Ohio Department of Health

Bureau of Radiation Protection

Annual Low-level Radioactive Waste Management Report for 2009

The report is designed to keep Ohioans informed of low-level radioactive waste in the State of Ohio. The final report is designed and intended for distribution to interested members of the public. Copies of this report may be obtained from the ODH web site at http://www.odh.ohio.gov or by contacting Ohio Department of Health, Bureau of Radiation Protection at 614-644-2727.

Ohio Department of Health

Bureau of Radiation Protection

Annual Low-level Radioactive Waste Management Report

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Introduction

The Ohio Department of Health (ODH) Bureau of Radiation Protection (BRP) collects low-level waste generation information from both Ohio and the U.S. Nuclear Regulatory Commission (NRC) licensees in accordance with rule 3701:1-54-02 of the Ohio Administrative Code (OAC). The purpose of this rule is to provide ODH with information relating to the amount of low-level radioactive waste (LLRW) generated, treated, stored and/or disposed of by generators within the state.

This report presents a summary of information on the generation and management of LLRW in Ohio during 2009. The definition of LLRW does not include naturally occurring or accelerator-produced radioactive material (NARM) waste. This information is compiled from the annual reports submitted by the LLRW generators to ODH.

Ohio's responsibility as host state for the Midwest Interstate Low-level Waste Compact was terminated by the Compact Commission in 1997. The compact is no longer involved in siting its own repository.

In prior years, radioactive waste generators often used the Barnwell, S.C., or EnergySolutions (formerly Envirocare) of Utah disposal facilities for land disposal of radioactive waste. After July 2008, the Barnwell facility has closed out the disposal volume available for out-of-compact radioactive waste generators, which includes Ohio generators. As indicated by the data, land disposal volumes are being shifted to the EnergySolutions facility for the Class A LLRW it accepts.

The Ohio Department of Health, Bureau of Radiation Protection

ODH is authorized by Ohio Revised Code (ORC) 3748 to be the radiation control agency for the state. The BRP performs the radiation control functions in behalf of the director of ODH.

Ohio became an agreement state with the NRC for the regulation of byproduct, source and special nuclear materials effective Aug. 31, 1999. Being an agreement state means the NRC has relinquished control and regulation of certain byproduct, source and special nuclear materials within Ohio to ODH.

The director of ODH, through the BRP, collects and analyzes information on LLRW generators within Ohio. These activities are performed in response to the responsibilities given to the states in the Low Level Radioactive Waste Policy Act (LLRWPA) (1980) as amended in 1985 and codified in Title 42 Section 2021 of the United States Code (USC). The reports submitted by waste generators provide information on the management, storage, transportation and disposal of radioactive wastes. Fees are collected from the LLRW generators to help fund this activity.

After Ohio became a member of the Midwest Compact, Ohio rules promulgated in OAC Chapter 3701-77 (effective Dec. 23, 1987) required annual reporting of LLRW generated in Ohio to the director of ODH. The reporting requirements under OAC 3701:1-54-02 rules were revised in 2007.

Under the current reporting rules, **LLRW reporting exemptions have expanded** to include all LLRW generated and disposed of in accordance with paragraphs (D) to (G) of OAC 3701:1-38-19 (Waste Disposal). Those wastes include:

1.) Licensed materials discharged into sanitary sewerage,

2.) Licensed material held for decay-in-storage (DIS),

3.) Licensed material disposed by incineration (at approved concentration limits), and

4.) Direct disposal of LLRW containing Carbon-14 and Hydrogen-3 (Tritium), at approved concentration limits.

As a consequence of these expanded reporting exemptions, LLRW generator volumes and activities reported are less than previous years.

Low- level Radioactive Waste

LLRW is defined in rule 3701:1-38-01 (89) of the OAC. For the purpose of this report, the definition of LLRW does not include NARM, transuranic waste, high-level radioactive waste, DOE generated or uranium mining and milling waste. LLRW is waste containing radioactive material that meets the definition contained in OAC rule 3701:1-38-01 (89). OAC rule 3701:1-38-01 (89) defines LLRW as follows:

"Low-level radioactive waste" or "LLRW," also "low-level waste," or "LLW" means radioactive waste which is not high-level radioactive waste, spent nuclear fuel, NARM, or byproduct material as defined in section 11 E. (2) of the Atomic Energy Act of 1954, as amended, but is radioactive material that the United States nuclear regulatory commission classifies as low-level radioactive waste.

