Pre-application Meeting
Development Engineer Notes

Date: 5-16-02
Time: 1:00

Project: CANYON VIEW PARK EXPANSION

Location: ± 725 24½ Rd Tax ID no. _____

Applicant, representative: _____

Planner(s): Kristin Ashbeck

Engineer: Rick Dorris

Site visit (date: 5-14-02)

Issues: water S side site sewer exist storm drainage see below
flood plain — wetlands N/A access —
site circulation — TCP unsure CDOT permit —
street class main arterial street impr. yes 24½ other —

Pre-application meeting notes: - Probably need to detain. Evaluate in drainage study. Account for entire park.
- Must build 24½ road improvements. Can guarantee with 5 yr DIA and build within 5 years. Can stop 24½ where the Church did.
- A bike/pedestrian path into the park (off of 24½ road) may substitute for the on street sidewalk → propose something.
- Park must provide a limited TIS. Can work out scope with Rick Dorris & George Miller see Chapter 2 of TEDS.

~~Follow-up items:~~
- Access off 24½ must meet TEDS.

RECEIPT OF APPLICATION

DATE BROUGHT IN: 4-4-03

CHECK #: ✓ **AMOUNT:** —

DATE TO BE CHECKED IN BY: 4-10-03

PROJECT/LOCATION: SW Corner 24½ & I-70

acct# 2011 711 82350 G33500

Items to be checked for on application form at time of submittal:

- ☑ Application type(s)
- ☑ Acreage
- ☑ Zoning
- ☑ Location
- ☑ Tax #(s)
- ☑ Project description
- ☑ Property owner w/ contact person, address & phone #
- ☑ Developer w/ contact person, address & phone #
- ☑ Representative w/ contact person, address & phone #
- ☑ Signatures of property owner(s) & person completing application

DH

Planner's Name: Kris

SUBMITTAL CHECKLIST
MAJOR SITE PLAN REVIEW

Date: 11/22/02

Expiration-6 months from above date

Location: SW Cor 24½ & I-70 Canyon View | Project Name: Canyon View Park

ITEMS		DISTRIBUTION																														
Date Received: 4/9/03		● City Community Development	● City Development Engineer	◐ City Utility Engineer	● City Real Estate Manager	◐ City Parks/Recreation	● City Attorney	○ City Sanitation	● City Fire Dept / Clifton Fire Dept	● City Transportation Engineer	○ City Addressing	● City Code Enforcement	○ City Downtown Dev. Authority	○ County Planning	● Building Department TCE	○ Persigo WWT	○ Walker Field Airport	○ School District #51	● Qwest	● Excel	● GVRP	● Water District Ute	○ Sewer District	● Drainage District GJDD	● Irrigation District GVIC	● CDOT	○ RTPO	○ Corps of Engineers	○ Urban Trails	○ Mesa County Health Department	○ State Environmental Health	○ Other	
Receipt #: 18644																																
File #: SPR-2003-062																																
DESCRIPTION	SSID Reference																															
● Application Fee $ 175+$15/ac	VII-1	1																														
● Development Application Form*	VII-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
● Submittal Checklist*	VII-4	1																														
● Review Agency Cover Sheet*	VII-3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
● Location Map	VII-3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
● Planning Clearance*	VII-3	1																														
○ Names & Addresses* Fee$	VII-3																															
● General Project Report	X-06	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
● Site Plan	IX-31	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
● ~~11"x17" Reduction of Site Plan~~ Overall Park Plan	IX-31	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
● ~~Evidence of Title/Lease Agreement~~	VII-2	1			1		1																									
● Legal Description*	VII-3	1			1																											
● Deeds, ROW and Easements	VII-2,3	1			1		1			1																1	1					
○ Avigation Easement	VII-1	1			1		1										1															
● DIA/Guarantee* MAYBE	VII-2	1	1	1			1																									
○ CDOT Access Permit	VII-4	1	1																							1	1					
○ Building Elevations	IX-10	1	1												1																	
● Road Cross-Sections	IX-28	1	2																													
● Roadway Plan and Profile	IX-29	1	2																					1			1					
● Traffic Impact Study	X-15	1								1																1	1					
● Water & Sewer Plan and Profile MAYBE	IX-35	1	2	1					1										1	1	1	1	1									
○ Industrial Pretreatment Sign-off*	VII-4	1		1												1																
○ Drainage & Irrigation Checksheet*	XI-02	1																						1	1							
● Final Drainage ~~Report~~ Letter	X-5,6	1	2																					1								
● Grading and Drainage Plan	IX-13	1	1																					1				1				
● Storm Drainage Plan-Drawing/Report IF NEEDED	IX-32	1	2																1	1	1			1				1				
● Stormwater Management Plan	X-14	1	2																					1				1				
○ Transaction Screen Process/Phase II Environmental	X10,16	1	1																													
● Final Geotechnical Report	X-07	1	1												1																	
● Detail Sheet – As needed	IX-09	1	2	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
● Landscape Plan	IX-19	2	1	1	/	/	/	/	/	/	/	1	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
● Lighting Plan	IX-20	1	1									1																				
● ~~Fire Flow Form~~	XI-03	1							1																							
○ Boundary Survey	na	1	1		1																											

Notes: * An asterisk in the item description column indicates that a form is supplied by the City.

General Meeting/Pre-Application Conference Checklist

Date 11/22/02

Applicant Shawn Cooper Phone X3869 Tax Parcel # 2701-333-00-941

Location 727 24½ Rd Proposal Canyon View Park

Meeting Attendees K Ashbeck, S Cooper, Ted Giavonne

While all factors in a development proposal require careful thought, preparation and design, the following circled items are brought to petitioner's attention as needing special attention or consideration. Other items of special concern may be identified during the review process. General meetings and pre-application conference notes/standards are **valid for only six months** following the meeting/ conference date shown above. Incomplete submittals will not be accepted. Submittals with insufficient information identified during th review process, which have not been addressed by the applicant will not be scheduled for a public hearing. Failure to meet any deadlin for the review process may result in the project not being scheduled for hearing or being pulled from the agenda. Any changes to the approved plan will require re-review and approval prior to those changes being accepted.

ZONING & LAND USE

(a.) Zoning:
b. Future Land Use Designation:
(c.) Growth Plan, Corridor & Area Plans Applicability:

OFF-SITE IMPACTS

(a.) access/right-of-way required
(b.) traffic impact
(c.) street improvements
d. drainage/stormwater management
(e.) availability of utilities

SITE DEVELOPMENT

a. bulk requirements
(b.) traffic circulation
(c.) parking (off-street: handicap, bicycle, lighting)
(d.) landscaping (street frontages, parking areas)
(e.) screening & buffering
(f.) lighting & noise
(g.) signage

MISCELLANEOUS

a. revocable permit
b. State Highway Access Permit
c. floodplain, wetlands, geologic hazard, soils
d. proximity to airport (clear or critical zone)

OTHER

(a.) related files SPR-95-108
b. neighborhood meeting

FEES

(a.) application fee: $140 + gkd plan + $15/ac
Due at submittal. Checks payable to City of GJ
(b.) Transportation Capacity Payment (TCP):
c. Drainage fee:
d. Parks Impact Fee:
e. Open Space Fee or Dedication:
f. School Impact Fee:
g. Recording Fee:
h. Plant Investment Fee (PIF) (Sewer Impact):

PROCESSING REQUIREMENTS

a. Documents – ZDC, SSID, TEDS, SWMM
(b.) Submittal Requirements/Review Process
c. Annexation (Persigo Agreement)

PLEASE RETURN A COPY OF THIS FORM IN THE COMMUNITY DEVELOPMENT DEPT. REVIEW PACKET

PLANNER'S NOTES

CSR

24 Rd Corridor Design Standards

GVPR vs XCEL ?

residential to South
lighting plan required

illustrate general signage plan

Admin Review

APPLICATION COMPLETENESS REVIEW

Use "N/A" for items which are not applicable

Date: 4/9/03

Project Name: Canyon View Park expansion (if applicable)

Project Location : 24½ Rd & I-70 (address or cross-streets)

Check-In Staff — Community Development: PC — initials of check-in staff members
Development Engineer: _____

APPLICATION TYPE(S): SPR
(e.g. Site Plan Review)

FEE PAID: Application: 140.00
Acreage: 570
Public Works: 35
745.00

BALANCE DUE:
° Yes amount $_____
° No Journal entry?

COMPLETENESS REVIEW:
Originals of all forms received w/signatures? ° Yes ° No, list is missing items below

- _____
- _____
- _____

Missing drawings, reports, other materials: ° No ° Yes, list missing items below
Note: use SSID checklist

- _____
- _____
- _____

Incomplete drawings, reports, other materials? ° No ° Yes, list missing items below
Note: Attach SSID checklist(s) w/incomplete information identified

- _____
- _____
- _____

Professional stamp/seal missing from drawings/reports?

° No ° Yes, list missing items below

- /
-
-

Other: Please list below

PROJECT ASSIGNMENT AND PROCESSING

Project Manager: KRS

Special Processing Instructions:

REVIEW AGENCY COVER SHEET

FILE NO. SPR-2003-062

Community Development Department
250 N 5th St, Grand Junction, CO 81501
Phone: (970) 244-1430
FAX: (970) 256-4031
E-mail: CommDev@ci.grandjct.co.us

Petitioner Please Fill In:

Review Agency

Community Development

Return to Communtiy Development by 5/5/03

Staff Planner Kristen Ashbeck

Petitioner Please Fill In:

PROPOSAL Canyon View Park East + Corner
LOCATION SW corner 24½ Rd + I70
ENGINEER/REPRESENTATIVE
Ciavonne + Assoc - Ted
PETITIONER City Parks + Rec
ADDRESS
PHONE NO 241-0745 - Ted

COMMENTS - *For Review Agency Use Only*

Use Additional Sheets If Necessary And Refer To File Number

REVIEWED BY PHONE NO DATE

From: Laura Lamberty
To: Shawn Cooper
Date: 7/8/03 9:46AM
Subject: Canyon View Park Expansion

As I said in my voice mail, this project has not been approved for construction and issues concerning the extent of the half street improvements and quality assurance requirements for drainage and roadway improvements need to be met. I understand that your contractor is currently constructing these types of improvements. STOP WORK on these improvements until you have approved plans and quality improvement plan in place. Any work which does not have the appropriate testing may need to be removed or have expensive in situ testing performed.

CC: Bob Blanchard; Kristen Ashbeck; Mike McDill; Rick Dorris

From: Shawn Cooper
To: Ashbeck, Kristen
Date: 5/13/03 4:04PM
Subject: Re: Cultural Corner

Joe has told me that if we need to cut the bank back to get the permit, CUT THE TREES! I'm glad we don't have to go that far, THANKS!

>>> Kristen Ashbeck 5/13/03 >>>
Just don't touch those trees!

>>> Shawn Cooper 05/13/03 03:58PM >>>
Thanks,
That's what we need, and I will talk with Ted and Bill to see what we can do for the wash.

SC

>>> Kristen Ashbeck 5/13/03 >>>
Shawn
Bob, Kathy and I discussed the concern with the go-ahead for the corner, the treatment of the wash etc. We are willing to give you clearance to move ahead with the project as bid. HOWEVER (the big however), Kathy mentioned that you had offered there might be something at least maintenance-wise that could be done to clean up that area of the wash some in lieu of having to reshape it, etc. We won't hold up the clearance for it but if you could get back with us on what could possibly be done with perhaps some weed control and/or other clean-up, it would be greatly appreciated. Please have Ted still respond to comments as we spoke as to justification for not following the cross-section recommended by the 24 Corridor Standards and Guidelines. Hopefully this gives you enough to go on. If not, please call or e-mail. Thanks,
Kris

GRAND JUNCTION DRAINAGE DISTRICT

P.O. BOX 969 GRAND JUNCTION, CO 81502
(970) 242-4343 FAX (970) 242-4348

Date: May 2, 2003
To: Grand Junction Community Development Department
Attention: Kristen Ashbeck
From: John L. Ballagh, Manager
Subject: Canyon View Park, SPR 2003-062

The District does operate and maintain the presently open drain known as the MITCHELL DRAIN. The location of the drain which is to be piped is shown correctly on the plans. The District does not have any arrangements with City Parks concerning installation of pipes into Canyon View Park as part of the piping of the open drain with the development of Spanish Trails Subdivision.

The District has a license from the City for the operation and maintenance of the drain once it is piped. The District would prefer an easement.

The activity is over five acres in area so a State Health Department construction permit will probably be required.

The Drainage District does not have jurisdiction over Corcoran Wash. The application indicated that the US Army Corps of Engineers had been contacted and that permits are expected.

Kristen

GRAND JUNCTION DRAINAGE DISTRICT

P.O. BOX 969 GRAND JUNCTION, CO 81502
(970) 242-4343 FAX (970) 242-4348

PP 5/8/03

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REVIEW AGENCY COVER SHEET

FILE NO. SPR-2003-062

Community Development Department
250 N 5th St, Grand Junction, CO 81501
Phone: (970) 244-1430
FAX: (970) 256-4031
E-mail: CommDev@ci.grandjct.co.us

APR 2003 District III Traffic

4/16/03

Petitioner Please Fill In:

Review Agency

CDOT

Petitioner Please Fill In:

PROPOSAL Canyon View Park East + Corner
LOCATION SW corner 24½ Rd + I70
ENGINEER/REPRESENTATIVE
Ciavonne + Assoc - Ted
PETITIONER City Parks + Rec
ADDRESS
PHONE NO 241-0745 - Ted

Return to Community Development by ~~5/5/03~~

Staff Planner Kristen Ashbeck

COMMENTS - *For Review Agency Use Only*

No Access or Utility Concess to date. Needs to Stay out of CDOT Right-of-way

RECEIVED
APR 16 2003
COMMUNITY DEVELOPMENT DEPT

Use Additional Sheets If Necessary And Refer To File Number

REVIEWED BY Permit Unit PHONE NO 970-248-7230 DATE 4-16-03

AP 4/18/03

From: "jim daugherty" <jdaugherty@utewater.org>
To: "Comm Dev" <CommDev@ci.grandjct.co.us>
Date: Thu, Apr 17, 2003 4:38 PM
Subject: CANYON VIEW PARK EAST

Ute Water Conservancy District
Review Number
SPR-2003-062
Review Name
CANYON VIEW PARK EAST

* COMMENT
* The proposed 8" water line shall not connect to 24 1/2 Rd. but end at the proposed fire hydrant.
* Relocation of the existing water meter and backflow prevention device serving the existing rest room and future concession stand would best serve the system by being located near the proposed fire hydrant.
* An existing water meter (3/4") for the G Rd. corner expansion will be credited to this site. Dual checks in the meter pit will be sufficient for back flow prevention at this site upon approval by our cross connection department, however if future expansion requires a greater degree of protection the proper device will be required.
* Mechanical plans for site and facility are required for cross connection review. This set of mechanical drawings need to be left with Ute for future reference.
* Water meters or wet taps will not be sold until a cross connection review is done from the mechanical drawings.
* A cross connection review must be completed, and an agreement that proper cross-connection devices will be installed must occur prior to Ute Water's approval.
* ALL FEES AND POLICIES IN EFFECT AT TIME OF APPLICATION WILL APPLY
If you have any questions concerning any of this, please feel free to contact Ute Water.

Edward Tolen P.E.
Project Engineer, Ute Water

Jim Daugherty
New Services Coordinator, Ute Water

George Jachim
Cross Connection Supervisor, Ute Water

DATE 4/17/03

PHONE OFFICE 242-7491
FAX 242-9189
EMAIL jdaugherty@utewater.org

AP
4/21/03

From: Peter Krick
To: Kristen Ashbeck; Wendy Spurr
Date: 4/21/03 8:51AM
Subject: Canyon View Park

Re: SPR-2003-062
Kris,
No comments at this time.
Peter

www.lucidcafe.com/library/95nov/twain.html

midwest.fws.gov/marktwain/

www.asheville.cc.nc.us/foundation/default.asp.

www.kyrene.k12.az.us/schools/brisas/sunda/great/zjon.htm

REVIEW COMMENTS

May 13, 2003

FILE #SPR-2003-062 **TITLE HEADING: Canyon View Park Expansion**

LOCATION: SW Corner of 24½ and I-70

PETITIONER: City of Grand Junction - Parks & Recreation

PETITIONER'S ADDRESS/TELEPHONE: 250 N 5th St
244-3869

PETITIONER'S REPRESENTATIVE: Ciavonne & Associates – Ted Ciavonne
241-0745

STAFF REPRESENTATIVE: Kristen Ashbeck

NOTE: THE PETITIONER IS REQUIRED TO SUBMIT AND LABEL A RESPONSE TO COMMENT FOR EACH AGENCY OR INDIVIDUAL WHO HAS REQUESTED ADDITIONAL INFORMATION OR REVISED PLANS, INCLUDING THE CITY, ON OR BEFORE 5:00 P.M., AUGUST 13, 2003.

CITY COMMUNITY DEVELOPMENT **5/7/03**
Kristen Ashbeck **244-1437**

1. Neither the general Project Report nor the plans make reference to or address the 24 Road Corridor Subarea Plan and Design Standards and Guidelines that apply to this project. of specific concern is the treatment of Leach Creek and provision of a trail per the Plan/Standards & Guidelines. These documents need to be reviewed and all pertinent sections addressed by the project.
2. Landscape sheets do not include standard note re: requirement for underground, pressurized irrigation system.
3. Provide a lighting detail for tennis court lights.
4. Include tennis court lighting in isofootcandle lighting plan.
5. Need to lable Corner Site Plan (L0.5 of 8).
6. Where needed on Landscape set, reference detail of park entry sign that is in Civil set on Sheet P100.
7. Need evidence of 401 and 404 permits prior to issuing a Planning Clearance for this project.
8. Architectural details of shelters for canyon View East - do have one for corner site.
9. Bicycle racks? Location and detail.
11. On Sheet E100ISO - lighting pole detail needs specific reference to full cut-off fixtures.

CITY DEVELOPMENT ENGINEER **5/7/03**
Laura Lamberty **256-4155**

Sheet C102

1. Street improvements need to extend to match street improvement limits on opposite side of street, approximately 460' to the north. Show irrigation ditch and related improvements as necessary.

Sheet C105

1. North area of 24 ½ Road (Sta 4+74) shown indicates a Irrigation headwall, frame and grate to be constructed. No detail is provided on this sheet as indicated.
2. Rock lined swale @1.12% to 1.4%. This slope is flatter than the SWMM minimum.

Sheet L0.5 CV east

1. Sheet has no scale or north arrow.
2. Confirm park sign at entrance off of G Road is not within sight triangle.

Sheet L 103

1. Confirm entrance landscaping does not conflict with sight triangle. Plantings need to be less than 30" at mature height.
2. Noted drawing scale does not match bar scale.

Sheet L 8

1. Confirm entrance landscaping does not conflict with sight triangle. Plantings need to be less than 30" at mature height.

Drainage Report:

1. Check temporary V-ditch capacity at design slope. Design slope of cobble lined v-ditch is less than that permitted by SWMM.
2. Provide calculation and detail for outlet scour protection at discharge of Mitchell Drain to Corcoran Wash and at extension of pipe for Corcoran Wash.
3. Address improvements at 24& G in Drainage Report. Separate drainage letter may be adequate.

24 & G

1. 24 Road Corridor Plan indicates a 10' separated pedestrian path on the east side of Leach Creek and channel improvements. Show improvements and compliance with this adopted plan.

CITY FIRE DEPARTMENT **4/25/03**
Norm Noble **244-1414**

1. No objections to the proposal.

CITY CODE ENFORCEMENT **4/23/03**
Nina McNally **256-4103**

Code Enforcement comments and questions are based upon the most frequently addressed code violations for new construction/uses as they may apply to this project and are subject to comments of other review agencies.

1. All vegetation, fences, walls and berms must be maintained so that there is no sight distance hazard nor road or pedestrian hazard. ZD 6.5

2. Outdoor storage must conform to regulations for this Zone ZD Chapter 3.4.I. referencing Outdoor Storage, Non-res. ZD Chapter 4.1.I.2.
3. Dumpsters and refuse containers shall be enclosed in a solid, opaque enclosure constructed of brick, masonry, stucco or wood at least six (6) feet tall.
4. Dust control measures must be taken during construction and for any parking areas Municipal Code 16-126, and parking areas maintained as required at ZD 6.6.A.9.b.
5. Adequate shielded lighting shall be provided for all parking facilities used at night ZD 6.6.A.8.
6. All outside light sources shall conform to the standards set forth at ZD 7.2.F., Nighttime Light Pollution.
7. If new signs are necessary a permit is required.
8. Fences require a permit. ZD 4.1.J.

CITY ATTORNEY **4/15/03**
John Shaver **244-1501**

No Comment.

CITY PROPERTY AGENT **4/21/03**
Peter Krick **256-4003**

No comments at this time.

CITY TRANSPORTATION ENGINEER **5/2/03**
George Miller **256-4123**

REVIEW COMMENTS / SPR-2003-000 / PAGE 2 of 4

Proposal is for the east expansion of Canyon View Park, as well as expand facilities (develop two shelters, horseshoe pits, and Bocce courts) at the NE corner of 24 and G Rds.. The east section will extend east to 24 ½ Rd, and will have an access to 24 ½ opposite the road at the south side of Vineyards Church.

This eastern road section will connect to the existing park road network to the west, but will predominantly be used to access the newly developed baseball field and the six tennis courts immediately adjacent to 24 ½ Rd.

24 ½ Rd is classed as a minor arterial, and is slated to receive bike lane markings by the 2001 Urban Trails Master Plan. G Rd is also classed as a minor arterial, and is slated to be expanded as part of a future City Capital Improvement project.

Comments:

1. (East Section) Though this has been stated in the project overview, the plans need to clearly show that there will be only one access point to 24 ½ Rd. Plans show potential access geometries extending to 24 ½ Rd, and also show an existing access across from the church.
2. (East Section) With respect to striping requirements, due to projected 24 ½ volumes, and possible park access volumes (as well as opposing left turn volumes utilizing the east leg

of the intersection), a left turn pocket will need to be developed for park access. Additionally, bike lane width will need to be provided along the entire site frontage.

3. (24 / G, NE Corner) It is not believed that these minimal facility improvements will generate new traffic to the level to justify any improvements to existing G Rd geometry at the adjacent park access. However, the Capital Improvements to G Rd will certainly exceed any capacity or flow issues.

CDOT **4/16/03**
Permit Unit 87230 **248-7230**

No access or utility concerns to date. Needs to stay out of CDOT right-of-way.

UTE WATER **4/18/03**
Jim Daugherty **242-7491**

COMMENT

* The proposed 8" water line shall not connect to 24 1/2 Rd. but end at the proposed fire hydrant.
* Relocation of the existing water meter and backflow prevention device serving the existing rest room and future concession stand would best serve the system by being located near the proposed fire hydrant.
* An existing water meter (3/4") for the G Rd. corner expansion will be credited to this site. Dual checks in the meter pit will be sufficient for back flow prevention at this site upon approval by our cross connection department, however if future expansion requires a greater degree of protection the proper device will be required.
* Mechanical plans for site and facility are required for cross connection review. This set of mechanical drawings need to be left with Ute for future reference.
* Water meters or wet taps will not be sold until a cross connection review is done from the mechanical drawings.
* A cross connection review must be completed, and an agreement that proper cross-connection devices will be installed must occur prior to Ute Water's approval.
* ALL FEES AND POLICIES IN EFFECT AT TIME OF APPLICATION WILL APPLY

If you have any questions concerning any of this, please feel free to contact Ute Water.

GRAND JUNCTION DRAINAGE DISTRICT **5/8/03**
John Ballagh **242-4343**

The District does operate and maintain the presently open drain known as the MITCHELL DRAIN. The location of the drain which is to be piped is shown correctly on the plans. The District does not have any arrangements with City Parks concerning installation of pipes into Canyon View Park as part of the piping of the open drain with the development of Spanish Trails Subdivision.

The District has a license from the City for the operation and maintenance of the drain once it is piped. The District would prefer an easement.

The activity is over five acres in area so a State Health Department construction permit will probably be required.

The Drainage District does not have jurisdiction over Corcoran Wash. The application indicated that the US Army Corps of Engineers had been contacted and that permits are expected.

Comments not available as of 5/13/03:
Bresnan Communications
Parks & Recreation Department
City Utility Engineer
Grand Valley Irrigation
Grand Valley Rural Power
Qwest
Xcel

REVIEW COMMENTS

2nd Round

July 9, 2003

FILE #SPR-2003-062(2) **TITLE HEADING: Canyon View Park Expansion**

LOCATION: SW Corner of 24½ and I-70

PETITIONER: City of Grand Junction - Parks & Recreation

PETITIONER'S ADDRESS/TELEPHONE: 250 N 5th St
244-3869

PETITIONER'S REPRESENTATIVE: Ciavonne & Associates – Ted Ciavonne
241-0745

STAFF REPRESENTATIVE: Kristen Ashbeck

NOTE: THE PETITIONER IS REQUIRED TO SUBMIT AND LABEL A RESPONSE TO COMMENT FOR EACH AGENCY OR INDIVIDUAL WHO HAS REQUESTED ADDITIONAL INFORMATION OR REVISED PLANS, INCLUDING THE CITY, ON OR BEFORE 5:00 P.M., JULY 16, 2003.

CITY DEVELOPMENT ENGINEER **6/20/03**
Laura Lamberty **256-4155**

1. Drainage and sight distance issues resolved satisfactorily - no response required.
2. Half-street improvements on 24 1/2 Road are still required per previous comments. I believe CDOT's comments are either poorly worded or taken out of context as in discussion with CDOT regarding the comment they did not feel it was intended to have that meaning.

CITY TRANSPORTATION ENGINEER **5/2/03**
George Miller **256-4123**

Comments pertain to plan set and comment response from 5-03.

1. 24 ½ Rd left turn lane design is incomplete (details of north leg striping changes needed). Area plan will be used to develop striping plan. This edited sheet will be provided to the planner (Kristen Ashbeck). In brief description, the park frontage will have to be widened north of the proposed entry access for a minimum distance with which to provide an on-street bike lane (see comment 3), as well as a median in which to provide a minimum 50' long full width turn lane. North of the turn lane width, the striping pattern will be revised so as to provide a 30:1 returning taper back to the existing centerline placement.
2. Landscaping details aren't clear on mature planting heights. Sight distance needs must be referenced at both park entrances. Please reference TEDS sections 5.2.6 and 6.2.3.

3. Earlier discussions about meeting Urban Trails needs for a bike facility along 24 ½ Rd led me to believe there would be a bike trail loop extending from 24 ½ Rd into the park property and running from the north to the south boundaries of this project. As there is no such loop shown, lets just stay with the Master Plan requirement for an on-street lane extending along available width of this project's 24 1/2 frontage.

RESPONSE TO REVIEW COMMENTS

June12, 2003

FILE #SPR-2003-062 **TITLE HEADING: Canyon View Park Expansion**

LOCATION: SW Corner of 24½ and I-70

PETITIONER: City of Grand Junction - Parks & Recreation

PETITIONER'S ADDRESS/TELEPHONE: 250 N 5th St
244-3869

PETITIONER'S REPRESENTATIVE: Ciavonne & Associates – Ted Ciavonne
241-0745

STAFF REPRESENTATIVE: Kristen Ashbeck

NOTE: THE PETITIONER IS REQUIRED TO SUBMIT AND LABEL A RESPONSE TO COMMENT FOR EACH AGENCY OR INDIVIDUAL WHO HAS REQUESTED ADDITIONAL INFORMATION OR REVISED PLANS, INCLUDING THE CITY, ON OR BEFORE 5:00 P.M., AUGUST 13, 2003.

CITY COMMUNITY DEVELOPMENT **5/7/03**
Kristen Ashbeck **244-1437**

1. Neither the general Project Report nor the plans make reference to or address the 24 Road Corridor Subarea Plan and Design Standards and Guidelines that apply to this project. of specific concern is the treatment of Leach Creek and provision of a trail per the Plan/Standards & Guidelines. These documents need to be reviewed and all pertinent sections addressed by the project.

Petitioner Comment: Page 2 of the noted document includes Standards "required unless it can be demonstrated that an acceptable alternative meets one or more of the following conditions:"

- *"The alternative better achieves the stated Purpose"- The original Master Plan for Canyon View Park predates the 24 Road Corridor Plan. In this Master Plan a north-south 8'wide concrete trail through the park was proposed and constructed internal to the park and not along its west boundary (24 Road). The current proposal reinforces the connection of the existing park trail system by extending it to G Road.*
- *"The purpose will not be achieved by application of the Standard in this application"- An estimated 90% of the above noted internal park trail has been constructed for a number of years. Further more, significant completed facilities and improvements (parking lots, sport courts, the Corcoran Wash wetland mitigation) predate the 24 Road Plan and now prohibit the placement of the trail and/or the widening of Leach Creek along the majority of the 24 Road frontage.*

- *"Unique site factors make the Standard impractical"- The above noted factors reinforce that the Standard is impractical. In addition, the corner area proposed for development has unique historic and cultural values associated with the Basque Community. The row of trees that exist along the east edge of Leach Creek have been carefully avoided to honor the wishes of with the Basque Community.*

2. Landscape sheets do not include standard note re: requirement for underground, pressurized irrigation system.

Petitioner Comment: This note has been added.

3. Provide a lighting detail for tennis court lights.

Petitioner Comment: Tennis court lighting is not currently a part of the construction. The tennis courts were bid as a 'design-build' portion of the project, with the contractor providing the appropriate foundations and conduit for future lighting.

4. Include tennis court lighting in isofootcandle lighting plan.

Petitioner Comment: Tennis court lighting has not been designed, nor budgeted.

5. Need to lable Corner Site Plan (L0.5 of 8).

Petitioner Comment: Completed.

6. Where needed on Landscape set, reference detail of park entry sign that is in Civil set on Sheet P100.

Petitioner Comment: Completed.

7. Need evidence of 401 and 404 permits prior to issuing a Planning Clearance for this project.

Petitioner Comment: Copies of Permits are included.

8. Architectural details of shelters for canyon View East - do have one for corner site.

Petitioner Comment: Shelters have not been designed, nor budgeted, however they will maintain the Architectural theme of the Phase 1 shelters.

9. Bicycle racks? Location and detail.

Petitioner Comment: Bicycle racks will be similar to Phase 1. Locations have been added to the Site Plans.

11. On Sheet E100ISO - lighting pole detail needs specific reference to full cut-off fixtures.

Petitioner Comment: This information is on the Lighting Drawings, but it is not clear. Please see the attached letter from Burke Associates confirming this.

CITY DEVELOPMENT ENGINEER **5/7/03**

Laura Lamberty **256-4155**

Sheet C102

1. Street improvements need to extend to match street improvement limits on opposite side of street, approximately 460' to the north. Show irrigation ditch and related improvements as necessary.

Petitioner Comment: There are a number of reasons for not providing the noted improvements:

- *We stopped the improvements at the Federal Highway ROW line on the west side of 24 ½ Road.*
- *CDOT comments in this document state, "Stay out of CDOT ROW."*

- *the future configuration of the highway overpass is unknown, but is assumed to be widened to the east because the centerline of 24 ½ Road is east of the centerline of the existing overpass;*
- *if widening of the existing overpass is determined, and a walkway along the west side is desired, this work would be part of future construction of the park. It is not in this Phase.*

Sheet C105

1. North area of 24 ½ Road (Sta 4+74) shown indicates a Irrigation headwall, frame and grate to be constructed. No detail is provided on this sheet as indicated.

Petitioner Comment: The note on this sheet has been changed to reference Sheet C106.

2. Rock lined swale @1.12% to 1.4%. This slope is flatter than the SWMM minimum.

Petitioner Comment: The rock- lined swale will be addressed below under "Drainage Report".

Sheet L0.5 CV east

1. Sheet has no scale or north arrow.

Petitioner Comment: This has been provided.

2. Confirm park sign at entrance off of G Road is not within sight triangle.

Petitioner Comment: This has been confirmed.

Sheet L 103

1. Confirm entrance landscaping does not conflict with sight triangle. Plantings need to be less than 30" at mature height.

Petitioner Comment: This has been confirmed

2. Noted drawing scale does not match bar scale.

Petitioner Comment: This has been corrected.

Sheet L 8

1. Confirm entrance landscaping does not conflict with sight triangle. Plantings need to be less than 30" at mature height.

Petitioner Comment: This has been confirmed

Drainage Report:

1. Check temporary V-ditch capacity at design slope. Design slope of cobble lined v-ditch is less than that permitted by SWMM.

Petitioner Comment: Since the ditch is temporary we were not concerned about capacity, only nuisance flows. The ditch is cobble lined, not riprap lined, so I didn't believe it fell under the dictates of this criteria. The swale is at this slope because that is the slope the paved area will be when completed. There is no way to steepen the grade without destroying the subgrade that is being prepared for future construction.

2. Provide calculation and detail for outlet scour protection at discharge of Mitchell Drain to Corcoran Wash and at extension of pipe for Corcoran Wash.

Petitioner Comment: Calculations for the riprap at the Mitchell drain outlet are attached.

3. Address improvements at 24& G in Drainage Report. Separate drainage letter may be adequate.

Petitioner Comment: See letter attached.

24 & G

1. 24 Road Corridor Plan indicates a 10' separated pedestrian path on the east side of Leach Creek and channel improvements. Show improvements and compliance with this adopted plan.

Petitioner Comment: See response to Community Development Department Comment #1.

CITY FIRE DEPARTMENT **4/25/03**
Norm Noble **244-1414**

1. No objections to the proposal.

CITY CODE ENFORCEMENT **4/23/03**
Nina McNally **256-4103**

Code Enforcement comments and questions are based upon the most frequently addressed code violations for new construction/uses as they may apply to this project and are subject to comments of other review agencies.

1. All vegetation, fences, walls and berms must be maintained so that there is no sight distance hazard nor road or pedestrian hazard. ZD 6.5
2. Outdoor storage must conform to regulations for this Zone ZD Chapter 3.4.I. referencing Outdoor Storage, Non-res. ZD Chapter 4.1.I.2.
3. Dumpsters and refuse containers shall be enclosed in a solid, opaque enclosure constructed of brick, masonry, stucco or wood at least six (6) feet tall.
4. Dust control measures must be taken during construction and for any parking areas Municipal Code 16-126, and parking areas maintained as required at ZD 6.6.A.9.b.
5. Adequate shielded lighting shall be provided for all parking facilities used at night ZD 6.6.A.8.
6. All outside light sources shall conform to the standards set forth at ZD 7.2.F., Nighttime Light Pollution.
7. If new signs are necessary a permit is required.
8. Fences require a permit. ZD 4.1.J.

Petitioner Comment: No comment Required

CITY ATTORNEY **4/15/03**
John Shaver **244-1501**

No Comment.

CITY PROPERTY AGENT **4/21/03**
Peter Krick **256-4003**

No comments at this time.

REVIEW COMMENTS / SPR-2003-062 / PAGE 5 of 7

CITY TRANSPORTATION ENGINEER **5/2/03**

George Miller **256-4123**

REVIEW COMMENTS / SPR-2003-000 / PAGE 2 of 4

Proposal is for the east expansion of Canyon View Park, as well as expand facilities (develop two shelters, horseshoe pits, and Bocce courts) at the NE corner of 24 and G Rds. The east section will extend east to 24 ½ Rd, and will have an access to 24 ½ opposite the road at the south side of Vineyards Church.

This eastern road section will connect to the existing park road network to the west, but will predominantly be used to access the newly developed baseball field and the six tennis courts immediately adjacent to 24 ½ Rd.

24 ½ Rd is classed as a minor arterial, and is slated to receive bike lane markings by the 2001 Urban Trails Master Plan. G Rd is also classed as a minor arterial, and is slated to be expanded as part of a future City Capital Improvement project.

Comments:

1. (East Section) Though this has been stated in the project overview, the plans need to clearly show that there will be only one access point to 24 ½ Rd. Plans show potential access geometries extending to 24 ½ Rd, and also show an existing access across from the church.

Petitioner Comment: A note has been added to Sheet C102 stating that the existing access points will be removed in this phase.

2. (East Section) With respect to striping requirements, due to projected 24 ½ volumes, and possible park access volumes (as well as opposing left turn volumes utilizing the east leg of the intersection), a left turn pocket will need to be developed for park access. Additionally, bike lane width will need to be provided along the entire site frontage.

Petitioner Comment: A striping plan is attached showing the northbound left turn lane.

3. (24 / G, NE Corner) It is not believed that these minimal facility improvements will generate new traffic to the level to justify any improvements to existing G Rd geometry at the adjacent park access. However, the Capital Improvements to G Rd will certainly exceed any capacity or flow issues.

Petitioner Comment: No comment Required

CDOT **4/16/03**

Permit Unit 87230 **248-7230**

No access or utility concerns to date. Needs to stay out of CDOT right-of-way.

Petitioner Comment: No comment Required

UTE WATER **4/18/03**

Jim Daugherty **242-7491**

COMMENT

* The proposed 8" water line shall not connect to 24 1/2 Rd. but end at the proposed fire hydrant.

Petitioner Comment: The line has been removed from the hydrant to the proposed connection in 24 ½ Road.

* Relocation of the existing water meter and backflow prevention device serving the existing rest room and future concession stand would best serve the system by being located near the proposed fire hydrant.

Petitioner Comment: A new water meter and backflow prevention devise will be installed at this location in Phase II.

* An existing water meter (3/4") for the G Rd. corner expansion will be credited to this site. Dual checks in the meter pit will be sufficient for back flow prevention at this site upon approval by our cross connection department, however if future expansion requires a greater degree of protection the proper device will be required.

Petitioner Comment: Understood

* Mechanical plans for site and facility are required for cross connection review. This set of mechanical drawings need to be left with Ute for future reference.

Petitioner Comment: We understand that this is provided at time of Building Permit.

* Water meters or wet taps will not be sold until a cross connection review is done from the mechanical drawings.

Petitioner Comment: Understood

* A cross connection review must be completed, and an agreement that proper cross-connection devices will be installed must occur prior to Ute Water's approval.

Petitioner Comment: Understood

* ALL FEES AND POLICIES IN EFFECT AT TIME OF APPLICATION WILL APPLY If you have any questions concerning any of this, please feel free to contact Ute Water.

Petitioner Comment: Understood

GRAND JUNCTION DRAINAGE DISTRICT **5/8/03**
John Ballagh **242-4343**

The District does operate and maintain the presently open drain known as the MITCHELL DRAIN. The location of the drain which is to be piped is shown correctly on the plans. The District does not have any arrangements with City Parks concerning installation of pipes into Canyon View Park as part of the piping of the open drain with the development of Spanish Trails Subdivision.

Petitioner Comment: Extensions will be performed by the Park's contractor.

The District has a license from the City for the operation and maintenance of the drain once it is piped. The District would prefer an easement.

Petitioner Comment: So noted, negotiation and preparation will be handled through the real estate division of the public works department.

The activity is over five acres in area so a State Health Department construction permit will probably be required.

Petitioner Comment: A construction permit is being processed

The Drainage District does not have jurisdiction over Corcoran Wash. The application indicated that the US Army Corps of Engineers had been contacted and that permits are expected.

Petitioner Comment: This is correct. Permits have now been secured.

Comments not available as of 5/13/03:
Bresnan Communications
Parks & Recreation Department
City Utility Engineer
Grand Valley Irrigation
Grand Valley Rural Power
Qwest
Xcel

Response to Review Comments - Round 2

Project Name: Canyon View Park Expansion
Project Reference Number: SPR-2003-062(2)

Petitioner: City of G.J. Parks + Rec Dept

Project Representative: Ciavonne + Assoc - Ted
Phone Number 241-0745 e-mail: ted@ciavonne.com

Date Submitted 7-16-2003

Agency: Community Development

RECEIVED
JUL 16 2003
COMMUNITY DEVELOPMENT
DEPT.

RESPONSE TO REVIEW COMMENTS

2nd Round

July 16, 2003

FILE #SPR-2003-062(2) **TITLE HEADING: Canyon View Park Expansion**

LOCATION: SW Corner of 24½ and I-70

PETITIONER: City of Grand Junction - Parks & Recreation

PETITIONER'S ADDRESS/TELEPHONE: 250 N 5th St
244-3869

PETITIONER'S REPRESENTATIVE: Ciavonne & Associates – Ted Ciavonne
241-0745

STAFF REPRESENTATIVE: Kristen Ashbeck

NOTE: THE PETITIONER IS REQUIRED TO SUBMIT AND LABEL A RESPONSE TO COMMENT FOR EACH AGENCY OR INDIVIDUAL WHO HAS REQUESTED ADDITIONAL INFORMATION OR REVISED PLANS, INCLUDING THE CITY, ON OR BEFORE 5:00 P.M., JULY 16, 2003.

CITY DEVELOPMENT ENGINEER **6/20/03**
Laura Lamberty **256-4155**

1. Drainage and sight distance issues resolved satisfactorily - no response required.
2. Half-street improvements on 24 1/2 Road are still required per previous comments. I believe CDOT's comments are either poorly worded or taken out of context as in discussion with CDOT regarding the comment they did not feel it was intended to have that meaning.

Petitioner Comment: Half-street improvements on 24 ½ Road will be built with Phase Two of this project, as per discussions between Joe Stevens and Tim Moore on July 16, 2003.

CITY TRANSPORTATION ENGINEER **5/2/03**
George Miller **256-4123**

Comments pertain to plan set and comment response from 5-03.

1. 24 ½ Rd left turn lane design is incomplete (details of north leg striping changes needed). Area plan will be used to develop striping plan. This edited sheet will be provided to the planner (Kristen Ashbeck). In brief description, the park frontage will have to be widened north of the proposed entry access for a minimum distance with which to provide an on-street bike lane (see comment 3), as well as a median in which to provide a minimum 50' long full width turn lane. North of the turn lane width, the striping pattern will be revised so as to provide a 30:1 returning taper back to the existing centerline placement.

Petitioner Comment:See comment to City Development Engineer, above, and item #3, below.

2. Landscaping details aren't clear on mature planting heights. Sight distance needs must be referenced at both park entrances. Please reference TEDS sections 5.2.6 and 6.2.3.

Petitioner Comment: Landscaping.has been designed to comply to required sight triangles in the TEDS manual with plant materials that normally do not exceed thirty inches in height.

REVIEW COMMENTS / SPR-2003-062 / PAGE 2 of 2

3. Earlier discussions about meeting Urban Trails needs for a bike facility along 24 ½ Rd led me to believe there would be a bike trail loop extending from 24 ½ Rd into the park property and running from the north to the south boundaries of this project. As there is no such loop shown, lets just stay with the Master Plan requirement for an on-street lane extending along available width of this project's 24 1/2 frontage.

