

International Ocean Discovery Program
JOIDES Resolution Science Operator
Texas A&M University

FY20 Annual Program Plan to NSF

for the time period
1 October 2019–30 September 2020

Amount proposed FY20: \$66,521,549

Respectively submitted to:
National Science Foundation



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30 July 2019

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1. Executive summary

Texas A&M University (TAMU) acts as manager and science operator of the research vessel (R/V) *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 TAMU Sponsored Research Services (SRS).

1.1. Annual Program Plan overview

The complex nature of IODP operations requires Annual Program Plans spanning operational years to establish priorities and allow the procurement of long-lead time equipment and services. The IODP JRSO FY20 Annual Program Plan to the National Science Foundation (NSF) defines the JRSO scope of work for FY20 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 for JRSO by NSF and (2) the JRSO operations schedule approved by the *JOIDES Resolution* Facility Board (JRFB) in May 2019. The scope and budget justification of the activities described in the Annual Program Plan are derived from NSF guidance to JRSO.

The IODP JRSO FY20 Annual Program Plan includes discussion of JRSO goals, responsibilities and deliverables, the operational schedule, descriptions of planned expeditions, and the organizational structure for science operations and platform operations activities. Section 1 provides budget definitions, assumptions, and directives used to construct the Annual Program Plan. Section 2 describes scheduled FY20 expedition operations. Section 3 covers organizational structure, personnel summary, and Management and Administration tasks. Section 4 provides an overview of subcontracts. Sections 5 through 9 address JRSO goals, deliverables, and budgets by department. Section 10 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 JRSO to protect contractual research and education activities. “Appendix II: recommended IODP JRSO program of insurance” provides information on risk management services provided to JRSO, including insurance policy monitoring, ongoing risk assessments, marine insurance negotiations, and claims settlement.

1.2. JRSO FY20 scope of work

As science operator of the *JOIDES Resolution* research facility, JRSO will provide wireline coring and logging services and technical, science, and engineering support for *JOIDES Resolution* expeditions (Sections 5 and 6); provide IT support, develop data applications, and manage digital databases (Section 7); curate core materials (Section 8); and publish pre- and postexpedition reports and research results (Section 9). These Program activities will be conducted in accordance with direction provided by the Program advisory panels and the JRFB and as outlined in the approved Annual Program Plan.

JRSO activities and deliverables associated with planning and preparation for *JOIDES Resolution* expeditions include conducting long-lead time planning for expeditions scheduled for future fiscal years, providing all necessary environmental assessments, and documenting operational challenges and risks. JRSO postexpedition activities, deliverables, and ongoing operational tasks include expedition reporting, facilitating expedition research, producing technical documentation, and continuing legacy work.

On behalf of JRSO and as outlined in this Annual Program Plan, TAMRF has contracted with Overseas Drilling Limited (ODL) for the services of the *JOIDES Resolution* and with a wireline logging subcontractor (to be determined [TBD]) for the provision of downhole logging equipment and engineering support (Section 4).

1.3. FY20 budget development

NSF guidance

NSF’s FY20 mission forecast for JRSO includes guidance to conduct four expeditions in FY20 and a budget upper limit of \$65,000,000.

FY20 budget assumptions

The total budget request of \$66,521,549 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, and so forth; 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 by IODP.

Assumptions about the operations schedule are outlined in Section 2. This plan provides JRSO’s best-effort estimate of FY20 costs. If additional funds are identified or expected costs can be avoided during the fiscal year, JRSO may, upon consultation with NSF, use these funds 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 within the stated budget. Assumptions were made using the best available data to determine a prudent estimate for FY20 fuel costs; however, market conditions are subject to fluctuations that may result in a need for supplemental funding during the period of operations.

FY20 budget request

The FY20 JRSO budget summary in Table 1.1 shows the overall budget request by department. The line-item total requested for each department includes only direct costs. Subcontracts to ODL and a wireline logging subcontractor (TBD) are budgeted in Management and Administration. Cumulative JRSO costs are separated into total direct costs and indirect costs that make up the “grand total” budget.

Table 1.1. JRSO FY20 budget request by department.

