Town Council
WORK SESSION
Tuesday, November 15, 2022
Public Meeting Room / Eagle Town Hall
200 Broadway Eagle, CO

This agenda and the meetings can be viewed at www.Townofeagle.org.
Times listed are approximate and are subject to change.

TOWN COUNCIL WORK SESSION ACCESS INFORMATION AND PUBLIC PARTICIPATION *This will be an in-person work session. Work sessions of the Town Council are not meetings requiring public comment. The public is allowed to attend, however, public comment will not be scheduled and will only be taken at the discretion of the Mayor. The Council shall take no final or official action, vote, nor make any motions.*

1.

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PRESENTATION 4:00 PM - 5:45 PM

1. Work Session with Mountain Recreation - Eagle Pool

I hereby certify that the above Notice of Meeting was posted by me in the designated location at least 24 hours prior to said meeting.

Jenny Rakow, CMC
Town Clerk

PUBLIC WIFI – Eagle Guest

BOARD & COUNCIL ACTION REPORT

Meeting Date: November 15, 2022

Prepared by: Janet Bartnik, Executive Director

SUBJECT: Eagle Pool Analysis of Options

RECOMMENDED ACTION:
Provide direction to staff regarding repairs to the Eagle Pool.

BACKGROUND:
The Town of Eagle and Mountain Recreation cooperatively constructed an outdoor pool and ice rink facility in 2002-03. By intergovernmental agreement, the facility is jointly owned with extraordinary capital outlays shared equally between the partners. Mountain Recreation operates the facility, subsidizing any annual operating deficits realized.

The Eagle Pool was closed for the season in 2022 when subsurface soil compaction had lowered the northwest end of the pool significantly enough not to permit proper filtration of pool water to ensure bather safety. Town and District staff have been working together to uncover the source of the issues related to an unusual water loss identified during normal pool opening procedures. Highlights of the forensic work undertaken by the joint staff team:

- Staff isolated each pool 'system' in an effort to identify the source of the unusual water loss. Testing over the Memorial Day weekend revealed that the unusual water loss is not related to three of the pool's systems. When those systems were operating, no more water was lost than would normally have been lost to evaporation.

- Onsite inspections by a leak detection firm and the pool builder confirmed staff's belief that the water loss must be associated with the gutter system that circulates water between the pool and the filtration system since the water loss only occurs when water levels are near full and lapping into the gutters. Staff calculated that, when the autofill is on and water levels are dropping, the pool lost between 13,000-16,000 gallons each day. Typically, evaporative losses would be between 800-1,000 gallons in a day. There was no good indication as to where the water is going once it left the pool.

- The northwest end of the pool dropped, making it impossible for the pool to fill with enough water to reach the entirety of the filtration system's gutters. Staff and consultants measured various areas around the pool to get a full understanding of the damage to the stainless-steel gutters. Measurements showed that the pool gutters had bowed, with the center of the lap pool higher than either the deep or shallow ends. Weld joints between stainless steel sections of the gutters were noted as split open.

- Concern over the water loss and its damage to surrounding soils, particularly considering preconstruction soils reports and potential future issues with a repaired pool, caused staff to call in a geotechnical firm (WJE) to conduct forensic testing. Three test pits were opened alongside the pool to examine the soil directly adjacent to the pool and underneath the deck, and to expose the plumbing lines around the pool. The staff team and WJE consultants observed voids in each test pit opened. The pool's sub-liner was observed in the test pit between the lap pool and the zero-depth entry. That liner was not observed in the other two test pits on the deep end of the

pool. Soil samples were taken. Staff filled the pool to observe for water leaks with the test pits opened. Water was easily visible in areas tested that was coming through the pool wall between the concrete pool structure and the stainless-steel gutters that are set atop the structure.

- Five exploratory borings were drilled to investigate ground conditions under and around the pool on August 4.

- A full report of the geotechnical investigation was delivered to staff in mid-September and is attached.

- A pool design firm was consulted to review pool system condition and to assist in development of recommended strategies for repair and mitigation of soils issues now and in the future.

- The design firm principal delivered a draft report in late October after a site visit October 5 and is attached.

The Town of Eagle and Mountain Rec are convening both decision making bodies to compare and weigh options available with regard to the future of the Eagle Pool. Consideration should be given to cost estimates, anticipated lifespan of the pool after replacement, community interest in / use of the pool, and the impact of mitigation strategies on the pool itself. Consultant team has provided a number of strategies for Town and District consideration for both mitigation and repair / replacement.

Soils Mitigation Strategies

The geotechnical engineering firm strongly recommends aggressive water management measures at this site. However, even with aggressive water management, some potential for, and therefore risk associated with future collapsible soil behavior will remain. Strategies below address either water management or mitigation of collapse potential.

Priority	Summary	Application	Cost Estimate
Water Management	**Landscaping/grading improvements** that prevent water from getting under the pool structure – may include elimination of irrigated turf grass within 50 feet of the pool perimeter, considerations related to planter boxes if used, and careful design of surface grading and drainage	Required for both repair or replacement	TBD
Water Management – enhanced option	In lieu of landscaping/grading improvements, **expanding the pool deck** could be considered	Could be applied to both	TBD
OPTION – Mitigation of Collapse Potential	**Removal and replacement of collapsible soil** with better material - the depth of excavation required with this approach will vary based on the thickness of the collapsible alluvial fan material under the pool	More practically applied with a replacement project	TBD
OPTION – Mitigation of Collapse Potential	**Ground improvement** to densify the soils under the site	Could be applied to both	TBD
OPTION – Mitigation of Collapse Potential	Deep foundations could be installed to support the pool through collapsible soils, potentially via drilled **micropiles, helical piers, or drilled piers**	Could be applied to both	TBD

The geotechnical engineering firm opinion suggests that limiting the amount of water entering the soil should strongly guide the scope and approach to any rehabilitation or reconstruction of the pool. Redundant measures to prevent, detect, and capture or repair leakage from the pool and related infrastructure and piping are advisable. This should include water supply, circulation, drains, gutters, and overflow components – essentially any component that could leak water into the ground under and

around the pool. This recommendation has been considered by the pool design firm and included in the cost estimates in the Eagle Pool Repair and Replacement Options section below. Not all costs for water management and mitigation of future collapse potential listed above are included in the cost estimates listed.

Eagle Pool Condition

The pool design firm report outlines the firm's assessment of the pool's condition in an effort to aid the Town Council and Mountain Rec Board in making decisions about the future of the pool. The report identifies the source of recent leaks to be pool water traveling under the stainless-steel gutter and through the pool wall/deck construction joint. The report also notes that in addition to the primary issues of water leaks and subgrade stability, there are other areas of the facility that have worn or are otherwise in need of improvement. Areas suggested in need of improvement are the pool structure, pool finish, pool deck, below-grade piping, water slide, toddler slide, spray feature, tiled vortex pool, and pool treatment equipment.

Eagle Pool Repair and Replacement Options

Staff from both the Town and District suggest there are four options for the partnership to explore:

1. Basic repair to the pool only.
2. Repair the pool with improvements to address the pool's aging (retains original design).
3. Replace the pool.
4. Close the pool permanently.

The following discussion provides a summary of key decision-making factors from the information detailed in the pool assessment for each option.

OPTION	Estimated Cost Range	Soils Modifications Cost	Anticipated Lifespan	Construction Timeframe
Basic Renovation to Fix the Pool	$1.1 - $1.4 million	TBD – depends on approach	Unknown	8-10 months
Long-Term Renovation	$1.8 - $2.3 million	TBD – depends on approach	15 to 20 years	8-10 months
Pool Replacement	$3.7 - $4.7 million	TBD – depends on approach	30 to 50 years	11-12 months
Close the Pool Permanently	Costs incurred for demolition and restoration of site	NA	NA	NA

POLICY ISSUE: Depending on the strategies employed, the Town and District may wish to consider negotiating a fresh intergovernmental agreement governing construction and future capital and operating plans. The current intergovernmental agreement was executed June 25, 2002. Its initial term expired after 15 years. Renewals are automatic for one-year intervals unless either party provides the other 180 days advance notice of non-renewal.

FINANCIAL CONSIDERATIONS:

☐ Budgeted item

Line item:
Amount:

☒ Non-Budgeted item
Line item:
Amount: TBD
dependent upon direction

☐ Not applicable

ATTACHMENTS:

Geotechnical Report (WJE)
Pool Assessment Report (Water's Edge Aquatic Design)
Construction Timeframe Estimates memo

November 10, 2022

Ms. Janet Bartnik
Executive Director
Mountain Recreation - Eagle, CO

Assessment of Conditions for Eagle Pool

Dear Ms. Bartnik:

Please find this report of our assessment of existing conditions, along with preliminary options to consider for correcting the adverse conditions.

BACKGROUND

The Eagle Pool was constructed in 2001, with the pool portion being constructed utilizing a design-build process. From staff interviews, I understand that issues weren't apparent immediately but started appearing several years following opening. The issues continued and became significant five to ten years ago. Repairs were made at that time. A renewed concern of differential settlement of the pool has occurred over the last three years.

The ongoing primary issue with the facility includes ground movement and differential settlement of the swimming pool, which is affecting the pool's operation, particularly with recirculation of the water and maintaining sanitary water conditions. There is belief that the condition has worsened as time passes, causing staff to be concerned over ability to operate the facility.

Previous reports indicate that the pool has been affected since prior to 2014, and attempts have been made to address the conditions and repair leaks. Current conditions indicate that the pool continues to leak water and has an elevation difference as much as 4 ½ inches within the gutter lip across the pool. See Appendix A for measurements of pool settlement.

Jeff Bartley, Waters Edge Aquatic Design, visited the facility on October 5, 2022, to review the conditions in person, along with representatives from the City of Eagle and Mountain Recreations.

This report is intended to supplement the Geotechnical Subsurface Investigation completed by Wiss, Janney, Elstner Associates, Inc. (WJE), dated September 23, 2022. Our understanding of this report follows.

SUBGRADE CONDITIONS (PER WJE REPORT)

The study by WJE included the following

- Excavation of test pits to expose the subgrade beneath the pool deck and adjacent to the pool structure
- Water loss testing while test pits were exposed- which resulted in observing water leaking from the pool structure through the seam just behind the stainless gutter system.
- Borings taken near the pool structure, just outside the pool deck perimeter
- Swell/collapse tests on the soils present within the pool subgrade. The testing revealed no swell potential but did reveal collapse/compression potential in the underlying sandy silt- as much as 0.36% upon becoming saturated.
- Moisture testing at boring locations

In our understanding, the report concludes the following

- A belief that the most significant locations of collapse/compression correlate with identified pool leaks and areas of high moisture.
- This is consistent with the expectation (from testing the existing soils) that the underlying sandy silts will collapse/compress to a higher degree at higher moisture contents.
- There is no guarantee that the collapse/compression has run its course, and there is potential for additional compression to occur.

Recommendations by the geotechnical engineer include

- Considering steps to limit the amount of water entering the soil, with redundant measures to prevent, detect, capture, and repair leakage from the pool.
- Revising surface drainage around the pool to limit surface water infiltration
- Mitigation of Collapse Potential of the underlying soils, through alternatives such as
    - Removal and replacement of the collapsible soil- which is not particularly feasible with the potential of undermining support beneath the existing pool structure
    - Densifying the soil beneath the structure, with techniques such as compaction grouting
    - Deep foundations along the perimeter of the pool and through the pool floor- such as micropiles, helical piers, or conventional drilled piers.

The geotechnical report more in-depth analysis of the conditions and recommendations to consider.

Our general opinion is that the remedies offered by geotechnical engineer might be effective in stabilizing settlement but would likely be very expensive and would not completely eliminate the risk of additional future settlement. The report makes mention of the potential high difficulty and expense of the remedial measures to the underlying soils.

FINDINGS AND ANALYSIS

In addition to findings from the WJE report, we have the following observations and findings.

It is of note that the pool settlement occurs at seemingly random locations around the pool, versus more conventional differential settlement that might occur more uniformly in given locations. This often occurs in areas where structure was constructed on deeper fill thicknesses, or there is a migration of water beneath the surface that is carrying silt and sediment- thus eroding support beneath the structure.

Water Leak

As shared from the WJE study, the observed water loss occurs from a seam/joint between the stainless-steel gutter and the concrete wall that is hidden below the concrete deck panels around the entire pool.

When reviewing the original construction drawings, it appears that the original designers of the facility were aware of the soils conditions and included a synthetic liner and underdrain system to contain potential leaked water from the pool structure. However, the system has not been effective in capturing the water leaking from the seam/joint under the concrete pool deck. Unfortunately, most water leaking from this seam/joint under the concrete deck panels was undetected and appears to be leaking behind/outside the liner and underdrain system becoming trapped in the subgrade as the constructed liner location and design is preventing it from being collected by the underdrain. See the figure below that represents the current condition with water leak and liner system.

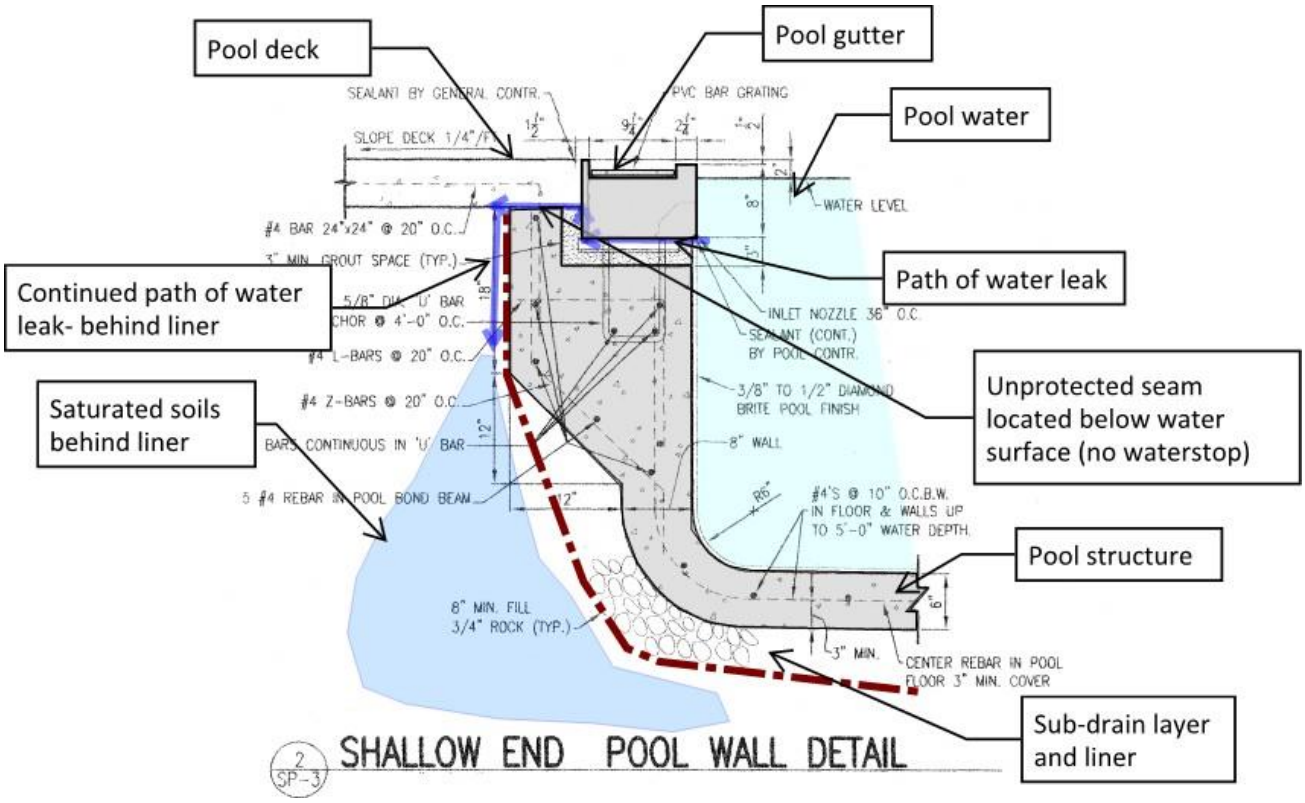


Figure – Current Water Leak Conditions

As mentioned above, the main cause for the leak appears to be water traveling undetected under the stainless-steel gutter and through the unprotected concrete pool wall/concrete deck panel construction joint beneath the pool water surface as shown above. We believe this condition has been a common occurrence in the stainless-steel gutter concrete wall pool construction. Historically, gutter systems have been designed/constructed with a 6” or more step down from the pool deck down below the water level. In a case like this, the unprotected (no water stop) horizontal seam between the top of the concrete pool wall and the concrete pool deck is below the normal pool water line. With a previous trend toward deck-level gutters, it is placing this seam below water level and making it a potential source of leaking.