Petitioner Comment: The current road section includes a bike lane. The future road section for Phase 2 will provide a full bike lane.

SUBSTANTIAL COMPLETION INSPECTION CHECKLIST

SPR-2003-062

Project: CANYON VIEW PARK EXPANSION

DATE: 9-10-04

City of Grand Junction, Colorado
250 N. 5th Street
81501-2668
FAX: (303) 244-1599

STREETS

- ☐ Pavement
- ☐ Concrete — TRUNCATED DOME MATS, CUT and CHECK FILLETS, CONC FLOW LINE
- ☐ Manholes — BOLT SIDEWALK DRAIN TROUGH LIDS
- ☐ Signs
- ☐ Lighting
- ☐ Site Grading
- ☐ Other STREET AS-BUILTS, PAVING TESTS - COMPACTION; CONCRETE MAT'LS TEST

UTILITIES & DRAINAGE

- ☐ Water lines
- ☐ Sewer Lines
- ☐ Inlet Structures
- ☐ Detention Facilities
- ☐ Outlet Structures
- ☐ Other S.D. AS BUILTS

Inspected by:

City Development Engineer

Developer or Representative:

Final acceptance of the Streets and Drainage Facilities will be made when the above items have been corrected and inspected. Please call 256-4031 when ready for final acceptance.

Distribution: White to Developer Yellow to Development Engineering Pink to Engineering Lab/Inspector Goldenrod to Community Development

City of Grand Junction GIS Sewer Map

- PUMP STATIONS
- SANITARY MANHOLES
- COMBINED SANITARY MANHOLES
- STORM MANHOLES
- CATCH BASINS
- IRRIGATION GATES
- CATCH BASIN LATERALS
- FORCE MAINS
- FORCE MAINS-NOT SURVEYED
- COMBINED SEWER
- SANITARY SEWER
- SANITARY SEWER-NOT SURVEYED
- STORM SEWER
- STORM SEWER-NOT SURVEYED
- IRRIGATION DITCHS
- Parcels

Air Photos

- 1997 Photos
- 1994 Photos

- Highways

SCALE 1 : 2,071

200 0 200 400 600

FEET

N

http://198.204.117.70/maps/sewermap.mwf

Wednesday, May 29, 2002 3:11 PM

5-16-02 CANYON VIEW PARK EXPANSION

PAUL KUHN - WINSTON
TED CIAVONNE -
JOHN CUNNINGHAM
KRISTIN ASHBECK
SHAWN COOPER
RICK DORRIS
JODY KLISKA
GEORGE MILLER
JIM LANGFORD

have them provide

- TIS → Can City staff do it.

- Check on 24½ & 6 roundabout in CIP.

- Ped pathway lighting, they want bollard type lighting. What does TEDS need?

DOT ROW Req.

- Can the Park stop C, 6, W on 24½ where the Church did?

can guarantee themselves

- Can 24½ Rd be guaranteed so they don't have to build all at once?

- They are going to seek relief on 24½ Road improvements.

maybe propose something

- Can a bikepath through the Park suffice for the attached sidewalk.

- Need to make sure drainage study accounts for entire site. Also, Leach Creek backwater.

From: George Miller
To: Dorris, Rick
Date: 5/29/02 5:57PM
Subject: CanyonView expansion (bike lane, impact study)

I checked with Jody, and she confirmed that the Parks dept. does need to provide a limited scope analysis for the 24 1/2 access points along the park's frontage.

With respect to the bike lane, an on-street facility will still be needed along the project's frontage. The off-street and on-street facilities serve different rider groups. Also, the off-street facility would not be evident as a link to the on-road system, nor would its indirect routing be desirable to distance, or speed, oriented riders.

CC: Kliska, Jody

DEVELOPMENT APPLICATION

Community Development Dept
250 North 5th Street
Grand Junction CO 81501
(970) 244-1430

We, the undersigned, being the owner's of the property adjacent to or situated in the City of Grand Junction, Mesa County, State of Colorado, as described herein do hereby petition this:

Petition for (check all appropriate boxes):

☐ Subdivision Plat/Plan - Simple	☒ Site Plan Review - Major	☐ Concept Plan
☐ Subdivision Plat/Plan - Major Preliminary	☐ Site Plan Review - Minor	☐ Minor Change
☐ Subdivision Plat/Plan - Major Final	☐ Conditional Use Permit	☐ Change of Use
☐ Planned Development - ODP	☐ Vacation, Right-of-Way	☐ Revocable Permit
☐ Planned Development - Preliminary	☐ Vacation, Easement	☐ Variance
☐ Planned Development - Final	☐ Extension of Time	
☐ Annexation/Zone of Annexation	☐ Rezone	☐ Growth Plan Amendment
From: _____	From: _____	From: _____
To: _____	To: _____	To: _____

Site Location: SW Corner 24½ + I-70

Site Tax No.(s):	Site Acreage/Square footage:	Site Zoning:
2701-333-00-941 + 940	37ac + 1.08ac	CSR

Project Description: Canyon View Park East + Canyon View Corner

City of G.J.	City Parks + Rec	Ciavonne + Assoc
Property Owner Name	Developer Name	Representative Name
250 N. 5th	1340 Gunnison Ave	844 Grand Ave
Address	Address	Address
GJ	GJ	GJ 81501
City/State/Zip	City/State/Zip	City/State/Zip
254-3869	254-3869	241-0745
Business Phone No.	Business Phone No.	Business Phone No.
	shawnceci.grandjct.co.us	ted@ciavonne.com
E-Mail	E-Mail	E-Mail
242-1637	242-1637	241-0765
Fax Number	Fax Number	Fax Number
Shawn Cooper	Shawn Cooper	Ted Ciavonne
Contact Person	Contact Person	Contact Person
254-3869	254-3869	241-0745
Contact Phone No.	Contact Phone No.	Contact Phone No.

Note Legal property owner is owner of record on date of submittal.

We hereby acknowledge that we have familiarized ourselves with the rules and regulations with respect to the preparation of this submittal, that the foregoing information is true and complete to the best of our knowledge, and that we assume the responsibility to monitor the status of the application and the review comments. We recognize that we or our representative(s) must be present at all required hearings. In the event that the petitioner is not represented, the item may be dropped from the agenda and an additional fee charged to cover rescheduling expenses before it can again be placed on the agenda.

Signature of Person Completing Application — Date: 4/2/03

Required Signature of Legal Property Owner(s) - attach additional sheets if necessary — Date: 3/25/03

THOMPSON - LANGFORD CORPORATION
ENGINEERS AND LAND SURVEYORS

tlc@tlcwest.com
Facsimile (970) 241-2845
Telephone: (970) 243-6067
529 25 1/2 Rd, Grand Junction, CO 81505

MEMO

March 25, 2003

To: Ted Ciavonne
Ciavonne & Associates, Inc.
844 Grand Ave.
Grand Junction, CO 81501
Ph. (970) 241-0745
FAX (970) 241-0765

From: Jim Langford

Re: Canyon View Park - Traffic Study

Ted:

Per my notes of a meeting held at the City Parks offices in Lincoln Park on May 16, 2002, Jody Kliska stated that the City Transportation Department would perform the traffic study needed for this project.

Respectfully,

Jim Langford

James E. Langford, PE & LS

JEL/iml

GENERAL PERMIT APPLICATION

STORMWATER DISCHARGES ASSOCIATED WITH:

CONSTRUCTION ACTIVITY

(Permit No. COR-030000)

FOR AGENCY USE ONLY									
Certification Number									
C	O	R	-	0	3				
Date Recieved									
Year			Month			Day			

Please print or type. All items must be completed accurately and in their entirety or the application will be deemed incomplete and processing of the permit will not begin until all information is received. Please refer to the instructions for information about the required items. An original signature is **required.**

1. **Name and address of the permit applicant:**

Company Name *City of Grand Junction, Parks and Recreation*

Mailing Address *1340 Gunnison Avenue*

City, State and Zip Code *Grand Junction, CO 81501*

Phone Number *(970) 254-3869* Who is applying? Owner ☒ Developer ☐ Contractor ☐

Federal Taxpayer (or Employer) ID #: ___ ___ - ___ ___ ___ ___ ___ ___ ___

Entity Type: Private ☐ Federal ☐ State ☐ County ☐ City ☒ Other: _____

Local Contact (familiar with facility) *James E. Langford*

Title *Professional Engineer* Phone Number *(970) 243-6067*

2. **Location of the construction site:**

Street Address *East of 24 ½ Road and south of I-70*

City, State and Zip Code *Grand Junction, CO 81503*

County *Mesa* Name of plan or development *Canyon View Park*

Legal Location (Township, Range, Section, ¼ Section): *T1N, R1W, Ute Meridian, Sec. 33, SW 1/4*

Latitude and Longitude *Latitude 39°06.21' N Longitude 108°37.72' W*

3. **Briefly describe the nature of the construction activity:**

Construction of city park. The site will be subject to clearing and grubbing, grading, excavation, and embankment as associated with the construction of roadways, utilities, and landscaping.

4. **Anticipated construction schedule:**

Commencement date: *May 2003* Completion date: *October 2003*

5. **Area of the construction site:** Total area (acres) *29.95 acres*

Area to undergo disturbance (acres) *29.95 acres*

6. **The name of the receiving stream(s). (If discharge is to a ditch or storm sewer, also include the name of the ultimate receiving water):** Mitchell Drain, Corcoran Wash, Leach Creek, *Colorado River*

7. **Other environmental permits held for this construction activity (include permit number):**

Wetlands 404 permit for work in Corcoran Wash

8. **Stormwater Management Plan Certification:**

"I certify under penalty of law that a complete Stormwater Management Plan, as described in Appendix A of this application, has been prepared for my facility. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the Stormwater Management Plan is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for falsely certifying the completion of said SWMP, including the possibility of fine and imprisonment for knowing violations."

Signature of Applicant — Date Signed: 3/27/03

Shawn Cooper — *Parks Planner*

Name (printed) — Title

9. **Signature of Applicant (legally responsible person)**

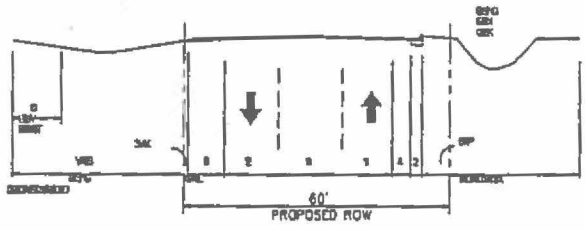
"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment."

Signature of Applicant — Date Signed: 3/27/03

Shawn Cooper — *Parks Planner*

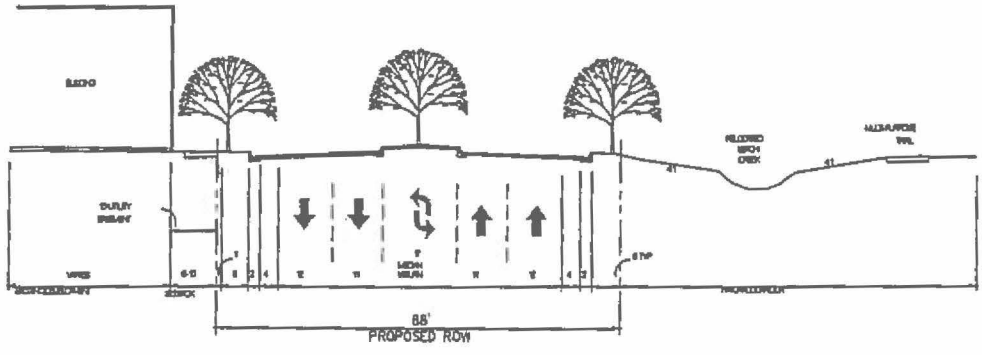
Name (printed) — Title

Figure 2.5: 24 Road Typical Section – Interim

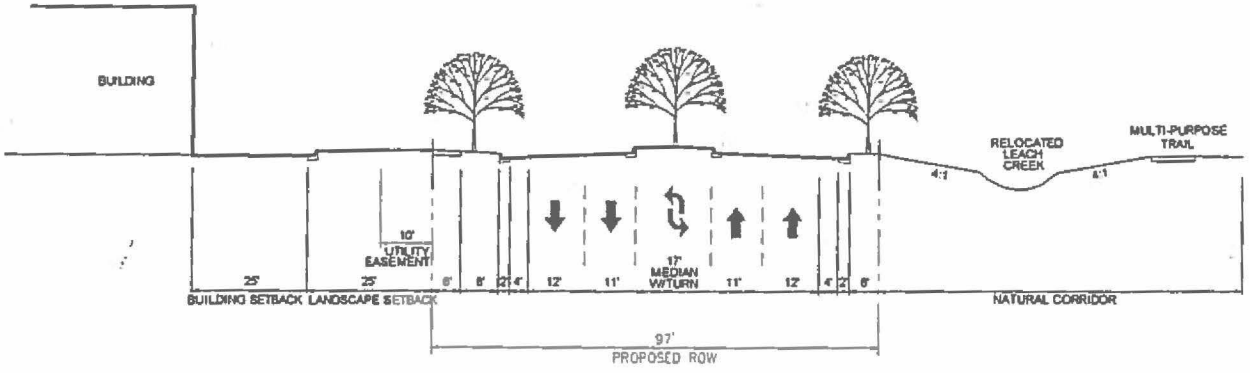


Initial Phase 3 Lanes

Figure 2.6: 24 Road Typical Sections



Ultimate Phase 5 Lanes (Existing Development)



Ultimate Phase 5 Lanes (New Development)

Final Drainage Report

Canyon View Park

March 13, 2003

Prepared for:

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Job No. 0401-002

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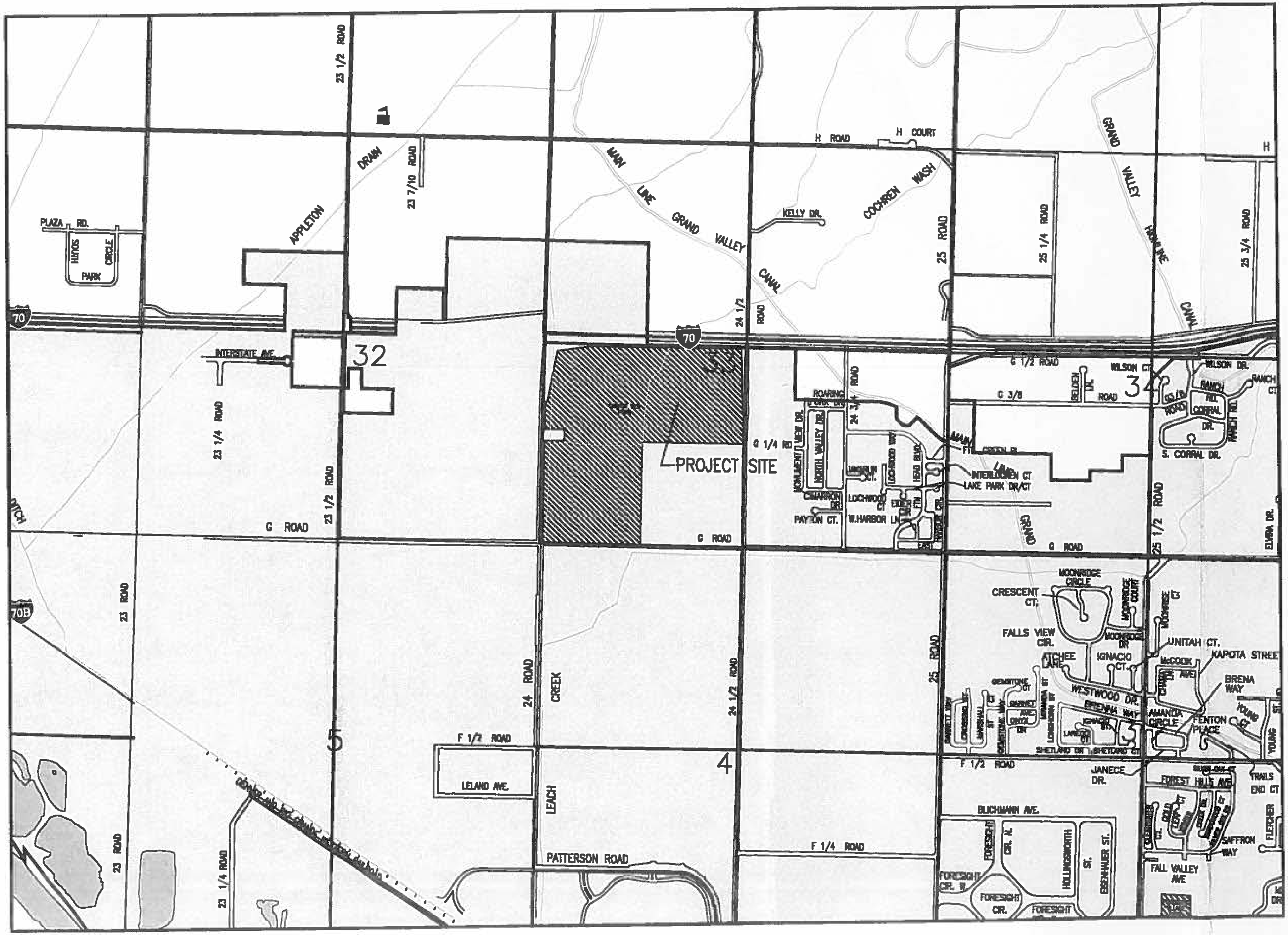
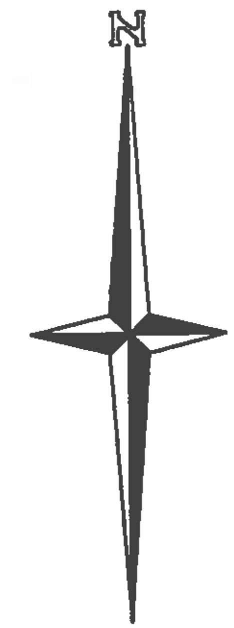
Engineer's Certification

I hereby certify that this report was prepared by me or under my direct supervision for the Owner's hereof.

Dale W. Thome, PE
Reg. No. 33929





City of Grand Junction

Grand Junction

Vicinity Map

THOMPSON-LANGFORD CORP.
ENGINEERS AND LAND SURVEYORS
GRAND JUNCTION, COLORADO

DRAWN BY: dmt
CHECKED BY: M

DATE: 3-13-03
SCALE: Horiz NTS
Project No: 0401-002
SHEET No: 1 of 1

I. GENERAL LOCATION AND DESCRIPTION:

A. Site and Major Basin Location:

The new expansion to Canyon View Park is located in the eastern portion of the Park's properties, adjacent to 24 ½ Road, just across the road from Canyon View Vineyards Church. In more legal terms, it is located in the Northeast 1/4 of the Southwest ¼ of Section 33, Township 1 South, Range 1 West of the Ute Meridian.

B. Site and Major Basin Description:

The site and major basin generally slope to the south and west at between 0 and 2 percent. As stated above, this portion of the park is bounded on the north by I-70, on the east by 24 ½ road, and on the west by Corcoran Wash. The Mitchell Drain, an open ditch, runs along the south side of the site. The site is currently fallow and as of this time has little vegetative cover.

The northerly portion of this site has been partially developed with a baseball facility and associated parking. The southerly half of the site, as proposed with this plan, will include tennis courts, soccer fields and associated parking. The full site consists of approximately 38 acres.

II. EXISTING DRAINAGE CONDITIONS:

A. Major Basin:

The general topography of the area slopes at between 0 and 2 percent to the southwest. Runoff follows the direction of previous agriculture southwesterly to the Mitchell Drain and Corcoran Wash. The Mitchell drain, owned and maintained by the Grand Junction Drainage District, borders the property on the south. Runoff, resulting from irrigation wastewater or storm water runoff, historically discharged directly into this drain, which in turn discharged into the Corcoran Wash.

B. Site:

Given the drainage barrier created by the Interstate and 24 ½ Road, the Site is somewhat isolated from the Major Basin. The existing baseball facility has been equipped with a drain that flows to the Corcoran Wash. All other undeveloped area drains directly into the Mitchell drain. The Mitchell Drain carries a residual flow of approximately 13.1 cfs according to GR Williams Engineering, Inc. letter, dated October 15, 2002, concerning drainage on the Canyon View Vineyards Church property to the east. A copy has been included in the appendix of this report.

III PROPOSED DRAINAGE CONDITIONS:

A. Site:

Even with development of the southerly half of the site, historic drainage patterns will not be materially changed. The proposed improvements to the site will continue to drain to the south, and directly into the Mitchell Drain. It is anticipated that when this project goes to construction, the Mitchell Drain will be piped and covered with the construction of the Spanish Trails Subdivision to the south. Given the more circuitous route that developed condition flows will take across the site, the longer time of concentration resulted in final discharges just slightly larger than the historic condition flows. Because there is not significant increase in flow from the site, we feel that early and direct discharge will aid in the relief of drainage congestion to the major basin.

Along the westerly portion of the project, more of Corcoran Wash will be placed underground using the same diameter pipe and pipe material (72" RCP). Though most of the soccer fields will drain directly to the open wash, a portion of the play field area will have to drain to inlets placed on the extended pipe.

B. Maintenance Issues:

Since the entire site is City property, all facilities will be maintained by the City of Grand Junction.

IV DESIGN CRITERIA AND APPROACH:

A. General Considerations:

From a drainage perspective, the site is nearly ideal. It is bounded on the north, east, and west by barriers that prevent tributary drainage and is bordered on the south by a maintained drainageway into which we can discharge our storm water flows.

B. Hydrology:

The developed area was broken into numerous small basins for the purpose of calculating flows to be used in the sizing of the on-site storm sewers. For purposes of designing the storm sewers, each sub-basin was evaluated using the Rational Method and sewers were sized accordingly.

Stormwater runoff for the 2-year and 100-year events were quantified using the Rational Method as detailed in Section VI "Hydrology" of the Joint City of Grand Junction, Mesa County, Stormwater Management Manual dated May 1996. Calculations for both historic and developed site runoff have been tabulated on spreadsheets and included in the Appendix of this report.

According to the Soil Conservation Service soil survey for the Grand Junction Area, the dominant soil type is Ravola Clay Loam, with areas of Billings Clay Loam. Both soil groups have a hydrologic soil group index of "B".

Pre-development Runoff coefficients used in the Rational equation were selected based on the hydrologic soil group and the ground cover as noted on the Canyon View Park Historic Basins exhibit. Post-development coefficients were selected for the various proposed surface covers, which along with the pre-development coefficients, were tabulated on the spreadsheet used to calculate the Composite Runoff Coefficients. This spreadsheet has been included in the Appendix of this report.

The times of concentration for the various basins, were calculated and compiled on a spreadsheet containing various formulas found in Appendix E of the SWMM. The summations for the travel times for each basin are shown along with the intensity for the storm event as taken from Appendix A of the SWMM.

The total area for each drainage basin was used in the calculation of runoff. The buildings were considered as impervious area as was the paved parking area. The affects of the landscape areas were accounted for in the calculation of the composite "C" values. The site was analyzed using the Rational Method as described in Section VI, Hydrology, of the Storm Water Management Manual (SWMM). Stormwater runoff for the 2-year and 100-year events were calculated and displayed on composite spreadsheets for each basin. These spreadsheets which calculates and displays the runoff rates for the pre and post development condition have been included in the Appendix of this report.

C. Hydraulics:

Stormwater runoff from paved and greenspace areas will collect in area drains as shown on the construction plans. Runoff from the parking areas will sheet flow to the curb and gutter which will carry the flows temporarily to cobble lined swales leading to inlets feeding into the Mitchell Drain. Ultimately, the swales will go away and the paved parking areas will convey the flows all the way to the inlets on the Mitchell Drain.

The conduits carrying the flows away form these inlets have been sized to transport the 100-year flows. Copies of the calculations have been included in the Appendix.

The pipe in the Mitchell Drain, has been verified to have the capacity to carry the composite flow for the entire site. We feel this verification is conservative due to the fact that the composite design flow exceeds the flow rate for the basin with the shortest time of concentration and highest flow. Copies of the calculations have been included in the Appendix.

D. Floodplain Impacts:

The FEMA floodplain map Community-Panel Number 080115 0460 B does not identify any floodplains in this area.

IV Results and Conclusions

Runoff Results:

Historic:

Full site 2-yr runoff rate = approx. 3 CFS
Full site 100-year runoff rate = approx 20 CFS

Developed:

Basin "A" 2-yr runoff rate = 0.9 CFS
Basin "A" 100-year runoff rate = 5.2 CFS

Basin "B" 2-yr runoff rate = 0.3 CFS
Basin "B" 100-year runoff rate = 1.9 CFS

Basin "C" 2-yr runoff rate = 0.5 CFS
Basin "C" 100-year runoff rate = 3.2 CFS

Basin "D" 2-yr runoff rate = 0.2 CFS
Basin "D" 100-year runoff rate = 1.1 CFS

Basin "E" 2-yr runoff rate = 2.0 CFS
Basin "E" 100-year runoff rate = 11.2 CFS

Basin "F" 2-yr runoff rate = 0.4 CFS
Basin "F" 100-year runoff rate = 2.4 CFS

Basin "G" 2-yr runoff rate = 0.7 CFS
Basin "G" 100-year runoff rate = 5.3 CFS

Basin "H" 2-yr runoff rate = 0.1 CFS
Basin "H" 100-year runoff rate = 0.9 CFS

Basins contributing to Storm Sewer Line A

Basin D - Developed Flow = 1.1 cfs
Existing Concrete Ditch flow = 5 cfs
Use 6.1 cfs

Basins contributing to Storm Sewer Line B

Basin C - Developed Flow, ($T_{c\ 100}$ = 60min) = 3.2 cfs
Basin E - Developed Flow, ($T_{c\ 100}$ = 17min) = 11.2 cfs

Basin H - Developed Flow, ($T_{c\ 100}$ = 23min) = 0.9 cfs
Use 12 cfs

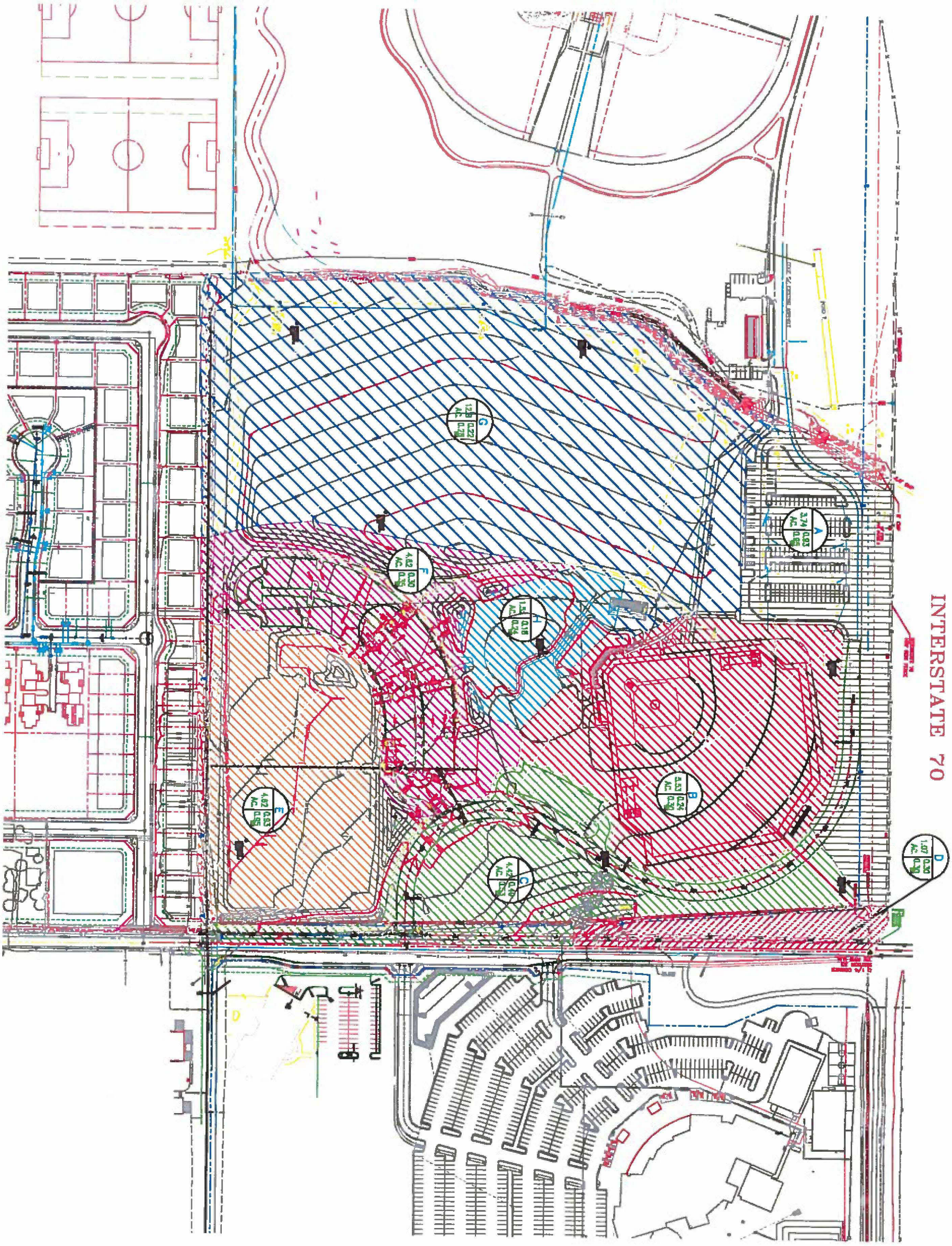
Basins contributing to Storm Sewer Line C

Basin F - Developed Flow = 2.4 cfs
Use 2.5 cfs

References

"STORMWATER MANAGEMENT MANUAL (SWMM)", City of Grand Junction, May 1996

TECHNICAL ADDENDUM



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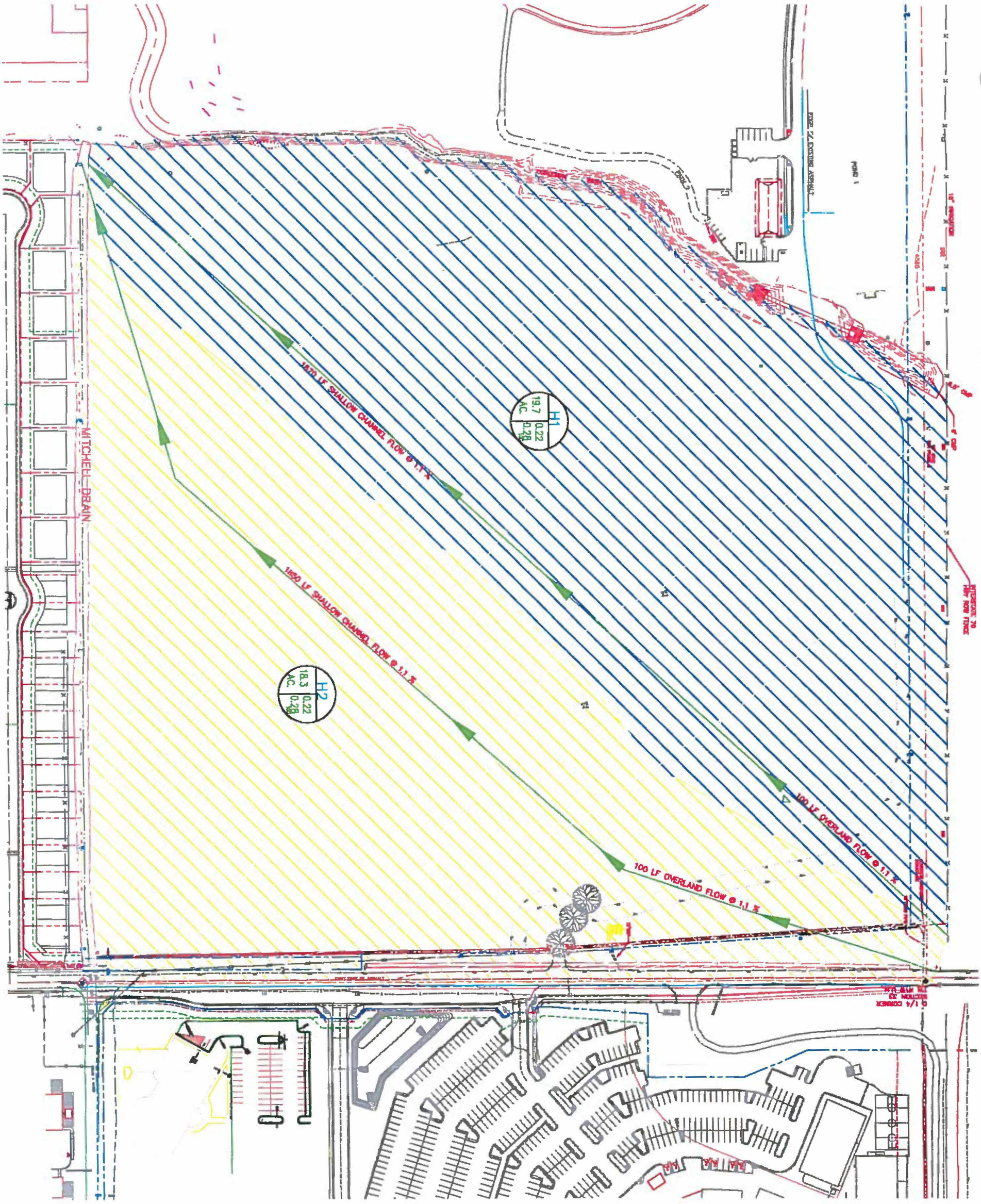
SHEET NO. 1 of 2	Project No. 0401-002	SCALE n/a	DATE 3-13-03		DRAWN BY: dwt	CHECKED BY: jal	THOMPSON-LANGFORD CORP. ENGINEERS AND LAND SURVEYORS 529 25 1/2 RD., SUITE B115 GRAND JUNCTION, COLORADO PH. (970) 243-8067 FAX (970) 241-2645 tlc@tlcwest.com	Grand Junction	Canyon View Park Developed Basins	REVISION / DATE / DESCRIPTION / BY / CHK	



SHEET NO. 2 of 2	Project No. 0401-002	SCALE: Horiz. n/a	DATE: 3-13-03		DRAWN BY: dwt	CHECKED BY: jel	

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Grand Junction

Canyon View Park

Historic Basin

REVISION	DATE	DESCRIPTION	BY	CHD

MITCHELL DRAIN

Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	36.0000 in
Flowrate	36.0000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	23.5499 in
Area	7.0686 ft2
Wetted Area	4.8994 ft2
Wetted Perimeter	67.8322 in
Perimeter	113.0973 in
Velocity	7.3478 fps
Hydraulic Radius	10.4010 in
Percent Full	65.4163 %
Full flow Flowrate	47.1629 cfs
Full flow velocity	6.6722 fps

Critical Information

Critical depth	23.6386 in
Critical slope	0.0049 ft/ft
Critical velocity	7.2816 fps
Critical area	4.9439 ft2
Critical perimeter	67.8259 in
Critical hydraulic radius	10.4964 in
Critical top width	36.0000 in
Specific energy	2.7942 ft
Minimum energy	2.9548 ft
Froude number	1.0179
Flow condition	Supercritical

Storm Sewer Line A - Flow = 6.1 cfs
Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	13.0000 in
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	6.4720 cfs
Area	1.7671 ft2
Wetted Area	1.3666 ft2
Wetted Perimeter	36.5643 in
Perimeter	56.5487 in
Velocity	4.7359 fps
Hydraulic Radius	5.3820 in
Percent Full	72.2222 %
Full flow Flowrate	7.4277 cfs
Full flow velocity	4.2032 fps

Critical Information

Critical depth	12.1050 in
Critical slope	0.0062 ft/ft
Critical velocity	5.2228 fps
Critical area	1.2717 ft2
Critical perimeter	34.4844 in
Critical hydraulic radius	5.3104 in
Critical top width	18.0000 in
Specific energy	1.4415 ft
Minimum energy	1.5131 ft
Froude number	0.8812
Flow condition	Subcritical

Storm Sewer Line B - Flow = 12 cfs - last section tying into Mitchell drain
Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	24.0000 in
Flowrate	12.0000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0090

Computed Results:

Depth	12.2727 in
Area	3.1416 ft2
Wetted Area	1.6162 ft2
Wetted Perimeter	38.2446 in
Perimeter	75.3982 in
Velocity	7.4246 fps
Hydraulic Radius	6.0856 in
Percent Full	51.1363 %
Full flow Flowrate	23.1060 cfs
Full flow velocity	7.3549 fps

Critical Information

Critical depth	15.0332 in
Critical slope	0.0026 ft/ft
Critical velocity	5.7794 fps
Critical area	2.0763 ft2
Critical perimeter	43.7655 in
Critical hydraulic radius	6.8317 in
Critical top width	24.0000 in
Specific energy	1.8794 ft
Minimum energy	1.8791 ft
Froude number	1.4561
Flow condition	Supercritical

Storm Sewer Line C - Flow = 2.5 cfs
Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	18.0000 in
Flowrate	2.5000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0090

Computed Results:

Depth	5.9112 in
Area	1.7671 ft2
Wetted Area	0.5052 ft2
Wetted Perimeter	21.9685 in
Perimeter	56.5487 in
Velocity	4.9486 fps
Hydraulic Radius	3.3114 in
Percent Full	32.8399 %
Full flow Flowrate	10.7289 cfs
Full flow velocity	6.0713 fps

Critical Information

Critical depth	7.1862 in
Critical slope	0.0024 ft/ft
Critical velocity	3.7971 fps
Critical area	0.6584 ft2
Critical perimeter	24.6218 in
Critical hydraulic radius	3.8506 in
Critical top width	17.6307 in
Specific energy	0.8732 ft
Minimum energy	0.8983 ft
Froude number	1.4569
Flow condition	Supercritical

BASIN "HISTORIC"
For: Canyon View Park Improvement
TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN	L	S	N** ~ n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity	
	ft.	%	coef.	fps	fps	min.	min.	min.	min.	Curves	
Basin "HISTORIC-1"											
Overland	100	1.12%	*0.300*	n/a	n/a	45.99	27.14	62.5	36.6	0.33	1.894
Shallow Swale	1670	1.12%	0.050	1.69	2.94	16.51	9.47				
Basin "HISTORIC-2"											
Overland	100	1.12%	*0.300*	n/a	n/a	45.99	27.14	63.7	37.9	0.32	1.851
Shallow Swale	1850	1.12%	0.050	1.74	2.87	17.69	10.76				

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.8181	16.20323968	0.050489903		50	1.00	0.162	0.0051	0.016	0.90605	0.741

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
3.8709	37.40747925	0.103479306		50	1.00	0.374	0.0051	0.016	1.46191	5.659

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
0.67403	5.70771583	0.118090672		12	0.237	0.02	0.03	1.6861	1.136

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
3.5643	13.12533809	0.271558719		12	0.545	0.02	0.03	2.9376	10.470

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.41903	11.10221978	0.037742452		50	1.00	0.111	0.0051	0.016	0.74628	0.313

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.97106	26.15522948	0.07535993		50	1.00	0.2615	0.0051	0.016	1.18334	2.332

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
0.74401	5.9967141	0.124069947		12	0.249	0.02	0.03	1.7426	1.296

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
3.3075	12.64367431	0.261593262		12	0.525	0.02	0.03	2.8653	9.477

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"N" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "N" value of 0.05 was used for natural ground.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs
Basin "HISTORIC-1"					
2-year	0.22	1.00	0.33	19.7	1.42
100-year	0.28	1.00	1.89	19.7	10.45
Basin "HISTORIC-2"					
2-year	0.22	1.00	0.32	18.3	1.30
100-year	0.28	1.00	1.85	18.3	9.48

Q-2 Year 2.72 <<<<<<<<<<<<<<<<<<<
Q-100 Year 19.93 <<<<<<<<<<<<<<<<<<<
*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

BASIN "A" (Developed)

For: CANYON VIEW PARK

TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN	L	S	N** ~ n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity Parachute	
	ft.	%	coef.	fps	fps	min.	min.	min.	min.	Curves	
Basin "A" Developed											
Overland	175	1.14%	*0.300*	n/a	n/a	71.46	42.17	89.2	53.8	0.25	1.446
Curb and Gutter #1	1025	0.55%	0.016	0.97	1.47	17.69	11.61				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	Check "Q" ***
1.01617	7.008208045	0.144997408		12	0.291	0.01	0.03	1.3671	1.389

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.8925	17.00339966	0.052489503		50	1.00	0.17	0.0055	0.016	0.9656	0.862

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.7061	24.20483952	0.070485904		50	1.00	0.242	0.0051	0.016	1.13175	1.931

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
3.72299	13.41433636	0.277537994		12	0.557	0.01	0.03	2.1076	7.846

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)	
3.50563	35.50709929	0.098730256		50	1.00	0.3550	0.0055	0.016	1.47134	5.158

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877		50	1.00	0.4426	0.0051	0.016	1.61924	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"*N*" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "*N*" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "A"						
2-year	0.93	1.00	0.25	3.74	0.86	<<<<<<<<<<<<<<<<<<<
100-year	0.95	1.00	1.45	3.74	5.14	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

BASIN "B" (Developed)

For: CANYON VIEW PARK

TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN		L	S	N** ~ n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
	Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity Parachute Curves	
		ft.	%	coef.	fps	fps	min.	min.	min.	min.		
Basin "B" Developed												
	Overland	290	0.93%	*0.300*	n/a	n/a	116.12	68.53	120.7	71.7	0.19	1.160
	Shallow swale	210	0.60%	0.030	0.76	1.11	4.59	3.17				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2) Check "Q" ***

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)
0.27725	3.660644752	0.075737478		12	0.152	0.01	0.03	0.8867

0.246

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)
0.3381	9.801959804	0.034493102		50	1.00	0.098	0.006	0.016	0.76231

0.258

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)
1.7061	24.20483952	0.070485904		50	1.00	0.242	0.0051	0.016	1.13175

1.931

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)
3.72299	13.41433636	0.277537994		12	0.557	0.01	0.03	2.1076

7.846

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)
1.21103	20.1040196	0.060237954		50	1.00	0.2010	0.006	0.016	1.10549

1.339

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877	50	1.00	0.4426	0.0051	0.016	1.61924	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"*N*" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "*N*" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "B"						
2-year	0.24	1.00	0.19	5.53	0.25	<<<<<<<<<<<<<<<<<<<
100-year	0.30	1.00	1.16	5.53	1.92	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

BASIN "C" (Developed)

