



**PLANNING DEPARTMENT ADMINISTRATIVE PUBLIC HEARING
SUMMIT COUNTY, UTAH
October 3, 2024**

The Planning Department of Park City, Utah, will hold a Public Hearing in person at the Marsac Municipal Building, Planning Department Conference Room, at 445 Marsac Avenue, Park City, Utah 84060. Meetings will also be available online and may have options to listen, watch, or participate virtually.

1. REGULAR AGENDA - 12:00PM

- 1.A. **3335 Solamere Drive - Administrative Conditional Use Permit** - The Applicant Proposes a Retaining Wall Greater Than 6 Feet in Height in the Residential Development Zoning District and Sensitive Land Overlay. PL-24-06172
(A) Public Hearing; (B) Action

Pursuant to the Americans with Disabilities Act, individuals needing special accommodations during the meeting should notify the Planning Department at 435-615-5060 or planning@parkcity.org at least 24 hours prior to the meeting.

***Parking is available at no charge for meeting attendees who park in the China Bridge parking structure.**

Planning Department Staff Report



Subject: 3335 Solamere Drive Retaining Wall
Application: PL-24-06172
Author: Jaron Ehlers, Planner I
Date: October 3, 2024
Type of Item: Administrative Conditional Use Permit

Recommendation

(I) Review the Administrative Conditional Use Permit (ACUP) for a ten-foot-tall and 56-foot-long Verti-Block retaining wall on a Very Steep Slope, (II) conduct a public hearing, and (III) consider approving the ACUP based on the Findings of Fact, Conclusions of Law, and Conditions of Approval outlined in the Draft Final Action Letter (Exhibit A).

Description

Applicant: Carol Martin
Todd Tanner – AEG, Applicant Representative
Location: 3335 Solamere Drive
Zoning District: Residential Development (RD)
Sensitive Land Overlay (SLO)
Adjacent Land Uses: Residential Dwellings, Open Space
Reason for Review: The Planning Department reviews and takes Final Action on ACUPs.¹

ACUP Administrative Conditional Use Permit
LMC Land Management Code
RD Residential Development
SLO Sensitive Land Overlay

Terms that are capitalized as proper nouns throughout this staff report are defined in LMC [§ 15-15-1](#).

Summary

The Applicant proposes to construct a ten-foot-tall and 56-foot-long Verti-Block retaining wall on a Very Steep Slope to replace and supplement failing boulder retaining walls at 3335 Solamere Drive, Lot 28 of the Hidden Oaks at Deer Valley Phase 1A Subdivision. The Lot is in the Residential Development (RD) Zoning District and the Sensitive Land Overlay (SLO) and is within the Deer Valley Master Planned Development.

¹ LMC [§ 15-2-8\(E\)](#)



Figure 1: Location of Lot highlighted in red. RD Zoning District is tan.

A Single-Family Dwelling was constructed on the property in 2006 with extensive boulder retaining walls along the Very Steep Slopes of the site. The following images show existing conditions:



Figure 2: Images of existing conditions submitted by Applicant.

The proposed replacement and supplemental retaining wall is Verti-block, approximately ten feet in height from Final Grade and 56 feet long. Land Management Code (LMC) [§ 15-2.13-2\(B\)\(40\)](#) establishes that “Fences and walls greater than six feet (6') in height from Final Grade” are Conditional Uses in the RD Zoning District, requiring an ACUP. The Applicant submitted an ACUP application on June 24, 2024.

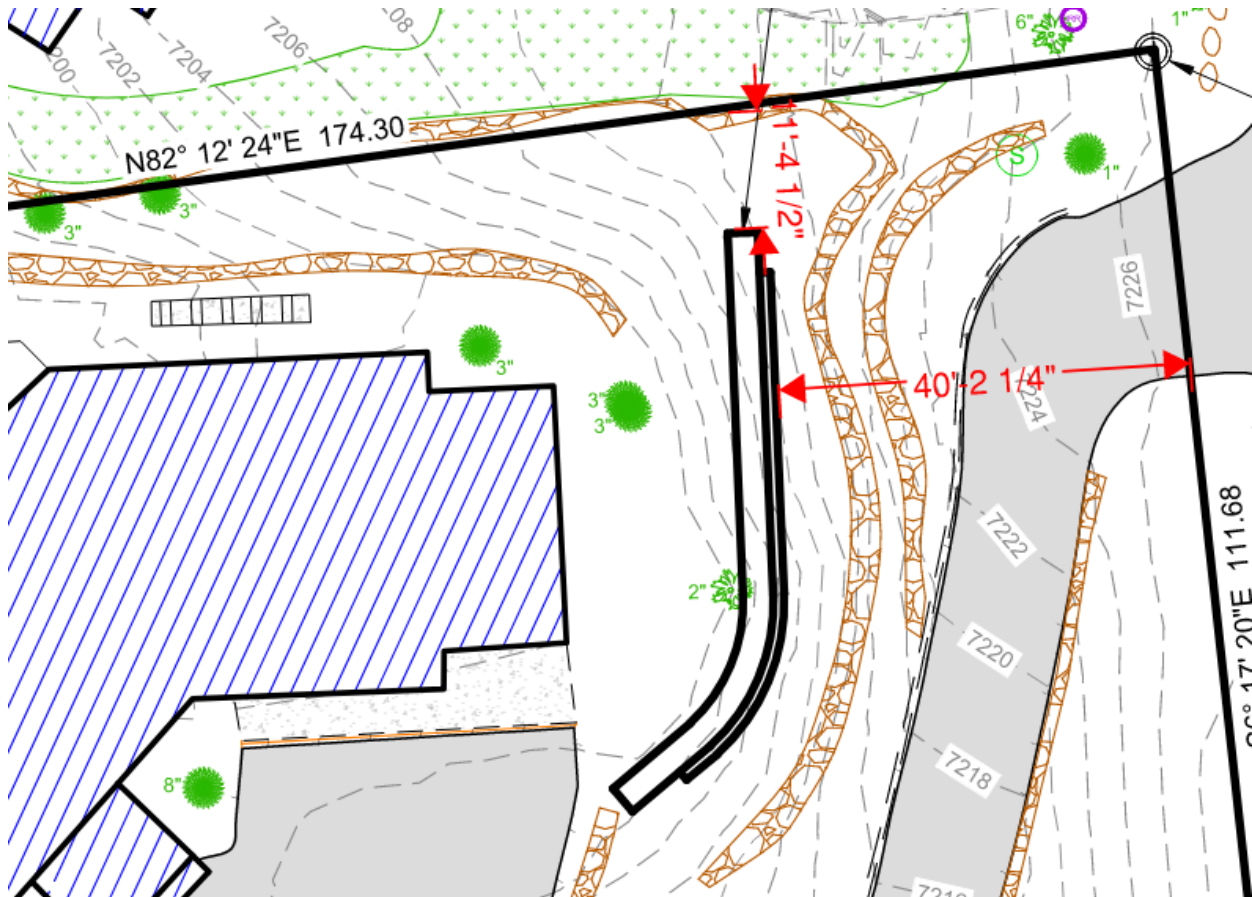


Figure 3: Location of proposed retaining wall onsite and distance from nearest property lines.



Slopes Table			
Number	Minimum Slope	Maximum Slope	Color
1	1%	15%	
2	15%	30%	
3	30%	40%	
4	40%	> 40%	

Figure 4: Location of proposed retaining wall and nearby slopes.

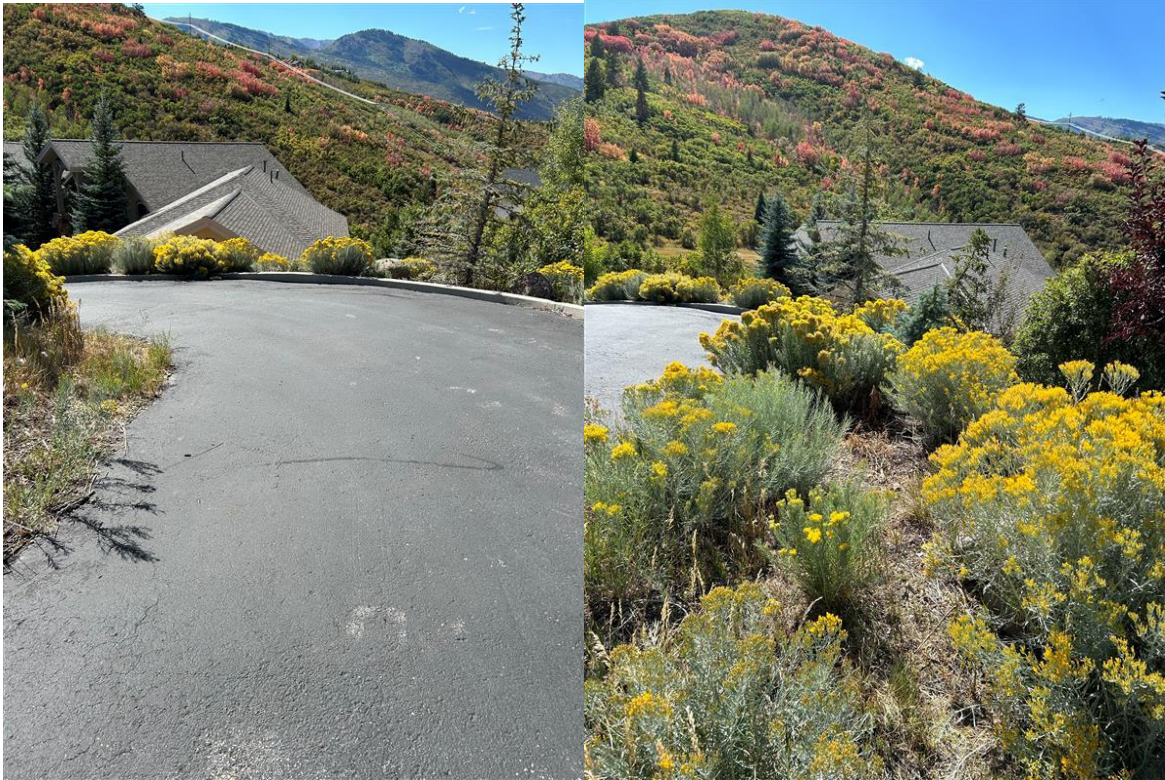


Figure 5: Photos of the property from Solamere Drive. Existing retaining wall cannot be seen.

The full analysis of the proposed retaining wall is outlined in the Draft Final Action Letter (see Exhibit A).

The Development Review Committee reviewed the proposal on July 23, 2024, and confirmed the proposal complies with required standards.²

Department Review

The Planning Department reviewed this report.

Notice

Staff published notice on the City's website and the Utah Public Notice website and posted notice to the property on September 19, 2024. Staff mailed courtesy notice to adjacent property owners on September 19, 2024.³

Public Input

Staff did not receive any public input at the time this report was published.

² The Development Review Committee meets the first and third Tuesday of each month to review and provide comments on Planning Applications, including review by the Building Department, Engineering Department, Sustainability Department, Transportation Planning Department, Code Enforcement, the City Attorney's Office, Local Utilities including Rocky Mountain Power and Dominion Energy, the Park City Fire District, Public Works, Public Utilities, and the Snyderville Basin Water Reclamation District (SBWRD).

³ LMC [§ 15-1-21](#)

Alternatives

- The Planning Director may approve the ACUP; or
- The Planning Director may deny the ACUP and direct staff to make Findings for the denial; or
- The Planning Director may request additional information and continue the discussion to a date certain.

Exhibits

Exhibit A: Draft Final Action Letter

Attachment 1: Approved Plans

Exhibit B: Recorded Plat

Exhibit C: Applicant Narrative

Exhibit D: Deer Valley Master Planned Development

Exhibit E: Retaining Wall Structural Plans

Exhibit F: Topographic Survey dated September 10, 2024

Exhibit G: Topographic Survey with Slope Grades Shown



Planning Department

October 3, 2024

Todd Tanner

CC: Carol Martin

NOTICE OF PLANNING DEPARTMENT ACTION

Description

Address: 3335 Solamere Drive

Zoning District: Recreation Development
Sensitive Land Overlay

Application: Administrative Conditional Use Permit

Project Number: PL-24-06172

Action: APPROVED WITH CONDITIONS (See Below)

Date of Final Action: October 3, 2024

Project Summary: The Applicant Proposes a ten-foot-tall and 56-foot-long Verti-Block retaining wall to replace and supplement a boulder retaining wall in the Residential Development Zoning District and Sensitive Land Overlay.

Action Taken

On October 3, 2024, the Assistant Planning Director conducted a public hearing and approved the ACUP according to the following findings of fact, conclusions of law, and conditions of approval:

Findings of Fact

1. 3335 Solamere Drive is a Single-Family Dwelling constructed in 2006. The site contains Very Steep Slopes with extensive boulder retaining walls.
2. 3335 Solamere Drive is Lot 28 of the Hidden Oaks at Deer Valley Phase 1A Subdivision. The Lot is in the Residential Development (RD) Zoning District and the Sensitive Land Overlay (SLO), and the Deer Valley Master Planned Development (MPD).



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3. The Applicant states that the existing terraced boulder retaining walls are in poor condition and need replacement and supplemented retention.
4. Land Management Code (LMC) § 15-2.13-2(B)(40) establishes that “Fences and walls greater than six feet (6') in height from Final Grade” are Conditional Uses in the RD Zone requiring an Administrative Conditional Use Permit (ACUP).
5. The proposed retaining wall is Verti-block and approximately 10 feet in height from Final Grade and 56 feet long.
6. The Applicant submitted an ACUP application on June 24, 2024.
7. The proposal to build a retaining wall greater than six feet in height meets the standards of the RD Zoning District in LMC Chapter 15-2.13 *Residential Development*:
 - a. The RD Zoning District establishes a 20-foot Front, 15-foot Rear, and 12-foot Side Setback.
 - b. The proposed retaining wall does not encroach into the Front, Rear, or southern Side Setback.
 - c. The proposed retaining wall encroaches into the 12-foot northern Side Setback. LMC § 15-2.13-3(G)(7) allows retaining walls over six feet in height from Final Grade within the Side Setback, subject to an ACUP.
 - d. LMC § 15-2.13-10 requires protection of Significant Vegetation but no Significant Vegetation is shown on the survey.
8. The Assistant Planning Director reviewed the proposal based on the following Conditional Use Permit criteria outlined in LMC § 15-1-10(E):
 - 1. Size and Location of Site**
 - **No required mitigation:** The proposed retaining wall is located on a site already disturbed by the existing structure and the existing retaining walls. Due to the topography of the site, neither the existing nor the proposed retaining wall are visible from Solamere Drive.
 - 2. Traffic**
 - **No required mitigation:** The proposed retaining wall will not increase the traffic that comes and goes from the site.
 - 3. Utility Capacity**
 - **No required mitigation:** No utilities are in locations that will be impacted by the proposed retaining wall and the retaining wall will not lead to an increase in needed capacity.
 - 4. Emergency Vehicle Access**



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- **No required mitigation:** The existing driveway will be unchanged.

5. Off-Street Parking

- **No required mitigation:** The parking requirement for the property is not increased by this Use nor will existing parking be affected.

6. Internal Vehicle and Pedestrian Circulation

- **No required mitigation:** The existing Driveway will not be affected by the retaining wall and the existing grade of the location for the retaining wall is already steep enough to discourage pedestrian use.

7. Fencing, Screening, and Landscaping

- **Condition of Approval recommended:** Any trees that are removed as part of construction shall be replaced (Condition of Approval 5).
- The existing retaining wall and proposed retaining wall are not visible from Solamere Drive.

8. Building Mass, Bulk, and Orientation

- **No mitigation required:** While the proposed retaining wall is large, stretching 56 feet in length, the disturbed area is also large. The retaining wall is in an area that is naturally screened by the existing changes in grade.

9. Usable Open Space

- **No mitigation required:** The area for the proposed retaining wall has already been extensively disturbed.

10. Signs and Lighting

- **No mitigation required:** There are no signs or lighting proposed or approved as part of this permit.

11. Physical Design and Compatibility with Surrounding Structures

- **No mitigation required:** While the proposed retaining wall is large, stretching 56 feet in length, the disturbed area is also large. The retaining wall is also located in an area that is naturally screened by the existing changes in grade. While the proposed wall is a single wall, larger than the existing walls, and from a different material, it is compatible with Surrounding Structures as the wall is naturally screened and not viewable in the larger context of the neighborhood. The proposed wall would be Verti-



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block, which is a precast concrete that is designed to appear to be stone, allowing it to visual match the existing retaining walls.

12. Noise, Vibration, Odors, Steam, or Other Mechanical Factors

- **No mitigation required:** The project will result in no unmitigated impacts. The existing situation will not be substantially altered, as the only change is an additional retaining wall.

13. Expected Ownership and Management

- **No mitigation required:** There is no expected change to the ownership and management of the property as a result of this permit.

14. Within and Adjoining the Site, Environmentally Sensitive Lands, Physical Mine Hazards, Historic Mine Waste, and Park City Soils Ordinance, Steep Slopes, and Appropriateness of the Proposed Structure to the Existing Topography of the Site

- **Condition of Approval Recommended:** The property is within the Sensitive Land Overlay. To minimize any further effect on the area, Staff recommends Condition of Approval 3 to ensure the retaining wall is not larger than necessary. Further analysis is contained in the specific Sensitive Land Overlay section of this Final Action Letter.

15. Reviewed for Consistency with the Goals and Objectives of the Park City General Plan

- **No mitigation required:** The property is in the Lower Deer Valley General Plan Neighborhood. Neighborhood Goal 8.7 states "The aesthetic of the Lower Deer Valley neighborhood should be preserved." The proposal allows for the creation of a retaining wall that will preserve existing site conditions.
9. The proposal to build a retaining wall greater than six feet in height meets the standards of the SLO in LMC Chapter 15-2.21. LMC § 15-2.21-24 includes specific regulations for Development among slopes in the SLO. Regulations that apply to retaining walls include:
- a. **PROHIBITIONS. No development is allowed on or within fifty feet (50'), map distance, of Very Steep Slopes, Areas subject to land slide activity, and other high-hazard geologic Areas. As used herein, an Area of Very Steep Slopes must cover a topographic Area at least twenty-five feet (25') vertically, upslope or downslope, and fifty feet**



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(50') horizontally in any direction to be subject to this prohibition.

The retaining wall will be located within a Very Steep Slope, as shown on the Topographic Survey, but that Very Steep Slope was created by the creation of the existing home. The retaining wall is needed to stabilize the existing walls and provide geological stability for the Lot. Failure to install a new wall could jeopardize the existing Single-Family Dwelling. The retaining wall is located over 100 feet from the nearest naturally occurring Very Steep Slope which is on the western downhill side of the Lot.

- e. **RETAINING WALLS. The Use, design, and construction of all retaining walls is subject to an Administrative Permit based upon assessment of visual impact, Compatibility with surrounding terrain and vegetation, and safety.** The submitted Topographic Survey shows that the proposed retaining wall is located within a Very Steep Slope. The Very Steep Slope was created by excavation of the site to allow for Development of the existing Single-Family Dwelling. The proposed retaining wall provides stabilization. No natural Steep or Very Steep Slopes will be disturbed by the proposed wall. The retaining wall has limited visual impacts as it cannot be seen from Solamere Drive and is naturally screened by the existing grade change.
- f. **LANDSCAPING AND REVEGETATION. An Applicant must commit to landscaping or re-vegetating exposed Slopes. Topsoil from any disturbed portion of a Steep Slope must be preserved and utilized in re-vegetation. Fill soil must be of a quality to support plant growth.** Vegetation is protected through Condition of Approval 5 which requires the replacement of any trees that are removed during construction. Any Topsoil from the disturbed area in the construction of the retaining wall shall be used in the re-vegetation of the site.
- g. **PRIVATE DEVELOPMENT DESIGN STANDARDS. All Development on Steep Slopes shall comply with the design standards set forth in LMC Chapter 15-5.** While the proposed wall is a single wall, larger than the existing walls, and from a different material, it is compatible with Surrounding Structures as the wall is naturally screened and not viewable in the larger context of the neighborhood. The proposed wall would be Verti-block, which is a precast concrete that is designed to appear to be stone, allowing it to visual match the existing retaining walls. Verti-block is



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not a material prohibited by LMC Chapter 15-5 as the prohibition against synthetic stone products applies only to siding.

10. The property is subject to the Deer Valley MPD, specifically Section E which governs the applicability of the SLO. Section E states properties within Deer Valley and the SLO are reviewed for (1) limits of disturbance, (2) vegetation protection, and (3) design standards (see analysis above).
11. The Development Review Committee reviewed the proposal on July 23, 2024, and confirmed the proposal complies with required standards.
12. Staff published notice on the City's website and the Utah Public Notice website and posted notice to the property on September 19, 2024. Staff mailed courtesy notice to adjacent property owners on September 19, 2024.

Conclusions of Law

1. The proposal complies with LMC § 15-1-10 *Conditional Use Review Process*, Chapter 15-2.21 *Sensitive Land Overlay Zone (SLO) Regulations*, Chapter 15-2.13 *Residential Development (RD) Zoning District*.
2. The proposal complies with the requirements of the Deer Valley Master Planned Development.
3. The Use is compatible with surrounding Structures in Use, scale, mass, and circulation.
4. The effects of any difference in use or scale have been mitigated through careful planning.

Conditions of Approval

1. The Applicant is responsible for notifying the Planning Department in writing of any changes, modifications, or deviations from the approved scope of work and shall be reviewed and approved or denied by the Planning Director or their designee in accordance with applicable development standards.
2. Final building plans and construction details shall reflect substantial compliance with the plans submitted with this application. Any changes, modifications, or deviations from the approved design that have not been approved in advance by the Planning Department may result in a Stop Work Order.
3. The retaining wall shall not exceed 10 feet in height from Final Grade nor be longer than 56 feet.
4. Any portion of the retaining wall over four feet and larger requires engineered plans at the time of building permit submittal and requires review and approval by the Engineering and Building Departments.



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5. Upon completion of the proposed retaining wall, that retaining wall and the existing retaining walls must be vegetatively screened.

If you have questions or concerns regarding this Final Action Letter, please call (435) 699-8991 or email jaron.ehlers@parkcity.org.

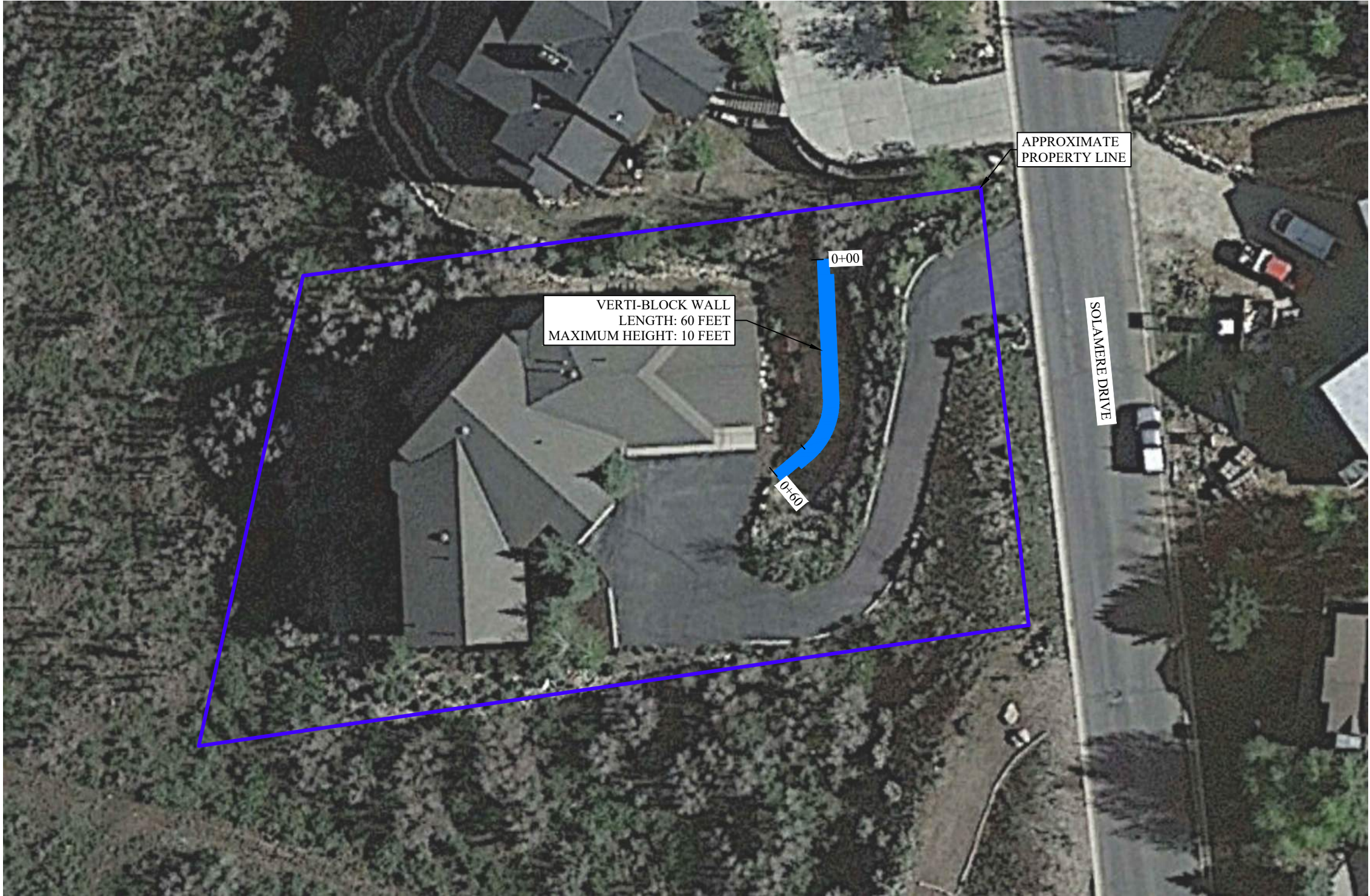
Sincerely,

Elissa Martin, Assistant Planning Director

CC: Jaron Ehlers, Project Planner

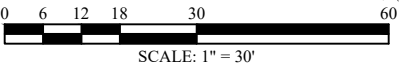
Attachment 1: Approved Plans

VERTI-BLOCK RETAINING WALL DESIGN PACKAGE
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH



NOTE: THIS PLAN SET HAS BEEN PREPARED WITH COLOR LINE-TYPES TO MAKE SOME DETAILS AND SPECIFICATIONS MORE CLEAR. ANY COPIES OF THESE PLANS SHOULD BE MADE IN COLOR.

PROJECT AERIAL VIEW
REFERENCE IMAGE FROM GOOGLE EARTH PRO,
IMAGE TAKEN MAY 24, 2022.



REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



12429 SOUTH 300 EAST
DRAPER, UTAH 84020
(801) 748-4044

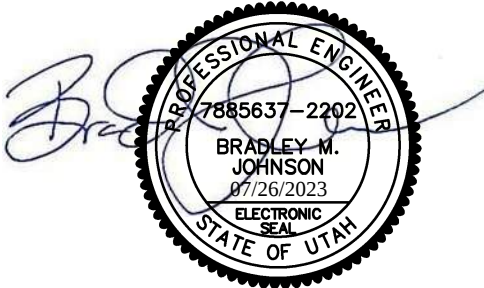
VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
COVER SHEET

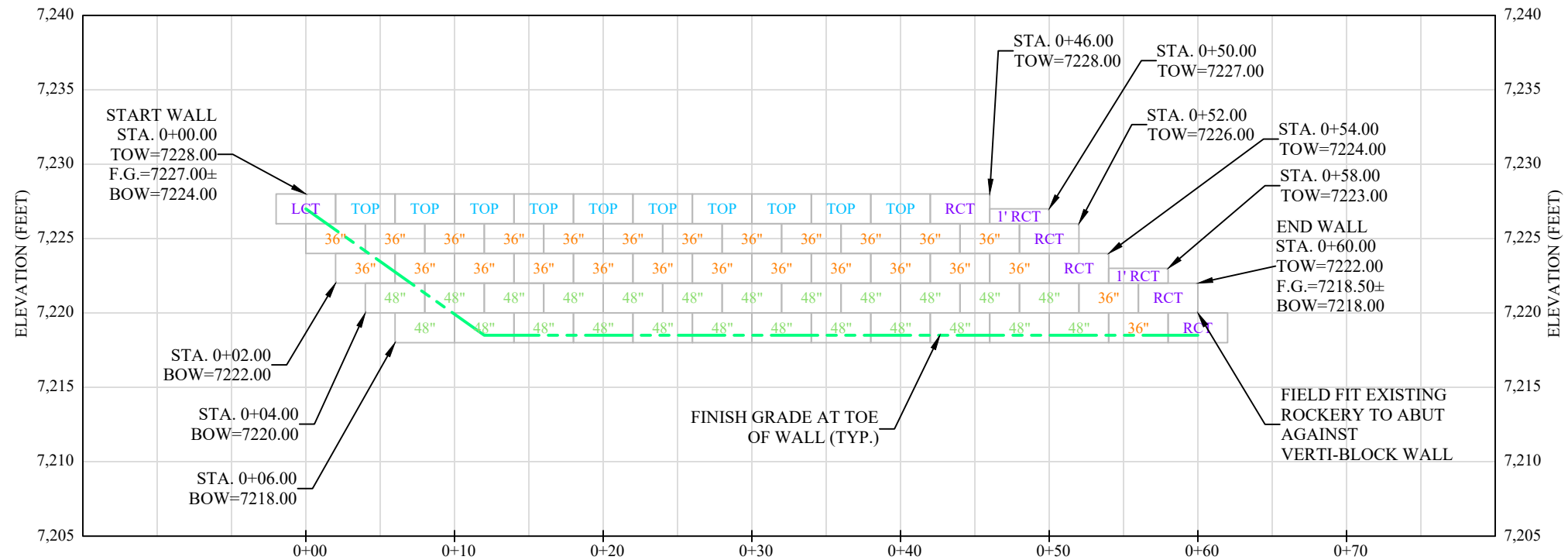
DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	1"=30'
IGES PROJECT NO: 04409-001	SHEET NO: 1	REV N/A

DESIGN PACKAGE CONTENTS		
	SHEET NO.	DESCRIPTION
SHOP DRAWINGS	1	COVER SHEET
	2	ELEVATION VIEW
	3	TYPICAL SECTION VIEW
	4	CONSTRUCTION SPECIFICATIONS & NOTES
	5	VERTI-BLOCK DETAILS
	6	DESIGN CRITERIA
	7	SITE PHOTOS
DESIGN CALCULATION PACKAGE	SECTION 2	STABILITY CALCULATIONS
	SECTION 3	GLOBAL STABILITY RESULTS
	SECTION 4	SEISMIC PARAMETERS

PREPARED FOR:
CAROL MARTIN
3335 SOLAMERE DRIVE
PARK CITY, UTAH 84060

APPROVED BY: BRADLEY M. JOHNSON, P.E.





VERTI-BLOCK RETAINING WALL ESTIMATED QUANTITIES	
MATERIAL	TOTAL
TOTAL VERTI-BLOCK WALL AREA (ft²)	536
TOP VERTI-BLOCK UNITS	10
36-INCH VERTI-BLOCK UNITS	26
48-INCH VERTI-BLOCK UNITS	24
LEFT CORNER TOP VERTI-BLOCK UNITS	1
RIGHT CORNER TOP VERTI-BLOCK UNITS	5
1' RIGHT CORNER TOP VERTI-BLOCK UNITS	2
DRAINAGE AND INFILL GRAVEL (yd³)	40
LEVELING PAD CRUSHED STONE (yd³)	5
4-INCH PERFORATED DRAINAGE PIPE (ft)	80
6-OZ NON-WOVEN GEOTEXTILE FABRIC (yd²)	90

TOP	36-INCH TOP VERTI-BLOCK	LCT	LEFT CORNER TOP VERTI-BLOCK	1' TOP	1' TOP VERTI-BLOCK
36"	36-INCH STANDARD VERTI-BLOCK	RCT	RIGHT CORNER TOP VERTI-BLOCK	1' RCT	1' RIGHT CORNER TOP VERTI-BLOCK
48"	48-INCH VERTI-BLOCK				

ELEVATION VIEW
REFERENCE ELEVATIONS ARE ESTIMATED FROM GOOGLE EARTH AND ARE FOR CONCEPTUAL USE ONLY. FIELD ADJUSTMENTS/CHANGES SHOULD BE EXPECTED ONCE CONSTRUCTION COMMENCES. IGES SHOULD BE CONSULTED WHERE FIELD CHANGES ARE REQUIRED.

