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SOLID LOW-LEVEL WASTE FORECASTING GUIDE

K. J. Templeton
L. L. Dirks

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Pacific Northwest Laboratory
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EXECUTIVE SUMMARY

Guidance for forecasting solid low-level waste (LLW) on a site-wide basis is described in this document. Forecasting is defined as an approach for collecting information about future waste receipts. The forecasting approach discussed in this document is based solely on Hanford's experience within the last six years. Hanford's forecasting technique is not a statistical forecast based upon past receipts. Due to waste generator mission changes, startup of new facilities, and waste generator uncertainties, statistical methods have proven to be inadequate for the site. It is recommended that an approach similar to Hanford's annual forecasting strategy be implemented at each U.S. Department of Energy (DOE) installation to ensure that forecast data are collected in a consistent manner across the DOE complex.

Hanford's forecasting strategy consists of a forecast cycle that can take 12 to 30 months to complete. The duration of the cycle depends on the number of LLW generators and staff experience; however, the duration has been reduced with each new cycle. Implementation of the forecasting cycle has required approximately 2.75 full-time equivalents (FTEs). Cycle duration and required FTEs are site-specific, however, and vary depending on site variables.

Several uncertainties are associated with collecting data about future waste receipts. Volume, shipping schedule, and characterization data are often reported as estimates with some level of uncertainty. At Hanford, several methods have been implemented to capture the level of uncertainty. Collection of a maximum and minimum volume range has been implemented as well as questionnaires to assess the relative certainty in the requested data.

In addition, improvements to the forecast cycle at Hanford are constantly being evaluated to improve data quality and reduce the duration of the forecast cycle. Past improvements to the forecast cycle include the addition of the questionnaire and collection of the maximum and minimum volume ranges. Improvements that are currently being implemented into the forecast cycle include the development of an electronic collection system and establishment of a formalized review process to evaluate Hanford's programs. Lastly, a few improvements for future forecast cycles are being considered such as optional forecasting for waste generators that do not have significant changes from the previous forecast cycle and reduction of the requested forecasting period.

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FIGURE

1.0 INTRODUCTION

This guidance, prepared by Pacific Northwest Laboratory (PNL)[a] under the direction of Westinghouse Hanford Company (WHC), is intended to support the Low-Level Waste Management Program Data Management Work Group. This group was formed by the U.S. Department of Energy's (DOE) Low-Level Waste Management Program to improve current data management systems, data collection techniques, and overall data quality for radioactive low-level waste (LLW) information being used to support DOE strategic planning efforts. Several issues were identified by the group as needing improvement and guidance, and among those was guidance in forecasting solid LLW on a complex-wide basis. Currently, forecasting is done on a limited basis at most DOE installations, with the exception of Hanford, which has an established forecasting strategy. In fact, DOE-RL Order 58202A requires Hanford waste generators to submit annual waste forecasts.

Forecasting is defined as an approach for collecting information about future waste receipts. Complex-wide forecasting would be valuable in developing consistent data throughout the complex. In addition, forecasting is valuable for several other reasons:

- Forecasting can be used for site-level treatment, storage, and disposal (TSD) planning and justification.
- Forecasting provides data for current and future national data needs that are used complex-wide for strategic planning and funding allocations.
- Forecasting supports other national TSD activities such as planning centralized treatment facilities or disposal sites.

Hanford has implemented, utilized, and revised a forecasting technique over the past six years to assist in solid waste short- and long-term planning. This technique is an interactive process between sources generating LLW in future years and analysts trained to assess data quality and validity. This guide is based solely upon Hanford's experience and will therefore require adaptation to

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specific site requirements. It is not intended that the information described in this report be initiated at the DOE-HQ level; implementation will be required at each DOE installation. DOE-HQ would provide necessary coordination and guidance for site implementation.

This report provides complex-wide guidance for solid radioactive LLW forecasting. The scope has been limited to solid LLW generated during general facility operations and maintenance, terminal cleanout and stabilization, and facility close-out. Decontamination and decommissioning (D&D)/environmental restoration (ER) wastes are not included in the forecasting approach discussed in this document; methodologies implemented in the Programmatic Environmental Impact Statement (PEIS) and Baseline Environmental Management Report (BEMR) exist for wastes associated with D&D/ER. Implementing a consistent methodology for forecasting at each site will allow the data collected to be used as a complex-wide planning baseline.

A proposed site-wide forecast cycle is described in Section 2 that lists the chronological steps, cycle time, and full-time equivalents (FTEs) needed for implementing a forecasting strategy. Section 3 describes the initial planning and preparation that is required before implementing a site-wide forecasting strategy. The steps necessary to prepare a forecast request, submit the forecast form, and perform any needed waste generator training are provided in Section 4. Section 5 describes the development of a forecast database; Section 6 delineates the data receipt, data entry, and verification steps. Section 7 contains a description of the review and analysis of the data as well as of the types of reports that can be generated for data reporting. Ongoing waste generator support that is provided throughout the forecast cycle is summarized in Section 8. Section 9 briefly provides an overview of forecast uncertainties involved in the forecasting life cycle. Lastly, Section 10 describes past, current, and future considered forecast cycle improvements at the Hanford Site. A sample forecast form used at the Hanford Site can be found in Appendix A, and a training syllabus is included as Appendix B. Lastly, Appendix C provides a sample hazardous and radioactive solid waste forecast request.

2.0 OVERVIEW OF THE FORECAST CYCLE

The cycle proposed for implementing a successful forecasting strategy is shown in Figure 2.1. Once the initial planning and preparation steps (see Section 3) are complete, the cycle continues with forecast preparation (Section 4). Forecast submittal and waste generator training (Section 4) occur concurrently with forecast database development (Section 5). Data receipt, entry, and verification (Section 6) follow the forecast submittal, with analysis and reporting (Section 7) concluding the cycle. In addition, waste generator support (Section 8) is provided throughout the forecast cycle.

The cycle is expected to take 12 to 30 months. The length of time required for completion of the cycle depends primarily on the number and types of onsite and offsite waste generators sending waste to the site in future years. For example, if the majority of the LLW generated in the future is routine waste that is currently being generated by existing facilities/operations, forecasting could be fairly simple. If the waste volumes are based upon facility cleanout or the startup of multiple facilities in future years, forecasting will be much more complex. In addition, the expertise of staff completing the forecasts will impact the cycle time. Other factors influencing the duration of the cycle are the availability of analytical tools, database storage requirements, and the expertise of current staff analysts. Cycle durations will vary from site to site; however, with experience, the duration will be minimized.

At Hanford the forecasting cycle takes approximately 12 months. The staff that are analyzing, collecting, and summarizing the forecast information have been involved in this process for six years. Hanford's forecasting technique is not a statistical forecast based upon past receipts; due to mission changes, startup of new facilities, and waste generator uncertainties, statistical methods have proved to be inadequate for the site. Therefore, specific data are collected from over 90 onsite and offsite waste generators on an annual basis to fulfill data needs. This information is entered and maintained in a database system developed by trained database design and management experts.