LLRW includes a variety of materials that have a wide range of levels of radioactivity. Which includes items contaminated with radioactive material, for example protective clothing, paper towels and laboratory equipment. Included are some highly radioactive items, such as sealed sources, materials used to purify coolant in nuclear power plants and from equipment associated with nuclear reactors. LLRW is generated in the operation and maintenance of nuclear power plants as well as hospitals, universities, private research firms, industrial facilities and the military.

The classification system for LLRW, defined in OAC rule 3701:1-54-10 (similar to section 10 CFR 61.55), is designed to take into account the potential hazards of LLRW. The system is based on the concentration of the particular radionuclides in the waste and their half-life and is part of an overall regulatory system designed to control the potential human exposure to disposed radioactive waste. The classes of radioactive waste are:

Class A waste, generally consisting of short-lived radionuclides, less than 30 years, but also including low concentrations of some long-lived radionuclides. Disposed Class A waste must be isolated for 100 years.

Class B waste, including waste with higher concentrations of short-lived radionuclides than Class A waste and concentrations of long-lived radionuclides similar to Class A waste. Class B waste must be in structurally stable physical form for disposal or in a structurally stable container that will last for 300 years.

Class C waste, including waste with the highest concentrations of short-lived and long-lived radionuclides that states are responsible for managing. Disposal units for Class C LLRW must have barriers capable of preventing people in future years from accidentally encountering the waste for at least 500 years.

As previously noted, federal law makes each state responsible for providing disposal capacity for LLRW generated in the state. These federal laws however, do not make the states responsible for all LLRW generated within their borders. The federal government, specifically the DOE, is responsible for LLRW from the following sources and types:

LLRW owned or generated by the DOE.

LLRW owned or generated by the U.S. Navy as the result of decommissioning Navy vessels.

LLRW owned or generated by the federal government as the result of any research, development, testing or production of nuclear weapons.

The primary source of "greater than Class C waste" is from the decommissioning of nuclear power plants and high-activity sealed sources. This class waste is generally not suited for shallow-land burial.

Additional forms of radioactive waste that require regulatory management and oversight are: "Mixed Waste," which satisfies the definition of both LLRW waste and hazardous waste in federal law.

While not considered by definition as LLRW, NARM and technologically enhanced, naturally occurring radioactive materials require disposal in a controlled manner due to the radiation hazards that exist with this waste.

The federal LLRWPA, ORC 3748 and Ohio rules do not address the collection of information on the activity and volume of NARM waste produced, although it is regulated to the same degree as LLRW. NARM waste is typically generated from medical, consumer and industrial sources. TENORM waste is typically generated as a byproduct from industrial processes and nonindustrial consumers, such as pipe scale and water treatment sludges.

LLRW Generation and Management

Inventory of generators

An LLRW generator report form is sent annually to select Ohio licensees and NRC licensees within Ohio. The inventory of generators is based on analysis of the 2009 annual generator reports that were completed and returned to the BRP. The BRP received 286 responses from generators, of which 36 reported billable waste. Only those licensees that generated, continued to store or disposed of LLRW in 2009 were required to submit a report. The remainder were either exempt or did not generate any LLRW.

ODH has provided seven separate classifications for generators instead of the standard five mentioned in national waste report statistics. The additional classifications are Uranium Enrichment and Academic/Medical. Uranium Enrichment was added because United States Enrichment Corporation (USEC) is regulated by the NRC as a private enterprise and has a unique waste stream. The blend of Academic/Medical was added because the facilities under this category are both medical institutions and universities, and as such, produce the activity typical of medical institutions and the volume typical of academic/research institutions.

The waste generator descriptions are:

Utilities – Public or private utilities that provide basic services within the state borders. The volume and activity in this category is almost exclusively from nuclear power plants. Other utilities use licensed radioactive material in the form of sealed sources for process measurements, typically for level and fill measurements in coal-fired utilities.

Medical Facilities – Hospitals, physicians and clinics licensed to use radioactive materials as part of their service.

Academic and Research Facilities – Licensed colleges, universities and research facilities within the state borders, including research reactors that use radioactive materials in the course of teaching or research.

Academic/Medical – A joint medical facility within an academic and research institution where the combined facility generates waste with activities and volumes characteristic of each.

Government – NRC-licensed and state-licensed government agencies within Ohio.

Industrial – NRC-licensed and Ohio-licensed sources within the State of Ohio. These licenses may include sealed sources and radioactive devices as well as commercial nuclear pharmacies or other service providers licensed by the NRC or Ohio to conduct radioactive material distribution activities that generate LLRW.

Uranium Enrichment – NRC-regulated activities for the processing of uranium and uranium ores for use as nuclear reactor fuel. This facility in Ohio is USEC.

