Environmental Programs Office and Environment, Health, and Safety Office

The Environmental Programs Office (EPO) is a senior administrative office. In keeping with MIT's values, EPO is responsible for working with MIT's senior officers and presidential committees to establish MIT's vision, commitment, and policies for environmental stewardship and for the health and safety of the MIT and larger community. MIT's values reflect excellent environment, health, and safety performance that exceeds regulatory compliance and embodies being an excellent environmental citizen of the world. EPO oversees the Environment, Health, and Safety (EHS) Office, which delivers EHS services and supports and oversees day-to-day Institute-wide EHS performance.

Highlights

- EHS training participation increased almost six-fold, from 4,000 individual sessions per year to 23,500 per year since implementation of the EHS system in FY2002.
- Hazardous waste cost per unit decreased by 15 percent in FY2007 for a total reduction of 40 percent since the inception of the Management System (MS) in FY2002. The total volume of waste decreased by four percent in FY2007, the first decrease since FY2002.
- The incidence rate of total recordable injury and incidence cases for MIT increased slightly and is at the national average for the college and university sector. The incident rate for cases with days away from work continues to decrease, but is still above the national average for colleges and universities.

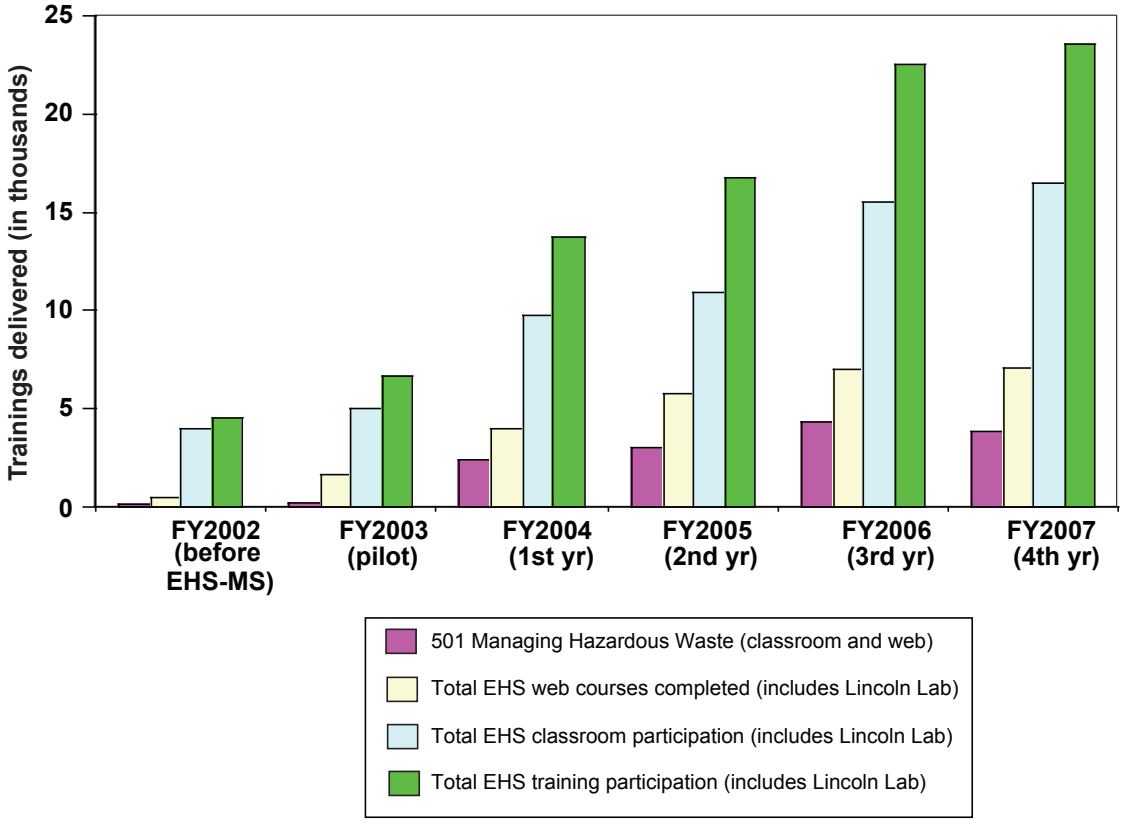
Goals for Fiscal Year 2008

- Conduct the biennial audit of the EHS–MS by a third party or the MIT Audit Division
- Maintain or increase training completion for the core EHS courses
- Develop and receive approval for an upgrade to the inspection system in SAP—This upgrade will facilitate data management and provide a more consistent and efficient method to capture, report, and correct findings.
- Enhance campus sustainability program by initiating new pollution prevention programs, decreasing hazardous waste costs, and supporting campus energy initiatives
- Reduce our injury and illness rates to below the average for colleges and universities

Training

Impact of EHS–MS on EHS Training. There has been a 12-fold increase in the number of individuals completing the Managing Hazardous Waste training sessions between FY2002 (the year before the EHS–MS training system was launched) and FY2007. For the same time period, overall EHS training participation has increased almost six-fold, from 4,000 individual sessions to 23,500 (an individual might be a participant in more than one course). See Figure 1.

Figure 1. Number of EHS course trainings delivered,* FY2002–FY2007



* Trainings refers to one participant in one course; an individual may be a participant in more than one course.

- There have been 9,753 individuals who have taken at least one EHS course since FY2002. In FY2007, 2,033 took a course for the first time.
- There was a 34-percent increase in EHS course participants between FY2005 and FY2006, following a 20 percent increase from FY2004 to FY2005. This increase has begun to level off, with a four percent increase from FY2006 to FY2007. We believe we are now reaching almost all of those who need EHS training.
- Training requirements can now be set based on academic courses and special groups. This new capability brought 800 undergraduate students into the EHS–MS training system between the fall and spring semesters.
- For FY2007, 30 percent of EHS training was web-–delivered, compared to 31 percent in FY2005 and 30 percent in FY2006.

- Total training time for participants was approximately 35,300 contact hours, compared to 25,101 for FY2005 and 33,747 hours for FY2006.
- Total time for EHS trainers (EHS Office only) was approximately 2,860 hours, or 1.5 full-time equivalents (FTEs). This was similar to FY2006, and represents more than a 25-percent increase in efficiency from FY2005, as more people were trained using fewer resources.
- Web-based training costs increased 16 percent, from $15.50 to $17.50 per student.
- EHS cost per student in the classroom was approximately $10.75 per session, which is similar to FY2006, and represents a 15-percent decrease from FY2005 because of increased class sizes.
- MIT's "Environmental Virtual Campus" continued to be extremely successful. Over the past twelve months, the site received more than one million hits from tens of thousands of visitors around the world. In all, the site has hosted visits from more than 100 countries.
- Web courses currently available are Managing Hazardous Waste, Resource Conservation and Recovery Act (RCRA), Oil Spill Prevention (SPCC), Hazard Communication (HAZCOM), Chemical Hygiene, Bloodborne Pathogens, Hydrofluoric Acid, and Nuclear Reactor Radiation Safety. Three web modules (RCRA, Chemical Hygiene, and Hydrofluoric Acid) have been customized as a separate course for Lincoln Laboratory (LL).

Core courses training completion metrics. This year, what we considered EHS core course metrics were calculated for the first time across the Institute. The May 7, 2007 data is presented in Table 1.

Table 1. Completion rates for core EHS courses, FY2007[1]

Course	Attendees	Completion Rate
General Chemical Hygiene and Hazard Communication (100 and 120)[2]	4,568	96%
Lab-specific Chemical Hygiene and Hazard Communication (110 and 121)[3]	3,314	85%
Bloodborne Pathogens (200 and 210)[2]	1,526	92%
General Biosafety (260)[3]	2,688	97%
Radiation Safety (301)[3]	1,074	96%
Laser Safety (371)[3]	962	96%
Managing Hazardous Waste (501 and LL 506)[2]	3,918	87%