In addition to the primary issue of water leaking and subgrade stability, there are other portions of the facility that are near or exceeded their useful life or otherwise need improvement. We have reviewed the facility with the following notes.

Pool Structure

Pool Structure Is covered by an exposed aggregate plaster finish making it difficult to see the full condition from surface. However, there is lack of significant spalling and stress cracking reflecting through that would reveal a deteriorating underlying pool structure.

However, we are aware of a significant stress crack in the deep end floor located in the northwest corner of the pool. This is presumably due to the 4 inches of differential settling in this area of the pool. Interestingly enough, it is apparently not enough to cause significant water loss through the pool structure as no water has been seen in the under drain system and the pool water level does not continue to fall once the pool water level falls below

the elevation of the unprotected horizontal joint between the concrete pool walls and the concrete pool deck,

Pool Finish

The pool finish is an exposed aggregate plaster finish (Diamond Brite product) that has worn and in need of replacement. It is nearing the end of expected life span.

Pool Deck

With the movement and subsidence of the underlying subgrade, it has reflected up to the pool deck causing a significant amount of movement in the pool deck. This results in differential settlement across pool deck joints and create potential trip hazards. The pool's maintenance staff has worked diligently to grind or otherwise soften the offsets and make it as safe as possible.

Regardless of options moving forward, the pool deck will likely need to be removed and replaced to make corrections to the pool and subgrade.

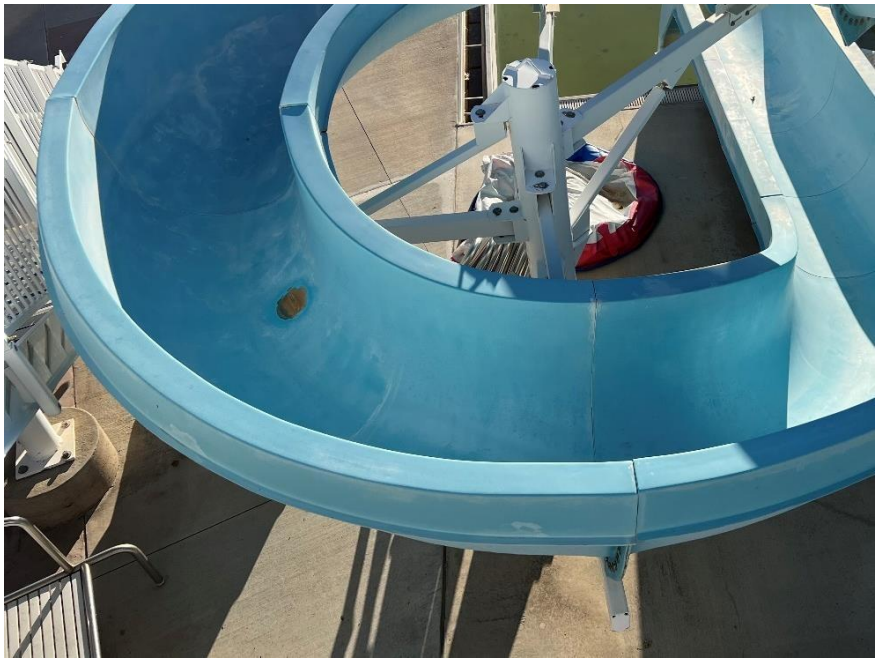
Below-grade Piping

It appears that the below-grade piping is currently intact as the swimming pool was holding a steady water level with the pool basin filled in October. Information from staff indicates that there have been historically below-grade pipe breaks that have been repaired during the past ten-to-fifteen-year history. With the history of underlying soil settlement and 20-year age, future pipe breaks are likely to occur.

Considering that the pool deck should be replaced, we recommend that the below pool deck piping also be replaced prior to constructing a new deck on top of older piping.

Waterslide

At 20 years old, the water slide needs reconditioning, particularly the fiberglass ride gel coating. The coating has faded and worn thin, and the color coat has worn through in spots. Eventually fibers will become exposed and become a hazard to the riders. The fiberglass should be regel-coated on the interior surface and re-painted on the exterior.



Additionally, the pool structure has differentially settled relative to the catch pool structure. This has resulted in a gap of a couple of inches where the slide exit flume rests on the stainless-steel gutter. The gutter elevation will need to be adjusted up, or the closest support will need to be lowered.

Toddler Slide and Spray Feature

The toddler slide coatings have worn, showing its 20-year age. The coating on the surface could be refreshed. However, many communities find that it is not much more expensive to replace the feature than recoat. Additionally, a new feature will change things up a bit and would add some new life.

The same comments apply to the mushroom water feature concept. The coatings have work and it is ready for reconditioning. However, it may make more sense to install an alternate feature to add new life in lieu of

reconditioning.

Tiled Vortex Pool

The vortex pool with integral bench has tiled surfaces at the water line and above. The joints within the tile field are in need of correction.

Pool Treatment Equipment

The swimming pool recirculation and treatment system includes the following major components

- Recirculation pump
- Dual-cell vertical pressure sand filter
- Below-grade piping – main drain, gutter, filtered water return
- Main drains
- Wet balance tank
- Stainless steel gutter
- Zero-depth gutter trough
- Pool chemical controller and feeders
- Strainer baskets

In general, these systems and components are operating reasonably effectively with some exceptions. Some of the equipment has been replaced over the years while some is still original. Original equipment includes some of the pumps, strainers, and filters. It may also include the pool controller and some of the chemical feeders. Staff has cared for this equipment well and reports that it seems to be functioning properly. Pumps and chemical feeders are rebuilt or replaced as needed.

The filters are the major component that is original and likely has remaining limited life. Our experience is that filters of this type typically have an approximate 30-year life-span, so we would anticipate the current filters to have another 10 years remaining life.

The recirculation system utilizes the stainless-steel gutter, which is intended to maintain the water level approximately 2" down the from the deck elevation. The gutter system has weir slots in the profile and operates as an "in-pool surge" system, in which the water level will raise/lower depending upon whether the pool is full of swimmers or has none. As the pool fills with swimmers, the water level will raise.

A challenge with the current system is that it has been difficult to maintain the water level skimming at the zero-depth trench with the differential settlement of the pool. As the water level raises/lowers, the water may either fall short of the zero-depth trench or it may flood this gutter- with no surge tank to temporarily store displaced volumes. The surge tank is not mandatory but could help manage the water level and cleanliness of the floor in the zero-depth entry.

The recirculation and filtration is adequate for the for turnover required. The filter system provides a unit loading rate of 13.6 gallons per minute per square feet of filter area. The maximum loading rate is 15 gallons per minute per square feet. The existing system runs close to the maximum, but staff reports that the system seems to provide reasonable water clarity- and that filter runs (between backwash cycles) are typically one week- which is a reasonable duration.

The stainless-steel gutter in experiencing stress from the significant differential settlement, which is as much as 4 ½ inches in a 35 feet distance on the northwest side. While the gutter system appears to be in fair condition from visual observation, staff reports that ongoing repair welds have been necessary on the gutter seams. There is reason to believe that this will continue to occur in the near future.

RENOVATION OPTIONS

Various corrections can be made to make the facility functional and extend the life span. Not all corrections /potential improvements fall under the same priority, so they are divided into the following categories

- **Base corrections**- are those intended to restore the levelness of the pool perimeter
- **Pool Piping Replacement**- is a secondary improvement as it is not necessary to put the pool back intact, but given the risk of continued future pipe breaks, it would be beneficial in helping extend the facility life and further protection from near-future subgrade related issues if the piping were to leak in the near term,
- **General Pool Renovation**- includes those wear and tear items unrelated to the subgrade issue.

A listing of recommendations includes

Base Corrections

Although the geotechnical report outlines optional measures that would attempt to relevel the pool and stabilize the subgrade, we believe that these options are not guaranteed and would be cost prohibitive. We recommend base corrections that would relevel the pool gutter and reconstruct the top of the wall. Additionally, the condition that is causing the water to leak would be corrected.

A listing of recommended base corrections includes

- **Remove and replace the stainless-steel gutter.** This would replace the existing gutter and require repairs that would allow it to be re-leveled. Given the bottom of the pool has differentially settled by 4 ½ inches, the grout bed beneath the pool gutter would vary by the same 4 ½ inches.
- **Construct a new pool stem wall** at the top of the wall, behind the gutter system up to the deck surface. This would be in lieu to having a seam located under the pool deck. The joint between the pool wall and deck would be exposed at surface of the deck and may allow the pool deck to settle without opening a seam located beneath the water level.
- **Repair the exposed water-proof liner** and extend it up along the back of the new stem wall.
- **Repair the stress crack** located in the floor of in the northwest corner of the pool resulting from the differential settlement.
- **Construct an additional perimeter underdrain** to collect and safely discharge percolated surface water or other leaked water that might come from broken pool pipes to prevent it reaching the subgrade soils.
- **Replace the pool deck.** The pool deck will need to be reconstructed once the pool repairs are complete.
- **Regrade the pool perimeter.** The perimeter of the pool deck area should be regraded to ensure that surface water is directed away from the perimeter of the pool and its subgrade.

Pool Piping Replacement

Replace the existing below-grade piping prior while replacing the pool deck, to extend its useful remaining life and reduce risks of having to demolish and patch portions of the new pool deck concrete to make a piping repair in the near future.

Mitigation of Continued Collapse/Settlement

WJE stated in their report, and in subsequent conversations, that there is no guarantee that the collapse behavior has "run its course" which leaves risk of continued differential settlement. In their opinion, this is true even with improvements made to prevent water from leaking from the pool and with an improved subsurface water collection system. They recommend that additional mitigation measures be made to the soils located beneath the pool at an estimated depth of 35 feet below the current ground surface. Alternatives listed include

- **Removal and replacement of the soils.** Which is only an option for removal and replacement of the pool structure.
- **Insitu (in-place) ground improvement**. There are options to "densify" the underlying soils without excavating. A primary option listed includes compaction grouting.
- **Deep Foundations**. Includes potentially drilling piers and underpinning the pool structure. Options listed include micropiles, helical piers, or conventional drilled piers

WJE is currently researching these options and working to provide an Opinion of Cost for an appropriate remedy. Any Opinion of Cost offered in this report provides an allowance placeholder until such costs are estimated.

General Pool Renovation

- **Remove and reconstruct the exposed aggregate plaster coating finish**
- **Replace gutter grating in zero-depth.** The current grating is 20 years old, which is reaching the end of anticipated life expectancy.
- **Recondition the water slide fiberglass**. Provide new field-applied gel coat on interior surface and re-paint exterior surface.
- **Replace the Toddler Slide and Spray Feature** with new alternate versions. This would replace the existing features that are reaching their anticipated end of life and add new interest to the facility.
- **Replace and regrout tile** at vortex pool
- **Provide water proofing to pump pit**

Given the anticipated scope of the renovation, the following includes a rough order magnitude of cost for the potential renovation item. We also provide a comparison to the anticipated cost of replacing the pool structures and systems with a new one.

Each option includes an anticipated budget for

- specific pool contractor items
- general pool deck or site construction
- a general contractor/ or construction manager
- a project contingency
- project costs for design and construction administration services

Base Renovation to fix the major current issues - **Anticipated Range $1.1M to $1.4M**

Plus the added cost for subsurface mitigation

Includes a base level of reconstruction to the top of the pool to re-level and make water-tight, removal and replacement of the pool deck, corrections to the subgrade liner / collection system, and an allowance for mitigation subsurface soil conditions/density. This option does not include general renovation to prolong the life of the facility or address continued ongoing miscellaneous pool equipment repairs/replacement that occurs each year. While it does include a budget to replace the pool deck, it does not include a budget for below pool deck piping.

A more-detailed listing of items and costs follows on subsequent pages.

Long-Term Renovation - **Anticipated Range $1.8M to $2.3M**

Plus the added cost for subsurface mitigation

Includes the base level of reconstruction listed above, plus the replacement of the below-deck pool piping and also improvements needed for the pool basin and equipment to extend the life of the facility for another 15 to 20 years.

Again, this option does not include ongoing miscellaneous pool equipment repairs/replacement. It also does not include a budget for major systems replacement, such as replacing the pool filters. Systems like this should be replaced at the end of life, which we would expect would be likely in 15 years or so.

A more-detailed listing of items and costs follows on subsequent pages.

Pool Replacement - **Anticipated Range $3.7M to $4.7M**

Plus the added cost for subsurface mitigation

This is intended to entirely replace the current swimming pool structure and systems, which allows for the construction and subgrade preparation to be entirely new. We would anticipate the life span of the facility to be 30 to 50 years, with the structures lifespan closer to 50 years while many systems would be at 30 years. This option would relieve on-going maintenance, repair and replacement needs that occur from operating a 20-year-old pool.

There are other intangible benefits to pool replacement. A full replacement of the pool and systems results in new equipment, structures, and piping- which reduces the current annual ongoing maintenance costs and effort required to maintain or replace older equipment and structures. This relief from additional maintenance efforts is relieved for the first five years or more.

Additionally, a full pool replacement provides an opportunity to start with a new design and amenities that provide a new experience for the guests. This typically results in sparking new interest and attendance for the facility.

OPINION OF COST - BASE RENOVATION ITEMS

EAGLE, CO POOL

RENOVATION ITEM	Subtotal Low	Subtotal High	Low Range	High Range
BASE POOL CORRECTIONS (settlement related)			**$658,240**	**$864,820**
Remove and replace stainless-steel gutter			$ 413,400.00	$479,700
Demo existing gutter	$ 23,400.00	$ 31,200.00		
New gutter (product)	$ 253,500.00	$ 273,000.00		
New Gutter (installation)	$ 136,500.00	$ 175,500.00		
Reconstruct the back of pool stem wall			$ 39,000.00	$ 78,000.00
Repair perimeter of waterproof liner			$ 9,000.00	$13,500
Repair stress crack in pool floor			$ 1,000.00	$1,500
Construct additional perimeter underdrain			$ 36,000.00	$54,000
Demo and replace pool deck (with deck drains)			$ 75,000.00	$112,500
Regrade pool perimeter			$ 20,000.00	$40,000
New anchors for existing deck equipment			$ 5,000.00	$7,000
Pool Subcontractor Supervision & GC's			$ 59,840.00	$ 78,620.00
SUBSURFACE SOILS MITIGATION (TO BE DETERMINED)			**$0**	**$0**
Subsurface Soil Mitigation			***TBD***	***TBD***
POOL PIPING REPLACEMENT			**$0**	**$0**
GENERAL POOL RENOVATION			**$0**	**$0**
CONSTRUCTION SUBTOTAL			**$658,240**	**$864,820**
Contractor. Mobilization, General Conditions, OH&P			$197,472	$259,446
Contingencies			$128,357	$168,640
TOTAL CONSTRUCTION BUDGET			**$984,069**	**$1,292,906**
SOFT COSTS			**$98,407**	**$129,291**
Design and Construction Admin Budget			$98,407	$129,291
TOTAL PROJECT COSTS			**$1,082,476**	**$1,422,196**
+ ADDED COSTS ASSOCIATED WITH SSUBSURFACE SOIL MITIGATION (YET TO BE DETERMINED)				