For: CANYON VIEW PARK

TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN		L	S	N** - n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
	Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity Parachute Curves	
		ft.	%	coef.	fps	fps	min.	min.	min.	min.		
Basin "C" Developed												
	Overland	176	1.00%	*0.300*	n/a	n/a	75.65	44.64	92.6	59.6	0.24	1.338
	Curb & Gutter	900	1.40%	0.016	0.88	1.37	16.99	10.96				
								4.00				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	Check "Q" ***
1.01617	7.008208045	0.144997408		12	0.291	0.01	0.03	1.3671	1.389

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.5676	13.20263974	0.042991403		50	1.00	0.132	0.006	0.016	0.88287	0.501

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.7061	24.20483952	0.070485904		50	1.00	0.242	0.0051	0.016	1.13175	1.931

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
3.72299	13.41433636	0.277537994		12	0.557	0.01	0.03	2.1076	7.846

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)	
2.4236	29.20583942	0.082983405		50	1.00	0.2920	0.006	0.016	1.36868	3.317

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877		50	1.00	0.4426	0.0051	0.016	1.61924	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"*N*" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "*N*" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "C"						
2-year	0.49	1.00	0.24	4.42	0.52	<<<<<<<<<<<<<<<<<<<
100-year	0.53	1.00	1.34	4.42	3.14	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

BASIN "D" (Developed)

For: CANYON VIEW PARK

TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN		L	S	N** ~ n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
	Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity Parachute	
		ft.	%	coef.	fps	fps	min.	min.	min.	min.	Curves	
Basin "D" Developed												
	Overland	83	44.00%	*0.300*	n/a	n/a	9.13	5.39	19.9	12.4	0.69	3.367
	Shallow Swale	573	1.40%	0.030	0.88	1.37	10.82	6.98				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2) Check "Q"

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	***
0.25931	3.540228806	0.073246113		12	0.147	0.01	0.03	0.8671	0.225

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.5676	13.20263974	0.042991403		50	1.00	0.132	0.006	0.016	0.88287	0.501

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.7061	24.20483952	0.070485904		50	1.00	0.242	0.0051	0.016	1.13175	1.931

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
0.8427	6.382045127	0.132042313		12	0.265	0.01	0.03	1.2844	1.082

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)	
2.4236	29.20583942	0.082983405		50	1.00	0.2920	0.006	0.016	1.36868	3.317

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877	50	1.00	0.4426	0.0051	0.016	1.61924	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"N" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "N" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "D"						
2-year	0.30	1.00	0.69	1.07	0.22	<<<<<<<<<<<<<<<<<<<
100-year	0.30	1.00	3.37	1.07	1.08	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

BASIN "E" (Developed)

For: CANYON VIEW PARK

TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN		L	S	N** ~ n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
	Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity Parachute Curves	
		ft.	%	coef.	fps	fps	min.	min.	min.	min.		
Basin "E" Developed												
	Overland	300	1.00%	0.050	n/a	n/a	27.64	16.31	28.4	17.2	0.56	2.916
	Shallow Swale	125	1.00%	0.013	2.94	2.38	0.71	0.87				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)		Check "Q" ***
0.82373	6.309795559	0.130547494		12	0.262	0.01	0.013	2.9416		2.423

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.5676	13.20263974	0.042991403		50	1.00	0.132	0.006	0.016	0.88287	0.501

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.7061	24.20483952	0.070485904		50	1.00	0.242	0.0051	0.016	1.13175	1.931

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
5.37073	16.11165355	0.333344556		12	0.669	0.01	0.03	2.3814	12.790

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)	
2.4236	29.20583942	0.082983405		50	1.00	0.2920	0.006	0.016	1.36868	3.317

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877	50	1.00	0.4426	0.0051	0.016	1.61924	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"*N*" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "*N*" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "E"						
2-year	0.93	1.00	0.56	4.62	2.42	<<<<<<<<<<<<<<<<<<<
100-year	0.95	1.00	2.92	4.62	12.80	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

BASIN "F" (Developed)

For: CANYON VIEW PARK

TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN		L	S	N** ~ n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
	Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity Parachute Curves	
		ft.	%	coef.	fps	fps	min.	min.	min.	min.		
Basin "F" Developed												
	Overland	185	1.00%	*0.300*	n/a	n/a	78.73	46.46	89.4	52.2	0.25	1.478
	Curb & Gutter	665	1.20%	0.016	1.04	1.94	10.70	5.73				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2) Check "Q"

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	***
0.35089	4.118225346	0.085204662		12	0.171	0.01	0.013	2.2134	0.777

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.2925	9.00179982	0.032493502		50	1.00	0.09	0.012	0.016	1.03599	0.303

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.88063	25.50509949	0.073735254		50	1.00	0.255	0.0051	0.016	1.16627	2.193

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
3.10897	12.25834328	0.253620895		12	0.509	0.01	0.03	1.9847	6.170

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)	
2.4236	29.20583942	0.082983405		50	1.00	0.2920	0.012	0.016	1.93561	4.691

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877		50	1.00	0.4426	0.0051	0.016	**1.61924**	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"*N*" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "*N*" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "F"						
2-year	0.30	1.00	0.25	4.3	**0.32**	<<<<<<<<<<<<<<<<<<<
100-year	0.35	1.00	1.48	4.3	**2.22**	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

BASIN "G" (Developed)

For: CANYON VIEW PARK

TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN	Descrip. of Flow	L Length ft.	S Slope %	N** ~ n** coef.	V_2 Vel. fps	V_{100} Vel. fps	Tt_2 Travel Time min.	Tt_{100} Travel Time min.	Tc2 Time of Concentration min.	Tc100 Time of Concentration min.	i_2 Intensity Parachute Curves	i_{100} Intensity Parachute Curves
Basin "G" Developed												
	Overland	200	2.00%	*0.400*	n/a	n/a	79.94	47.17	83.9	51.6	0.26	1.490
	shallow swale	665	2.00%	0.030	2.83	2.48	3.92	4.47				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	Check "Q" ***
0.25931	3.540228806	0.073246113		12	0.147	0.02	0.013	2.83	0.734

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.5676	13.20263974	0.042991403		50	1.00	0.132	0.012	0.016	1.24856	0.709

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.7061	24.20483952	0.070485904		50	1.00	0.242	0.0051	0.016	1.13175	1.931

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
2.14715	10.18718901	0.210769428		12	0.423	0.02	0.03	2.4809	5.327

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)	
2.4236	29.20583942	0.082983405		50	1.00	0.2920	0.012	0.016	1.93561	4.691

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877		50	1.00	0.4426	0.0051	0.016	1.61924	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"*N*" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "*N*" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "G"						
2-year	0.22	1.00	0.26	12.77	0.73	<<<<<<<<<<<<<<<<<<<
100-year	0.28	1.00	1.49	12.77	5.33	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

BASIN "H" (Developed)

For: CANYON VIEW PARK

TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN	L	S	N** ~ n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity Parachute Curves	
	ft.	%	coef.	fps	fps	min.	min.	min.	min.		
Basin "H" Developed											
Overland	100	2.00%	*0.300*	n/a	n/a	36.47	21.52	38.0	23.2	0.47	2.496
shallow swale	165	2.00%	0.030	1.85	1.59	1.48	1.72				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)		Check "Q" ***
0.07301	1.878488754	0.038865285		12	0.078	0.02	0.013	1.8548		0.135

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.5676	13.20263974	0.042991403		50	1.00	0.132	0.012	0.016	1.24856	0.709

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.7061	24.20483952	0.070485904		50	1.00	0.242	0.0051	0.016	1.13175	1.931

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
0.57029	5.250135236	0.108623488		12	0.218	0.02	0.03	1.5948	0.909

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)	
2.4236	29.20583942	0.082983405		50	1.00	0.2920	0.012	0.016	1.93561	4.691

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877		50	1.00	0.4426	0.0051	0.016	1.61924	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"*N*" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "*N*" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "H"						
2-year	0.18	1.00	0.47	1.52	0.13	<<<<<<<<<<<<<<<<<<<
100-year	0.24	1.00	2.50	1.52	0.91	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

COMPOSITE RUNOFF COEFICIENTS

For: CANYON VIEW PARK

USING

GRAND JUNCTION RECOMMENDED RUNOFF COEFICIENTS

Description Surface Area	Hydro. Soils Group	Slope 0-2% Runoff Coeff.'s	Sel. Coeff.		BASIN Hist. Unit Area	BASIN Hist. Wt'd Value	BASIN A Devel. Unit Area	BASIN A Devel. Wt'd Value	BASIN B Devel. Unit Area	BASIN B Devel. Wt'd Value	BASIN C Devel. Unit Area	BASIN C Devel. Wt'd Value	BASIN D Devel. Unit Area	BASIN D Devel. Wt'd Value
Pavement and Roofs	B	0.93	0.93	2-Yr.			2.22	2.065			1.810	1.68	0.16	0.15
	B	0.95	0.95	100-Yr.			2.22	2.109			1.810	1.72	0.16	0.15
Bare Ground	B	0.14 to 0.22	0.22	2-Yr.	38.00	8.36	1.52	0.334	2.10	0.462			0.79	0.17
	B	0.20 to 0.28	0.28	100-Yr.	38.00	10.64	1.52	0.426	2.10	0.588			0.79	0.22
Green landscaping	B	0.14 to 0.22	0.18	2-Yr.		0.00			2.70	0.486	2.610	0.47		
lawns and parks	B	0.20 to 0.28	0.24	100-Yr.		0.00			2.70	0.648	2.610	0.63		
Non-green and gravel	B	0.45 to 0.55	0.50	2-Yr.		0.00			0.73	0.365				
Landscaping	B	0.50 to 0.60	0.55	100-Yr.		0.00			0.73	0.402				
Total Basin Area:					38.00		3.74		5.53		4.42		1.07	
COMPOSITE "C" VALUE (2-year)						0.22		0.64		0.24		0.49		0.30
COMPOSITE "C" VALUE (100-year)						0.28		0.68		0.30		0.53		0.35
						10.64		2.535		1.638		2.346		0.373

COMPOSITE RUNOFF COEFICIENTS

For: CANYON VIEW PARK

USING

GRAND JUNCTION RECOMMENDED RUNOFF COEFICIENTS

Description	Hydro. Soils Group	Slope 0-2% Runoff Coeff.'s	Sel. Coeff.		BASIN E Devel. Unit Area	BASIN E Wt'd Value	BASIN F Devel. Unit Area	BASIN F Wt'd Value	BASIN G Devel. Unit Area	BASIN G Wt'd Value	BASIN H Devel. Unit Area	BASIN H Wt'd Value	TOTAL COMPOSITE Devel. Unit Area	TOTAL COMPOSITE Wt'd Value
Pavement and Roofs	B	0.93	0.93	2-Yr.	4.62	4.297								
	B	0.95	0.95	100-Yr.	4.62	4.389								
Bare Ground	B	0.14 to 0.22	0.22	2-Yr.			2.10	0.462	12.77	2.81				
	B	0.20 to 0.28	0.28	100-Yr.			2.10	0.588	12.77	3.58				
Green landscaping	B	0.14 to 0.22	0.18	2-Yr.			2.70	0.486			1.620	0.29		
lawns and parks	B	0.20 to 0.28	0.24	100-Yr.			2.70	0.648			1.620	0.39		
Non-green and gravel	B	0.45 to 0.55	0.50	2-Yr.			0.73	0.365						
Landscaping	B	0.50 to 0.60	0.55	100-Yr.			0.73	0.402						
Total Basin Area:					4.62		5.53		12.77		1.62		16.88	
COMPOSITE "C" VALUE (2-year)						0.93		0.24		0.22		0.18		
COMPOSITE "C" VALUE (100-year)						0.95		0.30		0.28		0.24		0.44
						4.389		1.638		3.576		0.389	9.9909	

BASIN : "Composite Developed
For: CANYON VIEW PARK
TIME OF CONCENTRATION/ INTENSITY/ FLOW

BASIN		L	S	N** ~ n**	V_2	V_{100}	Tt_2	Tt_{100}	Tc2	Tc100	i_2	i_{100}
	Descrip. of Flow	Length	Slope		Vel.	Vel.	Travel Time	Travel Time	Time of Concentration		Intensity Parachute	
		ft.	%	coef.	fps	fps	min.	min.	min.	min.	Curves	
Basin "Composite" Developed												
	Overland	176	1.00%	0.300	n/a	n/a	75.65	44.64	92.6	58.6	0.24	1.356
	Curb & Gutter	900	1.40%	0.016	0.88	1.37	16.99	10.96				
								3.00				

*** Vary the depths until this value equals "Q" below

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q2)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	Check "Q" ***
1.01617	7.008208045	0.144997408		12	0.291	0.01	0.03	1.3671	1.389

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
0.5676	13.20263974	0.042991403		50	1.00	0.132	0.006	0.016	0.88287	0.501

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q2)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)	
1.7061	24.20483952	0.070485904		50	1.00	0.242	0.0051	0.016	1.13175	1.931

V=1.486/n*R^2/3*S^1/2 (Shallow swale, Q100)

A	P	R	Q	SS-H/V	d(ft)	S('/')	n	V(fps)	
3.72299	13.41433636	0.277537994		12	0.557	0.01	0.03	2.1076	7.846

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #1, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	0.0055	n	V(fps)	
2.4236	29.20583942	0.082983405		50	1.00	0.2920	0.006	0.016	1.36868	3.317

V=1.486/n*R^2/3*S^1/2 (Curb and Gutter #2, Q100)

A	P	R	Q	SS-H/V	Bott.	d(ft)	S('/')	n	V(fps)

5.33997	44.26885111	0.120625877		50	1.00	0.4426	0.0051	0.016	1.61924	8.647

* Overland "To" based on SCS formula pg. E-2 Storm Water Management Manual
**"N" is an overland flow resistance factor (See Table E-1). "n" is the Manning's coefficient
An "N" value of 0.12 was used for natural ground with no tillage and 20-40% residue.
Mannings Equa. was used to determine open channel velocities.
Mannings "n" for curb and gutter and conc. pipe = 0.016, PVC pipe = 0.012 and earth swales = 0.030.
***Figure "E-3", Pg. E-9, Storm Water Management Manual was used for shallow flows.

RATIONAL CALCULATION OF DESIGN FLOWS

	C Composite Coefficient n/a	Cf Antecedent Precip. Fac. n/a	I* Rainfall Intensit in/hr	A Basin Area acres	Q Volume cfs	
Basin "C"						
2-year	0.41	1.00	0.24	38	3.73	<<<<<<<<<<<<<<<<<<<
100-year	0.44	1.00	1.36	38	22.67	<<<<<<<<<<<<<<<<<<<

*The rainfall intensity is based on the formula presented on Table A-3 of the SWMM

APPENDIX

SOIL SURVEY

Grand Junction Area, Colorado

Series 1940, No. 19

Issued November, 1955

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with the
COLORADO AGRICULTURAL EXPERIMENT STATION

Billings silty clay loam, 0 to 2 percent slopes (Bc).—This soil, locally called adobe, is one of the most important and extensive in the Grand Valley. It covers nearly one-fifth of the Grand Junction Area. The areas occur on the broad flood plains and very gently sloping coalescing alluvial fans along streams. Many large areas are north of the Colorado River.

The soil is derived from deep alluvial deposits that came mainly from Mancos shale but in a few places from fine-grained sandstone materials. The deposits ordinarily range from 4 to 40 feet deep but in places exceed 40 feet. The deposits have been built up from thin sediments brought in by the streams that have formed the coalescing alluvial fans or have been dropped by the broad washes that have no drainage channel. The thickest deposit, near Grand Junction, was built up by Indian Wash.

The color and texture of the soil profile vary from place to place. The 8- to 10-inch surface soil normally consists of gray, light-gray, light olive-gray, or light brownish-gray silty clay loam. This layer grades into material of similar color and texture that extends to depths of 3 or 4 feet. Below this depth the successive depositional layers show more variation. Although the dominant texture is silty clay loam, the profile may have a loam, clay loam, fine sandy loam, or a very fine sandy loam texture.

Where there are fairly uniform beds of Mancos shale and where the soil is not influenced by materials deposited by adjoining drainage courses, the profile varies only slightly within the upper 3 or 4 feet. In areas bordering drainage courses, however, the soil varies more in texture and color from the surface downward.

One small area about 1½ miles southeast of Loma consists of light grayish-brown or pale-brown heavy silty clay loam that shows only slight variation in texture to depths of 4 to 6 feet. The underlying soil material is more variable. Below depths of 6 to 10 feet the layers generally are somewhat thicker and have a higher percentage of coarse soil material.

Also included with this soil are several small areas totaling about 3 square miles that are dominantly pale yellow. These are located 2½ to 3½ miles northeast of Fruita, 5 miles north of Fruita, 2½ miles northeast of Loma, 3 to 5 miles north of Loma, 1½ miles northwest of Loma, and 4 miles northwest of Mack. In these areas the 8- or 10-inch surface soil is pale-yellow silty clay loam, and the subsoil is a relatively uniform pale-yellow silty clay loam to depths of 4 to 8 feet. The accumulated alluvial layers are difficult to distinguish, but in a few places transitional to Fruita soils there are small areas having a pale-brown to light-yellowish brown color. These transitional areas are included with Billings silty clay loam because they have a finer textured subsoil than is characteristic of the Ravola soils.

Although moderately fine textured, this Billings soil permits successful growth of deep-rooted crops such as alfalfa and tree fruits. Its permeability is normally not so favorable as that of the Mesa, Fruita, and Ravola soils. Its tilth and workability are fair, but it puddles so quickly when wet and bakes so hard when dry that good tilth can be maintained only by proper irrigation and special cultural practices. Runoff is slow and internal drainage is very slow.

Like all other soils in the area, this one has a low organic-matter content. Under natural conditions it contains a moderate concentration of salts derived from the parent rock (Mancos shale). In places, however, it contains so much salt that good yields cannot be obtained. Some large areas are so strongly saline they cannot be used for crops. Generally, this soil is without visible lime, but it is calcareous. In many places small white flecks or indistinct light-colored streaks or seams indicate that lime, gypsum, or salts are present.

Use and management.—About 80 percent of this soil is cultivated. The chief irrigated crops are alfalfa, corn, dry beans, sugar beets, small grains, and tomatoes and other truck crops. Where the soil is located so as to avoid frost damage, tree fruits are grown.

Most of the field crops are grown in the central and western parts of the valley, or from Grand Junction westward. The entire acreage in tree fruits—approximately 3 square miles—lies between Grand Junction and Palisade. Because the climate is more favorable near Palisade, the acreage in orchard fruits is greater there. A few small orchards are located northeast of Grand Junction in the direction of Clifton. The main fruit acreage is between Clifton and Palisade. Peach orchards predominate, but a considerable acreage is in pears, especially near Clifton. Yields depend on the age of the trees and other factors, including management, but the estimated potential yield is somewhat less on this soil than on Mesa soils. This takes into account the slower internal drainage of this soil and its susceptibility to salinity if overirrigated. Yields of other crops vary according to the length of time the land has been irrigated, internal drainage or subdrainage, salt content of the soil, management practices, and local climate.

The uncultivated areas of this soil are mostly inaccessible places adjoining the larger washes, which occur mainly in the western part of the area, and those places that cannot be cropped profitably because they have inadequate drainage and a harmful concentration of salts. The uncultivated land supports a sparse growth of greasewood, saltbush, shadscale, rabbitbrush, ryegrass, peppergrass, and saltgrass. From 70 to 90 acres are required to pasture one animal during a season.

A number of places shown on the map by small marsh symbols are low and seepy. They could be ditched, but their acreage is likely too small to justify the expense. Left as they are, their salt content makes them worthless for any use except pasture.

Sizeable acreages of this soil apparently were overirrigated in the past. Irrigation water applied at higher levels to the north seeps upward in this soil where it occurs in low areas toward the river. Even now, new saline areas are appearing, and existing areas are getting larger. The total acreage affected by salts has remained more or less the same for the last two decades, but affected areas will continue to change in size and shape because of seepage.

Most fields are ditched where necessary. Some uncultivated areas require both leveling and ditching. In places subdrainage is inadequate because irregularities in the underlying shale tend to create pockets and prevent underground water from flowing into the drainage ditches. Also, in some areas where the alluvial mantle is 30 to 40 feet thick, the ditches are not always deep enough to drain the soil. Some areas are seepy because there are no ditches running in an east-west direction to intercept lateral flow of ground water from the over-

irrigated, permeable, medium-textured, stratified soils on the upper parts of the fan to the north. After being leveled, uncultivated areas would have to be cropped for 3 years before their salt content would be reduced enough to permit good yields.

Farmers can increase the organic-matter content of this soil by applying manure liberally and by growing alfalfa or clovers at least part of the time. A combination field crop and livestock type of farming favors improvement of this soil. Many of the small imperfectly drained areas may be kept in pasture. Strawberry clover and sweetclover are well suited, and mixtures of pasture grasses grow well.

Billings silty clay loam, 2 to 5 percent slopes (Bo). This soil covers a relatively small acreage in the Grand Valley. The areas are widely scattered. Except for its stronger slope, the soil is almost the same as Billings silty clay loam, 0 to 2 percent slopes. In a few places, notably north of Loma, there are areas having a pale-yellow color rather than the gray typical of the Billings soils.

Use and management.—Only about 15 percent of this soil is cultivated. Many of the areas lie along large drainageways or washes where they are difficult to reach. Even a larger number have such an uneven surface that considerable leveling would have to be done before they could be cropped. The cost of leveling, together with the expense of controlling erosion and gullying, discourages farmers from using them.

Many of the uncultivated areas have moderate concentrations of salts, but they are not particularly difficult to reclaim because they border natural ditches or washes which afford free disposal of irrigation water. Furthermore, for the most part, they have a porous substratum.

About the same crops are grown on this soil as on Billings silty clay loam, 0 to 2 percent slopes. The average yields are approximately the same.

Billings silty clay, 0 to 2 percent slopes (Ba).—This soil, locally called heavy adobe, occurs well toward the Colorado River. It is on alluvial materials—4 to about 40 feet thick—that largely came from Mancos shale. Most of this soil lies east and southeast of Grand Junction and along the railroad between Grand Junction and Fruita.

The 8- or 10-inch surface soil consists of light brownish-gray, gray, or olive-gray silty clay. The layer is similar to the surface layer of Billings silty clay loam soils but it is harder and, in many places, darker. The subsoil consists of similarly colored layers of silty clay loam, silt loam, and silty clay. In places the soil is silty clay to depths exceeding 4 feet.

The entire profile is firm when moist and has a massive structure. The subsoil has many small irregularly shaped light-gray specks or indistinct mottles. Poorly defined light-colored streaks indicate the presence of lime, gypsum, or salts. The surface soil and subsoil are calcareous, the lime being well distributed. The fine texture of the soil greatly retards penetration of roots, moisture, and air.

Surface runoff is very slow to slow where the slope is less than 1 percent. Internal drainage is very slow because the subsoil is massive and very slowly permeable. Even with ample drainage ditches, the discharge of irrigation water is slow.

Tilth and workability are not good, because the soil has a fine texture and a low content of organic matter. Moreover, some fields contain areas 20 to 60 feet across that have excessive amounts of salts. Slick spots also occur. These salty areas and slick spots produce low or negligible yields of most crops and are extremely difficult to eliminate.

Use and management.—About 75 percent of this soil is cultivated. Most of the rest is affected by salts. Small grains, beans, sugar beets, and alfalfa are the chief crops. They yield less than on Billings silty clay loam, 0 to 2 percent slopes. Ordinarily, newly broken fields are cropped to oats or other small grains the first few seasons so that excess salts can be removed. Afterwards, if drainage is adequate, they may be planted to pinto beans, sugar beets, corn, or alfalfa. The very slow permeability of this soil makes it unsuitable for orchard crops. Also, it is located mainly in areas where the frost hazard is great. Probably the greater part of the irrigable acreage is used for sugar beets. Small grains, alfalfa, and pinto beans usually follow in the order named.

Billings silty clay, 2 to 5 percent slopes (Bn).—This soil is similar to Billings silty clay, 0 to 2 percent slopes. It differs mainly in having greater slopes and a slightly finer textured and darker gray surface soil. In places, below depths of 3 or 4 feet, the silty clay or clay material is light olive gray.

The tilth and workability are poor. Surface runoff is medium, and internal drainage is very slow. The soil is better suited to irrigation than most of the larger nearly level areas of Billings silty clay, 0 to 2 percent slopes, many of which are affected by salts. Approximately 12 acres of this soil is in peach orchards. All the rest is normally used for cultivated crops, principally corn, pinto beans, and alfalfa. This soil is suited to about the same crops as Billings silty clay, 0 to 2 percent slopes, but it generally produces better yields.

Billings silty clay, moderately deep over Green River soil material, 0 to 2 percent slopes (Be).—This soil occurs on the outer margin of coalescing alluvial fans where 1 to 4½ feet of fine-textured deposits derived from shale overlies Green River soil materials.

Except for a few strips only a few rods wide that adjoin low-lying areas of Green River soils, this soil has not been altered by high overflows from the Colorado River. It is not likely that the main part of the soil will be covered by floodwaters from the Colorado River, as it lies well above the level of normal overflow.

Use and management.—About 85 percent of this soil is cultivated. The principal crops are alfalfa, corn, sugar beets, and pinto beans. A few peach orchards are on this soil near Clifton. Because the underlying strata are coarser, crops produce better on this soil than on most areas of the other Billings silty clay soils. Drainage and saline conditions have to be corrected before the soil will produce well.

Uncultivated acreages of this soil northwest of Grand Junction are saline, imperfectly drained, or both. Their tilth and workability are poor because they have a fine texture and a low content of organic matter.

comparatively sharp rises or undulations having slopes of more than 5 percent that extend 4 to 6 feet above the prevailing level or in small irregularly shaped bodies on relatively smooth topography. Wherever the areas of Chipeta soil occur, they are too small and too intricately associated with the Persayo soil to be mapped separately.

Use and management.—About 25 percent of this complex is cultivated, but practically all of it could be. The Chipeta soil is not difficult to level, but the expense of leveling and the isolated location of the areas have not favored development for irrigation and cropping. The kinds of crops grown, the management practiced, and the yields produced are approximately the same as for Persayo-Chipeta silty clay loams, 0 to 2 percent slopes.

Ravola clay loam, 0 to 2 percent slopes (RA).—This soil, the second most extensive in the area, has developed in material that consists largely of reworked Mancos shale but includes an appreciable amount of sandy alluvium from the higher Mesaverde formation. The surface of these deposits is relatively level, but the depth of the deposits ranges from 5 to 30 feet. The soil is associated with the Billings silty clay loams and the Ravola fine sandy loams. The most important areas are east, northeast, and southeast of Fruita, north and northwest of Palisade, and north and northwest of Clifton.

The soil is much like the Billings silty clay loams but more porous because it contains more fine sand, especially in the subsoil. Ordinarily, the 10- or 12-inch surface layer consists of light brownish-gray to very pale-brown light clay loam. The underlying layers vary from place to place in thickness and texture and become more sandy below depths of 4 to 5 feet. The range in the subsoil is from fine sandy loam to clay loam.

Small fragments of shale and sandstone are common from the surface downward and are especially noticeable in areas nearest the source of the soil material. The entire profile is calcareous and friable, so internal drainage is medium and development of plant roots is not restricted. The surface is smooth. Most areas are at slightly higher levels than the associated areas of Billings silty clay loams and therefore have better drainage and a lower content of salts. The soil, however, is slightly saline under native cover, and in places it has strongly saline spots and a high water table.

Use and management.—About 95 percent of this soil is cultivated. The chief crops are alfalfa, corn, pinto beans, small grains, and, where climate is favorable, orchard fruits. Practically all the acreage used for tree fruits is near Clifton and Palisade. The acreage used for field crops varies from year to year, but by rough estimate about 30 percent is cropped to corn, 25 percent to alfalfa, 15 percent to pinto beans, 13 percent to orchard fruits, 10 percent to small grains, and the rest to sugar beets, tame hay, tomatoes, and various vegetable crops.

In general, the tilth and workability of this soil are favorable. The content of organic matter is generally less than 1 percent, but many farmers are improving the supply by growing more alfalfa and by using other improved management.

Ravola clay loam, 2 to 5 percent slopes (RB).—This soil differs from Ravola clay loam, 0 to 2 percent slopes, mainly in having greater slopes. Although the combined areas total only seven-tenths of a square mile, this soil is important because the largest single area—approximately 300 acres—is located southeast of Palisade in the Vinelands and is used for peach growing. The remaining areas, widely scattered over the valley, total about 150 acres and are of minor importance.

The large area occupies a position intermediate between the Green River soils and the higher Mesa soils. Its underlying gravel and stone strata consist not only of sandstone but also of granite, schist, basalt, and lava. Much of the lava was deposited by drainage from the southeast. This large area was included with the soil unit largely because its color was similar to that of the other soil areas. Not many years ago subdrainage became inadequate for existing tree fruits and it was not until a number of tile drains were laid, as deep as 7 to 8 feet in places, that subdrainage was corrected in parts of this particular area.

Use and management.—All of the large soil area is in peaches. On it peach yields average as high as in any section of the valley, primarily because the danger of frost damage is negligible. Some of the orchards are now more than 50 years old but have produced steadily and still yield more than 400 bushels an acre according to reports from local growers. About half of the small scattered areas are cultivated. They are used largely for field crops because climatic conditions are not so favorable for peach growing. In building up the organic matter content, the growing of legumes, application of manure in large amounts, and use of commercial fertilizer generally are practiced.

Ravola very fine sandy loam, 0 to 2 percent slopes (RF).—This extensive and important soil occurs either along washes or arroyas extending from the north or on broad coalescing alluvial fans. The alluvial material from which the soil has developed was derived from sandstone and shale and ranges from 4 to 20 feet deep. The principal areas of the soil are north and northwest of Grand Junction and north, northwest, and southwest of Fruita.

This soil is much like Ravola fine sandy loam, 0 to 2 percent slopes, but is generally more uniformly level. The texture is prevailingly very fine sandy loam, but the percentage of silt is noticeably higher in some places. A few small areas that have a loam texture are included.

The 10- or 12-inch surface layer consists of light brownish-gray to very pale-brown very fine sandy loam. In some places the underlying thin depositional layers vary only slightly in color or texture. In other places, especially near drainage courses, the layers are more variable and may grade to loam, silt loam, or fine sandy loam. Nevertheless, layers of very fine sandy loam are more numerous. Below depths of 4 to 5 feet, the texture is sandier, and at depths of 8 to 12 feet strata of loamy fine sand, gravel, and scattered sandstone rock are common.

Disseminated lime occurs from the surface downward. Owing to the friable consistence of the successive layers, the tilth, internal drainage, available supply of moisture for plants, permeability to plant roots, and other physical properties are favorable and assure a wide suitability range for crops. The organic-matter content, however, is low. The soil is slightly saline under native cover and has a few strongly saline spots. Occasionally the water table is high.

Use and management.—More than 90 percent of this soil is cultivated. The chief crops are alfalfa, corn, pinto beans, small grains,

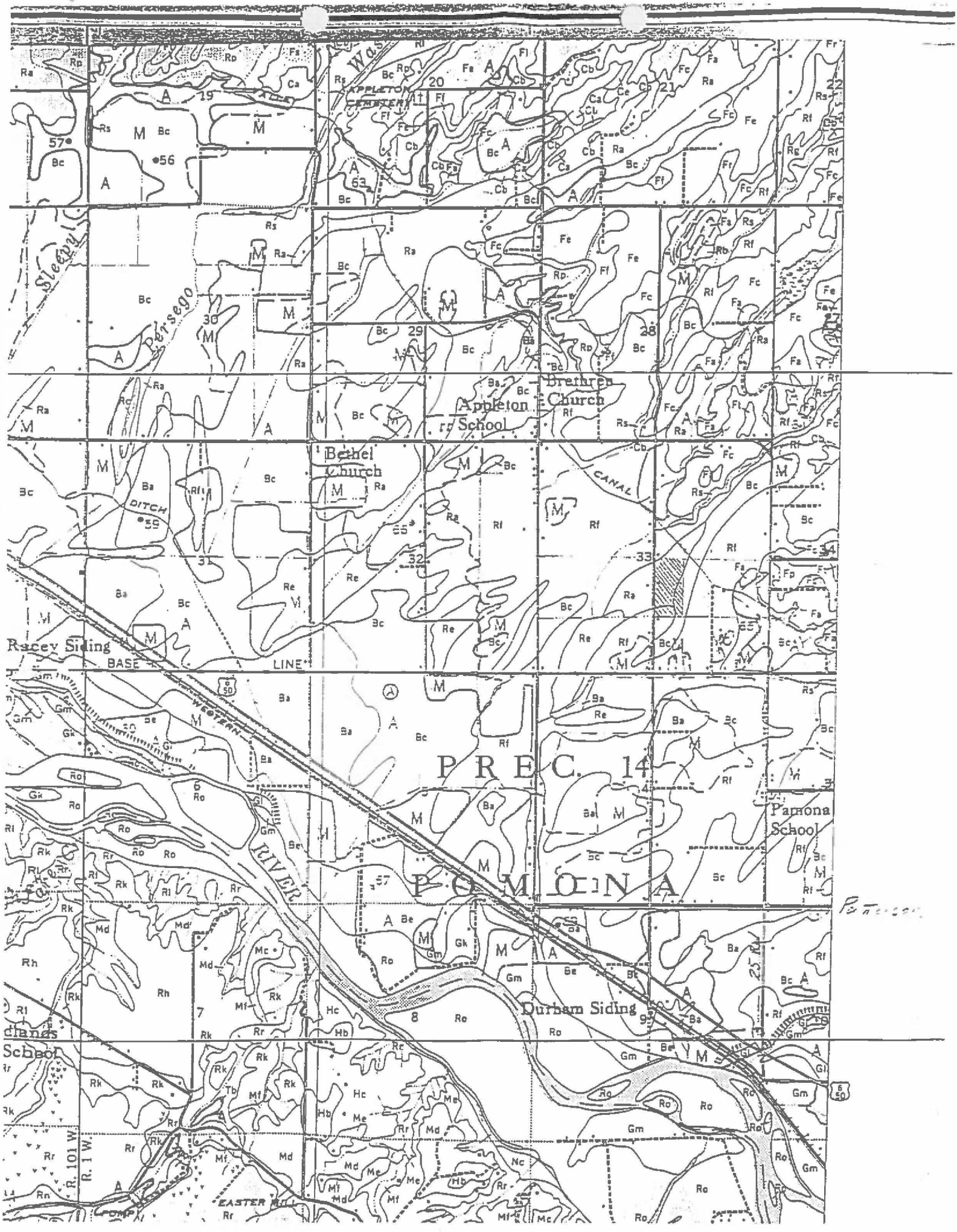

Appleton Cemetery
Appleton School
Brethren Church
Bethel Church
Racey Siding
BASE LINE
PRE C. 14
PAMONA
Pamona School
Durham Siding
Persego
Sleepy
DITCH
CANAL
RIVER
WESTERN
EASTER
R. 1 W.
R. 101 W.

Exhibit A-1, continued: Hydrologic soil groups for United States soils

BELMONT	B	BERTRAM	B	BILLINGS.	B	BLACKNOLL	C	BLUE LAKE	A
BELMORE	B	BERTRAND	B	MODERATELY SLOW		BLACKOAR	B/D	BLUE STAR	B
BELPRE	C	BERVILLE	B/D	PERM		BLACKPIPE	C	BLUEBELL	C
BELSAC	B	BERWOLF	B	BILLYCREEK	C	BLACKPRINCE	B	BLUECHIEF	C
BELTED	D	BERYL	B	BILLYMAN	D	BLACKROCK	B	BLUECREEK	D
BELTON	C	BERZATIC	D	BILTMORE	A	BLACKSAN	B	BLUEDOME	C
BELTRAMI	B	BESEMAN	A/D	BIMMER	D	BLACKSPAR	D	BLUEFLAT	C
BELTSVILLE	C	BESHERM	C	BINCO	D	BLACKSPOT	D	BLUEGROVE	C
BELUGA	D	BESNER	B	BINDLE	E	BLACKSTON	B	BLUEGULCH	B
BELUGA, DRAINED, SLOPING	C	BESSEMER	C	BINFORD	E	BLACKTHORN	B	BLUEHILL	C
		BESSIE	D	BINGER	E	BLACKTOP	D	BLUEMON	C
BELVOIR	C	BESTROM	C	BINGHAM	B	BLACKWATER	D	BLUEJOINT	B
BELZAR	C	BETHANY	C	BINGHAMPTON	B	BLACKWELL	D	BLUEMOSE	B
BEMIDJI	A	BETHEL	B	BINGHAMVILLE	D	BLADEN	D	BLUEPOINT	A
BEN LOMOND	B	BETHERA	D	BINNA	B	BLAG	D	BLUERIM	C
BENCHLEY	C	BETHESDA	C	BINNSVILLE	D	BLAGO	D	BLUESLIDE	D
BENCLARE	C	BETHLEHEM	B	BINS	B	BLAINE	C	BLUESPRIN	C
BENCO	B	BETIS	A	BINTON	C	BLAIR	C	BLUESTONE	D
BENDER	B	BETONNIE	B	BINTON, RECLAIMED	B	BLAIRTON	C	BLUEWING	A
BENDIRE	C	BETRA	C	BIOYA	B	BLAKABIN	C	BLUFF	D
BENEVOLA	C	BETTERAVIA	C	BIPPUS	B	BLAKE	B	BLUFFDALE	C
BENEVAM	D	BETTS	B	BIRCHBAY	C	BLAKELAND	A	BLUFFTON	C/D
BENFIELD	C	BEULAH	B	BIRCHFIELD	D	BLAKENEY	C	BLUFORD	C
BENGAL	C	BEVENT	A	BIRCHWOOD	C	BLAKEWELL	C	BLUM	C
BENGE	B	BEVERIDGE	D	BIRDOW	B	BLALOCK	D	BLY	B
BENHAM	B	BEVERLY	B	BIRDS	C/D	BLAMER	C	BLYBURG	B
BENIN	D	BEVERLY, GRAVELLY	A	BIRDSALL	D	BLANCA	B	BLYTHE	D
BENITO	D	BEW	C	BIRDSBORO	B	BLANCHARD	A	BOARDMAN	D
BENJAMIN	D	BEWLEYVILLE	D	BIRDSLEY	D	BLANCHE	B	BOARDTREE	C
BENKLIN	C	BEXAR	D	BIRDSVIEW	A	BLANCHESTER	B/D	BOASH	D
BENMAN	C	BEZD	D	BIRKBECK	B	BLANCOT	B	BOAZ	C
BENNDALE	B	BEZZANT	B	BIRMINGHAM	B	BLAND	C	BOBBITT	C
BENNINGTON	C	BIBB	C	BIRNEY	B	BLANDING	B	BOBILLO	A
BENRIDGE	B	BIBLESPRINGS	B	BIRONE	C	BLANEY	B	BOBNOB	C
BENSLEY	B	BICE	B	BISBEE	A	BLANKET	C	BOBS	D
BENSON	D	BICKERDYKE	D	BISCARO	D	BLANTON	A	BOBTAIL	C
BENTEEN	C	BICKETT	D	BISCAY	B/D	BLANTON,	B	BOBTOWN	B
BENWY	B	BICKLETON	B	BISGANI,	B	MODERATELY WET		BOCA	B/D
BENZ	D	BICKMORE	C	MODERATELY WET		BLANYON	C	BOCA, DEPRESSIONAL	D
BEOR	D	BICONDOA	D	BISGANI, FLOODED	C	BLAPPERT	D	BOCA, TIDAL	D
BEOSEA	B	BICONDOA, DRAINED	C	BISHOP	D	BLAQUIERE	C	BOCK	B
BEOTIA	B	BIDDEFORD	D	BISMARCK	D	BLASDELL	A	BOCKER	D
BEOWAWE	B	BIDDLEMAN	B	BISOODI	D	BLASE	C	BOCKSTON	B
BEQUIMM	B	BIDMAN	C	BISPING	E	BLASINGAME	C	BODE	B
BERCUPB	B	BIDWELL	B	BISSELL	E	BLAYDEN	D	BODECKER	A
BERDA	B	BIEBER	D	BISSONNET	D	BLAZBIRD	D	BODELL	D
BEREA	C	BIEDELL	D	BIT	C	BLAZON	D	BODEM	C
BERENICETON	B	BIEDSAW	C	BITTER	B	BLEAKWOOD	C	BODENBURG	B
BERGHOLZ	C	BIENVILLE	A	BITTER SPRING	B	BLEDSOE	C	BODINE	B
BERGLAND	D	BIG BLUE	D	BITTERROOT	C	BLEIBLERVILLE	D	BODORUMPE	C
BERGQUIST	B	BIG HORN	B	BITTERWATER	B	BLENCOE	D	BODOT	C
BERGSTROM	B	BIG TIMBER	D	BITTON	B	BLEND	D	BOEL	A
BERGSVIK	D	BIGARM	B	BIVANS	D	BLENDON	B	BOEL, OVERWASH	C
BERIND	B	BIGBEE	A	BIXBY	B	BLETHEN	B	BOELUS	A
BERIT	D	BIGBEND	B	BIXLER	C	BLEVINS	B	BOERNE	B
BERKS	C	BIGBROWN	C	BJORK	C	BLEVINTON	B	BOESEL	C
BERKSHIRE	B	BIGELOW	B	BLACHLY	B	BLEWETT	D	BOESEL, PROTECTED	B
BERLAKE	B	BIGETTY	B	BLACK BUTTE	B	BLICHTON	D	BOETTCHER	C
BERLIN	C	BIGFLAT	D	BLACK CANYON	D	BLICKENSTAFF	B	BOGAN	C
BERMESA	C	BIGFOOT	C	BLACK CANYON,	C	BLIMO	B	BOGART	B
BERMUDIAN	B	BIGFORK	C	DRAINED		BLIMSTER	C	BOGES	C
BERNAL	D	BIGHAMS	B	BLACK RIDGE	D	BLINN	C	BOGGY	C
BERNALDO	B	BIGHILL	B	BLACKA	C	BLISS	C	BOGRAP	B
BERNARD	D	BIGLAKE	A	BLACKBURN	B	BLITZEN	C	BOGUE	D
BERNARDINO	C	BIGMEADOW	C	BLACKDRAW	D	BLOCKHOUSE	D	BOGUS	C
BERNARDSTON	C	BIGNELL	C	BLACKETT	B	BLOMFORD	B/D	BOHANNON	C
BERNHILL	B	BIGRIVER	B	BLACKFOOT	C	BLOOM	D	BOHEMIAN	B
BERNICE	A	BIGSHEEP	B	BLACKFOOT, DRAINED	B	BLOOMFIELD	A	BOHICKET	D
BERNING	C	BIGSPRING	D	BLACKHALL	D	BLOOMING	B	BOHMA	B
BERNOV	B	BIGWIN	C	BLACKHALL, WARM	C	BLOOMSDALE	B	BOHMLT	D
BERRYLAND	B/D	BIGWINDER	D	BLACKHAMMER	B	BLOOR	C	BOHNSACK	B
BERRYMAN	C	BIJORJA	C	BLACKHAWK	D	BLOOR, GRAVELLY	D	BOISTFORT	B
BERSON	B	BIJOU	B	BLACKHOOF	D	SUBSTRATUM		BOJAC	B
BERTAG	C	BILBO	C	BLACKHORSE	C	BLOUNT	C	BOJO	D
BERTELSON	B	BILGER	D	BLACKLEED	B	BLOVERS	B	BOLAN	B
BERTHOUD	B	BILLETT	B	BLACKLEG	C	BLUCHER	C	BOLAP	C
BERTIE	B	BILLINGS	C	BLACKLOCK	D	BLUE EARTH	B/D	BOLD	B
BERTO	D			BLACKMAN	C	BLUE EARTH,	D	BOLENT	A
BERTOLOTTI	B			BLACKMOUNT	B	SLOPING		BOLES	C

NOTES: TWO HYDROLOGIC SOIL GROUPS SUCH AS B/C INDICATES THE DRAINED/UNDRAINED SITUATION.
MODIFIERS SHOWN, E.G., BEDROCK SUBSTRATUM, REFER TO A SPECIFIC SOIL SERIES PHASE FOUND IN SOIL MAP LEGEND.

