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File **1994-0021** Name: Country Club Estates – SE G Road / 12th Street- Final Plat/Plan

Present	Scanned	
		A few items are denoted with an asterisk (*), which means they are to be scanned for permanent record on the ISYS retrieval system. In some instances, items are found on the list but are not present in the scanned electronic development file because they are already scanned elsewhere on the system. These scanned documents are denoted with (**) and will be found on the ISYS query system in their designated categories. Documents specific to certain files, not found in the standard checklist materials, are listed at the bottom of the page. Remaining items, (not selected for scanning), will be listed and marked present. This index can serve as a quick guide for the contents of each file.
X	X	**Table of Contents**
		***Review Sheet Summary**
X	X	***Application form**
		Review Sheets
		Receipts for fees paid for anything
X	X	***Submittal checklist**
		***General project report**
		Reduced copy of final plans or drawings
		Reduction of assessor's map.
		Evidence of title, deeds, easements
X	X	***Mailing list to adjacent property owners**
		Public notice cards
		Record of certified mail
X		Legal description
		Appraisal of raw land
		Reduction of any maps – final copy
		***Final reports for drainage and soils (geotechnical reports)**
		Other bound or non-bound reports
		Traffic studies
X	X	***Review Comments**
X	X	***Petitioner's response to comments**
X	X	***Staff Reports**
		***Planning Commission staff report and exhibits**
		***City Council staff report and exhibits**
		***Summary sheet of final conditions**

DOCUMENT DESCRIPTION:

X	X	Planning Commission Minutes – 3/1/94 - **	X		Drainage Fee Chart
X	X	Correspondence	X		Grading and Drainage Plan – sent to GIS for scanning
X		Abstract & Title Co. of Mesa County – Commitment to insure	X		Street Plan and Profile – sent to GIS for scanning
X		Planning Commission Notice of Public Hearing mail-out – 2/22/94	X		Sewer and Water Plan and Profile – sent to GIS for scanning
X	X	Subsurface Soils Exploration Report – 12/20/93	X		Standard City Street Details – sent to GIS for scanning
X	X	City Council Minutes - ** - 1/19/94	X		Water and Sewer Details – sent to GIS for scanning
X	X	Final Drainage Report	X		Storm Sewer Details – sent to GIS for scanning
X		Proof of Publication			
X	X	City Council Minutes – 6/7/95 - **			
X	X	Avigation Easement – not signed			
X		Declaration of Covenants - Draft			

DEVELOPMENT APPLICATION

Community Development Department
250 North 5th Street Grand Junction, CO 81501
(303) 244-1430

Receipt 934
Date 2-3-94
Rec'd By mo
File No. #21 94

Original!
Do NOT Remove
From Office

We, the undersigned, being the owners of property situated in Mesa County, State of Colorado, as described herein do hereby petition this:

PETITION	PHASE	SIZE	LOCATION	ZONE	LAND USE
[X] Subdivision Plat/Plan	[ ] Minor [X] Major [ ] Resub	5 acres	SE corner of G & 27 Rd	PR 6	Residential
[ ] Rezone				From: To:	
[ ] Planned Development	[ ] ODP [ ] Prelim [ ] Final				
[ ] Conditional Use					
[ ] Zone of Annex					
[ ] Text Amendment					
[ ] Special Use					
[ ] Vacation					[ ] Right-of-Way [ ] Easement

[X] PROPERTY OWNER [X] DEVELOPER [X] REPRESENTATIVE

SIDNEY GOTTLIEB		THOMAS A. LOGUE
Name	Name	Name
477 ELKWOOD TERRACE		227 So. 9th Street
Address	Address	Address
ENGLEWOOD, NEW JERSEY 07631		Grand Junction, CO 81501
City/State/Zip	City/State/Zip	City/State/Zip
201-569-0916		245-4099
Business Phone No.	Business Phone No.	Business 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 t foregoing information is true and complete to the best of our knowledge, and that we assume the responsibility to monitor the status of the applicati and the review comments. We recognize that we or our representative(s) must be present at all hearings. In the event that the petitioner is n represented, the item will be dropped from the agenda, and an additional fee charged to cover rescheduling expenses before it can again be plac on the agenda.

X Thomas A. Logue 2/1/94
Signature of Person Completing Application Date

X Sidney Gottlieb

Signature of Property Owner(s) - Attach Additional Sheets if Necessary

#2194

U.S. Bank of Grand Junction
P.O. Box 908
Grand Junction, CO 81502

Allan Ledebur
2700 G Road #8D
Grand Junction, CO 81506

Florence Wilcox
2700 G Road #8C
Grand Junction, CO 81506

Shirley Gardner
2700 G Road #9C
Grand Junction, CO 81506

Jeanne Motz
2700 G Road #9D
Grand Junction, CO 81506

Shirley Woodard
P.O. Box 2087
Grand Junction, CO 81502

Rod Geddes
2700 G Road #11-B
Grand Junction, CO 81506

Florence Berg
2715 G Road
Grand Junction, CO 81506

Ladee Jensen
2713 G Road
Grand Junction, CO 81506

Clifford Allison
2711 G Road
Grand Junction, CO 81506

John Moss
715 Horizon Drive, Suite 380
Grand Junction, CO 81506

Reta Maxfield
2700 G Road #11-A
Grand Junction, CO 81506

William Bray
1015 North 7th Street
Grand Junction, CO 81501

Donald Edward Tyre
694 Westcliff Drive
Grand Junction, CO 81506

G Road Investments
2328 I-70 Frontage
Grand Junction, CO 81505

Roger Scholbe
2700 G Road #8B
Grand Junction, CO 81506

Robert Orr
2700 G Road #6D
Grand Junction, CO 81506

Mable Patsantaras
2700 G Road #A-10
Grand Junction, CO 81506

Amora Bley
2700 G Road #10-B
Grand Junction, CO 81506

Ruth Hockensmith
2700 G Road #10-C
Grand Junction, CO 81506

Everhart Family Revocable
Living Trust
2700 G Road #10-D
Grand Junction, CO 81506

Carlon Chambers
2700 G Road #12-C
Grand Junction, CO 81506

Bruce Jones
2700 G Road #12-D
Grand Junction, CO 81506

Mildred Gobbo
2700 G Road #8-A
Grand Junction, CO 81506

Gertrude Dalby
555 Pinyon Avenue
Grand Junction, CO 81501

Alvin Schiesswohl
123 South 6th Street
Grand Junction, CO 81501

Frederick Jones
3831 N 12th Street
Grand Junction, CO 81506

Tilman Bishop
2697 G Road
Grand Junction, CO 81506

Deanna Musgrave
2700 G Road #11-C
Grand Junction, CO 81506

Walter Holmes
2700 G Road #11-D
Grand Junction, CO 81506

Mary Luthe
2700 G Road #A-6
Grand Junction, CO 81506

Ella Hurtt
2700 G Road #6-B
Grand Junction, CO 81506

Mariam Bennett
2700 G Road #6-C
Grand Junction, CO 81506

City of Grand Junction
Community Development Dept.
250 North 5th Street
Grand Junction, CO 81501

Jeff Williams
715 Horizon Drive, Suite 200
Grand Junction, CO 81506

Thomas A. Logue
227 S. 9th Street
Grand Junction, CO 81501

SUBMITTAL CHECKLIST

MAJOR SUBDIVISION: FINAL

Location: SE corner of G Rd & 27 Rd   Project Name: Country Club Estates

ITEMS / DISTRIBUTION

#21 94

Original Do NOT Remove From Office

DESCRIPTION	SSID REFERENCE	● City Community Development	● City Dev. Eng.	● City Utility Eng.	● City Property Agent	● City Parks/Recreation	● City Fire Department	● City Attorney	● City G.J.P.C. (8 sets)	○ City Downtown Dev. Auth.	● City Police	● County Planning	○ County Bldg. Dept.	● County Surveyor	● Walker Field	● School Dist. #51	● Irrigation District (G.V. Water Users)	○ Drainage District	● Water District (Ute)	○ Sewer District	● U.S. West	● Public Service	○ GVRP	○ CDOT	○ Corps of Engineers	○ Colorado Geologic Survey	● U.S. Postal Service	● ~~Persigo WWTF~~	TOTAL REQ'D. 18
● Application Fee $720 plus $15/acre	VII-1	1																											
● Submittal Checklist*	VII-3	1																											2
● 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	18
● Application Form*	VII-1	1	1	1	1	1	1	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	27
● 11"x17" Reduction of Assessor's Map	VII-1	1	1	1	1	1	1	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	27
● Evidence of Title	VII-2	1			1			1																					[illegible]
~~● Appraisal of Raw Land~~	VII-1	1			1	1																							–
● Names and Addresses	VII-3	1																											3
● Legal Description	VII-2	1			1																								4
○ Deeds	VII-1	1			1			1																					
○ Easements	VII-2	1	1	1	1			1													1	1	1						
● Aviation Easement	VII-1	1			1			1																					5
○ ROW	VII-3	1	1	1	1			1													1	1	1						
● Covenants, Conditions, & Restrictions	VII-1	1	1					1																					6
○ Common Space Agreements	VII-1	1	1					1																					
● County Treasurer's Tax Cert.	VII-1	1																											
● Improvements Agreement/Guarantee*	VII-2	1	1	1				1																					
○ CDOT Access Permit	VII-3	1	1																										
○ 404 Permit	VII-3	1	1																										
○ Floodplain Permit*	VII-4	1	1																										
● General Project Report	X-7	1	1	1	1	1	1	1	8	1	1	1	1	1	1	1	1		1	1	1	2	1	1	1	1	1	1	[illegible]
● Composite Plan	IX-10	1	2	1	1																								
● 11"x17" Reduction Composite Plan	IX-10	1				1	1	1	8	1	1	1	1				1	1	1	1	1	1	1	1	1	1		1	
● Final Plat	IX-15	1	2	1	1			1						1															
● 11"x17" Reduction of Final Plat	IX-15	1							8	1	1	1			1	1	1	1	1	1	1	1	1				1		
● Cover Sheet	IX-11	1	2																										
● Grading & Stormwater Mgmt Plan	IX-17	1	2															1							1	1			
● Storm Drainage Plan and Profile	IX-30	1	2															1			1	1	1						5
● Water and Sewer Plan and Profile	IX-34	1	2	1			1												1	1	1	1	1					1	
● Roadway Plan and Profile	IX-28	1	2															1											
● Road Cross-sections	IX-27	1	2																										
● Detail Sheet	IX-12	1	2																										
● Landscape Plan	IX-20	2	1	1																									
● Geotechnical Report	X-8	1	1										1													1			4
○ Phase I & II Environmental Report	X-10,11	1	1																										
● Final Drainage Report	X-5,6	1	2															1											
○ Stormwater Management Plan (>5ac)	X-14	1	2															1							1				
○ Sewer System Design Report	X-13	1	2	1																1									
○ Water System Design Report	X-16	1	2	1															1										
○ Traffic Impact Study	X-15	1	2																					1					

NOTES:
1) An asterisk in the item description column indicates that a form is supplied by the City.
2) Required submittal items and distribution are indicated by filled in circles, some of which may be filled in during the pre-application conference. Additional items or copies may be subsequently requested in the review process.
3) Each submitted item must be labeled, named, or otherwise identified as described above in the description column.

SUBSURFACE SOILS EXPLORATION

COUNTRY CLUB ESTATES

GRAND JUNCTION, COLORADO

Prepared For:

Mr. Sid Gottlieb
477 Elkwood Terrace
Englewood, New Jersey

Prepared By:

LINCOLN-DeVORE, INC.
1441 Motor Street
Grand Junction, CO 81505

December 30, 1993

Lincoln DeVore, Inc.
Geotechnical Consultants
1441 Motor St.
Grand Junction, CO 81505

TEL: (303) 242-8968
FAX: (303) 242-1561

December 30, 1993

Mr. Sid Gottlieb
477 Elkwood Terrace
Englewood, New Jersey 87831

Re: SUBSURFACE SOILS EXPLORATION
Country Club Estates
Grand Junction, CO

Dear Mr. Gottlieb:

Transmitted herein are the results of a Subsurface Soils Exploration for the proposed Country Club Estates residential subdivision.

If you have any questions after reviewing this report, please feel free to contact this office at any time. This opportunity to provide Geotechnical Engineering services is sincerely appreciated.

Respectfully submitted,
LINCOLN-DeVORE, INC.

By: _____
Edward M. Morris, E.I.T.
Western Slope Branch Manager
Grand Junction, Office

Reviewed by: _____
George D. Morris, P.E.
Colorado Springs Office

GEORGE D. MORRIS REGISTERED 2051 PROFESSIONAL ENGINEER STATE OF COLORADO 1/3/94

LDTL Job#80088-J
EMM/ss

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INTRODUCTION

PROJECT DESCRIPTION

This report presents the results of our geotechnical evaluation performed to determine the general subsurface conditions of the site applicable to construction of a twenty two lot, single family residential subdivision. A vicinity map is included in the Appendix of this report.

To assist in our exploration, we were provided with a site development plan prepared by Thomas A. Logue, Land Development Consultants. The Boring Location Plan attached to this report is based on that plan provided to us.

We understand that the proposed structures will consist of one and two story, wood framed structures with a possible full basement and concrete floor slab on grade. Lincoln DeVore has not seen a full set of building plans, but structures of this type typically develop wall loads on the order of 600 to 1400 plf and column loads on the order of 6 to 15 kips.

The characteristics of the subsurface materials encountered were evaluated with regard to the type of construction described above. Recommendations are included herein to match the described construction to the soil characteristics found. The information contained herein may or may not be valid for other purposes. If the proposed site use is changed or types of construction proposed, other than noted herein, Lincoln DeVore should be contacted to determine if the information in this report can be used for the new construction without further field evaluations.

PROJECT SCOPE

The purpose of our exploration was to evaluate the surface and subsurface soil and geologic conditions of the site and, based on the conditions encountered, to provide recommendations pertaining to the geotechnical aspects of the site development as previously described. The conclusions and recommendations included herein are based on an analysis of the data obtained from our field explorations, laboratory testing program, and on our experience with similar soil and geologic conditions in the area.

This report provides site specific information for the construction of a single family, residential subdivision. Included in this report are recommendations regarding general site development and foundation design criteria.

The scope of our geotechnical exploration consisted of a surface reconnaissance, a geophoto study, subsurface exploration, obtaining representative samples, laboratory testing, analysis of field and laboratory data, and a review of geologic literature.

Specifically, the intent of this study is to:

1. Explore the subsurface conditions to the depth expected to be influenced by the proposed construction.
2. Evaluate by laboratory and field tests the general engineering properties of the various strata which could influence the development.
3. Define the general geology of the site including likely geologic hazards which could have an effect on site development.
4. Develop geotechnical criteria for site grading and earthwork.

5. Identify potential construction difficulties and provide recommendations concerning these problems.

6. Recommend an appropriate foundation system for the anticipated structure and develop criteria for foundation design.

FIELD EXPLORATION AND LABORATORY TESTING

A field evaluation was performed on December 16, 1993, and consisted of a site reconnaissance by our geotechnical personnel and the drilling of 5 shallow exploration borings, and 3 very shallow borings for pavement analysis. These shallow exploration borings were drilled within the proposed building pads ear the locations indicated on the Boring Location Plan. The exploration borings were located to obtain a reasonably good profile of the subsurface soil conditions. All exploration borings were drilled using a CME 45B, truck mounted drill rig with continuous flight auger to depths of approximately 14 to 24 feet. Samples were taken with a California split spoon sampler, thin wall Shelby tubes, and by bulk methods. Logs describing the subsurface conditions are presented in the attached figures.

Laboratory tests were performed on representative soil samples to determine their relative engineering properties. Tests were performed in accordance with test methods of the American Society for Testing and Materials or other accepted standards. The results of our laboratory tests are included in this report. The in-place moisture content and the standard penetration test values are presented on the attached drilling logs.

FINDINGS

SITE DESCRIPTION

The project site is located in the Northwest Quarter of the Northwest Quarter of the Northwest Quarter of Section 1, Township 1 South, Range 1 West of the Ute Principal Meridian, Mesa County, Colorado. More specifically the site is located on the Southeast corner of the intersections of North 12th Street (27 Road) and G Road. The site is located approximately 2 miles North of the main downtown district of the City of Grand Junction and is within the Grand Junction city limits.

The topography of the site is relatively flat, with a slight overall gradient to the South and Southwest. Portions of the site have been regraded with the Eastern two thirds of the site being cut and the Western third, along 12th Street containing minor amounts of fill over native alluvium. The exact direction of surface runoff on this site will be controlled by the proposed construction and therefore will be variable. In general, surface runoff is expected to travel to the South and West, entering the existing drain ditch along the East side of North 12th Street and traveling South eventually entering the Colorado River. Surface drainage on this site would be described as fair, subsurface drainage is poor.

GENERAL GEOLOGY AND SUBSURFACE DESCRIPTION

The geologic materials encountered under the site consist of the expansive clays of the Mancos Shale Formation with a significant amount of alluvial soil and minor amounts of fill in an ancient, buried gully feature along the West side of the property. The geologic and engineering properties of the materials found in our 5 shallow exploration borings will be discussed in the following sections.

The surface soils on this site, along the West side of the property, consist of an alluvial deposit placed by the action of ancient debris flows which originated in the Bookcliffs to the North and alluvium from the nearby slopes to the North of the site. The soil materials found in the exploration borings No.'s 1 & 4 consist of mixed soils containing silt, clay, shale fragments and some amounts of sand size fragments. Due to the method of deposition these materials are mixed and of variable composition and consistency.

Soil Type I consists of alluvial deposit mixed with some man made fills. This deposit and the fills tend to be concentrated along the West side of the property and fill an ancient gully feature. These soils have been derived from the Mancos Shale Formation and have general classification characteristics which are similar to the clays of the Mancos Shale Formation.

This soil type was classified as a silty clay (CL) under the Unified Classification System. The Standard Penetration Tests ranged from 37 to 88 blows per foot in the stiffer portions above the water table. Penetration tests

of this magnitude indicate that the soil located above the water table is relatively stiff and of medium density. The soils below the water table were not sampled using the standard penetration test however, these lower soils were found to be of low density and quite soft. The moisture content varied from 7.2% to 20.1%, indicating the upper soils are somewhat desiccated and the lower soils are saturated. This soil is plastic and is sensitive to changes in moisture content. With decreased moisture, it will tend to shrink, with some cracking upon desiccation. Upon increasing moisture, it will tend to expand. Expansion tests were performed on typical samples of the soil which have been remolded and expansive pressures on the order of 1600 psf were found to be typical. These expansion values indicate if the soils are found in a relatively dense condition, either naturally or placed as a man made fill, significant expansion can be anticipated. This material, found in the native state, will also consolidate upon saturation or excessive loading. If recommended bearing values are not exceeded, such settlement will remain within tolerable limits. The allowable maximum bearing value was found to be on the order of 800 to 2400 psf depending upon the soil density. A minimum dead load of 0 to 1000 psf for the native soils will be required, depending upon the native soil density. This soil was found to contain sulfates in detrimental quantities.

Determination of the allowable bearing capacities for the native alluvial silty clays of Soil Type I can only be determined on a building lot by building lot basis, if the soils are to be utilized for foundation bearing.

Soil Type II is representative of the Mancos Shale Formation. The Mancos Shale is described as a thinbedded, drab, light to dark gray marine shale, with thinly interbedded fine grain sandstone and limestone layers. Some portions of the Mancos Shale are bentonitic, and therefore, are highly expansive. The majority of the shale, however, has only a moderate expansion potential. Formational shale was encountered all exploration borings at depths ranging from 2 feet to 16 feet. It is anticipated that this formational shale will affect the construction and the performance of foundations on this site.

Soil Type II is physically described as a thin to laminated bedded shale with isolated strata of siltstone and sandstone. The Mancos Shale is generally quite hard, fractured and may transmit significant amounts of water through the fractures and some of the permeable beds. Some horizons of the Mancos Shale Formation are not thinbedded and appear to be more of a claystone or in some cases mudstone. Samples obtained from exploration boring No. 2 at eight feet, boring No.'s 3, 4 & 5 at fourteen feet indicate mudstone horizons. Laboratory testing indicates Soil Type III has engineering properties very similar to Soil Type II. The following discussion for Soil Type II also applies for Soil Type III.

This soil type was classified as a silty clay (CL) under the Unified Classification System. The Standard Penetration Tests ranged from 97 blows per foot to in excess of 120 blows per foot. Penetration tests of this magnitude indicate that the soil is relatively consistent and of high density. The moisture content varied from 5.6% to 16.3%, indicat-

ing a relatively dry to moist soil. This soil is plastic and is sensitive to changes in moisture content. With decreased moisture, it will tend to shrink, with some cracking upon desiccation. Upon increasing moisture, it will tend to expand. Expansion tests were performed on typical samples of the soil and expansive pressures on the order of 1700 to 2200 psf were found to be typical. The allowable maximum bearing value was found to be on the order of 6000 psf. A minimum dead load of 2200 psf will be required. This soil was found to contain sulfates in detrimental quantities.

