BSC

Design Calculation or Analysis Cover Sheet

Complete only applicable items.

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2. Page 1

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DISCLAIMER

The calculations contained in this document were developed by Bechtel SAIC Company, LLC (BSC) and are intended solely for the use of BSC in its work for the Yucca Mountain Project.

CONTENTS

ACRONYMS 5

1.0 PURPOSE 7

2.0 REFERENCES 8
- 2.1 PROJECT PROCEDURES/DIRECTIVES 8
- 2.2 DESIGN INPUTS 8
- 2.3 DESIGN CONSTRAINTS 9
- 2.4 DESIGN OUTPUTS 9

3.0 ASSUMPTIONS 9
- 3.1 ASSUMPTIONS REQUIRING VERIFICATION 9
- 3.2 ASSUMPTIONS NOT REQUIRING VERIFICATION 10

4.0 METHODOLOGY 10
- 4.1 QUALITY ASSURANCE 10
- 4.2 USE OF SOFTWARE 10
- 4.3 DESIGN METHODOLOGY 11

5.0 LIST OF ATTACHMENTS 11

6.0 BODY OF ANALYSIS 13
- 6.1 EMPLACEMENT DRIFT WITHOUT WASTE PACKAGES 16
- 6.2 EMPLACEMENT DRIFT WITH WASTE PACKAGES 17
- 6.3 EMPLACEMENT DRIFT WITH DRIP SHIELDS 18
- 6.4 RADIOLOGICAL CLASSIFICATION EMPLACEMENT ACCESS AREA 19
- 6.5 RADIOLOGICAL CLASSIFICATION EMPLACEMENT EXHAUST AREA 22

7.0 RESULTS AND CONCLUSIONS 24

FIGURES

Figure 6.1-1 Emplacement Drift without Waste Package 17
Figure 6.2-1 Emplacement Drift with Waste Package 18
Figure 6.3-1 Emplacement Drift with Drip Shield 19
Figure 6.4-1 Emplacement Access Area Radiation Zones 20
Figure 6.4-2 Emplacement Access Area Contamination Zones 21
Figure 6.5-1 Emplacement Exhaust Area Radiation Zones 22
Figure 6.5-2 Emplacement Exhaust Area Contamination Zones 23

TABLES

Table 6-1 PDC Requirements Summary for the Emplacement Drifts 13
Table 6-2 BOD Requirements Summary for the Emplacement Drifts 14
Table 6-3 PMADP Internal Constraints Summary for the Emplacement Drifts 14

ACRONYMS

BOD	Basis of Design
BSC	Bechtel SAIC Company, LLC
IED	Information Exchange Document
PDC	Project Design Criteria
PMADP	Postclosure Modeling and Analyses Design Parameters
TEV	Transport and Emplacement Vehicle

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1.0 PURPOSE

The purpose of this analysis is to present the operating configuration for the emplacement drifts. This analysis summarizes the primary design requirements that influence the emplacement drift operating configuration. Satisfaction or implementation of the requirements is included in the design input documents cited in this analysis. This analysis includes a presentation of the design features for the operating emplacement drift and integrates the various features into a comprehensive configuration. The primary design features that are integrated into the emplacement drift operations configuration are:

- Emplacement drift excavated diameter (Ref. 2.2.1, Section 4.2.13.8.4)
- Emplacement drift ground support (Ref. 2.2.2)
- Emplacement drift steel invert and crushed tuff ballast (Ref. 2.2.3)
- Emplacement drift and turnout interface (Ref. 2.2.4)
- Transport and emplacement vehicle (TEV) (Ref. 2.2.5)
- Drip shield emplacement gantry (Ref. 2.2.10)
- Waste package and drip shield (Ref. 2.2.6)
- Emplacement pallet (Ref. 2.2.11)
- Radiation protection (Ref. 2.2.8)

Some potential emplacement drift design elements, such as a third-rail electrical power conductor for the TEV or a microwave communication signal channel system, have not been designed for the emplacement drift. Design features that have not yet been developed are not included in this analysis.

The objective of this analysis is to produce figures that show multiple design features of the subsurface repository. The figures listed below are the results of this analysis. The figures include the emplacement drift operating configuration details. Figures also display radiological conditions and contamination potential in, and near, emplacement areas. The following figures are developed in this analysis:

- Figure 6.1-1 Emplacement Drift without Waste Package
- Figure 6.2-1 Emplacement Drift with Waste Package
- Figure 6.3-1 Emplacement Drift with Drip Shield
- Figure 6.4-1 Emplacement Access Area Radiation Zones
- Figure 6.4-2 Emplacement Access Area Contamination Zones
- Figure 6.5-1 Emplacement Exhaust Area Radiation Zones
- Figure 6.5-2 Emplacement Exhaust Area Contamination Zones

The radiological conditions in the exhaust area at the end of the emplacements drifts have not been formally documented. Those radiological conditions are shown in Figures 6.5-1 and 6.5-2. The assumption concerning the radiological conditions in the exhaust main at the ends of the emplacement drifts is explained in Assumption 3.1.1.

2.0 REFERENCES

2.1 PROJECT PROCEDURES/DIRECTIVES

2.1.1 EG-PRO-3DP-G04B-00037, Rev. 8, *Calculations and Analyses*. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070420.0002.

2.2 DESIGN INPUTS

2.2.1 BSC (Bechtel SAIC Company) 2006. *Project Design Criteria Document*. 000-3DR-MGR0-00100-000-006. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061201.0005.

2.2.2 BSC 2007. *Typical Ground Support for Emplacement Drifts*. 800-K00-SSE0-00101-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070515.0002.

2.2.3 BSC 2007. *Repository Subsurface Emplacement Drifts Steel Invert Structure Plan & Elevation.* 800-SS0-SSE0-00201-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070327.0001

2.2.4 BSC 2007. *Repository Subsurface Turnout, Invert & Rails Plan and Elevation*. 800-D00-SSD0-00701-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070529.0025

2.2.5 BSC 2007. *Emplacement and Retrieval Transport and Emplacement Vehicle Mechanical Equipment Envelope.* 800-MJ0-HE00-00101-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070312.0016.

2.2.6 BSC 2007. *Drift Cross Section Showing Emplaced Waste Package and Drip Shield.* 800-M00-WIS0-00101-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070412.0003.

2.2.7 BSC 2007. *Postclosure Modeling and Analyses Design Parameters*. TDR-MGR-MD-000037 REV 01. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070521.0012.

2.2.8 BSC 2007. *Classification of Radiation and Contamination Zones of Geologic Repository Operations Area*. 000-00C-WHS0-01600-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070529.0007.