Exhibit A-1, continued: Hydrologic soil groups for United States soils

POQUONOCK	C	PREMIER	B	PUNCHBOWL	D	QUINLIVEN	C	RAMROD	C		
PORFIRIO	C	PRENTISS	C	PUNG	C	QUINN	B/D	RAMSDELL	D		
PORRETT	D	PRESA	B	PUNGO	D	QUINNEY	C	RAMSDELL, DRAINED	C		
PORRONE	B	PRESHER	B	PUNOHU	A	QUINTANA	B	RAMSEY	D		
PORT	B	PRESTO	B	PUNSIT	C	QUINTO	D	RAMSHORN	B		
PORT BYRON	B	PRESTON	A	PUNTA	B/D	QUINTON	C	RANA	D		
PORTAGE	D	PREWITT	B	PUNTILLA	B	QUITERIA	B	RANCE	C		
PORTAGEVILLE	D	PREY	C	PURCELLA	B	QUITMAN	C	RANCHOSECO	C		
PORTALES	B	PRICE	B	PURCHES	C	QUIVERA	C	RANDADO	C		
PORTALTO	B	PRIDA	C	PURDAM	C	QUONSET	A	RANDALL	D		
PORTERFIELD	C	PRIDHAM	D	PURDY	D	QUOPANT	D	RANDCORE	D		
PORTERS	B	PRIESTLAKE	B	PURETT	B	QUOSATANA	D	RANDMAN	D		
PORTERVILLE	D	PRIETA	D	PURGATORY	C	RABBITEX	B	RANDOLPH	C		
PORTHILL	D	PRIM	D	PURNER	D	RABER	C	RANDS	C		
PORTIA	C	PRIMEAUX	C	PUROB	D	RABIDEUX	B	RANDSBURG	D		
PORTINO	C	PRIMEN	D	PURSLEY	E	RABUN	B	RANGEE	D		
PORTLAND	D	PRINGHAR	B	PURVES	D	RACE	B	RANGER	C		
PORTMOUNT	E	PRINCETON	B	PUSHMATAHA	C	RACINE	B	RANPUFF	D		
PORTNEUF	B	PRINEVILLE	C	PUSTOI	E	RACKER	A	RANSLO	D		
PORTOLA	B	PRING	B	PUTNAM	D	RACOMBES	E	RANSOM	E		
PORTSMOUTH	B/D	PRINGLE	D	PUTNEY	B	RACOON	C/D	RANSTEIN	B		
PORUM	D	PRITCHARD	C	PUTT	C	RAD	B	RANTOUL	D		
POSANT	D	PRITCHETT	C	PUTTSTER	C	RAD, LACUSTRINE	C	RAPATEE	D		
POSEN	B	PROCHASKA	A/D	PUU OO	A	SUBSTRATUM		RAPELJE	E		
POSEY	B	PROCTOR	E	PUU ORAE	E	RAD, FLOODED	C	RAPH	E		
POSEYVILLE	C	PROGRESSO	C	PUU PA	A	RADDLE	B	RAPHO	E		
POSITAS	D	PROMISE	D	PUU PA, NONSTONY	F	RADER	D	RAPIDAN	E		
POSKIN	C	PROMO	D	PUUKALA	E	RADERSBURG	B	RAPLEE	C		
POSO	B	PRONG	C	PUUONE	C	RADFORD	B	RAPPAHANNOCK	D		
POSOS	C	PROPHETSTOWN	B/D	PUYALLUP	E	RADLEY	B	RAPSON	E		
POST	D	PROSPECT	B	PYBURN	D	RADNOR	C	RARDEN	C		
POTAMUS	B	PROSPER	B	PYLE	B	RAFAEL	D	RARICK	C		
POTCHUB	C	PROSSER	C	PYLON	D	RAFTON	D	RARITAN	C		
POTEET	C	PROTIVIN	C	PYOTE	A	RAFTRIVER	C	RASBAND	E		
POTELL	B	PROUT	C	PYRAMID	D	RAGLAN	B	RASILLE	E		
POTH	C	PROUTY	C	PYRMONT	D	RAGNAR	B	RASSER	E		
POTLATCH	C	PROVIDENCE	C	PYRMONT, BEDROCK	C	RAGNEL	B	RASSET	E		
POTOMAC	A	PROVIG	C	SUBSTRATUM		RAGO	C	RASTUS	C		
POTOSI	A	PROVO	D	PYWELL	D	RAGPIE	D	RATAKE	D		
POTRATZ	C	PROVO BAY	D	QUAFEND	C	RAGSDALE	B/D	RATHBUN	C		
POTSDAM	C	PROW	D	QUAKER	C	RAGSDALE, OVERWASH	B	RATHORUM	B		
POTTER	C	PRUDY	B	QUAKERTOWN	C	RAGTOWN	C	RATLAKE	D		
POTTINGER	B	PRUE	B	QUAM	B/D	RAMAL	C	RATLEFLAT	B		
POTTS	B	PRUITTON	B	QUAMON	A	RAMM	C	RATLIFF	B		
POTTSBURG	B/D	PRUNIE	D	QUANAM	B	RAMWORTH	E	RATON	D		
POUDRE	D	PRYOR	C	QUANDER	E	RAIL	D	RATSON	C		
POUJADE	D	PSUGA	B	QUANTICO	B	RAILCITY	A	RATTLER	D		
POULSBO	D	PTARMIGAN	C	QUARLES	D	RAINBOW	C	RATTO	C		
POUNCEY	D	PUAPUA	D	QUARTZBURG	C	RAINEY	C	RATTO, STONY	D		
POVERTY	D	PUAULU	A	QUARTZVILLE	B	RAINIER	C	RAUB	C		
POVEY	B	PUCHYAN	B	QUARZ	C	RAINO	D	RAUGHT	B		
POWDER	B	PUDDLE	E	QUATAMA	C	RAINS	B/D	RAUVILLE	D		
POWDERHORN	C	PUERCO	D	QUAY	B	RAINS, FLOODED	D	RAUZI	B		
POWDERWASH	C	PUERTA	D	QUAZO	D	RAINSBORO	C	RAVALLI	D		
POWEEN	C	PUERTECITO	D	QUEALMAN	C	RAINSVILLE	E	RAVALLI, BEDROCK	B		
POWELL	C	PUETT	D	QUEALY	D	RAIRDENT	E	SUBSTRATUM			
POWER	B	PUFFER	D	QUEBRADA	C	RAISID	C	RAVEN	A		
POWERLINE	C	PUGET	D	QUEENY	D	RAKANE	C	RAVENDALE	D		
POWLEY	D	PUGET, PROTECTED	C	QUEETS	B	RAKE	D	RAVENELL	D		
POWMENT	C	PUGSLEY	C	QUEMADO	C	RAKIED	C	RAVENNA	C		
POWWAMKEE	B	PUMI	B	QUENZER	D	RALEIGH	D	RAVENSWOOD	C		
POWWATKA	C	PUMIMAU	D	QUERC	C	RALLOD	D	RAVIA	C		
POY	D	PUICE	C	QUERENCIA	E	RALLS	E	RAVOLA	B		
POYGAN	D	PULA	C	QUETICO	D	RALPH	B	RAWAH	C		
POYNOR	B	PULANTAT	C	QUICKSELL	C	RALPHSTON	B	RAWE	C		
POZO	C	PULASKI	B	QUICKSILVER	D	RALSEN	D	RAWLES	B		
POZO BLANCO	B	PULCAM	C	QUICKVERT	C	RAMADERO	B	RAWLINS	B		
PRAG	C	PULEHU	B	QUIDEN	B	RAMBLA	C	RAWSON	B		
PRAIRIEVILLE	B	PULEXAS	B	QUIENSABE	C	RAMBOUILLET	B	RAWSONVILLE	C		
PRAMISS	C	PULLMAN	D	QUIETUS	C	RAMELLI	D	RAYBURN	D		
PRATHER	C	PULPIT	C	QUIGLEY	B	RAMIRES	C	RAYEX	D		
PRATLEY	C	PULS	D	QUIHI	C	RAMMEL	C	RAYFORD	C		
PRATT	A	PULSIPHER	D	QUILCENE	C	RAMO	C	RAYLAKE	D		
PREACHER	B	PULTNEY	C	QUILLAYUTE	B	RAMONA	E	RAYMONDVILLE	D		
PREAKNESS	B/D	PUMEL	D	QUILOTOSA	D	RAMONA, HARD	C	RAYNE	B		
PREATORSON	B	PUMEL, NONGRAVELLY	C	QUILT	D	SUBSTRATUM		RAYNESFORD	E		
PREBISH	C/D	PUMPER	E	QUIMA	E	RAMPART	B	RAYNHAM	C		
PREBLE	D	PUNA	A	QUINCY	A	RAMPARTER	B	RAYNOLDSON	E		
PRELO	B	PUNALUU	D	QUINLAN	C	RAMPS	B	RAYOHILL	C		

NOTES: TWO HYDROLOGIC SOIL GROUPS SUCH AS B/C INDICATES THE DRAINED/UNDRAINED SITUATION.
MODIFIERS SHOWN, E.G., BEDROCK SUBSTRATUM, REFER TO A SPECIFIC SOIL SERIES PHASE FOUND IN SOIL MAP LEGEND.

LAND USE OR SURFACE CHARACTERISTICS	SCS HYDROLOGIC SOIL GROUP (SEE APPENDIX "C" FOR DESCRIPTIONS)											
	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
UNDEVELOPED AREAS												
Bare ground	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .40 - .48	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Cultivated/Agricultural	.08 - .18 .14 - .24	.13 - .23 .18 - .28	.16 - .26 .22 - .32	.11 - .19 .16 - .24	.15 - .23 .21 - .29	.21 - .29 .28 - .36	.14 - .22 .20 - .28	.19 - .27 .25 - .33	.26 - .34 .34 - .42	.18 - .26 .24 - .32	.23 - .31 .29 - .37	.31 - .39 .41 - .49
Pasture	.12 - .22 .15 - .25	.20 - .30 .25 - .35	.30 - .40 .37 - .47	.18 - .26 .23 - .31	.28 - .36 .34 - .42	.37 - .45 .45 - .53	.24 - .32 .30 - .38	.34 - .42 .42 - .50	.44 - .52 .52 - .60	.30 - .38 .37 - .45	.40 - .48 .50 - .58	.50 - .58 .62 - .70
Meadow	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .44 - .52	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Forest	.05 - .15 .08 - .18	.08 - .18 .11 - .21	.11 - .21 .14 - .24	.08 - .16 .10 - .18	.11 - .19 .14 - .22	.14 - .22 .18 - .26	.10 - .18 .12 - .20	.13 - .21 .16 - .24	.16 - .24 .20 - .28	.12 - .20 .15 - .23	.16 - .24 .20 - .28	.20 - .28 .25 - .33
RESIDENTIAL AREAS												
1/8 acre per unit	.40 - .50 .48 - .58	.43 - .53 .52 - .62	.46 - .56 .55 - .65	.42 - .50 .50 - .58	.45 - .53 .54 - .62	.50 - .58 .59 - .67	.45 - .53 .53 - .61	.48 - .56 .57 - .65	.53 - .61 .64 - .72	.48 - .56 .56 - .64	.51 - .59 .60 - .68	.57 - .65 .69 - .77
1/4 acre per unit	.27 - .37 .35 - .45	.31 - .41 .39 - .49	.34 - .44 .42 - .52	.29 - .37 .38 - .46	.34 - .42 .42 - .50	.38 - .46 .47 - .55	.32 - .40 .41 - .49	.36 - .44 .45 - .53	.41 - .49 .52 - .60	.35 - .43 .43 - .51	.39 - .47 .47 - .55	.45 - .53 .57 - .65
1/3 acre per unit	.22 - .32 .31 - .41	.26 - .36 .35 - .45	.29 - .39 .38 - .48	.25 - .33 .33 - .41	.29 - .37 .38 - .46	.33 - .41 .42 - .50	.28 - .36 .36 - .44	.32 - .40 .41 - .49	.37 - .45 .48 - .56	.31 - .39 .39 - .47	.35 - .43 .43 - .51	.42 - .50 .53 - .61
1/2 acre per unit	.16 - .26 .25 - .35	.20 - .30 .29 - .39	.24 - .34 .32 - .42	.19 - .27 .28 - .36	.23 - .31 .32 - .40	.28 - .36 .36 - .44	.22 - .30 .31 - .39	.27 - .35 .35 - .43	.32 - .40 .42 - .50	.26 - .34 .34 - .42	.30 - .38 .38 - .46	.37 - .45 .48 - .56
1 acre per unit	.14 - .24 .22 - .32	.19 - .29 .26 - .36	.22 - .32 .29 - .39	.17 - .25 .24 - .32	.21 - .29 .28 - .36	.26 - .34 .34 - .42	.20 - .28 .28 - .36	.25 - .33 .32 - .40	.31 - .39 .40 - .48	.24 - .32 .31 - .39	.29 - .37 .35 - .43	.35 - .43 .46 - .54
MISC. SURFACES												
Pavement and roofs	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97	.93 .95	.94 .96	.95 .97
Traffic areas (soil and gravel)	.55 - .65 .65 - .70	.60 - .70 .70 - .75	.64 - .74 .74 - .79	.60 - .68 .68 - .76	.64 - .72 .72 - .80	.67 - .75 .75 - .83	.64 - .72 .72 - .80	.67 - .75 .75 - .83	.69 - .77 .77 - .85	.72 - .80 .79 - .87	.75 - .83 .82 - .90	.77 - .85 .84 - .92
Green landscaping (lawns, parks)	.10 - .20 .14 - .24	.16 - .26 .22 - .32	.25 - .35 .30 - .40	.14 - .22 .20 - .28	.22 - .30 .28 - .36	.30 - .38 .37 - .45	.20 - .28 .26 - .34	.28 - .36 .35 - .43	.36 - .44 .42 - .52	.24 - .32 .30 - .38	.30 - .38 .40 - .48	.40 - .48 .50 - .58
Non-green and gravel landscaping	.30 - .40 .34 - .44	.36 - .46 .42 - .52	.43 - .53 .50 - .60	.45 - .55 .50 - .60	.42 - .50 .48 - .56	.50 - .58 .57 - .65	.40 - .48 .46 - .54	.48 - .56 .55 - .63	.56 - .64 .64 - .72	.44 - .52 .50 - .58	.50 - .58 .60 - .68	.60 - .68 .70 - .78
Cemeteries, playgrounds	.20 - .30 .24 - .34	.26 - .36 .32 - .42	.35 - .45 .40 - .50	.35 - .45 .40 - .50	.32 - .40 .38 - .46	.40 - .48 .47 - .55	.30 - .38 .36 - .44	.38 - .44 .45 - .53	.46 - .54 .54 - .62	.34 - .42 .40 - .48	.40 - .48 .50 - .58	.50 - .58 .60 - .68

NOTES:
1. Values above and below pertain to the 2-year and 100-year storms, respectively.
2. The range of values provided allows for engineering judgement of site conditions such as basic shape, homogeneity of surface type, surface depression storage, and storm duration. In general, during shorter duration storms (Tc ≤ 10 minutes), infiltration capacity is higher, allowing use of a "C" value in the low range. Conversely, for longer duration storms (Tc) 30 minutes), use a ""C value in the higher range.
3. For residential development at less than 1/8 acre per unit or greater than 1 acre per unit, and also for commercial and industrial areas, use values under MISC SURFACES to estimate "C" value ranges for use.

RATIONAL METHOD RUNOFF COEFFICIENTS
(Modified from Table 4, UC-Davis, which appears to be a modification of work done by Rawls)

TABLE "B-1"

REPRODUCED FROM TABLE 2, LECTURE 2, DAY 2, ACOE 1990

SURFACE	N VALUE	SOURCE
ASPHALT/CONCRETE	0.05 - ~~0.15~~	A
BARE PACKED SOIL FREE OF STONE	0.10	C
FALLOW - NO RESIDUE	0.008 - 0.012	B
CONVENTIONAL TILLAGE - NO RESIDUE	0.06 - 0.12	B
CONVENTIONAL TILLAGE - WITH RESIDUE	0.16 - 0.22	B
CHISEL PLOW - NO RESIDUE	0.06 - 0.12	B
CHISEL PLOW - WITH RESIDUE	0.10 - 0.16	B
FALL DISKING - WITH RESIDUE	0.30 - 0.50	B
NO TILL - NO RESIDUE	0.04 - 0.10	B
NO TILL (20-40 PERCENT RESIDUE COVER)	0.07 - 0.17	B
NO TILL (60-100 PERCENT RESIDUE COVER)	0.17 - 0.47	B
SPARSE RANGELAND WITH DEBRIS:		
0 PERCENT COVER	0.09 - 0.34	B
20 PERCENT COVER	0.05 - 0.25	B
SPARSE VEGETATION	0.053 - 0.13	F
SHORT GRASS PRAIRIE	0.10 - 0.20	F
POOR GRASS COVER ON MODERATELY ROUGH BARE SURFACE	0.30	C
LIGHT TURF	0.20	A
AVERAGE GRASS COVER	0.4	C
DENSE TURF	0.17 - 0.30	A, C, E, F
DENSE GRASS	0.17 - 0.30	D
BERMUDA GRASS	0.30 - 0.48	D
DENSE SHRUBBERY AND FOREST LITTER	0.4	A

A) CRAWFORD AND LINSLEY (1966).
B) ENGMAN (1986).
C) HATHAWAY (1945).
D) PALMER (1946).
E) RAGAN AND DURU (1972).
F) WOOLHISER (1975).

"N" values provided in this table pertain to both the SCS TR-55 "To" and FHWA 1984 HEC-12 "To" methods

APPROXIMATE SCALE IN FFFT

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

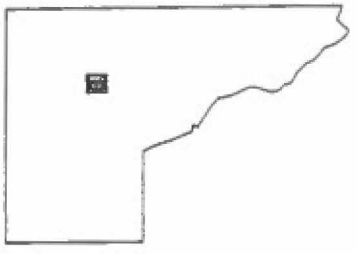
FIRM

FLOOD INSURANCE RATE MAP

MESA COUNTY, COLORADO
(UNINCORPORATED AREAS)

PANEL 460 OF 1000

(SEE MAP INDEX FOR PANELS NOT PRINTED)

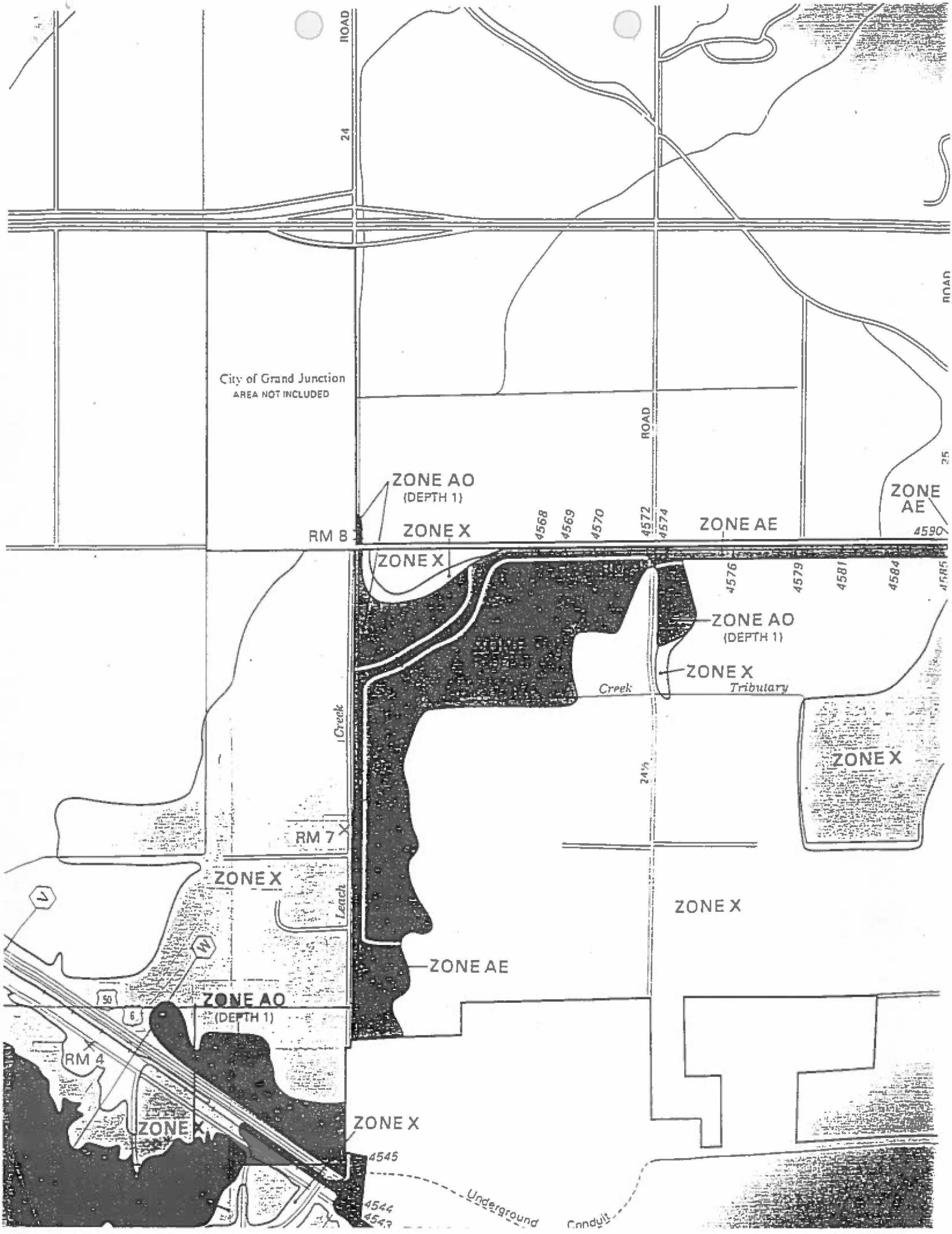


PANEL LOCATION

COMMUNITY-PANEL NUMBER
080115 0460 B

MAP REVISED:
JULY 15, 1992

Federal Emergency Management Agency


ROAD
24
City of Grand Junction
AREA NOT INCLUDED
ROAD
ZONE AO
(DEPTH 1)
ZONE X
RM 8
4568
4569
4570
4572
4574
ZONE AE
ZONE AE
4590
ZONE X
4576
4579
4581
4584
ZONE AO
(DEPTH 1)
ZONE X
Creek
Tributary
Creek
ZONE X
RM 7
ZONE X
Leach
ZONE X
ZONE AE
50
6
ZONE AO
(DEPTH 1)
RM 4
ZONE X
ZONE X
4545
4544
4543
Underground
Conduit

GR WILLIAMS ENGINEERING, INC

STUDIES — DESIGNS — CONSTRUCTION SERVICES — REVIEWS

Water, Sewer, and Drainage Systems
Roads and Municipal Engineering

Stormwater and Floodplain Management
Development Submittal Review

October 15, 2002

Jim Langford
Thompson-Langford Corp.
529 25-1/2 Road Suite B-210
Grand Junction, CO 81505

Re: Runoff to Mitchell Drain from North Valley Subdivision

Dear Jim:

The North Valley Subdivision Drainage Report for all filings was prepared by Rolland Engineering in 1994, and was updated October 1, 1996 when final drawings were prepared for Filings 3 in 4. A summary of information provided in the report is given below.

- The total area of Filings 3 and 4 is 10 acres, of which 3acres drain south to the Filing 1 area and from thence to Leach Creek. Therefore, a net of 7 acres of Filings 3 in 4 drain to the Mitchell Drain.
- There is no off-site runoff contribution to the site. The area drains to the Southwest, and a raised concrete ditch along the north boundary prevents inflow from the north, and a raised 27-3/4 Road prohibits inflow of runoff from the east of the site.
- The developed 100 year runoff from the site to Mitchell Drain is 9.7 CFS.

We have visited with the Grand Junction Drainage District, reviewed the report and site conditions, and are of the opinion that:

- The raised ditch and road north and east of Filings 3 and 4 of the North Valley Subdivision would prevent inflow from offsite in minor storm events, but may or may not prevent inflow during a storm event of the magnitude of the 100 year event;
- Notwithstanding, whatever off-site runoff entered the site, if any, it would combine with on-site runoff and drain toward the intersection just east of the Mitchell Drain where, to the capacity of the outflow pipe, runoff would drain to the Mitchell Drain. A high raised concrete ditch and earthen embankment along the west side of North Valley Subdivision would prevent runoff outflow from the subdivision except through the pipe. Moreover, if flooding depths became significant, then the runoff would continue southward to Filings 1 and 2 and away from the Mitchell Drain. Consequently, the Mitchell Drain at its east end and adjacent to the North Valley Subdivision can only receive what will flow to it through the 15 inch RCP pipe;
- The North Valley Subdivision Filings 3 and 4 also may receive runoff from a six inch irrigation tailwater drain that has a capacity of approximately 0.9 CFS, which amount should be considered as a base flow amount and additive to the estimated 100 year runoff of 9.7 CFS;
- Inasmuch as it is possible that inflow can come from the north or the east, it would be best to assume that the outflow to the Mitchell Drain is not limited to the estimated 9.7 CFS plus approximate 0.9 CFS base flow,

but rather to the hydraulic capacity of the pipe;

- The correct pipe capacity would be based on the hydraulic gradient available from the crown of the outfall pipe at the Mitchell Drain (where the tailwater condition in the drain would be lower than the crown of the outfall pipe) to the grate elevation of the nearest inlet. If we were to assume that the gradient at the first manhole is the same as at the inlet, then the difference in grate elevation and outlet crown divided by the 154 linear feet of 15 inch RCP results in a gradient of 2.95 percent; and
- Using a Mannings n value of 0.013, which we believe is appropriate for sediment laden stormwater, the pipe capacity is 11 CFS.

Pipe flow calculations are provided on the attached. It is our opinion that any design for the Mitchell Drain should be adequate to handle an inflow from the North Valley Subdivision of 11 CFS for the 100 year runoff condition.

If you have any questions regarding above, please feel free to call.

Sincerely,

GR Williams Engineering, Inc

By: Gerald R Williams

Gerald R. Williams, P.E.

Enclosure: Hydraulic Calculations

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: North VAlley Subd M

Comment: Outflow to Mitchell Drain-Mannings

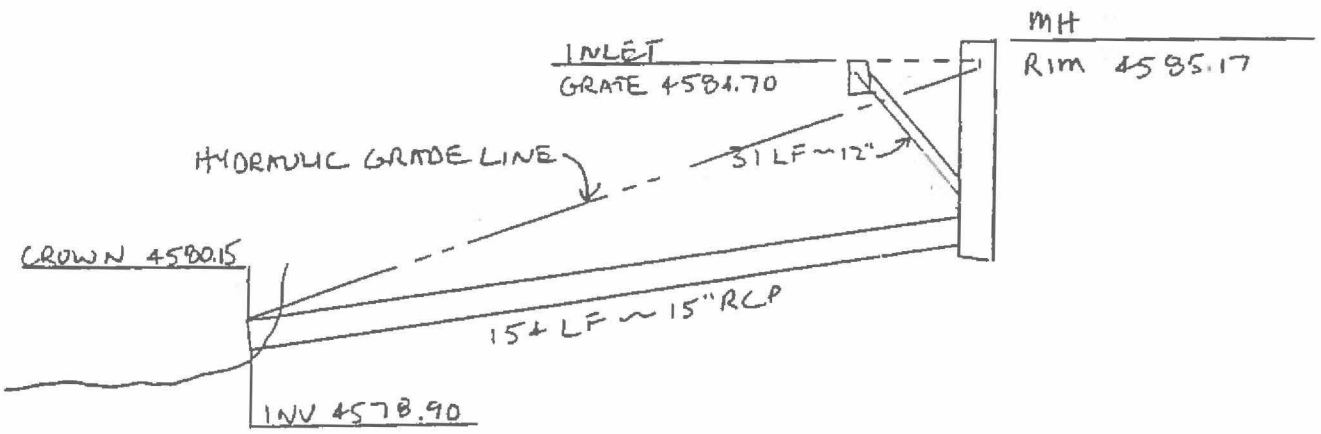
Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0295 ft/ft (SEE BELOW)
Manning's n.....	0.013
Discharge.....	11.10 cfs

Computed Results:

Full Flow Capacity.....	11.10 cfs
Full Flow Depth.....	1.25 ft
Velocity.....	9.04 fps
Flow Area.....	1.23 sf
Critical Depth.....	1.20 ft
Critical Slope.....	0.0258 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	11.10 cfs
QMAX @.94D.....	11.94 cfs
Froude Number.....	FULL



HYDRAULIC GRADE = (4584.70 - 4580.15)/154 = 2.95%
(ASSUMES NO AVAILABLE HYDRAULIC GRADE LINE FROM MH TO INLET)

Open Channel Flow Module, Version 3.43 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

10/17/2002
Canyon View Vinyard Church
Mitchell Drain

Depth of flow in 24-inch RCP with Off-site flow or
11 CFS and site flows from the two ponds of 2.07 CFS

Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	24.0000 in
Flowrate	13.0400 cfs
Slope	0.0072 ft/ft
Manning's n	0.0130

Computed Results:

Depth	14.5048 in
Area	3.1416 ft2
Wetted Area	1.9852 ft2
Wetted Perimeter	42.7458 in
Perimeter	75.3982 in
Velocity	6.5686 fps
Hydraulic Radius	6.6877 in
Percent Full	60.4366 %
Full flow Flowrate	19.1957 cfs
Full flow velocity	6.1102 fps

Geotechnical Engineering Group, Inc.

GEOTECHNICAL INVESTIGATION
Canyon View Park, Phase 2
North and West of G Road and 24 ½ Road
Grand Junction, Colorado

Prepared For:

City of Grand Junction
Parks and Recreation
1340 Gunnison Avenue
Grand Junction, CO 81501

Attention: Mr. Shawn Cooper

Job No. 1,284

March 6, 2003

Geotechnical, Environmental and Materials Testing Consultants

(970) 245-4078 • fax (970) 245-7115 • geotechnicalgroup.com
2308 Interstate Avenue, Grand Junction, Colorado 81505

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SCOPE

This report presents the results of a Geotechnical Investigation for the proposed Canyon View Park, Phase 2 to be located north and west of G Road and 24 ½ Road in Grand Junction, Colorado, Fig. 1. Our investigation was conducted to explore subsurface conditions, provide foundation design recommendations and pavement design recommendations for the proposed Canyon View Park, Phase 2. The report includes descriptions of subsoil and groundwater conditions found in twenty two exploratory borings, recommendations for design and construction, recommended pavement sections and design and construction criteria for details influenced by the subsurface conditions. This investigation was performed in general conformance with our Proposal No. 02-299A dated December 19, 2002.

The report was prepared from data developed during our field exploration, laboratory testing, engineering analysis and experience with similar conditions. A brief summary of our conclusions and recommendations follows. Detailed criteria are presented within the report.

SUMMARY OF CONCLUSIONS

1. Subsoils found in the exploratory borings included silty, sandy clay to the maximum depths explored of 5 to 60 feet below the ground surface. Cobbly, sandy gravel was encountered at a depth of 36 feet below the ground surface in exploratory boring, TH-19. Practical drill rig refusal was encountered in the cobbly, sandy gravel at a depth of 43 feet below the ground surface in exploratory boring, TH-19. Groundwater was encountered at depths of 10 to 12 feet below the ground surface the day of drilling and at 10 to 14 feet below the ground surface when checked 11 days later.

2. We believe a deep foundation such as driven piles can offer less potential movement than shallow foundations for the proposed shelters. An alternative of shallow foundations underlain by well compacted subgrade and a section of well compacted structural fill is presented for the proposed shelters. We believe post tensioned slabs can provide adequate foundations for the proposed tennis courts and the fountain park. An alternative of mat foundation underlain by well compacted subgrade and a section of well compacted structural fill is also presented for the proposed fountain park. A discussion including detailed design and construction criteria are included in the text of the report.

3. We believe slab-on-grade construction supported by the soil encountered will involve low potential for movement. We recommend structurally supported floors in all finished areas. Additional discussion is included in the text of the report.

4. A pavement section thickness of 5.5 inches of full depth asphalt or 3.0 inches of asphalt over 8.0 inches of base course are recommended for interior streets, ESAL=54,750 traffic. Additional section alternatives, discussion and detailed design and construction criteria for pavements are presented in the text of the report.

5. Surface drainage should be designed for rapid runoff of surface water away from the proposed structures.

SITE CONDITIONS

The subject site consisted of two distinct parcels located north and west of G Road and 24 ½ Road in Grand Junction, Colorado, Fig. 1. The smaller parcel (proposed area for shelter adjacent to existing handball court) was located north and east of 24 Road and G Road.

The smaller parcel (location proposed for the shelter adjacent to the existing handball court) consisted of sparse grasses and a remnant asphalt walk / drive. We understand a residence was previously located in the area of the subject site. An area of existing fill was noted north and east of the subject site. A parking area was north, beyond an existing handball court. An access drive and parking were east. Vacant land was west, beyond 24 Road and a canal. Vacant, agricultural land, was south beyond G Road. The handball court and the parking area were approximately 0.5 feet to 2 feet higher in elevation than the subject site (estimated with hand held Brunton). The canal was approximately 90 feet west of the subject site, was 7 to 10 feet in depth, approximately 20 feet wide and water was flowing in the bottom at the time of this investigation.

The larger parcel was developed in the north portion of the site. We noted an existing parking area, maintenance facility, and restroom and existing baseball

field in the north portion of the site. An access drive was noted on the east and north side of the baseball field. The central portion of the site was basically flat and level with sparse grasses and sloped down towards the west at less than 1 percent. We noted two stockpiles of soil in the east central portion of the site. The eastern most stockpile had two sections. One section was approximately 6 feet in height, 195 feet in length and 51 feet wide. The other section was 12 to 15 feet in height, approximately 162 feet long and approximately 84 feet wide (measurements were estimated with hand held Brunton and pacing). The stockpiles appeared to be relatively clean clay soils. A smaller stockpile of variable sand, gravel, wood, branches and grass clippings was east of the larger stockpile. The south portion was undeveloped. An east / west oriented drainage canal was noted near the south portion of the subject site. We estimated the depth to be approximately 12 feet in depth and 30 to 40 feet in width. Water was flowing in the bottom of the canal and appeared to be flowing towards the west. A concrete lined ditch was noted near the east edge of the property. The ditch was approximately 1 foot in depth and no water was flowing at the time of this investigation. The west portion of the site consisted of a north / south oriented wash and appeared to be flowing down towards the south to an intersection with the east / west oriented canal near the south and west corner of the subject site. The north / south oriented wash was about 10 feet in depth, and approximately 30 feet in width. The wash appeared to be benched with the main channel at the lowest elevation and a

bench between the main channel and the surrounding ground surface. Grasses lined the banks of the drainage.

An existing park with ponds, baseball fields and concrete paths was west. Vacant land and an existing residential subdivision were south, beyond the canal. Vacant land was north beyond Interstate 70. Commercial development was east, beyond 24 ½ Road. An embankment for the 24 ½ Road overpass was noted east of the north portion of the subject site. The embankment appeared to be up to 20 feet higher than the subject site (estimated from plan sheet titled "CANYON VIEW PARK, PHASE TWO, CONCEPT PLAN" by Winston Associates, Inc. and Ciavonne & Associates, Inc., dated 09/18/02). The vicinity sloped down toward the south and west at a grade of 1 percent or less (USGS Grand Junction, Colorado Quadrangle, 1962, photorevised 1973).

PROPOSED CONSTRUCTION

We understand the subject site will be developed by site grading including up to 3 feet cut and 5 feet fill. Site grading changes will predominately be made to the south and west portion of the site. Approximately 300 lineal feet of the existing wash (Cochren Wash) in the south and west area of the site will be realigned

during site grading. Buried utilities will be installed. Paving will be constructed to include acceleration and deceleration lanes on 24 1/2 Road, interior park drive lanes and interior park automobile parking. There will be approximately 160 automobile parking spaces. Construction will consist of light stands in a proposed parking area, light stands in an existing parking area, twelve tennis courts, one shelter, one shelter/restroom/vending building and one fountain park. Light stands will be added to the existing parking area located in the northwest portion of the subject site. An approximate 20 foot by 20 foot shelter structure is proposed near 24 Road and G Road. The combination building and fountain park is proposed in the central portion of the Phase 2 site. Post tensioned slab on grade foundations are desired for the tennis courts. No other improvements are anticipated. If proposed construction changes or is different from what is stated, we should be contacted to review actual construction and our recommendations.

SUBSURFACE CONDITIONS

Subsurface conditions at the site were investigated by drilling and sampling twenty-two exploratory borings. Locations of the exploratory borings are shown on Figs. 2 and 3. Graphic logs of the soils found in the borings and field penetration resistance tests are presented on Figs. 3 through 10.

Subsurface conditions encountered included silty, sandy clay to the maximum depths explored of 5 to 60 feet below the ground surface. Cobbly, sandy gravel was encountered at a depth of 36 feet below the ground surface in exploratory boring, TH-19. Practical drill rig refusal was encountered in the cobbly, sandy gravel at a depth of 43 feet below the ground surface in exploratory boring, TH-19. No competent bearing strata was found at exploratory boring location TH-12 to depths of 60 feet below the ground surface. The silty, sandy clay had silty to clayey sand lenses noted, was very stiff to very soft and dry to wet with depth and brown. The cobbly, sandy gravel exhibited substantial drill rig resistance to practical drill rig refusal.

One sand sample tested had a moisture content of 4.0 percent and 37 percent passing the No. 200 sieve (silt and clay sized particles). Seventeen clay samples were tested from various locations across the site. Clay samples tested had moisture contents of 6.9 to 28.2 percent and dry densities of 98 to 105 pcf. Seven clay samples tested varied from exhibiting non liquid and non plastic characteristics, to a liquid limit of 30, plasticity index of 14 and 73 to 96 percent passing the No. 200 sieve (silt and clay sized particles). Two other clay samples test had 70 and 78 percent passing the No. 200 sieve (silt and clay sized particles). Eight samples were tested for swell consolidation characteristics using a one dimensional odometer apparatus. These samples varied from

compressing 0.6 percent to swelling 0.4 percent when wetted under a confining pressure of 500 or 1,000 psf. Groundwater was encountered at depths of 10 to 12 feet below the ground surface the day of drilling and at 10 to 14 feet below the ground surface when checked 11 days later across the site. Results of laboratory testing are presented on Figs. 11 through 16 and summarized on Table I.

SITE DEVELOPMENT

We reviewed the plan sheet titled "CANYON VIEW PARK, PHASE TWO, CONCEPT PLAN" by Winston Associates, Inc. and Ciavonne & Associates, Inc., dated 09/18/02, to estimate proposed site grading changes. We estimated up to 3 feet of cut and up to 5 foot of fill predominately in the south and west portion of the site. We understand grading will be balanced from the subject site; fill will come from on site cuts. We also anticipate stockpiles of soil identified on site will be utilized for site grading fill.

Review of the plan sheet noted above indicates the deepest cut in the vicinity of exploratory boring, TH-9. We identified groundwater at a depth of 12 feet below the ground surface in exploratory boring, TH-9. We did not encounter groundwater in exploratory borings TH-10 or TH-11. We do not believe, from this

information, groundwater will impact the proposed cuts. We anticipate soils will become more soft and moist with increasing depth. Cut areas may require low pressure equipment or need to sit and let "heal" prior to final grading if soft conditions are encountered.

Prior to fill placement, the surface of native soils below fill should be stripped and all organic and deleterious materials completely removed. The surface should be scarified to a depth of 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor (ASTM D698) maximum dry density. Areas of soft to very soft conditions were encountered and stabilization may be necessary in locations across the subject site. On-site clay and sand soils free of deleterious materials, organics and particles over 6-inches diameter can be reused during grading. Stockpile soils should be evaluated by our office prior to use as site grading fill. Fill placement should be moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor (ASTM D698) maximum dry density and placed in 10-inch maximum thickness loose lifts. Compaction of site grading fill in structural areas must be confirmed by monitoring and testing in order for the foundation recommendations in this report to be valid. Placement and compaction of site grading fill should be observed and tested by a

representative of our firm during construction. Sample site grading specifications are included in Appendix A.

Grading Loss Estimate

We calculated dry densities of samples obtained in the field and performed a moisture-density relationship, standard Proctor (ASTM D698) to estimate the grading loss of compacted fill. Fifteen samples exhibited dry densities of 98 pcf to 105 pcf (as shown on Table A) with an average dry density of 101 pcf. The moisture-density relationship, standard Proctor exhibited a maximum dry density of 114.0 pcf and an optimum moisture content of 14.5 percent (Fig. A-1). We calculated an estimated grading loss of 6.7 percent to 11.5 percent. This range represents an in-situ dry density of 101 pcf and compaction to between 95 percent to 100 percent of maximum standard Proctor dry density, respectively. Soils tested in our laboratories also indicate that soils are predominately over optimum and will require moisture conditioning (in this case drying of soils) prior to compaction. Our estimates were made from calculations using the average of field and laboratory testing results presented and assumes no significant soil loss to stripping, waste, oversize or deleterious particles or transportation.

