**C**olorado **W**ater **P**rotective and **D**evelopment **A**ssociation

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

November 30, 2021

Mr. Patrick Lennberg

Environmental Protection Specialist

Colorado Division of Reclamation, Mining, and Safety

1313 Sherman Street, Rm. 215

Denver, CO 80203

RE: **Existing Slope Stability Conditions at Transit Mix of Pueblo – Pueblo West (Permit No. M-1977-573)**

Dear Mr. Lennberg,

This letter is written on behalf of Colorado Water Protective and Development Association (CWPDA) and seeks to provide assurance of stability of existing site conditions at the Pueblo West gravel pit formerly owned by Transit Mix of Pueblo (TMOP), along with the commensurate safety of any adjacent structures that could be negatively impacted by unstable site conditions.

The Division of Reclamation, Mining, and Safety (DRMS) has requested that CWPDA verify, as part of the Succession of Operator (SO) process currently underway by CWPDA as part of its assumption of the 112 Regular Operation Permit from the TMOP Pueblo West gravel pit, the stability of all existing slopes around the exposed excavations at the site, as well as whether adjacent structures are at risk due to cut slopes remaining on-site from mining operations.

CWPDA has reviewed the existing conditions on-site, including pit slopes, existing structures near the pit and setbacks from the pit to those structures, and construction data of the embankment at the pit. This letter will summarize CWPDA's findings from these sources and will seek to

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

demonstrate to DRMS the stability of the current slopes at the pit and the safety of the pit to adjacent structures.

## Background Information

The West Pueblo pit is a large open excavation located near the city of Pueblo, Colorado, in the NW 1/4, the SW 1/4, and the SW 1/4, in Section 32, Township 20 South, Range 65 West, 6th P.M., Pueblo County. The ground the pit is located on was historically used as farmland. As late as the 1980's, the land was a vacant field. By the late 1990's, mining operations were underway, and aggregates for building materials were being excavated at the site. Mining appears to largely have ceased by about 2004 and reclamation efforts had been started, starting with construction of a compacted clay embankment from 1998 through 2000 to separate water stored in the pit from the local groundwater table, enabling the pit to be used for offline water storage. Revegetation efforts are still underway.

CWPDA purchased the site in 2021 and is planning on finishing the conversion of the site into a water storage vessel. Design and construction of inlet and outlet conveyance structures are planned for 2022 and 2023, and CWPDA is expecting to complete site revegetation during that period as well.

As part of its purchase of the site, CWPDA is obligated to submit documents to DRMS so that it can be designated as the permit holder and operator of the site, at which time it will assume responsibilities for the site's reclamation as well as for the surety for the site. One of these documents is an engineering evaluation, performed by a professional engineer licensed in the State of Colorado, that attests to the status of all existing excavations at a site, the stability of those excavations, and the danger posed or not to adjacent structures by a sudden failure of an excavation slope. These details of the Pueblo West pit are presented below and in Appendices A, B, C, and D.

## Existing Site Conditions

The Pueblo West pit occupies an area of about 91.2 surface acres (Ac) at maximum water storage elevation and is situated on the north bank of the Arkansas River, just west of the city of Pueblo, Colorado. Permit data available for the pit states that the affected acreage of the site is 122.08 Ac. The

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

pit at its greatest depth is approximately 21 feet deep and has largely been excavated down to the shale bedrock underlying the site.

The perimeter of the pit is approximately 8,225 linear feet (LF) in length. The pit has graded slopes around the entirety of its perimeter that were constructed during the lining of the pit, in anticipation of using the vessel as a storage reservoir. This aspect of the site will be discussed in further detail in the section below.

There are four permanent structures near the site. The first is a reinforced concrete bridge that allows vehicles to cross the river onto the property; this bridge was obtained by CWPDA as part of its land purchase. The second permanent structure is a fence that bounds the site along its northern perimeter. This fence is co-owned by Colorado Parks and Wildlife. The third structure is a concrete slab-on-grade trail owned by CPW. The final structure is an overhead electrical utility pole near the southwest corner of the pit owned by Black Hills Energy. This pole will be included in future improvements at the site, as CWPDA, now known as Arkansas Groundwater and Reservoir Association (AGRA), goes forward with the design of a pumping station to deliver water from the reservoir to the Arkansas River. This pumping station will require electrical power and it is anticipated that this pole will be used to provide electrical service to the pumping station.

A site map which provides an overview of the pit and surrounding areas is given in Appendix A. A map of adjacent structures and associated setbacks is given in Appendix D.

## Slope Stability

As already mentioned, the Pueblo West pit has constructed slopes around the entire length of its perimeter. These slopes were constructed in the late 1990's and 2000's as part of a plan to convert the site to water storage.

The construction of the interior slopes of the vessel was completed in two phases. The first phase was undertaken beginning in 1998 by Haley and Aldrich, who performed the design of the berm around the northern end of the pit. The original berm design was for a compacted clay berm to be keyed into the bedrock to a depth of 5-feet. Clay availability on-site became an issue during construction and the

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

design required modification twice to accommodate shortages in clay soil. Construction of this berm was completed in 2000, and a final design report (Appendix B) was submitted to TMOP in 2002.

This berm was originally meant to tie into a slurry wall, which was proposed to go around the rest of the perimeter of the pit; however, after construction of the original compacted berm, TMOP proceeded with construction of a similar structure around the rest of the vessel. As noted in a September 8, 2021, email from Steven Kuehr, PE, who was the senior geotechnical engineer overseeing the design and construction of the original berm, this TMOP-built berm was so well constructed that Mr. Kuehr recommended that TMOP proceed with performing the permeability test required by the State Engineers' Office (SEO) for prospective gravel pit reservoirs, before initiating construction of the slurry wall. This second berm passed its permeability test, and the slurry wall was never constructed. The email from Mr. Kuehr is given in Appendix B.

An analysis of the existing condition of the vessel interior slopes was performed by CWPDA for this evaluation. The slope at 46 locations was examined around the perimeter of the vessel, and some basic descriptive statistics were computed to describe the status of the slopes. A slope analysis plan and the data from this analysis are given in Appendix C. A summary of the results from this analysis are below in Table 1.

*Table 1. A Summary of Slope Analysis Data for the Pueblo West Gravel Pit.*

| Number of Sample Locations | Design Slope | Maximum Slope | Minimum Slope | Average Slope |
|---|---|---|---|---|
| 46 | 3:1 | 8:1 | 3:1 | 6:1 |

As observed in Table 1, the design slope given by Haley and Aldrich for the original berm design (and two subsequent design modifications) was 3:1. In engineering practice, a 3:1 slope is commonly understood to be the minimum "stable slope" for compacted earth fills. The analysis by CWPDA shows that all sampled locations around the vessel conform at a minimum to this design parameter. At a few locations, the pit slope exceeds this minimum by more than a factor of 2 and is observed at a rate of 8:1

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

in some locations. The average slope for all sampled locations is 6:1, a factor of 2 greater than the required minimum design slope. This result demonstrates that at no location around the vessel does the constructed, as-built slope deviate negatively from the required design minimum slope. This indicates that the as-built, existing condition of the Pueblo West pit is stable.

As mentioned earlier in this memorandum, there are three structures located near the pit owned by other parties. Two of the three structures are located on the northern side of the pit, while the overhead electrical pole is on the southwest side of the pit.

An inspection by CWPDA staff using Google Earth imagery and AutoCAD was performed to investigate the distance between the edge of the pit and these structures; in several locations, these structures come into close proximity to the crest of the berm around the vessel. As part of the SO process, permanent structures owned by other parties that are within 200 feet of gravel pit mines must be included in evaluations such as this to determine the risk to those structures. Distances of less than 100 feet can be seen. In the case of the fence, nowhere is the fence more than 200 feet from the pit crest. The trail is as close as about 132 feet in one location and is a little over 200 feet in another place. The power pole is just a little over 150 feet from the edge of the pit. A summary of setback distances can be found in Appendix D.

As stated above, an analysis of the slopes of the pit shows no indication of being unstable and are therefore considered as not a posing any risk to these structures.

## Summary and Conclusion

CWPDA, which recently purchased the Pueblo West gravel pit site operated under DRMS reclamation permit M-1977-573, performed an engineering evaluation to assess the stability of as-built compacted slopes inside the pit, so as to make a determination of risk to adjacent structures located within 200 feet of the excavation limits.

An analysis was performed on the interior slopes of the pit at 46 locations. Background materials were reviewed, including the geotechnical design report by Haley and Aldrich for the original compacted berm constructed at the site. This review showed that a design slope of 3:1 was specified for all finished

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

slopes. CWPDA's analysis shows that all as-built slopes at the vessel meet this design specification. At no location inspected for this evaluation is this specification not met, and in many places, it is exceeded. An average slope of 6:1 is observed, twice the design slope for the vessel.

Three structures are near the limits of the excavation and are for the most part, within 200 feet of the pit. It is the judgement of CWPDA's engineer, duly licensed as a professional engineer in the State of Colorado, that this evaluation shows that all slopes at this site are currently stable and that there is no risk to these structures from the vessel slopes.

Best Regards,

Daniel Tucker, P.E.,
Water Resources Engineer
Colorado Water Protective and Development Association

COLORADO LICENSED
DANIEL RAYMOND TUCKER
56546
11/30/2021
PROFESSIONAL ENGINEER

CC:

Kent Ricken - CWPDA General Manager

Jerald Schnabel – President, Castle Aggregates

H. Bruce Humphries – Regulatory Permits Management, Inc.

Joseph Stadterman - Manager, Lake Pueblo State Park

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

# APPENDIX A

## Site Map


# WEST PUEBLO RESERVOIR

SITE PLAN

| No. | Revision/Issue | Date |
|---|---|---|
| | | |
| | | |

Firm Name and Address

Project Name and Address

WEST PUEBLO RESERVOIR
2596 CO-96
PUEBLO, COLORADO 81001

Project

Sheet

Date 21/OCT/21

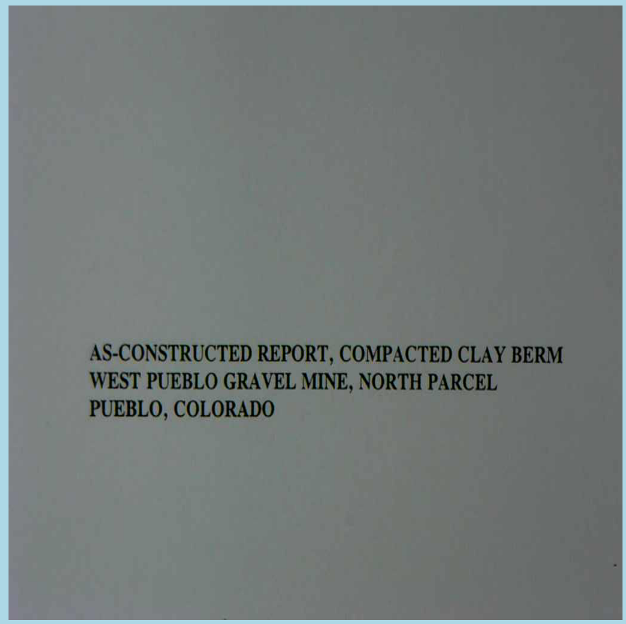
Scale As Noted

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

# APPENDIX B

## Background Data

AS-CONSTRUCTED REPORT, COMPACTED CLAY BERM_WEST PUEBLO
GRAVEL MINE, NORTH PARCEL_PUEBLO, COLORADO


AS-CONSTRUCTED REPORT, COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE, NORTH PARCEL
PUEBLO, COLORADO

# AS-CONSTRUCTED REPORT, COMPACTED CLAY BERM
# WEST PUEBLO GRAVEL MINE, NORTH PARCEL
# PUEBLO, COLORADO

by

Haley & Aldrich, Inc.
Denver, Colorado

for

Transit Mix of Pueblo
Colorado Springs, Colorado

File No. 20278-003
May 2002

HALEY & ALDRICH

UNDERGROUND
ENGINEERING &
ENVIRONMENTAL
SOLUTIONS

Haley & Aldrich, Inc.
110 16th Street
Suite 900
Denver, CO 80202-5202
Tel: 303.534.1100
Fax: 303.534.1777
Email: DEN@HaleyAldrich.com

HALEY & ALDRICH

30 May 2002
File No. 20278-003

Transit Mix of Pueblo
c/o Transit Mix Concrete Company
444 East Costilla
Colorado Springs, Colorado 80903

Attention: Jerry Hermans

Subject: As-Constructed Report, Compacted Clay Berm
West Pueblo Gravel Mine, North Parcel
Pueblo, Colorado

Jerry:

Haley & Aldrich is pleased to present the As-Constructed Report for the compacted clay berm at the subject property. Berm construction has concluded and conforms to the State Engineer-approved plans and specifications. Approximately 1,750 linear feet of the berm was completed. The remainder of the sealed water storage reservoir will be constructed using a slurry wall tied into the existing berm.

If you have any concerns or questions regarding the berm construction, quality control, or specifications, please do not hesitate to call.

Sincerely yours,
HALEY & ALDRICH, INC.

Jay C. Davenport, E.I.
Staff Engineer

Steven C. Kuehr, P.E.
Senior Engineer

COLORADO REGISTERED PROFESSIONAL ENGINEER
STEVEN C. KUEHR
24369
6/4/02

Enclosures

G:\PROJECTS\20278 Transit Mix\003\As-Constructed Report\As-Built Report (new).doc

**OFFICES**

Boston
*Massachusetts*

Cleveland
*Ohio*

Hartford
*Connecticut*

Los Angeles
*California*

Manchester
*New Hampshire*

Newark
*New Jersey*

Portland
*Maine*

Rochester
*New York*

San Diego
*California*

San Francisco
*California*

Washington
*District of Columbia*

TABLE OF CONTENTS



HALEY & ALDRICH

## LIST OF TABLES



## LIST OF FIGURES

# I. INTRODUCTION

Transit Mix of Pueblo (Transit Mix) has constructed a compacted clay berm at the West Pueblo Gravel Mine, North Parcel. The gravel mine is located along State Highway (SH) 96, approximately 2 miles west of SH 45 in the Arkansas River floodplain as shown in Figures 1 and 2. Construction of the berm began in March 1998 and concluded in October 2000. Approximately 1,750 linear feet (ft) of berm was constructed to full height on the northern and western perimeter of the future reservoir. The berm extends approximately 150 linear ft from the full height of constructed berm along the perimeter of the mined area as it slopes to the bottom of the pit, due to nature of the berm construction. The berm is part of a design to create a sealed water storage reservoir covering approximately 100 acres. A slurry wall will be constructed to complete the remainder of the reservoir perimeter seal. The slurry wall will connect to each end of the berm that has been constructed to full height. This reservoir would be owned and operated by Transit Mix.

A feasibility study and design of the compacted clay berm was prepared in March 1997. The design was approved by the State Engineer's Office (SEO) in September 1997. Construction drawings, earthwork specifications, and a Quality Assurance/Quality Control (QA/QC) plan were completed in November 1997. Haley & Aldrich, Inc. (Haley & Aldrich) was retained by Transit Mix to perform the following services:

- Perform a feasibility study and design the compacted clay berm.
- Prepare construction drawings, earthwork specifications and a Quality Assurance/Quality Control (QA/QC) plan.
- Provide construction QA of the berm.
- Prepare an As-Constructed Report for the berm.

This As-Constructed Report presents all construction information for the constructed clay berm. This information includes the berm layout and quality control results. The conformed earthwork specifications are provided in Appendix A. Construction photographs are provided in Appendix B.

## II. PROJECT OVERVIEW

The constructed compacted clay berm is approximately 1,750 linear ft long and up to 24 ft in height. Construction started along the west side of the mine (station 74+00) and progressed in a clockwise manner to the north side of the pit (station 94+00). (Note: Stationing was established by TMOP as construction progressed and is approximate.)

Construction of the compacted clay berm was performed using three different designs: the original design, modification No. 1 design, and modification No. 2 design. These designs are shown in Figures 3, 4, and 5, respectively.

As shown in Figure 3, the original design consists of a berm constructed entirely of compacted clay fill and is keyed five feet into the shale bedrock. The berm was constructed using this design from 74+00 to approximately 78+00 (March 1998 to May 1998).

