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Civilian Radioactive Waste Management System
Management & Operating Contractor

**MONITORED GEOLOGIC REPOSITORY
LIFE CYCLE COST ESTIMATE
ASSUMPTIONS DOCUMENT**

MIS-MGR-AD-000002 REV. 01

February 2001

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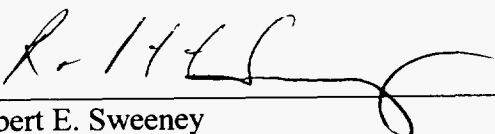
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CHANGE HISTORY

<u>Revision Number</u>	<u>Interim Change No.</u>	<u>Effective Date</u>	<u>Description of Changes</u>
00	00	February 2000	Initial Issue
01	01	February 2001	Changes throughout to reflect current MGR cost assumptions, strategies and schedules. Various editorial changes.

DISCLAIMER

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1.0 PURPOSE

The purpose of this assumptions document is to provide general scope, strategy, technical basis, schedule and cost assumptions for the Monitored Geologic Repository (MGR) life cycle cost (LCC) estimate and schedule update incorporating information from the Viability Assessment (VA), License Application Design Selection (LADS), 1999 Update to the Total System Life Cycle Cost (TSLCC) estimate and from other related and updated information. This document is intended to generally follow the assumptions outlined in the previous MGR cost estimates and as further prescribed by DOE guidance.

2.0 SCOPE

The MGR LCC represents the repository schedules and costs reflecting the reference design, commencing with Fiscal Year (FY) 2003 through decommissioning in 2073. Submittal of the License Application (LA) in March 2003 is required. This period includes completion of design, licensing, construction, and startup testing operations of the baseline repository. Use of an engineering, procurement and construction structure for each discrete product will also be a major focus of the plan.

Assumptions are noted that affect competitive strategies, funding schedules and profiles in order to meet government funding guidelines, and activities affecting long-lead procurement activities and critical paths. The cost figures and supporting assumptions are primarily derived from the MGR cost estimate and schedules prepared for the VA, LA10 and LADS efforts. This document and the resultant MGR schedule will supersede previous schedules developed in FY 99 under other initiatives.

3.0 PLAN ELEMENTS, MILESTONES AND PHASES

3.1 Plan Elements and Work Breakdown Structure

The MGR schedule shall be based upon discrete, defined major elements. These major elements and sub-elements of the MGR product are developed by a work breakdown structure (WBS) organized into specific and unique assets. The structure of the MGR WBS is a numerical, five level representation of discrete elements, which describe specific products, facilities, services, and/or data. Appendix A depicts the MGR WBS (1.2.30) to the fifth level (1.2.30.XX.YY).

3.1.1 Regulatory, Infrastructure & Management Support (WBS 1.2.30.1)

This element will consist of a variety of repository support services not included in other cost estimates. These services will include operational support, management, and administration systems under the following sub-elements:

- Systems Support (1.2.30.1.01)
- Regulatory & Licensing (1.2.30.1.02)
- Environment, Safety & Health (1.2.30.1.03)
- Information & Technology Management (1.2.30.1.04)
- Training, Facilities & Security Services (1.2.30.1.05)

- Institutional & External Affairs (1.2.30.1.06)
- DOE Support Services & Set Asides (1.2.30.1.07)
- Project Management (1.2.30.1.08)

3.1.2 Surface (WBS 1.2.30.2)

This element will include the work relating to surface facilities' design, procurement, construction, testing, training, operations and decommissioning. It will include the following sub-elements and associated activities under waste handling systems and operational support systems:

- Site Systems (1.2.30.2.01)
- Radiological Controlled Common Area (1.2.30.2.02)
- Balance of Plant Common Area (1.2.30.2.03)
- Waste Handling Building (1.2.30.2.04)
- Waste Treatment Building (1.2.30.2.05)
- Carrier Preparations Building (1.2.30.2.06)
- Transporter Maintenance Building (1.2.30.2.07)
- Airlock Building (1.2.30.2.08)
- Administration Building (1.2.30.2.09)
- Security Stations (1.2.30.2.10)
- Fire/Medical Building (1.2.30.2.11)
- Warehouses (1.2.30.2.12)
- Mock-up Building (1.2.30.2.13)
- Utility Building & Cooling Tower (1.2.30.2.14)
- Visitor's Center (1.2.30.2.15)
- Service Station (1.2.30.2.16)
- Maintenance Shops (1.2.30.2.17)
- Change House Modifications (1.2.30.2.18)
- Switchgear Building (1.2.30.2.19)
- Carrier Washdown Building (1.2.30.2.20)

3.1.3 Subsurface (WBS 1.2.30.3)

This element will include the work relating to subsurface facilities design, procurement, construction, testing and startup, long term monitoring, closure and decommissioning. It will include waste handling systems, waste isolation systems and operational support systems under the following sub-elements:

- South Portal Package (1.2.30.3.01)
- Panel No. 1 (1.2.30.3.02)
- Panel No. 2 (1.2.30.3.03)
- Panel No. 3 (1.2.30.3.04)
- Panel No. 4 (1.2.30.3.05)
- Panel No. 5 (1.2.30.3.06)

3.1.4 Waste Package (WBS 1.2.30.4)

This element will include the work relating to design, procurement, fabrication and testing of the disposal containers, drip shields and waste package supports.