Utility Installation

We understand utility systems will be installed from 24 ½ Road to the proposed structures. We believe utility installation in the clay soils may be accomplished using conventional excavation equipment. Utility trenches should be sloped or shored to meet local, State and Federal safety regulations. Based on our investigation, we believe soils at this site may be classified as either Type B or Type C, based on OSHA standards. Excavation slopes specified by OSHA are dependent upon types of soils and groundwater conditions encountered. Contractors should identify the conditions encountered in the excavation and refer to OSHA standards to determine appropriate slopes.

Compaction of trench backfill can have a significant effect on the life and serviceability of pavements. Water and sewer lines that are constructed beneath pavements should be well compacted. We recommend trench backfill be placed in thin, loose lifts, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698). The placement and compaction of utility trench backfill should be observed and tested by a geotechnical engineer during construction.

We identified groundwater during this investigation at depths of 10 feet to 14 feet below ground surface. We anticipate groundwater levels may rise during

irrigation season. As a result, there may be groundwater concerns during construction, which were not identified by this investigation. We believe continued monitoring of ground water levels during irrigation season would be a prudent measure to help further evaluate these potential impacts.

Relocation of Wash

We understand approximately 300 lineal feet of the existing wash located in the south west portion of the subject site will be realigned. We recommend slopes of the wash be laid back at a ratio of 3 horizontal to 1 vertical. If necessary, steeper slopes may be achieved with the use of geosynthetic fabrics. We can provide these recommendations if requested. The width and depth of the wash should be reviewed by the civil engineer to verify wash can accommodate anticipated flows. The slopes of the wash should be protected from erosion. We recommend a vegetative cover be implemented and maintained to prevent erosion. It may be necessary to use a geomat such as Western Excelsior, XCEL Permamats, or equivalent to achieve growth on the slopes. If on site soils are required to build slopes the resulting subgrade should be scarified 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of maximum dry density standard Proctor (ASTM D 698). Fill soils should be placed in 10-inch maximum loose lifts and compacted as stated above.

FOUNDATIONS

We understand there will be four different types of structures across the site as identified in the **"PROPOSED CONSTRUCTION"** section of this report. We present a brief discussion and foundation recommendations for the proposed structures below.

Shelter (Near 24 Road and G Road)

This investigation indicates relatively soft to very soft, silty, sandy clay soils exist at foundation levels (exploratory boring, TH-19). Existing fill was identified in this area during the site visit. Existing fill should not be relied upon for structural support and should be removed full depth. We believe a foundation system anchored below the silty, sandy clay and clay soils in an underlying competent strata would offer lower movement potential than shallow foundations. Driven pile foundations have been used for similar conditions as encountered in this investigation. We believe, driven piles would likely require a 36 to 41 foot length. We understand the proposed structure will consist of a shelter with relatively light loads. An alternative, with more potential of movement, of shallow foundations bearing on stabilized subgrade and a depth of structural fill is also presented. We anticipate stabilization will be required at foundation levels. It may be prudent, if the shallow foundation alternative is chosen, to elevate

structure as high as practical to help mitigate very soft conditions. The recommended design and construction criteria for these two alternatives, driven piles and column pad foundations, are presented below. These criteria were developed from analysis of field and laboratory data and our experience. The owner should also consider requirements established by the structural engineer which may impose additional foundation design and installation requirements.

Driven Piles – Shelter (near 24 Road and G Road)

1. The piles should be steel H sections (HP 10x42 or larger) or concrete filled, closed end, steel pipes (10-3/4-inch O.D., 0.25-inch thick walled or larger). Tip reinforcement should be provided to reduce pile damage during hard driving. A maximum allowable service stress of 12,000 psi should not be exceeded. We estimate an HP10 x 42 section or 10-3/4-inch diameter pipe section driven to a "set" of an average 0.5-inch per blow for the last 18 inches with a pile hammer delivering at least 18,000 foot-pounds of energy will penetrate the gravel and cobble strata approximately 5 feet. Based on our experience, capacities of 50 tons to 75 tons can be developed during driving. The capacity of piles in compression driven as described above will be the structural strength of the piles.

2. Groups of piles placed closer than three diameters, center to center, should be evaluated to determine their reduced capacity.

3. The pile driving hammer should be operated at the manufacturer's recommended stroke and speed when the "set" is measured.

4. The contractor should select a driving hammer and cushion combination which is capable of installing selected piles without overstressing the pile. The contractor should submit the pile driving plan and the pile hammer cushion combination to the structural engineer for evaluation of the driving stress in advance of the pile installation.

5. A representative of our office should observe and keep records of penetration resistance, pile lengths and other factors that could affect the performance of the foundation during installation.

Column Pad Foundations – Shelter (near 24 Road and G Road)

1. Foundation excavations should be limited in depth as much as practical. We recommend a maximum depth of excavation of 12 to 24 inches depth.

2. Existing fill, if encountered, should be removed full depth (at a 1 horizontal to 1 vertical ratio) and replaced with a well compacted structural fill as stated below. Foundation areas should be overexcavated a minimum of 2 feet below and 2 feet horizontally beyond footings in each direction. The resulting subgrade should be native soils, devoid of organics and deleterious material (or these materials removed); scarified 10-inches depth, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor (ASTM D698) maximum dry density. We anticipate stabilization will be necessary for the resulting subgrade. It may be prudent to leave excavation open to "heal" prior to stabilization. For planning purposes an 18-inch depth of granular structural fill and a geosynthetic grid can be used. Further stabilization recommendations can be made at the time of observation. Our representative should be called to verify stabilization and to test compaction of the structural fill, prior to forming.

   The minimum two foot zone should be replaced with well compacted structural fill. Structural fill should consist of a well graded granular imported soil with maximum particle size 6-inches, maximum 30 percent passing the No. 200 sieve and maximum liquid limit of 25. A CDOT Class 5 or Class 6 aggregate road base will satisfy these criteria and is recommended. The structural fill should be moisture conditioned and compacted in 10-inch maximum loose lifts as stated above.

3. Footings bearing on well compacted or stabilized subgrade and at least 2 feet of well compacted structural fill as described above can be designed for a maximum soils bearing pressure of 1,000 psf. Loose soils should be completely removed from foundation bearing areas, prior to placing concrete.

4. Column pads should be at least 30 inches by 30 inches. Column pads may be larger depending on the loads of the structure.

5. Exterior foundations should be protected from freezing. The normal depth assumed for frost protection in the Mesa County area is 2 feet.

6. The completed foundation excavation should be inspected by our representative to verify the subsurface foundation conditions are as anticipated from our borings, to observe subgrade stabilization and to test compaction of structural fill during placement.

Shelter/Restroom/Vending Building

This investigation indicates relatively medium stiff to very stiff, silty, sandy clay soils exist at foundation levels (exploratory borings, TH-12, TH-13 and TH-17). Soils generally became softer with depth. We believe a foundation system anchored below the silty, sandy clay in an underlying competent strata would offer lower movement potential than shallow foundations. Driven pile foundations have been used for similar conditions as encountered in this investigation. Driven piles would likely require a greater than 60 foot length. We understand the proposed structures will consist of shelters with relatively light loads. An alternative, with more potential of movement, of shallow foundations bearing on stabilized subgrade and a depth of structural fill is also presented.

We anticipate stabilization may be required at foundation levels. It may be prudent, if the shallow foundation alternative is chosen, to elevate structure as high as practical to help mitigate very soft conditions. The recommended design and construction criteria for these two alternatives, driven piles and column pad foundations, are presented below. These criteria were developed from analysis of field and laboratory data and our experience. The owner should also consider requirements established by the structural engineer which may impose additional foundation design and installation requirements.

Driven Piles – Shelter/Restroom/Vending Building

1. The piles should be steel H sections (HP 10x42 or larger) or concrete filled, closed end, steel pipes (10-3/4-inch O.D., 0.25-inch thick walled or larger). Tip reinforcement should be provided to reduce pile damage during hard driving. A maximum allowable service stress of 12,000 psi should not be exceeded. We estimate an HP10 x 42 section or 10-3/4-inch diameter pipe section driven to a "set" of an average 0.5-inch per blow for the last 18 inches with a pile hammer delivering at least 18,000 foot-pounds of energy will penetrate the gravel and cobble strata approximately 5 feet. Based on our experience, capacities of 50 tons to 75 tons can be developed during driving. The capacity of piles in compression driven as described above will be the structural strength of the piles.

2. Groups of piles placed closer than three diameters, center to center, should be evaluated to determine their reduced capacity.

3. The pile driving hammer should be operated at the manufacturer's recommended stroke and speed when the "set" is measured.

4. The contractor should select a driving hammer and cushion combination which is capable of installing selected piles without

overstressing the pile. The contractor should submit the pile driving plan and the pile hammer cushion combination to the structural engineer for evaluation of the driving stress in advance of the pile installation.

5. A representative of our office should observe and keep records of penetration resistance, pile lengths and other factors that could affect the performance of the foundation during installation.

Spread Footing Foundations – Shelter/Restroom/Vending Building

1. Foundation excavations should be limited in depth as much as practical.

2. Foundation areas should be overexcavated a minimum of 2 feet below and 2 feet horizontally beyond footings in each direction. The resulting subgrade should be native soils, devoid of organics and deleterious material (or these materials removed); scarified 10-inches depth, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor (ASTM D698) maximum dry density. We anticipate stabilization will be necessary for the resulting subgrade. It may be prudent to leave excavation open to "heal" prior to stabilization. For planning purposes an 18-inch depth of granular structural fill and a geosynthetic grid can be used. Further stabilization recommendations can be made at the time of observation. Our representative should be called to verify stabilization and to test compaction of the structural fill, prior to forming.

   The minimum two foot zone should be replaced with well compacted structural fill. Structural fill should consist of a well graded granular imported soil with maximum particle size 6-inches, maximum 30 percent passing the No. 200 sieve and maximum liquid limit of 25. A CDOT Class 5 or Class 6 aggregate road base will satisfy these criteria and is recommended. The structural fill should be moisture conditioned and compacted in 10-inch maximum loose lifts as stated above.

3. Footings bearing on well compacted or stabilized subgrade and at least 2 feet of well compacted structural fill as described above can be designed for a maximum soils bearing pressure of 1,000 psf. Loose soils should be completely removed from foundation bearing areas, prior to placing concrete.

4. We recommend a minimum width of 18 inches for continuous footings. Isolated pads should be at least 30 inches by 30 inches. Foundation walls should be well reinforced top and bottom. We recommend reinforcement sufficient to span an unsupported distance of at least 12 feet. Reinforcement should be designed by the structural engineer.

5. Exterior foundations should be protected from freezing. The normal depth assumed for frost protection in the Mesa County area is 2 feet.

6. The completed foundation excavation should be inspected by our representative to verify the subsurface foundation conditions are as anticipated from our borings, to observe subgrade stabilization and to test compaction of structural fill during placement.

Proposed Tennis Courts

This investigation indicates relatively soft to very stiff, silty, sandy clay soils at proposed tennis court subgrade level (exploratory borings TH-15 through TH-18 and TH-20 through TH-22). We assumed the post-tensioned slab foundations would be designed using the methods developed by the Post-Tensioning Institute (PTI, "Design and Construction of Post-Tensioned Slab-on-Ground", 1980). The following criteria should be used for design:

1. Post-tensioned slabs bearing on well compacted subgrade soils no deeper than 12 inches below ground surface should be designed for a maximum bearing pressure of 1,000 psf.

2. Subgrade soils should be scarified 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent maximum dry density (ASTM D698) standard Proctor. We recommend subgrade be proof rolled with a 10-wheeled pneumatic tired vehicle, such as a fully loaded dumptruck prior to forming. If excessive deflection is observed stabilization may be required. Stabilization recommendations can be made at the time of our observation site visits.

3. Edge moisture variation distance:
   a. Center lift = 5.5 feet
   b. Edge lift = 2.5 feet

4. Differential heave (or settlement):
   a. Center lift = 2.0 inches
   b. Edge lift = 1.5 inches

5. All stiffening beams (as appropriate) should be provided with at least two No. 5, grade 60 bars at the bottom to stiffen the slab system and provide strength in the event of edge lift or center settlement.

Fountain Park

This investigation indicates relatively medium stiff to very stiff, silty, sandy clay and / or proposed site grading fill soils will exist at anticipated foundation levels (exploratory TH-13 and TH-14). Soils generally became softer with depth. We understand the proposed structure will consist of a fountain park. We anticipate construction will be a slab type foundation. We recommend a post tensioned slab for the proposed construction. An alternative, with more potential of movement, of a heavily reinforced mat foundation bearing on stabilized

subgrade and a depth of structural fill is also presented. It may be prudent to elevate structure as high as practical to help mitigate very soft conditions. The recommended design and construction criteria for these two alternatives, post-tensioned slab and reinforced mat foundations, are presented below in order of decreasing attractiveness. These criteria were developed from analysis of field and laboratory data and our experience. The owner should also consider requirements established by the structural engineer which may impose additional foundation design and installation requirements. We also recommend the use of a pool drain. Recommendations are provided in the "**SURFACE DRAINAGE**" section of this report.

Post-Tensioned Slab Foundation – Fountain Park

We assumed the post-tensioned slab foundations would be designed using the methods developed by the Post-Tensioning Institute (PTI, "Design and Construction of Post-Tensioned Slab-on-Ground", 1980). The following criteria should be used for design:

1. Post-tensioned slabs bearing on well compacted subgrade soils should be designed for a maximum bearing pressure of 1,000 psf.

2. Subgrade soils should be scarified 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent maximum dry density (ASTM D698) standard

Proctor. We recommend subgrade be proof rolled with a 10-wheeled pneumatic tired vehicle, such as a fully loaded dumptruck prior to forming. If excessive deflection is observed stabilization may be required. Stabilization recommendations can be made at the time of observation.

3. Edge moisture variation distance:
   c. Center lift = 5.5 feet
   d. Edge lift = 2.5 feet

4. Differential heave (or settlement):
   c. Center lift = 2.0 inches
   d. Edge lift = 1.5 inches

5. All stiffening beams (as appropriate) should be provided with at least two No. 5, grade 60 bars at the bottom to stiffen the slab system and provide strength in the event of edge lift or center settlement.

6. If grading fill soils are required to maintain grade they should be placed in maximum 10-inch loose lifts on the well compacted subgrade and compacted as stated above. A sample of the proposed grading fill soils should be submitted to our office for approval, prior to fill placement.

Mat Foundation – Fountain Park

1. Foundation excavations should be limited in depth as much as practical.

2. Foundation areas should be overexcavated a minimum of 2 feet below and 2 feet horizontally beyond footings in each direction. The resulting subgrade should be native soils, devoid of organics and deleterious material (or these materials removed); scarified 10-inches depth, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor (ASTM D698) maximum dry density. We anticipate stabilization will be necessary for the resulting subgrade. It may be prudent to leave excavation open to "heal" prior to stabilization.

Stabilization recommendations can be made at the time of observation. Our representative should be called to verify stabilization and to test compaction of the structural fill, prior to forming.

3. The minimum two foot zone should be replaced with well compacted structural fill. Structural fill should consist of a well graded granular imported soil with maximum particle size 6-inches, maximum 30 percent passing the No. 200 sieve and maximum liquid limit of 25. A CDOT Class 5 or Class 6 aggregate road base will satisfy these criteria and is recommended. The structural fill should be moisture conditioned and compacted in 10-inch maximum loose lifts as stated above.

4. Footings bearing on well compacted or stabilized subgrade and at least 2 feet of well compacted structural fill as described above can be designed for a maximum soils bearing pressure of 1,000 psf. Loose soils should be completely removed from foundation bearing areas, prior to placing concrete.

5. We recommend reinforcement sufficient to span an unsupported distance of at least 12 feet. Reinforcement should be designed by the structural engineer.

6. Exterior foundations should be protected from freezing. The normal depth assumed for frost protection in the Mesa County area is 2 feet.

7. The completed foundation excavation should be inspected by our representative to verify the subsurface foundation conditions are as anticipated from our borings, to observe subgrade stabilization and to test compaction of structural fill during placement.

Light Pole Foundations

This investigation indicates relatively medium stiff silty, sandy clay soils exist at anticipated light pole foundation levels (exploratory boring, TH-1, TH-2, TH-7

and TH-8). We believe a friction pier foundation system can provide adequate support for the proposed construction. The recommended design and construction criteria for drilled friction piers are presented below. These criteria were developed from analysis of field and laboratory data and our experience. The owner should also consider requirements established by the structural engineer which may impose additional foundation design and requirements.

1. Piers should be designed for a maximum allowable end bearing pressure of 500 psf and an allowable skin friction value of 75 psf. Skin friction should be neglected for the top 2 feet of piers. These design pressures assume a medium stiff soil condition. A Geotechnical Engineering Group representative should be called to observe pier drilling and confirm bearing pressures at that time.

2. Piers should have a total length of at least 6 feet embedment into natural subgrade soils.

3. Foundations can be designed to resist lateral loads. We recommend a friction factor of 0.30 between the bottom of concrete and the subgrade soils. We recommend a passive equivalent fluid weight of 150 pcf for the natural clays, at least 2 feet below the ground surface. These values do not include allowances for surcharge, hydrostatic pressures or a factor of safety.

4. Piers should be carefully cleaned prior to placement of concrete. Groundwater was not encountered at the time of this investigation to the anticipated depths of drilling. We believe problems associated with pier installation can be reduced by using a "drill and pour" construction procedure. Concrete should be placed in the open pier holes immediately after they are drilled, cleaned and inspected. Concrete should not be placed in any pier hole containing more than 4 inches of water.

5. Installation of drilled piers should be observed by a representative of our firm to identify the proper bearing strata and document proper installation.

FLOOR SYSTEMS

The near-surface soils which will support slab-on-grade floors exhibited low movement potential. Some movement must be assumed from development and construction. To our knowledge, the only reliable solution to control floor movement is the construction of a structurally supported floor with at least a 12-inch air space between the floor and subgrade. In our opinion, structural floors should be used in all finished areas. A slab-on-grade floor can be used unfinished areas providing the owner is aware of and accepts risk of potential movement.

We recommend the following precautions for construction of slabs-on-grade at this site. These precautions will not prevent movement in the event the underlying conditions become wetted; they tend to reduce damage if movement occurs.

1. Slab-on-grade construction should be limited to unfinished areas and exterior flatwork where slab movement and cracking is acceptable.

2. Slab subgrade soils should be scarified 10-inches, moisture conditioned to within 2 percent of optimum moisture and compacted to at least 95 percent maximum standard Proctor (ASTM D698) dry density and tested prior to forming.

3. Slabs should be separated from exterior walls and interior bearing members with a slip joint which allows for free vertical movement of slabs.

4. The use of slab-bearing partitions should be minimized. Where such partitions are necessary, a slip joint allowing at least 1.5 inches of free vertical slab movement should be used. Doorways and stairwells should also be designed for this movement. The owner should be aware to reestablish this separation if it closes.

5. Underslab plumbing should be eliminated where feasible. Where such plumbing is unavoidable, it should be thoroughly pressure tested during construction for leaks and should be provided with flexible couplings.

6. Frequent control joints should be provided to reduce problems associated with shrinkage and curling. The American Concrete Institute (ACI) and Portland Cement Association (PCA) recommend a maximum panel size of 8 to 15 feet depending upon concrete thickness and slump, and the maximum aggregate size. We advocate additional control joints 3 feet off of and parallel to grade beams and foundation walls.

7. Plumbing and utilities which pass through the slab should be isolated from the slab. Heating and air conditioning systems supported by slabs should be provided with flexible connections capable of at least 1.5 inches of vertical movement so that slab movement is not transmitted to the duct work.

8. Exterior flatwork should be isolated from the structure. These slabs should be well-reinforced to function as independent units. Movements of these slabs should not be transmitted to the foundations. Stucco finish (if any) should terminate at least 6 inches above any flatwork.

BELOW-GRADE CONSTRUCTION

No below-grade construction is anticipated at this site. Typically, foundation drains are not required for construction of this type. Crawl space areas should be sloped so that potential moisture will not collect in these areas, but flow out of the crawl space. Crawl space areas should also be well ventilated to mitigate potential musty odors. We can provide foundation drain details if requested.

PAVEMENT

The pavement subgrade soils include medium stiff to stiff, silty, sandy clay. Soils across the subject site generally became softer with depth. We visually classified each sample obtained from the test pits and tested samples in our laboratory. We tested a combined sample from exploratory borings, TH-1, 3, 4, 5, 6 and 8 at variable depth between 0 to 5 feet, bulk, combined for pavement design purposes. The sample was tested for Atterberg limits, gradation, standard Proctor, and California Bearing Ratio (CBR). The sample tested exhibited a maximum dry density of 114.0 pcf, optimum moisture of 14.5 percent and a California Bearing Ratio (CBR) of 4.2. We used a design CBR value of 4.0. The results of laboratory testing are shown on Table I and included in Figs. B-1 and B-2.

Our design utilized the computer program WinPAS, based on the 1993 AASHTO Guide for Design of Pavements Structures a 30 year design period, the City of Grand Junction requirements, and our experience. We understand pavements will be used to for interior streets, parking areas and a 24 1/2 Road Improvement. We used an Equivalent Single Axle Load (ESAL) of 54,750 for the interior streets and parking areas in design calculations. We used an ESAL value of 219,000 for the 24 ½ Road lane improvements. These ESAL values were calculated using a daily 18 kip axle load of 5 and 20, respectively, over a 30 year period. We used a regional factor of 2.0 and a design serviceability index of 2.0 (for ESAL = 54,750) or 2.5 (for ESAL = 219,000). We used a CDOT developed, non-linear relationship to relate the CBR value to the subgrade resilient modulus (M_r), for flexible pavement. Using this relationship, we calculated a M_r value of 5,686 psi. We used this M_r value for flexible pavement design. We calculated a modulus of subgrade reaction (k) value for rigid pavement design from the M_r value using the relationship $k = M_r / 19.4$. Using this equation, we calculated a k value of 293 psi / in. Pavement design calculations are included in Appendix B. Table A below shows our recommendations.

TABLE A

SUMMARY OF RECOMMENDED PAVEMENT SECTIONS

Anticipated Traffic Type	Asphaltic Concrete	Asphalt and Aggregate Base Course	Asphalt, Aggregate Base Course and Aggregate Subbase Course	Portland Cement Concrete
Interior Streets (ESAL = 54,750)	5.5"	3.0" + 8.0" 4.0" + 5.0"	—	5.0"
24 ½ Road Improvements (ESAL= 219,000)	7.0"	3.0" + 13.0" 4.0" + 9.5" 5.0" + 6.25"	3.0" + 6.0" + 10.0"	5.0"

Existing access roads were identified across the site. We understand some of these roads will be paved. We anticipate existing fill in these areas. Existing fill should be removed full depth and replaced with a well compacted, suitable structural fill. Structural fill soils should have the same or better soils support characteristic as the native site soils, be placed in 10-inch maximum loose lifts and compacted as stated below. The pavement subgrade should be scarified a depth of 10-inches, moisture conditioned to within 2 percent of optimum moisture content and compacted to at least 95 percent of standard Proctor (ASTM D698) maximum dry density. Soft areas that require stabilization may be encountered. Stabilization recommendations can be made at time of subgrade preparation. We understand

there will be site grading fill. Site grading fill should be placed as described in the "**SITE DEVELOPMENT**" section of this report.

Our experience indicates asphalt pavement in areas which will be subjected to heavy trucks stopping and turning does not perform satisfactorily. We recommend placing a 6 inch thick Portland cement concrete pavement in all areas where this heavy truck traffic may occur, including access aprons and trash dumpster locations.

The design of a pavement system is as much a function of paving materials as supporting characteristics of the subgrade. The quality of each construction material is reflected by the strength coefficient used in the calculations. If the pavement system is constructed of inferior material, then the life and serviceability of the pavement will be substantially reduced.

The asphalt component of the pavement was designed assuming at least 1,650 pounds Marshall stability. Normally, an asphaltic concrete should be relatively impermeable to moisture and should be designed with a well-graded sand/gravel mix. The oil content, void ratio, flow and gradation need to be considered in the design. We recommend a job mix design be performed and periodic checks are made to verify compliance with these specifications.

If construction materials cannot meet the above requirements, then the pavement design should be evaluated based upon available materials. We recommend the materials and placement methods conform to the requirements listed in the Colorado Department of Transportation "Standard Specifications for Road and Bridge Construction". All materials planned for construction should be submitted and tested to confirm their compliance with these specifications.

A primary cause of early pavement deterioration is water infiltration into the pavement system. The addition of moisture usually results in softening of untreated base course and subgrade and eventual failure of the pavement. We recommend drainage be designed for rapid removal of surface runoff. Curb and gutter should be backfilled and the backfill compacted to reduce ponding adjacent to pavements. Final grading of the subgrade should be carefully controlled so that design cross-slope is maintained and low spots in the subgrade which could trap water are eliminated. Seals should be provided between curb and pavement and at all joints to reduce moisture infiltration. Landscaped areas and detention ponds in pavements should be avoided.

We have included construction recommendations for flexible and rigid pavement construction in Appendix C. Routine maintenance, such as sealing and repair of cracks annually and overlays at 5 to 7-year intervals, are necessary to

achieve the long-term life of an asphalt pavement system. If the design and construction recommendations cannot be followed or anticipated traffic loads change considerably, we should be contacted to review our recommendations.

CONCRETE

One soils sample (TH-1, TH-3 through TH-6 and TH-8 at 0 to 5 foot depth, bulk, combined) tested had a water soluble sulfate concentration of 1,100 ppm. Sulfate concentrations in this range are considered to have a moderate effect on concrete which comes into contact with the soils. We recommend a Type II (sulfate resistant) cement be used for concrete that comes into contact with the subsoils. In addition, concrete should have a maximum water-cement ratio of 0.5.

SURFACE DRAINAGE

Performance of foundations and concrete flatwork is influenced by surface moisture conditions. Risk of wetting foundation soils can be reduced by carefully planned and maintained surface drainage. Surface drainage should be designed to provide rapid runoff of surface water away from the proposed structures. We

recommend the following precautions be observed during construction and maintained at all time after the construction is completed.

1. The ground surface surrounding the exterior of a structure should be sloped to drain away from the structure in all directions. We recommend a slope of at least 12 inches in the first 10 feet around the structure, where possible. In no case should the slope be less than 6 inches in the first 5 feet. The ground surface should be sloped so that water will not pond adjacent to the structure.

2. Backfill around foundation walls should be moistened and compacted.

3. Roof downspouts and drains should discharge well beyond the limits of all backfill. Fountain blocks and downspout extenders should be provided at all discharge points.

4. Landscaping should be carefully designed to minimize irrigation. Plants used close to foundations should be limited to those with low moisture requirements; irrigated grass should not be located within 5 feet of the foundation. Sprinklers should not discharge within 5 feet of foundations. Irrigation should be limited to the minimum amount sufficient to maintain vegetation; application of more water will increase likelihood of slab and foundation movements.

5. Impervious plastic membranes should not be used to cover the ground surface immediately surrounding the structure. These membranes tend to trap moisture and prevent normal evaporation from occurring. Geotextile fabrics can be used to limit the weed growth and allow for evaporation.

Fountain Park

Water from pool type construction (fountain park) areas frequently flows through relatively permeable backfill placed adjacent to the structure and collects on the surface of relatively impermeable soils occurring at the bottom of the excavation. This can cause wet or moist conditions and contribute to settlement concerns. To reduce the risk of accumulation of water below fountain park areas we recommend the use of an underdrain. The provision of a drain will not eliminate slab movement. The drain should consist of a 4-inch diameter open joint or slotted pipe encased in free draining gravel. The drain should lead to a positive gravity outlet, such as a sump where water can be removed by pumping. A recommended drainage detail is included in Fig. 17.

CONSTRUCTION MONITORING

Geotechnical Engineering Group, Inc. should be retained to provide general review of construction plans for compliance with our recommendations. Geotechnical Engineering Group, Inc. should be retained to provide construction monitoring services during all earthwork and foundation construction phases of the work. This is to observe the construction with respect to the geotechnical

recommendations, to enable design changes in the event that subsurface conditions differ from those anticipated prior to start of construction and to give the owner a greater degree of confidence that the proposed construction is constructed in accordance with the geotechnical recommendations.

LIMITATIONS

Twenty two exploratory borings were drilled and sampled across the subject site. The exploratory borings are representative of conditions encountered only at the exact boring locations. Variations in the subsoil conditions not indicated by the borings are always possible. Our representative should observe the open foundation excavations and test compaction of subgrade and structural fill or inspect pile installation to confirm soils are as anticipated from the borings and foundations are prepared as recommended.

We believe this investigation was conducted in a manner consistent with that level of care and skill ordinarily used by geotechnical engineers practicing in this area at this time. No other warranty, express or implied, is made. If we can be

of further service in discussing the contents of this report or the analysis of the influence of the subsurface conditions on the design of the proposed construction, please call.

Sincerely,
GEOTECHNICAL ENGINEERING GROUP, INC.

Reviewed by:

Gregory G. Poettgen, P.E. 03/06/03
Project Engineer

John P. Withers, P.E.
Principal Engineer

GGP:JPW:cd
(1 copy sent)

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1 cc: Winston Associates
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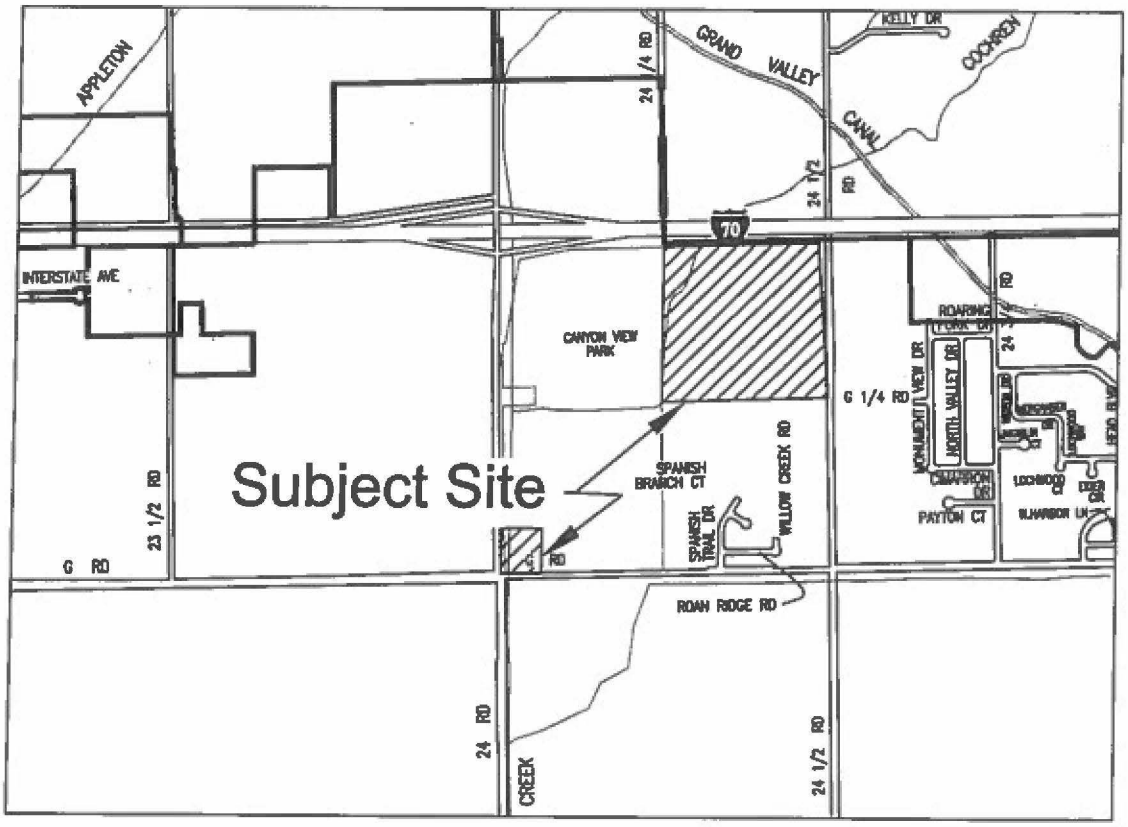
1 cc: Ciavonne and Associates
Mr. Ted Ciavonne
844 Grand Avenue
Grand Junction, CO 81501

Geotechnical Investigation
Canyon View Park, Phase 2
North and West of G Road
and 24 1/2 Road
Grand Junction, Colorado

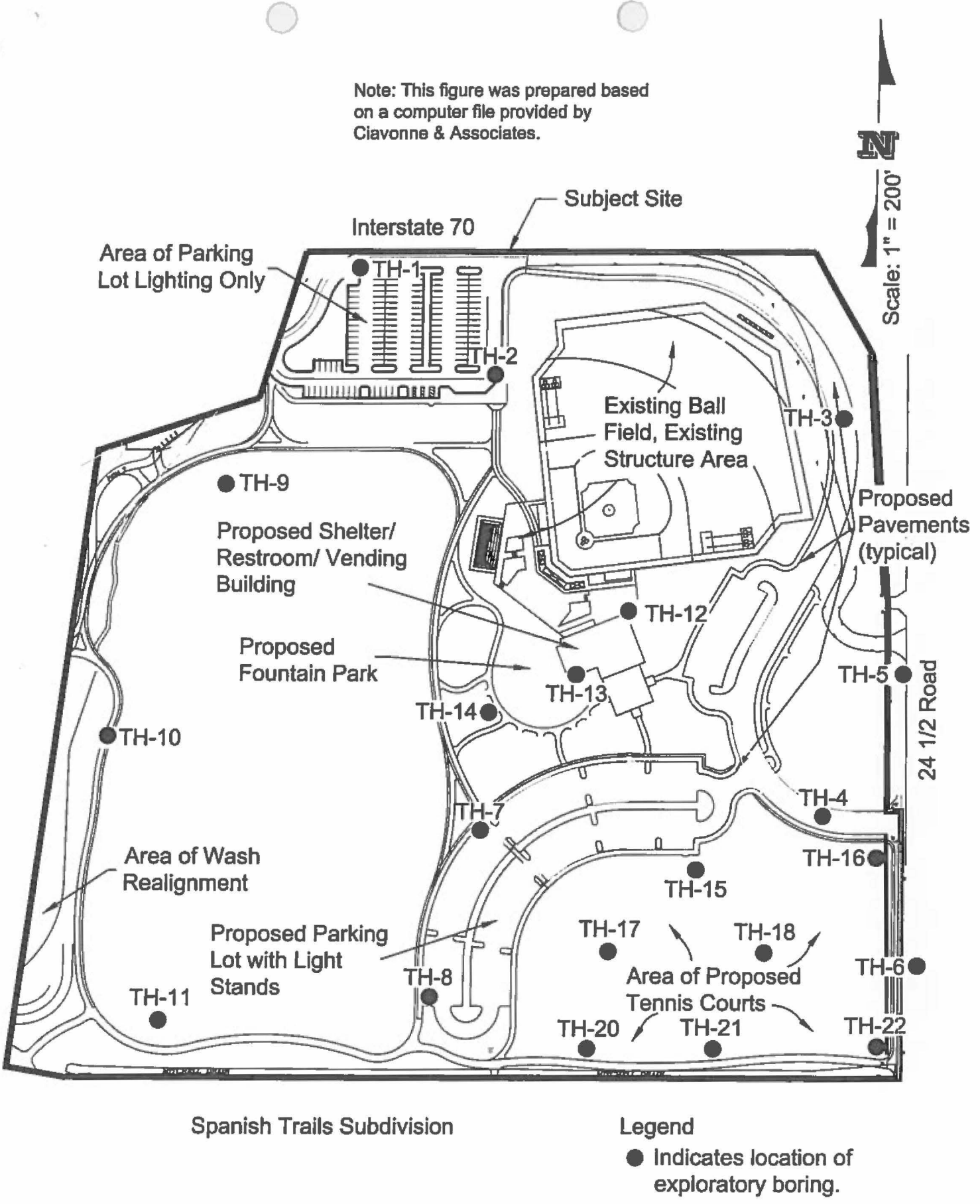
N
No Scale



Job No. 1,284

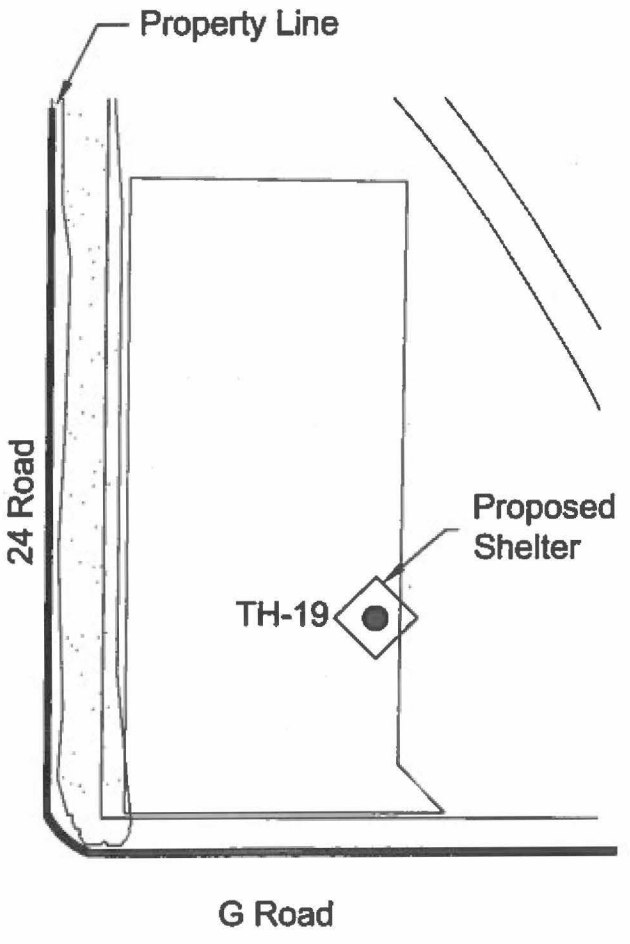
Vicinity Map

Fig. 1



Job No. 1,284 **Location of Exploratory Borings** Fig. 2

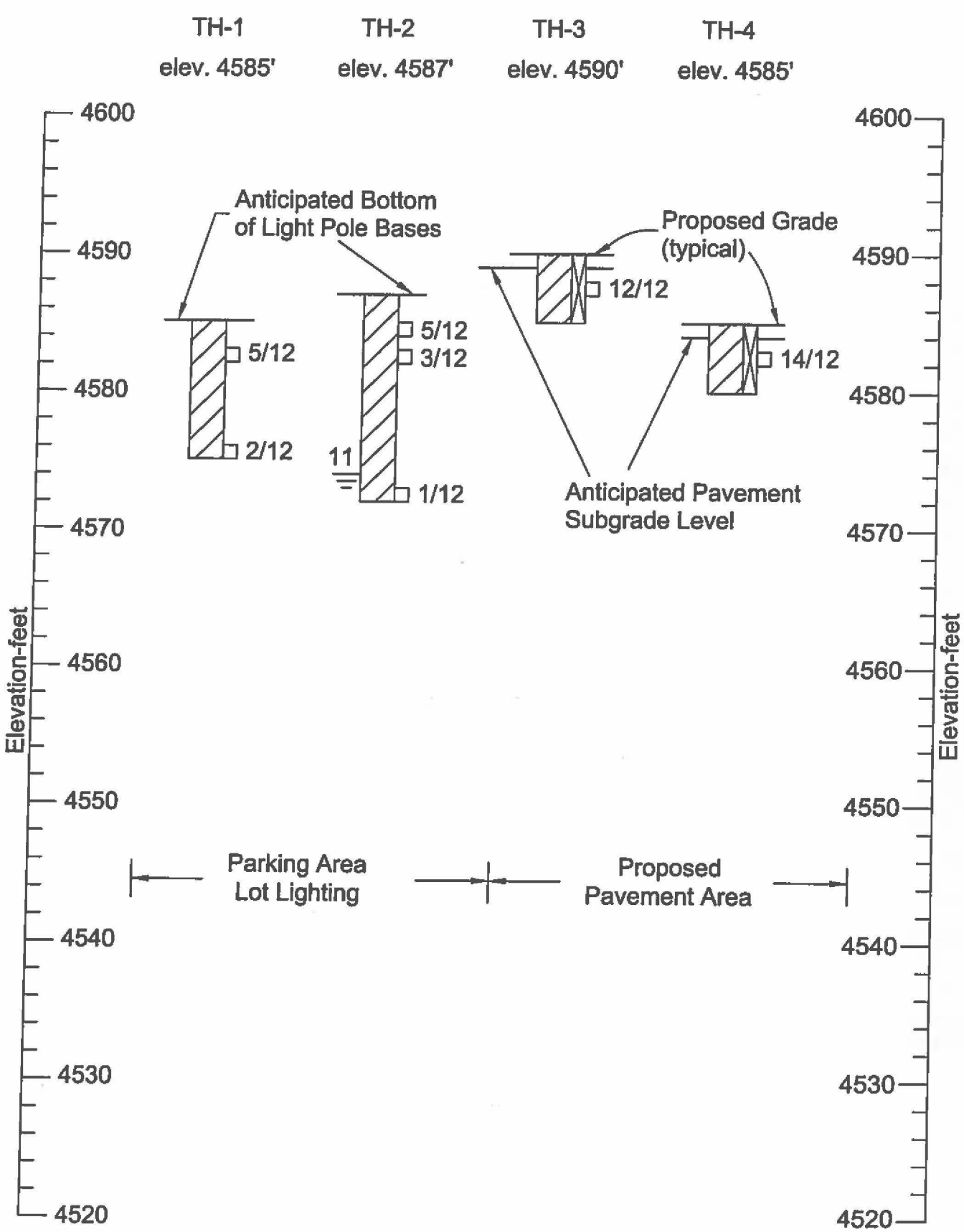
Note: This figure was prepared based on a computer file provided by Ciavonne & Associates.



