Brookhaven National Laboratory
ISM/Safety Improvement Project Plan
December 2008

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ISM/Safety Improvement Project Plan Change Log

Revision No.	Date	Reason
Draft	February. 15, 2006	Revitalization of the ISM Program
Draft	April 3, 2006	Operations Council Feedback and Suggestions on the appropriateness of corrective actions
0	May 16, 2006	Policy Council and DOE-BHSO briefed on the project plan. Project deliverable and action item dates entered into BNL 's Assessment Tracking System (ATS# 2944)
1	July 31, 2006	Added a new action item to establish requirements for personnel that perform assurance activities, and verification of the process. (Pg 28) Clarified several activities that spoke to updating senior management roles and responsibilities, and now require revisions and changes be forwarded to the Human Resource Management System contacts for incorporation in their R2A2s. Updated WBS 2.1.2 to include an action to evaluate the quality of job risk assessments based on their impact on worker planned work and institutional risk (Pg. 31). Updated WBS 2.1.5 to include an action to conduct workshops/training on revised work control processes (Pg. 34) Combined several corrective actions to revise the work planning and control subject area into one action. New action WBS 2.3 incorporates all required revisions/updates to SBMS documents (Pg. 36) Clarified WBS 3.1.3 deliverables. Organizations with specific SBMS deficiencies shall submit notices of intent to the SBMS office (Pg. 39). Updated WBS 4.1.5 to include Barrier Analysis and Five Whys causal analyses workshops in support of the renewed event/issues management process (Pg. 45) Updated WBS 4.1.6 to include the development and implementation of a Human Performance Strategy for the institution (result of the human-performance accident investigation from the arc-flash incident). (Pg. 46)

ISM/Safety Improvement Project Plan Change Log

Revision No.	Date	Reason
1	July 31, 2006	Updated WBS 5.1.2 to include improvement actions identified from benchmarking practices for MCC bucket insertion/removal with the bus energized. Electrical Safety Standard 1.5.0 will include requirements for performing this activity. (Pg. 51) Updated WBS 7.1.6 to include an action to update the Institutions Natural Phenomena Hazard Documentation (review of nuclear safety operations revealed that this document is required to reviewed and updated every 10 yrs) (Pg 67). Added a new improvement activity (WBS 7.3.4) employee concerns program evaluation. In an effort to benchmark best practices, Laboratory personnel reviewed the Savanna River ES&H evaluation and concluded that the ECP program at BNL should be reviewed for compliance with DOE O442.1A. (Pg. 73) Added a new improvement activity (WBS 7.3.5) Executive Management Training Program for Laboratory Operations and Support Managers. (Pg. 74) Added a new improvement activity (WBS 7.3.6), evaluate electronic delivery of experimental safety forms. (Pg. 74) Added a new improvement activity (WBS 7.3.7), an evaluation of the effectiveness of off-site ISM practices. (Pg. 74) Added a new improvement activity (WBS 7.3.8), review of the institutions safety committees reporting structure. (Pg. 75) Added a new improvement activity (WBS 7.3.9) to perform a follow-up review on feedback and improvement, and work planning and control elements of this plan. (Pg. 75) Added new appendix that summarizes the project assessment activities. (Pg 81)

ISM/Safety Improvement Project Plan Change Log

Revision No.	Date	Reason
2	January 29, 2007	Added a new activity to WBS 2.3, Revise WP&C Management System/Subject Area to include the review and assurance that functional connections are made with related management system processes. (Pg. 38) Clarified activity WBS 3.1.1, to evaluate the feasibility of combining ISM management systems. The activity previously required the combination of several management systems without evaluating the impact. (Pg. 40) Clarified WBS 3.2.1, the requirements management process implementation to align with the Quality Management Office project plan. (Pg. 43) Added a new activity under WBS 3.2.2, SBMS Completion Project. The SBMS Office Will update revision histories and review dates for documents reviewed/updated to support this activity. (Pg. 43) Updated WBS 5.0, Corrective Actions – Collider Accelerator Department Arc Flash Type B Incident. DOE-BHSO approved the BNL corrective action plan; action items were incorporated into this project plan under new section 5.3, BNL Arc Flash Corrective Action Plan Activities approved by DOE. Integrated ongoing WBS activities that duplicate DOE approved corrective action plan activities. (Pp 52 – 66). Updated WBS 7.1.6, Nuclear Safety Authorization/Readiness to include opportunities for improvement identified from the assessment of documented safety bases and pertinent exclusions/exemptions for special form sources. (Pg. 78) Clarified WBS 7.2 New Program Implementation-10CFR850 & 10CFR851. Changes were made to align worker safety and health activities with the Safety and Health Services Division 10 CFR 851 project plan activities. (Pg. 80)
3	July 15, 2007	Updated the project plan and schedule to include progress/status as of July 15, 2007. Updated WBS 2.2.2, Revitalize the Training Program for WCMs/WCCs. The target completion date was extended to the end of the calendar year (Pg. 38) Revised WBS 7.1.6, Nuclear Safety Authorization / Readiness to include Nuclear Safety Program, Improvement Project activities (Pg. 79)

4	January 31, 2008	Updated the project plan and schedule to reflect progress/status as of January 15, 2008 Revised the WBS structure to include the BNL Inspection of ES&H Corrective Action Plan. WBS 6.0 Ongoing Action plans was changed to Integrated Assessments and Ongoing Action Plan Risk impact. WBS 7.1 and 7.2 was changed facility safety authorization and institutional safety committee reporting. WBS 8.0 prior to revision 4 was Project Management and Support, now is the ES&H Inspection CAP. Developed an updated Project schedule which removed previously completed actions and added the ES&H CAP activities. The FY08 project schedule (Appendix A) encompasses all activities in the DOE CATS (tracking system) and activities not completed through Revision 3 of this plan.
5	June 15, 2008	Fire Protection Program Deficiency Nonconformance Tracking System was added under WBS 6.8. Changed M. Bebon (interim ES&H ALD) responsible actions to C. Parnell, ALD for ES&H.
6	August 25, 2008	Performed an effectiveness review of the work planning and control processes. The review focused on WBS 2.1.2, creating a culture “all work is planned”, and WBS 2.1.7, Integrate human performance principles into the WP&C management system. Opportunities for improvement identified from the effectiveness review, and actions identified to improve effectiveness were added to BNL Finding Section C-4 (p. 76 & 77).
7	November, 2008	Section 6.7 added institutional MRI open corrective actions (p. 60 -61) Updated WBS 7.1 adding specific dates to Facility Safety Assurance Plan milestones. Replaced Steve Coleman with John Selva as ISM SIP Manager. Updated project status as appropriate.

Table of Contents

I Introduction 8
II BNL Integrated Safety Management Program 9
II.a Roles and Responsibilities for ISM 9
II.b ISM Program Description 10
II.c Laboratory ES&H Goals 10
III Project Description/Project Plan Development Process 11
IV Integrated Project Team 14
IV.a Department of Energy Brookhaven Site Office (DOE-BHSO) 14
IV.b Brookhaven Science Associates Board 14
IV.c BNL Management 14
V Work Breakdown Structure (WBS) and WBS Elements 17
V.a Corrective Actions – Evaluation of ISM at BNL: Causal Analysis Results 23
1.0 Institutional Feedback and Performance Improvement Initiatives 23
2.0 Work Planning and Control Performance Improvement Initiatives 32
3.0 Documentation Improvement Initiatives 40
4.0 Communications and Involvement Initiatives 45
5.0 Corrective Actions – Collider Accelerator Department Arc Flash Type B Incident 53
5.1 DOE Team Interim Recommendations 53
5.2 BNL Corrective Actions 55
5.3 BNL Arc Flash Corrective Action Plan Activities Approved by DOE 57
6.0 Integrated Assessment Actions and Ongoing Action Plan Risk Impact 57
6.1 Programmatic Deficiencies Involving the Emergency Management Program 57
6.2 Equipment Falls off the Tailgate of a Box Truck Resulting in Near Miss to an Injury 57
6.3 Positive Unreviewed Safety Question at BNL Waste Management Facility 58
6.4 Programmatic Deficiency Involving Industrial Hygiene (IH) Exposure Monitoring 58
6.5 Programmatic Deficiencies Involving Electrical Safety 58
6.6 Subcontractor Noncompliance with 10CFR851 Occupational Medicine Requirements 59
6.7 Overexposure to Static Magnetic Field 60
6.8 Fire Protection Program Deficiencies 62
7.0 Safety Improvement Initiatives 63
7.1 Facility Safety Authorization 63
7.2 Institutional Safety Committee Reporting Structure 64
8.0 Inspection of ES&H Programs at BNL 65
ES&H CAP Development Process 65
ES&H CAP Roles and Responsibilities 69
Corrective Action Plan 70
1.0 BNL Finding C-1 70
2.0 BNL Finding C-2 73
3.0 BNL Finding C-3 76
4.0 BNL Finding C-4 77

5.0 BNL Finding D-3 80
6.0 BNL Finding D-4 82
7.0 BNL Finding D-5 84
Compensatory Actions for Identified Unmitigated Hazards 87
VI Project Reviews/Performance Reporting 93
VI.a Change Control Process 94
VII Resource Requirements 95
Appendix A – Summary of ES&H Corrective Actions 96
Appendix B – Summary of Compensatory Actions 97
Appendix C, ISM/Safety Improvement Project Schedule 98

Glossary of Document Acronyms and Abbreviations

ATS	Assessment Tracking System
BHSO	Brookhaven Site Office
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
DART	Days Away, Restricted, or Transferred
DDO	Deputy Director for Operations
DOE	Department of Energy
EPA	Environmental Protection Agency
EMS	Environmental Management System
ES&H	Environment Safety & Health
ESH&Q	Environment, Safety, Health & Quality
FRA	Facility Risk Analysis
FUA	Facility Use Agreement
FY	Fiscal Year
HQ	DOE Headquarters
ISO	International Organization for Standardization
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JON	Judgments of Need
JRA	Job Risk Analysis
OHSAS	Occupational Health & Safety Assessment Series
QA	Quality Assurance
QAP	Quality Assurance Program
QMO	Quality Management Office
QMS	Quality Management System
SBMS	Standards-Based Management System
S&HS	Safety and Health Services
SME	Subject Matter Expert
TRC	Total Recordable Case
WBS	Work Breakdown Structure
WCC	Work Control Coordinator
WCM	Work Control Manager
WP&C	Work Planning and Control

I Introduction

Brookhaven Science Associates (BSA) operates Brookhaven National Laboratory (BNL) under contract to the U.S. Department of Energy. BNL a multi-program national laboratory established in 1947, is located about 60 miles east of New York City, on a 5300 acre site at the east end of Long Island. The Laboratory has about 2600 employees and an annual budget of over $510 million. BNL's primary mission is to design, construct, operate, and develop large, world-class research facilities for the international scientific community. BNL's research programs include programs that cover nuclear and high-energy physics, basic energy sciences, life sciences, energy and environmental research, and applied and national security research. More than 3500 scientists visit BNL yearly to conduct their research. The Lab also hosts over 20,000 student and faculty visitors per year, as part of its science education mission.

BNL's vision is that of simultaneous excellence in science, operations, and community and stakeholder relations. Excellence in operations includes, as its highest priority, demonstrating world-class performance in worker safety and health and environmental stewardship. Laboratory senior management is committed to the premise that all injuries are preventable, and that BNL will strive continuously to be an injury-free workplace. Similarly, management places a great importance upon being a good steward of the environmental assets on the site, as well as in the adjacent ecosystem. These commitments will be communicated and managed through the Strategic Focus Area (SFA) framework discussed later in this document.

When BSA took over the operation of BNL in 1998, both worker safety and health and environmental stewardship needed improvement. They launched an aggressive campaign to implement DOE's Integrated Safety Management (ISM) to drive a rapid change in safety performance. In parallel, environmental programs were improved as part of an initiative to become the first DOE Laboratory to achieve registration to the International Standards Organization (ISO) 14001 Environmental Management System standard. This goal was reached in 2000, and BNL's Environmental Management Program continues along its path of improvement, most recently achieving Environmental Protection Agency (EPA) "Performance Track" recognition.

The Laboratory's initial implementation of ISM produced impressive results. Compared to FY 1998, BNL's Days, Away, Restricted or Transferred (DART) rate in fiscal year (FY) 2005 decreased by a factor of 4, a rate that was 50% below FY 2004, and a factor of 3 decrease in Total Recordable Case (TRC) rate as compared to FY 1998, which continues to fall. We are working hard to drive injuries down, with the goal of reaching zero within the next five years. While the Laboratory continues to strive to meet the DART goals of the DOE office of Science we have not yet met them and must do better. Also, we still experience near misses that point to weaknesses in the ISM program. Our senior leadership team, using feedback from BNL's Integrated Assessment Program (IAP) and input from DOE, continually introduces new programs and vigorously pursues corrective actions, all with the goal of accelerating progress toward our vision of zero-injury. An example of this commitment is BNL's recent sitewide registration to the Occupational Health and Safety Assessment Series (OHSAS) 18001 standard.

In October 2005, Laboratory management commissioned a comprehensive review/gap analysis of our implementation of ISM. This analysis conducted over two-weeks by a peer-review team, identified several shortcomings and omissions in the ISM Program. This ISM/Safety Improvement Plan outlines the Laboratory's corrective actions and initiatives developed in response to this review, and other activities needed to improve overall safety performance.

Additionally, in May 2007 the Laboratory conducted a contractor assurance program review which identified several additional weaknesses with program implementation. These weaknesses were analyzed and corrective actions were developed to address deficiencies.

During July and August 2007, the DOE's Office of Environment, Safety, and Health (ES&H) evaluations (HS-64), within the Office of Health, Safety and Security (HSS) conducted an inspection of environment, safety, and health (ES&H) program implementation at BNL ("HSS Inspection"). The DOE HS-64 inspection team concluded in their report "Inspection of ES&H Programs at BNL" ("HSS Report) that significant improvement was evident in all areas reviewed since the 2000 ES&H inspection of BNL programs. However, further work is needed in core functions (CF) 3 - Develop and Implement Hazard Controls, CF 4 –Perform Work Within Controls, and CF 5 - Feedback and Improvement. The HSS Report identified 9 site-specific findings. BSA/BNL has responsibility for developing corrective actions for 7 of the findings. DOE-BHSO has responsibility for 2 findings. The Laboratory has prepared the "Corrective Action Plan for the Inspection of ES&H Programs at BNL" (ES&H CAP) to address these findings [see appendix a].

II BNL Integrated Safety Management Program

The DOE made ISM a requirement of the contract between DOE and Brookhaven Science Associates (BSA) for the management and operation of Brookhaven National Laboratory. DOE Brookhaven Site Office (BHSO) oversees BNL's ISM Program through their regular interactions with BSA/BNL senior management, their facility representative program, ongoing surveillance, and targeted assessments. BHSO has also included Environment, Safety and Health (ES&H) performance objectives in the BSA contract. BHSO and BSA operate within a partnership agreement that includes freely sharing ISM related information to drive continuous improvement.

II.a Roles and Responsibilities for ISM

The Board of Directors of BSA holds the Laboratory Director accountable for achieving excellence in ES&H. Through its Corporate Assurance process, the Board charged the BSA's Operations Risk Committee with reviewing this ISM/Safety Improvement Plan, monitoring its establishment, and ensuring that the BNL ISM Program meets contract expectations.

The Laboratory Director is responsible for the Laboratory's ISM Program and is the final approval authority for this Plan. He charged the Deputy Director for Operations with managing the implementation of this ISM/Safety Improvement Plan to ensure the completion and verification of the effectiveness of the actions needed to close the gaps in BNL's ISM program. The Deputy Director has assigned the ISM/Safety Improvement Project Manager the task of defining and "projectizing" the

work scope, identifying and aligning the needed resources, managing the execution of activities by the project team, and regularly tracking and reporting progress to senior management.

The Laboratory's Policy Council, which reports directly to the Laboratory Director, meets twice monthly to consider matters related to BNL's performance, priorities, resource allocation, policy formulation or revision, and planning. They formally review performance quarterly, across the spectrum, and make recommendations for action to the Laboratory Director. Specific events are reviewed and discussed on an ad hoc basis as they occur. The Policy Council has reviewed and endorsed this Plan and its members have committed to providing the line organization resources necessary to assure its implementation.

II.b ISM Program Description

BNL's ISM Program utilizes several of the "Management Systems" within the Standards-Based Management System (SBMS). The elements are tied together through the ISM Program Description which can be reached via the following BNL intranet link https://sbms.bnl.gov/SBMSearch/ProgDesc/ISM/ISM_PD.cfm?ProgdescID=4.

II.c Laboratory ES&H Goals

BNL utilizes a strategic focus based management framework to achieve simultaneous excellence. At a Director's Planning Retreat in January 2006, BNL's senior management identified six "strategic focus areas" (SFA). They are not prioritized:

1. Advancing the Frontiers of Science
2. Attracting and Retaining Top Talent
3. Modernizing the Lab's Infrastructure
4. Improving Quality and Reducing the Cost of Business
5. Achieving Excellence in Environment, Safety, Security and Health (ESS&H)
6. Fostering Excellent Stakeholder Relationships

Achieving excellence in ESS&H (SFA 5) clearly has the dominant role in ISM. Attracting and Retaining Top Talent, Modernizing the Lab's Infrastructure, and Improving the Quality and Reducing the Cost of Business (SFAs 2, 3, and 4 respectively) have significant contributing roles in meeting the objectives of ISM core functions and guiding principles.

A senior management champion was appointed for each SFA and teams were gathered to establish specific goals and initiatives. Specific goals were instituted for each area for FY 2008.

The FY 2008 goal for worker safety and health is to surpass the Total Recordable Case (TRC) and DART goals set by the DOE Office of Science. [Does this need to Change ?]

This ISM/Safety Improvement Plan fully supports this goal by broadening and strengthening BNL's ISM Program. The project's goals are to competently finish each project activity, within allocated cost

(or contributed resource commitment) and schedule, and to verify the effectiveness of each of the completed actions (or take further corrective action).

Other frameworks for establishing institutional strategy were used at BNL in the past (i.e. "Simultaneous Excellence" and Critical Outcomes".) However, neither one was fully implemented through systematic prioritization, business planning, and on-going performance monitoring. The transition to strategic focus implemented through this plan will assure flow-down and translation of institutional strategy into routine business planning and on-going management processes (e.g. assurance).

III Project Description/Project Plan Development Process

BNL's IAP covers line self-assessment, management system steward assessments, incident critiques, independent assessments (Independent Audit/Independent Oversight, BSA Corporate Oversight) and external assessments (BHSO, DOE Headquarter (HQ), and Inspector General (IG) with each mode typically using a mix of performance measurement and data analysis, in-person reviews with managers, supervisors and workers, and survey products.

Several significant reviews focused specifically on the Laboratory's ISM Program:

- FY 2004 Multidisciplinary Task Force Review (Institutional Level Self-Assessment)
- FY 2004 ISMS Assessment (External - DOE Chicago Support Office)
- FY 2005 ISM Focused Management Review (External – DOE Chicago Support Office)
- FY 2006 Evaluation of ISM at BNL (Institutional Level Self-Assessment)

Note: The reports from these reviews can be accessed at http://www.bnl.gov/qmo/ISM.asp

Based on the information presented to senior management from these reviews, as well as other IAP input, the Laboratory Director commissioned a comprehensive review/gap analysis of BNL's ISM program in the fall of 2005. It identified several shortcomings and omissions, most importantly a programmatic deficiency in feedback and improvement at the Institution level. Furthermore, the review team recommended several organization-specific corrective actions, many of which are being adapted for improvement as part of the corrective actions outlined in this plan.

The Laboratory took a parallel approach to managing these results. Since many of the findings and recommendations spoke to specific issues, corrective actions were developed and launched to address them. However, the scope of the findings, the institutional level feedback and improvement programmatic deficiency and repeat findings, remain a significant concern to Laboratory management, and an indication that there were underlying issues needing to be resolved.

With the assistance of BSA corporate and consultant resources, the Laboratory looked beyond the individual findings of each of the reports to identify common problem areas, and then used causal analysis techniques to probe their direct and root causes. In all, five problem areas were identified as follows:

1. The Laboratory has not established effective institutional-level self assessment, corrective action management and feedback and improvement processes.
2. The work planning and control process is not achieving the Laboratory's goals and objectives.
3. Some Laboratory-wide and internal controlled procedures are not current and in some cases do not offer adequate or complete instructions.
4. Communication and involvement processes do not always result in adequate understanding of, and response to, Environment, Safety and Health (ESH) and operational issues and decisions.
5. The corrective action/issues management process is not achieving the Laboratory's goals and objectives.

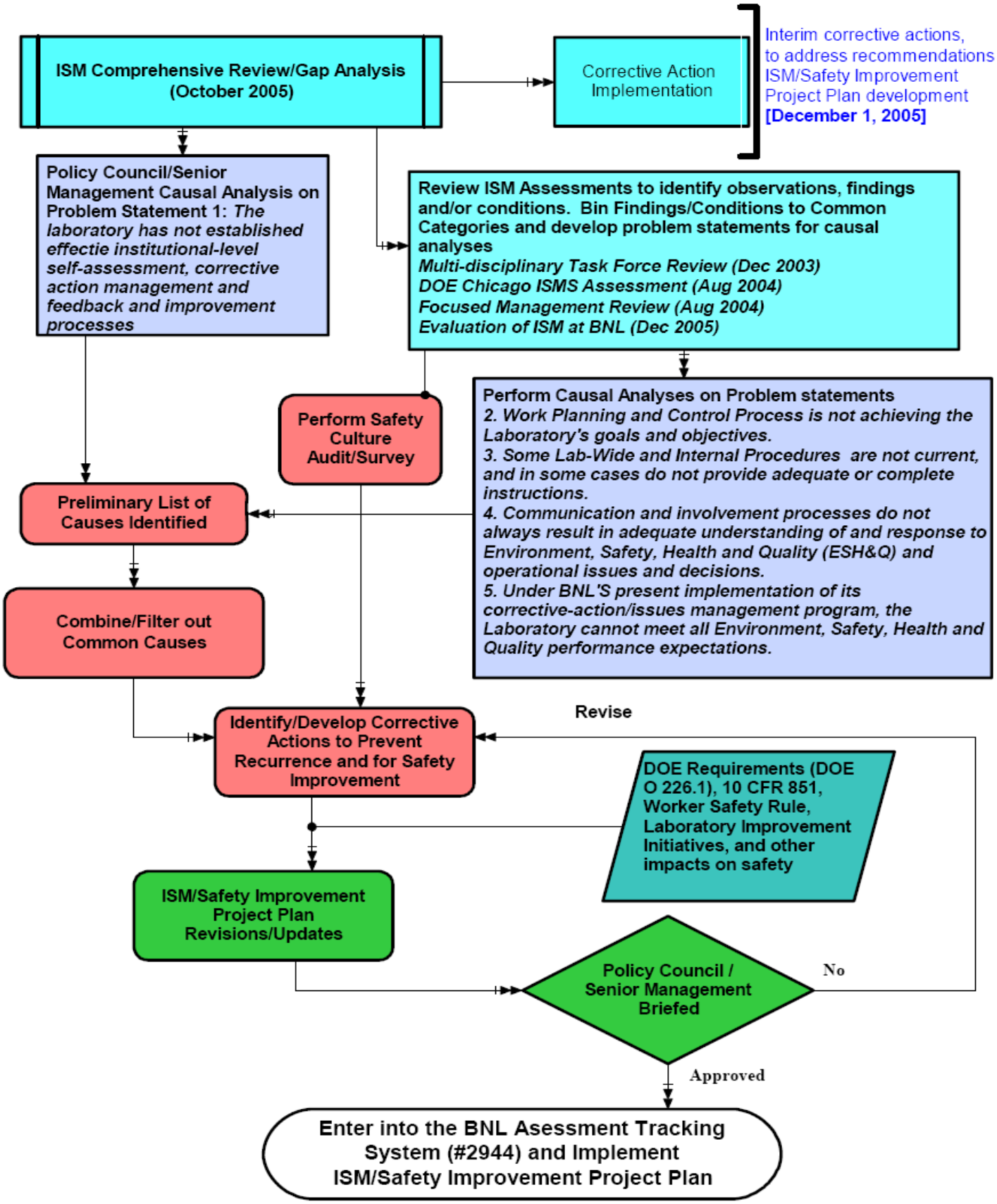
Problem areas 1 and 5 had many similarities, and, as a result were categorized as an institutional ISM Program deficiency. The senior management of the Laboratory conducted the causal analysis for this institutional-level feedback and improvement deficiency, assisted by a trained causal analysis subject matter expert (SME).