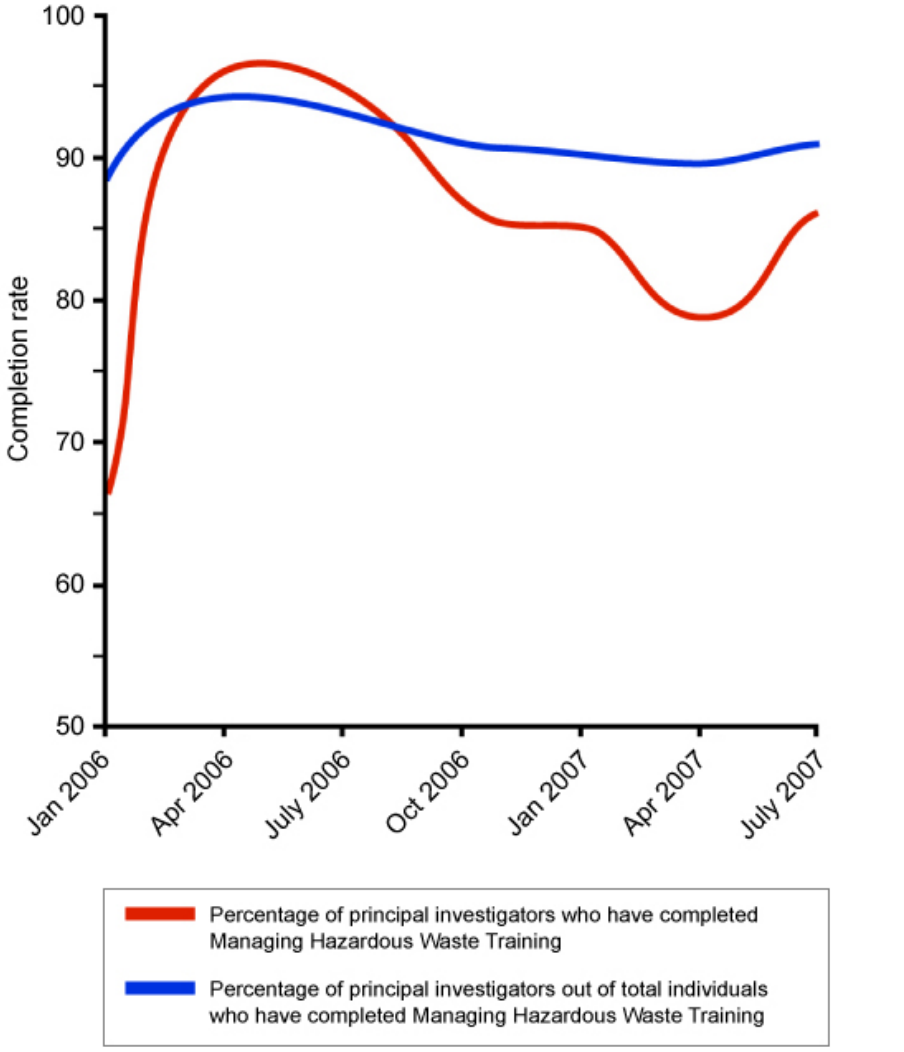
[1] Data as of May 7, 2007.

[2] Live and web course

[3] Live only

Principal investigator (PI) completion rates for Managing Hazardous Waste dropped steadily throughout the year, with a final completion rate of 79 percent. Hazardous waste overall hovered around a 90 percent completion rate for most of the year (See Figure 2).

Figure 2. EHS Managing Hazardous Waste training completion rates, January 2006–July 2007



Note: It is unlikely the system will ever show 100 percent statistical compliance because (1) people leave the Institute or space and their training expires but the system believes they are still here unless they are removed from the system, (2) individuals sometimes fill out their training needs assessments incorrectly and do not need some of the training identified, and (3) people may fill out the training needs assessment well before they actually begin work and wait until that time to complete training. A new data reconciliation procedure instituted in FY2006 has helped to rectify this issue. These data indicate that at any point in time, all those who need core EHS training have received it or are working under the supervision of someone who has.

Inspections

The EHS–MS Audit/Inspection program is a key component of the Management System, and promotes, monitors, and focuses on the effectiveness of regulatory training, compliance, and good practices to achieve environmental sustainability. This program consists of three tiers of inspection that are designed to assess performance, correct problems, and prioritize areas for improvement.

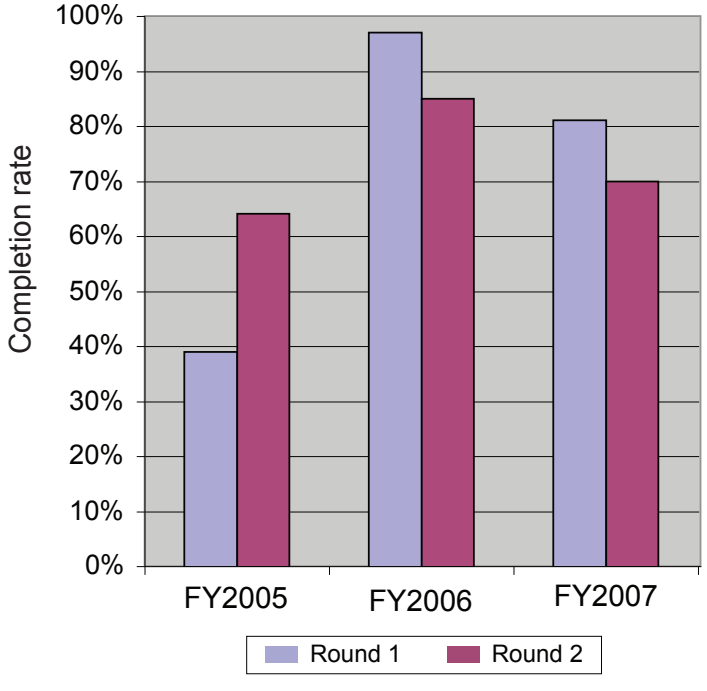
The Level I inspection is conducted by the department, lab, or center (DLC) person assigned that role and is reviewed at the time of the Level II program. The Level II program is a DLC-wide inspection conducted by the local DLC EHS coordinator and the EHS Office. Level II inspections are done twice each year in research DLCs and annually in non-research areas. The Level III audit is a third-party audit conducted on a two-year cycle, and can be focused on the overall system or a specific element(s). The next Level III audit is scheduled to be completed by the end of 2008 calendar year.

Ongoing Programs

Level II Inspections/Performance Metrics

In FY2007, two rounds of Level II inspections were conducted in research areas and one in operations. Completion metrics for each round in research DLCs are shown in Figure 3. It should be noted that the January–June 2007 round one (displayed as the second round in FY2007) is currently in process, and results are current as of the date of this report. In general, results indicate that approximately 80 percent of registered space was inspected this past fiscal year, a level consistent with that of the previous year. Similar results were found in operation areas for FY2007. The total number of spaces inspected at least once this year was 2,345.

Figure 3. Completion rate for Level II inspections, FY2005–FY2007

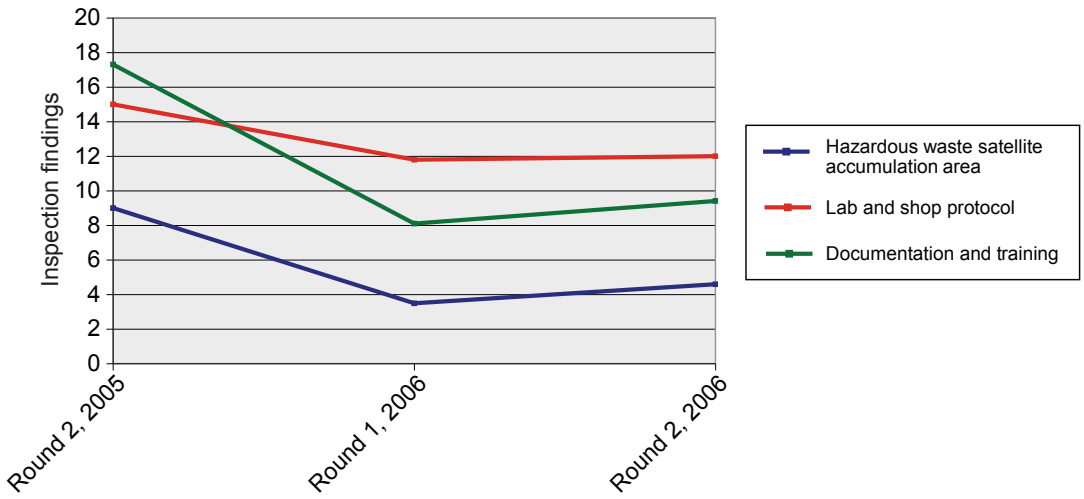


During this past fiscal year, we focused on improving the consistency of performance of the various elements of the inspection program. Efforts have included question review, development of a process to address issues that are difficult to resolve, and revision of the Level II Standard Operating Procedures and developing a proposal to enhance the overall management of the program.

