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MICROFICHE**Hazardous Materials Management Using a
Cradle-to-Grave Tracking and Information
System (CGTIS)**

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Hazardous Materials Management Using a Cradle-to-Grave Tracking and Information System (CGTIS)

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Abstract

Hazardous materials management includes interactions among materials, personnel, facilities, hazards, and processes of various groups within a DOE site's environmental, safety & health (ES&H) and line organizations. Although each group is charged with addressing a particular aspect of these properties and interactions, the information it requires must be gathered into a coherent set of common data for accurate and consistent hazardous material management and regulatory reporting. It is these common data requirements which the Cradle-to-Grave Tracking and Information System (CGTIS) is designed to satisfy. CGTIS collects information at the point at which a process begins or a material enters a facility, and maintains that information, for hazards management and regulatory reporting, throughout the entire life-cycle by providing direct on-line links to a site's multitude of data bases to bring information together into one common data model.

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Summary

The Cradle-to-Grave Tracking and Information System (CGTIS) project team set out to design a system that could link data bases across Sandia and provide on-line access to merged information for Environmental, Safety and Health (ES&H) and line organization hazards management. The CGTIS was developed with the requirement that ES&H data would not be duplicated; instead existing ES&H data bases would be used and linked to an existing Facilities Geographical Information System (GIS).

The CGTIS purpose is to collect information at the point at which a process begins or a material enters a facility and to maintain that information for its entire life cycle. CGTIS provides a data model where changes can be made in one place to modify or add new reporting requirements.

The major attributes of this proactive approach to ES&H hazards management, which should make it of value to any DOE site, are

- ◊ ***CGTIS can provide location-based chemical, process, and waste information to provide***
 - 1) the pollution prevention (PP) program a focus for their PP opportunity assessment efforts efficiently;
 - 2) waste management professionals a system to increase the efficiency of obtaining waste profile information from the line and improve the accuracy and accessibility of that data;
 - 3) chemical, process, and waste data queries and display using Geographical Information System (GIS) techniques,
- ◊ ***CGTIS can provide major assistance in meeting reporting requirements including***
DOE Annual Report on Waste Generation and Waste Minimization Progress,
EPA Hazardous Waste Report (Biennial Report), and
Toxic Chemical Release Inventory Report (EPCRA Section 313),
- ◊ ***CGTIS can provide automated updates to changing requirements with a data model that***
 - 1) defines all of the data elements that need to be present in the data bases, and the relationship among the data elements, the data bases, and the reports;
 - 2) responds to inevitable changes in reporting requirements efficiently and comprehensively, and
 - 3) provides access to operational data bases at a site, or designing new data bases within the CGTIS data model.

The CGTIS implementation at Sandia is a client/server configuration with data bases residing on the data owner's file server and the DBAccess™ front-end residing on a manager's client personal computer (PC). The Facilities GIS map shows the buildings requested by the user. The user can use the pull-down menu to request information, such as chemical and hazard listings by building, which can subsequently be viewed as a report listing. The Sandia data bases reside on different hardware and software platforms; e.g., the Chemical Information System (CIS) is an Informix data base on an AT&T PC file server, the Hazardous Waste System (HWDMS) is an Oracle data base on a Sun file server, and the client DBAccess™ GUI front-end is on an IBM PC.

It is clear that implementation of a CGTIS can provide a more accurate and efficient means to manage hazards, thereby significantly reducing both ES&H and line organization efforts, while providing an easy method of keeping up with fast changing regulatory laws and orders.

Background

The concept of a Cradle-to-Grave Tracking and Information System (CGTIS) originated in 1991 with a goal of linking chemical and waste tracking systems with process information in order to track chemicals from purchase and entry into a facility, through processes, into waste streams, and eventual disposal of the waste. Traditionally, chemical information systems and waste tracking systems have originated in different organizations to meet different needs. That is, chemical information was typically used by industrial hygiene groups to meet safety and health concerns, while waste information was needed by waste management organizations to meet environmental requirements. The resulting separate tracking systems were incapable of tracking chemicals from entry into a facility through disposal as waste.

The original concept of the CGTIS was to bridge the gap between the separate chemical and waste tracking systems by linking them through process information obtained from Process Waste Assessments (PWA). PWAs, which are now called Pollution Prevention Opportunity Assessments (PPOA), are performed as part of the pollution prevention program. A chemical tracking Quality Action Team (QAT) chose the AT&T Bell Labs' Chemical Information System (CIS) as a new chemical tracking system for Sandia, and endorsed the CGTIS concept.

In mid-1991 Sandia and AT&T Bell Labs initiated a joint project to investigate the feasibility of incorporating PWA forms and information into CIS as a first step in creating a CGTIS. Experience obtained from the early PWA development efforts showed that comprehensive process information is very difficult or impossible to obtain and maintain at a research and development (R&D) facility like Sandia. There are numerous processes, many of which are one-time, most of which change frequently. Thus it is very difficult to get meaningful quantitative chemical input and waste output and information that is stable over time to support the original process-based CGTIS. Obtaining accurate, up-to-date process information from line managers in a R&D facility is not cost effective. An alternate solution, discussed in detail in this report, uses location-based chemical and waste information, augmented by process information where applicable.

In fiscal year (FY)93, in response to a Sandia proposal, the DOE Environmental Management's Waste Minimization Division provided funds to support CGTIS development. The initial project involved implementation of the AT&T CIS at Sandia, CA, as a requisite front-end to a CGTIS. The results of the follow-on project at Sandia, NM, funded in mid-FY95 by DOE, is the subject of this report.

Introduction

The CGTIS project team, comprised of personnel from many organizations across Sandia who are aware of the complexity of meeting regulatory DOE and EPA reporting requirements, set out to design a system that could link data bases across Sandia and provide on-line access to merged information for ES&H and line organizations hazards management. CGTIS was developed with the requirement that data would not be duplicated and existing data bases would be used and linked to the existing Facilities Geographical Information System (GIS). CGTIS provides a data model where changes can be made in one place to modify or add new reporting requirements.

The CGTIS is designed to track where and how chemicals are used and wastes are generated, facilitate hazards management, and, specifically, support the pollution prevention (P2) program. CGTIS collects information at the point at which a process begins or a material enters a facility, and maintains that information, for hazards management and regulatory reporting, throughout its entire life cycle.

There are three major attributes of the CGTIS which should make it of value to any DOE site's ES&H organization, especially their pollution prevention program.

1. *The CGTIS can provide location-based chemical and waste information*

The CGTIS is based on Facilities' mapping and building layout information which is dynamically linked to other data bases, such as chemical and waste, to provide real-time, location-based chemical and waste data. The advantages of such a system include:

- ◊ The pollution prevention program can use the CGTIS to focus its pollution prevention opportunity assessment (PPOA) efforts efficiently. A major incentive for going to a location-based approach is that much of the data needed can be obtained directly from the data bases linked to the CGTIS, as opposed to costly and difficult to obtain *ad hoc* data calls to the line organizations for process information. Examples of the data available to determine what the PPOA focus should be are quantity and type of chemicals delivered to a location and quantity and type of waste generated at a location.
- ◊ Waste management professionals can use the system to increase the efficiency of obtaining waste profile information from the line and improve the accuracy and accessibility of that data.
- ◊ Hazards regulatory and *ad hoc* reporting is supported by location-dependent chemical usage, waste, and air emissions data.
- ◊ Other required information, such as location owner and description, as well as information on utilities of interest to a pollution prevention program and risk management program (e.g., drains, outfalls, hoods and vents) is readily available.
- ◊ The data can be queried and displayed using Geographical Information System (GIS) techniques which increases the ability of decision makers to understand complex ES&H situations.

2. *The CGTIS can provide major assistance in meeting reporting requirements.*

The CGTIS is designed to directly support pollution prevention/waste minimization-related reports, including:

- ◊ *DOE Annual Report on Waste Generation and Waste Minimization Progress,*
- ◊ *EPA Hazardous Waste Report (Biennial Report),*
- ◊ *Toxic Chemical Release Inventory Report (EPCRA Section 313).*

The CGTIS provides the means to work with operational data bases, or support the design of new data bases, at a site. The CGTIS, by means of the data model and the dynamic links to the relevant data bases, provides the user a single entry point to obtain all the information needed for a report.

3. *The CGTIS can provide automated updates to changing reporting requirements.*

- ◊ The data model that is part of the CGTIS supports reporting by defining all of the data elements that need to be present in the data bases, and the relationship among the data elements, the data bases, and the reports. This ability ensures that there are no data holes and the relationship between the data and the report is clear.
- ◊ The data model enables efficient and comprehensive response to ever-changing reporting requirements. Changes can be made readily to the data model which will then define the modifications which need to be made to each of the relevant data bases.
- ◊ The data model provides the ability to design new data bases to meet reporting requirements not currently supported by the existing data model. The tools used with the data model can support any relational data base, such as Oracle, Sybase, and Informix. The significance of this capability is that the CGTIS technology is readily transportable to other sites.

The CGTIS supports a graded-approach to pollution prevention, including prevention opportunity assessment (PPOA) activities, by helping to prioritize PPOAs, tracking P2 projects as they are implemented, and spotting laboratory-wide waste generation that could be minimized through a single, cross-laboratory PPOA. This will target the areas of concern where a full blown PPOA needs to be done. Other hazards data bases, such as water, air, radioactive materials, etc., can be added to the initial CGTIS prototype to support requirements such as Environmental Protection, Emergency Preparedness, Safety & Health, and Risk Management.

Cradle-to-Grave Tracking and Information System (CGTIS) Architecture

The picture below (*Figure 1*) depicts the life-cycle, location-based approach taken by the CGTIS. The grayed area represents the CGTIS prototype, which includes the Facilities' geographical information system (GIS) maps/location and building layout data systems as the base information system, linked to the chemical and waste data bases. Process information is included in the data model, and a CGTIS waste profile form is being implemented by the Generator Interface Department at SNL to collect process information. The prototype CGTIS has demonstrated the

ability to link chemical purchase information with chemical usage, as well as transaction and inventory data, and hazardous waste disposal information.

Cradle-to-Grave Tracking and Information System

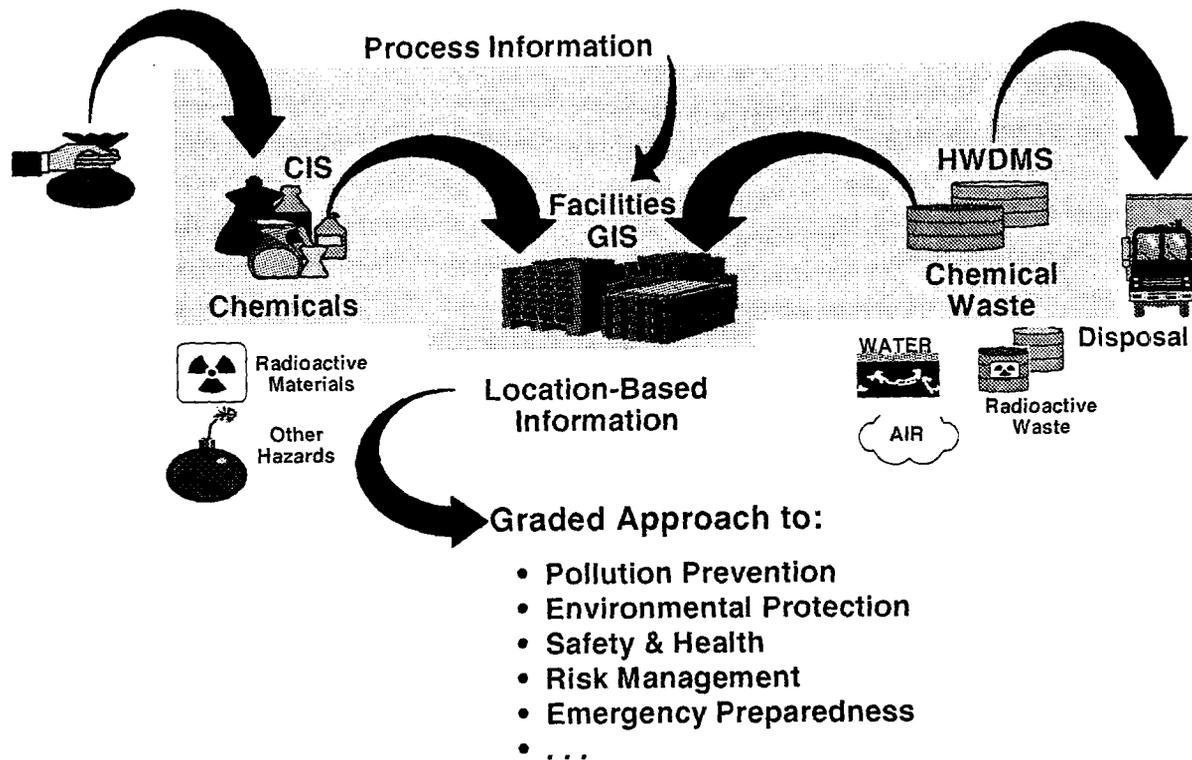


Figure 1: Illustration of a Hazardous Materials Information Management System based on CGTIS

The CGTIS provides an effective hazards management system to

- ◊ track materials from procurement to disposal by correlating information on personnel, locations, chemicals, and waste;
- ◊ provide a graphical representation of the hazards information based on location;
- ◊ provide regulatory reporting support to environmental and line organizations; and
- ◊ provide hazards information to management and infuse a “cradle-to-grave” mentality in waste generators.

System Design

The CGTIS design incorporates the use of geographic information and hazards data to give management a complete picture of what, where, and how hazards are located and report the information pictorially in a clear, concise manner. The system is designed to support

- ◊ **regulatory reporting for pollution prevention and waste minimization** with predefined DOE Waste Generation & Waste Minimization Progress, EPA Hazardous Waste, and Toxic Chemical Release Inventory (TRI) reports,

- ◊ **a CGTIS data model that can be easily modified and applied at different DOE sites** by creating CGTIS tables that define all data elements that need to be present in a hazardous materials management data base. CGTIS eliminates data holes in filling DOE and EPA hazardous material management and regulatory reporting requirements and provides a flexible system that can be readily modified to add new reporting requirements and additional hazard data bases as needed. As new EPA requirements for TRI reporting are added, e.g., new mass balance and substitution data elements, these data elements can be added to the CGTIS data model and mapped to a site's existing data bases. At that point, data elements may be identified as not currently being collected in existing data bases. This data can be collected directly in the CGTIS data base, or existing data bases can be expanded to meet the new data requirements.
- ◊ **waste characterization profiles of a generator's type and location of waste** based on sampling analysis and/or knowledge of process (KOP). Since CGTIS is linked to existing data bases, it can provide pre-filled forms with current information, such as chemicals and waste streams for the generator to approve, modify, or insert new or missing data instead of presenting the traditional blank form.
- ◊ **location-based facilities mapping of hazards** by joining site facilities maps with hazard data to enable, for example, a drill down (or zoom in) from building outline to room to chemicals or waste by owner,
- ◊ **ad hoc hazardous material management reporting** with on-line access to a site's multitude of chemical, waste, and hazards data bases.

Following the expansion of the TRI chemical list (286 chemicals added effective Jan.1, 1995), EPA is seriously considering a TRI expansion that will require all TRI reporters to include on Form R materials accounting (or mass balance) and worker exposure information. With CGTIS, chemical types, usage amounts, and process information for a location can be used by personnel managing a facility to determine if they are complying with OSHA and EPA regulations.

The CGTIS design brings data base information together with direct on-line access to current, accurate data using a distributed client/server environment. CGTIS accesses multiple data bases, with a graphical user interface (GUI) front-end presentation, for easy hazards management. The data bases are linked using SQL-based middleware software with access to facilities maps allowing managers to identify buildings and rooms, for example, and to ask for a graphical display of all chemicals used at this site.

Prototype Implementation

The CGTIS prototype, as implemented at Sandia National Laboratories, New Mexico (SNL/NM), exemplifies a proactive approach to ES&H information management. The CGTIS is designed to meet many of the SNL information needs of the various ES&H functional groups by tracking chemicals and wastes. Included in the CGTIS prototype, as depicted below in *Figure 2*, are on-line access to the following SNL data bases:

- ◊ **CGTIS Process Information (PI) data base** tracks a waste generator's processes for chemicals, hazardous, and non-hazardous, radioactive, and mixed waste, as well as air and water. The generator interface department works with a waste generator to determine a waste

profile, for example, the type of chemicals, etc., input to a process, to obtain process knowledge to help characterize the non-hazardous, hazardous, radioactive and mixed waste outputs.

- ◊ **Chemical Information System (CIS)** tracks chemical inventory data to identify the users of specific regulated materials and predictive process level emission data to assist regulatory reporting for the EPCRA Sec. 313, the Clean Air Act, the National Emission Standards for Hazardous Air Pollutants Act (NESHAPS), and state and local air quality control board regulations
- ◊ **Hazardous Waste Data base Management System (HWDMS)** tracks bar-coded, containerized wastes from the point of generation to final disposition and provides data for EPA and DOE waste and waste minimization regulatory reports
- ◊ **Facilities Geographical Information System (GIS)** maps the technical areas, building, floors, and rooms of all SNL facilities and contains location data, such as building names, numbers, owners, etc.

The information provided by the inventory and waste tracking components of CGTIS can be applied to improve the accuracy of process input and output estimates. CIS will supply data on the quantity of each material that enters a location over a given time; likewise, the HWDMS will supply data on the quantity of material that left a location as solid waste.

CGTIS collects waste profile information from line organizations to supply process information that is vital for identifying waste streams and providing the ability to characterize waste for disposal through process knowledge. This historical baseline data can then be extrapolated using predictions of future process modifications to support pollution prevention opportunity assessments (PPOA); using a graded approach.

The CGTIS implementation at Sandia is a client/server configuration with data bases residing on the data owner's file server, and the DBAccess™ front-end residing on a manager's client personal computer (PC). Examples of a CGTIS DBAccess™ front-end menu and report appear in *Figures 3 and 4*. The Facilities GIS map shows the buildings requested by the user. The user can use the pull-down menu as shown in *Figure 3* to request information, such as chemical and hazard listings by building, which can subsequently be viewed as a report listing as shown in *Figure 4*.

The Sandia data bases used in the prototype reside on different hardware and software platforms; e.g., CIS is an Informix data base on an AT&T PC file server, HWDMS is an Oracle data base on a Sun file server, and the client DBAccess™ GUI front-end is on an IBM PC.

Cradle-to-Grave Information System

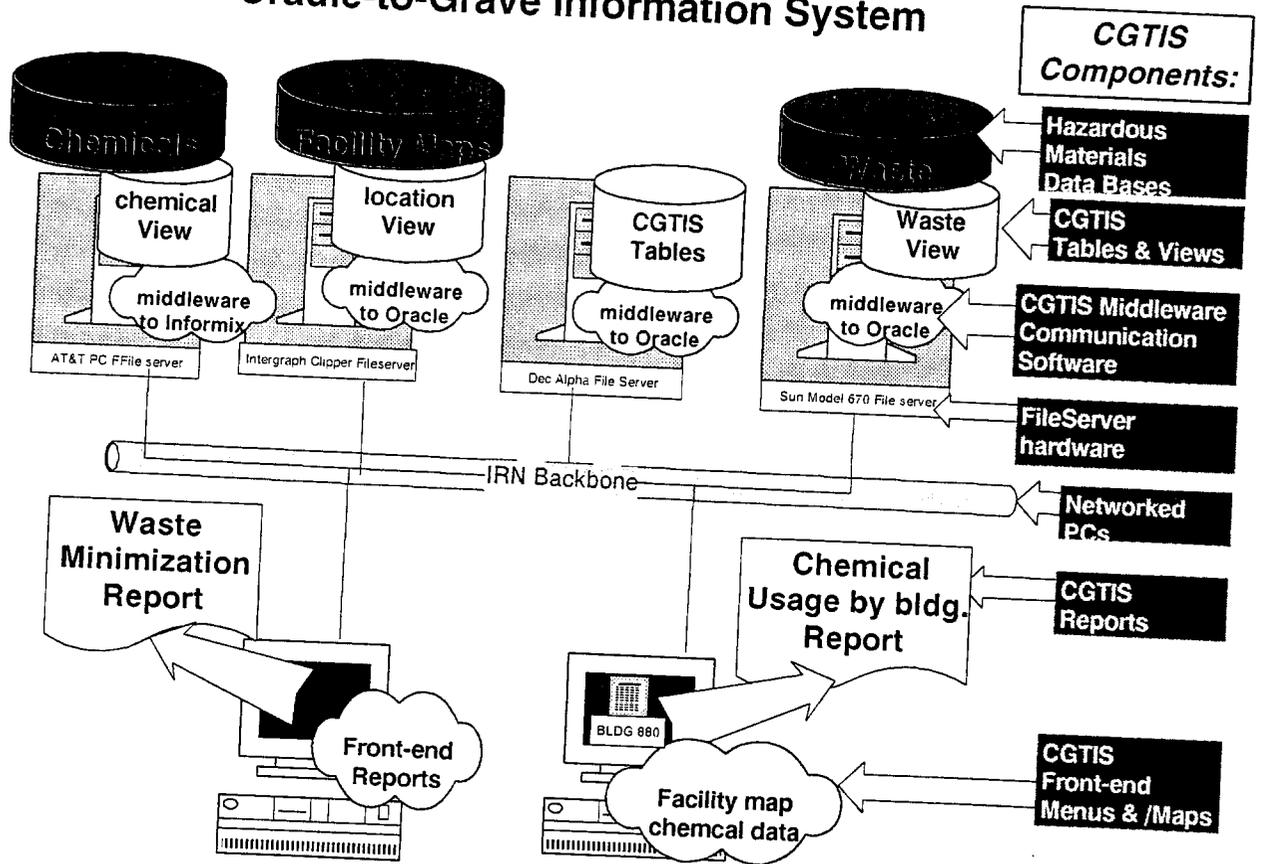


Figure 2: Illustration of the CGTIS as implemented at Sandia National Laboratories.

Hardware and Software Components

The CGTIS provides a graphical user interface (GUI) front-end with predefined and ad hoc queries of facility maps, locations, chemicals and waste data using middleware software to connect to the hazards data bases. The hardware and software components required for the SNL implementation of the CGTIS are listed below. Implementation of the CGTIS at other DOE sites will be different depending on a site's networked GIS and data base implementations.

SNL communication requirements are:

- ◊ access to a local area network (LAN) that is connected to Sandia's Internal Restricted Network (IRN),
- ◊ networked personal computer (PC).

SNL file server requirements are:

- ◊ networked relational data bases; e.g., CIS Informix™ and HWDMS and Facilities Oracle™ data bases,
- ◊ installed middleware software; e.g., Intergraph Relational Interface System™ (RIS) on Oracle™ file servers and Informix Star™/Informix Net™ on Informix™ file servers where data bases to be connected to will reside.

SNL client workstation requirements are:

- ◊ a networked IBM™ or fully compatible 386 or 486 CPU computer (or faster),
- ◊ Windows/NT™ (version 3.5) PC operating system,
- ◊ a two or three button mouse,
- ◊ at least 16 MB of available RAM (or more),
- ◊ at least 80 MB of free hard disk space,
- ◊ a 256-color VGA video board (or better),
- ◊ Intergraph RIS client software installed on networked PC to establish connections to file server schemas,
- ◊ Intergraph™ DBAccess™ runtime front-end software and Intergraph™ Microstation™ (optional for map graphics) installed on networked PC,
- ◊ Network File System™ (NFS) NFS/NT™ software installed on networked PC to establish remote mount points for Facilities graphics files,
- ◊ CGTIS startup script copied to a networked PC to set up Intergraph™ DBAccess™ environment variables,
- ◊ CGTIS DBAccess™ template library copied to a networked PC to set up CGTIS menus and reports,
- ◊ CGTIS file server logon with the appropriate passwords,
- ◊ CGTIS icon on a PC to run the CGTIS software.

The CGTIS data model (appendix C) comprises information about facilities, location, processes, chemical, and waste data. Included in this model is a symbolized view of data facts and their relationships which are required to provide a cradle-to-grave reporting data base.

The required reports and the user's understanding of the business identify what needs to be included in the information model and the structure of the model. This information model can be represented either graphically (appendix C diagram) or by natural language sentences. Once the model and the constraints are specified, the InfoModeler™ tool generates a data model that can be mapped to any relational data base management system (DBMS). The tool also generates the actual data base schema for a number of commercially available data managers. The reports can then be produced by queries and processing against the data base.

Enhancements to the system are done by working with the users to revise the information model and regenerating the data model and the schema. Most changes will involve adding fields to existing record types or adding new record types, either of which drastically changes the existing applications.

Construction of the data model begins with a fact-based information model developed using a structured natural language. For example, a site generates a hazardous waste stream, or conversely a hazardous waste stream is generated by a site. Constraints are then added to this generic model, often by using specific examples. The addition of mandatory and uniqueness constraints results in a more precise sentence; a site may generate one or more hazardous waste streams, or conversely, every hazardous waste stream must be generated by one site.

The information model developed for one site can often be the starting point for development at another site. The site can modify it to fit their existing practices and/or legacy systems or can use the data model as the starting point for re-engineering their processes.

Data Mapping

The CGTIS data model brings the SNL chemical, process, and waste information from many data bases together into one coherent set of information that can be used to produce the regulatory reports. Mapping the CGTIS data model against Sandia's CIS, HWDMS, and Facilities data bases (Appendix A) provides identification of existing data that needs to be brought together for reporting purposes. This mapping identifies the data holes in the existing site's data bases, thus allowing the owners to correct their data repositories in order to collect all of the data that is needed to meet regulatory requirements. Also, the CGTIS data model allows new regulatory requirements to be easily added to CGTIS and then subsequently to the existing site data base if that data is not already available.

The CGTIS data model is mapped against the CIS, HWDMS, and Facilities data bases to develop the CGTIS data views and tables which are created to produce the CGTIS forms and reports.

Technology Transfer

Transferring the technology developed in the CGTIS project to other DOE sites is of high priority to the DOE sponsors. There doesn't appear to be any clear guidance from DOE on how this type of technology transfer should be performed. Our approach has been to work directly with at least one DOE site, to participate in DOE workshops and conferences, and to publish the work in various publications. Sandia and the National Renewable Energy Laboratory (NREL), Golden, Colorado agreed to collaborate in this endeavor. Since each site has various information systems in place to meet current ES&H requirements, our approach is not to provide a new data base or information system, but to help an individual site use its current systems more efficiently and effectively, as well as to provide a sound, modern information system approach to improve its systems.

We have worked with NREL in two areas discussed in this report:

- ◊ data modeling in support of regulatory reporting, and,
- ◊ obtaining location-based hazards data using a site's facilities' mapping and building layout information system, dynamically linked to relevant data bases (e.g., chemical and waste tracking systems). We have mapped our pollution prevention-based reporting data model to NREL's chemical management system (CMS) (see appendix B), and we have discussed with them how they can link it to their facilities' data system, based on our experience. More specific guidance couldn't be given since the NREL facilities' information system software is different from Sandia's.

We have presented our recent work at a DOE conference/workshop and published a preliminary article in the DOE Pollution Prevention Advisor. Participation in additional workshops and conferences is planned, as is working directly with other interested DOE sites.

Future Direction

The initial funding for the CGTIS prototype did not make provisions for software market surveys needed to identify an open systems approach to client/server implementation that could readily facilitate technology transfer to other DOE sites. The CGTIS prototype was developed using Intergraph™ graphics middleware and front-end software because SNL Facilities department uses Intergraph™ software, thus making it available for this project. If future CGTIS versions could use a distributed open systems approach, CGTIS would

- ◊ work with any geographic information system (GIS),
- ◊ use middleware that will connect to all relational data bases, and,
- ◊ provide a generic front-end development tool that can be used by UNIX, Mac, and/or PC clients.

In addition, use of an object-relational data base management tool could expand the data base connectivity capability as well as improve performance. A generic third-party middleware product will make the applications portable to a variety of UNIX systems and/or PCs while making optimal use of higher performance software and reduce overall cost of a distributed system.

Conclusion

We have met the objectives of the CGTIS project. We have developed and demonstrated a computerized system that can link Facilities mapping and building information systems to chemical and waste data bases in order to track chemicals from purchase and entry into a facility, to locations where they are used and waste is generated, to eventual disposal of the waste. The system can provide on-line access to merged information for ES&H and line organizations to support hazards management, and, in particular, to support the pollution prevention program. The CGTIS was developed with the requirement that ES&H data would not be duplicated; instead existing ES&H data bases would be used and linked to an existing Facilities Geographical Information System (GIS). A prototype implementation of the CGTIS has been demonstrated using Facilities GIS information for a specific building at SNL/NM and attaching relevant chemical and waste data by on-line linkage to the chemical and waste data bases in CIS and HWDMS, respectively.

The CGTIS also contains a data model, which, combined with the dynamic links to the relevant data bases, provides the user a single entry point to obtain all the information needed for a report.

The CGTIS provides support for hazards management and regulatory reporting requirements that have been met only by extensive manual efforts in the past. Prior to the development of the CGTIS, it has not been possible to collect and draw together information from various ES&H and line organizations to meet regulatory requirements in an automated fashion. It is clear from the prototype demonstration that implementation of a CGTIS can provide a more accurate and efficient means to manage hazards, thereby significantly reducing both ES&H and line organization efforts, while providing an easy method of keeping up with fast changing regulatory laws and orders.