Separate causal analyses were conducted for the remaining three problem areas (2 through 4) by groups of BNL managers, supervisors and workers utilizing TapRoot and the "questioning to the void" ("Five Whys") technique. Each cause was binned using the causal analysis tree from the DOE Occurrence Reporting Causal Analysis Guide.

In addition, a safety culture survey was performed with several groups, combining interactions between safety SMEs and the groups, with written surveys. Either the Laboratory Director or one of the Deputy Directors provided opening remarks at each of the survey sessions. They followed a process recommended by J. M. Stewart in his book "Managing for World Class Safety." The results of the survey were analyzed in detail as part of the ESS&H SFA. Improvement actions and opportunities for improvement have been, and will continue to be incorporated into this improvement plan as appropriate.

After completing the causal analyses and the survey, corrective actions were identified to address the direct and root causes. These corrective actions are designed not only to address deficiencies, but to strengthen the safety culture and prevent future recurring findings. Figure 1 illustrates the development process for the ISM/Safety Improvement Project Plan.

Figure 1, ISM/Safety Improvement Project Plan Development Flow Chart



IV Integrated Project Team

The BHSO, BNL and BSA Operations Risk Committee have implemented an integrated team approach to managing the ISM/Safety Improvement Project. The following roles and responsibilities address the overall management decision-making for the approval, authorization, and change control of the ISM/Safety Improvement Project. Figure 2 illustrates the ISM/Safety Improvement Project Organization structure.

IV.a Department of Energy Brookhaven Site Office (DOE-BHSO)

To assure that BHSO is apprised of the performance of the ISM/Safety Improvement Project, BNL will:

- Report project progress monthly to the BHSO ISM Champion;
- Notify BHSO of deletions/additions to the ISM/Safety Improvement Plan;
- Notify BHSO of any extended due dates for corrective actions under the plan; and
- Include the BHSO Champion in progress/status meetings.

IV.b Brookhaven Science Associates Board

The BSA Assurance Council Board (i.e. Operations Risk Committee) will maintain oversight, and provide BSA corporate input on the implementation of this Plan on behalf of the Board. The Committee will be formally briefed on the status of the ISM/Safety Improvement Project at each of their quarterly meetings, and will receive written progress reports between meetings.

The Operations Risk Committee will brief the Board of Directors at each Board meeting. In addition, the Committee will conduct oversight through the corporate assurance process, to include external reviews (“deep dives”) of progress on the Project Plan.

IV.c BNL Management

Laboratory Director
The Laboratory Director has the authority and responsibility for managing BNL programs and facilities. The BSA Board has charged the Director with the responsibility of attaining a comprehensive, robust and credible ISM Program, and successfully completing this ISM/Safety Improvement Project.

Deputy Director for Operations
The Deputy Director of Operations (DDO) was tasked by the Laboratory Director as the sponsoring senior manager for this project to afford overall project policy, guidance and oversight for implementing the ISM/Safety Improvement Project. The DDO will report project’s progress monthly to the Laboratory’s Policy Council.

Policy and Strategic Planning Office
The Assistant Laboratory Director (ALD) for Policy and Strategic Planning (P&SP) is responsible for assuring that critical institutional level commitments of this plan are reflected in objectives defined in applicable SFAs and associated institutional level resource allocation. The ALD for P&SP will also report progress/status of this plan against institutional level objectives to the Policy Council.

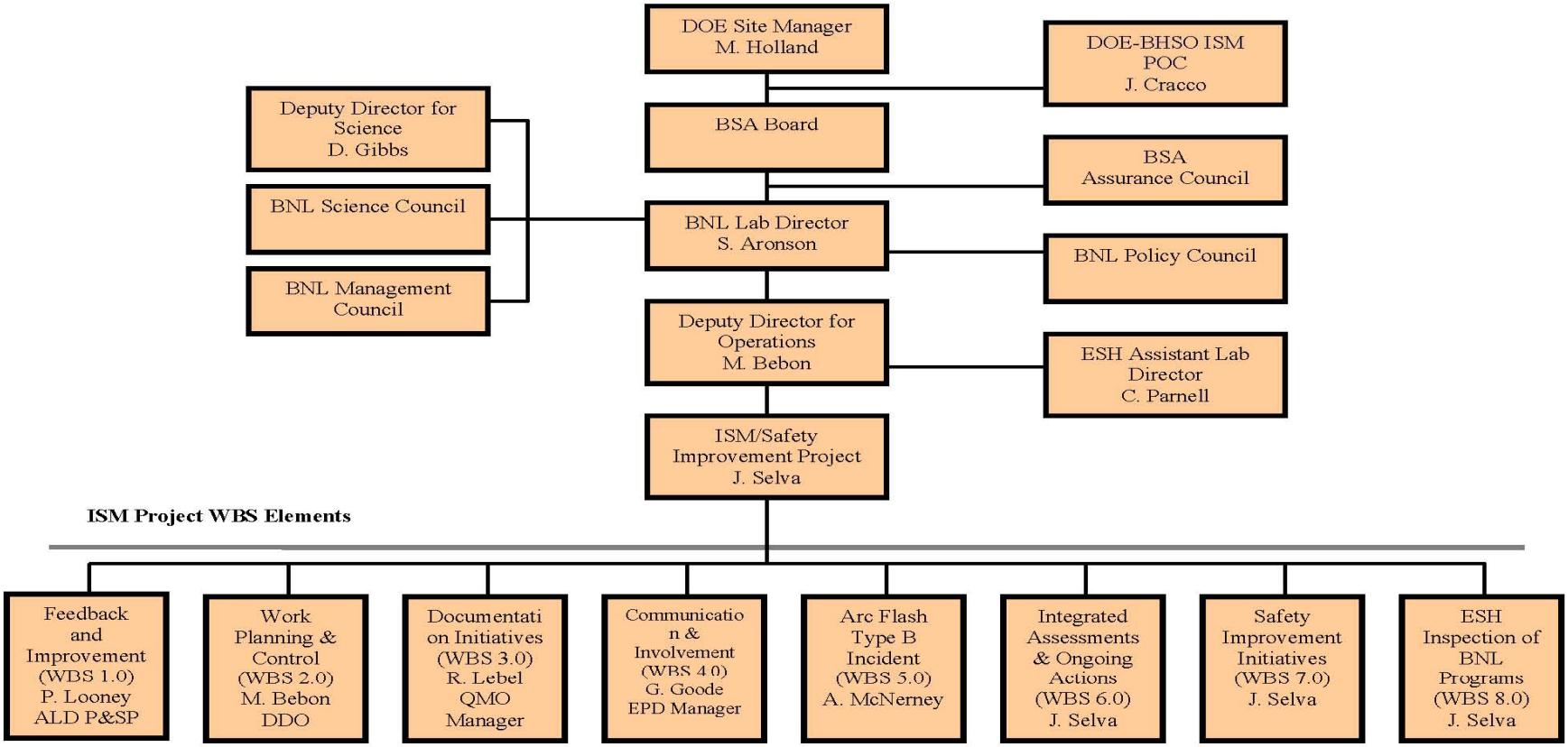
ISM/Safety Improvement Project Manager
The Project Manager has full responsibility and authority for carrying out the ISM/Safety Improvement Project in a manner consistent with this project plan. The project manager reports to the DDO. The project manager has the continuing responsibility to manage implementation of ISM/Safety Improvement project objectives. In fulfilling this vision the project manager is responsible for:

- Establishing goals and performance indicators to guide project efforts and measure progress.
- Developing, maintaining and tracking project tasks and activities.
- Holding managers responsible and accountable for successfully executing project objectives by the delivery of SME's and contributed resources.
- Managing resources to support execution of the project's activities.
- Communicating accurate project status, and performance issues to BNL Senior Management.
- Identifying and managing critical issues and risks that may impact project performance.
- Utilizing appropriate BNL subject matter experts to prepare and review key program documents, and oversee development of documents to assure compliance with DOE ISM requirements.
- Identifying, preparing, and managing documentation required to successfully manage the project.
- Collaborating with DOE-BHSO for closure of activities tracked in BNL ATS and DOE-HQ corrective action tracking system (CATS).

ES&H Assistant Laboratory Director
The ES&H ALD is responsible for the active participation of ES&H Directorate Divisions/Offices as well as guiding the ISM project manager in fulfilling requirements of the project plan including ES&H responsibilities. Specific responsibilities include:

1. Delivering the necessary subject matter experts and resources required for project success.
2. Supporting the project manager by identifying critical issues that may impact project performance, and offering advice to ensure its timely resolution.
3. Striving to remove any barriers to the ISM/Safety Improvement Project.

Figure 2, ISM / Safety Improvement Project Organization Structure



V Work Breakdown Structure (WBS) and WBS Elements

Figure 3 illustrates the high level WBS elements. The ISM/Safety Improvement Project elements are divided into eight main categories: 1.0 – Institutional Feedback and Improvement, 2.0 – Work Planning and Control, 3.0 – Documentation, 4.0 – Communication and Involvement, 5.0 – Collider Accelerator Arc Flash incident, 6.0 – Integrated Assessments and Ongoing Actions Risk Impact, 7.0 – Safety Improvement Initiatives, and 8.0 – ES&H Inspection of BNL Programs CAP.

WBS 1.0 – Institutional Feedback and Performance Improvement Initiatives

This activity involves improving current processes, and developing and implementing new elements of the planning and performance management process. The work will build on a SFA framework developed by Laboratory senior management at a retreat on January 9th and 10th, 2006. The plan contains four thrust areas, briefly described below (WBS 1.1-1.4). They are discussed in detail under section 1.0. Specific actions were developed to assure institutional responsiveness to the conditions, causes, and recommendations related to ISM Core Function 5, Feedback and Improvement.

WBS 1.1 – **Laboratory Strategy Focused Framework –** Includes identifying SFA Champions and establishing SFA working groups. The latter will define goals, identify and evaluate/characterize risks, identify appropriate measures and, as necessary, corporate and institutional level risk limits, and identify areas where institutional focused assessments should be performed.

WBS 1.2 – Institutional Decision Making Assurance Processes – Includes developing a capability that utilizes data, experience, and expertise to inform the Laboratory senior management of SFA progress towards objectives, ability to maintain performance within established institutional risk limits, to identify any new opportunities and/or emerging risks, and to verify the effectiveness of investments made to mitigate risks and/or resolve deficiencies. Under this WBS element, a “needs assessment” and “gap analysis” for each SFA will be conducted, and associated plans developed to improve analysis capabilities.

WBS 1.3 – Align Resource Allocation Processes – This WBS element will refine and align the processes in institutional level budget development, allocation, and execution processes with the strategic agenda. This WBS element will also drive accountability for organizational performance against established institutional level objectives, and the integration of the budget decision-making calendar and processes with the planning and performance monitoring calendar.

WBS 1.4 – Verify Sustainability and Effectiveness – Includes assurance that DOE and management expectations are clearly understood and effectively implemented, a review and update of senior management’s R2A2s for applicable and appropriate expectations, update senior management performance plans goals to reflect expectations for strategy execution and performance assurance within their respective organizations. It also covers an evaluation of

the overall effectiveness of institutional feedback and performance improvement reengineering.

WBS 2.0 – Work Planning and Control Performance Improvement Initiatives

Work under this element includes revising/updating the Work Planning and Control Management System and subject areas to further define the screening process and integrate the job risk and facility risk assessments into work planning and control at BNL. It also covers defining and clarifying the skill-of-the-worker process, methodologies and qualifications for work control managers and coordinators.

WBS 2.1 – Work Performance Improvement Initiatives – Activities under this WBS element include: (1) creating a culture of "All Work is Planned" (i.e. hazards are identified, mitigated and the work executed as planned) and supporting procedures and methodologies, (2) clarifying building manager roles in work planning and control process, (3) improving the ISM flow down process to subcontractors and vendors, (4) specifying job change control expectations, (5) integrating human performance factor and principles into work planning and control, and (6) upgrading the assessment plan for the Work Planning and Control Management System to include risks and quantitative measures to track and report its performance.

WBS 2.2 – Work Planning and Control Qualifications and Training – The WBS element here encompasses establishing the qualifications and training requirements for all Work Control Managers and Coordinators, and revitalizing the Work Planning and Control Training Program.

WBS 3.0 – Documentation Improvement Initiatives

This WBS element relates to updating SBMS documentation essential to the ISM Program to reflect current practices, expectations, and commitments.

WBS 3.1 – Key Programmatic Document Initiatives – Includes ensuring that management systems and program descriptions were reviewed, revision/issue dates updated and reflected in SBMS on-line documents, and strengthening processes for developing and implementing SBMS documents (i.e. Laboratory-wide Procedures and Internal Controlled Documents development).

WBS 3.2 – Requirements Management and SBMS Processes– Includes the rollout and implementation of the electronic record of decision tool, management system requirements verification, mapping contract requirements to management systems, and verifying current content of standard operating procedures, standard practice instructions, handbooks, and manuals that reside in SBMS.

WBS 4.0 – Communication and Involvement Initiatives

Activities herein include line management communicating safety expectations to staff, visitors and guests. Actions within the preceding WBS elements address the communication and involvement underlying and root causes identified from the causal analysis. The action items and initiatives described under WBS 1.0 address the accountability and performance expectations of line management. Activities under this element are targeted at communicating changes to SBMS documents, procedures, methodologies and processes.

WBS 4.1 – New / Revised Document Communications – activities under this element include communicating/explaining the revisions to SBMS documents to affected stakeholders Quality Assurance (QA) Representatives, ES&H Coordinators, Procedure Managers, Work Control Coordinators).

WBS 5.0 – Collider Accelerator Department Arc Flash Type B Incident

This WBS element includes those activities associated with and arising out of the arc flash incident. The Laboratory developed a set of actions designed to further assess its associated causal factors, and to revisit the effectiveness of existing plans, policies, and processes.

WBS 5.1 – DOE Team Interim Recommendations – The interim recommendations of the Type B Team and the Laboratory's corrective actions to address them are included.

WBS 5.2 – BNL Corrective Actions – In addition to implementing the interim recommendations of the DOE Type B team, the Laboratory identified several additional actions that will be taken to further understand the causal factors associated with the event, and to ensure that they are corrected.

WBS 5.3 – BNL Arc Flash Corrective Actions Approved by DOE

WBS 6.0 – Integrated Assessment Actions and Ongoing Actions Risk Impact

The actions under this WBS element are the corrective actions that have an impact on Annual Laboratory Plan and Performance Evaluation and Measurement Plan (PEMP) goals and objectives. Actions that have a noticeable or significant impact will be tracked to closure through this project plan.

WBS 6.1 – Integrated Assessment Action Risk Impact - Activities under this WBS element detail those corrective actions that are Nonconformance Tracking System (NTS) actions and activities that have a significant impact on Annual Laboratory Plan and Performance Evaluation and Measurement Plan (PEMP) objectives, measures and targets.

WBS 6.2 - Equipment falls off the tailgat2e of a box truck resulting in a near miss to an injury [ATS 3255]

WBS 6.3 - Positive unreviewed safety question at BNL Waste Management Facility [ATS 3625]

WBS 6.4 - Programmatic Deficiency involving industrial hygiene exposure monitoring [ATS 3785]

WBS 6.5 - Programmatic deficiencies involving electrical safety [ATS 3922]

WBS 6.6 - Subcontractor noncompliance with 10CFR851 Occupational Medicine Requirements [ATS 3949]

WBS 6.7 - Overexposure to static magnetic field

WBS 7.0 – Safety Improvement Initiatives

This WBS element details the initiatives aimed at improving safety management, performance and activities required to achieve excellence in ESS&H.

WBS 7.1 – Facility Safety Authorization – Activities under this WBS element detail actions for improving institutional safety basis documentation management.

WBS 7.2 – Institutional Safety Committee Reporting – Activities under this WBS element detail actions for re-engineering the safety committee reporting structure and roles and responsibilities of committee and working group chairs.

WBS 8.0 – Inspection of ES&H Programs at BNL Corrective Action Plan

This WBS element includes corrective actions that address the 7 findings from the DOE Office of ES&H Evaluations (HS-64) and compensatory actions that address unmitigated hazards extracted from the November 2007 DOE Inspection of ES&H Programs at BNL final report.

WBS 8.1 – ES&H Inspection Finding Corrective Actions

WBS 8.2 – ES&H Inspection Compensatory Actions

WBS 8.3 – C-3 Finding - Small science has not ensured that activity-level experiment safety reviews and job risk assessments provide sufficient information about work place hazards

WBS 8.4 – C-4 Finding - Plant Engineering has not sufficiently implemented the requirements in the BNL-Wide work planning and control subject area

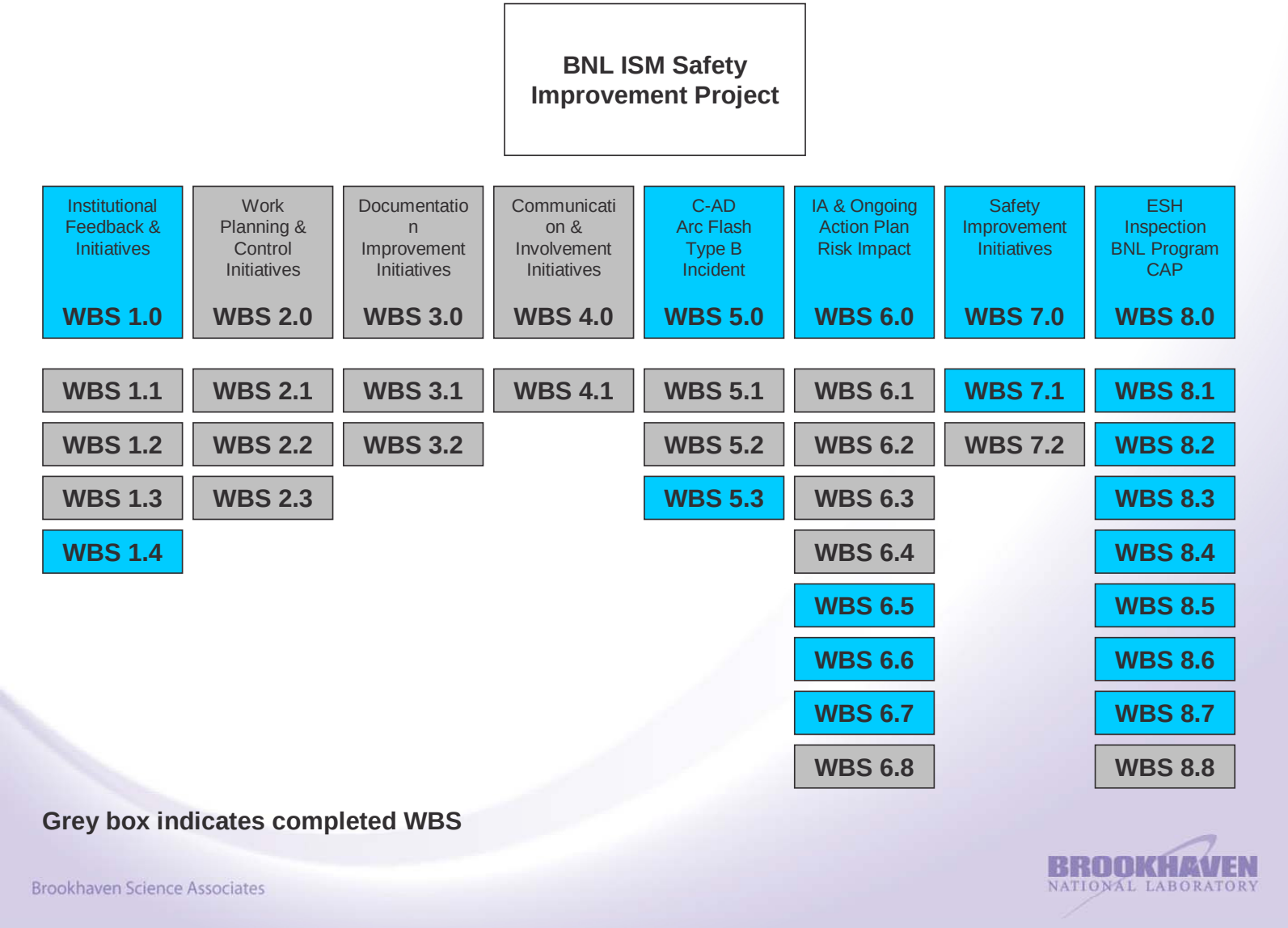
WBS 8.5 – D-3 Finding - BNL has not implemented an effective and compliant self-assessment program

WBS 8.6 – Corrective Action D-3.5 - Revise the Integrated Assessment Program Management System Documentation - incorporate new process requirements and training developed from CA D-3.1 - 3.4.

WBS 8.7 – D-4 Finding - BNL has not established and implemented an effective issues management program

WBS 8.8 – ES&H CAP Compensatory Actions

Figure 3, ISM/Safety Improvement Project Plan WBS



V.a Corrective Actions – Evaluation of ISM at BNL: Causal Analysis Results

This section details the problem areas identified from the Evaluation of ISM and previous assessments, and the corrective actions necessary to prevent recurrence of ISM deficiencies. Each sub-section describes the problems, the associated observations identified from the assessments and summarizes the direct and root causes from causal analyses, and corrective actions.

Following the findings from the Evaluation of ISM conducted in October 2005 and several safety assessments over past years, for example, FY04 Multidisciplinary Task Force Review, FY04 DOE Chicago Office ISMS assessment, FY05 BNL Management System Self-assessment Program, and FY05 ISM Focused Management Review), BNL undertook a comprehensive review/evaluation to determine why recurring deficiencies continue to recur. The BNL team identified 123 observations, findings and concerns that warranted further investigation. They were analyzed and binned into five problem areas: feedback and improvement; work planning and control; procedural deficiencies; communications/training; and corrective action management.

After the problem areas were defined, a causal analysis was performed on each utilizing the questioning to the void approach (5 Whys), and the TapRooT root cause tree analysis to identify all the particular parameters causing the problem, including management and supervisory influences that affect workers' behaviors. A summary of these causes is given for each problem area. Each cause was also linked to the causal analysis tree in the DOE Occurrence Reporting Causal Analysis Guide.

BNL developed corrective actions for all root and significant contributing/underlying causes and included needed actions for verification of effectiveness. Included for each problem area is a description of the corrective action, applicable management system, management system steward, action owner (individual responsible for completing the action item), and target completion date. Table 1, at the end of this section, show how the causes, recommendations from the FYO5 "Evaluation of ISM at BNL" and corrective actions relate to one another.

1.0 Institutional Feedback and Performance Improvement Initiatives

Problem Statement: The Laboratory has not established effective institutional-level self-assessment, corrective action management, and feedback and improvement processes.

A. <u>Supporting Observations from Assessment Activities:</u>

1. There is no effective process in place to systematically prioritize, on the basis of risk and within the framework of a laboratory-wide annual agenda, the various adverse ESH&Q and operations-related conditions identified through internal and external assessments for which holistic and sustainable corrections are needed or expected *[FY06 Evaluation of ISM at BNL].*
2. Major assessments (e.g. FY 04 DOE Chicago ISM Assessment, FY 05 ISM Assessment Follow-up Review, and FY05 ISM Focused Management Review) with cross cutting issues have not been adequately addressed. Recommendations to strengthen and reduce injuries from initiatives such as from the DuPont assessment

have not been systemically addressed by senior management. Corrective actions taken were not enough to prevent recurrence *[FY06 Evaluation of ISM at BNL]*

3. BNL has not established all of the elements of a robust and effective Contract Assurance Process. DOE Order 226.1 establishes high expectations for issues management, specifically determining the risk significance, and priority of deficiencies, evaluating the scope and extent of condition or deficiency, identifying root causes, verification that corrective actions are complete, and validation that corrective actions are effective *[FY06 Evaluation of ISM at BNL].*

B. Causal Analysis Summary

Three direct causes were identified:

1. The set of functions that capture, analyze, and communicate institutional-level performance information have not been fully established and/or implemented. Mechanisms to evaluate the efficacy or impact (costs and benefits) of initiatives or corrective actions are not sufficiently robust or lacking. *ORPS Cause Codes: A4B1C01, Management Policy guidance/expectations not well defined, understood, or enforced, and A4B1C09, Corrective action for previously identified problem or event was not adequate to prevent recurrence*
2. A sufficient set of processes and associated expectations for the reporting of important conditions and/or issues, which might require timely action by the senior laboratory management, have not been developed and implemented. *ORPS Cause Code A4B1C01, Management Policy guidance/expectations not well defined, understood, or enforced.*
3. Laboratory Senior Management has not sufficiently defined and executed their roles and responsibilities for institutional-level performance. *ORPS Cause Code A4B1C01, Management Policy guidance/expectations not well defined, understood, or enforced.*
4. **The root cause was determined to be:** The Laboratory has not defined the strategic outcomes it would need in order to (*ORPS Cause Code A4B1C01, Management Policy guidance/expectations not well defined, understood, or enforced)*:
    i. Establish a full range of (scientific, operational, and stakeholder relations, etc.) performance objectives,
    ii. Identify and convey to senior managers the individual, organizational, and management system expectations,
    iii. Systematically and rigorously assess and improve institutional performance, and
    iv. Establish expectations for reporting of conditions and issues affecting the institution.