The Mancos Shale Formation is often highly fractured, with fillings of soluble sulfate salts being very common. The samples obtained in this drilling program indicated virtually all fractured faces and some bedding planes in the upper portion of the shale contain sulfate salt deposits. Some seams of sulfate salts up to 1/8 inch thick were observed. Sulfate Salts exhibit variable strength, depending upon surrounding moisture conditions and their chemistry as related to water. In addition, Sulfate Salts are soluble and may be physically removed from the soil by ground moisture conditions. Such removal may leave significant amounts of void areas within the Mancos Shale, which may affect the load bearing capacity of the formation. Many of the fractures in the Mancos Shale Formation are open, allowing the rapid transmission of water to occur. Some sandstone and siltstone strata within the Mancos Shale Formation also exhibit elevated permeability.

GROUND WATER:

A free water table came to equilibrium during drilling at 6 to 8 feet below the present ground surface along the buried gully feature along the West side of the property. This is probably not a true phreatic surface but is an accumulation of subsurface seepage moisture (perched water). No free water was encountered in the Eastern 2/3 of the site. In our opinion the subsurface water conditions shown are a permanent feature on this site. The depth to free water would be subject to fluctuation, depending upon external environmental effects.

Because of capillary rise, the soil zone within a few feet above the free water level identified in the borings will be quite wet. Pumping and rutting may occur during the excavation process, particularly if the bottom of the foundations are near the capillary fringe. Pumping is a temporary, quick condition caused by vibration of excavating equipment on the site. If pumping occurs, it can often be stopped by removal of the equipment and greater care exercised in the excavation process. In other cases, geotextile fabric layers can be designed or cobble sized material can be introduced into the bottom of the excavation and worked into the soft soils. Such a geotextile or cobble raft is designed to stabilize the bottom of the excavation and to provide a firm base for equipment.

Several tracts of ground to the immediate South and East of this site have experienced significant flows of ground water through the Mancos Shale Formation. Such flow is usually isolated to specific strata of the Mancos Shale and have characteristics of confined aquifers. When this subsur-

subsurface flow is intercepted during construction of utilities or building foundations, unstable soil conditions are usually present. No evidence of this subsurface flow in the Mancos Shale was found during this exploration program. It is believed the problems associated with this subsurface flow are not present on this site and probably will not be a concern during the site development.

Data presented in this report concerning ground water levels are representative of those levels at the time of our field exploration. Groundwater levels are subject to change seasonally or by changed environmental conditions. Quantitative information concerning rates of flow into excavations or pumping capacities necessary to dewater excavations is not included and is beyond the scope of this report. If this information is desired, permeability and field pumping tests will be required.

Due to the proximity of the Mancos Shale Formation, there exists a possibility of a perched water table developing in the alluvial soils which overlie the Mancos Shale and within permeable strata and fractures of the Mancos Shale Formation. This perched water would probably be the result of increased irrigation due to the presence of lawns and landscaping and roof runoff. The exploration holes indicate that the top of the Mancos Shale Formation is relatively flat and that subsurface drainage would probably be quite slow. While it is believed that under the existing conditions at the time of this exploration the construction process would not be effected by any

free-flow waters, it is very possible that several years after development is initiated, a troublesome perched water condition may develop which will provide construction difficulties. In addition, this potential perched water could create some problems for existing or future foundations on this tract. Therefore it is recommended that the future presence of a perched water table be considered in all design and construction of both the proposed residential structures and any subdivision improvements.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL DISCUSSION

No geologic conditions were apparent during our reconnaissance which would preclude the site development as planned, provided the recommendations contained herein are fully complied with. Based on our investigation to date and the knowledge of the proposed construction, the site conditions which would have the greatest effect on the planned development is the low density, natural gully fill and the expansive Mancos Shale.

Since the exact magnitude and nature of the foundation loads are not precisely known at the present time, the following recommendations must be somewhat general in nature. Any special loads or unusual design conditions should be reported to Lincoln DeVore so that changes in these recommendations may be made, if necessary. However, based upon our analysis of the soil conditions and project characteristics previously outlined, the following recommendations are made.

OPEN FOUNDATION OBSERVATION

Since the recommendations in this report are based on information obtained through random borings, it is possible that the subsurface materials between the boring points could vary. Therefore, prior to placing forms or pouring concrete, an open excavation observation should be performed by representatives of Lincoln DeVore. The purpose of this observation is to determine if the subsurface soils directly below the proposed foundations are similar to those encountered in our

exploration borings. If the materials below the proposed foundations differ from those encountered, or in our opinion, are not capable of supporting the applied loads, additional recommendations could be provided at that time.

EXCAVATION & STRUCTURAL FILL:

Subgrade Site preparation in all areas to receive any structural fill should begin with the removal of all topsoil, vegetation, existing man made fill and other deleterious materials. Prior to placing any fill, the subgrade should be observed by representatives of Lincoln DeVore to determine if the existing vegetation has been adequately removed and that the subgrade is capable of supporting the proposed fills. The subgrade should then be scarified to a depth of 10 inches, brought to near optimum moisture conditions and compacted to at least 90% of its maximum modified Proctor dry density [ASTM D-1557]. The moisture content of this material should be within + or - 2% of optimum moisture, as determined by ASTM D-1557.

Structural Fill In general, we recommend all structural fill in the area beneath any proposed structure or roadway be compacted to a minimum of 90% of its maximum modified Proctor dry density (ASTM D1557). We recommend that fill be placed and compacted at approximately its optimum moisture content (+/-2%) as determined by ASTM D 1557. Structural fill should be a granular, coarse grained, non-free draining, non-expansive soil. This structural fill should be placed in the overexcavated portion of

this site in lifts not to exceed 6 inches after compaction. This Structural Fill must be brought to the required density by mechanical means. No soaking, jetting or puddling techniques of any type should be used in placement of fill on this site.

Non-Structural Fill We recommend that all backfill placed around the exterior of the building, and in utility trenches which are outside the perimeter of the building and not located beneath roadways or parking lots, be compacted to a minimum of 80% of its maximum modified Proctor dry density (ASTM D-1557).

Fill Limits To provide adequate lateral support, we recommend that the zone of overexcavation extend at least 3 feet beyond the perimeter of the building on all sides. The Structural Fill should be a minimum of 3 feet in final compacted thickness.
No major difficulties are anticipated in the course of excavating into the surficial soils on the site. It is probable that safety provisions such as sloping or bracing the sides of excavations over 4 feet deep will be necessary. Any such safety provisions shall conform to reasonable industry safety practices and to applicable OSHA regulations.

Field Observation & Testing: During the placement of any structural fill, it is recommended that a sufficient amount of field tests and observation be performed under the direction of the geotechnical engineer. The geotechnical engineer should determine the amount of observation time and field density tests required to determine substantial conformance with these recom-

mendations. It is recommended that surface density tests be taken at maximum 2 foot vertical interval.

The opinions and conclusions of a geotechnical report are based on the interpretation of information obtained by random borings. Therefore the actual site conditions may vary somewhat from those indicated in this report. It is our opinion that field observations by the geotechnical engineer who has prepared this report are critical to the continuity of the project.

Slope Angles Allowable slope angle for cuts in the native soils is dependent on soil conditions, slope geometry, the moisture content and other factors. Should deep cuts be planned for this site, we recommend that a slope stability analysis be performed when the location and depth of the cut is known.

No major difficulties are anticipated in the course of excavating into the surficial soils on the site. It is probable that safety provisions such as sloping or bracing the sides of excavations over 4 feet deep will be necessary. Any such safety provisions shall conform to reasonable industry safety practices and to applicable OSHA regulations. The OSHA Classification for excavation purposes on this site is Soil Class C for Soil Type I and Soil Class B for Soil Types II and III.

DRAINAGE AND GRADIENT:

Adequate site drainage should be provided in the foundation area both during and after construction to prevent the ponding of water and the saturation of the subsurface soils. We recommend that the ground surface around the structures be graded so that surface water will be carried quickly away from the building. The minimum gradient within 10 feet of the buildings will depend on surface landscaping. We recommend that paved areas maintain a minimum gradient of 2%, and that landscaped areas maintain a minimum gradient of 8%. It is further recommended that roof drain downspouts be carried across all backfilled areas and discharged at least 10 feet away from the structures. Proper discharge of roof drain downspouts may require the use subsurface piping in some areas. Planters, if any, should be so constructed that moisture is not allowed to seep into foundation areas or beneath slabs or pavements.

We recommend that a perimeter drain be placed around the exterior walls of the structures at foundation level or below. A drain of this type includes a perforated pipe and an adequate gravel collector, the whole being wrapped in a geotextile filter fabric. We recommend that the discharge pipe for this drain be given a free gravity outlet to exit at ground surface. If "daylight" cannot be obtained, we recommend that a sealed sump and pump be used to discharge the seepage. Under no circumstances shall a "dry well" be used on this site.

The existing drainage on the site must either be maintained carefully or improved. We recommend that water be drained away from structures as rapidly as possible and

not be allowed to stand or pond near the building. We recommend that water removed from one building not be directed onto the backfill areas of adjacent buildings. We recommend that a hydrologist or drainage engineer experienced in this area be retained to complete a drainage plan for this site.

Should an automatic lawn irrigation system be used on this site, we recommend that the sprinkler heads be installed no less than 5 feet from the building. In addition, these heads should be adjusted so that spray from the system does not fall onto the walls of the building and that such water does not excessively wet the backfill soils.

FOUNDATIONS

At this time, Lincoln DeVore has not been provided with a copy of the foundation/building plans and is, therefore, not informed as to the precise wall or column loading planned within the buildings. Therefore, three foundation types which could be utilized for single-family residential buildings are recommended, based on our experience in this area. The choice between these foundation types depends on the internal loading of the foundation members and the amount of excavation planned to achieve the finished floor elevations.

The three foundation types preliminarily recommended are as follows:

1. The voided wall on grade foundation system with the stem wall resting directly on the Shale Formation.
2. The isolated pad and grade beam foundation system in which the grade beam is voided and loads are transferred to the isolated pads.
3. The drilled pier and fully voided grade beam system with the loads transferred to the piers.

Recommendations given in this letter report are for both the shallow and deep foundation types.

Shallow Foundations:

A conventional shallow foundation system consisting of either a voided wall on grade or an isolated pad and grade beam system, resting on the relatively unweathered expansive clays of the Mancos Shale Formation, may be designed on the basis of an allowable bearing capacity of 6000 psf maximum, and a minimum dead load of 2200 psf must be maintained. Contact stresses beneath all continuous walls should be balanced to within + or -200 psf at all points. Isolated interior column

footings should be designed for contact stresses of about 200 psf more than the average used to balance continuous walls. The criteria use for balancing will depend somewhat upon the nature of the structure. Single-story, slab on grade structures and single-story crawlspace structures may be balance on the basis of dead load only. Multi-story structures may be balanced on the basis of Dead Load plus one half live load, for up to three stories.

For foundations placed on the variable density silty clays of Soil Type I, assignment of precise bearing capacities is not possible in a report of this nature. If the variable density, alluvial clays of Soil Type I are utilized for foundation bearing, the actual site conditions for each building will have to be evaluated.

For foundations placed on Soil Type I, we recommend the use of a conventional shallow foundation system consisting of continuous spread footings beneath all bearing walls and isolated spread footings beneath all columns and other points of concentrated load. Such a shallow foundation system, resting on the alluvial silty clays of Soil Type I, must be designed on the basis of an allowable bearing capacities determined for each individual site.

Contact stresses beneath all continuous walls should be balanced to within + or -150. psf at all points. Isolated interior column footings should be designed for contact stresses of about 150 psf less than the average used to balance the continuous walls. The criterion for balancing will depend somewhat upon the nature of the structure. Single-story, slab on

grade structures may be balanced on the basis of dead load only. Multi-story structures may be balanced on the basis of dead load plus 1/2 live load, for up to 3 stories.

It should be noted that the term "footings" as used above includes the wall on grade or "no footing" type of foundation system. On this particular site, the use of a more conventional footing, the use of a "no footing", or the use of voids will depend entirely upon the foundation loads exerted by the structure. We would anticipate the use of a conventional footing on many of the sites on the Western portion of the tract.

Stem walls for a shallow foundation system should be designed as grade beams capable of spanning at least fifteen feet. These "grade beams" should be horizontally reinforced both near the top and near the bottom. The horizontal reinforcement required should be placed continuously around the structure with no gaps or breaks. A foundation system designed in this manner should provide a rather rigid system and, therefore, be better able to tolerate differential movements associated with variable density soils and expansive pressures of some of the alluvial soils and the Mancos Shale Formation.

FROST PROTECTION

We recommend that the bottom of all foundation components rest a minimum of two feet below finished grade or as required by the local building codes. Foundation components must not be placed on frozen soils.

DEEP FOUNDATIONS

DRILLED PIERS:

Based upon our experience in this area and due to rather poor surface and subsurface drainage conditions of the subdivision, a drilled pier foundation system may be the preferred system. It must be noted that a drilled pier and fully voided grade beam system is quite rigid and will be quite sensitive to relative differential movements of the individual piers. The presence of subsurface water in the Mancos Shale Formation indicates that a 'Stable Strata Below The Zone of Seasonal Moisture Change' may not be adequately defined at this period of time.

We recommend that drilled piers have a minimum shaft length of five feet and be embedded at least five feet into the relatively unweathered bedrock of the Mancos Shale Formation. At this level,these piers may be designed for a maximum end bearing capacity of 25,000 psf, plus 1800 psf side support considering only the side wall area embedded in the bedrock. Due to the expansive potential of the bedrock, a minimum dead load uplift is required, consisting of a point uplift of 2200 psf and 370 psf side uplift, based on the side wall embedded in the bedrock. The overburden is soft and no supporting or uplift values are assigned to this material. The weight of the concrete in the pier may be incorporated into the required dead load.

It is recommended that the bottoms of all piers be thoroughly cleaned prior to the placement of con-

crete. The amount of reinforcing in each pier will depend on the magnitude and nature of loads involved. As a rule of thumb, reinforcing equal to approximately 1/2 of 1% of the gross cross-sectional concrete area should be used. Additional reinforcing should be used if structural conditions warrant. We recommend that reinforcing extend through the full length of pier.

To minimize the possibility of voids developing in the drilled piers, concrete with a slump of 5 to 6 inches is recommended. We recommend that piers be dewatered and thoroughly cleaned of all loose material prior to placing the steel cage and concrete. The pier excavation should contain no more than 2 inches of free water unless the concrete is placed by means of a tremie extending to the bottom of the pier. A free fall in excess of 5 feet is not recommended when placing concrete in drilled piers. We recommend that casing be pulled as the concrete is being placed and that a 5 foot head of concrete be maintained while pulling the casing. It is recommended that drilled piers be plumb with 2% of their length and that the shaft maintain a constant diameter for the full length of the pier and not allowed to "mushroom" at the top.

DRILLED PIER OBSERVATION:

The foundation installation for drilled piers should be continuously observed by a representative of Lincoln DeVore to determine that the recommended bearing material has been adequately penetrated and that soil conditions are as anticipated by the exploration. This observation will aid in attaining an adequate foundation system. In addition, abnormali-

ties in the subsurface conditions encountered during foundation installation can be identified and corrective measures taken as required. Lincoln DeVore requires a minimum of one working day's notice, and a copy of the foundation plan, to schedule any field observation.

GRADE BEAMS:

A reinforced concrete grade beam is recommended to carry the exterior wall loads in conjunction with the deep foundation system. We recommend that this grade beam be designed to span from bearing point to bearing point and not be allowed to rest on the ground surface between these points. We recommend a void space be left between the bottom of the grade beam and the subgrade below due to the expansive nature of the subgrade soils.

CONCRETE SLABS ON GRADE

Slabs could be placed directly on the natural soils or on a structural fill. We recommend that all slabs on grade be constructed to act independently of the other structural portions of the building. One method of allowing the slabs to float freely is to use expansion material at the slab-structure interface.

The magnitude of expansion measured of the soils on this site is such that floor slab movement should be expected if slab on grade construction is used. In general, the closer the slab is to the dense clays of Soil Type I or the expansive clays of the Mancos Shale Formation, the more movement which should be expected. Where floor slabs are cast on expansive soils, no known method of construction will prevent all future slab movement. If the builder and future owner are willing to risk the possibility of some damage due to concrete floor slab movement, the recommendations contained herein should be carefully followed and can help minimize such damage. Any subsequent owner should be advised of the soil conditions and advised to maintain the surface and subsurface drainage, framing of partition above floor slabs, dry wall and finish work above floor slabs, etc.

If the slab is to be placed directly on the expansive soils or on a thin fill overlying these soils, the risk of slab movement is high and stringent mitigation techniques are recommended. No design method known at this time will prevent slab movement should moisture enter the expansive soils below.

Therefore, to mitigate the effects of slab movement should they occur, we recommend the following:

1. Control joints should be placed in such a manner that no floor area exceeding 400 square feet remains without a joint. Additional joints should be placed at columns and at inside corners. These control joints should minimize cracking associated with expansive soils by controlling location and direction of cracks.

2. We recommend that all slabs on grade be isolated from structural members of the building. This is generally accomplished by an expansion joint at the floor slab / foundation interface. In addition, positive separation should be maintained between the slab and all interior columns, pipes and mechanical systems extending through the slab.

3. The slab subgrade should be kept moist 3 to 4 days prior to placing the slab. This is done by periodically sprinkling the subgrade with water. However, under no circumstances should the subgrade be kept wet by the flooding or ponding water.

4. Any partitions which will rest on the slabs on grade should be constructed with a minimum void space of 2 inches at the bottom of the wall (see figure in the Appendix). This base should allow for future upward movement of the floor slabs and minimize movement and damage in walls and floors above the slabs. This void may require rebuilding after a period of time, should heave exceed 2 inches.

The first alternative is to dispense with slab-on-grade construction and use a structural floor system. A structural floor system may be either a structural reinforced concrete slab or a structural wood floor system suspended with floor joists. Each system would utilize a crawl space. This alternative would substantially reduce a potential for post construction slab difficulties due to the expansive properties of the clays of the Mancos Shale Formation.

The second alternative is to install a three foot "buffer zone" of non-expansive, granular soil beneath the slab. This would mitigate the potential for slab movement; however, some potential for movement still exists. Should this alternative be selected, we would recommend that the following be performed:

1. Non-expansive granular soils should be selected for the "buffer zone". The granular soils should contain less than 20% of the material, by dry weight, passing the U.S. No. 200 Sieve. We recommend that the geotechnical engineer be contacted to examine the soils when they are selected, to substantiate that they comply with the recommendations.

2. The perimeter drain for the structures should be located at the elevation equal to or deeper than the "buffer zone". This is to reduce the potential for a "bathtub" effect" which may cause the slab to heave. The "bathtub effect" is created when water is allowed to seep into the "buffer zone" and then becomes trapped since the underlying clay soils have a much lower permeability rate than the "buffer zone" material. Therefore, water may accumulate in the "buffer zone" and subsequently wet the clay soils and cause them to expand.

3. All the non-bearing partitions which will be located on the slabs should be constructed with a minimum 2 inches of void space at the bottom of the wall. This space would allow for the future upward movement of the floor slabs and minimize damage to walls and roof sections above the slabs. The space may require rebuilding after a period of time, since heaving produced by the soils may exceed 2 inches.

4. We recommend that all slabs being placed on the "buffer zone" be constructed to act independently of the other structural portions of the building. One method of allowing the slabs to float freely is to use expansion material at the slab-structure interface. Control joints should be placed 20 feet on center in each direction. These control joints should control the cracking of the slab should the under-lying soils come in contact with water.

EARTH RETAINING STRUCTURES

The active soil pressure for the design of earth retaining structures may be based on an equivalent fluid pressure of 52 pounds per cubic foot. The active pressure should be used for retaining structures which are free to move at the top (unrestrained walls). For earth retaining structures which are fixed at the top, such as basement walls, an equivalent fluid pressure of 65 pounds per cubic foot may be used. It should be noted that the above values should be modified to take into account any surcharge loads, sloping backfill or other externally applied forces. The above equivalent fluid pressures should also be modified for the effect of free water, if any.

The passive pressure for resistance to lateral movement may be considered to be 253 pcf per foot of depth. The coefficient of friction for concrete to soil may be assumed to be .27 for resistance to lateral movement. When combining frictional and passive resistance, the latter must be reduced by approximately 1/3.