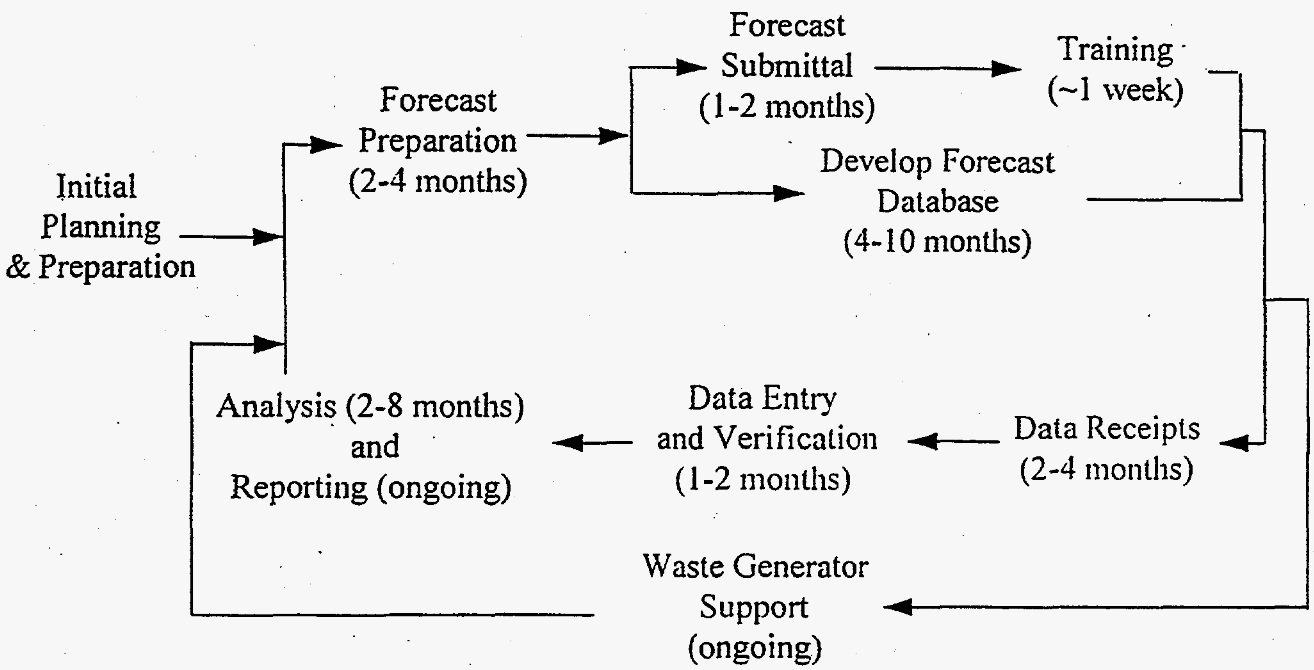

FIGURE 2.1. Data Collection Cycle

The staff required to complete a forecast cycle effort will also vary on a site-wide basis. The same factors that alter the cycle duration also affect the number of staff required. Hanford uses one project manager at about 3/4 full-time equivalent (FTE), one lead analyst at 1/2 FTE, and database management staff equivalent to 1.5 FTE. Total staff required is approximately 2.75 FTE. This only accounts for the staff members that are collecting, analyzing, maintaining, and reporting the forecast information. It does not account for the time that is needed for each waste generator to complete the forecast packet.

3.0 INITIAL PLANNING AND PREPARATION

The initial planning and preparation steps that are required for implementing a solid LLW forecasting strategy are described in this section. For the purposes of this document, it has been assumed that the reader has no experience in forecasting, so the complete forecast life cycle will be described in Sections 3 through 8. The first crucial step of the cycle is initial planning and preparation. This step includes identifying data needs and data sources, gaining site-wide support, locating tools and staffing, and providing internal training as needed. Upon completion of these planning issues, continuation of the forecast cycle can occur.

3.1 DATA NEEDS

Before implementing the forecast cycle, the site's data needs for future treatment, storage, and disposal (TSD) facility planning must be determined. The requested time period for forecasting volumes and characteristics should be evaluated to fit the site's needs. Many factors should be evaluated when determining the future time frame for forecasted data. Waste generator and TSD facility startups, site milestones, and knowledge of future solid waste generation are all issues that influence the data-collection time frame. For some sites, 30 years of waste information may be required to support current site-wide milestones, whereas a site that will be remediated within 10 years will require less than 30 years of forecast data.

Once the duration for collecting future waste data has been established, data needs should be determined. All of the various uses for the resulting data should be considered when establishing the data needs. The types of data most frequently requested include:

- future waste volumes
- waste types
- container types
- physical waste forms
- radionuclide information.

3.1.1 Future Waste Volumes

Future waste volumes are critical in determining the capacity for TSD facilities. In addition, volumes aid in justifying the need and size for such facilities. Waste volumes can also be assigned relative certainty levels by collecting maximum and minimum percentages with the baseline volume. Maximum and minimum percentages provide insight into scheduling and mission assumptions, alternative strategies, and mission uncertainties. This will allow the analyst to determine the quality of the baseline and assess alternative capacity requirements. It must be determined whether the waste volume information should be collected on an annual basis or if the volumes should be based upon a five- or ten-year average. At Hanford, a separate forecasted volume reported in cubic meters is provided for each year for the next 30 years (see Table 1, Appendix A). An alternative currently being evaluated is collecting five years of annual information and then collecting the remaining 25 years in five-year average intervals. It is also necessary to determine whether the waste volumes should be collected based on actual waste volumes or packaged waste volumes. For the purposes of waste storage and handling, packaged volumes are typically preferred.

3.1.2 Waste Types

Waste types that are necessary for TSD facility planning also need to be determined for each site. Waste category and class information should be evaluated and defined on a site-wide basis. Category information typically defines whether waste is contact- or remote-handled, whereas class information refers to the radioactivity limit for that category of waste. Definitions for the waste types should be consistent across the site and should match any existing complex-wide standards. This information is collected with volume information at Hanford (see Appendix A).

3.1.3 Waste Container

Waste package, or container, information is valuable to collect if a site is interested in planning waste handling and storage requirements. Facility waste handling requirements can be planned based on the size and type of the major containers forecasted. Therefore, if a site is in the facility planning stages, container information may be useful. In addition, required storage capacity is driven by external volumes and container types. If the packaged waste volume (excluding the container type) is the only information collected, the storage could potentially be inadequate in handling shielded waste or special case containers that have storage restrictions. An example of a special case container is the long-length equipment container from the Hanford Site that cannot be stacked. The total external waste volume is not sufficient information for determining storage needs; the container type must be known as well. General types of containers that are shipped to Hanford include 55-gallon drums, standard waste boxes (SWB), 4 x 4 x 8-foot boxes, and B-25 containers (see Table 2, Appendix A).

3.1.4 Physical Waste Form

The physical waste form of each waste class within each container may need to be collected to aid in deciding site treatment needs. The physical waste forms that require special treatment or that are specifically regulated may influence the type of physical waste form information that is collected at a site. Standard definitions must be given to each physical waste form to ensure consistency and accuracy within the forecast data. One method to ensure consistent physical waste form definitions complex-wide is to use the definitions provided by the national mixed waste treatability groups.[a] The treatability groups identify the types of physical waste forms that could be generated during site operations and provide consistent definitions for each waste form. Hanford has adapted its requested physical waste form data to match the national mixed waste treatability groups. Examples of the physical waste forms that Hanford requests include debris waste, special wastes, and soils (see Table 3, Appendix A).

3.1.5 Radionuclide Information

Lastly, radionuclide information may need to be collected if criticality,

[a]Kirkpatrick, T. D. January 1995. *DOE Waste Treatability Group Guidance*. DOE/LLW-217, Pacific Northwest Laboratory, Richland, Washington.

worker risk, or heat-loading are issues for the site's TSD facilities. Radionuclide information also helps determine whether waste classifications will change during treatment. The specific radionuclide concentration and activity for each waste form within each container may be needed for TSD planning. Past experience at the Hanford Site indicates that radionuclide information is often unavailable and inaccurate. Therefore, if a site has minimal radionuclide information, this type of data may not be worth collecting. The type of radionuclide data collected at Hanford is very specific and includes such requests as beta-gamma fission products, uranium, neptunium, plutonium, americium, etc. (see Table 4, Appendix A).

3.2 DATA SOURCES

Once the data needs for a particular site have been identified, the potential sources for obtaining the data must be evaluated. Data sources, which can provide data for future LLW generation, are specific waste generators that will ship LLW to a site. Identifying these waste generators can be difficult, especially if the facility does not currently exist. Potential future waste generators may include onsite and offsite operational facilities, facilities undergoing terminal cleanout and stabilization, TSD facilities, and/or planned facilities. Site-wide analysis of current waste generators and review of programmatic planning can assist in identifying all future waste generators.