In May 1998, Haley & Aldrich estimated the amount of clay material necessary to construct the compacted clay berm, compared that to an estimate of the available clay material, and determined that a 96,000 cubic yards (CY) deficit of clay material existed. Therefore, the first modification (Modification No. 1) to the berm design and construction occurred to compensate for the anticipated deficit of clay materials. As shown in Figure 4, this modification consists of a compacted berm with two zones. Zone I is compacted clay core. Zone II is compacted common fill on the front side (facing the reservoir) of the berm. Construction of the berm using this modified design occurred from approximately station 78+00 to 90+00 (May 1998 to March 2000).

In March 2000, Transit Mix had stripped all overburden from the site and estimated the stockpiled clay material to be less than required to continue construction using Modification No. 1 design. Haley & Aldrich remodified the berm design to compensate for an additional deficit of compatible clay material. The second modification (Modification No. 2) to the berm design occurred to further compensate for a deficit of clay materials. This modification was approved by the SEO on 06 April 2000. As shown in Figure 5, this modification consisted of a three-zoned berm. Zone I is a compacted clay core, Zone II is compacted common fill on the front side of the berm, and Zone III is compacted common fill on the backside of the berm.

A summary of construction activities for the berm is provided below:

- Key trench excavation and berm construction (unmodified design) occurred from Station 74+00 to approximately 78+00 from 3 March 1998 to 7 May 1998.
- Two-zone berm construction (Modification No. 1) began on 8 May 1998 starting at station 7+80.
- Construction was halted on 8 May 1998.
- Construction resumed on 10 March 1999.
- Three-zone berm construction (Modification No. 2) began in March 2000. Transition from Modification No. 1 to Modification No. 2 occurred between 85+00 and 90+00.
- Construction concluded on 20 October 2000 between stations 94+00 and 95+40.

## III. CONSTRUCTION SUMMARY

Figures 2 through 5 show the as-constructed plan and cross-sections of the compacted clay berm. Individual aspects of the construction are discussed below.

### 3.01 Foundation Preparation

The berm was founded on competent shale bedrock. A 5-ft deep by 12-ft wide key was excavated into the shale bedrock. The top of the bedrock was roughened and scarified. The floor was cleared of free gravel, cobbles, debris, organic material and other deleterious materials and filled with compacted clay within two days after excavation.

### 3.02 Construction Fill

Construction fill consisted of clay fill and common fill. Construction fill was placed in six to eight inch loose lifts, watered to within -1 percent to +3 percent of optimum moisture content, disked with a Cat 250 pulver mixer, and compacted with the REX pad foot roller to the required compaction based on standard proctor test results (98 percent relative density for clay fill, 95 percent relative density for common fill). Prior to placement of a new lift, previously placed lifts met compaction requirements and were sufficiently scarified and moisture conditioned to facilitate a bond between lifts. An 8-inch, dry soil blanket was generally placed over the construction at the end of the day during cold weather to prevent frost from affecting the moisture content in the compacted clay lifts.

Based on Transit Mix's daily field reports and considering the modifications to the clay berm design, Haley & Aldrich estimated that a total of 85,000 CY of construction fill was placed to construct the berm, with approximately 65,000 CY being clay fill.

### 3.03 Quality Control Test Results

Transit Mix collected and tested samples of stockpiled and placed clay fill as required in the QA/QC plan. Transit Mix performed required compaction tests of placed construction fill. Advanced Terra Testing performed four backpressure permeability tests and five Atterberg Limits and grain size analyses on select samples. Table I presents a summary of QC testing requirements and the testing performed for the clay berm construction.

Transit Mix performed 513 relative density and moisture content tests using a nuclear density gauge. Transit Mix performed 37 relative density and moisture content tests using a sand cone to periodically confirm nuclear density gauge measurement. Table

II summarizes the density testing performed during construction.

Particle size distribution and Atterberg Limits were determined for 34 clay fill samples. Table III presents the results of these analyses. Grain size analysis results range from 47 percent to 94 percent passing the #200 sieve with an average of 73 percent. The Plasticity Index (PI) results ranged from 35 to 9 with an average PI of 19.

Permeability tests were performed on four samples. Table III presents the results of permeability tests. Permeability test results range from $1.5 \times 10^{-9}$ to $1.8 \times 10^{-8}$ centimeters per second (cm/sec) with an average of $1.0 \times 10^{-8}$ cm/sec.

For compaction requirements, optimum moisture content and relative maximum density were determined using the Proctor Test (Standard) on 18 samples. Table IV presents the results of these tests.

## IV. DEVIATION FROM THE PLANS AND SPECIFICATIONS

Several aspects of the compacted clay berm construction were altered from the original design drawings and specifications. Major alterations and modifications are summarized below:

- The key was originally supposed to be excavated with a 1:1 side slope. After observation by Haley & Aldrich of key excavation, vertical cuts were allowed for the side slopes providing all loose rock was removed from the excavated vertical slopes prior to fill placement.
- According to the specifications, the excavation for the key was not to remain open for more than two days prior to fill placement. After a review of the conditions on site, and the rock's apparent weathering qualities, the excavation was allowed to remain open for more than two days prior to fill placement to permit the contractor to excavate a workable length of excavation. After a sufficient length of excavation was opened to allow room for equipment, the two-day rule was reapplied.
- Specifications called for a 5-ft final depth of key. After review of the rock quality, a variance of 1 ft was considered acceptable in the final depth, if a massive or cemented bed was encountered close to the final key depth.
- The definition of "uncontrolled fill" in the specifications was changed to include waste "come-back" concrete either wet, dumped into the fill directly from trucks, or already cured as hardened bulbs. Bulbs were required to be placed in a manner that prevented "nesting" of the bulbs or creation of large voids.
- Specifications called for sand cone testing to be performed once per day adjacent to a nuclear density test to verifying the accuracy of the nuclear density gage. Densities as determined by the nuclear density gage varied by less than 3 percent as compared to the densities determined using the sand cone method. This range was within the accuracy expected of nuclear density gages. The results suggested that Transit Mix QC personnel adequately maintained and operated the nuclear density gage and therefore the frequency of the sand cone testing was reduced to once per 5,000 CY.
- The definition of "uncontrolled fill" was changed to include previously excavated on-site shale bedrock if broken down to a maximum particle size of 6 inches.
- The following guidelines were incorporated into winter construction.
    - Water being mixed with the soil should not be allowed to freeze prior to mixing, or after mixing prior to compaction or prior to placing the next lift.
    - The exposed active fill area should be covered with a minimum 6-inch thick, loose, dry lift of soil as an insulator.

- At the beginning of each workday, the loose, insulating lift from the night before should be inspected for evidence of freezing. Any frozen material should be removed to the full depth of the freezing, even into previously compacted soil if necessary. After removing the frozen soil, the exposed surface should be properly scarified with a disk or pulvamixer and construction can continue as normal. If the insulating layer does not contain any freezing, then it may be moisture conditioned and compacted in place without removing it.
- Any portion of the fill not actively worked but subject to freeze/thaw should be scarified and recompacted prior to placing additional fill, even if it is not frozen at the time work resumes in that area.
- At the beginning of each workday, the borrow source should be inspected for evidence of freezing. All frozen material should be stripped from the borrow source and not used in the fill. Prewetting the borrow source is not desirable in winter construction.
- Earthwork can be conducted after snowstorms providing that the snow is removed from the borrow source and from the active fill area and providing that the other conditions outlined above are met.

## V. AS-BUILT SURVEY

An As-Constructed survey of the centerline of the compacted clay berm key was completed by Mangini & Associates, Inc. in May 2001. Survey information is shown on Figure 2 and presented in Table V. Haley & Aldrich established temporary As-Constructed stationing every 100 linear ft for the centerline of key after completion of the berm. The centerline of the key was determined to be 6 feet from the crest of the top of the berm. The berm was observed to be constructed to full height (premining ground surface) from stations 75+00 to 92+50. (Note: Stationing for surveying the centerline of the key does not directly coincide with stationing established by Transit Mix during construction).

### 5.01 Construction observations

Haley & Aldrich observed the construction of the compacted clay berm on a part-time basis. Construction performance was monitored and conditions encountered were compared with assumptions made during the design. Haley and Alrich's on-site observations focused on monitoring key excavation, fill placement, and fill compaction for compliance with the contract documents, design concepts, and design criteria.

## VI. LIMITATIONS

This As-Constructed Report has been prepared for the use of Transit Mix to summarize construction activity and quality control monitoring. This report is not intended to represent in detail the exact location, type of component, nor manner of construction. This report and previous reports produced by Haley & Aldrich have relied in part on information compiled by others. The Haley & Aldrich will not be responsible for any errors or omissions that have been incorporated into this report a result of that information.

G:\PROJECTS\20278 Transit Mix\003\As-Constructed Report\Final As-Built Report.doc

**TABLE I**

SUMMARY OF TESTING FREQUENCY FOR MATERIAL AND QUALITY EVALUATION
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| Test | ASTM No. | Minimum Frequency of Tests Required | No. of Tests Required[1] | No. of Tests Performed | Comments |
|---|---|---|---|---|---|
| Particle Size | D1140 | 1 per 2,500 CY | 26 | 34 | Stockpile and placed samples were analyzed. |
| Atterberg Limits | D4318 | 1 per 2,500 CY | 26 | 34 | Stockpile and placed samples were analyzed. |
| Optimum Moisture & Density | D698 | 1 per 10,000 CY or as borrow material changes | 9 | 18 | Stockpile and placed samples were analyzed. |
| Field Moisture Content & Density (Nuclear) | D3017<br>D2922 | 1 per 500 CY or one test per lift | 438 | 513 | Clay fill minimum density of 98%, controlled fill minimum density of 95%. Compacted soil failing to meet the minimum density was reworked and remeasured until the minimum density had been achieved. |
| Density-Sand Cone | D1556 | 1 per 5,000 CY | 17 | 37 | Frequent windy conditions did not allow this test to be performed every time a nuclear density test was |
| Permeability Testing | D5084 | 500 ft linear spacings along reservoir perimeter at varying fill elevations | 4 | 4 | Approximately 1,750 linear feet of completed berm was constructed |

Notes:
1. Number of tests required is based on an estimated volume and length of constructed berm (65,100 CY and 1,750 linear feet).

HALEY & ALDRICH, INC.

**TABLE II**



RELATIVE DENSITY & MOISTURE CONTENT TESTING SUMMARY
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| | | | Approximate Dimensions of Placed Material | | | | Estimated Volume of Material Placed[1] | | Field Density & Moisture (Nuclear Method) | | Field Density & Moisture (Sand Cone Method) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Transit Mix DFR | Date | Test Locations | length (feet) | width (feet) | height (feet) | No. of Lifts | Daily (CY) | Cumu-lative (CY) | No. of Tests Req'd | No. of Tests Done[2] | No. of Tests Performed |
| 1 | 10-Mar-98 | 74+00 to 78+00 | 400 | 12.5 | 1.0 | 2 | 190 | 190 | 2 | 5 | - |
| 2 | 12-Mar-98 | 74+00 to 78+00 | 400 | 12.5 | 3.0 | 3 | 560 | 750 | 3 | 7 | - |
| 3 | 13-Mar-98 | 74+00 to 78+00 | 400 | 12.5 | 2.0 | 4 | 370 | 1,120 | 4 | 10 | 1 |
| 4 | 26-Mar-98 | 74+00 to 78+00 | 400 | 85 | 0.5 | 3 | 630 | 1,750 | 3 | 4 | - |
| 5 | 01-Apr-98 | 74+00 to 78+00 | 400 | 85 | 1.5 | 2 | 1890 | 3,640 | 2 | 4 | - |
| 6 | 02-Apr-98 | 74+00 to 78+00 | 400 | 85 | 1.0 | 2 | 1260 | 4,900 | 2 | 4 | - |
| 7 | 03-Apr-98 | 74+00 to 78+00 | 400 | 85 | 1.0 | 1 | 1260 | 6,160 | 1 | 2 | - |
| 8 | 06-Apr-98 | 74+00 to 78+00 | 400 | 85 | 1.0 | 3 | 1260 | 7,420 | 3 | 6 | - |
| 9 | 07-Apr-98 | 74+00 to 78+00 | 400 | 60 | 2.0 | 5 | 1780 | 9,200 | 5 | 7 | - |
| 10 | 13-Apr-98 | 74+00 to 78+00 | 400 | 50 | 3.5 | 8 | 2590 | 11,790 | 8 | 10 | 1 |
| 11 | 14-Apr-98 | 74+00 to 78+00 | 400 | 42 | 2.0 | 5 | 1240 | 13,030 | 5 | 5 | - |
| 12 | 15-Apr-98 | 74+00 to 78+00 | 400 | 30 | 2.0 | 4 | 890 | 13,920 | 4 | 4 | - |
| 13 | 22-Apr-98 | 74+00 to 78+00 | 400 | 28 | 1.5 | 3 | 620 | 14,540 | 3 | 4 | - |
| 14 | 23-Apr-98 | 74+00 to 78+00 | 400 | 24 | 1.5 | 3 | 530 | 15,070 | 3 | 3 | - |
| 15 | 24-Apr-98 | 74+00 to 78+00 | 400 | 23 | 1.0 | 2 | 340 | 15,410 | 2 | 3 | - |
| 16 | 29-Apr-98 | 74+00 to 78+00 | 400 | 23 | 1.0 | 3 | 340 | 15,750 | 3 | 4 | - |
| 17 | 30-Apr-98 | 74+00 to 78+00 | 400 | 23 | 2.0 | 4 | 680 | 16,430 | 4 | 4 | - |
| 18 | 01-May-98 | 74+00 to 78+00 | 400 | 23 | 4.0 | 4 | 1360 | 17,790 | 4 | 4 | - |
| 19 | 04-May-98 | 74+00 to 78+00 | 400 | 23 | 3.0 | 3 | 1020 | 18,810 | 3 | 3 | - |
| 20 | 05-May-98 | 74+00 to 78+00 | 400 | 23 | 1.5 | 3 | 510 | 19,320 | 3 | 3 | - |
| 21 | 06-May-98 | 74+00 to 78+00 | 400 | 12 | 2.0 | 4 | 360 | 19,680 | 4 | 4 | - |
| 22 | 07-May-98 | 74+00 to 78+00 | 400 | 12 | 1.0 | 2 | 180 | 19,860 | 2 | 2 | - |
| 23 | 08-May-98 | 74+00 to 78+00 | 400 | 0 | 0.0 | 0 | 0 | 19,860 | 0 | 0 | - |
| 19[3] | 10-Mar-99 | 78+00 to 79+40 | 140 | 12 | 3.0 | 2 | 190 | 20,050 | 2 | 2 | - |
| 20[3] | 11-Mar-99 | 78+00 to 79+40 | 140 | 12 | 3.0 | 6 | 190 | 20,240 | 6 | 5 | 1 |
| 21[3] | 15-Mar-99 | 78+00 to 79+40 | 140 | 12 | 0.5 | 1 | 30 | 20,270 | 1 | 1 | - |
| 22[3] | 16-Mar-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 2 | 330 | 20,600 | 2 | 3 | - |
| 23[3] | 24-Mar-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 2 | 330 | 20,930 | 2 | 2 | - |
| 24 | 25-Mar-99 | 78+00 to 79+40 | 140 | 63 | 0.5 | 1 | 160 | 21,090 | 1 | 1 | 1 |
| 25 | 26-Mar-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 2 | 330 | 21,420 | 2 | 2 | - |
| 26 | 29-Mar-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 2 | 330 | 21,750 | 2 | 2 | - |
| 27 | 30-Mar-99 | 78+00 to 79+40 | 0 | 0 | 0.0 | 0 | 0 | 21,750 | 0 | 0 | - |
| 28 | 31-Mar-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 1 | 330 | 22,080 | 1 | 2 | - |
| 29 | 01-Apr-99 | 78+00 to 79+40 | 140 | 63 | 0.5 | 2 | 160 | 22,240 | 2 | 2 | - |
| 30 | 06-Apr-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 2 | 330 | 22,570 | 2 | 3 | - |
| 31 | 07-Apr-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 2 | 330 | 22,900 | 2 | 4 | - |