Level II Inspection/Findings Metrics

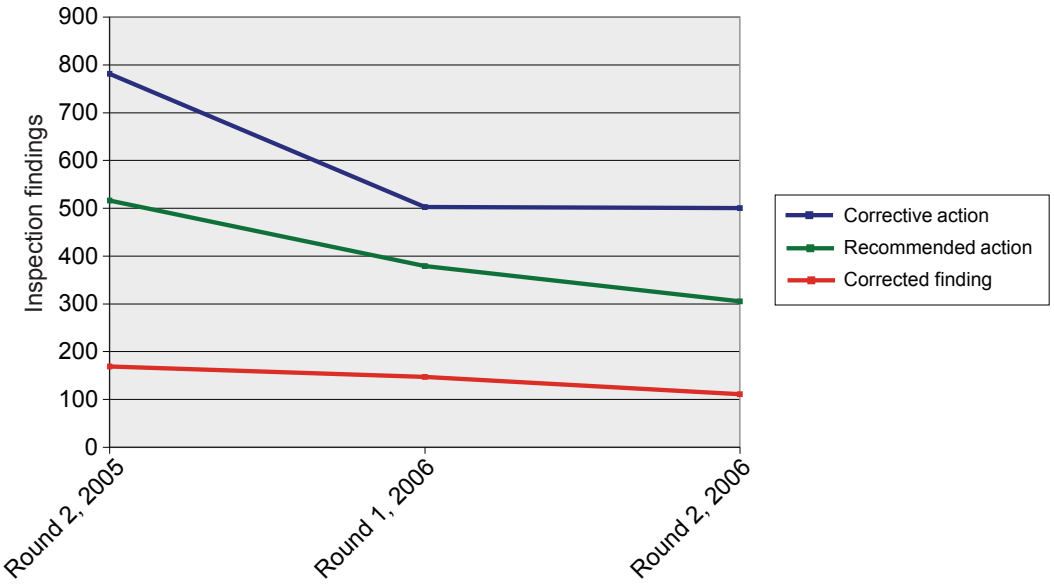
A DLC-specific checklist is created based on registered hazard(s) for the spaces. Findings (items that must be corrected) are either corrected at the time of inspection or assigned to someone for correction. The total number of findings in the first round in FY2007 (calendar year 2006 round two) for three key question categories (Hazardous Waste Satellite Accumulation Area, Lab Shop Protocol, and Documentation or Training) is again consistent with that of round one of 2006, and is a significant reduction from round two of 2005. To provide comparison across rounds, the data are normalized to the fraction of space subject to inspection for the given round. When corrected for the number of questions in a category, results in Figure 4 indicate an equivalent number of findings across the three categories. The consistency in the reduced number of findings from 2005 is evidence of the continued benefits of training and the overall awareness of EHS issues across MIT.

Figure 4. Level II inspection findings, by question category, normalized by round, 2005–2006



Findings are categorized into one of two general classes: recommended actions for minor findings and corrective actions for the more significant findings. Inspection teams consistently identify most findings as requiring a corrective action. The findings corrected at the time of inspection are categorized as corrected findings. The assigned findings by category are shown in Figure 5, which shows a decrease in the number of findings with "corrective" as the recommended action.

Figure 5. Level II inspection findings, normalized by round, 2005–2006



Faculty Research Protocol Support and Compliance Committees

The EHS Office's protocol development and review support is integral to our faculty's undertaking safe and legally compliant research. There are six faculty research oversight committees with significant EHS implications: the Committee on Use of Humans as Experimental Subjects (COUHES), the Institutional Animal Care and Use Committee, the Radiation Protection Committee (RPC), the Toxic Chemical Committee, the Reactor Safeguards Committee, and the Committee on Assessment of Biohazards (CAB). These committees fulfill specific federal regulatory requirements in the areas of human subjects and research animal protections, and the safe use and containment of radioactive, chemical, and biological materials at MIT. The faculty chairs of these committees are members of the Institute Council on EHS, which oversees MIT's EHS performance and the implementation, and effectiveness of the EHS–MS. The EHS Office participates in all six faculty research oversight committees and serves as administrative support for the RPC and the CAB. The managing director of the EHS programs and the director of the EHS Office are members of the Institute Council on EHS.

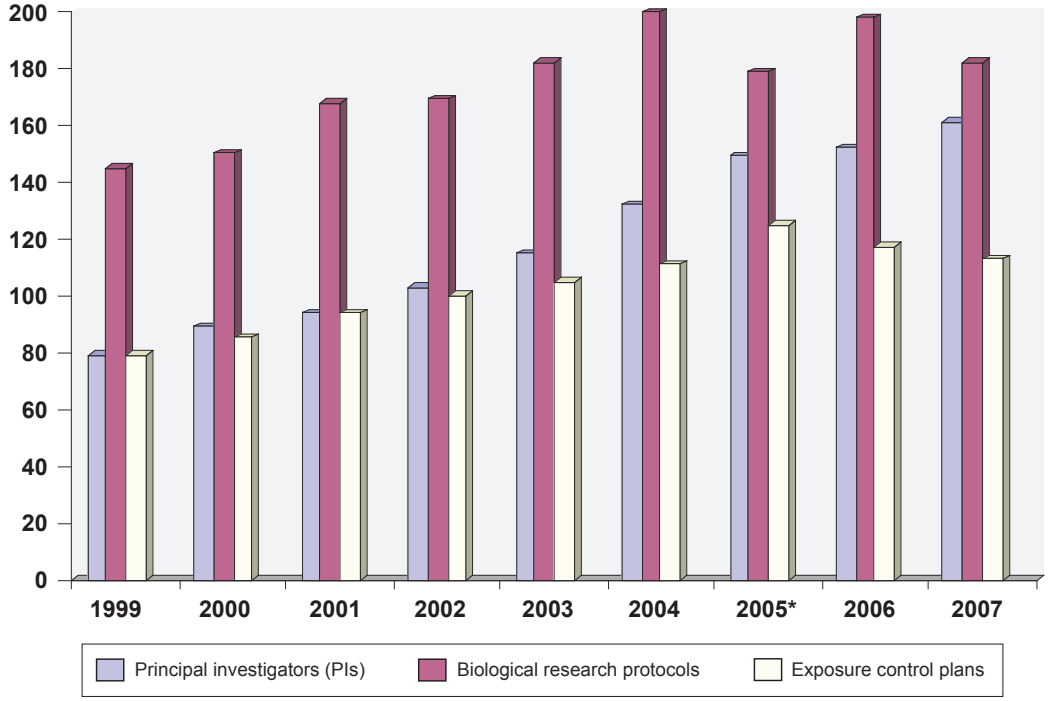
The EHS Biosafety Program and Lincoln Laboratory administration established an internal LL Biosafety Committee. This committee focuses on development and implementation of site-specific safety policies and procedures. All protocol reviews and approvals are the purview of the MIT CAB.

The EHS Biosafety Program also administers the Institutional Biosafety Committee for the Draper Laboratories. The Institute's RPC also functions as the Whitehead Institute's radiation committee.

Overall, the EHS Office has direct contact with almost 50 percent of the faculty in science, engineering, and research. During the past five years, the biosafety and radiation safety services (as measured by protocol and authorization reviews, inspections, and

training) have grown almost 10 times faster than the growth in faculty. This is due to the EHS Office's consistent efforts to interact with researchers, to optimize services and oversight through their respective registration and research tracking programs, and to the continued growth in research at MIT. For example, funding to MIT from the US Department of Health and Human Services (DHHS) grew by 12 percent over last year (data from the MIT Office of Institutional Research). In the past seven years, the number of PIs enrolled in the Biological and rDNA Research Project Registration Program has increased by 71 percent and the number of research protocols reviewed by the EHS Office and approved by the committees has increased by 32 percent. By comparison, the number of tenured and tenure-track faculty at MIT has increased by only six percent within the Schools of Science and Engineering and in the purview of the vice president for research. Figure 6 shows the growth in biological research as measured by the number of PIs and protocols registered in our system.

Figure 6. Increase in biological research registrations and principal investigators in Science, Engineering, and the Vice President for Research from FY1999–FY2007



*Prior to 2005 the Whitehead Institute's Biosafety Program was administered through MIT's EHS. In 2004, the Whitehead Institute implemented its own biosafety program, removing 13 PIs and 20 protocols that had been reviewed in 2004.

The number of faculty engaged in biological research continues to grow, and the number of new faculty engaged in bio-related research is up by 10 percent. This growth in bioresearch is also reflected in the increased level of DHHS funding. The projected growth in research space utilized for biological research at MIT has fulfilled expectations (Table 2). However, the growth in research space is due not just to the new buildings outlined below, but also to the conversion of a number of non-research spaces into biolabs (there are now bioresearchers in labs in Building E15, the Media Lab, for example). We mentioned the addition of many new faculty members engaged in

bioresearch last year, and we expect this trend to continue, as we have three new faculty members already in the process of registering their research. Their lab renovations are underway, and that data will be included in those for 2007–2008.

Table 2. Growth in space for biological research, 2003–2006[1]

Total assignable bioresearch space (2003)	340,173 sq ft
Additional assignable bioresearch space in building 46 (2006)	111,522 sq ft
Additional assignable bioresearch space in the Broad Institute at 7 Cambridge Center (2006)	105,000 sq ft
Total assignable bioresearch space in 2006	**556,695 sq ft**
Percent increase from 2003 to 2006	63.6%

[1]Data provided by MIT Office of Sponsored Programs

The growth of bioresearch at MIT dramatically increases the workload of the Biosafety Program staff. This, coupled with the development of several new research technologies (synthetic biology, nanoparticle delivery of biological materials, and development and use of hES cells), will be a challenge for the Biosafety Program staff. They will have to develop the expertise needed to provide the appropriate level of collaboration and oversight for these projects while maintaining the expected level of performance in all the other areas.

