Appendix A
DEFINITIONS AND ACRONYMS

Definitions

Air Pollution – The presence in the outdoor atmosphere of one or more air pollutants or any combination thereof in such quantities and of such characteristics and duration as to be, or be likely to be, injurious to public welfare, to the health of human, plant or animal life, or to property, or as unreasonably to interfere with the enjoyment of life and property. (Section 22a-170 of the Connecticut General Statutes (CGS))

Aquifer – A geologic formation, group of formations or part of a formation that contains sufficient saturated, permeable materials to yield significant quantities of water to wells and springs. (CGS Section 22a-354h (6))

Ash – Bottom ash, air pollution control residue and other residuals of the combustion process from an incinerator utilized for the combustion of municipal solid waste. (CGS Section 22a-285 (1))

Authority – Means the Connecticut Resources Recovery Authority created and established pursuant to Chapter 446e of the Connecticut General Statutes or any board, body, commission, department, officer, agency or other successor thereto. (CGS Section 22a-260 (1))

Bulky Waste – Land clearing debris and waste resulting directly from demolition activities other than clean fill. (Section 22a-208a-1 (10) of the Regulations of Connecticut State Agencies (RCSA))

Clean Wood – Any wood which is derived from such products as pallets, skids, spools, packaging materials, bulky wood waste, or scraps from newly built wood products, provided such wood is not treated wood as defined in section 22a-209a of the General Statutes or demolition wood. (RCSA Section 22a-208a-1 (11))

Composting – A process of accelerated biological decomposition of organic material under controlled conditions. (CGS Section 22a-207a (1))

Construction and Demolition Waste – Waste building materials and packaging resulting from construction, remodeling, repair and demolition operations on houses, commercial buildings and other structures, excluding asbestos, clean fill, as defined in regulations adopted under section 22a-209, or solid waste containing greater than de minimis quantities, as determined by the Commissioner of Environmental Protection, of (A) radioactive material regulated pursuant to section 22a-148, (B) hazardous waste as defined in section 22a-115, and (C) liquid and semiliquid materials, including, but not limited to, adhesives, paints, coatings, sealants, preservatives, strippers, cleaning agents, oils and tars. (CGS Section 22a-208x (1); RCSA Section 22a-208a (13))

Construction and Demolition Waste Processing Facility – A volume reduction plant, the operations of which involve solely the reduction in volume of construction and demolition waste generated elsewhere. (RCSA Section 22a-208a (14))

Contract Collection – Collection by a private collector under a formal agreement with a municipal authority in which the rights and duties of the respective parties are set forth. (CGS Section 22a-207 (17))

Direct Emissions – Emissions from sources that are owned or operated, in whole or in part, by an entity or facility, including, but not limited to, emissions from factory stacks, manufacturing processes and vents, and company owned or leased motor vehicles. (CGS Section 22a-200 (1))

Fiscal Year - The twelve-month period from July 1st to June 30th. For example, FY2005 goes from July 1, 2004 through June 30, 2005. Many state programs operate on a fiscal year basis.

Greenhouse Gas – Any chemical or physical substance that is emitted into the air and that the Commissioner of Environmental Protection may reasonably anticipate to cause or contribute to climate change, including, but not limited to, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. (CGS Section 22a-200 (4))

Hazardous Waste – Any waste material which may pose a present or potential hazard to human health or the environment when improperly disposed of, treated, stored, transported, or otherwise managed, including (A) hazardous waste identified in accordance with Section 3001 of the federal Resource Conservation and Recovery Act of 1976 (42 USC 6901 et seq.), (B) hazardous waste identified by regulation by the Department of Environmental Protection, and (C) polychlorinated biphenyls in concentrations greater than fifty parts per million, but does not mean by-product material, source material or special nuclear material, as defined in section 22a-151, or scrap tires. (CGS Section 22a-115 (1))

Indirect Emissions – Emissions associated with the consumption of purchased electricity, steam and heating or cooling by an entity or facility. (CGS Section 22a-200 (5))

Intermediate Processing Center – A facility which can recycle an item or items and market or deliver for reuse the resulting material product or products. Such facilities may be owned by the public or private entities or combinations thereof and may offer service on a state, regional, municipal or submunicipal level. (RCSA Section 22a-208a-1-(a) (18))

Intermediate Processing Facility –A facility where glass, metals, paper products, batteries, household hazardous waste, fertilizers and other items are removed from the waste stream for recycling or reuse. [Often referred to as an Intermediate Processing Center or IPC] (CGS Section 22a-260 (25))

Lamp Recycling Facility – A facility operated to remove, recover or recycle for reuse mercury, metals, phosphorous powder, gases, glass or other materials from fluorescent or high intensity discharge lamps. Such a facility shall be considered a volume reduction plant, as defined in section 22a-207, regardless of the volume of solid waste

generated, and shall not be subject to the requirements of section 22a-454 provided such facility is operated in compliance with federal law. (CGS Section 22a-209e)

Land Clearing/Clean Wood Processing Facility – A volume reduction plant, the operations of which involve solely the reduction in volume of land clearing debris or clean wood generated elsewhere. (RCSA Section 22a-208a-1 (a) (20))

Land Clearing Debris – Trees, stumps, branches, or other wood generated from clearing land for commercial or residential development, road construction, routine landscaping, agricultural land clearing, storms, or natural disasters. (RCSA Section 22a-208a-1 (a) (19))

Minor Change – Any change in the facility design, capacity, practice, process or equipment which, in the judgment of the Commissioner, would not significantly alter the nature of the facility or its impact on the environment. (RCSA Section 22a-208a-1(a) (21))

Mixed Municipal Solid Waste – Municipal solid waste that consists of mixtures of solid wastes which have not been separated at the source of generation or processed into discrete, homogeneous waste streams such as glass, paper, plastic, aluminum or tire waste streams provided such wastes shall not include any material required to be recycled pursuant to section 22a-241b. (CGS Section 22a-207a (2))

Mixed Municipal Solid Waste Composting Facility – A volume reduction plant where mixed municipal solid waste is processed using composting technology. (CGS Section 22a-207a (3))

Monocell – A variation of the cell construction method whereby only a single type of solid waste is disposed of in any individual cell. (RCSA Section 22a-209-1)

Mulch – A protective cover of organic material placed over soil to preserve soil moisture, prevent erosion, or promote the growth of plants. (RCSA Section 22a-209-1)

Municipal Authority – The local governing body having legal jurisdiction over solid waste management within its corporate limits which shall be, in the case of any municipality which adopts a charter provision or ordinance pursuant to section 7-273aa, the municipal resource recovery authority. (CGS Section 22a-207 (12))

Municipal Collection – Solid waste collection from all residents thereof by a municipal authority. (CGS Section 22a-207 (16))

Municipal Solid Waste – Solid waste from residential, commercial and industrial sources, excluding solid waste consisting of significant quantities of hazardous waste as defined in section 22a-115, land-clearing debris, demolition debris, biomedical waste, sewage sludge and scrap metal. (CGS Section 22a-207 (23))

Municipality – Any town, city or borough within the state. (CGS Section 22a-207 (11))

New Municipal Solid Waste Disposal Area – A solid waste facility or expansion thereof, other than a vertical expansion, for the disposal of municipal solid waste, for which facility or expansion a completed application under CGS Sections 22a-430 and

22a-208 is received by the Commissioner after the effective date of RCSA Section 22a-209-14. (RCSA Section 22a-209-1)

Processed Construction and Demolition Wood – The wood portion of construction and demolition waste which has been sorted to remove plastics, plaster, gypsum wallboard, asbestos, asphalt shingles, regulated wood fuel as defined in section 22a-209a and wood which contains creosote or to which pesticides have been applied or which contains substances defined as hazardous waste under section 22a-115. (CGS Section 22a-208x (2))

Processed Wood – Recycled wood or treated wood or any combination thereof which has been processed at a volume reduction facility permitted under this chapter. (CGS Section 22a-209a (3))

Recycled Wood – Any wood or wood fuel which is derived from such products or processes as pallets, skids, spools, packaging materials, bulky wood waste or scraps from newly built wood products, provided such wood is not treated wood. (CGS Section 22a-209a- (1))

Recycling – The processing of solid waste to reclaim material there from (CGS Section 22a-207 (7))

Recycling Facility/Recycling Center – Land and appurtenances thereon and structures where recycling is conducted, including but not limited to, an intermediate processing center as defined in section 22a-260. (CGS Section 22a-207 (8))

Region – Two or more municipalities which have joined together by creating a district or signing an interlocal agreement or signing a mutual contract for a definite period of time concerning solid waste management within such municipalities. (CGS Section 22a-207 (14))

Regional Authority – The administrative body delegated the responsibility of solid waste management for two or more municipalities which have joined together by creating a district or signing an interlocal agreement or signing a mutual contract for a definitive period of time. (CGS Section 22a-207 (13))

Regulated Wood Fuel – Processed wood from construction and demolition activities which has been sorted to remove plastics, plaster, gypsum wallboard, asbestos, asphalt shingles and wood which contains creosote or to which pesticides have been applied or which contains substances defined as hazardous under Section 22a-115. (CGS Section 22a-209a (4))

Residue – Bottom ash, air pollution control residue, and other residues from the combustion process at resources recovery facilities, wood-burning facilities, municipal solid waste incinerators, and biomedical waste incinerators. (RCSA Section 22a-208a-1 (a) (25))

Resources Recovery Facility – A facility utilizing processes to reclaim energy from municipal solid waste. (CGS Section 22a-207 (9))

Sludge Processing Facility – A volume reduction plant, the operations of which involve solely the reduction in volume of water treatment, sewage treatment or industrial sludge generated elsewhere. (RCSA Section 22a-208a-1 (1) (27))

Solid Waste – Unwanted or discarded solid, liquid, semisolid or contained gaseous material, including, but not limited to, demolition debris, material burned or otherwise processed at a resources recovery facility or incinerator, material processed at a recycling facility and sludges or other residue from a water pollution abatement facility, water supply treatment plant or air pollution control facility. (CGS Section 22a-207 (3))

Solid Waste Facility- means any solid waste disposal area, volume reduction plant, transfer station, wood-burning facility or biomedical waste treatment facility. (CGS Section 22a-207 (4))

Solid Waste Disposal Area– Any location, including a landfill or other land disposal site, used for the disposal of more than ten cubic yards of solid waste. For purposes of this subdivision, "disposal" means the placement of material at a location with the intent to leave it at such location indefinitely, or to fail to remove material from a location within forty-five days, but does not mean the placement of material required to be recycled under section 22a-241b in a location on the premises of a recycling facility, provided such facility is in compliance with all requirements of state or federal law and any permits required there under (CGS Section 22a-207 (6))

Solid Waste Management Plan – An administrative and financial plan for an area which considers solid waste storage, collection, transportation, volume reduction, recycling, reclamation and disposal practices for a twenty-year period, or extensions thereof. (CGS Section 22a-207 (15))

Solid Waste Management System – That portion of the overall state solid waste management plan specifically designed to deal with the provision of waste management services and to effect resources recovery and recycling by means of a network of waste management projects and resources recovery facilities developed, established and operated by the authority by contract or otherwise, but not embracing or including any regulatory or enforcement activities of the Department of Environmental Protection in accordance with applicable provisions of the general statutes and as may be referred to in the state solid waste management plan as developed and promulgated by the Commissioner of Environmental Protection. (CGS Section 22a-260 (23))

Solid Waste Planning Region – Those municipalities within the defined boundaries of regional planning agencies or as prescribed in the state solid waste management plan. (CGS Section 22a-207 (18))

Source-Separated Organic Material Composting Facility – Land, including structures and appurtenances thereon, where the composting of organic material that has been separated at the point or source of generation from non-organic material, takes place. Organic materials means substances composed primarily of carbon and nitrogen, including but not limited to food scraps, food processing residue, soiled or unrecyclable paper and yard trimmings. (RCSA Section 22a-208a-1(a)(31))

Special Wastes – The following wastes, so long as they are not hazardous waste pursuant to section 22a-115 of the General Statutes or radioactive material subject to section 22a-158 of the General Statutes: (1) water treatment, sewage treatment or

industrial sludges, liquid, solids and contained gases; fly-ash and casting sands or slag; and contaminated dredge spoils; (2)scrap tires; (3)bulky waste, as defined in this section; (4)asbestos; (5)residue; and (6)biomedical waste. (RCSA Section 22a-208a-1(a)(32))

Transfer Station – Any location or structure, whether located on land or water, where more than ten cubic yards of solid waste, generated elsewhere, may be stored for transfer or transferred from transportation units and placed in other transportation units for movement to another location, whether or not such waste is stored at the location prior to transfer. (CGS Section 22a-207 (10))

Treated Wood– Wood which contains an adhesive, paint, stain, fire retardant, pesticide or preservative. (CGS Section 22a-209a(2))

Volume Reduction Plant – Any location or structure, whether located on land or water, where more than two thousand pounds per hour of solid waste generated elsewhere may be reduced in volume, including but not limited to, resources recovery facilities and other incinerators, recycling facilities, pulverizers, compactors, shredders, balers and composting facilities. [Commonly referred to as volume reduction facilities or VRFs] (CGS Section 22a-207 (5))

Waste Management Project– Any solid waste disposal and resources recovery area, plant, works, system, facility or component of a facility, equipment, machinery or other element of a facility which the authority is authorized to plan, design, finance, construct, manage, operate or maintain under the provisions of this chapter, including real estate and improvements thereto and the extension or provision of utilities and other appurtenant facilities deemed necessary by the authority for the operation of a project or portion of a project, including all property rights, easements and interests required. (CGS Section 22a-260 (22))

Yard Trimmings – Leaves, grass clippings, weeds, branches up to one (1") inch in diameter and prunings from yards or gardens. (RCSA Section 22a-208a-1 (36))

Acronyms

BRRFOC/TROC – Bristol Resource Recovery Facility Operating Committee/Tunxis Recycling Operating Committee

CAA – Clean Air Act

CCM – CT Conference of Municipalities

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act

CGS – Connecticut General Statutes

COST – Council of Small Towns

CRRA – CT Resources Recovery Authority

CT DEP – CT Department of Environmental Protection

DMMP – Dredged Material Management Plan

ECOS – Environmental Commissioners Organization of the States

ECRRA – Eastern CT Resources Recovery Authority

EPP – Environmentally preferable purchasing

FR – Federal Register

HAP – Hazardous air pollutants

HHW – Household Hazardous Waste

HRRA – Housatonic Resources Recovery Authority

IPC – Intermediate Processing Center

LEED – Leadership in Environmental Energy Design – A U.S. Green Building Council program that promotes "green building" initiatives and programs.

MACT – Maximum Achievable Control Technology (Air quality standards for RRFs)

MSW – Municipal solid waste

NAAQS – National Ambient Air Quality Standards

NEPSI – National Electronics Product Stewardship Initiative

NERC – Northeast Recycling Coalition

NESHAP – National Emission Standards for Hazardous Air Pollutants

NEWMOA – Northeast Waste Management Officials Association

NGO – Non-governmental organization

NPDES – National Pollution Discharge Elimination System

NSPS – New Source Performance Standards

NSR – New Source Review – A type of air quality permit required by new RRFs.

OSW – Office of Solid Waste (Division of U.S. EPA)

PAYT – Pay-as-you-throw – A means of paying for waste disposed based on quantity.

PSA – Public Service Announcement

PSD – Prevention of Significant Deterioration (Air Quality Standards)

PSI – Product Stewardship Initiative

RBRC – The Rechargeable Battery Recycling Corporation (http://www.rbrc.org).

RCRA – Resource Conservation and Recovery Act

RCSA – Regulations of Connecticut State Agencies

RoHS – Regulations on Hazardous Substances – Adopted in the EU, and implemented in California.

RRF – Resources recovery facility

SCRRRA – Southeastern Connecticut Regional Resource Recovery Authority

SIP – State Implementation Plan

SWDA – Special Waste Disposal Authorization

TPY – Tons per Year

USEPA – United States Environmental Protection Agency

VOC – Volatile organic compounds

VRF – Volume reduction facility

WTE – Waste-to-energy

Appendix B
DATA SUMMARY, VALIDATION, AND ASSESSMENT

Introduction

This Appendix summarizes key data assumptions used in Connecticut's updated Solid Waste Management Plan. A summary of the major components of the state's waste, including municipal solid waste (MSW), residual ash from resource recovery facilities (RRFs), bulky wastes, recyclables, and special wastes is presented below. This summary is followed by a discussion of data validation and an assessment of Connecticut's process for data gathering and verification.

B.1 Data Summary

B.1.1 MSW

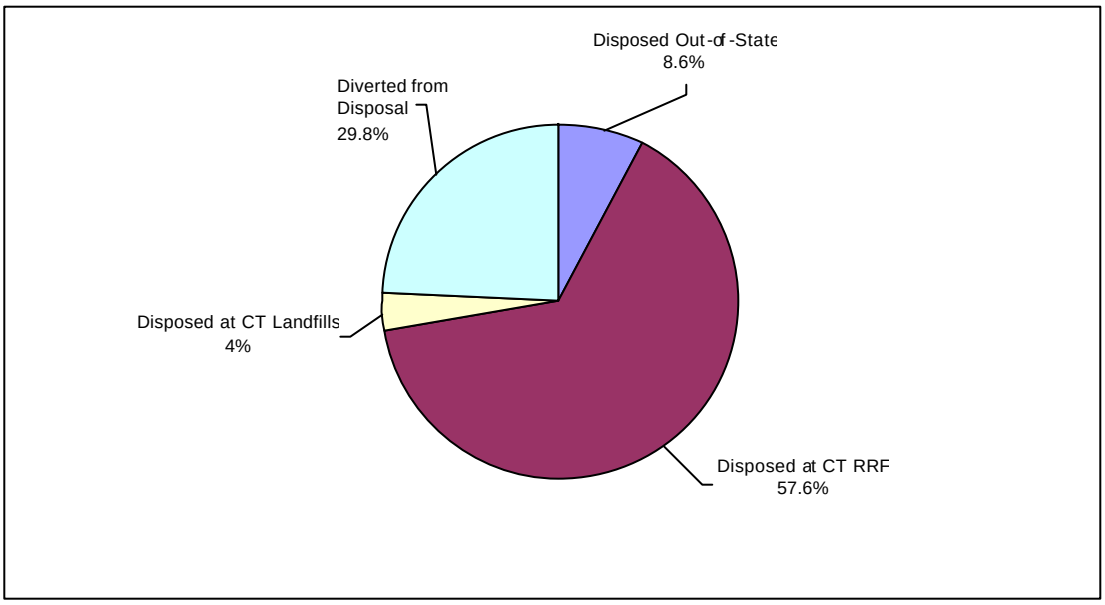
Section 22a-208a-1 defines MSW as "solid waste from residential, commercial, and industrial sources, excluding solid waste consisting of significant quantities of hazardous waste as defined in section 22a-115, land-clearing debris, demolition debris, biomedical waste, sewage sludge and scrap metal."

It is estimated that 3,805,000 tons of MSW was generated in Connecticut in FY2005. The FY2005 MSW statistics were used a baseline for this plan and were projected based on FY2003 actual data reported to the CT DEP plus estimates of additional recycling. Figure B-1 shows, for FY2005, the estimated percentage of MSW disposed in Connecticut (61.6 percent), the percent disposed out-of-state (8.6 percent), and the percent diverted from disposal through source reduction, composting, and recycling (29.8 percent). Of the total amount generated, 57.6 percent is estimated to be burned at Connecticut's six MSW RRFs and approximately four percent is disposed at Connecticut land fills.

On a per capita basis (using U.S. Census Bureau population projections) in FY2005, Connecticut was estimated to have: generated approximately 1.09 tons/person/year or six pounds/person/day of MSW; diverted from disposal approximately 0.325 tons/person/year or 1.8 pounds/person/day of MSW (30 percent of the MSW generated); and disposed approximately 0.77 tons or 4.2 pounds/person/day.

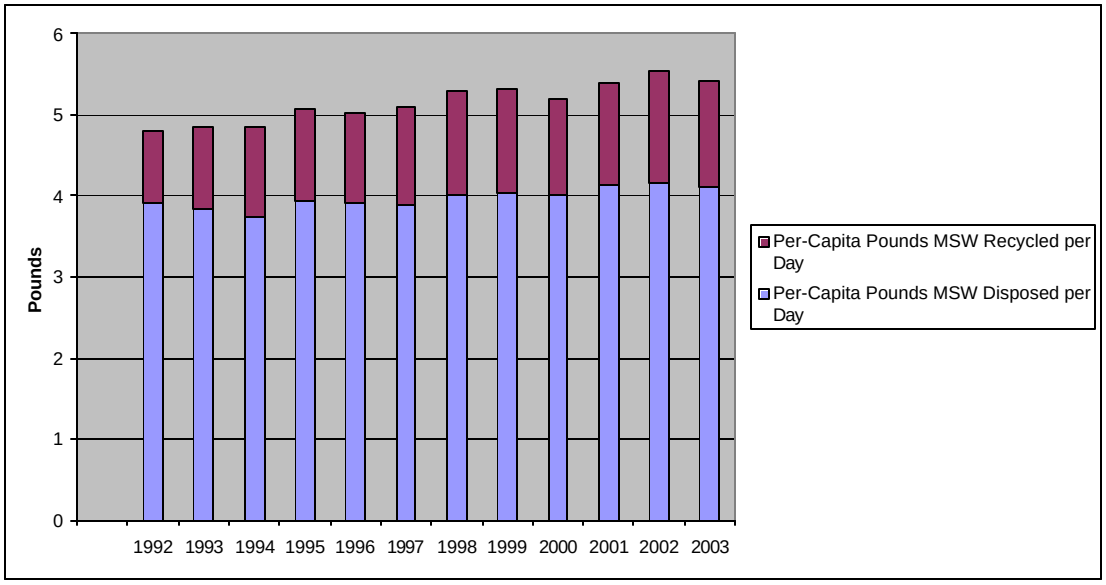
Figure B-2 shows the per capital rates for generation, diversion and disposal from FY1992 through FY2003.

Figure B-1
Management of Connecticut MSW – Estimated for FY 2005
[Total Generated: 3,805,000 tons]



Source: FY 2005 Estimates by R.W. Beck Based on FY2003 & FY2004 Data Compiled by the CT DEP and R.W. Beck estimates of additional recycling

Figure B-2
Per Capita Pounds Per Day of Connecticut-Generated MSW Disposed and Recycled
FY 1992-FY2003



Data Source: CT DEP (2002 Data May Contain Some Double Reporting for Recyclables by a CT IPC)

B.1.2 Residue Ash from RRFs

In preparing the Connecticut's Solid Waste Management Plan, it was necessary to estimate the amount of residue ash requiring disposal from Connecticut's six MSW RRFs. To develop this estimate, the five-year average (FY2000 through FY2004) of RRF ash residue disposed was used. This five-year average is 551,000 tons/year. Of this amount, 506,000 tons/year was disposed in-state and the remaining 45,000 tons/year represents ash generated by the Bristol RRF and disposed in a landfill in New York State through a contract that expires in FY2009.

B.1.3 Bulky Wastes

In Connecticut, bulky waste is defined by Title 22A, Section 22a-209-1, to mean "land clearing debris and waste resulting directly from demolition activities other than clean fill." In many other states, the term "bulky waste" refers only to oversized MSW and does not include construction and demolition waste which is considered a separate category of waste. Land clearing debris may be considered a third category of waste, although technically in Connecticut it is considered part of bulky waste.

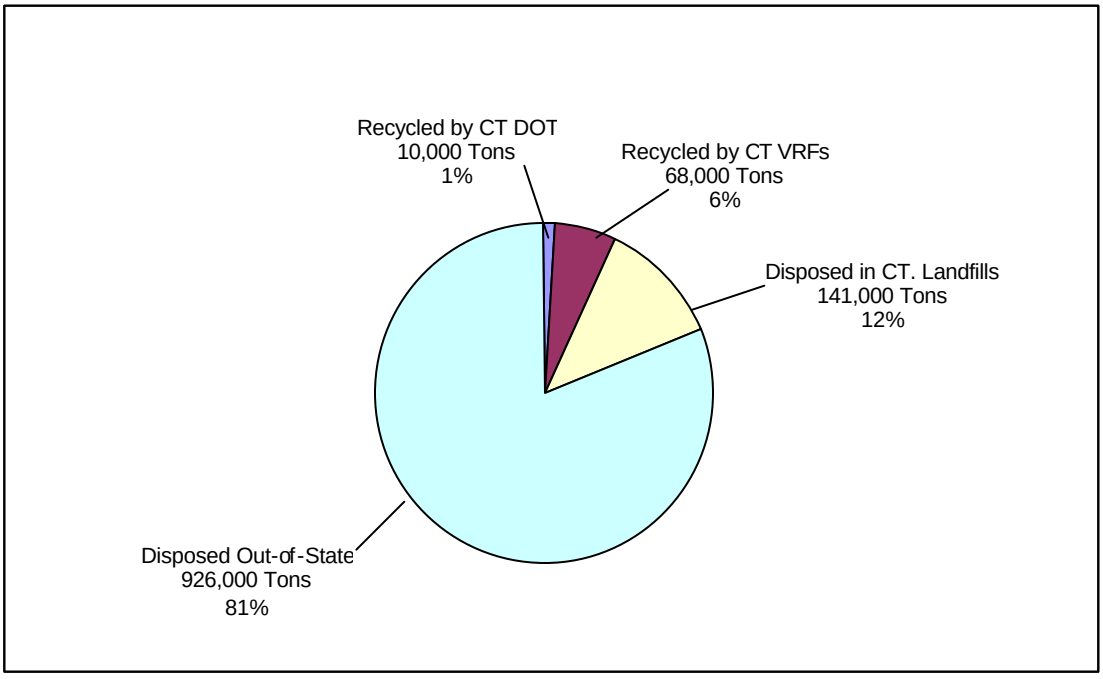
The data presented below pertains to C&D waste and oversized MSW. These materials will be referred to as "C&D waste/oversized MSW" throughout this Appendix.

Figure B-3 summarizes C&D waste/oversized MSW which includes all large items, including materials going to in-state bulky waste landfills, and materials being processed at construction and demolition volume reduction facilities, as well as materials being taken from transfer stations to out-of-state disposal facilities.

As shown in Figure B-3, a total of 1.145 million tons of C&D/oversized MSW were estimated to be have been processed, transferred, or disposed at CT solid waste facilities in FY2005. These estimates were based on FY2004 reports submitted to the CT DEP by those facilities. Approximately 78,000 tons of C&D/oversized MSW were estimated to have been marketed and recycled, mostly scrap metal and clean wood; including scrap metal recycled and wood reused by the Connecticut Department of Transportation (CT DOT). The data for C&D waste recycling does not include most of the clean fill generated in Connecticut because facilities which process or dispose only clean fill are not currently regulated by the CT DEP. Most inert clean fill is reused or recycled.

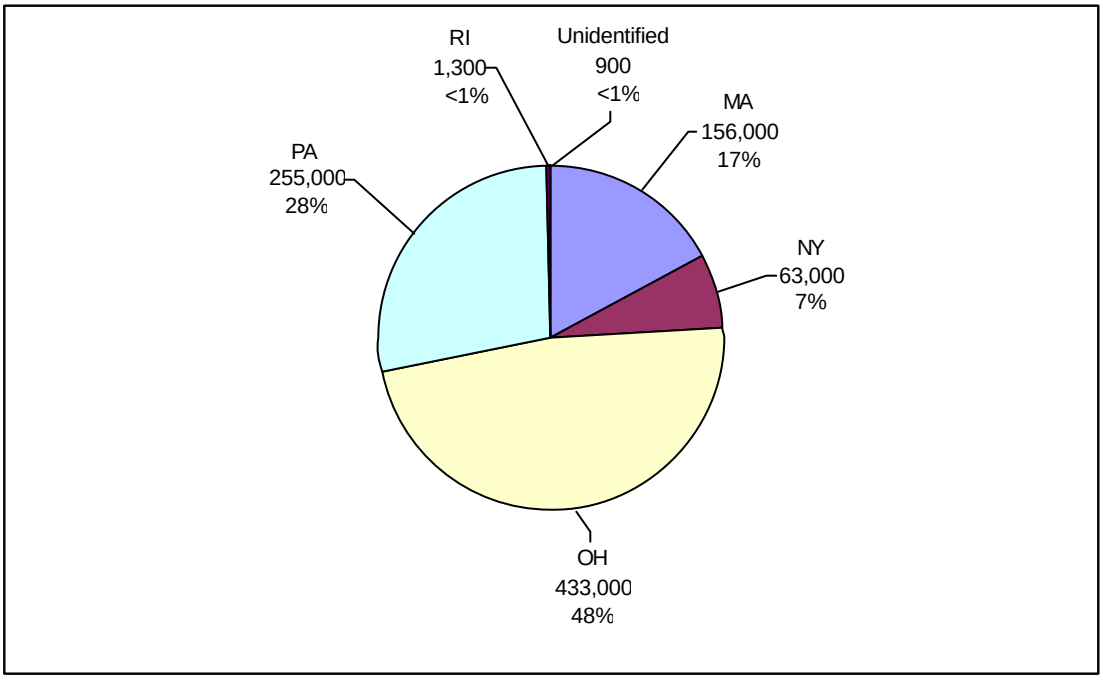
Most of Connecticut's C&D/oversized MSW is sent out-of-state for disposal. Approximately 909,000 tons were reportedly directed to out-of-state disposal in FY2004 and this is projected to increase to 926,000 tons in FY2005. Figure B-4 shows where Connecticut's C&D/oversized MSW was reportedly delivered. As Figure B-4 shows almost 50 percent of the C&D/oversized MSW is exported to Ohio. Pennsylvania is the recipient of nearly 30 percent of this waste. Although some oversized MSW, such as usable furniture, is donated for reuse, most of the oversized MSW generated in Connecticut is disposed.

Figure B-3
C&D/Oversized MSW Generated in Connecticut Estimated for FY 2005 (1)



(1) Excludes clean wood processed at clean wood VRFs and single –material processing facilities; some marketed tons include OCC, which is included in MSW recycled tons. Most marketed tons, however, consist of scrap metal. Does not include most of the clean fill generated and reused or recycled.
Data Source: FY2004 data reported to CT DEP; FY2005 estimates by R.W. Beck (escalated FY2004 data at rate of 1.6%/year)

Figure B-4
FY2005 Connecticut-Generated C&D/Oversized MSW Disposed Out-of-State



Data Source: FY2004 Data from CT DEP; FY2005 estimates by R.W. Beck

B.2 Recyclables

B.2.1 Materials Currently Recycled

In Connecticut, Sections 22a-241b-1 to 22a-241b-4 of the Regulations of Connecticut State Agencies and Sections 22a-241b(c), 22a-256a and Sec. 22a-208v of the Connecticut General Statutes designate the following as mandatory materials to recycle:

- glass and metal food containers,
- non-residential high grade white office paper,
- old newspaper,
- scrap metal,
- old corrugated containers,
- leaves,
- grass,
- waste oil,
- lead acid storage batteries, and
- NiCd rechargeable batteries.

In addition, there is a ban on disposal of grass and lead acid storage batteries in Connecticut.

These materials, plus other recyclables, are included in the following recycling tables. The estimate of recyclables diverted from disposal in FY2005 was based on FY2003 data reported to the CT DEP and estimates of additional materials diverted from disposal through the State's bottle bill and other commercial recycling but not reported to the CT DEP.

To estimate the amount of MSW recycled in FY2005, the amounts of specific materials that were reported by municipalities and processing facilities to have been recycled in FY2003 and estimates of additional material recycled (but not reported to the CT DEP) were escalated at 1.6 percent per year to reflect the growth in the generation of MSW. Table B-1 and Table B-2 present the amount of these materials estimated to have been recycled in FY2005.

In addition to the estimates made on reported amounts shown in Table B-1, estimates were made of the quantities of other material assumed to have been recycled in Connecticut but not captured by the data reported to the CT DEP. These additional tonnages included estimates of bottle-bill material generated and recovered in Connecticut through the deposit system, and additional commercial recycling (Franklin and Associates, *The Impact of Source Reduction and Recycling in Connecticut FY 1998 Update*, January 2000). The amounts of additional recyclables estimated to have been recycled in 1998 were escalated by 1.6 percent per year to

reflect the growth in the amount of MSW generated in Connecticut. This information is presented in Table B-2.

In addition to the recycling estimates for FY2005 as presented in Table B-1 and Table B-2, Connecticut also diverts waste from disposal through grasscycling and backyard composting programs. These programs encourage residents not to collect cut grass, but to leave it on their lawns and to compost leaves and other organics on-site. In FY2004, the CT DEP estimated that 49,578 tons of grass and leaves were diverted from disposal. When escalated by 1.6 percent, to account for the growth of MSW, the amount projected to be disposed in FY2005 is approximately 51,000 tons.

Table B-1
Tonnages of Materials Estimated Recycled in Connecticut FY 2005 (1)

Material	Amount Estimated Recycled (tons)
CONTAINERS (bottles, cans, cartons)	60,503.328
ORGANICS (yard waste, food, etc.)	236,865.888
PAPER (office paper, newspaper, cardboard, etc.)	465,968.448
SCRAP METAL	76,705.056
OTHER (waste oil, antifreeze, electronics, batteries, textiles, etc.)	3,797.282
TOTAL	843,840.002

(1) Source: FY2003 Data as Compiled by the CT DEP – Projected to FY2005

Table B-2
Projected Tonnages of Additional Material Recycled in Connecticut in FY2005 (based on estimates of recycled material not reported to the CT DEP such as Bottle Bill Materials and Additional Commercial Materials (1)

Material	Estimated in 1998 (tons)	Projected Estimates for FY 2005 (tons)
Corrugated cardboard	137,864	154,066
Office paper	18,077	20,201
Bottle Bill plastic containers	7,949	8,771
Bottle Bill glass containers	37,138	41,503
Bottle Bill aluminum cans	11,863	13,257
Total	**212,891**	**237,798**

(1) Source: 1998 Estimates from: *The Impact of Source Reduction and Recycling in Connecticut*; Franklin Associates for CRRA; 2000; Projections by R.W. Beck

B.2.2 Food Waste

In addition to the recyclables designated for recycling and other materials currently diverted from disposal, food waste offers Connecticut the opportunity to significantly increase the current waste disposal diversion rate of 30 percent.

Currently no known data specific to Connecticut is available regarding the quantity of residential and non-residential food waste generated and/or disposed in Connecticut. There is some food waste recovery taking place in Connecticut: in pilot programs; through food donated to soup kitchens and homeless shelters; in home composting programs; and school composting programs. Some of the pilot programs' food waste recovery tonnages are included in annual municipal recycling reports. In addition, there are anecdotal descriptions of other food waste recovery programs in some cafeterias such as those in colleges. For example, in their FY2002 annual recycling report, submitted voluntarily to the CT DEP, the Mohegan Sun Casino in Uncasville reported diverting food waste to the Millaras piggery.

According to U.S. EPA's Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2003, it is estimated that, nationally, food waste comprises 11.7 percent of generated commercial and residential MSW. In a study completed for the CT DEP in 2001, *Identifying, Quantifying, and Mapping Food Residuals from CT Businesses and Institutions*, the source-separated organics material generator categories studied in Connecticut were estimated to produce 99,000 to 153,000 tons per year of source-separated organics residuals suitable for composting. Additional food wastes could also potentially be captured from generators that did not meet the size threshold or generator category used for the study, such as restaurants.

B.3 Special Wastes

In this section, wastes which are defined as "Special Wastes" under Connecticut Statues are discussed; certain other wastes which present unusual management challenges, such as electronics, are included.

B.3.1 Electronics

The State of Connecticut uses the federal definition found in 40 CFR 100 (Code of Federal Regulations) for used electronics, which reads:

> Used electronics or used electronic devices -- A device or component thereof that contains one or more circuit boards or a cathode ray tube and is used primarily for data transfer or storage, communication, or entertainment purposes.

Management of used electronics must comply with the Universal Waste Rule in Connecticut. The universal waste rule requirements are found in Section 22a-449(c)-113 of the Regulations of Connecticut State Agencies (RCSA). The Connecticut Universal Waste Rule incorporates 40 CFR 273 in its entirety except for the following provision that is not incorporated: 40 CFR 273.32(a) (3) (regarding an exemption from notification requirements for large quantity handlers of recalled universal waste pesticides).

In additional to electronics, the following waste steams are subject to the Universal Waste Rule in Connecticut:

- batteries,
- mercury-containing thermostats,

- certain pesticides, and
- lamps, including but not limited to fluorescent, neon and mercury vapor lamps.

The Universal Waste Rule provides a set of streamlined regulations to reduce the regulatory burden by allowing longer time for the storage of the wastes, reduced record-keeping requirements and consolidation off-site without a permit.

The CT DEP does not specifically track the generation or disposal of electronics. According to the Electronics Industry of America, the average American discards 2.5 pounds of used electronics annually. Applying this statistic to the Connecticut population yields an annual quantity of approximately 4,354 tons of discarded used electronics.

The infrastructure for recycling used electronics is comprised of special collection events, drop-off sites at certain transfer stations, and private recycling companies. Special collection events are often hosted and funded by CRRA and other regional authorities, sometimes by municipalities, and sometimes by electronics manufacturers and retailers. Regional authorities and municipalities typically coordinate the events, and contract with a private company to transport and recycle the materials. Collection events are generally open to residents only. Some municipalities allow residents to bring their used electronics for recycling to the municipal transfer station or recycling drop-off site. Businesses typically hire a private company to remove their old electronics. See Appendix H for a more complete description of the management of electronics in Connecticut.

Information on private recyclers of used electronics that are either located in or serve Connecticut may be found at www.ct.gov/dep. Most municipalities charge residents to recycle their waste electronics.

To date, the only data pertaining to the quantity of used electronics recovered is from the special collection events and from municipalities which recycle electronics at their transfer stations. For 2003, the most recent data available, the CT DEP reports that annual municipal recycling reports and conversations with computer recyclers indicated approximately 427 tons of used electronics were recycled. This probably understates what was actually recovered because it does not include all materials recovered from commercial sources.

B.3.2 C&D Waste/Oversized MSW Materials

As noted above, R.W. Beck estimated that 1,145,000 tons of C&D/oversized MSW was managed by Connecticut permitted solid waste facilities in FY 2005. Reported tonnages of C&D wastes in Connecticut indicate that those wastes are generally processed through volume reduction facilities and then disposed (mostly in out-of-state landfills), or are disposed directly in bulky waste landfills without first being processed. For more information on tonnages reported, see the "Bulky Waste" section of this Appendix.

Because C&D materials are aggregated with oversized MSW, the exact amount of C&D waste generated and/or recovered in Connecticut is difficult to determine. As

shown in Figure B-3, in FY2005 the Plan projects that Connecticut C&D volume reduction facilities will send approximately 926,000 tons of C&D/oversized MSW out-of-state and approximately 141,000 tons to CT disposal facilities in FY2005. In addition, 68,000 tons of materials will be recovered at Connecticut VRFs and the CT DOT will recycle 10,000 tons of tons of steel from rebar, sheeting, and building structures.

B.3.3 Land Clearing Debris

In Connecticut, land clearing debris is one of the wastes, along with demolition waste, included in the legal definition of bulky waste. Land clearing debris, according to CT Regulations Title 22A Section 22a-208a-1(20), consists of "trees, stumps, branches, or other wood generated from clearing land for commercial or residential development, road construction, routine landscaping, agricultural land clearing, storms, or natural disasters." The CT DEP does not receive reported data pertaining to the amount of land clearing debris generated each year. However, the CT DEP does receive reports on the amount of clean wood received and processed by permitted solid waste recycling facilities including municipal compost sites. Such wood may be composted or chipped and sold or distributed as mulch by Connecticut municipalities and by various clean wood recycling facilities.

B.3.4 Contaminated Soils from Construction Projects

Contaminated soils are typically generated as a result of fuel and chemical spills, leaking oil tanks, and industrial accidents. Owners of property (Responsible Parties) containing contaminated soils generally retain a private contractor to clean up the site. The contractor has the responsibility, and liability, for managing the contaminated soils taken from the site. The four options available to Responsible Parties in Connecticut for managing contaminated soils are to deliver it to an out-of-state facility; dispose of it at an in-state landfill; deliver it to an in-state treatment facility, or reuse it in accordance with the State's Remediation Standard Regulations. Currently there is no tracking of this type of waste, and no means by which the quantity of contaminated soils in Connecticut can be reasonably estimated. The quantity of this type of waste stream is also expected to fluctuate significantly from year to year.

B.3.5 Dredged Materials

The CT DEP does not currently keep records regarding the quantity of dredged materials generated annually. In an Environmental Impact Statement for Long Island dredging that the EPA and the Corps recently completed, it is estimated that between 500,000 to 1 million cubic yards per year will be dredged from Long Island Sound, although this amount can vary significantly from year to year. This is analogous to 750,000 to 1.5 million tons of moist material. Also, this is for all Long Island Sound projects, much of which would be generated off of New York, not Connecticut. A project can produce 10,000 cubic yards per day. This material is tested, then unloaded by barge offshore at one of four designated disposal sites. Some material known to be contaminated (e.g., Bridgeport) has not been dredged as of yet, and there are no plans

to do so, as alternatives for properly managing contaminated dredged material are still being researched, and are quite costly.

B.3.6 Animal Mortalities

Animal mortalities are generated under different circumstances and at varying quantities. These can include road kill, daily or occasional mortalities of farm animals, catastrophic farm animal mortality, and veterinary animal mortalities. The generation and disposal of dead animals is not tracked by the CT DEP and no estimate of the number of animal mortalities in Connecticut is available.

B.3.7 Road Wastes

Road wastes include street sweepings and catch basin cleanings. Street sweepings are materials such as sand, salt, leaves, debris and litter that are removed from streets, parking lots, and sidewalks in order to prevent these materials from being washed into storm sewers and surface waters. There are no estimates regarding the amount of street sweeping materials generated in Connecticut. The CT DEP developed a guidance document (*Guideline for Municipal Management Practices for Street Sweepings and Catch Basin Cleanings)* for municipalities in order to educate them about the proper handling of these non-contaminated waste streams. Addressing best management practices for street sweeping is part of the requirements for the 130 Connecticut municipalities that need to obtain MS4 permits (Stormwater Management Regulations under NPDES II). According to CT DOT, there are 4,065.01 miles of State roads (e.g., roads managed by CT DOT) in Connecticut, excluding exit and entrance ramps. In addition, there are a total of 17,078.03 miles of road under local jurisdiction. According to the CT DOT, urban street sweepings are more contaminated than rural street sweepings. If 20.25 tons per street mile per year figure is applied to CT, then CT could be expected to generate approximately 428,000 tons per year of street sweepings, based on the per-mile generation rate cited above. However, the CT DEP does not track the generation of this waste. Catch basin cleanings are the materials such as sand, silt, leaves, and debris that accumulate in and are removed from catch basins. This material is usually wetter and has a higher organic content than street sweepings. There is no estimate of the quantity of catch basin cleaning waste generated in Connecticut each year. The CT DEP indicates in their Best Management Practices that approximately 0.1 pounds per catch basin per day is generated. CT DOT does not have an estimate of the number of catch basins that exist in Connecticut.

B.3.8 Household Hazardous Waste (HHW)

Pursuant to the CT DEP permitting conditions, HHW permanent facilities and contractors for the one-day HHW collections are required to report quantities of waste collected. Beginning in 2005, the CT DEP began to receive complete data from these sources. Some of this data has not been submitted and the data that has been submitted has not yet been entered onto a database.

Data limitations for the current reporting format, which includes both participation numbers and HHW types and amount, include the following.

- Inventories tend to include counts of barrels, whether they are full or not. Permanent facilities tend to have only full barrels, which is much more cost-effective. Temporary facilities tend to have many partially full barrels, and thus inventories of materials collected inherently overstate actual amounts;
- Participation rates, and thus quantities, can fluctuate significantly depending on outside factors such as weather on a collection day, availability of paint recovery program, etc.
- Not all types of HHW are equally toxic or harmful, thus citing a single figure for the number of tons or gallons of HHW can mask these different levels of toxicity.
- A decrease in participation and/or tons can actually be positive because it may be a sign that residents are not consuming more of a HHW product than they need, are finding reuse opportunities, or are using less toxic alternative products.

The CT DEP had made an effort in recent years to collect elemental mercury and mercury-containing devices through collection events at hospitals, schools, dental sweeps, and HHW and/or electronics collection events. The total pounds of mercury reported collected at these events from FY2000 through FY2004 are shown in Table B-3. As with HHW participation, the pounds of mercury collected may decrease over time, as users of mercury products switch to alternative products. Therefore, data pertaining to pounds of mercury collected in Table B-3 could indicate a successful program.

Table B-3
Pounds of Mercury Collected
2000 through 2004

Year	Thermometer Exchange	School Cleanouts	Dental Sweeps	Total
2000	43.3	306.8	412.0	1,561.9
2001	50.5	87.5	0.0	707.9
2002	10.4	88.8	0.0	99.2
2003	6.0	0.0	0.0	6.0
2004	3.0	0.0	0.0	3.0
TOTAL	**113.2**	**483.0**	**412.0**	**2,378.0**

B.3.9 Sewage Sludge

Sewage sludge is the product of Connecticut's 111 wastewater treatment facilities. It is primarily organic material and is typically de-watered on site. The management of sewage sludge is the responsibility of the municipality or owner of the wastewater treatment facility. The de-watered sewage sludge generates approximately 118,000 dry tons de-watered cake per year. Sewage sludge is handled by incineration, managed

on-site through composting, or shipped out of state for disposal. Approximately 74 percent of all facilities in Connecticut send their sludge to one of the state's six incineration facilities located in Hartford, Mattabasett (Cromwell), Naugatuck, New Haven, Waterbury, and West Haven. The amount of ash residue that is generated as a result of the incineration process is only reported to the CT DEP if the disposal of that ash occurs with the state and the Connecticut disposal facility reports to the CT DEP. This lack of reporting makes it difficult to quantify total amounts. In FY2004, four of the six sludge incinerators facilities shipped this waste out-of-state. Approximately fourteen percent of the sludge is shipped directly to out-of-state facilities. Approximately ten percent of the sludge is managed on-site/composted. Less than two percent of the sludge is managed in some other manner.

B.3.9.1 Summary of Special Waste

Table B-4 summarizes the status of CT DEP efforts to track the special wastes discussed in this section and provides an estimate of generation and recycling, where these estimates are available.

Table B-4
Summary of the Status of CT DEP Efforts to Track the Generation of Specific Connecticut Special Wastes

Special Waste	Is the Amount Generated Specifically Tracked by the CT DEP?	Estimated Generation	Source
Electronics	No	4,354 TPY	EIA (1)
Food Wastes	No	NA	
C&D Materials	No (2)	NA	
Land Clearing Debris	No	NA	
Contaminated Soils	No	NA	
Dredged Materials	No (3)	NA	
Animal Mortalities	No	NA	
Road Wastes	No		
Street Sweepings	No	428,126 TPY	CT DOT
Catch Basin Cleanings	No	NA	
HHW	Yes	NA	
Sewage Sludge	Yes	118,000 dry tons (dewatered) per year	

If these wastes are processed or disposed in a Connecticut permitted solid waste facility or included in a municipal annual recycling report, then the amounts recycled, processed, disposed, or transferred would be included in recycling, bulky waste or special waste tonnages tracked by the CT DEP. However, the amount generated is not tracked by specific material type.

(1) Electronics Industry of America

(2) The CT DEP does attempt to track Bulky Waste, of which C&D Materials are a part.

(3) The Army Corps of Engineers monitors the generation of dredged materials in Long Island Sound and certain bodies of fresh water

(4) NA-Not available.

B.4 Data Validation

B.4.1 Data Collection

Data pertaining to MSW are gathered by the CT DEP in a variety of ways. Table B-5 summarizes these methods. Reports are submitted to the CT DEP's Bureau of Materials Management and Compliance Assurance (BMM&CA), Bureau of Water Protection and Land Reuse (BWPLR), and the Office of Planning and Program Development (OPPD).

Table B-5
MSW Data Reports Submitted to CT DEP

Form Name	Submitter	Frequency	Main Data Contained
Annual Municipal Recycling Report Form (submitted to joint program OPPD/ BMM&CA)	Municipalities	Annual (due August 31)	■ Residential tons of recyclables recycled from residential facilities, names of receiving facilities ■ Quantities recycled from non-residential sources, and receiving facility names ■ Specific efforts to promote home composting and grasscycling (yes/no questions) ■ Education/enforcement activities and events ■ Recycling violations reported to municipality by RRFs/solid waste (SW) facilities ■ Pay as You Throw (PAYT) program ■ Registered haulers, and their contact info ■ Disposal sites (for MSW, bulky, and special wastes) and amounts disposed
RRF Operational Report (submitted to joint program OPPD/ BMM&CA)	CT RRF Facilities	Quarterly (or monthly depending on permit)	■ Tons CT waste received ■ Tons out-of-state waste received ■ Tons and destination of ash produced ■ Tons and destination of bypass waste sent out ■ Tons regulated wood fuel received ■ Tons coal burned (Mid-CT RRF) ■ Tons lime used ■ KWH produced (gross and net) ■ Tons metal recovered (before and after combustion) ■ Tons other material recovered before combustion ■ Tons separated non-ash residue disposed elsewhere ■ Pounds steam produced ■ Destination of all materials exiting facility ■ Authorized special waste tons received

Table B-5
MSW Data Reports Submitted to CT DEP

Form Name	Submitter	Frequency	Main Data Contained
RRF SW Detailed Tonnage Report (joint program OPPD/ BMM&CA)	CT RRF Facilities	Quarterly (April 30, July 31, Oct 31, Jan 31)	■ CT contract tons delivered by source (e.g., town or regional multi-town facility of origin) ■ CT spot tons delivered by source (e.g., town or regional multi-town facility of origin) ■ Out-of-state tons delivered by source (e.g. state or regional multi-town facility of origin) ■ Type of waste (MSW, bulky, authorized special waste, processed demolition wood) ■ All data is monthly
Landfill Solid Waste Tonnage Report (joint program OPPD/ BMM&CA)	CT Landfills	Quarterly (April 30, July 31, Oct 31, Jan 31)	■ Tons of waste received, by type (MSW, bulky, special, or ash), by town (for CT waste), by state (for out-of-state waste) or by regional multi-town solid waste facility of origin; ■ Type of special waste ■ All data by month
CT Solid Waste Transfer Station Report (joint program OPPD/ BMM&CA)	CT Solid Waste Transfer Stations	Quarterly (April 10, July 10, Oct 10, Jan 10)	■ Type of waste (MSW, bulky, special, recyclables), received by town (if from CT) or by state (if from out-of-state) of origin ■ Tons of waste (MSW, bulky, special, or recyclables) transferred to disposal or recycling or other type of facility, and name of facility receiving waste ■ All data by month
VRF – C&D Waste/SW Facilities (joint program OPPD/ BMM&CA)	VRF Facilities	Quarterly April 10, July 10, Oct 10, Jan 10	■ C&D tons delivered by waste type (e.g., scrap metal, non-treated lumber, clean wood, clean fill, C&D wastes, demolition wastes, mixed wastes, etc.) by state or regional multi-town facility of origin ■ Tons MSW recyclables received and processed by type (if permitted to process MSW recyclables) by town or regional multi-town facility of origin ■ Tons and end destination (disposal or recycling) of materials by type (e.g., clean wood, treated wood, scrap metal, etc.)

Table B-5
MSW Data Reports Submitted to CT DEP

Form Name	Submitter	Frequency	Main Data Contained
Recycling Transfer Station Form (joint program OPPD/ BMM&CA)	Recycling Transfer Stations	Quarterly April 10, July 10, Oct 10, Jan 10	■ Tons recyclables received by material type (can be commingled containers/mixed paper) by residential/non-residential, and mixed (residential and non-res.) by town or multi-town solid waste facility of origin. ■ Tons transferred to processing facilities/end markets by material type ■ Tons MSW, bulky waste, special waste, received by town or facility of origin, by month. (if permitted to also transfer solid waste) ■ Tons solid waste transferred and name/location of disposal or other facility receiving waste (if permitted to also transfer solid waste) ■ All data is monthly
Recycling/ SW Facility Reporting Form (joint program OPPD/ BMM&CA)	All IPC's and Recycling Facilities	Quarterly (April 30, July 31, Oct 31, Jan 31)	■ Total tons of recyclables received, by material (or commingled containers and mixed paper), from each municipality or multi-town regional SW facility ■ Tons of residue disposed, and disposal site ■ End markets and tons of each commodity recycled
Recycling/ SW Facilities Receiving Only Leaves/Yard Waste and Clean Wood (joint program OPPD/ BMM&CA)	All facilities that process yard waste or clean wood only	Quarterly (April 30, July 31, Oct 31, Jan 31)	■ Tons of leaves, grass, brush, mixed yard waste and clean wood (including stumps and land clearing) received, by town or multi-town regional facility of origin (by month) ■ Destination of material shipped by month, by category of end product
Scrap Metal Processor Report (joint program OPPD/ BMM&CA)	Scrap metal dealers	Annually (Calendar Year due by March 31)	■ Tons of scrap metal received, by month, by municipality or State agency (or other political subdivision) of origin (does not request scrap metal quantities by non-municipal generators).
HHW/ CESQG Report (OPPD)	HHW facilities, paint and stain facilities, and one-day event sponsors	Semi-Annual (permanent HHW) Annual – One-day events Quarterly – Paint and stain	■ Participation numbers by town; ■ CESQG's, name and type/quantity of waste delivered ■ Destination manifests, containing waste categories, unit of measure, amounts, destination, and final disposition of material (e.g., Incineration, TSDF, treatment, etc.)

Table B-5
MSW Data Reports Submitted to CT DEP

Form Name	Submitter	Frequency	Main Data Contained
Sewage Sludge Reporting – Monthly Operating Report (submitted to BWPLR)	Waste Water Treatment Plant	Monthly to annual, depending on size of facility.	■ Amount of sludge generated and where sludge is disposed

In addition, the CT DEP OPPD receives annual newsprint user reports from newspaper publishers and printers reporting the amount of newsprint used and the amount of recycled fiber contained in that newsprint and annual directory publisher reports reporting amount of recycled directory paper used and the tonnage and percent of directories retrieved for recycling. These reports are not part of the recycling database, but are managed by the CT DEP.

State agency reports are also submitted annually to the CT DEP OPPD (FY data due on October 1st), indicating types and quantities, if known of material recycled during the previous fiscal year. This is to ensure that State agencies are still complying with recycling mandates. These data are thought to be relatively accurate from buildings where State agencies manage the building directly or hire a contractor to manage the building. CT DEP reports that offices that are in leased office space are less likely to be in compliance with recycling regulations.

If solid waste goes directly from a generator to a non-reporting destination (i.e. out-of-state facility, end-user, etc.), the CT DEP does not receive this data unless a municipality solicits this information and includes it in their annual municipal recycling report. Most municipalities do not collect this data.

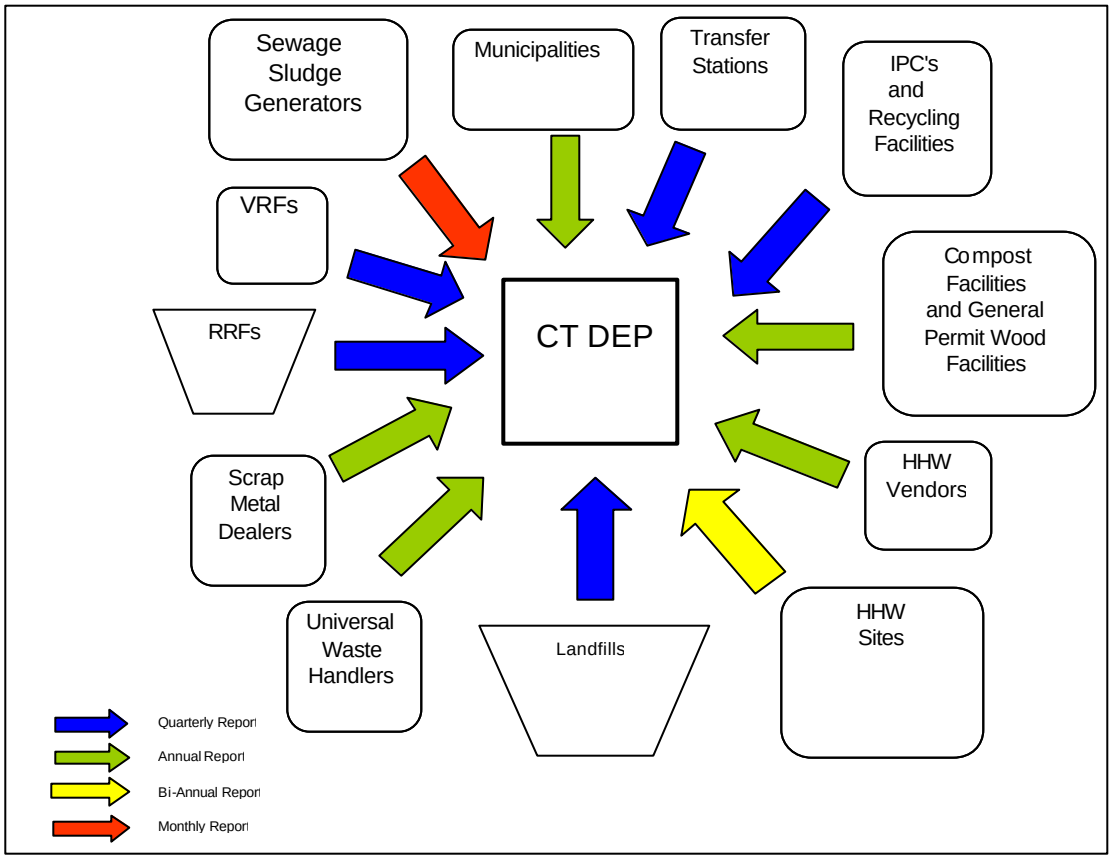
CGS Section 22a-208(e) requires that if a municipality or hauler delivers specific recyclables to a recycling facility which is not located in Connecticut, that municipality or collector must notify the CT DEP of the name and address of the owner or operator of such facility and is required to ensure, by contract, that the out-of-state facility has notice of and complies with the reporting requirements to the CT DEP. The CT DEP indicates that this reporting is not taking place.

There is, however, no similar statute for MSW or other solid waste (i.e. C&D waste, special waste, etc.) going to out-of-state facilities. If a municipality has a contract with a hauler taking MSW or other solid waste out-of-state, this will sometimes be indicated on the annual municipal recycling report or quarterly municipal transfer station reports, and the CT DEP will include that data in the calculation of solid waste disposal figures. However, MSW generated by commercial entities may be hauled directly out-of-state without record. In an attempt to capture this data, the CT DEP proposed legislation requiring haulers transporting waste directly out-of-state (without

going through a permitted CT solid waste facility) to submit a report to the CT DEP. This legislation was not passed, however.

Figure B-5 shows the type of solid waste or recycling reports the CT DEP receives. This table does not include State Agency annual recycling reports nor does it include the newsprint users and directory publishers reports. Much of this data (except sewage sludge generators, universal waste, and HHW vendor site reports) is managed by one full-time staff member in the Office of Planning and Program Development and a part-time assistant in the Bureau of Materials Management and Compliance Assurance.

Figure B-5
Type of CT Solid Waste Facilities and Municipalities Reporting to the CT DEP



B.4.2 Data Calculations

The CT DEP's program of solid waste data collection and calculation is guided by Connecticut statutes. Connecticut Statutes Chapter 446d, Section 22a-220(f) stipulate that "It shall be the goal to recycle 25 percent of the solid waste generated in each municipality provided it shall be the goal to reduce the weight of such waste by January 1, 2000, by an additional fifteen per cent [sic] by source reduction as determined by reference to the State solid waste management plan established in 1991,

or by recycling such additional percentage of waste generated, or both." This effectively puts the combined recycling and source reduction goal at 40 percent.

The CT DEP's methods for developing standard reports are described below. In addition, the CT DEP generates more targeted solid waste or recycling reports in response to requests for information received from other government agencies, from business and industry, and from the general public. The standard calculations have included:

- MSW generated, disposed, recycled; total tons and tons per capita statewide and town-by-town;
- MSW items recycled; tons and tons per capita statewide and town-by-town;
- comparison of MSW recycling rates (percent and per capita) by material type for towns as compared to other towns of similar population size
- home composting and grasscycling estimates - tons statewide and town-by-town;
- town specific per capita recycling rates compared year-to-year for five year periods;
- percentage of Connecticut MSW disposed at RRFs, disposed at landfills, disposed out-of-state, recycled, home composted/grasscycled;
- MSW imported into Connecticut from other states and disposed in Connecticut;
- C&D waste/ bulky waste disposed in Connecticut; transferred to out-of-state disposal facilities by Connecticut C&D VRFs and Connecticut transfer stations; recovered for reuse or recycling (do not get data on clean fill) by C&D VRFs or municipalities;
- special waste disposed in Connecticut disposal facilities or transferred out-of-state by Connecticut transfer stations, VRFs, RRFs, etc; and
- RRF operation reports include solid waste burned, energy recovered, ash residue tonnage and destination, by-pass waste tonnage and destination; etc.

Waste streams that are not considered MSW are not tracked as closely, because of gaps in data reporting requirements. It has been the practice of the CT DEP solid waste and recycling data management program to use Connecticut Department of Public Health population estimates to develop per capita estimates for MSW generated, disposed and recycled. Calculations of per capita MSW projections use the U.S. census population projections for Connecticut. Table B-6 summarizes the statewide figures for FY2005 estimated from actual FY2003 and FY2004 data and uses U.S. census population projections for Connecticut for July 1, 2004. The CT DEP has been collecting MSW recycling and disposal data since FY1992. FY2005 has been used in this section because it is the baseline year for assumptions made in the Solid Waste Management Plan.

For FY2005, the CT DEP-reported data yields an MSW recycling rate of 24.2 percent. Adding estimates for home composting and grasscycling and supplemental recycling, the rate of diversion from disposal is 30 percent.

Table B-6
MSW Estimates for FY 2005 Based on FY2003 and FY2004 Reports Submitted to the CT DEP and Additional Sources

	Tons per Year (numbers are rounded)	Tons Per Capita per Year (1)	Pounds Per Capita per Year	Pounds Per Capita per Day
MSW Disposed	2,671,000	0.766	1,533	4.20
CT DEP MSW Recycled (based on CT solid waste facility and municipal recycling reports)	844,000	0.242	484	1.33
MSW Home Composted/Grasscycled(2)	51,000	0.015	30	0.08
Supplemental Recycling (3)	238,000	0.068	137	0.37
Total MSW Generation (4)	3,805,000	1.09	2,183	6.0
Total MSW Recycling (5)	1,133,000	0.325	650	1.8

(1) Connecticut Population Estimate July 1, 2004: From U.S. Census Bureau Projections 3.485,593

(2) Estimated based on FY2003 municipal efforts to promote home composting and grasscycling

(3) Estimated - Includes Bottle Bill materials and some commercial recycling; Source: CRRA 2000 report *Impact of Source Reduction and Recycling in Connecticut*

(4) To project future residential and commercial generation, R.W. Beck developed a regression analysis based on Connecticut's population, to project residential generation, and the Gross State Product, to project commercial/industrial MSW generation. The output of this regression analysis is, therefore, expected to account for changes in waste generation due to fluctuations in population as well as changes in economic growth. Connecticut population projection was based on the U.S. Bureau of the Census's "Population Projections: States 1995-2025". The 1998 estimate of non-reported recyclables and the FY2003 estimate of tonnage home composed and grasscycled were projected to FY2005 at the rate of 1.6% annually – and that tonnage was added the generated tonnage to get the total projected tonnage generated for FY2005.

