

### 1 **7.2.5 Compliance Monitoring Parameter Data Results**

2 *In the EPA certification of compliance (63 FR 27354, May 18, 1998), the EPA concurred on*  
3 *the list of 10 compliance monitoring parameters (compliance parameters) that DOE proposed*  
4 *to monitor during the operational period of the project. The 10 compliance parameters are:*

- 5 • *Culebra groundwater composition,*
- 6 • *change in Culebra groundwater flow,*
- 7 • *probability of encountering a Castile brine reservoir,*
- 8 • *drilling rate,*
- 9 • *subsidence measurement,*
- 10 • *waste activity,*
- 11 • *creep closure and stresses,*
- 12 • *extent of brittle deformation,*
- 13 • *initiation of brittle deformation, and*
- 14 • *displacement of deformation features.*

15 *These parameters have been continually monitored over a period of several years, most of*  
16 *them before the initial receipt of waste. Existing WIPP monitoring programs gather data and*  
17 *information to develop the compliance parameter values. These programs are described in*  
18 *Appendix MON-2004; data resulting from these monitoring programs are provided in*  
19 *Appendix DATA.*

20 *The EPA also requires the DOE to report any negative condition that may indicate the*  
21 *repository will not function as predicted or a condition that is substantially different from the*  
22 *information contained in the most recent compliance application. Annual assessments of*  
23 *compliance parameters allow the DOE to monitor the predicted performance of the repository*  
24 *and report any condition adverse to waste containment.*

25 *All monitoring activities performed as part of the compliance parameters program have*  
26 *generated data within expected ranges, except for the changes in Culebra groundwater flow*  
27 *compliance parameter (the drilling rate was changed for PA; however, this parameter is*  
28 *monitored as a regulatory requirement and not to ensure it is within an expected range). For*  
29 *this compliance parameter, data related to water levels in monitoring wells have been recorded*  
30 *that are outside expected ranges. The implications of these unexpected monitoring parameter*  
31 *values are described in Chapters 2.0 and 6.0 of this recertification application.*

### 1 **7.3 Passive Institutional Controls**

2 Passive institutional controls, as opposed to active institutional controls, are controls that once  
3 established, can be expected to remain effective with no on-site human support. The DOE will  
4 implement passive institutional controls that involve multiple types and multiple levels of  
5 passive controls to make human intrusion into the disposal site unlikely. To accomplish this, the  
6 DOE intends to use several types of monuments and markers, land ownership, and written  
7 notations in land records in numerous locations (see Section XVI of *CCA* Appendix PIC).  
8 Written documentation will include information on the location, design, and disposal contents  
9 and hazards, as well as stipulations on allowable land uses. Components of the passive controls  
10 system will be instituted at the site and at remote locations (see *CCA* Appendix PIC).

11 As technology advances, this design concept will be revisited over the operational lifetime of the  
12 WIPP. If the DOE believes the design can be enhanced, changes will be proposed during the  
13 recertification process for EPA approval. The program described in *CCA* Appendix PIC will  
14 fulfill the requirements of 40 CFR Part 191 and satisfy the certification criteria of 40 CFR Part  
15 194.

#### 16 **7.3.1 Requirements for Passive Institutional Controls**

17 The EPA has specified that “[d]isposal sites shall be designated by the most permanent markers,  
18 records, and other passive institutional controls practicable” (40 CFR § 191.14[c]). The EPA  
19 then goes on to define passive institutional controls to mean “(1) permanent markers placed at a  
20 disposal site, (2) public records and archives, (3) government ownership and regulations  
21 regarding land or resource use, and (4) other methods of preserving knowledge about the  
22 location, design, and contents of a disposal system” (40 CFR § 191.12[e]). The DOE has  
23 interpreted this regulatory language to mandate the development and implementation of a system  
24 of passive institutional controls consistent with those components listed in the EPA’s definition  
25 in order to protect the integrity of the disposal system for as long as practicable after disposal.

26 Guidance is provided by the EPA in 40 CFR § 194.43 on what subject areas must be addressed  
27 in order to demonstrate compliance with the regulation. Three subject areas must be addressed:  
28 (a) detailed descriptions of the passive institutional controls must be provided, (b) the period of  
29 time that the passive institutional controls are expected to endure and be understood must be  
30 estimated, and (c) credit for the passive institutional controls in reducing the likelihood of  
31 inadvertent human intrusion in performance assessments must be justified for the proposed time  
32 period. Additional guidance is provided in EPA (1996b) indicating what documentation is  
33 required in the compliance application to address 40 CFR § 194.43(a), the need for rationales to  
34 explain the estimates of how long the passive institutional controls are expected to endure and be  
35 understood in 40 CFR § 194.43(b), and the limitations of effectiveness and duration of the  
36 effectiveness of the passive institutional controls in performance assessment to address 40 CFR  
37 § 194.43(c).

38 *In addition, as part of the initial EPA certification decision, the EPA added Condition 4. This*  
39 *condition is applicable to the implementation of the passive institutional controls, and has*  
40 *been included in 40 CFR Part 194 as Appendix A. The appendix provides that not later than*

1 *the final recertification application submitted before closure of the disposal system, the DOE*  
2 *will provide the following to the EPA:*

- 3     1. *A schedule for implementing passive institutional controls that demonstrates markers*  
4 *will be fabricated and emplaced and other measures will be implemented as soon as*  
5 *possible following closure of the WIPP. The schedule will also describe how testing of*  
6 *any aspect of the conceptual design will be completed before or soon after closure and*  
7 *what changes to the design of passive institutional controls may be expected to result*  
8 *from such testing.*
- 9     2. *Documentation showing that the granite pieces for the proposed monuments and*  
10 *information rooms described in Docket A-93-02, Item II-G-1, may be quarried (cut*  
11 *and removed from the ground) without cracking due to tensile stresses from handling*  
12 *or isostatic rebound; engraved on the scale required by the design; transported to the*  
13 *site, given the weight and dimensions of the granite pieces and the capacity of existing*  
14 *rail cars and rail lines; loaded, unloaded, and erected without cracking based on the*  
15 *capacity of available equipment; and successfully joined.*
- 16     3. *Documentation showing that archives and record centers will accept the documents*  
17 *identified and maintain them in the manner identified in Docket A-93-02, Item II-G-1.*
- 18     4. *Documentation showing that proposed recipients of WIPP information other than*  
19 *archives and record centers will accept the information and make use of it in the*  
20 *manner indicated by the DOE in Docket A-93-02, Item II-G-1, and supplementary*  
21 *information.*

### 22 **7.3.2 Objectives for Passive Institutional Controls**

23 As prescribed by the standards, the objectives of DOE's passive institutional controls for the  
24 WIPP are to convey the following:

- 25     • location,
- 26     • facility design,
- 27     • content, and
- 28     • hazard.

