

Periodic Safety Factor Assessment Report

Lower AQC Impoundment
La Cygne Generating Station

Evergy Metro, Inc.

October 2021

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1. Introduction

1.1 Purpose

The purpose of this Periodic Safety Factor Assessment Report is to document whether the Lower AQC Impoundment at the Evergy Metro, Inc. (Evergy) La Cygne Generating Station continues to achieve the minimum safety factors specified in 40 CFR §257.73(e)(1) of the Coal Combustion Residuals (CCR) Rule¹. The Lower AQC Impoundment is an existing CCR surface impoundment as defined by 40 CFR §257.53.

1.2 Regulatory Requirements

In accordance with the CCR Rule, this assessment documents whether the calculated safety factors for the Lower AQC Impoundment continue to achieve the minimum safety factors specified in 40 CFR §257.73(e) referenced below for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. An Initial Safety Factor Assessment was completed on October 11, 2016. Periodic safety factor assessments shall be prepared every five years. The date of completing the initial assessment is the basis for establishing the deadline to complete the first subsequent assessment. Therefore, this first Periodic Safety Factor Assessment has been completed by October 11, 2021, five years after the Initial Safety Factor Assessment Report. An owner or operator of a CCR unit who either fails to complete a timely safety factor assessment or fails to demonstrate minimum safety factors as required by paragraph (e) of this section is subject to the closure requirements of §257.101(b)(2).

Regulatory Citation: 40 CFR §257.73(e): 1) The owner or operator must conduct an initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in paragraphs (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.

(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.

(iii) The calculated seismic factor of safety must equal or exceed 1.00.

(iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

1.3 Brief Description of Impoundment

The La Cygne Generating Station is a coal-fired power plant located near La Cygne in Linn County, Kansas. The Station is located approximately 6.25 miles east of the city of La Cygne and is bordered to the west by La Cygnes Lake. The Lower AQC Impoundment is located on plant property. A site Location Map showing the area surrounding the station is in Figure 1 of Appendix A.

1.3.1 Design Operation and Construction

The Lower AQC Impoundment was commissioned in 1973. The Impoundment was constructed with embankments having with an approximate maximum height of 24 feet high and a crest elevation of

864.0 feet². The embankments have 2.5 horizontal to 1.0 vertical side slopes. The impoundment has a water surface area of approximately 56.1 acres at the normal operating elevation of 860.0 feet.

1.4 Assessment Approach

An initial safety factor assessment was performed in 2016 to document that the calculated factors of safety for the Lower AQC Impoundment achieved the minimum factors of safety listed in §257.73(e)(1)(i) through (iv). The assessment included evaluation of multiple cross-sections and performance of stability analyses at the critical (i.e. most susceptible) cross sections, based on appropriate engineering considerations and calculations³. The analyses used subsurface information collected from recent and historic subsurface investigations, including laboratory test data. Engineering properties for the various material strata were selected based on the results of available field and laboratory data. This periodic assessment was performed in 2021 to conform with regulatory requirements for the re-certification of the Lower AQC impoundment. The periodic assessment included the review of initial safety factor assessment data, and analysis of historical and recent topographic data, recent construction activities, and structural or geological changes that could have modified the structural stability of the slopes or the foundations of the impoundment. The following section summarizes the evaluations performed and the results from the analyses.

2. Results and Conclusions

The initial assessment completed in October 2016 met the requirements specified in 40 CFR §257.73(e)(1) and documented that the calculated factors of safety for the Lower AQC Impoundment at the La Cygne Generating Station achieved the minimum safety factors specified in paragraphs (e)(1)(i) through (iv) of 40 CFR §257.73 for the critical cross sections of the embankment.

This recent analysis did not find substantial changes in topography⁽⁴⁻⁶⁾, or in structural or geological features that could have compromised the stability of the impoundment, and therefore, concludes that further factor of safety analyses are not necessary. This periodic assessment documents that the initial methods, calculations, and calculated factors of safety for the Lower AQC Impoundment at the La Cygne Generating Station are still valid and achieve the minimum safety factors specified in paragraphs (e)(1)(i) through (iv) of 40 CFR §257.73 for the critical cross sections of the embankment. The results of the factor of safety assessment are summarized in Table 1 below. The calculations supporting these results are provided in Appendix B.

Table 1. Summary of Periodic Safety Factor Assessment

Loading Conditions	§257.73(e)(1) Subsection	Minimum Factor of Safety	Lowest Calculated Factor of Safety
Long-term, Maximum Storage Pool	(i)	1.50	1.82
Maximum Surcharge Pool	(ii)	1.40	2.21
Seismic	(iii)	1.00	1.54
Soils Susceptible to Liquefaction	(iv)	1.20	n/a ⁺

⁺ The dikes are not constructed of soils that have susceptibility to liquefaction³.

3. Limitations

Background information, design basis, and other data have been furnished to AECOM by Evergy, which AECOM has used in preparing this report. AECOM has relied on this information as furnished and is not responsible for the accuracy of this information. Our recommendations are based on available information from previous and current investigations. These recommendations may be updated as future investigations are performed.

The conclusions presented in this report are intended only for the purpose, site location, and project indicated. The recommendations presented in this report should not be used for other projects or purposes. Conclusions or recommendations made from these data by others are their responsibility. The conclusions and recommendations are based on AECOM's understanding of current plant operations, maintenance, stormwater handling, and ash handling procedures at the station, as observed by AECOM or provided by Evergy. Changes in any of these operations or procedures may invalidate the findings in this report until AECOM has had the opportunity to review the findings and revise the report if necessary.

This development of the periodic Safety Factor Assessment Report was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the engineering profession. The conclusions presented in this report are professional opinions based on the indicated project criteria and data available at the time this report was prepared. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

4. Certification Statement

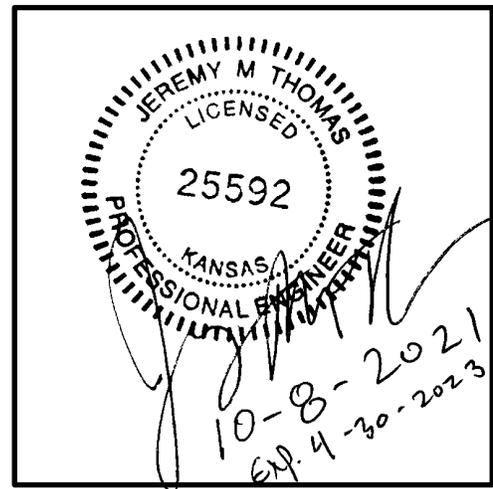
CCR Unit: Evergy La Cygne Generating Station, Lower AQC Impoundment

I, Jeremy Thomas, being a Registered Professional Engineer in good standing in the State of Kansas, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that this Periodic Safety Factor Assessment Report dated October 8, 2021, which includes all pages in Sections 1 and 2, was conducted in accordance with the requirements of 40 CFR § 257.73(e).