2.2.9 BSC 2006. *Basis of Design for the TAD Canister-Based Repository Design Concept*. 000-3DR-MGR0-00300-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20061023.0002.

2.2.10 BSC 2007. *Emplacement and Retrieval Drip Shield Emplacement Gantry Mechanical Equipment Envelope*. 800-MJ0-HE00-00201-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070515.0003.

2.2.11 BSC 2003. *Emplacement Pallet Configuration.* 000-M00-TEP0-00102-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20031006.0004.

2.3 DESIGN CONSTRAINTS

No design constraints are applicable to this analysis. Internal constraints (Ref. 2.2.7) are considered design inputs in this analysis. In this analysis internal constraint is synonymous with requirement.

2.4 DESIGN OUTPUTS

There are no unique outputs (drawings or specifications) expected from this analysis. The figures developed in this analysis may be used as input to other documents. This analysis supports the License Application.

The following drawings may be revised in the future and this analysis may support the revisions. These drawings are not classified as outputs from this analysis.

- Repository Subsurface Emplacement Drift Panel 1 General Arrangement, 800-KM0-SSE0-00601-000
- Repository Subsurface Emplacement Drift Panel 1 Drift 1-1, 800-KM0-SSE0-00701-000
- Repository Subsurface Emplacement Drift Panel 2 General Arrangement, 800-KM0-SSE0-00901-000
- D&E / PA/C IED Emplacement Drift Configuration and Environment, 800-IED-MGR0-00201-000

3.0 ASSUMPTIONS

This section contains the assumptions that are needed to generate the outputs of this analysis.

3.1 ASSUMPTIONS REQUIRING VERIFICATION

This section contains the assumptions that are used in this analysis and require verification.

3.1.1 Radiological Conditions in the Exhaust Mains

The exhaust mains are classified as radiation zone R5 where the dose rate is greater than 100 mrem/hr. The contamination classification is C3 since there is potential for airborne radiological contamination in the exhaust mains.

Rationale - The subsurface repository design does not include shielding between the exhaust main and the emplacement drift. Therefore, the exhaust mains should be classified as R5 which means that the potential dose rate is greater than 100 mrem/hr. This is the same classification as the subsurface emplacement drifts (Ref. 2.2.8, p. 62). The R5 classification represents the highest dose rate classification in the dose rate classification system at Yucca Mountain (Ref. 2.2.8, Table 1).

Air flow will be forced through the emplacement drift by the non-important to safety ventilation system (Ref. 2.2.9, p. 225). Since the air will travel through the emplacement drifts towards the

exhaust main, the contamination potential of the exhaust mains is C3, Contamination Area (Potential for airborne). This contamination potential is the same as the emplacement drifts (Ref. 2.2.8, p. 63).

This is a reasonable assumption for the exhaust main radiological conditions since the conditions are the same as the emplacement drifts, and the dose rate classification of R5 is the most restrictive that has been developed at the repository. The assumption is not entirely bounding since higher classifications for contamination are possible, C4 - high contamination area, and C5 - Airborne Radioactivity Area (Ref. 2.2.8, Table 2), but those contamination levels are not expected in the subsurface facility (Ref. 2.2.8, Table 19).

This assumption is needed because the radiological conditions in the exhaust main as shown in Figures 6.5-1 and 6.5-2 of this document have not been formally documented. The assumption is based on the information in *Classification of Radiation and Contamination Zones of Geologic Repository Operations Area* (Ref. 2.2.8, pp. 62-63) since the radiological conditions in the exhaust main are considered the same as inside the emplacement drifts. This assumption is in compliance with the dose rate criteria in the *Project Design Criteria Document* (PDC) (Ref. 2.2.1, Section 4.10.1.3), though no criteria has been established in the PDC because "normal access is precluded, because of thermal conditions in the exhaust main" (Ref. 2.2.1, Table 4.10.1-1).

This assumption will be verified when a calculation or analysis similar to what has already been accomplished for the access side of the emplacement drift (Ref. 2.2.8) includes the exhaust main radiological conditions. The assumption is complete at this time since it includes a representative section of the exhaust main. As with the access side of the emplacement drifts (Ref. 2.2.8, pp. 62-63), only a representative view is assumed at this time. This assumption is being tracked in CalcTrac.

3.2 ASSUMPTIONS NOT REQUIRING VERIFICATION

The are no assumptions used in this analysis that do not require verification.

4.0 METHODOLOGY

4.1 QUALITY ASSURANCE

This analysis was prepared in accordance with EG-PRO-3DP-G04B-00037, *Calculations and Analyses* (Ref. 2.1.1). The emplacement drift is classified as a Safety Category item, important to safety and important to waste isolation, in *Basis of Design for the TAD Canister-Based Repository Design Concept* (BOD) (Ref. 2.2.9, p. 94). In the BOD the emplacement drift invert (ballast) is a safety category item classified as important to waste isolation (Ref. 2.2.9, p. 94). The rails, ground support for emplacement drifts, and emplacement drift invert (steel) are classified as non-safety category items in the BOD (Ref. 2.2.9, p. 94). The approved version of this analysis is designated as QA:QA.

4.2 USE OF SOFTWARE

This document does not include hand or computer calculations.

4.3 DESIGN METHODOLOGY

By presenting the design features from various engineering sources, such as waste package, ground support, structural steel invert, etc., this analysis develops the emplacement drift operating configuration. The method involves compiling information from multiple sources to provide a comprehensive view of emplacement drifts at the repository.

The methodology includes revising this analysis and removing design information that is no longer in the design. Other design information has been changed and is incorporated into this revision. Some of the principal changes in this analysis from the previous version are:

- The emplacement drift invert, steel, and rail elevations have been revised because of the TEV design,
- The rails in the emplacement drift are wider to accommodate the TEV,
- The radiation shield wall concept has been removed,
- A step between the excavated turnout invert and the excavated emplacement drift invert has been eliminated,
- Radiological conditions at the access end and exhaust end of the emplacement drifts are shown.

5.0 LIST OF ATTACHMENTS

No attachments are necessary for this analysis.

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6.0 BODY OF ANALYSIS

This analysis combines design information from a variety of sources to present an overview of the repository emplacement drift operations configuration. The configurations presented in this analysis are:

- Figure 6.1-1 Emplacement Drift without Waste Package
- Figure 6.2-1 Emplacement Drift with Waste Package
- Figure 6.3-1 Emplacement Drift with Drip Shield
- Figure 6.4-1 Emplacement Access Area Radiation Zones
- Figure 6.4-2 Emplacement Access Area Contamination Zones
- Figure 6.5-1 Emplacement Exhaust Area Radiation Zones
- Figure 6.5-2 Emplacement Exhaust Area Contamination Zones

Principal requirements and internal constraints that govern the design and operating configuration of the emplacement drifts are summarized in Tables 6-1, 6-2, and 6-3. Requirements in Table 6-1 are from the PDC (Ref. 2.2.1). Requirements in Table 6-2 are from the BOD (Ref. 2.2.9). Internal constraints in Table 6-3 are from *Postclosure Modeling and Analyses Design Parameters* (PMADP) (Ref. 2.2.7).