29 The passive institutional controls program described within this application will be effective in  
30 accomplishing these objectives (~~see Appendix EPIC, Section EPIC.6~~).

### 31 **7.3.3 Implementation of the Passive Institutional Controls Program**

32 The DOE began addressing the issue of passive institutional controls in the context of the  
33 assurance requirements by convening two panels of experts to identify what future societies  
34 might be like (Hora et al. 1991). The panels were convened so that the appropriate types of  
35 messages, the contents of the messages, and the types of media for transmitting the messages can

1 be selected and to identify design concepts for the system of markers at the repository footprint  
2 (Trauth et al. 1993), which is one of the passive institutional controls. The work of the two  
3 panels was completed prior to promulgation of 40 CFR Part 194. To address the issues of the  
4 passive institutional controls in addition to the markers at the repository footprint and to  
5 incorporate the concept of practicability into the design, the DOE developed a conceptual design,  
6 which is included *in* as *CCA* Appendix PIC. With the promulgation of 40 CFR Part 194, the  
7 EPA provided guidance on how credit for the passive institutional controls deterring inadvertent  
8 human intrusion can be obtained for use in performance assessment. To address the issue of  
9 credit for passive institutional controls, the DOE has produced *CCA* Appendix EPIC.

10 ~~The timing and duration of the implementation of passive institutional controls is discussed in~~  
11 ~~Section 7.3.3.3 and depicted in Figure 7-12.~~

12 *In addition, the DOE has developed new information pertaining to the permanent markers*  
13 *portion of the passive institutional controls program and furthered the planning process since*  
14 *the development and submittal of the CCA. This material is documented in the following*  
15 *reports:*

- 16 1. *Permanent Markers Testing Program Plan, Waste Isolation Pilot Plant (DOE 2000) –*  
17 *This document presents DOE plans for the program to test reference designs and*  
18 *alternative permanent markers materials, physical configurations, and locations. The*  
19 *markers testing program will develop information useful in materials selection and in*  
20 *the development of final designs. Testing will help to determine the effectiveness and*  
21 *durability of selected and alternative materials and design configurations. The testing*  
22 *plan provides the following information:*

23 *Program Overview – Implementing the testing program will require performing a*  
24 *series of general activities, such as literature reviews and a survey and assessment of*  
25 *existing markers, the development of some testing methods, and the performance of*  
26 *both laboratory and field-scale tests. The coordination and integration of these*  
27 *activities is described.*

28 *Testing Rationale – The rationale for the testing process is described. The testing*  
29 *rationale links individual marker systems, applicable design criteria, and testing*  
30 *objectives and issues. The testing objectives and issues are, in turn, addressed by the*  
31 *performance of specific tests and analyses.*

32 *Tests Specification – Specific tests appropriate to address individual testing objectives*  
33 *and issues are identified for those cases where an appropriate method currently exists.*  
34 *Cases are identified where no method currently exists.*

35 *Detailed Test Plans – Information that must be addressed in detailed test and analysis*  
36 *plans is identified in the plan. These plans must be developed before testing begins*  
37 *and will address topics such as test objectives, management of the testing activity,*  
38 *specific test methods, data quality objectives, data management, reporting, quality*  
39 *assurance (QA) provisions, and others.*

1 *Evaluation of Results – The general manner in which testing and analyses results will*  
2 *be evaluated in the markers systems design process is described.*

3 *Program Organization – The organization of the testing and analysis program in a*  
4 *sequential progression of activities and the general schedule of testing activities are*  
5 *described in the plan.*

6 *QA – QA provisions applicable to the implementation of the testing program are*  
7 *described.*

- 8 2. *Contractor Report, Permanent Markers Monument Survey, Waste Isolation Pilot*  
9 *Plant (John Hart and Associates, P.A. 2000a) – The DOE is currently investigating*  
10 *alternative materials for the construction of permanent markers. One of the important*  
11 *considerations is the ability of the marker material to be inscribed with warning*  
12 *messages and the durability of these messages over very long time frames. In the CCA,*  
13 *the DOE provides details regarding the implementation of the permanent markers*  
14 *program. An important objective of the program is to optimize the design of the*  
15 *marker systems by evaluating alternative configurations and materials and aiding in*  
16 *the development of final designs. A related activity identified in the CCA is the survey*  
17 *of monuments within 150 miles of the WIPP site to obtain any information useful in*  
18 *the selection of marker materials and the development of marker designs. This report*  
19 *documents the results of a survey performed in the summer of 2000. The objective of*  
20 *this survey was to collect and compile information relevant to the assessment of the*  
21 *durability of ancient inscriptions made on various rock types. Conclusions are*  
22 *provided related to the durability of various rock types, the effects of aspect, the rates*  
23 *of erosion of inscriptions, the effects of inscription form, and the importance of*  
24 *contrast in color and texture in regard to inscription legibility. Recommendations*  
25 *based on study observations and related to the longevity of inscriptions on various*  
26 *rock types are provided. These include:*

27 *Rock Types – Rocks of hardness and durability suitable for use as WIPP permanent*  
28 *markers are available within a few hundred miles of the WIPP site. Basalt and*  
29 *sandstone are the most abundant, so one or both of these should be selected for*  
30 *further evaluation. Intrusive igneous rocks that are susceptible to exfoliation should*  
31 *not be used.*

32 *Form of Inscriptions – To the extent consistent with the necessary written and*  
33 *symbolic warnings and messages, inscriptions should be as large as possible, with*  
34 *groove widths several times the largest mineral particle size. Unless the rock is very*  
35 *fine-grained, like basalt, it probably will not be practical to inscribe letters smaller*  
36 *than about 25mm minimum plan dimension or less than 5mm deep.*

37 *Additional Studies – Given the consistent findings over the 16 sites included in this*  
38 *survey, it is anticipated that additional monument (petroglyph) surveys would not be*  
39 *useful. However, studies on material properties of rock and man-made materials*  
40 *would be useful, with emphasis on surface hardness, methods to create and preserve*

1 *color contrast, and the effects of rock texture on inscribability and inscription*  
2 *durability.*

