International Ocean Discovery Program
JOIDES Resolution Science Operator

Texas A&M University

FY16 Annual Program Plan

for the time period
1 October 2015–30 September 2016

Amount proposed FY16: $61,719,218

JOIDES Resolution
Science Operator

Respectfully submitted to
The National Science Foundation:

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1. Executive summary

1.1. Introduction

Texas A&M University (TAMU) acts as manager and science operator of the research vessel *JOIDES Resolution* as a research facility for the International Ocean Discovery Program (IODP). Administrative services in support of *JOIDES Resolution* Science Operator (JRSO) activities are provided by the Texas A&M Research Foundation (TAMRF) through the TAMU System (TAMUS) Office of Sponsored Research Services (OSRS).

1.2. Annual Program Plan overview

The complex nature of IODP operations will require Annual Program Plans spanning operational years to establish priorities and to allow the procurement of long–lead time equipment and services. The IODP-JRSO FY16 Annual Program Plan to the National Science Foundation (NSF) defines the *JOIDES Resolution* Science Operator (JRSO) scope of work for FY16 IODP activities and deliverables that are specifically covered under NSF Cooperative Agreement OCE-1326927. This Annual Program Plan is based on (1) the current mission forecast provided on 17 March 2015 for the JRSO by NSF and (2) the JRSO operations schedule that was approved by the *JOIDES Resolution* Facility Board (JRFB) in April 2014. The scope and budget justification of the activities described in the Annual Program Plan were derived from NSF guidance to the JRSO.

The IODP-JRSO FY16 Annual Program Plan includes a discussion of the goals of the JRSO, responsibilities and deliverables, the operational schedule, descriptions of expeditions, and the JRSO organizational structure for science operations and platform operations activities. This section (Section 1) provides budget definitions, assumptions, and directives used to construct the Annual Program Plans. Section 2 describes scheduled FY16 expedition operations; Section 3 describes the organizational structure, provides a personnel summary, and addresses Management and Administration tasks; Section 4 provides an overview of subcontracts; and Sections 5 through 8 address JRSO tasks and budgets by department. Section 9 provides a summary of costs by expense category, a cumulative budget request detail by department, a detailed budget justification, and a table showing cost savings should any of the planned expeditions be canceled.

“Appendix I: JRSO IT Security Summary” provides information requested by NSF regarding information technology (IT) security policies, procedures, and practices employed by the JRSO to protect contractual research and education activities. “Appendix II: Recommended IODP-JRSO Program of Insurance” provides information on risk management services provided to the JRSO, including insurance policy monitoring, ongoing risk assessments, marine insurance negotiations, and claims settlement.

1.3. Summary of FY16 scope of work

As the science operator of the *JOIDES Resolution* research facility, the JRSO will provide wireline coring and logging services and will provide technical, science, engineering, and IT support; curate core materials; develop data applications and manage digital databases; and publish pre-expedition and postexpedition reports and results. All of these Program activities will be conducted in accordance with direction provided by the Program’s advisory panels and the JRFB and as outlined in approved Annual Program Plans.

The scope of activities associated with initial planning and preparation of IODP expeditions is similar to early Integrated Ocean Drilling Program activities in terms of deliverables, challenges, and risks. In addition, the JRSO will carry out postexpedition activities related to IODP expeditions and ongoing operational tasks (e.g., completing reports and technical documentation), completing legacy work (e.g., producing scientific publications), conducting long-lead planning work in preparation for expeditions scheduled for future fiscal years, and providing all necessary environmental assessments for IODP expeditions conducted by the JRSO.

On behalf of the JRSO and as outlined in this Annual Program Plan, TAMRF has contracted with Overseas Drilling Limited (ODL) for the services of the RV *JOIDES Resolution* and with Schlumberger Technology Corporation (Schlumberger) for the provision of downhole logging equipment and engineering support.

1.4. FY16 budget development

1.4.1. NSF guidance

NSF provided guidance to the JRSO that outlined the FY16 Mission Forecast for the JRSO. The mission forecast included guidance to conduct four expeditions in FY16 and a budget target of $61,500,000. This Annual Program Plan reflects the NSF guidance to conduct four expeditions and their associated costs.

1.4.2. FY16 budget assumptions

The total budget request of $61,719,218 includes costs to support JRSO facility operations; science operations at sea and all costs in support of these operations such as planning, logistics, engineering science support, etc.; core curation tasks at the Gulf Coast Repository (GCR); publications tasks; shore-based data management tasks; and other costs in support of maintaining US capability for continued scientific ocean drilling in IODP.

Assumptions about the operations schedule are outlined in the “Expedition Operations” section (Section 2). The JRSO has provided a best-effort estimate of FY16 costs in this plan. If additional funds are identified or expected costs can be avoided during the fiscal year, the JRSO may, upon consultation with NSF, use them to purchase data management system equipment, drilling or science supplies, or high-priority capital replacement items in support of JRSO deliverables.

Fuel price volatility is a major risk factor for completion of the scheduled operations. Assumptions were made using the best available data to determine a prudent estimate for FY16 fuel costs; however, market conditions are subject to fluctuations that may result in a need for supplemental funding during the period of operations.

1.4.3. FY16 budget request

The FY16 JRSO budget summary below shows the overall budget request by department. The line-item total requested for each department includes only direct costs. Subcontracts to ODL and Schlumberger are budgeted in Management and Administration. The cumulative JRSO costs are separated into total direct costs and indirect costs that add up to the “grand total” budget.

Department	Cost
Management and Administration	40,509,275
Science Operations	8,415,730
Technical and Analytical Services	5,249,423
Development, IT, and Databases	1,578,179
Publication Services	1,393,500
JRSO total direct costs	**57,146,107**
JRSO modified total direct costs	17,588,891
JRSO indirect costs	4,573,111
Grand total JRSO FY16 budget	**$61,719,218**

