

Chapter 1 INTRODUCTION [MTS]

1.0 PURPOSE AND SCOPE

The purpose of this ALARA source and compliance manual is to provide the foundation of the sitewide ALARA program, as defined herein, for radiation exposure to onsite personnel. The Environmental ALARA Program is applicable to discharges to the environment and exposures to the public and is not within the scope of this document. It is the means toward completing and achieving compliance with applicable rules and regulations, and implementation of consistent ALARA policies and practices. This document provides assistance to those line organizations that are responsible for implementing the ALARA program at the Savannah River Site (SRS or Site) and serves as overall direction in the development of business and facility-specific programs. The information contained in this document originates from Title 10 Code of Federal Regulations, Part 835 *Occupational Radiation Protection* (10CFR835), is denoted in ***bold italic text***. Compliance-based commitments have an appropriate superscript and identified footnotes within the section. The information originating from other established good practices in ALARA, which is strongly recommended, is identified in plain text.

This document is controlled, periodically reviewed, and updated to keep pace with changing requirements and technological advances. Individual facility managers may develop facility-specific ALARA program guides which detail application of the information contained herein.

2.0 WHAT IS ALARA

ALARA is an acronym for the process of reducing radiation dose to levels As Low As Reasonably Achievable. It is an approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public to levels as low as reasonably achievable, taking into account social, technical, economic, practical and public policy considerations. ALARA is not a dose limit, but a process which has the objective of attaining (and maintaining, if achieved), doses as far below the applicable limits of 10CFR835 as is reasonably achievable.

3.0 POLICY STATEMENT

Personnel radiation exposure shall be maintained ALARA.

Radiation exposure of the work force and public shall be controlled such that radiation exposures are well below regulatory limits and that there is no radiation exposure without commensurate benefit.

4.0 BASIC ELEMENTS OF AN ALARA PROGRAM

The method of implementing an ALARA program is highly dependent on facility conditions. The ALARA program addresses, at a minimum, the following basic elements:

- Policy - Establish commitment and participation of all management and workforce levels to the ALARA policy.
- Training - Required for managers and workers involved with any aspects of radiological operations.
- Design - Ensure integration of appropriate methods during the design phase for maintaining occupational exposures ALARA during subsequent construction, modification and operation of the equipment or facility.
- Procedure - Provide direction for maintaining occupational exposures ALARA.
- Radiological Work/Planning – Implement controls and use optimization methods to assure that occupational dose is maintained ALARA for routine and special operations or experiments.
- Audits - Conduct comprehensive audits periodically and report results to the higher management levels.
- Records - Maintain documentation that demonstrate compliance, and that the program is adequately carried out.

The foundation of a strong ALARA program is the application and inclusion of the ALARA philosophy and the ALARA process in every aspect of tasks involving potential radiation exposure. This includes design, operation, maintenance, and decommissioning. It should be understood that the elements of ALARA and production responsibilities are mutually additive; job analyses and pre-job and post-job reviews inherent in the ALARA approach will increase overall efficiency and cost-effectiveness.

The ALARA philosophy is to strive for excellence and continuous improvement. Excellent performance is evident when radiation exposures are maintained well below regulatory limits, contamination is minimal, radioactivity is well controlled and radiological spills or uncontrolled releases are prevented.

Chapter 2 ADMINISTRATION [MTS]

1.0 MANAGEMENT COMMITMENT

The management at SRS continues to be committed to maintaining exposures to radiation produced during or from Site processes at ALARA levels, below all applicable DOE and Washington Savannah River Company (WSRC) limits. Dose reduction can best be achieved through increasing emphasis on ALARA program implementation. Exposures are minimized with the aggressive application of ALARA principles, which embody the best practices of other DOE facilities as well as the commercial nuclear industry.

In addition to the Site policy on radiation protection, the WSRC Radiological Improvement Strategic Plan (RISP) provides the vision to promote continuous improvement in the SRS Radiological Control Program while at the same time achieving the most cost-effective program possible within the concepts of safe mission essential.

2.0 ORGANIZATION

A network of review and approval committees is used to ensure adequate senior management oversight. The Site Policy and Procedures Council (SPPC) approves changes in Site Policy Manuals, including radiological safety policies.

The WSRC Site ALARA Committee (SAC) is chaired by a senior Site executive appointed by the WSRC President. The SAC reviews the overall conduct of the radiological control program to ensure continuous improvement by developing ALARA initiatives.

3.0 RESPONSIBILITIES

Each person involved in radiological work is expected to demonstrate responsibility and accountability through an informed, disciplined and cautious attitude towards radiation and radioactivity. The responsibilities for managers, senior managers, Radiological Protection Services (RPS) and radiation workers of all WSRC Business Units/Area Projects are given in WSRC Policy Manual 1-01, MP 4.4.

- Site management shall provide the leadership and resources to include ALARA assessments in production as well as radiation protection plans and controls.
 - Line management and support organizations shall provide the supervisory emphasis and program support involved in the implementation of ALARA policies and practices.
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- RPS is charged with the responsibility for providing technical support, assistance, and guidance to Site organizations by coordinating the WRSC ALARA Program within the bounds of the WSRC Radiological Protection Program.
- Each employee must be held personally responsible for maintaining radiation exposure and personnel contamination cases to levels ALARA and must implement the ALARA principles and procedures in their day-to-day work activities.

3.1 Facility ALARA Coordinators

Individuals are assigned to function as ALARA Coordinators. The ALARA Coordinators are responsible for providing technical support and assistance to line management to coordinate the development, implementation and documentation of the ALARA process and program, for maintaining communications on ALARA topics between established awareness subcommittees of the Business Units/Area Projects and ad hoc committees, and for assuring line management appropriately implement ALARA practices and procedures (formal plans and measures) and shall ensure during the goal setting process that exposure estimates are established for base routine and special work operations.

At a minimum, ALARA Coordinators shall take the following site core training requirements to perform duties as an ALARA Coordinator at Savannah River Site. Additional training requirements are at the direction of the Business Units or facility. The core training shall be completed prior to assuming the ALARA Coordinator duties per the ALARA Coordinator Training Standard.

