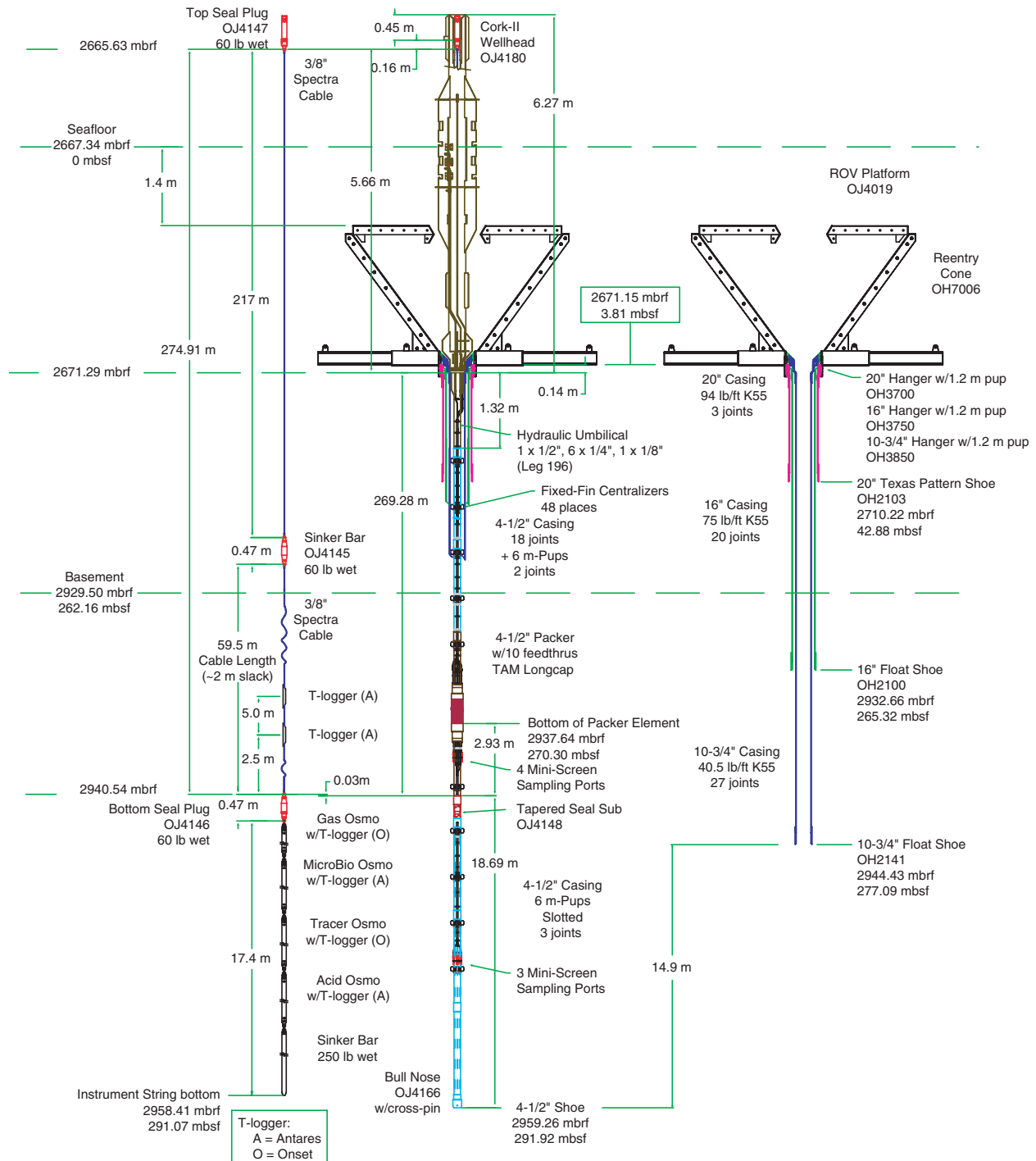
*Regional bathymetric map showing the locations of IODP Expedition 301 drill sites, the ODP Leg 168 drilling transect, and major tectonic features.*



formation-scale hydrogeologic properties within oceanic crust; (2) determine how fluid pathways are distributed within an active hydrothermal system; (3) establish linkages between fluid circulation, alteration, and microbiological

processes; and (4) determine relations between seismic and hydrologic anisotropy. Expedition 301 commenced on 27 June 2004, when the *JOIDES Resolution* departed Astoria and concluded when it returned to the same port on 20 August 2004.

Schematic showing the Hole UI301A reentry cone and borehole casing (right), CORK borehole completion (center), and the instrument string deployed through the 4 1/2 inch casing (left).



## ***Expedition Implementation***

Implementation of this expedition was significantly impacted by a number of issues and risks, including the short time between scheduling and expedition execution, the initiation of IODP, the mobilization of the *JOIDES Resolution*, staff turnover, the need to integrate a large group of third-party observatory scientists and requirements (which necessitated three precruise planning meetings), and late timing in finalizing some designs. Nevertheless, the array of hardware required for two new CORK installations, called CORK-IIs, and two replacement CORKs was successfully provided, and nearly all of the primary cruise objectives as stated in the Scientific Prospectus were achieved. These included installing two new CORKs and replacing one (in ODP Hole 1026B). CORKs installed during Expedition 301 are newly designed third-generation (CORK-II) well head completions (see figure below). The complex design includes a long 4 1/2 inch casing string, packers, multiple miniscreens, osmotic samplers, and thermistors for the multiple zones to be isolated, sampled, and monitored. An umbilical containing 10 hydraulic lines is required. In addition, there is a separate microbiology sampling hose. IODP Holes U1301A and U1301B penetrate 108 and 320 meters into basement, respectively. All of the holes have multiple isolated intervals that will be monitored for pressure, temperature, chemistry, and microbiology and will serve as observatory points for planned future cross-hole experiments. Short-term downhole experiments (logging, vertical seismic profiling, and packer tests) were also completed, and high-quality sediment and rock samples were recovered. A more complete account of Expedition 301 operations and scientific results is contained in the Preliminary Report available at [iodp.tamu.edu/publications/PR/301PR/301PR.html](http://iodp.tamu.edu/publications/PR/301PR/301PR.html).

Four wireline logging strings were run in Hole U1301B to characterize formation properties at a scale intermediate between hand samples and regional seismic data. The triple-combination (triple-combo) tool string (natural gamma ray, lithodensity, porosity, and spontaneous potential) penetrated essentially to total depth, yielding excellent data over most of the open hole (350–

580 meters below seafloor [mbsf]), and provided the locations of the best intervals for subsequent packer experiments. Unfortunately, subsequent logging strings (Formation MicroScanner, sonic, borehole televiewer, and vertical seismic profile) could not penetrate across an obstruction at 410 mbsf, limiting data collection to the uppermost part of the cored interval. Data were also collected through casing, but data from this interval are highly attenuated. A vertical seismic profile run over a depth range of approximately 360–420 mbsf (100–160 meters subbasement) was used to provide interval velocities in upper basement (approximately 5.0 km/s).

Actual operations during Expedition 301 differed from the Scientific Prospectus in two significant ways: (1) the CORK in ODP Hole 1027C was not replaced and (2) penetration into basement in Hole U1301B was less than was originally envisioned. This was partly due to our not being able to set casing as deep into the crust with a seafloor seal inside 16 inch casing as had been planned and partly because of difficulties that ensued as a result of unsuccessful cementing operations that were attempted in the absence of a seafloor casing seal. Several other operational challenges (reentry cone settling, casing failures, and unplanned fishing operations) required development and implementation of real-time engineering and operational solutions with a substantial component of shore-based support.

## ***Expedition 301 Operations and Engineering/Technical Support***

Major operational achievements accomplished during Expedition 301 include the following:

- Two CORK-II completion wellheads were successfully installed at IODP Site U1301 (proposed Site SR-1A). This included a shallow basement sampling installation (Hole U1301A) with a single casing packer set 8.1 meters into basement and a deep basement installation (Hole U1301B) completed with two casing packers set at 165.1 and 208.3 meters into basement. The later is the deepest basement CORK sampling interval on record.
- Using a rig-fabricated fishing tool, a 1 meter diameter aluminum reentry funnel was



removed from the top of the ODP Hole 1026B CORK wellhead, paving the way for a successful CORK replacement operation.

- A CORK assembly initially installed during ODP Leg 168 was successfully recovered from Hole 1026B.
- A new (third generation) CORK-II was successfully installed in Hole 1026B with a single casing packer. New osmotic samplers and thermistors were also installed.
- One of the deepest hydrologic tests in oceanic crust in the world was conducted.
- The longest duration hydrologic test in scientific ocean drilling was conducted.
- The advanced piston corer (APC) coring system was successfully used to collect pristine microbiological core samples throughout the sediment column and particularly deep (265.3 mbsf) samples from just above basement.
- Using another rig-fabricated fishing tool, a biocolumn sampler was successfully removed from the Hole 1026B reentry cone. This item was inadvertently lost (dropped) through one of the holes in the installed CORK remotely operated vehicle (ROV) platform by a previous microbiology visit to the drill site.
- Using a third rig-fabricated fishing tool, a failed (first installation attempt) 4 1/2 inch casing string and three casing packers were successfully fished from Hole U1301B.
- The fourth rig-fabricated fishing tool was used to engage another joint of 4 1/2 inch casing that was sticking vertically out of the seafloor directly adjacent to the Hole U1301B reentry cone. This obstacle had to be removed because it posed a serious threat to future ROV/ submersible operations on site.
- A new mechanical release system was used in the deployment of the CORK ROV platforms. The first deployment was successfully used in combination with the wireline. The system was used with the vibration-isolated television (VIT) camera during the last deployment, providing visual verification of proper landing and expediting the operations.
- Logging operations were successfully conducted in Hole U1301B including the triple combination (triple combo) and Formation MicroScanner sonic tool strings, the Ultrasonic Borehole Imager, and the Well Seismic Tool. In addition, the SlimXtreme Array Induction Tool was successfully integrated into the Schlumberger triple combo tool string and good-quality data were acquired. As a result of this successful test, the tool is being considered as an eventual replacement for the aging Dual Induction Tool.
- A shear pin locking system was conceived/ designed by coring technicians and, with the aid of IODP-USIO Science Services, TAMU, shipboard engineers, was rig-fabricated and utilized in the CORK running tools to prevent a possible premature release of a CORK during deployment.
- Three helicopter transfers were conducted to supply a number of needed items, including hardware to lengthen one CORK head to account for a subsided reentry cone and hardware that was not supplied to the riserless vessel in port.