LEGEND
TOW = TOP OF RETAINING WALL
BOW = BOTTOM OF RETAINING WALL
FG = FINISHED GRADE AT BOTTOM OF WALL

0 2 4 6 10 20
SCALE: 1" = 10'

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



12429 SOUTH 300 EAST
DRAPER, UTAH 84020
(801) 748-4044

VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
ELEVATION VIEW

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	1"=10'
IGES PROJECT NO: 04409-001	SHEET NO: 2	REV N/A

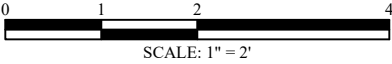
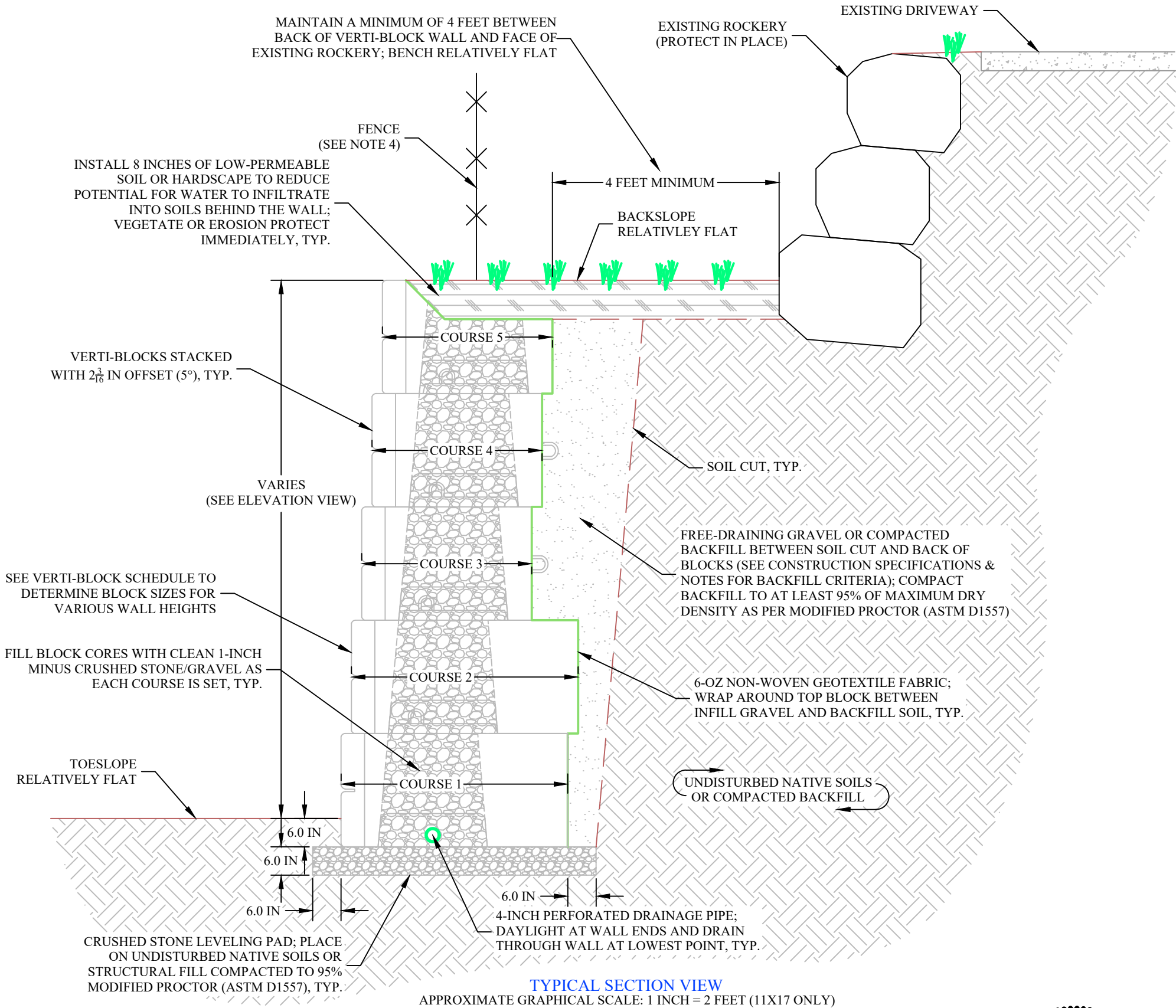


NOTES:

1. MAXIMUM SECTION SHOWN, ALL OTHER SECTIONS TO MEET THESE SAME SPECIFICATIONS, UNLESS NOTED OTHERWISE.
2. SOIL CUT SHOULD BE BENCHED AS NEEDED TO PROTECT WORKERS AND TO COMPLY WITH OSHA REQUIREMENTS.
3. RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION BUT PRIOR TO THE PLACEMENT OF LANDSCAPING/FINISHING ELEMENTS (E.G., LANDSCAPING, HARDSCAPE, CURB & GUTTER, PAVEMENT, ETC.). TO PREVENT DAMAGE TO THE WALL DURING ADDITIONAL SITE WORK, ALL SURFACE DRAINAGE SHOULD BE DIRECTED AWAY FROM THE WALL. EXCESS WATER DURING HEAVY PRECIPITATION EVENTS, IF NOT DRAINED PROPERLY, CAN CAUSE WASHOUTS AT WALL ENDS AND 'BLOWOUTS' OF INTERIOR SECTIONS. THESE PRECAUTIONS SHOULD BE TAKEN DURING AND AFTER WALL CONSTRUCTION UNTIL THE FINAL SITE DRAINAGE, LANDSCAPING AND/OR PAVING ARE COMPLETE.
4. WE RECOMMEND THAT AN APPROPRIATE SAFETY FENCE/BARRICADE BE CONSIDERED BY THE OWNER ABOVE THE RETAINING WALL.
- 4.1. IF FENCING SYSTEM WILL BE A CHAIN LINK, WROUGHT IRON FENCE OR RAILING, FOLLOW BLOCK MANUFACTURER'S GUIDELINES.
- 4.2. IF FENCING SYSTEM WILL BE A PRIVACY FENCE (E.G., VINYL, WOOD, PRECAST), IGES SHOULD BE CONTACTED TO PROVIDE CONSTRUCTION RECOMMENDATIONS FOR THE FENCE FOUNDATION SYSTEM.
- 4.3. WE RECOMMEND THAT ONCE FENCING SYSTEM IS DETERMINED IGES BE CONTACTED TO ASSESS THE IMPACT OF THE FENCE ON THE RETAINING WALL.

VERTI-BLOCK SCHEDULE (BLOCK SIZE FOR EACH COURSE FOR VARIOUS WALL HEIGHTS, WITH COURSE 1 BEING THE BOTTOM COURSE)										
COURSE	WALL HEIGHT (FEET)									
	1'	2'	3'	4'	5'	6'	7'	8'	9'	10'
5	-	-	-	-	-	-	-	-	1' TOP	TOP
4	-	-	-	-	-	-	1' TOP	TOP	36"	36"
3	-	-	-	-	1' TOP	TOP	36"	36"	36"	36"
2	-	-	1' TOP	TOP	36"	36"	36"	36"	48"	48"
1	1' TOP	TOP	36"	36"	36"	36"	36"	48"	48"	48"

- WHERE:
- 1' TOP = 1-FOOT STEP TOP BLOCK
 - TOP = 36-INCH TOP BLOCK
 - 36" = 36-INCH BLOCK
 - 48" = 48-INCH BLOCK



REV	REVISION DESCRIPTION	DATE	BY	CHK



12429 SOUTH 300 EAST
DRAPER, UTAH 84020
(801) 748-4044

VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
TYPICAL SECTION VIEW

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	1"=2'
IGES PROJECT NO: 04409-001	SHEET NO: 3	REV N/A



CONSTRUCTION SPECIFICATIONS & NOTES

1. INTRODUCTION
- 1.1. FOLLOW THE GUIDANCE CONTAINED IN THE VERTI-BLOCK CONSTRUCTION MANUAL FOR THE RETAINING WALL UNLESS SPECIFICALLY SUPERSEDED BY MORE STRINGENT SPECIFICATIONS OR MATERIAL PROPERTIES PROVIDED HEREIN OR ON THE DRAWINGS.

1.1.1. IN THE EVENT THERE IS ANY CONFLICT OR AMBIGUITY BETWEEN THE FOLLOWING SPECIFICATIONS AND THE REFERENCED GUIDANCE, BRING ALL SUCH ISSUES IMMEDIATELY TO THE ATTENTION OF IGES, INC. FOR WRITTEN CLARIFICATION.

1.2. DESIGN AND CONSTRUCTION INFORMATION IS BASED ON PROJECT PLANS, DISCUSSIONS WITH THE CLIENT AND THE ENGINEERING ANALYSIS PERFORMED AS PART OF THE SCOPE OF WORK FOR THIS PROJECT BY IGES, INC.

1.3. LOCATE ALL EXISTING UTILITIES PRIOR TO RETAINING WALL CONSTRUCTION.

1.4. IMPLEMENT THE FOLLOWING MEASURES TO REDUCE THE POTENTIAL FOR HYDROSTATIC PRESSURES TO BUILD UP BEHIND THE RETAINING WALL:

1.4.1. ESTABLISH VEGETATION OR EROSION CONTROL MEASURES ABOVE AND BELOW THE RETAINING WALL IMMEDIATELY FOLLOWING CONSTRUCTION.

1.4.2. PLACE A 4-INCH (MINIMUM) PERFORATED DRAIN PIPE AT BOTTOM OF GRAVEL INFILL.

1.5. CONDITIONS SUCH AS LEAKY OR BROKEN IRRIGATION LINES AND/OR UNCONTROLLED RUNOFF FROM IMPROPER SITE GRADING (E.G., ALLOWING WALTER TO POND ABOVE THE RETAINING WALL) CAN LEAD TO SLOPE OR WALL MOVEMENT.

1.5.1. HYDROSTATIC CONDITIONS WERE NOT CONSIDERED IN THE ANALYSES AND MUST BE AVOIDED.

1.5.2. RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION OF THE RETAINING WALL BLOCKS, BUT PRIOR TO THE PLACEMENT OF THE LANDSCAPING OR FINISHING ELEMENTS AT THE SITE (E.G., 8 INCHES OF LOW-PERMEABLE SOIL/HARDSCAPE, INSTALLATION OF CURB & GUTTER, VEGETATION OF SLOPES, ETC.). AS THESE ARE CRITICAL COMPONENTS TO THE OVERALL STABILITY OF THE RETAINING WALL, THE RETAINING WALL IS NOT CONSIDERED COMPLETELY INSTALLED UNTIL THE LANDSCAPING/FINISHING ELEMENTS ARE COMPLETED. WE RECOMMEND THAT THESE ELEMENTS BE INSTALLED IMMEDIATELY FOLLOWING THE INSTALLATION OF THE BLOCKS.

1.5.3. THE OWNER SHALL BE AWARE OF THE RISK IF THESE OR OTHER CONDITIONS OCCUR THAT COULD SATURATE OR ERODE THE SOIL BEHIND THE WALL, OR IF THE FINISHING/LANDSCAPING ELEMENTS ARE NOT INSTALLED IMMEDIATELY FOLLOWING THE INSTALLATION OF THE RETAINING WALL BLOCKS.

1.6. COMPLY WITH ALL ASPECTS OF OSHA 1926 SUBPART P APP B, SLOPING AND BENCHING FOR ALL EXCAVATED SLOPES.

2. VERTI-BLOCK RETAINING WALL MATERIALS

2.1. RETAINED BACKFILL CONSISTING OF NATIVE GRANULAR SOILS OR IMPORT MATERIALS COMPLYING WITH THE FOLLOWING CRITERIA:

2.1.1. GRANULAR MATERIALS CONTAINING LESS THAN 15% FINES AND A MAXIMUM NOMINAL PARTICLE SIZE OF 4 INCHES

2.1.2. PH GREATER THAN 3 BUT LESS THAN 9 AND PI OF 6 OR LESS

2.1.3. REASONABLY FREE FROM ORGANIC OR OTHER DELETERIOUS MATERIALS

2.1.4. MINIMUM EFFECTIVE FRICTION ANGLE OF 34 DEGREES

2.1.5. ANY STRUCTURAL FILL USED BELOW OR BEHIND THE RETAINING WALL SHALL BE TESTED FOR COMPLIANCE WITH THE SPECIFICATIONS ABOVE.

2.2. LEVELING PAD

2.2.1. 6-INCHES (MINIMUM) OF CLEAN 1-INCH MINUS CRUSHED STONE OR CRUSHED GRAVEL.

2.3. USE NEW BLOCK MATERIALS MEETING THE MINIMUM REQUIREMENTS OF VERTI-BLOCK RETAINING WALL SYSTEMS (VERTI-CRETE, LLC).

2.4. FACING FILL AND DRAINAGE GRAVEL FILL

2.4.1. CLEAN CRUSHED STONE OR CRUSHED GRAVEL THAT COMPLIES WITH THE FOLLOWING CRITERIA:

2.4.1.1.

SIEVE SIZE	% PASSING
2"	100
1"	75-100
$\frac{3}{8}$ "	0-15
NO. 4	0-10
NO. 200	0-5

2.5. 4-INCH (MINIMUM) PERFORATED PIPE (NO SOCK IS REQUIRED).

3. VERTI-BLOCK RETAINING WALL INSTALLATION

3.1. FIELD VERIFY PROPOSED FINISHED GRADE AT BOTTOM OF WALL TO PROVIDE THE MINIMUM WALL EMBEDMENT AS SHOWN ON THE SECTION DRAWING.

3.2. GRADE AND COMPACT FOUNDATION SUBGRADE SOILS FOR THE FULL LENGTH OF THE LEVELING PAD AND UP TO THE SOIL CUT PRIOR TO PLACEMENT OF THE LEVELING PAD AND ANY BACKFILL.

3.2.1. REMOVE ANY FOUNDATION SOILS FOUND TO BE UNSUITABLE OR UNSTABLE AND REPLACED WITH APPROVED FILL.

3.3. SET THE LEVELING PAD LEVEL SIDE-TO-SIDE AND FRONT-TO-BACK.

3.3.1. INSTALL LEVELING PAD TO A MINIMUM OF 6 INCHES THICK AND EXTEND Laterally A MINIMUM OF 6 INCHES BEYOND THE ENDS OF THE BLOCKS BOTH FRONT AND BACK AS SHOWN ON THE DRAWINGS.

3.4. SET THE FIRST ROW OF VERTI-BLOCK UNITS AND CHECK FOR LEVEL AND ALIGNMENT.

3.4.1. INSTALL WALL ELEMENTS IN ACCORDANCE WITH VERTI-BLOCK GUIDELINES.

3.5. POUR DRAINAGE INFILL GRAVEL INTO THE HOLLOW CORE OF EACH VERTI-BLOCK AND BETWEEN AND WITHIN THE BLOCKS AS EACH ROW OF BLOCKS IS INSTALLED. BEFORE ADDITIONAL COURSES OF BLOCKS ARE ADDED, THE CONTRACTOR MUST ENSURE THAT ALL VOIDS ARE FILLED AND NO AIR POCKETS ARE DETECTED.

3.5.1. SET DRAINAGE PIPE AT THE BASE OF THE GRAVEL INFILL ZONE AND SHALL SLOPE TO DAYLIGHT AND DISCHARGE AT THE LOW ENDS OF THE RETAINING WALL.

3.6. REMOVE AND SWEEP OFF ALL EXCESS AGGREGATE AND OTHER MATERIALS FROM THE TOP OF THE BLOCKS BEFORE CONTINUING TO THE NEXT COURSE.

3.7. PLACE WALL BACKFILL MATERIAL IN 12-INCH MAXIMUM LOOSE LIFTS AND COMPACT TO A MINIMUM OF 95 PERCENT OF ASTM D1557 (MODIFIED PROCTOR). THINNER LIFTS MAY BE NECESSARY TO ACHIEVE REQUIRED COMPACTION.

3.7.1. PERFORM DENSITY TESTING OF THE BACKFILL SOILS AT 50-FOOT INTERVALS ON EVERY LIFT.

3.7.2. USE ONLY SMALL, WALK-BEHIND TYPE COMPACTION EQUIPMENT WITHIN 3 FEET OF THE BACK OF THE RETAINING WALL BLOCK.

3.7.3. IF ANY LOCATIONS EXIST WHERE THE RETAINING WALL WILL NOT BE PLACED UPON NATIVE SOILS, COMPACT THE FILL TO A MINIMUM OF 95 PERCENT OF THE MAXIMUM DRY DENSITY PER ASTM D1557 (MODIFIED PROCTOR)

3.8. INSTALL THE EACH SUBSEQUENT COURSE TO BOND ON TOP OF THE BASE ROW. POSITION BLOCKS TO BE OFFSET FROM SEAMS OF BLOCKS ON LOWER COURSE. BLOCKS SHALL BE PLACED AT A $2\frac{3}{16}$ INCH SETBACK AND RECESSED OVER THE ALIGNMENT HOOP.

3.8.1. CHECK EACH BLOCK COURSE FOR PROPER ALIGNMENT AND LEVEL.

3.8.2. CONTINUE TO UNIT FILL AND BACKFILL BEHIND EACH COURSE OF UNITS AS DESCRIBED IN NOTES 3.5 THROUGH 3.7.

3.9. PROVIDE A FINAL GRADE ABOVE AND BELOW THE RETAINING WALL THAT WILL ALLOW FOR POSITIVE DRAINAGE AND PREVENT PONDING.

3.10. PROTECT FINAL COMPLETED RETAINING WALL FROM ADDITIONAL SITE CONSTRUCTION.

3.10.1. DO NOT OPERATE LARGE EQUIPMENT OR STORE MATERIALS ABOVE THE WALL THAT EXCEED THE DESIGN SURCHARGE LOADS AS SPECIFIED ON THE DESIGN CRITERIA SHEET.

4. CONSTRUCTION OBSERVATION

4.1. TO FULFILL ANY APPLICABLE CITY, COUNTY AND/OR STATE AGENCY REQUIREMENTS, AND TO PROTECT THE CONTRACTOR AND DESIGN ENGINEER, IGES, INC. MUST PERFORM PERIODIC CONSTRUCTION OBSERVATIONS TO PROVIDE A FINAL CONSTRUCTION OBSERVATION LETTER.

4.1.1. IF IGES, INC. DOES NOT OBSERVE THE RETAINING WALL DURING CONSTRUCTIONS, A FINAL LETTER REGARDING COMPLIANCE OF THE WALL CONSTRUCTION WITH THE DESIGN CRITERIA AND RECOMMENDATIONS CANNOT BE PROVIDED. IF IGES, INC. DOES NOT PERFORM THE PERIODIC CONSTRUCTION OBSERVATIONS OUTLINED BELOW, THE WALL CONTRACTOR/OWNER ASSUMES ALL RESPONSIBILITY FOR THE RETAINING WALL.

4.2. WALL OBSERVATIONS SCHEDULE:

4.2.1. OBSERVE THE EXCAVATION OF THE LEVELING PAD FOUNDATION SOILS.

4.2.1.1. ASSESS THE SUITABILITY OF THE FOUNDATIONS SOILS.

4.2.2. OBSERVE THE INSTALLATION OF THE RETAINING WALL BLOCK AT VARIOUS STAGES OF CONSTRUCTION.

4.2.2.1. ASSESS MINIMUM EMBEDMENT REQUIREMENTS.

4.2.2.2. ASSESS DEPTH OF GRAVEL DRAINAGE ZONE AND TYPE, LOCATION AND DIAMETER OF DRAINAGE PIPE.

4.2.2.3. ASSESS BLOCK PLACEMENT AND POSITIONING FOR COMPLIANCE WITH THE REQUIREMENTS IN THE SECTIONS ABOVE.

4.2.3. OBSERVE THE INSTALLATION OF THE REINFORCED BACKFILL MATERIAL.

4.2.3.1. VERIFY THAT THE BACKFILL MATERIALS MEET THE REQUIREMENTS SET FORTH IN THE SECTIONS ABOVE.

4.2.3.1.1. ASSESS LOOSE LIFT THICKNESS, FILL PLACEMENT AND COMPACTION.

4.2.3.1.2. ASSESS COMPACTED BACKFILL MATERIAL FOR COMPLIANCE WITH REQUIREMENTS SET FORTH IN THE SECTIONS ABOVE.

4.2.4. OBSERVE THE COMPLETED RETAINING WALL SYSTEM.

4.2.4.1. ASSESS THE FINISHED RETAINING WALL HEIGHT AND BATTER.

4.2.4.2. OBSERVE THAT BACKSLOPE AND TOESLOPE GRADING CONDITIONS DO NOT EXCEED DESIGN GEOMETRY TOLERANCES.

4.2.4.3. ASSESS SUITABILITY OF EROSION CONTROL MEASURES INSTALLED ABOVE THE RETAINING WALL.

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			

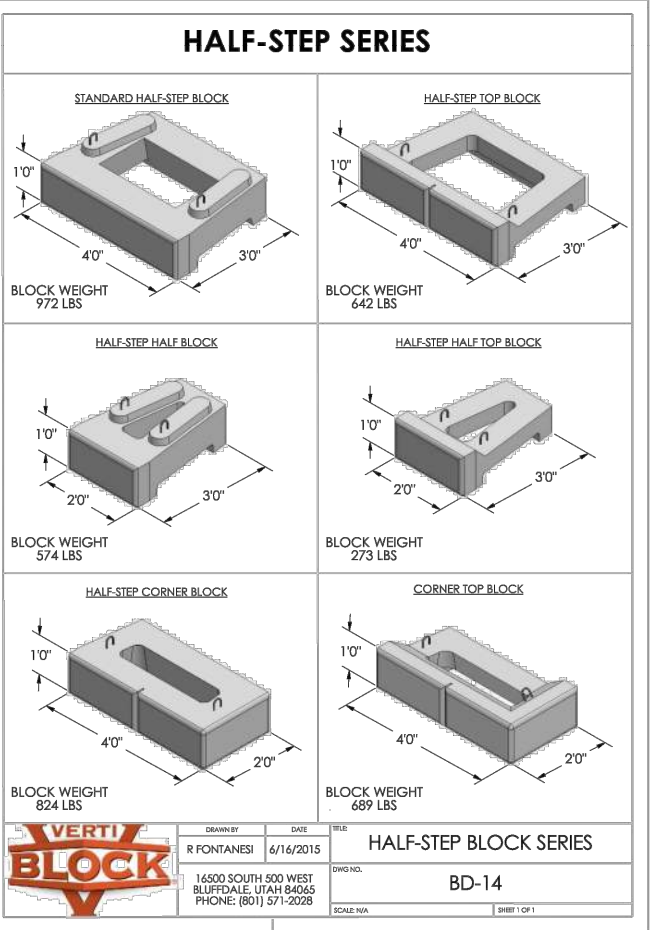
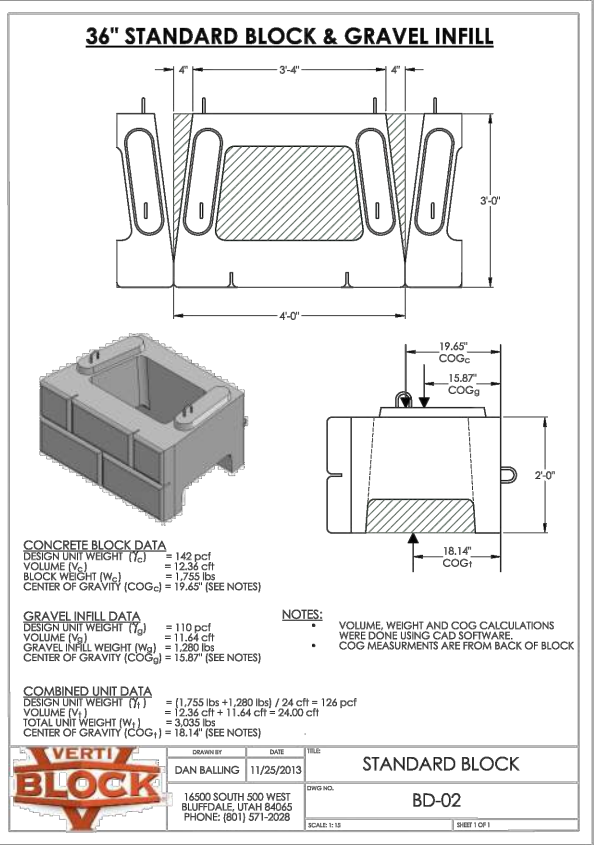
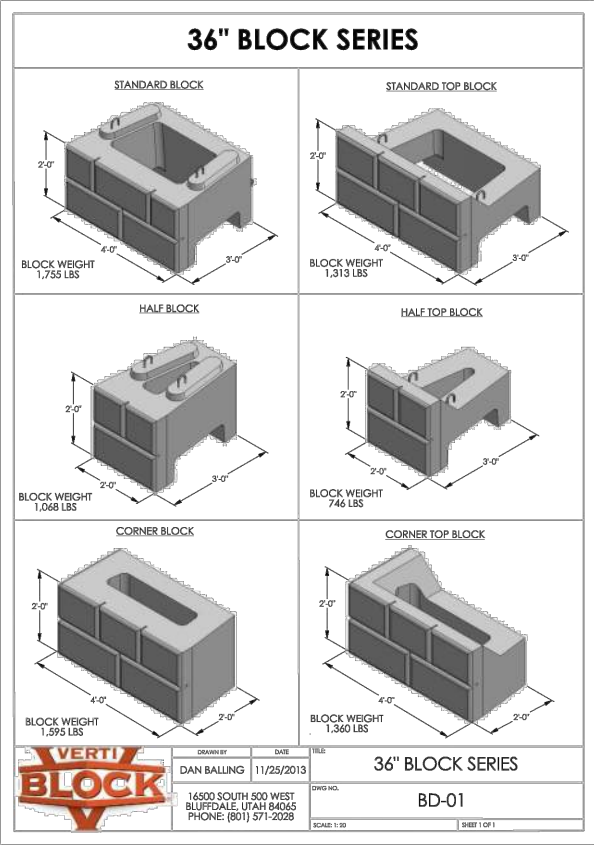
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DRAPER, UTAH 84020
(801) 748-4044

VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH

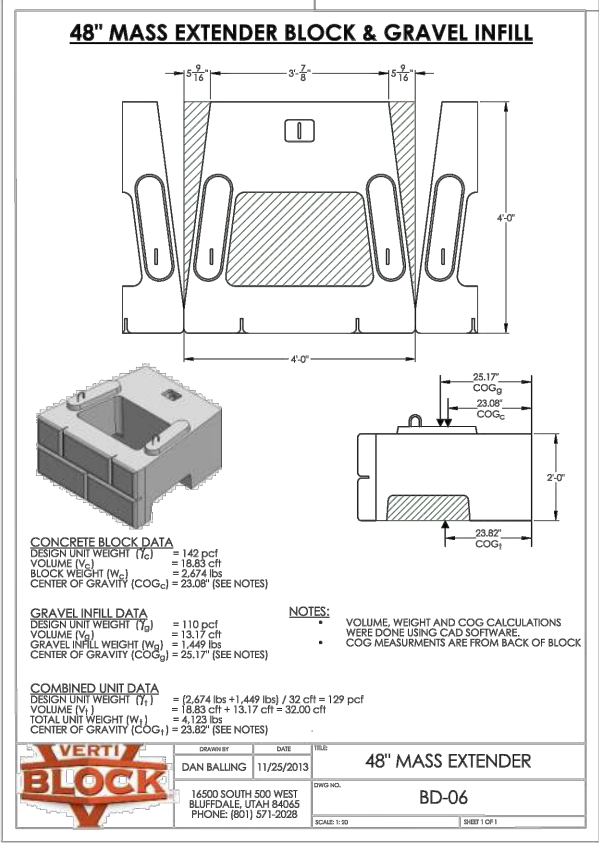
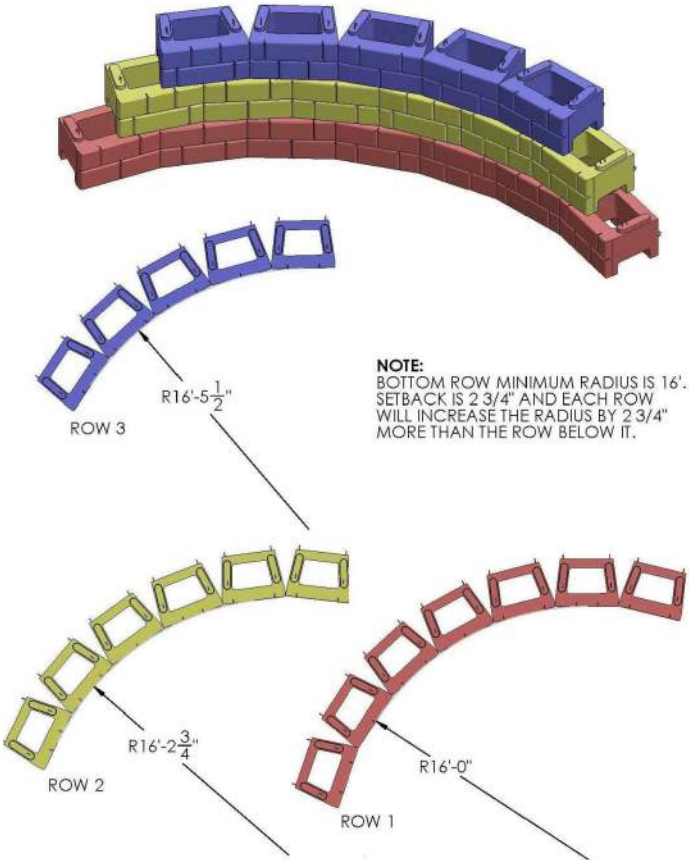
CONSTRUCTION SPECIFICATIONS & NOTES

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	NTS
IGES PROJECT NO: 04409-001	SHEET NO: 4	REV N/A

Page 18 of 114



INSIDE CURVE DETAIL



DETAILS PROVIDED BY VERTI-CRETE RETAINING WALL SYSTEMS, INC.

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



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VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
VERTI-BLOCK DETAILS

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	NTS
IGES PROJECT NO: 04409-001	SHEET NO: 5	REV N/A



RETAINING WALL GEOMETRY AND LOADING CONDITIONS			
LENGTH (FEET)	MAXIMUM HEIGHT (FEET)	BACKSLOPE CONDITIONS	SURCHARGE LOADING
60	10	RELATIVELY FLAT	500 PSF (EXISTING ROCKERY)

SOIL CONDITIONS USED IN DESIGN			
EARTH MATERIALS	FRICTION ANGLE	COHESION	UNIT WEIGHT
RETAINED SOIL	38°	0 PSF	140 PCF
FOUNDATION SOIL	32°	0 PSF	130 PCF

- SOURCES & NOTES:
- IGES, 2023, SITE OBSERVATIONS MADE ON JUNE 12, 2023.
 - COHESION USED ONLY IN GLOBAL STABILITY ANALYSES.

GENERAL NOTES:

- THE ENGINEERING PRESENTED IN THIS DESIGN PACKAGE IS BASED ON SPECIFIC PRODUCTS (E.G., VERTI-BLOCKS, FILL MATERIAL, ETC.). ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS ENGINEERING. ANY CHANGES IN WALL LOCATION, ELEVATIONS OF LEVELING PAD, GRADES AT THE TOE OR TOP OF THE WALL, AND SOIL PARAMETERS AT THE SITE WILL ALSO INVALIDATE THE ENGINEERING. FIELD ADJUSTMENTS/CHANGES MAY BE NEEDED TO MEET ACTUAL CONDITIONS ONCE CONSTRUCTION COMMENCES. IGES SHOULD BE CONSULTED WHERE FIELD CHANGES ARE REQUIRED.
- THESE DOCUMENTS ARE INSTRUMENTS OF SERVICE AND SHALL REMAIN THE INTELLECTUAL PROPERTY OF IGES, INC. THE DESIGN PACKAGE HAS BEEN FURNISHED FOR THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT NO USE OR RE-USE OF THESE DOCUMENTS (EITHER IN WHOLE OR IN PART) SHALL BE PERMITTED UNLESS EXPRESSLY AUTHORIZED IN WRITING BY IGES, INC.
- RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION BUT PRIOR TO THE PLACEMENT OF LANDSCAPING/FINISHING ELEMENTS AT THE SITE (E.G., LANDSCAPING, HARDSCAPE, CURB & GUTTER, PAVEMENT, ETC.). TO PREVENT DAMAGE TO THE WALL DURING ADDITIONAL SITE WORK, ALL SURFACE DRAINAGE SHOULD BE DIRECTED AWAY FROM THE WALL. EXCESS WATER DURING HEAVY RAIN EVENTS, IF NOT DRAINED PROPERLY, CAN CAUSE WASHOUTS AT WALL ENDS AND 'BLOWOUTS' OF INTERIOR SECTIONS. THESE PRECAUTIONS SHOULD BE TAKEN DURING AND AFTER WALL CONSTRUCTION UNTIL THE FINAL SITE DRAINAGE, LANDSCAPING AND PAVING ARE COMPLETE.

RETAINING WALL ANALYSIS USED IN DESIGN	
ANALYSIS	DESIGN REFERENCES/SOFTWARE
EXTERNAL STABILITY	VERTI-BLOCK RETAINING WALLS, 2023 VERTICRETE WALL DESIGNER SOFTWARE, VERSION 6.0.23160.945, BUILD DATE JUNE 9, 2023, AUTHOR - ROBERT RACE
GLOBAL STABILITY	SLIDE 2: ROCSCIENCE, INC., 1998-2023, VERSION 9.028, BUILD DATE JUNE 13, 2023.

SEISMIC PARAMETERS USED IN DESIGN					
SEISMIC CRITERIA	MCE _G PGA	SITE CLASS	F _{PGA}	PGA _M	HORIZONTAL COEFFICIENT (k _h)
ASCE 7-16	0.250g	D	1.35	0.337g	0.140g (EXTERNAL) 0.169g (GLOBAL)

- SOURCES & NOTES:
- SEISMIC PARAMETERS DEVELOPED FOLLOWING THE CRITERIA OUTLINED IN THE 2018 INTERNATIONAL BUILDING CODE. THE SPECTRAL RESPONSE AT THE SITE WAS EVALUATED FOR THE PROBABILISTIC GEOMETRIC MEAN *MAXIMUM CONSIDERED EARTHQUAKE* (MCE_G), TAKEN AS THE GEOMETRIC MEAN PEAK GROUND ACCELERATION. THE MCE_G SPECTRAL ACCELERATIONS WERE DETERMINED BASED ON THE LOCATION OF THE SITE USING THE *ASCE-7 HAZARD TOOL*.
 - TO ACCOUNT FOR SITE EFFECTS, SITE COEFFICIENTS THAT VARY WITH THE MAGNITUDE OF THE SPECTRAL ACCELERATION AND SITE CLASS ARE USED. SITE CLASS IS A PARAMETER THAT ACCOUNTS FOR SITE AMPLIFICATION EFFECTS OF SOFT SOILS AND IS BASED ON THE AVERAGE SHEAR WAVE VELOCITY OF THE UPPER 100 FEET. BASED ON OUR ENGINEERING JUDGMENT, A SITE CLASS D WAS USED FOR THIS PROJECT.
 - A MAXIMUM ALLOWABLE SEISMIC DISPLACEMENT THRESHOLD OF 3.37 INCHES (10*PGA) WAS USED TO REDUCE THE HORIZONTAL SEISMIC ACCELERATION COEFFICIENT IN ACCORDANCE WITH NCMA 3RD EDITION METHODOLOGY.
 - ONE-HALF OF THE PGA_M WAS USED TO MODEL THE HORIZONTAL SEISMIC ACCELERATION FOR GLOBAL STABILITY ANALYSES (k_h = 0.169g).
 - SEISMIC PARAMETERS DEVELOPED FROM:

SITE INFORMATION		
LATITUDE:	40.6568	DEGREES
LONGITUDE:	-111.4813	DEGREES
RETURN PERIOD:	2475	YEARS (2PE50)
SITE SOIL CLASS:	D	STIFF SOIL PROFILE (TABLE 20.3-1)

SEISMIC GROUND MOTION VALUES (GEOMETRIC MEAN VALUES)		
GEOMETRIC MEAN VALUES (MCE _G)		
F _{PGA} :	1.35	TABLE 11.8-1
MCE _G :	0.250	g (FROM ASCE-7 HAZARD TOOL)
PGA _M :	0.337	g (MCE _G *F _{PGA})

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



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VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
DESIGN CRITERIA

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	NTS
IGES PROJECT NO: 04409-001	SHEET NO: 6	REV N/A





PHOTOS TAKEN DURING SITE OBSERVATION MADE ON JUNE 12, 2023

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



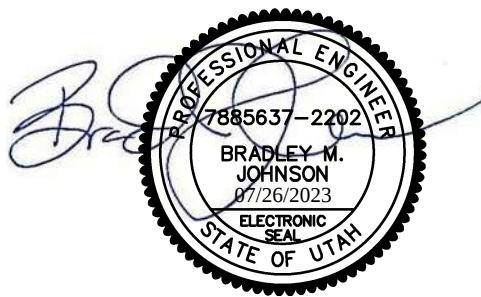
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(801) 748-4044

VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
SITE PHOTOS

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	NTS
IGES PROJECT NO: 04409-001	SHEET NO: 7	REV N/A

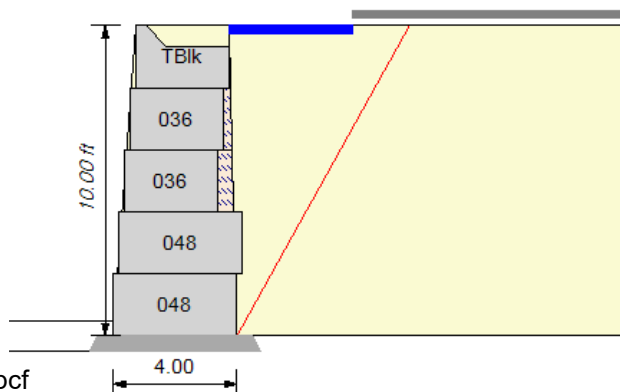


SECTION 2



Intermountain GeoEnvironmental Services

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 5 Blocks (10')
 Design Method: NCMA_09_3rd_Ed
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g



SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			

GEOMETRY

Design Height:	10.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	5.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

FoS Sliding: 2.13 (lvlpd) / 1.41 FoS Overturning: 2.11 / 1.26
 Bearing: 1882.30 / 1863.56 FoS Bearing: 3.95 / 1.52

Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	FSsl	siesFSsl	FoS OT	FoS SeisOT
TBlk	8.00	0.217	0.302	61	85	82	33	0	93	199	14.93	7.73	14.33	6.66
036	6.00	0.183	0.262	205	294	192	55	0	260	541	7.68	3.86	6.72	3.04
036	4.00	0.183	0.262	461	661	302	82	0	543	1046	4.95	2.63	3.82	1.85
048	2.00	0.242	0.334	1082	1496	452	145	91	1318	2184	3.50	2.08	2.99	1.72
048	0.00	0.229	0.319	1603	2233	601	172	220	1995	3225	2.13	1.41	2.11	1.26

Column Descriptions:

ka: active earth pressure coefficient
 kae: active seismic earth pressure coefficient
 Pa: active earth pressure
 Pae: dynamic earth pressure
 Pir: inertia force
 Paq: live surcharge earth pressure
 Paq2: live load 2 surcharge earth pressure
 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 FSsl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

DESIGN DATA

TARGET DESIGN VALUES (Factors of Safety - Static / Seismic)

Minimum Factor of Safety for the sliding along the base	FSsl =1.50 /1.125
Minimum Factor of Safety for overturning about the toe	FSot =1.50 /1.125
Minimum Factor of Safety for bearing (foundation shear failure)	FSbr =2.00 /1.500

MINIMUM DESIGN REQUIREMENTS

Minimum embedment depth	Min_emb =0.50 ft
-------------------------	------------------

INPUT DATA

Geometry

Wall Geometry

Design Height, top of leveling pad to finished grade at top of wall	H =10.00 ft
Embedment, measured from top of leveling pad to finished grade	emb =0.50 ft
Leveling Pad Depth	Thickness =0.50 ft
Face Batter, measured from vertical	i =5.20 deg

Slope Geometry

Slope Angle, measured from horizontal	β =0.00 deg
Slope toe offset, measured from back of the face unit	STL_offset =0.00 ft
Slope Length, measured from back of wall facing	SL_Length =0.00 ft

NOTE: If the slope toe is offset or the slope breaks within three times the wall height, a Coulomb Trial Wedge method of analysis is used.