The assignment of generator classification is based on the generator's self-identification. Commercial entities submitted under other classifications were entered under the "industrial" classification.

Volume and Activity of LLRW generated in 2009

The LLRW generator report form sent to licensees (copy in appendix) requested information regarding the volume and activity of the LLRW generated. Additional information regarding the amount of LLRW stored at the end of the calendar year, the amount of LLRW shipped for disposal and the treatment of LLRW during the calendar year were also requested.

The results of the responses were entered into a computer database. The computer program handled MBq (Megabequerel) and Ci (Curie) activity conversions. Due to the wide range of data values for activity and volume, the data were manipulated in scientific notation with three significant digits. The implicit error introduced by using data in this format ranges from 0.1 percent to 1 percent error.

For general readability of the report, the volume terms were reported in cubic feet number formats and radionuclide activities are converted back to Curie units. Therefore, some rounding errors may be found.

In accordance with OAC rule 3701:1-54-02 (D), certain generators of LLRW were exempted from having to submit a LLRW generator report. A reporting exemption was granted to users of DIS byproduct radioactive material, provided the only byproduct materials used had a half-life of one hundred twenty days or less. This exemption provides regulatory relief from filing by small clinics and physicians using short half-life radioactive materials for medical diagnosis and imaging even though they did generate LLRW. Other licensees who generate LLRW may also benefit from the additional reporting exemptions referred to previously on page six of this report if they qualify.

Generators of NARM waste are not designated as LLRW generators because NARM is not included in the definition of LLRW. Examples of these radionuclides include, but are not limited to, Germanium/Gallium-68, Cobalt-57 and 58, Thallium-201, Sodium-22, Iodine-123, Radium-226 and Indium-111. Often the distinction must be traced to a manufacturer, as numerous radionuclides may also be produced in a reactor.

The volume and activity of the waste generated by waste class is listed in Table 2 "Waste Generated by Waste Class." Class A waste constitutes all of the volume of waste generated. Class A also constitutes all of the activity, and for 2009 more than 60 percent of this originates from the nuclear utilities.

Table 1 – Waste Generator Classification

Waste Generator Classification	Activity in MBq (Ci)	% of total activity	Volume generated In ft^3	% of total volume generated
Academic	68,504.2 (1.85)	0.91	1,029	2.02
Academic/medical	2,595.6 (0.07)	0.03	42.7	0.08
Government office	8.53 (.0002)	<0.01	20.5	0.04
Industrial	2,802,079.9 (75.73)	37.18	6,734	13.25
Medical	169.32 (0.004)	0.02	27.7	0.06
Uranium enrichment	36,548.6 (0.99)	0.48	36,062	70.97
Utility	4,626,837 (125.05)	61.38	6,891.6	13.58
TOTAL	7,536,743.2 (203.7)	100	50,808	100

Table 2 – Waste Generated by Waste Class

	Activity in MBq (Ci)	% of Activity	Volume in ft3	% of Volume
A	7,536,743.2 (203.7)	100	50,808	100
B				
C				
Total	7,536,743.2 (203.7)	100	50,808	100

Trends of Generated LLRW

In 1998, an LLRW generator's report to report 1997 waste generation was not sent to generators. Factors included: The Midwest Compact Commission discontinuance of LLRW disposal siting in Ohio for which Ohio was to become host state and the reassignment of LLRW staff.

Changes in the volume generated or shipped do not translate into a proportional change in the volume disposed in a licensed land disposal facility. One reason is some generators are using commercial service providers to segregate and decontaminate radioactive waste prior to disposal, therefore reducing the volume disposed. Several kinds of waste, especially in the medical arena, are held for DIS on site prior to disposal, which is a common form of waste treatment to dispose of or eliminate the radioactive component of the waste.

Table 3 – Activity Trend (in Ci) of Waste Generated

Class/ year	Academic	Acad / Medical	Govern Office	Industrial	Medical	Uranium Enrich	Utility	Total
1995	2.2	-	0.39	15.3	25.6	-	551	595
1996	2.97	-	-	3.24	22.4	-	1,540	1,569
1998	1.81	7.0	0.36	31.9	976	0.59	132	1,150
1999	1.62	7.38	0.07	61.4	1,103	0.47	368	1,153
2000	1.77	1.76	0.15	3,644	1,650	0.45	442	5,740
2001	1.18	2.39	0.12	1,122	972	0.19	791	2,888
2002	1.14	2.08	0.03	1,611	667	0.16	976	3,258
2003	30.6	1.39	-	2,840	1,831	1.16	396	5,100
2004	11.9	5.6	0.01	1,943	13,060	1.96	1,933	16,956
2005	12.9	3.3	0.01	18,733	2,425	1.5	94.8	21,272
2006	16.9	3.6	0.73	5,068	1,467	0.3	2,692	9,249.9
2007	300	0.1	300	48.6	0.62	3.15	39,860.15	40,215.72
2008	81.25	0.2	0.0002	164.95	0.013	0.66	5,718.57	5,965.66
2009	1.85	0.07	0.0002	75.73	0.004	0.99	125.05	203.7