3.3 GAINING SITE-WIDE SUPPORT

Site-wide support of forecasting activities is crucial in implementing a successful forecasting strategy. Data must be collected from sources onsite and offsite, and support from these waste generators must be obtained to: 1) collect the data, 2) ensure data quality, 3) capture data uncertainties or alternatives, and 4) develop site-wide policies that enforce forecasting participation from all waste generators that will ship waste to the site.

In addition, site-wide support of the forecasting strategy will ensure management involvement and awareness. Management support is necessary to develop consistency with project and program plans. For example, the forecast data are often supplied by a technical monitor within a facility who may be unaware of long-term program plans that may affect the facility. However, if management is involved in the forecast process through data review and program interviews, the program mission plans can be captured within the facility data.

3.4 TOOLS AND STAFFING

As is the case with all initial projects, necessary tools and staff must be identified and obtained. Staffing requirements will vary from site to site depending on the following variables: the number of waste generators, the scope of data needs, forecasting knowledge, and solid LLW management knowledge. For example, if a site has 50 waste generators identified as data sources, identifies extensive data needs, and has little experience in LLW analysis and data collection, more staff may be needed than if there were fewer waste generators, fewer data needs, or more experienced staff.

Tools to be used by the data collectors and providers should be identified as well. If the data are collected electronically (a strategy currently being implemented at Hanford), access to personal computers must be available for each data provider (Section 10.2). In addition, database tools to maintain and report the data will need to be evaluated and selected to fit the data needs of a particular site.

3.5 INTERNAL TRAINING

Training of staff may be necessary for developing: 1) forecasting and analysis skills, 2) LLW generation knowledge, 3) database management skills, 4) software application knowledge, and 5) reporting skills. Development of these skills depends on each staff member's ability; in some areas training may not be required. However, with new staff, training can be an efficient means to ensure proper skills.

4.0 FORECAST PREPARATION, SUBMITTAL, AND TRAINING

When the initial planning and preparation (Section 3) have been completed, the next step in the forecast cycle, preparing the forecast packet, can begin. At Hanford, the forecast packet consists of a cover letter, a set of instructions, the data request tables, a questionnaire, a glossary, and other helpful tables for providing quality data. When the forecast packets have been completed, they are submitted to the appropriate waste generators. Waste generator training on submitting the data should follow. This section describes the preparation, submittal, and training required to initiate the forecast cycle.

4.1 FORECAST PREPARATION

The forecast preparation step includes selection of a team to synthesize needs from the data users, collectors, and sources; development of a draft forecast packet; and review and revision of the draft. The time required to complete this task is estimated to be two to four months, depending on the team's experience and the extent of the data needs.

When preparing a forecast packet to gather data on future waste shipments, the first step is to identify the site's data needs, as discussed in Section 3.1. Developing a team to identify specific data needs and ways to collect the information is recommended. The team should also be responsible for developing a draft forecast packet for review. The team should consist of the following:

- Data users - those individuals responsible for site TSD planning, responding to national and site-specific data calls, and budgeting for site-wide LLW management needs. The data users should provide a complete set of data needs that are necessary to meet their requirements.

- Data collectors - staff responsible for collecting, analyzing, and communicating the data to the users. Data collectors will determine whether the data needs expressed by the data users are reasonable and collectable.

- Data sources - facilities that will generate waste in future years (and may currently be generating waste). These generators should be able to identify the types of data that can be provided and a reasonable format for collecting this information. If the types of data requested by the users cannot be provided by the data sources, this information needs to be communicated so alternative data sources and/or requirements can be determined.

The forecast preparation team should synthesize the knowledge, skills, and needs from all participants when developing the draft forecast packet. Review of the draft should be performed by a broader audience consisting of waste generators and data users to assess the usability of the forecast packet from both the input and output perspectives. When comments have been properly addressed, revisions will be made until the forecast packet has been approved by all parties. An example forecast packet titled prepared by the Hanford Site is included as Appendix A.

4.2 FORECAST PACKET SUBMITTAL

Forecast packet submittal consists of pre-submittal notification (see Appendix C) and actual submittal of the packet. The time estimated to complete this task is approximately one to two months. Included in this time is the identification of data sources so that all potential future waste shipments can be included. Data source identification was discussed in Section 3.2.

Once all data providers have been identified, a presubmittal notification of upcoming activities, expectations, and requirements is sent to each waste generator. The notification is an effort to ensure return of the completed forecast packet in a timely manner. In addition, potential problems associated with waste generator requirements and expectations can be handled before the forecast packet is submitted. This will aid in identifying other collection options and expedite the cycle.

The forecast packet must be submitted so that the waste generator is allowed enough time, typically two months, to complete the forecast. The submittal should include a cover letter stating 1) the purpose of the forecast,

2) expectations, and 3) deadlines. The submittal should also include a set of instructions for completing the packet. A contact and phone number for questions should also be provided as a help line. Before submittal, a complete list of waste generators should be compiled to ensure that all identified data providers are sent a packet. The last action is mailing the complete forecast packet to the waste generator.

4.3 WASTE GENERATOR TRAINING

Once the forecast packet has been developed and revised by the forecast preparation team, it is useful to provide a waste generator training opportunity to ensure understanding and completeness of the forecast forms. Waste generator training is estimated to take one week, while preparation for the training may take several weeks. A sample syllabus of the training that occurs at Hanford is provided in Appendix B.

Waste generator training communicates the data needs and collection method in a clear, consistent way and gains site-wide support of the forecasting strategy. By communicating the purpose of the data, the waste generator becomes increasingly knowledgeable of the program and its goals. In addition, by communicating the use of the data, the waste generator is able to take ownership in the forecasting strategy, ensuring quality data.

Attendance at the training should include a point of contact for each facility that will be shipping LLW to the site. The training seminar should be structured to allow all facets of the forecast packet to be explained in detail. The training session should also address the purpose of each data element being collected (usually in tabular form) so the waste generator understands the importance of the data he/she will provide. An example forecast packet should be completed during the training session so the waste generator can learn through hands-on experience. Finally, feedback on the training session and forecast packet usability should be solicited from the waste generators and incorporated into the next forecast cycle.

5.0 MAINTAINING FORECAST DATA

An electronic database management system should be developed to efficiently capture, store, manipulate, and report forecast information. Implementation of a forecast database can begin as soon as the forecast survey packet has been finalized for submittal to the waste generators, although the definition of general database requirements and the selection of a software tool may be accomplished before the forecast survey has been finalized.

The forecast database serves as a means for storing and reporting the collected information. The development of the database is estimated to take four to ten months, depending on past experience, the extent of the data needs, and whether a database currently exists and needs modification or complete development of a database is required. In this section the four steps necessary to develop a complete forecast database are described. These steps are defining database requirements, selecting a software tool, implementing the software, and providing general maintenance and support.

5.1 DEFINING DATABASE REQUIREMENTS

When defining general requirements for a forecast database several items should be considered, such as user interface needs and hardware and software resources. General data requirements must be defined on the type and amount of data to store, the processing to be performed, and reporting needs. User interface requirements, such as the application appearance, operation, and data validation desired, must be determined as well. The experience and skill level of the users should be considered when defining interface requirements, because this will influence interface design. Hardware and network resource requirements can be selected by addressing issues of data accessibility, storage, and security. In addition, compatibility with other systems, multiuser access, and batch-versus-real-time update capability must also be considered.

Once defined, these requirements can be viewed as the minimum to be accomplished by the database system. Based on these requirements and several other considerations, a software development tool can then be chosen for database implementation.

5.2 SELECTION OF SOFTWARE TOOLS

An evaluation of products meeting the above requirements should be performed to determine their feasibility for implementation of the forecast database. Additional consideration should be given to the development features and functionality present in the software tool, its ease of use, the availability of training for users and developers, technical support, proven history of product reliability, and implementation cost.