OPINION OF COST - LONG-TERM RENOVATION ITEMS

EAGLE, CO POOL

RENOVATION ITEM	Subtotal Low	Subtotal High	Low Range	High Range
BASE POOL CORRECTIONS (settlement related)			**$658,240**	**$864,820**
Remove and replace stainless-steel gutter			$ 413,400.00	$479,700
Demo existing gutter	$ 23,400.00	$ 31,200.00		
New gutter (product)	$ 253,500.00	$ 273,000.00		
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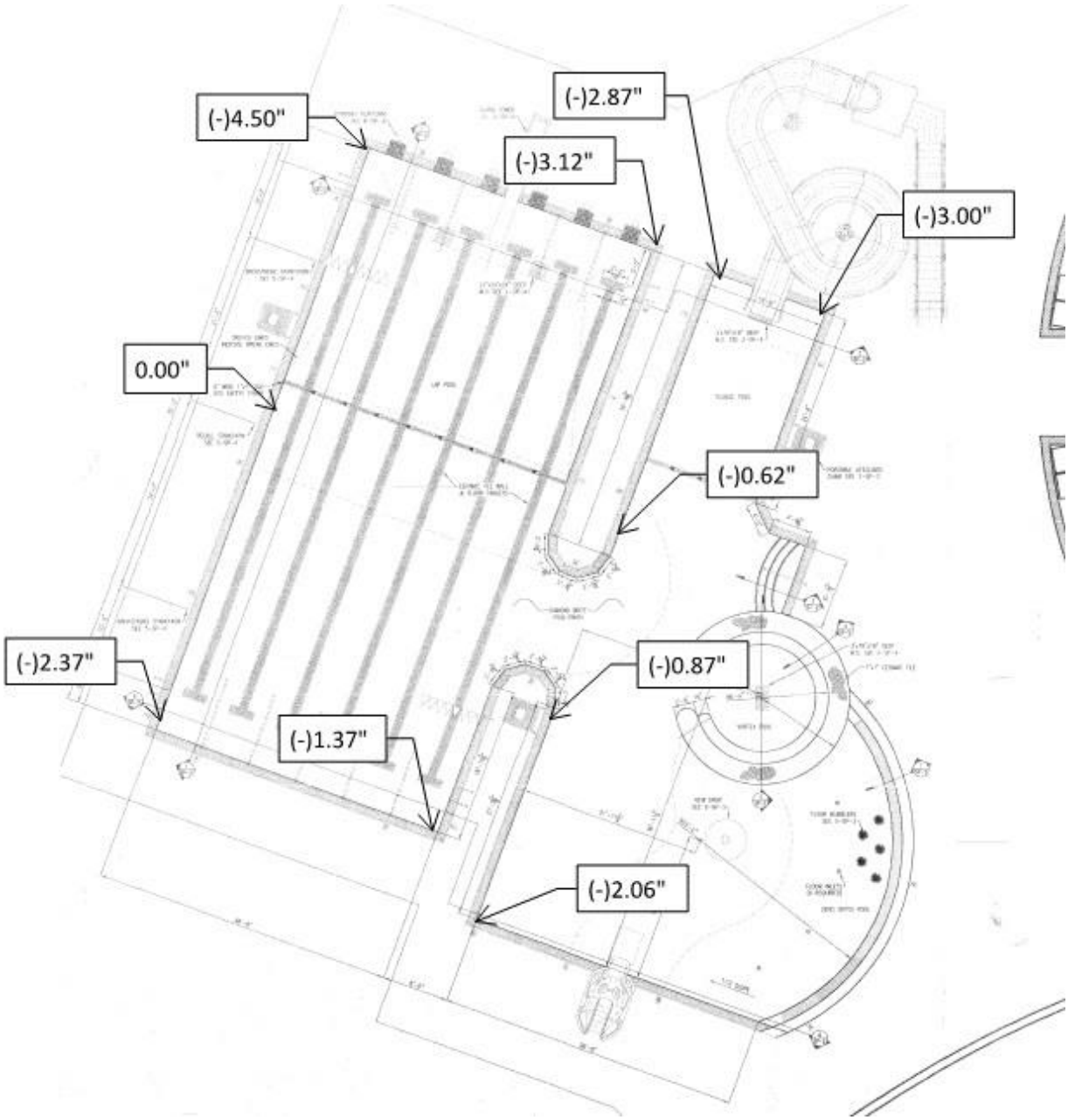
Reconstruct the back of pool stem wall			$ 39,000.00	$ 78,000.00
Repair perimeter of waterproof liner			$ 9,000.00	$13,500
Repair stress crack in pool floor			$ 1,000.00	$1,500
Construct additional perimeter underdrain			$ 36,000.00	$54,000
Demo and replace pool deck (with deck drains)			$ 75,000.00	$112,500
Regrade pool perimeter			$ 20,000.00	$40,000
New anchors for existing deck equipment			$ 5,000.00	$7,000
Pool Subcontractor Supervision & GC's			$ 59,840.00	$ 78,620.00
SUBSURFACE SOILS MITIGATION			**$0**	**$0**
Subsurface Soil Mitigation			***TBD***	***TBD***
POOL PIPING REPLACEMENT			**$151,850**	**$197,637**
Replace below-grade pool piping			$ 138,045.00	$179,670
Lap Pool Main drain pipe - 8"	$ 13,500.00	$ 17,550.00		
Plunge area main drain - 8"	$ 7,500.00	$ 9,750.00		
Vortex pool main drain - 8"	$ 17,250.00	$ 22,425.00		
NW gutter pipe - 8"	$ 17,250.00	$ 22,425.00		
NW filtered water return - 6"	$ 15,525.00	$ 21,275.00		
Zero-depth gutter pipe - 6"	$ 15,525.00	$ 21,275.00		
Vortex pool jets - 6"	$ 15,120.00	$ 20,720.00		
Spray feature supply - 4"	$ 12,000.00	$ 15,000.00		
Floor bubbler supply - 2"	$ 9,375.00	$ 11,250.00		
Floor inlet/ frog slide supply -2"	$ 15,000.00	$ 18,000.00		
Pool Subcontractor Supervision & GC's			$ 13,804.50	$17,967
GENERAL POOL RENOVATION			**$285,175**	**$348,013**
Replace zero-depth gutter grating			$ 2,250.00	$ 3,375.00
Remove and replace exposed aggregate pool finish and tile			$ 182,000.00	$ 208,000.00
Recondition water slide			$ 40,000.00	$ 50,000.00
Replace toddler slide			$ 25,000.00	$ 35,000.00
Replace tall spray feature			$ 10,000.00	$ 20,000.00
Pool Subcontractor Supervision & GC's			$ 25,925.00	$31,638
CONSTRUCTION SUBTOTAL			**$1,095,265**	**$1,410,470**
Contractor. Mobilization, General Conditions, OH&P			$306,674	$394,931
Contingencies			$210,291	$270,810
TOTAL CONSTRUCTION BUDGET			**$1,612,229**	**$2,076,211**
SOFT COSTS			**$161,223**	**$207,621**
Design and Construction Admin Budget			$161,223	$207,621
TOTAL PROJECT COSTS			**$1,773,452**	**$2,283,832**
+ ADDED COSTS ASSOCIATED WITH SSUBSURFACE SOIL MITIGATION (YET TO BE DETERMINED)				

APPENDIX A - Measurements of Settlement Surveyed by City Staff- 09/2022



November 10, 2022

Ms. Janet Bartnik
Executive Director
Mountain Recreation - Eagle, CO

Assessment of Conditions for Eagle Pool – Potential Schedule for Improvements

Dear Ms. Bartnik:

As we are completing the initial assessment report, we understand that you also are considering schedule while making any decisions for moving forward. This letter offers considerations relating to schedule for the options.

Current conditions impacting the schedule.
There are a number of current market conditions adversely impacting the schedule, including

- Contractors, especially pool contractors, are experiencing a very busy year with most unavailable to take on more work prior to summer of 2023.
- There is a lack of contractors nearby that are directly experienced with this type of swimming pool construction, making it even more difficult to find one immediately available to complete the work.
- Contractors that are available are likely "stretched thin" with their available manpower and current workload.
- Delivery lead times for products are currently fairly long. For example, quoted lead times for a replacement stainless-steel pool gutter is 8 to 12 weeks.
- We are entering the winter months, with viable weather to begin construction likely not until April.

The following includes our thoughts and understanding of the potential schedule for each option.

Schedule Option for Renovation
If renovation is pursued, we understand that a preferred schedule would include completing necessary work to have the pool open to the public for part of this summer. We believe the renovation option

- Finalize plan/options: 1 month
- Design: 1-1/2 to 2 months
- Bidding/pricing/procurement: 1 month
- Construction:
    - Contracts/shop drawings: 2 weeks min.
    - Manufacturer/delivery of s.s. gutter: 2 to 3 months
    - Installation of gutter and Completion of construction: 2 months min.

Total Schedule: 8 to 10 months

This schedule results in the earliest completion in August, assuming best-case scenario with no slips in the schedule. In our opinion, it is unlikely that the schedule would hold with an August completion.

Schedule Option for Pool Replacement

If a pool replacement option is pursued, the schedule would be longer and certainly would not be complete in 2023. The ideal schedule would include the following

- Concept planning: 6 to 8 weeks
- Final design: 3 months
- Bidding/pricing/procurement: 1 month
- Construction: 11 to 12 months- with a 2024 summer opening

At this point in the calendar year, I believe the feasible schedule for renovation or pool replacement is for a re-opening in the summer of 2024.

Please let me know if you have questions or comments.

Sincerely,

Jeff Bartley, P.E.

Wiss, Janney, Elstner Associates, Inc.
3609 South Wadsworth Boulevard, Suite 400
Lakewood, Colorado 80235
303.914.4300 tel
www.wje.com

September 23, 2022

Ms. Janet Bartnik
Executive Director
Mountain Recreation
1700 Bull Pasture Road
Eagle, CO 81631

Phase II Report - Geotechnical Subsurface Investigation

WJE No. 2022.4162

Dear Ms. Bartnik:

At your request and per our July 11, 2022, proposal, Wiss, Janney, Elstner Associates, Inc. (WJE) is pleased to deliver this report related to the geotechnical subsurface investigation of Mountain Recreation's Eagle Pool located at the above address in Eagle, Colorado.

BACKGROUND

Based on our previous conversations with you, we understand that ground movements began affecting the Eagle pool prior to 2014, and an attempt to re-level the pool and multiple leak repairs have been performed since that time. More recently, significant water losses on the order of 13,000 to 16,000 gallons per day have been detected, and relative elevation measurements indicate that the pool is three to four inches out of level. To help Mountain Recreation, the board, and the council decide the future of the Eagle pool, WJE conducted an initial evaluation (Phase I) of the pool during a site visit on June 29, 2022. During the site visit, we met with you, your staff, and the Eagle town engineer, and we performed a level survey of the pool deck. After this initial visit, you approved our July 11, 2022, proposal to perform Phase II invasive investigations of the subsurface nearby and immediately adjacent to the pool.

WJE PHASE II INVESTIGATION

As stated in our July 11, 2022, proposal, WJE's Phase II investigation included excavation of three test pits under the concrete pool deck, drilling of five exploratory boreholes in the grassy areas around the pool, video scoping of the pool drain line, and laboratory testing of soil samples retrieved from the exploratory borings. Each item is addressed separately below.

Bedrock Geology

The Eagle Pool site is underlain by bedrock of the Pennsylvanian-age (estimated to be 320 to 286 old) Eagle Valley Evaporite (Tweto and others, 1978). During this time, mineral salts and sediments associated with the erosion and weathering of the Ancestral Rockies were deposited in large, arid basins (playas) between the ancestral Uncompahgre Plateau and Front Range uplifts. As water in these basins evaporated, bedded selenite (gypsum), anhydrite, halite (salt), and minor dolomite were deposited along with interbedded layers of silts and clays carried into the basins by local streams. With time, these

originally flat-lying sediments became lithified (turned into rock) and were subsequently deformed under lateral compression associated with uplift of the modern Rocky Mountains. Because gypsum and anhydrite are weak and soluble rocks, they tend to dissolve and flow plastically, resulting in a highly deformed and contorted appearance in outcrop. Continued dissolution of these evaporites throughout the Holocene Period is responsible for the formation of sinkholes from the Minturn/Avon area to Glenwood Canyon. Evaporitic bedrock is present and well-exposed in the steep slopes located north and east of the Eagle Pool site.

The Eagle Valley Evaporite is a white to dark grey evaporitic sequence composed primarily of gypsum and anhydrite, with interbedded shale and siltstone. Due to its tendency to dissolve in the presence of water, exposures of the Eagle Valley Evaporite exhibit an irregular, yet distinct topographic signature, marked by weathered, rounded slopes and locally-formed collapse features. The lower slopes below evaporite outcrops are commonly covered by a veneer of gypsum-rich, silty alluvium that assumes a "popcorn-like" appearance due to wetting and drying. The Eagle Valley Evaporite is known to produce collapsible soils and form sinkholes up to several meters deep. (Lidke, 2002). Three sinkholes were reported north of the Eagle Pool & Ice Rink during the original geotechnical investigation by HP Geotech in 2001, and several more have also reportedly been discovered in the Haymeadow development currently under construction east of the Eagle Pool & Ice Rink. No sinkholes, however, are known to exist within the Eagle Pool site, although collapsible soils are likely to be present. Laboratory results (discussed below) indicate that local soils at the site are collapsible.

Surficial Geology

According to the Geologic Map of the Eagle Quadrangle (Lidke, 2002), the Eagle Pool site is situated within Holocene to middle Pleistocene-age alluvium and colluvium described as "*…broad alluvial and colluvial aprons that overlap and cover terrace deposits along [the] Eagle River*."

Bedrock across the site is locally overlain by unconsolidated alluvial and colluvial materials which primarily comprise sandy silts and limited fine to medium gravels. Deposition of coarser alluvial materials from hillslopes north of the site, related to slopewash and colluviation on steep slopes uphill, and deposition of alluvial/debris fans from other smaller steep ravines, interfinger with and mantle the fine-to-medium-grained alluvial deposits of sandy silts at the site. Limited lenses of eolian (wind-transported) fine-grained deposits are present within samples taken during the subsurface investigations.

Test Pit Excavation

On July 13, 2022, WJE was present along with the Eagle Town Engineer to observe the excavation of three test pits under the pool deck and immediately adjacent to the concrete pool wall. Mountain Recreation arranged for the excavation to be performed by Nottingham Excavation and Trucking (Nottingham). Nottingham removed the concrete pool deck prior to WJE's arrival on site, with the Test Pit 3 (TP-3) deck removed on the afternoon of July 12, 2022, and the decks at the other two test pits removed between approximately 7 am and 8 am on the morning of July 13, 2022. Upon arrival of a WJE geotechnical engineer and the Eagle Town Engineer, excavation of the test pit soil was initiated. The locations of the test pits are included in Appendix A, and the test pit logs are included in Appendix B.

At each pit, we encountered a gray silty gravel base course below the pool deck that varied in thickness between approximately 6 inches and 1 foot. Immediately adjacent to the pool wall, this gravel base course extended to the termination depth of the excavations. At a distance of approximately 2-8 feet away from the pool wall (depending on the test pit), the gravel base course was underlain by a tan to brown sandy silt that extended to the termination depth of the excavations. Both layers of soil were moist to wet, with the highest moisture contents near the pool wall and plumbing lines. In TP-1 and TP-2, the pool supply and return lines were exposed during excavation, and these lines were supported by either gravel base or what appeared to be Controlled Low Strength Material (CLSM), often referred to as flowable fill. The deepest excavation, TP-1, was terminated at 8 feet below the pool deck.

Around noon on July 13, 2022, Mountain Recreation personnel began filling the pool vessel to raise the water level above the joint between the concrete pool wall and the gutter system and allow observation of the joint performance during normal operating conditions. At approximately 1:30 pm, WJE observed water running down the concrete wall exposed in TP-2 near the northwest corner of the pool. This water ran down the wall and into a large void exposed below the pool deck at the northwest corner and appeared to extend around the corner to the east side of the pool. Consequently, Nottingham expanded the size of TP-2 to extend around this corner. After TP-2 was expanded, we observed water coming out of the joint between the pool wall and gutter. Over the next few hours, additional water leaks at this joint were observed at TP-1 and TP-3, although the flow rate was not as large as observed in TP-2. Mountain Recreation personnel stopped filling the pool and took a water level reading at approximately 4 pm, the test pits were left open, and the pool was allowed to equilibrate overnight. No water was observed at the discharge point of the pool underdrain system on July 13, 2022.

Mountain Recreation personnel performed another water level reading at about 7 am on July 14, 2022, and noted that the water surface had dropped roughly 4 inches overnight. Additionally, Mountain Recreation observed water dripping from the underdrain discharge point at approximately the same time. After the WJE engineer arrived on site, Mountain Recreation again raised the water level to a safe operating level, and then pressurized the supply and return lines to circulate water within the pool plumbing system. No water leaks were observed from the pool supply and return lines located within TP-1 and TP-2. Leaks were observed at the joint between the concrete pool wall and gutter (in the same locations as on July 13, 2022) and at broken joints within the gutter's pressurized distribution system. After approximately 30 to 45 minutes, the test was terminated and Mountain Recreation turned off the pool circulation.