(5) Includes CT DEP Recycling, Source Reduction, and Supplemental Recycling

Data Sources: FY2003 and FY2004 reported data from CT DEP; additional recycling estimates from Franklin and Associates; Estimates for FY2005 by R.W. Beck

B.4.3 Data Verification

B.4.3.1 MSW Disposal

Before reports are run, the CT DEP looks for data outliers to screen potential data problems, such as extreme increases or decreases in waste disposed. In addition, the CT DEP looks for potential double-counting of materials, and cases of reports that do not agree with each other, as well as other checks and balances. Examples include:

- Verifying that amount reported sent by individual transfer station to disposal facilities is equal to the amount the disposal facilities reported receiving from those transfer stations;
- Verifying that the tonnage reported in the RRF quarterly reports equals the amount reported in their operational report for totals, Connecticut and out-of-state;
- Checking the last page of the municipal recycling reports for the disposal tonnages to capture material that may be going out-of-state but not reported on transfer station reports;

- Comparing town disposal tonnages to their tonnages last year and to their averages over the past five years;
- Calling out-of-state disposal facilities known to be, or that have historically been, accepting MSW generated in Connecticut; this is based on the Office of Congressional Research Service annual report of *"Interstate Shipment of Municipal Solid Waste"* and the Northeast Waste Management Officials' Association (NEWMOA) annual study of import and export of MSW between NEMOA member states;
- Checking Connecticut border towns to find out who hauls in their towns and call to find additional exported waste;
- Calculating the amount of material disposed in the Mid-Connecticut system (Hartford landfill, Mid-CT RRF) from Connecticut towns. This includes accounting for:
  - bypass waste, process residue, non-processibles, and
  - metals recovered pre-combustion, and
  - material recovered as pre-combustion metal but not actually recycled (i.e., some residue comes back to the RRF as result of processing the pre-combustion metal).

The CT DEP calculates a per capita MSW disposal rate for the state overall, as well as for each municipality. This calculation is accurate to the extent that MSW data collected is complete. This calculation does not address C&D waste.

In addition to Connecticut MSW disposed at Connecticut RRF's and landfills and Connecticut MSW transferred out-of-state by Connecticut transfer stations and by-passed to out-of-state facilities from Connecticut resource recovery facilities, the calculated state overall MSW disposal rate also takes into account MSW disposed out-of-state by Connecticut recycling facilities and VRF's. The CT DEP tries to eliminate as much double counting as possible.

If per capita disposal rates are significantly inconsistent with the previous year's calculations, either at the state or municipal level, the numbers receive additional scrutiny.

B.4.3.2 MSW Recycling

Historically the recycling rate in Connecticut has been calculated only for MSW; the CT DEP has not attempted to calculate a percent recycled for special or bulky waste since complete data for the amount of bulky and special waste generated is not reported. When calculating the MSW recycling rate, the CT DEP does not include metal recovered post-combustion from RRF ash because ash is not part of the MSW stream. Based on FY2004 data submitted to the CT DEP, 9.5 percent of MSW RRF ash residue was recovered as scrap metal (i.e., post-combustion scrap metal recycled). This does not include the amount of ash residue generated at the MidCT RRF or the metal recovered from the MidCT MSW before it was burned at MidCT RRF.

Checks and balances that the CT DEP conducts in calculating the recycling rate include:

- Analyzing tonnages that may be double counted because they went from one Connecticut recycling facility to another and the receiving facility reported material as coming from a town instead of another recycling facility or from a transfer station; i.e., multi-town recycling transfer stations and VRF tons marketed, as well as recycling facility tons marketed;
- Ensuring that residue tons reported are due to processing of MSW recyclables, not due to processing C&D materials at a VRF. Residue due to processing MSW recyclables are subtracted, as appropriate, when calculating state recycling rates;
- Checking towns with very high (>35) percent or very low (<15) percent recycling rates;
- Checking town rates that are twenty percent higher or lower than the town rates in previous years;
- Comparing current municipal recycling reports with the reports from the previous year to identify any obvious changes to material types or tonnage and calling towns where significant differences occur; and
- Comparing amounts of recyclables towns reported sending to processing facilities with the amounts those facilities report receiving from those towns.

In calculating recycling rates, the CT DEP:

- Calculates **statewide** recycling rates based on tons of MSW reported recycled on the annual municipal recycling reports and on tons of bottles, cans, and paper reported marketed by Connecticut recycling facilities (Before FY2002 all recycling data was obtained from the annual municipal reports). From FY2002 on, municipal data was used for obtaining recycling data for other materials (other than bottles, cans, and paper) and for bottles, cans, and paper reported sent to non-reporting destinations (i.e. out-of-state recycling facilities, directly to end markets such as paper mills, etc.);
- Calculated **town-by-town** recycling rates based on tons of MSW reported recycled on the annual municipal recycling reports;
- Calculates **statewide and town-by-town** disposal tonnages based on the MSW reported received, buried, burned, or transferred by CT landfills, resource recovery facilities and transfer stations. Corrections are estimated for municipalities for which MSW disposal numbers appear inaccurate, either under-reported or over-reported.

MSW generation is calculated in the following manner:

Tons Generated = Tons Disposed + Tons Recycled (including organics composted)

In the past, the CT DEP did not count home composting and grasscycling as part of the generation rate since, in some circles (i.e. U.S. EPA), this waste is considered source reduction because it never reached the waste stream.

MSW recycling rate is calculated in the following manner:

Percent Recycled = (Tons Recycled+ Tons Composted) /Tons Generated

In addition, the CT DEP calculates additional bulky waste recycling tonnages based on information contained in the annual municipal recycling reports. For this Plan, the CT DEP also attempted to calculate C&D waste disposal and recycling tonnages, to the extent they are available, from C&D VRFs and Connecticut DOT reports. However, this information does not represent complete data on C&D waste recycling /reuse and disposal and it is therefore difficult to calculate the correct denominator (tons of C&D generated) for the reasons described above.

B.5 Principles of Data Management Systems

The following assessment of the CT DEP's management of solid waste data is based on general principles of effective and accurate data management. These principles are presented below and then discussed in relation to the current CT DEP data management program. A good solid waste data management system will incorporate the following seven guiding characteristics or principles. A robust data management system should provide data which is:

- complete,
- accurate,
- consistent with the institutions vision and goals,
- systematic,
- accessible and usable,
- cost-effective for data supplier and data users, and
- secure.

Each of these principles is examined below.

B.5.1 Complete

The CT DEP's current data collection system does not appear to provide complete data. Examples of data which is not collected include:

- Materials collected and recycled under the Bottle Bill;
- Lead acid storage batteries collected and recycled through Connecticut's deposit system;
- Commercial recyclables processed out-of-state or at non-permitted Connecticut solid waste facilities, such as:
    - Materials recovered and handled by a broker and/or sent directly to an end market without first passing through a permitted Connecticut solid waste facility;

  - Waste oil not recovered through municipal transfer stations or recycling facilities; and
  - Materials, such as OCC, which are back-hauled from retail chains and warehouse-type stores to out-of-state regional distribution centers or warehouses for baling and recycling.
- Data pertaining to ash generation and disposal from the six sludge incineration facilities;
- Commercially generated scrap metal which is recycled;
- Solid waste which is direct hauled out-of-state for disposal; and
- Materials from facilities which are required to report are incompletely or inaccurately reported.

In addition, the CT DEP's data management systems have limitations (e.g., the PAMS, a CT DEP system for tracking permits, only allows up to five types of recyclables to be entered; PAMS system doesn't interact with the solid waste database which tracks solid waste tonnages processed through solid waste facilities).

Recommendations for Gathering more Complete Data

First, the CT DEP should make a careful assessment of what data is important, even critical, to its mission of tracking solid waste management in the state. Not all data needs to be collected and analyzed.

Following are some suggestions for capturing certain types of data, if the CT DEP deems this data important to its mission.

- For Bottle Bill Materials: Obtain statewide sales data for beverages, estimate tons of containers sold in-state, apply a known return rate such as Massachusetts' 69 percent, and use this ratio to average weights to obtain an estimate of various bottle bill materials.
- OCC Backhauls: Survey some warehouse-type stores regarding their OCC management practices and obtain information pertaining to any other recyclables they recover that are not currently reported. Figures could be extrapolated to other stores based on sales figures or number of employees.
- Estimate lead acid storage battery recycling tonnages based on national figures.

In addition to or in lieu of the above suggestions, consider the following actions:

- De-emphasize the importance of capturing ***all*** recycling data, and instead focus on per capita disposal rates. The CT DEP might track municipal recycling, in order to monitor relative progress and assess program effectiveness, but not "chase" exact recycling percentages. Instead, the CT DEP could focus on total tons of disposed MSW, and disposed MSW per capita, as these figures are generally more easily obtained and tracked. Several states (e.g., North Carolina and California) have decided in recent years to track per capita MSW disposed and develop disposed waste reduction goals, rather than recycling goals, as they believe that some specific recycling figures will never be known.

- Conduct a waste characterization study to better understand the composition and size of the disposed MSW and C&D/bulky waste streams. Such a study might also help to identify materials that could be added to existing recycling programs, as well as identify recycling programs that might benefit from supplemental education and outreach, or incentives.
- Increase the CT DEP staff responsible for data management.
- Educate and remind permittees of their responsibilities for submitting solid waste management data to the CT DEP and increase enforcement of reporting requirements.
- Streamline reporting forms to make them more user-friendly.
- Work with other Connecticut agencies and CT DEP bureaus to ensure that all information they receive pertinent to solid waste management is shared.
- Ensure that there are sufficient data elements in the PAMS database for all requested data. For example, if a facility processes 11 types of materials, ensure that there are at least 11 fields available.
- Consider making it mandatory for haulers to report all waste direct-hauled from the point of generation for disposal or recycling out-of-state or to a non-reporting destination in Connecticut without first passing through a Connecticut permitted solid waste facility. Although haulers are already required to report specific recyclables hauled directly out-of-state to the CT DEP pursuant to CGS 22a-208e(c), this reporting is not happening.

B.5.2 Accurate

The more accurate data is, the more useful it is. The CT DEP staff spends a considerable amount of time cross-checking data to ensure that there is no double counting, and to avoid other potential errors. However, inaccuracies in the data still arise for various reasons. Sometimes data are inaccurate because respondents do not have their material weighed or are asked to provide data they are not collecting. This results in estimates of varying degrees of accuracy. For example, the CT DEP asks for yard waste tonnages, but it is often collected in terms of cubic yards. Using conversion factors introduces some level of inaccuracy but is not a major cause for concern. A conversion factor is built into the solid waste database to convert yard waste cubic yards to tonnage; in addition, there are 19 other conversion factors built into the database for other items as well.

Another cause of inaccuracy includes confusion about the legal definition of bulky waste in Connecticut which is not consistent with the definition used by many municipalities and other states. This causes facilities to provide inaccurate data, and leads to entire loads being reclassified to another waste type upon entry into another state. Also, because construction and demolition debris are currently managed together, for the most part, along with bulky (i.e. "oversized") MSW, the CT DEP does not have specific data pertaining to the tons of C&D waste, or oversized MSW, or clean wood. Still another cause of inaccuracy is the failure of some facilities and some haulers to provide accurate information regarding the city or town of origin of

solid waste or recyclables delivered to Connecticut MSW solid waste disposal, transfer, or recycling facilities.

In a very few cases, a facility owner or operator or a hauler may believe that the data requested from the CT DEP is proprietary and may not wish to divulge where materials are being sent or the origin of the waste received at the facility, regardless of reporting requirements.

Recommendations for Gathering More Accurate Data

Following are opportunities to address data inaccuracy:

- Continue to cross-check data where necessary.
- Provide some additional, more comprehensive, easy-to-understand conversion factors for certain waste streams. For example, use standard container sizes used for the waste stream, and provide a factor for various levels of compaction/moisture, etc.
- Develop clear definitions and consistent terminology for waste types, such as for C&D waste, oversized MSW, and land clearing debris that are more consistent with municipal and surrounding states' definitions, and are in line with management strategies for those waste streams.
- Develop and publicize policies for protecting proprietary information.

B.5.3 Consistent with the CT DEP's Solid Waste Management Vision and Goals

The CT DEP's Solid Waste Management Plan targets reducing the waste stream by 58 percent. However, as described above, there are many "holes" in the data required to calculate progress toward the stated target. As the CT DEP develops and/or revises its solid waste management goals, it should revisit the data it is seeking and the means of collecting that data. Tying data directly to the goals and objectives of the Solid Waste Management Plan makes them more logical to those providing the data.

Recommendations for Gathering More Accurate Data that is More Consistent with the CT DEP Vision and Goals

- Ensure that the key data required to measure progress towards identified goals and objectives are gathered in a manner consistent with the data system principles stated above.
- Ensure that key data required for strategic planning and implementation are gathered and available as needed.
- Relax data reporting in cases where the data do not directly relate to the State's vision and goals. Simply adding new data requirements or data-gathering activities will unnecessarily consume resources.

B.5.4 Systematic

A data management system should be systematic. This means that the data should be collected and stored in an orderly and logical fashion. The CT DEP's current database systems have evolved in a patchwork fashion over many years, resulting in an overall disjointed system. Anomalies of the current system include:

- The PAMS system (which tracks information related to permitting) does not interface with the solid waste/recycling database, so the staff entering solid waste/recycling data does not have up-to-date data pertaining to the active permitted facilities they should expect to hear from.
- In the PAMS system, general permit facilities' recyclables and individual permit facilities' recyclables are not assigned the same abbreviations for materials that can be disposed or processed at these facilities.
- Terminology is confusing. Some facilities categorized as recycling facilities are actually transfer stations; recycling facilities, IPC's, C&D VRFs, all have volume reduction facility permits.

Recommendations for Making the Data System More Systematic

- Develop one integrated database among all the CT DEP bureaus, or at least ensure they are integrated. The database developer should ensure that all bureaus are involved in the database development and that their needs are recognized. Managing one database would probably also be more cost-effective than managing separate, non-integrated databases.
- Develop consistent nomenclature and definitions for facilities, facility types, waste stream types, and so on, among the CT DEP's bureaus. This will not only simplify the database, but should help the bureaus within the CT DEP work together more effectively.
- Develop and document system protocol. When data is entered, calculations are made, or reports are run, there should be protocol for indicating where in the process the user is, and in what stage of completion the database is.
- Automate cross-checking to a greater extent, if possible. This will remove an element of subjectivity and ensure a greater degree of quality control;
- Periodically review the system. The data management system should be reviewed every two or three years to ensure that it continues to meet the needs of all data providers and data consumers.
- Broaden use of data system. A more robust data system will be increasingly attractive to both the CT DEP employees and the general public.

B.5.5 Accessible, User-Friendly, and Useful

Data should be readily accessible to all those who need to use it. All solid waste data should reside in an integrated system, as described above. Currently, the data in the CT DEP's solid waste division is in two databases: (1) the solid waste database, which

is in Access, tracks the tonnages and destinations of solid waste (including recyclables) passing through Connecticut-permitted solid waste facilities and recycling as reported by the municipalities and calculates MSW recycling, disposal, and generation data for the State and for individual municipalities, and (2) the CT DEP's permitting database, called PAMS, which is in Oracle. The focus of the PAMS system is to track permitting. The PAMS system and the solid waste database are not integrated. Furthermore, the permitting and enforcement staff do not have direct access to the solid waste database.

According to the CT DEP's MIS Manager, the Department is working toward developing an integrated system that will eventually be shared by all Agency programs, such that each facility will have a common identification number. The program, called FIS (for facility identifiers), will be supported by Sequel, and will eventually take the place of the Unix-based PAMS, and integrate land, air, and water permits.

Recommendations for Making Data More Accessible, User-Friendly, and Useful

- Provide adequate hardware and software support. Currently some key CT DEP waste permitting, enforcement, and recycling staff cannot directly access the solid waste database because of hardware incompatibility.
- Implement user-friendly interfaces. Both CT DEP staff and those stakeholders entering data online should have user-friendly interfaces that are simple, clear, and not too detailed, bur provide the user with the opportunity to click for more information, if needed.
- Develop consistent nomenclature. A user-friendly system will allow all users to employ the same terminology and acronyms.
- Increase staff and resources to develop the system and keep it current.
- Consider broadening availability of some data/information. The CT DEP might post some of the results of their annual analysis online, so that citizens, businesses, municipalities, and solid waste management authorities can track the State's progress toward its solid waste management goals. The CT DEP might also consider posting municipal or regional results. Results should be easily digested (graphic, when possible) and indicate where, relative to the goal, the municipality or region falls. Comparison could also be made against other regions or municipalities with similar characteristics.

B.5.6 Cost-Effective for Data Providers and Users

The current data system(s) do not appear to be efficient for data users because the systems are not integrated, and do not use the same terminology. In addition, the current system is not automated. All data are input manually, and several queries, calculations, and manual cross-checks are necessary to verify data. In some instances, the CT DEP is asking for the exact same information and checking it against different forms, sometimes from the same reporting entity, and sometimes from a different

reporting entity. The CT DEP must determine which cross-checking and multiple reporting of the same data is necessary.

Recommendations for Making the Data System More Cost-Effective for Data Providers and Users

- Develop one integrated database.
- Work with facilities and municipalities to understand which data elements are difficult to report. The CT DEP and the reporting entities should seek a mutually agreeable system for reporting and publishing data. For example, recycling and disposal facilities currently must submit the same data in separate reports to both the CT DEP and to the municipalities. It might be possible to develop a single report that would satisfy the needs of both parties.
- Consider having quarterly reports due at staggered times, so that data could be entered on an ongoing basis.
- Develop an online database so that municipalities and solid waste management facilities can enter data online. This should save both those who report data and those that enter and publish data significant amounts of time. It is likely that such a system would have to be online, linked to the CT DEP's system, so that facilities and municipalities do not have to purchase special software.
- Streamline the data reporting process, such that:
    - To the extent possible, data is gathered from the fewest data providers. In CT, these would include obtaining some data from the recycling facilities, RRFs, and landfills, for example, rather than getting the same data from the municipalities.
    - Identify and, where possible, eliminate, duplicative reporting. Currently, some data is provided twice for cross-checking purposes. In many cases, it may be possible to eliminate this duplication.
    - Consider having recycling facilities and landfill and resource recovery facilities submit their reports to the CT DEP only, and have the CT DEP add the data to the annual reports submitted by the municipalities, eliminating the facilities' reporting to the municipalities.
    - Consider having municipalities submit only data pertaining to materials that are NOT received by in-state IPC's, recycling facilities, and disposal facilities, as that data is already captured.
    - Consider having quarterly reports submitted in different months, such that the CT DEP staff can update databases on a rolling basis. Almost all data is reported on a monthly basis, but is submitted on a quarterly basis. Rotating the months that these reports are due would provide the CT DEP with an opportunity to keep up database entry more effectively.
    - Consider collecting in-depth data on a less frequent basis, perhaps every three to five years, and basic, necessary data on an annual basis. This would streamline efforts for both providers of data, and those in-putting and

analyzing data. Alternatively, the CT DEP could focus on one topic each year, asking in-depth information pertaining to a particular goal, and more basic information absolutely necessary to measure the achievement of goals.

B.5.7 Secure

It is important that data be secure so that potentially proprietary information is not compromised. Currently all data in the CT DEP systems is password protected, and there are various levels of password protection for different database-user types. Data is backed up on tape on a nightly basis using a Legato system, and stored off-site at a nearby warehouse on a weekly basis.

Recommendations for Improving the Security of the CT DEP Data System

- Continue to ensure all data is password protected.
- Ensure only authorized users can change certain fields. This is of particular importance if the CT DEP develops an integrated database.
- Continue to backup data daily.
- Continue to store backups off-site at least weekly.
- Develop a protocol to protect proprietary information.

Appendix C
STAKEHOLDER AND PUBLIC INPUT PROCESS

To ensure that perspectives from a wide variety of stakeholders were included in the development of the amendment to the State Solid Waste Management Plan, the CT DEP provided various opportunities for stakeholder input. These opportunities for the public to provide input included:

- Statewide Public Stakeholder Forum;
- Formation of External Stakeholder Committee, with all meetings open to the Public;
- Formation of a CT DEP Internal Stakeholder Working Group;
- Outreach;
- A series of telephone and personal interviews;
- CT DEP website, P2 View Newsletter; and
- Public meetings and public hearings on the Proposed Amendment to the State Solid Waste Management Plan.

Each of these opportunities is described below.

C.1 Statewide Public Stakeholder Forum

At the beginning of the planning process, the CT DEP held a Statewide Public Stakeholder Forum during which almost 200 people provided their input on issues of importance to the development of an effective amendment to the State Solid Waste Management Plan. The Stakeholder Forum was held on June 29, 2005.

Invitations were sent to municipal officials, regional solid waste and recycling programs, resource recovery authorities, environmental groups, community groups, representatives of the solid waste and recycling industries, private citizens; and others. The Stakeholder Forum began with welcoming remarks and an overview of MSW management by the CT DEP. Then, for the rest of the day, participants divided themselves into five discussion groups to focus on the following topics:

- source reduction,
- recycling and composting of municipal solid waste (MSW),
- disposal of MSW,
- management of construction and demolition debris, oversized MSW, and other special wastes, and
- management of electronic wastes.

In addition, the CT DEP accepted input via e-mail regarding solid waste management issues that the public believed were not addressed at the Statewide Public Stakeholder Forum.

Results of the Forum can be found on the CT DEP's website www.ct.gov/dep

C.2 External Stakeholder Committee

The CT DEP recognized that an important component in developing the Plan would be on-going public input. An integral part of the public process was the establishment of an External Stakeholder Committee for the purpose providing input and comment on strategy and policy options. The Committee was not intended to come to consensus on any issue or questions, nor was their participation to be construed as an endorsement of the proposed Plan.

The External Stakeholder Working Group (see Table C-1) included representatives from municipalities and government associations, regional solid waste management authorities, the solid waste management industry, the recycling sector, community and environmental groups, and business/waste generating industries.

From June 2005 through January 2006, meetings were scheduled and held; the meetings were chaired by the CT DEP and its consultant, R.W. Beck. Initial meetings focused on a particular issue or issues, such as waste generation and diversion data, the data gathering process, recycling, source reduction, special wastes, and disposal capacity. The latter meetings were used to discuss the Draft Plan. The External Stakeholder Committee meetings were open to the public and all attendees were provided the opportunity to comment on the issues under discussion. The activities of the External Stakeholder Committee were placed on the CT DEP's website; this included the listing of the Committee members, the meeting schedule and agendas, meeting materials, a summary for each meeting, and comments submitted by Committee members with regard to the preliminary draft Plan.

Table C-1
External Stakeholders Committee

Stakeholder Working Group Member Name	Title	Address
Mr. Jonathan Bilmes	Executive Director	Bristol Resource Recovery Facility Operating Committee 43 Enterprise Drive Bristol, CT 06010
Mr. James Butler	Executive Director	Southeastern CT Council of Governments 5 Connecticut Ave. Norwich, CT 06360
Mr. Gian-Carl Casa	Director of Legislative Services	Connecticut Conference of Municipalities 900 Chapel Street, 9th Floor New Haven, CT 06510
Ms. Marilyn Cruz-Aponte	Administrative Officer	City of New Britain 27 West Main Street New Britain, CT 06051
Mr. Tim DeVivo	Treasurer	Willimantic Waste Paper Co. PO Box 239 Willimantic, CT 06226
Mr. Peter Egan	Director of Environmental Affairs and Development	CRRA 100 Constitution Plaza Hartford, CT 06103-7722
Mr. Richard Goss	Director of Environmental Affairs	Electronic Industries Alliance 2500 Wilson Blvd. Arlington, VA 22201
Ms. Kathleen Hopkins	Global Environmental Manager	UTC 400 Main St. East Hartford, CT 06108
Mr. Robert Jacques	Manager of Development	New England Region Wheelabrator Technologies Inc. 331 Southwest Cutoff Road Millbury, MA 01527
Ms. Faith Gavin Kuhn	Director of Public Information	Connecticut Construction Industry Association 912 Silas Deane Highway Wethersfield, CT 06109
Mr. Cyril May	President CRC	Yale University Recycling Coordinator Dept. of Custodial Services Box 208297 New Haven, CT 06520

Table C-1
External Stakeholders Committee

Stakeholder Working Group Member Name	Title	Address
Ms. Betty McLaughlin	Director of Environmental Affairs	CT Audubon Society at Hartford 118 Oak Street Hartford, CT 06106-1514
Dr. Mark Mitchell	President	CT Coalition for Environmental Justice PO Box 2022 Hartford, CT 06145
Ms. Barbara Moser	Environmental Purchasing Advisor	DAS/Procurement Services Box 150414 165 Capitol Ave. Hartford, CT 06115-0414
Mr. Nicholas H. Mullane	1st Selectman Town of North Stonington	The North Stonington Old Town Hall 40 Main Street North Stonington, CT 06359
Mr. Mike Paine	CT Representative National Solid Waste Management Association	Paine's Inc. PO Box 307 Simsbury, CT 06070
Ms. Kristina Stefanski	Manager of Environmental Compliance and Risk Management	The Stop & Shop Supermarket Company, LLC 1385 Hancock Street Quincy, MA 02169

C.3 CT DEP Internal Stakeholder Working Group

The Internal Stakeholder Working Group (see Table C-2) consisted of CT DEP representatives in the areas of Air, Waste and Water Management, and the following programs under the Office of the Commissioner: Office of Long Island Sound Programs, Environmental Justice and Communications. The purpose of this Working Group was to gather those staff that had the professional and technical expertise related to solid waste management and to seek their input as to existing conditions, the consultant's findings, and recommendations as to how to best manage the types of waste within the planning timeframe.

Table C-2
Members of the CT DEP Internal Stakeholder Working Group

Stakeholder Working Group Member Name	Title	CT DEP Bureau/Division (Note: CT DEP has since reorganized, see website)
Ms. Kathy Alexander	Environmental Analyst 3	Bureau of Waste Management Engineering and Enforcement
Ms. Judy Belaval	Environmental Analyst 3	Bureau of Waste Management Planning, Standards and Remediation
Mr. Jan Czeczotka	Supervising Environmental Analyst	Bureau of Waste Management Planning, Standards and Remediation
Ms. Martha Fraenkel	Environmental Analyst 2	Bureau of Waste Management Engineering and Enforcement
Mr. Matt Fritz	Director	Office of the Commissioner Communications
Mr. Frank Gagliardo	Environmental Analyst 3	Bureau of Waste Management Engineering and Enforcement
Ms. Tessa Gutowski	Management Analyst 3	Bureau of Waste Management Office of Bureau Chief
Mr. Michael Harder	Bureau Chief	Bureau of Waste Management Office of Bureau Chief
Ms. Kim Hudak	Supervising Sanitary Engineer	Bureau of Waste Management Engineering and Enforcement
Mr. Robert Hust	Supervising Environmental. Analyst	Bureau of Water Management Planning and Standards
Mr. Oswald Inglese	Director	Bureau of Water Management Permitting and Enforcement
Mr. Robert Isner	Director	Bureau of Waste Management Engineering and Enforcement
Mr. Robert Kaliszewski	Ombudsman	Office of the Commissioner Planning and Program Development
Mr. David McKeegan	Environmental Analyst 3	Bureau of Waste Management Engineering and Enforcement
Ms. Elsie Patton	Director	Bureau of Waste Management Planning, Standards and Remediation
Ms. Edith Pestana	Planning Specialist	Office of the Commissioner Environmental Justice
Mr. Rick Pirolli	Supervising Air Pollution Control Engineer	Bureau of Air Management Engineering and Technical Services
Ms. Lynn Stoddard	Environmental Analyst 3	Office of the Commissioner Planning and Program Development

Table C-2
Members of the CT DEP Internal Stakeholder Working Group

Stakeholder Working Group Member Name	Title	CT DEP Bureau/Division (Note: CT DEP has since reorganized, see website)
Mr. Kevin Sullivan	Supervising Environmental Analyst	Bureau of Waste Management Engineering and Enforcement
Mr. Calin Tanovici	Sanitary Engineer 3	Bureau of Waste Management Engineering and Enforcement
Ms. Kim Trella	Supervising Environmental Analyst	Office of the Commissioner Planning and Program Development

C.4 Outreach

During the planning process beginning in May 2005, the CT DEP conducted a number of outreach activities, such as making presentations to groups and holding meetings with representatives from government, community groups, universities and colleges, business and industry, regional waste management authorities, regional recycling organizations, and the public. Presentations were made to Connecticut Business and Industry Association, the Connecticut Conference of Municipalities, the Capitol Region Council of Governments, the Hartford Neighborhood Environmental Partnership, Haznet (a household hazardous waste regional and local administrators and vendors), the CT DEP Bureau of Air Management's SIPRAC standing committee (State Implementation Plan Revision Advisory Committee), and representatives from Connecticut universities and colleges.

In addition, the CT DEP met with the General Assembly's House Leadership, as well as the Chairs of the Environment Committee. The CT DEP met separately on a number of occasions with the Connecticut Resources Recovery Authority. Finally, the CT DEP met with representatives from the Mashantucket Pequot Tribal Nation and the Mohegan Tribal Nation.

C.5 Interviews

The Consulting team also conducted telephone and personal interviews and site visits with individuals involved in managing solid waste in Connecticut. Table C-3 summarizes these interviews. In addition to those persons identified below, discussions were held with numerous Department staff on a variety of topics addressed in this Plan.

Table C-3

Name	Title	Address/Department	Topic(s)
EXTERNAL STAKEHOLDER COMMITTEE MEMBERS			
Mr. Jonathan Bilmes	Executive Director	Bristol RRFOC/ TROC 43 Enterprise Drive Bristol, CT 06010	MSW Disposal
Ms. Marilyn Cruz-Aponte	Administrative Officer	City of New Britain 27 West Main Street New Britain, CT 06051	MSW Disposal
Mr. Peter Egan	Director of Environmental Affairs and Development	CRRA 100 Constitution Plaza – 6th Floor Hartford, CT 06103-7722	MSW Disposal
Mr. Robert Jacques	Manager, Business Development	New England Region Wheelabrator Technologies Inc. 331 Southwest Cutoff Road Millbury, MA 01527	MSW & BW Disposal
Mr. Mike Paine	CT Representative National Solid Waste Management Association	Paine's Inc. PO Box 307 Simsbury, CT 06070	MSW & BW Disposal
OTHER STAKEHOLDERS			
Mr. Mark Bobman	Tunxis Recycling Operating Committee	75 Twinning St. Bristol CT 06010	Recycling
Mr. Tony Deprimo	Recycling, City of Bridgeport	475 Asylum Street Bridgeport, CT 06610	Yard Waste collection/management in Bridgeport
Mr. Paul DiNarrdo	RTI, Danbury	307 White St, Danbury, 06810	Recycling
Mr. Tom DiVivo	Willimantic Waste Paper	P.O. Box 4239, Willimantic, 06226	Recycling
Mr. Michael Flood	Central Naugatuck Valley COG	20 E. Main Street, Waterbury, 06702	Recycling
Mr. Tom Gaffey & Mr. Mike Bzdyra	CRRA	179 Allyn St, Hartford, 06103	Recycling
Ms. Mary Ellen Kowalewski	Capitol Region COG	221 Main Street, Hartford, 06106	Recycling
Mr. Rick Lynn	Litchfield Hills Council of Elected Officials	42 North St., Town Hall Goshen, CT 06756	Recycling
Ms. Carmen Mendez	Recycling Coordinator, City of New Haven		Yard Waste collection/management in New Haven

Table C-3

Name	Title	Address/Department	Topic(s)
Mr. Russ Morin	Maintenance Division CT DOT		Animal mortalities Street sweepings and catch basin cleanings (CT DOT-generated)
Ms. Cheryl Reedy	Housatonic Resource Recovery Authority	Old Town Rd, Rtes 25 & 133 Brookfield Center, CT 06805	Recycling
Mr. Jerry Rollette	Town of Torrington PW Director		Recycling
Mr. Tim Wentzel	Mid-Northeast Regional Recycling Operating Committee	630 Governors Highway S. Windsor CT 06074	Recycling
Mr. Brian West	Public Works issues, especially YW	City of Hartford Department of Public Works	Yard Waste collection/management in Hartford
Mr. Mike Zarba	Highway Department, City of Stamford		Yard Waste collection/management in Stamford Street sweeping/catch basin cleaning
Customer service representative	City of Waterbury		Yard Waste management in Waterbury
Education coordinator	CRRA	Hartford	Recycling education

C.6 CT DEP Web Site and P2View Newsletter

The CT DEP maintains a website concerning the development of this proposed Plan. The website contains the activities undertaken by the CT DEP with regards to the development of the Plan. Included are such actions as announcements of the public forum; a listing of the External Stakeholders Committee meetings as well as related Committee work such as meeting notices, agendas, handouts, documents, and meeting minutes; and the posting of the preliminary draft Plan. The website has been updated to post this Proposed Plan, as well supporting information concerning public meeting and public hearing notices. In addition, the CT DEP's newsletter entitled *P2View (Pollution Prevention View)* included a number of articles concerning the on-going process of developing the State Solid Waste Management Plan and kept its 3,000 readers updated and informed.

- The CT DEP website for the Solid Waste Management Plan can be found at: www.ct.gov/dep
- The CT DEP website for the *P2View* can be found at: www.ct.gov/dep

C.7 Public Informational Meetings and Hearings

The CT DEP held a series of public meetings and public hearings with all interested parties regarding the Proposed Amendment to the State Solid Waste Management Plan:

- The CT DEP held three public informational meetings on the following dates: July 25 and August 1 and 2, 2006.
- The CT DEP held three public hearings on the following dates: August 22, 23 and 29, 2006. The Public Comment period closed on September 8, 2006. Notice of the Public Hearings was published in the Connecticut Law Journal, in Connecticut newspapers of general circulation, and was posted on the CT DEP website at: www.ct.gov/dep

C.8 Hearing Officer's Report

In accordance with Section 22a-228 of the CGS, and regulations adopted thereunder, the CT DEP held public hearings (see above) for the purpose of receiving comments to the Department's document entitled *Proposed Amendment to the State Solid Waste Management Plan, July 2006*. The Commissioner designated Michael Harder as the Hearing Officer and Robert Kaliszewski as Alternate. After a full review of the record of the public hearings and testimony submitted on the Proposed Plan, a Hearing Officer's Report was prepared and submitted to the Commissioner for her review and approval. As required by Section 22a-228-1 of the RCSA, the Report includes: (1) the principal considerations raised in opposition to the Proposed Plan, and the reasons for rejecting any such considerations, and (2) a summary of the major differences between the Proposed and Final Plans, and the reasons for any changes. The Hearing Officer's Report was accepted and the Plan has been modified per the recommendations found in the Hearing Officer's Report. The adopted Plan will serve as the basis for Connecticut's solid waste management planning and decision making, now and through to the year 2024. Both the *Hearing Officer's Report* and the *Final State Solid Waste Management Plan* are posted on the CT DEP website at: www.ct.gov/dep

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Appendix D
CURRENT MSW WASTE DIVERSION PRACTICES

Introduction

This Appendix describes the current status of waste diversion options for municipal solid waste (MSW) in Connecticut. The Solid Waste Management Plan estimates that in FY2005, Connecticut diverted approximately 1,133,000 tons of waste from disposal. Of this amount, approximately 1,018,000 tons was diverted through recycling and composting programs, approximately 64,000 tons was diverted through the bottle bill, and the remaining 51,000 tons was diverted through backyard composting and grasscycling.

The current flow of recyclable materials from the MSW waste stream is described, including legislation that encourages or mandates certain practices. Also, an assessment is made as to the adequacy of the existing infrastructure and programs. Non-organic recyclables recovered from the MSW stream are described first, followed by organics. The assessment for both materials is provided in one section.

D.1 Non-Organic Materials (Traditional Recyclables)

Traditional non-organic recyclables include cardboard, glass food containers, metal food containers, newspaper, office paper, scrap metal, storage batteries, waste oil, and nickel-cadmium batteries.

D.1.1 Current Flow of Recyclables

D.1.1.1 Statutes and Regulations

Recycling Mandates

Connecticut's mandatory recycling legislation requiring separation of designated recyclables went into effect on January 1, 1991. Connecticut General Statutes (CGS") and the Regulations of the Connecticut State Agencies (RCSA) specify which materials in the solid waste stream are required to be separated for recycling by everyone who generates this type of waste, and governs how recycling will be implemented in Connecticut. Some of the major sections of recycling law include the following:

> CGS Section 22a-241b required the CT DEP to adopt regulations designating items required to be recycled.
>
> (a) On or before February 1, 1988, the Commissioner of Environmental Protection shall adopt regulations in accordance with the provisions of chapter 54 designating items that are required to be recycled. The commissioner may

designate other items as suitable for recycling and amend said regulations accordingly.

(b) Any item designated for recycling pursuant to subsection (a) of this section shall be recycled by a municipality within three months of the establishment of service to such municipality by a regional processing center or local processing system.

(c) On and after January 1, 1991, (1) each person who generates solid waste from residential property shall, in accordance with subsection (f) of section 22a-220, separate from other solid waste the items designated for recycling pursuant to subsection (a) of this section and (2) every other person who generates solid waste shall, in accordance with subsection (f) of section 22a-220, make provision for the separation from other solid waste of the items designated for recycling pursuant to subsection (a) of this section.

New legislation was subsequently passed to address nickel-cadmium (Ni-Cd) batteries and grass clippings, effectively banning them from disposal.

CGS Sec. 22a-256a requires the recycling of nickel-cadmium batteries contained in consumer products. On and after July 1, 1993, each municipality shall recycle nickel-cadmium batteries contained in consumer products and disposed of in municipal solid waste within three months of the establishment of service to such municipality by a regional processing center or local processing system.

CGS Sec. 22a-208v prohibits grass clippings from disposal at resources recovery facilities or solid waste facilities. (a) On and after October 1, 1995, the Commissioner of Environmental Protection, and on and after October 1, 1997, the Connecticut Resources Recovery Authority, shall provide for a program of public information to promote the recycling of grass clippings by composting at the property where the grass clippings are generated, by allowing the grass clippings to decompose in place or by composting grass clippings at a municipal or commercial composting facility.

(b) The commissioner shall authorize pilot projects, according to standards or guidelines he deems appropriate, under which municipalities may provide for the composting of grass clippings. The commissioner may adopt regulations, in accordance with the provisions of Chapter 54, to establish composting of grass clippings at the property where such clippings were generated as the preferred method of disposal, or at a commercial composting facility, and to allow municipalities to compost grass clippings.

(c) After October 1, 1998 or six months after the commissioner adopts such regulations, whichever is sooner, no resources recovery facility or solid waste facility, may accept significant quantities of grass clippings for disposal.

Connecticut recycling law required municipalities to enact ordinances and make provisions for these designated materials generated within their borders to be recycled. Responsibility for enforcement was spread among waste haulers or carters ("collectors", per statute), solid waste facilities, municipalities, and CT DEP. For example:

> CGS Sec. 22a-220c deals with recycling enforcement by municipalities, haulers, and solid waste facilities. (a) Each municipality, or its regional agent, shall, by mail, notify all collectors registered to haul solid waste pursuant to section 22a-220a of the provisions made for the collection, processing and marketing of items which are required to be recycled pursuant to section 22a-241b or municipal ordinance. After the mailing of such notice, any collector who has reason to believe that a person from whom he collects solid waste has discarded recyclable items with such solid waste in violation of said section 22a-241b shall promptly notify the municipal agent designated pursuant to section 22a-220 of the alleged violation. Upon the request of the municipality, a collector shall provide a warning notice, by tag or other means, to any person suspected by the collector or municipality of violating separation requirements. A collector shall also assist the municipality to identify any person responsible for creating loads containing significant quantities of recyclable items mixed with solid waste which are delivered to a resources recovery facility or solid waste facility by the collector and detected by the owner or operator of such facility pursuant to subsection (b) of this section.

It has been reported that the requirement for haulers to notify the municipality about customers violating recycling requirements, as required by this statute, are counter productive for collectors in a competitive service environment.

> CGS Section 22a-220c(b) On and after January 1, 1991, the owner or operator of each resources recovery facility or solid waste facility who has reason to believe, upon visual inspection, that a load of solid waste which is delivered to the facility contains significant quantities of grass clippings or significant quantities of any item required to be recycled pursuant to subsection (a) of section 22a-241b shall provide prompt notification of such belief to the driver of the vehicle delivering the load and to the agent of the municipality from which the load originated, designated pursuant to section 22a-220. The owner or operator of each resources recovery facility or solid waste facility shall conduct periodic unannounced inspections of loads delivered to the resources recovery facility or solid waste facility to assist municipalities and the commissioner in accurately assessing compliance with said section 22a-241b and subsection (c) of section 22a-208v. Such owners or operators shall conduct additional inspections upon the request of the commissioner.

Regulations promulgated as a result of the legislation specified which materials in the solid waste stream were to be separated for recycling, by both households and commercial enterprises. The language reads:

> RCSA 22a-241b-2 Items to be recycled. (1) The following items to be recycled by each municipality within three months of availability of the service to the municipality by a regional processing center or local processing system: (A) cardboard (B) glass food containers (C) leaves (D) metal food containers (E) newspaper (F) office paper (G) scrap metal (H) storage batteries, and (I) waste oil. (2) After January 1, 1991, no approval to landfill or incinerate the items specified in subdivision (a)(1) of this section may be granted by the Commissioner pursuant to subsection (b) of section 22a-241b-4.

Bottle Bill Legislation

Connecticut's mandatory beverage container deposit legislation (bottle bill) was enacted in 1978 and became effective in 1980. CGS sections 22a-243 through 22a-246 of the CGS and RCSA sections 22a-245-1 through 22a-245-6 prescribe a deposit and refund system for beverage (beer or other malt beverages and mineral waters, soda water and similar carbonated soft drinks) containers sold or offered for sale in Connecticut. The legislation covers labeling, redemption requirements for dealers and distributors, redemption center registration, handling fees, and penalties for violations.

> CGS Sec. 22a-244 covers the requirements regarding refunds, labeling and design requirements for beverage containers. (a) Every beverage container sold or offered for sale in this state, except beverage containers sold or offered for sale for consumption on an interstate passenger carrier, shall have a refund value. Such refund value shall not be less than five cents and shall be a uniform amount throughout the distribution process in this state.
>
> (b) Every beverage container sold or offered for sale in this state, except beverage containers sold or offered for sale for consumption on an interstate passenger carrier, shall clearly indicate by embossing or by a stamp or by a label or other method securely affixed to the beverage container (1) either the refund value of the container or the words "return for deposit" or "return for refund" or other words as approved by the Department of Environmental Protection and (2) either the word "Connecticut" or the abbreviation "Ct.", provided this subdivision shall not apply to glass beverage containers permanently marked or embossed with a brand name.

Connecticut designated recyclables collected through the bottle bill are required to be recycled. It is interesting to note that material collected through the bottle bill is generally of high quality and contains little contamination and, as a result, bottle bills in Connecticut and the other bottle bill states led to the development of markets for some of the material even before the material was mandated for recycling.

Connecticut recycling and bottle bill legislation provided the seed for a recycling infrastructure to develop in Connecticut that includes collection, hauling, processing, and marketing of both designated recyclables and other recyclables. However, the development of Connecticut's recycling infrastructure also required significant State funding and extensive efforts by municipal and regional recycling coordinators, regional resource recovery authorities, CRRA, CT DEP, recycling processors, haulers, as well as others. Connecticut law and permit conditions require extensive reporting to the CT DEP from municipalities and permitted solid waste facilities involved in handling recyclable materials, enabling data gathering and tracking of materials flow. Haulers are not required to report tonnage data to the CT DEP.

D.1.1.2 Recycling Regions

Regional recycling programs were established through regional planning agencies, regional waste management authorities, or some regional groupings of municipalities as a result of the 1991 statutes and solid waste plan to assist member municipalities

with recycling contracting and education. Grant funds were originally passed through these recycling regions to help develop recycling programs.

Today, however, some of the regional recycling entities have reduced their role in municipal recycling, while some still undertake contracting on behalf of their towns. Several of the committees have executed long-term contracts for recycling with the intermediate processing centers (IPCs) on behalf of the towns, but in most cases the towns do business directly with the IPCs. Telephone interviews were conducted with the recycling coordinators and other regional staff familiar with recycling to determine the current role of the regional recycling entities. Table D-1 indicates the recycling regions, towns in the region, and IPCs generally used by the towns in each region. In addition to the listed recycling regions, there are a number of towns that do not belong to regions and who market their recyclables independently.

Table D-1
Recycling Regions in Connecticut

Recycling Region	Relationship between Towns and Major Regional Facility Processing Residential Bottles, Cans, Paper	Towns	Major Regional Facility used (for recycling Residential Bottles, Cans, Paper)
Capitol Region Council of Governments	Recycling Committee inactive. Towns contract directly with IPC.	Bolton, Cromwell, E. Granby, E. Hartford, E. Windsor, Ellington, Enfield, Farmington, Glastonbury, Granby, Haddam, Hartford, Hebron, Newington, Rocky Hill, Simsbury, S. Windsor, Suffield, Tolland, Vernon, W. Hartford, Wethersfield, Windsor, Windsor Locks	CRRA Hartford IPC
Central Naugatuck Valley Council of Governments	Recycling Committee handles only issues with electronics recycling and HHW. Towns contract directly with IPC.	Beacon Falls, Bethlehem, Middlebury, Naugatuck, Oxford, Southbury, Thomaston, Watertown, Woodbury	CRRA Hartford IPC
Connecticut River Estuary Regional Planning Agency	Region administers contract with CRRA for towns' recyclables and MSW. Tip fee is charged for both. Plus an 80-cent per ton surcharge on MSW funds regional recycling committee activities, such as regional electronics recycling, permanent HHW collection site, and public education.	Chester, Clinton, Deep River, Essex, Killingworth, Old Saybrook, Westbrook	CRRA Hartford (some through Essex Transfer Station, some directly to Hartford IPC)

Table D-1
Recycling Regions in Connecticut

Recycling Region	Relationship between Towns and Major Regional Facility Processing Residential Bottles, Cans, Paper	Towns	Major Regional Facility used (for recycling Residential Bottles, Cans, Paper)
Housatonic Resources Recovery Authority (HRRA)	Regional Authority has a contract with the IPC for processing on behalf of the towns. Three towns use other facilities. Tip fee for recycling is $38.50 per ton, and double that for MSW disposal. Any recycling revenue goes to the HRRA, not back to the towns. HRRA funded solely on this and 50 cent per ton fee on MSW disposal.	Bethel, Bridgewater, Brookfield, Danbury, Kent, New Fairfield, New Milford, Newtown, Sherman, Redding, Ridgefield	RTI Danbury IPC
Litchfield Hills Council of Elected Official/Northwest Council of Governments Regional Advisory Committee	Region consists of 20 towns from both Litchfield and NW CT COGs. Recycling Advisory consists of 17 towns in advisory role only, and organizes regional HHW collections. Towns contract directly with IPC. Not all towns on the Recycling Advisory Committee contract with the Hartford IPC.	Members of the Recycling Advisory Committee include Barkhamsted, Canaan, Cornwall, Colebrook, Goshen, Hartland, Harwinton, Kent, Litchfield, Morris, New Hartford, Norfolk, North Canaan, Salisbury, Sharon, Torrington, Winchester	Most towns in the Recycling Advisory Committee contract with the CRRA Hartford IPC: some take their recyclables elsewhere: for example, Hartland and Morris are part of the Tunxis Recycling Region. Kent is part of the HRRA region.
Mid-Northeast Regional Recycling Operating Committee (ROC)	ROC does cooperative bidding on behalf of municipalities. Have long-term contract for waste paper with a paper dealer. Towns use contract independently, pay their own fees and keep revenue if there is any. Revenue varies with material. Commingled containers go to Willimantic Waste Paper's IPC, no contract, towns deal directly.	Andover, Ashford, Bolton, Chaplin, Columbia, Coventry, Eastford, Mansfield, Tolland, Union, Willington, Windham	Some towns use Willimantic Waste Paper's IPC in Willimantic for both fiber and commingled containers, while others use the Hartford IPC.
Northeast CT Council of Governments	At one time had a regional recycling component – which has been disbanded	Brooklyn, Canterbury, Eastford, Killingly, Plainfield, Pomfret, Putnam, Sterling, Thompson, Union, Woodstock	Most use Willimantic Waste Paper Facility.

Table D-1
Recycling Regions in Connecticut

Recycling Region	Relationship between Towns and Major Regional Facility Processing Residential Bottles, Cans, Paper	Towns	Major Regional Facility used (for recycling Residential Bottles, Cans, Paper)
Southeastern Connecticut Regional Resources Recovery Authority (SCRRRA)	SCRRRA owns the IPC in Groton and contracts with Willimantic Paper to operate the Groton IPC. Some towns use the IPC and other go directly to WWP. Recycling (bottle and cans) tip fee is $6 per ton. Next year will charge $0 per ton. This is made possible by gains on energy contracts with Covanta RRF in Preston that serves the region. Preston facility does bonding for SCRRRA and approves budget, but SCRRA has its own Board. SCRRA staff also organizes regional electronics recycling and HHW collection for towns.	Branford, East Lyme, Groton, Ledyard, Montville, New London, North Stonington, Norwich, Preston, Sprague, Stonington, Waterford	Most towns use Groton IPC for bottles and cans, Willimantic Waste Paper in Windham for paper and bottles & cans. All recycled paper goes to WWP's Willimantic facility.
Southwest Connecticut Regional ROC	Do not have a regional recycling coordinator.	Bridgeport, Darien, East Haven, Easton, Fairfield, Greenwich, Milford, Monroe, New Canaan, Norwalk, Orange, Shelton, Stamford, Stratford, Trumbull, Weston, Wilton, Woodbridge	CRRA Stratford IPC
Tunxis Recycling Operating Committee ("TROC")	TROC and the Bristol Resource Recovery Facility Operating Committee ("BRRFOC") are sister agencies. Sixteen communities are served – 14 use the services of the BRRFOC and 13 use the recycling services of the TROC; however, all member towns have comprehensive recycling programs. The agencies administer contracts with the participating towns for both MSW disposal ($66 per ton) and recycling ($33 per ton).	Berlin, Branford, Bristol, Burlington, Hartland, Meriden, Morris, New Britain, Plainville, Plymouth, Prospect, Seymour, Southington, Warren, Washington, Wolcott	Berlin IPC Waste Management Recycle America

D.1.1.3 Recycling Collection Infrastructure

For the purpose of analysis, recyclables in Connecticut can be considered in the following categories:

- Residential State mandatory recyclables (cardboard, glass food containers, metal food containers, newspaper, leaves, grass, scrap metal, lead-acid batteries, waste oil, Ni-Cad batteries). Law does not require curbside collection of recyclables.
- Residential State non-mandatory recyclables most commonly collected are PET and HDPE plastic containers, aluminum foil/trays, magazines, mixed paper, milk/juice cartons.
- Container deposit materials containers (generally made of PET plastic, glass, or aluminum) holding carbonated beverages.
- Commercial State mandatory recyclables (cardboard, glass food containers, metal food containers, newspaper, office paper, waste oil, scrap metal, leaves, grass, Ni-Cd batteries, lead acid storage batteries).

Curbside collection programs generally collect recyclables, such as cans, bottles, newspapers and magazines, and most communities with curbside programs also collect some type of plastic bottles and aluminum foil/trays, and some accept mixed residential paper and milk/juice containers. The particular materials collected are dictated by markets used either directly by the municipality or the markets used by the recycling facility or contracted IPC receiving the municipality's recyclables.

Many municipalities also offer residents optional services to recycle scrap metals, waste motor oil, and storage batteries, either through scheduled special curbside pickup, or access to a transfer station or recycling center that accepts these goods. Most communities provide these services to residents only, although some may also accept commercial waste. The commercial waste policies are different for different towns, as are the fees charged.

To illustrate the range of recyclables collected in curbside programs, Table D-2 summarizes the materials collected in a sample of some of Connecticut's cities and towns. In addition to the curbside collection of the recyclables shown in Table D-2, these towns also offer residents the opportunity to drop off other recyclables materials at a local transfer station, public works yard, drop-off center, or landfill. Table D-3 lists the additional items for each of the towns listed in Table D-2.

Since 2002, the CT DEP has recognized those municipalities with outstanding source reduction and recycling programs by placing them on the Connecticut Municipal Recycling Honor Roll. To date, fifteen towns have been honored and they are listed, along with a summary of their programs in Table D-4.

Table D-2
Curbside Recyclables Collected by Selected Connecticut Cities and Towns

Town	Region	IPC	Curbside Materials Collected									
			GL	PL	AL	ALFL	TIN	ONP	OMG	RMP	OCC	GBL
Hartford[1]	Capitol	CRRA Hartford	X	X	X	X	X	X	X		X	X
New Haven	Individual	WWP, Windham	X	X [2]	X	X	X	X	X	X	X	X
Stamford	SW CT	CRRA Stratford	X	X	X	X	X	X	X	X	X	
Norwalk[3]	SW CT	CRRA Stratford	X	X	X		X	X		X	X	
New Britain	Tunxis	RAA, Berlin	X	X	X	X	X	X	X	X	X	X
West Hartford	Capitol	CRRA Hartford	X	X	X	X	X	X	X		X	X
Bristol	Tunxis	RAA, Berlin	X	X	X	X	X	X	X		X	X
Meriden	Tunxis	RAA, Berlin	X	X	X	X	X	X	X		X	
East Hartford	Capitol	CRRA Hartford	X	X	X	X	X	X	X		X	X
Stratford[5]	SW CT	CRRA Stratford	X	X	X	X	X	X	X	X		
Milford	SW CT	CRRA Stratford	X	X	X	X	X	X				

Legend: GL = glass containers; PL = plastic containers 1 & 2; AL = aluminum cans; ALFL = aluminum foil/trays; TIN = tin food cans; ONP = newspaper; OMG = magazines; RMP = residential mixed paper; OCC = cardboard; GBL = gabletop or aseptic milk and juice cartons

(1) Provides curbside recycling for small commercial, multi-unit residences, and non-profits

(2) Accepts all plastic bottles #1-7

(3) Provides curbside recycling for commercial businesses

(4) Danbury's mobile recycling trailer accepts "glass, plastic and paper", per Danbury city web site. Only town of largest 15 without curbside. Curbside every other week.

Table D-3
Recyclables Drop-Off Services for Selected Connecticut Cities and Towns

Municipality	Materials	Drop-off Facility
Hartford	Scrap Metal	CRRA Landfill
	Lead-Acid Batteries, Motor Oil	Public Works Yard
New Haven	Scrap Metal, Motor Oil	Transfer Station (residents only)
Stamford	Scrap Metal	Drop-Off Center
Norwalk	Scrap, Metal, Lead-Acid Batteries, Motor Oil, Curbside materials	Transfer Station
New Britain	Scrap, Metal, Lead-Acid Batteries, Motor Oil, Freon Appliances, White Paper, Phone Books	Transfer Station (residents only)
West Hartford	Scrap Metal, Lead-Acid Batteries, Freon Appliances, office paper	Recycling Center
Bristol	Scrap Metal, Lead-Acid Batteries, Motor Oil, Freon Appliances, Curbside materials	Transfer Station (residents only)
Meriden	Scrap Metal	Bulky Waste Landfill (residents only)
East Hartford	Scrap Metal, Lead-Acid Batteries, Motor Oil, Freon Appliances	Transfer Station (residents only)
Stratford	Scrap Metal, Motor Oil, Freon Appliances, Curbside materials, OCC	Transfer Station (residents only)
Milford	Scrap Metal, Motor Oil, Curbside materials, OCC	Transfer Station (residents only)

Table D-4
Municipalities on the Connecticut Municipal Recycling Honor Roll

Municipality	Programs Beyond the Requirements [1]
Cornwall	Reuse programs for polystyrene packaging peanuts, eyeglasses, and ink jet cartridges; other programs operated with local non-profit groups.
Granby	Monthly recycling newsletter, 25% of residents have purchased backyard composters. In addition to mandated recyclables, offers opportunity to recycle #1 and #2 plastic, aseptic packaging, textiles, antifreeze, propane tanks, electronics, and mixed paper; operates town swap shop at its transfer station; waste oil furnace in the DPW garage.
Litchfield	Operates a book exchange. In addition to mandated recyclables, offers opportunity to recycle #1 and #2 plastic, magazines, waxed coated beverage containers, clean used clothing, fluorescent lamps, and eyeglasses; actively promotes recycling with weekly press releases, local TV and radio coverage, and annual calendar.
Manchester	In addition to mandated recyclables, offers opportunity to recycle plastics, clothing, mixed paper; offers subsidized composting bins to residents.
Mansfield	Offers opportunity to recycle aerosol and paint cans, televisions and computers, fluorescent bulbs, batteries, antifreeze, brake fluid, and polystyrene peanuts; operates town swap shop; unit-pricing (PAYT) for refuse; residents who are not recycling are fined after 3 warnings; town purchases paper with recycled content.
Middletown	In addition to mandated recyclables, offers opportunity to recycle some plastics, polycoated drink containers, mixed paper, and antifreeze, and block polystyrene; operates town swap shop; town purchases paper with recycled content; beginning large-scale vermin-composting project.
New Britain	Utilizes various town departments to conduct recycling inspections of businesses and institutions (e.g. Health Department includes recycling in inspection of restaurants); budgets for recycling education; in addition to mandated recyclables, offers curbside collection of #1 and #2 plastic and aseptic packaging.
Norwalk	City provides pick-up of OCC, mixed paper, and newspaper from small businesses; curbside pick-up of yard waste April through December; in addition to mandated recyclables, offers opportunity to recycle of antifreeze, batteries and waste oil.
Portland	In addition to mandated recyclables, offers opportunity to recycle #1 and #2 plastic, clothing, and polystyrene packaging; innovative office paper recycling program; unit-pricing for refuse.
Redding	In addition to mandated recyclables, offers opportunity to recycle #1 - #7 plastics, clothing, shoes, magazines, mail, fluorescent bulbs, and expanded polystyrene peanuts, aseptic packaging, textiles, antifreeze, propane tanks, electronics, and mixed paper; sends out annual flyer, operates swap shop.

Table D-4
Municipalities on the Connecticut Municipal Recycling Honor Roll

Municipality	Programs Beyond the Requirements (1)
Salisbury/Sharon	Rigorous checks for recyclables at the transfer station, which receive 90% of the waste generated in the towns; in addition to mandated recyclables, offers opportunity to recycle clothing, shoes, computers, televisions, office paper, Christmas trees, and mixed paper; operates a swap shop; collects paints and stains; innovated computer reuse program.
Somers	Town purchases products with recycled content through regional co-op program; reuse program for toys, furniture, appliances, dishes, and books; checks incoming refuse for recyclables at the transfer station; recycling education for residents and business at the transfer station.
Stonington	Unit pricing (PAYT) for refuse and free recycling services; in addition to mandated recyclables, offers opportunity to recycle #1 and #2 plastic, polycoated drink containers, junk mail, cereal /cookie boxes, and clothes; operates a swap shop for books, toys, and household items; sells compost bins at cost.
Windsor Locks	Rigorous recycling checks by haulers for businesses and residents; public schools have programs to recycle aseptic containers; used clothing collected a Town Hall.

(1) This table presents some examples of the programs in these towns. For a full description of these programs visit the CT DEP website.

D.1.1.4 Residential Material Flow

A wide variety of arrangements exist in Connecticut for moving recyclables from the generators to the stream of commerce. In general, residential recyclable materials are collected by private haulers or carters. Regional recycling coordinators report that very few municipalities have their own trucks and crews for recycling collection. Many communities contract for trash and recycling services, but there are also reports that in some communities the recycling function is handled by an open market system in which each household makes arrangements with its own hauler or self hauls to a recycling drop-off site or transfer station.

Recyclable materials are delivered by the collection trucks, either to transfer stations, which are permitted by the CT DEP (most are municipal transfer stations which only accept recyclables or solid waste from their own town) or directly to recycling processing facilities. In many localities, municipal transfer stations also serve as public drop-off centers for the standard household recyclables as well as a variety of other wastes such as motor oil and batteries, yard waste, and bulky items. From the transfer stations, materials are loaded for transfer to their destinations, which can include end markets or recycling processing facilities such as IPCs, paper processors, scrap metal dealers, and volume reduction facilities. Material that is redeemed through the container deposit law, which includes carbonated beverage containers made of PET plastic, glass and aluminum, is not handled through the system of permitted solid waste facilities. The material is redeemed by residents at stores or redemption centers; these centers are registered by the CT DEP but are not required to report redemption data. The redeemed containers are sent to various processors under contract to the beverage distributors directly. The flow of containers and of dollars through this parallel recycling system is not well documented.

D.1.1.5 Commercial Material Flow

About half of the fifteen largest municipalities in Connecticut allow commercial entities to use their transfer stations. It is assumed that since commercial vehicles would be able to use these facilities for disposal, they would also be able to take advantage of drop-off recycling opportunities. It is possible that some smaller towns also allow commercial entities to deliver recyclables to their transfer stations.

The permitted solid waste facilities in Connecticut that process recyclables provide capacity for both residential and commercial recyclable materials. Residential materials are usually brought to a specific facility that is permitted to handle only residential items, and commercial material is accepted at a separate part of the facility, or a separate building on the same site, under different terms.

Revenue sharing may be negotiated for the commercial customers. At Recycling Technology Inc (RTI) in Danbury and Willimantic Waste Paper (WWP) in Windham, the tipping fee for recyclables is about half of that for MSW, providing an incentive for commercial generators to recycle. However, it is not known how many commercial generators see the revenue benefits of recycling. The IPCs that operate their own hauling companies, RTI and WWP, likely offer customers a more attractive

rate for the collection of commercially generated recyclables than other haulers because they have control over the processing and marketing of the materials. One IPC operator that does not own hauling assets reported that haulers charge commercial customers for recycling services, then sell the material without sharing revenue with the generators. In this case, the haulers are pushing commercial materials into the marketplace, but the only cost savings to the generators are tip fee savings from recycling rather than disposing the materials. There is a sense among the IPC managers and the regional recycling coordinators that not many commercial businesses participate in programs of this type, where recycling has fixed costs and little savings to offset them.

D.1.1.6 Recycling Facility Capacity

Types and Capacities of Recycling Facilities

In Connecticut, depending on the type, amount, and/or number of waste materials being aggregated or processed, a solid waste management/recycling facility may either have an individual permit or be registered under the recycling general permit. The following describes the types of recycling facilities that are permitted through either an individual or general permit.