We recommend that the CGTIS prototype, which is based on proprietary software, be upgraded to an open systems approach that can then be easily applied at every DOE site. The usefulness of the CGTIS can be enhanced by linking to additional data bases, such as those for industrial hygiene and health physics, air and water quality, explosives, stockpile dismantlement, etc. In addition, analytical functions can be combined with the current data integration and GIS display capabilities to provide a significantly enhanced tool for ES&H managers.

Glossary

Client/Server – a computer hardware and software configuration that allows the data base to reside on a fileserver and the application to reside on another fileserver or a client PC.

Distributed Processing – computer processing that is not on a main frame but is distributed on a network where data bases and applications can be split across multiple types of hardware and software.

Graded Approach – an approach to pollution prevention that will use chemical and waste volume, toxicity, regulatory and/or legal thresholds, for example, to determine the level of rigor to apply for pollution prevention activities; e.g., indicate when a full-blown PPOA is justified. The CGTIS supports a graded approach to pollution prevention, including PPOA activities, by helping to prioritize PPOAs, tracking P2 projects as they are implemented, and spotting laboratory-wide waste generation that could be minimized through a single, cross-laboratory PPOA.

GUI – Graphical User Interface, a presentation method with a windows or Macintosh look and feel where the computer user access is the application using icons and pull-downs instead of traditional menu choices.

Middleware – software that gives data access to heterogeneous data bases, gateways to remote data bases, application partitioning across multiple hardware platforms, and distributed updates across a homogeneous or heterogeneous set of relational data bases.

Network – a group of computers connected to one another by wires (cables). Each computer contains an adapter card to which you attach the cable for that computer. One of the computers may be a file server which has the role of sharing files with other PCs.

KOP – Knowledge of Process, a method of waste characterization by means of a waste generator's knowledge of the processes in which the waste is used; which is generally documented in a facility standard operating procedures.

Pollution Prevention Opportunity Assessment (PPOA) – a process for identifying viable pollution prevention alternatives and facilitating the implementation of those alternatives. Cost effective techniques for reducing waste generation and pollutants are identified and implemented through a graded approach.

SQL-based – Standard Query Language-based software application which accesses a relational data base.

References

Sandia National Laboratories/*Pollution Prevention Plan: Today's Gift for Tomorrow*, Sandia National Laboratories, Albuquerque, NM, May 1994.

Kjeldgaard, E. A., et. al., *Waste Minimization/Pollution Prevention at R&D Facilities: Implementing the Sandia National Laboratories, New Mexico, Process Waste Assessment Program*, SAND93-0466, Sandia National Laboratories, New Mexico, April 13, 1993.

Michael W. Gillenwater, *Requirements Documentation for the Cradle-to-Grave Tracking and Information System at Sandia National Laboratories*, Sandia National Laboratories, Albuquerque, NM, May 1993

Stermer, D. L., and Fish, J. D., *Waste Minimization/Pollution Prevention at Sandia, New Mexico: The People Factor*, SAND93-0474, Sandia National Laboratories, New Mexico, April 13, 1993.

Fish, J.D., et al., *Cradle-to-Grave Tracking of Hazardous and Radioactive Materials for Pollution Prevention*, SAND92-0135C, Sandia National Laboratories, Albuquerque, NM, November 1992.

Process Waste Assessment Guidance Manual, SAND92-2343, Sandia National Laboratories, Albuquerque, NM, November 1992.

Sandia National Laboratories *Waste Minimization and Pollution Prevention Awareness Plan*, Sandia National Laboratories, Albuquerque, NM, December 31, 1992.

Appendix A - CGTIS Data Mapping for SNL

The following CGTIS data mapping reflects the mapping of the CGTIS data model against the SNL chemical (CIS) and waste (HWDMS) data bases. The gray areas on the mapping table indicates that the SNL source table or CGTIS store table for a grayed data element does not currently exist. This condition indicates a need to add a data element either in the SNL source or CGTIS tables, whichever is appropriate.

SNL DATA MAPPING

The purpose of this appendix is to map output requirements to existing databases and known tables modeled in the NIAM model of the Cradel-to-Grave Tracking and Information System. Each report or form is identified by name with its Data Elements and Data Element descriptions, as well as Data Sources and where the Data will be stored. The Data Store or Data Warehouse will be used to generate or aid in the generation of the identified reports or forms.

EPA Hazardous Waste Report (Biennial)

Form IC - Biennial Report			
Data Element	SNL source table	CGTIS Store table	Comments
Site Name	TSDF; HWDMS	Site	Site/Company Name
EPA ID NO	TSDF; HWDMS	Site	EPA Identification Number
County	TSDF; HWDMS	Site	County in which site is located
Company Name/Site	TSDF; HWDMS	Site	Site/Company Name
Site Name Change	TSDF; HWDMS	Site	Has site name changed flag [Yes/No]
Street Address	TSDF; HWDMS	Site	Street number and name
City	TSDF; HWDMS	Site	City in which Site is located
State	TSDF; HWDMS	Site	State in which Site is located
Zip Code	TSDF; HWDMS	Site	Postal Code
Mailing Street Address	TSDF; HWDMS	Site	Mailing Street number and name
Mailing City	TSDF; HWDMS	Site	Mailing City
Mailing State	TSDF; HWDMS	Site	Mailing State
Mailing Zip Code	TSDF; HWDMS	Site	Mailing Postal Code
Contact Last Name	Person	Person	Last name of person to be contacted if any questions
Contact First Name	Person	Person	First name of contact

Form IC - Biennial Report			
Data Element	SNL source table	CGTIS Store table	Comments
Contact Initial	Person	Person	Middle initial of contact
Contact Title	Person	Person	Title of Contact Person
Contact Area Code	PersonPhone	PersonPhone	Area Code
Contact Phone Number	PersonPhone	PersonPhone	Phone number of contact person
Contact Extension	PersonPhone	PersonPhone	Phone extension, if any
Cert. Official Last Name	Person	Person	Last name of certifying individual
Cert. Official First Name	Person	Person	First name of certifying individual
Cert Official Initial	Person	Person	Middle initial of certifying individual
Cert Official Title	Person	Person	Title of certifying individual
Cert Official Signature	Signature	Signature	Signature of certifying individual
Date of Signature	Signature	Signature	Date form was signed/certified
RCRA Generators Status	TSDF; HWDMS	Site	RCRA generators status [LQGISQGCESQG]
Reason(s) for not generating		SiteYearNon_gen_reason	Code(s) indicating reason for non generation(see page 12-13 of instructions for codes and descriptions.
Storage RCRA permitting	TSDF; HWDMS	Site	Codes(s) indicating storage subject to RCRA permitting requirements see page 13 of instructions for codes and desc.
RCRA Exempt TDR	TSDF; HWDMS	Site	On-site treatment indication of exempt RCRA wastes
Source Reduction Activity	WMIN		[Yes/No] Source reduction started or expanded
Recycling Activity	WMIN		[Yes/No] Recycling started or expanded
Systematic PPOA Activity	WMIN		[Yes/No] Systematic investigation opportunities for source reduction or recycling.
Limiting Factors Source Red	WMIN		[Yes/No] Any factors which delayed or limited Source Reduction

Form IC - Biennial Report			
Data Element	SNL source table	CGTIS Store table	Comments
Limiting Factors Recycling	WMIN		[Yes/No] Any factors which delayed or limited on-site or off-site recycling activities.

Form GM - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
Site Name	TSDF; HWDMS	Site	Site Name
EPA ID Number	TSDF; HWDMS	Site	EPA Identification number
Waste Description	Hazmat; HWDMS	Haz_waste_stream	General type; Source; Type of Hazard and generic chemical name or primary Hazardous Constituent.
EPA Haz Waste Code	Container; HWDMS	Haz_wst_strmEPA_hz_wst_cd	EPA Hazardous waste code(s) that applies to waste reported.
State Haz Waste Code	Container; HWDMS	Haz_wast_strmST_hz_wst_cd	State Hazardous waste code that apply (if any)
SIC Code	Generator; HWDMS	Site_SIC	Four digit Standard Industrial Classification
Origin Code	Waste; HWDMS	Haz_waste_stream	Code that best describes the process or activity that was the source of the hazardous waste reported.
System Type	Waste; HWDMS	Haz_waste_stream	The System type that best describes the operation from which the waste is a residual.
Source Code	Package; HWDMS	Haz_waste_stream	Code that best describes the production, service, or waste management

Form GM - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
			process that was the source associated with generation of the waste.
Point of Measurement	Waste; HWDMS	Haz_waste_stream	The point at which the waste reported was measured or estimated.
Form Code	Waste; HWDMS	Haz_waste_stream	Code that best corresponds to the physical form or chemical composition of the reported hazardous waste.
RCRA-Mixed Code	Waste; HWDMS	Haz_waste_stream	Flag to indicated if the hazardous waste is mixed with nuclear source, special nuclear, or by-product material.
Qty Generated 1992	Package; HWDMS	Haz_waste_streamYear	Total qty of the hazardous waste generated for specified year.
Qty Generated 1993	Package; HWDMS	Haz_waste_streamYear	Total qty of the hazardous waste generated for specified year.
UOM	Package; HWDMS	Haz_waste_streamYear	Unit of measure of given quantities.
Density	Waste; HWDMS	Haz_waste_stream	Density in either pounds per gallon or specific gravity.
Density Flag	Waste; HWDMS	Haz_waste_stream	Flag to identify basis of density measurement.
On-site Treatment Flag	Container; HWDMS	Haz_waste_streamYear	Flay to indicate if site did any on-site disposal, recycling, discharging to sewer /POTW.
On-site Process system type	Container; HWDMS	Haz_wst_strmYrSystem_typeQty	System type code that this waste enters.

Form GM - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
Qty TDR On-site 1993	Container; HWDMS	TDR_process_year	Quantity treated, disposed, recycled or discharged on-site.
Shipped Off-site flag	Container; HWDMS	Haz_waste_streamYear	Flag indicating off-site shipment of hazardous waste.
TSDF EPA ID	TSDF; HWDMS	Site	EPA ID of facility waste waste shipped.
System Type Shipped to	Container; HWDMS	Total_off_site_shipment_qty	System Type code that best describes the way the waste was managed.
Off-site avail code	TSDF; HWDMS	Site	Code that indicates the availability of the off-site facility for commercial hazardous waste management.
Total Qty shipped 1993	Container; HWDMS	Total_off_site_shipment_qty	Total Qty of waste shipped to facility for given period.
New WMIN Activity Flag	WMIN	Haz_waste_streamYear	Flag indicating new activities that resulted in minimization of the described hazardous waste stream.
Activity	WMIN	Haz_waste_streamYear	Activity code for implemented activity to achieve waste minimization result for the described waste stream.
Other Effects	WMIN	Haz_waste_streamYear	Other effects flag
Qty Recycled New Activity	WMIN	Haz_waste_streamYear	Quantity recycled due to new activities
Activity/Production Index	WMIN	Haz_waste_streamYear	The activity/production index is a measure of changes in economic or other factors that affected the qty of hazardous waste

Form GM - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
			generated for one year compared to another.
1993 Source Reduction Qty	WMIN	Haz_waste_stream Year	Best estimate of the source reduction qty if activity was selected.

Form PS - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
Site Name	TSDF; HWDMS	Site	Site name
EPA ID NO	TSDF; HWDMS	Site	EPA Identification number
Waste TDR System Desc		TDR_process_year	Describe the process in this system, the type of units used to carry out the processes and the types of waste managed.
System Type		TDR_process_year	Code that best describes the process system.
Regulatory Status		TDR_process_year	Code that best describes the regulatory status of the process system.
Operational Status		TDR_process_year	Code that describes the operational status of the process system.
Unit Types		TDR_process_year Unit_type	Code that describes the types of units in the process system.
Influent Qty Total		TDR_process_year	Total qty of waste entering the system.
UOM		TDR_process_year	Unit of measurement code.
Density		TDR_process_year	Density of influent if appropriate
Density Measurement Basis		TDR_process_year	Basis of density measurement

Form PS - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
RCRA Qty		TDR_process_year	Amount of Total influent to the process system that was RCRA hazardous waste.
Maximum Op Total		TDR_process_year	Estimate of the maximum operational capacity of the process system.
RCRA Op Total		TDR_process_year	Estimate of the maximum RCRA operational capacity of the process system.
Liquid effluent Qty		TDR_process_year	Total qty of liquid effluent exiting from the process system, including all RCRA hazardous, State hazardous, and non-hazardous waste.
UOM		TDR_process_year	Unit of measurement code.
Density		TDR_process_year	Density of influent if appropriate
Density Measurement Basis		TDR_process_year	Basis of density measurement
RCRA effluent Qty		TDR_process_year	Amount of RCRA hazardous liquid residuals
Solid-Sludge Residual Qty		TDR_process_year	Solid/Sludge residuals are non-liquid residuals from the management of hazardous waste.
UOM		TDR_process_year	Unit of measurement code.
Density		TDR_process_year	Density of influent if appropriate
RCRA Residual Qty		TDR_process_year	RCRA Solid/Sludge residuals are non-liquid residuals from the management of

Form PS - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
			hazardous waste.
Density Measurement Basis		TDR_process_year	Basis of density measurement
Limitations on Max. Op Cap.			Code to indicate any limits on the maximum operational capacity.
Commercial Cap Avail Code		TDR_process_change	Code describing the availability of the process system for commercial hazardous waste management.
Percent Cap Comm. Avail.		TDR_process_change	Estimate of percentage commercially available.

PURPOSE OF THE FORM WR

Form WR is divided into three parts labeled Waste 1, Waste 2, and Waste 3 that collect information about the quantities and characteristics of each hazardous waste received from an off-site source.

Form WR - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
Site Name	TSDF; HWDMS	Site	Site name
EPA ID NO	TSDF; HWDMS	Site	EPA Identification number
Hazardous Waste Desc	Waste; HWDMS	Haz_waste_stream	Narrative description of waste citing general type, source, type of hazard and generic name or primary hazardous constituents.
EPA Codes	Waste; HWDMS	Haz_wst_strmEpa_hz_wst_cd	EPA Hazardous waste code(s) that apply to the waste reported.
State Codes	Waste; HWDMS	Haz_wast_strmSt_hz	State hazardous

Form WR - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
		_wst_cd	waste code that apply to the waste reported.
Off-Site Source EPA ID NO	TSDF; HWDMS	Off_site_HWS_shipment	12-digit EPA Identification number of the off-site source.
Qty Received	CWDR; HWDMS	Off_site_HWS_shipment	Total qty of hazardous wastes that were received from the off-site source.
UOM	CWDR; HWDMS	Off_site_HWS_shipment	Unit of measurement code
Density	Waste; HWDMS		Density of hazardous waste, if volumetric.
Density Measurement Basis	Waste; HWDMS		Basis of density measurement.
Form Code	Waste; HWDMS	Haz_waste_stream	Code that corresponds to the physical form or chemical composition of the hazardous waste reported.
RCRA-Rad Mixed	Waste; HWDMS	Haz_waste_stream	Flag indicating if hazardous waste is mixed with nuclear source, special nuclear or by-product material.
System Type	Waste; HWDMS	Haz_waste_stream	Code describing the on-site treatment, disposal, or recycling process system in which the waste was or will be managed.

PURPOSE OF FORM OI

Form OI documents the names and addresses of off-site installations and transporters.

Form OI - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments

Form OI - Biennial Report			
Data Element	SNL source table	CGTIS store table	Comments
Site Name	TSDF; HWDMS	Site	Site name
EPA ID NO	TSDF; HWDMS	Site	EPA Identification number
EPA ID offsite installation	TSDF; HWDMS	Site	EPA ID No. for off-site installation or transporter
Offsite Installation Name	TSDF; HWDMS	Site	Name of the off-site installation or transporter
Generator Flag	TSDF; HWDMS	Site	Check box that describer the handler type of the off-site installation or transporter.
Transporter Flag	TSDF; HWDMS	Site	Check box that describer the handler type of the off-site installation or transporter.
TSDR Flag	TSDF; HWDMS	Site	Check box that describer the handler type of the off-site installation or transporter.
Street Address	TSDF; HWDMS	Site	Street number and name of the off-site installation.
City	TSDF; HWDMS	Site	City of off-site installation
State	TSDF; HWDMS	Site	State of off-site installation
Zip Code	TSDF; HWDMS	Site	Postal Code of off-site installation
Comments	TSDF; HWDMS	Site	Comments on off-site installation

DOE Annual Report on Waste Generation and Waste Minimization Progress (DOE Order 5400.1)

Purpose of DOE Annual Report on Waste Generation and Waste Minimization Progress.

The purpose is to report waste generation quantities, waste minimization successes, and inventory by site, individual CSOs, and specific waste types. The report is to be submitted to DOE on an annual basis.

General Site Information			
Data Element	SNL source table	CGTIS store table	Comment
Site Name	TSDf; HWDMS	Site	Site name
Primary State		Site	State which is the primary location for reporting site.
Address		Site	Street number and name for site
City		Site	City
State		Site	State
Zip		Site	Postal Code
Site Size		Site	Physical size of reporting site
DOE Employees		Site	Number of DOE Employees assigned to reporting site.
Contractor Employees		Site	Number of prime contractors employed at reporting site.
Other Contr. Employees		Site	Number of tenant or subcontractors employed at site.
Primary Site Classification		Site	Description of site's primary function.
Secondary Site Classification		Site	Secondary function
Additional State for this Site		SiteState	Any other states which site is operating.
Field Operations Office		Site	DOE Field office responsible for site.
Lead CSO		Site	Lead or Primary CSO for site
Additional CSOs		Site	Additional CSOs that operate at site.

General Site Mission			
Data Element	SNL source table	CGTIS store table	Comment

General Site Mission			
Data Element	SNL source table	CGTIS store table	Comment
Site Mission		SiteMission	Narrative describing reporting sites mission.

Site Wide Waste Min Accomplishment			
Data Element	SNL source table	CGTIS store table	Comment
Site Wide WMIN Accomplishment		SiteWminAccomplishments	Narrative describing any site-wide waste minimization accomplishments.

Site Wide Recycling Activities			
Data Element	SNL source table	CGTIS store table	Comment
Recycling Waste Type		RecycleContainer	Waste/material type that has been recycled.
Actual Qty		RecycleContainer	Total amount recycled by waste type
UOM		RecycleContainer	Unit of Measurement
Qty unknown Flag		RecycleContainer	Flag indicating recycling activities for waste type was done but total quantity is unknown.

Accomplishments by Waste Type			
Data Element	SNL source table	CGTIS store table	Comment
Waste Type	Waste; HWDMS	Waste_typeYearAccomplishment	Waste category
State of Waste	Waste; HWDMS	Waste_typeYearAccomplishment	Physical state of waste [Liquid Solid etc.]
CSO	CSO	Waste_typeYearAccomplishment	Cognoscente Secretary Office (DOE) Relationship through CWDR
Accomplishment		Waste_typeYearAccomplishment	Narrative about

Accomplishments by Waste Type			
Data Element	SNL source table	CGTIS store table	Comment
		mpishment	waste minimization accomplishments by waste type, state of waste, and CSO (MemoField)

Inventory Waste			
Data Element	SNL source table	CGTIS store table	Comment
Waste Type	Waste; HWDMS	Inventory_Waste	Waste Category
Qty	Package/Container; HWDMS	Inventory_Waste	Total amount by waste type in inventory
UOM	Package/Container; HWDMS	Inventory_Waste	Unit of Measurement

Operational Status			
Data Element	SNL source table	CGTIS store table	Comment
CSO	CSO	CSO	DOE Cognoscente secretary office
Operations at Site	CSO	CSO	Description of CSO activities at site.

Waste Generation Data Entry			
Data Element	SNL source table	CGTIS store table	Comment
CSO	CSO	Hazarsous_waste_container	DOE Cognoscente secretary office
Waste Type	Waste; HWDMS	Hazarsous_waste_container	Waste Category
Qty	Package; HWDMS	Hazarsous_waste_container	Total amount of waste type generated using particular CSOs funds
UOM	Package; HWDMS	Hazarsous_waste_container	Unit of Measure
Routine Flag	Waste; HWDMS	Hazarsous_waste_container	Flag indicating if waste is generated routinely.

WMIN Accomplishments			
Data Element	SNL source table	CGTIS store table	Comment
CSO	CSO	CSO	DOE Cognoscente secretary office
Specific Accomplishments	CSO	CSO	Specific Waste Minimization accomplishments by CSO

Points of Contact			
Data Element	SNL source table	CGTIS store table	Comment
DOE Contact Name		Person	Name of DOE contact for reporting site. No designation as to employer/site (DOE/Sandia)
DOE Title		Person	Title of DOE contact
DOE Office		Site	DOE office identifier.
DOE Phone		PersonPhone	Phone number
DOE Fax		PersonPhone	FAX number
DOE Address		Site	Street number and name
DOE City		Site	City
DOE State		Site	State
DOE Zip		Site	Postal Code
Contractor Name		Person	Name of Contact for reporting site. No designation as to employer/site (DOE/Sandia)
Contractor Title		Person	Title of contact
Contractor Office		Site	Contact office identifier
Contractor Phone		PersonPhone	Contact phone number
Contractor Fax		PersonPhone	Fax number
Contractor Address		Site	Street number and name
Contractor City		Site	City
Contractor State		Site	State
Contractor Zip		Site	Postal Code

Quantitative Goals for New Waste			
Data Element	SNL source table	CGTIS store table	Comment
Waste Type		Waste_min_goal	Waste Type
Year		Waste_min_goal	Goal Year
Qty		Waste_min_goal	Total Goal Amount for reduction by reported waste type
UOM		Waste_min_goal	Unit of Measurement
Percent Reduction Goal		Waste_min_goal	Percent Reduction Goal for reported waste type

Restoration and D&D Goals			
Data Element	SNL source table	CGTIS store table	Comment
Quant. Goals for Restor./D&D		Restore_D&D_Goal	Memo field

PPOA Goals			
Data Element	SNL source table	CGTIS store table	Comment
Year	PRG team charter		Goal year
No. of PPOA (Goal)	PRG team charter		Goal Number of PPOAs

WMIN/PP Budget for Site			
Data Element	SNL source table	CGTIS store table	Comment
Year	Pollution Prevent Plan	Wminpp_Budget	Budget year
Total Operating Amount	Pollution Prevent Plan	Wminpp_Budget	Total Operating Dollars
Total Capital Amount	Pollution Prevent Plan	Wminpp_Budget	Total Capital Dollars
Total Site Amount	Pollution Prevent Plan	Wminpp_Budget	Total Site WMIN budget

PPOA Budget			
Data Element	SNL source table	CGTIS store table	Comment
Year	Pollution Prevent Plan	Wminpp_Budget	Budget year
Total Amount	Pollution Prevent Plan	Wminpp_Budget	Total Dollars

PPOA Budget			
Data Element	SNL source table	CGTIS store table	Comment
	Plan		budgeted for PPOAs

Amount Needed for Key Programatic Elements			
Data Element	SNL source table	CGTIS store table	Comment
Year	Pollution Prevent Plan	Wminpp_Budget	Year
Waste Type	Pollution Prevent Plan	Wminpp_Budget	Waste Type (Normalize model)
Amount	Pollution Prevent Plan	Wminpp_Budget	Total amount needed
Category	Pollution Prevent Plan	Wminpp_Budget	source Reduction, Recycling or Sanitary

Toxic Chemical Release Inventory Reporting (Form R)			
Data Element	SNL source table	CGTIS store table	Comment
Reporting Year			Year of report
Trade Secret			Is the information on Form R a trade secret. [YES NO]
Certification		Signature	Cerification signature
Facility Name	TSDF; HWDMS	Site	Site/Facility name
Facility Location	TSDF; HWDMS	Site	Street number, name, city, state, and postal code
Facility Indication			Indication if report is for entire facility or not.
Technical Contact	TSDF; HWDMS	Person	Name of Technical contact for clarification of the information
Public Contact	TSDF; HWDMS	Person	Public relations contact name to respond to public questions
SIC Code	TSDF; HWDMS	SiteSIC	Standard Industrial Classification Code

Toxic Chemical Release Inventory Reporting (Form R)			
Data Element	SNL source table	CGTIS store table	Comment
Latitude	TSDF; HWDMS	Site	Latitudinal coordinates of facility or site
Longitude	TSDF; HWDMS	Site	Longitudinal coordinates of facility or site
D&B Number	TSDF; HWDMS	Site	9 digit number assigned by Dun and Bradstreet
EPA ID Number	TSDF; HWDMS	Site	12 character number assigned by EPA
NPDES Permit Number	TSDF; HWDMS	Site	National Pollutant Discharge Elimination System (NPDES)
UIC ID Number	TSDF; HWDMS	Site	Underground Injection Well Code (UIC) ID Number
Parent Company	TSDF; HWDMS	Site	The highest level company, in the US, that directly owns at least 50 percent of the voting stock of company.
Parent CO. D&B Number	TSDF; HWDMS	Site	9 digit number assigned by Dun and Bradstreet for parent co.
CAS Number	Chem; CIS	Compound	Chemical Abstract Service registry number for chemical being reported.
Toxic Chemical	Chem_Attr; CIS	Haz_waste_stream	Toxic Chemical or Chemical Category name
Generic Chemical Name	Chem; CIS	Compound	Generic chemical name that is descriptive of the chemical structure.
Toxic Chemical Usage	PI		Activities and uses of the toxic chemical
Chemical Manufacture			Check boxes as to

Toxic Chemical Release Inventory Reporting (Form R)

Data Element	SNL source table	CGTIS store table	Comment
			activity and purpose
Chemical Process	PI		Process category toxic chemical is used. (incorporative activities)
Otherwise Chemical Usage	PI		Other use categories (non-incorporative activities)
On-Site Maximum Amnt Year	trans		Range code indicating the maximum qty of toxic chemical on-site at any one time during the calendar year.
Non Point Emissions	PI		Fugitive or non-point Air Emissions
Point Emissions	PI		Stack or point Air Emissions
Water Body Discharge	PI		Discharges to receiving streams or water bodies
On-site underground Injection	PI/HWDMS		Total amount of the toxic chemical that was injected into all wells.
On-site Land Releases	PI/HWDMS		Subcategories identifying land release type
Estimate Basis	PI		Principle method used to determine the amount of release
percent from Stormwater	PI		Discharges to receiving streams or water bodied percent of which.
Discharge to POTW	PI		Qty estimate of the toxic chemical transferred to all POTW
Total Transfers	PI		Total amount of all

Toxic Chemical Release Inventory Reporting (Form R)			
Data Element	SNL source table	CGTIS store table	Comment
			transfers of toxic chemical
Estimate Basis	PI		Principle method used to determine the amount of release
Other Off-site Transfer Loc.	HWDMS	Off_site_HWS_shipment	EPA ID number, name, address for each off-site location to which facility ships or transfers waste containing the reported toxic chemical for the purpose of waste treatment, disposal, recycling, or energy recovery.
Total Transfers	HWDMS	Off_site_HWS_shipment	Total amount of toxic chemical transfer for each off-site facility
Estimate Basis	HWDMS	Off_site_HWS_shipment	Principle method used to determine the amount of release
Waste Type TDR	HWDMS	Haz_waste_stream	Codes identifying the type of waste treatment, disposal, recycling or energy recovery methods used by the off-site location.
On-site Waste Treatment	Waste; HWDMS	Haz_waste_stream	General waste stream types, Waste treatment method(s), range of concentration, of toxic chemical reported.
Treatment Efficiency	Waste; HWDMS		Efficiency of each waste treatment method and whether

Toxic Chemical Release Inventory Reporting (Form R)			
Data Element	SNL source table	CGTIS store table	Comment
			the waste treatment efficiency figure was based on actual operating data.
General Waste Stream	Waste; HWDMS		Indicate the type of waste stream containing the toxic chemical for each treatment method.
Waste Treatment Method(s)	Waste; HWDMS		Code for each on-site waste treatment method used on a waste stream containing the toxic chemical.
Range of Influent Concentration	PI		Range of concentration of the toxic chemical in the waste stream as it enters the waste treatment step.
Waste Treatment Efficiency Est	PI		Number indicating the percentage of the toxic chemical removed from the waste stream through destruction, biological degradation, chemical conversion, or physical removal.
Operating Data Based	PI		Was the waste treatment efficiency estimate based on actual operating data? [YES NO]
On-site Energy Recovery Proc.	PI		On-site recovery methods used on the reported toxic chemical.
On-site Recycling Process	PI		On-site recycling methods used on the reported toxic

Toxic Chemical Release Inventory Reporting (Form R)			
Data Element	SNL source table	CGTIS store table	Comment
			chemical.
Prior Year Qty	PI		Amount of source reduction and recycling prior to reporting year
Reporting Year Qty	PI		Amount of source reduction and recycling reporting year
Following Year Qty	PI		Amount of source reduction and recycling one year out
Next Following Year Qty	PI		Amount of source reduction and recycling two years out
Qty Released to Environment	PI		Release resulting from Remedial Action Catastrophic Events...
Production Ratio	PI		Ratio of reporting year production to prior year production.
Chemical Source Reduction Yr.	PI	Waste_typeYearAcc mplshmnts	Narrative source reduction and recycling of toxic chemical reported
Additional Information	PI		Information on Source Reduction/Recycling , Pollution controls

PROCESS WASTE ASSESSMENT

Process Definition (Data Form 1)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process

Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Process General Description	PI	Process	Description of general operations or activities.
Process Detail Description	PI	Process	Description of particular process that generates wastes and/or pollutants or uses hazardous materials.
Date	PI	DF1_form	Date form filled out
PWA#	PI	DF1_form	Unique ID for process
Prepared By	PI	DF1_form	Name of form preparer
Preparer's Phone	PI	DF1_form	Preparer's phone number
Process Contact	PI	DF1_form	Process technical contact
Contact's Phone	PI	DF1_form	Technical contact's phone number

Process Flow Diagram (Data Form 2)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process
Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Flow Diagram	PI	Process_flowDiagram	Electronic image of process flow diagram
Date	PI	DF2_form	Date form filled out
PWA#	PI	DF2_form	Unique ID for process
Prepared By	PI	DF2_form	Name of form preparer

Preparer's Phone	PI	DF2_form	Preparer's phone number
Process Contact	PI	DF2_form	Process technical contact
Contact's Phone	PI	DF2_form	Technical contact's phone number

Fiscal Year Waste Minimization Activity (Data Form 3)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process
Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Waste Minimization Activities	PI	Waste_min_activity	Have waste min activities been undertaken. [YIN] flag
Preventing Factors	PI	Waste_min_activity	If previous answer NO,, describe preventing factors.
WMIN Activity Name	PI	Waste_min_activity	Short name of WM activity
WMIN Activity Type	PI	Waste_min_activity	Type of WM activity
WMIN Activity Description	PI	Waste_min_activity	Brief description of WM activity
Waste Stream Type Affected	PI	StreamWaste_min_activity	Waste Stream type affected.
Waste Stream Name Affected	PI	StreamWaste_min_activity	Name of waste stream
Toxicity Increase	PI	Waste_min_act_on_wst_strm	Did activity increase toxicity, [YIN] flag
Toxicity Increase Qty	PI	Waste_min_act_on_wst_strm	Did activity increase qty. [YIN] flag
Toxicity Reduced	PI	Waste_min_act_on_wst_strm	Did activity reduce toxicity, but not qty, [YIN] flag
Mass before WMIN Activity (kg/yr)	PI	Waste_min_act_on_wst_strm	Mass before WM activity kg/year
Volume before WMIN Activity (l/yr)	PI	Waste_min_act_on_wst_strm	Volume before WM activity liters/year

Specific Activity (Ci/kg/yr)	PI	Waste_min_act_on_wst_strm	Specific activity before WM activity Ci/kg/year
Mass after WMIN Activity (kg/yr)	PI	Waste_min_act_on_wst_strm	Mass after WM activity kg/year
Volume after WMIN Activity (l/yr)	PI	Waste_min_act_on_wst_strm	Volume after WM activity liters/year
Specific Activity after (Ci/kg/yr)	PI	Waste_min_act_on_wst_strm	Specific activity after WM activity Ci/kg/year
Quantity Basis	PI	Waste_min_act_on_wst_strm	Basis of quantities
WMIN Activity Successful	PI	Waste_min_activity	Has the WM activity been successful, [Y N] flag
Unsuccessful Description	PI	Waste_min_activity	If unsuccessful, describe why
Date	PI	DF3_form	Date form filled out
PWA#	PI	DF3_form	Unique ID for process
Prepared By	PI	DF3_form	Name of form preparer
Preparer's Phone	PI	DF3_form	Preparer's phone number
Process Contact	PI	DF3_form	Process technical contact
Contact's Phone	PI	DF3_form	Technical contact's phone number

PROCESS CHARACTERIZATION

Hazardous Material and Waste Stream Estimates (Worksheet 1)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process
Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Stream Number	PI	Stream	Stream number from process flow diagram

Stream Name	PI	Stream	Hazardous solid waste stream name consistent with Data Form 2
Hazardous Constituents	PI	Hazardous_const_cell	Constituents that make up identified waste stream
Mass Flow Rate (kg/yr)	PI	Hazardous_const_cell	The mass flow rate in kg/year for constituent
Total Mass Flow Rate (kg/yr)	PI	Stream	Calculated mass flow rate for waste stream.
Date	PI	Hazardous_waste_est_ws	Date form filled out
PWA#	PI	Hazardous_waste_est_ws	Unique ID for process
Prepared By	PI	Hazardous_waste_est_ws	Name of form preparer
Preparer's Phone	PI	Hazardous_waste_est_ws	Preparer's phone number
Process Contact	PI	Hazardous_waste_est_ws	Process technical contact
Contact's Phone	PI	Hazardous_waste_est_ws	Technical contact's phone number

Hazardous/Radioactive Material Inputs (Data Form 4)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process
Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Hazardous/Rad Material Name	PI	Process_stream_material	Name of each hazardous or radioactive material used in process
Input Stream Number	PI	Process_stream_material	The input stream number assigned from Worksheet 1.

Predicted Frequency of Usage	PI	Process_stream_material	Indicate how often material is used., daily, weekly, monthly, etc
Average Annual Usage Rate (kg/yr)	PI	Process_stream_material	Indicate the average annual usage of the material, kg/year
Date	PI	DF4_form	Date form filled out
PWA#	PI	DF4_form	Unique ID for process
Prepared By	PI	DF4_form	Name of form preparer
Preparer's Phone	PI	DF4_form	Preparer's phone number
Process Contact	PI	DF4_form	Process technical contact
Contact's Phone	PI	DF4_form	Technical contact's phone number

Hazardous (Chemical) Solid Waste (Data Form 5)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process
Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Waste Stream Number	PI	Hazardous_solid_waste	Waste stream number as identified on Worksheet 1
Waste Stream Name	PI	Stream	Name of the Waste Stream as identified on Data Form 2
Waste Generation Location	PI	Hazardous_solid_waste	Location of Waste generation
RMMA	PI	Location	Is Process inside a declared RMMA , [YIN] flag
Waste Generation Description	PI	Hazardous_solid_waste	Brief description how the waste is generated.
Generation Frequency	PI	Hazardous_solid_waste	Predicted frequency

		ste	of generation, daily, weekly, monthly, etc
Process Step	PI	Hazardous_solid_waste	Description of process step that generates waste.
Annual Average Waste Generation (kg)	PI	Hazardous_solid_waste	Average amount of solid waste stream that is expected to be generated for a year.
Hazardous Constituents	PI	Hazrds_sld_wstHrds_cnstns	Listing of each constituent
Constituents Vary	PI	Hazardous_solid_waste	Do the hazardous constituents vary, [YIN] flag
Describe Variance	PI	Hazardous_solid_waste	Describe variance
Physical Characteristics	PI	Hazardous_solid_waste	Description of the physical state of the waste.
High pH	PI	Hazardous_solid_waste	Highest range of pH of waste stream
Low pH	PI	Hazardous_solid_waste	Lowest range of pH of waste stream
Ignitable	PI	Hazardous_solid_waste	[YIN]
Corrosive	PI	Hazardous_solid_waste	[YIN]
Reactive	PI	Hazardous_solid_waste	[YIN]
Toxic Metals	PI	Hazardous_solid_waste	[YIN] if Yes list Toxic Metals
Contains Vol, Semi-Vol, Pesticide	PI	Hazardous_solid_waste	[YIN]
List Vol, Semi-Vol-Pesticide	PI	Hazardous_sld_wstTSVP_mt	[YIN] if Yes list compounds
Benzene Derivatives	PI	Hazardous_solid_waste	[YIN] if Yes list derivatives
Sludge/Leachate	PI	Hazardous_solid_waste	[YIN] if Yes list process
Cyanide	PI	Hazardous_solid_waste	[YIN]
K Wastes	PI	Hazardous_solid_waste	EPA K-listed waste

Waste Generating Process	PI	Hazardous_solid_waste	Source code from Biennial report.
Date	PI	DF5_form	Date form filled out
PWA#	PI	DF5_form	Unique ID for process
Prepared By	PI	DF5_form	Name of form preparer
Preparer's Phone	PI	DF5_form	Preparer's phone number
Process Contact	PI	DF5_form	Process technical contact
Contact's Phone	PI	DF5_form	Technical contact's phone number

Radioactive/Mixed Solid Waste (Data Form 6)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process
Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Waste Stream Number	PI	Rad_mixed_solid_waste	Wastestream number of the radioactive/mixed waste stream as identified on Worksheet 1.
Type of Waste	PI	Rad_mixed_solid_waste	Type of Waste; LLW, TRU, etc.
Generation Location	PI	Rad_mixed_solid_waste	Location of waste generation.
Location Disposed/Stored	PI	Rad_mixed_solid_waste	Location description where waste is disposed/stored
Waste Types Description	PI	Rad_mixed_solid_waste	Brief description of waste type
Waste Generation Description	PI	Rad_mixed_solid_waste	Brief description of how waste is generated
Radiochemical Constituents	PI	Rad_mxd_sld_wstRdchm_sp	Predominant radiochemical

Radioactive/Mixed Solid Waste (Data Form 6)			
Data Element	SNL source table	CGTIS store table	Comment
			constituents
Hazardous Waste Constituents	PI	Rad_mxd_sld_wstH zrds_cns	Predominant hazardous waste constituents
Generation Frequency	PI	Rad_mixed_solid_w aste	Frequency of generation, daily, weekly, monthly, etc
Average Qty Generated (kg/yr)	PI	Rad_mixed_solid_w aste	Predicted average quantity generated
Average Specific Activity (Ci/kg/yr)	PI	Rad_mixed_solid_w aste	Specific activity of waste
Minimum Generated	PI	Rad_mixed_solid_w aste	Minimum qty expected to be generated.
Maximum Generated	PI	Rad_mixed_solid_w aste	Maximum qty expected to be generated
Date	PI	DF6_form	Date form filled out
PWA#	PI	DF6_form	Unique ID for process
Prepared By	PI	DF6_form	Name of form preparer
Preparer's Phone	PI	DF6_form	Preparer's phone number
Process Contact	PI	DF6_form	Process technical contact
Contact's Phone	PI	DF6_form	Technical contact's phone number

Waste Water Discharge (Data Form 7)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process
Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Discharge Type	PI	WW_discharge	Chemical or Radiochemical discharge
Discharge Location	PI	WW_discharge	Where ischarge

Waste Water Discharge (Data Form 7)			
Data Element	SNL source table	CGTIS store table	Comment
			occurred
RMMA	PI	Location	[YIN], inside RMMA
Discharge Path	PI	WW_discharge	Discharge path
Discharge Cause	PI	WW_discharge	Cause of discharge
Chemical/Radiochemical Discharge	PI	WW_discharge	[YIN]
Chemical Species	PI	WW_dischargeChem_speci	Chemcial constituents discharged
Discharge Rate (l/yr)	PI	WW_discharge	Rate of discharge (l/hour)
Typical pH	PI	WW_discharge	Typical pH of waste water discharge
Maximum pH	PI	WW_discharge	Highest pH of waste water discharge
Minimum Discharge (l/yr)	PI	WW_discharge	Minimum Discharge (l/yr)
Maximum Discharge (l/yr)	PI	WW_discharge	Maximum Discharge (l/yr)
Release Frequency	PI	WW_discharge	Frequency of release
Maximum 1-hour Release (l)	PI	WW_discharge	Maximum release in one hour
Credible Scenerio Release (l)	PI	WW_discharge	Maximum credible release during accident
Discharge Concnetration	PI	WW_discharge	Discharge concentration by weight of volume
Radionuclide Constituents	PI	Radionuclid_cnstcW_dschrq	Radionuclide constituents discharged
Date	PI	DF7_form	Date form filled out
PWA#	PI	DF7_form	Unique ID for process
Prepared By	PI	DF7_form	Name of form preparer
Preparer's Phone	PI	DF7_form	Prepareer's phone number
Process Contact	PI	DF7_form	Process technical contact
Contact's Phone	PI	DF7_form	Technical contact's phone number

Air Emissions (Data Form 8)			
Data Element	SNL source table	CGTIS store table	Comment
SNL/NM Organization	PI	Process	Organization responsible for process
Process Name	PI	Process	Name of process/activity
Process Location	PI	ProcessLocation	Location(s) of process
Emission Type	PI	Air_emission	Chemical or Radiochemical release
Emission Location	PI	Air_emission	location of Release
RMMA	PI	Location	Inside RMMA [Y/N]
Hood ID	PI	Air_emission	Unique hood identifier
Stack ID	PI	Hood	Unique stack identifier
Physical Form	PI	Air_emission	Physical form of release
Emission Controls	PI	Air_emission	Emission controls in place
Emission Control Describe	PI	Air_emission	Describe emission controls
Emission Occurance Description	PI	Air_emission	Describe release occurance
Chemical/Radiochemical Discharge	PI	Air_emission	Type of discharge
Chemical Species	PI	Air_emissionChem_s pecies	Chemical constituents release
Discharge Rate (l/yr)	PI	Air_emission	Discharge Rate (l/yr)
Minimum Discharge (l/yr)	PI	Air_emission	Minimum Discharge (l/yr)
Maximum Discharge (l/yr)	PI	Air_emission	Maximum Discharge (l/yr)
Release Frequency	PI	Air_emission	Release Frequency
Maximum 1-hour Release (l)	PI	Air_emission	Maximum 1-hour Release (l)
Credible Scenerio Release (l)	PI	Air_emission	Credible Scenerio Release (l)
Discharge Concnetration	PI	Air_emission	Discharge Concnetration
Radionuclide Constituents	PI	Air_emissionRadioch m_spcs	Radionuclide Constituents released
Date	PI	DF8_form	Date form filled out
PWA#	PI	DF8_form	Unique ID for process
Prepared By	PI	DF8_form	Name of form preparer
Preparer's Phone	PI	DF8_form	Prepareer's phone

Air Emissions (Data Form 8)

Data Element	SNL source table	CGTIS store table	Comment
			number
Process Contact	PI	DF8_form	Process technical contact
Contact's Phone	PI	DF8_form	Technical contact's phone number

Waste Profile Form

Data Element	SNL source table	CGTIS store table	Comment
Waste Stream No			
Generator's Name			
Interface Liaison			
Organization			
Telephone			
Mail Stop			
Technical Area			
Building			
Room			
Waste Accumulation			
Waste Acc. Tech Area			
Waste Acc Building			
Waste Acc Room			
Char Method			
Waste/Profile Desc.			
Waste Type			
Waste Source			
Waste Category			
Matrix Type			
Waste Classes			
Waste Matrix			
Ignitability			
Corrosivity			
Reactivity			
Tox Char			
Amount			
Determination Method			
Constituents			
Concentration			
Certifier's Name			
Certifying Organization			
Certifying Date			

Waste Profile Form			
Data Element	SNL source table	CGTIS store table	Comment
Approval Number			
Approver's Name			
Approving Organization			
Approving Date			
RCRA Waste			Flag
RCRA/Rad. Waste			Flag
Rad. Waste			Flag
TSCA Waste			Flag
SARA Waste			Flag

Characterization Form			
Data Element	SNL source table	CGTIS store table	Comment
Control Number			
Generator			
SSn			
Department			
Phone			
Technical Area			
Building			
Room Number			
Additional Location Desc			
Facility Decon.			
Start Date			
Completion Date			
On-Going			
Annual Volume Estimate			
Waste Type			
% of Whole			
Process Desc			
Contents Desc			
Document			
Doc Id #			
Chemical			
Purity Est/concentration			
Qty of Chemical			
Chemical Formula			
RCRA Code			
Explosives/Pyrophorics			
Organics			
Metals			

Characterization Form

Data Element	SNL source table	CGTIS store table	Comment
Solvents			
Corrosive			
Reactive			
Ignitable			
Toxic			
None			
Rcra Listed Chemical			
Alcohol			
Cheiating Agents			
Etiological Agents			
Halogenated Solvents			
PCB			
Asbestos			
Compressed Gases			
Free Liquids			
Particulates			
Other Attributes			
Waste Contain Haz Mat			
Separating Procedures Desc			
Const. Freq. Change			
Storage Problems			
Problem Desc			
Nuclide Activity			
Waste Types			
Waste Min Desc			
KOP			
> Class - C			
ProfileContant			
Freq. Re-Eval			
Manifest Tech Basis			
Basis Desc			
On-Site Assay			
Assay Des			
Sampling			
Reason			
Freq.			
Analysis Req			
Chem/Toxic Metals Used			
Hazardous Characteristics			
RCRA/CA Listed			

Characterization Form			
Data Element	SNL source table	CGTIS store table	Comment
Process Validity			
Compat. Problems			
Waste Matrix			
Mat. Present			
Haz Characteristics			
Additional Analysis			
Sampling Req.			
NTSWAC			
Evaluator			
Evaluation Date			
Dept. Mgr.			
Waste Ops.			
WCO/AWCO			
SNL Gen. Number			
WSIN			
Stream Name			

Appendix B - CGTIS Data Mapping for NREL

The following CGTIS data mapping reflects the mapping of the CGTIS data model against the National Renewable Energy Laboratory (NREL) chemical (CMS) and waste (Excel spreadsheet) data bases. The gray areas on the mapping table indicates that the NREL source table or CGTIS store table for a grayed data element does not currently exist. This indicates a need to add a data element either in the NREL source or CGTIS tables, whichever is appropriate.

NREL DATA MAPPING

EPA Hazardous Waste Report (Biennial)

Form IC - Biennial Report			
Data Element	NREL source table	CGTIS store table	Comments
Site Name	DY_CHEM_WMNO_FACILITIES	Site	Site/Company Name
EPA ID NO	DY_CHEM_WMNO_FACILITIES	Site	EPA Identification Number
County	DY_CHEM_WMNO_FACILITIES	Site	County in which site is located
Company Name/Site	DY_CHEM_WMNO_FACILITIES	Site	Site/Company Name
Site Name Change	DY_CHEM_WMNO_FACILITIES	Site	Has site name changed flag [Yes/No]
Street Address	DY_CHEM_WMNO_FACILITIES	Site	Street number and name
City	DY_CHEM_WMNO_FACILITIES	Site	City in which Site is located
State	DY_CHEM_WMNO_FACILITIES	Site	State in which Site is located
Zip Code	DY_CHEM_WMNO_FACILITIES	Site	Postal Code
Mailing Street Address	DY_CHEM_WMNO_FACILITIES	Site	Mailing Street number and name
Mailing City	DY_CHEM_WMNO_FACILITIES	Site	Mailing City
Mailing State	DY_CHEM_WMNO_FACILITIES	Site	Mailing State
Mailing Zip Code	DY_CHEM_WMNO_FACILITIES	Site	Mailing Postal Code
Contact Last Name	DY_CHEM_WMNO_FACILITIES	Person	Last name of person to be contacted if any questions
Contact First Name	DY_CHEM_WMNO_FACILITIES	Person	First name of contact

Form IC - Biennial Report			
Data Element	NREL source table	CGTIS store table	Comments
Contact Initial	DY_CHEM_WMNO_FACILITIES	Person	Middle initial of contact
Contact Title	DY_CHEM_WMNO_FACILITIES	Person	Title of Contact Person
Contact Area Code	DY_CHEM_WMNO_FACILITIES	PersonPhone	Area Code
Contact Phone Number	DY_CHEM_WMNO_FACILITIES	PersonPhone	Phone number of contact person
Contact Extension	DY_CHEM_WMNO_FACILITIES	PersonPhone	Phone extension, if any
Cert. Official Last Name	DY_CHEM_WMNO_FACILITIES	Person	Last name of certifying individual
Cert. Official First Name	DY_CHEM_WMNO_FACILITIES	Person	First name of certifying individual
Cert Official Initial	DY_CHEM_WMNO_FACILITIES	Person	Middle initial of certifying individual
Cert Official Title	DY_CHEM_WMNO_FACILITIES	Person	Title of certifying individual
Cert Official Signature		Signature	Signature of certifying individual
Date of Signature		Signature	Date form was signed/certified
RCRA Generators Status	DY_CHEM_WMNO_FACILITIES	Site	RCRA generators status [LQG SQG CESQG]
Reason(s) for not generating		SiteYearNon_gen_reason	Code(s) indicating reason for non generation(see page 12-13 of instructions for codes and descriptions.
Storage RCRA permitting		Site	Codes(s) indicating storage subject to RCRA permitting requirements see page 13 of instructions for codes and desc.
RCRA Exempt TDR		Site	On-site treatment indication of exempt RCRA wastes
Source Reduction Activity			[Yes No] Source reduction started or expanded

Form IC - Biennial Report			
Data Element	NREL source table	CGTIS store table	Comments
Recycling Activity			[Yes/No] Recycling started or expanded
Systematic PPOA Activity			[Yes/No] Systematic investigation opportunities for source reduction or recycling.
Limiting Factors Source Red			[Yes/No] Any factors which delayed or limited Source Reduction
Limiting Factors Recycling			[Yes/No] Any factors which delayed or limited on-site or off-site recycling activities.

Form GM - Biennial Report			
Data Element	NREL source table	NREL store table	Comments
Site Name	DY_CHEM_WMNO_FACILITIES	Site	Site Name
EPA ID Number	DY_CHEM_WMNO_FACILITIES	Site	EPA Identification number
Waste Description	CHEM_WASTE_SWMO	Haz_waste_stream	General type; Source; Type of Hazard and generic chemical name or primary Hazardous Constituent.
EPA Haz Waste Code	CHEM_WASTE_SWMO	Haz_wst_strmEPA_hz_wst_cd	EPA Hazardous waste code(s) that applies to waste reported.
State Haz Waste Code	CHEM_WASTE_SWMO	Haz_wast_strmST_hz_wst_cd	State Hazardous waste code that apply (if any)
SIC Code	DY_CHEM_WMNO_FACILITIES	Site_SIC	Four digit Standard Industrial Classification
Origin Code	CHEM_WASTE_SWMO	Haz_waste_stream	Code that best describes the process or activity that was the source of the

Form GM - Biennial Report			
Data Element	NREL source table	NREL store table	Comments
			hazardous waste reported.
System Type	CHEM_WASTE_SWMO	Haz_waste_stream	The System type that best describes the operation from which the waste is a residual.
Source Code	CHEM_WASTE_SWMO	Haz_waste_stream	Code that best describes the production, service, or waste management process that was the source associated with generation of the waste.
Point of Measurement	CHEM_WASTE_SWMO	Haz_waste_stream	The point at which the waste reported was measured or estimated.
Form Code	CHEM_WASTE_SWMO	Haz_waste_stream	Code that best corresponds to the physical form or chemical composition of the reported hazardous waste.
RCRA-Mixed Code	CHEM_WASTE_SWMO	Haz_waste_stream	Flag to indicated if the hazardous waste is mixed with nuclear source, special nuclear, or by-product material.
Qty Generated 1992	CHEM_WASTE_SWMO	Haz_waste_streamYear	Total qty of the hazardous waste generated for specified year.
Qty Generated 1993	CHEM_WASTE_SWMO	Haz_waste_streamYear	Total qty of the hazardous waste generated for specified year.
UOM	CHEM_WASTE_SWMO	Haz_waste_streamYear	Unit of measure of given quantities.
Density	DY_CHEMICAL_PROPERTIES	Haz_waste_stream	Density in either pounds per gallon or specific gravity.
Density Flag		Haz_waste_stream	Flag to identify basis

Form GM -Biennial Report			
Data Element	NREL source table	NREL store table	Comments
			of density measurement.
On-site Treatment Flag		Haz_waste_streamYear	Flag to indicate if site did any on-site disposal, recycling, discharging to sewer /POTW.
On-site Process system type		Haz_wst_strmYrSystem_typQty	System type code that this waste enters.
Qty TDR On-site 1993		TDR_process_year	Quantity treated, disposed, recycled or discharged on-site.
Shipped Off-site flag		Haz_waste_streamYear	Flag indicating off-site shipment of hazardous waste.
TSDF EPA ID		Site	EPA ID of facility waste waste shipped.
System Type Shipped to		Total_off_site_shipment_qty	System Type code that best describes the way the waste was managed.
Off-site avail code		Site	Code that indicates the availability of the off-site facility for commercial hazardous waste management.
Total Qty shipped 1993	CHEM_WASTE_SWMO	Total_off_site_shipment_qty	Total Qty of waste shipped to facility for given period.
New WMIN Activity Flag		Haz_waste_streamYear	Flag indicating new activities that resulted in minimization of the described hazardous waste stream.
Activity		Haz_waste_streamYear	Activity code for implemented activity to achieve waste minimization result for the described waste stream.
Other Effects		Haz_waste_streamYear	Other effects flag

Form GM - Biennial Report			
Data Element	NREL source table	NREL store table	Comments
Qty Recycled New Activity		Haz_waste_streamYear	Quantity recycled due to new activities
Activity/Production Index		Haz_waste_streamYear	The activity/production index is a measure of changes in economic or other factors that affected the qty of hazardous waste generated for one year compared to another.
1993 Source Reduction Qty		Haz_waste_streamYear	Best estimate of the source reduction qty if activity was selected.

Form PS - Biennial Report			
Data Element	NREL source table	NREL store table	Comments
Site Name	DY_CHEM_WMNO_FACILITIES	Site	Site name
EPA ID NO	DY_CHEM_WMNO_FACILITIES	Site	EPA Identification number
Waste TDR System Desc		TDR_process_year	Describe the process in this system, the type of units used to carry out the processes and the types of waste managed.
System Type		TDR_process_year	Code that best describes the process system.
Regulatory Status		TDR_process_year	Code that best describes the regulatory status of the process system.
Operational Status		TDR_process_year	Code that describes the operational status of the process system.
Unit Types		TDR_process_yearUnit_type	Code that describes the types of units in the process system.

Form PS - Biennial Report

Data Element	NREL source table	NREL store table	Comments
Influent Qty Total		TDR_process_year	Total qty of waste entering the system.
UOM		TDR_process_year	Unit of measurement code.
Density		TDR_process_year	Density of influent if appropriate
Density Measurement Basis		TDR_process_year	Basis of density measurement
RCRA Qty		TDR_process_year	Amount of Total influent to the process system that was RCRA hazardous waste.
Maximum Op Total		TDR_process_year	Estimate of the maximum operational capacity of the process system.
RCRA Op Total		TDR_process_year	Estimate of the maximum RCRA operational capacity of the process system.
Liquid effluent Qty		TDR_process_year	Total qty of liquid effluent exiting from the process system, including all RCRA hazardous, State hazardous, and non-hazardous waste.
UOM		TDR_process_year	Unit of measurement code.
Density		TDR_process_year	Density of influent if appropriate
Density Measurement Basis		TDR_process_year	Basis of density measurement
RCRA effluent Qty		TDR_process_year	Amount of RCRA hazardous liquid residuals
Solid-Sludge Residual Qty		TDR_process_year	Solid/Sludge residuals are non-liquid residuals from the management of hazardous waste.

Form PS - Biennial Report			
Data Element	NREL source table	NREL store table	Comments
UOM		TDR_process_year	Unit of measurement code.
Density		TDR_process_year	Density of influent if appropriate
RCRA Residual Qty		TDR_process_year	RCRA Solid/Sludge residuals are non-liquid residuals from the management of hazardous waste.
Density Measurement Basis		TDR_process_year	Basis of density measurement
Limitations on Max. Op Cap.			Code to indicate any limits on the maximum operational capacity.
Commercial Cap Avail Code		TDR_process_change	Code describing the availability of the process system for commercial hazardous waste management.
Percent Cap Comm. Avail.		TDR_process_change	Estimate of percentage commercially available.

PURPOSE OF THE FORM WR

Form WR is divided into three parts labeled Waste 1, Waste 2, and Waste 3 that collect information about the quantities and characteristics of each hazardous waste received from an off-site source.

Form WR - Biennial Report			
Data Element	NREL source table	NREL store table	Comments
Site Name	DY_CHEM_WMNO_FACILITIES	Site	Site name
EPA ID NO	DY_CHEM_WMNO_FACILITIES	Site	EPA Identification number
Hazardous Waste Desc		Haz_waste_stream	Narrative description of waste citing general type, source, type of hazard and generic name or primary

Form WR - Biennial Report			
Data Element	NREL source table	NREL store table	Comments
			hazardous constituents.
EPA Codes		Haz_wst_strmEpa_hz_wst_cd	EPA Hazardous waste code(s) that apply to the waste reported.
State Codes		Haz_wast_strmSt_hz_wst_cd	State hazardous waste code that apply to the waste reported.
Off-Site Source EPA ID NO		Off_site_HWS_shipment	12-digit EPA Identification number of the off-site source.
Qty Received		Off_site_HWS_shipment	Total qty of hazardous wastes that were received from the off-site source.
UOM		Off_site_HWS_shipment	Unit of measurement code
Density			Density of hazardous waste, if volumetric.
Density Measurement Basis			Basis of density measurement.
Form Code		Haz_waste_stream	Code that corresponds to the physical form or chemical composition of the hazardous waste reported.
RCRA-Rad Mixed		Haz_waste_stream	Flag indicating if hazardous waste is mixed with nuclear source, special nuclear or by-product material.
System Type		Haz_waste_stream	Code describing the on-site treatment, disposal, or recycling process system in which the waste was or will be managed.

PURPOSE OF FORM OI

Form OI documents the names and addresses of off-site installations and transporters.