Jeremy Thomas
Printed Name

October 8, 2021
Date

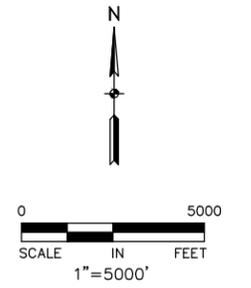
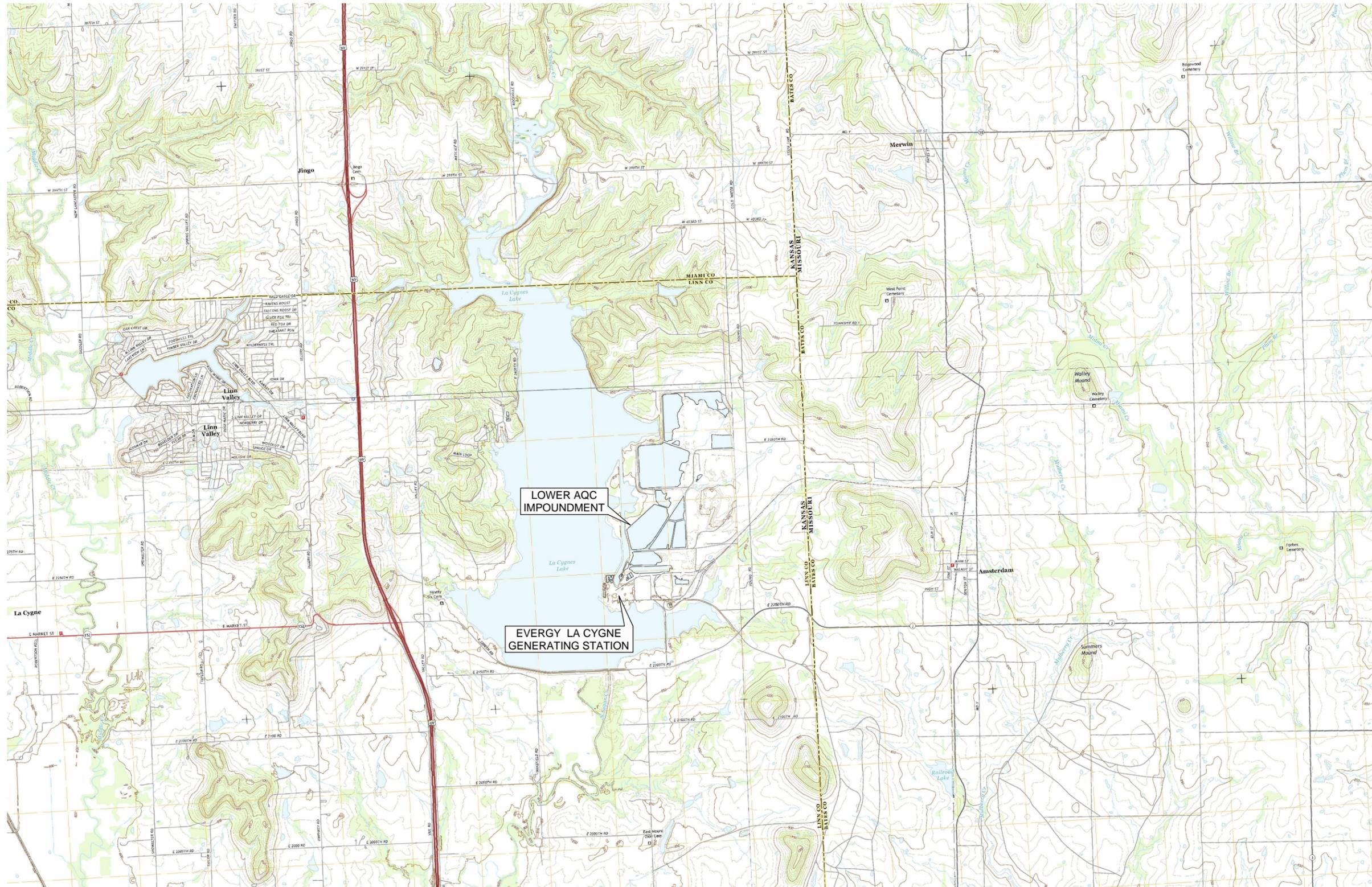
AECOM
2380 McGee Street, Suite 200
Kansas City, Missouri 64108
1-816-561-4443



5. References

1. U.S. Environmental Protection Agency, Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, 40 CFR §257. Federal Register 80, Subpart D, April 17, 2015.
2. AECOM, History of Construction Report, Lower AQC Impoundment, La Cygne Generating Station, Kansas City Power & Light Company, dated October 2016.
3. AECOM, Geotechnical Report, Lower AQC Impoundment, La Cygne Generating Station, Kansas City Power & Light Company, dated October 2016.
4. Burns & McDonnell, CCR Ditch Reroute Issued for Construction Drawings, La Cygne Generating Station, Evergy, dated June 2020.
5. Shafer, Kline and Warren, Bathymetric Survey for the La Cygne Generating Station Lower AQC Impoundment, dated 2014.
6. Western Air Mapping, Topographic Survey Plans for the La Cygne Generating Station, dated 2001.