**TABLE II**



RELATIVE DENSITY & MOISTURE CONTENT TESTING SUMMARY
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| Transit Mix DFR | Date | Test Locations | Approximate Dimensions of Placed Material | | | No. of Lifts | Estimated Volume of Material Placed[1] | | Field Density & Moisture (Nuclear Method) | | Field Density & Moisture (Sand Cone Method) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | length (feet) | width (feet) | height (feet) | | Daily (CY) | Cumu-lative (CY) | No. of Tests Req'd | No. of Tests Done[2] | No. of Tests Performed |
| 32 | 09-Apr-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 2 | 330 | 23,230 | 2 | 4 | - |
| 33 | 12-Apr-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 2 | 330 | 23,560 | 2 | 4 | 1 |
| 34 | 13-Apr-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 1 | 330 | 23,890 | 1 | 2 | - |
| n/a | 14-Apr-99 | 78+00 to 79+40 | 140 | 63 | 0.5 | 1 | 160 | 24,050 | 1 | 3 | - |
| 35 | 14-May-99 | 79+40 to 81+30 | 140 | 12 | 2.0 | 4 | 120 | 24,170 | 4 | 6 | - |
| 36 | 17-May-99 | 79+40 to 81+30 | 190 | 12 | 1.5 | 3 | 130 | 24,300 | 3 | 4 | - |
| 37 | 19-May-99 | 79+40 to 81+30 | 140 | 12 | 1.5 | 3 | 90 | 24,390 | 3 | 4 | - |
| 38 | 20-May-99 | 79+40 to 81+30 | 190 | 60 | 1.5 | 3 | 630 | 25,020 | 3 | 3 | - |
| 39 | 21-May-99 | 79+40 to 81+30 | 190 | 60 | 0.5 | 1 | 210 | 25,230 | 1 | 3 | - |
| 40 | 27-May-99 | 79+40 to 90+30 | 190 | 63 | 1.0 | 2 | 440 | 25,670 | 2 | 2 | 1 |
| 41 | 28-May-99 | 79+40 to 81+30 | 190 | 63 | 1.5 | 4 | 670 | 26,340 | 4 | 4 | 1 |
| 42 | 01-Jun-99 | 78+00 to 90+30 | 190 | 63 | 2.5 | 5 | 1110 | 27,450 | 5 | 5 | 1 |
| 43 | 02-Jun-99 | 78+00 to 79+00 | 100 | 63 | 2.0 | 4 | 470 | 27,920 | 4 | 4 | 1 |
| 44 | 03-Jun-99 | 78+30 to 78+60 | 140 | 63 | 1.0 | 2 | 330 | 28,250 | 2 | 3 | - |
| 45 | 04-Jun-99 | 78+10 to 79+40 | 130 | 63 | 1.5 | 2 | 460 | 28,710 | 2 | 2 | - |
| 46 | 07-Jun-99 | 78+00 to 79+40 | 130 | 63 | 1.5 | 5 | 460 | 29,170 | 5 | 5 | - |
| 47 | 08-Jun-99 | 78+00 to 79+40 | 140 | 63 | 1.0 | 1 | 330 | 29,500 | 1 | 1 | - |
| 48 | 09-Jun-99 | 78+10 to 79+40 | 130 | 63 | 1.5 | 4 | 460 | 29,960 | 4 | 4 | - |
| 49 | 10-Jun-99 | 78+10 to 79+40 | 130 | 63 | 1.0 | 2 | 300 | 30,260 | 2 | 2 | - |
| 50 | 11-Jun-99 | 78+10 to 79+40 | 130 | 63 | 2.0 | 4 | 610 | 30,870 | 4 | 4 | - |
| 51 | 01-Jul-99 | 81+30 to 85+00 | 370 | 12 | 2.0 | 4 | 330 | 31,200 | 4 | 4 | - |
| 52 | 07-Jul-99 | 81+30 to 85+00 | 370 | 12 | 2.0 | 4 | 330 | 31,530 | 4 | 4 | 1 |
| 53 | 09-Jul-99 | 81+30 to 85+00 | 370 | 80 | 1.0 | 2 | 1100 | 32,630 | 2 | 2 | - |
| 54 | 12-Jul-99 | 77+00 to 81+00 | 300 | 30 | 1.0 | 2 | 330 | 32,960 | 2 | 2 | - |
| 55 | 14-Jul-99 | 77+00 to 81+00 | 300 | 30 | 1.5 | 3 | 500 | 33,460 | 3 | 4 | 1 |
| 56 | 15-Jul-99 | 77+00 to 81+00 | 300 | 30 | 1.0 | 2 | 330 | 33,790 | 2 | 3 | - |
| 57 | 16-Jul-99 | 77+00 to 81+00 | 300 | 30 | 1.0 | 2 | 330 | 34,120 | 2 | 2 | - |
| 58 | 19-Jul-99 | 76+00 to 81+00 | 500 | 28 | 0.5 | 1 | 260 | 34,380 | 1 | 2 | - |
| 59 | 21-Jul-99 | 76+00 to 81+00 | 500 | 28 | 1.0 | 2 | 520 | 34,900 | 2 | 3 | - |
| 60 | 26-Jul-99 | 77+00 to 81+00 | 400 | 28 | 1.0 | 2 | 410 | 35,310 | 2 | 2 | - |
| 61 | 27-Jul-99 | 78+00 to 81+00 | 300 | 25 | 1.0 | 2 | 280 | 35,590 | 2 | 2 | - |
| 62 | 28-Jul-99 | 78+00 to 81+00 | 300 | 25 | 1.0 | 2 | 280 | 35,870 | 2 | 2 | 1 |
| 63 | 30-Jul-99 | 74+00 to 78+00 | 300 | 28 | 2.0 | 4 | 620 | 36,490 | 4 | 4 | - |
| 64 | 10-Aug-99 | 78+10 to 79+40 | 200 | 28 | 1.0 | 2 | 210 | 36,700 | 2 | 2 | 1 |
| 65 | 11-Aug-99 | 79+00 to 81+00 | 200 | 40 | 1.0 | 2 | 300 | 37,000 | 2 | 4 | - |
| 66 | 12-Aug-99 | 79+00 to 81+00 | 200 | 28 | 1.5 | 3 | 310 | 37,310 | 3 | 6 | - |

**TABLE II**
RELATIVE DENSITY & MOISTURE CONTENT TESTING SUMMARY
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| | | | Approximate Dimensions of Placed Material | | | | Estimated Volume of Material Placed[1] | | Field Density & Moisture (Nuclear Method) | | Field Density & Moisture (Sand Cone Method) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Transit Mix DFR | Date | Test Locations | length (feet) | width (feet) | height (feet) | No. of Lifts | Daily (CY) | Cumu-lative (CY) | No. of Tests Req'd | No. of Tests Done[2] | No. of Tests Performed |
| 67 | 18-Aug-99 | 79+50 to 82+00 | 150 | 25 | 1.0 | 2 | 140 | 37,450 | 2 | 2 | - |
| 68 | 19-Aug-99 | 79+50 to 83+00 | 350 | 25 | 1.0 | 2 | 320 | 37,770 | 2 | 4 | - |
| 69 | 20-Aug-99 | 79+50 to 82+00 | 250 | 25 | 2.0 | 4 | 460 | 38,230 | 4 | 3 | 1 |
| 70 | 21-Aug-99 | 79+60 to 82+00 | 260 | 25 | 1.0 | 2 | 240 | 38,470 | 2 | 4 | - |
| 71 | 23-Aug-99 | 79+60 to 82+00 | 240 | 25 | 1.0 | 2 | 220 | 38,690 | 2 | 2 | - |
| 72 | 24-Aug-99 | 79+60 to 82+00 | 230 | 25 | 1.0 | 2 | 210 | 38,900 | 2 | 2 | 1 |
| 73 | 25-Aug-99 | 79+70 to 82+10 | 240 | 25 | 2.0 | 4 | 440 | 39,340 | 4 | 4 | - |
| 74 | 26-Aug-99 | 79+70 to 82+10 | 240 | 25 | 1.0 | 2 | 220 | 39,560 | 2 | 2 | 1 |
| 75 | 27-Aug-99 | 80+00 to 82+50 | 250 | 40 | 2.0 | 4 | 740 | 40,300 | 4 | 4 | - |
| 76 | 30-Aug-99 | 80+00 to 83+00 | 300 | 40 | 1.0 | 2 | 440 | 40,740 | 2 | 3 | - |
| n/a | 31-Aug-99 | 80+00 to 83+00 | | | | 0 | 0 | 40,740 | 0 | 2 | - |
| 77 | 01-Sep-99 | 80+00 to 83+00 | 300 | 40 | 1.0 | 2 | 440 | 41,180 | 2 | 2 | 1 |
| 78 | 02-Sep-99 | 80+10 to 83+30 | 320 | 40 | 1.0 | 2 | 470 | 41,650 | 2 | 2 | - |
| 79 | 03-Sep-99 | 80+50 to 84+00 | 350 | 40 | 1.0 | 2 | 520 | 42,170 | 2 | 2 | 1 |
| 80 | 13-Sep-99 | 79+40 to 81+00 | 160 | 20 | 1.0 | 2 | 120 | 42,290 | 2 | 2 | - |
| 81 | 14-Sep-99 | 79+40 to 81+00 | 160 | 20 | 1.0 | 2 | 120 | 42,410 | 2 | 1 | - |
| 82 | 23-Sep-99 | 80+00 to 83+00 | 300 | 40 | 1.0 | 2 | 440 | 42,850 | 2 | 2 | 1 |
| 83 | 24-Sep-99 | 80+50 to 83+30 | 280 | 40 | 1.0 | 2 | 410 | 43,260 | 2 | 2 | - |
| 84 | 27-Sep-99 | 81+00 to 85+00 | 500 | 40 | 1.0 | 2 | 740 | 44,000 | 2 | 2 | - |
| 85 | 28-Sep-99 | 80+00 to 85+00 | 500 | 40 | 1.5 | 3 | 1110 | 45,110 | 3 | 3 | 1 |
| 86 | 30-Sep-99 | 81+00 to 85+00 | 500 | 40 | 0.5 | 1 | 370 | 45,480 | 1 | 1 | - |
| 87 | 01-Oct-99 | 81+00 to 85+00 | 400 | 40 | 1.0 | 2 | 590 | 46,070 | 2 | 2 | - |
| 88 | 04-Oct-99 | 81+00 to 85+00 | 400 | 40 | 1.0 | 2 | 590 | 46,660 | 2 | 2 | - |
| 89 | 05-Oct-99 | 81+00 to 85+00 | 400 | 40 | 1.0 | 2 | 590 | 47,250 | 2 | 2 | 1 |
| 90 | 06-Oct-99 | 81+00 to 85+00 | 400 | 40 | 1.0 | 2 | 590 | 47,840 | 2 | 2 | 1 |
| 91 | 08-Oct-99 | 81+00 to 85+00 | 400 | 40 | 1.0 | 2 | 590 | 48,430 | 2 | 2 | - |
| 92 | 11-Oct-99 | 82+00 to 85+00 | 300 | 40 | 1.0 | 2 | 440 | 48,870 | 2 | 2 | - |
| 93 | 12-Oct-99 | 82+00 to 85+00 | 300 | 40 | 0.5 | 1 | 220 | 49,090 | 1 | 1 | - |
| 94 | 13-Oct-99 | 82+00 to 85+00 | 300 | 40 | 1.0 | 2 | 440 | 49,530 | 2 | 2 | 1 |
| 95 | 21-Oct-99 | 85+00 to 87+00 | 200 | 10 | 2.0 | 4 | 150 | 49,680 | 4 | 4 | - |
| 96 | 22-Oct-99 | 85+00 to 87+00 | 200 | 10 | 0.5 | 1 | 40 | 49,720 | 1 | 2 | - |
| 97 | 25-Oct-99 | 85+00 to 87+00 | 200 | 10 | 1.5 | 3 | 110 | 49,830 | 3 | 3 | 1 |
| 98 | 26-Oct-99 | 85+00 to 87+00 | 200 | 10 | 1.5 | 3 | 110 | 49,940 | 3 | 3 | - |
| 99 | 27-Oct-99 | 85+00 to 87+00 | 200 | 10 | 0.5 | 1 | 40 | 49,980 | 1 | 1 | - |
| 100 | 28-Oct-99 | 85+00 to 87+00 | 200 | 40 | 0.5 | 1 | 150 | 50,130 | 1 | 1 | - |
| 101 | 29-Oct-99 | 85+00 to 87+00 | 200 | 40 | 1.0 | 2 | 300 | 50,430 | 2 | 2 | - |

**TABLE II**



RELATIVE DENSITY & MOISTURE CONTENT TESTING SUMMARY
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| | | | Approximate Dimensions of Placed Material | | | | Estimated Volume of Material Placed[1] | | Field Density & Moisture (Nuclear Method) | | Field Density & Moisture (Sand Cone Method) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Transit Mix DFR | Date | Test Locations | length (feet) | width (feet) | height (feet) | No. of Lifts | Daily (CY) | Cumu-lative (CY) | No. of Tests Req'd | No. of Tests Done[2] | No. of Tests Performed |
| 102 | 11-Nov-99 | 81+50 to 85+00 | 350 | 15 | 1.0 | 2 | 190 | 50,620 | 2 | 2 | - |
| 103 | 13-Nov-99 | 81+60 to 85+00 | 350 | 15 | 0.5 | 1 | 100 | 50,720 | 1 | 1 | - |
| 104 | 19-Nov-99 | 81+70 to 87+00 | 530 | 30 | 1.0 | 2 | 590 | 51,310 | 2 | 2 | - |
| 105 | 01-Dec-99 | 81+70 T0 87+00 | 530 | 30 | 1.0 | 2 | 590 | 51,900 | 2 | 2 | - |
| n/a | 02-Dec-99 | 81+70 to 87+00 | 530 | 30 | 1.0 | 0 | 590 | 52,490 | 0 | 2 | - |
| 106 | 08-Dec-99 | 81+80 to 87+00 | 520 | 50 | 1.0 | 2 | 960 | 53,450 | 2 | 2 | - |
| 107 | 13-Dec-99 | 84+00 to 87+00 | 300 | 40 | 1.5 | 3 | 670 | 54,120 | 3 | 3 | - |
| 108 | 15-Dec-99 | 85+00 to 87+00 | 200 | 40 | 1.0 | 2 | 300 | 54,420 | 2 | 2 | - |
| 109 | 16-Dec-99 | 84+00 to 84+50 | 450 | 40 | 1.5 | 3 | 1000 | 55,420 | 3 | 3 | - |
| 110 | 20-Dec-99 | 80+50 to 84+00 | 450 | 40 | 1.0 | 2 | 670 | 56,090 | 2 | 2 | - |
| 111 | 22-Dec-99 | 85+00 to 87+00 | 200 | 40 | 1.0 | 2 | 300 | 56,390 | 2 | 2 | - |
| 112 | 28-Dec-99 | 84+00 to 87+00 | 200 | 40 | 1.0 | 2 | 300 | 56,690 | 2 | 2 | 1 |
| 113 | 30-Dec-99 | 83+00 to 86+40 | 300 | 40 | 1.0 | 2 | 440 | 57,130 | 2 | 2 | - |
| 114 | 04-Jan-00 | 83+00 to 87+00 | 400 | 40 | 1.0 | 2 | 590 | 57,720 | 2 | 2 | - |
| 115 | 06-Jan-00 | 82+00 to 87+00 | 500 | 40 | 1.0 | 2 | 740 | 58,460 | 2 | 2 | - |
| 116 | 07-Jan-00 | 81+00 to 87+00 | 600 | 40 | 1.0 | 2 | 890 | 59,350 | 2 | 2 | - |
| 117 | 11-Jan-00 | 81+50 to 87+00 | 550 | 40 | 1.0 | 2 | 810 | 60,160 | 2 | 2 | 1 |
| 118 | 17-Jan-00 | 81+50 to 87+00 | 550 | 30 | 1.0 | 2 | 610 | 60,770 | 2 | 2 | - |
| 119 | 18-Jan-00 | 82+00 to 87+00 | 500 | 30 | 1.0 | 2 | 560 | 61,330 | 2 | 2 | - |
| 120 | 19-Jan-00 | 82+60 to 87+00 | 500 | 30 | 1.0 | 2 | 560 | 61,890 | 2 | 1 | - |
| 121 | 20-Jan-00 | 82+60 to 87+00 | 440 | 30 | 1.0 | 2 | 490 | 62,380 | 2 | 2 | - |
| 122 | 21-Jan-00 | 82+60 to 87+00 | 440 | 30 | 1.0 | 2 | 490 | 62,870 | 2 | 2 | - |
| 123 | 03-Feb-00 | 87+00 to 91+00 | 400 | 12 | 1.0 | 2 | 180 | 63,050 | 2 | 2 | - |
| 124 | 04-Feb-00 | 87+00 to 91+00 | 400 | 12 | 1.0 | 2 | 180 | 63,230 | 2 | 2 | - |
| 125 | 10-Feb-00 | 87+00 to 91+00 | 400 | 12 | 1.0 | 2 | 180 | 63,410 | 2 | 2 | 1 |
| 126 | 21-Feb-00 | 87+00 to 91+00 | 400 | 12 | 2.0 | 4 | 360 | 63,770 | 4 | 4 | - |
| 127 | 24-Feb-00 | 87+00 to 90+50 | 350 | 55 | 1.0 | 2 | 710 | 64,480 | 2 | 2 | - |
| 128 | 25-Feb-00 | 87+00 to 90+50 | 350 | 55 | 1.0 | 2 | 710 | 65,190 | 2 | 2 | - |
| 129 | 28-Feb-00 | 87+00 to 90+50 | 350 | 55 | 0.5 | 1 | 360 | 65,550 | 1 | 1 | 1 |
| 130 | 29-Feb-00 | 87+00 to 90+50 | 350 | 55 | 1.0 | 2 | 710 | 66,260 | 2 | 2 | - |
| 131 | 06-Mar-00 | 84+00 to 90+50 | 550 | 55 | 2.0 | 4 | 2240 | 68,500 | 4 | 3 | 1 |
| 132 | 09-Mar-00 | 84+10 to 90+50 | 550 | 50 | 1.0 | 2 | 1020 | 69,520 | 2 | 2 | - |
| 133 | 10-Mar-00 | 84+10 to 90+50 | 520 | 50 | 1.0 | 2 | 960 | 70,480 | 2 | 2 | 1 |
| 134 | 15-Mar-00 | 84+30 to 90+50 | 580 | 50 | 1.0 | 2 | 1070 | 71,550 | 2 | 2 | - |
| 135 | 28-Mar-00 | 84+30 to 90+50 | 580 | 40 | 1.0 | 2 | 860 | 72,410 | 2 | 3 | - |
| 136 | 30-Mar-00 | 84+30 to 90+50 | 580 | 40 | 1.0 | 2 | 860 | 73,270 | 2 | 2 | - |