- Waste Packages (1.2.30.4.01)
- Supports (1.2.30.4.02)
- Drip Shields (1.2.30.4.03)

3.1.5 Nevada Transportation (WBS 1.2.30.5)

This element will consist of the transportation and rail systems within the state up to the repository. These support services will include the following sub-elements:

- Nevada Railroads (1.2.30.5.01)
- Access Roadways (1.2.30.5.02)

3.1.6 Test & Performance Confirmation (WBS 1.2.30.6)

This element will include the work within the scope of the Testing and Performance Confirmation (PC) programs. It will include simulation, monitoring, testing and evaluation, waste isolation and systems integration under the following sub-elements:

- Post-closure System (1.2.30.6.01)
- Process Monitoring (1.2.30.6.02)
- Evaluations & Operational Support (1.2.30.6.03)
- Pre-emplacement Testing & Modeling (1.2.30.6.04)
- Systems & Integration Testing (1.2.30.6.05)

3.1.7 Off-Site Utilities & Infrastructure (1.2.30.7)

This element will consist of a variety of repository utility and infrastructure support and services not included in other cost estimates. These support services will include the following sub-elements:

- Utilities (1.2.30.7.01)
- Infrastructure (Not Used) (1.2.30.7.02)

3.2 Milestones and Phases

The major milestone dates and project phases to be used in the MGR schedule are below.

3.2.1 Milestones

The schedule contains the project activities required to meet key project milestones. The annual estimated costs reflect the schedule for which activities will be performed. The major milestones are given below.

Milestone	Date
Submit License Application for Construction Authorization	March 2003
Start Repository Construction	April 2006

Start Waste Emplacement Operations	June 2010
First Emplacement	September 2010
Complete Emplacement	September 2041
Start Repository Closure & Decommissioning	October 2067
Complete Repository Closure & Decommissioning	September 2073

3.2.2 MGR Project Phases

The MGR schedule extends through several unique project phases from FY2003 through FY2073. The phases, with their time periods and brief scope description, are presented below:

Licensing Review: March 2003 to March 2006

This phase begins with the submittal of the LA to the U.S. Nuclear Regulatory Commission (NRC) and ends with authorization to begin construction. This phase includes all activities and costs related to completion of the potential repository and waste package designs. It also includes activities and costs to support the LA and respond to any Environmental Impact Statement (EIS) issues. The phase also contains the costs to develop test requirements for facility operating systems and the monitoring systems that will confirm repository performance, as well as include some designated construction activities that are temporary in nature, which can be performed prior to issuance of the construction authorization.

Construction and Testing: April 2006 to June 2010

The Construction and Testing Phase begins after NRC authorization of construction and focuses on the execution of Title I and II designs, and initial construction under Title III. Included in this phase are activities to construct surface and subsurface facilities at the site and within the radiologically controlled area (RCA). The underground area will include, at a minimum, sufficient completion to be ready to begin accepting waste packages in June 2010 for emplacement of approximately 400 metric tons of heavy metal (MTHM) within the calendar year. Activities also include design and licensing work, personnel training, prototype testing, developing operating and maintenance procedures, potential repository start-up operations, establishing baseline parameters for confirming repository performance, and the initial procurement of disposal containers. Additionally, technical performance will be demonstrated and verified according to the project's baseline, functional requirements, and mission need objectives. The project manager will also ensure that validations and verifications, benchmark tests, and operational readiness reviews and assessments are performed.

Emplacement Operations Phase: June 2010 to September 2041

The Emplacement Operations Phase begins when the NRC issues an amendment to the license for the potential repository for receipt and possession of waste. The phase ends with the emplacement of the last waste package. Based upon the current waste stream schedule, it will take approximately 31 years to emplace the entire assumed inventory. The major cost elements

for this phase include waste acceptance, and the procurement, handling, and emplacement of waste packages, continued underground construction, and required tests and analyses to confirm the potential repository's performance.

Monitoring Phase: October 2041 to September 2067

The Monitoring Phase begins after the emplacement of the last waste package and ends when performance confirmation results show that the potential repository has been sufficiently ventilated to achieve thermal design requirements. Activities during this phase cover facility preservation in a standby mode and providing sufficient maintenance for necessary safety and asset management systems, as well as to retrieve waste packages, if necessary. Specifically, the ventilation and inspection of the underground access and main drifts will continue, as will performance confirmation and required security functions. Preparations and activities will begin during this phase to support the potential repository's closure, including fabrication, purchase and installation of the drip shields, some of which will also continue into the Closure and Decommissioning Phase.

Closure and Decommissioning Phase: October 2067 to September 2073

The Closure and Decommissioning Phase begins when performance confirmation results show that the potential repository has been sufficiently ventilated to achieve thermal design requirements and ends when final site restoration is completed. This phase includes demolition of the potential repository surface infrastructure; backfilling the access shafts, ramps and boreholes; construction of barriers to preclude human intrusion; and restoring the site to a condition that does not require human support.