Exploratory Boreholes

Four exploratory borings were completed in order to investigate the ground conditions in the areas immediately adjacent to the pool, and one additional boring (B-5) was completed a short distance away from the pool to the north to provide context and reference to conditions that are unlikely to have been affected by the influence of water lost from the pool. Ager Drilling was engaged as the drilling contractor to complete this work. These borings were located in the grassy areas surrounding the pool to avoid having to access the subsurface materials through the concrete pool deck. Drilling of the five borings occurred on August 4th and 5th, 2022. Borehole explorations were observed and logged by Dr. Wilcox.

Standard Penetration Testing (SPT) and sampling was executed at intervals of one foot every two-and-a-half feet (e.g. 2.5-3.5, 5-6, 7.5-8.5, etc.) for the upper 20 feet of each primary boring (i.e. B-1 through B-4), and less frequently at B-5. Samples were sent to Advanced Terra Testing in Golden, CO, for detailed analyses, discussed below. The boring logs are included in Appendix C.

Drain Line Scoping

Based on our initial site visit at the Eagle Pool in June 2022, we recommended video scoping of the pool drain line to help identify the presence and approximate location of potential breaks, if any, in the drain line that could be introducing water into the soil around/underneath the pool. Mountain Recreation contracted with Plumbing Systems Inc. (PSI) to perform this service on August 11-12, 2022. WJE was not present to observe the video scoping, but Mountain Recreation provided us with a copy of PSI's report and video recording for review.

PSI was able to extend the video scope approximately 270 feet (the maximum length of the scope) up the drain line towards the pool. Based on drawing sheet C 2.1, Drainage Plan and Profiles (dated September 3, 2002, by Alpine Engineering Inc.), this location of the camera was about 50 feet southwest of the southwestern edge of the pool. The technician did not observe any breaks in the drain line, but the recording showed several low spots along the length of the line where standing water was present. In some locations, the standing water in the line was deep enough to completely obscure the camera.

Laboratory Testing

WJE assigned laboratory testing on samples retrieved from the exploratory borings which included gradation, moisture content, dry density, and swell/collapse potential. The lab testing was performed by Advanced Terra Testing, and the results are included in Appendix D as well as on the boring logs (Appendix C).

One-dimensional swell/collapse tests ("Denver swell") were performed on three soil samples obtained from the boreholes closest to the pool deck (one sample per borehole from B-1, B-2, and B-3). The depth of samples varied between 7.5 and 15 feet below the ground surface. Each sample was inundated with water at a confining pressure approximately equal to the overburden pressure in the field and allowed to equilibrate under this confinement until deformation of the sample was complete. None of the three samples swelled during the tests, but rather exhibited collapse/compression potential which ranged from 0.06% to 0.36%.

ANALYSIS

Figures 1 through 3 are plots of SPT blow counts, moisture content, and dry density vs. elevation for the five borings we drilled, as well as the HP Geotech (HP) pre-construction borings from 2001. Note that HP drilled one boring within the pool footprint, but three more are reasonably close to the pool, so we plotted data from these four HP borings (2001) along with our (2022) borings. A number of observations are apparent from review of these plots and our boring logs (Appendix C):

1. The fine-grained soils (sandy silt) encountered within the Eagle Valley alluvium are potentially collapsible soils. At B-1, B-2, and B-3, this layer of collapsible soil has a thickness that varies between about 30 and 36 feet, although at B-4 this layer is only about 17 feet thick.
2. As is apparent on Figure 1, SPT blow counts in our 2022 borings B-1 through B-4 are distinctly lower than our B-5, which was drilled outside of the pool area to the north, as well as the 2001 HP borings. This pronounced decrease in the SPT blow counts is consistent with collapsible soil behavior. These soils lose strength and volume when their moisture contents increase. The lower blow counts represent a significant loss of strength. This comparison of "before and after" blow counts indicates, in our opinion, that to some degree, the soil profile around and under the pool, as represented by borings B-1 through B-4, has indeed been subject to increased moisture content and collapse behavior.
3. Figure 2, which depicts moisture content vs. elevation, also confirms that moisture contents have increased profoundly in and under the pool area in the roughly 21 years since HP's borings were drilled. Like Figure 1, this plot also confirms that the soil profile around and under the pool has been subject to moisture infiltration and collapsible soil behavior.
4. Figure 2 specifically indicates that boring B-3 exhibited significantly higher moisture contents, particularly at elevations below 6700 feet (the approximate bottom of the pool), than borings B1, B-2, and B-4. Note that B-3 was drilled at the corner of the pool that has settled the most, where the greatest pool leakage was observed (at TP-2), as discussed above.
5. In our opinion, it is not a coincidence that the wettest soil profile correlates very well with the location of the greatest pool leakage, as well as the lowest point of the pool perimeter (i.e., point of greatest settlement). The collapse behavior has progressed further at B-3 than at the other borings around the pool.
6. There is no guarantee that the collapse behavior has "run its course" at B-3; some degree of collapse potential may yet remain, but clearly some collapse potential remains in the soils at the other borings around the pool (B-1, B-2, and B-4).
7. The plot of dry density vs. elevation (Figure 3) is less informing. The plot does not appreciably indicate a change in density from 2001 to 2022. One would expect dry density to increase as soil collapse occurs, but the plot does not particularly indicate this. We attribute this largely to sample disturbance. It is difficult to get truly undisturbed samples in collapsible soils (because they are collapsible), and so this particular plot is less informative. By contrast, the SPT blow count and moisture content plots are not affected by sample disturbance, and in this case are more informative.

As noted earlier, we also ran swell/consolidation tests on selected samples, in an attempt to directly measure remaining collapse potential. As with density measurements, these test results are sensitive to sample disturbance. These tests do indicate some remaining collapse potential, which agrees with our interpretation of the moisture profile as discussed above, though we do suspect that these results have been somewhat affected by sample disturbance.

In summary, our analyses indicate that the pool area has indeed been subject to collapsible soil behavior. That mechanism is most apparent in the vicinity of boring B-3, which coincides with the greatest observed

pool leakage and the greatest settlement of the pool perimeter. It is significant that distress correlates well with a known water source. Although the collapse mechanism is further advanced at B-3, there is no guarantee that it has "run its course." In our opinion, this mechanism is present at the other locations around and under the pool (borings B-1, B-2, and B-4), but has not advanced as far as it has at B-3. Consequently, if soil moisture contents continue to increase, the potential for continuing collapse behavior is present over a significant portion of the pool area.

RECOMMENDATIONS

Water Management

As noted in the previous section, past distress (mostly differential settlement) of the pool correlates very well with known water sources, or leaks. Put simply, if all other variables are equal, limiting the water source should limit future collapse behavior and resulting settlement.

In our opinion, limiting the amount of water entering the soil should strongly guide the scope and approach to any rehabilitation or reconstruction of the pool. Redundant measures to prevent, detect, and capture or repair leakage from the pool and related infrastructure and piping are advisable. This should include water supply, circulation, drains, gutters, and overflow components – essentially any component that could leak water into the ground under and around the pool. We are available to consult with your pool designer in this regard, but since we are not pool specialists ourselves, we prefer not to be specific in terms of water management measures.

We also recommend the elimination of any irrigated turf grass within 50 feet of the pool perimeter, and that irrigation throughout the remainder of the site outside of this zone be carefully controlled and managed. We also recommend no "in ground" plantings (trees or shrubs) in this 50-foot zone. Any plantings should be in planter boxes or similar features that are hydraulically isolated from the soil profile around and under the pool. These features should be designed and installed in such a way that leaks or spillage is easily detected and avoided. If these features have drains, those drains should discharge into a watertight (or substantially leakproof) collection system and be conveyed to a suitable outfall.

Surface grading and drainage around the pool should be carefully designed to limit any surface water infiltration. Relatively impervious surfaces are generally desirable (though not fool proof, as discussed below), and slopes or grades should be robust enough that the inevitable ground movements that occur do not compromise drainage or promote infiltration. Because some ground movement is inevitable with time, maintenance to restore or maintain the function of surface grading and drainage is essential. A surface that drains effectively in year one of a facility's life may not do so at year five or ten. Such surfaces and or swales must be checked and maintained. Sometimes they need to be reconstructed.

Finally, there is perhaps a temptation to believe that simply a robust approach to water management will effectively solve this problem. While this thought is understandable, and, at least theoretically, makes sense, it is in our opinion likely to be overly optimistic. This is for two reasons:

1. Despite the best efforts to prevent, detect, and capture any leaks or spillage, leaks and spillage inevitably occur. Most of the surfaces you will consider using, including concrete, are not truly

impervious, and even robust lining or waterproofing systems deteriorate with time and can experience leaks. Joints can and should be sealed, but seals deteriorate, and at best, are often not watertight. Pipe joints leak, and with time, can pull apart, especially where ground movement occurs. Ground movement can compromise any attempt to limit or prevent infiltration. Despite best efforts, some infiltration is still likely.

2. Impervious (or relatively impervious) surfaces effectively cut off the natural evaporation and transpiration that occurs at the ground surface during the warmer months of the year. As a result, as time goes by, moisture contents tend to increase under such surfaces, even when surface drainage is effective. Even if surface drainage is perfect, and it will not be, moisture contents tend to increase under a pool, pavement, or building with time.

We strongly recommend aggressive water management measures at this site. However, even with aggressive water management, some potential for, and therefore risk associated with future collapsible soil behavior will remain. The following sections explore alternatives for reducing the associated risk.

Mitigation of Collapse Potential

In our opinion, for this site, alternatives for mitigation of collapse potential (beyond water management measures) fall into three categories, which are described below. Additional details will likely need to be developed to implement a preferred alternative, which we will proceed with after an alternative is selected.

Removal and Replacement

This alternative simply involves excavating the collapsible soil under the pool area and replacing it with better material. Alternatively, the same soil could be reused if carefully moisture-conditioned to optimum moisture content or above and suitably compacted, though the nature of this soil is such that some settlement risk would remain if the on-site material were re-used. Replacement with a high-quality granular material (for example, a pit run sand/gravel mixture), while expensive, would be more reliable.

The depth of excavation required with this approach will vary based on the thickness of the collapsible alluvial fan material under the pool. Based on our borings, a depth up to about 35 feet below the current ground surface should be anticipated. The excavation should extend laterally beyond the edge of the pool a distance equal to the depth of the excavation. Depending on how the new pool is sited, the excavation might conflict somewhat with the existing building, and therefore require excavation shoring to protect the building foundation.

Obviously, this approach would not be particularly applicable if the desire is to rehabilitate the existing pool, but it would be generally compatible with construction of a new pool. In addition, arguably, if this alternative is selected, extremely aggressive water management might not be necessary.

Ground Improvement

This alternative involves techniques employed by specialty contractors to improve (usually, to densify) the soils under a site, without major excavation. There are various techniques that could be considered. We

expect that compaction grouting is most likely to be appropriate for this situation, but we would consider other ground improvement measures proposed by an appropriately qualified specialty contractor.

Regardless of the technique selected, the details of the ground improvement plan should be designed by an appropriately qualified and experienced specialty contractor. We are available to provide input and review their designs if desired. Whatever technique is selected, the improvement should extend completely through the collapsible soils, which, based on our borings, we expect to be a depth up to about 35 feet below the current ground surface. As with excavation, the improvement should extend laterally beyond the pool edge at least equal to the depth of the improvement. Note, the ground below the pool itself would also need to be improved, which would almost certainly require penetrating through the pool structure itself.

We would expect the contractor to provide an estimate of performance, such as a maximum expected future settlement. In our opinion, limiting future settlement to not more than one inch would be reasonable. We are available to help with identification of appropriately qualified contractors, solicitation of proposals, interviews, bid reviews, selection, and award of contracts, as well as construction administration related services.

This approach could apply to either rehabilitation of the existing pool or construction of a new one. Certain challenges will attend to performing this work around and under an existing pool, but we believe it would be feasible to do. Again, consultation with an appropriately qualified contractor would be very useful, especially in regard to rehabilitation of the existing pool.

Deep Foundations

A new pool could be supported on deep foundations installed through the collapsible soils and bearing within the deeper, more competent underlying materials. We believe drilled micropiles are potentially a good choice, but helical piers or conventional drilled piers could also be considered.

The existing pool could also be underpinned, certainly with micropiles, and possibly with helical piers, all bearing on or within the more competent materials underlying the collapsible soil beneath the pool. Certain complexities would apply to underpinning the existing pool, such as determination of the capacity of the pool itself to span between underpin elements, and possibly the need to strengthen the pool bottom and sides to facilitate such an effort. It is likely that elements would also need to be installed through the pool bottom, which is likely feasible but somewhat challenging.

A potential drawback of this approach, whether for a new or rehabilitated pool, is the potential for future differential settlement between the deep foundation supported pool and any adjacent pool deck, flatwork, or other surfaces, as well as plumbing/piping connections. There are techniques to mitigate these concerns, but they do tend to add complexity and expense.

Whether for a new pool or rehabilitation of the existing one, a deep foundation approach will require development of a considerable number of details, including type(s) of deep foundation, depth or bedrock penetration, capacities, allowable bond strength, end bearing considerations, structural considerations, installation constraints or requirements, etc. If a deep foundation alternative is preferred, we would expect

to develop appropriate recommendations in conjunction with the pool designer. WJE can provide structural engineering support to this effort if needed.

Rehabilitation vs. New Construction Considerations

As can likely be gleaned from the discussion of alternatives above, any approach to rehabilitation of the existing pool is likely to involve complexities and risk. While removal and replacement is not without challenges, in our opinion executing that type of work comes with less challenges and future risk than rehabilitation.

The final decision on new construction vs. rehabilitation of course lies with your team, aided by our recommendations as well as your pool consultant. Certainly, you will want to look carefully at the economics of any approach. But as we have already discussed, there are a number of advantages to complete reconstruction over rehabilitation of the existing pool.

CLOSING

We appreciate this opportunity to be of service. Please do not hesitate to contact us if you have any questions or would like to discuss this report further.

\

Sincerely,

WISS, JANNEY, ELSTNER ASSOCIATES, INC.