- Radiological Worker Training comparable to the workers they support
- 652/653 ALARA Training
- ALARA Coordinator Training

3.2 SITE ALARA Coordinator

The SITE ALARA Coordinator is responsible for conducting reviews of all SRS internal and external exposures to ensure that exposures to radiation and radioactive material are maintained at levels as low as reasonably achievable (ALARA); providing radiological performance indicators and Site Metrics to DOE, management, and the ALARA Coordinators; coordinates and facilitates the Site ALARA Committee (SAC) meetings and communicates current issues, performance indicators, and maintains the meeting minutes; development of the annual Radiological Improvement Strategic Plan (RISP); SME of WSRC-SCD-6 Site ALARA Manual and Procedure Manual 5Q1.1, Procedure 505 ALARA Review Procedure; maintain radiological performance goals; and identifying and pursuing continuous ALARA improvement initiatives for the radiological control program.

Chapter 3 SITE ALARA COMMITTEES [MTS]

1.0 PURPOSE

The members of the Site ALARA Committee are an integral part of the Site ALARA Committee (Attachment 3-1). The members are designated to represent the business units across the site. Their formation centralizes the business unit ALARA responsibilities and serves as a direct link to the radiological worker, with respect to ALARA initiatives planned and implemented at the Site.

The members provide a multidisciplined forum of the area project/facility line organizations and support functions including Environment, Safety, Health & Quality Assurance (ESH&QA) Services, Construction, and Wackenhut Services, Inc. (Attachment 3-1). Line Organizations are ultimately responsible for ALARA and should demonstrate their support by both word and action. Radiological Protection Services (RPS) provides guidance and technical assistance. The trained professional and administrative, mechanical, operational, and technical personnel of the committee are focused on improving ALARA performance.

2.0 CHARTER AND SCOPE

2.1 Site ALARA Committee (SAC)

Charter

The WSRC SAC is a committee of the Facilities Management Integration Council (FMIC) and is chartered by the FMIC. The SAC ensures that exposure to radiation and radioactive material are maintained at levels as low as reasonably achievable (ALARA) as defined in WSRC Procedure Manual 5Q. The committee reviews the overall conduct of the radiological control program to ensure continuous improvement and makes recommendations to the FMIC to improve progress in ALARA initiatives.

Scope

Within its area of cognizance, this committee:

- Develops and implements policies and procedures
 - Sponsors Management Evaluations (MEs)
 - Communicates lessons learned and best practices
 - Identifies and implements improvements
 - Assesses and justifies impacts of changes to the FMIC
 - Develops, presents to the FMIC, and manages an integrated annual schedule that
 - includes procedure reviews, ME reviews, and planned improvements.
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2.1 Site ALARA Committee (SAC), continued

The SAC provides a focus and review of the overall conduct of the site radiological control program. The committee provides direction to the site radiological protection program through the Site Policy and Procedure Council (SPPC) by:

- Developing the annual Radiological Improvement Strategic Plan (RISP)
- Identifying and pursuing continuous improvement initiatives for the radiological control program
- Approving the Site ALARA goals
- Steering or ad hoc working groups may be established to support sitewide activities that require interdepartmental coordination.

2.1.1 ALARA/Radiological Awareness Subcommittees

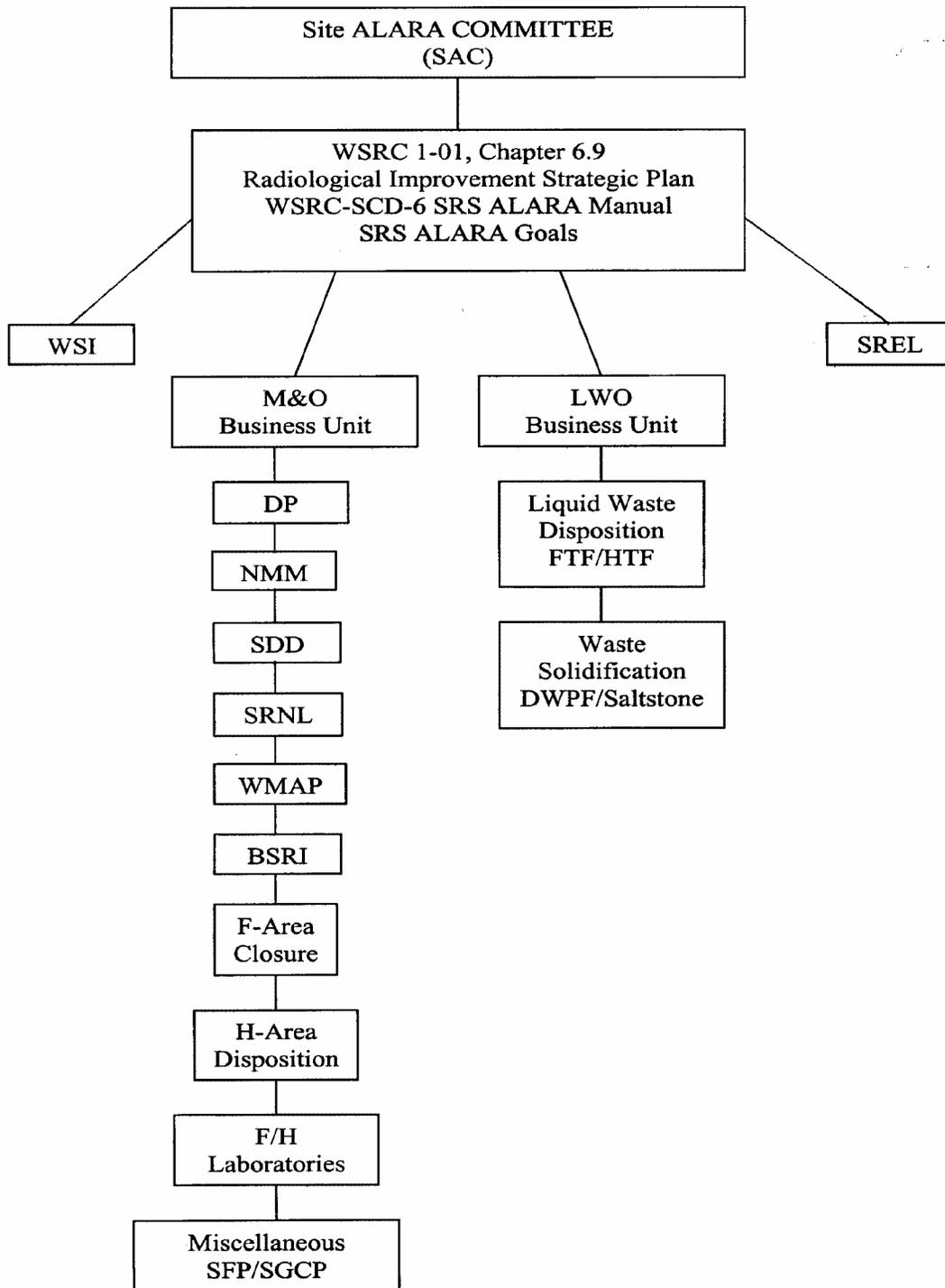
Line organizations are ultimately responsible for ALARA activities and subcommittees provide a direct link to the workforce with respect to radiological work being planned and performed. This operational linkage will be achieved by the inclusion of the operating facility staff, the Site ALARA Committee membership, and through the regularly scheduled meetings of the area RadCon Managers.