5.3 IMPLEMENTATION

During the time between submittal and receipt of the forecast packet, the forecast database can be developed once the forecast forms are finalized. A forecast database is site-specific, and several aspects should be evaluated before a database is implemented. Implementation includes the development and programming of the database and application user interface, implementation of specific screens and features, incorporation of quality assurance (QA) practices, software testing, user and technical documentation, installation of the system, and user training.

Forecast database implementation is estimated to take four to ten months, depending on the extent of the data and reporting needs, the specific requirements for the database application, and the experience and skills of the project team. Significant advantage can be obtained by using an existing forecast database as a baseline from which to build current requirements.

5.4 DATA MAINTENANCE AND SUPPORT

Maintenance and support activities for the forecast database application will occur over the life of the database. These activities include backup and archival of the database, support for system maintenance and modification, user technical support, and miscellaneous technical support.

It is recommended that consistent backups of both software and data be performed to safeguard data and software integrity, and provide reproducibility of information. Permanent archives of the final database product should be made after any significant changes or development activity. These archives should include data and software.

Support must be provided for system maintenance and modification. Maintenance on an established system includes monitoring routine processing, verification of results, and support for troubleshooting and repair. In addition, new reporting requirements may necessitate modifications to the database. These changes to the database, whether in table structure or software, should be archived and documented.

In addition to technical software support for users of the database, additional user support will need to be provided. A database administrator should be appointed to handle activities such as controlling access to the database and computer resources, coordinating and monitoring data updates, and providing support for ad hoc data requests. Ad hoc data requests should be treated as an extension of the database and documented and archived accordingly.

6.0 DATA RECEIPT, ENTRY, AND VERIFICATION

The next steps in the forecast cycle deal with receiving and storing the data. Data receipt occurs approximately two months after the forecast submittal process. Upon receipt, the data must be verified for completeness, accuracy, and quality before data entry can begin. It must be emphasized that the verification and entry steps could continue indefinitely; therefore a date at which to "freeze" the data should be determined so that the cycle can continue into the analysis and reporting steps. This section describes the process of receiving, verifying, and entering the data into the database.

6.1 DATA RECEIPT

Data receipt is the actual collection of all completed forecast packets. The receipt deadline is set during the forecast submittal activities (see Section 4.2) and is typically set two months after forecast submittal. To verify that all waste generators have submitted completed forms, a checkoff list was suggested in Section 4.2. This list is useful in identifying those waste generators that need to be reminded of their deadlines and, in some cases, notified of past-due forecasts.

6.2 DATA VERIFICATION

When all completed forecast packets have been received, the information needs to be verified. Verification involves approximately two months of reviewing the forecast for completeness and consistency. All data tables must be checked for completion, and the proper data points must be checked for consistency throughout the packet. For waste generators with varying waste characteristics and multiple container types, the verification process can be lengthy and cumbersome.

Verification also involves checking the hard-copy data with electronic data. Hard-copy verification should take approximately one week depending upon the size and complexity of the data being collected. If errors are found, data revisions would be made over the next two to three weeks. Hard-copy verification can be coupled with electronic verification checks; for example, if 55-gallon drums have been selected as a container type for contact-handled LLW Class I, electronic data checks throughout the process should only allow data to be entered for the specified container type. In addition, numerical calculations can be verified for the correct total through electronic checks, alerting the user of potential data errors. However, hard-copy verification will still need to be completed.

6.3 DATA ENTRY

While the data are being verified for completeness and consistency, data entry can take place. As discussed above, data entry and verification can be performed concurrently if electronic verification checks are present. The data entry process takes approximately one month; however, the amount of data drives the duration.

Data entry takes place in several phases: initial data input, verified data input, and revised data entry. Initial data input includes data that can be electronically verified. Verified data entry occurs after hard-copy verification and review have been completed. The final, revised data are input during the analysis period (Section 7) as new information and potential alternative scenarios are identified. However, a deadline should be established for completion of data entry to "freeze" the database and report consistent results.

7.0 DATA ANALYSIS AND REPORTING

Upon completion of data entry and verification, the next step in the forecast cycle is data analysis and reporting. Data analysis is necessary to summarize information that supports focused planning efforts. Reporting is a critical conclusion to the forecast cycle in that it communicates the analysis and conclusions of the completed forecast data. This section describes the analysis approach and reporting methods that are useful in completing the forecast cycle.

7.1 DATA ANALYSIS

Data analysis consists of identifying major waste generators (those facilities that will ship 90% of the total LLW to the site), trends, and significant impacts to TSD facility planning. The process takes anywhere from two to eight months, depending on the analysis staff's knowledge of waste generator missions and uncertainties, which influence progress in data analysis. In addition, the amount of data to be reviewed and their completeness are also factors that influence progress. For example, if an analyst has little knowledge about a waste generator's mission, the data are extensive and incomplete, and the data quality is questionable due to mission uncertainties, then the data analysis will require more time for initial review.

Analysis typically consists of identifying the major waste generators so analysis efforts can be focused appropriately. In some cases, five or fewer facilities will contribute up to 90% of the total waste; whereas other cases may show 20 or more facilities as major waste generators. Each case is site-specific and can alter the duration of analysis; the more generators required for analysis, the more time is required.

Once the major waste generators have been identified, three key points should be addressed for each facility:

- Forecast assumptions - each facility should be required to identify and explain the major assumptions driving their forecast data. In some cases, the assumptions may not match overall site-wide assumptions, and therefore changes would be necessary. Forecast assumptions need to be documented so that TSD planners can assign data validity.

- Forecast uncertainties - each facility should be required to identify and explain data uncertainties such as potential mission changes, shipping variations, or waste volume/characterization fluctuations. The analyst will need to research the potential for these uncertainties to occur and report the possibilities accordingly (see Section 9).

- Forecast completeness - each facility should submit a complete forecast packet. When the information is not readily available, the analyst should be able to identify alternate sources of data to supplement the forecast.

Waste generators should address these three elements in the forecast packets. If the information is not sufficiently described, analysts should contact the waste generators for clarification and follow-up information. These conversations may reveal additional data that are not routinely provided in the forecast but are required to support ongoing system studies.

Once the major waste generators have been identified, and the three key points have been clarified, major trends can be evaluated. Facilities that possess similar missions may demonstrate trends, which are useful in comparing data results and identifying any unusual scenarios. Trends are also identified by comparing forecast data with actual receipts. These trends are useful in evaluating the quality and accuracy of the forecast data. For example, at the Hanford Site, the forecast data have been accurately reflecting the actual receipts better each year since the cycle has been implemented; i.e., the 1993 forecast data are better in estimating the 1994 receipts than the 1992 forecast data were for estimating the 1993 receipts.

Actual receipt comparison is also useful in assigning certainty levels to the forecast data. For example, if, over the years, the forecast data prove to account for double the actual waste received, then analysts can use this trend to express confidence in the forecast data; i.e., the actual waste received should be half of the forecasted amount.

Lastly, the main goal of analysis is to identify significant impacts to the TSD facilities. Forecast data are often used to justify TSD facility funding by assigning confidence levels and identifying potential waste management scenarios. For example, actual waste receipts may be less than a forecasted waste amount due to shipping delays, not an overestimation of waste generation. Analysis is useful in identifying these and other issues, so that TSD planners are aware of all scenarios and not just the raw data.

7.2 DATA REPORTING

Data reporting is the last step in the forecast cycle and is a means of communicating the results of the analysis and the conclusions reached during the data collection cycle. Reports should be developed in support of site and national needs and should be tailored to meet the data user's needs. There are two main categories of data reporting: analyses and database reports. Data reports are an ongoing process throughout the data collection cycle, whereas analyses reporting is typically a four-month process at Hanford. Within each category of reporting there are two subcategories, standard reports and ad hoc reports. Standard reports are those needed on an annual basis; at Hanford, standard reports are typically used for budgeting purposes and aiding in TSD facility planning. Ad hoc reports are those that are randomly requested for unplanned activities.