4.0 ASSUMPTIONS

The costs and schedules for the MGR are based on a set of assumptions about the project during the time phases noted above. These assumptions primarily evolved from the VA Volumes 4 & 5, LA10 Updates, and LADS are consistent with the proposed SR design and baseline. It should be noted that the schedule and cost estimates will be only as valid as the assumptions, and if the assumptions are materially changed the integrity of the cost and schedule must be reconfirmed.

4.1 General Assumptions

The following general assumptions for the MGR updated schedule and cost summary include:

GA.1 The Yucca Mountain site is recommended and approved for development as a repository based upon the concepts of the current SR reference design and subsequent related efforts.

GA.2 All associated estimated costs are in constant 2000 dollars. Where previous years' estimates are used, an escalation factor based upon DOE approved escalation rates are used to convert to 2000 dollars.

GA.3 The costs and schedules are reflected in fiscal years.

GA.4 The estimates will account for costs beginning with the submission of a license application (LA) in March 2003 up to and including closure and decommissioning of the facility in FY2073.

GA.5 Historical and current planned repository related costs, i.e., FY1983 to FY2002 are only included within the OCRWM TSLCC estimate as sunk costs.

GA.6 Operations and Maintenance (O&M) costs associated with the activities required to maintain the effectiveness of response actions will be considered in the life-cycle costs. All other costs will be assumed as capital costs in accordance with DOE and Office of Management and Budget (OMB) guidelines.

GA.7 Repository and Waste Package Designs will accommodate approximate waste allocations as follows:

- 83,800 MTHM commercial spent nuclear fuel
- 2,500 MTHM DOE spent nuclear fuel including naval spent nuclear fuel
- 22,147 Canisters of Defense HLW

For commercial SNF, including mixed-oxide (MOX) fuel, the waste inventory is taken from the *1999 Design Basis Waste Input Report for Commercial Spent Nuclear Fuel*. For defense and commercial HLW and DOE SNF, canister shipments are consistent with the initial CRWMS receipt rates documented in requirement 3.2.1B of the *Civilian Radioactive Waste Management System Requirements Document*. It is assumed that all HLW canisters except West Valley contain 0.5 MTHM equivalent; West Valley HLW canisters are assumed to contain 2.13 MTHM equivalent.

GA.8 The repository schedules or costs do not address or accommodate a capacity for the repository beyond the 83,800 MTHM commercial spent nuclear fuel (SNF).

GA.9 The MGR concept shall allow the potential repository to be closed as early as 30 years after the last waste package is emplaced and to be kept open, with routine maintenance, for at least 100 years after the first waste package emplacement. The design shall not preclude the ability to keep the potential repository open, with appropriate maintenance and monitoring, for 300 years after initiation of waste emplacement.

GA.10 Future generations will make the ultimate decision on whether it is appropriate to continue to maintain the potential repository in an open, monitored condition or to close the potential repository, based on development of their own criteria and level of certainty regarding ultimate repository performance.

GA.11 CRWMS facilities shall be capable of opening sealed storage and transportable commercial canisters, handling the SNF, and managing associated site generated waste streams.

GA.12 The CRWMS shall be capable of accepting, transporting, and emplacing and isolating SNF and HLW at specified annual rates starting with 400 MTHM equivalent in calendar year 2010.

GA.13 Repository plans include disposal of only SNF or HLW that is not subject to regulation as hazardous waste under the Resource Conservation and Recovery Act (RCRA) Subtitle C.

GA.14 Activities are planned consistent with the project's execution of activities to meet NRC proposed 10 CFR Part 63 requirements, currently issued for public comment.

GA.15 The MGR design and planning will maintain flexibility by considering pending changes to applicable NRC repository licensing regulations and the U.S. Environmental Protection Agency radiation protection standards.

GA.16 There is no requirement for additional site characterization or collection of data in expansion areas within the potential repository. However, additional geotechnical and seismic data are required to support surface facility design (e.g., design footprint of the Waste Handling Building).

GA.17 A performance based management and operating (M&O) contract is in place to plan, manage, and integrate all activities supporting both unique and non-unique functions for the OCRWM program in the most cost-effective manner. The contract will be a performance based M&O contract for a five-year period (plus a transition period) with a unilateral extension option, at the Government's discretion, for up to an additional five-year period.

GA.18 The M&O, or its successor, is assumed to manage the design, licensing, and construction programs up to the beginning of emplacement. At that time, it is contemplated that a management and operations contractor will be selected and responsible for concurrent operations and construction management activities.

GA.19 It is assumed that DOE will continue to lease office space in Las Vegas for both DOE and M&O resources. The M&O will gradually shift resources to the site to support construction, start-up and ultimate commissioning. By the beginning of emplacement operations, the successor operations contractor and the majority of its construction and operations staff are assumed to be located at the site, with some limited presence offsite, possibly in Las Vegas. During the design and construction periods the contractor's home office will be providing support; however, it is assumed that any contractor home office resources that may be phased out will not impact Las Vegas or YMP office requirements.