Further input may be combined with Facility Operations Safety Committees (FOSC's) and/or Facility Radiological Assessment Team's (FRAT's). The purpose of the FOSC and FRAT is to review the overall safety (radiological, industrial, operational, nuclear, etc.) in the facility by assuring that all hazards are identified, controls are established to mitigate or eliminate hazards, and work can be performed within established controls.

2.2 ALARA Coordinator Council (ACC)

The ALARA Coordinator Council is made up of the facility ALARA coordinators and is chaired by the Site ALARA Coordinator. The goal of the council is to share lessons learned, assist each other in achieving ALARA goals via shared information and techniques, review of high hazard work evolutions, and recommending methods toward minimizing exposure and radiological releases. Meetings should be convened periodically.

Attachment 3-1 Site ALARA Committee



Chapter 4 DESIGN [MTS]

1.0 GENERAL

The design of new facilities or the modification of existing facilities must include consideration of ALARA principles from the original conception of the project to the final construction turnover. Planning in the early stages of design is the most cost-effective means of minimizing worker exposure. [5Q 311.(4)] Once the facility is complete, changes to the layout or the addition of shielding are costly to accomplish. When designing a facility, it is important that maintaining exposures below regulatory limits and optimizing the design for ALARA are treated as separate entities.

Measures shall be taken to maintain radiation exposure in controlled areas ALARA through physical design features and administrative control. The primary methods used shall be physical design features (e.g., confinement, ventilation, remote handling, and shielding). Administrative controls shall be employed only as supplemental methods to control radiation exposure. For specific activities where use of physical design features is demonstrated to be impractical, administrative controls shall be used to maintain radiation exposures ALARA. [835.1001(a)(b)]

ALARA and the radiological concerns associated with the various facility modes (e.g., normal operation, shutdown, transients, maintenance, postulated accidents and eventual decontamination and decommissioning) must be considered in the design. Engineered controls should be passive, containing no stored energy, whenever possible.

2.0 DESIGN CRITERIA

When designing a new facility or modifying existing facilities, the design must meet all applicable limits with respect to personnel exposure. Radiological design criteria are found in SRS Engineering Standard 01064, *Radiological Design Requirements*. Once applicable dose limits are attained, ALARA principles must be incorporated to optimize the exposure levels. This may include performing cost-benefit analyses using appropriate dollar per person-rem values specified in SRS Engineering Standard 01064. For modifications with low associated doses, a cost-benefit evaluation is an intrinsic part of the engineering review process and a detailed evaluation is not necessary. Radiological designs and documentation of them shall utilize a graded approach to ensure that missions are safely and successfully accomplished with minimal cost.

During the design of new facilities or modification of existing facilities, the following objectives shall be adopted:

- (a) Optimization methods shall be used to assure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls. [835.1002(a)]
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- (b) The design objective for controlling personnel exposure from external sources of radiation in areas of continuous occupational occupancy (2000 hours per year) shall be to maintain exposure levels below an average of 0.5 mrem (5 microsieverts) per hour and as far below this average as is reasonably achievable. The design objectives for exposure rates for potential exposure to a radiological worker where occupancy differs from the above shall be ALARA and shall not exceed 20 percent of the applicable standards in 835.202. [835.1002(b)]
- (c) Regarding the control of airborne radioactive material, the design objective shall be, under normal conditions, to avoid releases to the workplace atmosphere and in any situation, to control the inhalation of such material by workers to levels that are ALARA; confinement and ventilation shall normally be used. [835.1002(c)]
- (d) The design or modification of a facility and the selection of materials shall include features that facilitate operations, maintenance, decontamination, and decommissioning. [835.1002(d)]

3.0 DESIGN RESPONSIBILITIES

Manual E7, Procedure 2.05 and SRS Engineering Standard 01064 require the consideration of ALARA design principles in the design of new facilities and modifications to existing facilities, which pose potential radiological hazards to personnel. Specific analyses performed to determine appropriate radiological protection designs shall be documented in accordance with Manual E7. Radiological design aspects require approval of the Radiological Technology Group of Radiological Protection Services (RPS) to ensure compliance with WSRC Manual 1-01, MP4.4.

In those situations where a significant reduction in collective dose can be realized, use of optimization techniques is required. SRS Engineering Standard 01064 provides guidance on optimization analyses.

Chapter 5 ALARA PROCESS APPLICATION [MTS]

1.0 ALARA IMPLEMENTATION

The content of the Radiation Protection Program shall be commensurate with the nature of the activities performed and shall include formal plans and measures for applying the ALARA process to occupational exposure.

The ALARA process is comprised of all planned and systemic actions necessary to provide adequate confidence that occupational exposures are maintained as low as reasonably achievable. The process is applicable throughout the planning, design, construction, operating, maintaining and decommissioning facility life cycle. The application of ALARA principles have been engineered in the facility design, equipment selection, and facility construction such that occupational exposures emanating from radiological work operations performed in the facilities are maintained at levels as low as reasonably achievable. Planning of radiological work integrates applicable measures and radiological controls for maintaining occupational exposures ALARA for specific operations. Plans and procedures provide the course of action and direction to attain and maintain occupational exposures ALARA.

