ALPINE CITY COUNCIL MEETING AGENDA

NOTICE is hereby given that the **CITY COUNCIL** of Alpine City, Utah will hold a meeting on **Tuesday, February 10, 2015 at 7:00 pm** at Alpine City Hall, 20 North Main, Alpine, Utah as follows:

I. CALL MEETING TO ORDER*

- **A. Roll Call:** Mayor Pro Tem Troy Stout
- **B. Prayer:** Roger Bennett
- **C. Pledge of Allegiance:** By Invitation

II. PUBLIC COMMENT: The public may comment on items that are not on the agenda.

III. CONSENT CALENDAR

- **A. Approve the minutes of January 27, 2015**

IV. REPORTS AND PRESENTATIONS

V. ACTION/DISCUSSION ITEMS

- **A. Auto Repair Building Discussion:**
  James Lawrence, owner of the automobile repair building recently built on Main Street, will make a presentation to the Council.

- **B. Ordinance No. 2015-02 - Amendments related to Group Living Arrangements (Section 3.1.11, Section 3.2.3.3, Article 3.29, Article 3.30 and Article 3.15):**
  Proposed amendments to the Alpine City Development Code related to group living arrangements will be presented to the City Council. Dan McDonald is the legal counsel on these proposed amendments.

- **C. David's Court Final Plat F Reinstatement and Revisions – Approximately 355 East Healey Blvd.:**
  The City Council will consider reinstatement of final approval for plat F of the proposed David's Court subdivision and review proposed revisions to that plat.

- **D. Eagle Point PRD Preliminary Plan Exceptions Discussion – Mark Wells and Taylor Smith – Approximately 800 W 600 N.:**
  The City Council will make determinations on requested exceptions for the Eagle Point PRD.

- **E. FY 2015-2016 Budget Discussion:**
  The City Council will continue discussing the development of the budget for the next fiscal year.

- **F. Ordinance No. 2015-01 - Appeal Authority Ordinance Amendment – Article 2.3:**
  The proposed ordinance would eliminate the Board of Adjustment and send all various requests to the Appeal Authority.

VI. STAFF REPORTS

VII. COUNCIL COMMUNICATION

VIII. EXECUTIVE SESSION: Discuss litigation, property acquisition or the professional character, conduct or competency of personnel.
ADJOURN

***Council Members may participate electronically by phone.**

Don Watkins, Mayor
February 6, 2015

THE PUBLIC IS INVITED TO PARTICIPATE IN ALL CITY COUNCIL MEETINGS. If you need a special accommodation to participate, please call the City Recorder's Office at (801) 756-6241.

CERTIFICATE OF POSTING. The undersigned duly appointed recorder does hereby certify that the above agenda notice was posted in three public places within Alpine City limits. These public places being the bulletin board located inside City Hall at 20 North Main and located in the lobby of the Bank of American Fork, Alpine Branch, 133 S. Main, Alpine, UT; and the bulletin board located at The Junction, 400 S. Main, Alpine, UT. The above agenda notice was sent by e-mail to The Daily Herald located in Provo, UT, a local newspaper circulated in Alpine, UT. This agenda is also available on our web site at www.alpinecity.org and on the Utah Public Meeting Notices website at www.utah.gov/pmn/index.html

PUBLIC MEETING AND PUBLIC HEARING ETIQUETTE

Please remember all public meetings and public hearings are now recorded.

- All comments **must** be recognized by the Chairperson and addressed through the microphone.
- When speaking to the Planning Commission, please stand, speak slowly and clearly into the microphone, and state your name and address for the recorded record.
- Be respectful to others and refrain from disruptions during the meeting. Please refrain from conversation with others in the audience as the microphones are very sensitive and can pick up whispers in the back of the room.
- Keep comments constructive and not disruptive.
- Avoid verbal approval or dissatisfaction of the ongoing discussion (i.e., booing or applauding).
- Exhibits (photos, petitions, etc.) given to the City become the property of the City.
- Please silence all cellular phones, beepers, pagers or other noise making devices.
- Be considerate of others who wish to speak by limiting your comments to a reasonable length, and avoiding repetition of what has already been said. Individuals may be limited to two minutes and group representatives may be limited to five minutes.
- Refrain from congregating near the doors or in the lobby area outside the council room to talk as it can be very noisy and disruptive. If you must carry on conversation in this area, please be as quiet as possible. (The doors must remain open during a public meeting/hearing.)

Public Hearing v. Public Meeting

If the meeting is a **public hearing**, the public may participate during that time and may present opinions and evidence for the issue for which the hearing is being held. In a public hearing there may be some restrictions on participation such as time limits.

Anyone can observe a **public meeting**, but there is no right to speak or be heard there - the public participates in presenting opinions and evidence at the pleasure of the body conducting the meeting.

ALPINE CITY COUNCIL MEETING
Alpine City Hall, 20 N. Main, Alpine, UT
January 27, 2015

I. CALL MEETING TO ORDER: Troy Stout, mayor pro tem, called the meeting to order at 7:10 pm. Mayor Don Watkins was excused.

A. Roll Call: The following were present and constituted a quorum:

Council Members: Troy Stout – mayor pro tem, Will Jones, Lon Lott, Roger Bennett
Council Member not present: Kimberly Bryant was excused.
Staff: Rich Nelson, Charmayne Warnock, David Church, Shane Sorensen, Chief Brian Gwilliam, Alice Winberg
Others: Steve Cosper, Gregg Colton, Adam Lawrence, Ginny Rainsdon, Ashley Tracy, Brook James, Sheldon Wimmer, Greg Ketch, David Collings, Darren Gooch, Emily Gooch, Bruce R. Baird

B. Prayer: Will Jones
C. Pledge of Allegiance: Will Jones

II. PUBLIC COMMENT: Ashley Tracy and Brook James introduced themselves as co mayors of the Alpine Youth Council. Ms. Tracy said they were hosting a food drive. It was a competition among the youth councils in the state. She said they would love the support of the City Council. They would be putting out flyers and collecting food door-to-door on Saturday. Troy Stout said they would post a notice of the food drive on the website and on the utility bills. It would also be in the Newsline.

III. CONSENT CALENDAR

A. Approve minutes of January 13, 2015

MOTION: Lon Lott moved to approve the Consent Calendar with the minutes of January 13, 2015 as corrected. Will Jones seconded. Ayes: 4 Nays: 0. Will Jones, Lon Lott, Roger Bennett, Troy Stout voted aye. Motion passed.

IV. REPORTS AND PRESENTATIONS:

A. December Financial Report: Alice Winberg reported that the city was doing very well. The General Fund Balance was up from last year. Property tax revenue was at 82% and they were expecting another large deposit. Sale tax revenue, motor vehicle fees and franchise fees were all slightly above 50% with half the fiscal year elapsed. Building permit and plan check fees were at 92% and 80% respectively.

Will Jones said he would like to see what the cost was of operating the pressurized irrigation system. Rich Nelson said he would get that for him.

V. ACTION/DISCUSSION ITEMS

A. Canyon Crest/SR-92 Intersection Discussion: Troy Stout said there was a major problem at the intersection of Canyon Crest Road and SR-92 in the mornings when everyone was trying to get to work and trying to get to Lone Peak High School. The traffic was backed up a quarter mile long. He wanted to discuss a short-term solution and a long-term solution to the problem.

Shane Sorensen said he had met with Terry Newell, the regional direction of UDOT, two weeks earlier. He had also met with Highland City's engineer and the County Commission since the intersection was outside Alpine City limits. Terry Newell had suggested adjusting the timing signal on the lights for the peak-use time of day. There was more traffic on Canyon Crest (about 12,000 trips a day) than on SR-92. The traffic was backed all the way up to Healey Boulevard. He said the number of trips on Alpine Highway was only slightly higher than on Canyon Crest. If they adjusted the time on the traffic signal to allow more traffic to go through to the high school and westbound on SR-92, it should help. Mr. Sorensen said he was told that UDOTs hands were tied in terms of a long-term solution but their representative would come to an Alpine meeting. She wanted to first get some information on the results of

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adjusting the timing signal and see how that worked. The long term solution would be build a right-hand turn lane onto SR-92, but that would require the acquisition of some property. Mr. Sorensen said there would be federal funding available through MAG (Mountainland Association of Governments) but that was a lengthy and rigid process. The next time to apply for funding would be January 2016. By the end of June, they would select the project. The money was then four years out from the selection date. A match from the city would be involved. Since it was a multijurisdictional project, Utah County would most likely step in and manage it. Shane Sorensen said that because it would be an expensive project, it might be better handled with federal funds.

Shane Sorensen said that when the county boulevard was built, it came in under budget and the leftover funds were still sitting there. He met with the county engineer about the possibility of using those funds for the intersection. The engineer said he would talk to the county commission about that possibility, but the county commission had said absolutely not. He said he had passed that information onto Mayor Watkins who said he would meet with the county commission about it.

Lon Lott asked about the possibility of connecting to the road in Highland that ran past the gravel pit and came out onto SR-92. Shane Sorensen said it was designed so Alpine could connect to it, but the road was windy and steep. However, it would be another way out of Alpine.

David Church said that when the subdivision went in, both cities planned to connect. The final plat in Smooth Canyon would connect the road, but it was planned only as a neighborhood connection, not a collector road.

Sheldon Wimmer said that originally High Bench Road was supposed to come down to the canyon before there were any houses built there. There was an agreement with the county but it expired because there was a lack of support from the community.

David Church said it was a very controversial issue in the 90s. The City did have a right-of-way from the county for a road but the majority of the council felt the road would impose a burden on the residents instead of alleviating it.

B. Legal Nonconforming Apartment Extension Request - 201 W. Center - Lomoin Property Management: Rich Nelson said there was an apartment complex at 201 W. Center Street. They had been approached by Lomoin Property Management who were interested in buying it. They proposed cleaning it up and legalizing the six units that were currently being rented. When it was built in 1967, it had been approved as a four plex. Since then, existing space was converted into two more rental units but the owner did not go through a legal process.

Will Jones said he had made some calls about the building and learned that one of the units had originally been the laundry room. The other unit had been a hair salon. When the business went away, the owner combined it with an existing apartment. In the last 70s, they put in a circular staircase and made the hair salon an individual unit.

David Church said their proposal was to remodel the whole thing and have six legal units with six mail boxes and six electrical boxes. The ordinance no longer permitted multiple family dwellings but when it was built, they were permitted. State law and city ordinance allowed a legal, nonconforming use to continue as long as it was not expanded. Legalizing it as a six plex would not expand the footprint of the building. It was his opinion that they could allow the six units as long as it was remodeled within the footprint of the building.

Steve Cosper was the new Planning Commission Chairman. He said the Planning Commission had not been opposed to the concept of making it a legal six plex but they couldn't quite get around the fact that it had never been a legal six plex. They didn't feel that they had the latitude to approve it as a six plex. He noted that the ordinance regarding legal nonconforming structures was confusing and probably needed to be rewritten.

Troy Stout questioned how they could recognize it as legal when it had never been legal. He asked how this issue related to the decision they had made on auto repair shops.

David Church said it was similar in terms of a long-term illegal use that the City had allowed to continue. He said there was a provision in state law that allowed cities to recognize illegal, nonconforming uses. The City had allowed

to it function as a six plex. The new owners wanted it to be formally legalized. They had said they would not buy it unless they could use it as a six plex.

Will Jones said he had made some calls about the building and learned that one of the units had originally been the laundry room. The other unit had been a hair salon. When the business went away, the owner combined it with an existing apartment. In the last 70s, they did some remodeling and made the hair salon an individual unit.

Greg Ketch who represented the investment group that wanted to buy the property said he had talked to the neighboring property owners. They all said they wanted to see it cleaned up.

Troy Stout said his big question was density. It originally had four units and now they had six.

Will Jones said he struggled with the idea that it was easier to get forgiveness for something illegal than get permission.

Lon Lott said there were other situations throughout the community where something was illegal but it was already built. What did the City do to enforce the ordinance in those cases. How did they rectify things? David Church said the City could enforce the ordinance. In this instance they could kick the renters out of the illegal apartments and fine the owner.

Sheldon Wimmer said he felt this was on opportunity to provide more low income housing in Alpine. The City was already on low income housing. He said he would support seeing it cleaned up and turned into a legal six plex.

Troy Stout asked what the comparison was between this and the auto shop. Would they be setting a precedent for other illegal uses?

David Church said that under their ordinance, it was discretionary. The City had allowed it to exist. The potential owners had come forward and asked the City to formally recognize it. He said they were making a decision on this and this alone. There was no precedent.

Will Jones wondered what the potential was for having a similar situation in the house on the corner of Alpine Boulevard and Moyle Drive. The house had originally been built for parents and their son. Currently it was being rented as a triplex. What would stop that home from becoming a four plex or even a ten plex? It was large enough to accommodate that use.

David Church said the four plex on Center Street was built when Alpine allowed boarding houses. People still rented their homes to strangers. The question was, was it equitable, was it fair?

Troy Stout said that if it didn't tie their hands in the future, he would be more comfortable approving the six plex.

The owners discussed what the renovation process involved. They had some tenants with a month-to-month lease. They would terminate the lease and would renovate those units fist. For the tenants with longer leases, they would essentially bribe them to leave. They would give them their full security deposit, etc.

MOTION: Will Jones moved to approve the use of the building at 201 E. Center as a six plex with the following conditions:

1. Only four units would be rented until the proposed renovations were completed along with any other items deemed necessary to comply with the building code, to be approved by the Building Inspector.
2. The parking lot be asphalted as proposed with approval from the City Engineer.
3. All units have new cabinets, appliances, floor coverings, and paint as proposed.
4. All units have enlarged bathrooms, washer/dryer, additional cabinets, new bar, and other kitchen improvements as proposed.
5. There be a minimum of fourteen (14) striped parking stalls.

6. A landscaping plan with no deep-rooted trees be submitted and approved by the City Planner.
7. The renovation project shall be completed within ten (10) months.
8. Any derelict vehicles shall be moved within 14 days.
9. A building permit shall be obtained for the renovation.

Lon Lott seconded. Ayes: 4 Nays: 0. Will Jones, Lon Lott, Roger Bennett, Troy Stout voted aye. Motion passed.

The potential buyer said he would also like to add six garages at the back of the property.

C. Resolution No. R2015-02 -Moyle Park Master Plan: The Planning Commission had reviewed the master plan for Moyle Park and recommended approval. Rich Nelson said that if the master plan was approved, it would give him the ability to seek funding. They would add some benches and pathways in the area of item 7.

Lon Lott said he had spoken with Jason Bond about using the old restroom for storage. He asked if a public hearing had been held on the plan. The Council indicated they had.

MOTION: Lon Lott moved to approve the Moyle Park Master Plan and move forward to build it and add an item on the plan showing pathways and picnic tables, and address other details and move equipment as needed. Will Jones seconded. Ayes: 4 Nays: 0. Lon Lott, Will Jones, Roger Bennett, Troy Stout voted aye. Motion passed.

Shane Sorensen said that if they would install the new restroom at the same time as they installed the restroom in Lambert Park, it would save money on the installation since they would need a crane to do it.

Will Jones recused himself from the next item and sat in the audience.

D. Resolution No. 2015-03 – Amended Ilangeni Resolution. David Church said the in December 2014 the Council had adopted Resolution No. R2014-11 which approved the petition to amend and add to the Ilangeni Estates subdivision plat. It included a provision that if the Subdivision Improvement Agreement was not agreed to by February 25, 2015, the Resolution would be void. Since that time the owners of Ilangeni Estates had been in negotiation with the owners of the Beck property and were close to signing an agreement. The new Resolution No. R2015-03 showed a lapse date of March 31, 2015. If an agreement was reached with the Beck family interest, there would be another amended Resolution.

Bruce Baird said they had begun negotiating with the Bruce Parker and the Beck interest. Mr. Parker had filed a petition to appeal Resolution No. 2014-11, but they had since negotiated and he felt they had reached substantive terms on all major deal points. They sent a draft of the purchase and sale agreement to Bruce Parker's counsel. He had sent a return email saying there were close.

Troy Stout asked what this would mean for Alpine City. Mr. Baird said it meant they would acquire 80 more acres of open space in a conservation easement. The Beck family wanted there to be a particular name on that open sapce and have sign. The developers expected the additional open space would add three more lots.

Roger Bennett questioned why a particular portion of the development with ground water was shown as public open space. It was surrounded by homes and private open space. Bruce Baird agreed that it should probably be designated as private open space.

MOTION: Roger Bennett moved to adopt Resolution No. R2015-03. Lon Lott seconded. Ayes: 3 Nays: 0. Roger Bennett, Troy Stout, Lon Lott voted aye. Will Jones abstained. Motion passed.

E. Budget Discussion for Fiscal Year 2015-2016: Rich Nelson said that they had met their goals in the water fund balance, sewer fund, and pressurized irrigation. They had money to begin working on projects. They were getting close on the storm drain fund. He said Alpine had good infrastructure and it was time to do some maintenance. Once a city fell behind in their infrastructure, it was hard to catch up.

He said the City also had impact fees that needed to be spent. Shane Sorensen reviewed the impact fee projects which were: a) 100 South street improvement; b) 600 North sewer extension; c) 100 West sewer improvements; d) 600 North storm drain improvements.

Rich Nelson reviewed proposed budget items for fiscal year 2015-2016 which included the following:

1. Go out for bid for the outside audit.
2. Go out for bid for inspection services and plan checks.
3. Hire an additional front office staff person.
4. Install a sample number of electronic-read culinary and pressurized irrigation meters.
5. Refurbish the bell tower.
6. Impact fee expenditure plan.
7. Public Works projects.
8. Increase in burial fees.
9. Burgess Park tennis courts redo (add pickle ball).
10. Deer remediation.
11. GASB 68.
12. Increase culinary water base rate by $1.
13. Stay in Utah Lake Commission or not.
14. Change water leak policy.
15. Text amendment fee.
16. Parking lot/restroom/fence/entrance signage – Lambert Park.
17. Increase City funds in capital improvement fund to $500,000.
18. Continue to follow the equipment replacement schedule.
19. Begin using funds over the fund balance goals to start maintenance projects.

He next reviewed the projections for the five-year financial plan stating that they were the assumptions used to create the plan. He asked the Council to contact him if there was anything they wanted to add.

1. Assume 2 new permanent full-time new staff positions in the next 5 years.
2. Assume increased use of part-time workers by Public Works.
3. Assume 2% salary increase a year.
4. Assume retirement will go up by 0% to 1% a year for 3 years then go to 2% for the last two years.
5. Assume GASB 68 will require the City to set aside more assets for retirement.
6. Assume that all replacement hires in Public Works will be an entry level position.
7. Assume that health care costs will continue to increase at 2% a year and that Alpine will change its health care system by 2018.
8. Assume that we continue on the same capital equipment replacement schedule as we have.
9. Assume we will have 37 new homes per year for the next 5 years.
10. Assume the assessed valuations for the homes in Alpine has reached bottom and the assessed valuation of the properties will increase 3% to 5% a year for the next 5 years and that property tax will only increase based on new growth.
11. Assume TNT for the next 5 years to collect redemptions.
12. Assume one new soccer park or a new public works building and staging area will be constructed.
13. Assume a gradual increase in WC, insurance, FICA, etc.
14. Assume police and fire will hire an additional officer each in the next 5 years.
15. Assume police and fire and dispatch will grow 1 - 2% a year for the next 5 years.
16. Assume garbage rates will increase 2% a year and that they will be covered by rate increases.
17. Assume sewer rates will increase by 2% a year and they will be covered by rate increases.
18. Assume that the City will go to a mandatory city wide green waste garbage pickup program.
19. Assume that the City will pick up the total amount of fees for telecommunications and revenue will increase by 2% a year from telecommunications fees.
20. Assume a yearly 1 to 1.5% increase in utility rates for PI and storm drain based on a yearly CPI based rate increase.
21. Assume that culinary water rates will increase based on the water rates study of the City Engineer and the base rate will increase by at least $1 every year for the next 3 years.

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22. Assume that B&C road funds remain flat for the next year but will increase by 5% a year for 4 years.
23. Assume no new bonding.
24. Assume Alpine and Highland will jointly hire a part time emergency preparedness coordinator.
25. Assume that a new meter reading system for culinary and pressurized irrigation will be installed.
26. Assume a new PI reservoir will be constructed.
27. Assume that land for a new public works facility will be purchased.

F. Cell Tower in Lambert Park Proposed Lease: Rich Nelson said Alpine City had been approached by a telecommunication company to see if the City would lease out one of the two remaining spaces on the Lambert Park cell tower. The proposed lease terms were:

1. 5-year lease.
2. Renewal after five years with a 10% increase in payment.
3. Monthly lease rate of $1,600.

Troy Stout questioned if they city would be getting the maximum value out of the lease rate. He felt a 10% increase after five years was low. Rich Nelson said if they looked at the monthly lease rate in comparison with other leases, it was better.

MOTION: Will Jones moved to approve the terms of the lease on the Lambert Park cell tower as proposed. Roger Bennett seconded. Ayes: 4 Nays: 0. Will Jones, Roger Bennett, Lon Lott, Troy Stout voted aye. Motion passed.

Shane Sorensen said the site plan would have to go through the Planning Commission and the details of the lease agreement would be worked out later.

VI. STAFF REPORTS

Shane Sorensen reported on the following:

- The sewer line serving Box Elder South subdivision was being constructed.
- The Box Elder water tank was under construction.
- They were doing work in Lambert Park. The No Motorized Vehicle signs had been vandalized so they were putting in boulders.
- Crack sealing and road maintenance was being done.

Troy Stout said there was a dip on Healey Boulevard similar to the dip on 100 South before the waterline broke. Shane Sorensen said he would look into it.

Charmayne Warnock reported that the *Newsline* article on nightshade that the Council had requested and been beneficial. She had a neighbor who had nightshade growing in her backyard and thought it was some kind of current bush. She was going to make jelly out of the red berries until she read the article.

Brian Gwilliam asked it is would be possible to eradicate the plant. The police had an incident where a youth was trying to injure himself with the nightshade.

COUNCIL COMMUNICATION

Lon Lott read the following Conflict of Interest statement which he had submitted to the City.

"I voluntarily submit the following conflict of interest statement. I am employed as CEO of LSL Alpine Enterprise LLC. As such, I provide landscape and irrigation services to clients that include individuals, corporations and governmental entities. My clients have included Alpine City Corporation, Don Watkins, Will Jones, Kimberly Bryant, and Roger Bennett. Also other prominent individuals who live in Alpine City have been my clients. If any issues arise in my duties as Alpine City Council member that have to do with clients I have served or are now serving, I will declare that interest to the Council before voting on that issue."

Troy Stout said there had been things thrown around that were factual and some that were not. He said he appreciated Lon's integrity.

Will Jones said he had looked at the renderings for the James Lawrence Auto Repair Shop and what the City Council approved was not what was built. He said they took a risk in approving the business. It was his feeling that the plan that was presented to the Council was the plan that should be built.

Troy Stout said he agreed. They had approved it in good faith.

Rich Nelson said he had spoken with James Lawrence. The building he built was the building shown in the plans that were submitted to the building department, stamped and approved by the building official. There were features that were different from the plans presented to the City Council.

David Church said that the building official inspected the plans and the structure to make sure it met building code. There was no process in the City where someone monitored the construction to make sure it met the plans approved by the City Council. He said the building was constructed and the roofline was not going to change, but there were things that could be done to dress up the front of building.

Shane Sorensen said it was suggested that Mr. Lawrence have his architect look at the building and look at the design approved by the Council and see if there was something they could do to make it look better.

David Church said the City could revoke his business license but he suggested they talk to him first. Rich Nelson said he would put it on a City Council agenda for discussion.

Will Jones said he had spoken with the Hunters and the rock was removed as requested. He thanked David Church for his work on the McClure issue and said he was looking forward to the training presentation from David Church and wondered if it could be done the last meeting in February or the first meeting in March since he would be gone part of the time.

Shane Sorensen said he had met with Questar about gas line in Burgess Park. He showed a drawing of the proposed alignment and asked if it was acceptable. They were looking at doing the work in June or July and wanted to disrupt baseball as much as possible. He added that they needed to clean the gravel out of the debris basins in Lambert Park and would use it to fill some of the holes in roads.

EXECUTIVE SESSION: None held.

MOTION: Lon Lott moved to adjourn. Roger Bennett seconded. Ayes: 4 Nays: 0. Motion passed.

The meeting was adjourned at 9:50 pm.

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ALPINE CITY COUNCIL AGENDA

SUBJECT: **Group Living Amendments**

FOR CONSIDERATION ON: **10 February 2015**

PETITIONER: **Staff**

ACTION REQUESTED BY PETITIONER: **Adopt Ordinance No. 2015-02**

APPLICABLE STATUTE OR ORDINANCE: **Section 3.1.9 (Amendments to the Zoning Ordinance)**

PETITION IN COMPLIANCE WITH ORDINANCE: **Yes**

BACKGROUND INFORMATION:

Dan McDonald was the legal counsel for Alpine City in the lawsuit vs. the Alpine Recovery Lodge. After the lawsuit was settled, Mr. McDonald suggested that we address our ordinance in relation to group living arrangements within Alpine City. He has worked with staff to prepare some proposed amendments. This proposal would amend the applicable sections regarding group living arrangements which includes Section 3.1.11, Section 3.2.3.3, Article 3.29, Article 3.30 and Article 3.15 of the Alpine City Development Code. Dan McDonald will be at the Planning Commission meeting to discuss these proposed amendments.

PLANNING COMMISSION MOTION:

Bryce Higbee moved to recommend approval of the proposed changes to the Ordinance (Section 3.1.11, Section 3.2.3.3, Article 3.29, Article 3.15) as drafted.

Steve Swanson seconded the motion. The motion passed with 6 Ayes and 0 Nays. Bryce Higbee, Jason Thelin, Steve Cosper, David Fotheringham, Steve Swanson and Judi Pickell all voted Aye

ORDINANCE NO. 2015-02

AN ORDINANCE AMENDING SECTION 3.1.11, SECTION 3.2.3.3, ARTICLE 3.29, ARTICLE 3.30 AND ARTICLE 3.15 OF THE ALPINE CITY, UTAH, DEVELOPMENT CODE.

PART I

FINDINGS

1. The City recognizes, through its observation, study and experience, as the United States Supreme Court recognized in *Village of Belle Terre v. Boraas*, 416 U.S. 1, 9, 94 S.Ct. 1536, 1541, 39 L.Ed.2d 797 (1974), that group living, including "[t]he regimes of boarding houses, fraternity houses, and the like present urban problems." Among other things, "[m]ore people occupy a given space; more cars rather continuously pass by; more cars are parked; noise travels with crowds." *Id.*

2. The U.S. Supreme Court, in an attempt to help clarify the appropriate role of local government with respect to community planning noted:

> "The values it represents are spiritual as well as physical, aesthetic as well as monetary. It is within the power of the legislature to determine that the community should be beautiful as well as healthy, spacious as well as clean, well balanced as well as carefully patrolled."

Berman v. Parker, 348 U.S. 26, 33, 75 S. Ct. 98, 102-03, 99 L.Ed. 27 (1954).

The Supreme Court subsequently commented further in *Boraas* with respect to the right of a community in the preservation of residential areas:

> A quiet place where yards are wide, people few, and motor vehicles restricted are legitimate guidelines in a land use project addressed to family needs. The police power is not confined to elimination of filth, stench, and unhealthy places. It is ample to lay out zones where family values, youth values, and the blessings of quiet seclusion and clean air make the area a sanctuary for people."

3. The United States Supreme Court and federal appellate courts continue to recognize that "[l]and use planning and the adoption of land use restrictions constitute some of the most important functions performed by local government." *Bryant Woods Inn, Inc. v. Howard County*, 124 F.3d 597, 603 (4th Cir. 1997) (citing *FERC v. Mississippi*, 456 U.S. 742, 768 n. 30, 102 S.Ct. 2126, 2141 n. 30, 72 L.Ed.2d 532 (1982) ("regulation of land use is perhaps the quintessential state activity")). These courts continue to recognize that local land use ordinances may legitimately be utilized "to preserve 'the character of neighborhoods, securing "zones where family values, youth values, and the blessings of quiet seclusion and clean air make the area a sanctuary for people."'" *Id.* (quoting *City of Edmonds v. Oxford House, Inc.*, 514 U.S. 725, 732-33, 115 S.Ct. 1776, 1780, 131 L.Ed.2d 801 (1995) (quoting *Village of Belle Terre v. Boraas*, 416 U.S. 1, 9, 94 S.Ct. 1536, 1541, 39 L.Ed.2d 797 (1974))).

4. The Community Vision Statement & Guiding Principles contained in the City's General Plan state that "[f]uture residential development must be carefully considered and designed to maintain the low-density feeling in the City. Residential development projects should focus on maintaining the traditional single-family residence as the primary housing style in Alpine City." (Alpine City General Plan, pp. 6-7.)

5. The Land Use Element of the City's General Plan has, as its vision statement, the "desire[] to preserve and maintain the small-town, rural atmosphere of the community by maintaining lower density residential neighborhoods, limited appropriate commercial growth, and preserving and protecting open space and hillsides." (Alpine City General Plan, Land Use Element, p. 10.)

6. One of the goals of the Land Use Element is to "[m]aintain lower density residential neighborhoods with the traditional single-family residence as the principal housing style." (Alpine City General Plan, Land Use Element, p. 10.) Another goal is to "[p]rovide adequate screening or buffers when possible to minimize impacts on residential neighborhoods from commercial uses." (*Id.*)

7. According to the latest U.S. Census data for Alpine City, the average household size is 3.89 persons per household. And, for the years 2007-2011, 85.5% of individuals living in Alpine lived in the same house for 1 year or more.

8. Among other things, Group Living Arrangements tend to introduce transiency, congestion, increased traffic, increased parking and other urban problems and challenges into communities.

9. Regulation of Group Living Arrangements serves to preserve housing densities consistent with both reality (in terms of the average composition of single family households in Alpine) and the goals and objectives of the General Plan. It also promotes permanence and stability in neighborhood composition.

10. Regulating Group Living Arrangements is an essential aspect of fostering the goals of the General Plan and Alpine City's zoning scheme, which seeks uncrowded, stable (non-transitory) single family neighborhoods.

11. The City also recognizes the need, in certain demonstrable circumstances, for individuals with handicaps or disabilities to live in a Group Living Arrangements.

12. In order to fulfill the purposes of the General Plan while accommodating the demonstrable needs of individuals with handicaps or disabilities to live in Group Living Arrangements, which are generally prohibited for individuals without disabilities or handicaps, the City desires to clarify its ordinances and define its practices and policies with regard to these issues.

WHEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF ALPINE CITY, UTAH, AS FOLLOWS:

PART II

TEXT OF ORDINANCE

SECTION 1. Section **3.1.11** of the Development Code, is hereby amended as follows:

The following definition of "**GROUP LIVING ARRANGEMENT**" is added:

22. **GROUP LIVING ARRANGEMENT**. A group living or congregate living arrangement where groups of more than four unrelated persons live together in a single dwelling unit, including, but not limited to, a batching apartment, boarding house, Congregate Living Unit, Assisted Living Facility, Nursing Care Facility, Residential Facility for Persons With a Disability, dormitory, student housing, fraternity, club, institutional group, half-way house, or other similar group living or congregate living arrangement.

Paragraphs 22 – 51 are renumbered to paragraphs 23 – 52.

The definition of "**REASONABLE ACCOMMODATION**" is modified as follows:

~~40.~~ 41. **REASONABLE ACCOMMODATION.** A reasonable change in any rule, policy, practice, or service necessary to afford ~~a~~ persons with a disability equal opportunity to use and enjoy a dwelling when compared to similarly-situated persons or groups. ~~For the purposes of this and related ordinances, the following words have the following meanings:~~

~~A. Reasonable. A requested accommodation that will not undermine the legitimate purpose of existing zoning regulations notwithstanding the benefit that the accommodation will provide to a person with a disability.~~

~~B. Necessary. The applicant must show that, but for the accommodation one or more persons with a disability likely will be denied an equal opportunity to enjoy the housing of their choice.~~

~~C. Equal Opportunity. Achieving equal results as between a person with a disability and a nondisabled person.~~

The definition of "**RESIDENTIAL FACILITY FOR PERSONS WITH A DISABILITY**" is modified as follows:

~~43.~~ 44. **RESIDENTIAL FACILITY FOR PERSONS WITH A DISABILITY.** A residence in which no more than ~~one (1)~~ eight (8) unrelated persons with a disability reside~~s~~ and which is:

A. Licensed or certified by the Department of Human Services under Title 62A, Chapter 2, of the Utah Code, Licensure of Programs and Facilities; or

B. Licensed or certified by the Department of Human Health under Title 26, Chapter 21, Health Care Facilities Licensing and Inspection Act.

SECTION 2. Section **3.2.3.3** of the Development Code, is hereby amended as follows:

3. Child care nurseries and group day-care centers~~, nursing homes~~;

SECTION 3. Article **3.29** of the Development Code is hereby amended as follows:

3.29.1 PURPOSE AND INTENT. It is the intent of the City that this section shall be interpreted and applied in ~~such a way as to effectuate the policy and goals of~~ a manner that is consistent with Title 57, Chapter 21, Utah Fair Housing Act, and the federal Fair Housing Amendments Act of 1988, 42 U.S.C. Sec. 3601 et seq.~~ to allow persons with disabilities to have the same rights and privileges to live in the residential areas of Alpine City as those persons who are not disabled~~.

3.29.2 DEFINITIONS. The definition of disability shall be as defined in Title 57, Chapter 21, Utah Fair Housing Act, and shall include the definition of "Handicap" under the federal Fair Housing Amendments Act of 1988, 42 U.S.C. Sec. 3601 et seq. ~~Residential Facility for persons with a disability shall have the definition found in Utah Code 10-9a-102(43)~~ as may be amended from time to time. All other definitions shall be as found in Chapter 3 Section 3.1.11 of the Alpine City Development Code. If a word or term is not defined in the Development Code that word or term is intended to have the definition found in any good English language dictionary.

3.29.3 PERMITTED USE. A ~~residential facility for persons with a disability~~ Residential Facility for Persons With a Disability shall be a permitted use in any zone in the City where ~~similar residential dwellings that are not residential facilities for persons with a disability~~ Group Living Arrangements are allowed as a permitted or conditional use, subject to the same land use regulations applied to ~~single family residential dwellings~~ other Group Living Arrangements in the zone in which the facility is proposed to be located, except as may be specifically modified in this section.

~~**3.29.4 NOT A BUSINESS.** A residential facility for persons with a disability will not be considered a business because a fee is charged to the occupants of the facility for food, treatment, care or for actual and necessary costs of operation and maintenance of the facility.~~

~~**3.29.5 DISPERSAL OF FACILITIES.** In order to preserve the residential character of the neighborhoods of Alpine City, and the residential nature of the residential facilities for persons with a disability, and to see that such facilities are reasonably dispersed throughout the City, no residential facility for persons with a disability shall be located within 4,000 feet from an existing residential facility for persons with a disability. The distance shall be measured from the property line of the existing facility to the property line of the proposed facility~~.

~~**3.29.6 NUMBER OF OCCUPANTS.** Occupancy of a residential facility for persons with a disability shall be limited to no more than four (4) unrelated persons unless the zone in which the facility is located allows for greater occupancy for single family residences, in which case the occupancy limitations for single family residences in that zone shall~~

apply. For purposes of determining the number of occupants of a facility, persons engaged to provide services to the residents of the facility shall not be counted.

3.29.7 SECURITY FOR SUBSTANCE ABUSE FACILITIES. Residential facilities for persons with a disability that are substance abuse facilities and are located within 500 feet of a school, shall provide, in accordance with rules established by the Utah Department of Human Services under Title 62A, Chapter 2, Licensure of Programs and Facilities:

(A) a security plan satisfactory to the Lone Peak Public Safety District authorities;

(B) 24-hour supervision for residents; and

(C) other 24-hour security measures as may be recommended by the Lone Peak Public Safety District.

3.29.8 INSPECTIONS AND PERMITS. All residential facilities for persons with a disability shall obtain permits that verify compliance with the same building, safety, and health regulations as are applicable in the same zone to similar uses that are not residential facilities for persons with a disability.

3.29.9 FUNDAMENTAL CHANGE IN THE NEIGHBORHOOD. A residential facility for persons with a disability that would likely create a fundamental change in the character of a residential neighborhood may be excluded from a zone. The Development Review Committee (DRC) shall determine if a proposed residential facility for persons with a disability will result in a fundamental change in the character of the residential neighborhood in which it is proposed to be located. The criteria to be used to determine whether or not a proposed facility will fundamentally change the character of the neighborhood shall include such things as the look, design and size of any proposed new construction for the facility, but may not include the fact that the potential occupants of the facility are disabled; or that the occupants will require services, care, or treatment at the facility. The decision of the DRC may be appealed to the Alpine City Appeal Authority pursuant to Article 2.3 of the Alpine City Development Code.

3.29.10 LICENSES. The City does not require a license for single family residences and therefore shall not license programs or entities that operate facilities for persons with a disability. The responsibility to license programs or entities that operate facilities for persons with a disability, as well as to require and monitor the provision of adequate services to persons residing in those facilities, shall rest with:

(A) for programs or entities licensed or certified by the Department of Human Services, the Department of Human Services as provided in Title 62A, Chapter 5, Services to People with Disabilities; and

(B) for programs or entities licensed or certified by the Department of Health, the Department of Health under Title 26, Chapter 21, Health Care Facility Licensing and Inspection Act.

SECTION 4. Article 3.30 of the Development Code is hereby amended as follows:

3.30.1 PURPOSE. ~~It is the policy of the jurisdiction, pursuant to the Title 57, Chapter 21, Utah Fair Housing Act, and the federal Fair Housing Amendments Act of 1988, 42 U.S.C. Sec. 3601 et seq (hereafter "fair housing laws"), to provide individuals with disabilities reasonable accommodation in rules, policies, practices and procedures to ensure equal access to housing and facilitate the development of housing for individuals with disabilities.~~ This chapter establishes a procedure for making requests for reasonable accommodation in land use, zoning and building regulations, policies, practices and procedures of the City ~~to comply fully with the intent and purpose of fair housing laws~~.

3.30.2 APPLICABILITY. ~~Reasonable accommodation in the land use and zoning context means providing individuals with disabilities or developers of housing for people with disabilities, flexibility in the application of land use and zoning and building regulations, policies, practices and procedures, or even waiving certain requirements, when it is necessary to eliminate barriers to housing opportunities.~~

~~An individual with a disability is someone who has a physical or mental impairment that limits one or more major life activities; anyone who is regarded as having such impairment; or anyone with a record of such impairment.~~

A request for reasonable accommodation may be made by any individual with a disability, his or her representative, or a developer or provider of housing for individuals with disabilities~~, when the application of a land use, zoning or building regulation, policy, practice or procedure acts as a barrier to fair housing opportunities~~.

3.30.3 REQUESTING REASONABLE ACCOMMODATION.

~~A. In order to make housing available to an individual with a disability, any eligible person as defined in above may request a reasonable accommodation in land use, zoning and building regulations, policies, practices and procedures.~~

A.~~B.~~ Requests for reasonable accommodations shall be in writing and provide the following information:

(1) Name and address of the individual(s) requesting reasonable accommodation;

(2) Name and address of the property owner(s);

(3) Address of the property for which accommodation is requested;

(4) Description of the requested accommodation and the regulation(s), policy or procedure for which accommodation is sought; ~~and~~

(5) Reason that the requested accommodation may be necessary for the individual(s) with the disability to use and enjoy the dwelling; and

(6) All information necessary for the findings set forth in Sec. 3.30.5.

B.~~C.~~ Requests for reasonable accommodations shall be submitted to the Development Review Committee (DRC) ~~fourteen (14) days before a regularly scheduled Planning Commission meeting~~.

C.~~D.~~ Any information identified by an applicant as confidential shall be retained in a manner so as to respect the privacy rights of the applicant and shall not be made available for public inspection.

D.~~E.~~ ~~A request for reasonable accommodation in regulations, policies, practices and procedures may be filed at any time that the accommodation may be necessary to ensure equal access to housing.~~ A reasonable accommodation does not affect an individual's obligations to comply with other applicable regulations not at issue in the requested accommodation.

E.~~F.~~ If an individual needs assistance in making the request for reasonable accommodation, the City will provide assistance to ensure that the process is accessible.

3.30.4 REVIEWING AUTHORITY.

A. Requests for reasonable accommodations shall be reviewed ~~and recommended by the Planning Commission and approved by the City Council~~ using the criteria set forth in Sec. 3.30.5 below.

B. The ~~Alpine City Council~~ DRC shall issue a written decision on a request for reasonable accommodation within thirty (30) days of the date of the application and may either grant, grant with modifications, or deny a request for reasonable accommodation in accordance with the required findings set forth in Sec. 3.30.5 below.

C. ~~If necessary to reach a determination on the request for reasonable accommodation, the Planning Commission and/or City Council may request further information from the applicant consistent with fair housing laws, specifying in detail the information that is required. In the event that a request for additional information is made, the thirty (30) day period to issue a decision is stayed until the applicant responds to the request.~~ It is the applicant's burden to demonstrate that the accommodation is necessary and reasonable under the standards and definitions set forth in federal and state law, including federal and state case law.

3.30.5 REQUIRED FINDINGS.

The written decision to grant, grant with modifications, or deny a request for reasonable accommodation shall be ~~consistent with fair housing laws and~~ based on the following factors:

A. Whether the housing, which is the subject of the request for reasonable accommodation, will be used by an individual with disabilities protected under fair housing laws;

B. Whether the requested accommodation is necessary to ~~make housing available to an individual with disabilities protected under the fair housing laws;~~ to afford persons with a disability equal opportunity to use and enjoy a dwelling when compared to similarly-situated persons or groups without a disability;

C. Whether the requested accommodation would impose an undue financial or administrative burden on the City~~and~~;

D. Whether the requested accommodation would require a fundamental alteration in the nature of the City's land use, ~~and~~ zoning or building programs;~~.~~

E. Whether the requested accommodation is reasonable;

F. Whether the request for accommodation would result in a dwelling being made available to an individual whose tenancy would constitute a direct threat to the health or safety of other individuals or whose tenancy would result in substantial physical damage to the property of others; and

G. Any other relevant considerations under federal or state law.

3.30.6 WRITTEN DECISION ON THE REQUEST FOR REASONABLE ACCOMMODATION.

A. The written decision on the request for reasonable accommodation shall explain ~~in detail~~ the basis of the decision, including the reviewing authority's findings on the criteria set forth in Sec. 3.30.5. All written decisions shall give notice of the applicant's right to appeal and to request reasonable accommodation in the appeals process as set forth below. The notice of decision shall be sent to the applicant by certified mail.

B. The written decision of the ~~City Council~~ DRC shall be final unless an applicant timely appeals it to the Land Use Hearing Officer, as the Alpine City Appeal Authority.

C. If the ~~City Council~~ DRC fails to render a written decision on the request for reasonable accommodation within the thirty (30) day time period allotted by Sec. 3.30.4(B), the request shall be deemed ~~granted~~ denied based upon the insufficiency of the applicant's information to satisfy the criteria set forth in Sec. 3.30.3.

D. While a request for reasonable accommodation is pending, all laws and regulations otherwise applicable to the property that is the subject of the request shall remain in full force and effect.

3.30.7 APPEALS.

A. Within ten (10) days of the date of the ~~City Council's~~ DRC's written decision or expiration of the thirty (30) day time period allotted by Sec. 3.30.4(B), an applicant may appeal an adverse decision to the Alpine City Appeal Authority. Appeals from the adverse decision shall be made in writing.

B. If an individual needs assistance in filing an appeal on an adverse decision, the City will provide assistance to ensure that the appeals process is accessible.

C. All appeals shall contain a statement of the grounds for the appeal. Any information identified by an applicant as confidential shall be retained in a manner so as to respect the privacy rights of the applicant and shall not be made available for public inspection.

D. ~~Nothing in this procedure shall preclude an aggrieved individual from seeking any other state or federal remedy available.~~ The review of all such appeals shall be based upon the record presented to the DRC.

SECTION 4. Article 3.15 of the Development Code, is hereby amended as follows:

ARTICLE 3.15 ~~RESERVED.~~ GROUP LIVING ARRANGEMENTS

3.15.1 GROUP LIVING ARRANGEMENTS PROHIBITED. Group Living Arrangements which are not expressly permitted within a zone or by the Development Code are expressly prohibited.

PASSED AND ORDERED PUBLISHED BY THE CITY COUNCIL OF ALPINE CITY, UTAH, THIS ____ DAY OF _____ 20__.

_____
Don Watkins, Mayor

ATTEST:

_____
City Recorder

ALPINE CITY COUNCIL AGENDA

SUBJECT: David's Court Final Plat F Approval Reinstatement and Revisions

FOR CONSIDERATION ON: 10 February 2015

PETITIONER: Patterson Construction

ACTION REQUESTED BY PETITIONER: Reinstate Final Approval and Approve the Proposed Revisions

APPLICABLE STATUTE OR ORDINANCE: See Engineer Review

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

The Planning Commission and City Council have previously approved the David's Court Subdivision consisting 15 lots on 16.42 acres which is located north of Healey Blvd. and east of Canyon Crest Road. The proposed development is in the CR-40,000 zone.

Since that approval, the Developer was approached by a purchaser who is willing to buy the eastern half of the property and requested to have it remain as one lot for the time being. See the attached layout. This sale would combine several lots leaving a total of 9 lots on 16.42 acres to be platted. In order to accommodate the purchaser, the Developer revised the westerly lot layout slightly. The developer still proposes two cul-de-sacs for David's Court (see attached construction drawings) but will only record and build 9 lots for the time being. This is essentially a phased development proposal as we do not know if/when the easterly half of the development will ever be developed in the future by the land owner.

The approval has since expired (Paragraph 4.6.3.12). Because there are proposed revisions to the Final Plat, the approval will need to be reinstated with a recommendation from the Planning Commission and approval from the City Council (Paragraph 4.6.3.13).

The proposed David's Court Subdivision (revised) consists of 9 lots on 16.42 acres, with the future potential of 15 lots. The lots range in size from 40,003 to 361,865 square feet. This plan will require the vacation of David's Court Plats A thru C to allow property lines to be adjusted to the current plan. The development is not located within any sensitive lands overlay.

NOTE: The Engineer's review letter is written as if the development were fully developed with 15 lots and two new cul-de-sac streets being built.

PLANNING COMMISSION MOTION:

Judi Pickell moved to recommend approval of reinstatement with revisions of the David's Court Final Plat F with the following condition:

1. The Developer meet the water policy

Steve Swanson seconded the motion. The motion passed with 6 Ayes and 0 Nays. Bryce Higbee, Jason Thelin, David Fotheringham, Steve Cosper, Steve Swanson and Judi Pickell all voted Aye.

Date: January 27, 2015

By: Jed Muhlestein, P.E.
Assistant City Engineer

Subject: David's Court Subdivision – REVISED Final Review
9 lots on 16.42 acres

Background

The Planning Commission and City Council have previously approved the David's Court Subdivision consisting 15 lots on 16.42 acres which is located north of Healey Boulevard and east of Canyon Crest Road. The proposed development is in the CR-40,000 zone.

Since that approval the Developer was approached by a purchaser who was willing to buy the eastern half of the property and requested to have it remain as one lot for the time being. See the attached layout. This sale would combine several lots leaving a total of 9 lots on 16.42 acres to be platted. In order to accommodate the purchaser, the Developer revised the westerly lot layout slightly. The Developer still proposes two cul-de-sacs for David's Court (see attached construction drawings) but will only record and build 9 lots for the time being. This is essentially a phased development proposal as we do not know if/when the easterly half of the development will ever be developed in the future by the land owner.

The proposed David's Court Subdivision consists of 9 lots on 16.42 acres, with the future potential of 15 lots. The lots range in size from 40,003 to 361,865 square feet. This plan will require the vacation of David's Court Plats A thru C to allow property lines to be adjusted to the current plan. The development is not located within any sensitive lands overlay zone.

The rest of this review letter is written as if the development were fully developed with 15 lots and two new cul-de-sac streets being built.

Street System

The proposed development shows access from Healey Boulevard with two new cul-de-sacs. Both cul-de-sacs are less than 450' in length. All lots, except Lot 3, will have frontage on these

new cul-de-sacs. Lot 3 has frontage and will access off Canyon Crest Road which is an arterial road. Lot 3 will be required to have a driveway design such that backing out onto Canyon Crest will not occur (Development Code 4.7.4.14) and will require the recommendation of DRC, Planning Commission, and approval of the City Council. A note is shown on the plat for this requirement. A note is also shown on the plat to move the driveway as far south along the frontage of Lot 3 as possible to give the proper sight distance for south bound traffic on Canyon Crest. The DRC recommends this approach for Lot 3. This was previously recommended and approved by the Planning Commission and City Council. Previous redlines regarding street design have been addressed by the developer.

Sewer System

There is an existing 8-inch sewer line running in Healey Boulevard that can serve all but Lot 3 of the development. Some sewer laterals were installed northward off Healey Boulevard in anticipation for the development and most will be used. There is one on Healey Blvd at the intersection of the proposed cul-de-sac Austin Circle that will be or will remain capped as it is in an un-usable location for the site plan. In order to provide sewer service to Lot 3 an extension of the sewer system in Canyon Crest would need to be built as the nearest sewer manhole to that lot is about 175' to the south. The sewer design is provided and approved. Redlines from Preliminary have been addressed.

Culinary Water System

The subdivision is well below the 5350 foot elevation, which is the highest elevation the existing water system can serve and still provide a minimum 40 psi required by ordinance. There is currently an 8-inch water line running in Healey Boulevard that can serve the development.

At Preliminary Review the topic of available fire flows was discussed. Based on the International Fire Code, which the City has adopted, fire flows dictate the size of home that can be built with or without having to install automatic fire sprinklers. After Preliminary Review the developer has upsized the proposed size of lines in the cul-de-sacs to provide enough fire flow to support a 7,700 square foot home in the westerly cul-de-sac and a 6,200 square foot home in the easterly cul-de-sac. Whether or not automatic fire sprinklers, or other means, are required to protect a home due to available fire flow is checked at the building permit stage.

Redlines from Preliminary have been addressed and the water design is acceptable. The Fire Marshall has approved the location of the proposed fire hydrants. 3/4-inch service lines with 3/4-inch water meters are shown to be constructed for each new lot where existing services cannot be utilized. Where existing services cannot be utilized, they shall be removed.

Pressurized Irrigation System

There is currently a 12-inch pressurized irrigation line running in Healey Boulevard that could serve the development. Additionally, there are five pressurized irrigation boxes on the north side

of the Healey Boulevard, four are shown to be used, one will be removed. There is currently no service for Lot 3, one will have to be installed and connected to the 12-inch main line that is running in Canyon Crest. The construction drawings align with previous calculations on the pressurized water system model which show 6-inch lines serving the cul-de-sacs. 1 inch laterals will be required for each lot where they are not currently installed. Where existing services cannot be utilized, they shall be removed.

Storm Water Drainage System

A storm drain design was provided. It shows catchment at the lower end of each cul-de-sac with a detention basin which releases at a controlled rate into the existing system in Healey Blvd. Storm drain easements are provided for the city to perform routine maintenance when needed. Redlines on the storm drain design have been addressed.

A storm water pollution prevention plan would be required for the site addressing best management practices that will be implemented to control erosion on the site during construction. A UPDES and Land Disturbance Permit will be required prior to construction.

General Subdivision Remarks

The water policy will need to be met for this development. The applicant shows they plan to use credits, which are acceptable.

We recommend that Final Approval of the proposed development be approved with the following conditions:

- **The Developer meet the water policy**

January 27, 2015

Jason Bond, City Planner
Alpine City
20 North Main
Alpine, Utah 84004

Subject: **David's Court Plat F - Water Requirement**
9 lots on 16.42 acres

Dear Jason:

We have calculated the water requirement for Phase A of the David's Court subdivision. The subdivision consists of 9 lots on 16.42 acres.

The developer will be required to provide **3.87** acre-feet of water to meet the water policy for the development. The total required is 30.20 acre-feet but the developer had previously met the water policy for most of the property on prior plats.

Please contact me if you have any questions.

Sincerely,
ALPINE CITY

Jed Muhlestein, P.E.
Assistant City Engineer

cc: File
Developer

Water Requirements
David's Court Plat F
January 28, 2015

Lot	Area (sf)	Indoor Requirement (0.45 ac-ft per home)	Outdoor Requirement (1.66 ac-ft/acre)	Total (ac-ft)
1	40,003	0.45	1.52	1.97
2	42,059	0.45	1.60	2.05
3	40,012	0.45	1.52	1.97
4	41,320	0.45	1.57	2.02
5	40,738	0.45	1.55	2.00
6	40,214	0.45	1.53	1.98
7	40,007	0.45	1.52	1.97
8	40,009	0.45	1.52	1.97
9	361,865	0.45	13.79	14.24

Total	**30.20**
Credits Previously given	**26.33**
Total Needed	**3.87**

Jed Muhlestein, P.E.
Asistant City Engineer

11038 N
Highland Blvd
#400 Highland,
UT 84003

berg
CIVIL ENGINEERING

RECEIVED JAN 20 2015

DAVID'S COURT PLAT "F"

BOND ESTIMATE

9/4/14

Line #	Item Description	Estimated	Unit	Unit Price	Total Price
GENERAL					
1	Mobilization	1.00	LS	$4,500.00	$4,500.00
	Total Price for above GENERAL Items:				**$4,500.00**
SWPPP					
2	Silt Fence: Maintenance	1095.00	LF	$0.85	$930.75
3	Curb Inlet Box Protection	4.00	EACH	$80.30	$321.20
4	Gravel Construction Entrance: Maintenance Cobble Added;	12.00	TON	$24.60	$295.20
	Total Price for above SWPPP Items:				**$1,547.15**
ASPHALT & CONCRETE					
5	Asphalt 3" - Standard road	18,887.00	SF	$1.17	$22,097.79
6	Roadbase 9" Hauled, Placed & Compacted	22,029.00	SF	$0.48	$10,573.92
7	24" HB Curb & Gutter	1,052.00	LF	$10.25	$10,783.00
8	5' Sidewalk 4" Thick	1,260.00	SF	$2.71	$3,414.60
9	ADA Ramps	2.00	EACH	$487.00	$974.00
	Total Price for above ASPHALT & CONCRETE Items:				**$47,843.31**
SEWER					
10	8" PVC Sewer 10'-12' Deep	651.00	LF	$25.10	$16,340.10
11	4" PVC Sewer Lateral Complete (40 LF)	6.00	EACH	$975.00	$5,850.00
12	4' SWR Manhole Precast	4.00	EACH	$2,422.00	$9,688.00
	Total Price for above SEWER Items:				**$31,878.10**
DRAINAGE					
13	15" RCP Storm Drain	272.00	LF	$31.26	$8,502.72
14	Curb Inlet 2' X 3' X 4'	3.00	EACH	$3,500.00	$10,500.00
15	5' SD Manhole	1.00	EACH	$2,750.00	$2,750.00
16	4' Juntion Box	1.00	EACH	$2,500.00	$2,500.00
	Total Price for above DRAINAGE Items:				**$24,252.72**
CULINARY WATER					
17	10" DI Culinary Water	481.00	LF	$30.00	$14,430.00
18	10" Gate Valves W/ Hot tap	1.00	EACH #	$1,383.00	$1,383.00
19	Fire Hydrant	2.00	EACH	$4,155.00	$8,310.00
20	1" Water Service	6.00	EACH	$465.00	$2,790.00
	Total Price for above CULINARY WATER Items:				**$26,913.00**
PRESSURE IRRIGATION					
21	6" PVC Irrigation Water	438.00	LF	$28.00	$12,264.00
22	6" Gate Valve w/ Hot Tap	1.00	EACH	$1,527.00	$1,527.00
23	6" Plug	1.00	EACH	$350.00	$350.00
24	1" Irrigation Service	6.00	EACH	$430.00	$2,580.00
	Total Price for above PRESSURE IRRIGATION Items:				**$16,721.00**
DRY UTILITIES					
25	Dry Utility Trenching & Power conduit	1,052.00	LF	$4.61	$4,849.72
26	Utility Sleeve Trenching	60.00	LF	$3.80	$228.00
27	Gas Sleeve	60.00	LF	$2.40	$144.00
28	Phone Sleeve	60.00	LF	$2.40	$144.00
	Total Price for above DRY UTILITIES Items:				**$5,365.72**

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MISCELLANEOUS					
29	Street sign / traffic signs	2.00	EACH	$225.00	$450.00
30	Street Light	1.00	EACH	$2,500.00	$2,500.00
31	Mail Box	1.00	EACH	$1,500.00	$1,500.00
32	Subdivision monument	2.00	EACH	$450.00	$900.00
	Total Price for above Miscellaneous Items:				**$5,350.00**
CONSTRUCTION MANAGEMENT					
33	As-Builts as per city standards	1.00	LS	$1,500.00	$1,500.00
34	Construction Staking	1.00	LS	$2,150.00	$2,150.00
35	Testing, Cleaning, Inspections	1.00	LS	$800.00	$800.00
	Total Price for above Construction Managment Items:				**$3,650.00**

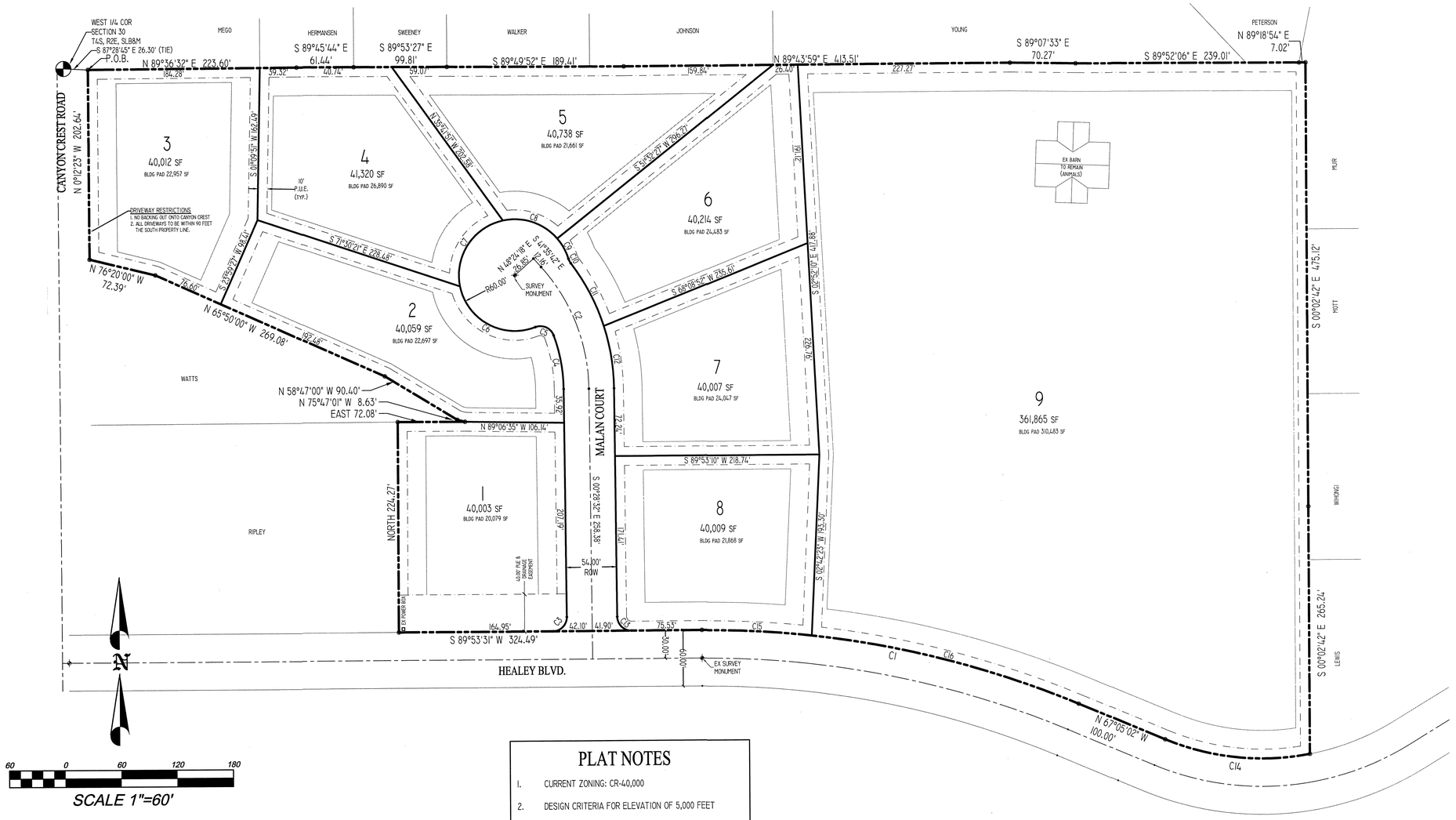
BOND ESTIMATE

CIVIL ENGINEERING

SUMMARY	
GENERAL	$4,500.00
SWPPP	$1,547.15
ASPHALT & CONCRETE	$47,843.31
SEWER	$31,878.10
DRAINAGE	$24,252.72
CULINARY WATER	$26,913.00
PRESSURE IRRIGATION	$16,721.00
DRY UTILITIES	$5,365.72
MISCELLANEOUS	$5,350.00
CONSTRUCTION MANAGEMENT	$3,650.00
Total Improvement Estimate:	$168,021.00
Bonding for 25%	$ 42,005.25
TOTAL IMPROVEMENT BOND AMOUNT:	**$210,026.25**

DAVID'S COURT
PLAT "F"

AND A VACATION OF DAVID'S COURT PLATS "A", "B" & "C"
LOCATED IN THE SW 1/4 OF SECTION 30, T4S, R2E, S.L.B.&M
ALPINE CITY, UTAH COUNTY, STATE OF UTAH

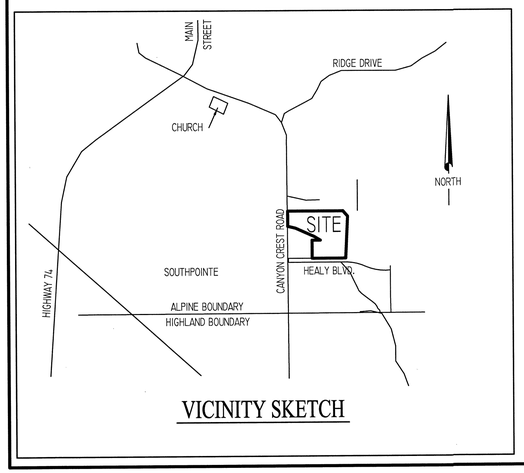


PLAT NOTES

1. CURRENT ZONING: CR-40,000
2. DESIGN CRITERIA FOR ELEVATION OF 5,000 FEET
3. DESIGN CRITERIA FOR SNOW LOAD OF 45 LB/SF
4. THE INTERNATION FIRE CODE MAY REQUIRE FIRE SPRINKLERS BASED UPON THE SIZE OF HOME AND FIRE FLOW CAPACITY. A FIRE FLOW TEST MAY BE REQUIRED AT THE TIME OF BUILDING PERMIT.
5. IF FIRE SPRINKLERS ARE PROPOSED THE FIRE FLOW REQUIREMENT IS REDUCED BY 50%.

CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA	CHORD	BEARING
C1	1030.00	413.90	23°01'27"	411.12	N 78°35'45" W
C2	200.00	143.53	41°07'09"	140.47	S 21°02'07" E
C3	15.00	23.66	90°22'03"	21.28	N 44°42'29" E
C4	173.00	59.00	19°32'26"	58.72	N 10°14'45" W
C5	15.00	23.85	91°06'36"	21.42	N 65°34'16" W
C6	60.00	104.63	99°54'49"	91.87	N 61°10'09" W
C7	60.00	93.38	89°10'13"	84.24	N 33°22'22" E
C8	60.00	64.40	61°29'38"	61.35	S 71°17'42" E
C9	60.00	24.89	23°46'13"	24.71	S 28°39'46" E
C10	15.00	5.30	20°14'14"	5.27	S 26°53'46" E
C11	227.00	76.69	19°21'22"	76.32	S 27°20'13" E
C12	227.00	68.08	17°11'00"	67.82	S 09°04'02" E
C13	15.00	23.47	89°37'57"	21.15	S 45°17'31" E
C14	270.00	158.00	33°31'42"	155.75	N 83°50'53" W
C15	1030.00	117.87	06°33'25"	117.81	N 86°49'46" W
C16	1030.00	296.03	16°28'02"	295.01	S 75°19'03" E



VICINITY SKETCH

ADDRESS TABLE

LOT #	ADDRESS
1	806 SOUTH MALAN COURT
2	774 SOUTH MALAN COURT
3	735 SOUTH CANYON CREST ROAD
4	748 SOUTH MALAN COURT
5	727 SOUTH MALAN COURT
6	759 SOUTH MALAN COURT
7	781 SOUTH MALAN COURT
8	809 SOUTH MALAN COURT
9	452 EAST HEALEY BLVD.

APPROVAL AS TO FORM

APPROVED AS TO FORM THIS _____ DAY OF _____ A.D., 20____

CITY ATTORNEY

DC-FINAL PLAT F.DWG 30.DEC.2014

SURVEYOR'S CERTIFICATE

I, _____, DO HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR, AND THAT I HOLD CERTIFICATE NO. _____ AS PRESCRIBED BY THE LAWS OF THE STATE OF UTAH. I FURTHER CERTIFY BY AUTHORITY OF THE OWNERS, I HAVE MADE A SURVEY OF THE TRACT OF LAND SHOWN ON THIS PLAT AND DESCRIBED BELOW, AND HAVE SUBDIVIDED SAID TRACT OF LAND INTO LOTS, BLOCKS, STREETS, OPEN SPACES, AND EASEMENTS AND THAT THE SAME HAS BEEN CORRECTLY SURVEYED AND STAKED ON THE GROUND AS SHOWN ON THIS PLAT AND THAT THIS PLAT IS TRUE AND CORRECT.

_____ DATE

_____ SURVEYOR (SEE SEAL BELOW)

BOUNDARY DESCRIPTION

BEGINNING AT A POINT WHICH IS S 87°28'45" E 26.30 FEET FROM THE WEST QUARTER CORNER OF SECTION 30, TOWNSHIP 4 SOUTH, RANGE 2 EAST, SLB&M;

RUNNING THENCE N 89°36'32" E 223.60 FEET; THENCE S 89°45'44" E 61.44 FEET; THENCE S 89°53'27" E 99.81 FEET; THENCE S 89°49'52" E 189.41 FEET; THENCE N 89°43'59" E 413.51 FEET; THENCE S 89°07'33" E 70.27 FEET; THENCE S 89°52'06" E 239.01 FEET; THENCE N 89°18'54" E 7.02 FEET; THENCE S 00°02'42" E 475.12 FEET; THENCE S 00°02'42" E 265.24 FEET; THENCE ALONG THE ARC OF A NON-TANGENT 270.00 FOOT RADIUS CURVE TO THE RIGHT 158.00 FEET (CURVE HAS A CENTRAL ANGLE OF 33°31'42" AND A CHORD THAT BEARS N 83°50'53" W 155.75 FEET); THENCE N 67°05'02" W 100.00 FEET; THENCE ALONG THE ARC OF A TANGENT 1030.00 FOOT RADIUS CURVE TO THE LEFT 413.90 FEET (CURVE HAS A CENTRAL ANGLE OF 21°01'27" AND A CHORD THAT BEARS N 78°35'45" W 411.12 FEET); THENCE S 89°53'31" W 324.49 FEET; THENCE NORTH 224.27 FEET; THENCE EAST 72.08 FEET; THENCE N 75°47'01" W 8.63 FEET; THENCE N 58°47'00" W 90.40 FEET; THENCE N 65°50'00" W 269.08 FEET; THENCE N 76°20'00" W 72.39 FEET; THENCE N 01°12'23" W 202.64 FEET TO THE POINT OF BEGINNING.

CONTAINING 16.42 ACRES OF LAND.
BASIS OF BEARINGS = STATE PLANE

OWNER'S DEDICATION

KNOWN ALL MEN BY THESE PRESENTS THAT WE, ALL THE UNDERSIGNED OWNERS OF ALL OF THE PROPERTY DESCRIBED IN THE SURVEYOR'S CERTIFICATE HEREON AND SHOWN ON THIS MAP, HAVE CAUSED THE SAME TO BE SUBDIVIDED INTO LOTS, STREETS, OPEN SPACE, AND EASEMENTS AND DO HEREBY DEDICATE THE STREETS AND OTHER PUBLIC AREAS AS INDICATED HEREON FOR PERPETUAL USE OF THE PUBLIC.

IN WITNESS HEREOF WE HAVE HEREUNTO SET OUR HANDS THIS _____ DAY OF _____, A.D. 20___

ACKNOWLEDGMENT

STATE OF UTAH
COUNTY OF UTAH

ON THE _____ DAY OF _____, A.D. 20____ PERSONALLY APPEARED BEFORE ME THE SIGNERS OF THE FOREGOING DEDICATION WHO DULY ACKNOWLEDGE TO ME THAT THEY DID EXECUTE THE SAME.

MY COMMISSION EXPIRES _____

_____ NOTARY PUBLIC

ACCEPTANCE BY LEGISLATIVE BODY

THE CITY COUNCIL OF ALPINE CITY, COUNTY OF UTAH, APPROVES THIS SUBDIVISION AND HEREBY ACCEPTS THE DEDICATION OF ALL STREETS, EASEMENTS, OPEN SPACES, AND OTHER PARCELS OF LAND INTENDED FOR PUBLIC PURPOSES FOR THE PERPETUAL USE OF THE PUBLIC THIS _____ DAY OF _____ A.D. 20____

APPROVED _____ CITY ENGINEER (SEE SEAL BELOW)

ATTEST _____ CLERK - RECORDER (SEE SEAL BELOW)

PLANNING COMMISSION APPROVAL

APPROVED THIS _____ DAY OF _____, A.D. 20 ____ BY THE ALPINE CITY PLANNING COMMISSION.

_____ DIRECTOR - SECRETARY

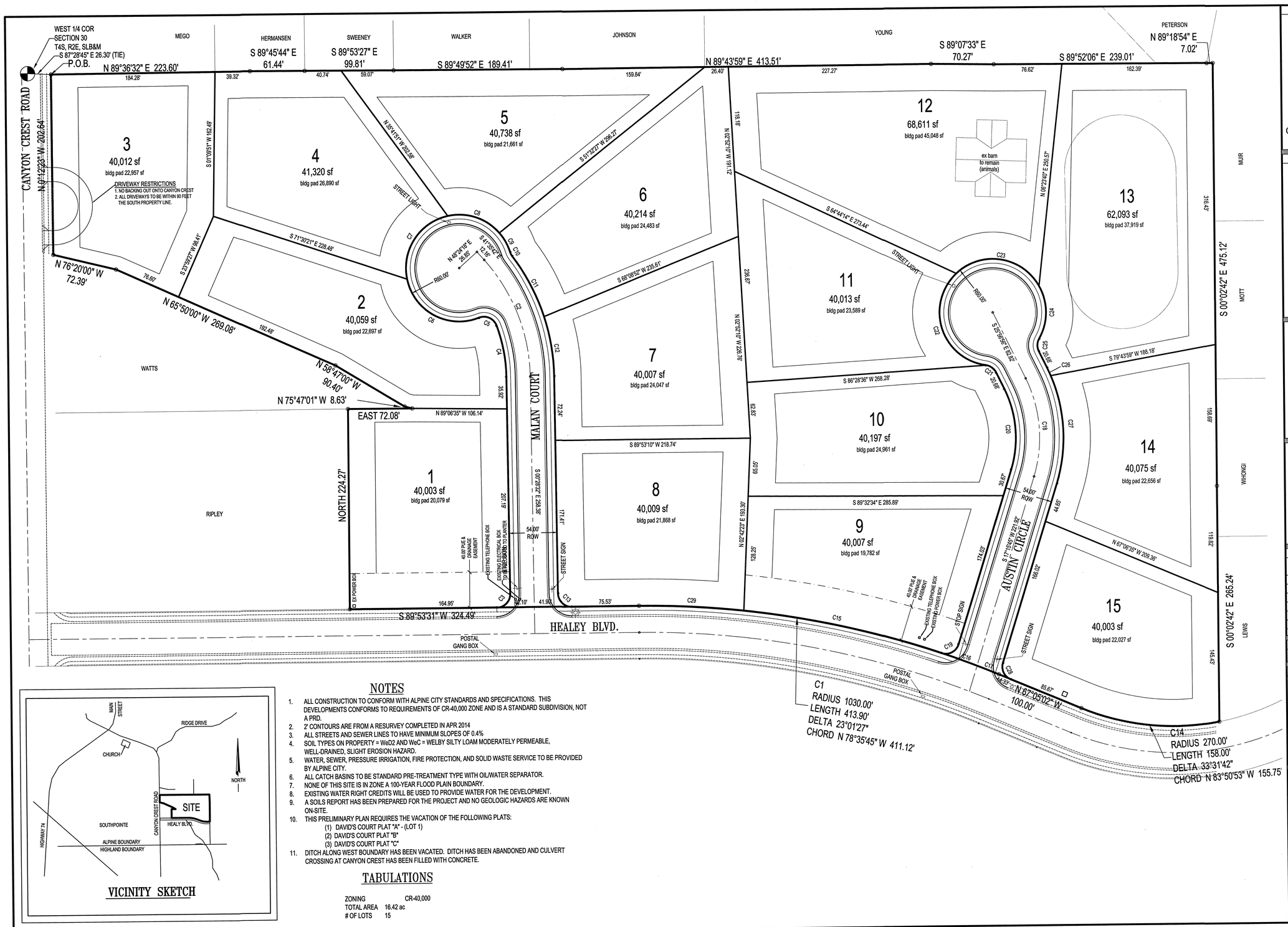
_____ CHAIRMAN, PLANNING COMMISSION

DAVID'S COURT
PLAT "F"

AND A VACATION OF DAVID'S COURT PLATS "A", "B" & "C"
LOCATED IN THE SW 1/4 OF SECTION 30, T4S, R2E, S.L.B.&M
ALPINE CITY, UTAH COUNTY, STATE OF UTAH

SCALE: 1"= 60 FEET

SURVEYOR'S SEAL	NOTARY PUBLIC SEAL	CITY ENGINEER SEAL	CLERK - RECORDER SEAL



VICINITY SKETCH

NOTES

1. ALL CONSTRUCTION TO CONFORM WITH ALPINE CITY STANDARDS AND SPECIFICATIONS. THIS DEVELOPMENTS CONFORMS TO REQUIREMENTS OF CR-40,000 ZONE AND IS A STANDARD SUBDIVISION, NOT A PRD.
2. 2' CONTOURS ARE FROM A RESURVEY COMPLETED IN APR 2014
3. ALL STREETS AND SEWER LINES TO HAVE MINIMUM SLOPES OF 0.4%
4. SOIL TYPES ON PROPERTY = WeD2 AND WeC = WELBY SILTY LOAM MODERATELY PERMEABLE, WELL-DRAINED, SLIGHT EROSION HAZARD.
5. WATER, SEWER, PRESSURE IRRIGATION, FIRE PROTECTION, AND SOLID WASTE SERVICE TO BE PROVIDED BY ALPINE CITY.
6. ALL CATCH BASINS TO BE STANDARD PRE-TREATMENT TYPE WITH OIL/WATER SEPARATOR.
7. NONE OF THIS SITE IS IN ZONE A 100-YEAR FLOOD PLAIN BOUNDARY.
8. EXISTING WATER RIGHT CREDITS WILL BE USED TO PROVIDE WATER FOR THE DEVELOPMENT.
9. A SOILS REPORT HAS BEEN PREPARED FOR THE PROJECT AND NO GEOLOGIC HAZARDS ARE KNOWN ON-SITE.
10. THIS PRELIMINARY PLAN REQUIRES THE VACATION OF THE FOLLOWING PLATS:
    (1) DAVID'S COURT PLAT "A" - (LOT 1)
    (2) DAVID'S COURT PLAT "B"
    (3) DAVID'S COURT PLAT "C"
11. DITCH ALONG WEST BOUNDARY HAS BEEN VACATED. DITCH HAS BEEN ABANDONED AND CULVERT CROSSING AT CANYON CREST HAS BEEN FILLED WITH CONCRETE.

TABULATIONS

ZONING	CR-40,000
TOTAL AREA	16.42 ac
# OF LOTS	15

DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

PATTERSON HOMES
www.phutah.com
11038 N. Highland Blvd Suite 100
Highland, UT 84003
(801) 642-0119

0 25 50 100 150
SCALE: 1"= 50'

CIVIL ENGINEERING
11038 N Highland Blvd Suite 400
Highland Ut, 84003
office (801) 492–1277
cell (801) 616–1677

PROJECT STATUS

NO.	DATE	DESCRIPTION
1		
2		
3		
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7		

SEAL

PROFESSIONAL ENGINEER
STATE OF UTAH
Kenneth Ray Berg
1-20-15

ACTION	DATE
FINAL	12/31/14

PROJECT

DAVID'S COURT PLAT F SUBDIVISION

DESCRIPTION

CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
COVER	C1

MEGO | HERMANSEN | SWEENEY | WALKER | JOHNSON | YOUNG | PETERSON

CANYON CREST ROAD

EX WATER

3
40,012 sf
bldg pad 22,957 sf

DRIVEWAY RESTRICTIONS
1. NO BACKING OUT ONTO CANYON CREST
2. ALL DRIVEWAYS TO BE WITHIN 90 FEET THE SOUTH PROPERTY LINE.

WATER LAT. (TYP.)
PI LAT. (TYP.)

4
41,320 sf
bldg pad 26,890 sf

5
40,738 sf
bldg pad 21,661 sf

6
40,214 sf
bldg pad 24,483 sf

12
68,611 sf
bldg pad 45,048 sf

ex barn to remain (animals)

13
62,093 sf
bldg pad 37,919 sf

MUIR

2
40,059 sf
bldg pad 22,697 sf

WATTS

7
40,007 sf
bldg pad 24,047 sf

WATER LAT. (TYP.)

MALAN COURT

11
40,013 sf
bldg pad 23,589 sf

PLUG

10
40,197 sf
bldg pad 24,961 sf

WATER LAT. (TYP.)

PI LAT. (TYP.)

14
40,075 sf
bldg pad 22,656 sf

MOTT

1
40,003 sf
bldg pad 20,079 sf

RIPLEY

8
40,009 sf
bldg pad 21,868 sf

484 LF 10" WATER

EXTEND SERVICES BEYOND DETENTION BASIN, 2' BELOW BOTTOM OF STORM DRAIN PIPE, CAP & MARK.

40 FT PIPE & DRAINAGE EASEMENT

EXISTING TELEPHONE BOX

EXISTING ELECTRICAL BOX TO BE RELOCATED TO PLANTER

CONNECT TO EX 8" WATER MAIN WITH 10" HOT TAP & VALVE

EX WATER LATERAL & METER

EXISTING PRESS. IRR. LATERAL

9
40,007 sf
bldg pad 19,782 sf

EXTEND SERVICES BEYOND DETENTION BASIN, 2' BELOW BOTTOM OF STORM DRAIN PIPE, CAP & MARK.