Form OI - Biennial Report			
Data Element	NREL source table	NREL store table	Comments
Site Name	DY_CHEM_WMNO_FACILITIES	Site	Site name
EPA ID NO	DY_CHEM_WMNO_FACILITIES	Site	EPA Identification number
EPA ID offsite installation	DY_CHEM_WMNO_FACILITIES	Site	EPA ID No. for off-site installation or transporter
Offsite Installation Name	DY_CHEM_WMNO_FACILITIES	Site	Name of the off-site installation or transporter
Generator Flag	DY_CHEM_WMNO_FACILITIES	Site	Check box that describer the handler type of the off-site installation or transporter.
Transporter Flag	DY_CHEM_WMNO_FACILITIES	Site	Check box that describer the handler type of the off-site installation or transporter.
TSDR Flag	DY_CHEM_WMNO_FACILITIES	Site	Check box that describer the handler type of the off-site installation or transporter.
Street Address	DY_CHEM_WMNO_FACILITIES	Site	Street number and name of the off-site installation.
City	DY_CHEM_WMNO_FACILITIES	Site	City of off-site installation
State	DY_CHEM_WMNO_FACILITIES	Site	State of off-site installation
Zip Code	DY_CHEM_WMNO_FACILITIES	Site	Postal Code of off-site installation
Comments		Site	Comments on off-site installation

DOE Annual Report on Waste Generation and Waste Minimization Progress (DOE Order 5400.1)

Purpose of DOE Annual Report on Waste Generation and Waste Minimization Progress.

The purpose is to report waste generation quantities, waste minimization successes, and inventory by site, individual CSOs and specific waste types. The report is to be submitted to DOE on an annual basis.

General Site Information			
Data Element	NREL source table	NREL store table	Comment
Site Name	DY_CHEM_WMNO_FACILITIES	Site	Site name
Primary State	DY_CHEM_WMNO_FACILITIES	Site	State which is the primary location for reporting site.
Address	DY_CHEM_WMNO_FACILITIES	Site	Street number and name for site
City	DY_CHEM_WMNO_FACILITIES	Site	City
State	DY_CHEM_WMNO_FACILITIES	Site	State
Zip	DY_CHEM_WMNO_FACILITIES	Site	Postal Code
Site Size	DY_CHEM_WMNO_FACILITIES	Site	Physical size of reporting site
DOE Employees	DY_CHEM_WMNO_FACILITIES	Site	Number of DOE Employees assigned to reporting site.
Contractor Employees	DY_CHEM_WMNO_FACILITIES	Site	Number of prime contractors employed at reporting site.
Other Contr. Employees	DY_CHEM_WMNO_FACILITIES	Site	Number of tenant or subcontractors employed at site.
Primary Site Classification	DY_CHEM_WMNO_FACILITIES	Site	Description of site's primary function.
Secondary Site Classification	DY_CHEM_WMNO_FACILITIES	Site	Secondary function
Additional State for this Site		SiteState	Any other states which site is operating.
Field Operations Office	DY_CHEM_WMNO_FACILITIES	Site	DOE Field office responsible for site.
Lead CSO	DY_CHEM_WMNO_FACILITIES	Site	Lead or Primary CSO for site
Additional CSOs	DY_CHEM_WMNO_FACILITIES	Site	Additional CSOs that operate at site.

General Site Mission

Data Element	NREL source table	NREL store table	Comment
Site Mission	BY_CHEM_WMING_FACILITIES	SiteMission	Narrative describing reporting sites mission.

Site Wide Waste Min Accomplishment			
Data Element	NREL source table	NREL store table	Comment
Site Wide WMIN Accomplishment		SiteWminAccomplishments	Narrative describing any site-wide waste minimization accomplishments.

Site Wide Recycling Activities			
Data Element	NREL source table	NREL store table	Comment
Recycling Waste Type		RecycleContainer	Waste/material type that has been recycled.
Actual Qty		RecycleContainer	Total amount recycled by waste type
UOM		RecycleContainer	Unit of Measurement
Qty unknown Flag		RecycleContainer	Flag indicating recycling activities for waste type was done but total quantity is unknown.

Accomplishments by Waste Type			
Data Element	NREL source table	NREL store table	Comment
Waste Type		Waste_typeYearAccomplishment	Waste category
State of Waste		Waste_typeYearAccomplishment	Physical state of waste [Liquid Solid etc.]
CSO		Waste_typeYearAccomplishment	Cognoscente Secretary Office (DOE) Relationship through CWDR
Accomplishment		Waste_typeYearAccomplishment	Narrative about waste minimization

Accomplishments by Waste Type			
Data Element	NREL source table	NREL store table	Comment
			accomplishments by waste type, state of waste, and CSO (MemoField)

Inventory Waste			
Data Element	NREL source table	NREL store table	Comment
Waste Type		Inventory_Waste	Waste Category
Qty		Inventory_Waste	Total amount by waste type in inventory
UOM		Inventory_Waste	Unit of Measurement

Operational Status			
Data Element	NREL source table	NREL store table	Comment
CSO		CSO	DOE Cognoscente secretary office
Operations at Site		CSO	Description of CSO activities at site.

Waste Generation Data Entry			
Data Element	NREL source table	NREL store table	Comment
CSO		Hazarsous_waste_co ntainer	DOE Cognoscente secretary office
Waste Type		Hazarsous_waste_co ntainer	Waste Category
Qty		Hazarsous_waste_co ntainer	Total amount of waste type generated using particular CSOs funds
UOM		Hazarsous_waste_co ntainer	Unit of Measure
Routine Flag		Hazarsous_waste_co ntainer	Flag indicating if waste is generated routinely.

WMIN Accomplishments

Data Element	NREL source table	NREL store table	Comment
CSO		CSO	DOE Cognoscente secretary office
Specific Accomplishments		CSO	Specific Waste Minimization accomplishments by CSO

Points of Contact			
Data Element	NREL source table	NREL store table	Comment
DOE Contact Name	DY_CHEM_WMNO_FACILITIES	Person	Name of DOE contact for reporting site. No designation as to employer/site (DOE/Sandia)
DOE Title	DY_CHEM_WMNO_FACILITIES	Person	Title of DOE contact
DOE Office	DY_CHEM_WMNO_FACILITIES	Site	DOE office identifier.
DOE Phone	DY_CHEM_WMNO_FACILITIES	PersonPhone	Phone number
DOE Fax	DY_CHEM_WMNO_FACILITIES	PersonPhone	FAX number
DOE Address	DY_CHEM_WMNO_FACILITIES	Site	Street number and name
DOE City	DY_CHEM_WMNO_FACILITIES	Site	City
DOE State	DY_CHEM_WMNO_FACILITIES	Site	State
DOE Zip	DY_CHEM_WMNO_FACILITIES	Site	Postal Code
Contractor Name	DY_CHEM_WMNO_FACILITIES	Person	Name of Contact for reporting site. No designation as to employer/site (DOE/Sandia)
Contractor Title	DY_CHEM_WMNO_FACILITIES	Person	Title of contact
Contractor Office	DY_CHEM_WMNO_FACILITIES	Site	Contact office identifier
Contractor Phone	DY_CHEM_WMNO_FACILITIES	PersonPhone	Contact phone number
Contractor Fax	DY_CHEM_WMNO_FACILITIES	PersonPhone	Fax number
Contractor Address	DY_CHEM_WMNO_FACILITIES	Site	Street number and name
Contractor City	DY_CHEM_WMNO_FACILITIES	Site	City
Contractor State	DY_CHEM_WMNO_FACILITIES	Site	State
Contractor Zip	DY_CHEM_WMNO_FACILITIES	Site	Postal Code

Quantitative Goals for New Waste			
Data Element	NREL source table	NREL store table	Comment
Waste Type		Waste_min_goal	Waste Type
Year		Waste_min_goal	Goal Year
Qty		Waste_min_goal	Total Goal Amount for reduction by reported waste type
UOM		Waste_min_goal	Unit of Measurement
Percent Reduction Goal		Waste_min_goal	Percent Reduction Goal for reported waste type

Restoration and D&D Goals			
Data Element	NREL source table	NREL store table	Comment
Quant. Goals for Restor./D&D		Restore_D&D_Goal	Memo field

PPOA Goals			
Data Element	NREL source table	NREL store table	Comment
Year			Goal year
No. of PPOA (Goal)			Goal Number of PPOAs

WMIN/PP Budget for Site			
Data Element	NREL source table	NREL store table	Comment
Year		Wminpp_Budget	Budget year
Total Operating Amount		Wminpp_Budget	Total Operating Dollars
Total Capital Amount		Wminpp_Budget	Total Capital Dollars
Total Site Amount		Wminpp_Budget	Total Site WMIN budget

PPOA Budget			
Data Element	NREL source table	NREL store table	Comment
Year		Wminpp_Budget	Budget year

PPOA Budget			
Data Element	NREL source table	NREL store table	Comment
Total Amount		Wminpp_Budget	Total Dollars budgeted for PPOAs

Amount Needed for Key Programatic Elements			
Data Element	NREL source table	NREL store table	Comment
Year		Wminpp_Budget	Year
Waste Type		Wminpp_Budget	Waste Type (Normalize model)
Amount		Wminpp_Budget	Total amount needed
Category		Wminpp_Budget	Source Reduction, Recycling or Sanitary

Toxic Chemical Release Inventory Reporting (Form R)			
Data Element	NREL source table	NREL store table	Comment
Reporting Year			Year of report
Trade Secret			Is the information on Form R a trade secret. [YES/NO]
Certification		Signature	Cerification signature
Facility Name	DY_CHEM_WMNO_FACILITIES	Site	Site/Facility name
Facility Location	DY_CHEM_WMNO_FACILITIES	Site	Street number, name, city, state, and postal code
Facility Indication	DY_CHEM_WMNO_FACILITIES		Indication if report is for entire facility or not.
Technical Contact	DY_CHEM_WMNO_FACILITIES	Person	Name of Technical contact for clarification of the information
Public Contact	DY_CHEM_WMNO_FACILITIES	Person	Public relations contact name to respond to public

Toxic Chemical Release Inventory Reporting (Form R)

Data Element	NREL source table	NREL store table	Comment
			questions
SIC Code	DY_CHEM_WASTE_FACILITIES	SiteSIC	Standard Industrial Classification Code
Latitude	DY_CHEM_WASTE_FACILITIES	Site	Latitudinal coordinates of facility or site
Longitude	DY_CHEM_WASTE_FACILITIES	Site	Longitudinal coordinates of facility or site
D&B Number	DY_CHEM_WASTE_FACILITIES	Site	9 digit number assigned by Dun and Bradstreet
EPA ID Number	DY_CHEM_WASTE_FACILITIES	Site	12 character number assigned by EPA
NPDES Permit Number	DY_CHEM_WASTE_FACILITIES	Site	National Pollutant Discharge Elimination System (NPDES)
UIC ID Number	DY_CHEM_WASTE_FACILITIES	Site	Underground Injection Well Code (UIC) ID Number
Parent Company	DY_CHEM_WASTE_FACILITIES	Site	The highest level company, in the US, that directly owns at least 50 percent of the voting stock of company.
Parent CO. D&B Number	DY_CHEM_WASTE_FACILITIES	Site	9 digit number assigned by Dun and Bradstreet for parent co.
CAS Number	DY-CHEM_BARCODE	Compound	Chemical Abstract Service registry number for chemical being reported.
Toxic Chemical	DY_CHEMICAL_PROPERTIES	Haz_waste_stream	Toxic Chemical or Chemical Category name
Generic Chemical Name	DY_CHEMICAL_NAMES	Compound	Generic chemical name that is descriptive of the chemical structure.
Toxic Chemical Usage			Activities and uses of the toxic chemical

Toxic Chemical Release Inventory Reporting (Form R)			
Data Element	NREL source table	NREL store table	Comment
Chemical Manufacture	DY_CHEMICALS_MSDS		Check boxes as to activity and purpose
Chemical Process			Process category toxic chemical is used. (incorporative activities)
Otherwise Chemical Usage			Other use categories (non-incorporative activities)
On-Site Maximum Amnt Year	DY_CHEM_BARCODE		Range code indicating the maximum qty of toxic chemical on-site at any one time during the calendar year.
Non Point Emissions			Fugitive or non-point Air Emissions
Point Emissions			Stack or point Air Emissions
Water Body Discharge			Discharges to receiving streams or water bodies
On-site underground Injection			Total amount of the toxic chemical that was injected into all wells.
On-site Land Releases			Subcategories identifying land release type
Estimate Basis			Principle method used to determine the amount of release
percent from Stormwater			Discharges to receiving streams or water bodied percent of which.
Discharge to POTW			Qty estimate of the toxic chemical transferred to all POTW
Total Transfers			Total amount of all transfers of toxic

Toxic Chemical Release Inventory Reporting (Form R)

Data Element	NREL source table	NREL store table	Comment
			chemical
Estimate Basis			Principle method used to determine the amount of release
Other Off-site Transfer Loc.		Off_site_HWS_shipment	EPA ID number, name, address for each off-site location to which facility ships or transfers waste containing the reported toxic chemical for the purpose of waste treatment, disposal, recycling, or energy recovery.
Total Transfers		Off_site_HWS_shipment	Total amount of toxic chemical transfer for each off-site facility
Estimate Basis		Off_site_HWS_shipment	Principle method used to determine the amount of release
Waste Type TDR		Haz_waste_stream	Codes identifying the type of waste treatment, disposal, recycling or energy recovery methods used by the off-site location.
On-site Waste Treatment		Haz_waste_stream	General waste stream types, Waste treatment method(s), range of concentration, of toxic chemical reported.
Treatment Efficiency			Efficiency of each waste treatment method and whether the waste treatment efficiency figure was based on actual operating data.
General Waste Stream			Indicate the type of waste stream

Toxic Chemical Release Inventory Reporting (Form R)			
Data Element	NREL source table	NREL store table	Comment
			containing the toxic chemical for each treatment method.
Waste Treatment Method(s)			Code for each on-site waste treatment method used on a waste stream containing the toxic chemical.
Range of Influent Concentration			Range of concentration of the toxic chemical in the waste stream as it enters the waste treatment step.
Waste Treatment Efficiency Est			Number indicating the percentage of the toxic chemical removed from the waste stream through destruction, biological degradation, chemical conversion, or physical removal.
Operating Data Based			Was the waste treatment efficiency estimate based on actual operating data? [YES NO]
On-site Energy Recovery Proc.			On-site recovery methods used on the reported toxic chemical.
On-site Recycling Process			On-site recycling methods used on the reported toxic chemical.
Prior Year Qty	DY_CHEM_BARCODE		Amount of source reduction and recycling prior to reporting year
Reporting Year Qty	DY_CHEM_BARCODE		Amount of source reduction and

Toxic Chemical Release Inventory Reporting (Form R)

Data Element	NREL source table	NREL store table	Comment
			recyclingreporting year
Following Year Qty	DY_CHEM_BARCODE		Amount of source reduction and recycling one year out
Next Following Year Qty	DY_CHEM_BARCODE		Amount of source reduction and recycling two years out
Qty Released to Environment			Release resulting from Remedial Action Catastrophic Events...
Production Ratio			Ratio of reporting year production to prior year production.
Chemical Source Reduction Yr.		Waste_typeYearAccmplshmnts	Narrative source reduction and recycling of toxic chemical reported
Additional Information			Information on Source Reduction/Recycling, Pollution controls

PROCESS WASTE ASSESSMENT

Process Definition (Data Form 1)

Data Element	NREL source table	NREL store table	Comment
Organization		Process	Organization responsible for process
Process Name		Process	Name of process/activity
Process Location		ProcessLocation	Location(s) of process
Process General Description		Process	Description of general operations or activities.
Process Deatail Description		Process	Description of particular process that generates wastes and/or pollutants or uses hazardous

			materials.
Date		DF1_form	Date form filled out
PWA#		DF1_form	Unique ID for process
Prepared By		DF1_form	Name of form preparer
Preparer's Phone		DF1_form	Preparer's phone number
Process Contact		DF1_form	Process technical contact
Contact's Phone		DF1_form	Technical contact's phone number

Process Flow Diagram (Data Form 2)			
Data Element	NREL source table	NREL store table	Comment
Organization		Process	Organization responsible for process
Process Name		Process	Name of process/activity
Process Location		ProcessLocation	Location(s) of process
Flow Diagram		Process_flowDiagram	Electronic image of process flow diagram
Date		DF2_form	Date form filled out
PWA#		DF2_form	Unique ID for process
Prepared By		DF2_form	Name of form preparer
Preparer's Phone		DF2_form	Preparer's phone number
Process Contact		DF2_form	Process technical contact
Contact's Phone		DF2_form	Technical contact's phone number

Fiscal Year Waste Minimization Activity (Data Form 3)			
Data Element	NREL source table	NREL store table	Comment
Organization		Process	Organization responsible for process
Process Name		Process	Name of process/activity
Process Location		ProcessLocation	Location(s) of process
Waste Minimization Activities		Waste_min_activity	Have waste min activities been

			undertaken. [YIN] flag
Preventing Factors		Waste_min_activity	If previous answer NO,, describe preventing factors.
WMIN Activity Name		Waste_min_activity	Short name of WM activity
WMIN Activity Type		Waste_min_activity	Type of WM activity
WMIN Activity Description		Waste_min_activity	Brief description of WM activity
Waste Stream Type Affected		StreamWaste_min_activity	Waste Stream type affected.
Waste Stream Name Affected		StreamWaste_min_activity	Name of waste stream
Toxicity Increase		Waste_min_act_on_wst_strm	Did activity increase toxicity, [YIN] flag
Toxicity Increase Qty		Waste_min_act_on_wst_strm	Did activity increase qty. [YIN] flag
Toxicity Reduced		Waste_min_act_on_wst_strm	Did activity reduce toxicity, but not qty, [YIN] flag
Mass before WMIN Activity (kg/yr)		Waste_min_act_on_wst_strm	Mass before WM activity kg/year
Volume before WMIN Activity (l/yr)		Waste_min_act_on_wst_strm	Volume before WM activity liters/year
Specific Activity (Ci/kg/yr)		Waste_min_act_on_wst_strm	Specific activity before WM activity Ci/kg/year
Mass after WMIN Activity (kg/yr)		Waste_min_act_on_wst_strm	Mass after WM activity kg/year
Volume after WMIN Activity (l/yr)		Waste_min_act_on_wst_strm	Volume after WM activity liters/year
Specific Activity after (Ci/kg/yr)		Waste_min_act_on_wst_strm	Specific activity after WM activity Ci/kg/year
Quantity Basis		Waste_min_act_on_wst_strm	Basis of quantities
WMIN Activity Successful		Waste_min_activity	Has the WM activity been successful, [YIN] flag
Unsuccessful Description		Waste_min_activity	If unsuccessful, describe why
Date		DF3_form	Date form filled out
PWA#		DF3_form	Unique ID for process
Prepared By		DF3_form	Name of form preparer

Preparer's Phone		DF3_form	Preparer's phone number
Process Contact		DF3_form	Process technical contact
Contact's Phone		DF3_form	Technical contact's phone number

PROCESS CHARACTERIZATION

Hazardous Material and Waste Stream Estimates (Worksheet 1)			
Data Element	NREL source table	NREL store table	Comment
Organization		Process	Organization responsible for process
Process Name		Process	Name of process/activity
Process Location		ProcessLocation	Location(s) of process
Stream Number	DY_CHEM_WASTE_COMPONENTS	Stream	Stream number from process flow diagram
Stream Name		Stream	Hazardous solid waste stream name consistent with Data Form 2
Hazardous Constituents	DY_CHEM_WASTE_COMPONENTS	Hazardous_const_cell	Constituents that make up identified waste stream
Mass Flow Rate (kg/yr)		Hazardous_const_cell	The mass flow rate in kg/year for constituent
Total Mass Flow Rate (kg/yr)		Stream	Calculated mass flow rate for waste stream.
Date		Hazardous_waste_est_ws	Date form filled out
PWA#		Hazardous_waste_est_ws	Unique ID for process
Prepared By		Hazardous_waste_est_ws	Name of form preparer
Preparer's Phone		Hazardous_waste_est_ws	Preparer's phone number
Process Contact		Hazardous_waste_est_ws	Process technical contact
Contact's Phone		Hazardous_waste_est_ws	Technical contact's phone number

Hazardous/Radioactive Material Inputs (Data Form 4)			
Data Element	NREL source table	NREL store table	Comment
Organization		Process	Organization responsible for process
Process Name		Process	Name of process/activity
Process Location		ProcessLocation	Location(s) of process
Hazardous/Rad Material Name	DY_CHEMICAL_WASTE	Process_stream_material	Name of each hazardous or radioactive material used in process
Input Stream Number		Process_stream_material	The input stream number assigned from Worksheet 1.
Predicted Frequency of Usage		Process_stream_material	Indicate how often material is used., daily, weekly, monthly, etc
Average Annual Usage Rate (kg/yr)		Process_stream_material	Indicate the average annual usage of the material, kg/year
Date		DF4_form	Date form filled out
PWA#		DF4_form	Unique ID for process
Prepared By		DF4_form	Name of form preparer
Preparer's Phone		DF4_form	Preparer's phone number
Process Contact		DF4_form	Process technical contact
Contact's Phone		DF4_form	Technical contact's phone number

Hazardous (Chemical) Solid Waste (Data Form 5)			
Data Element	NREL source table	NREL store table	Comment
Organization	CHEM_WASTE_SWMO	Process	Organization responsible for process
Process Name		Process	Name of process/activity
Process Location		ProcessLocation	Location(s) of process
Waste Stream Number	DY_CHEM_WASTE_COMPONENTS	Hazardous_solid_waste	Waste stream number as identified on Worksheet 1

Waste Stream Name		Stream	Name of the Waste Stream as identified on Data Form 2
Waste Generation Location		Hazardous_solid_waste	Location of Waste generation
RMMA		Location	Is Process inside a declared RMMA , [YIN] flag
Waste Generation Description		Hazardous_solid_waste	Brief description how the waste is generated.
Generation Frequency		Hazardous_solid_waste	Predicted frequency of generation, daily, weekly, monthly,etc
Process Step		Hazardous_solid_waste	Description of prcess step that generates waste.
Annual Average Waste Generation (kg)	BY_CHEM_WASTE_REQUEST_ITEMS	Hazardous_solid_waste	Average amount of solid waste stream thate is expected to be generated for a year.
Hazardous Constituents	BY_CHEM_WASTE_COMPONENTS	Hazrds_sld_wstHzrds_cnstn	Listing of each constiuent
Constituents Vary		Hazardous_solid_waste	Do the hazardous constituents vary, [YIN] flag
Describe Variance		Hazardous_solid_waste	Describe variance
Physical Characteristics		Hazardous_solid_waste	Description of the physical state of the waste.
High pH		Hazardous_solid_waste	Highest range of pHof waste stream
Low pH		Hazardous_solid_waste	Lowest range of pH of waste stream
Ignitable	CHEM_WASTE_SWMO	Hazardous_solid_waste	[YIN]
Corrosive	CHEM_WASTE_SWMO	Hazardous_solid_waste	[YIN]
Reactive	CHEM_WASTE_SWMO	Hazardous_solid_waste	[YIN]
Toxic Metals		Hazardous_solid_waste	[YIN] if Yes list Toxic Metals
Contains Vol, Semi-Vol, Pesticide		Hazardous_solid_waste	[YIN]

List Vol, Semi-Vol-Pesticide		Hazardous_sld_wstT SVP_mt	[YIN] if Yes list compounds
Benzene Derivatives		Hazardous_solid_waste	[YIN] if Yes list derivatives
Sludge/Leachate		Hazardous_solid_waste	[YIN] if Yes list process
Cyanide		Hazardous_solid_waste	[YIN]
K Wastes		Hazardous_solid_waste	EPA K-listed waste
Waste Generating Process		Hazardous_solid_waste	Source code from Biennial report.
Date		DF5_form	Date form filled out
PWA#		DF5_form	Unique ID for process
Prepared By		DF5_form	Name of form preparer
Preparer's Phone		DF5_form	Preparer's phone number
Process Contact		DF5_form	Process technical contact
Contact's Phone		DF5_form	Technical contact's phone number

Radioactive/Mixed Solid Waste (Data Form 6)			
Data Element	NREL source table	NREL store table	Comment
Organization		Process	Organization responsible for process
Process Name		Process	Name of process/activity
Process Location		ProcessLocation	Location(s) of process
Waste Stream Number		Rad_mixed_solid_waste	Wastestream number of the radioactive/mixed waste stream as identified on Worksheet 1.
Type of Waste		Rad_mixed_solid_waste	Type of Waste; LLW, TRU, etc.
Generation Location		Rad_mixed_solid_waste	Location of waste generation.
Location Disposed/Stored		Rad_mixed_solid_waste	Location description where waste is disposed/stored
Waste Types Description		Rad_mixed_solid_w	Brief description of

		aste	waste type
Waste Generation Description		Rad_mixed_solid_waste	Brief description of how waste is generated
Radiochemical Constituents		Rad_mxd_sld_wstRdchm_sp	Predominant radiochemical constituents
Hazardous Waste Constituents		Rad_mxd_sld_wstHrzd_cns	Predominant hazardous waste constituents
Generation Frequency		Rad_mixed_solid_waste	Frequency of generation, daily, weekly, monthly, etc
Average Qty Generated (kg/yr)		Rad_mixed_solid_waste	Predicted average quantity generated
Average Specific Activity (Ci/kg/yr)		Rad_mixed_solid_waste	Specific activity of waste
Minimum Generated		Rad_mixed_solid_waste	Minimum qty expected to be generated.
Maximum Generated		Rad_mixed_solid_waste	Maximum qty expected to be generated
Date		DF6_form	Date form filled out
PWA#		DF6_form	Unique ID for process
Prepared By		DF6_form	Name of form preparer
Preparer's Phone		DF6_form	Preparer's phone number
Process Contact		DF6_form	Process technical contact
Contact's Phone		DF6_form	Technical contact's phone number

Waste Water Discharge (Data Form 7)			
Data Element	NREL source table	NREL store table	Comment
Organization		Process	Organization responsible for process
Process Name		Process	Name of process/activity
Process Location		ProcessLocation	Location(s) of process
Discharge Type		WW_discharge	Chemical or Radiochemical discharge
Discharge Location		WW_discharge	Where discharge occurred
RMMA		Location	[Y/N], inside RMMA

Discharge Path		WW_discharge	Discharge path
Discharge Cause		WW_discharge	Cause of discharge
Chemical/Radiochemical Discharge		WW_discharge	[Y/N]
Chemical Species		WW_dischargeChem_speci	Chemical constituents discharged
Discharge Rate (l/yr)		WW_discharge	Rate of discharge (l/hour)
Typical pH		WW_discharge	Typical pH of waste water discharge
Maximum pH		WW_discharge	Highest pH of waste water discharge
Minimum Discharge (l/yr)		WW_discharge	Minimum Discharge (l/yr)
Maximum Discharge (l/yr)		WW_discharge	Maximum Discharge (l/yr)
Release Frequency		WW_discharge	Frequency of release
Maximum 1-hour Release (l)		WW_discharge	Maximum release in one hour
Credible Scenerio Release (l)		WW_discharge	Maximum credible release during accident
Discharge Concnetration		WW_discharge	Discharge concentration by weight of volume
Radionuclide Constituents		Radionuclid_cnstcW_dschr	Radionuclide constituents discharged
Date		DF7_form	Date form filled out
PWA#		DF7_form	Unique ID for process
Prepared By		DF7_form	Name of form preparer
Preparer's Phone		DF7_form	Prepareer's phone number
Process Contact		DF7_form	Process technical contact
Contact's Phone		DF7_form	Technical contact's phone number

Air Emissions (Data Form 8)			
Data Element	NREL source table	NREL store table	Comment
Organization		Process	Organization responsible for process
Process Name		Process	Name of