C. Feedback and Improvement Corrective Actions

BNL developed a Performance Management Improvement Plan to build on the SFA framework discussed in section 2.3. The framework will help focus the Laboratory's management on elements while fostering a comprehensive view of the most significant factors that affect the

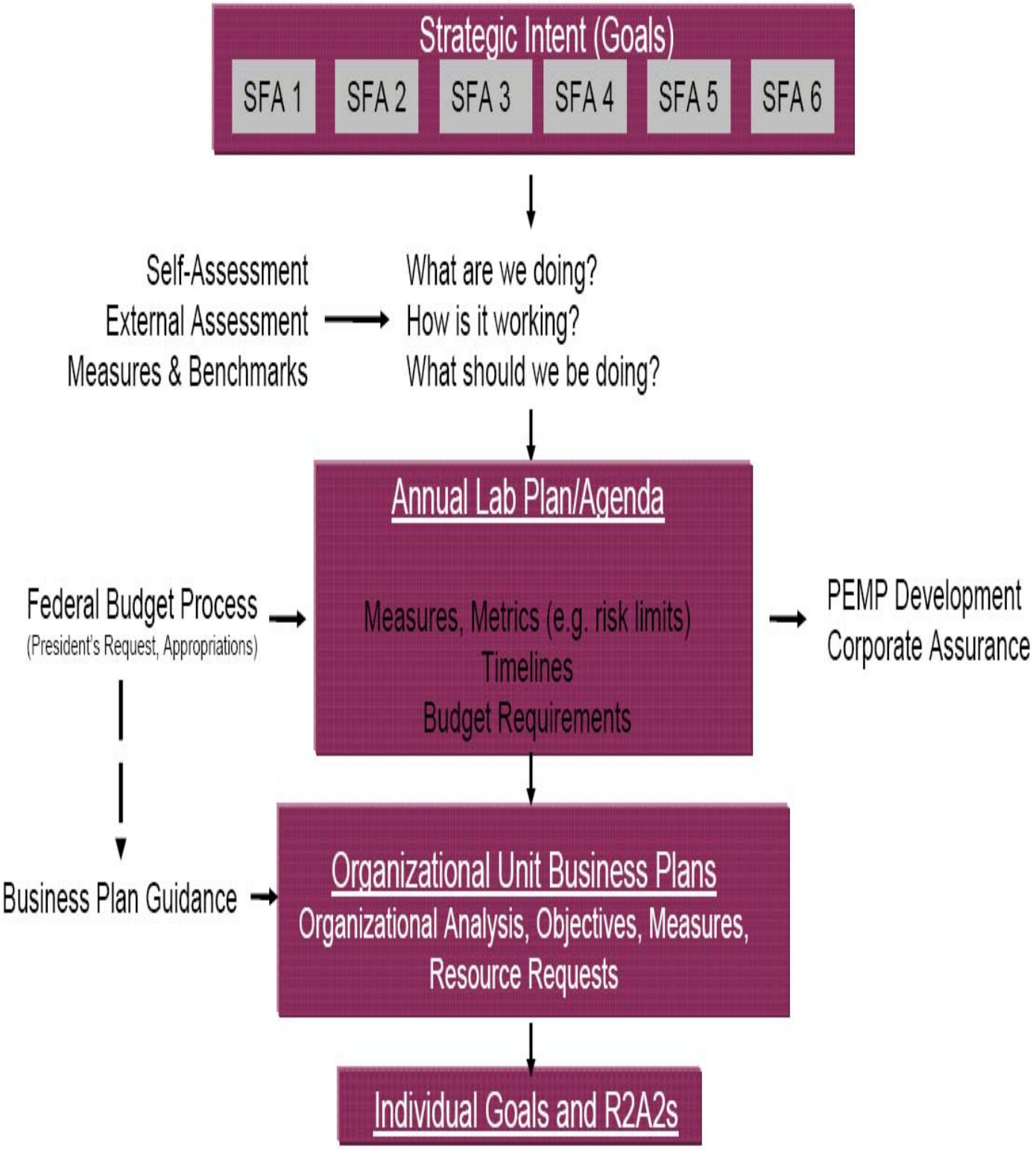
viability of the Laboratory's scientific mission (e.g. scientific productivity, stakeholder relations, safety, security, and costs). The improvement effort encompasses four thrust areas:

1. **Adopt a strategy-focused framework for Laboratory-wide planning, decision-making, and performance management.**
2. **Evolve an institutional performance and risk analysis to improve feedback to institutional decision-making and assurance processes.**
3. **Align decision and budget-allocation-processes with Laboratory's performance objectives.**
4. **Verify the sustainability and effectiveness of the performance management processes.**

The Performance Management Improvement Plan involves improving current processes, as well as developing and implementing new elements of the planning process, which will take time to develop and mature. The sequence and schedule of actions are based on the need to: (1) allow for time for the development and maturation of new core processes and practices (e.g. business planning), (2) simultaneously improve on-going processes (e.g. self-assessments and performance monitoring), (3) monitor and address on-going priority issues of performance, such as ISM performance, and (4) integrate and ultimately supplant some existing planning, decision, and performance-management activities which continue as improvements are established (for example, Contract Performance Evaluation and Measurement Plan (PEMP) development).

Specific actions were taken to (1) assure institutional responsiveness to the causes discussed above, (2) respond to recommendations made by the ISM review team (included in Appendix 1 of the Evaluation of ISM at BNL Report), and (3) assure the DOE's requirements and expectations are met for feedback, improvement, and assurance processes (viz. DOE O 226.1, DNFSB 2004-1 Feedback and Improvement Criteria and Review Approach Document [CRAD]). Figure 4 illustrates the Strategic/Integrated Planning Process.

Figure 4, Strategic/Integrated Planning Process



Corrective Action WBS-1.1:
Adopt a Strategy-Focused framework for Laboratory-wide planning, decision, and performance management.

This statement represents the cornerstone of improving performance management at the Laboratory. The SFA framework will be followed. SFA Champions will be identified and SFA working groups established. The Laboratory Director will charge them to help develop the necessary SFA planning and evaluation documents. Specifically the SFA working groups will define goals, identify and evaluate/characterize risks, suggest appropriate measures and, as necessary, corporate- and institutional-level risks limits, and highlight areas where institutional focused assessment activities should be undertaken. While the process will be initiated in the near-term, SFA planning and evaluation documents are expected to be fully mature after approximately 2 years as actions progress in other thrust areas (e.g., performance analysis capabilities).

To support the implementation of the SFAs we will develop and establish an integrated calendar of planning and performance-monitoring work that meets and integrates the needs and requirements of Laboratory management and the DOE, such as in PEMP development and reporting, corporate assurance and contractor assurance. This calendar will include defining and scheduling significant management retreats and integrating performance and assurance-reporting processes in accordance with the DOE and BSA's expectations.

The planning, decision, and performance management process will be aligned with management's fundamental beliefs and practices. Brookhaven executives and managers have varying skills, knowledge, experience, and perspectives on management principles and practices. Therefore, this element will encompass an executive and management symposia to assist in aligning management's thinking and approaches with best practices employed by successful businesses and institutions.

Management System: Integrated Planning
Management System Steward: J. Patrick Looney
Action Owner: Doug Ports/R. H. Lebel

Specific Actions	Target Completion Date
Complete initial SFA Planning and Performance Management Documents	September 30, 2006 ***Completed***
Develop, Publish, and Implement Integrated Planning and Performance Management/Assurance Calendar	September 30, 2006 ***Completed***
Realign Quarterly Institutional Level Reporting Along SFA Framework	December 31, 2006 ***Completed***
Define and Implement Management Symposia	May 30, 2007 ***Completed***

Corrective Action WBS-1.2:
Evolve institutional performance and risk analysis to improve feedback to institutional decision-making and assurance processes.

Transition to a strategy-focused institution will require new and better analysis methods and abilities. It is critical to understand institutional level opportunities and risks define priorities, allocate resources, and to evaluate the effectiveness of institutional improvements.

While some capability exists at the Laboratory, particularly for event driven analysis, we have not systematically and comprehensively evaluated and developed expertise, processes, practices and tools for analyzing institutional performance. A particular need is for evaluating relative risks, assessing beliefs and culture related to institutional performance, assuring effectiveness and efficiency of institutional business/work management processes, and comparing institutional performance against external benchmarks of competitiveness and excellence in performance.

The issues involved in developing these abilities greatly depend on the specific nature of the SFAs and the associated processes and practices. Ultimately, SFA Councils will be developed which will have a vital role in defining approaches and conducting on-going analysis for their respective focus area. They will utilize data, experience, and expertise to inform the Laboratory's senior management of SFA progress towards its objectives, ability to maintain performance within established institutional risk limits, to identify any new opportunities and/or emerging risks, and to verify the effectiveness of investments made to mitigate risks and/or resolve deficiencies. This area will conduct a "needs assessment" and "gap analysis" for each SFA and propose plans to improve our capabilities for analysis.

This thrust area also will define and deploy the analysis approaches used by each SFA Champion and Council.

Management System:	Integrated Planning
Management System Steward:	J. Patrick Looney
Action Owner:	T. Baker/R. H. Lebel

Specific Actions	Target Completion Date
Document/Define the Contractor Assurance Process in accordance with DOE O 226.1 Requirements	September 30, 2006 ***Completed***
Establish Institutional Prioritization Framework	March 30, 2007 ***Completed***
Renew Event/Issues Management Processes	December 31, 2006 ***Completed***
Upgrade/Re-Tool the Assessment Tracking System	February 28, 2007 ***Completed***
Establish Common Institutional Level Data Collection and Reporting Process and Tool	September 30, 2007 ***Completed***
Define and Develop SFA Analysis Capability	March 30, 2008 ***Completed***

Corrective Action WBS-1.3:
Align resource allocation processes with Laboratory performance objectives

The effectiveness of institutional-level decisions and resource allocations depend on a well-defined strategic agenda and a well characterized risk profile. Because we have not systematically and comprehensively defined them, we lack a framework to adequately integrate processes of budget decisions. Accordingly, this thrust area will refine and align institutional-level budget development, allocation, and execution processes with the strategic agenda.

Additionally, just as the individual/personal goal planning and evaluation/compensation processes drive individual performance, the comparable institutional processes must support the desired organizational behaviors required to achieve institutional objectives. For example, if there is an institutional expectation for safety excellence and efficiency in safety, the business-planning process must drive accountability for those expectations at the organizational level.

Under this thrust area we will also integrate the budget decision-making calendar and processes with the planning and performance-monitoring calendar.

The success of these activities is largely contingent upon our ability to adequately conduct the necessary analysis and define institutional priorities. Therefore, work under this thrust area is expected to lag the development of the SFA and the performance analysis thrust areas.

Management System: Integrated Planning
Management System Steward: J. Patrick Looney
Action Owner: Teresa Baker

Specific Actions	Target Completion Date
Refine and Redefine Institutional Level Discretionary Allocation Processes	July 31, 2007 ***Completed***
Integrate Decision and Budget Allocation Processes into Planning and Performance Management/Assurance Calendar	May 30, 2007 ***Completed***
Define and Implement an Organizational Unit Business Planning Process	July 30, 2007 ***Completed***

Corrective Action WBS-1.4:
Verify sustainability and effectiveness of the performance management processes

Actions under this thrust area will assure that the DOE's and management's expectations are clearly understood and effectively implemented.

A key element of driving performance management effectiveness and sustainability is a clear, consistent understanding of management's roles and responsibilities for strategy formation, execution, and performance assurance. Therefore this thrust area will include a review and update of senior management's R2A2s to encompass the appropriate expectations. Senior management's performance plans/personal goals also will be updated to reflect expectations for executing strategy and performance assurance within their respective organizations. We will redefine the roles and practices of the various councils that support BNL's management and establish new ones, where necessary.

An evaluation of organizational structure to assure optimal performance of key planning, decision, and performance-management processes will be conducted under this thrust area. Specifically we will address the adequacy of institutional commitment to independent oversight which is a potential issue identified by the ISM review team.

In addition to assuring optimal organizational structure, an evaluation of the overall effectiveness of the reengineering effort will be assessed under this thrust area. It will verify institutional awareness and acceptance as well as the adequacy and effectiveness of key performance-management processes, such as SFA planning, analysis, and decisions on resource allocation.

Specific Actions	Target Completion Date
Complete comprehensive gap analysis against key program design input requirements and expectations (e.g. DOE O 226.1, DFNSB 2004-1, Feedback and Improvement CRADS, OMB A-123)	July 20, 2006 ***Completed]***
Update ISM/Safety Improvement Project Plan as necessary to address gaps identified under task above.	July 30, 2006 ***Completed***
Review and refine as necessary Roles and Practices of Institutional Councils	September 30, 2006 ***Completed***
Complete analysis of the adequacy institutional commitment to independent oversight (Third Party Quality Assurance Review)	August 30, 2006 ***Completed***
Review and update as necessary Senior Management Roles, Responsibilities, Authorities and Accountabilities (R2A2s) and performance plans/personal goals to reflect strategy execution, assurance, and management system requirements.	February 28, 2007 ***Completed***
The comprehensive gap analysis against key program requirements identified that BNL has not established requirements and formal processes to ensure that personnel responsible for managing and performing assurance activities possess appropriate experience, knowledge, skills and abilities commensurate with their responsibilities. BNL will establish requirements to address the identified gap.	December 30, 2006 ***Completed***
Review Organizational Roles, Structure, and Resources and make necessary changes to optimize effectiveness and efficiency of on-going administration of performance management processes	June 30 2007 ***Completed***
Establish and implement a process to verify personnel responsible for managing and performing assurance activities possess appropriate experience, knowledge, skills and abilities.	September 30, 2007 ***Completed***
Review and update, as necessary, middle management (Level 2) and staff R2A2s and performance plans/personal goals to reflect their role in strategy execution and performance assurance	March 1, 2008 ***Completed***
Conduct an effectiveness review of the performance management program re-engineering effort. WBS 1.4.8	November 30, 2008 ***Completed***
Conduct an effectiveness review of the Science	March 31, 2009

performance management re-engineering effort. WBS 1.4.9	

Management System: Integrated Planning
Management System Steward: J. Patrick Looney
Action Owner: Teresa Baker

2.0 Work Planning and Control Performance Improvement Initiatives

Problem Statement: The work planning and control process is not achieving the Laboratory's goals and objectives.

Almost a decade ago, the Laboratory implemented a formal process for Work Planning & Control. It has evolved and improved since then as we have gained experience with it, and have received valuable input from external assessments.
Two principal processes are used: 1) Work Planning, which applies to support work, and, 2) Experimental Safety Review, which covers the scientific work.

The Senior Management responsibility for Work Planning & Control rests with the Deputy Director for Operations who is the Management System Steward. Plant Engineering's Deputy Manager of Operations and Maintenance currently serves as the Management System Point of Contact. The Work Control Managers (WCMs) are the individuals responsible for the work planning & control processes in their organizational units and typically are experienced managers. Each designates one or more Work Control Coordinators (typically supervisors) to screen and/or plan the work of specific groups, or work done in a specific building or area.

BNL's work planning process uses a screening process to determine the required extent of work planning with the two ends of the spectrum being "skill of the worker" and a formal Work Permit.

The Experimental Safety Review (ESR) process ensures that SMEs review experiments, and hazards are assessed and mitigated. The needed level of review and approval for the experiments depends on the severity of the hazards and their consequences, as dictated by DOE Orders and ES&H Standards. The ESR establishes controls and operational limits for experiments.

The "Evaluation of ISM at BNL" and related assessments and feedback from the Work Control Managers revealed weaknesses in the Work Planning & Control Management System, each of which is addressed in the corrective actions below.

Furthermore, a causal analysis was performed to identify their underlying causes. The problem statement, supporting observation and causes identified through the causal analysis process are described below.

A. <u>Supporting Observations from Assessment Activities:</u>

1. The Laboratory Work Planning and Control processes allow a significant amount of work to be identified as "skill of the worker" without having adequate mechanisms to assure that individuals relied upon to make key decisions are competent commensurate with their responsibilities. The present Laboratory process too easily allows WCCs and WCMs (screeners) to characterize the work as "skill of the worker". *[FY06 Evaluation of ISM at BNL]*
2. The training and qualifications process for work planning and control does not ensure that competence is commensurate with responsibilities. The work planning and control process relies heavily on the judgment, knowledge, skills and abilities of ES&H Coordinators, work control coordinators and work control managers. The level of knowledge and proficiency required for these positions is not sufficiently tested or validated. *[FY06 Evaluation of ISM at BNL]*
3. Management has not assured that adequate hazards analyses for "skill of the worker" activities have been performed and the results communicated to those workers performing the tasks. The Work Planning and Control (WP&C) subject area allows a requestor or work control coordinator to screen out the need for a work permit without first analyzing the hazards of the proposed scope, its complexity and the coordination required for execution. *[FY06 Evaluation of ISM at BNL] and [DOE Chicago ISMS Assessment, August 2004]*
4. Awareness and authorization of work activities by Building Managers is not formally required. Job supervisors are expected to communicate with appropriate personnel to ensure that the work will proceed safely and efficiently. *[Focused Management Review, August 2005].*

B. <u>Causal Analysis Summary</u>

The causal analysis for work planning and control was performed by a team of WCMs, facilitated by a senior safety professional from Battelle Memorial Institute's safety organization. The direct and root causes are presented below.

1. The operations section of the WP&C subject area contains logical flaws, is deficient, or in error in several of the following areas: (1) it does not provide sufficient and consistent requirements necessary to evaluate the nature of the hazards under consideration, (2) there is no guidance regarding the need to consider the interactions between hazards, and (3) it allows for a serial review of work permits rather than requiring a parallel review by required reviewers. *ORPS Cause Code: A5B2C08, Work planning and control guidance documentation does not provide clear or complete expectations and/or* requirements *[Direct Cause]*.
2. Employees have, in some cases, been assigned work planning and control positions without assuring their current knowledge, skills, and abilities are appropriate for the requirements of the position. *ORPS Cause Code: A4B2C09, Personnel selection (WCMs/WCCs) did not ensure match of worker motivations/job descriptions [Direct Cause]*
3. The primary mechanism used to communicate work planning and control training may not be sufficient, in and of itself, to ensure that all relevant information is being effectively conveyed and thoroughly retained. The training does not instruct or test the WCMs/WCCs on the following critical elements:

- How to screen for "skill of the worker,"
- How to prepare a Work Permit,
- How to conduct a proper walk-down and job review,
- How to perform a Job Hazard Analysis,
- The proper conduct of a pre- and post-job brief.

ORPS Cause Codes: A6B3C02, The training material has inadequate content and A6B2C02; Testing is inadequate [Direct Cause]

4. There is no re-training program in place to maintain the proficiency of these positions – which is believed essential given the fundamental importance of the WCMs/WCCs position to the success of the work planning and control process. *ORPS Cause Code: A6B2C03, The refresher training is less than adequate.*
5. The resources committed to work planning and control, and the rigor associated with work planning and control implementation is often balanced against other priorities and resource demands. *ORPS Cause Codes: A4B1C01, the Laboratory has not universally established the priority and importance of ensuring excellence in the work planning and control process, A4B2C04*, *The level of resource commitment and priority accorded to safety-related training is not commensurate with its importance to achievement of effective safety management [Root Cause].*

C. <u>Work Planning and Control Corrective Actions</u>

Corrective Action WBS-2.1.1
Integrate Work Planning & Control into the Laboratory's Strategic Planning Process
As discussed above, among the actions planned to address the institutional level feedback and improvement weakness, is the development of Strategic Focus Areas (SFAs) that will become the framework for institutional management. The "Excellence in ESS&H" SFA will serve as the forum to communicate to all Laboratory managers the importance of, and institutional commitment to, excellence in the WP&C process as a key tool toward achieving overall ESS&H excellence.

- Assign a WP&C Representative to the ESSH SFA Team.
- Incorporate a strong commitment to work planning & control into the SFA goals and objective for the ESS&H SFA.

Management System:	Work Planning and Control
Responsible Manager:	M. Bebon
Corrective Action Owner:	C. Johnson
Target Completion Date:	August 15, 2006 ***[Completed]***
Addresses Supporting Observations:	N/A
Addresses Direct or Root Causes:	2.0- B5

Corrective Action WBS-2.1.2
Create a Culture of "All Work is Planned" and Develop Supporting Procedures and Methodologies

Over 80% of the work performed at BNL in the non-science areas is handled as "skill of the worker", as evidenced in a recent survey done in Facilities & Operations. In practice, there is an apparent bias toward informal work planning or the "skill of the worker" approach, rather than utilizing the more formal Work Permit process. In recognizing this bias, the Laboratory has aggressively pursued OHSAS 18001 that features a Job Risk Assessment (JRA) and a Facility Risk Assessment (FRA) process with substantial worker involvement. These processes effectively introduce formal hazards analysis and mitigation to the routine tasks typically associated with SOW jobs. About 2/3 of the Laboratory's organizational units, including all of those using craft labor, have been registered. However, the Laboratory has not yet set expectations for integrating JRAs and FRAs into WP&C, nor how hazards and mitigation strategies are communicated to the workers. This corrective action will develop those expectations.

Another area needing improvement is the methodology for integrating multiple job-related hazards into the work planning process, particularly as it impacts "skill of the worker" in multi-craft jobs.

The following actions will reverse the bias toward SOW and drive a culture where all work is planned using a graded approach. The principal action here is developing methodologies to bridge the gap between "skill of the worker" and the Work Permit process. It will involve adding some formality to the present informal, undocumented work screening and planning processes that are used in many areas of BNL.

- Define and Implement a "Worker Planned Work" process (i.e. re-define and enhance skill of the worker determinations) that:
  - Clarifies when "Worker Planned Work processes" may be used in lieu of a formal work permit (i.e. work planning methodologies to bridge the gap between skill of the worker and the formal Work Permit.
  - Integrates hazard-analysis requirements into worker planned work determinations.
  - Includes a methodology for communicating hazards to workers for worker planned work jobs.
- Evaluate the quality of job risk assessments based on their impact on worker planned work and institutional risk. Revise/Update JRAs as appropriate.
- Develop a process to fully integrate JRAs and FRAs into the WP&C Process.
- Improve processes for hazard analysis and mitigation where there are multiple interacting hazards, e.g. multi-craft jobs.
- Integrate Lessons-Learned data into all Work Planning & Control processes.
- Develop requirements for considering multiple hazards and their interaction.

Management System:	Work Planning & Control
Responsible Manager:	M. Bebon
Corrective Action Owner:	C. Johnson/WCMs
Target Completion Date:	July 30, 2007 ***[Completed]***
Addresses Supporting Observations:	2.0- A1, A3

Addresses Direct or Root Causes: 2.0- B1

Corrective Action WBS-2.1.3
Clarify Building Manager Role in Work Planning & Control
In some of the Laboratory's organizations, though not in the majority, the same individual serves as Building Manager and WCM. The interface between these two key responsibilities has not been defined, and important guidance will be developed under this corrective action (CA).

- Evaluate the data collected from the pilot Building Manager work notification and use them to define the role of the Building Manager in Work Planning and Control, specifically, the required interaction between Building Manager and WCM.

Management System: Work Planning & Control
Responsible Manager: M. Bebon
Corrective Action Owner: C. Johnson
Target Completion Date: November 30, 2006 ***[Completed]***
Addresses Supporting Observations: 2.0- A4
Addresses Direct or Root Causes: N/A

Corrective Action WBS-2.1.4
Address Gaps in ISM Flow down Processes for Subcontractors and Vendors
The Laboratory has worked hard at its construction-safety program for many years, including placing substantial and continuing focus on flow-down of ISM requirements to construction subcontractors. The process was reviewed in response to the recent fatalities at Savannah River and Hanford. That review and the "Evaluation of ISM at BNL" assessment validated the BNL's process for its subcontractors, but identified gaps in the area of labor obtained through small contracts, purchase orders, and other modalities that use the "web requisition" process. The actions below will address these concerns.

- Supplement existing ISM requirements flow-down procurement processes to include small contracts, service work, and warranty where the work will be performed on site.
- Modify the terms and conditions of contracts, purchase orders, and other procurement documents.
- Integrate into procedures the review and approval of web requisitions by WCMs and/or WCCs when work is to be performed onsite.