40 FT PIPE & DRAINAGE EASEMENT

EXISTING TELEPHONE BOX

EXISTING POWER BOX

EX PI LATERAL TO BE REMOVED

AUSTIN CIRCLE

484 LF 12" WATER

EX WATER SERVICES TO BE REMOVED

CONNECT TO EX 8" WATER WITH 12" HOT TAP & VALVE

EX WATER LATERAL & METER

EXISTING PRESS. IRR. LATERAL

15
40,003 sf
bldg pad 22,027 sf

WIIHONGI

LEWIS

HEALEY BLVD.

EXISTING 15" SD

4" IRR. VALVE

CONNECT TO EX 12" PI WITH 6" HOT TAP & VALVE

EXISTING PRESS. IRR. LATERAL

CONNECT TO EX 12" PI WITH 6" HOT TAP & VALVE

EXISTING PRESS IRR. VALVE

4" IRR. VALVE

NOTES

1. EXISTING PRESSURIZED IRRIGATION & WATER LATERALS TO BE REMOVED BY SHUTTING CORP STOP AT MAIN AND REMOVING A 1' MIN SECTION OF LATERAL.

DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

PATTERSON HOMES
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(801) 642-0119

0 25 50 100 150
SCALE: 1"= 50'

berg
CIVIL ENGINEERING
11038 N Highland Blvd Suite 400
Highland Ut, 84003
office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
NO.	DATE	DESCRIPTION	PROFESSIONAL ENGINEER 12.31.14 Kenneth Ray Berg 1-305 STATE OF UTAH
1			
2			
3			
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ACTION	DATE
FINAL	12/31/14

PROJECT

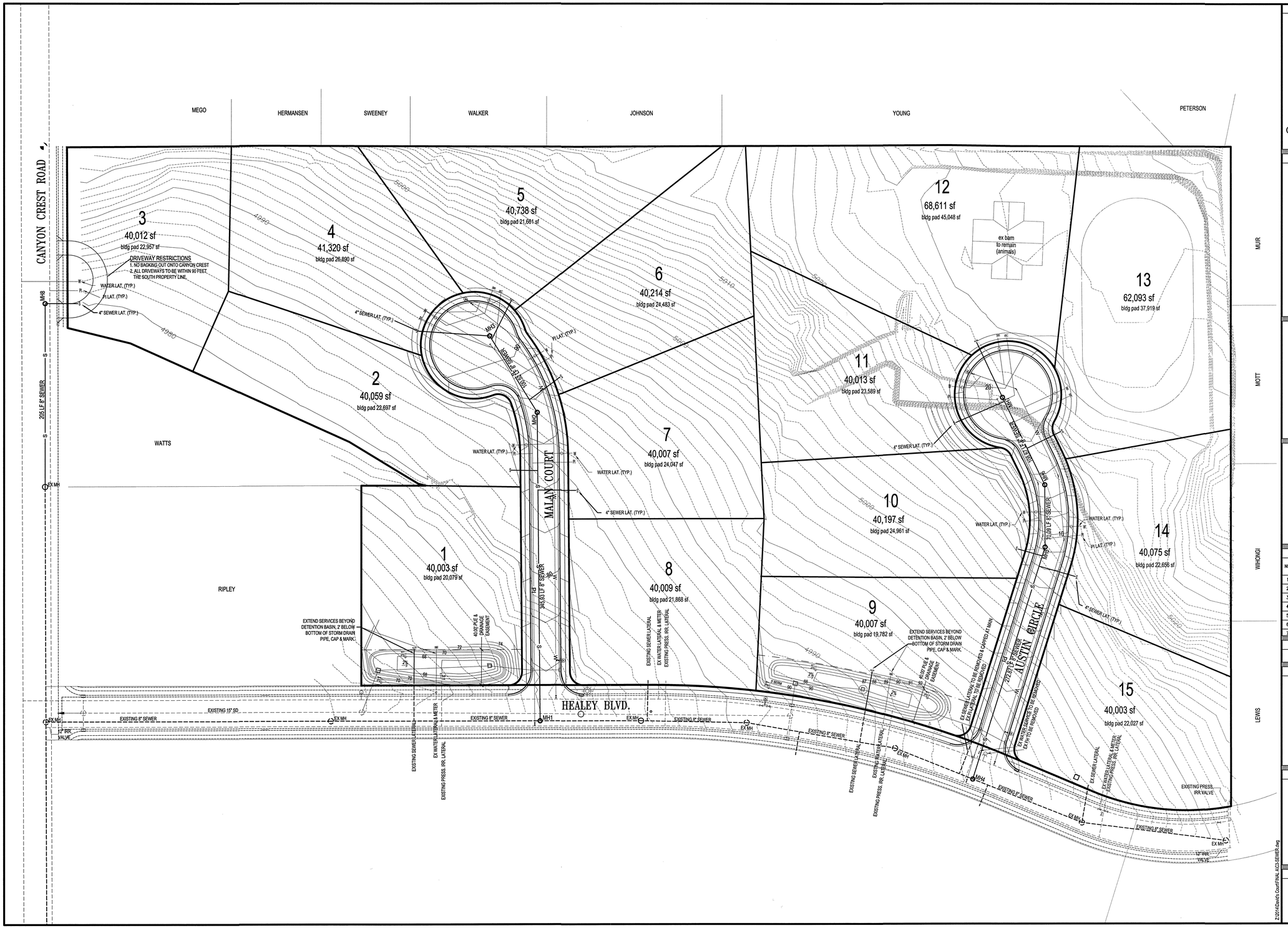
DAVID'S COURT PLAT F SUBDIVISION

DESCRIPTION

CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
UTILITY	*C2*

P:\2014\david's court\final plat\c2-utility.dwg



DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

PATTERSON HOMES
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N

0 25 50 100 150

SCALE: 1"= 50'

Berg
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office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
NO.	DATE	DESCRIPTION	
1			
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Kenneth Ray Berg 12-20-14 STATE OF UTAH

ACTION	DATE
FINAL	12/31/14

PROJECT

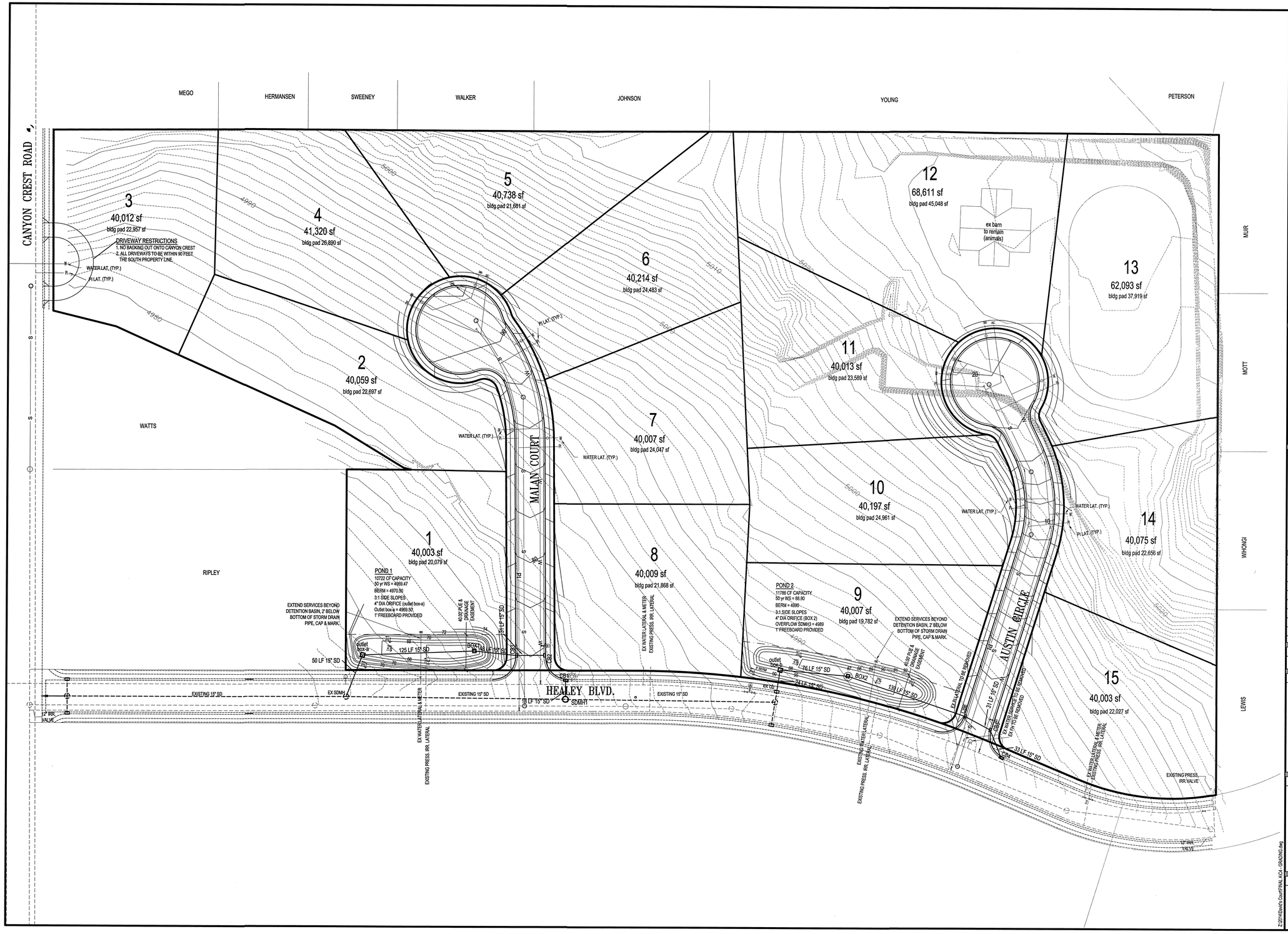
DAVID'S COURT PLAT F SUBDIVISION

DESCRIPTION

CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
SEWER PLAN	*C3*

Z:\2014\Dwg\5 Court\FINAL\AC3-SEWER.dwg



DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

PATTERSON HOMES
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11038 N. Highland Blvd Suite 100
Highland, UT 84003
(801) 642-0119

N

0 25 50 100 150
SCALE: 1"= 50'

berg
CIVIL ENGINEERING
11038 N Highland Blvd Suite 400
Highland Ut, 84003
office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
NO.	DATE	DESCRIPTION	
1			
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PROFESSIONAL ENGINEER
Kenneth Rey Berg
1-30-15
STATE OF UTAH

ACTION	DATE
FINAL	12/31/14

PROJECT

DAVID'S COURT PLAT F SUBDIVISION

DESCRIPTION

CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
GRADING & DRAINAGE	*C4*

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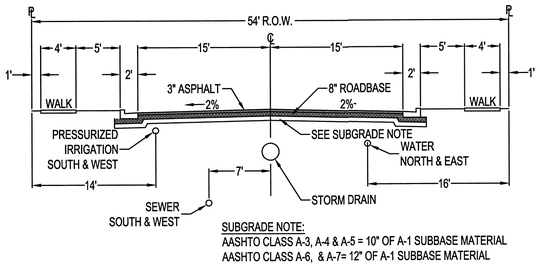
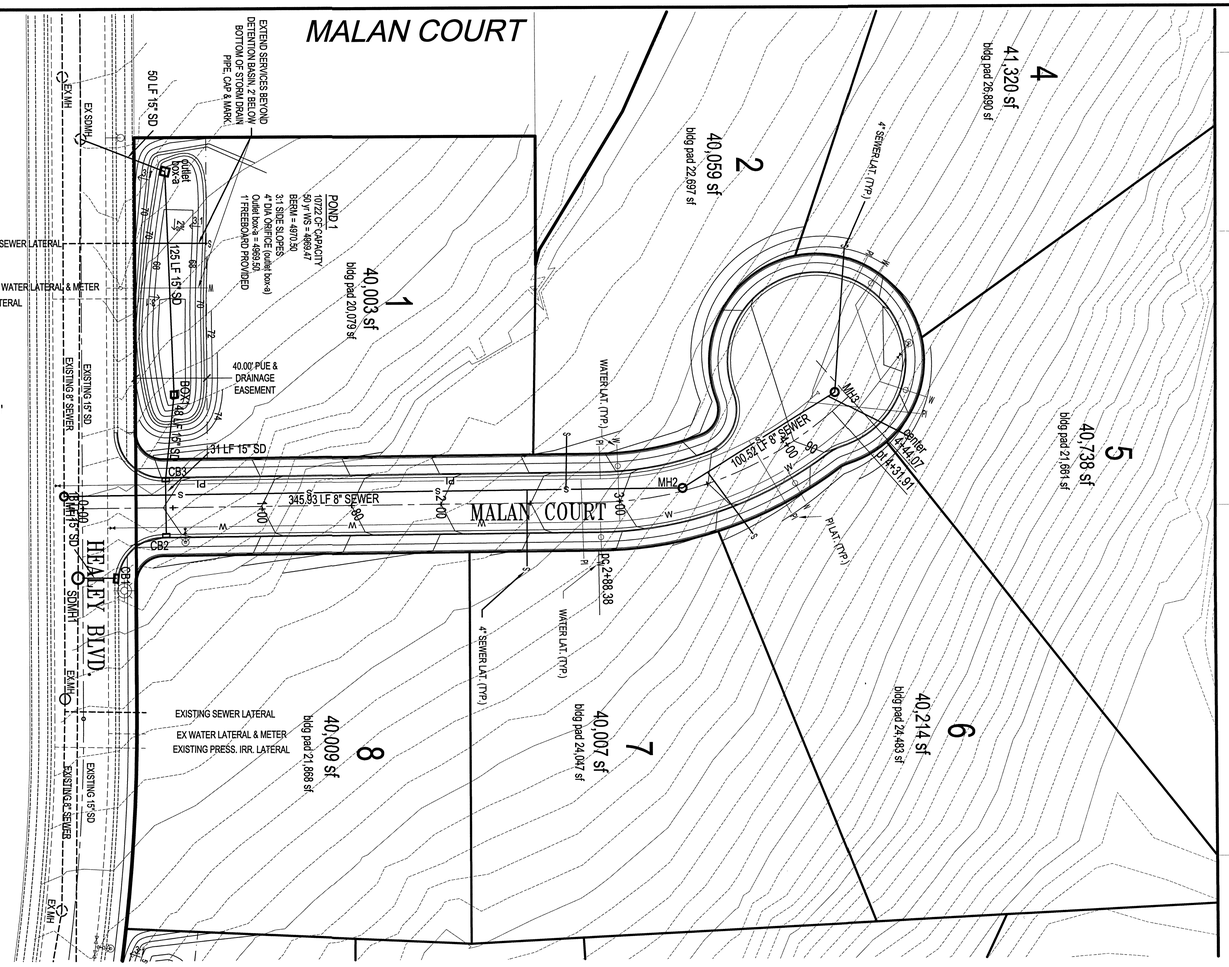
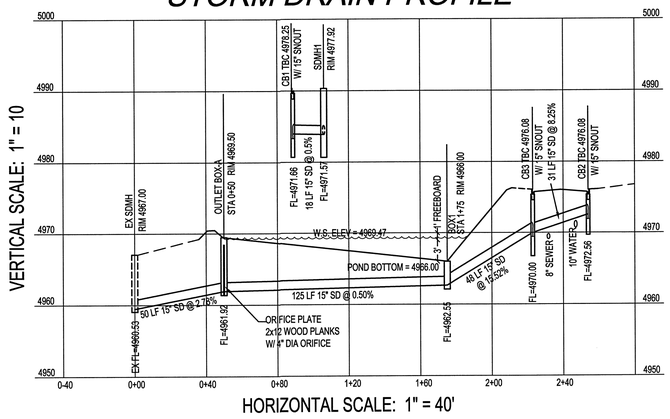


SUBGRADE NOTE:
AASHTO CLASS A-3, A-4 & A-5 = 10" OF A-1 SUBBASE MATERIAL
AASHTO CLASS A-6, & A-7= 12" OF A-1 SUBBASE MATERIAL

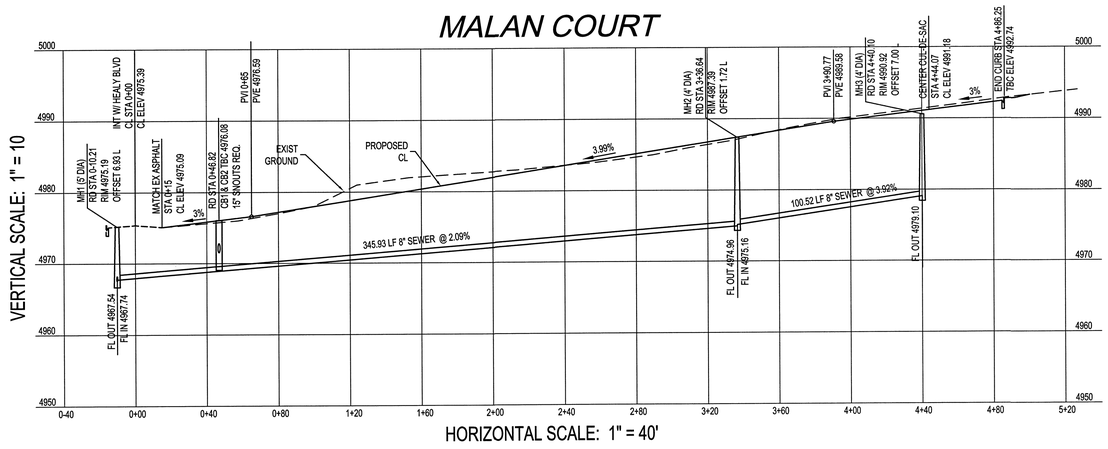
MALAN COURT CROSS-SECTION



STORM DRAIN PROFILE



MALAN COURT



DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

PATTERSON HOMES
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(801) 642-0119

0 20 40 80 120
SCALE: 1"= 40'

Berg
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Highland Ut, 84003
office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS		
NO.	DATE	DESCRIPTION
1		
2		
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SEAL: PROFESSIONAL ENGINEER 5430802 Kenneth Rey Berg 12-31-14 STATE OF UTAH

ACTION	DATE
FINAL	12/31/14

PROJECT

DAVID'S COURT PLAT F SUBDIVISION

DESCRIPTION

CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
MALAN COURT PROFILE	C5

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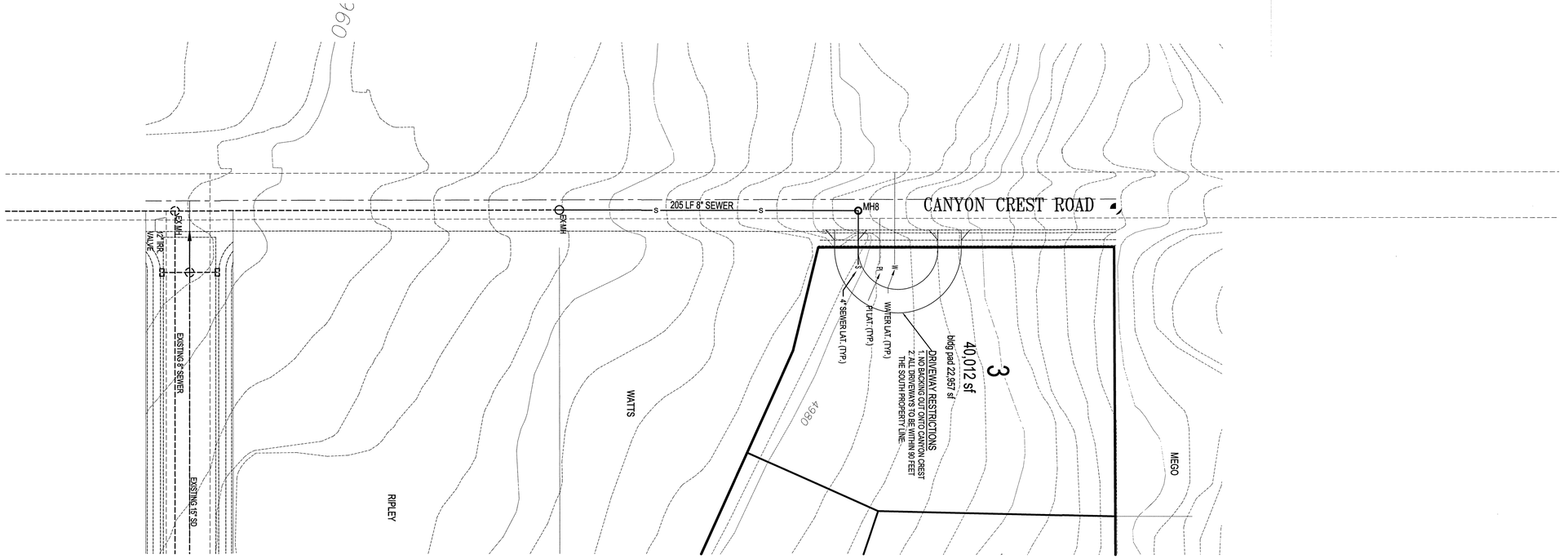
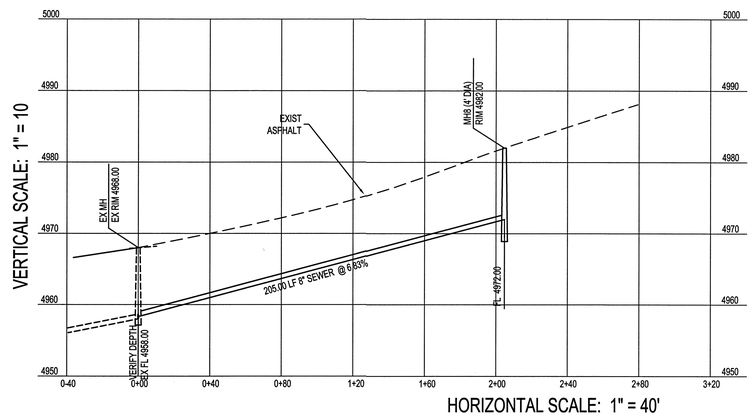
CANYON CREST - SEWER PLAN



CANYON CREST - SEWER PROFILE



DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

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11038 N. Highland Blvd Suite 100
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0 20 40 80 120

SCALE: 1"= 40'

CIVIL ENGINEERING
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Highland Ut, 84003
office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
NO.	DATE	DESCRIPTION	PROFESSIONAL ENGINEER 4362 Kenneth Ray Berg STATE OF UTAH
1			
2			
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4			
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7			

ACTION	DATE
FINAL	12/31/14

PROJECT

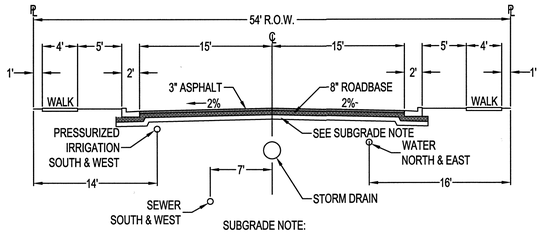
DAVID'S COURT PLAT F SUBDIVISION

DESCRIPTION

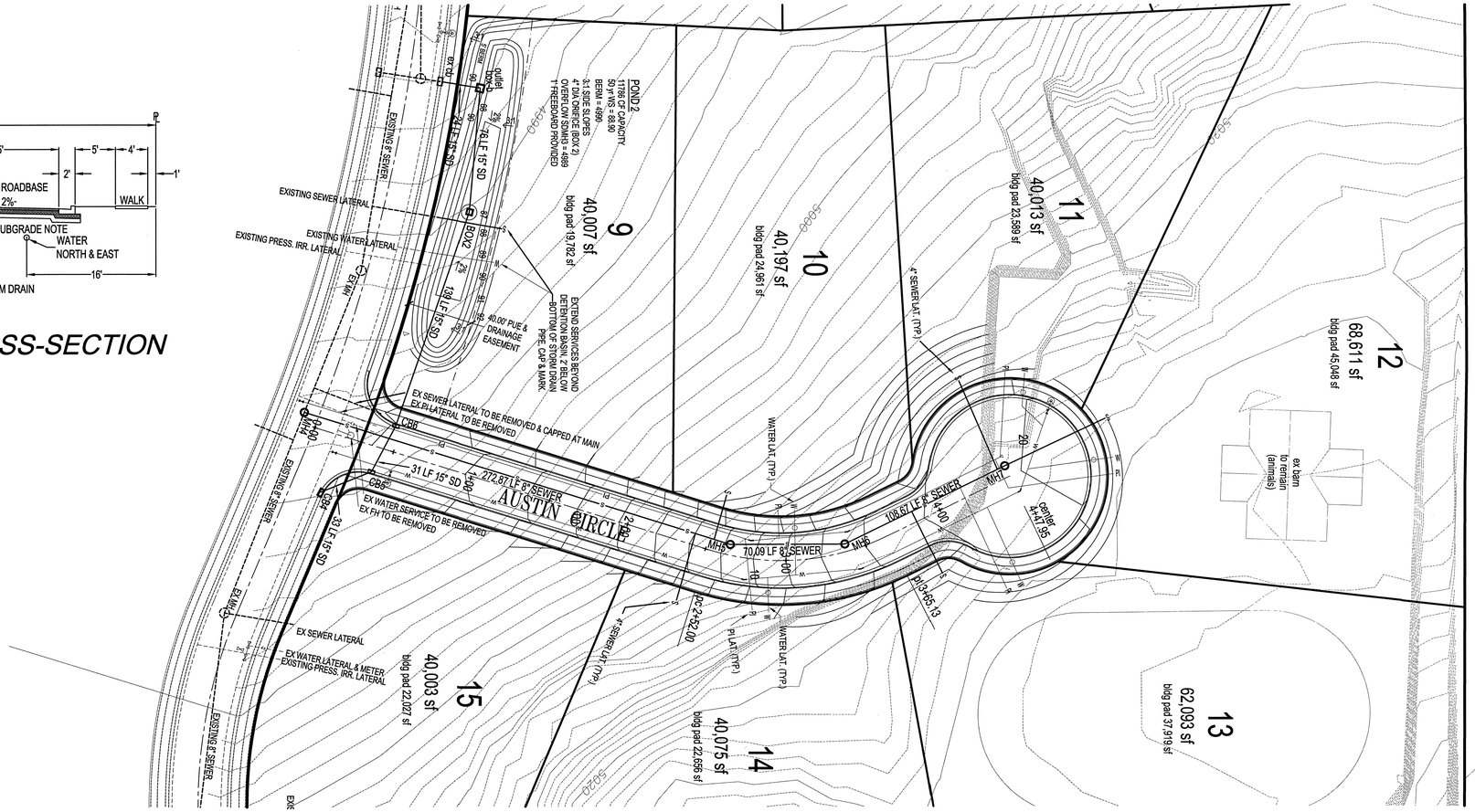
CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
CANYON CREST SEWER	C6

Z:\2014\David's Court\FINAL ACD - Canyon Road1.dwg



AUSTIN COURT CROSS-SECTION



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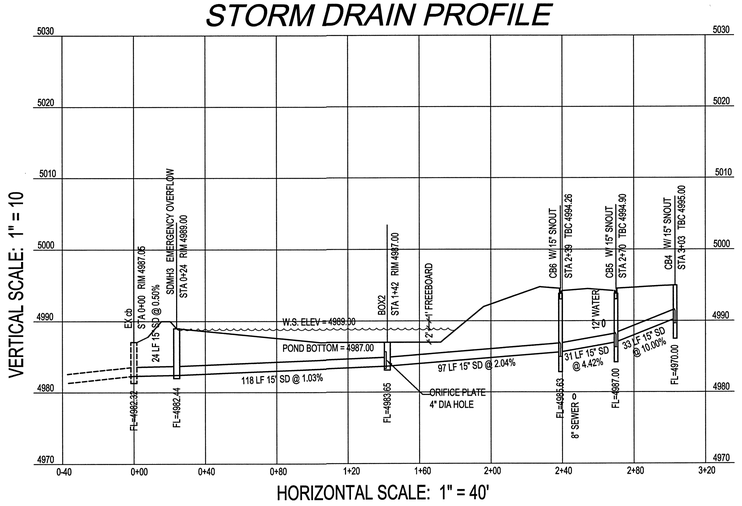
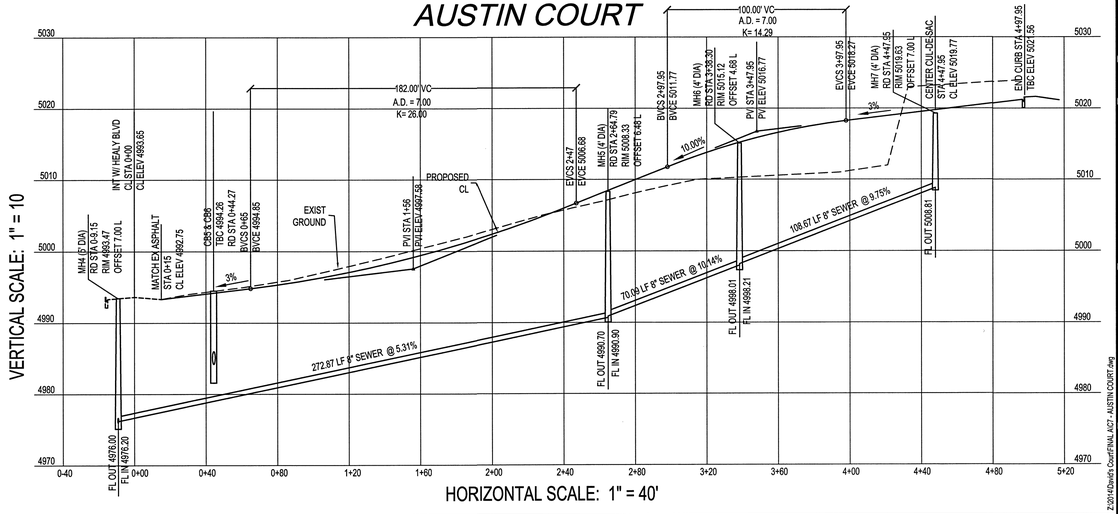
SCALE: 1"= 40'

STORM DRAIN PROFILE



AUSTIN COURT



DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

PATTERSON HOMES
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Berg
CIVIL ENGINEERING
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PROJECT STATUS		
NO.	DATE	DESCRIPTION
1		
2		
3		
4		
5		
6		
7		

SEAL

ACTION	DATE
FINAL	12/31/14

PROJECT

DAVID'S COURT PLAT F SUBDIVISION

DESCRIPTION

CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
AUSTIN COURT PROFILE	C7

Z:\2014\Dwf\S Court\FINAL ACT - AUSTIN COURT.dwg

ALPINE CITY COUNCIL AGENDA

SUBJECT: Eagle Pointe PRD Preliminary Site Plan

FOR CONSIDERATION ON: 10 February 2015

PETITIONER: Taylor Smith and Mark Wells

ACTION REQUESTED BY PETITIONER: Approve Exceptions

APPLICABLE STATUTE OR ORDINANCE: See Engineer Review

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

Preliminary approval of the Eagle Pointe was conditionally approved by the Planning Commission on February 3, 2015. The City Council would usually not have see a subdivision (at this stage of the process) on the agenda again until final approval. However, there are some exceptions that were requested and recommended by the Planning Commission that will require City Council approval. Rather than wait until final approval for these exceptions to be addressed by the City Council, they are on the agenda tonight. This will give some direction to the developer before working on a final plat and also give direction to the Planning Commission in making a recommendation to the City Council for Final approval.

The motion below does not reflect all of the conditions that were made by the Planning Commission for Preliminary approval. The Planning Commission made a total of 7 conditions. Condition 1 includes all of the exceptions that need to be addressed.

PLANNING COMMISSION MOTION:

Judi Pickell moved to recommend to the City Council that the following exceptions be granted and also grant preliminary approval of the proposed development subject to the following conditions:

a. an exception be granted for the small amounts of property within the lots that contain land sloped greater than 25% (Section 3.9.4).

b. an exception be granted to the 50 foot clear zone rule from station 1+00 to 5+00 (Section 4.1.2/4.17).

c. an exception be granted to allow the 2:1 cut/fill slope (Section 4.1.2/4.17).

d. approval be granted for the use of retaining walls with Ready Rock and the darker coloration shown to match the hillside. (Section 3.9.7.4).

e. approval be granted for exchanging open space: 931 square feet of current public open space being changed to public right of way in exchange for 7,280 square feet of public open space.

David Fotheringham seconded the motion. The motion passed with 5 Ayes and 1 Nay. Bryce Higbee, David Fotheringham, Steve Cosper, Steve Swanson and Judi Pickell all voted Aye. Jason Thelin voted Nay.

Date: January 28, 2015

By: Jed Muhlestein, P.E.
Assistant City Engineer

Subject: Eagle Point PRD Subdivision – Preliminary Review
14 lots on 32.929 acres

Background

This development was formerly known as the Vista Meadows PRD subdivision. The proposed Eagle Point PRD Subdivision consists of 14 lots on 32.929 acres. Technically there are only 13 new lots as Lot 14 is an amended Lot 3 of Falcon Ridge Plat A. The lots range in size from 23,190 to 71,766 square feet which meets the minimum lot size requirements as set forth in the PRD section of the Development Code, section 3.9.6. The development is located west of the Falcon Ridge development. The proposed development includes approximately 17.54 acres (53.3%) of open space. The proposed development is in the CR-40,000 zone.

PRD Requirements

The proposed development was presented before the Planning Commission and City Council to determine if it can be considered as a PRD. Both approved the property to be considered as a PRD.

The developer did not submit a slope analysis for the property as per the PRD, however we completed our own slope analysis in 2010 and again with this submittal. Based on our analysis, we have determined that the allowable base density is 14 units. As currently drawn, the development would provide approximately 17.54 acres of open space, or 53.3 percent of the total development area. This would provide sufficient open space to receive the maximum density bonus of 25 percent. Assuming the maximum density bonus, up to 17.52 lots (rounded to 18 lots) is possible if topography allows it. Because of the topographic challenges of the area, and the Development Code which protects the city from lots being developed on a hillside, the developer has proposed a plan with only 13 new lots. As mentioned earlier, Lot 14 is an existing lot (Lot 3 Falcon Ridge Plat A) which is proposed to be amended to accommodate the secondary access required by code. This existing lot is owned by an LLC which the developer is a part of.

The slope analysis has three main purposes; (1) is used to calculate base density, (2) helps evaluate building pads and (3) shows the percentage of land with slopes greater than 25% within a lot. The Developer has shown the building pads on the proposed Preliminary Plat. The pads appear to meet section 3.1.11.7 which requires no areas of ground greater than 20% slope to be within the buildable area. Section 3.9.4 details how much slope above 25% can be contained within a lot. All the new lots contain ground that is steeper than 25%. **The proposed plan will require an exception be recommended by the Planning Commission and approved by the City Council for this slope as outlined in section 3.9.4 of the Development Code.**

Street System

The proposed development shows access from Lakeview Drive and Hog Hollow (600 North). The general layout of the development meets code in regards of frontage, road alignments, and road design.

The proposed plans show an approximate line where fill material would extend beyond the 50-foot clear zone as identified in the Cut/Fill Ordinance (Section 4.17). The original plan showed three minor retaining walls at the extension of Lakeview Drive so as to not require an exception to the ordinance regarding cut/fill slopes. The Engineering department directed the Developer to eliminate these minor walls and request an exception for the 50-foot clear zone in this area. We are in support of an exception at this location as it is not wise to have a small retaining wall at the end of a long fill/cut slope, when the better design is to simply run the cut/fill slope another 10-20 feet to existing ground. **An exception to the 50-foot clear zone (4.17) to eliminate three minor retaining walls will require a recommendation by the City Engineer, Planning Commission, and approval by the City Council as outlined in section 4.1.2 of the Development Code.**

The plans are showing 2:1 cut/fill slopes on all slopes, which do not meet the Cut/Fill Ordinance as found in section 4.17. A letter from Earthec Engineering was submitted which ensures that the existing geotechnical report is still valid for the development. That report specifies the methods, material, and erosion control standards used to build 2:1 slopes. The City Engineer accepts and recommends the methods described in the report. **An exception to the Cut/Fill Ordinance to allow 2:1 cut/fill slopes to be used within the development will require a recommendation by the City Engineer, Planning Commission, and approval by the City Council as outlined in section 4.1.2 of the Development Code.**

On the lower end of the project there are two retaining walls. The heights of the walls vary as topography requires along the roadway. The wall on the downhill side of the road runs continuously for approximately 1,000 feet ranging in size from 2 to 12 feet tall, the majority of the wall averaging 10 feet high or less. The uphill wall also runs continuously for approximately 1,000 feet and ranges in size from 2 to 28 feet tall, with the majority of the wall being in the 16 foot range. There are two small sections that jump up to 25 and 28 feet high. No indication was given on the plans as to the type of the proposed retaining walls though it has been mentioned

they would be a soil-nail design. For safety, a 6 foot tall chain link style fence is shown to be installed along the top of the upper wall for safety purposes. Guard railing and signage is shown for the lower wall. **The use of retaining walls in a Planned Residential Development (PRD) requires approval. Part of Section 3.9.7.4 of the development code states: *"Use of retaining walls is prohibited unless approval is recommended by the City Engineer and the Planning Commission, and approved by the City Council."***

The City Engineer is required to make a recommendation as to whether or not retaining walls will be allowed in a PRD, however there are no criteria listed in the ordinance to base a recommendation on. From strictly an engineering standpoint, it is likely that walls could be designed and built in this situation. Quality control would be extremely important during construction to insure long term performance of the retaining walls. From an engineering standpoint we believe that it is possible to design retaining walls in this situation and would at least recommend approval for a design to be pursued for the proposed retaining walls. Final recommendation for approval from the City Engineer's office would be subject to review of a final design. This is with the understanding that the final approval is to be made by the City Council. **A retaining wall design, based on the geotechnical report, outlining the wall type, design, calculations, and construction standards will need to be submitted for the walls prior to Final Approval**.

The aesthetics of the walls has been mentioned and is more subjective, as everyone has their own opinion of what is "aesthetically pleasing". **Since the ordinance does not list aesthetics as a requirement, we recommend that the Planning Commission and City Council address that issue**.

Due to some roadway cuts/fills that extend well into some of the lots, the developer was asked to and has submitted driveway alignments for lots 1-3 & 14 to show a driveway can be built for the lot that would comply with ordinance (Dev. Code 3.1.11.7).

The improvements for this development cannot take place without an amendment to Lot 3 of Falcon Ridge Plat A. It is proposed that Lot 3 be included in this plat, with a note on the final Eagle Point plat vacating Lot 3 of Falcon Ridge Plat A.

Currently Falcon Ridge Plat A shows an easement alignment for the road dedication of Lakeview Drive through the open space on the northerly road connection. For the southerly road connection there is a small piece of open space (931 SF) proposed to be dedicated to road right-of-way for the new road alignment. The Developer is proposing to change the use of 931 SF of currently dedicated open space to road right of way in exchange for 7,280 SF of new open space taken from the existing Lot 3. **Modifying or changing the use of Open Space requires a recommendation from the Planning Commission and City Council Approval.**

<u>Sewer System</u>

The proposed plans show a new sewer system connecting to the existing line in 600 North which

has been modeled and built to handle the flow. In the proposed Vista Point cul-de-sac, a portion of the new sewer line is shown to be constructed outside of the street. As the City has increased its efforts to flush sewer lines our awareness of the issues associated with lines being constructed outside of the street has also increased. One of these issues is access for maintenance. The plans do show an access road to the manhole being constructed outside the roadway which is acceptable. A commercial grade driveway approach for the access shown. Besides lot 14, which is an existing lot with an existing sewer lateral, new sewer laterals are shown for each new lot.

Culinary Water System

Due to its elevation, this development will need to be served by the Grove pressure zone. Each lot has an area below the 5350 foot elevation, which is the highest elevation the existing water system can serve and still provide the minimum 40 psi required by the ordinance. The only connection available to this zone is an existing 8-inch water line at the end of Lake View Drive. Based on current water modeling (see attached letter), 150' of that 8-inch line would need to be upsized to 12-inch, and that 12-inch line would need to be extended to the intersection of Vista Point and Lakeview Drive. The remaining portions of the development would require 10-inch and 8-inch lines as shown.

As proposed the system would provide minimum fire flows to the development. But on a larger scale, because this development would have service lines which are higher than any other service in the water pressure zone, if developed this development would lower the fire flow level of service to the entire pressure zone to which it is connected (affecting one third of the city). Please see memorandum letter dated October 2, 2014 "Development Hydraulic Modeling Results and Recommendations" from Horrocks Engineers. In order to maintain the existing fire flow level of service to the entire water pressure zone, offsite improvements would be required. There are several options available for offsite improvements; the most likely solution is the construction of a new water tank just above the development. There are also culinary water improvements in the City's master plan that would improve fire flows in this area. However, the timing of construction of these improvements is unknown. **This is a concerning issue that Staff and Developer could work on together prior to Final Approval.**

Lots 1 – 3 currently show areas within the lot above the 5350 elevation. The Public Works department frequently gets low water pressure complaints from home owners who have landscaped above this elevation. The Developer has proposed to put a landscaping restriction on the plat for the portions of these lots which are above the 5350 elevation, which is has been discussed at the DRC and is acceptable to the City Engineer's office.

The Fire Chief has approved the locations of the proposed fire hydrants. 1-inch water laterals will need to be constructed for each new lot and are shown on the plan.

Pressurized Irrigation System

With the previous development plan for this property, we reviewed in detail and discussed many

options of how best to provide outdoor water for this development. We have concluded that since this development is towards the upper end of the pressure zone and since we have experienced some pressure issues in the Grove pressure zone on the west side of the City, that the best option would be to require dry pressurized irrigation lines and services to be installed throughout this development that could be used at some point in the future when improvements increase the operating pressure in the irrigation system for this area. In this case, we would provide outdoor water for this development through the culinary system. Since there is a relatively low demand on this water system as opposed to that of the irrigation system, more consistent pressure can be provided for outdoor use. A minimum 6-inch pressurized irrigation main would be required, as shown on the plans, with 1-inch laterals to each lot.

Storm Water Drainage System

Storm drain plans and calculations are required at preliminary review and have been submitted. The existing storm drain line in the Falcon Ridge subdivision and 600 North is shown to be extended to serve the development. As with the sewer system, some storm drain lines are shown to be constructed outside of the City streets. An access road is provided at station 18+00 for maintenance.

All storm water is collected and detained in two local detention ponds, one above Lakeview Drive and one closer to Hog Hollow/600 North, then released at pre-development run-off rates into the existing storm water system in 600 North. Storm drain calculations and a detailed design have been provided for what is shown and are accepted.

A storm water pollution prevention plan has been submitted for the site addressing best management practices that will be implemented to control erosion on the site during construction. Before construction this will be evaluated and any minor corrections would be made at that time. A Land Disturbance Permit and UPDES permit would be required prior to construction.

General Subdivision Remarks

The developer indicated on the application that a request will be made to meet the water policy with cash in lieu of water rights. This will be a condition of final approval, not preliminary.

Section 3.12 of the City's development codes outlines the requirements for areas considered as sensitive land. The applicability of this ordinance to lands is based on hazard maps that have been adopted by the City showing the location and extent of potential hazards with the City and other factors. Upon reviewing the hazard maps, it appears that Geologic Hazards and the Urban/Wildland Interface Overlay areas need to be addressed. The entire property falls within the Geologic Hazards Overlay Zone. The potential hazards identified on this property are debris flow, rockfall and slide hazards. The developer has previously submitted environmental studies for the Vista Meadows development. In addition, a geologic hazards assessment was also submitted. A letter has been submitted by Earthtec Engineering assuring that the previously

submitted studies are valid for what is currently being proposed. We recommend that the documents be kept on file and disclosed to potential lot buyers.

The Urban/Wildland Interface Overlay area (Section 3.12.7 of the development code) outlines the requirements for when property falls within this area, mainly secondary access. The plans show a secondary access as required. This topic has been discussed quite extensively in the past and what is proposed is the result of these discussions. From station 17+00 to 27+80 the road narrows to 26' of asphalt, sidewalk on one side of the road, and no park strip.

The current plan does not show any trail easements within the development. It appears that there are one or more trails shown through this property on the trail master plan. **This should be discussed to provide direction for the Developer.**

We recommend that preliminary approval of the proposed development be approved with the following conditions:

- **The Planning Commission recommends and City Council approves the following:**
  - **an exception for the small amounts of property within the lots that contain land sloped greater than 25% (Section 3.9.4)**
  - **an exception to the 50 foot clear zone rule from station 1+00 to 5+00 (Section 4.1.2/4.17)**
  - **an exception to the 2:1 cut/fill slope (Section 4.1.2/4.17)**
  - **approval for the use of retaining walls (Section 3.9.7.4)**
  - **approval in change of use: 931 square feet of current public open space being changed to public right of way in exchange for 7,280 square of public open space.**
- **The Planning Commission and City Council make a recommendation regarding the aesthetics of retaining walls on this subdivision.**
- **The Planning Commission discuss the trail master plan and whether or not something should be incorporated into this plan (Section 3.17)**
- **The Developer coordinate with the City to show what culinary water system improvements will be made to solve the issue of lowering the fire flow level of service to the pressure zone to which it is connected**
- **The Developer submit a retaining wall design based on the Geotechnical Report prior to Final Approval**

Attached:
John E. Schiess, PE. Horrocks Engineers, "Development Hydraulic Modeling Results and Recommendations" October 2, 2014

Timothy A. Mitchell, PE. Earthtec Engineering, "Update of Geotechnical Report (Revised)" December 5, 2014 (Includes all geotechnical files submitted)

HORROCKS ENGINEERS

To: Shane Sorensen, P.E.
Jed Muhlestein, P.E.
Alpine City

From: John E. Schiess, P.E.

Date: October 2, 2014

Memorandum

Subject: Development Hydraulic Modeling Results and Recommendations

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The proposed Eagle Point development consist of 15 lots at the end of Lakeview Drive in the Northwest part of the City. The proposed culinary water improvements are to connect to the existing 8 inch line in Lakeview Drive and extend 10 inch lines throughout the development. The pressure zone is the Grove Zone. This analysis has been completed in the latest updated water model which includes the latest connections and latest State drinking water supply standards.

Currently the highest service lateral in the Grove Zone is at the east end of Lakeview Drive which is an elevation of 5275 feet. Pressures during the peak day are approximately 67 psi and available fire flow is approximately 1,707 gpm at this location. The proposed Eagle point development as designed will have a high service lateral location of approximately 5314 which is 39 feet higher than the previous high point in the zone. The pressure would be approximately 51 psi with a fire flow available of 950 gpm.

As designed the improvements will meet minimum standards for pressure but will not meet the minimum standards for fire flow (1000 gpm for 3,600 sf home). It is assumed that the proposed homes in the area will be larger than 3,600 sf. In addition the proposed improvements actually decrease the amount of fire flow available in the rest of the pressure zone. At the current high point in the zone the available fire flow decreases from approximately 1,707 gpm to 1,080 gpm. The reason for this decrease is because the definition of available fire flow is the amount of flow available at any one location without dropping the pressure below 20 psi at any point in the pressure zone. This development will have a higher service lateral than anywhere else in the zone and effectively lowers the fire flow available everywhere in the zone.

In order to bring the fire flows up to the minimum standards of 1,000 gpm I recommend replacing the existing 150 feet of 8 inch waterline in Lakeview Drive with 12 inch and extending the 12 inch line to the intersection of Vista Point and Lakeview. This will allow for the construction of 3,600 sf homes in the proposed subdivision. If fire sprinklers are installed the size of home allowed goes up to 6,200 sf. These changes to the proposed water system will not address the reduction in fire flows for the rest of the zone. Significant offsite improvements are required to address the reduction in fire flows and to increase the available fire flows in the subdivision itself.

One possible solution to both the development needs for additional fire flow and the loss of available fire flow in the overall Grove Zone would be the construction of a tank in the northwest portion of the City on the Grove pressure zone. The required elevation of the tank is above the proposed subdivision boundary. In addition the elevation should match the existing Willow Canyon Tank as the master plan calls for the reconstruction of the Grove Tank to match Willow Canyon elevation. The size of the tank should be based on the fire flow needs of the proposed homes to be constructed (a 10,000 sf home would need 330,000 gallons). Another tank location would be up Fort Canyon which would be better for the overall zone but may not provide the fire flow necessary for the Eagle Point without additional pipeline improvements. It would provide up to 2,250 gpm which would be adequate for a 7,700 sf home.

When and if the development moves forward with a tank I should review proposed sizes and locations to fine tune the model and any recommendations. Please let me know if you have any questions.

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3662 West 2100 South
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Phone (801) 808-9310

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516

December 5, 2014

Mr. Taylor Smith
c/o Excel Engineering
12 West 100 North, Suite 201
American Fork, UT 84003

Re: Update of Geotechnical Report (Revised)
Eagle Pointe Subdivision
Lakeview Drive Extension
Alpine, Utah
Project No. 141303

Mr. Smith:

A geotechnical study[1] and geological hazards assessment[2] for the subject site was performed by Earthtec Testing & Engineering, P.C. in 2005 at the time of the original report the subdivision was Summit Hills Development. Since then the name of the subdivision has change to Vista Meadow in 2006, and now is known as Eagle Pointe Subdivision. Multiple design[3,4], additional explorations[5] and multiple response[6,7,8,9] letters have been written between 2005 and 2007 Since completion of the studies and letters construction activities on the subdivision has not been started. We understand that the plans of Lakeview Drive and Eagle Pointe Subdivision have been slightly modified but have not changed the validity of the work completed. It is our opinion that the referenced geotechnical report and letters remain valid for developing the remainder of the project.

The geotechnical report, responses to UGS and TGE, and the Supplemental Wall design have all included 2H:1V or steeper slopes with multiple slope stability analysis performed for this

[1] Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, August, 18, 2005.
[2] Geological Hazards Assessment, Study, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, September 20, 2005
[3] Retaining Wall Recommendations Proposed Lakeview Drive, Summit Hill (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, April 19, 2006
[4] Supplemental Wall Recommendations, Proposed Lakeview Drive, Vista Meadows, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, February 5, 2007
[5] Additional Field Exploration, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, November 29, 2005
[6] Response to UGS Review, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, October 17, 2005
[7] Additional Information, Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, January 26, 2006
[8] Response to Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, October 3, 2006
[9] Response to 2nd TGE Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, November 3, 2006

project. A 2H:1V slope is acceptable provided all of the recommendations are completely followed.

The information presented in this letter applies only to the information that is included in the referenced reports and letters. The update presented in this letter was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No warranty or representation is intended in our proposals, contracts, reports, or letters.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact us at (801) 225-5711.

Respectfully;
EARTHTEC ENGINEERING

Caleb R. Allred, E.I.T.
Staff Engineer

Timothy A. Mitchell, P.E.
Geotechnical Engineer

CA/tm

CITY OF DRAPER

N 00°21'07" E 1311.28'

S 89°46'06" E 1070.95'

S89°46'49"W 845.76'

PROPERTY DESCRIPTION

COMMENCING AT THE NORTHEAST CORNER OF SECTION 23, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 00°21'07" WEST ALONG THE SECTION LINE 1134.04 FEET; THENCE NORTH 56°15'37" EAST 35.18 FEET; THENCE NORTH 29°33'14" EAST 125.80 FEET; THENCE SOUTH 89°59'05" EAST 122.53 FEET; THENCE SOUTH 00°21'03" WEST 124.12 FEET; THENCE SOUTH 20°01'33" WEST 121.12 FEET; THENCE NORTH 89°59'05" WEST 172.27 FEET; THENCE SOUTH 00°21'07" WEST 6.61 FEET; THENCE ALONG THE ARC OF A 324.00 FOOT RADIUS CURVE TO THE LEFT 97.46 FEET (CHORD BEARS SOUTH 81°22'49" WEST 97.09 FEET); THENCE SOUTH 72°45'48" WEST 135.67 FEET; THENCE SOUTH 89°46'49" WEST 845.76 FEET; THENCE NORTH 00°21'07" EAST 1311.28 FEET; THENCE SOUTH 89°48'06" EAST 1070.95 FEET TO THE POINT OF BEGINNING.
(INCLUDES LOT 3, PLAT "A", FALCON RIDGE P.R.D.)

AREA = 32.929 ACRES

54' ACCESS EASEMENT THRU PARCEL A & LOT 4 OF FALCON RIDGE PLAT 'A'

COMMENCING AT A POINT LOCATED SOUTH 00°21'07" WEST ALONG THE SECTION LINE 715.85 FEET FROM THE NORTHWEST CORNER OF SECTION 24, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN;

THENCE SOUTH 47°09'34" EAST, A DISTANCE OF 18.93 FEET; THENCE ALONG THE ARC OF A 123.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 49°26'37" FOR 106.14 FEET (CHORD BEARS SOUTH 71°52'52" EAST 102.88 FEET); THENCE NORTH 83°23'49" EAST, A DISTANCE OF 51.84 FEET; THENCE ALONG THE ARC OF A 123.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 23°37'03" FOR 50.70 FEET (CHORD BEARS NORTH 71°35'17" EAST 50.34 FEET); THENCE NORTH 59°46'46" EAST, A DISTANCE OF 96.56 FEET TO THE POINT OF CURVE OF A NON TANGENT CURVE; THENCE ALONG THE ARC OF THE 50.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 94°35'19" FOR 82.54 FEET (CHORD BEARS SOUTH 12°29'07" WEST 73.48 FEET); THENCE SOUTH 59°46'46" WEST, A DISTANCE OF 46.72 FEET; THENCE ALONG THE ARC OF A 177.00 FEET RADIUS CURVE TO THE RIGHT THROUGH A CENTRAL ANGLE OF 23°37'03" FOR 72.96 FEET (CHORD BEARS SOUTH 71°35'18" WEST 72.44 FEET); THENCE SOUTH 83°23'49" WEST, A DISTANCE OF 51.84 FEET; THENCE ALONG THE ARC OF A 177.00 FEET RADIUS CURVE TO THE RIGHT THROUGH A CENTRAL ANGLE OF 40°12'09" FOR 124.20 FEET (CHORD BEARS NORTH 76°30'06" WEST 121.66 FEET); THENCE NORTH 00°21'07" EAST, A DISTANCE OF 70.11 FEET TO THE POINT OF BEGINNING.

CONTAINING 15,890 SQUARE FEET OR 0.3648 ACRES, MORE OR LESS.

SOUTHEAST ACCESS EASEMENT THRU PARCEL A OF FALCON RIDGE PLAT 'A'

COMMENCING AT A POINT LOCATED SOUTH 00°21'07" WEST ALONG THE SECTION LINE 1092.59 FEET FROM THE NORTHWEST CORNER OF SECTION 24, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN;

THE BEGINNING OF A CURVE TO THE RIGHT, OF WHICH THE RADIUS POINT LIES SOUTH 05°00'59" WEST, A RADIAL DISTANCE OF 177.00 FEET; THENCE EASTERLY ALONG THE ARC, THROUGH A CENTRAL ANGLE OF 12°18'53", A DISTANCE OF 38.04 FEET (CHORD BEARS SOUTH 78°49'35" EAST 37.97 FEET); THENCE SOUTH 29°33'14" WEST, A DISTANCE OF 16.73 FEET; THENCE SOUTH 56°15'37" WEST, A DISTANCE OF 35.18 FEET; THENCE NORTH 00°21'07" EAST, A DISTANCE OF 41.45 FEET TO THE POINT OF BEGINNING.

CONTAINING 931 SQUARE FEET OR 0.0214 ACRES, MORE OR LESS.

LOT 3 OF FALCON RIDGE PLAT 'A' NOTE:

LOT 3 OF FALCON RIDGE PLAT 'A' WILL BE VACATED WITH THE FINAL PLAT FOR THIS SUBDIVISION. THIS LOT IS LOCATED WHERE LOT 14 OF THIS SUBDIVISION IS PROPOSED.

GENERAL NOTES

1. ALL LOTS ARE SUBJECT TO A 5' UTILITY EASEMENT (P.U.E.) ALONG ALL SIDE LOT LINES AND A 10' UTILITY EASEMENT ALONG ALL STREET FRONTAGES AND REAR LOT LINES, IN ADDITION TO ANY EASEMENTS SHOWN ON THIS PRELIMINARY PLAT.

2. ALL BUILDINGS SHALL BE LOCATED WITHIN THE DESIGNATED BUILDING AREA AS SHOWN ON THIS PRELIMINARY PLAT. (SEE SEPARATE SLOPE ANALYSIS PLAN TO SEE AREAS WITH SLOPE GREATER THAN 20% SLOPE WHICH FORCED TYPICAL SETBACK LINES TO MOVE.)

60 30 0 60 120 180

Scale 1" = 60'

EAST 1/4 CORNER
SECTION 23, T4S, R1E,
SLB&M
FOUND BRASS CAP

S00°21'07"W
2606.94'
E1/4 TO NE COR

NORTHEAST CORNER
SECTION 23, T4S, R1E,
SLB&M
FOUND BRASS CAP

S00°21'07"W 1134.04'

PARCEL A
PUBLIC OPEN SPACE

PLAT "A"
FALCON RIDGE PRD

RICHARD HARTVIGSSEN

HOG HOLLOW RD

LAKEVIEW DR.

LAKEMEW DR.

VISTA POINT

OPEN SPACE

SOME BUILDING SETBACKS NOT TYPICAL (TO EXCLUDE SLOPES IN EXCESS OF 20%)

ONLY XERISCAPE ALLOWED ABOVE THIS ELEVATION.

12' SIDE SETBACK (TYP.)

30' REAR SETBACK (TYP.)

30' FRONT SETBACK (TYP.)

10' PUE (TYP.)

30' SEWER & SD EASEMENT

54' ACCESS EASEMENT. SEE DESCRIPTION.

SOUTHEAST ACCESS EASEMENT. SEE DESCRIPTION.

BENCH MARK
NORTHEAST CORNER, SECTION 23, TOWNSHIP 4S, RANGE 1E, SLB&M ELEV = 5355.52'

REVISIONS		
Rev.	Date	Description
1	01/06/15	REVISED AS PER CITY COMMENTS DATED 9/26/14
2	01/22/15	REVISED AS PER CITY COMMENTS

Developer:
Capital Property Management Series Eagle Pointe
P.O. Box 1212
American Fork, UT 84003
(801) 367-1636

EXCEL ENGINEERING
David W. Peterson, P.E., License #270393
12 West 100 North, Suite 201, American Fork, UT 84003
P: (801) 756-4504; F: (801) 756-4511

EAGLE POINTE SUBDIVISION

ALPINE CITY HOG HOLLOW RD/MATTERHORN DR. UTAH

Drawn by: D.W.P.
Designed by: D.W.P.
Checked by: D.W.P.

PRELIMINARY PLAT

Scale: 1"=60'
Date: 09/03/14
CV2

Earthtec Engineering

1497 West 40 South
Lindon, Utah - 84042
Phone (801) 225-5711

3662 West 2100 South
Salt Lake City, Utah - 84120
Phone (801) 808-9310

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516

December 5, 2014

Mr. Taylor Smith
c/o Excel Engineering
12 West 100 North, Suite 201
American Fork, UT 84003

Re: Update of Geotechnical Report (Revised)
Eagle Pointe Subdivision
Lakeview Drive Extension
Alpine, Utah
Project No. 141303

Mr. Smith:

A geotechnical study[1] and geological hazards assessment[2] for the subject site was performed by Earthtec Testing & Engineering, P.C. in 2005 at the time of the original report the subdivision was Summit Hills Development. Since then the name of the subdivision has change to Vista Meadow in 2006, and now is known as Eagle Pointe Subdivision. Multiple design[3,4], additional explorations[5] and multiple response[6,7,8,9] letters have been written between 2005 and 2007 Since completion of the studies and letters construction activities on the subdivision has not been started. We understand that the plans of Lakeview Drive and Eagle Pointe Subdivision have been slightly modified but have not changed the validity of the work completed. It is our opinion that the referenced geotechnical report and letters remain valid for developing the remainder of the project.

The geotechnical report, responses to UGS and TGE, and the Supplemental Wall design have all included 2H:1V or steeper slopes with multiple slope stability analysis performed for this

[1] Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, August, 18, 2005.
[2] Geological Hazards Assessment, Study, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, September 20, 2005
[3] Retaining Wall Recommendations Proposed Lakeview Drive, Summit Hill (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, April 19, 2006
[4] Supplemental Wall Recommendations, Proposed Lakeview Drive, Vista Meadows, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, February 5, 2007
[5] Additional Field Exploration, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, November 29, 2005
[6] Response to UGS Review, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, October 17, 2005
[7] Additional Information, Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, January 26, 2006
[8] Response to Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, October 3, 2006
[9] Response to 2nd TGE Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, November 3, 2006

project. A 2H:1V slope is acceptable provided all of the recommendations are completely followed.

The information presented in this letter applies only to the information that is included in the referenced reports and letters. The update presented in this letter was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No warranty or representation is intended in our proposals, contracts, reports, or letters.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact us at (801) 225-5711.

Respectfully;
EARTHTEC ENGINEERING

Caleb R. Allred, E.I.T.
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CA/tm

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GEOTECHNICAL STUDY
SUMMIT HILLS DEVELOPMENT
& LAKEVIEW DRIVE EXTENSION
ALPINE, UTAH

Prepared By:

Earthtec
Testing and Engineering, P.C.

133 North 1330 West
Orem, Utah 84057
(801) 225-5711

Job No. 051709

Prepared for:

Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

August 18, 2005

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1.0 INTRODUCTION

This report presents the results of a geotechnical study for a proposed residential development and the extension of Lakeview Drive in Alpine, Utah. The general location of the site is shown on Figure 1, *Vicinity Map*, at the end of this report.

The purposes of this study were to 1) evaluate the subsurface soil conditions at the site, 2) assess the engineering characteristics of the subsurface soils, and 3) to provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, miscellaneous concrete flatwork, retaining walls, and asphalt pavement sections. The scope of work completed for this study included field reconnaissance, subsurface exploration, field and laboratory soil testing, engineering analysis, and the preparation of this report.

2.0 CONCLUSIONS

The following is a brief summary of our findings and conclusions:

1. The soils encountered in the explorations consisted of approximately 12 inches of topsoil and up to 6 feet of fill, followed by Lean Clay (CL), Sand (SM, SC) and Gravel (GC, GP-GC) layers extending to the maximum depths explored of approximately 9 to 41½ feet below the existing surface.

2. Cut slopes up to 40 feet in height will be stable if constructed at 1.5H:1V slopes or flatter. Fill slopes (including rock walls) will be stable if constructed at 1.5H:1V slopes (overall) or flatter. Fill slopes may be constructed as steep as 1H:1V if geogrid is used to stabilize the slopes. More details regarding grading and slope stability are presented in Section 8.0.

3. We recommend that foundations be constructed entirely on undisturbed, uniform native sand/gravel soils, or entirely on a minimum zone of 18 inches of properly placed and compacted structural fill placed on undisturbed native soil. A maximum bearing capacity of 2,000 psf may be used for design of the footings. More details regarding foundation design can be found in Section 10.0 of this report.

These findings and conclusions should not be relied upon without reading and consulting this report for a more detailed description of the geotechnical evaluation and recommendations contained herein.

3.0 PROPOSED CONSTRUCTION

It is our understanding that the proposed project consists of developing 17 hillside lots and extending Lakeview Drive from the current cul-de-sac to its terminus at Hog Hollow Road. As part of the extension, two cul-de-sacs will be constructed off of the proposed Lakeview Drive. We also understand that at least four rock covered slopes/retaining walls will be located along the proposed streets, with two located near the existing cul-de-sac of Lakeview Drive where fill will be placed so the road can cross an existing ravine, one located near Hog Hollow Road to support proposed cut slopes, and one located along Lots B, 12, and 13 to support proposed cut slopes. We anticipate that the residential structures will be of wood frame construction and estimate that foundation loads will not exceed 3 kips per linear foot for bearing walls and 150 pounds per square foot for floor slabs. If structural loads will be greater our office should be notified so that we may review our recommendations and, if necessary, make modifications.

In addition to the structures described above, we anticipate that utilities will be installed to service the proposed residences, and that exterior concrete flatwork will be placed in the form of curb, gutter, sidewalks, and driveways.

4.0 GENERAL SITE DESCRIPTION

At the time of our field exploration, the site consisted of hilly terrain vegetated with sagebrush, grass, and weeds. Some grading (cutting and filling) had already begun at the site. The terrain ranges from slightly to steeply sloping, with existing slopes as steep as 1.5H:1V (Horizontal: Vertical). The site is bounded on the north and west by undeveloped land, on the east by existing residences, and on the south by Hog Hollow Road.

5.0 SUBSURFACE EXPLORATION

Under the direction of a qualified member of our geotechnical staff, subsurface exploration was conducted at the site on July 27, 2005, by excavating 4 test pits to approximate depths of 9 to 10 feet below the existing ground surface using a rubber-tire backhoe. An additional 2 exploratory test holes were drilled at the site on August 10, 2005 to approximate depths of 21½ to 41½ feet below the existing ground surface using an all-terrain hydraulic drill rig. The approximate locations of the test holes and test pits are shown on Figure 2 at the end of this report. Graphical representations and detailed descriptions of the soils encountered are shown on Figures 3 through 8, *Test Hole Log* and *Test Pit Log* at the end of this report. A key to the symbols and terms on the logs is presented on Figure 9, *Key to Symbols*.

The soils exposed in the test pits were classified by visual examination using the guidelines of the Unified Soil Classification System (USCS). Disturbed bag samples and relatively undisturbed block samples of the native soils were collected at various depths in the test pits.

Samples of the subsurface soils below the drill augers were collected at 2½ to 5 foot intervals through the augers. Disturbed samples were collected with a 1⅜ inch inside diameter split spoon sampler. The split spoon sampler was driven 18 inches into undisturbed soil with a 140 pound hammer free-falling through a distance of 30 inches. The blows required to drive the sampler through the final 12 inches of penetration is called the blow count and is recorded on the attached test hole logs at the respective sample depths. However, when 50 blows were achieved for any 6-inch drive increment, sampling was terminated and the number of blows per 6 inch increment were recorded.

The collected samples were classified by visual examination in the field following the guidelines of the Unified Soil Classification System (USCS). The samples were transported to our Orem, Utah laboratory where they will be retained for 30 days following the date of this

report and then discarded, unless a written request for additional holding time is received prior to the 30 day limit.

6.0 LABORATORY TESTING

Selected soil samples were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Laboratory testing consisted of natural moisture content and dry density tests, one-dimensional consolidation tests, Atterberg limits determinations, and mechanical gradation tests. The following table summarizes the results of the laboratory testing. Test results are also given on the enclosed test pit logs at the respective sample depths, and on Figures 10 and 11, *Consolidation-Swell Test*, at the end of this report.

Table 1: Laboratory Test Results

TEST PIT NO.	DEPTH (ft.)	NATURAL MOISTURE (%)	NATURAL DRY DENSITY (pcf)	ATTERBERG LIMITS		GRAIN SIZE DISTRIBUTION (%)			SOIL TYPE
				LIQUID LIMIT	PLASTICITY INDEX	GRAVEL #4	SAND	SILT/ CLAY #200	
TP-1	3	8	---	32	15	75	12	13	GC
TP-2	7	16	---	38	23	17	34	49	SC
TP-3	4½	16	88	44	26	---	---	---	CL
TP-3	7½	20	100	37	18	---	---	---	CL
TP-4	8	7	---	26	9	36	51	13	SC

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

The surface of the site was covered with clayey topsoil and/or fill. We estimated the topsoil to extend approximately 12 inches in depth, and the fill to extend as deep as 6 feet in TP-2, at the exploration locations. Underlying the topsoil and fill, we encountered layers of Lean CLAY (CL), Silty to Clayey SAND (SM to SC) with varying amounts of gravel, Clayey GRAVEL with

sand (GC), and Poorly Graded GRAVEL with clay and sand (GP-GC), extending to the maximum depths explored of about 9 to 41½ feet below the existing surface.

Graphical representations and detailed descriptions of the soils encountered are shown on Figures 3 through 8, *Test Hole Log* and *Test Pit Log* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units, the actual transition may be gradual. Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure No. 9, *Key to Symbols*.

7.2 Groundwater Conditions

Groundwater was not encountered in the test holes or test pits at the time of our field explorations. Groundwater levels will fluctuate in response to the season, precipitation and snow melt, irrigation, and other on and off-site influences. Precisely quantifying these fluctuations would require long term monitoring which is beyond the scope of this investigation.

8.0 SITE GRADING

8.1 General Site Grading

Unsuitable soils and vegetation should be removed from below areas which will ultimately support structural loads. These areas include those below foundations, floor slabs, exterior concrete flatwork, retaining walls, and pavements. Unsuitable soils consist of topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials. The topsoil was estimated to extend approximately 12 inches in depth, and fill (which we believe is undocumented) was encountered in TP-2 to a depth of about 6 feet. The topsoil and fill, even if found to extend deeper, along with any other disturbed or unsuitable soils, should be completely removed in the areas described above.

For hillside grading, it is very important that fill not be placed on any slopes steeper than about 5H:1V. Prior to placing fill on steeper slopes, the hillside beneath the fill footprint should be benched and keyed. The benches should be relatively level and not exceed a vertical height of 4 feet from one bench to the next. A minimum 3-foot deep and 10-foot wide key (bottom bench) should be cut into the native soils to help support the fill that will be placed. Through-drainage should be adequately sized and properly placed to ensure the fill does not become saturated from water flowing through underlying ravines.

The native sand/gravel soils may meet our recommendations for structural fill and could thus be used as such. The native clay soils will not meet those recommendations and should not be used as structural fill. Excavated soils may be stockpiled for use as fill in landscape areas.

8.2 Fill Material

Structural fill should consist of imported material meeting the following requirements:

Maximum particle size:	4 inches
Percent retained on the 3/4 inch sieve (coarse gravel):	30 maximum
Percent passing the No. 200 sieve (fines):	15 maximum
Liquid Limit of fines:	35 maximum
Plasticity Index of fines:	15 maximum

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable, however, compaction and compaction testing may be more difficult. As a result more strict quality controls measures than normally used may be required. Such measures may include using thinner lifts, and increased or full time observation of fill placement.

Utility trenches may be backfilled with the native soil or structural fill. If native soil that is predominantly fine grained (clay or silt) is used, it may be difficult and time consuming to adjust the moisture content and obtain the required compaction. All backfill soil should meet the following requirements:

Maximum particle size:	4 inches
Liquid Limit of fines:	35 maximum
Plasticity Index of fines:	15 maximum

8.3 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness of 4 inches for hand operated equipment, 6 inches for most "trench compactors", and 8 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift. The full thickness of each lift of structural fill placed should be compacted to at least the following percentages of the maximum dry density, as determined by ASTM D-1557:

In landscape areas not supporting structural loads:	90%
Less than 5 feet of fill below foundations, flatwork and pavements:	95%
5 or more feet of fill below foundations, flatwork and pavements:	98%

Generally, placing and compacting fill at a moisture content within 2% of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content is from optimum the more difficult it will be to achieve the required compaction.

We recommend that fill be tested frequently during placement. Early testing is recommended to demonstrate that placement and compaction methods are achieving the required compaction. It is the contractor's responsibility to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

8.4 Temporary Excavations

For temporary excavations less than 5 feet in depth into the native soils or into structural fill, slopes should not be made steeper than 0.5H:1V. Temporary excavations extending up to 10

feet in depth should not be made steeper than 1H:1V. If unstable conditions or groundwater seepage are encountered, flatter slopes or shoring or bracing may be required.

8.5 Permanent Slopes

Several steep slopes are currently planned as fills to either support Lakeview Drive or as hillside cuts to construct Lakeview Drive. We understand the planned fill slopes will be as high as 50 feet, which will fill in the ravine that the road will cross just west of the current cul-de-sac, and maximum cut heights will be approximately 40 feet. Fill slopes as steep as 1H:1V and cut slopes as steep as 2.5H:1V are planned.

Our engineering analyses of the project included evaluating the stability of the proposed walls. For our analyses, we assigned strength parameters to the native silty sand soils based on published values for, and our experience with, similar soil types. The Bureau of Reclamation[1] has performed large direct shear testing and indicated that compacted clayey gravel soils have an internal friction angle greater than 31°, and clayey sand soils have an internal friction angle of 28° to 34° and a saturated cohesion of 120 to 360 psf. Accordingly, we estimated the following parameters for use in the stability analyses:

Material	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Saturated Unit Weight (pcf)
Clayey Sand/Gravel	36	150	130
Rock Boulders	45	0	145

We also presumed that no phreatic surface would form behind the walls because of the sandy nature of the native soils. For the seismic evaluation, expected ground motions at the site for site (grid) locations of 40.464° north latitude and -111.794° west longitude were determined by

[1]U.S. Bureau of Reclamation, 1987, "Design Standards No. 13, Embankment Dams," Denver, Colorado.

querying the USGS website, which resulted in a value of 0.22g for a 10% probability of exceedance in 50 years. For seismic conditions, this peak acceleration value was used as the psuedostatic coefficient (0.22).

Using these input parameters, we evaluated the global stability of the wall using the computer program PCSTBL6. This program uses a limit equilibrium (Bishop's modified) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated.

The fill configuration we analyzed consisted of several rock tiers, each approximately 10 feet high, with the overall slope (toe to top) at about 1H:1V. The typical minimum factors of safety (FS) are 1.5 for static conditions and 1.1 for seismic (psuedostatic) conditions. In order to achieve these values, geogrid such as Tensar BX1200 or equivalent will be required for fill slopes steeper than 1.5H:1V. The geogrid layers need to be spaced vertically about 2 feet and extend back behind the wall/slope face a minimum distance equivalent to 70% of the overall slope height. Fill slopes placed at 1.5H:1V or flatter will be stable up to about 50 to 60 feet in height. Note that our analyses assumes the on-site clayey gravel with sand soils will be used to construct the fill embankments.

The cut configuration analyzed consisted of a 40-foot high 1.5H:1V cut slope. Our analyses indicate that this cut configuration provides adequate factors of safety as discussed above. The slope stability results are attached as Figures 12 through 15.

9.0 SEISMIC CONSIDERATIONS

9.1 Faulting

No surficial evidence of faulting across the site was observed during our field reconnaissance. A map produced by Utah County[2] indicates that the nearest fault trace is the Wasatch Fault, which is located approximately 1½ miles northeast of the site.

9.2 Liquefaction Potential

The site is located in an area mapped by the Utah Geological Survey[3] as having very low liquefaction potential. Liquefaction is a phenomenon where a soil loses intergranular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) relative density of the soil, 4) earthquake strength (magnitude) and duration, and 5) overburden pressures. In addition, the soils must be saturated for liquefaction to occur. As a part of this investigation, the potential for liquefaction to occur in the soils we observed was assessed

Loose, saturated sands are most susceptible to liquefaction, but soft, sensitive silt soils also have the potential to experience failure and movement during a seismic event. The relatively dense and unsaturated soil conditions encountered during our field exploration support a low liquefaction potential designation.

9.3 IRC Seismic Design Category

The Seismic Design Categories in the International Residential Code (IRC) are based upon the short period design accelerations determined using the seismic provisions of the International

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[2]Natural Hazards Overlay Series, Faults/Liquefaction, Urban Corridor, Utah County Government, 2001.

[3]Liquefaction Potential Map, Utah Geological Survey, Public Information Series 28. 1994.

Building Code (IBC) and the soil properties in the upper 100 feet of the soil profile. These properties are determined from SPT blow counts and undrained shear strength measurements. The IBC code also states that "Where site specific data are not available to a depth of 100 feet, appropriate soil properties may be estimated by the registered design professional preparing the soils report...." We estimate that the soils encountered in the test holes and test pits are best defined using Site Class C.

The site is located at the grid coordinates given above in Section 8.5, which results in $S_D = 1.60$. For Site Class C, Fa = 1.0 and $S_{DS} = 1.07$. The Seismic Design Category is D_2.

10.0 FOUNDATIONS

10.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered at the site, the results of laboratory testing of the native soils, the site grading recommendations presented in this report, and the foundation loading conditions presented in Section 3.0, *Proposed Construction*, of this report. If loading conditions are significantly different, we should be notified in order to re-evaluate our design parameters and estimates, and to provide additional recommendations if necessary.

Foundations should not be installed on topsoil, undocumented fill, debris, combination soils, frozen soil, or in ponded water. If foundation soils become disturbed during construction they should be proof rolled to provide a firm surface for footing construction or fill placement. We recommend that foundations be constructed entirely on undisturbed, uniform native sand/gravel soils, or entirely on a minimum of 18 inches of properly placed and compacted structural fill placed on undisturbed native soils. Note that footings placed on more than 5 feet of fill should be strictly controlled during placement (as described above in Section 8.3) to minimize potential settlements. For design of conventional strip and spread footings, the following parameters are recommended:

Minimum embedment for frost protection:	30 inches
Minimum strip footing width:	20 inches
Minimum spot footing width:	30 inches
Maximum allowable net bearing pressure:	2,000 psf
Bearing pressure increase for transient loading:	33 percent

Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 18 inches of structural fill are required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings.

10.2 Estimated Settlement

If the proposed foundations are properly designed and constructed using the parameters provided above, total settlement for non-earthquake conditions is estimated not to exceed one inch. Differential settlement is anticipated to be one-half of the total settlement over a 25-foot length of foundation. Note that placing more than about 5 feet of fill above the existing ground surface could also result in additional settlements if fill is not strictly controlled during placement and compaction. Additional settlement could occur due to shaking during a seismic event.

11.0 FLOOR SLABS

To facilitate construction, act as a capillary break, and aid in distributing floor loads we recommend that all at-grade slabs and exterior flatwork be underlain by four inches of free-draining granular material such as "pea" gravel or three-quarters to one-inch minus clean gravel supported on re-compacted native soils or structural fill.

To help control normal shrinkage and stress cracking the floor slabs should have the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;

2. Frequent crack control joints; and

3. Non-rigid attachment of the slabs to foundation and bearing walls.

Special precautions should be taken during placement and curing of all concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

12.0 SUBSURFACE DRAINAGE

According to Section R405 of the 2003 International Residential Code, "Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade." An exception is allowed when the foundation is installed on well drained ground consisting of Group 1 soils. These soils include those defined by the Unified Soil Classification System as GW, GP, SW, SP, GM, and SM. Some of the sand (SM) layers encountered in the test holes/pits are Group I soils, but other sand (SC), gravel (GC) and clay (CL) soils are not. If floor slabs will be placed at any depth below the existing surface, we recommend that foundation drains be installed.

13.0 MOISTURE CONTROL AND SURFACE DRAINAGE

Precautions should be taken during and after construction to reduce the potential for saturation of foundation soils. We recommend that the following precautions be taken at this site:

1. Adequate compaction of foundation backfill should be provided i.e. a minimum of 90% of ASTM D-1557. **Water consolidation methods should not be used.**

2. The ground surface should be graded to drain away from the residences in all directions. We recommend a minimum fall of 6 inches in the first 10 feet.

3. Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from structures, whichever is greater.

4. Sprinklers should be aimed away from foundation walls. Sprinkler systems should be well maintained, checked for leaks frequently, and repaired promptly.