**TABLE II**



RELATIVE DENSITY & MOISTURE CONTENT TESTING SUMMARY
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| Transit Mix DFR | Date | Test Locations | Approximate Dimensions of Placed Material | | | No. of Lifts | Estimated Volume of Material Placed[1] | | Field Density & Moisture (Nuclear Method) | | Field Density & Moisture (Sand Cone Method) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | length (feet) | width (feet) | height (feet) | | Daily (CY) | Cumu-lative (CY) | No. of Tests Req'd | No. of Tests Done[2] | No. of Tests Performed |
| 137 | 05-Apr-00 | 87+00 to 90+50 | 350 | 40 | 1.0 | 2 | 520 | 73,790 | 2 | 2 | - |
| 138 | 07-Apr-00 | 84+00 to 90+50 | 550 | 40 | 1.0 | 2 | 810 | 74,600 | 2 | 2 | 1 |
| 139 | 11-Apr-00 | 84+30 to 90+50 | 550 | 40 | 1.0 | 2 | 810 | 75,410 | 2 | 2 | - |
| 140 | 12-Apr-00 | 84+70 to 90+50 | 570 | 40 | 1.0 | 2 | 840 | 76,250 | 2 | 2 | - |
| 141 | 14-Apr-00 | 84+70 to 90+50 | 570 | 35 | 1.0 | 2 | 740 | 76,990 | 2 | 2 | - |
| 142 | 17-Apr-00 | 84+80 to 90+50 | 570 | 35 | 1.0 | 2 | 740 | 77,730 | 2 | 2 | - |
| 143 | 19-Apr-00 | 85+00 to 90+50 | 550 | 35 | 1.0 | 2 | 710 | 78,440 | 2 | 2 | - |
| 144 | 21-Apr-00 | 85+00 to 90+20 | 520 | 35 | 1.0 | 2 | 670 | 79,110 | 2 | 2 | 1 |
| 145 | 24-Apr-00 | 85+00 to 90+20 | 520 | 35 | 1.0 | 2 | 670 | 79,780 | 2 | 2 | - |
| 146 | 25-Apr-00 | 85+20 to 90+10 | 490 | 30 | 1.0 | 2 | 540 | 80,320 | 2 | 2 | - |
| 147 | 26-Apr-00 | 86+00 to 90+10 | 410 | 30 | 1.0 | 2 | 460 | 80,780 | 2 | 2 | - |
| 148 | 27-Apr-00 | 86+00 to 90+00 | 400 | 25 | 1.0 | 2 | 370 | 81,150 | 2 | 2 | - |
| 149 | 28-Apr-00 | 86+00 to 90+00 | 400 | 20 | 1.0 | 2 | 300 | 81,450 | 2 | 2 | - |
| 150 | 02-May-00 | 86+50 to 90+00 | 350 | 18 | 1.0 | 2 | 230 | 81,680 | 2 | 2 | - |
| 151 | 05-May-00 | 87+00 to 90+00 | 300 | 15 | 1.0 | 2 | 170 | 81,850 | 2 | 2 | 1 |
| 152 | 22-May-00 | 90+50 to 95+40 | 490 | 12 | 1.5 | 3 | 330 | 82,180 | 3 | 3 | - |
| 153 | 24-May-00 | 90+50 to 95+40 | 490 | 12 | 2.0 | 4 | 440 | 82,620 | 4 | 4 | - |
| 154 | 25-May-00 | 90+50 to 95+40 | 490 | 12 | 0.5 | 1 | 110 | 82,730 | 1 | 1 | 1 |
| 155 | 26-May-00 | 90+50 to 95+40 | 490 | 12 | 0.5 | 1 | 110 | 82,840 | 1 | 1 | - |
| 156 | 29-May-00 | 90+80 to 93+40 | 220 | 75 | 1.0 | 2 | 610 | 83,450 | 2 | 2 | - |
| 157 | 31-May-00 | 90+80 to 93+40 | 220 | 75 | 0.5 | 1 | 310 | 83,760 | 1 | 2 | - |
| 158 | 02-Jun-00 | 91+00 to 93+00 | 200 | 75 | 0.5 | 1 | 280 | 84,040 | 1 | 2 | - |
| 159 | 06-Jun-00 | 91+00 to 93+00 | 200 | 75 | 0.5 | 1 | 280 | 84,320 | 1 | 2 | - |
| 160 | 08-Jun-00 | 93+00 to 95+40 | 240 | 75 | 1.0 | 2 | 670 | 84,990 | 2 | 2 | - |
| 161 | 12-Jun-00 | 93+00 to 95+40 | 240 | 75 | 0.5 | 1 | 330 | 85,320 | 1 | 1 | - |
| 162 | 21-Jun-00 | 91+00 to 95+40 | 440 | 75 | 1.5 | 3 | 1830 | 87,150 | 3 | 3 | - |
| 163 | 27-Jun-00 | 90+80 to 92+00 | 120 | 70 | 1.0 | 2 | 310 | 87,460 | 2 | 2 | - |
| 164 | 28-Jun-00 | 92+00 to 94+00 | 200 | 70 | 1.0 | 2 | 520 | 87,980 | 2 | 2 | - |
| 165 | 05-Jul-00 | 90+80 to 92+00 | 120 | 60 | 1.0 | 2 | 270 | 88,250 | 2 | 2 | - |
| 166 | 06-Jul-00 | 90+80 to 94+00 | 320 | 60 | 1.0 | 2 | 710 | 88,960 | 2 | 3 | - |
| 167 | 10-Jul-00 | 90+80 to 94+00 | 320 | 60 | 0.5 | 1 | 360 | 89,320 | 1 | 2 | - |
| 168 | 11-Jul-00 | 90+80 to 94+00 | 320 | 60 | 1.0 | 2 | 710 | 90,030 | 2 | 3 | - |
| 169 | 12-Jul-00 | 92+00 to 94+00 | 200 | 60 | 1.0 | 2 | 440 | 90,470 | 2 | 2 | - |
| 170 | 24-Jul-00 | 90+80 to 95+40 | 460 | 60 | 1.0 | 2 | 1020 | 91,490 | 2 | 2 | - |
| 171 | 28-Jul-00 | 91+00 to 95+00 | 400 | 55 | 1.0 | 2 | 810 | 92,300 | 2 | 3 | - |
| 172 | 03-Aug-00 | 91+00 to 95+00 | 400 | 55 | 1.0 | 2 | 810 | 93,110 | 2 | 2 | 1 |

**TABLE II**



RELATIVE DENSITY & MOISTURE CONTENT TESTING SUMMARY
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| Transit Mix DFR | Date | Test Locations | Approximate Dimensions of Placed Material: length (feet) | width (feet) | height (feet) | No. of Lifts | Estimated Volume of Material Placed[1]: Daily (CY) | Cumu-lative (CY) | Field Density & Moisture (Nuclear Method): No. of Tests Req'd | No. of Tests Done[2] | Field Density & Moisture (Sand Cone Method): No. of Tests Performed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 173 | 07-Aug-00 | 91+00 to 94+80 | 380 | 50 | 1.0 | 2 | 700 | 93,810 | 2 | 2 | - |
| 174 | 09-Aug-00 | 91+10 to 94+80 | 370 | 50 | 1.0 | 2 | 690 | 94,500 | 2 | 2 | - |
| 175 | 29-Aug-00 | 91+10 to 94+70 | 360 | 50 | 1.0 | 2 | 670 | 95,170 | 2 | 2 | - |
| 176 | 31-Aug-00 | 91+10 to 94+60 | 350 | 45 | 1.0 | 2 | 580 | 95,750 | 2 | 2 | - |
| 177 | 06-Sep-00 | 91+10 to 94+60 | 350 | 45 | 1.0 | 2 | 580 | 96,330 | 2 | 2 | - |
| 178 | 12-Sep-00 | 91+20 to 94+00 | 280 | 45 | 0.5 | 1 | 230 | 96,560 | 1 | 1 | 1 |
| 179 | 18-Sep-00 | 91+00 to 94+30 | 330 | 40 | 0.5 | 1 | 240 | 96,800 | 1 | 0 | - |
| 180 | 19-Sep-00 | 91+00 to 94+30 | 330 | 40 | 0.5 | 1 | 240 | 97,040 | 1 | 2 | - |
| 181 | 22-Sep-00 | 91+00 to 94+80 | 380 | 40 | 1.0 | 2 | 560 | 97,600 | 2 | 3 | - |
| 182 | 26-Sep-00 | 91+00 to 94+80 | 380 | 40 | 1.0 | 2 | 560 | 98,160 | 2 | 4 | - |
| 183 | 28-Sep-00 | 91+00 to 94+20 | 320 | 40 | 0.5 | 1 | 240 | 98,400 | 1 | 1 | - |
| 184 | 2-Oct-00 | 91+00 to 94+00 | 300 | 40 | 0.5 | 1 | 220 | 98,620 | 1 | 3 | 1 |
| 185 | 5-Oct-00 | 91+30 tp 94+00 | 270 | 30 | 0.5 | 1 | 150 | 98,770 | 1 | 1 | - |
| 186 | 10-Oct-00 | 91+30 to 92+00 | 70 | 35 | 1.0 | 2 | 90 | 98,860 | 2 | 2 | - |
| 187 | 13-Oct-00 | 91+30 to 92+00 | 70 | 35 | 1.0 | 2 | 90 | 98,950 | 2 | 2 | - |
| 188 | 18-Oct-00 | 92+00 to 94+00 | 200 | 35 | 1.0 | 2 | 260 | 99,210 | 2 | 2 | - |
| 189 | 20-Oct-00 | 94+00 to 95+40 | 140 | 40 | 0.5 | 1 | 100 | 99,310 | 1 | 1 | - |
| TOTAL NUMBER OF TESTS | | | | | | | | | 438 | 513 | 37 |

Notes:
1. Volume placed based on placed area dimensions provided in DFRs.
2. Number of nuclear density tests performed indicates number of passing tests.
3. DFR numbering system repeats numbers 19 through 23.
4. DFRs not provided by Transit Mix for 30-Aug-99 and 02-Dec-99
DFR indicates Transit Mix Daily Field Report.

HALEY & ALDRICH, INC.

**TABLE III**



SOIL TEST RESULTS FOR CLAY FILL
AS CONSTRUCTED REPORT-COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| Sample ID | Sample Date | Sample Location | ASTM D1140 Particle Size Passing #200 Sieve (%) | ASTM D4318 Atterberg Limits PL | LL | PI | ASTM D5084 Permeability (cm/sec) |
|---|---|---|---|---|---|---|---|
| 001 | 13-Feb-98 | South Stockpile #5 | 70.3 | 16 | 35 | 19 | |
| 002 | 13-Feb-98 | North stockpile #6 | 47.4 | 17 | 26 | 9 | |
| 003 | 23-Feb-98 | Overburden stockpile #7 | 74.4 | 15 | 30 | 15 | |
| 004 | 26-Feb-98 | Blend: (2:1) South & North stockpiles | 52.8 | 15 | 30 | 15 | |
| 005 | 10-Mar-98 | Indigenous-North | 79.4 | 15 | 33 | 18 | |
| 006 | 12-Mar-98 | Indigenous-North | 56.0 | 16 | 33 | 17 | |
| 007 | 12-Mar-98 | Indigenous-Northwest | 79.1 | 17 | 36 | 19 | |
| 014 | 13-Mar-98 | 75+00 to 77+00 Key @ 4.0 ft | 71.0 | 16 | 35 | 19 | |
| 008 | 30-Mar-98 | Native | 76.9 | 19 | 38 | 19 | |
| 009 | 02-Apr-98 | Stockpile #7 | | 18 | 30 | 12 | |
| 009 | 02-Apr-98 | Stockpile #8 | 71.3 | | | | |
| 64-SC | 13-Apr-98 | @ 76+75 25ft North | 66.8 | 16 | 35 | 19 | |
| T1A* | 14-Apr-98 | 76+40 | 93.5 | 17 | 53 | 35 | 1.5E-08 |
| 011 | 14-Apr-98 | Blend #2, (2:1) Stockpile 5 & 6 | 72.5 | 17 | 35 | 18 | |
| Bag* | 24-Apr-98 | Bulk Sample | 77.5 | 16 | 44 | 27 | |
| 84-ND | 24-Apr-98 | @77+00 10 ft North | 72.0 | 17 | 36 | 19 | |
| 015 | n/a | South Pile - lower west | 80.0 | 18 | 41 | 23 | |
| 104-SC | 11-Mar-99 | @78+10 key | 74.0 | 17 | 36 | 19 | |
| 016 | n/a | South Pile - middle east | 76.0 | 17 | 32 | 15 | |
| 115-SC | 25-Mar-99 | 78+30 @ 5 ft south | 70.0 | 17 | 35 | 18 | |
| 017 | 20-May-99 | Stockpile # 12 - Center | 70.0 | 16 | 32 | 16 | |
| 018 | 20-May-99 | Stockpile #12 - East | 76.0 | 17 | 35 | 18 | |
| 019 | 20-May-99 | Stockpile #12 - West | 73.0 | 17 | 34 | 17 | |
| 161-SC | 27-May-99 | 80+10 | 76.0 | 16 | 36 | 20 | |
| 163-SC | 28-May-99 | 90+15 @ center | 77.0 | 17 | 36 | 19 | |
| 169-SC | 01-Jun-99 | 79+50 @ 5ft east | 75.0 | 16 | 35 | 19 | |
| 173-SC | 02-Jun-99 | 78+70 @5ft north | 76.0 | 17 | 35 | 18 | |
| 201-SC | 07-Jul-99 | 84+20 | 77.0 | 18 | 36 | 18 | |
| 211-SC | 14-Jul-99 | 80+00 @ 5ft west | 74.0 | 17 | 35 | 18 | |
| Sample #1* | 04-Nov-99 | NA | 76.0 | 15 | 42 | 27 | 1.5E-09 |
| 415-SC | 21-Apr-00 | 87+00 @ 15ft west | 72.0 | 17 | 35 | 18 | |