Individual Permit for Facilities Processing or Transferring Recyclables

Facilities with individual permits process or transfer recyclables in greater volumes, types, and amounts than facilities which have general permits. The different types of individual permits for processing or transferring recyclable include:

- **Intermediate Processing Center (IPC)** – means a facility that can recycle an item or items and market or deliver for reuse the resulting material product or products. Such facilities may be owned by public or private entities or combinations thereof and may offer service on a State, regional, municipal or sub-municipal level (RSCA 22a-208a-1 (a)(18)). Most of the solid waste facilities permitted as an "IPC" are regional facilities which process only paper and/or bottles and cans.
- **Volume Reduction Plant** – means any location or structure, whether located on land or water, where more than two thousand pounds per hour of solid waste generated elsewhere may be reduced in volume, including but not limited to, resources recovery facilities and other incinerators, recycling facilities, pulverizers, compactors, shredders, balers and composting facilities (GCS 22a-207(5)). Generally, those facilities which process bottles, cans, and paper and which are permitted as a "volume reduction plant" (as opposed to being permitted as an "IPC") also process other materials such scrap metal, construction and demolition waste, etc. Some facilities permitted as a volume reduction plant process only one type of recyclable (other than bottles, can or paper) such as tires, wood waste, fluorescent lamps, etc.
- **Transfer Station** – means any location or structure, whether located on land or water, where more than ten cubic yards of solid waste, generated elsewhere, may be stored for transfer or transferred from transportation units and placed in other

transportation units for movement to another location, whether or not such waste is stored at the location prior to transfer (GCS 22a-207 (10)). Most of Connecticut's municipalities have transfer stations with individual solid waste permits and many transfer recyclables as well as solid waste for disposal. Municipal transfer stations usually only transfer waste generated within their borders. There are also individually permitted regional recycling transfer stations that transfer recyclables aggregated from many towns.

Table D-5 identifies the major regional recycling facilities found in Connecticut and lists the materials accepted, the design capacity, and the annual capacity. These facilities have the design capacity to process a total of 3,375 tons per day, or approximately 1,088,000 tons per year.

Table D-5
Major Regional Recycling Facilities used by Towns in Connecticut Recycling Regions for recycling Residential Bottles, Cans, Paper
April 2006

Location	Facility	Materials	Design Capacity (TPD)	Annual Capacity (TPY)
Berlin, CT	Waste Management Recycle America Alliance LLC IPC (Recycling Facility)	Glass Bottles, Al and Fe cans, plastic (HDPE and PET) containers, cardboard, and newspaper; other paper	650	237,250
Danbury, CT	Recycling Technologies, Inc. IPC (Recycling Facility)	Glass bottles, Al and Fe cans, plastic (HDPE and PET) containers, cardboard, magazines, and newspaper	200	62,400
Groton, CT	Southeastern CT Regional Resources Recovery Authority IPC (operated by Willimantic Waste Paper)	Glass bottles, Al and Fe cans, plastic (HDPE and PET) containers, and paper beverage cartons	80 for commingled containers; permit for fiber for an additional 200 TPD pending	24,960
Hartford, CT	CRRA Hartford Paper IPC (Recycling Facility)	Newspaper, magazines, cardboard, and other paper (discarded mail)	1170	365,040
Hartford, CT	CRRA Hartford Container IPC (Recycling Facility)	Glass bottles, Al and Fe cans, plastic (HDPE and PET) containers, paper beverage cartons	210	65,520

Table D-5
Major Regional Recycling Facilities used by Towns in Connecticut Recycling Regions for recycling Residential Bottles, Cans, Paper
April 2006

Location	Facility	Materials	Design Capacity (TPD)	Annual Capacity (TPY)
Stratford, CT	CRRA Stratford IPC (Recycling Facility)	Glass bottles, Al and FE cans, plastic (HDPE and PET) containers, magazines, cardboard, newspaper and other paper	250	78,000
Willimantic, CT	Willimantic Waste Paper's IPC (Recycling Facility)	Newspaper, cardboard, glass bottles, Al and Fe cans, plastic (HDPE and PET) containers, paper beverage cartons, office paper, mixed residential paper, scrap metal	554 for paper and 261 tons of other material (scrap metal)	254,280

General Permit Facilities Processing or Transferring Recyclables

In Connecticut, there are several types of facilities that can obtain a registration under the recycling general permit for operation. The recycling general permit was developed to be less burdensome and to simplify and facilitate the permitting process for facilities that handle a relatively small amount of waste or only one material. There are limited numbers of these types of permitted facilities and many are under private ownership. The General Permit to Construct and Operate Certain Recycling Facilities was issued on September 26, 2002 and expires on September 26, 2007.

These types of facilities include:

- **Single-Item Recycling Facility –** means a solid waste facility where a single type of waste is received and processed and where no more than 100 tons of recyclables are accepted per day. Acceptable materials at this type of facility include paper, plastic containers, and brush and untreated wood.
- **Drop-Site Facility–** means a solid waste facility where (1) source separated solid waste is collected and with the exception of brush, not processed, (2) the capacity of each collection container does not exceed 40 cubic yards, and (3) the number of collection containers does not exceed three per category of paper and glass, metal, plastic and paper food and beverage containers, and two per category of all other categories of recyclable solid waste or scrap tires collected except used electronic and spent lead-acid batteries.

- **Recyclables Transfer Facility –** means a solid waste management facility which is used primarily by haulers, with incidental use by local residents, to transfer recyclable solid waste from collection vehicles into collection containers, and where no processing or sorting of solid waste other than such transfer or compaction is conducted.
- **Limited Processing Recycling Facility–** means a solid waste facility where source separated recyclables are collected and sorted or processed and where no more than 20 tons of such material is accepted each day.

The recycling general permit single-item processing facilities could potentially provide up to additional 1,200 tons per day, and the recycling general permit limited processing capacity facilities could potentially provide up to an additional 180 tons per day of processing capacity. However, it is not known if these facilities have a design capacity that reaches the general permit maximum of 20 tons per day. These capacities are based on the assumption that all general permit single item processing facilities have a capacity of 100 tons per day and all limited capacity processing facilities have a capacity of 20 tons per day, which are the respective maximums allowed under the general permit. Thus, the total recycling capacity may be overstated.

Recyclables processing capacity, which includes individually permitted facilities and general permitted facilities, appears to be adequate in Connecticut. For example, two processors have indicated that they could expand their capacity if additional material quantities were recovered. RTI, a regional IPC located in Danbury, indicated that their facility is operating at about 60 to 65 percent of rated capacity, and could reach 100 percent if there were higher participation in recycling programs. Willimantic Waste Paper officials report that they could double their capacity on their existing site, or install a second shift.

In August 2005, CRRA unveiled plans to update and expand the Hartford IPC container recycling facility that will greatly increase the capacity to 160,000 tons per year. The expanded facility will now handle residential mixed paper and a greater variety of bottles and cans. CRRA will enter into a new contract with FCR, the current IPC operator. Under the contract, FCR will finance the construction of a new recycling processing facility that will greatly increase the capacity and the efficiency of the operation, enabling them to process paper and co-mingled containers in the same building. The new FCR contract will also eliminate CRRA paying a processing fee, and in fact will result in a tonnage payment to CRRA from FCR, plus a revenue-sharing arrangement, with a net worth to CRRA of $2.7 million. This positive financial arrangement for CRRA will also enable the recycling operation to offset the disposal tipping fees at the Mid-Connecticut RRF by $3 per ton.

Towns that have revenue sharing arrangements with their IPCs or regional authorities will see positive results during times of good market conditions. For example, for 15 years WWP has had a partnership arrangement with 24 municipalities for sharing of market revenues on a monthly basis when prices are high. WWP also accepts a broad range of materials for recycling from these municipalities, thus encouraging maximum recycling.

D.1.1.7 Bottle Bill Material Flow

Bottle bill redemption centers and retailers redeem the nickel deposits and take back bottle bill containers from consumers. From there, bottles and cans are hauled either to distributors or directly to recycling facilities under contract to the beverage brand owners or to reverse vending machine owners. Bottle bill containers that flow through the bottle bill infrastructure are in high demand by markets and end-users because the material is remarkably free of contamination compared to curbside collected material. However, information pertaining to the contract terms, tonnages, sources, and end users is very difficult to obtain.

In Connecticut, bottle bill containers can be redeemed at retailers that sell those brands and types of beverages and/or at redemption centers registered with the CT DEP. Some retailers and redemption centers maintain banks of "reverse vending" machines, that accept beverage containers, provide the money back to the consumer, and then either crush or shred the material. Glass is crushed, and aluminum and PET are either crushed or shredded, depending on the technology. The costs of the redemption system are offset by a handling fee of 1.5 cents on each beer container and 2 cents on each soft drink container, paid by the distributors to the retailers or redemption centers.

Consumers pay the 5-cent deposit to the retailers for every carbonated beverage container purchased in Connecticut. If consumers choose not to redeem their containers, to either put them in the trash or recycle them through a curbside program, the unredeemed deposits become the property of the beverage distributors. The number of unredeemed containers, and the cash value of the unredeemed deposits, is closely guarded by the beverage industry. It is estimated that the redemption rate for bottle bill containers in Connecticut is similar to that of Massachusetts, which had a redemption rate of approximately 70 percent. Since there is no reporting requirement attached to the Connecticut bottle bill, the CT DEP does not get any data about quantities redeemed or material recycled. Consequently, the recycling impact and financial impact of the container deposit system cannot be comprehensively evaluated. Connecticut State law requires that all glass and metal food and beverage containers be recycled. It is assumed that bottle bill processors are in compliance with these requirements.

D.1.2 Material Markets

At the writing of this Plan (2006), markets for most recyclable commodities are strong nationwide. The New York/New England region, of which Connecticut is a part, has greater access to a diversity of material markets due to the number of port facilities. For this reason, commodity prices in this region either consistently track, or at times exceed, national commodity price averages. For example, currently the plastic materials, PET, natural HDPE, and colored HDPE, are all at record prices – PET in the high teens (cents per pound), and the HDPE's in the mid to high 20-cent per pound range. These numbers are consistent with national averages. Mixed residential waste paper is currently selling for around 15 dollars per ton in the New York/New England region, which is on the high side of prices nationally for this material.

Late summer prices for steel and aluminum cans are lower than they are in the spring, but most commodity markets experience some slowdowns and price softening toward year-end. However, these material prices are still either consistent with, or better than, national averages. The one exception to this may be mixed cullet, which is of very low value.

D.1.3 Public Education and Promotion

D.1.3.1 Municipalities

A review of the web sites of the 15 largest Connecticut municipalities showed that, generally, municipal recycling education is lacking in efforts to promote recycling to the public and to encourage participation. Most of the web sites included basic information about the types of materials to be recycled curbside and how to prepare them, but it was frequently difficult using the web site alone to find out what day recyclables were collected, what a recycling bin looked like, or even whether curbside recycling was offered weekly or every other week. Hartford is a notable exception, providing a six-page, comprehensive printed guide to recycling opportunities and regulations, downloadable from its web site.

Very few web sites stressed the reasons to recycle or the benefits of recycling. Most did mention that recycling was mandatory and several provided the State statute and/or their associated municipal ordinance as evidence, although municipal ordinances were mostly re-iterations of the State statute without much specific information. Several sites claimed that recycling saved taxpayer dollars, apparently a reference to the fact that tipping fees for recyclables are less than for refuse.

None of the web sites visited featured any of the contemporary new recycling educational materials, developed under an adaptation of the concept of "Social Marketing," that use quirky messages geared toward the values and interests of citizens who may not be motivated by more traditional, environmentally oriented recycling education. Some excellent social marketing derived message and media items are produced by other states. However these programs generally are resource intensive to implement, requiring both staff and funding resources to implement, neither of which are currently available in Connecticut. While web sites are only one way to educate the public about recycling, and municipal web sites in particular have a large amount and variety of information to present, they are nonetheless obvious choices for new residents, or those newly motivated to recycle, to look for quick information or links to other information sources. Only a few of the web sites' recycling pages contained links to other resources, the CT DEP, or their regional recycling agencies. It could certainly be true that communities successfully use other outreach methods to communicate the 'how to' and 'whys' of recycling to residents, but this is difficult to evaluate. Web site information could be much improved and provide guidance as to how to obtain additional materials and information.

D.1.3.2 CT DEP

The CT DEP maintains a recycling web page that deals comprehensively with a wide variety of recycling topics pertinent to Connecticut resident and businesses. Recycling regulations, municipal recycling, business recycling, recycling at schools and universities, and many other recycling topics are covered in detail.

While the information is exhaustive, this can cause some fatigue on the part of site visitors who are looking for quick, basic information. Often these pages require the visitor to read through a significant amount of text to get to the message.

Much of the new research into Social Marketing concepts as they can be applied to environmental issues reveals that guilt inducing or pessimistic interpretations of messages can backfire, and cause the public to "tune out" rather than to engage in the desired behavior.

While the de-emphasis of environmental messages, specifically negative ones, may be counter-intuitive to environmentalists who want to promote recycling and increase recycling rates, these new campaigns have been shown effective in producing short-term behavior change. Long-term, it may be the case that environmental awareness follows learned recycling behaviors.

The CT DEP does not participate in "contemporary" motivational campaigns that are available free from other states and from private sources to promote recycling. It should be noted that while the information may be free, there are costs in the implementation of such a programs. The types of resources that would be necessary have not been made available to the CT DEP. Although in the 1990s the CT DEP had a robust education and outreach program that extended to school age children to the adult consumer, this program essentially ended with a lack of funding.

D.1.3.3 Recycling Regions and Authorities

CRRA

CRRA offers a variety of educational activities through their Hartford and Stratford facilities. CRRA has two museums: the Visitors Center & Trash Museum in Hartford and the Children's Garbage Museum in Stratford. Each museum has a viewing area where visitors can observe the working regional recycling center. Approximately 50,000 people of all ages visit the museums each year. Educator-led group tours are available at the two museums. Tours include a guided and interactive exploration of the museum exhibits on all aspects of waste management, an opportunity to learn about the working recycling center, and optional hands-on, topic-specific activities. The activity choices for the programs are organized by school grade and age of the visitors. CRRA also has books and videos about solid waste and recycling topics available to borrow as well as curriculum and loan kits. In addition, CRRA representatives are available to speak at community events and group meetings about solid waste and recycling issues. CRRA has one full-time and five part-time educators on staff.

SCRRRA

The SCRRRA Education Center at the Groton IPC provides recycling and solid waste education to area schools and civic groups. Education outreach is available either at the Education Center or, upon request, at area schools. Demonstrations and viewing of the working IPC are available.

TROC

The Tunxis Recycling Operating Committee (TROC), through the Bristol Resource Recovery Facility Operating Committee, devotes several web site pages to recycling promotion and education for the towns in their region. They offer brochures, FAQ's, recycling statistics and links to other sites. They also publish recycling information specific to each town in the region. Some of their material may be out of date. For example, their one-page recycling information sheet instructs participants to remove the caps from all plastic bottles, when this has not been necessary for the markets for many years. In February 2006, the TROC announced a new market research effort to better understand factors influencing residential recycling participation rates and to make key improvements to increase recycling program participation. In 2006, TROC will be sharing the results of the study with the CT DEP and other recycling regions and municipalities.

HRRA

The Housatonic Resources Recovery Authority launched a new website in January 2006 which provides in-depth information about recycling in the region and in the member towns. The site features links to each of the member town's individual web site, as well as to other Connecticut resource recovery authorities, recycling information, regional reuse resources, etc. The other regions do not provide recycling web sites.

D.1.4 Stakeholder Roles in Waste Reduction and Recycling Efforts

Stakeholders in Connecticut's waste reduction and recycling efforts include haulers, facilities, municipalities, generators, authorities, and the CT DEP. Each of these stakeholders plays multiple roles in diverting waste from disposal. A summary of the roles of each stakeholder is presented below. A complete description of the responsibilities of each stakeholder under Connecticut law can be found on the CT DEP website.

D.1.4.1 Haulers

Haulers collect refuse and recyclables. They are required to comply with the State requirements, including registering with any municipality where the hauler collects solid waste. After the hauler has been notified by the municipality of its recycling requirements, the hauler must report any customer discarding designated recyclables with refuse.

D.1.4.2 Processing Facilities

The facilities that receive and/or process recyclables are described on pages D-16 through D-20. Owners/operators of a RRF or solid waste facility that receives a load of solid waste containing significant amounts of recyclables must notify the hauler and the municipality where the load originated. Furthermore, these owner/operators shall conduct unannounced inspections of loads coming into their facilities. Recycling facilities must keep a record of the amount of solid waste derived from each municipality and the amount of residue apportioned to each municipality. On a quarterly basis, facilities must report to the CT DEP the amount of designated recyclables received, processed, and sold. Certain wastes are prohibited from disposal, including grass clippings and lead acid storage batteries. The latter are returned to retailers through a deposit system.

D.1.4.3 Municipalities

Items designated for recycling, must be recycled by the municipality within 3 months of the establishment of a local or regional processing system. Each municipality must make provisions for the separation, collection, processing, and marketing of designated recyclables generated within its boundaries and must make provision for the disposal of the solid waste generated within its borders. Municipalities must notify registered haulers of the recycling requirements. Each municipality must designate a municipal or regional recycling contact person and submit an annual recycling report to the CT DEP on or before August 31.

D.1.4.4 Generators

Any person who generates solid waste must separate designated recyclables from other waste. The designated recyclables include glass and metal food containers, non-residential high-grade office paper, newspaper, scrap metal, old corrugated cardboard, waste oil, lead-acid batteries, leaves, grass, and Ni-Cd rechargeable batteries. Residents pay for recycling, either through the tax base or fees.

D.1.4.5 Authorities

Regional recycling authorities assist municipalities with recycling contracting and education. Authorities own or are affiliated with IPCs and may, in some cases, subsidize the operation of IPCs with MSW tip fees. Many regional authorities offer regional collection of electronics and HHW. CRRA has two educational facilities and offers in-school programs. Other authorities offer recycling education on their website, including:

- Central Naugatuck Valley Council of Governments
  http://www.opm.state.ct.us/pdpd3/physical/c&dplan-rec/Waste.htm
- Housatonic Resource Recovery Authority
  http://www.hrra.org/recycling.php
- Tunxis Recycling Operating Committee
  http://www.brrfoc.org/recycling.htm

See page D-5 for more information on the regional authorities.

D.1.4.6 CT DEP

The CT DEP has responsibility for the planning, program development and implementation, regulatory authority, and data management for source reduction, recycling, and composting in the state.

D.2 Yard Waste and Food Waste

D.2.1 Legislation

Current legislation specifically addresses grass and leaves. Connecticut enacted legislation in 1995 that placed a disposal ban on grass clippings beginning on October 1, 1998; the legislation was codified into CGS 22a-208v and reads as follows:

> Grass clippings prohibited from disposal at resources recovery facilities or solid waste facilities. (a) On and after October 1, 1995, the Commissioner of Environmental Protection, and on and after October 1, 1997, the Connecticut Resources Recovery Authority, shall provide for a program of public information to promote the recycling of grass clippings by composting at the property where the grass clippings are generated, by allowing the grass clippings to decompose in place or by composting grass clippings at a municipal or commercial composting facility.
>
> (b) The commissioner shall authorize pilot projects, according to standards or guidelines he deems appropriate, under which municipalities may provide for the composting of grass clippings. The commissioner may adopt regulations, in accordance with the provisions of chapter 54, to establish composting of grass clippings at the property where such clippings were generated as the preferred method of disposal, or at a commercial composting facility, and to allow municipalities to compost grass clippings.
>
> (c) After October 1, 1998, or six months after the commissioner adopts such regulations, whichever is sooner, no resources recovery facility or solid waste facility permitted under this chapter, other than a municipal or commercial composting facility, may accept significant quantities of grass clippings for disposal.

Connecticut made leaves a mandatory recyclable through RCSA Section 22a-24lb-2 which lists the items to be recycled. It reads…

> (1) The following items are required to be recycled by each municipality within three months of availability of service to the municipality by a regional processing center or local processing system: (A) cardboard, (B) glass food containers, (C) leaves, (D) metal food containers, (E) newspaper, (F) office paper, (G) scrap metal, (H) storage batteries, and (I) waste oil. (2) After January 1, 1991, no approval to landfill or incinerate

the items specified in subdivision (a) (1) of this section may be granted by the Commissioner pursuant to subsection (b) of section 22a-24lb-4.

D.2.2 Overview of Yard Waste Composting and Recycling

The components of the infrastructure include the collection infrastructure, the processing infrastructure, and the programs for backyard composting and grasscycling. They are described in more detail below.

D.2.2.1 Collection Infrastructure

The collection infrastructure for yard waste appears to be largely in place in urban and suburban areas, and less so in rural areas. In rural areas, however, yard debris is often managed on-site or in the neighboring woodlot, or delivered to a drop-off site. Many municipalities offer separate collection of leaves, either bagged or via a leaf vacuum system, although collection methods are not tracked by CT DEP. Table D-6 summarizes the yard waste collection and processing programs in some of Connecticut's larger municipalities.

Yard waste and wood generated from storm events is generally managed as part of the municipalities' solid waste management program. When generated by contractors, it is either delivered directly to an appropriate processing facility, or delivered to a transfer station for later delivery to such a processing site.

Table D-6
Summary of Larger Municipalities' Yard Waste Processing Programs

City	Collection	Processing/End Use
Bridgeport	Yard waste is collected on recycling schedule (leaves, grass clippings) in brown bag every two weeks, usually April through December, longer if weather-permits. Christmas trees also collected at curb. Drop-off site at transfer station where residents can bring all types of yard waste, including brush.	City crews compost yard waste and chip the woody waste at a municipal site. Use end products in City projects.
Hartford	City DPW collects bagged leaves, curb side, weekly mid-April – May and a fall collection as well (same day as trash) The City also does leaf vacuuming and a drop-off program for residents. Separate drop-off for brush.	Leaves are composted at City Yard, mulch offered to residents (free of charge) or used in City projects. Limbs and brushy waste are delivered to a separate site and ground. Try to give that away – farmers will take, towns in outskirts, use on City properties, give some to residents, etc. Some people do turn it down, not a high quality mulch. City uses in vacant lots to keep down weeds, etc., as well as for fill.
New Haven	Residential collection of yard waste, weekly, April through first week of October, includes brush, leaves. After that, leaves only, until the first now (end of December). Residents can use brown bags or clean trash barrels. Same day collection for all materials. City does not do leaf vacuuming. Drop-off site available (by coupon, residents receive three per year) – leaves and brush. Site also available to commercial generators for a fee.	Leaves go to a farm (Borrelli) and the City of West Haven (bid out annually, unless authorized by board of Alderman to be a multi-year bid). City purchases some compost back. Greencycle chips the wood. City pays them to process wood and yard waste (annual contract)

Table D-6
Summary of Larger Municipalities' Yard Waste Processing Programs

City	Collection	Processing/End Use
Stamford	Curbside leaf collection (loose, using loaders and trucks, supplemented by vacuum) Mid-November through second week of December. Curbside Christmas Tree collection Drop-off sites (2) (transfer station and) processing site also available for yard waste. Registered landscapers may also use. Residents can also deliver tree to northern site (and receive a sapling certificate through Environmental Planning Board – City agency) 70,000 cy of leaves per year	40,000-50,000 cy processed at City site. 25,000 to 30,000 cy hauled out of City, typically to a farm. Trees are ground into mulch and mixed in with leaf compost. Compost is given to residents, used in roadside projects/park projects, and some is sold to landscapers. Price ranges from $4 for unscreened to $10 to $13 per cy for screened material. Has been working with vendors, e.g., Agresource, to further process and market.
Waterbury	Every-other-week curbside collection of all types of yard waste including grass in brown bags, seasonal April through February. Includes Christmas trees Also have drop-off site for yard waste at landfill	Yard waste is delivered to a farm for composting.

D.2.2.2 Processing Infrastructure

In Connecticut, depending on the type and number of materials being collected and/or processed, and the quantity of material being collected and/or processed, a solid waste management facility may either have an individual permit, a general permit registration, or be a registered leaf composting facility. General permits were developed to provide a simpler permit process for facilities that handle a relatively small amount of waste or only one material. In the case of leaf composting facilities, they simply register with the CT DEP. The different types of facilities that handle organic waste that is typically composted or mulched are described below:

Individual Permit Facilities

Volume reduction plants and transfer stations are authorized through individual permits.

Volume Reduction Plants

Some VRFs in Connecticut are permitted to process one or more of the following types of organic wastes.

- Clean wood waste, meaning any wood that is derived from such products as pallets, skids, spools, packaging materials, bulky wood waste, or scraps from newly built wood products, provided such wood is not treated wood or demolition wood;
- Land-clearing debris;
- Brush;
- Other waste (e.g., food waste).

Transfer Stations

Some transfer stations have individual permits that allow them to chip wood. Most of the municipal transfer stations accept clean wood waste, land clearing debris and brush and some chip the wood they receive.

General Permit Facilities

There are several types of facilities that, if meeting certain types of requirements, can obtain a general permit registration for operation. The General Permit to Construct and Operate Certain Recycling Facilities was issued on September 26, 2002 and expires on September 26, 2007.

These types of facilities processing organics include:

Single Item Recycling Facilities

Acceptable organic materials accepted include brush and untreated wood. Many of these facilities process (e.g., chip) untreated wood waste. The CT DEP uses the following definitions:

- Brush – Tree stumps, which is considered land clearing debris, and cut or broken branches and shrubs; and untreated wood
- Wood to which no adhesives, paints, stains, fire retardants, pesticides, or preservatives have been applied.

Drop-site Facilities

Acceptable organic materials include leaves, grass clippings, and brush. Organic materials must be removed from the site at least once per week. These facilities cannot accept untreated wood.

Recyclables Transfer Facilities

Recyclables transfer stations may accept leaves, brush, grass clippings, and untreated wood.

Limited Processing Recycling Facilities

Acceptable organic materials include untreated wood, brush and leaves.

Registered Facilities

CGS Section 22a-208i granted the CT DEP commissioner the right to exempt leaf-composting facilities from permit requirements. This statute was passed so that the CT DEP could enable leaf waste composting facilities to develop relatively quickly, in response to leaves becoming a mandatory recyclable item. The statute reads, in part:

> CGS Sec. 22a-208i. Composting of leaves. Regulations. Certain recycling facilities exempt from requirement of permit for solid waste facility. (a) Notwithstanding any provision of this chapter, or chapter 446e or 446k, any facility where the sole business or activity conducted is composting of leaves shall be exempt from the requirements of sections 22a-208a and 22a-430. The commissioner may adopt regulations in accordance with the provisions of chapter 54 concerning facilities for the composting of leaves. Such regulations shall, without limitation, provide for the design, operation and monitoring of and reporting from such facilities.
>
> (b) The commissioner may, by regulations adopted in accordance with chapter 54, exempt categories or classes of recycling facilities from the requirements of said section 22a-208a or 22a-430 provided such exemption would not adversely affect the environment and would advance the objectives of the solid waste management plan adopted and revised under sections 22a-228 and 22a-241a and the municipal solid waste recycling plan adopted under section 22a-241. No person or municipality may operate or continue to operate a recycling facility without permits issued under said section 22a-208a or 22a-430 unless such person or municipality first files with the commissioner a written request for exemption under the regulations adopted under this section.
>
> (c) The provisions of subsection (a) exempting facilities composting leaves and the provisions of subsection (b) exempting recycling facilities from the requirements of section 22a-208a shall not be construed to relieve such facilities from the obligation to comply with any other provision of this chapter or chapter 446e, including but not limited to, operational requirements and other applicable requirements of regulations adopted under section 22a-209.

Registered leaf waste composting sites are either municipally owned, privately owned, or on-farm locations. There are approximately 100 registered sites, with a total estimated 662,192 cubic yards of leaves processed per year. Details regarding these sites are provided in Table D-7. Note that in some cases a single municipality may have more than one site. The CT DEP regulations also provide for sheet leaf composting, which is the application and incorporation of leaves on cropland actively devoted to agricultural production as a soil amendment and mulch. The CT DEP encouraged municipalities and farms to enter into such mutually beneficial arrangements for the delivery of leaf waste. A separate notification process was developed for these farm activities and the CT DEP developed an educational primer on sheet leaf composting. The Manual of Best Management Practices for Agriculture was also amended to include grass clipping utilization guidance for farms. Details regarding these sites are provided in Table D-7.

Table D-7
Summary of Registered Leaf Waste Composting Sites

Site Type	Number of Sites	Total Capacity in Cubic Yards(CY)	Average Capacity (CY) Per Site
Municipal	80	428,552	5,357
Private Non-Farm	14	143,444	10,246
Private Farm	6	90,200	15,033
Total/Average	**100**	**662,196**	**6,622**

(1) Source: CT DEP list of active leaf composting facilities.

As Table D-7 indicates, most of the capacity for leaf waste composting among the registered sites is with the 80 municipal sites, which have about 65 percent of the capacity. The private non-farm sites average a higher capacity per site, and together comprise roughly 22 percent of registered site capacity. The farm sites have the highest average capacity per site, at 15,033 cubic yards per site, and collectively manage roughly 14 percent of the registered sites' capacity.

D.2.2.3 Home Composting and Grasscycling

The CT DEP promotes the waste reduction activities of home composting and grasscycling through their website and through educational videos which were distributed free to towns and libraries, and continues to be aired on local public access television. They are also for sale in the CT DEP store. As part of the annual reporting process, municipalities are asked if they promote these activities. A point value is assigned for each "yes" response to questions posed. Points are then summed. Total points translate into different participation rates for the grass-cycling and home composting programs. Estimates of waste reduced are also based on the number of composting bins or the number of mulching mowers or blades distributed or subsidized during the year. Credit is also given for those distributed in previous years, if education is ongoing. Bins distributed more than five years ago are assumed to be in use at the rate of 75 percent. Based on these estimated participation rates, the CT DEP credits municipalities with reducing the amount of organic waste disposed based on the following:

- The average yard yields 1,200 pounds of grass clippings per year; and
- Home composting results in an average source reduction of 646 pounds per household per year.

These credits are awarded as a means to provide recognition to those towns actively promoting grasscycling and home composting and are not meant as actual measurements of waste reduction. Most communities that receive waste reduction credits compost relatively low tonnages. Only seven municipalities that received

source reduction credits for greater than 2,000 tons in FY2003. Eighteen municipalities had source reduction credits for greater than 1,000 tons in FY2003.

A total of 28,025 tons of organics were estimated to be backyard composted, and a total of 21,531 tons of grass clippings were estimated to be left on the lawn based on the methodology described above, for a total of 49,578 tons of yard waste that did not need to be disposed or managed off-site. It is likely that some municipalities fill out their annual reports more thoroughly than others, and that the reported quantities of yard waste recovered and source reduced may therefore be understated. This type of organics management is difficult to measure and classify since the material is generated but not disposed or recycled off-site.

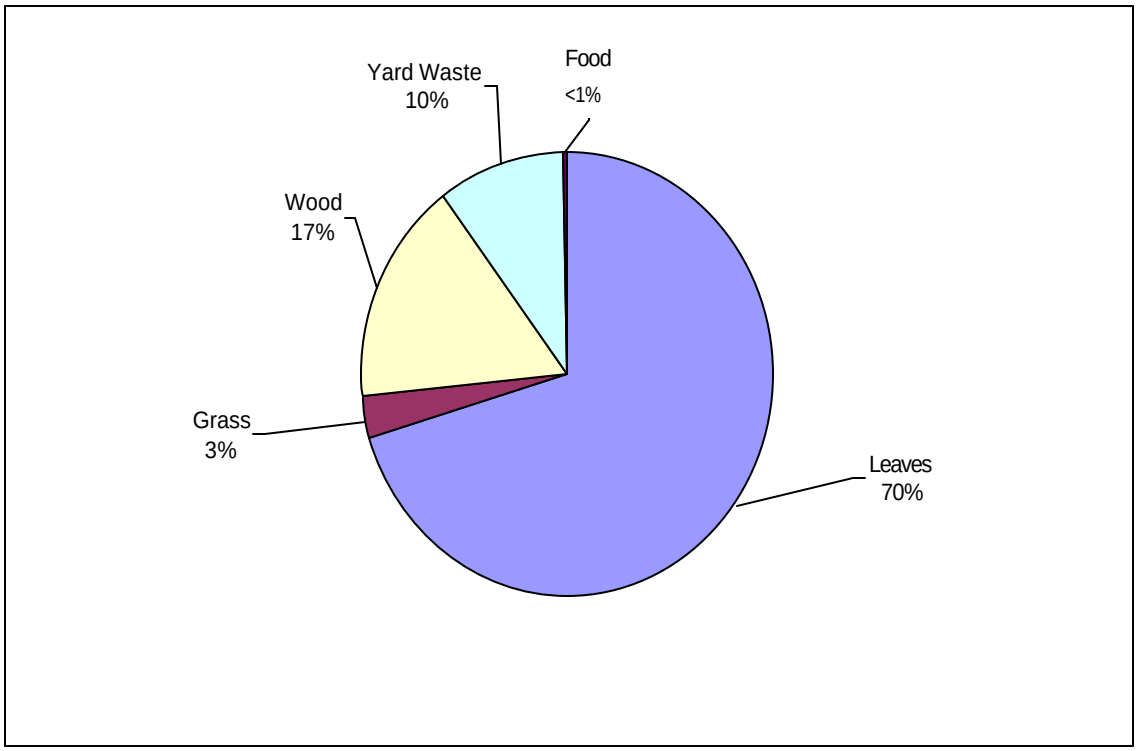
D.2.2.4 Summary of Yard Waste Diversion

In FY2003, Connecticut municipalities reported approximately 223,000 tons of yard waste was recycled or composted. This reported amount does not include yard waste that was home composted, grasscycled, left on site, or illegally disposed off-site. The amount reported translates to 129 pounds per capita per year of yard waste recovered. It is important to remember that the actual amount of yard waste composted or recycled is likely somewhat higher than that which is reported. Figure D-1 shows the percentages of municipally reported organics recycled in FY2003. As shown in Figure D-1, 70 percent of the municipally reported organic waste recycled consists of leaves, followed by wood waste (17 percent), yard waste (10 percent), grass (3 percent) and food waste (less than one percent). An analysis of how these reported recyclables are processed (e.g., by municipal facilities, private facilities, or farms) is presented in Figure D-2.

As Figure D-2 shows, 65 percent of the reported tonnages recovered are processed at municipal sites, 28 percent is processed by private non-farm processors, 7 percent is processed by farm processors, less than 0.5 percent by unknown or unreported types of facilities, and less than 0.5 percent by other types of processors.

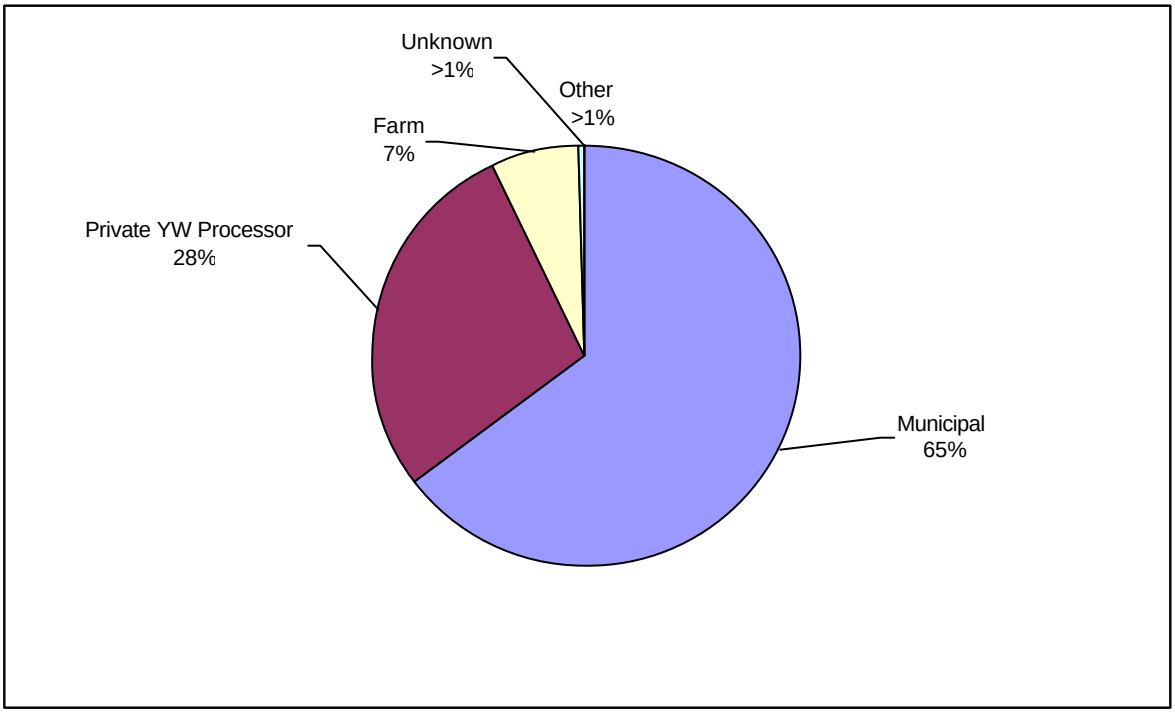
Clean wood in MSW includes yard waste, brush, pallets, spools, skids, packaging material, and scraps from newly built wood products that are untreated and contain no adhesives, paint, stain, fire retardant, pesticide, or preservative. Yard waste and brush are handled by municipalities and permitted recycling facilities. This material is generally chipped and used as mulch or composted. Although some of this material is being re-used, for example pallets in good condition, some of it is finding its way to facilities processing land-clearing debris for mulch or compost or to C&D volume reduction facilities that may recover such clean wood for mulch or compost. The remainder is being disposed at waste to energy facilities or landfills. For a discussion on land clearing debris, see Appendix H and Chapter Four that address special wastes.

Figure D-1
Organics Reported Recycled By CT Municipalities in FY 2003



Data Source: CT DEP

Figure D-2
Types of Recycling Facilities Processing Reported Recovered Organics in FY 2003



D.2.2.5 Assessment of Municipal Yard Waste Infrastructure

Although the CT DEP does not annually survey the municipalities regarding their existing hauling infrastructure, it appears that most municipalities provide residents with access to yard waste collection of some sort and processing. For example, of the 169 municipalities in the state, 115 reported recycling some quantity of yard waste in FY2003. It is speculated, however, that some municipalities do not fill out their reports as completely as they could. Of the 54 municipalities that did not report yard waste tons recycled in 2003, nine have municipal registered leaf waste composting sites. Another three have indicated that they have an arrangement either with a private processor or farm to accept leaf waste. Thus, it appears that only 42 municipalities may not provide for yard waste processing for residents. It is possible, however, that these residents have access to regional transfer stations that accept yard waste, or have private haulers that collect yard waste through and "open" system, and deliver yard waste to a processing site. It is also possible that some residents in rural areas do not find it necessary to have separate collection of yard waste. It is also possible that registered sites are inactive, or arrangements with private processors and farms have fallen through. This seems less likely, however, as it is difficult to take programs away from residents once they are implemented, particularly when they are managing a material that has been banned from disposal.

D.2.3 Farm-Generated Waste

Farm-generated waste and other waste that is integral to the farming operation can be composted on site, providing the waste and the processing meet certain criteria. The CT DEP has a program that addresses this issue. The primary concern of this program is to ensure that stormwater runoff does not carry pollutants into waterways or infiltrate groundwater supplies. The farm must therefore submit an approved Agricultural Waste Management Plan (AWMP) that shows the precautions taking place to ensure that this is true. There are 25 AWMP's filed with the CT DEP, however only 21 are active. Together, these 21 sites are expected to compost approximately 34,000 cubic yards per year. The types of waste managed include:

- vegetative waste,
- poultry, horse, sheep, pig, and cow manure,
- waste paper,
- leaves,
- vegetable slurry,
- dead chickens;
- sawdust bedding,
- fresh hay,
- slaughterhouse waste (mostly poultry),
- kitchen waste, and
- wood shaving bedding.

The CT DEP reviews the Agricultural Waste Management Plans and generally conducts a site visit to each farm to ensure that materials are being managed properly. Because there are relatively few farms in Connecticut, and the number is declining, this is not likely to become a major means of waste reduction. However it provides a beneficial product for some farms, and helps these farms avoid disposal costs.

D.2.4 Food Waste

D.2.4.1Introduction

The CT DEP has been proactive in making the public aware of commercial, industrial, and institutional food residuals composting and has had some successes. Currently, composting of food waste is limited to that which is processed through the Agricultural Waste Management Plan program, a successful composting program undertaken at a State prison, a few pilot projects, and some school composting programs. The CT DEP contracted with a private firm to conduct a food waste mapping study in 2001. At that time, it was estimated that there were over 1,300 potential sources for significant amounts of food waste in the state. These generator

types included the following categories, and considered only those that met certain size thresholds:

- food manufacturers and processors,
- food wholesalers and distributors,
- health care facilities,
- colleges and universities,
- independent schools,
- correctional facilities,
- resorts and conference facilities,
- supermarkets, and
- major private employers.

The study indicated that between 99,946 and 153,331 tons of source-separated organics could be collected from these generators as feedstock for composting. The study further concluded that there are enough generators of organics in Connecticut to warrant pursuing an organic composting program including food waste. Restaurants were not analyzed for organic waste generation for a variety of reasons including the sheer number of them and because they frequently go in and out of business. The study did, however, map restaurants in Hartford County to demonstrate the capabilities of the database and GIS mapping combination for such things as developing collection and hauling routes.

D.2.4.2 Industrial

New Milford Farms, a now-closed composting facility, was owned and operated by Nestle in connection with its New Milford plant. New Milford Farms was permitted to receive up to 54,000 tons per year of processed industrial food residuals from the local Nestle plant, as well as food residuals from Nestle plants in New York and New Jersey. Feedstocks included tea leaves and coffee grounds. The facility also accepted yard waste, clean wood waste, and pallets for processing, for a tip fee. In addition, they processed washwater sludge from a food processing facility located across the street, vegetative waste from two Stop and Shop stores in Danbury and New Milford, and hydrolyzed plant protein that was mined from the company's on-site landfill dedicated to this material. The processing was all under cover, using windrow technology. Composted cow manure was also delivered to the facility, and topsoil, potting soil, and manure blends were developed to a third-party marketing company's specifications. In its best year, New Milford Farms produced 944,000 40-pound bags (19,880 tons) of product.

D.2.4.3 Institutional

The CT DEP also funded the publication of a manual to instruct K-12 schools on how to develop an on-site food residuals composting program. This manual was based on the experience of Mansfield Middle School, which developed a pilot composting

program in 2000. The school of 650 was able to compost 4,168 pounds of food scraps, along with three to four cubic yards of leaf waste and wood chips, to produce 1.5 cubic yards of compost in the first year. During the second year, the school averaged 37 to 49 pounds per day of food waste, including both kitchen scraps and plate scrapings. The CT DEP does not monitor the number of such programs in existence, or the volume of food waste being source reduced in this manner, though media coverage suggests that such programs are growing.

D.2.4.4 Commercial

It is reported that food waste from the Mohegan Sun Casino in Uncasville is being diverted to the Millaras Piggery in Waterford, Connecticut. In FY2002, it was reported that 2,482 tons of food waste was diverted from the casino to this farm.

D.2.5 Stakeholder Roles in Organics Recycling

Stakeholder roles in promoting and implementing organics waste reduction and recycling programs are summarized in below.

Haulers

Many municipalities and private haulers provide separate yard waste collection. See Table D-6 for examples.

Facilities

Private facilities offer yard waste and clean wood processing and composting. See Table D-7.

Municipalities

Municipalities must mandate recycling of leaves and grass (leaving grass clippings on the lawn is the preferred method for dealing with this material). Many municipalities provide yard waste processing and/or drop-off sites for these materials and many also provide education on yard waste management and offer home composting bins and information on grasscycling.

Generators

Many citizens participate in grasscycling and backyard composting, supported by municipalities and regional authorities that offer compost bins, technical assistance, and educational materials. Connecticut's Enfield prison is conducting food waste composting programs. Mansfield Middle School and Foodshare have a vermicompost program. Stonington/Groton has a commercial organics collection program.

Authorities

CGS Section 22a-208v requires the CT DEP and CRRA to provide for a program of public information to promote the recycling of grass clippings by composting at the property where the grass clippings are generated, by allowing the grass clippings to

decompose in place, or by composting grass clippings at a municipal or commercial composting facility. The SCRRRA Education Center at the Groton IPC includes a demonstration of a composting garden and has sold compost bins through State grants (when available) or at cost. Some authorities provide yard waste collection.

CT DEP

The CT DEP has (1) made leaves a mandatory recyclable and banned grass clippings from landfills,(2)eased regulations for leaf waste composting and clean wood processing facilities, (3) worked with farms to develop AWMP's, (4) performed a food mapping study done in 2001, (5)provided information on leaf composting, grasscycling, and composting for schools, and (6) conducted research on using compost for erosion control. The CT DEP also offered grants to municipalities to fund yard waste processing sites in the early 1990's. Some of this money was used for backyard composting programs.

D.3 Summary of Current Waste Diversion Practices

D.3.1 Non-Organic Materials

The infrastructure for aggregating, processing, and marketing for most recyclable materials is in place. Because markets for most recyclable materials are strong and are expected to remain strong for some time, it is expected that private and/or public entities will increase capacity as the need for additional capacity develops. The current status of recycling for non-organic materials in summarized below:

- Most aggregation facilities (e.g., transfer stations) are publicly owned.
- Much of the recyclable materials processing infrastructure is privately owned.
- Most residents have access to recycling, although recycling could be made more convenient for some sectors, such as those living in more rural areas and those living in multi-family dwellings.
- Regional organizations are managing electronics recycling collection programs and household hazardous waste disposal for many municipalities. They have taken on this role, but many lack funding to provide comprehensive regional services, including education, about these specialized collection and recycling needs.
- The extent to which commercial entities recycle is unknown, however stakeholders indicate that commercial recycling, especially for small businesses, could increase considerably.
- Larger businesses appear to recycle due to cost savings as a result of economies of scale and mandate.
- The eleven state mandated recyclables are required to be recycled statewide. However, depending on markets used, the designated recyclables may be collected as part of a recycling mix for example corrugated cardboard may be

collected as part of a paper mix instead of as a separate grade, but it is still collected and marketed. In addition, towns have added recyclables in addition to the State mandated items for which they have identified markets.

- It is unknown how much material is being recovered through the State's bottle bill program, and reporting of these quantities is not required.
- Currently, some collection programs and IPCs accept additional materials, but residential mixed paper is under-recovered in some parts of the state and food waste is not collected.
- Enforcement of recycling mandates is minimal.
- In Connecticut as in other states, source reduction estimates are not being made because the measurement of this activity is very difficult to quantify or model. However, the CT DEP has made some attempt to quantify waste managed on site such as grass-cycling and home composting.
- Commercial and residential sectors often have no incentive to reduce the amount of solid waste they dispose.
- Small commercial waste generators, in particular, lack incentives to recycle materials, as they may not be able to reduce the frequency of pick ups, and thus costs, by recycling.
- Fee structures paid at the various recycling facilities in the state are inconsistent. At CRRA facilities, for example, there is no tipping fee charged for recyclables delivered to the IPC. In other regions, however, recycling tip fees are about half of the tip fees for disposed MSW.
- The types, frequency, and quality of recycling/waste reduction education and outreach are not consistent throughout the state. With few exceptions, the State does not participate in or offer to municipalities for any of the new, contemporary recycling motivational campaigns developed by other states and private organizations that are free or have very low costs. However, there are costs associated with implementation and State funding for these outreach campaigns is not available.
- Funding for municipal and regional recycling coordinators and infrastructure development is no longer available from the State, hence some programs lack staff, promotion, education, and enforcement.
- Lack of waste characterization data makes it difficult to identify capture effectiveness and recycling and waste reduction opportunities and priorities.

D.3.2 Organic Materials

The current state of efforts to recycle organic materials is summarized in list form below.

- The infrastructure for collecting yard waste is largely in place throughout the state.

- There may be an opportunity to increase the amount of brushy waste being recovered, as it is not currently banned from disposal and many communities do not offer separate collection of brush and tree limbs mandated as a material that can not be disposed.
- Some brushy waste that is delivered to transfer stations is reportedly burned, rather than ground into mulch, and therefore this material is not recycled.
- The CT DEP does not count wood used as fuel as recycled.
- The amount of yard waste recovered, particularly by private entities, is likely under reported.
- Much of the leaf compost and mulch produced at municipal sites is given away free of charge.
- There are many private entities that have entered the market to process and market organic products.
- There is no significant amount of food waste being composted in Connecticut at this time, although there are several food waste composting "pilot projects" operating at schools, at Food Share, in some towns, and at a prison.
- There are no permitted composting facilities operating at this time that accept food waste.
- There is no infrastructure in place to process food waste.
- Source separated organics recycling facilities taking materials from off-site sources at a rate greater than one ton per hour are required to obtain an individual solid waste volume reduction plant permit.

Appendix E
OPTIONS TO INCREASE WASTE DIVERSION

This appendix presents four brief, revised handouts that were used during a meeting of the External Stakeholder Committee to help frame a discussion of alternative waste diversion options. The meeting was held in August 2005 as part of the efforts leading to preparation of this Plan. Waste diversion is used here to refer to diversion of solid waste from disposal, through source reduction, reuse, recycling, and composting.

The revised handouts include the following:

- **Opportunities to Increase Waste Diversion (E.1)** identifies the five broad opportunities that lead to increased waste diversion: reducing the amount of waste generated; increasing access to recycling and reuse services; increasing the range of materials covered; increasing participation and capture rates; and increasing processing efficiencies. Also provided are illustrative examples of the many types of policies and programs that can be employed to successfully seize these opportunities. This handout is intended to identify the five main results that all types of efforts to increase waste diversion must seek to effect, in one way or another.
- **Menu of State Options to Overcome Barriers and Pursue Opportunities (E.2)** is a listing of options that State agencies can employ to achieve increased waste diversion through the opportunities described above. The options are grouped into ten categories: State funding mechanisms; financial assistance; technical assistance; research; mandates; education and outreach; regulatory reform; incentives; regional efforts; and facilitation and partnership building. This handout is intended to provide a list of options for consideration.
- **Current Conditions in Connecticut and Examples of Alternative Approaches (E.3)** is a table that identifies eight elements that together characterize a state's waste diversion approach: the diversion rate and trends; goals and measurement; planning and measurement; State program funding; State policies to drive local waste diversion efforts; local infrastructure and services; State programs to assist and promote waste diversion; and drivers of manufacturer activities to support waste diversion. For each of these elements, the table provides a very brief synopsis of current conditions and practices found in Connecticut, and provides observations about some examples of approaches and conditions in selected other states. This handout is intended to broadly characterize Connecticut's current waste diversion programs and provide context in terms of some other states' efforts.
- **Elements of Highly Effective Local Waste Diversion Programs (E.4)** lists twelve categories of policies, programs, and activities that together characterize highly effective local waste diversion programs: goals, planning and staffing; funding and financial incentives; education and outreach; technical assistance; source reduction; residential services; commercial services; facilities; public

venue services; community partners; market development; and special waste programs. Examples are provided under each category. This handout is intended to indicate the broad range of local and regional activities that states should seek to promote and support.

E.1 Opportunities to Increase Waste Diversion

There are five primary opportunities to increase waste diversion in Connecticut:

1. Reduce the amount of waste generated, for example by:
   - Expanding efforts to promote grass cycling and on-site composting;
   - Promoting new products and packaging designs that reduce waste;
   - Providing hands-on technical assistance to businesses;
   - Promoting changes in consumption patterns; and
   - Expanding producer responsibility for the waste generated by their products.
2. Increase access to and use of recycling and reuse services, for example by:
   - Establishing new multi-family, away-from-home and commercial recycling services where they do not currently exist. Where they do exist, make these services more efficient, less costly, and more convenient to assure that these sectors use those services and participate in recycling programs;
   - Encouraging haulers to offer enhanced recycling services to residents and commercial businesses in an efficient and cost effective manner;
   - Promoting new reuse business opportunities for charities and local governments such as those in Berkeley, CA and Monterey, CA; and
   - Promoting new manufacturer-funded or operated recycling services.
3. Increase the range of materials recovered in recycling programs, for example by:
   - Adding additional materials to existing curbside and drop-off programs;
   - Expanding the range of containers included in the bottle bill;
   - Expanding food waste composting services;
   - Supporting stronger markets for waste materials with currently low demand and/or price; and
   - Promoting the design and use of products that are more readily recyclable (e.g., waxed cardboard substitutes).
4. Increase participation and capture rates in existing programs, for example by:
   - Funding major statewide and local public outreach campaigns;
   - Assuring that local recycling information such as local participation instructions and requirements is readily accessible and available to everyone in Connecticut;

- Exploring the costs and benefits of implementing single stream collection systems combined with enhanced processing systems and, based on findings, deciding whether to promote single stream recycling collection in Connecticut. The potential costs would include the cost of retrofitting the collection infrastructure and state's IPCs, as well as the risks attending the marketing of contaminated paper. The potential benefits include simpler preparation of recyclables by residents and lower collection costs;
- Exploring the option of increasing the size of curbside recycling containers to promote greater participation;
- Establishing price incentives through the promotion of pay-as-you-throw systems, raising the cost of disposal, and using innovative contracting practices with haulers, recyclers and processors;
- Establishing additional mandatory recycling items and/or disposal bans; and
- Increasing recycling enforcement efforts on the local, regional, and State levels.

5. Increase processing efficiencies to decrease non-recycled waste residuals and improve the quality of materials marketed, for example by:
   - Providing technical and financial assistance to modernize existing processing facilities; and
   - Promoting regional cooperation to improve economies-of-scale.

E.2 Menu of State Options to Overcome Barriers and Pursue Opportunities

Category	Options
State Funding Mechanisms	■ Extend the solid waste assessment at RRF's (CGS Section 22a-232) to cover all discarded waste, whether at RRF facilities, landfills, or export. This would become an obligation of the cities and towns. ■ Increase amount of RRF fee. This would become an obligation of the cities and towns. ■ Assess product or packaging fees either at the retailer or manufacturer level. ■ Adjust beverage container deposit system to retain escheat payments and expand system to increase potential revenue amount. ■ Evaluate other existing Connecticut programs for revenue sources.

Category	Options
Financial Assistance	■ Grants to municipalities, regional authorities, private businesses for: ■ recycling equipment, operations, and coordinators; ■ projects to promote reuse; ■ source reduction, reuse, and recycling education; ■ other program enhancements. ■ Active recycling business development financing programs, including loans, loan guarantees through the CT Department of Economic and Community Development in consultation with the CT DEP, CRRA, etc. ■ Shared development, ownership and/or operational stake in processing facilities.
Technical Assistance	■ Provide expert staff, funding and/or contractors to: ■ promote local program optimization; ■ help analyze local options; ■ assist private recycling and reuse businesses; ■ conduct waste audits and analyze benefits of waste diversion; ■ promote contractual and ownership alternatives to flow control. ■ Establish and promote best practices for local programs and markets.
Research	■ Conduct waste characterization studies to assist local governments and businesses in identifying waste diversion opportunities and strategies. ■ Sponsor research by Connecticut universities and others to innovate new, more efficient waste collection, processing, and product manufacturing approaches. ■ Document developments in waste management and market development technologies that may benefit Connecticut.

Category	Options
Mandates	■ Target waste generators and service providers by: ■ expansion of landfill bans; ■ expanding the list of mandated recyclables; ■ strengthening enforcement of recycling mandates. ■ Target local jurisdictions by: ■ requiring waste diversion planning and/or goal achievement; ■ requiring levels of recycling service; ■ requiring recycling coordinators. ■ Target product manufacturers by: ■ promoting voluntary product stewardship initiatives; ■ adopting producer responsibility legislation; ■ adopting minimum content or utilization requirements. ■ Target State agencies by: ■ enhancing recycled product procurement practices; ■ requiring waste diversion plans and/or goal achievement.
Education and Outreach	■ Prepare promotional materials for local use. ■ Conduct statewide campaigns, including publicity and ads at the state and local levels. ■ Leverage existing materials developed by other states and trade associations. ■ Enhance information services such as web site, hotline, brochures, etc. ■ Conduct ongoing workshops and training seminars for: ■ municipal recycling staff; ■ commercial businesses (to reduce waste costs); ■ promotion of market development initiatives. ■ Provide information on recycling markets and opportunities. ■ Document the economic and environmental benefits of recycling and reuse.
Regulatory Reform	■ Streamline facility permitting processes, where appropriate.

Category	Options
Incentives	■ Promote or require local pay-as-you-throw pricing systems. ■ Tie financial assistance to performance targets. ■ Increase beverage container deposit amounts. ■ Promote service and facility ownership agreements that include built- in financial incentives for maximizing waste diversion.
Regional Efforts	■ Establish goals by region. ■ Fund regional facilities.
Facilitation and Partnership Building	■ Work with other states and US EPA to promote product stewardship initiatives. ■ Forge alliances between recycling, business development, transportation, purchasing and other state agencies to build markets and promote recycling. ■ Work with other states and industry on national and statewide education and promotion campaigns. ■ Maintain and strengthen alliances with other Northeastern states in NERC and NEWMOA. ■ Fund research and policy centers at Connecticut universities.

E.3 Current Conditions in Connecticut and Examples of Alternative Approaches

Element	CT Current Practices	Observations and Examples from Other States
Diversion Rate Trends	Municipally reported disposal diversion has remained stagnant for past several years at about 24%.	Similar to situation in many other states. Diversion has declined in some states (e.g., NJ from 45% in 1995 to 32% in 2003), and is increasing in only a few (e.g., CA from 25% in 1995 to 48% in 2003; MA from 51% in 1999 to 57% in 2001.) PA currently at 26% with goal of 35% by 2005.
Goals and Measurement	25% recycling and 15% source reduction. Tracking of municipal waste diversion efforts. Little documentation on commercial recycling, beverage container deposit redemptions and source reduction. No statewide waste characterization data to determine prevalence of recyclables in disposed waste stream.	Similar to many other states. Source reduction and non-municipal diversion are always difficult to measure. State diversion goals of up to 70% (MA), with a wide range of measurement practices. CA: waste diversion formula with proposal to move to disposal accounting only plus best practices. NJ and many states: Documented municipal flows plus commercial estimates. Many states: similar to EPA standard methodology, includes broader range of materials in MSW than CT. OR: 2000 50% goal extended to 2009, regional goals of 10%-65%, combine to State goal. City goals of 70%+ in many CA local governments (e.g., SF, Alameda, Palo Alto). MN: Best prac tices approach to measuring source reduction. Alternative measures under consideration (PA, CA). Several states (e.g., PA, GA, OR, WA, CA) have performed statewide waste characterization studies and/or require local studies.
Planning and Measurement	Last adopted Statewide plan in 1991. Focus on guaranteeing sufficient disposal capacity. Plan proposed in 1999 but not adopted.	Common for states to prepare plans on 5-10 year basis. Two- year development process not uncommon. Some recent plans: NJ (05), OR (05), CA (03), WA (05). Some state plans have broad focus on sustainability, materials management, and/or zero waste (MN, WA, CA).

Element	CT Current Practices	Observations and Examples from Other States
State Program Funding	Fee levied on waste disposed at RRFs. Fee not levied on exported wastes or wastes disposed in CT landfills.	Many states have disposal fee funding mechanism. Other funding systems include: ▪ State retains unredeemed bottle bill deposits (CA, MA); ▪ Product fees for targeted programs (many states tires, CA electronics, oil, VA packaging, FL Sunset packaging ADF); ▪ Business recycling tax (NJ sunset); ▪ Bond issue (NY).
State Policies to Drive Local Waste Diversion Efforts	State goal of 25% recycling + 15% source reduction and/or additional recycling. Local authority must identify a recycling contact, only some towns have coordinators. Mandatory recycling for designated materials (glass and metal food containers, scrap metal, high grade white office paper (non-residential), old corrugated cardboard (OCC), old newspaper (ONP), waste oil, leaves, lead acid storage batteries, Ni-Cad rechargeable batteries, grass. Grass, and lead acid storage battery disposal bans. Local recycling ordinance required. Haulers must notify municipality of non-compliance and issue warnings. RRF operators must notify driver/municipality of significant recyclable loads. Fines of up to $1,000. Hauler fines for knowingly mixing recyclables with waste.	Some states have mandates on local governments. CA: 50% diversion with 5-year plans and annual updates, up to $10,000/day fine for noncompliance. PA: Programs required and must include designated materials. Some states have mandates on generators like CT (e.g., NJ, NY). Enforcement of recycling mandates is always problematic and generally not aggressively pursued. Some states use bans extensively as a driver (MA, WI). Some states require PAYT (MN, WI) and some have provided incentives for PAYT or other local innovations via grant programs (MA, PA). Over 6,000 PAYT programs nationwide.

Element	CT Current Practices	Observations and Examples from Other States
Local Infrastructure and Services	Nine recycling regions originally established (many no longer active), some handle recyclables contracting and/or marketing. Regional disposal system via RRFs. CRRA established in 1973. Regional Intermediate Processing Centers (IPCs) established, complemented by commercial processing facilities. Many towns include materials beyond the designated list. Many municipalities contract for residential waste and recyclables collection. Most IPC contracts are at regional level. Two regions have no IPC tip fee for residential bottles, cans, and paper, others have IPC tip fees much lower than disposal tip fees at the RRFs; one has revenue sharing. Some PAYT programs. Some public education and promotion. Beverage container deposit and battery deposit collection systems handled separately. Most commercial recycling handled independently of municipalities.	CT offers more comprehensive access than many states, and regional IPCs provide a strong foundation and offer favorable pricing. Significant, sustained growth in diversion infrastructure continues in relatively few states and cities: ▪ CA (driven by local mandate and public support, some cities at over 60% or even 70%); ▪ Cities driven by strong public support (Portland) and/or local capacity challenges (Seattle). As in many states, local infrastructure growth has slowed or stalled. Main opportunities for growth are typically: ▪ expanding range of materials typically accepted (e.g., mixed paper, food waste, clean wood); ▪ increasing multi-family and small-business access; ▪ need for more aggressive and sustained education and promotion; ▪ potential for incentive-based contracting and facility ownership and pricing structures; ▪ need for significant new local and state funding to drive efforts; ▪ potential for private sector recycling enterprise expansion; ▪ facilities to further sort residual streams for recyclables.