GA.20 Based upon the OCRWM developed Enterprise Architecture, a strategic information asset base will be assumed to support program business and information technologies (IT) needs in support of the program operations and related transitional processes for implementing new technologies over the life cycle of the repository and OCRWM programs.

GA.21 DOE will own and control land, water rights, and subsurface rights. After the SR is submitted to Congress, and final congressional action is taken, DOE will formally dedicate the land for constructing a potential repository.

GA.22 Construction activities that are temporary in nature can be performed prior to issuance of the CA. The pre-construction site test facilities will become part of the final potential repository layout. It is assumed that any upgrades to these facilities that may be required may take place prior to construction authorization.

GA.23 Based on experience gained from activities performed during the pre-construction phase of DOE and commercial nuclear facilities, as well as reliance on NRC concurrence of non-nuclear pre-construction site development plans, options are assumed for pre-construction authorization, including allowances and provisions for early procurement of long-lead items.

GA.24 To facilitate site preparation, equipment erection and initial sinking of exhaust and intake shafts to support construction, it is assumed that NRC concurrence on limited work approval will be obtained. Any pre-CA activities conducted are assumed to be reversible and non-adverse to project funding or environs.

GA.25 Construction under the M&O concept will assume that any support operations and facilities will be part of the contracting requirements for the specific area, building, etc. for which that contractor(s) is responsible. The contractor is assumed to be responsible for supplying any related maintenance, supplies, or service personnel in conjunction with its contract deliverables. Any significant site-wide, shared support facilities will be identified in a specific contractor work element

GA.26 To accommodate fast track and parallel construction activities, multiple contractors working or overlapping simultaneously will be assumed, such that work rates and safety management are not compromised.

GA.27 Repository design, construction and initial emplacement of waste will be conducted under a quality assurance program as described in the current *Quality Assurance Requirements and Description* (DOE 1998).

GA.28 Substantially complete construction of repository facilities will be required for the initial receipt and possession of spent nuclear fuel and high-level radioactive waste. Substantially complete construction is defined as completion of the surface facilities and sufficient construction of emplacement drifts to safely handle and emplace the initial waste packages.

GA.29 DOE Operational Readiness Reviews will rely on the site visits, inspections, audits and surveillances from the NRC and other regulatory agencies, prior to emplacement authorization.

GA.30 All spent nuclear fuel and high level waste will be shipped to the repository. Most commercial spent nuclear fuel will be transported by rail directly from the utility. No interim storage or co-located interim storage at the repository is considered.

GA.31 There are no requirements identified at this time for a prototype facility.

GA.32 To support thermal blending of commercial SNF, the design assumes in-process retention of approximately 5,000 MTHM within a fuel pool. Design does not accommodate onsite storage of canistered fuel.

GA.33 Repository design and facility operations planning will be compatible with transportation of SNF and HLW to the repository by rail, heavy haul vehicle, and legal weight truck, and as further delineated in the program requirement documents.

GA.34 Cost impacts resulting from possible schedule delays or other actions beyond the control of YMP will not be included.

GA.35 Current cost-sharing and support arrangements with the Nevada Test Site will continue as needed. A Memorandum of Understanding revision will be developed later to refine scope and responsibilities.

GA.36 The MGR shall provide a solar power component to the repository power grid that supplies power to the subsurface emplacement ventilation system. The solar component shall be capable of supplying a nominal 3MW capacity during peak daylight hours, with an initial capability of at least 500 kW available one year prior to the start of emplacement of waste. The design of the solar component shall not preclude future modular-type expansion of capability if necessary.

GA.37 Low Level Waste (LLW) will be packaged, dispositioned and/or disposed at the Nevada Test Site, under a rate structure consistent with a commercial service.

GA.38 All permanent equipment will be purchased by the contractor and therefore subject to the contractor's overhead, profit, and bond; no equipment will be furnished by DOE.

GA.39 Repository construction and pre-emplacement operations organizations will interface with appropriate federal, state, tribal, and local government agencies to meet legal, regulatory and operational requirements for emplacement and isolation of waste, such as scheduling, permitting, notifications, emergency planning and response, and security.

GA.40 Pursuant to the *Nuclear Waste Policy Act as Amended*, (1987) Payment Equal To Taxes (PETT), Financial and Technical Assistance (F&TA) and other benefits as defined by the Nuclear Waste Policy Act will continue to be planned and estimated.

4.2 Element Specific Assumptions

The following are assumptions specific to each of the major elements for the project phases included in the plan, and they address topics to be considered affecting the cost. Assumptions may be further expanded and documented in more detail in the backup documentation for each respective WBS.

4.2.1 Regulatory, Infrastructure & Management Support

RA.1 Emphasis of TSPA studies, abstraction and testing and sensitivity analyses to support regulatory activities will continue on the following process models: unsaturated zone hydrology, saturated zone hydrology, unsaturated zone and saturated zone transport, thermal hydrology, waste package degradation, coupled process models, and waste form mobilization.