Appendix A Figures

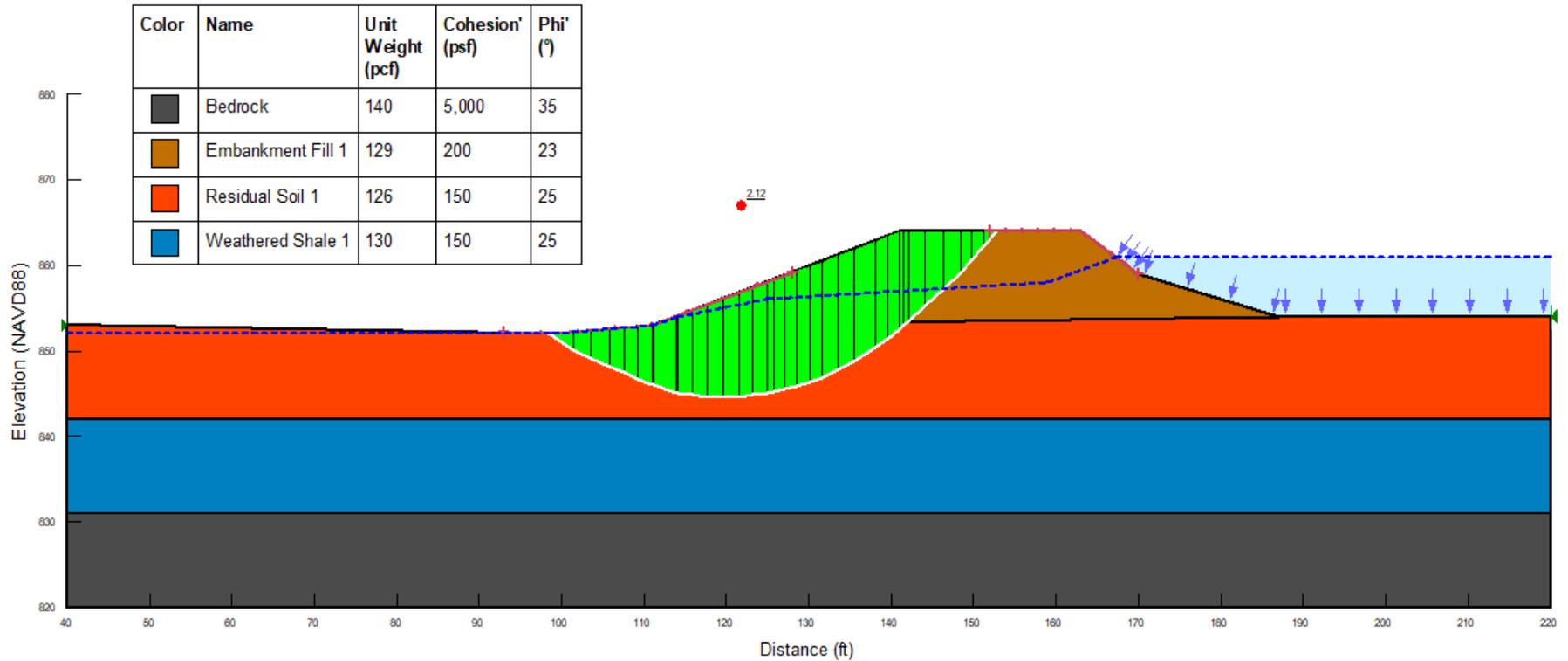


SOURCE: 2015 USGS 7.5 MINUTE QUADRANGLES: NEW LANCASTER-KS, BIOCURT-KS, AMORET-MO, AND DREXEL-MO.

 2380 McGee Street, Suite 200 Kansas City, Missouri 64108	EVERGY METRO, INC. RE-CERTIFICATION REPORT - LOWER AQC IMPOUNDMENT	Project Number 60660588	Date AUG. 2021
	LOCATION AND SITE VICINITY MAP	Checked by JMT	Figure No. 1

Appendix B Supporting Calculations

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: A-A (LOWER AQC IMPOUNDMENT)
ANALYSIS: LONG-TERM, MAX. STORAGE POOL, CIRCULAR FAILURE SURFACE
SEISMIC LOAD: 0 g



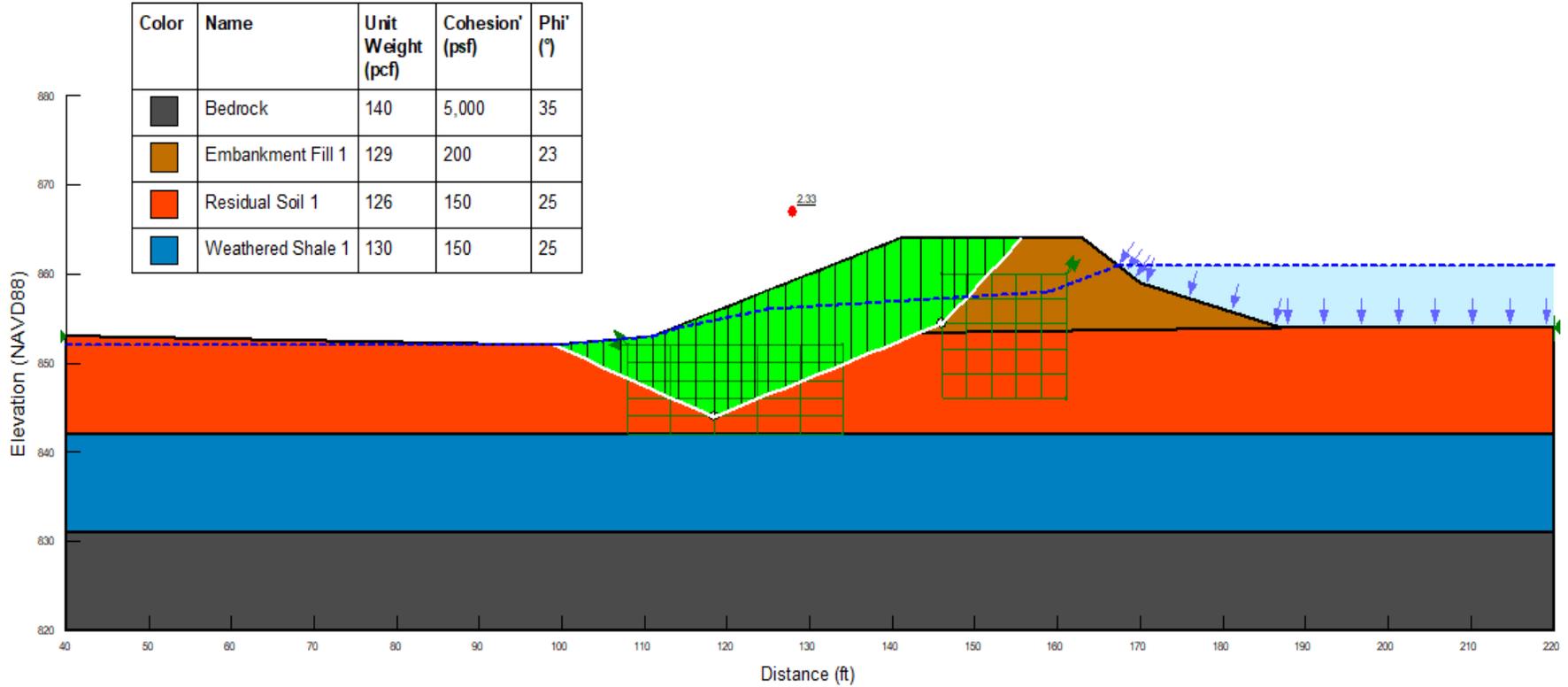
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (LONG-TERM, MAX. STORAGE POOL, CIRCULAR)
CROSS SECTION A-A

Drawn By	JAA/PEF
Date	08/10/2021
Checked By	JMT
Date	08/11/2021

Project No.	60660588
Figure No.	F.1-1

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: A-A (LOWER AQC IMPOUNDMENT)
ANALYSIS: LONG-TERM, MAX. STORAGE POOL, BLOCK FAILURE
SURFACE SEISMIC LOAD: 0 g



