

EXECUTIVE SUMMARY

The objective of the Renovate Science Laboratories - Phase I (RSL-I) Project was to design, renovate, and commission laboratory and office space at Brookhaven National Laboratory (BNL). The project specifically addressed buildings 815 (the D Wing) and 480 (the East wing), with other upgrades to these buildings as funding allowed. The baseline scope included new building systems and lab services in the selected wings, new finishes, new laboratory casework and energy efficient lab hoods, correction of storm water drainage problems at building 480, and demolition of the modular office wing at building 480.

As a result of the favorable market conditions and competitive bids, the threshold baseline scope and key performance parameters were exceeded with the addition of twelve alternates at contract award. In building 815, this included exterior siding replacement, renovation of additional labs (D-1 and 24/26), window replacements, a new entry and renovation of the lobby and central corridor, and renovation of rest rooms, the locker room and the lunch room. In building 480, this included a new heating, ventilation and air conditioning (HVAC) system for the Transmission Electron Microscope (TEM) labs 1 and 2, new casework for TEM lab 1, the renovation of additional labs (4 and 122), and renovation of the lobby and central corridor. Several change orders were also awarded during implementation for scope enhancements using contingency funds. The major upgrades involved upgrades of the exhaust fans to Strobic systems in both buildings and the purchase of mobile laboratory furniture.

BNL conducted a beneficial occupancy review in October and pre-occupancy findings were completed. An Independent Project Review was held on November 8, 2011 and recommended approval of CD-4 once pre-occupancy findings were completed. CD-4 was subsequently approved on December 6, 2011. Despite the default of the general contractor, the project finished on schedule with a new general contractor. The Total Project Cost is \$18,070,000. Actual costs through February 2012 are \$17,880,297 with \$267,382 remaining in contingency.

Table 6 – Three Biggest Successes for the RSL-I Project

Lessons Learned – Successes	Description, Impacts, and Solutions
Goal Alignment and Team Work Following Default of the GC Allowed CD-4 Approval On-time	<p>During the execution phase of the RSL-I Project, the General Contractor experienced financial issues, was not paying its subcontractors and ultimately defaulted. The project was able to recover and still received CD-4 approval slightly ahead of the baseline schedule.</p> <ul style="list-style-type: none"> • The recovery effort impacted multiple organizations, stakeholders and functional disciplines at DOE and BSA (e.g., the DOE Program office, DOE and BSA Integrated Project Team, BSA Modernization Project Office (MPO), BSA Procurement and Property Management Division (PPM), DOE and BSA Legal, BSA Safety, etc.). • Team work, goal alignment, frequent communications and effective involvement at the appropriate level of management resulted in quick planning and assignment of responsibilities that allowed for the speedy negotiation of a tender agreement and completion contract. This cooperative effort continued through contract completion and approval of Critical Decision – 4 slightly ahead of schedule.
Appropriate Packaging of the Design and Procurement Allowed Additional Scope to be Performed	<p>Due to the competitive bidding environment, the project was able to award all alternates. The final value of the renovation scope performed exceeded the minimum scope of the project by over ten percent.</p> <ul style="list-style-type: none"> • Appropriately sized (\$ value) and prioritized additive and deduct alternate packages provided flexibility at bid and reduced the risks of unstable market conditions. Appropriately designed alternates also decrease the chance that scope modification, and the associated design/re-bid cost, will be required should bids be higher than the allocated funding. • Some additional scope items that were designed (e.g., movable lab tables) were also able to be purchased later in the project with available contingency.

<p>Speedy Negotiations With Bonding Company and Completion Contractor Allowed Project to be Completed on Schedule</p>	<p>During construction of RSL-I, the General Contractor experienced financial issues, was not paying its subcontractors and ultimately defaulted.</p> <ul style="list-style-type: none"> • Negotiations among BSA, the Bonding company, General Contractor and Completion Contractor were completed within an unprecedented period of two months. Negotiations were led by the BSA PPM Manager who had the authority, knowledge and experience necessary to facilitate a quick settlement between the various parties. • Numerous actions resulted in this accomplishment: <ul style="list-style-type: none"> - Communicated a clear vision of the goals, focused upon timely contract completion - Involved the appropriate BSA legal assistance in the development of the tender agreement - Held frequent as-needed meetings - Oral and written progress reports from the bonding company - Accepted no time delays from the Bonding Company in the assessment process to define the remaining scope for the new Completion Contractor - Provided administrative support to the Bonding Company in the assessment of remaining scope - Provided access to BSA documents to aid the new Completion Contractor - Worked together to calculate project budget - Worked together to generate a tender agreement acceptable to all parties - Appropriately involved the original General Contractor in the assessment of remaining scope - Generated new contract documents in a timely manner
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Table 7 – Three Areas of Improvement for Future Projects