5. Any additional precautions which may become evident during construction.

14.0 PAVEMENT DESIGN

We understand that the proposed streets within the development will consist of asphalt pavement. We have based our design on clayey sand/gravel soil layers which will support the pavement sections on many of the cut areas throughout the site. We estimate that a California Bearing Ratio (CBR) value of 10 is appropriate for these soils.

We have prepared a pavement section design based on this assumed CBR value, an assumed traffic volume of 200 vehicles a day (consisting mostly of cars and pickup trucks, some delivery trucks, a daily school bus, and a weekly garbage truck), a design life of 20 years, and the site grading recommendations presented in this report. Based on these parameters and the procedures outlined in the *AASHTO Guide for Design of Pavement Structures (1993)*, we recommend the minimum asphalt pavement section presented in the table below.

Table 2: Pavement Section Design

ASPHALT THICKNESS (in)	COMPACTED ROADBASE THICKNESS (in)	COMPACTED SUBBASE THICKNESS (in)
3.0	8.0	0.0

This pavement section is not intended to support construction traffic, or heavy trucks. All base material and asphalt should conform to local requirements regarding thickness, gradation, oil content, and any other requirements pertaining to the project. We recommend that all roadbase and subbase be properly processed, moisture conditioned, and compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557. All asphalt should be compacted to a minimum of 95% of the laboratory Marshal mix design density.

15.0 GENERAL CONDITIONS

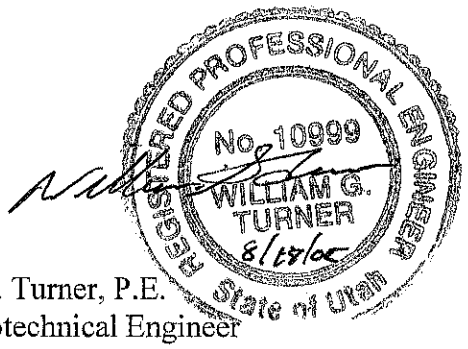
The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The test holes and test pits may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the test holes/pits may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, please advise us so that the appropriate modifications can be made.

The geotechnical study as presented in this report was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No other warranty or representation, either expressed or implied, is intended in our proposals, contracts or reports.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

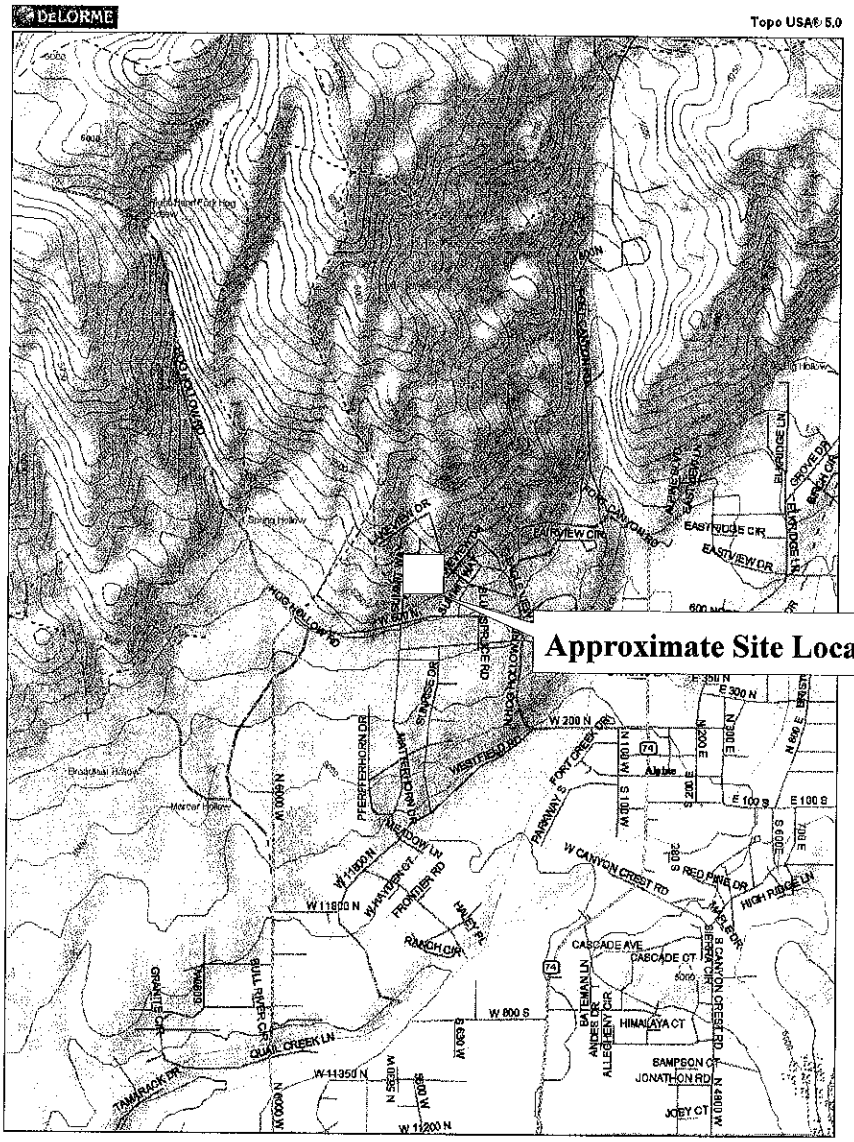
EARTHTEC TESTING AND ENGINEERING, P.C.



William G. Turner, P.E.
Senior Geotechnical Engineer

Jeffrey J. Egbert, P.E.
Project Engineer

VICINITY MAP
SUMMIT HILLS DEVELOPMENT



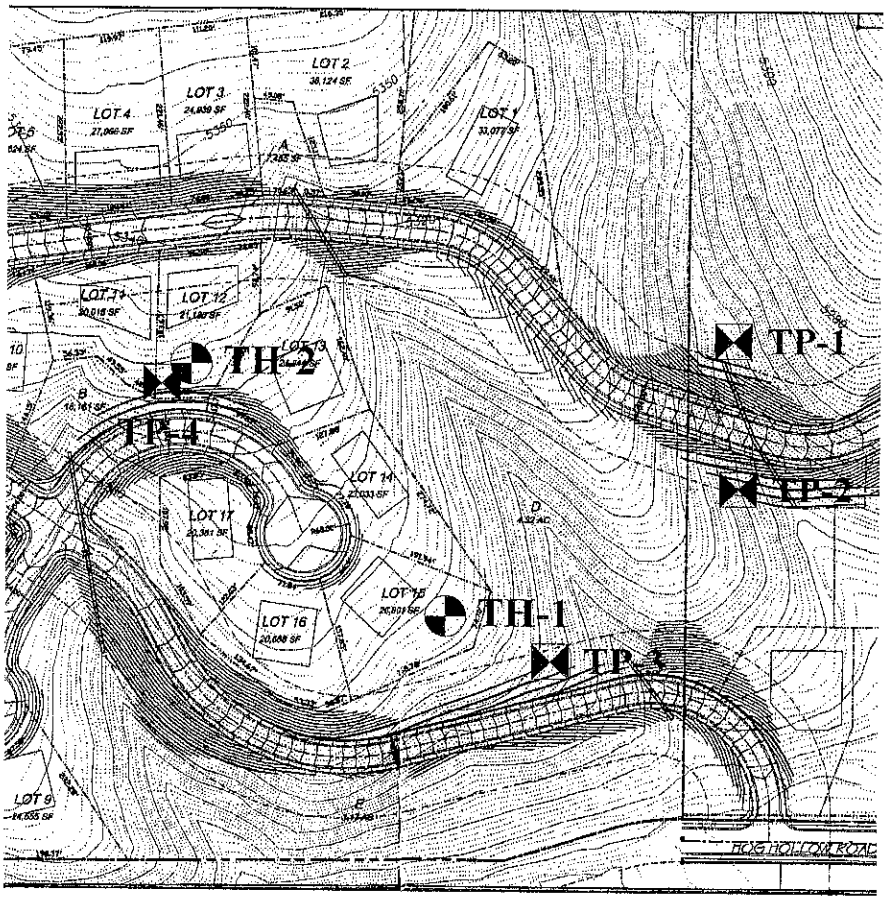
N

Not to Scale

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 1

SITE PLAN & LOCATION OF TEST HOLES AND PITS

SUMMIT HILLS DEVELOPMENT



Approximate Test Pit Location

Approximate Test Hole Location

N

Not to Scale

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 2

TEST HOLE LOG

NO.: TH-1

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Raycon
EQUIPMENT: D120 ATV
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 08/10/05
ELEVATION: Not Measured
LOGGED BY: S.G.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, some gravel, trace of sand, roots and organics, moist, brown.										
3		SC	Clayey SAND with gravel: Medium dense, moist, light brown.		28								
6		SM	Silty SAND with gravel: Dense, moist, light brown.		42								
9		SM			37								
12		SM			32								
15		GC	Clayey GRAVEL with sand: Some clay lenses, dense to very dense, moist, brown.		48								
18		GC											
21		GC			31								
24		GC											
27		GC			52								
30		GC											

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 051709

Earthtec Testing and Engineering, P.C.

FIGURE NO.: 3a

LOG OF TESTHOLE 051709.GPJ EARTHTEC.GDT 8/18/05

TEST HOLE LOG

NO.: TH-1

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Raycon
EQUIPMENT: D120 ATV
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 08/10/05
ELEVATION: Not Measured
LOGGED BY: S.G.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
30			Clayey GRAVEL with sand (continued) - reddish brown.		47								
33													
36		GC	- Light brown below 35 feet.		77								
39													
			Bottom at 40¼ feet.		50/2"								
42													
45													
48													
51													
54													
57													
60													

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

TEST HOLE LOG

NO.: TH-2

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Raycon
EQUIPMENT: D120 ATV
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 08/10/05
ELEVATION: Not Measured
LOGGED BY: S.G.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, some gravel and sand, roots and organics, moist, brown.										
			Poorly Graded GRAVEL with clay and sand: Dense to very dense, moist, light brown.										
3					8 50/6"								
6		GP-GC			44								
9					53								
12					46								
15			Clayey GRAVEL with sand: Very dense, moist, light brown.		9 29 50/6"								
18		GC											
21					58								
24			Bottom at 21½ feet.										
27													
30													

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

TEST PIT LOG
NO.: TP-1

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Halls Excavating
EQUIPMENT: Rubber-tire backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 07/27/05
ELEVATION: Not Measured
LOGGED BY: J.E.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, silt, sandy and gravelly, roots and organics, dark brown.									
1												
2			Clayey GRAVEL: Some sand, trace of cobbles and boulders, a few clay pockets, medium dense to dense, moist, brown.									
3												
4				X		8	15	32	75	12	13	
5		GC										
6												
7			- More cobbles and orange-brown below 6 feet.	X								
8												
9												
10			Bottom at 9 feet.									
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 051709

Earthtec Testing and Engineering, P.C.

FIGURE NO.: 5

TEST PIT LOG
NO.: TP-2

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Halls Excavating
EQUIPMENT: Rubber-tire backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 07/27/05
ELEVATION: Not Measured
LOGGED BY: J.E.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			FILL: Clay, some sand and gravel, organic debris, pieces of wood, moist, red-brown to gray-black.									
6		SC	Clayey SAND with gravel: Medium dense, moist, gray to brown, some roots.	X		16	23	38	17	34	49	
9			Bottom at 9 feet.									

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 051709

Earthtec Testing and Engineering, P.C.

FIGURE NO.: 6

LOG OF TESTPIT 051709.GPJ EARTHTEC.GDT 8/18/05

TEST PIT LOG
NO.: TP-3

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Halls Excavating
EQUIPMENT: Rubber-tire backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 07/27/05
ELEVATION: Not Measured
LOGGED BY: J.E.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, gravelly, occasional cobbles and boulders at surface, roots and organics, moist, dark brown.									
1		GC	Clayey GRAVEL with sand and cobbles: Medium dense, moist, dark brown, some roots.									
2												
3		CL	Lean CLAY with sand: Stiff, moist, red-brown, minor to moderate pinholes.									
4												
5				■	88	16	26	44				
6												
7												
8				■	100	20	18	37				
9												
10												
11			Bottom at 10 feet.									
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

TEST PIT LOG
NO.: TP-4

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Halls Excavating
EQUIPMENT: Rubber-tire backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 07/27/05
ELEVATION: Not Measured
LOGGED BY: J.E.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, sandy, gravelly, occasional cobbles and boulders at surface, roots and organics, slightly moist, dark brown.									
1												
2		GC	Clayey GRAVEL with sand and cobbles: Dense, moist, red-brown.									
3												
4												
5												
6		SC	Clayey SAND with gravel: Dense, moist, brown.									
7												
8				X		7	9	26	36	51	13	
9			Bottom at 9 feet.									
10												
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 051709

Earthtec Testing and Engineering, P.C.

FIGURE NO.: 8

LOG OF TESTPIT 051709.GPJ EARTHTEC.GDT 8/18/05

LEGEND

PROJECT: Summit Hills Development **DATE:** 07/27/05
CLIENT: Taylor Smith c/o Sowby & Berg Consultants **LOGGED BY:** J.E.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS			USCS SYMBOL	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)	GW	Well Graded Gravel, May Contain Sand, Very Little Fines
			GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)	GM	Silty Gravel, May Contain Sand
			GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)	SW	Well Graded Sand, May Contain Gravel, Very Little Fines
			SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)	SM	Silty Sand, May Contain Gravel
			SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
			ML	Silt, Inorganic, May Contain Gravel and/or Sand
			OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)		CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
			MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
			OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS			PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

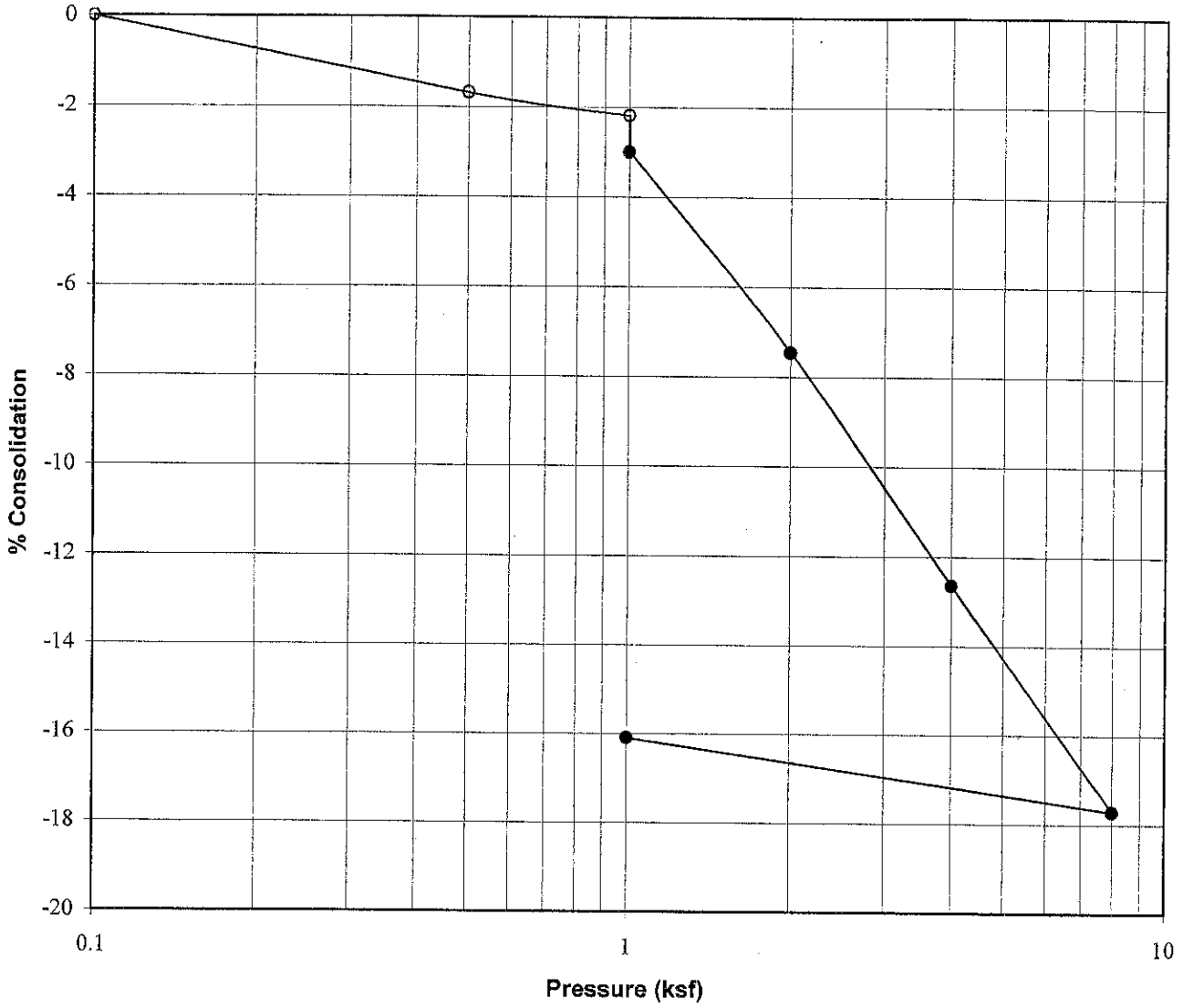
- SPLIT SPOON SAMPLER (1 3/8 inch inside diameter)
- MODIFIED CALIFORNIA SAMPLER (2½ inch outside diameter)
- SHELBY TUBE (3 inch outside diameter)
- BLOCK SAMPLE
- BAG/BULK SAMPLE

WATER SYMBOLS

- ▽ Water level encountered during field exploration
- ▼ Water level encountered at completion of field exploration

NOTES:
1. The logs are subject to the limitations, conclusions, and recommendations in this report.
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
3. Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
4. In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

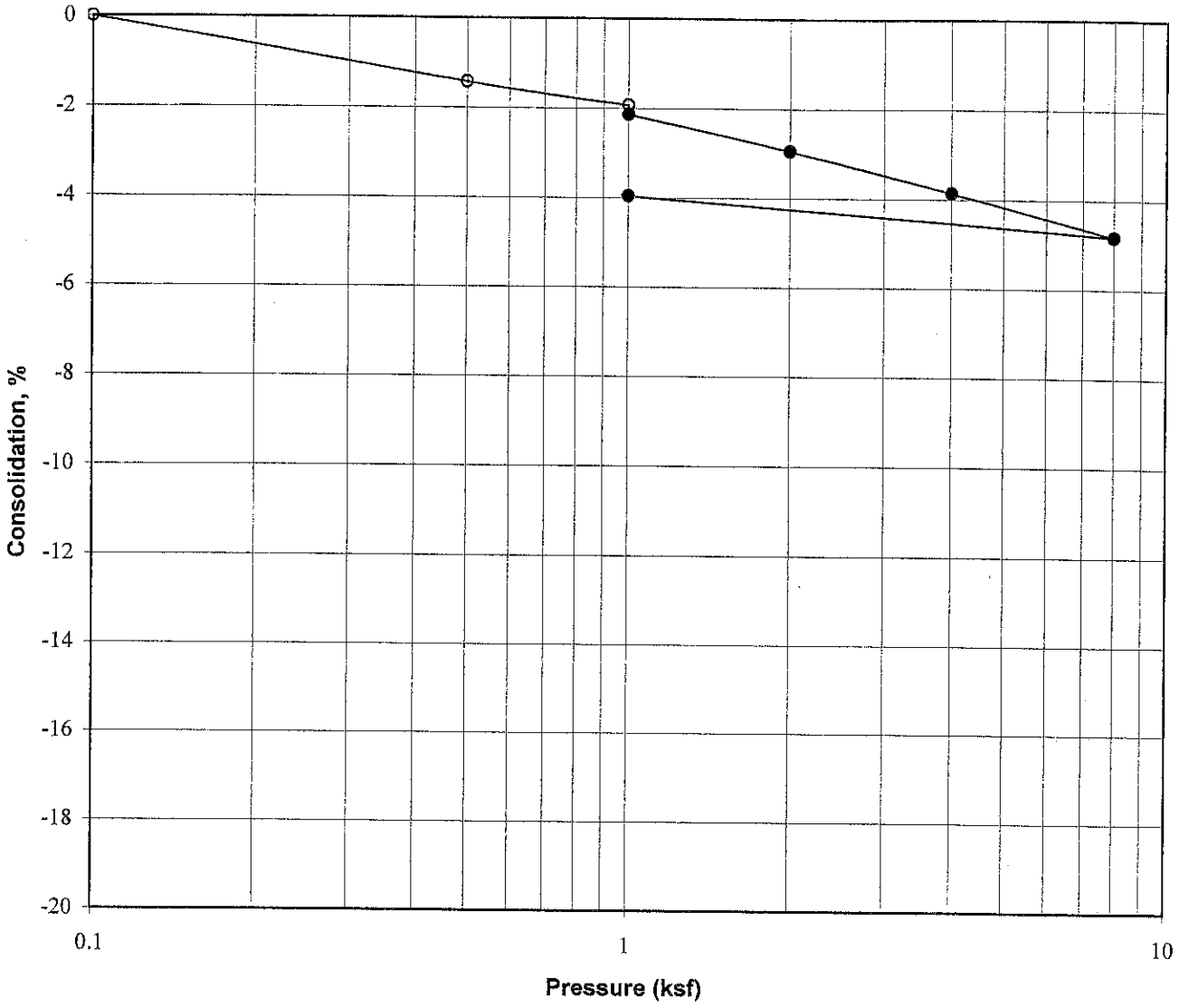
CONSOLIDATION - SWELL TEST



Project:	Lakeview Drive Walls
Location:	TP-3
Sample Depth:	4½
Description:	Block
Soil Type:	LEAN CLAY (CL)
Dry Density, pcf:	88
Natural Moisture, %:	16
Liquid Limit:	44
Plasticity Index:	26
Water Added at:	1 ksf
Percent Collapse:	0.8

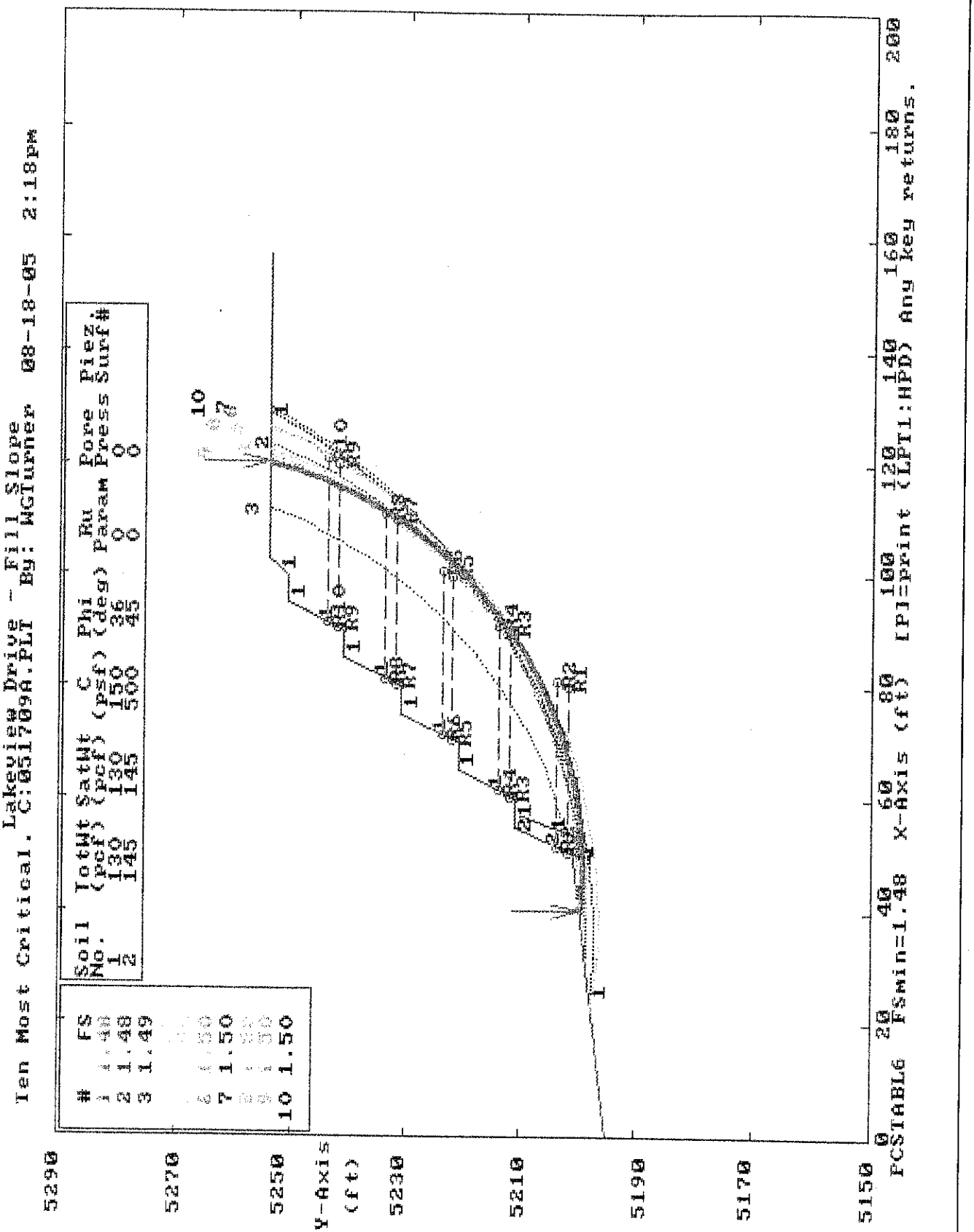
(Sample slightly disturbed due to removal of small gravel particles)

CONSOLIDATION - SWELL TEST



Project:	Lakeview Drive Walls
Location:	TP-3
Sample Depth:	7½
Description:	Block
Soil Type:	LEAN CLAY (CL)
Dry Density, pcf:	100
Natural Moisture, %:	20
Liquid Limit:	37
Plasticity Index:	18
Water Added at:	1 ksf
Percent Collapse:	0.2

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 12

STABILITY RESULTS

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 15

Earthtec Testing & Engineering, P.C.

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GEOLOGICAL HAZARDS ASSESSMENT
SUMMIT HILLS DEVELOPMENT
ALPINE, UTAH

Prepared By:

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133 North 1330 West
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Job No. 051709

Prepared for:

Mr. Taylor Smith
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45 North 490 West
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September 20, 2005

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3.0 GEOLOGIC SETTING 2

4.0 GEOLOGIC HAZARDS 4
- 4.1 Surface Fault Rupture 4
- 4.2 Landslides 5
- 4.3 Rockfall Hazard 6
- 4.4 Flooding and Debris Flow 7
- 4.5 Tectonic Deformation 8
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FIGURES

No. 1 VICINITY MAP
No. 2 SITE PLAN
No. 3 GEOLOGIC MAP
Nos. 4 & 5 STABILITY RESULTS

1.0 INTRODUCTION

This report presents the results of a geological hazards assessment for the proposed Summit Hills residential development in Alpine, Utah. The approximate location of the site with respect to existing roadways is shown on Figure No. 1, *Vicinity Map*, at the end of this report. The purpose of this assessment is to identify potential geologic hazards at the site, to assess whether such hazards pose a risk to development, and to determine if further evaluation and/or mitigation is warranted. This assessment was aided by a recent geotechnical study (Earthtec, 2005) completed by our office for the site. The findings and conclusions of this assessment are based on a geologic reconnaissance of the site, a review of available topographic, geologic and hazards maps, a review of available aerial photographs, and the findings of the referenced geotechnical study for the site.

2.0 GENERAL SITE DESCRIPTION

A geologic reconnaissance of the site was conducted by the undersigned geologist on September 16, 2005. The subject site is located in the foothills on the southern flank of the Traverse Mountains in northern Utah County. The elevation of the site ranges from approximately 5,200 to 5,380 feet above sea level. The boundaries and topography of the proposed development are shown on Figure No. 2, *Site Plan.* As shown on Figure No. 2, the topography at the site is formed by a series of south-southeast trending ridges and ravines. The sides of the ravines and the south-facing slopes at the southern ends of the ridges are the steepest areas on the site with slopes ranging from approximately 15 to 30 degrees. The areas along the ridge tops where proposed building lots will be sited are less steep with slopes ranging from 3 to 12 degrees. The area is vegetated with grass, sage brush, and patches of scrub oak. No surface water, springs, or seeps were observed at the site. None of the ravine channels showed evidence of recent runoff flow and all the channels were over-grown with grass and brush. The site is bordered on the north and west by open foothills and on the east and south by existing residential development.

3.0 GEOLOGIC SETTING

As discussed above, the subject site is located on the southern flank of the Traverse Mountains at the northern end of Utah Valley. The Traverse Mountains are a major east-west trending bedrock salient that separates the Utah Valley to the south from the Salt Lake Valley to the north (Machette, 1992). The Traverse Mountains abut the Oquirrh Mountains to the west and the Wasatch Mountains to the east. The Wasatch Range to the east forms the eastern boundary of the Basin and Range physiographic province. The north trending Wasatch Fault Zone lies at the base of the Wasatch Range and separates the Basin and Range physiographic province to the west from the Middle Rocky Mountain and Colorado Plateau physiographic provinces to the east. Seismic displacement within the Wasatch Fault Zone during the Tertiary and Quaternary geologic periods has resulted in the uplift of the Wasatch Range and relative down drop of Utah Valley.

Tectonically, the Traverse Mountains are the location of an intersection between the inactive Charleston-Nebo Thrust Fault and the active Wasatch Fault Zone (Stokes, 1986) (Machette, 1992). The mountain range is also the structural boundary between the Salt Lake (north) and Provo (south) segments of the Wasatch Fault Zone. Motion between the two segments of the Wasatch Fault Zone is transferred along the Fort Canyon Fault located approximately 1.5 miles north-northeast of the subject site (Machette, 1992). The Wasatch Fault Zone is considered to be an "active" fault zone. An active fault zone is defined as one that has shown evidence for displacement during Holocene time (past 10,000 years). The Wasatch Fault Zone runs in a southerly direction from near the Utah-Idaho border to central Utah. The fault zone is comprised of six to ten separate segments. As discussed, the subject site is located near the transition between the Salt Lake and Provo Segments of the fault zone. A number of studies have been completed on the Wasatch Fault, including studies by Swan and others (1980), Schwartz and Coppersmith (1984), Lund and others (1991), Machette and others (1991, 1992), McCalpin and others (1994), and Black and others (1995). Evidence of multiple surface rupture events on the five central segments of the fault zone during the late Pleistocene and Holocene has been

documented. Recurrence intervals for these events during the past 5,600 years are on the order of 350 years for the entire fault zone and 1,275 to 2,800 years for individual segments. The most recent surface rupture events on the five central segments of the fault zone appear to have occurred between 620 ±30 and 2,120 ±100 years ago. These surface rupture events have been estimated to be associated with paleo-earthquakes of surface wave magnitude (M_s) 6.5 to 7.5. (Machette, 1992; McCalpin and Nishenko, 1996).

The surficial geology of the Wasatch Fault Zone and the eastern margin of Utah Valley has been mapped by Machette (1992). A portion of this geologic map showing the location of the subject site and surrounding area is included as Figure No. 3, *Geologic Map*. The surficial geology at the location of the site has been mapped as Neogene sedimentary rocks (Ns) that are overlain on areas of the southeast corner of the site by upper to middle Pleistocene, pre-Bonneville lake cycle fan alluvium (af4). Two younger, Holocene to uppermost Pleistocene alluvial fans (afy) are mapped at the mouths of two ravines to the southeast of the site. These younger alluvial fans are shown to overlie older, upper Pleistocene lacustrine gravels, sands, and clays (lbg, lbs, lbm) to the south of the subject site. Machette (1992) describes the Neogene sedimentary rock (Ns) mapped at the site as "a mixture of fine to coarse grained sandstone and conglomerate in the eastern half of the Traverse Mountains." The older alluvial fan (af4) deposits at the site are generally a conglomeration of pebble to cobble sized clasts with a few boulders in a matrix of sand, silt, and sandy clays. Machette (1992) did not map any landslide deposits or features at or adjacent to the site and no fault traces were mapped crossing or projecting toward the site.

The surficial deposits observed at the site during the geologic reconnaissance were generally pebble to cobble gravels in a silt or silty clay matrix with a few scattered boulders at the surface. No bedrock outcrops were found at the site. The subsurface deposits encountered during our geotechnical investigation (Earthtec, 2005) at the site generally consisted of medium dense to very dense clayey gravels and clayey sands, and an occasional pocket of stiff sandy clay. The deposits encountered at the site are generally consistent with those mapped by Machette (1992)

and appear to be mostly weathered conglomerate bedrock. However, no contact separation between Neogene bedrock and younger alluvial fan deposits was identified. The ravine channels at the site all contain relatively shallow deposits of young (late Holocene) alluvial and colluvial material eroded from the surrounding hillsides.

4.0 GEOLOGIC HAZARDS

The primary focus of the geologic reconnaissance at the site was to identify, document, and provide an assessment of potential geologic hazards at the site. Our assessment of these potential hazards is discussed in the following paragraphs. It should be noted that some hazard assessments may be preliminary and may require additional study to adequately quantify the hazard. In addition to the site reconnaissance, a review was conducted of available geologic maps, hazard maps, topographic maps, and aerial photographs to aid in the identification of potential hazards at the site. Potential hazards and other issues related to shallow groundwater, soil liquefaction, collapsible or compressible soils, and seismic considerations were addressed in the geotechnical study (Earthtec, 2005) for the site.

4.1 Surface Fault Rupture

Available geologic mapping reviewed as part of this study does not indicate the presence of surface fault rupture traces crossing the site or projecting toward the site (Machette, 1992) (Utah County Natural Hazards Overlay Map, 2001). No evidence of past faulting on the property or surrounding areas was observed during the geologic reconnaissance. The nearest mapped active faults to the site of the proposed development are the Fort Canyon Fault 1.5 miles north-northeast and the Wasatch Fault approximately 2 miles to the east. It is our conclusion that additional surface fault rupture investigations for the site are not warranted and no fault setbacks are recommended for the proposed development.

4.2 Landslides

In addition to the geologic mapping completed by machette (1992) that shows no landslide deposits or features on or in the vicinity of the subject site, a landslide map completed by Harty (1992) also shows no landslide deposits or features on or near the site. However, the steep slopes on the southern edge of the site that slope down toward 600 North Street were identified to have the greatest potential for slope instability due to their steep profile and the observed rock-faced road cuts at the toes of the slopes. The steepest of these slope faces was measured to have a slope of approximately 30 degrees and the highest road cut was estimated to be between 10 and 15 vertical feet. Using the mapped and measured topographic profile for the slope directly south of the proposed Lots 15 and 16 at the site, a computer-aided slope stability analysis was conducted. The soil strength parameters assigned to the native soils at the site in the stability models were based on the subsurface soils observed during our geotechnical study (Earthtec, 2005) and published values for, and our experience with, similar soil types. The U.S. Bureau of Reclamation (1987) has performed large direct shear testing and indicated that compacted clayey gravel soils have an internal friction angle greater than 31°, and clayey sand soils have an internal friction angle of 28° to 34° and a saturated cohesion of 120 to 360 psf. Accordingly, we estimated the following parameters for use in the stability analyses:

Material	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Saturated Unit Weight (pcf)
Clayey Sand/Gravel	36	150	130

We also presumed that no phreatic surface would form behind the walls because of the sandy nature of the native soils. For the seismic evaluation, expected ground motions at the site for site (grid) locations of 40.464° north latitude and -111.794° west longitude were determined by querying the USGS website, which resulted in a value of 0.22g for a 10% probability of

exceedance in 50 years. For seismic conditions, this peak acceleration value was used as the psuedostatic coefficient (0.22).

Using these input parameters, we evaluated the global stability of the wall using the computer program PCSTBL6. This program uses a limit equilibrium (Bishop's modified) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated. The typical minimum factors of safety (FS) are 1.5 for static conditions and 1.1 for seismic (psuedostatic) conditions.

The general profile of the slope modeled in the slope stability analysis is shown on Figure Nos. 4 and 5, *Stability Results*. As shown, the factors of safety determined by the analysis for static and psuedostatic conditions are 1.92 and 1.18 respectively.

Stability of the proposed cuts and fills for the extension of Lakeview Drive at the site were addressed in the geotechnical study (Earthtec, 2005) completed by our office.

4.3 Rockfall Hazard

The Utah County Natural Hazards Overlay Map (2001) places the subject site in a rockfall potential area. Based on our site reconnaissance, the subject property, and specifically the proposed building sites, are not located in a rockfall run out zone. There is no potential rockfall source area up-slope to the north of the site. A few scattered boulders were observed on the surface throughout the site. None of the observed boulders were greater than 2 feet in diameter. It is our interpretation that these boulders were transported as alluvium or eroded from the existing deposits at the site, and are not the result of rockfall events due to the lack of any rockfall source areas in the vicinity. It is our conclusion that the proposed building areas at the site are in a low relative rockfall hazard area. Existing loose rocks or rocks excavated during construction activities could roll down steeper slopes at the site into the ravines or possibly onto

600 North Street to the south of the development. It is recommended that any existing loose boulders or excavated rocks over 1 foot in diameter be removed from any locations on or within 25 feet of any slope greater than 15% at the site.

4.4 Flooding and Debris Flow

The ravines that cross the site are all relatively small and do not contain regularly flowing streams. No evidence of recent steam flow or erosion was apparent in the ravine channels at the time of the reconnaissance. The areas drained by the ravines are relatively small, well vegetated, and covered with extensive soil deposits. Based on our observations and empirical analysis, the ravines do have the potential to produce relatively small volumes of water runoff and small volume debris flows. However, all of the proposed building sites in development are located on the ridge crests and are not at risk from flooding or debris flow events that could occur in the ravines. The absence of significant erosion on the slopes at the site and the presence of relatively dense vegetation over most of the slopes suggest that the slope soils are capable of absorbing "normal" amounts of precipitation or snow melt.

The mapped young alluvial fans (afy) (Machette, 1992) at the mouths of the drainage ravines to the east of the site are located to the southeast of the subject site on currently developed areas. It is our opinion that flooding and debris flow events at the site have relatively long recurrence intervals. However, the drainages to the east and those on the site currently empty onto these developed areas, which are, and will continue to be, at greatest risk from any future water runoff or debris flows. The proposed extension of Lakeview Drive will cross the ravines at the site at four locations, as shown on Figure No. 2. It is our understanding that the ravines will be filled at these locations and that drainage structures will be installed to allow water runoff to pass through the fills. However, debris flow material originating up-stream from the road crossings will not likely pass the drainage structures and should be effectively contained on the up-slope sides of the road fill crossings. Therefore, it is our opinion that the proposed residential

development and extension of Lakeview Drive will actually decrease the existing debris flow hazard on the existing development to the south. Water runoff could still affect these off-site areas and will not be significantly affected by the proposed development. We do recommend that the ravine areas directly upstream of the proposed Lakeview Drive fills be periodically cleaned of sediment buildup and loose debris to maintain proper water flow through the planned drainage structures. This should also be completed immediately following any debris flow events.

4.5 Tectonic Deformation

Tectonic deformation could include cracking, surface tilting, and liquefaction with possible subsidence associated with ground motion during an earthquake. There is no evidence of significant ground deformation at the site. The absence of active faulting at or near the site and the presence of shallow bedrock and granular soils suggests that the potential for significant future ground deformation is low. A large magnitude earthquake on one of several active faults in the region could cause relatively intense ground shaking at the site. The recommendations given in Section 9.0 of the geotechnical study (Earthtec, 2005) for the site regarding IBC seismic design should be fully implemented in building design and construction.

4.6 Surface Water

No evidence of springs or seeps was observed on the hilly terrain or in the ravines at the site. No surface water was observed during our reconnaissance. As discussed in Section 4.4, the ravines at the site have the potential to transport surface runoff resulting from locally intense rainfall or heavy, rapid snow melt. Based on our review of the proposed building locations at the site, we do not believe that surface runoff in the ravines will pose a risk to the development.

4.7 Radon

A radon hazard potential map of Utah prepared by Black (1993), indicates that the subject property is located in an area of "high " radon hazard potential. Radon is a radioactive gas that is a product of the natural radioactive decay of uranium, a trace element commonly found in soils and bedrock. Radon is believed to be a significant cause of lung cancer in humans. Radon can enter groundwater and the atmosphere as it moves upward after being produced naturally in the subsurface. The gas has the potential to enter buildings through cracks and other openings in footings and floor slabs and can affect buildings of any age or type. The radon hazard map reviewed for this report is only intended to be used as a general reference. Radon levels in buildings are influenced by both geological and non-geological factors and levels can vary from site to site. Radon testing would be necessary to determine actual indoor radon levels in any future buildings at the site. However, radon ventilation systems are relatively inexpensive and easy to implement into building plans during construction, if desired.

4.8 Other Geologic Hazards

Other geologic hazards that are not likely to affect the subject site due to the location of the site, the regional geologic setting, or the low probability of occurrence are seismic seiche, snow avalanche, and volcanic eruption. The probability of these hazards affecting the site is rated as low.

5.0 CONCLUSIONS

Based on our site reconnaissance, review of available maps and aerial photographs, and on the slope stability analysis, there do not appear to be any significant or imminent geologic conditions at the site that might threaten the proposed development. The site appears to be suitable for the proposed development from a geologic standpoint provided the recommendations in this report and in the referenced geotechnical study (Earthtec, 2005) are followed and implemented. It is our opinion that additional geologic assessment at the site is not warranted at this time.

6.0 GENERAL CONDITIONS

The observations, conclusions, and recommendations presented in this report were conducted and presented within the limits prescribed by our client and according to the generally accepted practices of the engineering geology profession. No other warranty or representation, either expressed or implied, is intended in our proposals, contracts, reports, and letters.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.

Mark C. Larsen, P.G.
Project Geologist

William G. Turner, P.E.
Senior Geotechnical Engineer

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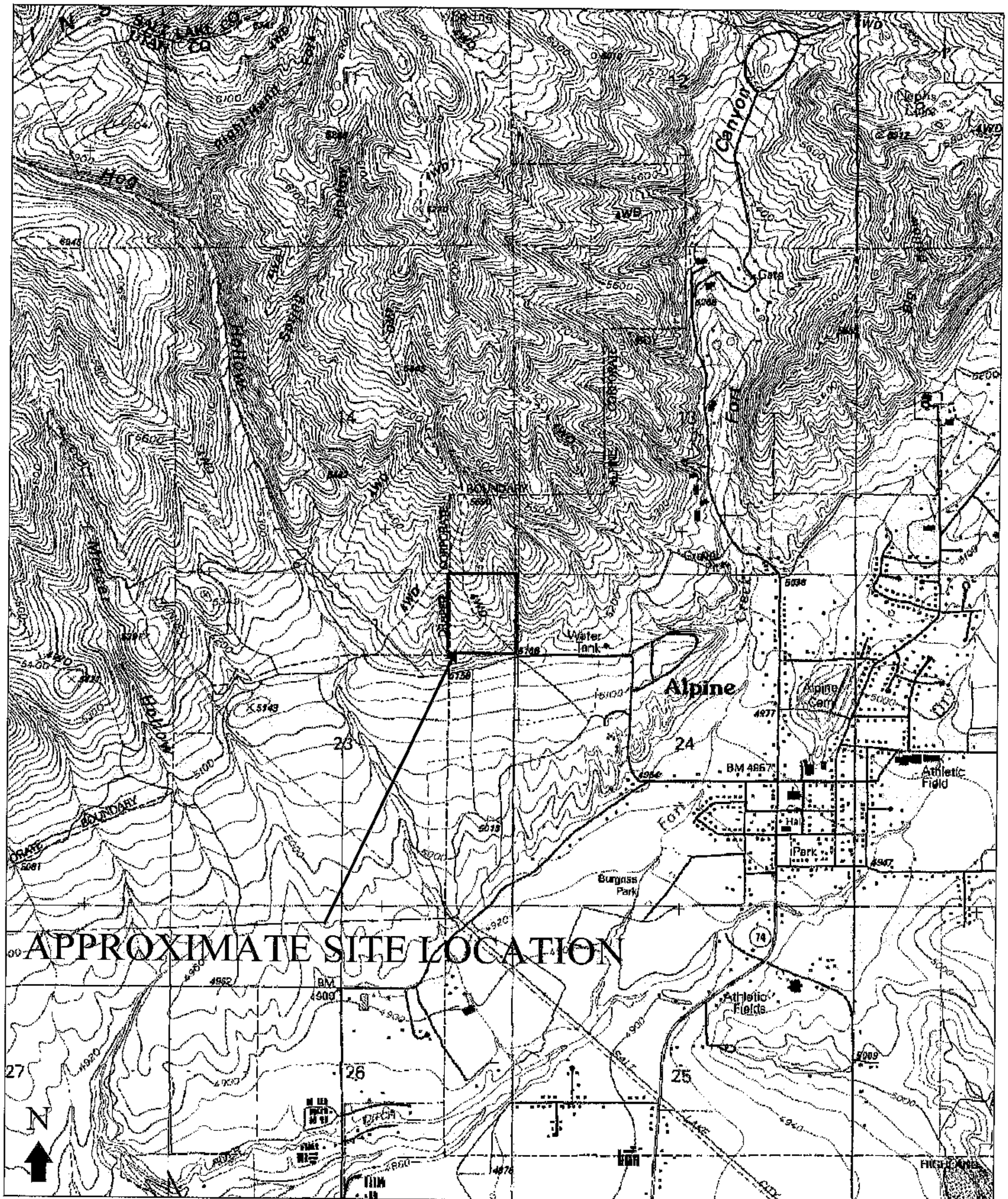
VICINITY MAP

SUMMIT HILLS

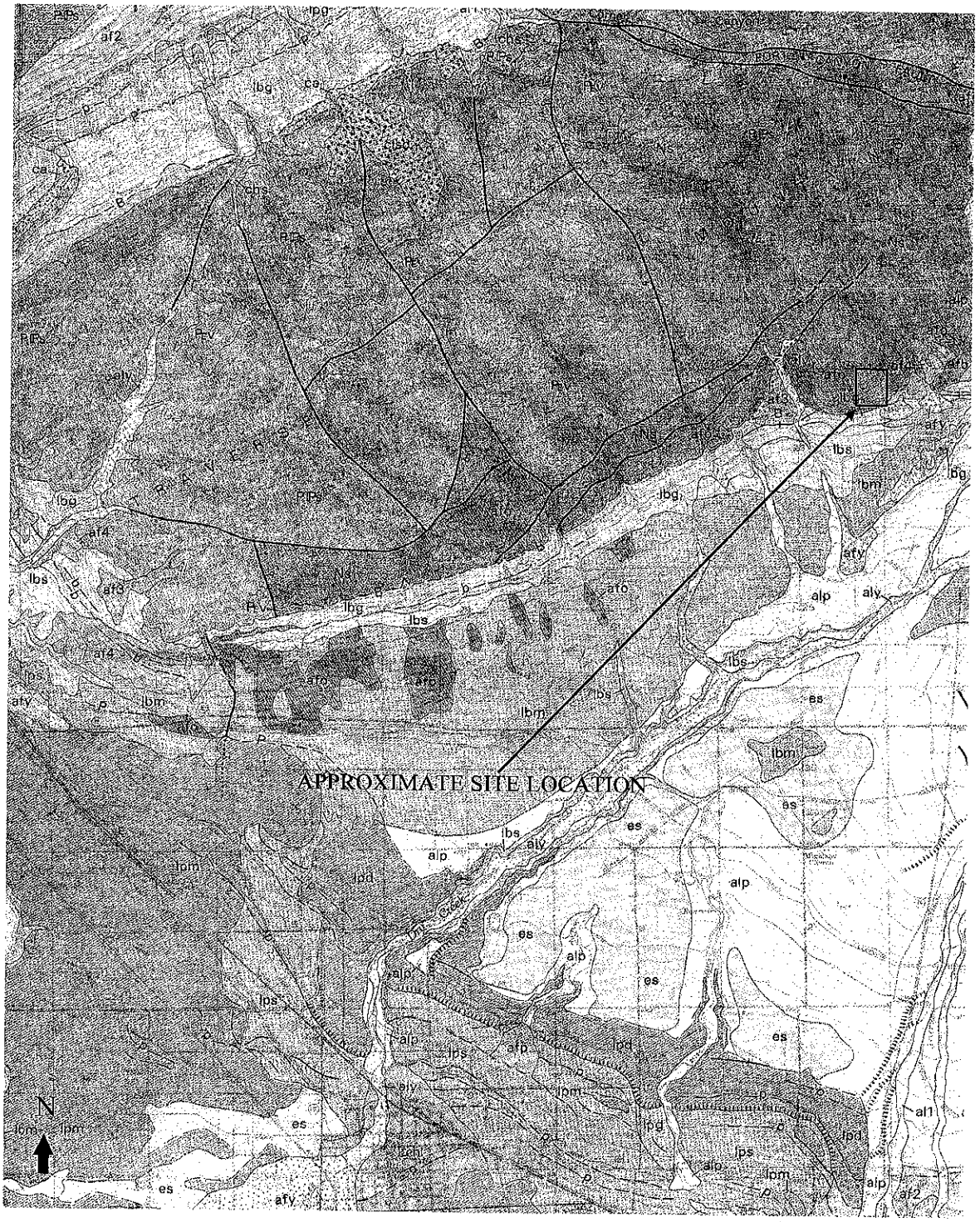


3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

700 ft Scale: 1 : 24,000 Detail: 13-0 Datum: WGS84

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 1

GEOLOGIC MAP
SUMMIT HILLS



Map Taken From Machette, 1992

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 3

GEOLOGIC MAP LEGEND

SUMMIT HILLS

LIST OF MAP UNITS

[See Description of Map Units in pamphlet for detailed descriptions of units]

LACUSTRINE DEPOSITS

Deposits younger than the Bonneville Lake Cycle (Holocene to upper Pleistocene)

- lyl — Younger lacustrine and marsh deposits
- lally — Lacustrine, marsh, and alluvial deposits, undivided

Deposits of the Provo (regressive) phase of the Bonneville lake cycle (upper Pleistocene)

- lpd — Deltaic deposits
- lpg — Lacustrine gravel
- lpm — Lacustrine silt and clay

Deposits of the Bonneville (transgressive) phase of the Bonneville lake cycle (upper Pleistocene)

- lbd — Deltaic deposits
- lbg — Lacustrine gravel
- lbs — Lacustrine sand
- lbm — Lacustrine silt and clay

Deposits of the Bonneville lake cycle, undivided by phase (upper Pleistocene)

- lbpg — Lacustrine gravel
- lbps — Lacustrine sand
- lbpm — Lacustrine silt and clay

ALLUVIAL DEPOSITS

Deposits of stream alluvium

- al1 — Stream alluvium, unit 1 (upper Holocene)
- al2 — Stream alluvium, unit 2 (middle Holocene to uppermost Pleistocene)
- aly — Younger stream alluvium, undivided (Holocene to uppermost Pleistocene)
- alp — Stream alluvium related to the Provo phase of the Bonneville lake cycle (uppermost Pleistocene)
- alb — Stream alluvium related to the Bonneville phase of the Bonneville lake cycle (upper Pleistocene)
- al3 — Stream alluvium unit 3, related to undifferentiated phases of the Bonneville lake cycle (upper Pleistocene)
- alo — Older stream alluvium, undivided (upper ? to middle Pleistocene; probably pre-Little Valley lake cycle)

Alluvial-fan deposits

- af1 — Fan alluvium, unit 1 (upper Holocene)
- af2 — Fan alluvium, unit 2 (middle Holocene to uppermost Pleistocene)
- afy — Younger fan alluvium, undivided (Holocene to uppermost Pleistocene)
- afp — Fan alluvium related to the Provo phase of the Bonneville lake cycle (uppermost Pleistocene)
- afb — Fan alluvium related to Bonneville phase of the Bonneville lake cycle (upper Pleistocene)
- af3 — Fan alluvium unit 3, related to undivided phases of the Bonneville lake cycle (upper Pleistocene)
- af4 — Fan alluvium, unit 4 (upper to middle Pleistocene; pre-Bonneville lake cycle)
- af5 — Fan alluvium, unit 5 (middle Pleistocene; pre-Little Valley lake cycle)
- afo — Older fan alluvium, undivided (upper to middle Pleistocene; pre-Bonneville lake cycle)

GLACIAL DEPOSITS

- qbgo — Outwash of the Bells Canyon advance (upper Pleistocene, Pinedale equivalent)
- qbgt — Till of the Bells Canyon advance (upper Pleistocene, Pinedale equivalent)
- qdgo — Outwash of the Dry Creek advance (uppermost middle Pleistocene, Bull Lake equivalent)
- qdgt — Till of the Dry Creek advance (uppermost middle Pleistocene, Bull Lake equivalent)
- as — Eolian sand and silt (Holocene to uppermost Pleistocene)

COLLUVIAL DEPOSITS

- cd1 — Debris flows, unit 1 (upper Holocene)
- cd2 — Debris flows, unit 2 (middle Holocene to uppermost Pleistocene)
- cdy — Debris flows, undivided (Holocene to uppermost Pleistocene)
- cfs — Fault-scarp colluvium (Holocene to uppermost Pleistocene)
- chs — Hillslope colluvium (Holocene to upper Pleistocene)
- cr — Rockfall deposits (Holocene to upper Pleistocene)
- clsp — Lateral-spread deposits (Holocene to upper Pleistocene)
- cly — Younger landslide deposits (Holocene to upper Pleistocene)
- clo — Older landslide deposits (upper Pleistocene to upper Tertiary?)
- c — Colluvium and alluvium, undivided (Holocene to middle Pleistocene)

ARTIFICIAL DEPOSITS

- f — Artificial fill and associated disturbed ground (historic)

BEDROCK

- Ng — Neogene sedimentary rocks
- Nv — Paleogene volcanic rocks
- Ni — Paleogene intrusive rocks
- PzKs — Paleogene and Upper Cretaceous sedimentary rocks, undivided
- Pu — Paleozoic sedimentary rocks, upper part (Lower Permian)
- PPs — Paleozoic sedimentary rocks, middle part (Lower Permian and Pennsylvanian)
- PCs — Paleozoic sedimentary rocks, lower part (Lower Pennsylvanian, Mississippian, Devonian, and Cambrian)—Stipple pattern indicates Manning Canyon Shale
- pCa — Proterozoic and Archean rocks (Precambrian)

Contact—Solid where well located or defined; dashed where approximately located; dotted where concealed

Gradational contact—Contact between two units that interfingue or between two differentiated units (such as af1 and af2) and its undifferentiated counterpart (afy)

Normal fault—Bar and solid ball on down-dropped side along Wasatch fault zone; bar and hollow ball along other faults. Dashed where approximately located; dotted where concealed. Height of fault scarp and amount of offset of geomorphic surface (in parentheses) shown in meters. Location of exploratory trenches shown by following symbols: AF, American Fork Canyon; RC, Rock Creek; DH, Deadmans Hollow; HC, Hobble Creek; MN, Mapleton North; MS, Mapleton South; WC, Water Canyon; and WH, Woodland Hills

Thrust fault—Sawteeth on overriding plate or block (mapped in bedrock only); dashed where approximately located; dotted where concealed

Anticline—Solid arrows show folded lake beds as indicated by geophysical surveys of Utah Lake. Hollow arrows show anticline in surficial units

Syncline—Solid arrows show folded lake beds as indicated by geophysical surveys of Utah Lake. Hollow arrows show syncline in surficial units

Shoreline, combination of prominent shorelines related to levels of the Bonneville lake cycle and its successor, Utah Lake—May coincide with contact, topographic escarpment, or topographic crest of lacustrine bar or spit

—B— Highest shoreline of the Bonneville (transgressive) phase

—b— Other shorelines of the Bonneville phase—Mostly transgressive

—P— Highest shoreline of the Provo (regressive) phase—Dotted where buried by younger units or removed by erosion

—p— Other shorelines below the highest Provo shoreline—Mostly of the Provo phase, but may include some shorelines of the Bonneville (transgressive) phase

—U— Shorelines of Utah Lake

Topographic crest of lacustrine bar or spit

Topographic crest of lateral- or terminal-glacial moraine (units gbot and gdot)

Topographic escarpment—Escarpment along stream channels, terraces, and deltas; formed primarily by fluvial processes. Where escarpment coincides with the contact between map units, pointis face upslope; dashed where approximately located; queried where position of escarpment is poorly located. Height of escarpment (in meters) shown in selected areas

Landslide escarpment—Major headscarp and (or) fissure in landslide (unit cly or clo) or lateral spread (unit clsp) deposit; may coincide with geologic contacts

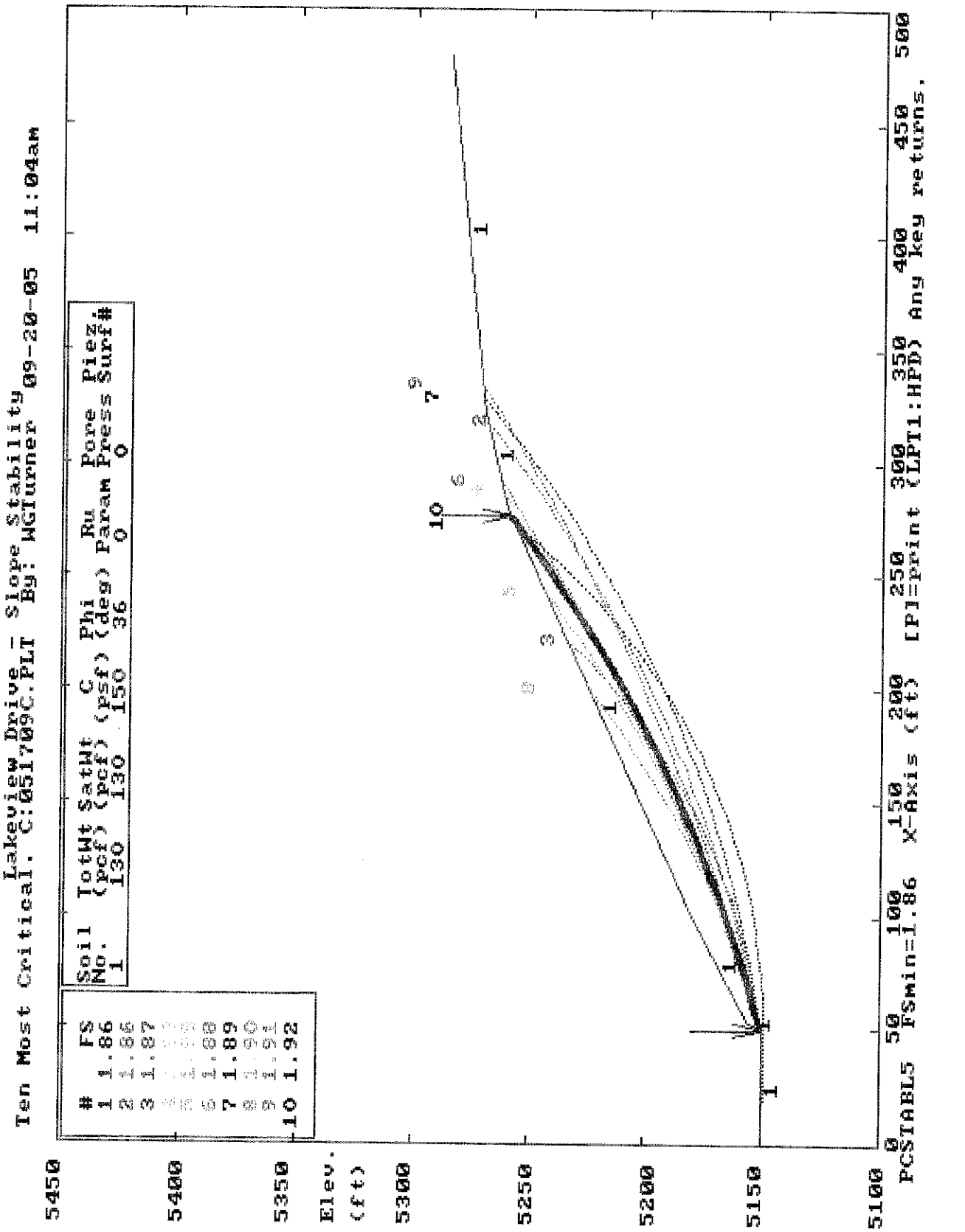
Paleostream channel—Preserved margin of abandoned stream channel or debris-flow levee. Half-barrel of arrow on outer edge of feature

Broadly tilted geomorphic surface—Arrow points in general

From Machette (1992)

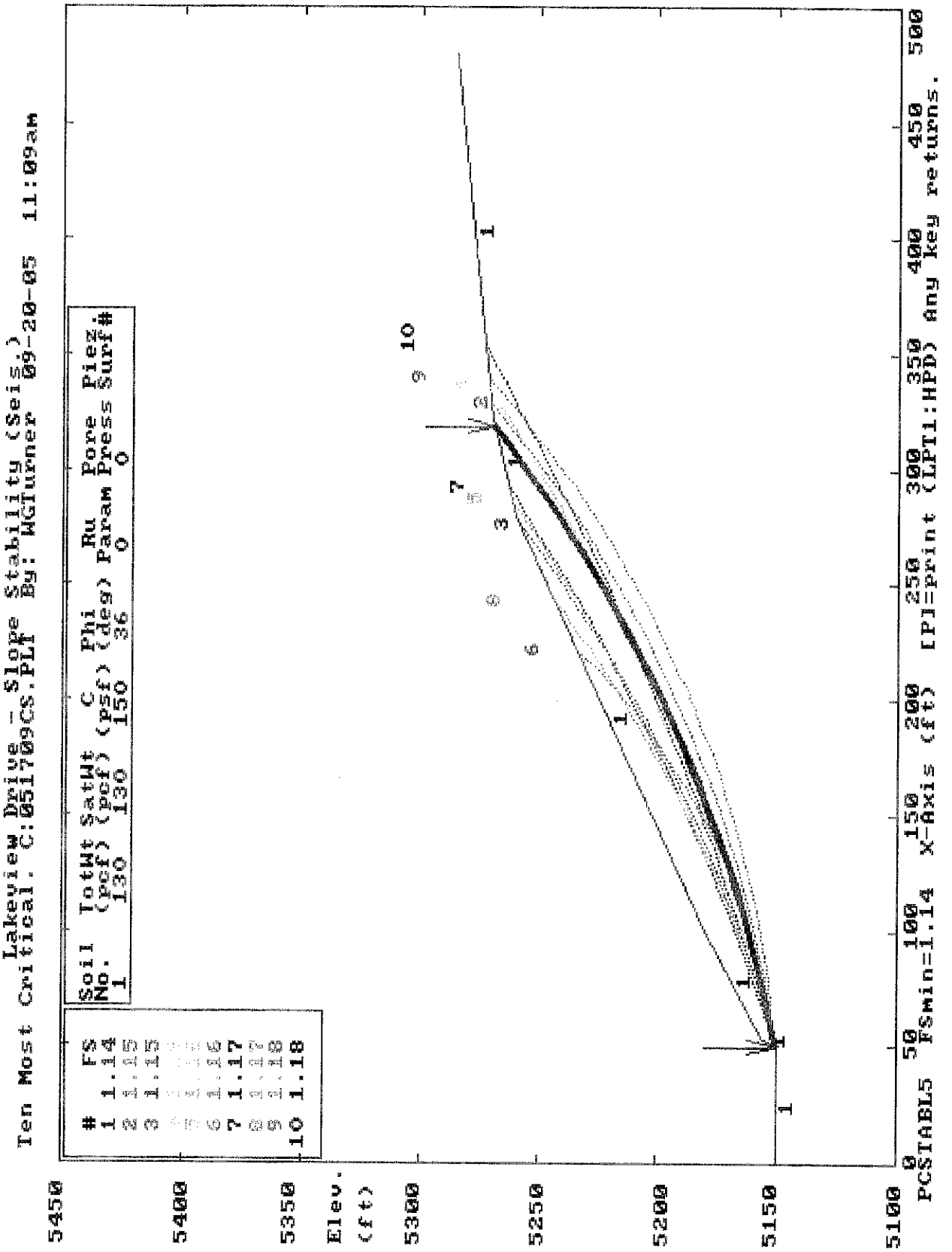
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 3 (CONT.)

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 4

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 5

Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
Fax (801) 225-3363

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

April 19, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

Subject: **Retaining Wall Recommendations**
Proposed Lakeview Drive
Summit Hills (Vista Meadows)
Alpine, Utah
Job No. 051709

Dear Mr. Smith:

As you requested, we have evaluated block retaining walls along the proposed Lakeview Drive at the subject site. We previously prepared a geotechnical report[1] for the project and have performed several stability analyses for the south facing slope on which Lakeview drive will be constructed, with the latest analysis[2] indicating the overall slope will be stable. The design presented herein is based on our understanding of the retaining wall requirements, soil conditions at the site, and our engineering analyses.

Proposed Construction

Based on current plans provided by Sowby & Berg Consultants, the highest retaining walls in cut areas will be on the order of 27 feet in height (located on the south-facing hillside above Hog Hollow Road). A 2H:1V backslope will be cut into the hillside above the highest wall, extending to as much as 12 feet in height. In fill areas, walls will be constructed up to about 27 feet in height to retain Lakeview Drive on the south-facing hillside above Hog Hollow Road. A higher fill is also planned near the east end of Lakeview Drive, with the maximum fill height of approximately 48 feet.

Stability Analyses

Our engineering analyses for the planned retaining walls consisted of evaluating the stability of the proposed wall. Our stability analyses included sliding, overturning, bearing capacity, and the overall (global) stability of the wall, which were evaluated based on existing soils at the site and assumming that backfill soils will consist of structural fill as discussed in the recommendations below. Typical minimum factors of safety are 1.5 for sliding, 1.5 for overturning and 3.0 for bearing. We considered

[1]Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, August 18, 2005.

[2]Additional Information, Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Job No. 051709, January 26, 2006.

using Redi-Rock and Lock+Load block walls, and selected Lock+Load walls so that a granular backfill can be placed and compacted behind the wall (between the wall and the backcut native soils). The results of our analysis for a Lock+Load block wall indicates that the minimum factors of safety are met with a maximum wall height of about 9⅓ feet in cut areas and about the same in fill areas (see Figures 1 and 2). The retainage heights discussed above can be achieved by placing walls on levels or tiers, with the bottom of each tier offset a minimum 9 feet from the bottom of each lower tier so that the influence from each upper tier does not impose a surcharge on the lower wall tier. It is possible to have higher walls if geogrid reinforcements are placed behind the walls, but this would require additional cutting (and possibly significantly higher cuts) to make room for the geogrid.

Engineering parameters for on-site soils and the computer program for analyses are the same as used in our referenced letter. For the seismic stability analysis, the same pseudostatic coefficient (0.20) was also used for the stability analysis. Since much of the wall in cut areas will be below elevation 5230 feet, we used native clay soil parameters beneath and behind the retaining walls in cuts. In fill areas, we used clayey gravel soil parameters to represent the native soils. A phreatic surface was assumed within the slope behind and/or beneath the walls in native soils.

The configurations analyzed consisted the following:

- Two tiers of 9-foot high Lock+Load walls, with a 2H:1V cut slope extending above the wall for a height of about 22 feet.

- Three tiers of 9-foot high Lock+Load walls, with a 2H:1V cut slope extending above the wall for a height of about 12 feet.

- Three tiers of 9-foot high Lock+Load walls retaining the roadway embankment fill (above Hog Hollow Road), with a 250 psf surcharge (to account for traffic loads) on a relatively level backfill.

- Five tiers of 9-foot high Lock+Load walls retaining the roadway embankment fill (near east end of Lakeview Drive), with a 250 psf surcharge (to account for traffic loads) on a relatively level backfill.

Typically, the required global minimum factors of safety (FS) are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. The results of our analyses indicate the configurations analyzed will meet both these requirements, except for the five tier wall retaining fill which will require geogrid to meet these requirements. The slope stability data are attached as Figures 3 through 10.

Conclusions and Recommendations

Based on the results of our analyses, we recommend that a Lock+Load retaining wall be constructed to maximum heights of 9⅓ feet using the standard Lock+Load blocks, provided granular soils meeting the recommendations for structural fill are used as fill beneath and backfill behind the wall. We recommend the Lock+Load wall blocks be placed on a minimum 12-inch thick pad of structural fill, as shown on the attached Figure 11. Our analyses also indicate that the blocks should be embedded a minimum of 12 inches.

For the five-tier wall near the east end of Lakeview Drive, at least 3 layers of geogrid are required behind the lowest wall tier to achieve the minimum factors of safety. The geogrid material should be placed starting at the bottom of the first row of blocks (base blocks), and between the next two rows of blocks so that three layers of geogrid are placed. The geogrid should extend a minimum length of 22 feet, inserted fully to just behind the face of each block, and should consist of Tensar UX1500MSE or an engineer approved equivalent (different geogrids have properties that could affect the performance of the wall). The geogrid should be rolled out from the face of the wall (machine direction) and pulled taut to remove slack prior to placing fill on the grid. Equipment wheels (if equipment on geogrid is necessary) should not be turned while driving over the geogrid. Overlapping of the geogrid is not required. Figure 12 depicts the design recommendations for the wall with geogrid.

Our analyses were performed assuming that no hydrostatic (water) pressures occur directly behind the wall. We thus recommend that a minimum 12-inch zone of free-draining granular material be placed behind the wall to intercept any possible water. In addition, a minimum 6-inch diameter perforated ADS drain pipe or equivalent should be wrapped in a filter fabric, placed at the bottom of the 12-inch zone at a minimum grade of 2%, and discharged beyond the wall to an appropriate drainage device. The free draining granular material should consist of 3/4-inch to 2-inch size gravel with less than 5% passing the No. 200 sieve (see Figure 7).

The fill pad beneath the walls and backfill behind the walls should consist of angular on-site gravel soils having less than 20% fines (percent passing the No. 200 sieve), or angular imported fill material meeting the following recommendations:

Maximum particle size:	3 inches
Percent retained on the 3/4 inch sieve (coarse gravel):	30 maximum
Percent passing the No. 4 sieve (total sand):	40 maximum
Percent passing the No. 200 sieve (fines):	10 maximum
Plasticity Index of fines:	non-plastic

Backfill soils should be placed in loose lifts not exceeding a thickness of 12 inches, moisture conditioned to within 2% of optimum, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D698 (Standard Proctor).

Wall movements or even failure can occur if walls are undermined or the backfill soils become saturated. Surface drainage should be provided that directs surface water away from the walls. A drainage ditch should be constructed at the top of the cut slopes above the walls so that water does not flow over the slope face. If water is observed seeping from cut slopes, a blanket drain will be needed to appropriately convey water away from the wall. Should this situation occur, Earthtec should be consulted.

Finally, we recommend that a representative of Earthtec visit the site during construction to observe implementation of these recommendations. Note that Lock+Load blocks should be installed in accordance with the guidelines of each respective manufacturer.

Closure

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations presented therein. We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.