The primary hole initially required four instrumented zones hydraulically isolated for chemistry, biology, and hydrogeology experiments. The operations plan was changed to split the primary, deep installation into two less complex installations. A new mechanical release mechanism for deploying the ROV platform was designed to replace the acoustic release. Additional activities included the preparation, testing, and calibration of three advanced piston core temperature (APCT; Adara) tool electronics, a Davis-Villinger temperature probe (DVTP), and Davis-Villinger temperature-pressure probe (DVTPP) tools. The Rig Instrumentation System that provides for real-time monitoring and electronic storage of drilling parameters and vessel motion was reinstalled. After some initial sensor setup and electrical problems, the system performed well and provided useful information. A new digital close-up image data management application was deployed in the shipboard laboratories during Expedition 301 to enter close-up metadata into the Janus

database. Scientists are now able to access digital close-up images on the riserless vessel in real time.

## IODP-USIO Expedition 301T: Costa Rica Hydrogeology/Transit

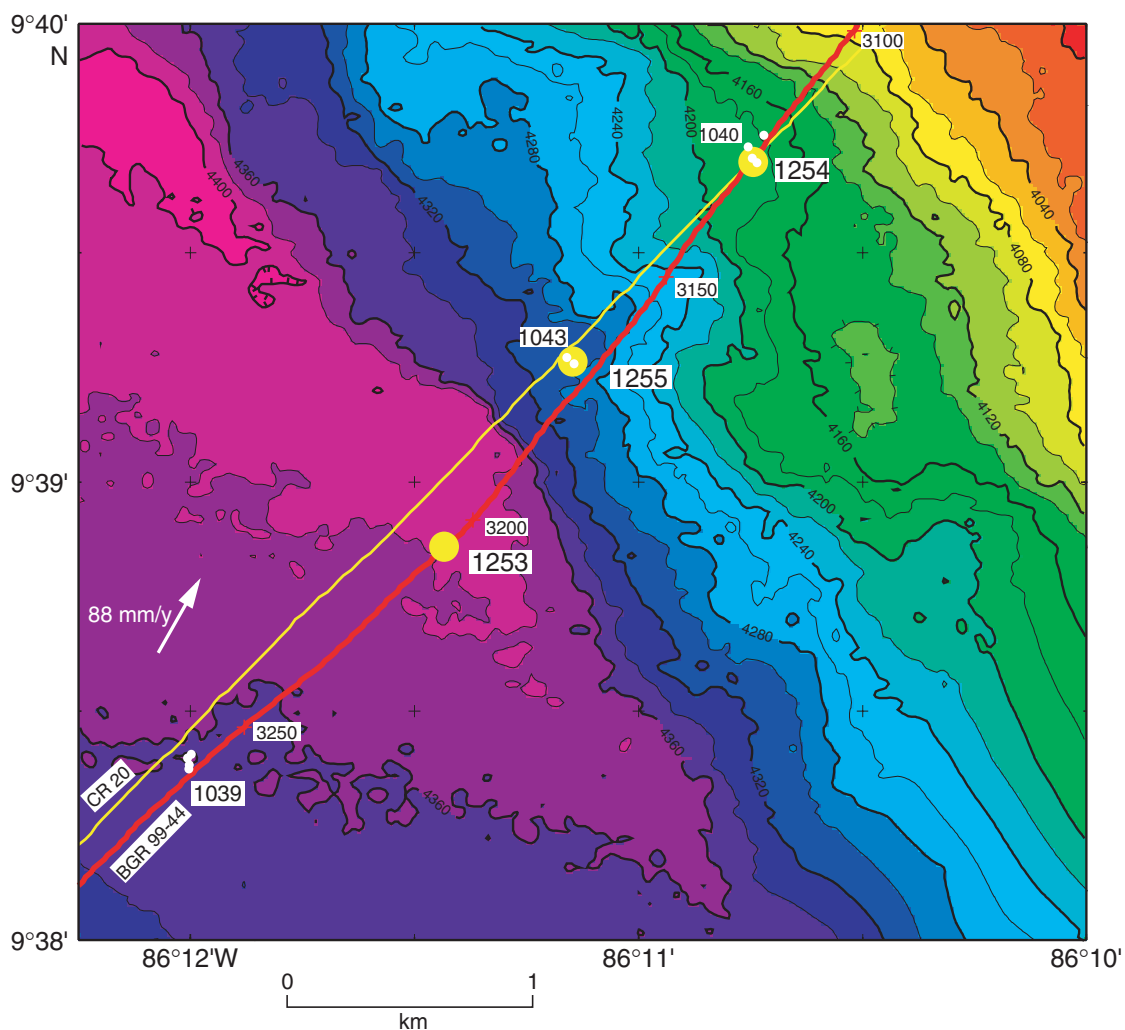
Following Expedition 301, the *JOIDES Resolution* made a transit from Astoria to St. John's. This provided an opportunity to conduct limited operations off Costa Rica.

The principal objective during Expedition 301T was to recover OsmoSamplers installed at Sites 1253 and 1255 during ODP Leg 205 and to install

replacement OsmoSamplers (see site map below). Operations at Site 1255 were completely successful. At Site 1253, we recovered the float and some of the Spectra line attached to the OsmoSamplers, but the line parted, allowing the OsmoSamplers to fall to the seafloor. A more complete account of Expedition 301T operations and scientific results is contained in the Preliminary Report available at [iodp.tamu.edu/publications/PR/301TPR/301TPR.html](http://iodp.tamu.edu/publications/PR/301TPR/301TPR.html).

Expedition 301T ended on 25 September 2004, when the riserless vessel entered St. John's 3 days later than scheduled because of bad weather during the transit north from the Panama Canal.

Regional bathymetric map of the ODP Leg 205 drilling area revisited during Expedition 301T.



### ***Expedition 301T Operations and Engineering/Technical Support***

In preparation for Expedition 301T, Modifications to the OsmoSampler recovery system (CORK reentry tool) were designed and fabricated by an outside contractor at the expense of the principal investigator. Two instrument strings were successfully removed from the two sites, although part of one string was lost during the recovery process at Site 1253, and two replacement instrument strings were successfully installed. The work required 3 days of riserless vessel time and was accomplished successfully. The only untoward incident occurred at Site 1253, when the Spectra line parted during recovery of the OsmoSamplers, allowing them to fall to the seafloor. After

installing the replacement at both sites, a search of the seafloor around Site 1253 was conducted with the VIT. After 7 hours of survey, the upper sampler was found on the seafloor within about 20 meters of the wellhead. This was successfully grappled and recovered using a fishing tool fabricated on board the vessel. The whereabouts of the lower OsmoSampler and sinker bar remain uncertain.

### ***IODP-USIO Expedition 303: North Atlantic Climate 1***

IODP-USIO Expedition 303 (North Atlantic Climate 1) commenced on 25 September 2004, and port call activities were completed on 30 September 2004.





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## ACCOMPLISHMENTS

IODP-USIO contractual requirements are outlined in the IODP-USIO FY04 Program Plan under the following categories or elements: Management and Administration, Science Services, Data Management, Curation, Publication Services, Education and Outreach, and Platform Services. Each of these elements is discussed below.

Under guidance from NSF, a IODP-USIO FY04 Program Plan was developed in consultation with the JOI Alliance subcontractors for inclusion in the integrated IODP FY04 Program Plan assembled by the IODP-MI interim office. This plan was approved at the first meeting of the Science Planning and Policy Oversight Committee (SPPOC) in December 2003, but revisions were necessary to finalize the plan, as outlined below.

### Management and Administration

The IODP-USIO Management and Administration element encompasses the activities related to management of all tasks to ensure that deliverables are met in accordance with NSF and IODP-MI requirements.

The JOI Alliance had many challenges in managing and administering the U.S. Systems Integration Contract (SIC) for IODP in this first year, which included a fast start-up of activities immediately after contract award, in parallel with tasks that followed demobilization of the *JOIDES Resolution* at the end of ODP field operations, as well as the necessity to secure the continued use of the *JOIDES Resolution* for IODP-USIO Phase I and to interact with a wide range of stakeholders and other organizations. At the same time, we needed to respond to the needs of NSF and the newly created IODP central management office, IODP-MI, which was established first as an interim office located in Austin, Texas, USA, and later as a permanent office with branches in Washington, D.C., USA, and Sapporo, Japan. In FY04, although there was no formal contract between the JOI Alliance and IODP-MI, we worked hard to coordinate decision-making, implement program plan actions, and establish open and frequent communications.

### *Subcontracts*

One of the first actions of the fiscal year was to establish contract relationships between JOI and the College of Geosciences at TAMU through TAMRF and between JOI and LDEO through subcontracts that formally establish the JOI Alliance for IODP. The goal of having the riserless vessel leave port for its first IODP expedition in June 2004 placed immediate demands on the JOI Alliance that were reflected in the IODP-USIO FY04 Program Plan and the activities undertaken in the first months of the fiscal year.

## ***Indemnification***

A primary task for the JOI Alliance was securing government approval from NSF for indemnification under 10 U.S. C. 2354 for liabilities arising from drilling-peculiar risks, such as damage to underground reservoirs; pollution of, contamination to, degradation of, or other damage to the environment caused by blowout, loss of well control, or seepage of underground fluids; costs of control of blowout or wild well; costs of drilling one or more relief wells; third-party liabilities; and seafloor cables and associated loss of revenue. This process was initiated by sending a letter with all appropriate information to NSF in February 2004. The request was evaluated and approved by the time the *JOIDES Resolution* was mobilizing for IODP-USIO operations.

## ***Annual Program Plan Development***

The preliminary IODP-USIO FY04 Program Plan initiated the USIO scope of work for IODP program activities and deliverables for the fiscal year. It was based on the FY04 mission forecast (see below) and recognized that the complex nature of IODP operations would eventually require multiyear program plans to establish priorities and to allow the procurement of long-lead-time equipment and services. The IODP Science Advisory Structure (SAS) reviewed and prioritized science proposals to recommend an operations schedule that reflects the requirements of the IODP for the near term (1–2 years), which formed the basis for the mission forecast.

IODP-MI, working together with the other implementing organizations and with input from IODP funding agencies (NSF, the Ministry of Education, Culture, Sports, Science, and Technology [MEXT], the European Consortium of Ocean Research Drilling [ECORD], and other national funding agencies), provided guidance and instruction to the USIO on the preparation of the USIO contribution to the integrated IODP FY04 Program Plan. The IODP-USIO FY04 Program Plan included a discussion of the goals of the USIO, all tasks and deliverables, schedules of activities, definitions of projects, and required budgets that

incorporated funding allocations for science and platform operations.