Management System: Work Planning & Control
Responsible Manager: M. Bebon
Corrective Action Owner: C. Johnson
Target Completion Date: October 30, 2006 ***[Completed]***
Addresses Supporting Observations: 2.0- A3
Addresses Direct or Root Causes: N/A

Corrective Action WBS-2.1.5
Work Planning Processes for Job Change Control
Another problem raised in the feedback from the WCMs to the Management System Steward was that of changes to the work (after planning) not being called to the attention of the WCM or WCC. A related problem is "scope creep" wherein additional work that was not screened for hazards is added to the job without notification. This CA will address these issues.

- Develop procedures for addressing "scope creep" or changes in the work after the completing the initial work planning.
- Conduct workshops/training with Work Control Managers/Coordinators and workers to communicate the job change control process and institutional expectations.

Management System:	Work Planning & Control
Responsible Manager:	M. Bebon
Corrective Action Owner:	C. Johnson
Target Completion Date:	November 30, 2006 ***[Completed]***
Addresses Supporting Observations:	2.0- A3
Addresses Direct or Root Causes:	2.0- B1

Corrective Action WBS 2.1.6
Upgrade Work Planning and Control Management System Assessment Plan
This CA will focus primarily at the Management System Steward and Point of Contact level and upgrade the current assessment and reporting processes to keep pace with the evolution of the Laboratory's strategic planning process.

- Define risks and success factors for the WP&C Management System.
- Identify quantitative measures to track and report the management system's performance and incorporate such measures into quarterly reporting of the management system's status as part of Contractor and Corporate Assurance processes.
- Formalize the role of WCMs quarterly feedback session in management system assessment and improvement planning.
- Update the Work Planning & Control Assessment Tool.

Management System:	Work Planning & Control
Responsible Manager:	M. Bebon
Corrective Action Owner:	C. Johnson
Target Completion Date:	July 30, 2007 ***[Completed]***
Addresses Supporting Observations:	N/A
Addresses Direct or Root Causes:	2.0- B5

Corrective Action WBS-2.1.7
Integrate Human Performance Factors Principles into the Work Planning & Control Management System
Several of the Laboratory's Senior Managers were trained in the principles of Human Performance. Their reaction was very positive; they viewed these principles as being very powerful tools. This CA will develop a process to integrate these principles into the Laboratory's WP&C processes; a short-term and a longer term approach are being contemplated. The former approach is intended to achieve measurable results as rapidly as possible.

- Integrate the "Four Key Questions" into the process of Pre-Job Briefing.
- Develop an approach to include error precursors in the hazards analysis process.
- Develop and provide the Management System Steward with longer term recommendations for a more comprehensive integration process to the Management System Steward.

Management System:	Work Planning & Control
Responsible Manager:	M. Bebon
Corrective Action Owner:	C. Johnson
Target Completion Date:	July 30, 2007 ***[Completed]***
Addresses Supporting Observations:	2.0- A1
Addresses Direct or Root Causes:	N/A

Corrective Action WBS-2.2.1
Upgrade Work Control Manager and Coordinator Training & Qualifications
When BNL implemented its Work Planning and Control program in 1997, the institutional level program did not set specific requirements for training and qualifications of WCMs and WCCs. Since then, several organizational units have done so, but others have not. Since BNL relies heavily on the work planning & control process as part of implementing its ISM Program, and because these individuals are the key day-to-day decision-makers therein, it is considered a key aspect of "Competence Commensurate with Responsibilities" to set training and qualification-standards for these important roles. The action items under this CA will develop, and publish in SBMS, minimum Lab-wide training and qualification requirements for WCMs and WCCs.

- Review current training & qualifications requirements for WCMs and WCCs.
- Revise existing and add new requirements as appropriate.
- Develop a schedule for re-qualifying WCMs and WCCs through training and testing.

Management System:	Work Planning & Control
Responsible Manager:	M. Bebon
Corrective Action Owner:	C. Johnson
Target Completion Date:	July 30, 2007 ***[Completed]***
Addresses Supporting Observations:	2.0- A2

Addresses Direct or Root Causes: 2.0- B2

Corrective Action WBS-2.2.2
Revitalize the Training Program for Work Control Managers and Work Control Coordinators
The Work Planning & Control Management System Steward periodically meets with WCMs to discuss performance and solicit feedback. This feedback included dissatisfaction with the scope and quality of the training offered to WCMs and WCCs and the lack of a formal recurring training program. Several of the ISM reviews also questioned the lack of testing within the current training program. The actions under this CA will address all of these points.

- Develop a classroom training curriculum that offers scenario-based, or "case study" training.
- Add to or enhance the following elements of the training program
  - Screening Work
  - Preparing Work Permits
  - Performing Job Hazards Analyses/Evaluations
  - Conducting a Job Walk-down and Job Review
  - Conducting Pre and Post-Job Briefings
  - Soliciting Worker Feedback
- Upgrade the computer-based training to incorporate case studies.
- Institute learning validation through testing.
- Incorporate all applicable changes resulting from corrective actions in this plan in the revised WCM/WCC training/re-training as applicable.

Management System: Work Planning & Control
Responsible Manager: M. Bebon
Corrective Action Owner: C. Johnson
Target Completion Date: September 30, 2008 ***[90%]***
Addresses Supporting Observations: 2.0- A2
Addresses Direct or Root Causes: 2.0- B3, B4

Corrective Action WBS 2.3
Revise the Work Planning and Control Management System/Subject Area
The Work Planning and Control SBMS Documents will be revised to include new processes, improvements and updates to the institutions work control processes. Specific revisions/updates shall include the following:

- Define the "Worker Planned Work" methodology and/or processes;
- Describe the hazard analysis process, and how JRAs and FRAs are integrated into the WP&C process;
- Define job change control, and the Building Managers role in WP&C;
- Describe ISM Flowdown Processes for Subcontractors and Vendors; and
- Training and Qualification requirements for WCMs/WCCs.

- Revise the WP&C to ensure that clear, effective and functional connections are made between related management systems and processes (i.e. worker safety and health, facility safety, and occupational safety and health management systems), as applicable

Management System:	Work Planning & Control
Responsible Manager:	M. Bebon
Corrective Action Owner:	C. Johnson/S. Coleman
Target Completion Date:	September 15, 2007 ***[Completed]***
Addresses Supporting Observations:	All
Addresses Direct or Root Causes:	All

3.0 Documentation Improvement Initiatives

Problem Statement: Some BNL-wide and internal controlled procedures are not current and in some cases do not provide adequate or complete instructions.

From 2004 – 2005, four internal assessments identified the need to strengthen institutional procedure controls in order to ensure that local procedures continue to meet minimum requirements delineated in corresponding SBMS Subject Areas. The Laboratory PAAA Committee reviewed these noncompliances, resulting in a NTS Noncompliance Report being filed on November 4, 2005 (NTS-CH-BH-BNL-BNL-2005-0001). A corrective action plan was developed to address these issues, details of the plan can be found in Section 6.6 of this Plan.

The "Evaluation of ISM at BNL" conducted in October 2005 found additional examples of weakness in documentation management, including several related to the SBMS Management System's Descriptions, Subject Areas, and Program Descriptions associated with the ISM program. Similar inconsistencies or dated conditions were observed in other operations documentation. Corrective actions included in this section were identified to address each specific weakness.

Additionally, the Laboratory's Senior Management conducted two separate causal analyses to identify the factors underlying the weaknesses. The supporting observations and causes identified through causal analyses are described below.

A. <u>Supporting Observations from Assessment Activities</u>

1. Critical ISM program documentation does not fully reflect current ESH&Q and Operations or ISM practices. The ISM Program Description is not current. The Integrated Assessment Program (IAP) Management System does not link to the Integrated Planning Management System and does not specify roles and responsibilities for Management System Stewards and/or Points of Contact (POC). The Assessment Planning & Evaluation Criteria Framework in the IAP management system description does not fully match the analogous framework in the IA Subject Area. *[FY06 Evaluation of ISM at BNL]*
2. Chapter IV of the Procurement Operations Manual (POM) "Construction Procurement" Revision 2 is written as if the Plant Engineering Division performs all construction activities. It does not; Plant Engineering uses a different construction inspection checklist than specified by the Construction Safety Subject Area. The

Construction Safety subject area (Section 1, step 2) cannot be performed as written. [*FY06 Evaluation of ISM at BNL]*

3. The WP&C Management System does not address the impact of the OHSAS processes. *[FY06 Evaluation of ISM at BNL]*
4. Labeling procedure for facility power distribution equipment and circuit breaker panel schedules is either not accurate or not up to date. *[FY06 Evaluation of ISM at BNL]*

B. <u>Causal Analysis Summary</u>

A team from across BNL conducted the first causal analysis process for this area, facilitated by a senior safety professional from Battelle Memorial Institute's VP/ESH&Q Office. The second one was led by the BNL DDO with managers from the ESH&Q directorate. Each analysis identified the direct and root causes presented below:

1. The Laboratory's requirements for periodically reviewing documentation at the institutional level and for reviewing local documentation have not been completely established and are not effectively communicated*. [Direct Cause]*
   NOTE: The corrective actions that address this cause are associated with the Procedures NTS Report and are described under Section 6.6 of this Plan.
2. The current management/reporting structure for Management System Stewards does not allow effective prioritization of requirements, or accountability for performance related to management system documentation and other responsibilities. *[Direct Cause]*
3. The support reorganization failed to effectively redistribute all responsibilities for document management throughout the new organizational structure. *[Direct Cause]*
4. Institutional roles, responsibilities, accountabilities and authorities (R2A2) documents for Level 1 managers do not always include all responsibilities assigned to them in SBMS. (Also, SBMS documents do not facilitate a grouping of responsibilities by position). *[Root Cause]*

C. <u>Documentation Corrective Actions</u>:

Corrective Action WBS-3.1.1
Evaluate Consolidation of ISM Related Management Systems; Upgrade Program Description

Evaluate the feasibility of combining the Occupational Safety and Health (OSH) (Pilot for OHSAS 18001) Program Description, OSH (Pilot for OHSAS 18001) Management System Description, Facility Safety Management System and Worker Safety and Health Management System Description into one Worker Safety and Health Management System. This assessment will use ISM as the basis to demonstrate how and where BNL applies the core functions and guiding principles to worker safety and health programs. The evaluation should include processes for keeping all ISM program documentation current, complete, and consistent with other SBMS documents.

- Complete management system consolidation evaluation and publish a revised Integrated Safety Management Program Description, Integrated Assessment Management system and new Worker Safety and Health Program Description as appropriate

- Designate a Steward and Point of Contact for the new management system.
- Develop and Implement a training/awareness presentation to actively communicate the significant changes resulting from consolidation, if applicable.

Management System:	Worker Safety & Health
Responsible Manager:	J. Tarpinian
Corrective Action Owner:	P. Williams
Target Completion Date:	January 30, 2007 ***[Completed]***
Addresses Supporting Observations:	3.0- A1
Addresses Direct or Root Causes:	N/A

Corrective Action WBS-3.1.2
Incorporate Annual ISM Documentation Review into Lab Planning & Assessment Calendar
As discussed under the Institutional Feedback and Improvement section, we will develop an annual Laboratory Planning & Assessment Calendar. The calendar will include the requirements for the annual ISM Declaration, and an annual review and update of all ISM documentation will be included in the calendar to ensure they are completed on time.

Management System:	Integrated Planning
Responsible Manager:	P. Looney
Corrective Action Owner:	S. Coleman
Target Completion Date:	September 30, 2006 ***[Completed]***
Addresses Supporting Observations:	3.0- A1
Addresses Direct or Root Causes:	3.0- B1

Corrective Action WBS-3.1.3
Correct Specific Procedure Deficiencies from "Evaluation of ISM at BNL"
Review the "Evaluation of ISM at BNL" Assessment Report identified many procedural and documentation deficiencies, which will be corrected:

- Review the "Evaluation of ISM at BNL" Report and capture all references to deficiencies in documentation/procedures.
- Notify the appropriate management system stewards to correct these deficiencies.
- Develop and Submit Notice of Intents (NOIs) to the SBMS office for incorporation of SBMS Document revision dates into the SBMS Completion Project (WBS 3.2.2)

Management System:	SBMS
Responsible Manager:	J. Tarpinian
Corrective Action Owner:	R. Lebel
Target Completion Date:	August 30, 2006 ***[Completed}***
Addresses Supporting Observations:	3.0- A2
Addresses Direct or Root Causes:	N/A

Corrective Action WBS-3.1.4
Realign Management System Steward Reporting Structure

Currently management system stewards report functionally to the DDO, under this arrangement, several of them report outside their line management structure. To increase accountability and ensure an appropriate balance between Management System Stewards and line priorities, the reporting relationship of the stewards will be revised. They will report to their line manager for their stewardship responsibilities, which will include the management-system's self assessment.
This change will also elevate the responsibility of several management systems since their stewards will then report to the Laboratory Director and the Deputy Director for Science.

- Revise appropriate SBMS documentation to reflect the new reporting relationship.
- Brief the Laboratory Director and Deputy Director for Science on their new responsibilities
- Deliver to the Human Resources Management System Steward/Point of Contact, additional R2A2 responsibilities of the:
  - Laboratory Director
  - Deputy Director for Operations;
  - Deputy Director for Science; and
  - Management System Stewards

Management System:	SBMS
Responsible Manager:	J. Tarpinian
Corrective Action Owner:	R. Lebel
Target Completion Date:	August 1, 2006 ***[Completed]***
Addresses Supporting Observations:	N/A
Addresses Direct or Root Causes:	3.0- B2, B3, B4

Corrective Action WBS-3.1.5
Roll-up Roles and Responsibilities to Management System Level; Include Management System Stewards and Points of Contact – Operations Group
The current SBMS guidelines do not require that roles and responsibilities embedded in subject areas, program descriptions or other SBMS documents are rolled up into the Roles and Responsibilities section of the Management System Description. This requirement will be instituted and all documentation reviewed to identify such roles and responsibilities, which then will then be captured at the management system level. A section will be added wherever the roles and responsibilities of the Management System Steward and Point of Contact are not explicitly stated in the description of the management system.

- Revise the guidelines for the SBMS documents by adding the requirement that all roles and responsibilities in any management system documents are summarized in the description of that system.
- In coordination with points of contact (POC) and Human Resources search SBMS documents to identify all such roles and responsibilities.
- Update the descriptions of the management system, where needed.
- Summarize the management system responsibilities by position.
- Deliver to the Human Resource Management System Steward/Point of Contact for incorporation of responsibilities in Management System Stewards and Point of Contact R2A2s.

Management System:	SBMS
Responsible Manager:	J. Tarpinian
Corrective Action Owner:	R. H. Lebel/J. Canestro
Target Completion Date:	June 1, 2007 ***[Completed]***
Addresses Supporting Observations:	N/A
Addresses Direct or Root Causes:	3.0- B3, B4

Corrective Action WBS-3.2.1
Complete Requirements Management Process Improvements
Each Management System Steward will review the Records of Decision (ROD) associated with their management systems and verify that the requirements set included in the management system is consistent with the compliance documents in the BSA contract and relevant best-practice commitments made by the Laboratory. Develop and implement electronic ROD process and complete contract mapping to management systems.

- Phase 1: Execute the process of Requirements Verification
  - Develop software tools to facilitate and document the verification of requirements.
  - Pilot (test) the verification process tools and prepare guidelines for the management system stewards.
  - Bin the management systems into phases based on their impact on institutional risk.
  - Train management system stewards in the requirements verification tools and processes.
- Phase 2: Test, Modify and Rollout Electronic ROD Tools
- Phase 3: Contract Mapping – This activity assures that all contract requirements and legal obligations are mapped to appropriate management systems.

Management System:	SBMS
Responsible Manager:	M. Bebon
Corrective Action Owner:	R. H. Lebel/J. Canestro
Target Completion Date:	August 15, 2008 ***[Completed]***
Addresses Supporting Observations:	3.0- A1
Addresses Direct or Root Causes:	3.0- B1

Corrective Action WBS-3.2.2
R-Baseline and Finish the SBMS Completion Project
Verify current content of standard operating procedures, standard practice instructions, handbooks, and manuals that reside in SBMS. The scope of the SBMS Completion Project scope was defined as updating legacy documents on SBMS (standards, procedures and manuals) to conform to current requirements and practices or canceling them if they are no longer needed. This project started at the beginning of FY05 but all the documents had not been revised by the end of FY05. This corrective action re-establishes this project.

- Update the SBMS Completion Project's scope, responsibilities, and schedules.
- Secure the commitment of contributed and/or incremental resources.

- Implement the SBMS Completion Project in accordance with the approved plan (A completion date for finishing the SBMS project will be provided when the plan is finalized). ***Completed 12/30/06***
- Document revision histories and review dates for the legacy documents specified above.

Management System:	SBMS
Responsible Manager:	J. Tarpinian
Corrective Action Owner:	R. H. Lebel
Target Completion Date:	June 30, 2007 ***[Completed]***
Addresses Supporting Observations:	N/A
Addresses Direct or Root Causes:	N/A

4.0 Communications and Involvement Initiatives

Problem Statement: Communication and involvement processes do not always result in adequate understanding of, and response to, ESH&Q and operational issues and decisions.

BNL uses a wide range of communications methods and products to provide ES&H information to, and solicit feedback from, employees, visitors, guests, and students. Among the highest level ones are the Director's All-Hands meetings, Safety Focus Weeks, "the safety sign" at the entrance to the Laboratory, the weekly Brookhaven Bulletin, the biweekly Monday Memo, various institutional-level groups (Brookhaven Council, Director's Safety Committee), Quarterly Performance Reviews, and meetings of the three senior leadership councils (Policy, Science and Operations). In addition to these institutional level mechanisms, similar communication pathways exist within all of BNL's organizational units.

Despite these efforts, several external reviews and internal assessments found that BNL employees sometimes were not fully aware of the Laboratory's ES&H requirements, goals, and processes for ensuring excellence in ES&H. Also, employees do not always receive information on how well their work groups met safety goals and objectives, or on lessons-learned by other work groups (at BNL or at other laboratories) that might help improve their performance.

Some of these issues may be related to the need for senior management to visit the groups more often. Their increased presence in the work areas and at jobsites would facilitate communications with and among staff members on ES&H matters.

[NOTE: The initiative to increase managers' field observations is covered in section 7.3 "Safety Improvements Initiatives"].

Workers' involvement in ES&H processes has steadily improved over the last eight years, as work planning and control activity has expanded, and Worker Safety & Health Committees have been set up in many organizational units. However, the level of worker involvement is still highly variable across the Laboratory; the extent of employees' participation in work planning & control is less than desirable, particularly in formal feedback after completing jobs.

A key related issue is how BNL can effectively and efficiently communicate with visitors, guests, and students. All individuals working at BNL must know the Laboratory's ES&H requirements and obtain the knowledge needed to comply with them. Processes are in place, however based on recent experiences, their effectiveness needs further evaluation.

In addition, a causal analysis was performed to identify underlying causes of each specific weakness. The supporting observations and causes identified are described below:

A. <u>Supporting Observations from Assessment Activities:</u>

1. Information on the National Synchrotron Light Source (NSLS) electrical shock incident on the X1 beam line was not disseminated in a timely fashion to the Chairman or members of the Laboratory Electrical Safety Committee *[DOE Chicago ISMS Assessment, August 2004]*
2. Inconsistent Senior Management message concerning importance of safety. There is inadequate identification, flow down and application of requirements. *[DOE Chicago ISMS Assessment, August 2004]*
3. Experimental Safety Review (ESR) process is sound but scientific staffs do not demonstrate awareness of this work planning and control process. The effectiveness of the ESR process is undercut by the fact that science staffs typically do not communicate awareness that the ESR process and associated documentation are the definitive source of hazard control requirements (i.e. boundaries/guard against unreviewed experimental evolutions) for their work. *[FY06 Evaluation of ISM at BNL].*
4. The process for communicating and incorporating best practices/lessons learned information is largely informal and may not be providing full value to the Laboratory *[FY06 Evaluation of ISM at BNL].*

B. <u>Causal Analysis Summary</u>

1. Employees do not always understand the value of assigned actions and/or directives. The values of actions to the Laboratory and the underlying requirements or expectations are not always adequately explained. Some employees assume that they are expected to strictly comply without obtaining further understanding or clarification. *[ORPS Cause Codes A5B2C05 Communications Less than Adequate (LTA) - Ambiguous instructions / requirements; A5B2C02 Communications LTA – Difficult to implement; A4B1C03 Management Methods LTA – Management direction created insufficient awareness of impact of actions on safety / reliability; A4B5C11 Change Management LTA – Changes not adequately communicated] [Direct Cause].*
2. There is evidence that appropriate personnel are not being involved in certain safety related processes. Some workers state they have not been involved in work planning activities for evolutions in which they participated. Supervisors and workers have not always been involved in the conduct of causal analysis and subsequent development of corrective actions to address findings and weaknesses in their area of responsibility. *[ORPS Cause Codes: A4B5C05 Change Management LTA –*

System interactions not considered; A4B5C06 Change Management LTA – Personnel / department interactions not considered; A4B3C03 Work Organization and Planning LTA – Duties not well distributed among personnel] [Direct Cause].

3. The Laboratory has not established clear expectations for communication of safety-related information. Personnel are not universally aware of management's expectations regarding what safety-related information is to be communicated, under what circumstances, and with what "level of formality. *[ORPS Cause Codes. A5B1C01 Written Communications Method of Presentation LTA – Format deficiencies; A5B3C01 Written Communication Not Used – Lack of written communication; A4B1C01 Management Methods LTA – Management policy guidance / expectations not well-defined understood or enforced*] *[Direct Cause].*
4. The line management chain of command is not being universally used as the vehicle to convey safety expectations and priorities. The primary mechanism that is used to communicate safety expectations to some managers is via ES&H Coordinators and not necessarily from higher-level managers. *[ORPS Cause Codes. A4B1C01 Management Methods LTA – Management policy guidance / expectations not well-defined understood or enforced; A4B1C02 Management Methods LTA – Job performance standards not adequately defined; A5B3C01 Written Communication Not Used – Lack of written communication; and A4B4C01 Supervisory Methods LTA, Tasks and individual accountability not made clear to worker]. [Root Cause].*

C. <u>Communication and Involvement Corrective Actions</u>

The direct and root causes associated with this activity will be addressed by the corrective actions detailed in sections 1.0, Institutional Feedback and Improvement, 2.0, Work Planning and Control, and 3.0, Documentation. Table 1 shows the correlation of direct and root causes to corrective actions. The actions described below are focus on the proposals for communicating all implemented revisions and changes to documents, methodologies, and processes at BNL.

Corrective Action WBS-4.1.1
Communicate revisions and work Control Requirements
Conduct workshops/training sessions to communicate the Work Planning & Control expectations, Management System and subject area revisions/changes, and new methodologies to WCCs/WCMs, Building Managers, ES&H Coordinators and applicable staff.

Management System:	Work Planning and Control
Management System Steward:	M. Bebon
Action Owner:	C. Johnson
Target Completion Date:	January 30, 2007 ***[Completed]***
Addresses Supporting Observations:	N/A
Addresses Direct or Root Causes:	4.0-B1

Corrective Action WBS-4.1.2
ISM Operations Communications

Using a stakeholder team comprised of ES&H coordinators, safety professionals and ISM Division/Department points of contact will develop ISM general awareness/training to inform/help staff, visitors and guests understand how to perform work safely, and to clarify ISM activity/operation practices. The training/awareness material will be extended into a web-based course and linked to applicable JTAs.

Management System:	Integrated Assessment Program
Management System Steward:	J. Tarpinian
Action Owner:	S. Coleman
Target Completion Date:	August 30, 2006 ***[Completed]***
Addresses Supporting Observations:	4.0-A3
Addresses Direct or Root Causes:	4.0-B2

Corrective Action WBS-4.1.3
Operations Forum Evaluation/Implementation
Evaluate the need and/or establishment of an Operations Management Forum to analyze, evaluate, and inform Laboratory Management (Associate/Assistant Laboratory Directors (ALD), Department Chairs and Division Managers) of significant operational trends, including "recurring" events reportable to the Department of Energy Occurrence Reporting and Processing System (DOE ORPS) and the DOE Noncompliance Tracking System (NTS); suggest improvements, good practices, and lessons learned for wider application.