The SRS ALARA Center facilitates the implementation of ALARA principles and practices at the planning stages of radiological work. The ALARA Center is supported by the Containment Fabrication Facility (CFF). These groups are targeted at efforts in waste minimization and pollution prevention, radiological hazard reduction and safe, cost effective operations within the concepts of safe mission essential. The ALARA Center is operated by the Radiological Protection Services. The CFF is operated by M&O and I&S, Field Services.

2.0 RADIOLOGICAL WORK/PLANNING

Job planning has been integrated into the work control process. Early planning ensures that as many hazards as practical have been addressed and removed from the work environment in advance of work performed. The ALARA principles applied to the evolutionary process of radiological work are incorporated in the following stages: planning stage through procedure development, review and approval; the actual work evolution including the preparation of the associated radiological work permit (RWP) and associated ALARA pre-job review; execution and associated ALARA in-progress review; post job review including performance evaluation; evaluation and incorporation of lessons learned to reduce exposures on subsequent similar work.

Maintenance and modification plans and procedures shall be reviewed to identify and incorporate radiological requirements and radiological control action steps and hold points, such as engineering controls and dose and contamination reduction considerations. Performance of the review is the responsibility of line management, with support and concurrence from Radiological Control Operations (RCO). The specific operations are reviewed, ALARA measures applied, performance measured and evaluated, and corrective measures implemented.

Planning of operations involving hands-on work with radioactive materials (non-routine or complex work), the potential for significant exposure rates, or the potential spread of radioactive materials is accomplished with a technical work document, such as procedures or work packages, or job or research plans. Work packages are a collection of formally approved documents that control work. The work packages are used to authorize work, provide instructions for the performance of the work, and document radiological controls and accomplishments of the work.

Planning of routine work, such as surveillance, tours and minor nonradiological maintenance, may be accomplished with the completion of the Safe Work Permit (SWP).

NOTE: The SWP is satisfied in cases where Assisted Hazards Analysis (AHA) is implemented by facilities and organizations in the performance of work planning.

2.1 JOB SITE MONITORING

Monitoring of the job site provides the necessary information about radiation and radioactive materials to support the completion of the radiological work permit and pre-job ALARA review. A survey of the area should have been performed to identify and control potential sources of individual exposure to radiation and/or radioactive material documenting the radiological conditions and detecting any buildup of radioactive material. Diagrams and/or photographs should be marked, showing where the sources are located, to assist in identifying locations where personnel may take advantage of factors that reduce exposure. Specific areas that are chronic "hot spots" should be clearly labeled. Access routes, as well as working areas, should be determined based on lowest radiation and contamination levels.

2.2 CONTAMINATION CONTROL

Contamination control minimizes the potential for worker internal exposure and the spread of contamination. Contamination should be controlled at the source and areas that become contaminated should be promptly decontaminated. Contamination levels caused by ongoing work shall be monitored and maintained ALARA. Reducing the size and scope of existing contamination areas in a facility generally improves productivity.

Personnel should not be exposed unnecessarily to contamination and airborne radioactivity. Use of engineering and administrative controls should be evaluated before allowing personnel to work with or without respiratory protection. When engineering and administrative controls have been applied and the potential for airborne radioactivity still exists, respiratory protection should be used to limit internal exposures. The selection of respiratory protection equipment includes considerations of worker safety, comfort and efficiency. Positive pressure respiratory protection devices are recommended whenever practical to alleviate fatigue and increase comfort. When feasible, work should be planned to avoid the routine use of respiratory protection devices.

3.0 PROCEDURES

The development and periodic revision of plans and procedures provide the documented course of action and direction to attain and maintain occupational exposures ALARA. The revision process ensures that personnel with experience in ALARA have had the opportunity to recommend changes consistent with the ALARA philosophy.

3.1 RADIOLOGICAL WORK PERMITS (RWP)

Written authorization shall be required to control entry into and perform work within radiological areas. These authorizations shall specify radiation protection measures commensurate with the existing and potential hazards. The RWP is an administrative mechanism used to establish radiological controls for intended work activities. The radiological work activities shall be conducted as specified by the RWP. The RWPs serve as the primary administrative process for planning and controlling radiological work and for providing a mechanism to relate worker exposure to work activities.

Two types of RWPs are in use. A Standing Radiological Work Permit (SRWP) is used to control routine or repetitive activities in areas with well-characterized and stable radiological conditions. A Job-Specific Radiological Work Permit (strictly referred to as an RWP) is used to control non-routine operations and complex work activities, work in areas with changing radiological conditions, and entries into Very High Radiation Areas. The RWP program is documented in Procedure Manual 5Q1.1, Procedure 504.

The key aspects of the RWP program are that the work is described, the job site conditions (based on current surveys and anticipated conditions) and personnel protective requirements including equipment and clothing are documented, and the approval signatures are documented. Additionally, individual workers entering the designated work area shall read the RWP and acknowledge by signature that they " ... have read, understand and will comply with the RWP prior to initial entry to the area and after any revision to the RWP". These may be documented electronically.

3.2 FORMAL ALARA REVIEW

ALARA reviews are an integral part of the RWP process. Radiological Control Operations (RCO) initially determines if a formal radiological or ALARA review is required based on work activity, established trigger levels, and the current and anticipated working conditions and exposure levels of the job. Any special ALARA controls are documented.

3.2.1 Pre-job Review and Planning

For routine tasks, the ALARA review may be completed as a part of the RWP process using the "Checklist for Reducing Occupational Exposure" found in Appendix 3A of WSRC Manual 5Q. For non-routine or complex tasks the ALARA review may either be completed using Appendix 3A checklist or by a formal documented radiological or ALARA review.

The minimum ALARA review requirements to be considered (including established trigger levels under which a formal ALARA review must be conducted for non-routine or complex tasks) are outlined in the ALARA Review procedure.

When a formal ALARA review is required and a significant reduction in collective dose can be realized by utilizing optimization techniques, the dollar per person-rem values in Table 5.3.2.1 shall be used.

Table 5.3.2.1

Annual Dose Basis (rem)	Dollars per person-rem
0.10	2300
0.15	2400
0.20	2500
0.25	2700
0.30	2900
0.35	3000
0.40	3200
0.45	3400
0.50	3600
0.55	3900
0.60	4100
0.65	4400
0.70	4600
0.75	4900
0.80	5200
0.85	5500
0.90	5900
0.95	6300
1.00	6600
1.10	7500
1.20	8400
1.30	9500
1.40	11000
1.50	12000

A pre-job briefing is an ALARA tool to employ. At the pre-job briefing, the scope of work to be performed is reviewed and evaluated. The Lead Work Group manager should conduct the briefing. Workers and managers participating in the job, knowledgeable RCO personnel, and representatives from involved support organizations should attend the briefing. The minimum pre-job briefing requirements (as well as additional suggested items) to be considered are outlined in the RWP procedure.