On behalf of the JOI Alliance and as outlined in the IODP-USIO FY04 Program Plan, TAMRF contracted with Transocean for the services of the *JOIDES Resolution* as currently configured for use as the riserless drilling vessel for Phase I activities in IODP. In support of the riserless vessel, the JOI Alliance provided the full array of science, operations, logging, engineering, information technology, technical, and publications services; laboratory facilities; core repositories; and administrative services. In addition, LDEO contracted with Schlumberger for the provision of downhole logging equipment and engineering support during FY04. Schlumberger provided a set of services comparable to those provided for ODP in the past.

Following the submission of the preliminary IODP-USIO FY04 Program Plan, corrections and modifications were required before final acceptance by NSF and implementation of the operational activities in FY04.

## ***IODP-USIO FY04 Mission Forecast from NSF***

As called for in NSF Contract OCE-0352500, NSF sent the JOI Alliance a memorandum outlining the FY04 mission forecast for the USIO as the U.S. System Integration Contractor for IODP. The program start-up schedule required that the preliminary IODP-USIO FY04 Program Plan be produced after FY04 began. The SPOCC and the lead agencies endorsed this program plan in December 2003. The mission forecast stated that from the IODP-USIO FY04 Program Plan, the following expedition projects should be drilled in FY04: 545-Full3 Juan de Fuca Ridge Flank Hydrogeology (Part I) and 572-Full3 N. Atlantic Neogene–Quaternary Climate (first portion of Part I). Furthermore, the mission forecast directed the USIO that the following expedition projects should be planned to drill in FY05: 572-Full3 N. Atlantic Neogene–Quaternary Climate (remainder of Part I), 512-Full3 Atlantis Oceanic Core Complex (Part I), 512-Full3 Atlantis Oceanic Core

Complex (Part II), 572-Full3 N. Atlantic Neogene–Quaternary Climate (Part II), and 543-Full2 Norwegian Margin Bottom Water.

## ***USIO FY04 Budget Definitions***

### **Platform Operating Costs Versus Science Operating Costs**

The development of budgets for the IODP-USIO FY04 Program Plan required certain assumptions to guide the allocation of JOI Alliance costs into platform operating costs (POCs) and science operating costs (SOCs). The process used to define POCs for the USIO was based on a small number of (proposed) fundamental principles, which are as follows:

- all activities required for the safe drilling and completion of a hole
- all activities required for the safe installation of subseafloor hardware
- all activities required for the safe delivery of core to the core laboratory

During the course of this evaluation, it was determined that a fourth principle would be required to account for the management and administration of the platform in support of the first three principles; however, only the JOI budget incorporated this additional principle for the IODP-USIO FY04 Program Plan submission because of the urgency of getting a program plan in place to support impending field operations. All USIO activities that were not defined by the fundamental principles outlined above were considered to be SOCs in the preliminary program plan submitted by the USIO.

In response to a request for guidance made by the JOI Alliance, NSF provided a memorandum containing POC and SOC definitions on 15 January 2004 for use in the development of the final IODP-USIO FY04 Program Plan. The FY04 POC and SOC definitions were provided in response to questions raised by the JOI Alliance during submittal of the preliminary IODP-USIO FY04 Program Plan. These questions involved whether specific budgetary items should be considered POCs or SOCs for IODP-USIO budget preparation. The memorandum was

presented for consideration in December 2003 to a joint NSF-MEXT meeting in San Francisco, California, USA, where some minor suggestions were made, and the memorandum was appropriately modified by the IODP lead agencies. The memorandum stated that the POC and SOC lists presented below were not considered comprehensive, and that budgetary guidance may be modified for FY05 planning based on MEXT input. The following section describes the details of this guidance to the USIO.

### **Defining Guidelines**

Annex I of the memorandum between MEXT (Japan) and NSF (USA) concerning Cooperation on IODP provides definitions of what items are considered POCs and SOCs. Annex I definitions are consistent with the interpretation that safely making and completing a hole, with installation of subseafloor hardware and delivery of core to the core laboratory, are POCs, as is the management and oversight of POC items. Annex I definitions also imply that when developmental tools and drilling equipment become operational, funding for these items changes from SOC to POC.

Following IODP Platform and Program Principles, it is an expectation that Platform Providers will provide a fully capable drilling platform to the IODP. Functional, standard scientific equipment should be provided, and the costs of providing a scientifically instrumented drilling platform should be considered part of platform mobilization costs.

### **POC-Specific Items**

Numbers in parentheses relate to additional NSF-MEXT Cooperative Agreement Annex I definitions for POCs that are relevant for cost classification.

1. Costs of the drilling and riserless vessel's crew  
Vessel support: medical evacuations (10)  
Personnel: percentage of science core technicians
2. Catering services
3. Fuel, vessel supplies, and other related consumables
4. Berthage and port call costs
5. Disposal of wastes



6. Crew travel  
Personnel: percentage of technical crew change (does not include SOC technician costs)
7. Inspections and insurance  
Vessel support: safety-related insurance, including control of well seepage, seepage and pollution liability, third-party property liability, cargo liability, charter's legal liability, contractor's pollution liability, worker's compensations and maritime employer's liability, comprehensive general and automobile liability, below the keel, umbrella, and other required policies (10)  
Percentage of logging insurance policy (10)
8. Drilling equipment, supplies, and related consumables  
Hardware: CORK body, platform; casing, casing hangers; bits, beacons, mud; backoff/severing equipment; explosives and cabinet; drill equipment supplies and consumables; camera systems survey and borehole (9); fishing tools; reentry cone and related hardware; H<sub>2</sub>S system (9)
9. Engineering or geophysical surveys and data acquisition and laboratory analyses required for the safety of platform and drilling operations  
Hardware: logging cable and drum (8); natural gamma logging tool (8); Schlumberger MAXIS control system (8); heave-compensated logging winch (8); cement bond log (8); logging while drilling/measurement while drilling/logging while coring when required for safety (1, 8, 10); logging cable head and telemetry cartridge (8); shooting tool and casing collar locator (8); laboratory instrumentation for safety analysis  
Vessel support: safety monitoring (1, 10); navigation equipment; weather forecasting; geophysical engineering surveys for final site selection and/or other safety requirements  
Personnel: Assistant Laboratory Officer for Safety (1, 10); geochemistry technicians (for hydrocarbon safety assessment) (1); backoff/severing engineer Officer (1); travel to Site Survey Panel (SSP), Environmental Protection and Safety Panel (EPSP) (1, 10)
10. Administration and management costs of the platform operators  
Vessel support: communications (9); clearance costs; support vessel (1, 10); logging and other measurements while coring or drilling when required for safety (1, 8, 9); safety and environmental compliance costs (1, 5, 8); shipping of POC (4, 8); initial computer infrastructure (mobilization cost and 9)  
Personnel: Operations Superintendent (1, 9); percentage of Health, Safety, and Environment Officer (1, 5, 9); percentage of logistical support (3, 4, 5, 8); percentage of Expedition Project Manager (Staff Scientist) (1); safety training (1)

### SOC-Specific Items

Numbers in parentheses relate to additional applicable NSF-MEXT Cooperative Agreement Annex I definitions for SOCs.

1. Technical services  
Hardware, personnel: maintenance and upgrades for scientific instrumentation (including instrumentation and personnel costs) (2, 6, 8)
2. Computer capability  
Hardware: computer infrastructure upgrade and maintenance (3)
3. Data storage and distribution
4. Description, archiving, and distribution of data and samples  
Vessel support: shipping of core to repository
5. Deployment of a standard suite of logging tools
6. Development of new drilling tools and techniques required by IODP research  
Hardware: CORK instrumentation and packers (1, 8); logging and other measurements while coring or drilling; engineering development; pressure core system development; APCT logging tool development
7. Program publications
8. Costs of consumables (exclusive of those identified under POCs)  
Hardware: science supplies and consumables (such as D-tubes, gases, etc.)

9. Costs required for administration and management, including the central management office  
Vessel support: percentage of administrative costs, including management and oversight of SOC items (9); Site Survey Data Bank (large majority of costs related to SOC) (3); percentage of logistics costs for SOC support (1, 8, 9)

Based on the receipt of these guidelines, the USIO proceeded to develop a revised IODP-USIO FY04 Program Plan based on the IODP-USIO FY04 Mission Forecast from NSF and to begin to implement start-up activities.

## ***USIO FY04 Activities***

### **Phase 1 Start-Up Activities**

The scope of activities associated with the preparation and execution of typical IODP expeditions followed previous ODP experience. IODP Phase I operations began in June 2004. Numerous activities concerning IODP Phase I expeditions were initiated in early FY04, including review and assessment of potential science programs, long-lead-time procurement, weather, clearance, and staffing requirements; procurement, inspection, and service of laboratory equipment and tools; restoration of inventories; equipment enhancements; documentation preparation; scientific staffing for cruises; and hiring and training of technical staff.

Another primary task was to undertake an environmental assessment, tiered upon the Environmental Impact Statement for ODP, which updated operational procedures and planning processes for the IODP activities, as well as providing detailed information about the distribution of marine mammals, turtles, and other marine life and describing the risk mitigation measures that would be implemented to minimize risk to human health and the environment.

Platform operator insurance was part of the vessel day rate, and its adequacy and currency was verified annually by receipt of insurance cover pages. Among other coverage, operational

insurance will provide drilling-peculiar coverage (e.g., control of well, seepage and pollution, third-party property, etc.) utilizing an umbrella, followed by government indemnification should that threshold be reached, as explained earlier. Permits required for the riserless platform (e.g., American Bureau of Shipping and communication licenses), which are the responsibility of the platform operator, were secured, with verification of adequacy done by inclusion of the requirements in the contract and enforcement of the appropriate provisions. Drilling clearances, which are the responsibility of the JOI Alliance, were addressed by the IODP-USIO Science Services, TAMU, in coordination with the U.S. State Department.

### **JOI Alliance Total Systems Integration**

In FY04, the JOI Alliance established six cross-functional management teams, each charged with a different set of responsibilities that had to be successfully administered and fulfilled if the science support for operations of the riserless vessel were to be successful. Two overarching management teams are responsible for strategic planning, oversight of JOI Alliance mission delivery, prioritization of resources, and program plan development. The first of these teams is the JOI Alliance Systems Integration Team (JASIT), which is responsible for strategic planning and systems integration. The other team is the JOI Alliance Systems Management Team (JASMT), which is responsible for program management, resource allocation, and overall science services delivery. Four tactical teams were created and tasked with the planning and implementation of the JOI Alliance's deliverables: (1) scientific drilling operations, (2) technical development, (3) information, and (4) publications, reports, and education and outreach.

