On The Development of a Waste Management Plan For The State University of New York at Stony Brook

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- *Establish An Office Of Waste Management For The Campus With University-Wide Responsibility And Authority.*

- *Create A Recycling Coordinator Position For The University.*

- *Work More Effectively With The Town Of Brookhaven Concerning Waste Disposal.*

- *Network With Other Research Institutions To Exchange Information On Waste Disposal.*

- *Study The Sources And Character Of The University's Municipal Solid Waste.*

- *Assess The Hazards Of Infectious Waste To Solid Waste Handlers.*

- *Investigate The Potential Role The New Incubator Facility Could Play For Marketing Recycled Materials From the University.*

- *Conduct A Comprehensive Study Of The Planned Infectious Waste Incinerator.*

- *Install Automated Bottle Recycling Machines On Campus.*

EXECUTIVE SUMMARY

MUNICIPAL SOLID WASTE

__Finding__: The authority and responsibility for managing municipal wastes on campus is decentralized. As a consequence, contractual arrangements with vendors and supporting operations are fragmented and inefficient.

__Recommendation__: Centralize the management of municipal solid waste under a single department so that the waste stream can be better managed from its source (office, laboratory, dining room, etc.), to its ultimate fate (recycling center, landfill, incinerator, etc.). The department assigned the responsibility to manage the municipal solid waste stream must be fully staffed and have a Director. The Director should have the full responsibility, with the concomitant authority, to be able to carry out cost effective and environmentally effective waste management.

The current fragmented system of contractual arrangements with various vendors should be eliminated. Funding for the effort should be obtained by reprogramming existing budgets.

__Finding__: The fragmented waste collection system reduces Stony Brook's management capabilities. An example is the use of oversized, large waste containers which require complex handling equipment at excessive cost.

__Recommendation__: The present fragmented waste collection system should be eliminated. A campus operated fleet of waste disposal vehicles could result in efficiencies that could make the construction and operation of a transfer station and tipping floor an effective waste handling mechanism.

Waste not suited for recycling would be moved to the transfer station area (within the same building) for distribution, incineration, RDF (refuse derived fuel), or compaction for movement to landfills.

Finding: *The University has excessive volumes of wastes because of its failure to break down loads and its inability to compact them. As a result, carting costs are excessive.*

Recommendation: *The University should construct a transfer station to facilitate more effective compaction equipment. This would result in carting efficiencies and reduced costs.*

Finding: *The University's overall waste stream can be reduced. This can be done by assessing its waste stream and developing mechanisms of waste separation and recycling.*

Recommendation: *A tipping floor and the transfer station could serve as a recycling center. This center would separate materials. The separated materials then would be transferred to a Town, County or State facility, for recycling and resource recovery. The University would be "trading wastes" through clearing houses and material exchanges that are emerging. Wastes that might be included in this process are acids and alkalies, paper, plastics, rubber, solvents, textiles, scrap metal and wood. Use of a transfer station would provide the flexibility to be able to react quickly to waste market changes and new technologies.*

The University transfer station could also be made available to the local area residents to provide a recycling center for

INFECTIOUS WASTES

Finding: Infectious waste disposal costs will increase because of public perception of the risk and subsequent increasing regulation, regardless of scientific data on the biological or microbiological content of "infectious" waste. Further, infectious waste disposal costs will continue to be greater than those for municipal solid waste because it is treated as hazardous waste.

Recommendation: A rational, scientifically-based definition of infectious waste is required for effective management. A broadly based public education program on infectious waste is needed. The target groups should range from landfill workers to legislators. Stony Brook and the Nassau-Suffolk Hospital Council should work with the several concerned legislative bodies to redefine the term infectious waste. The Waste Management Institute and other appropriate departments should conduct a policy forum for decision makers and develop educational programs for sanitation workers, based on the review of available data and information concerning the nature and hazards of infectious waste.

Finding: Objective information concerning risk to solid waste handlers and the community at large is limited.

Recommendation: Assess the hazards to municipal solid waste handlers through well-designed, population-based research projects.

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infectious waste and an assessment made of them. For example, more expensive and more complex methods of waste disposal might become feasible if the volume of infectious waste were significantly reduced.

Recommendation: As an incentive to the Principal Investigator to handle all his/her hazardous wastes in the proper manner, make the cost of disposing of hazardous waste an indirect cost. This operational expense could be administered through the Department of Environmental Health and Safety in coordination with the current waste contractor.

Finding: Growing waste management responsibilities have made it necessary for Stony Brook to consider forming a campus Waste Management Office.

Recommendation: Stony Brook should create an office responsible for all aspects of the campus waste disposal program. More specifically, that office should handle training, pickup and disposal, waste exchange, and campus compliance with regulations. In addition, the waste office should maintain contact with institutions and universities with established waste management programs.

Finding: Various solvent wastes can be used as alternative liquid fuel in a properly-equipped incinerator.

Recommendation: The possibility of equipping the proposed campus incinerator with alternative liquid fuel facilities should be explored. The campus hazardous chemical volume could be reduced by nearly 15 percent.

It is also recommended that resources be made available to hire a radioactive waste manager in the Division of Radiation Protection Services.

__Finding__: Because of the rapid turnover of personnel in research laboratories, training programs should be developed and presented on a routine basis to keep all lab personnel current on policy and procedure.

__Recommendation__: Provide resources to Radiation Protection Services for an instructor to develop and deliver training programs concerning proper handling of radioactive waste materials and all related regulatory aspects.

__Finding__: Radioactive waste disposal charges have skyrocketed over the past 10 years. In 1977 the price of disposing a 55 gallon drum was $50; now it is over $500 and the price continues to rise. At present, the cost and burden of disposing of radioactive materials is passed along to the Principal Investigator.