Surcharge Loading

Live Load, assumed transient loading (e.g. traffic)	LL = 75.00 psf
Live Load Offset, measured from back face of wall	LL_offset =0.00 ft
Live Load Width, assumed strip loading	LL_width = 4.00 ft
Dead Load, assumed permanent loading (e.g. buildings)	DL = 500.00 psf
Dead Load Offset, measured from back face of wall	DL_offset =4.00 ft
Dead Load Width, assumed strip loading	DL_width = 100.00 ft

Soil Parameters

Retained Zone

Angle of Internal Friction	$\phi = 38.00$ deg
Cohesion	coh = 0.00 psf
Moist Unit Weight	gamma = 140.00 pcf

Foundation

Angle of Internal Friction	$\phi = 32.00$ deg
Cohesion	coh = 0.00 psf
Moist Unit Weight	gamma = 130.00 pcf

Leveling Pad

Angle of Internal Friction	$\phi = 40.00$ deg
Cohesion	coh = 0.00 psf
Moist Unit Weight	gamma = 135.00 pcf

Infill Soil

Angle of Internal Friction	$\phi = 30.00$ deg
Cohesion	coh = 0.00 psf
Moist Unit Weight	gamma = 120.00 pcf

RETAINING WALL UNITS

STRUCTURAL PROPERTIES:

N is the normal force [or factored normal load] on the base unit

The default leveling pad to base unit shear is $0.8 \tan(\phi)$ [AASHTO 10.6.3.4] or

may be the manufacturer supplied data. ϕ is assumed to be 40 degrees for a stone leveling pad.

Unit	Ht (in)	Width (in)	Depth (in)	Cn_Vol (cf/ft)	Cn_Den (pcf)	CG (in)	Ag_Vol (cf/ft)	Ag_Den (pcf)	Ag_CG (in)
TopBlock	24.00	48.00	36.00	2.31	142.00	13.53, 12.00	2.13	120.00	20.09, 20.09
Standard	24.00	48.00	36.00	3.09	142.00	16.35, 12.00	2.90	120.00	20.19, 20.19
48inch	24.00	48.00	48.00	4.71	142.00	24.92, 12.00	3.30	120.00	22.83, 22.83

CALCULATION RESULTS

OVERVIEW

VertiBlock calculates stability assuming the wall is a rigid body. Forces and moments are calculated about the base and the front toe of the wall. The base block width is used in the calculations. The concrete units and granular fill over the blocks are used as resisting forces.

EARTH PRESSURES

The method of analysis uses the Coulomb Earth Pressure equation (below) to calculate active earth pressures. Wall friction is assumed to act at the back of the wall face. The component of earth pressure is assumed to act perpendicular to the boundary surface. The effective δ angle is δ minus the wall batter at the back face. If the slope breaks within the failure zone, a trial wedge method of analysis is used.

EXTERNAL EARTH PRESSURES

Effective δ angle (3/4 retained phi)
Coefficient of active earth pressure

$\delta = 28.5$ deg
 $k_a = 0.229$

External failure plane

$\rho = 61$ deg

Effective Angle from horizontal

$\theta = 88.44$ deg

Coefficient of passive earth pressure: $k_p = (1 + \sin(\phi)) / (1 - \sin(\phi))$

$k_p = 0.00$

$$k_u = \frac{\sin^2(\theta + \phi')}{\Gamma [\sin^2 \sin(\theta - \delta)]}$$

in which:

$$\Gamma = \left[1 + \frac{\sin(\phi' + \delta) \sin(\phi - \beta)}{\sin(\theta - \delta) \sin(\theta + \beta)} \right]^2$$

where:

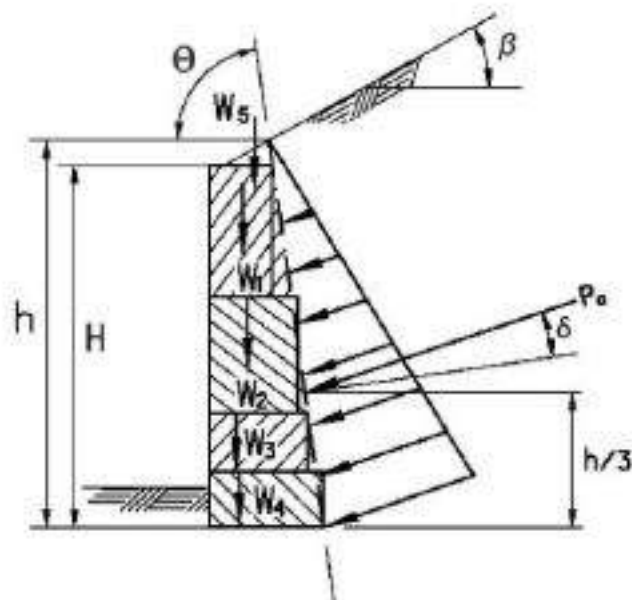
δ = friction angle between fill and wall (degrees)

β = angle of fill to the horizontal (degrees)

θ = angle of back face of wall to the horizontal (degrees)

ω = angle of wall batter (degrees) = $\theta - 90$

ϕ' = effective angle of internal friction (degrees)



FORCE DETAILS

The details below shown how the forces are calculated for each force component. The values shown are not factored. All loads are based on a unit width (ppf / kNpm).

Layer	Block Wt	Soil Fill Wt	Soil Wt
1	328	255	31
2	439	348	135
3	439	348	240
4	668	396	105
5	668	396	

Block Weight = 2542.51 ppf X-Arm = 2.01 ft

Soil Infill Weight = 1743.00 ppf X-Arm = 2.09 ft

Soils Wedge Weight = 189.79 ppf X-Arm = 3.64 ft

Active Earth Pressure $P_a = 1602.65$ ppf

P_{a_h} (Force H) = $P_a \cos(\delta - \omega) = 1602.65 \times \cos(28.50 - (-1.56)) = 1387$ ppf

Y-Arm = 3.33 ft

P_{a_v} (Force V) = $P_a \sin(\delta - \omega) = 1602.65 \times \sin(28.50 - (-1.56)) = 803$ ppf

X-Arm = 3.91 ft

Live Load $P_q = 171.71$ ppf

P_{q_h} (Force H) = $P_q \cos(\delta - \text{batter}) = 171.71 \times \cos(28.50 - (-1.56)) = 148.62$ ppf

Y-Arm = 5.00 ft

P_{q_v} (Force V) = $P_q \sin(\delta - \text{batter}) = 171.71 \times \sin(28.50 - (-1.56)) = 86.01$ ppf

X-Arm = 3.86 ft

Dead Load $P_{qd} = 220.23$ ppf

P_{qd_h} (Force H) = $P_{qd} \cos(\delta - \text{batter}) = 220.23 \times \cos(28.50 - (-1.56)) = 190.61$ ppf

Y-Arm = 5.00 ft

P_{qd_v} (Force V) = $P_{qd} \sin(\delta - \text{batter}) = 220.23 \times \sin(1.56 + 28.50) = 110.31$ ppf

X-Arm = 3.86 ft

FORCES AND MOMENTS

The program resolves all the geometry into simple geometric shapes to make checking easier. All x and y coordinates are referenced to a zero point at the toe of the bottom unit.

LOADS FOR OVERTURNING ABOUT THE TOE

Name	Force (V)	Force (H)	X-len	Y-len	Mo	Mr
Soil Fill(W0)	1743.00	--	2.09	--	--	3639.81
Face Blocks(W1)	2542.51	--	2.01	--	--	5101.68
Soil Wedge(W2)	189.79	--	3.64	--	--	690.86
Pa_h	--	1387.13	--	3.33	4623.76	--
Pa_v	802.72	--	3.91	--	--	3138.13
Pq_h	--	148.62	--	5.00	743.10	--
Pq_v	86.01	--	3.86	--	--	332.33
Pqd_h	--	190.61	--	5.00	953.06	--
Pqd_v	110.31	--	3.86	--	--	426.23
Sum V / H	5474	1726		Sum Mom	6320	13329

W0: stone within units

W1: facing units

W2: soil wedge behind the face

X-Len: is measured from the center of the base (+) Driving, (-) Resisting.

Pa_h: horizontal earth pressure

Pa_v: vertical earth pressure

Pq_h: horizontal surcharge pressure

Pq_v: vertical surcharge pressure

BEARING LOADS: NCMA

All x and y coordinates are referenced to a zero point at the middle of the base block for eccentricity calculations.

Name	Force (V)	Force (H)	X-len	Y-len	Mo	Mr
Soil Fill(W0)	1743.00	--	-0.09	--	--	-153.81
Face Blocks(W1)	2542.51	--	-0.01	--	--	-16.66
Soil Wedge(W2)	189.79	--	-1.64	--	--	-311.28
Pa_h	--	1387.13	--	3.33	4623.75	--
Pa_v	802.72	--	-1.91	--	--	-1532.68
Pq_h	--	148.62	--	5.00	743.10	--
Pq_v	86.01	--	-1.86	--	--	-160.32
Pqd_h	--	190.61	--	5.00	953.06	--
Pqd_v	110.31	--	-1.86	--	--	-205.61
Sum V / H	5474	1726		Sum Mom	6320	-2380

BASE SLIDING

Sliding at the base is checked at the block to leveling pad interface between the base block and the leveling pad.

$$\text{Forces Resisting sliding} = W0 + W1 + W2 + Pav + Pqv + Pqdv$$
$$1743 + 2543 + 190 + 803 + 86 + 110$$

$$N = 5474 \text{ ppf}$$

$$\text{Resisting force at pad} = (N * 0.8 * \tan(\text{slope}) + \text{intercept} * L)$$
$$5474 * 0.8 * \tan(40.0) + 0.0$$

$$Rf = 3,675$$

$$\text{Driving force is the horizontal component of}$$
$$Pah + Pqh + Pqdh$$
$$1387 + 149 + 191$$

$$Df = 1,726$$

$$FSsl = Rf / Df$$

$$FSsl = 2.13$$

OVERTURNING ABOUT THE TOE

Overturning at the base is checked by assuming rotation about the front toe by the block mass and the soil retained on the blocks. Allowable overturning can be defined by eccentricity (e/L). For concrete leveling pads eccentricity is checked at the base of the pad.

Moments Resisting Overturning = $M_0 + M_1 + M_2 + MP_{av} + MP_{qv} + MP_{qdv}$

$3640 + 5102 + 691 + 3138 + 332 + 426$

$Mr = 13329 \text{ ft-lbs}$

Moments causing Overturning = $MP_{ah} + MP_{qh} + MP_{qdh}$

$4624 + 743 + 953$

$Mo = 6320 \text{ ft-lbs}$

$FSot = Mr / Mo$

$FSot = 13329 / 6320$

$FSot = 2.11$

ECCENTRICITY AND BEARING

Eccentricity is the calculation of the distance of the resultant away from the centroid of mass. In wall design the eccentricity is used to calculate an effective footing width.

Calculation of Eccentricity

$$\text{SumV} = W0 + W1 + W2 + P_{av} + P_{qv} + P_{qdv}$$

$$1743 + 2543 + 190 + 803 + 86 + 110$$

Moment Resisting

Moment Driving

$$\text{SumV} = 5474$$

$$M_r = -2380$$

$$M_d = 6320$$

$$e = (\text{Sum}M_r + \text{Sum}M_d) / (\text{SumV})$$

$$e = (3940 / 5474)$$

$$e = 0.720 \text{ ft}$$

BEARING

Bearing Capacity Factors [Foundation]

$$N_c = 35.49 \text{ Myerhoff Eqn}$$

$$N_q = 23.18 \text{ Myerhoff Eqn}$$

$$N_g = 30.21 \text{ Vesic Eqn}$$

Shape Factors [Foundation]

$$S_c = 1.07$$

$$S_q = 1.06$$

$$S_g = 0.96$$

Depth Correction Factor

$$d_f = 1.03$$

Modified Bearing Capacity Factors [Foundation]

$$N_{cm} = N_c \times S_c = 37.81$$

$$N_{qm} = N_q \times S_q \times d_f = 25.47$$

$$N_{gm} = N_g \times S_g = 29.01$$

Water Correction Factor

$$C_{wq} = 1.00$$

$$C_{wg} = 1.00$$

Base width at foundation, B'f

B'f = B - 2e + 1/2 Pad Thickness (Bearing area at foundation)

$$4.00 - 2 \times 0.72 + 0.50$$

$$B'f = 3.06 \text{ ft}$$

q = embedment * γ

$$= 0.50 \times 130.00$$

$$q = 65.00 \text{ psf}$$

Calculation of Bearing Pressures on Foundation

$$q_n = (c \times N_{cm}) + (q \times N_{qm} \times C_{wq}) + 0.5 \times \gamma \times B'f \times N_{gm} \times C_{wg}$$

$$[(0.00 \times 37.81) + (65 \times 25.47 \times 1.00) + (0.5 \times 130 \times 3.06 \times 29.01 \times 1.00)]$$

$$q_{ult} = 7426 \text{ psf}$$

Nbrg = Bearing at Foundation Level

$$N_{Brg} = 5761 \text{ psf}$$

Calculate Ultimate Bearing, qult

Bearing Pressures (σ)

Calculated Factor of safety for bearing

$$q_{ult} = 7426 \text{ psf}$$

$$N_{Brg}/B'f = 1882 \text{ psf}$$

$$q_{ult}/\sigma = 3.95$$

SEISMIC CALCULATIONS

The loads considered under seismic loading are primarily inertial loadings. The wave passes the structure putting the mass into motion and then the mass will try to continue in the direction of the initial wave. In the calculations you see the one dynamic earth pressure from the wedge of the soil behind the reinforced mass, and then all the other forces come from inertia calculations of the face put into motion and then trying to be held in place.

Design Ground Acceleration $A = 0.337$
 Horizontal Acceleration $[k_h = A/2]$ $k_h = 0.140$
 Vertical Acceleration $k_v = 0.000$

INERTIA FORCES OF THE STRUCTURE

Face (Pif) = $(W1) \cdot k_h(\text{ext}) = 2542.51 \cdot 0.140$
 $Pif = 600.99 \text{ ppf}$

SEISMIC THRUST

K_{ae} $K_{ae} = 0.319$
 $D_{Kae} = K_{ae} - K_a = (0.319 - 0.229)$ $D_{Kae} = 0.090$
 $P_{ae} = 0.5 \cdot \gamma(H)^2 \cdot D_{Kae}$ $P_{ae} = 629.92 \text{ ppf}$
 $P_{ae_h} = P_{ae} \cdot \cos(\delta)$ $P_{ae_h} = 545.21 \text{ ppf}$
 $P_{ae_v} = P_{ae} \cdot \sin(\delta)$ $P_{ae_v} = 315.51 \text{ ppf}$

TABLE OF RESULTS FOR SEISMIC REACTIONS

Name	Force (V)	Force (H)	X-len	Y-len	Mo	Mr
Face Soil(W0)	1743.00	-1.00	-0.09	-1.00	--	-153.81
Face Blocks(W1)	2542.51	-1.00	-0.01	-1.00	--	-16.66
Soil Block(W2)	189.79	-1.00	-1.64	-1.00	--	-153.81
LevelingPad(W18)	286.88	-1.00	0.00	-1.00	--	0.00
P_{a_h}	-1.00	1387.13	-1.00	3.33	4623.75	--
P_{a_v}	802.72	-1.00	-1.91	-1.00	--	-1532.68
P_{a_v}	-1.00	148.62	-1.00	5.00	--	743.10
P_{a_v}	86.01	-1.00	-1.86	-1.00	--	-160.32
P_{a_v}	-1.00	190.61	-1.00	5.00	--	953.06
P_{a_v}	110.31	-1.00	-1.86	-1.00	--	-205.61
Pif	-1.00	600.99	-1.00	6.00	3605.91	--
P_{ae_h}	-1.00	545.21	-1.00	6.00	3271.26	--
P_{ae_v}	315.51	-1.00	-1.91	-1.00	--	-602.42
Sum V / H	5703.84	2723.93		Sum Mrs	0.0	0.0

SEISMIC SLIDING

The target factor of safety for seismic is 75% of the static value. Live loads are ignored in these analysis based on the basic premise that the probability of the maximum acceleration occurring at the exact same instant as the maximum live load is small.

Details are only shown for sliding at the base of blocks, a check is made at the foundation level with the answer only shown.

The vertical resisting forces is $W0 + W1 + W2 + Pav + Paev$

$$1743 + 2543 + 190 + 803 + 316$$

Resisting force = $SumVs * \tan(\phi) + \text{intercept} \times L$

Driving force = $Pa_h + Pae_h + Pif$

$$= 1387 + 545 + 601$$

FOS = FRe / FDr

$$SumVs = 5704$$

$$FRe = 3829 \text{ ppf}$$

$$FDr = 2724 \text{ ppf}$$

$$FoS = 1.41$$

SEISMIC OVERTURNING

Overturning is rotation about the front toe of the wall. Eccentricity is also a check on overturning

Resisting Moment = $M0 + M1 + M2 + MPav + MPaev$

$$3640 + 5102 + 691 + 3138 + 1219 +$$

Driving Moment = $MPah + MPaeh + MPif$

$$4624 + 2726 + 3005$$

Factor of Safety = $SumMrS / SumMoS$

$$SumMrS = 14216 \text{ ft ppf}$$

$$SumMoS = 11307.79 \text{ ft ppf}$$

$$FoS = 1.26$$

SEISMIC BEARING

Bearing is the ability of the foundation to support the mass of the structure.

$$Qult = c * Nc + q * Nq + 0.5 * \gamma * (B') * Ng$$

where:

$$Nc = 35.49 \text{ Myerhoff Eqn}$$

$$Nq = 23.18 \text{ Myerhoff Eqn}$$

$$Ng = 30.21 \text{ Vesic Eqn}$$

$$c = 0.00 \text{ psf}$$

$$q = 130.00 \text{ psf}$$

Calculate Ultimate Bearing, Qult (seismic)

eccentricity (e)

Equivalent Footing Width, $B' = L - 2e + |e| \text{ pad}$

Bearing Pressure = $sumVs / B'$

Factor of Safety for Bearing = $Qult / \text{Bearing}$

$$Qult = 2829.81 \text{ psf}$$

$$e = 1.689$$

$$B' = 1 \text{ ft}$$

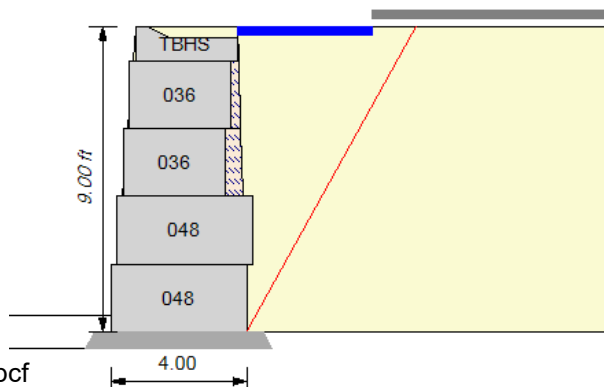
$$\sigma = 1864 \text{ psf}$$

$$FoS = 2$$

REA Analysis

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 5 Blocks (9')
 Design Method: NCMA_09_3rd_Ed
 Design Unit: VertiBlock (Extra)
 Seismic Acc: $kh(\text{external})=0.140g$

SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			



GEOMETRY

Design Height:	9.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	5.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

FoS Sliding: 2.47 (lvlpd) / 1.56 FoS Overturning: 2.70 / 1.52
 Bearing: 1527.99 / 1497.54 FoS Bearing: 5.44 / 2.79

Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	FSsl	siesFSsl	FoS OT	FoS SeisOT
TBHS	8.00	0.217	0.302	15	21	59	16	0	31	96	38.93	14.00	57.57	18.21
036	6.00	0.183	0.262	115	165	169	41	0	156	376	11.67	5.13	12.60	4.86
036	4.00	0.183	0.262	320	459	280	69	0	388	808	6.44	3.20	5.70	2.53
048	2.00	0.245	0.338	841	1160	429	129	25	995	1743	4.32	2.43	4.13	2.19
048	0.00	0.230	0.320	1305	1817	578	155	146	1607	2697	2.47	1.56	2.70	1.52

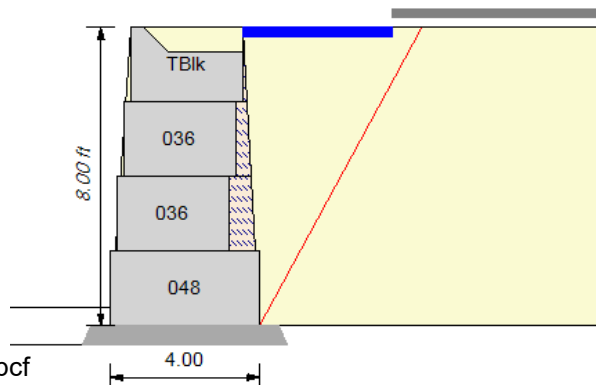
Column Descriptions:

ka: active earth pressure coefficient
 kae: active seismic earth pressure coefficient
 Pa: active earth pressure
 Pae: dynamic earth pressure
 Pir: inertia force
 Paq: live surcharge earth pressure
 Paq2: live load 2 surcharge earth pressure
 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 FSsl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

Intermountain GeoEnvironmental Services

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 4 Blocks (8')
 Design Method: NCMA_09_3rd_Ed
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g

SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			



GEOMETRY

Design Height:	8.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	5.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

FoS Sliding: 2.49 (lvlpd) / 1.60 FoS Overturning: 2.94 / 1.69
 Bearing: 1257.29 / 1216.29 FoS Bearing: 6.63 / 3.90

Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	FSsl	siesFSsl	FoS OT	FoS SeisOT
TBlk	6.00	0.217	0.302	61	85	82	33	0	93	199	14.93	7.73	14.22	6.61
036	4.00	0.183	0.262	205	294	192	55	0	260	541	7.68	3.86	6.68	3.02
036	2.00	0.183	0.262	461	661	302	82	0	543	1046	4.95	2.63	3.78	1.84
048	0.00	0.242	0.334	1082	1496	452	145	93	1320	2186	2.49	1.60	2.94	1.69

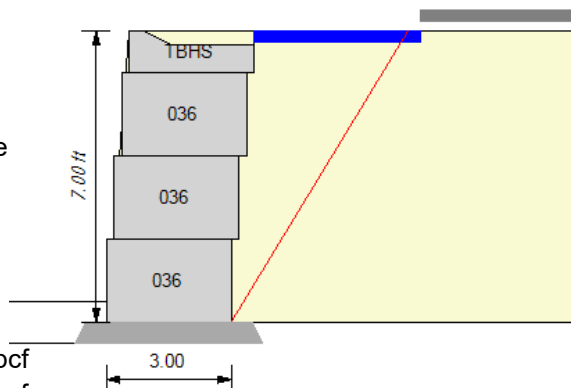
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 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 FSsl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

REA Analysis

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 4 Blocks (7")
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g

SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			



GEOMETRY

Design Height:	7.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	4.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

FoS Sliding: 3.00 (lvlpd) / 1.68 FoS Overturning: 3.35 / 1.61
 Bearing: 1045.44 / 994.51 FoS Bearing: 7.21 / 3.82

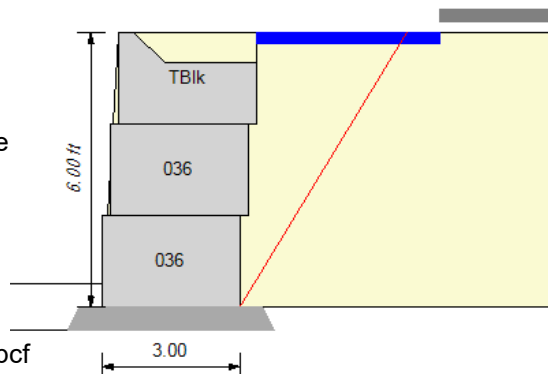
Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	FSsl	siesFSsl	FoS OT	FoS SeisOT
TBHS	6.00	0.217	0.302	15	21	59	16	0	31	96	38.93	14.00	57.37	18.16
036	4.00	0.183	0.262	115	165	169	41	0	156	376	11.67	5.13	12.54	4.84
036	2.00	0.183	0.262	320	459	280	69	0	388	808	6.44	3.20	5.67	2.51
036	0.00	0.183	0.262	627	900	390	96	0	723	1386	3.00	1.68	3.35	1.61

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 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 FSsl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

Intermountain GeoEnvironmental Services

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 3 Blocks (6')
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g



SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			

GEOMETRY

Design Height:	6.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	4.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

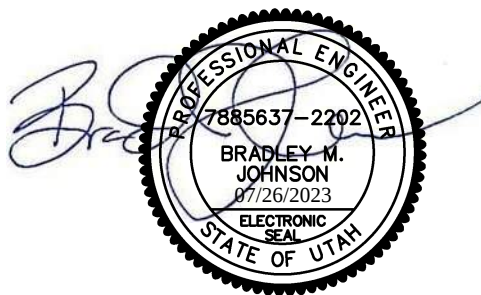
FoS Sliding: 3.09 (lvlpd) / 1.73 FoS Overturning: 3.75 / 1.82
 Bearing: 835.70 / 777.48 FoS Bearing: 8.92 / 5.40

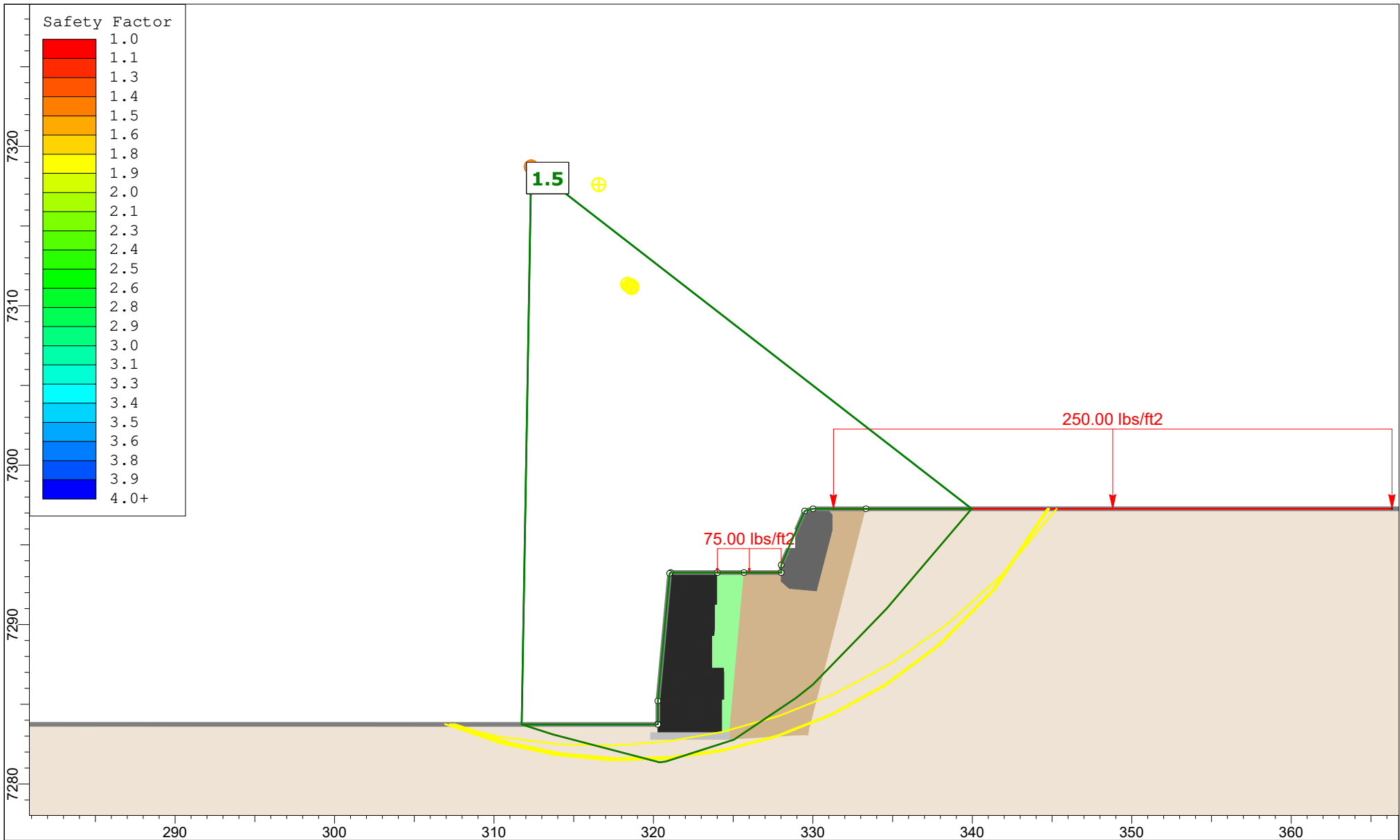
Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	Fssl	siesFssl	FoS OT	FoS SeisOT
TBlk	4.00	0.217	0.302	61	85	82	33	0	93	199	14.93	7.73	14.11	6.56
036	2.00	0.183	0.262	205	294	192	55	0	260	541	7.68	3.86	6.63	3.00
036	0.00	0.183	0.262	461	661	302	82	0	543	1046	3.09	1.73	3.75	1.82

Column Descriptions:

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 FSot: factor of safety of overturning about the toe.