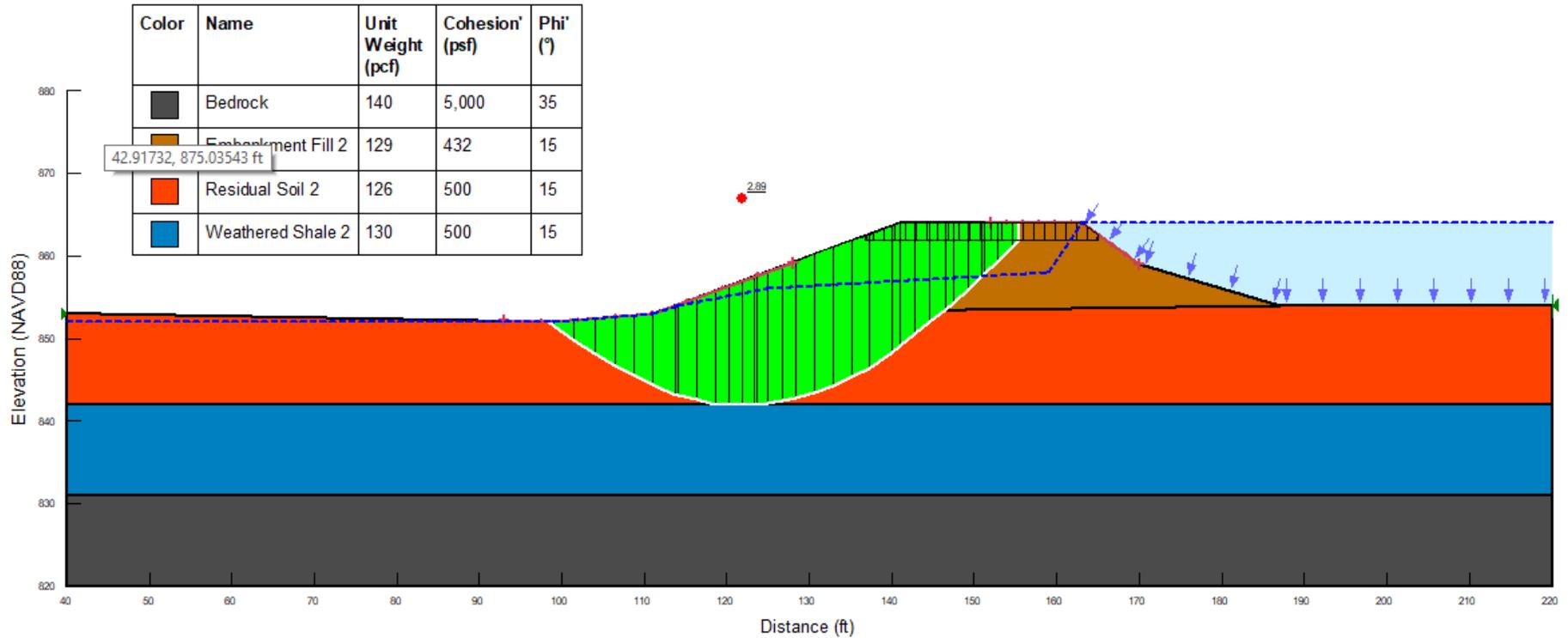
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (LONG-TERM, MAX. STORAGE POOL, BLOCK)
CROSS SECTION A-A

Drawn By	JAA/PEF
Date	08/10/2021
Checked By	JMT
Date	08/11/2021

Project No.	60660588
Figure No.	F.1-2

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: A-A (LOWER AQC IMPOUNDMENT)
ANALYSIS: MAXIMUM SURCHARGE POOL, CIRCULAR FAILURE SURFACE
SEISMIC LOAD: 0 g



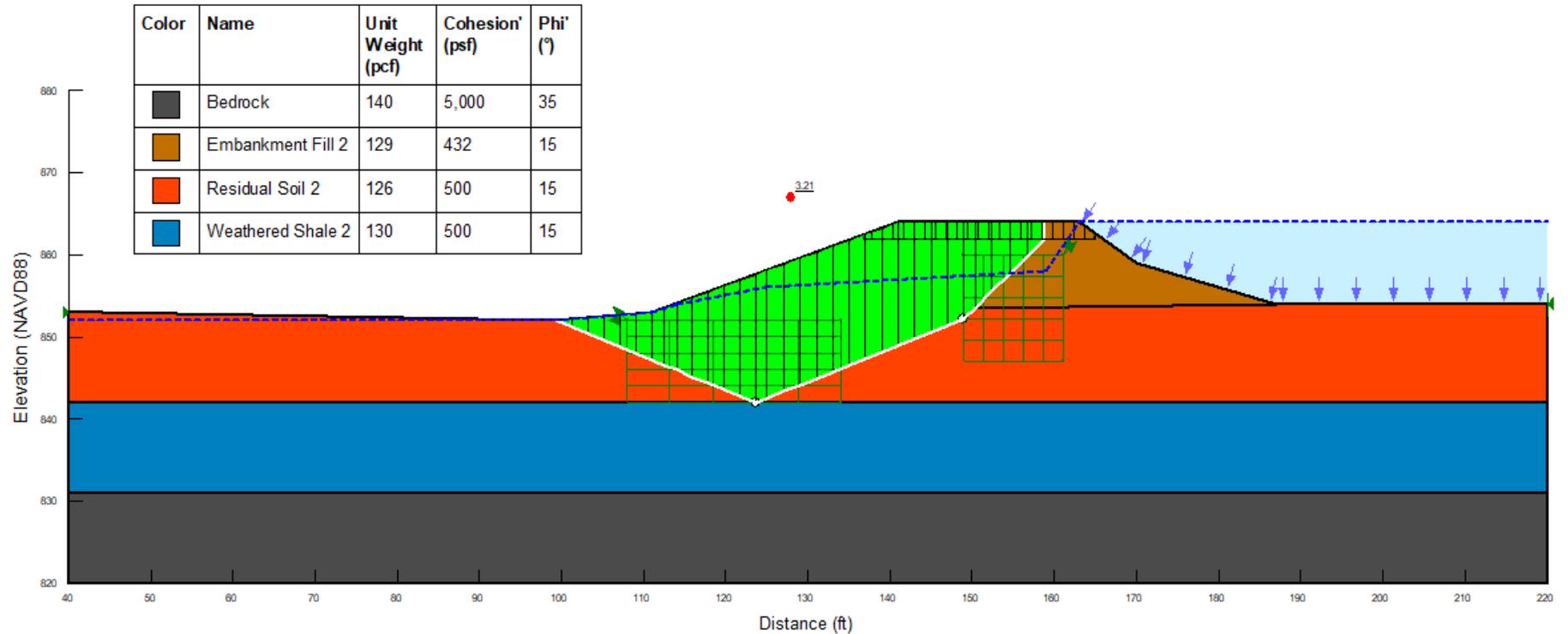
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (MAX. STORAGE POOL, CIRCULAR)
CROSS SECTION A-A

Drawn By	JAA/PEF
Date	08/10/2021
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Date	08/11/2021

Project No.	60660588
Figure No.	F.1-3

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: A-A (LOWER AQC IMPOUNDMENT)
ANALYSIS: MAXIMUM SURCHARGE POOL, BLOCK FAILURE SURFACE
SEISMIC LOAD: 0 g