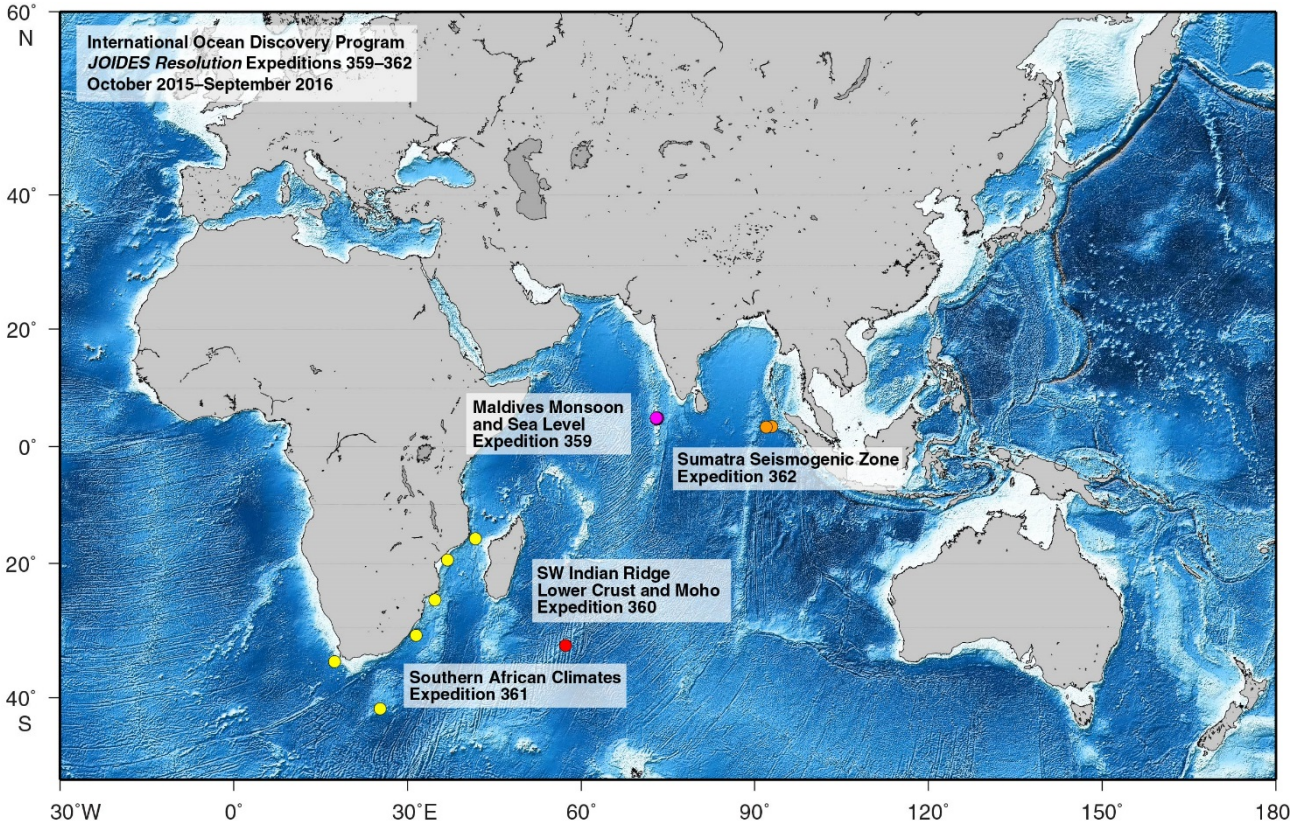
2. Expedition operations

2.1. FY16 operations schedule

This Annual Program Plan is based on the following operations schedule published 23 July 2014, including a tie-up period.

30 September–30 November 2015	Expedition 359: Maldives Monsoon and Sea Level
30 November 2014–30 January 2016	Expedition 360: SW Indian Ridge Lower Crust and Moho
30 January–31 March 2016	Expedition 361: South African Climates
31 March–31 July 2016	Tie-up period
31 July–30 September 2016	Expedition 362: Sumatra Seismogenic Zone

2.2. FY16 site map



2.3. Operations overview

2.3.1. Expedition 359: Maldives Monsoon and Sea Level

Proposed Operations

To address the IODP Expedition 359 objectives, scientific operations are planned at seven proposed primary sites (with two alternate sites). The Maldives carbonate edifice bears a unique and mostly unread Indian Ocean archive of the evolving Cenozoic icehouse world and has great potential to serve as a key area for better understanding the effects of global evolution in the Indo-Pacific realm. Based mainly on seismic stratigraphic data, a model for the evolution of this carbonate bank has been developed, showing how changing sea level and ocean current patterns shaped the bank geometries. A dramatic shift in development of the carbonate edifice from a sea level–controlled to a predominantly current-controlled system is thought to be directly linked to the evolving Indian monsoon. Fluctuations in relative sea level control the stacking pattern of depositional sequences during the lower to middle Miocene. This phase was followed by a two-fold configuration of bank development: bank growth continued in some parts of the edifice, whereas, in other places, banks drowned. Drowning steps seem to coincide with onset and intensification of the monsoon-related current system and the deposition of giant sediment drifts. The shapes of drowned banks attest to the occurrence of these strong currents. The drift sediments, characterized by off-lapping geometries, formed large-scale prograding complexes, filling the Maldives Inner Sea basin. Because the strong current swept most of the sediment around the atolls away, relict banks did not prograde, and steady subsidence was balanced by aggradation of the atolls, which are still active today.

One important outcome of Expedition 359 will be to groundtruth the hypothesis that the dramatic, pronounced change in the style of the sedimentary carbonate sequence stacking was caused by a combination of relative sea level fluctuations and ocean current system changes. Answering this question will directly improve our knowledge on processes shaping carbonate platforms and their stratigraphic records. Our findings would be clearly applicable to other Tertiary carbonate platforms in the Indo-Pacific region and to numerous others throughout the geological record. In addition, the targeted successions will allow calibration of the Neogene oceanic carbon isotopic record with data from a carbonate platform to platform-margin series, which is becoming important as such records are the only type that exist in deep time. Coring will provide the records required for reconstructing changing current systems through time that are directly related to the evolution of the Indian monsoon. As such, the drift deposits will provide a continuous record of Indian monsoon development in the region of the Maldives. These data will be valuable for a comparison and other monsoon-dedicated IODP expeditions.

Logistics

Operations for Expedition 359 are budgeted based on an estimated 61 days (5 in port, 17 in transit, and 39 in operations).

2.3.2. Expedition 360: SW Indian Ridge Lower Crust and Moho

Proposed Operations

Expedition 360 will form the first leg of a multiphase drilling project that aims to drill through the crust/mantle boundary at the ultraslow-spreading Southwest Indian Ridge and investigate the nature of the Mohorovičić seismic discontinuity (Moho). Expedition 360 is expected to drill ~1,300 m into lower crustal

gabbro and is unlikely to penetrate the crust–mantle transition or recover a significant amount of peridotite. Drilling will be sited at Atlantis Bank, on an elevated wave-cut platform on the east flank of the Atlantis II Transform. Previous drilling and mapping shows that Atlantis Bank is a large oceanic core complex, exposing a tectonic window of deep crustal and lithospheric mantle exhumed on the footwall of an oceanic detachment fault. The shallowest part of Atlantis Bank, at 700 m water depth, consists of a ~25 km^2 wave-cut platform rimmed by a thin bioclastic limestone cap. The platform is part of a continuous gabbro massif ~40 km long by 30 km wide, overlying granular mantle peridotite that forms the lower slopes of the eastern wall of the Atlantis II Transform. Mapping shows that basement on the wave-cut platform consists largely of shallow-dipping amphibolitized gabbro mylonite generated by detachment faulting. This fault rooted near-continuously into partially crystalline gabbro for >4 million years. The mylonite exposed on the platform, and by cross-faulting and landslips on the sides of Atlantis Bank, both cut and are cut by steeply north dipping greenschist-facies diabase dikes. Thus, the gabbro crystallized at depth was uplifted into the zone of diking at the ridge axis, creating, in effect, the equivalent to the base of a dike–gabbro transition seen in many ophiolites.

Previous Ocean Drilling Program (ODP) operations at Atlantis Bank drilled the 1508 m deep Hole 735B and 150 m deep Hole 1105A, both recovering long sections of gabbro. During Expedition 360, we propose to drill to a nominal depth of 1.3 km at a site on the northern edge of the Atlantis Bank platform, ~1 km north-northeast of Hole 1105A and ~2 km northeast of Hole 735B. A future drilling expedition aims to deepen the hole to ~3 km, with the overall goal of penetrating the crust–mantle transition, which is believed to be ~2.5 km above the seismically determined Moho. Specific objectives of Expedition 360 include establishing the lateral continuity of the igneous, metamorphic, and structural stratigraphies previously drilled to the southwest, testing the nature of a magnetic polarity transition, and investigating the biogeochemistry of the lower crust.

Logistics

Operations for Expedition 360 are budgeted based on an estimated 61 days (5 in port, 14 in transit, and 42 in operations).