Table 4 - Volume Trend (in ft^3) of Waste Generated

Class Year	Academic	Acad/ Medical	Govern Office	Industrial	Medical	Uranium Enrich	Utility	Total
1995	2,682	-	59	11,055	26,082	-	11,244	51,122
1996	1,371	-	10	2,792	22,351	-	14,641	41,165
1998	3,340	4,200	76	7,640	25,300	62,400	17,000	120,000
1999	859	3,897	91	35,308	80,921	41,521	30,140	192,736
2000	1,893	3,189	24	510,664	8,853	42,388	29,259	596,271
2001	1,732	1,885	134	21,311	8,638	18,013	73,255	124,969
2002	2,153	1,216	31	7,310	8,524	15,400	66,581	101,216
2003	2,017	1,319	5	23,291	21,393	6,001	86,793	140,820
2004	2,096	1,413	247	87,035	22,116	21,099	19,599	121,544
2005	2,093	1,558	29	23,937	7,791	19,074	51,582	106,065
2006	2,705	1,159	8	23,344	8,881	20,338	82,165	138,601
2007	288.6	549.2	164.3	6,321	301.6	9,442	81,958	99,024
2008	766	552	97	6,463	11.9	18,095	50,612	76,608
2009	1,029	42.7	20.5	6,734	27.7	36,062	6,891.6	50,808

Treatment of LLRW

LLRW may be treated to reduce the waste volume, radionuclide activity or make the waste safer. As defined in rule 3701:1-54-01 of the OAC, “Treatment” means any method, technique, or process, including storage for radioactive decay, that changes the physical, chemical, or biological characteristics or composition of any radioactive waste in order to render the waste safer for transport or management, amenable to recovery, convertible to another usable material, or reduced in volume.”

DIS is the most commonly used method for treating LLRW. To use DIS, the radioactive waste is held in a segregated container from other waste and stored for 10 half-lives or until the radioactivity from the waste is no longer distinguishable from background, whichever is longer. After the radioactive material has decayed, the remaining waste can be disposed of appropriately as biohazardous, sharps, pathological, chemical or normal trash.

LLRW is frequently processed off site to reduce the volume prior to disposal and/or achieve a more stable waste form for disposal. Waste volume reduction can be accomplished in a number of ways including:

- Decontamination.
- Compaction.
- Supercompaction.

- Incineration.
- Commercial DIS.
- Thermal reduction.

Commercial LLRW processors used by Ohio generators are located outside of Ohio. The vast majority of processors disposed of the processed waste at a licensed facility on behalf of the generator in lieu of returning the processed waste.

For nuclear power plants, there has been a shift from treating the waste on site, to having a commercial firm segregate the waste, then treat the remaining waste by incineration or other means. The processor, not the generator, is primarily responsible for the final volume reduction.

Use of DIS

Medical and academic facilities are avid users of DIS because it is simple to implement and does not have any direct costs. Indirect costs include the use of secured space and personnel time for logging, tracking and surveying waste.

Unless identified otherwise, the volume and activities listed are for the waste generated, not the volume and activity for the LLRW after treatment.

The "final volume" is the generator-identified volume after treatment, either by the generator or a commercial processor. The radioactive waste generation fee can be reduced by declaring the reduced volume after treatment. The final volume and activity after treatment is in Table 9. This statistic is the volume and activity disposed at the EnergySolutions LLRW land disposal facility.

The waste type "Dry Solid" may combine several subcategories of solid waste into a single category. Examples of subcategories combined in the Dry Solid waste type include incinerator ash, sludges, filter media, contaminated equipment, stock vials and other solid waste containing trace quantities of free-standing liquids. Resins/beads are separated out from the "Dry Solid" waste stream as they constitute the majority proportion of the activity. Most of this waste stream results from the filtration of water in the nuclear power industry.