RA.2 Testing to support license application will be estimated based upon data needs identified via analysis and process model reports (AMR/PMR) to support licensing basis arguments and to support authorization to receive and possess waste. Testing as specified by the NRC during licensing negotiations will also be estimated. TSPA updates will focus on improving models in previously identified areas necessary to support the licensing arguments (a blanket model improvement program is not proposed).

RA.3 Continued interaction with the NRC on licensing amendments to possess and emplace waste and other regulatory issues will be required.

RA.4 No substantial change in proposed actions or significant new information is assumed that could require a new EIS. Cost estimates will include costs associated with supporting an EIS supplement, if necessary.

RA.5 Regulatory, infrastructure, and management support cost estimates will contain Environment, Safety and Health work activities up to authorization to emplace waste in 2010. After 2010, costs associated with these activities are assumed covered in the surface and subsurface WBSs estimates.

RA.6 Except for configuration management functions, the scope and costs of systems engineering functions are assumed in the RIMS WBS through 2010 and subsequently they are assumed to be covered by the scope and costs in the Surface WBS. Configuration management functions currently residing in systems engineering are assumed part of the RIMS WBS for the entire duration of the project.

RA.7 Computer hardware and software upgrades are assumed to occur approximately every 36 months with one-third of the upgrade occurring each year.

RA.8 Information and technology in the RIMS WBS element are assumed through 2010, and will later be transferred to site operations and included in the Surface WBS from 2011 to 2073.

RA.9 Training up to August 2007 is assumed in the RIMS WBS and is then transferred to the Surface WBS for initial and update training of operators. All subsequent operations training is assumed to be in the surface operations cost estimates.

RA.10 Functions involving intergovernmental affairs, public outreach and information for external relations are assumed in the RIMS WBS from 2003 and continue through the end of the project in 2073.

RA.11 Support to DOE by the management and technical support contractor will be maintained through 2010 and emplacement of the entire inventory. The level of effort to support the DOE

will vary over the different phases commensurate with the type of work and intensity of design, licensing, construction and operational activities.

RA.12 Project management, cost and scheduling, and overall project coordination is included in the RIMS WBS.

RA.13 As a set-aside, performance fee is paid to the M&O contractor for the life of the MGR Program. Except for the Licensing and Construction Phases, the fee is based on calculations for the 1999 MGR-TSLCC and on 48 CFR 915 and 48 CFR 970.

RA.14 For the Licensing and Construction phases, fee is based on the fee amounts and fee schedules in the procurement documents, e.g., *Request for Proposals (RFP), Management and Operating Contract for the Office of Civilian Radioactive Waste Management (OCRWM) Program*, and the new M&O contract effective February 12, 2001. It is further assumed that an extension period of the contract will be executed for an additional 5 years from FY2007 through FY2011.

4.2.2 Surface

SA.1 Site surface facilities shall be placed on the north portion of the project site encompassing approximately 110 acres and include the radiologically controlled area.

SA.2 Waste handling building is assumed to handle primary operations, e.g. fuel handling and transfer, and include pool storage capability for up to 12,000 assemblies.

SA.3 Facilities and operations are designed and prepared to handle a waste acceptance peak rate of 3,000 MTHM per year.

SA.4 Unit costs for material and productivity are assumed using available information and knowledge of project engineers and estimators. Labor hours are base on experience and/or staffing studies.

SA.5 Construction crews will consist of one foreman and five craft workers. Construction staff working swing and graveyard shifts work 7 hours a day and will be paid for 8 hours.

SA.6 Construction labor rates will be based on craft rate data from the Nevada Test Site's 1997–2002 labor agreements.

SA.7 Design costs to support construction will be estimated as a percentage of total field costs without contingency. Surface facility design activities are assumed to continue through the construction period up to October 2009.

SA.8 Major surface facilities will be constructed on a competitive contract basis maximizing the use of lump sum type contracts, and any major equipment needed by the contractor to support the scope of work will be provided by the contractor.

SA.9 Construction of facilities will be completed in advance of emplacement operations with sufficient time to ensure pre-operational testing and training is completed to support turnover to DOE and the necessary DOE and regulatory agency inspections and acceptance reviews.

SA.10 Construction management costs will be estimated as a percentage of total direct and indirect field costs and subcontracts, without contingency.

SA.11 Start-up preparation activities, e.g., procedures, training, etc., are assumed to begin approximately 3+ years in advance to emplacement.

SA.12 Nuclear workers will require additional training; and any staff that performs safety functions will require additional training.

SA.13 The cost of the initial spare parts will be estimated as a percent of the maintenance materials cost for an average emplacement year.

SA.14 Some level of design support will be required during operational phase and support maintenance and modifications.

SA.15 Training for operations staff will include maintenance and surveillance training to maintain and operate the facility and equipment.

SA.13 Waste handling, security, and associated support operations will be planned for three shifts per day, 7 days per week, 50 weeks a year. Other operations will be planned for a single shift and 5 days per week.