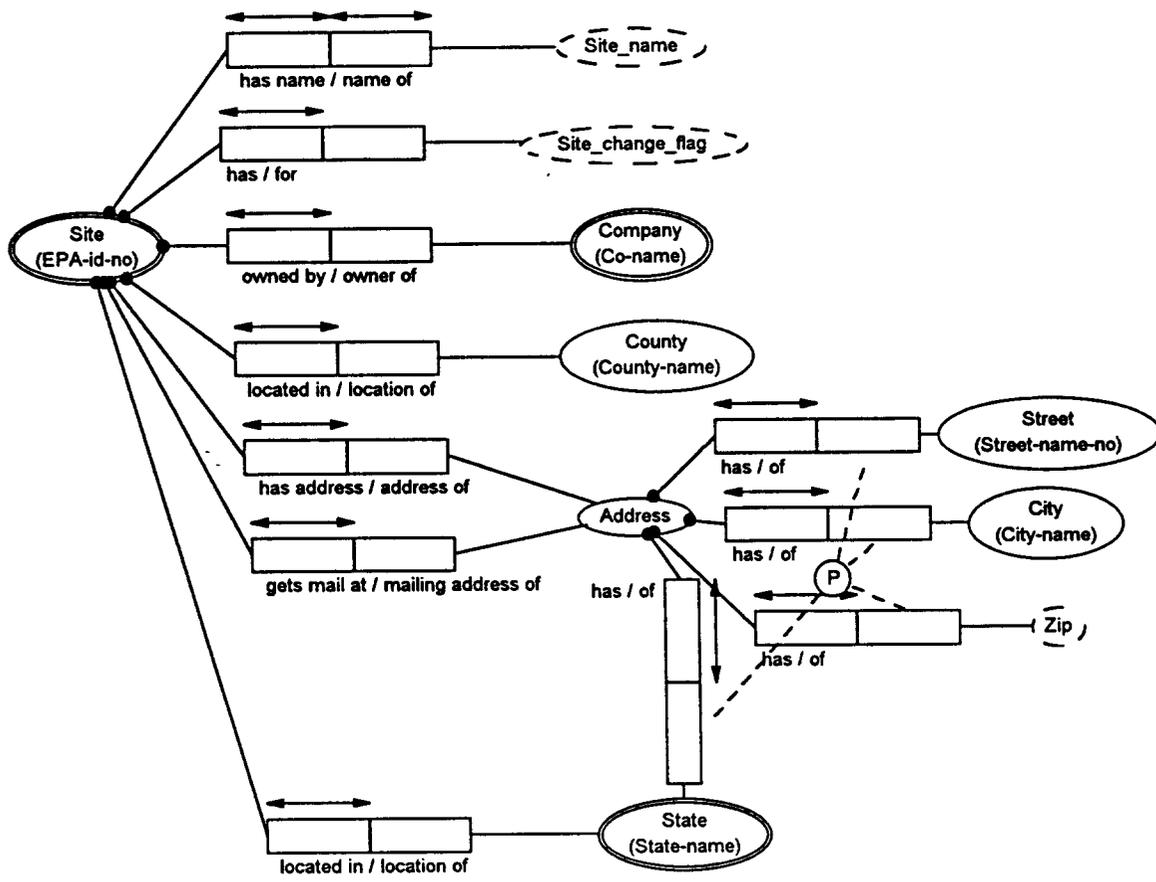
			process/activity
Process Location		ProcessLocation	Location(s) of process
Emission Type		Air_emission	Chemical or Radiochemical release
Emission Location		Air_emission	location of Release
RMMA		Location	Inside RMMA [YIN]
Hood ID		Air_emission	Unique hood identifier
Stack ID		Hood	Unique stack identifier
Physical Form		Air_emission	Physical form of release
Emission Controls		Air_emission	Emission controls in place
Emission Control Describe		Air_emission	Describe emission controls
Emission Occurance Description		Air_emission	Describe release occurance
Chemical/Radiochemical Discharge		Air_emission	Type of discharge
Chemical Species		Air_emissionChem_species	Chemical constituents release
Discharge Rate (l/yr)		Air_emission	Discharge Rate (l/yr)
Minimum Discharge (l/yr)		Air_emission	Minimum Discharge (l/yr)
Maximum Discharge (l/yr)		Air_emission	Maximum Discharge (l/yr)
Release Frequency		Air_emission	Release Frequency
Maximum 1-hour Release (l)		Air_emission	Maximum 1-hour Release (l)
Credible Scenerio Release (l)		Air_emission	Credible Scenerio Release (l)
Discharge Concnetration		Air_emission	Discharge Concnetration
Radionuclide Constituents		Air_emissionRadioc hm_spcs	Radionuclide Constituents released
Date		DF8_form	Date form filled out
PWA#		DF8_form	Unique ID for process
Prepared By		DF8_form	Name of form preparer
Preparer's Phone		DF8_form	Prepareer's phone number
Process Contact		DF8_form	Process technical contact
Contact's Phone		DF8_form	Technical contact's phone number

Appendix C - CGTIS Data Model

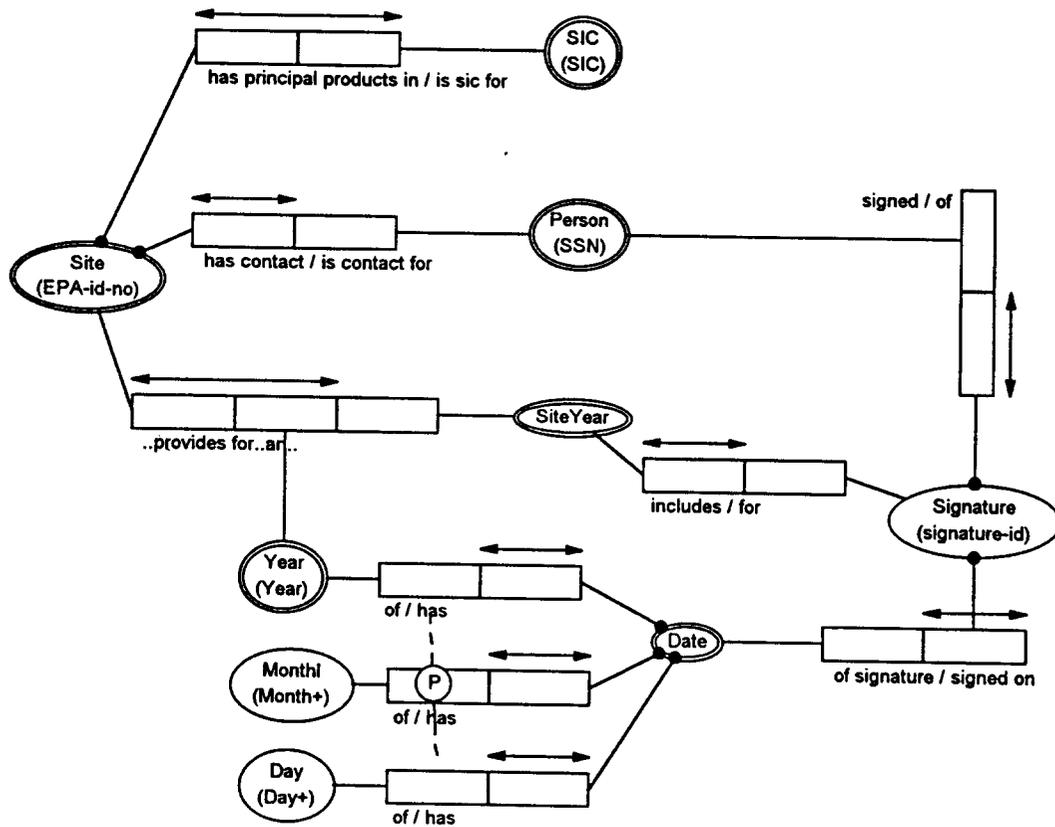
The following CGTIS data model is currently being developed using Asymetrix™ InfoModeler™. Included in Appendix C are the CGTIS data diagrams and data tables.