2.3.3. Expedition 361: South African Climates

Proposed Operations

The Agulhas Current is the strongest western boundary current in the Southern Hemisphere, transporting some 70 Sv of warm and saline surface waters from the tropical Indian Ocean along the East African margin to the tip of Africa. Exchanges of heat and moisture with the atmosphere influence southern African climates including individual weather systems such as extra-tropical cyclone formation in the region and rainfall patterns. Ocean models and palaeoceanographic data further point at a potential role of the Agulhas Current in controlling the strength and mode of the Atlantic Meridional Overturning Circulation (AMOC). Spillage of saline Agulhas water into the South Atlantic stimulates buoyancy anomalies that act as control mechanisms on the basin-wide AMOC, with implications for convective activity in the North Atlantic and Northern Hemisphere climate. Expedition 361 targets a suite of drill sites on the southeast African margin and in the Indian-Atlantic ocean gateway. The central research objective centers on the (1) sensitivity of the Agulhas Current to changing climates of the Pliocene–Pleistocene, in association with transient to long-term changes of high-latitude climates, tropical heat budgets and the monsoon system; (2) dynamics of the

Indian-Atlantic gateway circulation during such climate changes, in association with changing wind fields and migrating ocean fronts; and (3) connection between Agulhas Leakage and ensuing buoyancy transfer and shifts of the AMOC during major ocean and climate reorganizations of the past 5 My. The impact of Agulhas variability on southern Africa terrestrial climates and, notably, rainfall patterns and river runoff, is a further secondary objective. A few selected deep ocean objectives are pursued in connection with the AMOC and North Atlantic Deep Water (NADW) formation/export.

Previous paleoceanographic studies demonstrate variability of the Agulhas Current during the Late Pleistocene, connectivity between warm water flow along the southeast African coast and regional climates, and variable Agulhas Leakage intensity on glacial–interglacial and suborbital timescales. Expedition 361 aims to extend this work to periods of major ocean and climate restructuring during the Pliocene–Pleistocene to assess the role the Agulhas Current and ensuing (interocean) marine heat and salt transports have played in shaping the regional and global scale ocean and climate developments

Logistics

Operations for Expedition 361 are budgeted based on an estimated 61 days (5 in port, 6 in transit, and 50 in operations).

2.3.4. Shipboard laboratory analysis of ICDP Oman Drilling Project cores

The *JOIDES Resolution* is expected to tie up in Cape Town, South Africa, for a period of 104 days after the conclusion of Expedition 361. During this non-IODP period, shipboard laboratories will be made available for use by the International Continental Scientific Drilling Program (ICDP) science party to analyze, describe, and sample as much as 2 km of core expected to be recovered during the first year of operations of the Oman Drilling Project. Funds are included in this Annual Program Plan budget request to support travel and two months of effort by a full JRSO shipboard complement to provide standard IODP laboratory analysis, curation, data acquisition, and data archiving, as well as publications support to produce a complete characterization of the Oman cores.

2.3.5. Expedition 362: Sumatra Seismogenic Zone

Proposed Operations

The 2004 Mw 9.2 earthquake and tsunami that struck North Sumatra and the Andaman-Nicobar Islands devastated coastal communities around the Indian Ocean and was the first earthquake to be analyzed by modern techniques. This earthquake, followed by Tohoku-Oki in 2011, showed unexpectedly shallow megathrust slip, and in the case of North Sumatra, this slip was focused beneath the distinctive plateau of the accretionary prism. This intriguing seismogenic behavior and forearc structure are not well explained by existing models and by relationships observed at margins where seismogenic slip typically occurs further landward. The input materials of the North Sumatran subduction zone are a distinctive, thick (as much as 4–5 km) sequence of primarily Bengal-Nicobar Fan related sediments. This sequence shows strong evidence for induration and dewatering and has probably reached the temperatures required for sediment-strengthening diagenetic reactions prior to accretion. The correspondence between the 2004 rupture location and the overlying prism plateau, along with evidence for a strengthened input section, suggests the input materials are key to driving the distinctive slip behavior and long-term forearc structure. Properties of the incoming section affect the strength of the wedge interior and base, likely promoting the observed

plateau development. In turn, deeper input sediment properties control décollement position and properties, and hence hold the key to shallow coseismic slip. Expedition 362 aims to begin to understand the nature of seismogenesis in North Sumatra through sampling input materials and assessing their evolution, en route to understanding such processes on related margins. Two riserless sites will be drilled on the oceanic plate, together generating a complete section of the input materials. Coring and wireline logging (including in situ temperature and pore pressure measurements) at these sites will constrain sediment deposition, diagenesis, and thermal and physical properties, and postexpedition experimental and numerical analyses will investigate the mechanical and frictional behavior of the input section sediments/rocks as they thicken, accrete, and become involved in plate boundary slip and prism development.

The overall objective of the expedition is to establish the initial and evolving properties of the North Sumatran incoming sedimentary section and their potential effect on seismogenesis, tsunamigenesis, and forearc development for comparison with global examples. Two drill sites will be used to accomplish this objective with the two following goals.

1. Core and log the complete input stratigraphic sequence on the Indian oceanic plate offshore North Sumatra, including the trench wedge, Nicobar Fan succession, pre-fan pelagic succession, and sediment/basaltic basement interface. These data will be used to derive primary stratigraphic, lithological, hydrogeological, chemical, physical, thermal, biological, and structural properties of the sequence and determine its sedimentary history.
2. Assess the degree of diagenetic alteration of the sampled sequence and assess how diagenetic processes will evolve on increasing burial and heating and ultimately on accretion. We anticipate these processes create a strong prism core and promote shallow seismogenic slip. Postexpedition experimental and numerical analyses will provide the ability to extrapolate input properties to greater stresses and temperatures due to burial and subduction through time.

Logistics

Operations for Expedition 362 are budgeted based on an estimated 61 days (5 in port, 7 in transit, and 49 in operations).

2.4. Expedition outreach

Berths will be made available for Onboard Education Officers during each expedition, where possible, and JRSO personnel will facilitate the activities of teachers at sea, give port call tours, and work with the US Science Support Program, the IODP Science Office, the IODP Forum, and the TAMU College of Geosciences on diversity and education issues and to further advance the Program through outreach.

3. Management and administration

3.1. Organizational structure

The JRSO's existing organizational structure directly reflects the responsibilities specified by NSF for the technical and scientific management, administration, and operation of the *JOIDES Resolution*, including planning, coordinating, overseeing, reviewing, and reporting activities. The TAMU portion of the organization consists of four departments: Science Operations (SciOps); Technical and Analytical Services (TAS); Development, Information Technology, and Databases (DITD); and Publication Services (Pubs). Managers of these departments report to the JRSO Director, who is responsible for the Program's overall management and performance. The Human Resources group resides within the Director's Office.

On-site administrative staff dedicated to JRSO support are overseen by a General Manager who reports to the Executive Director of the TAMUS OSRS. This separate reporting chain ensures that the administrative unit retains the independence to ensure regulatory compliance while working directly with the JRSO staff to efficiently implement the Program. The Director's Office and the Administrative Services group combined comprise the Management and Administration portion of this Annual Program Plan.

On behalf of the JRSO, and as outlined in this Annual Program Plan, TAMRF has contracted with ODL for the services of the *JOIDES Resolution* for use as the JRSO riserless drilling vessel and with Schlumberger for the provision of wireline logging equipment and engineering support.

3.2. Personnel summary

The personnel summary table presents an accounting of the cumulative estimated effort within the departments to which positions are assigned. The table reflects actual senior personnel and departmental staffing as of 22 April 2015 plus projected staffing for FY16. Staffing levels may change annually due to unanticipated changes in the operations schedule and/or scope of work. The table does not show student workers or the dedicated Administrative Services, IT, and application developer positions that are supported through indirect costs.

