

FIRST ISSUE – REVISION 0

Closure Plan Ash Disposal Area PGE Boardman Power Plant

Prepared for

Portland General Electric

September 2015



2020 SW 4th Avenue, Suite 300
Portland, Oregon 97201



This document was prepared under direct supervision of Michelle Langdon, PE,
a registered civil engineer in the State of Oregon, in accordance with
40 Code of Federal Regulations 257.102.

Contents

Section	Page
Acronyms and Abbreviations	v
1 Introduction	1-1
1.1 Closure Criteria	1-1
1.2 Site Description	1-1
2 Closure Plan	2-1
2.1 Closure Process Narrative Description	2-1
2.1.1 Final Cover System.....	2-1
2.1.2 Methods and Procedures	2-2
2.2 Estimate of Largest Area of Required Closure.....	2-2
2.3 Coal Combustion Residual Waste Inventory.....	2-2
2.4 Slope Stability	2-2
2.5 Stormwater Management and Control	2-3
2.6 Schedule.....	2-3
Table	
2-1 Preliminary Closure Construction Schedule – Ash Disposal Area.....	2-3
Exhibit	
1-1 PGE Boardman Power Plant Site Map	1-2
Figure (attached)	
1 Conceptual Final Cover Design	

Acronyms and Abbreviations

§	section of the Final CCR Rule
BPP	Boardman Power Plant
CCR	Coal Combustion Residual
cm/sec	centimeter(s) per second
DEQ	Oregon Department of Environmental Quality
Rule	U.S. Environmental Protection Agency Final CCR Rule
yd ³	cubic yard(s)

Introduction

This *Closure Plan* presents the activities that will be conducted and the procedures that will be followed to close the Ash Disposal Area (also known as the Ash Landfill) at the Portland General Electric (PGE) Boardman Power Plant (BPP) in Boardman, Oregon. Closure will occur in accordance with the U.S. Environmental Protection Agency's Final Coal Combustion Residual (CCR) Rule (Rule). The Rule was published in the Federal Register on April 17, 2015 and becomes effective on October 19, 2015. The Rule regulates the disposal of CCR as solid waste under Subtitle D of the Resource Conservation and Recovery Act. The Rule sets forth national minimum criteria for existing and new CCR landfills and surface impoundments, and lateral expansions to landfills and impoundments.

This closure plan becomes effective once it is finalized, sealed by a qualified professional engineer, and placed, by PGE, in the facility's operating record. In accordance with Section 257.105(i) of the Rule, the plan must be placed in the operating record as it becomes available, but not later than October 17, 2016, per 257.102(a). Additionally, within 30 days of placing the plan in the operating record, PGE must post the plan on a publicly accessible Web site and notify the State Director (Oregon Department of Environmental Quality [DEQ]) in accordance with Section (§) 257.106(i) and §257.107(i) of the Rule, respectively.

1.1 Closure Criteria

The Rule includes the following closure criteria for CCR landfill units: (1) requirements for preparing closure plans; (2) requirements for clean closure and closure in place of a CCR unit, including design criteria for final cover systems; (3) timeframes for commencing and completing final closure activities; and (4) closure certification requirements. Specific closure requirements for CCR landfills are listed in §257.101 to §257.103 of the Rule.

1.2 Site Description

PGE owns and operates the Ash Disposal Area at the 617-megawatt BPP. The BPP is located approximately 12 miles south of the Columbia River near the town of Boardman, Oregon. The main plant is located north of the Carty Reservoir and the Ash Disposal Area is located on the south side of the Carty Reservoir (Exhibit 1). The Ash Disposal Area is approximately 43 acres in size and is used for disposal of surplus and off-spec fly ash and bottom ash materials generated by the BPP that are not otherwise beneficially used.

The disposal area is located on gently sloping ground with elevations ranging from approximately 715 feet above mean sea level on the south end to approximately 695 feet on the north end. The natural ground is "hummocky," which is typical of dune sand topography in this area. Dune sands are apparent today on the north end of the disposal area.¹ The Ash Disposal Area is located in Section 33, Township 2 North, Range 24 East, just southwest of the City of Boardman, Oregon.

The Ash Disposal Area operates under the Water Pollution Control Facilities permit (No. 100189) issued by DEQ. Site use is restricted to BPP operations. The landfill is scheduled to continue to receive ash waste until the BPP is retired in 2020.

¹ Shannon & Wilson, Inc. 1979. *Geotechnical Investigation Ash Disposal Area Boardman Plant Unit #1*. September.