### ***JOI Alliance Contractual Relationships***

#### **JOI Alliance Prime Contractor**

JOI, as the prime contractor for the JOI Alliance, has ultimate responsibility for all contractual obligations entered into by the USIO. JOI's responsibilities included the following in FY04:

- Oversee and assure the performance of management, administrative, financial, and information systems that support the U.S. riserless vessel and vessel operations in IODP.
- Exercise management and financial controls to ensure compliance with contract provisions and to encourage creative, effective, and efficient delivery of services.
- Oversee the development of an environmental assessment for riserless drilling operations based on the IODP mission forecast.
- Lead the JOI Alliance in long-term planning and strategy development for the USIO.
- Retain primary responsibility for representation of the U.S. component of IODP and the Program as a whole, when appropriate.
- Retain primary responsibility for clear and effective communication and coordinate linkages with IODP stakeholders including NSF, IODP-MI, Japan Agency for Marine-Earth Science and Technology (JAMSTEC)/Center for Deep Earth Exploration (CDEX), ECORD Managing Agency/ECORD Science Operator (ESO), and other IODP partners.
- Coordinate planning for initial drilling operations with Japanese and European organizations, ensuring all operations are consistent with governmental agreements and safe operating practices.
- Establish various performance assessment systems that will ensure quality control of key functions of the USIO.
- Provide information on IODP to other federal agencies and the U.S. Congress and be generally responsible for program outreach, interactions with the news media, and oversight of programmatic science and outreach efforts.
- Lead efforts to augment NSF resources for IODP by fostering relationships between IODP and other national and international science programs and developing proposals for work in those cases in which program priorities are coincident.
- Provide the primary lead for coordinating required publications and reports.

As part of the overall program responsibilities, the JOI Alliance focused on the responsibilities outlined above, delivered the following required reports and publications, and worked with the other Implementing Organizations (IOs) to establish these as models for all of IODP:

- A draft USIO Policy Manual for IODP was produced by JOI, based on information contained in the existing ODP Policy Manual. This document will require frequent updating as IODP is implemented and new policies are adopted.
- The JOI Public Affairs Director, in collaboration with members of the science party, produced news releases and science articles relating to each scheduled cruise on the riserless vessel. These news releases are available on the JOI Alliance Web site at [www.iodp-usio.org/Newsroom/News.html](http://www.iodp-usio.org/Newsroom/News.html).
- The JOI Alliance produced and disseminated Daily Ship Status Reports, Weekly Reports, and Site Summary Reports. Examples of these can be accessed online at [iodp.tamu.edu/scienceops/sitesumm.html](http://iodp.tamu.edu/scienceops/sitesumm.html).
- The JOI Alliance produced and disseminated the environmental assessment, IODP-USIO FY04 Program Plan, and Quarterly Operations and Management Reports, as required throughout the fiscal year. In FY04, these documents were often produced under severe time pressure because of the compressed schedule for implementation of vessel operations as compared with earlier ODP planning time lines.
- The JOI Alliance established the process for managing the production and dissemination of expedition Scientific Prospectuses and Preliminary Reports for the IODP in FY04 and began to develop the production process for the Expedition Reports. This work will continue in FY05.

### ***JOI Alliance Subcontractors***

TAMU, through TAMRF, and LDEO served as subcontractors to JOI and contributed distinct but complementary capabilities that, collectively, supported the full range of activities necessary for implementation of a riserless vessel scientific



drilling program by the JOI Alliance in FY04. These activities are summarized below and are presented in more detail in appropriate sections of this document.

For the JOI Alliance, IODP-USIO Science Services, TAMU, provided services that were directly related to the ship operations and the scientific and engineering activities necessary to support science expeditions, as well as the management of expedition-related shore-based functions (data management, core curation, and publications). Specifically, these service deliverables included the following:

- support of science operations (i.e., technical staffing of shipboard laboratories, staff scientists, and engineering operations superintendents)
- implementation of sound procedures in drilling and laboratory operations that minimize environmental impact
- materials and logistical support of expedition implementation
- developmental support of analytical equipment and engineering tools necessary to achieve the scientific goals of riserless drilling and to maintain the state-of-the-art drilling and coring capability
- support of information technology and services
- management of the archival data produced by the riserless vessel
- curation of cores collected during Deep Sea Drilling Project (DSDP), ODP, and IODP riserless operations
- production of required reports
- publication of the scientific and technical results produced as a result of riserless drilling
- ensurance of a Health, Safety, and Environment program for the drilling vessel and shore-based facilities
- identification of potential risks and provide recommendations for mitigating security risks of international travel, work in port environments, and at sea
- support of USIO education and outreach activities

In addition, the administrative services in support of TAMU activities were managed by TAMRF, which provided and managed all administrative services (contractual, fiscal, property/procurement, human resources assistance, and travel assistance) to support the science operations carried out by IODP-USIO Science Services, TAMU.

For the JOI Alliance, IODP-USIO Science Services, LDEO, provided the following:

- logging services in cooperation with an international logging consortium for the riserless platform
- shipboard and shore-based logging data analysis and information systems management
- engineering and technological services
- support of USIO education and outreach activities

The IODP-USIO accomplishments are discussed in more detail below. The tasks undertaken in FY04 were both challenging and relentless in their necessary execution under limited time and planning constraints. The JOI Alliance staff were nothing short of heroic in their efforts to make the transition from ODP to IODP-USIO operations without any significant reduction in services or science delivery despite all of these challenges and the complexities involved in the start-up of IODP operations in FY04.

## Science Services

The IODP-USIO Science Services element encompasses the activities of the Science Operations and Tools and Analytical Services Departments at TAMU and Engineering Services at LDEO. During FY04, the JOI Alliance Science Services staff carried out pre-expedition planning, Co-Chief Scientist and scientific party selection, port call activities, logistical support, expedition execution, shipboard technical support and safe laboratory operations, and postcruise assessment. Other ongoing activities during FY04 included the participation of Science Services staff members as liaisons to the SAS panels, IOs, and IODP-MI; involvement in enhancing coring tool capabilities

and laboratory instruments; and preparation for publication- and science-related postcruise meetings.

### ***Pre-Expedition Planning and Preparation***

Three precruise planning meetings were held in FY04 for FY05 Expeditions 303–306 in addition to planning for Expedition 301. These expeditions (303 and 306; 304 and 305) are considered to be two major, two-part programs and were planned as such. A single Scientific Prospectus was produced for Expeditions 303 and 306 ([iodp.tamu.edu/publications/SP/303306SP/303306SP.html](http://iodp.tamu.edu/publications/SP/303306SP/303306SP.html)) and for Expeditions 304 and 305 ([iodp.tamu.edu/publications/SP/304305SP/304305SP.html](http://iodp.tamu.edu/publications/SP/304305SP/304305SP.html)).

In preparation for Expedition 303, a noncontact resistivity sensor was purchased. A fast-track MST system (customized Geotek track) was installed during the Expedition 303 port call (at the end of FY04) for real-time determination of vertical hole offsets to ensure stratigraphically complete recovery.

JOI Alliance engineers initiated preparations to deploy the hard rock reentry system to support the crustal objectives of Expeditions 304 and 305. This required a subcontract to secure the use of the hydraulic hammer drill technology for these two expeditions and the design, fabrication, and

procurement of casing strings needed to stabilize the holes drilled with the hammer system. The vendor had only one hammer available, and agreements were made for the vendor to fabricate a back-up hammer in time for Expedition 304.

### ***Cruise Staffing***

Co-Chief Scientists for IODP Expeditions 301 and 303–306 were selected and appointed in early 2004, and science parties were selected from nominations received from IODP members, taking into account required expertise and member balance indicated in the Memoranda of Understanding. As of the end of FY04, staffing through Expedition 305 had been completed. The following table shows the breakdown of participation for all these expeditions, although it should be noted that Expeditions 303–306 fall in FY05.

### ***Shipboard Technical Support***

During FY04, a major effort was put into the safety and laboratory training of new and returning staff members in order to ensure efficient and safe seagoing laboratory operations. The technical support group from ODP was also reorganized to better meet the needs of IODP.

When not at sea, members of the seagoing technical support teams report to shore-based

	Expedition 301	Expedition 301T	Expedition 303	Expedition 304	Expedition 305	Expedition 306	Total Staffed
<b>Science Party:</b>							
J-DESC	6 (6)	1 (1)	8 (9)	5 (6 <sup>‡</sup> )	7 (8 <sup>‡</sup> )	7 (8)	34
USSSP	7 (11)	0 <sup>†</sup>	8 (20)	7 (16)	9 (14)	7 (14)	38
ECORD	6 (7*)	1 (1)	8 (16)	8 (11)	7 (11)	8 (22)	38
China	0 (0)	(0)	1 (1)	(0)	(0)	1 (1)	2
<b>Co-Chiefs:</b>							
J-DESC	1		1		1	1	4
USSSP	1		1	2			4
ECORD					1	1	2

Notes: J-DESC = Japan Drilling Earth Science Consortium, USSSP = United States Science Support Program. Numbers indicate total number of sailing participants except for Expedition 306, where the number reflects the number accepted. Number includes people nominated for more than one cruise; total nominees submitted are in parenthesis. \* = six were nominated during the staffing period; the seventh came after staffing competed in a specialty not needed. † = five U.S. from proponent group sailed as National Science Foundation supported scientists; none were supported by USSSP. ‡ = all nominees invited, one declined on each expedition; does not include dropouts prior to initiation of invitations (one each cruise). For Expeditions 304 and 305, the participant breakdown was altered to accommodate the late medical withdrawal of Co-Chief Scientist C. MacLeod.

departments throughout the organization. They are, therefore, more integrated into the ongoing programmatic effort, and their skills can be more effectively utilized to further the long-term goals of the program.

The shipboard technical support team is responsible for the routine maintenance and operation of the shipboard laboratories and for providing support to the shipboard science party. The team consists of Marine Laboratory Specialists, Computer Specialists, Instrumentation Specialists, a Curator, and a Yeoperson. On each expedition, the Laboratory Officer (LO), with the Assistant Laboratory Officers, is responsible for supervising technical support personnel during the port call and while at sea. The LO forms a partnership with the shore-based supervisors, serving as their seagoing representative and acting on their behalf to coordinate the efforts of the shipboard technical support personnel from multiple departments.

The LO is responsible for considering the overall needs of the expedition and for strategic planning concerning technical resources. The Staff Scientist and Logging Staff Scientist provide a liaison between the science party and the LO and the technical team. The LO is ultimately responsible for safety throughout the shipboard laboratories. The LO determines shifts and task assignments to meet the needs of the expedition and has the flexibility to reassign tasks and resources to meet mission-specific needs.

### ***Science Service Activities in Support of Expeditions***

In addition to directly supporting the scientific and engineering requirements of scheduled expeditions, JOI Alliance engineering and technical staff members are responsible for the stewardship of drilling, wireline, and analytical tools that are available in the JOI Alliance's inventory and ready to be deployed as necessary.