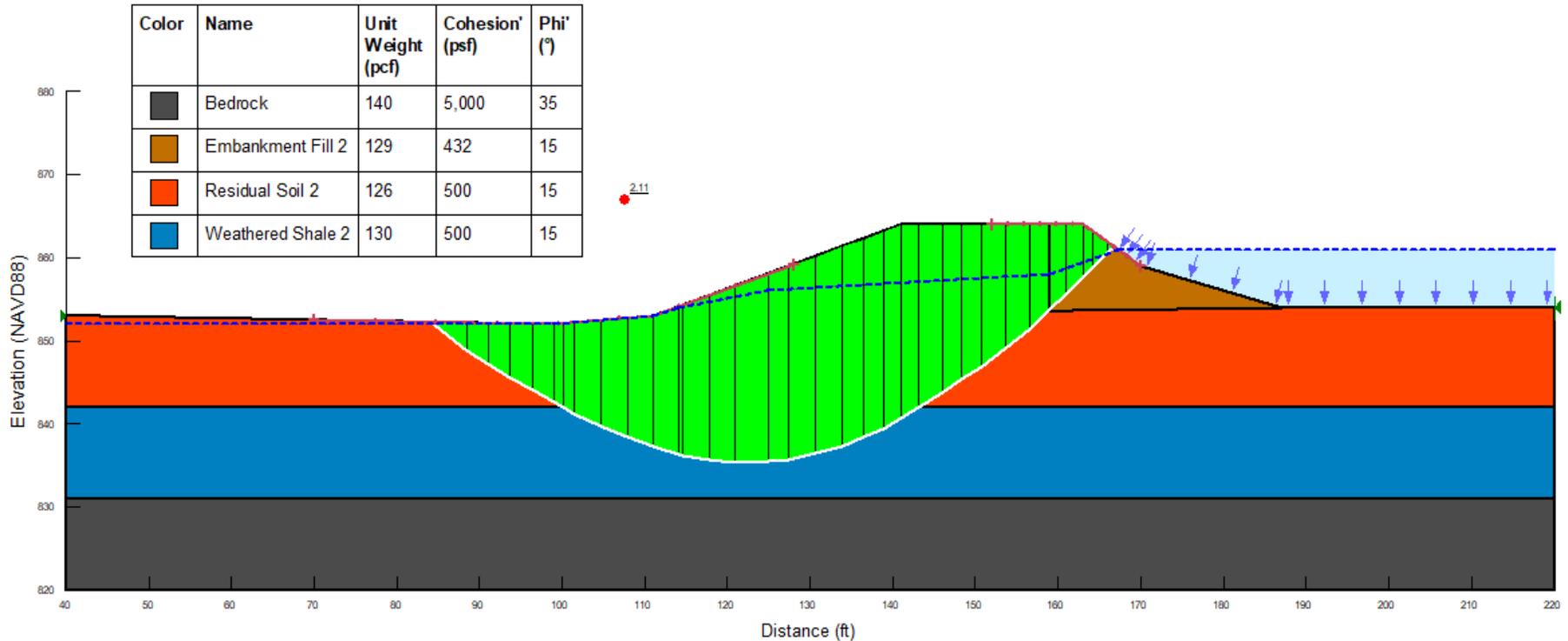
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (MAX. STORAGE POOL, BLOCK)
CROSS SECTION A-A

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Date	08/11/2021

Project No.	60660588
Figure No.	F.1-4

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: A-A (LOWER AQC IMPOUNDMENT)
ANALYSIS: SEISMIC, CIRUCLAR FAILURE SURFACE
SEISMIC LOAD: 0.092 g



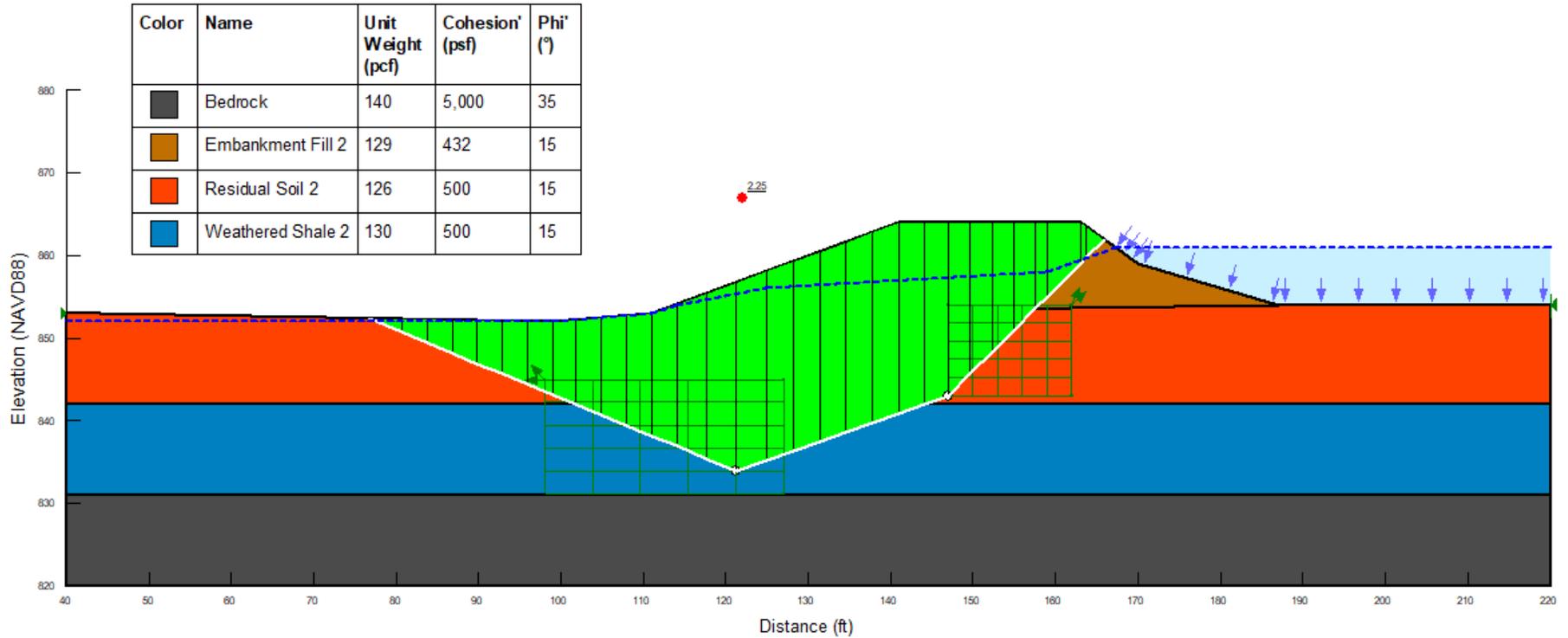
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (SEISMIC, CIRCULAR)
CROSS SECTION A-A

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Date	08/11/2021

Project No.	60660588
Figure No.	F.1-5

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: A-A (LOWER AQC IMPOUNDMENT)
ANALYSIS: SEISMIC, BLOCK FAILURE SURFACE
SEISMIC LOAD: 0.092 g