**TABLE III**
SOIL TEST RESULTS FOR CLAY FILL
AS CONSTRUCTED REPORT-COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| Sample ID | Sample Date | Sample Location | ASTM D1140 Particle Size Passing #200 Sieve (%) | ASTM D4318 Atterberg Limits PL | LL | PI | ASTM D5084 Permeability (cm/sec) |
|---|---|---|---|---|---|---|---|
| 428-SC | 05-May-00 | 89+50 @ center | 71.0 | 17 | 34 | 17 | |
| 437-SC | 25-May-00 | 90+90 center | 73.0 | 17 | 36 | 19 | |
| 020 | 09-2000 | Indigenous Stockpile | 75.0 | 17 | 35 | 18 | |
| 021 | 09-2000 | Indigineous Stockpile | 76.0 | 17 | 36 | 19 | |
| TMOP | 06-Apr-01 | 87+10 | | | | | 1.8E-08 |
| TMOP | 06-Apr-01 | 90+20 | | | | | 5.8E-09 |
| | | TOTAL NUMBER OF TESTS | 34 | 34 | 34 | 34 | 4 |
| | | MINIMUM | 47 | 15 | 26 | 9 | 1.5E-09 |
| | | MAXIMUM | 94 | 19 | 53 | 35 | 1.8E-08 |
| | | AVERAGE | 73 | 17 | 35 | 19 | 1.0E-08 |

Notes:
Permeability was determined using a sample collected with a sampling tube and sujected to back pressure permeability testing with 10 psi confining pressure
* indicates a sample tested by Advanced Terra Testing
PL indicates plastic limit
LL indicates liquid limit
PI indicates plasticity index

HALEY & ALDRICH, INC.
G:\PROJECTS\20278 Transit Mix\003\As-Constructed Report\tables\[quality control.xls]As-Built Survey 5/30/2002

**TABLE IV**



COMPACTION TEST RESULTS
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

| Sample ID | Sample Date | Sample Location | ASTM D698 Moisture/Density Relationship (Proctor) Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|---|
| 001 | 13-Feb-98 | South stockpile #5 | 109.1 | 17.0 |
| 002 | 13-Feb-98 | North stockpile #6 | 116.0 | 14.0 |
| 003 | 23-Feb-98 | Overburden stockpile #7 | 108.3 | 16.0 |
| 004 | 26-Feb-98 | Blend: (2:1) South & North stockpiles | 113.5 | 13.5 |
| 005 | 10-Mar-98 | Indigenous-North | 114.5 | 14.0 |
| 006 | 12-Mar-98 | Indigenous-North | 121.5 | 13.0 |
| 007 | 12-Mar-98 | Indigenous-Northwest | 118.2 | 13.8 |
| 014 | 13-Mar-98 | 75+00 to 77+00 Key @ 4.0 ft | 111.9 | 15.0 |
| 008 | 30-Mar-98 | Native | 103.9 | 17.5 |
| 009 | 02-Apr-98 | Stockpile #7 | 108.5 | 18.7 |
| 011 | 14-Apr-98 | Blend #2, (2:1) Stockpile 5 & 6 | 111.0 | 16.0 |
| 015 | n/a | South Pile - lower west | 104.5 | 21.8 |
| 016 | n/a | South Pile - middle east | 108.0 | 17.3 |
| 017 | 20-May-99 | Stockpile # 12 - Center | 112.5 | 14.5 |
| 018 | 20-May-99 | Stockpile #12 - East | 108.8 | 17.5 |
| 019 | 20-May-99 | Stockpile #12 - West | 111.0 | 15.5 |
| 020 | Sep-00 | Indigenous stockpile | 112.5 | 14.9 |
| 021 | Sep-00 | Indigineous stockpile | 112.8 | 14.3 |
| | | TOTAL TESTS | 18 | 18 |

HALEY & ALDRICH, INC.

G:\PROJECTS\20278 Transit Mix\003\As-Constructed Report\tables\[quality control.xls]As-Built Survey 5/30/2002

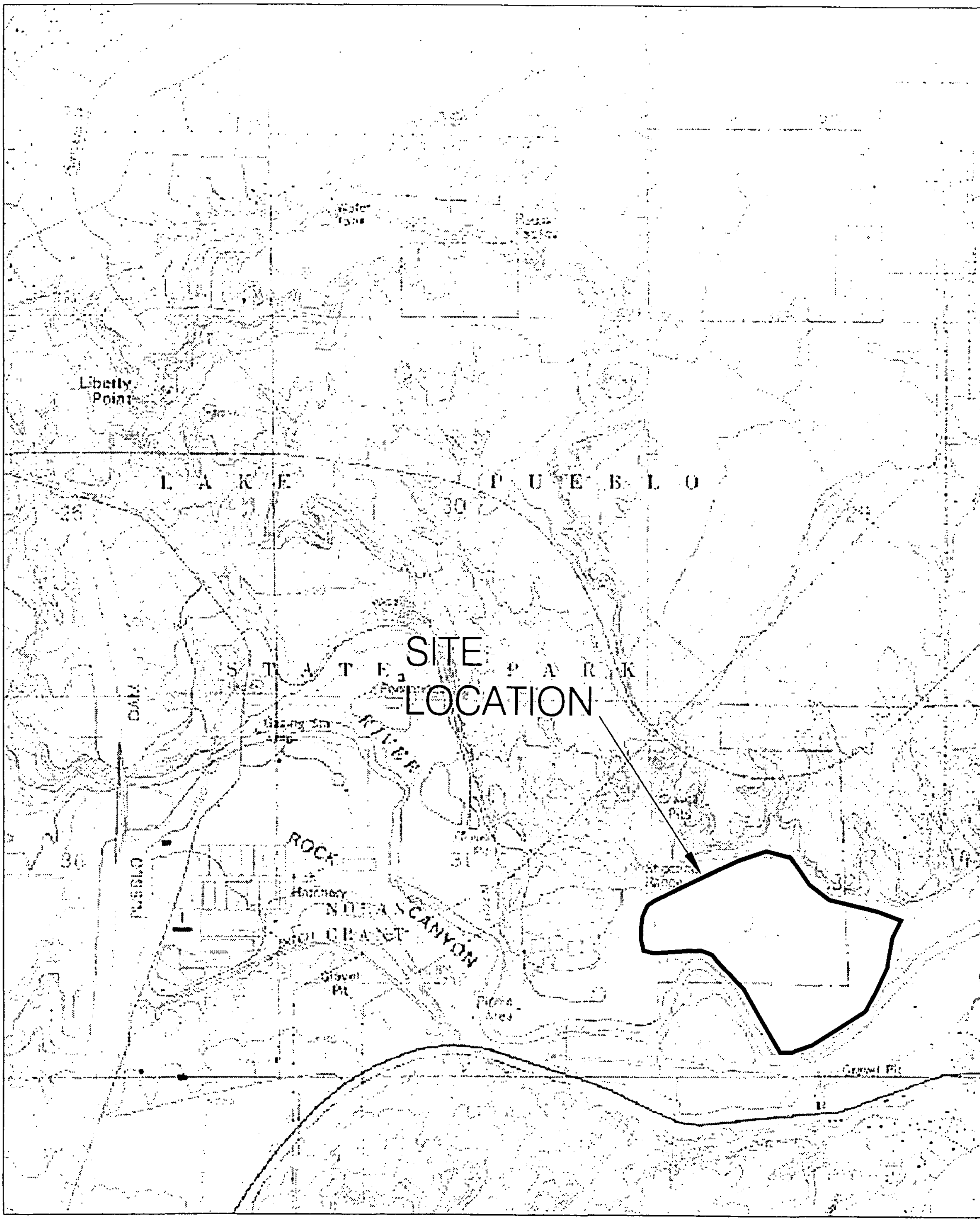
**TABLE V**
AS-BUILT SURVEY INFORMATION
AS CONSTRUCTED REPORT--COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

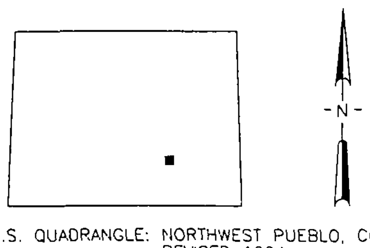


| As-Built Berm Location | Northing (feet) | Easting (feet) | Elevation (feet) |
|---|---|---|---|
| 75+00 CL | 13920.9 | 15743.2 | 4718.7 |
| 76+00 CL | 13943.6 | 15645.1 | 4719.5 |
| 77+00 CL | 13941.9 | 15544.6 | 4719.8 |
| 78+00 CL | 13970.8 | 15448.4 | 4722.0 |
| 79+00 CL | 14067.9 | 15431.7 | 4722.9 |
| 80+00 CL | 14164.6 | 15458.7 | 4723.0 |
| 81+00 CL | 14257.0 | 15500.5 | 4722.5 |
| 82+00 CL | 14342.9 | 15549.7 | 4722.6 |
| 83+00 CL | 14425.6 | 15609.9 | 4722.6 |
| 84+00 CL | 14495.3 | 15681.8 | 4722.4 |
| 85+00 CL | 14563.8 | 15757.4 | 4722.2 |
| 86+00 CL | 14632.3 | 15832.0 | 4722.0 |
| 87+00 CL | 14690.7 | 15917.6 | 4721.1 |
| 88+00 CL | 14721.0 | 16012.5 | 4719.8 |
| 89+00 CL | 14748.4 | 16109.2 | 4719.4 |
| 90+00 CL | 14779.4 | 16206.2 | 4719.1 |
| 91+00 CL | 14796.9 | 16303.1 | 4719.1 |
| 92+00 CL | 14802.9 | 16407.3 | 4718.4 |
| 93+00 CL | 14800.9 | 16507.2 | 4711.4 |
| 94+00 CL | 14797.9 | 16606.7 | 4703.3 |

Notes:
CL indicates centerline of clay berm key as determined by a 6-ft outward offset from the crest of the berm.
Berm was observed to be constructed to full height from sta. 75+00 to 92+50.
A correlation of as-built stationing to construction stationing is recorded in Haley & Aldrich's field notebook.

HALEY & ALDRICH, INC.