The Institute biosafety officer leads an effort to reduce the burden on researchers using established human cell lines. COUHES has agreed that the use of established human cell lines from commercial sources or where no identifying information concerning the original cell or tumor donor is available to the researcher does not require registration or the committee's review. Use of these established human cell lines is not considered human subject research by the Office for Human Research Protections or by the National Institutes of Health (NIH). This agreement removes the conflict with NIH grant process that was created by the former COUHES requirement. The MIT Biosafety Program will refer to COUHES for approval any investigators who use human materials that might be traced back to a donor. Many investigators (80–90) no longer require COUHES registration and approval, which reduces their administrative burden.

The Radiation Protection Program of the EHS Office reviewed or renewed 90 applications or amendments for authorizations to use radiation-producing material under MIT's license. The total number of authorizations currently in effect is 129, which are used in 648 laboratories by approximately 1,500 researchers. Each authorization can include several protocols, and is required to be reviewed biennially. There are currently 385 protocols on file for use of radioactive material.

Hazardous Waste Metrics

In FY2007, the EHS Office requested bids for all hazardous waste services provided to MIT. The Environmental Management Program (EMP) selection committee followed a thorough process in choosing MIT's next environmental management service provider,

in which a request for proposal (RFP) was sent out to all of the top service providers in the area. Based on the selection process and criteria, the EMP committee recommended that MIT present Triumvirate Environmental, Inc. (TEI) with the full three-year contract. The selection criteria and key improvements in the new contract include:

1. Cost of Services—TEI has proposed a 10–15 percent reduction in current rates billed to MIT for the next three years.
2. Technical and Readiness Qualifications—TEI's 13-year history at MIT has created a strong relationship with facets of the MIT community that include members of the EHS Office, EMP, and laboratory and facility managers throughout the campus.
3. Quality of Service—TEI's experience and commitment to pollution prevention initiatives at MIT and other universities has set the company apart from its competition.
4. RFP Response—TEI provided a complete and relevant RFP response. All questions and requests were answered upon request.
5. Limit Liability, Indemnification, and Compliance History—TEI fulfills the requirements to minimize risk over the long term for hazardous waste disposal.

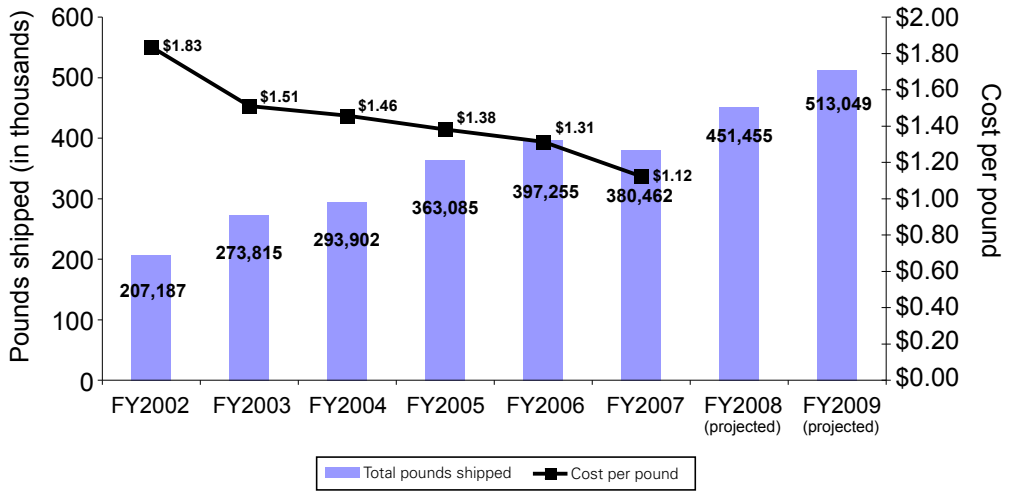
The most important outcome from this accomplishment is a strong and complete contractual agreement between MIT and the hazardous waste vendor, which is a significant step forward in this program. This contract will enable MIT to reduce the overall costs associated with the services provided while improving quality and reducing liability.

In FY2007, MIT continued the trend of unprecedented waste generation due in part to growth in research and infrastructure. To confront this issue, the hazardous waste program has set a goal for reduction using a balanced scorecard approach. An improved tracking system identified the DLCs with the highest levels of waste generation, and those areas have new strategic objectives for reduction. For example, one new objective worked on the consolidation of liquid effluent wastes from certain lab procedures and lab equipment. Consolidation of these waste streams improves compliance in labs, reduces clutter, reduces waste, and saves money. There are several installations on campus and the program continues to catch on. One indicator of this success is the hazardous waste unit costs have been reduced consistently every fiscal year. These savings total $7,000–10,000 per month, and that number will improve with the new contract that starts in FY2008. Other program efficiencies leading to waste and cost reduction included:

- Increasing storage in the main hazardous waste accumulation area to reduce the number of pickups by 50 percent
- Lab-specific waste generation analysis
- A fully staffed hazardous waste team
- Improved communication and guidance

As a result of all of these efficiencies, MIT achieved the first-ever reduction in hazardous waste generation when compared with the previous fiscal year. Overall, hazardous waste generation (measured in pounds) at MIT decreased by four percent between FY2006–FY2007. Figure 7 shows the history of hazardous waste generation and disposal costs per unit. There has been a 15 percent reduction in costs per pound in FY2007, and an overall reduction of 40 percent since FY2002.

Figure 7. Total pounds of waste shipped from MIT's main hazardous waste accumulation area, and cost per pound, FY2002–FY2009 (projected)



Ergonomics

The EHS Office has collaborated with MIT programs and departments to reduce repetitive stress and other injuries and lost workdays. The intended outcomes are an increase in productivity, a reduction in medical and disability costs, and most important, reduced pain and suffering among members of the MIT community. The EHS Office leads the Ergonomics Committee, an ad hoc collaborative effort of the Libraries, Information Services and Technology, Human Resources, the Department of Facilities (DOF), Lincoln Laboratory, the Whitehead Institute, MIT Medical, and a student representative introduced a web-based training course in FY2005. In FY2007, 30 computer users at MIT took the online training, bringing the total to 1,326 since the course's launch in February 2004. There were some technical problems in FY2007 because of introduction of new software from the service provider, and as a result, access to the ergonomics program was limited to 30 people.

A key feature of this online course is to provide a risk assessment for each participant. Risks are classified as high, moderate, or low, and the course provides immediate feedback on corrective actions that the participants can take. If they complete the corrective actions, the program reclassifies them. In FY2007, 20 people were initially classified as high risk, but after they made changes, five of them, or 25 percent, were

reclassified. Those remaining classified as high risk were contacted by the EHS Office for a site visit. There were 152 onsite visits conducted in FY2007. A follow-up survey to those visited indicated more than 90 percent of them experienced improvement in their work environments.

DLCs with a high incidence of repetitive strain injuries collaborated with the EHS Office and Ergonomics Committee to develop programs to identify and correct problem areas to prevent future injury. This involved detailed surveys and reviews of specific work sites and activities, the development of materials including PowerPoint presentations and videos, and the implementation of training. This program was implemented in the DOF, the Division of Student Life (DSL), and the Division of Comparative Medicine, the three DLCs with the highest injury rates.

Construction Safety Program

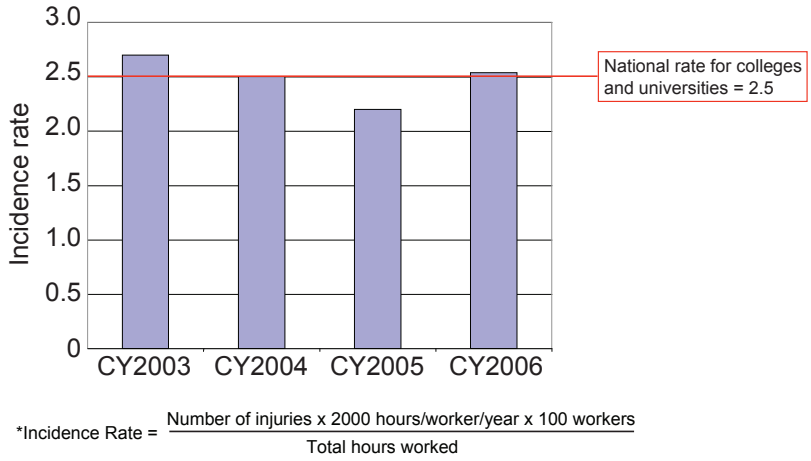
This is the fifth full year of the EHS Office's collaborative effort (with funding from the DOF) to provide EHS expertise to new construction and renovation projects. The objectives of the program are to ensure that EHS requirements are addressed for new construction and renovations, to protect the MIT community during construction and renovation activities on campus, and to strengthen MIT's relationship with authorities in the City of Cambridge responsible for regulating these activities. This program involves an initial review of design and construction plans; close communication with DOF project managers, contractors, and City of Cambridge Fire Department and Inspectional Services Department; and ongoing inspections of the construction sites. The advantages of the program include fewer regulatory inspections, fewer time delays, and cost savings. During FY2007, six major projects and 44 renovations were reviewed.