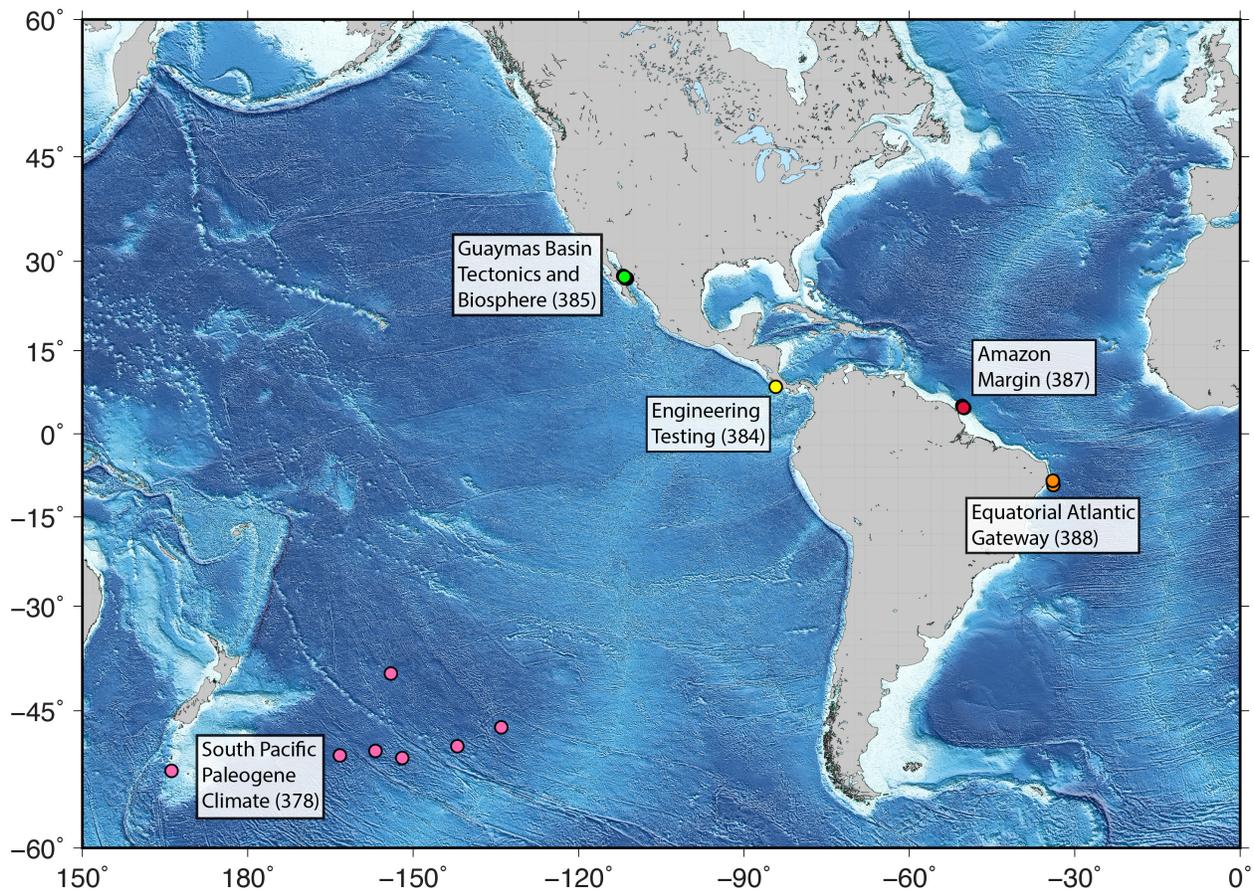
Department	Cost
Management and Administration	45,387,117
Science Operations	8,299,793
Technical and Analytical Services	4,779,459
Development, IT, and Databases	1,834,523
Publication Services	1,547,468
JRSO total direct cost	61,848,360
JRSO modified total direct costs	17,973,796
JRSO indirect costs	4,673,189
Grand total JRSO FY20 budget request	66,521,549

2. Expedition operations

This Annual Program Plan is based on the following operations schedule published 18 September 2018 and includes two tie-up periods.

16 September–16 November 2019	Expedition 385: Guaymas Basin Tectonics and Biosphere
16 November–3 January 2020	Tie-up period
3 January–4 March 2020	Expedition 378: South Pacific Paleogene Climate
4 March–26 April 2020	Expedition 384: Engineering Testing
26 April–26 June 2020	Expedition 387: Amazon Margin
26 June–26 August 2020	Expedition 388: Equatorial Atlantic Gateway
26 August–5 October 2020	Tie-up period

Figure 2.1. FY20 JRSO expedition site map.



2.1. FY20 expeditions

Expedition 385: Guaymas Basin Tectonics and Biosphere

Proposed operations

The Guaymas Basin in the Gulf of California is a young, marginal rift basin characterized by active seafloor spreading and rapid deposition of organic-rich sediments from highly productive overlying waters. The high sedimentation rates in combination with an active spreading system produce distinct oceanic crust where the shallowest magmatic emplacement occurs as igneous intrusion into overlying sediments. The intrusion of magma into organic-rich sediments creates a dynamic environment where tightly linked physical, chemical, and biological processes regulate the cycling of sedimentary carbon and other elements, not only in a narrow hydrothermal zone at the spreading center but also in widely distributed off-axis venting. Heat from magmatic sills thermally alters organic-rich sediments, releasing CO₂, CH₄, petroleum, and other alteration products. This heat also drives advective flow, which distributes these alteration products in the subsurface and may also release them to the water column. Within the sediment column, the thermal and chemical gradients created by this process represent environments rich in chemical energy that support microbial communities at and below the seafloor. These communities may play a critical role in chemical transformations that influence the stability and transport of carbon in crustal biospheres. Collectively, these processes have profound implications for the exchange of heat and mass between the lithosphere and overlying water column and may determine the long-term fate of carbon accumulation in organic-rich sediments.

The fate of carbon deposited in Guaymas Basin, throughout the Gulf of California, and more broadly within similar marginal seas throughout the world, depends on the relative efficiencies of interacting physical, chemical, and microbial processes, some working to sequester carbon and others working to release carbon back to the ocean and the atmosphere. Drill core samples from Expedition 385 will enable us to study these processes, their interactions, and their ultimate effects on carbon cycling. Samples obtained from scientific drilling are crucial to these goals, which include (1) quantifying the sedimentary and elemental inputs to the system through time and their variation with oceanographic and climatic conditions; (2) sampling igneous sills and the surrounding sediments to determine the products and efficiency of alteration and key hydrologic factors such as sediment type, faulting, and permeability evolution; and (3) studying subsurface microbial communities hosted by alteration products to determine their efficiency at capturing carbon-bearing alteration products and to further our understanding of the conditions that limit life in the deep biosphere.