Table 5 – Waste Activity and Volume Generated by Waste Type

Waste Type	Activity MBq (Ci)	% of activity	Volume in ft^3	% of volume
Animal Carcass	1,036 (0.028)	0.01	4.0	0.01
Aqueous Liquid	569,223.8 (15.38)	7.55	606	1.19
Biohazard/ Pathological	15,806.0 (0.42)	0.21	378.7	0.75
Debris (HV-LLRW)	2,657,426.4 (71.8)	35.26	4,584.26	9.02
Dry Solid	488,784.38 (13.21)	6.49	44,684.32	87.95
Nat U/Th	5.33 (0.0001)	<0.01	3.00	0.01
Liquid Mixed Waste	29,009.5 (0.78)	0.38	18.18	0.04
Resin/Beads (ion exchange)	3,774,000 (102)	50.07	285.02	0.56
Scintillation Vials	1,055.3 (0.02)	0.01	225.63	0.44
Scintillation Fluid-bulk	115.03 (0.003)	<0.01	-	-
Sealed Sources	277.4 (0.007)	< 0.01	6.75	0.01
Other	3.7 (0.0001)	< 0.01	12.0	0.02
Total	7,536,743.2 (203.7)	100	50,808	100

LLRW Shipments

The generalized flow of radioactive waste from generation to disposal can be simplified into the following sequence of events. (1) The waste is generated and recognized as a radioactive waste. (2) The radioactive waste is treated on site and packaged for shipment as appropriate for the waste stream. (3) The radioactive waste is shipped to a treatment, storage or disposal facility (TSDF). (4) The waste is treated to reduce volume and activity as appropriate by the TSDF. (5) The remaining radioactive waste is sent by the TSDF back to the generator or a licensed facility for burial on behalf of the generator.

For the purposes of the waste generator report, the return of contaminated syringes to a radiopharmacy was not considered either a waste shipment or disposal. Syringes and needles are used to inject patients with short-lived radionuclides. The syringe volumes and activities are incorporated in the nuclear pharmacy waste reports.

A total of 23 facilities reported shipping LLRW waste in 2009.

Table 6 – LLRW Shipments by Waste Class

Waste Class	Activity MBq (Ci)	% of activity	Volume (ft^3)	% of volume
A	8,996,184.89 (243.14)	100	133,989.6	100
B	-		-	
C	-		-	
TOTAL	8,996,184.89 (243.14)	100	133,989.6	100

As can be seen in the data, no class B or C LLRW was reported being shipped in Ohio in CY 2009. Many generators expedited the removal of their higher activity inventories in anticipation of the current lack of disposal capacity for these classes of LLRW.

The waste shipped was also broken down by the destination of the waste.

Table 7 – LLRW Shipments by Destination

Destination	Activity MBq (Ci)	% of activity	Volume (ft^3)	% of volume
East Chicago, IN	417.58 (0.011)	<0.01	117.8	0.08
El Dorado, AR	4.29 (0.0001)	<0.01	15	0.01
Kingston,TN	23,638.82 (0.638)	0.26	29.37	0.02
Clive, Utah	8,856,663.03 (239.37)	98.44	108,013	80.6
Oak Ridge, TN	111,501.6 (3.01)	1.23	519.5	0.38
Tinely Park, IL	458.5 (0.012)	<0.01	30.0	0.02
Gainesville, Fla	305.73 (0.008)	<0.01	56.84	0.04
Heiskell, TN	21.61 (0.0005)	<0.01	24,640	18.4
Port Arthur, TX	3,163.5 (0.08)	0.03	567	0.43
TOTAL	8,996,184.89 (243.14)	100	133,989.6	100

The EnergySolutions site in Clive, Utah currently accepts class A radioactive waste. As evidenced by the data in Table 7, this facility is the site of choice for disposal of LLRW, including large volume decommissioning waste.

Table 8 – Total LLRW Shipments by Year

Calendar Year	Activity in MBq (Ci)	Volume in ft^3
1998	5,840,000 (158)	27,518
1999	15,900.000 (430)	92,310
2000	22,021,265 (595)	74,484
2001	30,323,124 (820)	105,899
2002	14,807,530 (400)	69,880
2003	3,005,880.1 (81.24)	62,253
2004	21,868,587.69 (591.04)	36,556
2005	5,233,693.71 (141.45)	59,631
2006	100,141,428 (2,706.5)	135,281
2007	1,674,096,043.22 (45,245.8)	103,525
2008	223,002,127.28 (6,027.08)	89,656.7
2009	8,996,184.89 (243.14)	133,989.6

LLRW Land Disposal

Table 9 is a list of the activity and volume of radioactive waste received from Ohio licensees and disposed at the EnergySolutions facility in Clive, Utah. The 2009 data are values reported by Ohio generators at the respective land disposal facility.