The purpose of this design analysis does not include demonstrating that the requirements and internal constraints in Tables 6-1 through 6-3 have been satisfied or implemented. The design inputs to this analysis (Section 2.2) must be consulted to determine how these requirements and internal constraints have been addressed.

Table 6-1 PDC Requirements Summary for the Emplacement Drifts

Requirement Source	PDC Requirement Text
PDC (Ref. 2.2.1) 4.2.13.8.4	**Emplacement Drift Configuration** - The excavated diameter of openings that are used to dispose of waste packages shall be a nominal 18 ft.
PDC (Ref. 2.2.1) 4.2.13.3	**Materials** - The use of materials in the emplacement drifts shall be limited to those that do not have an adverse effect on postclosure performance. The use of materials in the emplacement drifts is currently limited to steel and ballast. Any other materials shall not be allowed for use until appropriate testing and modeling work is done with respect to potential affects on postclosure performance. Materials other than those specified above may be used in the nonemplacement drifts.
PDC (Ref. 2.2.1) 4.2.13.3.1	**Structural Steel** - Structural steel for the invert structure in emplacement drifts shall be corrosion resistant, high-strength, low-alloy steel as specified in the PDC (Ref. 2.2.1).
PDC (Ref. 2.2.1) 4.2.13.3.4	**Ballast** - Crushed tuff generated from the tunnel boring machine excavations shall be evaluated for its suitability for use as ballast material for the emplacement drift invert. Technical specification shall then be developed that describes the requirements for the ballast material, placement, and compaction.
PDC (Ref. 2.2.1) 4.5.2.2	**Rockfall Prevention** - The ground support shall be designed to prevent rockfalls that could result in personnel injury.
PDC (Ref. 2.2.1) 4.5.2.11	**Ground Support / Subsurface / Emplacement Drift** - The ground support design shall interface with the subsurface development and emplacement drift subsystems (subsystems of the subsurface facility) to accommodate opening orientation, configuration, and excavated opening sizes.

Requirement Source	PDC Requirement Text
PDC (Ref. 2.2.1) 4.5.2.13	**Minimized Maintenance Design** - The ground support for emplacement drifts and nonaccessible nonemplacement areas shall be designed to function without planned maintenance during the operational life, while providing for the ability to perform unplanned maintenance in the emplacement drifts and non-accessible nonemplacement areas on an as-needed basis.

Table 6-2 BOD Requirements Summary for the Emplacement Drifts

Requirement Source	BOD Requirement Text
BOD (Ref. 2.2.9) 8.2.2.1	**Service Life** - The Subsurface Facility shall be designed, constructed and maintained and shall incorporate acceptable materials and practices appropriate for a 100-year operational service life.
BOD (Ref. 2.2.9) 8.2.3.1.4	**Rockfall in Drifts** - The Subsurface Facility shall be designed to ensure the size and layout of the emplacement drifts are consistent with the drift and rockfall analysis, including the evaluation of the characteristics of the credible bounding rockfalls.
BOD (Ref. 2.2.9) 8.2.4.5	**Component Characteristics** - Characteristics of the drip shields and other [ground support, invert, etc.] materials used in the Subsurface Facility shall be maintained in accordance with BOD section 8.2.4.5 (Ref. 2.2.9, Section 8.2.4.5).

The information from the PMADP (Ref. 2.2.7) are internal constraints from the PMADP document. For the purposes of this design analysis, and in accordance with *Calculations and Analyses* (Ref. 2.1.1, p. 6), these statement from the PMADP are not considered design constraints. The information in Table 6-3 is design input.

Table 6-3 PMADP Internal Constraints Summary for the Emplacement Drifts

Internal Constraint Source	PMADP Internal Constraint Text
PMADP (Ref. 2.2.7) 01-10	**Emplacement Drift Configuration** - The emplacement drifts shall be circular in cross section with a diameter nominally 5.5 m (-0/+10%).
PMADP (Ref. 2.2.7) 01-11	**Emplacement Drift Gradient** - The grade of the emplacement drift shall be nominally horizontal so that overall water drainage is directly into the rock to prevent water accumulation.
PMADP (Ref. 2.2.7) 01-15	**Design of Ground Support System** - The interface for the design and materials used for ground support shall be controlled through the Subsurface Facilities Ground Support Configuration and Subsurface Facilities Committed Materials IEDs [information exchange documents].
PMADP (Ref. 2.2.7) 01-16	**Air Circulation Through Ground Support** - The permanent ground support shall allow air circulation between the host rock and ground support for moisture removal.
PMADP (Ref. 2.2.7) 02-07	**Emplacement Drift Invert Function** - The emplacement drift invert (ballast) shall provide a nominally level surface that supports the drip shield, waste package, and waste package emplacement pallet for static and dynamic loads associated with ground motion (but excluding faulting displacements) after closure of the repository.

Internal Constraint Source	PMADP Internal Constraint Text
PMADP (Ref. 2.2.7) 02-08	**Invert Materials** - a) The interface for the components and materials used in the invert shall be controlled through the Emplacement Drift Invert (IED)s. b) The invert material will be plain carbon steel and crushed tuff. The crushed tuff shall have properties consistent with the RHH (repository host horizon) excavated by mechanical means. c) The interface for the gradation and placement of invert ballast material shall be controlled through the Emplacement Drift Invert IED(s).
PMADP (Ref. 2.2.7) 02-10	**Emplacement Drift Invert Configuration** - The interface for the general configuration, plan, and details of the emplacement drift invert shall be controlled through the Emplacement Drift Invert IED.
PMADP (Ref. 2.2.7) 06-02	**Drift Wall Temperature** - The maximum emplacement drift wall temperature shall not exceed 200 °C to avoid possible adverse conditions (e.g. mineralogical transitions, rock weakening etc.)

6.1 EMPLACEMENT DRIFT WITHOUT WASTE PACKAGES

The emplacement drifts at Yucca Mountain represent the final location for spent nuclear fuel and high-level radioactive waste. Prior to being loaded with waste packages, the emplacement drifts are constructed by a tunnel boring machine, final ground support is installed, and a steel and crushed tuff invert is installed. This section summarizes the principal design features of the emplacement drifts at Yucca Mountain.