SA.13 Operations staff are assumed to work 1,840 hours annually, including training hours. All employees will require 8 hours of general employee training. Operations staff working the swing and graveyard shifts will be paid shift differentials.

SA.14 Facility operation is planned for approximately 6,000 hours per year.

SA.15 The cost of operating supplies will be a percentage of the operations and labor cost and include materials such as decontamination and water-treating chemicals, inerting gases, offices supplies, and janitorial supplies.

SA.16 Annual maintenance materials costs will be estimated as percentages of the non-labor portion of the direct field costs without contingency. Maintenance materials costs will not be included for the site work and concrete accounts.

SA.17 Costs for final decontamination and removal of surface facilities are assumed and estimated as a percentage of construction costs.

4.2.3 Subsurface

SSA.1 The layout will be similar to the EDA Alternate II with additional emplacement drifts in

the lower block to allow for the additional waste.

SSA.2 The access and ventilation mains will be 7.62 meters in diameter.

SSA.3 The emplacement drifts (approximately 80) will be 5.5 meters in diameter and approximately 78.0km in length. Ground support will be grouted rock bolts and wire mesh, supplemented with steel sets as needed.

SSA.4 The ventilation rate will be 15cms to allow cooling of waste packages. Ventilation shafts will be 8.0 meters in diameter.

SSA.5 Enough of the north end of the repository will be developed to allow the emplacement of waste to begin starting in late 2010, and to provide space while the access and ventilation drifts are developed after the 2010 start.

SSA.6 The North Portal is assumed fairly congested because of the surface facility construction. As a result, the subsurface access will be from the South Portal. The area will be graded to provide a place for the Subsurface Construction Support Facilities.

SSA.7 The muck disposal belt will exit from the South Portal.

SSA.8 Facilities at the South Portal will provide support to the subsurface operations. The scope of the South Portal Facilities includes underground utilities, a substation, an office, shop facilities, warehouse facilities, and a change house.

SSA.9 A batch plant and pre-cast yard should be located near the South Portal area to minimize transportation distances and re-handling.

SSA.10 During the closure phase a crushing and screening plant will be required in the South Portal Area.

SSA.11 The repository is assumed to have airtight bulkheads to separate the emplacement operations with access from the North Portal from the construction operations with access from the South Portal.

SSA.12 Labor rates for craft labor will be based upon the current Union Labor Contracts at the site or as otherwise provided and documented.

SSA.13 The emplacement operation will receive waste packages from a loading dock at the surface processing plant. The waste package will be transported using a special rail and specialized locomotives.

SSA.14 Fixed price contracts are assumed for constructing and equipping portions of the underground subsurface facility and South Portal, as well as closing and decommissioning the subsurface repository.

4.2.4 Waste Package

WPA.1 Waste packages will be designed and fabricated in advance to begin emplacement of 400 MTHM in the first year at the repository and to receive annual waste shipments up to a peak rate of 3,000 MTHM commercial SNF, and 700 canisters of combined DOE SNF and Defense High Level Waste.

WPA.2 The waste package outer and inner barrier designs are based on 10 designs that are assumed to perform in accordance with LADS EDA II and support identified SNF and defense HLW.

WPA.3 The waste package fabrication organization will procure prototypes and mockups.

WPA.4 Methods and processes for procuring mock ups, prototypes and associated other direct costs items to continue the weld and NDE development work are assumed not to change materially from current expectations.

WPA.5 Borated stainless steel plates will be used for criticality control where needed.

WPA.6 The waste packages will be fabricated and inspected in accordance with the American Society of Mechanical Engineers Code, Section III, and any section referred to by Section III, but are not assumed to be N stamped.

WPA.7 Prototype, mockup and dummy cask testing will be performed to support waste package design, construction, test and evaluation activities.

WPA.8 Labor rates will be based upon information obtained from acceptable sources, and considered fully loaded.

WPA.9 It is assumed that the NRC will require prototype tests to validate the engineering analyses and models even though 10 CFR 63 does not contain specific criteria that require a waste package prototype.

WPA.10 Waste Package prototypes are assumed full scale and have the same geometry as the production Waste Packages. Waste Package welding mock-ups are assumed full-scale diameter but short length.

WPA.11 Waste Packages for a pre-operational test program of waste handling systems will have the same external geometry as the production Waste Packages with internals to simulate the proper weight distribution.

WPA.12 It is assumed that the "component testing" of Waste Package prototypes will be destructive.

WPA.13 A remote welding system will be developed and tested.

WPA.14 Just-in-time delivery is considered with a one-week supply of disposal containers stored on site.

WPA.15 In 2009 a large number of waste packages are assumed for purchase, increasing in volume as emplacement approaches in 2010, and sustaining a significant level of units on an annual basis to support the 3,000 MTHM per year rate through emplacement.

WPA.16 Current engineering, testing and fabrication details of drip shields and Waste Package supports are assumed based upon general conceptual sketches and information.

WPA.17 To support schedules for decommissioning and drip shield installation, it is assumed that drip shield procurement activities begin in 2056.

