

Table 2-2. BNL Pollution Prevention, Waste Reduction, and Recycling Programs.

WASTE DESCRIPTION	TYPE OF PROJECT	POUNDS REDUCED, REUSED, RECYCLED OR CONSERVED IN 2007	WASTE TYPE	POTENTIAL COSTS FOR TREATMENT & DISPOSAL	COST OF RECYCLE, PREVENTION	ESTIMATED COST SAVINGS	PROJECT DESCRIPTION DETAILS *
Aerosol can disposal system	Recycling	528	Hazardous waste	\$12,000	\$0	\$12,000	Empty aerosol cans can now be recycled as scrap, rather than sent to the Waste Management Division as hazardous waste. Eight units (F&O=5; CA=1; NSLS=1; BES =1) each handle 66 lbs of hazardous waste.
Portable closed-head drum mixer	Neutralization	1,600	Hazardous waste	\$0	\$1,450	-\$1,450	The National Synchrotron Light Source (NSLS) bought a closed drum mixer to neutralize Rydlyme, used to descale cooling pipes.
Relocation of hazardous storage sheds	Reuse	3,200	Industrial waste	\$0	\$500	\$26,500	Recycled two hazardous storage material sheds for reuse in Plant Engineering. Relocation cost \$550, but avoided the purchase of new sheds.
Formaldetox	Source reduction	8	Non-hazardous waste (neutralized approximately 1 gallon)	\$25	\$0	\$25	Neutralizes nonhazardous para-formaldehyde, chlorix, bleach, and rat blood.
HPLC solvent recycler	Reuse	110	Hazardous waste	\$2,500	\$0	\$6,755	Allows reuse of approximately 50 liters of solvent and saves approximately 50 labor hours.
Propane cylinder de-valver	Recycling	50	Hazardous waste	\$3,750	\$0	\$3,750	The Collider Accelerator Division (CA-D) bought a propane cylinder de-valver to avoid sending cylinders to a disposal vendor at \$75 each; instead they are now recycled as scrap.
Fluorescently labeled oligonucleotides	Waste minimization	3,144	Radiological waste (396 ft <sup>3</sup> ); Mixed waste (35 gallons); Hazardous Waste (108 gallons)	\$67,600	\$0	\$67,600	This project was cost-shared with Biology. The process avoids the use of radioactivity, thus avoiding radiological waste generation.
Electronic recycling	Recycling	140,600	E-waste	N/A	\$2,300	N/A	BNL e-waste was formerly collected by a scrap metal dealer, but the recycling process was questionable. The Laboratory has now partnered with a government-based e-waste recycler and now pays shipping fees only.
Building demolition recycling	Recycling	12,350,000	Industrial waste	\$561,925	\$32,000	\$529,925	On-site demolition products (steel and concrete) are segregated, recycled, and reused.
System One parts cleaner	Substitution	640	Hazardous waste	\$10,000	\$0	\$10,000	Plant Engineering bought a System One parts washer to re-distill dirty solvent, eliminating the need for a vendor such as Safety Kleen. Removed grit and sludge are mixed with the waste oil.
Photon-counting spectrofluorimeter	Substitution	54	Mixed waste (2 ft <sup>3</sup> )	\$0	\$0	\$50,000	Eliminated the need for radioactive assays and thus their radioactive waste. Savings include 1,000 work-hours plus savings on material costs.
Replacement of mercury utility devices	Substitution	40	Mercury	\$2,350	\$4,000	\$2,350	Approximately 36 lb of mercury-containing devices were removed from utility devices during 2007. Savings are based on the cost of one mercury spill and cleanup.
Animal bedding conveying system	Composting		Low-level Radiological Waste (76 yds <sup>3</sup> )	\$0	\$0	\$0	Animal bedding material is no longer sent to sanitary landfill. It is now conveyed to a dumpster that is emptied or composted at the stump dump.
Plant Engineering grounds vehicle wash system *	Waste minimization	8,000	Oils/grease to soils	\$16,000	\$3,000	\$13,000	This multi-year, multi-department project was completed in 2007 and eliminates the potential of oil and grease being released to soil.
Organic solvents	Substitution	678	Hazardous waste	\$0	\$0	\$26,000	Life Sciences bought a Microwave Peptide Synthesizer in 2004 to significantly reduce the hazardous wastes generated. Saves ~1,000 work-hours/year (reflected in cost savings).
Organic solvents	Purification/reuse	44	Hazardous waste	\$0	\$0	\$3,400	The primary savings of the BES solvent purification system are in not purchasing new solvent and labor savings from not running the stills.
Cooling water	Reuse	63,400	Deionized water	\$0	\$0	\$7,925	A closed-cycle water recycling system for the Building 480 melt spinner saved 7,925 gallons of ultra-pure water and extends the life expectancy of equipment worth \$100,000.
Mercury utility devices	Substitution	37	Mercury	\$2,300	\$0	\$2,300	Plant Engineering replaced mercury-containing utility devices with mercury-free equipment in 2007. Savings are based on the cost of one mercury spill and cleanup.