Logistics

Operations for Expedition 385 are budgeted based on an estimated 61 days (5 in port, 9 in transit, and 47 in operations).

Expedition 378: South Pacific Paleogene Climate

Proposed operations

Expedition 378 is designed to recover the first comprehensive set of Paleogene sedimentary sections from a transect of sites strategically positioned in the South Pacific to reconstruct key changes in oceanic and atmospheric circulation. These high southern-latitude sites will provide an unparalleled opportunity to add crucial new data and geographic coverage to existing reconstructions of Paleogene climate.

As the world's largest ocean, the Pacific Ocean is intricately linked to major changes in the global climate system. Previous drilling in the low-latitude Pacific Ocean during Ocean Drilling Program (ODP) Legs 138 and 199 and Integrated Ocean Drilling Program Expeditions 320 and 321 provided new insights into the mechanisms of the climate and carbon system, productivity changes across the zone of divergence, time-dependent calcium carbonate dissolution, bio- and magnetostratigraphy, the location of the Intertropical Convergence Zone, and evolutionary patterns for times of climatic change and upheaval. Expedition 378 in the South Pacific Ocean uniquely complements this work because appropriate high-latitude records are unobtainable in the Northern Hemisphere of the Pacific Ocean.

To optimize the recovery of Paleogene carbonates buried under red clay sequences at present latitudes of 40°–52°S and enable a full range of paleoceanographic proxy-based investigations, we will core a transect of sites primarily situated along magnetic Anomaly 25n on ~56 Ma crust. Additional sites are located on 40 Ma crust (Anomaly 18). The drilling strategy will also recore the sedimentary record at Deep Sea Drilling Project (DSDP) Site 277 to obtain a continuous record of a previously spot-cored, classic Paleogene high-latitude site and provide a crucial, continuous record of the shallow Subantarctic South Pacific Ocean from the Paleocene to late Oligocene.

Expedition 378 will provide material from the far South Pacific Ocean in an area with no previous scientific drilling as part of a major regional slate of expeditions in the Southern Ocean to fill a critical need for high-latitude climate reconstructions.

The operational plan is to occupy seven primary sites (with two proposed alternate sites) along an east–west transect to recover the most complete sedimentary succession possible, which includes coring three holes at each site with wireline logging operations at the two deepest penetration sites. Basement will be tagged in at least one of the holes at each site.

Logistics

Operations for Expedition 378 are budgeted based on an estimated 61 days (3 in port, 27 in transit, and 31 in operations).

Expedition 384: Engineering Testing

Proposed operations

The main priority of the Expedition 384 will be to test new types of drilling bits and reamers identified at the Deep Crustal Drilling Workshop (October 2017). Testing will take place at sites in the low-latitude East Pacific at previously occupied scientific ocean drilling site(s) with suitable sediment cover, adequate basement penetration, and acceptable water depth to maximize the testing that can be accomplished in this time window.

Logistics

Operations for Expedition 384 are budgeted based on an estimated 53 days (5 in port, 25 in transit, and 23 in operations).

Expedition 387: Amazon Margin

Proposed operations

During Expedition 387, two sites will be cored and logged in the upper part of the long-lived Foz do Amazonas Basin on the equatorial margin of Brazil. Together, these sites will target recovery of a

complete, high-resolution sedimentary sequence spanning nearly the entire Cenozoic. Their particular outer shelf/upper slope location minimizes the (still-significant) influence of sea level variation on the sedimentary record. Their location proximal to the continent and downcurrent of the outlet of the modern Amazon River ensures that these sediments will contain an abundance of terrigenous materials including pollen, organic matter, zircon grains, and clay minerals, which will allow a detailed reconstruction of the biodiversity, climate, and hydrology of the adjacent tropical South American continent. At the same time, an abundance of well-preserved marine microfossils and organic matter will allow accurate determination of the age and oceanographic conditions of the western equatorial Atlantic that partly forced the climate of the adjacent continent.

Reconstructions of the spatial patterns of biodiversity and climate through time will be interpreted with the knowledge that the geometry of the watersheds that contributed water and sediment to the coastal Atlantic was itself rearranged through time. For example, a transcontinental proto-Amazon did not likely reach the Atlantic until somewhere between 11 and 2 Ma, a date that we expect to determine very accurately. Prior to that event, terrigenous sediments at our sites were derived from smaller coastal rivers draining watersheds limited to the eastern tropics of northeastern South America. This record is the marine complement to a transect of continental drill sites (anticipated to begin in early 2020), which together form the “Trans-Amazon Drilling Project” (TADP). This undertaking addresses fundamental questions about the Cenozoic climatic evolution of the Amazon region, the origins and evolution of the neotropical rain forest and its incomparable biodiversity, the paleoceanographic history of the western equatorial Atlantic, and the origins of the transcontinental Amazon River. These studies will transform our understanding of Amazonian geological, climatic, and biological history.

Logistics

Operations for Expedition 387 are budgeted based on an estimated 61 days (5 in port, 8 in transit, and 48 in operations).