Management System:	Integrated Assessment Program
Management System Steward:	J. Tarpinian
Action Owner:	R. Lebel
Target Completion Date:	February 15, 2007 ***[Completed]***
Addresses Supporting Observations:	4.0-A2, A3
Addresses Direct or Root Causes:	4.0-B3, B4

Corrective Action WBS-4.1.4
Worker Safety & Health Rule (10CFR851) Workshops/Training Awareness
Communicate changes and requirements to appropriate Laboratory staff to ensure understanding of the new worker, safety and health rule. The changes and requirements established through the development of the Worker Safety and Health Program Description will be communicated through the SBMS subscription service and implementation workshops.

Management System:	Worker Safety and Health
Management System Steward:	J. Tarpinian
Action Owner:	S. Coleman
Target Completion Date:	February 28, 2007 ***[Completed]***
Addresses Supporting Observations:	4.0-A3
Addresses Direct or Root Causes:	4.0-B1

Corrective Action WBS-4.1.5
Barrier Analysis and Five Whys Causal Analyses Workshops

In support of the revised Event/Issues Management process, selected BNL Managers and Supervisors will be trained on causal analysis techniques (five whys, barrier analysis) required to ensure consistent classification, analysis and management of deficiencies to effective resolution.

Management System:	Quality Management
Management System Steward:	J. Tarpinian
Action Owner:	R. Lebel
Target Completion Date:	December 30, 2006 ***[Completed]***
Addresses Supporting Observations:	N/A
Addresses Direct or Root Causes:	N/A

Corrective Action WBS-4.1.6
Human Performance Strategy and Implementation Plan Development
In response to the Arc-Flash event at the Collider Accelerator Department (C-AD), BNL commissioned a Human Performance-Based accident investigation, which identified several observations in human performance characteristics used at BNL. In an effort to address those observations and support the human performance improvement, BNL will develop a site-wide human performance strategy and implementation plan [i.e., white paper for Laboratory Management consideration].

Management System:	Quality Management
Management System Steward:	J. Tarpinian
Action Owner:	R. Lebel
Target Completion Date:	March 30, 2007 ***[Completed]***
Addresses Supporting Observations:	N/A
Addresses Direct or Root Causes:	N/A

Table 1, Correlation of Direct and Root Causes, Key ISM Readiness Review Recommendations and Corrective Actions

Problem Area #1 – Feedback and Improvement, Corrective Action Management ORPS Cause Codes	Key Evaluation of ISM at BNL Final Report Recommendation(s) (Oct 2005)	Corrective Action Number(s)
1. Management Policy guidance/expectations not well defined, understood, or enforced [A4B1CO1] 2. Corrective Action for Previously identified problem or event was not adequate to prevent recurrence [A4B1C09]	**CF5-1A** – The Policy Council should adopt, set expectations, standards and outcomes for, and widely communicate a more aggressive commitment to institutionalized, prioritized and projectized ESH&Q and operations- related improvement initiatives. **CF5-1B** – To facilitate this endeavor, the Policy Council should seek to enhance and better integrate existing initiatives (Quarterly Performance Summary, management system stewardship, annual management reviews, contractor assurance, TIER I workshops) and create new initiatives (e.g. operations forum) to manage institutional ESH&Q and operations-related issues and risks. **CF5-1C –** BNL should re-evaluate (through benchmarking, internal and external customer surveys, and/or other mechanisms) its commitment to implementing a robust and credible Independent Oversight Program. **CF5-2 –** BNL should assure the establishment and implementation of an effective Contract Assurance Process as described in DOE Order 226.1.	**WBS-1.1 –** Adopt a strategy focused framework for Laboratory Wide planning, decision-making, and performance management. **WBS-1.2 –** Evolve institutional performance and risk analysis to improve feedback to institutional decision making and assurance processes. **WBS-1.3 –** Align resource allocation processes with the Laboratory's performance objectives. **WBS-1.4 –** Verify the sustainability and effectiveness of the performance-management processes
Problem Area #2 – Work Planning and Control ORPS Causes Codes		
1. Work planning and control guidance documentation does not provide clear or complete expectations and/or requirements [A5B2C08] 2. Personnel selection (WCMs/WCCs) did not ensure match of worker motivations/job descriptions [A4B2C09] 3. The training material has inadequate content [A6B3C02]	**EWP-2 –** Each "small science" department has unique work planning and control approaches and practices that, if coordinated and integrated, could result in more effective operations at lower cost. **AWP-1 –** The training of work control coordinators should be enhanced to ensure consistent and proper screening of work activities, and this training should include a performance-testing element. **OWP-1 –** The operations work planning and screening process should be modified to create the presumption that work requires job-specific planning (e.g. work permit or standard operating procedure) unless shown otherwise (in order to show a conservative posture)	**WBS-2.2.1 –** Upgrade Work Control Manager and Coordinator Training & Qualifications **WBS-2.1.1 –** Integrate Work Planning and Control into the Laboratory's Strategic Planning Process. **WBS-2.1.2 –** Create a culture of "All Work is Planned" along with supporting procedures and methodologies.

Problem Area #2 – Work Planning and Control ORPS Causes Codes (Cont'd)	**Key Evaluation of ISM at BNL Final Report Recommendation(s) (Oct 2005)**	**Corrective Action Number(s)**
4. Testing is inadequate [A6B2C02] 5. The refresher training is less than adequate [A6B2C02	**AWP-2 –** Job risk assessments (JRAs), Job training assessments (JTAs), qualification matrices, and equivalent hazard controls should be required for all work of equivalent risk regardless of whether that work is performed by a technician, tradesperson, engineer, subcontractor, visiting experimenter, or student. **AWP-3 –** A more proactive role for JRAs should be defined and incorporated into the work planning and control process. This is the most practical method to ensure that staffs understand the requirements. A more proactive JRA process will also alleviate the need for generating additional Standing Work Permits. **OWP-2 –** Training and proficiency requirements for key work planning positions should be identified. **OWP-3 –** A more proactive role for JRAs and FRAs in the work planning and control process should be defined and communicated.	**WBS-2.2.2 –** Revitalize the training program for work control managers and work control coordinators. **WBS-2.1.3**– Clarify the Building Manager Role in Work Planning and Control. **WBS-2.1.5 –** Work Planning Processes for Job Change Control. **WBS-2.1.6 –**Upgrade the Work Planning and Control Management System Assessment Plan**.** **WBS-2.1.7 –** Integrate human performance factors principles into the work planning and control management system
Problem Area #3 – Currency of Lab-Wide and Internal Controlled Procedures ORPS Cause Codes		
1. Written communication content less than adequate, incomplete/situation not covered [A5B2C08] 2. Written communication content less than adequate, ambiguous instructions/requirements [A5B2C05] 3. Corrective action for previously identified problem or event was not adequate to prevent recurrence [A4B1C09] *(This cause is addressed by corrective actions identified in problem statement #1)*	**CF5-4 –** All SBMS documentation essential to the ISMS Program should reflect current practices, expectations, and commitments. **RM-1 –** A resource-loaded project management plan to address the full scope of the identified Requirements Management/SBMS should be established, funded, and carefully managed. **IH-3 –** Specific actions should be established for the SBMS Office to publish identified revisions to IH subject areas. **COO-3 –** The conduct of operations conformance matrix for central plant operations should be updated. **RC-1** – The 10CFR835 Radiation Protection Plan scope statement should be revised to explicitly cover off-site radiological work.	**WBS-3.1.1 –** Consolidate ISM related Management Systems; Upgrade Program Description **WBS-3.1.2 –** Incorporate Annual ISM Documentation Review into Laboratory Planning & Assessment Calendar **WBS-3.1.3 –** Correct specific procedure deficiencies from the "Evaluation of ISM at BNL" **WBS-3.2.1 –** Complete the SBMS Requirements Verification **WBS-3.1.4–** Realign management system steward reporting structure **WBS-3.2.2** – Re-Baseline SBMS Completion Project **WBS-3.1.5 –** Roll-up Roles and Responsibilities to Management System Level

Problem Area #4 – Communication and Involvement ORPS Cause Codes	Key Evaluation of ISM at BNL Final Report Recommendation(s) (Oct 2005)	Corrective Action Number(s)
1. Management direction created insufficient awareness of impact of actions on safety / reliability [A4B1C03] 2. Communications less than adequate (LTA) – Ambiguous instructions / requirements [A5B2C05] 3. Communications LTA – Difficult to implement [A5B2C02] 4. Change management LTA – changes not adequately communicated [A4B5C11] 5. Change management LTA – System interactions not considered [A4B5C05] 6. Change management LTA – Personnel/department interactions not considered [A4B5C06] 7. Work Organization and Planning LTA – Duties not well distributed among personnel [A4B3C03] 8. Written Communication Not Used - Lack of Written Communication [A5B3C01]	**CF5-3 –** The Laboratory should establish and maintain all the conditions necessary for an effective program to evaluate and drive improvements in institutional ESH&Q and operations performance. These include: (1) clearly articulating Laboratory performance information needs, (2) establishing expectations, (3) empowering the line organizations and Management System Stewards to ensure delivery of required information needs, and (4) establishing a mechanism and process for evaluation and analysis at the institutional level. **EWP-1 –** Communications with scientific staff and visitors throughout the research directorates should reinforce the notion that they should keep the Experimental Safety Review (ESR) in the front of their mind as the definitive source of requirements and controls needed to be implemented and followed in order to understand the hazards in their work spaces and conduct their experimental activities safely. **AWP-4** – The Laboratory should encourage documentation of informal worker feedback, some of which can be very important. Sources of such informal feedback include: logbooks, toolbox meeting minutes, supervisors' personal notes, feedback from "skill of the worker" activities and JRA reviews, feedback from revised procedures or work plans, and pre and post-job briefings.	**WBS-1.1 –** Adopt a strategy Focused framework for Laboratory Wide planning, decision, and performance management. **WBS-1.2 –** Evolve institutional performance and risk analysis to improve feedback to institutional decision making and assurance processes. **WBS-1.3 –** Align resource allocation processes with Laboratory performance objectives. **WBS-1.4 –** Integrate Work Planning and Control into the Laboratory's Strategic Planning Process. WBS-2.1.2 – Create a culture of "All Work is Planned" AND Supporting procedures and methodologies**.** **WBS-2.1.3** – Clarify the Building Manager Role in Work Planning and Control. **WBS-2.1.5 –** Work Planning Processes for Job Change Control **WBS-2.1.6 –**Upgrade Work Planning and Control Management System Assessment Plan**.** **WBS-3.1.4 –** Realign management system steward reporting structure

5.0 Corrective Actions – Collider Accelerator Department Arc Flash Type B Incident

On Friday April 14, 2006, an electrical engineer restoring power by operating a 400 amp disconnect switch, after he had helped to trouble-shoot a problem in a power supply for one of the detectors of the Relativistic Heavy Ion Collider, was burned. The burns were caused by hot gasses and particles being ejected though seams in the disconnect switch and panel board, which remained intact, resulting from the rapid heating and over pressurization of the air caused by an arc flash that occurred within the 480V switch he was operating. The engineer received mostly first- and some second-degree burns across his head, forearms, and chest. The Laboratory Director ordered an immediate stand-down of electrical work above 440v, and a meeting with all Laboratory electrical workers to review the incident, the NFPA 70E requirements, and to solicit worker feedback. Several of the corrective actions in Section 5.1 below resulted from worker feedback at these sessions. An incident critique was held, and interim upgrades to personal protective equipment (PPE) were mandated Laboratory-wide.

A DOE Type B investigation was initiated following the incident. The team provided interim recommendations on Friday April 21st; Section 5.1 below describes the corrective actions that directly respond to them. In parallel with the Type B investigation, the Laboratory developed a set of actions to further assess the causal factors associated with the incident, and to revisit the effectiveness of existing plans, policies, and processes. The corrective actions from the Laboratory's response to this incident are included below in Section 5.2. Two of the principal ones are a review of human factors, and a comprehensive self-assessment of our electrical safety program.

On August 11, 2006, the DOE Type B Accident Investigation Board issued their final report. The board determined the accident resulted from a number of deficiencies in the implementation of a series of management systems and related processes. The team identified causal factors and 17 judgments of need (JON) for corrective actions to prevent recurrence. Based upon the investigation Board's recommended JON and Causal Factors, BNL developed a corrective action plan and forwarded the plan to DOE for review and approval.

In January 2007, a corrective action plan based on the investigations Board's recommended Judgments of Need (JON) and Causal Factors. The actions required to prevent a similar occurrence overlap, and in some cases extend beyond the DOE interim actions and preliminary actions items initially detailed in sections 5.1 and 5.2. Actions that overlap initial DOE and BNL recommended corrective actions, which have not been completed and duplicated in the approved plan, have been deleted from sections 5.1 and 5.2, and the DOE approved corrective action plan activities are detailed in section 5.3.

5.1 DOE Team Interim Recommendations

The interim recommendations of the Type B Team and the Laboratory's corrective actions are described below:

Corrective Action WBS-5.1.1
DOE Team Interim Recommendation #1:
With exception noted below, dress for Hazard Category 2 for 480V circuit breaker and switch operation (Exception – 480V panels where incident energy is sufficiently high that higher hazard category clothing is required or where operation is too dangerous to be performed manually)
Laboratory Response:
As of the receipt of this recommendation, the Laboratory had issued interim PPE requirements that met or exceeded the team's recommendation. They will remain in place until the following actions are completed].

- Review the NFPA 70E standards and determine the adequacy of the recommended personal protective equipment to protect workers to a level consistent with Laboratory safety goals, for all operations, including switching operations.
- If indicated, upgrade, the Laboratory Electrical Safety Standards to better address arc-flash personal protective equipment.
- Publish the upgraded standard in SBMS and/or local procedures, as appropriate

Management System:	Worker Safety
Management System Steward:	J. Tarpinian
Action Owner:	J. DiNicola (LESC Chair)
Target Completion Date:	September 30, 2006 ***[Completed]***

Corrective Action WBS-5.1.2
DOE Team Interim Recommendation #2:
Review the practice of racking circuit breakers with the bus energized or while inserting/removing Motor Control Center (MCC) starter buckets while the MCC is energized.
Laboratory Response:

- Review current procedures to evaluate whether the practice of racking circuit breakers into live bus should be continued and, if not, modify Laboratory Electrical Safety Standards to increase electrical safety *[completed on July 31, 2006]*.
- Benchmark practices for MCC bucket insertion/removal with other Laboratories and industrial sites *[completed on July 31, 2006]*.
- Benchmarking of practices identified a need to modify the SBMS Electrical Safety Standard 1.5.0 to include requirements for inserting/removing MCC starter buckets with the bus energized. The standard will be revised to include the following Laboratory Electrical Safety Committee (LESC) hazard controls:
    - An energized work permit shall be generated to validate that the task is necessary and that the proper PPE is used.
    - Arc-Flash analysis shall be performed to determine PPE requirements.
    - Arc –Flash incident energy must not exceed 40 cal/cm^2.

***Note: If these hazard control requirements can not be met then the equipment must be deenergized in order to rack a breaker or insert or remove an MCC bucket.**

- Train the Laboratory's electrical workers in the updated procedures (Electrical Safety Standard 1.5.0).

Management System:	Worker Safety
Management System Steward:	J. Tarpinian
Action Owner:	P. Williams
Target Completion Date:	December 30, 2006 ***[Completed]***

Corrective Action WBS-5.1.3
DOE Team Interim Recommendation #6:
Assure that PPE (Personal Protective Equipment) is worn properly.
Laboratory Response:

- Review current practices for using personal protective equipment
- Include the wearing of PPE as an item in upcoming negotiations with the IBEW

Management System:	Worker Safety
Management System Steward:	J. Tarpinian
Action Owner:	W. Hempfling
Target Completion Date:	September 30, 2006 ***[Completed]***

5.2 BNL Corrective Actions

In addition to implementing the interim recommendations of the DOE Type B team, the Laboratory identified several more actions that will be taken to further understand the causal factors in the event, and to ensure that they are corrected. The Laboratory's senior management wants to ensure that all aspects of our electrical safety program, including those without a direct role in the incident, are functioning as designed and are adequate to ensure safe operations once corrections are fully implemented. Based on this approach, the following is planned:

Corrective Action WBS-5.2.1
Human Performance-Based Accident Investigation
The Laboratory assembled a three-member accident investigation team of recognized subject matter experts (SMEs) in the field of human performance; one member is an expert consultant to the nuclear industry, another an INL SME, and a BNL SME. The team is charged with making thorough on-scene investigation to identify the (non-technical) direct and root causes for the incident, and the organizational weaknesses that led to the actions of the personnel involved. The investigation is scheduled to start May 8th.

Management System:	Worker Safety
Management System Steward:	J. Tarpinian
Action Owner:	M. Bebon

Target Completion Date: May 31, 2006 ***[Completed]***

Corrective Action WBS-5.2.2
Electrical Safety Self Assessment
As part of its Integrated Assessment program for the remainder of CY06, the Laboratory will hold a comprehensive electrical program self-assessment using a combination of reviews by management system stewards and line organizations as part of their annual self assessments, evaluations by the Laboratory's Internal Audit/Independent Oversight Office, and external reviews (include in FY 07 Self-Assessment Planning (completed in the 1st Qtr FY 07). Further corrective actions likely will result from these reviews. The reviews' scope will include the following areas:

- Engineering design
- Procurement
- Installation and testing
- Maintenance (including 480V breakers, switches, and programmatic equipment)
- Management of deferred maintenance risk
- Effectiveness of electrical workers' training and qualifications
- Institutional electrical-safety support and oversight
- Lessons learned

Management System: Integrated Assessment
Management System Steward: J. Tarpinian
Action Owner: P. Williams
Target Completion Date: September 30, 2007 ***[Completed]***

Corrective Action WBS-5.2.3
Electrical Safety Self Assessment - Corrective Action Effectiveness Review
The Laboratory will perform an effectiveness review of corrective actions previously implemented in conjunction with our NFPA 70E electrical safety self assessment.

Management System: Integrated Assessment
Management System Steward: J. Tarpinian
Action Owner: R. McNair
Target Completion Date: September 30, 2006 ***[Completed]***

Corrective Action WBS-5.2.4
Lessons Learned / Best Practices Review
The Laboratory will evaluate the DOE's ORPS- and lessons learned-databases concerning all previous electrical events to identify lessons learned. In addition, a search will be made for electrical safety "best practices" within the DOE complex. The results of this evaluation/search will be presented to the ALD for ESH&Q, the Safety and Health Services Manager, and the Laboratory's Electrical Safety Committee for them to assess the applicability to BNL.

Management System: Integrated Assessment
Management System Steward: J. Tarpinian
Action Owner: E. Sierra
Target Completion Date: September 1, 2006 ***[Completed]***

5.3 BNL Arc Flash Corrective Action Plan Activities Approved by DOE

This section details the corrective actions specified in the corrective action plan approved by DOE. Actions in this section have been incorporated into BNL's Institutional Assessment Tracking System (ATS); and will be tracked through closure under ATS# 3474. DOE-BHSO has requested that they review and approve each corrective action before closure. BNL will notify DOE-BHSO for participation in the verification of completion of actions. BNL will prepare a closure package for each corrective action and document the specific actions taken to address the applicable ATS action item. Below is a list of open corrective actions.

Corrective Action ATS 3474.14.3

Action Title: Complete calculations/label remaining systems

Action Description: Complete calculations and label remaining systems for C-AD and BOP.

Action Owner: A. McNerney
Due Date: December 30, 2008

6.0 Integrated Assessment Actions and Ongoing Action Plan Risk Impact

The actions under this WBS element are the corrective actions that have a noticeable or significant impact on Annual Laboratory Plan and Performance Evaluation and Measurement Plan (PEMP) goals and objectives, and Price Anderson Amendments Act (PAAA) noncompliances (i.e. Nuclear Safety Rules (NSRs) and Worker safety & Health (WS&H) requirements).

6.1 Programmatic Deficiencies Involving the Emergency Management Program

NTS-CH-BH-BNL-BNL-2004-0001, programmatic deficiencies involving the emergency management program was issued on May 11, 2004. This report identified programmatic weaknesses in several elements of the Emergency Management Program. Over the past 3 years the emergency management program has improved in general. However, continued attention from management is needed to ensure that actions to address deficiencies reported are closed within scope and schedule (ATS 2243). ***[Completed]***

6.2 Equipment Falls off the Tailgate of a Box Truck Resulting in Near Miss to an Injury

NTS-CH-BH-BNL-BNL-2006-0001, equipment falls off the tailgate of a box truck resulting in near miss to an injury was issued July 17, 2006. A near miss to a serious occupational injury occurred when a worker attempted to stop a wheeled rack containing 500-600 pounds of computer equipment (ATS 3255). ***[Completed]***

6.3 Positive Unreviewed Safety Question at BNL Waste Management Facility

NTS-BHSO-BNL-BNL-2007-0002, positive unreviewed safety question at BNL Waste Management Facility was issued March 26, 2007. The Documented Safety Analysis (DSA) for the Waste Management Facility (WMF) does not demonstrate that applicable hazards have been analyzed and therefore an Unreviewed Safety Question exists. After completion of a needs and cost analysis, an institutional decision was made to downgrade the WMF to less than a Hazard Category 3 Nuclear Facility (ATS 3625). ***[Completed]***

6.4 Programmatic Deficiency Involving Industrial Hygiene (IH) Exposure Monitoring

NTS-BHSO-BNL-BNL-2007-0004, programmatic deficiency involving industrial hygiene exposure monitoring was issued on June 15, 2007. The required baseline monitoring is not complete and exposure monitoring resources are not adequately directed to ensure the timely completion of baseline surveys (ATS 3785).

Open Corrective Actions

- **ATS 3785.1.2**

Action Owner: R. Selvey
Action Title: Complete Remaining IH Baseline Surveys
Action Description: Complete Remaining IH Baseline Surveys utilizing additional resources and the strategy for completion of the baseline monitoring based upon risk ranking.
Due Date: September 30, 2008.***[Completed]***

6.5 Programmatic Deficiencies Involving Electrical Safety

NTS-BHSO-BNL-BNL-2007-0005, a programmatic deficiency involving electrical safety was issued on September 26, 2007. Noncompliances with NFPA 70 and 70E involving overloaded cable trays; Laboratory manufactured electrical equipment without having AHJ or Nationally Recognized Testing Laboratory (NRTL) approvals; and electrical panels/disconnect switches that do not meet minimum working space clearance requirements (ATS 3922)

Open Corrective Actions

- **ATS 3922.1.6**

Action Owner: R. Biscardi
Action Title: List Elect. Inspectors to Receive AHJ Authority; Corrective Action Seq #6
Action Description: List Elect. Inspectors to Receive AHJ Authority. BNL will compile a list of staff members who will be evaluated by the LESC for approval to conduct electrical inspections as the Authority Having Jurisdiction (AHJ) at BNL.
Due Date: February 28, 2009

- **ATS 3922.1.7**

Action Owner: R. Biscardi
Action Title: Revise JTAs for AHJ Electrical Inspectors; Corrective Action Seq #7
Action Description: Electrical Safety NTS report updated to include 6 additional corrective actions dealing with the identification and training of people designated to conduct electrical inspections and those designated to conduct design, installation and repair with electrical content. Also includes development of a guidance document for conducting inspections; this is Corrective Action Seq#7.
Due Date: April 30, 2009

- **ATS 3922.1.8**

Action Owner: R. Biscardi
Action Title: Develop Guidance Doc. for AHJ Elect. Inspections: Corrective Action Seq #8
Action Description: Develop Guidance Doc. for AHJ Elect. Inspections. BNL will develop a guidance document for use while conducting AHJ Electrical inspections.
Due Date: November 30, 2008 ***[COMPLETED]***

- **ATS 3922.1.10**

Action Owner: R. Biscardi
Action Title: Revise JTA for Staff Who Design/Install/Repair; Corrective Action Seq # 10
Action Description: Revise JTA for Staff Who Design/Install/Repair. BNL will review and revise Job Training Analysis (JTA) for staff members who conduct facility design, installation or repair with electrical content as necessary to ensure formal training in NFPA 70 (NEC) is included.
Due Date: October 30, 2008 ***[COMPLETED]***

6.6 Subcontractor Noncompliance with 10CFR851 Occupational Medicine Requirements

NTS-BHSO-BNL-BNL-2007-0006, subcontractor noncompliances with 10CFR851 occupational medicine requirements was issued on October 25, 2007. A programmatic deficiency involving the inability of BSA subcontractors to immediately comply with provision of 10CFR851 WS&H rule requirements (ATS 3949).