Drainage behind retaining walls is considered critical. If the backfill behind the wall is not well drained, hydrostatic pressures are allowed to build up and lateral earth pressures will be considerably increased. Therefore, we recommend a vertical drain be installed behind any impermeable retaining walls. Because of the difficulty in placement of a gravel drain, we recommend the use of a composite drainage mat similar to Exxon Battledrain or Tensar MD Series NS-1100. An outfall must be provided for this drain.

It is noted that no retaining wall can be economically constructed on this site which would be completely resistant to movement. As the earth pressure builds over a period of time with the addition of moisture, movement of the low stability soil above will cause the wall to slide or tilt. Even though the movement is relatively small, its effects will be seen in the building structure and some movements must be expected over a period of time.

REACTIVE SOILS

Since groundwater in the Grand Junction area typically contains sulfates in quantities detrimental to a Type I cement, a Type II or Type I-II or Type II-V cement is recommended for all concrete which is in contact with the subsurface soils and bedrock. Calcium chloride should not be added to a Type II, Type I-II or Type II-V cement under any circumstances.

PAVEMENTS

Samples of the surficial native soils at this property that may be required to support pavements have been evaluated using the Hveem-Carmany method (ASTM D-2844) to determine their support characteristics. The results of the laboratory testing are as follows:

AASHTO Classification - A-6(12)
R = 16
Expansion @ 300 psi = 17.3
Displacement @ 300 psi = 4.09

No estimates of traffic volumes have been provided to Lincoln DeVore. However, we assume that the roads will be classified as residential. The design procedures utilized are those recognized by the Colorado Department of Highways and the 1986 AASHTO design procedure. The terminal Serviceability Index of 2.0, a Reliability of 70 and a design life of 20 years have been utilized, based on recommendations by the Highway Department. An 18 kip ESAL of 5, also recommended by the Highway Department, was used for the analysis. Due to the poor subsurface drainage of these soils and the existing ground water conditions, a Drainage Factor of 0.6 was utilized in the analysis and design.

Based on the soil support characteristics outlined above, the following pavement sections are recommended:

Residential Roadway:

3 inches of asphaltic concrete pavement
on 6 inches of aggregate base course
on 8 inches of recompacted native material

Full Depth Asphalt:

5 inches of asphaltic concrete pavement
on 12 inches of recompacted native material

Rigid Concrete:

6 inches of portland cement pavement
on 4 inches of aggregate base course
on 8 inches of recompacted native material

We recommend that the asphaltic concrete pavement meet the State of Colorado requirements for a Grade C mix. In addition, the asphaltic concrete pavement should be

compacted to a minimum of 95% of its maximum Hveem density. The aggregate base course should meet the requirements of State of Colorado Class 5 or Class 6 material, and have a minimum R value of 78. We recommend that the base course be compacted to a minimum of 95% of its maximum Modified Proctor dry density (ASTM D-1557), at a moisture content within + or -2% of optimum moisture. The native subgrade shall be scarified and recompacted to a minimum of 90% of their maximum Modified Proctor day density (ASTM D-1557) at a moisture content within + or -2% of optimum moisture.

All pavement should be protected from moisture migrating beneath the pavement structure. If surface drainage is allowed to pond behind curbs, islands or other areas of the site and allowed to seep beneath pavement, premature deterioration or possibly pavement failure could result.

We recommend that the rigid concrete pavement have a minimum flexural strength (F_t) of 650 psi at 28 days. This strength requirement can be met using Class P or AX or A or B Concrete as defined in Section 600 of the Standard Specifications for Road and Bridge Construction, Colorado DOT. It is recommended that field control of the concrete mix be made utilizing compressive strength criteria. Flexural Strength should only be used for the design process. Control joints should be placed at a minimum distance of 12 feet in all directions. If it is desired to increase the spacing of control joints, then 66-66 welded wire fabric should be placed in the mid-point of the slab.

If the welded wire fabric is used, the control joint spacing can be increased to 40 feet. Construction joints designed so that positive joint transfer is maintained by the use of dowels is recommended.

Concrete with a lower flexural strength may be allowed by the agency having jurisdiction however, the design section thicknesses should be confirmed. In addition, the final durability of the pavement should be carefully considered.

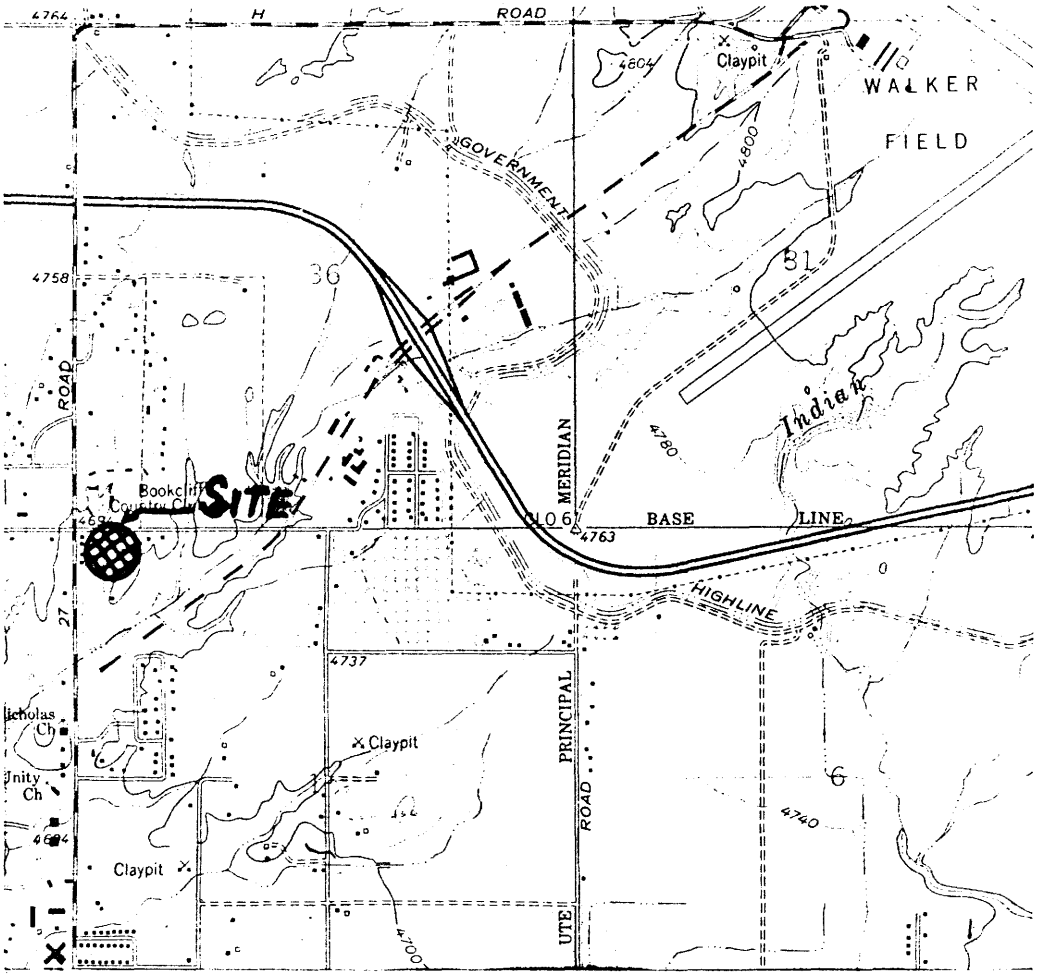
Control joints should be placed at a minimum distance of 12 feet along the slab/road lane length or to match curb and gutter jointing and 15 feet in width. If it is desired to increase the spacing of control joints, then 66-66 welded wire fabric should be placed in the mid-point of the slab. If the welded wire fabric is used, the control joint spacing can be increased to a maximum of 40 feet.

LIMITATIONS

This report is issued with the understanding that it is the responsibility of the owner, or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project, and are incorporated into the plans. In addition, it is his responsibility that the necessary steps are taken to see that the contractor and his sub-contractors carry out these recommendations during construction. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in acceptable or appropriate standards may occur or may result from legislation or the broadening of engineering knowledge. Accordingly, the findings of this report may be invalid, wholly or partially, by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of 3 years.

The recommendations of this report pertain only to the site investigated and are based on the assumption that the soil conditions do not deviate from those described in this report. If any variations or undesirable conditions are encountered during construction or the proposed construction will differ from that planned on the day of this report, Lincoln DeVore should be notified so that supplemental recommendations can be provided, if appropriate.

Lincoln DeVore makes no warranty, either expressed or implied, as to the findings, recommendations, specifications or professional advice, except that they were prepared in accordance with generally accepted professional engineering practice in the field of geotechnical engineering.



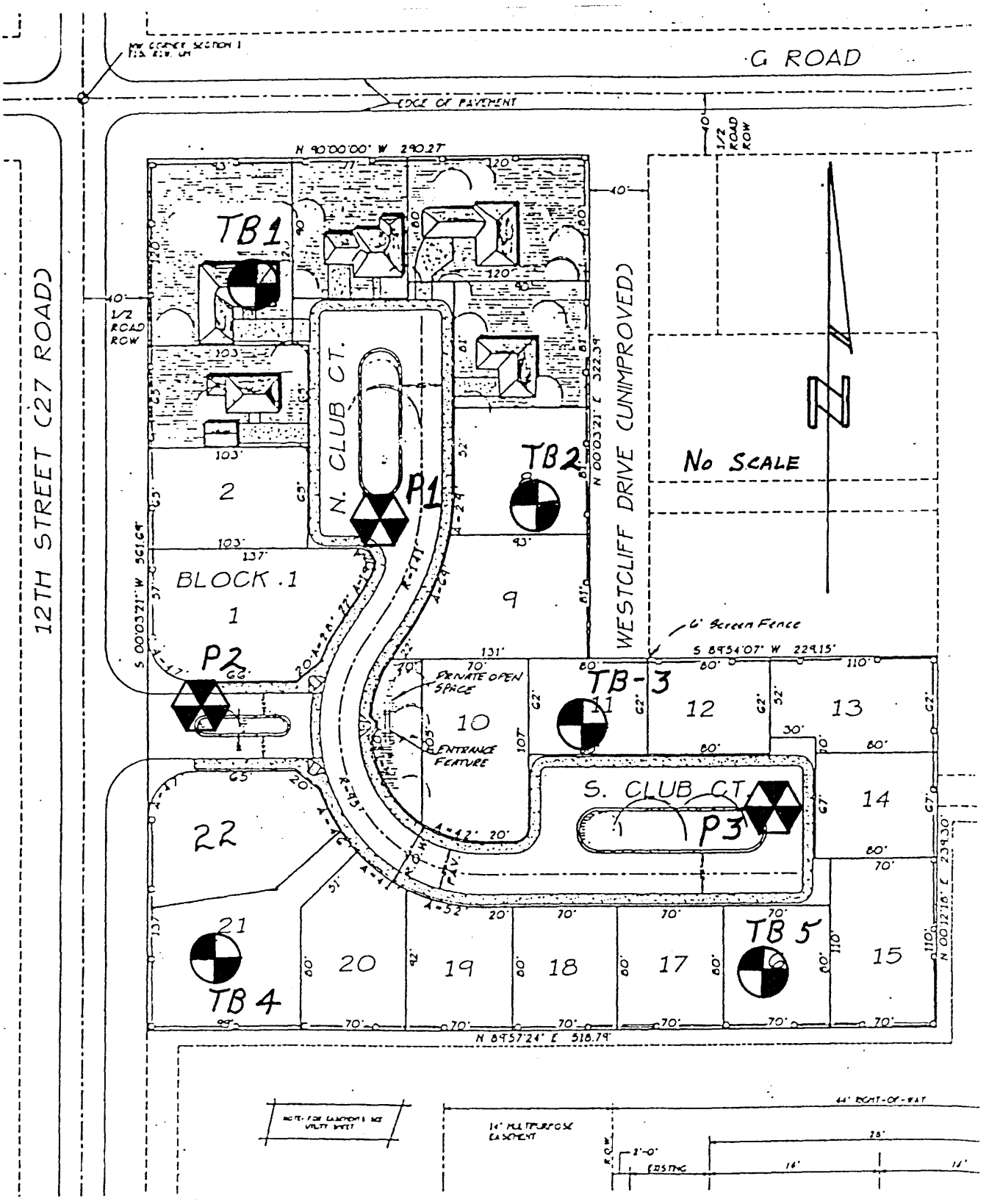
SCALE - 1" = 2000'

U.S.G.S. 7-1/2' Quadrangle Series

GENERAL SITE LOCATION DIAGRAM

Lincoln DeVore, Inc.
Geotechnical Consultants

		DATE
JOB NO.	DRAWN	



TEST BORING LOCATION

Lincoln DeVore, Inc.
Geotechnical Consultants

COUNTRY CLUB ESTATES, GRD. JCT., COLO.		
MR. SID GOTTLIEB		DATE 12-30-93
JOB NO. 80088-J	DRAWN EHM	

BORING NO. 1

BORING ELEVATION:

DEPTH (FT.)	LOG	DESCRIPTION			BLOW COUNT	SOIL DENSITY pcf	WATER %
		FILL	Alluvial	Dessicated Surface			
		Silty Clay, Shale Chips		Stratified			
		I CL	Firm		CS	34 6	117.6	7.2%
		Alluvial	Low Moisture			88 12		
5		Low Plastic	Low Expansion		5			
				Sulfates				
		Water Table	Shale chips					
		I CL	Low Plastic, Silty Clay		CS	17 6	125.3	9.6%
		Alluvial				37 12		
10		Stratified, Alluvial	Decreasing Density		10	63 18		
		Hole Squeezing	Saturated	Sulfates				
			Compressible					
		I CL			ST		100.7	13.5%
		Alluvial						
15				Compressible	15			
		Mancos Shale	Firm					
		Low Plastic Clay	Expansive					
		II CL	Fractured	Sulfates	CS	61 6	122.5	10.9%
		Mancos Shale	Increasing Density					
20		Hard to Drill	Siltstone Strata		20			
		High Sulfates in some Strata and Fractures						
		II CL	Dense, Expansive					
		Mancos Shale	Very Hard					
25		TD @ 24'			25			
30					30			

Blow Count Totals are Cumulative

Free Water @ 8'

During Drilling 12/16/93

LOG OF SUBSURFACE EXPLORATION

COUNTRY CLUB ESTATES SUB.

12th Street & G Road, Grand Junction

Mr. SID GOTTLIEB

Date 12/29/93

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

Job No. 80088-J

Drawn EMM

BORING NO. 2

BORING ELEVATION:

DEPTH (FT.)	LOG	DESCRIPTION				BLOW COUNT	SOIL DENSITY pcf	WATER %
		I CL	Dessicated Surface					
		Silty Clay, Shale Chips		Alluvial				
		II CL	Firm		CS	36/6	114.4	13.9%
		Mancos Shale	Expansive	Very Moist		97/12		
5		Firm, Stratified			5			
		High Sulfates in some Strata and Fractures						
		Low Plastic Clay	Increasing Density		ST		113.1	9.5%
		III CL	Moist	Sulfates				
10		Mancos Shale	Mudstone Strata		10			
		Expansive		Decreasing Moisture				
		II CL	Siltstone Strata					
		Mancos Shale	Fractured		CS	65/6	111.3	7.6%
		Very Hard to Drill						
15		TD @ 14'			15			
20					20			
25					25			
30					30			

Blow Count Totals are Cumulative

No Free Water During Drilling 12/16/93

LOG OF SUBSURFACE EXPLORATION

COUNTRY CLUB ESTATES SUB.

12th Street & G Road, Grand Junction

Mr. SID GOTTLIEB

Date 12/29/93

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

Job No. 80088-J

Drawn EMM

BORING NO. 3

BORING ELEVATION:

DEPTH (FT.)	LOG	DESCRIPTION		BLOW COUNT	SOIL DENSITY pcf	WATER %
		I CL	Silty Clay, Shale Chips			
		II CL	Slightly Moist			
		Mancos Shale	Expansive	ST	100.7	7.5%
		Firm, Stratified				
5		High Sulfates in some Strata and Fractures		5		
		Siltstone Strata				
		II CL	Low Plastic Clay			
		Mancos Shale	Fractured	CS	50/5	112.9	9.8%
		Very Hard to Drill				
10			Decreasing Moisture	10		
		Sulfates				
		Low Plastic Clay	Increasing Density			
		III CL	Sl. Moist	CS	75/6	119.6	9.5%
		Mancos Shale	Mudstone Strata			
15		Expansive		15		
20				20		
25				25		
30				30		

Blow Count Totals are Cumulative

No Free Water

During Drilling 12/16/93

LOG OF SUBSURFACE EXPLORATION

COUNTRY CLUB ESTATES SUB.

12th Street & G Road, Grand Junction

Mr. SID GOTTLIEB

Date 12/29/93

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

Job No. 80088-J

Drawn EMM

BORING NO. 4

BORING ELEVATION:

DEPTH (FT.)	LOG	DESCRIPTION			BLOW COUNT	SOIL DENSITY pcf	WATER %
		Dessicated Surface	Alluvial				
		FILL					
		Silty Clay. Shale Chips					
	I CL	Firm	Compressive	ST		95.5	9.5%
	Alluvial	Low Moisture					
5		Low Plastic	Decreasing Density		5		
	Water Table		Sulfates				
		Shale chips					
	I CL	Stratified, Alluvial		BULK			20.1%
	Alluvial	Low Plastic, Silty Clay					
10		Hole Squeezing	Saturated	Sulfates	10		
		Compressible					
	II CL	Firm					
	Mancos Shale	Expansive		ST		109.2	16.3%
		Hard to Drill					
15		High Sulfates in some Strata and Fractures			15		
			Siltstone Strata				
		Low Plastic Clay					
	II CL	Fractured	Sulfates	BULK			6.7%
	Mancos Shale	Increasing Density					
20		TD @ 19'			20		
25					25		
30					30		

Blow Count Totals are Cumulative

Free Water @ 6'

During Drilling 12/16/93

LOG OF SUBSURFACE EXPLORATION

COUNTRY CLUB ESTATES SUB.

12th Street & G Road, Grand Junction

Mr. SID GOTTLIEB

Date 12/29/93

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

Job No. 80088-J

Drawn EMM

BORING NO. 5

BORING ELEVATION:

DEPTH (FT.)	LOG	DESCRIPTION		BLOW COUNT	SOIL DENSITY pcf	WATER %
		I CL	Soft Silty Clay, Shale Chips			
		Alluvial and weathered in-place				
		II CL	Moist	ST	122.5	5.8%
		Mancos Shale	Fractured			
5		High Sulfates in some Strata and Fractures		5		
		Expansive	Slightly Moist			
		II CL	Low Plastic Clay			
		Mancos Shale	Very Silty Strata	CS	45/6	124.5 7.3%
		Very Hard to Drill			102/12	
10			Decreasing Moisture	10		
		Low Plastic Clay				
		Sl. Moist	Dense			
		III CL	Mudstone Strata	CS	50/6	119.5 5.6%
		Mancos Shale			78/12	
15		Sulfates	Expansive	15		
		TD @ 14'				
20				20		
25				25		
30				30		

Blow Count Totals are Cumulative

No Free Water

During Drilling 12/16/93

LOG OF SUBSURFACE EXPLORATION

LINCOLN - DeVORE, Inc.

Grand Junction, Colorado

COUNTRY CLUB ESTATES SUB.

12th Street & G Road, Grand Junction

Mr. SID GOTTLIEB

Date 12/29/93

Job No. 80088-J

Drawn EMM

SUMMARY SHEET

Soil Sample ALLUVIAL SILTY CLAY (CL)

Test No. 80088-J

Location COUNTRY CLUB ESTATES

Date 12-23-93

Boring No. 4 Depth 3'

Sample No. I

Test by JLS

Natural Water Content (w) 9.5 %

Specific Gravity (Gs) _____

In Place Density (γ_o) 95.5 pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	100
4	98
10	95
20	90
40	86
100	78
200	74

HYDROMETER ANALYSIS:

Grain size (mm)	%
.02	64
.005	48

Plastic Limit P.L. 17 %

Liquid Limit L. L. 35 %

Plasticity Index P.I. 18 %

Shrinkage Limit _____ %

Flow Index _____

Shrinkage Ratio _____ %

Volumetric Change _____ %

Lineal Shrinkage _____ %

MOISTURE DENSITY: ASTM METHOD

Optimum Moisture Content - w_o _____ %

Maximum Dry Density - γ_d _____ pcf

California Bearing Ratio (av) _____ %

Swell: 1 Days 4.1 %

Swell against 1600 psf Wo gain 10.5 %

REMOLDED

BEARING:

Housel Penetrometer (av) _____ psf

Unconfined Compression (qu) _____ psf

Plate Bearing: _____ psf

Inches Settlement _____

Consolidation % under psf

PERMEABILITY:

K (at 20°C) _____

Void Ratio _____

Sulfates 5000+ ppm.