Expedition 388: Equatorial Atlantic Gateway

Proposed operations

Expedition 388 is designed to address first-order questions about the tectonic, climatic, and biotic evolution of the Equatorial Atlantic Gateway (EAG). We propose to target sequences of Late Cretaceous and Cenozoic sediments offshore northeast Brazil, just south of the theorized final opening point of the EAG. These sequences are accessible to conventional riserless drilling in the vicinity of the Pernambuco Plateau, part of the northeastern Brazilian continental shelf. This region was chosen to satisfy two key constraints that other regions in equatorial Brazil could not meet: first, Aptian-Albian aged sediments, which record the main phases of the South Atlantic marine incursion, are present at depths shallow enough to be recovered by riserless drilling; second, Late Cretaceous and Paleogene sediments preserved on the Pernambuco Plateau are close enough to the continental margin and at shallow enough paleowater depths (<2000 m) to provide well-preserved organic biomarkers and calcareous microfossils for multiproxy studies of greenhouse climate states. New records in this region will allow us to address major questions within four key themes: (1) the early rift history of the equatorial Atlantic, (2) biogeochemistry of the restricted equatorial Atlantic, (3) the long-term paleoceanography of the Equatorial Atlantic Gateway, and (4) the limits of tropical climates and ecosystems under conditions of extreme warmth. Tackling these major questions with new drilling in the EAG region will advance our understanding of the long-term interactions between tectonics, oceanography, ocean biogeochemistry and climate, and the functioning of tropical ecosystems and climate during intervals of extreme warmth.

Logistics

Operations for Expedition 388 are budgeted based on an estimated 61 days (5 in port, 2 in transit, and 54 in operations).

2.2. Expedition outreach

Berths will be made available for Onboard Education and Outreach Officers during each expedition, and JRSO personnel will facilitate their activities; give port call tours; and work with the US Science Support Program (USSSP), 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

JRSO's organizational structure directly reflects the responsibilities specified by NSF for 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 and Curation groups are part of the Director's Office.

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

On behalf of 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 a wireline logging subcontractor (TBD) for the provision of wireline logging equipment and engineering support (Section 4).

3.2. Personnel summary

The personnel summary table below presents an accounting of the cumulative estimated effort within each department. The table reflects actual senior personnel and departmental staffing as of 28 February 2019 plus projected staffing for FY20. 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 applications developer positions that are supported through indirect costs.

Table 3.1. FY20 personnel summary

Department/ senior personnel	Position titles	Personnel (#)
Management and Administration		8
Brad Clement	Director	1
	Curator	1
	Superintendent of Gulf Coast Repository	1
	Curatorial Specialists	3
	XRF Laboratory Manager	1
Michele Lacey	General Manager, JSRO Administrative Services	1
Science Operations		26
Mitch Malone	Assistant Director and Manager of Science Operations	1
	Administrative Coordinator	1
	Clearance and Permitting Specialist	1
	Supervisor of Engineering and Logistics Support	1
	Staff Engineers	2
	Designers	3
	Staff Researcher	1
	Marine Logistics Coordinator	1
	International Shipping and Receiving Coordinator	1
	Materials Technician	1
	Supervisor of Operations	1
	Operations Superintendent	1
	Operations Engineer	1
	Materials Specialist	1
	Supervisor of Science Support	1
Expedition Project Managers/Staff Scientists	8	
Technical and Analytical Services		35
Gary Acton	Manager of Technical and Analytical Services	1
	Business Coordinator	1
	Supervisor of Analytical Systems	1
	Imaging Specialists	2
	Supervisor of Technical Support	1
	Laboratory Officers	3
	Assistant Laboratory Officers	4
	Marine Laboratory Specialists (Research Associates/Research Specialists)	18
Marine Instrumentation Specialists	4	
Development, IT, and Databases		4
Jim Rosser	Manager of Development, IT, and Databases	1
	Supervisor of Databases and Archives	1
	Software Applications Developer III	1
	Data Analyst	1
Publication Services		18
Lorri Peters	Manager of Publication Services	1
	Supervisor of Editing	1
	Editors	4
	Publications Coordinator	1
	Business Coordinator	1
	Supervisor of Production and Graphics	1
	Production Editors	4
Graphics Specialists	5	
Total FY20 JRSO personnel		93

3.3. Management and Administration goals

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

3.4. Management and Administration deliverables in FY20

Program planning

Develop and ensure implementation of Annual Program Plans.

Progress reporting

Provide content for and submit quarterly and annual reporting deliverables, including financial reports.

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 [PMOs], 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, procurement, 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 JRSO on behalf of IODP.

4. Subcontractors

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 JRSO. Establishment of subcontracts involves developing a detailed scope of work that outlines the operational responsibilities of the subcontractor, reviewing subcontractors' policies and agreements to ensure that applicable flow-down regulations are incorporated into any subagreements (e.g., shipboard catering), and monitoring 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 audits of subcontractors' financial records to ensure financial compliance with cost allowability and other contractual requirements.

4.1. Overseas Drilling Limited

ODL is responsible for safely conducting drilling and coring operations to meet the scientific goals outlined in the Annual Program Plan. These responsibilities include 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. Review of ODL policies and agreements related to catering, travel, and purchasing ensure that applicable flow-down regulations are incorporated. 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.