__Recommendation__: As an incentive for the Principal Investigator to handle all his/her radioactive waste in the proper manner, make the cost of disposing of radioactive waste an indirect cost. This would relieve the burden of cost from the Principal Investigator. This operational expense could be administered through the Department of Environmental Health and Safety in coordination with the current waste contractor.

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must be in a position to say that it is doing everything possible to control the use of radioactive materials on campus (refer to resource recommendations).

__Recommendation__: Our administration needs to support the current radiation safety program and be sensitive to this issue as new research programs come on-line at Stony Brook. Principal Investigators must be more accountable for the supervision of their lab personnel (regardless of turn-over), and for compliance with University policy and procedure and to State Sanitary Code 16.

CAMPUS PAPER RECYCLING PROGRAM

<u>Finding</u>: A paper recycling program is in place at the University through the Office of General Institutional Services (GIS). They believe they have only scratched the surface in terms of capturing University waste that could be recycled. At present, nine tons of waste paper are collected each week for recycling. It is estimated that a comprehensive program could yield more than 36 tons per week.

<u>Recommendation</u>: Greater efficiencies in paper recycling could be achieved if a University-wide recycling coordinator position were established. Appropriate funding and staffing must be ensured to support such a position.

<u>Finding</u>: The present paper recycling program has to deal with a number of problems including: paper is co-mingled with other wastes, insufficient employee education, and insufficient employee participation.

<u>Recommendation</u>: Identify one person in each building to act as a recycling captain for that building. These persons not only should coordinate activities with GIS but also should look for waste items specific to that building that could be recycled.

<u>Finding</u>: Much of the University community is not aware of, or familiar with, the goals of the University in reducing its waste stream through source reduction and recycling.

MUNICIPAL SOLID WASTE FINDINGS

David G. Thomas

DEFINITION

Solid waste is continually being defined in terms of what it is not rather than what it is. I have attempted to seek a specific definition of solid waste in the positive terms and have come up with the following definitions:

The description of sold waste from the Federal Environmental Protection Agency as quoted to the National Solid Waste Management Association in Washington, and then to me, is as follows:

> "Solid Waste means any garbage, refuse, sludge from a waste treatment plant or air pollution control facility, and other discarded material, including solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include solid or dissolved materials in irrigation return flows, or industrial discharges which are point sources subject to permits under 33-USC or source special nuclear or by-product material as defined by the Atomic Energy Act".

The description (definition) of solid waste by the New York State Department of Environmental Conservation contained in "6NYCRR Part 36 - Solid Waste Management Facilities" effective April 25, 1986, is contained in a booklet covering the codes, rules, and regulations of the department. Rather than re-type the definition, we have copied the regulation, in part, to demonstrate the vast field of coverage. The DEC Definition: (see attached).

MUNICIPAL SOLID WASTE CHARACTERISTICS

The characteristics of the wastes as generally removed from the campus, has to our knowledge, never been a matter of specific and detailed review. At the present time, there is some effort toward the elimination of various paper at source generation through recycling and the continuing recycling effort on the part of General Institutional Studies. The New York (bottle law) materially assist in the reduction of the types of beverage containers that would be discarded and, therefore, is not a major consideration in the overall effort of elimination from the waste stream at source generation.

solid waste will be a direct reflection of the size of the campus, degrees offered, and graduate and research programs.

The characteristics should be determined before we proceed into resource conservation (umbrella term for re-use, recycling, resource recovery) to ascertain the required resources necessary to maximize the waste stream reduction, and at what points to effect this effort.

QUANTITY AND COST

The information for the amount and costs of refuse from the campus are on the following pages. It should be noted we have used several different figures from time to time as to the compaction rate; this is due to the various types of equipment that are used on the campus. This effects, of course, the overall quantity as viewed from a landfill prospective and a weight prospective.

The average compaction rate for self-contained or for stand-alone compactors, which are usually the compactors for the 30 yard and up type compaction, and stand-along compactors up to 65 yards, generally use an industry standard compaction rate of 4 to 1. This does not effect us at this juncture for our compaction rate because we are assuming that we are compacting at the full cubic yardage of the compactors provided.

For the front end loaders, that is the type of equipment which remove the refuse from the individual 4, 6, and 8 yard type dumpsters, we have received two different compaction rates, and they are as follows:

1. From the compactor 2.5 to 1 compaction rate for this type of equipment, the compaction would be 500 pounds per yard on compaction within the body of the front end loader. There has been another standard used on the campus by one of the Physical Plants.

2). 3 to 1 ratio for compaction rate from the dumpster loose to the body of the compacting vehicle and 2,000 pounds per yard after compaction.

The former rate of 2.5 to 1, and 500 pounds per front end loader rate is the one that has been used in the computations for front loaded operations. Open top roll-offs do not compact, and we have assumed 300 pounds per yard as the container loading.