Francis E. Harrison, PE
Project Manager & Principal

Matthew T. LeBlanc, PE
Associate III

Attachments

Figures:

Figure 1 – Subsurface Elevation Profile – Standard Penetration Test (SPT) Blow Count
Figure 2 – Subsurface Elevation Profile – Moisture Content
Figure 3 – Subsurface Elevation Profile – Dry Unit Weight (Dry Density)

Appendices:

Appendix A – Project Site Vicinity and Locations of Test Pits and Boreholes
Appendix B – Test Pit Logs
Appendix C – Boring Logs and Legend
Appendix D – Laboratory Test Results

FIGURES

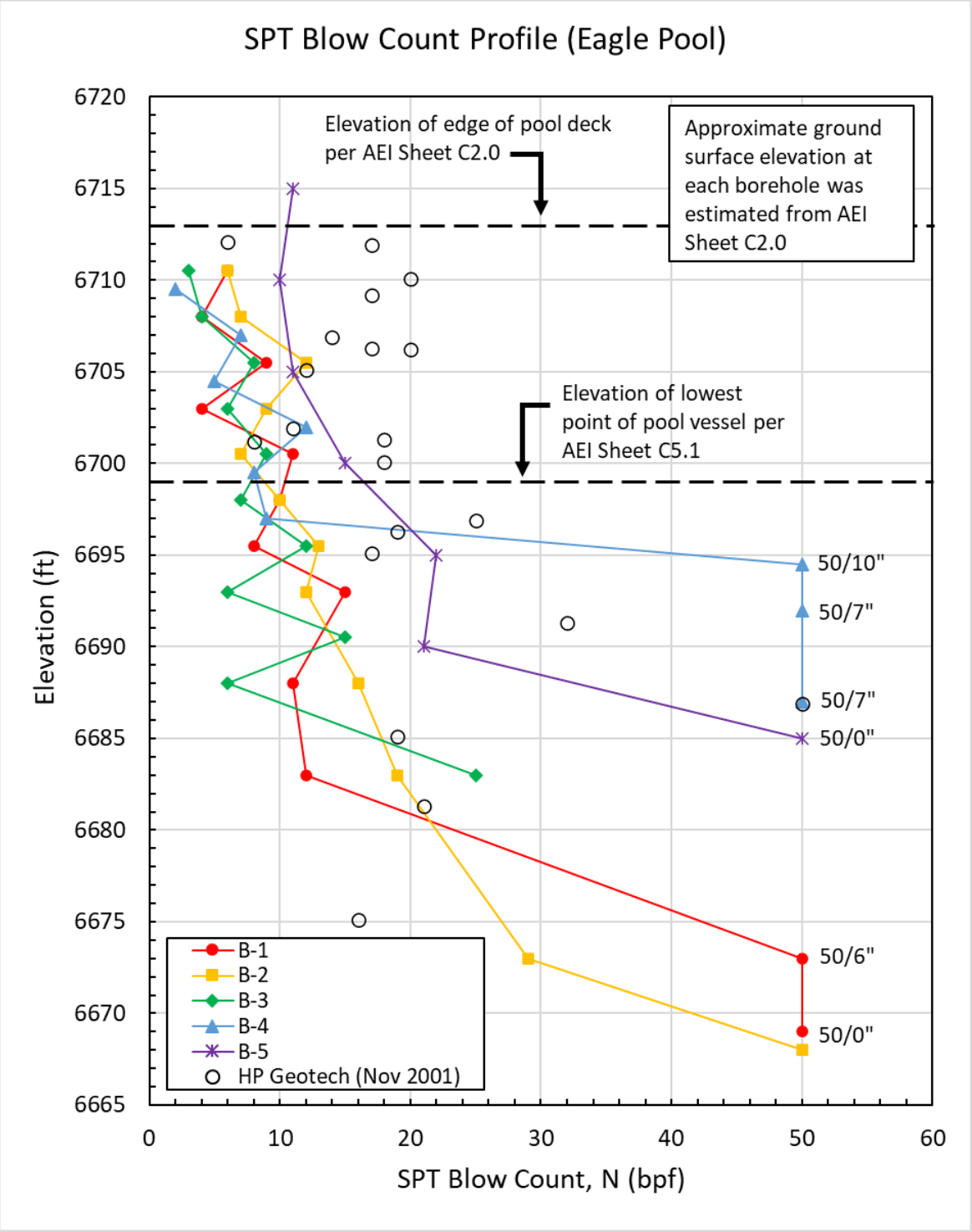


Figure 1. Subsurface Elevation Profile - Standard Penetration Test (SPT) Blow Count

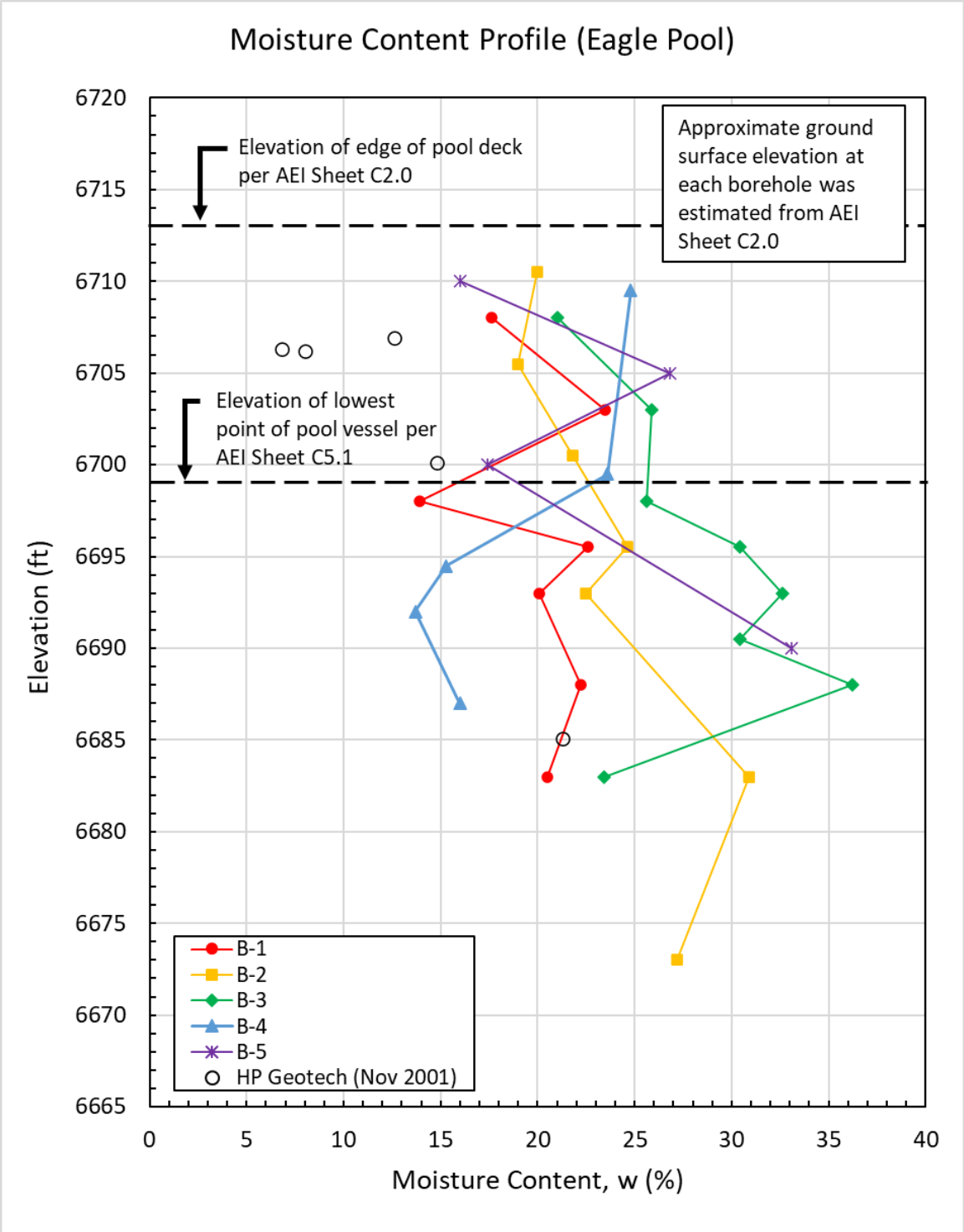


Figure 2. Subsurface Elevation Profile – Moisture Content

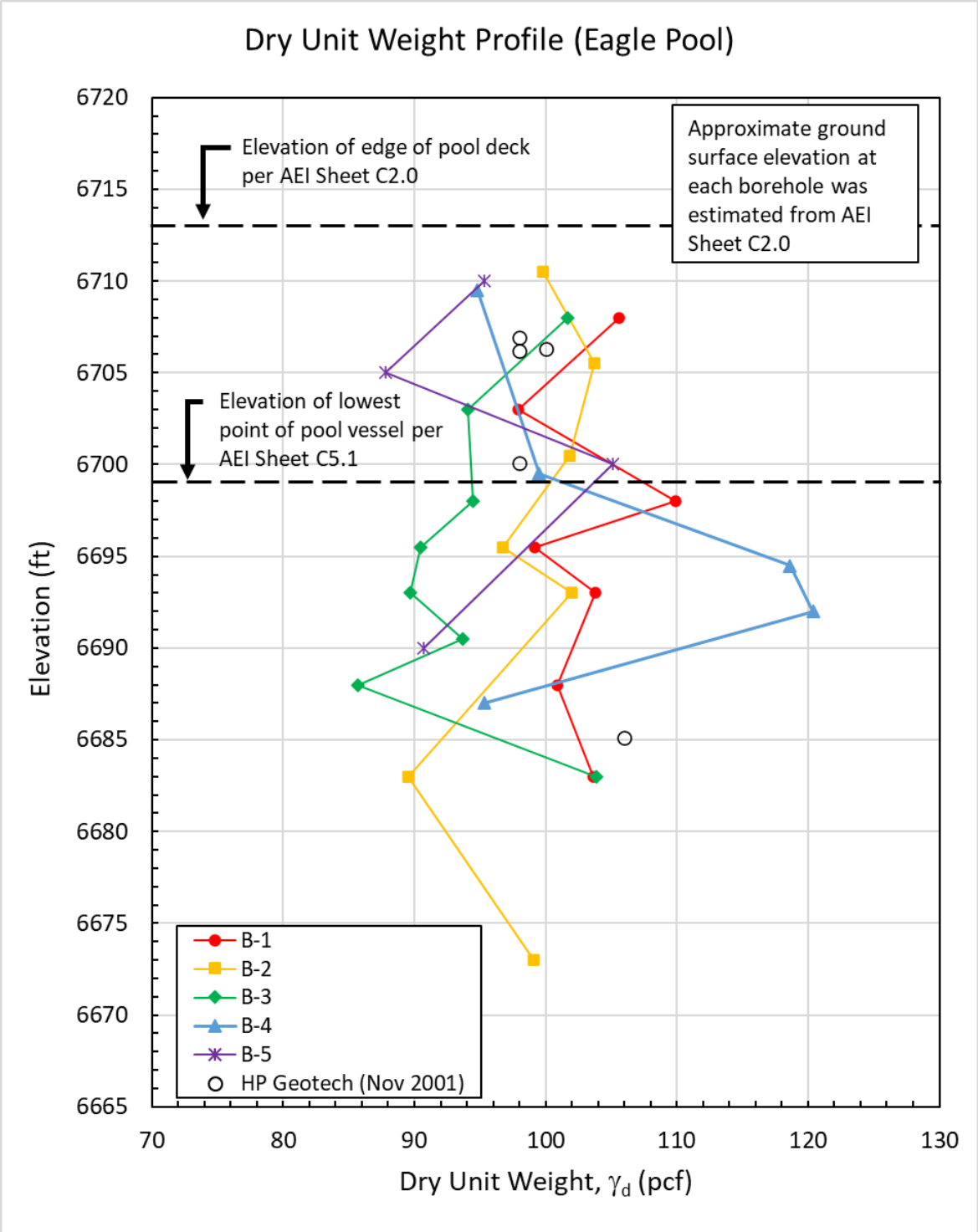


Figure 3. Subsurface Elevation Profile – Dry Unit Weight (Dry Density)

APPENDIX A. PROJECT SITE VICINITY AND LOCATIONS OF TEST PITS AND BOREHOLES

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS
Wiss, Janney, Elstner Associates, Inc.
3609 South Wadsworth Boulevard, Suite 400
Lakewood, Colorado 80235
303.914.4300 tel | 303.914.3000 fax
www.wje.com

Project
Eagle Pool
1700 Bull Pasture Road, Eagle, Colorado

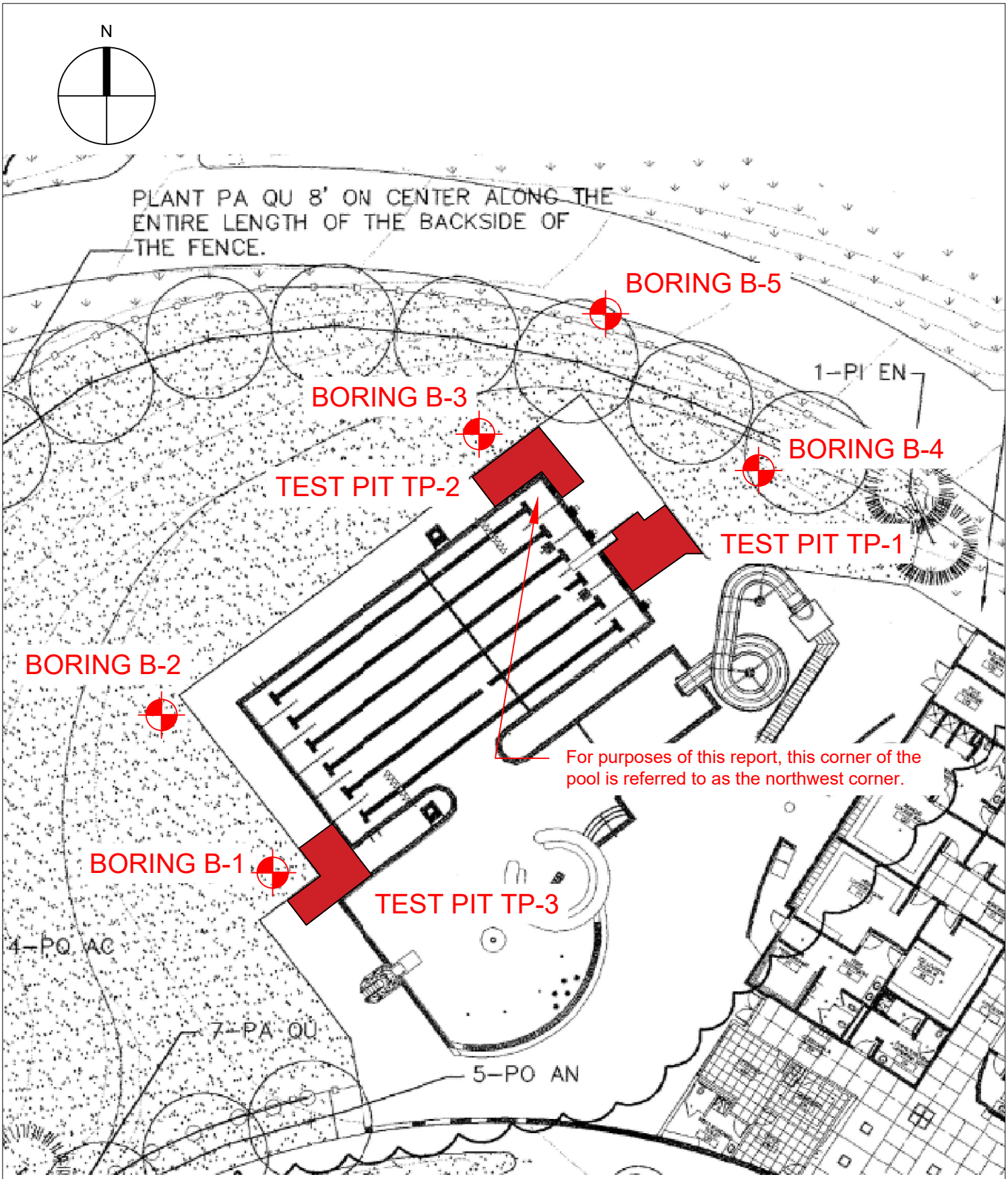
Figure Title
Site Vicinity Map

Proj. No.	2022.4162.0
Date	Aug 30, 2022
Drawn	MTL
Checked	FEH
Scale	AS SHOWN

Figure No. **A.1**

File Name: P:\2022\2022.4xxx\2022.4162.0 - EAGLE POOL (FEH)\Reports\Appendices and Figures\Site Vicinity & Borehole Locations_Eagle Pool_FINAL.dwg

Plotted: 9/20/2022 10:49 AM by LeBlanc, Matthew



WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS **Wiss, Janney, Elstner Associates, Inc.** 3609 South Wadsworth Boulevard, Suite 400 Lakewood, Colorado 80235 303.914.4300 tel | 303.914.3000 fax www.wje.com	Project Eagle Pool 1700 Bull Pasture Road, Eagle, Colorado Figure Title Borehole and Test Pit Location Map	Proj. No. 2022.4162.0 Date Aug 30, 2022 Drawn MTL Checked FEH Scale NTS	**A.2** Figure No.