3 **3. Contractor Report, Permanent Markers Materials Analysis, Waste Isolation Pilot**  
4 **Plant (John Hart and Associates P.A., 2000b) – This report documents assessments of**  
5 **marker materials included in the reference design as well as potential alternative**  
6 **materials. The permanent markers will be constructed of materials that will be**  
7 **selected through an evaluation process. Candidate materials identified in the CCA**  
8 **reference designs will be evaluated against performance criteria. The evaluations are**  
9 **being performed using methods identified in the Permanent Markers Testing Program**  
10 **Plan. Information obtained from literature reviews is provided in this report and has**  
11 **been used to refine the evolving candidate materials lists. The literature review also**  
12 **provides information supporting preliminary evaluations of the candidate materials.**  
13 **This information is also of value in planning laboratory and field tests that will**  
14 **provide additional information necessary to make final marker material selections.**

15 **4. Contractor Report, Ancient Cementitious Materials (John Hart and Associates, P.A.**  
16 **2000c) – The current reference design for WIPP permanent markers calls for granite**  
17 **as the primary construction material for the large surface markers, small surface**  
18 **markers, buried storage rooms, and the information center. Although the reference**  
19 **design specifies granite, the DOE has committed to evaluate alternative materials in**  
20 **an effort to optimize final designs. One potential alternative material is concrete.**  
21 **Accordingly, a literature review was performed to investigate instances in which man-**  
22 **made cementitious materials have survived for very long time periods. The intent of**  
23 **this effort was to determine and document, when possible, the attributes of**  
24 **cementitious materials that contribute to their survival for long periods.**

25 *This literature review showed that cementitious materials used nearly 9,000 years ago*  
26 *have survived intact to the present day. Concretes that have survived over such long*  
27 *periods have been some form of pozzolanic concrete. Results suggest that the*  
28 *blending of ancient and modern concrete technologies may provide a durable, long-*  
29 *lasting concrete meeting the DOE goal to mark the WIPP site for a very long time.*

#### 30 7.3.3.1 Definition of Passive Institutional Design Appropriate for the WIPP

31 In deciding which passive institutional controls are appropriate for the WIPP, the DOE was  
32 guided by the regulatory language in 40 CFR § 191.14(c) that states that the controls should be  
33 practicable. The DOE is expected to address the components of the passive institutional controls  
34 listed in the definition of 40 CFR § 191.12(e). The components of the passive institutional  
35 controls for the WIPP consist of (1) monuments that define the boundary of the withdrawal area,  
36 (2) markers at the footprint of the repository that consist of monuments that identify the outer  
37 boundary of the subsurface facility, a berm surrounding the repository footprint, an information  
38 center on the surface at the center of the repository footprint, a buried room halfway between the  
39 information center and the berm, a buried room halfway between the berm and the hot cell, and  
40 randomly spaced buried markers distributed across the repository footprint, (3) sets of records  
41 distributed to national and international archives, (4) sets of records distributed to records centers  
42 locally, nationally, and internationally (both those of a general nature and those specializing in

1 land and resource use), (5) government control and land-use restrictions, and (6) other means of  
 2 communication, such as encyclopedias, dictionaries, textbooks, and various maps and road  
 3 atlases. *CCA* Appendix PIC contains a detailed description of the designs of each of these  
 4 components.

5 Trauth et al. (1993) examined a variety of configurations and materials in concluding that a  
 6 system comprised of natural materials incorporating massive structures with messages provided  
 7 in an enduring configuration offered the best system for permanently marking the site. The  
 8 permanent marker system incorporates these concepts and thus is the best system of passive  
 9 institutional controls for permanently marking the repository. The use of archives and national  
 10 publications as described in *CCA* Appendix PIC is the most extensive means of widespread  
 11 distribution of the WIPP information. Use of radio or television is transient and will not provide  
 12 the long-term societal memory.

### 13 7.3.3.1.1 Markers

14 Two groups of experts, the Futures Panel and the Markers Panel, were established to examine the  
 15 issues involved with designing an effective system of permanent markers. Hora et al. (1991)  
 16 incorporates judgments of the Futures Panel and discusses the underlying physical and societal  
 17 factors that would influence society and the likely modes of human intrusion at the WIPP site.

18 The Hora et al. report was an important reference and source of information for the preparation  
 19 of Trauth et al. (1993). Trauth et al. (1993) reports the results of the Markers Panel, which  
 20 considered various concepts of marking the site and conveying to future generations information  
 21 regarding the presence of dangerous waste material and the potential consequence of intrusion  
 22 into the waste repository. *CCA* Appendix PIC (Section I) is a modification of the ideas  
 23 developed by this panel.

24 *CCA* Appendix PIC sets forth the permanent markers system for the WIPP facility. This system  
 25 involves the use of surface monuments, small subsurface warning markers, buried rooms, and  
 26 large earthen structures marking the WIPP repository footprint on the surface. *CCA* Appendix  
 27 EPIC (Section EPIC.6) indicates the period of time during which passive institutional controls  
 28 will be effective.