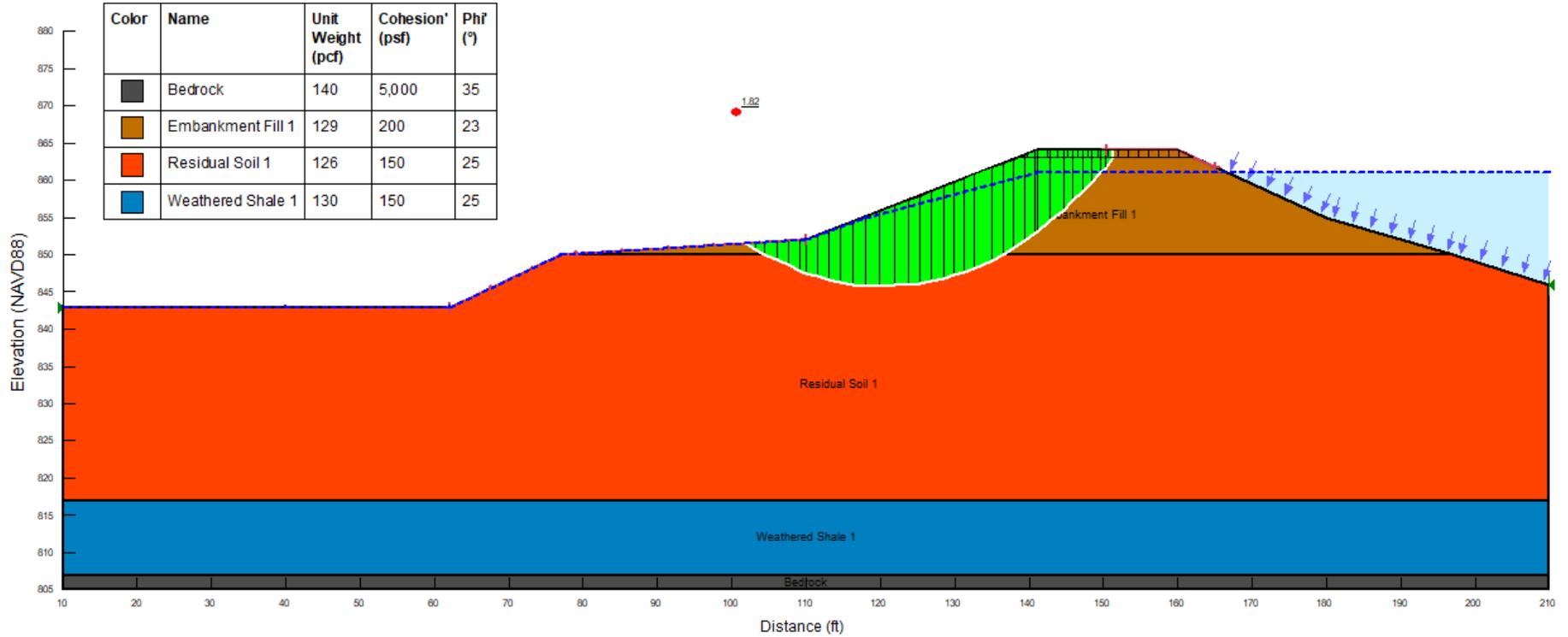
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (SEISMIC, BLOCK)
CROSS SECTION A-A

Drawn By	JAA/PEF
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Date	08/11/2021

Project No.	60660588
Figure No.	F.1-6

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: B-B (LOWER AQC IMPOUNDMENT)
ANALYSIS: LONG-TERM, MAX. STORAGE POOL, CIRCULAR FAILURE SURFACE
SEISMIC LOAD: 0 g



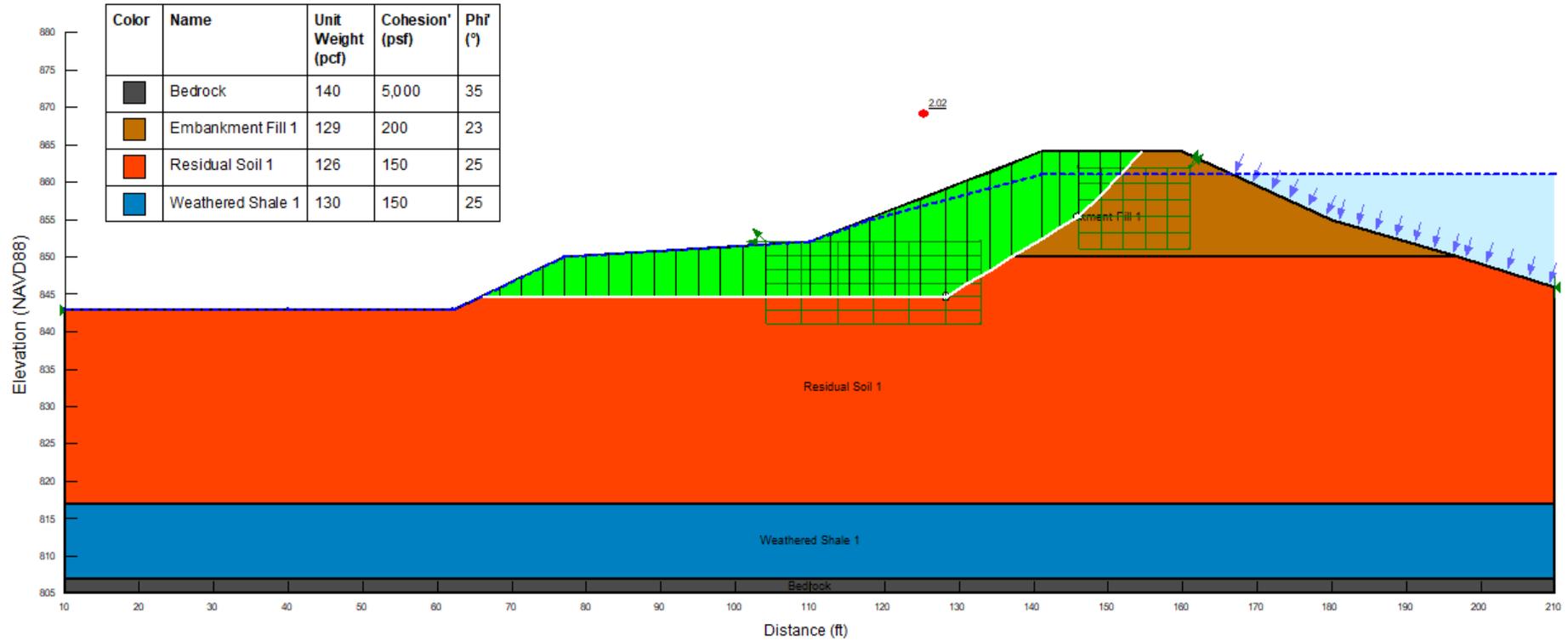
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (LONG-TERM, MAX. STORAGE POOL, CIRCULAR)
CROSS SECTION B-B

Drawn By	JAA/PEF
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Checked By	JMT
Date	08/11/2021

Project No.	60660588
Figure No.	F.1-7

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: B-B (LOWER AQC IMPOUNDMENT)
ANALYSIS: LONG-TERM, MAX. STORAGE POOL, BLOCK FAILURE SURFACE
SEISMIC LOAD: 0 g