Radiation exposures associated with the entire job should be evaluated before beginning work. The manpower requirements should be outlined. The number of personnel involved in actual work is minimized, while performing the work safely and efficiently. Estimates are to be based on the number of personnel involved in the task, the anticipated time spent in the radiation field, and the measured dose rate. The overall dose estimate for the job is obtained by summing the individual worker dose estimates. Timekeepers may be required to notify workers when their estimated exposure reaches a predetermined level. Supplemental dosimetry, such as electronic personal dosimeters (EPDs) may also be required.

For non-routine maintenance work, a detailed work plan is developed to communicate to the worker the expectations at the job site. The proper techniques associated with the specific task and tool requirements are included. Special tools should be considered either where the job can be more efficient, or when the distance between the worker and the source of radiation can be increased. Any mock up training of the work and prefabrication and assembly of necessary equipment should be conducted in areas without contamination and radiation exposure concerns wherever practical (outside of the radiological area). Generically, as much preparation as possible should be completed outside of the radiological area.

Communications should be operationally checked before being brought into the work area. When exposure rates are high, use of closed-circuit television should be considered.

3.2.2 In-progress Review

Logs should be maintained to document radiological occurrences, the status of work activities and other relevant information. As a part of normal review, work should periodically be reviewed to ensure the implementation of ALARA initiatives/controls is functioning effectively and efficiently. For jobs with pre-job estimates, dose accumulation should be monitored to assess the need for corrective actions. Contamination levels caused by ongoing work shall be monitored and maintained ALARA.

Stop work authority shall be exercised justifiably and responsibly. Once stopped, work shall not be resumed until proper radiological controls have been established and appropriate approvals obtained.

3.2.3 Post-Job Review

The post-job review is a forum for discussing the techniques used in the specific task. The post-job review should compare actual exposures with estimates and evaluate effectiveness of ALARA controls. Post-job reviews are to be documented and a copy attached to the final work package. The information can be reviewed and recommendations considered as part of the pre-job meeting when the same task, or a similar task, is performed. Post-job reviews are especially important on jobs requiring significant amounts of manpower, tasks where there was a large amount of radiation exposure, or where the task resulted in a loss of control contributing to the release of radioactive contamination to the work area or the environment.

3.3 LESSONS LEARNED

Lessons learned from both positive and negative experiences are evaluated, distributed, and incorporated into related operations and related training programs. Worker input is essential. The intent is to promote safe, effective, and efficient operation of SRS facilities.

3.4 PROBLEM REPORT

All WSRC personnel are responsible for identifying and documenting radiological problems. The Problem Report (PR) is a method to document and report radiological deficiencies, which lead to programmatic conditions and activities that do not meet established requirements, or management expectations. The individual identifying a radiological problem must notify the responsible management for the activity and initiate a PIR. The PR program requirements are found in Procedure Manual WSRC 1-01, 5.35. A significance category for applicability to the radiological control program and corrective action taken/planned are listed.

3.5 PERSONNEL MONITORING

Monitoring of individuals and areas shall be performed to verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposures. Personnel monitoring requirements are given in Procedure Manual 5Q1.1, Procedure 604.

3.6 ADMINISTRATIVE CONTROL LEVELS

An administrative dose control system is implemented sitewide, consisting of Administrative Control Levels (ACL). The intent of the dose control system is to gain management control over planned and actual doses within the bounds of DOE limits.

Administrative limits and reference levels are used as guides and not considered to be desirable dose commitments. In general, efforts to reduce individual dose should not be allowed to cause a concurrent increase in collective dose. The

control levels are multi-tiered with increasing levels of authority required to approve higher ACLs.

A DOE ACL of 2000 mrem per year per person has been established for all DOE activities. The Site shall annually establish SRS ACLs that are more restrictive based upon an evaluation of historical and projected radiation exposures, work load and mission. The ACL shall not be knowingly exceeded without prior approval. The level of approval required (for the RWP controlling work) will depend on the magnitude of the exposure.

In addition, prior to a planned special exposure, written consent shall be obtained from each individual involved. Each such written consent shall include: the purpose of the planned operations and procedure to be used; the estimated doses and associated potential risks and specific radiological conditions and other hazards which might be involved in performing tasks; and instructions on the measures to be taken to keep the dose ALARA considering other risks that may be present.

Guidance is given in Procedure Manual 5Q1.1, Procedure 507. The procedure provides guidance on when normal exposure limits may be exceeded, the approval process for exceeding the limits, the exposure limits applicable for emergency situations, and the necessary follow up actions should exposure limits be exceeded.

3.7 SHIELDING

The source of radiation in an area may be from liquid material in lines or traps. Before conducting work, the lines may be drained and flushed. If not possible, the use of shielding should be considered. The shielding may be temporarily installed, or where the work is a maintenance function that must be conducted on a routine basis, the addition of permanent shielding should be considered. Instructions for the installation, maintenance, and inventory requirements of temporary shielding are given in Procedure Manual 5Q1.1, Procedure 516. When evaluating the installation of shielding, the estimated exposure for installation and eventual removal must be considered. The overall cost in dollars and initial radiation exposure may outweigh the savings.

3.8 POSTINGS

Radiological postings are used to alert personnel to the presence of radiation and radioactive materials at specified control levels to aid in minimizing exposures and preventing the spread of contamination.

As applicable, the area may be barricaded and posted, and a step-off pad, a waste container, and a count rate meter placed at the ingress/egress point. Posting-requirements are documented in Procedure Manual 5Q1.1, Procedure 518.

3.9 VENTILATION

Portable ventilation systems or containment enclosures and expendable floor coverings can control the spread of contamination and limit the intake by workers through inhalation. Instruction on ventilation equipment is given in Procedure Manual 5Q1.1 Procedure 508. Instruction in containments is given in WSRC-OS-94-14, Radiological Containment Guide.