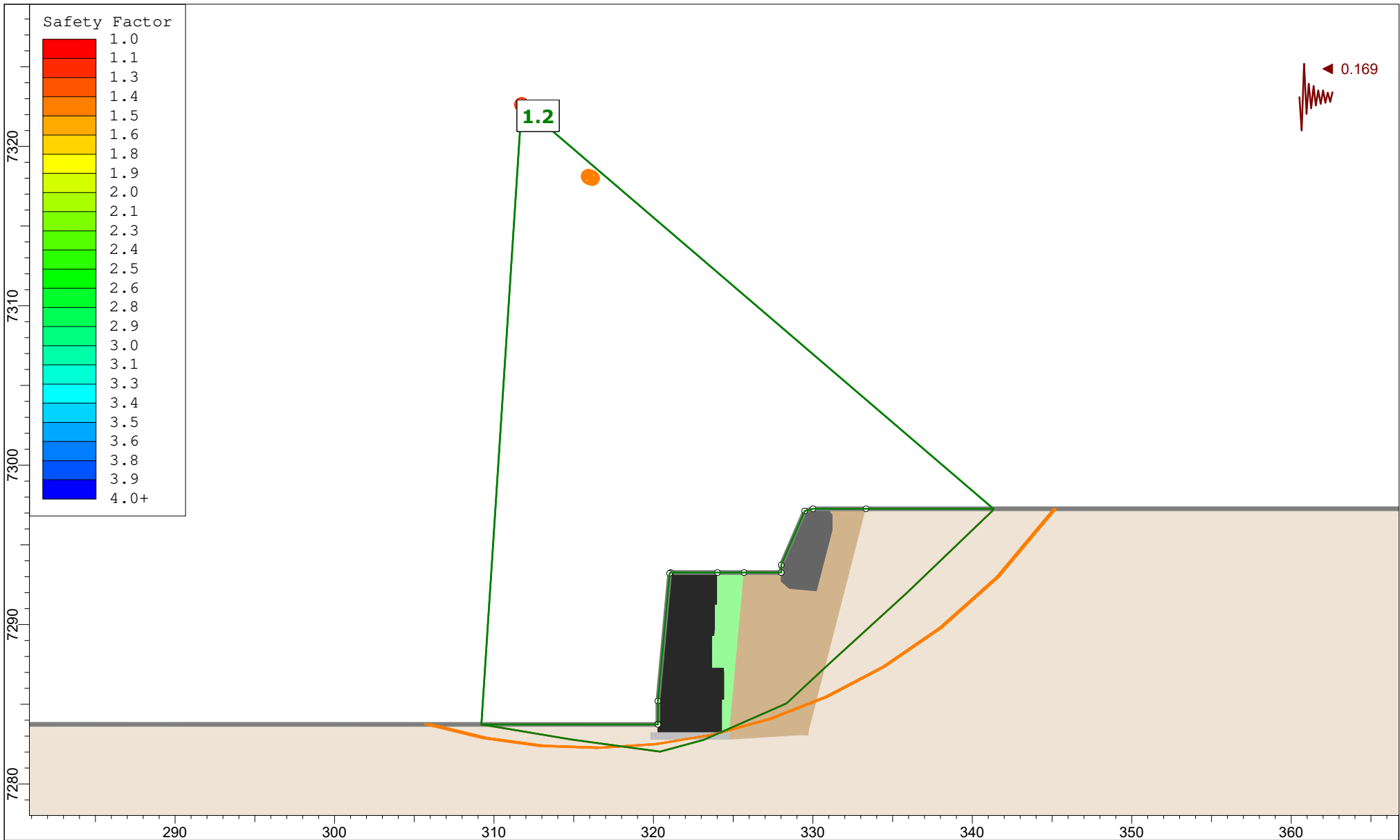
SECTION 3





SLIDEINTERPRET 9.028

Project			
Martin Residence - Verti-Block Design Package			
Analysis Description			
Global Stability Analysis - Static			
Drawn By	DHB	Scale	1:100
Date	7/20/2023	File Name	04409-001.slmd
		Company	
		Intermountain GeoEnvironmental Services, Inc. (IGES) 12429 South 300 East, Draper, Utah 84020	



SLIDEINTERPRET 9.028

Project			
Martin Residence - Verti-Block Design Package			
Analysis Description			
Global Stability Analysis - Seismic			
Drawn By	DHB	Scale	1:100
Date	7/20/2023	File Name	04409-001.slmd
		Company	
		Intermountain GeoEnvironmental Services, Inc. (IGES) 12429 South 300 East, Draper, Utah 84020	

Slide2 Analysis Information

04409-001

Project Summary

File Name: 04409-001.slmd
Slide2 Modeler Version: 9.028
Project Title: Martin Residence - Verti-Block Design Package
Analysis: Global Stability Analysis
Author: DHB
Company: IGES, Inc.
Date Created: 7/20/2023

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Verti-Block Wall 	Static	Spencer: 1.450270	00h:00m:04.529s
	Seismic	Spencer: 1.207350	00h:00m:05.907s

Analysis Options

All Open Scenarios

Slices Type: Vertical

	Analysis Methods Used
Number of slices:	Spencer
Tolerance:	25
Maximum number of iterations:	0.005
Initial trial value of FS:	50
Steffensen Iteration:	1
	Yes

Seismic Loading

Verti-Block Wall - Static

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Verti-Block Wall - Seismic

Advanced seismic analysis: No
Staged pseudostatic analysis: No
Seismic Load Coefficient (Horizontal): 0.169

Loading

◆ Verti-Block Wall - Static

Distribution:	Constant
Magnitude [psf]:	75
Orientation:	Vertical
Distribution:	Constant
Magnitude [psf]:	250
Orientation:	Vertical

Materials

Native

Color	
Strength Type	Mohr-Coulomb
Unit Weight	135 lbs/ft3
Cohesion	50 psf
Phi	34 °
Water Surface	Assigned per scenario
Ru Value	0

Gravel

Color	
Strength Type	Mohr-Coulomb
Unit Weight	135 lbs/ft3
Cohesion	0 psf
Phi	40 °
Water Surface	Assigned per scenario
Ru Value	0

Granular Fill

Color	
Strength Type	Mohr-Coulomb
Unit Weight	135 lbs/ft3
Cohesion	0 psf
Phi	34 °
Water Surface	Assigned per scenario
Ru Value	0

Verti-Block

Color	
Strength Type	Mohr-Coulomb
Unit Weight	120 lbs/ft3
Cohesion	3000 psf
Phi	0 °
Water Surface	Assigned per scenario
Ru Value	0

Bedrock

Color	
Strength Type	Mohr-Coulomb
Unit Weight	150 lbs/ft3
Cohesion	0 psf
Phi	38 °
Water Surface	Assigned per scenario
Ru Value	0

Rockery

Color	
Strength Type	Anisotropic Strength
Unit Weight	150 lbs/ft3
Cohesion 1	0 psf
Phi 1	45 °
Cohesion 2	2000 psf
Phi 2	0 °
Angle (ccw to 1)	-10 °
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Static	Seismic
Native 	✓	✓
Gravel 	✓	✓
Granular Fill 	✓	✓
Verti-Block 	✓	✓
Bedrock 	✓	✓
Rockery 	✓	✓

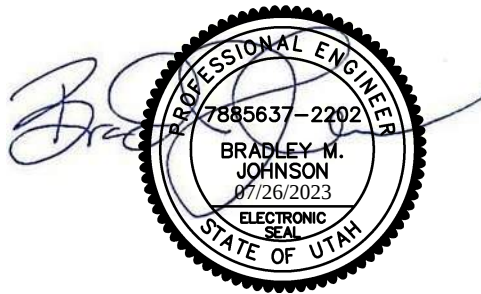
Global Minimums**◆ Verti-Block Wall - Static****Method: spencer**

FS	1.450270
Axis Location:	312.330, 7318.721
Left Slip Surface Endpoint:	311.742, 7283.748
Right Slip Surface Endpoint:	339.955, 7297.267
Resisting Moment:	664824 lb-ft
Driving Moment:	458415 lb-ft
Resisting Horizontal Force:	15200.3 lb
Driving Horizontal Force:	10481.1 lb
Total Slice Area:	166.56 ft2
Surface Horizontal Width:	28.213 ft
Surface Average Height:	5.90367 ft

◆ Verti-Block Wall - Seismic**Method: spencer**

FS		1.207350
Axis Location:		311.741, 7322.615
Left Slip Surface Endpoint:		309.206, 7283.749
Right Slip Surface Endpoint:		341.313, 7297.267
Resisting Moment:		642396 lb-ft
Driving Moment:		532071 lb-ft
Resisting Horizontal Force:		13993.7 lb
Driving Horizontal Force:		11590.4 lb
Total Slice Area:		165.685 ft ²
Surface Horizontal Width:		32.1074 ft
Surface Average Height:		5.16033 ft

SECTION 4

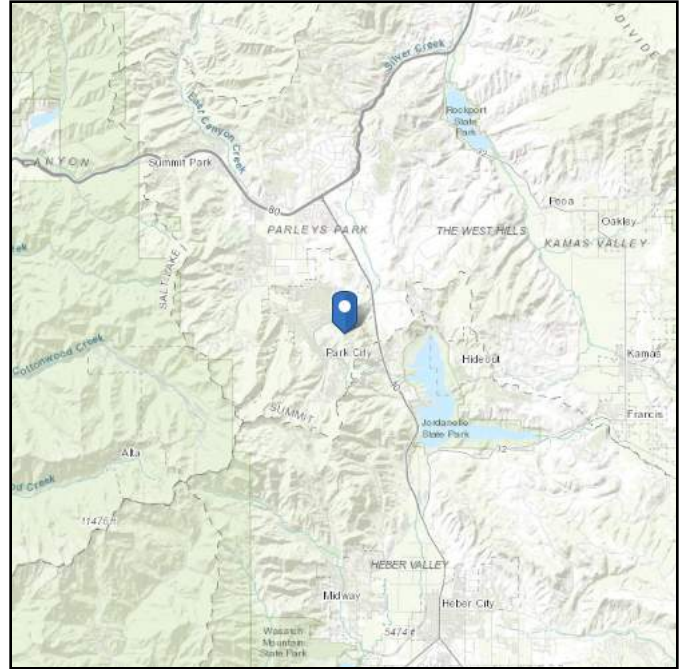
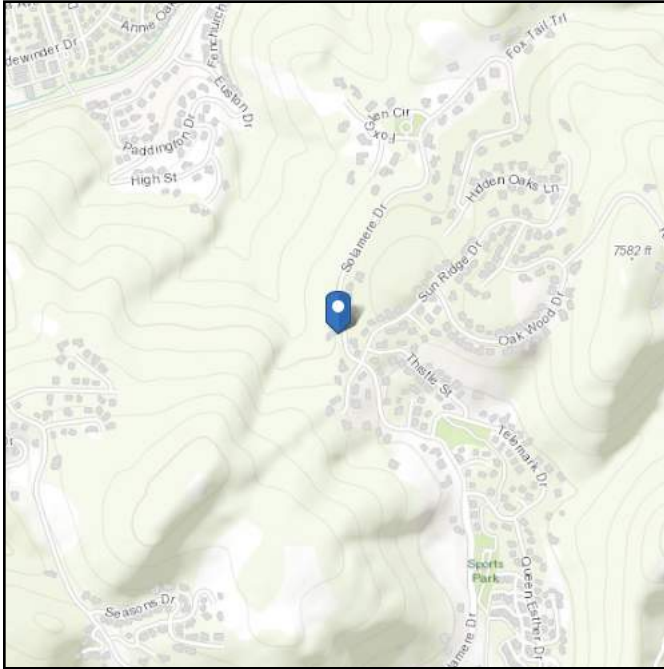


ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Stiff Soil

Latitude: 40.656813
Longitude: -111.481284
Elevation: 7204.821559346934 ft
(NAVD 88)



Site Soil Class: D - Stiff Soil

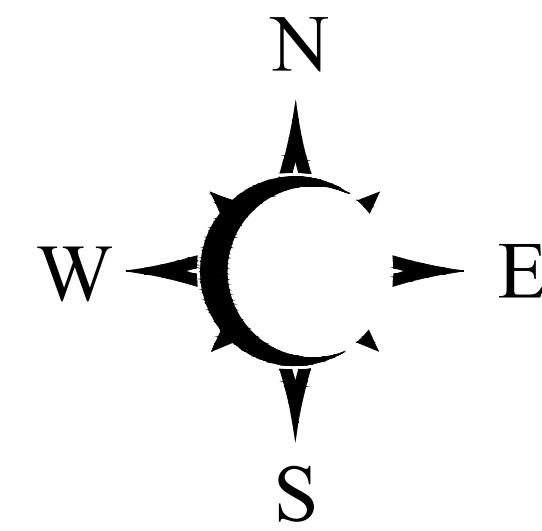
Results:

S_S :	0.57	S_{D1} :	N/A
S_1 :	0.203	T_L :	8
F_a :	1.344	PGA :	0.25
F_v :	N/A	PGA_M :	0.337
S_{MS} :	0.766	F_{PGA} :	1.35
S_{M1} :	N/A	I_e :	1
S_{DS} :	0.511	C_v :	1.08

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

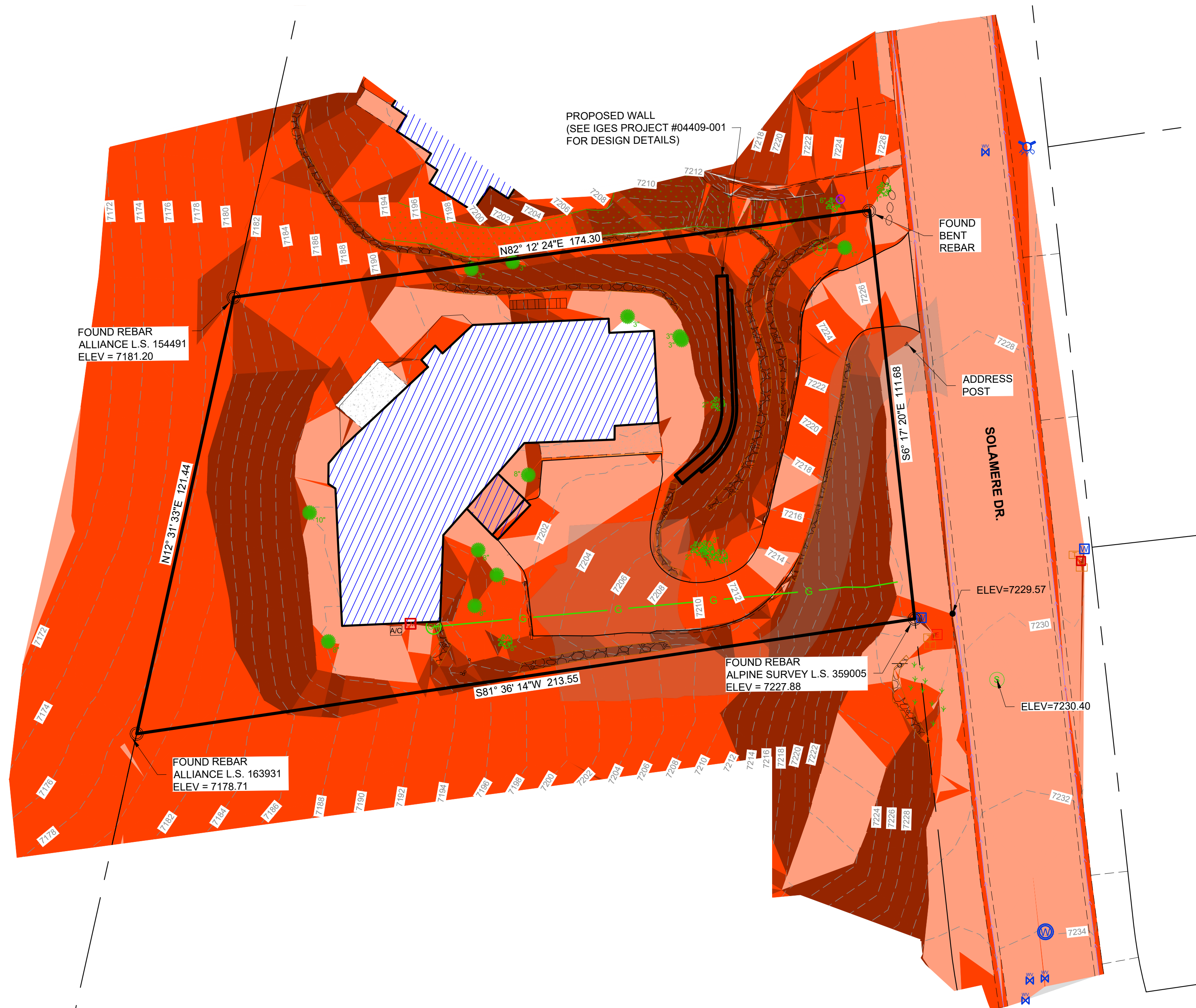
Data Accessed: Wed Jul 19 2023

Date Source: [USGS Seismic Design Maps](#)

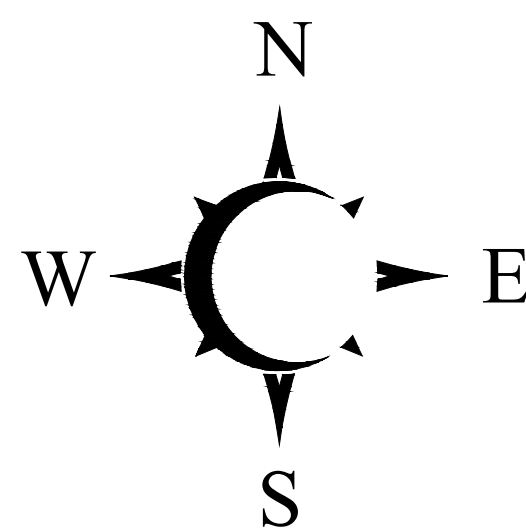


P: (801) 616-6848
F: (801) 704-9384
surveydanpls@gmail.com
563 North Rees Ave.
Spanish Fork, UT 84660

DRAWN: THK		PROJECT #		SCALES		
DESIGNER: DEK		VA. 979		HORIZ: 1"=20'	 BAR SCALE MEASURES FOR A FULL SIZE SHEET	
REVIEWED: DEK		DATE:				
		9/10/2024				
PROJECT NAME:						
3335 SOLAMERE DRIVE						
PROJECT LOCATION:						
PARK CITY, UTAH						
SHEET TITLE:				SHEET		
TOPOGRAPHIC SURVEY				1 of 1		



Slopes Table			
Number	Minimum Slope	Maximum Slope	Color
1	1%	15%	
2	15%	30%	
3	30%	40%	
4	40%	> 40%	



LEGEND

- = FOUND 5/8" REBAR & CAP
- = FOUND PLUG
- = EXISTING SEWER MANHOLE
- = EXISTING FIRE HYDRANT
- = EXISTING WATER MANHOLE
- = EXISTING WATER VALVE
- = EXISTING WATER METER
- = EXISTING IRRIGATION BOX
- = EXISTING TELEPHONE PEDESTAL
- = EXISTING ELECTRICAL METER
- = EXISTING ELECTRICAL BOX
- = EXISTING PVC 8" VENT PIPE
- = EXISTING GAS METER
- = EXISTING A/C UNIT
- = EXISTING TREE
- = EXISTING EVERGREEN
- = EXISTING BUSH
- = EXISTING LAWN
- = EXISTING BUILDING
- = EXISTING ASPHALT
- = EXISTING CONCRETE
- = EXISTING ROCK WALL

NOTES

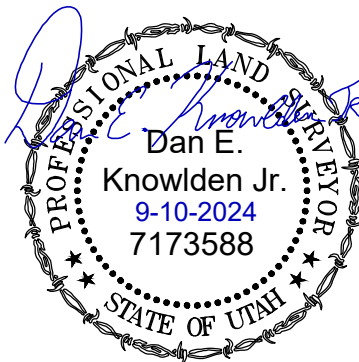
- 1.) VERTICAL DATA (CONTOURS AND/OR SPOT ELEVATIONS) SHOWN HEREON ARE BASED ON THE FOOT EQUIVALENT ELEVATION OF 7230.40', EXISTING SEWER MANHOLE, COLLECTED WITH GPS ON THE UTAH VRS NETWORK (GEOID 2018)
- 2.) THIS TOPOGRAPHIC SURVEY WAS COMPLETED UNDER THE DIRECT AND RESPONSIBLE CHARGE OF DAN KNOWLDEN, PLS FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION; THAT THE IMAGERY AND/OR ORIGINAL DATA WAS OBTAINED ON SEPTEMBER 5, 2024.
- 3.) THIS TOPOGRAPHIC SURVEY PLAT WAS PREPARED WITHOUT THE BENEFIT OF A TITLE COMMITMENT OR TITLE REPORT AND ALL EASEMENTS AND ENCUMBRANCES THAT MIGHT BE DISCLOSED IN A TITLE SEARCH MAY NOT BE SHOWN.
- 4.) PROPERTY LINES SHOWN HERON ARE COMPILED FROM RECORD INFORMATION FOR REFERENCE ONLY. NO BOUNDARY SURVEY WAS PERFORMED BY VALLEY LAND SURVEYING.
- 5.) THIS TOPOGRAPHIC SURVEY PLAT IS NOT PROOF OF OWNERSHIP.
- 6.) THIS TOPOGRAPHIC SURVEY PLAT MAKES NO ASSUMPTIONS AS TO ANY UNWRITTEN RIGHTS THAT MAY EXIST BY AND BETWEEN THE ADJOINING LAND OWNERS.
- 7.) UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON ABOVE GROUND FACILITIES AND EXISTING BLUE STAKE MARKINGS FOUND ON SITE AT THE TIME OF SURVEY. UTILITIES SHOWN HEREON ARE BASED ON FIELD OBSERVATION ONLY.

TOPOGRAPHIC SURVEY
3335 SOLAMERE DRIVE, PARK CITY

LOCATED IN SECTION 10, TOWNSHIP 2 SOUTH, RANGE 4 EAST
SALT LAKE BASE AND MERIDIAN

SURVEYOR'S CERTIFICATE

I, DAN E. KNOWLDEN JR DO HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR AND THAT I HOLD CERTIFICATE NO. 7173588 AS PRESCRIBED UNDER THE LAWS OF THE STATE OF UTAH AND THAT A TOPOGRAPHICAL SURVEY OF THE DESCRIBED PROPERTY HEREIN WAS PERFORMED UNDER MY DIRECTION.



BOUNDARY DESCRIPTION

LOT 28, HIDDEN OAKS AT DEER VALLEY PHASE 1A, ACCORDING TO THE OFFICIAL PLAT ON FILE IN THE OFFICE OF THE SUMMIT COUNTY RECORDERS OFFICE.

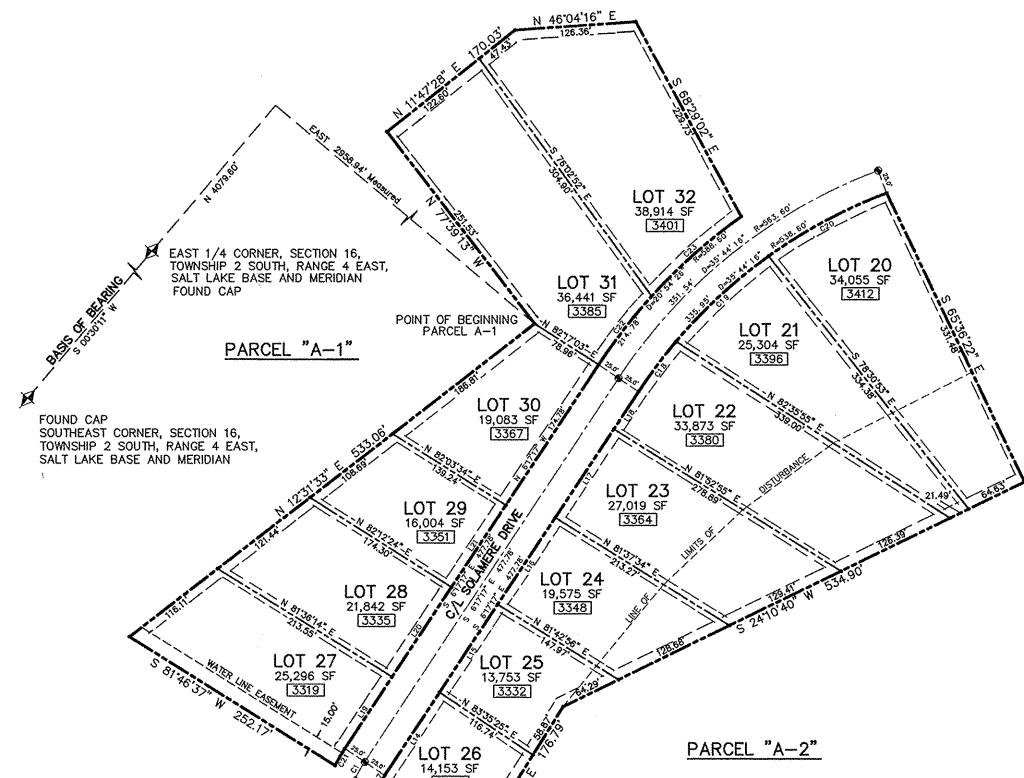
NARRATIVE

VALLEY LAND SURVEYING WAS CONTRACTED BY TODD TANNER TO PREPARE A TOPOGRAPHIC SURVEY TO FULFILL THE REQUIRMENTS FOR LMC 15-2-21-3(A)(2) SUBMITTAL 4 (PARK CITY MUNICIPAL CORPORATION) TO BUILD A NEW RETAINING WALL.



P: (801) 616-6848
F: (801) 704-9384
surveydanpls@gmail.com
563 North Rees Ave.
Spanish Fork, UT 84660

DRAWN: THK	PROJECT # VA. 979	SCALES	
DESIGNER: DEK	DATE: 9/12/2024	HORIZ: 1"=20'	
REVIEWED: DEK			
PROJECT NAME:			
3335 SOLAMERE DRIVE			
PROJECT LOCATION:			
PARK CITY, UTAH			
SHEET TITLE:			SHEET
TOPOGRAPHIC SURVEY			1 of 1



LEGEND

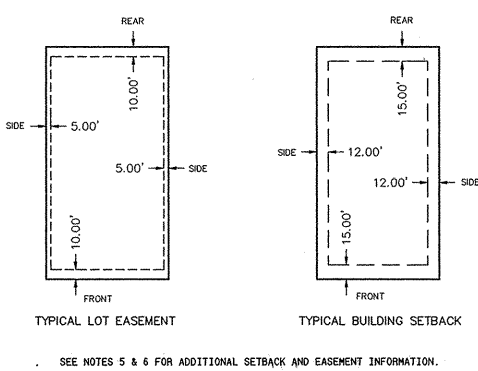
● SURVEY MONUMENT TO BE SET

C/L - CENTERLINE

00000 - STREET ADDRESS

LINE	BEARING	DISTANCE
L1	N 88°01'27" W	15.00
L2	N 78°23'33" E	44.47
L3	N 31°58'33" E	105.53
L4	N 31°58'33" E	37.37
L5	N 31°58'33" E	46.78
L6	N 31°58'33" E	113.16
L7	S 78°13'22" E	33.20
L8	S 78°13'22" E	38.74
L9	N 78°13'22" W	47.22
L10	N 78°13'22" W	24.72
L11	S 89°02'50" E	25.00
L12	N 05°03'03" E	63.25
L13	N 67°17'17" W	102.07
L14	N 67°17'17" W	109.36
L15	N 67°17'17" W	109.36
L16	N 67°17'17" W	109.36
L17	N 67°17'17" W	109.36
L18	N 67°17'17" W	109.36
L19	N 67°17'17" W	109.36
L20	N 67°17'17" W	109.36
L21	N 67°17'17" W	109.36
L22	S 27°36'58" E	109.21
L23	N 27°36'58" E	63.83
L24	N 02°03'03" E	48.80
L25	N 13°28'24" W	116.21
L26	S 07°03'03" W	63.83
L27	N 78°13'22" W	33.20
L28	N 26°43'03" W	95.15
L29	S 10°45'32" E	34.08
L30	N 80°23'22" E	13.54
L31	N 78°13'22" E	87.82
L32	S 49°39'23" W	86.00
L33	S 39°16'17" W	9.14
L34	S 49°39'23" W	77.87
L35	S 49°39'23" W	45.69
L36	S 49°39'23" W	23.28
L37	S 81°02'27" W	81.26
L38	S 81°02'27" W	87.78
L39	S 70°07'04" W	45.31
L40	S 81°02'27" W	27.85
L41	S 70°07'04" W	80.37
L42	S 11°02'09" W	117.06
L43	S 65°43'33" W	77.78
L44	S 70°07'04" W	45.31
L45	N 72°36'06" W	112.32
L46	S 78°13'22" W	24.72
L47	S 14°56'26" W	102.16
L48	N 75°56'33" W	110.00
L49	N 78°13'22" W	109.36
L50	S 31°58'33" W	109.36
L51	N 67°17'17" E	109.36
L52	N 67°17'17" E	109.36
L53	N 67°17'17" E	109.36
L54	N 67°17'17" E	109.36
L55	N 67°17'17" E	109.36
L56	N 67°17'17" E	109.36
L57	S 33°11'18" E	122.78
L58	S 51°59'48" W	86.88
L59	N 32°59'31" W	89.72
L60	S 67°02'23" E	92.39
L61	N 71°05'13" E	24.79
L62	S 51°59'48" W	86.88
L63	S 44°33'06" E	121.46
L64	S 39°16'17" W	106.31
L65	N 31°58'33" E	68.88
L66	S 39°16'17" W	123.81
L67	N 31°58'33" E	121.16
L68	S 14°56'26" W	35.90
L69	S 14°56'26" W	35.90
L70	S 10°45'32" E	86.02
L71	N 14°56'26" W	95.55
L72	N 78°13'22" W	44.47
L73	N 48°04'16" E	126.36
L74	S 69°33'07" E	50.00
L75	S 78°13'22" W	44.47
L76	S 13°36'22" E	50.00
L77	N 47°40'58" W	51.69

CURVE	ARC	DELTA	RADIUS
C1	19.46	726.91	150.00
C2	16.78	1707.88	80.00
C3	85.16	6979.24	80.00
C4	47.34	2419.57	80.00
C5	54.01	3640.56	80.00
C6	143.13	3338.22	245.00
C7	132.16	26114.67	300.00
C8	153.28	5832.50	150.00
C9	96.79	3638.14	150.00
C10	87.15	20723.57	245.00
C11	55.98	1365.30	245.00
C12	132.43	2639.55	284.54
C13	5.17	190.97	284.54
C14	51.01	1016.16	284.54
C15	42.91	838.24	284.54
C16	33.34	642.62	284.54
C17	18.63	832.16	125.00
C18	64.76	632.20	538.60
C19	121.33	1350.14	538.60
C20	139.84	1452.34	538.60
C21	20.50	638.45	175.00
C22	89.81	944.34	568.60
C23	124.97	1209.53	568.60
C24	48.80	901.50	309.54
C25	95.26	1737.99	309.54
C26	30.41	642.90	259.54
C27	24.64	849.40	15.00
C28	112.92	3638.14	175.00
C29	150.45	1734.51	35.00
C30	20.07	7639.21	15.00
C31	127.73	5832.50	125.00
C32	13.88	1350.14	538.60
C33	117.76	1251.94	525.00
C34	101.79	1198.50	525.00
C35	107.24	1142.12	525.00
C36	110.42	1203.59	525.00
C37	133.06	1451.17	525.00
C38	14.01	131.46	525.00
C39	148.59	2611.44	335.00
C40	33.89	1284.26	15.00
C41	32.96	3419.27	50.00
C42	125.73	2611.44	275.00
C43	18.69	2764.57	475.00
C44	125.22	1509.15	475.00
C45	109.31	1311.08	475.00
C46	103.83	1230.82	475.00
C47	109.74	1314.14	475.00
C48	73.28	8502.37	475.00
C49	24.68	8245.37	175.00
C50	104.01	3433.12	175.00
C51	50.13	1924.40	175.00
C52	80.66	3638.14	125.00
C53	27.44	10448.00	15.00
C54	4.71	132.25	259.54
C55	142.14	2854.06	291.15
C56	120.14	2343.23	291.15
C57	111.77	6079.24	165.00
C58	20.41	7758.31	15.00
C59	70.25	1817.43	220.00
C60	58.28	13707.50	220.00
C61	16.14	1829.28	50.00
C62	53.16	6024.52	50.00
C63	54.58	6189.07	50.00
C64	20.27	2313.23	50.00
C65	72.41	321.11	775.00
C66	21.10	2470.26	50.00
C67	62.85	7201.07	50.00
C68	18.36	7070.07	15.00
C69	39.72	8354.46	270.00
C70	56.32	11579.06	270.00
C71	108.43	3623.40	240.15
C72	91.54	21501.10	240.15
C73	152.35	14497.57	568.60
C74	96.04	20723.57	270.00
C75	128.53	3328.22	220.00
C76	73.52	8414.57	50.00
C77	72.41	5201.11	775.00



SEE NOTES 5 & 6 FOR ADDITIONAL SETBACK AND EASEMENT INFORMATION.

SURVEYOR'S CERTIFICATE

I, John Demkowicz, do hereby certify that I am a registered Land Surveyor and that I hold Certificate No. 163931 as prescribed under the laws of the State of Utah, I further certify that by authority of the owner I have made a survey of the tract of land shown on this plat and described herein and subdivided said tract of land into lots, public easements, and public right-of-ways to be hereafter known as HIDDEN OAKS AT DEER VALLEY, PHASE 1A and that the same has been correctly surveyed on the ground as shown on this plat.

John Demkowicz 7-12-95
JOHN DEMKOWICZ L.S. NO. 163931 DATE



PARCEL "A-1" BOUNDARY DESCRIPTION

Beginning at the Northeast corner of the Emma mining claim (mineral Survey 6992), said point is located North 4079.60 feet and East 2958.94 feet from the East quarter corner of Section 16, Township 2 South, Range 4 East, Salt Lake Base and Meridian; and running thence along the northerly end line of the Emma mining claim North 77° 39' 13" West 251.53 feet; thence North 11° 47' 28" East 170.03 feet; thence North 46° 04' 16" East 126.36 feet; thence South 68° 29' 02" East 229.73 feet to a point on a 588.60 foot radius curve to the left, whose radius point bears South 75° 22' 51" East; thence along the arc of said curve 214.78 feet thru a central angle of 20° 54' 26"; thence South 06° 17' 17" East 477.78 feet to a point on a 175.00 foot radius curve to the left, whose radius point bears North 83° 42' 43" East; thence along the arc of said curve 20.30 feet thru a central angle of 06° 38' 46"; thence along the northerly boundary line of The Oaks at Deer Valley boundary South 24° 10' 40" West (Plat South 24° 12' 50" West) (Recorded Instrument # 311418 in the office of the Summit County Recorder) South 81° 46' 37" West (Plat South 81° 48' 47" West) 252.17 feet; thence along the east side line of the Emma Mining Claim North 12° 31' 33" East 533.06 feet to the point of beginning. Description contains 3.62 acres. The Basis of Bearing for the above description is South 00° 30' 11" West between the East Quarter Corner and the Southeast corner of Section 16.

PARCEL "A-2" BOUNDARY DESCRIPTION

Beginning at a point on the boundary line of The Oaks at Deer Valley (Recorded Instrument No. 311418 in the office of the Summit County Recorder), said point is located North 3619.41 feet (Plat 3621.23 feet) and East 3259.75 feet (Plat 3261.43 feet) from the East Quarter corner of Section 16, Township 2 South, Range 4 East, Salt Lake Base and Meridian; and running thence along The Oaks at Deer Valley boundary South 81° 46' 37" West (Plat South 81° 48' 47" West) 118.34 feet to a point on a 125.00 foot radius curve to the right, whose radius point bears North 75° 10' 27" East; thence along the arc of said curve 335.95 feet thru a central angle of 35° 44' 16"; thence South 65° 36' 22" East 331.48 feet; thence along The Oaks at Deer Valley boundary South 24° 10' 40" West (Plat South 24° 12' 50" West) 534.90 feet; thence along The Oaks at Deer Valley boundary South 07° 42' 17" East (Plat South 07° 40' 07" East) 176.79 feet to the point of beginning. Description contains 3.65 acres. The Basis of Bearing for the above description is South 00° 30' 11" West between the East Quarter Corner and the Southeast corner of Section 16.

OWNER'S DEDICATION AND CONSENT TO RECORD

KNOW ALL MEN BY THESE PRESENT: That the undersigned is the owner of the herein described tract of land, having caused the same to be subdivided into lots, ROS parcels and public right-of-ways, together with easements as set forth on this Record of Survey Plat to be known hereafter as HIDDEN OAKS AT DEER VALLEY, PHASE 1A, does hereby dedicate for the perpetual use of the public, all parcels of land as intended for public use and further consents to the recordation of this Record of Survey Plat in accordance with Utah Law. ALSO, the owner hereby dedicates to Snyderville Basin Sewer Improvement District, Park City Fire Protection District, and Summit County a non-exclusive easement over the utility easements shown on this plat for the purpose of providing access for utility installation, maintenance, use and eventual replacement. The owner, or his representative, hereby irrevocably offers for dedication to the City of Park City all the streets, land for local government uses, easements, parks and required utilities and easements shown on the subdivision plat and construction plans in accordance with an irrevocable offer of dedication.

IN WITNESS WHEREOF, the undersigned set his hand this 12th day of July, 1995.

OAKWOOD DEVELOPMENT, L.L.C.
A Utah Limited Liability Company

David L. Evans
David L. Evans
Its Manager



ACKNOWLEDGMENT

State of Utah }
County of Summit }

On the 12th day of July, 1995, personally appeared before me David L. Evans, who, being by me duly sworn, did say that he is the Manager of Oakwood Development, L.L.C., a Utah Limited Liability Company and that the within and foregoing Owners Dedication and Consent to Record was signed on behalf of said L.L.C. and said Manager duly acknowledged to me that said L.L.C. executed the same.

Debbie Ward
Notary Public

Commission Expires: May 30, 99
Residing at: Heber, UT

GENERAL NOTES:

- Plans, Design and Construction shall be in accordance with the "Conditions, Covenants, and Restrictions" as on record in the Summit County Recorder's Office. All Final Conditions of Approval dated April 26, 1995 shall also apply.
- All dwellings shall be fire sprinkled in accordance with UBC Standards #38-1, 1990. The Sprinkling Plan shall be submitted with the Site Plan and Architectural drawings for review prior to issuance of a building permit. Roof covering to be class "B" fire rated or better.
- Park City will assume responsibility for snow plowing only upon completion and legal occupation of structures on at least 50% of the Lots. Costs to homeowners will be substantial in the meanwhile.
- Allowable irrigated area shall be 10,000 Sq. feet, maximum per lot.
- Non-exclusive public utilities, snow storage, and drainage easements are dedicated along the front 10 feet, the side 5 feet, and the rear 10 feet of each lot. Additional easements are as shown on the plat.
- Building setbacks shall be 15 feet front and rear of each lot, and 12 feet side lot. Rear yard setback is further limited to the Limit of Disturbance Area (LODA) on those lots where LODA exists. Standard rear setback is required from Limits of Disturbance Line. Additional setbacks due to easements will be required on affected lots.
- All Homes shall be a maximum size of 7,500 Sq. Ft. Lots under 16,000 Sq. Ft. in size shall limit the home size to a maximum of 5,000 Sq. Ft.
- Lots on the downhill side of roads may require pump facilities to lift sewage into the sewer laterals. Due to the terrain and Architectural styles of construction, the elevation of all sewer laterals should be verified and incorporated into home design. Pump design shall be private individual ejector pumps at the individual lot owner's expense.
- The boundary descriptions are derived from surveys performed and recorded as entries S-1913 and S-164 in the office of the Summit County Surveyors Office.
- No building permits will be issued until roads are paved.

HIDDEN OAKS AT DEER VALLEY

PHASE 1A

A SUBDIVISION LOCATED IN SECTION 10, TOWNSHIP 2 SOUTH, RANGE 4 EAST, SALT LAKE BASE AND MERIDIAN.