Table 9 – Land Disposal - EnergySolutions Utah Site Reports

Year	Activity in MBq (Ci)	Volume (ft^3)
1998	24,383 (0.659)	4,240
1999	-	73,905
2000	72,520 (1.96)	62,091
2001	258,260 (6.98)	48,764
2002	202,760 (5.48)	14,329
2003	96,200 (2.6)	5,005
2004	781,762 (21.13)	215,883
2005	1,011,432 (27.34)	108,713
2006	10,815,100 (292.3)	103,638
2007	1,184,407 (32.011)	21,127
2008	21,635,852.83 (584.75)	86,016
2009	8,856,663.03 (239.37)	108,013

The volumes and activities of the radioactive waste presented here are what remain after the generated radioactive waste has been treated, segregated and reduced in volume prior to final disposal. There are some lag times between waste generation, to shipment and/or treatment and eventually disposal at a land disposal facility when appropriate.

Due to the closure of the Barnwell, S.C. site to Ohio generators, the activity and volume of LLRW going to EnergySolutions in Utah has increased. Disposal availability may increase in the future if legislative initiatives across the country point to the development of new disposal sites or policy options such as waste blending.

LLRW Storage

Currently, few locations in Ohio store LLRW for extended periods. LLRW is stored on site for DIS awaiting treatment options or accumulating for shipment. The current policy and requirements for licensees storing LLRW beyond a five-year period may be found in OAC rule 3701:1-54-03, titled "Assured Isolation Facility." The NRC, by policy and license conditions, does not allow their licensees to store LLRW for extended periods on site, other than DIS, if there were readily available treatment or disposal options.

Medical facilities commonly use DIS or transfer their material back to the pharmaceutical vendor as the preferred method of waste management. The radionuclides in the LLRW held for DIS generally have short half-lives, six hours or less in many cases. These facilities plan to continue to use DIS and thus are able to avoid the reporting and costs associated with other disposal methods.

OAC 3701:1-54-02 (F) provides a fee exemption for LLRW first generated or stored prior to Jan. 1, 1998.

The following tables provide information on waste storage as of Dec. 31, 2008, placed into storage during and prior to 2009. There are 18 facilities who reported storing LLRW in calendar year 2009.

Table 10 – Pre – 2009 LLRW Remaining in Storage by Year Generated

Year Generated	Activity MBq (Ci)	% of total activity	Volume in ft^3	% of total volume
1993	29.6 (0.0008)	0.01	89.00	0.9
1994	296 (0.008)	0.11	215	2.17
1995	0.74 (20µCi)	<0.01	3	0.03
1996	185 (0.005)	0.07	577	5.82
1997	74 (0.03)	0.03	165	1.66
1998	185 (0.005)	0.07	479	4.83
1999	740 (0.02)	0.28	1,035	10.44
2000	156,510 (4.23)	59.93	2,399	24.21
2001	33,485 (0.905)	12.82	397	4.01
2002	370 (0.01)	0.14	948	9.57
2003	11,248 (0.30)	4.31	406	4.10
2004	22,348 (0.6)	8.56	428	4.32
2005	16,243.48 (0.43)	6.22	568	5.73
2006	1,332.01 (0.36)	0.51	542.43	5.47
2007	10,223.45 (0.27)	3.91	294.57	2.97
2008	7,879.14 (0.21)	3.02	1,364.76	13.77
Total	261,149.41 (7.06)	100	9,910.8	100

Table 11 breaks down the waste held in storage for more than one year by the waste type. Sealed sources followed by dry active waste represented the largest percentage activity.

Table 11 – LLRW Remaining in Storage by Waste Type

Waste Type	Activity MBq (Ci)	% of activity	Volume ft^3	% of volume
Dry solid waste	106,818.92 (2.88)	40.9	9,637.92	97.24
Liquid-aqueous	5,109.11 (0.14)	1.96	119.5	1.21
Biohazard/Pathological	4.24 (0.1mCi)	<0.01	50.24	0.51
Scintillation vials	2.8 (0.07mCi)	<0.01	100.5	1.01
Sealed sources/special form	149,214.34 (4.03)	57.14	2.6	0.03
TOTAL	261,149.41 (7.06)	100	9,910.8	100

Appendix

Low-level Radioactive Waste Generator Report Form

For Calendar Year 2009

2009 Low- Level Radioactive Waste Generator Report
Ohio Department of Health – Bureau of Radiation Protection

Licensee Information

Licensee Name _____
Street Address _____
_____
_____

Telephone number (_____) _____ - _____
Federal Tax ID number _____

Organization Classification
[__] Academic
[__] Industrial
[__] Medical
[__] Utility
[__] Government Office
[__] Uranium Enrichment
[__] Academic and Medical

[__] I/We did not generate, possess, or store any low-level radioactive waste in CY 2009.