There are two primary systems in an emplacement drift without waste packages as shown in Figure 6.1-1. They are: 1) the ground support system, and 2) the invert and rail system. The ground support system is from *Typical Ground Support for Emplacement Drifts* (Ref. 2.2.2). The invert and rail system is from *Repository Subsurface Emplacement Drifts Steel Invert Structure Plan & Elevation* (Ref. 2.2.3).

Turnout Interface - The emplacement drift is shown in Figure 6.1-1 and is reached through a curved turnout that originates in the access main. Previous designs included grade changes and excavation profile changes at the interface between the turnout and the emplacement drift. In the current underground design, the top of steel invert elevation is the same elevation at the turnout and emplacement drift interface. The excavation profile, 18 feet diameter, is approximately the same except the turnout includes small notches for the invert steel (Ref. 2.2.4).

TEV Interface - The TEV is the vehicle that delivers waste packages to the emplacement drifts and travels on an 11 foot gauge, 171 pound per yard crane rail shown in Figure 6.1-1. The TEV design is based in part on requiring that the vehicle functions within an operating envelope defined by the emplacement drift. The TEV operating envelope, and the TEV within an emplacement drift, is shown on *Emplacement and Retrieval Transport and Emplacement Vehicle Mechanical Equipment Envelope* (Ref. 2.2.5).

Drip Shield Emplacement Gantry Interface - A drip shield emplacement gantry operates within the emplacement drift to position and lower drip shields. The drip shield emplacement gantry operating envelope, and the drip shield emplacement gantry operating within an emplacement drift, is shown on *Emplacement and Retrieval Drip Shield Emplacement Gantry Mechanical Equipment Envelope* (Ref. 2.2.10).

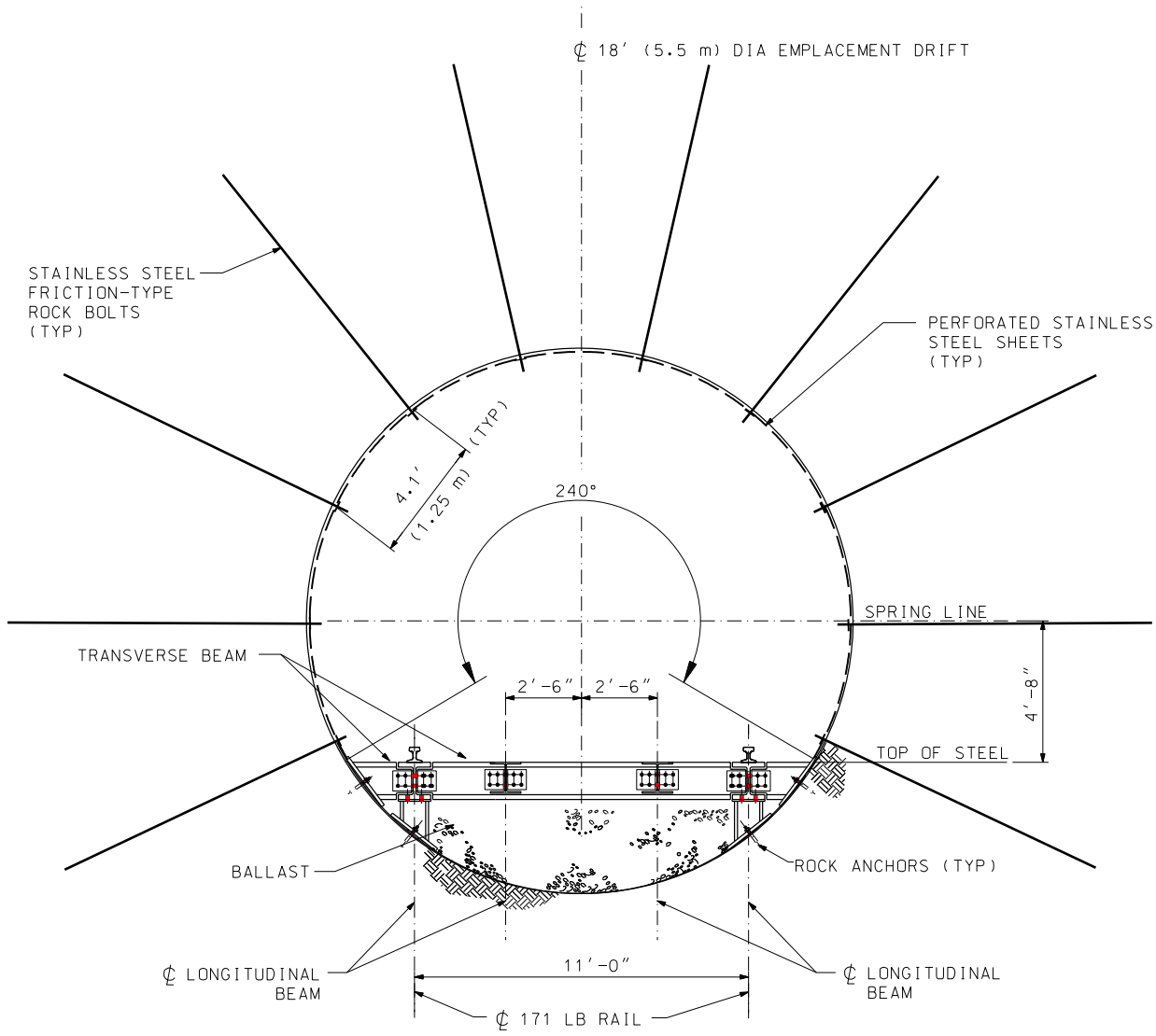


Figure 6.1-1 Emplacement Drift without Waste Package

Source: *Typical Ground Support for Emplacement Drifts* (Ref. 2.2.2)
Repository Subsurface Emplacement Drifts Steel Invert Structure Plan & Elevation (Ref. 2.2.3)

Note: Some potential design features, such as a third-rail electrical power supply or a microwave communication channel system, are not shown in this figure. These additional design features for the emplacement drift system will be developed during detailed design prior to construction of the emplacement drifts.

6.2 EMPLACEMENT DRIFT WITH WASTE PACKAGES

The emplacement drift is loaded with waste packages that contain spent nuclear fuel and high-level radioactive waste. The emplaced waste package rests on a pallet. The configuration of the emplacement drift containing a waste package and pallet is shown in Figure 6.2-1. The configuration shown with the waste package in the emplacement drift is a combination of the information in Figure 6.1-1, the waste package configuration from *Drift Cross Section Showing Emplaced Waste Package and Drip Shield* (Ref. 2.2.6), and the pallet configuration from *Emplacement Pallet Configuration* (Ref. 2.2.11).