4.2.5 Nevada Transportation

NTA.1 Rail will be available for transporting waste to the repository at the start of emplacement operations. Rail is the "reference case" for project planning.

NTA.2 Repository design and facility operations planning will be compatible with transportation of SNF and HLW to the repository by rail, limited heavy haul vehicle, and legal weight truck.

NTA.3 The public comment period for NEPA review is on the order of 60 days. Related NEPA and design activities are performed by M&O contractor.

NTA.4 Rail construction will sub-contracted via competitive solicitation via requests for proposals. A short-line rail operator will be contracted by DOE to perform O&M tasks.

NTA.5 Mode and route designation studies are required. A decision must be made after SR; however, the final design can start prior to route designation. Preliminary design cannot be completed until the completion of the draft NEPA document.

NTA.6 A new site access road will be available for start of repository construction, and it will be located on the west side adjacent to 40-Mile Wash.

NTA.7 The schedule to design and construct the site access road is 28 months. Construction time estimate is approximately 10 months

NTA.8 Preliminary rail design will develop all options and alternates equally. Final design will drop all options and alternates and assume a single alignment. Designs will be in accordance with national railway industry standards.

NTA.9 Engineering and procurement for all 5 routes options are assumed to have the same duration.

NTA.10 Construction RFP(s) are assumed to start 2 months before completion of final rail design. Construction cannot start until all Bureau of Land Management land is obtained; however, it can start with some, not necessarily all, private land purchased.

NTA.11 Land acquisition activities will be the same duration for all 5 rail routes. In any event, rail construction would not start before CA.

NTA.12 It is assumed that construction time for the Caliente route is same as Carlin route, and construction time for the Jean route is same as Caliente/Chalk Mountain route.

NTA.13 Constrained funding scenarios are not assumed for Nevada transportation activities.

4.2.6 Performance Confirmation

PCA.1 Excavation equipment will be limited for Performance Confirmation (PC) activities, requiring sequential excavation of different PC alcove facilities.

PCA.2 Due to conflicts with initial excavation activities near the South Portal, PC seal and backfill facilities will not be excavated until after 2010.

PCA.3 The PC element will be limited to post-emplacment estimates for the post-closure simulation tests and the process confirmation tests, and those resources necessary to support those tests.

PCA.4 Seals testing will be estimated under subsurface and will not be estimated under the PC element.

PCA.5 In situ backfill and drip shield testing will be performed in conjunction with the post-closure simulation test.

PCA.6 Waste packages to support PC tests are selected from the fabrication stream. Therefore, they are identical to waste packages for emplacement purposes. Only the costs of the waste packages are included in the estimates for this PC activity. The procurement order quantity would be increased to cover the needed quantity of test assets.

PCA.7 Materials specimens will be prepared from material samples supplied with the fabricated waste packages. The preparation of material specimens will be a procurement of that service similar to the current procurement process for material specimens.

PCA.8 Information management support and TSPA updates will be estimated to support PC activities. Performance assessment and technical expertise resources will be assumed available when needed. Core staff on hand throughout the monitoring phase will be kept to a minimum.

PCA.9 Excavation activities and associated costs under PC Subsurface Facilities in the Viability Assessment have been transferred to the subsurface construction activities and costs.

PCA.10 Excavation of PC Observation Drifts will begin after ramp upgrade activities.

PCA.11 Subsurface activities will design the excavations for PC test programs. PC plan and design activities will determine borehole and instrument placement and layouts.

PCA.12 The development of Remotely Operated Vehicles (ROVs) for PC work is performed under other subsurface activities.

PCA.13 Special test alcoves and niches for seismic monitoring and seepage monitoring, located along access mains, are excavated as soon as possible after construction of the attendant accessway to minimize disturbance.

PCA.14 The first emplacement observation drift and attendant alcoves are excavated and completed two years prior to the start of emplacement to allow for instrumentation installation and baseline development prior to the start of emplacement.

PCA.15 Construction of emplacement drift observation facilities (other than the first observation drift) are completed two years prior to the construction of emplacement drifts in the respective test areas to allow for the monitoring of construction-induced effects.

PCA.16 Surface-based monitoring wells for evaluating water quality around the emplacement horizon are constructed and completed at least one year prior to the start of emplacement to establish a sufficient data baseline.

PCA.17 A full-time core staff will provide continuity of test activities during the different phases of the repository. Participation from outside organizations will be minimal. The core staff will consist of the minimum number of people needed to process, analyze, evaluate and report test data.

PCA.18 Technical expertise is assumed to be provided by National Laboratories, if available, for activities traditionally supplied by the laboratories, provided that their rates are competitive with commercial entities or other third parties having comparable expertise.

4.2.7 Off-Site Utilities

UA.1 In order to minimize potential budget and schedule impacts, it will be assumed that the cost of the electric power line(s) will be borne by a utility company. Cost will be amortized over the life of the construction program, or approximately 30 years and included in future electric rate charges to the project.

UA.2 Prior to construction authorization and commissioning of the new line, electricity to YMP will continue to be provided by via agreements with Nevada Test Site Operations.