CURRENT FUNDING FOR MUNICIPAL SOLID WASTE REMOVAL

Budget Allocation - FY 87/88

DEPARTMENT	AMOUNT	TOTAL
Physical Plants:		
Academic Core	$176,049.88	$
"Out Buildings"	1,427.52	177,477.40
(Shorewood/Attwood/Flax Pond)		
Residential *	90,571.22	
Dorm Cooking	75,000.00	165,571.22
Health Sciences Center	59,400.00	59,400.00
(Inc. Point of Woods)		
University Hospital:		
Contract		108,607.20
(Survey: $170,000.00)		
SOLID WASTE REMOVAL (CONTRACT) - TOTAL		$511,055.82

* Residential Physical Plant Expenditure

CONTAINER PROFILE

BUILDING/LOCATION	#-SIZE	PK-UP/MO	MO/COST
Residential - Main Campus			
ROTH QUAD:			
1	1 8/YD	21.666	393.41
2	1 8/YD	21.666	393.41
3	1 8/YD	21.666	393.41
4	1 8/YD	21.666	393.41
5	1 8/YD	21.666	393.41
CAFE	1 8/YD	21.666	393.41
TABLER QUAD:			
1	1 8/YD	21.666	393.41
2	1 8/YD	21.666	393.41
3	1 8/YD	21.666	393.41
4	1 8/YD	21.666	393.41
5	1 8/YD	21.666	393.41
CAFE	1 8/YD	21.666	393.41
KELLY QUAD:			
1	1 8/YD	21.666	393.41
2	1 8/YD	21.666	393.41
3	1 8/YD	21.666	393.41
4	1 8/YD	21.666	393.41
5	1 8/YD	21.666	393.41
CAFE (COMPACTOR)	1 30 YD	2.58	701.23
STAGE XII:			
A	1 8/YD	21.666	393.41
B	1 8/YD	21.666	393.41
C	1 8/YD	21.666	393.41
D	1 8/YD	21.666	393.41
CAFE	1 8/YD	21.666	393.41
"H" QUAD:			
JAMES	1 8/YD	21.666	393.41
LANGMUIR	1 8/YD	21.666	393.41
BENEDICT	1 30/YD	3.410	874.36
IRVING	1 8/YD	21.666	393.41
O'NEILL	1 8/YD	21.666	393.41
AMMANN	1 8/YD	21.666	393.41
GRAY	1 8/YD	21.666	393.41

PRESENT DISPOSAL METHOD

Currently, the campus uses 2 cartage companies for which services have been contracted on the part of one, and for which a purchase order has been generated on the part of the other (the "out" buildings).

The present contractor for the campus, as opposed to the "out" buildings residential pick up, uses various sizes and types of containers as required and requested. The majority of the containers are the "front-end loading" type for the ease of location and removal of the waste. The remainder are self contained compactors (roll-off type) and open-top roll-off containers, primarily for overflow and structural waste.

Where possible, based on local and state regulations, the contractor deposits the solid wastes at the local (town operated) landfill located at Yaphank, New York. At the present time, the cost of the use of the landfill is per yard based on the contractor's truck.

ALTERNATIVE DISPOSAL METHODS

It comes as no surprise, that in the development of information for this and for previous presentations on the subject of SOLID WASTE, we generated more questions, than answers. The questions that come up only serve to indicate the need for further information from all sources, including campus requirements, finances, contractors, regulations, and time tables from the Town, County, State, and Federal authorities.

Other questions are evident, such as utilization of the present equipment on the part of both the contractor and campus:

* What is <u>true</u> loading of the containers?

* What is the "balloon" effect of the plastic bag use?

* Where are the <u>best</u> container locations?

* What are the best containers for the use?

* What are the "characteristics" of the SOLID WASTE?

* How best can we determine the "characteristics" of the waste?

The question of MUNICIPAL SOLID WASTE on the campus must be addressed as a total entity. There must be a coordinated approach to the problem of MUNICIPAL SOLID WASTE. It cannot be fractionalized or broken up into its minor constituencies

Where:

* NIMBY
* Town
* Bi-county facility
* Contractor

When:

* Education
* Dependence on the course of town/county programs
* Market and resource availability

Why:

* Public relations
* Closing of the landfills
* Cost/benefit ratio - cost effective
* State, Town, County regulation
* Capital construction costs:
    - °campus
    - °town
    - °county

Recycling - or resource recovery, because it deals with the total solid waste problem is sometimes thought to be a panacea to the over-all solid waste situation. This is not true. At times the various entities believe that in themselves they can effect a market representation. This is also not true. In a highly fluctuating market for "recycled" materials, the lone entrepreneur, given enough storage space, might be able to select markets. This is no longer the case, and the development of the markets is best left to the volume recovery groups.

At present, regulations and requirements are being laid down in various Long Island towns and in nearby states. Massachusetts and New Jersey have set recycle goals at 20% and 25% of the waste stream. These goals seem to be unrealistic from industry standards, but assuming that these two states did only 20% and that their effective rate was 50% of the required, they would produce enough mixed paper to provide the market with 105% of the requirements for the New England and Middle Atlantic states (9) based on the 1985 demand.

As has been presented, this is a regional and State problem, and must be dealt with on that basis, with the effective input of all constituencies, including the civic associations and the contractor(s).

as IW, without regard to the particular organisms involved, their number or the kind of items contained within the waste. The same is true for waste generated from surgery, labor and delivery, and the microbiology laboratory.

The subjective nature of the definition is also illustrated by the inclusion in the DOH's (and others) categories of IW some items that are only occasionally "infectious" - sharps, even unused sharps, the principal hazard of which is physical injury; and human body parts, the principal objections to which are moral and aesthetic.

The above problems notwithstanding, the University must be governed by the applicable regulations of public health agencies. In New York, the DOH regulates the hospital definition and handling of IW in its DOH Medical Facilities Code, Part 10NYCRR 405.3 (b) (5), and its 84-2 memorandum (Appendix I), a policy that may be superseded by pending legislation concerning infectious waste that changes the definition minimally. Or it may be altered by pending incinerator legislation (Appendix 3) that expands the definition of the DOH to include "waste from cleaning, sterilizing or disinfection isolation, precaution or surgical areas" and "all waste pharmaceuticals, drugs, and therapeutic agents".