U.S.G.S. QUADRANGLE: NORTHWEST PUEBLO, CO
REVISED 1994

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

AS CONSTRUCTED REPORT–COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE–NORTH PARCEL
PUEBLO, COLORADO

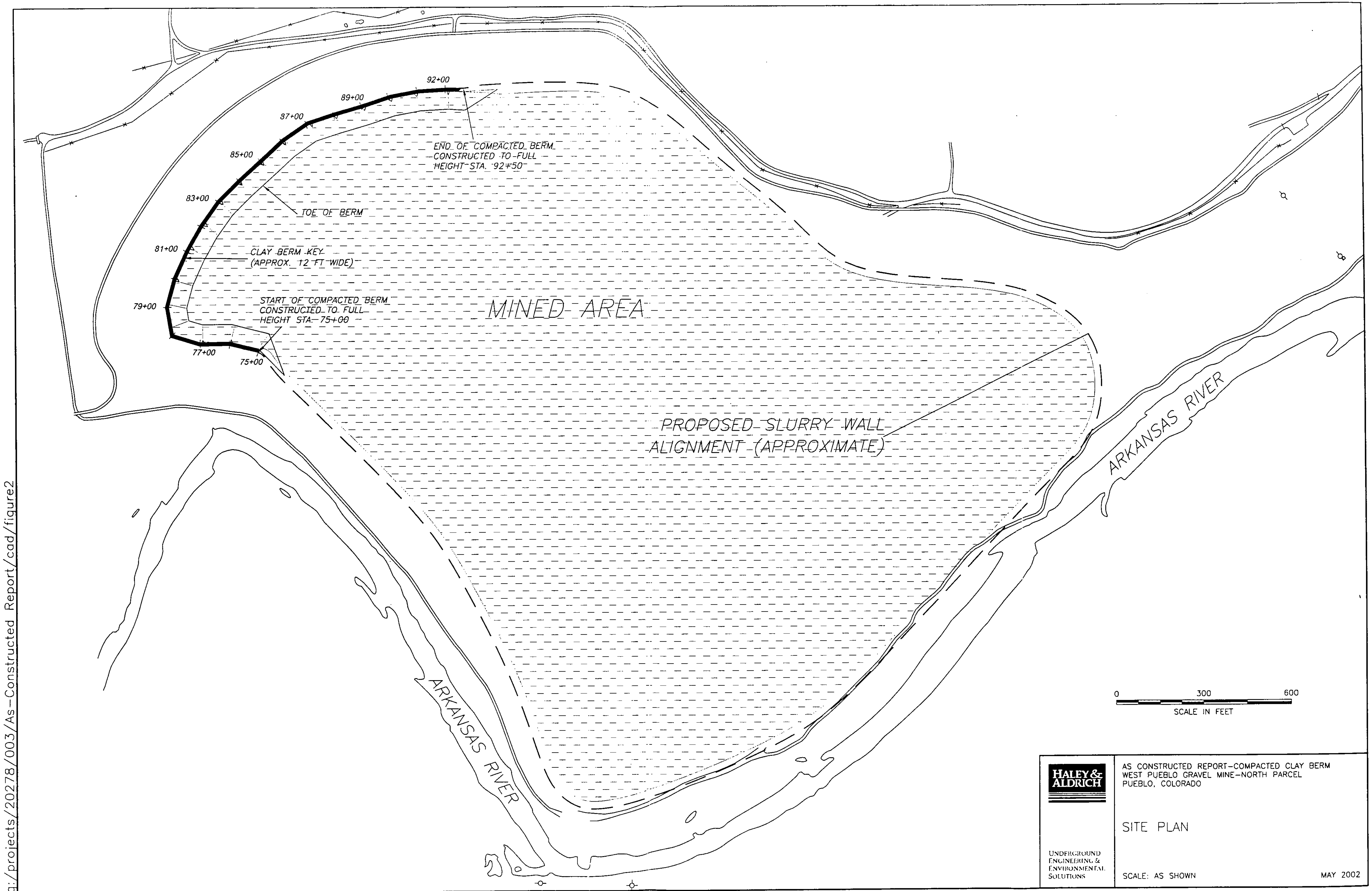
SITE LOCUS

SCALE: 1:24,000

MAY 2002

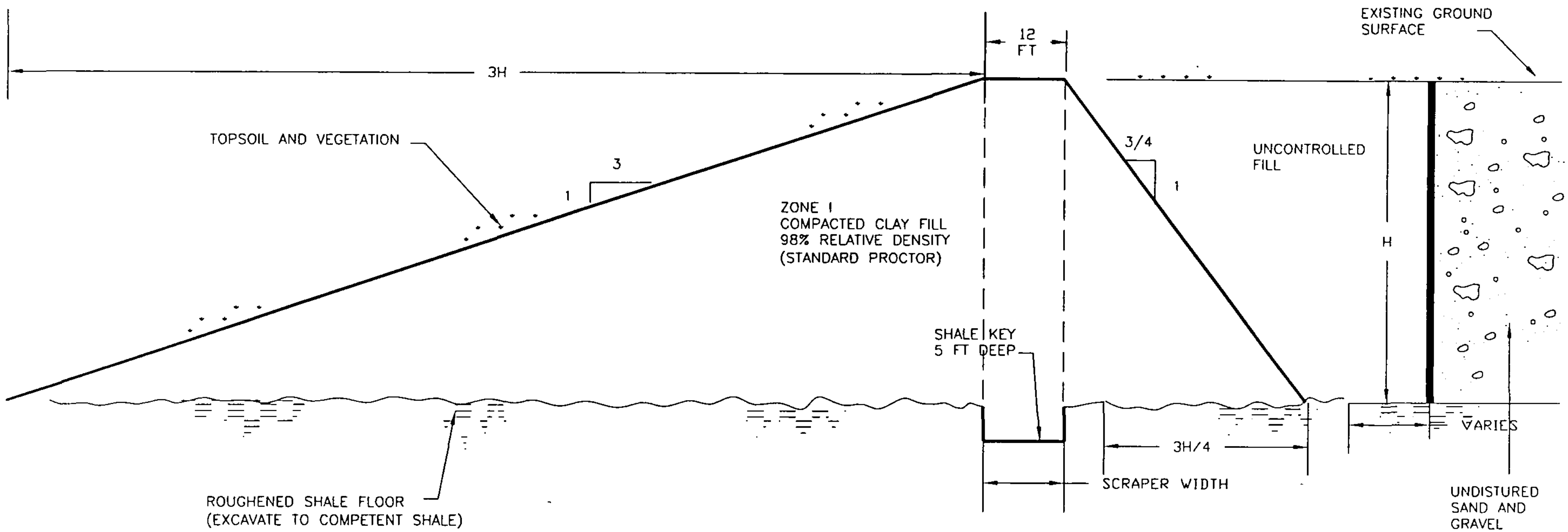
FIGURE 1

G:\projects\20278\003\As-Constructed Report\cad\Locus.dwg




g:/projects/20278/003/As-Constructed Report/cad/figure2

FIGURE 2




NOTE: SHALE KEY CHANGE TO VERTICAL SLOPE
24 FEB 1998

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

AS CONSTRUCTED REPORT-COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE-NORTH PARCEL
PUEBLO, COLORADO

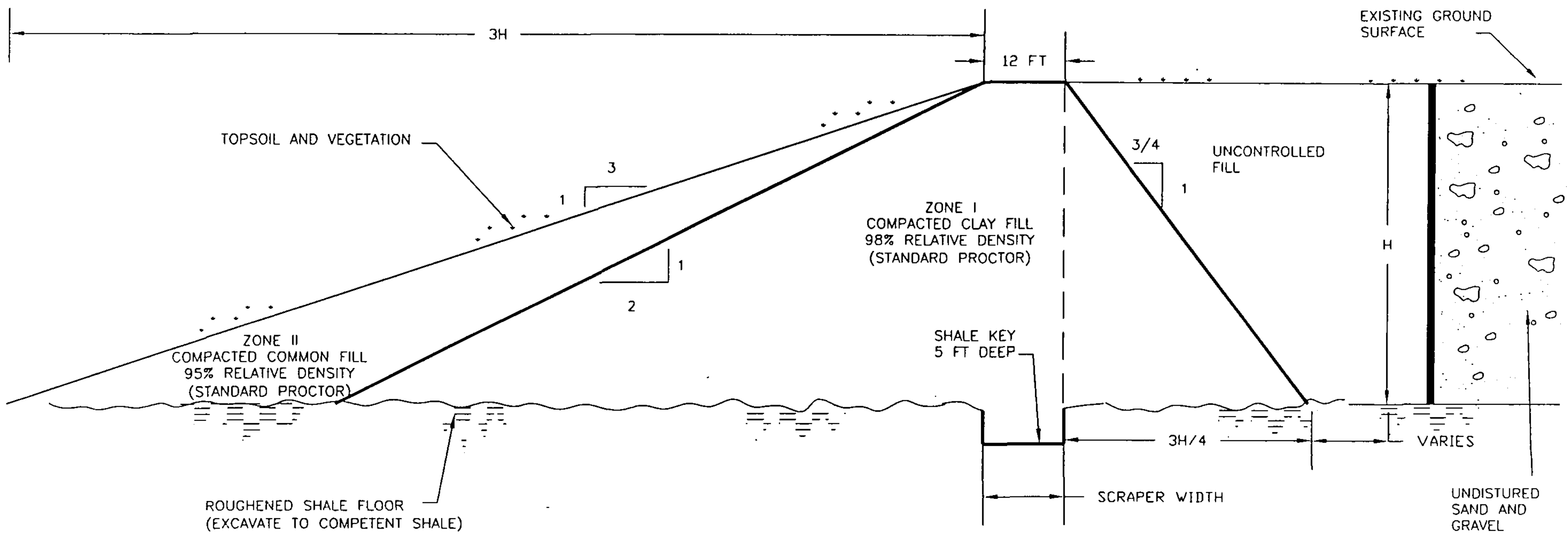
TYPICAL SECTION
COMPACTED CLAY BERM
ORIGINAL DESIGN (NOV 1997)

NOT TO SCALE

MAY 2002

FIGURE 3

g:/projects/20278/003/As-Constructed Report/Cad/figure3(REVa).dwg




NOTE: SHALE KEY CHANGE TO VERTICAL SLOPE
24 FEB 1998

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

AS CONSTRUCTED REPORT–COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE–NORTH PARCEL
PUEBLO, COLORADO

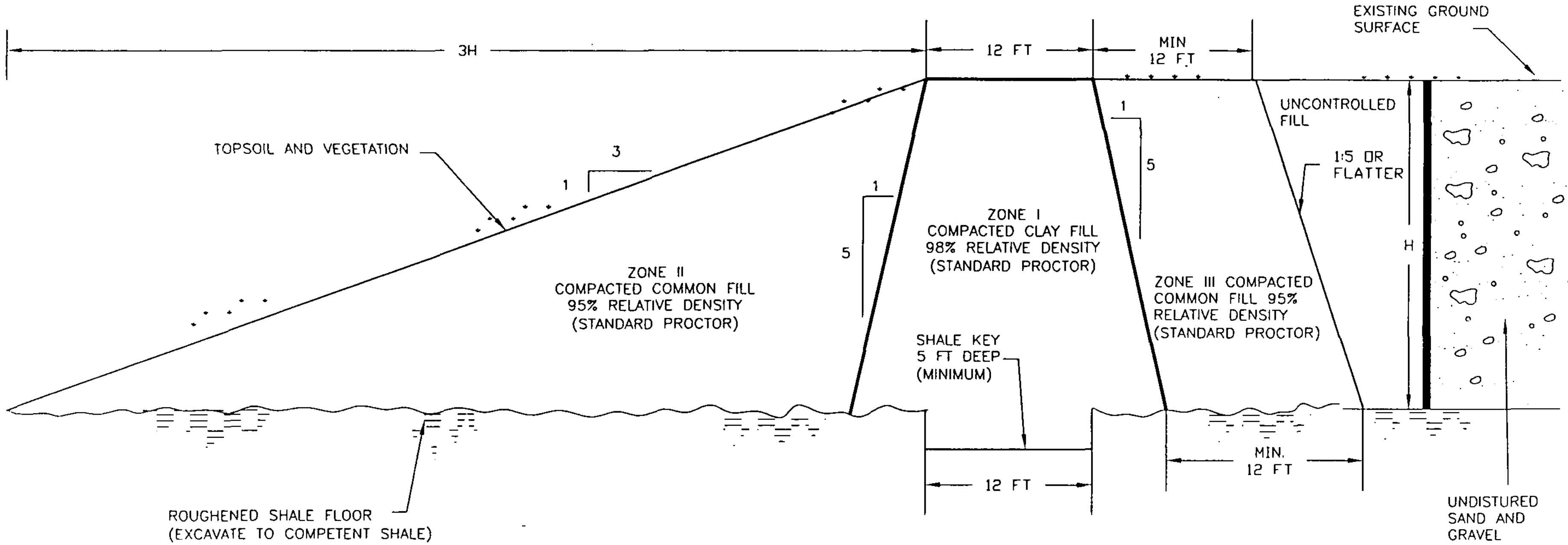
TYPICAL SECTION
COMPACTED CLAY BERM
MODIFICATION NO. 1 (MAY 1998)

NOT TO SCALE

MAY 2002

FIGURE 4

g:/projects/20278/003/As–Constructed Report/cad/figure4(REV) dwg




g/projects/20278/003/As-Constructed Report/cad/figure5.dwg

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

AS CONSTRUCTED REPORT–COMPACTED CLAY BERM
WEST PUEBLO GRAVEL MINE–NORTH PARCEL
PUEBLO, COLORADO

TYPICAL SECTION
COMPACTED CLAY BERM
MODIFICATION NO. 2 (MAR 2000)

NOT TO SCALE

MAY 2002

FIGURE 5

# APPENDIX A

## Conformed Earthwork Specifications

CONFORMED EARTHWORK SPECIFICATIONS
COMPACTED CLAY BERMS
TRANSIT MIX OF PUEBLO
WEST PUEBLO GRAVEL MINE, NORTH PARCEL

1. SCOPE

1.1 WORK INCLUDED: This section covers all earthwork to construct the compacted clay berms.

1.2 DEFINITIONS

1.2.1 Relative Compaction: "Relative compaction" is defined as the ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D 698. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the Engineering Representative.

1.2.2 Optimum Moisture Content: "Optimum moisture content" shall be determined by the ASTM D 698 to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.

1.2.3 Fines: "Fines" shall be that material which passes the No. 200 sieve as determined by ASTM D 1140.

1.2.4 Competent Shale: ACompetent shale@ is defined as unweathered shale as determined by the Engineering Representative.

1.2.5 Uncontrolled Fill: AUncontrolled fill@ shall be defined as non-hazardous, non-organic silty overburden ~~or~~ excess clayey overburden, previously excavated on-site shale, or waste "come-back" concrete. Peat and organic clay are not acceptable as uncontrolled fill

1.2.6 Engineer: The AEngineer@ is defined as the representative of Haley and Aldrich designated to perform construction inspection services and administrative functions.

1.2.7 Owner: The AOwner@ is Transit Mix of Pueblo.

1.2.8 Quality Control Technician: The AQuality Control Technician@ is defined as that representative of Transit Mix Concrete designated to perform quality control testing as approved by the Engineer.

1.2.9 Engineering Representative: The AEngineering Representative@ is defined as the Engineer or the Quality Control Technician, if the Engineer gives authorization to the Quality Control Technician to represent the Engineer for a specific task.

1.2.10 Constructor: The AConstructor@ is defined as that representative of the Owner who is responsible for constructing the berm.

1.3 CODES, ORDINANCES, AND STATUTES: The Constructor shall be familiar with, and comply with, all applicable codes, ordinances, statutes, and bear sole responsibility for the penalties imposed for noncompliance.

1.4 TOLERANCES: All material limits shall be constructed within a tolerance of 0.1 foot except where dimensions or grades are shown or specified as minimum. All grading shall be performed to maintain slopes as shown.

2. MATERIALS

2.1 CLAY FILL: Clay fill shall consist of on-site or imported material free from roots, organic matter, debris, and other deleterious material. Clay fill shall be used in Zone I of the berm. Peat and organic clay are not acceptable as clay fill. Clay fill shall have at least 55 percent fines and shall have a plasticity index of at least 15 when tested in accordance with ASTM D 4318. Individual particles up to three inches in diameter are acceptable. When compacted, clay fill shall result in a fill without visible voids between particles, and all particles larger than 1/4 inches shall be completely surrounded by a continuous soil matrix.

2.2 COMPACTION EQUIPMENT: Provide compaction, watering, and aerating equipment of suitable type to achieve the specified compaction moisture content and relative compaction. A pad foot roller or equivalent which kneads the soil during compaction is required for clay fill compaction.

2.3 UNCONTROLLED FILL: Uncontrolled fill material shall be as defined and will be needed for Zone III of the berm to support the ~~3/4H:1V~~ clay fill and common fill slope as construction proceeds. Shale should be broken down to a maximum particle size of 6 inches or less. "Come-back" concrete could be placed either wet, dumped into the fill directly from trucks, or already cured, as hardened bulbs. If the concrete is placed as hardened bulbs, placement should be in a manner that prevents "nesting" of the bulbs or any other creation of large voids.

2.4 COMMON FILL: Common fill shall consist of any on-site non-organic overburden material needed for Zone II of the berm.

3. EXECUTION

3.1 FOUNDATION PREPARATION

3.1.1 The clay berm shall be founded on competent shale as defined in 1.2.4. If the shale is not considered competent, it shall be excavated until competent shale is found.

3.1.2 Excavate the shale key to the lines and grades shown. Excavation of the shale key shall be timed such that the excavated key is filled with compacted clay within two days after excavation.

3.1.3 The competent shale floor shall be roughened and scarified to the satisfaction of the Engineering Representative.

3.1.4 Immediately before the placement of fill the roughened shale floor shall be free of gravel, cobbles, debris, organic materials, and other deleterious materials.

3.2 FILL SURFACE PREPARATION: Immediately before additional clay fill is added to an existing fill surface that surface shall meet the following specifications.

3.2.1 Surfaces to receive fill shall be free of debris, organic materials, particles larger than six inches, and other deleterious materials.

3.2.2 Previous fill surfaces to receive additional fill shall be compacted to the required relative density ~~98 percent relative compaction~~ with a moisture content within a range of -1 to +3 percent of the optimum moisture content.

3.2.3 Prior to placement of subsequent lifts, previous fill surfaces shall be scarified with a disc or similar equipment and moisture conditioned to facilitate bonding with the new fill.

3.2.4 Surfaces to receive fill shall not have ponded water, snow or ice, nor be desiccated or cracked.

3.3 PROTECTION OF COMPLETED LIFT AND PREPARED GROUND SURFACE: After completion of a lift or ground surface preparation, all unnecessary traffic shall be kept off. Should it be found necessary to haul over the completed lift or prepared ground surface, the Constructor shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface. All cuts, ruts, and breaks in the lift or surface that are not removed by the above operations shall be repaired. Winter earthwork operations are common along the Front Range and can be performed satisfactorily by adopting certain procedures and taking prudent precautions.

3.3.1 Generally, earthwork operations can be conducted whenever the water being used to moisture condition the fill does not freeze prior to being mixed with the fill and, after mixing, the moisture-conditioned fill does not freeze prior to compaction or prior to placing the next lift. These conditions can obviously be met when temperatures are above freezing and can even be met when temperatures are below freezing due to direct sunshine and/or due to the fill material being warmer than the ambient temperature. The exact temperature and weather limitations can be determined by the Constructor and the Engineer as winter operations progress.

3.3.2 At the end of each work day, the exposed active fill area should be covered with a minimum six-inch thick, loose, dry lift of soil which will serve as an insulating layer to limit freezing.

3.3.3 At the beginning of each work day, the loose lift form the night before should be inspected for evidence of freezing. If any frozen soil exists, it should be removed to the full depth of freezing, even if frozen soil extends beneath the loose lift and into previously compacted soil. After removing frozen soil, the exposed surface should be scarified with a disk or pulvamixer. Earthwork operations can then proceed as normal. If the loose lift does not contain any frozen soil, then it can be moisture conditioned and compacted in place without the need for removing it.

3.3.4 Any portion of the fill which is not being actively worked but becomes subject to freeze/thaw cycles should be scarified and recompacted prior to placing additional fill even if it is not frozen at the time work is resumed in that area.

3.3.5 Also at the beginning of each work day, the borrow source should be inspected for evidence of freezing. All frozen materials should be stripped form the borrow source and not used in the fill. Prewetting the borrow source is not desirable for winter construction.

3.3.6 Earthwork can be conducted after snowstorms providing that the snow is removed form the borrow source and form the active fill area and providing that the other conditions outlined above are met.

## 3.4 FILL

3.4.1 Obtain the Engineering Representative's review of the surface to be filled and the fill material to be used prior to placing any fill.

3.4.2 Do not place frozen fill, or fill mixed with snow or ice.

3.4.3 ~~Clay~~ Fill shall be placed in horizontal lifts and each lift compacted to the specified relative compaction for the full width. Borrow area fill shall be blended to achieve a homogenous fill across the embankment without lenses, pockets, or zones of different materials.

3.4.4 All ~~clay~~ fill shall be moisture conditioned to the specified range.

3.4.5 All surfaces shall be finished to provide adequate drainage. Any softening or loosening due to the collection of water shall be corrected by overexcavation and replacement. The finished surface shall be reasonably smooth, compacted, free from irregular surface changes, and comparable to the smoothness obtained by bladegrader operations.

3.4.6 The 3/4H:1V, 2H:1V, or 1H:5V fill slope shall not be left exposed for heights greater than 5 feet as shown in the construction stage typical cross section. Uncontrolled fill shall be placed between the 3/4H:1V or 1H:5V slope and the undisturbed sand and gravel.

3.4.7 Zone I,II, and III material should be constructed simultaneously. Zone I material should be "benched" into the Zone II material to prevent the development of a potential sliding surface.

3.5 COMPACTION REQUIREMENTS

3.5.1 General: Compact all materials by mechanical means. Flooding or jetting will not be permitted. If compaction tests indicate that compaction or moisture content is not as specified, material placement shall be terminated and the Constructor shall take corrective action prior to continued placement.