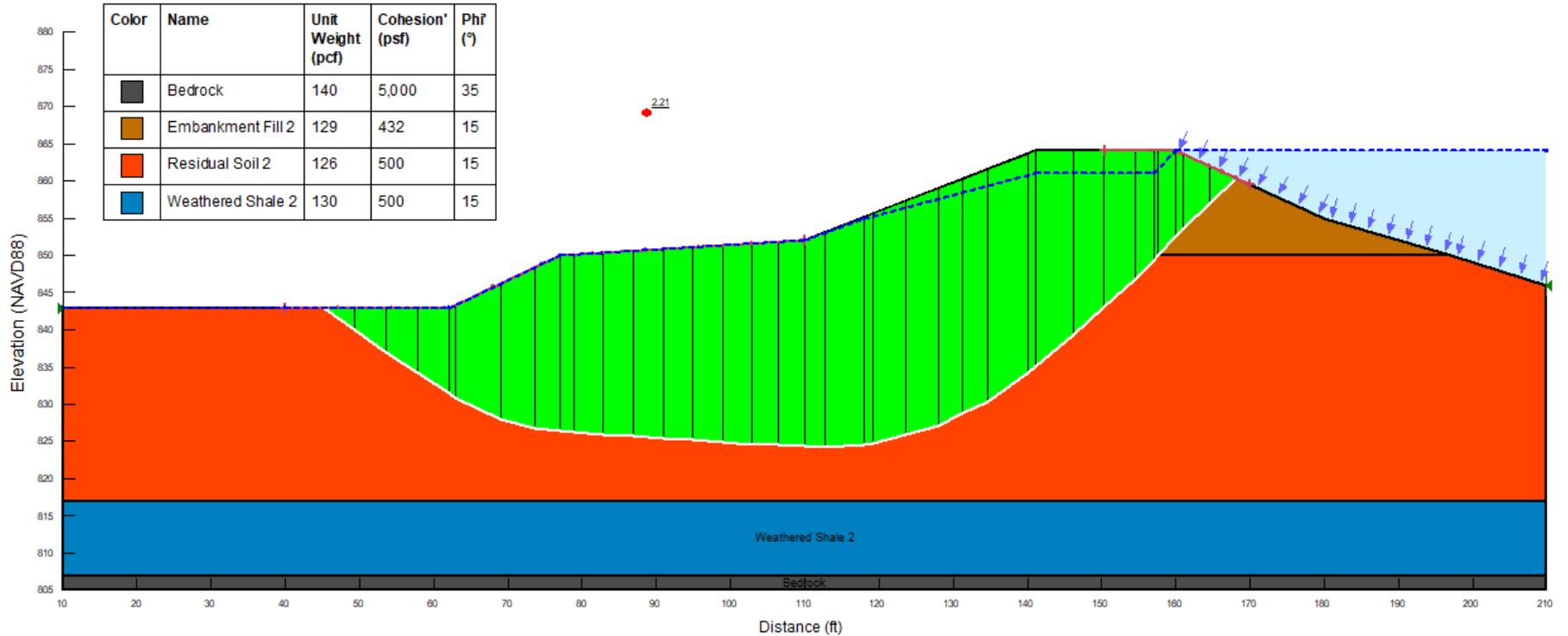
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (LONG-TERM, MAX. STORAGE POOL, BLOCK)
CROSS SECTION B-B

Drawn By	JAA/PEF
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Date	08/11/2021

Project No.	60660588
Figure No.	F.1-8

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: B-B (LOWER AQC IMPOUNDMENT)
ANALYSIS: MAXIMUM SURCHARGE POOL, CIRCULAR FAILURE SURFACE
SEISMIC LOAD: 0 g



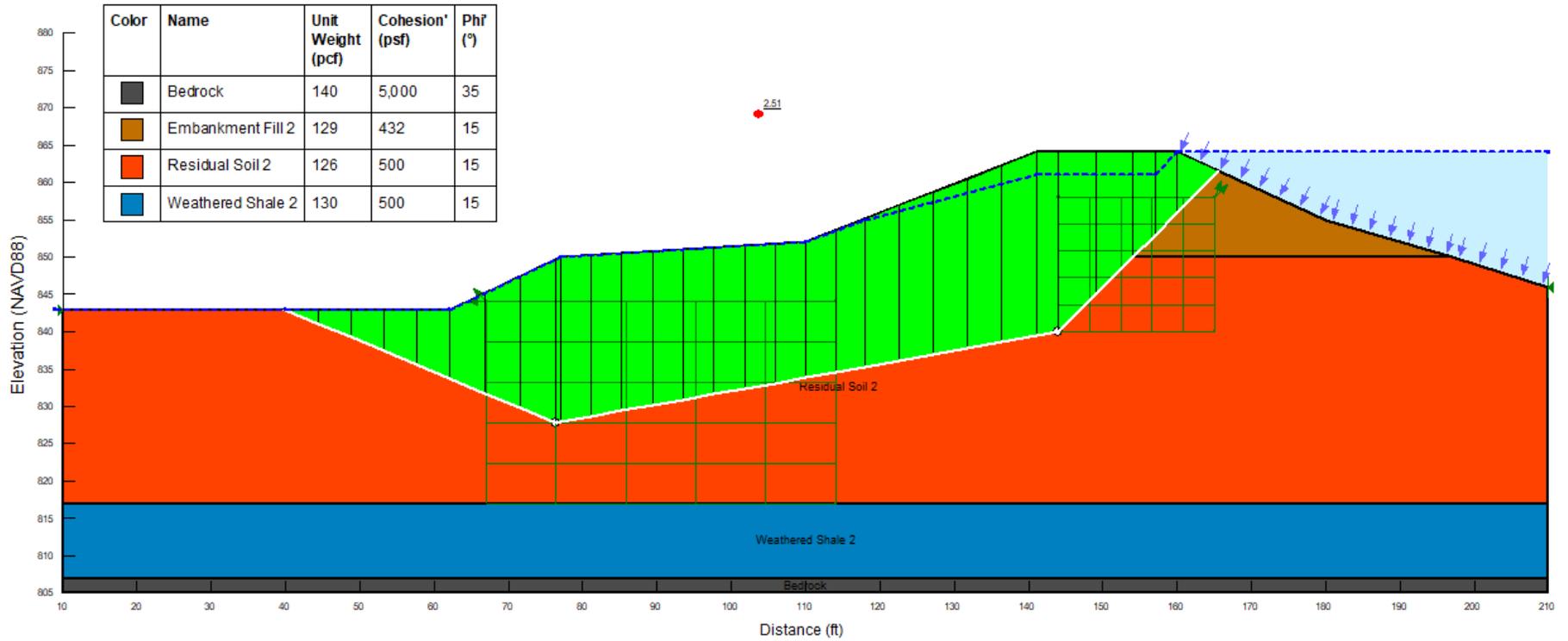
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (MAXIMUM SURCHARGE POOL, CIRCULAR)
CROSS SECTION B-B

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Date	08/11/2021

Project No.	60660588
Figure No.	F.1-9

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: B-B (LOWER AQC IMPOUNDMENT)
ANALYSIS: MAXIMUM SURCHARGE POOL, BLOCK FAILURE SURFACE
SEISMIC LOAD: 0 g