3.2.1. FY16 personnel summary

Department/ senior personnel	Position title	Personnel (#)
Management and Administration		**3**
Brad Clement	Director of Science Services	1
	Administrative Assistant	1
Barbara Neyses	General Manager, JRSO Administrative Services	1
Science Operations		**25**
Mitch Malone	Manager of Science Operations	1
	Administrative Assistant	1
	Supervisor of Engineering Services	1
	Staff Engineers	2
	Designers	3
	Staff Researcher	1
	Supervisor of Operations and Logistics Support	1
	Operations Superintendent	1
	Operations Engineer	1
	Materials Specialist	1
	Marine Logistics Coordinator	1
	Materials Technician	1
	Shipping and Receiving Coordinator	1
	Supervisor of Science Support	1
	Staff Scientists	8
Technical and Analytical Services		**39**
Jay Miller	Manager of Technical and Analytical Services	1
	Business Coordinator	1
	Supervisor of Analytical Services	1
	Imaging Specialists	2
	Supervisor of Technical Support	1
	Laboratory Officers	3
	Assistant Laboratory Officers	4
	Marine Laboratory Specialists (Res. Asst./Res. Spec.)	18
	Marine Instrumentation Specialists	4
	Curator	1
	Superintendent of the Gulf Coast Repository	1
	Curatorial Specialists	2
Development, IT, and Databases		**5**
Jim Rosser	Manager of Development, IT, and Databases	1
	Supervisor of Databases/Archives	1
	Senior Software Applications Developer	1
	Data Analyst	1
Publication Services		**17**
Angie Miller	Manager of Publication Services	1
	Publications Coordinator	1
	Supervisor of Editing	1
	Editors	4
	Supervisor of Production and Graphics	1
	Production Editors	3
	Distribution Specialist	1
	Graphics Specialists	5
Total FY16 JRSO personnel		**88**

3.3. Management and Administration goals

Management and Administration goals include planning, coordinating (with other IODP-related entities), overseeing, reviewing, and reporting on IODP activities.

3.4. M&A deliverables in FY16

- Program planning: Develop and assure implementation of Annual Program Plans.
- Progress reporting: Provide content for and submit quarterly and annual reporting deliverables, including financial reports. During the first year of the cooperative agreement, this effort will include reframing the quarterly and annual reports to best inform NSF and the JRFB.
- Reporting and liaison activities: Report to and liaise with funding agencies and with IODP-related agencies (e.g., the JRFB, JRFB advisory panels, Program Member Offices, and other national organizations and facility boards). Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate.
- Project portfolio management: Manage large cross-departmental tasks and projects through teams using a formal project portfolio management approach to identify, categorize, review, evaluate, select, and prioritize proposed projects.
- Compliance support: Ensure compliance with university, state, and US federal statutes and rules governing research, including US export control regulations for all materials shipped to the *JOIDES Resolution*, including third-party instruments, and all scientific personnel sailing during a JRSO expedition.
- Contract services: Provide contract services for IODP-related activities, including negotiation, management, and contractual oversight of subcontracts.
- Other administrative services: Manage payroll, travel, invoicing, financial and subcontract reporting, equipment inventory, and risk management services for the Program.
- Human resources management: Assist with management and supervision of JRSO staff to ensure adherence to TAMU's policies and procedures for maintaining a well-trained and productive workforce and safe work environment.
- Legacy documentation: Routinely archive electronic copies of documents and reports produced by the JRSO on behalf of IODP.

4. Subcontractors

4.1. Introduction

The Administrative Services department manages subcontracts by implementing established policies and procedures that ensure compliance with the applicable laws, regulations, provisions, and obligations of the NSF cooperative agreement with the JRSO. Establishment of subcontracts involves development of a detailed scope of work that outlines operational responsibilities of the subcontractor, a review of the subcontractors' policies and agreements to ensure that applicable flow-down regulations are incorporated into any subagreements (e.g., shipboard catering), and monitoring of the subcontractors' adherence to the established scope of work through direct supervision, periodic meetings, and review of progress reports. Administrative Services staff review subcontractor invoices prior to payment and conduct periodic site visits and audits of the subcontractors' financial records to ensure financial compliance with cost allowability and other contractual requirements.

4.2. Overseas Drilling Limited

ODL is responsible for safely conducting drilling and coring operations to meet the scientific goals outlined in the Annual Program Plan. This includes providing the marine crew, the drilling crew, and complete logistical requirements (i.e., ship supplies, drilling supplies, spare parts, and port call–related activities) in accordance with the approved Operations Plan. The JRSO Operations Superintendent monitors ODL adherence to their scope of work on board the *JOIDES Resolution*. In addition, JRSO Science Operations staff review the required daily operations report that details logistical, scientific, and operational data. Expedition planning and crossover meetings held with ODL also ensure that the subcontractor adheres to the scope of work and scientific objectives. Thorough review of invoices submitted prior to payment and periodic audit of ODL financial records ensure financial compliance with cost allowability and other contractual requirements.

4.3. Schlumberger Technology Corporation

Schlumberger provides services associated with the design, installation, and operation of logging infrastructure on board the *JOIDES Resolution*, including pipe-severing services as needed, to meet the scientific goals outlined in the Annual Program Plan. To ensure the Program's goals are met through the subcontract with Schlumberger Technology Corporation, the JRSO will follow similar procedures to those used for managing established subcontracts.

5. Science Operations

5.1. Science Operations goals

The Science Operations (SciOps) department is responsible for providing scientific, operational, engineering, and logistical planning and implementation for *JOIDES Resolution* drilling expeditions. SciOps goals include leading the scoping, planning, and implementation of science expeditions; interacting with and providing oversight to the drilling and logging subcontractors; conducting long-range operational planning for out-year JRSO expeditions; and utilizing IODP resources to oversee engineering development projects.

5.2. SciOps deliverables in FY16

- Drilling proposal evaluation: Scope proposals and conduct risk assessment for proposed expeditions.
- Risk management: Engage a panel of experts (the TAMU Safety Panel) to participate in site reviews with the Environmental Protection and Safety Panel (EPSP) to provide independent recommendations to the JRSO on drilling safety and environmental protection.
- Expedition planning and implementation: Provide scientific, engineering, operational, and logistical planning and execution for each scheduled expedition; interact with and provide oversight to the drilling subcontractor (ODL) and wireline logging subcontractor (Schlumberger); manage rig instrumentation; perform/oversee drilling, logging, and coring operations; plan and implement large projects; and conduct long-range operational and science planning for out-year expeditions.
- Expedition staffing: Provide selection and support for scientific staffing and Co-Chief Scientist selection for each scheduled JRSO expedition.
- Logistics support: Provide for expedition and shore-based activities including procurement, shipping, and inventory of equipment and supplies.
- Clearance/Environmental assessment: Obtain permits and clearances to drill in US and international waters, as well as the Exclusive Economic Zones (EEZs) and territorial waters of potentially any coastal country; provide for environmental assessment services for marine mammal permitting associated with seismic operations; and ensure environmental protection and safety.
- Engineering support: Provide engineering support for maintaining and developing shipboard and shore-based drilling, coring, logging, and downhole systems, including third-party developments and long–lead time borehole installation projects, for each scheduled JRSO expedition.
- Scientific leadership: Provide scientific leadership within the JRSO for expeditions, projects, and Laboratory Working Groups and provide scientific leadership on board the *JOIDES Resolution* during expeditions.
- Progress reporting: Provide expedition-related reports and content for expedition publications (e.g., *Scientific Prospectus, Preliminary Report,* etc.). Provide content for shipboard and shore-based reporting deliverables (e.g., daily and weekly ship reports, site summaries, and JRSO quarterly and annual reports).