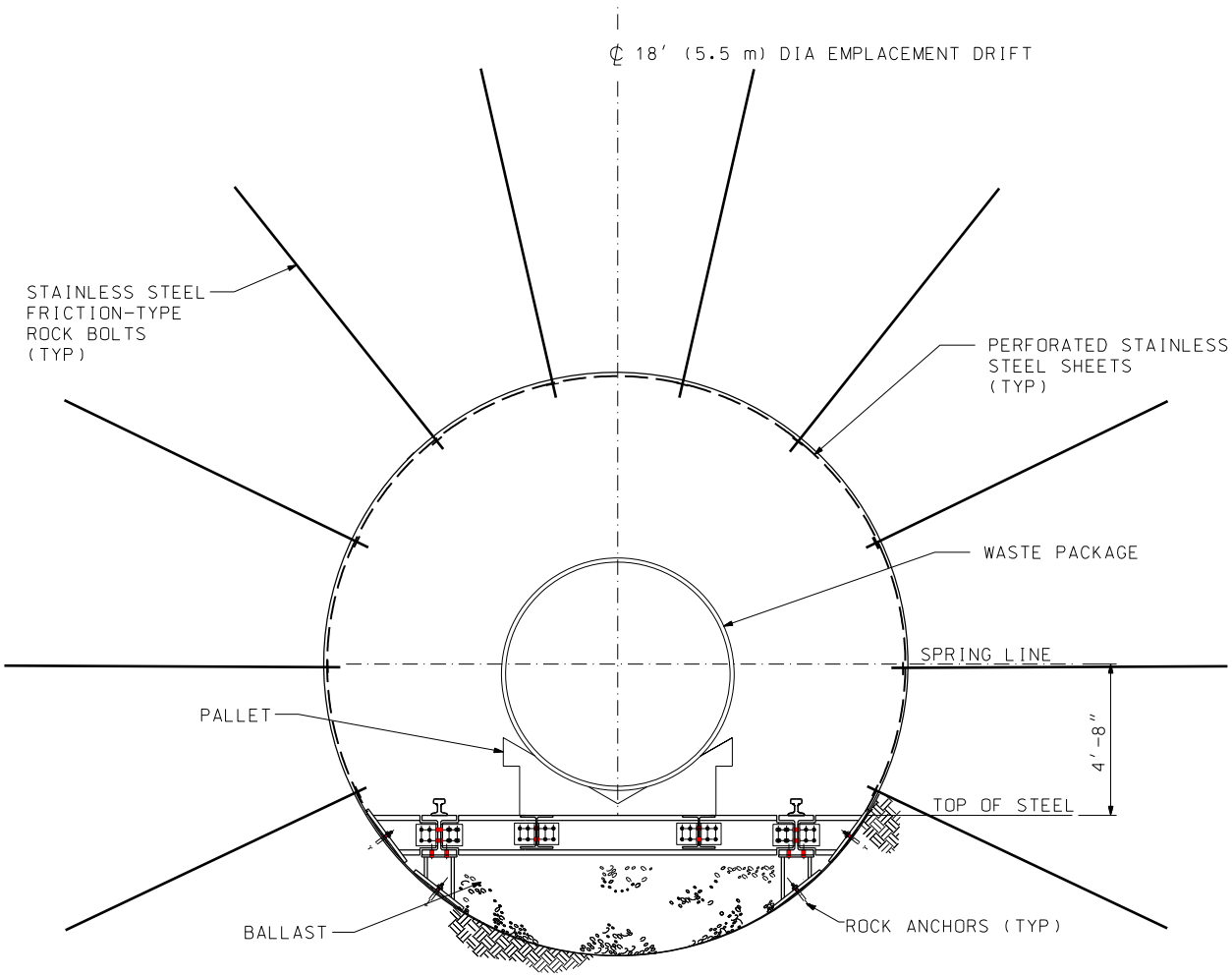


Figure 6.2-1 Emplacement Drift with Waste Package

Source: *Typical Ground Support for Emplacement Drifts* (Ref. 2.2.2)
Repository Subsurface Emplacement Drifts Steel Invert Structure Plan & Elevation (Ref. 2.2.3)
Drift Cross Section Showing Emplaced Waste Package and Drip Shield (Ref. 2.2.6)
Emplacement Pallet Configuration (Ref. 2.2.11)

Note: Some potential design features, such as a third-rail electrical power supply or a microwave communication channel system, are not shown in this figure. These additional design features for the emplacement drift system will be developed during detailed design prior to construction of the emplacement drifts.

6.3 EMPLACEMENT DRIFT WITH DRIP SHIELDS

The final configuration of the emplacement drift includes a drip shield. The drip shield is installed just prior to permanent closure of the repository. After the drip shield is installed, no other operations are expected to occur in the emplacement drift. The final configuration is shown in Figure 6.3-1. The configuration shown with the drip shield in the emplacement drift is a combination of the information in Figure 6.1-1, Figure 6.2-1, and drip shield information from *Drift Cross Section Showing Emplaced Waste Package and Drip Shield* (Ref. 2.2.6).