### ***Engineering Support Activities***

The JOI Alliance's engineering staff provides support for wireline and downhole measurement tools, coring tools, and rig instrumentation.

Generally, this support is focused on existing tools and addresses ongoing maintenance, repair, and calibration but also includes periodic improvements to hardware, electronics, and software to enhance measurement quality, reliability, durability, maintainability, and operational ease. During FY04, three tools in the arsenal required ongoing support to maintain state-of-the-art scientific drilling capability: the APCT tool, the DVTP, and the DVTPP.

In preparation for upcoming expeditions, all APCT tools were recalibrated and the DVTP and DVTPP measurements were verified prior to Expedition 301. In addition, one APCT system and the USIO backup drill string were loaned to the British Geological Survey for Expedition 302 (Arctic Coring).

The rig instrumentation system is an integrated monitoring system that allows the drilling engineers to monitor and record pertinent drilling parameters in real time, allowing engineers to better assess drilling conditions during operations and to review operations after the fact. An important parameter measured by the rig instrumentation system is the weight-on-bit filter (WOBF), which provides a measure of how the weight on bit varies in time. The WOBF system was reinstalled during mobilization and was operational at the beginning of Expedition 301. Unfortunately, chronic electronic failures during the expedition led to the removal of the original version of the system at the end of the expedition. The electronics will be replaced with off-the-shelf, more rugged, surface-mounted modules. Reinstallation is targeted for the third quarter of FY05.

A goal of the JOI Alliance, based on lessons learned during ODP, is to establish a calibration and test facility at TAMU that will allow us to be better stewards of our tools in terms of testing components and calibrating sensors at elevated temperatures and pressures and simulating borehole conditions in terms of sediment type and pressures up to 3,000 psi. Such a capability will allow us to verify vendor specifications of sensors before incorporating them into our tools and to test the outcome of tool refurbishments and modifications prior to their deployment on the



*JOIDES Resolution* in support of science. In FY04, almost all of the components for a Simulated Borehole Test Facility (SBTF) were purchased, and a plan was put in place to have the SBTF operational and evaluating tools such as the APCT, DVTP, DVTTP, instrumented water sampler, and pressure core sampler tool by the third quarter of FY05.

In addition, the borehole testing facility at LDEO was upgraded during FY04 and includes 200 meter open test holes in variable formations, new capabilities for pressure testing (up to 10,000 psi while assembled tools are acquiring data) and temperature testing (in the  $-40$  to  $200\text{C}^{\circ}$  range) for electronics in a large-envelope environmental chamber, and computer-controlled machine tools and electronic surface mounting equipment for instrument production. Owing to these technological enhancements, prototype creation, refined design, and multiple piece production can now be accomplished efficiently and accurately.

It is the policy of the JOI Alliance that these two test facilities at TAMU and LDEO offer capabilities that are available for use by the CDEX and ECORD staffs and IODP participants that are involved in downhole tool development.

During the late stages of ODP, engineers at LDEO and TAMU initiated a joint development project to build a downhole Drilling Sensor Sub (DSS) and a retrievable memory module (RMM). The DSS is designed to record near-bit drilling parameters during coring operations to aid in an understanding of the dynamic forces at work near the bit and to quantify the impact of heave and surface inputs (torque, weight, rpm, and flow rate) on coring performance. The DSS is positioned in the bottom-hole assembly (BHA) above the outer core barrel. The DSS records weight on bit, torque on bit, annulus pressure, pipe pressure, and annulus temperature near the bit. The RMM is an instrumented core barrel with an antenna, which is deployed along with a core barrel. The RMM lands in the BHA where its antenna is coincident with the DSS antenna. Data from the DSS is transmitted to the RMM via a wireless connection, providing the means to bring DSS data up with the retrieval of the core barrel.

Following deployment on ODP Legs 208 and 210, the two DSS tools were refurbished. The decision was made to not deploy the DSS tools again until they passed an acceptance test in FY04. The acceptance test was performed at Schlumberger's Sugar Land, Texas, facility. These tests included 18 hours of drilling in the test well and a cycling of pressure and temperature conditions in the company's pressure test facility. Each DSS tool experienced a different sensor failure; on one, the temperature sensor failed, and on the other, a pressure transducer failed. The acceptance test of the DSS tools will be repeated. Following a successful DSS acceptance test, the RMM will go through similar testing in the Schlumberger drilling rig. In addition, testing of TAMU's wireless telemetry equipped DSS and RMM was completed in May 2004 at the facility in Cromwell, Connecticut, USA. The wireless telemetry module met objectives, with DSS sensor data accurately communicated from the DSS to the RMM.

### ***Analytical Support Services***

IODP-USIO Science Services, TAMU, is responsible for shipboard and shore-based analytical systems procurement, upgrades, and repairs. Analytical systems components include instrument hardware and software applications, analytical procedures and protocols, and quality control.

A strategic plan to undertake improvements to the JOI Alliance's shipboard laboratories was developed during FY04. A list of laboratory-related activities, with initial descriptions of high-priority activities, served as a resource for defining the activities that would be incorporated in the IODP-USIO FY05 Program Plan. The list was prioritized to (1) maintain existing analytical capabilities, (2) provide mission-specific expedition support, and (3) address high-priority enhancement needs.

Four Application Developers and nine Laboratory Specialists, along with the Senior Project Administrator, sailed on the mobilization transit. Select staff also sailed on the three subsequent expeditions in support of operating and maintaining the shipboard systems. In addition, these staff members collected specific information

on systems deficiencies (software bugs and upgrade requirements, quality control problems, and procedural issues) to be addressed as resources permit. The Application Developers addressed numerous bugs and systemic problems that typically appear with data capture, data transfer, and data access software applications in mission-specific configurations.

Following pre-expedition meetings with Co-Chief Scientists, it was determined that Expeditions 303 and 306 would require a dedicated, rapid core logging system to support the stratigraphic correlation process. Existing equipment was assembled and configured in a customized magnetic susceptibility core logger, which was deployed on the riserless vessel in September 2004.

Development of a laboratory systems inventory and document management database began in May 2004 and continued throughout the year. This new and cost-effective addition to the Janus database will eventually become the main source of metadata associated with scientific measurements, providing linked information on methodologies and protocols, data capture parameters, quality control, and so forth. The database will be used for, among other things, planning activities, laboratory reports, and access to laboratory documents.

## Data Management

The IODP-USIO Data Management element encompasses management responsibilities concerning the shipboard and shore-based IT infrastructure (equipment and support) and management and archive tasks related to the collection of riserless drilling vessel data. Major accomplishments this fiscal year included the mobilization of the *JOIDES Resolution* and the completion of several ongoing data management initiatives, including oversight and collaboration activities for data, curation, and information technology. These were undertaken in addition to routine support of shipboard and shore-based data management efforts. Routine efforts included maintaining the Janus database and the Oracle

relational database management system; providing help desk support for printers, workstations, and servers; continuous security audits; software license inventory and management; digital imaging and photographic services; and software application support. These activities occurred on shore during the entire fiscal year and on board the riserless vessel during mobilization, Expeditions 301 and 301T, and the beginning of Expedition 303.

The USIO also provided upgrades to shipboard and shore-based network and computer equipment and systems and initiated the development of next-generation information technologies, such as data warehousing and video conferencing, for the USIO and IODP.

## Curation

The IODP-USIO Curation element encompasses the activities associated with managing the IODP-USIO core collection, including participating in the development of sampling strategies for IODP Expeditions 301 and 303–306; providing advisory support to shipboard staff during Expedition 301; and working with the other IOs, SAS panels, and IODP-MI to define possible strategies to manage IODP curation and sampling challenges. In addition, during FY04, the Curator worked with JOI Alliance members, IODP-MI, and the IODP science advisory committees to refine the plan to distribute DSDP and ODP cores to the Gulf Coast Core Repository and Bremen Core Repository and to close the East Coast Repository and West Coast Repository, as outlined by the JOI Alliance.

Two major acquisitions improved the effectiveness of the curation team. An automatic sample bagging and printing machine was purchased that improved sampling efficiency for large-volume requests by more than 100 percent and is now in daily use in the Gulf Coast Repository. A mold for custom-designed paleomagnetic sample cubes was acquired that served to reduce costs and avoid long lead times for purchasing off-the-shelf plastic cubes that did not always meet the requirements of the program.

## Publication Services

The IODP-USIO Publication Services element encompasses the activities of developing, producing, delivering, and archiving all required reports and publications for the USIO. In FY04, Publication Services began laying a foundation for the production of IODP expedition-related publications. Initial tasks included the development of a Scientific Prospectus for IODP Expeditions 301, 303 and 306, and 304 and 305. Because the IODP-MI office was not started until April 2004, the USIO took the lead in creating the Scientific Prospectus report with guidance from the SAS and lead agencies. In August 2004, after the conclusion of Expedition 301, Publication Services began production of IODP's first Preliminary Report. The contents of both report series are similar to the Scientific Prospectus and the Preliminary Report series published by ODP. The Scientific Prospectus series summarizes the expedition plan, based on SAS panel recommendations and site priorities. The Preliminary Report series summarizes the shipboard scientific results and technical operations. A notable addition to the IODP Preliminary Reports is a new section that more thoroughly assesses whether expedition objectives were successfully met.

Through Publication Services, the USIO is also tasked with publishing the initial shipboard results for all IODP Phase I expeditions. The initial science results will be published 1 year after each expedition in a new report series tentatively titled the *Expedition Reports of the Integrated Ocean Drilling Program*. IODP-MI has instructed the USIO that for IODP Phase I the content of the *Expedition Reports* volumes should mirror that of the *Initial Reports of the Proceedings of the Ocean Drilling Program*. Development of a layout and design for the new *Expedition Reports* series will be an ongoing effort in FY05. Near the conclusion of FY04, Publications Services staff members met with Hans Christian Larsen, Vice President of Science Planning for IODP-MI, who visited the USIO facility in College Station, Texas, USA, in August 2004 for an overview on publication policies and implementation procedures used to produce ODP publications. As part of the meeting, Publication Services staff members highlighted

publication policy issues for which the USIO needed guidance from IODP-MI before publication of the *Expedition Reports* could begin. In addition, in mid-FY04, IODP-MI added the task of editing and producing the mission-specific *Expedition Reports* volume for Expedition 302. As a courtesy to the ESO staff, the department also volunteered to produce the Expedition 302 *Preliminary Report* upon final content approval by IODP-MI.