- Liaison activities: Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate.
- Education/Outreach support: Facilitate activities of teachers at sea, give port call tours, and participate in efforts to further advance the Program through outreach.
- Legacy documentation: Routinely archive electronic copies of documents and reports produced by the JRSO on behalf of IODP, including expedition science and operations reports.

6. Technical and Analytical Services

6.1. Technical and Analytical Services goals

The Technical and Analytical Services (TAS) department's major responsibilities are to facilitate core flow and oversee laboratories. TAS stocks, maintains, upgrades, and staffs the shipboard and shore-based laboratories and instrumentation and oversees the GCR staff who curate, archive, and manage cores and samples collected by the Program.

6.1.1. Technical support and analytical systems

TAS goals include managing the complex supply chain for stocking the shipboard laboratories; operating scientific measurement equipment and providing support to shipboard scientists in the fulfilling of their responsibilities and expectations; providing a supervisory and reporting structure for seagoing JRSO personnel; educating customers regarding laboratory-specific and general shipboard safety requirements; maintenance, repair, and development of scientific equipment and laboratories while at sea to enable expedition staff to meet scientific objectives; providing support for downhole tools and measurements; working to ensure proper quality assurance (QA)/quality control (QC) of measurements made in the shipboard laboratories; and supporting shore-based laboratories.

6.1.2. Core curation

Core Curation goals include providing services in support of IODP core sampling and curation of the core collection archived at the GCR and interacting with and providing technical expertise to the KOCHI Core Center (KCC) in support of core material obtained from NSF-funded scientific ocean drilling and housed at the KCC.

6.2. TAS deliverables in FY16

- Analytical systems: Support and maintain shipboard and shore-based analytical facilities, tools, instruments, and associated QA/QC protocols.
- Laboratory working groups: Provide oversight, research direction, and advice on corrective actions and potential developments for laboratories and QA for the methods, procedures, and analytical systems both on the *JOIDES Resolution* and on shore through regular review of cruise evaluations, expedition technical reports, issues management communications, and interactions with members of the science community.
- Shipboard laboratory support: Ensure shipboard laboratory safety; handle core; oversee and assist in shipboard analytical measurements; manage and troubleshoot issues in the shipboard laboratories; ensure effective capture and transfer of expedition to database systems; manage supply chain for shipboard consumables; and support Science Parties in achieving scientific objectives;
- Scientific leadership: Provide scientific leadership within the JRSO for project management and in Laboratory Working Groups.

- Sampling and curation policy and procedures: Work with other IODP facilities and the IODP advisory panel to review and revise the IODP Sample, Data, and Obligations Policy, as needed, and implement a policy for IODP core curation. Work closely with staff to coordinate, standardize, and document curatorial procedures for IODP cores and samples.
- Sample and curation strategies: Plan sample and curation strategies for upcoming JRSO expeditions and review all shipboard and moratorium-related requests in coordination with the other members of the Sample Allocation Committee for each expedition.
- Core sampling: Provide curator specialist on board the drillship to supervise core sampling during ship operations.
- Core curation and sample requests: Conduct all responsibilities associated with curation of core collections at the GCR and provide services in support of core sampling, analysis, and education; fulfill postmoratorium sample requests from the scientific community; analyze geological core in shore-based laboratories; and provide technical expertise in interactions with the KCC in support of sampling and curation of core material obtained from NSF-funded scientific ocean drilling and housed at the KCC.
- Use of core collection: Promote outreach use of the core collection in collaboration with IO education/outreach personnel and other science partners by providing materials for display at meetings or museums, as well as conducting tours and supporting other JRSO outreach activities.
- Progress reporting: Provide content for reporting deliverables (e.g., JRSO quarterly and annual reports).
- Liaison activities: Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate. Participate in annual IODP curatorial staff meeting.
- Education/outreach support: Facilitate activities of teachers at sea, give port call tours, and participate in efforts to further advance the Program through outreach.
- Legacy documentation: Routinely archive electronic copies of documents and reports produced by the JRSO on behalf of IODP.

7. Development, IT, and Databases

7.1. Development, IT, and Databases goals

The Development, IT, and Databases (DITD) department oversees JRSO data collection/storage, management, and archiving; maintains IT infrastructure on ship and shore; develops and maintains instrument-specific software for data acquisition; and manages the Programs' extensive databases.

DITD goals include management of data supporting IODP activities, management of expedition and postexpedition data, providing long-term archival access to data, and supporting IT services.

7.2. DITD deliverables in FY16

- Expedition data services: Maintain and manage databases supporting expedition planning and data collected during expeditions; operate and maintain data management and harvesting systems (including QA/QC for storage and archival of expedition and postexpedition data, including core and sample tracking); ensure data integrity; respond to data requests from the scientific community; process downhole log data as needed; and plan data handling for special/third-party science equipment.
- Program-wide data query services: Provide JRSO customers with access to expedition databases and data using web-based services.
- Operation and maintenance: Operate and maintain computer and network systems both on ship and shore; maintain IT infrastructure, including satellite communications, personal computers, and network instrumentation hosts; and maintain congruency between ship and shore system architectures.
- IT service support: Provide help desk services and support IT needs of visiting scientists.
- Security services: Monitor and protect JRSO network and server resources to ensure safe, reliable operation and security for IODP data and IT resources.
- Software development: Provide software development services as needed, maintain software, and provide training support for shipboard scientists as necessary.
- Project Portfolio Management: Administer the JRSO project portfolio management program.
- Reporting: Provide content for reporting deliverables (e.g., JRSO quarterly and annual reports). Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate.
- Expedition outreach: Facilitate activities of teachers at sea and enable ship-to-shore videoconferencing with classrooms, museums, and meetings.
- Legacy documentation: Routinely archive electronic copies of documents and reports produced by the JRSO on behalf of IODP, including documentation of all IT architecture and corresponding services configurations.

8. Publication Services

8.1. Publication Services goals

The Publication Services (Pubs) department is responsible for producing IODP scientific publications, from pre-expedition planning documents (i.e., *Scientific Prospectuses*) to postexpedition *Proceedings* volumes, along with technical documentation and Program reporting deliverables. Integrated presentation of IODP Program publications will be managed through a combination of NSF funding and IO contracts for expeditions taking place from FY15 forward.

Pubs goals include providing publications support services for JRSO drilling expeditions and editing, production, and graphics services for all required reports and scientific publications as defined in the JRSO cooperative agreement with NSF. IODP publications for FY16 will include quarterly and annual reports for the JRSO; a *Scientific Prospectus, Preliminary Report,* and *Proceedings of the International Ocean Discovery Program* volume for each JRSO and CDEX expedition; and *Proceedings of the Integrated Ocean Drilling Program* volumes for USIO, CDEX, and ESO expeditions that concluded by the end of FY14.

8.2. Pubs deliverables in FY16

- Shipboard publications support: Provide a Publications Specialist for publications support and report coordination during each FY16 JRSO expedition.
- Postexpedition editorial meetings: Provide editorial, graphics, and production support during each JRSO postexpedition editorial meeting.
- IODP scientific publishing: Produce scientific and expedition reports, including approximately 8 JRSO and 2 CDEX scientific reports (*Scientific Prospectuses* and *Preliminary Reports*) and expedition reports from 7 JRSO expeditions that will either be published or in production during FY16, as well as postexpedition data reports and synthesis papers from 13 Integrated Ocean Drilling Program expeditions and 7 IODP expeditions.
- Publications management: Manage peer-review process for Integrated Ocean Drilling Program and JRSO *Proceedings* volumes (~40 data reports or synthesis papers) and provide centralized recordkeeping of IODP postexpedition research submissions.
- Bibliography and citation management: Manage postexpedition publication citations, maintain cumulative Program and expedition-related bibliographies, prepare annual report of Program-related citation statistics, and respond to special requests for Program-related citation data.
- Progress reporting: Edit and produce the JRSO FY15 fourth quarterly report, 3 JRSO FY16 quarterly reports, the JRSO FY15 Annual Report, and the JRSO FY17 Annual Program Plan, including original versions and all revisions required by NSF.
- Expedition outreach: Facilitate activities of teachers at sea during JRSO expeditions.
- Legacy and technical documentation: Routinely archive electronic copies of all documents, reports, technical documentation, and scientific publications produced by the JRSO on behalf of IODP.