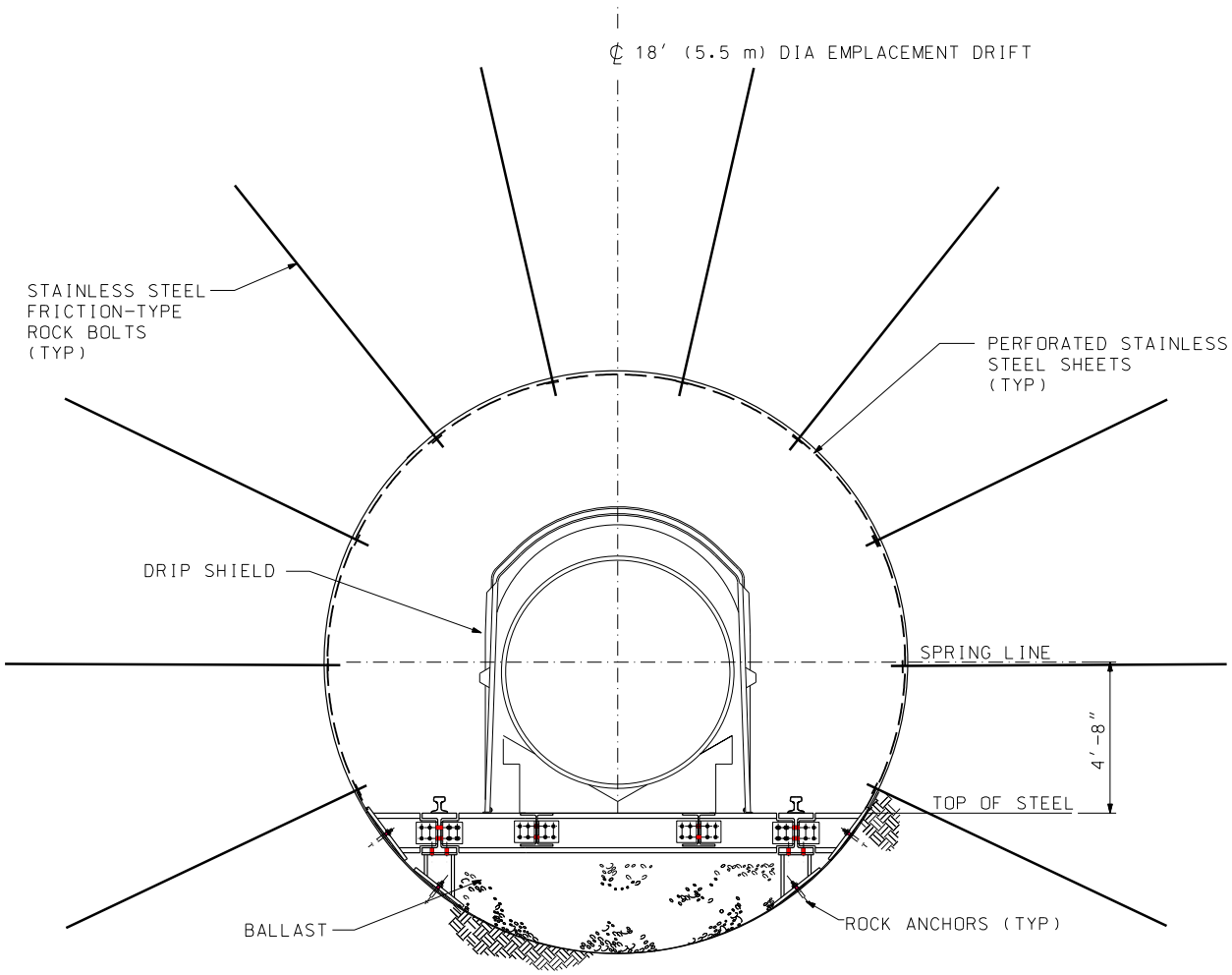


Figure 6.3-1 Emplacement Drift with Drip Shield

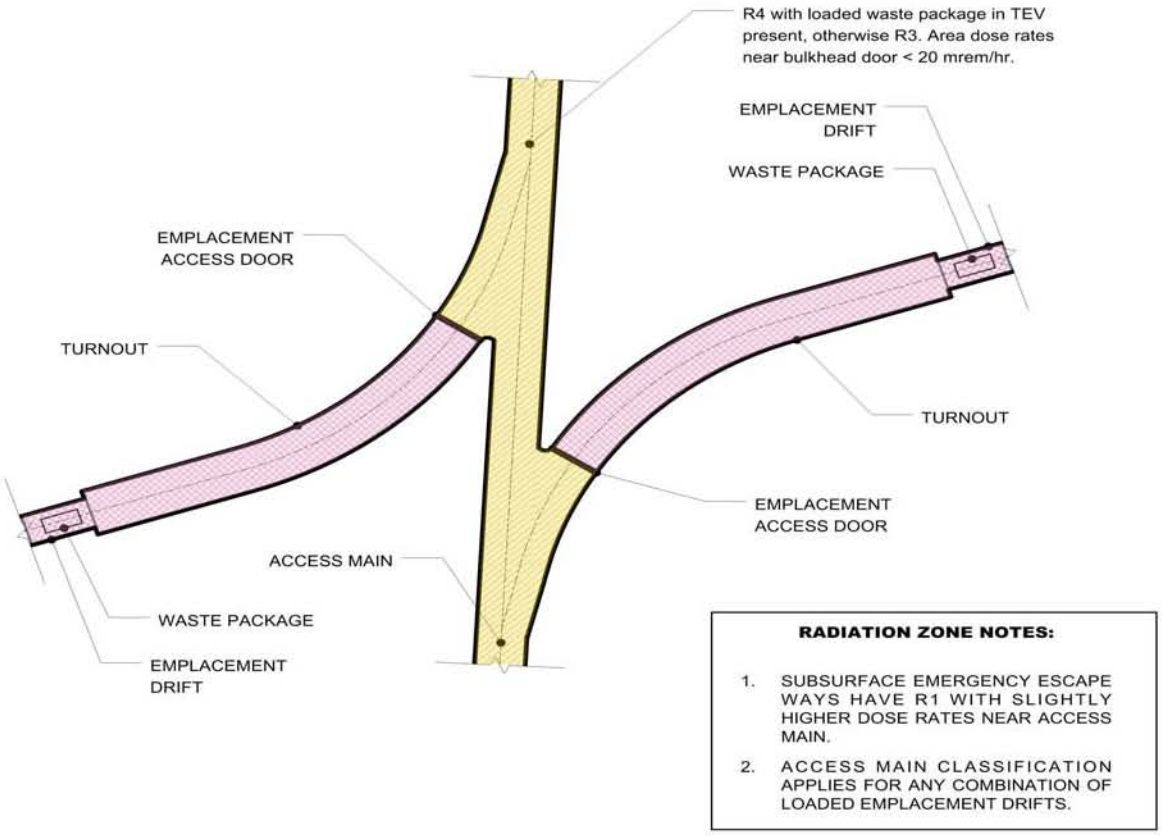
Source: *Typical Ground Support for Emplacement Drifts* (Ref. 2.2.2)
Repository Subsurface Emplacement Drifts Steel Invert Structure Plan & Elevation (Ref. 2.2.3)
Drift Cross Section Showing Emplaced Waste Package and Drip Shield (Ref. 2.2.6)
Emplacement Pallet Configuration (Ref. 2.2.11)

Note: Some potential design features, such as a third-rail electrical power supply or a microwave communication channel system, are not shown in this figure. These additional design features for the emplacement drift system will be developed during detailed design prior to construction of the emplacement drifts.

6.4 RADIOLOGICAL CLASSIFICATION EMPLACEMENT ACCESS AREA

The radiological classification of the access area at the emplacement drifts is shown in Figures 6.4-1 and 6.4-2. These figures are from *Classification of Radiation and Contamination Zones of Geologic Repository Operations Area* (Ref. 2.2.8, pp. 62-63).

The radiation zones in the access areas to the emplacement drifts are shown in Figure 6.4-1. The area near the waste packages, inside the emplacement access door in the turnout, is classified as "limited or no occupancy, access restricted, occupancy not normally allowed."