JOB NO. 18-10-94 VC\D\PLTH01A

ALLIANCE ENGINEERING INC. P.O. BOX 2664 323 MAIN STREET PARK CITY, UTAH 84060 (801) 649-9467	SNYDERVILLE BASIN SEWER IMPROVEMENT DISTRICT REVIEWED FOR CONFORMANCE TO SNYDERVILLE BASIN SEWER IMPROVEMENT DISTRICT STANDARDS ON THIS 28th DAY OF July, 1995 A.D. BY <i>James R. Baird</i> S.B.S.I.D.	PLANNING COMMISSION APPROVED BY THE PARK CITY PLANNING COMMISSION THIS 24th DAY OF July, 1995 A.D. BY <i>Brian W. Oakman</i> CHAIRMAN	ENGINEERS CERTIFICATE I FIND THIS PLAT TO BE IN ACCORDANCE WITH INFORMATION ON FILE IN MY OFFICE THIS 31st DAY OF July, 1995 A.D. BY <i>Brian W. Oakman</i> PARK CITY ENGINEER	APPROVAL AS TO FORM APPROVED AS TO FORM THIS 12th DAY OF September, 1995 A.D. BY <i>Mark D. Hays</i> PARK CITY ATTORNEY	CERTIFICATE OF ATTEST I CERTIFY THIS RECORD OF SURVEY MAP WAS APPROVED BY PARK CITY COUNCIL THIS 11th DAY OF MAY, 1995 A.D. BY <i>Antia L. Sheldon</i> PARK CITY RECORDER	COUNCIL APPROVAL AND ACCEPTANCE APPROVAL AND ACCEPTANCE BY THE PARK CITY COUNCIL THIS 11th DAY OF MAY, 1995 A.D. BY <i>Bruce B. Orr</i> MAYOR # 437480 RECORDED STATE OF UTAH COUNTY OF SUMMIT AND FILED AT THE REQUEST OF First American Title DATE 09-18-95 TIME 11:10 AM BOOK PAGE 432 Alan Spragg FEE RECORDER
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Site Plan / Explanation for 3335 Solamere Dr permit# PREP23-58403335

AEG proposes to install a Verti-block Retaining wall for Carol Martin on the East side of the home, there is an existing native rock wall that is crumbling and rolling towards the home , the Verti-block wall has been engineered (By IGES)to approximately 10' tall x 56' long tall to mitigate the crumbling existing wall , See Desing Package IGES.

When recorded, Mail to:
Park City Recorder
PO Box 1480
Park City, UT 84060

**DEER VALLEY RESORT TWELFTH AMENDED AND RESTATED
LARGE SCALE MASTER PLANNED DEVELOPMENT PERMIT
November 30, 2016**

WHEREAS, Royal Street Land Company, a Utah corporation ("Royal Street") heretofore submitted to the Planning Commission of Park City ("Commission") certain items with relation to a residential, commercial, and recreational development project known as Deer Valley / Lake Flat Area Development ("Project") which items were listed in the original Permit granted for the Project by Commission and are incorporated herein by reference; and

WHEREAS, Commission found that such items submitted by Royal Street complied with and satisfied all applicable requirements of the Park City Land Management Code as then in force, to permit the construction of the Project as a planned unit development pursuant to the planned unit development exception then contained in the Park City Land Management Code; and

WHEREAS, Commission heretofore issued to Royal Street a Special Exception Permit dated September 27, 1977, with relation to the Project, which Special Exception Permit was amended by an Amended Special Exception Permit dated June 27, 1979 issued to Royal Street and by a Second Amended and Restated Special Exception Permit dated January 27, 1982, a Third Amendment to Special Exception Permit dated May 17, 1984, a Fourth Amendment to Special Exception Permit dated February 21, 1985, a Fifth Amended and Restated Special Exception Permit dated December 23, 1986, a First Amendment to Fifth Amended and Restated Special Exception Permit dated November 29, 1989, a Second Amendment to Fifth Amended and Restated Special Exception Permit dated April 11, 1990, a Sixth Amended and Restated Special Exception Permit dated October 10, 1990, a Seventh Amended and Restated Large Scale Master Planned Development Permit dated April 14, 1993, an Eighth Amended and Restated Large Scale Master Planned Development Permit dated April 25, 2001, a Ninth Amended and Restated Large Scale Master Planned Development Permit dated June 28, 2006, a Tenth Amended and Restated Large Scale Master Planned Development Permit dated August 12, 2009, and an Eleventh Amended and Restated Large Scale Master Planned Development Permit dated March 23, 2011, which were issued to Deer Valley Resort Company ("Permittee"), as assignee and successor to the rights of Royal Street under the Special Exception Permit; and

WHEREAS, Permittee and Commission desire to further amend and restate the Large Scale Master Planned Development Permit to reflect actions approved by the Commission with respect to the combination of vacant Deer Valley MPD Silver Lake Village Lots F, G, and H into one Lot I and to transfer 843 square feet of existing residential density (0.4215 unit equivalents (UE)) from Deer Valley MPD Silver Lake Village Lot D (existing Goldener Hirsh Inn) to the new Deer Valley MPD Silver Lake Village Lot I, to accommodate connection, access and circulation between the Goldener Hirsch Inn on Parcel D and the future Goldener Hirsch Residences proposed on Parcel I.

WHEREAS, Permittee has requested modification to the Large Scale Master Planned Development Permit and Commission is willing to grant said modifications as herein set forth; and

WHEREAS, Commission finds that it is in the best interest of Park City and its citizens that Permittee be granted the right to construct and develop the Project as a Master Planned Development in accordance with the Park City Land Management Code passed and adopted December 22, 1983, effective January 1, 1984 as the same has been amended by Ordinance to the date hereof (herein designated the "Code") and in accordance with the Large Scale Master Planned Development Permit as amended and restated hereby.

NOW THEREFORE, the Large Scale Master Planned Development Permit is hereby amended and restated to authorize and grant the right, and Permittee is hereby authorized and granted the right, to develop and construct the Project, subject to Planning Commission approval of any required Conditional Use Permits for site specific development and City Council approval and recordation of any required subdivision plats, as outlined and detailed in this: (A) Twelfth Amended and Restated Large Scale Master Planned Development Permit ("Permit") including the Exhibits hereto and those documents and items submitted by Permittee as aforesaid, as a Master Planned Development pursuant to the Master Planned Development provisions contained in the Code; and, (B) the Agreement dated July 12, 1978, between Park City, as "City", and Royal Street, as "Royal Street", as amended by an Amendment to Agreement dated May 29, 1978, a Second Amendment to Agreement dated April 3, 1980, a Third Amendment to Agreement dated August 21, 1980, as amended and restated in its entirety by a Fourth Amendment and Restatement of Agreement, a Fifth Amendment to Agreement dated May 17, 1984, and a Sixth Amendment to Agreement dated February 21, 1985, and all subsequent amendments, which are all incorporated herein by reference and which Agreement as so amended is herein referred to as the "Agreement", and as such Agreement may hereafter be further amended from time to time. Park City is hereinafter referred to in this Permit as "City".

A. **Densities.** For purposes of determining densities in the Project:

(1) Insofar as the following portions of the Project are concerned, the authorized densities shall be as follows:

<u>Parcel Designation</u>	<u>Authorized Dwelling Units</u>
Northwest Multi-Family (Fawn grove)	80
North Entrance Multi-Family (Pinnacle)	40
North Hillside Multi-Family (Pinnacle)	46
Southwest Multi-Family (Aspenwood)	30
Southwest Multi-Family (Courchevel)	13.5
Northwest Hillside Multi-Family (Daystar)	24
South Entrance Multi-Family (Stonebridge)	50
South Multi-Family (Lakeside)	60
West Multi-Family (Pine Inn and Trails End)	40
Total	383.5

For purposes of determining densities on the parcels designated in this Subparagraph (1), a single family home or an apartment containing two bedrooms or more constituted a dwelling

Unit, a one-bedroom apartment constituted one-half of a dwelling Unit, and a hotel room or lodge room constituted one-half of a dwelling Unit. The parcels in this subparagraph have all been developed as of the date hereof.

(2) Insofar as all portions of the Project other than the nine parcels containing 383.5 dwelling Units identified in Subparagraph A. (1) above are concerned, an apartment Unit containing one bedroom or more shall constitute a dwelling Unit and a hotel room or lodge room shall constitute one-half of a dwelling Unit.

(3) If approved in advance by Commission and Permittee, the owner of any development parcel in the Project shall have the right to have the densities permitted on said development parcel calculated in accordance with Subparagraph A. (1) or Subparagraph A. (2) above and/or with Exhibit 1 attached hereto (whichever is applicable) or in accordance with the Unit Equivalent formula contained in Section 10.12 of the Code, as said Unit Equivalent formula may from time to time be amended or modified. In the event of election of an owner to utilize said Unit Equivalent formula and approval thereof by Commission and Permittee, the maximum number of Unit Equivalents which may be contained in the structures built upon said development parcel shall not exceed the permitted number of dwelling Units to be constructed thereon determined in accordance with Subparagraph A. (1) or Subparagraph A. (2) above and/or with Exhibit 1 attached hereto (whichever is applicable) and the number of Unit Equivalents as constructed on said development parcel shall for all purposes hereof be deemed the number of units constructed thereon. Approval of use of the Unit Equivalent formula by Commission and Permittee shall not, and cannot, alter or release any private land use covenants between the owner and Deer Valley, or others, concerning development of the property or the density permitted thereon.

(4) Insofar as the following portions of the Project are concerned, the authorized densities, permitted on the development parcels are required to be calculated in accordance with the Unit Equivalent Formula contained in Section 10.12 of the Code as said Unit Equivalent formula may from time to time be amended or modified:

<u>Parcel Designation</u>	<u>Authorized Unit Equivalents</u>
Snow Park Village	209.75
Total	209.75

B. Unit Size. Except for units with relation to which the owner elected or elects to or is required to utilize the Unit Equivalent formula, there shall be no size limitation for Units constructed on any parcel provided that following construction the parcel proposed to be developed contains a minimum of 60% open space and otherwise complies with MPD and all applicable zoning regulations.

C. Development Parcel Designations. Development parcel designations, prescribed densities, parcel sizes, building height limitations (the height limitation for each parcel will be determined by reference to the Code in effect at time of application for approval of the development of the parcel) and the status of development of the parcels as of the date hereof are reflected on Exhibit 1. Permittee shall have the right to develop a total of 2,110 residential Units (exclusive of employee housing Units) within the Project. Permittee shall have the right to develop 209.75 Unit Equivalents within the Snow Park Village, subject to the conditions and

requirements of the Park City Design Guidelines, the Deer Valley Design Guidelines, and the following:

(1) **Conditional Use Review.** Prior to the sale by Permittee of the Snow Park Village, Permittee shall submit a site-specific plan with relation to such parcel to the Commission requesting approval for construction on the parcel. In addition, the Permittee shall request the establishment of building site conditions with relation to the parcel. Accordingly, Permittee or persons acting on its behalf shall file with the Community Development Department of City a completed application form supported by the information set forth in Section 15-6 of the Code, as the same may be amended from time to time. The procedure for the approval or disapproval of any site-specific plan shall be based upon the provisions of this Permit and the conditional use criteria of the Code in effect on the date of application. Components of the Project, other than land development parcels, are listed on Exhibits 2 and 3.

D. Subdivision of Development Parcels. Prior to the sale of any individual lots on any parcel listed on Exhibit 1 developed for residential use as a "subdivision" as defined by the City subdivision ordinance and state statute, the party electing to establish a subdivision on said parcel shall comply with all applicable provisions of the City subdivision ordinance in effect at the time of application. The procedure for the approval or disapproval of any subdivision application shall be based upon the procedure provided in the City subdivision ordinance in effect at the time of application.

Prior to the filing of a record of survey map and declaration of condominium to establish a condominium on any parcel listed on Exhibit 1, the party electing to establish a condominium shall comply with all applicable provisions of any City condominium ordinance in effect at the time of application. The procedure for the approval or disapproval of any condominium shall be based upon the Utah Code and any City condominium ordinance in effect at the time of application.

E. Applicability of Sensitive Area Overlay Zone. For projects within the Deer Valley Large Scale Master Planned Development, the density limitations of the Sensitive Area Overlay Zone do not apply because Master Planned Developments approved prior to the adoption of the Sensitive Area Overlay Zone are vested in terms of density. Site planning standards can be applied only to the extent that they do not unequivocally reduce vested density. Limits of disturbance, vegetation protection, and building design standards do apply.

F. Relationship to National Standards. The provisions of the Code and any other applicable zoning and development ordinances including national standards with respect to engineering or building requirements as adopted by City, in effect in City on the date hereof, shall govern the development within the Project, except as otherwise provided herein.

G. Off-Street Parking. Parking required with relation to each portion of the Project shall be based upon Code as in effect at the time application for a building permit for such portion of the Project as is filed with City. For purposes of calculating required parking, the Project shall be deemed to be zoned Residential Development District (RD) Master Planned Developments (MPD). Parking for each separate development parcel in the Project shall be determined in accordance with the Code at the time of application for Conditional Use approval. Any additional parking shall not encroach into zoned open space.

If the capacity of the surface parking lots in the Snow Park Community is exceeded on 10% or more of the days during any single ski season the need for constructing additional parking in said area shall be reviewed by the Commission.

H. Commercial Space, Support Commercial, and Meeting Space. Exhibit 2 hereto lists commercial and support space allotted to the Project. The General Snow Park Commercial category is restricted in utilization within the Project to the following parcels in the Snow Park area:

Pine Inn Multi-Family Parcel
Snow Park Lodge Multi-Family Parcel (Black Diamond Lodge)
Snow Park Village (Combination of Snow Park Hotel Parcel and
Snow Park Parking Area Parcel)
Snow Park Day Center Parcel

Utilization of portions of the General Snow Park Commercial category within any of the above listed parcels is subject to the specific approval of both Permittee and Commission.

In addition to the Exhibit 2 Commercial Space permitted in the Project, Support Commercial shall be permitted and used as defined in the Code, as amended, at the time of application.

I. Employee Housing. Permittee has been required to cause the development of 112 employee (affordable) housing units pursuant to prior editions of this Permit. Prior to the date of this Permit, Permittee has developed or caused to be developed units qualifying under the low and moderate income housing exception of the Code as follows:

<u>Project Location</u>	<u>Number of Qualifying Units</u>
A. Units in Deer Valley:	
Little Belle Manager Unit	1
Stag Lodge Manager Unit	1
Sterlingwood Manager Unit	1
Bald Eagle Caretaker Units	2
Mt. Cervin Manager Unit	1
Deer Valley Club Manager Unit	1
B. Units Other Than in Deer Valley:	
Parkside Apartments	42
Fireside Apartments / Condos	42
Washington Mill Apts.	8
Peace House	3
Aspen Villas / Silver Meadows (Participation)	9
Fawn grove Employee Unit	1
Total	112

Deer Valley shall be obligated to comply with all applicable ordinances of City relating to the creation and construction of employee housing, including ordinances that are adopted after the date of this Permit. Deer Valley will be given credit for the previously developed units

identified above when computing the employee housing obligation under applicable ordinances. The City acknowledges full satisfaction of Deer Valley's current obligation in the Employee Housing Agreement dated October 6, 1995 executed in conjunction with Deer Valley's contribution to the Silver Meadows project. If, at the time a new employee / affordable housing ordinance is adopted, the number of existing employee / affordable housing units built by Deer Valley or persons acting on its behalf exceeds the number of units required by the new ordinance, credit shall be given against the ordinance imposed obligation, but in no event shall City be obligated to reimburse Deer Valley for any excess, or to permit the assignment of the excess to other parties with a similar employee housing requirement. If, at the time a new employee / affordable housing ordinance is adopted, the number of existing units built by Deer Valley or those acting on its behalf falls short of the newly imposed ratio of employee units to conventional units, Deer Valley agrees to be bound by the provisions of the newly adopted ordinance; provided, however, that the new ordinance shall apply only to those Units on which site specific approval is granted after the adoption of the employee / affordable housing ordinance.

J. Technical Reports. Permittee shall submit updated technical reports with regard to traffic monitoring, water systems, and sewer systems for review by Commission as significant changes occur in those systems and as needed for specific project review as required by the Community Development Director and Public Works Director prior to density approval.

K. Public Use of Ski Facilities. Use of all ski facilities shall be open to the general public and shall not be restricted to owners of property located in Deer Valley or to members of any private club. Furthermore, all charges, fees and costs paid by the general public for the use of such facilities shall not exceed the charges, fees and costs paid by owners of property located in Deer Valley.

L. Trails .There are 4 types of trails in Deer Valley:

- (1) Bicycle paths located within street rights-of-way;
- (2) Pedestrian paths connecting parcels together within a community;
- (3) Connecting paths connecting communities together; and
- (4) Hiking trails to provide access to the mountain.

Bicycle paths shall be located within street rights-of-way dedicated to City and shall be operated and maintained by City as shown on the Deer Valley Trails Master Plan and the City Trails Master Plan.

Pedestrian paths shall be hard surfaced, a minimum of five feet wide, a maximum of six feet wide and built to public sidewalk specifications. These paths shall connect development parcels together and connect development parcels to commercial nodes. At the time of conditional use approval of a particular development parcel, the developer of said parcel shall provide a pedestrian path across said parcel connecting to the paths on the adjoining parcels. The location of these paths shall be determined by the parcel developer and by City staff with the Deer Valley Trails Master Plan used as a guide. The locations shall be modified as necessary to take into consideration topography and existing trails, and shall tie into the bus system which serves Deer Valley. These paths shall form a year-round system. Maintenance shall be the responsibility of the parcel owner. A 10 to 15 foot wide easement (easement size

shall be determined at the time of site specific conditional use approval) for each pedestrian path shall be dedicated to City and is required to be shown on the recorded plat for the applicable development parcel.

It is recognized by the parties that the property within the Deer Valley Resort is private property. Public access to ski runs is at the discretion of Permittee. Summer public access and non-destructive summer use which includes casual hiking on ski runs shall be allowed by Permittee subject to reasonable rules and regulations.

In the event that City in its sole discretion determines that City should hold any easements for hiking, City shall make a request that an easement be granted for any or all of the hiking trails that City desires to hold within or adjacent to ski runs shown on the Trails Master Plan. In the event that City obtains a formal agreement, City agrees to maintain such hiking trails, and Permittee will provide legal descriptions, signage and grant to City an easement (minimum of 10 feet to maximum of 15 feet wide) to maintain such hiking trails without hard surface and without winter maintenance. If City desires to upgrade the hiking trails beyond that which currently exists, City agrees to bear the cost of those improvements. The Trails Master Plan shall serve as a general guide in determining the final location of said hiking trails. In the event City obtains and holds formal easements for hiking trails, City shall indemnify and hold Permittee and its successors and assigns harmless from and against any loss, damage, injury or responsibility with relation to any such trail and any claims, demands or causes of action from any person resulting from injuries sustained while utilizing any hiking trails for which City has obtained and holds easements. Said public easement shall also be subject to such additional reasonable rules and regulations as Permittee deems appropriate to eliminate possible interference with the operation and maintenance of the ski resort, or in the interest of safety or security.

M. Open Space. With the exception of those parcels identified on Exhibit 1 and those areas and items listed on Exhibit 2 as "commercial and support space", all remaining property in the Project is hereby designated "landscaped open space" as that term is defined in the Code as presently in effect and shall remain substantially free from structures, roads and parking lots except as otherwise approved by City or permitted by the Code as presently in effect. The "landscaped open space" shall be maintained and operated by Permittee at Permittee's sole cost and expense.

N. Fire Considerations. All buildings or structures located within the Bald Eagle, Silver Lake, and North Silver Lake Communities shall be fire sprinkled in accordance with UBC 38-1-82.

O. Water Improvements .Permittee agrees that, as a condition of and concurrently with issuance to Permittee of a building permit for the construction of any buildings or structures comprising a portion of the Project, Permittee shall be obligated to agree in writing to construct and convey to City storage facilities, pumping facilities, and transmission lines, as agreed upon and approved by the Public Works Director and City Engineer at the time of issuance of said building permit, to the extent necessary to store and transmit culinary water, irrigation water, and water for fire flows to the buildings and structures covered by the building permit and to connect the same to the water system of City, and shall evidence to the satisfaction of City the ability of Permittee to comply with such agreements.

Permittee agrees that completion of the action required by this Section O with relation to any building or structure included in the Project shall be deemed a condition precedent to the

right to occupy and utilize the building or structure. Commission and Permittee agree that the general level of water facilities construction for the Project required by this Section O has been heretofore accomplished by Permittee.

The existing agreement relating to water rights and water facilities for Deer Valley development entered into November 17, 1988 between Permittee as "DVRC", Royal Street as "Royal Street", and City as "Park City" and the Deer Valley Water Facilities Improvement Agreement dated March 31, 1994 between City, Royal Street and Permittee (as "DVRC") and the Amendment to the 1994 Deer Valley Water Facilities Improvement Agreement dated May 12, 2006 between City as "Park City", Royal Street and Permittee (as "DVRC") are made a part of this Permit by reference.

P. Sewer Considerations .Although City has no responsibility for sewer approvals; the Snyderville Basin Sewer Improvement District has indicated the following with respect to sewerage in Deer Valley: Projected flow calculations are based on average wastewater flow from residential units and make no distinction regarding size. In other words, the Sewer District does not follow the "unit equivalent" concept as does City.

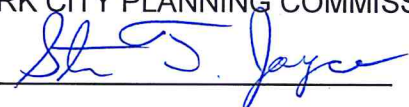
The Sewer District has previously reviewed both the Upper and Lower Deer Valley sewer systems and made the following comments: Upper System (American Flag / Silver Lake Community) - There are two sections of sewer within the American Flag Subdivision that limit upstream, new growth to approximately 325 additional residential units. There are several sections with only slightly greater capacity. This concern or limitation was eliminated by construction of a new sewer trunk line from Royal Street through the Westview Parcel in 1988. Lower System (Solamere, Queen Esther, Fawn grove) - A portion of the trunk sewer serving this area was replaced in 1985 to provide greater capacity for Hanover and Park Con projects as well as Deer Valley's. These three developers executed an agreement with the District which identified their anticipated development and the percentage of the cost they would fund to "reserve" capacity in the sewer system. Of the present sewer capacity of approximately 1385 units, Deer Valley has approximately 200 units available for future development. However, there are downstream sections of sewer that have less capacity than the new Deer Valley North Road sewer. This problem will be pursued with the developers as necessary.

Q. Separability. If any provision or provisions of this Permit shall be held or deemed to be, or shall, in fact, be illegal, inoperative, or unenforceable, the same shall not affect any other provision or provisions herein contained or render the same invalid, inoperative or unenforceable to any extent, whatsoever.

R. Term of Permit. The term of this Permit is governed by the Twenty-Ninth Edition of the Land Management Code of Park City as revised as of April 1, 1993.

Approved this 30th day of November, 2016.

PARK CITY PLANNING COMMISSION

By 

Planning Commission Chair

**DEER VALLEY RESORT
TWELFTH AMENDED AND RESTATED
LARGE SCALE MASTER PLANNED DEVELOPMENT PERMIT
EXHIBIT 1
DEVELOPMENT PARCELS**

PARCEL NAME	PERMITTED DENSITY (UNITS)	DEVELOPED DENSITY (UNITS)	NOTES	HEIGHT (FEET)	PARCEL SIZE (ACRES)
DEER VALLEY COMMUNITY					
Stonebridge & Boulder Creek Multi-Family	50	54	1	28	10.23
Aspenwood Multi-Family	30	30		28	9.21
Pine Inn & Trails End Multi-Family	40	45	1	35	8.52
In The Trees (South Multi-Family) Multi-Family	14	14		28-45	2.87
Black Diamond Lodge (Snow Park Lodge Multi-Family)	29	27		28-75	5.70
Courcheval Multi-Family	13.5	27	1	35	1.82
Daystar Multi-Family	24	24		28	9.84
Fawngrove Multi-Family	50	50		28	12.05
Chateaux Fawngrove Multi-Family	10.5	11	2	28	Incl
Bristlecone Multi-Family	20	20		28	Incl
Lakeside Multi-Family	60	60		28	6.49
Solamere Single Family (includes Oaks, Royal Oaks & Hidden Oaks)	274	274		28	237.81
Pinnacle Multi-Family	86	86		28	36.80
Comstock Lodge (East Bench Multi-Family)	10.5	21	1	35	3.50
Red Stag Lodge	8.5	11	1	35	Incl
Powder Run Multi-Family	25	33	1	35	3.20
Wildflower (Deer Valley North Lot 1 Multi-Family)	11	14	1	28	1.04
Glenfiddich (Deer Valley North Lot 2 Multi-Family)	12	12		28	1.45
Chapparal (Deer Valley North Lot 3 Multi-Family)	15	20	1	28	1.44
Northeast Multi-Family:					12.65
Lodges @ Deer Valley	73.25	85	3	28-35	
Silver Baron Lodge	42.75	50	12	28-35	
Snow Park Village (Snow Park Hotel & Parking Sites)	209.75	0	4	28-45	14.93
Total Deer Valley Community	1108.75				
AMERICAN FLAG COMMUNITY					
American Flag Single Family	93	93		28	83.04
LaMaconnerie Multi-Family	15	15		28	6.19
Total American Flag Community	108				
NORTH SILVER LAKE COMMUNITY					
Westview Single Family	15	1		28	40.69
Evergreen Single Family	36	36		28	27.60
NSL Homesite Parcel #1	1	1		35	1.90
Belleterre Single Family	10	10		28	11.42
Bellevue Townhomes (NSL Subdivision Lot 1)	24	14	10	28	4.62
Bellemont Townhomes (NSL Subdivision Lots 2A and 2A-1)	18	12	10	28	3.75
NSL Subdivision Lot 2B	54	0		45	5.96
BelleArbor Townhomes (NSL Subdivision Lot 2C)	43	21	10	28-35	8.25
NSL Subdivision Lot 2D Open Space Lot	0	0	5	0	4.03
Total North Silver Lake Community	201				
SILVER LAKE COMMUNITY					
Stag Lodge Multi-Family	50	52	6	28-35	7.34
Cache Multi-Family	12	12		28	1.77
Sterlingwood Multi-Family	18	18		28-35	2.48
Deer Valley Club	20	30	1	28-45	1.53
Double Eagle (SL East Parcel 2 Multi-Family)	18	18		28-35	2.26
Stein Eriksen Lodge Multi-Family	66.75	65	11	28-35	10.86
Little Belle Multi-Family	20	20		28	3.66
Chateaux At Silver Lake Lot 23 Deer Valley Club Estates Subdivision)	65	78	1	28-45	3.24
Sterling Lodge (Lot 2 Silver Lake East Subdivision)	14	14		28-45	0.61
Royal Plaza Multi-Family (Silver Lake Village Lot A)	7.6215	13	1	59 (A)	0.48
Mt. Cervin Plaza Multi-Family (Silver Lake Village Lot B)	7.5	7		59 (A)	0.54
Inn at Silver Lake (Silver Lake Village Lot C)	10	8		59 (A)	0.50
Goldener Hirsch Inn (Silver Lake Village Lot D)	5.5785	18	1	59 (A)	0.35
Mt Cervin Multi-Family (Silver Lake Village Lot E)	16	15		59 (A)	0.53
Silver Lake Village Lot F	0	0		59 (A)	0.35
Silver Lake Village Lot G	0	0		59 (A)	0.38
Silver Lake Village Lot H	0	0		59 (A)	0.44
Silver Lake Village Lot I (combination of Silver Lake Village lots F, G, H)	34.4215	38	13,14,15	59 (A)	1.17
SL Knoll Condominiums	4	4		35	0.76
Knoll Estates Single Family	21	21		35	9.90
Black Bear Lodge (Lot 22 Deer Valley Club Estates Subdivision)	51	51		35	1.39
Knollheim Single Family	20	5	7	35	1.84
Alpen Rose Single Family	2	2		35	0.66
Silverbird Multi-Family	6	6		35	0.80
Ridge Multi-Family	24	24		35	2.34

**DEER VALLEY RESORT
TWELFTH AMENDED AND RESTATED
LARGE SCALE MASTER PLANNED DEVELOPMENT PERMIT
EXHIBIT 1
DEVELOPMENT PARCELS**

PARCEL NAME	PERMITTED DENSITY (UNITS)	DEVELOPED DENSITY (UNITS)	NOTES	HEIGHT (FEET)	PARCEL SIZE (ACRES)
Enclave Multi-Family	17	17		28-35	1.79
Twin Pines Multi-Family	8	8		28-35	1.33
Cottages Single Family	11	11		28	7.06
Alta Vista Subdivision	7	7		35	6.02
Woods Multi-Family	16	7	8	28-35	2.41
Trailside Multi-Family	9	9		28-35	1.46
Aspen Hollow Multi-Family	16	16		28-35	3.18
Ridgepoint Multi-Family	38	38		28-35	5.60
Total Silver Lake Community	614.8715				
BALD EAGLE COMMUNITY					
Bald Eagle Single Family	78	58	9	28	35.65
Total Bald Eagle Community	78				
TOTAL CONVENTIONAL UNITS	2110.6215				
EMPLOYEE HOUSING UNITS					
Little Belle	1				
Stag Lodge	1				
Sterlingwood	1				
Bald Eagle	2				
Mt. Cervin	1				
Deer Valley Club	1				
TOTAL EMPLOYEE HOUSING UNITS	7				

NOTES:

1. These projects have been approved under the Unit Equivalent Formula contained in Section 10.12 of the Code, resulting in a different developed density than base permitted density.
2. One small unit was separately permitted in this project using .5 unit of density.
3. This project has been approved under the Unit Equivalent Formula contained in Section 10.12 of the Code, resulting in a different developed density (85) than base permitted density (73.25).
4. This parcel is required to use the Unit Equivalent Formula contained in Section 10.12 of the Code.
5. This parcel has been platted as open space, with the open space applying to the open space requirement of Lot 2B.
6. Two additional units were permitted in this project on land that was not a part of the Deer Valley MPD.
7. This parcel was originally permitted as 20 MF units but subsequently developed as 5 single family homesites.
8. This parcel was permitted as 16 units. Subsequently 9 of the unit development rights were acquired by the homeowners and dedicated as open space.
9. This parcel was originally permitted as a combination of single family and multi-family. The multi-family uses were converted to single family with a density reduction from 78 to 58 units.
10. The development density on these parcels is less than the original permitted density at the election of the developer.
11. The transfer of 1.75 Unit Equivalents to this parcel from the Snow Park Village parcel was authorized by the Planning Commission on June 28, 2006.
12. This project has been approved under the Unit Equivalent Formula contained in Section 10.12 of the Code, resulting in a different developed density (50) than base permitted density (42.75). The transfer of 1 Unit Equivalent to this parcel from the Snow Park Village parcel was authorized by the Planning Commission on March 23, 2011.
13. Prior to issuance of a building permit on Lot I, the Property owner shall submit an Historic Mine Waste report.
If Historic Mine Waste is located on the site, a mitigation plan shall also be submitted compliant with the Park City Soils Boundary Ordinance.
14. Building on Lot I shall be designed to be broken into more than one volumetric mass above final grade, exhibiting both horizontal and vertical articulation. Common underground parking is permitted.
15. The transfer of 0.4215 UE from Lot D to Lot I was approved by Planning Commission on November 30, 2016.

A. Lots in the Silver Lake Village Subdivision have a development height limitation tied to a base elevation of 8122' with peak of roof not to exceed elevation 8186'.

DEER VALLEY RESORT
TWELFTH AMENDED AND RESTATED
LARGE SCALE MASTER PLANNED DEVELOPMENT PERMIT
EXHIBIT 2
COMMERCIAL AND SUPPORT SPACE

LOCATION	RETAIL	RESTAURANT (3)	COMM'L OFFICES	ADMIN., SUPPORT & OTHER	TOTAL	TRANSFER TO RESIDENTIAL	DEVELOPED	REMAINING
SNOW PARK LODGE	13807	26958		85578	126343		126343	0
SNOW PARK TICKET SALES BUILDING				5112	5112		5112	0
SNOW PARK PLAZA BUILDING	3100		16000	4180	23280		23280	0
GENERAL SNOW PARK COMMERCIAL (1)	21890				21890		0	21890
SILVER LAKE LODGE	1200	29160		15790	46150		46150	0
EMPIRE LODGE (4)		22456		12544	35000		30453	4547
SILVER LAKE COMMUNITY (2)	27962		4265	12938	45165	1243	31954	11968
NORTH SILVER LAKE COMMUNITY	8000			6525	14525		0	14525
MAINTENANCE, WHSE, & SHOPS				31724	31724		31724	0
TOTAL	75959	78574	20265	174391	349189		295016	52930

NOTES:

(1) General Snow Park Commercial may only be utilized on certain parcels with approval of Commission and Permittee.
18110 square feet of General Snow Park Commercial has previously been allocated to and is included in totals for Snow Park Lodge.

(2) 10125 square feet of Silver Lake Community commercial has previously been allocated to and is included in totals for Silver Lake Lodge (1994 Silver Lake Lodge expansion 6990 sf and 1998 Silver Lake Lodge expansion 3135 sf).
Remainder of Silver Lake Community commercial consists of:

Developed Space:

Royal Plaza	14312
Mt. Cervin Plaza	8080
Goldener Hirsch Inn	2062 (see note #5)
Chateaux at Silver Lake	7500
Total	31954

Transferred to Royal Plaza Residential

1243

Allocated but Undeveloped Space:

Silver Lake Village Lot C	7000
Remainder Unallocated	4968
Total	45165

(3) Includes kitchen, receiving and storage.

(4) Maximum size of Empire Lodge is 35000 sf of which 30453 sf has been developed.

(5) Commercial uses on Silver Lake Village Lot D includes 2,062 sf as allocated from this Amended and Restated Large Scale MPD, plus support commercial uses.