REGISTERED PROFESSIONAL ENGINEER
No. 10999
WILLIAM G. TURNER
4/19/06
State of Utah

William G. Turner, P.E.
Senior Geotechnical Engineer

Attachments: Figures 1-2, Lock+Load Wall Stability Evaluation
Figures 3-10, Stability Results
Figure 11, Lock+Load Wall Design Without Geogrid
Figure 12, Lock+Load Wall Design With Geogrid

LOCK+LOAD WALL STABILITY EVALUATION

Project: Summit Hills (Vista Meadows) - Cut Slope
Location: Lakeview Drive, Alpine, Utah

Job No.: 051709
Date: 4/7/2006
By: WGT

Backfill slope angle, β:	26 degrees	Foundation soil γ_f:	135 pcf
Batter angle (from vertical):	-5.71 degrees	Foundation soil ϕ:	40 degrees
Soil/wall interface friction:	20 degrees	Found. soil cohesion:	0 psf
Surcharge pressure:	0 psf	Retained soil γ:	135 pcf
Rows of planter blocks:	0 rows	Retained soil ϕ:	40 degrees
Embedment depth:	1 feet	FS against sliding:	1.5
Total K_a =	0.225	FS against overturning:	1.5
Horizontal K_{ah} =	0.218	FS for bearing:	3.0
		Foundation soil δ:	26.67 degrees

Block depth: 30 **inches** Average block wall γ: 145 pcf

Wall Ht (ft)	2.67	**4.00**	**5.33**	**6.67**	**8.00**	**9.33**	**10.67**	**12.00**
P_{ah} (lbs/ft)	104	235	418	653	940	1280	1672	2116
Wall Wt (lbs)	967	1450	1933	2417	2900	3383	3867	4350
Wall $x_{centroid}$	1.38	1.45	1.52	1.58	1.65	1.72	1.78	1.85
$P_{sliding}$	104	235	418	653	940	1280	1672	2116
$P_{resisting}$	655	914	1180	1453	1732	2019	2312	2611
$FS_{sliding}$	**6.3**	**3.9**	**2.8**	**2.2**	**1.8**	**1.6**	**1.4**	**1.2**
$M_{overturn}$	93	313	743	1451	2508	3982	5944	8464
$M_{resisting}$	1441	2206	3036	3930	4888	5911	6999	8151
$FS_{overturn}$	**15.5**	**7.0**	**4.1**	**2.7**	**1.9**	**1.5**	**1.2**	**1.0**
Vertical Load	349	500	637	763	879	985	1084	1176
Soil Capacity	8444	8444	8444	8444	8444	8444	8444	8444
$FS_{bearing}$	**24.2**	**16.9**	**13.2**	**11.1**	**9.6**	**8.6**	**7.8**	**7.2**

Max. Recommended Wall Height: 9.33 feet for 16-inch high by 30-inch deep blocks

LOCK+LOAD WALL STABILITY EVALUATION

Project: Summit Hills (Vista Meadows) - Fill Slope
Location: Lakeview Drive, Alpine, Utah

Job No.: 051709
Date: 4/7/2006
By: WGT

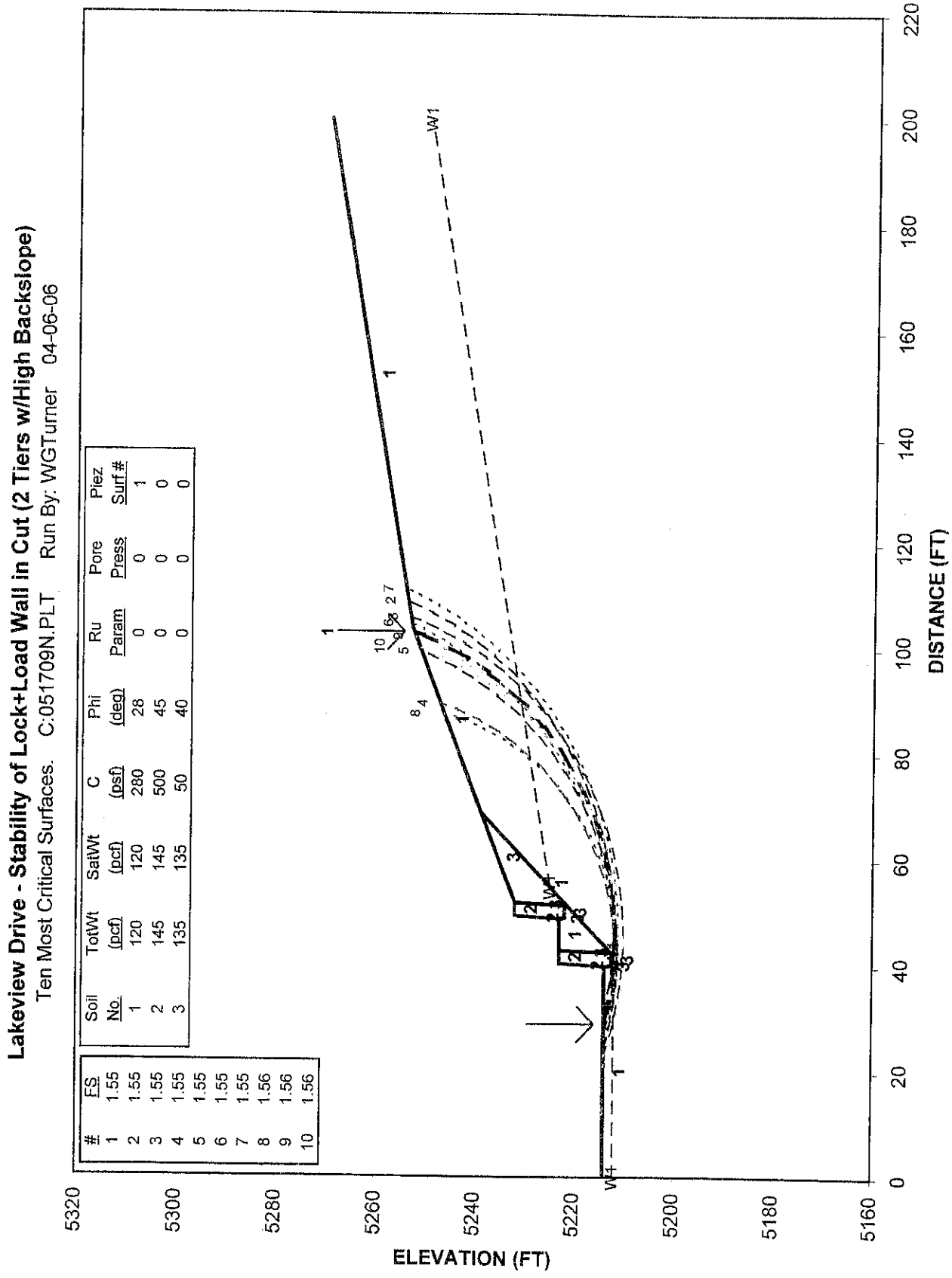
Backfill slope angle, β:	0 degrees	Foundation soil γ_f:	135 pcf
Batter angle (from vertical):	-5.71 degrees	Foundation soil ϕ:	40 degrees
Soil/wall interface friction:	19 degrees	Found. soil cohesion:	0 psf
Surcharge pressure:	250 psf	Retained soil γ:	135 pcf
Rows of planter blocks:	0 rows	Retained soil ϕ:	38 degrees
Embedment depth:	1 feet	FS against sliding:	1.5
Total K_a =	0.181	FS against overturning:	1.5
Horizontal K_{ah} =	0.176	FS for bearing:	3.0
		Foundation soil δ:	26.67 degrees

Block depth: 30 **inches** Average block wall γ: 145 pcf

Wall Ht (ft)	2.67	**4.00**	**5.33**	**6.67**	**8.00**	**9.33**	**10.67**	**12.00**
P_{ah} (lbs/ft)	130	236	384	574	807	1082	1399	1759
Wall Wt (lbs)	967	1450	1933	2417	2900	3383	3867	4350
Wall $x_{centroid}$	1.38	1.45	1.52	1.58	1.65	1.72	1.78	1.85
$P_{sliding}$	130	236	384	574	807	1082	1399	1759
$P_{resisting}$	693	948	1209	1474	1744	2020	2300	2586
$FS_{sliding}$	**5.3**	**4.0**	**3.1**	**2.6**	**2.2**	**1.9**	**1.6**	**1.5**
$M_{overturn}$	115	314	682	1276	2152	3366	4975	7035
$M_{resisting}$	1465	2230	3060	3954	4913	5936	7023	8175
$FS_{overturn}$	**12.7**	**7.1**	**4.5**	**3.1**	**2.3**	**1.8**	**1.4**	**1.2**
Vertical Load	349	500	637	763	879	985	1084	1176
Soil Capacity	8784	8784	8784	8784	8784	8784	8784	8784
$FS_{bearing}$	**25.1**	**17.6**	**13.8**	**11.5**	**10.0**	**8.9**	**8.1**	**7.5**

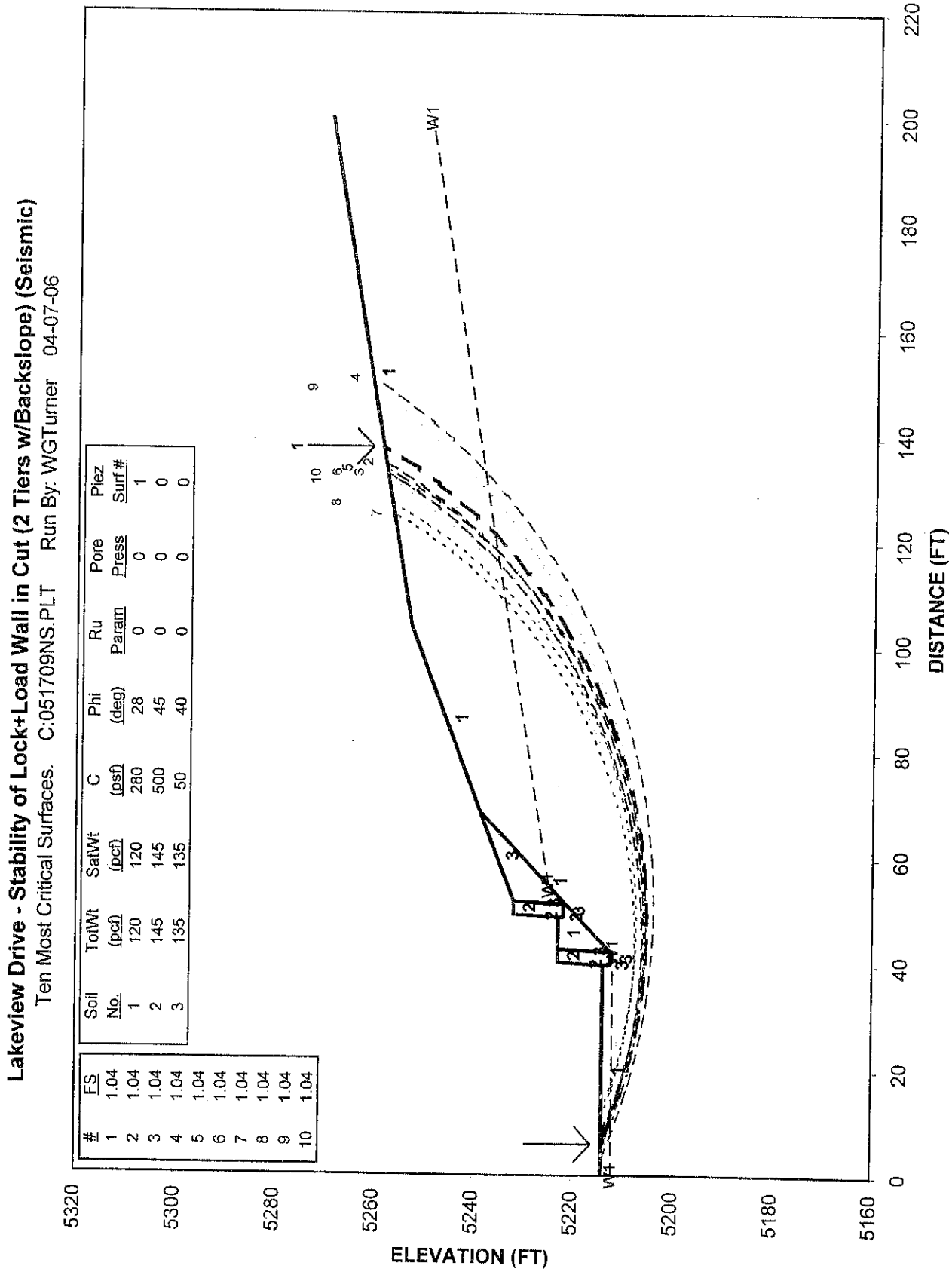
Max. Recommended Wall Height: 9.33 feet for 16-inch high by 30-inch deep blocks

STABILITY RESULTS



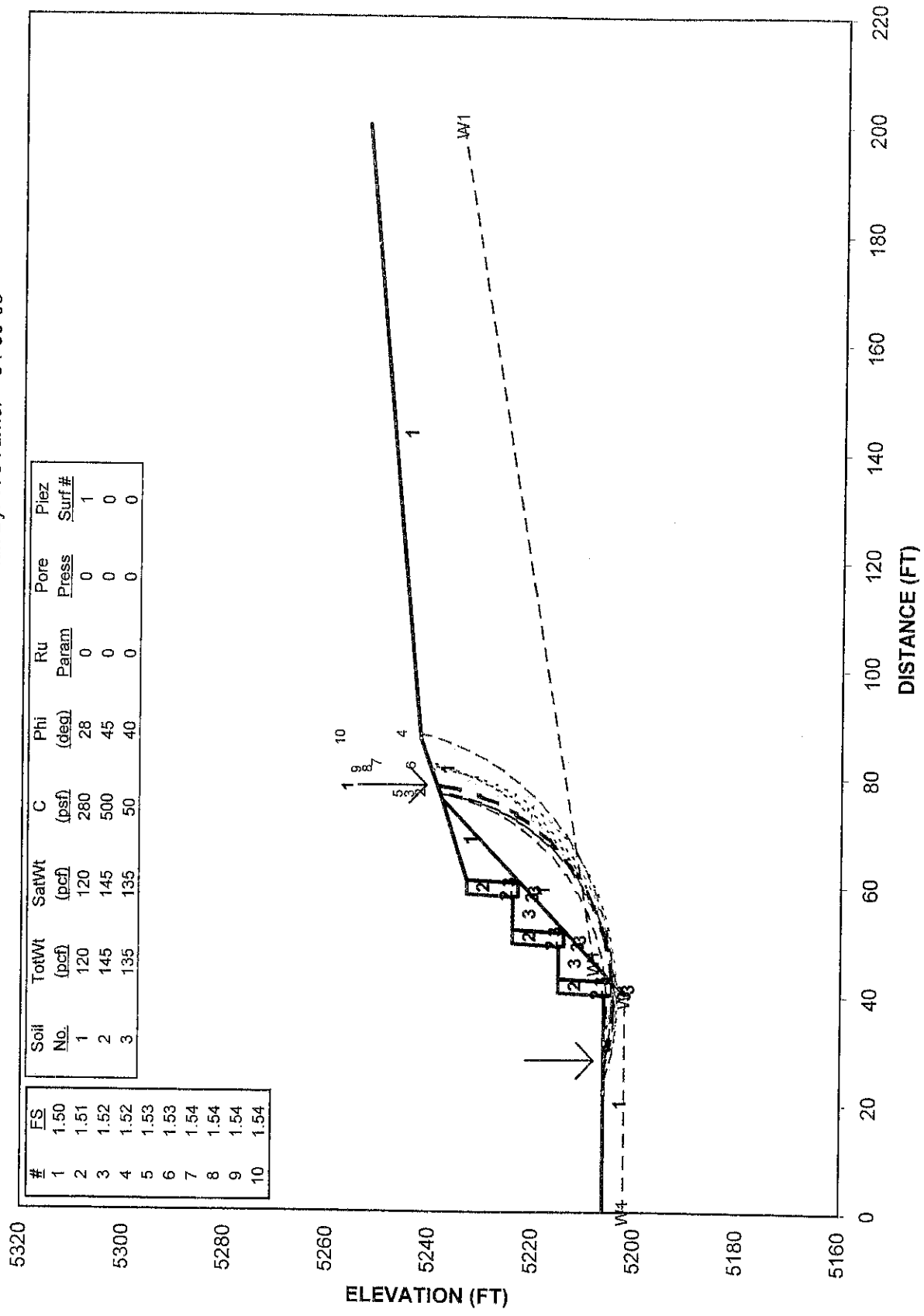
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 3

STABILITY RESULTS



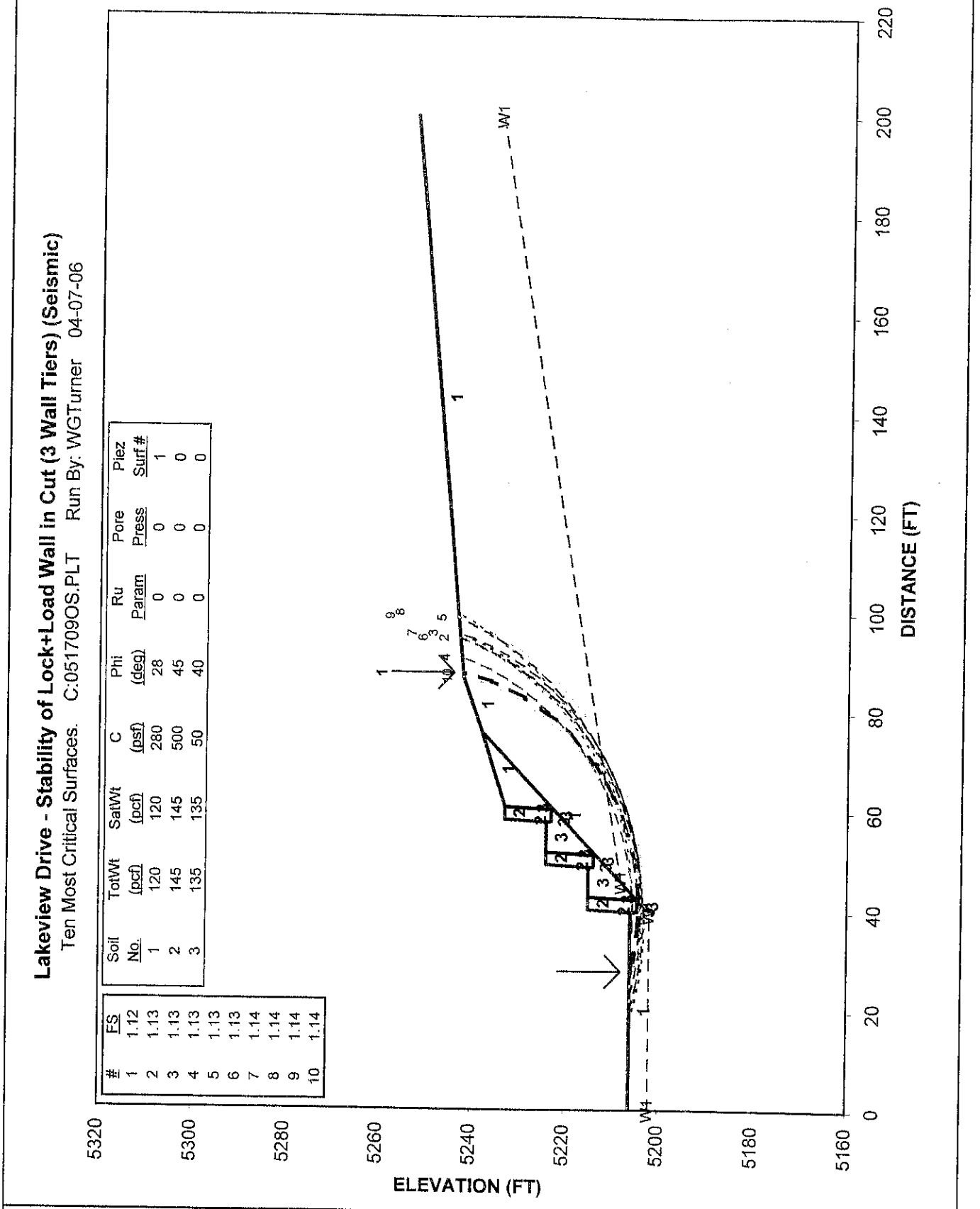
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 4

STABILITY RESULTS



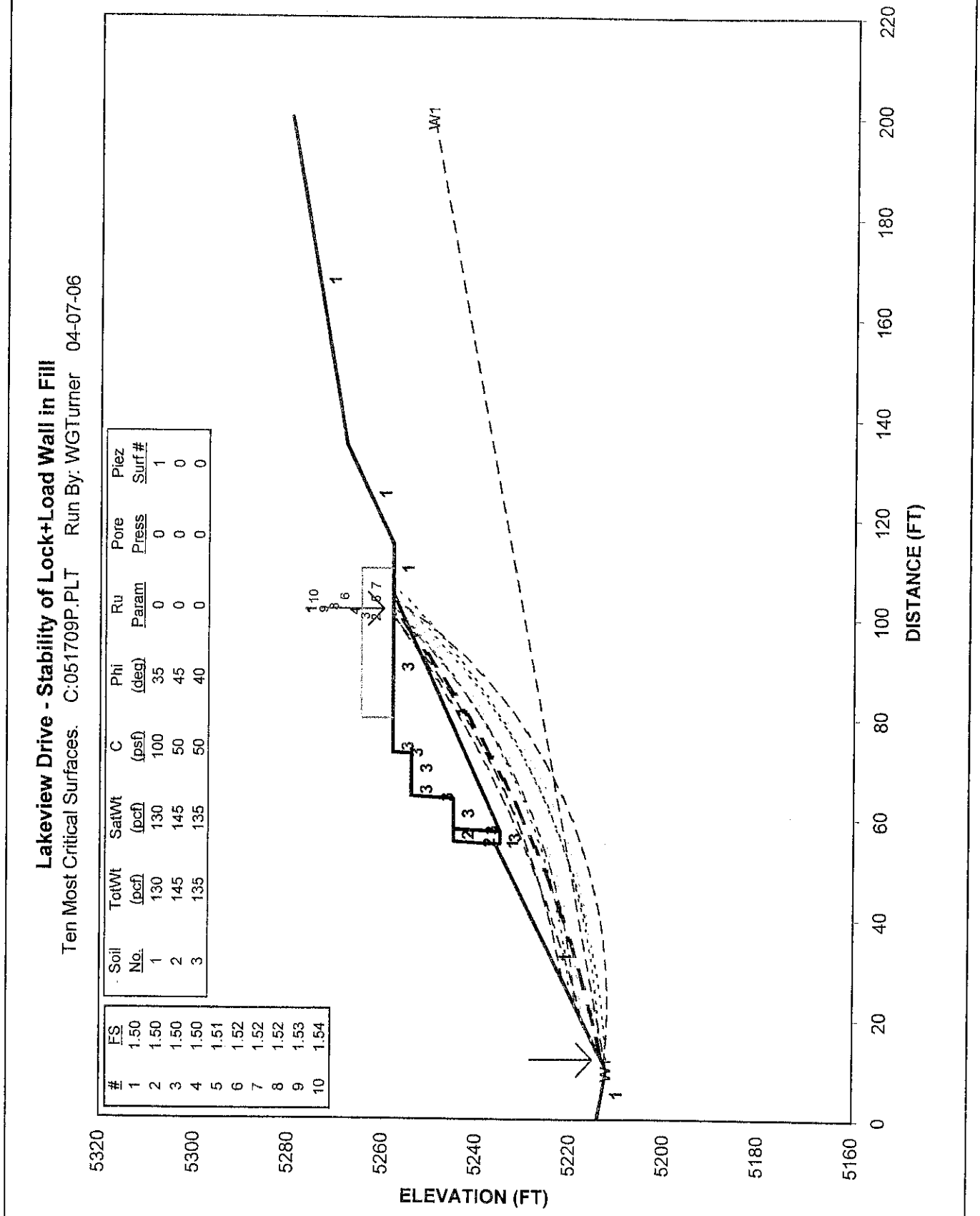
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 5

STABILITY RESULTS



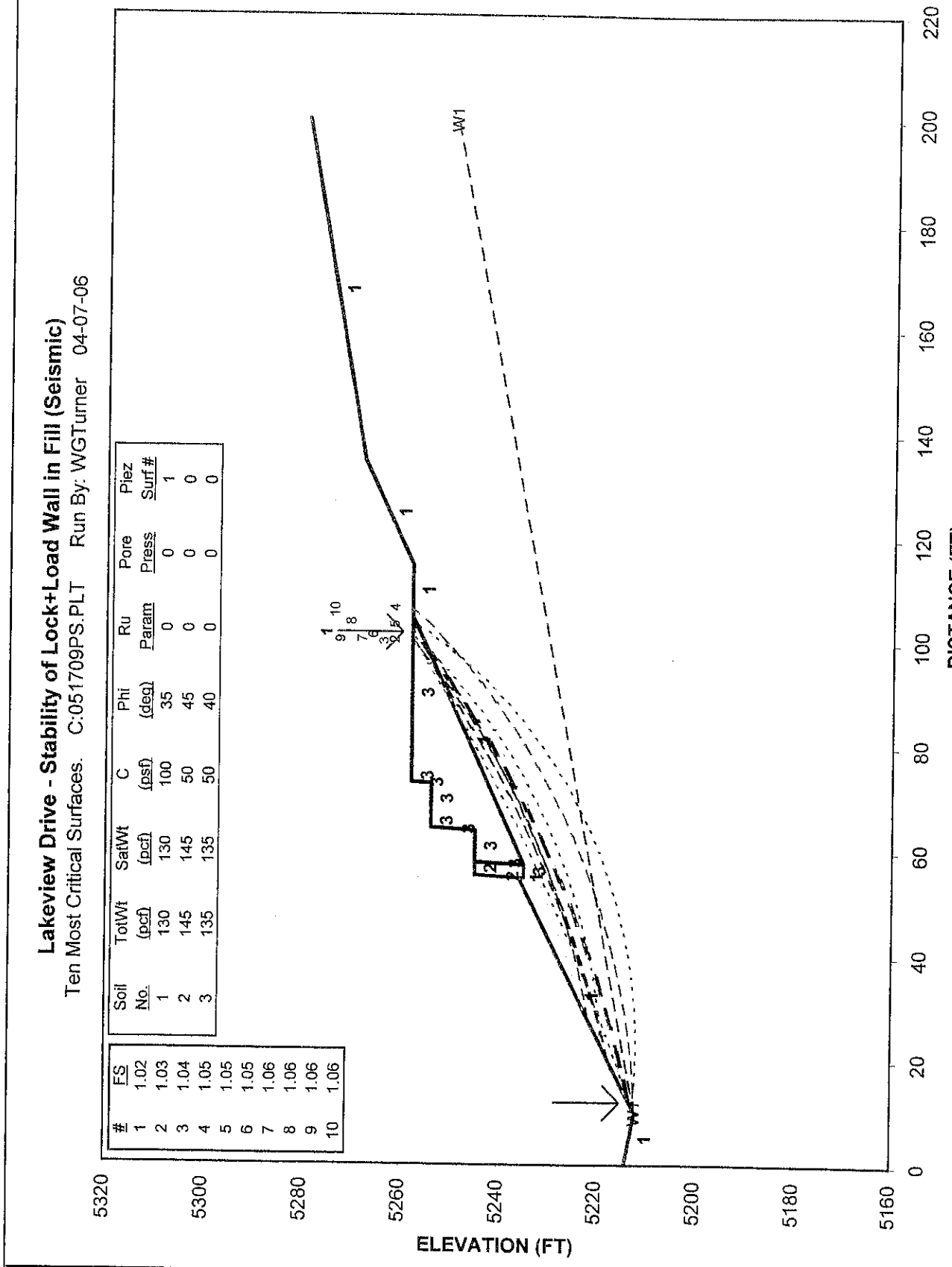
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 6

STABILITY RESULTS



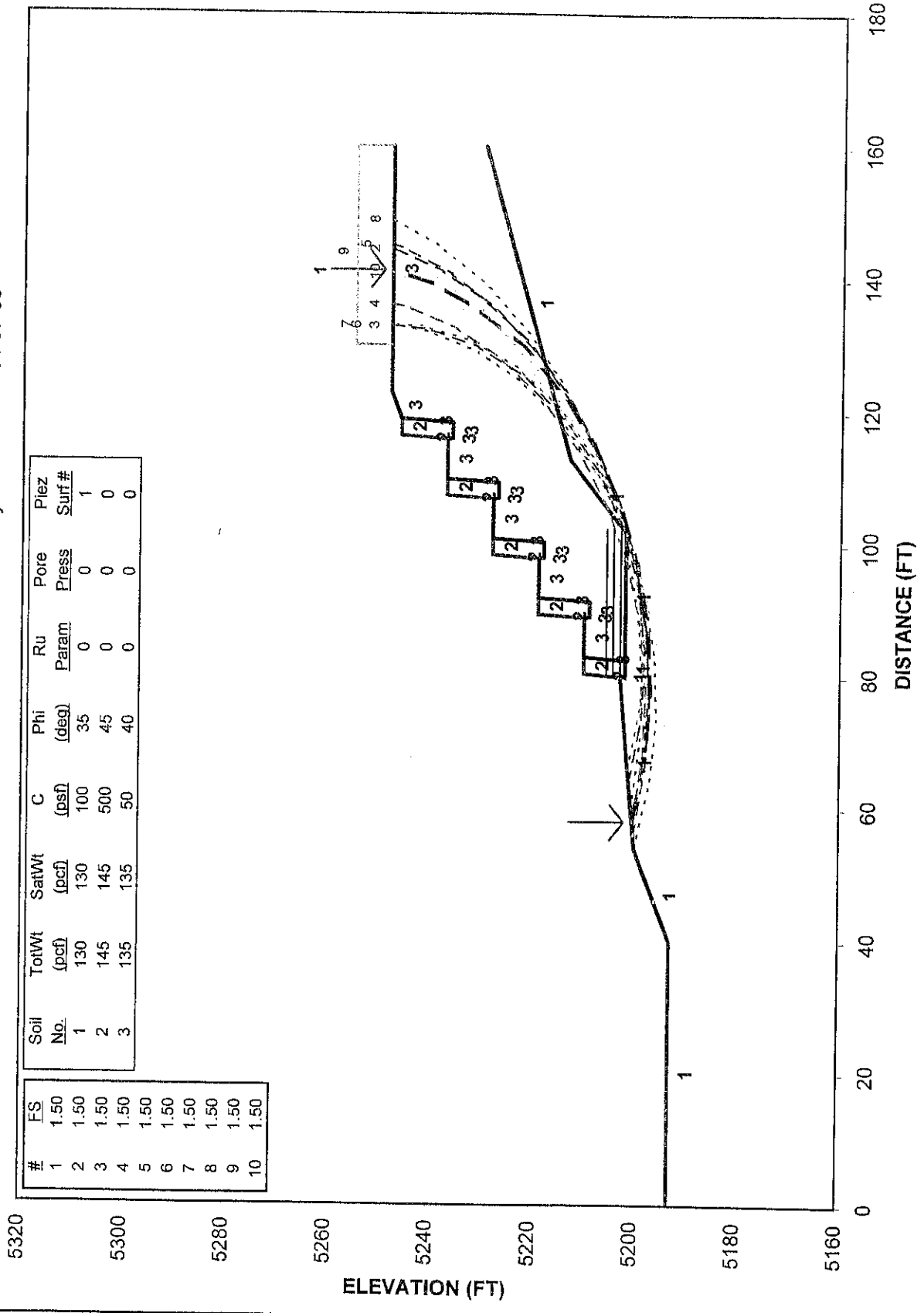
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 7

STABILITY RESULTS



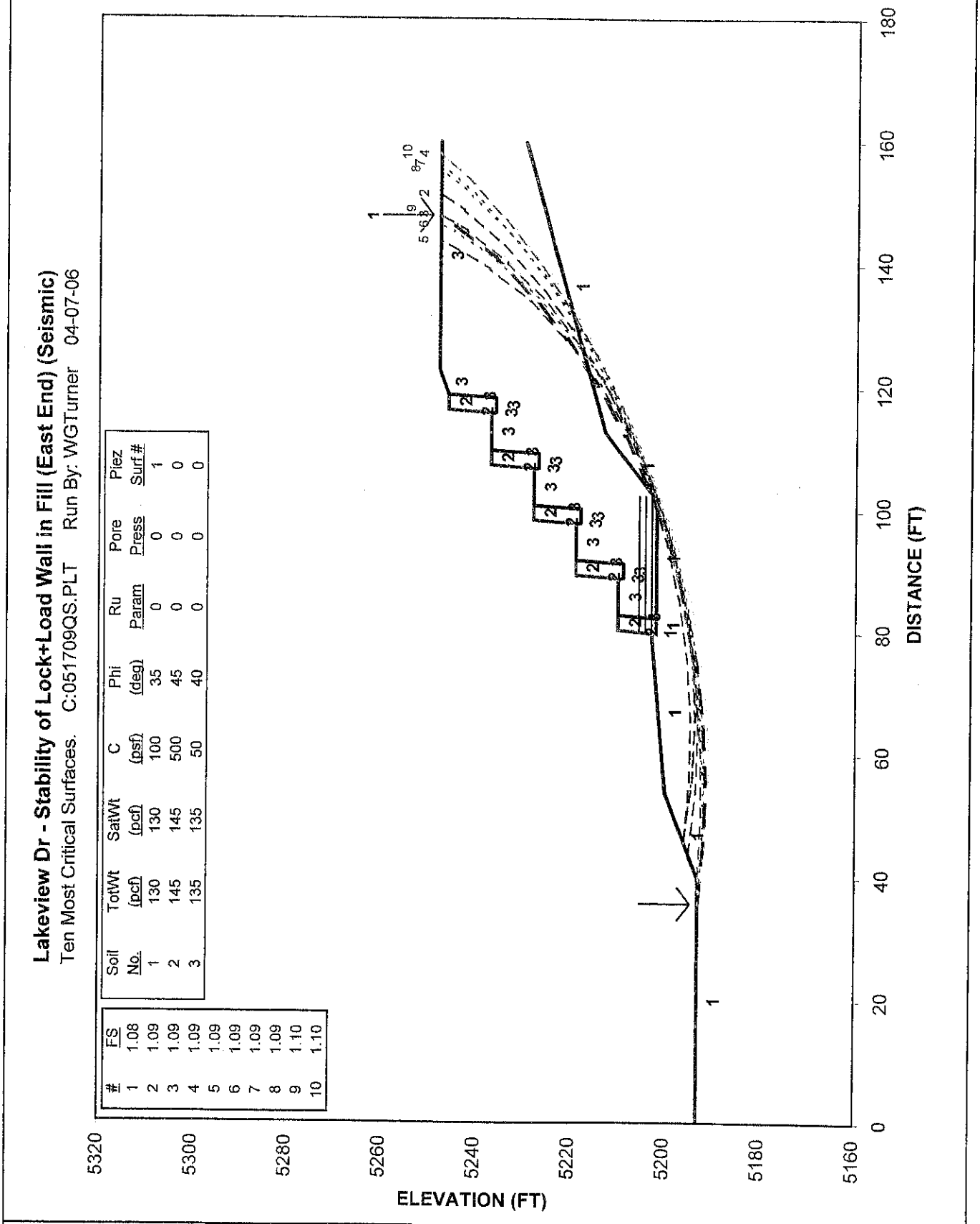
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 8

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 9

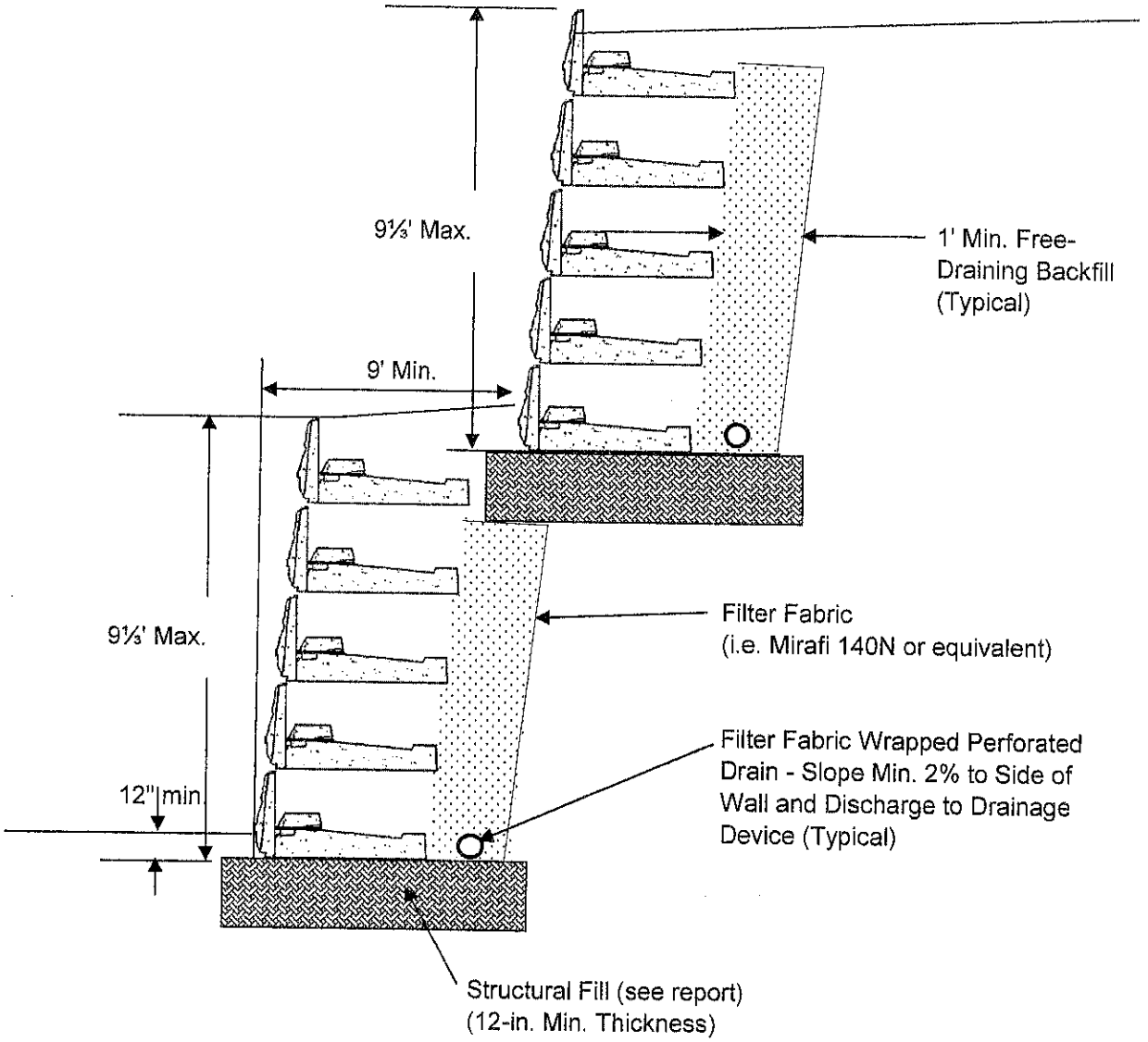
STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 10

LOCK+LOAD WALL WITHOUT REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE

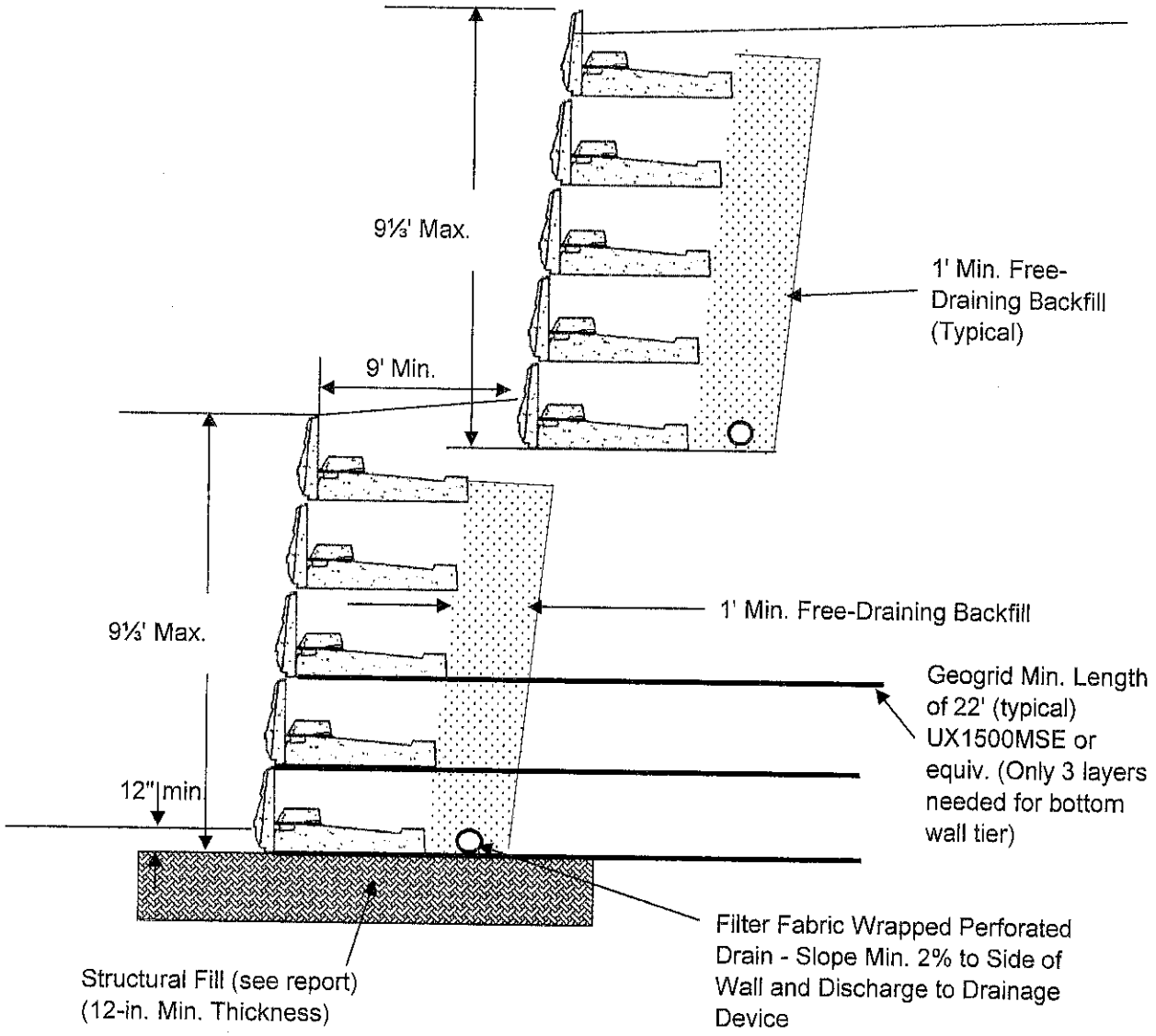


NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 11

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE



NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 12

Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
Fax (801) 225-3363

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

February 5, 2007

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

Subject: **Supplemental Wall Recommendations**
Proposed Lakeview Drive
Vista Meadows
Alpine, Utah
Job No. 051709

Dear Mr. Smith:

As you requested, we have evaluated the possibility of reducing the number of tiers for the proposed retaining walls within the Vista Meadows Subdivision. We previously provided retaining wall recommendations[1] and associated information[2,3] for the proposed Lakeview Drive at the subject site.

The biggest change in the number of wall tiers that can be made is the Lock+Load walls, particularly the large fill to be constructed between street Stations 24+00 and 26+00. In this area, at least 47± feet of fill will be placed above the existing ground surface. We analyzed this scenario by evaluating the Lock+Load walls using the same strength parameters and methodologies presented in our referenced reports. The initial results of our *MSEW* analysis indicated that the geogrid would need to extend behind the walls as much as 40 feet or more, which would require overlapping the geogrid since the distance between the upper half of the walls would only be about 55 feet. Therefore, we analyzed the walls in this area as back-to-back walls where the geogrid would extend entirely from one wall to the other wall. The results of our *MSEW* analysis indicated that a single-tier wall can be used up to a retained height of 30 feet, and a double-tier wall can be used up to a retained height of about 50 feet, with the lower wall tier embedment about 10% of the wall height. The horizontal separation between the two wall tiers would need to be a minimum of 10 feet (a geogrid length of about 75 feet between each lower wall tier) in order to provide adequate factors of safety against pullout failure. Results of the *PCSTBL6* analysis indicate minimum factors of safety greater than

---

[1]Retaining Wall Recommendations, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Job No. 051709, April 19, 2006.

[2]Response to Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Job No. 051709, October 3, 2006.

[3]Response to 2nd TGE Review, Proposed Lakeview Drive, Vista Meadows (was Summit Hills), Alpine, Utah, Job No. 051709, November 3, 2006.

1.5 for static conditions and 1.1 for seismic conditions (even without modeling all the geogrid layers).

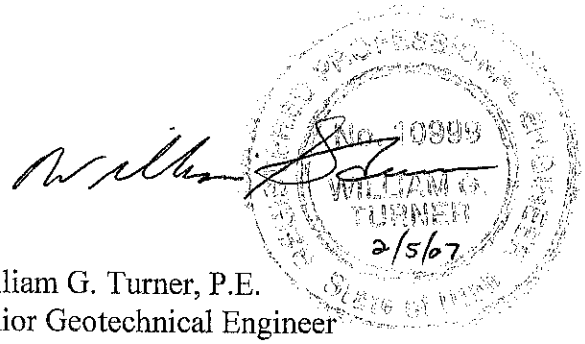
We also analyzed a section of Lock+Load wall on the south side of the street, just south of Lot 16, which was shown as a three-tiered wall. A single-tier wall at this location is possible and will shorten the wall height. However, our initial results of the *PCSTBL6* analysis for this wall using the spacing and lengths obtained from *MSEW* resulted in factors of safety less than the required minimums. Our analyses indicated that four layers of geogrid spaced about one block height apart, starting at the lowest bock, would need to extend beneath most of the roadway (approximately 45 feet) in order to provide the required minimum factors of safety. This may require more over-excavation than using two or more tiers.

Stability analysis results for both areas are shown on the attached Figures 1 through 4 and in the Appendix. Cross-sections with recommended geogrid lengths are also shown on Figures 5 through 7, attached. For the Lock+Load walls, Tensar UX1700MSE geogrid or equivalent is recommended for the reinforcement. The geogrid should be placed at mid-height of the Lock+Load blocks as shown on the attached figures.

All other recommendations presented in our October 3, 2006 report, unless specifically superceded herein, remain valid.

Closure
This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations presented therein. We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

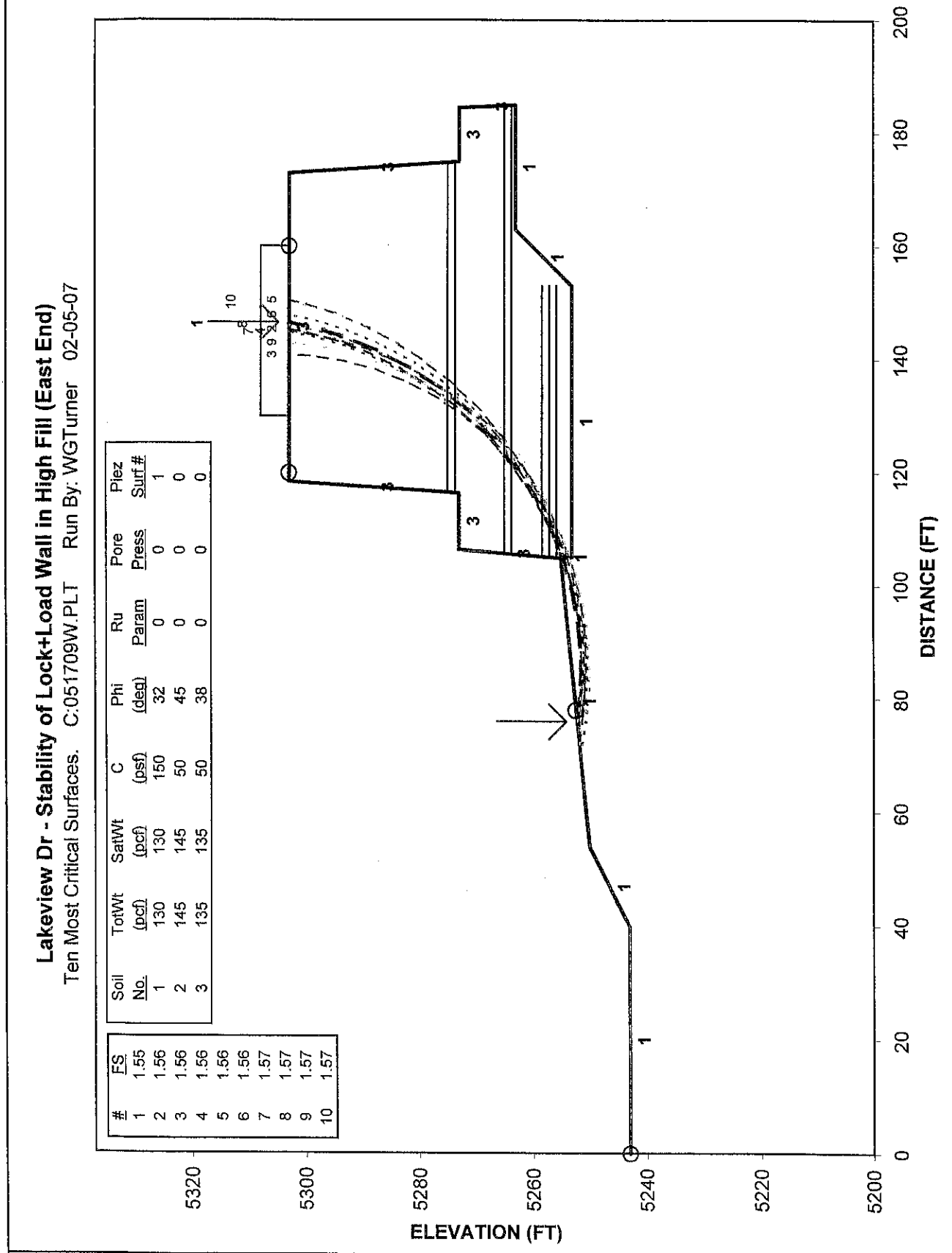
Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.



William G. Turner, P.E.
Senior Geotechnical Engineer

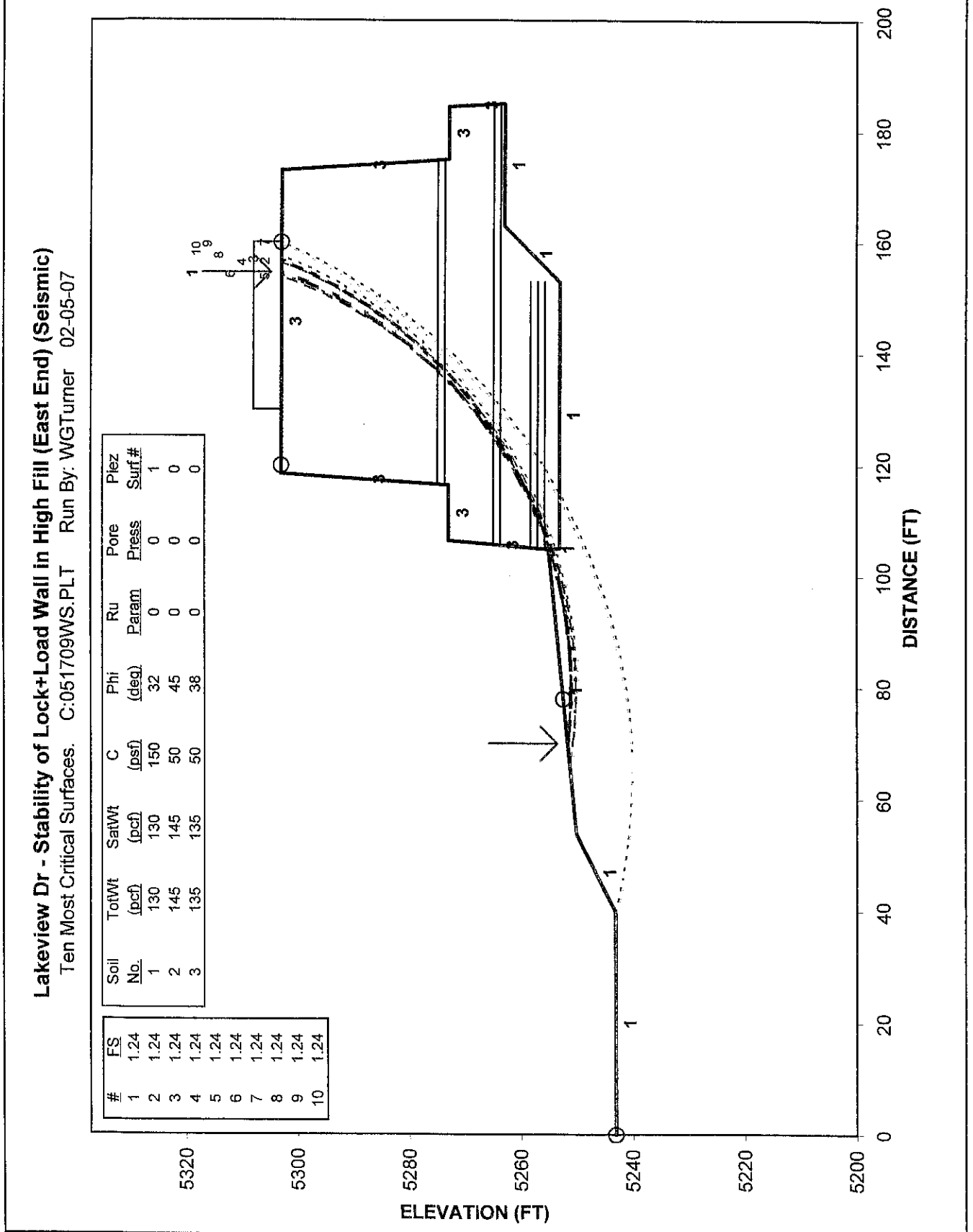
Attachments: Figures 1-4, Stability Results
Figure 5, Lock+Load Wall Design With Geogrid (Back-to-Back Walls)
Figure 6, Lock+Load Wall Design With Geogrid (S. Side of Lakeview Drive)
Appendix: *MSEW* Output Data (12 sheets)

STABILITY RESULTS



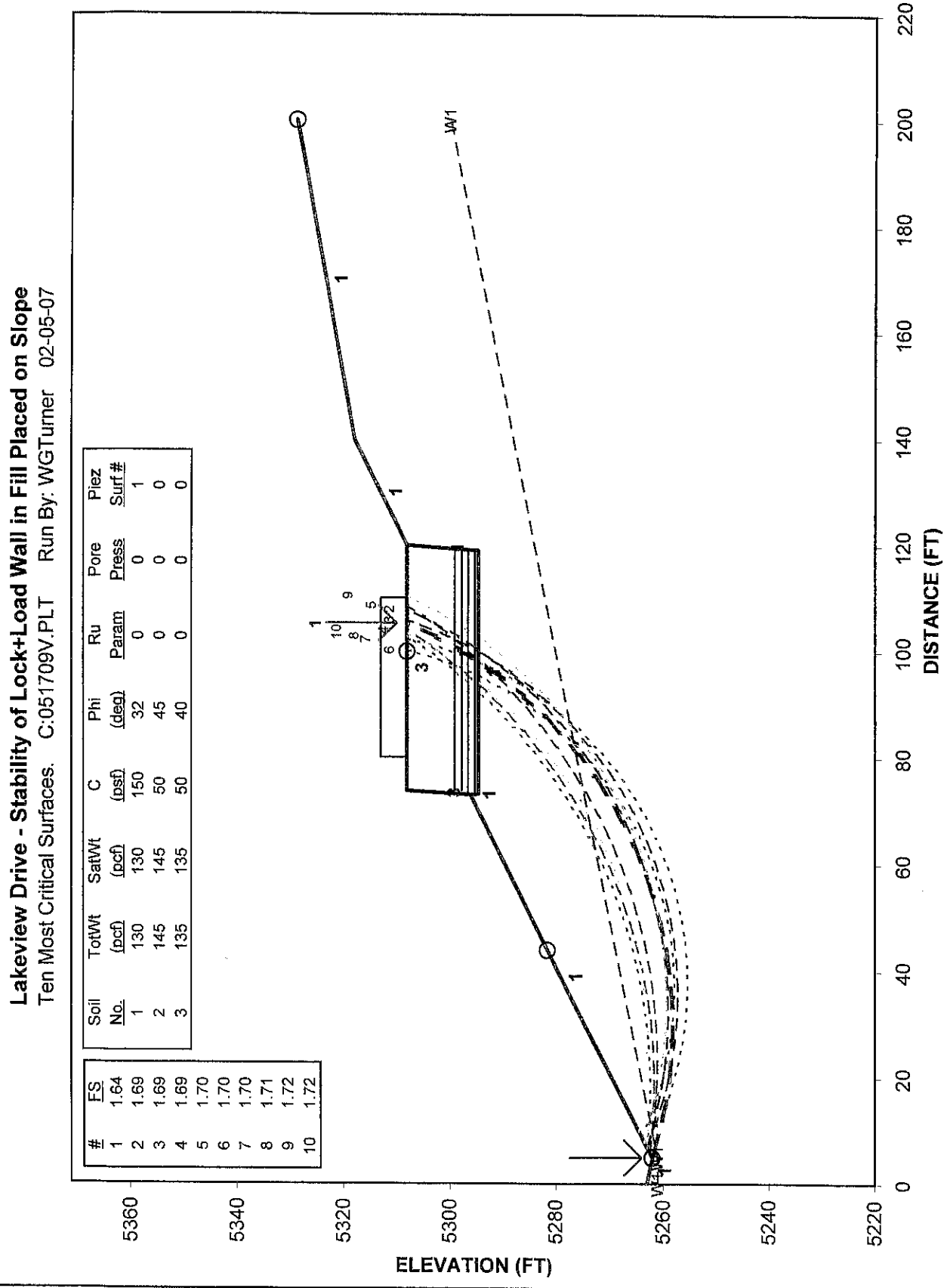
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 1

STABILITY RESULTS



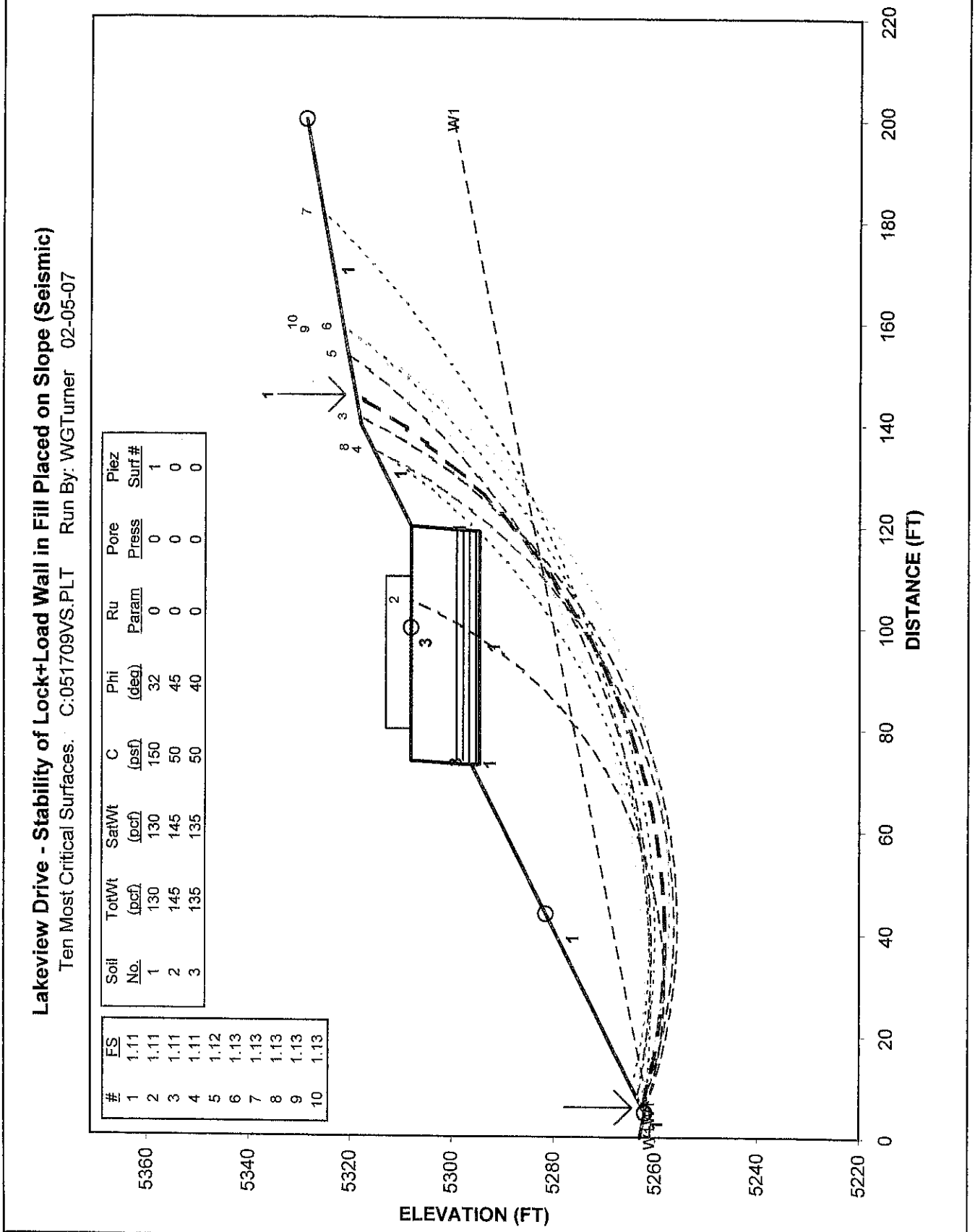
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 2

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 3

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 4

LOCK+LOAD WALL DESIGN WITH GEOGRID

BACK-TO-BACK WALLS, VISTA MEADOWS, ALPINE

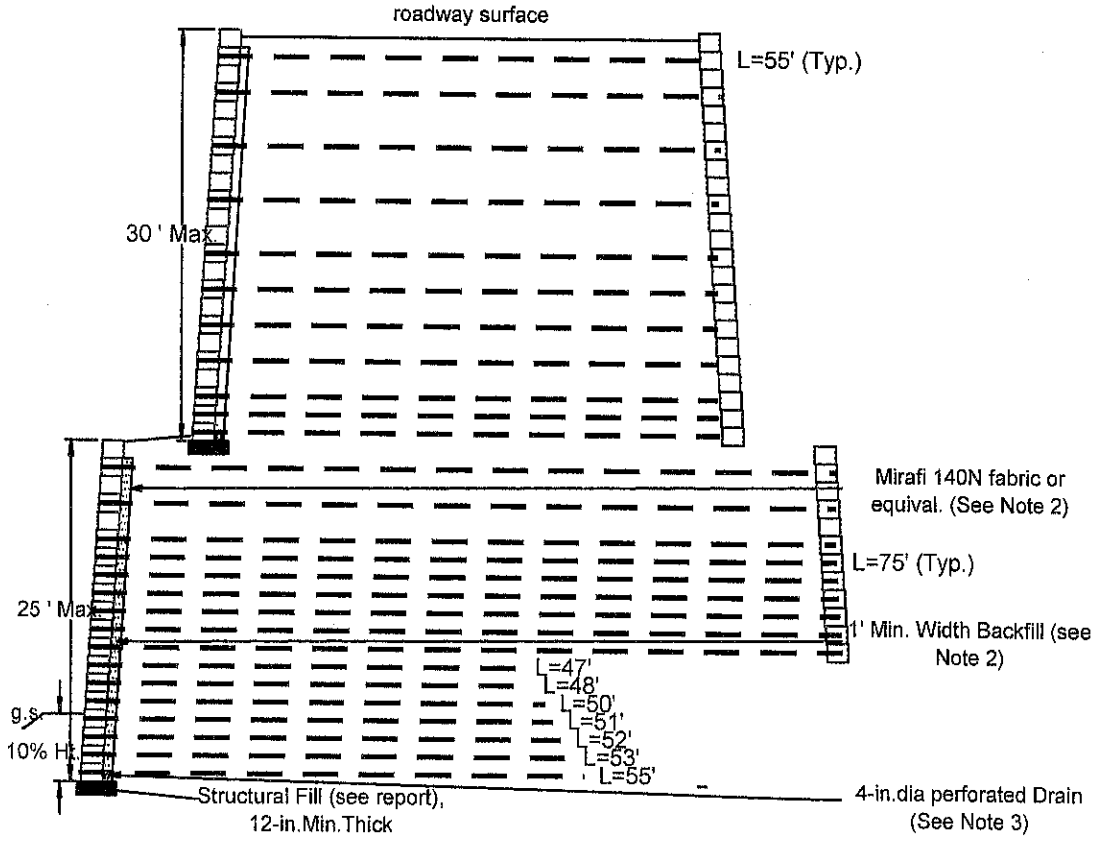
NOTES:

1. BACKFILL SOILS SHOULD BE PLACED IN LOOSE LIFTS NOT EXCEEDING A THICKNESS OF 12 INCHES, MOISTURE CONDITIONED TO WITHIN 2% OF OPTIMUM, AND COMPACTED TO A MINIMUM 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557.

2. FREE-DRAINING BACKFILL SHALL CONSIST OF GRAVEL HAVING LESS THAN 5% PASSING No. 200 SIEVE, OR MAY USE MIRADRAIN (OR EQUIVALENT) INSTEAD OF GRAVEL & FABRIC.

3. PERFORATED DRAIN SHALL BE WRAPPED WITH FABRIC, SLOPED A MINIMUM 2% TO SIDE OF WALL, AND DISCHARGED TO APPROPRIATE DRAINAGE DEVICE.

4. FOR LOWER GEOGRID LAYERS WHERE BOTH WALLS DO NOT EXTEND TO THE SAME DEPTH, THE MINIMUM GEOGRID LENGTH SHALL BE THE HEIGHT OF WALL ABOVE THAT LAYER.



NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 5

LOCK+LOAD WALL DESIGN WITH GEOGRID

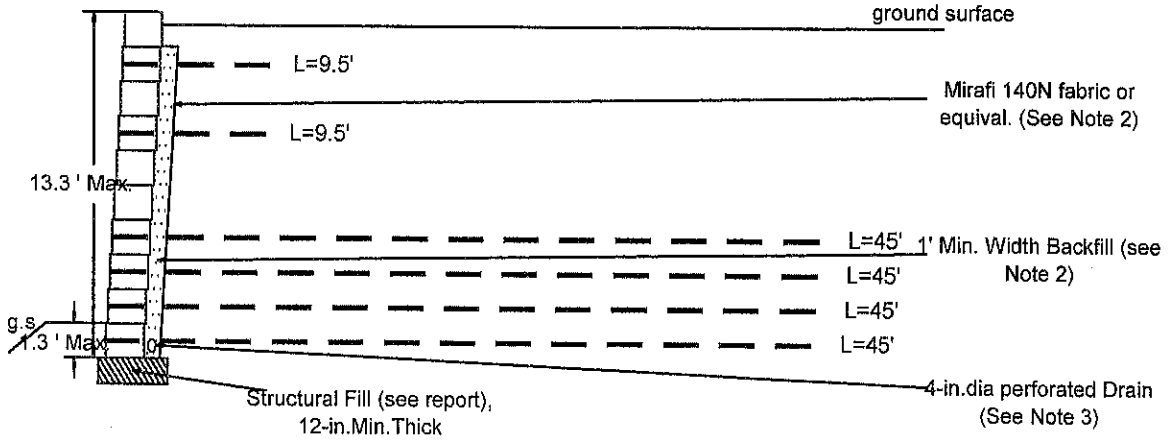
SOUTH SIDE OF LAKEVIEW DRIVE, VISTA MEADOWS, ALPINE

NOTES:

1. BACKFILL SOILS SHOULD BE PLACED IN LOOSE LIFTS NOT EXCEEDING A THICKNESS OF 12 INCHES, MOISTURE CONDITIONED TO WITHIN 2% OF OPTIMUM, AND COMPACTED TO A MINIMUM 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557.

2. FREE-DRAINING BACKFILL SHALL CONSIST OF GRAVEL HAVING LESS THAN 5% PASSING No. 200 SIEVE, OR MAY USE MIRADRAIN (OR EQUIVALENT) INSTEAD OF GRAVEL & FABRIC.

3. PERFORATED DRAIN SHALL BE WRAPPED WITH FABRIC, SLOPED A MINIMUM 2% TO SIDE OF WALL, AND DISCHARGED TO APPROPRIATE DRAINAGE DEVICE.



NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 6

APPENDIX

MSEW OUTPUT DATA

AASHTO DESIGN METHOD
Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of BACK to BACK WALL
using GEOGRID as reinforcing material.

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License number M-LNL-0598

DESIGN DATA

DESIGN OBJECTIVES

Minimum factor of safety against pullout, Fs-po	1.50
Minimum factor of safety against direct sliding, Fs-sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, Fs-comp-static	1.30
Minimum factor of safety against compound and overall failure, Fs-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 15.00 ft.
Prescribed minimum normalized length of each layer is: L/Hd = 0.70 --> L = 21.93 ft.
Prescribed minimum absolute total length of each layer is: L = 15.00 ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.	
Maximum permissible eccentricity ratio (soil), e/L	0.1667
Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach)	2.50

Bearing capacity coefficients: $N_c = 35.49$ $N_\gamma = 30.21$

SOIL DATA

REINFORCED SOIL

Unit weight, γ	135.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	150.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2174 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 65.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.420
Kae ($\alpha_o > 0$) = 0.6932 Kae ($\alpha_o = 0$) = 0.3073 Δ Kae = 0.3859 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY
Seismic safety factor is 67.0% of specified static FS for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

BEARING CAPACITY
Seismic safety factor is 67.0% of specified static FS for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

INTERNAL STABILITY
Seismic soil-geogrid friction coefficient, F* is 100.0% of its specified static value.
Seismic factor of safety against pullout, Fs-po, is 67.0% of its specified static value.
Seismic overall factor of safety, Fs-overall, is 67.0% of its specified static value.
The reduction of Fs-overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

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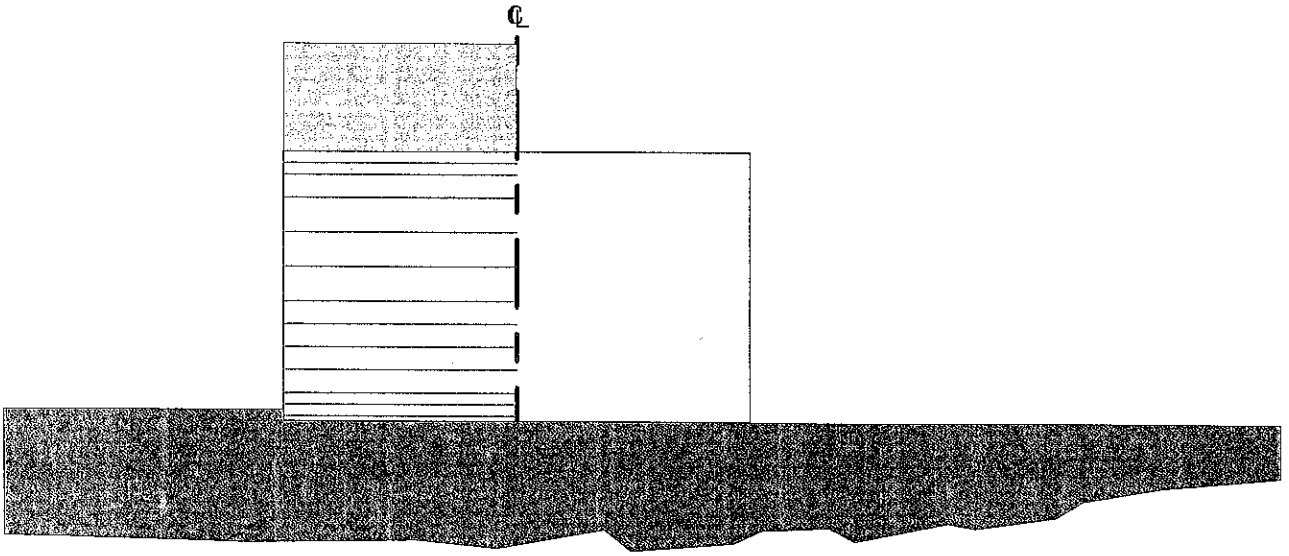
INPUT DATA: Geometry and Surcharge loads (of BACK to BACK wall)

Design height, Hd	31.33	[ft]	{ Embedded depth is E = 1.33 ft, and height above top of finished bottom grade is H = 30.00 ft }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Distance between walls (Back to Back) = 55.0 ft, and Reinforcement length, L = 16.4 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 250.0 [lb/ft ²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 5 10 15 20 25 30 [ft]

Copyright © 1998-2004 ADAMA Engineering, Inc.

DESIGN: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 13.25, Meyerhof stress = 4480 lb/ft².
Foundation Interface: Direct sliding, Fs = 11836298.304, Eccentricity, e/L = 0.0000, Fs-overturning = 94684599.46

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	27.50	1	4.03	4.03	4.03	4.034	100.553	6878655.210	0.0000	UX1700MSE
2	2.00	27.50	1	4.22	4.22	4.22	4.222	98.648	6597262.090	0.0000	UX1700MSE
3	3.33	27.50	1	2.97	2.97	2.97	2.966	64.805	6315868.970	0.0000	UX1700MSE
4	6.00	27.50	1	2.41	2.41	2.41	2.413	45.698	5750967.000	0.0000	UX1700MSE
5	8.67	27.50	1	2.68	2.68	2.68	2.680	43.456	5186065.030	0.0000	UX1700MSE
6	11.33	27.50	1	3.01	3.01	3.01	3.007	41.179	4623278.790	0.0000	UX1700MSE
7	14.00	27.50	1	2.79	2.79	2.79	2.785	31.609	4058376.820	0.0000	UX1700MSE
8	18.00	27.50	1	2.88	2.88	2.88	2.883	23.588	3212081.730	0.0000	UX1700MSE
9	22.00	27.50	1	3.91	3.91	3.91	3.915	21.279	2365786.640	0.0000	UX1700MSE
10	26.00	27.50	1	6.95	6.99	6.99	6.987	21.759	1519491.550	0.0000	UX1700MSE
11	28.67	27.50	1	8.97	18.06	18.06	18.063	32.480	954589.586	0.0000	UX1700MSE
12	30.00	27.50	1	7.65	30.80	30.80	30.803	37.329	673196.469	0.0000	UX1700MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 7.39, Meyerhof stress = 6095 lb/ft².
Foundation Interface: Direct sliding, Fs = 2.830, Eccentricity, e/L = 0.1325, Fs-overturning = 3.77

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	27.50	1	1.51	1.89	1.89	1.886	47.013	1.717	0.1268	UX1700MSE
2	2.00	27.50	1	1.56	1.95	1.95	1.950	45.570	1.800	0.1157	UX1700MSE
3	3.33	27.50	1	1.32	1.65	1.65	1.649	36.019	1.890	0.1052	UX1700MSE
4	6.00	27.50	1	1.19	1.49	1.49	1.490	28.228	2.103	0.0855	UX1700MSE
5	8.67	27.50	1	1.30	1.62	1.62	1.622	26.292	2.370	0.0679	UX1700MSE
6	11.33	27.50	1	1.42	1.78	1.78	1.775	24.313	2.712	0.0524	UX1700MSE
7	14.00	27.50	1	1.39	1.73	1.73	1.734	19.675	3.171	0.0388	UX1700MSE
8	18.00	27.50	1	1.47	1.83	1.83	1.834	15.004	4.242	0.0223	UX1700MSE
9	22.00	27.50	1	1.84	2.30	2.30	2.302	12.510	6.377	0.0104	UX1700MSE
10	26.00	27.50	1	2.63	3.30	3.30	3.303	10.285	12.551	0.0030	UX1700MSE
11	28.67	27.50	1	1.97	4.95	4.95	4.948	8.898	31.657	0.0006	UX1700MSE
12	30.00	27.50	1	1.15	5.79	5.79	5.788	7.015	89.302	0.0001	UX1700MSE

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AASHTO DESIGN METHOD
Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of BACK to BACK WALL
using GEOGRID as reinforcing material.

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DESIGN DATA

DESIGN OBJECTIVES

Minimum factor of safety against pullout, Fs-po	1.50
Minimum factor of safety against direct sliding, Fs-sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, Fs-comp-static	1.30
Minimum factor of safety against compound and overall failure, Fs-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 15.00 ft.
Prescribed minimum normalized length of each layer is: L/Hd = 0.70 --> L = 35.00 ft.
Prescribed minimum absolute total length of each layer is: L = 15.00 ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.	
Maximum permissible eccentricity ratio (soil), e/L	0.1667
Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach)	2.50

Bearing capacity coefficients: Nc = 0.00 N_γ = 14.99

SOIL DATA

REINFORCED SOIL

Unit weight, γ	135.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	150.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2174 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 65.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.420
Kae (α_o > 0) = 0.6932 Kae (α_o = 0) = 0.3073 Δ Kae = 0.3859 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY
Seismic safety factor is 67.0% of specified static FS for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

BEARING CAPACITY
Seismic safety factor is 67.0% of specified static FS for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

INTERNAL STABILITY
Seismic soil-geogrid friction coefficient, F* is 100.0% of its specified static value.
Seismic factor of safety against pullout, Fs-po, is 67.0% of its specified static value.
Seismic overall factor of safety, Fs-overall, is 67.0% of its specified static value.
The reduction of Fs-overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

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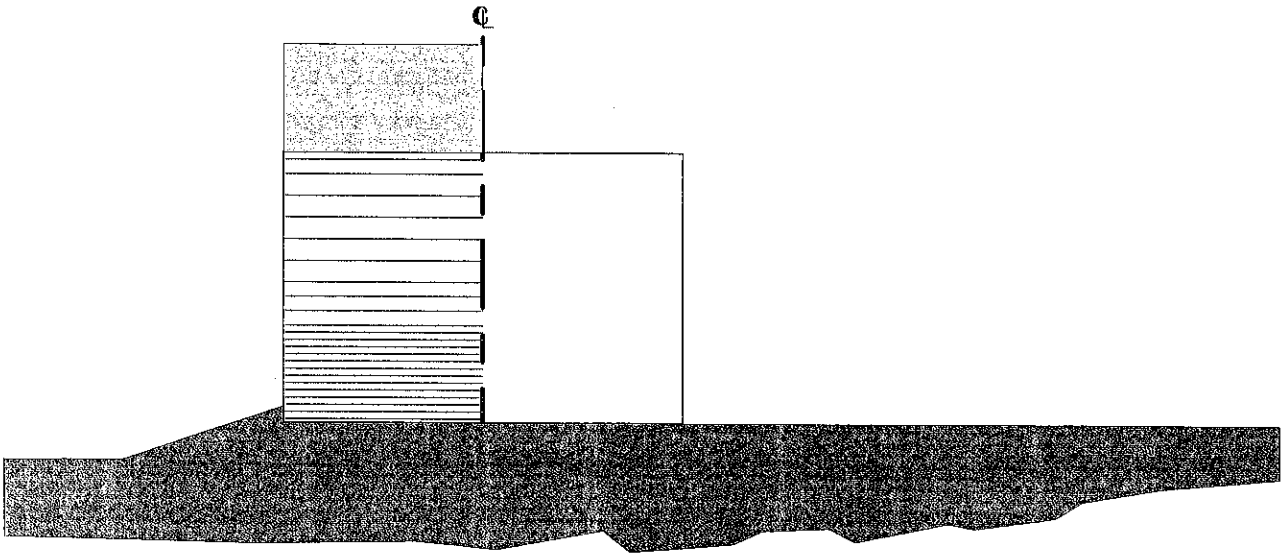
INPUT DATA: Geometry and Surcharge loads (of BACK to BACK wall)

Design height, Hd	50.00	[ft]	{ Embedded depth is E = 3.00 ft, and height above top of finished bottom grade is H = 47.00 ft }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Distance between walls (Back to Back) = 75.0 ft, and Reinforcement length, L = 16.4 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 250.0 [lb/ft ²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 5 1015202530 [ft]

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DESIGN: CALCULATED FACTORS (Static conditions) Bearing capacity, Fs = 5.22, Meyerhof stress = 7000 lb/ft².
Foundation Interface: Direct sliding, Fs = 24760011.459, Eccentricity, e/L = 0.0000, Fs-overturning = 172397329.70

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	37.50	1	2.56	2.56	2.56	2.563	137.586	14766460.20	0.0000	UX1700MSE
2	2.00	37.50	1	2.64	2.64	2.64	2.641	135.788	14382742.39	0.0000	UX1700MSE
3	3.33	37.50	1	2.70	2.70	2.70	2.703	132.974	13999024.59	0.0000	UX1700MSE
4	4.67	37.50	1	2.78	2.78	2.78	2.780	130.648	13612421.52	0.0000	UX1700MSE
5	6.00	37.50	1	2.87	2.87	2.87	2.871	128.825	13228703.64	0.0000	UX1700MSE
6	7.33	37.50	1	2.95	2.95	2.95	2.946	126.095	12844985.73	0.0000	UX1700MSE
7	8.67	37.50	1	3.04	3.04	3.04	3.037	123.768	12458382.76	0.0000	UX1700MSE
8	10.00	37.50	1	3.14	3.15	3.15	3.146	121.919	12074664.84	0.0000	UX1700MSE
9	11.33	37.50	1	3.24	3.24	3.24	3.237	119.158	11690946.99	0.0000	UX1700MSE
10	12.67	37.50	1	3.35	3.35	3.35	3.347	116.830	11304344.01	0.0000	UX1700MSE
11	14.00	37.50	1	3.48	3.48	3.48	3.478	115.014	10920626.12	0.0000	UX1700MSE
12	15.33	37.50	1	3.59	3.59	3.59	3.592	112.278	10536908.23	0.0000	UX1700MSE
13	16.67	37.50	1	3.73	3.73	3.73	3.728	109.950	10150305.25	0.0000	UX1700MSE
14	18.00	37.50	1	2.61	2.61	2.61	2.612	72.572	9766587.360	0.0000	UX1700MSE
15	20.67	37.50	1	2.11	2.11	2.11	2.107	51.632	8996266.490	0.0000	UX1700MSE
16	23.33	37.50	1	2.30	2.30	2.30	2.304	49.324	8228830.719	0.0000	UX1700MSE
17	26.00	37.50	1	2.06	2.06	2.06	2.057	38.072	7458509.840	0.0000	UX1700MSE
18	30.00	37.50	1	2.00	2.00	2.00	2.003	29.019	6304471.090	0.0000	UX1700MSE
19	34.00	37.50	1	2.45	2.45	2.45	2.452	26.723	5150432.330	0.0000	UX1700MSE
20	38.00	37.50	1	3.16	3.16	3.16	3.160	24.408	3996393.573	0.0000	UX1700MSE
21	42.00	37.50	1	4.44	4.44	4.44	4.443	22.112	2842354.814	0.0000	UX1700MSE
22	46.00	37.50	1	8.49	8.49	8.49	8.490	22.489	1688316.056	0.0000	UX1700MSE
23	48.67	37.50	1	7.68	20.63	20.63	20.633	27.404	917995.185	0.0000	UX1700MSE

DESIGN: CALCULATED FACTORS (Seismic conditions) Bearing capacity, Fs = 2.07, Meyerhof stress = 11125 lb/ft².
Foundation Interface: Direct sliding, Fs = 2.324, Eccentricity, e/L = 0.1854, Fs-overturning = 2.70

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	37.50	1	1.05	1.31	1.31	1.308	70.209	1.424	0.1804	UX1700MSE
2	2.00	37.50	1	1.07	1.34	1.34	1.339	68.840	1.465	0.1706	UX1700MSE
3	3.33	37.50	1	1.09	1.37	1.37	1.366	67.206	1.508	0.1611	UX1700MSE
4	4.67	37.50	1	1.12	1.40	1.40	1.398	65.692	1.554	0.1518	UX1700MSE
5	6.00	37.50	1	1.15	1.43	1.43	1.433	64.302	1.603	0.1429	UX1700MSE
6	7.33	37.50	1	1.17	1.46	1.46	1.465	62.696	1.655	0.1342	UX1700MSE
7	8.67	37.50	1	1.20	1.50	1.50	1.501	61.170	1.711	0.1257	UX1700MSE
8	10.00	37.50	1	1.23	1.54	1.54	1.542	59.757	1.771	0.1176	UX1700MSE
9	11.33	37.50	1	1.26	1.58	1.58	1.579	58.120	1.835	0.1097	UX1700MSE
10	12.67	37.50	1	1.30	1.62	1.62	1.621	56.578	1.903	0.1021	UX1700MSE
11	14.00	37.50	1	1.33	1.67	1.67	1.668	55.167	1.977	0.0948	UX1700MSE
12	15.33	37.50	1	1.37	1.71	1.71	1.712	53.522	2.057	0.0878	UX1700MSE
13	16.67	37.50	1	1.41	1.76	1.76	1.762	51.962	2.144	0.0809	UX1700MSE
14	18.00	37.50	1	1.18	1.48	1.48	1.479	41.102	2.238	0.0744	UX1700MSE
15	20.67	37.50	1	1.06	1.32	1.32	1.324	32.449	2.454	0.0622	UX1700MSE
16	23.33	37.50	1	1.14	1.42	1.42	1.424	30.491	2.715	0.0512	UX1700MSE
17	26.00	37.50	1	1.08	1.35	1.35	1.348	24.953	3.038	0.0411	UX1700MSE
18	30.00	37.50	1	1.09	1.36	1.36	1.359	19.683	3.698	0.0282	UX1700MSE
19	34.00	37.50	1	1.28	1.60	1.60	1.598	17.415	4.721	0.0176	UX1700MSE
20	38.00	37.50	1	1.55	1.94	1.94	1.939	14.979	6.512	0.0096	UX1700MSE
21	42.00	37.50	1	1.97	2.47	2.47	2.466	12.273	10.421	0.0040	UX1700MSE
22	46.00	37.50	1	2.86	3.58	3.58	3.579	9.480	24.760	0.0008	UX1700MSE
23	48.67	37.50	1	1.51	5.06	5.06	5.062	6.723	121.775	0.0001	UX1700MSE

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AASHTO DESIGN METHOD
Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

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DESIGN DATA

DESIGN OBJECTIVES

Minimum factor of safety against pullout, Fs-po	1.50
Minimum factor of safety against direct sliding, Fs-sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, Fs-comp-static	1.30
Minimum factor of safety against compound and overall failure, Fs-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 3.28 ft.
Prescribed minimum normalized length of each layer is: L/Hd = 0.70 --> L = 9.33 ft.
Prescribed minimum absolute total length of each layer is: L = 8.20 ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.	
Maximum permissible eccentricity ratio (soil), e/L	0.1667
Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach)	2.50

Bearing capacity coefficients: Nc = 0.00 N_γ = 14.99

SOIL DATA

REINFORCED SOIL

Unit weight, γ	135.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	150.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2174 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 65.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.420
Kae (α_o > 0) = 0.6525 Kae (α_o = 0) = 0.2705 Δ Kae = 0.3820 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY
Seismic safety factor is 75.0% of specified static FS for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

BEARING CAPACITY
Seismic safety factor is 75.0% of specified static FS for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

INTERNAL STABILITY
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic factor of safety against pullout, Fs-po, is 75.0% of its specified static value.
Seismic overall factor of safety, Fs-overall, is 75.0% of its specified static value.
The reduction of Fs-overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

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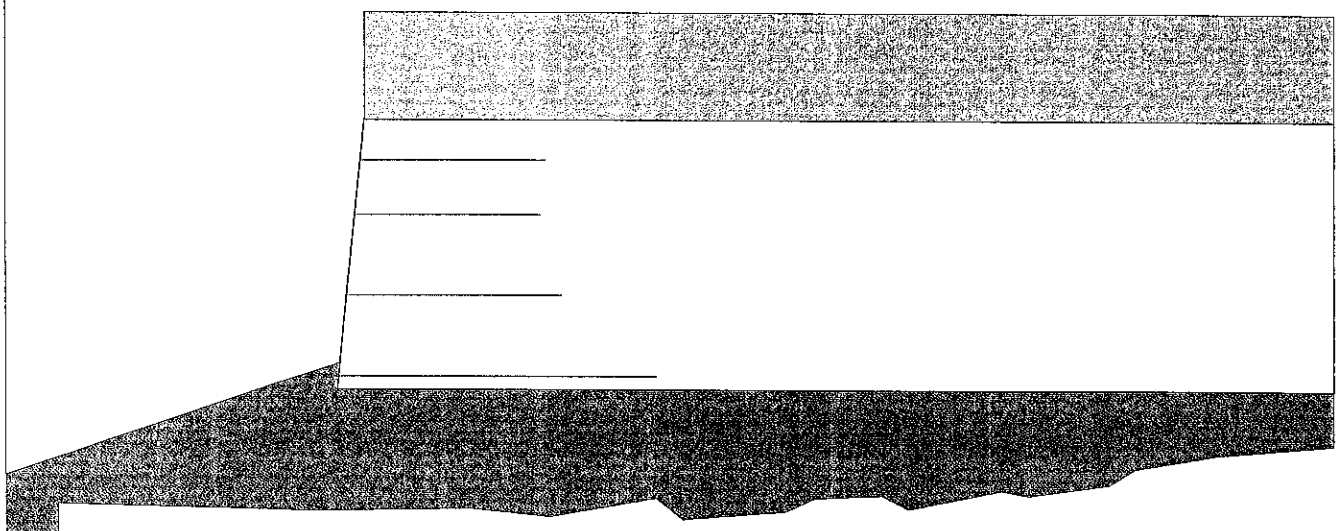
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	13.33	[ft]	{ Embedded depth is E = 1.33 ft, and height above top of finished bottom grade is H = 12.00 ft }
Batter, ω	5.7	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE
Uniformly distributed dead load is 250.0 [lb/ft ²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10 [ft]

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DESIGN: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 7.28, Meyerhof stress = 2045 lb/ft².
Foundation Interface: Direct sliding, Fs = 4.793, Eccentricity, e/L = 0.0223, Fs-overturning = 11.56

	GEOGRID			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	15.99	1	4.73	4.73	4.73	4.735	29.572	2.800	0.0191	UX1700MSE
2	4.67	10.81	1	4.16	4.16	4.16	4.163	11.232	2.638	0.0225	UX1700MSE
3	8.67	9.33	1	6.68	7.68	7.68	7.676	8.682	3.915	0.0045	UX1700MSE
4	11.33	9.33	1	5.58	14.93	14.93	14.930	8.409	7.976	-0.0032	UX1700MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 4.66, Meyerhof stress = 2555 lb/ft².
Foundation Interface: Direct sliding, Fs = 1.914, Eccentricity, e/L = 0.1176, Fs-overturning = 3.72

	GEOGRID			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	15.99	1	2.15	2.69	2.69	2.686	13.420	1.126	0.1044	UX1700MSE
2	4.67	10.81	1	2.40	3.00	3.00	3.001	6.477	1.126	0.1052	UX1700MSE
3	8.67	9.33	1	3.60	5.17	5.17	5.175	4.682	1.899	0.0320	UX1700MSE
4	11.33	9.33	1	2.49	8.33	8.33	8.334	3.755	4.794	0.0004	UX1700MSE

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Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
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Fax (801) 225-3363

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

November 29, 2005

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

Re: Additional Field Exploration
Summit Hills Development
Alpine, Utah
Job No. 051709

Dear Mr. Smith:

As you requested, we have performed additional field exploration at the site. On November 22, 2005, two test pits (TP-5 and TP-6) were excavated at the proposed cut slope below Lot 16 to depths of approximately 12 to 13 feet below the ground surface. The approximate locations of the test pits are shown on the attached Figure 1. The soils encountered consisted of a thin layer of topsoil overlying predominantly gravel (GC, GP-GM) soils, as shown on the attached Test Pit Logs (Figures 2 and 3).