RADIATION ZONE LEGEND

SYMBOL	DESCRIPTION	(mrem/hr)
R1	Unlimited occupancy possible. Areas including those outside restricted areas.	Background to <0.05
R2	Routine occupancy possible, <2,000 hours/ year possible	0.05 to 2.5
R3	Occasional occupancy possible, <200 hours/ year	>2.5 to 15
R4	Infrequent occupancy, <35 hours/year	>15 to 100
R5	Limited or no occupancy, access restricted, occupancy not normally allowed	>100

Figure 6.4-1 Emplacement Access Area Radiation Zones

Source: *Classification of Radiation and Contamination Zones of Geologic Repository Operations Area* (Ref. 2.2.8, p. 62). The geometry of the drifts shown in this figure has been changed (see Ref. 2.2.4). This figure is only meant to show radiation zones and is best viewed in color.

The potential radiologically contaminated zones in the access areas to the emplacement drifts are shown in Figure 6.4-2. Due to the robustness of the waste package and the waste package handling components, contamination is not expected in the access areas. The external surfaces of the waste packages are required to be decontaminated prior to being moved underground

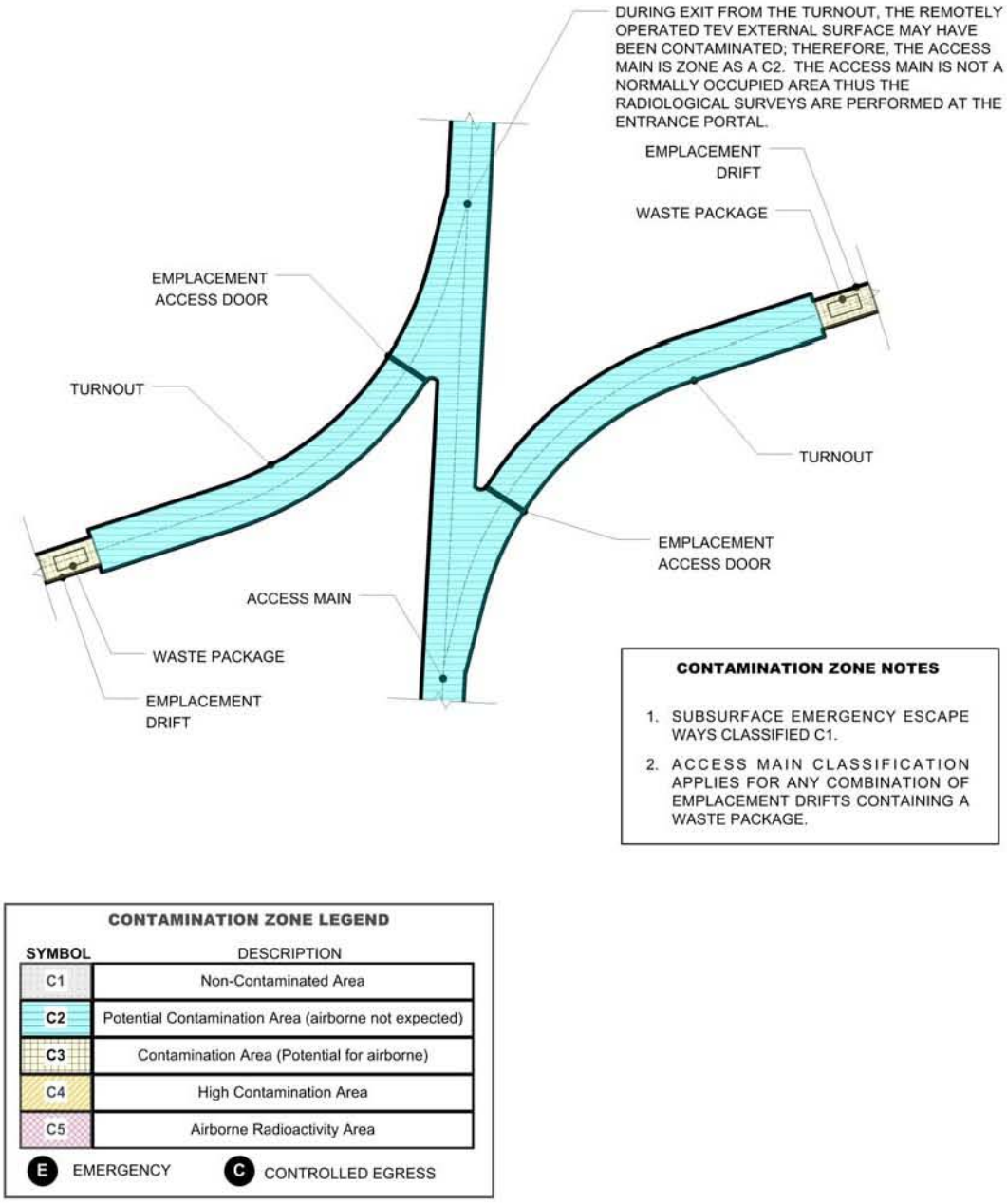


Figure 6.4-2 Emplacement Access Area Contamination Zones

Source: *Classification of Radiation and Contamination Zones of Geologic Repository Operations Area* (Ref. 2.2.8, p. 63). The geometry of the drifts shown in this figure has been changed (see Ref. 2.2.4). This figure is only meant to show contamination zones and is best viewed in color.

6.5 RADIOLOGICAL CLASSIFICATION EMPLACEMENT EXHAUST AREA

The radiological classification of the exhaust main at end of the emplacement drifts is considered to be equivalent to the emplacement drifts (Assumption 3.1.1). The radiation zone and contamination zone classifications for the exhaust areas are shown in Figures 6.5-1 and 6.5-2. The radiation zone and contamination zone classifications may vary at the end of each emplacement panel, between emplacement drifts, or near the ventilation shafts.