Element	CT Current Practices	Observations and Examples from Other States
State Programs to Assist and Promote Waste Diversion	Integrated Waste Management Hierarchy formally adopted. State permitting responsibility for solid waste facilities. State procurement price preference policy. Required State agency plans to eliminate the use of disposables/ single use products by State government.	Many states formally adopted IWM hierarchy. States have developed a wide range of promotion and assistance programs: ▪ State staff/specialists (many states); ▪ Business waste reduction assistance (CA, MA, ME, WI); ▪ Regional State recycling staff (PA, MA, NY). State grants to local governments: ▪ CA (HHW, electronics, reuse, beverage containers, market development) ▪ PA (per tons, equipment, expansion); ▪ WI (local program operations); ▪ Business market development/business development (NC, CA, AZ, MA); ▪ Procurement (many states).
Manufacturer Drivers	Lead acid battery deposit law; Beverage container deposit law; Newsprint and directory minimum content purchasing law; Directory publisher requirement to recover a percentage of directories distributed in CT; Toxics in packaging law. Participation in Northeast Recycling Council, Northeast Waste Management Officials Association and Product Stewardship Institute.	Few states have adopted very many manufacturer related legislation; CT has more than most. Some states are adopting policies explicitly promoting product stewardship or producer responsibility (MN, CA). Some states are funding product stewardship initiatives (MN, CA, NC).

E.4 Elements of Highly Effective Local Waste Diversion Programs

Goals, Planning, and Staffing

- Sufficient funding.
- Recycling or waste diversion goals and targets drive progress.
- Regularly updated plan to achieve waste diversion goals and increase system efficiency.
- Typically, at least one full-time dedicated recycling staff person per 500,000 to 1,000,000 population to maintain programs.
- Ongoing task force or advisory committee, and engaged elected officials.
- City as a model: aggressive programs for city buildings and operations.

Enforcement

- Consistent enforcement of recycling laws and regulations.

Funding and Financial Incentives

- Funding for all diversion activities derived from rate structure, not from general fund or property tax assessment.
- Critical importance of municipalities to understand the full cost of solid waste management and be cost-efficient in providing collection services.
- Incentives for increasing diversion offered via:
  - Recycling costs low relative to disposal;
  - PAYT pricing;
  - Hauler contracts and facility/service rate structures;
  - Ownership and operation of facilities and rates.

Education and Outreach

- Sustained program of education and outreach via local media, mailings, and other avenues, including community based social marketing.
- School-based education programs in place.
- Simple, easy to understand, widely disseminated, ongoing instructions for recycling participation, especially for new residents and businesses and new town government officials including Board of Education members.

- Awards and recognition for local leaders.

Technical Assistance

- Hands-on assistance to commercial businesses (e.g., waste audits, service contracting, etc.).
- Market and service provider information readily available.
- Workshops and case studies widely available and disseminated.

Source Reduction

- Focus on on-site organics management in all programs:
  - Home composting, grass cycling;
  - Food waste recycling at commercial establishments;
  - Education and technical assistance;
  - Purchase or subsidize and distribute bins, mulching blades, etc;
  - Workshops and training.
- Focus on purchasing and operational changes in commercial businesses:
  - Paper reduction;
  - Reusable packaging/shipment options;
  - Address in educational and technical assistance programs.
- Provide price incentives:
  - PAYT pricing;
  - Waste hauler/collector contractual structures.

Residential Services

- Broad coverage of curbside services:
  - Wide range of materials, especially mixed paper and yard waste, and viable, continuing markets for those materials;
  - Yard waste services provided (some include food waste);
  - Large bins, regular service, easy to use, clear education materials.
- Drop-Off programs complement curbside:
  - Main option for rural, remote or low-density areas;
  - Complement curbside with added convenience and wider range of accepted materials.

Commercial Services

- Competition driven services and pricing:
  - Open market based commercial recycling services;
  - Franchise contracting for commercial garbage services;
  - Wide range of materials and services offered, including food waste;
  - Aggressive education and outreach and technical assistance services
  - Case studies;
  - Hands-on audits and assistance to contractors, staff, and nonprofits;
  - Typical targets: office buildings, restaurants, retail.
- At-work recycling services promotion.

Facilities

- Ample capacity at regional processing centers for recyclables and organics.
- Additional sorting of residual streams to remove recyclables.

Public Venue Services

- Recycling drop-offs (conveniently located to minimize extra driving) in downtown areas, city buildings, etc.
- Recycling at special events.

Community Partners

- Community based non-profits to assist in education, promote reuse and other enterprises, etc.
- Partnerships with State, US EPA, industry on select projects.

Reuse/Recycling Enterprise and Market Development

- Environmentally preferable (including recycled content product) procurement program for all purchases.
  - Include roads projects (aggregate, tires, etc.);
  - Close coordination with business development/promotion programs;
  - Business siting and expansion assistance;
  - Certified green business program.

Related Special Waste Programs

- Permanent HHW facility.
- C&D ordinance promoting and providing incentives for recovery and reuse.
- Green building program.
- Market development and product stewardship policies and programs.

Appendix F
SOLID WASTE DISPOSAL OVERVIEW

Introduction

This Appendix provides an overview of Connecticut's historic disposal practices for municipal solid waste (MSW), RRF ash residue, and bulky waste. This historic data is the basis for the assumptions regarding MSW disposal for the next 20 years on which this Solid Waste Management Plan is based. These assumptions are presented in Appendix B. The first section of this appendix is a review of selected Connecticut legislation regarding disposal practices, followed by three sections that describe the disposal trends for MSW, RRF ash residue, and bulky waste. A listing of CT DEP permitted solid waste transfer stations is presented at the end of this appendix.

F.1 Connecticut Solid Waste Disposal Legislation

The Solid Waste Management and Solid Waste Management Services Acts (which establishes the creation of the Connecticut Resources Recovery Authority – CRRA), Chapters 446d and 446e respectively of Title 22a of the Connecticut General Statues, (CGS) provide the basis for State-level responsibility for provision of solid waste disposal services for all of the people of Connecticut through development and implementation of a statewide solid waste management plan. Specifically, CGS Section 22a-259 (Chapter 446e) includes the following as State policies:

- That maximum resources recovery from solid waste and maximum recycling and reuse of such resources in order to protect, preserve, and enhance the environment of the state shall be considered environmental goals of the state;
- That appropriate governmental structure, processes and support are to be provided so that effective state systems and facilities for solid waste management and large-scale resources recovery may be developed, financed, planned, designed, constructed, and operated for the benefit of the people and municipalities of the state;
- That solid waste disposal services shall be provided for municipal and regional authorities and private persons in the state, at reasonable cost, by state systems and facilities where such services are considered necessary and desirable in accordance with the statewide solid waste management plan, and that any revenues received from the payment of the costs of such services otherwise from the operation of state systems and facilities shall be redistributed to the users of such services provided that the authority has determined that all contractual obligations related to such systems and facilities have been met and that such revenues are surplus and not needed to provide necessary support for such systems and facilities;

- That provision shall be made for planning, research, and development, and appropriate innovation in the design, management and operation of the state's systems and facilities for solid waste management, in order to permit continuing improvement and provide adequate incentives, and processes for lowering operating and other costs.

Additional guidance in development of the disposal section of the State Solid Waste Management Plan is found in CGS 22a-228(b) that states that the plan shall establish specific goals for source reduction, bulky waste recycling, and composting. The plan shall establish the following order of priority for managing solid waste: source reduction; recycling; composting of yard waste or vegetable matter; bulky waste recycling; resource recovery or waste-to-energy plants; incineration and landfilling.

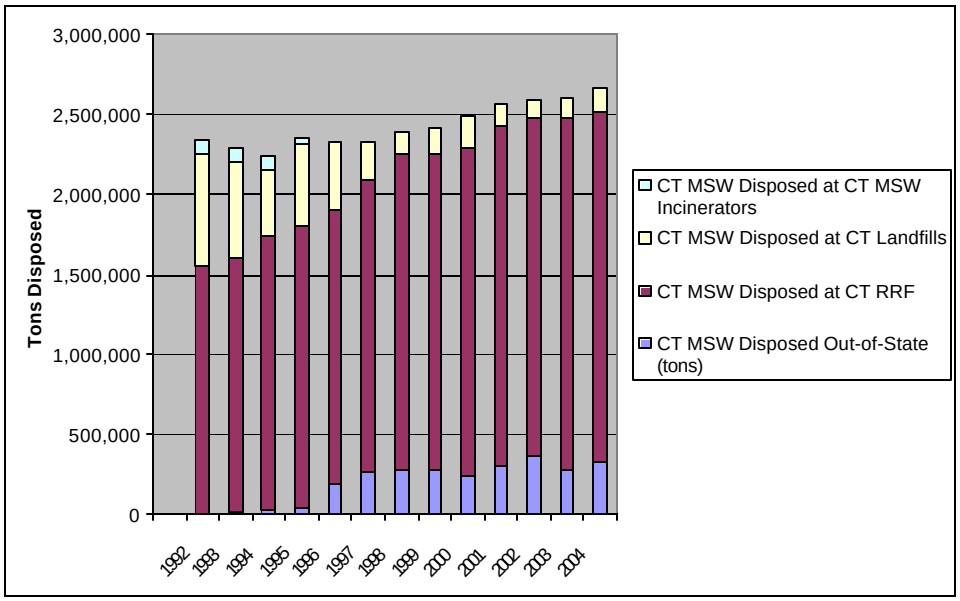
F.2 MSW Disposal

The amount of MSW requiring disposal is equal to total statewide generation of MSW less the quantity diverted through source reduction, recycling, and composting. As shown in Figure F-1, the quantity of Connecticut-generated MSW requiring disposal has been growing steadily since 1992. Disposal is growing because waste generation is growing and the amount of material recycled has not grown enough to completely offset that increased growth in MSW generation. MSW generation has been driven by increased per capita generation of waste and population growth.

The reported tonnages of Connecticut MSW generated has increased about 17 percent from FY1992 through FY2003, from an estimated 2.9 million tons/year in FY1992 to an estimated 3.4 million tons/year in FY2003 (does not include additional non-reported recyclables). The amount of Connecticut MSW disposed has increased from an estimated 2.3 million tons/year in FY1992 to an estimated 2.6 million tons/year in FY2003. MSW disposal tonnages have not risen as quickly as MSW generation rates due to rising amounts of MSW recycled. However, the percent of MSW recycled in Connecticut has remained essentially constant for more than ten years, resulting in increased amounts of Connecticut generated MSW requiring disposal.

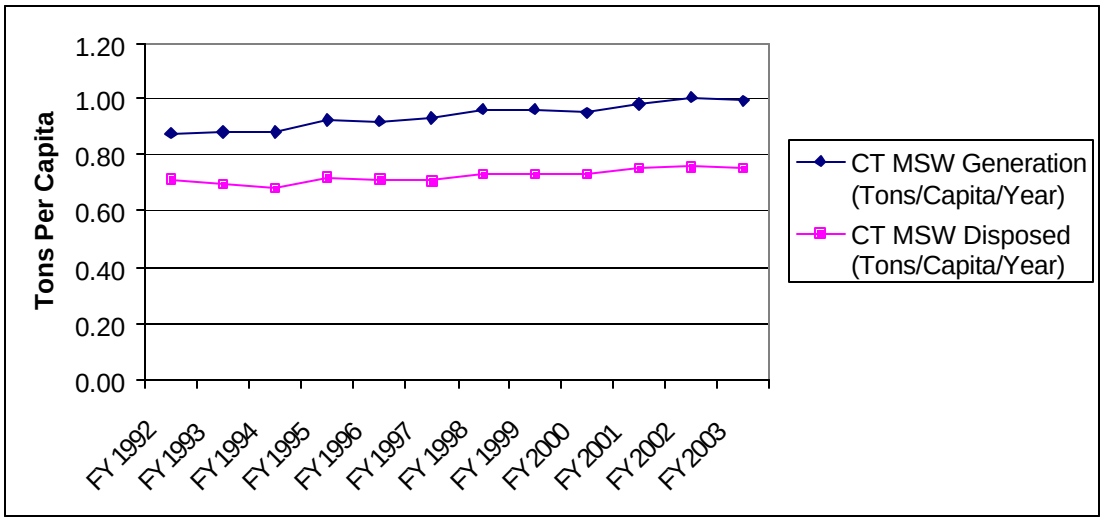
As shown in Figure F-2, the per capita rate of Connecticut MSW generated and Connecticut MSW disposed appear to be increasing as well. Based on the CT DEP data, per capita MSW disposal increased from 0.71 tons per capita per year in 1992 to 0.75 tons per capita per year in 2003. While incomplete reporting, especially prior to the year 2002, precludes absolute confirmation of this trend, data from nearby states suggests that this increase has occurred. Massachusetts and Maine reported three and nine percent increases in generation from 2001 to 2002, respectively.

Figure F-1
Disposal of Connecticut-Generated MSW
FY1992-FY2004



Source: FY 92-04 data.doc, from CT DEP based on reports submitted to the CT DEP by Solid Waste Facilities

Figure F-2
Connecticut MSW Per Capita Generation and Disposal Rates*
FY1992 – FY2003



*Based on data compiled by the CT DEP based on reports submitted by CT solid waste facilities and CT municipalities

F.2.1 MSW Disposal Practices

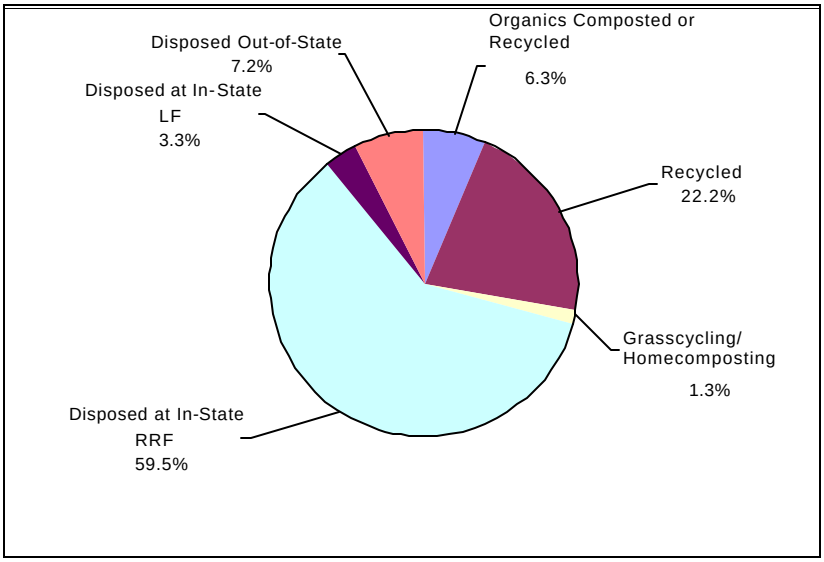
In order to get more complete recycling data, R.W. Beck estimated the amount of additional MSW recycled in FY2003 (but not reported to the CT DEP), and added that

estimate to the amount of MSW reported recycled and generated. As shown in Figure F-3, in 2003 the additional recycling estimates increased the estimate of CT MSW generated in FY2003 to approximately 3.7 million tons. Source reduction, composting, and recycling amounted to approximately 30 percent (1.1 million tons) of the MSW managed. Approximately 60 percent (2.2 million tons) of the MSW was disposed in in-state Resources Recovery Facilities (RRFs), three percent (121,000 tons) was disposed in in-state landfills, and the remaining seven percent (268,823 tons) was disposed out-of-state.

Figure F-4 shows the percentage of Connecticut-generated MSW that was not diverted but was disposed in 2003. A total of 2.6 million tons of Connecticut generated MSW was disposed at the following types of MSW disposal facilities:

- About 2.2 million tons (85 percent of all disposed tons) were sent to six MSW Resources Recovery Facilities in Connecticut;
- About 121,000 tons (five percent of all disposed tons) were sent to two MSW landfills in Connecticut; and
- About 269,000 tons (ten percent of all disposed tons) were sent to MSW landfills and waste-to energy facilities outside of the state.

Figure F-3
Municipal Solid Waste Management in 2003
(Total Generation = 3.7 million tons per year)



Source: FY2003 Solid Waste and Recycling Reports Submitted to CT DEP and Estimates of Additional Recycling by R.W. Beck

Additionally, about 506,000 tons (92 percent) of the RRF ash residue disposed was disposed at two Connecticut landfills, and about 45,000 tons (eight percent) was disposed in a landfill in New York State. An average of 35,000 tons/year (six percent) of the total ash residue generated) of scrap metal were separated out of the RRF ash and recycled over the FY2000-FY2004 period.

Figure F-4
FY2003 Disposed MSW

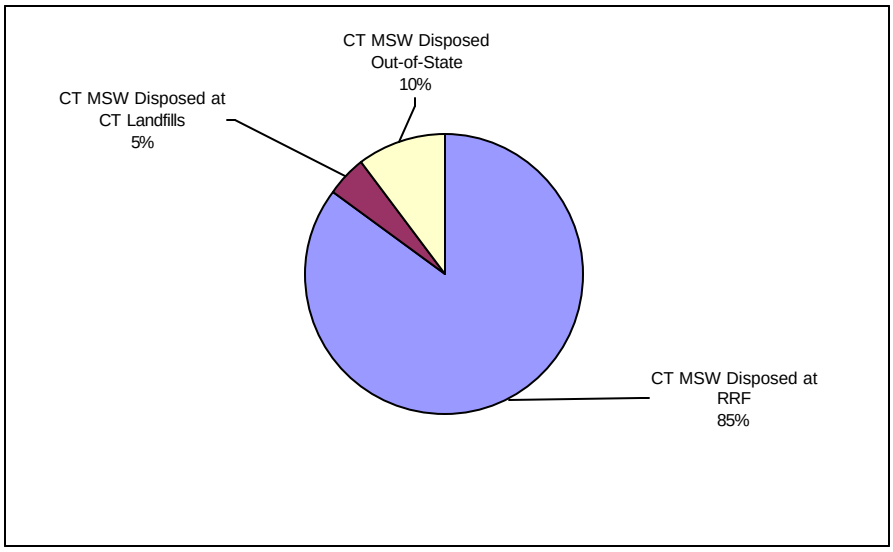


Table F-1 indicates the historical trends in MSW generation and disposal practices in Connecticut. It highlights that the use of landfills and incinerators has been declining steadily, while RRF capacity has grown due to several expansions, and RRF throughput has been stable at a high percentage of total capacity.

F.2.2 MSW Resources Recovery Facilities (RRF)

As shown in Table F-2, at the present time, there are six RRFs in Connecticut that process MSW, with a combined maximum permitted design capacity of 2.6 million tons/year and which burned an average of 2,209,444 tons/year with over the five-year period FY2000 thorough FY2004. The six MSW RRFs are: (1) the Bridgeport RRF; (2) the Wallingford RRF; (3) the Mid-Connecticut RRF; (4) the Preston RRF; (5) the Bristol RRF; and (6) the Lisbon RRF. There is also an RRF in Sterling, CT that processes only waste tires. Assuming an on-line efficiency of ninety percent, the six MSW RRFs have an estimated annual MSW disposal capability of 2.3 million tons/year. RRFs provide contracted MSW disposal for approximately 140 out of the 169 municipalities in the state. The disposal capacity for all but one facility is substantially utilized under long-term contractual waste delivery commitments. All six facilities have at least 20 years of remaining useful life assuming normal maintenance and ongoing upgrading of environmental control technologies.

Of the six MSW RRFs shown in Table F-2, all but the Lisbon and Bristol facilities are affiliated with the CRRA. Individual community contracts with these facilities or companies all expire between 2008 and 2020. Additional information relating to the key elements of each of the RRF projects is also summarized in Table F-2. Figure F-5 summarizes the amount of CT MSW disposed at each of the Connecticut RRFs, in-state landfills, and exported out-of-state in FY2004.

Table F-1
Connecticut MSW Generation, Recycling, and Disposal (1992 – 2004)

	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
CT MSW Generation – Total	2,883,521	2,897,128	2,900,747	3,041,185	3,006,218	3,046,460	3,157,339	3,167,644	3,232,541	3,351,828	3,464,723	3,430,707	NA
CT MSW Recycled (1)	540,402	605,009	660,378	688,458	679,165	720,483	765,474	749,780	741,076	779,764	867,333	830,264	NA
CT MSW Disposed – Total	2,343,119	2,292,119	2240,369	2,352,727	2,327,053	2,325,977	2,391,865	2,417,864	2,491,465	2,572,064	2,597,390	2,600,443	2,663,529
CT MSW Disposed at RRF	1,553,013	1,587,634	1,716,681	1,757,011	1,712,438	1,830,465	1,972,656	1,966,956	2,047,224	2,118,702	2,111,601	2,210,540	2,184,159
CT MSW Disposed at CT Landfills	694,970	603,773	410,334	517,077	424,034	234,030	143,244	168,994	197,380	149,023	119,786	121,080	152,518
CT MSW Disposed at MSW Incinerators	95,136	92,504	86,322	39,831	---	---	---	---	---	---	---	---	---
CT MSW Disposal Out of State	0	8,208	27,032	38,808	190,581	261,482	275,965	281,914	246,861	304,339	366,003	268,823	326,852
CT Population – US Census Bureau (2)	3,279,000	3,278,000	3,275,000	3,275,000	3,267,000	3,269,000	3,273,000	3,282,000	3,406,000	3,412,263	3,432,463	3,458,362	3,485,881
CT MSW Generation (tons/capita/year) (3)	0.88	0.88	0.89	0.93	0.92	0.93	0.96	0.97	0.95	0.98	1.01	0.99	NA
CT MSW Disposed (tons/capita/year) (4)	0.71	0.70	0.68	0.72	0.71	0.71	0.73	0.74	0.73	0.75	0.76	0.75	0.76

(1) Recycling figures in this table reflect recycled and composted tons as estimated by the CT DEP based on reports submitted to the CT DEP by CT solid waste facilities and CT municipalities. Elsewhere in this Plan MSW recycling and generation estimates for FY2003 and beyond include R.W. Beck estimates of additional estimates for commercial and bottle bill recycling that were not captured in the reports submitted to the CT DEP. Starting in FY2002, recycling calculations captured more of the bottles, cans, and paper recycled by the non-residential sector.

(2) FY Population is U.S. Census population estimate for July 1 of previous calendar year. FY 2002, 2003, and 2004 data source: U.S. Census 2005 Population Estimates, Total Population, April 1 2000 Estimates Base.

(3) Total generation divided by population.

(4) Total disposal divided by population.

Source: MSW data: CT DEP; Per capita calculations: R.W. Beck

Table F-2
MSW RRFs in Connecticut

Selected information	Bridgeport RRF	Bristol RRF	Mid-CT RRF	Southeast RRF	Wallingford RRF	Lisbon RRF
Maximum Permitted Design Capacity (tons/year) (1)	821,250	237,250	888,888	251,485	153,300	195,640 (2)
Average Amount (tons) of MSW Burned/Year (3)	722,692	196,113	715,011	250,484	143,158	181,987
Year Bonds will be Paid Off	2008	2014	2012	2015	2009	2020
Operator	Wheelabrator	Covanta	MDC/ Covanta	Covanta	Covanta	Wheelabrator
Number of Towns Contracted (4)	19 (Towns contracted to CRRA; CRRA has contract with Wheelabrator)	14	70	16	5	5 +11 (4)
2005 Member Tipping Fee (5)	$69	$66	$70	$60	$57	$60-$66
Ash Disposal Site	Putnam	Seneca Meadows (NY)	Hartford	Putnam	Putnam	Putnam
Post-Contract Ownership	Wheelabrator	Covanta	CRRA	Covanta	Covanta	Eastern CT Resource Recovery Authority (ECRRA)

(1) This represents the maximum (theoretical) amount of waste the facility is permitted to process per day multiplied by the number of days a year the facility operates. Facilities usually do not operate at this level due to efficiency variations and to repairs, maintenance, and other down time.

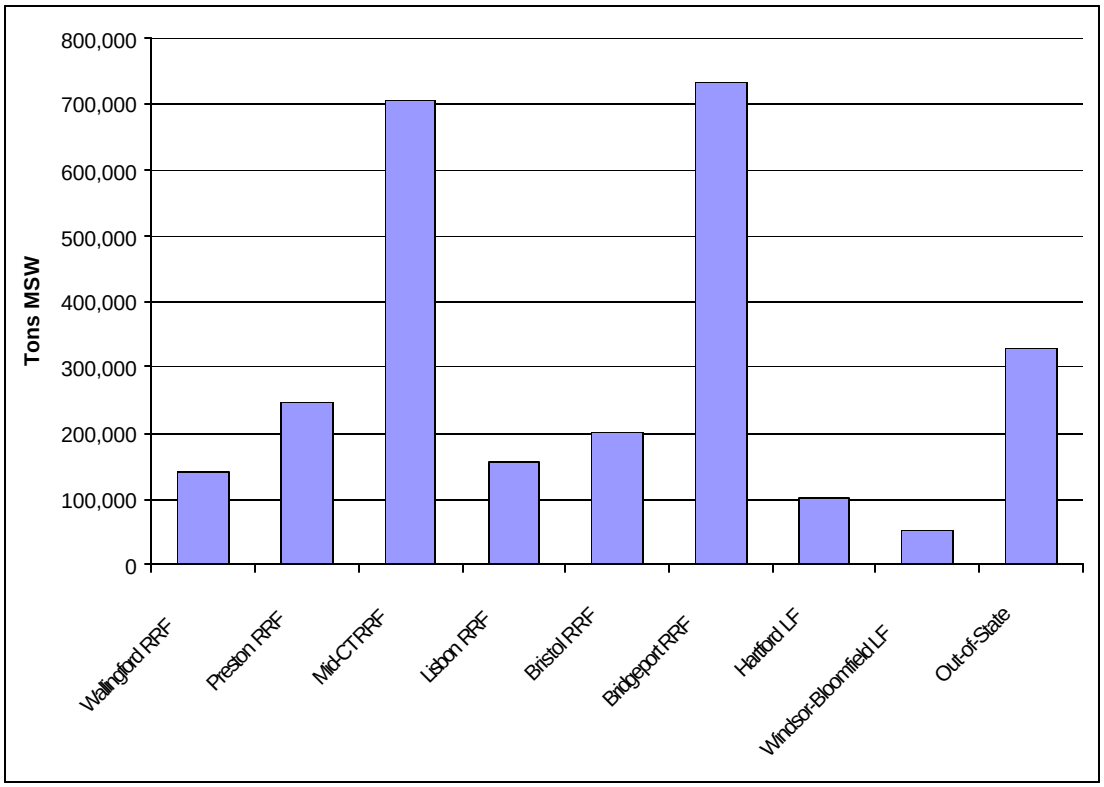
(2) As appropriate, 13,140 tons/year are dedicated only for processed demolition wood (based on the Lisbon RRF permit to operate).

(3) The Average Amount of waste burned per year is based on the fiveyear period of FY2000 – FY2004.

(4) A total of 129 CT municipalities of 169 are currently under contract for MSW disposal at one of the six in-state MSW RRFs plus eleven Housatonic Resources Recovery Authority (HRRA) communities that have a contract with Wheelabrator to dispose of their MSW at a Wheelebrator disposal facility. Currently most of this HRRA waste is delivered to the Lisbon facility, however it is not contracted specifically to that facility.

(5) Tipping fees cover a range of activities, from disposal only to transfer, recycling education, recyclables processing, and electronics recycling activities.

Figure F-5
CT MSW Disposal Destinations FY2004 – Based on Solid Waste Facility Reports Submitted to the CT DEP



F.2.3 Connecticut MSW Landfills

There are two Connecticut landfills permitted to accept MSW. The Connecticut Resources Recovery Authority (CRRA) operates the Hartford Landfill and uses it primarily for refuse derived fuel (RDF) process residue, as well as by-pass wastes and wastes that cannot be processed at RRFs. The Hartford landfill was expected to reach its permitted capacity in June of 2006 but CRRA submitted a revised closure plan to the CT DEP for consideration and approval; as of November 2006, the revised plan is under technical review by the CT DEP and the landfill continues to process residue. The only other landfill permitted by the CT DEP to accept MSW is the Windsor-Bloomfield Sanitary Landfill owned by the Town of Windsor. The CT DEP estimates that the landfill had approximately 400,000 cubic yards of capacity remaining as of mid-2005 and is scheduled to close at the end of 2007. Approximately 27,000 tons of CT MSW and 235 tons of MSW from out-of-state were disposed at the Windsor-Bloomfield Landfill in 2003.

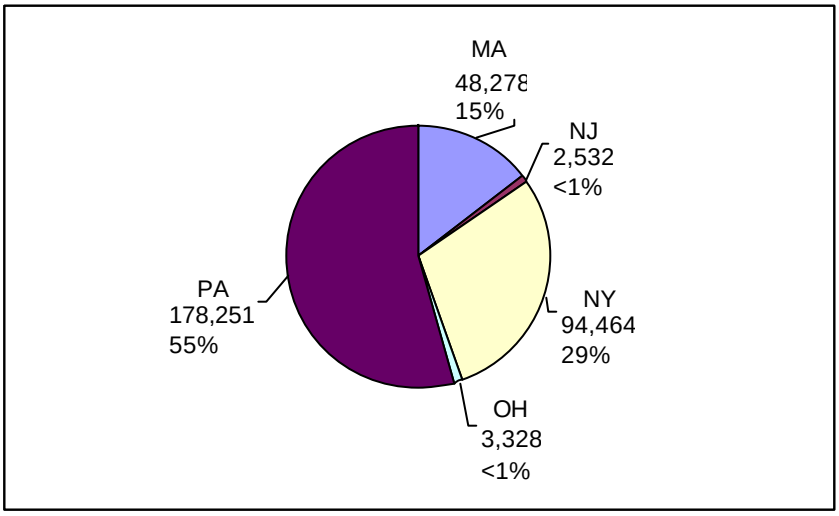
F.2.4 MSW Exported to Out-of-State Landfills and Waste to Energy Facilities

With relatively minimal MSW landfill capacity, and essentially fixed RRF capacity, out-of-state disposal facilities serve as the only option for MSW requiring disposal beyond the existing in-state MSW disposal capacity of approximately 2.3 million tons per year. Thus, while down slightly from a peak in FY2002, out-of-state disposal of MSW has increased tenfold in the past ten years, from approximately 27,000 TPY in FY1994 to approximately 327,000 TPY in FY 2004. Individual out-of-state disposal facilities and annual MSW tonnage reported sent to those facilities by Connecticut solid waste facilities in FY 2004 are summarized in Table F-3. Figure F-6 provides a graphical representation of MSW exported for disposal from Connecticut to the receiving states, as shown by tons and percent of total.

Table F-3
Summary of CT MSW Disposed Out-of-State (2004)

Facility	State	Tons
CT VY Sanitation Waste Disposal Chicopee LF Facility	MA	45,581
Springfield Resource Recovery, Inc.	MA	2,119
Bondi Island	MA	426
Wheelabrator Millbury, Inc.	MA	152
Massachusetts Subtotal		**48,278 (15%)**
Seneca Meadows LF	NY	69,870
Westchester Resco (Wheelabrator)	NY	24,582
Hyland Facility Association Landfill	NY	11
New York Subtotal		**94,463 (29%)**
Better Management Corp. of Ohio	**OH**	**3,328 (<1%)**
New Jersey – NA	**NJ**	**2,532 (<1%)**
Keystone Sanitation Landfill	PA	124,576
Empire Sanitary LF (Alliance)	PA	32,430
Superior Greentree LF	PA	19,192
Commonwealth Landfill	PA	1,825
Shade Landfill	PA	227
Pennsylvania Subtotal		**178,251(55%)**
Total MSW Exported		**326,852 (100%)**

Figure F-6
MSW Exported for Disposal (2004)



F.2.5 MSW Imports

Some states also export waste to Connecticut. However, these amounts have decreased over time. Before 1998, Connecticut was a net importer of MSW, but since then the state has been a net exporter. In 2004, Connecticut imported about 52,000 tons of waste, mostly from MA, with small amounts from RI, NY, and NJ, for a net export figure of 275,250 tons.

F.2.6 Assessment of the MSW Disposal Capacity Shortfall

As described above, MSW disposal capacity in Connecticut is almost fully utilized and increasing amounts of MSW are being exported to other states. In FY2005, the estimated shortfall between MSW requiring disposal, and in-state disposal capacity was about 327,000 tons.

Unless Connecticut meets a 58 percent MSW disposal diversion rate by FY2024, this disposal capacity shortfall is projected to grow. As a part of preparing Connecticut's update solid waste management plan, four disposal scenarios were developed, each using different assumptions for the amount of waste diverted from disposal through source reduction, reuse, and recycling.

Scenario One is the "status quo" scenario. The current estimated rate of waste diversion from disposal through source reduction, reuse, and recycling is approximately 30 percent. Scenario One assumes that this 30 percent diversion rate remains constant through 2024, even as the amount of waste increases. Under this scenario, the disposal capacity shortfall would be 1,454,000 tons in FY2024.

Scenario Two assumes that waste diversion grows to a rate of 40 percent in 2015 and remains constant thereafter. Under this scenario, Connecticut's disposal capacity shortfall in FY2024 would be 931,000 tons.

Scenario Three assumes that waste diversion grows steadily over the next 20 years and reaches a 49 percent diversion rate in 2024, thereby maintaining a consistent tonnage of MSW disposed per year from FY2005 through FY2024. A 49 percent MSW disposal diversion rate would only slightly increase the current annual in-state disposal capacity shortfall and would be 471,000 tons by FY2024.

Scenario Four assumes Connecticut will meet the Plan's target of a fifty-eight percent MSW disposal diversion rate by FY2024 thereby eliminating the projected in-state disposal capacity shortfall by FY2024.

In terms of ash disposal capacity for RRFs, adequate capacity is available at the Putnam Ash Landfill through the end of FY2018, assuming no new additional in-state RRF capacity is developed.

F.3 RRF Ash Residue Disposal

Connecticut's six MSW RRFs generated approximately 551,000 tons of ash residue (not including metal separated from the ash and recycled) from combustion of 2.2 million TPY of MSW over the five-year period FY2000-FY2004. The two landfills permitted to accept and dispose this material are the Hartford Landfill owned by CRRA, and the Putnam Ash Landfill, owned and operated by Wheelabrator Putnam, Inc., a subsidiary of Waste Management, Inc.

The ash monofill section of the Hartford Landfill currently only accepts ash residue from the Mid-Connecticut RRF and is estimated to close in October of 2008. Ash residue generation from the Mid-Connecticut RRF averaged approximately 166,000 tons/year for the 5 years period from FY2000 through FY2004. CRRA has initiated a search for acceptable replacement sites with the potential to accept ash residue from all six RRFs for a period of 30 years and has identified three sites with appropriate hydrogeologic conditions.

As indicated in Table F-4, four RRFs disposed a total approximately 343,000 tons of ash residue at the Putnam Ash Landfill in FY2004. This landfill's permit requires that enough landfill capacity be reserved to accommodate ash residue from the current Connecticut RRFs and it is projected that the Putnam Ash Landfill will have sufficient capacity to accommodate that ash residue through the end of FY2018 (see Table J-5 in Appendix J). At of the end of 2004, the Putnam Landfill had enough remaining capacity to manage over 6.7 million tons of residue. Ash residue from the Bristol RRF is currently disposed outside the state. The Bristol RRF produces approximately 45,000 to 50,000 tons/year of ash residue (not including metal recovered from that ash) and recently signed a contract for transportation to and disposal at the Seneca Meadows Landfill in Waterloo, NY through July 1, 2008.

Table F-4
RRF Ash Residue Disposed (FY2004)

RRF Facility	Disposal Facility	Tons Disposed FY 2004
Mid-CT	Hartford Landfill	173,928
Bridgeport	Putnam Ash Landfill	173,925
Lisbon	Putnam Ash Landfill	51,419
Southeast	Putnam Ash Landfill	71,136
Wallingford	Putnam Ash Landfill	46,575
Total Ash Disposed In CT		516,983
Bristol	Seneca Meadows, NY	47,836
Total RRF Ash Residue Disposed		**564,818**

F.4 Bulky Waste Management

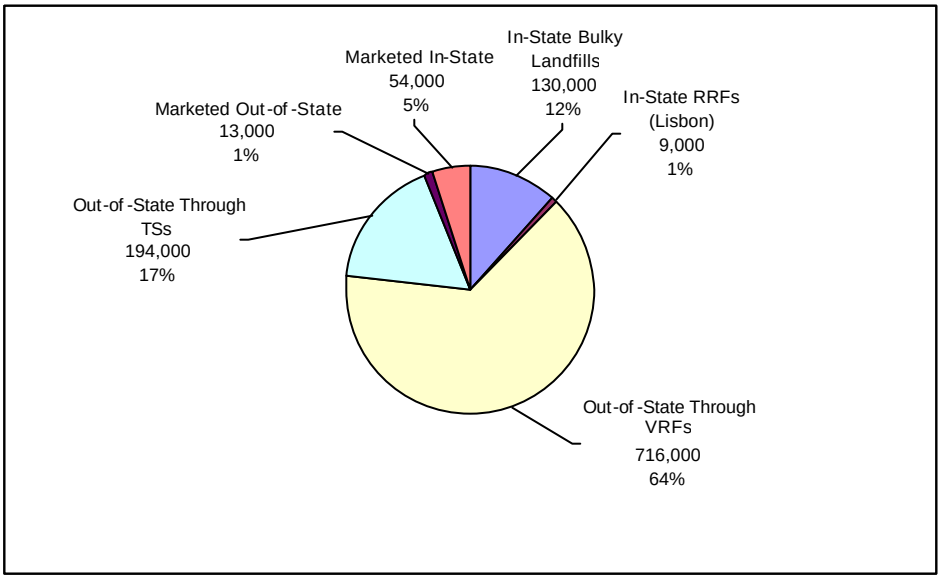
Bulky waste is included in the definition of special wastes in Connecticut's RSCA Section 22a-209-1. These regulations state that bulky waste means landclearing debris and waste, other than clean fill, resulting directly from demolition activities. The definition does not include construction debris, although much of this material is typically disposed as bulky waste. In practice, debris resulting from building construction activities is typically included in the collection, processing, and disposal of bulky wastes. Land clearing debris is often handled separately from construction and demolition debris and may be disposed at bulky waste landfills or processed into wood chips for use as mulch or compost. Sometimes it is exported for combustion as hog fuel outside the state. Furniture, appliances, carpeting, and mattresses, normally referred to as bulky waste in most states, are typically referred to as oversized MSW waste in Connecticut. However, in practice, oversized MSW waste is often managed and co-mingled with bulky waste in Connecticut.

The Department has bulky waste data, which may include C&D waste and oversized MSW, reported by Connecticut regional (multi-town) transfer stations and Connecticut landfills, and C&D waste data reported by Connecticut C&D volume reduction facilities. That data serves as the basis for the description of bulky waste generation and disposal that follows. Land clearing debris, while technically included in the State's legal definition of bulky waste, is generally managed differently and is not addressed in the following discussion. More information on the management of bulky waste, land clearing debris, and other special wastes is provided in Appendix D (Current Diversion Practices) and Appendix H (Special Waste Management).

As shown in Figure F-7, in FY2004 about 1.1 million tons of Connecticut C&D waste/oversized MSW were transferred through Connecticut regional solid waste transfer stations, processed at Connecticut C&D volume reduction facilities, or disposed in Connecticut landfills. About 830,000 tons were processed the state's C&D

volume reduction facilities (VRFs) and over 85 percent of the C&D waste processed waste by those facilities was disposed in out-of-state landfills; about 194,000 tons of bulky waste (actually C&D waste/oversized MSW) were reported transferred to out-of-state disposal facilities through CT solid waste transfer stations (mostly through multi-town regional transfer stations). Single or two town municipal transfer stations also received and transferred C&D/oversized MSW; nine of those municipal transfer stations reported sending that waste to out-of-state disposal facilities. The vast majority of bulky waste taken to transfer stations is sent to landfills, although a small amount may go to VRFs for further processing and recycling. Approximately 139,000 tons (directly from generators, from Connecticut transfer stations, and from volume reduction facilities) were buried in Connecticut landfills (130,000 tons) or burned at CT RRFs (9,000 tons); however most of the C&D waste/oversized MSW generated in FY2004 was disposed out-of-state.

Figure F-7
Final Disposition of CT C&D waste/oversized MSW Which Has Passed Through CT C&D Volume Reduction Facilities or CT Regional Solid Waste Transfer Stations FY2004 [Total 1.1 million tons]



Source: Solid Waste Facility Reports submitted to CT DEP; data is rounded; data does not incude the 10,000 tons of C&D metal recycled and wood reused by the CT DOT (based on FY2003 DOT report)

F.4.1 CT Bulky Waste Passing through CT Transfer Stations

C&D waste/oversized MSW received by in-state transfer stations is generally either transferred to in-state bulky waste landfills or VRFs, or transferred out-of-state. There are 84 transfer stations in Connecticut that are permitted to accept bulky waste and/or C&D wastes. One of these is also permitted to accept asbestos. Eighty of these transfer stations are municipally-owned and four privately owned. Data regarding C&D waste/oversized MSW that is transferred through a single town municipal transfer station to a solid-waste facility reporting to the CT DEP are not entered in the CT DEP solid waste database. Only data regarding C&D waste/oversized MSW that

is transferred through these single town transfer stations to destinations that do not report to the CT DEP are entered and tracked through the database.

F.4.2 C&D Volume Reduction Facilities

As of August 2005, there were 20 VRFs in Connecticut. One is a municipally-owned and operated C&D VRF for use by that municipality, and 19 are privately-owned and operated VRFs receiving and processing C&D waste and/or bulky waste, excluding land clearing debris. These facilities have a combined permitted capacity of approximately 11,000 tons per day, or 2.7 million tons/year, assuming facilities operate 260 days per year. This capacity is for all of the waste streams these facilities accept. C&D VRFs sort construction and demolition waste, process it for recycling, and reduce the volume of waste to enable more cost-effective transport, primarily to out-of-state landfills. Processing activities typically include sorting, separating, chipping, shredding, and compacting. C&D VRFs vary greatly according to the types of waste processed, processing techniques (manual versus mechanical), and the quality of the end products. Materials recovered for reuse and recycling include brick and block, ferrous metal, and clean untreated wood. VRFs also produce chipped demolition wood that may be suitable as hog fuel for combustion. Some residue from VRF processing may contain a concentration of highly contaminated materials and when this is the case, the material should be disposed at lined landfills, but that is not occurring in-state at the present time.

F.4.3 Connecticut Bulky Waste Landfills

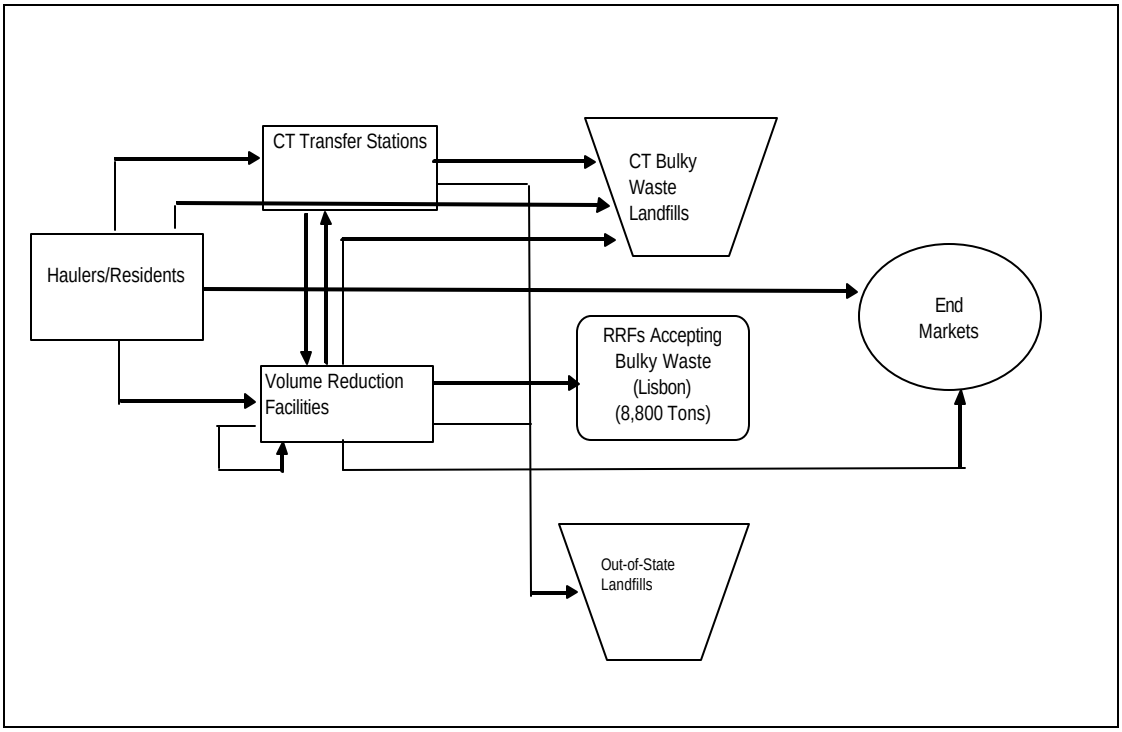
There are 25 active landfills in Connecticut that accept C&D waste/oversized MSW waste or C&D waste only. Only one of these is privately owned and operated. Most of the remaining landfills serve only their communities. Most of these landfills are former MSW landfills that the CT DEP has approved for short-term cost-effective disposal of bulky wastes by allowing a reduction in the daily cover requirement from daily to weekly. The CT DEP does not keep records of remaining bulky waste landfill capacity. For planning purposes it has been assumed that all of the bulky waste landfills with the exception of the Manchester landfill and the Glastonbury municipal landfill (which only accepts Glastonbury waste), will reach capacity, or the end of their permitted operating period, by FY2009. The Manchester Landfill reports that based on a permitted filling rate of 125,000 tons/year, capacity will be depleted by late 2015. It is possible that this landfill will reach capacity before that point if it accepts more than 125,000 tons per year. It is uncertain when the Manchester Landfill will close.

F.4.4 Bulky Waste Export to Out-of-State Landfills

Transfer stations and C&D VRFs reported sending approximately 909,350 tons of bulky waste to 35 out-of-state landfills in five states in FY2004. More than three-quarters of this bulky waste was disposed in two states, with almost half of the total going to Ohio, and about one quarter to landfills in Pennsylvania. The future viability

and costs of disposal in each of the major destination states is described in more detail in Appendix G. Figure F-8 shows the solid waste facility flow of bulky waste, excluding land clearing debris, in Connecticut. C&D and oversized MSW may be hauled directly out-of-state from the site of generation or it may be delivered to transfer stations, volume reduction facilities, or bulky waste landfills. The final destinations for Connecticut-generated C&D waste and oversized MSW are (1) in-state disposal (bulky waste landfills or Lisbon RRF), (2) in-state or out-of-state markets for recycled materials, or (3) out-of-state disposal. Some C&D VRFs in Connecticut are known to be processing waste and shipping fines to out-of-state landfills for use as alternative daily cover. This tonnage would be included in the out-of-state disposed tons. As Figure F-8 shows, in some instances, smaller VRFs and transfer stations may deliver some bulky waste to each other.

Figure F-8
Flow of C&D and Oversized MSW Waste Generated in Connecticut



In FY2004, it is estimated that approximately 1.1 million tons of CT C&D waste/oversized MSW was disposed or marketed based on reports submitted to the CT DEP by Connecticut solid waste facilities. Of this amount:

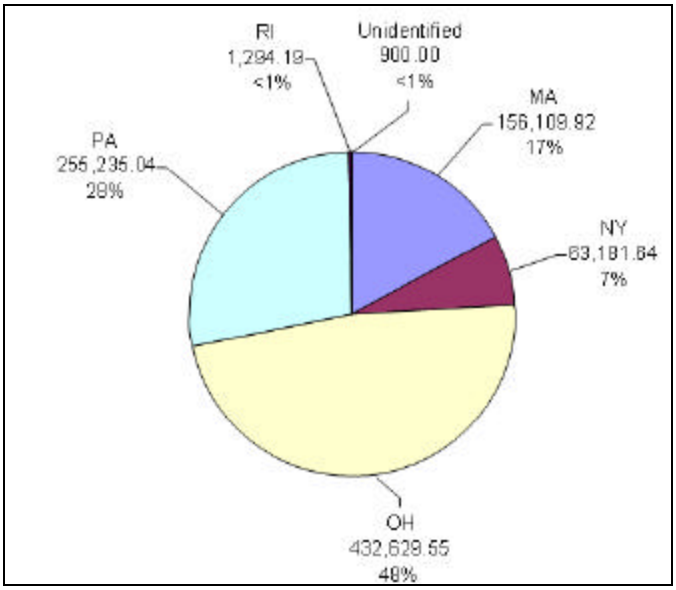
- 139,000 tons were disposed in Connecticut;
- 909,000 tons was disposed out-of-state;
- 67,000 tons of C&D debris were recycled and marketed; and

- 10,000 tons of C&D materials were recycled by the Connecticut Department of Transportation (CT DOT)

Most of the Connecticut C&D waste/oversized MSW generated in FY2004 and transferred through Connecticut multi-town transfer stations or processed through Connecticut C&D VRF's was disposed out-of-state.

Figure F-9 shows the disposal destination by state for that C&D waste/oversized MSW. Only waste reported transferred out-of-state by Connecticut VRFs and transfer stations is included. It is possible that some C&D waste/oversized MSW is transported out-of-state directly for disposal or reuse.

Figure F-9
Summary of CT-Generated C&D waste/oversized MSW Reported Disposed Out-of-State by CT Multi-town Transfer Stations and CT C&D Volume Reduction Facilities FY2004



F.4.5 C&D Recycling

Materials recovered and marketed from bulky waste at Connecticut C&D VRFs typically include brick and block, clean wood, wood chips, scrap metal, and very small amounts of old corrugated cardboard. VRF reports to the CT DEP of C&D waste diverted for recycling to markets in and outside the state total 67,000 tons for FY2004 as shown in Figure F-7. It is possible that some C&D materials are reused and/or recycled without being reported through VRFs. Little to no oversized MSW is recycled at VRFs in Connecticut.

In addition to the above materials that are reported recycled through Connecticut C&D VRFs, CT DOT reports that they also recycle certain materials which would not be reported through these means. In FY2003, CT DOT reported that they reused 7,352

tons of clean wood and 2,547 tons of steel. In addition, CT DOT reused 393,984 tons of clean fill, consisting of bituminous asphalt and concrete. Again, clean fill is not categorized as a solid waste in Connecticut and, as a result, the CT DEP does not get complete tonnage reports on amounts generated and reused/recycled. However, because of the way C&D VRF's report to CT DEP, some clean fill is probably included in the C&D tonnages reported received at those facilities and some is included in their marketed reports as well.

F.4.6 Assessment of the Bulky Waste Disposal Capacity Shortfall

Disposal capacity for bulky wastes in Connecticut is minimal. There are 25 landfills in Connecticut that accepted C&D waste/oversized MSW in FY2004. Most of these are small, municipal bulky waste landfills that only serve their own residents, and are nearing closure. Only the Hartford, Manchester, Glastonbury, and Windsor-Bloomfield landfills were considered for this analysis since they are the only bulky waste landfills with significant capacity. According to estimates of remaining cubic yards, and assuming that each of these landfills continues to receive approximately the same amount of C&D waste it receives today, the following is expected:

- The MSW and bulky waste sections of the Hartford Landfill were expected to reach capacity and close in June 2006. However, CRRA submitted a revised closure plan to the CT DEP for consideration and approval and as of November 2006, the revised plan is under technical review by the CT DEP and the landfill continues to process residue.
- The Windsor Landfill is expected to reach capacity and close in December 2008.
- The Manchester Landfill is expected to reach capacity and close in 2022. Although its current permit expires in 2015, it is assumed that it will be granted a permit extension).
- The Glastonbury Landfill will have capacity for approximately 70 years, if it continues to accept C&D/ oversized MSW from Glastonbury residents only.
- The state is projected to have a C&D waste/oversized MSW disposal shortfall of 940,000 in FY2005.

The net result is that the shortfall in disposal capacity for Connecticut generated bulky waste is projected to continue to grow. As stated above, in FY2005 the shortfall is projected to be 940,000 tons and is expected to grow to as much as 1.1 million tons by 2010, unless diversion rates for bulky waste grow rapidly and substantially.

F.5 CT DEP Permitted Transfer Stations

The following table lists the CT DEP permitted transfer stations as of December 2006.

CT DEP Permitted Solid Waste Transfer Stations, December 2006.

Permittee	PERMIT ID	CAPACITY (tons/day)	MATERIAL *
Andover, Town Of	0010573-PO	25	C&D, RC, SW, WOOD
Ansonia, Town Of	0020714-PO	75	C&D, LAND, MSW, RC, TIRE
Ashford, Town Of	003-2C	120	BW, MSW
Avon, Town Of	0040257-R/PO	75	ANFR, C&D, MSW, RC
Regional Refuse Disposal District #1	0050190	75	BW, C&D, MSW, SCRP
Beacon Falls, Town Of	0060504-PO	50	BAT, BW, C&D, UO, TIRE
Bethel, Town Of	0090654-PO	43	BRSH, BW, MSW, SCRP, UO
Bethlehem, Town Of	0100584-PO	40	C&D, MSW, RC, TIRE, UO
Bolton, Town Of	0120706-PO	50	BTLA, C&D, LAND, TIRE, WOOD
Branford, Town Of	0140158	25	BW, MSW, RC, TIRE, WOOD
Bridgeport, Town Of	0160809-PO	165	BW, C&D, MSW, SCRP, WOOD
Bristol, Town Of	0170801-PO	75	C&D, LEAF, MSW, RC, UO
Brooklyn, Town Of	0190427-PO	30	BW, C&D, MSW, RC
Canaan, Town Of	0210372	8	BAT, C&D, MSW, RC, TIRE
Canton, Town Of	0230113	3000	MSW, RC
Chaplin, Town Of	0240521-PO	9	C&D, MSW, RC, TIRE, UO
Charles M. Gordon & Sons	1130670-PO	300	ASB
Cheshire, Town Of	0250102	104	MSW, RC
Circle Of Life, L.L.C.	1010660-PO	500	ASH
Clinton, Town Of	027-2C	60	BW, MSW
Colchester, Town Of	0280524-PO	50	BRSH, C&D, MSW, RC, SCRP
Columbia, Town Of	0300637-PO	30	BCP, BW, C&D, MSW, UO
CRRA	035-2C	600	MSW
CRRA	0480810/PO	400	MSW
CRRA	050-3C	300	RC
CRRA	051-2C	600	MSW
CRRA	0570185	72000	BW, MSW
CRRA	084-2C	250	MSW
CRRA	1030582-PO	460	LAND, MSW, TIRE, SCRP, WHIT
CRRA	1260154	2200	BW, MSW, SCRP
CRRA	1430666-PO	400	BCP, MSW, PAPR
CRRA	1440529-PO	600	BRSH, MSW, SCRP, TIRE, WHIT
CRRA	1530132	350	MSW, RC
CRRA	1580528-PO	600	BRSH, MSW, SCRP, TIRE, WHI

*ANFR-Antifreeze; ASB-Asbestos; ASH-Ash Residue; BAT-Batteries; BCP-Bottles, Cans, Plastic, And/Or Glass; BIO-Biomedical Waste; BRSH-Brush; BTLA-Spent Lead-Acid Batteries; BW-Oversized MSW; C&D-Construction & Demolition; CARD-Cardboard; ELEC-Consumer Electronics; HG-Mercury Containing Lamps; HHW-Household Hazardous Waste; LAND-Land Clearing Debris; LEAF-Leaves; MSW-Municipal Solid Waste; PAPR-Paper; RC-Recyclables; SCRP-Scrap Metal; SEPT-Septage; SLUG-Sludge; TIRE-Tires; UO-Used Oil; WHIT-White Goods (Refrigerators, Etc); WOOD-Clean Untreated Wood

Permittee	PERMIT ID	CAPACITY (tons/day)	MATERIAL *
Cornwall, Town Of	0310712-PO	25	CARD, C&D, MSW, TIRE, UO
Cromwell, Town Of	0330594-PO	75	C&D, LAND, TIRE, WHIT, WOOD
CWPM, LLC	1100586-R/PO	50	MSW
Dainty Rubbish Service, Inc.	0830702-PO	250	MSW
Dainty Rubbish Service, Inc.	0830702-PO	250	MSW
Deep River, Town Of	036-2C	650	BW, MSW
Durham / Middlefield, Towns Of	0380661-PO	40	MSW, ANFR, BW, C&D, UO
East Granby, Town Of	0400600-PO	75	BCP, BW, MSW, WHIT, UO
East Haddam, Town Of	0410424-PO	75	BAT, BCP, MSW, HHW, PAPR
East Hampton, Town Of	0420807-PO	20	BAT, LAND, TIRE, UO
East Hartford, Town Of	0430578-PO	75	BCP, C&D, MSW, SCRP, UO
East Lyme, Town Of	0450620-PO	50	BW, C&D, LAND, UO, WOOD
Eastford, Town Of	039-2C	120	MSW, RC
Ellington, Town Of	0480703PC/PO	50	ANFR, BW, C&D, SCRP, UO
Enfield, Town Of	0490527-PO	65	C&D, LAND, RC
Essex, Town Of	0500805-PO	75	BCP, BTLA, BW, C&D, MSW
Franklin, Town Of	0530647-PO	13	BW, C&D, LAND, MSW, SCRP
Glastonbury, Town Of	054-2C	15	MSW
Groton, Town Of	0590591-PO	75	BW, C&D, ELEC, MSW, RC
Guilford, Town Of	060-7C	320	MSW
Hamden, Town Of	0620593-PO	70	BCP, BW, C&D, SCRP
Hampton, Town Of	0630581-PO	12	C&D, LAND, MSW, RC, TIRE
Hartland, Town Of	0650198	12	CARD, MSW, RC
Hebron, Town Of	067-2C	100	BW, MSW, RC, SCRP, UO
Kent, Town Of	0680485-PO	36	C&D, MSW, SCRP, UO
Killingly, Town Of	0690571-PO	80	C&D, MSW, RC, SCRP, TIRE
Killingworth, Town Of	0700629-PO	47	ANFR, BW, MSW, RC, TIRE
Lebanon, Town Of	0710716-PO	75	ANFR, C&D, MSW, UO, WOOD
Ledyard, Town Of	0720718-PO	75	BW, C&D, MSW, SCRP, WOOD
Mansfield, Town Of	0780718-PC/PO	75	BCP, BW, C&D, HG, MSW
Marlborough, Town Of	0790539-PO	50	C&D, MSW, RC, SCRP, TIRE
Middlebury, Town Of	0810705-PO	50	BCP, BTLA, BW, CARD, MSW
Middletown, Town Of	0830369	50	C&D, MSW, PAPR, SCRP, TIRE
Montville, Town Of	0860314	20	BW, C&D, MSW, RC, TIRE
Morris, Town Of	0870444-PO	25	C&D, LAND, MSW, RC, UO
New Britain, Town Of	089-2C	860	BW, MSW
New Canaan, Town Of	0900468-PO	200	C&D, MSW, RC, SCRP, UO
New Fairfield, Town Of	0910717-PO	75	C&D, LAND, MSW, TIRE, UO
New London, Town Of	094-2C	300	BW, MSW
New Milford, Town Of	0960218	11	MSW

*ANFR-Antifreeze; ASB-Asbestos; ASH-Ash Residue; BAT-Batteries; BCP-Bottles, Cans, Plastic, And/Or Glass; BIO-Biomedical Waste; BRSH-Brush; BTLA-Spent Lead-Acid Batteries; BW-Oversized MSW; C&D-Construction & Demolition; CARD-Cardboard; ELEC-Consumer Electronics; HG-Mercury Containing Lamps; HHW-Household Hazardous Waste; LAND-Land Clearing Debris; LEAF-Leaves; MSW-Municipal Solid Waste; PAPR-Paper; RC-Recyclables; SCRP-Scrap Metal; SEPT-Septage; SLUG-Sludge; TIRE-Tires; UO-Used Oil; WHIT-White Goods (Refrigerators, Etc); WOOD-Clean Untreated Wood

Permittee	PERMIT ID	CAPACITY (tons/day)	MATERIAL *
Newtown, Town Of	097-2TS	1500	BW
Norfolk, Town Of	0980802-PO	15	BCP, BTLA, BW, C&D, MSW
North Canaan, Town Of	1000537-PO	1500	BAT, RC, SCRP, UO, WOOD
North Haven, Town Of	1010553-PO	40	C&D, LAND, MSW, SCRP, TIRE
North Stonington, Town Of	1020735-PC/PO	24	ANFR, C&D, LAND, MSW, RC
Norwich, Town Of	1040627-PO	75	ANFR, BW, MSW, RC, WOOD
Old Lyme, Town Of	1050404-PO	10000	SEPT
Old Saybrook, Town Of	106-3C	65	C&D, MSW, RC, SCRP, UO
Orange, Town Of	1070134	16000	BW, MSW
Oxford, Town Of	1080731-PC-PO	42	BW, C&D, MSW, SCRP, UO
Plymouth, Town Of	SW-111-2C	40	MSW
Portland, Town Of	1130395	6	ANFR, C&D, MSW, RC, TIRE
Preston, Town Of	1140562-PO	13	ANFR, BCP, C&D, MSW, TIRE
Redding, Town Of	1170726-PO	75	C&D, MSW, SCRP, UO, WOOD
Regional Refuse Disposal District #1	0050283	75	BW, C&D, MSW, WOOD
Ridgefield, Town Of	1180380	250	C&D, MSW
Roxbury, Town Of	1200724-PO	40	BCP, C&D, MSW, SCRP, UO
Salem, Town Of	1210733-PO	15	BW, C&D, LAND, RC, UO
Salisbury, Town Of	12200707-PCPO	60	BW, C&D, MSW, SCRP, UO
Seymour, Town Of	124-2C	82	MSW
Somers, Town Of	1290646-PO	24	BAT, MSW, RC, TIRE, WHIT
Southbury, Town Of	1300525-PO	75	ANFR, C&D, MSW, RC, TIRE
Southington, Town Of	131-5LOC	200	BW
Sprague, Town Of	1330622-PO	50	BW, C&D, MSW, RC, WOOD
Stafford, Town Of	1340548-PO	62	ANFR, C&D, MSW, RC, SCRP
Stamford, Town Of	1350699-PO	400	C&D, MSW, SCRP, TIRE, WOOD
Stericycle	0830819-M/PO	42	BIO
Sterling / Voluntown, Towns Of	1470551-PO	4000	BAT, BW, MSW, RC, TIRE
Stonington, Town Of	1370531-PO	15	C&D, LAND, MSW, RC, SCRP
Stratford, Town Of	1380592-PO	800	C&D, LAND, MSW, RC, TIRE
Suffield, Town Of	1390621-PO	48	BW, C&D, MSW, UO, WOOD
Thompson, Town Of	1410688-PO	25	MSW, LAND, ANFR, UO
Tolland, Town Of	1420179	700	BW, RC
Transfer Systems, Inc.	0340555-PO	950	MSW, TIRE
Union, Town Of	1450547-PO	100	C&D, LAND, MSW, RC, SCRP
Vernon, Town Of	0460730-PO	35	BCP, BW, C&D, SCRP, UO
Washington, Town Of	1500623-PO	63	BCP, BW, C&D, MSW, SCRP
Waste Management Of CT, Inc.	1620507-PO	100	C&D, SCRP, TIRE
Waterbury, Town Of	1510609-PO	75	ANFR, BW, C&D, LAND, RC
Waterford, Town Of	1520693-PO	75	C&D, MSW, SCRP, TIRE, WOOD

*ANFR-Antifreeze; ASB-Asbestos; ASH-Ash Residue; BAT-Batteries; BCP-Bottles, Cans, Plastic, And/Or Glass; BIO-Biomedical Waste; BRSH-Brush; BTLA-Spent Lead-Acid Batteries; BW-Oversized MSW; C&D-Construction & Demolition; CARD-Cardboard; ELEC-Consumer Electronics; HG-Mercury Containing Lamps; HHW-Household Hazardous Waste; LAND-Land Clearing Debris; LEAF-Leaves; MSW-Municipal Solid Waste; PAPR-Paper; RC-Recyclables; SCRP-Scrap Metal; SEPT-Septage; SLUG-Sludge; TIRE-Tires; UO-Used Oil; WHIT-White Goods (Refrigerators, Etc); WOOD-Clean Untreated Wood

Permittee	PERMIT ID	CAPACITY (tons/day)	MATERIAL *
West Hartford, Town Of	155-2C	1200	BW, RC
Weston, Town Of	157-2C	100	MSW
Wethersfield, Town Of	1590605-PO	10	BCP, BW, MSW, SCRP, UO
Wheelabrator Environmental Systems, Inc.	0970719-PO	100	MSW
Willimantic Waste Paper Co., Inc.	1630675-PO	150	MSW
Willington, Town Of	1600532-PO	30	C&D, MSW, RC, SCRP, TIRE
Wilton, Town Of	161-2C	100	BW, MSW
Windham, Town Of	163-2C	60	MSW
Woodbridge, Town Of	1670725-PO	20	C&D, HG, MSW, TIRE, UO
Woodbury, Town Of	1680110	5500	MSW
Woodstock, Town Of	1690542-PO	40	C&D, MSW, RC, UO

*ANFR-Antifreeze; ASB-Asbestos; ASH-Ash Residue; BAT-Batteries; BCP-Bottles, Cans, Plastic, And/Or Glass; BIO-Biomedical Waste; BRSH-Brush; BTLA-Spent Lead-Acid Batteries; BW-Oversized MSW; C&D-Construction & Demolition; CARD-Cardboard; ELEC-Consumer Electronics; HG-Mercury Containing Lamps; HHW-Household Hazardous Waste; LAND-Land Clearing Debris; LEAF-Leaves; MSW-Municipal Solid Waste; PAPR-Paper; RC-Recyclables; SCRP-Scrap Metal; SEPT-Septage; SLUG-Sludge; TIRE-Tires; UO-Used Oil; WHIT-White Goods (Refrigerators, Etc); WOOD-Clean Untreated Wood

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Appendix G
COST ANALYSIS OF OUT-OF-STATE DISPOSAL OPTIONS

Introduction

Solid waste landfills outside Connecticut that meet Subtitle D regulations provide a potentially viable option for disposal of MSW, ash residue from Connecticut RRFs, and bulky waste. Nationwide, the private solid waste management industry has invested heavily in the development of landfill capacity in the past ten years. Due to the existence of many large MSW and construction and demolition (C&D) disposal facilities with significant amounts of disposal capacity in the Mid-Atlantic and Mid–West states, the options for Connecticut municipalities and private haulers are many.