In addition to the DOH's role in defining the nature and handling of infectious waste in hospitals and chronic care facilities (but not private homes, clinics or physicians offices), once such waste is either incinerated on-site or moved off-site for disposal, it comes under the purview of the New York State Department of Environmental Conservation (DEC). The authority of DEC to regulate disposal of IW derives from 6NYCRR 364.2 (a) (3) that prohibits relinquishing "regulated" waste (of which IW is a part) and transporting of such waste except under permitted circumstances and by permitted carriers. The DEC has stated that it accepts the DOH's definition of IW as written in 84-21. However, its interpretation of 84-21, as set forth in a regional "guidance" memorandum of January 16, 1987, significantly extended IW to include all surgical, and labor and delivery waste, as well as all liquid blood-containing items (e.g., IV tubing), whether these emanated from a patient on isolation or not. This difference in perspective is currently undergoing a clarification, but the nature of this resolution is uncertain.

Finally, whatever the regulations proffered by the DOH and the DEC, the township that operates the relevant landfill may further restrict what it accepts as "non-infectious waste", though it may not be less restrictive than state regulations require. The University and the Hospital have been subject to this discretion over the past six months, resulting ultimately in a stipulated legal agreement between the University and the Township of Brookhaven, establishing what constitutes IW

Waste Category	Pounds Per Week
Surgical Waste	7,500
Obstetrical Waste	3,000
Biological Waste	1,000
Blood & Blood Products	2,500
Pathological Waste	500
Isolation Waste	25,000
Renal Dialysis	3,500
Sharps	1,500
TOTAL	44,500

B. Campus Facilities

The accompanying tables break down the infectious waste generation by sharps/non-sharps and by HSC and non-HSC source, by department. As shown, the HSC weekly total is about 150,000 grams (sharps and non-sharps), the total non-HSC total is about 415,000 grams. At approximately 480 grams/lb., this comes to a total generation of 11.7 lbs./week of infectious waste, or about 2.6% of that which is coming from the hospital.

INFECTIOUS WASTE DISPOSAL METHODS

As in the previous section, disposal methods for IW at University Hospital will be described separately, along with current cost estimates. Disposal methods for IW for the University as a whole are presently being developed. However, from a perusal of the returned questionnaires, it is clear that there is a widespread misunderstanding of what constitutes "infectious waste" and a comparable confusion about appropriate methods of decontamination and discard.

At the present time, infectious waste is not considered a hazardous waste by the DEC. Although they require that haulers have a part 364 permit, which the University's contractor has, no waste manifest is required. However, it is specifically written in the University's contract that a manifest must accompany any billing for waste disposal. These manifests are kept on file with the department of Environmental Health and Safety. New legislation is pending which will require, among other things, that all infectious waste be disposed of in a similar manner to chemical waste, using the manifest system.

A. University Hospital

University Hospital has segregated infectious waste since its doors were opened in February, 1980. However, from February disposal can be maintained.

CURRENT INFECTIOUS WASTE DISPOSAL COSTS

Since March of 1987, the cost of infectious waste has increased, from approximately $.14/lb. to $.32/lb. due to new and pending regulations regarding the transport and disposal of infectious waste, including boxing of infectious waste for transport. Also during this period, there was an increase in volume of infectious waste as a result of newly adopted "interpretations" of existing regulations by various governmental agencies which lead to increased disposal costs. Costs will continue to increase in the future as new regulations are promulgated, following the same pattern as chemical and radioactive wastes have in the last two decades.

A. University Hospital

In 1985, the Hospital had negotiated a contract for a "flat monthly rate" rather than per bag or per pound to save on administrative costs, personnel time to oversee the actual count or weight, and a concern for accuracy when weight was determined "off site" by weigh station or vendor. This rate was $13,500/month, or $162,000/year. Currently, the Hospital has renegotiated a monthly "flat rate" of $56,000/month, or $672,000/year. This translates to approximately $.295/lb. Before this contract was negotiated, the Hospital was paying at a rate of approximately $85,000/month, or $1,000,000/year. In addition, this required an increase in FTE's from the Housekeeping Department (1 FTE to 6 FTEs) due to the added step of boxing the waste, and the increase in the volume of waste generated mentioned above.

The sharps disposal service will cost the hospital approximately $8,400/month or $100,000/year.

B. Campus Facilities

Based on the experiences of the Hospital, it was evident that campus infectious waste disposal would also have to be addressed. A mechanism for this waste's removal was also established in the current contract. The rate negotiated for the campus is $.40/lb. This was partially due to the fact that the volume of waste to be removed was an unknown.

The estimated yearly cost for campus infectious waste generation based on data drawn from the questionnaire, is approximately $28,000/year. Of course, this is an approximation. The actual cost will not be known until the program is fully implemented. However, even if the estimates used are off by a magnitude of 100-400%, the volume and costs of non-Hospital waste will remain less than 10% of that occasioned by University Hospital waste. In addition, it is expected that the campus infectious waste program will require at least one additional FTE.

FUTURE ALTERNATIVES TO PRESENT DISPOSAL

A. Alternatives that decrease the volume of waste generated.

   1. Re-definition
   2. Use of re-usable supplies

B. Alternatives that decrease the cost of waste generated.

   1. Generic environmental impact statement for incinerators
   2. Coordinate regulatory efforts
   3. Hospital incinerator consortium on Long Island
   4. Use of incinerator ash

C. Alternatives that primarily alter the safety of handling.

   1. Educational programs for:
      a. hospital workers
      b. landfill employees
   2. Studies of infectious hazards for landfill workers
   3. Use of non-vinyl chloride plastics

D. Other approaches

   1. Chemical disinfection, e.g., chlorine bath
   2. Irradiation

(The above 2 approaches render infectious waste as non-infectious.)