Injury and Illness Reduction Initiative

The EHS Office continues to work with DLCs to use the new incident reporting and investigation system completed in FY2006. The system centralizes and links all information related to an incident electronically, facilitates data handling, and provides online access to reports on injuries to DOF management, EHS office staff, and EHS coordinators in the DLCs. We focused in FY2007 on introducing this new system to supervisors, and using the information collected to design strategies to minimize future incidents. We also developed and implemented a program to certify a number of EHS Office staff in Incident Investigation.

The incidence rate (2.5) of total recordable injury and illness cases for the 2006 calendar year is shown in Figure 8, along with data for the previous three years. While the downward trend in the incidence rate that had occurred over the previous three years did not continue for 2006, due primarily to the major fire at One Broadway, the incidence rate is still well below that of the latest available (2005) incidence rate of 4.6 for private industry, and equal to the incidence rate of 2.5 for colleges and universities. We worked with supervisors and employees in 2006 on an initiative to decrease the number of days away from work. The number of days away from work decreased by 33 percent from 2005 to 2006, and has decreased by 49 percent from 2003 to 2006. MIT saved an estimated $433K in 2006, relative to costs of lost productivity if the number of days away had not changed since 2003, and an estimated $766K over the past three years (see Table 3).

Figure 8. MIT incidence rates* of recordable injuries and illnesses, calendar years 2003–2006



*Incidence Rate = $\frac{\text{Number of injuries x 2000 hours/worker/year x 100 workers}}{\text{Total hours worked}}$

Table 3. Cost savings from reduction in number of days away

Year	Number of days away	Number of FTEs	Cost of FTEs[1]	Cost if days away equal to 2003[1]	Cost Savings
2003	2,721	13.605	$816,300	$816,300	$0
2004	2,295	11.475	$705,713	$836,708	$130,995
2005	2,079	10.395	$654,885	$857,115	$202,230
2006	1,385	6.925	$448,740	$881,604	$432,864

[1]Cost calculation uses the following estimated compensation: for 2006, $64,800; for 2005, $63,000; for 2004, $61,500; for 2003, $60,000.

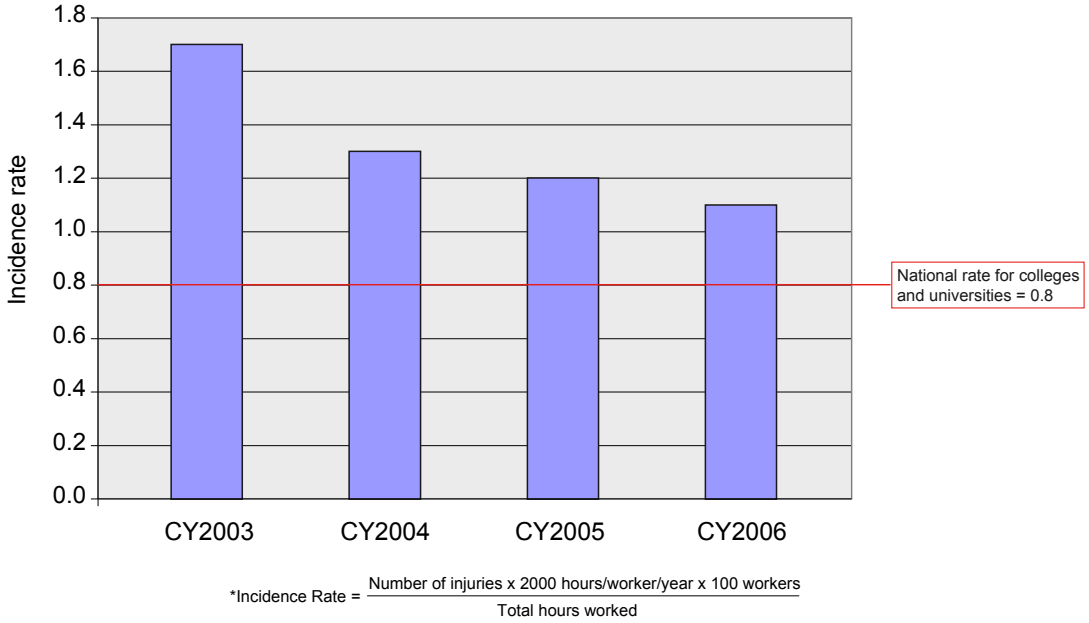
The trend in MIT's incidence rate of cases with days away from work is shown in Figure 9. MIT's rate continues to decrease, and approaches the national rate for colleges and universities, which has held steady for several years at 0.8. We estimate that MIT could save approximately $116K if the Institute were at that 0.8 rate instead of the 1.1 rate (details of calculation are shown in Table 4).

Table 4. Cost savings for 2006 if MIT were at the national incident rate for days away from work for colleges and universities[1]

	Days away rate	Number of cases	Number of FTEs lost[3]	Cost of Lost Productivity at $64,800 per FTE
MIT actual rate	1.1	116	6.90	$447,120
NAICS 6113 (university)[1]	0.8	86[2]	5.11	$331,128
Difference	0.3	30[2]	1.79	$115,992

[1]Per the North American Industry Classification System (NAICS, code 6113)
[2]Number of cases = (rate x hours worked) / (2,000 hours per work year x 100 workers)
[3]MIT's average number of lost work days per lost work day case in 2006 = 11.9. Full-time equivalents (FTEs) = (number of cases x 11.9 lost work days/case) / 200 workdays/year/FTE

Figure 9. MIT incidence rates* of recordable injuries and illnesses with days away from work, calendar years 2003–2006



*Incidence Rate = $\frac{\text{Number of injuries x 2000 hours/worker/year x 100 workers}}{\text{Total hours worked}}$

Select Agent Program

The passage of the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 resulted in new regulations from the DHHS and the US Department of Agriculture (USDA). The new regulations were promulgated in December of 2002, and require tighter controls on access to, and the possession, use, transfer and disposal of, certain biological agents and toxins (called select agents and toxins in the regulations) that have been determined by the DHHS, the Centers for Disease Control and Prevention (CDC), and/or by the USDA Animal and Plant Health Inspector Service to have the potential to cause significant harm to the public, animal, and/or plant health or products. This act and the new regulations have had a significant impact on a small number of MIT laboratories, but have required MIT to register as an institution, to maintain strict inventory control on certain agents and toxins, to have FBI security risk assessments done on researchers and other staff who have access to such materials, and to have specially secured research spaces. The regulations have separate campus-wide and Lincoln-wide per-PI toxin volume exemptions, and the EHS Office, with support by a faculty-led task force, worked with Procurement to implement central purchasing through the EHS Office Biosafety Program for all listed toxins. This ensures that researchers who use these common toxins do not inadvertently exceed the volume exemptions and become subject to the regulations. All regulated agent purchases also must be made through the EHS Office Biosafety Program deputy director or her alternate under the regulations. The EHS Office conducted several broad surveys of all laboratories that have the potential to possess or use regulated or exempt materials.

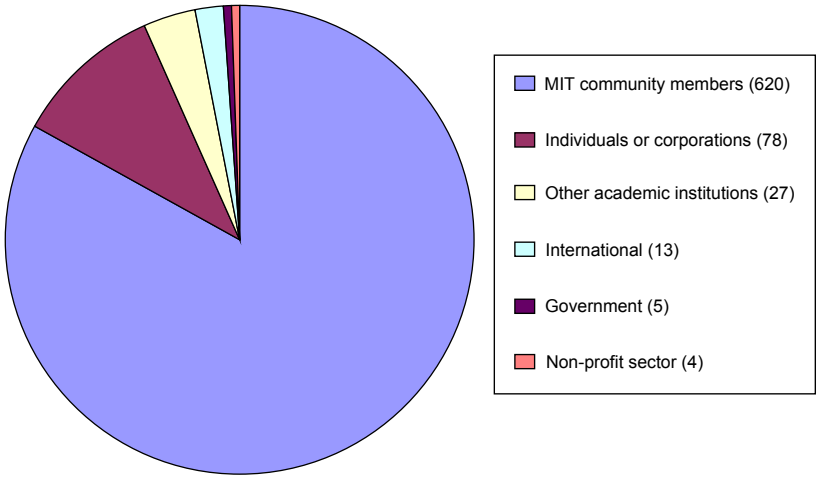
The Select Agent Program has undergone one federal agency inspection this past year, conducted by the CDC and the USDA. There were no significant findings.