File Name: P:\2022\2022.4xxx\2022.4162.0 - EAGLE POOL (FEH)\Reports\Appendices and Figures\Site Vicinity & Borehole Locations_Eagle Pool_FINAL.dwg

Plotted: 9/20/2022 10:49 AM by LeBlanc, Matthew

APPENDIX B. TEST PIT LOGS

WJE | ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

TEST PIT: TP-1

CLIENT: MOUNTAIN RECREATION

WJE PROJECT NO.: 2022.4162.0

PROJECT NAME: EAGLE POOL

PROJECT LOCATION: 1700 BULL PASTURE RD, EAGLE, CO

EXCAVATION STARTED: 7/13/2022 COMPLETE: 7/13/2022

CONTRACTOR: NOTTINGHAM

EXCAVATOR TYPE: JOHN DEERE 35G; HAND SHOVEL

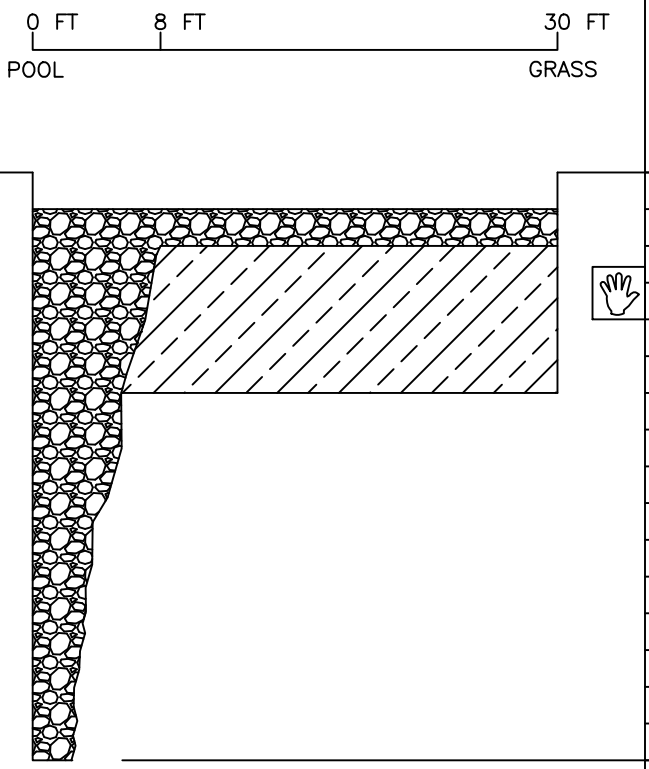
LOGGED BY: M. LEBLANC

GROUND ELEVATION (FT): N/A

COORDINATES: N/A

MAXIMUM DEPTH BELOW GROUND SURFACE (FT): 8

▽ DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED



DEPTH (FT)	DESCRIPTION OF FACE
0	
1	Concrete pool deck 3–5 inches thick
	GRAVEL base, with silt, wet, grey
2	SANDY SILT, moist, tan and brown with trace calcareous nodules
3	Benched at 3 feet
4	
5	
6	
7	
8	Bottom of test pit at 8 feet below the top of the concrete pool deck.
9	
10	

NOTES

Concrete pool deck removed on 7/13/2022 (7–8 am)

Soil was wetter on north side of pit near the diving board footing and the drain line

Pit was benched at 3 ft; one area near the diving board footing continued to 8 ft termination depth

Encountered fiber board at 6 foot depth; board was parallel to the pool wall and offset about 2 feet

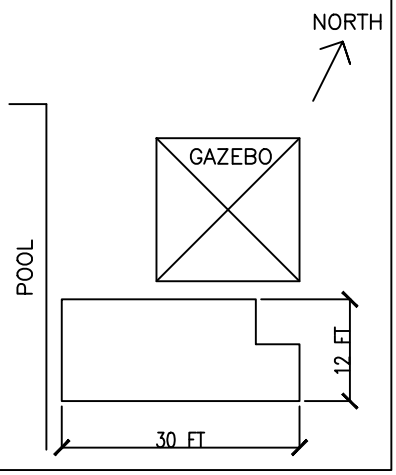
Gravel portion of the underdrain system was not encountered

Pool supply and return lines were exposed in this pit; returned on morning of 7/14/2022 to inspect for leaks; none observed

SAMPLE TYPE(S)

Grab Sample (GS)

PLAN VIEW OF PIT



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WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

TEST PIT: TP-2

CLIENT: MOUNTAIN RECREATION

WJE PROJECT NO.: 2022.4162.0

PROJECT NAME: EAGLE POOL

PROJECT LOCATION: 1700 BULL PASTURE RD, EAGLE, CO

EXCAVATION STARTED: 7/13/2022 COMPLETE: 7/13/2022

CONTRACTOR: NOTTINGHAM

EXCAVATOR TYPE: JOHN DEERE 135G; HAND SHOVEL

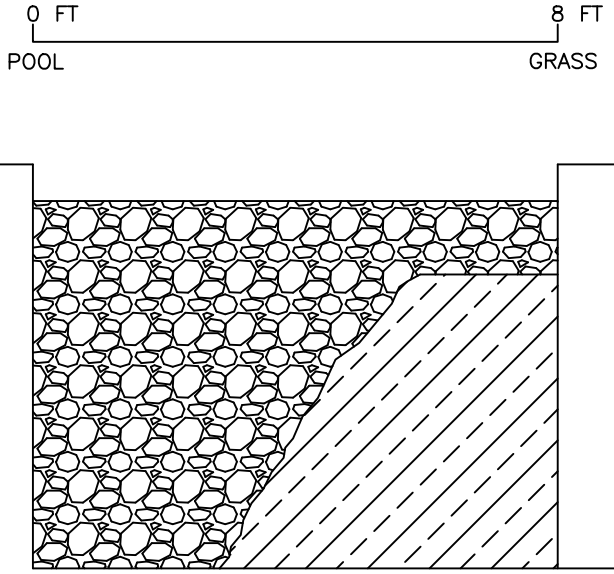
LOGGED BY: M. LEBLANC

GROUND ELEVATION (FT): N/A

COORDINATES: N/A

MAXIMUM DEPTH BELOW GROUND SURFACE (FT): 5.5

▽ DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED



Bottom of test pit at 5.5 feet below the top of the concrete pool deck.

DEPTH (FT)	DESCRIPTION OF FACE
0	Concrete pool deck 3–5 inches thick
1	GRAVEL base, with silt, wet, grey
2	SANDY SILT, moist, tan and brown
3	
4	
5	
6	
7	
8	
9	
10	

NOTES

Concrete pool deck removed on 7/13/2022 (7–8 am)

Soil wetter near east end of excavation by NW corner of pool

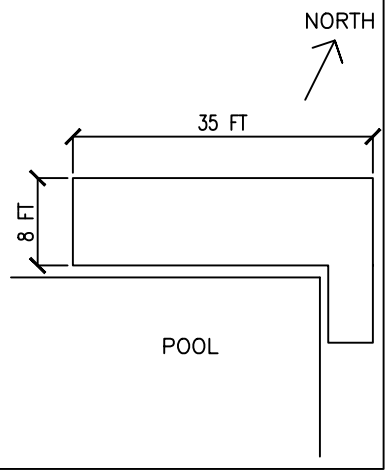
Extended pit around NW corner of pool after observed water running down pool wall and a cavity/void under pool deck near NW corner

Pool supply and return lines were exposed in this pit; returned on morning of 7/14/2022 to inspect for leaks; none observed

SAMPLE TYPE(S)

Grab Sample (GS)

PLAN VIEW OF PIT



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WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

TEST PIT: TP-3

CLIENT: MOUNTAIN RECREATION

WJE PROJECT NO.: 2022.4162.0

PROJECT NAME: EAGLE POOL

PROJECT LOCATION: 1700 BULL PASTURE RD, EAGLE, CO

EXCAVATION STARTED: 7/13/2022 COMPLETE: 7/13/2022

CONTRACTOR: NOTTINGHAM

EXCAVATOR TYPE: JOHN DEERE 35G; HAND SHOVEL

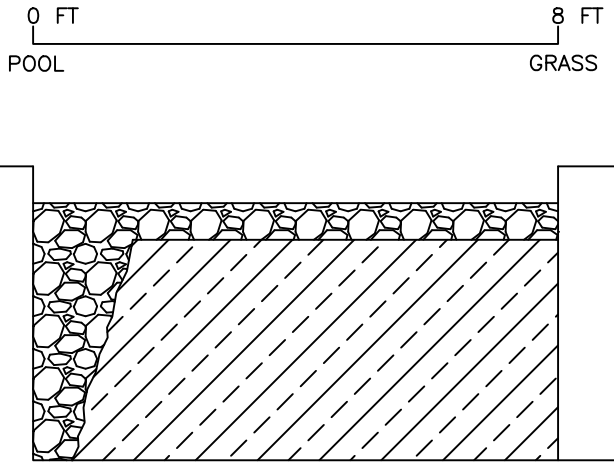
LOGGED BY: M. LEBLANC

GROUND ELEVATION (FT): N/A

COORDINATES: N/A

MAXIMUM DEPTH BELOW GROUND SURFACE (FT): 4

▽ DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED



Bottom of test pit at 4 feet below the top of the concrete pool deck.

DEPTH (FT)	DESCRIPTION OF FACE
0	Concrete pool deck 3–5 inches thick
1	GRAVEL base, with silt, wet, grey
2	SANDY SILT, moist, tan and brown
3	
4	
5	
6	
7	
8	
9	
10	

NOTES

Concrete pool deck removed during the afternoon of 7/12/2022

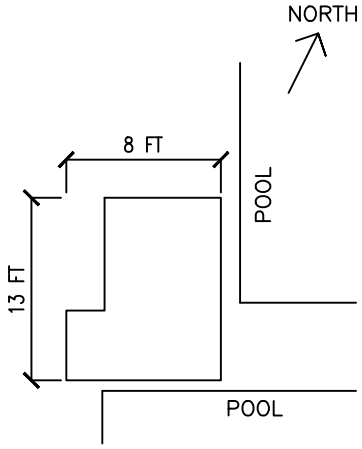
Encountered plastic liner at 2.5 feet oriented parallel to pool wall

Multiple water leaks at joint between gutter and concrete pool wall

SAMPLE TYPE(S)

Grab Sample (GS)

PLAN VIEW OF PIT



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APPENDIX C. BORING LOGS AND LEGEND

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/4/2022

BORING: B1
PAGE: 1 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED 9:00am COMPLETED: 10:50am
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 36
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	ADDITIONAL TESTS AND REMARKS
0												
1		FILL: slightly moist med. reddish brown to tannish brown, fine sandy silt (derived from Eagle Valley alluvium) w/ coarse angular to sub-angular gravel.										
2												
3	3		CAL-MOD									
	3											
4												
5												
6	2		CAL-MOD			105.6	17.6					
	2											
7												
8	5	Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt.	CAL-MOD									
	4											
9												
10												
11	2		CAL-MOD			97.9	23.5	85.5				
	2											
12												
13	5		CAL-MOD									
	6											
14												
15												
16	5		CAL-MOD									Den.Swell%: -0.06
	5											
17												
18	4		CAL-MOD			99.2	22.6					
	4											
19												
20												

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/4/2022

BORING: B1
PAGE: 2 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED 9:00am COMPLETED: 10:50am
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 36
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	ADDITIONAL TESTS AND REMARKS
20												
21	5 10	Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt.	CAL-MOD			103.8	20.1					
22												
23												
24												
25												
26	5 6		CAL-MOD			100.9	22.2					
27												
28												
29												
30												
31	6 6		CAL-MOD			103.6	20.5					
32												
33												
34												
35												
36												
37		Auger stem exhibits mild chatterand slowed advance - material hardens. 36 feet interpreted as top of weathered Eagle Valley Evaporite (bedrock). SPT sampling is refused with 50 blows for 6 inches and no further advance.										
38												
39												
40	50/6in		Refusal									

Note: 50/6in at 40-40.5 feet, 50/0in at 40.5feet. Advanced auger to 44 feet. Bottom of hole at 44 feet. SPT attempted, 50 blows / 0 inches: Refusal.

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/4/2022

BORING: B2
PAGE: 1 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED 11:10am COMPLETED: 12:55pm
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 34
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	ADDITIONAL TESTS AND REMARKS
0		Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt.										
1												
2												
3	3 3		CAL-MOD			99.8	20					
4												
5												
6	3 4		CAL-MOD									
7												
8	5 7		CAL-MOD									Den.Swell%: -0.14
9												
10												
11	5 4		CAL-MOD									
12												
13	4 3		CAL-MOD			101.8	21.8	89.7				
14												
15												
16	5 5		CAL-MOD									
17												
18	6 7		CAL-MOD			96.7	24.6					
19												
20												

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/4/2022

BORING: B2
PAGE: 2 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED 11:10am COMPLETED: 12:55pm
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 34
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	ADDITIONAL TESTS AND REMARKS
20												
21	6 6	Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt.	CAL-MOD			102	22.5					
22												
23												
24												
25												
26	7 9		CAL-MOD									
27												
28												
29												
30												
31	8 11		CAL-MOD			89.5	30.9					
32												
33												
34												
35		Auger stem exhibits mild chatter and slowed advance - material hardens. Slight to moderate iron-staining is present and some minor component of medium to coarse sub-angular to sub-rounded gravel present. 34 feet interpreted as top of weathered Eagle Valley Evaporite (bedrock). SPT blow counts at 40-41 feet = 13/16.										
36												
37												
38												
39												
40						99.1	27.2					

Note: Advanced auger to 45 feet, no samples taken. Bottom of hole at 45 feet. SPT attempted, 50 blows / 0 inches: Refusal.

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/4-5/2022

BORING: B3
PAGE: 1 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED: 2:30pm 8/4 COMPLETED: 9:30am 8/5
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 30
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS			ADDITIONAL TESTS AND REMARKS
									LL	PL	PI	
0												
1		Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt.										
2												
3	1		CAL-MOD									
4	2											
5												
6	2		CAL-MOD			101.7	21	86.8				
7	2											
8												
9	4		CAL-MOD									
10	4											
11												
12	3		CAL-MOD									Den.Swell%: -0.36
13	3											
14												
15	4		CAL-MOD									
16	5											
17												
18	3		CAL-MOD			94.5	25.6					
19	4											
20												
	6		CAL-MOD			90.5	30.4					
	6											

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/4/2022

BORING: B3
PAGE: 2 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED: 2:30pm 8/4 COMPLETED: 9:30am 8/5
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 30
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	ADDITIONAL TESTS AND REMARKS
20												
21	3 3	Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt. Note: when dropping sampler and drill string before sampling, the assembly sank into soft material approximately 10 inches (per B. Ager, Driller)	CAL-MOD			89.7	32.6					
22												
23	7 8		CAL-MOD			93.7	30.4					
24												
25												
26	3 3		CAL-MOD			85.7	36.2					
27												
28												
29												
30												
31	12 13	Auger stem exhibits mild chatter and slowed advance - material hardens. Some minor component of medium to coarse sub-angular to sub-rounded gravel present. 30 feet interpreted as top of weathered Eagle Valley Evaporite (bedrock).	CAL-MOD			103.9	23.4					
32												
33												
34												
35	50/0											
36												
37												
38												
39												
40												

Refusal at 35', with 50/0". Bottom of hole at 35'

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/4/2022

BORING: B4
PAGE: 1 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED: 1:45pm COMPLETED: 2:20pm
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 17
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS			ADDITIONAL TESTS AND REMARKS
									LL	PL	PI	
0												
1		FILL: slightly moist med. reddish brown to tannish brown, fine sandy silt (derived from Eagle Valley alluvium) w/ coarse angular to sub-angular gravel.										
2												
3	1		CAL-MOD			94.8	24.8					
4	1											
5												
6	4		CAL-MOD									
7	3											
8		Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt.										
9	3		CAL-MOD									
10	2											
11												
12	5		CAL-MOD									
13	7											
14												
15	3		CAL-MOD			99.5	23.6	82.7				
16	5											
17												
18	4		CAL-MOD									
19	5											
20												
	10	Auger stem exhibits mild chatter and slowed advance - material hardens, resembling claystone. 17 feet interpreted as top of weathered Eagle Valley Evaporite (bedrock).	CAL-MOD			118.6	15.3					
	50/5"											

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/4/2022

BORING: B4
PAGE: 2 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED: 1:45pm COMPLETED: 2:20pm
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 17
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS			ADDITIONAL TESTS AND REMARKS
									LL	PL	PI	
20												
21	28	Auger stem exhibits mild chatter and slowed advance - material hardens, resembling claystone. interpreted as top of weathered Eagle Valley Evaporite (bedrock). Sampling refusal at 20.5ft and again at 25ft. Bottom of hole at 25ft, no recovery at 25ft.	CAL-MOD			120.4	13.7					
22	50/7"t.											
23												
24												
25	50/7"t.		none									
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

Note: "50/7"t." refers to a total sampler advance of 7in for 50 blows, which includes the 28 blows for 6in above (e.g. 22 blows for 1in after first 6in)