PRESENT DISPOSAL METHOD

The Department of Environmental Health and Safety is responsible for administering the campus chemical waste disposal program. In addition to collection and preparation of waste for disposal, Environmental Health and Safety is responsible for maintenance of manifest records including the following disposal information:

- Waste Class
- Date of Shipment via disposal contractor
- Waste contractor Identification information
- Final destination of waste

Manifests for all chemical wastes are forwarded to the New York State Department of Environmental Conservation.

Actual disposal of chemical waste is executed by a contracted disposal firm. In 1986, University disposal costs reached the $40,000 level. The final destination of waste is either an approved landfill or destruction through incineration.

ALTERNATE DISPOSAL METHODS

In looking at alternate disposal methods for hazardous chemical waste, four specific chemical wastes can be targeted as suitable for disposal through a differing, cost effective manner. They are as follows:

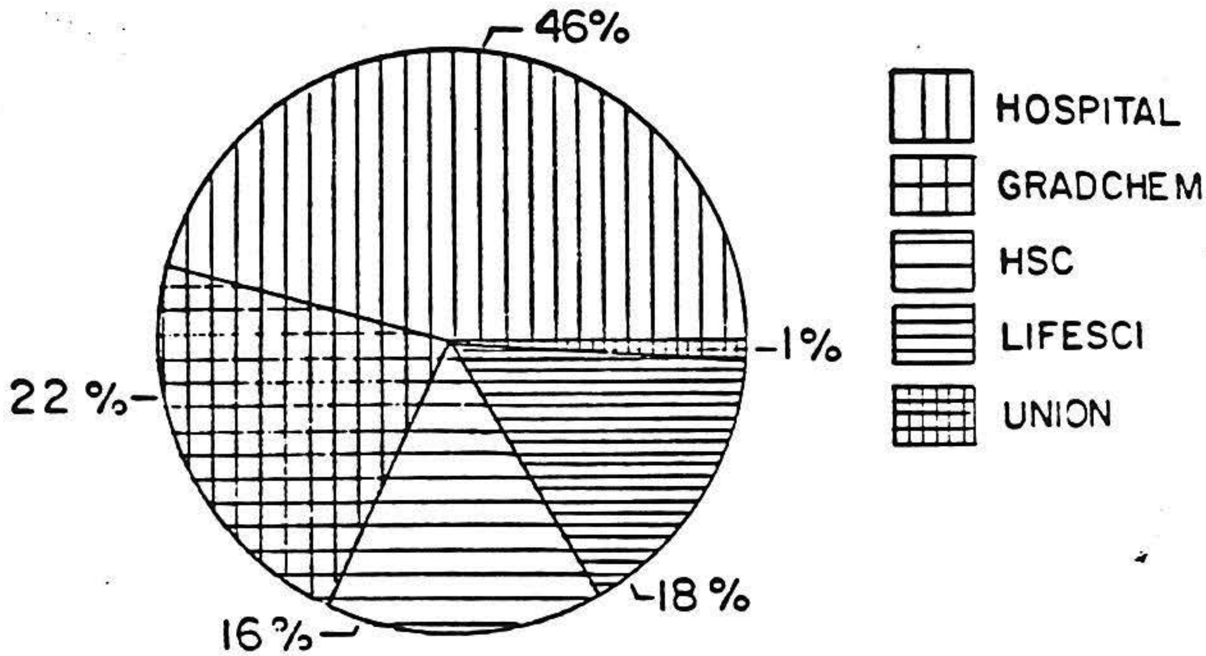
1. Laboratory Waste Oil - As with automotive oil, this waste can be disposed of at minimal cost through a waste oil removal contractor. However, in order for this method to be cost effective, waste oil must be gathered and placed into a single holding tank, as removal companies require each individual oil container be analyzed for PCB contamination at the generator's cost($500.00 per analysis).

2. Solvent Waste - Certain solvents can be used as alternate liquid fuel (ALF) in incinerators. Properly equiped, future campus incinerators could be utilized.

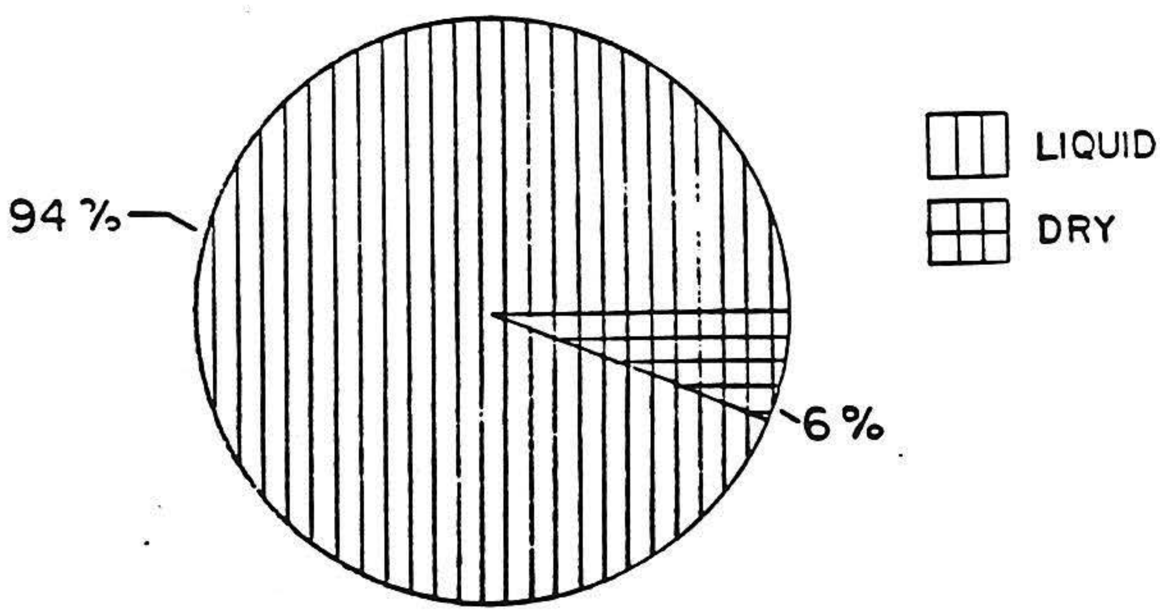
3. Mercury Waste - Gathered from several sources on campus, mercury can be sold for purification and reuse.