This Appendix provides an analysis of the costs associated with the utilization of representative MSW and C&D landfills in the states that have ample, accessible, long-term disposal capacity. For MSW, cost analyses are provided for landfills in New York, Ohio, Pennsylvania and Virginia. While some MSW from Connecticut has historically been disposed in landfills in Massachusetts, the increasing in-state demand for capacity and the depletion of most of the existing landfill capacity by 2012 preclude these landfills from consideration as viable long-term disposal alternatives. For ash residue, a cost analysis utilizing representative ash residue landfills in Massachusetts, New York and Pennsylvania is presented. For bulky wastes, a cost analysis of utilizing C&D landfills in Massachusetts, New York, Ohio and Pennsylvania is presented.

A description of current capacity and identification of representative facilities for MSW, bulky waste, and ash residue is followed by an analysis of the cost of each of the essential system components associated with utilization of out-of-state disposal options. These include transfer, transportation, and tipping or other disposal fees.

It should be emphasized that future competitive MSW tipping fees offered by the six resources recovery facilities in Connecticut will be largely determined by the all-inclusive cost of transferring, transporting, and disposing of waste at the most economically competitive alternative, which could be landfills located outside of Connecticut. In order to develop an estimate of the cost of such competing alternatives, an analysis consisting of the following steps was conducted:

- Identification of the location of large landfills that accept significant quantities of out-of-state waste. MSW, ash residue, and bulky waste landfills located in Massachusetts, Pennsylvania, eastern Ohio, Virginia, and western New York are included, with tipping fee information on the various types of landfills.
- Estimation of the cost to construct and operate a generic truck-based transfer station/volume reduction facility designed to transfer 700 – 1,000 TPD of MSW

or bulky waste to facilities outside the state. This was accompanied by developing an estimate of the cost of transporting, via truck, the waste from the transfer station to the various out-of-state landfills identified in the step above.

- Development of a cost estimate to construct and operate a generic rail-based transfer station designed to transfer 700 – 1,000 TPD and the cost of the necessary equipment to allow the transportation of solid waste via rail from the transfer station to selected out-of-state landfills that have rail access.

G.1 Out-of-State Disposal Options

The first step in performing the cost analysis was to review information from state waste management agencies regarding landfills located in those states previously identified as the most likely recipients of MSW, ash residue, and bulky waste from Connecticut. Landfills included are those that: (1) received the greatest quantities of waste generated outside the state in which they are located; and (2) had significant remaining disposal capacity. Information was also obtained regarding the current market-based tipping fee charged by landfills located in each state.

Obtaining reliable data on the current tipping fees actually being charged to large-volume customers at privately owned disposal facilities for MSW, ash residue, or bulky waste is problematic at best. Owners of privately owned landfills located in Pennsylvania, Virginia, eastern Ohio, and western New York were contacted as part of this effort. Most of the responses received fell into one of the following categories:

- Respondent would not give information, considered tip fee information to be proprietary;
- Requests for information would have to be submitted in writing and forwarded to corporate headquarters where the request would be considered; or
- The only information they would provide was the posted gate rate.

Based on this lack of direct response from the owners of the facilities, public-sector clients were contacted, where possible. In addition available information on recent bids and publicly available information were reviewed. Using this approach, a range of tipping fees was developed. It is important to note that in most instances, the posted gate rates that are provided in the following tables are higher than the tipping fee that would be charged as the result of the execution of a long-term disposal contract involving a significant quantity of waste.

G.2 MSW Disposal Options

G.2.1 New York Disposal Facility Options

The New York State Department of Environmental Conservation reports that there are 30 active MSW landfills located in the state. Twelve of these are permitted to accept more than 500 TPD. Eight of the landfills are privately owned. Both the High Acres

and Seneca Meadows landfills were reported to have in excess of 20,000,000 tons of remaining disposal capacity as of the end of 2003. Based on the review of State landfill information and CT DEP reports listing facilities currently receiving Connecticut MSW, the landfills presented in Table G-1 are representative of the MSW landfills in New York for 2004.

Table G-1
Representative MSW Landfills in New York

Landfill	Location	Reported Disposal Fee ($/ton)	Existing Capacity (tons as of 1/1/2004) (1)
Seneca Meadows	Seneca Falls, NY	50.00	11,147,730
High Acres	Fairport, NY	45.00	27,962,487
Ontario County	Stanley, NY	25.00	3,049,103
Hyland	Agelica, NY	30.00	1,429,229
Monroe County	Riga, NY	44.00	9,348,737

(1) New York Department of Environmental Conservation data on active MSW Landfill in New York State.

Since tipping fees generally decrease as one moves farther west in the state, away from urban areas with large demand for disposal capacity, they provide the most cost-effective landfill options in the state. For the purposes of this analysis, it has been assumed that a market-based tipping fee of approximately $28 to $30 per ton would be reasonable for MSW disposal in central to western New York. Estimated transportation costs to access these facilities are provided in the transportation cost analysis section later in this Appendix.

G.2.2 Ohio Disposal Facility Options

In early 2005, the Division of Solid and Infectious Waste Management of the Ohio Environmental Protection Agency (OEPA) reported that there were 41 licensed MSW landfills in Ohio. Private industry owns and operates 27 of these facilities. OEPA further reported that these 41 MSW landfills had a total of 513,212,000 cubic yards of airspace available, representing a useful life ranging from 22.3 to 31.2 years, depending upon assumptions regarding the rate of fill. An additional 292,000,000 cubic yards of airspace is proposed and is pending OEPA approval. In 2003, MSW landfills in Ohio received approximately 18 million tons of solid waste including over 2 million tons of out-of-state deliveries as shown in Table G-2.

Table G-2
States that Export MSW to Ohio Landfills

State	Tons Delivered in 2003
Massachusetts	99,061
Connecticut	228,697 (1)
New Jersey	431,982
New York	889,376
Pennsylvania	457,394
Total	**2,106,510**

(1) Includes some waste categorized as bulky waste by CT but called MSW in Ohio

The average landfill tipping fees in the northeast and southeast regions of Ohio during the period of 1997 – 2002 are shown in Table G-3.

Table G-3
Average Landfill Tipping Fees for MSW in Ohio
($ per Ton)

Year	Northeast Region	Southeast Region
1997	28.60	28.00
1998	30.37	26.85
1999	30.86	26.85
2000	32.67	27.11
2001	30.73	28.00
2002	30.83	27.86

A review of the information in Table G-3 indicates that the average tipping fee in the eastern regions of Ohio remained relatively flat at $28 - $30 per ton during the 1997 through 2002 period. OEPA representatives indicate that during the last three years landfill tipping fees have continued to remain relatively flat. Therefore, a market-based tipping fee of approximately $25 to $30 per ton would be reasonable to assume for MSW disposal in Ohio.

The eastern Ohio landfills shown in Table G-4 are considered to be representative of MSW landfill options in Ohio. Estimated transportation costs to access these facilities are provided in the transportation cost analysis later in this Appendix.

Table G-4
Representative Eastern Ohio MSW Landfills

Name of Landfill	Location	Reported Disposal Fee ($/ton)	Existing Capacity (Tons) (1)
BFI Carbon Limestone	Mahoning County, OH	30.00	39,727,043
American Landfill	Stark County, OH	20.00	8,754,655
Countywide Landfill	Stark County, OH	28.00	71,374,428
BFI Lorain County	Lorain County, OH	45.00	32,331,043
Suburban South RDF	Perry County, OH	27.50	16,197,862

(1) Ohio EPA 2003 MSW Landfill Remaining Capacity , capacity as of 1/1/2004

G.2.3 Pennsylvania Disposal Facility Options

The Pennsylvania Department of Environmental Protection (PA DEP) reports that there are currently 51 active MSW landfills located in Pennsylvania. Over the recent past, Pennsylvania has been a major destination for solid wastes from most states in the Northeast. However, the State has recently undertaken measures to reduce the delivery of solid waste from out-of-state. Pennsylvania has accomplished a reduction in out-of-state deliveries by imposing a $6.25 per ton "Growing Greener Tax" which is imposed on landfills but not on waste-to-energy facilities. Landfills are also required to charge a minimum of $1.00 per ton as a host fee to be paid to the jurisdiction in which the landfill is located. The governor of Pennsylvania has proposed increasing the tax further from $6.25 to $9.00 per ton.

Finally, since Pennsylvania has no landfill serviced by rail, more waste from the Northeast is beginning to be diverted to large landfills in Virginia that do have rail service.

Information developed by PA DEP was reviewed, in which landfills were identified that: (1) accept significant quantities of solid waste from out-of-state, (2) have permitted capacity of at least 700 TPD; and (3) have a significant amount of remaining disposal capacity. Based on those criteria, the list of representative Pennsylvania landfills was developed, which is provided in Table G-5.

Table G-5
Representative Eastern Pennsylvania MSW Landfills

Name of Landfill	Location	Reported 2004 Disposal Fee ($/ton)	Remaining Capacity (tons) (1)
Alliance Sanitary LF	Taylor, PA	49.00	26,860,081
Grand Central LF	Pen Argyl, PA	56.00	7,506,868
Keystone Sanitary LF	Dunmore, PA	71.00	12,595,055
GROWS LF	Morrisville, PA	54.00	7,036,465
Conestoga/New Morgan	Morgantown, PA	54.00	18,154,359

(1) Source: Chartwell's Directory & Atlas of Solid Waste Disposal Facilities 2004, capacity remaining as of 1/1/05.

During 2004, a telephone survey of tipping fees being charged at the large Pennsylvania landfills was conducted. The results of that survey indicated a reported range of tipping fees from $32 to $53 per ton.

In addition, other existing information regarding tipping fees was reviewed. These sources indicate that tipping fees decline as one moves further west in the state. Within a 50-mile radius of the Delaware Valley, there are three large privately owned landfills, which appear to be receiving a market-based tipping fee of approximately $35 to $40 per ton. These facilities are reported to be operating close to their permit limits and are increasing their tipping fees.

Within a 100-mile radius of the Delaware Valley are four additional large, privately owned landfills that appear to be receiving a market-based tipping fee of approximately $30 to $35 per ton.

Based on this review, a market-based tipping fee in the range of $30 to $35 per ton represents a reasonable planning estimate for those landfills located in eastern Pennsylvania, with tipping fees of $20 to $25 per ton available in the western part of the state. Estimated transportation costs to access these facilities are provided in the transportation cost analysis section later in this Appendix.

G.2.4 Virginia Disposal Facility Options

Although no solid waste was reported to be delivered to Virginia from Connecticut in FY2003, it is evolving as a major destination for solid waste generated in the Northeast, particularly with the $7.25 per ton tax now being charged by the Commonwealth of Pennsylvania. The June 2005 report, "Solid Waste Management in Virginia During Calendar Year 2004" prepared by the Department of Environmental Quality ("DEQ") of the Commonwealth of Virginia, indicates that in 2004, 17,883,000 tons of solid waste was disposed in Virginia, of which 5,893,000 tons originated outside of Virginia. The deliveries of out-of-state waste in 2004 increased by 7.4 percent over the deliveries received in 2003, which further reflects the actions taken in Pennsylvania. The Virginia DEQ estimates that at the current rate of

deliveries, Virginia has approximately 16.1 years of available MSW disposal capacity remaining.

Information from the Virginia DEQ regarding waste deliveries to specific landfills in 2004, and the annual capacity of those landfills, was also reviewed. Based on that review, we identified those Virginia landfills shown in Table G-6 that could receive significant quantities of solid waste from outside the state.

Table G-6
Representative Virginia MSW Landfills

Name of Landfill	Location	Reported Disposal Fee ($/ton)	Remaining Capacity (Tons) (1)
Atlantic Waste Disposal	Waverly, VA	40.00	46,510,211
Charles City Landfill	Richmond, VA	38.00	15,527,359
King and Queen Landfill	Little Plymouth, VA	50.00	13,494,465
King George Landfill	King George, VA	39.00	14,516,668
Middle Pennsylvania Landfill	Gloucester, VA	36.00	19,481,474
Shoosmith Landfill	Chester, VA	40.00	5,979,042

(1) Solid Waste Management the State of Virginia during Calendar Year 2004, Virginia DEQ. Remaining capacity as of 1/1/05.

Published information regarding disposal fees in Virginia has also been reviewed. This information indicates that the published tipping fees range from approximately $27.50 to $50 per ton. As part of this review, a public solid waste agency which is considering participating in the development of a 10,000 TPD landfill to be located near the border of Virginia and North Carolina was contacted. The tipping fee that is being discussed for that very large landfill is $18 per ton. Based on this review, a market-based fee for a Virginia landfill could reasonably be expected to range from $18 to $25 per ton, with the low end of the range dependent upon the permitting and construction of this 10,000 TPD landfill in northeastern North Carolina. In the event that landfill is not developed, the range is estimated to be between $22 and $25 per ton. Estimated transportation costs to access these facilities are provided in the transportation cost analysis section later in this Appendix.

G.3 Ash Residue Disposal Options

The quantity of ash residue disposal capacity available in Connecticut is adequate to meet the ash residue disposal needs of the existing six RRFs through the year 2018, assuming no new in-state RRF processing capacity is developed. However, with remaining capacity at the Hartford Landfill ash monofill expected to be depleted within three years, the Putnam Wheelabrator ash landfill will serve as the only in-state alternative. While CRRA is presently investigating potential sites for a new in-state ash residue landfill, the actual development of new in-state capacity is uncertain.

Current ash residue disposal fees in Connecticut range from approximately $25 to $40 per ton. For planning purposes it is prudent to be aware of the cost of utilizing out-of-state alternatives if the need arises. Out-of-state landfills permitted for disposal of ash residue in Massachusetts, New York, and Pennsylvania, which are within cost-effective transportation distance from Connecticut are potentially viable alternatives to existing in-state disposal.

G.3.1 Massachusetts Ash Disposal Facility Options

There are six ash landfills in Massachusetts. Each of these facilities has been developed in conjunction with, and is related to a single combustion facility. Some are permitted to accept waste only from the associated combustion facility. With the exception of the Shrewsbury ash landfill, which accepted 23,000 tons of ash from a small Wheelabrator combustion facility in New Hampshire, none of these landfills accepted ash from outside the state in 2004. While this facility could take ash from Connecticut RRFs, it would seem reasonable to conclude that use of the Putnam Ash Landfill would be a more cost-effective alternative. Therefore, it is unlikely that ash landfills in Massachusetts will be a viable alternative for ash generated in Connecticut in the future.

G.3.2 New York Ash Disposal Facility Options

The NYSDEC reports that there are 30 active MSW landfills located in the state, all of which are permitted to accept ash residue from incinerators and waste-to-energy facilities. Representative landfills with large remaining capacities are shown in Table G-1. In July 2005, the Bristol Resource Recovery Facility signed an ash residue transportation and disposal contract for a total price of $54.50 per ton. The contract allows disposal at either the Ontario County or Seneca Meadows landfill. Assuming a transportation cost of approximately $30.00 to $35.00 per ton for the 600-mile trip (lower than for MSW as aggregate can be backhauled), it is estimated that the tipping fee is approximately $20 to $25 per ton.

Since tipping fees generally decrease as one moves farther west in the state, landfills in central and western New York provide the most cost-effective landfill disposal options in the state. Assuming a market-based tipping fee of approximately $20 to $25 per ton would be reasonable for ash residue disposal in New York for the purposes of this analysis.

G.3.3 Pennsylvania Ash Disposal Facility Options

In Pennsylvania, all MSW landfills constructed after 1988 must be double-lined. Those that are can accept ash for disposal. Tip fees are the same for ash as for MSW, and the State fees are applied to all waste disposed.

G.4 Bulky Waste (C&D) Disposal Options

As illustrated in Table G-7, solid waste facilities that handled bulky waste in Connecticut reported sending approximately 909,000 tons of bulky waste to landfills outside the State in FY2004. Since disposal facility options for bulky waste outside Connecticut are typically facilities that take C&D, we have chosen to refer to bulky waste from Connecticut as C&D waste in this section of the analysis.

Table G-7
Reported Tonnage of Bulky Waste Disposed Out-of-State
FY 2004

	Destination State (1,000 Tons)					
	MA	NY	OH	PA	RI	Total
Tons Disposed	156	63	433	255	1	909
Percent of Total	17.2	6.9	47.6	28.1	0.1	100.0

G.4.1 Massachusetts C&D Landfill Options

All landfills permitted to accept MSW in Massachusetts are also permitted to accept C&D wastes. Currently there are 19 MSW landfills in the state and three accepted C&D from outside the state (all three accepted C&D from Connecticut) in 2004.

According to CT DEP records, approximately 17 percent of the 909,000 tons of bulky waste exported from Connecticut in FY2004 was exported to facilities in Massachusetts. However, some of this material is known to have been used as alternative daily cover, which in some states is not considered disposal.

Discussions with Massachusetts DEP staff confirmed that the state is currently promulgating regulations that will ban asphalt, bricks, concrete, metal and wood from Massachusetts landfills. These regulations are expected to take effect in July 2006 and will effectively preclude Massachusetts's landfills as viable alternatives for mixed C&D waste generated in Connecticut. However, there is extensive C&D processing infrastructure and capacity available in the state, with 14 facilities permitted as processing facilities, which can accept, and process mixed C&D from Connecticut. Telephone calls to three of these facilities revealed tipping fees of approximately $80 to $100 per ton.

G.4.2 New York C&D Landfill Options

As of May 2005, there were 108 registered land clearing debris landfills of three acres or less, requiring, at a minimum a compacted soil liner; and 18 permitted construction and demolition debris landfills greater than three acres, requiring, at a minimum, a single composite liner with a leachate collection and removal system.

The CT DEP reports that approximately 7 percent of C&D waste exported from the state in FY2004, 63,000 tons, was sent to six landfills in New York.

To develop an estimate of average tipping fees, three of the five sites that the Department reported as receiving C&D from Connecticut were contacted. The results, summarized in Table G-8, reveal reported tipping fees in the range of $30 to $50 per ton.

Table G-8
Representative Landfills in New York Receiving Bulky Waste from Connecticut

Named Landfill	Location	Reported Disposal Fee ($/ton)	Existing Capacity (tons) (1)
Seneca Meadows	Seneca Falls, NY	35.00-50.00	11,147,730
Niagara Recycling	Niagara Falls, NY	45.00	1,675,000
Hyland	Agelica, NY	30.00	1,429,229

(1) New York Department of Environmental Conservation data on active MSW Landfills in New York State and includes total capacity for all solid waste.

Assuming a market-based tipping fee of approximately $28 to $30 per ton is reasonable for bulky waste disposal in New York for the purposes of this analysis.

G.4.3 Ohio C&D Landfill Options

The Ohio EPA reports that there was 71 licensed C&D landfill facilities operating in the state as of December 2004. The plethora of facilities is due to the fact that, in Ohio, local health department officials have primacy for siting and operation of C&D landfill facilities. Ohio EPA has no direct jurisdiction over either siting or operation.

The Department estimates that approximately half of the 909,000 TPY of C&D waste exported from Connecticut in FY04 was sent to fourteen separate landfills in Ohio.

New regulations permit local health departments to assess a $0.40 per ton fee to provide funding for increased inspection. In addition, the local health department may require groundwater monitoring at the facility. Lastly, increased efforts are required to ensure that incoming material has not been processed to the point where it is unrecognizable as C&D and may in fact include MSW. In October 2005, the Ohio Environmental Protection Agency reported that recent tests have found high levels of lead, arsenic, cyanide, and other metals, plus pesticides and other man-made chemicals leaking out of these lightly regulated landfills.

Even with these changes in the regulations and increased oversight, discussions with Ohio EPA staff suggest that state's less stringent requirements will continue to make Ohio C&D landfills a relatively inexpensive disposal option for exporters of C&D from Connecticut and the entire Northeast.

Tipping fees for C&D in Ohio are extremely low due to the availability of enormous landfill capacity and the relatively lenient environmental regulations described above.

To confirm an average range of tipping fees, we attempted to contact bulky waste destinations reported to the Department. No information was available for several of the destinations listed and some of those contacted stated that they only took MSW from Connecticut. Information that was obtained is summarized in Table G-9. Based on this information and follow-up inquiries to Ohio EPA staff and the Construction Materials Recycling Association (CMRA), it is reasonable to assume that the market-based tipping fee for C&D in Ohio is in the range of $10 to $15 per ton.

Table G-9
Eastern Ohio C&D Debris Landfills Receiving Bulky Waste from Connecticut

Named Landfill	Location	Reported Disposal Fee ($/ton)
A&L Salvage	Lisbon, OH	9.60
LaFarge	Lordstown, OH	13.50 to $16.50 (1)
Total Waste Logistics (LAS)	Girard City	12.60

(1) Dependent upon size of rail car.

The Ohio DEP does not track C&D facility operations as it does MSW landfills. Information regarding remaining capacity is not available. However, it is reasonable to assume that the 71 C&D landfills have capacity in excess of the 500,000,000 cubic yards of airspace reported for the 41 MSW landfills.

G.4.4 Pennsylvania C&D Landfill Options

The CT DEP reports that approximately 30 percent of the C&D waste exported from the state in FY2004 was sent to five separate landfills in Pennsylvania. The PA DEP reports that there are six construction and demolition waste landfills in operation at the present time. In addition, most of the 51 MSW landfills are also permitted to accept C&D. However, due to the surcharge imposed on all waste disposed at MSW landfills, and the fact that no Pennsylvania landfills have rail access, Pennsylvania is becoming less attractive as an option for disposal of C&D waste from outside the state.

To confirm an average range of tipping fees, attempts were made to contact Connecticut bulky waste destinations in Pennsylvania reported to the CT DEP. No information was available for some of the destinations listed and some of those contacted stated that they only took MSW from Connecticut. Information that was obtained is summarized in Table G-10.

Table G-10
Representative Pennsylvania Landfills that Receive Connecticut Bulky Waste

Named Landfill	Location	Reported Disposal Fee ($/ton)	Existing Capacity (tons) (1)
County Environmental	Clarion County, PA	46.00	NA
Keystone Sanitary LF	Dunmore, PA	71.00	NA
Phoenix Resources	Tioga County, PA	54.00	NA
Environmental Recycling	Taylor, PA	50.00	NA

(1) Pennsylvania Department of Environmental Protection does not make remaining landfill capacity publicly available.

Based on this review, a market-based tipping fee in the range of $30 to $35 per ton represents a reasonable planning estimate for those landfills located in eastern Pennsylvania, with lower pricing as one moves further west.

G.5 Transfer and Transportation Costs

Truck transfer represents the most frequently used method of transporting solid waste from a specific area to disposal facilities located outside the area. Truck transfer of solid waste does not depend on access to rail lines, the turn-around time of equipment is relatively short, and it provides maximum flexibility in routing and destination. However, the cost of truck transfer is highly correlated with fuel costs and drivers' salaries, and its cost effectiveness decreases as the distance increases. As a result, the development of rail-haul systems is rapidly evolving both in Connecticut and nationwide, and thus cost estimates for rail haul to selected disposal facilities are also included in this analysis.

G.5.1 Transfer Cost Estimates

In order to utilize the long-haul option to deliver solid waste to disposal facilities located outside Connecticut, it will be necessary to have access to a transfer station for MSW or volume reduction facility (VRF) for bulky wastes to allow collection vehicles to unload these wastes for consolidation into transfer vehicles. Estimates of the capital and operating and maintenance (O&M) costs to build and operate a transfer station or VRF (which are assumed will be privately-owned and operated) were developed for this analysis.

An R.W. Beck proprietary computer model, the "Transfer Station Cost Model", which estimates both the transfer station costs and truck/rail transfer costs, was utilized to develop these estimates. The model uses estimates of capital and operating costs of a transfer station sized to accept all the solid waste to be transferred and the distance to the out-of-state disposal facility to estimate transportation costs.

The Transfer Station Cost Model is based on an analysis of the capital and O&M costs of numerous operating transfer stations and/or VRFs located throughout the Untied

States. The output of this analysis includes estimates of the fixed and variable cost components for both the capital and O&M portions of the transfer station costs. The Transfer Station Cost Model provides an estimate of costs for transfer stations and VRFs of varying design capacities. In addition, the cost estimates developed by the Transfer Station Cost Model have been reviewed for accuracy against recently constructed facilities.

In view of the fact that MSW and bulky waste tonnage exceeding in-state disposal capacity is not concentrated in one area, but rather dispersed across the state, an average transfer station/VRF size of 700 to 1000 TPD has been assumed. Moreover, transfer stations of this size are representative of facilities being constructed in the Northeast today.

The capital cost components of a transfer station/VRF include land, building, utilities, site development, material handling and processing equipment, transfer vehicles, loaders, scales, and fees for design, permitting and legal services. Provision has also been included for a return on equity investment assumed to be equal to 20 percent. The O&M cost components of a transfer station include labor, utility service charges, station and vehicle maintenance, insurance, taxes, vehicle licenses, facility permit, vehicle operating costs, host community benefits, renewals and replacements, and an operator's fee to provide for a level of profit.

Based on the assumptions described above, the cost of transfer at 700 TPD to 1000 TPD facilities transfer stations/VRFs is estimated to be approximately $6.15 to $7.65 per ton. These values are incorporated in the total transfer/transportation costs summarized in Tables G-11 through G-14.

G.5.2 Truck/ Trailer Transportation Cost

Solid waste transportation costs were developed for transport via transfer trailer and rail car. For the purpose of providing a range of transportation costs that would cover the state, points in Danbury and Putnam were selected to represent the shortest and longest distances to representative out-of-state disposal sites, all of which are in states located west or south of Connecticut.

As noted above, the Transfer Station Cost Model also estimates transportation costs. The cost factors that were considered in developing the transfer costs include:

- vehicle payload,
- driver salary,
- vehicle service life,
- average driving speed,
- tractor-trailer cost,
- licenses, taxes, insurance,
- tractor miles per gallon,
- vehicle warm-up,

- load trailer,
- unload trailer,
- breaks and lunch, and
- shut down and refuel.

Information was developed for long haul using a tractor- trailer as the transfer vehicle. The cost of diesel fuel is assumed to be approximately $3.00 per gallon. Sensitivity analysis revealed that transportation costs change by approximately $1.10/ton per 100 miles for each $0.50 change in diesel fuel price.

It should be noted that the analysis presented herein represents a planning level, or text book approach, where it is assumed that speed limits are strictly obeyed, union-based wages are paid to drivers, drivers are limited to driving no more than 11 hours per day, and provision is included for lunch, driver breaks, proper vehicle warm-up, shutdown, and refueling. Based on such assumptions, the model will develop costs which are likely to be on the higher end of the range of transfer and transportation costs. Certainly there are instances where the actual transportation costs for long haul truck transfer costs are lower because of intensive trucking industry competition, longer workdays, heavier trailer loads, and drivers' salaries, which are below union scale. In those situations where the textbook approach is not followed, the transportation costs will be somewhat lower than costs estimated under these textbook assumptions.

G.5.3 Total Truck Transfer and Transportation Cost Estimates

Presented in Tables G-11 and G-12 are summaries of the total cost per ton in 2005 dollars of transferring and transporting MSW via truck/trailer from the western (Danbury area) and northeastern parts (Putnam area) of Connecticut to selected out-of-state landfills. As illustrated, the lowest costs are to the four eastern Pennsylvania landfills, with total transfer and transportation costs associated with their use at approximately $27 and $44 per ton from the western and northeastern areas of the state, respectively. Transportation costs to these same destinations from municipalities located between Danbury and Putnam would fall in between these benchmarks.

The estimated cost of transfer and transportation of bulky wastes from western and northeastern Connecticut to out-of-state landfills in New York, Pennsylvania, and Ohio are summarized in Tables G-13 and G-14. As illustrated, the lowest cost truck/trailer transfer is associated with use of the Keystone Landfill in Pennsylvania with total transfer and transportation costs of $27 and $44 per ton from the western and northeastern areas of the state respectively. Transportation costs to these same destinations from municipalities located between Danbury and Putnam would fall in between these benchmarks. The total transfer and transportation costs shown in Table G-11, G-12, G-13, and G-14 include transfer and hauling costs, but do not include other fees.

Table G-11
Estimated Cost to Transfer MSW from Danbury to Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Transfer Cost	Haul Cost ($/Ton)	Total Transfer and Transportation Cost ($/Ton)
New York					
	Seneca Meadows – Seneca Falls	296	$6.15- $7.65	$42.14	$48.29 - $49.79
	High Acres – Fairport	326	$6.15- $7.65	$44.62	$50.77 - $52.27
	Ontario County - Stanley	310	$6.15- $7.65	$43.30	$49.45 - $50.95
	Monroe County - Riga	353	$6.15- $7.65	$47.62	$53.77 - $ 55.27
	Hyland - Angelica	328	$6.15- $7.65	$44.79	$50.94 - $52.44
Ohio					
	BFI Carbon Limestone-Mahoning Co.	448	$6.15- $7.65	$58.64	$64.79 - $66.29
	American Landfill – Stark County	498	$6.15- $7.65	$64.45	$70.60 - $72.10
	Countrywide Landfill – Stark County	513	$6.15- $7.65	$66.19	$72.34 - $73.84
	BFI of Ohio – Lorain County - Oberlin	528	$6.15- $7.65	$67.95	$74.10 - $75.60
	Suburban – Perry County - Glenford	567	$6.15- $7.65	$72.46	$78.61 - $80.11
Pennsylvania					
	Alliance Sanitary –Lackawanna Co.	140	$6.15- $7.65	$20.68	$26.83 - $28.33
	Grand Central – Pen Argyl	134	$6.15- $7.65	$20.18	$26.33 - $27.83
	Keystone – Dunmore	133	$6.15- $7.65	$20.10	$26.25 - $27.75
	GROWS – Morrisville Bucks Co.	133	$6.15- $7.65	$20.10	$26.25 - $27.75
	BFI Conestoga – Morgantown	198	$6.15- $7.65	$34.06	$40.21 - $41.71
Virginia					
	Atlantic Waste Disposal – Sussex Co.	455	$6.15- $7.65	$59.46	$65.61 - $67.11
	King and Queen – Little Plymouth	401	$6.15- $7.65	$53.18	$59.33 - $60.83
	King George – King George	340	$6.15- $7.65	$46.11	$52.26 - $53.76
	Middle Peninsula – Glenns	404	$6.15- $7.65	$53.53	$59.68 - $61.18
	Shoosmith – Chester	422	$6.15- $7.65	$55.62	$61.77- $63.27

Table G-12
Estimated Costs to Transfer MSW from Putnam to Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Transfer Cost	Haul Cost ($/Ton)	Total Transfer and Transportation Cost ($/Ton)
New York					
	Seneca Meadows – Seneca Falls	317	$6.15-$7.65	$43.87	$50.02-$51.52
	High Acres – Fairport	347	$6.15-$7.65	$46.91	$53.06-$54.56
	Ontario County - Stanley	331	$6.15-$7.65	$45.05	$51.20-$52.70
	Monroe County - Riga	374	$6.15-$7.65	$50.05	$56.20-$57.70
	Hyland - Angelica	405	$6.15-$7.65	$53.64	$59.79-$61.29
Ohio					
	BFI Carbon Limestone-Mahoning Co.	548	$6.15-$7.65	$70.25	$76.40-$77.90
	American Landfill – Stark County	599	$6.15-$7.65	$76.18	$82.33-$83.83
	Countrywide Landfill – Stark County	613	$6.15-$7.65	$77.80	$83.95-$85.45
	BFI of Ohio – Lorain County - Oberlin	629	$6.15-$7.65	$79.67	$85.82-$87.32
	Suburban – Perry County - Glenford	678	$6.15-$7.65	$84.76	$90.91-$92.41
Pennsylvania					
	Alliance Sanitary –Lackawanna Co.	240	$6.15-$7.65	$37.52	$43.67-$45.17
	Grand Central – Pen Argyl	246	$6.15-$7.65	$38.01	$44.16-$45.66
	Keystone – Dunmore	234	$6.15-$7.65	$37.02	$43.17-$44.67
	GROWS – Morrisville Bucks Co.	237	$6.15-$7.65	$37.27	$43.42-$44.92
	BFI Conestoga – Morgantown	302	$6.15-$7.65	$42.63	$48.78-$50.28
Virginia					
	Atlantic Waste Disposal – Sussex Co.	559	$6.15-$7.65	$71.53	$77.68-$79.18
	King and Queen – Little Plymouth	506	$6.15-$7.65	$65.38	$71.53-$73.03
	King George – King George	444	$6.15-$7.65	$58.18	$64.33-$65.83
	Middle Peninsula – Glenns	508	$6.15-$7.65	$65.61	$71.76-$73.26
	Shoosmith – Chester	527	$6.15-$7.65	$67.83	$73.98-$75.48

Table G-13
Estimated Costs to Transfer Bulky Waste from Danbury to Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Transfer Cost	Haul Cost ($/Ton)	Total Transfer and Transportation Cost ($/Ton)
New York					
	Seneca Meadows – Seneca Falls	296	$6.15- $7.65	$42.13	$48.29-$49.78
	Niagara Recycling – Niagara Falls	411	$6.15- $7.65	$54.34	$60.49-$61.99
	Hyland - Angelica	328	$6.15- $7.65	$44.78	$50.93-$52.43
Ohio					
	A&L Salvage – Columbiana County	469	$6.15- $7.65	$61.08	$67.23-$68.73
	LaFarge – Lordstown	450	$6.15- $7.65	$58.88	$65.03-$66.53
	Total Waste Logistics (LAS) - Youngstown	440	$6.15- $7.65	$57.72	$63.87-$65.37
Pennsylvania					
	County Environmental – Clarion County	371	$6.15- $7.65	$49.69	$55.84-$57.34
	Keystone Sanitary LF – Dunmore	133	$6.15- $7.65	$19.83	$25.98-$27.48
	Phoenix Resources – Tioga County	248	$6.15- $7.65	$38.18	$44.33-$45.83
	Environmental Recycling – Taylor, Lackawanna Co.	140	$6.15- $7.65	$20.41	$27.19-$28.69

Table G-14
Estimated Costs to Transfer Bulky Waste from Putnam to Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Transfer Cost	Haul Cost ($/Ton)	Total Transfer and Transportation Cost ($/Ton)
New York					
	Seneca Meadows – Seneca Falls	317	$6.15- $7.65	$43.87	$50.02-$51.52
	Niagara Recycling – Niagara Falls	432	$6.15- $7.65	$56.79	$62.94-$64.44
	Hyland - Angelica	405	$6.15- $7.65	$53.65	$59.80-$61.30
Ohio					
	A&L Salvage – Columbiana County	569	$6.15- $7.65	$72.67	$78.82-$80.32
	LaFarge – Lordstown	551	$6.15- $7.65	$70.61	$76.76-$78.26
	Total Waste Logistics (LAS) - Youngstown	541	$6.15- $7.65	$69.46	$75.61-$77.11

Table G-14
Estimated Costs to Transfer Bulky Waste from Putnam to Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Transfer Cost	Haul Cost ($/Ton)	Total Transfer and Transportation Cost ($/Ton)
Pennsylvania					
	County Environmental – Clarion County	472	$6.15- $7.65	$61.44	$67.59-$69.09
	Keystone Sanitary LF – Dunmore	234	$6.15- $7.65	$37.03	$43.18-$44.68
	Phoenix Resources – Tioga County	371	$6.15- $7.65	$49.70	$55.85-$57.35
	Environmental Recycling – Taylor, Lackawanna Co.	240	$6.15- $7.65	$37.52	$43.67-$45.17

G.5.4 Estimate of Rail Haul Costs

Rail transport of waste is being increasingly utilized as a lower cost alternative for transporting waste from Connecticut to out-of-state destinations. Typically rail transport requires specialized facilities for loading rail cars at each end of the rail line. Rail transport can be via intermodal containers that are placed on specially configured rail cars, or in direct-loaded, bulk handling rail cars such as gondola cars.

In view of the fact that the private waste management industry is utilizing and proposing significant rail haul infrastructure, it is likely to play an increasing role in waste transfer in Connecticut. In that regard, the following is offered as an overview of the principal issues and considerations associated with rail haul for State and local officials to utilize in their assessment the viability and application of rail haul as a means of transporting solid waste in Connecticut.

Rail car and inter-modal container service offer certain specific cost and efficiency advantages. In general, the greater the distance, the more economical rail transport becomes versus over-the-road trucking, and the higher the profit margin for railroads. Relatively low-margin waste operations, particularly for short-haul, do not normally make rail transport of waste attractive vis-à-vis other rail traffic commodities. Intermodal waste transfer facilities allow consolidation of waste from a broad area, facilitating greater densities per unit and origin location(s). The greater the tonnage per container is, the greater the density, and the lower the transportation costs per ton and per ton-mile. Also, the increasing cost of diesel fuel favors rail intermodal or rail car over trucking. There is a nationwide shortage of truck drivers.

On the other hand, the growth of international and domestic intermodal freight traffic is causing capacity shortages at many existing railroad intermodal facilities. There is tremendous growth in international import container freight demand that is impacting availability of intermodal facility capacity, railroad capacity, and availability of intermodal rail cars. In developing rail transfer facilities, the site footprint must be

linear in nature to accommodate facility ramp tracks. Sites must be adjacent and preferably parallel to main line rail for service access. Sufficient site or railroad right-of-way must be available to accommodate construction of rail car staging and storage capacity and train makeup/breakup capacity without negatively affecting main line operations.

There is an order of dispatching priorities for rail operations. Passenger operations, particularly on Amtrak's Northeast Corridor, have priority over freight movements. Most freight will have a higher priority for movement over waste rail car traffic because of its higher profit margin and sensitivity of service. It is desirable to have competitive rail access by more than one railroad, although often this is not practical. Multiple rail access can be accomplished in a number of ways, including sites located along or between rail lines with multiple rail service providers, sites located along rail line with the owner having already granted track rights to another railroad, or sites in an area under a reciprocal witch agreement. The most difficult situations occur where the site is closed to all but the primary service provider, thereby requiring difficult access negotiations for additional rail service.

A conceptual rail-haul system was used to develop an estimate of the capital and operating costs for transporting solid waste to out-of-state landfills by rail. For planning- level purposes, it was assumed that transfer costs, not including transportation, would be similar to those estimated for transfer in conjunction with truck transport; or approximately $5 to $7 per ton.

Various out-of-state disposal sites have available disposal capacity to receive waste shipped by rail from Connecticut. Some additional sites might not currently receive waste by rail, but could arrange for suitable rail sidings at the receiving end. These disposal sites include some of the landfills listed below in Ohio, Pennsylvania, and Virginia as well as one in South Carolina. Potential disposal sites for use in conjunction with rail haul include:

- Ohio - Carbon-Limestone and L.A.S. Landfills, both have rail access;
- Pennsylvania - various landfills in Pittsburgh area with no known rail delivery at present;
- South Carolina - Lee County Landfill (Bishopville). This site currently receives waste delivered from Boston and Springfield, Massachusetts and New Jersey;
- Virginia:
  - Maplewood Landfill. Direct rail served facility;
  - Brunswick Landfill. Existing rail delivered waste via a shuttle to landfill from a nearby rail siding;
  - Charles City County Landfill. Formerly had rail delivered waste via a shuttle to the landfill from a nearby rail siding; and
  - King George County Landfill. Existing direct rail service to facility.

The estimated range of costs to ship waste via rail from Connecticut to landfills in New York, Virginia, South Carolina, Ohio, and western Pennsylvania is presented in Table G-15.

Table G-15
Estimated Range of Rail-Haul Costs to Out-of-State Landfills from Connecticut

Landfill Location	Estimated Range of MSW Costs ($ per Ton)[1]			
	Transfer	Rail Haul [2]	Tipping Fee	Total System
Virginia	$5.00-$7.00	$44.00-$48.00	$22.00-$25.00	$71.00-$80.00
South Carolina	$5.00-$7.00	$53.00-$57.00	$20.00-$25.00	$78.00-$89.00
Ohio	$5.00-$7.00	$47.00-$51.00	$25.00-$30.00[1]	$77.00-$88.00[1]
Western Pennsylvania	$5.00-$7.00	$45.00-$49.00	$25.00-$30.00	$75.00-$86.00
New York, Rochester Area	$5.00-$7.00	$35.00-$39.00	$28.00-$30.00	$68.00-$76.00

(1) Tipping fee for bulky waste estimated to be $10-$15 per ton and total system $62-$73 per ton.

(2) Rail routing to all landfills would initially be north on a short line railroad to a Class 1 railroad, then west to Selkirk, New York. From the Selkirk rail yard waste destined for Virginia and South Carolina would be routed south, to Ohio the railcars would be routed south to Newark, New Jersey, then west through Pittsburgh, and to western Pennsylvania the railcars would follow the same route as to Ohio, except the cars would stop in the Pittsburgh area, and to New York State west to the Rochester area.

The estimates of freight rates, railcar routing, and cycle times were based on a recent rail haul analysis performed for R.W. Beck. The receipt of actual quotes from rail companies are a better indicator of these cost factors. Quotes from rail companies may be negotiated to yield better rates for a shipper than the rates utilized in this analysis. Shippers that generate a large volume of car shipments may be in a position to negotiate better terms with the railroads. The analysis assumes that 100 percent of the waste currently delivered to the transfer station will be shipped by rail.

It should be noted that it might be possible to negotiate a reduction in the freight rate of 10 to 20 percent for a larger volumes of waste. This assumes that the communities and/or private haulers could commit waste quantities at the level currently being delivered to the waste-to-energy facility servicing that area.

Freight rates are dependent primarily on the distance traveled and the allowed weight per car. The number of railroads involved in a move, both Class 1 and short-line companies, also affects rates. In addition, the portion of a move on branch lines can affect the rate but more importantly the cycle time. Branch line traffic tends to move at a slower speed due to a combination of reasons including other deliveries on the line, availability of engines and crews, track condition, and/or track time competition with commuter lines.

G.6 Total Estimated Cost of Out-of-State Disposal Options

Estimates of transfer and transportation, tipping fee, and total system costs associated with the use of each MSW and bulky waste disposal facility investigated are summarized in Tables G-16 through G-19. As indicated in Table G-16, the lowest cost out-of-state disposal alternatives for MSW transferred by truck from municipalities in western Connecticut are landfills in eastern and central Pennsylvania, with total costs ranging from approximately $56 to $63 per ton. As shown in Table G-17, the lowest cost out-of-state disposal alternatives for MSW transferred by truck from municipalities in northeastern Connecticut are also landfills in eastern and central Pennsylvania with total costs ranging from approximately $73 to $80 per ton. As indicated in Table G-15, rail haul to western New York or Virginia would appear to be an economically feasible option to consider in the future.

For the disposal of bulky wastes, the lowest total system cost for rail haul is estimated to be in the range of $62 to $73 per ton for disposal at C&D landfills in Ohio. Truck transport of bulky waste from western Connecticut to Pennsylvania landfills is competitive. As indicated in Table G-18, the lowest cost out-of-state disposal alternatives for bulky waste transferred by truck from western Connecticut are landfills in eastern Pennsylvania with total costs ranging from approximately $56 to $63 per ton. As shown in Table G-19, the lowest cost out-of-state disposal alternatives for bulky waste transferred by truck from municipalities in northeastern Connecticut are landfills in eastern Pennsylvania with total costs ranging from approximately $73 to $80 per ton.

Table G-16
Estimated Total System Costs to Dispose of MSW from Danbury Area at Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Total Transfer and Transportation Cost ($/ton)	Estimated Range of Tipping Fees ($/ton)	Total System Costs ($/ton)
New York					
	Seneca Meadows – Seneca Falls	296	$48.29 - $49.79	$28.00-$30.00	$76.29-$79.79
	High Acres – Fairport	326	$50.77 - $52.27	$28.00-$30.00	$78.77-$82.27
	Ontario County - Stanley	310	$49.45 - $50.95	$28.00-$30.00	$77.45-$80.95
	Monroe County - Riga	353	$53.77 - $ 55.27	$28.00-$30.00	$81.77-$85.27
	Hyland - Angelica	328	$50.94 - $52.44	$28.00-$30.00	$78.94-$82.44
Ohio					
	BFI Carbon Limestone-Mahoning Co.	448	$64.79 - $66.29	$25.00-$30.00	$89.79-$96.29
	American Landfill – Stark County	498	$70.60 - $72.10	$25.00-$30.00	$95.60-$102.10
	Countrywide Landfill – Stark County	513	$72.34 - $73.84	$25.00-$30.00	$97.34-$103.84
	BFI of Ohio – Lorain County - Oberlin	528	$74.10 - $75.60	$25.00-$30.00	$99.19-$105.60
	Suburban – Perry County - Glenford	567	$78.61 - $80.11	$25.00-$30.00	$103.61-$110.11
Pennsylvania					
	Alliance Sanitary –Lackawanna Co.	140	$26.83 - $28.33	$30.00-$35.00	$56.83-$63.33
	Grand Central – Pen Argyl	134	$26.33 - $27.83	$30.00-$35.00	$56.33-$62.83
	Keystone – Dunmore	133	$26.25 - $27.75	$30.00-$35.00	$56.25-$62.75
	GROWS – Morrisville Bucks Co.	133	$26.25 - $27.75	$30.00-$35.00	$56.25-$62.75
	BFI Conestoga – Morgantown	198	$40.21 - $41.71	$30.00-$35.00	$70.21-$76.71
Virginia					
	Atlantic Waste Disposal – Sussex Co.	455	$65.61 - $67.11	$22.00-$25.00	$87.61-$92.11
	King and Queen – Little Plymouth	401	$59.33 - $60.83	$22.00-$25.00	$81.33-$85.83
	King George – King George	340	$52.26 - $53.76	$22.00-$25.00	$74.26-$78.76
	Middle Peninsula – Glenns	404	$59.68 - $61.18	$22.00-$25.00	$81.68-$86.18
	Shoosmith – Chester	422	$61.77- $63.27	$22.00-$25.00	$83.77-$88.27

Table G-17
Estimated Total System Costs to Dispose of MSW from Putnam Area at Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Total Transfer and Transportation Cost ($/ton)	Estimated Range of Tipping Fees ($/ton)	Total System Costs ($/ton)
New York					
	Seneca Meadows – Seneca Falls	317	$50.02-$51.52	$28.00-$30.00	$78.02-$81.52
	High Acres – Fairport	347	$53.06-$54.56	$28.00-$30.00	$81.06-$84.56
	Ontario County - Stanley	331	$51.20-$52.70	$28.00-$30.00	$81.20-$82.70
	Monroe County - Riga	374	$56.20-$57.70	$28.00-$30.00	$84.20-$87.70
	Hyland - Angelica	405	$59.79-$61.29	$28.00-$30.00	$87.79-$91.29
Ohio					
	BFI Carbon Limestone-Mahoning Co.	548	$76.40-$77.90	$25.00-$30.00	$107.90
	American Landfill – Stark County	599	$82.33-$83.83	$25.00-$30.00	$97.33
	Countrywide Landfill – Stark County	63	$83.95-$85.45	$25.00-$30.00	$115.45
	BFI of Ohio – Lorain County - Oberlin	629	$85.82-$87.32	$25.00-$30.00	$117.32
	Suburban – Perry County - Glenford	678	$90.91-$92.41	$25.00-$30.00	$122.41
Pennsylvania					
	Alliance Sanitary –Lackawanna Co.	240	$43.67-$45.17	$30.00-$35.00	$73.67-$80.17
	Grand Central – Pen Argyl	246	$44.16-$45.66	$30.00-$35.00	$74.16-$81.66
	Keystone – Dunmore	234	$43.17-$44.67	$30.00-$35.00	$73.17-$79.67
	GROWS – Morrisville Bucks Co.	237	$43.42-$44.92	$30.00-$35.00	$73.42-$79.92
	BFI Conestoga – Morgantown	302	$48.78-$50.28	$30.00-$35.00	$78.78-$85.28
Virginia					
	Atlantic Waste Disposal – Sussex Co.	559	$77.68-$79.18	$22.00-$25.00	$99.68-$104.18
	King and Queen – Little Plymouth	506	$71.53-$73.03	$22.00-$25.00	$93.53-$98.03
	King George – King George	444	$64.33-$65.83	$22.00-$25.00	$86.33-$90.83
	Middle Peninsula – Glenns	508	$71.76-$73.26	$22.00-$25.00	$93.76-$98.26
	Shoosmith – Chester	527	$73.98-$75.48	$22.00-$25.00	$95.98-$100.48

Table G-18
Estimated Total System Cost to Dispose of Bulky Waste from Danbury Area to Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Total Transfer and Transportation Cost ($/Ton)	Estimated Range of Tipping Fees ($/Ton)	Total System Costs ($/Ton)
New York					
	Seneca Meadows – Seneca Falls	296	$48.28 - $49.78	$28.00 - $30.00	$76.28 - $79.78
	Niagara Recycling-Niagara Falls	411	$60.49 - $61.99	$28.00 - $30.00	$88.93 - $91.99
	Hyland - Angelica	328	$50.93 - $52.43	$28.00 - $30.00	$78.93 - $82.43
Ohio					
	A&L Salvage-, Columbiana Co.	469	$67.23 - $68.73	$10.00 - $15.00	$77.23 - $83.73
	LaFarge-Lordstown	450	$65.03 - $66.53	$10.00 - $15.00	$75.03 - $81.53
	Total Waste Logistics (LAS)-Youngstown	440	$63.87 - $65.37	$10.00 - $15.00	$73.87 - $80.37
Pennsylvania					
	County Environmental-Clarion Co	371	$55.84 - $57.34	$20.00 - $25.00	$75.84 - $82.34
	Keystone Sanitary LF– Dunmore	133	$25.98 - $27.48	$30.00 - $35.00	$55.98 - $62.48
	Phoenix Resources-Tioga Co.	248	$44.33 - $45.83	$25.00 - $30.00	$69.33 - $75.83
	Environmental Recycling-Taylor, Lackawanna Co.	140	$27.19 - $28.69	$30.00 - $35.00	$57.19 - $63.69

Table G-19
Estimated Total System Costs to Dispose of Bulky Waste from Putnam Area at Selected Out-of-State Landfills

State	Facility	Hauling Distance (One-Way Miles)	Total Transfer and Transportation Cost ($/Ton)	Estimated Range of Tipping Fees ($/Ton)	Total System Costs ($/Ton)
New York					
	Seneca Meadows – Seneca Falls	317	$50.02-$51.52	$28.00 - $30.00	$78.02-$81.82
	Niagara Recycling-Niagara Falls	432	$62.94-$64.44	$28.00 - $30.00	$90.94-$94.44
	Hyland – Angelica	405	$59.80-$61.30	$28.00 - $30.00	$87.80-$91.30
Ohio					
	A&L Salvage-, Columbiana Co.	469	$78.82-$80.32	$10.00 - $15.00	$88.82-$95.32
	LaFarge-Lordstown	450	$76.76-$78.26	$10.00 - $15.00	$86.76-$93.26
	Total Waste Logistics (LAS)-Youngstown	440	$75.61-$77.11	$10.00 - $15.00	$85.61-$92.11
Pennsylvania					
	County Environmental-Clarion Co	371	$67.59-$69.09	$20.00 - $25.00	$87.59-$94.09
	Keystone Sanitary LF– Dunmore	133	$43.18-$44.68	$30.00 - $35.00	$73.18-$76.68
	Phoenix Resources-Tioga Co.	248	$55.85-$57.35	$25.00 - $30.00	$80.85-$87.35
	Environmental Recycling-Taylor, Lackawanna Co.	140	$43.67-$45.17	$30.00 - $35.00	$73.67-$80.17

G.7 Comparison of In-State vs. Out-of-State Disposal Costs

G.7.1 Background

Valid comparison of solid waste disposal options requires taking into account each of the components of the disposal system: transfer, transportation, and disposal tipping fees. While use of in-state RRFs does not always include transfer and transportation, these essential components comprise a significant share of the total cost of out-of-state disposal options.

G.7.2 Transfer Costs

Transfer costs comprise a relatively small share of the total cost of either in- or out-of-state disposal. Costs are largely fixed, with the incremental cost of each additional ton handled being relatively small. Thus, transfer costs per ton decrease significantly as the number of tons handled increases.

G.7.3 Transportation Costs

As revealed in the cost analysis of out-of-state disposal options, transportation costs comprise the majority of total system costs, with a large share of the costs attributed to driver and fuel costs. Thus, increases in transportation costs closely correlate with the increase in distance between the point of transfer and the disposal destination selected.

G.7.4 Disposal Tipping Fees

Tipping fees are assessed for use of disposal capacity. Development of solid waste landfill and resource recovery facility capacity is capital intensive. Fixed costs are high relative to incremental operating costs for both options. Owners seek to maximize utilization of the fixed asset and offer a menu of tipping fees including contract and spot market prices to do so. However, since RRF capacity is production-rate related, i.e. there is a finite number of tons that can be processed per hour, RRFs typically have to be more aggressive and offer longer term contracts to ensure that capacity is utilized on a consistent basis.

Solid waste disposal capacity is a commodity. As such, the price of capacity is driven by supply and demand. As supply increases relative to demand, the price will drop, and to the contrary, prices will rise when demand grows faster than supply. In other words, beyond covering incremental costs, to a certain extent tipping fees become based on what disposal facilities are able to charge, rather than what they must charge to make a reasonable return on investment.

As a result of being highly correlated with the supply/demand ratio, tipping fees charged by both landfills and RRFs are based on what the market will bear. This is known as the market-based tipping fee. From the standpoint of any given disposal facility, the market-based tipping fee that can be charged will typically fluctuate based on the number and type of competing disposal options available, and with the distance of the supplier from the facility, since the total disposal cost to the waste supplier will include transfer and transportation costs.

The market-based tipping fee for a given wasteshed can be established though an assessment of alternatives available to a potential waste supplier, e.g. a Connecticut municipality, and identification of the lowest cost alternative. If there are no options within a short driving distance of the waste supplier, the market-based tipping fee will be higher than the norm. This is the case in Connecticut, as documented by the analysis of costs associated with disposal options presented earlier in this analysis.

G.7.5 Comparison of Current Total Disposal System Option Costs

G.7.5.1 MSW Disposal

At the present time, the majority of the communities in the state pay tipping fees for disposal at RRFs in the range of $57 to $70 per ton. In some cases the tipping fee includes the cost of non-disposal related services such as recycling education and HHW collection programs. While some deliver MSW directly, others incur transfer and transportation costs that may add from $5 to $15 per ton. Thus, it is believed that, even including those communities that do not contract with any of the six RRFs, the total MSW disposal system cost falls in the broad range of $57 to $85 per ton, with the majority of total system costs estimated to be in the range of $65 to $75 per ton.

The cost analysis of out-of-state disposal alternatives revealed the most cost effective MSW disposal options available are in Pennsylvania with total system costs in the broad range of $56 to $80 per ton depending largely on the distance the Connecticut municipality is from Pennsylvania. The total system cost for most municipalities in the central and western regions of the state would fall between $65 and $70 per ton. Thus, it appears that the $65 to $70 per ton range is the market-based price of disposal options available to Connecticut communities. Given that the RRFs in Connecticut will be free of their bond debt in upcoming years, it is expected that the facilities, with the exception of Wallingford, will be able to operate more cost-effectively, if no additional bonds are issued.

G.7.5.2 Bulky Waste Disposal

The tipping fees charged by the two major in-state landfills receiving bulky wastes are currently $60 to $65 per ton. Gate rates at VRFs range from $65 to $90, but since integrated waste hauling/processing companies have developed much of the VRF capacity for internal use, the actual cost to these firms is less than tipping fees at the two major landfills. Total system costs, including transportation costs, vary widely, largely dependent upon the distance from the municipality to these landfills.

For disposal of bulky wastes outside the state, the lowest total system cost for rail haul is estimated to be in the range of $62 to $73 per ton for disposal at C&D landfills in Ohio. Truck transport of bulky waste from western Connecticut to Pennsylvania landfills is competitive. As indicated in Table G-19, the lowest cost out-of-state disposal alternatives for bulky waste transferred by truck from western Connecticut are landfills in eastern Pennsylvania with total costs ranging from approximately $56 to $63 per ton. As shown in Table G-19, the lowest cost out-of-state disposal alternatives for bulky waste transferred by truck from municipalities in northeastern Connecticut are landfills in eastern Pennsylvania with total costs ranging from approximately $73 to $80 per ton.

G.7.6 Projected Future Disposal System Costs

The market-based price serves as a benchmark which in-state RRFs presently have been able to meet, and will have to continue to meet in the future. In view of the fact that the market establishes disposal capacity tipping fees, the future tipping fees that in-state RRFs will be able to charge will be determined by the costs of the competing out-of-state alternatives, which in turn will be largely determined by the balance of the supply of disposal capacity and the demand for capacity. Thus, the best way to project future RRF tipping fees is to assess the factors that will have the most impact on out-of-state disposal facility costs and the supply/demand ratio.

Over the past 10 to 15 years, the private waste management industry has invested in and created additional capacity. This increase in supply relative to demand has resulted in oversupply and has placed downward pressure on prices despite the increase in demand over the same period. As a result, the national average gate rate has increased at a slower rate than inflation, increasing from $29 per ton in 1992 to only $35 per ton in 2004.

Solid waste suppliers, including Connecticut communities, are interested in having some sense of what the future tipping fees might be. Barring some unforeseen economic downturn, it would appear that the growth in demand for disposal capacity would exceed the growth in supply. Thus, tipping fees at out-of-state landfills will more likely than not increase at a rate above inflation.

Factors that would tend to increase the demand for capacity faster than the increase in supply include the following:

- Consumer spending on goods and housing, with the attendant generation of waste, continues to increase;
- Diversion of materials is unlikely to increase at the same rate, as residential and commercial recycling program implementation and growth has leveled off over the last ten years;
- Land values are increasing more rapidly than inflation and would comprise a larger portion of the cost of landfill capacity even if it could be purchased and developed;
- Statewide moratoriums on development of landfill capacity are increasing;
- Public pressure for increased state and federal enforcement of environmental regulations relating to protection of air and water quality will make siting and operation more difficult and more costly; e.g. C&D landfills in Ohio; and
- The pressures of residential and commercial land development will result in less availability of land suitable for meeting the multiple tests of political and social acceptance, and environmental, health, safety, and economic suitability required for disposal facilities.

There are also reasons beyond changes in the supply/demand curve that could arbitrarily increase out-of-state tipping fees. Government intervention can impact tipping fees by actions that artificially reduce supply or cost competitiveness. Daily

capacity limits imposed by state regulatory agencies in the facility construction and operations permitting process are an example of the former. State surcharges imposed on a per-ton basis, as in Pennsylvania and more recently in Ohio, are an example of the latter.

Although revenues from electricity typically may account for as much as 50 percent of the revenue for a resource recovery facility, changes in the retail electricity price are generally not reflected in the tipping fee. This is because competitive market forces generally determine tipping fees. However, the projected retail price for electricity is worth noting. As a part of its analysis of the Clear Skies initiative, the United State Environmental Protection Agency (U.S. EPA) has projected retail electricity prices for NERC's Northeast Power Coordinating Council region, which includes Connecticut. The U.S. EPA projects that retail electricity prices in the NPCC region will increase from approximately $0.070 per kilowatt hour in 2005 to $0.085 per kilowatt hour in 2020.

On a cautionary note, however, the option to ship waste out-of-state may be questioned for at least two reasons. First, the issue of the long-term reliability of out-of-state disposal, especially with regard to changed circumstances of private operators (for example, financial insolvency) or changes in state level regulation could make this option less available. A good example of this is the increasing pressure being placed on state officials in Ohio to increase regulation of C&D landfills. Growing interstate conflicts, which often become protracted battles in the federal courts, have emerged in recent decades as states allege that they are recipients of unwanted imports. Nowhere is the problem of interstate transfer more evident than in the disposal of solid, hazardous, and nuclear wastes. Out-of-state waste export has been an increasingly common pattern, with wastes often shipped to facilities which were opened before concern over waste and facility siting became widespread. In the long term, waste may ultimately be deposited in the least resistant state or facility at any given time in the future.