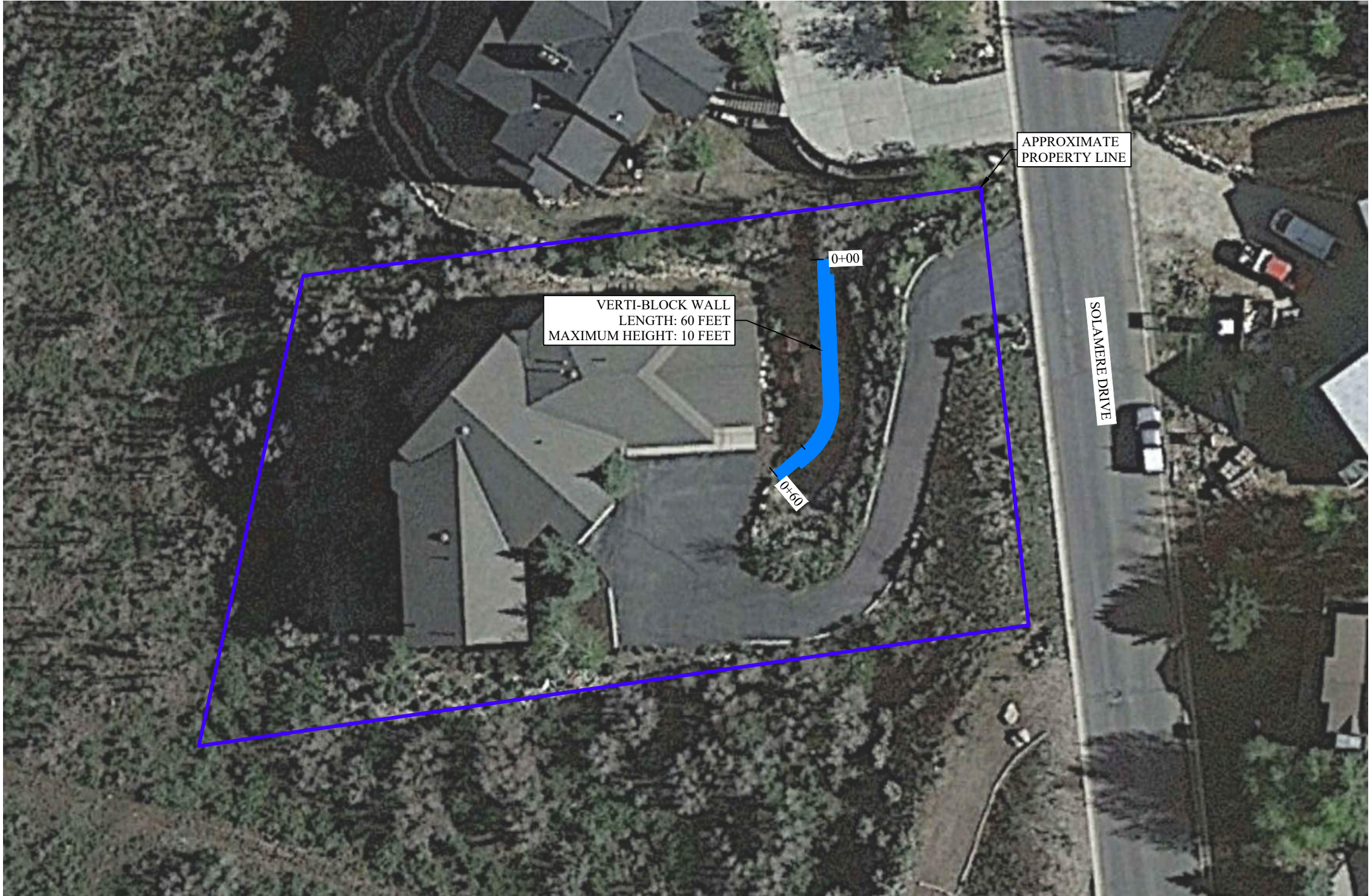
DEER VALLEY RESORT
TWELFTH AMENDED AND RESTATED
LARGE SCALE MASTER PLANNED DEVELOPMENT PERMIT
EXHIBIT 3
OTHER PROJECT COMPONENTS

ITEM	WITHIN PARK CITY	OUTSIDE PARK CITY
SKI AREA (1)		
CHAIRLIFTS	15	5
GONDOLA		1
SKI TRAILS AND BOWLS	63	34
SNOWMAKING	X	X
SKI PATROL / UTILITY STATIONS:		
BALD EAGLE MTN.	X	
BALD MTN.	X	
FLAGSTAFF MTN.	X	
LITTLE BALDY		X
JORDANELLE BASE		X
EMPIRE CANYON	X	
AMENITIES		
SNOW PARK LAKES & MEADOWS	X	
SNOW PARK PARKING LOTS	X	
PEDESTRIAN TRAIL SYSTEM	X	X
MOUNTAIN BIKING TRAILS SYSTEM	X	X
SOLAMERE SWIM & TENNIS FACILITY	X	
SNOWSHOE TOMMY'S CABIN	X	
CUSHINGS CABIN	X	
BIRDSEYE CABIN	X	
JORDANELLE BASE		X
SNOW PARK CONCERT AMPHITHEATRE	X	

(1) ADDITIONAL SKI AREA FACILITIES AS DEMAND DICTATES, SUBJECT TO PROVISIONS OF PARK CITY LAND MANAGEMENT CODE AND OTHER APPLICABLE JURISDICTIONS.

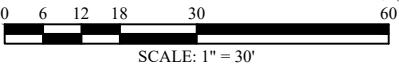


VERTI-BLOCK RETAINING WALL DESIGN PACKAGE
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH



NOTE: THIS PLAN SET HAS BEEN PREPARED WITH COLOR LINE-TYPES TO MAKE SOME DETAILS AND SPECIFICATIONS MORE CLEAR. ANY COPIES OF THESE PLANS SHOULD BE MADE IN COLOR.

PROJECT AERIAL VIEW
REFERENCE IMAGE FROM GOOGLE EARTH PRO,
IMAGE TAKEN MAY 24, 2022.



REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



12429 SOUTH 300 EAST
DRAPER, UTAH 84020
(801) 748-4044

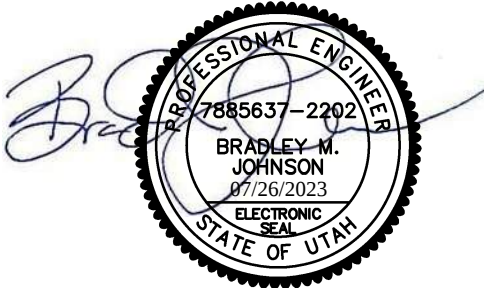
VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
COVER SHEET

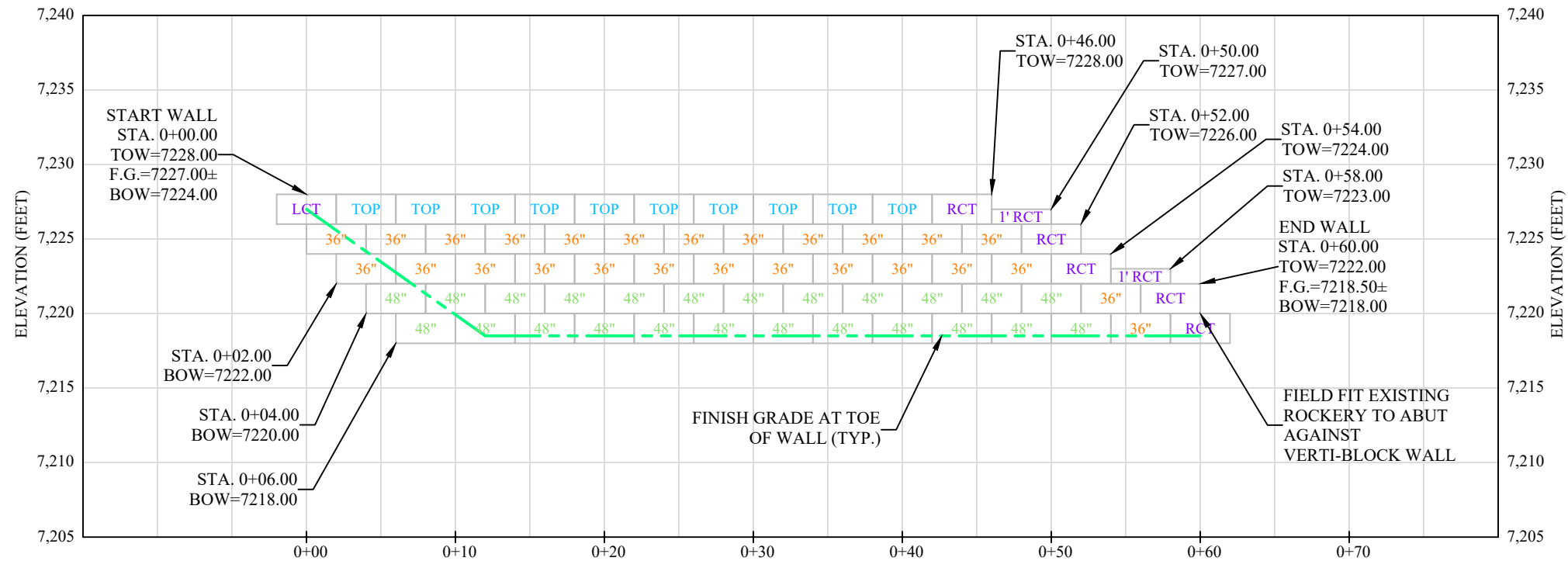
DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	1"=30'
IGES PROJECT NO: 04409-001	SHEET NO: 1	REV N/A

DESIGN PACKAGE CONTENTS		
	SHEET NO.	DESCRIPTION
SHOP DRAWINGS	1	COVER SHEET
	2	ELEVATION VIEW
	3	TYPICAL SECTION VIEW
	4	CONSTRUCTION SPECIFICATIONS & NOTES
	5	VERTI-BLOCK DETAILS
	6	DESIGN CRITERIA
	7	SITE PHOTOS
DESIGN CALCULATION PACKAGE	SECTION 2	STABILITY CALCULATIONS
	SECTION 3	GLOBAL STABILITY RESULTS
	SECTION 4	SEISMIC PARAMETERS

PREPARED FOR:
CAROL MARTIN
3335 SOLAMERE DRIVE
PARK CITY, UTAH 84060

APPROVED BY: BRADLEY M. JOHNSON, P.E.





VERTI-BLOCK RETAINING WALL ESTIMATED QUANTITIES	
MATERIAL	TOTAL
TOTAL VERTI-BLOCK WALL AREA (ft²)	536
TOP VERTI-BLOCK UNITS	10
36-INCH VERTI-BLOCK UNITS	26
48-INCH VERTI-BLOCK UNITS	24
LEFT CORNER TOP VERTI-BLOCK UNITS	1
RIGHT CORNER TOP VERTI-BLOCK UNITS	5
1' RIGHT CORNER TOP VERTI-BLOCK UNITS	2
DRAINAGE AND INFILL GRAVEL (yd³)	40
LEVELING PAD CRUSHED STONE (yd³)	5
4-INCH PERFORATED DRAINAGE PIPE (ft)	80
6-OZ NON-WOVEN GEOTEXTILE FABRIC (yd²)	90

TOP	36-INCH TOP VERTI-BLOCK	LCT	LEFT CORNER TOP VERTI-BLOCK	1' TOP	1' TOP VERTI-BLOCK
36"	36-INCH STANDARD VERTI-BLOCK	RCT	RIGHT CORNER TOP VERTI-BLOCK	1' RCT	1' RIGHT CORNER TOP VERTI-BLOCK
48"	48-INCH VERTI-BLOCK				

ELEVATION VIEW
REFERENCE ELEVATIONS ARE ESTIMATED FROM GOOGLE EARTH AND ARE FOR CONCEPTUAL USE ONLY. FIELD ADJUSTMENTS/CHANGES SHOULD BE EXPECTED ONCE CONSTRUCTION COMMENCES. IGES SHOULD BE CONSULTED WHERE FIELD CHANGES ARE REQUIRED.

LEGEND
TOW = TOP OF RETAINING WALL
BOW = BOTTOM OF RETAINING WALL
FG = FINISHED GRADE AT BOTTOM OF WALL

0 2 4 6 10 20
SCALE: 1" = 10'

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



12429 SOUTH 300 EAST
DRAPER, UTAH 84020
(801) 748-4044

VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
ELEVATION VIEW

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	1"=10'
IGES PROJECT NO: 04409-001	SHEET NO: 2	REV N/A

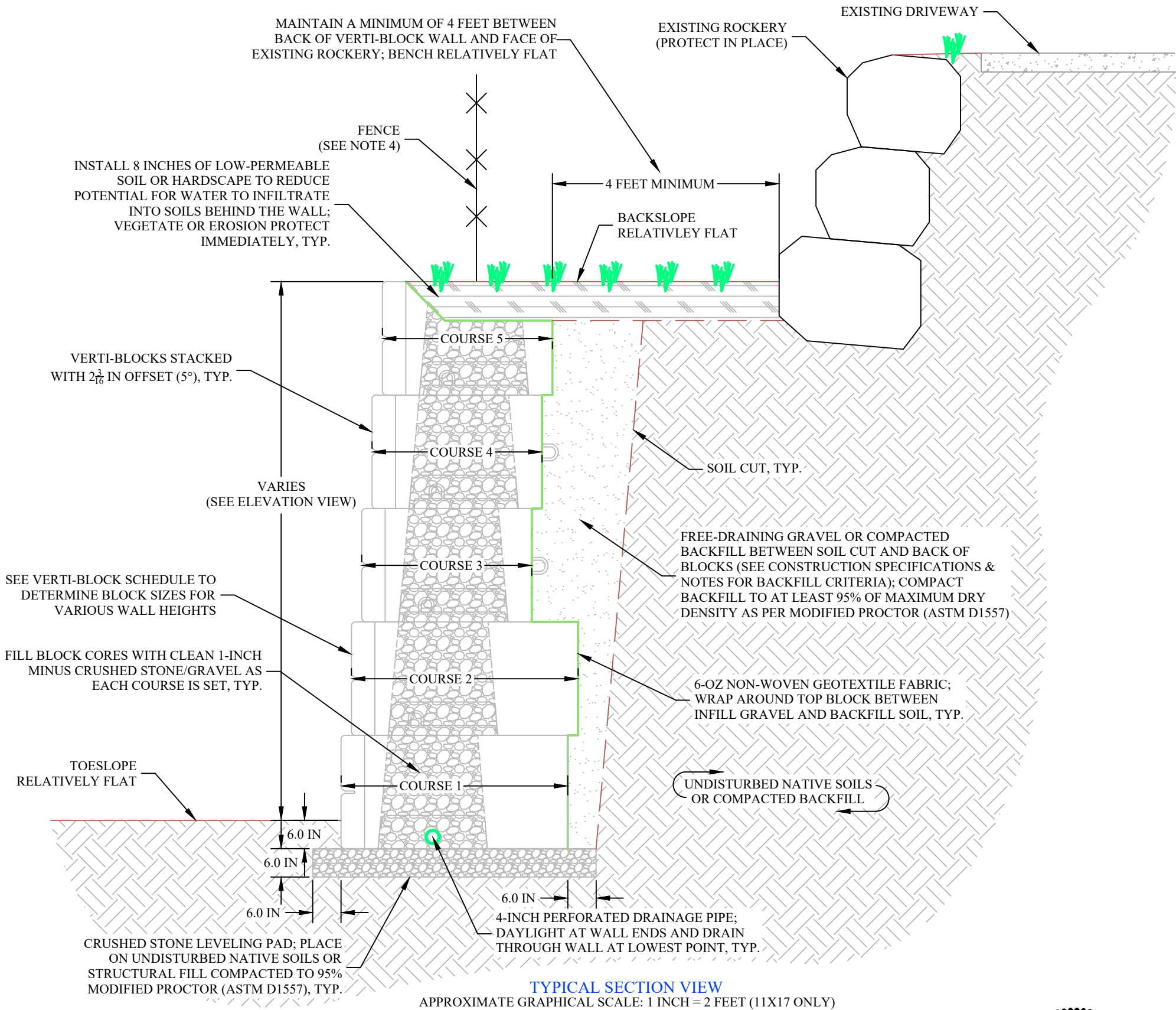


NOTES:

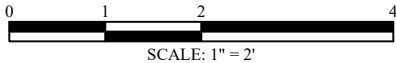
1. MAXIMUM SECTION SHOWN, ALL OTHER SECTIONS TO MEET THESE SAME SPECIFICATIONS, UNLESS NOTED OTHERWISE.
2. SOIL CUT SHOULD BE BENCHED AS NEEDED TO PROTECT WORKERS AND TO COMPLY WITH OSHA REQUIREMENTS.
3. RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION BUT PRIOR TO THE PLACEMENT OF LANDSCAPING/FINISHING ELEMENTS (E.G., LANDSCAPING, HARDSCAPE, CURB & GUTTER, PAVEMENT, ETC.). TO PREVENT DAMAGE TO THE WALL DURING ADDITIONAL SITE WORK, ALL SURFACE DRAINAGE SHOULD BE DIRECTED AWAY FROM THE WALL. EXCESS WATER DURING HEAVY PRECIPITATION EVENTS, IF NOT DRAINED PROPERLY, CAN CAUSE WASHOUTS AT WALL ENDS AND 'BLOWOUTS' OF INTERIOR SECTIONS. THESE PRECAUTIONS SHOULD BE TAKEN DURING AND AFTER WALL CONSTRUCTION UNTIL THE FINAL SITE DRAINAGE, LANDSCAPING AND/OR PAVING ARE COMPLETE.
4. WE RECOMMEND THAT AN APPROPRIATE SAFETY FENCE/BARRICADE BE CONSIDERED BY THE OWNER ABOVE THE RETAINING WALL.
- 4.1. IF FENCING SYSTEM WILL BE A CHAIN LINK, WROUGHT IRON FENCE OR RAILING, FOLLOW BLOCK MANUFACTURER'S GUIDELINES.
- 4.2. IF FENCING SYSTEM WILL BE A PRIVACY FENCE (E.G., VINYL, WOOD, PRECAST), IGES SHOULD BE CONTACTED TO PROVIDE CONSTRUCTION RECOMMENDATIONS FOR THE FENCE FOUNDATION SYSTEM.
- 4.3. WE RECOMMEND THAT ONCE FENCING SYSTEM IS DETERMINED IGES BE CONTACTED TO ASSESS THE IMPACT OF THE FENCE ON THE RETAINING WALL.

VERTI-BLOCK SCHEDULE (BLOCK SIZE FOR EACH COURSE FOR VARIOUS WALL HEIGHTS, WITH COURSE 1 BEING THE BOTTOM COURSE)										
COURSE	WALL HEIGHT (FEET)									
	1'	2'	3'	4'	5'	6'	7'	8'	9'	10'
5	-	-	-	-	-	-	-	-	1' TOP	TOP
4	-	-	-	-	-	-	1' TOP	TOP	36"	36"
3	-	-	-	-	1' TOP	TOP	36"	36"	36"	36"
2	-	-	1' TOP	TOP	36"	36"	36"	36"	48"	48"
1	1' TOP	TOP	36"	36"	36"	36"	36"	48"	48"	48"

- WHERE:
- 1' TOP = 1-FOOT STEP TOP BLOCK
 - TOP = 36-INCH TOP BLOCK
 - 36" = 36-INCH BLOCK
 - 48" = 48-INCH BLOCK



TYPICAL SECTION VIEW
APPROXIMATE GRAPHICAL SCALE: 1 INCH = 2 FEET (11X17 ONLY)



REV	REVISION DESCRIPTION	DATE	BY	CHK



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DRAPER, UTAH 84020
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VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
TYPICAL SECTION VIEW

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	1"=2'
IGES PROJECT NO: 04409-001	SHEET NO: 3	REV N/A



CONSTRUCTION SPECIFICATIONS & NOTES

1. INTRODUCTION
- 1.1. FOLLOW THE GUIDANCE CONTAINED IN THE VERTI-BLOCK CONSTRUCTION MANUAL FOR THE RETAINING WALL UNLESS SPECIFICALLY SUPERSEDED BY MORE STRINGENT SPECIFICATIONS OR MATERIAL PROPERTIES PROVIDED HEREIN OR ON THE DRAWINGS.

1.1.1. IN THE EVENT THERE IS ANY CONFLICT OR AMBIGUITY BETWEEN THE FOLLOWING SPECIFICATIONS AND THE REFERENCED GUIDANCE, BRING ALL SUCH ISSUES IMMEDIATELY TO THE ATTENTION OF IGES, INC. FOR WRITTEN CLARIFICATION.

1.2. DESIGN AND CONSTRUCTION INFORMATION IS BASED ON PROJECT PLANS, DISCUSSIONS WITH THE CLIENT AND THE ENGINEERING ANALYSIS PERFORMED AS PART OF THE SCOPE OF WORK FOR THIS PROJECT BY IGES, INC.

1.3. LOCATE ALL EXISTING UTILITIES PRIOR TO RETAINING WALL CONSTRUCTION.

1.4. IMPLEMENT THE FOLLOWING MEASURES TO REDUCE THE POTENTIAL FOR HYDROSTATIC PRESSURES TO BUILD UP BEHIND THE RETAINING WALL:

1.4.1. ESTABLISH VEGETATION OR EROSION CONTROL MEASURES ABOVE AND BELOW THE RETAINING WALL IMMEDIATELY FOLLOWING CONSTRUCTION.

1.4.2. PLACE A 4-INCH (MINIMUM) PERFORATED DRAIN PIPE AT BOTTOM OF GRAVEL INFILL.

1.5. CONDITIONS SUCH AS LEAKY OR BROKEN IRRIGATION LINES AND/OR UNCONTROLLED RUNOFF FROM IMPROPER SITE GRADING (E.G., ALLOWING WALTER TO POND ABOVE THE RETAINING WALL) CAN LEAD TO SLOPE OR WALL MOVEMENT.

1.5.1. HYDROSTATIC CONDITIONS WERE NOT CONSIDERED IN THE ANALYSES AND MUST BE AVOIDED.

1.5.2. RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION OF THE RETAINING WALL BLOCKS, BUT PRIOR TO THE PLACEMENT OF THE LANDSCAPING OR FINISHING ELEMENTS AT THE SITE (E.G., 8 INCHES OF LOW-PERMEABLE SOIL/HARDSCAPE, INSTALLATION OF CURB & GUTTER, VEGETATION OF SLOPES, ETC.). AS THESE ARE CRITICAL COMPONENTS TO THE OVERALL STABILITY OF THE RETAINING WALL, THE RETAINING WALL IS NOT CONSIDERED COMPLETELY INSTALLED UNTIL THE LANDSCAPING/FINISHING ELEMENTS ARE COMPLETED. WE RECOMMEND THAT THESE ELEMENTS BE INSTALLED IMMEDIATELY FOLLOWING THE INSTALLATION OF THE BLOCKS.

1.5.3. THE OWNER SHALL BE AWARE OF THE RISK IF THESE OR OTHER CONDITIONS OCCUR THAT COULD SATURATE OR ERODE THE SOIL BEHIND THE WALL, OR IF THE FINISHING/LANDSCAPING ELEMENTS ARE NOT INSTALLED IMMEDIATELY FOLLOWING THE INSTALLATION OF THE RETAINING WALL BLOCKS.

1.6. COMPLY WITH ALL ASPECTS OF OSHA 1926 SUBPART P APP B, SLOPING AND BENCHING FOR ALL EXCAVATED SLOPES.

2. VERTI-BLOCK RETAINING WALL MATERIALS

2.1. RETAINED BACKFILL CONSISTING OF NATIVE GRANULAR SOILS OR IMPORT MATERIALS COMPLYING WITH THE FOLLOWING CRITERIA:

2.1.1. GRANULAR MATERIALS CONTAINING LESS THAN 15% FINES AND A MAXIMUM NOMINAL PARTICLE SIZE OF 4 INCHES

2.1.2. PH GREATER THAN 3 BUT LESS THAN 9 AND PI OF 6 OR LESS

2.1.3. REASONABLY FREE FROM ORGANIC OR OTHER DELETERIOUS MATERIALS

2.1.4. MINIMUM EFFECTIVE FRICTION ANGLE OF 34 DEGREES

2.1.5. ANY STRUCTURAL FILL USED BELOW OR BEHIND THE RETAINING WALL SHALL BE TESTED FOR COMPLIANCE WITH THE SPECIFICATIONS ABOVE.

2.2. LEVELING PAD

2.2.1. 6-INCHES (MINIMUM) OF CLEAN 1-INCH MINUS CRUSHED STONE OR CRUSHED GRAVEL.

2.3. USE NEW BLOCK MATERIALS MEETING THE MINIMUM REQUIREMENTS OF VERTI-BLOCK RETAINING WALL SYSTEMS (VERTI-CRETE, LLC).

2.4. FACING FILL AND DRAINAGE GRAVEL FILL

2.4.1. CLEAN CRUSHED STONE OR CRUSHED GRAVEL THAT COMPLIES WITH THE FOLLOWING CRITERIA:

2.4.1.1.

SIEVE SIZE	% PASSING
2"	100
1"	75-100
$\frac{3}{8}$ "	0-15
NO. 4	0-10
NO. 200	0-5

2.5. 4-INCH (MINIMUM) PERFORATED PIPE (NO SOCK IS REQUIRED).

3. VERTI-BLOCK RETAINING WALL INSTALLATION

3.1. FIELD VERIFY PROPOSED FINISHED GRADE AT BOTTOM OF WALL TO PROVIDE THE MINIMUM WALL EMBEDMENT AS SHOWN ON THE SECTION DRAWING.

3.2. GRADE AND COMPACT FOUNDATION SUBGRADE SOILS FOR THE FULL LENGTH OF THE LEVELING PAD AND UP TO THE SOIL CUT PRIOR TO PLACEMENT OF THE LEVELING PAD AND ANY BACKFILL.

3.2.1. REMOVE ANY FOUNDATION SOILS FOUND TO BE UNSUITABLE OR UNSTABLE AND REPLACED WITH APPROVED FILL.

3.3. SET THE LEVELING PAD LEVEL SIDE-TO-SIDE AND FRONT-TO-BACK.

3.3.1. INSTALL LEVELING PAD TO A MINIMUM OF 6 INCHES THICK AND EXTEND Laterally A MINIMUM OF 6 INCHES BEYOND THE ENDS OF THE BLOCKS BOTH FRONT AND BACK AS SHOWN ON THE DRAWINGS.

3.4. SET THE FIRST ROW OF VERTI-BLOCK UNITS AND CHECK FOR LEVEL AND ALIGNMENT.

3.4.1. INSTALL WALL ELEMENTS IN ACCORDANCE WITH VERTI-BLOCK GUIDELINES.

3.5. POUR DRAINAGE INFILL GRAVEL INTO THE HOLLOW CORE OF EACH VERTI-BLOCK AND BETWEEN AND WITHIN THE BLOCKS AS EACH ROW OF BLOCKS IS INSTALLED. BEFORE ADDITIONAL COURSES OF BLOCKS ARE ADDED, THE CONTRACTOR MUST ENSURE THAT ALL VOIDS ARE FILLED AND NO AIR POCKETS ARE DETECTED.

3.5.1. SET DRAINAGE PIPE AT THE BASE OF THE GRAVEL INFILL ZONE AND SHALL SLOPE TO DAYLIGHT AND DISCHARGE AT THE LOW ENDS OF THE RETAINING WALL.

3.6. REMOVE AND SWEEP OFF ALL EXCESS AGGREGATE AND OTHER MATERIALS FROM THE TOP OF THE BLOCKS BEFORE CONTINUING TO THE NEXT COURSE.

3.7. PLACE WALL BACKFILL MATERIAL IN 12-INCH MAXIMUM LOOSE LIFTS AND COMPACT TO A MINIMUM OF 95 PERCENT OF ASTM D1557 (MODIFIED PROCTOR). THINNER LIFTS MAY BE NECESSARY TO ACHIEVE REQUIRED COMPACTION.

3.7.1. PERFORM DENSITY TESTING OF THE BACKFILL SOILS AT 50-FOOT INTERVALS ON EVERY LIFT.

3.7.2. USE ONLY SMALL, WALK-BEHIND TYPE COMPACTION EQUIPMENT WITHIN 3 FEET OF THE BACK OF THE RETAINING WALL BLOCK.

3.7.3. IF ANY LOCATIONS EXIST WHERE THE RETAINING WALL WILL NOT BE PLACED UPON NATIVE SOILS, COMPACT THE FILL TO A MINIMUM OF 95 PERCENT OF THE MAXIMUM DRY DENSITY PER ASTM D1557 (MODIFIED PROCTOR)

3.8. INSTALL THE EACH SUBSEQUENT COURSE TO BOND ON TOP OF THE BASE ROW. POSITION BLOCKS TO BE OFFSET FROM SEAMS OF BLOCKS ON LOWER COURSE. BLOCKS SHALL BE PLACED AT A $2\frac{3}{16}$ INCH SETBACK AND RECESSED OVER THE ALIGNMENT HOOP.

3.8.1. CHECK EACH BLOCK COURSE FOR PROPER ALIGNMENT AND LEVEL.

3.8.2. CONTINUE TO UNIT FILL AND BACKFILL BEHIND EACH COURSE OF UNITS AS DESCRIBED IN NOTES 3.5 THROUGH 3.7.

3.9. PROVIDE A FINAL GRADE ABOVE AND BELOW THE RETAINING WALL THAT WILL ALLOW FOR POSITIVE DRAINAGE AND PREVENT PONDING.

3.10. PROTECT FINAL COMPLETED RETAINING WALL FROM ADDITIONAL SITE CONSTRUCTION.

3.10.1. DO NOT OPERATE LARGE EQUIPMENT OR STORE MATERIALS ABOVE THE WALL THAT EXCEED THE DESIGN SURCHARGE LOADS AS SPECIFIED ON THE DESIGN CRITERIA SHEET.

4. CONSTRUCTION OBSERVATION

4.1. TO FULFILL ANY APPLICABLE CITY, COUNTY AND/OR STATE AGENCY REQUIREMENTS, AND TO PROTECT THE CONTRACTOR AND DESIGN ENGINEER, IGES, INC. MUST PERFORM PERIODIC CONSTRUCTION OBSERVATIONS TO PROVIDE A FINAL CONSTRUCTION OBSERVATION LETTER.

4.1.1. IF IGES, INC. DOES NOT OBSERVE THE RETAINING WALL DURING CONSTRUCTIONS, A FINAL LETTER REGARDING COMPLIANCE OF THE WALL CONSTRUCTION WITH THE DESIGN CRITERIA AND RECOMMENDATIONS CANNOT BE PROVIDED. IF IGES, INC. DOES NOT PERFORM THE PERIODIC CONSTRUCTION OBSERVATIONS OUTLINED BELOW, THE WALL CONTRACTOR/OWNER ASSUMES ALL RESPONSIBILITY FOR THE RETAINING WALL.

4.2. WALL OBSERVATIONS SCHEDULE:

4.2.1. OBSERVE THE EXCAVATION OF THE LEVELING PAD FOUNDATION SOILS.

4.2.1.1. ASSESS THE SUITABILITY OF THE FOUNDATIONS SOILS.

4.2.2. OBSERVE THE INSTALLATION OF THE RETAINING WALL BLOCK AT VARIOUS STAGES OF CONSTRUCTION.

4.2.2.1. ASSESS MINIMUM EMBEDMENT REQUIREMENTS.

4.2.2.2. ASSESS DEPTH OF GRAVEL DRAINAGE ZONE AND TYPE, LOCATION AND DIAMETER OF DRAINAGE PIPE.

4.2.2.3. ASSESS BLOCK PLACEMENT AND POSITIONING FOR COMPLIANCE WITH THE REQUIREMENTS IN THE SECTIONS ABOVE.

4.2.3. OBSERVE THE INSTALLATION OF THE REINFORCED BACKFILL MATERIAL.

4.2.3.1. VERIFY THAT THE BACKFILL MATERIALS MEET THE REQUIREMENTS SET FORTH IN THE SECTIONS ABOVE.

4.2.3.1.1. ASSESS LOOSE LIFT THICKNESS, FILL PLACEMENT AND COMPACTION.

4.2.3.1.2. ASSESS COMPACTED BACKFILL MATERIAL FOR COMPLIANCE WITH REQUIREMENTS SET FORTH IN THE SECTIONS ABOVE.

4.2.4. OBSERVE THE COMPLETED RETAINING WALL SYSTEM.

4.2.4.1. ASSESS THE FINISHED RETAINING WALL HEIGHT AND BATTER.

4.2.4.2. OBSERVE THAT BACKSLOPE AND TOESLOPE GRADING CONDITIONS DO NOT EXCEED DESIGN GEOMETRY TOLERANCES.

4.2.4.3. ASSESS SUITABILITY OF EROSION CONTROL MEASURES INSTALLED ABOVE THE RETAINING WALL.

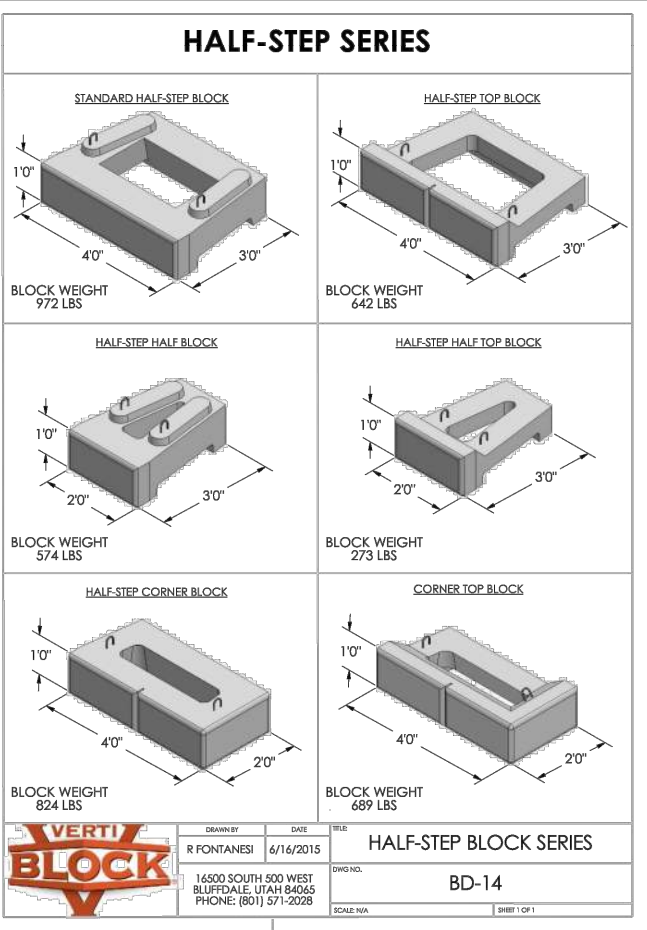
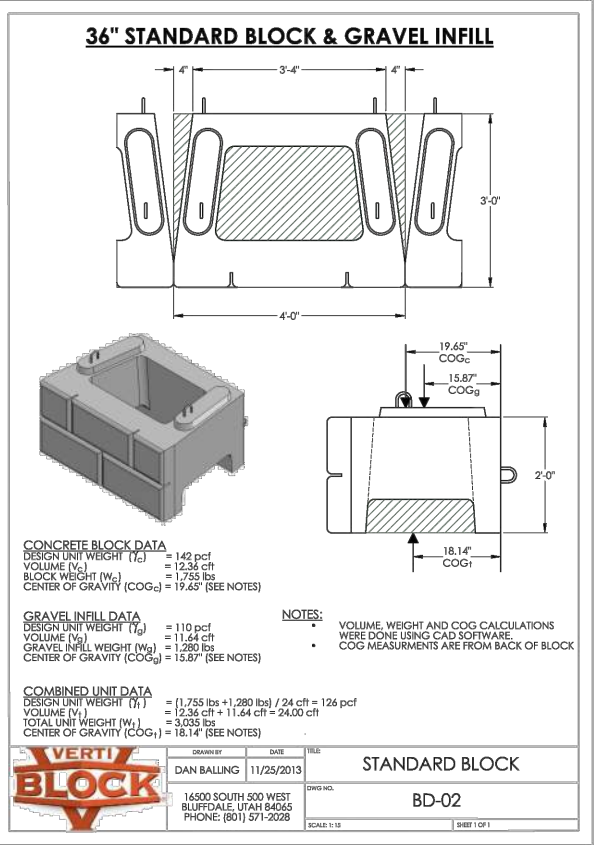
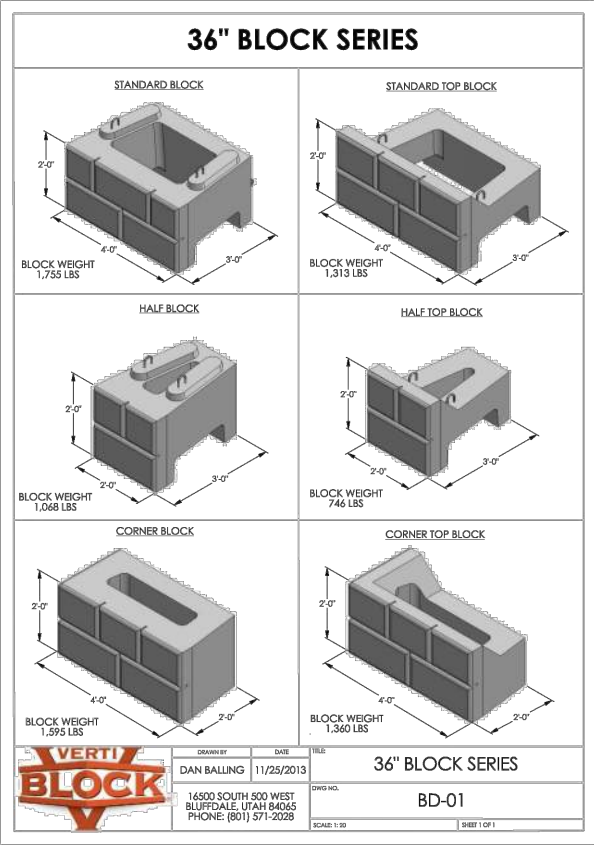
REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			

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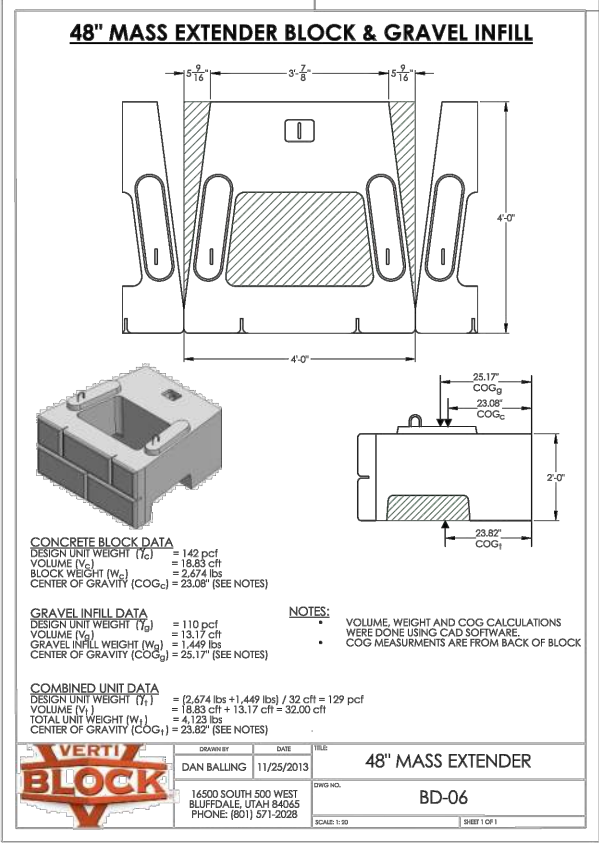
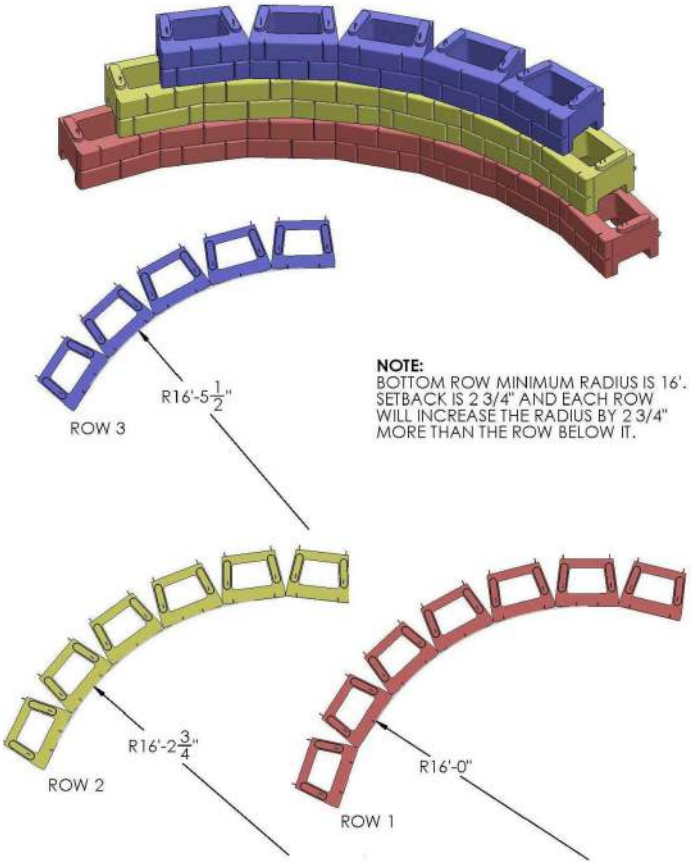
VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
CONSTRUCTION SPECIFICATIONS & NOTES

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	NTS
IGES PROJECT NO: 04409-001	SHEET NO: 4	REV N/A

Page 76 of 114



INSIDE CURVE DETAIL



DETAILS PROVIDED BY VERTI-CRETE RETAINING WALL SYSTEMS, INC.