4. Neutralization - Small Quantities of Acids and Bases can be neutralized and poured down the local drain.

1986 CHEMICAL WASTE GENERATION TOTALS



BUILDINGS



WASTE TYPE

Total Chemical Waste
1986 Generation Information

BUILDING	GENERATED GALLONS
Hospital	1,035.23
Graduate Chemistry	492.31
Health Sciences Center	355.82
Life Sciences Building	351.13
Student Union	18.00
Marine Sciences	17.03
Library	9.76
Educational Comm Center	3.58
Engineering	1.40
Putnam Hall	1.00
Total Gallons>>>>	2,285.26

Dry Chemical Waste
1986 Generation Information

BUILDING	GENERATED GALLONS
Life Sciences Building	89.00
Health Sciences Center	52.00
Putnam Hall	1.00
Total Gallons>>>>	142.00

Liquid Chemical Waste
1986 Generation Information

BUILDING	GENERATED GALLONS
Hospital	1,035.23
Graduate Chemistry	492.31
Health Sciences Center	303.82
Life Sciences Building	262.13
Student Union	18.00
Marine Sciences	17.03
Library	9.76
Educational Comm Center	3.58
Engineering	1.40
Total Gallons>>>>	2,143.26

RADIOACTIVE WASTE FINDINGS

Edward J. O'Connell

DEFINITION

Low-level radioactive wastes result from a variety of specific activities. The following presents an overview of the various types and forms of LLRW generated by institutions.

INSTITUTIONAL WASTE

Hospitals, universities, and research centers are grouped together in the category of institutional generators.

Waste produced by Medical sources result from the use of radioactive materials in the practice of medicine. Nuclear medicine , which involves the use of radionuclides for diagnosis, is widely practiced, and an estimated 10,000,000 in-vivo nuclear medicine procedures are performed annually in the United States. Currently the University Hospital performs approximately 4,000 in-vivo nuclear medicine studies per year. Most of the radionuclides used in nuclear medicine have half-lives of less than 8 days.

Bioresearch wastes result from the use of radioactive material in biochemical, and physiological investigations. This research uses various radionuclides as tracers in test animals and labeling of organic chemicals to study reactions and obtain basic medical data. Tritium, with a half-life of 12.3 years, is the principal radionuclide found in these wastes.

Low-level waste is also generated through research in physics, inorganic chemistry, materials analysis, and geology. Much of this waste is produced through the use of charged-particle accelerators or small research nuclear reactors. Some low-level waste is also produced through the instructional or classroom use of radioactive materials.

All of the above institutional activities produce the following types of low-level wastes.

*Dry Waste. Protective clothing, gloves, small tools, plastics,rags, paper, and packaging materials are typical wastes from all institutional sources.

*Liquid Scintilation Vials. Scintilation "cocktails" consist of an organic fluid (usually toulene) contained in a plastic or glass vial. The organic fluid reacts to collisions with radionuclides by emitting flashes of light, which can be

Figure 1

Primary Radionuclides Found in Institutional Wastes

Radionuclide	Half-Life	Predominant Waste Types	Used In/ with Patients	Dominance In Waste Shipped %	Primary Waste Stream	Type of Radiation
Calcium-45	165 days	Research fluids	--	--	Bioresearch	Beta
Carbon-14	5,730 years	Research fluids	--	3	Bioresearch	Beta
Cesium-137	30 years	--	Radiation therapy	--	--	Beta, gamma
Chromium-51	27.8 days	Research fluids	--	2	Bioresearch Medical	Gamma
Galium 67	77.9 hours	Syringes	Yes	--	Medical	Gamma
Hydrogen-3 (Tritium)	12.3 years	Research fluids	--	75	Bioresearch, 65% Other research, 35%	Beta
Indium-111	2.8 days	Bottles/ syringes	Yes	--	Medical	Gamma
Iodine-123	13.3 hours	Containers/ syringes	Yes	--	Medical	Gamma
Iodine-125	60.2 days	Clinical and research fluids	Tests outside body	11	Medical 40% Bioresearch 59%	Gamma
Iodine-131	8.05 days	Bottles/ syringes	Yes	--	Medical	Beta, gamma
Molybdenum-99	66.7 hours	Depleted sources	--	--	Medical	Beta, gamma
Phosphorus-32	14.28 days	Bottle/ syringes/ research fluids	Yes	5	Bioresearch Medical	Beta
Rubidium-86	18.66 days	Research fluids	--	--	Bioresearch	Beta, gamma
Selenium-75	120.4 days	Bottles/ syringes	Yes	--	Medical	Gamma
Sulfur-35	87.9 days	Research fluids	--	3	Bioresearch	Beta
Technetium-99m	6.05 hours	Depleted sources	--	--	Medical	Gamma
Thallium-201	74 hours	Bottles/ syringes	Yes	--	Medical	Gamma
Xenon-133	5.27 days	Bottles/ collectors	Yes	--	Medical	Beta, gamma
Ytterbium-169	37.8 days	Bottles/ syringes	Yes	--	Medical, 58% Other research, 47%	Beta

a Normally held for decay of radioactivity and disposed of as non-radioactive.