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/5/2022

BORING: B5
PAGE: 1 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED: 10:00am COMPLETED: 11:30am
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 32
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS			ADDITIONAL TESTS AND REMARKS
									LL	PL	PI	
0												
1		Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt.										
2												
3												
4												
5												
6	5 6											
7												
8												
9		No sample taken above 10', due to elevation difference from previous 4 borings (B5 is located approximately 10ft above the elevation of the pool).										
10												
11	5 5		CAL-MOD			95.3	16					
12												
13												
14												
15												
16	5 6		CAL-MOD			87.8	26.8					
17												
18												
19												
20												

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

DATE: 8/5/2022

BORING: B5
PAGE: 2 OF 2

CLIENT: MOUNTAIN RECREATION
WJE PROJECT NO: 2022.4162

PROJECT NAME: EAGLE POOL
PROJECT LOCATION: EAGLE, COLORADO

DRILLING STARTED: 10:00am COMPLETED: 11:30am
DRILING CONTRACTOR: AGER DRILLING
DRILING RIG TYPE: CME-45 ATV HOLE DIAMETER: 4 in
LOGGED BY: ATW REVIEWED BY: MTL / FEH

GROUND ELEVATION (FT): NA
COORDINATES: NA
DEPTH TO BEDROCK (FT): 32
DEPTH TO GROUNDWATER (FT): NOT ENCOUNTERED

DEPTH (FT)	BLOW COUNTS / 6IN	MATERIAL DESCRIPTION	SAMPLE TYPE	POCKET PEN. (TSF)	USCS CLASSIFICATION	DRY UNIT WEIGHT (PCF)	MOISTURE CONTENT (%)	PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS			ADDITIONAL TESTS AND REMARKS
									LL	PL	PI	
20												
21	7 8	Eagle Valley alluvium: Slightly moist med. reddish brown to tannish brown, fine sandy silt. No coarse gravel present - limited occurrences of fine to medium sub-angular to sub-rounded gravels and limited lenses of light reddish-brown to tannish-gray fine silt, the latter being interpreted as eolian deposits within the Eagle Valley alluvium. Some intervals within this material exhibit gypsiferous veining, observed as white-to-gray 'marbling' within fine sandy silt.	CAL-MOD									
22												
23												
24												
25												
26	10 12		CAL-MOD									
27												
28												
29												
30												
31	10 11		CAL-MOD									
32												
33		Auger stem exhibits mild chatter and slowed advance - material hardens, resembling claystone. interpreted as top of weathered Eagle Valley Evaporite (bedrock).										
34												
35	50/0in		none									
36		Bottom of hole at 35ft										
37												
38												
39												
40												

APPENDIX D. LABORATORY TEST RESULTS

ADVANCED TERRA TESTING
833 PARFET ST UNIT A
LAKEWOOD, CO
303-232-8308 www.terratesting.com

Tuesday, September 13, 2022

Project Number:	3020-035
Company:	Wiss Janney Elstner
Address:	3609 S Wadsworth Boulevard, Suite 400
City:	Lakewood
State:	CO

RE:	Soil Testing
	Eagle Pool
	2022.4162.0

Dear Tarka Wilcox,

With this letter you will find a report on Soil samples assigned on 8/22/2022.

Testing was performed in accordance with standardized test methods, accepted industry practices as well as specific instructions received from you, our client. Advanced Terra Testing accepts no responsibility and makes no claims to the use or purpose of the material being tested. Furthermore, the results herein are based solely on the material received and tested. Please note that all material will be disposed of after thirty days unless other arrangements are made.

We respectfully request that sample reports be considered proprietary information and are not to be reproduced, except in full and only with prior written approval of Advanced Terra Testing. We are pleased to have been given the opportunity to perform high quality laboratory testing for your project. We sincerely hope the results herein provide you with all the information required. If you have questions or need anything further, please reach out and we will be happy to assist you.

Respectfully,

ADVANCED TERRA TESTING

Moisture and Density
ASTM D 2216 and ASTM D 7263

CLIENT	Wiss Janney Elstner			JOB NO.	3020-035
PROJECT	Eagle Pool			LOCATION	--
PROJECT NO.	2022.4162.0				
BORING NO.		B-1	B-1	B-1	B-1
DEPTH		5-6'	17.5-18.5'	20-21'	10-11'
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED		09/07/22	09/07/22	09/07/22	09/07/22
TECHNICIAN		KR	KR	KR	KR
DESCRIPTION					
Mass of Wet Soil and Pan (g):		307.65	313.27	386.52	454.28
Mass of Dry Soil and Pan (g):		262.66	256.85	322.96	390.04
Mass of Pan (g):		6.76	6.67	6.64	116.39
Moisture (%):		**17.6**	**22.6**	**20.1**	**23.5**
Diameter (in):		1.92	1.92	1.93	1.94
Height (in):		3.20	3.31	3.99	3.63
Mass of Wet Soil and Ring (g):		301.39	306.94	490.65	338.67
Mass of Ring (g):		0.00	0.00	109.54	0.00
Wet Density (lbs/ft³):		**124.2**	**121.6**	**124.6**	**120.9**
Dry Density (lbs/ft³):		**105.6**	**99.2**	**103.8**	**97.9**
Wet Density (kg/m³):		**1990**	**1947**	**1997**	**1937**
Dry Density (kg/m³):		**1692**	**1589**	**1662**	**1568**
BORING NO.		B-1	B-1	B-2	B-2
DEPTH		25.26'	30-31'	2.5-3.5'	12.5-13.5'
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED		09/07/22	09/07/22	09/07/22	09/07/22
TECHNICIAN		KR	KR	KR	KR
DESCRIPTION					
Mass of Wet Soil and Pan (g):		296.19	351.97	322.59	470.11
Mass of Dry Soil and Pan (g):		243.59	293.29	269.98	406.95
Mass of Pan (g):		6.70	6.67	6.71	117.36
Moisture (%):		**22.2**	**20.5**	**20.0**	**21.8**
Diameter (in):		1.93	1.93	1.93	1.92
Height (in):		3.08	3.59	3.45	3.75
Mass of Wet Soil and Ring (g):		289.67	345.54	316.11	353.00
Mass of Ring (g):		0.00	0.00	0.00	0.00
Wet Density (lbs/ft³):		**123.3**	**124.8**	**119.8**	**124.0**
Dry Density (lbs/ft³):		**100.9**	**103.6**	**99.8**	**101.8**
Wet Density (kg/m³):		**1975**	**1999**	**1918**	**1986**
Dry Density (kg/m³):		**1616**	**1660**	**1599**	**1630**
NOTES					

Data entry by:	KMS	Date:	09/12/22
Checked by:	KR	Date:	09/12/22
File name:	3020035__Moisture and Density ASTM D7236_0.xlsm		

ADVANCED TERRA TESTING

Moisture and Density
ASTM D 2216 and ASTM D 7263

CLIENT	Wiss Janney Elstner			JOB NO.	3020-035
PROJECT	Eagle Pool			LOCATION	--
PROJECT NO.	2022.4162.0				
BORING NO.	B-2	B-2	B-2	B--2	
DEPTH	17.5-18.5'	20-21'	30-31'	40-41'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	09/07/22	09/07/22	09/07/22	09/07/22	
TECHNICIAN	KR	KR	KR	KR	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	373.48	327.38	364.37	386.38	
Mass of Dry Soil and Pan (g):	301.08	268.51	279.95	305.12	
Mass of Pan (g):	6.81	6.69	6.73	6.71	
Moisture (%):	**24.6**	**22.5**	**30.9**	**27.2**	
Diameter (in):	1.93	1.93	1.93	1.92	
Height (in):	3.99	3.36	3.99	3.99	
Mass of Wet Soil and Ring (g):	478.47	320.96	469.29	490.42	
Mass of Ring (g):	111.40	0.00	111.13	110.21	
Wet Density (lbs/ft³):	**120.5**	**124.9**	**117.2**	**126.1**	
Dry Density (lbs/ft³):	**96.7**	**102.0**	**89.5**	**99.1**	
Wet Density (kg/m³):	**1930**	**2001**	**1877**	**2019**	
Dry Density (kg/m³):	**1549**	**1633**	**1434**	**1587**	
BORING NO.	B-3	B-3	B-3	B-3	
DEPTH	5-6'	15-16'	17.5-18.5'	20-21'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	09/07/22	09/07/22	09/07/22	09/07/22	
TECHNICIAN	KR	KR	KR	KR	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	471.01	345.03	332.30	326.03	
Mass of Dry Soil and Pan (g):	410.63	276.10	256.43	247.59	
Mass of Pan (g):	123.14	6.68	6.73	6.62	
Moisture (%):	**21.0**	**25.6**	**30.4**	**32.6**	
Diameter (in):	1.93	1.94	1.93	1.92	
Height (in):	3.69	3.69	3.58	3.53	
Mass of Wet Soil and Ring (g):	348.03	338.64	325.85	319.74	
Mass of Ring (g):	0.00	0.00	0.00	0.00	
Wet Density (lbs/ft³):	**123.0**	**118.7**	**118.0**	**118.9**	
Dry Density (lbs/ft³):	**101.7**	**94.5**	**90.5**	**89.7**	
Wet Density (kg/m³):	**1971**	**1902**	**1890**	**1904**	
Dry Density (kg/m³):	**1629**	**1514**	**1450**	**1437**	
NOTES					

Data entry by:	JT	Date:	09/09/22
Checked by:	KMS	Date:	09/12/22
File name:	3020035__Moisture and Density ASTM D7236_1.xlsm		

ADVANCED TERRA TESTING

Moisture and Density
ASTM D 2216 and ASTM D 7263

CLIENT	Wiss Janney Elstner			JOB NO.	3020-035
PROJECT	Eagle Pool			LOCATION	--
PROJECT NO.	2022.4162.0				
BORING NO.	B-3	B-3	B-3	B-4	
DEPTH	22.5-23.5	25-26'	30-31'	2.5-3.5'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	09/07/22	09/07/22	09/07/22	09/07/22	
TECHNICIAN	KR	KR	KR	KR	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	319.02	304.31	335.85	323.96	
Mass of Dry Soil and Pan (g):	246.16	225.19	273.52	260.98	
Mass of Pan (g):	6.75	6.68	6.72	6.70	
Moisture (%):	**30.4**	**36.2**	**23.4**	**24.8**	
Diameter (in):	1.92	1.92	1.93	1.93	
Height (in):	3.36	3.36	3.35	3.50	
Mass of Wet Soil and Ring (g):	312.81	298.14	329.58	317.64	
Mass of Ring (g):	0.00	0.00	0.00	0.00	
Wet Density (lbs/ft³):	**122.2**	**116.8**	**128.1**	**118.3**	
Dry Density (lbs/ft³):	**93.7**	**85.7**	**103.9**	**94.8**	
Wet Density (kg/m³):	**1958**	**1870**	**2052**	**1895**	
Dry Density (kg/m³):	**1501**	**1373**	**1664**	**1519**	
BORING NO.	B-4	B-4	B-4	B-5	
DEPTH	12.5-13.5'	17.5-18.5'	20-21'	10-11'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED	09/07/22	09/07/22	09/07/22	09/07/22	
TECHNICIAN	KR	KR	KR	KR	
DESCRIPTION					
Mass of Wet Soil and Pan (g):	476.43	404.59	431.09	323.11	
Mass of Dry Soil and Pan (g):	412.05	351.88	379.99	279.39	
Mass of Pan (g):	139.24	6.77	6.74	6.80	
Moisture (%):	**23.6**	**15.3**	**13.7**	**16.0**	
Diameter (in):	1.93	1.93	1.94	1.92	
Height (in):	3.58	3.79	4.00	3.77	
Mass of Wet Soil and Ring (g):	337.49	398.17	531.93	316.80	
Mass of Ring (g):	0.00	0.00	106.93	0.00	
Wet Density (lbs/ft³):	**122.9**	**136.8**	**136.9**	**110.6**	
Dry Density (lbs/ft³):	**99.5**	**118.6**	**120.4**	**95.3**	
Wet Density (kg/m³):	**1969**	**2191**	**2192**	**1771**	
Dry Density (kg/m³):	**1593**	**1901**	**1928**	**1526**	
NOTES					

Data entry by:	JT	Date:	09/09/22
Checked by:	KMS	Date:	09/12/22
File name:	3020035__Moisture and Density ASTM D7236_2.xlsm		

ADVANCED TERRA TESTING

Moisture and Density
ASTM D 2216 and ASTM D 7263

CLIENT	Wiss Janney Elstner			JOB NO.	3020-035
PROJECT	Eagle Pool			LOCATION	--
PROJECT NO.	2022.4162.0				
BORING NO.		B-5	B-5	B-5	
DEPTH		15-16'	20-21'	30-31'	
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED		09/07/22	09/07/22	09/07/22	
TECHNICIAN		KR	KR	KR	
DESCRIPTION					
Mass of Wet Soil and Pan (g):		319.28	374.70	315.45	
Mass of Dry Soil and Pan (g):		253.27	320.24	238.74	
Mass of Pan (g):		6.69	6.83	6.68	
Moisture (%):		**26.8**	**17.4**	**33.1**	
Diameter (in):		1.94	1.93	1.90	
Height (in):		3.64	3.88	3.43	
Mass of Wet Soil and Ring (g):		312.96	368.38	309.24	
Mass of Ring (g):		0.00	0.00	0.00	
Wet Density (lbs/ft³):		**111.4**	**123.4**	**120.7**	
Dry Density (lbs/ft³):		**87.8**	**105.1**	**90.7**	
Wet Density (kg/m³):		**1784**	**1976**	**1933**	
Dry Density (kg/m³):		**1407**	**1684**	**1453**	
BORING NO.					
DEPTH					
SAMPLE NO.					
DATE SAMPLED					
DATE TESTED					
TECHNICIAN					
DESCRIPTION					
Mass of Wet Soil and Pan (g):					
Mass of Dry Soil and Pan (g):					
Mass of Pan (g):					
Moisture (%):					
Diameter (in):					
Height (in):					
Mass of Wet Soil and Ring (g):					
Mass of Ring (g):					
Wet Density (lbs/ft³):					
Dry Density (lbs/ft³):					
Wet Density (kg/m³):					
Dry Density (kg/m³):					
NOTES					

Data entry by:	KMS	Date:	09/12/22
Checked by:	KR	Date:	09/12/22
File name:	3020035__Moisture and Density ASTM D7236_3.xlsm		

ADVANCED TERRA TESTING

Percent Minus #200
ASTM D 1140

CLIENT	Wiss Janney Elstner	BORING NO.	B-3
JOB NO.	3020-035	DEPTH	5-6'
PROJECT	Eagle Pool	SAMPLE NO.	--
PROJECT NO.	2022.4162.0	DATE SAMPLED	--
LOCATION	--	DESCRIPTION	--
DATE TESTED	09/08/22		
TECHNICIAN	CK		

Hygroscopic Moisture

Mass Wet Pan and Soil (g):	471.01
Mass Dry Pan and Soil (g):	410.63
Mass of Pan (g):	123.14
Moisture (%):	**21.0**

Sample Data

Total Wet Mass of Sample (g):	347.9
Total Dry Mass of Sample (g):	287.5

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
#4	4.75	0.0	0.0	--	--	**100.0**
#200	0.075	161.1	123.1	38.0	1.00	**86.8**

USCS Classification ASTM D 2487

Atterberg Classification:	--
Group Symbol:	--
USCS Classification:	--

NOTES

Data entry by:	JT	Date:	09/09/22
Checked by:	KMS	Date:	09/12/22
File name:	3020035__Percent Minus #200 ASTM D1140_0.xlsm		

ADVANCED TERRA TESTING

Percent Minus #200
ASTM D 1140

CLIENT	Wiss Janney Elstner	BORING NO.	B-4
JOB NO.	3020-035	DEPTH	12.5-13.5'
PROJECT	Eagle Pool	SAMPLE NO.	--
PROJECT NO.	2022.4162.0	DATE SAMPLED	--
LOCATION	--	DESCRIPTION	--
DATE TESTED	09/08/22		
TECHNICIAN	CK		

Hygroscopic Moisture

Mass Wet Pan and Soil (g):	476.43
Mass Dry Pan and Soil (g):	412.05
Mass of Pan (g):	139.24
Moisture (%):	**23.6**