- Integrated Ocean Drilling Program closeout activities: Complete and archive expedition publications (e.g., publish data reports and synthesis papers in the *Proceedings of the Integrated Ocean Drilling Program* and update expedition-related citation lists associated with legacy program expeditions).

9. JRSO FY16 budget

9.1. Overview

The budget summary and detailed departmental budgets in this section describe the overall JRSO FY16 budget requests to provide a framework for interpreting fiscal data in quarterly reports delivered to NSF by the JRSO.

Section 9.2 provides the cumulative total for each major expense category in the JRSO FY16 budget, Section 9.3 shows the detailed budget request for each department, and Section 9.4 outlines the potential cost savings by expedition that would result from elimination of a scheduled expedition. The budget explanation for each expense category is provided in Section 9.5.

9.2. FY16 expense category summary

FY16 JRSO budget by expense category	
Expense category	**Cost**
Salaries and fringes	8,676,464
Equipment	738,000
Travel	1,446,750
Materials and supplies	3,024,683
Consultant/professional services	779,310
Computer services	20,000
Subcontracts	38,799,216
Other direct costs	3,661,684
Shipping	*1,430,378*
Communication	*374,494*
Business conferences	*35,650*
Training	*240,170*
Insurance	*666,245*
Maintenance and repair	*527,847*
Other	*386,900*
Total direct costs	57,146,107
Modified total direct costs	17,588,891
Indirect costs	4,573,111
Total JRSO FY16 budget	**$61,719,218**

9.3. FY16 JRSO budget detail

FY16 JRSO budget by department	
Department/expense category	**Cost**
Management and Administration	
Salaries and fringes	471,268
Equipment	0
Travel	100,000
Materials and supplies	16,000
Consultant/professional services	19,542
Computer Services	20,000
Subcontracts	38,799,216
Overseas Drilling Limited	*35,240,932*
Day rate	26,487,241
Fuel and lubricants	4,934,518
Per diem	644,709
Port calls	1,308,860
Travel—ODL	1,050,000
Insurance—*JOIDES Resolution*	780,604
Other	35,000
Schlumberger Technology Corporation	*3,558,284*
Day rate	3,152,564
Supplies	173,000
Shipping	30,000
Travel	35,000
Equipment rental	92,720
Maintenance and repair	75,000
Other direct costs	1,083,249
Shipping	*2,000*
Communication	*359,154*
Business conferences	*35,650*
Training	*15,000*
Insurance	*658,245*
Maintenance and repair	*4,800*
Other	*8,400*
Total Management and Administration direct costs	$40,509,275

Note: Continued on next two pages.

FY16 JRSO budget by department	
Expense category by department	**Cost**
Science Operations	
Salaries and fringes	2,921,131
Equipment	522,000
Travel	365,500
Materials and supplies	2,218,871
Consultant/professional services	598,450
Computer Services	0
Subcontracts	0
Other direct costs	1,789,778
Shipping	*1,372,078*
Communication	*3,500*
Training	*40,000*
Insurance	*8,000*
Maintenance and repair	*18,700*
Other	*347,500*
Total Science Operations direct costs	$8,415,730
Technical and Analytical Services	
Salaries and fringes	3,494,773
Equipment	82,000
Travel	714,000
Materials and supplies	614,500
Consultant/professional services	55,450
Computer Services	0
Subcontracts	0
Other direct costs	288,700
Shipping	*55,400*
Communication	*2,000*
Training	*108,200*
Maintenance and repair	*94,500*
Other	*28,600*
Total Technical and Analytical Services direct costs	$5,249,423
Development, IT, and Databases	
Salaries and fringes	471,197
Equipment	134,000
Travel	220,000
Materials and supplies	164,212
Consultant/professional services	101,808
Computer Services	0
Subcontracts	0
Other direct costs	486,962
Shipping	*700*
Communication	*9,840*
Training	*71,820*
Maintenance and repair	*402,702*
Other	*1,900*
Total Development, IT, and Databases total direct costs	$1,578,179

Note: Continued on next page

FY16 JRSO budget by department	
Expense category by department	**Cost**
Publication Services	
Salaries and fringes	1,318,095
Equipment	0
Travel	47,250
Materials and supplies	11,100
Consultant/professional services	4,060
Computer Services	0
Subcontracts	0
Other direct costs	12,995
Shipping	*200*
Communication	*0*
Training	*5,150*
Maintenance and repair	*7,145*
Other	*500*
Total Publication Services direct costs	**$1,393,500**
JRSO total direct costs	57,146,107
JRSO total modified total direct costs	17,588,891
JRSO indirect costs	4,573,111
Total JRSO FY16 budget	**$61,719,218**

9.4. Cost savings resulting from elimination of certain expeditions

Expense category	Maldives Monsoon and Sea Level	SW Indian Ridge Lower Crust and Moho	South African Climates	Sumatra Seismogenic Zone
Ship operations reduction	84,620	211,629	305,893	237,338
Payroll and travel reduction	287,287	311,971	300,639	281,807
Supplies reduction	340,103	350,832	296,047	384,429
Shipping reduction	86,250	139,313	270,873	134,050
Total potential budget reduction	**$798,260**	**$1,013,745**	**$1,173,452**	**$1,037,624**

9.5. Expense category definitions

Salaries and fringe benefits. Salaries, fringe benefits, and sea pay, including an anticipated cost-of-living allowance for staff supporting the Program (see Section 3.2). Fringe rates are calculated based on a University-established percentage of 17.4% plus insurance premiums.

Equipment. Procurement, upgrading, or fabrication of operational equipment with an acquisition cost of more than $5,000; computer and network equipment to replace aged network models, workstations, and plotters, and new workstations for new staff. Costs associated directly with equipment (computer, scientific, and drilling) intended solely for use on the ship over a period of time greater than one expedition, equipment purchased for a specific expedition, and the pro-rata cost of shore-based equipment used partially to support expedition activities. Tools and equipment in support of logging operations. Operational equipment replacement and acquisition of parts and spare units for downhole tools. Acquisition of new analytical systems and capital replacement or upgrades of failed or obsolete laboratory equipment. Estimated equipment costs are projected based on potential for loss during operations as well as on the need for replacement and are calculated using current quotes on file.

Travel. Transportation, per diem, lodging, and other associated costs.

Domestic. Travel to IODP meetings and workshops, pre- and postexpedition planning meetings; subcontractor, insurance, and vendor meetings; and professional conferences. Travel costs to bring off-site JRSO staff to participate in on-site meetings. Costs are estimated at $2,000 per domestic trip based on the current published government per diem rates.

International. Travel for personnel attending international Program meetings and workshops and for personnel who will work at port calls, sail during expeditions, and/or work on the ship during transits or tie-up periods. Costs are estimated at $5,000 for regular meetings and $5,500 for port calls/expeditions based on the expedition schedule, the current published government per diem rates, and estimated air travel costs specific to the port call location.