4.2. TBD wireline logging subcontractor

The wireline logging subcontract is currently being competed and JRSO expects to have a contract in place well before the beginning of FY20. The wireline logging subcontractor provides services associated with the design, installation, and operation of logging infrastructure on board the *JOIDES Resolution* to meet the scientific goals outlined in the Annual Program Plan. Two logging engineers sail on a rotating basis, working directly with JRSO staff throughout the expedition and assisting with logging projects on shore. This integration embeds logging operations in the Science Operations department's approach to planning, ensuring the Program's goals are met in accordance with the approved operations plan and subcontract agreement. Detailed review of invoices submitted prior to payment ensures financial compliance.

4.3. Rutgers-IODP Core Repository

The Rutgers-IODP Core Repository archives cores obtained during ODP Legs 150X and 174AX. These cores are currently being used to answer questions pertaining to the Paleocene/Eocene Thermal Maximum, Cretaceous/Paleogene mass extinction, Cenozoic sea level change, and Holocene sea level rise. The Rutgers-IODP Core Repository will maintain the cores, fill sampling requests, host visitors, maintain and improve databases related to these cores, and use these cores in outreach to undergraduates, graduate students, and other geologists.

5. Science Operations

5.1. Science Operations goals

The SciOps department provides scientific, operational, engineering, and logistical planning and implementation for *JOIDES Resolution* drilling expeditions in response to the IODP science planning structure. 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. Science Operations deliverables in FY20

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 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 (TBD); manage rig instrumentation; perform and 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 waters as well as the Exclusive Economic Zones (EEZs), Extended Continental Shelves (ECSs), 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 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 Education and Outreach Officers, 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 JRSO on behalf of IODP, including expedition science and operations reports.

6. Technical and Analytical Services

6.1. Technical and Analytical Services goals

The TAS department oversees the laboratories and facilitates core curation, handling, and shipping. TAS stocks, maintains, upgrades, and staffs the shipboard and shore-based laboratories. TAS goals include managing the complex supply chain for stocking the shipboard laboratories; operating scientific instruments and providing support to shipboard scientists in making scientific measurements; educating scientists about laboratory-specific and general shipboard safety requirements; maintaining, repairing, and developing scientific equipment and laboratories while at sea to enable expedition staff to meet scientific objectives; providing support for downhole tools and measurements; establishing quality assurance/quality control (QA/QC) for measurements made in the laboratories; and supporting shore-based laboratories.

6.2. Technical and Analytical Services deliverables in FY20

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 data to database systems, manage supply chain for shipboard consumables, and support Science Parties in achieving scientific objectives.

Scientific leadership

Provide scientific leadership within JRSO for project management and in Laboratory Working Groups.

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.

Education/Outreach support

Facilitate activities of Education and Outreach Officers, 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 JRSO on behalf of IODP.

7. Development, IT, and Databases

7.1. Development, IT, and Databases goals

The 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 dissemination; and manages the Programs' extensive databases.

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

7.2. Development, IT, and Databases deliverables in FY20

Expedition data services

Maintain and manage databases that support 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, such as core and sample tracking), ensure data integrity,

respond to data requests from the scientific community, 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 on 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

Support outreach activities at sea by providing access to internet collaboration services such as ship-to-shore web conferencing.

Documentation

Maintain electronic copies of all IT architecture and corresponding services configurations.

8. Core Curation

8.1. Core Curation goals

The Core Curation unit's major responsibilities are to curate, archive, and manage cores and samples collected by the Program. Core Curation goals include providing precruise and shipboard curatorial services; postexpedition services including Sample Allocation Committee (SAC) support, sample parties, and post moratorium sampling; X-ray fluorescence (XRF) scanning services including programmatic and

personal measurements and digital imaging; core storage and preservation; and educational use of the core collection including tours and use of the repository for classes and workshops.

8.2. Core Curation deliverables in FY20

Sample 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. Work with DITD and TAS to develop new software solutions designed to replace the curation software application SampleMaster.

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 SAC for each expedition. Coordinate with the SAC, and plan and execute shore-based sample parties for cores ultimately stored at the GCR and Kochi Core Center (KCC). Assist with Bremen Core Repository (BCR) sample parties.

Core sampling

Provide a curatorial specialist on board the *JOIDES Resolution* to develop, coordinate, and execute site-sampling plans and supervise core sampling during ship operations.

Core curation and sample requests

Conduct all responsibilities associated with curating core collections at the GCR and supporting core sampling, analysis, and education; fulfill postmoratorium sample requests from the scientific community; and provide technical expertise in interactions with KCC and BCR in support of sampling and curating core material obtained from NSF-funded scientific ocean drilling and housed at the KCC and BCR.

Use of core collection and education and outreach support

Promote outreach use of the core collection in collaboration with Institute for Marine-Earth Exploration and Engineering (MarE³) (previously known as Center for Deep Earth Exploration [CDEX]) and European Consortium for Ocean Research Drilling (ECORD) Science Operator (ESO) education/outreach personnel and other science partners by providing materials for display at meetings or museums, conducting tours, and supporting other JRSO outreach activities.

Onshore XRF scanning

Provide support and oversight of the XRF scanning laboratory at the GCR. Train users in the basic operation of the equipment. Develop models for optimizing data interpretation; provide pre- and post-analysis support. Support high-resolution digital imaging.

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.

Core storage and preservation

Maintain and, where possible, improve the core storage facility. Receive, sort, and store core and residue shipments from the *JOIDES Resolution*, including the temporary storage of KCC and BCR cores (shipped from the *JOIDES Resolution* for XRF scanning). Coordinate core shipments to the KCC. Shrink-wrap and maintain the collection.