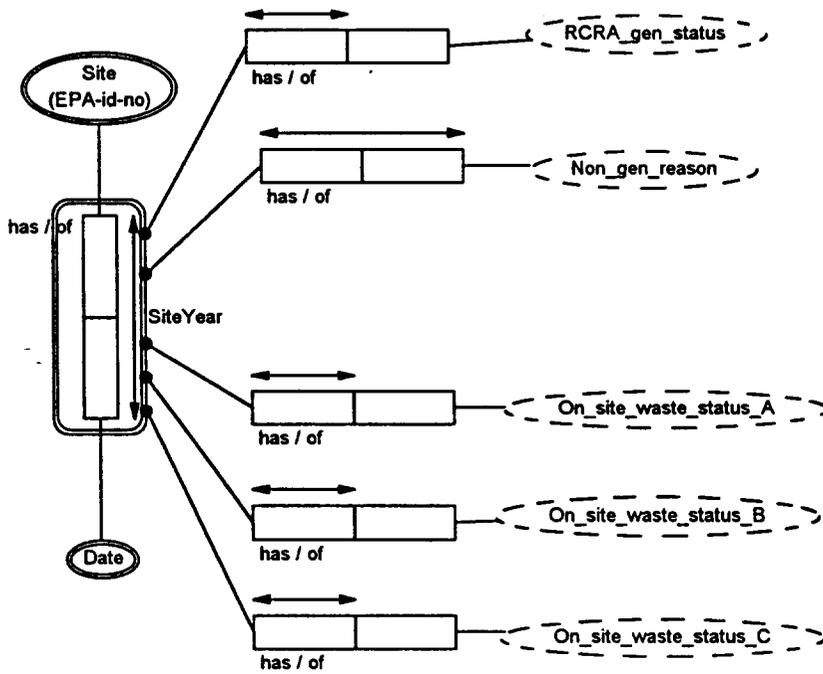
Site 1 IC



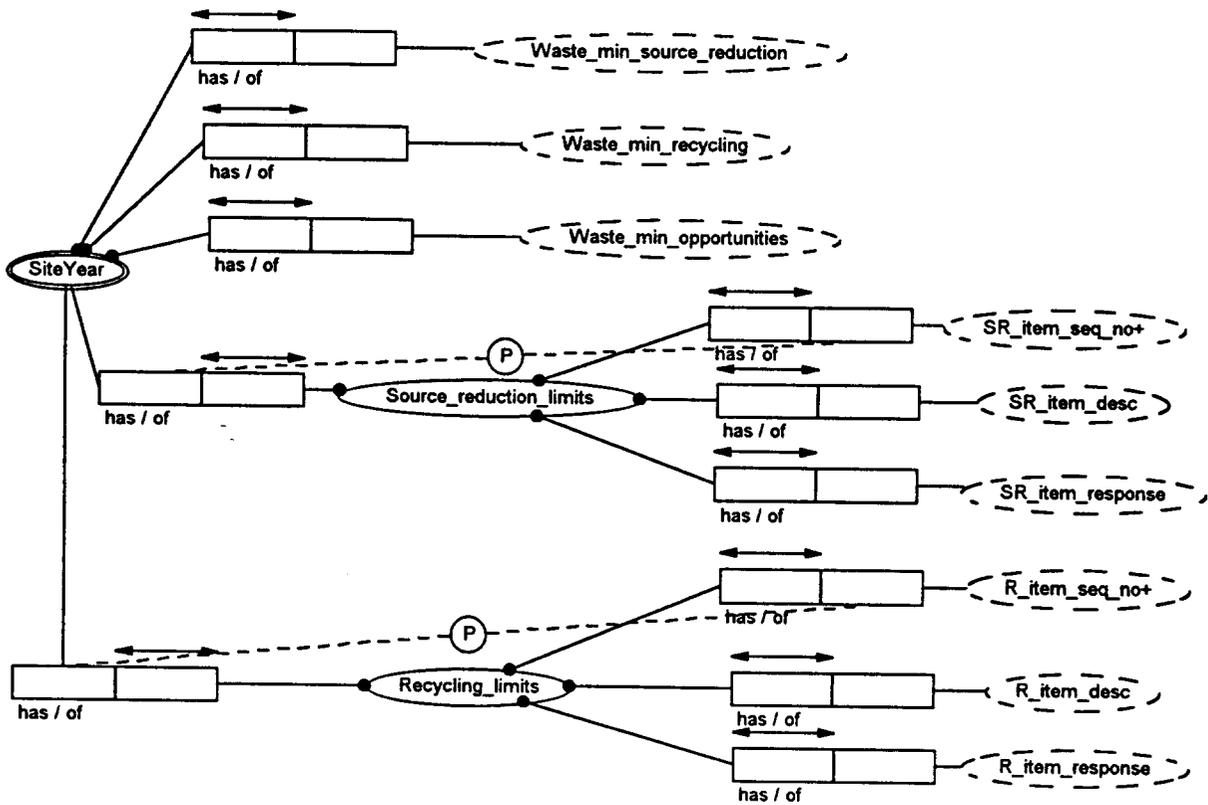
Site 2 IC



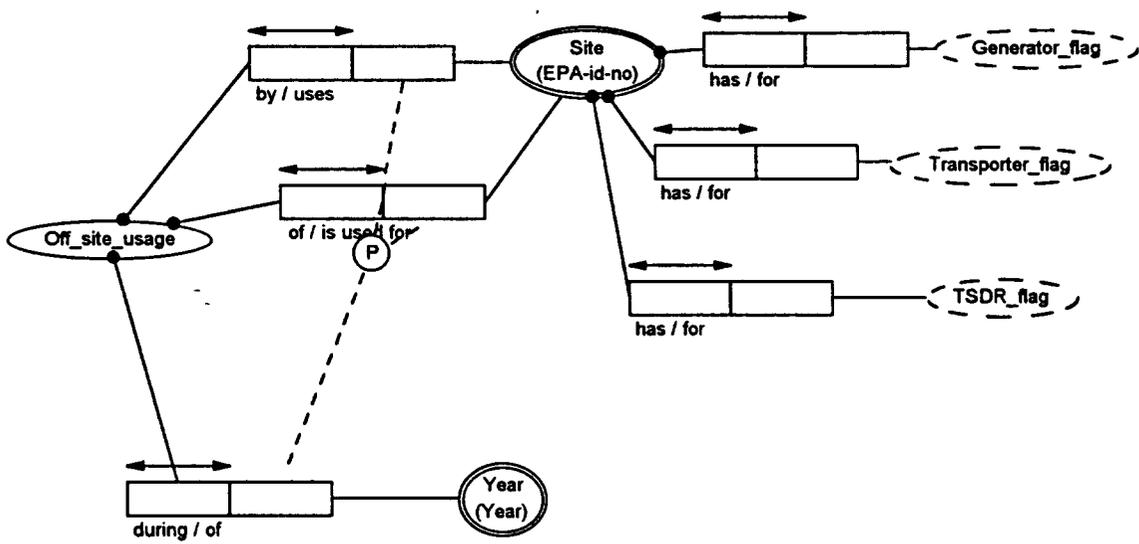
Site 3 IC



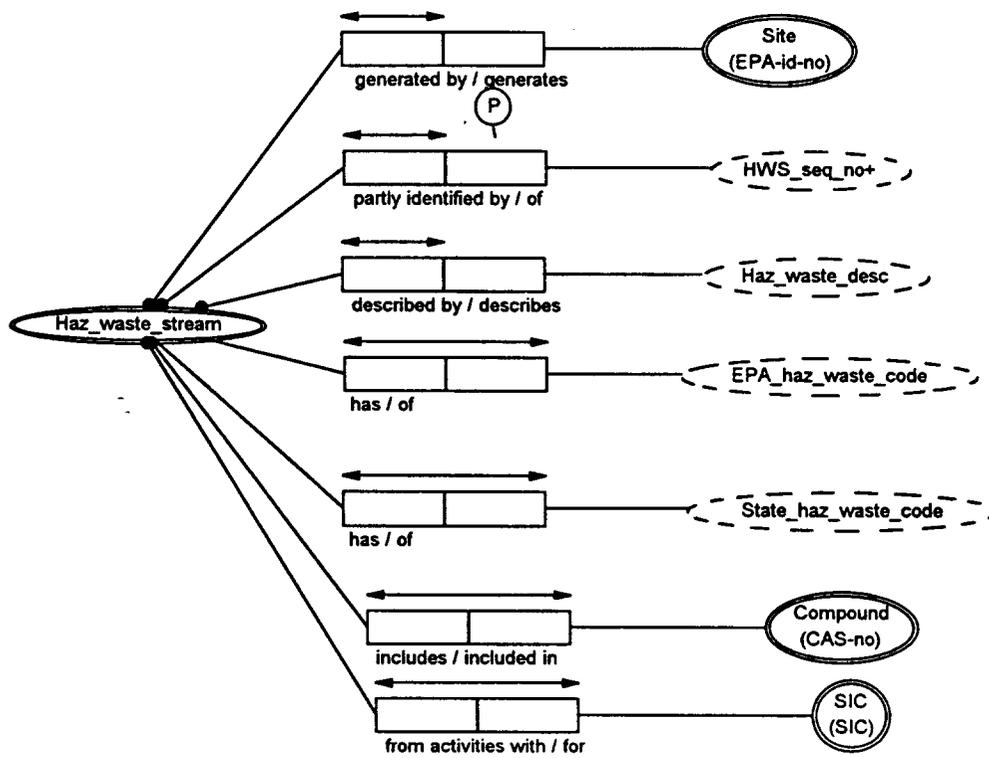
Site 4 IC



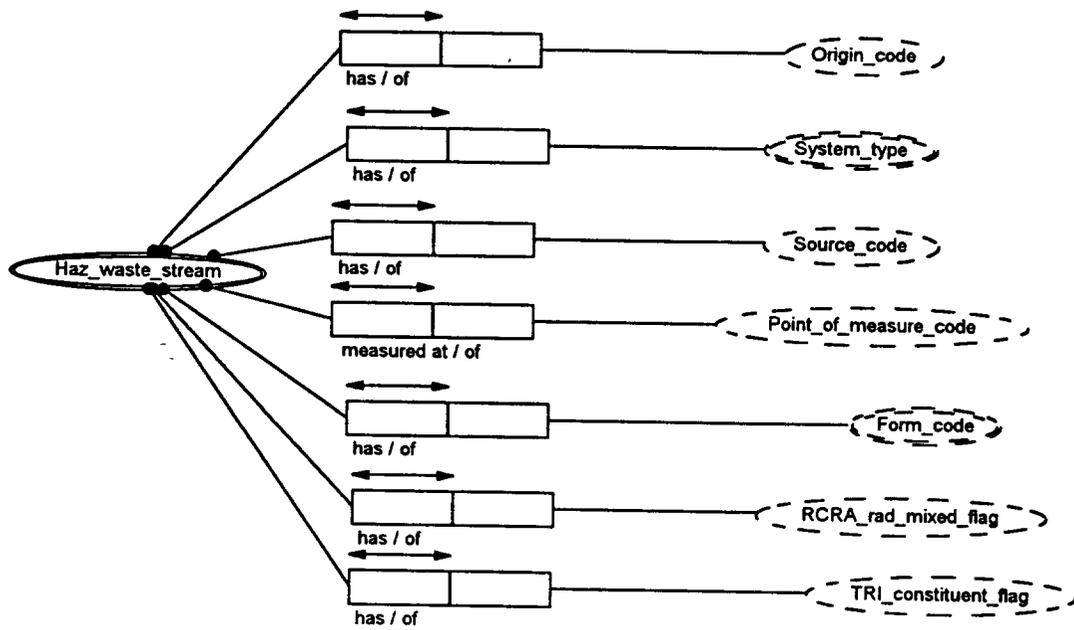
Off-site usage OI



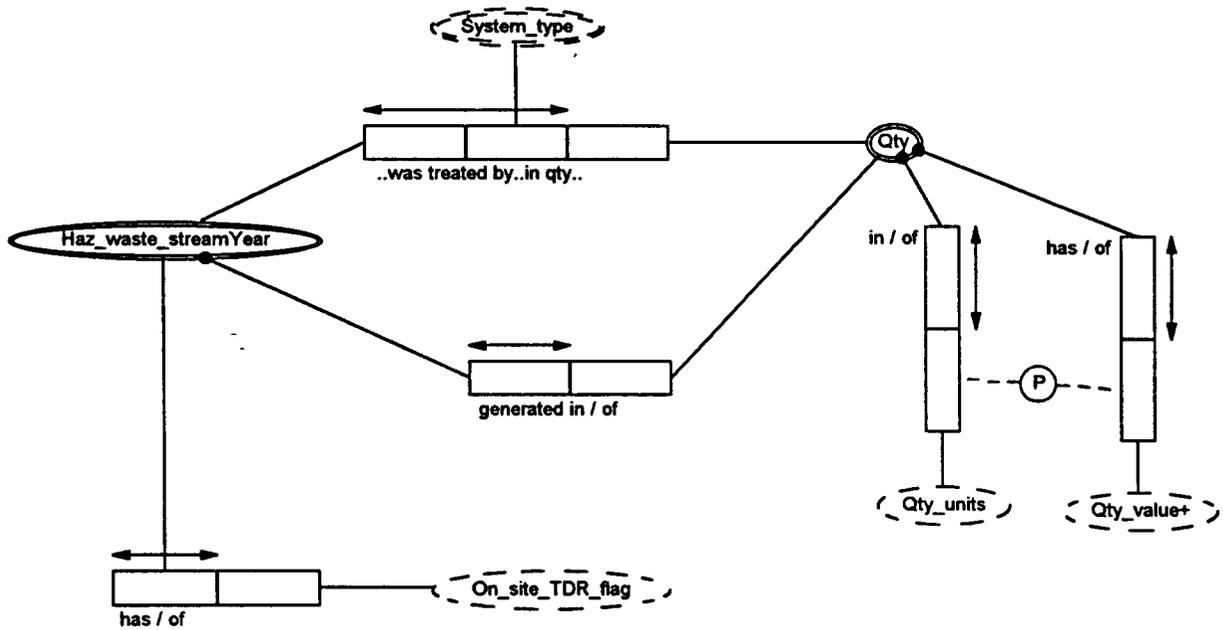
Hazardous waste stream 1 GM



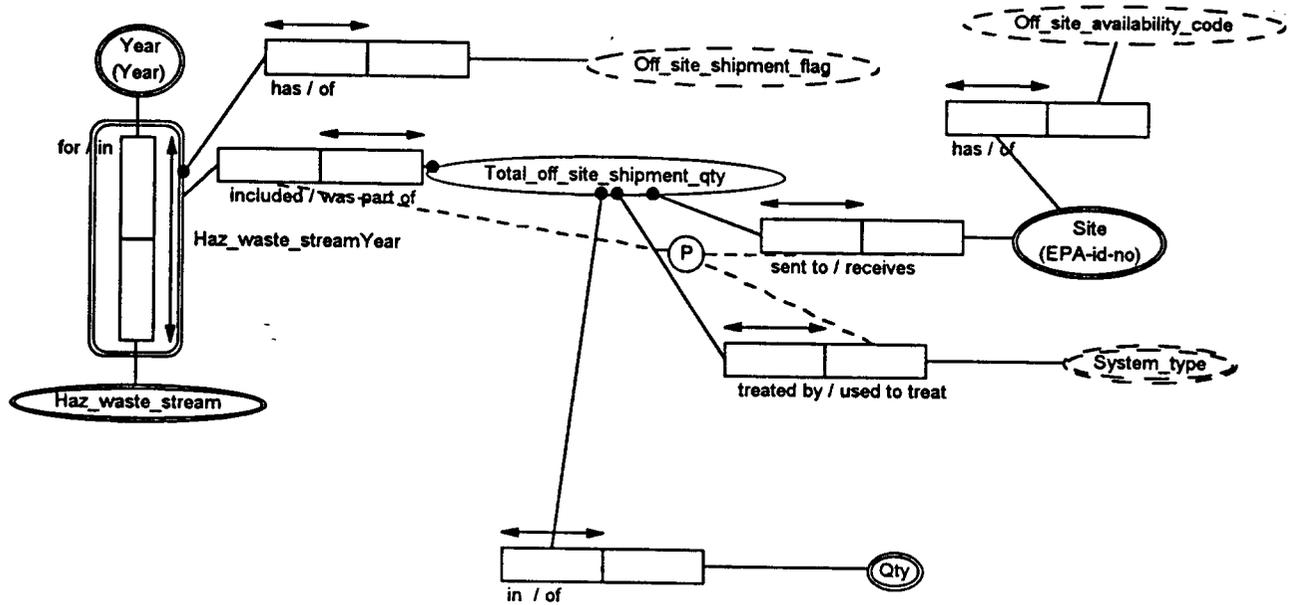
Hazardous waste stream 2 GM



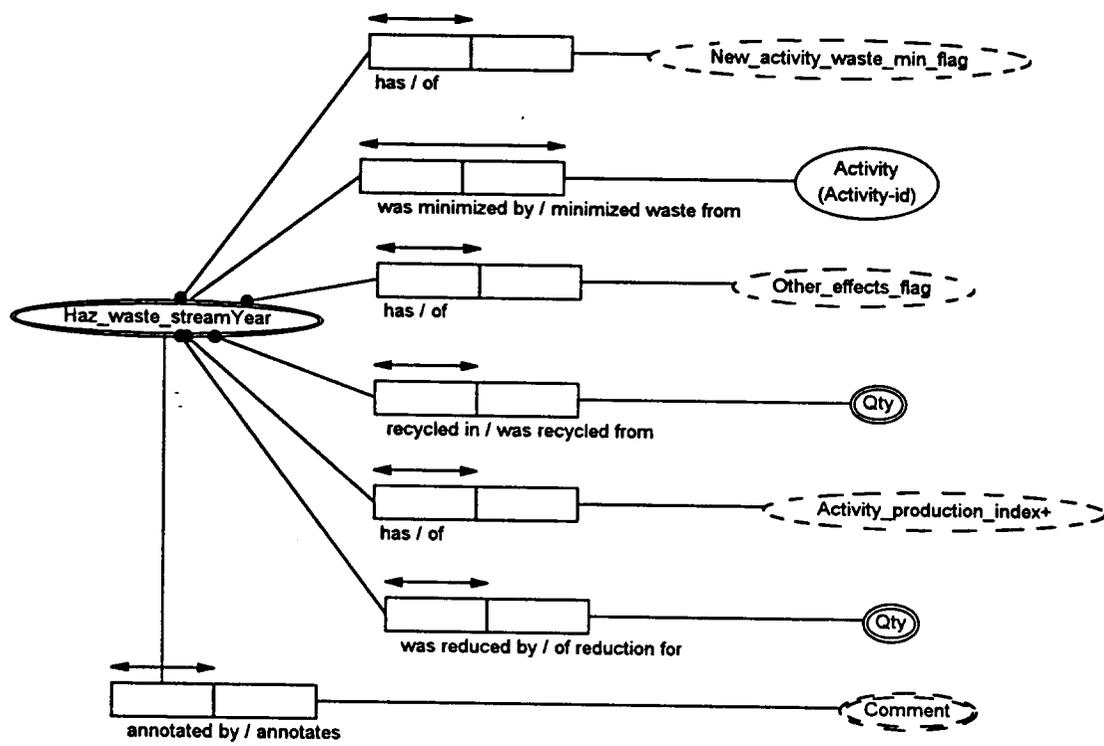
Hazardous waste stream 3 GM



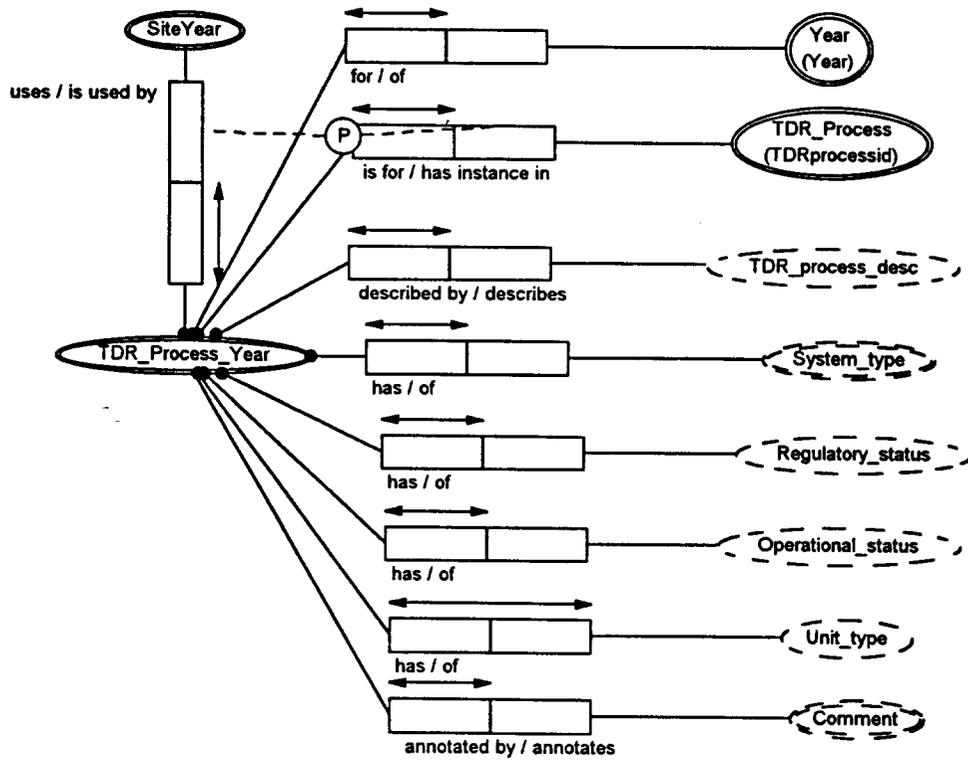
Hazardous waste stream 4 GM



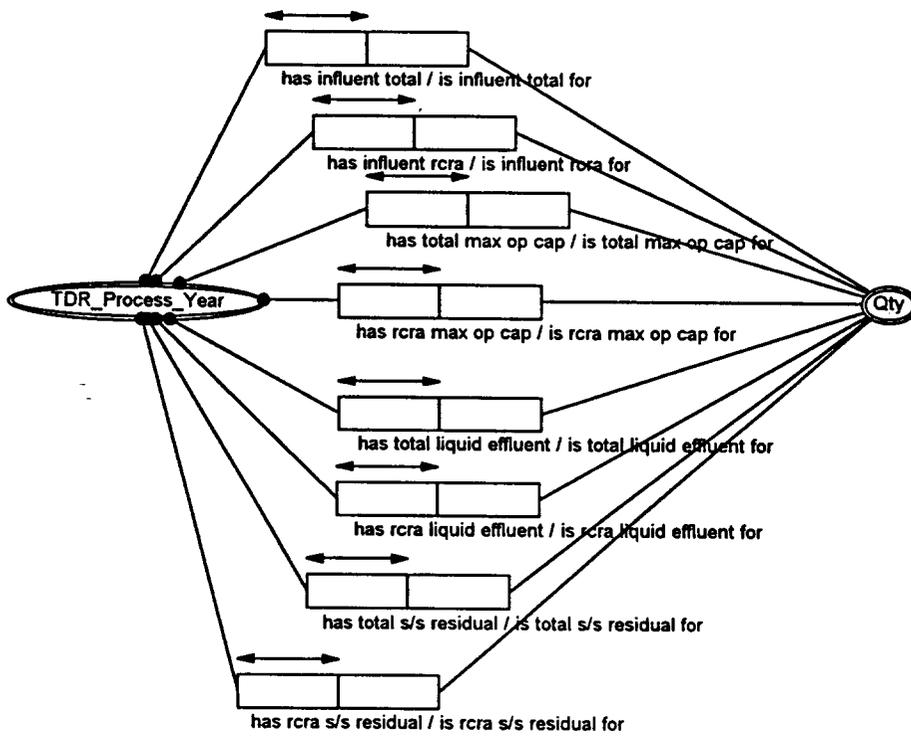
Hazardous waste stream 5 GM



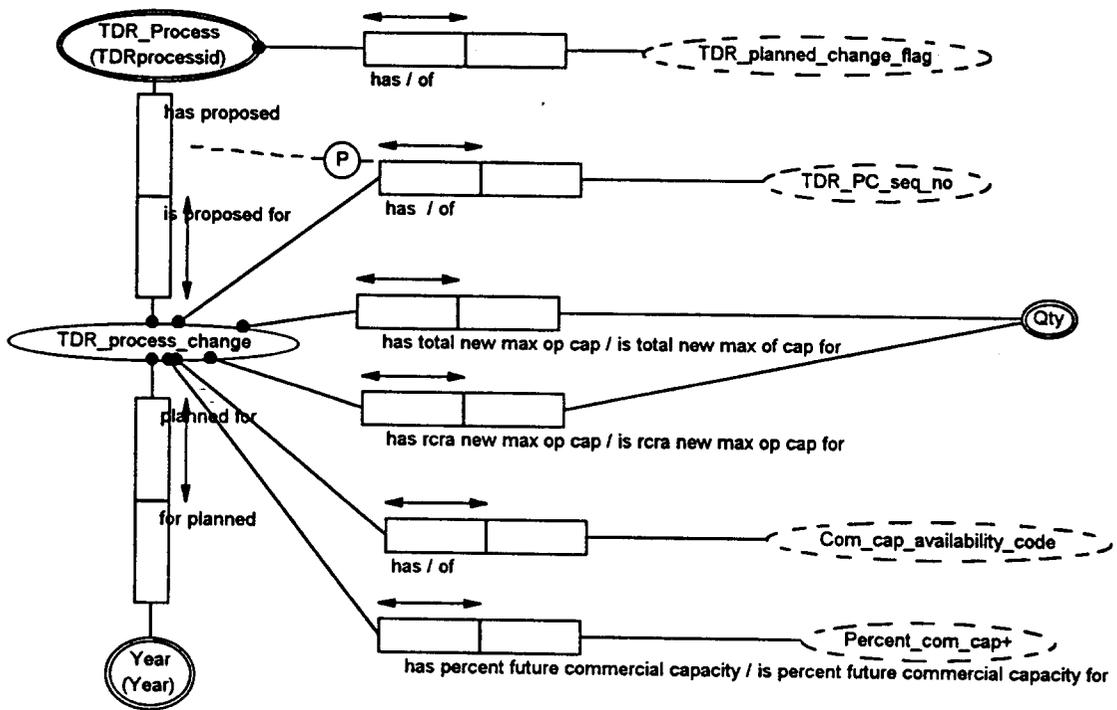
Hazardous waste stream 6 PS



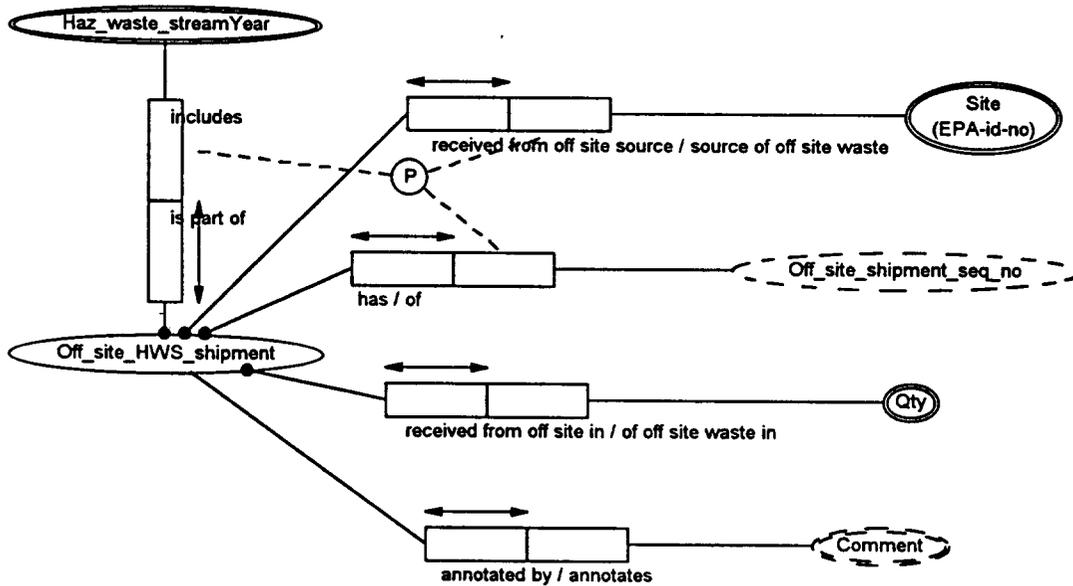
Hazardous waste stream 7 PS



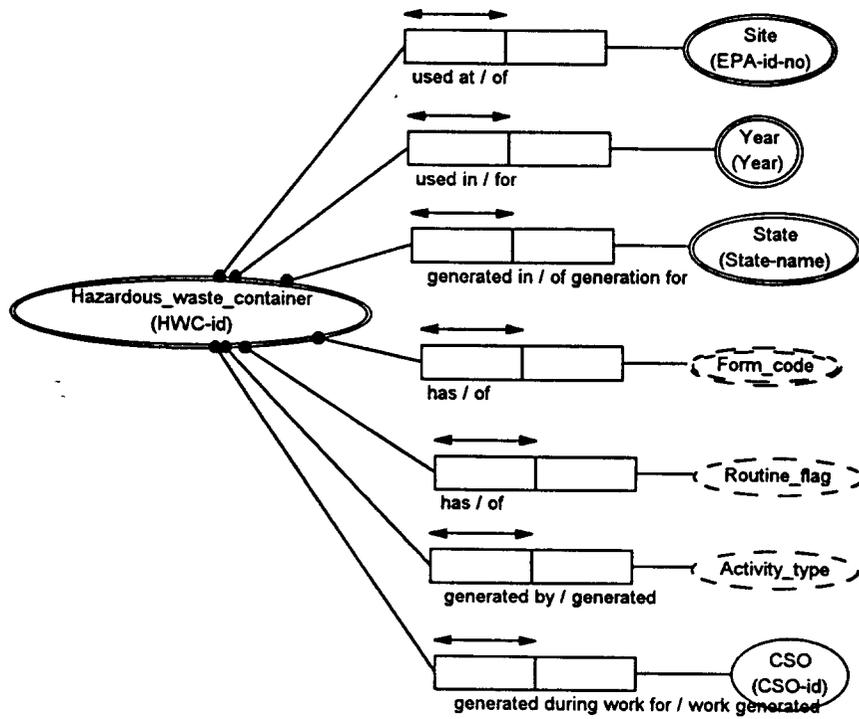
Hazardous waste stream 8 PS



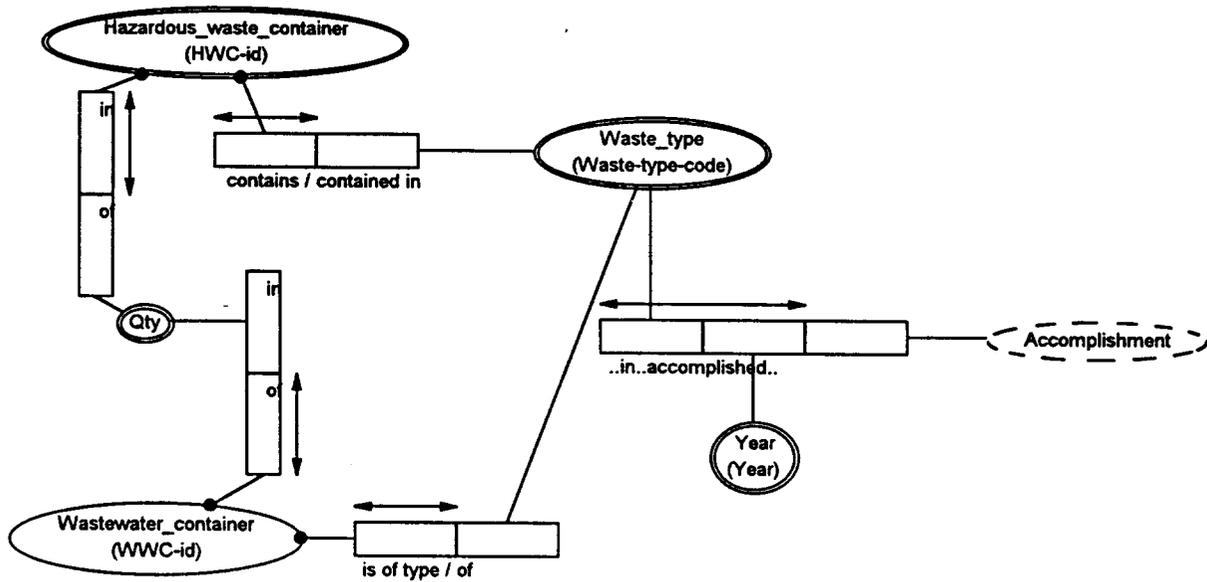
Hazardous waste stream 9 WR



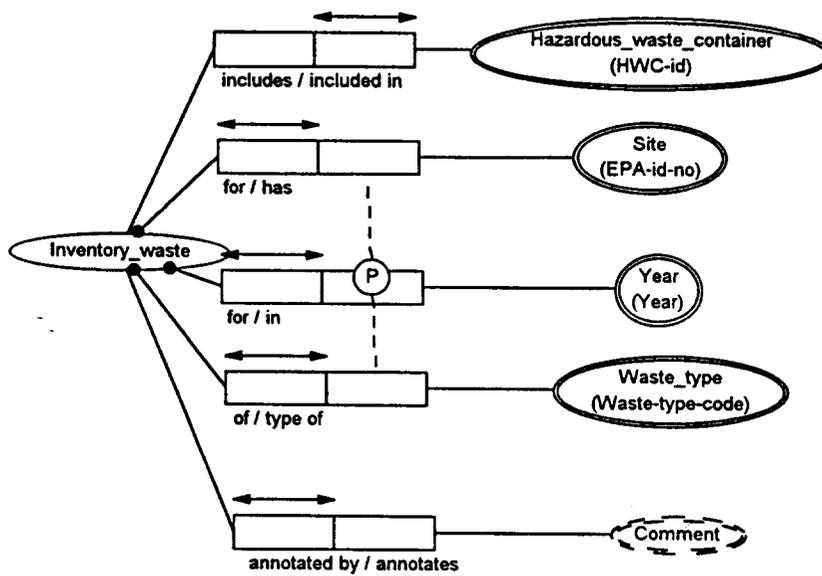
Waste min - site generation 1



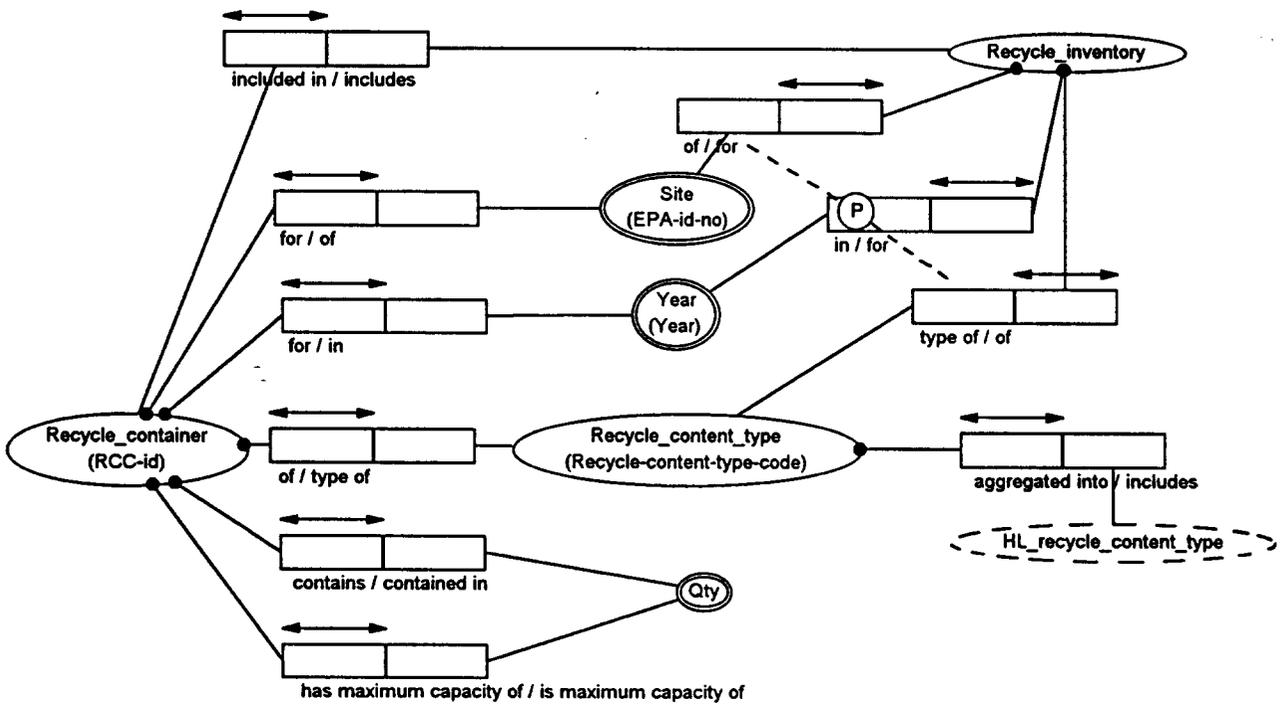
Waste min - site generation 2



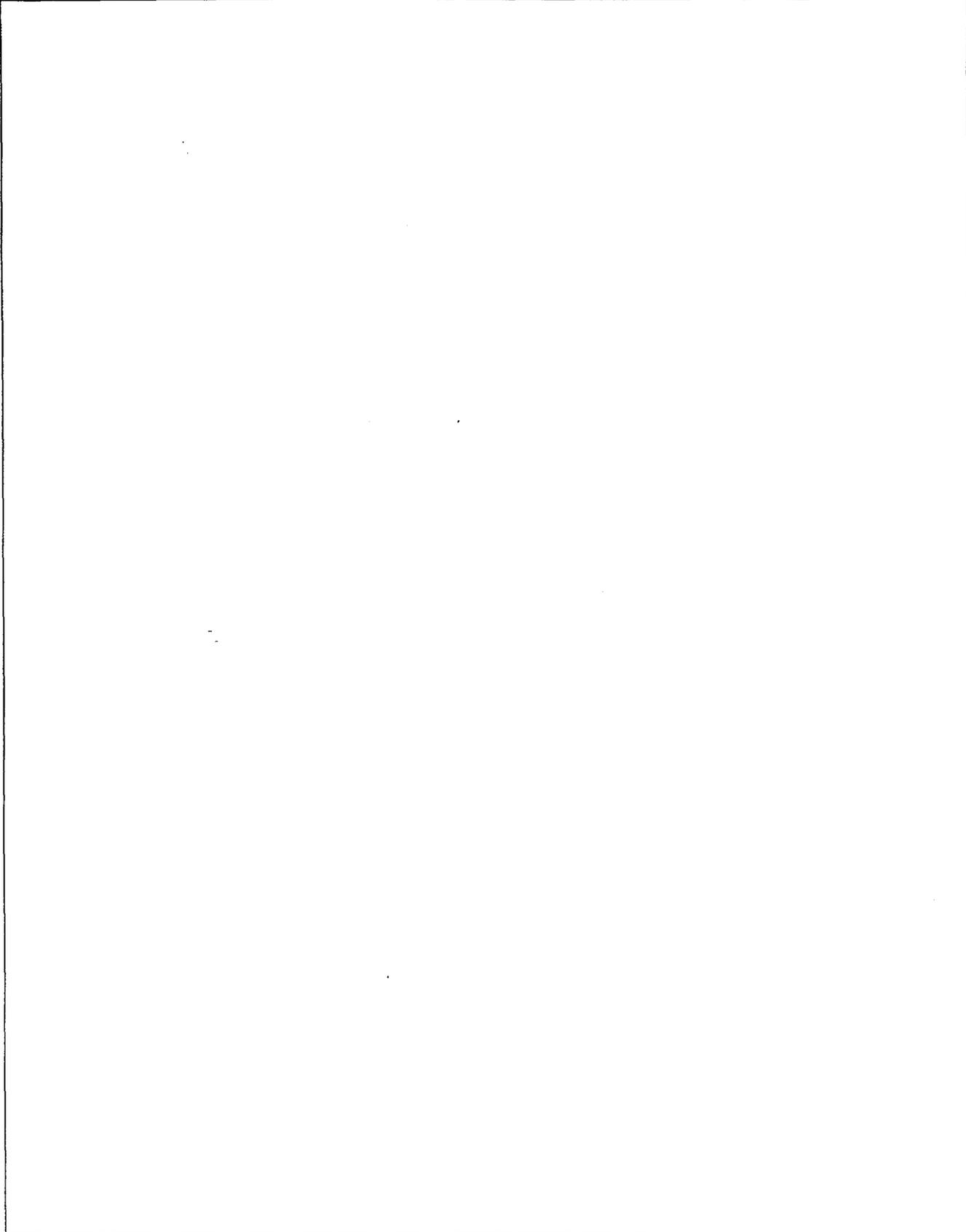
Inventory waste



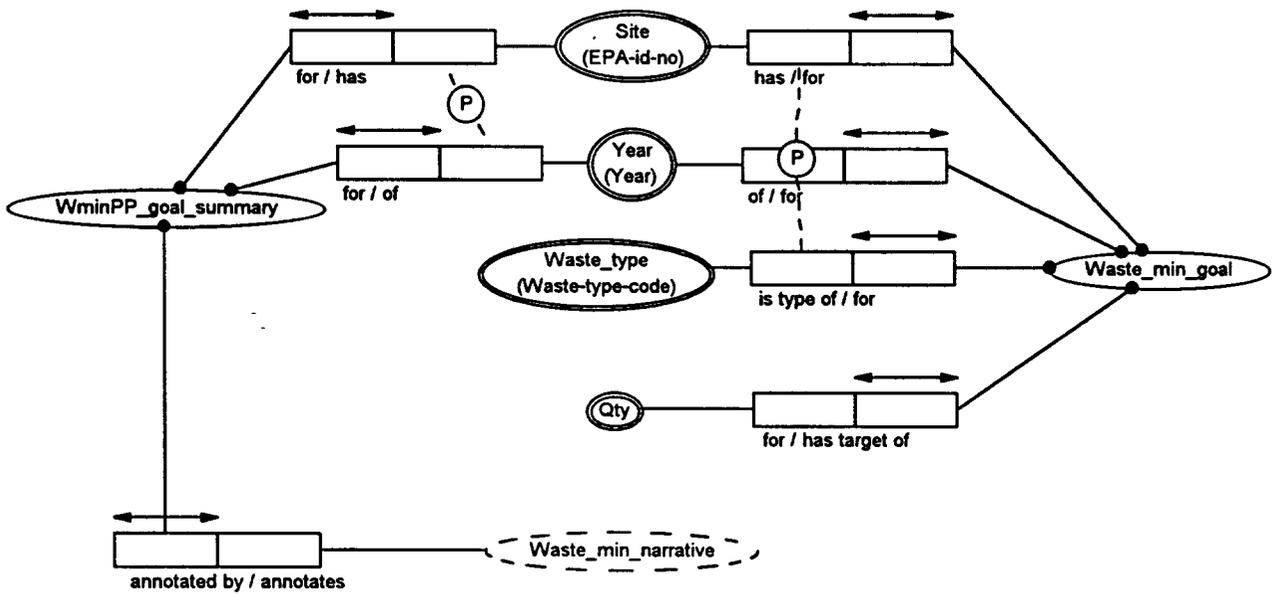
Waste min recycling 1



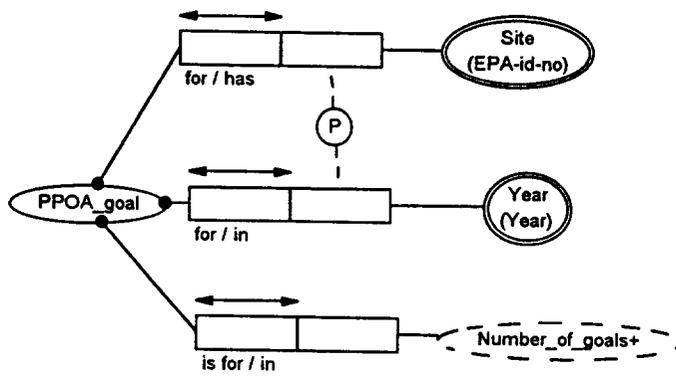
Waste min recycling 2



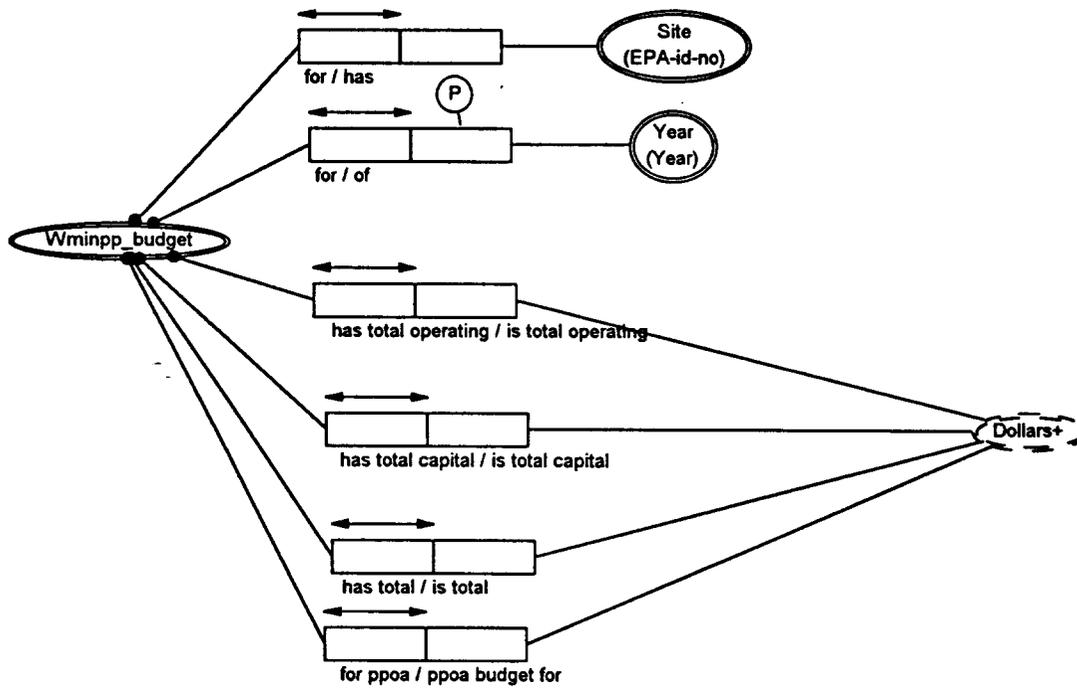
Waste min ppoa goal 1



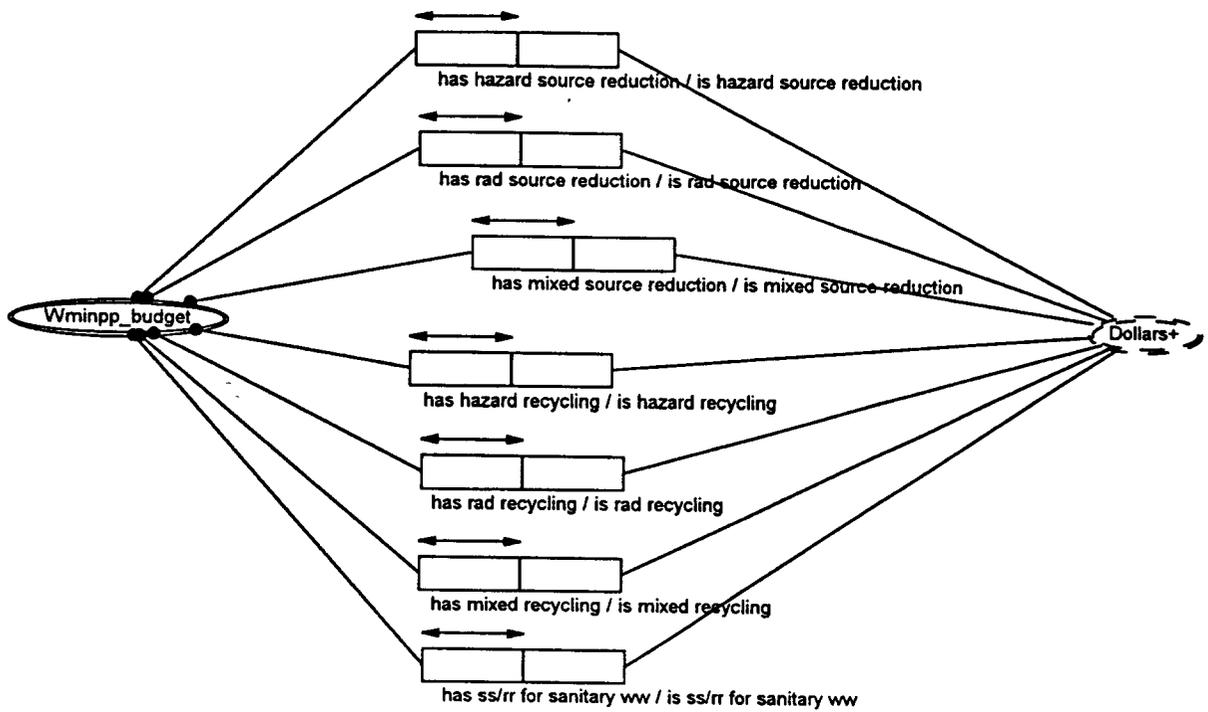
Waste min ppoa goal



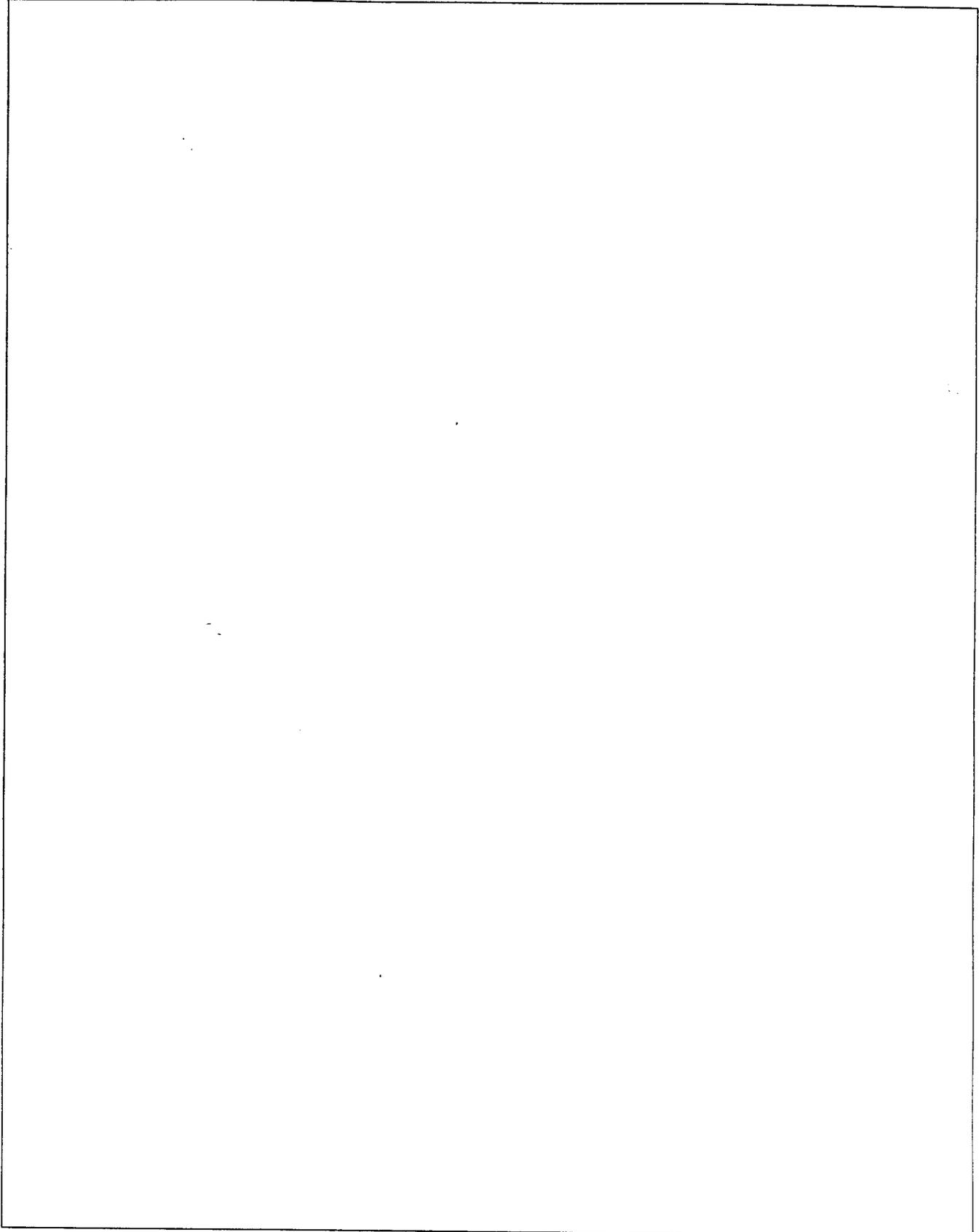
Waste min/pp budget 1



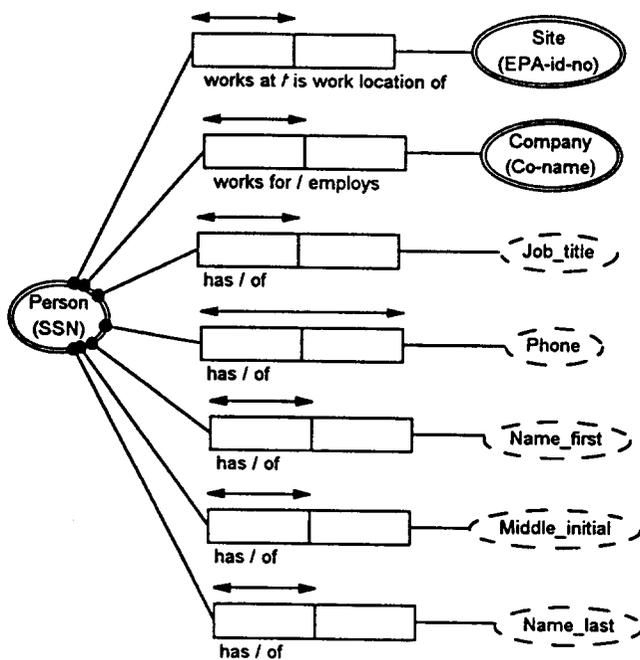
Waste min/pp budget 2



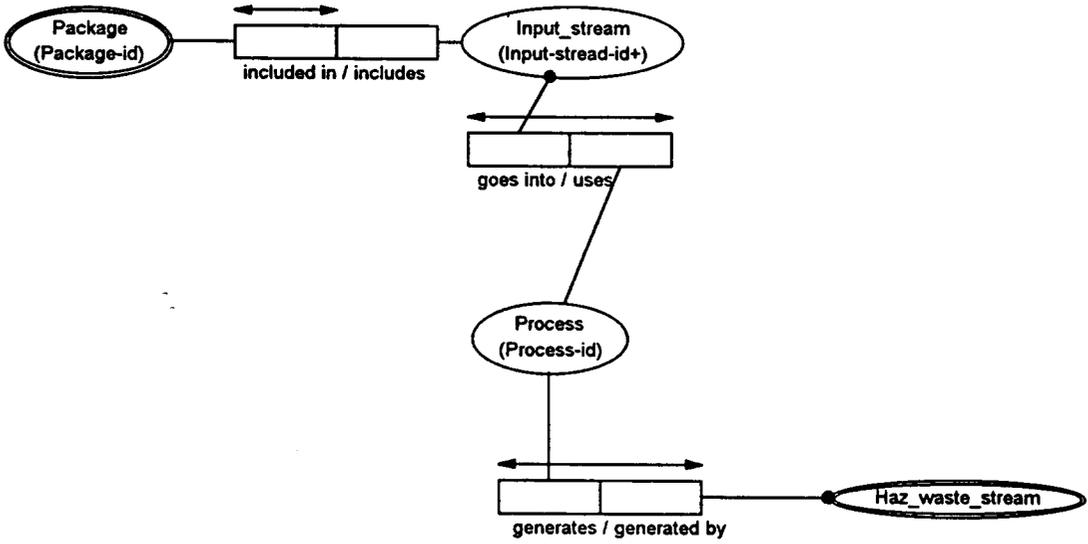
Waste min/pp budget 3



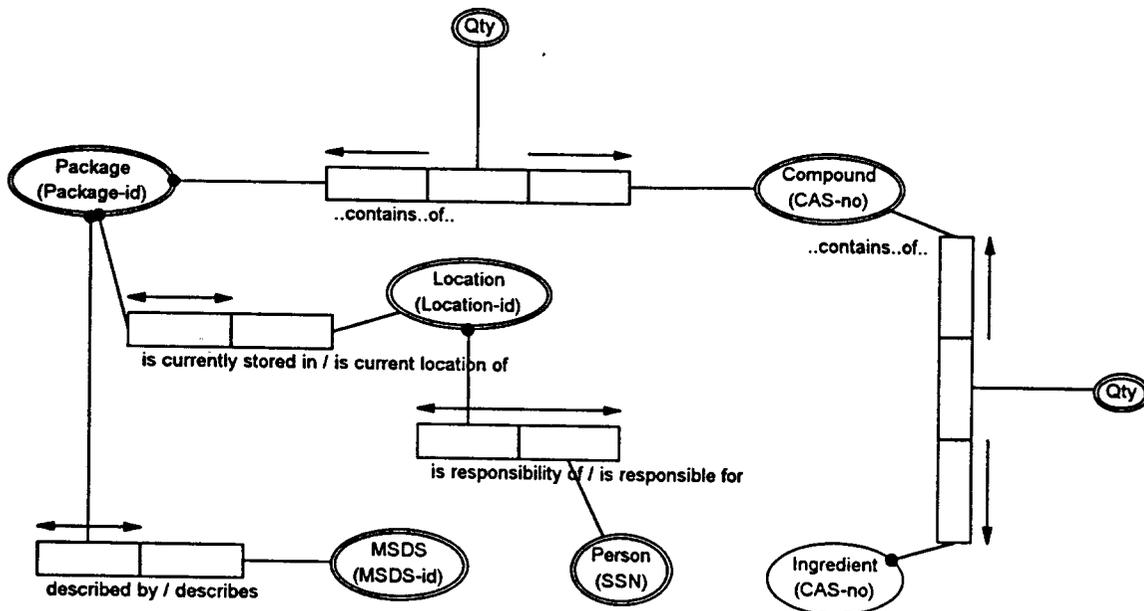
Person



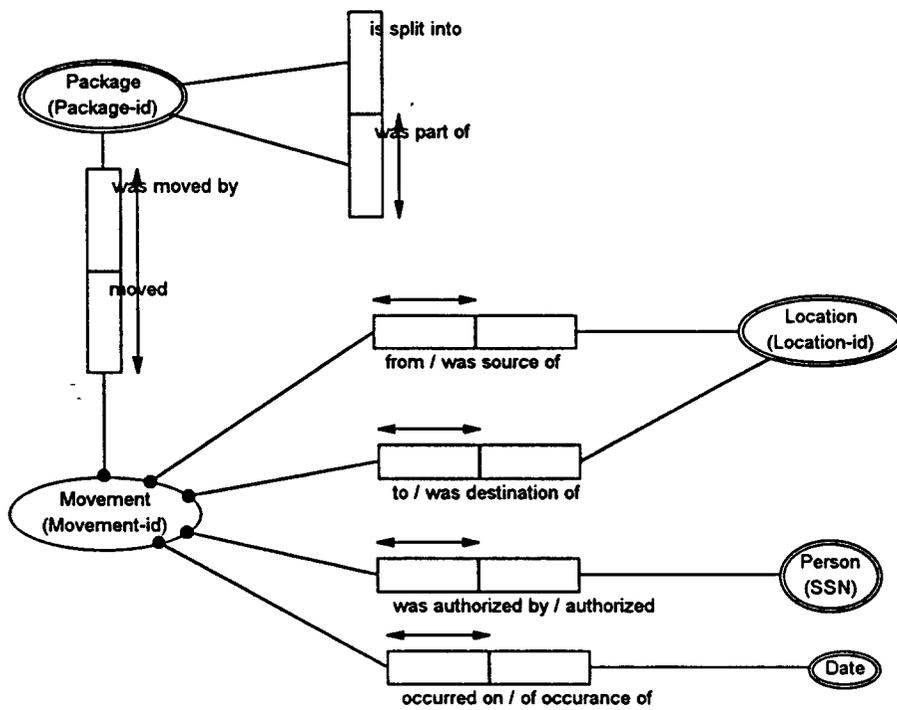
Process place holder



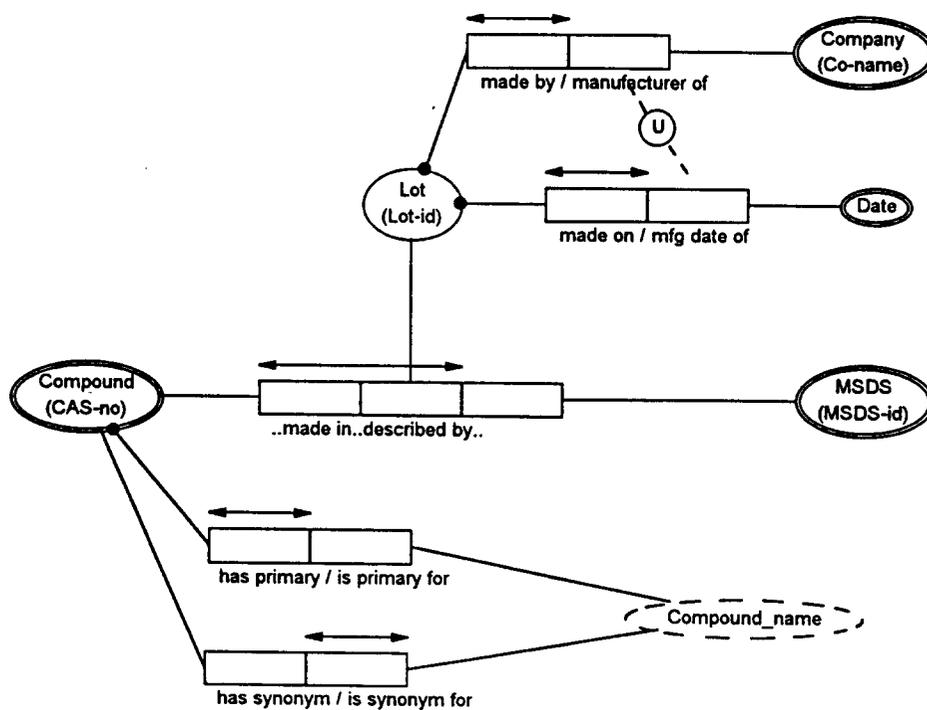
Package 1 CIS



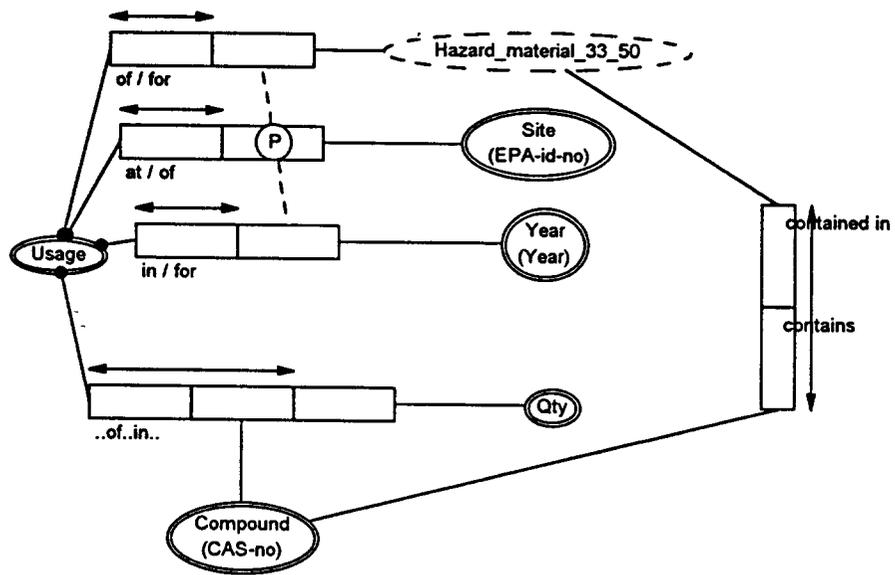
Package 2 CIS



Package 3 CIS



Usage 1 - 33/50



Compound**Description**

Table of Compound

This table contains the 1 to many roles of Compound.

Primary Key

Compound

char 2, mandatory

Description:

*Compound that has primary Compound_name***Fields**

PrimaryCompound_name

char 2, mandatory

Description:

Compound_name that is primary for Compound

Foreign Key To:

Compound_name

Fact:

*"Compound has primary Compound_name" on model-page 30.***Incident Foreign Keys**

Table	Field(s)	Relationship
Haz_waste_streamCompound	IncludesCompound	1:m
PackageQtyCompound	Compound	1:m
CompoundQtyIngredient	Compound	1:m
CompoundLotMSDS	Compound	1:m
UsageCompoundQty	Compound	1:m
Hazard_material_3_50Cmpnd	Compound	1:m
Compound_name	SynonymCompound	1:m

Compound_name**Description**

Table of Compound_name

This table contains the 1 to many roles of Compound_name.

Primary Key

Compound_name

char 2, mandatory

Description:

*Compound_name that is synonym for Compound***Fields**

SynonymCompound

char 2, optional

Description:

Compound that has synonym Compound_name

Foreign Key To:

Compound

Fact:

*"Compound has synonym Compound_name" on model-page 30.***Incident Foreign Keys****Table****Field(s)****Relationship**

Compound

PrimaryCompound_name

1:m

CompoundLotMSDS**Description**

Compound made in Lot described by MSDS

This table was derived from the fact Compound made in Lot described by MSDS.

Primary Key

Compound char 2, mandatory
Foreign Key To:
Compound

Lot char 2, mandatory
Foreign Key To:
Lot

Fields

MSDS char 2, mandatory
Fact:
"Compound made in Lot described by MSDS" on model-page 30.

CompoundQtyIngredient**Description**

Compound contains Qty of Ingredient

This table was derived from the fact Compound contains Qty of Ingredient.

Primary Key

Compound	char 2, mandatory Foreign Key To: <i>Compound</i>
Ingredient	char 2, mandatory

Fields

Qty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Compound contains Qty of Ingredient" on model-page 28.</i>
Qty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Compound contains Qty of Ingredient" on model-page 28.</i>

Haz_wast_strmSt_hz_wst_cd**Description**

Haz_waste_stream has State_haz_waste_code

This table was derived from the fact Haz_waste_stream has State_haz_waste_code.

Primary Key

GeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>
PartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>
State_haz_waste_code	char 2, mandatory Description: <i>State_haz_waste_code that of Haz_waste_stream</i>

Haz_waste_stream**Description**

Table of Haz_waste_stream

This table contains the 1 to many roles of Haz_waste_stream.

Primary Key

GeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Site</i>
PartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i>

Fields

DescribedHaz_waste_desc	char 2, mandatory Description: <i>Haz_waste_desc that describes Haz_waste_stream</i> Fact: <i>"Haz_waste_stream described by Haz_waste_desc" on model-page 7.</i>
Origin_code	char 1, mandatory Description: <i>Origin_code that of Haz_waste_stream</i> Fact: <i>"Haz_waste_stream has Origin_code" on model-page 8.</i>
System_type	char 3, mandatory Description: <i>System_type that of Haz_waste_stream</i> Fact: <i>"Haz_waste_stream has System_type" on model-page 8.</i>
Source_code	char 2, mandatory Description: <i>Source_code that of Haz_waste_stream</i> Fact: <i>"Haz_waste_stream has Source_code" on model-page 8.</i>
MeasuredPoint_of_measr_cd	char 2, mandatory Description: <i>Point_of_measure_code that of Haz_waste_stream</i> Fact: <i>"Haz_waste_stream measured at Point_of_measure_code" on model-page 8.</i>

Form_code	char 3, mandatory Description: <i>Form_code that of Haz_waste_stream</i> Fact: <i>"Haz_waste_stream has Form_code" on model-page 8.</i>
RCRA_rad_mixed_flag	char 1, mandatory Description: <i>RCRA_rad_mixed_flag that of Haz_waste_stream</i> Fact: <i>"Haz_waste_stream has RCRA_rad_mixed_flag" on model-page 8.</i>
TRI_constituent_flag	char 1, mandatory Description: <i>TRI_constituent_flag that of Haz_waste_stream</i> Fact: <i>"Haz_waste_stream has TRI_constituent_flag" on model-page 8.</i>

Incident Foreign Keys

Table	Field(s)	Relationship
Haz_wst_strmEPA_hz_wst_cd	GeneratedSite	1:m
Haz_wast_strmSt_hz_wst_cd	PartlyHWS_seq_no	1:m
Haz_waste_streamCompound	GeneratedSite	1:m
Haz_waste_streamSic	PartlyHWS_seq_no	1:m
ProcessHaz_waste_stream	IncludedGeneratedSite	1:m
Haz_waste_streamYear	IncludedPartlyHWS_seq_no	1:m
	GeneratedSite	1:m
	PartlyHWS_seq_no	1:m
	GeneratesGeneratedSite	1:m
	GeneratesPartlyHWS_seq_no	1:m
	GeneratedSite	1:m
	PartlyHWS_seq_no	1:m

Haz_waste_streamCompound**Description**

Haz_waste_stream includes Compound

This table was derived from the fact Haz_waste_stream includes Compound.

Primary Key

IncludedGeneratedSite

char 2, mandatory

Description:

Site that generates Haz_waste_stream

Foreign Key To:

Haz_waste_stream

IncludedPartlyHWS_seq_no

integer 2, mandatory

Description:

HWS_seq_no that of Haz_waste_stream

Foreign Key To:

Haz_waste_stream

IncludesCompound

char 2, mandatory

Description:

Compound that included in Haz_waste_stream

Foreign Key To:

Compound

Haz_waste_streamSic**Description**

Haz_waste_stream from activities with SIC

This table was derived from the fact Haz_waste_stream from activities with SIC.

Primary Key

GeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>
PartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>
FromActivitiesSic	char 4, mandatory Description: <i>SIC that for Haz_waste_stream</i>

Haz_waste_streamYear**Description**

Table of Haz_waste_streamYear

This table contains the 1 to many roles of Haz_waste_streamYear.

Primary Key

Year	char 2, mandatory Description: <i>Year that for Haz_waste_stream</i>
GeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>
PartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>

Fields

On_site_TDR_flag	char 2, optional Description: <i>On_site_TDR_flag that of Haz_waste_streamYear</i> Fact: <i>"Haz_waste_streamYear has On_site_TDR_flag" on model-page 9.</i>
Off_site_shipment_flag	char 1, mandatory Description: <i>Off_site_shipment_flag that of Haz_waste_streamYear</i> Fact: <i>"Haz_waste_streamYear has Off_site_shipment_flag" on model-page 10.</i>
GeneratedQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Haz_waste_streamYear generated in Qty" on model-page 9.</i>
GeneratedQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Haz_waste_streamYear generated in Qty" on model-page 9.</i>

New_activity_waste_mn_flg	char 1, mandatory Description: <i>New_activity_waste_min_flag that of Haz_waste_streamYear</i> Fact: <i>"Haz_waste_streamYear has New_activity_waste_min_flag" on model-page 11.</i>
Other_effects_flag	char 1, mandatory Description: <i>Other_effects_flag that of Haz_waste_streamYear</i> Fact: <i>"Haz_waste_streamYear has Other_effects_flag" on model-page 11.</i>
RecycledQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Haz_waste_streamYear recycled in Qty" on model-page 11.</i>
RecycledQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Haz_waste_streamYear recycled in Qty" on model-page 11.</i>
Activity_production_index	real 4, mandatory Description: <i>Activity_production_index that of Haz_waste_streamYear</i> Fact: <i>"Haz_waste_streamYear has Activity_production_index" on model-page 11.</i>
ReducedQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Haz_waste_streamYear was reduced by Qty" on model-page 11.</i>
ReducedQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Haz_waste_streamYear was reduced by Qty" on model-page 11.</i>
AnnotatedComment	varchar 2, optional Description: <i>Comment that annotates Haz_waste_streamYear</i> Fact: <i>"Haz_waste_streamYear annotated by Comment" on model-page 11.</i>

Incident Foreign Keys

Table	Field(s)	Relationship
H _z _wst_strmYrSystm_typQty	Year GeneratedSite PartlyHWS_seq_no	1:m

Haz_waste_streamYerActvty	MinimizedWasteFromYear	1:m
	MinimizedWasteFromGnrtdSt	
Total_off_site_shpmnt_qty	MinmzdWstFrmPrtyHWS_sq_n	1:m
	Year	
	GeneratedSite	
	PartlyHWS_seq_no	
Off_site_HWS_shipment	Year	1:m
	GeneratedSite	
	PartlyHWS_seq_no	

Haz_waste_streamYerActvty**Description**

Haz_waste_streamYear was minimized by Activity

This table was derived from the fact Haz_waste_streamYear was minimized by Activity.

Primary Key

MinimizedWasteFromYear	char 2, mandatory Description: <i>Year that for Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
MinimizedWasteFromGnrtdSt	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
MinmzdWstFrmPrtyHWS_sq_n	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
MinimizedActivity	char 2, mandatory Description: <i>Activity that minimized waste from Haz_waste_streamYear</i>

Haz_wst_strmEPA_hz_wst_cd**Description**

Haz_waste_stream has EPA_haz_waste_code

This table was derived from the fact Haz_waste_stream has EPA_haz_waste_code.

Primary Key

GeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>
PartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>
EPA_haz_waste_code	char 2, mandatory Description: <i>EPA_haz_waste_code that of Haz_waste_stream</i>

Hazard_material_3_50Cmpnd

Description

Hazard_material_33_50 contained in Compound

This table was derived from the fact Hazard_material_33_50 contained in Compound.

Primary Key

Hazard_material_33_50

char 2, mandatory

Description:

Hazard_material_33_50 that contained in Compound

Compound

char 2, mandatory

Description:

Compound that contains Hazard_material_33_50

Foreign Key To:

Compound

Hazardous_waste_container**Description**

Table of Hazardous_waste_container

This table was derived from the fact Hazardous_waste_container used at Site.

Primary Key

Hazardous_waste_container char 2, mandatory
 Description:
The primary identifier of Hazardous_waste_container

Fields

UsedSite char 2, mandatory
 Description:
Site that of Hazardous_waste_container
 Foreign Key To:
Site
 Fact:
"Hazardous_waste_container used at Site" on model-page 16.

UsedYear char 2, mandatory
 Description:
Year that for Hazardous_waste_container
 Fact:
"Hazardous_waste_container used in Year" on model-page 16.

GeneratedState char 2, mandatory
 Description:
State that of generation for Hazardous_waste_container
 Fact:
"Hazardous_waste_container generated in State" on model-page 16.

Form_code char 3, mandatory
 Description:
Form_code that of Hazardous_waste_container
 Fact:
"Hazardous_waste_container has Form_code" on model-page 16.

Routine_flag char 1, mandatory
 Description:
Routine_flag that of Hazardous_waste_container
 Fact:
"Hazardous_waste_container has Routine_flag" on model-page 16.

GeneratedActivity_type char 2, mandatory
 Description:
Activity_type that generated Hazardous_waste_container
 Fact:
"Hazardous_waste_container generated by Activity_type" on model-page 16.

GeneratedWorkCSO	<p>char 2, mandatory</p> <p>Description: <i>CSO that work generated Hazardous_waste_container</i></p> <p>Fact: <i>"Hazardous_waste_container generated during work for CSO" on model-page 16.</i></p>
Waste_type	<p>char 2, mandatory</p> <p>Description: <i>Waste_type that contained in Hazardous_waste_container</i></p> <p>Fact: <i>"Hazardous_waste_container contains Waste_type" on model-page 17.</i></p>
Qty_value	<p>real 4, mandatory</p> <p>Description: <i>Qty_value that of Qty</i></p> <p>Fact: <i>"Hazardous_waste_container in Qty" on model-page 17.</i></p>
Qty_units	<p>char 2, mandatory</p> <p>Description: <i>Qty_units that of Qty</i></p> <p>Fact: <i>"Hazardous_waste_container in Qty" on model-page 17.</i></p>
IncludedSite	<p>char 2, optional</p> <p>Description: <i>Site that has Inventory_waste</i></p> <p>Foreign Key To: <i>Inventory_waste</i></p> <p>Fact: <i>"Inventory_waste includes Hazardous_waste_container" on model-page 18.</i></p>
IncludedYear	<p>char 2, optional</p> <p>Description: <i>Year that in Inventory_waste</i></p> <p>Foreign Key To: <i>Inventory_waste</i></p> <p>Fact: <i>"Inventory_waste includes Hazardous_waste_container" on model-page 18.</i></p>
IncludedWaste_type	<p>char 2, optional</p> <p>Description: <i>Waste_type that type of Inventory_waste</i></p> <p>Foreign Key To: <i>Inventory_waste</i></p> <p>Fact: <i>"Inventory_waste includes Hazardous_waste_container" on model-page 18.</i></p>

Hz_wst_strmYrSystem_typQty**Description**

Haz_waste_streamYear was treated by System_type in qty Qty

This table was derived from the fact Haz_waste_streamYear was treated by System_type in qty Qty.

Primary Key

Year	char 2, mandatory Description: <i>Year that for Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
GeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
PartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
System_type	char 3, mandatory

Fields

Qty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Haz_waste_streamYear was treated by System_type in qty Qty" on model-page 9.</i>
Qty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Haz_waste_streamYear was treated by System_type in qty Qty" on model-page 9.</i>

Input_streamProcess**Description**

Input_stream goes into Process

This table was derived from the fact Input_stream goes into Process.

Primary Key

UsesInput_stream

integer 2, mandatory.

Description:

Input_stream that goes into Process

GoesProcess

varchar 2, mandatory

Description:

Process that uses Input_stream

Inventory_waste

Description

Table of Inventory_waste
 This table contains the 1 to many roles of Inventory_waste.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Inventory_waste</i> Foreign Key To: <i>Site</i>
Year	char 2, mandatory Description: <i>Year that in Inventory_waste</i>
Waste_type	char 2, mandatory Description: <i>Waste_type that type of Inventory_waste</i>

Fields

AnnotatedComment	varchar 2, optional Description: <i>Comment that annotates Inventory_waste</i> Fact: <i>"Inventory_waste annotated by Comment" on model-page 18.</i>
------------------	--

Incident Foreign Keys

Table	Field(s)	Relationship
Hazardous_waste_container	IncludedSite IncludedYear IncludedWaste_type	1:m

LocationPerson**Description**

Location is responsibility of Person

This table was derived from the fact Location is responsibility of Person.

Primary Key

ResponsibleLocation

char 2, mandatory

Description:

Location that is responsibility of Person

ResponsibilityPerson

char 9, mandatory

Description:

Person that is responsible for Location

Foreign Key To:

Person

Lot**Description**

Table of Lot

This table contains the 1 to many roles of Lot.

Primary Key

Lot

char 2, mandatory

Description:

*The primary identifier of Lot***Fields**

MadeYear

char 2, mandatory

Description:

Year that of Date

Fact:

"Lot made on Date" on model-page 30.

MadeMonthl

integer 2, mandatory

Description:

Monthl that of Date

Fact:

"Lot made on Date" on model-page 30.

MadeDay

integer 2, mandatory

Description:

Day that of Date

Fact:

"Lot made on Date" on model-page 30.

MadeCompany

char 2, mandatory

Description:

Company that manufacturer of Lot

Fact:

*"Lot made by Company" on model-page 30.***Secondary Indexes**

LotIdx2

Compound alternate unique index over:

*MadeCompany, MadeYear, MadeMonthl, MadeDay***Incident Foreign Keys**

Table

Field(s)

Relationship

CompoundLotMSDS

Lot

1:m

Movement**Description**

Table of Movement

This table contains the 1 to many roles of Movement.

Primary Key

Movement

char 2, mandatory

Description:

The primary identifier of Movement

Fields

FromLocation

char 2, mandatory

Description:

Location that was source of Movement

Fact:

"Movement from Location" on model-page 29.

ToLocation

char 2, mandatory

Description:

Location that was destination of Movement

Fact:

"Movement to Location" on model-page 29.

AuthorizedPerson

char 9, mandatory

Description:

Person that authorized Movement

Foreign Key To:

Person

Fact:

"Movement was authorized by Person" on model-page 29.

OccurredYear

char 2, mandatory

Description:

Year that of Date

Fact:

"Movement occurred on Date" on model-page 29.

OccurredMonthl

integer 2, mandatory

Description:

Monthl that of Date

Fact:

"Movement occurred on Date" on model-page 29.

OccurredDay

integer 2, mandatory

Description:

Day that of Date

Fact:

"Movement occurred on Date" on model-page 29.

Incident Foreign Keys

Table	Field(s)	Relationship
PackageMovement	MovedMovement	1:m

Off_site_HWS_shipment**Description**

Table of Off_site_HWS_shipment

This table contains the 1 to many roles of Off_site_HWS_shipment.