5 gallon dry

Health Sciences Center	29	
Hospital	7	
Life Science Building	20	
South Campus	10	
Earth and Space Sciences	1	
Total Containers>>>>	67	$5,025.00
Total Gallons>>>>	335	

5 gallon vial

Health Sciences Center	5	
Life Science Building	8	
South Campus	1	
Total Containers>>>>	14	$1,050.00
Total Gallons>>>>	70	

30 gallon dry

Health Sciences Center	8	
Hospital	4	
Life Science Building	2	
South Campus	1	
Total Containers>>>>	15	$4,500.00
Total Gallons>>>>	450	

liquid solid pack
55 gallon

Life Science Building	2	
Total Containers>>>>	2	$1,200.00
Total Gallons>>>>	110	

PRESENT DISPOSAL METHOD - BURIAL THROUGH A BROKER

The University maintains a contract for the disposal of most of the low-level radioactive waste that is generated with a licensed disposal company called Radiac Research Corp.. This broker picks-up properly packaged metal drums for transportation to the two operating disposal sites in the country located at Richland, Washington or Barnwel, South Carolina. The Department of Environmental Health and Safety is responsible for the administering of the campus radioactive waste disposal program. In addition to the collection and preparation of waste for disposal, Environmental Health and Safety is responsible for maintenance of manifest records including the following disposal information:

- -Waste Type
- -Waste Class
- -Amount of Waste
- -Waste contractor identification number
- -Final destination of Waste

On a limited basis the Department of Environmental Health and Safety operates a decay program for short half-lived material (< 14 day). This program saves the University about $25,000 per year.

ALTERNATIVE DISPOSAL METHOD - DEREGULATION

The disposal of radioactive waste is highly regulated so the alternatives are very few at this time. Deregulation of institutional waste could represent a breakthrough to the shortage of available space at disposal sites (Texas has already passed such legislation).

VOLUME REDUCTION - NEW HAZARDOUS WASTE STORAGE FACILITY

There is an Environmental Health and Safety capital budget request awaiting additional funds for the construction of a hazardous waste storage facility which would allow the University to expand the following alternative programs:

1) On site decay program to include longer half-lived isotopes (<60 day).

2) Compaction of dry waste in order to reduce volume.

3) Operation of a liquid scintilation vial crusher that would reduce liquid volume and offer a possible "ALF" route for deregulated (3H & 14C) radioactive waste

CAMPUS PAPER RECYCLING PROGRAM STATUS

Michael J. DeMartis

Paper recycling is a concept which has been around for many years. This is evidenced by the number of companies which have existed in this market recycling paper and related products.

In the early 1980's a student group on campus operated a limited service to the campus community which exclusively involved computer paper refuse. Finding it difficult to meet normal operating expenses, the service was dissolved in 1984 forcing departments to dispose of their computer paper via the normal garbage removal process.

On December 21, 1984, the General Institutional Services Department (G.I.S.) negotiated a contract through the Research Purchasing Department whereby established prices were put into place for keypunch cards, cardboard, computer paper, and related items. The fact that a contract price was put into place not only proved to be valuable in a fluctuating market, but also began to minimally show savings in garbage removal costs.

During its initial stages, the primary item being recycled was first and second instance computer paper. First instance computer paper simply means paper which has not been recycled before. Second instance computer paper has already been recycled, and carries less of a value in the paper market. The only non-computer paper product being collected was refuse from the Print Shop, which amounted to scraps from the paper cutting machine and test runs from printing presses.

May, 1987 marked the widespread expansion of this service, involving the participation of all office employees recycling most paper generated from the average office environment. Items such as stationery, note paper, calculator tapes, calendar sheets, maps, brochures, colored paper, coated paper, NCR paper, envelopes (without plastic windows), and soft covered magazines were now being collected by the custodial crews and kept separate from other garbage products. Although still considered to be in its infant stage, the recycling concept is quickly becoming an awareness which did not exist in the past. Today, the average throughout the recycling market, we are looking into storing canvas bins in a storage trailer with a smoke alarm, or experimenting with fabricated metal bins constructed from 55 gallon drums.

The main campus is anxious to recycle cardboard, which not only occupies a large portion of space in our dumpsters, but is also awkward in its handling. Conditions called for in recycling cardboard are that it must be baled and palletized. The former requires staffing to manually load the baler and empty the machine when full. Since G.I.S. operates the recycling service without a provided budget or staff, cardboard recycling has become the last commodity to be involved in the program. Once this is arranged, additional savings will be realized with our dumping costs. If provided with staff, the following can be achieved:

a. recycle all cardboard waste,

b. provide continuous education to participants seeking to obtain 100% cooperation,

c. separate papers maximizing payment to the University,

d. recycle wooden pallets which presently also increases dumping cost,

e. allow for more timely removal of full paper bins, reducing the concern of fire hazards, and relieving G.I.S. service units of this task.

Recycling is a concept which is here to stay. The demand for paper recycling will always be with us since the end product finds it place in every home and office building in the form of toilet paper. Also, countries such as Japan draw on our recycling resource since they are not able to generate the supply of paper required for their economy.

The time is now to devote the necessary resources to make this program work on a large scale at the University.