Legacy documentation

Routinely archive electronic copies of documents and reports produced by JRSO on behalf of IODP.

9. Publication Services

9.1. Publication Services goals

The Pubs department is responsible for producing IODP scientific publications, from pre-expedition planning documents (i.e., *Scientific Prospectuses*) to postexpedition *Proceedings* volumes, technical documentation (user guides, policies, and procedures), and Program reporting deliverables, along with bibliographic and citation management. Integrated presentation of IODP Program publications is managed through a combination of NSF funding and implementing organization (IO) contracts for expeditions.

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 FY20 will include quarterly and annual reports for JRSO and a *Scientific Prospectus*, *Preliminary Report*, and *Proceedings of the International Ocean Discovery Program* volume and data reports for each JRSO and MarE³ expedition.

9.2. Publication Services deliverables in FY20

Shipboard publications support

Provide a Publications Specialist for publications support and report coordination during each FY20 JRSO expedition.

Postexpedition editorial meetings

Provide editorial, graphics, and production support during JRSO and MarE³ postexpedition editorial meetings.

IODP scientific publishing

Produce scientific reports for JRSO, ESO, and MarE³ (*Scientific Prospectuses* and *Preliminary Reports*) and expedition reports *Proceedings* volumes for JRSO, ESO, and MarE³ expeditions that will be either published or in production during FY20.

Publications coordination

Manage the peer-review process for Integrated Ocean Drilling Program and JRSO *Proceedings* data reports and synthesis papers and provide centralized recordkeeping of Integrated Ocean Drilling Program and IODP postexpedition research submissions and publications in outside literature; track shipboard party publication obligations and reviewer activities.

Website maintenance

Maintain and manage the ship and shore websites (<http://iodp.tamu.edu>, <http://publications.iodp.org>, and www.ship.iodp.tamu.edu) and legacy websites (www.odplegacy.org, www-odp.tamu.edu/publications, and www.deepseadrilling.org).

Bibliography and citation management

Manage postexpedition publication citation records, 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.

Discovery and accessibility

Maintain and update IODP publications and expedition-related research collections at Science Open researcher portal, TAMU Elements database, and EBSCO information services and register extended metadata (including author ORCiDs and licensing and funding information) at CrossRef.

Publication archiving

Maintain the print archive of DSDP and ODP publications at HathiTrust and the digital archive of DSDP, ODP, Integrated Ocean Drilling Program, and IODP publications at Archive-it.

Progress reporting

Edit and produce the JRSO FY19 quarter 4 report, three JRSO FY20 quarterly reports, the JRSO FY19 Annual Report, and the JRSO FY21 Annual Program Plan, including original versions and all revisions required by NSF.

Expedition outreach

Facilitate activities of Onboard Education and Outreach Officers 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 Integrated Ocean Drilling Program legacy program expeditions).

10. JRSO FY20 budget

The budget summary and detailed departmental budgets in this section describe the overall JRSO FY20 budget requests to provide a framework for interpreting fiscal data in quarterly reports delivered to NSF by JRSO.

Table 10.1 provides the cumulative total for each major expense category in the JRSO FY20 budget, Table 10.2 shows the detailed budget request for each department, and Section 10.1 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 10.2.

Table 10.1. FY20 expense category summary.

Expense category	Cost
Salaries and fringes	9,770,846
Equipment	965,100
Travel	1,165,700
Materials and supplies	2,733,068
Consultant/professional services	368,677
Computer services	75,000
Subcontracts	42,899,464
Other direct costs	3,870,505
<i>Shipping</i>	1,218,367
<i>Communication</i>	244,092
<i>Business conferences</i>	33,000
<i>Training</i>	184,665
<i>Insurance</i>	660,427
<i>Maintenance and repair</i>	868,973
<i>Other</i>	660,981
JRSO total direct costs	61,848,360
JRSO total modified direct costs	17,973,796
JRSO indirect costs	4,673,189
Grand total JRSO FY20 budget request	66,521,549

Table 10.2. FY20 JRSO budget detail by department.

Department/expense category	Cost
Management and Administration	
Salaries and fringes	1,052,703
Equipment	0
Travel	143,000
Materials and supplies	109,750
Consultant/professional services	93,450
Computer Services	75,000
Subcontracts	42,899,464
<i>Overseas Drilling Limited</i>	39,172,338
Day rate	29,435,780
Fuel and lubricants	4,789,800
Per diem	664,737
Port calls	1,780,880
Travel—ODL	1,170,500

Note: Continued on next two pages.

Table 10.2. FY20 JRSO budget detail, continued.

Department/expense category	Cost
Insurance— <i>JOIDES Resolution</i>	777,071
Other	553,570
<i>TBD wireline logging subcontractor</i>	3,662,875
Day rate	3,489,375
Supplies	15,000
Shipping	10,000
Travel	36,000
Equipment rental	30,000
Maintenance and repair	82,500
<i>Rutgers-IODP Core Repository</i>	64,251
Salaries and fringes	38,218
Materials and supplies	1,000
Other	2,234
Indirect costs	22,799
Other direct costs	1,013,750
Shipping	29,400
Communication	235,542
Business conferences	33,000
Training	20,575
Insurance	648,427
Maintenance and repair	8,815
Other	37,991
Total Management and Administration direct costs	45,387,117
Science Operations	
Salaries and fringes	3,285,402
Equipment	187,500
Travel	304,000
Materials and supplies	2,202,568
Consultant/professional services	134,400
Computer Services	0
Subcontracts	0
Other direct costs	2,185,923
Shipping	1,182,667
Communication	0
Training	12,990
Insurance	12,000
Maintenance and repair	358,686
Other	619,580
Total Science Operations direct costs	8,299,793
Technical and Analytical Services	
Salaries and fringes	3,481,009
Equipment	447,000
Travel	463,500
Materials and supplies	236,000
Consultant/professional services	12,000
Computer Services	0

Note: Continued on next page.