Enhanced Delivery of EHS Services

Automated Request Tracking

The EHS Office continues to triage and expedite its service response to internal and external customers using a single email alias for all EHS and EHS–MS questions. When customers submit requests to EHS using the environment@mit.edu email address, it submits their queries to the EHS queue in MIT's Request Tracker (RT) customer support system and emails the customer request to the EHS Office RT administrator and backup. RT then sends an acknowledgement to the customer to say that the request has been received and to expect a response within 48 hours. The EHS staff personally assists most customers within two days, with the occasional more complex requests requiring additional time to resolve. Using this streamlined process, 747 customer requests and questions were resolved in FY2007. The source of the email request is shown in Figure 10.

Figure 10. Customer emails received by EHS Office, by source, FY2007

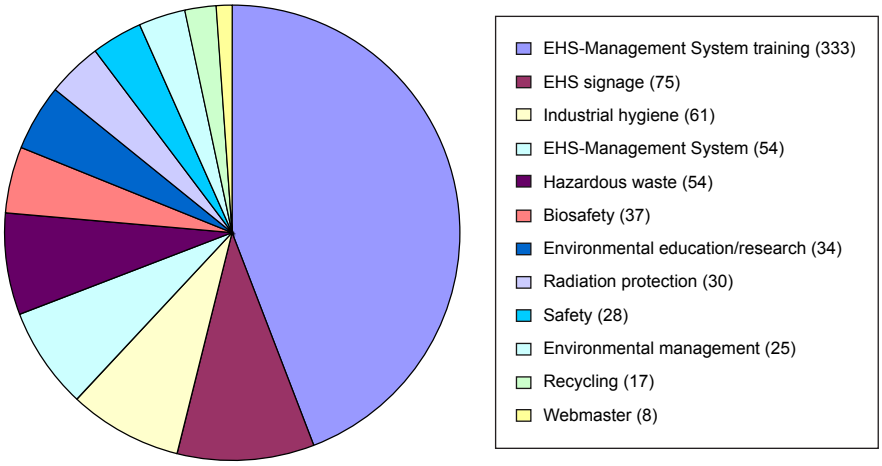


The EHS RT triage process provides information on the EHS–MS and EHS operations service areas that generate the most email requests. This helps management plan the resources required to meet customer needs. The breakout of types of requests by topic is presented in Figure 11.

Customer Satisfaction Surveys

Once a customer request is marked as resolved, RT sends out a link to the EHS Customer Satisfaction Survey. This functionality, originally launched exclusively for EHS in FY2006, also identifies the numbers of the original requests so that EHS staff can provide additional assistance if the survey responses indicate that the services provided do not fully resolve the requests. This process supports both the EHS–MS and EHS operations continuous improvement initiatives. Monitoring and analyzing survey responses highlights types of responses that are most effective and those that could be improved. It also provides an electronic EHS suggestion box, where customers send in ideas for improving the EHS–MS and EHS.

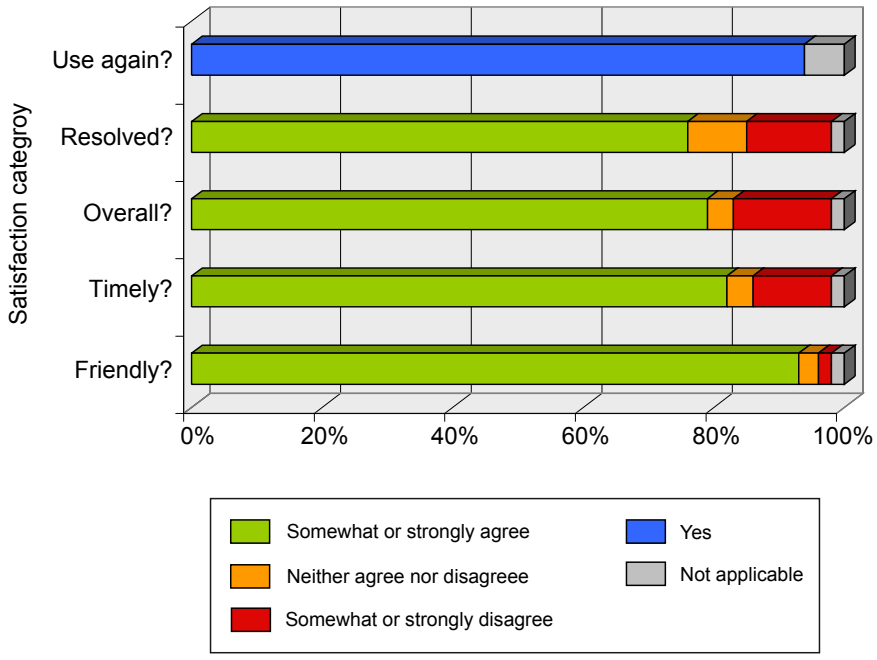
Figure 11. Email requests received by EHS Office, by topic, FY2007



Of the 622 requests submitted to EHS (the survey was not operating for 18 weeks), 100 surveys (or 16.1 percent of the total) were returned after the customers' requests were resolved; this is a 2.9 percent increase from FY2006. Nine of the 100 surveys received included requests for additional service or clarification, which provided EHS with the opportunity to understand its customers' needs better and to tailor its response to these individual clients.

The results include 90 MIT customer surveys and 10 surveys from outside MIT. On a scale of one to five (with five as the most positive rating) Figure 12 illustrates the results of these surveys.

Figure 12. EHS email service customer satisfaction survey results, FY2007



Support for Special Off-Campus Projects

The EHS Office provided significant support to off-campus efforts over the past year. These activities included activities related to the Bates Linear Accelerator facility's decommissioning, extensive efforts in support of environmental activities for the Office of Real Estate's portfolio properties, and support related to the Haystack Ultrawideband Satellite Imaging Radar Upgrade Project.

During FY2005, the Bates Lab initiated a pre-decontamination and decommissioning (D&D) program as part of the Department of Energy user facility phase-out. This program involved identifying and removing equipment that would no longer be useful in future lab activities. As part of this effort, the EHS Office developed and implemented a screening procedure to separate those materials requiring disposal as radioactive waste from those meeting free-release criteria, representing an approximately $300K savings in D&D costs in FY2005, $100K in FY2006, and another $100K in FY2007.

Scope of EHS Activities

EHS Office activity metrics reflected the scope and intensity of services necessitated by both expanding research activity at MIT and a host of local, state, and federal EHS regulatory requirements that related to this research. Since MIT's research volume has increased by almost 20 percent since FY2004, the EHS Office experienced at least a 10 percent increase in activity. Many EHS activities fall into the following three major groupings:

Surveys (typically involving measurements) to monitor the safe use of equipment and materials. Approximately 21,000 such surveys were implemented in FY2007 concerning equipment and safety practices related to the use biological and radioactive materials, chemicals, recombinant DNA technology, and infectious agents.

Inspections (involving detailed observations) conducted to verify the quality and compliance of EHS activity on campus and investigations initiated at the request of MIT programs and laboratories. Approximately 7,000 such inspections took place this past year, encompassing the use and storage of hazardous waste, the use of ventilation hoods, and the use of recombinant DNA technology or infectious agents.

Monitoring and prevention regarding a range of potential workplace hazards and exposures. This includes chemicals, asbestos, blood-borne pathogens, workplace injuries such as repetitive strain injuries, and safe practices during hot work. In FY2007, the EHS Office performed more than 3,800 lab analyses for chemical and biological materials and more than 50,000 surface, air, and water samples for radioactive contamination. Approximately 251 asbestos abatement projects were monitored and completed, an increase of 33 percent from FY2006, due to an increase in renovation activities and implementation of new asbestos procedures.