<p align="center">Lessons Learned— Potential Improvements</p>	<p align="center">Description, Impacts, and Solutions</p>
<p align="center">Improve Hazardous Material Surveys and Removals Prior to Arrival of General Contractor</p>	<p>While resources and time were included in the Project Baseline for relocation of personnel and hazardous material removal efforts, the time allocated was rushed and contaminated ductwork was not able to be removed in advance.</p> <ul style="list-style-type: none"> • Earlier relocation of personnel and more intensive review of possible contamination surveys would have identified additional areas to be remediated prior to the start of construction. • Contaminated ductwork and additional asbestos were discovered that contributed to some delays however these items were quickly addressed without personnel exposure. There was also sufficient schedule and cost contingency in the schedule to accommodate this additional scope. • Planning for sufficient time to analyze the hazardous materials was incorporated into BNL’s next large renovation project, Renovate Science Labs – Phase II. Relocation of personnel was accomplished earlier allowing access for more aggressive surveys and remediation. Lab hoods and contaminated ductwork were removed well in advance of the start of construction.
<p align="center">Ensure Financial Confidence and Security</p>	<p>The original General Contractor (GC) experienced financial issues, turned over the contract to the bonding company and ultimately defaulted. The GC was unresponsive to numerous requests made by the MPO and PPM personnel regarding manpower, schedule, and the payment of subcontractors. The GC indicated that payments were paid to its subcontractors when in fact they were not. This failure to report accurate information about payment contributed to delays in mitigating the issues. After examining the reasons that contributed to the default, actions were taken by BSA to improve its practices and procedures.</p> <ul style="list-style-type: none"> • The BSA PPM Procedures for responsibility reviews were enhanced in order to better ascertain the financial status of the GC prior to award and continuing through execution. A new Standard Work Instruction was prepared and issued to describe how to request and use a Dun and Bradstreet report, indicating specific conditions under which the report should be acquired (e.g., U.S. company; contracts with a value over \$1 million, new suppliers to BSA; contracts with a period of performance over one year, etc.), as well as instructions on how to read and understand the report. • Submittal of lien waivers from the subcontractors would have indicated earlier on that subcontractors were not being

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	<p>paid. The requirement to submit lien waivers from both the GC and its subcontractors as part of the payment application was added the RSL-II Project Renovation Contract.</p> <ul style="list-style-type: none"> • Similar to operational discipline and safety meetings, pre-award and pre-construction meetings with the GC need to stress the Contractor’s financial obligations to pay its subcontractors and associated submittal requirements. This was accomplished for the RSL-II Project and BSA should consider adding this requirement to the MPO procedure on pre-award meetings. • The BSA PPM Performance Bond standard template is being revised to impose more stringent conditions on the bonding company. The proposed changes will give BSA more control in the resolution of issues that may arise similar to the RSL-I default and will provide for an increased sense of security and confidence in awards to new contractors.
Emphasize and clarify safety requirements to Contractors	<p>Overall safety performance on the renovation contracts was excellent with no lost time injuries and only one first aid case during a three year period due to additional effort by BSA safety personnel. However, there are still a number of lessons learned.</p> <ul style="list-style-type: none"> • The BSA Construction Safety Specification and Subject Area was strengthened after the RSL-I Project contract was awarded to include expanded training, qualifications and experience for Site Safety Representatives, among other things. Enhanced Safety Specification 000900-Site and Construction Safety is now a standalone document. The BSA Template for Health and Safety Plans was also revised and is now a requirement to be used. These improvements were incorporated into BNL’s RSL-II Project, whose contract was awarded in June 2011. Additionally, BSA is evaluating the transformation of the BSA Template for Health and Safety Plans into a requirements document which will require specific data submittals from the Contractor dependent on the work to be performed. If incorporated, this approach will help to provide clearer requirements to the Contractor and simplify oversight activities for both the Contractor and BSA. • While safety expectations were discussed during the Pre-Bid Meeting, pre-Award interviews and the kick-off meeting, expectations may not have been made sufficiently clear at senior levels of the company. For higher profile projects, BSA expectations must be clearly articulated to the executive management of the General Contractor during the pre-bid and pre-construction phases. MPO Procedure MPO-312 was updated in 2010 to require meetings between BSA and General Contractor senior management before the Notice to Proceed is issued for contracts greater than \$25 million to reinforce BSA expectations and obtain the Contractor’s personal commitment for operational discipline and

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	<p>safety on the jobsite. This was accomplished for the RSL-II Project. However, the \$25 million threshold is arbitrary and should be reevaluated based on the risks involved with the contract such as: a) is the subcontract issued under a project subject to the DOE Project Management System? b) is completion required to support a key activity at BNL? c) is the General Contractor new to BNL, etc.? Ensuring that new Contractors perform well at BNL is a desirable goal for a number of reasons, including increasing the number of qualified contractors to provide for a competitive marketplace. BSA should investigate how to strengthen the process of acquainting new contractors with the rigorous requirements of discipline, planning and safety at BNL.</p>