Exhibit 1-1. PGE Boardman Power Plant Site Map

Closure Plan

The Ash Disposal Area will be closed by leaving the CCR in place in accordance with the closure performance standards, as specified in §257.102(d). The landfill will be closed in a manner that will achieve the following:

1. *Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated runoff to the ground, surface waters or to the atmosphere*
2. *Preclude the probability of future impoundment of water, sediment, or slurry*
3. *Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during closure and post-closure care period*
4. *Minimize the need for further maintenance of the CCR unit*
5. *Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices*

2.1 Closure Process Narrative Description

2.1.1 Final Cover System

The final cover system for the Ash Disposal Area will be designed and constructed to minimize infiltration and erosion and will have lower permeability than the underlying soil. The thickness of the cover layers and soil characteristics will be determined during final design of the cover. However, they will meet the minimum cover requirements of §257.102(d), consisting of (bottom to top):

- Minimum 18-inch-thick soil infiltration layer of select earthen materials with permeability of no greater than 1×10^{-5} centimeters per second²
- Minimum 6-inch-thick erosion layer of either earthen materials capable of sustaining plant growth or, on the roadways, crushed gravel to resist wind and water erosion.

The conceptual final closure plan is presented in Figure 1. The final cover will be designed to accommodate settling and subsidence in order to maintain cover integrity. A written certification will be provided by a qualified professional engineer certifying that the design meets the requirements of the Rule at the time of final closure design.

PGE retains the option to install an alternative final cover system instead of the prescriptive cover (such as an evapotranspiration cover), provided that the alternative cover is equivalent to the prescriptive cover, in accordance with §257.102(d)(3) (ii).

² The Rule requires that the permeability of the final cover system be less than or equal to the permeability of the bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} centimeters per second (cm/sec), whichever is less. In accordance with the *Geotechnical Investigation Ash Disposal Area Boardman Plant Unit #1* (Shannon & Wilson, September 1979), the construction of the dikes for the Ash Disposal Area was recommended to be stripped of topsoil, leveled, and compacted. There is no specific reference to the preparation of the subgrade within the dike areas for ash disposal. As such, it is assumed that this is natural subsoils of loess and dune sand soils. The assumed permeability of these natural soils is expected to be less than the minimum requirement of 1×10^{-5} cm/sec. Loess soils (silty sand with very little clay) are expected to have a hydraulic conductivity ranging from 1×10^{-3} cm/sec to 1×10^{-4} cm/sec. Therefore, the infiltration layer for the final cover system will have a permeability no greater than 1×10^{-5} cm/sec in accordance with the Rule.

2.1.2 Methods and Procedures

2.1.2.1 Final Grading

The final cover will be graded to drain surface water from the cover, and the top slope will have a grade of not less than 3.5 percent. The proposed final grades will be designed to accommodate surface water drainage from the completed landfill after anticipated settlement and to minimize erosion of the final cover soil.

2.1.2.2 Final Cover System Installation

Final cover installation generally will be completed in the following steps:

1. Preparing the site and contractor mobilization including temporary facilities and controls
2. Installing temporary sediment and erosion control measures
3. Preparing the subgrade (top of waste) in all areas identified for closure to shape slopes and grades and to facilitate construction of subsequent closure activities
4. Placing the infiltration layer soils to meet the minimum requirements
5. Placing the erosion layer and seeding and planting of native vegetative cover including applying fertilizer and implementing weed deterrent control measures (as necessary)
6. Installing permanent drainage control features (for example, ditches, culverts)
7. Completing roadways
8. Final cleanup and contractor demobilization

2.2 Estimate of Largest Area of Required Closure

In accordance with §257.102, the estimated largest area of Ash Disposal Area that would require final cover at any time during the active life of the landfill if the site was closed is approximately 43 acres. Figure 1 shows a site plan with the final closure cover grades and stormwater features. This acreage corresponds to the maximum area of the site planned for waste fill (that is, the entire landfill footprint already in use).

2.3 Coal Combustion Residual Waste Inventory

In accordance with §257.102(b), the total estimate of the maximum CCR waste that would ever be present onsite during the active life of the Ash Landfill is approximated at 838,000 cubic yards (yd³). The current estimate of waste in-place is 538,000 yd³ based on PGE's May 2015 ground survey. The closure grades as shown in Figure 1 (attached) project an additional 300,000 yd³ of airspace available, for a total estimate of 838,000 yd³. A final volumetric waste survey will be conducted as part of the final closure design.