In their most recent review of our geological hazards assessment[1], geotechnical report[2] and response letter[3], the Utah Geological Survey (UGS) indicated that they were concerned about the strength parameters used in our evaluation of the cut slopes, particularly below Lot 16, because of a significant clay layer encountered in TP-3. The results of our additional field exploration at the location of the cut slope below Lot 16 indicates that the soils predominantly consist of gravel, as described above. To evaluate the effects of cutting into these soils, we performed a stability analysis for the subject cut slope, using the same methodology as presented previously and using an internal friction angle of 34° and an apparent cohesion value of 120 psf. Our analysis assumed a long-term phreatic (water) surface exiting from the slope above the roadway, and resulted in a static factor of safety of 2.1. Higher factors of safety are obtained if the phreatic surface is lower than assumed. Using these same parameters and the same psuedostatic coefficient as our referenced geotechnical report, a seismic factor of safety greater than 1.0 is obtained. These factors of safety are considered acceptable (see Figures 5 and 6, attached). We concur, however, with the UGS that Earthtec should

[1]Geological Hazards Assessment, Summit Hills Development, Alpine, Utah, Job No. 051709, September 20, 2005.

[2]Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, August 18, 2005.

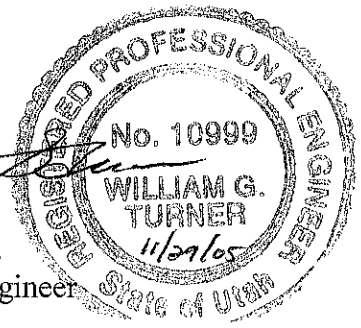
[3]Response to UGS Review, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, October 17, 2005.

observe the cut slopes during construction, since the cut slopes near the beginning of the roadway connection to 600 North could encounter clay soils, in which case flatter slopes or retaining walls may be necessary (depending on the thickness of the clay layer).

This letter is considered an addendum to our referenced reports and is subject to the same conditions and limitations described therein.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.



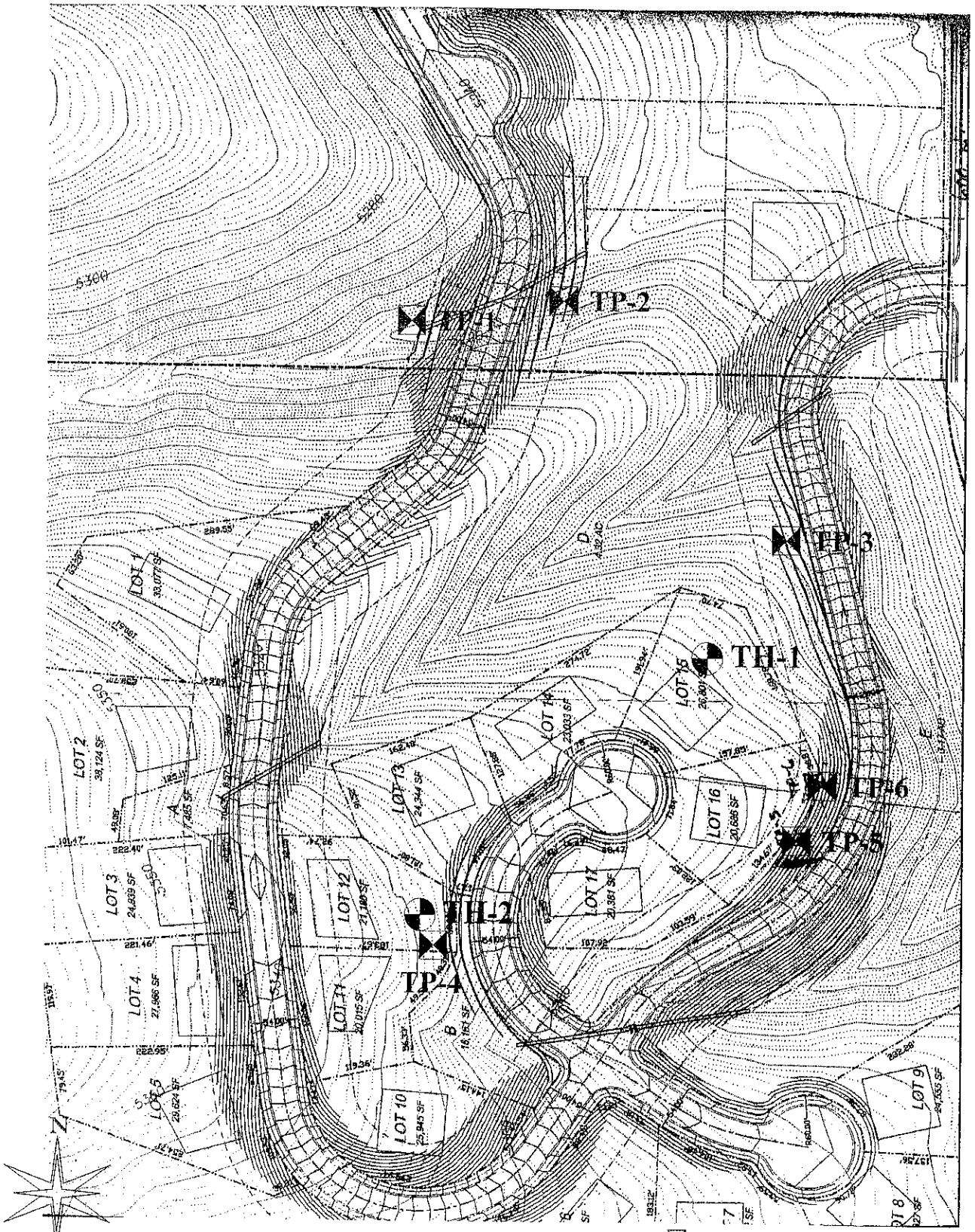
William G. Turner, P.E.
Senior Geotechnical Engineer

Steven L. Smith, P.E.
Principal Geotechnical Engineer

Attachments: Figure 1, Site Plan & Location of Test Holes and Pits
Figures 2-3, Test Pit Log
Figure 4, Legend
Figures 5-6, Stability Results

SITE PLAN & LOCATION OF TEST HOLES AND PITS

SUMMIT HILLS DEVELOPMENT



Not to Scale

Approximate Test Pit Location

Approximate Test Hole Location

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 1

TEST PIT LOG
NO.: TP-5

PROJECT: Summit Hills Development
CLIENT: Taylor Smith
LOCATION: See Figure 2
OPERATOR: Client
EQUIPMENT: Rubber-Tire Backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 11/22/05
ELEVATION: Not Measured
LOGGED BY: M.L.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, sandy, gravelly, organics, moist, dark brown.									
1		GC	Clayey GRAVEL with sand and cobbles: Dense, slightly moist, light brown.									
2												
3												
4		GP-GM	Poorly Graded GRAVEL with silt, sand and cobbles: Dense, slightly moist, brown, weakly cemented to 5 feet.									
5				X		4			63	27	10	
6												
7												
8												
9												
10				X								
11												
12												
13												
14			Bottom at about 13 feet.									
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 051709

Earthtec Testing and Engineering, P.C.

FIGURE NO.: 2

LOG OF TESTPIT 051709.GPJ EARTHTEC.GDT 11/25/05

TEST PIT LOG
NO.: TP-6

PROJECT: Summit Hills Development
CLIENT: Taylor Smith
LOCATION: See Figure 2
OPERATOR: Client
EQUIPMENT: Rubber-Tire Backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 051709
DATE: 11/22/05
ELEVATION: Not Measured
LOGGED BY: M.L.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS: Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, sandy, gravelly, organics, moist, dark brown.									
1												
2		GC	Clayey GRAVEL with sand and cobbles: Dense, slightly moist, light brown.									
3												
4		GP-GM	Poorly Graded GRAVEL with silt, sand and cobbles: Dense, slightly moist, brown, weakly cemented to 4 feet.									
5												
6												
7												
8												
9												
10												
11												
12												
13			Bottom at about 12 feet.									
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

LEGEND

PROJECT: Summit Hills Development
CLIENT: Taylor Smith
DATE: 11/22/05
LOGGED BY: M.L.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS			USCS SYMBOL	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)	GW	Well Graded Gravel, May Contain Sand, Very Little Fines
			GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)	GM	Silty Gravel, May Contain Sand
			GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)	SW	Well Graded Sand, May Contain Gravel, Very Little Fines
			SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)	SM	Silty Sand, May Contain Gravel
			SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
			ML	Silt, Inorganic, May Contain Gravel and/or Sand
			OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)		CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
			MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
			OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS			PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

- SPLIT SPOON SAMPLER (1 3/8 inch inside diameter)
- MODIFIED CALIFORNIA SAMPLER (2½ inch outside diameter)
- SHELBY TUBE (3 inch outside diameter)
- BLOCK SAMPLE
- BAG/BULK SAMPLE

WATER SYMBOLS

- ▽ Water level encountered during field exploration
- ▼ Water level encountered at completion of field exploration

NOTES:
1. The logs are subject to the limitations, conclusions, and recommendations in this report.
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
3. Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
4. In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

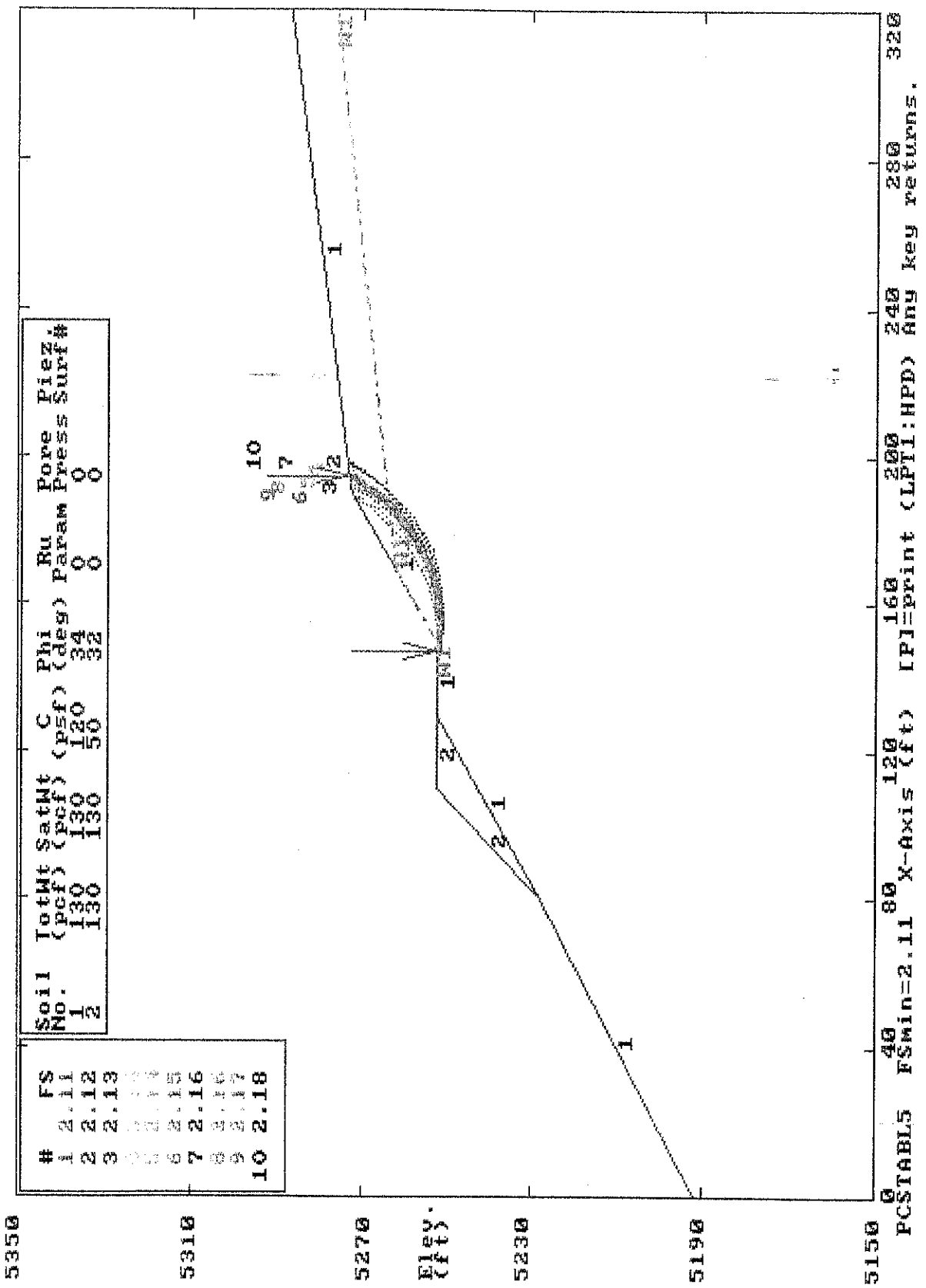
PROJECT NO.: 051709

Earthtec Testing and Engineering, P.C.

FIGURE NO.: 4

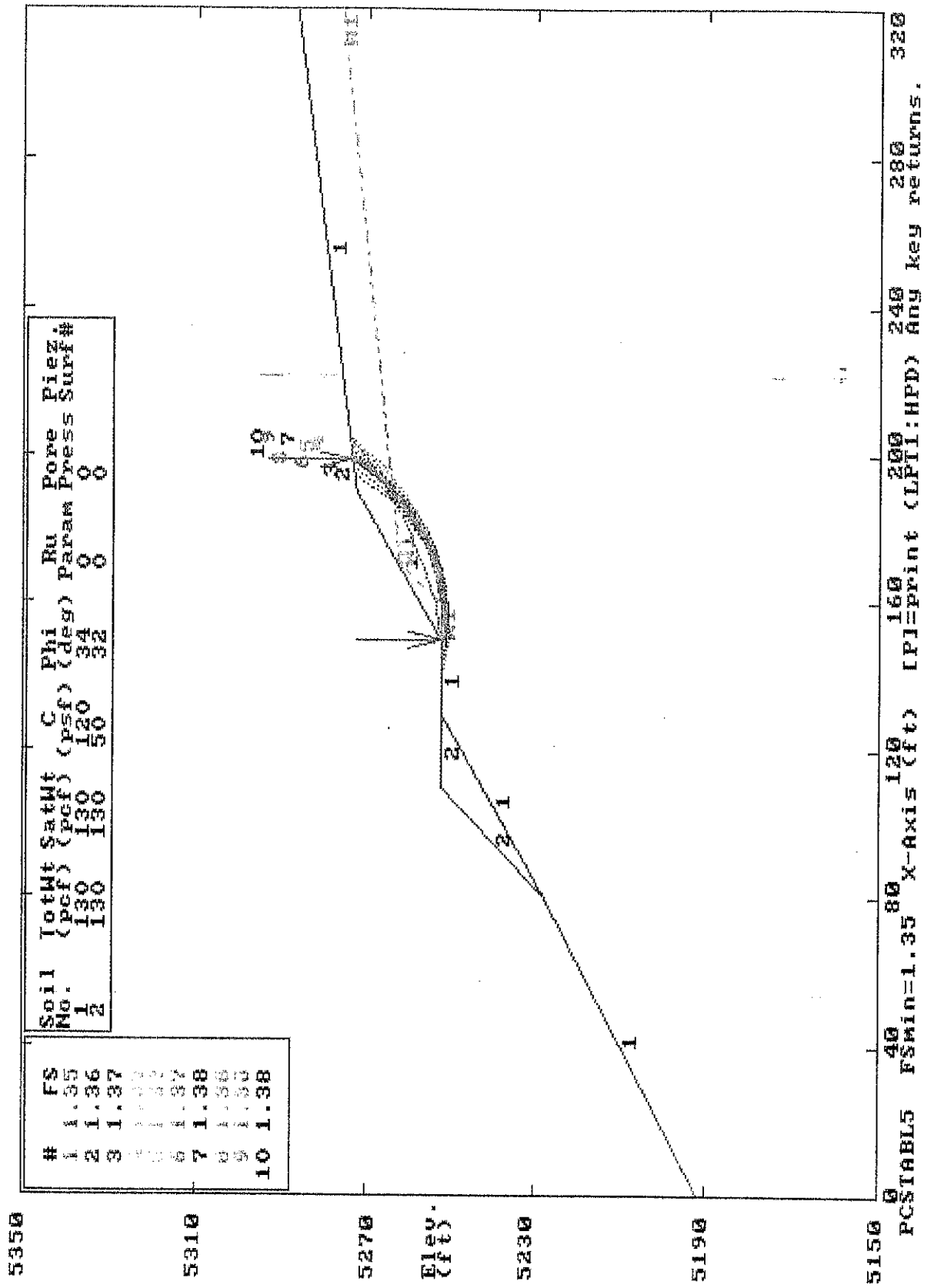
LEGEND 051709.GPJ EARTHTEC.GDT 11/25/05

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 5

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering Pc	FIGURE NO.: 6

Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
Fax (801) 225-3363

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

October 17, 2005

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

Re: Response to UGS Review
Summit Hills Development
Alpine, Utah
Job No. 051709

Dear Mr. Smith:

As you requested, this letter presents our response to a review by the Utah Geological Survey (UGS) of our geological hazards assessment[1] for the proposed Summit Hills residential development located in Alpine, Utah. Earthtec also previously prepared a geotechnical report[2] for the project. The main concerns that the UGS expressed in their review letter dated October 3, 2005 regarded landslide and radon hazards. Regarding landslides, the UGS indicated:

> "Earthtec (2005a) reports that steep (15-30°) slopes in the southern part of the property have the greatest potential for slope failure, and we concur. One of the steepest slopes at the site, located below lots 15 and 16 and above 600 North, may principally consist of clay, based on Earthtec's (2005b) test pit 3, which was excavated at the east end of the slope. Earthtec (2005a) analyzed the stability of this slope using a topographic profile (location not shown in report) and estimated soil strengths, and determined factors of safety around 1.9 (under static conditions). However, their models use an internal friction angle of 36° despite citing angles of >31° for clayey gravel and 28-34° for clayey sand by U.S. Bureau of Reclamation (1987). Earthtec (2005a) did not consider the strength of lean clay, which may underlie and control the stability of the slope. Some typical published friction angles for drained, compacted, cohesive soils range from about 28±5 for lean clay to 31±5 for clayey sand (U.S. Bureau of Reclamation, 1973; Duncan and Wright, 2005).
>
> "We recommend performing slope-stability analyses using lab-determined strength parameters for material from the site. If such data are not available, we recommend using a range of values, considering the variety of material that may occur in the slope. In general,

[1]Geological Hazards Assessment, Summit Hills Development, Alpine, Utah, Job No. 051709, September 20, 2005.

[2]Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, August 18, 2005.

> the final calculation of factors of safety should be based on lower range strengths as indicated in Hylland (1996, p. 4), rather than medium or upper range strengths as appears to have been done here. Additionally, Earthtec (2005a) did not include the anticipated shape of the road cut in their profile. We recommend that the topographic profile and stability models include the anticipated road cuts and fills below lots 15 and 16, and that a geotechnical engineer review these and the individual road cut and fill slope stability analyses in Earthtec (2005b). We also recommend that transient shallow-ground-water conditions be addressed in the stability analysis. Earthtec (2005a) did not encounter ground water during their subsurface investigations, but shallow ground water resulting from heavy precipitation or rapid snow melt may negatively affect the stability of the steep slopes, particularly road cuts and fills."

The UGS review pointed out that the lean clay encountered in test pit TP-3 suggested that the clay may control the stability of the slope. Note that test hole TH-1, which encountered clayey to silty sand with gravel and clayey gravel with sand, was located on Lot 15 not too far from but above test pit TP-3. Lean clay soils also were not encountered in the other test pits and test hole throughout the property. Our observations of the southern slope above 600 North indicated that the exposed soils consisted of clayey gravel with sand and not lean clay. It is our opinion that the lean clay encountered within TP-3 was a localized pocket and not a continuous layer, and that the majority of soils on the steeper south-facing slopes above 600 North consist of clayey gravel with sand.

Testing a representative undisturbed specimen of on-site gravel soils is not plausible since obtaining a representative undisturbed sample is very difficult (and expensive), and since gravel can only be properly tested in a large direct shear machine, which is not readily available in Utah. Thus, we gave estimated parameters for clayey gravel soils in our referenced geotechnical report based on published sources. It is possible that clayey sand with some gravel is more prevalent in some areas of the slope. According to the U.S. Bureau of Reclamation[3], clayey sands have internal friction angles between 28° and 34° and saturated cohesion values of 120 to 360 psf. Typically, lower friction angles have higher cohesion values and vice-a-versa. Varying the friction angle from 28° to 34° and respective cohesion values from 360 psf to 120 psf, the factor of safety (FS) ranges from 1.45 to 1.55. This analysis assumes a long-term phreatic (water) surface exiting from the slope above the roadway. Higher factors of safety are obtained if the phreatic surface is lower than assumed. Using average strength parameters, a static FS of 1.5 is obtained (see attached Figure 1). Using these same parameters and the same psuedostatic coefficient as our referenced geotechnical report, a seismic FS greater than 1.0 is obtained. These factors of safety are considered acceptable.

Contrary to what the UGS indicated, we did perform a stability analysis for the anticipated shape of the road cut, as presented in our referenced geotechnical report (see Figures 14 and 15). As described in our report, we analyzed the highest anticipated cut slope (40 feet high and 1.5H:1V cut face). This particular cut slope is located relatively close to TP-3, so we revised the strength parameters to reflect possible lean clay soils for that cut slope (which we believe will be the worst-case scenario), and re-ran the stability for this particular slope using what we believe are appropriate

[3]U.S. Bureau of Reclamation, 1987, "Design Standards No. 13, Embankment Dams," Denver, Colorado.

values (internal friction angle of 24° and a cohesion of 400 psf). The results of this analysis indicate a static FS greater than 1.5 and a seismic FS greater than 1.0, which are acceptable (see Figures 3 and 4, attached).

Regarding the potential radon hazard, the UGS indicated the following:

> "Earthtec (2005a) reports that the subdivision site is within an area mapped by Black (1993) as having a potentially high radon hazard, and discusses radon testing and radon-resistant building construction. Appendix F of the International Residential Code (IRC) contains requirements for new construction in jurisdictions where radon-resistant construction is required. Geologic factors contributing to elevated indoor-radon levels, such as volcanic clasts within the alluvial-fan unit Taf (Biek, 2005), are found on the subdivision site and we recommend implementing techniques in IRC Appendix F, unless these regulations are superceded by local government requirements. Approval of building permits need not depend upon fulfilling this recommendation, but incorporating radon-resistant techniques in new construction is generally less expensive than adding post-construction radon reduction measures."

We concur with the UGS that incorporating radon-resistant techniques in new construction is generally less expensive than adding post-construction radon-reduction measures, and recommend that ventilation and other techniques be considered prior to building.

This response letter is considered an addendum to our referenced reports and is subject to the same conditions and limitations described therein.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.

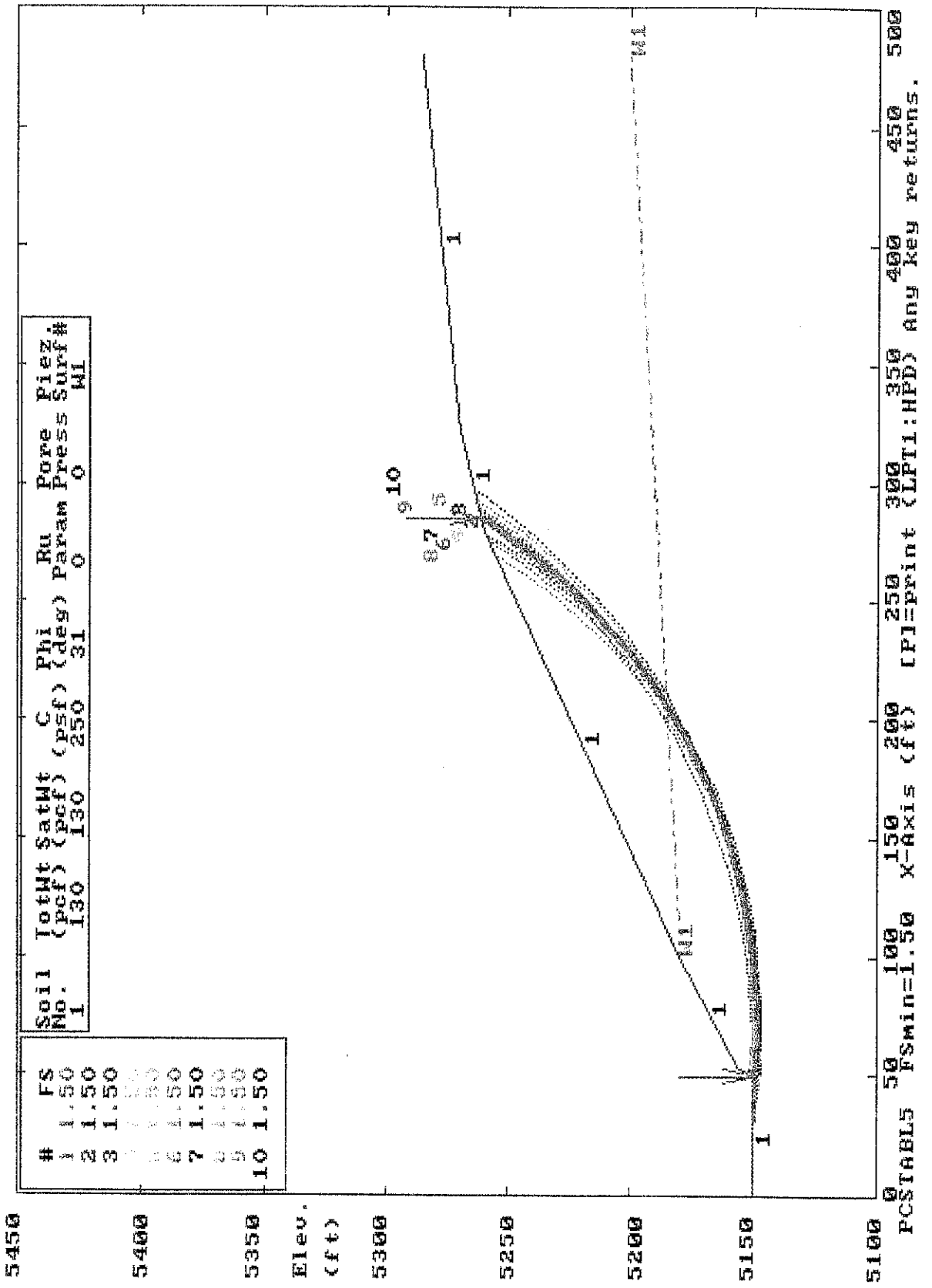
REGISTERED PROFESSIONAL ENGINEER
No. 10999
WILLIAM G. TURNER
10/17/05
State of Utah

William G. Turner, P.E.
Senior Geotechnical Engineer

Steven L. Smith, P.E.
Principal Geotechnical Engineer

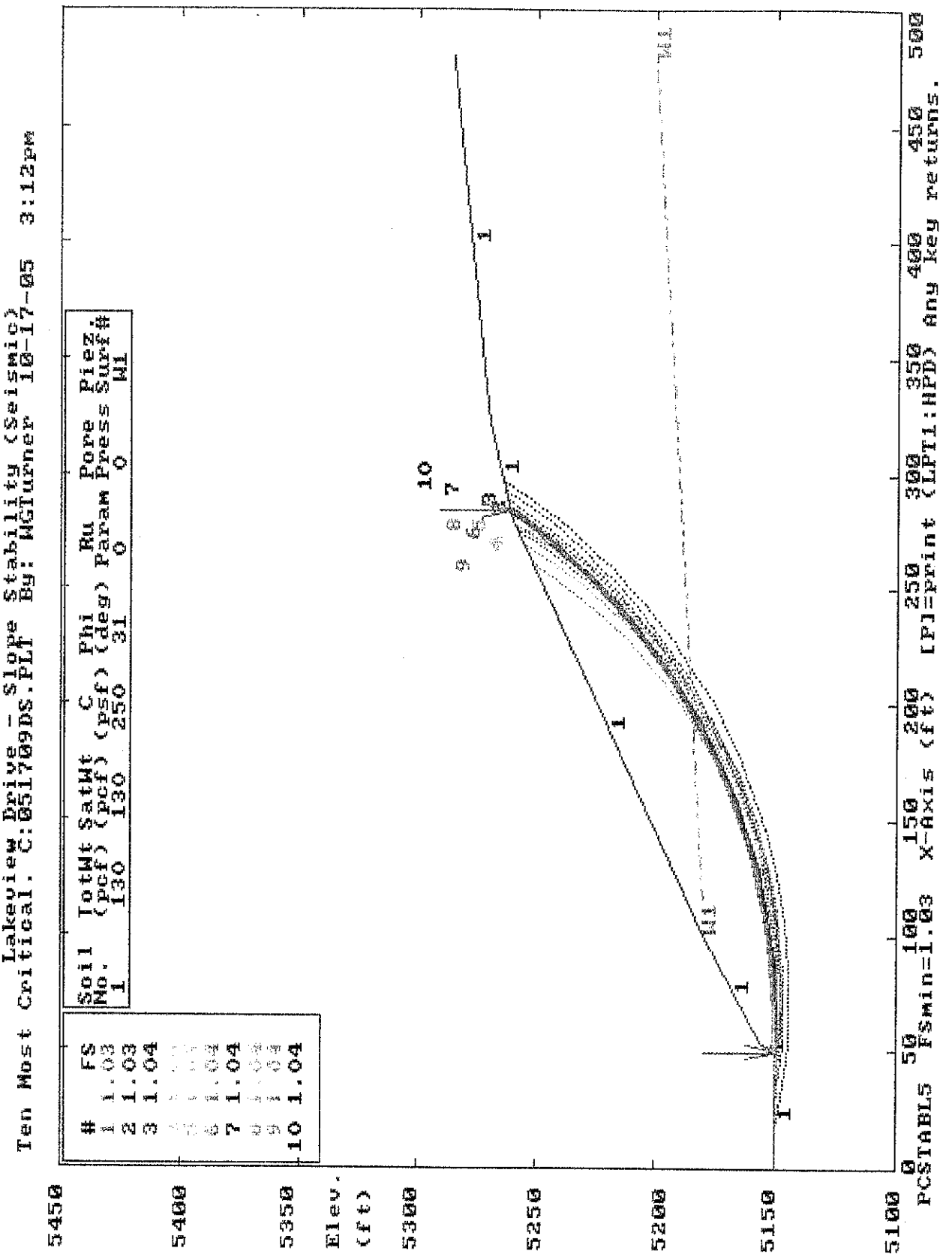
Attachments: Figures 1-4, Stability Results

STABILITY RESULTS



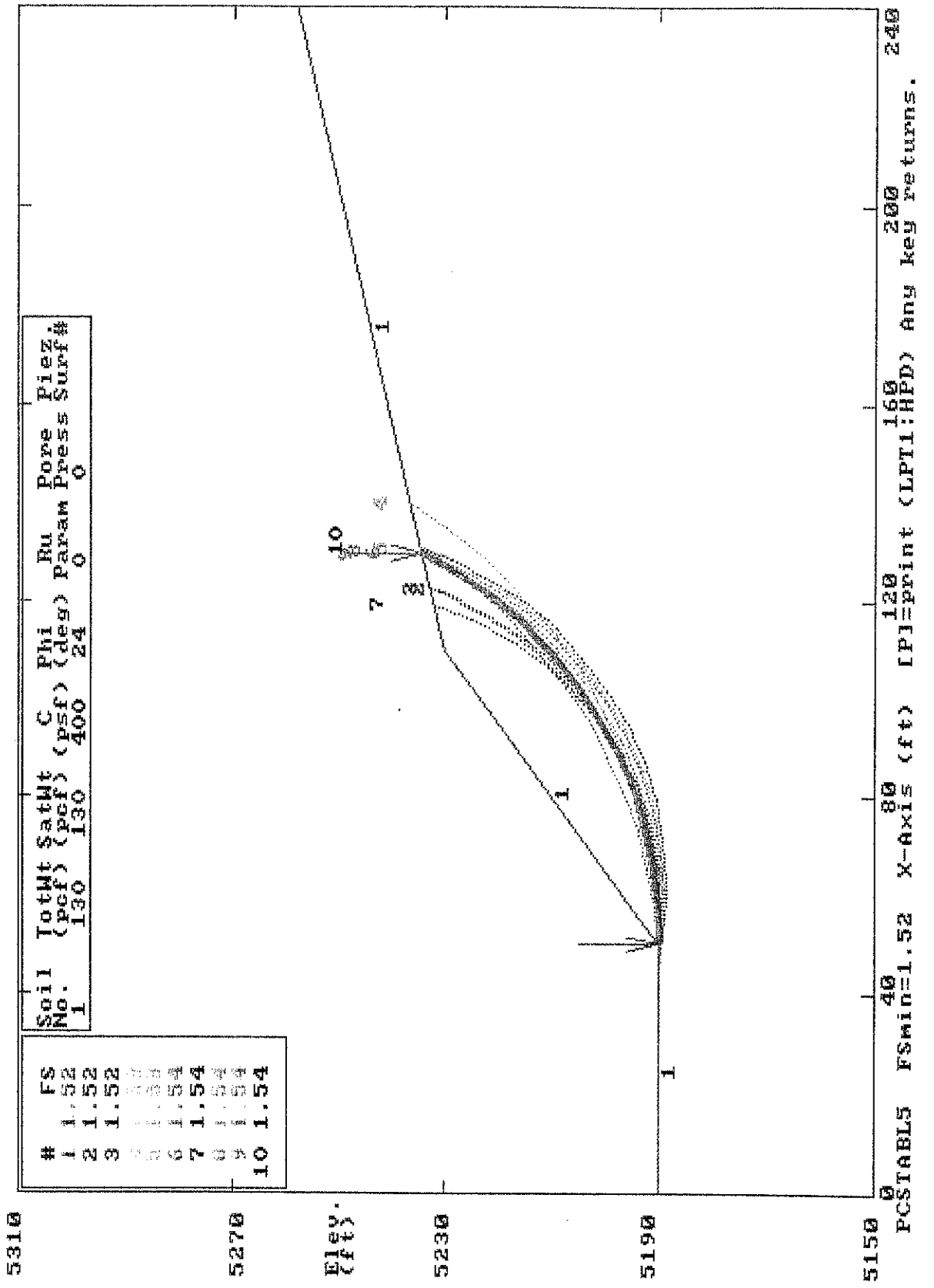
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 1

STABILITY RESULTS



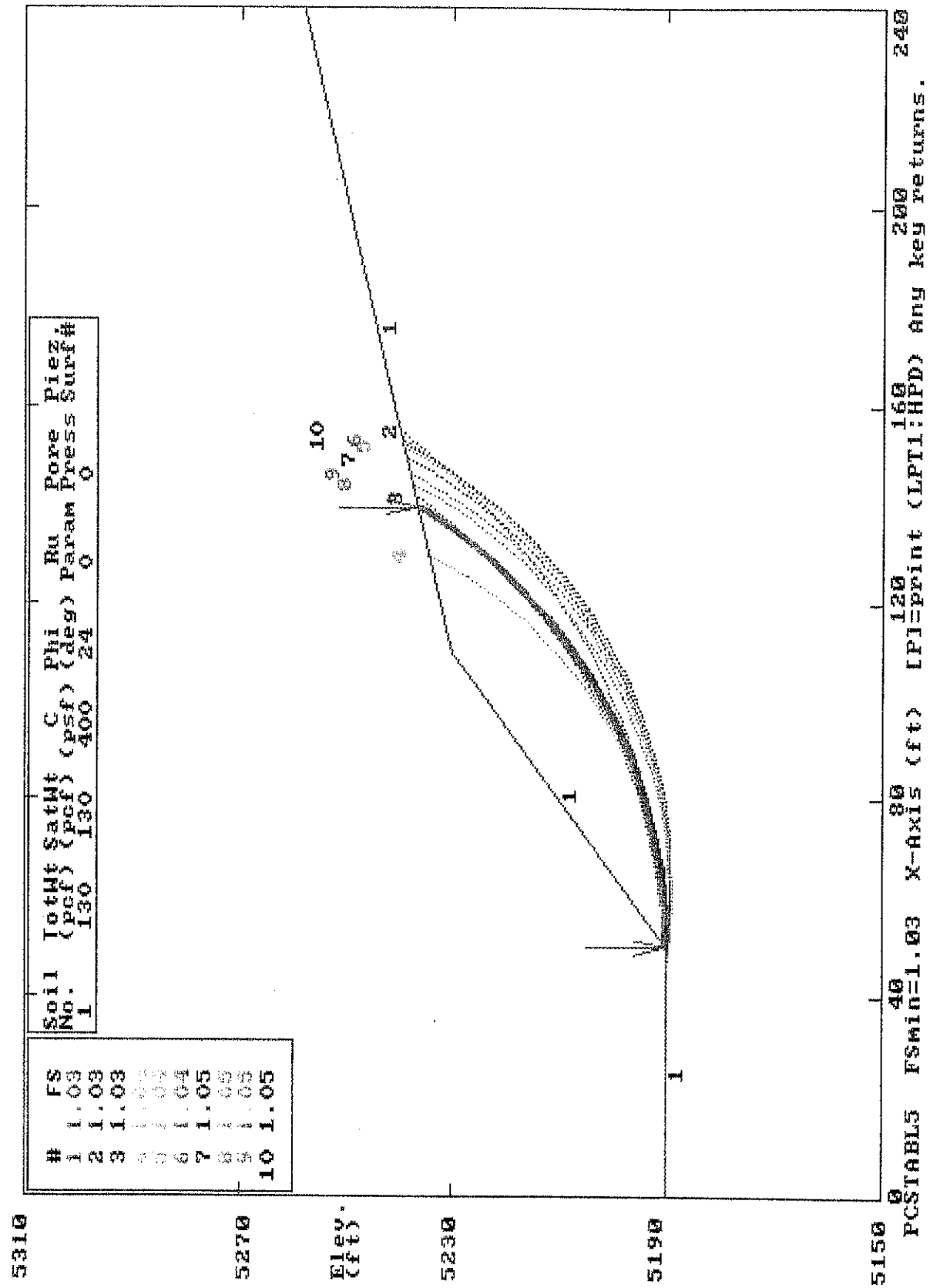
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 2

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 3

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 4

Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
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1596 W. 2650 S. #108
Ogden, Utah - 84401
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Fax (801) 399-9842

January 26, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

Re: Additional Information
Stability of Slope Below Lot 16
Summit Hills Development
Alpine, Utah
Job No. 051709

Dear Mr. Smith:

As you requested, this letter addresses the most recent comments dated January 23, 2006 by the Utah Geological Survey (UGS) regarding our last letter[1] which presented our stability analyses for the post-construction slopes below Lot 16. In their last letter, the UGS indicated that our stability analysis did not include the entire slope, but only analyzed the upper 80 feet of the slope below the subject lot. They indicated that the entire 120-foot high slope should be analyzed with "potential landslide failure surfaces daylighting near the base of the slope." The reason we chose the 80-foot high slope configuration for analysis was because that particular cross-section included the highest cut and fill slopes below Lot 16 and it has been our engineering experience that the location where the most change will occur provides the lowest factor of safety.

As suggested by the UGS, we analyzed the highest slope (nearly 120 feet high) below Lot 16 using the existing topography and proposed road cut and fill slopes. Using the same soil strengths, groundwater level, possible clay layer below elevation 5230 feet, and methodology as indicated in our referenced letter, following are the associated factors of safety for this slope:

Soil Type	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Static Factor of Safety	Seismic Factor of Safety
Lean Clay Clayey Gravel	26 32	320 150	1.59	0.99
Lean Clay Clayey Gravel	28 35	280 100	1.68	1.03
Lean Clay Clayey Gravel	30 38	240 50	1.77	1.09

[1] Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Job No. 051709, January 17, 2006.

Typically, the minimum acceptable factors of safety (FS) are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. The results of our analyses indicate that the minimum FS are exceeded, except the seismic condition for the lowest friction angle where the FS is slightly less than the minimum. Our analyses indicates that using an average or higher than average friction angle (and a lower cohesion) results in a factor of safety greater than the typical minimum values. This suggests that a slight increase in the friction angle (greater than 26°) will result in a factor of safety that meets the minimum value for the seismic condition. We believe that the average strength values indicated above adequately represent the slope, thus it is our opinion that the post-construction slopes will be stable. Stability results are presented on Figures 1 and 2, attached.

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations described therein.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

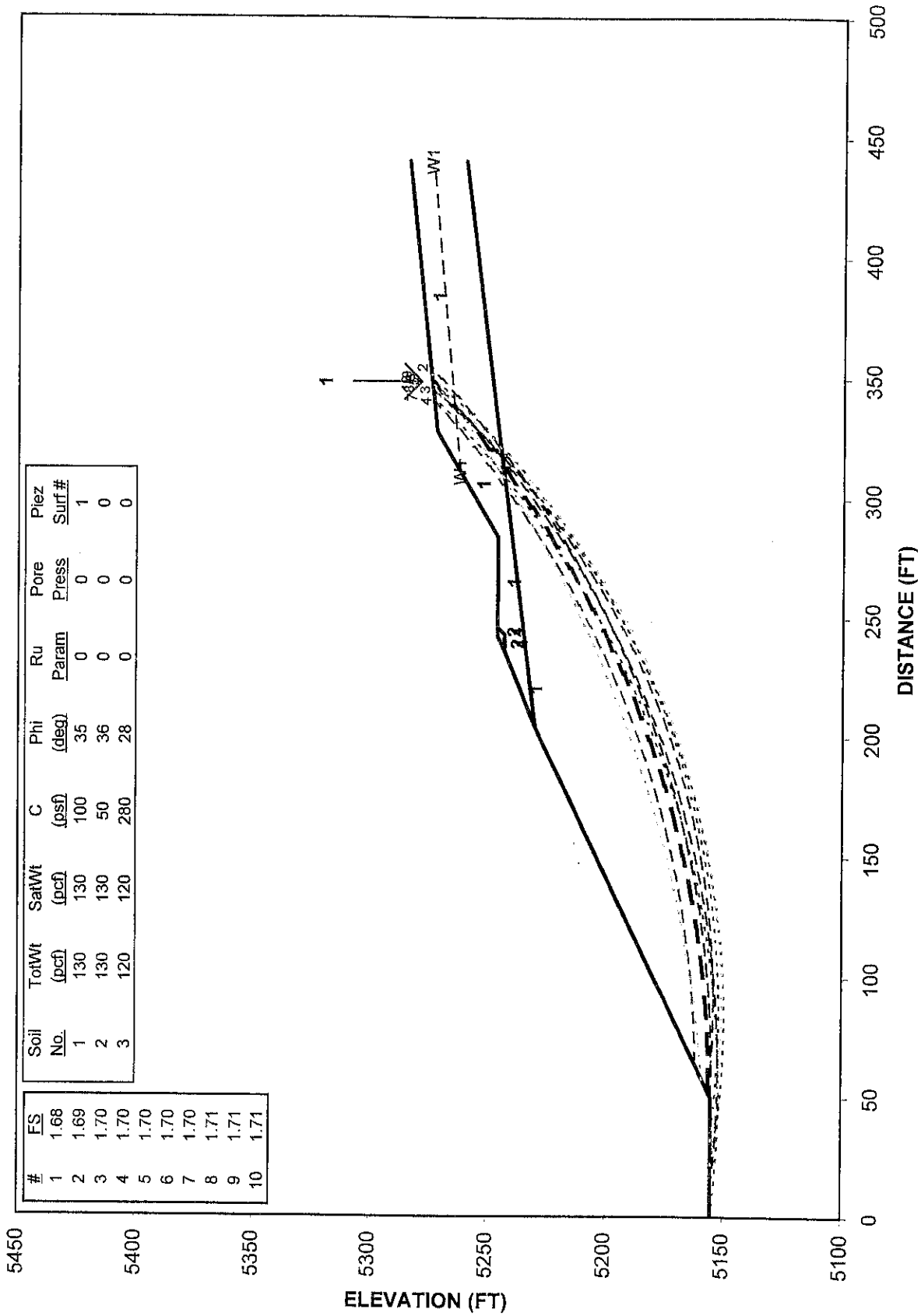
Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.

REGISTERED PROFESSIONAL ENGINEER
No. 10999
WILLIAM G. TURNER
1/27/06
State of Utah

William G. Turner, P.E.
Senior Geotechnical Engineer

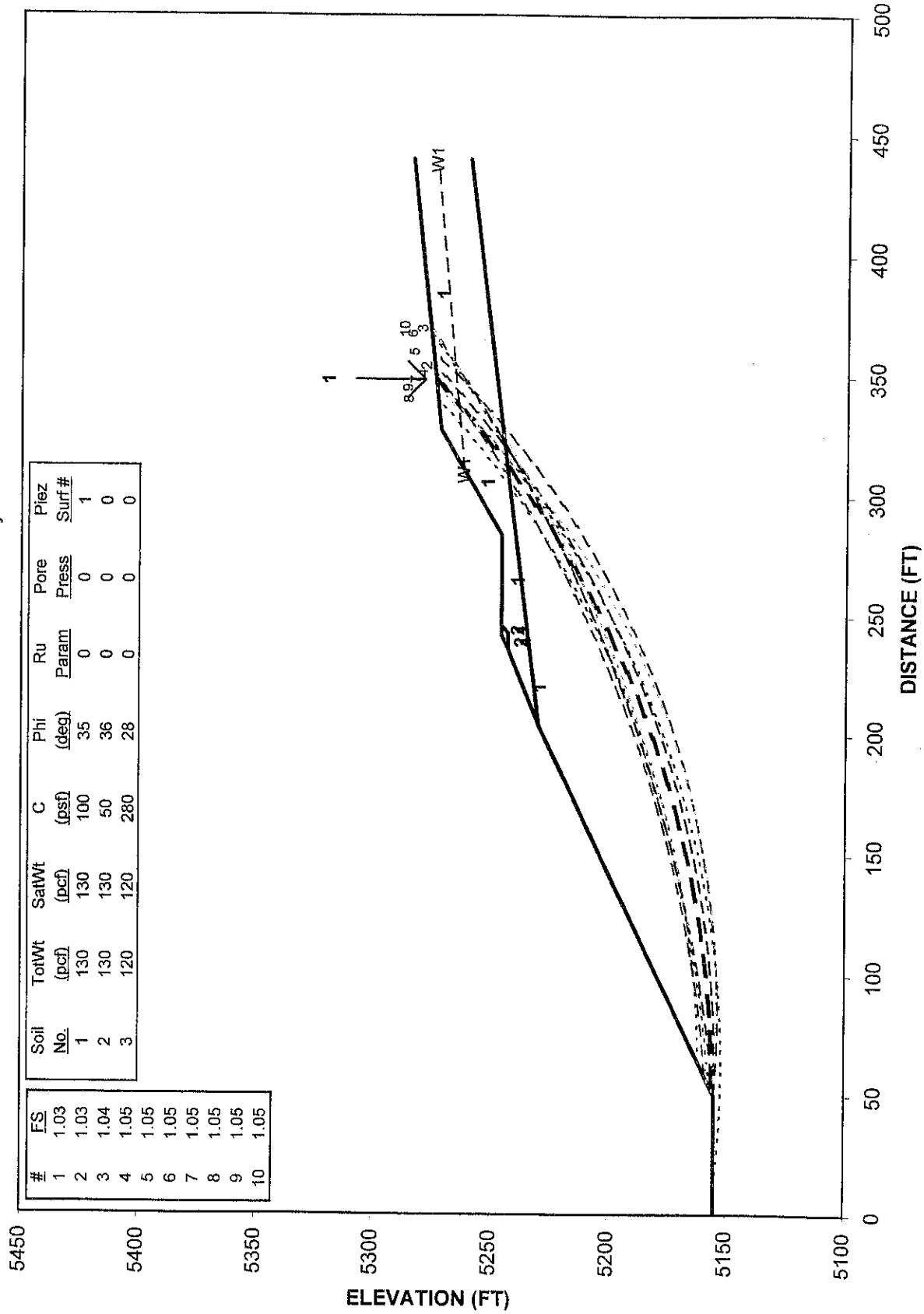
Attachments: Figures 1-2, Stability Results

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 1

STABILITY RESULTS



PROJECT NO.: 051709K	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 2

Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
Fax (801) 225-3363

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Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

January 17, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

Re: Stability of Slope Below Lot 16
Summit Hills Development
Alpine, Utah
Job No. 051709

Dear Mr. Smith:

At your request, this letter addresses the most recent comments (dated December 21, 2005) by the Utah Geological Survey (UGS) regarding our last letter[1] which presented more information for the proposed cut slopes below Lot 16. The UGS indicated that the stability of the overall slope after construction is completed should be performed. Accordingly, we performed a stability analysis for the overall slope with a post-construction configuration, using the same methodology and phreatic surface as presented in our referenced letter. Since test pits were not excavated within the lower portion of the slope, we assumed that the clay soils encountered in test pit TP-3, which was located on the east side of the slope, extend at about the same elevation around the bottom of the slope.

According to the U.S. Bureau of Reclamation[2], clays of low to medium plasticity have internal friction angles between 26° and 30° and saturated cohesion values of 240 to 320 psf, and clayey gravel soils have internal friction angles greater than 31°. Typically, lower friction angles have higher cohesion values and vice-a-versa. Following are the parameters used and the associated factors of safety:

Soil Type	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Static Factor of Safety	Seismic Factor of Safety
Lean Clay Clayey Gravel	26 32	320 150	1.48	0.97
Lean Clay Clayey Gravel	28 35	280 100	1.60	1.01
Lean Clay Clayey Gravel	30 38	240 50	1.66	1.03

[1] Additional Field Exploration, Summit Hills Development, Alpine, Utah, Job No. 051709, November 29, 2005.

[2] U.S. Bureau of Reclamation, 1987, "Design Standards No. 13, Embankment Dams," Denver, Colorado.

Typically, the minimum acceptable factors of safety (FS) are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. Note that for the lower range of friction angles, the factors of safety for both conditions are slightly less than the minimum. Our analyses indicates that using an average or higher than average friction angle (and a lower cohesion) results in factors of safety greater than the typical minimum values. This suggests that a slight increase in the friction angle (greater than 26°) will result in factors of safety that meet the minimum values. We believe that the average strength values indicated above adequately represent the slope, thus it is our opinion that the post-construction slopes will be stable. Stability results are presented on Figures 1 through 6, attached.

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations described therein.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.

REGISTERED PROFESSIONAL ENGINEER
No. 10999
WILLIAM G. TURNER
1/17/06
State of Utah

William G. Turner, P.E.
Senior Geotechnical Engineer

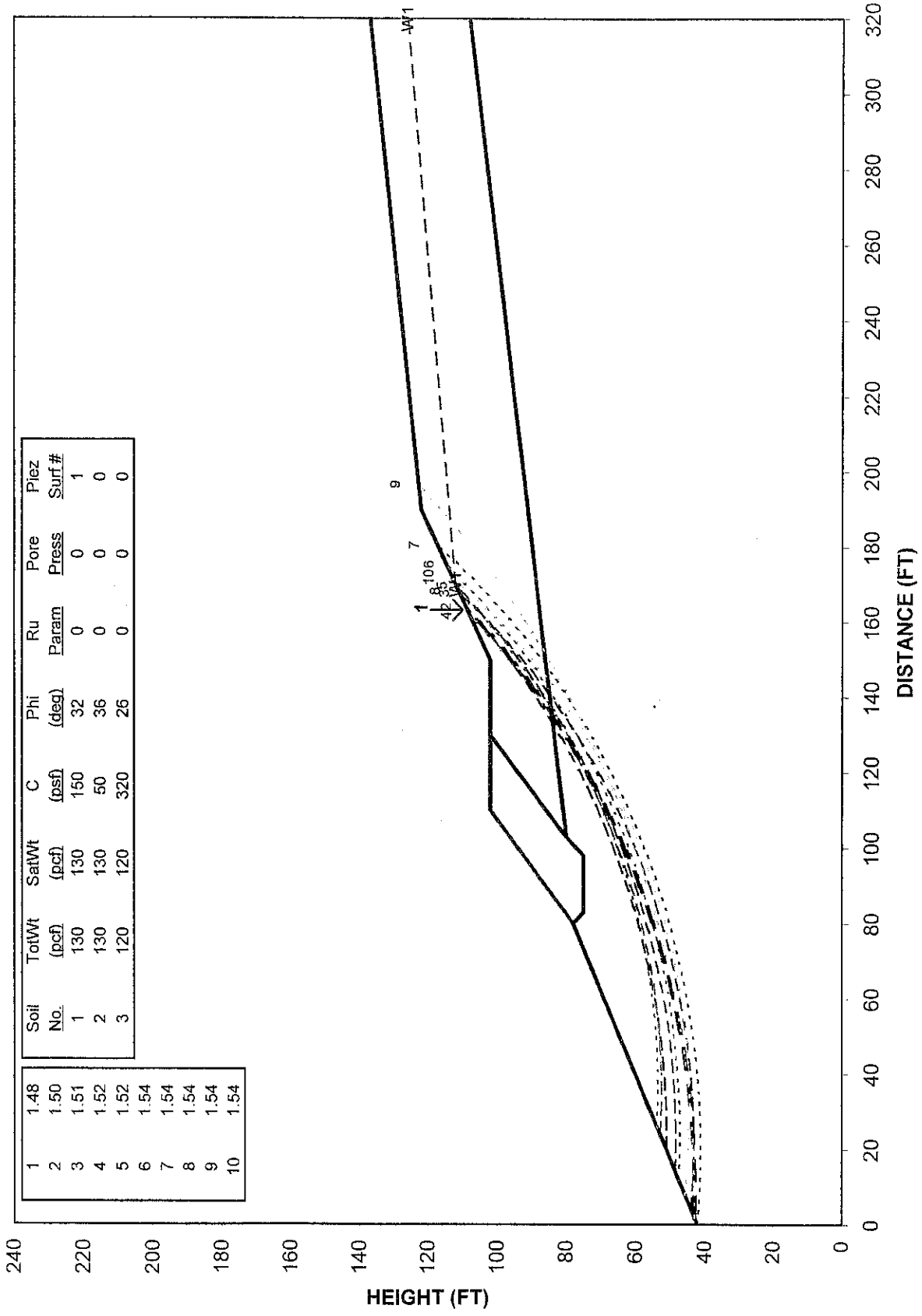
Steven L. Smith, P.E.
Principal Geotechnical Engineer

Attachments: Figures 1-6, Stability Results

STABILITY RESULTS

Lakeview Drive - Slope Stability Below Lot 16

Ten Most Critical Surfaces. C:051709H.PLT Run By: WGTurner 01-18-06



Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez Surf #
1	130	130	150	32	0	0	1
2	130	130	50	36	0	0	0
3	120	120	320	26	0	0	0

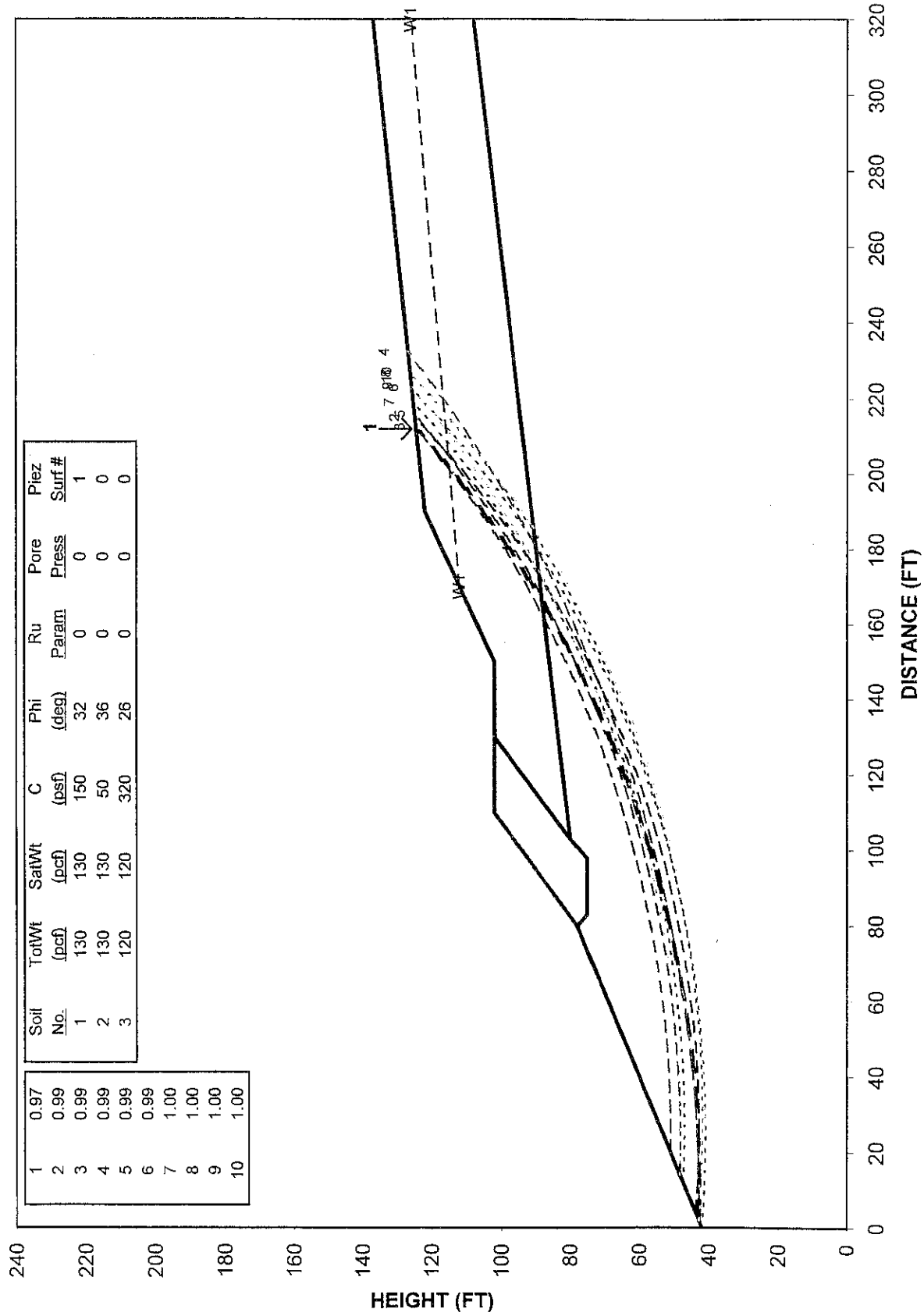
1	1.48
2	1.50
3	1.51
4	1.52
5	1.52
6	1.54
7	1.54
8	1.54
9	1.54
10	1.54

PROJECT NO.: 051709

Earthtec Testing and Engineering, P.C.

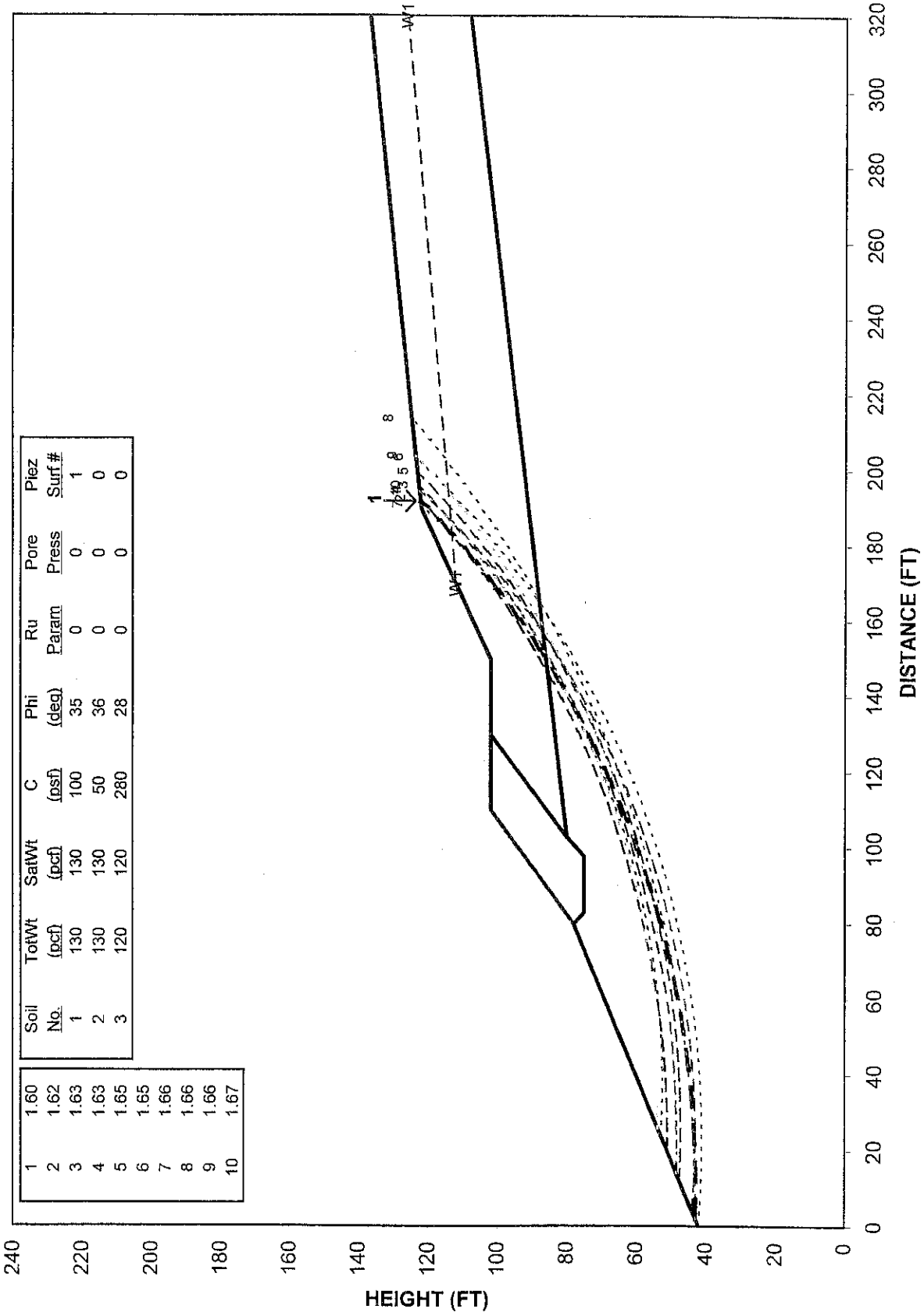
FIGURE NO.: 1

STABILITY RESULTS



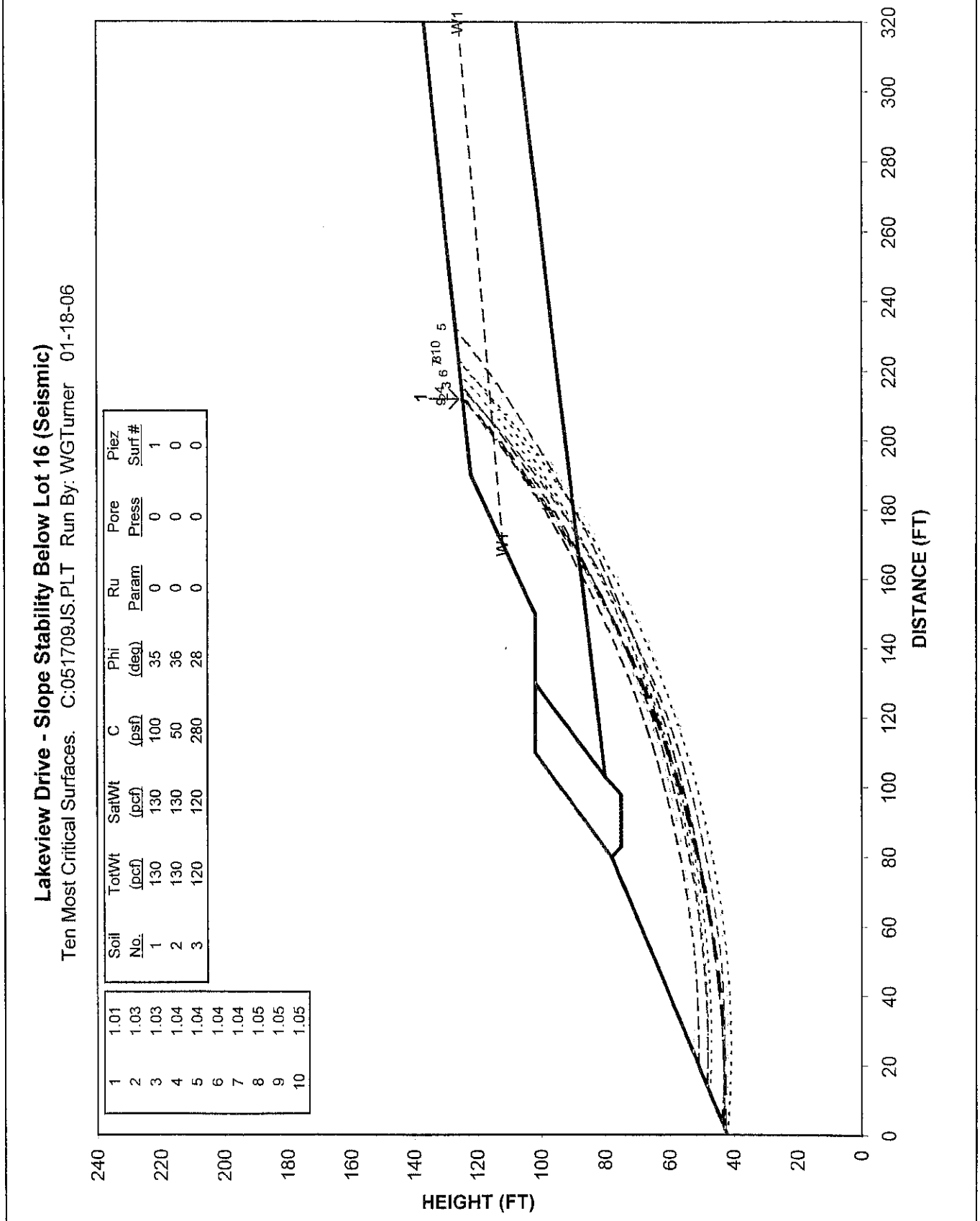
PROJECT NO.: 051709H	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 2

STABILITY RESULTS



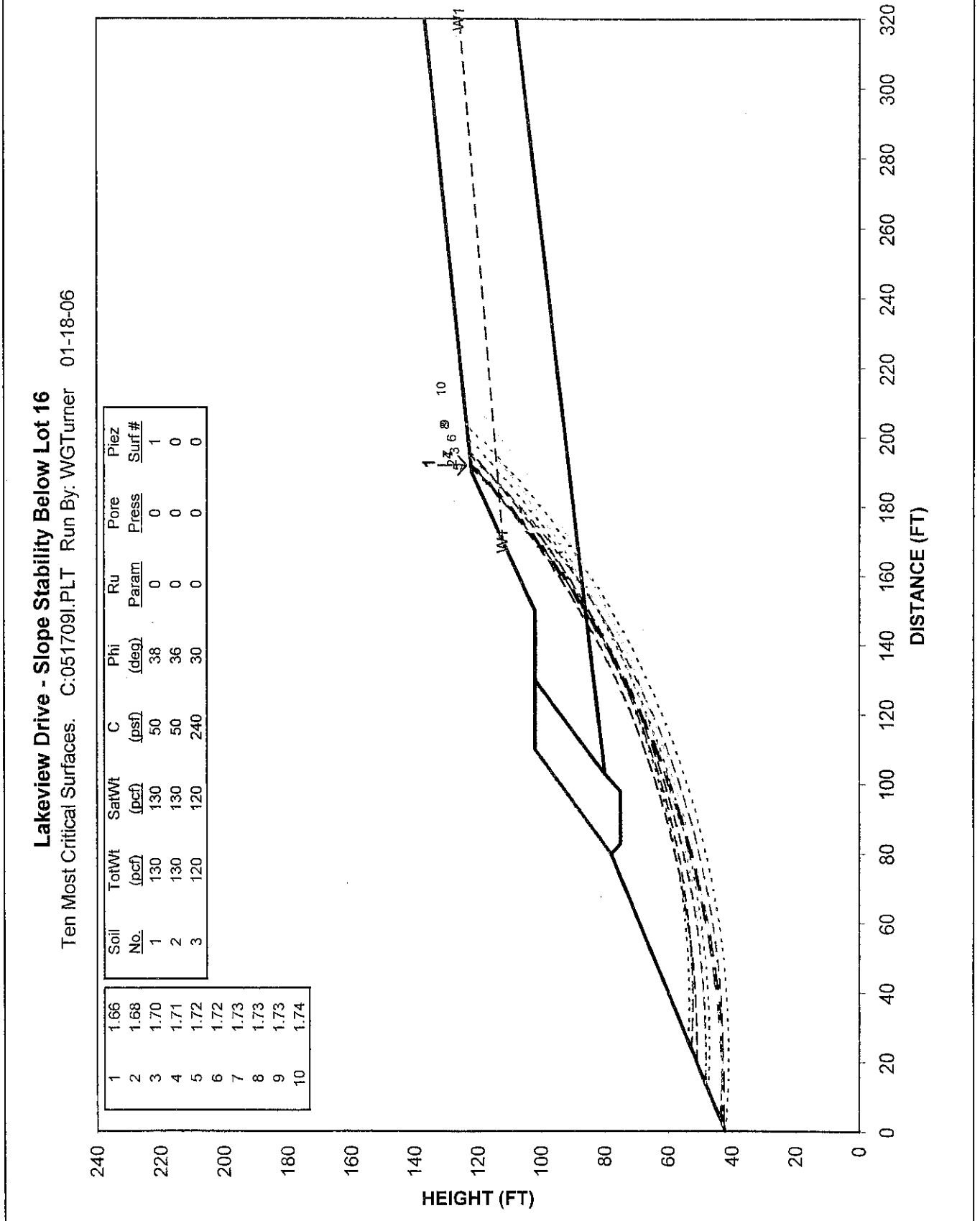
PROJECT NO.: 05170	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 3

STABILITY RESULTS



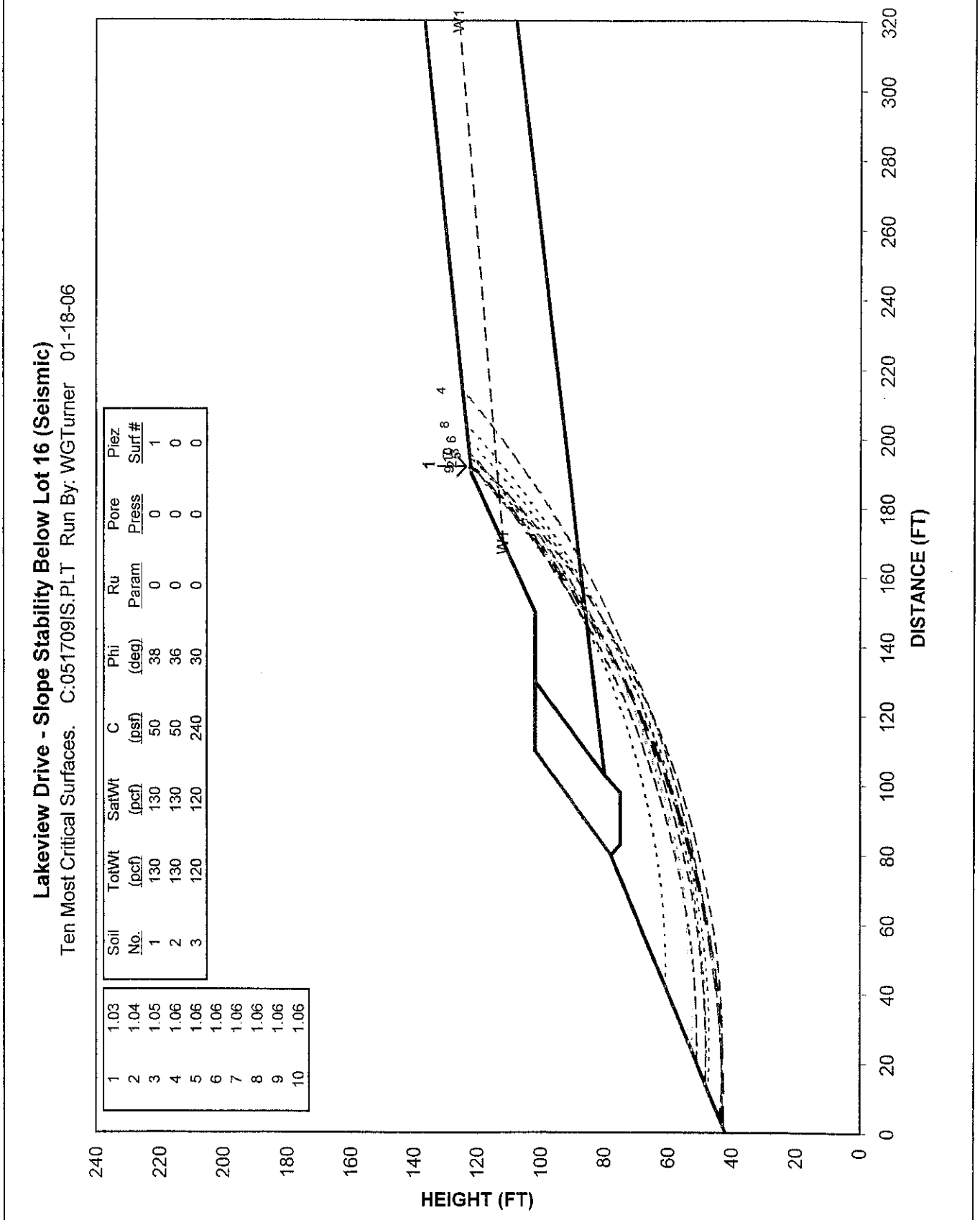
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 4

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 5

STABILITY RESULTS



PROJECT NO.: 051709I	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 6

Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
Fax (801) 225-3363

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

October 3, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

Subject: **Response to Review**
Proposed Lakeview Drive
Summit Hills (Vista Meadows)
Alpine, Utah
Job No. 051709

Dear Mr. Smith:

As you requested, this letter presents our response to a review prepared by Taylor Geo-Engineering (on behalf of Alpine City) of our retaining wall recommendations[1] for the proposed Lakeview Drive at the subject site. The review expressed three main concerns that we address herein. Those concerns include:

1. Placing geogrid in Lock+Load walls taller than 4 feet and performing internal and external stability analyses of the geogrid.

2. Revising the seismic analyses by using a minimum 1.1 factor of safety and a peak ground acceleration based on the characteristic earthquake at the site.

3. Including a plan showing the locations of the cross-sections for the stability analyses in relation to exploration locations.