SOIL ANALYSIS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS, COLORADO

SUMMARY SHEET

Soil Sample MANCOS SHALE (CL)

Test No. 80088-J

Location COUNTRY CLUB ESTATES

Date 12-23-93

Boring No. 2 Depth 3'

Sample No. II

Test by JLS

Natural Water Content (w) 5.8 %

Specific Gravity (Gs) _____

In Place Density (γ_o) 122.5 pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	100
4	99
10	98
20	96
40	94
100	92
200	90

HYDROMETER ANALYSIS:

Grain size (mm)	%
.02	76
.005	57

Plastic Limit P.L. 17 %

Liquid Limit L. L. 33 %

Plasticity Index P.I. 16 %

Shrinkage Limit _____ %

Flow Index _____

Shrinkage Ratio _____ %

Volumetric Change _____ %

Lineal Shrinkage _____ %

MOISTURE DENSITY: ASTM METHOD

Optimum Moisture Content - w_o _____ %

Maximum Dry Density - γ_d _____ pcf

California Bearing Ratio (av) _____ %

Swell: 1 Days 7.1 %

Swell against 220 psf Wo gain 10.7 %

BEARING:

Housel Penetrometer (av) 5000+ psf

Unconfined Compression (qu) _____ psf

Plate Bearing: _____ psf

Inches Settlement _____

Consolidation % under psf

PERMEABILITY:

K (at 20°C) _____

Void Ratio _____

Sulfates 5000+ ppm.

SOIL ANALYSIS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS, COLORADO

SUMMARY SHEET

Soil Sample MANCOS SHALE (CL) (MUDSTONE FACIES)
Location COUNTRY CLUB ESTATES
Boring No. 2 Depth 8'
Sample No. III

Test No. 80088-J
Date 12-23-93
Test by JLS

Natural Water Content (w) 9.5 %
Specific Gravity (Gs) _____

In Place Density (γ_o) 113.1 pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	100
4	99
10	99
20	98
40	96
100	94
200	92

HYDROMETER ANALYSIS:

Grain size (mm)	%
.02	70
.005	53

Plastic Limit P.L. 19 %
Liquid Limit L. L. 36 %
Plasticity Index P.I. 17 %
Shrinkage Limit _____ %
Flow Index _____
Shrinkage Ratio _____ %
Volumetric Change _____ %
Lineal Shrinkage _____ %

MOISTURE DENSITY: ASTM METHOD

Optimum Moisture Content - w_o _____ %
Maximum Dry Density - γ_d _____ pcf
California Bearing Ratio (av) _____ %
Swell: 1 Days 5.3 %
Swell against 1630 psf Wo gain 8.9 %

BEARING:

Housel Penetrometer (av) 6000+ psf
Unconfined Compression (qu) _____ psf
Plate Bearing: _____ psf
Inches Settlement _____
Consolidation % under psf

PERMEABILITY:

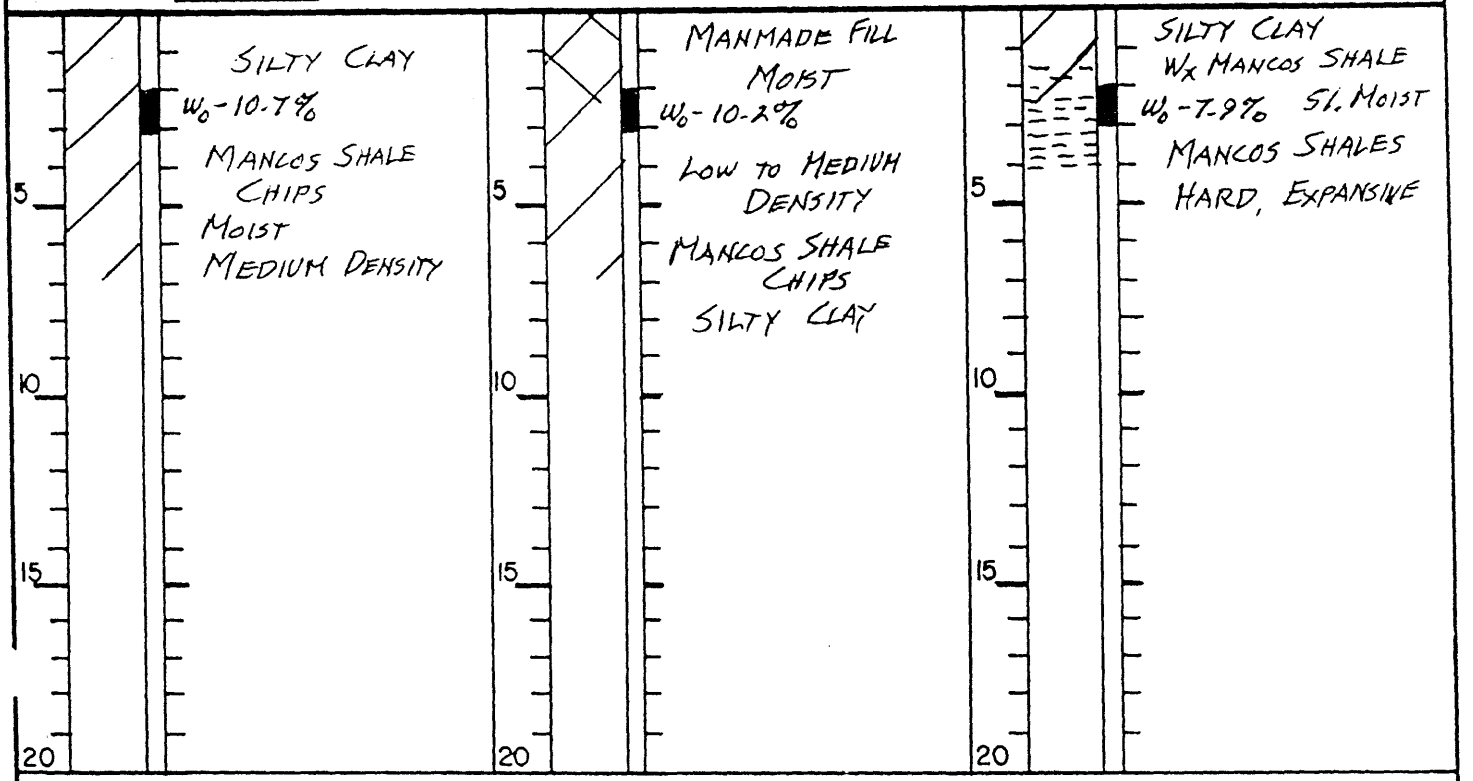
K (at 20°C) _____
Void Ratio _____

Sulfates 1000 ppm.

SOIL ANALYSIS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS, COLORADO

TEST BORING No.	P-1	P-2	P-3
ELEVATION			



ALL SOILS ARE NEARLY IDENTICAL

AASHTO CLASSIFICATION - A-6 (12)
UNIFIED CLASSIFICATION - CL

NO FREE WATER IN THESE BORINGS

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

CLUB COURTS - COUNTRY CLUB ESTATES		
MR. SID GOTTLIEB		DATE 10-23-93
JOB NO. 80088-J	DRAWN EHM	

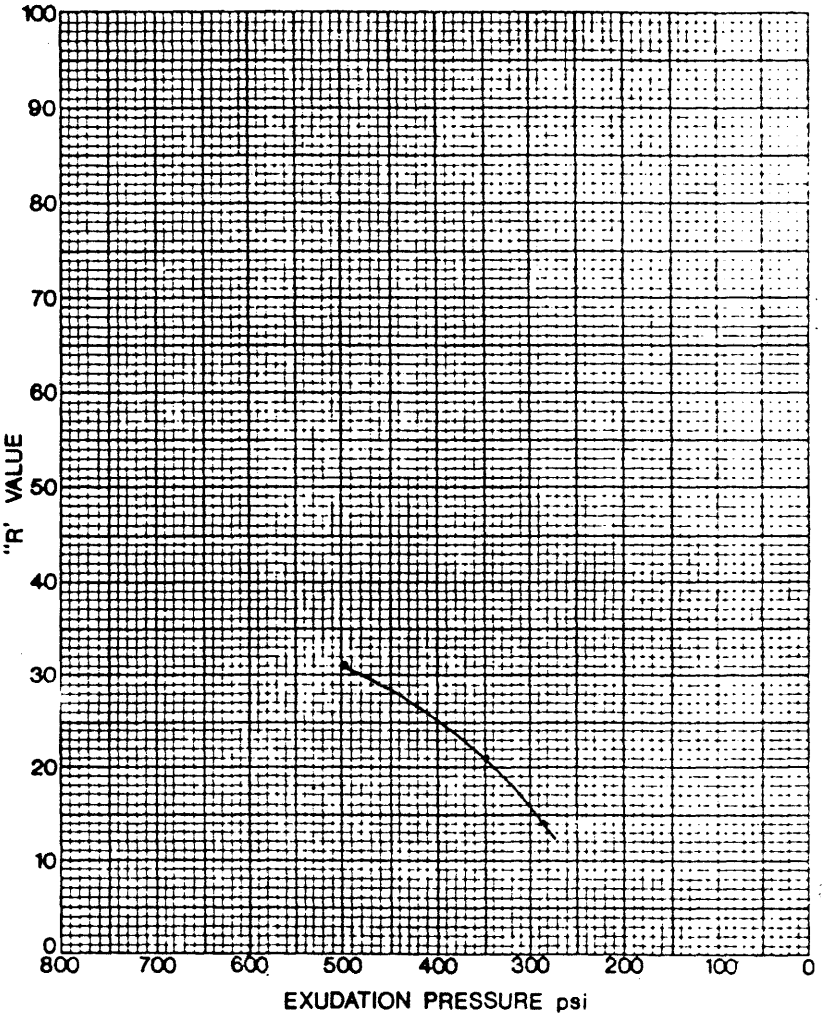
SAMPLE: SILTY CLAY, SOIL TYPE #1 AASHTO - A-6(12) UCS - CL

	TEST SPECIMAN		A	B	C	D	E
	DATE TESTED		12-28-93	—	—		
SPECIMEN FABRICATION	Compactor Air Pressure	psi					
	Initial Moisture	%	7.5	7-5	7-5		
	Moisture at Compaction	%	19-5	17-5	18-5		
	Briquette Height	in.	2.56	2.48	2.51		
	Density	pcf	106.6	112.0	109.7		
	EXUDATION PRESSURE	psi	286	497	350		
	EXPANSION PRESSURE DIAL		0.0	11.	9.		
STABILOMETER	P_h at 1000 pounds	psi	42	24	36		
	P_h at 2000 pounds	psi	12.6	95	112		
	Displacement	turns	4.10	3.85	4.05		
	"R" Value						
	CORRECTED "R" VALUE		14	31	21		

EXPANSION @ 300 PSI EXUDATION PRESSURE 17.3
DISPLACEMENT @ 300 PSI EXUDATION PRESSURE 4.09
"R: VALUE @ 300 PSI EXUDATION PRESSURE 16

1½"	
1"	
3/4"	
1/2"	
3/8"	100
4	99
10	98
20	96
40	94
100	85
200	80
.02 mm	68
.005 mm	47

LIQUID LIMIT	35
PLASTIC LIMIT	16
PLASTICITY INDEX	19
SAND EQUIVALENT	



Lincoln DeVore, Inc.
Geotechnical Consultants

COUNTRY CLUB ESTATES, GRAND JUNCTION, CO

MR. SID GOTTLIEB

DATE 12-23-93

JOB NO. 80088-J

DRAWN EMH

THOMAS A. LOGUE
LAND DEVELOPMENT CONSULTANTS

February 1, 1994

Grand Junction Planning Commission
250 North 5th. Street
Grand Junction, CO 81501

RE: COUNTRY CLUB ESTATES, FINAL PLAT & PLAN

Dear Members:

Attached is the Final Plat and Plan application for Country Club Estates located SE of G Road and 12th. Street.

This submittal addresses the conditions of approval during the Preliminary Plan review process.

Changes made to the Preliminary Plan which are incorporated in the Final Plat and Plan include:

1. Reconfigation of the turn arounds utilizing conventional cul-de-sacs.

2. Providing a Pedestrian and Golf Cart easement to Westcliff Drive.

3. Building envelopes with detailed setback requirements are attached.

4. Additional details for fencing and landscaping of open areas are included with the application. Site distance triangles have been incorporated on the plan.

5. Since an area wide storm water detention facility has been proposed by others a short distance south of the property, funds will be escrowed in accordance with the City's escrow schedule for storm water management.

All other elements of the initial Preliminary Plan Application consistent with the above modifications remain unchanged.

The applicant and myself will be present at the scheduled Public Hearings to discuss the application and answer any questions which may arise.

Respectfully,

Thomas A. Logue

Thomas A. Logue

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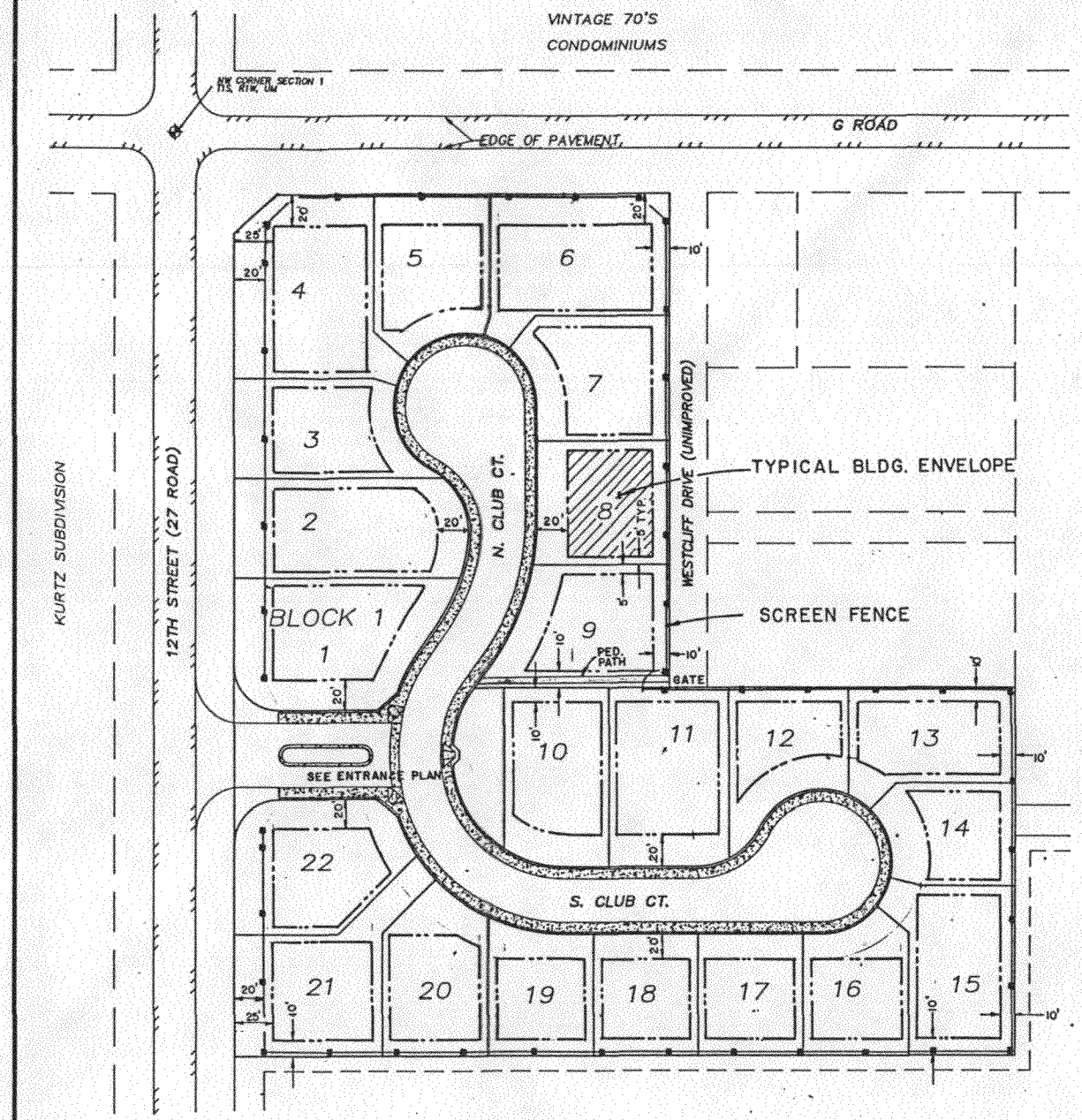
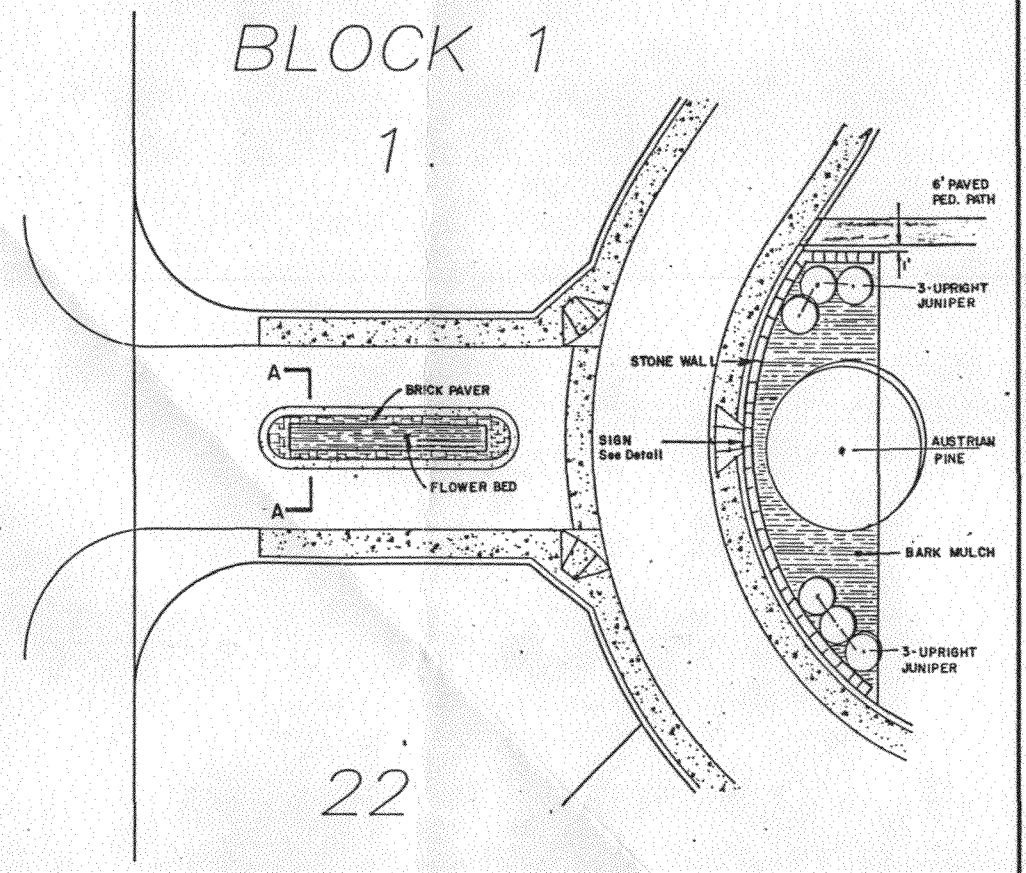
#21 94

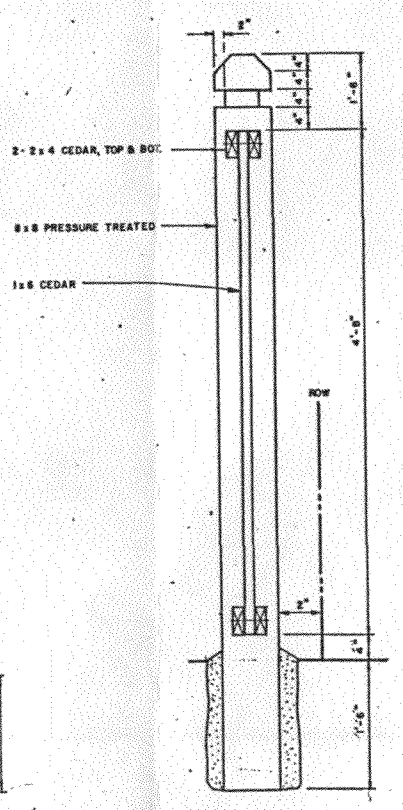
227 SOUTH 9TH STREET • GRAND JUNCTION, COLORADO 81501
(303) 245-4099