The current contract between the USIO and NSF does not provide for a publication product devoted to IODP postcruise research. To develop an effective and coherent publication policy for IODP as a whole, including policies on postcruise research publications, IODP-MI created an IODP Publications Task Force late in FY04. In recommending publication policy to IODP-MI, the task force is to pay particular attention to securing (1) maximum scientific documentation and impact for short- and long-term scientific legacy, (2) the most efficient and coordinated publication of initial expedition results, and (3) effective links between the initial expedition results and primary data bases. The Publications Task Force will also address and make recommendations toward the long-term legacy of electronic publications and related data. Membership includes scientists, program employees, and representatives of the publishing industry.

During FY04, Publication Services took the leading role in the production of required JOI Alliance reports and NSF-required publications. With support and contributions from all of the USIO, Publication Services produced the first three IODP Quarterly Reports and the IODP-USIO FY04 and FY05 Program Plans for both IODP-MI and NSF.

## Education and Outreach

IODP-USIO Education and Outreach Services facilitate the education and outreach activities handled by the JOI Alliance, including providing information on IODP to federal agencies and the U.S. Congress, handling outreach interactions with news media, coordinating other programmatic outreach for the science community and general public, and developing Web-based IODP-USIO resources.

The JOI Alliance began initiatives during FY04 to reach a wide array of scientists and educators. The JOI Alliance will build upon these inaugural activities in future years in an effort to create new and innovative ways to communicate science to target audiences. As part of this effort, the JOI Alliance examined education and outreach opportunities for the coming years to develop an integrated, holistic plan that prioritizes activities for FY05 and beyond, allowing the JOI Alliance to be proactive and cohesive in its efforts.

At the start of the fiscal year, three Education Coordinator positions were planned to carry out the activities outlined in the contract. As a result of budget negotiations, these three positions were reduced to a single half-time JOI position (creating one full position shared with the U.S. Science Support Program). This position was filled in August 2004. Nonetheless, the main education and outreach activities outlined in the IODP-USIO FY04 Program Plan were all addressed by securing assistance on a limited basis from other JOI Alliance staff members.

A “Teacher at Sea” pilot program was launched this year by the USIO. After developing the goals, objectives, and processes for this new program, the JOI Alliance selected Jonathan Rice, a middle and high school earth science teacher, to sail on Expedition 301. During the expedition, Rice produced an online journal that chronicled the expedition ([iodp.ldeo.columbia.edu/EDU/TAS/](http://iodp.ldeo.columbia.edu/EDU/TAS/)) and began creating a series of laboratory briefs. By the end of FY04, briefs on microbiology, chemistry, paleomagnetism, and physical properties were completed and briefs concerning the other laboratories were in progress. These briefs will be available on the USIO Web site, broadening the impact of the program to teachers.

The JOI Alliance also initiated the planning for a fellowship for students attending Historically Black Colleges and Universities (HBCU). During this planning year, goals, objectives, and promotional materials were developed, and staff members worked with HBCU educators to disseminate information. Drawing upon the diverse strengths of the three USIO institutions, students will have an opportunity to learn about program management, education and public affairs, and

postcruise research. A pilot program will be conducted in FY05 that solicits applications from students in the Washington, D.C., and College Station, Texas, areas. The goal is to expand the fellowship nationwide in the coming years.

The JOI Alliance initiated a plan to expand the organization’s presence at conferences in FY04 to highlight the start of IODP-USIO operations. Staff members from the USIO participated in booths, talks, and media activities at the Geological Society of America annual meeting and American Geophysical Union Fall Meeting; distributed educational materials; and sponsored speakers at meetings including the Conference for the Advancement of Science Teaching, National Science Teachers Association, and National Marine Educators Association conferences. These meetings allowed the JOI Alliance to test its products, promote new USIO education activities, and generate ideas for future projects with other educators.

New materials on riserless drilling were produced during this inaugural year of IODP. The JOI Alliance created a new image library (including aerial and shipboard images from the riserless vessel), coffee mugs, baseball caps, fleece jackets, T-shirts, and sweatshirts. More than 2,000 copies of a new IODP-USIO brochure were distributed at conferences and port calls worldwide. This brochure included information on the riserless drilling vessel and the first five IODP-USIO Phase I expeditions. The JOI Alliance plans to produce a new brochure annually with updated expedition information.

During FY04, the JOI Alliance developed and implemented new public relations procedures. The JOI Alliance worked with the media to make a seamless transition from ODP to IODP, publicizing the initial voyages of IODP with the USIO riserless vessel and working with IODP-MI on a strategy to increase coverage of the program as a whole. These activities resulted in articles on the program in print, radio, and television. These include *Earthwatch Radio*, the BBC, *Geotimes*, *Discovery*, *Sea Technology*, *Science*, *Nature*, and *U.S. News and World Reports*.

The IODP-USIO public and intranet Web sites were launched in FY05. The JOI Alliance Web



team conducted a review of the site, streamlined content located on individual institution servers, and worked with IODP-MI to ensure consistency and reduce content redundancy between the organizations. These activities resulted in a USIO Web site that presents information in a clear and engaging manner. An intranet was created to increase communication across JOI Alliance institutions and as a means for storing legacy content related to internal operations.

The JOI Alliance worked to increase awareness among members of the U.S. Congress of the value of scientific ocean drilling and the scientific objectives possible with a new vessel. IODP-USIO members participated in many science communitywide events, such as the Coalition for National Science Funding exhibit, Congressional Visits Day, and a special event honoring U.S. Senator K.B. Hutchison (R-Texas) that took place at TAMU.

## **Platform Services**

In addition to the other services already discussed regarding activities on the *JOIDES Resolution*, other platform services encompass health, safety, and environment and clearance issues and the management of fuel procurement.

### ***Health, Safety, and Environment***

Prior to IODP-USIO operations with the *JOIDES Resolution*, an environmental assessment of the impact of riserless drilling in Phase I of IODP was conducted by Metcalf & Eddy, Inc., under a contract from the JOI Alliance. This was based on the earlier environmental impact statement under which ODP operated, with appropriate amendments. The most significant modification was the addition of a discussion (prepared by LGL, Ltd., environmental research associates) of the potential impact of IODP riserless vessel seismic activities on marine mammals and the USIO plan to mitigate these effects. This concluded that the very limited seismic work conducted from the *JOIDES Resolution* would have little or no effect on

marine mammals and that the measures proposed to mitigate possible risks were appropriate and adequate. The IODP-USIO environmental assessment was submitted to NSF and the National Oceanic and Atmospheric Administration National Marine Fisheries Office for review and was assessed favorably with respect to the proposed expedition operations.

Commencing with the start of IODP-USIO Phase I, an addendum was made to the waste management plan in effect on the *JOIDES Resolution* during IODP operations. The purpose of this agreement is to reduce and maintain control of waste on the vessel. This agreement outlines individual and shared areas of responsibility between Transocean and the JOI Alliance.

On 24 March 2004, the *JOIDES Resolution* began operating under the new International Ship and Port Facility Security Code (ISPS) regulations. These security measures and procedures have been adopted by the International Maritime Organization to enhance the protection of ships, personnel, cargo, and ports. In accordance with the new protocol, all oncoming temporary or crew personnel are required to attend a security briefing in addition to the standard safety indoctrination. The ISPS stipulates that there are three security alert conditions: (1) Level 1 (yellow: normal threat), (2) Level 2 (orange: heightened level), and (3) Level 3 (red: highest threat). To date, it has not become necessary for the vessel to operate above U.S. Coast Guard Maritime Security Level 1.

### ***Clearance***

Expeditions 301, 301T, and 303 included operations in Canadian, Costa Rican, and Greenlandic territorial waters. Applications seeking approval to operate in coastal states' jurisdictions require submittal of detailed schedules and operational plans, together with a summary of the scientific objectives and rationale for operating at the proposed locations and other documentation concerning the riserless vessel and IODP. Through the U.S. Department of State, the

USIO successfully applied for and received approval from all countries involved to enter their waters and conduct riserless drilling vessel operations.

### ***Fuel Costs***

At the time the USIO-IODP FY04 Program Plan was submitted, the plan was to mobilize the *JOIDES Resolution* in Pusan, Korea, taking on 2,550 metric tons of fuel at an estimated cost of \$268 per metric ton. A second refueling (1,200 metric tons at \$267.50 per metric ton) was scheduled for Panama. Plans were subsequently altered, and the vessel was mobilized in Gamagori. On board fuel, 1,011 metric tons was purchased at \$268.50 per metric ton (the Galveston, Texas, demobilization price) from Transocean and 1623 metric tons at \$378 per metric ton was purchased locally.

Because prices in Astoria were projected at \$450 per metric ton, the decision was made to exceed the original estimate. More would have been taken, but the vessel was at maximum capacity. The addition of the Costa Rica operations (Expedition 301T), an altered schedule (e.g., elimination of a refueling in Panama and a Caribbean port call), and the need to provide a safe operating level for transit to the Costa Rica site, on-site operations, and the long transit to St. John's required the purchase of 1,013 metric tons (\$448 per metric ton) in Astoria. A comparison of fuel prices between St. John's (\$398) and Ponta Delgada, Portugal (\$484), dictated the decision to purchase 1,678 metric tons at the end of FY04 to reduce fuel cost by \$266,000 and provide a safe operating level in the weather conditions anticipated for Expedition 303.



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## BROADER IMPACTS

The primary objective of IODP is to deliver the science summarized in IODP's Initial Science Plan in a cost-efficient, seamless fashion, using multiple drilling capabilities. IODP will provide two primary drilling and sampling capabilities, the riser-equipped *Chikyu* and a riserless vessel (in two phases), which, for Phase I (FY04 and FY05), will be the *JOIDES Resolution*. In addition, mission-specific platform (MSP) drilling and sampling will be supplied on an as-needed basis for shallow water and Arctic Ocean drilling that cannot be effectively done through the use of the riser-capable or riserless vessel, as science prioritization by the international community dictates.

Riserless operations for science prioritized by the SAS began in June 2004 in the northeast Pacific Ocean, and MSP operations began in August 2004 with a multi-icebreaker expedition to the Lomonosov Ridge in the high Arctic Ocean. The *Chikyu* continues to be outfitted in expectation that sea trials for the riser vessel will begin sometime in FY05.

In 2004, the JOI Alliance interacted with numerous groups and individuals to implement the mobilization of the *JOIDES Resolution* and the start-up of IODP-USIO riserless vessel operations. These interactions served to better define the long-term structure, planning process, and objectives of the IODP; helped to establish a functioning SAS structure for the IODP (following on the work of the interim SAS panels during the transition from ODP to IODP); and helped to develop functional working relationships among the IODP IOs, lead agencies, and IODP-MI.