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Radioactive emissions	Emission reduction	0	Radioactive emissions	\$0	\$0	\$0	A shroud was installed over the 16-inch diameter shaft in the Hot Cell of the Brookhaven Linac Isotope Producer (BLIP), isolating cooling water from the rapidly moving air of the exhaust system and allowing radiological decay within the water system. Slowing the diffusion into the hot cell air will effectively reduce gaseous emissions into the exhaust stack, as these radionuclides have very short half lives. The shroud/enclosure has been instrumental in reducing short-lived radioactive gaseous emissions. Beyond the environmental benefits associated with the project and due to the efficiency of the enclosure in reducing emissions, the facility has been able to stay below the emissions level that would require additional regulatory burdens.
Radioactive waste generated through wet chemistry	Waste minimization	30	Mixed waste/Liquid radioactive waste	\$17,600	\$0	\$22,500	The use of a Kinetic Phosphorescence Analyzer (KPA) system for uranium analysis eliminated mixed waste generation in a chemistry lab, reduced 90 percent of the volume of liquid waste, reduced 90 percent of radioactive material handled, minimized exposure to uranium by laboratory personnel, and decreased labor costs by 75 percent.
Radioactive waste from labeled chemicals	Waste minimization/volume reduction	0	Solid radioactive waste	\$2,168	\$0	\$2,168	A vial crusher for glass vials, pipettes, and other glassware reduces the volume of rad waste.
Radioactive and mixed wastes from radio-labeled chemicals	Waste minimization	112	Mixed waste	\$27,690	\$0	\$27,690	Use of a microplate scintillation counter generates less mixed waste.
Electrophoretic Mini-Gels	Microscale chemical use	2,200	Hazardous waste - lab pack	\$6,000	\$0	\$6,000	Minimizing silver waste from silver-staining electrophoretic mini-gels saves waste disposal costs and lowers material purchase costs (\$6,000).
Sewage sludge	Volume reduction	18,450	Radioactive waste	\$1,249,500	\$47,738	\$1,201,762	Disposal of 110,000 gallons of radioactive Sewage Treatment Plant liquid waste by a contractor would cost \$1,249,500. Instead, waste from the anaerobic sludge digester was dried on the drying tables (96 percent reduction), mixed with absorbent and lime, and shipped in (21) 55-gallon drums to a disposal facility.
Film and other radioisotopic imaging	Substitution	300	Hazardous waste/Industrial waste	\$22,000	\$0	\$22,000	Replacement of film-based autoradiography and other radioisotopic imaging with a Phosphor Imager reduced waste generation by 200 lb of hazardous waste and 100 lb of industrial waste. Additional projected savings are in annual supply costs and labor reduction.
Lead acid batteries	Recycled	5,000	Universal waste	\$0	\$0	\$0	Avoids hazardous waste disposal costs for approximately 40 lb of lead per battery.
Ion exchange wastewater	Source reduction	1250	Hazardous and sanitary wastewater	\$0	\$0	\$0	Prefilters, added to the deionization system, polish makeup water entering the ion exchange system. This extends the useful life of the ion exchange resins, requiring less frequent regeneration. The regeneration process generates hazardous and sanitary waste.
Short half-life waste	Decay in storage	490	Radioactive waste	\$0	\$0	\$0	Short half-life isotopes, particularly iodine-125 and phosphorus-32, are often used in life sciences experiments. In 2007, wastes from these operations (21.5 ft <sup>3</sup> and 133 lbs of liquid) were managed in accordance with BNL decay-in-storage requirements, rendering the wastes eligible for volumetric release.
Cooling Tower chemicals	Source reduction	9,563	Industrial waste	\$22,500	\$0	\$22,500	Ozone water treatment units were installed on cooling towers at SEM, the National Space Radiation Laboratory (NSRL), and the RHIC Research Facility, for biological control of cooling water. These systems eliminate the need for water treatment chemicals (typically toxic biocides), save labor, and reduce analytical costs for monitoring cooling tower blowdown.
Blasocut machining coolant	Recycled/Reused	19,456	Industrial waste	\$2,450	\$0	\$6,450	Central Shops Division operates a recycling system that reclaims Blasocut machining coolant and supplies it Laboratory-wide. In 2007, 2,432 gal (19,456 lb) of Blasocut lubricant were recycled. Recycling involves aeration, centrifuge, and filtration. This avoids cost of disposal as industrial waste plus an avoided cost of buying 5 drums of concentrate (\$800/drum) and 49 empty drums for shipping (\$50/drum).
Used motor oil	Energy recovery	16,160	Industrial waste	\$2,050	\$0	\$2,050	Used motor oil from the motor pool and the on-site gas station is given to Strebel's Laundry Service, who use it to fire their boilers. In 2007, they collected 2,020 gal of oil at no charge to BNL, which thus avoided the costs for disposal and 41 shipping drums (\$50/drum).
Office paper	Recycled	354,000	Industrial waste	\$0	\$0	\$0	Cost avoidance based on \$106/ton for disposal as trash.
Cardboard	Recycled	242,000	Industrial waste	\$0	\$0	\$0	Cost avoidance based on \$106/ton for disposal as trash.
Scrap metal	Recycled	764,000	Industrial waste	\$57,300	\$0	\$57,300	Cost avoidance based on \$106/ton for disposal as trash, plus \$150/ton revenue.

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Bottles/cans	Recycled	48,800	Industrial waste	\$0	\$0	\$0	Cost avoidance based on \$106/ton for disposal as trash.
Construction debris	Recycled	574,000	Industrial waste	\$12,915	\$0	\$12,915	Cost avoidance based on \$45/ton difference for disposal as trash
	<b>TOTALS</b>	<b>14,627,944</b>		<b>\$2,100,623</b>	<b>\$90,988</b>	<b>\$2,143,415</b>	

\* Cost savings of projects funded by the BNL Pollution Prevention Council will be tracked for