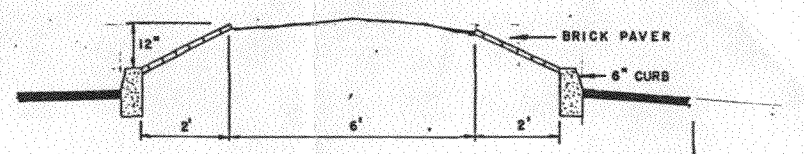




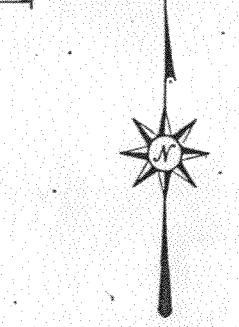
ENTRANCE PLAN

POST DETAIL





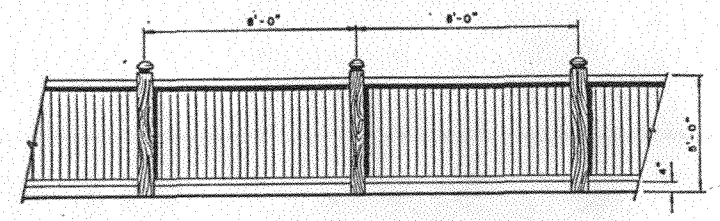
SECTION A-A



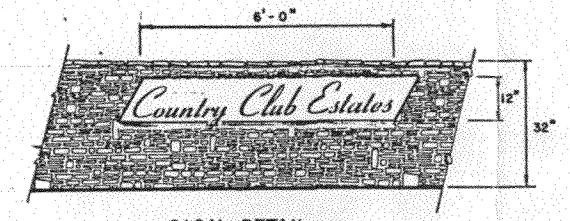
SCALE 1" = 50'

50 0 50 100

BENCHMARK; SECTION CORNER AT 12TH AND "G" ROAD ELEVATION = 4692.59



SCREEN FENCE



SIGN DETAIL

#21 94

Original
Do NOT Remove
From Office

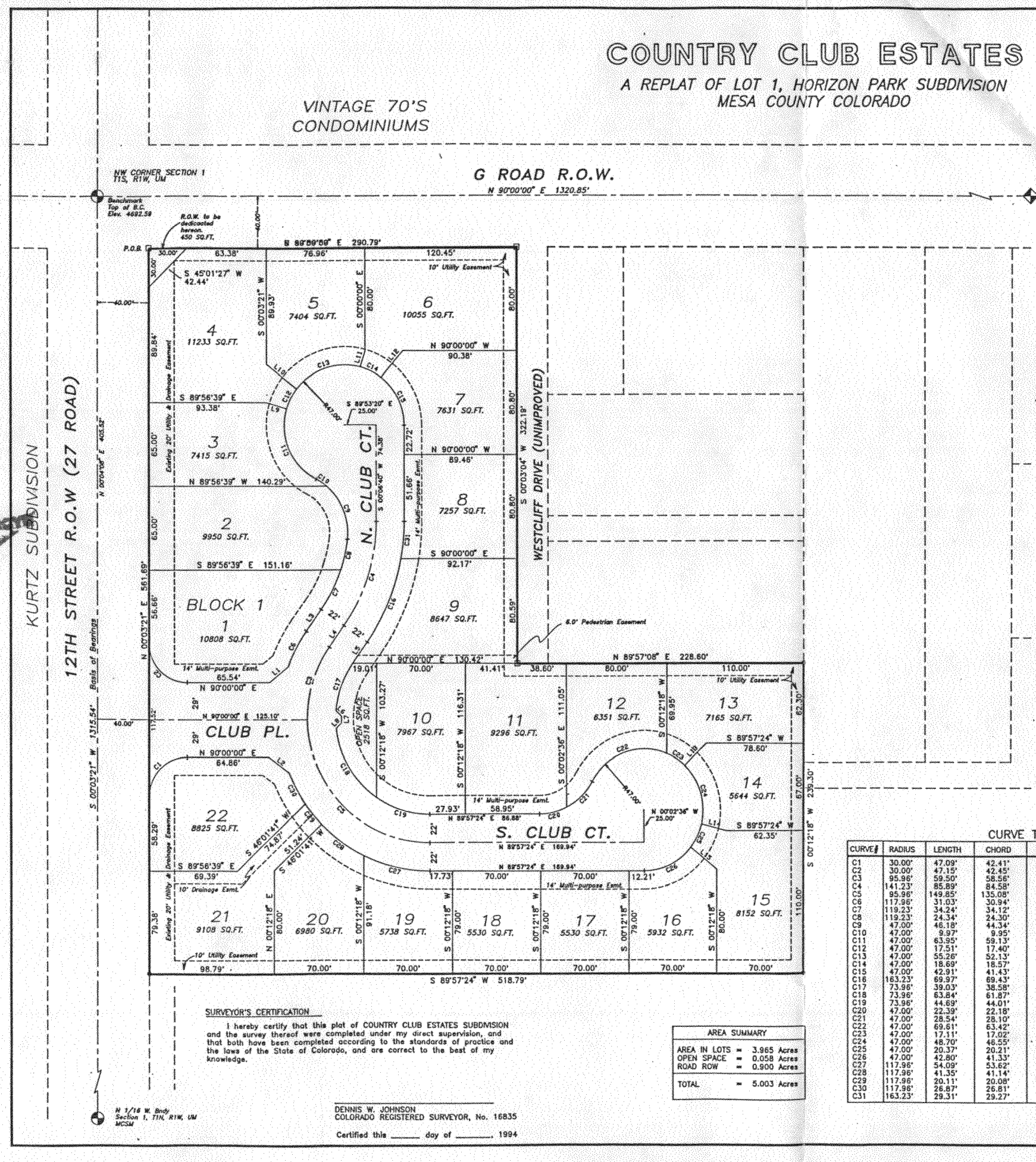
SITE DEVELOPMENT PLAN
COUNTRY CLUB ESTATES

THOMAS A. LOGUE
LAND DEVELOPMENT CONSULTANT

PROJECT NO. 9383	SHEET 1	OF 1
DATE: FEBRUARY, 1994		

COUNTRY CLUB ESTATES

A REPLAT OF LOT 1, HORIZON PARK SUBDIVISION
MESA COUNTY COLORADO



SCALE: 1"=40'

40 20 0 40

LEGEND

- MESA COUNTY OR BLM SURVEY MONUMENT
- O CALCULATED POSITION (NOT SET)
- • SET ALUMINUM CAP ON No. 5 REBAR, PLS 16835,IN CONCRETE
- (R) RECORD MEASUREMENT
- □ FOUND PROPERTY CORNER AS NOTED

NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT, MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF CERTIFICATION SHOWN HEREON.

BASIS OF BEARINGS

Basis of bearings assume the West line of the NW1/4 NW1/4 of Section 1 to bear S 00°03'21" W 1315.54 feet. Both monuments on this line are or Mesa County Survey Monuments as shown on the accompanying plat.

Easement and title documents (schedules A&B) provided by Meridian Land Title Company – Title policy No. OP 000899

Note: Existing property corners which were recovered during this survey which were within 0.25 feet ± of the calculated position were accepted as being "in position".

MINIMUM SETBACK REQUIREMENTS	
PRINCIPAL BUILDING	
Front	20 Feet
Side	10 Feet
Rear	20 Feet
ACCESSORY BUILDING	
Front	Rear 1/2 of Lot
Side	5 Feet
Rear	5 Feet

CURVE TABLE

CURVE #	RADIUS	LENGTH	CHORD	CHORD BEARING	DELTA ANGLE	TANGENT
C1	30.00'	47.09'	42.41'	N 45°01'40" E	89°56'39"	29.97'
C2	30.00'	47.15'	42.45'	N 44°58'19" W	90°03'21"	30.03'
C3	95.96'	59.50'	58.56'	N 17°11'32" E	35°31'43"	30.74'
C4	141.23'	85.89'	84.58'	S 17°32'02" W	34°50'45"	44.32'
C5	95.96'	149.85'	135.08'	N 45°18'28" W	89°28'17"	95.08'
C6	117.96'	31.03'	30.94'	N 27°25'17" E	15°04'14"	15.60'
C7	119.23'	34.24'	34.12'	S 26°43'51" W	16°27'08"	17.24'
C8	119.23'	24.34'	24.30'	S 12°39'22" W	11°41'50"	12.21'
C9	47.00'	46.18'	44.34'	S 21°20'18" E	56°17'29"	25.14'
C10	47.00'	9.97'	9.95'	S 55°33'41" E	12°09'15"	5.00'
C11	47.00'	63.95'	59.13'	N 22°39'42" W	77°57'12"	38.03'
C12	47.00'	17.51'	17.40'	N 26°59'07" E	21°20'25"	8.86'
C13	47.00'	55.26'	52.13'	N 71°20'14" E	67°21'50"	31.32'
C14	47.00'	18.69'	18.57'	S 63°35'13" E	22°47'16"	9.47'
C15	47.00'	42.91'	41.43'	S 26°02'27" E	52°18'15"	23.08'
C16	163.23'	69.97'	69.43'	S 22°40'38" W	24°33'32"	35.53'
C17	73.96'	39.03'	38.58'	N 19°50'23" E	30°14'02"	19.98'
C18	73.96'	63.84'	61.87'	N 30°41'45" W	49°27'16"	34.06'
C19	73.96'	44.69'	44.01'	S 72°43'59" E	34°37'14"	23.05'
C20	47.00'	22.39'	22.18'	N 76°18'25" E	27°17'57"	11.41'
C21	47.00'	28.54'	28.10'	S 45°15'46" W	34°47'22"	14.72'
C22	47.00'	69.61'	63.42'	N 70°17'40" E	84°51'10"	42.96'
C23	47.00'	17.11'	17.02'	S 56°50'54" E	20°51'41"	8.65'
C24	47.00'	48.70'	46.55'	S 16°44'05" E	59°21'57"	26.79'
C25	47.00'	20.37'	20.21'	S 25°21'57" W	24°50'08"	10.35'
C26	47.00'	42.80'	41.33'	N 63°52'13" E	52°10'22"	23.01'
C27	117.96'	54.09'	53.62'	S 76°54'25" E	26°16'21"	27.53'
C28	117.96'	41.35'	41.14'	S 53°43'42" E	20°05'05"	20.89'
C29	117.96'	20.11'	20.08'	N 38°48'11" W	09°45'57"	10.08'
C30	117.96'	26.87'	26.81'	N 27°23'43" W	13°02'57"	13.49'
C31	163.23'	29.31'	29.27'	S 05°15'16" W	10°17'13"	14.69'

LINE TABLE

LINE #	BEARING	DISTANCE
L1	S 50°15'32" W	18.90'
L2	S 53°01'47" E	20.06'
L3	N 34°57'24" E	20.16'
L4	N 34°57'24" E	20.16'
L5	N 34°57'24" E	20.16'
L6	S 45°00'00" E	6.17'
L7	S 00°25'00" W	5.24'
L8	S 45°00'00" W	5.90'
L9	N 72°58'24" W	16.58'
L10	S 50°48'20" E	30.61'
L11	S 17°20'52" W	13.19'
L12	S 39°41'06" W	27.09'
L13	S 45°18'52" W	24.17'
L14	N 74°41'38" W	20.52'
L15	S 50°19'54" E	26.88'

AREA SUMMARY

AREA IN LOTS	=	3.965 Acres
OPEN SPACE	=	0.058 Acres
ROAD ROW	=	0.900 Acres
TOTAL	=	5.003 Acres

SURVEYOR'S CERTIFICATION

I hereby certify that this plat of COUNTRY CLUB ESTATES SUBDIVISION and the survey thereof were completed under my direct supervision, and that both have been completed according to the standards of practice and the laws of the State of Colorado, and are correct to the best of my knowledge.

DENNIS W. JOHNSON
COLORADO REGISTERED SURVEYOR, No. 16835

Certified this _____ day of _____, 1994

Located in the NW1/4 Section 1, T1S, R1W, UTE M.

COUNTRY CLUB ESTATES
A REPLAT OF LOT 1, HORIZON PARK SUB.
SECTION 1, T1S, R1W,
UTE MERIDIAN, MESA COUNTY, CO

Professional Surveying Services
P.O. BOX 4506
Grand Junction, CO 81502
303-241-3841

SUR. BY: JF/LD | DRAWN BY: DWJ

JOB NO. 9383 | SHEET 2 OF 2

FINAL DRAINAGE REPORT FOR:

COUNTRY CLUB ESTATES

Grand Junction, Colorado
February, 1994

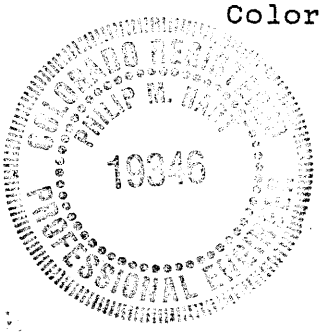
Prepared For:
Jeff Williams, Country Club Estates, LLC.
715 Horizon Drive, Suite 200, Grand Junction, CO 81506
303-245-0200

Prepared By: _____
Monty D. Stroup

"I hereby certify that this report for the final drainage design of COUNTRY CLUB ESTATES was prepared under my direct supervision."

Reviewed By: _____
Philip M. Hart, P.E.

Colorado Reg. No. 19346



I. General Location and Description

A. Site and Major Basin Location:

Country Club Estates is bounded to the north by G Road, to the west by 27 Road, (12th. Street), to the south by undeveloped alluvial lands and to the east by low density rural residential lots.

Development in the vicinity consists of Vintage 70's Condominiums to the north with Fairway Park Subdivision beyond. To the northwest lies Bella Vista Subdivision a medium density residential development. To the east of and adjacent to the site are 7 rural residential lots.

The project site and its offsite tributary basins are located approximately 750 feet north of and are ultimately tributary to Horizon Drive Channel as defined in and shown on the detailed drainage study entitled "Flood Hazard Information, Colorado River and Tributaries" (Reference 3, Exhibit I-1.0).

This project is a replat of a portion of "The Park on Horizon Drive" a multifamily development, originally planned and partially constructed in 1981. Engineering of the original development included a detailed analysis of all offsite tributary basins located north and east of the site (Reference 6, Exhibit I-2.4).

B. Site and Major Basin Description:

The project site contains approximately 5.00 acres and is planned for 22 single family residential lots. Offsite tributary sub-basins include OF1 (24.63 acres), OF2 (46.86 acres) and OF3 (2.10 acres) as shown on Exhibits I-2.0, I-2.1 and I-2.2. Sub-basin OF2 as defined on Exhibit I-2.1 was previously analyzed and defined by the "Flood Plain Permit Study for The Park On Horizon Drive" (Reference 6, Exhibit I-2.4). This basin was designated as OB-1 and was analyzed using "The Colorado Urban Hydrograph Procedure", calculation sheets are attached (Exhibits I-2.4 and IV-4.0).

The project site has been striped and is currently void of vegetation. Offsite sub-basins OF1, OF2 and OF3 are developed basins having associated ground covers.

Based on the "Soil Survey, Grand Junction Area, Colorado" (Reference 5, Exhibit I-3.0) onsite soils are defined as (Cc), hydrological soil group "D", (Rp and Rs), hydrological soil group "D" and (Pb), hydrological soil group "D". Soils within offsite sub-basin OF1 are defined as (Fs), hydrological soil group "B" and (Pb), hydrological soil group "D". Soils within offsite sub-basin OF2 are defined as (Ge), hydrological soil group "B" and

(Cb, Pa, Pb and Rs), hydrological soil group "D". Soils within offsite sub-basin OF3 are defined as being (Cc), hydrological soil group "D".

II. Existing Drainage Conditions

A. Major Basin:

Generally the area wide basin drains from the north to the south. Flows from areas north of the Horizon Drive Channel are intercepted and conveyed by roadside drainage swales and irrigation ditches to the Horizon Drive Channel.

Wetland areas have been identified and occur within an existing drainage channel herein defined as the 12th. Street Channel along 27 Road from G Road south to the Horizon Drive Channel. The channel and associated wetlands are accommodated by an existing 20'-foot wide utility, irrigation and drainage easement.

As identified in Reference 3 and shown on Exhibit I-1.0 the project site and offsite tributary basins are not within the defined 100 year floodplain for the Horizon Drive Channel.

B. Site:

Historically the property drains in a sheetflow fashion from the northeast to the southwest at approximately 4.0% slope where it is intercepted by the 12th. Street Channel adjacent to 27 Road and is subsequently conveyed south to the Horizon Drive Channel.

As the property is bounded to the west by 27 Road, a portion of off-site flows from sub-basin OF1 are intercepted and directed to the 12th. Street Channel at the northwest corner of the site via 15"-inch diameter CMP culverts under G Road and 27 Road. A portion of the offsite runoff from sub-basin OF2 is intercepted and conveyed under G Road and subsequently to the 12th. Street Channel at the northwest corner of the site via a 12"-inch diameter PVC storm sewer. Flow not conveyed by the 12"-inch pipe over tops G Road. Offsite runoff from sub-basin OF3 enters the site in a overland sheetflow fashion from the east to the west.

Runoff from offsite and onsite sub-basins are intercepted and conveyed south to the Horizon Channel via the 12th. Street Channel adjacent to 27 Road.

III. Proposed Drainage Conditions

A. Changes in Drainage Patterns:

Historic offsite drainage patterns and the way in which the flows enter the site shall not be altered.

The proposed site plan divides the site into 3 sub-basins labeled as A1 (0.80 acres), A2 (3.58 acres) & A3 (0.62 acres). Runoff from sub-basin A1 shall be conveyed via lot grading and side yard swales directly to the 12th. Street Channel adjacent to 27 Road and subsequently south to the Horizon Drive Channel. Runoff from sub-basin A2 shall be directed via lot grading and roadway alignments to sump inlets constructed in South Club Court adjacent to lots 10 and 22. This runoff shall be conveyed directly to the 12th. Street Channel via a 18"-inch RCP storm sewer. Runoff from Sub-basin A3 shall be conveyed via lot grading, side yard and rear yard swales directly to the 12th. Street Channel.

Impact to the existing wetlands is minimal and shall be confined and limited to the area of the main entrance to the site. The integrity of the existing drainage ditch and associated wetlands along 27 Road shall be preserved as development activity shall not infringe upon the existing 20'-foot utility, irrigation and drainage easement (see the Grading and Drainage Plan).

B. Maintenance Issues:

Access to and through the site shall be by dedicated public-right-of-way. Access to the 12th. Street Channel shall be by dedicated easement.

Ownership and responsibility for maintenance of the 12th. Street Channel shall be that of the City of Grand Junction.

IV. Design Criteria & Approach

A. General Considerations:

The "Interim Outline of Grading and Drainage Criteria, City of Grand Junction" (Reference 1) and the "Mesa County Storm Drainage Criteria Manual" (Reference 2) shall be used as the basis for analysis and facility design.

Area wide detention requirements for offsite and onsite basins have been addressed in the "Flood Plain Permit Study For The Park On Horizon Drive" (Reference 6). A area wide detention pond was planned for and partially constructed at the northeast corner of the intersection of Horizon Drive and 12th. Street (Exhibit IV-5.0). Based on these facts onsite detention requirements for this project are considered mitigated.

B. Hydrology:

As the project is a single family residential development containing approximately 5.0 acres the "Rational Method" was used to calculate historic and developed flow rates. The minor storm

is the 2 year frequency rainfall event and the major storm is the 100 year frequency rainfall event.

Runoff Coefficients used in the computations are based on the most recent City of Grand Junction criteria as defined in Reference 1 and shown on Exhibit IV-1.0.

As the project is located within the Grand Junction Urbanized area the Intensity Duration Frequency Curves (IDFC) shown on Exhibit IV-2.0 were used for design and analysis.

Times of Concentration were calculated based on the Average Velocities For Overland Flow and the Overland Flow Curves as provided in Reference 1 and shown on Exhibits IV-3.0 and 3.1.

A portion of the total runoff from offsite sub-basin OF1 is conveyed, limited and directed to the 12th. Street Channel via an existing 15"-inch CMP under 12th. Street. Runoff from offsite sub-basin OF2 is conveyed to the 12th. Street Channel at the northwest corner of the project site and subsequently south to the planned area wide detention pond at the intersection of 12th. Street and Horizon Drive. Runoff calculations for this basin were based on information provided in Reference 6. Runoff from sub-basin OF3 shall be allowed to pass without detention through the site directly to the 12th. Street Channel.

Runoff from onsite sub-basins A1 and A3 are conveyed via overlot grading and swales directly to the 12th. Street Channel. A calculation of flow rates associated with the 2 year storm event for these sub-basins is not critical to the design of the local drainage. Therefore the 100 year was calculated and used to analyze the impact of development on the 12th. Street Channel.