Second, the question to consider is whether as a matter of environmental responsibility, Connecticut should manage its own waste when the resources could be made available in-state to deal with the problem. Both these considerations may lead the State to conclude that Connecticut should continue to develop in-state RRF capacity necessary to meet future demand. To achieve compliance with the guiding principal of cost effectiveness will require a balance between short-term cost and long-term security.

This cost analysis of in-state versus out-of-state disposal options and the accompanying comparison of the environmental impacts (see Appendix I) reveal that both have advantages and disadvantages. The advantages and disadvantages of expansion of in-state RRF disposal capacity can be summarized as follows:

- Advantages
  - Maintenance of disposal option results in lower market-based tipping fee available to municipalities over the long term;
  - Preserves the opportunity for each municipality to evaluate and choose based upon what is in their own best interest;
  - Less impact on state air quality since truck and rail transportation required for out of state options are significantly reduced;
  - Less truck/trailer traffic and wear and tear on state highways;
  - Closer compliance with the State solid waste management hierarchy;
  - Creation of more local jobs;
  - Increases capability to implement economic incentives to reduce waste generation;
  - Easier to manage political, regulatory, and economic risks;
  - Continuing residential and commercial development may inhibit ability to site new out-of-state facilities in the future;
  - Provides more accurate and complete data to perform future capacity planning; and
  - During economic swings, excess capacity can be used to generate revenue from spot market tip fees.
- Disadvantages
  - May not be as cost effective as out-of-state disposal in the short term;
  - More potential for negative impact with regard to emissions to the environment;
  - Disposal capacity is less flexible; requires a commitment to supplying a specific disposal tonnage to be cost-effective; and
  - Difficulty in siting new in-state facilities.

This issue will requires further analysis before any conclusions can be reached and the State Solid Waste Management Plan begins to address it. The Plan's Strategy 7-15 states: The CT DEP will continue to evaluate the environmental impacts of the alternatives for solid waste disposal and will examine its authority to require an applicant for new capacity and disposal to provide detailed information on such impacts.

Appendix H
THREE AREAS OF OPPORTUNITY IN SPECIAL WASTE MANAGEMENT

Introduction

This Appendix identifies and assesses the current management practices and diversion opportunities for three types of special wastes of particular importance to the CT DEP. These types of wastes represent great opportunities for diverting an increased percentage of materials that are currently being diverted at relatively modest rates:

- Used electronics, a rapidly growing waste stream which includes some products that contains potentially hazardous materials;
- Commercial food waste, (from institutions and businesses), a major waste stream for which few diversion programs have been developed; and
- Construction and demolition debris, a significant portion of state's waste stream for which very little diversion has taken place in Connecticut.

There are other special wastes are addressed in more detail in Chapter Four and in Appendix B. These include animal mortalities; land clearing debris; road wastes; contaminated soils; dredge materials; sewage sludge, water treatment residual solids; preservative treated wood; household hazardous waste, sharps and waste pharmaceuticals; and disaster debris.

This Appendix will discuss electronic wastes, commercial food wastes, and construction and demolition waste.

H.1 Used Electronics

H.1.1 Existing Infrastructure for Managing Used Electronics

According to the Electronics Industry of America, the average American discards 2.5 pounds of used electronics annually. Applying this statistic to the Connecticut population yields an annual quantity of approximately 4,354 tons of discarded used electronics. The infrastructure for recycling used electronics is comprised of special collection events, drop-off sites at certain transfer stations and landfills, and private recycling companies. The special collection events are hosted and funded by CRRA, other regional authorities, and municipalities. Authorities and municipalities typically coordinate the events, and contract with a private company to transport and recycle the materials. Collection events are generally open to residents only. Businesses typically hire a private company to remove their old electronics. In addition to the special

collection events, source-separated electronics may be delivered to the transfer stations and landfills identified in Table H-1.

Table H-1
Transfer Stations and Landfills that Accept Used Electronics

Facility	County
Avon Transfer Station	Hartford
Branford Transfer Station	New Haven
Granby Transfer Station	Hartford
New Milford Recycling Center	Litchfield
Rocky Hill Transfer Station	Hartford
Suffield Landfill	Hartford
Watertown Transfer Station	Litchfield
Wethersfield Transfer Station	Hartford
Woodstock Residential Transfer Station	Windham

It should be noted that the transfer stations and landfills in Connecticut that accept used electronics frequently change, thus Table H-1 should not be considered conclusive. Finally, there are private recyclers for used electronics are either located in or service Connecticut. In general, municipalities do not charge residents to recycle their waste electronics.

To date, the only data pertaining to the quantity of used electronics that these outlets recover is from the special collection events. For 2003, the most recent data available, CT DEP reports that approximately 67 tons of used electronics was recycled. This probably understates what was actually recovered because it does not include materials recovered from commercial sources.

H.1.2 Assessment of Current Infrastructure

A recent study by the National Recycling Coalition estimates that over 20 million personal computers became obsolete in the United States in 1998. Between 1997 and 2007, nearly 500 million personal computers will become obsolete, almost two computers for each person in the United States. Some studies predict that a large number of televisions will be disposed when high definition television becomes widely available and affordable. Many used televisions, monitors, printers, and other types of electronic equipment are finding their fate in attics, basements, and warehouses while some people still dispose of electronics curbside in the residential sector. Businesses and households keep these products because they believe that they may still be valuable, but the longer equipment remains in storage, the less useful it becomes.

While end-of-life electronics currently comprise only one to two percent by weight of the municipal waste stream, that percentage is expected to grow dramatically in the

next few years. As this waste stream increases, the cost of recycling these materials may become financially prohibitive for Connecticut municipalities and authorities, which may decrease the availability of these events. In addition, the current recycling events are already limited in terms of location and frequency in Connecticut. This has the effect of limiting participation because the events do not serve all the residents of the state, and residents may have difficulty learning about those that are held irregularly. In addition, businesses, especially small businesses that lack the staff/management support found in larger organizations, may not be aware of their obligations or opportunities in handling their end-of-life electronics.

To help address these issues, and as part of the development of this Solid Waste Management Plan, the CT DEP conducted a stakeholder forum in June 2005, at which the management of used electronics was the topic of a breakout session. One of the outcomes from the forum was the following vision statement for used electronics:

> "By 2010, the State of Connecticut should develop reduction/recycling programs to eliminate electronics from landfills and resource recovery facilities. The programs should involve shared responsibilities amongst producers, consumers, retailers, and government."

As part of the planning process, CT DEP requested R. W. Beck to analyze the Maine legislation for managing used electronics, as well as the Northeast Recycling Council (NERC) and National Electronics Product Stewardship Initiative (NEPSI) initiatives to determine how they address shared responsibility for used electronics.

H.1.3 Strategies for Managing Used Electronics

H.1.3.1 Overview of State Strategies

Table H-2 shows an overview of some of the legislative strategies various states are taking to address the management of electronic wastes. The legislative efforts vary in impact, from stating that they will study effective means of managing electronic waste streams, to banning State agency electronics from the waste stream, to charging an advance recovery fee on the sale of electronics.

Table H-2
Examples of State Legislation

State	Type Of Law	Status as of June, 2006
Arkansas	Starting January 1, 2008, State-agency generated computers, monitor's, TVs, audio and stereo equipment, VCRs, keyboards, printers, telephones and fax machines will be banned from landfill disposal.	Signed by the Governor on March 21, 2005

Table H-2
Examples of State Legislation

State	Type Of Law	Status as of June, 2006
California	An advance recovery fee assessed on any device with a cathode ray tube or any flat-panel device; graduated fee system; manufacturer must submit a collection and recycling plan; retailers can retain 3% administrative fee; fines for non-compliant retailers.	Became effective January 1, 2005
Illinois	Commissions a study into effective means for recycling e-waste.	Becomes effective June 1, 2006
Louisiana	Commissions a study into effective means for recycling e-waste and how it should be funded.	Passed House and Senate Presidents
Maine	Manufacturers must submit collection, reuse, recycling plans to State. Municipalities must transport waste electronics to a consolidation site. Manufacturers shall pay for the consolidation, based on market share. Cost can not be separate line item, nor charged at end of product life. Landfill ban on e-waste beginning January 2006. All manufacturers must comply by January 2006, or may not sell products in state.	Bill passed in 2003 and signed by Governor; took effect January 1, 2005.
Minnesota	Established a county-by-county collection system, with manufacturers being responsible for funding the program or creating their own plan.	Took effect July 1, 2005
Washington	Commissions a study into effective means for recycling e-waste. Law enacted that provides for electronic recycling through manufacturer financed opportunities.	Passed May 2004 Bill passed and Governor signs into law March 24, 2006.

H.1.3.2 Maine

Maine legislated one of the country's more progressive models for producer responsibility of used electronics. The law requires individual municipalities to transport television monitors or displays with a circuit board and greater than four inches (targeted electronics) to consolidation facilities. The manufacturers of targeted electronics must ensure that consolidation facilities are situated so as to provide convenient access as determined by the State, and pay reasonable operational costs of the consolidation facilities, transportation to the recycling/dismantling facilities, and the costs of recycling.

The consolidation facilities must then identify and count devices by manufacturer. These facilities must also work cooperatively "…with manufacturers to ensure implementation of a practical and feasible financing system. At a minimum, a consolidation facility shall invoice the manufacturers for handling transportation and recycling costs for which they are responsible under the provisions…"

The cost of this may not be directly passed on to the consumer as a separate line item. If the cost is incorporated into the price of the product, it must be done at the point of purchase, rather than at the end of the product's useful life.

Beginning in November 2005, the manufacturers of the targeted electronics must label all devices. Effective January 2006, no manufacturers may sell targeted electronics in Maine unless they demonstrate compliance with Chapter 1610. Also by January 2006, all targeted electronics will be banned from disposal in Maine.

H.1.3.3 NERC

Northeastern Recycling Council (NERC) is comprised of ten states, including Connecticut, and is currently developing a model for diverting used televisions and computer equipment from landfill disposal. Similar to the Maine approach, manufacturers must label all covered devices with how to obtain information about reuse/recycling, and pay fees to support reuse/recycling collection programs. In addition, retailers must provide information on how to reuse or recycle covered devices. The NERC strategy establishes a not-for-profit corporation designated by the State environmental agency to implement the Act. The corporation's purpose would be to: develop and implement State-wide reuse and recycling programs, receive and distribute fees, recommend adjustments to fees, and report annual progress to State legislature.

The corporation is to be governed by a multi-stakeholder board of directors, comprised of the following representatives: manufactures of covered device; retailers of covered devices; not-for-profit recycler of covered devices; for-profit recycler; government representatives, including one from local government; and ex-officio representative of State agency's director.

The corporation must remit three percent of collected fees to the State agency for administrative, education, and enforcement purposes, and the corporation may not spend more than five percent of its collected fees on administrative expenses.

Other provisions of the NERC strategy include:

- No-charge recycling/reuse programs;
- Recovery, reuse and recycling goals:
  - 100 percent reuse/recycling in ten years;
  - State agency to establish annual goals to progress toward 100 percent; and
  - Agency authorized to implement regulations to create alternative actions to meet goals;

- Disposal Ban (Covered devices would be banned from disposal after two years from enactment);
- Deferral to Federal Law which would sunset this act following implementation of national program for covered devices;
- Incentives for green design; corporations shall annually publicize which manufacturer or brands:
  - Contain the least amounts of specific toxic materials;
  - Contain the highest recycled material content; and
  - Demonstrate the greatest overall improvements in these areas. Manufacturers could use such status in advertisements and promotions.

H.1.3.4 NEPSI

Development of a national recovery system had been underway since 2001 by the National Electronics Product Stewardship Initiative (NEPSI) that promoted a product stewardship approach whereby all parties share responsibility for environmental impacts resulting from the manufacture, use, and disposal of obsolete electronics. The NEPSI collaborative proposed implementation of a sustainable financing system for a national electronics product stewardship plan, utilizing an up-front fee system or cost-internalized model, where the cost for recycling is included in the purchase price of the electronic product. The NEPSI strategy for managing used electronics was similar to the NERC approach in that their proposal included a:

- fee to fund program, possibly an Advanced Recovery Fee , but this has not yet been determined;
- third-party organization to operate/oversee system;
- recovery/recycling goals;
- environmentally sound management; and
- oversight by environmental agency and legislature.

This initiative has come to a close. On the national level, no consensus has been reached and now the states are moving forward in developing their own approaches to managing this type of waste.

H.2 Commercial Food Waste

H.2.1 Statutes and Regulations

CT Statutes

Sec. 22a-207 (5) Volume reduction plant means any location or structure, whether located on land or water, where more than two thousand pounds per hour of solid waste generated elsewhere may be reduced in volume, including but not limited to,

resources recovery facilities and other incinerators, recycling facilities, pulverizers, compactors, shredders, balers and composting facilities.

Sec. 22-207a (1) Composting means a process of accelerated biological decomposition of organic material under controlled conditions.

CT Regulations

Sec. 22a-208a-1. Solid Waste Permit Fee Regulations

(a) Definitions

(31) **Source-separated organic material composting facility** means land, including structures and appurtenances thereon, where the composting of organic material that has been separated at the point source of generation from non-organic material, takes place. For purposes of this section **organic material** means substances composed primarily of carbon and nitrogen, including but not limited to food scraps, food processing residue, soiled or unrecyclable paper and yard trimmings.

(b) Fees for an Application for a Permit to Construct a Solid Waste Facility.

3(B) Source-separated organic material composting facility with a capacity as designed of no more than 100 TPD: $5,000

(C) Source-separated organic material composting facility with a capacity as designed of greater than 100 TPD: $6,500

H.2.2 Other States' Strategies for Encouraging Food Waste Recovery

H.2.2.1 Massachusetts

The Commonwealth of Massachusetts began an initiative to target food waste in the early 1990's. The Commonwealth formed an organics subcommittee to focus on developing significant infrastructure to compost food waste in Massachusetts. Relatively high tipping fees, particularly in the eastern portion of the state, have also helped facilitate the development of this infrastructure. MA DEP also is considering a disposal ban on food waste, if infrastructure is in place by 2010. Another driver that helped initiate interest in food waste composting was the fact that in-sink disposal systems might be disallowed at sites that generate large quantities of food waste. MA DEP also provided the following types of support for their Supermarket Organics Recycling Network:

- Developed a food density mapping study (similar to the one conducted in Connecticut) which is used to provide technical assistance to haulers in terms of developing efficient routes;
- Provided financial assistance to organics generators, processors, and haulers through its Recycling Industries Reimbursement Credit grant and Recycling Loan Fund programs;

- Provided hands-on technical assistance to generators, physically going to sites of large-scale generators and showing them how to effectively capture food waste;
- Worked with State procurement agencies to create State agency demand for compost;
- Partnered with the Massachusetts Food Association, a supermarket industry group. Recently the MA DEP and MFA signed a memorandum of understanding to encourage grocery stores across Massachusetts to increase their recycling participation, especially in terms of composting spoiled fruits and vegetables, deli wastes, and waxed cardboard. By working together, a program that makes sense for industry was created.

In 2004, 57 grocery stores participated in the program. The supermarkets were able to divert, between composting and recycling packaging, 60 to 75 percent of their waste, diverting 8,900 tons of organics, 26,200 tons of cardboard, and more than 1,000 tons of plastic from disposal. This resulted in a cost savings, on average, of more than $45,000 per year per store. Currently, 62 stores participate in the program, and the hope is that at least 100 stores will be participating in the program by 2006. Ultimately, MA DEP hope to have 400 supermarkets actively recycling in three years. The U.S. EPA is looking at the Massachusetts program, and hopes to replicate it nationwide.

H.2.2.2 Pennsylvania

In Pennsylvania, the PA DEP also formed an organics task force to determine how best to promote organics recycling in that state. The task force included a variety of members, including municipal, regulatory, and commercial/industrial members. They used a consensus process to develop recommendations to the PA DEP. The task force submitted their recommendations in August 2002. PA DEP was asked to examine and make strides in the following broad categories: economics and marketing, education and training, legislation and regulation, and coordination and strategy.

Many recommendations were put into action, and today PA DEP's composting programs are growing. PA DEP provides technical assistance opportunities, through a program with the Solid Waste Association of North America, to food waste generators interested in composting food waste. They also have a grant program that provides 90 percent of funds to public entities for recycling infrastructure. In 2005, the State began offering Composting Infrastructure Development Grants for public and private entities needing capital to secure composting equipment. There is a $75,000 maximum per project, and the applicant must pay for twenty percent of the cost of the equipment. The City of Philadelphia received an Act 198 Resource Recovery Demonstration Grant for in-vessel composting of pre- and post-organic food waste in an urban setting.

PA DEP also:

- works with Professional Recyclers of Pennsylvania (PROP) in order to develop workshops and courses on composting and marketing compost;

- developed food processing manual's Best Management Practices, e.g., no permit is required to process food processing residuals on site, if guide is followed;
- developed a general permit for food-waste composting facilities receiving source-separated food waste up to five acres in size; and
- developed an on-farm food waste composting general permit.

This has resulted in several programs with universities, prisons, and farmers, sometimes working collaboratively, to compost food waste. Also, there are several private operators that include food waste in their composting operations. Development of a composting facility can occur relatively quickly, generally within a matter of 30 days for a general permit, and a few months for an individual permit. No public hearing is required unless the PA DEP determines that it is warranted. The PA DEP is planning to develop a general permit that will allow municipal yardwaste sites to accept post-consumer food for processing. PA DEP is also involved in market development for compost. They recently conducted an erosion and sedimentation control and stormwater design class with PROP.

H.3 Construction Waste and Demolition Debris

H.3.1 Statutes and Regulations

In Connecticut, construction waste and demolition debris are regulated as two distinct waste streams.

Construction waste is a component of the MSW waste stream in Connecticut. Section 22a-207 of the Connecticut General Statutes (CGS) defines MSW as solid waste from residential, commercial, and industrial sources, excluding solid waste consisting of significant quantities of hazardous waste as defined in CGS 22a-115, land-clearing debris, demolition debris, biomedical waste, sewage sludge, and scrap metal. Due to construction waste being included in the statutory definition of MSW, this waste stream is required to be disposed in an MSW solid waste landfill or at a resource recovery facility (RRF).

Demolition debris is a component of the bulky waste stream. CGS Section 22a-209-1 defines bulky waste as waste resulting directly from demolition activities other than clean fill. In practice, waste resulting from building and highway construction activities is typically included in the collection, processing, and disposal of bulky wastes. Bulky waste also includes land clearing debris. Bulky waste is less stringently regulated than MSW in Connecticut. Consequently, demolition debris is not required to be disposed in MSW solid waste landfill or at an RRF, and is permitted to be disposed at a bulky waste landfill.

H.3.2 Existing Infrastructure

The terminology currently used to categorize bulky and bulky-type wastes makes it difficult to separate construction waste, demolition debris, oversized MSW, and other

bulky wastes. The CT DEP estimates that in 2004, 1.1 million tons of bulky wastes were generated in Connecticut. As discussed in Appendix F, the majority of construction waste and demolition debris in Connecticut is delivered to volume reduction facilities (VRFs). VRFs sort construction waste and demolition debris, removing some materials for recycling, and reduce the volume of the remaining waste to enable more cost-effective transportation.

In Connecticut, it is estimated that in 2004 approximately 7 percent of bulky waste was recovered and marketed. The majority of this recovered material was cardboard, scrap metal, and clean wood. Approximately 12 percent of the residue (non-recovered material) was disposed in Connecticut and 81 percent was transported out-of-state for final disposal. Ohio receives the majority of Connecticut's VRF residue (49 percent), with Pennsylvania (25 percent), Massachusetts (18 percent), and New York (9 percent) receiving smaller amounts.

H.3.3 Assessment of Existing System to Manage Construction Waste and Demolition Waste

The generation of C&D waste typically increases as communities develop housing stock and office space. Currently, only about 7 percent of C&D waste is reported as being recycled and/or reused in Connecticut. Comments from CT DEP External Stakeholders Committee reflect some dissatisfaction with the current permitting process for recycling facilities. In addition, the State's beneficial reuse policies do not appear to facilitate innovate waste reduction alternatives. Nor has the State allocated funds for the research and development of C&D waste recycling and market development.

As previously discussed, Connecticut regulations include construction waste in MSW and demolition debris in bulky waste. However, CT DEP believes that a measurable portion of construction waste and demolition debris is managed as one waste stream. In addition, demolition debris that is transported to certain VRFs can be consolidated with MSW if they are permitted to receive MSW. In some instances, these particular VRFs are sending waste, which includes MSW, to out-of-state landfills that are only permitted to accept C&D waste. The concern about MSW being included in out-of-state waste has prompted some states, such as Ohio, to consider significant restrictions on imports from out-of-state VRFs to C&D landfills. If the states receiving waste from Connecticut VRFs become less flexible about this waste stream, they could reduce the number of facilities that may receive this waste stream or increase the disposal cost. Beyond out-of-state shipments, CT DEP currently has no monitoring mechanism to assure that construction waste is not being disposed in bulky waste landfills.

H.3.4 Strategies for Minimizing Construction Waste and Demolition Debris

The following programs and strategies are examples of options for minimizing the disposal of C&D waste disposed and are designed to increase the amount of such

waste that is recycled, reduced or reused: green building programs that promote the Leadership in Energy and Environmental Design (LEED) rating system for new and rehabilitated buildings; material recovery facilities; on-site grinding; and deconstruction.

H.3.4.1 Green Building Programs

Green building is an environmentally responsible approach to land development and housing construction in an effort to conserve natural resources. A green building approach can involve virtually every aspect of design and construction for both the structure(s) and landscape.

The U.S. Green Building Council (USGBC) developed the LEED Program. LEED is a rating system used to set standards and provide evaluation criteria to determine if construction or deconstruction of commercial or institutional buildings has occurred in an environmentally friendly manner. The LEED rating system is made up of a checklist of a number of possible points and recommends strategies that enable a building project to earn these points. These points are based on a number of different categories including: sustainable sites; water efficiency; energy and atmosphere; materials and resources; indoor air quality; and innovation and design process.

Since commercial buildings are typically much larger than homes, the potential impact of commercial buildings on the waste stream is significant. Instituting a program such as LEED is one way to encourage waste minimization activities in commercial building. The USGBC has also developed a similar program for the residential sector. In addition, the American Society of Landscape Architects (ASLA) is creating a draft tool for rating a site's outdoor ecological innovation. ASLA officials hope to work with the USGBC so that the rating standards become part of the Council's widely used LEED system.

Green building programs are usually administered by a local or regional government, local utilities, or a homebuilders association. Communities with green building programs are typically responsible for developing evaluation criteria and certifying whether a building meets the criteria. Many green building efforts occur based on voluntary programs developed to encourage the use of green building practices in the construction industry. Denver, Colorado and Austin, Texas are often cited as having the largest and most well established green building programs in the United States. Some cities, such as Frisco, Texas and Boulder, Colorado, have mandatory programs that require builders to comply with their green building programs in order to obtain building permits.

Today, there are 20 to 30 established green building programs across the country; however, more cities are developing green building programs on a regular basis. Nationwide, there were 18,887 homes built to local green building program guidelines from 1990 - 2001. In 2002 alone, there were 13,224 green homes built. It appears that the number of new green building homes will increase going forward given recent increases in the number of newly established programs across the United States.

H.3.4.2 Green Builder Case Study

The City of Austin, through its electric utility, Austin Energy, developed the first green building program in the United States in 1990. Austin Energy originally piloted this program in order to promote energy conservation. The initial idea was to work with builders to identify and develop opportunities to improve energy code compliance. Based on the success of this effort, Austin Energy expanded the program to include other factors such as water conservation, waste management, site development and impact on the community. While the program is primarily voluntary, it is required in the downtown district and for affordable housing projects. Austin Energy staff stated green building is required for affordable housing projects in an effort to reduce future, long-term utility costs. Furthermore, their research has indicated that green building can often occur for these projects without added costs. Austin Energy has a five-level certification system, ranging from one to five stars. To determine the level of certification, Austin Energy uses a comprehensive, weighted checklist. All buildings must meet certain mandatory requirements, as well as attain points from specific requirements in categories that include energy, materials, water and health/safety. The materials category includes waste management issues. The mandatory requirements primarily focus on energy conservation issues, but also include limited water conservation measures.

The management of waste managed also is a component of the program's rating system. Builders have an option of deciding which of the following waste management alternatives they would like to accomplish:

- at least one 50 percent recycled-content material used;
- lumber longer than two feet is used or recycled;
- jobsite garbage is recycled according to the City of Austin Solid Waste Services guidelines including: paper, plastic bottles, glass bottles and jars, and metal cans (no paint cans, no hazardous materials);
- Stone, concrete, masonry rubble, metal scraps and corrugated cardboard construction waste is separated and re-used or recycled.

Staff from Austin Energy stated that having a waste management plan as a part of the construction process is very important, as it specifically guides how waste will be managed. Staff also stated that on-site grinders have been used successfully in the Austin area. Based on discussions with an on-site grinder subcontractor in the Austin area, some homebuilders were initially skeptical about using on-site grinding due to their unfamiliarity with this approach. However, since the subcontractor was able to provide service at the same cost as disposal, the builders chose to try the on-site grinding. In addition, the builders have been very pleased with many of the consequential benefits including site maintenance and increased marketability.

From a long-term perspective, Austin Energy recommends using materials that will be more durable over time, as this will eliminate or delay the need for replacement, which would increase disposal quantities. For example, masonry is preferred over siding, and roofs using high quality shingles are recommended.

Austin Energy offers multiple training and technical assistance to the building industry. Austin Energy will conduct formal seminars for members on a monthly basis that focus on specific topics. Austin Energy is proactive in attracting green building conferences to the city, which provides opportunities for builders to access valuable information in a cost-effective manner.

One-on-one technical assistance to members is a key component of the program. Austin Energy staff will meet directly with builders and frequently conducts research for its members. Builders have stated to Austin Energy staff that this is a valuable resource that they feel comfortable using on a regular basis.

H.3.4.3 Construction Waste and Demolition Debris Material Recovery Facilities

Construction waste and demolition debris contains materials such as concrete, wood, metal, and cardboard that is generated from construction, demolition, and renovation projects. This material has a net economic value if it can be recovered and reused less expensively than disposed in a landfill. There are several ways to reuse and recycle construction waste and demolition debris material. One way is through the use of a material recovery facility (MRF), which is a processing center that accepts mixed C&D waste, and then sorts it by material type. The MRF operator can then sell materials with an economic value. The remaining material that has little or no value, called residual, must be landfilled or otherwise disposed or reused.

To illustrate the configuration and potential of a C&D MRF, a model facility has been developed. This model facility assumes:

- average amount of material processed of 580 tons per day,
- operational schedule of 5 days a week, 8 hours a day,
- site size of approximately seven acres of land, and
- building footprint of 52,500 square-foot building, including a scale house with both in-going and out-going scales and a pre-engineered 1,000 square-foot administrative building with a break area and small office space.

A C&D MRF collects mixed C&D waste from construction, demolition, and renovation projects. While some loads of delivered material may consist of one or two types of material, the typical load will be composed of a mixture of several materials.

The composition of C&D waste is far more variable than MSW and will depend on the type of construction or demolition, the stage of construction or demolition activity, the area of the country where the activity is taking place, and many other factors. The North Carolina Department of Environmental and Natural Resources conducted a study that included an estimate of the overall composition of C&D waste. The results are shown in Table H-3. Because no waste composition data was available for Connecticut, this estimate was used in developing the model C&D MRF.

The equipment used at a C&D MRF includes both processing equipment to separate the mixed C&D waste and rolling stock to move material within the facility.

H.3.4.3.1 Processing Equipment

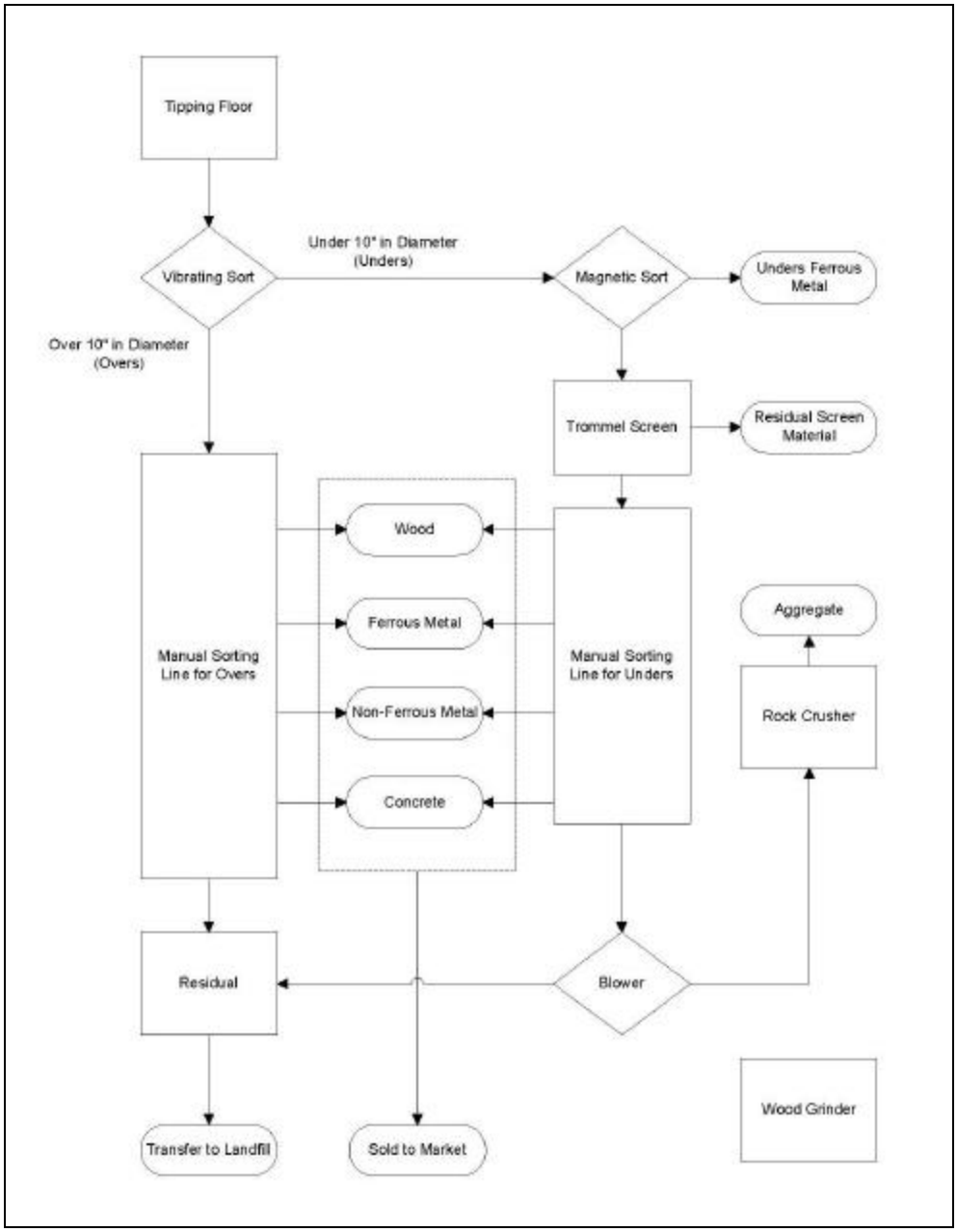
The processing equipment is the most capital-intensive component of the C&D MRF and may include: vibrating screen, conveyors, manual picking lines, magnetic sorter, trommel screen, storage bins, rock/concrete grinder, and wood grinder. Figure H-1 presents a process flow diagram of the model facility, which is typical of C&D MRF of this size.

Table H-3
Type of C&D Debris (1)

Material	% of C&D Waste Stream (by weight)
Wood	27.5%
Drywall	13.4%
Cardboard	2.7%
Metals	8.8%
Plastics	0.5%
Masonry	4.8%
Concrete	18.4%
Roofing	12.0%
Asphalt	0.1%
Miscellaneous	11.8%
Total	100.0%

(1) Source: North Carolina Department of Environmental and Natural Resources, Construction & Demolition Commodity Profile Markets Assessment 1998

Figure H-1
C&D MRF Process Flow Diagram



H.3.4.3.2 Rolling Stock

Rolling stock is equipment that moves C&D waste within the facility and may include a front-end loader used on the tipping floor to lift the mixed C&D waste onto the vibrating screen (see Figure H-1) and a second front-end loader to place residuals and recovered materials into the outbound trucks and feed wood into the grinder.

The model facility assumes that residual material is placed into the transfer trucks for disposal at a landfill using the front-end loader. The transfer trucks would be in a bay

that lies below grade so that the top of the trailer is level with the floor of the C&D MRF. This allows the front-end loader to simply push the material into the transfer trailer.

The facilities at the C&D MRF site include three primary buildings: a main building that contains the processing equipment, an administrative support building, and a scale house at the entrance/exit.

There are several categories of staffing required at a C&D MRF. Table H-4 provides an overview of the full-time staff requirements for the model facility.

Table H-4
Staffing Requirements

Staff Position	FTE Required
Heavy Equipment Operators	2
Pickers for Overs Manual Picking Line	8-12
Pickers for Unders Manual Picking Line	3-4
Picker for Rock Crusher Line	1
Floor Workers	4-6
Scale House	1-2
Crew Leader	1-2
Supervisor	1
Mechanic	1-2
Administrative Assistant	1
Total	**24-35**

H.3.4.4 Commodity Materials

At the present time, the materials recovered at a C&D MRF with the greatest value include the following:

- **Wood**: Generally, the markets for recovered wood include use as a component of engineered woods, landscape mulch, animal bedding, compost additive, and boiler fuel. These markets vary by region and depend on other available materials and which industries are located in the region. Connecticut regulations do not allow treated wood to be used as mulch, compost, or animal bedding.
- **Metal**: Scrap metals, both ferrous and non-ferrous, have well-developed markets. Although prices can suffer from large fluctuations, the demand is consistent.
- **Concrete**: Concrete and other masonry products can be ground up and used in paved roads as aggregate base, gravel roads as surfacing, and as base for building foundations. It should be noted that concrete is considered clean fill. Clean fill is not regulated by the CT DEP. Clean fill also includes brick, block, asphalt, and

rock. Clean fill is recovered at a MRF is typically transported to an aggregate recycling facility for processing.

- **Cardboard**: Although cardboard represents a relatively small portion of the mixed C&D waste stream, it is currently a valuable commodity with an established market. However, the revenue from selling cardboard may depend on whether the MRF has enough cardboard to interest a potential buyer.

H.3.4.5 Non-Recoverable Materials with Alternative Uses

While some of the by-products of a C&D MRF are not considered valuable in the marketplace, the MRF operators may be able to find customers that are willing to accept the material at no cost, rather than landfilling the material and paying a tipping fee.

For example, the 3/8-inch trommel screen in the model facility allows very small size material to pass through and drop to the one of the collection bins below. This material, called residual screen material ("RSM"), is similar in many respects to dirt. While the RSM may not be sufficient for some uses, neighboring landfills may accept this material without charge for use as alternative daily cover or road stabilization.

H.3.4.6 On-Site Grinding Programs

On-site grinding is the practice of grinding or crushing building materials that would traditionally be disposed of at a landfill, and using them on-site as a soil amendment or for erosion control. From a waste management perspective, on-site grinding can divert up to 85 percent of C&D waste generated from new home construction. It should be emphasized that care must be taken to avoid grinding any hazardous materials that may be part of the C&D waste. For this reason, although on-site grinding is taking place in other parts of the country, the CT DEP does not consider this a preferred option.

Homebuilders have two options for on-site grinding. The homebuilder may choose to own and operate a grinder or subcontract on-site grinding services. Both options use on-site grinders to process materials that have been designated for disposal from the construction of homes. Once separated, the material is processed onsite into smaller chips or dust. This material is typically used onsite for erosion control.

The economic feasibility of on-site grinding can vary depending on the following factors: the number of homes or buildings being serviced by the grinding operation, the type of construction, the stage of construction, and cooperation between the contractor and the grinding operator.

Grinders are available in a variety of types and sizes. The throughput capacity of a grinder is most often affected by its size, its age, and the type and quantity of material it is processing.

Grinders are ideal for processing wood, stone, masonry, drywall, and corrugated cardboard. C&D waste such as wood or drywall typically must be trimmed, shortened, or split prior to loading into the grinder. Initially cutting it into sections

will increase the machines ability to grind the material without stoppages, as well as allow for more material to be loaded at one time.

Table H-5 illustrates the major waste generating periods of a development and the materials that are typically generated for each phase of construction. Based on discussions with homebuilders, the slab, frame, and sheetrock cleanup phases generate the greatest amounts of debris and require the most time for grinding.

Table H-5
Major Waste Generating Periods

Period	Type of Waste
Slab Cleanup	Wood
Frame Cleanup	Wood
Cornered Cleanup	Stone/Masonry (1)
Rough Mechanical Cleanup	Corrugated Cardboard
Sheetrock Cleanup	Drywall
Trim Cleanup	Wood
Final Mechanical Cleanup	Corrugated Cardboard

(1) Based on discussions with grinder operators, breakdowns will most often occur during the grinding of stone, masonry or other dense materials.

Using C&D materials to replace a portion of the common fill used on the site at the end of the job can save approximately 50 cubic yards of material that would otherwise be purchased and hauled to the construction site. In addition, the use of wood chips as a means of erosion control in lieu of silt fencing can also be cost-effective.

H.3.4.7 LEED Deconstruction

Deconstruction is defined as the selective dismantling and removal of materials from buildings for reuse or recycling. This process, as an alternative to the more traditional demolition of a building, can serve as an effective way of substantially reducing the amount of waste entering the waste stream. Deconstruction is also one of the many activities used under the U.S. Green Building Council's LEED program.

There are several keys to a successful LEED deconstruction project, including the following.

- Waste management plans are a key to successful waste minimization efforts, as these plans provide a complete description of how waste will be managed throughout all phases of the deconstruction project.
- Communication between the contractor and city staff should continue throughout the project. This may include phone calls, site visits, and weekly meetings. City staff should monitor operations on a day-to-day or weekly basis to observe the deconstruction process and make certain that the waste management plan is being

carried out. City staff should also obtain bi-weekly or monthly reports on all disposed and recycled tonnage data.

- Cooperation between contractors and recyclers is necessary to negotiate equitable agreements, and to obtain load verification tickets upon depositing loads at their facilities. Whenever possible, loads should be independently verified on-site by deconstruction staff to ensure accuracy.

During the planning process it is important to establish realistic diversion goals. It is simply unrealistic to recycle or reuse all of the material from a demolition project. Typically, a goal of 70 to 80 percent diversion by weight for many projects is possible. However, the diversion goal will always be project-specific.

H.3.5 Funding for Construction Waste and Demolition Debris Minimization

The following serves as an illustration of the types of programs that were available for funding C&D waste minimization projects in July 2005. Typically these programs are established and curtailed quickly.

Pilot programs for C&D waste minimization may require alternative funding sources during the project initiation period. Typically these funding sources are grants or loans intended to assist the program on a short-term basis. The information provided below should be used as a guide for local governments or the private sector during the planning stages of a C&D waste reduction program or project.

H.3.5.1 Funding for State Governments

Environmental Protection Agency

The U.S. Environmental Protection Agency's Office of Enforcement and Compliance Assurance offers a grant to foster environmental enforcement and compliance assurance activities and to improve compliance with environmental laws. This grant could be applied for by the State of Connecticut to enforce any laws pertaining to the recycling of C&D materials.

H.3.5.2 Funding Local Governments

U.S. Department of Agriculture

The U.S. Department of Agriculture's Rural Utility Service offers solid waste grant No. 10.762. It may be used to provide technical assistance or training to help associations divert materials from landfills. This grant could be used by municipalities or regions to provide consulting to either public or private sector entities in the design of C&D processing facilities, including C&D MRFs, C&D recycling education programs, C&D recycling pilot programs, or other uses that promote C&D recycling.

U.S. Environmental Protection Agency

The U.S. EPA's Office of Solid Waste offers solid waste grant No. 66.808. One purpose for the grant is to promote the use of integrated solid waste management systems to solve municipal solid waste management problems at the local levels and to assist in advancing waste minimization programs.

U.S. Department of Commerce

The Economic Development Association, which is a part of the U.S. Department of Commerce, offers grants geared towards the revitalization of depressed areas of cities and towns. Such grants to state and local governments could help to fund local private investment in the recycling industry tied to C&D waste or reuse or salvage of wastes. The funding of a C&D MRF would be a potentially eligible project.

The Home Depot Foundation

The Home Depot Foundation has four grant initiatives, one of which is associated with aiding the environment. Based on discussions with Foundation representatives, grants for C&D waste minimization projects are within the environmental topic area.

H.3.5.3 Funding for Developers

Green Communities Program

The Enterprise Foundation and the Natural Resources Defense Council created the Green Communities Program in 2004. The initiative provides $550,000,000 over five years in low interest financing, grants, and technical assistance for the development of 8,500 housing properties across the nation that conserve energy and natural resources.

H.3.5.4 Green Building Funding Opportunities

The Home Depot Foundation

The Home Depot Foundation is also interested in building efficient and healthy homes. Green building programs that promote this type of building are in line with the programs values. Grants for green building are within the Foundation's stated scope of interest.

StEPP Foundation

The StEPP Foundation aims to increase the number of energy efficiency, clean energy and pollution prevention projects implemented across the country through the funding of projects performed by governmental, non-profit, and academic entities. Based on the latest available data, the foundation awarded over $500,000 in grants in 2003.

Table H-6
C&D Recycling Grant Information

Name of Program	Typical Value	Website/ Contact Information	Deadlines
Available to Local Governments			
USDA Grant #10.762	$85,000	http://12.46.245.173/cfda/cfda.html (1)	N/A
U.S. EPA Grant #66.808	$76,000	http://12.46.245.173/cfda/cfda.html	Varies by regional office
Economic Development Assoc	N/A	http://12.39.209.165/xp/EDAPublic/InvestmentsGrants/FFON.xml	N/A
StEPP Foundation	$100,000	http://www.steppfoundation.org/main.htm	N/A
The Home Depot Foundation	$5,000 - $25,000	http://www.homedepotfoundation.org/hfus/enus/apply.html	Four deadlines throughout the year
Available to State Governments			
U.S. EPA Grant	N/A	http://www.epa.gov/compliance/	N/A
Available to Developers			
Green Communities Program	$15,000 - $50,000	http://www.enterprisefoundation.org/resources/green/QA/index.asp	N/A

(1) Link to Catalog of Federal Grant Search Engine; this search engine enables user to access all federal grants. These grants may also be located by using an internet search engine such as Google.

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Appendix I
ENVIRONMENTAL IMPACT OF DISPOSAL OPTIONS

Background

Environmentally compatible disposal of solid waste generated in Connecticut over the next 20-year planning period is a priority Department objective. Alternative disposal options available to the Sate include:

- Adding additional in-state Resources Recovery Facility ("RRF"), along with the associated ash residue disposal capacity needed in-state;
- Implementing new in-state MSW landfill capacity; and/or
- Use in-state transfer stations for transfer and transport of wastes to out-of-state landfills and/or RRFs.

Over the next 20 years, the potential exists for new disposal technologies to emerge. Some alternative technologies (e.g., gasification) are already proven from a technological standpoint. However, achieving economic viability remains the largest hurdle for such options in the foreseeable future. As a result, such alternative technologies have not been included in this comparison. However, it is assumed that CT DEP will continue to monitor alternative technologies for their feasibility and cost-effectiveness.

This Section examines the environmental impact (on air, land, and water) associated with each alternative disposal option, and is organized accordingly. For comparison purposes, each disposal option is assumed to be compliant with the latest federal and state environmental regulations.

Applicable federal and state environmental regulations provide the basis for this discussion. The federal regulations that have led to the promulgation of state regulations include the following:

- Clean Air Act ("CAA") (42 U.S.C. s/s 7401 et seq. (1970));
- Resource Conservation and Recovery Act ("RCRA")(42 U.S.C. s/s 6901 et seq. (1976)); and
- Clean Water Act ("CWA") (P.L. 92-500) (1972).

It is important to recognize that federal regulatory standards establish minimum compliance requirements. When implementing such requirements, states may elect to impose more stringent regulations.

Other applicable state regulations promulgated from implementation of Title 22a of the General Statutes of Connecticut ("CGS") referenced in this analysis include:

- State of Connecticut Solid Waste Management Regulations (Section 22a-209);

- Section 22a-174, relating to the Abatement of Air Pollution; and
- Section 22a-430, relating to Water Discharge Permit Regulations.

The potential environmental impacts associated with each of the potentially viable solid waste disposal options available to the state are discussed in separate sections below.

Finally, an analysis of the U.S. EPA's Waste Reduction Model (a.k.a. Greenhouse Gas Model) has been conducted to assess the change in emissions of carbon and CO_2 under several waste management scenarios using data from Connecticut's Solid Waste Management Plan. A discussion of this analysis and the results appears as the final section of this appendix.

I.1 In-State Disposal – Resource Recovery Facilities

I.1.1 Background

Resource Recovery Facilities ("RRF") operations are subject to stringent federal regulations under the CAA, RCRA, and CWA. As a source of air emissions, each RRF is required to obtain a Title V permit issued pursuant to Title 22a of the CGS and Section 22a-174-33 of the Regulations of Connecticut State Agencies ("RCSA") and pursuant to the Code of Federal Regulations ("CFR"), Title 40, Part 70. The overarching purpose of the Title V permits is to reduce violations of, and improve enforcement of air pollution laws. More specifically, Title V permits include monitoring, testing and recordkeeping requirements, and require the source to certify each year whether or not it has met all of the requirements in its Title V permit.

RRFs are also subject to state regulations that include site-specific environmental, health risk, safety assessments. Under Section 22a-209-4 (b) (2) (B) and (C) of the State of Connecticut Solid Waste Management Regulations each RRF must have separate permits to construct and to operate. These provisions require, among other things, demonstration of how OSHA safety requirement will be met, and how the facility will minimize environmental impacts. As applicable, such a facility must also be consistent with the State Solid Waste Management Plan, the Connecticut Solid and Hazardous Waste Land Disposal Siting Policy, and the Connecticut Water Quality Standards.

It is fully anticipated that the State of Connecticut will continue to rely heavily on RRFs for the disposal of MSW during the next 20 years. Based on their track record of exceeding compliance with regulatory requirements detailed selectively in the sections below, any negative environmental impact from such operations is expected to continue to be negligible.

I.1.1.1 Potential Impact of RRFs on Air Quality

Air emissions generated by RRFs include acid gases (e.g., hydrogen chloride ("HCl"), sulfur dioxide ("SO_2"), and nitrogen oxides ("NO_X"), metals (e.g., cadmium, lead, particulate matter, mercury), and organics (e.g., carbon monoxide ("CO"),

dioxins/furans). Such pollutants, if not properly controlled and managed, can cause adverse impacts to human health and the environment such as bioaccumulation of mercury in the environment, acid rain, and ground level ozone from nitrogen oxides.

Federal CAA regulations aimed at controlling such emissions from RRF include:

- New Source Performance Standards ("NSPS");
- National Ambient Air Quality Standards ("NAAQS"),
- Prevention of Significant Air Quality Deterioration ("PSD") for attainment areas,
- New Source Review ("NSR") for non-attainment areas, and
- Operating Permit Review and periodic renewal.

On February 1991, the U.S. EPA issued NSPS for RRFs under Subpart Ea of 40 CFR Part 60, and Emission Guidelines for existing facilities under Subpart Ca of 40 CFR Part 60. Subsequently, under Section 129 of the CAA Amendments of 1990, U.S. EPA was directed to revise the earlier municipal waste combustor (i.e., RRF) regulations to address additional pollutants and to regulate both large- and small-unit facilities based on maximum achievable control technology ("MACT"). EPA promulgated revised regulations for large-unit facilities (i.e., unit capacity >250 tons per day ("TPD")) in December 1995 and these facilities were subject to compliance by December 2000. Small-unit facilities (i.e., 35 TPD to 250 TPD) became delayed due to a lawsuit and will meet similar MACT requirements by December 2005.

To determine the level of emission reductions thus far resulting from the MACT regulations, U.S. EPA collected stack data from all large units. According to a June 2002 U.S. EPA memorandum, "The performance of the MACT retrofits has been outstanding. Of particular interest are dioxin/furan emissions and mercury emissions. Since 1990 (pre-MACT conditions), dioxin/furan emissions have been reduced by more than 99 percent, and mercury emissions have been reduced by more than 95 percent." (U.S. EPA, Office of Air Quality Planning and Standards Memo, Docket A-90-45, June 2002).

These and other significant emission reductions resulted from: 1) air pollution control device retrofits on existing RRF units; 2) the retirement of several RRF units; and 3) special actions, most notably U.S. EPA's dioxin initiative and the voluntary mercury reduction by battery manufacturers.

Moreover, regarding the dioxin levels, the German Ministry of the Environment recently concluded, in a major international report, that dioxin emissions from its 66 well-controlled waste-to-energy plants are no longer a significant public health concern. The Japanese have reported similar results, and public health experts at the Massachusetts Institute of Technology have reached similar conclusions.

According to U.S. EPA, the small-unit municipal waste combustor rule will reduce emissions of organics, metals, and acid gases by about 4,700 tons per year nationwide. Further, based on 1990 emissions data, the rule will reduce dioxin emissions by at least 97 percent and mercury emissions by 95 percent. When combined with the impact of the large-unit rule, dioxin emissions from municipal waste combustors in the

U.S. will account for less than half of one percent of known sources, and mercury emissions will account for less than two percent of the U.S. inventory.

In addition to NSPS, each new RRF, depending upon its size and projected annual emissions, is subject to PSD permit requirements. PSD permit provisions include an analysis of existing air quality surrounding the facility, determination of what constitutes the Best Available Control Technology ("BACT"), emission dispersion modeling, facility plans and specifications, and public comment and hearings.

A New Source Review (NSR) Permit is also required for any proposed RRF to be located in a non-attainment area with an emission increase equal to or more that those listed in for a PSD review. Such a facility must employ emission controls that achieve either the strictest emission rate achieved by an existing facility, or the strictest limitation in the State Implementation Plan ("SIP"). The facility emission rate must also be offset by the reduction of that pollutant from an existing source, times a factor dependent upon the severity of non-attainment level of that pollutant. Further, the CAA requires each state to adopt a state implementation plan for the implementation, maintenance, and enforcement of primary and secondary NAAQS for each air quality control region in the state, including both attainment and non-attainment areas.

In Connecticut, there are both large (e.g., Bridgeport) and small (e.g., Wallingford) unit RRFs. All are subject to federal MACT rules by no later than December 2005 and to State regulations under Section 22a-174-38. Key municipal waste combustor provisions included in the state regulations relate to:

- Specific air pollutant emission limits relating to heavy metals, organics, and acid gases;
- Nitrogen oxides emissions trading program;
- Fugitive ash emission;
- Operator training and certification;
- Continuous compliance monitoring; and
- Record keeping and reporting.

Further, State of Connecticut Solid Waste Management Regulations for RRFs, under Section 22a-209-10, provides compliance requirements relating to air quality. These include requirements that air emissions, dust and odors must be controlled at all times to assure compliance with the applicable regulations of the Department of Abatement of Air Pollution.

Solid wastes that are collected for disposal at in-state RRFs are typically hauled directly from the collection point to the RRF or be taken to a transfer station and hauled a relatively short distance to the RRF. As described in the section addressing truck transportation air emissions inherent with use of out-of-state disposal options, disposal of solid waste at in-state RRFs results in far lower air emissions than the alternatives.

It should be noted that each of Connecticut's RRF units employ state-of-the art air pollutions control equipment, the requirement to perform annual emissions tests and

ambient sampling. Connecticut's NOx limitations are more stringent that current federal standards and one of the most stringent RRF mercury emission rates in the United States, leading to the installation of mercury air pollution control devices.

I.1.1.2 Potential Land-Related Impacts of RRFs

The RRF combustion process produces an ash residue (residue) amounting to approximately 25 percent (dry weight) of unprocessed MSW input. This residue is in the form of bottom ash, which comprises the largest quantity (about 80 percent), and fly ash. Bottom ash contains a combination of heavy noncombustible materials like ferrous metals, glass, and ceramics, and ash residues. Fly ash consists of the lighter products of combustion and those materials collected in the emission control equipment. Such materials are in particulate form. Most RRF operations combine the residue streams to facilitate proper management and disposal.

In Connecticut, approximately 550,000 TPY of residue is generated by the six operating MSW RRFs. Though no ash residue is beneficially used in Connecticut, across the U.S., more than 2.9 million tons of RRF ash is currently being beneficially used in various landfill applications (e.g., daily cover, road construction, landfill closure material, landfill gas venting layer).

Strict management of RRF ash residue is important since it contains constituents that could potentially adversely impact human health and the environment. Constituents of particular concern include heavy metals such as lead, cadmium, and mercury. Two major programs under RCRA regulate management of RRF ash. RCRA gave U.S. EPA the authority to control hazardous waste from the "cradle-to-grave" Subtitle C and also set forth a framework for non-hazardous waste (i.e. Subtitle D) management. RRF facilities must determine if their ash is hazardous. This is typically accomplished through testing. Per a May 1994 ruling by the U.S. Supreme Court, an RRF ash residue that exhibits a hazardous waste characteristic is defined to be a hazardous waste and must be managed accordingly. However, the testing of ash since the U.S. Supreme Court decision has generated an extensive database proving that RRF ash is not hazardous, and only subject to Subtitle D and state regulations.

The disposal of residue, under State of Connecticut Solid Waste Management Regulations Section 22a-209-14, provides compliance requirements relating to the prevention of residue dispersion, the safe management and transport of residue, engineering plans for construction and operation of residue monocells, and cover requirements. Further, State of Connecticut Solid Waste Management Regulations for RRFs, under Section 22a-209-10, provide compliance requirements relating to potential land worker safety impacts including waste restrictions, waste storage, working area, fire control, explosive protection and litter control at the RRF, operator certification, fire control, and explosion protection.

Assuming full compliance with applicable state regulations, the in-state disposal of ash residue will likely mean reduced land-related environmental, health and safety impacts when compared with the total land related impacts of transfer/transportation to out-of- state residue disposal facilities.

I.1.1.3 Potential Water Quality Impacts of RRFs

RRFs generate wastewater in a variety of forms including tipping floor runoff system wash water, ash quench water, pollution control system water, sanitary wastewater disposal, and site surface-water runoff. When not properly managed, wastewater could have a negative impact on both surface and ground waters. RRF wastewater is typically recycled in a closed-loop system. The quantity of water consumed at most facilities is a few gallons per ton of MSW burned. Such wastewater is often discharged to a local sewer system, and may require pretreatment.

The State of Connecticut Solid Waste Management Regulations for the disposal of residue, under Section 22a-209-14, provides compliance requirements relating to the protection of state waters from pollution, the use of monocells for residue disposal, leachate management, groundwater monitoring, post-closure maintenance and monitoring and stormwater control. Moreover, Section 22(a)-209(b)1 requires compliance with all applicable provisions of Chapter 446d of the General Statutes and Sections 22a-209-1 through 22a-209-13 inclusive of the Regulations of Connecticut State Agencies. A residue monocell liner system is required that consists of a protective cover, a leachate collection system, a primary liner, a leachate leak detection zone, a secondary liner, and a sub base (i.e., bottom of the liner system).

The probability of groundwater contamination from RRF ash residue operations has been proven to be negligible due to the extremely stringent siting criteria for all solid waste landfills in the state described in more detail in the next section addressing Subtitle D landfills. Moreover, proper management and handling practices driven by operating permits requiring that the appropriate wastewater treatment and disposal permits be in place at all times. Further, test results and measurements taken in the field show that the levels of metals present in waste-to-energy ash leachate are close to drinking water standards and far lower than the TCLP toxicity criteria.

I.2 In-State Solid Waste Disposal – Subtitle D Landfills

I.2.1 Background

It is anticipated that the State of Connecticut will rely, at least to some degree, on landfill disposal of various waste streams over the next 20 years. This is inevitable, as land disposal is required for residue from recycling and combustion, and can also be used as backup emergency disposal capacity if alternative facilities are temporarily out of service, or to handle overflow waste due to seasonal changes in generation, as well as oversized MSW.

Solid waste landfills are subject to two primary types of federal, state, and local government standards: engineering design standards and performance standards. The former are essentially building codes that specify how the landfill must be constructed. The latter apply over the facility's operating life and specify that high levels of environmental control be accomplished during the operation, closure and post-closure stages. The state agency responsible for groundwater quality may define the maximum allowable contaminant concentration allowed in groundwater below or

adjacent to the site. Landfill operators must then install the necessary control system to be in compliance with the groundwater standard. If the initial landfill design is inadequate, additional protective systems must be installed.

The federal government establishes minimum landfill standards that are implemented at the state level. For example, RCRA regulations (40 CFR, Section 258) focus on air criteria, surface water requirements, groundwater monitoring, landfill gas hazard and nuisance abatement, etc., and CAA regulations (61 RF 9905, March 12, 1996) focus on control of landfill gas emissions.

The State of Connecticut Solid Waste Management Regulations for solid waste disposal areas, under Section 22a-209-4, require that each facility must have a permit to construct and a permit to operate. These provisions require, among other things, hydro-geologic and geologic information including predictions of movement of and impact on surface and ground water, and controls necessary to protect public health, safety, and welfare.

State of Connecticut Solid Waste Management Regulations for solid waste disposal areas, under Section 22a-209-7, further detail that facilities or practices shall not cause or contribute to the taking of any endangered or threatened fish, plant, or wildlife species, pursuant to Section 4 of the Endangered Species Act. Likewise, the facility or practice shall not destroy or adversely modify the critical habitat of endangered or threatened species, as identified in 50 CFR Part 17.

As applicable, MSW landfills must also be consistent with the State Solid Waste Management Plan, the Connecticut Solid and Hazardous Waste Land Disposal Siting Policy, and the Connecticut Water Quality Standards.

I.2.2 Potential Impacts of MSW Landfills on Air Quality

The decomposition of solid waste in landfills generates a gas that is primarily comprised of methane and carbon dioxide. Gas from landfills is the single largest source of human made methane emissions in the U.S., contributing approximately 40 percent of the total. Each ton of methane emitted into the atmosphere has the same impact as 21 tons of carbon dioxide over a 100-year time period. Methane also cycles through the atmosphere about 20 times faster, meaning controlling this source can make quicker progress toward slowing global climate change. In addition to being a greenhouse gas ("GHG") and a hydrocarbon source, landfill gas entering the atmosphere will carry trace quantities of a large number of volatile organic compounds ("VOCs"), some of which have known adverse health effects.

Landfill gas must be properly controlled to protect human health and the environment. Gas that is not collected and/or recovered will either vent to the atmosphere or migrate underground. Landfill gas control and recovery also offers the potential of reducing the risk of global climate change. In both cases monitoring and control equipment must be used to detect and control air pollution to prevent threats to landfill employees, on-site structures and surrounding vegetation. Landfill operators must receive adequate safety training, and gas monitoring equipment and other safety devices must be properly calibrated and maintained.

Without control, the air emissions from landfills are continuously released to the atmosphere as waste decomposes. This, along with undesirable gas accumulation, can be minimized through the use of an active gas collection system. Such a system removes landfill gas with a vacuum pump. This system may provide gas migration control, which can be directly vented to the atmosphere, burned or flared, or directed to an energy recovery system. Venting is usually done through a stack to facilitate atmospheric dispersion and to minimize potential odors.

With regard to flaring and gas recovery options, both address local air quality and safety concerns. However, only power production taps the energy value of landfill gas, while also displacing the use of fossil fuels. Further, landfill gas energy recovery operations are typically more closely managed than flaring operations, thus having greater potential for more gas being combusted in compliance with all applicable regulations and fewer emissions being emitted into the atmosphere.

Decomposition of MSW in a landfill is accelerated and increased gas emissions results when additional moisture is added into the system (i.e., bioreactor landfills). Under such a circumstance, there will be an increased environmental impact if: 1) there is no or inadequate landfill gas collection and control; 2) there is a delay in landfill gas capture/control from the onset of liquid additions; 3) the use of a porous material for promoting infiltration results in a larger loss of fugitive landfill gas emissions; and 4) there are cracks and fissures in the existing cover and/or landfill cap. In addition, there will be increased metals content in landfills if leachate, sewage sludge, CCA-treated wood, and/or industrial wastes are added.

Data from recent and historical studies of landfill gas indicate that the quantities of heavy metals in landfill gas are relatively low. The same attenuating mechanisms that naturally limit the leaching of heavy metals in landfills (reduction conditions, neutral to high pH, and presence of sulfides) also limit the release of significant gas-phase metals (including metallic or methylated mercury). In addition, the low vapor pressures for all metals except mercury are also limiting factors.

In March 1996, U.S. EPA promulgated New Source Performance Standards and Emission Guidelines (NSPS and EG) for landfills pursuant to mandates set forth under Title 1 of the CAA (61 RF 49, 9905, March 12, 1996). These rules require landfills to collect landfill gas, and prescribe design standards and performance limits for gas extraction systems (i.e., demonstrated to reduce non-methane organic compounds by 98 percent). This regulation applies to new (i.e., started operations on or after May 30, 1991) and existing (i.e., started on or after November 8, 1987), with a design capacity greater than 2.75 million tons.

In January 2003, U.S. EPA issued its final rule promulgating National Emission Standards for Hazardous Air Pollutants ("NESHAP") for MSW landfills (FR Volume 68, Number 11, January 16, 2003, pages 2227 – 2242). The final rule is applicable to both major and area sources and contains the same requirements as the NSPS and EG. The final rule adds startup, shutdown, and malfunction ("SSM") requirements, adds operating condition deviations for out-of-bounds monitoring parameters, requires timely control of bioreactor landfills, and more. The final rule fulfills the requirements of section 112(d) of the CAA, which requires the Administrator to

regulate emissions of hazardous air pollutants listed in section 112(b), and helps implement the Urban Air Toxics Strategy developed under section 112(k) of the CAA. The intent of the standards is to protect the public health by requiring new and existing sources to control emissions of Hazardous Air Pollutants (HAP) to the level reflecting the MACT.

The HAP emitted by MSW landfills include, but are not limited to, vinyl chloride, ethyl benzene, toluene, and benzene. Each of the HAP emitted from MSW landfills can cause adverse health effects provided sufficient exposure. For example, vinyl chloride can adversely affect the central nervous system and has been shown to increase the risk of liver cancer in humans, while benzene is known to cause leukemia in humans.

Further, RCRA Subtitle D standards prohibit the routine open burning of solid wastes. Infrequent burning of agricultural waste, debris from emergency cleanup operations, etc., is allowed subject to federal and state air pollution control regulations. Any designated area for burning must be far enough away from the landfill to avoid burning other solid waste. Other regulations have also been promulgated under the CAA that apply to control of air emissions from new and existing landfill sources. These include: 1) NAAQS; 2) PSD for attainment areas; and 3) NSR for non-attainment areas.