7.2.1 Data Reports

Data reports contain only data queried from the database and require no analysis. Data reports can be standard data reports or ad hoc data reports. Standard data reports can be used by upper management, technicians, and engineers; the information is typically a high-level summary with details on a year-by-year basis. At Hanford, national data requests and reports for facility budgeting are often met by these standard data reports.

Several users of the data may have unique requirements that are not met by the standard data reports. These special requests that require detailed and tailored alterations to the standard data reports are referred to as ad hoc data reports and should be formally requested by the user (e.g., a TSD facility planner). In addition, each ad hoc data report prepared from the database should be documented before being submitted to the requestor. Documenting this information ensures data reproducibility and traceability. In addition, documentation may show the same ad hoc data report was requested several times, making it apparent that the report should become a standard data report. This is useful information that may make the data more accessible to many users in a timely manner.

7.2.2 Analyses Reports

Analyses reports include narrative on the assumptions, uncertainties, and completeness of the major waste generator's forecasts and the associated waste volumes and characteristics. There are standard analyses reports and ad hoc analyses reports. The standard reports are formally requested by the data users at the beginning of the forecast collection cycle. These requests have associated deliverable dates and specified requirements.

Standard analyses reports at Hanford contain summaries of the volume information, container information, and characteristic information. In addition, analyses reports may also include stored waste data reports and reports of actual receipts versus forecast volumes. All of these reports can take several months to compile, because they require initial analysis and formal documentation.

Analyses reports can also be ad hoc requests. These requests are unusual but can occur in certain circumstances. Examples of ad hoc analyses reports include storage justification studies, facility startup justifications, and similar solid waste system analyses. At Hanford, these requests are typically quick turnaround analysis reports that can be used by the appropriate data user.

8.0 WASTE GENERATOR SUPPORT

Waste generator support is an ongoing step in the forecast cycle. It is believed that data quality is improved by providing waste generator support in the following ways: forecast form preparation support, forecast form completion support, and data alteration support. The following explains how and why waste generator support is critical in ensuring data quality.

8.1 FORECAST FORM PREPARATION SUPPORT

During forecast preparation, waste generator support is provided by soliciting their feedback on data requirements. As stated in Section 4.1, a team of data users, data collectors, and data providers should be gathered to develop the forecast packet. By involving the data providers, or waste generators, the data being requested can be ensured to be reasonably submitted and of good quality as well. For example, if the data could not be submitted, they would be of no worth; they would either be incomplete or without reference, and thus of poor quality.

Waste generator support can also be provided at the beginning of each new forecast cycle. Hanford collects forecast information on an annual basis, and it has been useful to solicit feedback on the previous year's forecast forms. Collection methods that were easily understood and reasonable for reporting purposes should be kept in the following year's forecast; however, those methods that were complex and unreasonable should be omitted or revised. In all cases, feedback and suggestions provided by the waste generators should be incorporated to ensure data quality for the next year.

8.2 FORECAST FORM COMPLETION SUPPORT

Waste generator support should also be provided during forecast completion by providing waste generator training (see Section 4.3 and Appendix B) and a waste generator help-line (see Section 4.2). The waste generator training ensures that the requested forecast information is understood and the correct information is being reported. A help line is useful for the same reason, and provides real-time support.

8.3 WASTE GENERATOR DATA ALTERATION SUPPORT

Lastly, waste generator support should be provided to the facilities throughout the forecast cycle to capture alterations in the forecast data. Meetings with the waste generators on a quarterly basis can aid in obtaining any new mission changes, shipping delays, or waste characterization issues that occur after the forecast has been submitted. Providing the opportunity for the waste generators to meet and report these changes allows the facilities to remain accountable for their submitted data. In addition, potential changes can be documented and reported for TSD facility planners in a timely manner, rather than during the next forecast cycle. Incorporating these new scenarios into the forecast improves overall data quality.

9.0 FORECAST UNCERTAINTIES

This section describes the uncertainties associated with the data gathered during the forecast life cycle. The main data uncertainties that arise each life cycle typically fall into six categories: waste volumes, waste shipment schedules, waste characterization, waste generator maturity, waste generator mission scope, and comprehensive profile uncertainty. It must be emphasized that within each of these areas, one underlying assumption drives all data reporting: the current or planned mission and funding will continue. In addition, one major trend that is observed with all uncertainties is that the level of uncertainty increases for the later years of the requested forecast period. The following will discuss each of the six areas of uncertainty and any strategies currently being used by Hanford to address these uncertainties.

9.1 WASTE VOLUME UNCERTAINTY

Because forecasting requires knowledge of future activities, uncertainties in waste volume estimates will always exist. Even when facility missions are clearly defined, uncertainties are to be expected. For example, process equipment failures are difficult to report with absolute certainty; therefore, some degree of uncertainty is to be expected unless the facility has a long history of waste generation and the failure rate has been accurately calculated. Most uncertainties in waste volumes, however, are associated with an unclear or new mission in future years. Future waste volume information may be difficult to estimate if a facility does not currently exist. In these cases, rough estimates based on conceptual designs would be used as a source for forecasting future wastes (see Section 9.4).

At Hanford, several strategies have been implemented to address uncertainties associated with forecasted waste volumes. First, maximum, minimum, and baseline (best estimate) volumes have been requested for each year that waste volume data are collected (see Section 10.1). This allows the analyst to assess the uncertainty the generator has in the reported baseline volumes. In addition, a written justification for the maximum and minimum percentages is provided. If the maximum or minimum waste volumes seem as likely as the baseline, then an alternative scenario can be analyzed. Lastly, an extensive review of the major onsite programs that will be generating solid waste in future years is being conducted. The approach to this effort has been to review all available documentation for the programs to identify major uncertainties associated with future waste generation. Follow-on interviews with program representatives are expected to gather additional information (see Section 10.2). The review will also allow scenarios other than the baseline to be analyzed. Implementation of these alternative scenarios would be dependent on waste generator approval when appropriate and a strong indication from upper management that the alternative is more certain than the forecasted estimates.

9.2 SHIPMENT SCHEDULE UNCERTAINTY

Often a waste generator is certain of its waste volumes but uncertain on the exact shipment schedule for the waste. It must be emphasized that distinguishing between the schedule and waste volume uncertainties is critical in TSD planning. Schedule uncertainties mainly affect timing of TSD facilities, whereas waste volumes affect all aspects of waste management. Uncertainties with the shipping schedule are closely related to funding changes that may occur in the future. For example, a waste generator may have identified the waste volume to be shipped but does not have adequate funding to ship all the waste within a certain period, thus delaying the shipping schedule. In addition, schedules are often driven by set program milestones and are subject to alterations with milestone revisions.

Hanford has set forth a strategy to address the uncertainties associated with shipping schedules by conducting a detailed review of the primary onsite program missions (Section 10.2) and planned activities to identify scheduling uncertainties and inconsistencies with the forecast data. Forecast data are then updated accordingly. The waste generator's degree of confidence in shipment schedules is also obtained through the forecast questionnaire.

9.3 WASTE CHARACTERIZATION UNCERTAINTY

Waste characterization data are the most detailed of all data requested and therefore are typically the most uncertain for waste generators. The main factors effecting the uncertainty is lack of characterization in the facility, lack of facility process history, and unknown waste generation. The Hanford Tank Farms are an example of a facility that has difficulty characterizing their waste; therefore high uncertainty is associated with these forecast data. Lack of processing history is observed with waste generators that do not currently exist or newer waste generators. For these cases, the conceptual designs are used to estimate characterization, waste generators with similar missions are used to develop data, or no characterization information is provided by the facility. Lastly, unknown waste generation such as spills, soil contamination, and equipment failures is often encountered and difficult to forecast. For these situations, an average or trend is forecasted if past processing history is available.