The 2 year and 100 year storm events were calculated for sub-basin A2. Street, storm sewer and inlet capacities were analyzed using these results.

C. Hydraulics:

All site facilities and conveyance elements are designed in accordance with the City of Grand Junction guidelines as provided in Reference 1.

V. Results and Conclusions

A. Runoff Rates for 2 and 100 Year Storm Events:

The calculated runoff times of concentration and runoff rates are presented on Exhibits IV-4.0, 4.1, 4.2, 4.3 and 4.4.

This Final Drainage Study has been prepared to address site specific drainage concerns in accordance with the requirements of the City of Grand Junction, Colorado. The Appendix of this report includes criteria, exhibits, tables and design nomographs used in the analysis and design.

The 12th. Street Channel is capable of conveying runoff generated by the 100 year storm event from offsite and onsite sub-basins. Proposed lots are not within the calculated 100 year floodplain for the 12th. Street Channel.

VI. References

1. Interim Outline of Grading and Drainage Criteria, City of Grand Junction, July, 1992.

2. Mesa County Storm Drainage Criteria Manual, Final Draft, Mesa County, Colorado, March, 1992.

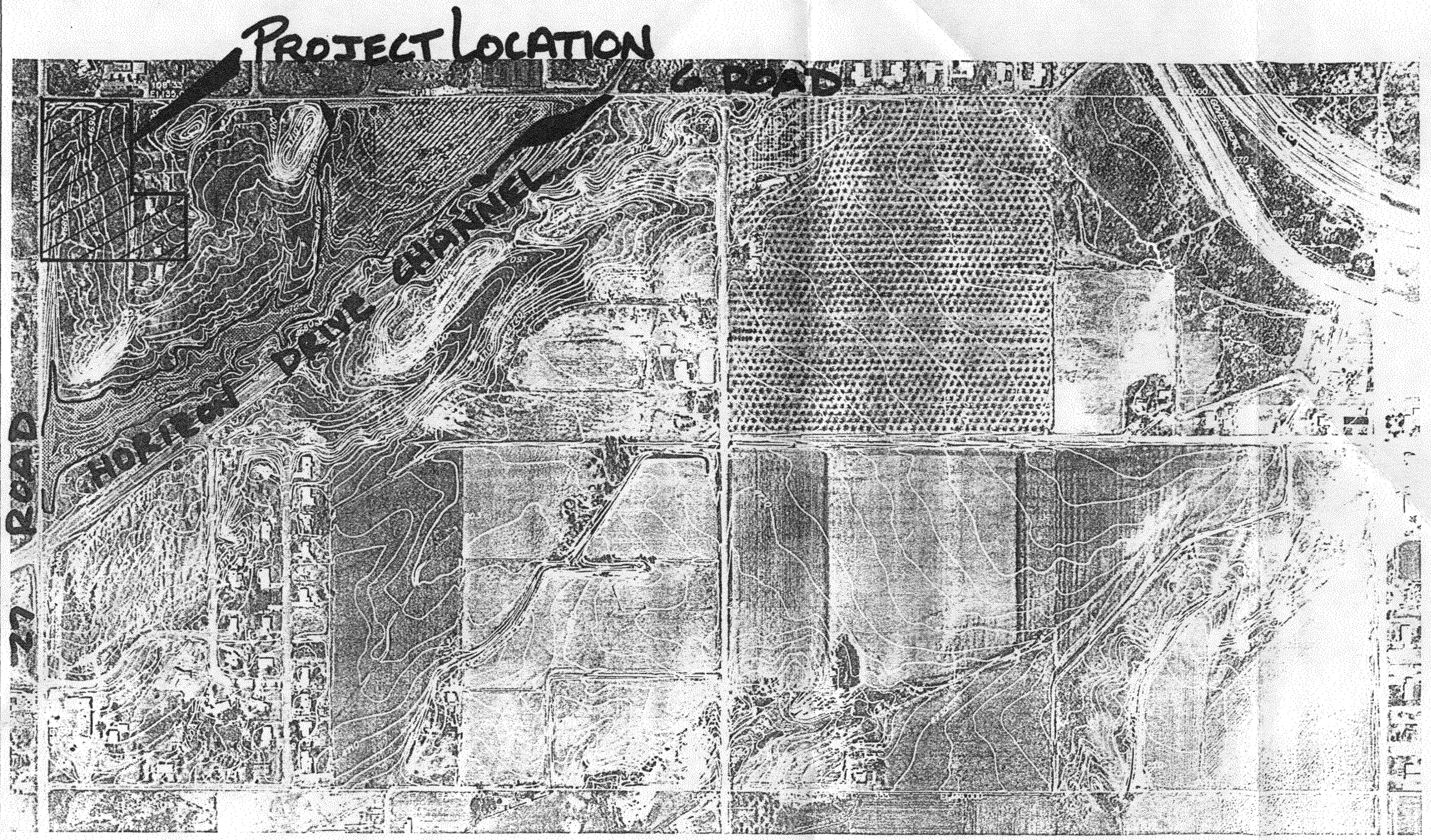
3. Flood Hazard Information, Colorado River and Tributaries, Grand Junction, Colorado, prepared for the City of Grand Junction and Mesa County, by The Department Of The Army, Sacramento District, Corps Of Engineers, Sacramento, California, November, 1976.

4. Flood Insurance Rate Map, Mesa County, Colorado, (Unincorporated Areas), Community Panel Number 080115 0460 B, Federal Emergency Management Agency, Map Revised July 15th, 1992.

5. Soil Survey, Grand Junction Area, Colorado, Series 1940, No. 19, U.S. Department of Agriculture, issued November, 1955.

6. Flood Plain Permit Study For "The Park On Horizon Drive", TRI-CONSULTANTS, INC., Denver, Colorado, March, 1981, Job No. 07430.

APPENDIX



LEGEND

Overflow Limits

100 Year Flood

500 Year Flood

500 Year Sheet Flo

19+00 Distance in thousa of feet upstream f mouth along tribut streams.

NOTES

Map based on April 1975 orthophoto map provided by the U.S. Bureau of Reclamation. Minor additions and justments made by Corps of Enginee

Sheet number agrees with sheet number shown on Bureau of Recla- mation maps.

Limits of overflow shown may vary actual locations on the ground bec of accuracy of available topograph

Areas outside the overflow limits shown may be subject to flooding from local runoff.

SCALE IN FEET
200 0 200 400 6

CONTOUR INTERVAL 2 FEET
MEAN SEA LEVEL DATUM

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENG
SACRAMENTO, CALIFORNIA

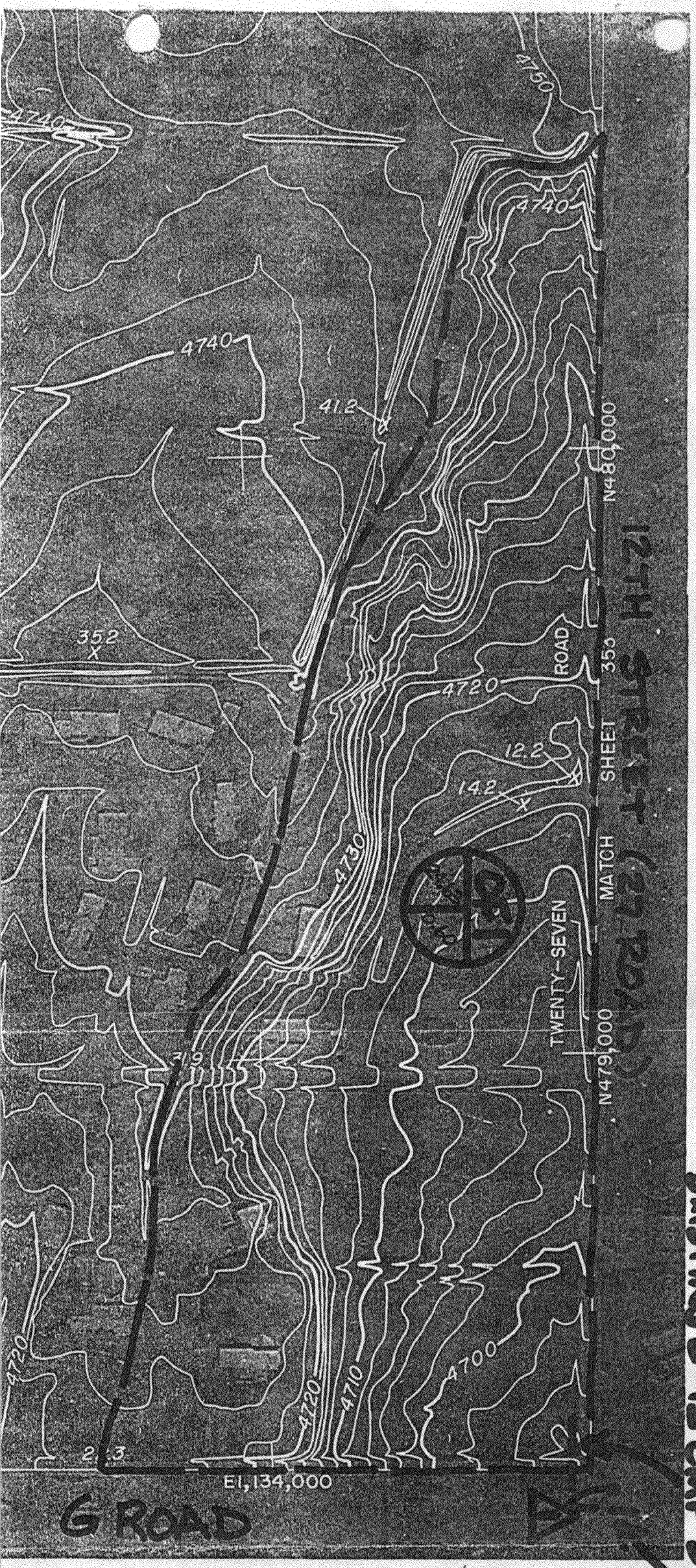
FLOOD HAZARD INFORMATIO COLORADO RIVER AND TRIBUTA GRAND JUNCTION, COLORAD

FLOODED AREAS

NOVEMBER 1976

SHEET 354 PLA

EXHIBIT I-1.0



SEE EXHIBIT I-2.1

SEE EXHIBIT I-2.3

SEE EXHIBIT I-2.0

N

MAG.

320	336	352
321	337	353
322	338	354

SHEET INDEX

ORTHOPHOTOGRAPHY : IMAGES OF OBJECTS NOT AT GROUND LEVEL MAY BE DISPLACED.

COLORADO STATE PLANE COORDINATES CENTRAL ZONE
BASED ON ELEVATION 4700 FEET. C.A.F. 1.000288278

200 0 200 400 600
SCALE OF FEET

U.S.C. & G.S. DATUM
CONTOUR INTERVAL 2 FEET

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLORADO RIVER BASIN SALINITY CONTROL PROJECT

GRAND VALLEY UNIT – COLORADO

ORTHOPHOTO MAP
TOPOGRAPHY

TOPOG _____ SUBMITTED _____

INKED _____ RECOMMENDED _____

CHECKED _____ APPROVED _____

GRAND JUNCTION, COLORADO APRIL 13, 1975
SHEET 337 OF 488

1295-417-


EL 136,000
EL 135,000
108° 33'
N480,000
N479,000
33rd
MATCH
SHEET
ROAD
TWENTY-SEVEN
12TH STREET (27 ROAD)
FAIRWAY PARK SUBDIVISION
VINTAGE 70'S CONDOS
ORIGIN OF FLOW
SEE EXHIBIT I-2.0
Ex. 2-15" Ø CMPs
SEE EXHIBIT I-2.2
EXHIBIT I-2.1

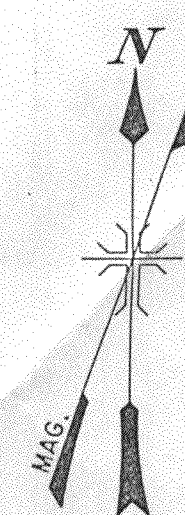
SEE EXHIBIT I-2.1

SEE EXHIBIT I-2.3

EXHIBIT I-2.2

JEE EXHIBIT I-2.0

COUNTRY CLUB ESTATES SEE EXHIBIT I-2.2



321	337	353
322	338	354
323	339	355

SHEET INDEX

ORTHOPHOTOGRAPHY: IMAGES OF OBJECTS NOT AT GROUND MAY BE DISPLACED.

COLORADO STATE PLANE COORDINATES CENTRAL ZONE BASED ON ELEVATION 4700 FEET. C.A.F. 1.000286278

200 0 200 400

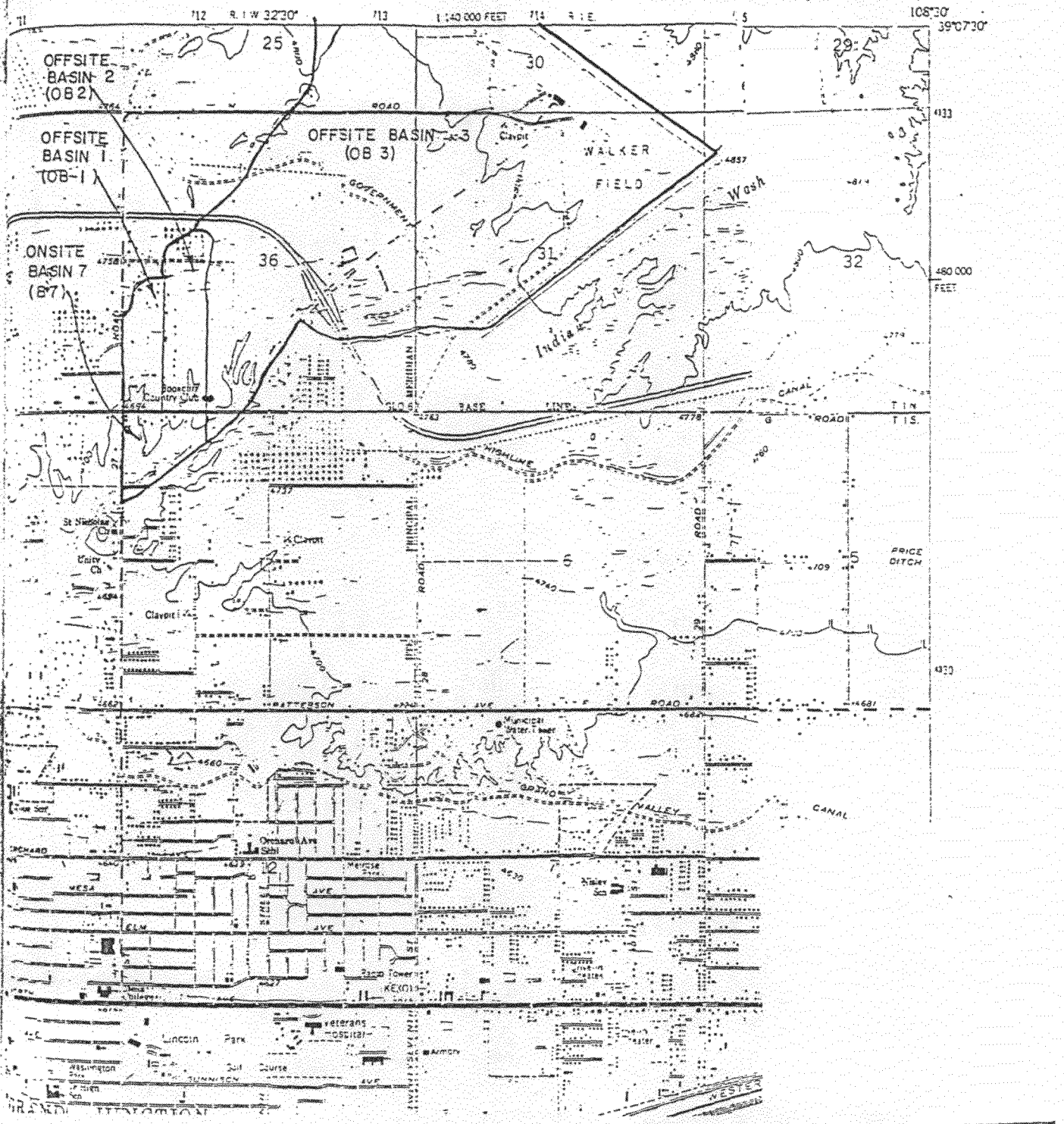
SCALE OF FEET

U.S.C. & G.S. DATUM

CONTOUR INTERVAL 2 FEET

FIGURE 6
DRAINAGE BASIN MAP

GRAND JUNCTION QUADRANGLE
COLORADO-MESA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

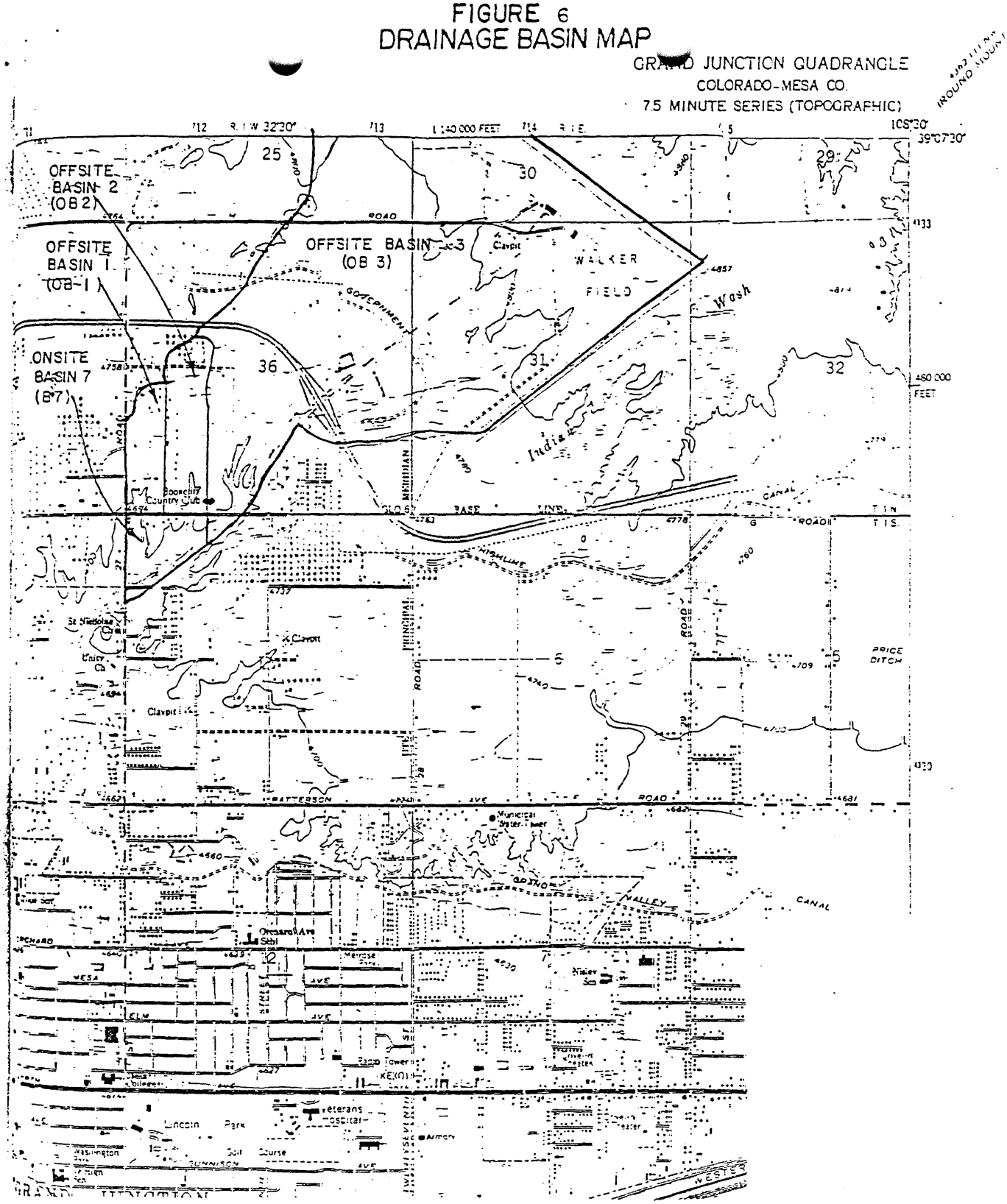


TRI-CONSULTANTS, INC.
CONSULTING ENGINEERS AND LAND SURVEYORS
7500 West Mississippi, Suite 30 / Denver, Colorado 80226 / (303) 922-1155

PROJECT: THE PARK AT HORIZON DRIVE

EXHIBIT I-2.4

FIGURE 6
DRAINAGE BASIN MAP



TRI-CONSULTANTS, INC.
CONSULTING ENGINEERS AND LAND SURVEYORS
7500 West Mississippi, Suite 30 / Denver, Colorado 80226 / (303) 922-1156

PROJECT: THE PARK AT HORIZON DRIVE

EXHIBIT I-3.1

APPENDIX B

RATIONAL METHOD
RECOMMENDED AVERAGE RUNOFF COEFFICIENTS

Land Use or Surface Characteristics	"C" VALUES 2-YR STORM A&B*	2-YR STORM C&D*	100-YR STOR A&B*	100-YR STOR C&D*	
Undeveloped Areas (Vacant or pre-development analysis condition)	0.10	0.20	0.25	0.35	
Residential Areas					
Less than 1/8 acre per unit	0.55	0.65	0.70	0.80	PROJECT SITE
1/8 acre per unit	0.50	0.60	0.65	0.75	OFFSITE
1/4 acre per unit	0.40	0.50	0.55	0.65	BASINS
1/3 acre per unit	0.35	0.45	0.50	0.60	
1/2 acre per unit	0.30	0.40	0.45	0.55	
1 acre per unit	0.25	0.35	0.40	0.50	
Pavement and Roofs	0.90	0.90	0.95	0.95	
Gravel and Soil Traffic areas	0.70	0.70	0.85	0.85	
Lawns and Green Landscaping	0.15	0.25	0.30	0.40	
Gravel and Non-Green Landscaping	0.45	0.50	0.60	0.70	
Parks, Cemeteries, Pastures	0.25	0.35	0.40	0.50	
Schools	0.45	0.50	0.60	0.70	

* Refers to SCS soil hydrologic group classification.