Open Corrective Actions

- **ATS 3949.1.6**

Action Owner: M. McGrath
Action Title: Subcontractor Acknowledgement of Amendments
Action Description: Obtain written acknowledge in the form of the supplier's signature on the contract amendment, by those contractors included on the list from CA #2 above. This will serve as the acknowledgement of and compliance to 10CFR851 including the Occ. Med. Program.
Due Date: December 15, 2008

6.7 Overexposure to Static Magnetic Field

NTS-BHSO-BNL-BNL-2007-0007, overexposure to static magnetic field was issued on December 28, 2007. The report cited several entries in September 2007 into the 4 Tesla static magnetic field in violation of ACGIH limits of 2 Tesla ceiling limit and 60mT 8-hour time weighted average (TWA). An existing DOE approved exemption that allowed entry expired after May 25, 2007. A causal analysis was performed and as a result, NTS corrective actions and institutional opportunities for improvement were developed. NTS corrective actions will be tracked to closure in ATS 4013 and supplemental institutional opportunities for improvement will be tracked in ATS 4223.

NTS Report Open Corrective Actions

- **ATS 4013.2.4**

Action Owner: P. Williams
Action Title: Establish a site wide process for the identification and implementation of a variance to 851
Action Description: Establish a site wide process for the identification and implementation of a variance to 851 to include revision of work control processes and communication, training and acknowledgement by affected workers.
Due Date: October 31, 2008 ***[Completed]***

- **ATS 4013.2.8**

Action Owner: A. Emrick
Action Title: Staff and users of the 4T and 9.4T MRI facilities update their training on static magnetic fields
Action Description: Staff and users of the 4T and 9.4T MRI facilities update their training on static magnetic fields by taking the revised training course.
Due Date: December 1, 2008

- **ATS 4013.2.9**

Action Owner: N. Bernholc
Action Title: Upon DOE approval of variance to ACGIH exposure limits (imposed by 10CFR851) provide MRI training
Action Description: Upon DOE approval of the variance to the ACGIH exposure limits (imposed by 10CFR851) provide MRI facility specific training concerning new limits and operational impact.
Due Date: May 16, 2009

- **ATS 4013.2.13**

Action Owner: R. Lebel
Action Title: Communicate CCTS Subject Area revisions to affected parties
Action Description: Communicate CCTS Subject Area revisions to affected parties
Due Date: December 5, 2008 ***[COMPLETED]***

- **ATS 4013.2.14**

Action Owner: B. Gunther
Action Title: An independent party shall assess and document the effectiveness of actions
Action Description: An independent party shall assess and document the effectiveness of actions
Due Date: December 15, 2009

Institutional Open Corrective Actions

- **ATS 4223.2.1**

Action Owner: L. Bates
Action Title: Develop a Risk-based Management System Assessment Plan
Action Description: The Facility Operations Management System steward, working in coordination with the steward for the Facility Safety Management System, shall develop a risk-based Management System Assessment Plan.
Due Date: January 15, 2009

- **ATS 4223.3.1**

Action Owner: R. Lebel
Action Title: SBMS Steward will charter a working group to review provisions of requirements management process
Action Description: The SBMS Steward will charter a working group to review the current provisions of the recently enhanced requirements management process (including the variance process). The process will be modified, if necessary, to ensure that organization-specific requirement implementation is appropriately recorded.
Due Date: December 31, 2008

- **ATS 4223.4.1**

Action Owner: C. Parnell
Action Title: Perform a baseline needs assessment of the IH, Radiological Control, & Environmental and Waste Management functions.
Action Description: A baseline needs assessment of the IH, Radiological Control, and Environment/Waste Management functions shall be performed to determine the need for potential reallocation of resources.
Due Date: February 10, 2009

- **ATS 4223.4.2**

Action Owner: C. Parnell
Action Title: Re-evaluate business model for providing ES&H services
Action Description: The business model for providing ES&H services will be re-evaluated and adjusted as appropriate.
Due Date: October 1, 2009

- **ATS 4223.5.2**

Action Owner: R. Lebel

Action Title: Add to IAP Required Line Self-Assessment Plan FY09 to perform a review, validation & update
Action Description: The Standards-Based Management System Steward (owner of the Variance Process) will add to the IAP Required Line Self Assessment Plan for FY09 that line organizations perform a review, validation and update of all organizational specific variances. The findings of this review will be documented and reported to the SBMS Office for inclusion in the Laboratory's Requirement System.
Due Date: September 30, 2009

- **ATS 4223.6.1**

Action Owner: M. Israel
Action Title: IA&O will perform strategic review and evaluation of QA processes associated with Lab-wide training
Action Description: The Office of Internal Audit and Oversight (IA&O) will perform a strategic review and evaluation of the quality assurance processes associated with the development of Lab-wide training courses that address high-risk operations that pose significant hazards to workers.
Due Date: March 31, 2009

- **ATS 4223.6.2**

Action Owner: W. Hempfling
Action Title: Add to IAP Required Line Self Assessment Plan FY09 a line org rev of facility-specific training
Action Description: The T&Q Management System steward will add to the FY 09 IAP Required Line Self Assessment Plan, a line organization review of facility specific training for facilities operated by their organization. This review will evaluate the adequacy of current facility specific training, and determine if additional training is needed. The review will be documented and shared with the ESH Directorate to ensure alignment with institutional ESH programs, and acted upon when appropriate.
Due Date: September 30, 2009

6.8 Fire Protection Program Deficiencies

NTS-BHSO-BNL-BNL-2007-0003, fire protection program deficiencies was issued on June 15, 2007. BNL conducted a series of programmatic gap analyses of BNL programs that address the requirements of 10CFR 851 Worker Safety & Health rule. The gap analysis completed for the Fire Protection Program (10CFR851 Appendix A2) identified the following areas of concern:

- Fire Hazards Analyses (FHA) have been completed for only half of the BNL Buildings requiring a FHA (required for 60 facilities/30 have been complete).
- The Baseline Needs Assessment completed for the Fire Department and Fire Protection Engineering is outdated and must be redone to identify the following needs, based upon risk to workers:
    - staffing levels
    - training

  - equipment
  - documents and procedures
- The inspection, test and maintenance program for building fire safety equipment does not meet all NFPA or OSHA requirements.
- Several key fire protection program elements are not included in the periodic self assessment of the Fire Protection Program. In addition, Department level assessments (Tier 1s) generically are not identifying existing common fire hazards i.e. missing exit signs, blocked fire extinguishers.

<u>No Open Corrective Actions</u>

7.0 Safety Improvement Initiatives

BNL's management continues to seek ways of improving safety performance by incorporating of best management practices, lessons learned and feedback from assessments into the Laboratory's practices. Many initiatives focused on improving safety processes and many corrective actions in this plan also are focused on process improvement. However, real improvements in BNL's safety culture at BNL will only come about from caring leadership and behavioral changes. To establish the commitment needed to achieve such changes specific, measurable, and attainable objectives must be established based on a vision for excellence in safety and clearly articulated expectations for improved safety performance.

7.1 Facility Safety Authorization

7.1.1 Develop and implement a comprehensive integrated corrective action plan, which address maintenance of facility authorization basis documentation including nuclear safety topical areas.

Management System:	Facility Safety
Management System Steward:	C. Parnell
Action Owner:	M. Daum
Target Completion Date:	Sept 30, 2008 ***[COMPLETED]***

7.1.2 Develop, implement and assign Roles, responsibilities, authorities and accountabilities (R2A2).

Management System:	Facility Safety
Management System Steward:	C. Parnell
Action Owner:	M. Daum
Target Completion Date:	Feb 10, 2009

7.1.3 Identity training and qualification Gaps and Provide Required Training

Management System:	Facility Safety

Management System Steward: C. Parnell
Action Owner: M. Daum
Target Completion Date: Jun 30, 2009

7.1.4 Review/Evaluate/Update the BNL Hazard Identification Tool

Management System: Facility Safety
Management System Steward: C. Parnell
Action Owner: M. Daum
Target Completion Date: Jun 30, 2009

7.1.5 Utilize the Revised Hazard Identification Tool to Verify/Update BNL Facility Categorizations

Management System: Facility Safety
Management System Steward: C. Parnell
Action Owner: M. Daum
Target Completion Date: Dec 31, 2009

7.1.6 Facility Safety and Facility Operations Management System Revisions/Updates (SBMS)

Management System: Facility Safety
Management System Steward: C. Parnell
Action Owner: M. Daum
Target Completion Date: Jun 30, 2009

7.1.7 Conduct Effectiveness & Sustainability Review

Management System: Facility Safety
Management System Steward: C. Parnell
Action Owner: TBD
Target Completion Date: Dec 31, 2010

7.2 Institutional Safety Committee Reporting Structure

7.2.1 Institutional Safety Committees Reporting Structure Re-Engineering

- Re-Engineer the Safety Committee Reporting structure to address improvements and efficiencies identified from the FYO7 ISM follow up review and workshops with key committee chair persons. Committee charters and membership will be revised as appropriate.

Management System: Integrated Assessment Program
Management System Steward: M. Bebon
Action Owner: S. Coleman

Target Completion Date: June 30, 2008 ***[COMPLETED]***

8.0 Inspection of ES&H Programs at BNL

During July and August 2007, the DOE's Office Environment, Safety, and Health (ES&H) evaluations (HS-64), within the Office of Health, Safety and Security (HSS) conducted an inspection of environment, safety, and health (ES&H) program implementation at BNL ("HSS Inspection"). The DOE HS-64 inspection team concluded in their report "Inspection of ES&H Programs at BNL" ("HSS Report) that significant improvement was evident in all areas reviewed since the 2000 ES&H inspection of BNL programs. However, further work is needed in core functions (CF) 3 - Develop and Implement Hazard Controls, CF 4 –Perform Work Within Controls, and CF 5 - Feedback and Improvement. The HSS Report identified 9 site-specific findings. BSA/BNL has responsibility for developing corrective actions for 7 of the findings. DOE-BHSO has responsibility for 2 findings. The Laboratory has prepared this "Corrective Action Plan for the Inspection of ES&H Programs at BNL" (ES&H CAP) to address these findings. The HSS Report also identified 18 opportunities for improvement. Many of these are being incorporated as part of the corrective actions outlined in this ES&H CAP. The others are being evaluated and will be added to the scope of the BNL ISM/Safety Improvement Project.

Beyond the findings, opportunities for improvement and analysis of ongoing corrective action plans, the Laboratory reviewed the Inspection of ES&H Programs at BNL Validation Appendices to identify unmitigated hazards or situations that present an unacceptable immediate risk to workers, public health, or the environment. In all, 17 compensatory actions were identified to address unmitigated hazards. Section V of this CAP detail those corrective actions.

Given the Laboratory's past success in using an integrated project approach to safety improvement, once approved by DOE, this ES&H CAP will be incorporated into the ISM/Safety Improvement Project with a specific Work Breakdown Structure (WBS) designation, and managed as a part of the overall project. The ES&H CAP portion of the project WBS will be updated as corrective actions are completed and tracked to closure in the BNL Assessment Tracking System (ATS) as Assessment No. 4015.

ES&H CAP Development Process

Method

The Laboratory prepared this ES&H CAP in accordance with DOE Order 470.2B Independent Oversight and Performance Assurance Program. Many Laboratory managers and subject matter experts were included in its preparation and the causal analysis workshops were led either by a Laboratory manager or consultant. A broad cross-section of the laboratory staff participated as members of the causal analysis teams. Corrective actions and their scheduled completion dates were developed by the DDO, ISM/Safety Improvement Project manager, the assigned Management System Stewards, and the Action Owners. Figure 5 illustrates the ES&H CAP development process.

Extent of Condition

The approach to determining whether an extent of condition review should be conducted was based on guidance developed by the Energy Facility and Contractor Operations Group (EFCOG) - Energy Facility Contractors Operating Group (EFCOG), August 2006. White Paper: Extent of Condition Evaluations. This guidance suggests that a graded approach to the EOC process should be considered and includes six questions that are to be asked in order to make a determination of the need for an EOC evaluation. The six questions below were considered for EOC determinations.

1. Has BNL seen this before?
2. If BNL is seeing this again, why?
3. Is the management system(s) deficient in some way? How?
4. Could other activities and facilities at the site be experiencing the same problem?
5. To what extent does this problem have an impact or potential impact on the project or activity?
6. Can this matter affect the ability of BSA/BNL to conduct work safely and in compliance with requirements at the site?

A panel of BNL line managers and subject matter experts reviewed each of the seven findings using the above question set. The results of this analysis indicated that the issues described in each of the 7 findings were applicable across the Laboratory and had to be treated in corrective action planning as institutional issues.

Evaluation of the Applicability of Existing Corrective Actions

The Laboratory's ISM/Safety Improvement Plan contains many ongoing and recently implemented corrective actions that were thought to be potentially relevant to the HSS Report findings. To ensure proper alignment of these with the HSS Report findings in this ES&H CAP, the following process was used.

Each HSS Report finding was carefully analyzed by Laboratory management and ES&H subject matter experts to determine:

- If the causes of the deficiencies described by the finding had been previously identified through causal analyses of similar findings from earlier assessments.
- If corrective actions included in the ISM/Safety Improvement Plan or Contractor Assurance CAP (if fully implemented) would successfully address the finding in whole or in part.
- If the findings had identified new deficiencies that would require comprehensive causal analysis.

When it was found that the causes for the deficiencies described in the finding had been previously determined, no further causal analysis was conducted. In these cases, the existing corrective actions, or relevant aspects of them, were included in this ES&H CAP specific to the appropriate finding. If the existing corrective action was considered to be adequate to address the finding, but has not yet been fully deployed, an effectiveness review was included as a new corrective action in this ES&H CAP.

New Causal Analyses and Corrective Actions

When an HSS Report finding identified conditions for which no prior causal analysis had been performed, or a previous causal analysis was found not to be sufficient to fully address them, with the

assistance of consultant resources, causal analysis subject matter experts, and organizational staff, laboratory management looked beyond the ES&H inspection findings to identify common problem areas, develop problem statements, and then used causal analysis techniques to probe direct and root causes.

To ensure each problem statement adequately captured the essential elements of the associated finding, the laboratory rolled-up supporting conditions from the HSS Report "Validation Appendices" that were associated with the finding. The teams that developed the problem statements were provided these listings as reference material to support their work.

Four problem statements were developed for further analysis as follows:

1. The laboratory has not fully established clear, adequate, and consistent requirements; and effectively communicated these requirements to enable the implementation of some ES&H and assurance requirements/controls.
2. Work is not consistently performed within established and required controls.
3. BNL has not implemented an effective and compliant self-assessment program that appropriately identifies, prioritizes, plans, and conducts rigorous evaluations of the adequacy of programs and implementation by line organizations.
4. The laboratory has not established and implemented an effective, consistent, lab-wide Issues Management process that ensures identification of issues and the determination of causes and extent of conditions; and that ensures the development and implementation of effective corrective actions, and reporting and trending of institutional (ESHQ) performance.

Causal analyses were performed for these problem statements using the questioning to the void (five whys) and barrier analysis methods. The causes were binned using the causal analysis tree contained in the DOE Occurrence Reporting Causal Analysis Guide. Based on completion of causal analyses, new corrective actions were developed for the specific organization or facility reviewed and/or the applicable BNL Management System.

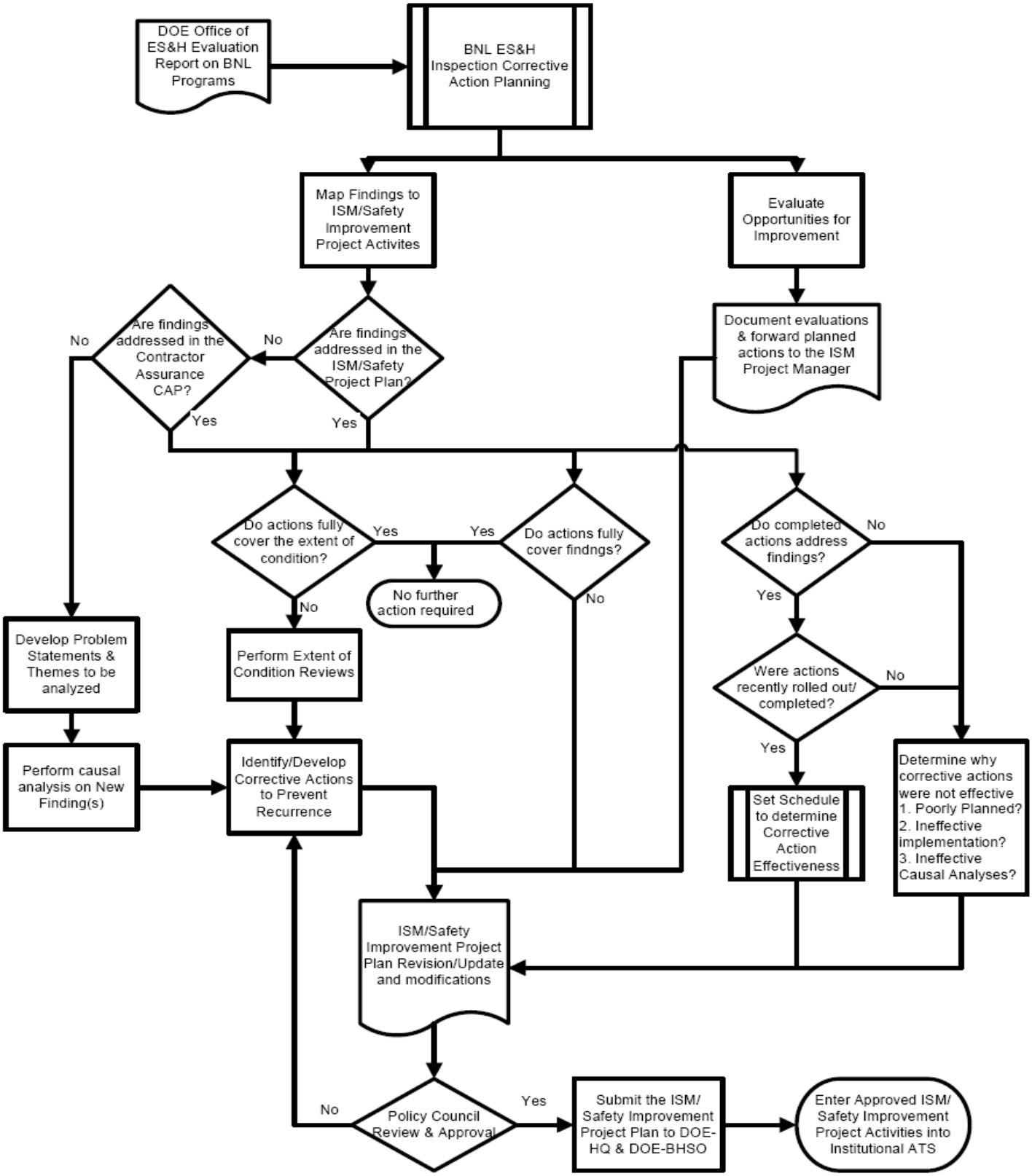
Opportunities for Improvement

The opportunities for improvement identified in the HSS Report that were not directly tied to a finding were also considered as corrective actions were developed.

Compensatory Actions

The HSS report "Validation Appendices" identified 17 conditions where some work activity hazards had not been identified or hazard controls not put in place to eliminate or mitigate hazards to workers. Compensatory measures were developed by BNL line management and subject matter experts to address these issues. These are described in Section V.

Figure 5, ES&H Inspection CAP Development Flow Chart



ES&H CAP Roles and Responsibilities

Assurance and Oversight

The Board of Directors of BSA holds the Laboratory Director accountable for achieving excellence in ESS&H. Through its Corporate Assurance process, the Board has charged the BSA Assurance Council with reviewing this ES&H CAP, monitoring its progress, and assuring its timely completion. ES&H CAP Progress will be formally reported to the BSA Board a minimum of three times per year

Authorization, Implementation and Performance Monitoring

At the management level, the Laboratory Director is responsible for the Laboratory's ES&H CAP and is the final approval authority for this Plan. He has charged the Deputy Director for Operations (DDO) with preparing the Plan, and with managing its implementation to ensure completion, and verification of the effectiveness of, the corrective actions and compensatory actions. The DDO will also be responsible for reporting progress to the Laboratory Director and the BSA Board. The DDO has assigned the ISM/Safety Improvement Project Manager the tasks of defining and "projectizing" the work scope, identifying and aligning the needed resources, managing the execution of activities, and regularly tracking and reporting ES&H CAP progress to senior management.

Resource Allocation

The Laboratory's Policy Council, which reports directly to the Laboratory Director, meets twice monthly to consider matters related to BNL's performance, priorities, resource allocation, policy formulation or revision, and planning. They formally review performance tri-annually, across the spectrum, and make recommendations for action to the Laboratory Director. Specific events are reviewed and discussed on an ad hoc basis as they occur. The Policy Council has reviewed and endorsed this ES&H CAP and its members have committed to providing the resources necessary to assure its execution.

Project Management

The ISM/Safety Improvement Project Manager has full responsibility and authority for carrying out the ISM/Safety Improvement Project and is responsible for incorporating this ES&H CAP into the project plan. The project manager reports to the DDO. The project manager has the continuing responsibility to manage implementation of ISM/Safety Improvement project objectives. In fulfilling this mandate, the Project Manager is responsible for:

- Integrating this ES&H CAP with the ISM/Safety Improvement Project Plan
- Establishing goals and performance indicators to guide project efforts and measure progress.
- Developing, maintaining and tracking project tasks and activities.
- Managing resources to support execution of the project's activities.

- Communicating accurate project status, and performance issues to BNL Senior Management.
- Identifying and managing critical issues and risks that may impact project performance.
- Utilizing appropriate BNL subject matter experts to prepare and review key program documents, and oversee development of documents to assure compliance with DOE ISM requirements.
- Identifying, preparing, and managing documentation required to successfully manage the project.

All corrective actions for the BNL site-specific findings will be entered into the BNL ATS under ATS No. 4015. The process for tracking corrective actions is described in the BNL Standards Based Management System (SBMS) Event/Issues Management subject area. Verification to ensure that actions have been appropriate to prevent recurrence of findings will be accomplished through management system evaluations, independent oversight reviews, effectiveness reviews, and division level self-assessments.

Corrective Action Plan

This section presents a description of the application of causal analysis to each of the 7 HSS Report findings and the associated corrective actions. ORPS causal analysis tree codes are provided for each causal analysis.

For each corrective action the cognizant BNL Management System Steward and owners of specific actions are identified. The target completion date for the corrective action is also provided. Where existing ongoing or completed (but not yet fully deployed) corrective actions are relevant, these are summarized in a table for each finding.

Each of these existing corrective actions will be assessed for effectiveness. The completion date for the corrective actions in the table is indicated in the table itself. The management system steward, action owner and completion date for the effectiveness review is indicated immediately below the table.

1.0 BNL Finding C-1

BNL institutional-level and facility/functional area-level management has not ensured that some ES&H and assurance requirements/controls are adequately defined and communicated to workers through SBMS and supporting facility/functional level documents in a manner that ensures workers are adequately protected from all hazards, as required by DOE Manual 450.4-1, *Integrated Safety Management System Manual*, DOE Order 414.1C, *Quality Assurance*, and 10 CFR 851, *Worker Safety and Health Program*.

A. Causal Analysis Summary

Previously accomplished causal analyses were not considered adequate to address this finding. A group of managers and supervisors from across the Laboratory was convened to conduct a causal analysis and develop corrective actions. The group

developed the problem statement below and then used the "5 Why" technique to perform the causal analysis.

The Laboratory has not fully established clear, adequate, and consistent requirements and effectively communicated these requirements to enable the implementation of some ES&H and assurance requirements/controls.

The following ORPS causal analysis tree cause codes were identified:

1. A4B1C01 – Management Problem, Management Methods Less Than Adequate (LTA) – management policy guidance / expectations not well defined, understood or enforced.
2. A4B1C03 – Management Problem, Management Methods LTA – Management direction created insufficient awareness of impact of actions on safety / reliability.
3. A4B2C07 – Management Problem, Resource Management LTA – means not provided to assure procedures / documents / records were adequate quality and up to date.
4. A5B2C05 – Communication LTA, Written Communication Content LTA – ambiguous instructions/requirements.
5. A5B4C01 – Communication LTA, Verbal Communication LTA – communication between work groups LTA.
6. A5B4C05 – Communication LTA, Verbal Communication LTA – information sent but not understood.

B. New Corrective Actions

Corrective Action C-1.1 – Develop enhanced processes for developing SBMS documents [ATS 4015.1.1]

The Laboratory will review SBMS development processes currently used to translate external requirements into institutional procedures (typically SBMS Management System Descriptions and Subject Areas). A working group will be formed and charged to review current processes, and propose enhancements for the development of SBMS documents. Variability/flexibility in requirements will be allowed only through the laboratory to the extent necessary to ensure safe operations. The processes to be revised/developed will include those used to communicate changes and roll-out of new documents. This corrective action will be closely coordinated with the Laboratory's Human Performance Improvement (HPI) initiative and HPI principles will be incorporated into the new processes.