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



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VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
VERTI-BLOCK DETAILS

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	NTS
IGES PROJECT NO:	SHEET NO:	REV
04409-001	5	N/A



RETAINING WALL GEOMETRY AND LOADING CONDITIONS			
LENGTH (FEET)	MAXIMUM HEIGHT (FEET)	BACKSLOPE CONDITIONS	SURCHARGE LOADING
60	10	RELATIVELY FLAT	500 PSF (EXISTING ROCKERY)

SOIL CONDITIONS USED IN DESIGN			
EARTH MATERIALS	FRICTION ANGLE	COHESION	UNIT WEIGHT
RETAINED SOIL	38°	0 PSF	140 PCF
FOUNDATION SOIL	32°	0 PSF	130 PCF

- SOURCES & NOTES:
- IGES, 2023, SITE OBSERVATIONS MADE ON JUNE 12, 2023.
 - COHESION USED ONLY IN GLOBAL STABILITY ANALYSES.

GENERAL NOTES:

- THE ENGINEERING PRESENTED IN THIS DESIGN PACKAGE IS BASED ON SPECIFIC PRODUCTS (E.G., VERTI-BLOCKS, FILL MATERIAL, ETC.). ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS ENGINEERING. ANY CHANGES IN WALL LOCATION, ELEVATIONS OF LEVELING PAD, GRADES AT THE TOE OR TOP OF THE WALL, AND SOIL PARAMETERS AT THE SITE WILL ALSO INVALIDATE THE ENGINEERING. FIELD ADJUSTMENTS/CHANGES MAY BE NEEDED TO MEET ACTUAL CONDITIONS ONCE CONSTRUCTION COMMENCES. IGES SHOULD BE CONSULTED WHERE FIELD CHANGES ARE REQUIRED.
- THESE DOCUMENTS ARE INSTRUMENTS OF SERVICE AND SHALL REMAIN THE INTELLECTUAL PROPERTY OF IGES, INC. THE DESIGN PACKAGE HAS BEEN FURNISHED FOR THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT NO USE OR RE-USE OF THESE DOCUMENTS (EITHER IN WHOLE OR IN PART) SHALL BE PERMITTED UNLESS EXPRESSLY AUTHORIZED IN WRITING BY IGES, INC.
- RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION BUT PRIOR TO THE PLACEMENT OF LANDSCAPING/FINISHING ELEMENTS AT THE SITE (E.G., LANDSCAPING, HARDSCAPE, CURB & GUTTER, PAVEMENT, ETC.). TO PREVENT DAMAGE TO THE WALL DURING ADDITIONAL SITE WORK, ALL SURFACE DRAINAGE SHOULD BE DIRECTED AWAY FROM THE WALL. EXCESS WATER DURING HEAVY RAIN EVENTS, IF NOT DRAINED PROPERLY, CAN CAUSE WASHOUTS AT WALL ENDS AND 'BLOWOUTS' OF INTERIOR SECTIONS. THESE PRECAUTIONS SHOULD BE TAKEN DURING AND AFTER WALL CONSTRUCTION UNTIL THE FINAL SITE DRAINAGE, LANDSCAPING AND PAVING ARE COMPLETE.

RETAINING WALL ANALYSIS USED IN DESIGN	
ANALYSIS	DESIGN REFERENCES/SOFTWARE
EXTERNAL STABILITY	VERTI-BLOCK RETAINING WALLS, 2023 VERTICRETE WALL DESIGNER SOFTWARE, VERSION 6.0.23160.945, BUILD DATE JUNE 9, 2023, AUTHOR - ROBERT RACE
GLOBAL STABILITY	SLIDE 2: ROCSCIENCE, INC., 1998-2023, VERSION 9.028, BUILD DATE JUNE 13, 2023.

SEISMIC PARAMETERS USED IN DESIGN					
SEISMIC CRITERIA	MCE _G PGA	SITE CLASS	F _{PGA}	PGA _M	HORIZONTAL COEFFICIENT (k _h)
ASCE 7-16	0.250g	D	1.35	0.337g	0.140g (EXTERNAL) 0.169g (GLOBAL)

- SOURCES & NOTES:
- SEISMIC PARAMETERS DEVELOPED FOLLOWING THE CRITERIA OUTLINED IN THE 2018 INTERNATIONAL BUILDING CODE. THE SPECTRAL RESPONSE AT THE SITE WAS EVALUATED FOR THE PROBABILISTIC GEOMETRIC MEAN *MAXIMUM CONSIDERED EARTHQUAKE* (MCE_G), TAKEN AS THE GEOMETRIC MEAN PEAK GROUND ACCELERATION. THE MCE_G SPECTRAL ACCELERATIONS WERE DETERMINED BASED ON THE LOCATION OF THE SITE USING THE *ASCE-7 HAZARD TOOL*.
 - TO ACCOUNT FOR SITE EFFECTS, SITE COEFFICIENTS THAT VARY WITH THE MAGNITUDE OF THE SPECTRAL ACCELERATION AND SITE CLASS ARE USED. SITE CLASS IS A PARAMETER THAT ACCOUNTS FOR SITE AMPLIFICATION EFFECTS OF SOFT SOILS AND IS BASED ON THE AVERAGE SHEAR WAVE VELOCITY OF THE UPPER 100 FEET. BASED ON OUR ENGINEERING JUDGMENT, A SITE CLASS D WAS USED FOR THIS PROJECT.
 - A MAXIMUM ALLOWABLE SEISMIC DISPLACEMENT THRESHOLD OF 3.37 INCHES (10*PGA) WAS USED TO REDUCE THE HORIZONTAL SEISMIC ACCELERATION COEFFICIENT IN ACCORDANCE WITH NCMA 3RD EDITION METHODOLOGY.
 - ONE-HALF OF THE PGA_M WAS USED TO MODEL THE HORIZONTAL SEISMIC ACCELERATION FOR GLOBAL STABILITY ANALYSES (k_h = 0.169g).
 - SEISMIC PARAMETERS DEVELOPED FROM:

SITE INFORMATION		
LATITUDE:	40.6568	DEGREES
LONGITUDE:	-111.4813	DEGREES
RETURN PERIOD:	2475	YEARS (2PE50)
SITE SOIL CLASS:	D	STIFF SOIL PROFILE (TABLE 20.3-1)

SEISMIC GROUND MOTION VALUES (GEOMETRIC MEAN VALUES)		
GEOMETRIC MEAN VALUES (MCE _G)		
F _{PGA} :	1.35	TABLE 11.8-1
MCE _G :	0.250	g (FROM ASCE-7 HAZARD TOOL)
PGA _M :	0.337	g (MCE _G *F _{PGA})

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



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VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
DESIGN CRITERIA

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	NTS
IGES PROJECT NO: 04409-001	SHEET NO: 6	REV N/A





PHOTOS TAKEN DURING SITE OBSERVATION MADE ON JUNE 12, 2023

REV	REVISION DESCRIPTION	DATE	BY	CHK
REVISIONS				



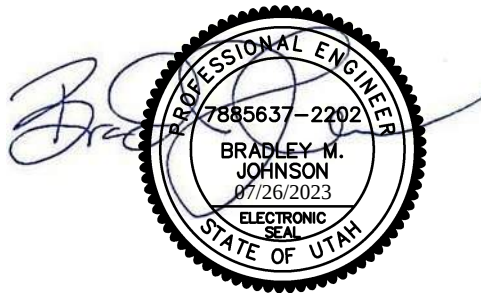
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DRAPER, UTAH 84020
(801) 748-4044

VERTI-BLOCK RETAINING WALL
MARTIN RESIDENCE
3335 SOLAMERE DRIVE
PARK CITY, UTAH
SITE PHOTOS

DESIGNED BY: DHB	7-25-2023	PLOT SCALE
DRAWN BY: DHB	7-25-2023	1=1
CHECKED BY: BMJ	7-25-2023	DWG SCALE
APPROVED BY: BMJ	7-25-2023	NTS
IGES PROJECT NO: 04409-001	SHEET NO: 7	REV N/A

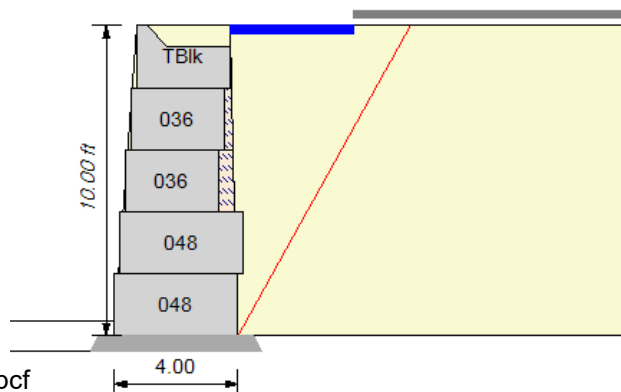


SECTION 2



Intermountain GeoEnvironmental Services

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 5 Blocks (10')
 Design Method: NCMA_09_3rd_Ed
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g



SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			

GEOMETRY

Design Height:	10.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	5.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

FoS Sliding: 2.13 (lvlpd) / 1.41 FoS Overturning: 2.11 / 1.26
 Bearing: 1882.30 / 1863.56 FoS Bearing: 3.95 / 1.52

Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	FSsl	siesFSsl	FoS OT	FoS SeisOT
TBlk	8.00	0.217	0.302	61	85	82	33	0	93	199	14.93	7.73	14.33	6.66
036	6.00	0.183	0.262	205	294	192	55	0	260	541	7.68	3.86	6.72	3.04
036	4.00	0.183	0.262	461	661	302	82	0	543	1046	4.95	2.63	3.82	1.85
048	2.00	0.242	0.334	1082	1496	452	145	91	1318	2184	3.50	2.08	2.99	1.72
048	0.00	0.229	0.319	1603	2233	601	172	220	1995	3225	2.13	1.41	2.11	1.26

Column Descriptions:

ka: active earth pressure coefficient
 kae: active seismic earth pressure coefficient
 Pa: active earth pressure
 Pae: dynamic earth pressure
 Pir: inertia force
 Paq: live surcharge earth pressure
 Paq2: live load 2 surcharge earth pressure
 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 FSsl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

DESIGN DATA

TARGET DESIGN VALUES (Factors of Safety - Static / Seismic)

Minimum Factor of Safety for the sliding along the base	FSsl =1.50 /1.125
Minimum Factor of Safety for overturning about the toe	FSot =1.50 /1.125
Minimum Factor of Safety for bearing (foundation shear failure)	FSbr =2.00 /1.500

MINIMUM DESIGN REQUIREMENTS

Minimum embedment depth	Min_emb =0.50 ft
-------------------------	------------------

INPUT DATA

Geometry

Wall Geometry

Design Height, top of leveling pad to finished grade at top of wall	H =10.00 ft
Embedment, measured from top of leveling pad to finished grade	emb =0.50 ft
Leveling Pad Depth	Thickness =0.50 ft
Face Batter, measured from vertical	i =5.20 deg

Slope Geometry

Slope Angle, measured from horizontal	β =0.00 deg
Slope toe offset, measured from back of the face unit	STL_offset =0.00 ft
Slope Length, measured from back of wall facing	SL_Length =0.00 ft

NOTE: If the slope toe is offset or the slope breaks within three times the wall height, a Coulomb Trial Wedge method of analysis is used.

Surcharge Loading

Live Load, assumed transient loading (e.g. traffic)	LL = 75.00 psf
Live Load Offset, measured from back face of wall	LL_offset =0.00 ft
Live Load Width, assumed strip loading	LL_width = 4.00 ft
Dead Load, assumed permanent loading (e.g. buildings)	DL = 500.00 psf
Dead Load Offset, measured from back face of wall	DL_offset =4.00 ft
Dead Load Width, assumed strip loading	DL_width = 100.00 ft

Verti-Block. Retaining Walls

Soil Parameters

Retained Zone

Angle of Internal Friction	$\phi = 38.00$ deg
Cohesion	coh = 0.00 psf
Moist Unit Weight	gamma = 140.00 pcf

Foundation

Angle of Internal Friction	$\phi = 32.00$ deg
Cohesion	coh = 0.00 psf
Moist Unit Weight	gamma = 130.00 pcf

Leveling Pad

Angle of Internal Friction	$\phi = 40.00$ deg
Cohesion	coh = 0.00 psf
Moist Unit Weight	gamma = 135.00 pcf

Infill Soil

Angle of Internal Friction	$\phi = 30.00$ deg
Cohesion	coh = 0.00 psf
Moist Unit Weight	gamma = 120.00 pcf

RETAINING WALL UNITS

STRUCTURAL PROPERTIES:

N is the normal force [or factored normal load] on the base unit

The default leveling pad to base unit shear is $0.8 \tan(\phi)$ [AASHTO 10.6.3.4] or

may be the manufacturer supplied data. ϕ is assumed to be 40 degrees for a stone leveling pad.

Unit	Ht (in)	Width (in)	Depth (in)	Cn_Vol (cf/ft)	Cn_Den (pcf)	CG (in)	Ag_Vol (cf/ft)	Ag_Den (pcf)	Ag_CG (in)
TopBlock	24.00	48.00	36.00	2.31	142.00	13.53, 12.00	2.13	120.00	20.09, 20.09
Standard	24.00	48.00	36.00	3.09	142.00	16.35, 12.00	2.90	120.00	20.19, 20.19
48inch	24.00	48.00	48.00	4.71	142.00	24.92, 12.00	3.30	120.00	22.83, 22.83

CALCULATION RESULTS

OVERVIEW

VertiBlock calculates stability assuming the wall is a rigid body. Forces and moments are calculated about the base and the front toe of the wall. The base block width is used in the calculations. The concrete units and granular fill over the blocks are used as resisting forces.

EARTH PRESSURES

The method of analysis uses the Coulomb Earth Pressure equation (below) to calculate active earth pressures. Wall friction is assumed to act at the back of the wall face. The component of earth pressure is assumed to act perpendicular to the boundary surface. The effective δ angle is δ minus the wall batter at the back face. If the slope breaks within the failure zone, a trial wedge method of analysis is used.

EXTERNAL EARTH PRESSURES

Effective δ angle (3/4 retained phi)
Coefficient of active earth pressure

$\delta = 28.5$ deg
 $k_a = 0.229$

External failure plane

$\rho = 61$ deg

Effective Angle from horizontal

$\theta = 88.44$ deg

Coefficient of passive earth pressure: $k_p = (1 + \sin(\phi)) / (1 - \sin(\phi))$

$k_p = 0.00$

$$k_u = \frac{\sin^2(\theta + \phi')}{\Gamma [\sin^2 \sin(\theta - \delta)]}$$

in which:

$$\Gamma = \left[1 + \frac{\sin(\phi' + \delta) \sin(\phi - \beta)}{\sin(\theta - \delta) \sin(\theta + \beta)} \right]^2$$

where:

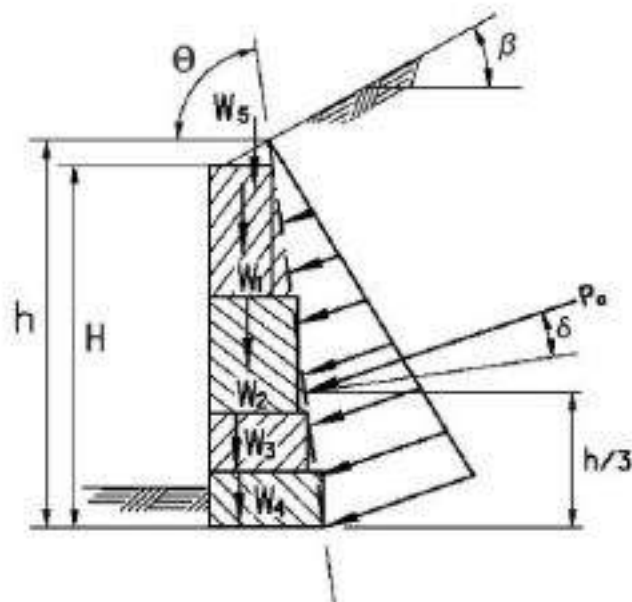
δ = friction angle between fill and wall (degrees)

β = angle of fill to the horizontal (degrees)

θ = angle of back face of wall to the horizontal (degrees)

ω = angle of wall batter (degrees) = $\theta - 90$

ϕ' = effective angle of internal friction (degrees)



FORCE DETAILS

The details below shown how the forces are calculated for each force component. The values shown are not factored. All loads are based on a unit width (ppf / kNpm).

Layer	Block Wt	Soil Fill Wt	Soil Wt
1	328	255	31
2	439	348	135
3	439	348	240
4	668	396	105
5	668	396	

Block Weight = 2542.51 ppf X-Arm = 2.01 ft
 Soil Infill Weight = 1743.00 ppf X-Arm = 2.09 ft
 Soils Wedge Weight = 189.79 ppf X-Arm = 3.64 ft

Active Earth Pressure $P_a = 1602.65$ ppf

$$P_{a_h} \text{ (Force H)} = P_a \cos(\delta - \omega) = 1602.65 \times \cos(28.50 - (-1.56)) = 1387 \text{ ppf}$$

$$Y\text{-Arm} = 3.33 \text{ ft}$$

$$P_{a_v} \text{ (Force V)} = P_a \sin(\delta - \omega) = 1602.65 \times \sin(28.50 - (-1.56)) = 803 \text{ ppf}$$

$$X\text{-Arm} = 3.91 \text{ ft}$$

Live Load $P_q = 171.71$ ppf

$$P_{q_h} \text{ (Force H)} = P_q \cos(\delta - \text{batter}) = 171.71 \times \cos(28.50 - (-1.56)) = 148.62 \text{ ppf}$$

$$Y\text{-Arm} = 5.00 \text{ ft}$$

$$P_{q_v} \text{ (Force V)} = P_q \sin(\delta - \text{batter}) = 171.71 \times \sin(28.50 - (-1.56)) = 86.01 \text{ ppf}$$

$$X\text{-Arm} = 3.86 \text{ ft}$$

Dead Load $P_{qd} = 220.23$ ppf

$$P_{qd_h} \text{ (Force H)} = P_{qd} \cos(\delta - \text{batter}) = 220.23 \times \cos(28.50 - (-1.56)) = 190.61 \text{ ppf}$$

$$Y\text{-Arm} = 5.00 \text{ ft}$$

$$P_{qd_v} \text{ (Force V)} = P_{qd} \sin(\delta - \text{batter}) = 220.23 \times \sin(1.56 + 28.50) = 110.31 \text{ ppf}$$

$$X\text{-Arm} = 3.86 \text{ ft}$$

FORCES AND MOMENTS

The program resolves all the geometry into simple geometric shapes to make checking easier. All x and y coordinates are referenced to a zero point at the toe of the bottom unit.

LOADS FOR OVERTURNING ABOUT THE TOE

Name	Force (V)	Force (H)	X-len	Y-len	Mo	Mr
Soil Fill(W0)	1743.00	--	2.09	--	--	3639.81
Face Blocks(W1)	2542.51	--	2.01	--	--	5101.68
Soil Wedge(W2)	189.79	--	3.64	--	--	690.86
Pa_h	--	1387.13	--	3.33	4623.76	--
Pa_v	802.72	--	3.91	--	--	3138.13
Pq_h	--	148.62	--	5.00	743.10	--
Pq_v	86.01	--	3.86	--	--	332.33
Pqd_h	--	190.61	--	5.00	953.06	--
Pqd_v	110.31	--	3.86	--	--	426.23
Sum V / H	5474	1726		Sum Mom	6320	13329

W0: stone within units

W1: facing units

W2: soil wedge behind the face

X-Len: is measured from the center of the base (+) Driving, (-) Resisting.

Pa_h: horizontal earth pressure

Pa_v: vertical earth pressure

Pq_h: horizontal surcharge pressure

Pq_v: vertical surcharge pressure

BEARING LOADS: NCMA

All x and y coordinates are referenced to a zero point at the middle of the base block for eccentricity calculations.

Name	Force (V)	Force (H)	X-len	Y-len	Mo	Mr
Soil Fill(W0)	1743.00	--	-0.09	--	--	-153.81
Face Blocks(W1)	2542.51	--	-0.01	--	--	-16.66
Soil Wedge(W2)	189.79	--	-1.64	--	--	-311.28
Pa_h	--	1387.13	--	3.33	4623.75	--
Pa_v	802.72	--	-1.91	--	--	-1532.68
Pq_h	--	148.62	--	5.00	743.10	--
Pq_v	86.01	--	-1.86	--	--	-160.32
Pqd_h	--	190.61	--	5.00	953.06	--
Pqd_v	110.31	--	-1.86	--	--	-205.61
Sum V / H	5474	1726		Sum Mom	6320	-2380

BASE SLIDING

Sliding at the base is checked at the block to leveling pad interface between the base block and the leveling pad.

$$\text{Forces Resisting sliding} = W0 + W1 + W2 + Pav + Pqv + Pqdv$$

$$1743 + 2543 + 190 + 803 + 86 + 110$$

$$N = 5474 \text{ ppf}$$

$$\text{Resisting force at pad} = (N * 0.8 * \tan(\text{slope}) + \text{intercept} * L)$$

$$5474 * 0.8 * \tan(40.0) + 0.0$$

$$Rf = 3,675$$

$$\text{Driving force is the horizontal component of}$$

$$Pah + Pqh + Pqdh$$

$$1387 + 149 + 191$$

$$Df = 1,726$$

$$FSsl = Rf / Df$$

$$FSsl = 2.13$$

OVERTURNING ABOUT THE TOE

Overturning at the base is checked by assuming rotation about the front toe by the block mass and the soil retained on the blocks. Allowable overturning can be defined by eccentricity (e/L). For concrete leveling pads eccentricity is checked at the base of the pad.

Moments Resisting Overturning = $M_0 + M_1 + M_2 + MP_{av} + MP_{qv} + MP_{qdv}$

$3640 + 5102 + 691 + 3138 + 332 + 426$

$Mr = 13329 \text{ ft-lbs}$

Moments causing Overturning = $MP_{ah} + MP_{qh} + MP_{qdh}$

$4624 + 743 + 953$

$Mo = 6320 \text{ ft-lbs}$

$FSot = Mr / Mo$

$FSot = 13329 / 6320$

$FSot = 2.11$

ECCENTRICITY AND BEARING

Eccentricity is the calculation of the distance of the resultant away from the centroid of mass. In wall design the eccentricity is used to calculate an effective footing width.

Calculation of Eccentricity

$$\text{SumV} = W0 + W1 + W2 + P_{av} + P_{qv} + P_{qdv}$$

$$1743 + 2543 + 190 + 803 + 86 + 110$$

Moment Resisting

Moment Driving

$$\text{SumV} = 5474$$

$$M_r = -2380$$

$$M_d = 6320$$

$$e = (\text{Sum}M_r + \text{Sum}M_d) / (\text{SumV})$$

$$e = (3940 / 5474)$$

$$e = 0.720 \text{ ft}$$

BEARING

Bearing Capacity Factors [Foundation]

$$N_c = 35.49 \text{ Myerhoff Eqn}$$

$$N_q = 23.18 \text{ Myerhoff Eqn}$$

$$N_g = 30.21 \text{ Vesic Eqn}$$

Shape Factors [Foundation]

$$S_c = 1.07$$

$$S_q = 1.06$$

$$S_g = 0.96$$

Depth Correction Factor

$$d_f = 1.03$$

Modified Bearing Capacity Factors [Foundation]

$$N_{cm} = N_c \times S_c = 37.81$$

$$N_{qm} = N_q \times S_q \times d_f = 25.47$$

$$N_{gm} = N_g \times S_g = 29.01$$

Water Correction Factor

$$C_{wq} = 1.00$$

$$C_{wg} = 1.00$$

Base width at foundation, B'f

B'f = B - 2e + 1/2 Pad Thickness (Bearing area at foundation)

$$4.00 - 2 \times 0.72 + 0.50$$

$$B'f = 3.06 \text{ ft}$$

q = embedment * γ

$$= 0.50 \times 130.00$$

$$q = 65.00 \text{ psf}$$

Calculation of Bearing Pressures on Foundation

$$q_n = (c \times N_{cm}) + (q \times N_{qm} \times C_{wq}) + 0.5 \times \gamma \times B'f \times N_{gm} \times C_{wg}$$

$$[(0.00 \times 37.81) + (65 \times 25.47 \times 1.00) + (0.5 \times 130 \times 3.06 \times 29.01 \times 1.00)]$$

$$q_{ult} = 7426 \text{ psf}$$

Nbrg = Bearing at Foundation Level

$$N_{Brg} = 5761 \text{ psf}$$

Calculate Ultimate Bearing, qult

Bearing Pressures (σ)

Calculated Factor of safety for bearing

$$q_{ult} = 7426 \text{ psf}$$

$$N_{Brg}/B'f = 1882 \text{ psf}$$

$$q_{ult}/\sigma = 3.95$$

SEISMIC CALCULATIONS

The loads considered under seismic loading are primarily inertial loadings. The wave passes the structure putting the mass into motion and then the mass will try to continue in the direction of the initial wave. In the calculations you see the one dynamic earth pressure from the wedge of the soil behind the reinforced mass, and then all the other forces come from inertia calculations of the face put into motion and then trying to be held in place.

Design Ground Acceleration $A = 0.337$
 Horizontal Acceleration $[k_h = A/2]$ $k_h = 0.140$
 Vertical Acceleration $k_v = 0.000$

INERTIA FORCES OF THE STRUCTURE

Face (Pif) = $(W1) \cdot k_h(\text{ext}) = 2542.51 \cdot 0.140$
 $Pif = 600.99 \text{ ppf}$

SEISMIC THRUST

K_{ae} $K_{ae} = 0.319$
 $D_{Kae} = K_{ae} - K_a = (0.319 - 0.229)$ $D_{Kae} = 0.090$
 $P_{ae} = 0.5 \cdot \gamma(H)^2 \cdot D_{Kae}$ $P_{ae} = 629.92 \text{ ppf}$
 $P_{ae_h} = P_{ae} \cdot \cos(\delta)$ $P_{ae_h} = 545.21 \text{ ppf}$
 $P_{ae_v} = P_{ae} \cdot \sin(\delta)$ $P_{ae_v} = 315.51 \text{ ppf}$

TABLE OF RESULTS FOR SEISMIC REACTIONS

Name	Force (V)	Force (H)	X-len	Y-len	Mo	Mr
Face Soil(W0)	1743.00	-1.00	-0.09	-1.00	--	-153.81
Face Blocks(W1)	2542.51	-1.00	-0.01	-1.00	--	-16.66
Soil Block(W2)	189.79	-1.00	-1.64	-1.00	--	-153.81
LevelingPad(W18)	286.88	-1.00	0.00	-1.00	--	0.00
P_{a_h}	-1.00	1387.13	-1.00	3.33	4623.75	--
P_{a_v}	802.72	-1.00	-1.91	-1.00	--	-1532.68
P_{a_v}	-1.00	148.62	-1.00	5.00	--	743.10
P_{a_v}	86.01	-1.00	-1.86	-1.00	--	-160.32
P_{a_v}	-1.00	190.61	-1.00	5.00	--	953.06
P_{a_v}	110.31	-1.00	-1.86	-1.00	--	-205.61
Pif	-1.00	600.99	-1.00	6.00	3605.91	--
P_{ae_h}	-1.00	545.21	-1.00	6.00	3271.26	--
P_{ae_v}	315.51	-1.00	-1.91	-1.00	--	-602.42
Sum V / H	5703.84	2723.93		Sum Mrs	0.0	0.0

SEISMIC SLIDING

The target factor of safety for seismic is 75% of the static value. Live loads are ignored in these analysis based on the basic premise that the probability of the maximum acceleration occurring at the exact same instant as the maximum live load is small.

Details are only shown for sliding at the base of blocks, a check is made at the foundation level with the answer only shown.