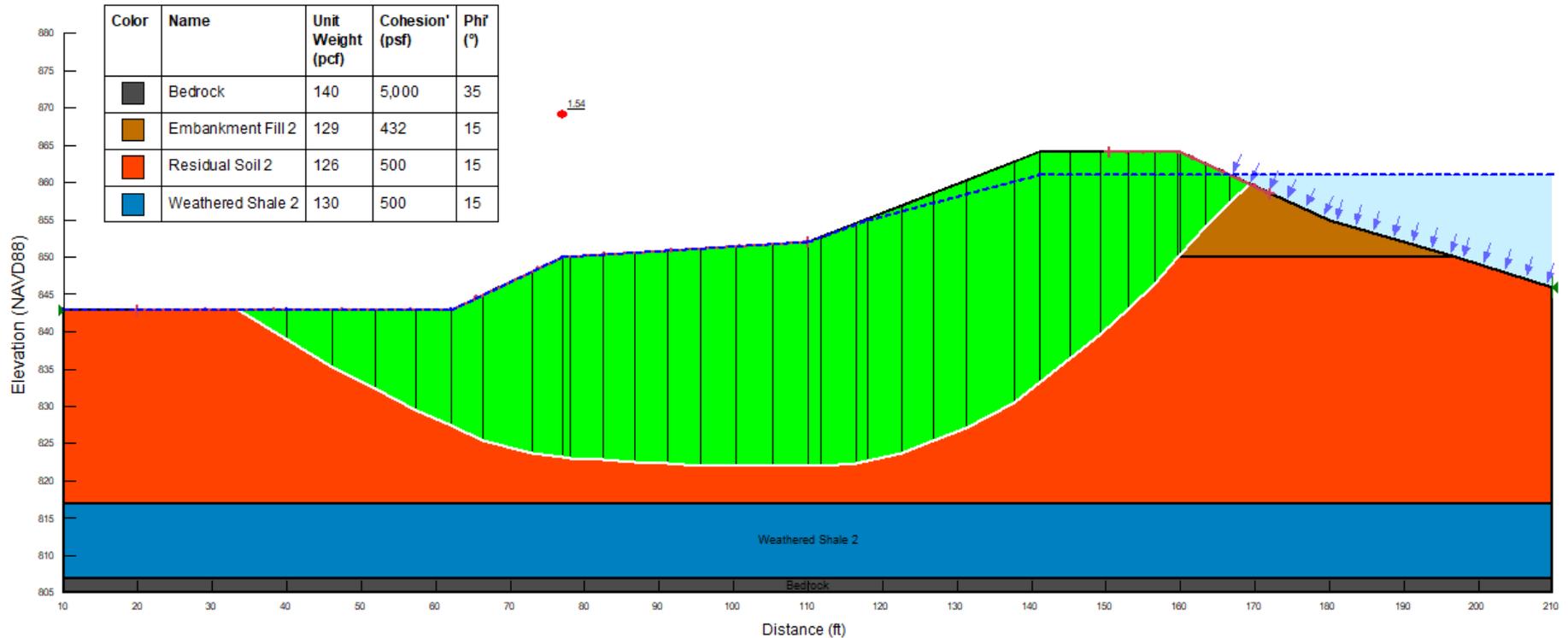
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EVERGY - LA CYGNE LOWER AQC IMPOUNDMENT
LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (MAXIMUM SURCHARGE POOL, BLOCK)
CROSS SECTION B-B

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Date	08/11/2021

Project No.	60660588
Figure No.	F.1-10

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: B-B (LOWER AQC IMPOUNDMENT)
ANALYSIS: SEISMIC, CIRUCLAR FAILURE SURFACE
SEISMIC LOAD: 0.092 g



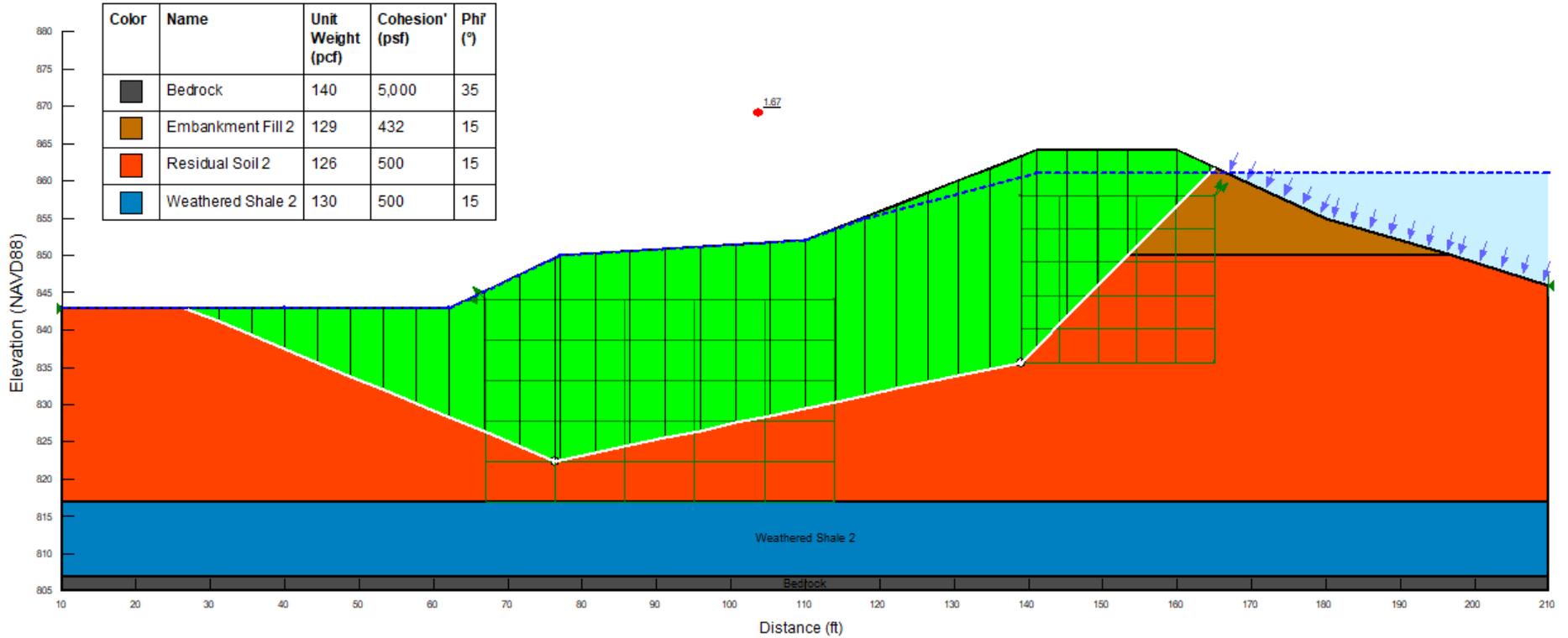
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LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (SEISMIC, CIRCULAR)
CROSS SECTION B-B

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Project No.	60660588
Figure No.	F.1-11

PROJECT: EVERGY - LA CYGNE GENERATING STATION
PROJECT LOCATION: LA CYGNE, KS
AECOM PROJECT NO.: 60660588
CROSS SECTION: B-B (LOWER AQC IMPOUNDMENT)
ANALYSIS: SEISMIC, BLOCK FAILURE SURFACE
SEISMIC LOAD: 0.092 g



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LA CYGNE, KS
GRAPHICAL OUTPUT FROM SLOPE/W ANALYSIS (SEISMIC, BLOCK)
CROSS SECTION B-B

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Date	08/11/2021

Project No.	60660588
Figure No.	F.1-12