Sample Data

Total Wet Mass of Sample (g):	337.2
Total Dry Mass of Sample (g):	272.8

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
#4	4.75	0.0	0.0	--	--	**100.0**
#200	0.075	186.3	139.2	47.1	1.00	**82.7**

USCS Classification ASTM D 2487

Atterberg Classification:	--
Group Symbol:	--
USCS Classification:	--

NOTES

Data entry by:	JT	Date:	09/09/22
Checked by:	KMS	Date:	09/12/22
File name:	3020035__Percent Minus #200 ASTM D1140_1.xlsm		

ADVANCED TERRA TESTING

Percent Minus #200
ASTM D 1140

CLIENT	Wiss Janney Elstner	BORING NO.	B-1
JOB NO.	3020-035	DEPTH	10-11'
PROJECT	Eagle Pool	SAMPLE NO.	--
PROJECT NO.	2022.4162.0	DATE SAMPLED	--
LOCATION	--	DESCRIPTION	--
DATE TESTED	09/09/22		
TECHNICIAN	CK		

Hygroscopic Moisture

Mass Wet Pan and Soil (g):	454.28
Mass Dry Pan and Soil (g):	390.04
Mass of Pan (g):	116.39
Moisture (%):	**23.5**

Sample Data

Total Wet Mass of Sample (g):	337.9
Total Dry Mass of Sample (g):	273.7

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
#4	4.75	0.0	0.0	--	--	**100.0**
#200	0.075	156.1	116.4	39.7	1.00	**85.5**

USCS Classification ASTM D 2487

Atterberg Classification:	--
Group Symbol:	--
USCS Classification:	--

NOTES

Data entry by:	KMS	Date:	09/12/22
Checked by:	KR	Date:	09/12/22
File name:	3020035__Percent Minus #200 ASTM D1140_2.xlsm		

ADVANCED TERRA TESTING

Percent Minus #200
ASTM D 1140

CLIENT	Wiss Janney Elstner	BORING NO.	B-2
JOB NO.	3020-035	DEPTH	12.5-13.5'
PROJECT	Eagle Pool	SAMPLE NO.	--
PROJECT NO.	2022.4162.0	DATE SAMPLED	--
LOCATION	--	DESCRIPTION	--
DATE TESTED	09/09/22		
TECHNICIAN	CK		

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 470.11
Mass Dry Pan and Soil (g): 406.95
Mass of Pan (g): 117.36
Moisture (%): **21.8**

Sample Data

Total Wet Mass of Sample (g): 352.8
Total Dry Mass of Sample (g): 289.6

Sieve Number	Sieve Size (mm)	Mass of Pan and Soil (g)	Mass of Pan (g)	Mass of Individual Retained Soil (g)	Correction Factor	Percent Passing by Weight (%)
#4	4.75	0.0	0.0	--	--	**100.0**
#200	0.075	147.1	117.4	29.8	1.00	**89.7**

USCS Classification ASTM D 2487

Atterberg Classification: --
Group Symbol: --
USCS Classification: --

NOTES

Data entry by: KMS Date: 09/12/22
Checked by: KR Date: 09/12/22
File name: 3020035__Percent Minus #200 ASTM D1140_3.xlsm

ADVANCED TERRA TESTING

One Dimensional Swell / Collapse

Denver Swell

CLIENT	Wiss Janney Elstner	BORING NO.	B-1
JOB NO.	3020-035	DEPTH	15-16'
PROJECT	Eagle Pool	SAMPLE NO.	--
PROJECT NO.	2022.4162.0	DATE SAMPLED	--
LOCATION	--	SAMPLED BY	--
DATE TESTED	08/23/22	DESCRIPTION	Cal Liner
TECHNICIAN	AC		
RAW FILE	--		

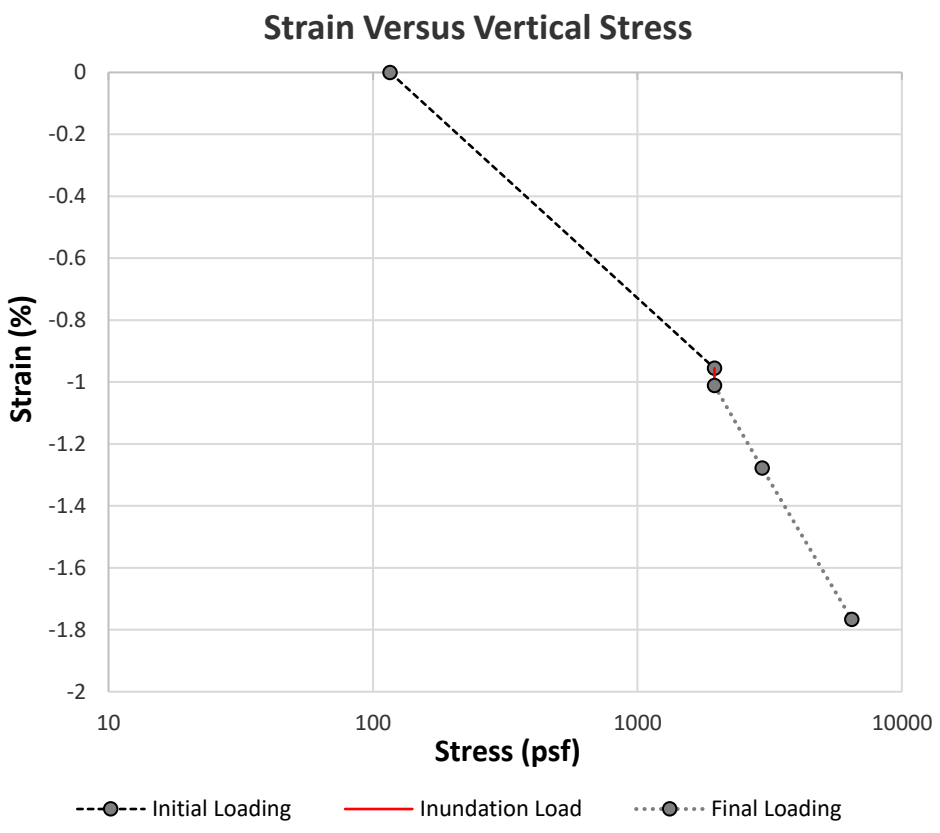
Sample Conditions

Before Test Mass of Wet Soil and Ring (g):	330.57	Initial Wet Density (pcf):	125.2
After Test Mass of Wet Soil and Ring (g):	333.28	Initial Dry Density (pcf):	109.9
Mass of Dry Soil, Ring, and Pan (g):	370.72	Initial Wet Density (kg/m³):	2006
Diameter (in):	1.94	Initial Dry Density (kg/m³):	1760
Initial Height (in):	0.90	Initial Moisture (%):	13.9
Mass of Ring (g):	243.31	Final Wet Density (pcf):	132.2
Mass of Pan (g):	50.82	Final Dry Density (pcf):	112.6
Inundation Load (psf):	1956	Final Wet Density (kg/m³):	2118
Inundation Load (kPa):	94	Final Dry Density (kg/m³):	1803
Oedometer ID:	ATT-2	Final Moisture (%):	17.5

Swell / Collapse Data

Collapse (%):	-0.06	Swell Pressure (psf):	--
		Swell Pressure (kPa):	--

Load (psf)	Deformation (in)	Strain (%)
116	0.0000	0.00
1956	-0.0086	-0.96
Inundated	-0.0091	-1.01
2962	-0.0115	-1.28
6465	-0.0159	-1.77



Data entry by: AC Date: 09/07/22
Checked by: WAR Date: 09/12/22
File name: 3020035__Swell Collapse ASTM D4546_0.xlsm

ADVANCED TERRA TESTING

One Dimensional Swell / Collapse

Denver Swell

CLIENT	Wiss Janney Elstner	BORING NO.	B-2
JOB NO.	3020-035	DEPTH	7.5-8.5'
PROJECT	Eagle Pool	SAMPLE NO.	--
PROJECT NO.	2022.4162.0	DATE SAMPLED	--
LOCATION	--	SAMPLED BY	--
DATE TESTED	08/23/22	DESCRIPTION	Cal Liner
TECHNICIAN	AC		
RAW FILE	--		

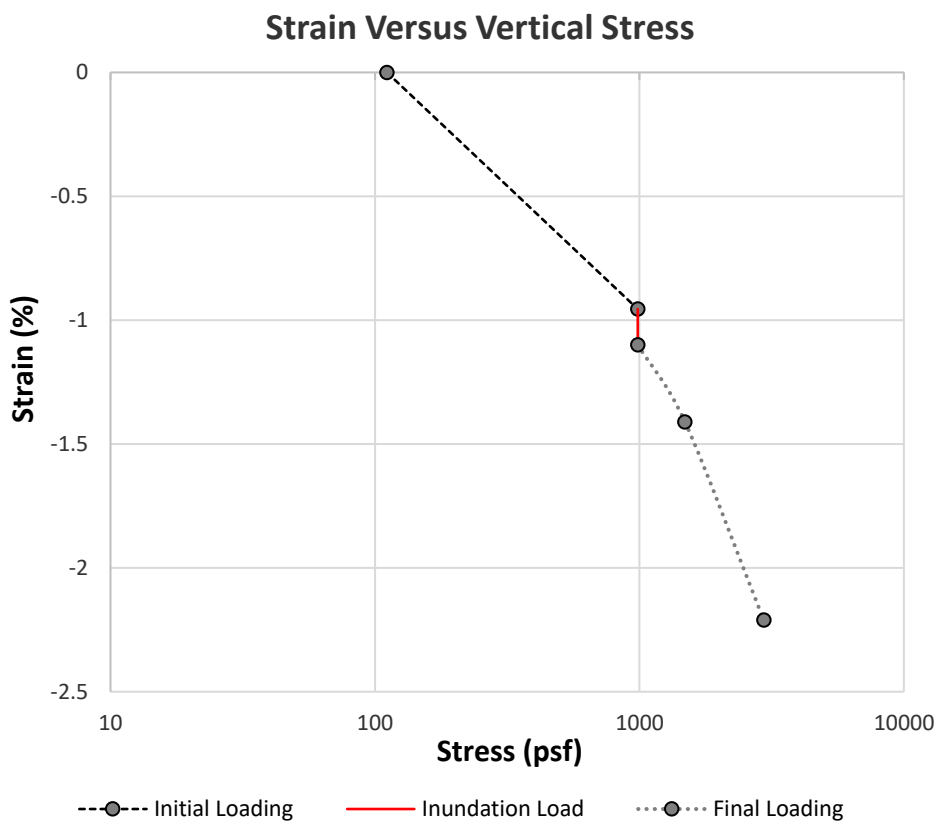
Sample Conditions

Before Test Mass of Wet Soil and Ring (g):	327.53	Initial Wet Density (pcf):	123.4
After Test Mass of Wet Soil and Ring (g):	328.48	Initial Dry Density (pcf):	103.7
Mass of Dry Soil, Ring, and Pan (g):	362.96	Initial Wet Density (kg/m³):	1977
Diameter (in):	1.94	Initial Dry Density (kg/m³):	1662
Initial Height (in):	0.90	Initial Moisture (%):	19.0
Mass of Ring (g):	241.52	Final Wet Density (pcf):	128.1
Mass of Pan (g):	49.15	Final Dry Density (pcf):	106.5
Inundation Load (psf):	986	Final Wet Density (kg/m³):	2052
Inundation Load (kPa):	47	Final Dry Density (kg/m³):	1706
Oedometer ID:	ATT-5	Final Moisture (%):	20.3

Swell / Collapse Data

Collapse (%):	-0.14	Swell Pressure (psf):	--
		Swell Pressure (kPa):	--

Load (psf)	Deformation (in)	Strain (%)
111	0.0000	0.00
986	-0.0086	-0.96
Inundated	-0.0099	-1.10
1487	-0.0127	-1.41
2952	-0.0199	-2.21



Data entry by:	AC	Date: 09/07/22
Checked by:	WAR	Date: 09/12/22
File name:	3020035__Swell Collapse ASTM D4546_1.xlsm	

ADVANCED TERRA TESTING

One Dimensional Swell / Collapse

Denver Swell

CLIENT	Wiss Janney Elstner	BORING NO.	B-3
JOB NO.	3020-035	DEPTH	10-11'
PROJECT	Eagle Pool	SAMPLE NO.	--
PROJECT NO.	2022.4162.0	DATE SAMPLED	--
LOCATION	--	SAMPLED BY	--
DATE TESTED	08/31/22	DESCRIPTION	Cal Liner
TECHNICIAN	AC		
RAW FILE	--		

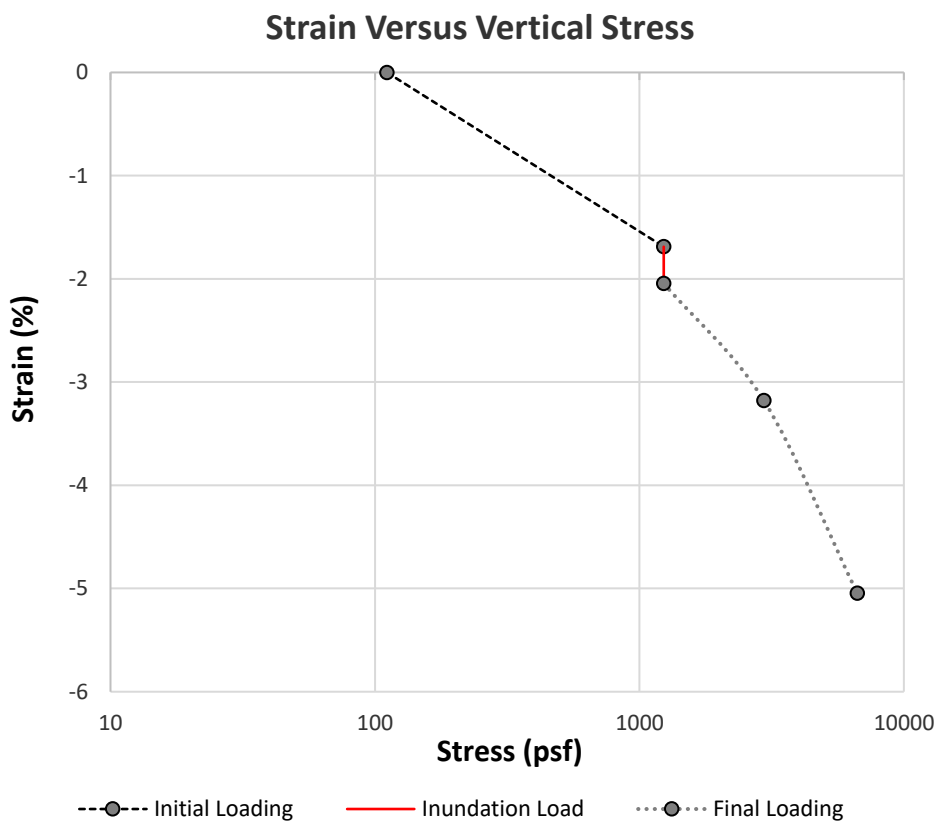
Sample Conditions

Before Test Mass of Wet Soil and Ring (g):	324.18	Initial Wet Density (pcf):	118.5
After Test Mass of Wet Soil and Ring (g):	324.32	Initial Dry Density (pcf):	94.1
Mass of Dry Soil, Ring, and Pan (g):	356.62	Initial Wet Density (kg/m³):	1899
Diameter (in):	1.94	Initial Dry Density (kg/m³):	1508
Initial Height (in):	0.90	Initial Moisture (%):	25.9
Mass of Ring (g):	241.58	Final Wet Density (pcf):	125.9
Mass of Pan (g):	49.44	Final Dry Density (pcf):	99.8
Inundation Load (psf):	1236	Final Wet Density (kg/m³):	2017
Inundation Load (kPa):	59	Final Dry Density (kg/m³):	1599
Oedometer ID:	ATT-5	Final Moisture (%):	26.1

Swell / Collapse Data

Collapse (%):	-0.36	Swell Pressure (psf):	--
		Swell Pressure (kPa):	--

Load (psf)	Deformation (in)	Strain (%)
111	0.0000	0.00
1236	-0.0152	-1.69
Inundated	-0.0184	-2.04
2952	-0.0286	-3.18
6659	-0.0454	-5.04



Data entry by: AC Date: 09/07/22
Checked by: WAR Date: 09/12/22
File name: 3020035__Swell Collapse ASTM D4546_2.xlsm