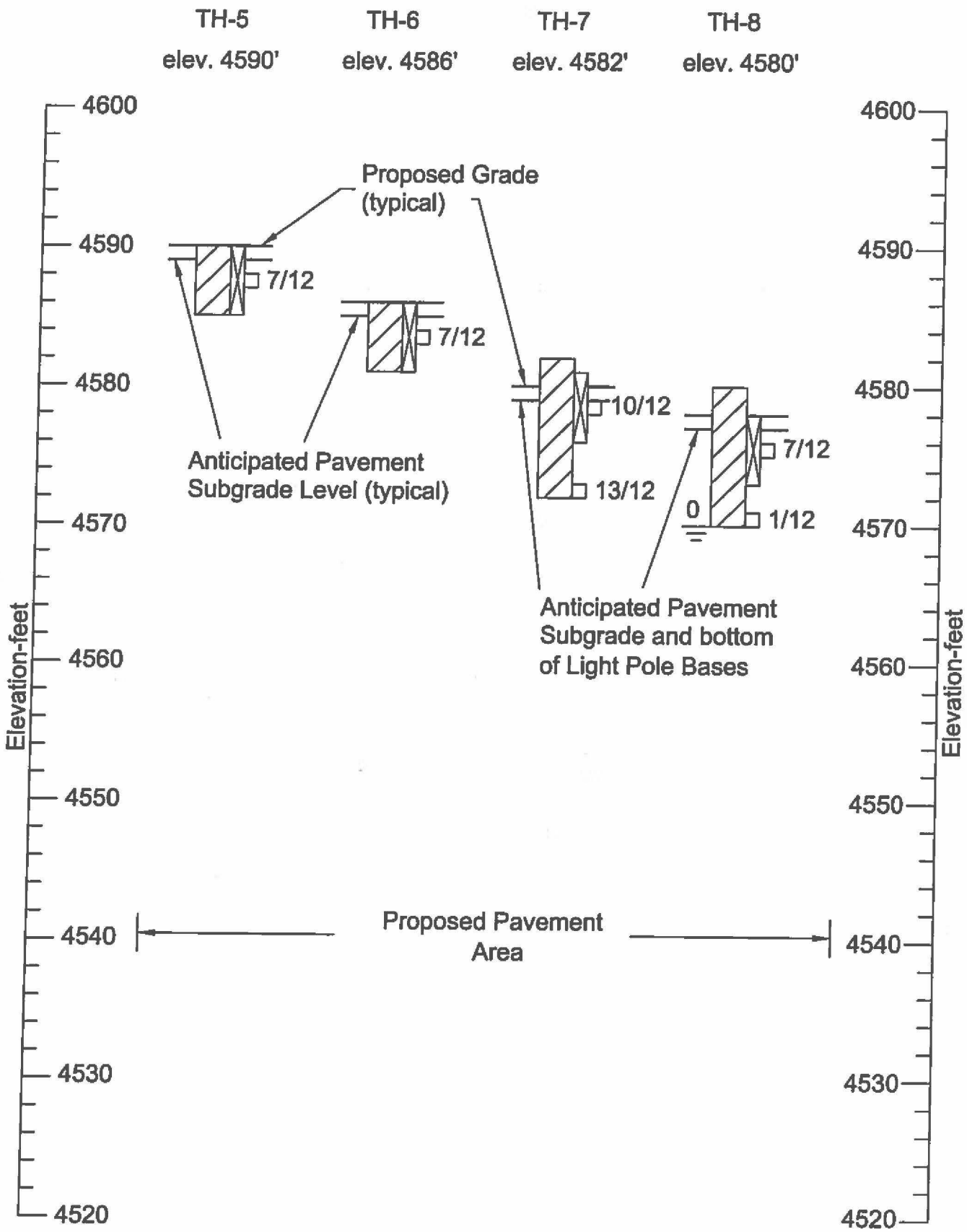
Legend

● Indicates location of exploratory boring.

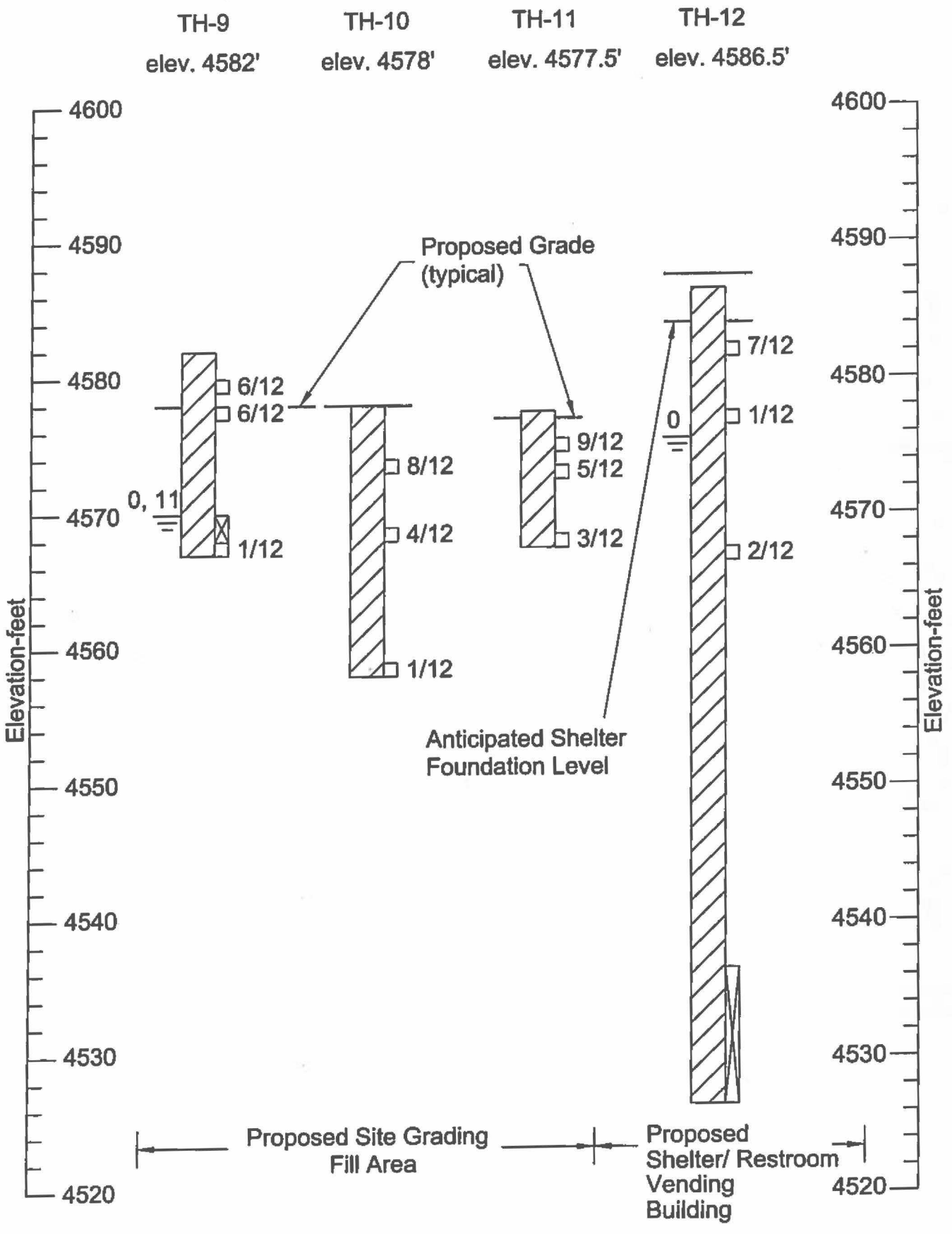
Job No. 1,284 **Location of Exploratory Borings** Fig. 3



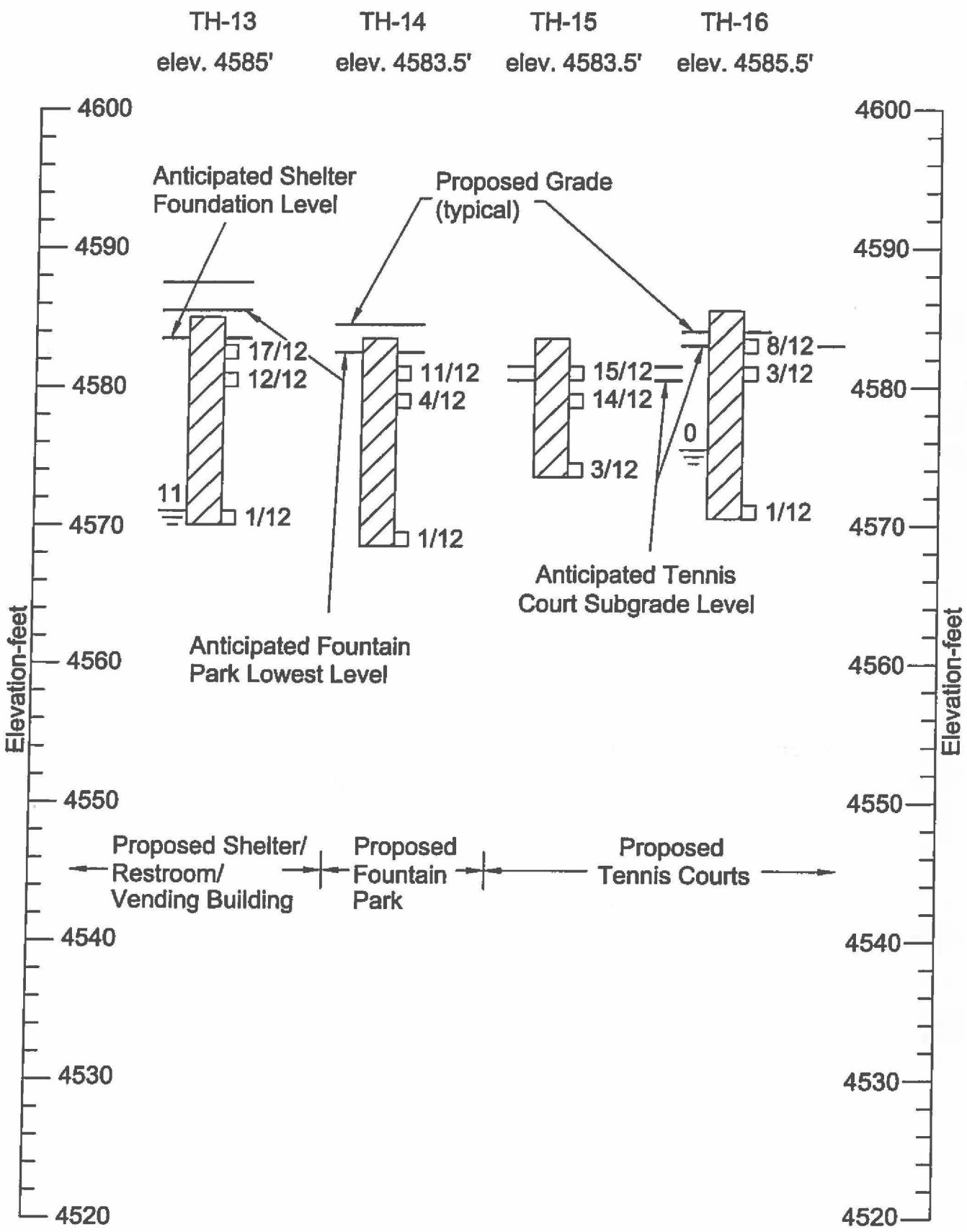
Job No. 1,284 **Logs of Exploratory Borings** Fig. 4



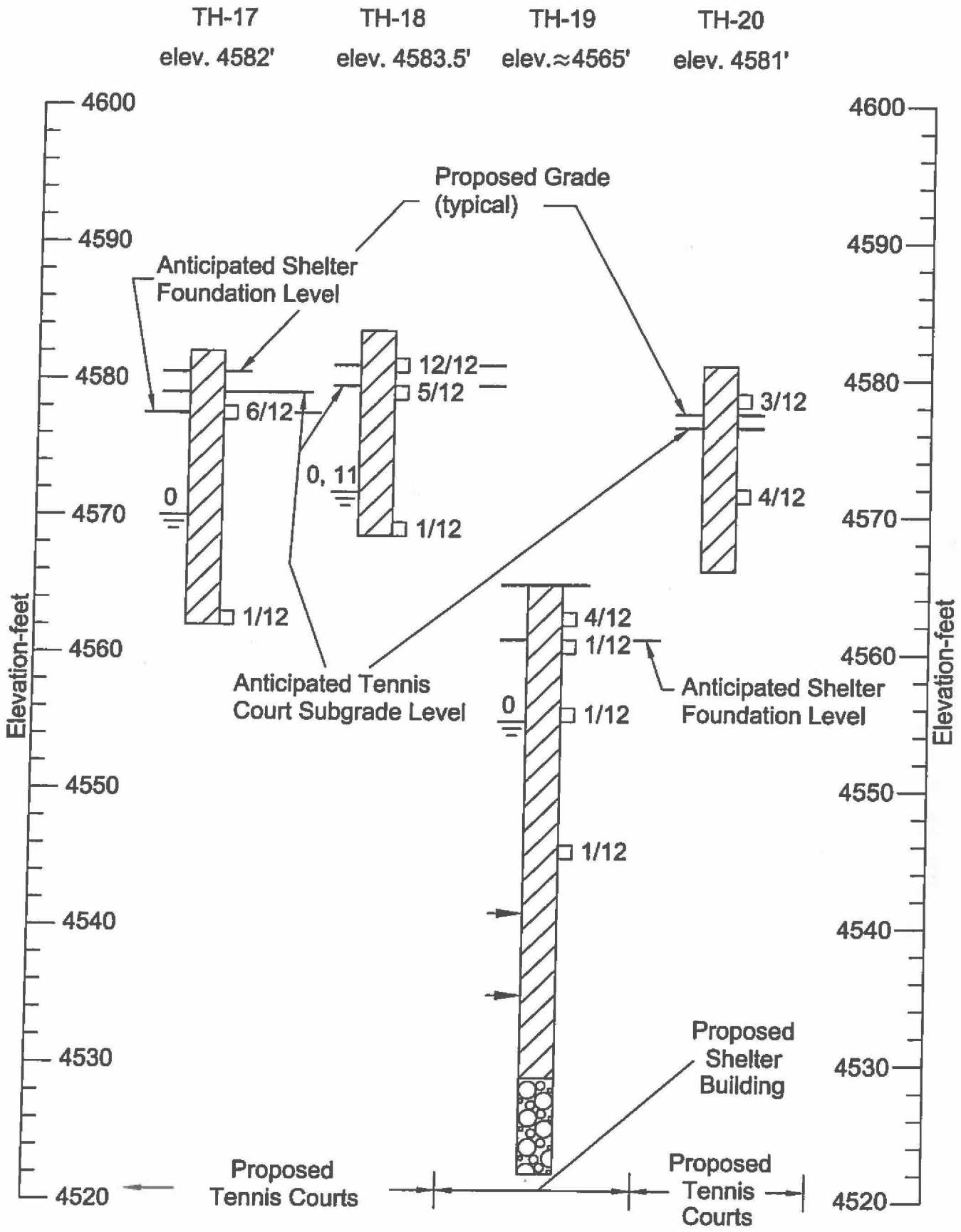
Job No. 1,284 Logs of Exploratory Borings Fig. 5



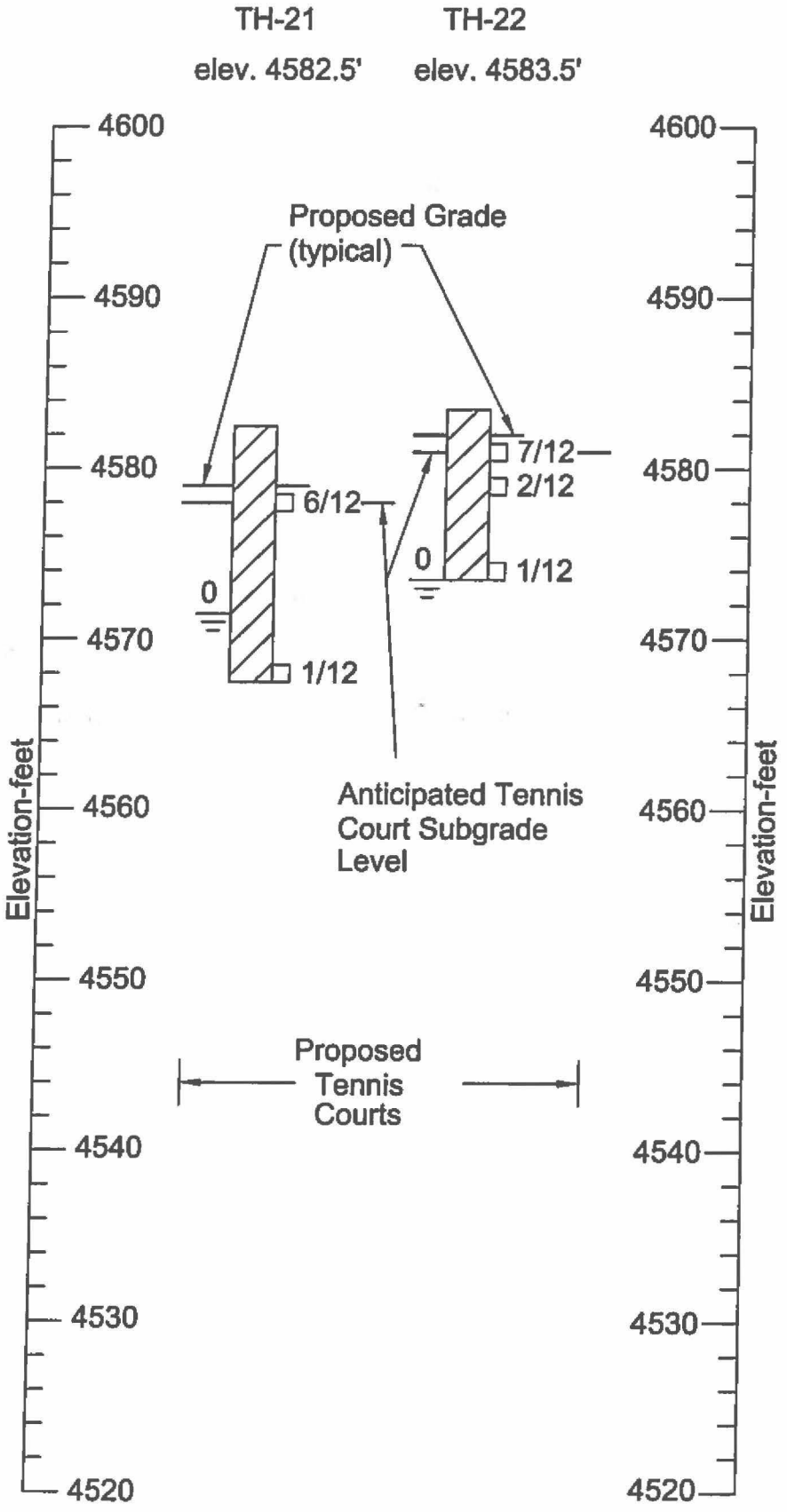
Job No. 1,284 **Logs of Exploratory Borings** Fig. 6



Job No. 1,284 **Logs of Exploratory Borings** Fig. 7



Job No. 1,284 **Logs of Exploratory Borings** Fig. 8



Job No. 1,284 **Logs of Exploratory Borings** Fig. 9

Legend

Clay, silty, sandy with sand, silty to clayey lenses noted, very stiff to very soft, dry to wet with depth, tan, brown (CL)

Gravel, cobbly, sandy, exhibited substantial drill rig resistance to practical drill rig refusal

Indicates drive sample. The symbol 5/12 indicates that 5 blows of a 140 pound hammer falling 30 inches were required to drive a 2.5 inch O.D. sample barrel 12 inches.

Indicates location of bulk sample collected from auger cuttings during drilling.

Indicates depth at which exploratory boring caved.

Indicates free water level. Numeral indicates number of days after drilling that measurement was taken.

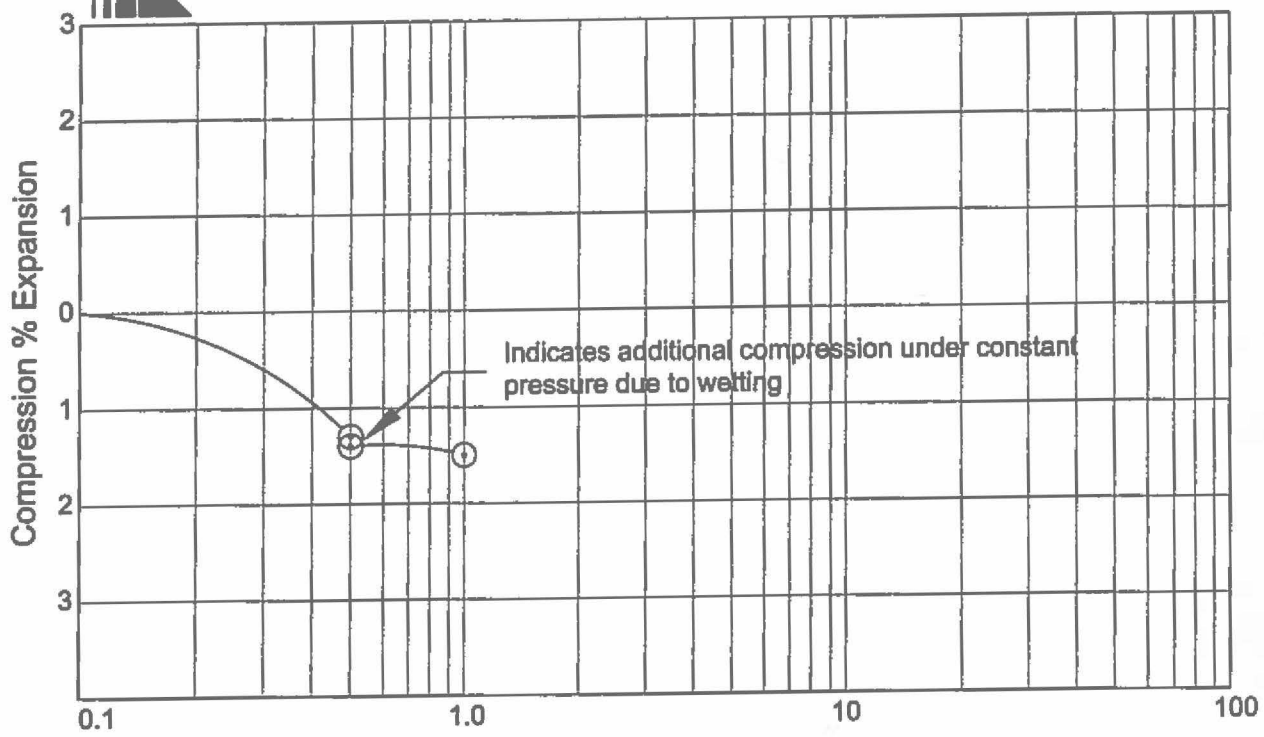
Notes

1. Exploratory borings were drilled and sampled on January 8, 9 and 10, 2003 using 6- inch diameter solid stem, continuous flight auger and a truck mounted rig.
2. Exploratory boring surface elevations were estimated from a plan sheet titled "Canyon View Park, Phase Two, Concept Plan" by Winston Associates Inc. and Ciavonne & Associates, Inc., dated 09/18/02.
3. These logs are subject to the explanations, limitations and conclusions as contained in this report.

Legend of Logs of Exploratory Borings

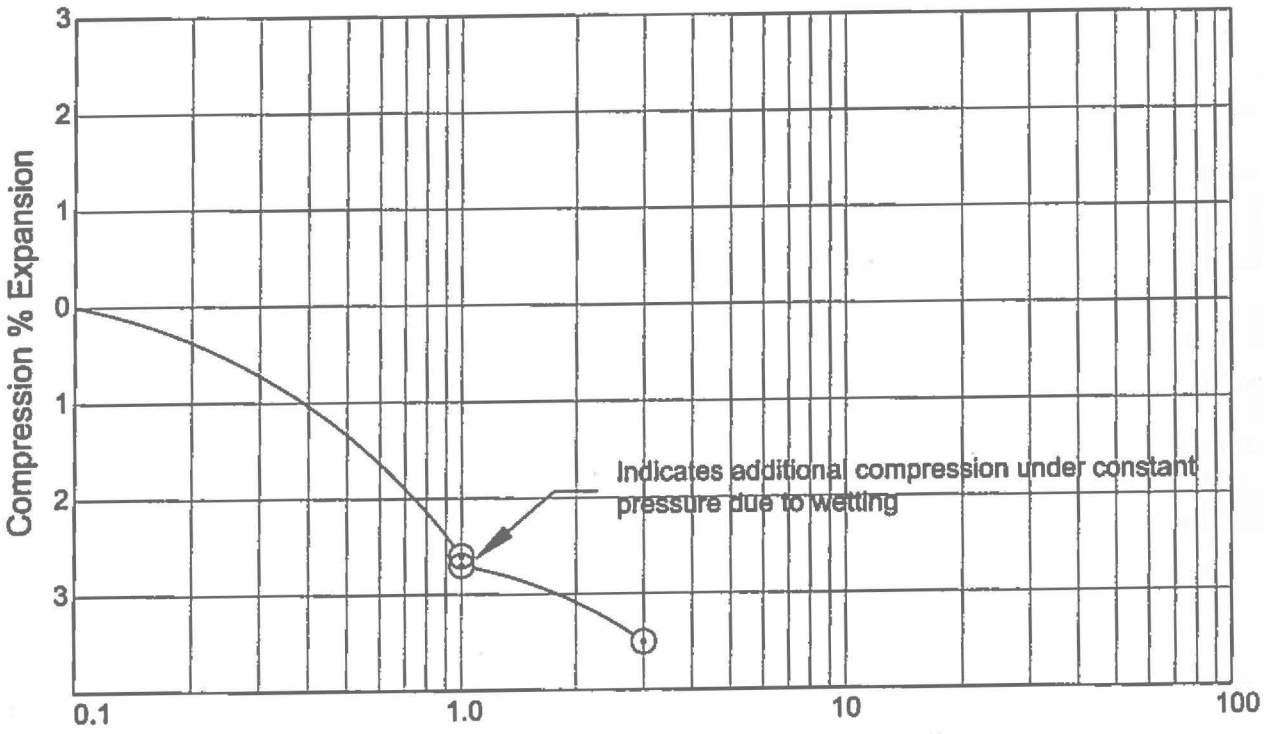
Job No. 1,284

Fig. 10



Sample of: Clay, silty, sandy (CL)
From: TH-1 @ 2 foot depth

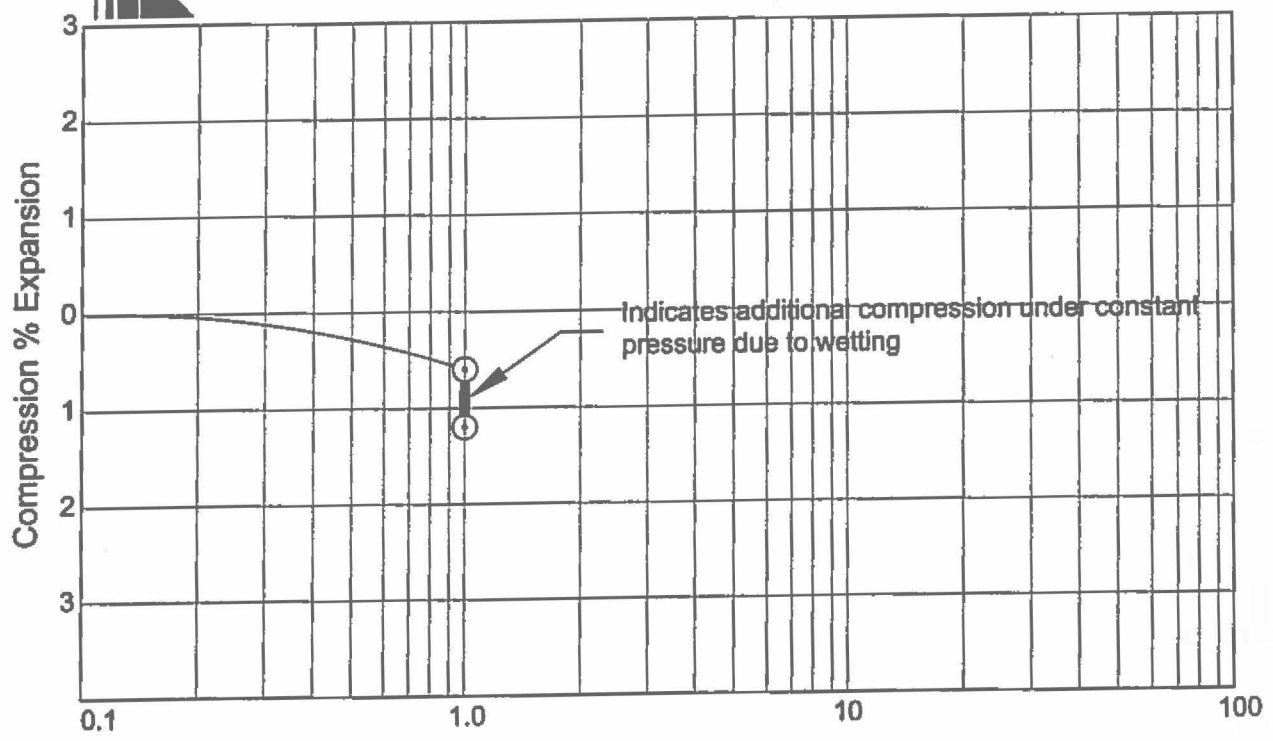
Dry Unit Weight= 99 PCF
Moisture Content= 22.1 %



Sample of: Clay, silty, sandy (CL)
From: TH-2 @ 4 foot depth

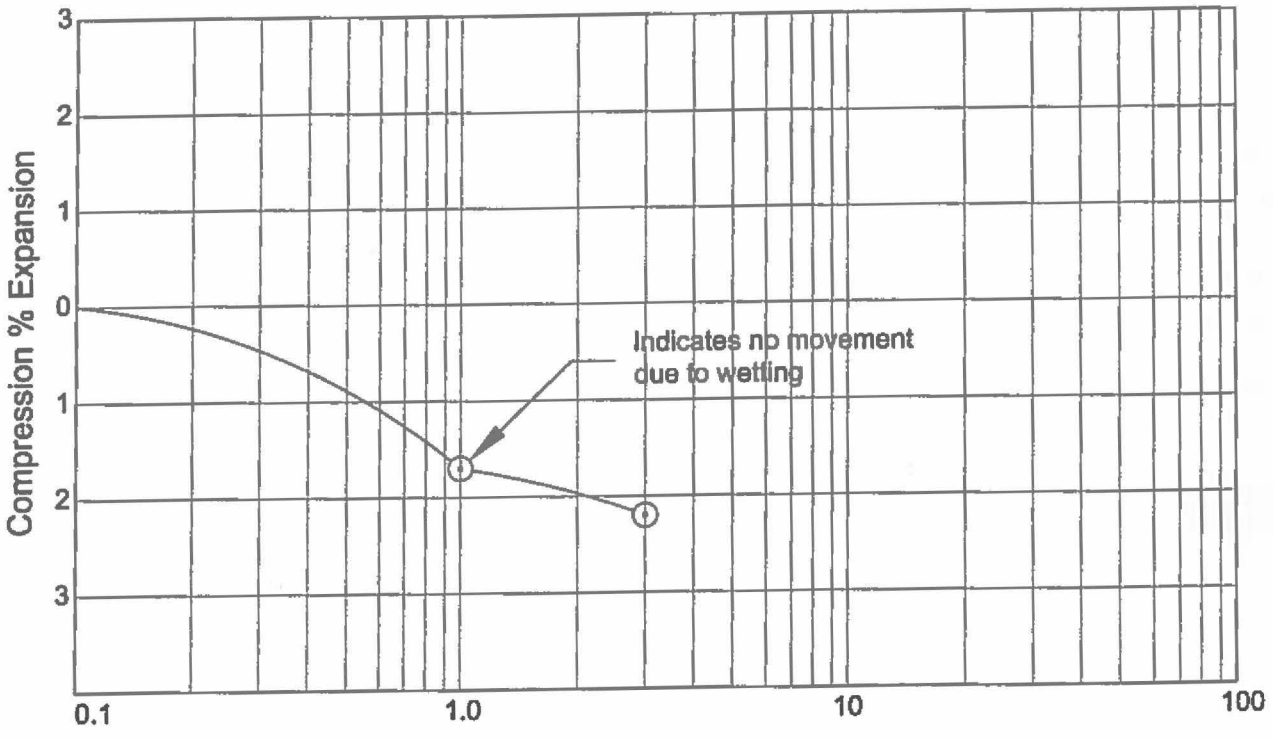
Dry Unit Weight= 98 PCF
Moisture Content= 25.3 %

Job No. 1,284 Swell Consolidation Test Results Fig. 11



Sample of: Clay, silty, sandy (CL)
From: TH-13 @ 4 foot depth

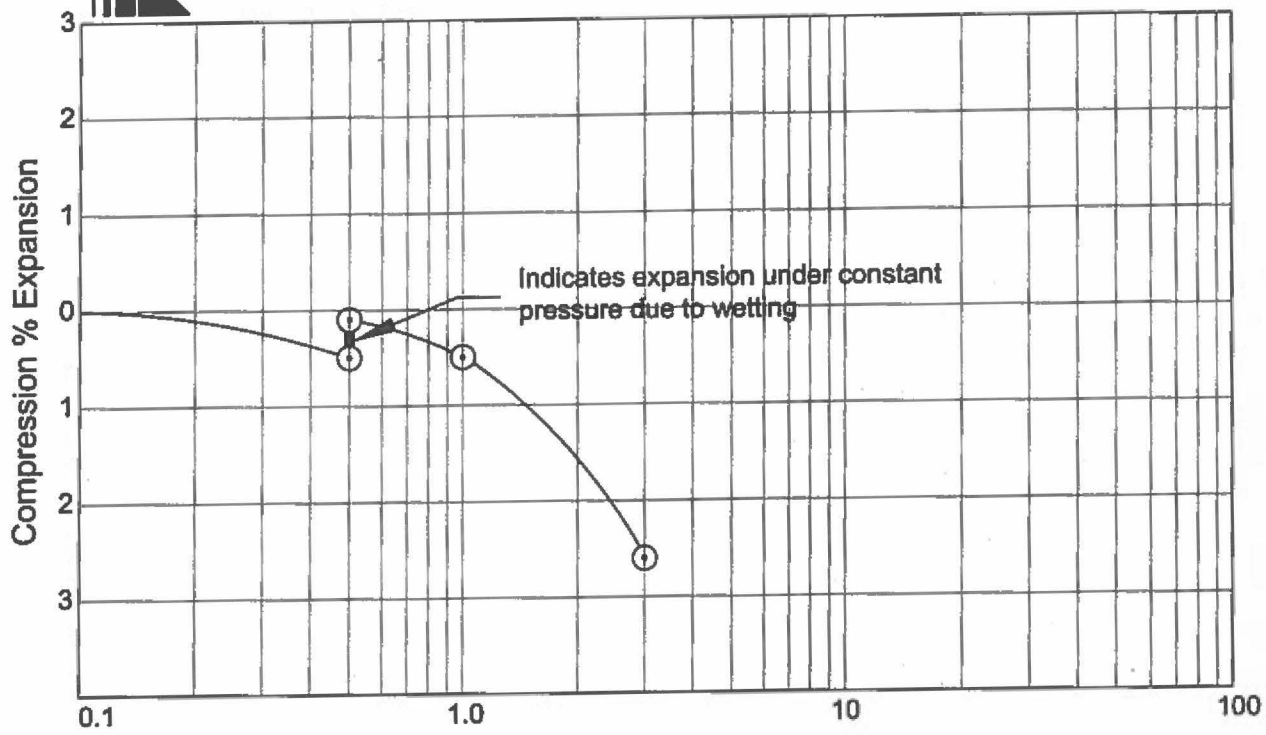
Dry Unit Weight= 96 PCF
Moisture Content= 6.9 %



Sample of: Clay, silty, sandy (CL)
From: TH-14 @ 9 foot depth

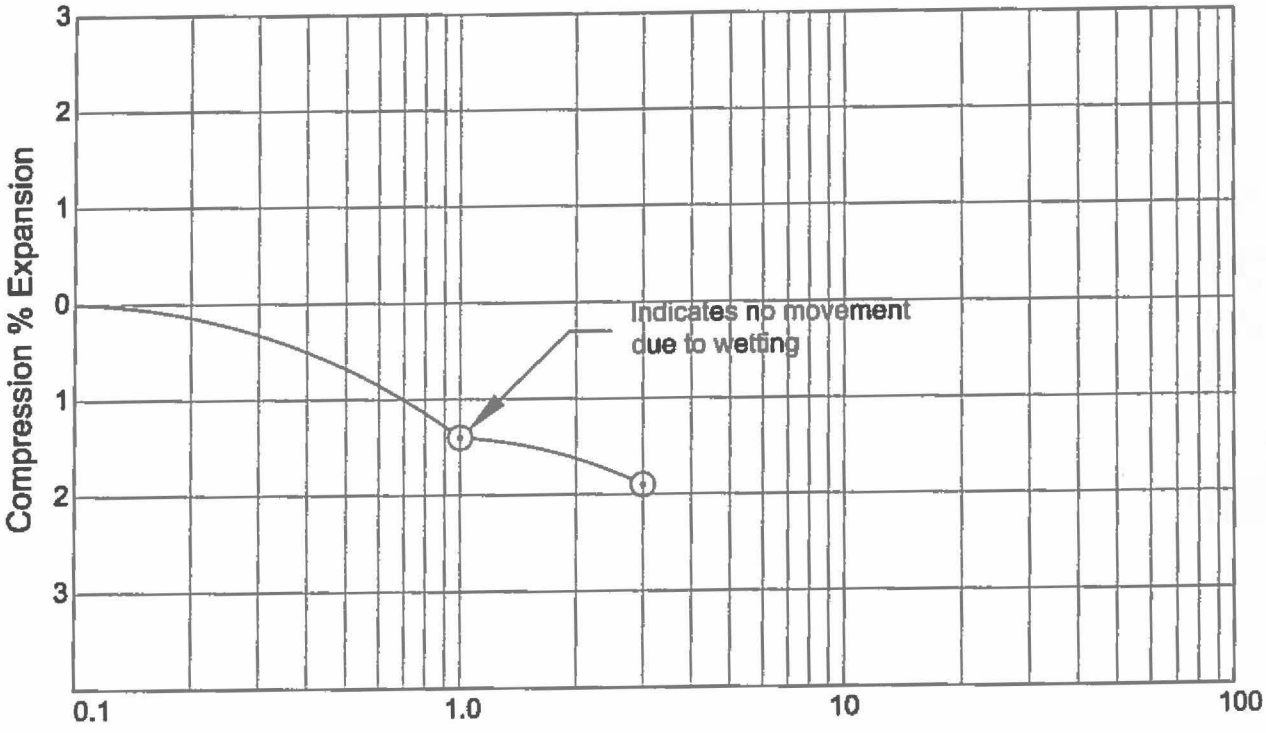
Dry Unit Weight= 105 PCF
Moisture Content= 19.5 %

Job No. 1,284 Swell Consolidation Test Results Fig. 12



Sample of: Clay, silty, sandy (CL)
From: TH-15 @ 2 foot depth

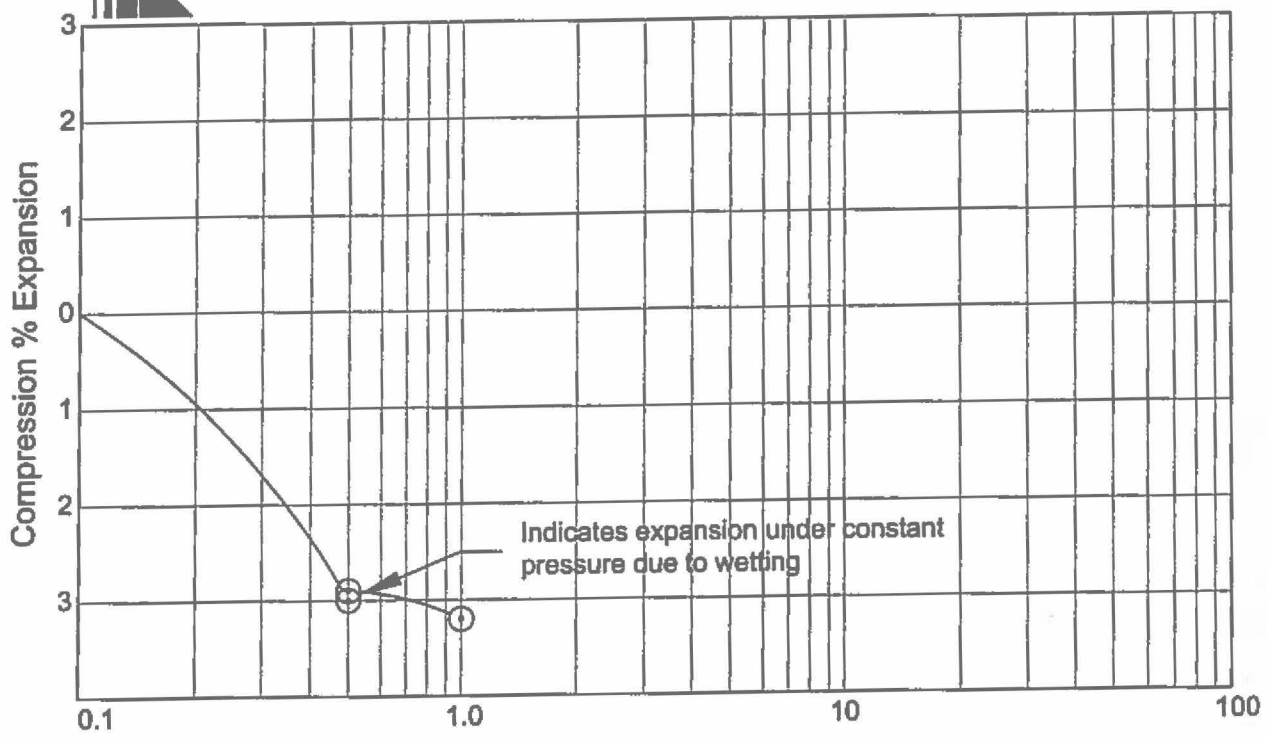
Dry Unit Weight= 98 PCF
Moisture Content= 7.0 %