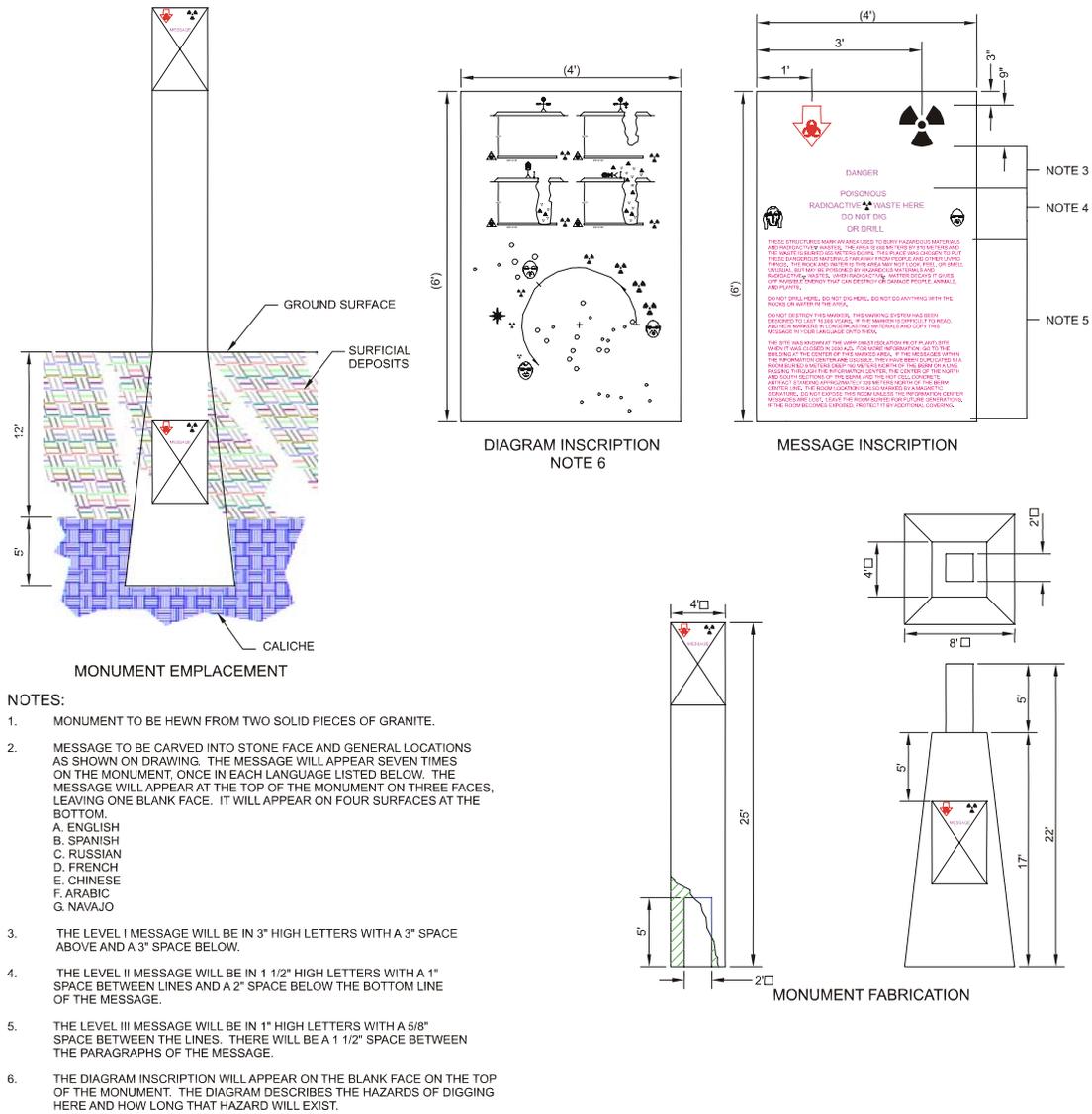
29 The surface monuments are large monuments erected on the surface at both the repository  
 30 footprint and the controlled area boundaries. To facilitate fabrication and shipping of the  
 31 monuments, each monument will consist of two separate stones connected by a tendon joint.  
 32 The large monuments will be engraved with Level II and III messages and Level IV pictographs,  
 33 as described in *CCA* Appendix PIC (Section IV).<sup>3,4</sup> Figures 7-10~~13~~ and 7-11~~14~~ provide the

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<sup>3,4</sup> Five levels of messages will be used in the permanent marker system.

- Level I conveys the message that the site is man-made. The message itself is in the physical form of the marker system and the effort expended in constructing it.
- Level II conveys the message that something dangerous is buried here and that no digging or drilling should be conducted. This message is carried in seven languages uniformly distributed among the subsurface warning markers. Each marker has the message in a single language. The Level II message is also engraved on each monument in seven languages.

1



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**Figure 7-1013. Repository Footprint Perimeter Monument Configuration**

CCA-112-2

- Level III conveys basic information that tells what, why, when, where, who, and how. This message is carried by the monument markers.
- Level IV conveys complex information in seven languages and is stored in the permanent structures buried underground and the information center on the surface.
- Level V is archival and involves storing more complete rulemaking records than the messages provided at the WIPP site. These records are not stored at the site, but will be located in various public access facilities at the local, state, federal, and international levels.