2.4 Slope Stability

The concept design for the Ash Disposal Area final cover system consists of side slopes and a top deck slope of 3.5 percent. These slopes are relatively shallow for these types of cover systems and are expected to be stable. The final design certification for closure of the Ash Disposal Area will ensure that it is closed in a manner that will provide for major slope stability to prevent the sloughing or movement of the final cover system during closure and throughout the post-closure care period, as specified in §257.102(d).

2.5 Stormwater Management and Control

Drainage control at the landfill during closure will be achieved by the proposed final grading plan and stormwater control system as shown in Figure 1. The grades have been designed to drain surface water from the cover to the perimeter stormwater ditch system surrounding the landfill. Stormwater will be conveyed in the ditches to a stormwater retention/evaporation pond or directly into Carty Reservoir located in the western portion of the site. These measures will reduce the probability of future impoundment of water, sediment, or slurry within the Ash Disposal Area.

2.6 Schedule

In accordance with §257.102, closure must commence no later than 30 days after the date that the landfill receives the known final receipt of waste or 2 years after not receiving any waste (although extensions are possible). Closure construction must be completed within 6 months of commencing closure activities as required by the Rule. Extensions for closure may be allowed if it can be demonstrated that closure is not feasible within the required timeframes because of factors beyond the facility's control. If such a demonstration is necessary, a demonstration narrative will be placed into the BPP's operating record.

Closure is anticipated to occur in 2021, following retirement of the BPP. A preliminary closure construction schedule, illustrating the sequencing and anticipated duration of closure activities, is shown in Table 2-1.

Table 2-1 Preliminary Closure Construction Schedule – Ash Disposal Area

Portland General Electric Boardman Power Plant

Task	Task Completion Timeframe^a
Last Known Receipt of Waste	TBD
Preparation of Notification of Intent to Close Landfill ^b	+30 days
Commence Closure: Site Preparation and Mobilization (Set Temporary Controls)	+30 days
Waste Contouring and Subgrade Preparation (Top of Waste)	+15 days
Final Cover Low-Permeability Soil Placement	+30 days
Final Cover Erosion Protection Layer	+15 days
Installation of Permanent Drainage Structures	+15 days
Completion of Roadways	+15 days
Seeding/Planting of Vegetation (as applicable) ^c	+10 days
Closure Certification/Notification and Deed Notation	+30 days ^{d, e}

^a Timeframes are provided in approximated calendar days. Expected Last Known Receipt of Waste is to be determined (TBD) based on the final waste placement in the Ash Disposal Area as part of the Boardman Power Plant retirement schedule and demolition activities. Plant retirement is scheduled for December 31, 2020. Dates shown build on the Last Known Receipt of Waste date, currently TBD. Actual dates and durations for construction will depend on weather, contractor availability, and other such variables.

^b Notification of intent to close is required no later than the date closure is initiated. Notification must include the certification from the qualified professional engineer for the design of the final cover system as required by §257.102(d)(3)(iii). Notification must be placed in the facility's operating record, and within 30 days posted on the publicly accessible Web site and notice sent to the State Director.

^c Seeding and vegetation establishment will be adjusted to align with the growing season. Temporary erosion controls will be used as needed to prevent erosion of the erosion protection layer.

^d Per §257.102(h), within 30 days of completing closure, PGE must complete a certified notice of closure completion by a qualified professional engineer and place it in the facility's operating record. The notification is complete once it has been posted on PGE's publicly accessible Web site. The State Director must be notified within 30 days (§257.106(i) and §257.107(i)) of posting.

^e Notation on the deed of the property in perpetuity to notify any potential purchaser that the property has been used as a CCR unit and its use is restricted under the post-closure care requirements in accordance with §257.104(d)(1)(iii). Notation of deed must be done following completion of closure. Within 30 days of recording the notation on the deed to the property, PGE must prepare a notification stating that the notation has been recorded. The notification is completed when it has been placed in the facility's operating record. Notification to the State Director is required within 30 days of recording the notation on the deed. PGE must also post this on their publicly accessible Web site within 30 days.

Figure

SHEET NOTES

- EXISTING GROUND SURVEY PROVIDED BY PGE, MAY 2015.