Sample of: Clay, silty, sandy (CL)
From: TH-18 @ 4 foot depth

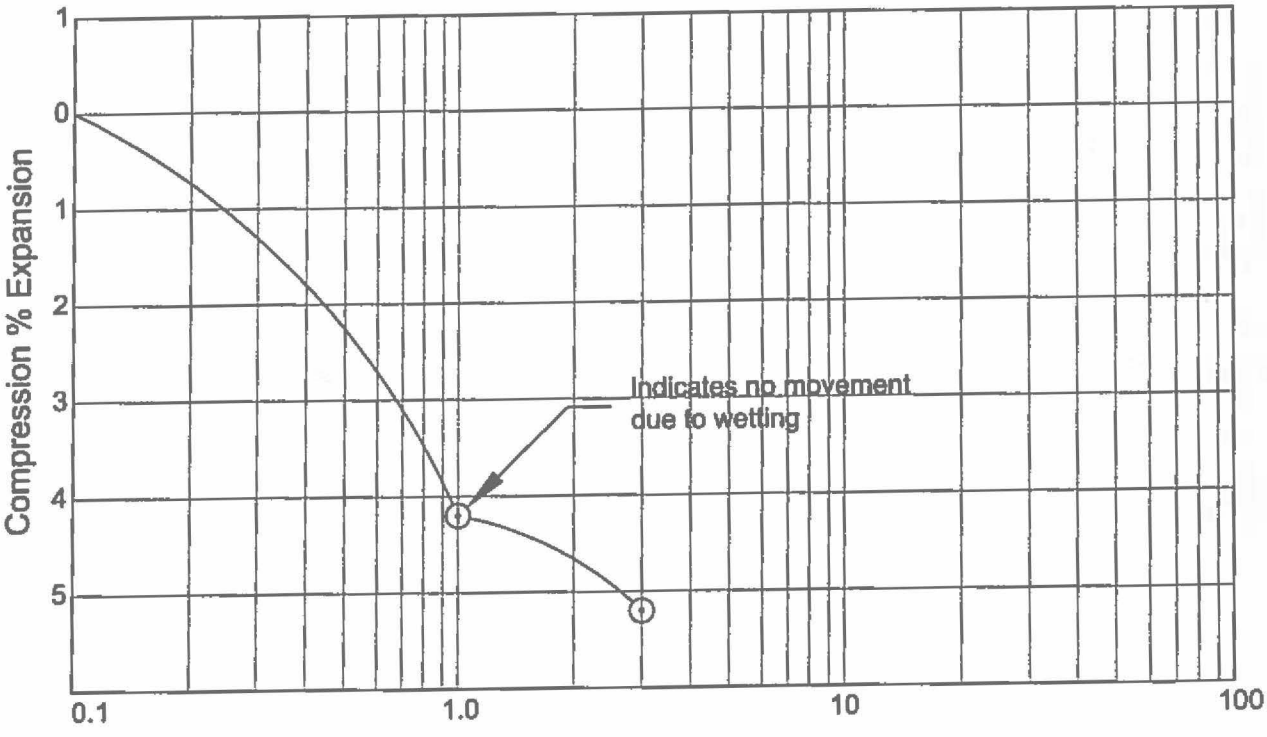
Dry Unit Weight= 104 PCF
Moisture Content= 18.3 %

Job No. 1,284 Swell Consolidation Test Results Fig. 13



Sample of: Clay, silty, sandy (CL)
From: TH-19 @ 2 foot depth

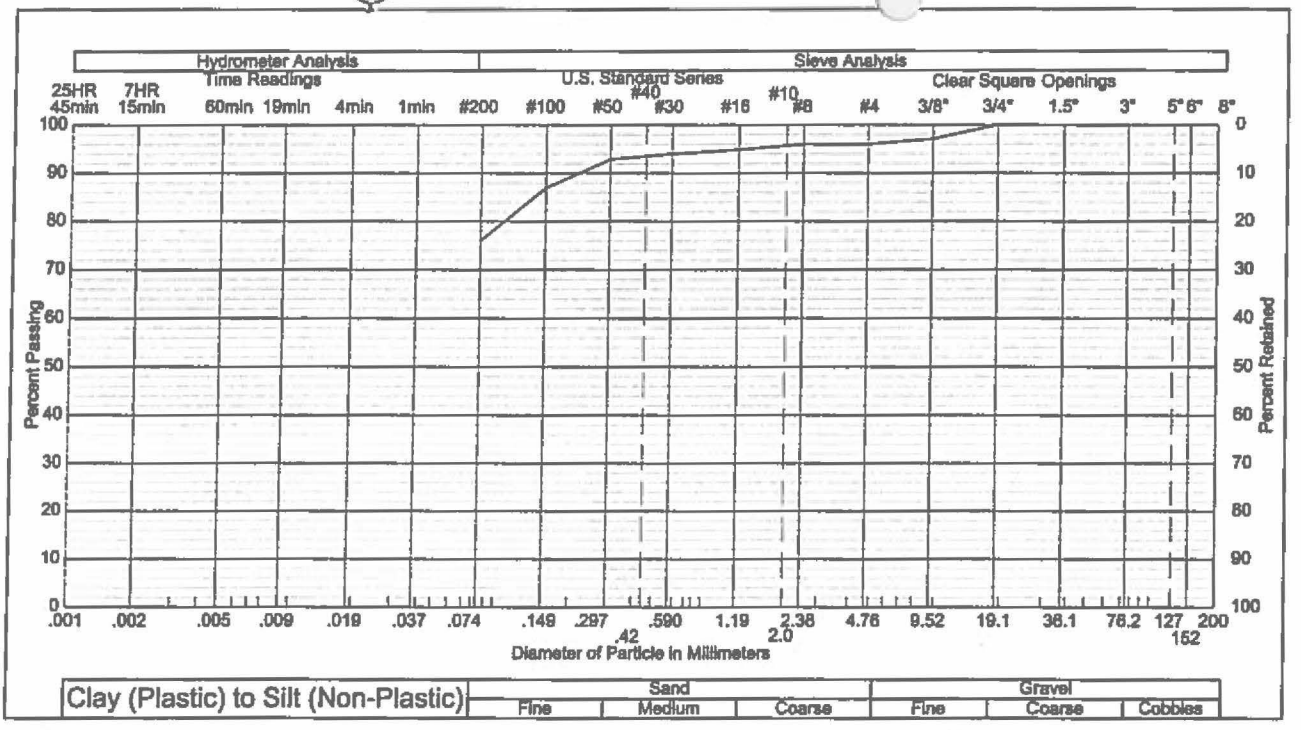
Dry Unit Weight= 105 PCF
Moisture Content= 19.8 %



Sample of: Clay, silty, sandy (CL)
From: TH-22 @ 4 foot depth

Dry Unit Weight= 101 PCF
Moisture Content= 20.6 %

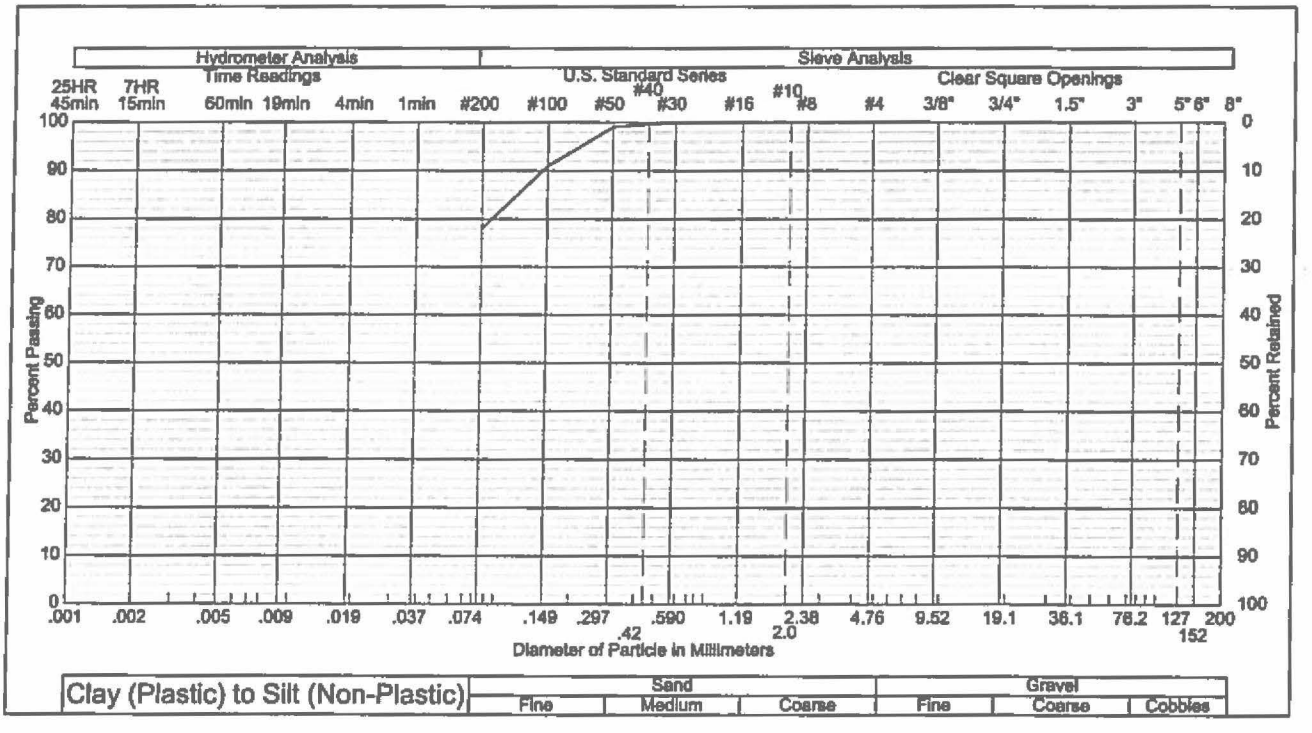
Job No. 1,284 Swell Consolidation Test Results Fig. 14



Sample of: Clay, silty, sandy (CL)
From: TH-1, 3, 4, 5, 6, 8 @ 0 to 5 foot depth, bulk combined

Gravel: 4 %
Silt & Clay: 76 %
Plasticity Index: 11

Sand: 20 %
Liquid Limit: 29



Sample of: Clay, silty, sandy (CL)
From: TH- 12 @ 4 foot depth

Gravel: 0 %
Silt & Clay: 78 %
Plasticity Index:

Sand: 22 %
Liquid Limit:

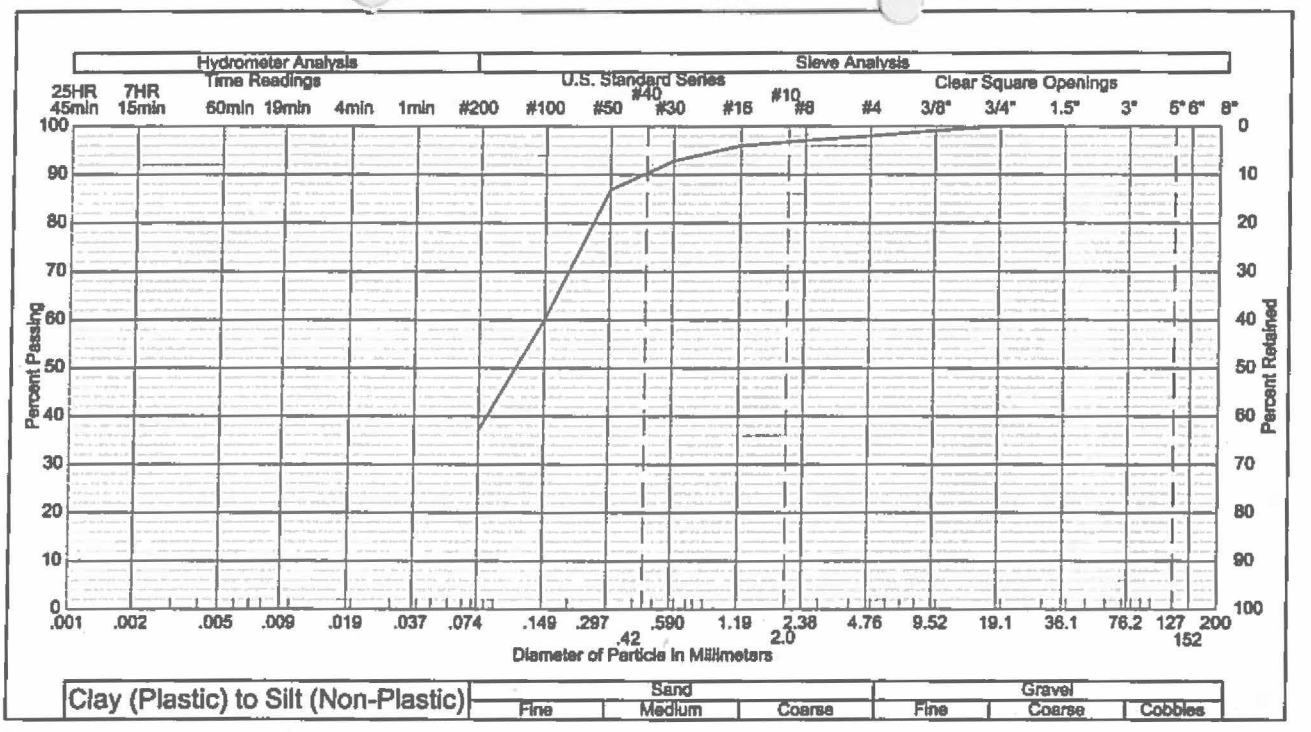
Gradation Test Results

Job No. 1,284

Date: March, 2003

Fig. 15

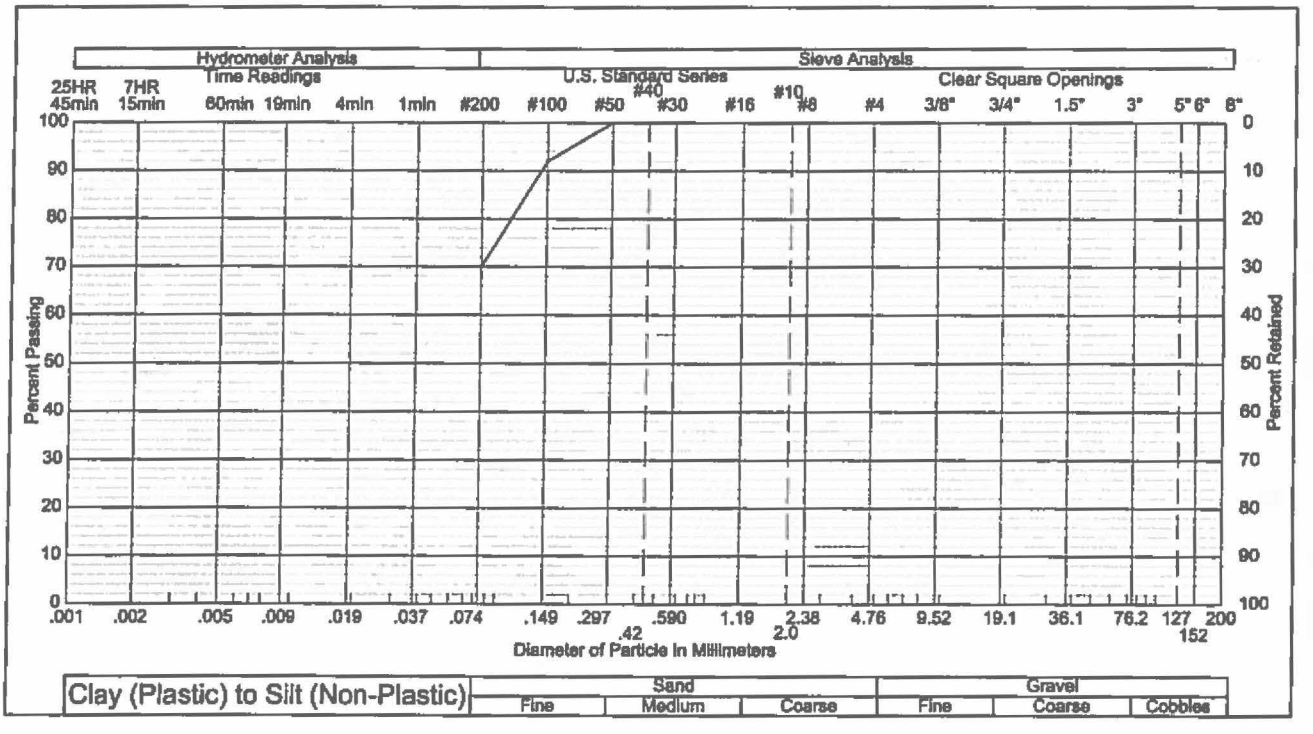
Geotechnical Engineering Group, Inc.



Sample of: Sand, clayey (SC)
From: TH-15 @ 9 foot depth

Gravel: 2 %
Silt & Clay: 37 %
Plasticity Index:

Sand: 61 %
Liquid Limit:



Sample of: Clay, silty, sandy (CL)
From: TH- 19 @ 9 foot depth

Gravel: 0 %
Silt & Clay: 70 %
Plasticity Index:

Sand: 30 %
Liquid Limit:

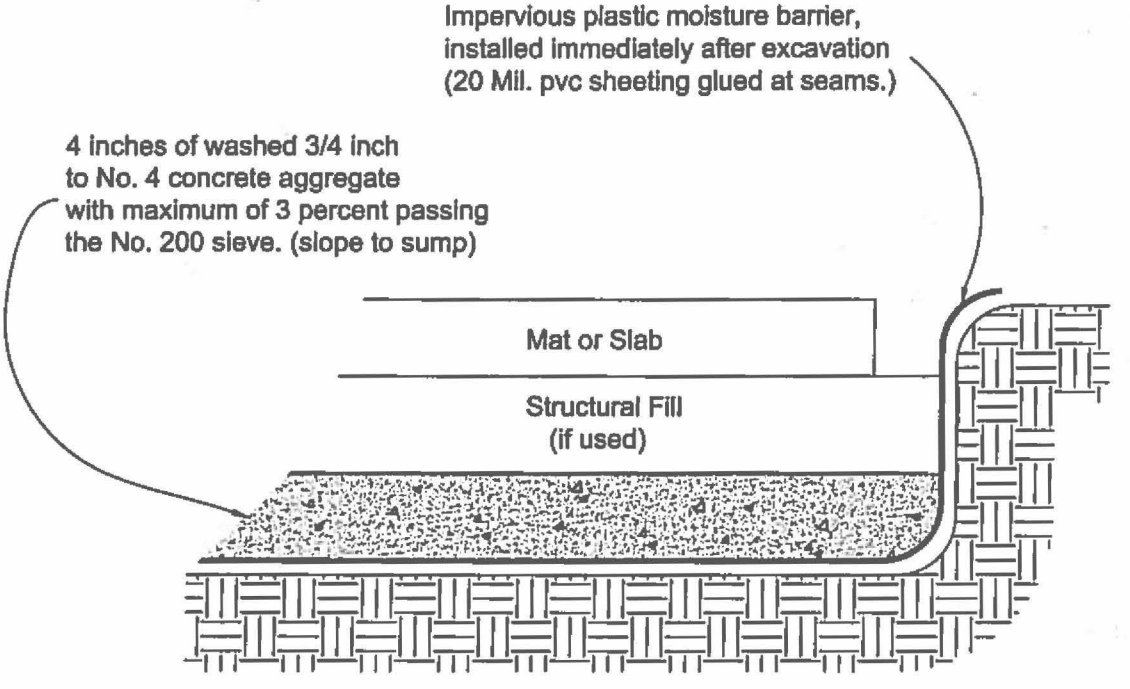
Gradation Test Results

Job No. 1,284

Date: March, 2003

Fig. 16

Geotechnical Engineering Group, Inc.



Job No. 1,284

Recommended Fountain Park Drainage Detail

Fig. 17

JOB NO. 1,284

Geotechnical Engineering Group, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

HOLE	DEPTH (FEET)	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	Atterberg Limits		Swell / Consolidation		PASSING NO. 200 SIEVE (%)	WATER SOLUBLE SULFATES (ppm)	SOIL TYPE
				LIQUID LIMIT (%)	PLASTICITY INDEX (%)	SWELL (%)	CONFINING PRESSURE (PSF)			
TH-1, 3, 4, 5, 6, 8 Bulk Combined	0 – 5	13.2	--	29	11			76		Clay, silty, sandy (CL)
TH-1	2	22.1	99			-0.1	500			Clay, silty, sandy (CL)
TH-2	2	18.7	104	26	8			85		Clay, silty, sandy (CL)
	4	25.3	98			-0.1	1,000			Clay, silty, sandy (CL)
TH-12	4	14.7	103					78		Clay, silty, sandy (CL)
	9	25.2	99	NL*	NP*			85		Clay, silty, sandy (CL)
TH-13	4	6.9	96			-0.6	1,000			Clay, silty, sandy (CL)
TH-14	9	19.5	105			+0.0	1,000			Clay, silty, sandy (CL)
	14	26.1	98	26	5			93		Clay, silty, sandy (CL)
TH-15	2	7.0	98			+0.4	500			Clay, silty, sandy (CL)
	9	4.0	--					37		Sand, clayey
TH-16	4	22.3	--	25	3			86		Clay, silty, sandy (CL)
TH-18	4	18.3	104			+0.0	1,000			Clay, silty, sandy (CL)

* NL – Indicates sample did not exhibit liquid characteristics.

* NP – Indicates sample did not exhibit plastic characteristics.

JOB NO. 1,284

Geotechnical Engineering Group, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

HOLE	DEPTH (FEET)	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	Atterberg Limits		Swell / Consolidation		PASSING NO. 200 SIEVE (%)	WATER SOLUBLE SULFATES (ppm)	SOIL TYPE
				LIQUID LIMIT (%)	PLASTICITY INDEX (%)	SWELL (%)	CONFINING PRESSURE (PSF)			
TH-19	2	19.8	105			+0.1	500			Clay, silty, sandy (CL)
	4	28.2	98	25	7			96		Clay, silty, sandy (CL)
	9	23.3	104					70		Clay, silty, sandy (CL)
TH-20	9	23.2	104	30	14			73		Clay, silty, sandy (CL)
TH-22	4	20.6	101			+0.0	1,000			Clay, silty, sandy (CL)

APPENDIX A

SAMPLE SITE GRADING SPECIFICATIONS

SAMPLE SITE GRADING SPECIFICATIONS

Canyon View Park, Phase 2
Grand Junction, Colorado
Job No. 1,284

1. DESCRIPTION

This item shall consist of the excavation, transportation, placement and compaction of materials from locations indicated on the plans, or staked by the Engineer, as necessary to achieve preliminary street and overlot elevations. These specifications shall also apply to compaction of excess cut materials that may be placed outside of the subdivision and/or filing boundaries.

2. GENERAL

The Soils Engineer shall be the Owner's representative. The Soils Engineer shall approve fill materials, method of placement, moisture contents and percent compaction, and shall give written approval of the completed fill.

3. CLEARING JOB SITE

The Contractor shall remove all trees, brush, and rubbish before excavation or fill placement is begun. The Contractor shall dispose of the cleared material to provide the Owner with a clean, neat appearing job site. Cleared material shall not be placed in areas to receive fill or where the material will support structures of any kind.

4. SCARIFYING AREA TO BE FILLED

All topsoil and vegetable matter shall be removed from the ground surface upon which fill is to be placed. The surface shall then be plowed or scarified until the surface is free from ruts, hummocks or other uneven features, which would prevent uniform compaction by the equipment to be used.

5. COMPACTING AREA TO BE FILLED

After the foundation for the fill has been cleared and scarified, it shall be disked or bladed until it is free from large clods, brought to the proper moisture content (within 2 percent above or below optimum) and compacted to not less than 95 percent of maximum density as determined in accordance with ASTM D 698.

6. FILL MATERIALS

Fill soils shall be free from vegetable matter or other deleterious substances, and shall not contain rocks or lumps having a diameter greater than six (6) inches. Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer.

On-site materials classifying as CL, CH, SC, SM, SW, SP, GP, GC and GM are acceptable. Concrete, asphalt, organic matter and other deleterious materials or debris shall not be used as fill.

7. MOISTURE CONTENT

Fill materials shall be moisture treated to within 0 to 3 percent above optimum moisture content specified for soils classifying as CH. Non-expansive soils classifying as CL, SC, SM, SP, GP, GC and GM shall be moisture treated to within 2 ± percent of optimum moisture content as determined from Proctor compaction tests. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for thee various soils encountered in borrow areas.

The Contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Soils Engineer, it is not possible to obtain uniform moisture content by adding water on the fill surface. The Contractor may be required to rake or disk the fill soils to provide uniform moisture content through the soils.

The application of water to embankment materials shall be made with any type of watering equipment approved by the Soils Engineer, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are washed out.

Should too much water be added to any part of the fill, such that the material is too wet to permit the desired compaction from being obtained, rolling and all work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework wet material in an approved manner to hasten its drying.

8. COMPACTION OF FILL AREAS

Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density. Expansive soils classifying as CL, CH, or SC shall be compacted to at least 95 percent of the maximum dry density as determined in accordance with ASTM D 698 (100 percent for fill deeper than 15 feet below final grade). At the option of the Soils Engineer, soils classifying as SW, SP, GP, GC or GM may be compacted to 90 percent of the maximum density as determined in accordance with

ASTM D 1557 (95 percent for fill deeper than 15 feet below final grade). Fill materials shall be placed such that the thickness of loose material does not exceed 10 inches and the compacted lift thickness does not exceed 6 inches.

Compaction, as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Engineer for soils classifying as CL, CH, or SC. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Soils Engineer. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area. Compaction equipment shall make sufficient trips to insure that the required density is obtained.

9. COMPACTION OF SLOPES

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and there is no appreciable amount of loose soil on the slopes. Compaction of slopes may be done progressively in increments of three to five feet (3' to 5') in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 3:1 (horizontal to vertical).

10. DENSITY TESTS

Field density tests shall be made by the Soils Engineer at locations and depths of his choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate that the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.

11. COMPLETED PRELIMINARY GRADES

All areas, both cut and fill, shall be finished to a level surface and shall meet the following limits of construction:

A. Overlot cut or fill areas shall be within plus or minus 2/10 of one foot.

B. Street grading shall be within plus or minus 1/10 of one foot.

The civil engineer, or duly authorized representative, shall check all cut and fill areas to observe that the work is in accordance with the above limits.

12. SUPERVISION AND CONSTRUCTION STAKING

Observation by the Soils Engineer shall be continuous during the placement of fill and compaction operations so that he can declare that the fill was placed in general conformance with specifications. All inspections necessary to test the placement of fill and observe compaction operations will be at the expense of the Owner. All construction staking will be provided by the Civil Engineer or his duly authorized representative. Initial and final grading staking shall be at the expense of the owner. The replacement of grade stakes through construction shall be at the expense of the contractor.

13. SEASONAL LIMITS

No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed materials are as specified.

14. NOTICE REGARDING START OF GRADING

The contractor shall submit notification to the Soils Engineer and Owner advising them of the start of grading operations at least three (3) days in advance of the starting date. Notification shall also be submitted at least 3 days in advance of any resumption dates when grading operations have been stopped for any reason other than adverse weather conditions.

15. REPORTING OF FIELD DENSITY TESTS

Density tests made by the Soils Engineer, as specified under "Density Tests" above, shall be submitted progressively to the Owner. Dry density, moisture content, of each test taken and percentage compaction shall be reported for each test taken.

16. DECLARATION REGARDING COMPLETED FILL

The Soils Engineer shall provide a written declaration stating that the site was filled with acceptable materials, or was placed in general accordance with the specifications.

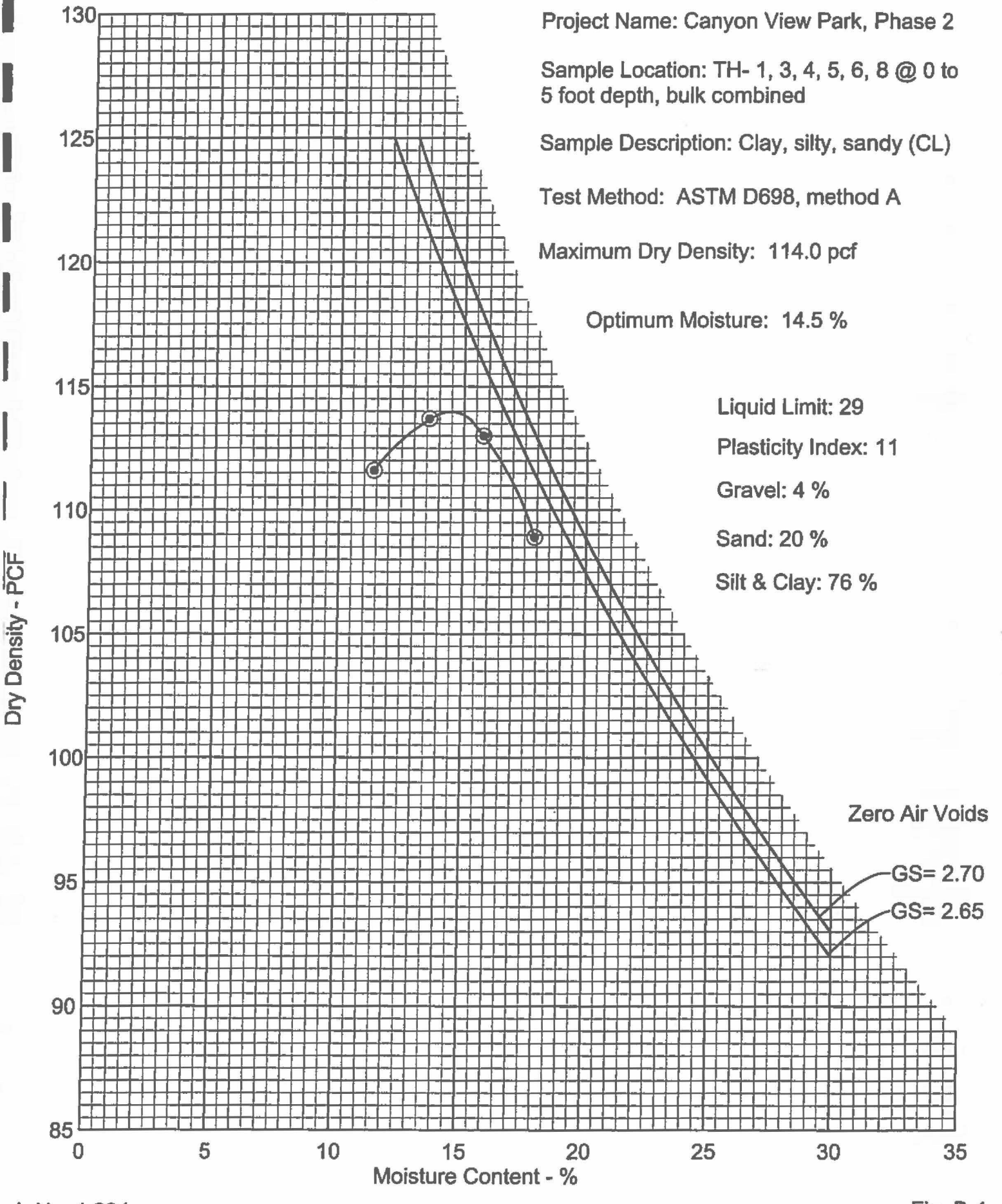
17. DECLARATION REGARDING COMPLETED GRADE ELEVATIONS

A registered Civil Engineer or licensed Land Surveyor shall provide a declaration stating that the site grading has been completed and resulting elevations are in general conformance with the accepted detailed development pan.

APPENDIX B

PAVEMENT DESIGN CALCULATIONS

Geotechnical Engineering Group, Inc.
Moisture- Density Relationship



Project Name: Canyon View Park, Phase 2

Sample Location: TH- 1, 3, 4, 5, 6, 8 @ 0 to 5 foot depth, bulk combined

Sample Description: Clay, silty, sandy (CL)

Test Method: ASTM D698, method A

Maximum Dry Density: 114.0 pcf

Optimum Moisture: 14.5 %

Liquid Limit: 29

Plasticity Index: 11

Gravel: 4 %

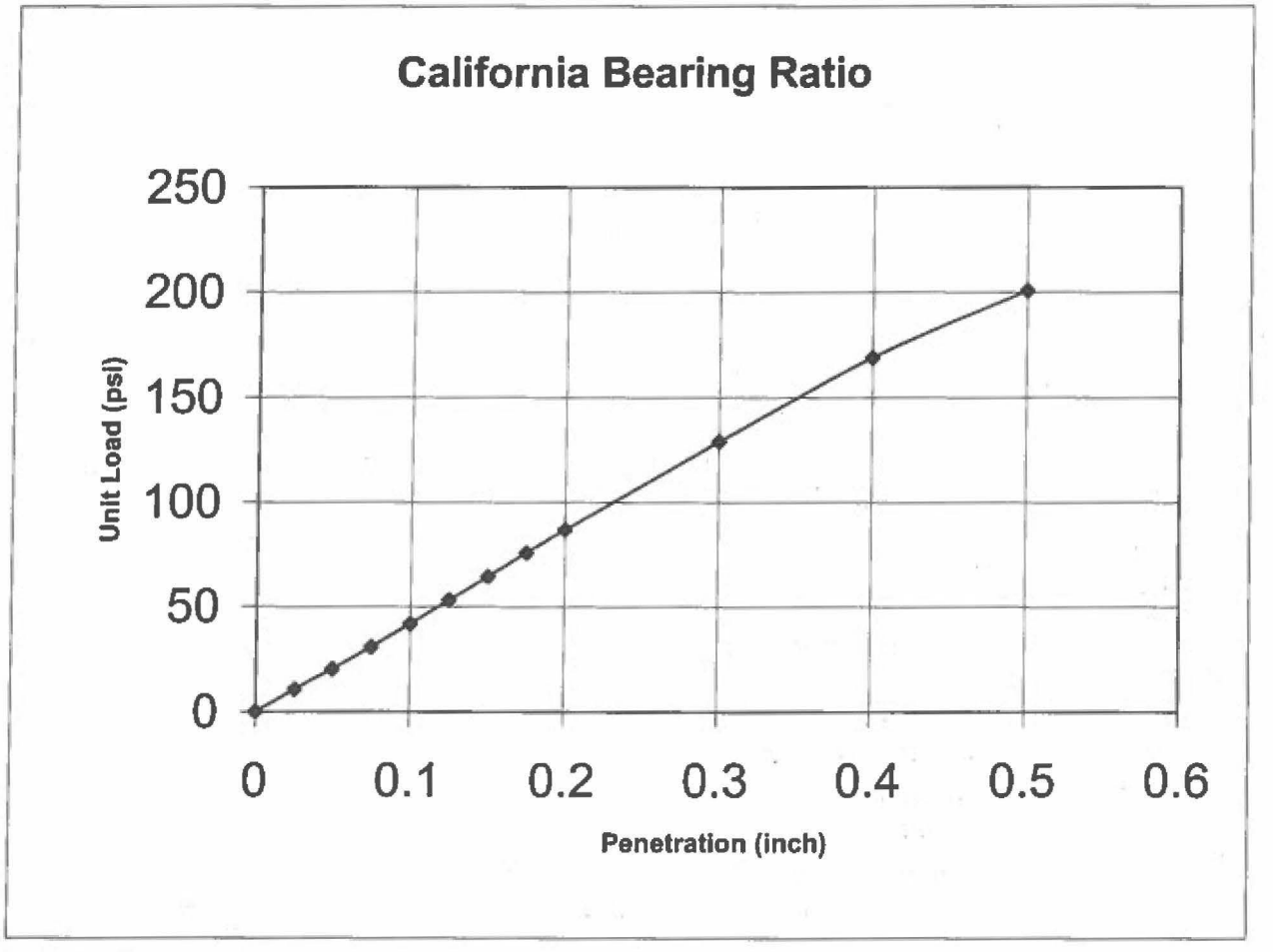
Sand: 20 %

Silt & Clay: 76 %

Job No. 1,284

Fig. B-1

Geotechnical Engineering Group, Inc.



CBR @ 0.1" Penetration	4.2
CBR @ 0.2" Penetration	5.8
Maximum Dry Density (pcf)	114.0
Optimum Moisture Content (%)	14.5
Dry Density (pcf)	115.4
Dry Density (% Maximum)	101.2
Surcharge Weight (lbs)	10.0
Swell (%)	0.9
Before Soaking Moisture Content	14.4
After Soaking Moisture Content:	
Top Inch	16.4
Average	15.0

Job No. 1,284

Fig. B-2

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, 24 1/2 Road Improvements
Location: North and west of G Road and 24 1/2 Road

Flexible Pavement Design/Evaluation

Structural Number	2.74		**Soil Resilient Modulus**	5,686.00	**psi**
Design ESALs	219,000.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	6.85	2.74
Crushed Stone Base	0.12	1.00	0.00	0.00
	0.10	1.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	2.74

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, 24 1/2 Road Improvements
Location: North and west of G Road and 24 1/2 Road

Flexible Pavement Design/Evaluation

Structural Number	2.74		**Soil Resilient Modulus**	5,686.00	**psi**
Design ESALs	219,000.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	3.00	1.20
Crushed Stone Base	0.12	1.00	12.83	1.54
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	2.74

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, 24 1/2 Road Improvements
Location: North and west of G Road and 24 1/2 Road

Flexible Pavement Design/Evaluation

Structural Number	2.74		**Soil Resilient Modulus**	5,686.00	**psi**
Design ESALs	219,000.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	4.00	1.60
Crushed Stone Base	0.12	1.00	9.49	1.14
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	2.74

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:	
Company:	Job No. 1,284
Contractor:	
Project Description:	Canyon View Park, 24 1/2 Road Improvements
Location:	North and west of G Road and 24 1/2 Road

Flexible Pavement Design/Evaluation

Structural Number	2.74		**Soil Resilient Modulus**	5,686.00	**psi**
Design ESALs	219,000.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	5.00	2.00
Crushed Stone Base	0.12	1.00	6.16	0.74
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	2.74

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, 24 1/2 Road Improvements
Location: North and west of G Road and 24 1/2 Road

Flexible Pavement Design/Evaluation

Structural Number	2.74		**Soil Resilient Modulus**	5,686.00	**psi**
Design ESALs	219,000.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.50	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	3.00	1.20
Crushed Stone Base	0.12	1.00	4.00	0.48
Granular Subbase	0.10	1.00	10.59	1.06
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	2.74

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Rigid Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, 24 1/2 Road Improvements
Location: North and west of G Road and 24 1/2 Road

Rigid Pavement Design/Evaluation

PCC Thickness	4.93	inches	**Load Transfer, J**	3.20	
Design ESALs	219,000.00		**Mod. Subgrade Reaction, k**	293	psi/in
Reliability	80.00	percent	**Drainage Coefficient, Cd**	1.00	
Overall Deviation	0.45		**Initial Serviceability**	4.50	
Modulus of Rupture	500	psi	**Terminal Serviceability**	2.50	
Modulus of Elasticity	3,375,000	psi			

Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade	5,429.70	psi
Resilient Modulus of the Subbase	0.00	psi
Subbase Thickness	0.00	inches
Depth to Rigid Foundation	0.00	feet
Loss of Support Value (0,1,2,3)	0.00	

Modulus of Subgrade Reaction	293.00	psi/in

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, Interior Streets and Parking Areas
Location: North and west of G Road and 24 1/2 Road

Flexible Pavement Design/Evaluation

Structural Number	2.17		**Soil Resilient Modulus**	5,686.00	**psi**
Design ESALs	54,750.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.00	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	5.42	2.17
Crushed Stone Base	0.12	1.00	0.00	0.00
	0.10	1.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	2.17

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, Interior Streets and Parking Areas
Location: North and west of G Road and 24 1/2 Road

Flexible Pavement Design/Evaluation

Structural Number	2.17		**Soil Resilient Modulus**	5,686.00	**psi**
Design ESALs	54,750.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.00	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	3.00	1.20
Crushed Stone Base	0.12	1.00	8.06	0.97
	0.10	1.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	2.17

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, Interior Streets and Parking Areas
Location: North and west of G Road and 24 1/2 Road

Flexible Pavement Design/Evaluation

Structural Number	2.17		**Soil Resilient Modulus**	5,686.00	**psi**
Design ESALs	54,750.00		**Initial Serviceability**	4.50	
Reliability	80.00	**percent**	**Terminal Serviceability**	2.00	
Overall Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.40	1.00	4.00	1.60
Crushed Stone Base	0.12	1.00	4.73	0.57
	0.10	1.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
			Σ SN	2.17

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Rigid Design Inputs

Agency:
Company: Job No. 1,284
Contractor:
Project Description: Canyon View Park, Interior Streets and Parking Areas
Location: North and west of G Road and 24 1/2 Road

Rigid Pavement Design/Evaluation

PCC Thickness	4.00	inches	**Load Transfer, J**	3.20	
Design ESALs	54,750.00		**Mod. Subgrade Reaction, k**	270	psi/in
Reliability	80.00	percent	**Drainage Coefficient, Cd**	1.00	
Overall Deviation	0.35		**Initial Serviceability**	4.50	
Modulus of Rupture	500	psi	**Terminal Serviceability**	2.00	
Modulus of Elasticity	3,375,000	psi			

Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade	5,429.70	psi
Resilient Modulus of the Subbase	0.00	psi
Subbase Thickness	0.00	inches
Depth to Rigid Foundation	0.00	feet
Loss of Support Value (0,1,2,3)	0.00	

Modulus of Subgrade Reaction	270.00	psi/in

APPENDIX C

CONSTRUCTION RECOMMENDATIONS FOR FLEXIBLE AND RIGID PAVEMENTS

FLEXIBLE PAVEMENT CONSTRUCTION RECOMMENDATIONS

Experience has shown that construction methods can have a significant effect on the life and serviceability of a pavement system. We recommend the proposed pavement be constructed in the following manner:

1. The subgrade should be stripped of organic matter and deleterious materials, scarified, moisture treated, and compacted. Soils should be moisture treated to within 2 percent of optimum moisture content and compacted to at least 95 percent of maximum standard Proctor dry density (ASTM D 698).

2. After final subgrade elevation has been reached and the subgrade compacted, the area should be proof-rolled with a heavy pneumatic-tired vehicle (i.e., a loaded 10-wheel dump truck). Subgrade that is pumping or deforming excessively should be stabilized.

3. If areas of soft or wet subgrade soils are encountered, the material should be subexcavated and replaced with properly compacted structural backfill. Where extensively soft, yielding subgrade is encountered, we recommend the excavation be inspected by a representative of our office.

4. Aggregate subbase and base course should be laid in thin, loose lifts, moisture treated to within 2 percent of optimum moisture content, and compacted to at least 95 percent of maximum modified Proctor dry density (ASTM D 1557, AASHTO T 180).

6. Asphaltic concrete should be hot plant-mixed material compacted to at least 95 percent of maximum Marshall density. The temperature at laydown time should be at least 235 degrees F. The maximum compacted lift should be 3.0 inches and joints should be staggered.

7. The subgrade preparation and the placement and compaction of all pavement material should be observed and tested. Compaction criteria should be met prior to the placement of the next paving lift. The additional requirements of the Colorado Department of Transportation and City of Grand Junction Specifications should apply.

RIGID PAVEMENT CONSTRUCTION RECOMMENDATIONS

Rigid pavement sections are not as sensitive to subgrade support characteristics as flexible pavement. Due to the strength of the concrete, wheel loads from traffic are distributed over a large area and the resulting subgrade stresses are relatively low. The critical factors affecting the performance of a rigid pavement are the strength and quality of the concrete, and the uniformity of the subgrade. We recommend subgrade preparation and construction of the rigid pavement section be completed in accordance with the following recommendations:

1. Subgrade areas should be stripped of organics and deleterious materials. The pavement subgrade shall be compacted within 2% of optimum moisture content to at least 95% of maximum standard Proctor dry density (ASTM D 698). Moisture treatment and compaction recommendations also apply where additional fill is necessary.