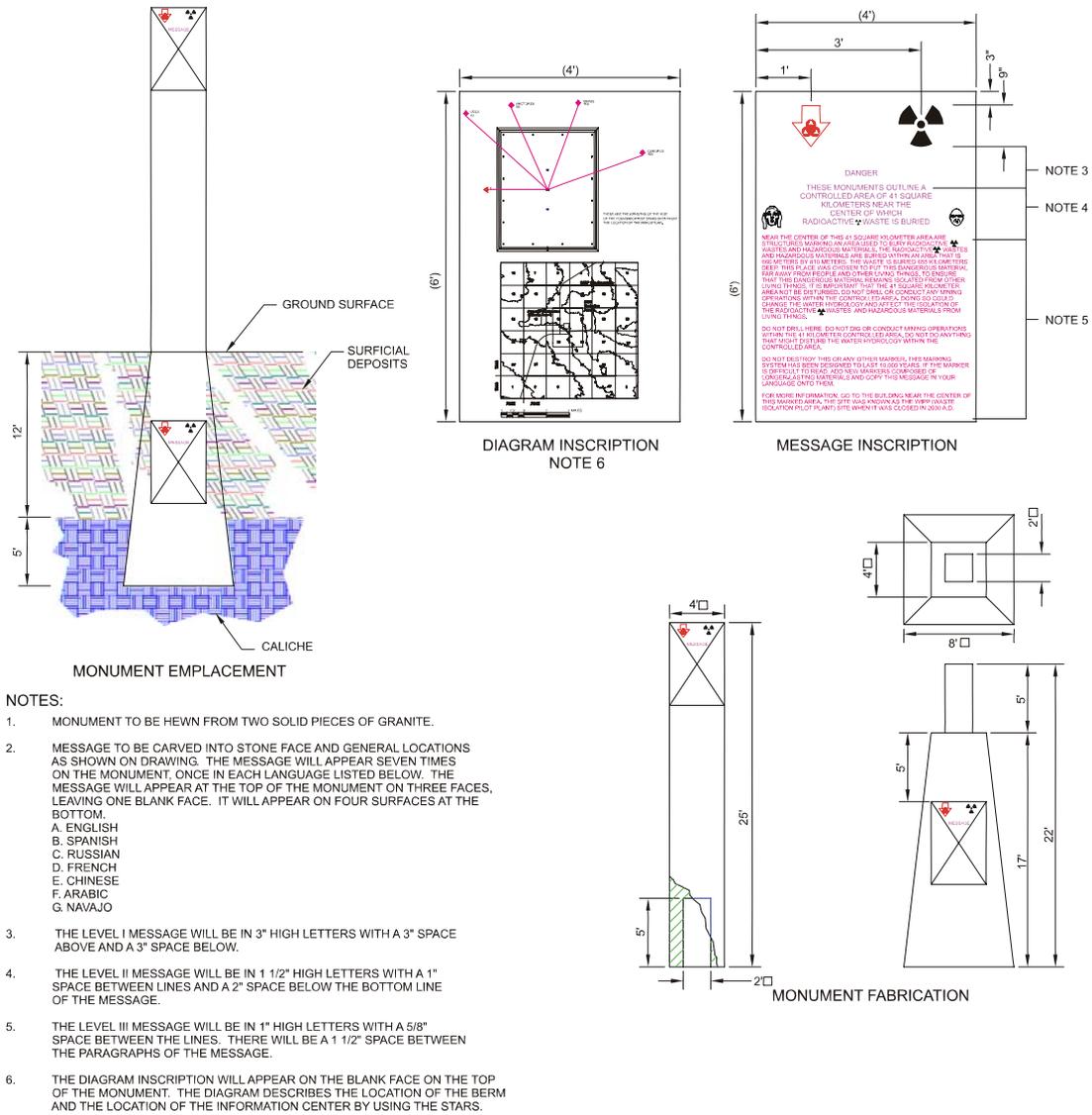


Figure 7-114. Controlled Area Perimeter Monument Configuration

dimensional characteristics of the large monuments. The monuments intended for marking the controlled area boundaries will differ from the monuments marking the repository footprint. Each footprint monument will be inscribed with the Level II and III messages in seven languages, the six official United Nations languages (English, French, Spanish, Chinese, Russian, and Arabic), and Navajo. The controlled area boundary monuments will be inscribed with warning messages. Trauth et al. (1993, Appendix F) discusses in some detail the selection of these languages by the Markers Panel.

The monuments will be quarried from granite and shipped by rail to the WIPP site. Each monument base will be soundly founded by excavating into the near-surface caliche. After

1 emplacing the base monument, the excavation will be backfilled and the upper monument will be  
2 placed over the base tendon.

3 The small warning marker is shown in Figure 7-1215. The Level II messages placed on the  
4 small subsurface warning markers will be in the seven languages previously listed. However,  
5 each marker will have the message in only one of the seven languages. Warning markers will be  
6 placed throughout the repository footprint and within the berm. The warning markers will be  
7 made of a diversity of durable materials, such as granite, aluminum oxide, and fired clay, thus  
8 improving the likelihood that at least some of the markers will endure for thousands of years.



Diameter of Disk is 23 cm. (9 in.)  
Not to Scale

CCA-114-2

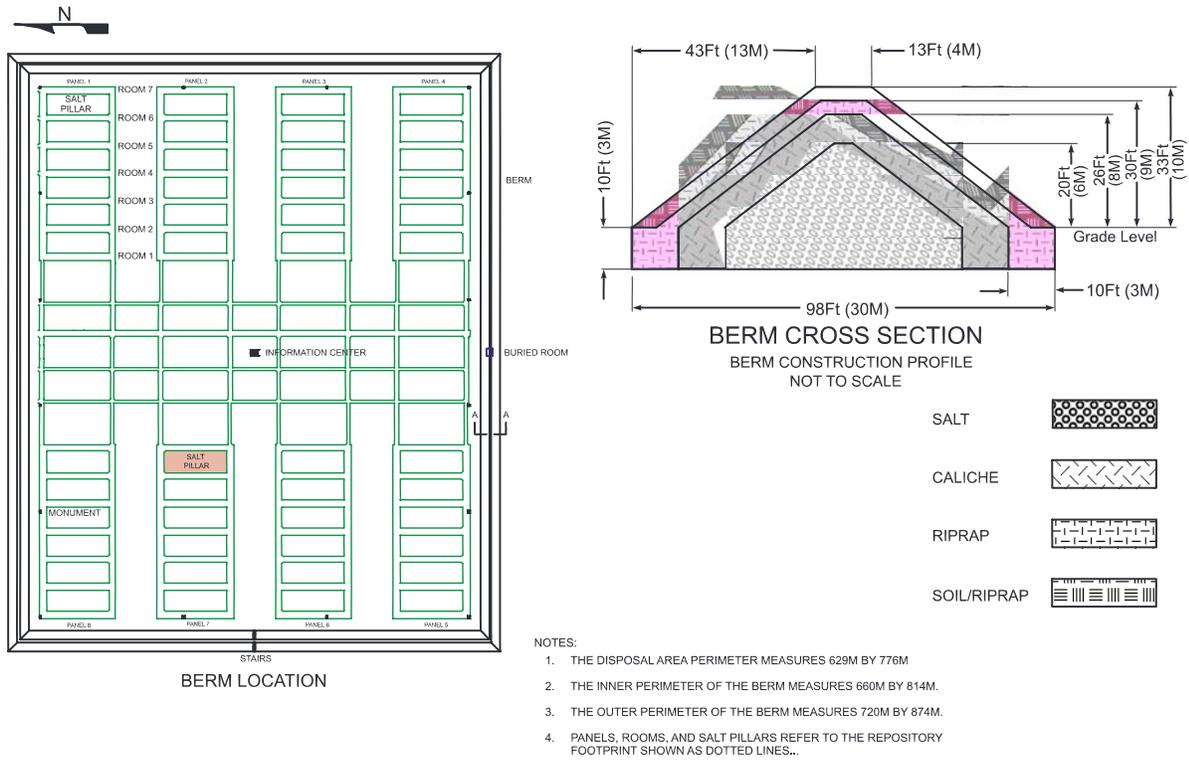
9  
10

**Figure 7-1215. Small Buried Warning Marker**

1 The small buried warning markers will be randomly spaced in locations and at depths to provide  
 2 a reasonable expectation of discovery by any organized exploration effort, but to discourage  
 3 organized efforts at collecting the markers. The current petroleum industry practice in the  
 4 Delaware Basin is to remove surface soil down to the caliche layer over an area sufficiently large  
 5 to set up a drilling rig and dig a mud pit. Nominally, this area is 50,000  $ft^2$  (4,648  $m^2$ ). By  
 6 placing the small warning markers above the caliche at intervals of a few feet, several of the  
 7 warning markers should be unearthed during any soil clearing operation.

8 The inclusion of a berm in Figure 7-1316 in the permanent marker design is based upon the  
 9 following criteria (see CCA Appendix PIC, Section VII, for more detail).

- 10 • The surface footprint of the repository should be essentially outlined by some enduring  
 11 structure.
- 12 • The structure should be sufficiently massive to provide reasonable expectation that it will  
 13 endure for thousands of years.
- 14 • The structure's profile should minimize the likelihood that it can become buried by  
 15 shifting sands or that characteristics of the profile may lead to fabrication stresses  
 16 affecting the ability of the structure to retain its configuration.
- 17 • The structure should be constructable without the need for sophisticated equipment or  
 18 processes.



19  
20

**Figure 7-1316. Berm Construction**

- 1 • The construction materials should be reasonably available to the WIPP site and have little  
2 intrinsic value.
- 3 • The cost should not be disproportionately high for the advantages that the alternative  
4 provides.
- 5 • To the extent practicable, the nature of the structure should lend itself to testing over a  
6 period of two to five decades.

7 The berm is proposed to encompass the repository footprint. Figure 7-~~13~~<sup>16</sup> also depicts the  
8 *reference design* berm cross section.