The vertical resisting forces is $W0 + W1 + W2 + Pav + Paev$

$$1743 + 2543 + 190 + 803 + 316$$

Resisting force = $SumVs * \tan(\phi) + \text{intercept} \times L$

Driving force = $Pa_h + Pae_h + Pif$

$$= 1387 + 545 + 601$$

FOS = FRe / FDr

$$SumVs = 5704$$

$$FRe = 3829 \text{ ppf}$$

$$FDr = 2724 \text{ ppf}$$

$$FoS = 1.41$$

SEISMIC OVERTURNING

Overturning is rotation about the front toe of the wall. Eccentricity is also a check on overturning

Resisting Moment = $M0 + M1 + M2 + MPav + MPaev$

$$3640 + 5102 + 691 + 3138 + 1219 +$$

Driving Moment = $MPah + MPaeh + MPif$

$$4624 + 2726 + 3005$$

Factor of Safety = $SumMrS / SumMoS$

$$SumMrS = 14216 \text{ ft ppf}$$

$$SumMoS = 11307.79 \text{ ft ppf}$$

$$FoS = 1.26$$

SEISMIC BEARING

Bearing is the ability of the foundation to support the mass of the structure.

$$Qult = c * Nc + q * Nq + 0.5 * \gamma * (B') * Ng$$

where:

$$Nc = 35.49 \text{ Myerhoff Eqn}$$

$$Nq = 23.18 \text{ Myerhoff Eqn}$$

$$Ng = 30.21 \text{ Vesic Eqn}$$

$$c = 0.00 \text{ psf}$$

$$q = 130.00 \text{ psf}$$

Calculate Ultimate Bearing, Qult (seismic)

eccentricity (e)

Equivalent Footing Width, $B' = L - 2e + |e| \text{ pad}$

Bearing Pressure = $sumVs / B'$

Factor of Safety for Bearing = $Qult / \text{Bearing}$

$$Qult = 2829.81 \text{ psf}$$

$$e = 1.689$$

$$B' = 1 \text{ ft}$$

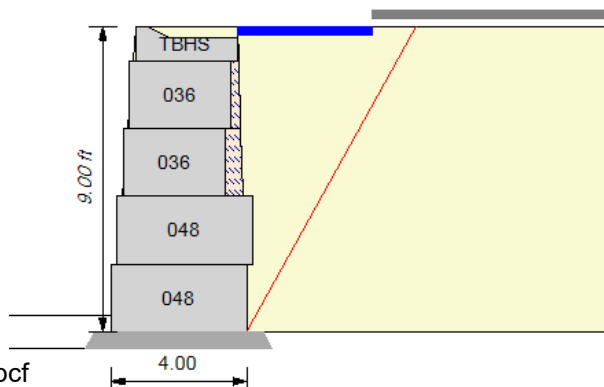
$$\sigma = 1864 \text{ psf}$$

$$FoS = 2$$

REA Analysis

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 5 Blocks (9')
 Design Method: NCMA_09_3rd_Ed
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g

SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			



GEOMETRY

Design Height:	9.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	5.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

FoS Sliding: 2.47 (lvlpd) / 1.56 FoS Overturning: 2.70 / 1.52
 Bearing: 1527.99 / 1497.54 FoS Bearing: 5.44 / 2.79

Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	FSsl	siesFSsl	FoS OT	FoS SeisOT
TBHS	8.00	0.217	0.302	15	21	59	16	0	31	96	38.93	14.00	57.57	18.21
036	6.00	0.183	0.262	115	165	169	41	0	156	376	11.67	5.13	12.60	4.86
036	4.00	0.183	0.262	320	459	280	69	0	388	808	6.44	3.20	5.70	2.53
048	2.00	0.245	0.338	841	1160	429	129	25	995	1743	4.32	2.43	4.13	2.19
048	0.00	0.230	0.320	1305	1817	578	155	146	1607	2697	2.47	1.56	2.70	1.52

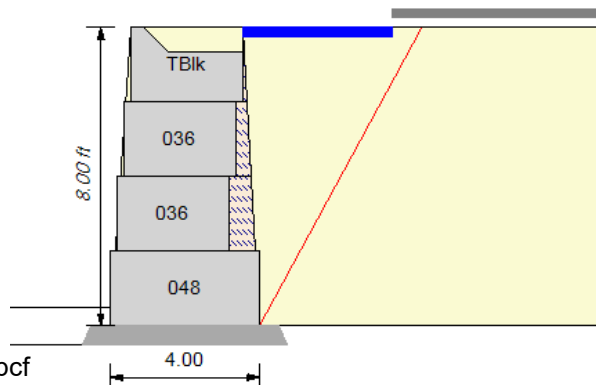
Column Descriptions:

ka: active earth pressure coefficient
 kae: active seismic earth pressure coefficient
 Pa: active earth pressure
 Pae: dynamic earth pressure
 Pir: inertia force
 Paq: live surcharge earth pressure
 Paq2: live load 2 surcharge earth pressure
 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 FSsl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

Intermountain GeoEnvironmental Services

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 4 Blocks (8')
 Design Method: NCMA_09_3rd_Ed
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g

SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			



GEOMETRY

Design Height:	8.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	5.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

FoS Sliding: 2.49 (lvlpd) / 1.60 FoS Overturning: 2.94 / 1.69
 Bearing: 1257.29 / 1216.29 FoS Bearing: 6.63 / 3.90

Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	FSsl	siesFSsl	FoS OT	FoS SeisOT
TBlk	6.00	0.217	0.302	61	85	82	33	0	93	199	14.93	7.73	14.22	6.61
036	4.00	0.183	0.262	205	294	192	55	0	260	541	7.68	3.86	6.68	3.02
036	2.00	0.183	0.262	461	661	302	82	0	543	1046	4.95	2.63	3.78	1.84
048	0.00	0.242	0.334	1082	1496	452	145	93	1320	2186	2.49	1.60	2.94	1.69

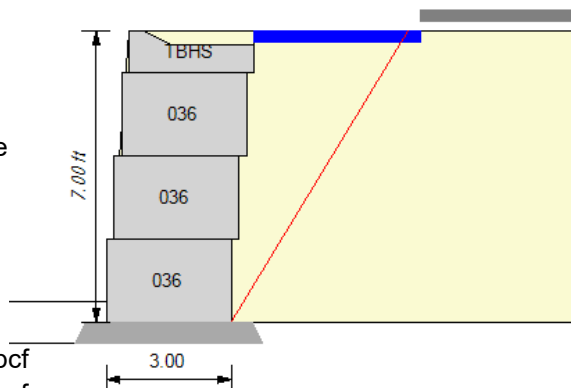
Column Descriptions:

ka: active earth pressure coefficient
 kae: active seismic earth pressure coefficient
 Pa: active earth pressure
 Pae: dynamic earth pressure
 Pir: inertia force
 Paq: live surcharge earth pressure
 Paq2: live load 2 surcharge earth pressure
 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 FSsl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

REA Analysis

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 4 Blocks (7")
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g

SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			



GEOMETRY

Design Height:	7.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	4.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

FoS Sliding: 3.00 (lvlpd) / 1.68 FoS Overturning: 3.35 / 1.61
 Bearing: 1045.44 / 994.51 FoS Bearing: 7.21 / 3.82

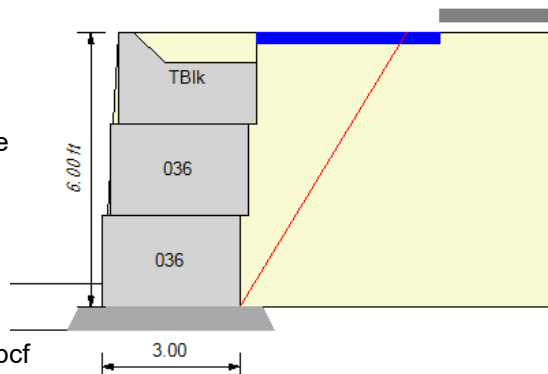
Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	FSsl	siesFSsl	FoS OT	FoS SeisOT
TBHS	6.00	0.217	0.302	15	21	59	16	0	31	96	38.93	14.00	57.37	18.16
036	4.00	0.183	0.262	115	165	169	41	0	156	376	11.67	5.13	12.54	4.84
036	2.00	0.183	0.262	320	459	280	69	0	388	808	6.44	3.20	5.67	2.51
036	0.00	0.183	0.262	627	900	390	96	0	723	1386	3.00	1.68	3.35	1.61

Column Descriptions:

ka: active earth pressure coefficient
 kae: active seismic earth pressure coefficient
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 Pae: dynamic earth pressure
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 Paq2: live load 2 surcharge earth pressure
 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 FSsl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

Intermountain GeoEnvironmental Services

Project: Martin Residence
 Location: 3335 Solamere Drive, Park City, Utah
 Designer: DHB
 Date: 7/19/2023
 Section: 3 Blocks (6')
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock (Extra)
 Seismic Acc: kh(external)=0.140g



SOIL PARAMETERS	ϕ	coh	γ
Retained Soil:	38 deg	0 psf	140 pcf
Foundation Soil:	32 deg	0 psf	130 pcf
Infill Soil:	30 deg	0 psf	120 pcf
LvlPad / Drain Mat:	40 deg	0 psf	135 pcf
Crushed Stone Lvlng Pad			

GEOMETRY

Design Height:	6.00 ft	Live Load:	75.00 psf
Wall Batter/Tilt:	5.20/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	0.50 ft	Live Load Width:	4.00 ft
Leveling Pad Depth:	0.50 ft		
Slope Angle:	0.0 deg	Dead Load:	500.0 ft
Slope Length:	0.0 ft	Dead Load Offset:	4.0 ft
Slope Toe Offset:	0.0 ft	Dead Load Width:	100.00 ft
Leveling Pad Width:	4.00 ft	D.L. Embedment:	0.00 ft

Vert δ on Single Dpth

Note: For typical designs the passive resistance in front of the wall units is ignored for sliding, overturning (eccentricity) and bearing calculations.

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.125	Overturning:	1.50 / 1.125
Bearing:	2.00 / 1.5		

RESULTS (Static / Seismic)

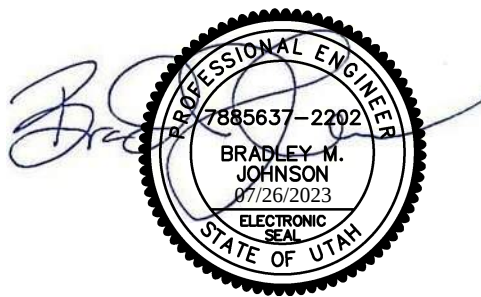
FoS Sliding: 3.09 (lvlpd) / 1.73 FoS Overturning: 3.75 / 1.82
 Bearing: 835.70 / 777.48 FoS Bearing: 8.92 / 5.40

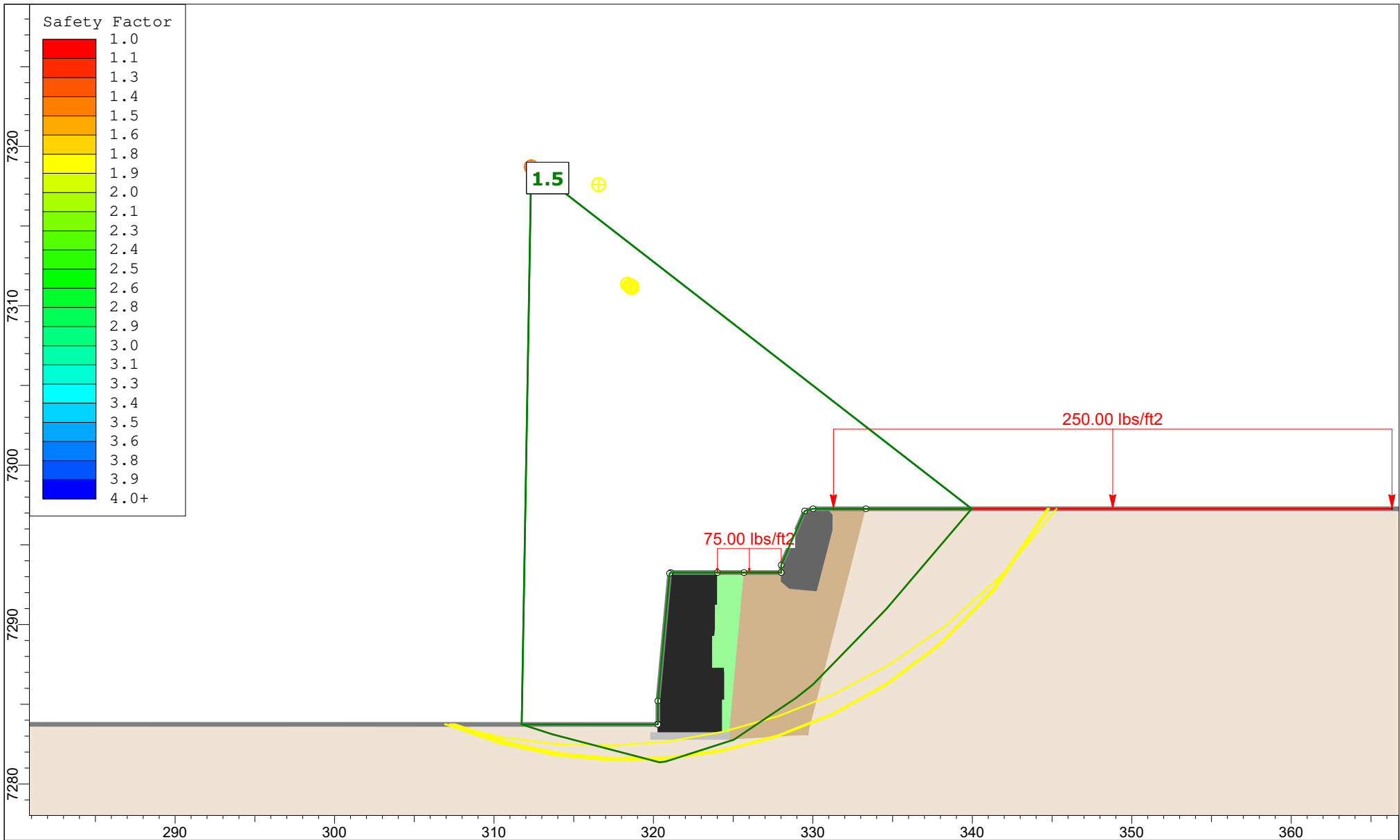
Name	Elev.	ka	kae	Pa	Pae	Pir	Paq	Paqd	PaT	PaTs	Fssl	siesFssl	FoS OT	FoS SeisOT
TBlk	4.00	0.217	0.302	61	85	82	33	0	93	199	14.93	7.73	14.11	6.56
036	2.00	0.183	0.262	205	294	192	55	0	260	541	7.68	3.86	6.63	3.00
036	0.00	0.183	0.262	461	661	302	82	0	543	1046	3.09	1.73	3.75	1.82

Column Descriptions:

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 kae: active seismic earth pressure coefficient
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 Paqd: dead surcharge earth pressure
 (PaC): reduction in load due to cohesion
 PaT: sum of all earth pressures
 Fssl(lvl Pad): factor of safety for sliding at each layer. (FS sliding below the leveling pad)
 FSot: factor of safety of overturning about the toe.

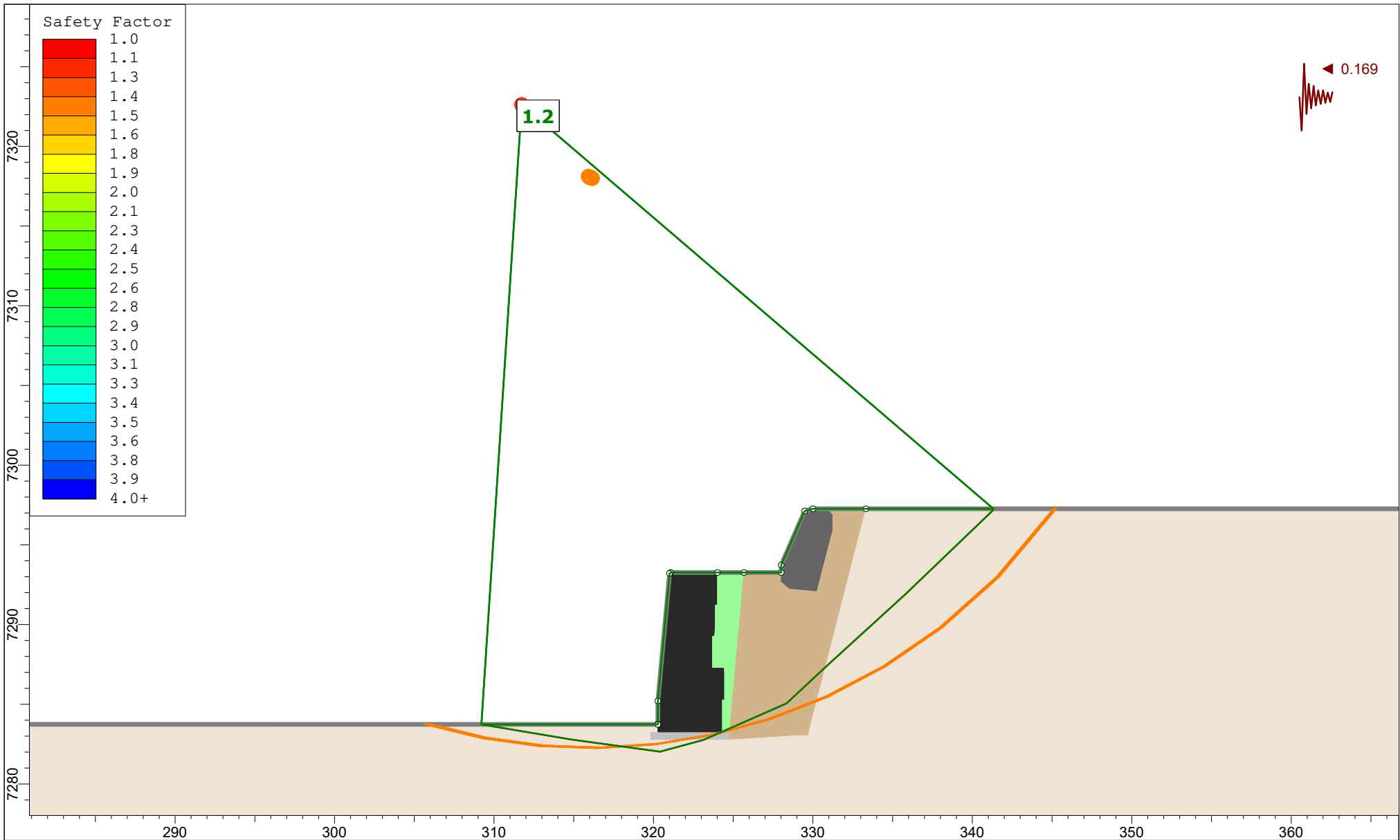
SECTION 3





SLIDEINTERPRET 9.028

Project			
Martin Residence - Verti-Block Design Package			
Analysis Description			
Global Stability Analysis - Static			
Drawn By	DHB	Scale	1:100
Date	7/20/2023	File Name	04409-001.slm
		Company	
		Intermountain GeoEnvironmental Services, Inc. (IGES) 12429 South 300 East, Draper, Utah 84020	



SLIDEINTERPRET 9.028

Project			
Martin Residence - Verti-Block Design Package			
Analysis Description			
Global Stability Analysis - Seismic			
Drawn By	DHB	Scale	1:100
Date	7/20/2023	File Name	04409-001.slmd
		Company	
		Intermountain GeoEnvironmental Services, Inc. (IGES) 12429 South 300 East, Draper, Utah 84020	

Slide2 Analysis Information

04409-001

Project Summary

File Name: 04409-001.slmd
Slide2 Modeler Version: 9.028
Project Title: Martin Residence - Verti-Block Design Package
Analysis: Global Stability Analysis
Author: DHB
Company: IGES, Inc.
Date Created: 7/20/2023

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Verti-Block Wall 	Static	Spencer: 1.450270	00h:00m:04.529s
	Seismic	Spencer: 1.207350	00h:00m:05.907s

Analysis Options

All Open Scenarios

Slices Type: Vertical

	Analysis Methods Used
Number of slices:	Spencer
Tolerance:	25
Maximum number of iterations:	0.005
Initial trial value of FS:	50
Steffensen Iteration:	1
	Yes

Seismic Loading

Verti-Block Wall - Static

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Verti-Block Wall - Seismic

Advanced seismic analysis: No
Staged pseudostatic analysis: No
Seismic Load Coefficient (Horizontal): 0.169

Loading

◆ Verti-Block Wall - Static

Distribution:	Constant
Magnitude [psf]:	75
Orientation:	Vertical
Distribution:	Constant
Magnitude [psf]:	250
Orientation:	Vertical

Materials

Native

Color	
Strength Type	Mohr-Coulomb
Unit Weight	135 lbs/ft3
Cohesion	50 psf
Phi	34 °
Water Surface	Assigned per scenario
Ru Value	0

Gravel

Color	
Strength Type	Mohr-Coulomb
Unit Weight	135 lbs/ft3
Cohesion	0 psf
Phi	40 °
Water Surface	Assigned per scenario
Ru Value	0

Granular Fill

Color	
Strength Type	Mohr-Coulomb
Unit Weight	135 lbs/ft3
Cohesion	0 psf
Phi	34 °
Water Surface	Assigned per scenario
Ru Value	0

Verti-Block

Color	
Strength Type	Mohr-Coulomb
Unit Weight	120 lbs/ft3
Cohesion	3000 psf
Phi	0 °
Water Surface	Assigned per scenario
Ru Value	0

Bedrock

Color	
Strength Type	Mohr-Coulomb
Unit Weight	150 lbs/ft3
Cohesion	0 psf
Phi	38 °
Water Surface	Assigned per scenario
Ru Value	0

Rockery

Color	
Strength Type	Anisotropic Strength
Unit Weight	150 lbs/ft3
Cohesion 1	0 psf
Phi 1	45 °
Cohesion 2	2000 psf
Phi 2	0 °
Angle (ccw to 1)	-10 °
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Static	Seismic
Native 	✓	✓
Gravel 	✓	✓
Granular Fill 	✓	✓
Verti-Block 	✓	✓
Bedrock 	✓	✓
Rockery 	✓	✓

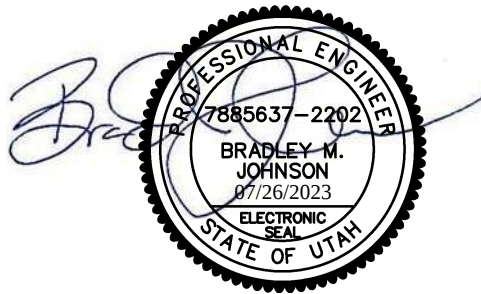
Global Minimums**◆ Verti-Block Wall - Static****Method: spencer**

FS	1.450270
Axis Location:	312.330, 7318.721
Left Slip Surface Endpoint:	311.742, 7283.748
Right Slip Surface Endpoint:	339.955, 7297.267
Resisting Moment:	664824 lb-ft
Driving Moment:	458415 lb-ft
Resisting Horizontal Force:	15200.3 lb
Driving Horizontal Force:	10481.1 lb
Total Slice Area:	166.56 ft2
Surface Horizontal Width:	28.213 ft
Surface Average Height:	5.90367 ft

◆ Verti-Block Wall - Seismic**Method: spencer**

FS		1.207350
Axis Location:		311.741, 7322.615
Left Slip Surface Endpoint:		309.206, 7283.749
Right Slip Surface Endpoint:		341.313, 7297.267
Resisting Moment:		642396 lb-ft
Driving Moment:		532071 lb-ft
Resisting Horizontal Force:		13993.7 lb
Driving Horizontal Force:		11590.4 lb
Total Slice Area:		165.685 ft ²
Surface Horizontal Width:		32.1074 ft
Surface Average Height:		5.16033 ft

SECTION 4

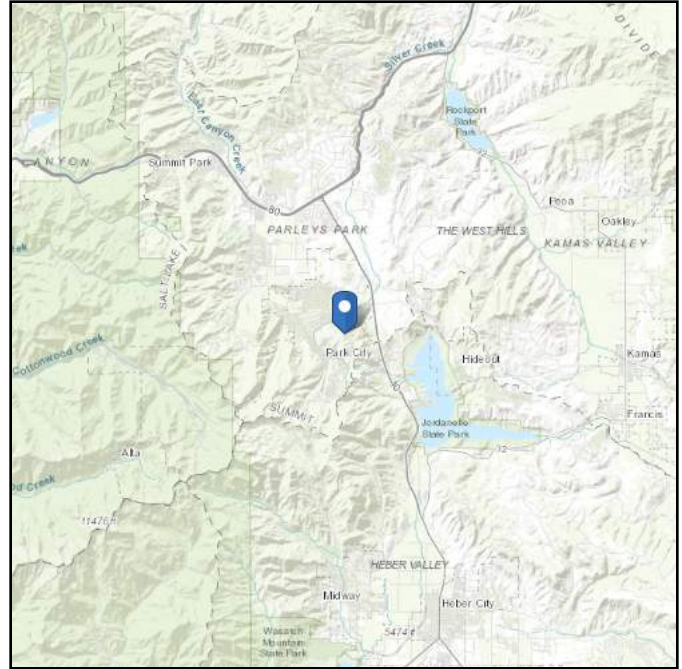
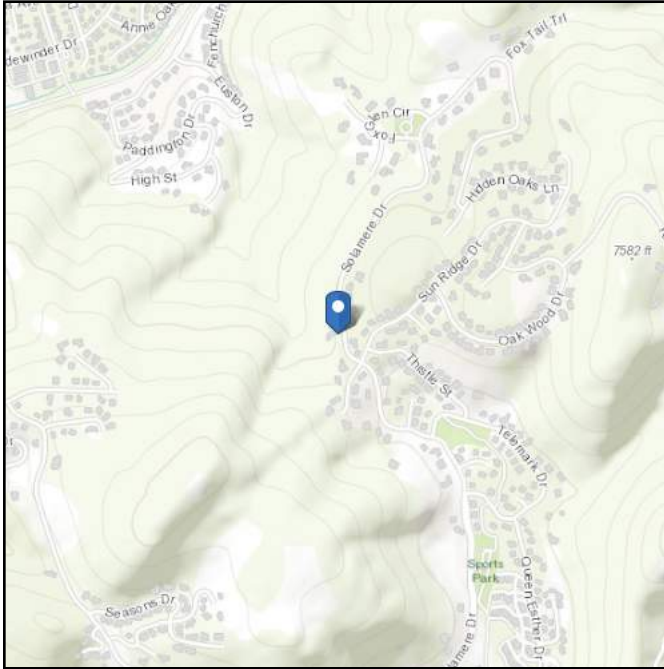


ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Stiff Soil

Latitude: 40.656813
Longitude: -111.481284
Elevation: 7204.821559346934 ft
(NAVD 88)



Site Soil Class: D - Stiff Soil

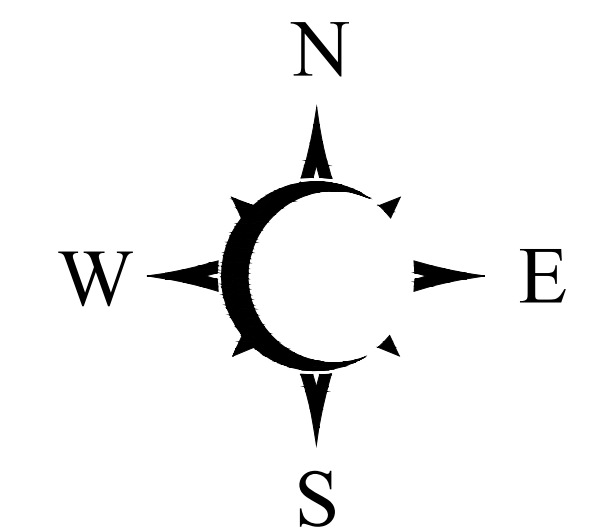
Results:

S_S :	0.57	S_{D1} :	N/A
S_1 :	0.203	T_L :	8
F_a :	1.344	PGA :	0.25
F_v :	N/A	PGA_M :	0.337
S_{MS} :	0.766	F_{PGA} :	1.35
S_{M1} :	N/A	I_e :	1
S_{DS} :	0.511	C_v :	1.08

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Wed Jul 19 2023

Date Source: [USGS Seismic Design Maps](#)



- LEGEND**
- = FOUND 5/8\"

- NOTES**
- 1.) VERTICAL DATA (CONTOURS AND/OR SPOT ELEVATIONS) SHOWN HEREON ARE BASED ON THE FOOT EQUIVALENT ELEVATION OF 7230.40', EXISTING SEWER MANHOLE, COLLECTED WITH GPS ON THE UTAH VRS NETWORK (GEOID 2018)
 - 2.) THIS TOPOGRAPHIC SURVEY WAS COMPLETED UNDER THE DIRECT AND RESPONSIBLE CHARGE OF DAN KNOWLDEN, PLS FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION; THAT THE IMAGERY AND/OR ORIGINAL DATA WAS OBTAINED ON SEPTEMBER 5, 2024.
 - 3.) THIS TOPOGRAPHIC SURVEY PLAT WAS PREPARED WITHOUT THE BENEFIT OF A TITLE COMMITMENT OR TITLE REPORT AND ALL EASEMENTS AND ENCUMBRANCES THAT MIGHT BE DISCLOSED IN A TITLE SEARCH MAY NOT BE SHOWN.
 - 4.) PROPERTY LINES SHOWN HERON ARE COMPILED FROM RECORD INFORMATION FOR REFERENCE ONLY. NO BOUNDARY SURVEY WAS PERFORMED BY VALLEY LAND SURVEYING.
 - 5.) THIS TOPOGRAPHIC SURVEY PLAT IS NOT PROOF OF OWNERSHIP.
 - 6.) THIS TOPOGRAPHIC SURVEY PLAT MAKES NO ASSUMPTIONS AS TO ANY UNWRITTEN RIGHTS THAT MAY EXIST BY AND BETWEEN THE ADJOINING LAND OWNERS.
 - 7.) UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON ABOVE GROUND FACILITIES AND EXISTING BLUE STAKE MARKINGS FOUND ON SITE AT THE TIME OF SURVEY. UTILITIES SHOWN HEREON ARE BASED ON FIELD OBSERVATION ONLY.

TOPOGRAPHIC SURVEY

3335 SOLAMERE DRIVE, PARK CITY

LOCATED IN SECTION 10, TOWNSHIP 2 SOUTH, RANGE 4 EAST
SALT LAKE BASE AND MERIDIAN

SURVEYOR'S CERTIFICATE

I, DAN E. KNOWLDEN JR DO HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR AND THAT I HOLD CERTIFICATE NO. 7173588 AS PRESCRIBED UNDER THE LAWS OF THE STATE OF UTAH AND THAT A TOPOGRAPHICAL SURVEY OF THE DESCRIBED PROPERTY HEREIN WAS PERFORMED UNDER MY DIRECTION.



BOUNDARY DESCRIPTION

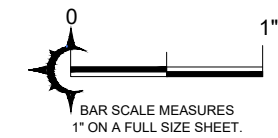
LOT 28, HIDDEN OAKS AT DEER VALLEY PHASE 1A, ACCORDING TO THE OFFICIAL PLAT ON FILE IN THE OFFICE OF THE SUMMIT COUNTY RECORDERS OFFICE.

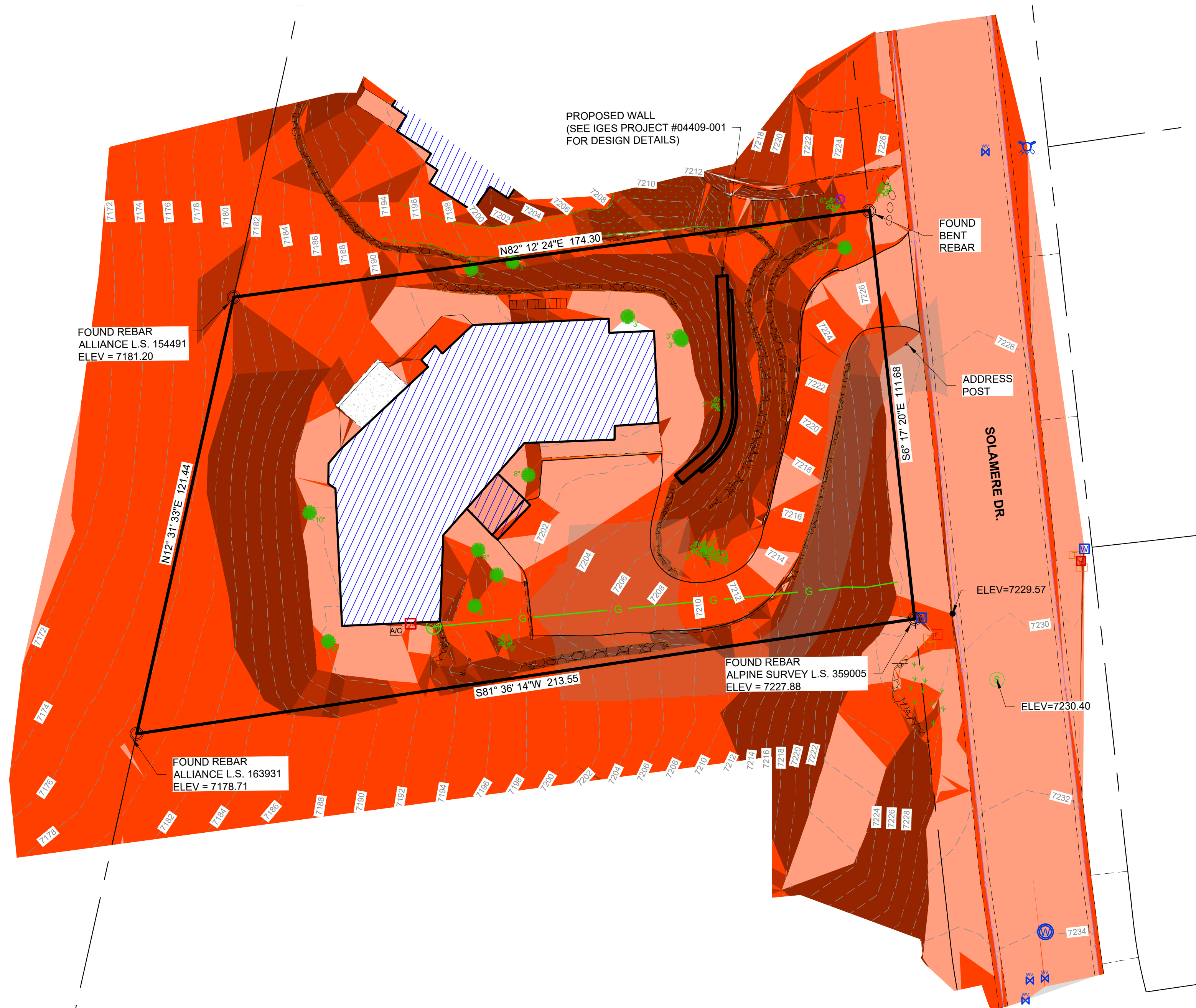
NARRATIVE

VALLEY LAND SURVEYING WAS CONTRACTED BY TODD TANNER TO PREPARE A TOPOGRAPHIC SURVEY TO FULFILL THE REQUIRMENTS FOR LMC 15-2.21-3(A)(2) SUBMITTAL 4 (PARK CITY MUNICIPAL CORPORATION) TO BUILD A NEW RETAINING WALL.

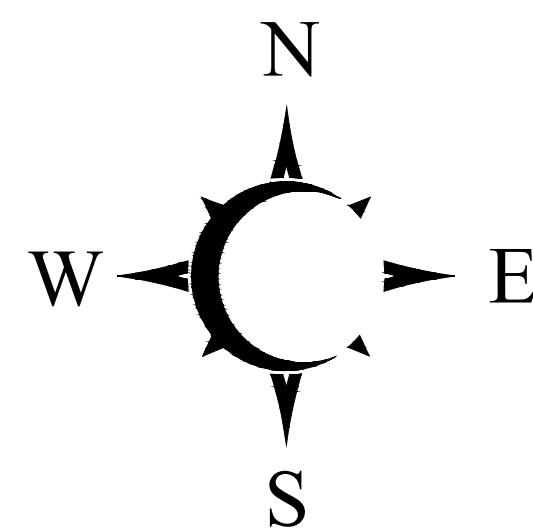


P: (801) 616-6848
F: (801) 704-9384
surveydanpls@gmail.com
563 North Rees Ave.
Spanish Fork, UT 84660

DRAWN: THK	PROJECT # VA. 979	SCALES	
DESIGNER: DEK	DATE: 9/10/2024	HORIZ: 1"=20'	
REVIEWED: DEK			
PROJECT NAME:			
3335 SOLAMERE DRIVE			
PROJECT LOCATION:			
PARK CITY, UTAH			
SHEET TITLE:		SHEET	
TOPOGRAPHIC SURVEY		1 of 1	



Slopes Table			
Number	Minimum Slope	Maximum Slope	Color
1	1%	15%	
2	15%	30%	
3	30%	40%	
4	40%	> 40%	



LEGEND

- = FOUND 5/8" REBAR & CAP
- = FOUND PLUG
- ⊙ = EXISTING SEWER MANHOLE
- ⊙ = EXISTING FIRE HYDRANT
- ⊙ = EXISTING WATER MANHOLE
- ⊙ = EXISTING WATER VALVE
- ⊙ = EXISTING WATER METER
- ⊙ = EXISTING IRRIGATION BOX
- ⊙ = EXISTING TELEPHONE PEDESTAL
- ⊙ = EXISTING ELECTRICAL METER
- ⊙ = EXISTING ELECTRICAL BOX
- = EXISTING PVC 8" VENT PIPE
- ⊙ = EXISTING GAS METER
- ⊙ = EXISTING A/C UNIT
- ⊙ = EXISTING TREE
- ⊙ = EXISTING EVERGREEN
- ⊙ = EXISTING BUSH
- ⊙ = EXISTING LAWN
- ⊙ = EXISTING BUILDING
- ⊙ = EXISTING ASPHALT
- ⊙ = EXISTING CONCRETE
- ⊙ = EXISTING ROCK WALL

NOTES

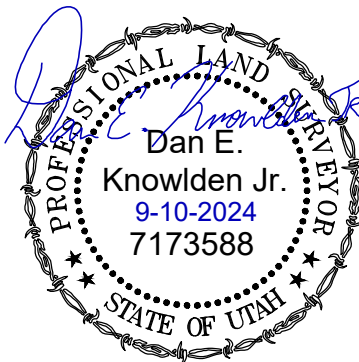
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TOPOGRAPHIC SURVEY 3335 SOLAMERE DRIVE, PARK CITY

LOCATED IN SECTION 10, TOWNSHIP 2 SOUTH, RANGE 4 EAST
SALT LAKE BASE AND MERIDIAN

SURVEYOR'S CERTIFICATE

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DESIGNER: DEK	VA. 979	HORIZ: 1"=20'	
REVIEWED: DEK	DATE: 9/12/2024		
PROJECT NAME:			
3335 SOLAMERE DRIVE			
PROJECT LOCATION:			
PARK CITY, UTAH			
SHEET TITLE:		SHEET	
TOPOGRAPHIC SURVEY		1 of 1	