Materials and supplies. Operational, laboratory, logistical, and shipping supplies for shipboard and shore-based analytical and engineering laboratory and test facilities and expeditions, including long-lead hardware for FY17 expeditions (to be determined based on the outcome of the May 2015 JRFB meeting). Cost estimates for drill bits, core liner, hardware, bulk materials, and coring supplies are calculated based on expedition-specific requirements such as estimated penetration, core recovery, lithology, and potential hole instability. Standard reference material; shipboard laboratory consumables and safety supplies; specialized supplies for core sampling and curation tasks; expendables and small hardware for continued operation and maintenance of IT resources; digital photographic supplies (e.g., drum scanner supplies, CDs, DVDs, and tapes) for processing images on shore; general operational and office supplies including printer and copier supplies and paper; non-inventory equipment costing less than $5,000; software purchases and upgrades, software subscriptions, volume licensing agreements, concurrent usage software agreements, electronic media, and other computer supplies; costs of office furniture, including replacing broken or aging office furniture; and general safety and cleaning supplies.

Consultant/professional services. Costs for expert assistance, including annual physical examinations for seagoing personnel, external printing and copier services, vehicle and warehouse equipment repair, testing and calibration of laboratory instruments and equipment, machine shop services, inspection and refurbishment of drill pipe, facilities repair, lease of off-premises records storage facility, visitor parking permits, back-up services, IT expert assistance services, TAMU Physical Plant services, temporary labor, tuition for Graduate Assistant Research positions, transfer fees, and weather reports. Consultant and contract services, including services in support of network and videoconferencing equipment, engineering evaluation services as needed, and liaisons to selected panels as needed. American Geosciences Institute (AGI) Ocean Drilling Citation Database fee for inclusion of new citations, CrossRef annual membership and administrative costs, digital object identifier (DOI) registration charges, and CrossMark registration charges.

Computing services. Use of TAMU's financial and management information system (FAMIS), including the Program's share of costs based on the number of entry lines.

Subcontracts. Consultant and contract services.

Overseas Drilling Limited (ODL). Subcontract for operations of the research vessel *JOIDES Resolution.* Costs related to this subcontract include

Day rate: Vessel staffing for the subcontractor's sailing crew and drilling personnel, not including the cost of the USIO personnel or scientists aboard the ship. The day rate varies according to the mode of the ship, which is operating (drilling or cruising) or standing by (in port). Although it is a fixed rate per day, the day rate is adjusted for changes in the Consumer Price Index-Urban (CPI-U) and Employment Cost Index (ECI). The amount is based on 365 days, which includes all or part of the tie-up period, and the budget allows for one CPI-U adjustment of 2.468915% and one ECI adjustment of 2.244142%, each based on an average of the last 3 actual percentage increases. The anticipated operating/transiting and standby day rates, respectively, are $72,796.49 and $70,533.54 through 31 December 2015, then adjusting to $73,270.17 and $70,865.94 for the remainder of the fiscal year.

Fuel and lubricants: Fuel to be purchased for the riserless vessel estimated at a total of 6,605 metric tons: 1,200 metric tons in Darwin, Australia; 1,350 and 1,600 metric tons in Colombo, Sri Lanka (2 refuelings); 1,300 metric tons in Port Louis, Mauritius; and 1,200 metric tons in Cape Town, South Africa. Price per metric ton is based on prices quoted by Bunkerworld for those locations as of 25 March 2015.

Per diem: Shipboard catering costs associated with meals and berthing on the vessel and cleaning of the laboratory stack. The estimate is based on a shipboard party of 60 participants at $33.91/day/person for all nontransit and nonmaintenance periods. The number of personnel on board for transit and non-IODP periods was estimated based on previous staffing schedules in like circumstances. This category does not include per diem for the ship subcontractor's sailing crew and drilling personnel, as they are accounted for in the day rate unless charged as a reimbursable (see "Day Rate" above).

Port call costs: Vessel agent's expenses, subcontractor freight, and meals and lodging costs incurred during subcontractor's crew rotations for port calls scheduled for Colombo, Sri Lanka (2 port calls at 5 days each); Port Louis, Mauritius (5 days); Cape Town, South Africa (104 day tie-up period); and Singapore (5 days).

Insurance—JOIDES Resolution. Annual insurance premiums for subcontractor and TAMRF, including subcontractor's premium costs for All Risks Marine Hull and Machinery (H&M) and Removal of Wreck (ROW) insurance and TAMRF premium costs for General and Automobile Liability, Workers Compensation, Cargo, Third Party Property (Equipment), Excess Liability, Control of Well and Seepage and Pollution Liability, Charterers Legal Liability, and Contractor's Pollution Liability–Gradual coverage for the vessel. All premium amounts are based on 366 days of coverage, and the premiums for Sections 1 and 2 of the Hull & Machinery coverage are discounted 50% during the non-IODP periods, which total 104 days in FY16.

Travel—ODL: Subcontractor transportation, including airfare for ship subcontractor's crews to/from 7 scheduled crew changes—Colombo, Sri Lanka (Expedition 360); Port Louis, Mauritius (Expedition 361); Cape Town, South Africa (3 during non-IODP period); Colombo, Sri Lanka (Expedition 362), and Singapore (Expedition 363). The estimate is based on a crew of 60 personnel with various domestic and international origin fly points arriving and departing each port call.

Schlumberger Technology Corporation (Schlumberger). Subcontract for the provision of a standard suite of tools, engineer services, software support, mobilization services, and specialty tools as needed; support for a dedicated engineer on the ship for each cruise and support from the base of operations; the services of a

district engineer, staff engineer, electronics technician, and special services engineer on an as-needed basis. Costs (including shipping charges) related to leasing equipment needed for wireline fishing, back-off and severing services, day rate and travel expenses for the Schlumberger engineer, and the day rate for tool insurance for the deployment of downhole logging tools.

Other direct costs. Costs not covered in other categories.

Shipping. Postage, express mail, and freight, including general postage and express mail/courier services for regular correspondence, scientific reports, small packages, and data and photo requests; shipping of materials, equipment, and supplies to and from expeditions; regular-sized sample shipments to scientists; and costs for special shipments of deep-frozen microbiological samples, U-channels, or whole core sections for X-ray fluorescence scanning. Estimated costs are based on historical averages of similar shipments for standard items sent to the ship for each expedition as well as expedition-specific items.

Communication. Standard telephone line, long distance, and fax charges; cellular phone charges; satellite; and cost of web and video conferencing as needed. Cost for very small aperture terminal (VSAT) communication and Marisat communication to and from the *JOIDES Resolution.*

Business conferences. Catering, supply, and incidental costs associated with hosting pre- and postexpedition meetings, core sampling events, educational workshops, on-site training events, and visits to the GCR. The cost per meeting is based on the past three years' expense data for these meetings. IODP-TAMU hosts approximately 21 meetings per year.

Training. Registration, transportation, per diem, and lodging expenses related to professional courses and meetings and online training courses.

Insurance. Annual insurance premiums for JRSO vehicles.

Maintenance and repair. Equipment service agreements and noncontracted maintenance and repair of equipment in warehouse, forklift, overhead cranes and other loading dock equipment, deep freezers, shrink-wrap and bagging machinery, office equipment, copiers, postage meter, imaging equipment such as cameras, vehicle fleet, IT computer hardware and software; and drilling, coring, logging operations, laboratory, repository, and safety equipment.

Equipment rental. Rental of equipment when it is more economical to rent than purchase, including conference equipment, mud motors, and water cooler rental.