An FY04 program plan for IODP was submitted by the interim IODP-MI planning office in late November 2004, in concert with the Chair of the Science Planning Committee (SPC) and the IOs, and was approved by SPPOC and the lead agencies in December 2004. The program plan development process was guided by information from the lead agencies (NSF-MEXT) about POC and SOC definitions. The complexities that resulted from multiple organizations needing to interact seamlessly in order to realize an integrated outcome for the program illustrated some of the many challenges faced by the USIO and others in the first year of IODP. This section of the FY04 IODP-USIO Annual Report focuses on the primary interactions and broader impacts of these efforts both within and external to the USIO.

### USIO Interactions with the Interim IODP-MI Office (Austin)

The JOI Alliance (USIO) initially interacted with the interim office of IODP-MI, the central management office for IODP, which was established at the University of Texas at Austin and staffed by P. Stoffa and J. Austin. This office was formed prior to the award of the platform SIC by NSF and was evolving simultaneously with the implementation of the IODP SAS and the start-up of IODP operational planning in the late summer/early fall of 2003.



One of the first activities of the interim IODP-MI office was to host and participate in the first IODP-MI meeting with the IODP IOs, which was held in Bozeman, Montana, USA, in late August 2003. The participants in this meeting, which included the USIO following the initial announcement of the SIC award by NSF the same week, also included NSF, MEXT, JAMSTEC/CDEX, and ECORD/ESO representatives and invited guests.

This initial meeting of the IOs defined the framework for the second IODP-MI meeting with the IOs in Edinburgh, Scotland, that the interim IODP-MI office coordinated, which was hosted by the ESO on 26–28 February 2004. The focus of this second meeting was to establish the roles of the integrating organizations in the IODP and to continue the cross-platform integration required for a successful multiplatform IODP.

The main meeting outcomes and all of the action items assigned to the IOs are listed below. The group was tasked with reporting on the status of each item at the Edinburgh meeting.

1. Develop a programwide Health, Safety, and Environment policy that emphasizes a high standard but also maintains flexibility in response to site-specific demands and match that policy with an Health, Safety, and Environment and training framework for technical personnel across platforms.
2. Implement sharing and exchange of technical staff members among platforms, tied to annual program planning.
3. Agree upon, and then implement, a programwide sample curation and management policy in two phases: (1) for IODP cores to be collected beginning in FY04 and (2) for older (DSDP, ODP) cores, should the decision be made to move them. Before implementation, the SAS should be consulted for advice and input about both phases.
4. Develop a minimum acceptable set of IODP data to be derived from all platforms (in consultation with the SAS), so as to distinguish them from proponent-driven data production, analysis, and interpretation (some of which may be derived directly from IODP data).

5. Collectively, educate our “customer base,” the international scientific community submitting proposals to IODP, about the need to commit to long-range (multiyear) expedition planning. Reemphasize (to the SAS, the lead agencies, etc.) that a successful IODP will require such a commitment, constrained by annual (budget based) program planning.

A variety of presentations were made at the meeting to focus the group’s attention on the key points and questions related to each of these issues and steps were outlined to address these issues at future SAS and IO meetings. Addressing these issues required focused interactions among the staff of the IOs and interactions with various SAS panels and members to establish options and evaluate the state of current planning for each issue. A third meeting of the IOs was held in April 2004 in Washington, D.C., once the permanent IODP-MI office was established.

Another activity of the interim office was to guide the development and integration of the IODP-USIO FY04 Program Plan, which was required to be delivered by the USIO in early November 2003, only shortly after the award of the SIC contract. The interim IODP-MI office gathered input from the IODP IOs (USIO, CDEX, and ESO) to present an integrated FY04 program plan to SPPOC for approval at the panel’s inaugural meeting in December 2003. The USIO was challenged to provide operational and budgetary scenarios within a few weeks of the SPC meeting, agreeing to a draft schedule for FY04 in late September 2003. This resulted in insufficient time to cost out various operational and logistical options prior to assembling a plan, which created fiscal difficulties later in the year as fuel costs rose and additional requirements of the science planning process led to “science creep” and cost increases.

Finally, the interim IODP-MI office hosted an Education and Outreach Workshop on 20–24 February 2004 in Austin, Texas, which brought together representatives from all of the IOs, national science support offices, and other interested groups to discuss the overall vision for education and outreach activities in IODP. The primary outcome of this meeting was a report to which the USIO staff strongly contributed that

helped to develop a consensus among the group of attendees that was consistent with program plan realities and the integrated visions of the individual IODP platform operators.

## **USIO Interactions with IODP-MI Offices (Washington, D.C., and Sapporo)**

Beginning in April 2004, the two IODP-MI permanent offices were established in Washington, D.C., and Sapporo. The Washington, D.C., office, headed by M. Talwani (President) and T. Janecek (Vice President for Operations), serves as the headquarters and corporate office. The Sapporo office, headed by H.C. Larsen (Vice President for Science Planning), serves as SAS coordinator and integrator for IODP science planning, database, and publications.

The Washington, D.C., IODP-MI office was initiated with significant assistance and support from JOI (e.g., travel and meetings, Internet and Web services, contracts and finance) in the initial months of its existence. These interactions helped the Washington, D.C., office become quickly established and operational in the shortest possible time in order to allow it to accomplish the requirements of its role in IODP, which included coordinating SAS and Operations Planning Committee planning for future expeditions, establishing a review process for expeditions, negotiating with the IODP lead agencies (NSF-MEXT) and the IOs about the definitions of SOCs and POCs, and presenting the IODP annual program plan for approval by SPPOC and the lead agencies, among many other tasks.

Another of the initial activities of the Washington, D.C., office was to coordinate an IODP-MI Education and Outreach Task Force, which held its first meeting in Washington, D.C., in May 2004. This meeting built upon the outcomes of and report from the first IODP-MI sponsored Education and Outreach Workshop (20–24 February 2004 in Austin). The meeting was supposed to coincide with the hiring of a new IODP-MI Director of Communications, but this appointment fell through and the momentum of

the planned education and outreach integration at IODP-MI was somewhat dissipated. However, the IOs were able to define their education and outreach vision in the crucible of other stakeholder group interactions and to prepare for education and outreach program plan requests for FY05.

N. Light was hired as Director of Communications at IODP-MI effective 11 August 2004, when she assumed responsibility for coordination of the IODP-MI education and outreach activities.

## **USIO Interactions with IODP Implementing Organizations**

The interactions among the three IODP IOs in FY04 were extremely useful and contributed in many ways to the overall success of the first year of IODP by establishing a high level of communication and trust among the operators through their management and staff and by facilitating integrated solutions to a wide range of operational and programmatic challenges.

As described previously, the first two meetings of the IODP IOs were held in association with scheduled IODP-MI meetings. The IO meetings were a helpful means for the IODP platform operators to consult before making presentations to IODP-MI, NSF-MEXT and SAS representatives. A fourth meeting of the IOs hosted by CDEX was held on 11 June 2004 at the Tokyo (Japan) offices of JAMSTEC. Participants exchanged information relevant to the upcoming SPC meeting. Topics discussed and outcomes or processes that were agreed upon by the IOs included

- database integration efforts (e.g., Janus, J-CORES, and the digital imaging system) and planning for additional database requirements involving stakeholder groups
- Health, Safety, and Environment systems and training for IO staff members/contractors and expedition participants, as well as the development of coherent policies among IOs and platforms
- planning for inter-IO exchanges of technical, engineering, scientific, and curatorial staff

members and policies related to these exchanges

- the content and format of reports originating from each platform (e.g., daily, weekly, and site reports)
- review and evaluation of outcomes from pre-, syn-, and postexpedition activities by stakeholders and integration with external reviews conducted by IODP-MI
- engineering development and exchanges of information among IOs relating to coring tools and other downhole systems
- exchanges of information about technical publications and information systems between the JOI Alliance and other IOs
- discussion about expedition staffing procedures that reflect experience with national and consortium offices and the challenges of maintaining balance of expertise and international representation

## **USIO Interactions with the IODP SAS**

Throughout the fiscal year, JOI Alliance staff members have represented the USIO at a range of IODP SAS meetings in various venues and with differing focuses of activities. This has required the ongoing preparation of informational materials and graphics for dissemination to these groups and has provided opportunities to interact with representatives and guests attending these meetings.

The USIO participated in 15 primary meetings during FY04 (see USIO Quarterly Reports for a record); however, other working groups and ad

hoc meetings required the support and assistance of the USIO staff during FY04 to report on operations, planning, and other issues (e.g., environmental issues, safety evaluations, database management, engineering development, laboratory facilities, scoping activities for expeditions, core repositories, sample, data and publications policies, etc.).

These interactions are an essential means of communication with our stakeholder communities, provide an important opportunity for two-way exchanges about the essential needs and requirements of the USIO, and establish support mechanisms for decision making. In FY04, the SAS was still evolving and, therefore, many inefficiencies and miscommunications were addressed, at least in part, by the involvement of the USIO staff; however, much work remains to be accomplished to create a responsive, efficient scientific advisory structure for IODP.

## **USIO Interactions with USSAC and the Science Community**

As with the IODP SAS, the USIO staff provided briefings to the United States Science Advisory Committee (USSAC) members at their scheduled meetings and interacted with proponents, participants, and the general public with respect to individual expeditions and the program as a whole. Because FY04 expeditions did not begin until the third quarter, there were fewer of these interactions than might be the case in a full year of operations, but efforts were made to coordinate information sharing at port calls, national meetings, and other venues such as workshops and meetings, as appropriate.











## RESEARCH TOWARD ENHANCED DRILLING CAPABILITY

IODP-USIO activities during FY04 included initiating the process for converting and leasing a riserless vessel to serve as the Phase 2 riserless SODV. Major accomplishments of the JOI Alliance Platform Team during the year included conducting a market survey of drilling equipment vendors, issuing an Invitation to Tender (ITT) to potential drilling contractors, developing a preliminary Project Execution Plan (PEP), issuing a U.S. SODV RFP, developing a Major Research Equipment and Facilities Construction (MREFC)-U.S. SODV Web site, developing a plan for NSF and community stakeholder interactions on the SODV planning process, and compiling a Briefing Book for the community that presents a vision of the IODP-USIO Phase 2 riserless vessel. In addition, JOI hired a Director for the SODV conversion. Each of these activities is described in more detail below.

### JOI Alliance Platform Team

The Platform Team, which was formed early in the first quarter of FY04 to lead the planning activities for the U.S. SODV project, is now headed by the JOI Director, SODV Conversion, who started work in September 2004. Following normal source selection procedures, all individuals who participated on the Platform Team were required to sign a confidentiality agreement. Eighteen individuals from JOI, TAMU, and LDEO have participated on the Platform Team during the past fiscal year.

Meetings were held on the following dates: 29–31 March 2004, College Station, Texas; 5–9 May 2004, Washington, D.C.; 26–28 May 2004, Washington, D.C.; 6–8 June 2004, Washington, D.C.; 12–13 July 2004, Washington, D.C.; and 8–12 August 2004, College Station, Texas.