Management System Steward:	**M. Bebon**
Action Owner:	**R. Lebel**
Target Completion Date:	**July 7, 2008 *[Completed]***

Corrective Action C-1.2 – Review and revise SBMS documents

The revised processes developed in corrective action C-1.1 will be used to review/revise those ES&H Subject Areas that address significant institutional risks. A team of subject matter experts, workers and line managers will be created to review and upgrade each of these subject areas. Other subject areas will be revised based on the

normal SBMS documents review cycle. The table below lists the "significant institutional risk" subject areas and target dates for completing the revisions and publishing them in SBMS. The target completion dates in the table below are based on a preliminary risk-based approach. The team's charge will include assessing the deficiencies in each of the subject areas which may result in a reordering of upgrade priorities and completion dates.

Subject Areas	Target Completion Date
1. Lockout/Tagout [ATS 4015.1.2]	Complete
2. Personal Protective Equipment [ATS 4015.1.3]	October 6, 2008
3. Cryogenics Safety [ATS 4015.1.4]	January 30, 2009
4. Construction Safety [ATS 4015.1.5]	February 27, 2009
5. Working With Chemicals [ATS 4015.1.6]	March 31, 2009
6. Confined Space Safety [ATS 4015.1.7]	April 30, 2009
7. Fire Protection [ATS 4015.1.8]	May 29, 2009
8. Exhaust Ventilation [ATS 4015.1.9]	June 29, 2009

Management System Steward: **C. Parnell**
Action Owner: **MS Stewards for appl. subject areas**
Target Completion Date: **July 7, 2009**

Corrective Action C-1.3 – Communicate new requirements and significant changes to subject areas
The new processes developed in 1.1 above will be used to communicate new and changed requirements for each of the revised subject areas developed in 1.2 above. These are tracked as ATS actions 4015.10 thru 4015.17.

Management System Steward: **C. Parnell**
Action Owner: **MS Stewards for appl. subject areas**
Target Completion Date: **September 16, 2009**

C. Contributing Corrective Actions from the ISM/Safety Improvement Project Plan
A number of existing corrective actions in the ISM/Safety Improvement Project address this finding in whole or in part. These are listed in the table below. The Laboratory will complete these corrective actions and, after a reasonable period of deployment, evaluate their effectiveness using a range of assessment resources including BNL Independent Oversight, internal SMEs, and external peer reviewers and consultants. Additional actions identified as a result of the effectiveness reviews will be incorporated into this ES&H CAP.

WBS No.	Description	Status	Completion Date
2.1.2	Create a culture "all work is planned" and develop supporting procedures and methodologies	Completed	October 1, 2007 ***[Completed]***
2.1.7	Integrate human performance factors principles into the WP&C Management System	Completed	October 1, 2007 ***[Completed]***
3.1.5	Roll-up Roles and Responsibilities to Management System Level; Include MS Stewards	Completed	June 1, 2007 ***[Completed]***
3.2.1	Complete Requirements Management Process Improvements	Completed	June 19, 2008 ***[Completed]***

Management System Steward: **M. Bebon**
Action Owner: **J. Selva**
Target Effectiveness Review Completion Date: **January 30, 2009**

2.0 BNL Finding C-2

BNL institutional-level and facility/functional area-level management and supervisors have not ensured that workers implement established safety controls, as required by DOE Manual 450.4-1, *Integrated Safety Management System Manual*, and 10 CFR 851, *Worker Safety and Health Program*.

A. Causal Analysis Summary

Previously accomplished causal analyses were not considered adequate to address this finding. The Laboratory convened a group of senior managers to conduct the causal analysis and develop corrective actions. The group developed the problem statement below and then used the "5 Why" technique to perform the causal analysis.

Work is not consistently performed within established and required controls.

The following ORPS causal analysis tree cause codes were identified:

1. A3B2C04 – Human Performance LTA, Rule Based Error – previous success in use of rule reinforced continued use of rule.
2. A4B1C02 – Management Problem, Management Methods LTA – job performance standards not adequately defined.
3. A4B1C07 – Management Problem, Management Methods LTA – Responsibility of personnel not well defined or personnel not held accountable.
4. A4B2C09 – Management Problem, Resource Management LTA – personnel selection did not assure match of worker motivations / job descriptions.

B. New Corrective Actions

Corrective Action C-2.1 – Laboratory Director's Manager and Supervisor Forum
The Laboratory recognizes that it needs to do a more robust job of developing leaders and leadership skills at all levels. There are a number of new initiatives underway that are designed to address these issues. At present, the Laboratory offers a range of courses for supervisors and managers pertaining to the skills required to be successful in their positions. Beyond these courses, however, the Laboratory Director will convene quarterly meetings for all Supervisors and Managers. Worker safety and health performance and the mangers' and supervisors' role in managing safety will be key elements of these meetings.

Management System Steward: **S. Aronson**
Action Owner: **W. Hempfling**
Target Completion Date: **February 1, 2008 *[Completed]***

Corrective Action C-2.2 – Leadership development connection and communication
The Laboratory will publish a quarterly, electronic newsletter for all supervisors and managers, entitled "The Leadership Connection." This newsletter will deal with a variety of topics that impact supervisors at all levels of the Laboratory and be designed to provide them with information that will increase their effectiveness as leaders.

Management System Steward: **W. Hempfling**
Action Owner: **B. Schwaner**
Target Completion Date: **February 1, 2008 *[Completed]***

Corrective Action C-2.3 - Performance management system enhancements
The Laboratory with the assistance of Drotter Human Resources consulting will better define performance dimensions for each level of supervision at the Laboratory. The new Performance Management system will be centered on the role played by every supervisor/manager in ensuring that the Laboratory achieves the objectives and targets associated with each of the Strategic Focus Areas in the Laboratory Annual Plan. One of these Strategic Focus Areas pertains to Excellence in ESS&H. Frequent and regular performance discussions will be held between supervisors and managers that will be centered on individual performance as it relates to each of the focus areas.

Management System Steward: **W. Hempfling**
Action Owner: **B. Schwaner**
Target Completion Date: **December 1, 2008 *[Completed]***

Corrective Action C-2.4 – Organization conduct of operations and safety town hall meetings
Each Laboratory Associate and Assistant Director has been directed to hold All-Hands meetings either wholly devoted to safety and conduct of operations, or including safety

as a prominent part. These meetings are to be used to review issues identified by the HSS Inspection, including performing work within established controls, to discuss the Laboratory and the directorate's illness/injury statistics, and to discuss plans for the upcoming year in safety. In addition, either the Laboratory Director or Deputy Directors for Science or Operations will be present at each of the meetings and briefly communicate and reinforce the Laboratory's institutional safety and conduct of operation expectations.

Management System Steward: **S. Aronson**
Action Owner: **Assistant/Associate Lab Directors'**
Target Completion Date: **March 1, 2008 *[Completed]***

C. Contributing Corrective Actions from the ISM/Safety Improvement Project Plan

A number of existing corrective actions in the ISM/Safety Improvement Project address this finding in whole or in part. These are listed in the table below. The Laboratory will complete these corrective actions and, after a reasonable period of deployment, evaluate their effectiveness using a range of assessment resources including BNL Independent Oversight, internal SMEs, and external peer reviewers and consultants. Additional actions identified as a result of the effectiveness reviews will be incorporated into this ES&H CAP.

WBS No.	Description	Status	Completion Date
1.4	Verify sustainability and effectiveness of the performance management processes	Open	March 30, 2009
2.1.3	Clarify Building Manager Role in Work Planning & Control	Completed	October 1, 2007
2.2.1	Upgrade Work Control Manager and Coordinator Training & Qualifications	Completed	October 1, 2007
3.1.4	Realign Management System Steward Reporting Structure	Completed	August 1, 2006
3.1.5	Roll-up Roles and Responsibilities to Management System Level; Include Management System Stewards	Completed	June 1, 2007
7.3.2	Safety Observation Training of Managers and Supervisors	Completed	September 30, 2006

Management System Steward: **M. Bebon**
Action Owner: **S. Coleman**
Target Effectiveness Review Completion Date: **February 22, 2009**

3.0 BNL Finding C-3

BNL small science has not ensured that activity-level experiment safety reviews and job risk assessments provide sufficient information about workplace hazards such that all appropriate hazard controls could be identified and effectively communicated to the workers in accordance with DOE Manual 450.4-1, *Integrated Safety Management System Manual*.

A. Causal Analysis Summary

Previously accomplished causal analyses performed in conjunction with the development of the ISM/Safety Improvement Project and the Contractor Assurance Review CAP were examined to determine adequacy. A determination was made that these prior causal analyses were effective in identifying the causes responsible for the conditions described in finding C-3. No further causal analysis was found to be required.

B. New Corrective Actions

Corrective Action C-3.1 – Review/revise the Experimental Safety Review (ESR) process
A working group of Work Control Managers and Experimental Review Coordinators will be formed to review the existing process, identify deficiencies, and define and implement a revised ESR process. The new/revised process will incorporate human performance principles, integrate job and facility risk assessments into hazard analysis, and clarify when and how worker planned work processes are to be integrated into ESR activities. Section 1 of the Work Planning & Control (WP&C) subject area will be revised, reissued and communicated using the revised SBMS document development and communication processes developed under corrective action C-1.1.

Management System Steward: **M. Bebon**
Action Owner: **C. Johnson/S. Coleman**
Target Completion Date: **July 18, 2008 *[Completed]***

Corrective Action C-3.2 – Develop and Implement a Web-Based Electronic ESR process
A web-based ESR process is currently in use in the Physics Department. A review of the effectiveness of this ESR electronic process will be conducted and the system enhanced and adapted for lab-wide use by a team of Experimental Review Coordinators and safety SMEs. The process will be incorporated into the revised WP&C subject area. Necessary information technology changes will be made to implement the process Lab-wide.

Management System Steward: **M. Bebon**
Action Owner: **C. Johnson/S. Coleman**
Target Completion Date: **June 30, 2009**

Corrective Action C-3.3 – Perform an effectiveness review of the new web-based Experimental Safety Review process
An external consultant team will be utilized to conduct a review of the new web-based ESR process. This review will include the quality of job hazard evaluations and job hazard analyses performed for experimental work activities and the extent to which deficiencies in the ESR process were identified as root or contributing causes in accidents and injuries.

Management System Steward: **M. Bebon**
Action Owner: **C. Johnson/S. Coleman**
Target Completion Date: **January 15, 2010**

C. Contributing Corrective Actions from the ISM/Safety Improvement Project Plan
A number of existing corrective actions in the ISM/Safety Improvement Project address this finding in whole or in part. These are listed in the table below. The Laboratory will complete these corrective actions and, after a reasonable period of deployment, evaluate their effectiveness using a range of assessment resources including BNL Independent Oversight, internal SMEs, and external peer reviewers and consultants. Additional actions identified as a result of the effectiveness reviews will be incorporated into this ES&H CAP.

WBS No.	Description	Status	Completion Date
2.1.2	Create a culture "all work is planned" and develop supporting procedures and methodologies	Completed	October 1, 2007
2.1.7	Integrate human performance factors principles into the WP&C Management System	Completed	October 1, 2007

Management System Steward: **M. Bebon**
Action Owner: **S. Coleman**
Target Effectiveness Review Completion Date: **August 30, 2008 *[Completed]***

4.0 BNL Finding C-4

Plant Engineering has not sufficiently implemented the requirements in the BNL-wide work planning and control subject area of SBMS to ensure that all hazards associated with the work being performed are effectively identified, analyzed, and categorized during the work planning process.

A. Causal Analysis Summary

Previously accomplished causal analyses performed in conjunction with the development of the ISM/Safety Improvement Project and the Contractor Assurance Review CAP were examined to determine adequacy. A determination was made that these prior causal analyses were effective in identifying the causes responsible for the conditions described in finding C-4. No further causal analysis was found to be required.

B. Corrective Actions

In an effort to create a culture of "All Work is Planned" Brookhaven National Laboratory recently implemented a three tiered approach to work planning and control. The three tiered approach includes worker planned, prescribed, and permit planned work processes. The enhanced work planning and control process described above was rolled out for implementation at the time of the HSS Inspection and the completed corrective actions had not had sufficient deployment time to become fully effective.

C. Contributing Corrective Actions from the ISM/Safety Improvement Project Plan

A number of existing corrective actions in the ISM/Safety Improvement Project address this finding in whole or in part. These are listed in the table below. The Laboratory will, after a reasonable period of deployment, evaluate their effectiveness using a range of assessment resources including BNL Independent Oversight, internal SMEs, and external peer reviewers and consultants. Additional actions identified as a result of the effectiveness reviews will be incorporated into this ES&H CAP.

WBS No.	Description	Status	Completion Date
2.1.2	Create a culture "all work is planned" and develop supporting procedures and methodologies	Completed	October 1, 2007
2.1.7	Integrate human performance factors principles into the WP&C Management System	Completed	October 1, 2007

Management System Steward: **M. Bebon**
Action Owner: **S. Coleman**
Target Effectiveness Review Completion Date: **August 30, 2008 *[Completed]***

D. Opportunities for Improvement Identified from WP&C Effectiveness Review

In August 2008, a third party independent review was performed to ascertain the effectiveness of work planning and control actions implemented to create a culture that all work is planned (WBS 2.1.2) and the integration of human performance principles into the work planning and control management system (WBS 2.1.7). Results of the effectiveness review identified no findings and the actions BNL implemented were generally to partially effective. However, several opportunities for improvement were

identified. Below are the actions BNL will take to address identified opportunities for improvement.

OFI.1.1 **Worker Planned Work Assurance:** Assurance mechanisms as currently applied do not effectively verify the implementation of worker planned work. As part of the ES&H corrective action D-3.2, a risk based assessment plan for each ESH&Q management system. The risk based assessment plan will define each key function within the management system, the methods to be used to assess the function and the frequency of assessment. This action will provide the necessary assurance mechanisms for maintenance and continual improvement to worker planned work processes. See corrective action D-3.2 in section 8.0 of this plan.

OFI.1.2 **MAXIMO Work Order/Preventive Maintenance Job Planning Questions:** Job planning questions used with MAXIMO preventive maintenance activities and work orders does not align with the WP&C subject area requirements. BNL will revise/update the MAXIMO job planning questions to align with WP&C requirements. [ATS 4015.4.2]

Management System:	Work Planning and Control
Management System Steward:	M. Bebon
Action Owner:	C. Johnson
Target Completion Date:	February 25, 2009

OFI.1.3 **Human Performance Deliverables and Measures for Success:** There does not appear to be a set of performance measures or outcomes that define what “success” would look like (near-term and long-term). In consolation with the BNL Human Performance (HP) Steering Committee, the HP Project Manager will develop a set of success measures that the HP Steering Committee can use to measure progress against. [ATS 4015.4.3]

Management System:	All Management Systems
Management System Steward:	All MS. Stewards
Action Owner:	J. Labas / Steering Committee
Target Completion Date:	December 30, 2008

OFI.1.4 **BNL Human Performance Advocate Expectations:** In some cases, the Laboratory Human Performance Advocates (HPA) are unsure of their roles and responsibilities within respective organizations. The Laboratory HP Project Manager will develop a general HPA R2A2 (consider posting on the HPI wikipedia site) and communicate those expectations to Laboratory HPAs. [ATS 4015.4.3]

Management System:	Work Planning and Control
Management System Steward:	M. Bebon

Action Owner: J. Labas
Target Completion Date: December 30, 2008

5.0 BNL Finding D-3

BNL has not implemented an effective and compliant self-assessment program that appropriately identifies, prioritizes, plans, and conducts rigorous evaluations of the adequacy of safety programs and implementation by line organizations as required by DOE Order 414.1C, *Quality Assurance*, and DOE Order 226.1, *Implementation of DOE Oversight Policy*.

A. Causal Analysis Summary

The laboratory convened a group of managers, supervisors, ES&H Coordinators and scientific staff to conduct the causal analysis and develop corrective actions. The group used the "5 Why" technique to perform the causal analysis on the following problem statement:

BNL has not implemented an effective and compliant self-assessment program that appropriately identifies, prioritizes, plans, and conducts rigorous evaluations of the adequacy of programs and implementation by line organizations.

The following ORPS causal analysis tree cause codes were identified:

1. A4B1C01 – Management Problem, Management Methods Less Than Adequate (LTA) – management policy guidance / expectations not well defined, understood or enforced.
2. A4B1C02 – Management Problem, Management Methods LTA – job performance standards not adequately defined.
3. A4B1C03 – Management Problem, Management Methods LTA – Management direction created insufficient awareness of impact of actions on safety / reliability.
4. A4B2C03 – Management Problem, Resource Management LTA – insufficient manpower to support identified goal / objectives.
5. A5B2C05 – Communications LTA, Written Communication Content LTA, Ambiguous instructions/requirements.
6. A6B1C02 – Training Deficiency, No Training Provided – Training requirements not identified.

B. New Corrective Actions

Corrective Action D-3.1 – Review and Revise the Integrated Assessment Program Management System

To ensure expectations are clearly defined and actionable, the institutional process for planning, prioritizing and conducting integrated assessments (including organization self assessments) will be reviewed to identify process and procedure enhancements. The Laboratory will benchmark DOE sites and other research and development (R&D) laboratories to gain insights for process efficiencies.

Management System Steward: **M. Bebon**

Action Owner: **R. Lebel**
Target Completion Date: **September 16, 2008 [Complete]**

Corrective Action D-3.2 – Create a baseline, risk-based assessment plan for each ESH&Q management system
Based on the results of the review and benchmarking of the integrated assessment program management system, develop a baseline management system assessment plan for each ESH&Q management system based on institutional risk. The baseline plan will define, for each key function within the management system, the methods to be used to assess the function and the frequency of assessment. The range of methods is expected to include performance monitoring metrics as well as internal and external independent assessments, and organizational self-assessments. [ATS 4015.5.2]

Management System Steward: **M. Bebon**
Action Owner: **R. Lebel/C. Parnell**
Target Completion Date: **June 30, 2009**

Corrective Action D-3.3 – Develop an annual assessment plan for each ESH&Q management system
Create a Laboratory process for developing an annual assessment plan for each ESH&Q management system utilizing the baseline plans developed under corrective action D-3.2. The process will include institutional integration of all of the individual ESH&Q management system assessment plans, and incorporation of the final plans into appropriate organizational business plans. Execute the process for all ESH&Q Management Systems. [ATS 4015.5.3]

Management System Steward: **M. Bebon**
Action Owner: **R. Lebel/C. Parnell**
Target Completion Date: **September 30, 2009**

Corrective Action D-3.4 – Develop and deliver training for conducting Integrated Assessments
Utilizing the expectations developed in corrective action D-3.1 develop and implement training for conducting effective integrated assessments. Job Training Assessments (JTAs) will be developed and assigned to individuals. Appropriate training will be developed and delivered. [ATS 4015.5.4]

Management System Steward: **M. Bebon**
Action Owner: **R. Lebel**
Target Completion Date: **September 30, 2008 [Complete needs Verification]**

Corrective Action D-3.5 - Revise Integrated Assessment Program Management System Documentation
The integrated assessment program management system and associated subject areas will be revised to incorporate changes associated with corrective actions D-3.1 through

D-3.3. The new requirements and changes will be communicated through workshops/training sessions.

Management System Steward: **M. Bebon**
Action Owner: **R. Lebel**
Target Completion Date: **January 10, 2009**

Corrective Action D-3.6 – Line Organization Implementation Effectiveness Review
The Laboratory will, after a reasonable period of deployment, evaluate line organization implementation and effectiveness of assessment programs. The implementation and effectiveness evaluation will be based on objective evidence of compliance with requirements established in D-3.1 through D-3.5. [ATS 4015.5.6]

Management System Steward: **M. Bebon**
Action Owner: **R. Lebel**
Target Completion Date: **September 30, 2009**

C. Contributing Corrective Actions from the ISM/Safety Improvement Project Plan
A number of on-going corrective actions in response to an ISM Readiness Review address this finding in part. The laboratory will evaluate effectiveness of corrective actions by conducting a review of ISM/Safety Improvement Project corrective actions listed in the table below. New actions identified as a result of the effectiveness reviews will be incorporated into this CAP.

WBS No.	Description	Status	Completion Date
1.1	Adopt a Strategy-Focused framework for Laboratory-wide planning, decision, and performance management	Completed	May 30, 2007
1.2	Evolve institutional performance and risk analysis to improve feedback to institutional decision-making and assurance processes	Completed	March 30, 2008

Management System Steward: **M. Bebon**
Action Owner: **S. Coleman**
Target Effectiveness Review Completion Date: **February 22, 2009**

6.0 BNL Finding D-4

BNL has not established and implemented an effective issues management program that appropriately describes safety deficiencies, determines their causes and the extent-of-condition reviews, and ensures development and implementation of effective corrective and preventive actions as required by DOE Order 414.1C, *Quality Assurance*, and DOE Order 226.1, *Implementation of DOE Oversight Policy*.

A. Causal Analysis Summary

The laboratory convened a group of department chairs, division and operation managers, and supervisors to conduct the causal analysis and develop corrective actions. The group used the "5 Why" technique to perform the causal analysis on the following problem statement:

The laboratory has not established and implemented an effective, consistent, lab-wide Issues Management process that ensures identification of issues and the determination of causes and extent of conditions; and that ensures the development and implementation of effective corrective actions, and reporting and trending of institutional (ESHQ) performance.

The following ORPS causal analysis tree cause codes were identified:

1. A4B1C01 – Management Problem, Management Methods Less Than Adequate (LTA) – management policy guidance / expectations not well defined, understood or enforced.
2. A4B1C02 – Management Problem, Management Methods LTA – job performance standards not adequately defined.
3. A5B2C08 – Communications LTA, Written Communication Content LTA – incomplete / situation not covered.
4. A5B4C01 – Communications LTA, Verbal Communication LTA – communication between work groups LTA.

B. New Corrective Actions

Corrective Action D-4.1 - **Establish an institutional issues and assessments tracking working group**

Establish a working group consisting of a cross section of organizational representatives to identify and recommend a set of [ESH&Q] data/information to be reported to Laboratory management.

Management System Steward:	**M. Bebon**
Action Owner:	**T. Schlagel**
Target Completion Date:	***Completed***

Corrective Action D-4.2 – **Identify Key ES&H Performance Information**

Organizational information needed for managing institutional performance will be identified. This will include ES&H information, as well as other organizational information that is pertinent. A process will be developed to track, trend and analyze this information, and a structure and format developed to communicate the results. [ATS 4015.6.2]

Management System Steward:	**M. Bebon**
Action Owner:	**T. Schlagel/R. Lebel/C. Parnell**
Target Completion Date:	**December 30, 2008**

Corrective Action D-4.3 – Revise Roles, Responsibilities, Authorities and Accountabilities (R2A2s)
Revise appropriate R2A2s to include responsibilities for data/information gathering, analysis, report preparation, and distribution. [ATS 4015.6.3]

Management System Steward:	**M. Bebon**
Action Owner(s):	**T. Schlagel**
Target Completion Date:	**December 30, 2008**

Corrective Action D-4.4 – Revise Integrated Assessment Program Management System Documentation and Implement the ES&H Performance Information Process
The integrated assessment program management system and associated subject areas will be revised to incorporate changes associated with corrective actions D-4.1 through D-4.3. The revised process will be implemented and the new requirements and changes will be communicated through workshops/training sessions. [ATS 4015.6.4]

Management System Steward:	**M. Bebon**
Action Owner:	**R. Lebel**
Target Completion Date:	**January 10, 2009**

Corrective Action D-4.5 – Line Organization Issues Implementation Effectiveness
The Laboratory will, after a reasonable period of deployment, evaluate line organization implementation and effectiveness of the institutions issues management process. The implementation and effectiveness evaluation will be based on objective evidence of line organization compliance with requirements established in D-4.2 through D-4.4.

Management System Steward:	**M. Bebon**
Action Owner:	**R. Lebel**
Target Completion Date:	**September 30, 2009**

7.0 BNL Finding D-5

BNL has not implemented a rigorous and effective program of injury and illness investigations that consistently documents and evaluates conditions and causes, and establishes appropriate corrective and preventive actions as required by BNL SBMS procedures and DOE Order 414.1C, *Quality Assurance*, and DOE Order 226.1, *Implementation of DOE Oversight Policy*.

A. Causal Analysis Summary

Previously accomplished causal analyses performed in conjunction with the development of the ISM/Safety Improvement Project and the Contractor Assurance Review CAP were examined to determine adequacy. A determination was made that these prior causal analyses were effective in identifying the causes responsible for the conditions described in finding D-5. No further causal analysis was found to be required.