4.0 DOCUMENTATION AND TRENDING

The trending of radiation exposures is a method to quantify the success of the ALARA program and focus attention towards areas of performance requiring improvement. Radiological Performance Indicators are provided in WSRC Manual 5Q, Article 131.

Contamination cases are recordable events. Performance reports are periodically issued detailing contamination cases, year-to-date statistics, and trending the cases. The use of documentation is a tool for use in future job planning as well as the goal-setting process for an upcoming year. Conduct of Operations Manual 2S, Procedure 5.2, provides direction for the performance of critiques.

5.0 ALARA AUDITS

Internal audits of the radiation protection program, including examination of program content and implementation, shall be conducted through a process that ensures that all functional elements are reviewed no less frequently than every 36 months.

Planned and periodic audits are conducted to verify compliance with the ALARA Program and determine the effectiveness of the program. Audit results, including corrective and follow-up action(s), are documented and reviewed by management. The periodic review of the overall conduct of the radiological control program, including the results of internal and external audits, is the responsibility of the ALARA Committee.

6.0 ALARA AWARENESS

The key to an effective ALARA program is individual worker participation. Periodic publications as well as monthly Spectrum safety meetings and videotapes are designed to reinforce these values. Individuals within line management are held accountable for the performance of their respective organizations with regards to ALARA. This responsibility is essential to ensuring continued support of the ALARA program.

A formal program for submitting ideas for improving performance in all work related areas (including ALARA) exists via the Individuals Developing Effective Alternative Solutions (IDEAS) program.

Chapter 6 TRAINING [MTS]

1.0 GENERAL EMPLOYEES

ALARA training is developed, documented, revised and provided through Site Training. Training is provided to all site personnel commensurate with the degree of hazard. Each individual shall complete radiation safety training on the topics established in 10 CFR 835, commensurate with the hazards in the area and the required controls before being permitted unescorted access to controlled areas; and before receiving occupational dose during access to controlled areas at a DOE site or facility. The training for an occasional visitor to a controlled area is not as comprehensive, yet commensurate with the work to be performed.

2.0 RADIOLOGICAL WORKERS

The training process is continuous, from orientation at initial employment through on-the-job training and periodic refresher training. Training is designed to supplement an individual's educational background, providing the skill development and proficiency necessary to perform a particular job assignment. Radiation safety training shall be provided to individuals when there is significant change to radiation protection policies and procedures, that may affect the individual, and at intervals not to exceed 24 months. Such training provided for individuals are subject to the requirements of 10CFR835.

3.0 RADIOLOGICAL CONTROL INSPECTORS

Radiological Control Technician training is comprehensive and commensurate with the work to be performed. Training and retraining for Radiological Control Technicians should be established and conducted at intervals not exceeding 2 years, to familiarize the Technician with the fundamentals of radiation protection and the proper procedures for attaining and maintaining exposures ALARA.

4.0 SUPPORT PERSONNEL

Appropriate technical support personnel (engineers, etc.) should be trained in the principles of ALARA, basic ALARA techniques and dose reduction techniques. The support personnel should also participate in selected portions of job-specific and specialized training, particularly in situations using mock-ups.

Planners who develop detailed work plans involving or associated with radioactivity or radioactive materials should have Radiological Worker training to the level required by the workers using the work plans. It is desirable that planners have Radiological Worker II training. Planners should be trained on the ALARA process as described in WSRC 5Q Manual, Article 653.

Radiological support personnel who are responsible for implementing aspects of the site ALARA program shall receive ALARA training.

Specialized Radiological Worker training should be completed for nonroutine operations or work in areas with changing radiological conditions. The training is in addition to radiological worker II training and is required for personnel planning, preparing and performing jobs that have the potential for high radiological consequences. Such jobs may involve special containment devices, the use of mock-ups and ALARA considerations.

5.0 ALARA COORDINATORS

ALARA Coordinators training should include the total training materials given to radiological workers in order to fit into the entire ALARA process effectively. Training is required for the comprehensive SRS ALARA program and includes the use of Procedure Manual 5Q1.1, Procedure 504 and 505 in controlling work activities in accordance with WSRC radiological control standards.

Chapter 7 ESTABLISHING GOALS [MTS]**1.0 PURPOSE**

The establishment and maintenance of goals, their periodic review, and comparison with actual data are methods for tracking the progress toward reducing exposures ALARA. The WSRC President shall establish, approve and maintain a radiological performance goal program. The Environment, Safety and Health (ES&H) Services, Radiological Protection Services (RPS) Manager should provide a quarterly summary report of the radiological performance goals in this Section to WSRC Management. The report shall include the radiological performance goals established and maintained to demonstrate the adequacy of the ALARA Program.

Goals at SRS are established annually by those responsible for performing the work (owners). Radiological protection goals are understood to be motivators for improvement, not an end themselves. Goals should be measurable, achievable, auditable, challenging, and meaningful in promoting improvement. The process of establishing goals are provided in Appendix 7A.

2.0 GOALS

Goals listed in WSRC 5Q Manual should be established.

- Person-Rem of collective exposure, with a separate goal for neutron person-rem of exposure (whole-body).
- Personnel contaminations, numbers of skin occurrences and personal clothing occurrences.
- Number of intakes of radioactivity in which the committed effective dose equivalent (CEDE) is 500 mrem or more.

The reduction of existing contaminated areas needs to be balanced by the recognition that this generates radioactive waste. Goals for both should be correlated.

- Cubic feet and curies of radioactive waste and the number of cubic feet not subject to volume reduction by incineration, compaction or other means.
 - Curies (dose equivalent) of liquid and airborne radioactivity released.
-

3.0 GOAL DEVELOPMENT

A network of review and approval committees is used to ensure adequate senior management cognizance. The Site Policy and Procedures Council (SPPC) approves changes in radiological safety policies. The Site ALARA Committee (SAC) reviews the radiological safety program, the ALARA initiatives, and initiates improvement programs. The SAC establishes the goals.

4.0 RADIOLOGICAL PERFORMANCE

A performance indicator program to verify ALARA initiatives and for measuring and trending the effectiveness of the radiological control program against predetermined goals is established and maintained. The site radiological performance indicators and the process of reporting performance indicators are provided as Appendix 7B.

5.0 REVIEW OF GOALS AND PERFORMANCE

Senior Management shall review progress towards the goals at least quarterly. Radiation exposure goals are compared to the actual exposure to measure performance in the quarterly reports.