Recruiting and relocation. Employee recruitment costs, including local, internet, and science and trade journal advertisements as well as other costs related to filling/replacing positions and recruiting professional staff. Relocation costs for new employees.

Library. Technical books, journals, and other resources, including subscriptions to professional publications and documentation materials required for reference.

Indirect costs. The TAMU off-campus indirect cost rate of 26% modified total direct cost (MTDC) is applied to this cooperative agreement. MTDC is calculated as total direct costs minus costs in exempt categories (e.g., equipment and subcontract costs over $25,000).

Appendix I: IT security summary

Policies and procedures

Extensive Standard Administrative Procedures provided by Texas A&M University are available at http://rules-saps.tamu.edu/TAMURulesAndSAPs.aspx.

The JRSO policy for communications to and from the RV *JOIDES Resolution* is available at http://iodp.tamu.edu/participants/policies/IODP_Comm_Policy.pdf. IT-specific policies for IODP are available on IODP's intranet site (not open to the public).

All employees must take yearly security awareness training as required by Texas A&M University. As part of this training, all users are required to acknowledge that they have read, understand, and will comply with university requirements regarding computer security policies and procedures.

Risk assessment

The JRSO completes an annual Information Security Assessment, Awareness, and Compliance (ISAAC) report as required by TAMU. The results are electronically reviewed by the Supervisor of Information Technology & Support, department manager, and Director, and then filed with the Texas A&M University Risk Management Office.

Roles and responsibilities

System Administrator, Marine Computer Specialist, and Service Desk Specialist (departmental IT personnel) responsibilities include

- Applying platform technical safeguards.
- Supplying the first-level response (i.e., restoration services) to any security breach.
- Immediately reporting any security breach to the Supervisor of Information Technology & Support.

Supervisor of Information Technology & Support responsibilities include

- Assuring that best practices are followed in the administration of systems.
- Reporting criminal activity under applicable state code concerning computer or telecommunications crimes to the department manager, Director, College of Geosciences Dean, and Texas A&M University's Chief Information Security Officer or designee.
- Determining if a violation rises to the standard of fraud or fraudulent action and reporting it to the department manager, Director, and College of Geosciences Dean.
- Determining the physical and electronic evidence to be gathered as part of incident investigation such as initiating, completing, and documenting the incident investigation.

Technical safeguards

- Departmental IT personnel shall test security patches prior to implementation where practical. Departmental IT personnel are encouraged to have hardware resources available for testing security patches in the case of special applications.
- Departmental IT personnel shall ensure that vendor-supplied patches are routinely acquired, systematically tested, and installed promptly based on risk-management decisions.
- Departmental IT personnel shall enable security features included in vendor-supplied systems in accordance with best practices, including but not limited to firewalls, virus scanning and malicious code protections, and other file protections, where possible. Audit logging shall also be enabled. User privileges shall be set utilizing the “least privileges” concept of providing the minimum amount of access required to perform job functions. Privileges may be added as need is demonstrated by the user. The use of passwords shall be enabled in accordance with Texas A&M University policies referenced below.
- Departmental IT personnel shall disable or change the password of default accounts.
- Departmental IT personnel or their designee shall test servers, especially, for known vulnerabilities periodically or when new vulnerabilities are announced.
- Departmental IT personnel shall seek and implement best practices for securing their particular system platform(s).

Physical safeguards

After business hours, JRSO building entry is allowed via identification (ID)/keycard. Information is logged and available for retrieval at a later date. An access list is maintained by the Building Proctor. Entry into the main computer room is granted only to authorized personnel whose job responsibilities require access to the facility, and to vendors, when necessary. Doors are secured using push-button locks for which codes are changed periodically and whenever there is personnel change, regardless of the employee’s status upon termination. Access codes are not to be shared with others.

Power to the computer room is provided via 50 kVA uninterruptible power supply (UPS) and matching power distribution unit (PDU). In case of power outage, power is supplied to UPS and backup heating, ventilation, and air-conditioning (HVAC) by a diesel generator. The computer room is protected from fire by a halon fire suppression system.

Incremental backups are completed on a daily basis and full backups are completed weekly. One full backup copy is kept locally and another is removed to off-site storage.

Cybersecurity breach notification procedures

In the event of a cybersecurity breach:

1. Departmental IT personnel have information security roles and responsibilities that can take priority over normal duties.
2. Departmental IT personnel are responsible for notifying the Supervisor of Information Technology & Support and department manager and initiating the appropriate action, including restoration. The department manager will notify the Director and Texas A&M University's Chief Information Security Officer or designee.
3. Departmental IT personnel are responsible for determining the physical and electronic evidence to be gathered as part of the incident investigation, such as initiating, completing, and documenting the incident investigation.
4. Departmental IT personnel shall report security incidents that may involve criminal activity under their respective state's penal code concerning computer or telecommunications crimes to the Director or department manager and Texas A&M University's Chief Information Security Officer or designee.
5. If fraud or theft is suspected as part of security incident detection, the person detecting the incident shall follow their respective system policies concerning the control of fraud and fraudulent actions.
6. If there is a substantial likelihood that security incidents could be propagated to other systems beyond departmental control, Departmental IT shall report/escalate such incidents as soon as an incident is identified.
7. The Supervisor of Information Technology & Support shall file an after-action report to the Texas A&M University Information Technology Risk Management (ITRM) office by e-mail to security@tamu.edu.

Security measures for nonemployees

All subcontractors, researchers, and others who will have access to the systems employed in support of this contract are required to follow all Texas A&M University and JRSO security policies.

Appendix II: Recommended program of insurance

TAMRF will utilize the risk management services of TAMUS and TAMU. These services will include insurance policy monitoring, ongoing risk assessments, marine insurance negotiations, and claims settlement. TAMRF's established relationship with the London insurance market coupled with the Program's safety history have enabled TAMUS and TAMU staff to obtain cost-effective premiums. TAMUS and TAMU staff have used market relationships, attention to detail, and clear communication to educate insurance brokers and underwriters to the specific risks involved in deep-ocean coring and to foster an understanding of risk mitigation along with differentiation from the common risks incurred during energy-related drilling.

Premium negotiations include documentation and explanation of specific exposures, estimated payroll costs, estimated operational time, confirmation of valuation, and operational history. As a result of proactive risk management, communication, and education, the Program's premiums have historically averaged less than the energy market, and terms and conditions for insurance coverage have been more favorable than the norm in the energy sector. The premiums in the table below are preliminary estimates subject to underwriter confirmation in FY15.

The FY16 proposed program of insurance for mitigation of drilling risks and marine/employer's liability is depicted in the following table. In addition, TAMUS and TAMU, on behalf of the JRSO, will assess specialty risks and procure insurance if warranted.

JRSO FY16 program of insurance details			
Program of insurance with government indeminification	Coverage limits	Deductible	Estimated annual premiums
Hull & Machinery and Removal of Wreck[1]	190,000,000	250,000	780,604
Control of Well	25,000,000	50,000	107,852
Seepage & Pollution Liability[2]	1,000,000	50,000	0
Cargo	5,000,000	25,000	46,892
Third Party Property/Equipment	10,000,000	25,000	29,659
Charterer's Legal Liability	1,000,000	10,000	13,944
Contractor's Pollution Liability—Gradual	10,000,000	1,000,000	27,000
Umbrella	200,000,000	Per underlying limits	309,588
Worker's Compensation & Maritime Employer's Liability	1,000,000	None	92,323
Comprehensive General & Automobile Liability	1,000,000	None	30,987
Total estimated annual premiums			**$1,438,849**

[1] Carried by ship subcontractor (ODL) and reimbursed by TAMRF.
[2] Included in Control of Well Policy and covered under the Umbrella.