UA.3 Utility work necessary to support meeting electrical requirements for construction phase activities will be completed in advance of CA.

UA.4 Water permits will be obtained for extended usage needs in advance.

UA.5 Offsite water is physically close enough to be considered in the surface facilities balance of plant estimate.

UA.6 Offsite communication strategy includes: development of telecommunications infrastructure supporting data, voice and video, associated support systems in Las Vegas and at the site, and implementation of a site wireless communications systems employing of ultra high and very high radio systems at the north and south portals.

UA.7 Communication upgrades are assumed to be 30 percent of the original as constructed cost, and would be completed after five years of operation.

UA.8 Communication replacements are assumed to be 70 percent of the original as constructed cost and are assumed to be completed after ten years of operation.

UA.9 Estimate design costs were assumed at 50 percent of the equipment cost. Procurement was estimated at 2 percent of the construction costs. Operations and maintenance costs are assumed at 3 percent of the construction cost.

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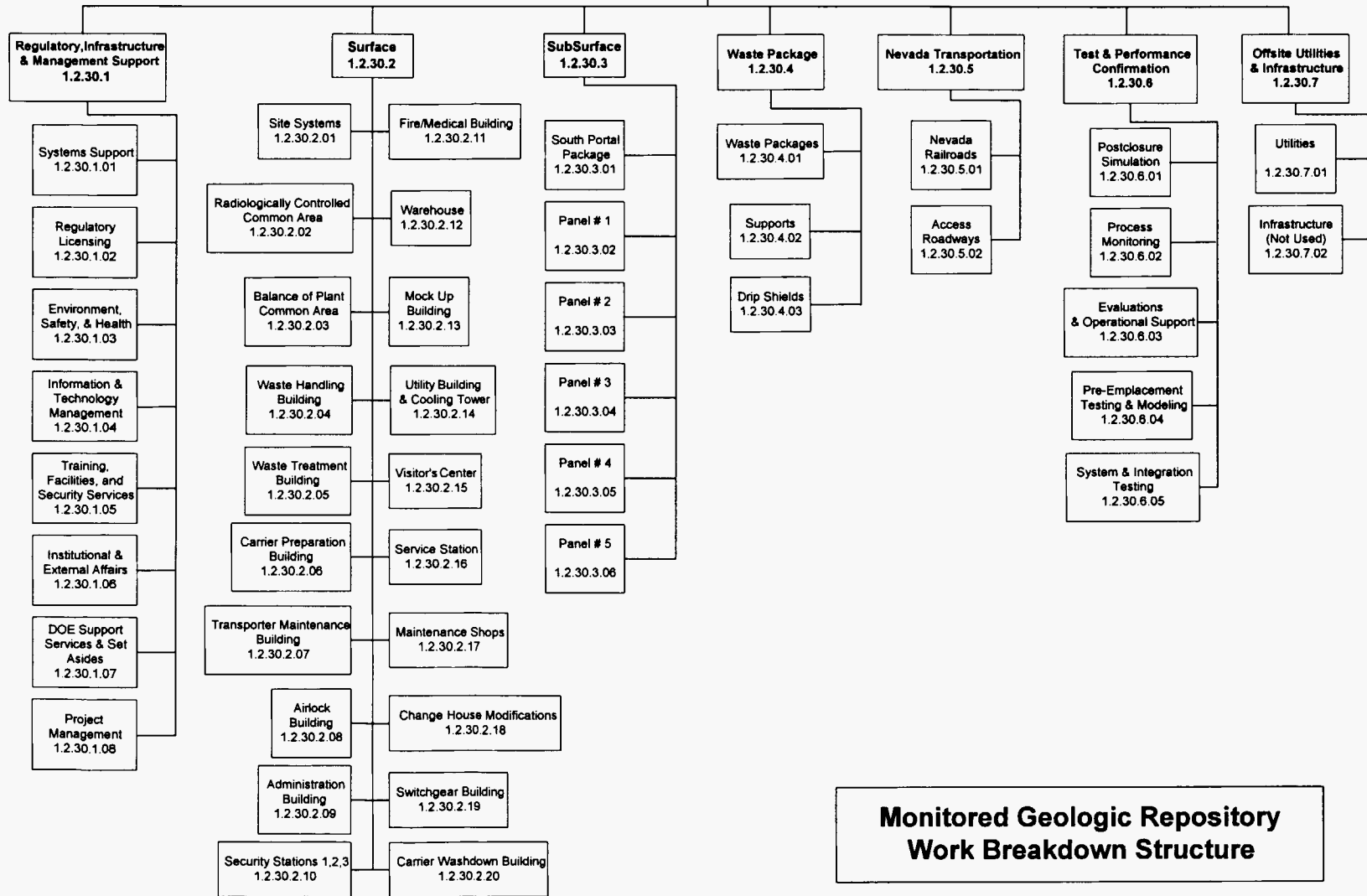
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Monitored Geologic Repository Product 1.2.30



Appendix A - Monitored Geologic Repository Work Breakdown Structure