APPENDICES

APPENDIX B

FORUM PARTICIPANTS

1. Aldo Andreoli, Director of Environmental Quality, Suffolk County Department of Health Services

2. Thomas Cuthel, Chemical Safety Lab Manager, Department of Environmental Health and Safety

3. Gerald P. Brezner, Regional Solid and Hazardous Waste Engineer, New York State Department of Environmental Conservation

4. John Davis, Safety Data Manager, Department of Environmental Health and Safety, SUNY at Stony Brook

5. Michael J. DeMartis, Assitant Director, Office of General Instututional Services, SUNY at Stony Brook

6. Dr. Robert A. Francis, Vice President for Operations, SUNY at Stony Brook

7. Dr. Ted Goldfarb, Associate Vice Provost, SUNY at Stony Brook

8. Judy Hayward, Assistant Director, Department of Environmental Health and Safety, SUNY at Stony Brook

9. Ronald Lavalle, Deputy Director for Operations, University Hospital, SUNY at Stony Brook

10. John Marchese, Assistant to the Director, Department of Environmental Health and Safety, SUNY at Stony Brook

11. George Marshall, Director, Department of Environmental Health and Safety, SUNY at Stony Brook

12. J. Howard Oaks, Vice President of Health Sciences Center, University Hospital, SUNY at Stony Brook

13. Edward O'Connell, University Health Physicist, Department of Environmental Health and Safety, SUNY at Stony Brook

14. Dr. Sheldon Reaven, Waste Management Institute, SUNY at Stony Brook

15. Dr. Frank Roethel, Research Professor, Marine Sciences Reseach Center, SUNY at Stony Brook

16. John Rose, Associate Director, University Hospital, SUNY at Stony Brook

APPENDIX C

TASK FORCE PARTICIPANTS

1. John Davis, Safety Data Manager, Department of Environmental Health and Safety, SUNY at Stony Brook

2. Michael J. DeMartis, Assistant Director, Office of General Institutional Services, SUNY at Stony Brook

3. Dr. Robert Francis, Vice President of Operations, SUNY at Stony Brook

4. Dr. William Greene, Associate Professor of Medicine, Director of Infectious Diseases, University Hospital, SUNY at Stony Brook

5. Judy Hayward, Assistant Director, Department of Environmental Health and Safety, SUNY at Stony Brook

6. Ronald Lavalle, Deputy Director for Operations, University Hospital, SUNY at Stony Brook

7. John Marchese, Assistant to the Director, Department of Environmental Health and Safety, SUNY at Stony Brook

8. Edward O'Connell, University Health Physicist, Department of Environmental Health and Safety, SUNY at Stony Brook

9. Dr. Sheldon Reaven, Waste Management Institute, SUNY at Stony Brook

10. Dr. Frank Roethel, Research Professor, Marine Sciences Research Center, SUNY at Stony Brook

11. John Rose, Associate Director, University Hospital, SUNY at Stony Brook

12. Tony Ruggiero, President of Local 614, CSEA, SUNY at Stony Brook

13. J. R. Schubel, Provost, SUNY at Stony Brook

14. David G. Thomas, Director of Transportation Services

Appendix D

BRAINSTORMING SESSION RESULTS

The principle objectives of the Forum were to review the findings of the task force and to generate ideas on rèducing the University's waste management problems to more manageable levels. We ended the Forum with a brainstrorming session in which participants shared ideas freely. The brainstorming session was patterned after the technique developed by Alex Osborne in the 1940's. The participants were given the following instruction. Generate as many responces as you can to the following statement:

"HOW CAN THE STATE UNIVERSITY AT STONY BROOK IMPROVE ITS WASTE MANAGEMENT POLICIES AND PRACTICES?"

As the final activity of the brainstorming session, each member was given ten votes which he/she could cast for any of the ideas. Each participant was told that they could put all ten votes on a single idea or they could spread them among up to ten ideas.

Below is a list of the ideas. They have been put into the following catagories: general, municipal solid waste, infectious waste, radioactive waste, and hazardous waste. For each catagory the ideas were ranked by vote.

GENERAL

Votes/Ideas

6 - Follow up this forum--use the ideas generated.

6 - Provide resources for training.

6 - Commit to best available technology.

4 - Network with other institutions.

3 - Invite waste scavengers on to campus.

3 - Levy penalties for non-compliance with University regulations.

3 - Get commitment from the University administration to follow up.

3 - Set goals for research and secure appropriate funds.

2 - Assess hazards to infectious and hazardous waste workers.

- Do industrial engineering study of waste disposal by employees.
- Augment fuel with burnable waste products.
- Set up Long Island University Waste Disposal Consortium.
- Is garbage trash?
- Make disposal profitable.
- Charge departments by quantity of waste generated.

MUNICIPAL SOLID WASTE

Votes/Ideas

9 - Create a recycling coordinator position for the University.

9 - Implement a source reduction program.

5 - Install automated bottle recycling machines on campus.

5 - Set University-wide goals for recycling.

5 - Assess creative uses of incinerator ash.

5 - Establish a campus commission on solid waste disposal.

3 - Use electronic bulletin boards in place of newsletters.

3 - Purchase non-plastic furniture.

3 - Create a network of recycling captains.

3 - Expand cardboard bailing operation.

3 - Study composition and origin of the University's waste.

3 - Buy from companies which minimize packaging.

3 - Establish reward system for good recycling ideas.

2 - Separate at the source.

2 - Allocate funds and resources to create and sustain a SUSB recycling commission.

2 - Consider composting.

- Implement a take home program.
- Consider selling disposal services elsewhere.
- Have demonstation projects on campus using recycled waste.
- Set-up a glass recycler on campus.
- Reduce size of dumpster.
- Recycle collection bags.
- Put a garbage chute in HSC.
- The Provost must publish books on recycled paper.
- Recycle oils and service materials.
- Set up SUSWAP (State University Solid Waste Administration Program).
- Provide full funding for the Waste Management Institute.
- Adopt quality control in purchasing to ensure acquisition of goods with longer lifetimes.

INFECTIOUS WASTE

Votes/Ideas

7 - Establish a regional hospital disposal consortium.

4 - Redefine infectious waste.

1 - Have SUSB serve as a regional infectious waste incinerator site.

1 - Landfill sterilized waste.

- Review landfill agreement.
- Study the suitability of the planned hospital incinerator.