We previously prepared a geotechnical report[2] for the project and have performed several stability analyses[3] for the south facing slope on which Lakeview Drive will be constructed, indicating the overall slope will be stable. The design presented herein is based on our understanding of the retaining wall requirements, soil conditions at the site, and our engineering analyses.

---

[1]Retaining Wall Recommendations, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Job No. 051709, April 19, 2006.

[2]Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, August 18, 2005.

[3]Additional Information, Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Job No. 051709, January 26, 2006.

Proposed Construction

As indicated in our April 19, 2006 letter, the plans provided by Sowby & Berg Consultants indicated that the highest retaining walls in cut areas will be on the order of 27 feet in height (located on the south-facing hillside above Hog Hollow Road). A 2H:1V backslope will be cut into the hillside above the highest wall, extending to as much as 12 feet in height. In fill areas, walls will be constructed up to about 27 feet in height to retain Lakeview Drive on the south-facing hillside above Hog Hollow Road. A higher fill is also planned near the east end of Lakeview Drive, with the maximum fill height of approximately 48 feet.

Stability Analyses

Our stability analyses included sliding, overturning, bearing capacity, and the overall (global) stability of the proposed walls, which were evaluated based on existing soils at the site and assuming that backfill soils will consist of structural fill as discussed in the recommendations below. Typical minimum factors of safety are 1.5 for sliding, 1.5 for overturning and 3.0 for bearing. We considered using Redi-Rock block walls in cut situations (to minimize the amount of cut behind the wall that would be needed to place geogrid) and using Lock+Load block walls in fill situations. These factors of safety are met for the Lock+Load blocks up to a maximum height of 9⅓ feet when backfilled with select fill material, as presented in the April 19, 2006 letter. The results of our analyses indicate that these minimum factors of safety are also met with a maximum wall height of about 6 feet for 30-inch deep Redi-Rock blocks and 7½ feet for 40-inch deep Redi-Rock blocks (see Figure 1). The retainage heights discussed in the proposed construction section above can be achieved by placing walls on levels or tiers, with the bottom of each tier offset about 9 feet for Lock+Load walls and 7½ feet for Redi-Rock walls, measured from the bottom of each lower tier. Geogrid will need to be placed behind the Lock+Load walls retaining fill soils, as discussed below.

Engineering parameters for on-site soils and the computer program for analyses are the same as presented in our referenced letter of January 26, 2006, using the lowest (most conservative) friction angles presented therein, as follows:

Material Type	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Moist Unit Weight (pcf)
Lean Clay	26	320	120
Clayey Gravel	32	150	130
Structural Fill	40	50	135
Redi-Rock	0	5000	145
Lock+Load	45	50	145

Since much of the wall in cut areas will be below elevation 5230 feet, we used native clay soil parameters beneath and behind the retaining walls in cuts. In fill areas, we used clayey gravel soil

parameters to represent the native soils. A phreatic surface was assumed within the slope behind and/or beneath the walls in native soils.

For the seismic (pseudostatic) analyses, we believe a reasonable "characteristic" earthquake event is the acceleration associated with a 5% probability of exceedance in 50 years. A value of 0.42*g* for the 5% probability of exceedance in 50 years was obtained by querying the USGS website[4] at site (grid) locations of 40.462° north latitude and -111.794° west longitude. Half of this value, 0.21, was used as the pseudostatic coefficient for the stability analysis.

The internal stability of the geogrid was analyzed using the computer program *MSEW*, which allows modeling of geogrid strengths, geogrid/soil interface strengths and geogrid/block facing interface strengths. *MSEW* is only capable of modeling a two-tiered wall, so for the wall with five tiers we modeled the bottom two tiers by applying a 3600-pound (135 pcf times 27 feet, and rounded off) surcharge load on top of the wall to simulate the weight of the fill to be placed above the wall. The results of this analysis indicate that geogrid used in conjunction with Lock+Load blocks will need to extend at least 24 feet behind the block facing for the bottom tier, and that geogrid is needed at vertical spacings equivalent to one block height for the bottom three tiers. For the upper two tiers, the geogrid used in conjunction with Lock+Load blocks will need to extend at least 16½ feet behind the block facing for the bottom tier, and geogrid is needed at vertical spacings equivalent to two block heights. The analysis results are included in the Appendix.

The configurations analyzed consisted of the following (see Figure 2 for approximate cross-section locations):

- Two tiers of 7½-foot high Redi-Rock walls, with a 2H:1V cut slope extending above the wall for a height of about 22 feet.

- Three tiers of 7½-foot high Redi-Rock walls, with a 2H:1V cut slope extending above the wall for a height of about 12 feet.

- Three tiers of 5- to 9-foot high Lock+Load walls retaining the roadway embankment fill (above Hog Hollow Road), with a 250 psf surcharge (to account for traffic loads) on a relatively level backfill and geogrid extending at least 16½ feet behind the wall.

- Five tiers of 9-foot high Lock+Load walls retaining the roadway embankment fill (near east end of Lakeview Drive), with a 250 psf surcharge (to account for traffic loads) on a relatively level backfill and geogrid extending at least 24 feet behind the wall.

In accordance with the FHWA guidelines for MSE walls, the required global minimum factors of safety (FS) are 1.5 for static conditions and 1.1 for seismic (pseudostatic) conditions. The results

[4]USGS, 2005, Earthquake Hazards Program, http://eqhazmaps.usgs.gov/

of our analyses indicate the configurations analyzed will meet both these requirements, provided the geogrid extends 45 feet behind the wall face of the bottom tier where the wall/fill will be placed on relatively steep slopes, and extends 35 feet behind the wall face of the bottom tier where the wall/fill will be placed on structural fill. The slope stability data are attached as Figures 3 through 10.

Conclusions and Recommendations

Based on the results of our analyses, we recommend the following:

- To retain cut slopes, we recommend the wall be constructed using 40-inch deep Redi-Rock blocks, with maximum tier heights of 7½ feet and the bottom blocks in each row embedded a minimum 12 inches. The blocks should be placed on a minimum 12-inch thick pad of structural fill, as shown on the attached Figure 11.

- To retain fill slopes, we recommend that the wall be constructed using standard Lock+Load blocks, with maximum tier heights of 9⅓ feet and the bottom blocks in each row embedded a minimum 12 inches. The blocks should be placed on a minimum 12 inches of structural fill as outlined below (see Figure 11, attached). The blocks should be placed on a minimum 12 inches of structural fill as outlined below (also see Figure 12, attached).

- For the Lock+Load walls, geogrid is not needed for walls up to 4 feet high. For higher walls, we recommend that geogrid be placed between every other row of blocks within the upper two tiers, and between every row of blocks for the lower tiers.

- For walls/fill placed on ground sloping steeper than 5H:1V, the geogrid should extend 45 feet behind the wall face for the bottom tier, 36 feet for the next tier, etc., and should consist of Tensar UX1500MSE or an engineer approved equivalent (different geogrids have properties that could affect the performance of the wall).

- For the 5-tier wall to be constructed as part of the fill toward the east end of Lakeview Drive, the geogrid should extend 35 feet behind the wall face for the bottom tier, 26 feet for the next tier, 20 feet for the third tier, 16½ feet for the fourth tier, and 13 feet for the fifth tier. For the bottom two tiers, the top and bottom layers of geogrid for each tier should consist of Tensar UX1600MSE or an engineer approved equivalent. All other layers of geogrid should consist of Tensar UX1500MSE or an engineer approved equivalent.

- For other walls/fill placed on ground sloping at 5H:1V or flatter, the geogrid should extend the same length as described above for the 5-tier wall, with the top tier the same as the fifth tier (13 feet long), the next tier down the same as the fourth tier (16½ feet long), etc. The geogrid should consist of Tensar UX1500MSE or an engineer approved equivalent.

- The geogrid should be rolled out from the face of the wall (machine direction) and pulled taut to remove slack prior to placing fill on the grid. Equipment wheels (if equipment on

geogrid is necessary) should not be turned while driving over the geogrid. Overlapping of the geogrid is not required.

Our analyses were performed assuming that no hydrostatic (water) pressures occur directly behind the wall. We thus recommend that a minimum 12-inch zone of free-draining granular material be placed behind the block walls to intercept any possible water. In addition, a minimum 6-inch diameter perforated ADS drain pipe or equivalent should be wrapped in a filter fabric, placed at the bottom of the 12-inch zone at a minimum grade of 2%, and discharged beyond the wall to an appropriate drainage device. The free draining granular material should consist of 3/4-inch to 2-inch size gravel with less than 5% passing the No. 200 sieve (see Figure 7).

The fill pad beneath and the backfill behind the walls should consist of angular on-site gravel soils having less than 20% fines (percent passing the No. 200 sieve), or angular imported fill material meeting the following recommendations:

Maximum particle size:	3 inches
Percent retained on the 3/4 inch sieve (coarse gravel):	30 maximum
Percent passing the No. 4 sieve (total sand):	40 maximum
Percent passing the No. 200 sieve (fines):	10 maximum
Plasticity Index of fines:	non-plastic

Backfill soils should be placed in loose lifts not exceeding a thickness of 12 inches, moisture conditioned to within 2% of optimum, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D698 (Standard Proctor).

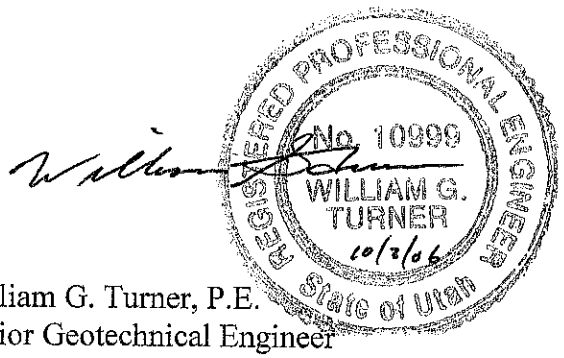
Surface drainage should be provided that directs surface water away from the walls. A drainage ditch should be constructed at the top of the cut slopes above the walls so that water does not flow over the slope face. If water is observed seeping from cut slopes, a blanket drain will be needed to appropriately convey water away from the wall. Should this situation occur, Earthtec should be consulted.

Finally, we recommend that a representative of Earthtec visit the site during construction to observe implementation of these recommendations. Note that Redi-Rock blocks and Lock+Load blocks should be installed in accordance with the guidelines of each respective manufacturer.

Closure

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations presented therein. We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.



William G. Turner, P.E.
Senior Geotechnical Engineer

Steven L. Smith, P.E.
Principal Geotechnical Engineer

Attachments: Figure 1, Redi-Rock Wall Stability Evaluation
Figure 2, Approximate Exploration and Cross-Section Locations
Figures 3-10, Stability Results
Figure 11, Redi-Rock Wall Design Without Geogrid
Figure 12, Lock+Load Wall Design With Geogrid
Appendix: MSEW Output Data (8 sheets)

REDI-ROCK WALL STABILITY EVALUATION

Project: **Lakeview Drive (Vista Meadows)** Date: **10/3/2006**
Location: **Alpine, Utah** By: **WGT**

Backfill slope angle, β:	**26** degrees	Foundation soil γ_t:	**135** pcf
Batter angle (from vertical):	**5.55** degrees	Foundation soil ϕ:	**40** degrees
Soil/wall interface friction:	**16** degrees	Found. soil cohesion:	**0** psf
Surcharge pressure:	**0** psf	Retained soil γ:	**130** pcf
Rows of planter blocks:	**0** rows	Retained soil ϕ:	**32** degrees
Embedment depth:	**1** feet	FS against sliding:	**1.5**
Total K_a =	**0.379**	FS against overturning:	**1.5**
Horizontal K_{ah} =	**0.373**	FS for bearing:	**3.0**
Horizontal K_{ph} =	**2.682**	Foundation soil δ:	**26.67** degrees

Block depth: 30 **inches** Average block wall γ: **145** pcf

Wall Ht (ft)	**1.5**	**3.0**	**4.5**	**6.0**	**7.5**	**9.0**	**10.5**	**12.0**
P_{ah} (lbs/ft)	55	218	491	873	1363	1963	2672	3490
Wall Wt (lbs)	544	1088	1631	2175	2719	3263	3806	4350
Wall $x_{centroid}$	1.25	1.40	1.47	1.54	1.61	1.69	1.76	1.83
$P_{sliding}$	55	218	491	873	1363	1963	2672	3490
$P_{resisting}$	559	868	1195	1544	1914	2306	2720	3155
$FS_{sliding}$	**10.3**	**4.0**	**2.4**	**1.8**	**1.4**	**1.2**	**1.0**	**0.9**
$M_{overturn}$	27	218	736	1745	3408	5890	9353	13961
$M_{resisting}$	1003	1841	2719	3676	4713	5828	7023	8297
$FS_{overturn}$	**36.8**	**8.4**	**3.7**	**2.1**	**1.4**	**1.0**	**0.8**	**0.6**
Vertical Load	218	390	555	705	842	967	1081	1187
Soil Capacity	11853	11853	11853	11853	11853	11853	11853	11853
$FS_{bearing}$	**54.5**	**30.4**	**21.3**	**16.8**	**14.1**	**12.3**	**11.0**	**10.0**

Max. Recommended Wall Height: 6 feet for 30-inch blocks and no planter blocks

Block depth: 40 **inches** Average block wall γ: **145** pcf

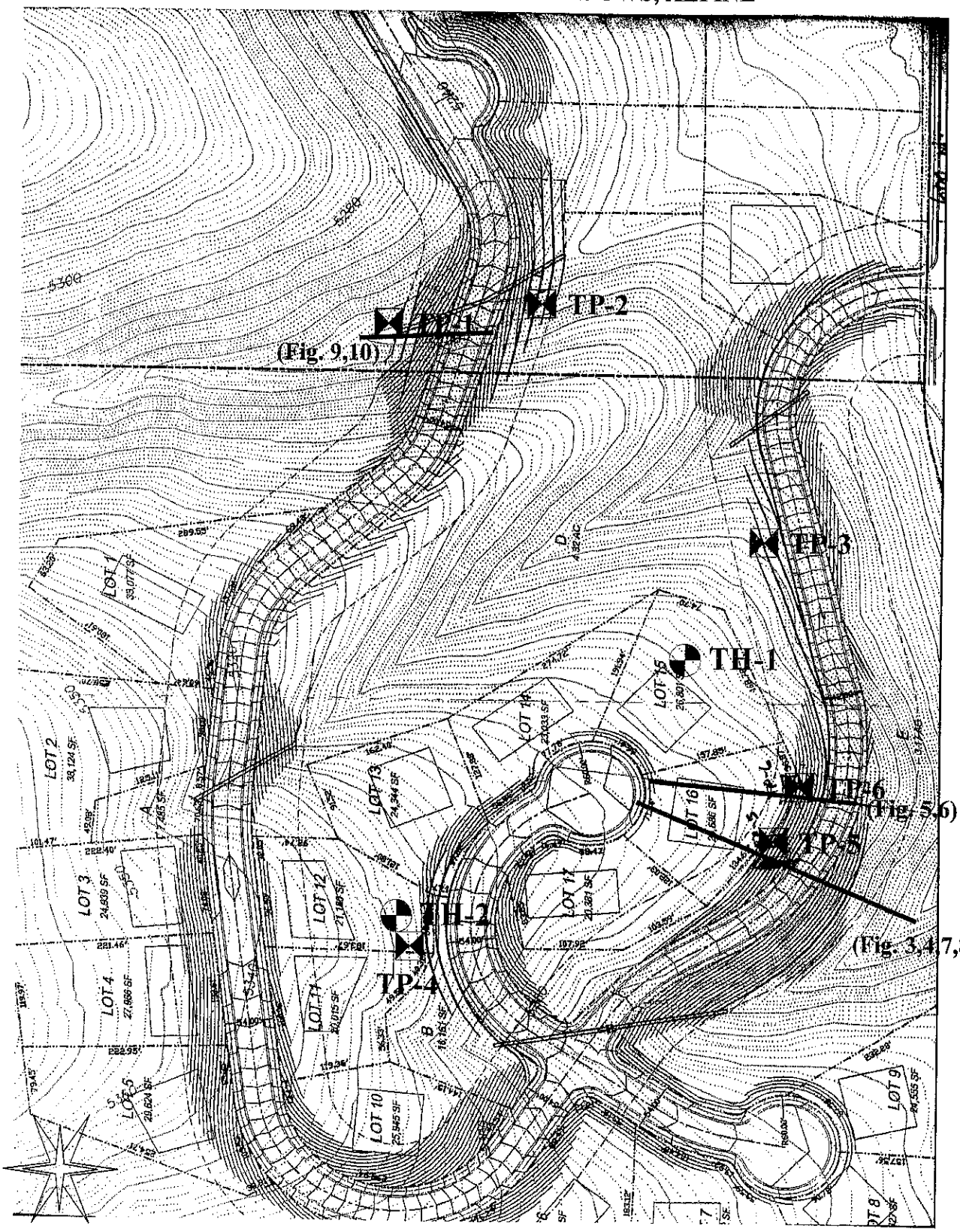
Wall Ht (ft)	**1.5**	**3.0**	**4.5**	**6.0**	**7.5**	**9.0**	**10.5**	**12.0**
P_{ah} (lbs/ft)	55	218	491	873	1363	1963	2672	3490
Wall Wt (lbs)	725	1450	2175	2900	3625	4350	5075	5800
Wall $x_{centroid}$	1.67	1.81	1.89	1.96	2.03	2.10	2.18	2.25
$P_{sliding}$	55	218	491	873	1363	1963	2672	3490
$P_{resisting}$	650	1050	1468	1908	2369	2852	3357	3884
$FS_{sliding}$	**11.9**	**4.8**	**3.0**	**2.2**	**1.7**	**1.5**	**1.3**	**1.1**
$M_{overturn}$	27	218	736	1745	3408	5890	9353	13961
$M_{resisting}$	1532	2951	4424	6002	7686	9475	11371	13372
$FS_{overturn}$	**56.2**	**13.5**	**6.0**	**3.4**	**2.3**	**1.6**	**1.2**	**1.0**
Vertical Load	218	400	577	740	892	1034	1166	1289
Soil Capacity	11853	11853	11853	11853	11853	11853	11853	11853
$FS_{bearing}$	**54.5**	**29.6**	**20.5**	**16.0**	**13.3**	**11.5**	**10.2**	**9.2**

Max. Recommended Wall Height: 9 feet for 40-inch blocks and no planter blocks

PROJECT NO.: 051709 | Earthtec Testing and Engineering, P.C. | FIGURE NO.: 1

LOCATION OF EXPLORATIONS & CROSS-SECTIONS

LAKEVIEW DRIVE/VISTA MEADOWS, ALPINE



Not to Scale

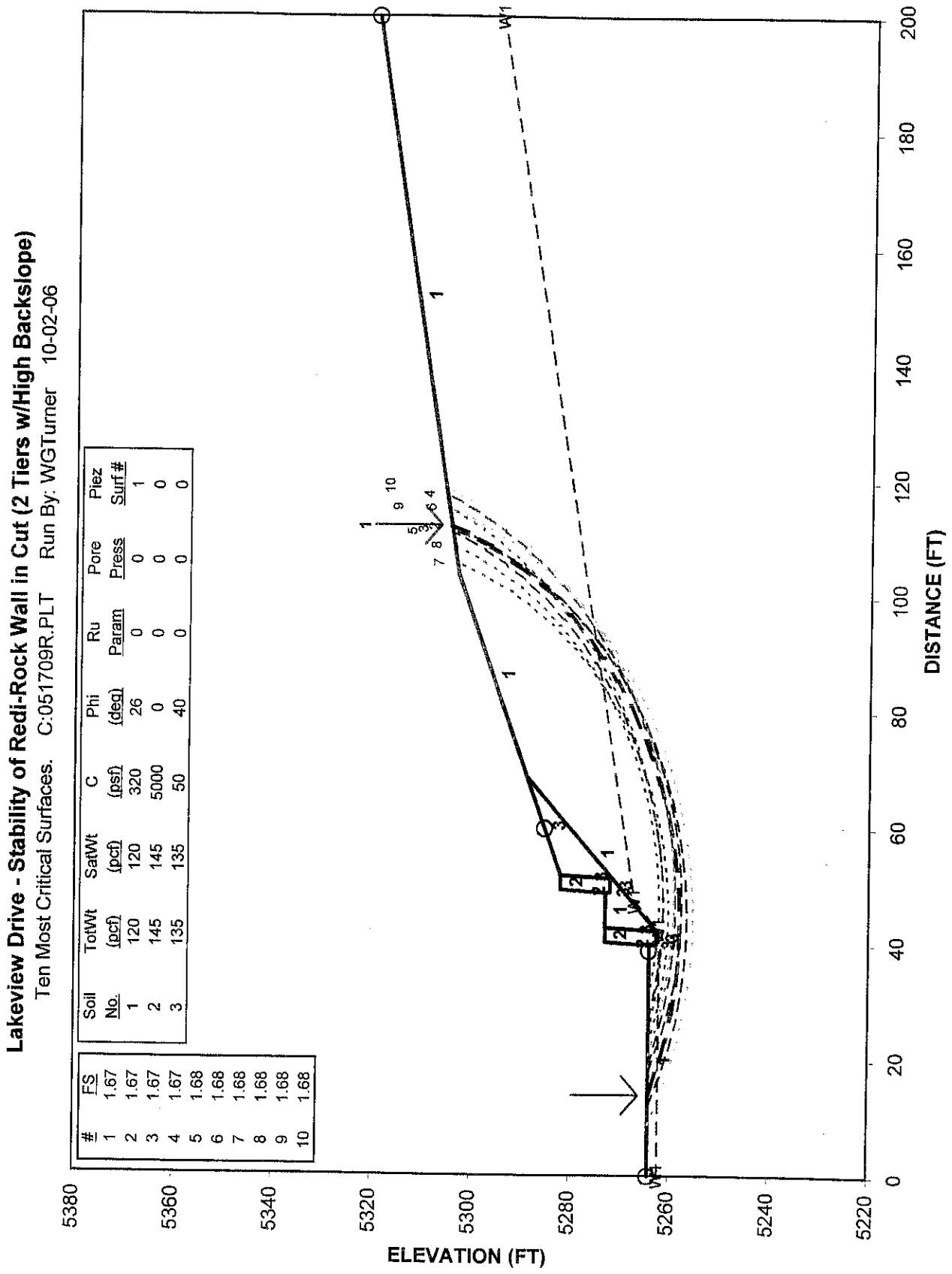
Approximate Cross-Section Location

Approximate Test Pit Location

Approximate Test Hole Location

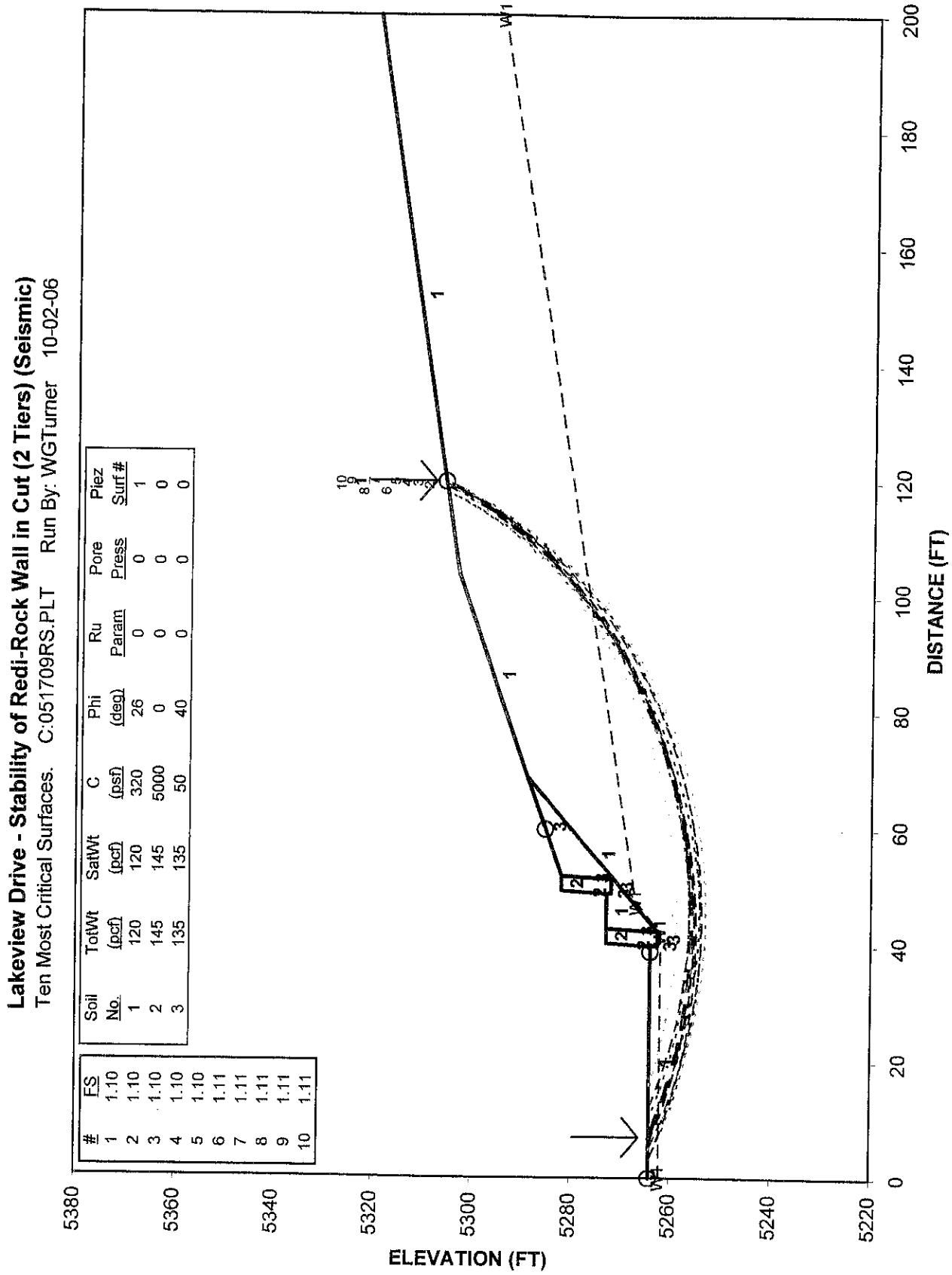
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 2

STABILITY RESULTS



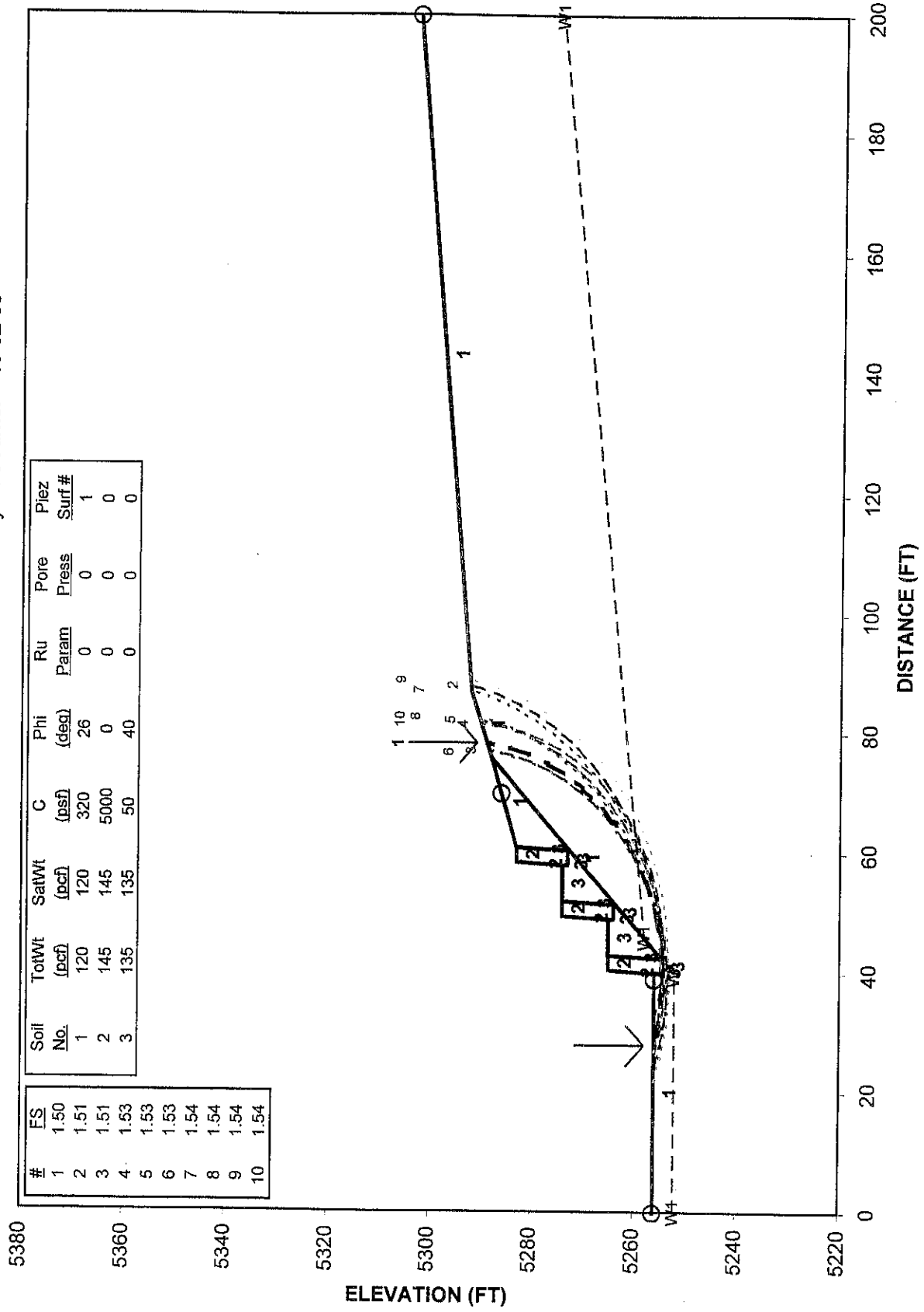
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 3

STABILITY RESULTS



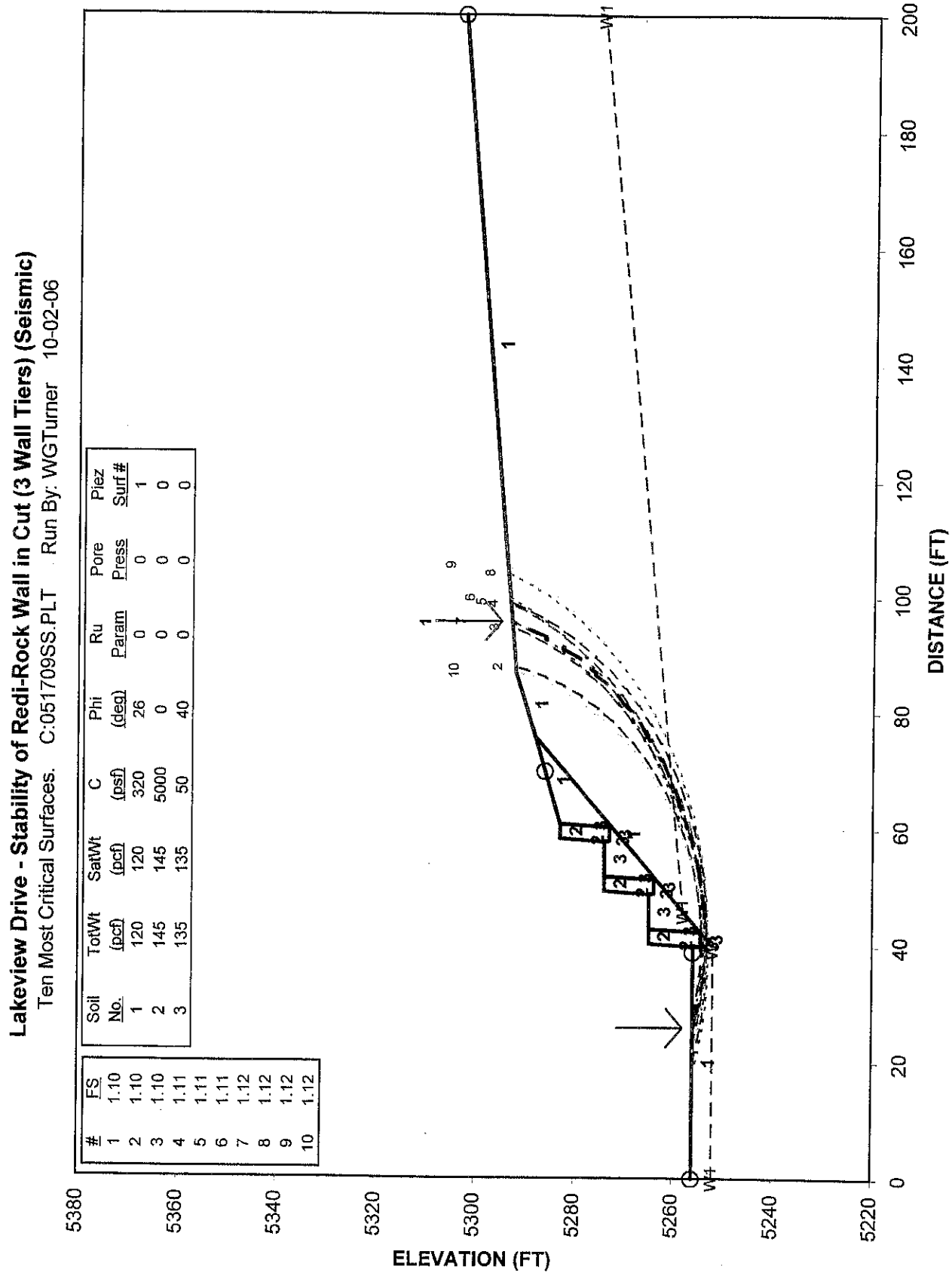
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 4

STABILITY RESULTS



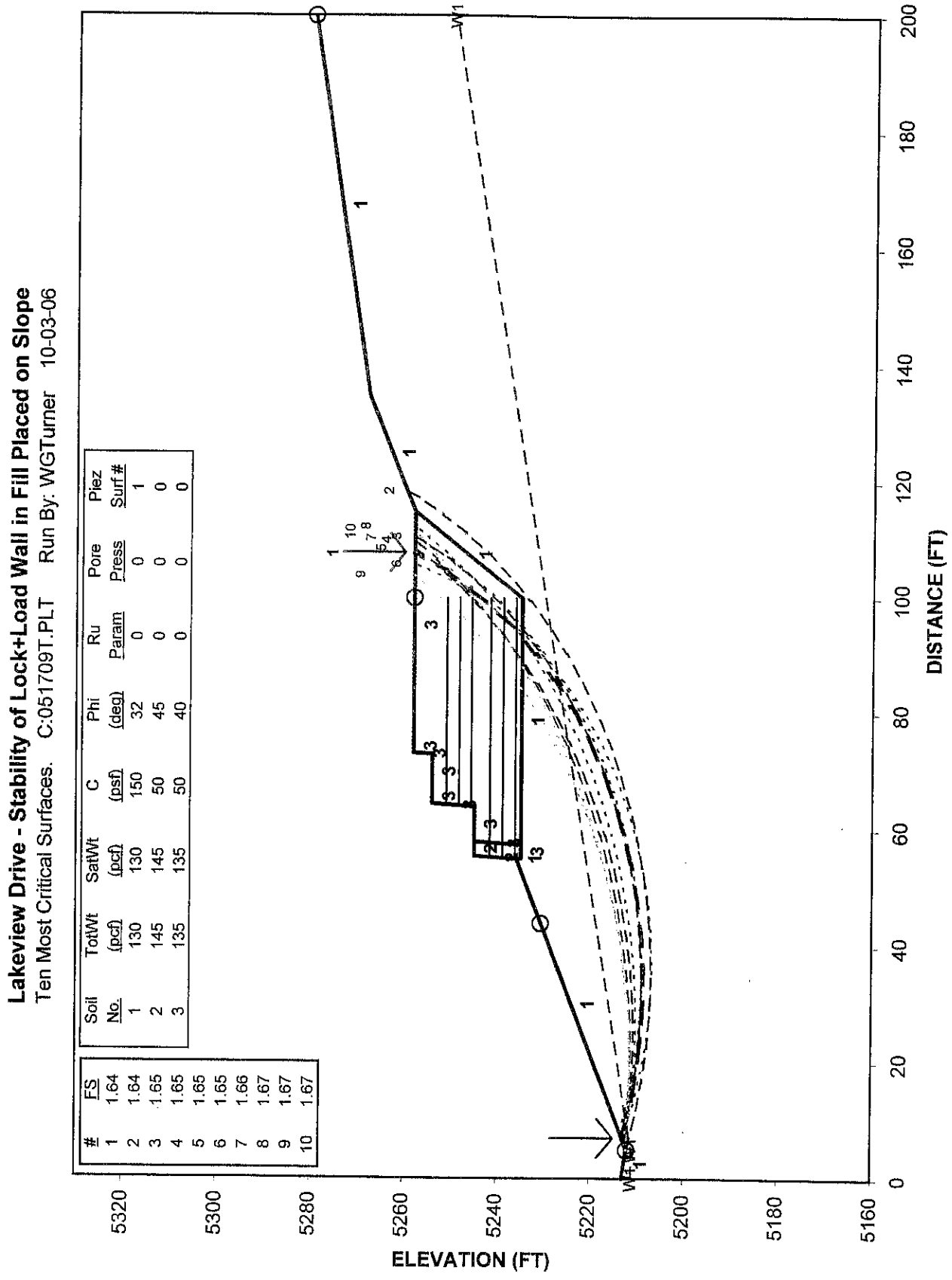
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 5

STABILITY RESULTS



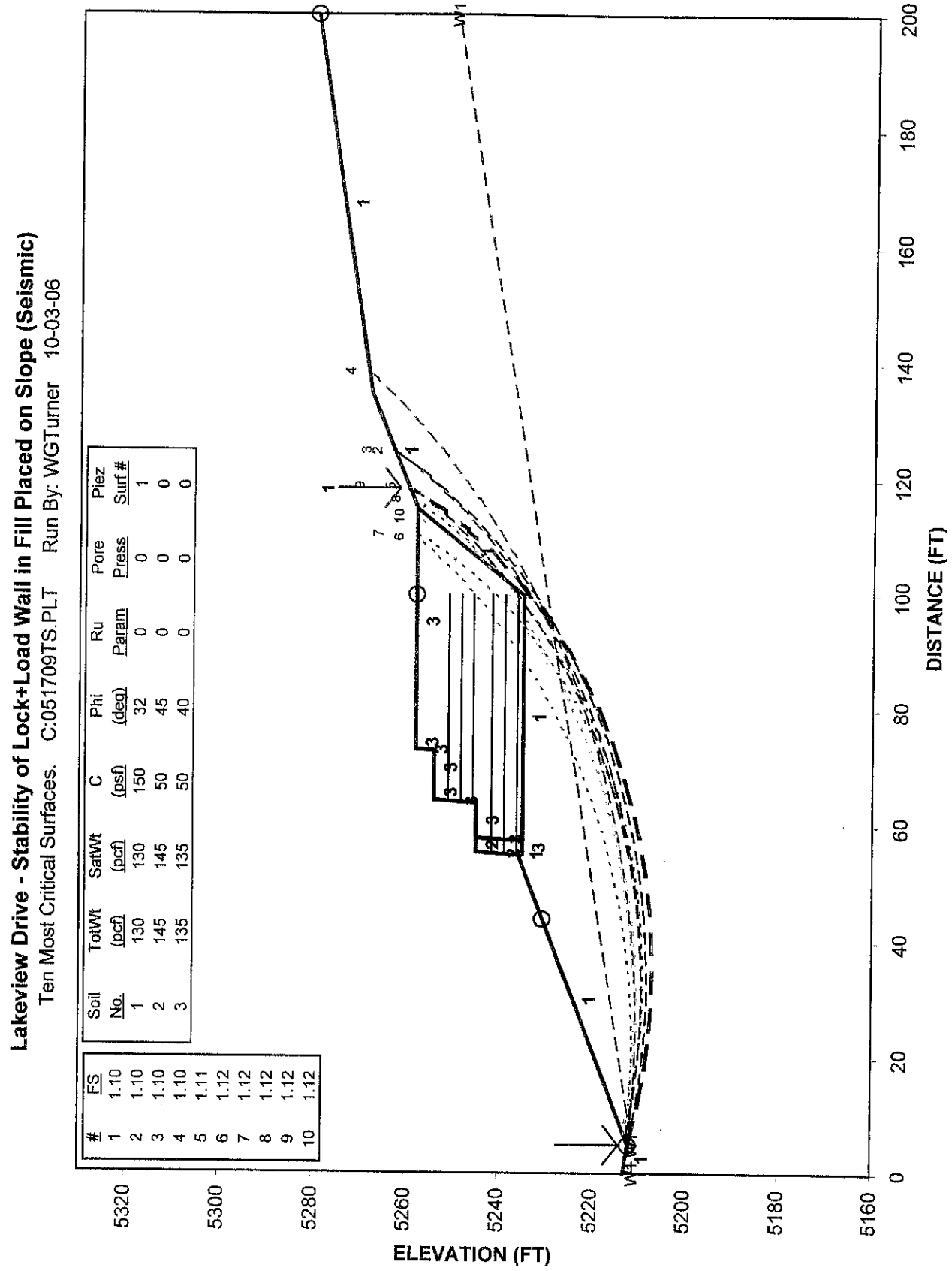
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 6

STABILITY RESULTS



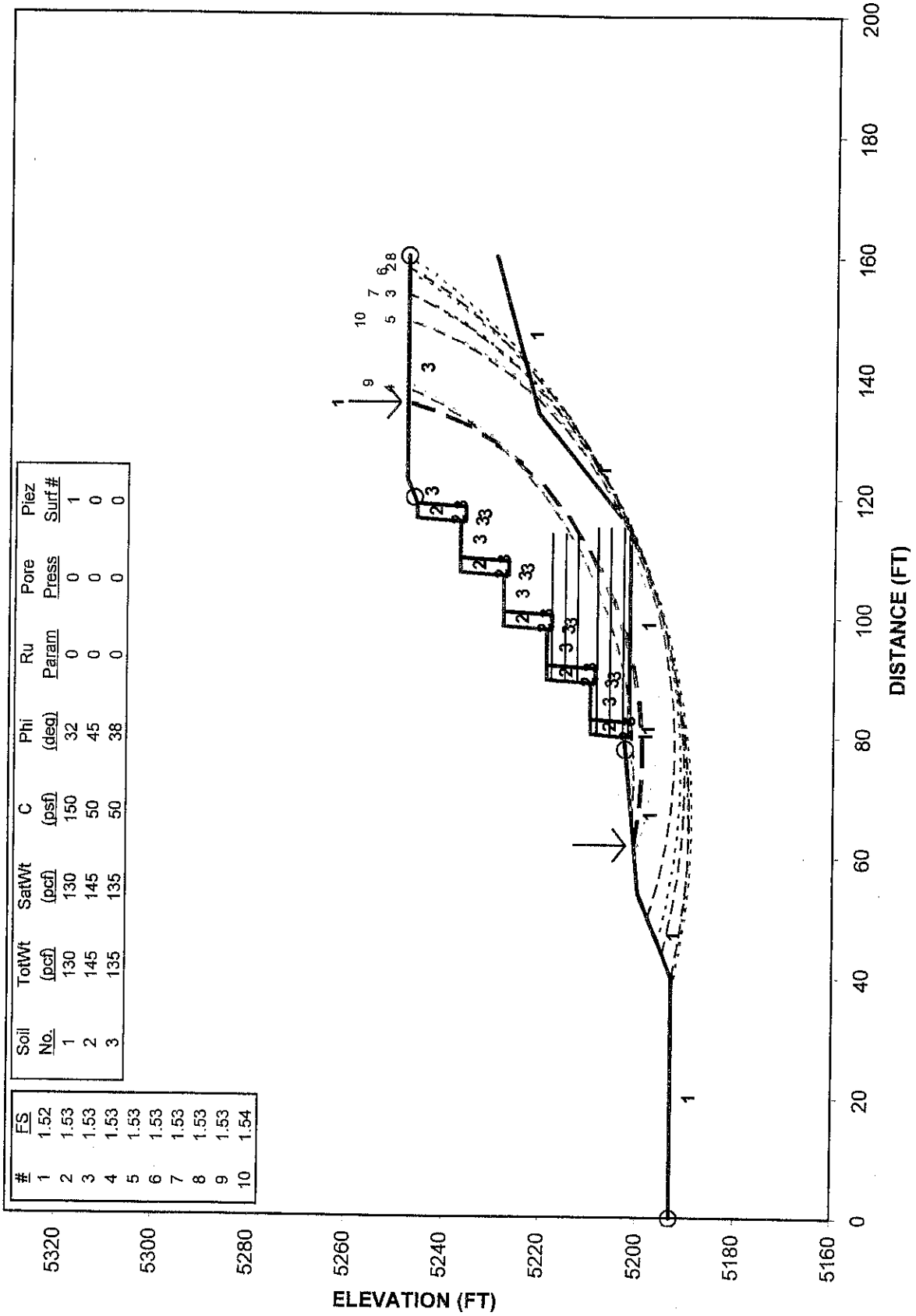
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 7

STABILITY RESULTS



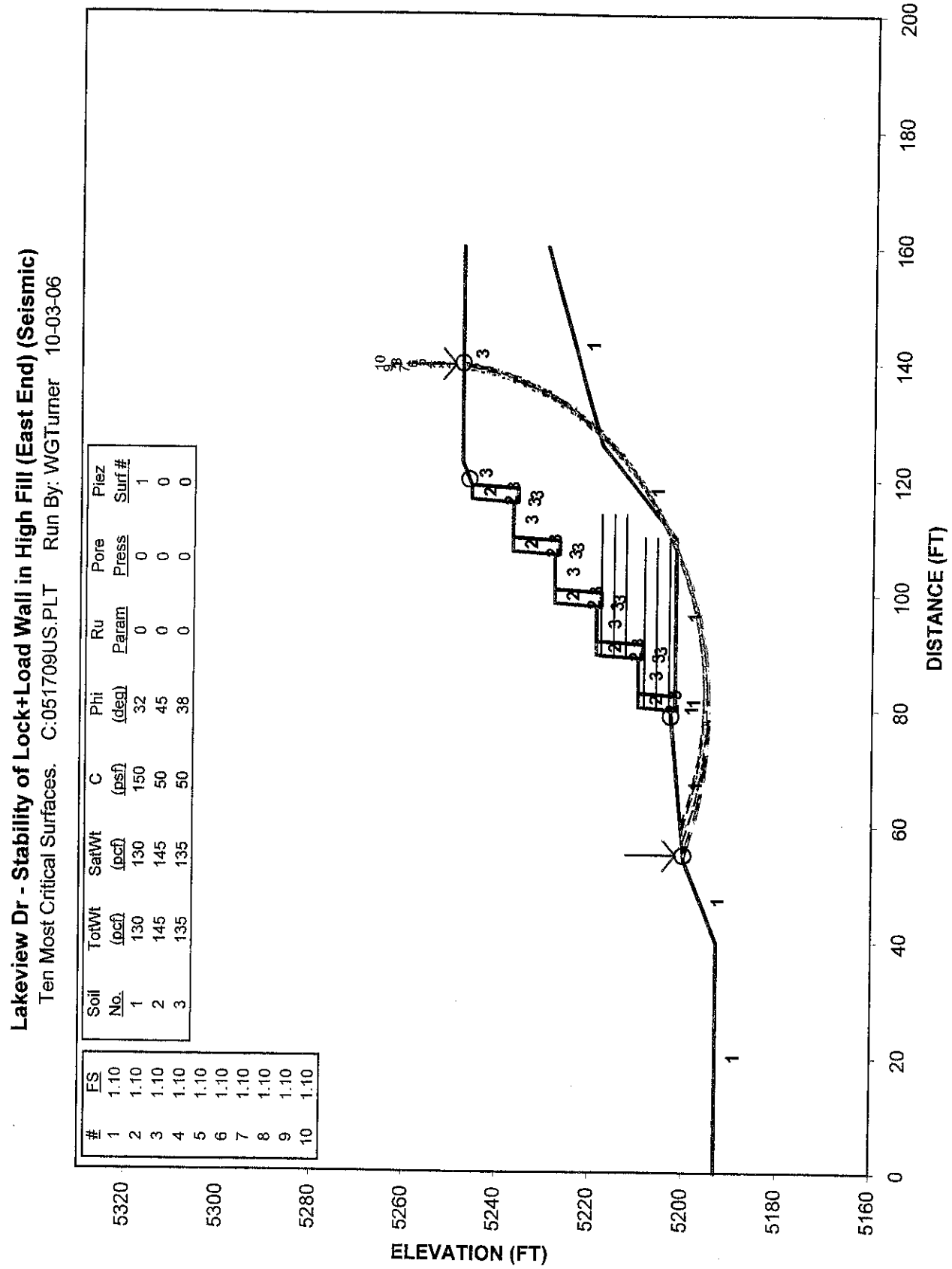
PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 8

STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 9

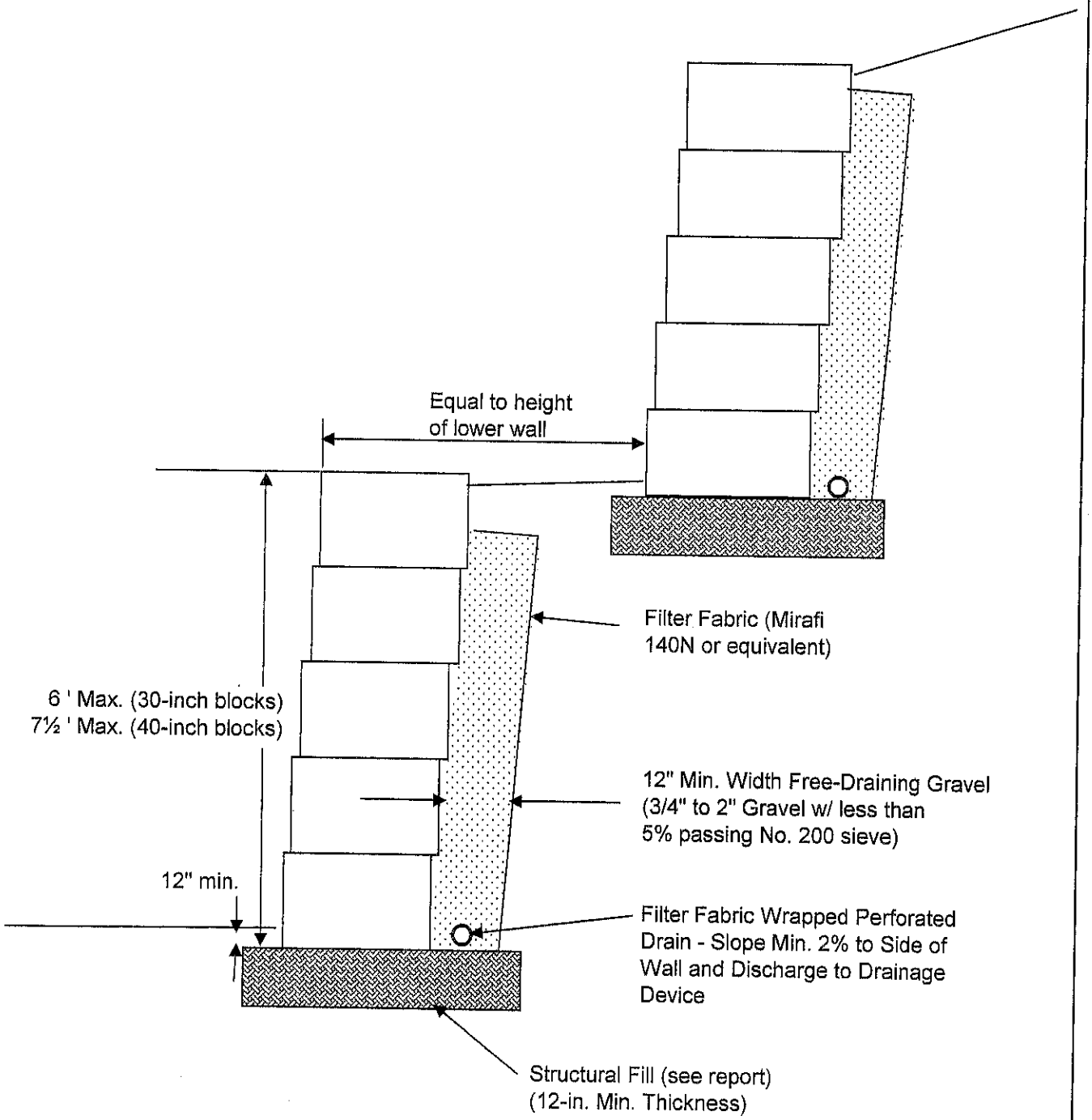
STABILITY RESULTS



PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 10

REDI-ROCK WALL DESIGN WITHOUT GEOGRID

LAKEVIEW DRIVE (VISTA MEADOWS), ALPINE

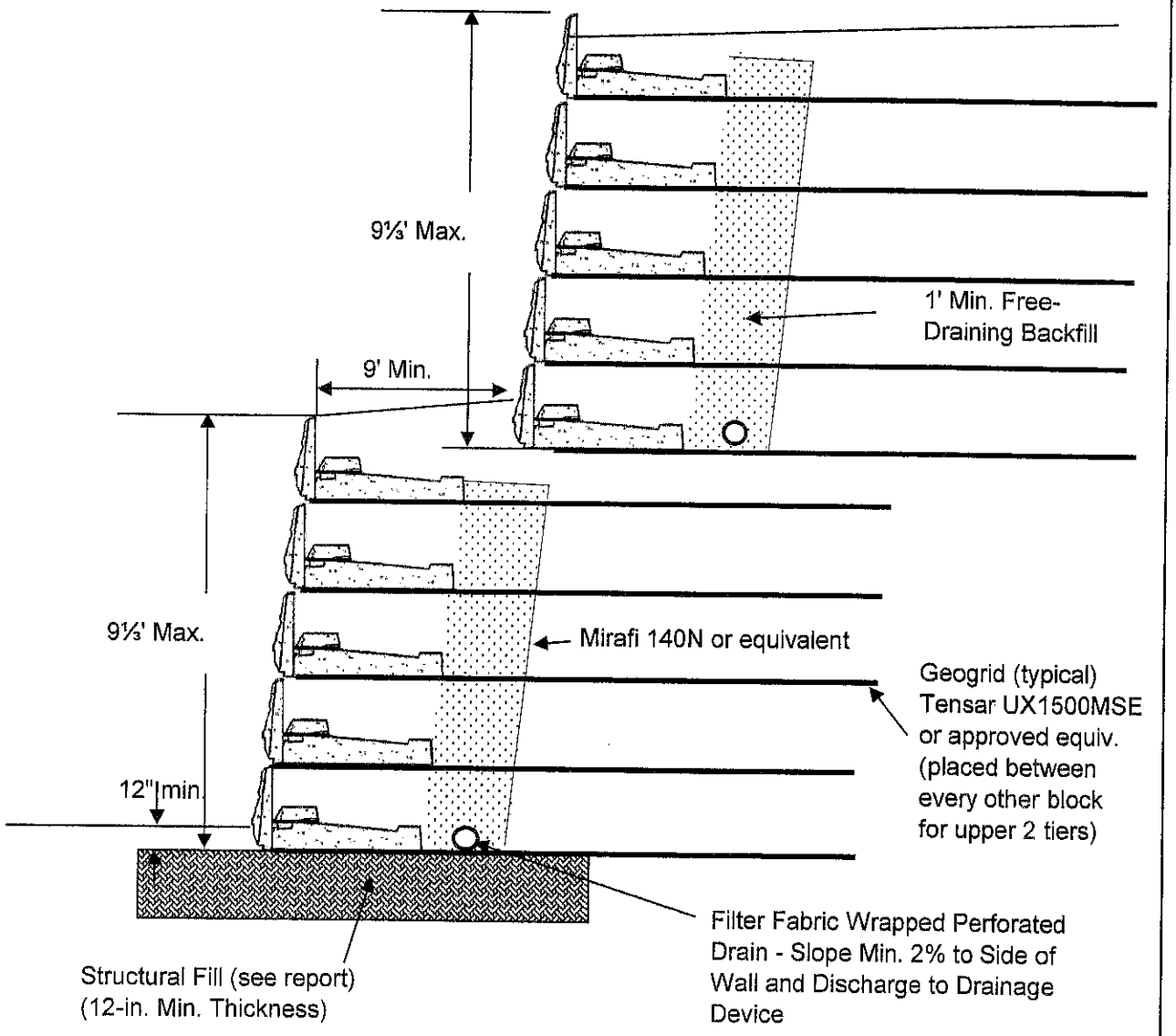


NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 11

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE



NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 12

APPENDIX

MSEW OUTPUT DATA

AASHTO DESIGN METHOD
Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title:	Lakeview Drive Vista Meadows Subdivision
Project Number:	051709
Client:	Taylor Smith
Designer:	WGTurner
Station Number:	

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

Copyright © 1998-2004 ADAMA Engineering, Inc.

License number M-LNL-0598

DESIGN DATA

DESIGN OBJECTIVES

Minimum factor of safety against pullout, Fs-po	1.50
Minimum factor of safety against direct sliding, Fs-sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, Fs-comp-static	1.30
Minimum factor of safety against compound and overall failure, Fs-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 3.28 ft.
Prescribed minimum normalized length of each layer is: L/Hd = 0.70 --> L = 13.07 ft.
Prescribed minimum absolute total length of each layer is: L = 8.20 ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.	
Maximum permissible eccentricity ratio (soil), e/L	0.1667
Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach)	2.50

Bearing capacity coefficients: Nc = 0.00 N_γ = 14.99

SOIL DATA

REINFORCED SOIL

Unit weight, γ	135.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	150.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2174 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 65.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.420
Kae ($\alpha_o > 0$) = 0.6932 Kae ($\alpha_o = 0$) = 0.3073 Δ Kae = 0.3859 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY
Seismic safety factor is 75.0% of specified static FS for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

BEARING CAPACITY
Seismic safety factor is 75.0% of specified static FS for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

INTERNAL STABILITY
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic factor of safety against pullout, Fs-po, is 75.0% of its specified static value.
Seismic overall factor of safety, Fs-overall, is 75.0% of its specified static value.
The reduction of Fs-overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

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INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

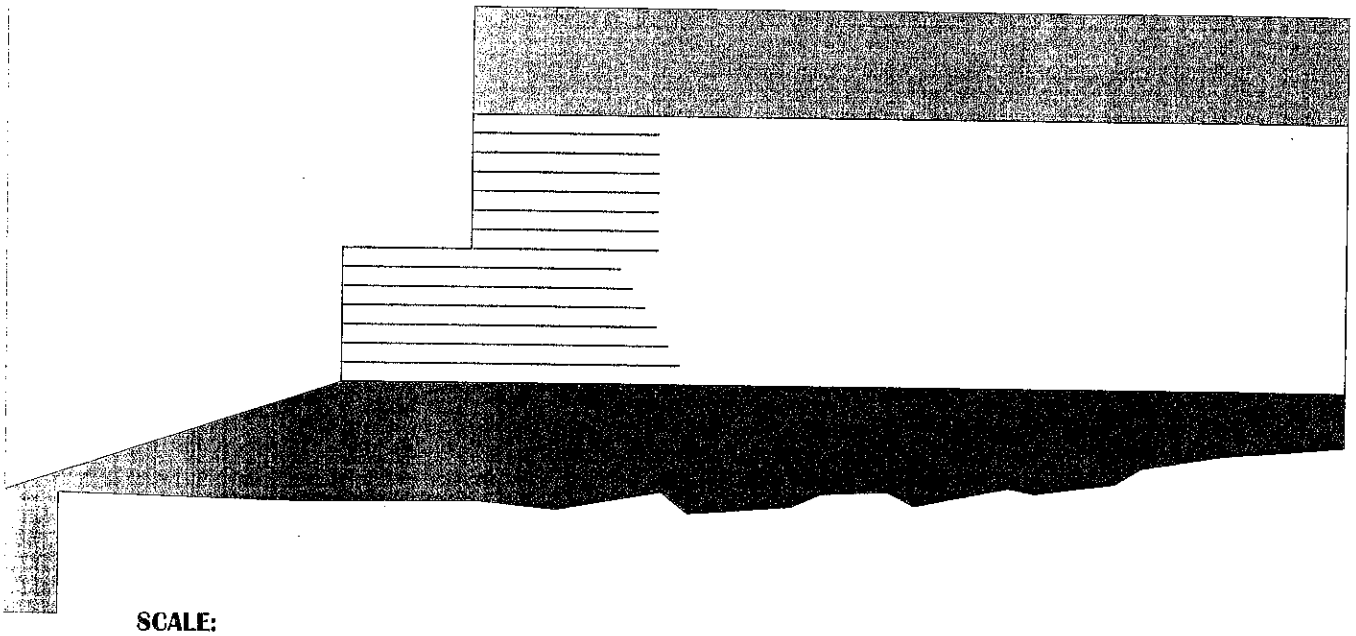
Design height, Hd	18.67	[ft]	{ Embedded depth is E = 0.00 ft, and height above top of finished bottom grade is H = 18.67 ft, where H1 = 9.33 and H2 = 9.33 }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 9.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE

Uniformly distributed dead load is 3600.0 [lb/ft ²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10 [ft]

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DESIGN: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 4.66, Meyerhof stress = 4597 lb/ft².
Foundation Interface: Direct sliding, Fs = 2.417, Eccentricity, e/L = -0.0354, Fs-overturning = 6.43

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	1.33	23.66	2	4.62	4.62	1.89	1.894	53.567	1.502	-0.0523	UX1600MSE
2	2.67	22.82	1	5.85	5.85	2.33	2.327	77.437	1.502	-0.0667	UX1500MSE
3	4.00	21.98	1	5.81	6.23	2.48	2.475	74.347	1.502	-0.0830	UX1500MSE
4	5.33	21.13	1	4.55	6.50	2.58	2.583	69.038	1.502	-0.1017	UX1500MSE
5	6.67	20.28	1	3.17	6.79	2.70	2.700	63.716	1.502	-0.1235	UX1500MSE
6	8.00	19.42	2	1.62	5.20	2.13	2.134	34.085	1.503	-0.1492	UX1600MSE
7	9.33	13.07	2	14.14	14.14	5.80	5.802	48.035	2.056	0.0646	UX1600MSE
8	10.67	13.07	1	5.75	5.75	2.28	2.285	22.157	2.358	0.0486	UX1500MSE
9	12.00	13.07	1	5.98	5.98	2.38	2.376	20.547	2.779	0.0346	UX1500MSE
10	13.33	13.07	1	5.81	6.23	2.48	2.475	19.593	3.408	0.0227	UX1500MSE
11	14.67	13.07	1	4.55	6.50	2.58	2.583	18.132	4.453	0.0131	UX1500MSE
12	16.00	13.07	1	3.17	6.79	2.70	2.700	16.772	6.535	0.0060	UX1500MSE
13	17.33	13.07	2	1.89	6.08	2.49	2.493	10.887	12.770	0.0015	UX1600MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 5.31, Meyerhof stress = 4306 lb/ft².
Foundation Interface: Direct sliding, Fs = 1.791, Eccentricity, e/L = -0.0040, Fs-overturning = 4.87

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	1.33	23.66	2	3.26	4.08	1.67	1.674	37.879	1.358	-0.0474	UX1600MSE
2	2.67	22.82	1	3.91	4.89	1.94	1.943	51.737	1.389	-0.0634	UX1500MSE
3	4.00	21.98	1	3.89	5.21	2.07	2.070	49.742	1.419	-0.0810	UX1500MSE
4	5.33	21.13	1	3.06	5.46	2.17	2.172	46.439	1.449	-0.1007	UX1500MSE
5	6.67	20.28	1	2.15	5.75	2.28	2.284	43.115	1.475	-0.1231	UX1500MSE
6	8.00	19.42	2	1.18	4.72	1.94	1.938	24.773	1.495	-0.1492	UX1600MSE
7	9.33	13.07	2	9.21	11.51	4.72	4.724	31.290	1.579	0.0863	UX1600MSE
8	10.67	13.07	1	4.14	5.17	2.05	2.055	15.943	1.866	0.0627	UX1500MSE
9	12.00	13.07	1	4.31	5.38	2.14	2.140	14.803	2.270	0.0431	UX1500MSE
10	13.33	13.07	1	4.19	5.62	2.23	2.232	14.134	2.880	0.0272	UX1500MSE
11	14.67	13.07	1	3.29	5.87	2.33	2.332	13.099	3.903	0.0151	UX1500MSE
12	16.00	13.07	1	2.29	6.14	2.44	2.442	12.135	5.963	0.0066	UX1500MSE
13	17.33	13.07	2	1.41	5.68	2.33	2.330	8.139	12.172	0.0016	UX1600MSE

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AASHTO DESIGN METHOD
Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

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DESIGN DATA

DESIGN OBJECTIVES

Minimum factor of safety against pullout, Fs-po	1.50
Minimum factor of safety against direct sliding, Fs-sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, Fs-comp-static	1.30
Minimum factor of safety against compound and overall failure, Fs-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 3.28 ft.
Prescribed minimum normalized length of each layer is: L/Hd = 0.70 --> L = 13.07 ft.
Prescribed minimum absolute total length of each layer is: L = 8.20 ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.	
Maximum permissible eccentricity ratio (soil), e/L	0.1667
Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach)	2.50

Bearing capacity coefficients: Nc = 0.00 $N\gamma$ = 14.99

SOIL DATA

REINFORCED SOIL

Unit weight, γ	135.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	150.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2174 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 65.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.420
Kae ($\alpha_o > 0$) = 0.6932 Kae ($\alpha_o = 0$) = 0.3073 Δ Kae = 0.3859 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY
Seismic safety factor is 75.0% of specified static FS for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

BEARING CAPACITY
Seismic safety factor is 75.0% of specified static FS for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

INTERNAL STABILITY
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic factor of safety against pullout, Fs-po, is 75.0% of its specified static value.
Seismic overall factor of safety, Fs-overall, is 75.0% of its specified static value.
The reduction of Fs-overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

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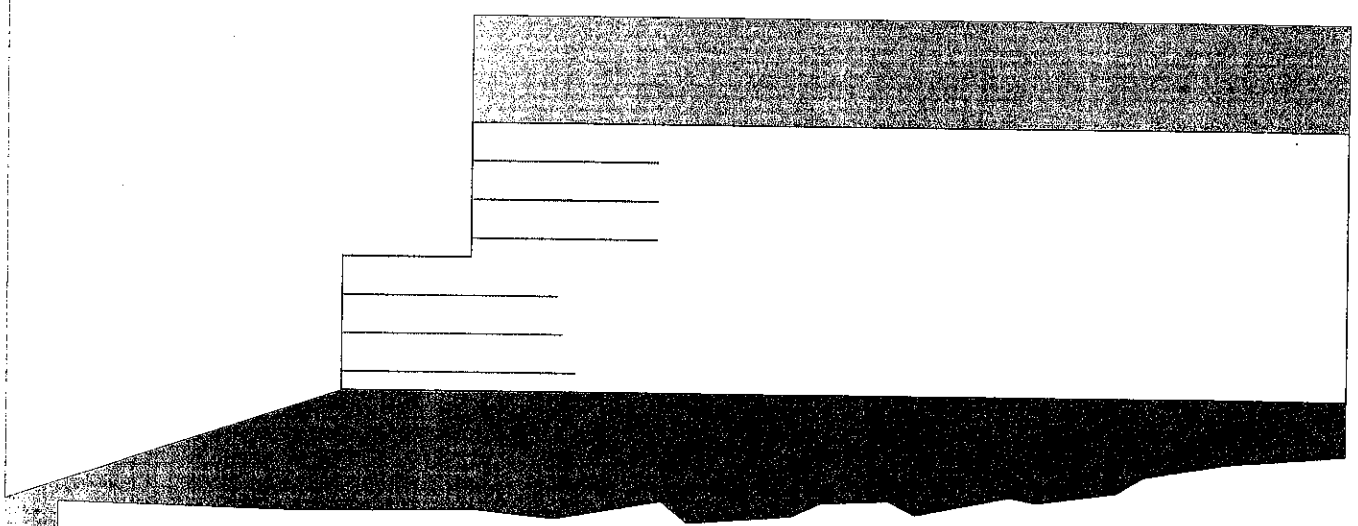
INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

Design height, Hd	18.67	[ft]	{ Embedded depth is E = 0.00 ft, and height above top of finished bottom grade is H = 18.67 ft, where H1 = 9.33 and H2 = 9.33 }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 9.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 250.0 [lb/ft ²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10 [ft]

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DESIGN: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 7.83, Meyerhof stress = 1990 lb/ft².
Foundation Interface: Direct sliding, Fs = 2.664, Eccentricity, e/L = 0.0122, Fs-overturning = 5.49

	GEOGRID			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	1.33	16.40	N/A	8.84	8.84	3.51	3.515	47.211	1.539	-0.0086	UX1500MSE
2	4.00	15.45	N/A	11.78	12.62	5.02	5.018	49.584	1.503	-0.0452	UX1500MSE
3	6.67	15.08	N/A	3.64	7.80	3.10	3.099	22.432	1.503	-0.1102	UX1500MSE
4	10.67	13.07	N/A	10.11	10.11	4.02	4.020	20.122	3.585	0.0258	UX1500MSE
5	13.33	13.07	N/A	12.94	13.87	5.51	5.512	17.359	5.062	0.0127	UX1500MSE
6	16.00	13.07	N/A	8.05	17.25	6.85	6.854	10.878	8.973	0.0038	UX1500MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 3.89, Meyerhof stress = 2824 lb/ft².
Foundation Interface: Direct sliding, Fs = 1.240, Eccentricity, e/L = 0.1563, Fs-overturning = 2.36

	GEOGRID			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	1.33	16.40	N/A	4.52	5.65	2.24	2.244	24.113	1.128	0.0153	UX1500MSE
2	4.00	15.45	N/A	5.56	7.44	2.96	2.958	23.387	1.233	-0.0348	UX1500MSE
3	6.67	15.08	N/A	2.11	5.66	2.25	2.248	13.014	1.394	-0.1083	UX1500MSE
4	10.67	13.07	N/A	5.36	6.69	2.66	2.661	10.655	1.487	0.0757	UX1500MSE
5	13.33	13.07	N/A	6.35	8.51	3.38	3.381	8.518	2.286	0.0330	UX1500MSE
6	16.00	13.07	N/A	3.79	10.16	4.04	4.039	5.128	4.835	0.0079	UX1500MSE

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Phone (801) 399-9516
Fax (801) 399-9842

November 3, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

Subject: **Response to 2nd TGE Review**
Proposed Lakeview Drive
Vista Meadows (was Summit Hills)
Alpine, Utah
Job No. 051709

Dear Mr. Smith:

As you requested, this letter presents our response to a review prepared by Taylor Geo-Engineering (on behalf of Alpine City) of our most recent retaining wall recommendations[1] for the proposed Lakeview Drive at the subject site. Following are the TGE review comments (in italics) and our responses:

1. *The soil parameters used for the Redi-Rock stability evaluation and the Lock+Load evaluation varied from that used for the global stability analysis and varied from the previous submitted reports. Earthtec needs to substantiate the reasoning for the soil parameter changes from the April 19, 2006 and October 3, 2006 and October 18, 2006 Earthtec documents. Earthtec references a January 26, 2006 report for the soil parameters used in the October 3, 2006 report but does not provide a reason why they were not used in the April 19, 2006 report.*

   The January 26, 2006 report presented a range of possible parameters for the on-site lean clay and clayey gravel soils, and we presented our analyses of the slope below Lot 16 using the low, median and high ranges of internal friction angles and cohesion values. The median values for these ranges were used for the stability analyses to model the on-site soils in our April 19, 2006 report. The low internal friction angles and associated cohesion values for both soil types were used for the stability analyses to model the on-site soils in our October 3, 2006 report. In this latter report, the parameters for the lean clay were used in cut situations and the parameters for the clayey gravel were used in fill situations. This was consistent for both our global stability and *MSEW* geogrid analyses (including the October 18, 2006 data), but with Redi-Rock being proposed in cut situations, we inadvertantly

[1]Response to Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Job No. 051709, October 3, 2006.

applied the clayey gravel parameters instead of the lean clay parameters to the Redi-Rock wall evaluation shown in Figure 1 of the reviewed report.

Attached is a revised Figure 1 with the lean clay parameters for retained soils and structural fill (bottom row of blocks should be placed on a 1-foot thick structural fill pad) for the foundation interface. The analysis shown on the revised Figure 1 applies to the top row of Redi-Rock blocks, which would retain an approximate 2H:1V slope, and indicates that both 30-inch and 40-inch deep blocks would be stable up to 3 feet high in such situations. The lower blocks would retain level backfill but would also be subject to the surcharge imposed from the adjacent upper Redi-Rock wall tier. This analysis, shown on the attached Figure 1A, indicates that 30-inch blocks should not be used in these situations but that 40-inch blocks would be stable up to 7½ feet high for each tier, given a surcharge of 943 psf (145 pcf times 6½ feet of wall above the ground surface, which subtracts the 1 foot of embedment). Figure 11 has also been revised to reflect these changes.

2. *On Figure No. 1 of the October 3, 2006 report ETE used a batter angle of 5.55 degrees for the Redi-Rock walls. This is an incorrect value. The batter for Redi-Rock walls is 4 degrees. The soil values used in the Redi-Rock analysis used a phi of 32 degrees, representative of the clayey gravel soils. The locations of the proposed cuts are in the location of TP-3 of the original soils report. As indicated by ETE on page 2, the soils in that area are clay. Although some backfill behind the Redi-Rock blocks may be structural fill or on-site borrow clayey gravel, a majority of the soils will be native clay soils.*

TGE recommends that ETE complete the Redi-Rock stability evaluation using the appropriate soil parameters. Additionally, the Redi-Rock manufacture recommends that NCMA design procedure be used when designing the Redi-Rock retaining walls.

We understand that there has been some confusion about the batter angle for Redi-Rock walls because the manufacturer's standard Redi-Rock block detail indicates the setback for each row of blocks is 1.75 inches, which would be a batter angle of 5.55° (the value we used in our previous calculations). Upon discussion with the Redi-Rock manufacturer, the setback should be 1.25 inches which corresponds with a 4° batter angle. We have revised our analyses accordingly (see Figures 1 and 1A, attached), which also assumes that the majority of the soils to be retained by the Redi-Rock walls will consist of clay.

With respect to the last review comment, our Redi-Rock evaluation is a spreadsheet that is based on the Coulomb method for obtaining lateral pressures behind walls, which is the same method used in the NCMA design procedure. The lateral pressure is applied behind the entire wall height, measured from the top of the leveling pad (bottom of the lowest row of blocks) to the top of the wall (highest row of blocks), in the same manner as the NCMA design procedure.

3. *TGE recommends to Alpine City that Earthtec or the developer provide a cross-section of each of the planned walls to aid Alpine City and the Contractor in the construction and inspection of the walls. This would include a correction to Figure No. 12 of the October 3, 2006 report and the correction of sheet VW10 of the subdivision plan sheets submitted by Sowby and Berg dated August 17, 2006.*

   Figure 12 has been revised to show the geogrid layers at the mid-height of each Lock+Load block where such geogrid is needed. Additional figures (11A, 12A, 12B and 12C) also show cross-sections for each set of wall tiers.

4. *Earthtec indicated on page (4) of the October 3, 2006 report, "For the 5-tier wall to be constructed as part of the fill toward the east end of Lakeview Drive, the geogrid should extend 35 feet behind the wall face for the bottom tier, 26 feet for the next tier, 20 feet for the third tier, 16½ feet for the fourth tier, and 13 feet for the fifth tier. For the bottom two tiers, the top and bottom layers of geogrid for each tier should consist of Tensar UX1600MSE or an engineer approved equivalent. All other layers of geogrid should consist of Tensar UX1500MSE or an engineer approved equivalent." In the analysis of the walls for this portion of the design, Earthtec used a UX1700MSE not a UX1600MSE. TGE request that Earthtec clarify the geogrid to be used for the bottom layers of soil reinforcement.*

   Subsequent to our October 3, 2006 report, we submitted to the reviewer revised *MSEW* results (included in the Appendix, attached) wherein UX1700MSE geogrid was used in the bottom and top layers of soil reinforcement due to placing geogrid at mid-height of the Lock+Load blocks. The geogrid type that should be used for the bottom and top layers of reinforcement for all but the upper wall tier is UX1700MSE. This change is shown on the revised Figure 12 (and 12A, 12B, 12C as well), attached.

5. *TGE recommends to Alpine City to have Earthtec comment on the surficial stability of the 1H:1V cut slopes and fill slopes and provide mitigation recommendations to sloughing. During spring runoff, the upper soil layers of slopes can become saturated and the analysis of the slopes based on shallow saturation should be reviewed for long term solutions during the revegation period. This can be accomplished by completing an infinite slope analyses.*

   Using the same strength parameters as used in our global stability analyses, the results of our infinite slope stability analysis[2] indicate a factor of safety (FS) of at least 3.2 for the native clay soils and a FS of about 1.5 for the native clayey gravel soils (using only the cohesion side of the equation), assuming a saturated depth of 2 feet. Typically, the required minimum FS for surficial stability is 1.5. These calculations are included in the Appendix.

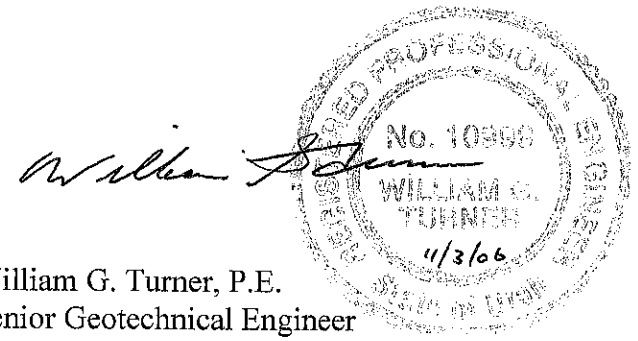
[2] Infinite FS = $(c' / \gamma d) \sec \beta \operatorname{cosec} \beta + (\tan \phi' / \tan \beta)(1 - r_u \sec^2 \beta)$

All other recommendations presented in our October 3, 2006 report, unless specifically superceded herein, remain valid.

Closure

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations presented therein. We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.