When characterization data are uncertain, the waste generator may assume a worst case scenario since the worst case will require special TSD. It is important to determine when the waste generator is forecasting uncertain worst case data characterization so TSD planning is not based solely on these estimates. Hanford has included questions in the attached forecast (Appendix A) that address characterization confidence, changes from previous years, and characterization data baselines.

9.4 WASTE GENERATOR MATURITY UNCERTAINTY

The maturity of each waste generator influences data uncertainties. For example, if a waste generator is an established facility with many years of process history, waste data should be fairly accurate and certain for future years, assuming the mission and funding do not change. On the other hand, if a facility does not currently exist or is a new generator, future data will be uncertain until waste generation history is established. Some possible methods for determining waste data for these types of facilities are 1) to develop a forecast profile based upon a similar facility currently providing a forecast, 2) forecast only a few years' worth of data, or 3) provide estimates based on conceptual facility designs.

At Hanford, data uncertainties for future facilities are addressed by 1) identifying those facilities that are planned for the future or that are new generators, 2) obtaining current designs and plans for the facilities, and 3) updating the forecast data to reflect changes in the design or alterations in the facility mission.

9.5 WASTE GENERATOR MISSION UNCERTAINTY

As stated earlier, the main assumption associated with the forecast data is that the facilities will continue their projected mission(s) and funding status. Uncertainties arise, however, if the facility has predicted only one mission for the entire forecast period when the facility is known to be undertaking an alternative mission such as decontamination and decommissioning (D&D). On the other hand, a facility may account for a change in mission but not the potential waste for the transition period between missions. A waste generator may also forecast a certain mission and not be consistent with high-level program plans. In these cases, ongoing effort must be placed on identifying unpredicted or misrepresented missions. Lastly, uncertainties arise when high mission uncertainty exists for future waste generators. For example, Hanford has experienced major mission changes for several facilities that will treat tank waste. The results of these changes affect volumes, characterization, and scheduling, all critical data for successfully implementing a TSD management plan.

Hanford is attempting to address waste generator mission uncertainties through a detailed analysis and review of the major onsite programs that will generate solid waste. The objective of the review is to gain insight into evolving missions, identify inconsistencies between program and facility plans, and incorporate associated waste data into the forecast data for TSD planning.

9.6 COMPREHENSIVE PROFILE UNCERTAINTY

The last uncertainty involves the initial planning and preparation step of the forecast life cycle, which is identifying all LLW generators (Section 3.2). One uncertainty associated with this step is whether all potential waste generators have been accounted for in the established forecasting period, necessary to produce a complete comprehensive forecast profile. Extensive site review and analysis are required to assess with reasonable certainty that all future onsite waste generators are accounted for. Site-wide mission plans, program plans, and facility plans are all resources for identifying future onsite waste generators. For example, if a program plans to pretreat waste prior to stabilization in a stand-alone facility, then the pretreatment facility must submit a separate forecast. This type of information would only be obtained if analysts are continually reviewing site-wide mission plans.

At Hanford, the continual review of site-wide missions did not formally occur until this current forecasting life cycle. Past years had focused on ensuring that the generators provided quality data; however, a large effort was not undertaken to ensure that all waste generators and site-wide activities had been identified that could potentially generate large waste volumes in the future. Because the missions change rapidly, it has been necessary to spend more time this year ensuring that a comprehensive data set that represents future waste activities can be identified.

10.0 HANFORD'S EXPERIENCE: PAST, CURRENT, AND FUTURE

The forecast life-cycle described in this document is based solely upon Hanford's experience and may require adaptation to other site-specific requirements. Hanford has implemented, used, and revised a forecasting technique over the past six years to assist in solid waste short- and long-term planning. During this time, many forecasting improvements have been implemented to improve forecast data quality, reduce the burden on the data providers, and reduce the forecast cycle duration. By reducing the forecast cycle duration, the data are available in a timely manner for the data users; thus, planning efforts are more efficient and complete.

As insights are gained about future waste generation, and TSD planning progresses, alterations to the forecast packet often occur. Prior to making changes to the forecast packet, the benefit to the end users and the ability of the data providers to report the data should be determined. If it is determined that the data must be collected, training should be given to the data providers prior to sending out the revised forecast packet (see Sections 4.3 and 8.2).

The improvements that have been implemented are described within previous sections of this document, but a brief summation of these improvements is included in the following sections. In addition, alterations currently in progress for the next forecast cycle and the revisions proposed for future cycles are described.

10.1 PAST IMPROVEMENTS TO THE FORECAST CYCLE

Past efforts at Hanford have focused on the three main goals of improving data quality, reducing the burden on the data provider, and reducing the forecast cycle duration. Several specific improvements to the forecast cycle have occurred to improve data quality. These include:

- Providing a detailed questionnaire with the forecast packet
- Providing waste generator forecast training seminars

- Requesting a maximum and minimum volume range for each year data are required
- Customizing the forecast tables for specific waste generators
- Issuing three standard forecast reports instead of one comprehensive report
- Allowing optional forecasting for small waste generators.

Data quality was improved when the questionnaire was included in the forecast packet. The questionnaire allowed data providers to express future waste generating activities in a narrative, enabling the data collector to compare data tables and questions for consistency. By identifying the activities that are included in its forecast, the waste generator provided insights into the stage of operations (i.e., operations, terminal cleanout and stabilization, or D&D) in its scope of work over the next 30 years. For example, if, in the questionnaire, the waste generator specified that only operational waste is included in its data, then the analyst would quickly assess that terminal cleanout/stabilization and D&D waste from that facility is not provided and further analysis would be required to obtain these data. Furthermore, the questionnaire identifies assumptions that were made while completing the forecast packet.

Waste generator forecast training seminars have also proved invaluable in ensuring that the requested information is not only understood, but that the waste generator is providing correct information, thus quality data. For example, waste generators have provided inconsistent physical waste form information in Tables 3 and 4 (see Appendix A). The training has eliminated some of these problems by identifying these and other inconsistencies. Training also meets the goal of reducing the forecast cycle duration by allowing the waste generator a preview of the requested information and prompting the gathering of information before the data request is submitted. In addition, training helps familiarize the waste generator with the forecast forms, allows them to ask questions prior to completing the forecasts, and reduces the time required to complete the requested information, thus reducing their burden.

The collection of maximum, baseline, and minimum volume ranges for each requested year is useful in assessing confidence in data quality. For example, if a generator reports a 110% maximum range and 90% minimum range, it is likely that the waste generator has high confidence in its volumes. On the other hand, if the range indicates that the volumes could be zero or half the baseline, and the maximum could be double the baseline, it is likely that the generator has low confidence in the baseline due to uncertain mission scope and funding issues. The ranges also allow the data collectors to analyze alternate planning scenarios and potentially plan for the worst-case scenario.

The forecasts have also been customized for some waste generators to assist them in completing the forms accurately. Not only is the forecast format specific for those generators, but the data are reported correctly and quickly. For example, some of the waste generators at Hanford plan to use very large cylindrical containers to package solid waste. These generators have been identified, and a customized form has been developed to gain insights into the sizes and quantities of containers that will be used. Improved data quality, a reduced waste generator burden, and reduction in the forecast cycle are achieved through forecast form customization.

In addition, three annual summary reports instead of one comprehensive report are now issued to reduce forecast cycle duration. In past cycles, a comprehensive report was issued that reported the results of the forecast analysis and summarized the forecast data. The report was quite large, and extracting specific information from it was difficult. The report also took approximately six months to generate. Therefore, to increase the efficiency and usability of the data, three reports were issued. The first report contained volume information for all waste classes, the second report summarized the types of containers that would be shipped to the Hanford Site and the waste classes within each container type, and the third report described the characteristics of the waste that would be handled at Hanford. The results of reporting the forecast data in three separate reports allowed the volume data, which are most important at this stage of planning at Hanford, to be available two months prior to the previous comprehensive report. In addition, by separating the volume, container, and waste characteristic information the forecast data were less cumbersome, and specific data needs were easier to extract.