Annual radiological performance goals are not normally revised, unless there is strong supporting justification provided. This adjustment provision is designed to accommodate jobs that started and were not completed, delayed jobs, and operations that were not anticipated when the original goal was established. Any revisions will be recommended and approved using the method described in Section 3.0.

Goals for minimizing solid waste, liquid releases, and airborne releases are developed, approved and maintained by other SRS committees or organizations. Solid waste goals are provided in cubic feet by waste types (low level, hazardous, mixed low level and TRU waste). Liquid and airborne release goals are provided in mrem.

The individual Facility Radiological Assessment Teams (FRATs) are responsible to interface with these other committees or organizations to correlate goals for reduction of existing contaminated areas and radioactive wastes. The reduction of existing contaminated areas needs to be balanced by the recognition that this in the short term may generate radioactive waste but in the long term may reduce radioactive waste. The site radiological performance indicators are provided as Attachment 7B-1.

APPENDIX 7A PROCESS OF ESTABLISHING GOALS**1.0 RESPONSIBILITIES¹**

An Operations ALARA "steering or ad hoc" committee is established under the sponsorship of the Site ALARA Committee to support site wide activities which require business unit and area project coordination, such as the establishing of goals. Representation on the ALARA goal committee includes representatives of the divisional line organizations (e.g., FRATs) and support organizations [e.g., Project Design and Construction Services (PD&CS), and Field Support Services (FSS)].

2.0 BASIS FOR GOALS

The development of goals requires the review of historic work with associated exposures and schedules for anticipated production and maintenance. The radiological work permit program and associated pre-job and post-job ALARA reviews provide a base of historical information. Once the type of and amount of work that will actually be performed is developed and an estimate value established, the amount of savings through implementation of ALARA principles will be subtracted.

2.1 Establishment of Radiation Exposure Goals

The following steps are recommended to be taken to provide the required information:

Categorize the activities as either Base Routine Operations or Special Work Operations.

Base Routine Operations are defined as those non-discretionary activities that are necessary to maintain normal day-to-day functions of the facility. As a general rule Base Routine Operations are work activities performed under a Standing Radiological Work Permit (SRWP).

Special Work Operations are defined as discretionary activities that are outside a facility's normal scope of work. This includes the following: work activities that could exceed a predetermined individual or collective exposure limit; the activity is performed first time or infrequently; the activity is determined to need special training (e.g., mock-ups); the activity is determined to have a high risk; or the activity falls out of the facility's Annual Operation Plan (AOP) scope. As a general rule Special Work Operations are work activities performed under a Radiological Work Permit (RWP).

- Estimate exposure of the activity.
- Base operations are estimated for the entire year
- Special operations are estimated for the entire year.
- Estimate the total exposure of base plus special operations by the individual calendar quarter.

2.1 Establishment of Radiation Exposure Goals, continued

Goal Establishment

- Determine all work groups (organization codes) involved in the operations.
- Estimate the exposure that will be received by each work group (organization codes) involved.
- Estimate the total exposure received by the facility and each work group.

After the facility has developed its activity plan and estimated the total exposure, the support organization work groups involved establish their ALARA goals. Work groups that have responsibilities in one or more facilities must coordinate their goal based on these activity plans.

Prior to the beginning of each quarter the facilities reevaluate the projected special work and submit updated estimates for the new quarter. When a quarter is completed, the facilities determine what work was actually started and subtract out the estimated exposure for special work that was not started.

The goal is revised only when there is a significant change in the basic work assumption used to establish it.

2.2 Establishment of Contamination Goals

The establishment of contamination goals is a combination of historic performance and the type of work activities (e.g., decontamination and decommissioning). The type of activities scheduled give indications for the possibility for contamination cases.

2.3 Establishment of Intake Goals

The goal for intakes other than tritium is zero.

2.4 Maximum Individual Exposure

An annual ACL established by senior management is based upon an evaluation of historic and projected radiation exposure, workload and mission. The operational business unit/area project/facility may establish an ACL less than or equal to that of the site.

3.0 DOCUMENTATION OF GOALS

Facilities and work groups will document their respective activity plans and person-rem collective exposures using OSR 49-7, Radiation Exposure Worksheet, shown as Attachment 7A-1.

A summary of the goals established for the facilities and work groups is collated. An annual SRS ALARA Goals document is published.

ATTACHMENT 7A-1 Sample of Radiation Exposure Worksheet

Radiation Exposure Worksheet

Facility/Work Group	Manager	Area	ALARA Coordinator	Phone	Date				
PART I (Enter Percentages % of Exposure, as applicable)									
Activity	Estimated Total Exposure	Anticipated Schedule				Percent % of Work Group Exposure per Section	Percent % of Work Group Exposure per Total	Final Yearly Exposure	
		Quarter 1	Quarter 2	Quarter 3	Quarter 4				
A. Base Routine Operations									
A.1								A.1	
A.2								A.2	
A.3								A.3	
A.4								A.4	
A.5								A.5	
A.6								A.6	
A.7								A.7	
A.8								A.8	
A.9								A.9	
A.10								A.10	
A. Total									
B. Special Work Operations									
B.1								B.1	
B.2								B.2	
B.3								B.3	
B.4								B.4	
B.5								B.5	
B.6								B.6	
B.7								B.7	
B.8								B.8	
B.9								B.9	
B.10								B.10	
B.11								B.11	
B.12								B.12	
B. Total									
TOTALS									
_____ REM Base Rem	_____ REM Total (Base + Special)	By exposure anticipated in the quarter the work is performed				_____ REM Facility/Work Group Total			
Part II (List specific ALARA Actions to Reduce Exposures on above work/jobs. Reference to sections in Part I.)									

Retention Period - 75 Years

APPENDIX 7B SITE RADIOLOGICAL PERFORMANCE INDICATORS**1.0 RADIOLOGICAL PERFORMANCE**

The trending of radiation exposures is a method of quantifying the success of the ALARA program and of focusing and directing the attention of all levels of management and workers towards areas of performance requiring improvement. This trending applies both at the site level and the facility level. A performance indicator program to verify ALARA initiatives and for measuring and trending the effectiveness of the radiological control program against predetermined goals is established and maintained.