9 *As reported in John Hart and Associates, P.A. (2002b), the permanent markers will be*  
10 *constructed of materials selected through an evaluation process. Candidate materials*  
11 *identified in the CCA reference designs will be evaluated against performance criteria. The*  
12 *evaluations will be performed using methods identified in the Permanent Markers Testing*  
13 *Program Plan (DOE 2000).*

14 *A variety of earth materials that occur on or close to the WIPP site are available for use in the*  
15 *construction of the berm including native soils and caliche. Salt, excavated from the WIPP*  
16 *underground and stockpiled on site, may not be a good material for use in the berm. Its*  
17 *solubility and low strength make it an unreliable material to form the core of the berm, and*  
18 *use at shallower locations in the berm, while structurally of less consequence, nevertheless*  
19 *may not be feasible because of the closer proximity to infiltrating groundwater and the*  
20 *resulting increased risk of dissolution.*

21 *The berm design shown in Figure 7-13, including materials of construction, will be refined*  
22 *through the ongoing design-development process and finalized prior to its construction. Final*  
23 *design specifications will be provided to the EPA for approval prior to construction.*

24 To provide a distinctive magnetic signature for the berm, large permanent magnets *or other*  
25 *magnetically distinct* materials buried at intervals in the berm will be used. These *materials are*  
26 *intended to* magnets will produce a detectable *signature* signal with current airborne detection  
27 equipment. The magnetic signal's geometric form will provide strong indication that it could  
28 only have been humanly engineered. This magnetic signature should motivate any organization  
29 capable of magnetic surveying to further investigate this anomaly prior to initiating drilling  
30 activities.

31 Similarly, to provide a distinctive radar-reflective signature unique from the surrounding terrain,  
32 *DOE will consider the use of radar-reflective* trihedrals *for placement within the top layer of*  
33 *fabricated from metal will be buried in the berm. Bellus and Eckeman (1994) provide a*  
34 *description of the trihedrals.*

35 Another aspect of the marker system includes on-site buried storage rooms containing the Level  
36 IV message and associated diagrams. These rooms will be designed to endure for a similar time  
37 period as the permanent marker system and will be buried (see *CCA* Appendix PIC). The design  
38 characteristics contributing to this longevity will be the material and environmental conditions

1 associated with construction and location. The rooms will be made of granite with a minimum  
 2 number of joints. Individual walls, the floors, and the roofs will comprise single granite slabs  
 3 joined only at the edges. The configuration minimizes the risk of failure caused by chemical  
 4 interactions between the construction material and the environment. The message texts  
 5 contained within the buried storage rooms will be engraved on the walls. To provide  
 6 redundancy, additional granite slabs engraved with the message text and the diagrams will be  
 7 held in place against the interior walls. Although some damage could be inflicted by vandals, the  
 8 granite composition of the message-carrying materials will provide the greatest opportunity for  
 9 preventing complete destruction of the information contained within the buried rooms.

10 In addition to the buried storage rooms, an information center, as described in *CCA* Appendix  
 11 PIC (Section VII), will be located on the surface, providing access to the same information that is  
 12 contained in the buried rooms. Details regarding the location of one of the buried storage rooms  
 13 and identical information will be contained in the information center.

14 7.3.3.1.2 Records

15 A significant part of the overall system will be the archiving of important information at sites  
 16 remote to the repository. The archived material will include information that defines the  
 17 location, design, content, and hazards associated with the WIPP. The amount of information will  
 18 be more extensive than that available within the permanent marker system at the repository  
 19 location. Information will be preserved using practicable materials and techniques at record  
 20 centers and archives throughout the world. *CCA* Appendix EPIC (Section EPIC.6) provides  
 21 justification for a period of time that materials placed in archives and records centers are  
 22 expected to endure and be understood.

23 *Although DOE has not yet established the specific archival files, examples of the types of*  
 24 *documents that will be archived include the following.* ~~Specific documents in the archived~~  
 25 ~~information portfolio will include the following.~~ The specific requirements of 40 CFR § 194.43  
 26 *(a)(2)(2)(a) are listed and responsive documents* ~~applicable to each document~~ are indicated in  
 27 parentheses.

- 28 • *(i) The location of the controlled area and the disposal system (detailed maps*  
 29 *describing the exact location of the repository, Safety Analysis Report, the Final*  
 30 *Environmental Impact Statement (FEIS) for WIPP and the supplement(s) to the FEIS,*  
 31 *the RCRA Permit, the last compliance recertification application (CRA))*
- 32 • *(ii) The design of the disposal system (Safety Analysis Report, the FEIS for WIPP and*  
 33 *the supplement(s) to the FEIS, the RCRA Permit, the last CRA, drawings defining the*  
 34 *construction and configuration of the repository and shafts, design information for the*  
 35 *passive institutional controls)*
- 36 • *(iii) The nature and hazard of the waste (Safety Analysis Report, the FEIS for WIPP*  
 37 *and the supplement(s) to the FEIS, the RCRA Permit, the last CRA, records of the*  
 38 *waste container contents and disposal locations within the WIPP repository)*

- 1 • *(iv) Geologic, geochemical, hydrologic, and other site data pertinent to the containment*  
2 *of waste in the disposal system, or the location of such information (Safety Analysis*  
3 *Report, the FEIS for WIPP and the supplement(s) to the FEIS, the RCRA Permit, the*  
4 *last CRA, environmental and ecological background data collected during the*  
5 *preoperational phase of WIPP and summaries of data collected during the disposal*  
6 *and decommissioning phases of WIPP)*
  
- 7 • *(v) The results of tests, experiments, and other analyses relating to backfill of*  
8 *excavated areas, shaft sealing, waste interaction with the disposal system, and other*  
9 *tests, experiments, or analyses pertinent to the containment of waste in the disposal*  
10 *system, or the location of such information. (Safety Analysis Report, the FEIS for*  
11 *WIPP and the supplement(s) to the FEIS, the RCRA Permit, the last CRA, drawings,*  
12 *procedures, and design reports describing how the waste was emplaced, and how the*  
13 *repository was decommissioned, closed and sealed)*