3.5.2 Clay Fill: Place clay fill in loose lifts not exceeding 8 inches. Compact each lift to at least 98 percent relative compaction within a moisture content of -1 to +3 percent of optimum. A kneading compactor such as a pad foot roller or equivalent is required for clay fill compaction. Rubber tired rollers are specifically excluded. Do not attempt to compact fill material that contains excess or insufficient moisture. If the fill contains insufficient moisture, add water by sprinkling and thoroughly discing the fill. If the fill contains excess moisture, aerate the material by blading, discing, harrowing, or other methods, to accelerate the drying process.

3.5.3 Uncontrolled Fill: No compaction is needed for uncontrolled fill.

3.5.4 Common Fill: Same as Clay fill except that only 95 percent relative compaction is required.

3.6 FIELD DENSITY AND MOISTURE TESTING: Density and moisture testing shall be carried out as specified in the Construction Quality Assurance and Quality Control Plan

3.7 SITE GRADING: Perform all earthwork to the lines and grades as shown. Shape, trim, and finish slopes to conform with the lines, grades, and cross sections shown. Make slopes free of all exposed roots and stones exceeding 6-inch diameter. Finished site grading will be reviewed by the Engineering Representative. Blend new berm and uncontrolled fill into existing topography. Perform grading such that ponding or channeling of water is avoided.

3.8 TOPSOIL: To minimize erosion, topsoil shall be spread and vegetation planted on 3H:1V slopes in accordance with the Owner=s approved permit.

***END OF SECTION***

# CONSTRUCTION QUALITY ASSURANCE AND QUALITY CONTROL PLAN
# COMPACTED CLAY BERMS
# TRANSIT MIX OF PUEBLO
# WEST PUELBO GRAVEL MINE, NORTH PARCEL

## PURPOSE AND SCOPE

This Construction Quality Assurance and Control Plan addresses Quality Assurance and Quality Control for the construction of the Compacted Clay Berms. In the context of this plan, Quality Assurance (QA) refers to the means and action employed to monitor construction methods, materials and completed work to verify that the project is constructed in accordance with the Construction Drawings and Specifications; and to demonstrate that the objectives of the design are achieved.

In order to accomplish QA objectives, the scope of this plan includes:

Pre-construction review of the Constructor=s proposed methods and materials

Field observations of construction activities,

Verification of material types and properties through field and laboratory testing, and field observations,

Post-construction evaluation.

Project quality is fostered through clearly defined roles and responsibilities, through frequent review of work in progress and required Quality Control (QC) measures. QC is defined as the measures implemented by the Constructor during construction to consistently monitor construction materials and activities such that potential deficiencies can be remedied in a timely manner.

## APPROACH

Quality Control will be provided full time by a Transit Mix Quality Control Technician. During the initial first two weeks a Haley & Aldrich earthwork specialist will be on site full time and train the Transit Mix Quality Control Technician in clayey soil selection, moisture conditioning, placement and compaction, and Quality Control testing and observations. After the initial two week period, the specialist will make periodic visits at the rate of one day per week for the next two months and then one trip per month for the next 22 months. The Haley and Aldrich earthwork specialist and Colorado P.E. will provide Quality Assurance throughout the project.

## QUALITY CONTROL

During the initial two weeks, through cooperative interaction, Haley & Aldrich will train the Transit Mix Technician in Quality Control procedures that will aid in the verification of project quality. The Quality Control procedures that will be set forth by Haley & Aldrich and that will be conducted full-time by the Transit Mix Technician after the initial two weeks include the following.

1. Material and quality evaluation testing will be conducted on a daily basis. Test types and the frequency of the tests are outlined in Table 1. Testing procedures and forms follow Table I. A record of all test results will be kept and submitted to Haley & Aldrich on a weekly basis for review.

2. Quality Control Field Reports will be conducted on a daily basis, and will cover the following items.

    A. Date, project name, location, weather conditions

    B. Summary of meetings or discussions

    C. Summary of daily activities including: identification of work areas, description and location of on-going construction, equipment and personnel in each work area, description and specific locations of areas, or units, of work being tested or observed and documented, locations where tests and samples were taken, a summary of field test results and retest results.

    D. A detailed description of construction problems which includes the probable cause of the deficiency and how and when the deficiency was found and located and the resolution of the problem.

    E. Daily field reports will be submitted to Haley & Aldrich weekly for review.

3. Specific observations that are relevant to the final quality of the project and that must be included as observed in the Quality Control daily reports include the following.

    A. The material used as clay fill for the compacted clay berm meets the standards set forth in the design and initial feasibility studies.

    B. The percent moisture of the clay and the compaction effort placed on the clay should be recorded. This observation should include the thickness of the lifts, a visual description of the clay, the number of passes made by the compactor, how water was added to the lift, and if the material needed to be reworked.

    C. A description of any questionable material, poor procedure, failure, or erosion that may lead to a possible seep in the clay berm that includes location and initial date of discovery.

    D. The dimension of the clay berm should be observed, recorded and checked for compliance with the specification.

E. The shale subgrade preparation should be recorded. This observation should include the condition of the shale prior to fill placement, how the shale was roughened, and the location and frequency of jointing in the shale.

F. The shale key depth, width, and measured location should be recorded at 50 ft stations along the berm.

## QUALITY ASSURANCE

Haley & Aldrich will provide Quality Assurance during the project. This will be accomplished through daily to monthly site visits, review of field and laboratory test results, review of Quality Control daily field reports, and cooperative interaction with Transit Mix on methods and procedures used during construction.

The Quality Assurance personnel will perform the following tasks that will aid in verification of project quality and remedy any potential discrepancy.

1. Prior to construction, Haley & Aldrich will conduct a pre-construction meeting to ensure methods and materials outlined in the specifications are employed in the construction of the compacted clay berm. Haley & Aldrich will be on-site for two weeks to ensure proper construction methods are employed.

2. After the initial two weeks, site visits will be conducted weekly for two months and monthly for 22 months. During these visits, Haley & Aldrich will observe field activities including construction methods and testing procedures performed by Transit Mix.

3. Construction documents such as Quality Assurance daily field reports and field and laboratory test result summary reports will be submitted to Haley & Aldrich weekly for review.

4. Haley & Aldrich will produce weekly to monthly summary reports detailing construction activities and any discrepancies noted. The reports will be in a format acceptable to the State Engineer=s Office (SEO).

5. Haley & Aldrich will provide on-going assistance with construction issues which include construction methods, materials, Quality Control procedures, and testing procedures. Discrepancies will be dealt with immediately by Haley & Aldrich and Transit Mix.

6. A Final As-Built Report will be prepared by Haley & Aldrich. The final report will be in a format acceptable to the SEO.

**TABLE 1**

TRANSIT MIX COMPACTED CLAY BERM

MINIMUM TESTING FREQUENCY FOR MATERIAL AND QUALITY EVALUATION

| | GRADATION (D1140) | ATTERBERG LIMITS (D4318) | PROCTORS (D698) | SAND CONE (D1556) | MOISTURE & DENSITY (D3017 & D2922) | PERMEABILITY (D5084) |
|---|---|---|---|---|---|---|
| Minimum Frequency Required | One per 2,500 CY | One per 2,500 CY | One per 10,000 CY | ~~One per day adjacent to Nuclear Density Compaction test~~ Once per 5,000 CY | One per 500 CY or 1 per lift placed | 500 ft spacing around perimeter at varying fill elevations |

Quality Control Testing including laboratory permeability and full-time quality control observation will be provided by Transit Mix.

Haley & Aldrich will direct the sampling for laboratory permeability testing. If these tests are performed by Transit Mix, duplicates of the first three tests will be performed by an outside laboratory and every fifth test thereafter will be performed by an outside laboratory.

Transit Mix staff will be trained in clayey soil selection, moisture conditioning, placement and compaction by an Haley & Aldrich earthwork specialist.

Quality Assurance will be provided by Haley & Aldrich geologists and engineers and will include review of all laboratory testing data sheets, calculations and results.

# APPENDIX B

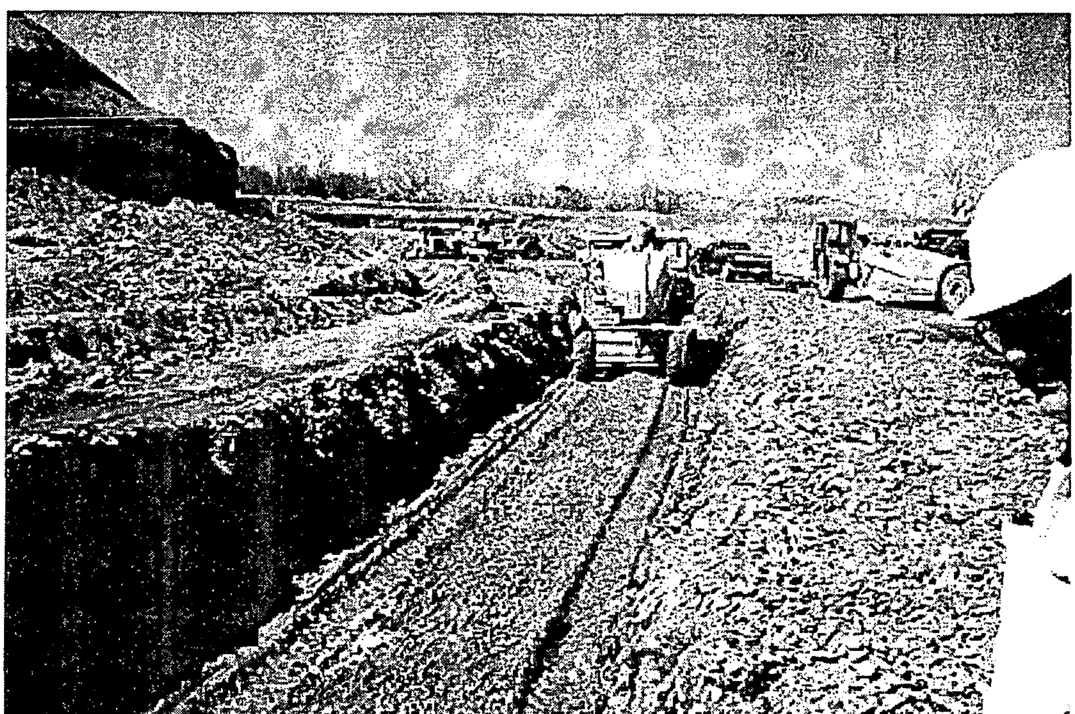
## Construction Photographs

Excavation of keyway between station 74+00 and 78+00.

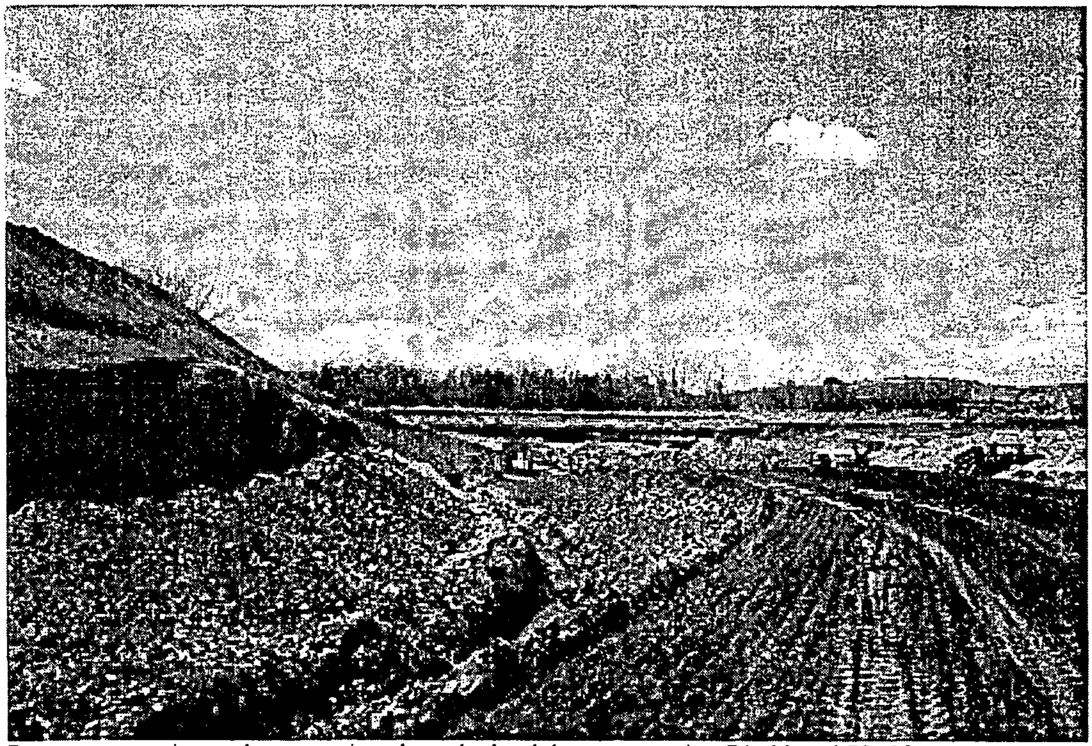
Excavating the keyway between Station 74+00 and 78+00.

HALEY & ALDRICH

Clay placement in keyway between station 74+00 and 78+00.

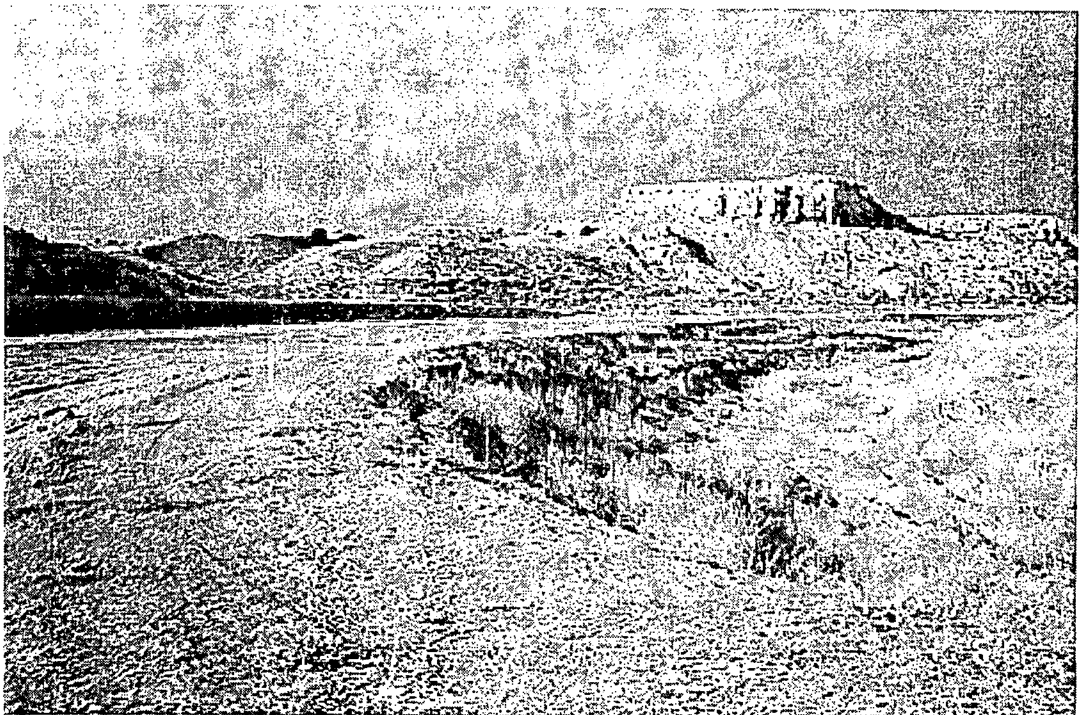


Clay placement in keyway between station 74+00 and 78+00.