William G. Turner, P.E.
Senior Geotechnical Engineer

Attachments: (all are revised from our October 3, 2006 report except as noted)
Figure 1, Redi-Rock Wall Stability Evaluation
Figure 1A, Redi-Rock Wall Stability Evaluation (new)
Figure 11, Redi-Rock Wall Design Without Geogrid
Figure 12, Lock+Load Wall Design With Geogrid (A through C are new)
Appendix: *MSEW* Output Data (8 sheets) & Infinite Slope Analysis (1 sheet)

REDI-ROCK WALL STABILITY EVALUATION

Project: **Lakeview Drive, Vista Meadows**
Location: **Alpine, Utah**

Date: **11/3/2006**
By: **WGT**

Backfill slope angle, β:	**26** degrees	Foundation soil γ_f:	**135** pcf
Batter angle (from vertical):	**4** degrees	Foundation soil ϕ:	**40** degrees
Soil/wall interface friction:	**13** degrees	Found. soil cohesion:	**0** psf
Surcharge pressure:	**0** psf	Retained soil γ:	**120** pcf
Rows of planter blocks:	**0** rows	Retained soil ϕ:	**26** degrees
Embedment depth:	1 feet	FS against sliding:	**1.5**
Total K_a =	**0.763**	FS against overturning:	**2.0**
Horizontal K_{ah} =	**0.754**	FS for bearing:	**3.0**
Horizontal K_{ph} =	**1.327**	Foundation soil δ:	**26.67** degrees

Block depth: 30 **inches** Average block wall γ: 145 pcf

Wall Ht (ft)	**1.5**	**3.0**	**4.5**	**6.0**	**7.5**	**9.0**	**10.5**	**12.0**
P_{ah} (lbs/ft)	102	407	916	1628	2544	3663	4986	6512
Wall Wt (lbs)	544	1088	1631	2175	2719	3263	3806	4350
Wall $x_{centroid}$	1.25	1.35	1.41	1.46	1.51	1.56	1.62	1.67
$P_{sliding}$	102	407	916	1628	2544	3663	4986	6512
$P_{resisting}$	330	654	1005	1387	1801	2246	2722	3229
$FS_{sliding}$	**3.2**	**1.6**	**1.1**	**0.9**	**0.7**	**0.6**	**0.5**	**0.5**
$M_{overturn}$	51	407	1374	3256	6359	10988	17449	26047
$M_{resisting}$	710	1503	2326	3205	4141	5135	6185	7292
$FS_{overturn}$	**13.9**	**3.7**	**1.7**	**1.0**	**0.7**	**0.5**	**0.4**	**0.3**
Vertical Load	218	401	580	745	899	1043	1177	1303
Soil Capacity	10941	10941	10941	10941	10941	10941	10941	10941
$FS_{bearing}$	**50.3**	**27.3**	**18.9**	**14.7**	**12.2**	**10.5**	**9.3**	**8.4**

Max. Recommended Wall Height: 3 feet for 30-inch blocks and no planter blocks

Block depth: 40 **inches** Average block wall γ: 145 pcf

Wall Ht (ft)	**1.5**	**3.0**	**4.5**	**6.0**	**7.5**	**9.0**	**10.5**	**12.0**
P_{ah} (lbs/ft)	102	407	916	1628	2544	3663	4986	6512
Wall Wt (lbs)	725	1450	2175	2900	3625	4350	5075	5800
Wall $x_{centroid}$	1.67	1.77	1.82	1.88	1.93	1.98	2.03	2.09
$P_{sliding}$	102	407	916	1628	2544	3663	4986	6512
$P_{resisting}$	421	836	1278	1751	2256	2792	3359	3958
$FS_{sliding}$	**4.1**	**2.1**	**1.4**	**1.1**	**0.9**	**0.8**	**0.7**	**0.6**
$M_{overturn}$	51	407	1374	3256	6359	10988	17449	26047
$M_{resisting}$	1238	2599	3997	5472	7022	8649	10351	12130
$FS_{overturn}$	**24.3**	**6.4**	**2.9**	**1.7**	**1.1**	**0.8**	**0.6**	**0.5**
Vertical Load	218	409	596	773	940	1098	1248	1390
Soil Capacity	10941	10941	10941	10941	10941	10941	10941	10941
$FS_{bearing}$	**50.3**	**26.7**	**18.4**	**14.2**	**11.6**	**10.0**	**8.8**	**7.9**

Max. Recommended Wall Height: 3 feet for 40-inch blocks and no planter blocks

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 1

REDI-ROCK WALL STABILITY EVALUATION

Project: Lakeview Drive, Vista Meadows
Location: Alpine, Utah

Date: 11/3/2006
By: WGT

Backfill slope angle, β:	0 degrees	Foundation soil γ_f:	135 pcf
Batter angle (from vertical):	4 degrees	Foundation soil ϕ:	40 degrees
Soil/wall interface friction:	13 degrees	Found. soil cohesion:	0 psf
Surcharge pressure:	943 psf	Retained soil γ:	120 pcf
Rows of planter blocks:	0 rows	Retained soil ϕ:	26 degrees
Embedment depth:	1 feet	FS against sliding:	1.5
Total K_a =	0.326	FS against overturning:	2.0
Horizontal K_{ah} =	0.322	FS for bearing:	3.0
Horizontal K_{ph} =	3.103	Foundation soil δ:	26.67 degrees

Block depth: 30 **inches** Average block wall γ: 145 pcf

Wall Ht (ft)	**1.5**	**3.0**	**4.5**	**6.0**	**7.5**	**9.0**	**10.5**	**12.0**
P_{ah} (lbs/ft)	347	478	696	1000	1392	1870	2436	3089
Wall Wt (lbs)	544	1088	1631	2175	2719	3263	3806	4350
Wall $x_{centroid}$	1.25	1.35	1.41	1.46	1.51	1.56	1.62	1.67
$P_{sliding}$	347	478	696	1000	1392	1870	2436	3089
$P_{resisting}$	419	725	1031	1351	1684	2031	2391	2764
$FS_{sliding}$	**1.2**	**1.5**	**1.5**	**1.4**	**1.2**	**1.1**	**1.0**	**0.9**
$M_{overturn}$	174	478	1043	2000	3479	5611	8526	12355
$M_{resisting}$	749	1543	2366	3245	4181	5175	6225	7332
$FS_{overturn}$	**4.3**	**3.2**	**2.3**	**1.6**	**1.2**	**0.9**	**0.7**	**0.6**
Vertical Load	218	401	580	745	899	1043	1177	1303
Soil Capacity	10941	10941	10941	10941	10941	10941	10941	10941
$FS_{bearing}$	**50.3**	**27.3**	**18.9**	**14.7**	**12.2**	**10.5**	**9.3**	**8.4**

DO NOT USE

Block depth: 40 **inches** Average block wall γ: 145 pcf

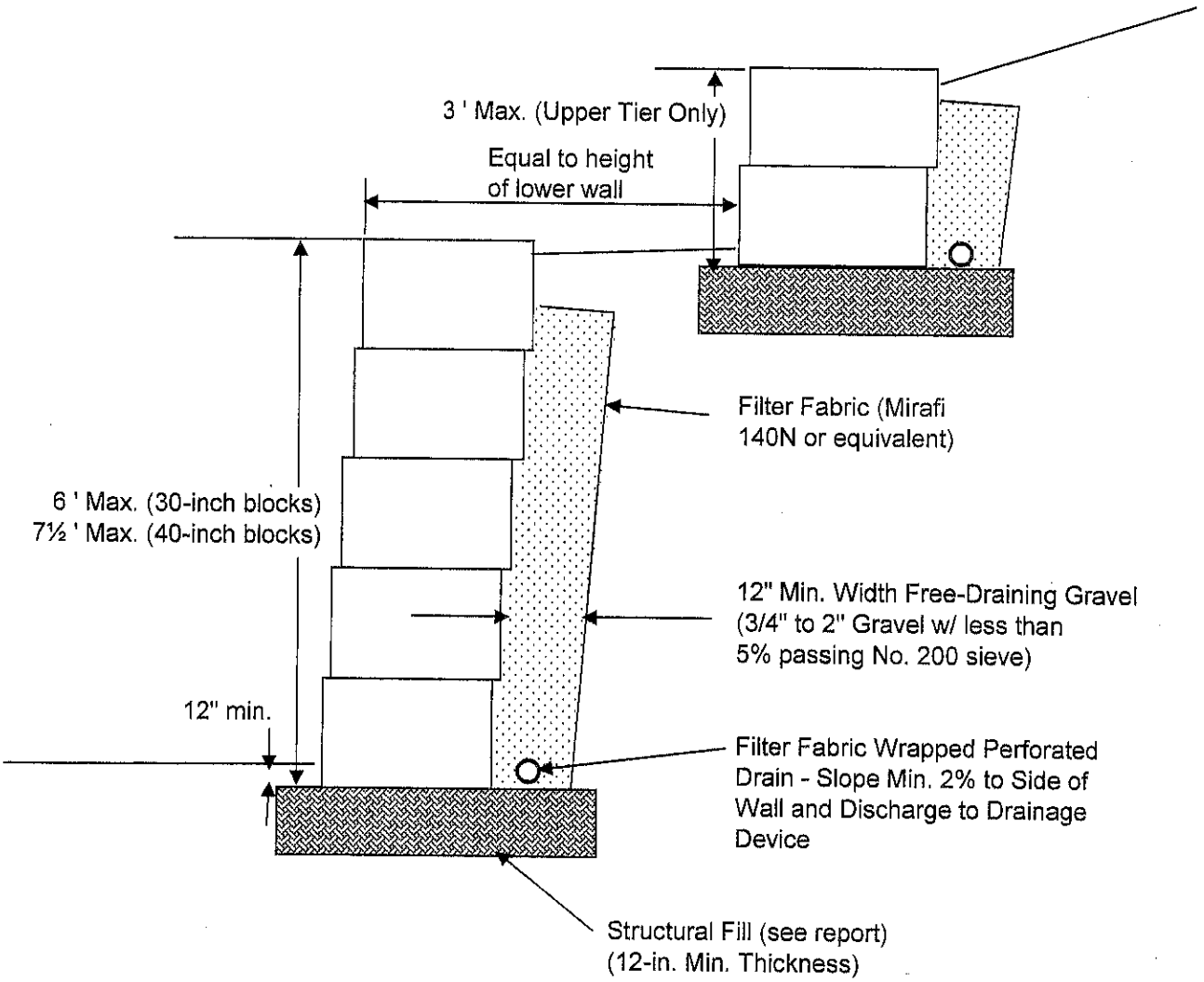
Wall Ht (ft)	**1.5**	**3.0**	**4.5**	**6.0**	**7.5**	**9.0**	**10.5**	**12.0**
P_{ah} (lbs/ft)	347	478	696	1000	1392	1870	2436	3089
Wall Wt (lbs)	725	1450	2175	2900	3625	4350	5075	5800
Wall $x_{centroid}$	1.67	1.77	1.82	1.88	1.93	1.98	2.03	2.09
$P_{sliding}$	347	478	696	1000	1392	1870	2436	3089
$P_{resisting}$	510	907	1304	1715	2139	2577	3028	3492
$FS_{sliding}$	**1.5**	**1.9**	**1.9**	**1.7**	**1.5**	**1.4**	**1.2**	**1.1**
$M_{overturn}$	174	478	1043	2000	3479	5611	8526	12355
$M_{resisting}$	1278	2639	4037	5512	7062	8689	10391	12170
$FS_{overturn}$	**7.4**	**5.5**	**3.9**	**2.8**	**2.0**	**1.5**	**1.2**	**1.0**
Vertical Load	218	409	596	773	940	1098	1248	1390
Soil Capacity	10941	10941	10941	10941	10941	10941	10941	10941
$FS_{bearing}$	**50.3**	**26.7**	**18.4**	**14.2**	**11.6**	**10.0**	**8.8**	**7.9**

Max. Recommended Wall Height: 7.5 feet for 40-inch blocks and no planter blocks

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 1A

REDI-ROCK WALL DESIGN WITHOUT GEOGRID

LAKEVIEW DRIVE (VISTA MEADOWS), ALPINE

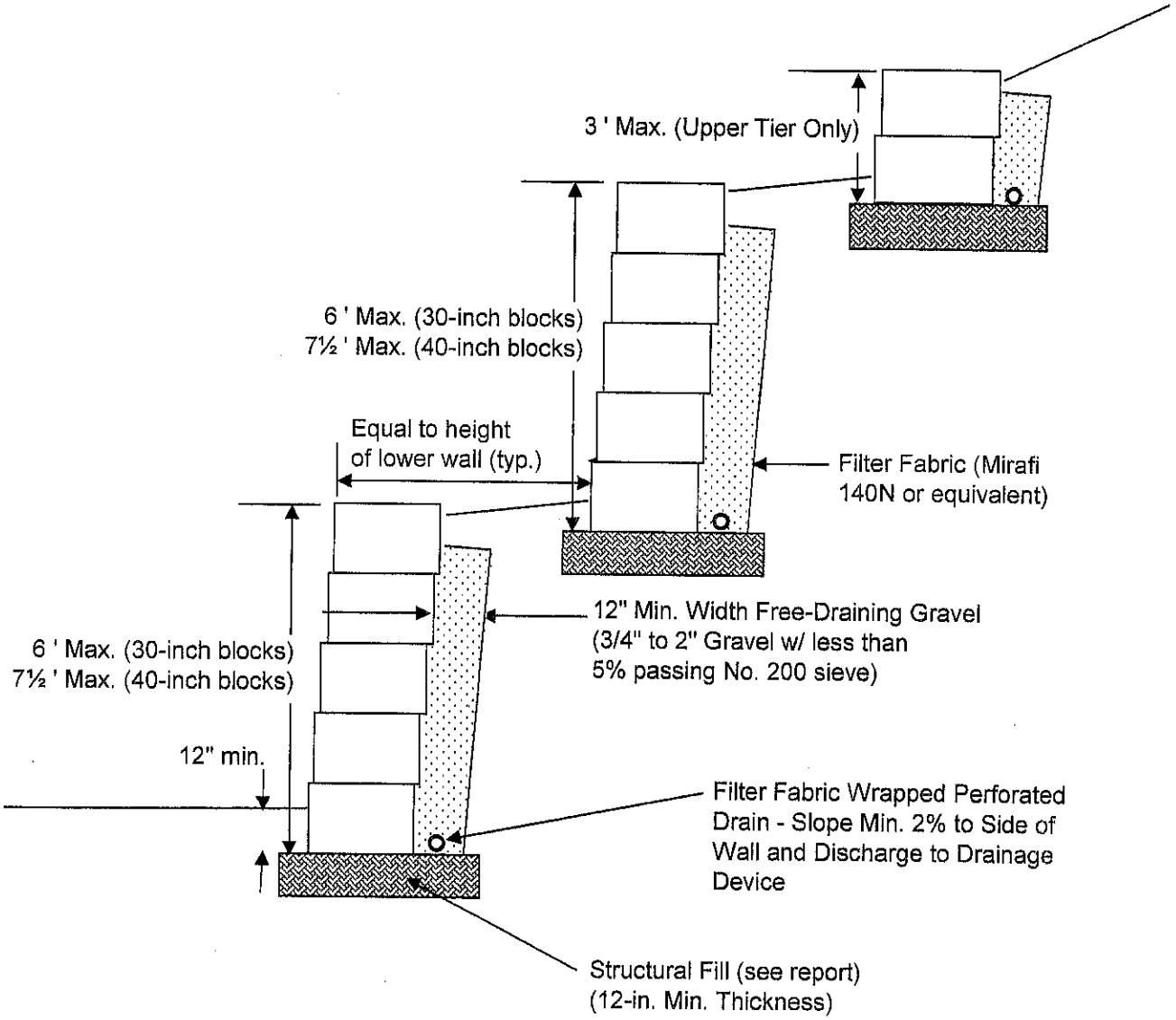


NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 11

REDI-ROCK WALL DESIGN WITHOUT GEOGRID

LAKEVIEW DRIVE (VISTA MEADOWS), ALPINE



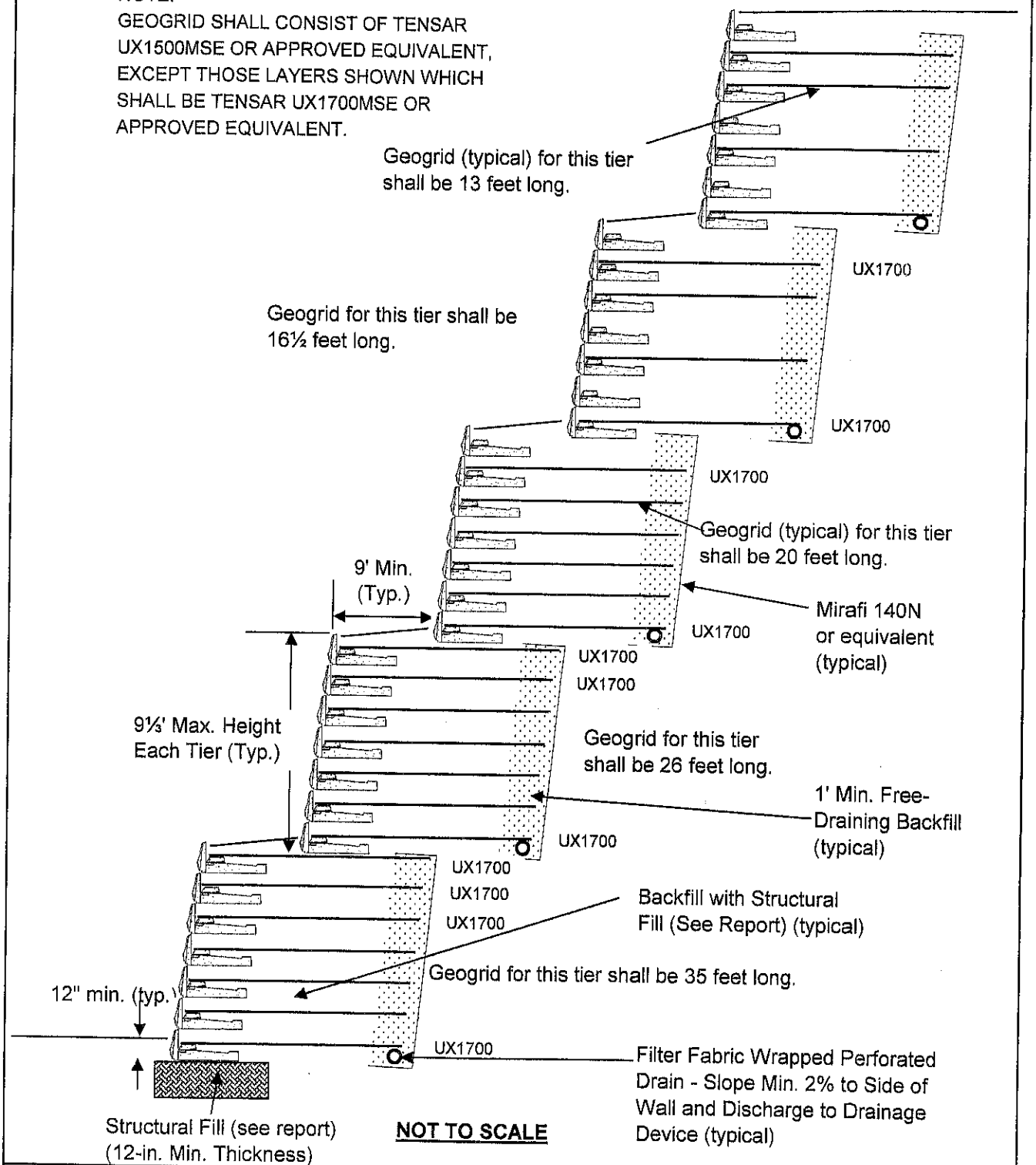
NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 11A

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE (5 TIERS)

NOTE:
GEOGRID SHALL CONSIST OF TENSAR UX1500MSE OR APPROVED EQUIVALENT, EXCEPT THOSE LAYERS SHOWN WHICH SHALL BE TENSAR UX1700MSE OR APPROVED EQUIVALENT.



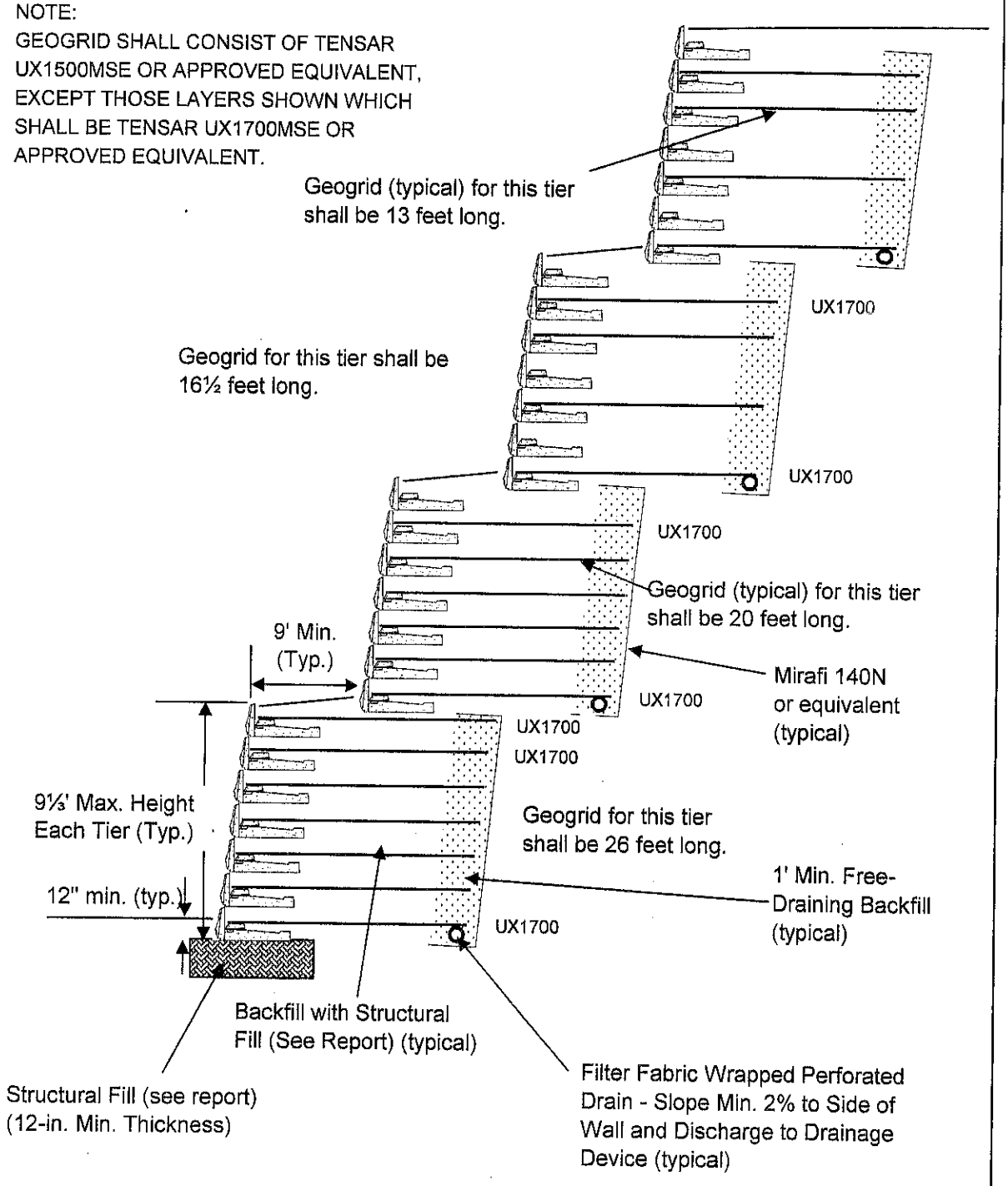
NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 12

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE (4 TIERS)

NOTE:
GEOGRID SHALL CONSIST OF TENSAR UX1500MSE OR APPROVED EQUIVALENT, EXCEPT THOSE LAYERS SHOWN WHICH SHALL BE TENSAR UX1700MSE OR APPROVED EQUIVALENT.



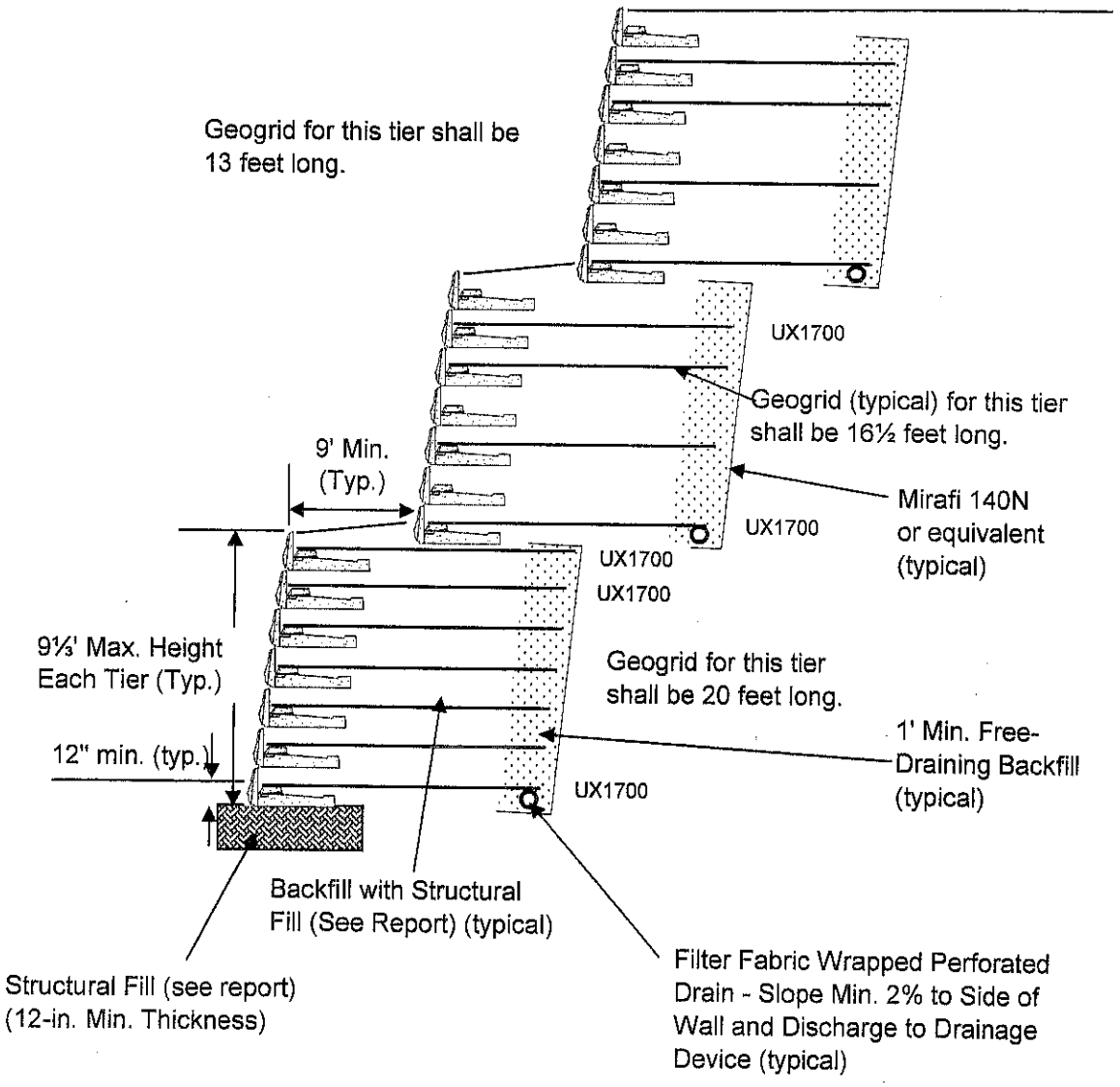
NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	FIGURE NO.: 12A

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE (3 TIERS)

NOTE:
GEOGRID SHALL CONSIST OF TENSAR UX1500MSE OR APPROVED EQUIVALENT, EXCEPT THOSE LAYERS SHOWN WHICH SHALL BE TENSAR UX1700MSE OR APPROVED EQUIVALENT.



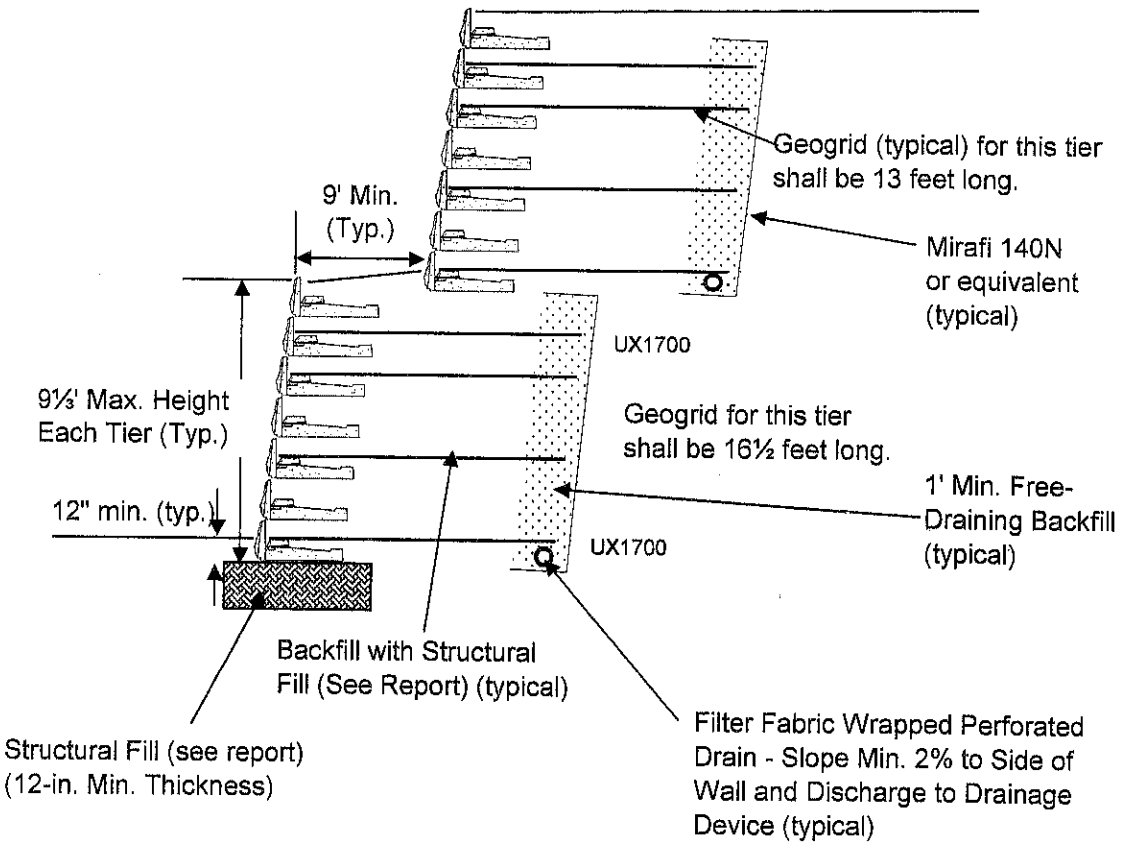
NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 12B

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE (LESS THAN 3 TIERS)

NOTE:
GEOGRID SHALL CONSIST OF TENSAR UX1500MSE OR APPROVED EQUIVALENT, EXCEPT THOSE LAYERS SHOWN WHICH SHALL BE TENSAR UX1700MSE OR APPROVED EQUIVALENT.



NOT TO SCALE

PROJECT NO.: 051709	Earthtec Testing and Engineering, P.C.	**FIGURE NO.:** 12C

APPENDIX

MSEW OUTPUT DATA
INFINITE SLOPE ANALYSIS

AASHTO DESIGN METHOD
Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

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DESIGN DATA

DESIGN OBJECTIVES

Minimum factor of safety against pullout, Fs-po	1.50
Minimum factor of safety against direct sliding, Fs-sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, Fs-comp-static	1.30
Minimum factor of safety against compound and overall failure, Fs-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 3.28 ft.
Prescribed minimum normalized length of each layer is: L/Hd = 0.70 --> L = 13.07 ft.
Prescribed minimum absolute total length of each layer is: L = 8.20 ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.	
Maximum permissible eccentricity ratio (soil), e/L	0.1667
Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach)	2.50

Bearing capacity coefficients: Nc = 0.00 N_γ = 14.99

SOIL DATA

REINFORCED SOIL

Unit weight, γ	135.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	150.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2174 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 65.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.420
Kae (α_o > 0) = 0.6932 Kae (α_o = 0) = 0.3073 Δ Kae = 0.3859 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY
Seismic safety factor is 75.0% of specified static FS for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

BEARING CAPACITY
Seismic safety factor is 75.0% of specified static FS for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

INTERNAL STABILITY
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic factor of safety against pullout, Fs-po, is 75.0% of its specified static value.
Seismic overall factor of safety, Fs-overall, is 75.0% of its specified static value.
The reduction of Fs-overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

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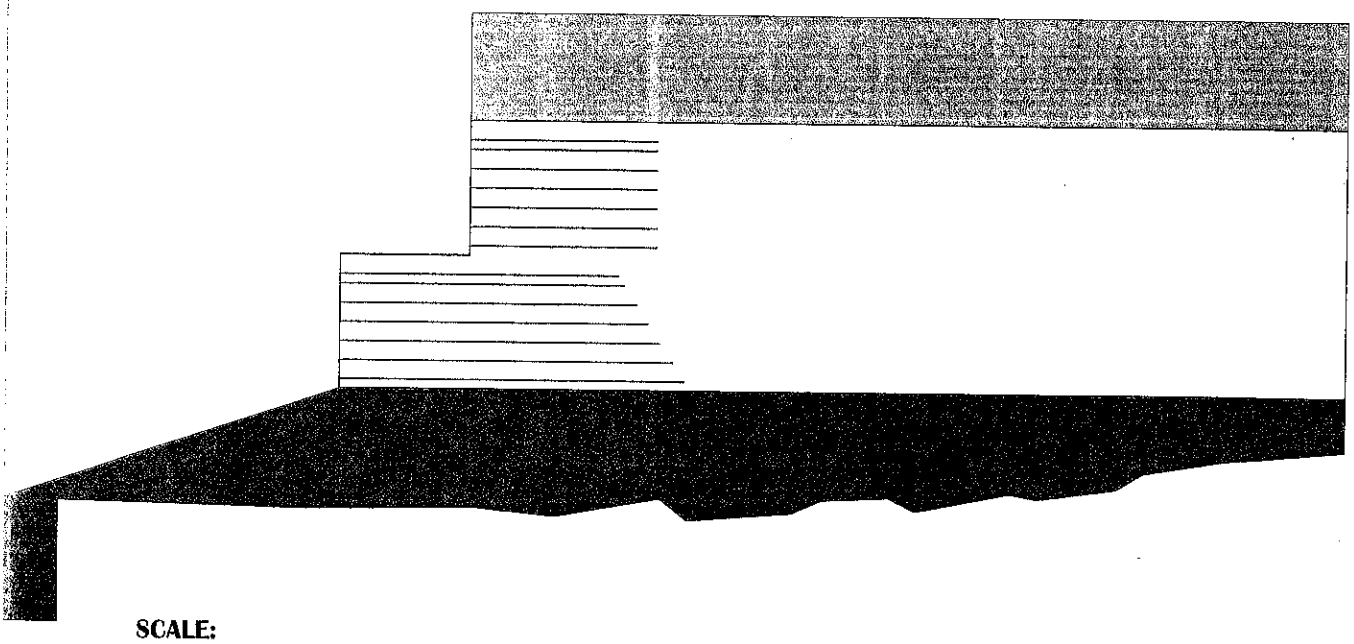
INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

Design height, Hd	18.67	[ft]	{ Embedded depth is E = 0.00 ft, and height above top of finished bottom grade is H = 18.67 ft, where H1 = 9.33 and H2 = 9.33 }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 9.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 3600.0 [lb/ft ²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10 [ft]

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DESIGN: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 4.66, Meyerhof stress = 4653 lb/ft².
Foundation Interface: Direct sliding, Fs = 2.477, Eccentricity, e/L = -0.0376, Fs-overturning = 6.68

	GEOGRID			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	24.08	2	3.57	3.57	3.57	3.569	83.314	1.502	-0.0458	UX1700MSE
2	2.00	23.25	1	2.24	2.24	2.24	2.242	78.947	1.502	-0.0593	UX1500MSE
3	3.33	22.40	1	2.37	2.37	2.37	2.370	75.006	1.502	-0.0745	UX1500MSE
4	4.67	21.55	1	2.20	2.52	2.52	2.525	71.274	1.502	-0.0920	UX1500MSE
5	6.00	20.70	2	2.73	4.39	4.39	4.388	66.837	1.502	-0.1121	UX1700MSE
6	7.33	19.85	2	2.27	6.07	6.07	6.072	81.356	1.502	-0.1357	UX1700MSE
7	8.00	19.42	2	0.81	3.26	3.26	3.263	41.072	1.503	-0.1492	UX1700MSE
8	10.00	13.07	2	3.72	3.72	3.72	3.721	22.737	2.195	0.0563	UX1700MSE
9	11.33	13.07	1	2.33	2.33	2.33	2.327	21.604	2.549	0.0413	UX1500MSE
10	12.67	13.07	1	2.42	2.42	2.42	2.422	20.027	3.061	0.0283	UX1500MSE
11	14.00	13.07	1	2.21	2.53	2.53	2.534	18.595	3.856	0.0176	UX1500MSE
12	15.33	13.07	1	1.64	2.64	2.64	2.637	17.731	5.281	0.0093	UX1500MSE
13	16.67	13.07	2	2.26	6.07	6.07	6.073	21.765	8.629	0.0034	UX1700MSE
14	17.33	13.07	2	0.95	3.82	3.82	3.821	13.147	12.739	0.0016	UX1700MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 5.29, Meyerhof stress = 4369 lb/ft².
Foundation Interface: Direct sliding, Fs = 1.836, Eccentricity, e/L = -0.0074, Fs-overturning = 5.07

	GEOGRID			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	24.08	2	2.41	3.01	3.01	3.015	56.297	1.343	-0.0399	UX1700MSE
2	2.00	23.25	1	1.52	1.90	1.90	1.900	53.530	1.374	-0.0552	UX1500MSE
3	3.33	22.40	1	1.61	2.01	2.01	2.013	50.953	1.404	-0.0719	UX1500MSE
4	4.67	21.55	1	1.50	2.15	2.15	2.147	48.492	1.435	-0.0906	UX1500MSE
5	6.00	20.70	2	1.87	3.75	3.75	3.750	45.686	1.462	-0.1115	UX1700MSE
6	7.33	19.85	2	1.49	4.99	4.99	4.993	53.510	1.485	-0.1356	UX1700MSE
7	8.00	19.42	2	0.58	2.94	2.94	2.937	29.575	1.495	-0.1492	UX1700MSE
8	10.00	13.07	2	2.70	3.37	3.37	3.374	16.492	1.711	0.0740	UX1700MSE
9	11.33	13.07	1	1.69	2.11	2.11	2.112	15.691	2.048	0.0525	UX1500MSE
10	12.67	13.07	1	1.76	2.20	2.20	2.201	14.563	2.542	0.0347	UX1500MSE
11	14.00	13.07	1	1.61	2.31	2.31	2.305	13.534	3.317	0.0207	UX1500MSE
12	15.33	13.07	1	1.20	2.40	2.40	2.403	12.926	4.721	0.0104	UX1500MSE
13	16.67	13.07	2	1.61	5.39	5.39	5.389	15.450	8.044	0.0037	UX1700MSE
14	17.33	13.07	2	0.71	3.55	3.55	3.546	9.762	12.141	0.0016	UX1700MSE

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AASHTO DESIGN METHOD
Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

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DESIGN DATA

DESIGN OBJECTIVES

Minimum factor of safety against pullout, Fs-po	1.50
Minimum factor of safety against direct sliding, Fs-sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, Fs-comp-static	1.30
Minimum factor of safety against compound and overall failure, Fs-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, Le = 3.28 ft.
Prescribed minimum normalized length of each layer is: L/Hd = 0.70 --> L = 13.07 ft.
Prescribed minimum absolute total length of each layer is: L = 8.20 ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.	
Maximum permissible eccentricity ratio (soil), e/L	0.1667
Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach)	2.50

Bearing capacity coefficients: Nc = 0.00 N_γ = 14.99

SOIL DATA

REINFORCED SOIL

Unit weight, γ	135.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	150.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2174 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 65.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.420
Kae (α_o > 0) = 0.6932 Kae (α_o = 0) = 0.3073 Δ Kae = 0.3859 (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY
Seismic safety factor is 75.0% of specified static FS for direct sliding.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

BEARING CAPACITY
Seismic safety factor is 75.0% of specified static FS for bearing capacity.
Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

INTERNAL STABILITY
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.
Seismic factor of safety against pullout, Fs-po, is 75.0% of its specified static value.
Seismic overall factor of safety, Fs-overall, is 75.0% of its specified static value.
The reduction of Fs-overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

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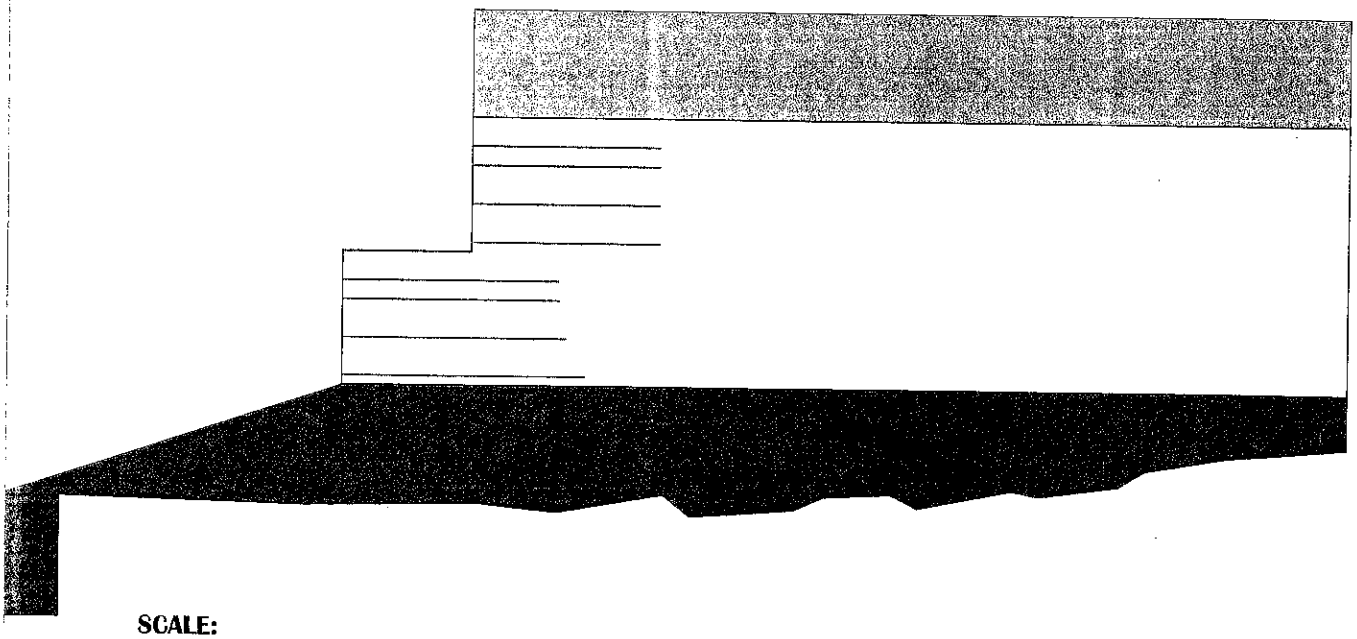
INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

Design height, Hd	18.67	[ft]	{ Embedded depth is E = 0.00 ft, and height above top of finished bottom grade is H = 18.67 ft, where H1 = 9.33 and H2 = 9.33 }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 9.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 250.0 [lb/ft ²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10 [ft]

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DESIGN: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 8.20, Meyerhof stress = 1987 lb/ft².
Foundation Interface: Direct sliding, Fs = 2.776, Eccentricity, e/L = 0.0053, Fs-overturning = 5.90

	GEOGRID			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	16.90	1	4.55	4.55	4.55	4.552	66.622	1.576	-0.0046	UX1500MSE
2	3.33	15.59	1	4.63	4.63	4.63	4.629	49.217	1.501	-0.0333	UX1500MSE
3	6.00	15.12	1	5.95	9.57	9.57	9.565	74.960	1.501	-0.0903	UX1500MSE
4	7.33	15.07	2	3.13	8.36	8.36	8.357	33.755	1.503	-0.1333	UX1700MSE
5	10.00	13.07	1	5.18	5.18	5.18	5.180	28.562	3.345	0.0298	UX1500MSE
6	12.67	13.07	1	5.05	5.05	5.05	5.047	18.061	4.586	0.0156	UX1500MSE
7	15.33	13.07	1	5.96	9.57	9.57	9.568	18.734	7.467	0.0056	UX1500MSE
8	16.67	13.07	1	4.63	12.43	12.43	12.434	15.550	11.378	0.0023	UX1500MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 4.36, Meyerhof stress = 2725 lb/ft².
Foundation Interface: Direct sliding, Fs = 1.292, Eccentricity, e/L = 0.1393, Fs-overturning = 2.54

	GEOGRID			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	16.90	1	2.30	2.87	2.87	2.872	33.627	1.127	0.0223	UX1500MSE
2	3.33	15.59	1	2.46	3.08	3.08	3.079	26.192	1.195	-0.0197	UX1500MSE
3	6.00	15.12	1	2.49	5.00	5.00	4.999	31.340	1.351	-0.0869	UX1500MSE
4	7.33	15.07	2	1.72	5.74	5.74	5.744	18.562	1.433	-0.1324	UX1700MSE
5	10.00	13.07	1	2.74	3.43	3.43	3.426	15.113	1.367	0.0892	UX1500MSE
6	12.67	13.07	1	2.78	3.48	3.48	3.481	9.964	2.017	0.0419	UX1500MSE
7	15.33	13.07	1	2.71	5.43	5.43	5.433	8.509	3.788	0.0125	UX1500MSE
8	16.67	13.07	1	1.92	6.45	6.45	6.445	6.449	6.637	0.0043	UX1500MSE

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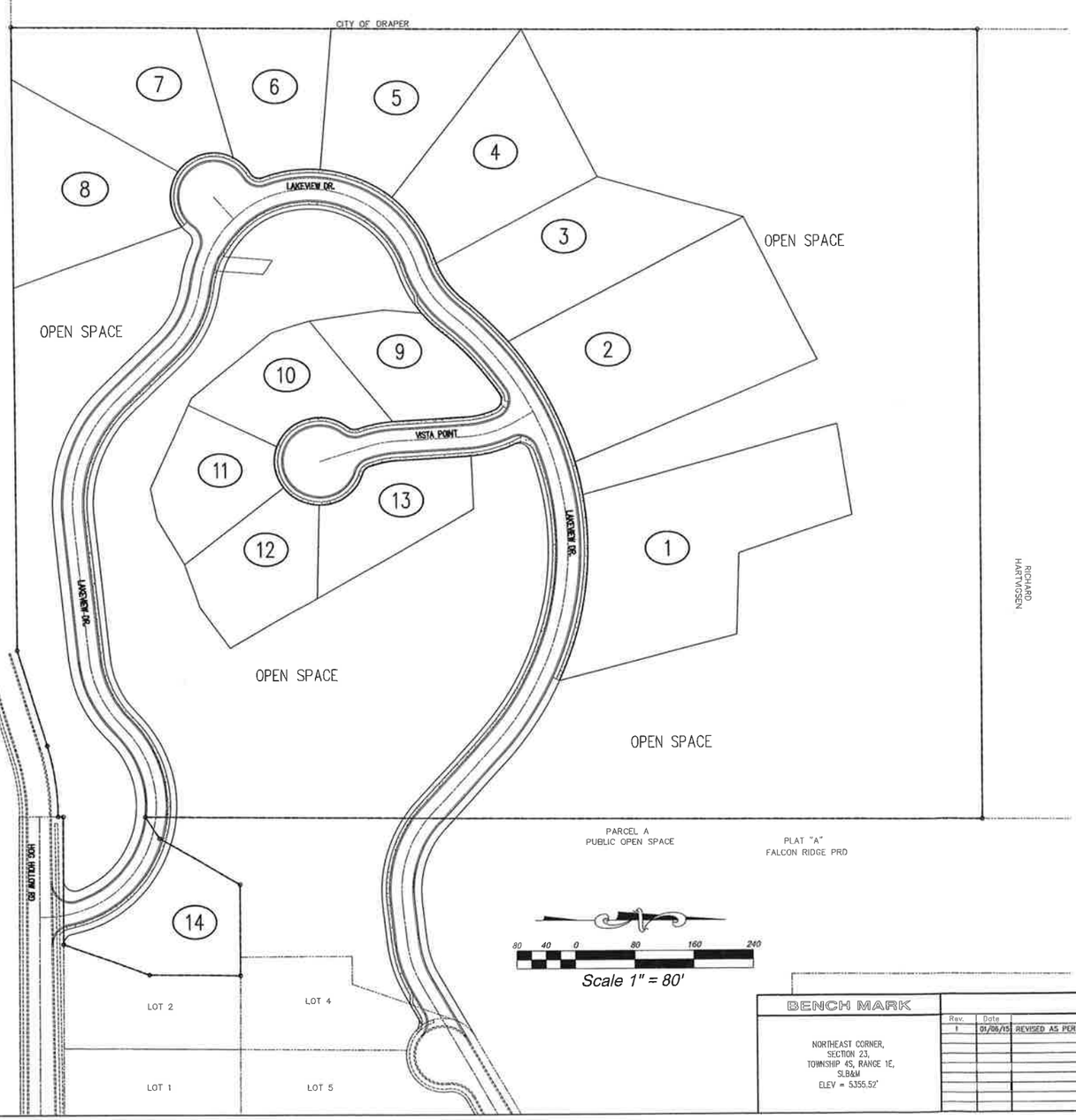
Earthtec Testing and Engineering, P.C.

INFINITE SLOPE ANALYSIS					
					Prepared By: Jeff Egbert, P.E.
					Reviewed By: Bill Turner, P.E.
Project:	Vista Meadows - Job #051709				
Soil Type:	Lean Clay				
Depth, d:	2	feet (usually 2 to 4 feet)			
Soil wt, γ:	120	pcf			
Cohesion, c':	320	psf			
Phi angle, ϕ:	26	deg. =	0.453786	radians	
Slope angle, β:	26	deg. =	0.453786	radians	
r_u factor:	0.5	(0 to 1)			
Infinite FS = (c' / γ d)(sec β)(cosec β) + (tan ϕ ' / tan β)(1 - r_u sec^2 β)					
Infinite FS:					
cohesion side=	3.384049				
frict. angle side=	0.381058				
Total FS =	3.765107				
Soil Type:	Clayey Gravel				
Depth, d:	2	feet (usually 2 to 4 feet)			
Soil wt, γ:	130	pcf			
Cohesion, c':	150	psf			
Phi angle, ϕ:	32	deg. =	0.558505	radians	
Slope angle, β:	26	deg. =	0.453786	radians	
r_u factor:	0.5	(0 to 1)			
Infinite FS = (c' / γ d)(sec β)(cosec β) + (tan ϕ ' / tan β)(1 - r_u sec^2 β)					
Infinite FS:					
cohesion side=	1.464252				
frict. angle side=	0.488201				
Total FS =	1.952453				

EAGLE POINTE SUBDIVISION

LOCATED IN THE NORTHEAST QUARTER OF SECTION 23,
TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN

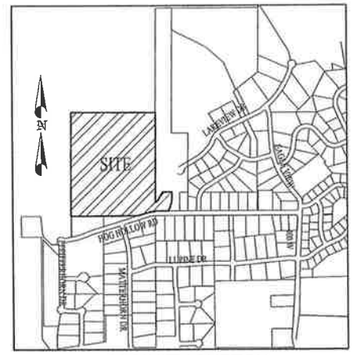


80 40 0 80 160 240

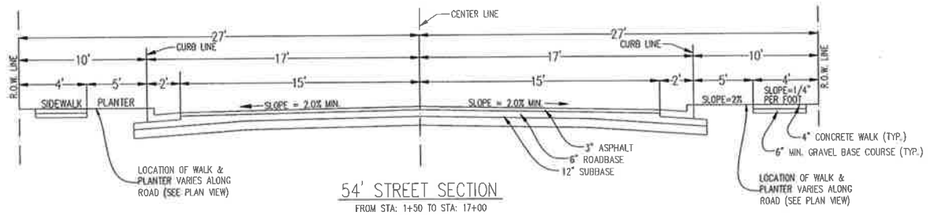
Scale 1" = 80'

SHEET INDEX

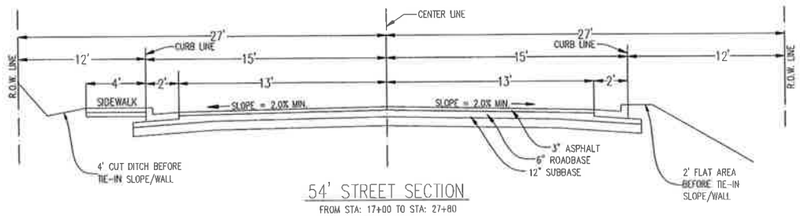
CV1	COVER SHEET
CV2	PRELIMINARY PLAT
OU1	OVERALL UTILITY PLAN
GP1	GRADING & DRAINAGE PLAN
GP2	GRADING & DRAINAGE PLAN
PP1	LAKEVIEW DR. PLAN/PROFILE
PP2	LAKEVIEW DR. PLAN/PROFILE
PP3	LAKEVIEW DR. PLAN/PROFILE
PP4	VISTA POINT & SEWER/STORM DRAIN PLAN/PROFILE
PP5	STORM DRAIN PONDS PLAN/PROFILE
SWPP1	EROSION CONTROL PLAN
D1	STORM DRAIN CALCULATIONS



VICINITY SKETCH



54' STREET SECTION
FROM STA: 1+50 TO STA: 17+00
SCALE: NONE



54' STREET SECTION
FROM STA: 17+00 TO STA: 27+80
SCALE: NONE

TABULATIONS

ZONE:	CR-40,000 (1 ACRE)
TOTAL ACRES:	32.929 ACRES
LOT AREA:	12.595 ACRES
ROADS:	3.520 ACRES
OPEN SPACE:	16.813 ACRES (51.1%)
LOTS:	14
DENSITY:	0.43 LOTS/ACRE

RECEIVED JAN 07 2015

BENCH MARK

NORTHEAST CORNER,
SECTION 23,
TOWNSHIP 4S, RANGE 1E,
SLB&M
ELEV = 5355.52'

REVISIONS

Rev.	Date	Description
1	01/06/15	REVISED AS PER CITY COMMENTS DATED 9/26/14

Developer:
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American Fork, UT 84003
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12 West 100 North, Suite 201, American Fork, UT 84003
P: (801) 756-4504; F: (801) 756-4511

EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

Drawn by: G.J.Y.
Designed by: G.J.Y.
Checked by: D.W.P.

COVER SHEET

Scale: 1"=80'
Date: 09/03/14
CV1

PROPERTY DESCRIPTION

COMMENCING AT THE NORTHEAST CORNER OF SECTION 23, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 00°21'07" WEST ALONG THE SECTION LINE 1134.04 FEET; THENCE NORTH 56°15'37" EAST 35.18 FEET; THENCE NORTH 29°33'14" EAST 125.80 FEET; THENCE SOUTH 89°59'05" EAST 122.53 FEET; THENCE SOUTH 00°21'03" WEST 124.12 FEET; THENCE SOUTH 20°01'33" WEST 121.12 FEET; THENCE NORTH 89°59'05" WEST 172.27 FEET; THENCE SOUTH 00°21'07" WEST 6.61 FEET; THENCE ALONG THE ARC OF A 324.00 FOOT RADIUS CURVE TO THE LEFT 97.46 FEET (CHORD BEARS SOUTH 81°22'49" WEST 97.09 FEET); THENCE SOUTH 72°45'48" WEST 135.67 FEET; THENCE SOUTH 89°46'49" WEST 845.76 FEET; THENCE NORTH 00°21'07" EAST 1311.28 FEET; THENCE SOUTH 89°48'06" EAST 1070.95 FEET TO THE POINT OF BEGINNING.
(INCLUDES LOT 3, PLAT "A", FALCON RIDGE P.R.D.)

AREA = 32.929 ACRES

54' ACCESS EASEMENT THRU PARCEL A & LOT 4 OF FALCON RIDGE PLAT 'A'

COMMENCING AT A POINT LOCATED SOUTH 00°21'07" WEST ALONG THE SECTION LINE 715.85 FEET FROM THE NORTHWEST CORNER OF SECTION 24, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN;

THENCE SOUTH 47°09'34" EAST, A DISTANCE OF 18.93 FEET; THENCE ALONG THE ARC OF A 123.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 49°26'37" FOR 106.14 FEET (CHORD BEARS SOUTH 71°52'52" EAST 102.88 FEET); THENCE NORTH 83°23'49" EAST, A DISTANCE OF 51.84 FEET; THENCE ALONG THE ARC OF A 123.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 23°37'03" FOR 50.70 FEET (CHORD BEARS NORTH 71°35'17" EAST 50.34 FEET); THENCE NORTH 59°46'46" EAST, A DISTANCE OF 98.56 FEET TO THE POINT OF CURVE OF A NON TANGENT CURVE; THENCE ALONG THE ARC OF THE 50.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 94°35'19" FOR 82.54 FEET (CHORD BEARS SOUTH 12°29'07" WEST 73.48 FEET); THENCE SOUTH 59°46'46" WEST, A DISTANCE OF 46.72 FEET; THENCE ALONG THE ARC OF A 177.00 FEET RADIUS CURVE TO THE RIGHT THROUGH A CENTRAL ANGLE OF 23°37'03" FOR 72.96 FEET (CHORD BEARS SOUTH 71°35'18" WEST 72.44 FEET); THENCE SOUTH 83°23'49" WEST, A DISTANCE OF 51.84 FEET; THENCE ALONG THE ARC OF A 177.00 FEET RADIUS CURVE TO THE RIGHT THROUGH A CENTRAL ANGLE OF 40°12'09" FOR 124.20 FEET (CHORD BEARS NORTH 76°30'06" WEST 121.66 FEET); THENCE NORTH 00°21'07" EAST, A DISTANCE OF 70.11 FEET TO THE POINT OF BEGINNING.

CONTAINING 15,890 SQUARE FEET OR 0.3648 ACRES, MORE OR LESS.

SOUTHEAST ACCESS EASEMENT THRU PARCEL A OF FALCON RIDGE PLAT 'A'

COMMENCING AT A POINT LOCATED SOUTH 00°21'07" WEST ALONG THE SECTION LINE 1092.59 FEET FROM THE NORTHWEST CORNER OF SECTION 24, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN;

THE BEGINNING OF A CURVE TO THE RIGHT, OF WHICH THE RADIUS POINT LIES SOUTH 05°00'59" WEST, A RADIAL DISTANCE OF 177.00 FEET; THENCE EASTERLY ALONG THE ARC, THROUGH A CENTRAL ANGLE OF 12°18'53", A DISTANCE OF 38.04 FEET (CHORD BEARS SOUTH 78°49'35" EAST 37.97 FEET); THENCE SOUTH 29°33'14" WEST, A DISTANCE OF 16.73 FEET; THENCE SOUTH 56°15'37" WEST, A DISTANCE OF 35.18 FEET; THENCE NORTH 00°21'07" EAST, A DISTANCE OF 41.45 FEET TO THE POINT OF BEGINNING.

CONTAINING 931 SQUARE FEET OR 0.0214 ACRES, MORE OR LESS.

LOT 3 OF FALCON RIDGE PLAT 'A' NOTE:

LOT 3 OF FALCON RIDGE PLAT 'A' WILL BE VACATED WITH THE FINAL PLAT FOR THIS SUBDIVISION. THIS LOT IS LOCATED WHERE LOT 14 OF THIS SUBDIVISION IS PROPOSED.

GENERAL NOTES

1. ALL LOTS ARE SUBJECT TO A 5' UTILITY EASEMENT (P.U.E.) ALONG ALL SIDE LOT LINES AND A 10' UTILITY EASEMENT ALONG ALL STREET FRONTAGES AND REAR LOT LINES, IN ADDITION TO ANY EASEMENTS SHOWN ON THIS PRELIMINARY PLAT.

2. ALL BUILDINGS SHALL BE LOCATED WITHIN THE DESIGNATED BUILDING AREA AS SHOWN ON THIS PRELIMINARY PLAT. (SEE SEPARATE SLOPE ANALYSIS PLAN TO SEE AREAS WITH SLOPE GREATER THAN 20% SLOPE WHICH FORCED TYPICAL SETBACK LINES TO MOVE.)

Scale 1" = 60'

BENCH MARK	REVISIONS		
	Rev.	Date	Description
NORTHEAST CORNER, SECTION 23, TOWNSHIP 4S, RANGE 1E, SLB&M ELEV = 5355.52'	1	01/06/15	REVISED AS PER CITY COMMENTS DATED 9/26/14

Developer:
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(801) 367-1636

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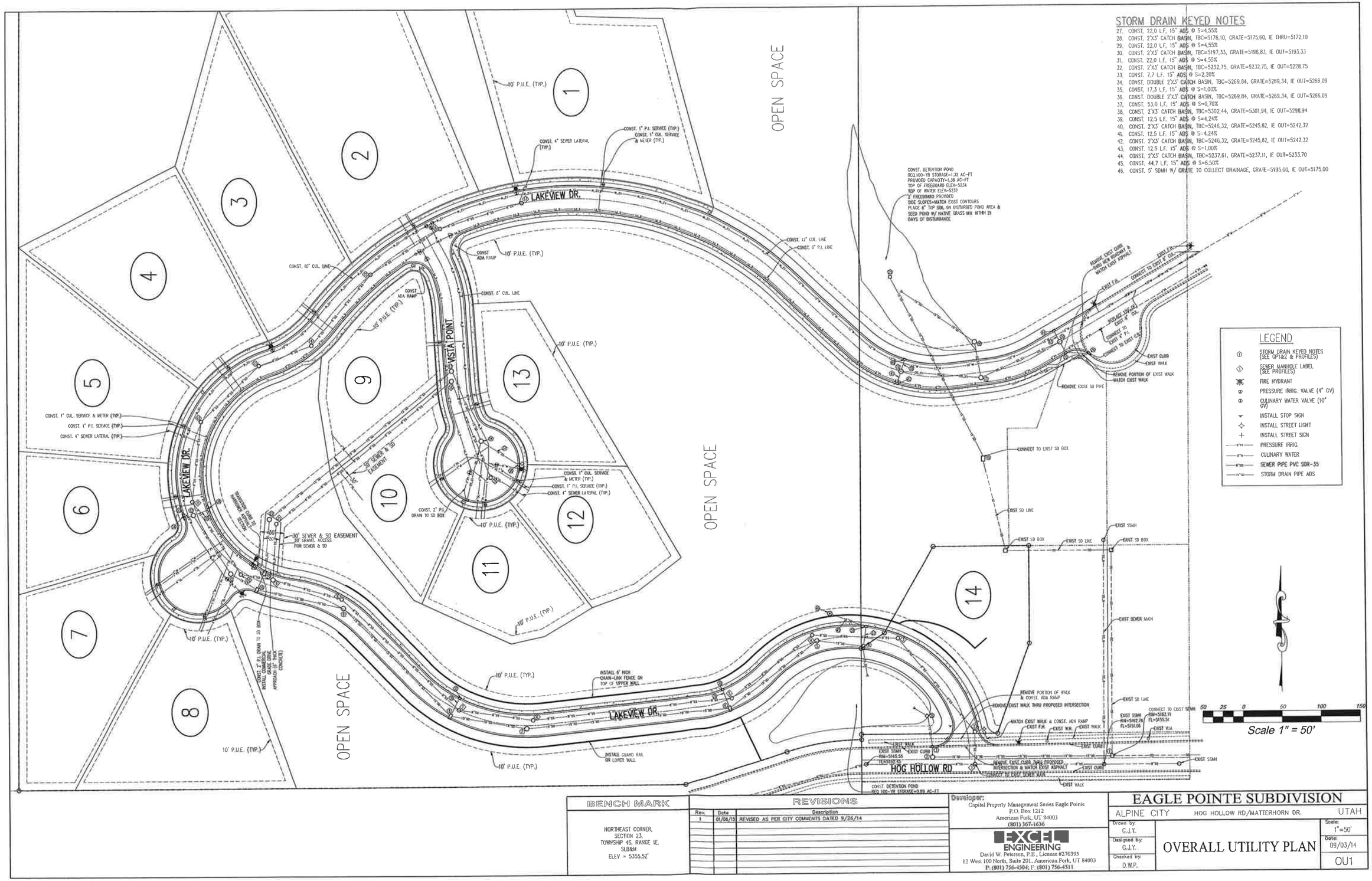
EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

Drawn by: D.W.P.
Designed by: D.W.P.
Checked by: D.W.P.

PRELIMINARY PLAT

Scale: 1"=60'
Date: 09/03/14
CV2



STORM DRAIN KEYED NOTES

27. CONST. 22.0 L.F. 15" ADS @ S=4.55%
28. CONST. 2'X3' CATCH BASIN, TBC=5176.10, GRATE=5175.60, IE THRU=5172.10
29. CONST. 22.0 L.F. 15" ADS @ S=4.55%
30. CONST. 2'X3' CATCH BASIN, TBC=5197.33, GRATE=5196.83, IE OUT=5193.33
31. CONST. 22.0 L.F. 15" ADS @ S=4.55%
32. CONST. 2'X3' CATCH BASIN, TBC=5232.75, GRATE=5232.25, IE OUT=5228.75
33. CONST. 7.7 L.F. 15" ADS @ S=2.20%
34. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
35. CONST. 17.3 L.F. 15" ADS @ S=1.00%
36. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
37. CONST. 53.0 L.F. 15" ADS @ S=0.70%
38. CONST. 2'X3' CATCH BASIN, TBC=5302.44, GRATE=5301.94, IE OUT=5298.94
39. CONST. 12.5 L.F. 15" ADS @ S=4.24%
40. CONST. 2'X3' CATCH BASIN, TBC=5246.32, GRATE=5245.82, IE OUT=5242.32
41. CONST. 12.5 L.F. 15" ADS @ S=4.24%
42. CONST. 2'X3' CATCH BASIN, TBC=5246.32, GRATE=5245.82, IE OUT=5242.32
43. CONST. 12.5 L.F. 15" ADS @ S=1.00%
44. CONST. 2'X3' CATCH BASIN, TBC=5237.61, GRATE=5237.11, IE OUT=5233.70
45. CONST. 44.7 L.F. 15" ADS @ S=6.50%
46. CONST. 5' SDMH W/ GRATE TO COLLECT DRAINAGE, GRATE=5195.60, IE OUT=5175.00

LEGEND

- STORM DRAIN KEYED NOTES (SEE GP1&2 & PROFILES)
- SEWER MANHOLE LABEL (SEE PROFILES)
- FIRE HYDRANT
- PRESSURE IRRIG. VALVE (4" GV)
- CULINARY WATER VALVE (10" GV)
- INSTALL STOP SIGN
- INSTALL STREET LIGHT
- INSTALL STREET SIGN
- 8"PI — PRESSURE IRRIG.
- 8"W — CULINARY WATER
- 8"SDS — SEWER PIPE PVC SDR-35
- 15"SD — STORM DRAIN PIPE ADS

BENCH MARK	REVISIONS		
NORTHEAST CORNER, SECTION 23, TOWNSHIP 4S, RANGE 1E, SLB&M ELEV = 5355.52'	Rev.	Date	Description
	1	01/06/15	REVISED AS PER CITY COMMENTS DATED 9/26/14

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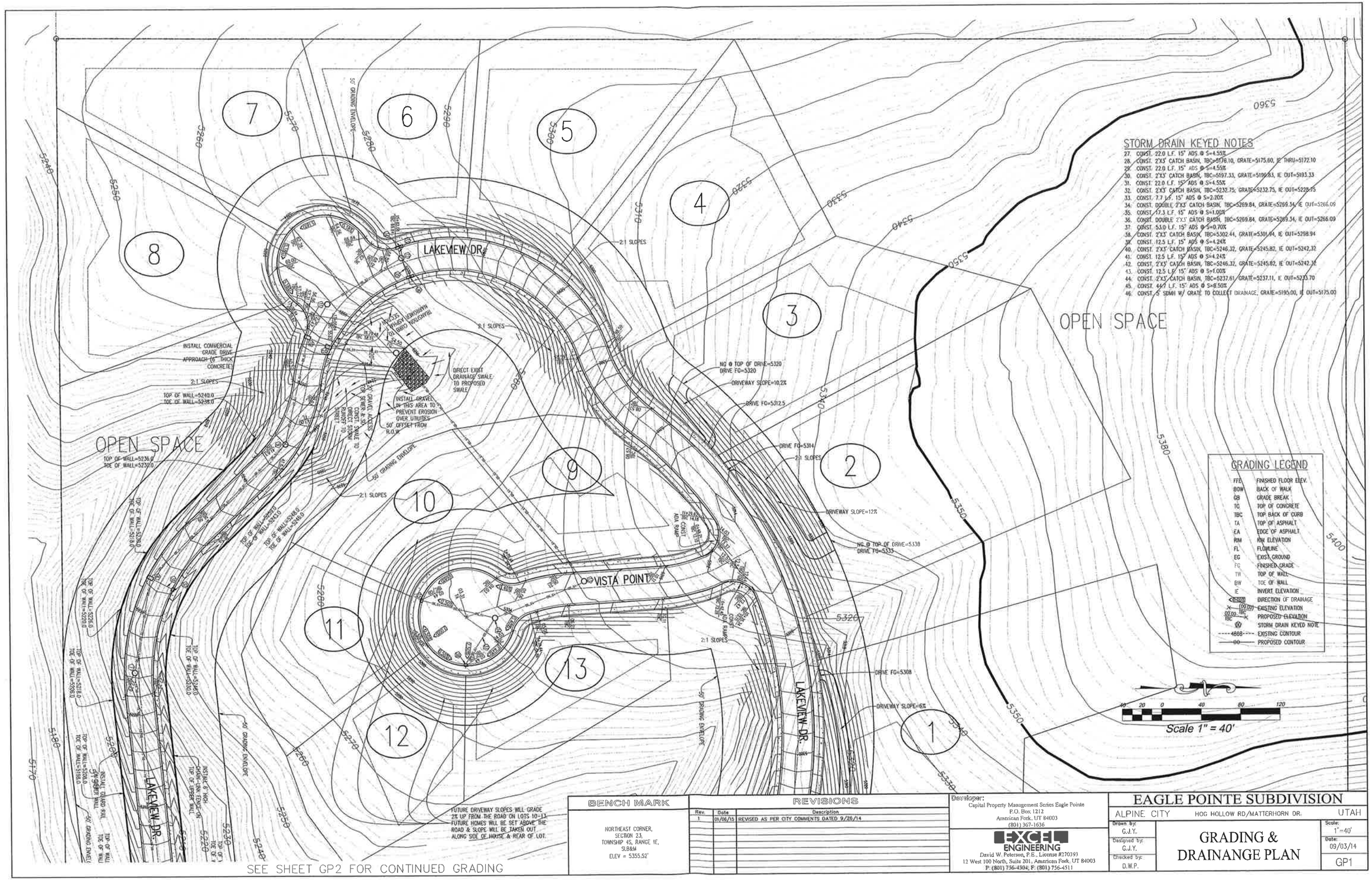
EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

Drawn by:	G.J.Y.
Designed by:	G.J.Y.
Checked by:	D.W.P.
Scale:	1"=50'
Date:	09/03/14

OVERALL UTILITY PLAN

OU1



STORM DRAIN KEYED NOTES

27. CONST. 22.0 L.F. 15" ADS @ S=4.55%
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31. CONST. 22.0 L.F. 15" ADS @ S=4.55%
32. CONST. 2'X3' CATCH BASIN, TBC=5232.75, GRATE=5232.75, IE OUT=5228.75
33. CONST. 7.7 L.F. 15" ADS @ S=2.70%
34. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
35. CONST. 17.3 L.F. 15" ADS @ S=1.00%
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37. CONST. 53.0 L.F. 15" ADS @ S=0.70%
38. CONST. 2'X3' CATCH BASIN, TBC=5302.44, GRATE=5301.94, IE OUT=5298.94
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44. CONST. 2'X3' CATCH BASIN, TBC=5237.61, GRATE=5237.11, IE OUT=5233.70
45. CONST. 44.7 L.F. 15" ADS @ S=8.50%
46. CONST. 5' SDMH W/ GRATE TO COLLECT DRAINAGE, GRATE=5195.00, IE OUT=5175.00

GRADING LEGEND

FFE	FINISHED FLOOR ELEV.
BOW	BACK OF WALK
GB	GRADE BREAK
TC	TOP OF CONCRETE
TBC	TOP BACK OF CURB
TA	TOP OF ASPHALT
EA	EDGE OF ASPHALT
RIM	RIM ELEVATION
FL	FLOWLINE
EG	EXIST. GROUND
FG	FINISHED GRADE
TW	TOP OF WALL
BW	TOE OF WALL
IE	INVERT ELEVATION
	DIRECTION OF DRAINAGE
(00.00)	EXISTING ELEVATION
00.00 TBC	PROPOSED ELEVATION
	STORM DRAIN KEYED NOTE
4868	EXISTING CONTOUR
90	PROPOSED CONTOUR

40' 20' 0 40 80 120
Scale 1" = 40'

SEE SHEET GP2 FOR CONTINUED GRADING

FUTURE DRIVEWAY SLOPES WILL GRADE 2% UP FROM THE ROAD ON LOTS 10-13. FUTURE HOMES WILL BE SET ABOVE THE ROAD & SLOPE WILL BE TAKEN OUT ALONG SIDE OF HOUSE & REAR OF LOT.

BENCH MARK

NORTHEAST CORNER,
SECTION 23,
TOWNSHIP 4S, RANGE 1E,
SLB&M
ELEV = 5355.52'

REVISIONS

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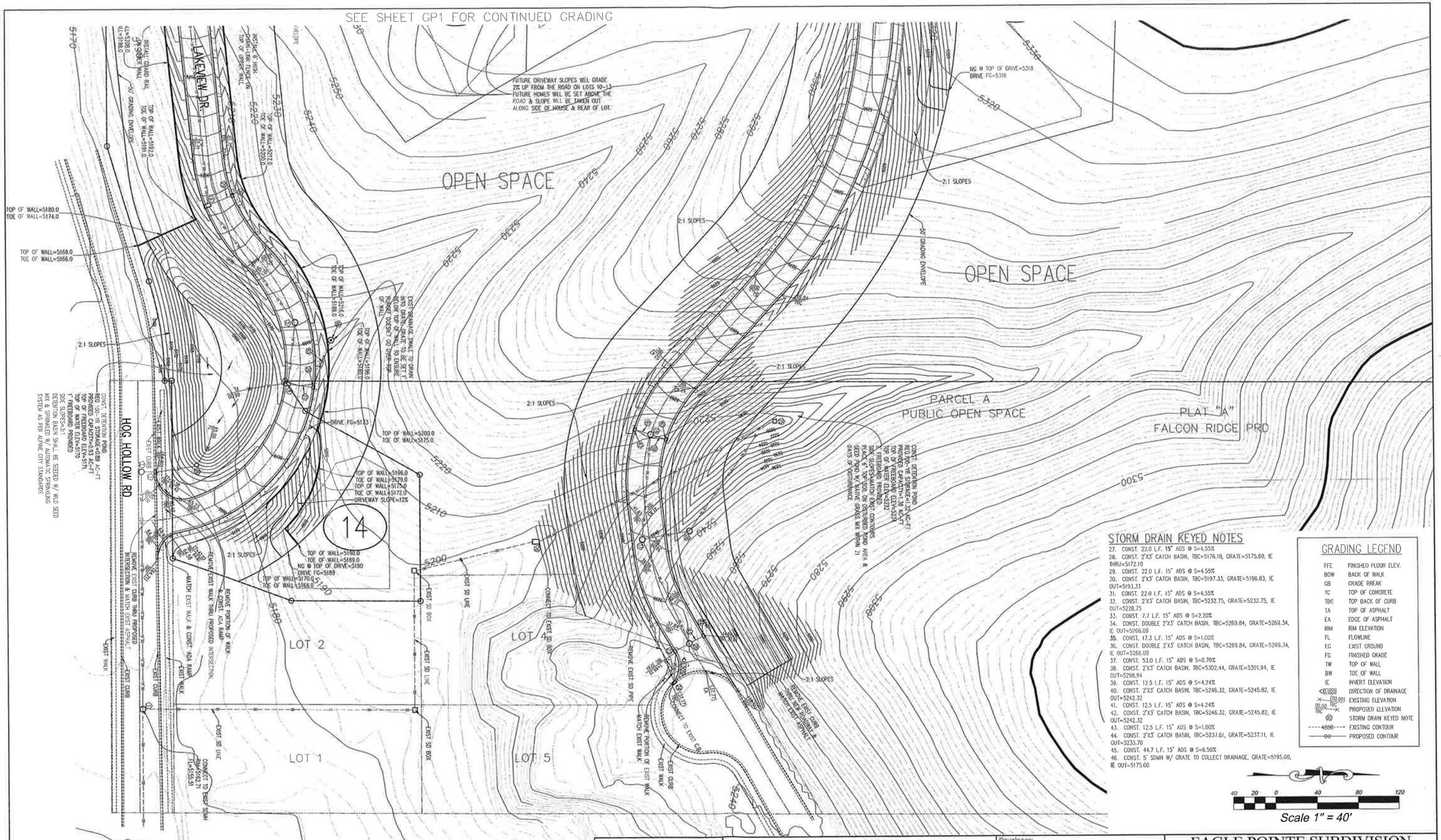
EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

GRADING & DRAINANGE PLAN

Drawn by:	G.J.Y.
Designed by:	G.J.Y.
Checked by:	D.W.P.
Scale:	1"=40'
Date:	09/03/14
	GP1

SEE SHEET GP1 FOR CONTINUED GRADING



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36. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
37. CONST. 53.0 L.F. 15" ADS @ S=0.70%
38. CONST. 2'X3' CATCH BASIN, TBC=5302.44, GRATE=5301.94, IE OUT=5298.94
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GRADING LEGEND

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TBC	TOP BACK OF CURB
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EA	EDGE OF ASPHALT
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FL	FLOWLINE
EG	EXIST GROUND
FG	FINISHED GRADE
TW	TOP OF WALL
BW	TOE OF WALL
IE	INVERT ELEVATION
0.00%	DIRECTION OF DRAINAGE
00.00	EXISTING ELEVATION
00.00 TBC	PROPOSED ELEVATION
00	STORM DRAIN KEYED NOTE
4686	EXISTING CONTOUR
00	PROPOSED CONTOUR

40 20 0 40 80 120

Scale 1" = 40'

BENCH MARK

NORTHEAST CORNER, SECTION 23, TOWNSHIP 4S, RANGE 1E, SLB&M
ELEV = 5355.52'

REVISIONS

Rev.	Date	Description
1	01/08/15	REVISED AS PER CITY COMMENTS DATED 9/26/14

Developer:
Capital Property Management Series Eagle Pointe
P.O. Box 1212
American Fork, UT 84003
(801) 367-1636

EXCEL ENGINEERING
David W. Peterson, P.E., License #270393
12 West 100 North, Suite 201, American Fork, UT 84003
P: (801) 756-4504; F: (801) 756-4511

EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

Drawn by: G.J.Y.
Designed by: G.J.Y.
Checked by: D.W.P.