The State of Connecticut Solid Waste Management Regulations address the control of decomposition gases from landfills through requirements for gas venting and monitoring under Section 22a-209-7 (n), but do not directly address landfill gas collection. Likewise, the Regulations for solid waste disposal areas, under Section 22a-209-7(r), detail provisions relating to air quality including open burning restrictions, and also stipulate that dust and odors shall be controlled at all times to assure compliance with applicable regulations established by the Department for the Abatement of Air Pollution.

Connecticut currently requires NSR permits and Best Available Control Technologies for landfills with greater than 15 tons per year of any air pollutant. In addition, a Title V permit may be required based on size criteria.

I.2.3 Potential Land-Related Impacts of Subtitle D Landfills

Solid waste landfills are subject to federal regulations under RCRA Subtitle D (40 CFR Parts 257 and 258). U.S. EPA's Subtitle D rule establishes facility design (e.g., for liners, leachate control systems, final cover systems, etc.) and operating standards, groundwater monitoring, corrective action measures, and conditions for closing and providing post-closure care for municipal landfills. State regulations under Subtitle D can be flexible to accommodate local conditions.

Uncontrolled landfill gas migration can be a major threat to landfill employees, buildings located on and in close proximity to the site, and surrounding vegetation. Landfill gas must be controlled to avoid explosions and vegetation damage near the landfill, and the threat of asphyxiation in confined spaces. RCRA Subtitle D standards limit landfill gas migration to no greater than 25 percent of the lower explosive limit in

occupied structures. Landfill buildings and monitoring probes located around the landfill must be tested quarterly for methane concentrations. RCRA Subtitle D also defines requirements for methane emission monitoring at landfill, during operation and for the 30-year post-closure period (i.e., 40 CFR Section 264).

RCRA Subtitle D requirements that minimize impacts on surrounding lands include the operating requirement that all solid waste received must be covered with six inches of an earthen material at the end of each operating day. This prevents the exposure of landfill waste to birds, insects, and rodents, which represent the primary transmission pathways of human disease. Covering MSW also minimizes the potential for landfill fires, reduces odor, and controls blowing litter.

The State of Connecticut Solid Waste Management Regulations for solid waste disposal areas, under Section 22a-209-7, meet or exceed all of the above requirements addressing blowing litter, cover operations and vector control as specified in Sections 22a-207 (k), (l) and (m), respectively.

RCRA Subtitle D also requires that MSW landfills be closed using a final cover system composed of an infiltration layer overlaid by an erosion layer. The goal of minimizing liquid infiltration into the landfill is achieved by way of good surface drainage and runoff with minimal erosion, among other factors. Surface water runoff must also be properly controlled to prevent excessive erosion and soil loss.

Proper landfill design and operation are always in the long-term financial interest of the landfill construction and operation permittee, since, under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), landfill owners are held responsible for environmental damage and cleanup from the time of startup of the facility through the 30 years following closure. Furthermore, it is worth noting that even claims and documentation that a landfill has been in compliance with regulatory standards throughout construction and operation has not been an adequate defense against pollution damage claims.

I.2.4 Potential Water Quality Impacts of Subtitle D Landfills

Under RCRA Subtitle D regulations, all new MSW landfills and expansions at existing facilities must include a composite liner system (e.g., combination of synthetic and natural liners) and a leachate collection system, or meet a groundwater protection performance standard. This is aimed at preventing leachate that is formed as water migrates through the MSW from migrating from the site and into ground or surface waters beyond the landfill boundary.

The landfill groundwater protection performance standard specifies that groundwater contaminant concentrations flowing away from the landfill must meet water quality standards for a range of chemicals including heavy metals such as arsenic, cadmium, lead, mercury, and zinc.

Many landfills in the U.S. constructed and operated prior to RCRA Subtitle D requirements are unlined or have liner systems that cannot adequately contain the leachate. Leachate chemicals may then pass through the landfill base and may undergo various destruction and conversion reactions as they pass through underlying

formations. One example of this process, known as attenuation, is heavy metals in leachate being retained by clay soil under the landfill.

Regarding this issue, it is worth noting that a study commissioned by the Solid Waste Association of North America ("SWANA") Applied Research Foundation (as reported by Jeremy O'Brien, "Summary of the SWANA Applied Research Foundation's Findings," MSW Management May/June 2005) found that all available research data on the subject indicate that despite the dramatic increase in the disposal of discarded consumer electronics in recent years, the tonnages of heavy metals being disposed in MSW landfills have actually decreased over the last 15 years, primarily as a result of lead-acid battery recycling efforts. In total, five studies representing all recent published investigations regarding leachate characteristics were reviewed in the SWANA research effort and all of these studies concluded that heavy metal concentrations in leachate are, on average, relatively low.

RCRA Subtitle D also requires that ground water monitoring systems be in place for new, existing, and lateral expansions of existing landfills. This is necessary to measure groundwater quality at the facility and determine if any contaminants have been released through the landfill base. RCRA calls for detection monitoring to establish background concentrations for a set of detection monitoring parameters, assessment monitoring to determine if maximum Safe Drinking Water Act levels have been exceeded, and corrective actions, as needed. Landfill owners may have to provide a temporary supply of drinking water, if in violation, and corrective actions must continue until groundwater standards compliance is accomplished for three consecutive years.

In addition, RCRA Subtitle D specifies landfill run-on and runoff controls for rainfall and snow melt, calling for the development of drainage channels within the site. Drainage structures should generally be designed for 25-year storms. Implementation of a detention basin should also be considered to minimize siltation problems downstream. This allows for the testing of runoff water for chemical contamination prior to discharge into a stream or lake. Ultimately, the runoff must be managed in compliance with the point and non-point source requirements of the Clean Water Act.

Landfill gas recovery projects also typically generate wastewater from maintenance and cleaning, domestic wastewater, and cooling tower blowdown. This water may be treated onsite or sent to a municipal wastewater treatment plant. The wastewater treatment facility operator will ensure that standards governing pollutant concentrations in incoming wastewater streams are complied with. For projects that discharge wastewater into rivers or other surface waters, a National Pollution Discharge Elimination System ("NPDES") permit is required and typically issued by the state.

State of Connecticut Solid Waste Management Regulations for solid waste disposal areas, under Section 22a-209-7, far exceeds Federal Standards. Specifically, these regulations (1) require any solid waste landfill to install a double liner with a sub base five feet above the maximum high water table (Section 22a-209-14(g)), and (2) require as set forth in Section 22a-430-4(c)20(E)(vii) of the Water Discharge Permit

Regulations that the Commissioner shall not issue a permit for the discharge of leachate from a solid waste disposal area unless;

- Assuming for purposes of analysis the absence of any means at such solid waste disposal area to collect or treat leachate, the discharge of such leachate would not pollute any receiving surface water classified as B or SB by the Water Quality Standards or interfere with the attainment of any water quality classification goal that has been adopted for such surface water in the Water Quality Standards;
- The permit applicant has the right of possession, by means of fee interest, easement, or otherwise, to the zone of influence of such solid waste disposal area and;
- No potable water supply well is located within the zone of influence of such solid waste disposal area and no portable water supply well is located such that recharge of such well from such zone of influence could be induced by pumpage, unless the permit applicant will, with the approval of the Commissioner and the agreement of the user of any such we, provide an alternate supply of potable water to such user.

In addition, Section 22a-209-14 requires that: leachate from a leachate collection system installed pursuant to subsection (g) of this section and leachate from a leachate treatment system installed pursuant to a permit issued under Section 22a-430 of the General Statutes and Sections 22a-430-3 and 22a-430-4 of the Regulations of Connecticut State Agencies shall be discharged only in accordance with the terms of such permit, and shall be subject to all requirements specified in such permit.

Moreover, in addition to the requirement of 22a-209-7(c)(1), and Section 22a-430-4(c)20(E)(vii) above, Section 22a-209-7(c)(2) specifies that: a new or existing solid waste disposal area shall not impair the quality of surface or ground water beyond the solid waste boundary to a degree that would degrade the quality of such waters beyond the water quality classification established by the Department in accordance with Section 22a-426 of the Connecticut General Statues, The Connecticut Water Quality Standards and Criteria, as amended, or the standards for quality of public drinking water established by the State Department of Health Services and contained in Section 19-13-B102 of the Regulations of Connecticut State Agencies, as amended. In those cases where the existing water quality fails to meet the established standards, the disposal area shall not further degrade the water quality.

Enforcement by the Commissioner of compliance with Section 22a-430-4(c)20(E)(vii) in the site application and approval process effectively precludes the risk of negative environmental impact on either the ground and surface waters of the state.

I.3 Transfer to Out-of-State Disposal Facilities

The option of sending solid waste out of state eliminates the potential environmental impacts from expansion of RRFs or development and operation of new landfills. However, inherent with the selection of this option is the construction and operation of transfer stations, and the truck/trailer and/or rail car transportation of waste over state

highways and/or rail lines. The potential environmental advantages and disadvantages associated with the transfer, transportation and disposal components of this option are described below.

I.3.1 Potential Environmental Impacts Associated with Transfer Stations

In considering the alternative of sending solid wastes to out-of-state landfills or RRFs over the next 20 years, the operation of transfer facilities has potential advantages and disadvantages when compared to in-state disposal options. For the purposes of this analysis, the potential impacts associated with the siting and operations of volume reduction facilities ("VRFs") are assumed to be similar to those for transfer stations and are addressed as such.

A number of environmental benefits can be accrued from transfer of solid waste, including the following:

- Reduced route collection vehicle impacts on traffic and air emissions;
- Reduced fuel usage for route collection vehicles;
- Increased flexibility in selecting more environmentally sound disposal facilities;
- The potential to remove recyclable materials and thereby reduce energy and GHG emissions associated with product manufacture using virgin materials; and
- The potential to reduce the volume of wastes; thus reducing truck traffic, energy usage, air emissions and land consumption and potential environmental impacts of landfills.

However, there is difficulty in siting and permitting new transfer facilities, especially in heavily populated areas, due to the perceived negative environmental (and other) impacts. Various interest groups are likely to oppose this type of waste management facility in any community with its inherent truck traffic and noise, and potential impacts on surrounding air, water and land.

A current issue of major environmental concern associated with rail haul is the use of a transfer facility on railroad property operating without adequate environmental permits. Under the federal Interstate Commerce Commission Termination Act (49 U.S.C. Section 10510), rail yards are exempt from local zoning and permitting requirements ostensibly to promote the efficient operation of railroads and protect interstate railroads from local interference. In New Jersey and other parts of the Northeast, this has resulted in some rail sites essentially becoming open-air waste-processing operations with waste being dumped on the ground, processed and shipped out on rail cars – without state or local permits in place. However, the CT DEP has taken the position that rail yards are not exempt from local zoning and permitting requirements.

In efforts to combat such practices, the New Jersey Department of Environmental Protection has assessed a $2.5 million fine against a rail company operating five solid waste transfer facilities in North Bergen. Moreover, waste industry associations are

supporting the Solid Waste Environmental Regulation Clarification Affecting Railroads Act of 2005 (S-2005) a federal bill introduced by both U.S. Senators from New Jersey. This legislation would transfer oversight of rail yard transfer stations from the Surface Transportation Board.

The State of Connecticut Solid Waste Management Regulations addresses solid waste transfer station siting and operation under Section 22a-209-4. This section specifies that each transfer station facility must have a permit to construct and a permit to operate. Most importantly, the information required for a permit to construct a transfer station, specified in Section 22-209-4(b)(2)(B), includes all of the same information required for permits to construct solid waste disposal areas enumerated in Section 22-209-4(b)(2)(A). As applicable, such facilities must also be consistent with the State Solid Waste Management Plan, the Connecticut Solid and Hazardous Waste Land Disposal Siting Policy, and the Connecticut Water Quality Standards.

In addition, State of Connecticut Solid Waste Management Regulations for solid waste transfer stations, under Section 22a-209-9, provide environmental compliance requirements relating to waste storage, litter control, the control of dust and odors, restrictions on open burning, fire control, waste restrictions, vector control, and more.

The status of federal regulations aimed at minimizing air quality impacts and the relative impact of both transportation options are addressed in the discussion of each transportation option that follows.

I.3.2 Potential Environmental Impacts Associated with Transportation

Transportation of solid waste from in-state transfer stations to out-of-state disposal facilities may be provided via truck/trailer or rail haul. Both of these options generate air emissions from combustion of diesel fuel that are of concern to public health and the environment. The degree to which such emissions cause a negative impact is determined largely by such factors as how old the vehicle/engine is, cleanliness of the diesel fuel, type of vehicle engine, how far the vehicle travels, and whether the vehicle is in compliance with regulatory requirements.

The environmental impacts associated with each mode of transportation are addressed separately in the following sections.

I.3.2.1 Truck/Trailer Systems

Most transfer systems use tractor-trailers to carry solid waste to the disposal site. These trailers are classified as either compaction (i.e., rear-loading, enclosed, with a push-out blade for unloading) or non-compaction (i.e., open top for loading, with a tarp or top doors to cover the MSW, and moving floor to unload material).

From an environmental health and safety impact perspective, truck/trailer systems must be designed to meet the following type of requirements:

- All waste must be covered during transportation to prevent littering and exposure to precipitation;

- Vehicles must be operated safely along the hauling routes to avoid accidents and spills;
- Truck capacity must not exceed road weight limits to prevent roadway wear and tear;
- Truck design and construction must prevent liquids leakage during transportation to avoid potential land and water impacts; and
- Unloading methods should be dependable and not subject to frequent downtime (i.e., worker exposure issue).

Further, to minimize hazards to transportation personnel, truck and rail transport employees must be properly trained to identify hazardous and other unacceptable wastes, and receive ongoing environmental safety and health training from employers.

I.3.2.2 Potential Truck/Trailer Impacts on Air Quality

There are a number of factors that affect the rate at which any vehicle emits air pollutants. Some of the most important are the vehicle age and accumulated mileage, type of fuel used (gasoline, diesel, others), ambient weather conditions (temperature, precipitation, wind), the maintenance condition of the vehicle (well maintained, in need of maintenance, presence and condition of pollution control equipment), and how the vehicle is driven (e.g., long cruising at highway speeds, stop-and-go urban congestion, typical urban mixed driving).

The Environmental Protection Agency ("EPA") has developed and refined a series of computer models that estimate, for different types of highway vehicles, the fleet-wide in-use average emissions as a function of many variables. The EPA data presents average emission rates for gasoline-fueled and diesel heavy-duty vehicles.

Heavy-duty vehicles, or heavy-duty trucks, are vehicles that are greater than 8,500-pound gross vehicle weight and are equipped with heavy-duty engines, a distinct category under EPA's highway vehicle pollution control regulations. Such vehicles emit large amounts of CO, NO_X and particulate matter ("PM"), which contribute to serious public health problems including premature mortality, aggravation of respiratory and cardiovascular disease, and increased incidence of lung cancer. The heaviest trucks, in GVW classes VIIIa (33,001 lb. to 60,000 pound GVW) and VIIIb (over 60,000 lb. GVW) are used mostly for the interstate transport of goods including solid waste, and in some cases accumulate more than 250,000 miles annually.

The most current version of the computer model used by EPA to estimate average in-use emissions from highway vehicles is MOBILE6.2. The emission rates (also commonly termed emission factors) presented for diesel heavy-duty trucks in this discussion are based on national average data representing the in-use fleet as of July 1, 2005. These estimates use national averages for most of the variables that affect emission rates, as discussed in greater detail in the following section, and are based on average summertime weather conditions. These estimates are suitable for use in obtaining first-order approximations of vehicle emissions. The emission rates for hydrocarbons ("HC"), CO, NO_X, and particulate matter ("PM_{10}", or particulate 10 microns diameter and smaller; and "$PM_{2.5}$", or particulate 2.5 microns diameter and

smaller) shown in Table I-1 are from the most recent version of the MOBILE6.2 highway vehicle emission factor model. They assume an average, properly maintained heavy-duty truck on the road in July 2005, operating on typical gasoline or diesel fuel on a warm summer day (72-92°F). Emission rates can be higher in very hot weather (especially HC) or very cold weather (especially CO).

Table I-1
Average Heavy-Duty Truck Emissions by GVW Class (2005)

Truck GVW Class	Emission Rates (Grams/Mile)				
	HC	CO	NO_X	$PM_{2.5}$	PM_{10}
VIII (a)	0.55	3.21	12.6	0.33	0.36
VIII (b)	0.70	4.38	16.2	0.36	0.42

Under 40 CFR Parts 69, 80, and 86 of the Clean Air Act, the U.S. EPA issued a final rule in January 2001 regarding the control of air pollution from new motor vehicles, including heavy-duty trucks. The rule's requirements go into effect in 2006 for low-sulfur diesel and model year 2007 for cleaner engines (i.e., applying after treatment pollution control technologies). This is aimed at reducing PM and NO_X emissions from these sources by 90 percent and 95 percent below current standard levels, respectively.

This rule will require a 97 percent reduction in the sulfur content of highway diesel fuel from its current level of 500 parts per million ("ppm") to 15 ppm. Further, engine manufacturers will have flexibility to meet the new standards through a phase-in approach between 2007 and 2010. The fuel provision will go into effect in June 2006 and will be phased-in through 2009.

Class VIIIa and Class VIIIb vehicles emissions, on average, on grams per mile ("g/m") traveled basis to meet 2010 requirements are summarized in Table I-2.

Table I-2
Average Heavy-Duty Truck Emissions by GVW Class (2010)

Truck GVW Class	Emission Rates (Grams/Mile)				
	HC	CO	NO_X	$PM_{2.5}$	PM_{10}
VIII (a)	0.08	0.44	1.82	0.44	0.049
VIII (b)	0.10	0.63	2.35	0.057	0.048

As illustrated in Table I-1, when MSW and bulky wastes are transported out of the state there is a significant increase in air emissions associated with the transportation that is largely precluded by disposal at in-state RRFs. To quantify the accumulative

impact of air emissions, the Department calculated truck diesel engine emissions that would be largely eliminated by though disposal at in-state RRFs.

Department data suggests that approximately 400,000 TPY of MSW and 900,000 TPY of bulky waste were transported out-of-state in FY 2004. Assuming an average of 20 tons per trip, this translates to 20,000 trips for MSW and 45,000 trips for bulky waste annually. Even under a conservative assumption that all of the waste is delivered to the closest cost competitive landfills in Eastern Pennsylvania an average roundtrip distance of approximately 400 miles from central Connecticut is required. Estimates of total emissions associated with transportation using these assumptions are summarized in Tables I-3 and I-4 for MSW and bulky waste respectively. As illustrated in these tables, if all of the MSW and bulky wastes currently transferred out of state were transported by truck, it is estimated that over 606 tons of diesel engine pollutants would be added to the air in Connecticut and states to the southwest.

Table I-3
Estimate of Annual Emissions from Truck Transportation of MSW to Cost-Competitive Out-of-State Landfills

	Truck Transport				
Type of Emission	**Emission Rate (1) (Grams/Mile)**	**Roundtrip Miles**	**Annual Trips**	**Annual Miles Traveled**	**Annual Emissions (tons)**
HC	0.70	400	20,000	8,000,000	6
CO	4.38	400	20,000	8,000,000	38
NO_X	16.2	400	20,000	8,000,000	143
$PM_{2.5}$	0.36	400	20,000	8,000,000	3
PM_{10}	0.42	400	20,000	8,000,000	4

(1) For heavy duty truck GVW Class VIII(b)

Table I-4
Estimate of Annual Emissions from Truck Transportation of Bulky Waste to Cost-Competitive Out-of-State Landfills

Type of Emission	Truck Transport				
	Emission Rate[1] (Grams/Mile)	Roundtrip Miles	Annual Trips	Annual Miles Traveled	Annual Emissions (tons)
HC	0.70	400	45,000	18,000,000	14
CO	4.38	400	45,000	18,000,000	87
NO_X	16.2	400	45,000	18,000,000	321
$PM_{2.5}$	0.36	400	45,000	18,000,000	7
PM_{10}	0.42	400	45,000	18,000,000	8

(1) For heavy duty truck GVW Class VIII(b)

Comparison of existing diesel engine emissions with the air emissions from RRFs is also useful to put emission levels into perspective. According to a report by the Waste-to-Energy Research and Technology ("WTERT") Council, headquartered at Columbia University, diesel trucks transporting MSW from NYC to Pennsylvania and Virginia emit five times more particulate matter per ton of MSW than if combusted in more local RRF operations (Columbia University WTERT Report, Dr. N. Themelis, April 13, 2005).

I.3.2.3 Potential Land and Water Related Impacts

The use of truck/trailer systems for transportation can also have potential negative environmental and safety impacts on surrounding lands and surface waters. These potential impacts include:

- Contribution to increased roadway congestion; especially on the overburdened interstate highways in the Northeastern and Mid-Atlantic States;
- Roadway wear and tear;
- Litter and associated pollution of adjacent surface waters if waste is not properly contained;
- Potential leakage of liquids onto highways and into adjacent surface waters from waste cargo if not properly contained; and
- Potential for hydraulic oil and diesel fuel spills and potential contamination of surface water, and potentially other waterways.

I.3.2.4 Rail Haul Systems

A viable and increasingly popular alternative to tractor-trailers is the use of rail haul for waste transport to more distant landfill or RRF operations. While this option has not traditionally accounted for much of the waste transferred in the U.S., the use of rail

haul is growing. This option makes particular sense when rail service is available to both the transfer facility and the disposal facility, and, typically, the hauling distance is 150 miles or more.

Solid waste can be rail hauled using dedicated gondola cars (i.e., with removable roofs for direct loading) or containerized intermodal freight systems (i.e., requiring double handling of waste to load and unload). If the transfer station or disposal facility is not served by rail, trucks must be used to collect and/or deliver the materials. This would result in additional environmental impact (e.g., air emissions, etc.).

Decision-makers should bear in mind these and other possible environmental impacts associated with rail haul, and potential opposition from communities along the transportation route. Rail cars should be kept clean and covered, and shipments should be scheduled to minimize any travel delays.

I.3.2.5 Impacts on Air Quality

Similarly to heavy-duty trucks, locomotive diesel engines contribute significantly to air pollution. This is the case, even though diesel-powered locomotive engines being produced today have to meet relatively modest 1997 emission requirements.

Emissions from diesel-powered locomotive engines are measured on a grams-per-gallon of fuel used basis since locomotives consume fuel more on a mass-per-work basis; i.e., a locomotive pulling a fully loaded train of rail cars consumes more fuel and emits more pollution than a train of empty cars. U.S. EPA estimates locomotives emit, on average, the following emissions on a grams per gallon of fuel ("g/gf") consumed basis:

- For 1998 (Pre-control): NO_X, 270 g/gf; PM 10, 6.7 g/gf;
- For 2005: NO_X, 200 g/gf; PM 10, 6.6 g/gf; and
- For 2020: NO_X, 140 g/gf; PM 10, 4.9 g/gf.

In May 2004, U.S. EPA finalized new requirements for non-road diesel fuel as part of the Clean Air Non-road Diesel Rule (40 CFR Parts 9, 69, et al.). This rule will decrease the sulfur levels allowed for fuels used in locomotives by 99 percent; from about 3,000 ppm to 15 ppm when fully implemented in 2012. This will result in immediate public health and environment benefits through the reduction of PM from existing engines.

At the same time, U.S. EPA announced its intent to propose more stringent locomotive engine emission standards (40 CFR Parts 92 and 94), similar in stringency to the standards adopted for heavy-duty diesel-powered trucks (40 CFR Parts 69, 80, and 86). EPA estimates that a 90 percent reduction in PM and NO_X emissions can be accomplished through the use of advanced emission-control technologies. New engine standards, based on engine horsepower, begin to take effect in 2008. Engines with more than 750 horsepower will have until 2015 to meet the emission standards.

In order to make a meaningful comparison between heavy-duty trucks and locomotive air emissions, it is necessary to convert locomotive emissions from grams-per-gallon of fuel consumed to grams-per-vehicle-mile traveled. This is accomplished by

applying a reasonable average fuel economy multiplier number (i.e., how many miles per gallon, on average, a typical locomotive consumes). This is estimated to be 7.7 gallons of fuel per mile. Applying this conversion factor to the grams-per-gallon consumed numbers summarized above yields the following estimated grams of emissions per mile traveled for locomotives:

- For 1998 (Pre-control): NO_X, 2,076 g/m; PM 10, 51.5 g/mile;
- For 2005: NO_X, 1538 g/m; PM 10, 50.8g/mile; and
- For 2020: NO_X, 1077 g/m; PM 10, 37.7g/mile.

Although locomotives clearly generate more NO_X and PM emissions than heavy-duty diesel trucks on a grams per mile basis, they also transport far more tonnage of material per mile. Therefore, a valid comparison between trucks and locomotives requires using grams of pollutant per ton-mile. Unfortunately, the U.S. EPA has not completed such an analysis since 1994. This 1994 analysis provided an estimate of the relative NO_X emissions resulting from movement of freight by truck and locomotive, taking into account the existing and anticipated air regulations at that time. Using the averages of the results calculated for 38 truck and locomotive scenarios evaluated result in the following relative estimates of air emissions:

- In the year 2005, NO_X emissions from the movement of freight by truck can be expected to be between 2.8 and 5.0 times higher, on average, than NO_X emissions from rail transportation of the same freight between the same two points; and
- In the year 2010, NO_X emissions from the movement of freight by truck can be expected to be between 3.2 and 5.0 times higher, on average, than NO_X emissions from rail transportation of the same freight between the same two points.

It is important to bear in mind that additional truck and locomotive emissions standards have been promulgated. As of 2005, U.S. EPA experts believe that while NO_X emissions from locomotives versus heavy-duty diesel trucks (i.e., on a per ton mile basis) are less, the difference is less dramatic than stated in the 1994 analysis.

I.3.2.6 Potential Land and Water Related Impacts

The use of rail-haul systems for transportation can have the same potential negative environmental and safety impacts on surrounding lands and surface waters as transportation via truck/trailers.

These potential impacts include:

- Litter and associated pollution of adjacent surface waters if waste is not properly contained;
- Potential leakage of liquids along railroad sidings during storage and along tracks during transport into adjacent surface waters from waste cargo if not properly contained; and
- Potential for hydraulic oil and diesel fuel spills and potential contamination of surface water and potentially other waterways.

I.4 Potential Environmental impacts Associated with Out-of-State Disposal – Subtitle D Landfill or RRF

Out-of-state solid waste landfills and RRF are subject to the same federal environmental regulations as those in Connecticut. Depending upon the regulations and enforcement resources applied in the state in which these disposal facilities are located; there may be more or less stringent compliance requirements at such facilities. In either case, the environmental impacts on air, water and land within the State of Connecticut associated with use of out-of-state disposal facilities are limited to those emanating from the transfer and transportation components. However, Connecticut is concerned with all environmental impacts that stem for solid waste management, not just those taking place within their borders.

I.5 Summary

There are only three potentially viable options for the disposal of solid waste generated in the State of Connecticut over the next 20 years. These include:

- In-state disposal at RRFs;
- In-state disposal of MSW at a Subtitle D Landfill; and
- Transfer and transportation to out-of-state landfills or waste-to-energy facilities.

Each of these options has the potential of adversely impacting human health and the environment if not properly managed, and are subject to federal and state environmental regulations to help ensure this does not happen. Nonetheless, assuming facility compliance with state and federal regulations, the summary in Table I-5 illustrates that disposal at in state RRFs poses less potential risk of negative environmental impacts than landfills located either in or outside of the State; generating lower air emissions, being relatively isolated from surface and groundwater, and occupying a smaller footprint on land.

It should be noted that the above discussion was prepared by the CT DEP's contractor R.W. Beck, while developing the Plan. The CT DEP undertook an analysis of air emissions impacts and that discussion follows. The findings differ and until such time more information and analysis is conducted, no firm conclusions can be made.

Air Emission Analysis by CT DEP

During the development of the Plan, the CT DEP's Bureau of Air Management, evaluated criteria and some air toxic pollutants for three MSW disposal scenarios which indicated that additional incineration of MSW in Connecticut will create more air emissions than transporting that waste to out-of-state landfills for disposal. This information was provided to the consultant during the development of the Plan, but it is unclear how the consultants evaluated this information.

The following table presents the average estimated emissions for criteria and non-criteria pollutants from three MSW disposal scenarios. Each scenario addresses handling 380,000 tons per year in-state MSW disposal capacity shortfall. The first scenario assumes that all the waste is burned at a resources recovery facility located in Connecticut either by increasing existing facility capacity or building a new facility. The remaining two scenarios assume that the additional tonnage is shipped out of state to a landfill located in Ohio. The landfill is assumed to have no gas collection or controls. One scenario presents the emissions expected from transportation by rail and the other by truck. The results of this analysis indicate that incineration of MSW in Connecticut will create more air emissions than transporting and disposing the MSW in a landfill in Ohio. With the exception of volatile organic compounds (VOC) and hydrocarbons, incineration will emit over five times more NOx, CO, CO2, and SO2 than shipping the same amount of MSW to Ohio. Methane generation from the landfill significantly overshadows hydrocarbon formation from combustion. Absent from the DEP analysis is an energy displacement analysis to consider the energy produced by the RRF and any air quality impacts that would occur from shifting energy from a resource recovery facility to traditional power plants. The DEP analysis also did not evaluate any of the other environmental issues associated with land-filling, such as water quality, land use, etc.

Estimated Air Emissions Associated with the Disposal of 380,000 tons/year of MSW

Pollutants	Incineration of MSW at a RRF (tons per year)	Transport MSW in Trucks to Ohio Landfill** (tons per year)	Transport MSW by Rail to Ohio Landfill** (tons per year)
VOC/HC	4	95	98
CO	85	14	14
NOx	560	67	102
PM10	10	2	3
CO2	374,300	51,853	44,789
SO2	58	0.1	8.4
Ammonia	0.8	0.2	0.04
HCL	40	No Data	No Data
Mercury	125*	No Data	No Data
Nickel	20*	No Data	No Data
Cadmium	10*	No Data	No Data
Arsenic	2*	No Data	No Data
Dioxin	0.02*	No Data	No Data
Lead	80*	No Data	No Data
Benzene	No Data	1.82	1.80
Formaldehyde	No Data	0.13	No Data
Methane	No Data	14,436	14,436
1,3 Butadiene	No Data	20*	No Data
Acetaldehyde	No Data	100*	No Data
Acrolein	No Data	12*	No Data

* - pounds per year

**includes landfill emissions

Table I-5
Summary Comparison of Environmental Impacts of Solid Waste Disposal Options

Disposal Option	Air	Land	Water
In-State RRF	Minor impact on air quality due to U.S. EPA MACT and state regulations that include continuous emissions monitoring to ensure compliance. RRF ash residue does not generate greenhouse gas emissions. Energy generation reduces consumption of fossil fuels at energy generation alternatives.	Negligible impact on land since ash routinely tests as a non-hazardous material. No litter, odor, vector, bird or potential fire and explosion problems. Facilities occupy small footprint relative to landfills.	Negligible impact on water since RRF wastewater is typically recycled in a closed-loop system. Metals present in RRF ash leachate are close to drinking water standards and far lower than the toxicity test criteria.
In-State Landfill	Landfills are the largest source of human-made methane emissions in the U.S. Federal regulations controlling such emissions apply only to large facilities (>2.75 mm tons capacity). Air emissions monitoring not as stringent as applied to RRF.	Landfill gas migration poses the threat of explosion, vegetation damage, and asphyxiation if not managed properly Greater potential for wind blown litter compared to RRF due to being exposed to the elements. Greater potential for odor, vectors, attraction to birds and other wildlife.	Greater potential for water contamination at landfills versus RRF due to the diversity and variability associated with elements found in MSW leachate. Continuous exposure to the elements increases risk of impact on water quality. Requires intensive post-closure care period with potential remediation activities
Out of State Disposal	Far greater impact on air quality due to emissions from heavy-duty trucks and/or locomotives, coupled with associated road congestion (trucks), and other potential impacts (e.g., fossil fuel consumption), compared to in state disposal option(s).	Impact of transfer facilities in CT that includes traffic and attraction to vectors, birds and insects.	Potential impact on CT water resource only from transfer facilities and potential of spills from truck/trailer or rail haul leakage or accidents.

I.6 WARM (Greenhouse Gas Model)

Introduction

The United States Environmental Protection Agency ("US EPA") has developed the Waste Reduction Model ("WARM") to estimate the generation of greenhouse gas ("GHG") emissions under various solid waste management scenarios. The WARM calculates GHG emissions for baseline and alternative waste management practices. The model calculates emissions in both metric tons of carbon equivalents ("MTCE") and metric tons of CO_2 equivalents ("$MTCO_2E$") across a wide range of material types found in municipal solid waste. The WARM also calculates energy use for each option.

As a part of Connecticut's Climate Change Action Plan, the Connecticut Bureau of Air Management is currently using the WARM to update a GHG inventory addressing emissions from waste disposal. The first inventory can be found at http://ctclimatechange.com/ct_inventory.html.

As a part of preparing Connecticut's solid waste management plan (the "Plan"), the US EPA's WARM version 7 (08/05) has been used to assess the environmental impact of alternative waste management practices in two areas. First, the WARM has been used to measure and compare the environmental effect of diverting 30 percent of the State's MSW from disposal with the effect of diverting 49 percent of the MSW from disposal. Second, the WARM has been used to assess the effect on emissions of increasing the RRF disposal capacity in Connecticut and decreasing the amount of MSW disposed in out-of-State landfills.

The WARM analysis involves developing three scenarios, each comparing two options. As pointed out in this discussion, some of the assumptions or conditions used in the scenarios may be open to criticism, for example due to information being taken from other states. It should be noted that these comparisons are for the purpose of evaluating the relative impacts of the different scenarios on greenhouse gas emissions, not for the purpose of supporting any specific strategies or recommendations of this Plan.

1. **Scenario 1** uses the WARM analytical inputs applied to the projected management of MSW for FY 2005 in the Plan. This scenario compares the FY 2005 projection of a 30 percent waste diversion rate with a 49 percent waste diversion rate. In both cases, Connecticut's current annual RRF disposal capacity of 2,209,000 tons is assumed with any remaining MSW disposed at out-of-state landfills.
2. **Scenario 2** compares two RRF disposal capacities with 30 percent waste diversion rate in FY 2024, using the MSW projections in the Plan. In the first case, RRF disposal capacity for MSW is assumed to be 2,066,000 tons with the remaining waste disposed in out-of-state landfills. In the second case, RRF disposal capacity is assumed to be increased by 614,000 tons per year which would eliminate the MSW disposal capacity shortfall in FY2024 when the State's MSW diversion rate reaches 49 percent (see Table 1 in Appendix J). With the addition of the 614,000

TPY of MSW disposal capacity, Connecticut's MSW RRF disposal capacity would be 2,680,000 TPY. The effect of increasing the MSW RRF disposal capacity is to reduce Connecticut's reliance on out-of-State landfills.

3. **Scenario 3** compares a 30 percent waste diversion rate to a 49 percent diversion rate in FY 2024, using the MSW projections in the Plan. In addition, it is assumed that 614,000 tons of RRF capacity has been added to the State's existing 2,066,000 tons of RRF capacity, resulting in a total Connecticut RRF disposal capacity of 2,680,000 tons.

I.6.1 Scenario Development

As inputs, the WARM uses specific MSW material categories. Because Connecticut has not conducted a waste composition study, certain assumptions regarding the composition of the State's MSW had to be made in order to conform to the WARM format. These adjustments are explained below.

I.6.1.1 MSW Generation

As a first step in the WARM analysis, the model requires the user to quantify the amount of MSW in 33 material categories. That is, the user must indicate the number of tons of each material in the MSW that is generated, recycled, landfilled, combusted, and composted for all scenarios. The 33 material categories in the WARM are listed in Table I-6

Table I-6
Material Categories in WARM, Version 7

Material
Aluminum Cans
Steel Cans
Copper Wire
Glass
HDPE
LDPE
PET
Corrugated Cardboard
Magazines/Third Class Mail
Newspaper
Office Paper
Phone Books
Text Books
Dimension Lumber

Table I-6
Material Categories in WARM, Version 7

Medium Density Fiberboard
Food Scraps
Yard Trimmings
Grass
Leaves
Branches
Mixed Paper (General)
Mixed Paper (Residential)
Mixed Paper (primarily from offices)
Mixed Metals
Mixed Plastics
Mixed Recyclables
Mixed Organics
Mixed MSW
Carpet
Personal Computers
Clay Bricks
Aggregate
Fly Ash

In the absence of a waste composition study for Connecticut, it was necessary to develop a proxy (i.e. another study) which could be used to represent Connecticut's MSW stream. Selecting a proxy for Connecticut's MSW stream involved consideration of several issues, including:

- The date of the proxy study. Because changes in products and materials are constantly taking place, it is helpful to have a study that has been conducted recently to reflect the latest trends in materials. For example a 10 or 15 year-old study probably would not reflect the growth in electronic products which are now appearing the waste stream.
- A deposit container law. Connecticut's bottle bill affects the amount of glass, aluminum, and plastic in the MSW disposed. Ideally, a proxy study should be from a jurisdiction which also has a bottle bill.
- Regional climate influences. Connecticut experiences four distinct seasons which affect the amount of yard waste generated in the state. A proxy study should have a similar climactic profile. For example, a study from Florida or Arizona where the growing season is longer would probably include a greater percentage of yard waste than one would expect to find in Connecticut.

Because no single study could be found that captured the features of both Connecticut's residential MSW and commercial MSW, two proxy studies were chosen – one for the State's residential MSW stream and one for the State's commercial MSW stream.

To represent Connecticut's residential MSW stream, the recently completed New York City Waste Characterization Study (the "NYC Study") was selected. The part of the NYC Study to be used as a proxy characterized the entire New York City's residential MSW stream. Like Connecticut, New York State has a deposit container law and shares the same type of climatic conditions, although it is probable that New York City's urban environment generates less yard waste than Connecticut's mix of urban, suburban, and rural areas. The NYC Study does not include commercial waste.

To represent Connecticut's commercial MSW stream, the Pennsylvania State Waste Characterization Study (the "Pennsylvania Study") was selected. Completed in 2003, the section of the Pennsylvania Study to be used as a proxy for Connecticut's commercial MSW characterized Pennsylvania's commercial MSW stream. Pennsylvania has climate that is similar to Connecticut's climate. Pennsylvania does not have a container deposit law.

Finally, to develop a proxy of Connecticut's MSW for use in the WARM, it is assumed that 50 percent of the State's MSW was generated by residents and 50 percent is generated by commercial establishments. Table I-7 presents the estimated composition of tons of MSW generated in Connecticut, based on these proxy studies and the tons of MSW projected to be generated in Connecticut in FY 2005.

Table I-7
Composition of Connecticut Generated MSW Based on Proxy Studies (1)

Material	Total MSW Generated	Percent Generated
Paper	1,179,550	31.00%
Plastic	475,625	12.50%
Glass	123,663	3.25%
Metal	190,250	5.00%
Organics	1,160,525	30.50%
Electronics	76,100	2.00%
C&D	539,930	14.10%
Inorganics	49,465	1.30%
HHW	9,893	0.26%
TOTAL	3,805,000 (2)	

(1) The residential portion of the MSW is based on the 2006 New York City Waste Characterization Study and the commercial portion of the MSW is based on the estimate of commercial waste in the 2003 Pennsylvania Waste Characterization Study

(2) The Connecticut Solid Waste Management Plan estimates that 3,805,000 tons of MSW will be generated in FY 2005.

To apply the composition of Connecticut's MSW to the material categories in the WARM, it was necessary to sub-divide certain material groups shown in Table I-7. Table I-8 shows the way in which the "proxy" estimate of Connecticut's MSW was applied to 17 of the 33 WARM material categories.

Table I-8
Connecticut's MSW Using WARM Material Categories

WARM Material Categories	Tons Generated	Percent of Total
Newspaper	188,819	4.96%
Corrugated Cardboard	272,819	7.17%
Mixed Paper (General)	270,440	7.11%
Office Paper	90,635	2.38%
PET	38,815	1.02%
HDPE	25,695	0.68%
Mixed Plastics	411,115	10.80%
Glass	123,663	3.25%
Aluminum Cans	10,996	0.29%
Mixed Metals	179,254	4.71%
Yard Trimmings	78,370	2.06%
Grass	51,000	1.34%
Food Scraps	533,136	14.01%
Personal Computers (1)	76,100	2.00%
Mixed Organics	497,915	13.09%
Mixed Recyclables (2)	709,263	18.64%
Mixed MSW	246,877	6.49%
Total	3,805,000	100.00%

(1) Assumes all electronics in this category.
(2) Assumes all C&D materials in this category

These categories and amounts were used to develop the three scenarios in the WARM analysis.

Scenario 1

Scenario 1 compares two MSW diversion rates in FY 2005. The Plan estimates that in FY 2005 30 percent, or approximately 1,133,000 tons, of the MSW generated is diverted from disposal. Of this amount, approximately 24 percent is accounted for through reports to the CT DEP and an additional 6 percent was accounted for from materials recycled through the State's bottle bill and certain types of commercial recycling.

Because a proxy is being used to represent the composition of Connecticut's MSW, there are three anomalies which occur when Connecticut's diversion rates are applied to the proxy composition numbers. For three materials, the number of tons reported diverted by the CT DEP is greater than the number of tons generated, as estimated by the proxy studies.

- OCC: The number of tons of OCC diverted in FY2005, including an estimate of the tons of commercial OCC diverted, exceed the number of tons generated by approximately 119,000 tons.
- Aluminum Cans: The number of tons of aluminum cans diverted in FY2005, including aluminum cans captured by the bottle bill, exceed the number of tons aluminum cans generated by approximately 3,400 tons. Another possible explanation may be that since 1998, when the study on which the diversion figure for aluminum cans is based, the weight of an aluminum can has been significantly reduced.
- Yard Waste: The number of tons of yard waste diverted in FY2005, including home composting and grasscycling, exceeds the number of tons of yard waste generated by approximately 161,000 tons.

In each of these cases, it may be that the number of tons of the material in the proxy study is less than the actual number of tons of the material in Connecticut's MSW. For example, it is likely that the percentage of yard waste in New York City, which is more highly urbanized than Connecticut, is smaller than the percentage of yard waste in Connecticut. It may also be that the estimate of the number of tons diverted in Connecticut may be overstated, or it may be a combination of the two. These anomalies illustrate one difficulty with using proxies. Because these anomalies suggest that Connecticut is diverting a significant amount of these materials, it has been assumed, for the purposes of this analysis, that 90 percent of these three materials are diverted from disposal.

Of the 70 percent of MSW not diverted from disposal, approximately 2,671,000 tons, it is estimated that 2,209,000 tons are combusted in Connecticut's six RRFs and the remaining 462,000 tons are landfilled. For the purposes of this analysis, it is assumed that this waste will be transported out-of-state for disposal. Furthermore, it is assumed that each material is disposed in identical proportions, 83 percent to combustion and 17 percent to landfilling.

Table I-9 presents the 30-percent diversion case in Scenario 1.

Table I-9
Scenario 1 - FY 2005, 30 Percent Diversion

FY 2005 Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Newspaper	188,918	136,166	9,126	43,626	---
Corrugated Cardboard	272,819	245,537	4,720	22,562	---
Mixed Paper	270,440	30,207	41,560	198,673	---
Office Paper	90,635	74,241	2,836	13,558	---
PET	38,815	14,515	4,2104	20,096	---
HDPE	25,695	7,889	3,080	14,726	---
Mixed Plastics	411,115	---	71,123	339,992	---
Glass	123,663	76,238	8,205	39,220	---
Aluminum Cans	10,996	9,896	190	909	---
Mixed Metals	179,254	94,556	14,653	70,045	---
Yard Trimmings	129,370	---	2,264	10,673	116,433
Food Scraps	533,136	---	92,648	439,809	679
Personal Computers	76,100	441	13,089	62,570	---
Mixed Organics	497,915	---	86,139	411,776	---
Mixed Recyclables	709,263	326,201	66,270	316,792	---
Mixed MSW	246,866	---	42,708	204,158	---
TOTAL (1)	3,805,000	1,015,888	462,814	2,209,186	117,112

(1) Figures may not add due to rounding

To estimate the reduction in emissions when the MSW diversion rate increases from 30 percent, as shown in Table I-9, to 49 percent, the following changes were assumed.

1. A more aggressive program to divert Mixed Paper from disposal is implemented, resulting in an increase in the amount of Mixed Paper recycled. On a percentage basis, the diversion rate for Mixed Paper increases from 11 percent to 40 percent.
2. An aggressive program to divert food waste from disposal is assumed to be implemented resulting in an increase in the amount of Food Scraps composted. On a percentage basis, the diversion rate for Food Scraps increases from less than 1 percent to 60 percent.
3. A program to divert electronics from disposal is assumed to be implemented resulting in an increase in the amount of electronics [Personal Computers] recycled. On a percentage basis, the diversion rate for electronics increases from less than 1 percent to 50 percent.
4. A program to divert C&D Materials from disposal is assumed to be implemented resulting in an increase in the amount of C&D Materials recycled. Because the WARM does not have a category for C&D Materials, it is assumed that these materials are included in the WARM's Mixed Recyclables category. On a

percentage basis, the diversion rate for C&D Materials increases from less than 1 percent to 60 percent. It should be noted that the C&D waste shown here are those C&D materials disposed with the MSW and do not include the large amount of C&D waste disposed from large construction projects.

5. It is further assumed that all other recycling and composting programs remain exactly as they are in the 30 percent case, including the 90 percent diversion rates for OCC, aluminum cans, and yard waste.

Together these assumptions result in an overall MSW diversion rate of 49 percent. These strategies are used for illustration and it should be emphasized that these assumptions do not necessarily represent the goals that Connecticut will adopt to reduce its waste. There are many possible options for diverting waste from disposal and selecting them will take time and careful planning.

A 49 percent diversion in FY 2005 would result in 1,864,496 tons of MSW diverted from disposal, leaving 1,940,504 tons of MSW remaining for disposal. With Connecticut's RRF disposal capacity at 2,209,000, this means that all remaining MSW could be disposed in the State's RRF facilities and none would need to be land filled.

Table I-10 shows the details of Scenario 1 with a 49 percent diversion rate.

Table I-10
Scenario 1 – FY 2005, 49 Percent Diversion

Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Newspaper	188,918	136,166	---	52,752	---
Corrugated Cardboard	272,819	245,537	---	27,282	---
Mixed Paper	270,440	162,264	---	108,176	---
Office Paper	90,635	74,241	---	16,394	---
PET	38,815	14,515	---	24,300	---
HDPE	25,695	7,889	---	17,806	---
Mixed Plastics	411,115	---	---	411,115	---
Glass	123,663	76,238	---	37,425	---
Aluminum Cans	10,996	9,896	---	1,100	---
Mixed Metals	179,254	94,556	---	84,698	---
Yard Trimmings	129,370	---	---	116,433	116,433
Food Scraps	533,136	---	---	213,254	319,881
Personal Computers	76,100	38,050	---	38,050	---
Mixed Organics	497,915	---	---	497,915	---
Mixed Recyclables	709,263	598,829	---	140,434	
Mixed MSW	246,866	---	---	246,866	---
TOTAL (1)	3,805,000	1,428,181	---	1,940,504	436,315

(1) Figures may not add due to rounding.

Based on the CT DEP estimates for FY2003 grasscycling and home composting were projected to account for approximately 51,000 tons of yard trimmings being diverted from disposal in FY2005. Therefore, in the analysis, it is assumed that these 51,000 tons of yard trimmings are composted.

The results of Scenario 1 rest on the following assumptions which are included in the WARM:

- The emissions from landfilling depend, in part, on whether or not the landfill has a landfill gas control system. Although the types of landfill gas control systems in the landfills accepting Connecticut's MSW are varied, the analysis assumes that all landfills have some type of landfill gas control system.
- The analysis also assumes that landfill gas captured by the landfill gas control systems are flared, rather than captured for energy.
- Because the efficiencies of the landfill gas control systems used in all landfills that are accepting Connecticut MSW are not known, the WARM's default value of 75 percent efficiency is assumed.

- Emissions that occur during the transport of materials to the management facility are included in the WARM. These emissions occur when materials are transported by truck to an IPC, a composting site, an RRF, or a landfill. The analysis assumes that materials that are being recycled, composted, or combusted are moved within Connecticut and the average transportation distance, from the point of generation to the management facility, is 50 miles. On the other hand, when MSW is transported to out-of-state landfills for disposal, it is assumed that the average transportation distance is 300 miles. It should also be noted that in addition to the air emissions, there would also be GHG emissions.

Based on the assumptions above, the results of Scenario 1 are as follows:

MTCE: In the 30 percent diversion case, there is a reduction of approximately 962,638 metric tons of carbon equivalents. For the 49 percent diversion rate, the reduction is 1,237,463 metric tons of carbon equivalents. In other words, when the diversion rate in FY 2005 is increased from 30 percent to 49 percent, there is a reduction of the equivalent of 274,825 metric tons of carbon.

MTCO$_2$E: In the 30 percent diversion case, there is a reduction of approximately 3,529,674 metric tons of CO_2 equivalents. For the 49 percent diversion rate, the reduction is 4,537,366 metric tons of CO_2 equivalents. In other words, when the diversion rate in FY 2005 is increased from 30 percent to 49 percent, there is a reduction of the equivalent of 1,007,691 metric tons of CO_2

The WARM model also estimates that increasing the diversion rate from 30 percent to 49 percent in FY 2005 is the equivalent of removing 218,115 passenger cars from the road each year.

Scenario 2

Scenario 2 uses the same assumptions as Scenario 1, with two exceptions. First, Scenario 2 uses the Plan's MSW projections for FY 2024. Because of the projected growth in Connecticut's population, economic growth, and per capita waste generation, the amount of MSW generated is projected to increase from approximately 3,805,000 tons in FY 2005 to approximately 5,233,000 tons in FY 2024. Second, Scenario 2 includes two different disposal cases. In the first case, it is assumed that Connecticut's RRF disposal capacity in FY 2024 remains at the FY 2010 level of 2,066,000 tons per year. In the second case, it is assumed that an additional 614,000 tons of RRF disposal capacity is added, resulting in a total RRF disposal capacity in FY 2024 of 2,680,000 tons per year.

Table I-11 presents the 30 percent diversion case for FY 2024, assuming no new RRF disposal capacity.

Table I-11
Scenario 2 – FY 2024, 30 Percent Diversion with 2,066,000 of RRF Disposal Capacity

FY 2024 Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Newspaper	259,818	187,269	31,631	40,918	---
Corrugated Cardboard	375,207	337,686	16,359	21,162	---
Mixed Paper	371,935	41,544	144,051	186,341	---
Office Paper	124,650	102,103	9,830	12,716	---
PET	53,382	19,962	14,571	18,849	---
HDPE	35,338	10,850	10,677	13,812	---
Mixed Plastics	565,405	---	246,516	318,888	---
Glass	170,073	104,850	28,437	36,786	---
Aluminum Cans	15,123	13,610	659	853	---
Mixed Metals	246,527	130,042	50,787	65,697	---
Yard Trimmings	177,922	---	7,829	9,964	160,130
Food Scraps	733,220	---	322,206	410,080	934
Personal Computers	104,660	607	45,471	58,582	---
Mixed Organics	684,780	---	298,564	386,216	---
Mixed Recyclables	975,446	448,623	231,802	295,021	---
Mixed MSW	339,514	---	149,386	190,128	---
TOTAL (1)	5,233,000	1,397,146	1,608,778	2,066,012	161,064

(1) Figures may not add due to rounding

As Table I-11 shows, 31 percent of MSW generated in FY 2024 is disposed in out-of-state landfills.

Table I-12 presents the 30 percent diversion case for FY 2024, assuming RRF disposal capacity increases from approximately 2,066,000 tons per year to 2,680,000 tons per year.

Table I-12
Scenario 2 - FY 2024, 30 Percent Diversion with 2,680,000 of RRF Disposal Capacity

FY 2024 Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Newspaper	259,818	187,269	19,951	52,598	---
Corrugated Cardboard	375,207	337,686	10,318	27,202	---
Mixed Paper	371,935	41,544	90,858	239,534	---
Office Paper	124,650	102,103	6,200	16,346	---
PET	53,382	19,962	9,190	24,229	---
HDPE	35,338	10,850	6,612	17,877	---
Mixed Plastics	565,405	---	152,659	412,745	---
Glass	170,073	104,850	17,610	47,613	---
Aluminum Cans	15,123	13,610	416	1,098	---
Mixed Metals	246,527	130,042	31,451	85,034	---
Yard Trimmings	177,922	---	4,893	12,899	160,130
Food Scraps	733,220	---	197,717	534,569	934
Personal Computers	104,660	607	28,094	75,959	---
Mixed Organics	684,780	---	184,891	499,890	---
Mixed Recyclables	975,446	448,623	142,242	384,581	---
Mixed MSW	339,514	---	91,669	247,845	---
TOTAL [1]	5,233,000	1,397,146	994,772	2,680,018	161,064

(1) Figures may not add due to rounding.

When RRF disposal capacity is increased, the percentage of MSW being landfilled decreases from 31 percent to 19 percent.

Based on the assumptions above, the results of Scenario 2 are as follows:

MTCE: In the case with no new RRF capacity, there is a reduction in emissions of approximately 1,289,764 metric tons of carbon equivalents. When the additional 614,000 tons of RRF disposal capacity is added, the reduction in emissions is approximately 1,308,672 metric tons of carbon equivalents. In other words, when the amount of MSW disposed in RRFs increases, there is an emissions reduction of the equivalent of 18,908 metric tons of carbon.

MTCO$_2$E: In the case with no new RRF capacity, there is a reduction in emissions of approximately 4,729,135 metric tons of CO_2 equivalents. When the additional RRF capacity is added and less MSW is landfilled, the reduction of emissions is 4,798,443 metric tons of CO_2 equivalents. In other words, when the amount of MSW disposed in RRFs increases and the amount landfilled out-of-state decreases, there is a reduction of the equivalent of 69,329 metric tons of CO_2

The WARM model estimates that increasing RRF disposal capacity from 2,066,000 tons per year to 2,680,000 tons per year in FY 2024 is the equivalent of removing 15,006 passenger cars from the road each year.

Scenario 3

Scenario 3 presents a 30 percent diversion case and a 49 percent diversion case in FY 2024. In this scenario, it is also assumed that Connecticut's RRF capacity in FY 2024 is increased by 614,000 tons. As in Scenario 2, in FY 2024, the State's annual RRF disposal Capacity with this added capacity is assumed to be 2,680,000 tons which eliminates any disposal capacity shortfall in FY 2024 with a 49 percent diversion rate.

All other assumptions used in Scenarios 1 and 2 are used in Scenario 3.

Table I-13 presents the 30 percent diversion case for FY 2024, assuming an RRF disposal capacity of 2,680,000 tons.

Table I-13
Scenario 3 - FY 2024, 30 Percent Diversion with RRF Capacity of 2,680,000 tons

FY 2024 Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Newspaper	259,818	187,269	19,951	52,598	---
Corrugated Cardboard	375,207	337,686	10,318	27,202	---
Mixed Paper	371,935	41,544	90,858	239,534	---
Office Paper	124,650	102,103	6,200	16,346	---
PET	53,382	19,962	9,190	24,229	---
HDPE	35,338	10,850	6,612	17,877	---
Mixed Plastics	565,405	---	152,659	412,745	---
Glass	170,073	104,850	17,610	47,613	---
Aluminum Cans	15,123	13,610	416	1,098	---
Mixed Metals	246,527	130,042	31,451	85,034	---
Yard Trimmings	177,922	---	4,893	12,899	160,130
Food Scraps	733,220	---	197,717	534,569	934
Personal Computers	104,660	607	28,094	75,959	---
Mixed Organics	684,780	---	184,891	499,890	---
Mixed Recyclables	975,446	448,623	142,242	384,581	---
Mixed MSW	339,514	---	91,669	247,845	---
TOTAL (1)	5,233,000	1,397,146	994,772	2,680,018	161,064

(1) Figures may not add due to rounding.

Table I-14 presents the 49 percent diversion case for FY 2024, assuming an RRF disposal capacity of 2,680,000 tons.

Table I-14
Scenario 3 - FY 2024, 49 Percent Diversion with RRF Capacity of 2,680,000 tons

FY 2024 Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Newspaper	259,818	187,269	---	72,550	---
Corrugated Cardboard	375,207	337,686	---	37,521	---
Mixed Paper	371,935	148,744	---	223,161	---
Office Paper	124,650	102,103	---	22,547	---
PET	53,382	19,962	---	33,420	---
HDPE	35,338	10,850	---	24,489	---
Mixed Plastics	565,405	---	---	565,405	---
Glass	170,073	104,850	---	65,223	---
Aluminum Cans	15,123	13,610	---	1,512	---
Mixed Metals	246,527	130,042	---	116,485	---
Yard Trimmings	177,922	---	---	17,792	160,130
Food Scraps	733,220	---	---	293,288	439,932
Personal Computers	104,660	52,330	---	52,330	---
Mixed Organics	684,780	---	---	684,780	---
Mixed Recyclables	975,446	845,517	---	129,929	---
Mixed MSW	339,514	---	---	339,514	---
TOTAL [1]	5,233,000	1,952,994	---	2,679,945	600,062

(1) Figures may not add due to rounding.

As Table I-14 shows, no MSW is landfilled with a 49 percent diversion rate in FY 2024.

Based on the assumptions above, the results of Scenario 3 are as follows:

MTCE: In the 30 percent diversion case, there is a reduction of approximately 1,308,672 metric tons of carbon equivalents. For the 49 percent diversion rate, the reduction is 1,689,784 metric tons of carbon equivalents. In other words, when the diversion rate in FY 2024 is increased from 30 percent to 49 percent and RRF disposal capacity is increased, there is an emissions reduction of the equivalent of 381,112 metric tons of carbon.

$MTCO_2E$: In the 30 percent diversion case, there is a reduction of approximately 4,798,463 metric tons of CO_2 equivalents. For the 49 percent diversion rate, the reduction is 6,195,874 metric tons of CO_2 equivalents. In other words, when the diversion rate in FY 2024 is increased from 30 percent to 49 percent, there is a reduction of the equivalent of 1,397,410 metric tons of CO_2

The WARM model estimates that increasing the diversion rate in FY 2024 from 30 percent to 49 percent, with an RRF disposal capacity of 2,680,0000 tons per year is the equivalent of removing 302,470 passenger cars from the road each year.

I.6.2 WARM Summary

Table I-15 summarizes the results of the three scenarios developed with the WARM, based on the assumptions described above.

Table I-15
Summary of WARM Analysis

Scenario	MSW Diverted (%)	MSW Landfilled (%)	MSW Combusted (%)	MTCE	$MTCO_2E$
Scenario 1 (1)	30%	12%	58%	(962,638)	(3,529,674)
Scenario 1 (1)	49%	0%	51%	(1,237,463)	(4,537,366)
Scenario 2 (2)	30%	31%	39%	(1,289,674)	(4,729,135)
Scenario 2 (3)	30%	19%	51%	(1,308,672	(4,798,463)
Scenario 3 (4)	30%	19%	51%	(1,308,672)	(4,798,463)
Scenario 3 (4)	49%	0%	51%	(1,689,784)	(6,195,874)

(1) FY2005, assumes MSW generation of 3,805,000 TPY and an RRF disposal capacity of 2,290,000 tons.
(2) FY2024, assumes MSW generation 5,233,000 TPY and an RRF disposal capacity of 2,066,000 tons.
(3) FY2024, assumes MSW generation of 5,233,000 TPY and an RRF disposal capacity of 2,680,000 tons.
(4) FY2024, assumes MSW generation of 5,233,000 TPY and an RRF disposal capacity of 2,680,000 tons.

As both Scenarios 1 and 3 show that the greatest reductions in emissions occur at the 49 percent diversion rates. Scenario 2 indicates that there is a reduction in emissions when MSW is disposed in Connecticut RRFs, rather than being disposed in out-of-state landfills.

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Appendix J
PROJECTIONS OF SOLID WASTE GENERATION AND DISPOSAL

Introduction

Appendix J presents a summary of the projections of Connecticut solid waste for the period FY2005 through FY2024. These projections provide the basis for the discussion of solid waste management contained in this Plan. The projected trends for waste generation, disposal, diversion from disposal, and the in-state disposal capacity are presented here in table form.

The projections were developed by R. W. Beck, Inc., consultants hired by the CT DEP to assist in developing the Plan, and are based on a combination of solid waste data reported to the CT DEP. These include estimates of data not captured by the reporting system and the development and use of a regression analysis based on Connecticut's population and the gross state product. These analyses resulted in the assumption of a 1.6 percent annual increase for some components of the solid waste stream. Because conflicting information was presented in regards to the fate of the Wallingford RRF after FY2009, projections presented in various projection tables and figures reflect both scenarios, i.e., the Wallingford RRF remains open or the Wallingford RRF closes in June 2009. Additional assumptions are presented in footnotes accompanying each of these tables. The revised MSW and RRF Ash Residue tables were amended by the CT DEP.

Data Sources and Calculations Used for Projections of MSW Generation, Diversion from Disposal, and Disposed

- **MSW Generated**

The R.W. Beck estimate (projection) of MSW generated for FY2005 was 3,805,000 tons.

The basis for this estimate was data provided by the CT DEP (based on reports submitted to the CT DEP by CT solid waste facilities and by CT municipalities) on CT MSW disposed between FY1992 and FY2004 and MSW recycled and generated between FY1992 and FY2003.

To project future residential and commercial generation, R.W. Beck developed a regression analysis based on: (1) Connecticut's population, to project residential generation and (2) the Gross State Product ($), to project commercial/industrial MSW generation. The output of this regression analysis was, therefore, expected to account for changes in waste generation due to fluctuations in population as well as changes in economic growth.

- Connecticut population projections were based on the U.S. Bureau of the Census's "Population Projections: States 1995-2025". Because that U.S. Census report provided population projections in five-years increments, the years between the Census Bureau's estimates were interpolated linearly by R.W. Beck.
- Projected Gross State Product for Connecticut was based on millions of chained FY2000 dollars (Reference: Survey of Current Business; "Gross State Product: Accelerated Estimates for 2004 and Revised Estimates for 1997-2003"; Woodruff, Downy, and Kort).

The output of the regression analysis for FY2005 is provided below.

(CT population x 0.49) + (Gross State Product x 10.7) = Tons/year of MSW generated.

Applying this formula to FY2005, the result is:
(3,317,000 x 0.49) + (177,000 x 10.7) = 3,516,000 tons/year MSW generated

Although the changes in the amount of MSW generated each year between FY1992 and FY2003 varied, the average annual increase was 1.6%. This percentage was used to escalate components of the MSW stream in projecting generation during the planning period (FY2005 to FY2024).

The initial estimate of 3,516,000 tons MSW generated in FY2005 does not include estimates for material home composted or grasscycled nor does it include "supplemental recycling" as presented in a CRRA report prepared by Franklin Associates. Therefore, these amounts were added to the total MSW generation. The amount of material home composted and grasscycled in FY2003, as estimated by the DEP was 49,578 tons. This amount was escalated by 1.6% per year for two years to provide a FY2005 estimate of 51,177, or 51,000 tons.