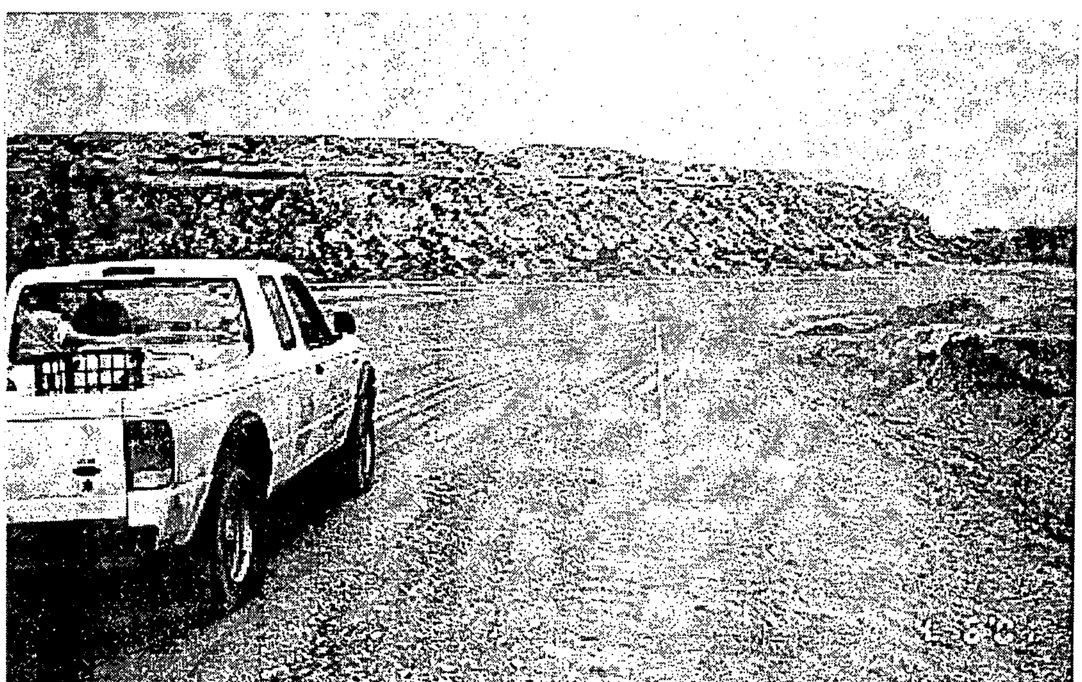


Berm construction and compaction above bedrock between station 74+00 and 78+00.

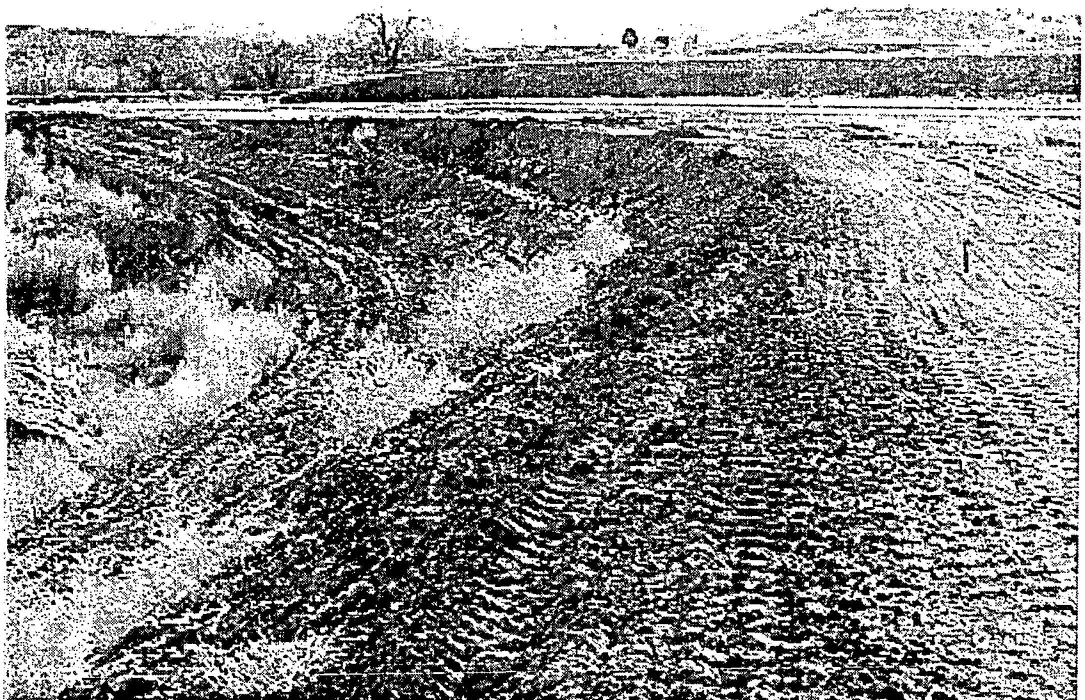
Looking west at the start of the berm (station 74+00).



Looking north along completed berm from station 78+00.



Looking east from station 91+60 to end of completed berm.



Looking west along completed berm from station 89+00.

Gmail

Dan Tucker <dan@agraco.net>

# Fw: Transit Mix

1 message

**Wayne Eckas** <wayne@eckaswater.com> Wed, Sep 8, 2021 at 5:13 PM
To: "Daniel Tucker, PE" <dan@cwpda.org>

Dan,

Here is a note from Steve regarding the liner at the Pueblo West pit.

Wayne E. Eckas, P.E.

c: 970-690-1001

e: wayne@eckaswater.com

www.eckaswater.com

*WATER WORKING EFFICIENTLY*

---

**From:** Steve Kuehr <Steve@LithosEng.com>
**Sent:** Wednesday, September 8, 2021 3:16 PM
**To:** Wayne Eckas <wayne@eckaswater.com>
**Subject:** Transit Mix

Hi Wayne – let me know if you have any questions on what I sent over. For the West pit, some of the documents refer to a partial berm and future slurry wall. As discussed, Transit Mix completed the reclamation along the alignment of the proposed slurry wall with compacted fill rendered form overburden soils. The fill was so well constructed that I suggested thye do a 90 day test before building the slurry wall. The test passed and the wall was never built. Let me know if you think you may still need something from the Brierley files.

**Steve Kuehr, PE**

*Senior Consultant*

LITHOS ENGINEERING

*Lithos Engineering*

*Direct: 720.316.4858*

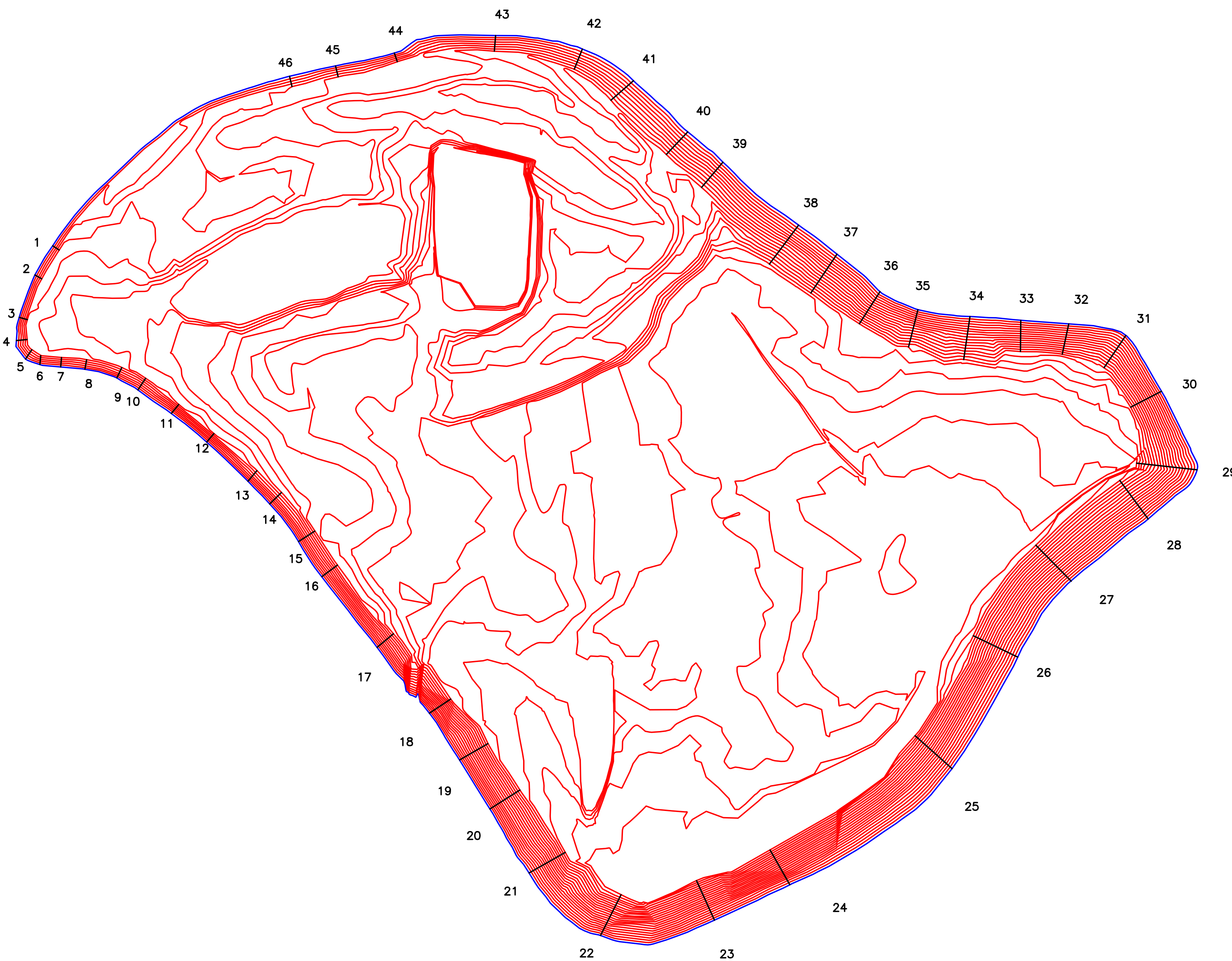
*Cell: 303.618.8367*

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

# APPENDIX C

## CWPDA Slope Analysis

Figure 1. The CWPDA Slope Stability Analysis Plan, showing slope analysis locations.



| Location | Elevation Y2, Top of Slope, Ft | Elevation Y1, Toe of Slope, Ft | Distance, X | Slope, Ft/Ft | |
|---|---|---|---|---|---|
| 1 | 4715 | 4711 | 20.2 | 5 | :1 |
| 2 | 4715 | 4711 | 20.3 | 5 | :1 |
| 3 | 4715 | 4710 | 22.0 | 4 | :1 |
| 4 | 4715 | 4710 | 28.1 | 6 | :1 |
| 5 | 4715 | 4710 | 29.3 | 6 | :1 |
| 6 | 4715 | 4710 | 23.3 | 5 | :1 |
| 7 | 4715 | 4710 | 24.6 | 5 | :1 |
| 8 | 4715 | 4710 | 25.1 | 5 | :1 |
| 9 | 4715 | 4709 | 29.8 | 5 | :1 |
| 10 | 4715 | 4708 | 36.3 | 5 | :1 |
| 11 | 4715 | 4708 | 30.5 | 4 | :1 |
| 12 | 4715 | 4708 | 29.1 | 4 | :1 |
| 13 | 4715 | 4708 | 36.2 | 5 | :1 |
| 14 | 4715 | 4707 | 42.9 | 5 | :1 |
| 15 | 4715 | 4705 | 50.5 | 5 | :1 |
| 16 | 4715 | 4705 | 50.7 | 5 | :1 |
| 17 | 4715 | 4704 | 55.3 | 5 | :1 |
| 18 | 4715 | 4700 | 66.5 | 4 | :1 |
| 19 | 4715 | 4699 | 85.1 | 5 | :1 |
| 20 | 4715 | 4698 | 92.0 | 5 | :1 |
| 21 | 4715 | 4696 | 108.1 | 6 | :1 |
| 22 | 4715 | 4694 | 118.6 | 6 | :1 |
| 23 | 4715 | 4694 | 112.7 | 5 | :1 |
| 24 | 4715 | 4694 | 103.9 | 5 | :1 |
| 25 | 4715 | 4694 | 128.6 | 6 | :1 |
| 26 | 4715 | 4696 | 128.1 | 7 | :1 |
| 27 | 4715 | 4695 | 131.2 | 7 | :1 |
| 28 | 4715 | 4697 | 124.3 | 7 | :1 |
| 29 | 4715 | 4695 | 158.0 | 8 | :1 |
| 30 | 4715 | 4699 | 89.8 | 6 | :1 |
| 31 | 4715 | 4701 | 101.2 | 7 | :1 |
| 32 | 4715 | 4701 | 80.6 | 6 | :1 |
| 33 | 4715 | 4701 | 81.2 | 6 | :1 |
| 34 | 4715 | 4701 | 112.8 | 8 | :1 |
| 35 | 4715 | 4701 | 99.8 | 7 | :1 |
| 36 | 4715 | 4699 | 99.1 | 6 | :1 |
| 37 | 4715 | 4699 | 121.8 | 8 | :1 |
| 38 | 4715 | 4699 | 126.3 | 8 | :1 |
| 39 | 4715 | 4698 | 85.9 | 5 | :1 |
| 40 | 4715 | 4698 | 80.9 | 5 | :1 |
| 41 | 4715 | 4704 | 77.6 | 7 | :1 |
| 42 | 4715 | 4705 | 56.5 | 6 | :1 |

| | | | | | |
|---|---|---|---|---|---|
| 43 | 4715 | 4706 | 40.8 | 5 | :1 |
| 44 | 4715 | 4707 | 24.0 | 3 | :1 |
| 45 | 4715 | 4708 | 29.2 | 4 | :1 |
| 46 | 4715 | 4710 | 27.9 | 6 | :1 |
| | | | **Average:** | 6 | :1 |
| | | | **Min:** | 3 | :1 |
| | | | **Max:** | 8 | :1 |

| Number of Sample Locations | Design Slope | Maximum Slope | Minimum Slope | Average Slope |
|---|---|---|---|---|
| 46 | 3:1 | 8:1 | 3:1 | 6:1 |

**C**olorado **W**ater **P**rotective and **D**evelopment **A**ssociation

205 South Main Street
Fowler, Colorado, 81039
Phone: 719-826-2597
www.cwpda.org

## APPENDIX D

## Setback Evaluation


# WEST PUEBLO GRAVEL PIT & RESERVOIR

SETBACK ANALYSIS PLAN

AGRA
Arkansas Groundwater & Reservoir Association

| No. | Revision/Issue | Date |
|---|---|---|
| | | |
| | | |

Firm Name and Address

Project Name and Address

WEST PUEBLO RESERVOIR
2596 CO-96
PUEBLO, COLORADO 81001

Project

Sheet

Date
21/OCT/21

Scale
As Noted

**CPW Fence**

| Location | Distance, X, feet |
|---|---|
| 1 | 171.2 |
| 2 | 153.4 |
| 3 | 156.8 |
| 4 | 153.3 |
| 5 | 144.5 |
| 6 | 142.1 |
| 7 | 142.1 |
| 8 | 140.7 |
| 9 | 142.4 |
| 10 | 139.9 |
| 11 | 149.9 |
| 12 | 150.4 |
| 13 | 145.4 |
| 14 | 139.3 |
| 15 | 154.1 |
| 16 | 145.8 |
| 17 | 148.5 |
| 18 | 150.7 |
| 19 | 152.3 |
| 20 | 155.9 |
| 21 | 108.4 |
| 22 | 101.1 |
| 23 | 104.4 |
| 24 | 108.1 |
| 25 | 113.7 |
| 26 | 137.5 |
| 27 | 132.4 |
| 28 | 107.8 |
| 29 | 96.6 |
| 30 | 111.5 |
| 31 | 101.8 |
| 32 | 98.5 |
| 33 | 105.3 |
| 34 | 102.7 |
| 35 | 106.3 |

| | |
|---|---|
| **Average:** | 131.9 |
| **Min:** | 96.6 |
| **Max:** | 171.2 |

**CPW Trail**

| Location | Distance, X, feet |
|---|---|
| 1 | 202.5 |
| 2 | 192.3 |
| 3 | 184.4 |
| 4 | 166.8 |
| 5 | 165.0 |
| 6 | 200.2 |
| 7 | 191.9 |
| 8 | 140.0 |
| 9 | 148.5 |
| 10 | 139.3 |
| 11 | 146.1 |
| 12 | 133.8 |
| 13 | 131.6 |

| | |
|---|---|
| **Average:** | 164.8 |
| **Min:** | 131.6 |
| **Max:** | 202.5 |

**Black Hills Energy - OH Electrical Pole**

| Location | Distance, X, feet |
|---|---|
| 1 | 150.9 |