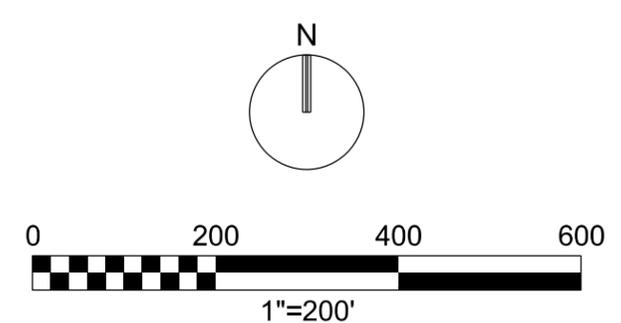
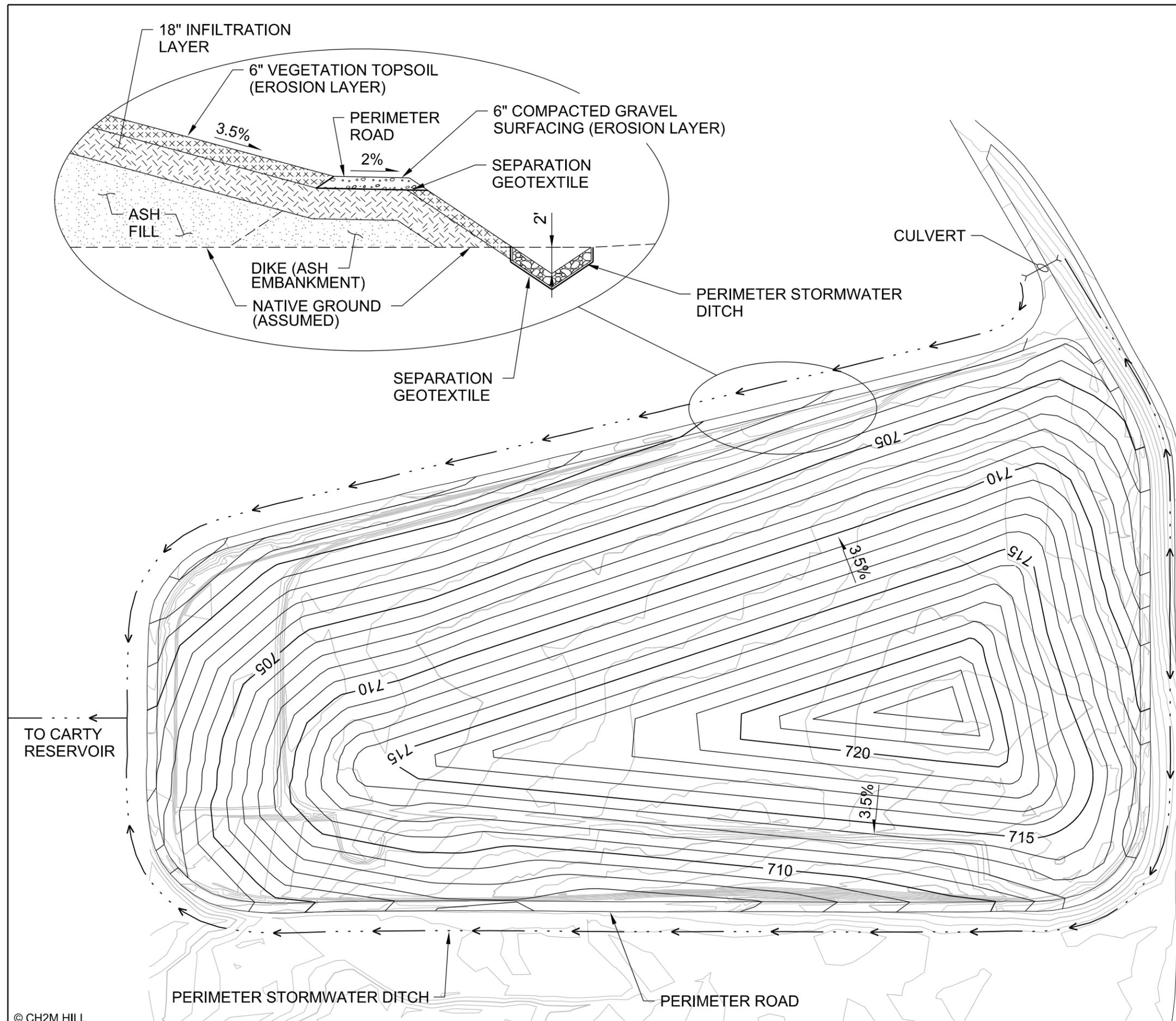


FIGURE 1
CONCEPTUAL
FINAL COVER DESIGN
 PGE BOARDMAN POWER PLANT
 ASH DISPOSAL AREA