Table 10.2. FY20 JRSO budget detail, continued.

Department/expense category	Cost
Subcontracts	0
Other direct costs	139,950
Shipping	6,000
Communication	0
Training	57,450
Maintenance and repair	76,500
Other	0
Total Technical and Analytical Services direct costs	4,779,459
Development, IT, and Databases	
Salaries and fringes	515,224
Equipment	330,600
Travel	169,300
Materials and supplies	163,500
Consultant/professional services	149,317
Computer Services	0
Subcontracts	0
Other direct costs	506,582
Shipping	300
Communication	8,300
Training	71,150
Maintenance and repair	424,972
Other	1,860
Total Development, IT, and Databases direct costs	1,834,523
Publication Services	
Salaries and fringes	1,436,508
Equipment	0
Travel	50,500
Materials and supplies	21,250
Consultant/professional services	14,910
Computer Services	0
Subcontracts	0
Other direct costs	24,300
Shipping	0
Communication	250
Training	22,500
Maintenance and repair	0
Other	1,550
Total Publication Services direct costs	1,547,468
JRSO total direct costs	61,848,360
JRSO total modified total direct costs	17,973,796
JRSO indirect costs	4,673,189
Grand total JRSO FY20 budget request	66,521,549

10.1. 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 Table 3.1). Fringe rates are calculated based on actual costs.

Equipment

Procurement, upgrading, or fabrication of operational equipment with an acquisition cost of more than \$5,000, including tools and equipment in support of logging operations and computer and network equipment to replace aged network models, workstations, and plotters as well as 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. 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 and 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 \$1,500 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 \$4,500 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, engineering, laboratory, and logistical supplies for shipboard and shore-based analytical and engineering laboratory and test facilities and expeditions, including long-lead time hardware for FY20 expeditions. Cost estimates for drill and core 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; noninventory 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 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 tubulars (drill pipe, knobbies, and other outer core barrel components), environmental evaluations, 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 non-teaching (GANT) 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) Scientific Ocean Drilling Bibliographic Database fee for inclusion of new citations, Science Open fee for featuring publications, CrossRef annual membership and administrative costs, digital object identifier (DOI) registration charges, CrossMark registration charges, and publications archiving fees.

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.

ODL

Subcontract for operations of the *JOIDES Resolution*. Costs related to this subcontract include the following.

Day rate

Vessel staffing for the subcontractor's sailing crew and drilling personnel, not including the cost of JRSO 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 budgeted amount is based on 366 days, including two extended port calls/tie-up periods, and allows for one CPI-U adjustment and two ECI adjustments of 2.25% each. The anticipated operating/cruising and standby day rates, respectively, are \$77,071.80 and \$75,510.00 through 31 December 2019, adjusted to \$78,440.69 and \$75,866.79 through 31 March 2020, adjusted to \$79,570.23 and \$76,959.27 through 30 June 2020 and adjusted to \$79,946.20 and \$77,322.90 for the remainder of the fiscal year.

In addition to the day rate described above, a separate supplemental day rate of \$2,000 is included in the budget effective 1 October 2019. It represents IODP's contribution to the estimated costs for major dry dock activities scheduled to occur in FY23 that are required after a vessel has been in service for 45 years. The supplemental day rate is expected to remain in effect thru 30 September 2024 and will not be subject to escalation by movement of the CPI-U or ECI.

Fuel and lubricants

Fuel to be purchased for the riserless vessel is estimated at a total of 7,000 metric tons (mt) of Marine Gas Oil (MGO), which includes 1,200 mt in San Diego, California (US); 1,400 mt in Papeete, Tahiti; 1,000 mt in Barbados; 2,200 mt and 500 mt in Recife, Brazil (2 refuelings); and 700 mt in Rio de Janeiro, Brazil. Quantities are based on ODL's fuel forecast as of 8 December 2018. All prices per metric ton were obtained from the *Livebunkers* website on 6 March 2019, but due to unavailability, prices for Long Beach, California (US); Auckland, New Zealand; Paramaribo, Surinam; and Maceio, Brazil, were substituted for San Diego, Papeete, Barbados, and Recife, respectively.

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 \$34.72/day/person, except during noncoring transits and tie-up/extended port call periods. The lower number of personnel on board for noncoring transits and tie-up periods is based on previous staffing schedules in like circumstances and other information on anticipated staffing requirements obtained from the IODP Manager of Science Operations. This category does not include per diem for the ship subcontractor's sailing crew and drilling personnel because they are accounted for in "Day rate," above.