The amount of supplemental recycling of MSW estimated by the CRRA report in 2000, based on FY1998 data, was 212,791 tons. This amount was escalated by 1.6 percent/year to provide the FY2005 estimate of 237,799, or 238,000 tons.

Therefore:
Total MSW generation for FY2005 = Initial estimate + home composting/grasscycling + supplemental recycling

Total MSW generation for FY2005 = 3,516,000 + 51,000 + 238,000 = 3,805,000

In succeeding years, MSW generation was escalated as follows:

1. The regression formula for MSW generation was applied to the projected CT population and Gross State Product to obtain the initial generation estimate;
2. Source Reduction was escalated at 1.6% per year; and
3. Supplemental Recycling was escalated at 1.6% per year.

- **Percent MSW Diverted from Disposal**

The R.W. Beck FY2005 estimate (projection) of Percent Diverted from Disposal was 30%.

1. The DEP reported a 24.21% recycling rate in FY2003. It was assumed in these estimates that the same recycling rate would be achieved in FY2004 and FY2005. In addition, two other streams of diverted waste were added to this recycling rate: source reduction (home composting and grass cycling) and supplemental recycling tons.
2. 49,578 tons of source reduction through home composting and grass cycling in 2003. Escalated at 1.6% per year, this results in an estimate of 51 (000) tons diverted through source reduction in FY2005, and
3. The supplemental recycling tons, which were included in a report prepared for CRRA in January 2000. In this report, FY1998 data was used. This data was escalated annually by 1.6% to develop FY2005 data. This supplemental recycling includes:

Material	FY1998	FY2005
o Commercial corrugated cardboard	137,864 tons	154,066 tons
o Commercial office paper	18,077 tons	20,201 tons
o Bottle Bill – Plastic containers	7,849 tons	8,771 tons
o Bottle Bill – Glass containers	37,138 tons	41,503 tons
o Bottle Bill – Aluminum containers	11,863 tons	13,257 tons
Total	212,791 tons	237,799 tons

For FY2005, therefore, supplemental recycling is 238,000 tons.

Tons diverted from disposal FY2005 = (24% x 3,516,000) + 51,000 + 238,000 = 1,133,000 tons.

FY2005 percent MSW estimated (projected) diverted from disposal =1,133,000/ 3,805,000 = 30%

Thereafter, the percent of waste diverted is based on the scenario described in the table. The tons diverted from disposal are the percentage of MSW diverted times the tons of MSW generated each year.

- **MSW Disposed**

The R.W. Beck FY2005 estimate (projection) of MSW disposed was 2,671,000.
Tons of MSW disposed was calculated by subtracting tons of MSW projected diverted from Disposal from tons of MSW projected Generated

FY2005 MSW estimated (projected) Disposed = 3,805,000 – 1,133,000 = 2,671,000

This formula is applied for all succeeding years.

Table and Figure Discussion

Table J-1. MSW Projections – Assuming a MSW Diversion Rate (from Disposal) of 58% by FY2024

This table shows the projected generation and disposal of municipal solid waste (MSW) over the twenty year planning period, assuming that Connecticut's waste diversion rate increases from 30 percent in FY2005 to 58 percent in FY2024. Based on the assumptions used in these projections this rate of increase would eliminate the projected in-state disposal capacity shortfall projected for FY2024 (assuming that the Wallingford RRF remains open after 2009 and no new MSW disposal capacity is built in Connecticut through 2024). Achieving the 58 percent rate would require Connecticut to divert 3,035,000 tons of MSW from disposal in FY2024.

Table J-2. MSW Projections – Assuming a MSW Diversion Rate of 49% by FY2024

This table shows the projected generation and disposal of municipal solid waste (MSW) over the twenty year planning period, assuming that Connecticut's waste diversion rate increases from 30 percent in FY2005 to 49 percent in FY2024. This rate of increase would maintain a consistent annual tonnage of MSW disposed from FY2005 through FY2024 at approximately 2.7 million tons per year. Based on the assumptions used in these projections and if the Wallingford RRF remains open, Connecticut's in-state disposal capacity shortfall shown in Table J-2 would be 471,000 tons in FY2024. If the Wallingford RRF closes in June 2009 Connecticut's in-state disposal capacity shortfall shown in Table J-2 would be 614,000 tons in FY2024.

Table J-3. MSW Projections – Assuming a MSW Diversion Rate of 40% by FY2015 through FY2024

This table shows the projected generation and disposal of MSW over the twenty year planning period, assuming that Connecticut's waste diversion rate increases from 30 percent in FY2005 to 40 percent in FY2015 and remains at 40 percent through FY2024. Based on the assumptions used in these projections, and if the Wallingford

RRF remains open after FY2009, Connecticut's in-state disposal capacity shortfall shown in Table J-3 would be 931,000 tons in FY2024. If the Wallingford RRF closes in June 2009, Connecticut's in-state disposal capacity shortfall in Table J-3 would be 1,074,000 tons in FY2024.

Table J-4. MSW Projections – Assuming the MSW Diversion Rate Remains at 30% through FY2024

This table shows the projected generation and disposal of MSW over the twenty year planning period, assuming that Connecticut's waste diversion rate remains at 30 percent from FY2005 through FY2024. Based on the assumptions used in these projections, and if the Wallingford RRF remains open after FY2009, Connecticut's in-state disposal capacity shortfall shown in Table J-4 would be 1,454,000 tons in FY2024. If the Wallingford RRF closes in June 2009, Connecticut's in-state disposal capacity shortfall as shown in Table J-3 would be 1,597,000 tons in FY2024.

Figure J-1. Projections of In-State MSW Disposal Capacity Shortfall

Figure J-1 illustrates the projected in-state disposal capacity shortfall from FY2005 through FY2024 under the four waste diversion assumptions shown in Tables J-1, J-2, J-3, and J-4, assuming the Wallingford RRF remains open through FY2024.

Table J-5. RRF Ash Residue Generation Projections

This table shows the projected generation and disposal of RRF ash residue over the twenty year planning period assuming that no new in-state RRF processing capacity is developed. It shows both scenarios regarding the Wallingford RRF – i.e. Wallingford RRF ceases operation in June 2009 and Wallingford continues to operate.

Based on the assumptions used in these projections, and if the Wallingford RRF continues operating, Connecticut's in-state RRF ash residue disposal capacity as shown in Table J-5 would be sufficient to dispose of ash from all six RRFs through FY2017 and most of FY2018. The projected in-state RRF ash residue disposal capacity shortfall would be 551,000 tons in FY2024.

Based on the assumptions used in these projections, and if the Wallingford RRF ceases operation in June 2009, Connecticut's in-state RRF ash residue disposal capacity as shown in Table J-5 would sufficient to dispose of ash from all six RRFs through FY2018 and part of FY2019. The projected in-state RRF ash residue disposal capacity shortfall would be 504,000 tons in FY2024.

Figure J-2. Projections of In-State MSW RRF Ash Residue Disposal Capacity Shortfall

Figure J-2 illustrates the projected in-state disposal capacity shortfall for RRF ash residue from FY2005 through FY2024, as presented in Table J-5.

Table J-6. Construction and Demolition (C&D) Waste/Oversized MSW Projections Assuming a Disposal Diversion Rate of 48% by FY2024

Table J-6 shows the projected generation and disposal of construction and demolition waste (C&D Waste) and oversized MSW over the twenty year planning period, assuming that Connecticut's C&D waste diversion from disposal rate increases from seven percent in FY2005 to 48 percent in FY2024. Based on the assumptions used in these projections, Connecticut's C&D waste/oversized MSW disposal capacity shortfall in Table J-6 would be 801,000 tons in FY2024.

Table J-7. Construction and Demolition (C&D) Waste/Oversized MSW Projections Assuming a Disposal Diversion Rate of 40% by FY2015 through FY2024

This table shows the projected generation and disposal of C&D waste/oversized MSW over the twenty year planning period, assuming that Connecticut's C&D waste diversion rate increases from 7 percent in FY2005 to 40 percent in FY2015 and remains at 40 percent through FY2024. Based on the assumptions used in these projections, Connecticut's C&D waste/oversized MSW disposal capacity shortfall in Table J-7 would be 925,000 tons in FY2024.

Table J-8. Construction and Demolition (C&D) Waste/Oversized MSW Projections Assuming a Disposal Diversion Rate Remains at 7% through FY2024

This table shows the projected generation and disposal of C&D waste/oversized MSW over the twenty year planning period, assuming that Connecticut's C&D waste diversion rate remains at seven percent from FY2005 through FY2024. Based on the assumptions used in these projections, Connecticut's C&D waste/oversized MSW disposal capacity shortfall in Table J-8 would be 1,436,000 tons in FY2024.

Figure J-3. Projections of In-State C&D Waste/Oversized MSW Disposal Capacity Shortfall

Figure J-3 illustrates the projected in-state C&D waste/oversized MSW disposal capacity shortfall from FY2005 through FY2024 under the three waste diversion assumptions shown in Tables J-6, J-7, and J-8.

Table J-1
CT MSW Projections and In-State MSW Disposal Capacity Projections, FY2005-FY2024: Assumes MSW Diversion Rate of 58% by FY2024

Fiscal Year	MSW Generated (1) (000 tons/year)	Percent MSW Diverted from Disposal (2)	MSW Diverted from Disposal (000 tons/year)	MSW Disposed (000 tons/year)	In-State Disposal Capacity (000 tons/year) (3)	In-State Disposal Capacity Shortfall (4) (000 tons/year)
2005	3,805	30%	1,133	2,671	2,344	327
2006	3,865	32%	1,237	2,628	2,344	284
2007 (5)	3,926	33%	1,296	2,630	2,260	370
2008 (6)	3,988	34%	1,356	2,632	2,235	397
2009	4,052	36%	1,459	2,593	2,209	384
2010 (7)	4,118	37%	1,523	2,594	2,209	385
2011	4,186	39%	1,633	2,554	2,209	345
2012	4,257	40%	1,703	2,554	2,209	345
2013	4,328	42%	1,818	2,510	2,209	301
2014	4,402	43%	1,893	2,509	2,209	300
2015	4,476	45%	2,014	2,462	2,209	253
2016	4,553	46%	2,094	2,459	2,209	250
2017	4,632	48%	2,223	2,409	2,209	200
2018	4,712	49%	2,309	2,403	2,209	194
2019	4,794	51%	2,445	2,349	2,209	140
2020	4,879	52%	2,537	2,342	2,209	133
2021	4,965	54%	2,681	2,284	2,209	75
2022	5,052	55%	2,779	2,274	2,209	65
2023	5,142	57%	2,931	2,211	2,209	2
2024	5,233	58%	3,035	2,198	2,209	0

(1) MSW generation projections based on projections of Connecticut's population from US Census Bureau and the Gross State Product.
(2) The percent of MSW diverted from disposal = the amount of MSW recycled and composted divided by the amount of MSW generated. For FY2005, the 30% diversion rate was based on reported and estimated amounts of material recycled and composted; the estimated amounts included additional commercial recycling (not reported) and estimates of bottle bill material recycled. Projections of yearly recycling rates after FY2005 were calculated assuming a linear recycling rate increase reaching 58% by FY2024.
(3) In-State MSW Disposal Capacity = In-State Landfill Capacity (based on amount of MSW disposed in FY2004) plus In-State Resource Recovery Facility capacity (based on the five-year average processed at CT RRFs FY2000-FY2004) assuming no new disposal capacity is added.
(4) In-State Disposal Capacity Shortfall = MSW disposed minus In-State Disposal Capacity.
(5) Hartford Landfill closes in June 2006 resulting in a reduction of 84,000 tons/year of MSW (process residue) starting in 2007. Note: CRRA submitted a revised closure plan for Landfill, decision pending as of 12/06.
(6) Windsor-Bloomfield Landfill closes in December 2007 resulting in a reduction of 26,000 tons of MSW disposal capacity starting in FY 2008 and no disposal capacity for this landfill thereafter.
(7) Projections made in this table regarding in-state disposal capacity shortfall were based on the assumption that the Wallingford RRF would remain open through the projection period.

Table J-2
CTMSW Projections and In-State MSW Disposal Capacity Projections, FY2005-FY2024: Assumes MSW Diversion Rate of 49% by FY2024

Fiscal Year	MSW Generated (1) (000 TPY) (2)	Percent MSW Diverted from Disposal (3)	MSW Diverted from Disposal (000 TPY)	MSW Disposed (000 TPY)	In-State Disposal Capacity (000 TPY) (4)		In-State Disposal Capacity Shortfall (5) (000 TPY)	
					Wallingford RRF Remains Open	Wallingford RRF Closes in June 2009	**Wallingford RRF Remains Open**	Wallingford RRF Closes in June 2009
2005	3,805	30%	1,133	2,671	**2,344**	2,344	**327**	327
2006	3,865	31%	1,190	2,675	**2,344**	2,344	**331**	331
2007 (6)	3,926	32%	1,248	2,678	**2,260**	2,260	**418**	418
2008 (7)	3,988	33%	1,308	2,681	**2,235**	2,235	**446**	446
2009	4,052	34%	1,369	2,683	**2,209**	2,209	**474**	474
2010 (8)	4,118	35%	1,432	2,685	**2,209**	2,066	**476**	619
2011	4,186	36%	1,498	2,688	**2,209**	2,066	**479**	622
2012	4,257	37%	1,566	2,691	**2,209**	2,066	**482**	625
2013	4,328	38%	1,636	2,693	**2,209**	2,066	**484**	627
2014	4,402	39%	1,707	2,694	**2,209**	2,066	**485**	628
2015	4,476	40%	1,781	2,695	**2,209**	2,066	**486**	629
2016	4,553	41%	1,857	2,696	**2,209**	2,066	**487**	630
2017	4,632	42%	1,936	2,696	**2,209**	2,066	**487**	630
2018	4,712	43%	2,016	2,696	**2,209**	2,066	**487**	630
2019	4,794	44%	2,099	2,695	**2,209**	2,066	**486**	629
2020	4,879	45%	2,185	2,694	**2,209**	2,066	**485**	628
2021	4,965	46%	2,273	2,691	**2,209**	2,066	**482**	625
2022	5,052	47%	2,364	2,688	**2,209**	2,066	**479**	622
2023	5,142	48%	2,457	2,685	**2,209**	2,066	**476**	619
2024	5,233	49%	2,553	2,680	**2,209**	2,066	**471**	614

(1) MSW generation projections based on projections of Connecticut's population from US Census Bureau and the Gross State Product.
(2) TPY is defined as Tons per Year.
(3) The percent of MSW diverted from disposal = the amount of MSW recycled and composted divided by the amount of MSW generated. For FY2005, the 30% diversion rate was calculated based on reported and estimated amounts of material recycled and composted; the estimated amounts included additional commercial recycling (not reported) and estimates of bottle bill material recycled.
(4) In-State MSW Disposal Capacity = In-State Landfill Capacity (based on amount of MSW disposed in FY2004) plus In-State Resource Recovery Facility capacity (based on the five-year average processed at CT RRFs FY2000-FY2004) assuming no new disposal capacity is added.
(5) In-State Disposal Capacity Shortfall = MSW disposed minus In-State Disposal Capacity.
(6) Hartford Landfill closes in June 2006 resulting in a reduction of 84 (000) TPY of MSW (process residue) starting in 2007. Note: CRRA submitted a revised closure plan for Landfill, decision pending as of 12/06.
(7) Windsor-Bloomfield Landfill closes in December 2007 resulting in a reduction of 26 (000) tons of MSW disposal capacity starting in FY 2008 and no disposal capacity for this landfill thereafter.
(8) Projections of in-state disposal capacity shortfall were calculated for both scenarios i.e. (a) the Wallingford RRF closing in June 2009 and (b) the Wallingford RRF remaining open through the projection period.

Table J-3

CT MSW Projections and In-State MSW Disposal Capacity Projections, FY 2005-FY2024: Assumes MSW Diversion Rate of 40% by 2015 and maintains at this level to FY2024

Fiscal Year	MSW Generated (1) (000 TPY) (2)	Percent MSW Diverted from Disposal (3)	MSW Diverted from Disposal (000 TPY)	MSW Disposed (000 TPY)	In-State Disposal Capacity (000 TPY) (4)		In-State Disposal Capacity Shortfall (000 TPY) (5)	
					Wallingford RRF Remains Open	Wallingford RRF Closes in June 2009	**Wallingford RRF Remains Open**	Wallingford RRF Closes in June 2009
2005	3,805	30%	1,133	2,671	**2,344**	2,344	**327**	327
2006	3,865	31%	1,190	2,675	**2,344**	2,344	**331**	331
2007 (6)	3,926	32%	1,248	2,678	**2,260**	2,260	**418**	418
2008 (7)	3,988	33%	1,308	2,681	**2,235**	2,235	**446**	446
2009	4,052	34%	1,369	2,683	**2,209**	2,209	**474**	474
2010 (8)	4,118	35%	1,432	2,685	**2,209**	2,066	**476**	619
2011	4,186	36%	1,498	2,688	**2,209**	2,066	**479**	622
2012	4,257	37%	1,566	2,691	**2,209**	2,066	**482**	625
2013	4,328	38%	1,636	2,693	**2,209**	2,066	**484**	627
2014	4,402	39%	1,707	2,694	**2,209**	2,066	**485**	628
2015	4,476	40%	1,781	2,695	**2,209**	2,066	**486**	629
2016	4,553	40%	1,821	2,732	**2,209**	2,066	**523**	666
2017	4,632	40%	1,853	2,779	**2,209**	2,066	**570**	713
2018	4,712	40%	1,885	2,827	**2,209**	2,066	**618**	761
2019	4,794	40%	1,918	2,877	**2,209**	2,066	**668**	811
2020	4,879	40%	1,951	2,927	**2,209**	2,066	**718**	861
2021	4,965	40%	1,986	2,979	**2,209**	2,066	**770**	913
2022	5,052	40%	2,021	3,031	**2,209**	2,066	**822**	965
2023	5,142	40%	2,057	3,085	**2,209**	2,066	**876**	1,019
2024	5,233	40%	2,093	3,140	**2,209**	2,066	**931**	1,074

(1) MSW generation projections based on projections of Connecticut's population from US Census Bureau and the Gross State Product.

(2) TPY is defined as Tons per Year.

(3) The percent of MSW diverted from disposal = the amount of MSW recycled and composted divided by the amount of MSW generated. For FY2005, the 30% diversion rate was calculated based on reported and estimated amounts of material recycled and composted; the estimated amounts included additional commercial recycling (not reported) and estimates of bottle bill material recycled.

(4) In-State MSW Disposal Capacity = In-State Landfill Capacity (based on amount of MSW disposed in FY2004) plus In-State Resource Recovery Facility capacity (based on the five-year average processed at CT RRFs FY2000-FY2004) assuming no new disposal capacity is added.

(5) In-State Disposal Capacity Shortfall = MSW disposed minus In-State Disposal Capacity.

(6) Hartford Landfill closes in June 2006 resulting in a reduction of 84,000 tons/year of MSW (process residue) starting in 2007. Note: CRRA submitted a revised closure plan for Landfill, decision pending as of 12/06.

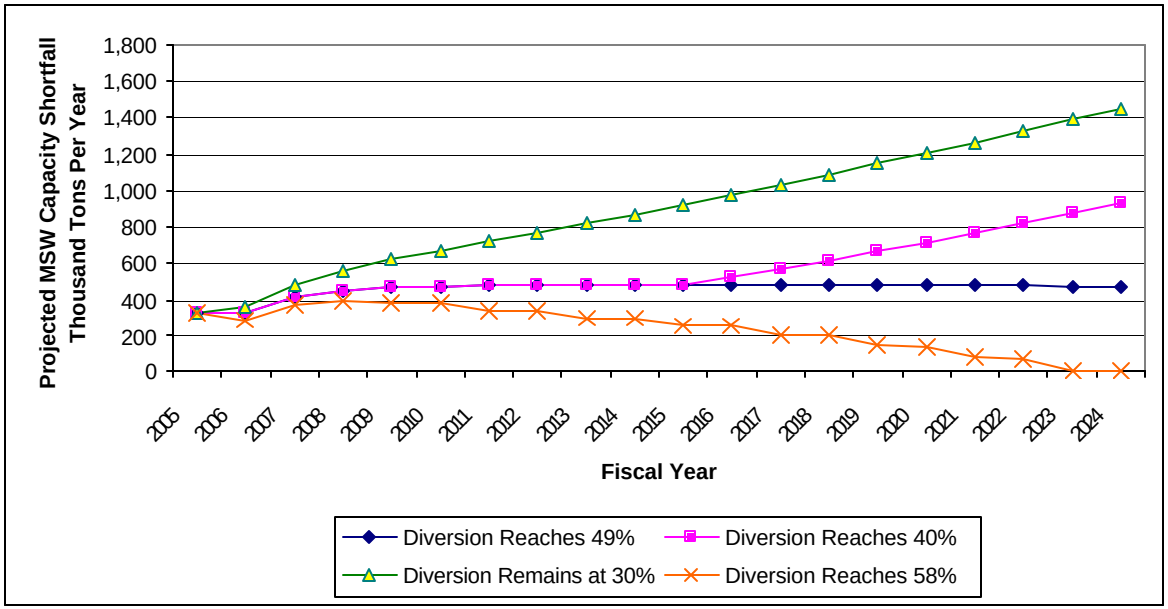
(7) Windsor-Bloomfield Landfill closes in December 2007 resulting in a reduction of 26,000 tons of MSW disposal capacity starting in FY 2008 and no disposal capacity for this landfill thereafter.

(8) Projections of in-state disposal capacity shortfall were calculated for both scenarios i.e. (a) the Wallingford RRF closing in June 2009 and (b) the Wallingford RRF remaining open.

Table J-4
CT MSW Projections and In-State MSW Disposal Capacity Projections, FY2005-FY2024: Assumes MSW Diversion Rate of 30% beginning in FY2005 and remains at this level to FY2024

Fiscal Year	MSW Generated (1) (000 TPY) (2)	Percent MSW Diverted from Disposal (3)	MSW Diverted from Disposal (000 TPY)	MSW Disposed (000 TPY)	In-State Disposal Capacity (000 TPY) (4)		In-State Disposal Capacity Shortfall (000 TPY) (5)	
					Wallingford RRF Remains Open	Wallingford RRF Closes in June 2009	**Wallingford RRF Remains Open**	Wallingford RRF Closes in June 2009
2005	3,805	30%	1,133	2,671	**2,344**	2,344	**327**	327
2006	3,865	30%	1,159	2,705	**2,344**	2,344	**361**	361
2007 (6)	3,926	30%	1,178	2,748	**2,260**	2,260	**488**	488
2008 (7)	3,988	30%	1,197	2,792	**2,235**	2,235	**557**	557
2009	4,052	30%	1,216	2,837	**2,209**	2,209	**628**	628
2010 (8)	4,118	30%	1,235	2,882	**2,209**	2,066	**673**	816
2011	4,186	30%	1,256	2,930	**2,209**	2,066	**721**	864
2012	4,257	30%	1,277	2,980	**2,209**	2,066	**771**	914
2013	4,328	30%	1,299	3,030	**2,209**	2,066	**821**	964
2014	4,402	30%	1,320	3,081	**2,209**	2,066	**872**	1,015
2015	4,476	30%	1,343	3,133	**2,209**	2,066	**924**	1,067
2016	4,553	30%	1,366	3,187	**2,209**	2,066	**978**	1,121
2017	4,632	30%	1,390	3,242	**2,209**	2,066	**1,033**	1,176
2018	4,712	30%	1,414	3,299	**2,209**	2,066	**1,090**	1,233
2019	4,794	30%	1,438	3,356	**2,209**	2,066	**1,147**	1,290
2020	4,879	30%	1,464	3,415	**2,209**	2,066	**1,206**	1,349
2021	4,965	30%	1,489	3,475	**2,209**	2,066	**1,266**	1,409
2022	5,052	30%	1,516	3,537	**2,209**	2,066	**1,328**	1,471
2023	5,142	30%	1,543	3,599	**2,209**	2,066	**1,390**	1,533
2024	5,233	30%	1,570	3,663	**2,209**	2,066	**1,454**	1,597

(1) MSW generation projections based on projections of Connecticut's population from US Census Bureau and the Gross State Product.
(2) TPY is defined as Tons per Year.
(3) The percent of MSW diverted from disposal = the amount of MSW recycled and composted divided by the amount of MSW generated. For FY2005, the 30% diversion rate was calculated based on reported and estimated amounts of material recycled and composted; the estimated amounts included additional commercial recycling (not reported) and estimates of bottle bill material recycled.
(4) In-State MSW Disposal Capacity = In-State Landfill Capacity (based on amount of MSW disposed in FY2004) plus In-State Resource Recovery Facility capacity (based on the five-year average processed at CT RRFs FY2000-FY2004) assuming no new disposal capacity is added.
(5) In-State Disposal Capacity Shortfall = MSW disposed minus In-State Disposal Capacity.
(6) Hartford Landfill closes in June 2006 resulting in a reduction of 84 (000) TPY of MSW (process residue) starting in 2007.
(7) Windsor-Bloomfield Landfill closes in December 2007 resulting in a reduction of 26 (000) tons of MSW disposal capacity starting in FY 2008 and no disposal capacity for this landfill thereafter.
(8) Projections of in-state disposal capacity shortfall were calculated for both scenarios i.e. (a) the Wallingford RRF closing in June 2009 and (b) the Wallingford RRF remaining open.



FigureJ-1
Projections of In-State MSW Disposal Capacity Shortfall Under Various Waste Diversion Assumptions for the Period FY2005 - FY2024 (Assuming the Wallingford RRF Remains Open through FY2024)

Table J-5

Projections of CT RRF Ash Residue Generation and In-State RRF Ash Residue Disposal Capacity, FY2005-FY2024: Assumes No New In-State RRF Processing Capacity Developed

Fiscal Year	Total Projected Remaining In-State RRF Ash Disposal Capacity (1) (000 Tons)		MSW Processed (burned) at CT RRFs (000 TPY)		Total RRF Ash Residue Requiring Disposal (2) (000 TPY)		CT RRF Ash Residue Assumed To Be Disposed In-State (000 TPY)		Annual RRF Ash Residue Disposal Capacity Shortfall (000 TPY)	
	Wallingford RRF Stays Open	Wallingford RRF Closes in June 2009	**Wallingford RRF Stays Open**	Wallingford RRF Closes in June 2009	**Wallingford RRF Stays Open**	Wallingford RRF Closes in June 2009	**Wallingford RRF Stays Open**	Wallingford RRF Closes in June 2009	**Wallingford RRF Stays Open**	Wallingford RRF Closes in June 2009
2005	**7,501**	7,501	**2,209**	2,209 [3]	**551**	551	**506**	506	**0**	0
2006	**6,995**	6,995	**2,209**	2,209	**551**	551	**506**	506	**0**	0
2007	**6,490**	6,490	**2,209**	2,209	**551**	551	**506**	506	**0**	0
2008 (4)	**5,984**	5,984	**2,209**	2,209	**551**	551	**506**	506	**0**	0
2009 (5)	**5,479**	5,479	**2,209**	2,209	**551**	551	**551**	551	**0**	0
2010 (6)	**4,928**	4,928	**2,209**	2,066	**551**	504	**551**	504	**0**	0
2011	**4,378**	4,424	**2,209**	2,066	**551**	504	**551**	504	**0**	0
2012	**3,827**	3,919	**2,209**	2,066	**551**	504	**551**	504	**0**	0
2013	**3,277**	3,415	**2,209**	2,066	**551**	504	**551**	504	**0**	0
2014	**2,726**	2,910	**2,209**	2,066	**551**	504	**551**	504	**0**	0
2015	**2,176**	2,406	**2,209**	2,066	**551**	504	**551**	504	**0**	0
2016	**1,625**	1,901	**2,209**	2,066	**551**	504	**551**	504	**0**	0
2017	**1,075**	1,397	**2,209**	2,066	**551**	504	**551**	504	**0**	0
2018	**524**	892	**2,209**	2,066	**551**	504	**524**	504	**27**	0
2019	**0**	388	**2,209**	2,066	**551**	504	**0**	388	**551**	116
2020	**0**	0	**2,209**	2,066	**551**	504	**0**	0	**551**	504
2021	**0**	0	**2,209**	2,066	**551**	504	**0**	0	**551**	504
2022	**0**	0	**2,209**	2,066	**551**	504	**0**	0	**551**	504
2023	**0**	0	**2,209**	2,066	**551**	504	**0**	0	**551**	504
2024	**0**	0	**2,209**	2,066	**551**	504	**0**	0	**551**	504

(1) In-State RRF Ash Disposal sites are the Hartford Landfill (CRRA) and the Putnam Ash Landfill (Wheelabrator Putnam, Inc).

(2) Assumes ash generation rate reflects average MSW RRF ash generation requiring disposal per year based on the period FY2000-FY2004.

(3) Based on five-year average of waste burned at In-State RRFs for the period (fiscal years) 2000 through 2004.

(4) Assumes that ash disposal capacity at the Hartford Landfill will be available to dispose of RRF from Mid-CT until October 2008.

(5) Assumes that Bristol's RRF ash is disposed In-State after its current contract with Seneca Meadows landfill in NY expires in June 2008.

(6) Projections of in-state disposal capacity and in-state disposal capacity shortfalls for ash residue generated by CT RRFs were calculated for both scenarios i.e. (a) the Wallingford RRF closing in June 2009 and (b) the Wallingford RRF remaining open. The Wallingford RRF is estimated to generate approximately 46,056 tons of ash residue requiring disposal a year (based on amount of ash residue generated for the period FY2000-FY2004).

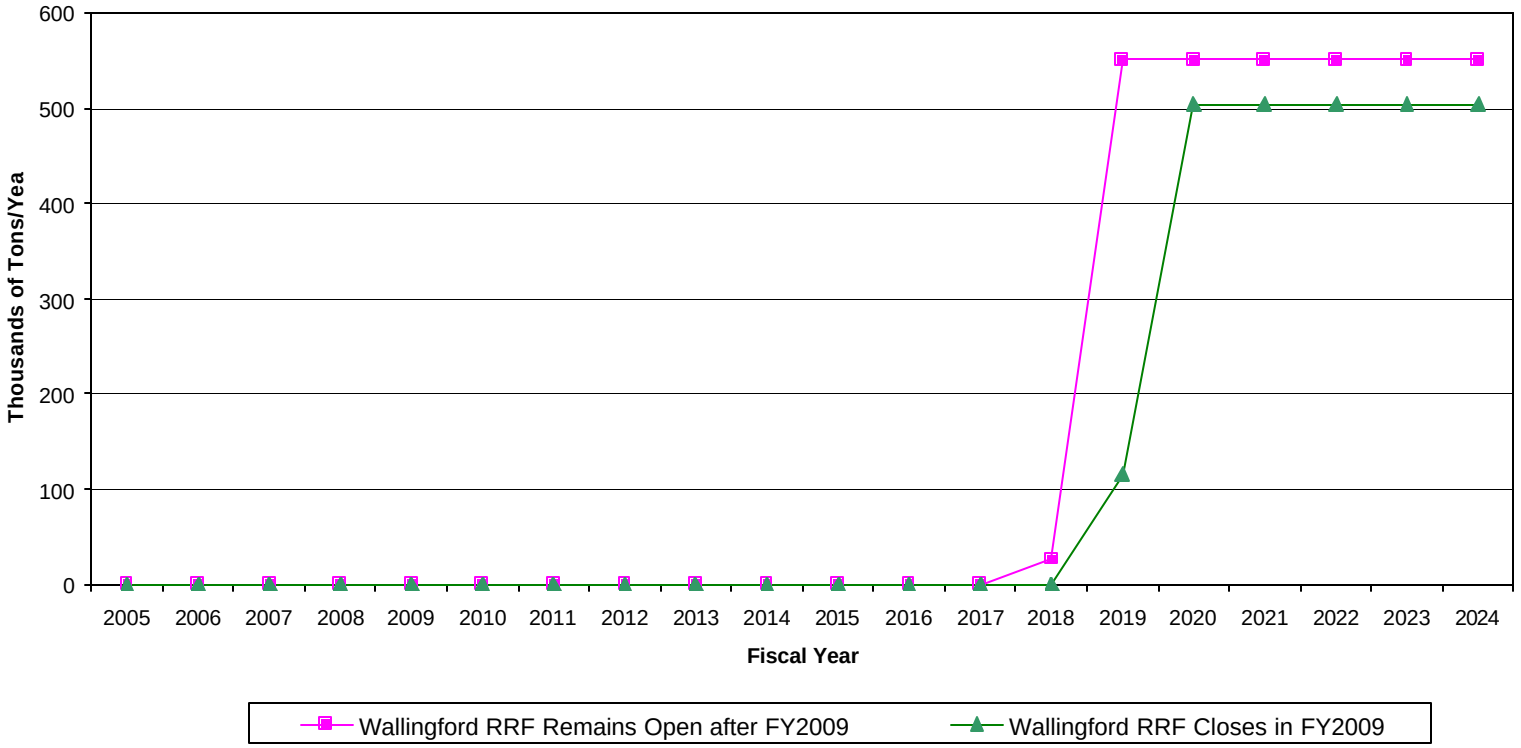


Figure J-2
Projections of In-State MSW RRF Ash Residue Disposal Capacity Shortfall for the Period FY2005 through FY2024

Table J-6

CT C&D Waste/Oversized MSW [1] [2] Projections and In-State Disposal Capacity Projections, FY2005-FY2024: Assumes C&D Diversion Rate of 48% by FY2024

Fiscal Year	C&D/Oversized MSW Processed or Disposed by CT Solid Waste Facilities (000 TPY) [3]	Percent C&D/Oversized MSW Diverted from Disposal [4]	C&D/Oversized MSW Disposed (000 TPY) [5]	Estimated In-State Disposal Capacity (000 TPY) [6]	C&D/Oversized MSW In-State Disposal Capacity Shortfall (000 TPY) [7]
2005	1,145	7%	1,066	126	940
2006	1,163	10%	1,047	128	919
2007 [8]	1,182	15%	1,005	103	902
2008	1,201	20%	961	104	856
2009 [9]	1,220	25%	915	86	829
2010	1,240	35%	806	67	738
2011	1,259	36%	806	68	738
2012	1,280	37%	806	69	737
2013	1,300	38%	806	71	735
2014	1,321	39%	806	72	734
2015	1,342	40%	805	73	732
2016	1,363	41%	804	74	730
2017	1,385	42%	803	75	728
2018	1,407	43%	802	76	726
2019	1,430	44%	801	78	723
2020	1,453	45%	799	79	720
2021	1,476	46%	797	80	717
2022	1,500	47%	795	81	713
2023 [10]	1,524	48%	792	4	788
2024	1,548	48%	805	4	801

(1) "Oversized MSW" is not consistently reported; sometimes it is reported as "bulky" or C&D waste (included in this table); sometimes it is reported as MSW (included in tables presenting CT MSW figures); CT definition for bulky waste and MSW contribute to this confusion.

(2) The figures presented in this table are based on C&D and "bulky waste" data reported by CT C&D volume reduction facilities, CT transfer stations, CT Dept. of Transportation, and CT landfills. This table does not include figures regarding clean wood reported recycled by CT recycling facilities or by CT municipalities. Figures reported for FY2004 have been escalated 1.6% to arrive at FY2005 estimates.

(3) C&D projections based on FY2004 C&D and "bulky waste" data reported to DEP (see footnote #1) and assumes a 1.6% annual increase in the amount of such waste generated.

(4) The 7% diversion (recycling) rate is the CT current C&D diversion rate as calculated from data submitted to the CT DEP as described in footnote #2.

(5) Disposed both in-state and out-of-state.

(6) In-State disposal includes current landfill capacity for FY2005. After FY2005, assume landfills accept 1.6% more waste per year.

(7) C&D Capacity Shortfall = C&D/oversized MSW disposed minus C&D/oversized MSW In-State Disposal Capacity

(8) Assumes the Hartford Landfill, which received 27,000 tons of this type of waste in FY2005, closes in 2006. Note: CRRA submitted a revised closure plan for Landfill, decision pending as of 12/06.

(9) Assumes the Windsor-Bloomfield Landfill, which received 39,000 tons of this type of waste in FY2005, closes December 2008, resulting in a reduction of 20,000 tons of disposal capacity in FY2009 and an additional reduction of 20, 000 tons of disposal capacity in FY2010.

(10) Assumes the Manchester Landfill extends its permit and continues to operate, closing in 2022.

Table J-7
CT C&D Waste/Oversized MSW [1] [2] Projections and In-State Disposal Capacity Projections, FY2005-FY2024:
Assumes C&D Diversion Rate of 40% by 2015 and remaining at that level through FY2024

Fiscal Year	C&D/Oversized MSW Processed or Disposed by CT Solid Waste Facilities (000 TPY) [3]	Percent C&D/Oversized MSW Diverted from Disposal [4]	C&D/Oversized MSW Disposed (000 TPY) [5]	Estimated In-State Disposal Capacity (000 TPY) [6]	C&D/Oversized MSW In-State Disposal Capacity Shortfall (000 TPY) [7]
2005	1,145	7%	1,066	126	940
2006	1,163	10%	1,047	128	919
2007 [8]	1,182	15%	1,005	103	902
2008	1,201	20%	961	104	856
2009 [9]	1,220	25%	915	86	829
2010	1,240	35%	806	67	738
2011	1,259	36%	806	68	738
2012	1,280	37%	806	69	737
2013	1,300	38%	806	71	735
2014	1,321	39%	806	72	734
2015	1,342	40%	805	73	732
2016	1,363	40%	818	74	744
2017	1,385	40%	831	75	756
2018	1,407	40%	844	76	768
2019	1,430	40%	858	78	780
2020	1,453	40%	872	79	793
2021	1,476	40%	886	80	806
2022	1,500	40%	900	81	818
2023 [10]	1,524	40%	914	4	910
2024	1,548	40%	929	4	925

(1) "Oversized MSW" is not consistently reported; sometimes it is reported as "bulky" or C&D waste (included in this table); sometimes it is reported as MSW (included in tables presenting CT MSW figures); CT definition for bulky waste and MSW contribute to this confusion.

(2) The figures presented in this table are based on C&D and "bulky waste" data reported by CT C&D volume reduction facilities, CT transfer stations, CT Dept. of Transportation, and CT landfills. This table does not include figures regarding clean wood reported recycled by CT recycling facilities or by CT municipalities. Figures reported for FY2004 have been escalated 1.6% to arrive at FY2005 estimates.

(3) C&D projections based on FY2004 C&D and "bulky waste" data reported to DEP (see footnote #1) and assumes a 1.6% annual increase in the amount of such waste generated.

(4) The 7% diversion (recycling) rate is the CT current C&D diversion rate as calculated from data submitted to the CT DEP as described in footnote #2.

(5) Disposed both in-state and out-of-state.

(6) In-State disposal includes current landfill capacity for FY2005. After FY2005, assume landfills accept 1.6% more waste per year.

(7) C&D Capacity Shortfall = C&D/oversized MSW disposed minus C&D/oversized MSW In-State Disposal Capacity

(8) Assumes the Hartford Landfill, which received 27,000 tons of this type of waste in FY2005, closes in 2006. Note: CRRA submitted a revised closure plan for Landfill, decision pending as of 12/06.

(9) Assumes Windsor-Bloomfield Landfill, which received 39,000 tons of this type of waste in FY2005, closes December 2008, resulting in a reduction of 20,000 tons of disposal capacity in FY2009 and an additional reduction of 20,000 tons of disposal capacity in FY2010.

(10) Assumes the Manchester Landfill extends its permit and continues to operate, closing in 2022.

Table J-8
CT C&D Waste/Oversized MSW [1] [2] Projections and In-State Disposal Capacity Projections, FY2005-FY2024: Assumes C&D Diversion Rate remains at 7% through FY2024

Fiscal Year	C&D/Oversized MSW Processed or Disposed by CT Solid Waste Facilities (000 TPY) [3]	Percent C&D/Oversized MSW Diverted from Disposal [4]	C&D/Oversized MSW Disposed (000 TPY) [5]	Estimated In-State Disposal Capacity (000 TPY) [6]	C&D/Oversized MSW In-State Disposal Capacity Shortfall (000 TPY) [7]
2005	1,145	7%	1,066	126	940
2006	1,163	7%	1,082	128	954
2007 [8]	1,182	7%	1,099	103	997
2008	1,201	7%	1,117	104	1,013
2009 [9]	1,220	7%	1,135	86	1,049
2010	1,240	7%	1,153	67	1,086
2011	1,259	7%	1,171	68	1,103
2012	1,280	7%	1,190	69	1,121
2013	1,300	7%	1,209	71	1,138
2014	1,321	7%	1,228	72	1,157
2015	1,342	7%	1,248	73	1,175
2016	1,363	7%	1,268	74	1,194
2017	1,385	7%	1,288	75	1,213
2018	1,407	7%	1,309	76	1,233
2019	1,430	7%	1,330	78	1,252
2020	1,453	7%	1,351	79	1,272
2021	1,476	7%	1,373	80	1,293
2022	1,500	7%	1,395	81	1,313
2023 [10]	1,524	7%	1,417	4	1,413
2024	1,548	7%	1,440	4	1,436

(1) "Oversized MSW" is not consistently reported; sometimes it is reported as "bulky" or C&D waste (included in this table); sometimes it is reported as MSW (included in tables presenting CT MSW figures); CT definition for bulky waste and MSW contribute to this confusion.

(2) The figures presented in this table are based on C&D and "bulky waste" data reported by CT C&D volume reduction facilities, CT transfer stations, CT Dept. of Transportation, and CT landfills. This table does not include figures regarding clean wood reported recycled by CT recycling facilities or by CT municipalities. Figures reported for FY2004 have been escalated 1.6% to arrive at FY2005 estimates.

(3) C&D projections based on FY2004 C&D and "bulky waste" data reported to DEP (see footnote #1) and assumes a 1.6% annual increase in the amount of such waste generated.

(4) The 7% diversion (recycling) rate is the CT current C&D diversion rate as calculated from data submitted to the CT DEP as described in footnote #2.

(5) Disposed both in-state and out-of-state

(6) In-State disposal includes current landfill capacity for FY2005. After FY2005, assume landfills accept 1.6% more waste per year.

(7) C&D Capacity Shortfall = C&D/oversized MSW disposed minus C&D/oversized MSW In-State Disposal Capacity

(8) Assumes the Hartford Landfill, which received 27,000 tons of this type of waste in FY2005, closes in 2006. Note: CRRA submitted a revised closure plan for Landfill, decision pending as of 12/06.

(9) Assumes the Windsor-Bloomfield Landfill, which received 39,000 tons of this type of waste in FY2005 closes December 2008, resulting in a reduction of 20,000 tons of disposal capacity in FY2009 and an additional reduction of 20 (000) tons of disposal capacity in FY2010.

(10) Assumes the Manchester Landfill extends its permit and continues to operate, closing in 2022.

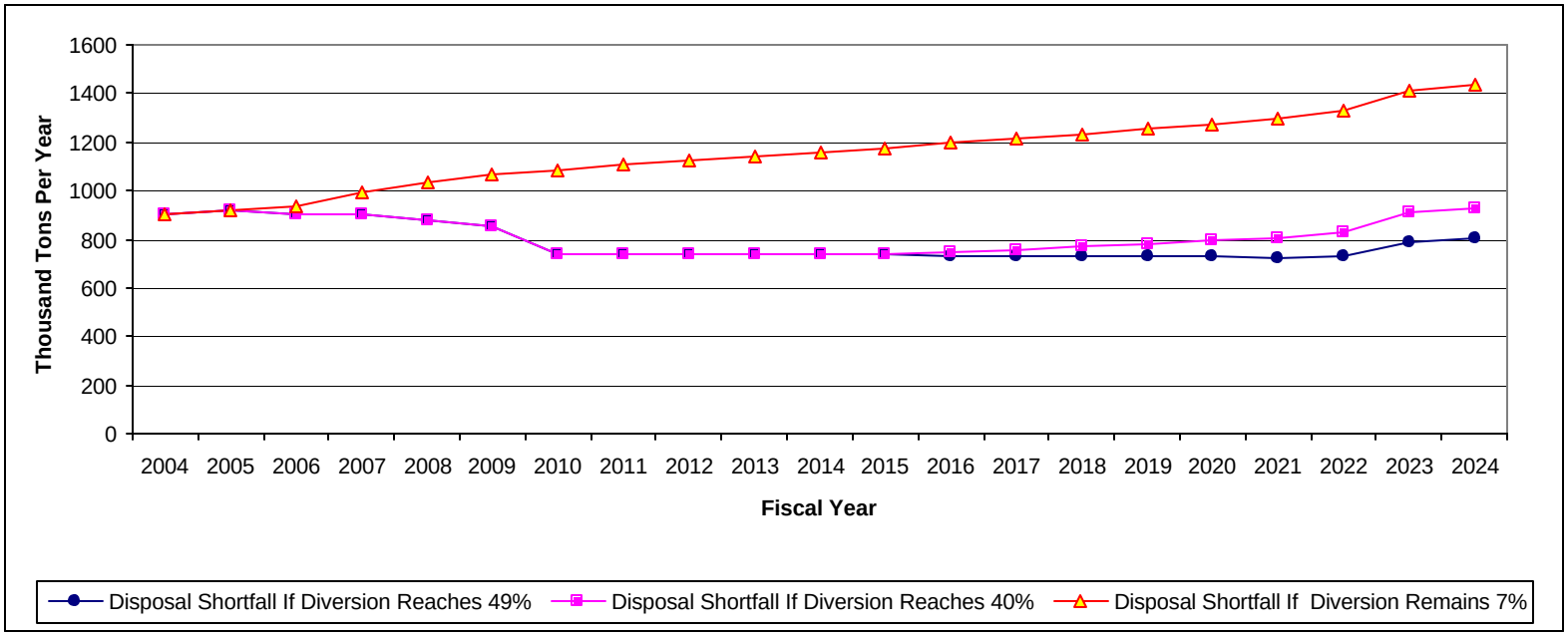


Figure J-3
Projections of In-State C&D Waste/Oversized MSW Disposal Capacity Shortfall Under Various Waste Diversion Assumptions for the Period FY2005 through FY2024

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Appendix K
MSW RRF STATUS OF OWNERSHIP

At the writing of this Plan (December 2006), there are six MSW resources recovery facilities (RRFs) in Connecticut that process MSW with a combined maximum permitted design capacity of 2.6 million tons per year; all but the Lisbon and Bristol facilities are part of the CRRA system. Over the five-year period consisting of FY2000 thorough FY2004, those RRFs burned an average of 2,209,444 tons of solid waste per year. Over the next two to fourteen years the following will occur: (1) expiration of the RRF contracts with municipalities and/or with CRRA or other regional resource recovery authorities or operating committees; (2) retirement of the bonds that financed the RRFs; and (3) potential transfer of control of the processing capacity from the public to the private sector at four of the Connecticut RRFs. In order to fully explain these issues and their ramifications for Connecticut, the following information was provided at the request of the CT DEP: (1) a brief description of ownership issues regarding the Lisbon Resource Recovery Facility provided by the Plant Manager of the Lisbon RRF; (2) a description of the Bristol Resource Recovery Facility contractual scenarios provided by the Bristol Resource Recovery Facility Operating Committee (BRRFOC); and (3) a letter and Exhibit provided by the CRRA regarding the solid waste facilities currently owned and operated by CRRA on behalf of municipalities.

Testimony regarding the CT RRFs was received by the Connecticut DEP during the public hearing comment period for the Proposed Plan. Two of the testimonies presented a different slant on certain information included in the Proposed Plan in this appendix and in assumptions made in the Proposed Plan. These include the following:

- Covanta Energy commented regarding Wallingford RRF post expiration of current energy contract and CRRA operating agreement: "…For the avoidance of doubt, should CRRA not elect to purchase the facility at the end of the term, Covanta is currently prepared to continue to operate the facility at its current high standard on a merchant basis as was envisioned by the Service Agreement….". Based on this testimony, this Plan now assumes that Wallingford RRF will remain in operation through the planning period (FY2024).

- Waste Management commented on the ownership of Wheelebrator Bridgeport LP: "...Although some of the financing of the facility may have been facilitated by the CRRA on behalf of the SCRRA communities, Wheelebrator the facility owner, made substantial equity contributions to the construction of that facility. Furthermore, Wheelebrator, not the CRRA, pays the continuing debt service on [the] facility. …"

Lisbon RRF (information provided by John O'Rourke, Lisbon's Plant Manager)
The Lisbon RRF is owned by the Eastern CT Resource Recovery Authority with the lone member being the City of Middletown, CT. The facility will be owned by ECRRA when the municipal bonds are paid in 2020. Wheelabrator has an operating agreement with the Authority with no ownership interest. HRRA (Housatonic Resources Recovery Authority) member towns have a disposal agreement with Wheelabrator CT and their waste is disposed at Wheelabrator facilities in Connecticut and out-of-state, including the Lisbon RRF.

Bristol Resource Recovery Facility Contractual Scenarios – Provided by Jonathan Bilmes, Executive Director – Bristol Resource Recovery Facility Operating Committee/Tunxis Recycling Operating Committee (BRRFOC/TROC) - July 7, 2006

As of August 1, 1985, the original Contracting Communities, now 14 of them, entered into an Amended and Restated Service Agreement (the "Agreement") with Ogden Martin Systems of Bristol, Inc., now Covanta of Bristol, Inc. (the "Company") whereby the Company would own, operate and maintain a waste to energy facility in Bristol (the "Facility"), and the Contracting Communities committed to deliver Acceptable Waste to the Facility. The Agreement continues in effect to July 1, 2014 when the respective obligations of the Company and Contracting Communities terminate. Pursuant to the Agreement, the following options or avenues are availability to the Company and the Contracting Communities:

Unless one of the options described below are exercised, in 2014 the Company can contract with anyone to deliver Municipal Solid Waste ("MSW") to the Facility since it will own the Facility free and clear, and its obligations to the Contracting Communities are terminated. Under this scenario, the Company could cease or reduce operations, sell the Facility or fill the capacity of the Facility with Contracting Community MSW, merchant MSW and/or out of state waste MSW.

Existing Options in the Agreement for Contracting Communities:

1. Agreement Section 8.01(b) Term. One or more Contracting Communities have the option to extend the Agreement for a period of 5 years, provided that the Electricity Agreement with CL&P will not expire or be terminated prior to the end of the five year period[1]. There is a one year notice requirement for the Contracting Communities to notify the Company of the option.
2. Agreement Section 8.20 Option to Contract. One or more Contracting Communities can contract with the Company for the entire disposal capacity[2] of the Facility on the basis of a negotiated Agreement. At least one year notice of intent is required from the Contracting Communities at which time the parties are to promptly commence negotiations in a good faith effort upon the terms of, and execute such an Agreement.
3. Agreement Sections 8.21 and 8.22 Fair Market Value Option and Determination of Fair Market Value. Prior to termination, the Contracting Communities may purchase the Facility from the Company at Fair Market Value[3]. The Agreement sets forth a process to arrive at the Fair Market Value of the Facility. The Agreement requires that the Company be released from all liability under the Electricity Agreement for the purchase to be accomplished.

[1]In today's electric marketplace, the ability to extend the existing Electricity Agreement and/or secure a commercially reasonable new five year Electricity Agreement is uncertain.
[2]None of the existing Contracting Communities individually have enough MSW for the entire disposal capacity of the Facility. The Agreement does not define "good faith effort."
[3]The Contracting Communities have to defease any outstanding Bonds in addition to paying the Company the Fair Market Value.

CONNECTICUT
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June 14, 2006

Mr. Robert Kaliszewski
Director of Planning & Program Development Connecticut Department of Environmental Protection 79 Elm Street
Hartford, Connecticut 06106-5127

RE: CRRA Waste Disposal Facility Ownership and Contract Structure

Dear Mr. Kaliszewski

CRRA is writing in response to a request from the CTDEP to provide a summary overview of the structure and ownership of the comprehensive solid waste disposal and recycling facilities currently owned and operated by CRRA on behalf of Connecticut's municipalities. This summary is presented as Exhibit I to this letter.

As stated in the attached summary, CRRA owns, among other facilities, four waste-to-energy plants for the disposal of municipal solid waste ("MSW"). The plants are located in Bridgeport, Wallingford, Hartford (Mid-Connecticut Project), and Preston (Southeast Project). The resource recovery revenue bonds ("Bonds") issued by CRRA to finance the acquisition and construction of each facility will be retired in 2008,2010,2012 and 2015 respectively. Upon the payment of the Bonds and expiration of relevant project agreements, three of the four waste-to-energy plants may convert from public ownership to private ownership. Only the Mid-Connecticut waste-to-energy plant will remain publicly held.

This transition of ownership has potential adverse impacts to waste management and recycling in the State:

- Over 1,000,000 tons of MSW disposal capacity currently dedicated to the waste disposal needs of over 40 Connecticut municipalities will become merchant capacity with no guarantee that the capacity will be used for the disposal of Connecticut generated waste. In other words, operators of these plants could simply accept waste from whoever is willing to pay top dollar regardless of whether that waste comes from Connecticut or a neighboring state. The Preston plant is less than 15 miles from the Rhode Island border, while the Bridgeport plant is less than 60 miles from midtown Manhattan.

- Private ownership of the waste-to-energy plants could result in a reduction in the amount of material recycled by the communities presently served by such facilities. Varying somewhat by project, CRRA' s current tip fee structure includes not only the cost of providing MSW disposal services but also the bundling of services and associated costs for recycling of commingled containers, fiber, and electronics, recycling educational programs and other services provided by CRRA. Each year all these costs are "bundled" into a uniform MSW tip fee as part of the annual budgetary process. CRRA has never charged a separate tip fee for recycling or an additional fee for any of these other services. Private-sector operators cannot be expected to follow suit, and, absent the current project structure, these services will likely be unbundled, with the imposition of additional fees adversely impacting recycling rates.

If not properly addressed, the transition from public to private ownership may adversely impact future progress toward achieving the diversion/recycling goals proposed in DEP's draft Solid Waste Management Plan.

Sincerely

Floyd M. Gent
Director of Operations

Cc: Tom Kirk
Peter Egan

EXHIBIT 1

Connecticut Resources Recovery Authority

Project Ownership and Contract Structure[1]

The Connecticut Resources Recovery Authority ("CRRA ") in meeting its obligations under state statute has planned, designed, financed, built, manages and owns four waste- to-energy projects: Bridgeport, Mid-Connecticut, Southeast and Wallingford Projects. Through municipal service agreements with Connecticut municipalities and the Southeastern Connecticut Regional Resources Recovery Authority ("SCRRRA "), and solid waste delivery agreements with over 60 private haulers, CRRA serves the municipal solid waste needs of 118 Connecticut municipalities and its citizens.

In conformance with Connecticut General Statute Sec. 22a-259 and 262, CRRA has entered into various service agreements with private sector contractors for the operation and maintenance of each facility as further described hereafter. As part of the original project financing for the Bridgeport, Southeast and Wallingford Projects, CRRA entered into lease agreements with the operator or a financial institution as the lessee, whereby the lessee has the right to purchase the waste-to-energy facility upon expiration of the project lease. The Mid-Connecticut Project will remain a publicly owned facility with CRRA.

Bridgeport Project

The Bridgeport Project, consisting of a mass burn resource recovery facility located in Bridgeport, a regional recycling center in Stratford, the Shelton landfill, the Waterbury landfill, and eight transfer stations, is currently owned by CRRA. The Bridgeport Project provides solid waste disposal services to nineteen Connecticut municipalities in Fairfield and New Haven counties through municipal service agreements with CRRA. Pursuant to a Solid Waste Disposal Agreement ("SWDA") with CRRA, Wheelabrator Bridgeport, LP, is responsible for operating the facility and transfer stations for a term ending on December 31, 2008. As part of the original sale and leaseback financing transaction in 1988, CRRA leased the facility to Ford Motor Credit Company as an owner trustee. Upon the repayment of the project bonds or at the end of the lease, the current owner trustee, which is a limited liability company principally owned by John Hancock Life Insurance Company, has the right to purchase the waste-to energy facility for $1.00. It is expected that the owner trustee will exercise its purchase option and therefore will own the facility post 2008. Currently, CRRA, with the support of the Bridgeport Project towns, and Wheelabrator

[1] The financing, structuring and ownership for each project are complex and involve a number of interrelated agreements including but not limited to bond indentures, facility and site leases, operating agreements and municipal service agreements. The description of the project ownership and contract structure herein is provided as an overview for informational purposes only, and is not intended to be a comprehensive legal review thereof.

are pursuing good faith negotiations for a long term extension of the SWDA for the period after December 31, 2008. Depending on the outcome of the negotiations, part or all of the facility capacity may be privately controlled by Wheelabrator.

Mid-Connecticut Project

The Mid-Connecticut Project consists of a refuse derived fuel resource recovery facility located in Hartford, four transfer stations, the Hartford landfill, the Ellington landfill and a regional recycling center located in Hartford. This system of facilities provides solid waste disposal services to 70 Connecticut municipalities through municipal service agreements. The resource recovery facility includes the power block and electric generating facilities which are operated by Covanta Energy and the waste processing facility which is operated by the Metropolitan District Commission ("MDC"). The operating agreements with Covanta and the MDC will expire in 2012. CRRA currently owns the resource recovery facility, the transfer stations, the Ellington landfill and the container-processing portion of the regional recycling center (211 Murphy Road) in Hartford. CRRA controls the Hartford landfill under a long-term lease with the City of Hartford. CRRA leases the land for the Essex transfer station. CRRA controls the solid waste operating permit for the paper processing portion of the regional recycling center, (123 Murphy Road) while the property, building, and processing equipment is owned by a private company. CRRA is currently in the process of combining the commingled container and paper processing into a single operation under one roof at 211 Murphy Road. FCR, Inc., the current operator for processing commingled container recyclables, will build, own, and operate the processing equipment at the new regional recycling center at 211 Murphy Road for a term of 10 years. At the expiration of the 10-year term, CRRA has the right to purchase the equipment for one dollar or extend the agreement for five years. On or before November 2012, CRRA will have paid off the outstanding project bonds and will retain ownership of a debt free facility to continue to serve the disposal needs of Connecticut municipalities.

Southeast Project

The Southeastern Project consists of a mass burn resource recovery facility located on an approximately l2-acre site in Preston and the Montville landfill. The system provides solid waste disposal services to 22 municipalities in the eastern portion of Connecticut through municipal service agreements. The municipal service agreements and operating agreements will expire November 2015. The Facility was designed and constructed by American Ref-Fuel. The Facility is owned by CRRA and the Facility site is owned by SCRRRA. CRRA and SCRRRA are parties to a Bridge and Management Agreement under which SCRRRA is obligated to deliver to the Facility all Acceptable Waste generated within the boundaries of the Participating Municipalities. As part of the Facility's financing transaction, SCRRRA leased the Facility site to American Ref-Fuel. Covanta Energy, Inc., as the successor to American Ref-Fuel, has beneficial ownership of the Facility through this arrangement. When the bonds are fully paid off in November 2015 (or earlier), Covanta has the

option to purchase the facility for $1.00. The current service agreement provides for a five-year extension at substantially the same terms. At the end of the first renewal term, if Covanta elects to continue operating the facility, CRRA has the option to extend the term for an additional five years at the then fair market value. At the end of the second extension term (or at the end of the initial term or the first extension term if Covanta does not elect to continue operation) CRRA has the option to purchase the facility at fair market value. If CRRA does not purchase the facility, then Covanta retains ownership of the facility and continues to lease the land from SCRRRA.

Wallingford Project

The Wallingford Project consists of a mass bum resource recovery facility, the Wallingford landfill and a 45 acre parcel of land adjacent to the landfill all owned by CRRA and located in Wallingford. Five municipalities in New Haven County are provided solid waste disposal services by the Project through municipal service agreements with CRRA. The resource recovery facility is operated by Covanta Energy, Inc. pursuant to an Operator Agreement. All the Project agreements expire June 30, 2010. Subject to certain conditions, the Operator Agreement provides for one five-year renewal term post June 30, 2010. Both Covanta Energy, Inc. and CRRA have the right to exercise options to extend. Either party must exercise its option to extend (declare its intent to extend) in 2007. In addition to the extension options, any time prior to January 31,2010, Covanta has the right to purchase the facility for $1.00 and operate the facility as a privately owned waste-to-energy facility or CRRA can purchase the facility from Covanta at fair market value. Covanta' s contractual right to purchase the facility supersedes all other extension options contained in the Operator Agreement. If neither Covanta nor CRRA exercise its respective options to extend or purchase the Facility, the Facility ceases operation and the land reverts to American Cyanamid. American Cyanamid could then direct CRRA to restore the property "cleared to grade".

CRRA Value Added Services

Through the ownership and contract structure of the four resource recovery projects, CRRA has been able to offer the following benefits and value added services to the majority of the 169 municipalities and its citizens in the State of Connecticut:

- Economies of scale, standardization, risk reduction and capital avoidance through the aggregation of waste on a project basis to maximize resources recovery and recycling in order to protect and preserve the environment.
- Uniform disposal fees to private haulers on a project by project basis to encourage a competitive market for waste collection and transportation services to residential and commercial customers.
- Bundling of recycling and waste disposal services including billing, waste delivery inspection, enforcement, environmental regulation compliance, and recycling education programs.

- Operation of two regional recycling centers (the largest in Connecticut) serving approximately 90 Connecticut municipalities.
- Operation of the CRRA Trash Museum in Hartford and the CRRA Children's Garbage Museum in Stratford serving all of Connecticut and educating more than 20,000 children and adults annually.
- Electronics recycling programs for over 90 Connecticut municipalities.

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External Stakeholders Committee:

- Mr. Jonathan Bilmes, Executive Director, Bristol Resource Recovery Facility and Operating Committee
- Mr. James Butler, Executive Director, Southeastern Connecticut Council of Governments
- Mr. Gian-Carl Casa, Director of Legislative Services, Connecticut Conference of Municipalities
- Ms. Marilyn Cruz-Aponte, Administrative Officer, City of New Britain
- Mr. Tim DeVivo, Treasurer, Willimantic Waste Paper Company, Inc.
- Mr. Peter Egan, Director of Environmental Affairs and Development, Connecticut Resources Recovery Authority
- Mr. Richard Goss, Director of Environmental Affairs, Electronic Industries Alliance
- Ms. Kathleen Hopkins, Global Environmental Manager, United Technologies Corporation
- Mr. Robert Jacques, Manager of Development, New England Region Wheelabrator Technologies Inc.
- Ms. Faith Gavin Kuhn, Director of Public Information, Connecticut Construction Industry Association
- Mr. Cyril May, President Connecticut Recyclers Coalition
- Ms. Betty McLaughlin, Director of Environmental Affairs, Connecticut Audubon Society
- Dr. Mark Mitchell, President, Connecticut Coalition for Environmental Justice
- Ms. Barbara Moser, Environmental Purchasing Advisor, Connecticut Department of Administrative Services
- Mr. Nicholas H. Mullane, 1st Selectman, Town of North Stonington
- Mr. Mike Paine, Connecticut Representative National Solid Waste Management Association
- Ms. Kristina Stefanski, Manager of Environmental Compliance and Risk, The Stop & Shop Supermarket Company, LLC