B. New Corrective Actions

Corrective Action D-5.1 – Revise the Investigation of Incidents, Accidents and Injuries subject area

The subject area will be revised to modify the requirements for reporting accidents, injuries and incidents to BNL Event Categorizers for reportability determinations.

Management System Steward: **C. Parnell**
Action Owner: **J. Ellerkamp**
Target Completion Date: ***Completed***

Corrective Action D-5.2 – Use Trained Investigators to Perform Accident Investigation Analyses

Future investigations will be performed by trained investigators designated by the Laboratory Director and Deputy Directors for Operations and Science. The intent of this action is to augment the managers' and supervisors' investigation capability, provide an additional source of institutional trending and to develop the skill level of staff. The incidents, accidents and injuries subject area will be revised to reflect this new requirement and communicated through workshops/training sessions.

Management System Steward: **C. Parnell**
Action Owner: **J. Ellerkamp**
Target Completion Date: **May 8, 2008 *[Completed]***

Corrective Action D-5.3 – Review/evaluate prior accident investigation reports

The Safety and Health Services Division (SHSD) will evaluate accident investigation reports, provide feedback and recommendations on the quality of reports to the Department Chairs and Division Managers, and assist in completion of causal analyses. Enhancements/improvements will be incorporated into appropriate SBMS documents.

Management System Steward: **P. Williams**
Action Owner(s): **J. Ellerkamp**
Target Completion Date: **May 8, 2008 *[Completed]***

Corrective Action D-5.4 – Conduct accident investigation training and assign injury/illness investigators

Training will be developed and provided to a cadre of employees assigned to qualify them to complete injury/illness investigations. This includes developing and assigning job training assessments that detail minimum requirements, and incorporating requirements into appropriate SBMS documents. [ATS 4015.7.4]

Management System Steward: **C. Parnell**
Action Owner: **J. Ellerkamp/S. Kane**
Target Completion Date: **December 30, 2008**

Corrective Action D-5.5 – Line Organization Implementation and Effectiveness of Injury and Illness Investigations and Reporting

The Laboratory will, after a reasonable period of deployment, evaluate line organization implementation and effectiveness of the institutions injury and illness investigation and reporting process. The implementation and effectiveness evaluation will be based on objective evidence of line organization compliance with conducting and documenting thorough investigations and identification of appropriate corrective actions and recurrence controls.

Management System Steward:	**M. Bebon**
Action Owner:	**C. Parnell**
Target Completion Date:	**April 15, 2009**

Compensatory Actions for Identified Unmitigated Hazards

Beyond the findings, the HSS Report identified 17 conditions where some work activity hazards were not identified or hazard controls not in place to eliminate/mitigate hazards to workers. This section presents the conditions as stated in the HSS Report Validation Appendices and details the compensatory actions that BNL has taken and will take to address these unmitigated hazards.

1. **Condition 1 - Synthesis of Alanes for Automotive Applications ESR 15403N rev.2** - does not analyze some conditions that may result in release of hazardous materials or direct impacts on workers. The ESR does not place upper limits on loading or introduction of new flammable gases/liquids/solids, which are stored in the glove box in the presence of pyrophoric materials, and the ESR has not established engineering or administrative controls to ensure the glove box remains inert.

   Action Description: ESR 15403N work activities will be re-evaluated to identify hazards and controls required for performing work. The ESR will be revised to reflect appropriate engineering and administrative controls. The ESR will be reviewed and approved in accordance with the SBMS ESR process. Communication of, and training on new hazard controls and requirements will be accomplished through workshops/training sessions. ATS No. 4027.

   Organization: **Energy, Environment and National Security**
   Action Owner: **J. Wegrzyn**
   Target Completion Date: **February 8, 2008 *[Completed]***

2. **Condition 2 - A Novel Approach for Biofuel Generation ESR 18507E rev.1** - does not identify the physical hazard of a soldering iron routinely used to prepare copper electrodes.

   Action Description: ESR 18507 work activities will be re-evaluated to ensure all hazards and controls required for performing work are identified. The ESR will be revised to reflect appropriate engineering and administrative controls. The ESR will be reviewed and approved in accordance with the SBMS ESR process. Communication of, and training on new hazard controls and requirements will be accomplished through workshops/training sessions. ATS No. 4028.

   Organization: **Energy, Environment and National Security**
   Action Owner: **P. Kalb**
   Target Completion Date: **February 8, 2008 *[Completed]***

3. **Condition 3 - Soft Matter Chemical Procedures and Instrumentation, ESR PM 2007-74** - does not address the injection hazard for sharps, or provide an analysis of the range of materials that could be contained in syringes, and the only PPE in use was nitrile gloves and safety glasses. Section III of the ESR (develop and implement hazard controls) part B

(chemical hazards and controls) lists chloroform, a carcinogen, and sets requirements for waste management and handling in a fume hood, but provides no requirements for PPE such as laboratory coats or chemical protective gloves as required by SBMS subject area.

Action Description: Evaluate ESR PM 2007-74 to ensure all hazards associated with the work being performed are identified and successfully mitigated. The ESR will be updated and changes communicated to staff using the Work Planning and Control Experimental Safety Review approval process.

Organization:	**Basic Energy Sciences (BES) Directorate**
Action Owner:	**J. Taylor**
Target Completion Date:	**January 30, 2008 *[Completed]***

4. **Condition 4 - Environmental Analysis for Mercury to Assess Deposition from Coal-Fired Electric Generating Plants, ESR 15603 rev. 2** - does not identify hazards and controls associated with vehicular traffic during field sample collection in the ESR, and the effluent vent path for the detector was directed through a tygon tube into an adjacent high bay area; any potential hazard to co-located workers has not been controlled.

Action Description: ESR 15603 work activities will be re-evaluated to ensure all hazards and controls required for performing work are identified. The ESR will be revised to reflect appropriate engineering and administrative controls. The ESR will be reviewed and approved in accordance with the SBMS ESR process. Communication of and training on new hazard controls and requirements will be accomplished through workshops/training sessions. ATS No. 4029.

Organization:	**Energy, Environment and National Security**
Action Owner:	**P. Sullivan**
Target Completion Date:	**February 22, 2008 *[Completed]***

5. **Condition 5 - Lockout/tagout programs in SBMS and in BNL-approved health and safety plans** - are not fully compliant with NFPA 70E. For example, neither the SBMS lockout/tagout procedure, nor the Environmental Restoration Project (ERP) lockout/tagout procedure, requires each person who could be exposed directly or indirectly to a source of electrical energy to be involved in the lockout/tagout process as specified by Section 120.2(B)(1) of NFPA70E, Section 120.2(B)(1). BNL has not established effective mechanisms for implementing lockout/tagout requirements of National Fire Protection Association (NFPA) 70E and construction safety analysis requirements of 10CFR851 are not fully reflected in SBMS.

Action Description: Revise the Lockout/Tagout subject area to ensure requirements of all applicable external regulations are addressed. Evaluate/revise Lockout/Tagout training to ensure training objectives are in accordance with the revised Subject Area. Modifications/changes to lockout/Tagout Subject Area and/or training will be communicated through workshops and/or training sessions.

Organization: **Laboratory Electrical Safety Committee**
Action Owner: **J. Durnan**
Target Completion Date: **April 3, 2008 *[Completed]***

6. **Condition 6 - The Work Planning and Control subject area** - requires consideration of three risk factors (ES&H issues, complexity, and work coordination) in assigning hazard categories but provides rating criteria for only one of the three (ES&H issues).

   Action Description: BNL will modify the Work Planning Subject Area to clarify complexity and work coordination requirements. A team of Work Control Managers will be utilized. Communication of subject area modifications made to address work coordination and complexity will be accomplished through Work Control Manager and Coordinator training.

   Organization: **Institutional/BNL-Wide**
   Action Owner: **S. Coleman**
   Target Completion Date: **April 1, 2008 *[Completed]***

7. **Condition 7 – Instrumentation division local exhaust ventilation systems observed** - none of the exhaust ventilation systems were labeled or marked to indicate to employees in the work-place or to inspection personnel that the systems had been tested to verify proper operation.

   Action Description: Portable exhaust/filter systems will be tested and labeled in accordance with established procedures

   Organization: **Instrumentation Division**
   Action Owner: **R. Beuttenmuller**
   Target Completion Date: **February 21, 2008 *[Completed]***

8. **Condition 8 - Conflicting direction about required safety controls** - Personnel protective equipment (PPE) for cryogenic hazards are defined and communicated to workers through several different mechanisms (training, facility level hazard analysis, SBMS, work packages, and procedures).

   Action Description: The Laboratory Director commissioned a PPE Working Group to address conflicting safety controls. The Working Group is charged to accomplish the following tasks and provide a set of recommendations and a resource-loaded plan to implement them to the Director:
   - Provide recommendations on modifying/clarifying the requirements for long sleeve shirts.
   - Address issues raised by BNL staff regarding PPE requirements in the interim, prior to the completion of your work.
   - Review the present PPE requirements of the Laboratory as defined in any and all media (SBMS, FRAs, JRAs, etc) and ensure that they are “necessary and sufficient” for effective mitigation and control of the hazards that exist at BNL.

- Consider whether there have been any new hazards introduced into the Laboratory's operations that are not adequately addressed by the present requirements set.
- Adjust the PPE requirements set as appropriate.
- In conjunction with HPI principles, review the current framework and processes for communicating PPE requirements to all BNL people (employees, guests, visitors, contractors).
- Revise the present PPE requirements framework to ensure the requirements (and the PPE itself) are readily and conveniently accessible to all who need to use them. (For example, this may include moving to more extensive local/area postings and availability of PPE at point of use).
- Identify any other factors that may be impacting compliance with PPE requirements and recommend solutions.

Organization: **Institutional/BNL-Wide**
Action Owner: **B. Gunther**
Target Completion Date: **July 11, 2008 *[Completed]***

9. **Condition 9 - Containers of flammable materials** - (i.e., spray cans of surface lubricants or cleaning compounds) at many locations were not properly stored, including several containers of flammable materials being stored on top of a flammable storage cabinet.

Action Description: Laboratory ES&H Coordinators will evaluate organization work spaces to identify flammable material storage deficiencies. Included in this action will be the implementation of administrative and engineering controls; such as postings and flammable storage cabinet use.

Organization: **Institutional/BNL-Wide**
Action Owner: **P. Williams**
Target Completion Date: **March 7, 2008 *[Completed]***

10. **Condition 10 - Infrared and Optical Studies of the Electronic Properties of Solids under ESR PO2006-045** - where the oxygen deficiency analysis was based on 50 liters of liquid helium. The analysis indicated catastrophic failure of the dewar will result in a laboratory breathing air concentration barely above 19.5% oxygen. However this calculation and/or Oxygen Deficiency Hazard (ODH) controls were not revised when the amount of liquid helium in the storage dewar was increased to 62 liters.

Action Description: ESR PO2006-045 work activities will be re-evaluated to ensure all hazards and controls required for performing work are identified. The ESR will be revised to reflect appropriate engineering and administrative controls. The ESR will be reviewed and approved in accordance with the SBMS ESR process. Communication of and training on new hazard controls and requirements will be accomplished through workshops/training sessions.

Organization: **Condensed Matter Physics and Material Science**
Action Owner: **C. Homes**
Target Completion Date: **January 22, 2007 *[Completed]***

11. **Condition 11 - O&M-MMC-003 procedure for Collection and Disposal of Waste Oil** - does not specifically address requirements for managing halogenated oils as hazardous waste. This procedure requires that the halogenated oil be stored separately but does not reference controls or the procedure for hazardous waste management.

Action Description: Plant Engineering will revise O&M-MMC-003 procedure to clarify requirements for collection and disposal of halogenated waste oil. Modifications/changes to the procedure will be communicated through Division memo, safety and toolbox meetings.

Organization:	**Facilities and Operations (F&O)**
Action Owner:	**L. Somma**
Target Completion Date:	**March 7, 2008 *[Completed]***

12. **Condition 12 - Belts and pulleys were not adequately guarded** - on some machine tools in Building 423 motor pool, Building 422 carpenter shop, and Building 555 machine shop as required by OSHA 1910.219, and some of the machine tools in the same facilities designed for fixed location were not lagged down to prevent walking or moving as required by OSHA 1910.212(b).

Action Description: Belts and pulleys will be installed in accordance with OSHA 1910.212(b) requirements. The Laboratory will consult with the manufacturer and OSHA to determine applicable requirements for the equipment in question.

Organization:	**Facilities and Operations (Bldg 422)**
Action Owner:	**Pete Stelmaschuk**
Target Completion Date:	**February 15, 2008 *[Completed]***

Organization:	**Facilities and Operations (Bldg 423)**
Action Owner:	**Richard Allingham**
Target Completion Date:	***Completed***

Organization:	**Instrumentation (Bldg 555)**
Action Owner:	**R. Beuttenmuller**
Target Completion Date:	**February 15, 2008 *[Completed]***

13. **Condition 13 - The floor accessible electrical outlets in the HEMO shop** - are not ground fault circuit interrupter (GFCI) protected as required by the National Electrical Code and portable GFCIs were not observed being used.

Action Description: GFCI electrical outlets will be installed on floor accessible outlets in the HEMO shop.

Organization:	**Facilities and Operations (F&O)**
Action Owner:	**Tom Roza**

Target Completion Date: **February 1, 2008 *[Completed]***

14. **Condition 14 - The FRA for Facilities Used for Automotive Repair and Maintenance** - does not list flammable materials as a hazard yet aerosol cans containing flammables are stored on an open shelf in the motor pool.

    Action Description: Review and evaluate requirements for storage and handling of flammable materials used in the auto shop with Fire Safety and take appropriate actions to update the facility risk assessment and to ensure compliance.

    Organization: **Facilities and Operations (F&O)**
    Action Owner: **Richard Allingham**
    Target Completion Date: **February 1, 2008 *[Completed]***

15. **Condition 15 - A tire inflation cage has not been provided in the HEMO shop** - for repair of medium and large split rim truck tires used on heavy equipment as required by OSHA 1910.177.

    Action Description: A tire inflation cage will be installed in the HEMO shop for repair of medium and large split rims truck tires. The job risk assessment (JRA) will be updated to reflect new hazards and communicated through Division safety and toolbox meetings.

    Organization: **Facilities and Operations (F&O)**
    Action Owner: **Tom Roza**
    Target Completion Date: **February 8, 2008 *[Completed]***

16. **Condition 16 - A flammable storage container is not provided in the motor pool for storage** - of aerosol cans containing flammables in accordance with OSHA standards.

    Action Description: A flammable storage cabinet will be procured for the Bldg 423 motor pool, and flammable material storage requirements will be communicated to motor pool workers and staff.

    Organization: **Facilities and Operations (F&O)**
    Action Owner: **Richard Allingham**
    Target Completion Date: **February 22, 2008 *[Completed]***

17. **Condition 17 - The suggested frequency exhibit of the ESH&Q (TIER 1) Inspection Subject Area** - specifies that mechanical equipment areas are to be inspected semi-annually, once by the building occupant and once by Plant Engineering. However, Plant Engineering has identified over 275 of these rooms and only inspected nine of them in 2006 and only six are scheduled for inspection in 2007.

    Action Description: The laboratory will assemble a team of SMEs familiar with the hazards in their Mechanical Equipment Rooms (MER) to develop a risk based inspection schedule. The

Subject Area and guidance provided in the exhibit Organizational ESH&Q Inspections will be revised as appropriate. Communication of the revised inspection requirements will be communicated to Building Managers and ES&H Coordinators.

Organization:	**Safety and Health Services Division**
Action Owner(s):	**P. Williams/C. Johnson**
Target Completion Date:	**May 9, 2008 *[Completed]***

VI Project Reviews/Performance Reporting

The ISM Project Manager will continuously evaluate the progress and performance towards meeting the ISM/Safety Improvement Project objectives and compare it to what was originally planned. The evaluation will enable the ISM/Safety Improvement Project Manager to:

- Improve project performance together with the management of this project.
- Reveal developing problems early so that action can be taken to mitigate risks and/or resolve issues and concerns.
- Reaffirm the Institutions commitment to this performance improvement project.
- Keep the Laboratory's senior management, stakeholders and clients informed of the project's status.

The ISM/Safety Improvement Project Manager will report schedule progress to the DDO and DOE-BHSO a monthly basis. At a minimum, the report shall contain:

1. Current project status (e.g. cost, schedule variance, percent complete).
2. Future status – forecast what is expected to happen, and if significant deviations are expected in schedule, cost and/or performance.
3. Status of high priority and/or critical activities status.
4. Risk Assessment – note whether any risk were identified that highlight the potential for project failure.
5. Status of changes
6. Lessons Learned – information that may be relevant to other projects

The ISM/Safety Improvement Project Manager determines the value of completed work. The basis of that determination is guided by seeking the most objective means possible, consistent with the nature of the work, to determine the percent complete of a specific task or activity. The ISM/Safety Improvement Project Manager assesses project performance against the baseline plan every month for all assigned project activities.

The responsible manager for each of the work breakdown elements serves as the starting point for the ISM/Safety Improvement Project Managers' determination of percent complete for the task or activity. Upon receipt and review of objective evidence (i.e. approved procedures, presentations, training material and rosters, published SBMS documents, etc), the Project Manager turns to other means of validating the work accomplished by the responsible manager or action owner. Several sources of additional information may be available. These include first-hand observations, meetings,

telephone discussions with the responsible manager and/or action owner, and reports/documentation used as objective evidence. Upon assessment of all of these sources, activity/task % complete is determined for processing and reporting. To determine the subjective % complete, an educated guess will be employed.

VI.a Change Control Process

Change approval level and thresholds listed in Table 2 below establish the levels for any change to the ISM/Safety Improvement Plan baselines. Any project participant or stakeholder may propose a change. The ISM Project Manager reviews the request and identification of the affected system(s), confers with members of the Integrated Project Team (IPT), if needed, and makes the necessary changes, if appropriate. The ISM/Safety Improvement Project Manager routinely will communicate all changes to the IPT, who must approve any WBS Level 1 and above change. The IPT will include the DOE-BHSO, the BNL's Leadership and the BSA Board. The Project Manager and project participants must use the change control process to add, subtract, or modify the approved cost, schedule, and/or corrective actions.

Table 2, ISM/Safety Improvement Project Plan Change Approval Levels

	Integrated Project Team (Level 0 – 1)	Deputy Director for Operations (DDO)	ISM Project Manager (Level 3)
Cost	Contributed Resources	Contributed Resources	Contributed Resources
Schedule	≥ 3 months delay in a level 1 schedule milestone	≥ 1 month delay in Level 1 or Level 2 schedule milestone	Any delay in a Level 3 activity/action item or ≤ 1 month delay in Level 2 schedule milestone
Corrective Actions	New scope or any modifications to corrective actions that address direct and/or root causes	Any change affecting the mission or scope of the ISM/Safety Improvement project plan	New/updates to corrective actions. Minor edits and clarification on corrective actions

VII Resource Requirements

Line Managers will ensure resources identified to support ISM project objectives are made available in the time frames that are specified for project deliverables. This requirement includes department/division participation in Laboratory-wide document and training development, review and revision of existing BNL processes and methodologies, and working with the ISM/Safety Improvement Project Manager to incorporate ISM requirements into management systems, program descriptions and/or subject areas, and communicating of those changes to appropriate BNL staff.

Appendix A – Summary of ES&H Corrective Actions

Corrective Action	Target Completion Date	Action Owner
1. C.-1.1 – Developed enhanced processes for developing SBMS	***Completed***	R. Lebel
2. C-1.2 – Review and Revise SBMS Documents	June 29, 2009	R. Lebel
3. C-1.3 – Communicate new requirements and significant changes to subject areas	September 16, 2009	MS Stewards
4. Finding C-1 contributing actions from the ISM/Safety Improvement Plan effectiveness review	January 30, 2009	J. Selva
5. C-2.1 – Laboratory Director's Manager and Supervisor Forum	***Completed***	W. Hempfling
6. C-2.2 – Leadership development connection and communication	***Completed***	B. Schwaner
7. C-2.3 – Performance management system enhancements	***Completed***	B. Schwaner
8. C-2.4 – Organization conduct of operations and safety town hall meetings	***Completed***	S. Aronson
9. Finding C-2 contributing actions from the ISM/Safety Improvement Plan effectiveness review	February 22, 2009	J. Selva
10. C-3.1 - Review/revise the Experimental Safety Review (ESR) Process	***Completed***	S. Coleman
11. C-3.2 – Develop and implement a Web-Based Electronic ESR process	June 30, 2009	J. Selva/C. Johnson
12. C-3.3 – Perform an effectiveness review of the new web-based Experimental Safety Review process	January 15, 2010	C. Johnson
13. Finding C-3 contributing actions from the ISM/Safety Improvement Plan effectiveness review	***Completed***	S. Coleman
14. Finding C-4 contributing actions from the ISM/Safety Improvement Plan effectiveness review	***Completed***	S. Coleman
15. D-3.1 – Review and Revise the Integrated Assessment Program Management System	***Completed***	R. Lebel
16. D-3.2 – Create a baseline, risk-based assessment plan for each ESH&Q management system	June 30, 2009	R. Lebel / C. Parnell
17. D-3.3 – Develop an annual assessment plan for each ESH&Q management system	September 30, 2009	R. Lebel / C. Parnell
18. D-3.4 – Develop and implement training for conducting Integrated Assessments	***Completed***	R. Lebel
19. D-3.5 – Revise Integrated Assessment Program Management System Documentation	January 10, 2009	R. Lebel
20. D-3.6 – Line Organization Implementation Effectiveness Review	September 30, 2009	R. Lebel
21. Finding D-3 contributing actions from the ISM/Safety Improvement Plan effectiveness review	February 22, 2009	J. Selva
22. D-4.1 – Establish an institutional issues and assessments tracking working group	***Completed***	M. Bebon
23. D-4.2 – Identify Key ES&H Performance Information	December 30, 2008	R. Lebel / C. Parnell
24. D-4.3 – Revise Roles, Responsibilities, Authorities and Accountabilities (R2A2s)	December 30, 2008	T. Schlagel / R. Lebel
25. D-4.4 – Revise Integrated Assessment Program Management System Documentation and Implement the ES&H Performance Information Process	January 10, 2009	J. Usher
26. D-4.5 – Line Organization Issues Implementation Effectiveness	September 30, 2009	R. Lebel
27. D-5.1 – Revise the Investigation of Incidents, Accidents, and Injuries subject area	***Completed***	P. Williams
28. D-5.2 – Use trained investigators to perform accident investigations	***Completed***	P. Williams
29. D-5.3 – Review/evaluate prior accident investigation reports	***Completed***	P. Williams
30. D-5.4 – Conduct accident investigation training and assign injury / illness investigations	December 30, 2008	C. Parnell
31. D-5.5 – Line Organization Implementation Effectiveness	April 15, 2009	C. Parnell

Appendix B – Summary of Compensatory Actions

Compensatory Action	Target Completion Date	Action Owner
1. Synthesis of Alanes for Automotive Applications ESR 15403N rev.2	***Completed***	J. Wegrzyn
2. A Novel Approach for Biofuel Generation ESR 18507E rev.1	***Completed***	P. Kalb
3. Soft Matter Chemical Procedures and Instrumentation, ESR PM 2007-74	***Completed***	J. Taylor
4. Environmental Analysis for Mercury to Assess Deposition from Coal-Fired Electric Generating Plants, ESR 15603 rev. 2	***Completed***	P. Sullivan
5. Lockout/tagout programs in SBMS and in BNL-approved health and safety plans	***Completed***	J. Durnan
6. The Work Planning and Control subject area	***Completed***	S. Coleman
7. Instrumentation division local exhaust ventilation systems	***Completed***	R. Beuttenmuller
8. Conflicting direction about required safety controls	***Completed***	B. Gunther
9. Containers of flammable materials	***Completed***	P. Williams
10. Infrared and Optical Studies of the Electronic Properties of Solids under ESR PO2006-045	***Completed***	C. Homes
11. O&M-MMC-003 procedure for Collection and Disposal of Waste Oil	***Completed***	L. Somma
12. Belts and pulleys were not adequately guarded	***Completed***	P. Stelmaschuk
13. The floor accessible electrical outlets in the HEMO shop	***Completed***	T. Roza
14. The FRA for Facilities Used for Automotive Repair and Maintenance	***Completed***	R. Allingham
15. A tire inflation cage has not been provided in the HEMO shop	***Completed***	T. Roza
16. A flammable storage container is not provided in the motor pool for	***Completed***	R. Allingham
17. The suggested frequency exhibit of the ESH&Q Inspection Subject Are	***Completed***	C. Johnson

Appendix C, ISM/Safety Improvement Project Schedule