----------Remainder for Generators Only ----------

Person completing LLRW annual report

Name _____ Title _____
Phone number (_____) _____ - _____

Radiation Safety Officer

Name (printed) _____ Title _____

RSO Signature _____ Date _____

Radioactive Material License Number: _____

Generator Reporting Exemption

[__] This facility is exempt from low- level radioactive waste generator reporting requirements under Ohio Administrative Code (OAC) rule 3701:1-54-02(D) since this facility exclusively generates and disposes of LLRW in accordance with paragraphs (D) to (G) of OAC rule 3701:1-38-19.

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Table 1a - 2009 LLRW Generated and Not Placed in Storage
[OAC 3701:1-54-02(A)(2), - 02(E)]

Complete the following table for the types and amount of waste generated in CY 2009 and not placed into storage. Summarize from your records, and subtotal based on waste class and type, the information requested in the table below.

- In the column "Waste Class," enter the waste classification of A, B or C as defined in OAC 3701:1-54-10.
- In the column "Waste Type," enter the waste type as a generic description of the physical characteristics of the waste. Examples of generic descriptions are dry solid, aqueous liquid, scintillation vials, biological (animal carcasses) or high-volume, low-level radioactive waste (HV-LLRW) from decommissioning or decontamination. HV-LLRW is defined in OAC 3701:1-54-02(C).
- Enter the predominant radionuclides contained in each waste class and type in the column labeled "Radionuclide."
- Enter the total radionuclide activity for each waste class and type in the column labeled "Activity." Indicate by check mark the units of activity that are being used.
- In the column labeled "Volume Generated," enter the volume of waste generated in cubic feet before using waste treatment techniques.
- If the waste was treated, enter the volume of waste after treatment in cubic feet in the column labeled "Volume after Treatment." [Complete information on the processor in table "Generator Certification of Processed Waste" as applicable.]
- Treatment is defined in OAC 3701:1-54-01.
- In the column labeled "Type of Disposal," indicate the disposition of the waste as land burial, vitrification, etc.

[__] Does not apply - no data to report for this table.

Waste Class	Waste Type	Radionuclide	Activity [_] Ci [_] mCi [_] MBq	Volume Generated (cu ft)	Volume after treatment (cu ft)	Type of Disposal

Table 1b - 2009 LLRW Generated and Placed into Storage

[OAC 3701:1-54-02(A)(2), -02(A)(3), -02(E)]

Complete the following table for the types and amount of waste generated in the CY 2009 and placed into storage. Summarize, from your records, and subtotal, based on the waste class and type, the information requested in the table below.

- In the column "Waste Class," enter the waste classification of A, B or C as defined in OAC 3701:1-54-10.
- In the column "Waste Type," enter the waste type as a generic description of the physical characteristics of the waste. Examples of generic descriptions include dry solid, aqueous liquid, scintillation vials, biological (animal carcasses) or high- volume, low- level radioactive waste (HV-LLRW) from decommissioning or decontamination. HV-LLRW is defined in OAC 3701:1-54-02(C).
- Enter the predominant radionuclides for the waste class and type in the column labeled "Radionuclide."
- Enter the total radionuclide activity for the waste class and type in the column labeled "Activity." Indicate by check mark the units of activity that are being used.
- In the column labeled "Volume Generated," enter the volume in cubic feet of waste generated before treating the waste.
- If the waste was treated, enter the volume of waste (in cubic feet) placed into storage after treatment in the column labeled "Volume After Treatment." [Complete information on the processor in table "Generator Certification of Processed Waste" as applicable.]
- Treatment is defined in OAC 3701:1-54-01.

[__] Does not apply - no data to report for this table.

Waste Class	Waste Type	Radionuclide	Activity [_] Ci [_] mCi [_] MBq	Volume generated (cu ft)	Volume after treatment (cu ft)

Pre-2009 LLRW Remaining in Storage

[OAC 3701:1-54-02(A)(3)]

Complete the following table for the types and amounts of LLRW that was placed in storage before Jan. 1, 2009, and continued to be held in storage as of Dec. 31, 2009. Summarize from your records, subtotal based on the waste class and type by year, the information requested in the table below.