Lastly, optional forecasting for small waste generators has been implemented to reduce forecast cycle time and the data provider's burden. Small waste generators are those facilities that generate primarily hazardous waste or small amounts of radioactive low-level waste. These small waste generators are allowed to carry over previous years' forecast data when significant changes have not occurred in their baseline planning; therefore, the forecast cycle is reduced and simplified. If the generator data have changed significantly, then the facility does not have the option to carry over previous years' data and must submit a new forecast. Implementing optional forecasting has eliminated or reduced submission time for the waste generator, data review time by the analysts, and data input time by the database administrator. However, if forecast data needs have changed slightly from the previous year, then some assumptions and mapping of data may be required. For example, if alpha-bearing waste was a radionuclide requirement that was changed the following year to specify americium, then the previous year's data would need to be mapped into the specific radionuclide information being requested for the new forecast cycle.

10.2 CURRENT IMPROVEMENTS TO THE FORECAST CYCLE

Hanford is currently in the fiscal year 1995 forecast cycle in which three major improvements are being implemented to reduce the forecast cycle duration and improve forecast data. The improvements consist of:

- Implementing an electronic data collection system
- Establishing a formalized review process of Hanford's programs that generate significant volumes of solid waste
- Changing forecast data needs to match national data needs.

The main improvement consists of development and planned implementation of an electronic data collection system for fiscal year 1996. This system will reduce the forecasting cycle by approximately two to three months, reduce the waste generator's burden, and increase data quality. The forecast duration will be reduced by allowing the waste generator to input all waste data into an electronic program that can then be transferred to the main database. Data entry by the database administrator and verification of these data will be eliminated, saving approximately one month of forecast cycle time. In addition, the electronic system will have automatic consistency checks that will reduce forecast review by approximately one to two months. The system will also improve data quality by ensuring that all consistency errors are found and corrected. In addition, the burden of completing numerous hard-copy forms and completed several self-verification steps will be reduced for the waste generator.

Secondly, establishing a formalized review process of major onsite programs has been implemented this fiscal year to ensure program planning and specific facility planning are consistent and reported appropriately in the forecasts. The review will consist of extensive document reviews and onsite integration meetings with the major onsite programs. In addition, the reviewers will identify waste generators that are not currently forecasting waste, identify missions that are not captured in the forecast for specific facilities, and ensure overall forecast completeness.

Lastly, the forecast data collected for the current forecasting cycle were developed based on national data needs. Specifically, the waste characterization data groups were aligned with the most recent national treatability groups, which will allow quick responses to national data calls and ensure that the collected data at Hanford are within national scope and consideration.

10.3 POTENTIAL FUTURE IMPROVEMENTS TO THE FORECAST CYCLE

Several improvements for future forecasting cycles are currently under consideration. These include:

- Optional forecasting for all waste generators
- Reducing the forecasting request period

• Submitting parts of the forecast packet to different individuals.

Optional forecasting for all waste generators is currently under consideration for several reasons. First, the forecast cycle would be essentially eliminated for those waste generators that do not have significant changes. Second, the data for those waste generators would be verified and their quality ensured at all times. Lastly, carryover of previous years' data would reduce cost and time, allowing for additional analysis to be performed. However, optional forecasting has not been implemented because some problems need to be investigated. A trend has occurred over Hanford's six years of forecasting that shows that forecast data are improving with each cycle. If the cycle is eliminated, then data quality may not be maintained. In addition, problems arise over how to capture major changes in forecast data for the waste generators if they do not submit an annual forecast. These issues involving optional forecasting for all waste generators are still being reviewed. It must be emphasized that this option is being considered at Hanford only because of its many years of forecasting effort and establishment of a baseline forecast.

Currently, the forecast data at Hanford are collected over a 30-year period. Reducing the period is under consideration because there is a lack of information available for a 30-year future time period. Many waste generators are only able to make estimates for a 10- to 15-year period and must assume the same rate for the additional years. However, some generators are able to provide estimates for the full 30 years based on site-wide milestones that must be met within the 30-year period. The main problem associated with reducing the forecasting duration is limiting those waste generators that can provide full 30-year estimates and risking the loss of valuable information. This issue is being evaluated, and several considerations are under review.

The last recommendation for future improvements stemmed from current analysis of onsite programs. In future years, separate sections of the forecast packet will be submitted to several individuals so that program and facility consistency can be measured. For example, if a high-level questionnaire is submitted to the program office, and a detailed forecast questionnaire is submitted to the facility, then the two questionnaires could be compared for consistency. This may increase awareness by the facility of current high-level activities and the effects they may have on their waste-generation rates. All of these benefits would improve data quality and consistency.

APPENDIX A

HANFORD'S SOLID LOW-LEVEL-WASTE FORECAST

Projected Solid Waste External Volumes (M3)

Table 1

Report Shielded RH Waste as RH Waste NOT CH Waste

Waste Class	Estimate	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CH-LLW-I	Est. (m^3)															
	Min. %															
	Max. %															
CH-LLW-III	Est. (m^3)															
	Min. %															
	Max. %															
CH-LLW-GTCIII	Est. (m^3)															
	Min. %															
	Max. %															
RH-LLW-I	Est. (m^3)															
	Min. %															
	Max. %															
RH-LLW-III	Est. (m^3)															
	Min. %															
	Max. %															
RH-LLW GTC III	Est. (m^3)															
	Min. %															
	Max. %															

Projected Solid Waste External Volumes (M3)

Table 1

Report Shielded RH Waste as RH Waste NOT CH Waste

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024

Held Low Level Waste

Table 1

Waste Class	1994 Estimate (m^3)
CH-LLW-I	
CH-LLW-III	
CH-LLW-GTCIII	
RH-LLW-I	
RH-LLW-III	
RH-LLW-GTCIII	

Container Type and Volume %

Table 2

Step 1: Circle one Waste Class
CH-LLW-I
CH-LLW-III
CH-LLW-GTC-III
RH-LLW-I
RH-LLW-III
RH-LLW-GTC-III

Complete a Separate Table 2 for each Waste Class Identified in Table 1

Step 3: Indicate Volume % of Waste Class Packaged in Identified Containers

Containers	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	HELD
55 Gal Drum 0.26 m^3																															
85 Gal Drum 0.34 m^3																															
4X4X8 Box W/Skids 4.1 m^3																															
4X4X8 Box W/O Skids 3.6 m^3																															
4X4X8 Metal 3.6 m^3																															
B-25 2.9 m^3																															
OTHER																															
*Total (0 or 100%)																															

*Total for each year MUST equal 0 or 100%
Other - Indicate container type, external dimensions, and external colume (cubic meters, gallons):
The containers listed above conform to the acceptance criteria in WHC-EP-0063-4 (Hanford Site Solid Waste Acceptance Criteria).
"OTHER" containers may be accepted.