Regulatory Interactions

OSHA	One complaint was filed with OSHA and is still under investigation.
Nuclear Regulatory Commission (NRC)	One unannounced inspection of the Special Nuclear Materials license, SNM-986, conducted on January 22–23, 2007. Based on the inspection findings, no violations were identified.
Centers for Disease Control and Prevention, US Department of Agriculture	Each of these agencies separately inspected our select agent laboratories. All inspections were satisfactory and in some cases, commendations were made.
Cambridge Fire Department	Training for the Cambridge Fire Department Hazardous Materials Response Team was conducted in preparation for "Operation Poseidon", an Office of Homeland Security drill simulating a radiological dispersal device explosion at the CambridgeSide Galleria. The EHS Office played a major role in the drill: 15 EHS individuals participated on September 17, 2006 (a Sunday) from 5:00 am to 1:00 pm, playing roles as radiological contaminated victims or as trained observers. EHS continues its effort in offering training to the Cambridge Fire Department and the Cambridge Police Department.
Massachusetts Water Resources Authority	Received notice of noncompliance for slightly elevated levels of mercury in waste water discharge. No monetary fine.
Cambridge Local Emergency Planning Committee (LEPC)	Several members of the EHS Office participated as members of the Cambridge LEPC. The Institute participated in two disaster drills with the city. EHS personnel assisted in the planning of one of the drills.
Massachusetts Department of Environmental Protection (DEP)	The EHS Office interacted with the Massachusetts DEP regarding many of MIT's 83 Massachusetts Contingency Plan sites (urban materials contaminated sites), many of which result from the location of our campus on urban fill. Massachusetts DEP assessed MIT $42,965 as the result of an accidental oil spill in November 2005. MDEP did not request any changes to MIT protocols and is in agreement that MIT addressed the cause of the accident immediately and adequately.
Massachusetts Department of Public Health Radiation Control Program	One unannounced inspection of the MIT Broad Scope license #60-0094 was conducted on October 4–6, 2006. There were no items of noncompliance found as a result of this inspection. One announced inspection of the MIT Broad Scope license #60-0094 was conducted on May 17–18, 2007 to verify the implementation of the "increased controls" security orders issued by the NRC in July 2006. There were no items of noncompliance found as a result of this inspection.

Communications and Awareness

Three newsletters were published and distributed in the last year, with articles on a variety of topics written by EHS and EPO staff members. EHS staff also distributed EHS and EHS–MS information at the Vendor Fair, The Events Fair, the Health and Wellness Fair, and the Earth Day Fair. Surveys were conducted at these events to assess awareness, as part of a balanced score card initiative. Awareness is high amongst those working with potentially hazardous materials and significant for the campus as whole.

Campus Sustainability Initiatives

MIT's approach to EHS performance reflects a holistic and high standard of stewardship, integrating important voluntary environmental stewardship initiatives (which are managed through the Campus Sustainability Program of the EPO) with compliance programs. Over the past year, we undertook numerous collaborative initiatives that involve many departments and programs in order to reduce the Institute's environmental impacts and to improve the safety and quality of life at MIT. These efforts benefit MIT, its neighbors, and the region. Going well beyond regulatory requirements, these initiatives are intended to develop sustainable ways to safeguard the environment and the health and safety of the MIT and larger community.

Campus Sustainability Program

FY2007 saw the continued growth of the Campus Sustainability Program, with its development of new stewardship initiatives that focus on energy and a deepening of our partnerships with faculty, students, and staff. The deputy director position created in FY2006 continues to serve as focal point of new program development, coordination among other departments and academic units with campus sustainability roles, and as a liaison with senior leadership on issues of campus sustainability. This staff member was recognized with the institute's James N. Murphy Award for his contributions to campus community life. The assignment half-time of an assistant officer in the EHS Office to support the Sustainability Program has allowed the program to meet some of the growing programmatic needs required by these new partnerships, especially with our students.

Support for Campus Operations, Academics, and the Community: An Overview of Several Campus Sustainability Initiatives

EPO and EHS Office work to advance MIT's environmental goals relies on building and supporting collaborations across campus and across the community. These programs work simultaneously with MIT's operational units and DLCs to find ways of reducing environmental impacts of the way we do business on campus, from the type of vehicles driven in the MIT fleet, to how we use and manage our energy. We also work with faculty and students to support their interests and needs for researching the environmental impacts of our campus operations.

Enhancing Campus Operations

- The EPO continued to play a key role in developing the campus-focused campus energy initiative as a component of the new MIT Energy Initiative (MITEI). In FY2007, the campus energy program has progressed from being a "proposed activity" to being a formal initiative of the MITEI. EPO staff serve on the Institute's Campus Energy Task Force, which is charged with developing the initiative into a comprehensive program for demonstrating leadership in campus sustainable energy practices. These efforts have been an important collaborative effort among MIT's administration, faculty, and students.
- The EPO deepened its collaborations with the DOF on energy-related issues, and focused on increasing support and programming for energy conservation. We expect to realize sizable energy cost savings as the planned conservation investments are implemented. Additional collaborations will introduce more environmentally friendly vehicles and increase the use of biofuels on campus.
- MIT's Community Solar Power Initiative is managed by the EPO in partnership with the DOF, and is now focused on making the installed systems available to students, faculty, and the community for research and education. Through a grant developed and obtained by the DOF and augmented by an outside donor, installed solar power capacity on campus is expected to rise 200% in FY2008.
- EPO and EHS continued to promote collaborative partnerships to educate the community on recycling issues, build awareness of recycling opportunities, and provide learning opportunities for our students. The EPO and the EHS Office continued to work closely in partnership with the DOF, the Working Group Recycling Committee (WGR) and others to support MIT's recycling and waste minimization programs and to increase the Institute's recycling rates. In FY2007, MIT continued to achieve a recycling rate of more than 40 percent. In addition, with EHS coordination, MIT again participated in the national Recyclemania Competition, which strengthened recycling and awareness in the MIT dormitory community.

Supporting Student Educational Opportunities:

The EPO, in partnership with the Education Program of the Laboratory for Energy and the Environment, expanded its innovative Campus Sustainability Program available through the Undergraduate Research Opportunities Program (UROP). The program is designed to facilitate the educational involvement of MIT undergraduates in practical research questions of interest and concern to campus sustainability initiatives at MIT. In FY2007, the program supported and supervised seven Campus Sustainability UROPs.

The EPO and the EHS Office provided significantly increased technical and educational support to student research projects that focused on campus energy and environmental issues. The EPO partnered with the Sloan School's Sustainability Lab class to develop campus-focused research projects that addressed campus sustainability issues. From individual theses, class projects, student projects, and student organizations, we worked with students to provide data, operational information, and access to key operational personnel. The students' research has a return to our department, in that they inform us on aspects of our operations.

Building Community Involvement

Supporting and participating in local and regional environmental initiatives is an important role of the EPO and the EHS Office. Together, the EPO and the EHS Office represent MIT in a number of off-campus community initiatives and programs to share information, to learn best practices, and to enable others to take action. Examples include participation in the Northeast Campus Sustainability Consortium, Greater Boston Breathes Better, the Campus Consortium for Environmental Excellence, Cambridge Public School Volunteers, the Boston Consortium, the Clean Charles Coalition, Boston Earth Night, and the Campus Safety Health and Environmental Management Association. In FY2007, the EPO served on the organizing committee of the Cambridge Energy Alliance, an important new initiative by the City of Cambridge to address energy conservation and climate protection.

MIT's largest Earth Day event so far took place in April 2007. More than 40 students, staff, and educational and community organizations participated in the event. A week of environmentally focused activities to build awareness and engagement in stewardship initiatives preceded Earth Day 2007. The EPO and EHS were responsible for managing the joint student and staff Earth Day planning committee.

Successfull Pollution Prevention Program Efforts in FY2007

Official launch of the Green Chemical Alternatives Wizard at the 2006 Campus Safety Health and Environmental Management Association (CSHEMA) Annual Meeting. Visitors to the Green Chemical Alternatives Wizard have come from more than 50 different universities, including more than 20 major research universities, approximately 12 private companies, and nine governmental entities (the majority are federal agencies). Since its launch, the Green Chemical Alternatives Wizard has logged more than 1,100 visits, a number that represents more than 475 separate domains. At least 15 websites of various research universities, government agencies, and nonprofit organizations have established a link to the Green Chemical Alternatives Wizard. The Green Chemical Alternatives Wizard received press coverage, including mention in *Technology Review* and in a major personal care products manufacturer newsletter.

Hazardous chemical waste and waste packaging reduction. The 20-liter hazardous waste consolidation program continued to grow from the initial five-building pilot effort initiated in FY2006. Reducing waste through further consolidation of liquid effluent wastes from certain lab procedures and lab equipment has proven to be successful. This program saves an estimated $7–$10K monthly (please refer to the Hazardous Waste Metrics section for data on reductions in the packaging associated with hazardous chemical waste removal). The hazardous waste contract negotiated and signed in FY2007 now contains specific language and agreements for reducing waste at MIT. Under this contract, the hazardous waste vendor has pledged to subsidize the installation of solvent recycling units in key locations on campus. Several other strategies to reduce waste generation at MIT are currently under development as part of the contract.

Outreach to laboratories on solid waste recycling opportunities. In collaboration with the DOF solid waste manager, the EHS Office visited biological laboratories to identify candidate materials for solid waste recycling, then delivered a presentation to Center

for Cancer Research staff in May 2007. At present, these materials, predominately plastics, are sterilized before being sent to landfills. The intent of the presentation was to raise awareness of recycling as a strategy to reduce waste while preserving laboratory safety standards.