EXHIBIT IV-1.0

INTENSITY DURATION FREQUENCY CURVES
GRAND JUNCTION, COLORADO

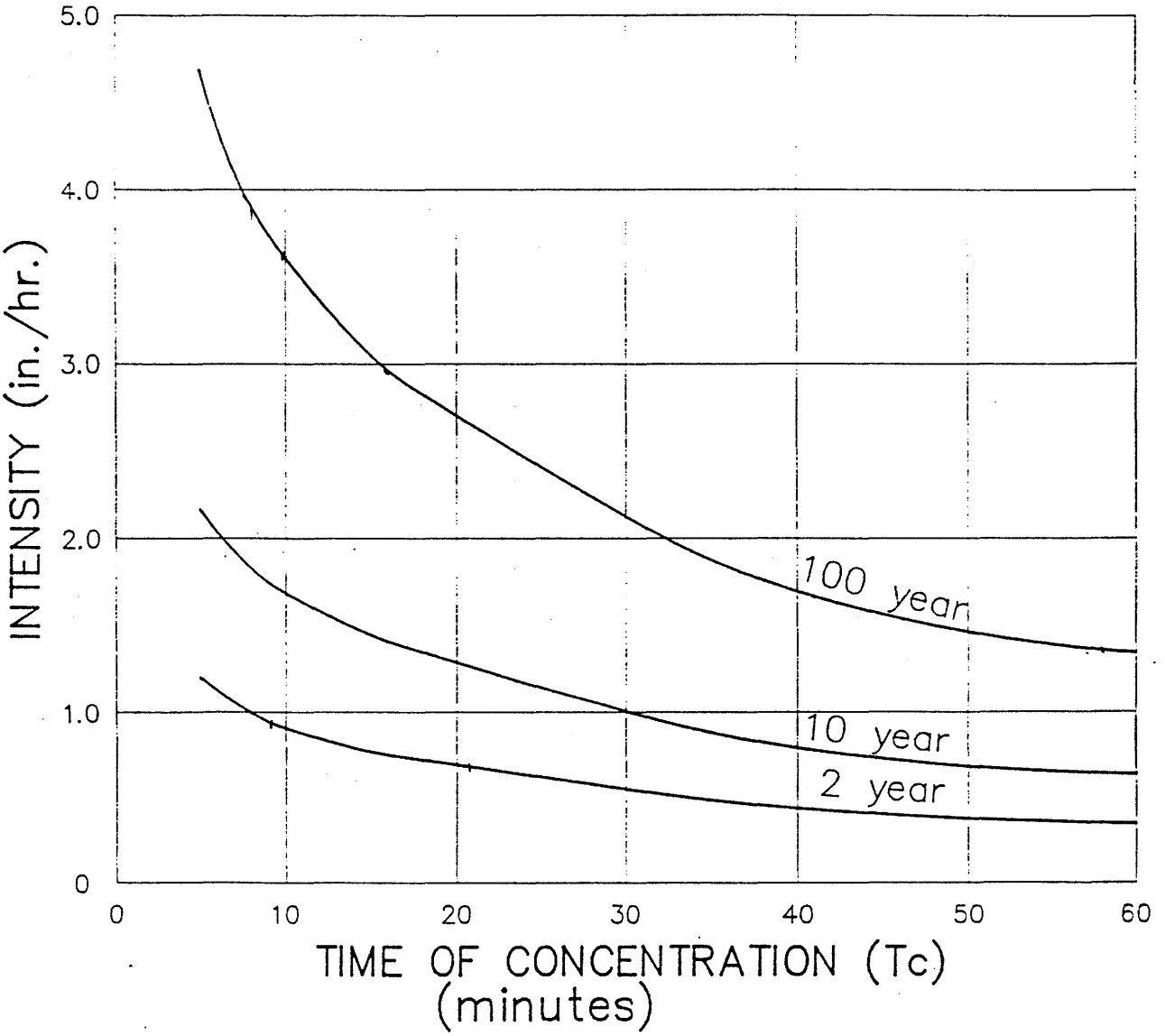
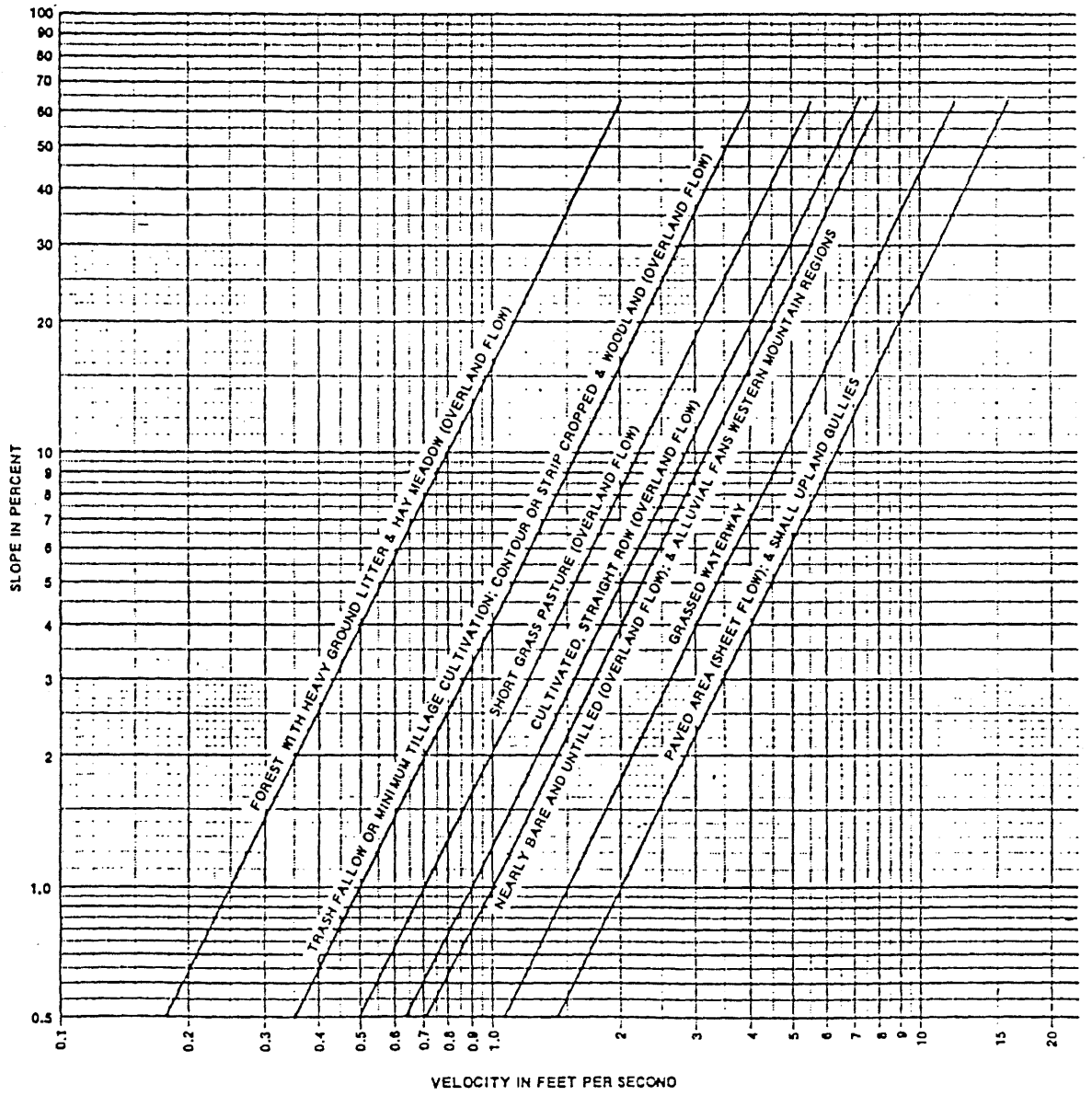


EXHIBIT IV-2.0

MESA COUNTY
STORM DRAINAGE CRITERIAL MANUAL

FIGURE 402

Taken from TR-55 (1975) and NEH-4, both SCS publications.

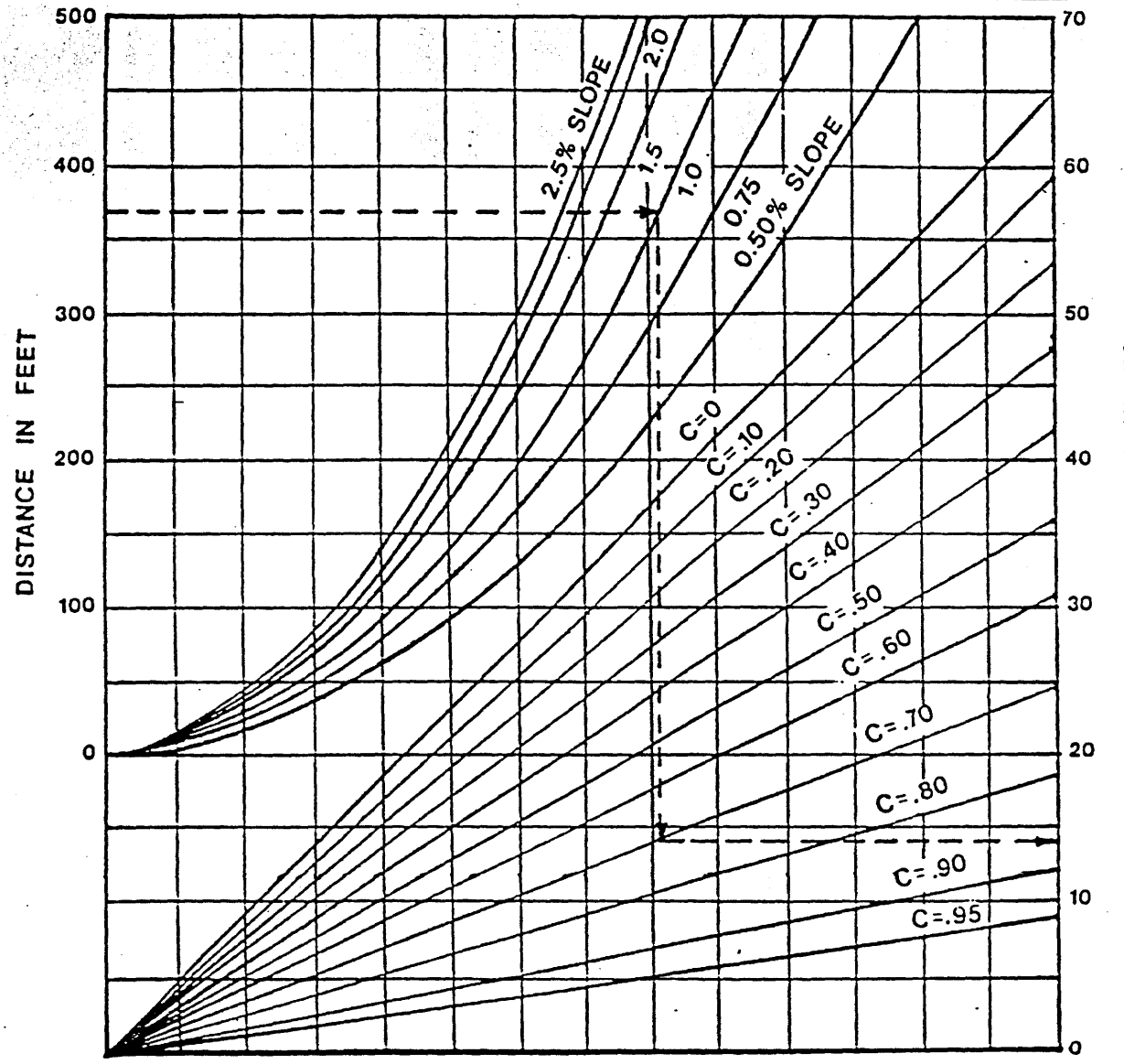


AVERAGE VELOCITIES FOR OVERLAND FLOW

EXHIBIT IV-3.0

MESA COUNTY
STORM DRAINAGE CRITERIAL MANUAL

FIGURE 403



THE ABOVE CURVES ARE A SOLUTION OF THE FOLLOWING EQUATION:

$$t_c = \frac{1.8\,(1.1 - C_{10})\sqrt{L}}{\sqrt[3]{S}}$$

where: t_c = initial flow time (min.)
S = slope of basin (%)
C_{10} = runoff coeficient for 10 year frequency
L = length of basin (ft.)

Notes: 1. The curves are for use with the Rational Method.

2. The curves shall not be used for distances in excess of ~~500~~ 300'

EXHIBIT IV-3.1

OVERLAND FLOW CURVES

OFFSITE BASIN 1 FOR HORIZON PROJECT
100 50 10 5 AND 2 YEAR STORMS

100 YEAR STORM HYDROGRAPH
2 HR DURATION

AREA	= 0.061	SQ MI	STORM TPEAK	=	58 MIN
LENGTH	= 0.455	MILES	STORM QPEAK	=	62. CFS +2 = 64cfs
LENGTH-CA	= 0.218	MILES	QP/AC	=	1.569 CFS/AC
PERVIOUS	= 0.80		QP/SMI	=	1004. CFS/SQ MI
IMPERVIOUS	= 0.20		TOTAL PRECIP	=	2.02 IN
INFIL(1HR)	= 1.000	IN	EXCESS PRECIP	=	1.05 IN
LOSS	= 0.050		UNIT VOLUME	=	3.3 AF
			STORM VOLUME	=	3.5 AF

CT=0.70 CP=0.69 K= 0

TIME (MIN)	STORM PRECIP (IN)	EXCESS PRECIP (IN)	UNIT HYDRO (CFS)	STORM HYDRO (CFS)
0	0.00	0.00	0.	0.
10	0.06	0.00	15.	0.
20	0.07	0.01	61.	0.
30	0.35	0.07	47.	0.
40	1.04	0.80	30.	6.
50	0.27	0.14	22.	31.
60	0.06	0.01	16.	62.
70	0.04	0.01	12.	41.
80	0.03	0.01	9.	29.
90	0.03	0.01	7.	21.
100	0.02	0.00	5.	16.
110	0.02	0.00	4.	12.
120	0.02	0.00	3.	9.
130			2.	7.
140			1.	5.
150			1.	4.
160			0.	3.
170			0.	2.
180			0.	1.

EXHIBIT IV-4.0

TRI-CONSULTANTS, INC.
CONSULTING ENGINEERS AND LAND SURVEYORS
7900 West Mansanarres, Suite 30 / Denver, Colorado 80228 / (303) 922-1154

PROJECT: THE PARK AT HORIZON DRIVE

TIME OF CONCENTRATION CALCULATIONS (2 YEAR STORM EVENT)

PROJECT: COUNTRY CLUB ESTATES
JOB # 93-419
T A L

(OVERLAND FLOW)
DEVELEOPED CONDITION

DATE: 01-Feb-94

SUB-BASIN DATA			INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME TIME (Tt)				INITIAL	Tc CHECK (URBANIZED BASINS)		FINAL Tc	REMARKS
BASIN	C 2	AREA AC.	LENGTH FT.	SLOPE %	Ti MIN.	LENGTH FT.	SLOPE %	VEL F.P.S.	Tt MIN.	Tc MIN.	TOTAL LENGTH FT.	Tc = (L/180)+10 MIN.	MIN.	
OF2	———	46.86	———	———	———	———	———	———	———	———	———	———	NA	OFFSITE FAIRWAY PARK SUB. Tp PER TRI-CONSULTANTS
OF3	0.60	2.10	400.0	2.00	14.29	———	———	———	———	14.29	400.00	12.22	12.22	OFFSITE OVERLAND FLOW
A1	0.65	0.80	260.0	2.31	9.88	———	———	———	———	9.88	260.00	11.44	9.88	OVERLAND TO 12TH. ST. CHANNEL
A2	0.65	3.58	155.0	3.87	6.42	322.0	1.21	3.22	1.67	8.09	477.00	12.65	8.09	OVERLAND FLOW TO NORTH CLUB CT STREET FLOW TO SUMP INLETS
A3	0.65	0.62	45.0	2.00	4.31	480.0	0.48	1.72	4.65	8.96	525.00	12.92	8.96	OVERLAND TO REAR YARD SWALE SWALE TO 12TH. ST. CHANNEL

FORMULAS

$$Ti = \frac{1.8(1.1-C)(L)^{1/2}}{S^{1/3}} \qquad Tt = \frac{(L)}{60 \text{ SEC/MIN. } (V \text{ F.P.S.})}$$

EXHIBIT A-1

TIME OF CONCENTRATION CALCULATIONS (100 YEAR STORM EVENT)

PROJECT: COUNTRY CLUB ESTATES
JOB # 93-419
TAL

(OVERLAND FLOW)
DEVELEOPED CONDITION

DATE: 01-Feb-94

SUB-BASIN DATA			INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME TIME (Tt)				INITIAL	Tc CHECK (URBANIZED BASINS)		FINAL Tc	REMARKS
BASIN	C 100	AREA AC.	LENGTH FT.	SLOPE %	Ti MIN.	LENGTH FT.	SLOPE %	VEL F.P.S.	Tt MIN.	Tc MIN.	TOTAL LENGTH FT.	Tc = (L/180)+10 MIN.	MIN.	
OF2	—	46.86	—	—	—	—	—	—	—	—	—	—	58.00	OFFSITE FAIRWAY PARK SUB. Tp PER TRI-CONSULTANTS
OF3	0.75	2.10	400.0	2.00	10.00	—	—	—	—	10.00	400.00	12.22	10.00	OFFSITE OVERLAND FLOW
A1	0.80	0.80	260.0	2.31	6.59	—	—	—	—	6.59	260.00	11.44	6.59	OVERLAND TO 12TH. ST. CHANNEL
A2	0.80	3.58	155.0	3.87	4.28	322.0	1.21	3.22	1.67	5.95	477.00	12.65	5.95	OVERLAND FLOW TO NORTH CLUB CT STREET FLOW TO SUMP INLETS
A3	0.80	0.62	45.0	2.00	2.88	480.0	0.48	1.72	4.65	7.53	525.00	12.92	7.53	OVERLAND TO REAR YARD SWALE SWALE TO 12TH. ST. CHANNEL

FORMULAS

$$Ti = \frac{1.8(1.1-C)(L)^{1/2}}{1/3} \qquad Tt = \frac{(L)}{60\ SEC/MIN.\ (V\ F.P.S.)}$$