14 detailed maps describing the exact location of the repository (i),

- 15 • ~~the Safety Analysis Report (i—iv),~~
- 16 • ~~the Final Environmental Impact Statement (FEIS) for WIPP and the supplement(s) to the~~  
17 ~~FEIS (i—iv),~~
- 18 • ~~the RCRA Permit (i—v),~~
- 19 • ~~the Compliance Certification Application (i—v),~~
- 20 • ~~environmental and ecological background data collected during the preoperational phase~~  
21 ~~of WIPP and summaries of data collected during the disposal and decommissioning~~  
22 ~~phases of WIPP (iv),~~
- 23 • ~~records of the waste container contents and disposal locations within the WIPP repository~~  
24 ~~(iii),~~
- 25 • ~~drawings defining the construction and configuration of the repository and shafts (ii),~~
- 26 • ~~drawings, procedures, and design reports describing how the waste was emplaced, and~~  
27 ~~how the repository was decommissioned, closed and sealed (v), and~~
- 28 • ~~design information for the passive institutional controls (ii).~~

29 The National Archives will be one organization responsible for the permanent storage of this  
30 information. As discussed in [CCA](#) Appendix PIC, the information will also be distributed to  
31 appropriate organizations such as the following for long-term safekeeping:

- 32 • federal and state government agencies,
- 33 • federal, state, tribal, and local archives and libraries,

- 1 • local and state and record repositories (for example, the Eddy County Clerk New  
2 Mexico)
- 3 • national archives and libraries of nations that possess nuclear weapons and nuclear  
4 energy or produce natural gas and oil resources, and
- 5 • professional and technical societies.

6 The archival and record centers identified in *CCA* Appendix PIC as planned recipients of  
7 information were selected based upon one or more of the following criteria:

- 8 • representing an international location in a nation which had citizens engaged in the oil  
9 and gas exploration and exploitation industry,
- 10 • representing an international location in a nation which had the potential to generate  
11 radioactive waste,
- 12 • representing a local governmental organization frequented by individuals engaged in the  
13 oil and gas exploration and exploitation industry,
- 14 • representing a National Archival location,
- 15 • representing a Regional Library, or
- 16 • is a public funded location.

17 The DOE intends to submit WIPP records to over 100 archives nationally and internationally as  
18 identified in *CCA* Appendix PIC. *The final number of archive recipients will depend upon the*  
19 *agreements reached between DOE and the facilities.* The initial submittal of these records will  
20 occur after closure and decommissioning of the WIPP. Since this time frame is decades into the  
21 future and thus significant changes will occur to some or all of the archives as well as some of  
22 the governments, the DOE has not attempted to identify the practices employed by each archive  
23 and repository for maintaining records and making them accessible to the public. However, the  
24 National Archive-Rocky Mountain Region practices are described and are representative of the  
25 National Archives and its regional facilities. The state of New Mexico Archive and the Canadian  
26 National Archive were also contacted and their practices are similar to those employed by the  
27 U.S. National Archives. There are also international standards for the organization and operation  
28 of archives that enable the world's archives to function similarly in many aspects of the practices  
29 governing maintenance of records and access to the records by members of the public.

30 To ensure the proper storage and retrievability of archived material, the DOE archivist will  
31 develop a filing code system specifically for the WIPP material. This system will be a part of the  
32 overall document submittal the DOE will provide to the various archival locations. In the  
33 development of the filing code system and communications with worldwide archives, it is  
34 expected that differing cultural issues will be addressed in order that the DOE gain acceptance of  
35 the information from as many archives as possible.

1 To reduce the possibility that future archivists may destroy the provided documents, each volume  
2 containing documents will be labeled with a warning that the intent of providing the archived  
3 material is to ensure its preservation for the 10,000-year regulatory time frame stipulated in the  
4 U.S. Government's regulations controlling the disposal of transuranic waste. It is recognized  
5 that the federal government may incur some long-term financial obligations to the archival  
6 locations to ensure retention. Within two years following the distribution of archival material  
7 and at least every 15 years thereafter during the active institutional controls period, the DOE will  
8 conduct audits of selected archival locations to verify retention and retrievability of the historical  
9 documents.

10 As an example of how an archive will handle archived information, the National Archive will  
11 use the indexing system provided by the DOE in organizing the WIPP material submitted for  
12 archiving and public use. Upon receipt of the material in boxes, the archive staff will examine  
13 the documents; remove staples, paper clips, rubber bands, and other miscellaneous materials that  
14 may damage or are otherwise incompatible with the records over an extended period of time;  
15 enclose any damaged material in individual protective covers; place the records in acid-free  
16 boxes; and store those boxes in an environmentally controlled vault. The individual boxes are  
17 labeled with coded alpha-numeric designations that tie the contents back to the agency  
18 submitting the documents, the year in which the documents were received, and the general  
19 content of the documents. Finding aids, content indices, or significant word lists are developed  
20 to aid researchers in identifying the material desired. The coded number will also provide  
21 information relative to whether or not the documents may be destroyed after a given amount of  
22 time. Many government documents are scheduled to be destroyed after 30 years. Other  
23 documents are preserved indefinitely.

24 Title 36 CFR Part 1254, Availability of Records and Donated Historical Materials, regulates the  
25 manner in which archival material within the National Archive system is made available to  
26 members of the public. In general, researchers must register each day that they enter a research  
27 facility and may be required to provide identification. The researcher must sign for the  
28 documents received and again may be required to show identification. The researcher is not  
29 permitted to leave the room without notifying the room attendant and placing all documents in  
30 their proper containers. Documents must be returned to the research room attendant prior to the  
31 room closing. Documents may not be used where there is food, drink, or the presence of ink.  
32 Only pencils may be used in the room containing original documents. If the researcher requires  
33 copies of documents, the appropriate document must be marked with a paper tab provided by the  
34 archive. No paper clips or rubber bands may be used on the documents. The room attendant will  
35 provide the copying services for the researcher. Documents must be maintained in order by the  
36 researcher; however if the documents become disordered, the room attendant must perform the  
37 re-ordering function and not the researcher. Upon exiting a research room, the researcher must  
38 present for examination any article that could contain documents.

39 In addition to the national and state archives, Indian tribes and pueblos (for example, Navajo,  
40 Mescalero Apache, and Zuni) were contacted to determine the extent of any archival activity.  
41 Only the Zuni were establishing a limited internal archive. Other groups forward archive worthy  
42 materials to federal storage facilities. The DOE will continue to work with key nations, tribes,  
43 and pueblos to establish pertinent agreements and to ensure that appropriate WIPP records are  
44 distributed for archiving and reference purposes.