SYBR Safe® as an alternative to ethidium bromide for DNA gel staining. The EHS Office continues to promote and support laboratory conversion from ethidium bromide to SYBR Safe®. Using funds from its People, Prosperity, and Planet grant from the Environmental Protection Agency, the EHS Office purchased 100 units of SYBR Safe®. Additionally, the EHS Office continues to field technical assistance requests from researchers both on-campus and from other research institutions.

Promoting pollution prevention awareness via Lab Specific Chemical Hygiene training. Laboratory Specific Chemical Hygiene training continues to serve as a vehicle for pollution prevention awareness training.

Providing pollution prevention tools for the MIT community via the Working Group on Recycling's "Working Green at MIT" site. The EHS Office served as a key content developer for the "Buy Green" portion of the redesigned WGR website, launched during MIT's April 26 celebration of Earth Day. Buying green is pivotal to the concept of pollution prevention and toxins use reduction, and we hope that this website will facilitate more sustainable purchasing practices.

Greening of the 2007 Campus Safety Health and Environmental Management Association Annual Meeting. Through its role in the tri-campus Host Committee for the 2007 CSHEMA annual meeting in Boston, the EHS Office spearheaded efforts to "green" the CSHEMA conference, which had more than 400 attendees. Green conference features included a meeting facility with a strong sustainability program; reusable water bottles and recycled content pens; locally sourced speaker gift bags; host committee shirts made with bamboo, a renewable and sustainable material, and shuttle services that ran on alternative fuel to and from the conference site. MIT also produced an ordering guide, which included links to green meeting information and on buying from local purveyors.

Extended Outage and Pandemic Planning, Emergency Management, and Business Continuity

MIT continues to develop response and recovery protocols for an extended outage such as an influenza pandemic or other disaster. MIT's approach is three-fold. First, organize around general emergencies using the National Incident Management System model as required of entities receiving federal funding. Second, planning with local DLCs and offices to ask them to prepare themselves for any extended outage, from pandemic influenza to power outages to a severe winter or summer storm. Third, respond professionally and effectively to emergencies and to support MIT departments in recovering their businesses should a loss occur.

Emergency Organization

To organize for emergencies, MIT–EHS and MIT Police developed an Emergency Operations Center (EOC) to muster the service of all MIT departments to resolve major emergencies. In September 2006, MIT participated in a regional and federal, state and local agency emergency drill called "Operation Poseidon." MIT–EHS provided actual radiological sources to be placed on mock victims for this radiological dirty bomb scenario. MIT–EHS regularly trains the Cambridge Fire Department on radiological detection. MIT's EOC was also activated for the drill and was part of the exercise. A communications drill to examine MIT's ability to communicate quickly with our community is planned for the summer of 2007. MIT Police and EHS are planning how to address the intersecting issues of security, policing, emergency management, and EHS programs in a more systematic way. In the past year, the EVP approved the new position of an emergency planner to report jointly to the MIT Police and EHS headquarters.

A companion organization for MIT executives is planned as a leadership forum for decisions about messages to the MIT community, parents, press, and for decisions about recovery efforts, major commitment of resources, and related issues.

Emergency and Disaster Planning

To prepare for large emergencies and disasters, the EOC has been communicating with many parts of MIT to raise awareness and interest, to begin some trials of preparation and drills, and to promote adoption of emergency planning as a necessity at the Institute. The DSL and the Dean for Undergraduate Education (DUE) area have begun to analyze the impacts of a major emergency or outage and plan for the mitigation of these impacts. We have engaged the Faculty Policy Committee, the Committee on Undergraduate Program, the Controller's Accounting Office, Human Resources, the Registrar's Office, Student Financial Services, DUE, the dean for graduate students, DSL, the assistant deans across all schools, the Committee on the Assessment of Biohazards, the administrative officers within the School of Engineering, the Administrative Advisory Council II, general counsel, the Insurance Office, DOF, and others at MIT and beyond to begin planning mitigation of an extended outage using pandemic influenza as an exercise. To support this work going forward, the provost has approved a temporary assignment for a retired senior associate dean to continue this planning.

The Massachusetts Department of Public Health and the Cambridge hospitals are collaborating with MIT in planning responses to a public health emergency such as pandemic influenza. MIT is providing information about our facilities and resources, with the intent to extend MIT Medical's ability to care for our MIT community, as well as the MIT area of Cambridge.

Departments such as Facilities and Dining and Housing (which rely on incoming supplies or service) or groups that provide essential service to other parts of MIT are examining their supply and service chains to determine how they can be made more redundant, more robust, more substantial, or more resilient in the time of an upset. Supply and service chains are of great concern, especially in light of the decentralized procurement systems in place at MIT and our urban location.

MIT's Engineering Systems Division participated with MIT–EHS to examine disaster potentials facing the Institute. This work was carried out by Hua Li, G, under the guidance of Professor George Apostolakis. The results of this work show two disaster types: those that have higher likelihood and severe consequences, and those that have very low probability but extreme impact. This work is helping to prioritize the preparation and planning of MIT emergency officials. The work was also commissioned by a grant from the Federal Emergency Management Agency and the Massachusetts counterpart, the Massachusetts Emergency Management Agency.

Future work will seek to increase the emphasis on local departments planning their own mitigation to protect their work and research. Engagement of the research mission has been slower than the academic program, and we will seek to increase the engagement with researchers in the coming year. More formalization and participation in emergency centers and drills will be needed, including participation by MIT executives in a drill to improve emergency management at MIT.

Business Continuity

On December 8, 2006, a major fire at One Broadway caused the first mass-victim emergency in memory at our campus. An NStar electrical worker died in the accident, and more than 50 people were treated and/or transported to area hospitals to be treated for smoke inhalation. MIT had about 80 personnel as tenants in the building.

MIT–EHS provided support to the affected departments in helping to access service groups of MIT for restarting their business. Many lessons were learned, including the need for addressing anxiety among workers and restoring business equipment.

MIT is forming a business continuity team to address these issues systematically and to plan for future business outages. We are also collaborating with the University of California at Berkeley, which has developed a business continuity tool to assist in restarting business at a university. The tool is freely available.

Emerging Issues

Nanotechnology

EHS has been establishing a close collaboration with MIT faculty and staff who are conducting research in the area of nanoparticles. EHS closely monitors the studies on potential health effects and waste issues of nanoparticles, as well as public perception of potential new hazards presented by nanoparticles, and we communicate this information to research staff. EHS has been at the forefront in characterizing potential exposures to nanoparticles and we conducted air sampling in five MIT laboratories in collaboration with the UMass–Lowell Department of Work Environment. The UMass group purchased an $80K research monitor, which can measure particles 5–500 nm. We conducted sampling in five laboratories in the following departments: the Institute for Soldier Nanotechnologies, mechanical engineering, materials science and engineering, electrical engineering and computer science, and the Laboratory for Electromagnetic and Electronic Systems. The operations sampled included carbon nanotube growth reactors (both atmospheric and vacuum), work with nanometer size amorphous silica powder,

and electrospinning with polyacrylonitrile fibers and fullerenes. Air sampling confirmed that the work practices and engineering controls in place for these research areas are effective in reducing nanoparticle exposures. EHS will continue to seek out those beginning research in this area through the EHS–MS organizational structure, print and web communications, and presentations during the Independent Activities Period.

The City of Cambridge has formed a scientific advisory committee to investigate the need for a local ordinance on nanotechnology; EHS represents MIT on this committee.

Toxic Substance Control Act

The federal Toxic Substance Control Act (TSCA) requirements related to research with new materials were presented in EHS representative orientation training and in lab-specific chemical hygiene training. This expands the effort to educate research personnel about what is required of them under the TSCA.

Reduction of Injuries and Illnesses

MIT would be able to save substantial resources if the number and severity of injuries and illnesses can be reduced. We plan to work with the DOF to identify programs to reduce their injury and illness rate.

Polychlorinated Biphenyl Compounds in Building Materials

In the past year, MIT has learned that a number of buildings built after 1930 and prior to 1978 may have polychlorinated biphenyl compounds (PCBs) in some of the original construction materials (such as masonry caulking). Some PCB materials have been discovered in an MIT housing unit, and an effort is underway under the oversight of the US Environmental Protection Agency and the Massachusetts Department of Environmental Protection to remove and replace these materials. MIT–EHS is also developing protocols for other candidate buildings to be sure they are checked when an opportunity arises through renovations or other disturbances.

William VanSchalkwyk
Director for Environment, Health, and Safety Programs

Lou DiBerardinis
Director, Environment, Health, and Safety Office

More information about the Environment, Health, and Safety Office can be found at http://web.mit.edu/environment/index.html.