Port call costs

Vessel port agent's expenses, subcontractor freight, and meals and lodging costs incurred during subcontractor's crew rotations for seven port calls scheduled in San Diego, California (5 days); Fiji (27 days—extended tie-up period); Papeete, Tahiti (5 days); Barbados (5 days); two in Recife, Brazil (the first for 5 days and the second for an extended tie-up period of 34 days); and Rio de Janeiro, Brazil (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, Contractor's Pollution Liability—Gradual coverage for the vessel and coverage for rental of mud motors on Expedition 387 and during testing of a wireline logging tool on Expedition 388. All premium amounts are based on 366 days of coverage (with the exception of the coverage on the mud motor rental and the wireline logging tool).

Travel—ODL

Subcontractor transportation, including airfare for ship subcontractor's crews to/from 6 scheduled crew changes: San Diego, California (Expedition 378T/extended port call in Fiji); Fiji (Expedition 378); Papeete, Tahiti (Expedition 384); Barbados (Expedition 387); Recife, Brazil (2 crew changes: Expedition 388 and Expedition 388P/transit and tie-up period); and Rio de Janeiro, Brazil (Expedition 390). The estimate is based on a crew of 60 personnel with various domestic and international originating fly points arriving and departing each port call.

TBD wireline logging subcontractor

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 expedition and support from the base of operations; and the services of a district engineer, staff engineer, electronics technician, and special services engineer as needed. Costs (including shipping charges) related to leasing equipment needed for wireline fishing, back-off and severing services, day rate and travel expenses for the wireline logging engineer, and 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 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, and so on. Estimated costs are based on historical averages of similar shipments for standard items sent to the ship for each expedition and 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 Inmarsat 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 3 years' expense data for these meetings. IODP JRSO 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, and IT computer hardware and software. Drilling, coring, logging, 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 coolers.

Recruiting and relocation

Employee recruitment costs, including local, internet, and science and trade journal advertisements, and 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

Texas A&M University's (TAMU's) Information Security Controls Catalog is available at <https://it.tamu.edu/policy>. Additionally, TAMU Rules and Standard Administrative Procedures are available at <http://rules.tamu.edu/TAMURulesAndSAPs.aspx>.

The JRSO policy for shipboard communications is available at <https://goo.gl/SrILWS>.

All employees must take yearly security awareness training as required by TAMU. 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

JRSO completes an annual information security risk assessment report as required by TAMU and the State of Texas. The results are electronically reviewed by the Supervisor of Information Technology & Support, department manager, Director of Science Services, and College of Geosciences Dean and then filed with the TAMU Division of IT Risk Management Office for further assessment and follow-up.

Roles and responsibilities

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

- Applying platform technical safeguards,
- Supplying the first-level response (i.e., restoration services) to any security breach, and
- 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 TAMU'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; and
- 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, multifactor authentication, 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 TAMU policies referenced below. When feasible, multifactor authentication shall be used by system and network administrators when accessing IT infrastructure with elevated privileges.

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 JRSO and TAMU data centers on shore is granted only to authorized personnel whose job responsibilities require access to the facility and to vendors when necessary. JRSO’s data center is secured using centrally controlled electronic locks with swipe card access capability. TAMU’s data center is secured 24/7 using biometric access capability and armed guard(s).

Data center information

Power to the JRSO data center 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.

TAMU’s West Campus Data Center is a 50,000 square foot facility with up to 30,000 square feet of raised floor, HVAC services providing 7.4M BTU/hr cooling capacity, two 2.5 MW generators for backup power, three uninterruptible power supply (UPS) systems totaling 4,000 kVA, and Very Early Warning Aspirating Smoke Detection (VESDA) and fire suppression systems.

Data backups

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 every 30 days.

Cybersecurity breach notification procedures

In the event of a cybersecurity breach:

1. Departmental IT personnel have information security roles and responsibilities that 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 TAMU'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 to TAMU'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 TAMU's Chief Information Security Officer or designee by email to security@tamu.edu.

Security measures for nonemployees

All subcontractors, researchers, and others who have access to the systems employed in support of this contract are required to follow all TAMU and JRSO security policies.

Appendix II: recommended program of insurance

Texas A&M Research Foundation (TAMRF) will utilize the risk management services of Texas A&M University (TAMU), which 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 TAMU staff to obtain cost-effective premiums. 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 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 FY19.

The FY20 proposed program of insurance for mitigation of drilling risks and marine/employer’s liability is depicted in the following table. In addition, TAMU, on behalf of the *JOIDES Resolution* Science Operator (JRSO), will assess specialty risks and procure insurance if warranted.

JRSO FY20 program of insurance details			
Program of insurance with government indemnification	Coverage limits	Deductible	Estimated annual premiums
Hull & Machinery and Removal of Wreck ¹	190,000,000	250,000	777,071
Control of Well	25,000,000	50,000	98,076
Seepage & Pollution Liability ²	1,000,000	Included in COW	Included in COW
Cargo	5,000,000	25,000	42,642
Third Party Property/Equipment	10,000,000	25,000	26,971
Charterer’s Legal Liability	1,000,000	10,000	13,247
Contractor’s Pollution Liability—Gradual	10,000,000	1,000,000	27,000
Umbrella	200,000,000	Underlying policy limits	270,000
Worker’s Compensation & Maritime Employer’s Liability	1,000,000	None	120,782
Comprehensive General & Automobile Liability	1,000,000	None	51,266
Total estimated annual premiums			\$1,427,055

¹ Carried by ship subcontractor (ODL) and reimbursed by TAMRF.

² Included in Control of Well (COW) Policy and covered under the Umbrella.