Primary Key

ReceivedFromSiteSourceSit	char 2, mandatory Description: <i>Site that source of off site waste Off_site_HWS_shipment</i> Foreign Key To: <i>Site</i>
Off_site_shipment_seq_no	char 3, mandatory Description: <i>Off_site_shipment_seq_no that of Off_site_HWS_shipment</i>
Year	char 2, mandatory Description: <i>Year that for Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
GeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
PartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>

Fields

ReceivedFromSiteQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Off_site_HWS_shipment received from off site in Qty" on model-page 15.</i>
ReceivedFromSiteQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Off_site_HWS_shipment received from off site in Qty" on model-page 15.</i>

AnnotatedComment

varchar 2, optional

Description:

Comment that annotates Off_site_HWS_shipment

Fact:

"Off_site_HWS_shipment annotated by Comment" on model-page 15.

Package**Description**

Table of Package

This table was derived from the fact Package included in Input_stream.

Primary Key

Package

char 2, mandatory

Description:

*The primary identifier of Package***Fields**

IncludedInput_stream

integer 2, optional

Description:

Input_stream that includes Package

Fact:

"Package included in Input_stream" on model-page 27.

CurrentlyStoredLocation

char 2, mandatory

Description:

Location that is current location of Package

Fact:

"Package is currently stored in Location" on model-page 28.

DescribedMSDS

char 2, mandatory

Description:

MSDS that describes Package

Fact:

"Package described by MSDS" on model-page 28.

PartPackage

char 2, optional

Description:

Package that is split into Package

Foreign Key To:

Package

Fact:

*"Package is split into Package" on model-page 29.***Incident Foreign Keys****Table****Field(s)****Relationship**

PackageQtyCompound

Package

1:m

PackageMovement

MovedPackage

1:m

Package

PartPackage

1:m

PackageMovement**Description**

Package was moved by Movement

This table was derived from the fact Package was moved by Movement.

Primary Key

MovedPackage

char 2, mandatory

Description:

Package that was moved by Movement

Foreign Key To:

Package

MovedMovement

char 2, mandatory

Description:

Movement that moved Package

Foreign Key To:

Movement

Person**Description**

Table of Person

This table contains the 1 to many roles of Person.

Primary Key

Person

char 9, mandatory

Description:

*The primary identifier of Person***Fields**

WorksSite

char 2, mandatory

Description:

Site that is work location of Person

Foreign Key To:

Site

Fact:

"Person works at Site" on model-page 26.

WorksCompany

char 2, mandatory

Description:

Company that employs Person

Fact:

"Person works for Company" on model-page 26.

Job_title

varchar 2, mandatory

Description:

Job_title that of Person

Fact:

"Person has Job_title" on model-page 26.

Name_first

varchar 2, mandatory

Description:

Name_first that of Person

Fact:

"Person has Name_first" on model-page 26.

Middle_initial

char 1, mandatory

Description:

Middle_initial that of Person

Fact:

"Person has Middle_initial" on model-page 26.

Name_last

varchar 2, mandatory

Description:

Name_last that of Person

Fact:

"Person has Name_last" on model-page 26.

Incident Foreign Keys

Table	Field(s)	Relationship
PersonPhone	Person	1:m
LocationPerson	ResponsibilityPerson	1:m
Site	ContactPerson	1:m
Signature	Person	1:m
Movement	AuthorizedPerson	1:m



PersonPhone

Description

Person has Phone

This table was derived from the fact Person has Phone.

Primary Key

Person

char 9, mandatory

Description:

Person that has Phone

Foreign Key To:

Person

Phone

char 10, mandatory

Description:

Phone that of Person

PPOA_goal**Description**

Table of PPOA_goal

This table contains the 1 to many roles of PPOA_goal.

Primary Key

Site

char 2, mandatory

Description:

Site that has PPOA_goal

Foreign Key To:

Site

Year

char 2, mandatory

Description:

*Year that in PPOA_goal***Fields**

Number_of_goals

integer 2, mandatory

Description:

Number_of_goals that in PPOA_goal

Fact:

"PPOA_goal is for Number_of_goals" on model-page 22.

ProcessHaz_waste_stream**Description**

Process generates Haz_waste_stream

This table was derived from the fact Process generates Haz_waste_stream.

Primary Key

GeneratedProcess	varchar 2, mandatory Description: <i>Process that generates Haz_waste_stream</i>
GeneratesGeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>
GeneratesPartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_stream</i>

Recycle_container

Description

Table of Recycle_container

This table contains the 1 to many roles of Recycle_container.

Primary Key

Recycle_container : char 2, mandatory
 Description:
The primary identifier of Recycle_container

Fields

Site char 2, mandatory
 Description:
Sife that of Recycle_container
 Foreign Key To:
Site
 Fact:
"Recycle_container for Site" on model-page 19.

Year char 2, mandatory
 Description:
Year that in Recycle_container
 Fact:
"Recycle_container for Year" on model-page 19.

Recycle_content_type varchar 2, mandatory
 Description:
Recycle_content_type that type of Recycle_container
 Foreign Key To:
Recycle_content_type
 Fact:
"Recycle_container of Recycle_content_type" on model-page 19.

Qty_value real 4, mandatory
 Description:
Qty_value that of Qty
 Fact:
"Recycle_container contains Qty" on model-page 19.

Qty_units char 2, mandatory
 Description:
Qty_units that of Qty
 Fact:
"Recycle_container contains Qty" on model-page 19.

MaximumCapacityQty_value real 4, mandatory
 Description:
Qty_value that of Qty
 Fact:
"Recycle_container has maximum capacity of Qty" on model-page 19.

MaximumCapacityQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Recycle_container has maximum capacity of Qty" on model-page 19.</i>
IncludedSite	char 2, optional Description: <i>Site that of Recycle_inventory</i> Foreign Key To: <i>Site</i> Fact: <i>"Recycle_container included in Recycle_inventory" on model-page 19.</i>
IncludedYear	char 2, optional Description: <i>Year that in Recycle_inventory</i> Fact: <i>"Recycle_container included in Recycle_inventory" on model-page 19.</i>
IncludedRecycle_cntnt_typ	varchar 2, optional Description: <i>Recycle_content_type that type of Recycle_inventory</i> Foreign Key To: <i>Recycle_content_type</i> Fact: <i>"Recycle_container included in Recycle_inventory" on model-page 19.</i>

Recycle_content_type**Description**

Table of Recycle_content_type

This table contains the 1 to many roles of Recycle_content_type.

Primary Key

Recycle_content_type

varchar 2, mandatory

Description:

Recycle_content_type that aggregated into HL_recycle_content_type

Fields

AggrgtdHL_rcycl_cntnt_typ

varchar 2, mandatory

Description:

HL_recycle_content_type that includes Recycle_content_type

Fact:

"Recycle_content_type aggregated into HL_recycle_content_type" on model-page 19.

Incident Foreign Keys

Table	Field(s)	Relationship
Recycle_container	Recycle_content_type	1:m
Recycle_container	IncludedRecycle_cntnt_typ	1:m

Recycling_limits**Description**

Table of Recycling_limits

This table contains the 1 to many roles of Recycling_limits.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Date</i> Foreign Key To: <i>SiteYear</i>
Year	char 2, mandatory Description: <i>Year that of Date</i> Foreign Key To: <i>SiteYear</i>
Monthl	integer 2, mandatory Description: <i>Monthl that of Date</i> Foreign Key To: <i>SiteYear</i>
Day	integer 2, mandatory Description: <i>Day that of Date</i> Foreign Key To: <i>SiteYear</i>
R_item_seq_no	integer 2, mandatory Description: <i>R_item_seq_no that of Recycling_limits</i>

Fields

R_item_desc	varchar 2, mandatory Description: <i>R_item_desc that of Recycling_limits</i> Fact: <i>"Recycling_limits has R_item_desc" on model-page 4.</i>
R_item_response	char 1, mandatory Description: <i>R_item_response that of Recycling_limits</i> Fact: <i>"Recycling_limits has R_item_response" on model-page 4.</i>

Site**Description****Table of Site**

This table contains the 1 to many roles of Site.

Primary Key

Site char 2, mandatory
 Description:
The primary identifier of Site

Fields

Site_change_flag char 2, mandatory
 Description:
Site_change_flag that for Site
 Fact:
"Site has Site_change_flag" on model-page 1.

NameSite_name char 2, mandatory
 Description:
Site_name that name of Site
 Fact:
"Site has name Site_name" on model-page 1.

OwnedCompany char 2, mandatory
 Description:
Company that owner of Site
 Fact:
"Site owned by Company" on model-page 1.

LocatedCounty char 2, mandatory
 Description:
County that location of Site
 Fact:
"Site located in County" on model-page 1.

AddressStreet varchar 2, mandatory
 Description:
Street that of Address
 Fact:
"Site has address Address" on model-page 1.

AddressCity varchar 2, mandatory
 Description:
City that of Address
 Fact:
"Site has address Address" on model-page 1.

AddressZip	char 9, mandatory Description: <i>Zip that of Address</i> Fact: <i>"Site has address Address" on model-page 1.</i>
AddressState	char 2, mandatory Description: <i>State that of Address</i> Fact: <i>"Site has address Address" on model-page 1.</i>
GetsMailStreet	varchar 2, mandatory Description: <i>Street that of Address</i> Fact: <i>"Site gets mail at Address" on model-page 1.</i>
GetsMailCity	varchar 2, mandatory Description: <i>City that of Address</i> Fact: <i>"Site gets mail at Address" on model-page 1.</i>
GetsMailZip	char 9, mandatory Description: <i>Zip that of Address</i> Fact: <i>"Site gets mail at Address" on model-page 1.</i>
GetsMailState	char 2, mandatory Description: <i>State that of Address</i> Fact: <i>"Site gets mail at Address" on model-page 1.</i>
LocatedState	char 2, mandatory Description: <i>State that location of Site</i> Fact: <i>"Site located in State" on model-page 1.</i>
ContactPerson	char 9, mandatory Description: <i>Person that is contact for Site</i> Foreign Key To: <i>Person</i> Fact: <i>"Site has contact Person" on model-page 2.</i>
Generator_flag	char 1, mandatory Description: <i>Generator_flag that for Site</i> Fact: <i>"Site has Generator_flag" on model-page 5.</i>

Transporter_flag	char 1, mandatory Description: <i>Transporter_flag that for Site</i> Fact: <i>"Site has Transporter_flag" on model-page 5.</i>
TSDR_flag	char 1, mandatory Description: <i>TSDR_flag that for Site</i> Fact: <i>"Site has TSDR_flag" on model-page 5.</i>
Off_site_availability_cod	char 1, optional Description: <i>Off_site_availability_code that of Site</i> Fact: <i>"Site has Off_site_availability_code" on model-page 10.</i>

Secondary Indexes

Siteldx1	Simple alternate unique index over: <i>NameSite_name</i>
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Incident Foreign Keys

Table	Field(s)	Relationship
SiteSic	SicSite	1:m
SiteYearSiteYear	Site	1:m
Hazardous_waste_container	UsedSite	1:m
Recycle_container	Site	1:m
Person	WorksSite	1:m
UsageCompoundQty	Site	1:m
SiteYear	Site	1:m
Haz_waste_stream	GeneratedSite	1:m
Total_off_site_shpmnt_qty	SentToSite	1:m
Off_site_HWS_shipment	ReceivedFromSiteSourceSit	1:m
Inventory_waste	Site	1:m
Recycle_container	IncludedSite	1:m
WminPP_goal_summary	Site	1:m
Waste_min_goal	Site	1:m
PPOA_goal	Site	1:m
Wminpp_budget	Site	1:m

SiteSic

Description

Site has principal products in SIC

This table was derived from the fact Site has principal products in SIC.

Primary Key

SicSite

char 2, mandatory

Description:

Site that has principal products in SIC

Foreign Key To:

Site

PrincipalProductsSic

char 4, mandatory

Description:

SIC that is sic for Site

SiteYear**Description**

Table of SiteYear

This table contains the 1 to many roles of SiteYear.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Date</i> Foreign Key To: <i>Site</i>
Year	char 2, mandatory Description: <i>Year that of Date</i>
Monthl	integer 2, mandatory Description: <i>Monthl that of Date</i>
Day	integer 2, mandatory Description: <i>Day that of Date</i>

Fields

IncludesSignature	varchar 2, optional Description: <i>Signature that for SiteYear</i> Foreign Key To: <i>Signature</i> Fact: <i>"SiteYear includes Signature" on model-page 2.</i>
RCRA_gen_status	char 2, mandatory Description: <i>RCRA_gen_status that of SiteYear</i> Fact: <i>"SiteYear has RCRA_gen_status" on model-page 3.</i>
On_site_waste_status_A	char 2, mandatory Description: <i>On_site_waste_status_A that of SiteYear</i> Fact: <i>"SiteYear has On_site_waste_status_A" on model-page 3.</i>
On_site_waste_status_B	char 2, mandatory Description: <i>On_site_waste_status_B that of SiteYear</i> Fact: <i>"SiteYear has On_site_waste_status_B" on model-page 3.</i>

On_site_waste_status_C char 2, mandatory
 Description:
On_site_waste_status_C that of SiteYear
 Fact:
"SiteYear has On_site_waste_status_C" on model-page 3.

Waste_min_source_reductin char 2, mandatory
 Description:
Waste_min_source_reduction that of SiteYear
 Fact:
"SiteYear has Waste_min_source_reduction" on model-page 4.

Waste_min_recycling char 2, mandatory
 Description:
Waste_min_recycling that of SiteYear
 Fact:
"SiteYear has Waste_min_recycling" on model-page 4.

Waste_min_opportunities char 2, mandatory
 Description:
Waste_min_opportunities that of SiteYear
 Fact:
"SiteYear has Waste_min_opportunities" on model-page 4.

Incident Foreign Keys

Table	Field(s)	Relationship
SiteYearSiteYear	Site0 Yea0 Month1 Day	1:m
SiteYearNon_gen_reason	Site Year Month1 Day	1:m
Source_reduction_limits	Site Year Month1 Day	1:m
Recycling_limits	Site Year Month1 Day	1:m
TDR_Process_Year	Site Year Month1 Day	1:m

SiteYearNon_gen_reason**Description**

SiteYear has Non_gen_reason

This table was derived from the fact SiteYear has Non_gen_reason.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Date</i> Foreign Key To: <i>SiteYear</i>
Year	char 2, mandatory Description: <i>Year that of Date</i> Foreign Key To: <i>SiteYear</i>
Monthl	integer 2, mandatory Description: <i>Monthl that of Date</i> Foreign Key To: <i>SiteYear</i>
Day	integer 2, mandatory Description: <i>Day that of Date</i> Foreign Key To: <i>SiteYear</i>
Non_gen_reason	char 2, mandatory Description: <i>Non_gen_reason that of SiteYear</i>

SiteYearSiteYear**Description**

Site provides for Year an SiteYear

This table was derived from the fact Site provides for Year an SiteYear.

Primary Key

Site	char 2, mandatory Foreign Key To: Site
Year	char 2, mandatory

Fields

Sit0	char 2, mandatory Description: Site that has Date Foreign Key To: SiteYear Fact: "Site provides for Year an SiteYear" on model-page 2.
Yea0	char 2, mandatory Description: Year that of Date Foreign Key To: SiteYear Fact: "Site provides for Year an SiteYear" on model-page 2.
Monthl	integer 2, mandatory Description: Monthl that of Date Foreign Key To: SiteYear Fact: "Site provides for Year an SiteYear" on model-page 2.
Day	integer 2, mandatory Description: Day that of Date Foreign Key To: SiteYear Fact: "Site provides for Year an SiteYear" on model-page 2.

Source_reduction_limits**Description**

Table of Source_reduction_limits

This table contains the 1 to many roles of Source_reduction_limits.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Date</i> Foreign Key To: <i>SiteYear</i>
Year	char 2, mandatory Description: <i>Year that of Date</i> Foreign Key To: <i>SiteYear</i>
Monthl	integer 2, mandatory Description: <i>Monthl that of Date</i> Foreign Key To: <i>SiteYear</i>
Day	integer 2, mandatory Description: <i>Day that of Date</i> Foreign Key To: <i>SiteYear</i>
SR_item_seq_no	integer 2, mandatory Description: <i>SR_item_seq_no that of Source_reduction_limits</i>

Fields

SR_item_desc	char 2, mandatory Description: <i>SR_item_desc that of Source_reduction_limits</i> Fact: <i>"Source_reduction_limits has SR_item_desc" on model-page 4.</i>
SR_item_response	char 1, mandatory Description: <i>SR_item_response that of Source_reduction_limits</i> Fact: <i>"Source_reduction_limits has SR_item_response" on model-page 4.</i>

TDR_process_change**Description**

Table of TDR_process_change

This table contains the 1 to many roles of TDR_process_change.

Primary Key

TDR_PC_seq_no	char 2, mandatory Description: <i>TDR_PC_seq_no that of TDR_process_change</i>
ProposedTDR_Process	char 2, mandatory Description: <i>TDR_Process that has proposed TDR_process_change</i> Foreign Key To: <i>TDR_Process</i>

Fields

TotalNewMaxOpCapQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_process_change has total new max op cap Qty" on model-page 14.</i>
TotalNewMaxOpCapQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_process_change has total new max op cap Qty" on model-page 14.</i>
RcraNewMaxOpCapQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_process_change has rcra new max op cap Qty" on model-page 14.</i>
RcraNewMaxOpCapQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_process_change has rcra new max op cap Qty" on model-page 14.</i>
Com_cap_availability_code	char 1, mandatory Description: <i>Com_cap_availability_code that of TDR_process_change</i> Fact: <i>"TDR_process_change has Com_cap_availability_code" on model-page 14.</i>

PrcntFtrCmrcI CpctyPrcnt_cm_cp

real 4, mandatory

Description:

Percent_com_cap that is percent future commercial capacity for TDR_process_change

Fact:

"TDR_process_change has percent future commercial capacity Percent_com_cap" on model-page 14.

PlannedYear

char 2, mandatory

Description:

Year that for planned TDR_process_change

Fact:

"TDR_process_change planned for Year" on model-page 14.

TDR_Process_Year**Description**

Table of TDR_Process_Year

This table contains the 1 to many roles of TDR_Process_Year.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Date</i> Foreign Key To: <i>SiteYear</i>
Year	char 2, mandatory Description: <i>Year that of Date</i> Foreign Key To: <i>SiteYear</i>
Monthl	integer 2, mandatory Description: <i>Monthl that of Date</i> Foreign Key To: <i>SiteYear</i>
Day	integer 2, mandatory Description: <i>Day that of Date</i> Foreign Key To: <i>SiteYear</i>
TDR_Process	char 2, mandatory Description: <i>TDR_Process that has instance in TDR_Process_Year</i> Foreign Key To: <i>TDR_Process</i>

Fields

DescribedTDR_process_desc	char 2, mandatory Description: <i>TDR_process_desc that describes TDR_Process_Year</i> Fact: <i>"TDR_Process_Year described by TDR_process_desc" on model-page 12.</i>
System_type	char 3, mandatory Description: <i>System_type that of TDR_Process_Year</i> Fact: <i>"TDR_Process_Year has System_type" on model-page 12.</i>

Regulatory_status	char 2, mandatory Description: <i>Regulatory_status that of TDR_Process_Year</i> Fact: <i>"TDR_Process_Year has Regulatory_status" on model-page 12.</i>
Operational_status	char 2, mandatory Description: <i>Operational_status that of TDR_Process_Year</i> Fact: <i>"TDR_Process_Year has Operational_status" on model-page 12.</i>
AnnotatedComment	varchar 2, optional Description: <i>Comment that annotates TDR_Process_Year</i> Fact: <i>"TDR_Process_Year annotated by Comment" on model-page 12.</i>
Yea0	char 2, mandatory Description: <i>Year that of TDR_Process_Year</i> Fact: <i>"TDR_Process_Year for Year" on model-page 12.</i>
InfluentTotalQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_Process_Year has influent total Qty" on model-page 13.</i>
InfluentTotalQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_Process_Year has influent total Qty" on model-page 13.</i>
InfluentRcraQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_Process_Year has influent rcra Qty" on model-page 13.</i>
InfluentRcraQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_Process_Year has influent rcra Qty" on model-page 13.</i>
TotalMaxOpCapQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_Process_Year has total max op cap Qty" on model-page 13.</i>

TotalMaxOpCapQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_Process_Year has total max op cap Qty" on model-page 13.</i>
RcraMaxOpCapQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_Process_Year has rcra max op cap Qty" on model-page 13.</i>
RcraMaxOpCapQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_Process_Year has rcra max op cap Qty" on model-page 13.</i>
TotalLiquidEffluentQty_vl	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_Process_Year has total liquid effluent Qty" on model-page 13.</i>
TotalLiquidEffluentQty_nts	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_Process_Year has total liquid effluent Qty" on model-page 13.</i>
RcraLiquidEffluentQty_val	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_Process_Year has rcra liquid effluent Qty" on model-page 13.</i>
RcraLiquidEffluentQty_nts	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_Process_Year has rcra liquid effluent Qty" on model-page 13.</i>
TotalSsResidualQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"TDR_Process_Year has total s/s residual Qty" on model-page 13.</i>
TotalSsResidualQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"TDR_Process_Year has total s/s residual Qty" on model-page 13.</i>

RcraSsResidualQty_value

real 4, mandatory

Description:

Qty_value that of Qty

Fact:

"TDR_Process_Year has rcra s/s residual Qty" on model-page 13.

RcraSsResidualQty_units

char 2, mandatory

Description:

Qty_units that of Qty

Fact:

"TDR_Process_Year has rcra s/s residual Qty" on model-page 13.

Incident Foreign Keys

Table	Field(s)	Relationship
TDR_Process_YearUnit_type	Site Year Monthl Day TDR_Process	1:m

TDR_Process_YearUnit_type**Description**

TDR_Process_Year has Unit_type

This table was derived from the fact TDR_Process_Year has Unit_type.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Date</i> Foreign Key To: <i>TDR_Process_Year</i>
Year	char 2, mandatory Description: <i>Year that of Date</i> Foreign Key To: <i>TDR_Process_Year</i>
Monthl	integer 2, mandatory Description: <i>Monthl that of Date</i> Foreign Key To: <i>TDR_Process_Year</i>
Day	integer 2, mandatory Description: <i>Day that of Date</i> Foreign Key To: <i>TDR_Process_Year</i>
TDR_Process	char 2, mandatory Description: <i>TDR_Process that has instance in TDR_Process_Year</i> Foreign Key To: <i>TDR_Process_Year</i>
Unit_type	char 2, mandatory Description: <i>Unit_type that of TDR_Process_Year</i>

Total_off_site_shpmnt_qty**Description**

Table of Total_off_site_shipment_qty
 This table contains the 1 to many roles of Total_off_site_shipment_qty.

Primary Key

SentToSite	char 2, mandatory Description: <i>Site that receives Total_off_site_shipment_qty</i> Foreign Key To: <i>Site</i>
TreatedSystem_type	char 3, mandatory Description: <i>System_type that used to treat Total_off_site_shipment_qty</i>
Year	char 2, mandatory Description: <i>Year that for Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
GeneratedSite	char 2, mandatory Description: <i>Site that generates Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>
PartlyHWS_seq_no	integer 2, mandatory Description: <i>HWS_seq_no that of Haz_waste_stream</i> Foreign Key To: <i>Haz_waste_streamYear</i>

Fields

Qty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Total_off_site_shipment_qty in Qty" on model-page 10.</i>
Qty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Total_off_site_shipment_qty in Qty" on model-page 10.</i>

UsageCompoundQty**Description**

Usage of Compound in Qty

This table was derived from the fact Usage of Compound in Qty.

Primary Key

Hazard_material_33_50	char 2, mandatory Description: <i>Hazard_material_33_50 that for Usage</i>
Site	char 2, mandatory Description: <i>Site that of Usage</i> Foreign Key To: <i>Site</i>
Year	char 2, mandatory Description: <i>Year that for Usage</i>
Compound	char 2, mandatory Foreign Key To: <i>Compound</i>

Fields

Qty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Usage of Compound in Qty" on model-page 31.</i>
Qty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Usage of Compound in Qty" on model-page 31.</i>

Waste_min_goal**Description**

Table of Waste_min_goal

This table contains the 1 to many roles of Waste_min_goal.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Waste_min_goal</i> Foreign Key To: Site
Year	char 2, mandatory Description: <i>Year that of Waste_min_goal</i>
Waste_type	char 2, mandatory Description: <i>Waste_type that is type of Waste_min_goal</i>

Fields

TargetQty_value	real 4, mandatory Description: <i>Qty_value that of Qty</i> Fact: <i>"Qty for Waste_min_goal" on model-page 21.</i>
TargetQty_units	char 2, mandatory Description: <i>Qty_units that of Qty</i> Fact: <i>"Qty for Waste_min_goal" on model-page 21.</i>

Waste_typeYearAccmplshmnt**Description**

Waste_type in Year accomplished Accomplishment

This table was derived from the fact Waste_type in Year accomplished Accomplishment.

Primary Key

Waste_type

char 2, mandatory

Description:

HLW, TRU, mixed TRU, LLW, mixed LLW, RCRA reg, state reg, TSCA reg, mixed TSCA, sanitary

Year

char 2, mandatory

Fields

Accomplishment

varchar 2, mandatory

Fact:

"Waste_type in Year accomplished Accomplishment" on model-page 17.

Wastewater_container**Description**

Table of Wastewater_container

This table was derived from the fact Wastewater_container is of type Waste_type.

Primary Key

Wastewater_container

char 2, mandatory

Description:

The primary identifier of Wastewater_container

Fields

TypeWaste_type

char 2, mandatory

Description:

Waste_type that of Wastewater_container

Fact:

"Wastewater_container is of type Waste_type" on model-page 17.

Qty_value

real 4, mandatory

Description:

Qty_value that of Qty

Fact:

"Qty in Wastewater_container" on model-page 17.

Qty_units

char 2, mandatory

Description:

Qty_units that of Qty

Fact:

"Qty in Wastewater_container" on model-page 17.

Wminpp_budget**Description**

Table of Wminpp_budget

This table contains the 1 to many roles of Wminpp_budget.

Primary Key

Site	char 2, mandatory Description: <i>Site that has Wminpp_budget</i> Foreign Key To: <i>Site</i>
Year	char 2, mandatory Description: <i>Year that of Wminpp_budget</i>

Fields

TotalOperatingDollars	real 4, mandatory Description: <i>Dollars that is total operating Wminpp_budget</i> Fact: <i>"Wminpp_budget has total operating Dollars" on model-page 23.</i>
TotalCapitalDollars	real 4, mandatory Description: <i>Dollars that is total capital Wminpp_budget</i> Fact: <i>"Wminpp_budget has total capital Dollars" on model-page 23.</i>
TotalDollars	real 4, mandatory Description: <i>Dollars that is total Wminpp_budget</i> Fact: <i>"Wminpp_budget has total Dollars" on model-page 23.</i>
PpoaDollars	real 4, mandatory Description: <i>Dollars that ppoa budget for Wminpp_budget</i> Fact: <i>"Wminpp_budget for ppoa Dollars" on model-page 23.</i>
HazardSourceReductionDlrs	real 4, mandatory Description: <i>Dollars that is hazard source reduction Wminpp_budget</i> Fact: <i>"Wminpp_budget has hazard source reduction Dollars" on model-page 24.</i>

RadSourceReductionDollars	real 4, mandatory Description: <i>Dollars that is rad source reduction Wminpp_budget</i> Fact: <i>"Wminpp_budget has rad source reduction Dollars" on model-page 24.</i>
MixedSourceReductionDollars	real 4, mandatory Description: <i>Dollars that is mixed source reduction Wminpp_budget</i> Fact: <i>"Wminpp_budget has mixed source reduction Dollars" on model-page 24.</i>
HazardRecyclingDollars	real 4, mandatory Description: <i>Dollars that is hazard recycling Wminpp_budget</i> Fact: <i>"Wminpp_budget has hazard recycling Dollars" on model-page 24.</i>
RadRecyclingDollars	real 4, mandatory Description: <i>Dollars that is rad recycling Wminpp_budget</i> Fact: <i>"Wminpp_budget has rad recycling Dollars" on model-page 24.</i>
MixedRecyclingDollars	real 4, mandatory Description: <i>Dollars that is mixed recycling Wminpp_budget</i> Fact: <i>"Wminpp_budget has mixed recycling Dollars" on model-page 24.</i>
SsrrSanitaryWwDollars	real 4, mandatory Description: <i>Dollars that is ssrr for sanitary ww Wminpp_budget</i> Fact: <i>"Wminpp_budget has ss/rr for sanitary ww Dollars" on model-page 24.</i>

WminPP_goal_summary**Description**

Table of WminPP_goal_summary

This table contains the 1 to many roles of WminPP_goal_summary.

Primary Key

Site	char 2, mandatory Description: <i>Site that has WminPP_goal_summary</i> Foreign Key To: <i>Site</i>
Year	char 2, mandatory Description: <i>Year that of WminPP_goal_summary</i>

Fields

AnnotatedWaste_min_narrtv	varchar 2, mandatory Description: <i>Waste_min_narrative that annotates WminPP_goal_summary</i> Fact: <i>"WminPP_goal_summary annotated by Waste_min_narrative" on model-page 21.</i>
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