Table 8 – Other Lessons Learned for the RSL-I Project

<p align="center">Other Lessons Learned</p>	<p align="center">Description, Impacts, and Solutions</p>
<p align="center">Procurement Management and Contract Administration</p>	<p>In addition to the procurement management and contract administration items discussed in Table 2, other improvements are planned as described below.</p> <ul style="list-style-type: none"> • Termination for Default clauses were revised in the PPM Procedure Operations Manual (POM), Terms and Conditions for Construction, and Labor Hour Agreements to further detail and clarify the basis for termination. • Contractual language will be removed from the standard MPO Technical Specifications document resulting in a new document titled, “Performance Requirements and Special Conditions for Construction” which will be part of the contract. This document will be controlled by PPM and applicable to all construction contracts, not just those under the management of MPO. • New Contractors can introduce additional risks to BNL projects. BSA needs to ensure that the new Contractor fully understands DOE and BSA requirements and expectations. Key personnel and their experience must be appropriately assessed during the evaluation process of the bid and prior to award. For example, the Project Manager for the General Contractor was inexperienced and did not have backup within his organization. Evaluation criteria should be reviewed to ensure that sufficient information is requested and properly evaluated.
<p align="center">Safety Management</p>	<p>Due to the daily vigilance and active participation of the entire BSA Project team to include its safety personnel, the overall safety performance on the RSL-1 Project was excellent as demonstrated by having no lost time injuries and only one first aid case during a three year period. However, there are still a number of lessons learned.</p> <ul style="list-style-type: none"> • While the General Contractor displayed acceptable safety performance in its bid package, the staff assigned to the RSL-I Project lacked experience with projects of similar technical complexity (i.e. laboratory renovations) and had not worked at BNL before. The staff was not familiar with the complexity of the BSA safety management system and the additional requirements imposed by 10 CFR 851 and by BSA, and had difficulty in obtaining safety approvals in a timely matter. • BSA provided additional oversight and support as soon as issues became apparent early in the project. The General

<p>Other Lessons Learned</p>	<p>Description, Impacts, and Solutions</p>
	<p>Contractor also added more experienced safety personnel with BNL specific experience to the RSL-I Project. New Contractors may require additional attention to succeed in a different atmosphere to which they are accustomed.</p> <ul style="list-style-type: none"> • BSA developed the Phase Hazard Analysis (PHA) process to comply with 10 CFR 851. The process for Contractors to develop PHA and BSA’s approval process was maturing at the start of the project. Since that time the PHA process has improved and is now supported by an extensive library of PHAs to assist Contractors. In addition, the BSA review team’s process for reviewing PHAs and providing feedback to Contractors has also matured. As a result issues experienced at the beginning of the RSL-I project has not been experienced in the RSL-II project. • Safety findings are documented and provided to the General Contractor; however trending reports are not. In January 2009, BSA introduced a computerized system for documenting construction safety inspections. This process has now matured to the point that summary reports can be provided to General Contractors showing details of the inspection results and trends, both negative and positive. This information should be provided to the General Contractor and project team on a routine basis to re-enforce good practices and identify areas needing improvement.
<p>Alignment of Support Functions</p>	<p>The misalignment of roles, responsibilities, authorities and accountabilities (R2A2s) among the project team and matrix support organizations often resulted in poor communication of project issues across BSA.</p> <p>For Line Item Projects such as RSL-I, which are managed under DOE’s Project Management Order, R2A2’s are defined in the Project Execution Plan, the Integrated Project Team Charter and the Construction Management Plan, which are developed and approved by DOE during the design phase.</p> <ul style="list-style-type: none"> • Safety and procurement team members and their responsibilities changed around the award of the contract. R2A2s should be reinforced with new members of the project team as the project progresses for better partnership and goal alignment. • The importance to DOE of successfully completing its projects managed under the DOE Project Management Order (i.e., with a total project cost of greater than \$10 million) needs to be reinforced to all team members and supporting organizations. Issues that threaten successful completion must be raised to management quickly for resolution. BSA is executing a handful of these projects; requirements and expectations may not be well understood among all

Other Lessons Learned	Description, Impacts, and Solutions
	<p>organizations.</p> <ul style="list-style-type: none"> • Due to the relatively small dollar value for this line item project, the BSA Project Manager also acted as the technical representative for the RSL-I contract. The technical representative listed on the contract was not who performed the role. Roles and responsibilities need to be clear between project management, technical and procurement as each had differing opinions of their respective responsibilities causing conflict. Field change authorities and processes should be examined to ensure that they are consistent with the delegations in the DOE-approved Project Execution Plan and other project documentation and that an effective and efficient process is in place.
Communications	<ul style="list-style-type: none"> • Inspector communication with subcontractors throughout the course of the project helps to further bring issues to the forefront and ultimately helps solve them sooner. • Due to limited amount of visits the commissioning agent can make, ensure there has been significant progress made so money and time will be spent wisely. • Perceived contractor deficiencies need to be quickly raised to management particularly on critical projects.