GRADING & DRAINANGE PLAN

Scale: 1"=40'
Date: 09/03/14
GP2

CENTERLINE PROFILE

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=20'

338.00' VC
PVI STA = 3+32.32
PVI Elev = 5236.02
Low Pt STA = 1+89.32
Low Pt Elev = 5237.58
K = 26.00
A.D. = 13.00%

200.00' VC
High Pt. STA: = 10+48
High Pt. Elev. = 5312.48
PVI STA = 9+48.00
PVI Elev = 5309.90
K = 21.22

EXISTING GROUND @ CENTERLINE

CONST. 105.1 L.F. 8" PVC SEWER @ S=0.40%
CONST. 105.4 L.F 15" ADS @ S=0.50%
CONST. 12.5 L.F 15" ADS @ S=0.50%
CONST. 27.9 L.F 15" ADS @ S=0.50%
CONST. 97.2 L.F 15" ADS @ S=9.00%

-0+50 0+00 0+50 1+00 1+50 2+00 2+50 3+00 4+00 4+50 5+00 5+50 6+00 6+50 7+00 7+50 8+00 8+50 9+00 9+50 10+00 10+50

SD NORTH
SEE SHEET NO. PP5

LAKEVIEW DR.
SEE SHEET NO. PP2

LEGEND

- STORM DRAIN KEYED NOTES (SEE GP1&2 & PROFILES)
- SEWER MANHOLE LABEL (SEE PROFILES)
- FIRE HYDRANT
- PRESSURE IRRIG. VALVE (4" GV)
- CULINARY WATER VALVE (10" GV)
- INSTALL STOP SIGN
- INSTALL STREET LIGHT
- INSTALL STREET SIGN
- PRESSURE IRRIG.
- CULINARY WATER
- SEWER PIPE PVC SDR-35
- STORM DRAIN PIPE ADS

40 20 0 40 80 120
Scale 1" = 40'

LAKEVIEW DR. PLAN/PROFILE

REVISIONS		
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EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

Drawn by: G.J.Y.	LAKEVIEW DR. PLAN/PROFILE	Scale: 1"=40'
Designed by: G.J.Y.		Date: 09/03/14
Checked by: D.W.P.		PP1

CENTERLINE PROFILE

CONST. 4' SDMH STA=6+52.69 RIM=5303.87 IE OUT=5299.87

CONST. 4' SDMH STA=10+48.01 RIM=5317.48 IE IN=5299.45 IE OUT=5299.25

CONST. 4' SDMH STA=11+89.92 RIM=5313.54 IE IN=5296.04 IE OUT=5295.84

CONST. 4' SDMH STA=12+86.01 RIM=5305.07 IE IN=5293.07 IE OUT=5293.07

CONST. 4' SDMH STA=13+56.03 RIM=5305.11 IE IN=5285.11 IE OUT=5284.91

CONST. 4' SDMH STA=14+60.13 RIM=5294.43 IE IN=5277.63 IE OUT=5277.43

CONST. 4' SDMH STA=15+48.23 RIM=5271.83 IE IN=5261.13 IE OUT=5260.93

CONST. 5' SDMH STA=16+80.74 RIM=5269.88 15" IE IN@U=5265.92

CONST. 5' SDMH STA=16+85.47 RIM=5269.56 15" IE IN@U=5265.06

CONST. 4' SDMH STA=17+18.75 RIM=5262.49 IE IN=5246.16 IE OUT=5245.96

CONST. 15.0 CAMBO BOX STA=17+20.48 TBC=5263.48 GRATE=5254.98 15" IE IN (NW)=5250.46 15" IE THRU (NE&S)=5243.96

12.00%

RVC STA = 8+48.00 RVC ELEV = 5297.90

200.00' VC
High Pt. STA: = 10+48
High Pt. Elev. = 5312.48
PVI STA = 9+48.00
PVI Elev = 5309.90
K = 21.22

RVC STA = 10+48.00 RVC ELEV = 5317.48

RVC STA = 10+95.00 RVC ELEV = 5313.60

200.00' VC
High Pt. STA: = 11+30.35
High Pt. Elev. = 5314.15
PVI STA = 11+95.00
PVI Elev = 5316.27
K = 13.72

RVC STA = 12+95.00 RVC ELEV = 5304.56

CONST. 105.1 L.F. 6" PVC SEWER @ S=0.40%

CONST. 103.5 L.F. 8" PVC SEWER @ S=0.40%

CONST. 113.0 L.F. 8" PVC SEWER @ S=4.75%

CONST. 67.8 L.F. 6" PVC SEWER @ S=11.7%

CONST. 98.7 L.F. 8" PVC SEWER @ S=12.4%

CONST. 98.7 L.F. 8" PVC SEWER @ S=12.5%

CONST. 83.3 L.F. 15" ADS @ S=13.0%

CONST. 107.1 L.F. 8" PVC SEWER @ S=12.9%

CONST. 35.4 L.F. 15" ADS @ S=13.0%

CONST. 36.7 L.F. 8" PVC SEWER @ S=13.4%

UTILITY CROSSING
15" SD FL=43.91
8" SS FL=42.49

5340.0 5330.0 5320.0 5310.0 5300.0 5290.0 5280.0 5270.0 5260.0 5250.0 5240.0 5230.0 5220.0 5210.0 5200.0 5190.0 5180.0 5170.0 5160.0 5150.0 5140.0

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=20'

6+50 7+00 7+50 8+00 8+50 9+00 9+50 10+00 10+50 11+00 11+50 12+00 12+50 13+00 13+50 14+00 14+50 15+00 15+50 16+00 16+50 17+00

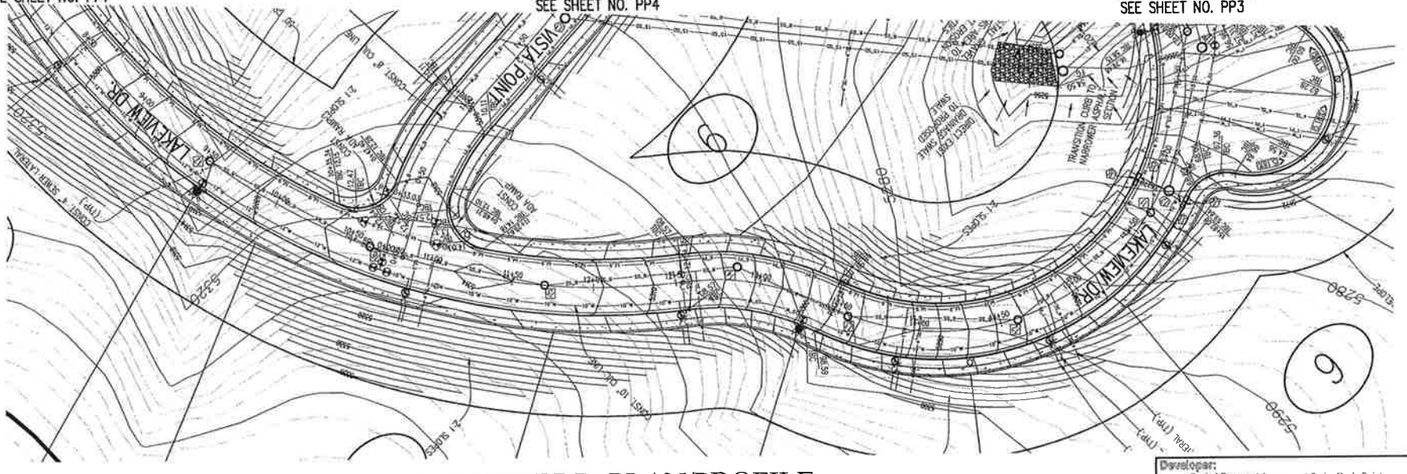
LEGEND

- STORM DRAIN KEYED NOTES (SEE OP1&2 & PROFILES)
- SEWER MANHOLE LABEL (SEE PROFILES)
- FIRE HYDRANT
- PRESSURE IRRIG. VALVE (4" GV)
- CULINARY WATER VALVE (10" GV)
- INSTALL STOP SIGN
- INSTALL STREET LIGHT
- INSTALL STREET SIGN
- 8"PI — PRESSURE IRRIG.
- 8"W — CULINARY WATER
- 8"SS — SEWER PIPE PVC SDR-35
- 15"SD — STORM DRAIN PIPE ADS

LAKEVIEW DR.
SEE SHEET NO. PP1

VISTA POINT
SEE SHEET NO. PP4

LAKEVIEW DR.
SEE SHEET NO. PP3



STORM DRAIN KEYED NOTES

27. CONST. 22.0 L.F. 15" ADS @ S=4.55%
28. CONST. 2'X3' CATCH BASIN, TBC=5176.10, GRATE=5175.60, IE THRU=5172.10
29. CONST. 22.0 L.F. 15" ADS @ S=4.55%
30. CONST. 2'X3' CATCH BASIN, TBC=5197.33, GRATE=5196.83, IE OUT=5193.33
31. CONST. 22.0 L.F. 15" ADS @ S=4.55%
32. CONST. 2'X3' CATCH BASIN, TBC=5232.75, GRATE=5232.75, IE OUT=5228.75
33. CONST. 7.7 L.F. 15" ADS @ S=2.20%
34. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
35. CONST. 17.3 L.F. 15" ADS @ S=1.00%
36. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
37. CONST. 53.0 L.F. 15" ADS @ S=0.70%
38. CONST. 2'X3' CATCH BASIN, TBC=5302.44, GRATE=5301.94, IE OUT=5298.94
39. CONST. 12.5 L.F. 15" ADS @ S=4.24%
40. CONST. 2'X3' CATCH BASIN, TBC=5246.32, GRATE=5245.82, IE OUT=5242.32
41. CONST. 12.5 L.F. 15" ADS @ S=4.24%
42. CONST. 2'X3' CATCH BASIN, TBC=5246.32, GRATE=5245.82, IE OUT=5242.32
43. CONST. 12.5 L.F. 15" ADS @ S=1.00%
44. CONST. 2'X3' CATCH BASIN, TBC=5237.61, GRATE=5237.11, IE OUT=5233.70
45. CONST. 44.7 L.F. 15" ADS @ S=6.50%
46. CONST. 5' SDMH W/ GRATE TO COLLECT DRAINAGE, GRATE=5195.00, IE OUT=5175.00

40 20 0 40 80 120
Scale 1" = 40'

LAKEVIEW DR. PLAN/PROFILE

REVISIONS

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Developer:
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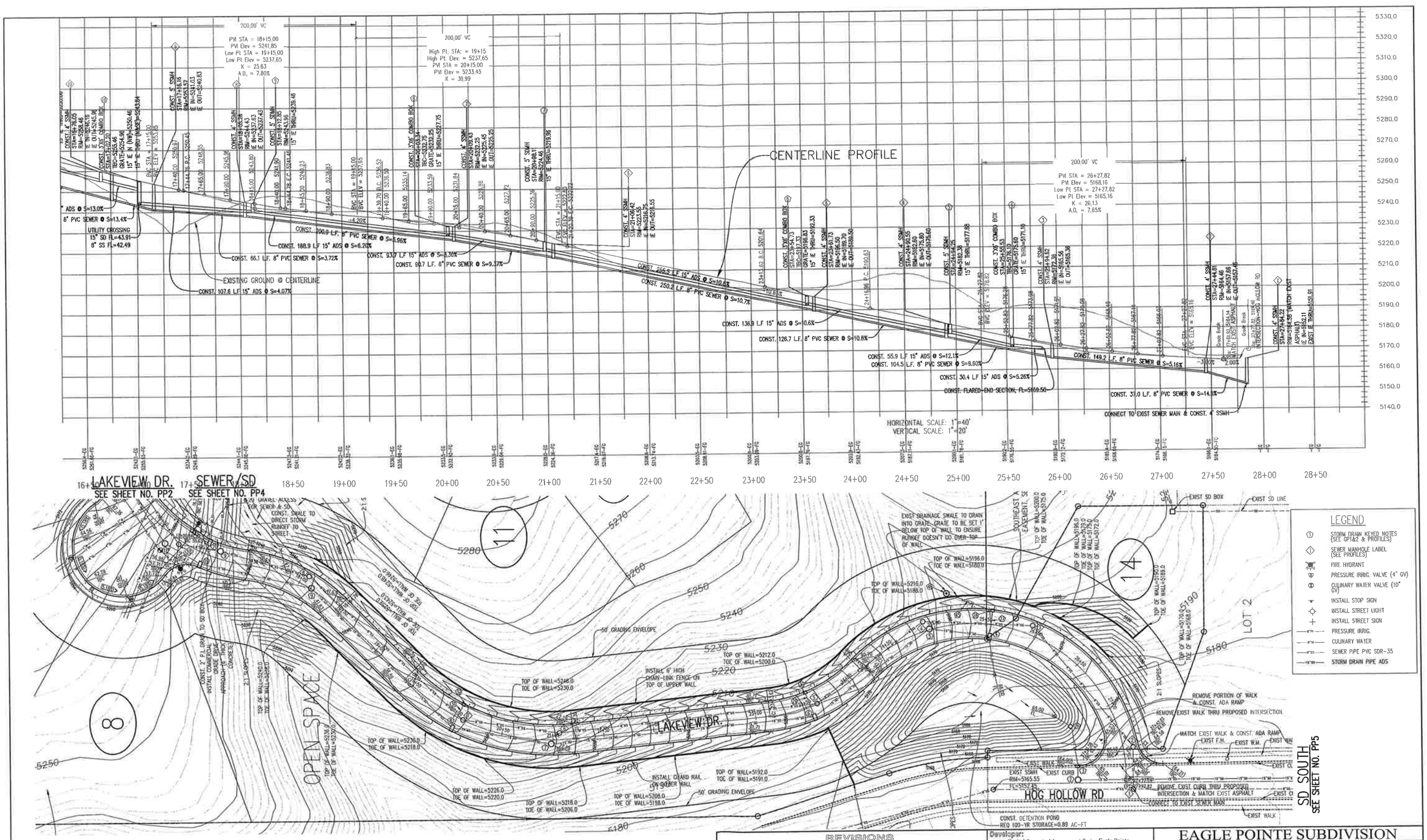
EAGLE POINTE SUBDIVISION
ALPINE CITY HOG HOLLOW RD/MATTERHORN DR. UTAH

Drawn by: G.J.Y.
Designed by: G.J.Y.
Checked by: D.W.P.

LAKEVIEW DR. PLAN/PROFILE

Scale: 1"=40'
Date: 09/03/14
PP2



LAKEVIEW DR. PLAN/PROFILE

REVISIONS		
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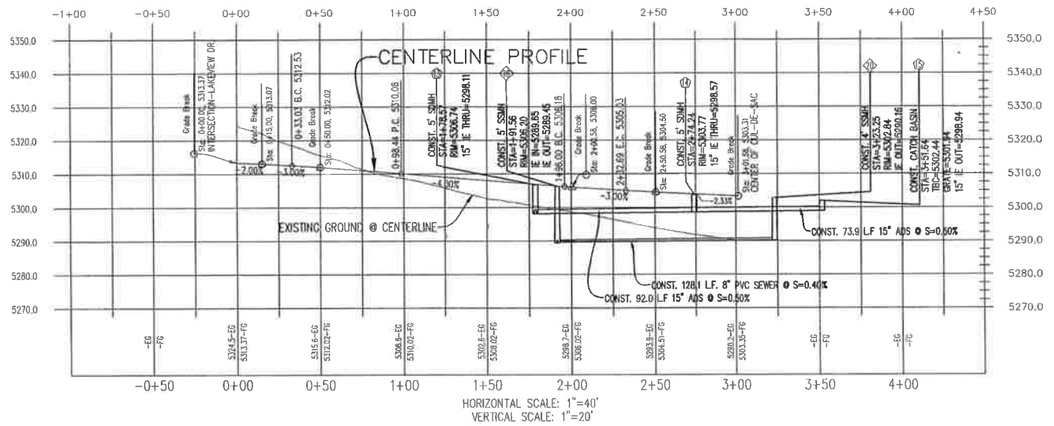
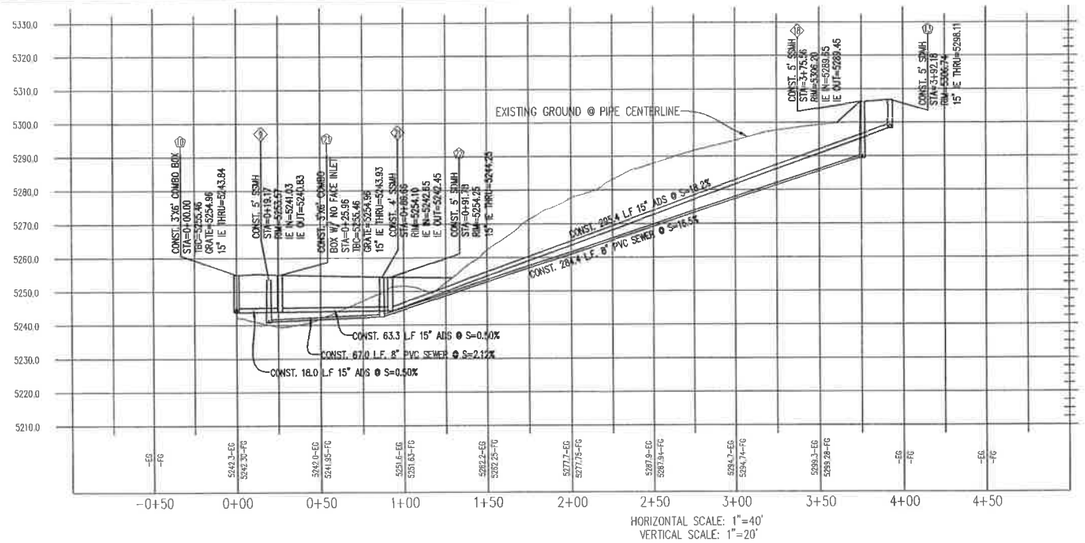
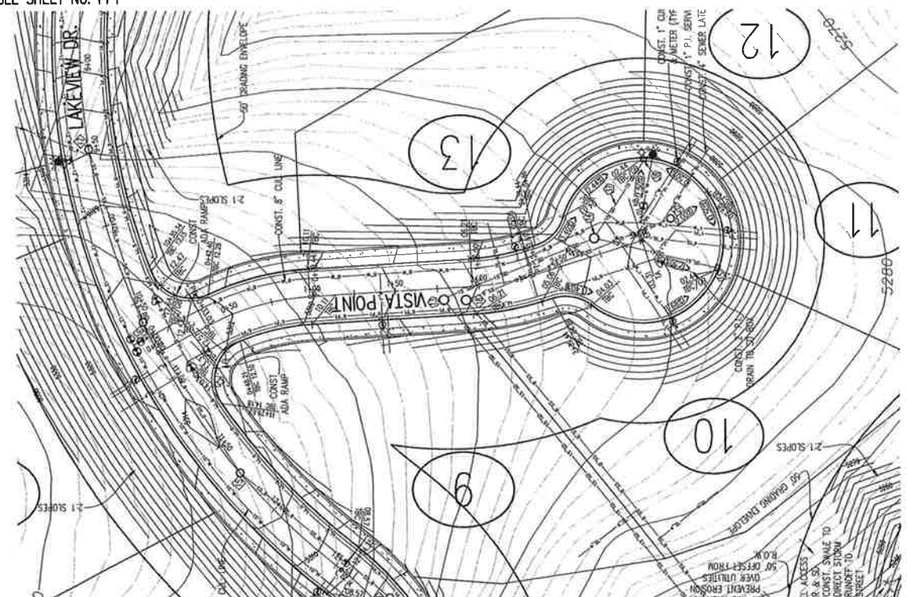
EAGLE POINTE SUBDIVISION

ALPINE CITY HOG HOLLOW RD/MATTERHORN DR. UTAH

Drawn by: G.J.Y.	LAKEVIEW DR. PLAN/PROFILE	Scale: 1"=40'
Designed by: G.J.Y.		Date: 09/03/14
Checked by: D.W.P.		PP3



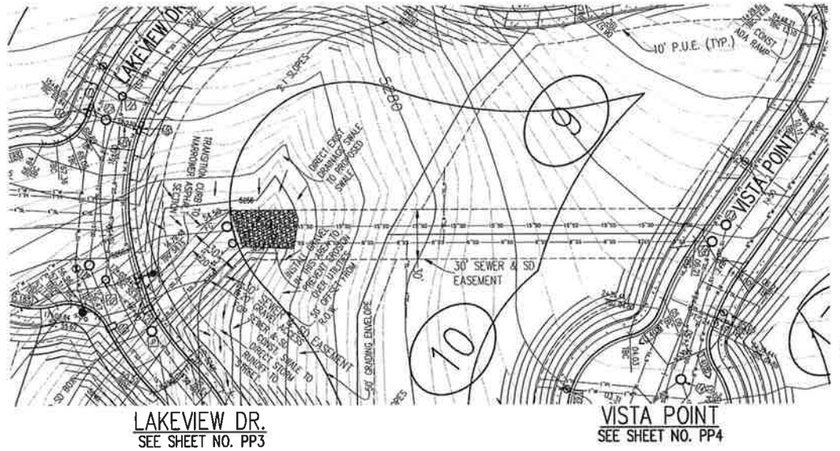




VISTA POINT PLAN/PROFILE

LEGEND

- STORM DRAIN KEYED NOTES (SEE GP1&2 & PROFILES)
- SEWER MANHOLE LABEL (SEE PROFILES)
- FIRE HYDRANT
- PRESSURE IRRIG. VALVE (4" GV)
- CULINARY WATER VALVE (10" GV)
- INSTALL STOP SIGN
- INSTALL STREET LIGHT
- INSTALL STREET SIGN
- PRESSURE IRRIG.
- CULINARY WATER
- SEWER PIPE PVC SDR-35
- STORM DRAIN PIPE ADS



SEWER/STORM DRAIN PLAN/PROFILE

STORM DRAIN KEYED NOTES

27. CONST. 22.0 L.F. 15" ADS @ S=4.55%
28. CONST. 2'X3' CATCH BASIN, TBC=5176.10, GRATE=5175.60, IE THRU=5172.10
29. CONST. 22.0 L.F. 15" ADS @ S=4.55%
30. CONST. 2'X3' CATCH BASIN, TBC=5197.33, GRATE=5196.83, IE OUT=5193.33
31. CONST. 22.0 L.F. 15" ADS @ S=4.55%
32. CONST. 2'X3' CATCH BASIN, TBC=5232.75, GRATE=5232.75, IE OUT=5228.75
33. CONST. 7.7 L.F. 15" ADS @ S=2.20%
34. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
35. CONST. 17.3 L.F. 15" ADS @ S=1.00%
36. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
37. CONST. 53.0 L.F. 15" ADS @ S=0.70%
38. CONST. 2'X3' CATCH BASIN, TBC=5302.44, GRATE=5301.94, IE OUT=5298.94
39. CONST. 12.5 L.F. 15" ADS @ S=4.24%
40. CONST. 2'X3' CATCH BASIN, TBC=5246.32, GRATE=5245.82, IE OUT=5242.32
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43. CONST. 12.5 L.F. 15" ADS @ S=1.00%
44. CONST. 2'X3' CATCH BASIN, TBC=5237.61, GRATE=5237.11, IE OUT=5233.70
45. CONST. 44.7 L.F. 15" ADS @ S=6.50%
46. CONST. 5' SDMH W/ GRATE TO COLLECT DRAINAGE, GRATE=5195.00, IE OUT=5175.00

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REVISIONS

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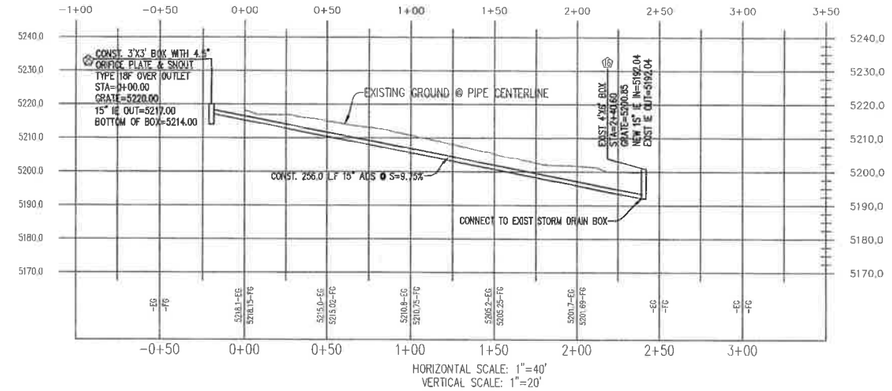
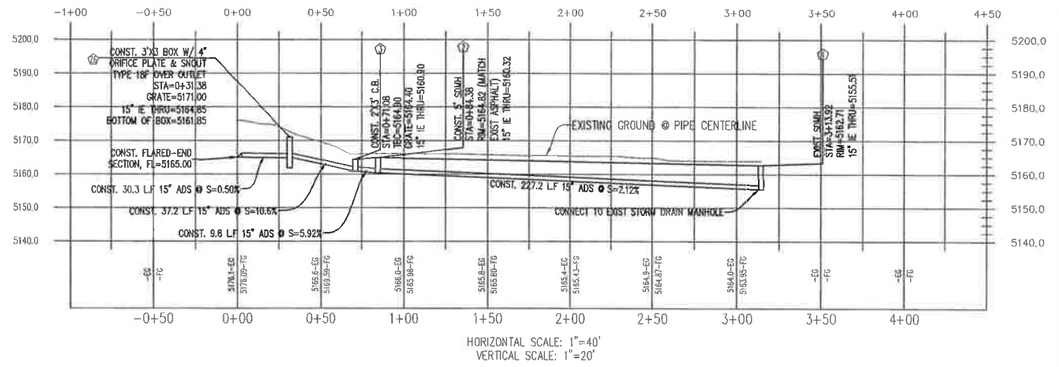
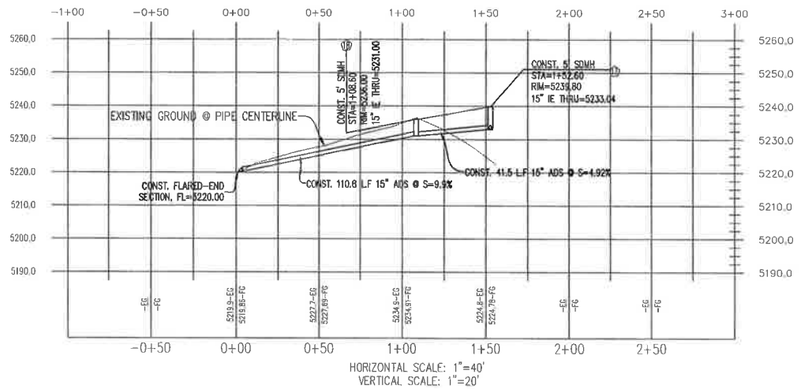
EAGLE POINTE SUBDIVISION

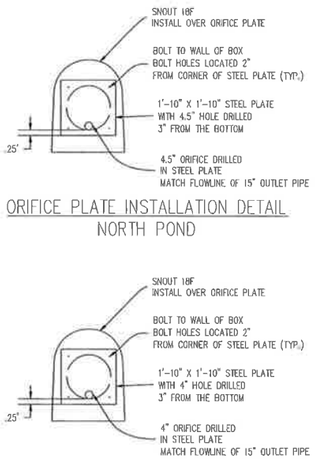
ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

Drawn by: G.J.Y.	VISTA POINT & SEWER/STORM DRAIN PLAN/PROFILE	Scale: 1"=40'
Designed by: G.J.Y.		Date: 09/03/14
Checked by: D.W.P.		PP4



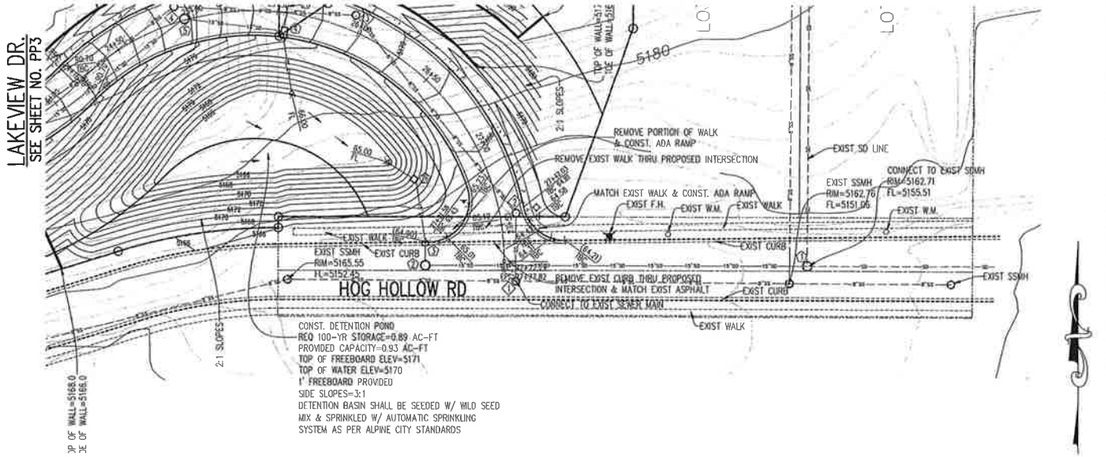




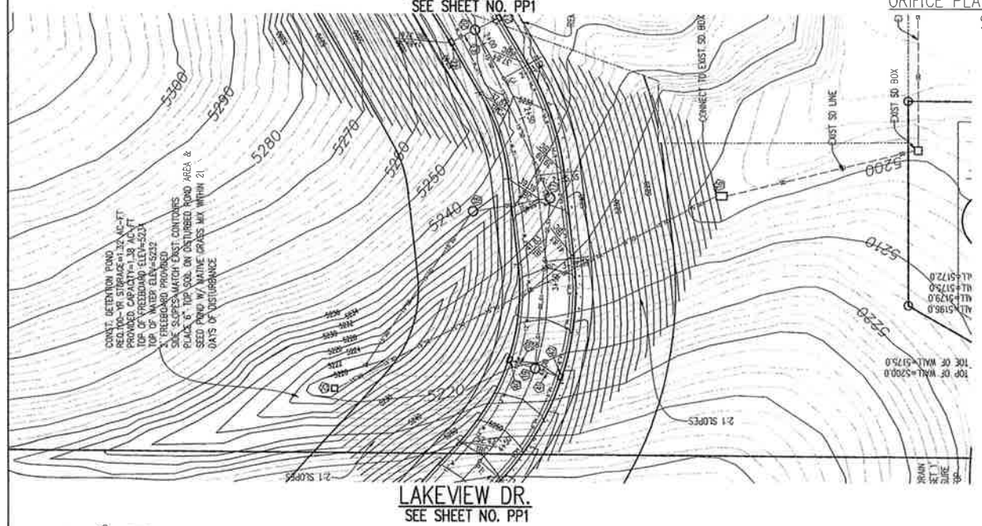


ORIFICE PLATE INSTALLATION DETAIL
NORTH POND

ORIFICE PLATE INSTALLATION DETAIL
SOUTH POND



STORM DRAIN-SOUTH POND PLAN/PROFILE



STORM DRAIN-NORTH POND PLAN/PROFILE

LEGEND

- STORM DRAIN KEYED NOTES (SEE GP1&2 & PROFILES)
- SEWER MANHOLE LABEL (SEE PROFILES)
- FIRE HYDRANT
- PRESSURE IRRIG. VALVE (4" GV)
- CULINARY WATER VALVE (10" GV)
- INSTALL STOP SIGN
- INSTALL STREET LIGHT
- INSTALL STREET SIGN
- PRESSURE IRRIG.
- CULINARY WATER
- SEWER PIPE PVC SDR-35
- STORM DRAIN PIPE ADS

STORM DRAIN KEYED NOTES

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34. CONST. DOUBLE 2'X3' CATCH BASIN, TBC=5269.84, GRATE=5269.34, IE OUT=5266.09
35. CONST. 17.3 L.F. 15" ADS @ S=1.00%
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45. CONST. 44.7 L.F. 15" ADS @ S=6.50%
46. CONST. 5' SDMH W/ GRATE TO COLLECT DRAINAGE, GRATE=5195.00, IE OUT=5175.00

40 20 0 40 80 120
Scale 1" = 40'

REVISIONS		
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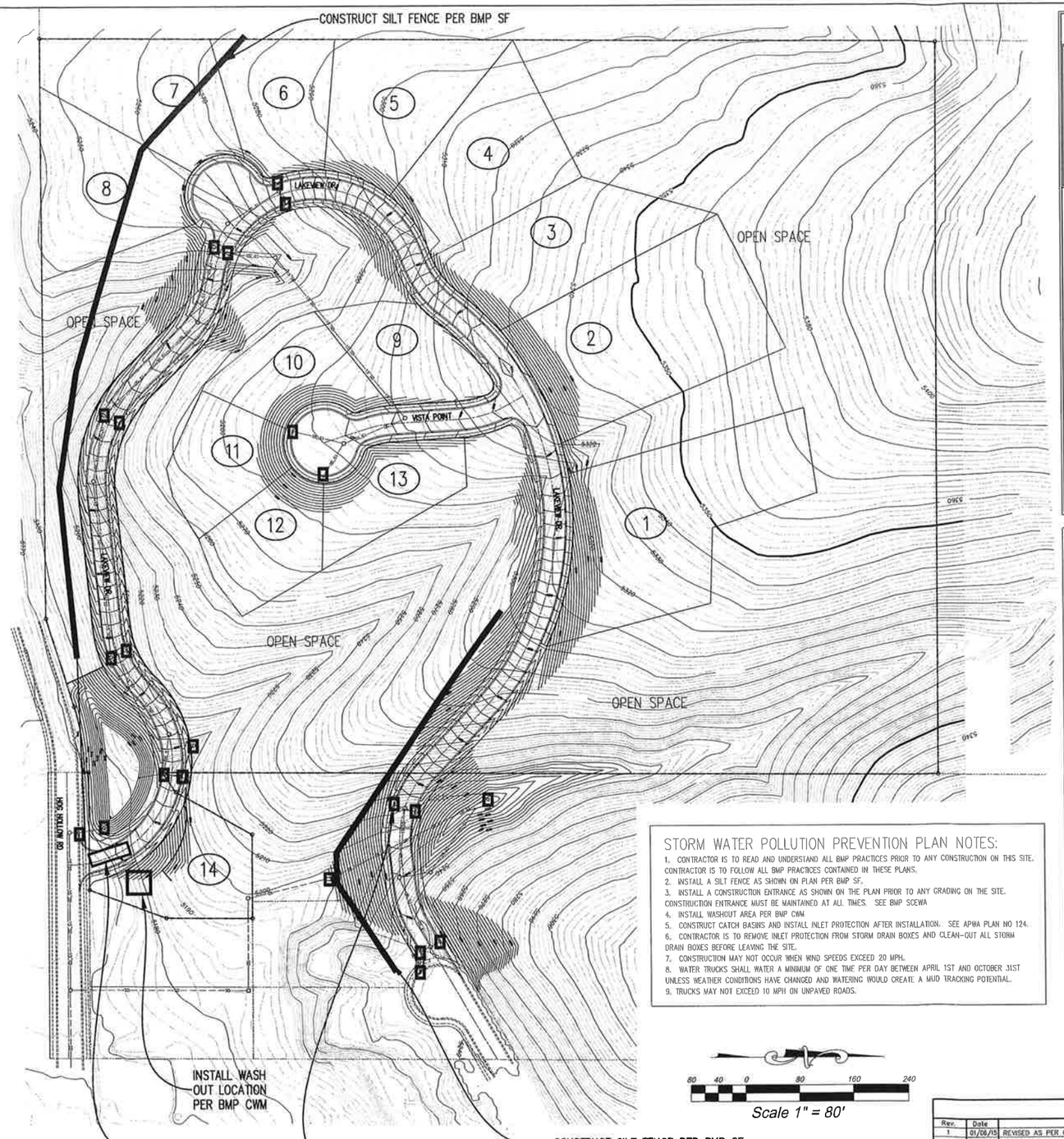
EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD./MATTERHORN DR. — UTAH

Drawn by: G.J.Y.	Scale: 1"=40'
Designed by: G.J.Y.	Date: 09/03/14
Checked by: D.W.P.	PP5

LAKEVIEW DR.
PLAN/PROFILE



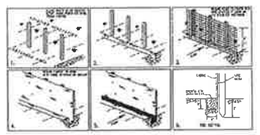
STORM WATER POLLUTION PREVENTION PLAN NOTES:

1. CONTRACTOR IS TO READ AND UNDERSTAND ALL BMP PRACTICES PRIOR TO ANY CONSTRUCTION ON THIS SITE. CONTRACTOR IS TO FOLLOW ALL BMP PRACTICES CONTAINED IN THESE PLANS.
2. INSTALL A SILT FENCE AS SHOWN ON PLAN PER BMP SF.
3. INSTALL A CONSTRUCTION ENTRANCE AS SHOWN ON THE PLAN PRIOR TO ANY GRADING ON THE SITE. CONSTRUCTION ENTRANCE MUST BE MAINTAINED AT ALL TIMES. SEE BMP SCEWA
4. INSTALL WASHOUT AREA PER BMP CWM
5. CONSTRUCT CATCH BASINS AND INSTALL INLET PROTECTION AFTER INSTALLATION. SEE APWA PLAN NO 124.
6. CONTRACTOR IS TO REMOVE INLET PROTECTION FROM STORM DRAIN BOXES AND CLEAN-OUT ALL STORM DRAIN BOXES BEFORE LEAVING THE SITE.
7. CONSTRUCTION MAY NOT OCCUR WHEN WIND SPEEDS EXCEED 20 MPH.
8. WATER TRUCKS SHALL WATER A MINIMUM OF ONE TIME PER DAY BETWEEN APRIL 1ST AND OCTOBER 31ST UNLESS WEATHER CONDITIONS HAVE CHANGED AND WATERING WOULD CREATE A MUD TRACKING POTENTIAL.
9. TRUCKS MAY NOT EXCEED 10 MPH ON UNPAVED ROADS.

80 40 0 80 160 240

Scale 1" = 80'

BMP: Silt Fence — SF



Description:
A temporary sediment barrier consisting of entrenched filter fabric stretched across and secured to supporting posts.

Application:
- Perimeter control: place barrier at downgradient limits of disturbance
- Sediment barrier: place barrier at toe of slope or soil stockpile
- Protection of existing waterways: place barrier near top of stream bank
- Inlet protection: place fence surrounding catchbasins

Installation/Application Criteria:
- Place posts 6 feet apart on center along contour (or use preassembled unit) and drive 2 feet minimum into ground. Excavate an anchor trench immediately upgradient of posts.
- Sedara wire mesh (14 gage min. With 6 inch openings) to upslope side of posts. Attach with heavy duty 1 inch long wire staples, tie wires or hog rings.
- Cut fabric to required width, unroll along length of barrier and drape over barrier. Secure fabric to mesh with twine, staples, or similar, with trailing edge extending into anchor trench.
- Backfill trench over filter fabric to anchor.

Limitations:
- Recommended maximum drainage area of 0.5 acre per 100 feet of fence
- Recommended maximum upgradient slope length of 150 feet
- Recommended maximum uphill grade of 2:1 (50%)
- Recommended maximum flow rate of 0.5 cfs
- Ponding should not be allowed behind fence

Maintenance:
- Inspect immediately after any rainfall and at least daily during prolonged rainfall.
- Look for runoff bypassing ends of barriers or undercutting barriers.
- Repair or replace damaged areas of the barrier and remove accumulated sediment.
- Reanchor fence as necessary to prevent shortcutting.
- Remove accumulated sediment when it reaches ½ the height of the fence.

Objectives
- ☐ Housekeeping Practices
- ☐ Contain Waste
- ☐ Minimize Disturbed Areas
- ☐ Stabilize Disturbed Areas
- ☒ Protect Slopes/Channels
- ☒ Control Site Perimeter
- ☒ Control Internal Erosion

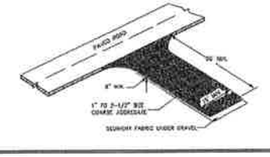
Targeted Pollutants
- ■ Sediment
- ☐ Nutrients
- ☐ Toxic Materials
- ☐ Oil & Grease
- ☐ Floatable Materials
- ☐ Other Waste

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

Implementation Requirements
- ■ Capital Costs
- ■ O&M Costs
- ■ Maintenance
- ☐ Training

■ High ■ Medium ☐ Low

BMP: Stabilized Construction Entrance and Wash Area — SCEWA



Description:
A stabilized pad of crushed stone located where construction traffic enters or leaves the site from or to paved surface. The area can be used to spray off vehicles before they leave the site.

Applications:
At any point of ingress or egress at a construction site where adjacent traveled way is paved. Generally applies to sites over 2 acres unless special conditions exist.

Installation/Application Criteria:
- Clear and grub area and grade to provide maximum slope of 2%
- Compact subgrade and place filter fabric if desired (recommended for entrances to remain for more than 3 months).
- Place coarse aggregate, 1 to 2-1/2 inches in size, to a minimum depth of 8 inches.
- Provide water to the area that can be used to spray off vehicles as needed to prevent the tracking of mud off of the construction site. This may not be needed during dry periods of work, but is needed when construction is proceeding under wet conditions.
- Provide berming as needed to prevent sediment laden wash water from entering storm water facilities or other water bodies, or leaving the site.

Limitations:
- Requires periodic top dressing with additional stones.
- Should be used in conjunction with street sweeping on adjacent public right-of-way.
- Must be situated such that waste water does not run off site.

Maintenance:
- Inspect daily for loss of gravel or sediment build-up.
- Inspect adjacent roadway for sediment deposit and clean by shoveling and sweeping.
- Repair entrance and replace gravel as required to maintain control in good working condition.
- Expand stabilized area as required to accommodate traffic and prevent erosion at driveways.

Objectives
- ■ Housekeeping Practices
- ☐ Contain Waste
- ☐ Minimize Disturbed Areas
- ☐ Stabilize Disturbed Areas
- ☐ Protect Slopes/Channels
- ☒ Control Site Perimeter
- ☐ Control Internal Erosion

Targeted Pollutants
- ■ Sediment
- ☐ Nutrients
- ☐ Toxic Materials
- ☐ Oil & Grease
- ☐ Floatable Materials
- ☐ Other Waste

- ☐ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

Implementation Requirements
- ☒ Capital Costs
- ☒ O&M Costs
- ☒ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Concrete Waste Management — CWM

Description:
Prevent or reduce the discharge of pollutants to storm water from concrete waste by conducting washout off-site, performing on-site washout in a designated area, and training employees and subcontractors.

Applications:
This best practice is applicable to all types of sites.

Installation/Application Criteria:
- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete or cement on-site.
- Perform washout of concrete trucks off-site or in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped on-site, except in designated areas.
- When washing concrete to remove fine particles and expose the aggregate, avoid creating runoff by draining the water within a formed or level area. (See Earth Berm Barrier information sheet.)
- Train employees and subcontractors in proper concrete waste management.

Limitations:
- Off-site washout of concrete wastes may not always be possible.

Maintenance:
- Inspect subcontractors to ensure that concrete wastes are being properly managed.
- If using a temporary pit, dispose hardened concrete on a regular basis.

Objectives
- ☐ Housekeeping Practices
- ☒ Contain Waste
- ☐ Minimize Disturbed Areas
- ☐ Stabilize Disturbed Areas
- ☐ Protect Slopes/Channels
- ☐ Control Site Perimeter
- ☐ Control Internal Erosion

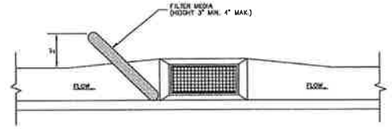
Targeted Pollutants
- ☐ Sediment
- ☐ Nutrients
- ☐ Toxic Materials
- ☐ Oil & Grease
- ☐ Floatable Materials
- ☒ Other Waste

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

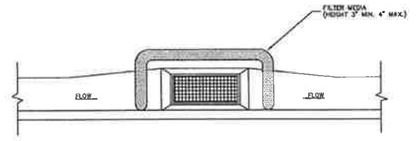
Implementation Requirements
- ☐ Capital Costs
- ☐ O&M Costs
- ☒ Maintenance
- ☒ Training

■ High ■ Medium ☐ Low

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.



ON-GRADE INLET PROTECTION DETAIL



DROP INLET PROTECTION DETAIL

Inlet protection - gravel sock

Plan No. **124**

Drawing 1 of 3

September 2008

REVISIONS		
Rev.	Date	Description
1	01/06/15	REVISED AS PER CITY COMMENTS DATED 9/26/14

Developer:
Capital Property Management Series Eagle Pointe
P.O. Box 1212
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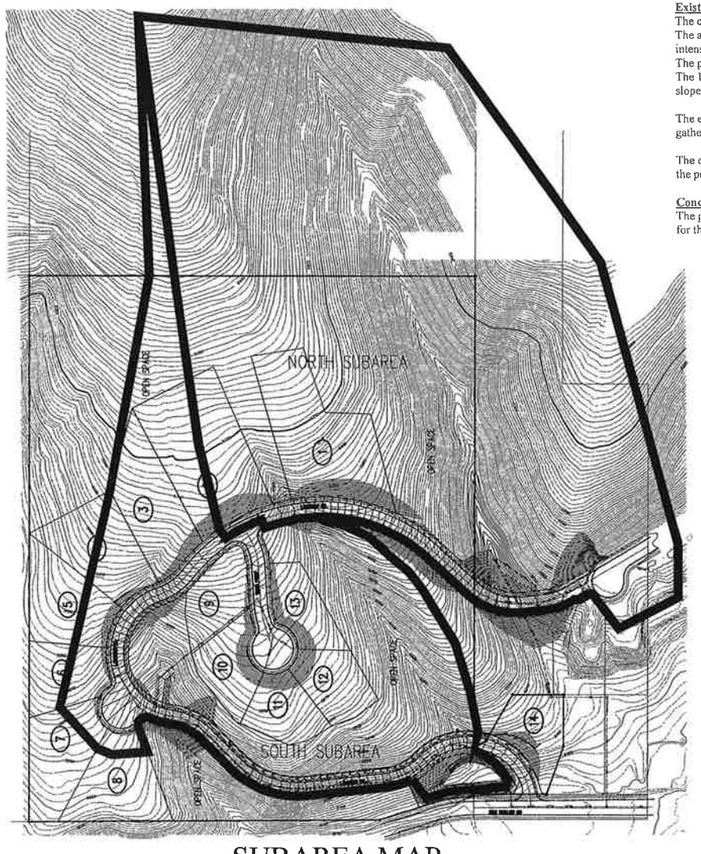
EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

Drawn by: G.J.Y.	EROSION CONTROL PLAN	Scale: 1"=80'
Designed by: G.J.Y.		Date: 09/03/14
Checked by: D.W.P.		SWPP1



SUBAREA MAP

Eagle Pointe Subdivision

Storm Drain Discussion

November 14, 2014

Introduction:
This subdivision is located at approximately Hog Hollow Road and Matterhorn Drive. The storm water from this site will be detained in two separate basins with each having a controlled release into the existing storm drain system in Hog Hollow Road. The calculations for the detention volume required are based on the NOAA rainfall data for this area for the 100-year storm event with an allowable release rate of 0.07 cfs per acre.

Detention Calculations:
The subdivision was divided into two subareas – North and South. These subareas area shown on the attached 'Subarea Map'. As shown on the 'Subarea Map', off-site hillside area flowing into the subdivision was included in the storm water calculations. The required detention volumes for each of the basins in this subdivision are shown on the attached spreadsheets.

The volume required for the North Pond was calculated to be 57,407 c.f. or 1.32 acre-feet. The volume required for the South Pond was calculated to be 38,618 c.f. or 0.89 acre-feet.

The proposed North Pond has a capacity of 59,428 c.f. of 1.36 acre-ft with an additional 2' of freeboard provided. The proposed South Pond has a capacity of 39,535 c.f. of 0.91 acre-ft acres with an additional 1' of freeboard provided.

Orifice Sizing:
The orifice calculations are shown on the attached spreadsheets. The orifice size for the North Pond was calculated to be 4.5". The orifice size for the South Pond was calculated to be 4".

Pipe Capacity:
Pipe capacities were sized for the 10-year storm event. The intensity of the 10-year storm event with a 60 min. time of concentration is 0.94 in/hr. The peak flow for the North Subarea is 9.11 cfs. The peak flow for the South Subarea is 5.80 cfs.

The 15" storm drain pipe carrying flows to the proposed detention basins are designed at a minimum slope of 4.9%. The capacity of 15" ADS at a slope of 4.9% is 15.5 cfs.

Existing Drainage Swales:
The culvert for the existing south drainage swale was sized for the 100-year storm event. The area contributing to the swale is 4.52 acres (C-value of 0.3 was used in calcs). The intensity of the 100-year storm event with a 30 min. time of concentration is 2.95 in/hr. The peak flow for the existing south drainage swale is 4.00 cfs.
The 15" storm drain pipe carrying flows from the storm drain manhole is designed at a slope of 6.5%. The capacity of 15" ADS at a slope of 6.5% is 17.8 cfs.

The existing north drainage swale as shown by the contours on the subarea map does not gather a significant area. This area will drain directly onto the proposed road.

The exist swale west of lots 9 & 10 is not a significant area and will be directed around the proposed gravel drive and drain directly onto the proposed road.

Conclusion:
The proposed detention basins and pipes are adequate to handle storm water requirements for this area.

Eagle Pointe - North Pond
100-Year Storm Water Calculations
14-Nov-14

The storm drain calculations were performed using the rational method.

Hydrologic Calculations

CA CALCULATION

	C	Area (sf)	C * A
Roadway Area	0.85	56380	47923
Lot Area	0.4	99250	39700
Hillside Area	0.3	1114891	334467
Total CA		1270521	422090

Total Acres: 29.17
Qallow = (0.07 cfs/acre)(29.17 acres) = 2.04 cfs

Detention calculations

Lapsed Time (min.)	Rainfall intensity (in/hr)	Total Rainfall (in)	Rainfall Volume (cu.ft.)	Release Volume (cu.ft.)	Required Storage (cu.ft.)
A	B	C	D	E	F
5	6.97	0.58	20401	613	19789
10	5.30	0.88	30953	1225	29728
15	4.38	1.09	38340	1838	36502
30	2.95	1.47	51706	3675	48031
60	1.82	1.82	64017	7350	56667
120	1.02	2.05	72107	14700	57407
180	0.71	2.14	75273	22050	53222
360	0.41	2.44	85825	44101	41724
720	0.26	3.08	108337	88201	20135
1440	0.14	3.40	119592	176403	-56811

Required Detention Storage = 57,407 cf or 1.32 acre-ft

Notes:
A, B, & C are based upon NOAA Atlas 14 Point Precipitation Frequency Estimates for the Alpine area
D = C / (12 inches/foot) x total acreage of site x 43,560 sf/acre x run-off coefficient, where Q=CIA and V=CiA
E = an allowable release rate (0.07 cfs/acre) x A x 60 sec.
F = D - E to determine storage volume

Orifice sizing

Q = C x A x (2 x g x h)^1/2, where

Q =	2.04	cfs	the maximum allowable release rate x Area (acres)
C =	0.6		coefficient of discharge for sharp-edged, submerged orifice
A =		in^2	unknown cross-sectional orifice area
g =	32.2	ft/s^2	acceleration of gravity
Head, h=	15	ft	top of water surface to center of orifice outlet

Maximum orifice design requirements - to ensure that maximum release rate is not exceeded.

0.1095 square foot cross-sectional orifice area
4.48 inch diameter of circular orifice

Detention pond

Elevation	Volume (cf)	
5234	85,629	2' foot of freeboard
5232	59,428	Top of water surface
5230	38,672	
5228	23,184	
5226	12,540	
5224	5,676	
5222	1,703	
5220	0	

Eagle Pointe - South Pond
100-Year Storm Water Calculations
14-Nov-14

The storm drain calculations were performed using the rational method.

Hydrologic Calculations

CA CALCULATION

	C	Area (sf)	C * A
Roadway Area	0.85	107958	91764
Lot Area	0.4	217318	86927
Landscape Area	0.15	9994	1499
Hillside Area	0.3	295217	88565
Total CA		630487	268756

Total Acres: 14.47
Qallow = (0.07 cfs/acre)(14.47 acres) = 1.01 cfs

Detention calculations

Lapsed Time (min.)	Rainfall intensity (in/hr)	Total Rainfall (in)	Rainfall Volume (cu.ft.)	Release Volume (cu.ft.)	Required Storage (cu.ft.)
A	B	C	D	E	F
5	6.97	0.58	12990	304	12686
10	5.30	0.88	19709	608	19101
15	4.38	1.09	24412	912	23500
30	2.95	1.47	32923	1824	31099
60	1.82	1.82	40761	3647	37114
120	1.02	2.05	45912	7295	38618
180	0.71	2.14	47928	10942	36986
360	0.41	2.44	54647	21885	32762
720	0.26	3.08	68981	43769	25211
1440	0.14	3.40	76147	87539	-11391

Required Detention Storage = 38,618 cf 0.89 acre-ft

Notes:
A, B, & C are based upon NOAA Atlas 14 Point Precipitation Frequency Estimates for the Alpine area
D = C / (12 inches/foot) x total acreage of site x 43,560 sf/acre x run-off coefficient, where Q=CIA and V=CiA
E = an allowable release rate (0.07 cfs/acre) x A x 60 sec.
F = D - E to determine storage volume

Orifice sizing

Q = C x A x (2 x g x h)^1/2, where

Q =	1.01	cfs	the maximum allowable release rate x Area (acres)
C =	0.6		coefficient of discharge for sharp-edged, submerged orifice
A =		in^2	unknown cross-sectional orifice area
g =	32.2	ft/s^2	acceleration of gravity
Head, h=	6	ft	top of water surface to center of orifice outlet

Maximum orifice design requirements - to ensure that maximum release rate is not exceeded.

0.0859 square foot cross-sectional orifice area
3.97 inch diameter of circular orifice

Detention pond

Elevation	Volume (cf)	
5172	51,124	1' foot of freeboard
5171	39,535	Top of water surface
5170	29,423	
5169	20,667	
5168	13,166	
5167	6,828	
5166	1,566	

REVISIONS

Rev.	Date	Description
1	01/06/15	REVISED AS PER CITY COMMENTS DATED 9/26/14

Developer:
Capital Property Management Series Eagle Pointe
P.O. Box 1212
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EXCEL ENGINEERING
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EAGLE POINTE SUBDIVISION

ALPINE CITY — HOG HOLLOW RD/MATTERHORN DR. — UTAH

Drawn by: G.L.Y.
Designed by: G.L.Y.
Checked by: D.W.P.

STORM DRAIN CALCULATIONS

Scale: NTS
Date: 09/03/14
D1

NORTH

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

PROPERTY DESCRIPTION

COMMENCING AT THE NORTHEAST CORNER OF SECTION 23, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 00°21'07" WEST ALONG THE SECTION LINE 1249.58 FEET; THENCE ALONG THE ARC OF A 324.00 FOOT RADIUS CURVE TO THE LEFT 97.46 FEET (CHORD BEARS SOUTH 81°22'49" WEST 97.09 FEET); THENCE SOUTH 72°45'48" WEST 135.67 FEET; THENCE SOUTH 89°46'49" WEST 845.76 FEET; THENCE NORTH 00°21'07" EAST 1311.28 FEET; THENCE SOUTH 89°48'06" EAST 1070.95 FEET TO THE POINT OF BEGINNING.

AREA = 31.975 ACRES

AREA = 31.975 ACRES

SLOPE ANALYSIS

Color	Range Beg.	Range End	Percent	Area
	10.00	15.00	48.3	312359.44
	15.00	20.00	31.5	203647.71
	20.00	25.00	14.7	95292.86
	25.00	30.00	3.8	24602.53
	30.00	60.00	1.7	11085.93

JUDCO
PLANNING.SURVEYING.ENGINEERING
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LINDON, UTAH 84042
(801) 367-7409
judco1@gmail.com

NO	REVISIONS	BY	DATE

SCALE 24x36:1"=80'
SCALE 11x17:1"=160'
DRAWN: MBJ
DESIGN: MBJ
CHECKED: MBJ
DATE: 11-14-14

SLOPE ANALYSIS

EAGLE POINTE SUBDIVISION

LOCATED IN SECTION 23, T4S, R1E, SLB&M

ALPINE, UTAH

SHEET 1 OF 1

ALPINE CITY COUNCIL AGENDA

SUBJECT: FY 2015-2016 Budget Discussion

FOR CONSIDERATION ON: February 10, 2015

PETITIONER: Rich Nelson, City Administrator

ACTION REQUESTED BY PETITIONER: For Council discussion and direction to staff in the development of the FY 2015-2016 City Budget.

INFORMATION: The following information is attached:

1. **Budget Item Recommendations. A list of important budget items to consider in the development of next year's budget. This list is from Council recommendations and from staff recommendations.**

2. **5-Year Financial Plan. This is the plan that shows what City staff think will happen during the next 5 years; what assumptions the staff is using to make the plan; and where the staff thinks the City is headed.**

RECOMMENDED ACTION: *That the Council review the information included in the packet and make recommendations to staff on the direction that they want staff to follow in the development of the FY 2015-2016 City Budget.*

Budget Items
Fiscal Year 2015-2016

Proposed Items

1. Go out for bid for the outside audit.
2. Go out for bid for inspection services and plan checks.
3. Hire an additional front office staff person.
4. Install a sample number of electronic-read culinary and pressurized irrigation meters.
5. Refurbish the bell tower.
6. Impact fee expenditure plan.
7. Public Works projects.
8. Increase in burial fees.
9. Burgess Park tennis courts redo (add pickle ball).
10. Deer remediation.
11. GASB 68.
12. Increase culinary water base rate by $1.
13. Stay in Utah Lake Commission or not.
14. Change water leak policy.
15. Text amendment fee.
16. Parking lot/restroom/fence/entrance signage – Lambert Park.
17. Increase City funds in capital improvement fund to $500,000.
18. Continue to follow the equipment replacement schedule.
19. Begin using funds over the fund balance goals to start maintenance projects.

Alpine City

5-Year Financial Projections

Part One – Assumptions

The key to the creation of a 5-year financial plan are the assumptions used to create the plan. Below is listed the assumptions that will be the drivers of the plan.

1. Assume 2 new permanent full-time new staff positions in the next 5 years.
2. Assume increased use of part-time workers by Public Works.
3. Assume 2% salary increase a year.
4. Assume retirement will go up by 0% to 1% a year for 3 years then go to 2% for the last two years.
5. Assume GASB 68 will require the City to set aside more assets for retirement.
6. Assume that all replacement hires in Public Works will be an entry level position.
7. Assume that health care costs will continue to increase at 2% a year and that Alpine will change its health care system by 2018.
8. Assume that we continue on the same capital equipment replacement schedule as we have.
9. Assume we will have 37 new homes per year for the next 5 years.
10. Assume the assessed valuations for the homes in Alpine has reached bottom and the assessed valuation of the properties will increase 3% to 5% a year for the next 5 years and that property tax will only increase based on new growth.
11. Assume TNT for the next 5 years to collect redemptions.
12. Assume one new soccer park or a new public works building and staging area will be constructed.
13. Assume a gradual increase in WC, insurance, FICA, etc.
14. Assume police and fire will hire an additional officer each in the next 5 years.
15. Assume police and fire and dispatch will grow 1 - 2% a year for the next 5 years.
16. Assume garbage rates will increase 2% a year and that they will be covered by rate increases.
17. Assume sewer rates will increase by 2% a year and they will be covered by rate increases.
18. Assume that the City will go to a mandatory city wide green waste garbage pickup program.
19. Assume that the City will pick up the total amount of fees for telecommunications and revenue will increase by 2% a year from telecommunications fees.
20. Assume a yearly 1 to 1.5% increase in utility rates for PI and storm drain based on a yearly CPI based rate increase.
21. Assume that culinary water rates will increase based on the water rates study of the City Engineer and the base rate will increase by at least $1 every year for the next 3 years.
22. Assume that B&C road funds remain flat for the next year but will increase by 5% a year for 4 years.
23. Assume no new bonding.

24. Assume Alpine and Highland will jointly hire a part time emergency preparedness coordinator.
25. Assume that a new meter reading system for culinary and pressurized irrigation will be installed.
26. Assume a new PI reservoir will be constructed.
27. Assume that land for a new public works facility will be purchased.

ALPINE CITY COUNCIL AGENDA

SUBJECT: Appeal Authority Amendment

FOR CONSIDERATION ON: 10 February 2015

PETITIONER: Staff

ACTION REQUESTED BY PETITIONER: Adopt Ordinance No. 2015-01

APPLICABLE STATUTE OR ORDINANCE: Article 2.3 (Appeal Authorities)

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

The proposed amendment would be eliminating the Board of Adjustment. The Board of Adjustment is not needed often for variances. The appointed Hearing Officer would handle anything that requires an Appeal Authority.

PLANNING COMMISSION MOTION:

David Fotheringham moved to recommend approval to the City Council to Amend Article 2.3 Appeal Authority Ordinance Amendment.

Judi Pickell seconded the motion. The motion was unanimous and passed with 6 Ayes and 0 Nays. Bryce Higbee, Jason Thelin, David Fotheringham, Steve Cosper, Steve Swanson and Judi Pickell all voted Aye.

ARTICLE 2.3 APPEAL AUTHORITY (Ord. 98-02:1/13/98, Amended Ord. 2006-17, 11/14/06; Ord. 2013-03, 3/12/13)

2.3.1 APPEAL AUTHORITY

2.3.1.1 There is hereby created an Appeal Authority, consisting of an appointed Hearing Officer ~~and a Board of Adjustment~~, which shall act in a quasi-judicial manner to hear appeals regarding the interpretation or application of Alpine City land use ordinances.

2.3.2 HEARING OFFICER

2.3.2.1 **Establishment and Appointment of Hearing Officer.** There is hereby created the officer of Land Use Hearing Officer. The Alpine City Hearing Officers shall be appointed by the mayor with the advice and consent of the Council. The individual appointed as a hearing officer shall be a person who is trained in or familiar with the disciplines of planning or law.

2.3.2.2 **Term of Office.** The hearing officer shall serve at the pleasure of the City for an indefinite term. The Land Use Hearing Officer may be dismissed from officer by the mayor, with the advice and consent of the council, with or without cause at anytime.

2.3.2.3 **Duties and Powers.** The Land Use Hearing Officer, as the Appeal Authority, shall

1. hear and decide appeals from decisions granting or denying reasonable accommodations for persons with disabilities from land use regulations; and
2. hear and decide appeals from land use decisions applying or interpreting the land use ordinances.

~~**2.3.2 BOARD OF ADJUSTMENT**~~

~~**2.3.2.1** **Establishment and Organization of Board of Adjustment.** The Board of Adjustment shall consist of five members to be appointed by the Mayor with the advice and consent of the City Council, and two alternate members who shall sit as members of the Board at the call of the Chair of the Board of Adjustment in the temporary absence of a regular member. At least three members of this Board must be present to form a quorum. The Board of Adjustment shall organize and elect a Chair and adopt rules for its activities in accordance with this Code. The Rules shall include at a minimum that the Board:~~

~~1. shall notify each of its members of any meeting or hearing;~~
~~2. provide each of its members with the same information and access to City resources as any other member;~~
~~3. convene only if a quorum of its members is present; and~~
~~4. act only upon the vote of a majority of its convened members.~~

~~Meetings of the Board shall be held at the call of the Chair and at such times as the Board may determine. All meetings of the Board shall be open to the public. The concurring vote of three members of the Board of Adjustment is necessary to reverse any order, requirement, decision, or determination of any administrative official or agency, or to decide in favor of the appellant.~~

~~**2.3.2.2** **Term of Office.** Each member and alternate member shall serve for a term of five years, provided that the term of members of the first Board shall be such that the term of one member shall expire each year. The term of office of each member shall commence the first day of February. Any vacancy occurring on said Board shall be filled in the same manner as an original appointment for the unexpired term. The Mayor, with the advice and consent of the City Council, may remove any member of the Board of Adjustment for~~

~~cause if written charges against the member are filed with the Mayor and after a public hearing, if such hearing is requested by the member.~~

~~**2.3.2.3 Duties and Powers.** The Board of Adjustment, as the Appeal Authority, shall~~

~~1. hear and decide variances from the terms of the land use ordinances, and~~
~~2. hear and decide appeals from land use decisions applying or interpreting the land use ordinances.~~

2.3.3 VARIANCES

1. Any person or entity desiring a waiver or modification of the requirements of a land use ordinance as applied to a parcel of property that he owns, leases, or in which he holds some other beneficial interest may apply to the ~~Board of Adjustment~~ Hearing Officer for a variance from the terms of the ordinance.

2. An appeal for a variance shall be filed with the Zoning Administrator.

3. The ~~Board of Adjustment~~ Hearing Officer shall fix a reasonable time for the hearing of the appeal, and give at least ten (10) days public notice thereof, as well as due notice to the parties in interest and adjacent property owners within 300 feet, and shall decide the same within a reasonable time. Upon the hearing, any party may appear in person, by agent, or by attorney.

4. The ~~Chair, or in his or her absence the acting Chair,~~ Hearing Officer may administer oaths and compel the attendance of witnesses.

5. The ~~Board~~ Hearing Officer shall ~~keep~~ cause minutes of ~~its~~ his/her proceedings to be kept, ~~showing the vote of each member upon each question, or if absent or failing to vote~~, indicating such fact, and shall ~~keep~~ cause records or ~~its~~ his/her examinations and other official actions to be kept; all of which shall be immediately filed ~~in the office of the Board~~ at Alpine City Hall and shall be public record.

6. Decisions of the ~~Board of Adjustment~~ Hearing Officer regarding variances become effective at the meeting in which the decision is made, unless a different time is designated in the ~~Board's~~ Officer's rules or at the time the decision is made.

7. The ~~Board of Adjustment~~ Hearing Officer may grant a variance only if:

   (1) Literal enforcement of the ordinance would cause an unreasonable hardship for the applicant that is not necessary to carry out the general purpose of the land use ordinances;

   (2) There are special circumstances attached to the property that do not generally apply to other properties in the same zone;

   (3) Granting the variance is essential to the enjoyment of a substantial property right possessed by other property in the same zone;

   (4) The variance will not substantially affect the general plan and will not be contrary to the public interest; and

   (5) The spirit of the land use ordinance is observed and substantial justice done.

8. In determining whether or not enforcement of the land use ordinance would cause unreasonable hardship under Subsection 2.3.3 #7, the ~~Board of Adjustment~~ Hearing Officer may not find an unreasonable hardship unless the alleged hardship:

(1) Is located on or associated with the property for which the variance is sought; and

(2) Comes from circumstances peculiar to the property, not from conditions that are general to the neighborhood.

9. In determining whether or not enforcement of the land use ordinance would cause unreasonable hardship under Subsection 2.3.3 #7, the ~~Board of Adjustment~~ Hearing Officer may not find an unreasonable hardship if the hardship is self-imposed or economic.

10. In determining whether or not there are special circumstances attached to the property under Subsection 2.3.3 #7, the ~~Board of Adjustment~~ Hearing Officer may find that special circumstances exist only if the special circumstances:

(1) Relate to the hardship complained of; and

(2) Deprive the property of privileges granted to other properties granted in the same zone.

11. The applicant shall bear the burden of proving that all of the conditions justifying a variance have been met.

12. Variances run with the land.

13. The ~~Board of Adjustment~~ Hearing Officer may not grant a use variance.

14. In granting a variance, the ~~Board of Adjustment~~ Hearing Officer may impose additional requirements on the applicant that will:

(1) Mitigate any harmful effects of the variance; or

(2) Serve the purpose of the standard or requirement that is waived or modified.

2.3.4 APPEALS FROM LAND USE DECISIONS

2.3.4.1 Standards for Review of Appeals. The Hearing Officer shall hear and decide appeals from land use decisions applying or interpreting the land use ordinances, and shall comply with the following standards:

1. The applicant, a board or officer of the City, or any person adversely affected by the Land Use Authority's decision administering or interpreting a land use ordinance may appeal that decision to the Hearing Officer by alleging that there is error in any order, requirement, decision, or determination made by the Land Use Authority in the administration or interpretation of the land use ordinance.

2. The appeal must be filed within ten (10) days from the date of such decision by filing with the Zoning Administrator and with the Hearing Officer a written notice of appeal specifying the grounds thereof. The Zoning Administrator shall forthwith transmit to the Hearing Officer all the papers constituting the record upon which the action appealed from was taken.

3. An appeal filed in accordance with this section stays all proceedings in the appeal action, unless the Zoning Administrator certifies to the Hearing Officer, after the notice of appeal shall have been filed with him, that by reason of facts stated in the certificate a stay would, in his opinion, cause imminent peril to life or property. In such case, proceedings shall not be stayed otherwise than by restraining order which may

be granted by the Hearing Officer or by the district court on application and notice and on due cause shown.

4. The Hearing Officer shall fix a reasonable time for the hearing of any appeal within thirty (30) days of the date of filing such appeal with the Zoning Administrator.

5. Proceedings and hearings before the Hearing Officer shall be public and held pursuant to rules adopted by the City and in conformance with the Utah Open and Public Meetings Act and with the general principles of due process. The person or entity filing the appeal may appear at such hearing in person, by agent, or by an attorney of his/her choice and may present to the Hearing Officer any evidence or argument to support the contentions on appeal. The Land Use Authority that rendered the decision that is being appealed shall appear and present any evidence or argument it finds necessary to justify its decision. The Hearing Officer shall cause a record of his/her proceedings to be kept and shall make written findings and conclusions of all of his/her decisions.

6. The appellant has the burden of proving that the Land Use Authority erred.

7. The Hearing Officer shall presume that the decision of the Land Use Authority that is being appealed is correct, and shall only modify the decision if there is substantial evidence presented at the hearing of the Hearing Officer that the Land Use Authority erred in its application or interpretation of the land use ordinances.

8. Only decisions applying and interpreting the adopted land use ordinances of the City or requesting reasonable accommodations for persons with disabilities may be appealed to the Hearing Officer. A person may not appeal, and the Hearing Officer, in his/her duties as an Appeal Authority, may not consider, any appeal of a legislative decision of the City Council, such as a decision to adopt or amend any land use (zoning or subdivision) ordinance of the City.

9. Appeals may not be used to waive or modify the terms of requirements of the land use ordinance, except as specifically allowed by the ordinance.

10. The Hearing Officer shall render his/her decision on the appeal within fifteen (15) days from the date that the hearing is held. The Officer may affirm, wholly or partly, or may modify the order, requirement, decision or determination of the Land Use Authority.

11. A decision of the Hearing Officer takes effect on the date when the Officer issues a written decision, or as otherwise provided by ordinance. A written decision, or other event as provided by ordinance, constitutes a final decision under Subsection 10-9a-802(2)(a) or a final action under Subsection 10-9a-801(4) of the Utah State Code.

2.3.5 DISTRICT COURT REVIEW OF APPEAL AUTHORITY DECISIONS.

1. Any person adversely affected by any decision of the Hearing Officer may petition the district court for a review of the decision. However, no person may challenge in district court the City's land use decision until that person has exhausted the person's administrative remedies as provided in Utah State Code Title 10, Chapter 9a, Part 7, Appeal Authority and Variances, if applicable.

2. In the petition, the petitioner may only allege that the Hearing Officer's decision was arbitrary, capricious, or illegal.

3. (a) The petition is barred unless it is filed within 30 days after the Hearing Officer's decision is

final.

(b)(i) The time under 3(a) to file a petition is tolled from the date a property owner files a request for arbitration of a constitutional taking issue with the private property ombudsman under Utah Code Annotated 13-43-204 until 30 days after:

A. the arbitrator issues a final award; or

B. the private property ombudsman issues a written statement under Utah Code Annotated 13-43-204(3)(b) declining to arbitrate or to appoint an arbitrator.

(ii) A tolling under Subsection 3(b)(i) operates only as to the specific constitutional taking issues that are the subject of the request for arbitration filed with the private property ombudsman by a property owner.

(iii) A request for arbitration filed with the private property ombudsman after the time under Subsection 3(a) to file a petition has expired does not affect the time to file a petition.

4. (a) The Hearing Officer shall transmit to the district court the record of his/her proceedings including its minutes, findings, orders, and if available, a true and correct transcript of its proceedings.

   (b) If the proceeding was taped, a transcript of that tape recording is a true and correct transcript for purposes of this subsection.

5. (a)(i) If there is a record, the district court's review is limited to the record provided by the Hearing Officer.

   (ii) The court may not accept or consider any evidence outside the Hearing Officer record unless that evidence was offered to the Officer and the court determines that it was improperly excluded by the Hearing Officer.

   (b) If there is no record, the court may call witnesses and take evidence.

6. The court shall affirm the decision of the Hearing Officer if the decision is supported by substantial evidence in the record and is not arbitrary, capricious, or illegal.

7. (a) The filing of a petition does not stay the decision of the Hearing Officer.

   (b)(i) Before filing a petition under this section or a request for mediation or arbitration of a constitutional taking issue under Utah Code Annotated 13-43-204, the aggrieved party may petition the Hearing Officer to stay his/her decision.

   (ii) Upon receipt of a petition to stay, the Hearing Officer may order its decision stayed pending district court review if the Board of Adjustment finds it to be in the best interest of the City.

   (iii) After a petition is filed under this section or a request for mediation or arbitration of a constitutional taking issue is filed under Utah Code Annotated 13-43-204, the petitioner may seek an injunction from the district court staying the Hearing Officer's decision.

ORDINANCE NO. 2015-01

AN ORDINANCE ADOPTING AMENDMENTS TO ARTICLE 2.3 OF THE ALPINE CITY DEVELOPMENT CODE RELATING TO THE ELIMINATION OF THE BOARD OF ADJUSTMENT.

WHEREAS, The City Council of Alpine, Utah has deemed it in the best interest of Alpine City to amend the ordinance regarding the elimination of the Board of Adjustment; and

WHEREAS, the Alpine City Planning Commission has reviewed the proposed Amendments to the Development Code, held a public hearing, and has forwarded a recommendation to the City Council; and

WHEREAS, the Alpine City Council has reviewed the proposed Amendments to the Development Code:

NOW, THEREFORE, BE IT ORDAINED BY THE ALPINE CITY COUNCIL THAT:

The amendments to Article 2.3 contained in the attached document will supersede Article 2.3 as previously adopted.

This Ordinance shall take effect upon posting.

Passed and dated this 10th day of February 2015.

_____

Don Watkins, Mayor

ATTEST:

_____

Charmayne G. Warnock, Recorder

ARTICLE 2.3 APPEAL AUTHORITY (Ord. 1998-02, 01/13/98, Ord. 2006-17, 11/14/06; Ord. 2013-03, 03/12/13; Ord. 2015-01, 02/10/15)

2.3.1 APPEAL AUTHORITY

2.3.1.1 There is hereby created an Appeal Authority, consisting of an appointed Hearing Officer, which shall act in a quasi-judicial manner to hear appeals regarding the interpretation or application of Alpine City land use ordinances.

2.3.2 HEARING OFFICER

2.3.2.1 Establishment and Appointment of Hearing Officer. There is hereby created the officer of Land Use Hearing Officer. The Alpine City Hearing Officers shall be appointed by the mayor with the advice and consent of the Council. The individual appointed as a hearing officer shall be a person who is trained in or familiar with the disciplines of planning or law.

2.3.2.2 Term of Office. The hearing officer shall serve at the pleasure of the City for an indefinite term. The Land Use Hearing Officer may be dismissed from officer by the mayor, with the advice and consent of the council, with or without cause at anytime.

2.3.2.3 Duties and Powers. The Land Use Hearing Officer, as the Appeal Authority, shall:

1. hear and decide appeals from decisions granting or denying reasonable accommodations for persons with disabilities from land use regulations; and
2. hear and decide appeals from land use decisions applying or interpreting the land use ordinances.

2.3.3 VARIANCES

1. Any person or entity desiring a waiver or modification of the requirements of a land use ordinance as applied to a parcel of property that he owns, leases, or in which he holds some other beneficial interest may apply to the Hearing Officer for a variance from the terms of the ordinance.

2. An appeal for a variance shall be filed with the Zoning Administrator.

3. The Hearing Officer shall fix a reasonable time for the hearing of the appeal, and give at least ten (10) days public notice thereof, as well as due notice to the parties in interest and adjacent property owners within 300 feet, and shall decide the same within a reasonable time. Upon the hearing, any party may appear in person, by agent, or by attorney.

4. The Hearing Officer may administer oaths and compel the attendance of witnesses.

5. The Hearing Officer shall cause minutes of his/her proceedings to be kept, indicating such fact, and shall cause records or his/her examinations and other official actions to be kept; all of which shall be immediately filed at Alpine City Hall and shall be public record.

6. Decisions of the Hearing Officer regarding variances become effective at the meeting in which the decision is made, unless a different time is designated in the Officer's rules or at the time the decision is made.

7. The Hearing Officer may grant a variance only if:

   (1) Literal enforcement of the ordinance would cause an unreasonable hardship for the applicant that is not necessary to carry out the general purpose of the land use

ordinances;

(2) There are special circumstances attached to the property that do not generally apply to other properties in the same zone;

(3) Granting the variance is essential to the enjoyment of a substantial property right possessed by other property in the same zone;

(4) The variance will not substantially affect the general plan and will not be contrary to the public interest; and

(5) The spirit of the land use ordinance is observed and substantial justice done.

8. In determining whether or not enforcement of the land use ordinance would cause unreasonable hardship under Subsection 2.3.3 #7, the Hearing Officer may not find an unreasonable hardship unless the alleged hardship:

(1) Is located on or associated with the property for which the variance is sought; and

(2) Comes from circumstances peculiar to the property, not from conditions that are general to the neighborhood.

9. In determining whether or not enforcement of the land use ordinance would cause unreasonable hardship under Subsection 2.3.3 #7, the Hearing Officer may not find an unreasonable hardship if the hardship is self-imposed or economic.

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2. In the petition, the petitioner may only allege that the Hearing Officer's decision was arbitrary, capricious, or illegal.

3. (a) The petition is barred unless it is filed within 30 days after the Hearing Officer's decision is final.

   (b)(i) The time under 3(a) to file a petition is tolled from the date a property owner files a request for arbitration of a constitutional taking issue with the private property ombudsman under Utah Code Annotated 13-43-204 until 30 days after:

   A. the arbitrator issues a final award; or

   B. the private property ombudsman issues a written statement under Utah Code Annotated 13-43-204(3)(b) declining to arbitrate or to appoint an arbitrator.

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   (iii) A request for arbitration filed with the private property ombudsman after the time under Subsection 3(a) to file a petition has expired does not affect the time to file a petition.

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7. (a) The filing of a petition does not stay the decision of the Hearing Officer.

   (b)(i) Before filing a petition under this section or a request for mediation or arbitration of a

constitutional taking issue under Utah Code Annotated 13-43-204, the aggrieved party may petition the Hearing Officer to stay his/her decision.

(ii) Upon receipt of a petition to stay, the Hearing Officer may order its decision stayed pending district court review if the Board of Adjustment finds it to be in the best interest of the City.

(iii) After a petition is filed under this section or a request for mediation or arbitration of a constitutional taking issue is filed under Utah Code Annotated 13-43-204, the petitioner may seek an injunction from the district court staying the Hearing Officer's decision.