2.0 RESPONSIBILITIES**Radiological Protection Services Manager**

- Establish the scope of the radiological performance reports
- Appoints Radiological Performance Indicator Coordinator
- Maintain overview of Radiological Reporting Program

SITE ALARA Coordinator

- Collates radiological data
- Issues radiological performance reports

Facility ALARA Representative

- Functions as a focal point and contact in the various facilities and organizations to obtain the information necessary to support the radiological performance reports
- Reviews radiological performance reports
- Selects appropriate indicators related to the work for posting in facilities

3.0 REPORTS**3.1 Radiological Summary Report**

A radiological summary of the sitewide performance metrics will be periodically prepared by the site ALARA Coordinator to be reported to WSRC senior staff as a current status of radiological statistics. The summary includes available exposure and personnel contamination information. Trends for the month as well as for the prior 12 month period should be provided to highlight areas of opportunity.

3.2 Quarterly Radiological Performance Report

A quarterly report, which provides a more detailed analysis of trends, is issued and shows site performance in relation to established goals.

3.0 REPORTS, continued

3.3 Supplemental Exposure Reports

Supplemental exposure reports provide dose information of individuals to permit priority management of exposure control. The reports are issued in accordance with Procedure Manual 5Q2.1, Procedure 704.

4.0 POSTINGS

To promote worker awareness of radiation exposure status, the Facility ALARA representatives will post selected indicators in their respective areas. The site ALARA Coordinator will provide the data necessary to update the postings on a quarterly basis, at a minimum.

ATTACHMENT 7B-1 Site Radiological Performance Indicators

EXPOSURE CONTROL

- Collective dose (total and neutron)
- Average worker dose
- Maximum dose to a worker
- Number of unplanned exposures resulting in doses greater than the Administrative Control Level

PERSONNEL CONTAMINATIONS

- Number of skin and personnel clothing contaminations

CONTROL OF INTERNAL EXPOSURE

- Number of intakes with a dose of at least 500 mrem (CEDE)
-

Chapter 8 RECORDS ^[MTS]

1.0 10 CFR 835 RECORDS

Records shall be maintained to demonstrate compliance with Standards/Requirements Identification Documents (S/RIDs), 10 Code of Federal Regulations (CFR) 835 Supplementary Information, and the adequacy of, the implemented ALARA program. Records include:

- Training records shall be maintained, as necessary, to demonstrate compliance with 10 CFR 835.901
- Actions taken to maintain occupational exposures ALARA, including the actions required for this purpose by 10 CFR 835.101, as well as facility design and control actions required by 10 CFR 835.1001, 10 CFR 835.1002 and 10 CFR 835.1003, shall be documented
- Records shall be maintained to document the results of internal audits and other reviews of program content and implementation.

2.0 WSRC 5Q MANUAL RECORDS

Other records that should be maintained include:

- ALARA plans and goals that demonstrate the adequacy of the program
- Minutes of ALARA Committee meetings and other committees where radiological safety issues are formally discussed.

3.0 OTHER RECORDS

Other records that should be maintained include:

- Collective doses received by the total facility and by specific work groups and specific high-dose jobs
 - Annual or special ALARA reports, (e.g. dose/dosimetry trend data)
 - Approvals to exceed administrative control levels (ACL)
 - Dose, intake, and personnel contamination investigations
 - Radiological performance goals, status, and annual performance
-

3.0 OTHER RECORDS, continued

- ALARA design reviews
- Results of optimization analysis
- Radiological Work Permit (RWP)
- ALARA reviews.

Bibliography

Chapter 9 BIBLIOGRAPHY

Facility Safety, DOE Order 420.1, 11/22/2000

International Commission on Radiological Protection, Cost-Benefit Analysis in the Optimization of Radiation Protection, ICRP Publication 37 (adopted June 1982), Pergamon Press, Oxford

International Commission on Radiological Protection, Implication of Commission Recommendations that Doses be Kept As Low As Reasonably Achievable, ICRP Publication 22 (adopted April 1973), Pergamon Press, Oxford

Institute of Nuclear Power Operations, Guidelines for Radiological Protection at Nuclear Power Stations, INPO 91-014, December 1991

Kathren, R.L., Management Organization and Administration for ALARA, Health Physics, 42, 119-131, 1982

Munson, L.H., Herrington, W.N., Higby, D.P., Kathren, R.L., Merwin, S.W., Stoetzel, G.A., Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels that are As Low As Reasonably Achievable (ALARA), Report PNL-6577, Pacific Northwest Laboratory, Richland, Washington, June 1988

WSRC-TM-95-1, SRS Engineering Standards Manual, Standard No. 01064 Radiological Design Requirements

WSRC, FY02 Radiological Improvement Plan, ESH-RPD-2001-00066, 9/26/01

WSRC, FY95 Waste Minimization and Pollution Prevention (WMIN/PP) Objectives (U)", SWE-PPG-94-0002, 11/20/94

WSRC, 1995 Environmental Release Guides, ESH-EMS-94-0929, 12/22/94

WSRC, 2003 ALARA Goals, ESH-RPS-2003-00021, Rev.0, 03/04/03

U.S. Department of Energy, Real Property Asset Management, DOE Order 430.1B, 9/24/2003

U.S. Department of Energy, Radiological Control Standard, DOE STD-1098-99, July 1999

U.S. Department of Energy, Occupational Radiation Protection, Title 10 Code of Federal Regulations Part 835, 11/28/2006

U.S. Department of Energy, Radiological Protection Programs Guide, DOE G 441.1-1B, 3/1/2007

Procedure Manual 5Q1.1, Radiation and Contamination Control Procedures

Procedure Manual 5Q1.2, Radiation Monitoring Procedures

Procedure Manual Q1-1, Administrative Procedures

Procedure Manual 5Q, Radiological Control

Procedure Manual E7, Conduct of Engineering

Procedure Manual 8Q, Employee Safety

Procedure Manual 1-01, Management Policies

Procedure Manual 1B, Management Requirements and Procedures

Procedure Manual 1Y, Conduct of Maintenance

Procedure Manual 2S, Conduct of Operations

S-CLC-G-00253, ALARA Dollar Per Man-Rem Values

Radiological Containment Guide, WSRC-OS-94-14

[MTS 1], MANAGEMENT TRACKING SYSTEM, STAR:2007-CTS-003645-06