Physical Waste Forms

Table 3

Step 1 Container Type: Step 2 Years: To: (Include Held if applicable)	A Separate Table 3 must be completed for each container identified in Table 2 Step 3 Indicate Volume % of each Waste Form present for each Waste Class.						Are Waste Forms Segregated?
Waste Forms	CH LLWI	CH LLWIII	CH LLW CTCIII	RH LLWI	RH LLWIII	RH LLW GTCIII	Y/N
Shielding							
Steel							
Lead							
Concrete							
Solid Process Residues							
Inorganic Particulates							
Inorganic Absorbed Liq/Sludge							
Organic Particulates							
Organic Absorbed Liq/Sludge							
Soils							
Contaminated Soils							
Debris Contaminated Soils							
Debris Waste							
Metal							
Inorganic Non-Metal							
Combustible							
Hetergeneous							
Special Waste							
Lab Packs/Containerized Liquids							
Unknown							
Other*							
Total[1] (0 or 100%)							

[1]Total for Each Waste Class MUST Equal 0 or 100%

*OTHER WASTE DESCRIPTION:

WASTE CLASS:
CONTAINER TYPE:
YEAR: TO: (INCLUDE HELD IF APPLICABLE)

Radiation Type

Table 4

A Separate Table 4 must be completed for each applicable Waste Class and Container Type
RADIATION TYPE: Please indicate the Concentration and Total Activity for each Waste Form

	Fission Product BETA/GAMMA		Uranium/ Neptunium		Pu/AM		Volatile Radionuclide (^{14}C, ^{3}H, I, Rn, Kr, Xe)		Selenium		Technitium 99	
Waste Forms	**Conc. Ci/m^3**	**Total Act (Curies)**	**Conc. Ci/m^3**	**Total Act (Curies**	**Conc. Ci/m^3**	**Total Act (Curies)**	**Conc. Ci/m^3**	**Total Act (Curies)**	**Conc. Ci/m^3**	**Total Act (Curies)**	**Conc. Ci/m^3**	**Total Act (Curies)**
Shielding												
Steel												
Lead												
Concrete												
Solid Process Residues												
Inorganic Particulates												
Inorganic Absorbed Liquids/Sludges												
Salt Waste												
Organic Particulates												
Organic Absorbed Liq/Sludge												
Soils												
Contaminated Soils												
Debris Contaminated Soils												
Debris Wastes												
Metal												
Inorganic Non-Metal												
Combustible												
Heterogeneous												
Special Wastes												
Lab Packs/Containerized Liq.												
Reactive Metals												
Explosives/Propellents												

OTHER WASTE DESCRIPTION:

1994 SOLID WASTE FORECAST QUESTIONNAIRE

A. Please answer all questions. This information will help determine Hanford's treatment, storage, and disposal requirements.

Question 4 (for all waste classes) provide a basis for determining how your waste will be grouped. Be sure to answer these questions or your forms will be returned.

B. Ensure that the contact name, Level 3 Manager, and budget personnel are identified in the sign-off area of the questionnaire. **Names must be typed (or printed) as well as written.**

1. Please circle the waste classes that will be generated.

CH_LLW_I	CH_LLW_III	CH_LLW_GTCIII
RH_LLW_I	RH_LLW_III	RH_LLW_GTC_III

2. Generally describe these wastes and how they will be generated.

____

____

____

____

3. Have your waste volumes changed from your previous forecast? Yes No

Explain: ____________________________________

____

____

____

____

4. Will waste be separated into like waste forms prior to shipping? (If you generate contaminated soils, inorganic particulates and metal debris, will you ship these wastes in separate containers or will the waste be combined and placed into one container?)

Please explain for each waste class:

____

____

5. Describe your quarterly expected shipping schedule for each applicable waste class during FY-1995 (e.g., 40% of waste shipped during the first quarter, 20% in the second quarter, etc.).

6. Discuss the assumptions that were used to prepare this forecast. (Identify known dates for facility closure, decontamination and decommissioning [D&D], or any new programs that drive the forecast data provided in this request.)

7. What assumptions were used in estimating the minimum and maximum waste volumes identified in Table 1? (Minimum waste percentage is based upon the majority of the waste being sent to a commercial disposal site. Maximum waste percentage is based upon additional projects being initiated that will generate waste not accounted for in the best estimate volume.)

Minimum: ____________________

Maximum: ____________________

8. Indicate confidence level for the following waste characterization data: (The physical waste forms are based upon historical characterization information.)

Physical Waste Forms (Table 3): High Low Medium

Explain:____

Radiation Type (Table 5): High Low Medium

Explain:____

9. What percentage of the waste forecasted is existing waste?__________
Of your existing waste, how confident are you in the current shipping schedule? HIGH LOW MEDIUM

Explain:____

What percentage of waste forecasted is future generated waste? ________
Of your future generated waste, how confident are you in the volumes and shipping schedule? HIGH LOW MEDIUM

Explain:____

9a. Please indicate whether your forecasts include only operational waste, or if transitional waste, environmental restoration (ER) and/or D&D activities have also been included. If transitional waste, ER, and D&D have been included, indicate when each of these activities will take place.

____

____

____

9b. If you have not included transitional waste, ER, or D&D waste, will this waste potentially be managed at Hanford? Please provide an estimate of the expected volumes and years that the waste would be shipped.

____

____

____

10. Please supply contact personnel information for data verification. Names must be typed (or printed) as well as written:

LLW:____________________ Phone: ____________________

Approved by: ______________________________ Date: __________
(Level 3 Manager Signature)

Approved by: ______________________________ Date: __________
(Budget Concurrence)

APPENDIX B

WASTE GENERATOR FORECAST SUBMITTAL TRAINING SYLLABUS

APPENDIX B

WASTE GENERATOR FORECAST SUBMITTAL TRAINING SYLLABUS

COURSE OBJECTIVES

- Obtain a general picture of the Solid Waste Program
- Understand how the forecast data fit into planning and designing TSD facilities
- Provide feedback and recommendations for improving the forecast packet
- Fill out the questionnaire to benefit TSD operators and designers
- Share your "best guess" methods and assumptions
- Critique the class and help improve future training courses
- Become familiar with and correctly complete a forecast packet

COURSE AGENDA

- Solid Waste Program integration with other onsite and offsite programs
- How are the forecast data used?
- Understanding acronyms
- Definitions of solid waste categories
- Table 1, Projected Solid Waste External Volumes
    - Why is it required?
    - How do you determine waste category?
    - Example demonstration
- Table 2, Container Type and Volume Percentages
    - Why is it required?
    - Be sure that volume percentages equal 100%
    - Example demonstration

- Table 3, Physical Waste Forms

  - Why is it required?
  - How do you determine physical waste form?
  - Example demonstration

- Table 4, Radiation Type

  - Why is it required?
  - Example demonstration

- Questionnaire

  - Why is it required?
  - How do you make your best guess?

- Evaluation of Training

- Evaluation of Forecast Packet

APPENDIX C

FISCAL YEAR 1994 HAZARDOUS AND RADIOACTIVE SOLID WASTE VOLUME FORECAST REQUEST

Program Name
Phone Number
Date

ACTION ITEM

FISCAL YEAR 1994 HAZARDOUS AND RADIOACTIVE SOLID WASTE VOLUME FORECAST REQUEST

Program Director

REFERENCE: WHC-EP-0063-4, "Hanford Site Radioactive Solid Waste Acceptance Criteria," January 1994

DUE DATE: July 14, 1994

This letter is a notification that the 1994 formal request for the Solid Waste Forecast information for FY 1995 through FY 2023 as required by the referenced document will be sent within the next few days. The Systems Engineering section within the WHC Solid Waste Disposal Division administers this annual forecast request. The 1994 forecast data will be used to establish FY 1995 billing rates for storage and disposal. The 30-year forecast data will be used to define Hanford's solid waste treatment, storage, and disposal needs, and to provide information to the Integrated Database (IDB). The completed forecast due date is July 14, 1994.

In order for WHC to meet QA requirements, the original forecast input must be returned to WHC and shall have all required signatures.

Training sessions have been scheduled to help explain and provide guidance through the process of correctly completing the forms. Training instructors highly recommend that attenders bring a calculator and writing utensils. Listed below are the training dates, locations, and times:

May 25, 1994	7:30 am to 11:30 am	Technical Training Center Mt. Bachelor, Richland, Wa 99352
June 8, 1994	7:30 am to 11:30 am	Technical Training Center Mt. Bachelor, Richland, Wa 99352
June 9, 1994	7:30 am to 11:30 am	Columbia Basin College (Richland Branch) Room F109, Richland, Wa 99352

Representatives of each organization are encouraged to attend one or more of the training sessions. Videotapes of the training will also be available.

Should you have any programmatic questions related to this request, please contact Mr. K. L. Hladek on 372-3201; if you have any technical questions related to this request, please contact Mr. O. J. Valero on 372-2601. Please mail the completed forecast to Mr. O. J. Valero, MSIN: H5-33.

R. J. Roberts, Manager
Restoration and Upgrades Programs

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Enclosure