- In the column labeled "Year Generated," enter the year that the waste was placed into storage.
- Enter the waste classification of A, B or C as defined in OAC 3701:1-54-10 in the column labeled "Waste Class."
- Enter the waste type as a description of the physical characteristics of the waste in the column labeled "Waste Type." Examples of the generic descriptions include dry solid, aqueous liquid, scintillation vials, biological (animal carcasses) or high- volume, low-level radioactive waste (HV-LLRW) from decommissioning or decontamination. HV-LLRW is defined in OAC 3701:1-54-02(C).
- In the column "Radionuclide," enter the predominant radionuclides remaining in the waste as of December 31, 2009.
- Enter the decay corrected activity of the waste remaining in storage as of Dec. 31, 2009, in the column labeled "Activity." Indicate by check mark the units of activity that are being used.
- In the column "Volume," enter the volume (in cubic feet) of waste held in storage after any treatment techniques were used.

[__] Does not apply - no data to report for this table.

Year Gener-ated	Waste Class	Waste Type	Radionuclide(s)	Activity (12/31) [_] Ci [_] mCi [_] MBq	Volume (cu ft)

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LLRW Shipment Information

[OAC 3701:1-54-02(A)(4)]

Identify the types and amount of LLRW shipped in CY 2009, including carrier or broker, shipment dates and modes of transportation. Provide a summary of the information from your individual waste manifest forms. The summaries may be subtotaled by carrier and destination for a shipment period in lieu of specifying individual dates. For example, a period may be a calendar quarter or a year. Make additional copies of this page if needed.

- In the column "Waste Class," enter the waste classification of A, B or C as defined in OAC 3701:1-54-10.
- In the column "Waste Type," enter the waste type as a generic description of the physical characteristics of the waste as entered on your waste manifest (ref. OAC 3701:1-38-19 Appendix A, OAC 3701:1-50-05).
- In the column "Radionuclide," enter the predominant radionuclides contained in each waste class and type.
- Enter the total radionuclide activity in the column labeled "Activity" for each waste class and type. Indicate by check mark the units of activity that are being used.
- In the column labeled "Volume," enter the volume of waste transported by the carrier/broker in cubic feet. (Note: there are 35.3 cu. ft. in a cubic meter.)
- Enter the *final* destination/disposal site (e.g. Energy Solutions). List only one disposal site per table.
- Make as many copies of this page as needed.

[__] Does not apply - no data to report for this table.

Carrier/Broker:_____ Shipment date(s)/period:_____

Final Destination: _____Disposal Site: _____

Mode of Transportation (OAC 3701:1-50-05)

[_] public highway [_] air [_] vessel [_] rail

Truck carrier permitted by Ohio PUCO to transport hazardous materials

Waste Class	Waste Type	Radionuclide	Activity [_] Ci [_] mCi [_] MBq	Volume (cu ft)

LLRW General Information

Was any LLRW stored or shipped in CY 2008 that was not reported in last year's report?

[_] Yes [_] No [OAC 3701:1-54-02(A)(5)]

If yes, describe the types and amounts.

_____

_____

Describe the methods used to treat, store and dispose of LLRW.
[OAC 3701:1-54-02(A)(6)]

_____

_____

_____

_____

_____

_____

Describe actions taken, or planned to be taken, to reduce the LLRW volume or production
[OAC 3701:1-54-02(A)(7)]

_____

_____

_____

_____

_____

_____

Anticipated 2010 LLRW Generation

[OAC 3701:1-54-02(A)(8)]

If the anticipated types and amount of waste to be generated or placed in storage during CY 2010 will be approximately the same as CY 2009, check the box below. Otherwise, complete the table below estimating the type and amount of LLRW to be generated or placed in storage during CY 2010.

[_] Approximately the same as CY 2009.

Waste Class	Waste Type	Radionuclide	Activity [_] Ci [_] mCi [_] MBq	Volume (cu ft)

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Generator Certification of Processed Waste
[OAC 3701:1-54-02(E)]

Was any low- level radioactive waste sent to a processor for the purpose of treating the low-level radioactive waste, and either returning the waste to the generator or disposing of the waste on behalf of the generator?

[__] Yes [__] No

If yes, complete the following table for low level radioactive waste that was sent out for volume reduction. The date is the date shipped. The volume shipped is the initial volume of the shipment being sent out for volume reduction. Indicate who the processor was and what treatment was used (e.g. compaction, incineration). Indicate for that particular shipment the volume of waste returned or disposed on behalf of the generator. If the waste was returned to the generator, include the date of the return by the processor.

Date	Volume Shipped	Processor	Process Technique	Volume Returned or Disposed	Return Date