1 Finally, the International Atomic Energy Agency (IAEA), with the DOE as a current  
 2 participatory through the agency of its Scientific Advisor, is developing a procedure for the  
 3 archiving of records pertinent to the disposal of radioactive waste in deep geological repositories.  
 4 The procedure, published in ~~final draft May 31, 1996,~~ **July 1999**, is titled ***Maintenance of***  
 5 ***Records for Radioactive Waste Disposal (IAEA 1999)***. The DOE embraces this effort ~~and~~  
 6 ~~intends to continue to pursue final publication of this comprehensive document with the IAEA.~~

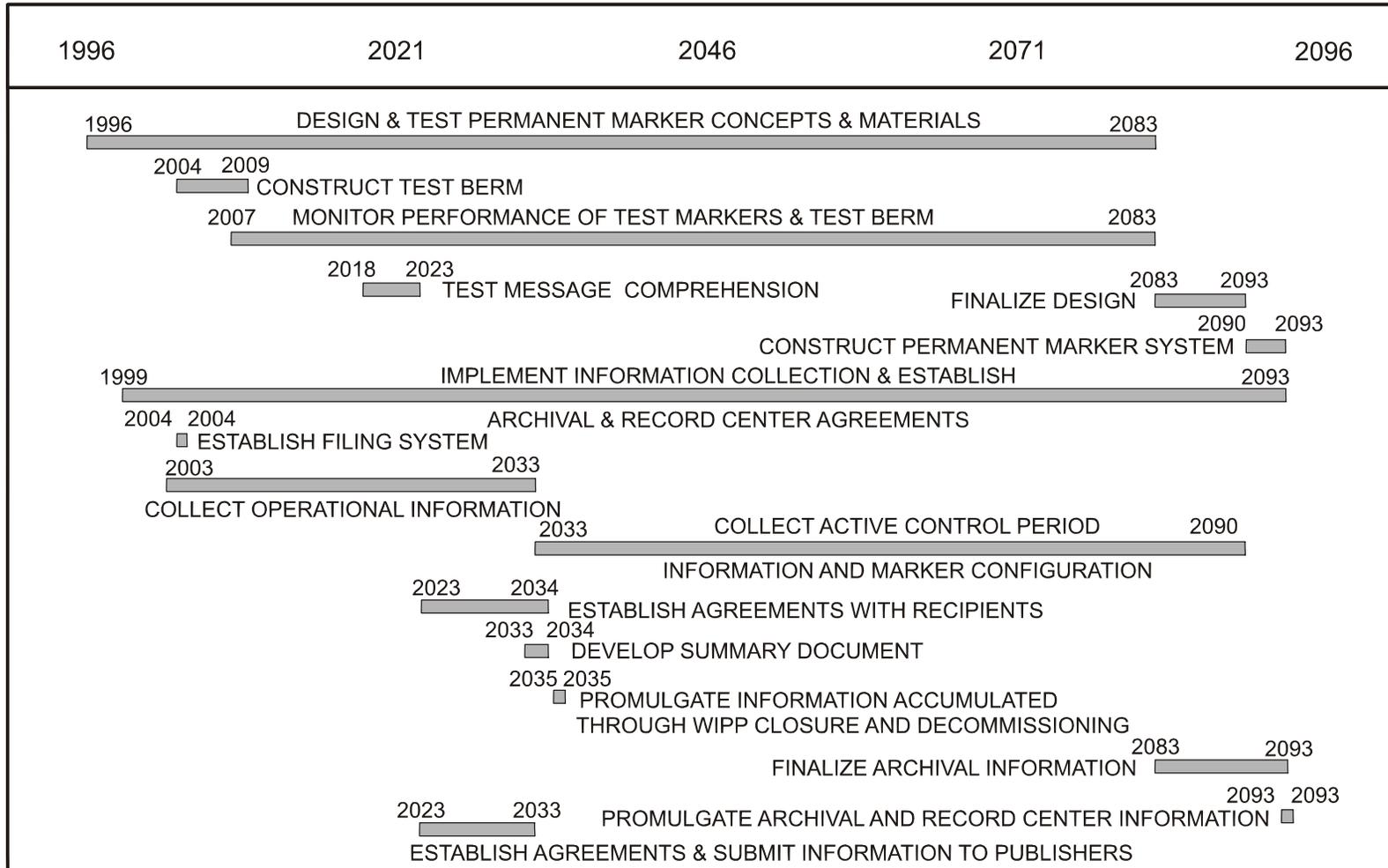
#### 7 7.3.3.2 Implementation of Programs to Collect Information

8 Prior to implementing the passive institutional controls, a testing program will determine  
 9 whether the specific messages proposed can be expected to convey the intended warnings and  
 10 information across cultures and whether the proposed media for transmitting the messages will  
 11 endure to the degree anticipated in the development of the conceptual model. The testing to be  
 12 conducted will address the refinement of the messages, diagrams, and the method of  
 13 presentation. As recommended in Trauth et al. (1993), the translated versions of the message  
 14 text should be evaluated by presentations to groups indigenous to the countries whose language  
 15 is represented in the message. This process should provide input into how comprehensible the  
 16 messages are and provide information regarding any idiom changes that may be necessary in the  
 17 translated versions. When considering that the messages were developed by educated  
 18 individuals residing in the U.S., it is prudent that the effectiveness of the messages to convey  
 19 their intended content to a broader cross-section of individuals be thoroughly tested. The testing  
 20 therefore should include cross-cultural groups in evaluating the effectiveness of conveying the  
 21 intended messages through diagrams and pictures as well as script. The DOE will continue to  
 22 develop and review the details of a testing program to ensure that a comprehensive effort is made  
 23 to test the final written and pictograph message comprehensibility. For those components that  
 24 include either large volumes of various materials (for example, the berm) or the movement of  
 25 heavy objects (for example, the sections of granite in the monuments), procedures will be tested  
 26 for transporting the material and constructing the specified designs. The testing programs are  
 27 described in **CCA** Appendix PIC. See **CCA** Appendix EPIC for a discussion of the durability of  
 28 materials to be used to construct passive institutional controls.

#### 29 7.3.3.3 Passive Institutional Controls Timelines

30 The DOE has prepared a tentative schedule of the implementation of the passive controls  
 31 program. The schedule is shown in Figure 7-~~14~~**12**. The following is provided as a brief  
 32 expansion of the timelines provided in Figure 7-~~14~~**12**.

- 33 • 1996 – 2083 Design and Test Permanent Marker Concepts and Materials. During this  
 34 period the testing and monitoring described in **CCA** Appendix PIC related to the  
 35 permanent marker components, materials, and communication concepts are conducted.
- 36 - ~~1998—2005~~ **2004-2009** Construct Test **Markers Berm**. During this period, the  
 37 DOE will install **prototype markers** ~~test monuments, buried test markers, and~~  
 38 ~~construct a section of berm for testing.~~ ***The types of prototype markers and their***  
 39 ***materials of construction will be based on results of screening tests.*** ~~The berm~~  
 40 ~~section will include magnets and radar reflectors for testing.~~



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Figure 7-12. Passive Institutional Controls Timeline