### Market Survey and Invitation to Tender

The Market Survey was distributed on 17 November 2003 to eight drilling equipment vendors, with a submission response due date of 6 February 2004. The ITT for the IODP-USIO Phase 2 riserless vessel was sent to 13 drilling contractors on 15 December 2003, with a submission date of 17 March 2004. Of the 13 vendors contacted, eight responded. The review process for the Market Survey and the ITT was integrated to eliminate duplication of effort and improve cost efficiency. In addition to an internal review, EXMAR Offshore Company was contracted to perform an integrated assessment evaluating and summarizing the responses to both the Market Survey and the ITT. The objectives of the review were to address the responses of the potential contractors with respect to the scientific objectives and priorities outlined in the Conceptual Design Committee (CDC) report, as well as to compile data tables comparing the potential riserless vessels, describe the cost trade-off versus science priorities, recommend an optimal drill string

configuration, and assess the need for a top-hole drilling package. The EXMAR review was delivered in July 2004. Ultimately, the responses to the Market Survey and the ITT were used to guide the development of the SODV RFP.

## Project Execution Plan

The PEP is intended to be a constantly evolving document that describes the strategy for acquiring, converting, and commissioning an SODV that is in keeping with the MREFC guidelines issued by NSF. The PEP was submitted to NSF for review on 17 February 2004. To date, there have been no updates to the original document, which outlined a funding profile and an associated time line for converting and outfitting the future IODP riserless platform.

## U.S. SODV Request for Proposals

During FY04, the JOI Alliance Platform Team wrote an RFP for the U.S. SODV. The RFP was released on 19 October 2004. The RFP is composed of three volumes: (1) cost, (2) management, and (3) technical. Because of funding uncertainty, the project work has been packaged into several contract tasks comprising engineering design, long-lead item procurement, shipyard solicitation and procurement, mobilization, conversion, operations, and demobilization.

## MREFC–U.S. SODV Web Site

The JOI Alliance MREFC–U.S. SODV Web site ([www.joialliance.org/MREFC](http://www.joialliance.org/MREFC)) was established on 19 March 2004. The Web site was designed to include an overview of the MREFC account and includes links to MREFC guidelines. The Web site also includes downloadable copies of the U.S. SODV preplanning documents such as the CDC report, Market Survey, ITT, PEP, RFP, and IODP-USIO Science Services, LDEO, logging market survey. The Briefing Book is also available from the Web site.

## NSF and Community Stakeholder Interactions

A strategy was developed by the JOI Alliance to ensure NSF and community involvement in the U.S. SODV project. The strategy is composed of six elements:

1. Invite IODP-MI to coordinate an IODP SAS process to provide comments on the design documents for the onboard science capability of the U.S. SODV.
2. Invite select members of the science community to review and provide comments on the ITT responses submitted by contractors, in conjunction with the JOI Alliance Platform Team, in order to prepare the U.S. SODV RFP.
3. Invite selected individuals from the USSAC and/or the Science Measurement Panel to serve as community representatives on each of the design teams tasked with planning the onboard science capability for the U.S. SODV.
4. Introduce the scientific community to the MREFC Web site and encourage the use of this site as a way to become informed about U.S. SODV development activities. Also provide updates to stakeholders via community listservers.
5. Conduct town meetings at major scientific conferences (e.g., Geological Society of America and American Geophysical Union) and provide updates at appropriate SAS or USSAC panel meetings to ensure community awareness about the U.S. SODV.
6. Invite the USSAC chair, or a delegate, to serve as a nonvoting member on the U.S. SODV selection team.

## Briefing Book

The Briefing Book presents a vision for a riserless drilling platform to meet the needs of scientific ocean drilling in the 21st century. It encompasses drilling, coring, and logging capabilities; onboard scientific research capabilities; and issues of habitability in an attempt to synthesize the needs

and preferences expressed by the scientific community in numerous reports presented over the past decade. The Briefing Book serves to inform and engage the scientific community in the design of the SODV and provide guidance for the development of baseline specifications for a detailed design document. It includes an overview

of each of the proposed research areas (e.g., chemistry, microbiology, paleomagnetism, petrophysics, etc.), a list of the capabilities currently available on the *JOIDES Resolution*, and a list of proposed enhancements for the U.S. SODV. The Briefing Book was made available to the community via the MREFC Web site.









## **IODP-USIO FY04 PROGRAM PLAN FINANCIAL SUMMARY**

### **Description of Adjustments to the FY04 Initial Program Plan Budget**

The initial FY04 program plan budget submission of \$24,635,618 is a reflection of the JOI Alliance's CLIN 0001A budget in the Best and Final Offer (BAFO) submitted to NSF by the JOI Alliance on 23 August 2003 in response to the IODP system integration RFP. The JOI Alliance submitted a revised program plan budget on 21 January 2004 in the amount of \$24,589,310 (a \$46,307 reduction from the initial program plan; see description below). In Modification 6, dated 27 July 2004, NSF provided additional funding in the amount of \$1,433,863. This section describes the adjustments that were made to that budget during the fiscal year. Please refer to the financial tables below for details.

#### ***Reduction of \$46,307***

This reduction was made to reconcile the initial FY04 program plan budget (i.e., TAMRF's BAFO budget) with the actual FY04 program plan budget of \$19,742,290 submitted to NSF by the JOI Alliance on 21 January 2004.

#### ***Increase of \$1,433,863***

The FY04 Program Plan budget was increased due to an increase in the scope request for IODP to complete FY04 Program Plan objectives. Higher labor requirements for completing IODP tasks (versus ODP), costs associated with the teacher sailing on Expedition 301, increased shipping costs generated by higher fuel prices, unanticipated helicopter trips during Expedition 301, higher than expected stevedoring costs in Astoria, negotiated initial day rate exceeding the estimated day rate in the BAFO (due to economic index adjustments), and, most significantly, a sharp increase in fuel costs (\$895,000) had resulted in a projected budget deficit for IODP.

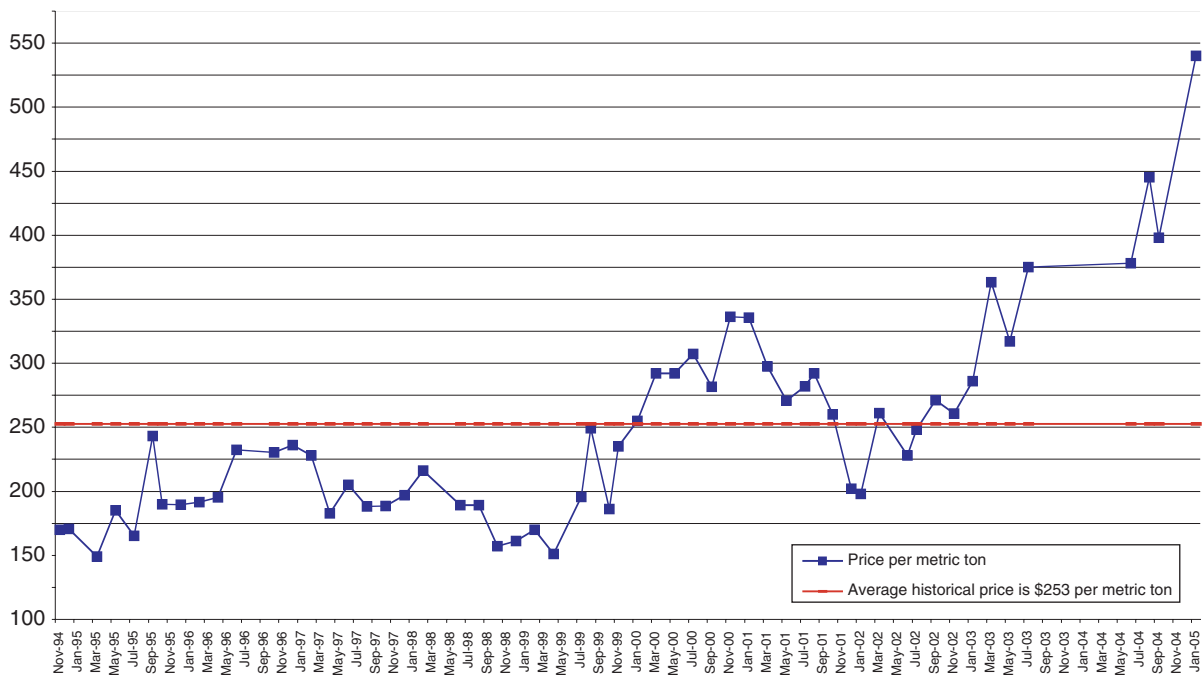
The FY04 program plan budget was increased to purchase the maximum amount of fuel at the Expedition 303 port call in September 2004. The price for fuel in St. John's was only \$389 per metric ton versus \$484 per metric ton at the next refueling location in Ponta Delgada. By maximizing the fuel purchase at the lower price and minimizing the fuel requirement at the higher one, the JOI Alliance was able to reduce FY05 fuel costs by more than \$266,000.

Prices per metric ton of fuel purchased since 1994 have gradually escalated (see figure below). From FY94 to FY98, the average was \$207 per metric ton. During the period from FY99 to FY03, the average price paid was \$261 per metric ton, a 26 percent increase from FY98. In FY04, the average fuel price continued its upward climb to \$320 per metric ton. To illustrate the effect of this trend on the annual fuel budget, 7,200 metric tons of fuel (the average annual purchase over the most recent 10 years of full operations prior to FY04) purchased in FY04 would have cost \$813,600 more than in an average year during the FY94–FY98 period.

The FY04 program plan budget was increased for the purchase of a data visualization system to be used on board the *JOIDES Resolution*. Additional funds were also provided for the purchase of video conferencing equipment to be installed at JOI, IODP-USIO Science Services, LDEO and TAMU, and on the *JOIDES Resolution*.

The following tables provide the end-of-year financial summary for the IODP-USIO, along with summaries for SOC and POC.

FY95–FY04 fuel price per metric ton.



Please contact [info@joiscience.org](mailto:info@joiscience.org) for hard copies of the financial pages (p 43–52).



## **PUBLISHER'S NOTES**

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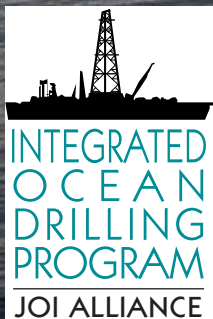
## **DISCLAIMER**

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Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the participating agencies, IODP Management International, Inc., Joint Oceanographic Institutions, Inc., Lamont-Doherty Earth Observatory of Columbia University, Texas A&M University, or Texas A&M Research Foundation.







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