2. The resulting subgrade shall be checked for uniformity and all soft or yielding materials should be replaced prior to paving. Concrete should not be placed on soft, spongy, frozen, or otherwise unsuitable subgrade.

3. The subgrade shall be kept moist prior to paving.

4. Concrete should not be placed in cold weather nor on frozen subgrade.

5. Curing procedures should protect the concrete against moisture loss, rapid temperature change, freezing, and mechanical injury for at least 3 days after placement. Traffic should not be allowed on the pavement for at least one week.

6. A white, liquid membrane curing compound, applied at the rate of 1 gallon per 150 square feet, should be used.

7. Construction joints, including longitudinal joints and transverse joints, should be formed during construction or should be sawed shortly after the concrete has begun to set, but prior to uncontrolled cracking. All joints should be sealed.

8. Construction control and inspection shall be carried out during the subgrade preparation and paving procedures. Concrete shall be carefully monitored for quality control. The additional requirements of the City of Grand Junction and Colorado Department of Transportation Specifications should apply.

9. Deicing salts should not be used for the first year after placement.

THOMPSON - LANGFORD CORPORATION
ENGINEERS AND LAND SURVEYORS

tlc@tlcwest.com
Facsimile (970) 241-2845
Telephone: (970) 243-6067
529 25 1/2 Rd, Grand Junction, CO 81505

May 21, 2003

Laura Lamberty
City of Grand Junction
Department of Public Works
250 North 5th Street
Grand Junction, CO 81501
E-mail laural@ci.grandjct.co.us
Ph. (970) 256-4155
FAX (970) 244-1599

Subject: Canyon View Park - G & 24 Road Drainage

Laura,

I have looked at the improvements that are planned for the northeast corner of the intersection of G and 24 Roads and reviewed the original drainage study done by Western Engineers. This area was included in the original study, but as it historically exists, not as currently proposed.

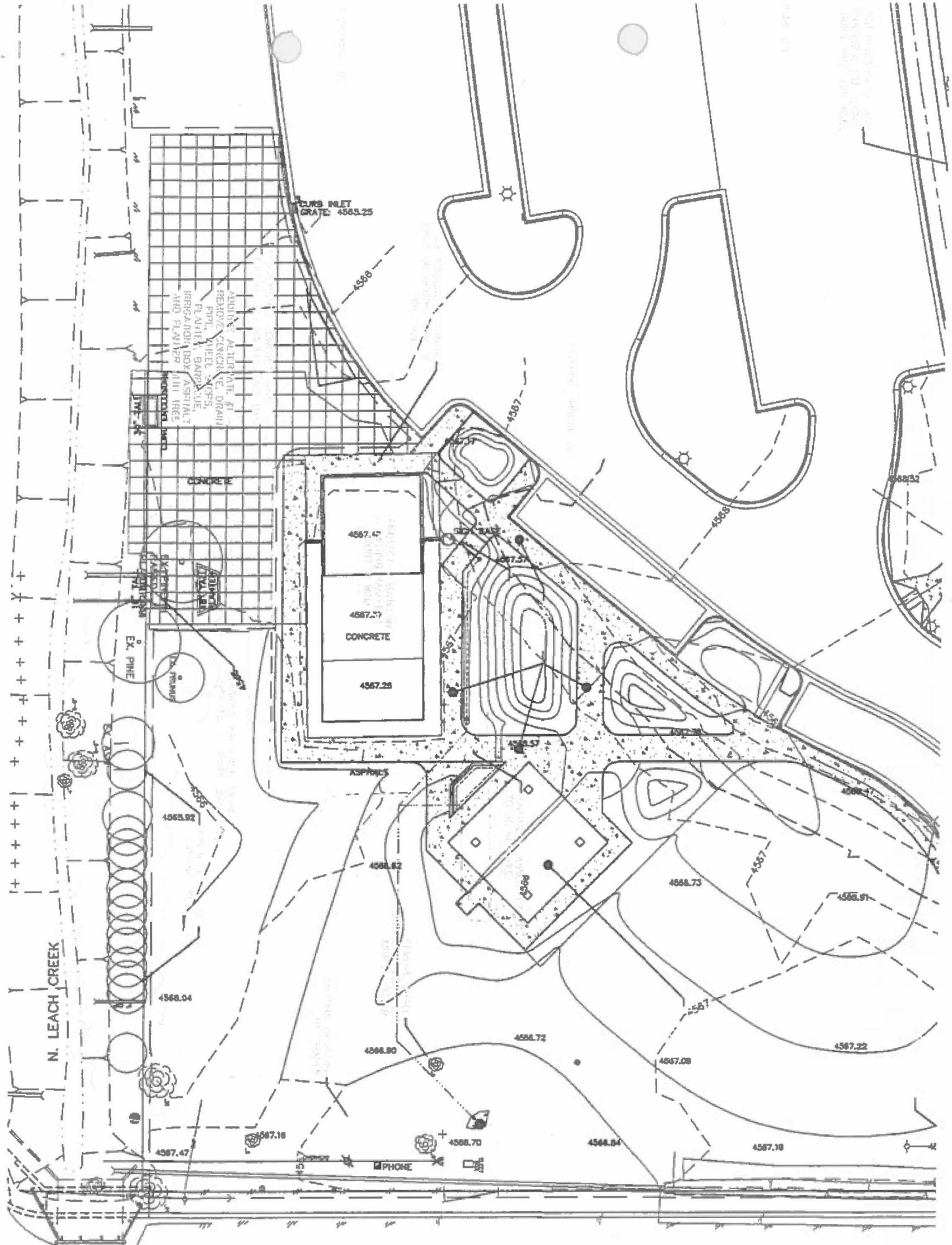
The area once had a house on it which has since been removed. There was an asphalt driveway and parking area along with quite a bit of concrete flatwork north and west of the handball court. The house, parking, driveway and concrete are either gone or being removed as we speak. Most of this area is being landscaped with mounds covered with either shrubs, lawns or native grasses. In addition to decreasing the runoff coefficients with the new ground covers, the flow paths for runoff are being lengthened. All of this tells me that the runoff, if calculated using the Rational Method, where the "C" factors have been decreased and Time of Concentration increased, will be much less than historic.

Given the above, we would hope that you would agree that runoff will be less and that performing runoff calculations is not warranted.

Respectfully,

James E. Langford, PE & LS

JEL/iml



S:\design\0401-002\dwg\TOJM5-7-03.dwg, Model, 5/21/2003 12:20:36 PM, DESKJET 1220C

G ROAD

CANYON VIEW PARK Job No. 0410-002

RIPRAP SIZING (Mitchell Drain Outlet)

(Using UD&FCD procedures, See J-12 & J-13, SWMM)

Q =	36.00	CFS	Design flow
V =	7.35	FPS	Culvert Flow Vel.
TW =	1.20	*Ft	Tailwater depth
D =	3.00	Ft	Pipe diameter
dn =	1.20	*Ft	Channel normal depth
Fn =	1.02		Froude number

*Tailwater depth assumed at 0.4D

Subcritical Flow (dc < dn; Fr < 1.0)
Tailwater depth (TW) known

$D_{50} = 0.023Q/TW^{1.2}D^{0.3}$ = 0.48 Ft.

Subcritical Flow (dc < dn; Fr < 1.0)
Tailwater depth (TW) unknown

$D_{50} = 0.069Q/D^{1.5}$ = 0.48 Ft.

Supercritical Flow (dn < dc; Fr > 1.0)
Tailwater depth (TW) known

$D_{50} = 0.028Q/TW^{1.2}(D+dn)^{0.3}$ = 1.25 Ft.

Supercritical Flow (dn < dc; Fr > 1.0)
Tailwater depth (TW) unknown

USE:

$D_{50} = 0.195Q/(D+dn)^{1.5}$ = 0.82 Ft. <<<<<<<<

**In no case should D_{50} be less than 6-inches

MINIMUM RIPRAP BLANKET DIMENSIONS:

(See detail on construction plans)

$W_b = Q/TW*V_p$ = 4 FT

$W_{Lp} = 2D$ = 6 FT

"Ce" from Figure "J-13"

TW/D = 0.40

$Q/D^{2.5}$ = 2.31

Ce = 5.3

$L_p = C_e(W_{Lp}-D)$ = 16 FT

MITCHELL DRAIN

Manning Pipe Calculator

Given Input Data:	
Shape	Circular
Solving for	Depth of Flow
Diameter	36.0000 in
Flowrate	36.0000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:	
Depth	23.5499 in
Area	7.0686 ft2
Wetted Area	4.8994 ft2
Wetted Perimeter	67.8322 in
Perimeter	113.0973 in
Velocity	7.3478 fps
Hydraulic Radius	10.4010 in
Percent Full	65.4163 %
Full flow Flowrate	47.1629 cfs
Full flow velocity	6.6722 fps

Critical Information

Critical depth	23.6386 in
Critical slope	0.0049 ft/ft
Critical velocity	7.2816 fps
Critical area	4.9439 ft2
Critical perimeter	67.8259 in
Critical hydraulic radius	10.4964 in
Critical top width	36.0000 in
Specific energy	2.7942 ft
Minimum energy	2.9548 ft
Froude number	1.0179
Flow condition	Supercritical

5. **Drop Structures** Rock drop structures and other channel flow energy dissipation and grade control structures shall be designed in accordance with engineering practices. Excellent resources are the UD & FCD and Maricopa County drainage manuals. Figure "I-2" provides guidance on the application of various types of facilities that may aid in selecting a type of drop structure prior to researching design procedures.

6. **Permissible Velocities** To mitigate erosion, flow velocities shall not exceed that allowed for liners per procedures presented in Appendix "J", nor the velocities shown below in Table "I-4".

7. **Channel Liners** There are many types of liners that may be used for channels. Appendix "J" presents design procedures for all types of flexible liners for flows less than 50 cfs, and for larger flows with use of riprap.

TABLE "I-4"
ALLOWABLE CHANNEL FLOW VELOCITIES

Channel Cover*	Maximum Velocity	
	Erosion Resistant Soil	Easily Eroded Soil
a) Bare soil	4	2.5
b) Buffalo Grass, Bluegrass, Smooth Brome, Blue Grama Native Grass Mix	7	5
c) Lespedeza, Lovegrass, Kudzu, Alfalfa, Crabgrass	4.5	3
*Assuming a good stand of grass		
Source: UD & FCD		

C. **DESIGN AIDS** An assortment of nomographs, graphs, and chart are provided which may assist in the hydraulic design of open channels. These comprise Figure "I-3" through Figure "I-9". Worksheets for channel design are provided in Appendix "J" — Flexible Lining Erosion Protection". Table "I-5" provides a matrix of design charts that can be used in channel design. They do not account for transitions, however. These must be addressed separately.

Canyon View Park East and 24 and G Corner
Major Site Plan Review
General Project Report

Project Overview

The City Council and City Parks Department approved a Master Plan for 120 acres in 1995. In 1997 the 'core' of the park (approximately 65 acres along 24 Road) was constructed, including four softball fields, five multi-purpose fields, four acres of ponds, and associated restrooms, shelters, court games, tot lots, and parking. In 1998 a baseball field and associated parking were constructed on a portion of the 40 acre parcel to the east of the 'core' park, and in 1999 three additional multi-purpose fields and the associated parking were constructed on the approximate 15 acres to the south of the 'core' park. Neither of these expansions included the landscaping and lighting of their associated parking lots.

This submittal includes the landscaping and lighting of the above noted parking lots, as well as the initial phased development of the remaining vacant real estate that the original 120 acre Master Plan addressed. One vacant area surrounds the existing handball court at the corner of 24 and G Roads. The master plan for this corner includes a restroom, two shelters, two new handball courts, walkways, lawn, and shrub beds. The initial construction phase for this corner includes one shelter, walkways, a drinking fountain, earthwork, lawn, shrub beds, and irrigation. The bid package for the 24 and G Road Corner area also includes the landscaping and lighting of the parking area that was constructed for the additional multi-purpose fields. The second vacant area, east of Corcoran Wash and south of the baseball field, is master planned for four multi-purpose fields, 12 tennis courts, a splash park, restrooms, tot lots, trails, landscape, associated parking, and includes piping 500 LF of Corcoran Wash. The initial construction phase includes three or four multi-purpose fields, two to six tennis courts, trails, a drinking fountain, earthwork, lawn, shrub beds, irrigation, associated parking and lighting, improvements to 24 ½ Road, and the piping of 500 LF of Corcoran Wash. The bid package for the Canyon View East area also includes the landscaping and lighting of the parking area that was constructed for the baseball field.

A. Project Description

Location

- Canyon View Park is bounded on the west by 24 Road, on the north by I-70, on the east by 24 ½ Road, and on the south by G Road. This boundary is generally a ¼ Section of land (160 acres), but the park does not include the southeast 40 acres, which is Spanish Trail Subdivision. As noted above, the two areas slated for construction include approximately five acres at the corner of 24 and G Road, and approximately 35 acres west of 24 ½ Road, north of Spanish Trail, east of Corcoran Wash, and south of I-70.

Acreage

- The acreages noted above are approximate. Exact acreages are difficult to provide as for each project includes the final landscaping of an existing parking lot, and each project has Bid Alternates in their bid package.

Proposed Use

- Expansion to an existing Regional Park.

B. Public Benefit

Canyon View Park, being a Regional Park for the City, has obvious public Benefits. Not so obvious public benefits include:

- the improvement of 24 ½ Road;
- a better alignment of a third park access from 24 ½ Road;
- utility improvements that accommodate full build out of the project;
- interim irrigated native grass areas on all disturbed areas (dust control);
- slope improvements to an existing steep sided Corcoran Wash.

C. Project Compliance, Compatibility, and Impact

Adopted Plans and Policies

The Canyon View Park Master Plan was adopted in 1996. The approximate 80 acre area of the park that borders 24

and G Road provided the required drainage reports, traffic studies, and wetland permits. Subsequent park expansions and refinements have been made, or are about to be made, which are included with this submittal. Specific to the 40 acre Canyon View East area, new drainage, stormwater management, and geotechnical studies are provided.

The proposed piping of 500 LF of Corcoran Wash has required working with the COE in pursuing a 404 Conditional Permit. As of 4/4/03 indications were that this permit would be secured, and that a corresponding 401 certification from the State Health Department would be available around mid-May.

need copy prior to plan clearance

Surrounding Land Use
The land surrounding Canyon View Park is gradually converting from an agricultural use. To the east is Vineyards Church; to the south east in Spanish Trail subdivision; to the south and west is vacant land; to the north is I-70 with limited residential development north of the highway.

Site Access & Traffic
An existing access on 24 ½ Road is being relocated to a safer position and in alignment with a Vineyard Church entry. Respecting the theme of the original master plan, at build out this park will have a fully improved road around its east, north, and west perimeter … with no internal roads (only limited parking). This improved access will aid in collecting and dispersing park traffic that has been limited to the existing improved entries on 24 and G Roads.

The need for a traffic study for the Canyon View East area will be determined, and if needed, provided by City Staff (per previous discussions with the Traffic Engineering Department).

Availability of Utilities
All necessary utilities are available in either 24 ½ Road, or as utility stubs that were provided in previous development. Ute provides the water. Grand Valley Rural Electric provides new and future power to areas east of Corcoran Wash; Xcel provides power to current and future development west of Corcoran Wash and Spanish Trail; the City of Grand Junction provides sewer; Grand Junction Drainage District has facilities on the property.

Effects On Public Facilities
Canyon View Regional Park is the result of a public need. It reduces impacts on other park lands; it has no impact on schools; it has far less impact on police and fire than residential development.

To date, parking provided on-site has displayed that +/- 50 spaces per multi-use and ballfield has been adequate to accommodate major park events. Additional parking has also been provided for sport court, picnic, playground, and passive park uses. At build out, Canyon View East is master planned for 425 designated parking spaces; additional parallel parking will occur along the perimeter road. To accommodate the existing baseball field and the initial phase construction of 3½ multi-purpose fields and 2 to 6 tennis courts, the Canyon View East area of the park will have 252 parking spaces (134 existing and 118 new). Based on the proven use of the Canyon View Park parking, proposed parking should be adequate.

Drainage from Canyon View East is primarily into the Mitchell Drain, a GJDD drainage facility that is being buried. Detention is provided for parking lot drainage.

Site Soils
A geologic report is included.

D. Development Schedule and Phasing

The initial Phase for the Corner of 24 and G Road is scheduled for construction in May of 2003. It will likely be constructed in three phases (future restroom; future handball courts).

The initial Phase for Canyon View Park East is scheduled for construction in June of 2003. It will likely be constructed in three or four phases (future splash park; future tennis).

BURKE ASSOCIATES, INC.
Mechanical and Electrical Engineers
2518 MONUMENT ROAD
GRAND JUNCTION, CO 81503
(970) 243-9090
FAX (970) 242-8543
WATS (800) 226-8163

June 2, 2003

Attn: Ted Ciavonne
Ciavonne & Associates, Inc.
844 Grand Ave.
Grand Junction, CO 81501
Fax: 970-241-0765

Re: Canyon View Park East - Response to City Review
BA job #02-083

Dear Ted:

The lighting in question is a GE #DCF-250-IIPS-MVOLT-H-1-F-**FWT**-DB-1. This fixture meets the full cutoff as defined and required by the city. I have included a copy of the city's full cutoff light fixture description.

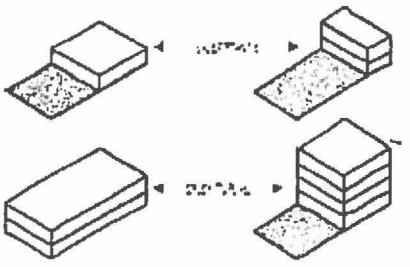
Please contact me if you have any questions.

Sincerely,

BURKE ASSOCIATES, INC.
A. Joel Martinez, EIT

cc: Paul Kuhn

Exhibit 9.6



FLOOR AREA RATIO (FAR)

The ratio of the gross floor area of a structure to the gross area of the parcel on which it is located. (see Exhibit 9.6)

FRONTAGE

The frontage of a parcel of land is that distance where a property line is common with a road right-of-way line.

FRONT LOT LINE

The property line dividing a lot from a road right-of-way.

FULL CUTOFF LIGHT FIXTURE:

A light fixture in which no more than 2.5 percent (two and one-half) of its total output is emitted above 90 degrees from the vertical pole or building wall on which it is mounted.

GARAGE, PUBLIC

A structure, or portion thereof, other than a private customer and employee garage or private residential garage, used primarily for the parking and storage of vehicles and available to the general public.

GASOLINE SERVICE STATION

Buildings and/or surfaced area where motor vehicles may be refueled and/or serviced.

GEOLOGIC HAZARD AREA

An area identified by a qualified State or Federal government agency as containing or being directly affected by a geologic hazard.

GFA

See "Gross Floor Area."

GRADE

The lowest point of elevation of the finished surface of the ground, paving or sidewalk within the area between the building and the property line or, when the property line is more than five feet from the building, the point between the building and a line five feet from the building.

GRADE, FINISHED

The level of the soil after completion of site development.

DEPARTMENT OF THE ARMY PERMIT

Permittee: Mr. Shawn Cooper
City of Grand Junction
1340 Gunnison Avenue
Grand Junction, Colorado 81501

Permit Number: 200375080

Issuing Office: U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 "J" Street
Sacramento, California 95814-2922

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: Construction of four multipurpose playing fields, enlargement of a maintenance building and storage area, and addition of maintenance access roads and pedestrian trails in the vicinity of Corcoran Wash, in conjunction with piping of 500 feet of Corcoran Wash, and 600 feet of stream improvement work as mitigation for the piping.

All work is to be completed in accordance with the attached plan(s).

Project Location: Canyonview Park, along Corcoran Wash within the Southwest 1/4 of Section 33, Township 1 North, Range 1 West, Mesa County, Colorado.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on April 5, 2008. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The applicant shall provide for and implement best management practices including permanent and temporary erosion and sediment control measures. All such measures shall ensure economical, effective, and continuous control throughout the construction period and during the operation of the project.

2. The applicant shall not stage or refuel construction equipment in wetland areas, or perform refueling in a manner that would allow spillage to enter waters of the United States.

3. This project has not been issued Section 401 Water Quality Certification by the Colorado Department of Public Health and Environment. Therefore, this permit is "provisional" and is subject to and must comply with all conditions which may be identified in the State 401 Water Quality Certification.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant.

Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

5-13-03

(PERMITTEE) (DATE)

(PERMITTEE) (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Issued for and in behalf of Colonel Michael J. Conrad, Jr., District Engineer

5-16-03

Ken Jacobson, Chief, Colorado/Gunnison Basin Regulatory Office (DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) (DATE)

STATE OF COLORADO

Bill Owens, Governor
Douglas H. Benevento, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

Laboratory Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

http://www.cdphe.state.co.us

Colorado Department
of Public Health
and Environment

May 6, 2003

City of Grand Junction
Attn: Shawn Cooper
1340 Gunnison Avenue
Grand Junction, Colorado 81591

Re: Section 401 Water Quality Certification
Permit No. COE 200375080
Colorado Certification No.3046

Dear Mr. Cooper:

The Water Quality Control Division has reviewed the federal license or permit application, public notice, or other information submitted related to certification for the activity described below. Provided the plans of operation included in the submitted information are followed and the attached General Conditions (where applicable) are complied with, the Division is reasonably assured that Sections 301, 302, 303, 306 and 307 of the Clean Water Act and applicable sections of the Colorado Water Quality Control Act will not be violated by this activity.

Description: Culvert and bank stabilization of wash through park near city.

Location: Section 33, Township 1 North, Range 1 West in Mesa County, Colorado.

Watercourse: Corcoran Wash, Lower Colorado River Basin, Segment COLCLC13b, Lower Colorado River Sub-basin.

This certification does not constitute a relinquishment of the Water Quality Control Division's authority as delineated in the "Colorado Water Quality Control Act," or any subsequent alterations thereto, nor does it fulfill or waive any other local, state or federal regulations.

Sincerely,

Andrew Ross

Andrew Ross
Water Quality Assessor
WATER QUALITY CONTROL DIVISION

Attachment

cc: U. S. Army Corps of Engineers, Western Colorado Regulatory Office
U. S. Army Corps of Engineers, Sacramento District Office
Applicant's Agent, Mr. James Armstrong, Rare Earth Science, LLC
District Engineer, Mr. Dwain Watson, Water Quality Control Division, w/o attachment
File

COMMUNITY DEVELOPMENT FILE # SPR-2003-0[illegible]

BOOK3385 PAGE666
2127336 06/12/03 0340PM
JANICE WARD CLK&REC MESA COUNTY CO
RECFEE $10.00 SURCHG $1.00

BE IT KNOWN THAT: 2 PAGE DOCUMENT

The City of Grand Junction, as owner(s) of the real property described herein, all situated in the City of Grand Junction, Mesa County, Colorado, and more particularly known and described as 2402 G Road do hereby acknowledge and agree that this instrument shall represent our understanding that as a condition of City approval of the attached site plan, that 2402 G Rd & 730 24 Road are and shall be treated as one parcel for the principal use of a public park and to satisfy setback requirements for any and all structures constructed thereon.

If and when we or our successors in interest build, own or acquire any structure, which has been placed or built on or over the property line between 2402 G Rd & 730 24 Rd or on or over any portion of said line, or so close thereto that the structure does not meet applicable setbacks and/or bulk requirements then sufficient area from one and/or both lots shall be used to meet any and all required setbacks and bulk requirements as required by the Zoning and Development Code of the City of Grand Junction.

2701-333-00-940 & 2701-333-00-948

We further understand and agree that 2402 G Rd & 730 24 Rd constitute two parcels but by placement of a use on or sufficiently near the property line that the adjoining and contiguous parcel shall be encumbered by and shall serve as, the necessary area for setback and bulk requirement purposes and either or both lots may be rendered undevelopable for additional uses.

This instrument shall be recorded in the land records of Mesa County and shall be deemed to be a covenant which runs with the land for such time as any or all structure(s) constructed on 2402 G Road or 730 24 Road is (are) on or over the lot line, or is (are) so close thereto as to not meet applicable setback and bulk requirements for each lot.

This covenant shall be binding upon any and all successors in interest to the above described property and shall not cease except for and in accordance with cause stated herein.

Any agreement, representation or waiver is made knowingly and voluntarily with full understanding and complete knowledge of the consequences thereof.

IN WITNESS WHEREOF, I (WE), have signed, executed and acknowledged this instrument on this 10th day of June 2003.

Director of Parks & Recreation

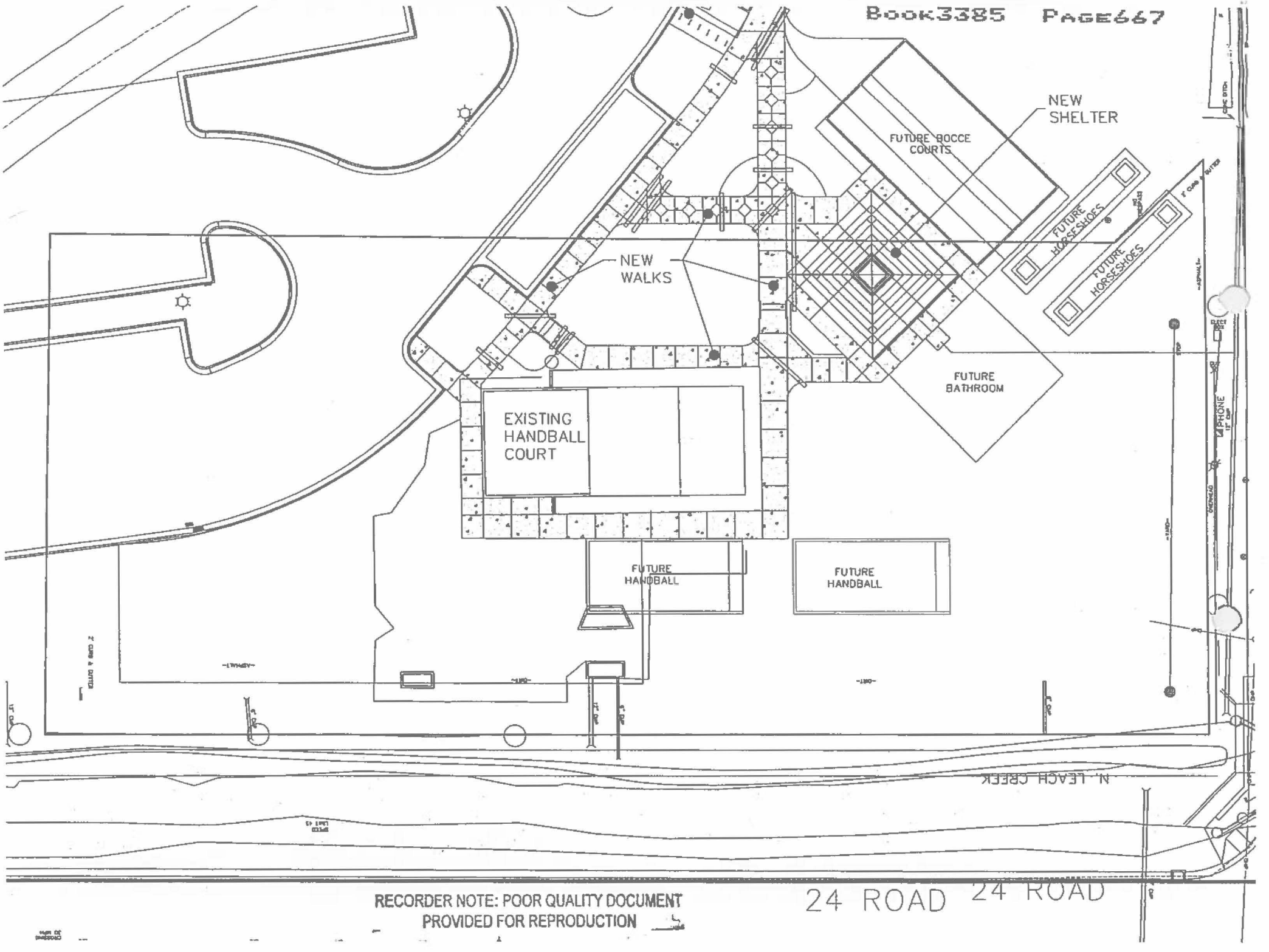
STATE OF COLORADO
COUNTY OF MESA

The foregoing agreement was subscribed and sworn to before me this 11th day of June 2003.

Gayleen Henderson
Notary Public

My commission expires 10/29/2005

GAYLEEN HENDERSON NOTARY PUBLIC STATE OF COLORADO



CHRISTOPHER TOMLINSON/The Daily Sentinel

s his luck at Mesa Lake on Grand Mesa on Tuesday. Daytime highs in the pite from the near 100-degree heat of the Grand Valley.

Springs Utilities and the city of Aurora signed more than five years ago as part of the Eagle River Assembly memorandum of understanding.

In the agreement, Colorado Springs and Aurora agreed to limit their water project development on the Eagle River to 30,000 acre-feet — less than half of their rights. The Western Slope would receive 10,000 acre-feet of the development.

Aurora and Colorado Springs formed with locals in 1998.

"Wi veryone in this cooperative mood ... the possibility of getting some physical, wet water is better than this pie-in-the-sky development of every conditional water right," said Peter Roessmann, spokesman with the Colorado River Water Conservation District.

See **DEAL**, page 5A ➤

g focuses on Patriot Act resolution

EGAN FROMM
Daily Sentinel

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resolution is presented to City Council members Thursday.

Brenda St. John, with the seminar's host, the Civil Involvement Project, said she hoped bringing speakers like Niederkruger to Grand Junction would make residents aware of ways to be involved in local government.

While she is still unsure about her own stance on the Patriot Act, St. John said she wants to learn more about it.

"It's been a scary situation since Sept. 11," she said. "The Patriot Act was when I saw, like,

See **PATRIOT**, page 5A ➤

Pentagon developing an all-seeing project

By THE ASSOCIATED PRESS

WASHINGTON — The Pentagon is developing an urban surveillance system that would use computers and thousands of cameras to track, record and analyze the movement of every vehicle in a foreign city.

Dubbed "Combat Zones That See," the project is designed to help the U.S. military protect troops and fight in cities overseas.

Police, scientists and privacy experts say the unclassified technology could easily be adapted to spy on Americans.

The project's centerpiece is groundbreaking computer software that is capable of automatically identifying vehicles by size, color, shape and license tag, or drivers and passengers by face.

According to interviews and contracting documents, the software may also provide instant alerts after detecting a vehicle with a license plate on a watchlist, or search months of records to locate and compare vehicles spotted near terrorist activities.

The project is being overseen by the Defense Advanced Research Projects Agency, which is helping the Pentagon develop new technologies for combatting terrorism and fighting wars in the 21st century.

Its other projects include developing software that scans databases of everyday transactions

See **PROJECT**, page 5A ➤

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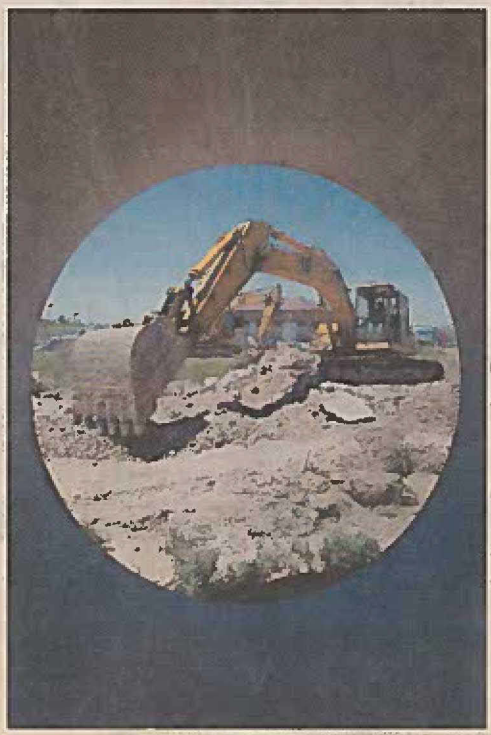

GRETEL DAUGHERTY/The Daily Sentinel

Viewed through a 72-inch concrete drainage pipe, Bill Ogle of Sorter Construction Inc. reroutes the Corcoran Wash drainage ditch with a track hoe as crews begin work on the new East Canyon View Park. Among the facilities that will be added to the park are an all-purpose practice field, six tennis courts and additional parking.

Avalon may begin showing more films

By MARIJA B. VADER
The Daily Sentinel

Katharine Hepburn and Spencer Tracy may soon be appearing at a movie theater near you.

Classic movies, foreign films and independent films will begin showing regularly at the Avalon Theater if city leaders and volunteers with Cinema at the Avalon reach agreement.

A nonprofit group, Cinema at the Avalon currently shows an independent film one weekend a month, said Diana Woods, executive director of the group. Recent showings include "Frida" and "Bowling for Columbine."

But with the city's approval, projectors could be whirring 330 days a year, up from the current 23.

Plans call for a mid-September start date.

Parks and Recreation Director Joe Stevens and Downtown Development Authority Director Harold Stalf presented the Cinema at the Avalon's proposal Monday in a Grand Junction City Council work session.

If ticket sales proceed as the city and the Cinema at the Avalon hope, the city's subsidy will come to $12,247. If not, the city's subsidy may grow

See **FILMS**, page 5A

Planning $ RW/SPR	Drainage
TCP $ —	School Impact $ —

BLDG PERMIT NO.	89790
FILE #	SPR-2003-062

PLANNING CLEARANCE

(site plan review, multi-family development, non-residential development)

Grand Junction Community Development Department

☞ THIS SECTION TO BE COMPLETED BY APPLICANT ☜

BUILDING ADDRESS (2402 G Road) 730 24 RD

TAX SCHEDULE NO. 2701-333-00-948 2701-333-00-94D

SUBDIVISION —

SQ. FT. OF PROPOSED BLDG(S)/ADDITION 900#

FILING — BLK — LOT —

SQ. FT OF EXISTING BLDG(S) 0

OWNER CITY of GRAND JCT

NO. OF DWELLING UNITS: BEFORE CONSTRUCTION 0 AFTER 1

ADDRESS 250 N 5TH ST

NO. OF BLDGS ON PARCEL: BEFORE CONSTRUCTION 0 AFTER 1

TELEPHONE 201-1177 (Shawn Cooper)

USE OF ALL EXISTING BLDGS NA

APPLICANT WD CHRISTENSEN WD Yards

DESCRIPTION OF WORK & INTENDED USE: OPEN A.B. PICNIC SHELTER

ADDRESS 577 N WESTGATE DR GJ CO 81505

TELEPHONE 243 1229

✓ ***Submittal requirements are outlined in the SSID (Submittal Standards for Improvements and Development) document.***

☞ THIS SECTION TO BE COMPLETED BY COMMUNITY DEVELOPMENT DEPARTMENT STAFF ☜

ZONE CSR

LANDSCAPING/SCREENING REQUIRED: YES X NO —

SETBACKS: FRONT: 25 from Property Line (PL) or — from center of ROW, whichever is greater

PARKING REQUIREMENT: NA

SIDE: 5 from PL REAR: 10 from PL

SPECIAL CONDITIONS: —

MAXIMUM HEIGHT 6

MAXIMUM COVERAGE OF LOT BY STRUCTURES NA

CENSUS TRACT — TRAFFIC ZONE — ANNX —

Modifications to this Planning Clearance must be approved, in writing, by the Community Development Department Director. The structure authorized by this application cannot be occupied until a final inspection has been completed and a Certificate of Occupancy has been issued by the Building Department (Section 307, Uniform Building Code). Required improvements in the public right-of-way must be guaranteed prior to issuance of a Planning Clearance. All other required site improvements must be completed or guaranteed prior to issuance of a Certificate of Occupancy. Any landscaping required by this permit shall be maintained in an acceptable and healthy condition. The replacement of any vegetation materials that die or are in an unhealthy condition is required by the Grand Junction Zoning and Development Code.

Four (4) sets of final construction drawings must be submitted and stamped by City Engineering prior to issuing the Planning Clearance. One stamped set must be available on the job site at all times.

I hereby acknowledge that I have read this application and the information is correct; I agree to comply with any and all codes, ordinances, laws, regulations, or restrictions which apply to the project. I understand that failure to comply shall result in legal action, which may include but not necessarily be limited to non-use of the building(s).

Applicant's Signature — Date 6/5/03

Department Approval — Date 6/5/03

Additional water and/or sewer tap fee(s) are required:	YES	NO	W/O No. NO drywell
Utility Accounting			Date 6/5/03

VALID FOR SIX MONTHS FROM DATE OF ISSUANCE (Section 2.2.C.1 Grand Junction Zoning and Development Code)

(White: Planning) (Yellow: Customer) (Pink: Building Department) (Goldenrod: Utility Accounting)

EXISTING ACCESS ROAD

PARK SIC

FUTURE SHELTER

ACCEPTED LEA 6/5/03
ANY CHANGE OF SETBACKS MUST BE APPROVED BY THE CITY PLANNING DEPT. IT IS THE APPLICANT'S RESPONSIBILITY TO PROPERLY LOCATE AND IDENTIFY EASEMENTS AND PROPERTY LINES.

FUTURE BOCCE COURTS

FUTURE HORSESHOES

FUTURE HORSESHOES

NEW WALKS

FUTURE BATHROOM

EXISTING HANDBALL COURT

EXISTING STORM DRAIN

NEW SHELTER

FUTURE HANDBALL

FUTURE HANDBALL

Planning $ 0	Drainage	BLDG PERMIT NO.
TCP $	School Impact $	FILE # SPR-2003-002

PLANNING CLEARANCE

(site plan review, multi-family development, non-residential development)

Grand Junction Community Development Department

727 24 1/2 — THIS SECTION TO BE COMPLETED BY APPLICANT

BUILDING ADDRESS SW Corner 24½ & I-70

TAX SCHEDULE NO. 2701-333-00-941

SUBDIVISION —

SQ. FT. OF PROPOSED BLDG(S)/ADDITION —

FILING — BLK — LOT —

SQ. FT OF EXISTING BLDG(S) 1,100 GTL = restroom/storage

NO. OF DWELLING UNITS: BEFORE 0 AFTER 0

CONSTRUCTION

NO. OF BLDGS ON PARCEL: BEFORE 1 AFTER 1

CONSTRUCTION

OWNER City of Grand Junction

ADDRESS 250 N. 5th

TELEPHONE

USE OF ALL EXISTING BLDGS N/A

APPLICANT City Parks + Rec - Shawn Cooper

DESCRIPTION OF WORK & INTENDED USE:

ADDRESS 1340 Gunnison Ave

City Park

TELEPHONE 254-3869

✓ ***Submittal requirements are outlined in the SSID (Submittal Standards for Improvements and Development) document.***

THIS SECTION TO BE COMPLETED BY COMMUNITY DEVELOPMENT DEPARTMENT STAFF

ZONE CSR

LANDSCAPING/SCREENING REQUIRED: YES ____ NO ____

SETBACKS: FRONT: _____ from Property Line (PL) or _____ from center of ROW, whichever is greater

SIDE: _____ from PL REAR: _____ from PL

PARKING REQUIREMENT:

SPECIAL CONDITIONS:

MAXIMUM HEIGHT

MAXIMUM COVERAGE OF LOT BY STRUCTURES

CENSUS TRACT ____ TRAFFIC ZONE ____ ANNX ____

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Four (4) sets of final construction drawings must be submitted and stamped by City Engineering prior to issuing the Planning Clearance. One stamped set must be available on the job site at all times.

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Applicant's Signature Shawn Cooper Date 3/25/03

Department Approval Kristen Dragoo Date 7/29/03

Additional water and/or sewer tap fee(s) are required:	YES	NO ✓	W/O No.
Utility Accounting Debbie Kovalik			Date 7-29-03

VALID FOR SIX MONTHS FROM DATE OF ISSUANCE (Section 2.2.C.1 Grand Junction Zoning and Development Code)

(White: Planning) (Yellow: Customer) (Pink: Building Department) (Goldenrod: Utility Accounting)

Planning $ RW/SPR	Drainage
TCP $	School Impact $

BLDG PERMIT NO.	89790
FILE #	SPR-2003-062

PLANNING CLEARANCE

(site plan review, multi-family development, non-residential development)

Grand Junction Community Development Department

☞ THIS SECTION TO BE COMPLETED BY APPLICANT ☜

(2402 G Road)

BUILDING ADDRESS 730 24 RD

TAX SCHEDULE NO. 2701-333-00-948 2701-333-00-94D

SUBDIVISION

SQ. FT. OF PROPOSED BLDG(S)/ADDITION 900#

FILING BLK LOT

SQ. FT OF EXISTING BLDG(S) 0

NO. OF DWELLING UNITS: BEFORE CONSTRUCTION 0 AFTER 1

NO. OF BLDGS ON PARCEL: BEFORE CONSTRUCTION 0 AFTER 1

OWNER CITY of GRAND JCT

ADDRESS 250 N 5TH ST

TELEPHONE 201-1177 (Shawn Cooper)

USE OF ALL EXISTING BLDGS NA

APPLICANT WD CHRISTENSEN WOODWORKS

DESCRIPTION OF WORK & INTENDED USE: OPEN AIR PICNIC SHELTER

ADDRESS 577 N WESTGATE DR GJ CO 81505

TELEPHONE 243 1229

✓ ***Submittal requirements are outlined in the SSID (Submittal Standards for Improvements and Development) document.***

☞ THIS SECTION TO BE COMPLETED BY COMMUNITY DEVELOPMENT DEPARTMENT STAFF ☜

ZONE CSR

LANDSCAPING/SCREENING REQUIRED: YES X NO

SETBACKS: FRONT: 25 from Property Line (PL) or from center of ROW, whichever is greater

SIDE: 5 from PL REAR: 10 from PL

PARKING REQUIREMENT: NA

SPECIAL CONDITIONS:

MAXIMUM HEIGHT 6

MAXIMUM COVERAGE OF LOT BY STRUCTURES NA

CENSUS TRACT TRAFFIC ZONE ANNX

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Applicant's Signature Date 6/5/03

Department Approval Date 6/5/03

Additional water and/or sewer tap fee(s) are required:	YES	NO	W/O No.
Utility Accounting			Date 6/5/03

No dig in area

VALID FOR SIX MONTHS FROM DATE OF ISSUANCE (Section 2.2.C.1 Grand Junction Zoning and Development Code)

(White: Planning) (Yellow: Customer) (Pink: Building Department) (Goldenrod: Utility Accounting)