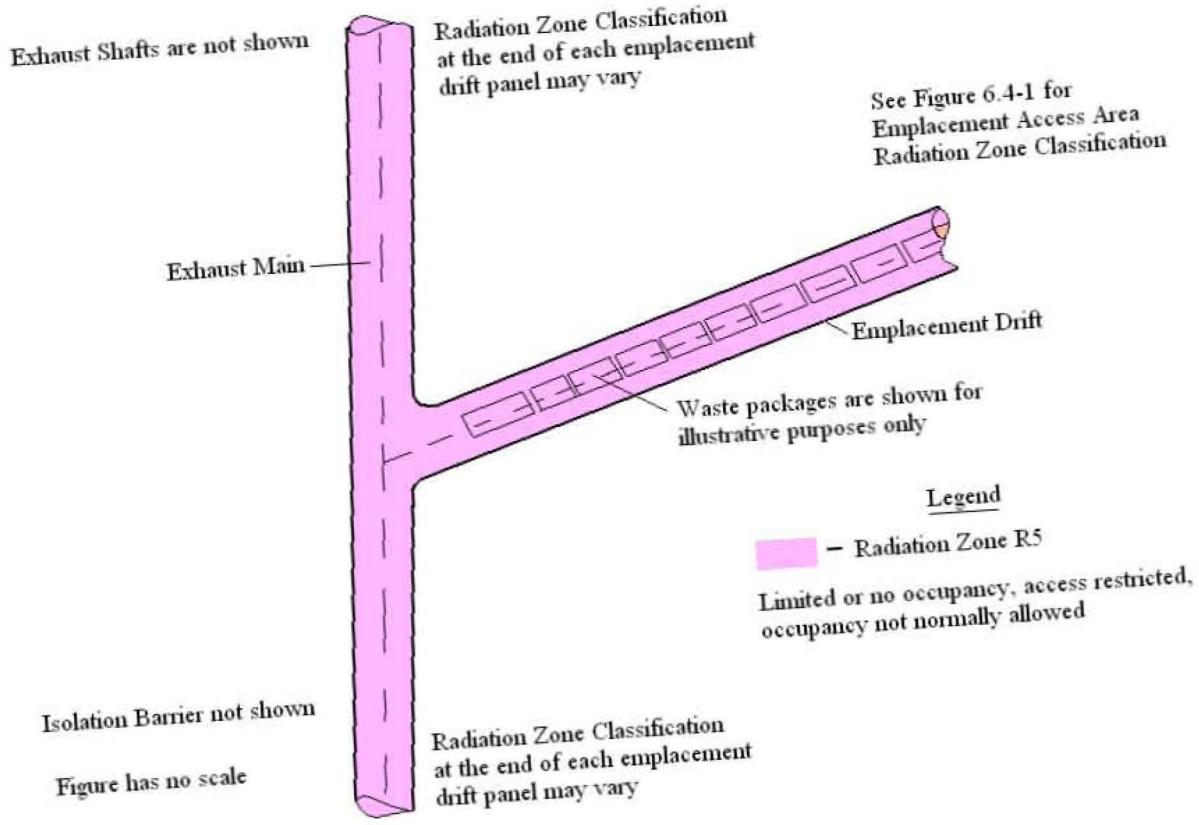


Figure 6.5-1 Emplacement Exhaust Area Radiation Zones

Source: Assumption 3.1.1. The geometry of the drifts shown in this figure varies. This figure is only meant to show radiation zones and is best viewed in color.

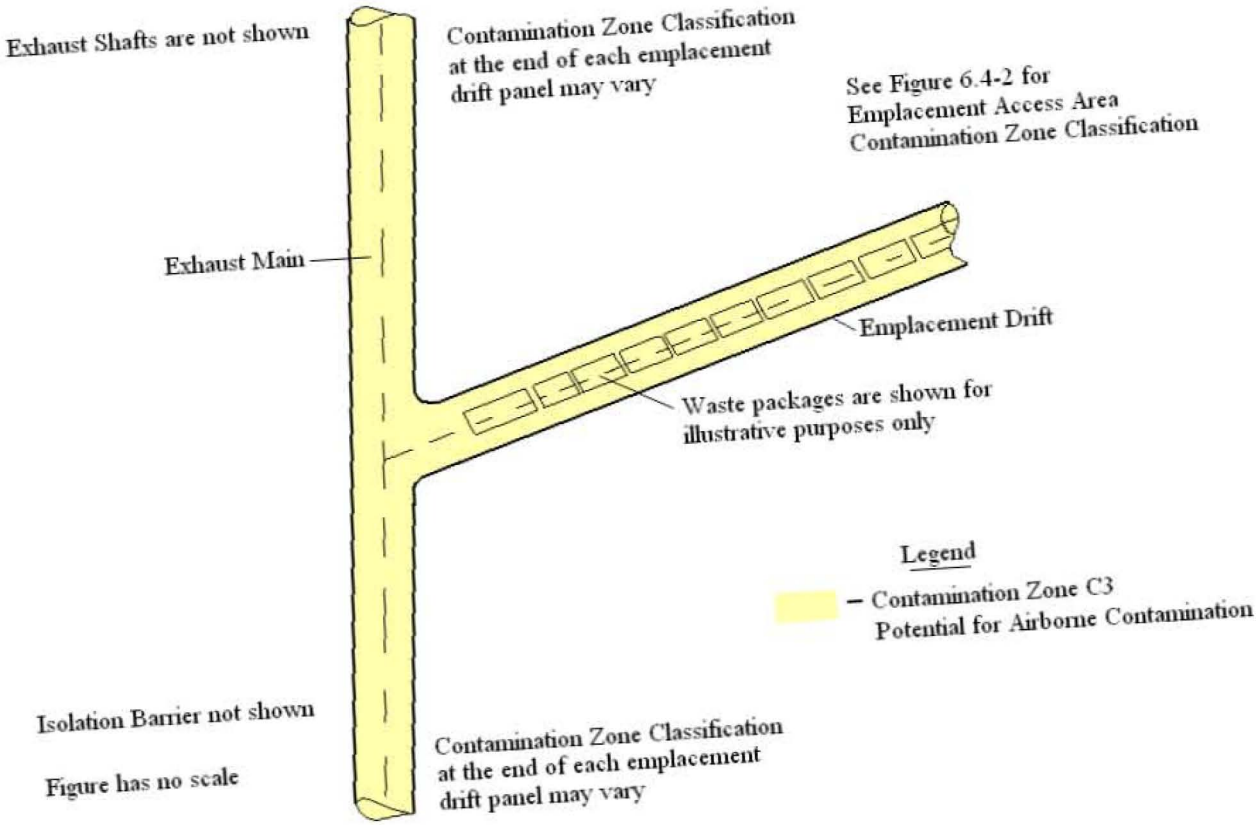


Figure 6.5-2 Emplacement Exhaust Area Contamination Zones

Source: Assumption 3.1.1. The geometry of the drifts shown in this figure varies. This figure is only meant to show contamination zones and is best viewed in color.

7.0 RESULTS AND CONCLUSIONS

The operating configuration of the emplacement drifts has been developed to support the License Application. Requirements are summarized that influence the emplacement drift operations configuration. The figures that represent the results of this analysis are:

- Figure 6.1-1 Emplacement Drift without Waste Package
- Figure 6.2-1 Emplacement Drift with Waste Package
- Figure 6.3-1 Emplacement Drift with Drip Shield
- Figure 6.4-1 Emplacement Access Area Radiation Zones
- Figure 6.4-2 Emplacement Access Area Contamination Zones
- Figure 6.5-1 Emplacement Exhaust Area Radiation Zones
- Figure 6.5-2 Emplacement Exhaust Area Contamination Zones