EXHIBIT IV-4.2

STORM DRAINAGE SYSTEM DESIGN DATA

(100 YEAR STORM EVENT)
DEVELOPED CONDITION
CITY OF GRAND JUNCTION, COLORADO

PROJECT: COUNTRY CLUB ESTATES
JOB # 93-419
TAL

DATE: 01-Feb-94

LOCATION OR NODE	BASINS	LENGTH FEET	INLET TIME min.	FLOW STREET	FLOW PIPE	TIME T C min.	COEFF. "C"	INTENSITY "I"	AREA "A" AC.	DIRECT RUNOFF C.F.S.	OTHER RUNOFF C.F.S.	SUM RUNOFF C.F.S.	STREET SLOPE %	STREET CAPACITY ALLOWED C.F.S.	PIPE SLOPE %	PIPE SIZE IN.	PIPE CAPACITY ALLOWED C.F.S.	STREET DESIGN F.P.S.	STREET VELOC. F.P.S.	PIPE DESIGN F.P.S.	PIPE VELOC. F.P.S.	REMARKS
1	OF1					NA	NA	NA	24.63	NA	3.7	3.7	CAPACITY OF 15" CMP. REMAINDER BY-PASSES ALONG WEST SIDE OF 12TH. STREET.									OFFSITE BASIN N.W. OF 12TH.& G ROAD
	OF2					58.00	NA	NA	46.86	64.0	3.7	67.7										OFFSITE FAIRWAY SUB. & VINTAGE 70'S
												>>>>>>										
2	A1			OFFSITE BASINS Tp		58.00	0.80	1.36	0.80	0.9	67.7	68.6										FLOW IN CHANNEL AT RCP X-ING @ Tp
												>>>>>>										
3	OF3					10.00	0.75		2.10													OFFSITE OVERLAND FLOW
	A2					5.95	0.80		3.58													ONSITE LOTS
						15.95	0.78	2.97	5.68	13.2		13.2	1.00	97.69								FLOW TO SUMP INLETS AND CHANNEL
												>>>>>>										
4	OF3					NA	0.75		2.10													OFFSITE OVERLAND FLOW
	A2					NA	0.80		3.58													ONSITE LOTS
				OFFSITE BASINS Tp		58.00	0.78	1.36	5.68	6.0	68.6	74.6										FLOW IN CHANNEL AT 18" RCP @ Tp
												>>>>>>										
" "	A2					7.53	0.80	3.98	0.62	2.0		2.0	0.48	3.44 CAPACITY OF SWALE								ONSITE LOTS TO CHANNEL
												>>>>>>										
" "	A2			OFFSITE BASINS Tp		58.00	0.80	1.36	0.62	0.7	74.6	75.3										FLOW IN CHANNEL AT SOUTH BOUNDARY
												>>>>>>										

EXHIBIT IV-4.3

STORM DRAINAGE SYSTEM DESIGN DATA

(2 YEAR STORM EVENT)
DEVELOPED CONDITION
CITY OF GRAND JUNCTION, COLORADO

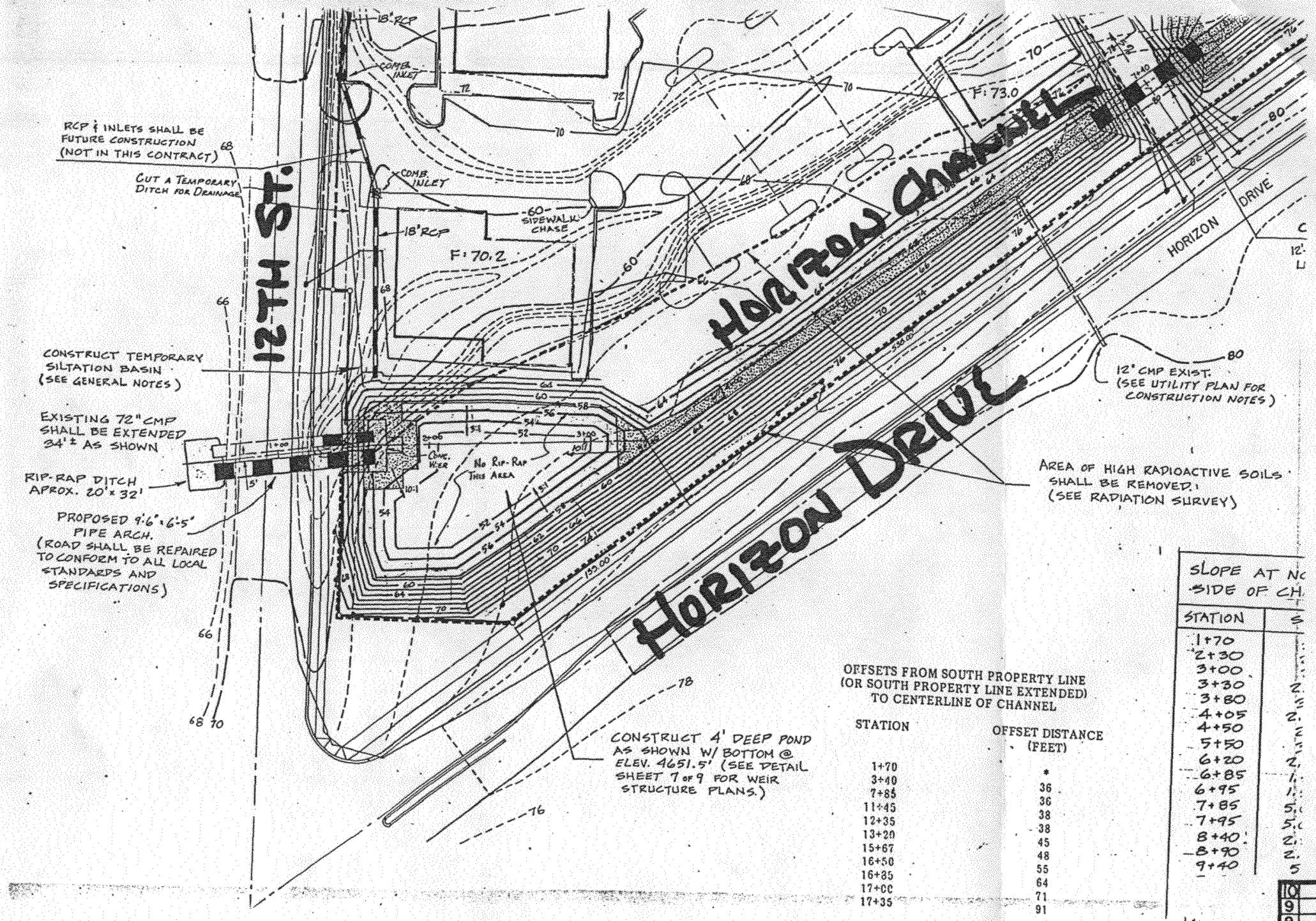
PROJECT: COUNTRY CLUB ESTATES
JOB #: 93-419
TAL

DATE: 01-Feb-94

LOCATION OR NODE	BASINS	LENGTH FEET	INLET TIME min.	FLOW TIME STREET	FLOW TIME PIPE	T C min.	COEFF. "C"	INTENSITY "I"	AREA "A" AC.	DIRECT RUNOFF C.F.S.	OTHER RUNOFF C.F.S.	SUM RUNOFF C.F.S.	STREET SLOPE %	STREET CAPACITY ALLOWED C.F.S.	PIPE SLOPE %	PIPE SIZE IN.	PIPE CAPACITY ALLOWED C.F.S.	STREET DESIGN F.P.S.	STREET VELOC. F.P.S.	PIPE DESIGN F.P.S.	PIPE VELOC. F.P.S.	REMARKS
1	OF1								24.63	NA		NA	THE 12TH. STREET CHANNEL CONVEYS 100 FLOWS FROM THESE OFFSITE SUB-BASINS.									OFFSITE BASIN N.W. OF 12TH.& G ROAD
	OF2								46.85	NA		NA	THE 2 YEAR STORM IS NOT CRITICAL TO THE ANALYSIS OF THIS PROJECT.									OFFSITE FAIRWAY SUB. & VINTAGE 70'S
2	A1								0.80	NA		NA	THE 12TH. STREET CHANNEL CONVEYS 100 FLOWS FROM THIS SUB-BASIN. THE 2 YEAR STORM IS NOT CRITICAL TO THE ANALYSIS OF THIS PROJECT.									ONSITE OVERLAND FLOW TO CHANNEL
3	OF3					12.22	0.60		2.10													
	A2					8.09	0.65		3.58													ONSITE LOTS
						20.31	0.63	0.68	5.68	2.4		2.4	1.00	11.00								FLOW TO SUMP INLETS AND CHANNEL
4	A3					8.96	0.65	0.95	0.62	0.4		0.4	0.48	3.44 CAPACITY OF SWALE								ONSITE LOTS TO CHANNEL

EXHIBIT IV-4.4

COUNTRY CLUB ESTATES



OFFSETS FROM SOUTH PROPERTY LINE
(OR SOUTH PROPERTY LINE EXTENDED)
TO CENTERLINE OF CHANNEL

STATION	OFFSET DISTANCE (FEET)
1+70	*
3+40	36
7+85	36
11+45	38
12+35	38
13+20	45
15+67	48
16+50	55
16+85	64
17+00	71
17+35	91

SLOPE AT NO
SIDE OF CH

STATION	S
1+70	
2+30	
3+00	
3+30	
3+80	
4+05	2.
4+50	
5+50	
6+20	2.
6+85	1.
6+95	1.
7+85	5.
7+95	5.
8+40	2.
8+90	2.
9+40	5

FOR INFORMATION ONLY

No.	Revisions	Date	By
10			
9			
8			
7			
6			
5	NORTH SIDE CHANNEL	1/8/82	JFS.
4	GROUTED RIP-RAP SHAPE	7/8/81	JFB
3	REVISE ALT & CONC. SHAPE	7/1/81	JFB.
2	ADD STATIONING	4/30/81	JFB.
1	NEW BLD'G. LAYOUT	5/6/81	JFS.

TRI-CONSULTANTS, INC.
CONSULTING ENGINEERS AND LAND SURVEYORS
7500 West Mississippi, Suite 30 / Denver, Colorado 80226 / (303) 922-1158

PROJECT: THE PARK AT HORIZON DRIVE
UNIT: OVERLOT GRADING PLAN
Designed By: J.F.S.
Drawn By: A.A.G. & J.F.S.
Checked By:
Scale: 1" = 50'
Date: MARCH 2, 1981
Sheet: 2 of: 9
Project No: 07430
File No:

EXHIBIT IV-5.0

APPENDIX "D"
1 of 5

Appendix A.—TABLES

Design Limits for Open Channel Flow HDS No 3 US Dept of Transportation
Aug 1961; Reprinted 1977

Table 1.—Manning roughness coefficients, n [1]

	Manning's n range [2]
I. Closed conduits:	
A. Concrete pipe	0.011–0.013
B. Corrugated-metal pipe or pipe-arch:	
1. 2⅔ by ½-in. corrugation (riveted pipe): [3]	
a. Plain or fully coated	0.024
b. Paved invert (range values are for 25 and 50 percent of circumference paved):	
(1) Flow full depth	0.021–0.018
(2) Flow 0.8 depth	0.021–0.016
(3) Flow 0.6 depth	0.019–0.013
2. 6 by 2-in. corrugation (field bolted)	0.03
C. Vitrified clay pipe	0.012–0.014
D. Cast-iron pipe, uncoated	0.013
E. Steel pipe	0.009–0.011
F. Brick	0.014–0.017
G. Monolithic concrete:	
1. Wood forms, rough	0.015–0.017
2. Wood forms, smooth	0.012–0.014
3. Steel forms	0.012–0.013
H. Cemented rubble masonry walls:	
1. Concrete floor and top	0.017–0.022
2. Natural floor	0.019–0.025
I. Laminated treated wood	0.015–0.017
J. Vitrified clay liner plates	0.015
II. Open channels, lined [4] (straight alinement): [5]	
A. Concrete, with surfaces as indicated:	
1. Formed, no finish	0.013–0.017
2. Trowel finish	0.012–0.014
3. Float finish	0.013–0.015
4. Float finish, some gravel on bottom	0.015–0.017
5. Gunite, good section	0.016–0.019
6. Gunite, wavy section	0.018–0.022
B. Concrete, bottom float finished, sides as indicated:	
1. Dressed stone in mortar	0.015–0.017
2. Random stone in mortar	0.017–0.020
3. Cement rubble masonry	0.020–0.025
4. Cement rubble masonry, plastered	0.016–0.020
5. Dry rubble (riprap)	0.020–0.030
C. Gravel bottom, sides as indicated:	
1. Formed concrete	0.017–0.020
2. Random stone in mortar	0.020–0.023
3. Dry rubble (riprap)	0.023–0.033
D. Brick	0.014–0.017
E. Asphalt:	
1. Smooth	0.013
2. Rough	0.016
F. Wood, planed, clean	0.011–0.013
G. Concrete-lined excavated rock:	
1. Good section	0.017–0.020
2. Irregular section	0.022–0.027
III. Open channels, excavated [6] (straight alinement, [5] natural lining):	
A. Earth, uniform section:	
1. Clean, recently completed	0.016–0.018
2. Clean, after weathering	0.018–0.020
3. With short grass, few weeds	0.022–0.027
4. In gravelly soil, uniform section, clean	0.022–0.025
B. Earth, fairly uniform section:	
1. No vegetation	0.022–0.025
2. Grass, some weeds	0.025–0.030
3. Dense weeds or aquatic plants in deep channels	0.030–0.035
4. Sides clean, gravel bottom	0.025–0.030
5. Sides clean, cobble bottom	0.030–0.040
C. Dragline excavated or dredged:	
1. No vegetation	0.028–0.033
2. Light brush on banks	0.035–0.050
D. Rock:	
1. Based on design section	0.035
2. Based on actual mean section:	
a. Smooth and uniform	0.035–0.040
b. Jagged and irregular	0.040–0.045
E. Channels not maintained, weeds and brush uncut:	
1. Dense weeds, high as flow depth	0.08–0.12
2. Clean bottom, brush on sides	0.05–0.08
3. Clean bottom, brush on sides, highest stage of flow	0.07–0.11
4. Dense brush, high stage	0.10–0.14
IV. Highway channels and swales with maintained vegetation [6 7] (values shown are for velocities of 2 and 6 f.p.s.):	
A. Depth of flow up to 0.7 foot:	
1. Bermudagrass, Kentucky bluegrass, buffalograss:	
a. Mowed to 2 inches	0.07–0.045
b. Length 4–6 inches	0.09–0.05
2. Good stand, any grass:	
a. Length about 12 inches	0.18–0.09
b. Length about 24 inches	0.30–0.15
3. Fair stand, any grass:	
a. Length about 12 inches	0.14–0.08
b. Length about 24 inches	0.25–0.13
B. Depth of flow 0.7–1.5 feet:	
1. Bermudagrass, Kentucky bluegrass, buffalograss:	
a. Mowed to 2 inches	0.05–0.035
b. Length 4 to 6 inches	0.06–0.04
2. Good stand, any grass:	
a. Length about 12 inches	0.12–0.07
b. Length about 24 inches	0.20–0.10
3. Fair stand, any grass:	
a. Length about 12 inches	0.10–0.06
b. Length about 24 inches	0.17–0.09
V. Street and expressway gutters:	
A. Concrete gutter, troweled finish	0.012
B. Asphalt pavement:	
1. Smooth texture	0.013
2. Rough texture	0.016
C. Concrete gutter with asphalt pavement:	
1. Smooth	0.013
2. Rough	0.015
D. Concrete pavement:	
1. Float finish	0.014
2. Broom finish	0.016
E. For gutters with small slope, where sediment may accumulate, increase above values of n by	*0.002*
VI. Natural stream channels: [8]	
A. Minor streams [9] (surface width at flood stage less than 100 ft.):	
1. Fairly regular section:	
a. Some grass and weeds, little or no brush	0.030–0.035
b. Dense growth of weeds, depth of flow materially greater than weed height	0.035–0.05
c. Some weeds, light brush on banks	0.035–0.05
d. Some weeds, heavy brush on banks	0.05–0.07
e. Some weeds, dense willows on banks	0.06–0.08
f. For trees within channel, with branches submerged at high stage, increase all above values by	*0.01–0.02*
2. Irregular sections, with pools, slight channel meander; increase values given in 1a–e about	*0.01–0.02*
3. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stage:	
a. Bottom of gravel, cobbles, and few boulders	0.04–0.05
b. Bottom of cobbles, with large boulders	0.05–0.07
B. Flood plains (adjacent to natural streams):	
1. Pasture, no brush:	
a. Short grass	0.030–0.035
b. High grass	0.035–0.05
2. Cultivated areas:	
a. No crop	0.03–0.04
b. Mature row crops	0.035–0.045
c. Mature field crops	0.04–0.05
3. Heavy weeds, scattered brush	0.05–0.07
4. Light brush and trees: [10]	
a. Winter	0.05–0.06
b. Summer	0.06–0.08
5. Medium to dense brush: [10]	
a. Winter	0.07–0.11
b. Summer	0.10–0.16
6. Dense willows, summer, not bent over by current	0.15–0.20
7. Cleared land with tree stumps, 100–150 per acre:	
a. No sprouts	0.04–0.05
b. With heavy growth of sprouts	0.06–0.08
8. Heavy stand of timber, a few down trees, little undergrowth:	
a. Flood depth below branches	0.10–0.12
b. Flood depth reaches branches	0.12–0.16
C. Major streams (surface width at flood stage more than 100 ft.): Roughness coefficient is usually less than for minor streams of similar description on account of less effective resistance offered by irregular banks or vegetation on banks. Values of n may be somewhat reduced. Follow recommendation in publication cited [8] if possible. The value of n for larger streams of most regular section, with no boulders or brush, may be in the range of	0.028–0.033

Footnotes to table 1 appear at the top of page 101.

HDS 3 EXHIBIT IV-6.0

Table 13-3
MANNING'S ROUGHNESS COEFFICIENTS

Lining Category	Lining Type	Depth Ranges 0 - 0.5 (ft)	0.5 - 2.0 (ft)	> 2.0 (ft)
Rigid	Concrete	0.015	0.013	0.013
	Grouted Riprap	0.040	0.030	0.028
	Stone Masonry	0.042	0.032	0.030
	Soil Cement	0.025	0.022	0.020
	Asphalt	0.018	0.016	0.016
Temporary	Woven Paper Net	0.016	0.015	0.015
	Jute Net	0.028	0.022	0.019
	Fiberglass Roving	0.028	0.021	0.019
	Straw and Erosion Net	0.065	0.033	0.025
	Curled Wood Mat	0.066	0.035	0.028
	Nylon Mat	0.036	0.025	0.021
Gravel	1-inch, D_{50}	0.044	0.033	0.030
	2-inch, D_{50}	0.066	0.041	0.034
Rock Riprap	6-inch, D_{50}	0.104	0.069	0.035
	12-inch, D_{50}	---	0.078	0.040

Streets 1016 - 1015

ARAPAHOE CO., COLORADO
1995
EROSION & SEDIMENTATION CONTROL

EXHIBIT IV-6.1

2.3.2 Continued

Inspect frequently, especially after each heavy rain. Repair damages at once.

Keep equipment out of the waterway when it is wet.

2.3.3 Channel Cross Sections. The channel shape may be almost any type suitable to the location and the environmental conditions. Often the shape can be chosen to suit open space and recreational needs to create additional sociological benefits. (7)

However, limitations within which design must fall for the major storm design flow include:

Side Slopes -- The flatter the side slope, the better. 4:1 is a normal maximum slope; however, local standards or conditions may require flatter side slopes. Under special conditions where development exists and right-of-way is a problem the slopes may be as steep as 3:1 which is also the maximum limit for mowing equipment.

Depth -- The maximum depth should not exceed the guidelines in paragraph 2.3.1A above.

Bottom width - The bottom width should be designed to satisfy the hydraulic capacity of the cross-section recognizing the limitations on velocity and depth.

Trickle Channel - Trickle channels or underdrain pipes are required on all urban grassed channels. Concrete trickle channels are preferred because of their ease of maintenance. Other types are acceptable if they are properly designed. Trickle channels may not be practical on major streams and rivers or in large channels through fine sand soils.

Typical cross sections suitable for grassed channels are given in Figure 2-3.

2.3.4 Roughness Coefficients. The hydraulic roughness of man-made grass lined channels depends on the length of cutting, if any, the type of grass, as well as the depth of flow (11). Typical roughness coefficients are as follows:

TABLE 2-4

MANNING ROUGHNESS COEFFICIENTS, n*

	Depth of Flow of 0.7-1.5 ft.	Depth of Flow Greater Than 3.0 ft.
Bermuda grass, Buffalo grass, Kentucky Bluegrass		
a. Mowed to 2 inches	0.035	0.030
b. Length 4-6 inches	0.040	0.030

EXHIBIT IV-6.2

2.3.4 Continued

TABLE 2-4 (Continued)

MANNING ROUGHNESS COEFFICIENTS, n*

	Depth of Flow of 0.7-1.5 ft.	Depth of Flow Greater Than 3.0 ft.
Good stand any grass		
a. Length of 12 inches	0.070	0.035
b. Length of 24 inches	0.100	0.035
Fair stand any grass		
a. Length of 12 inches	0.060	0.035
b. Length of 24 inches	0.070	0.035

*For straight channels without shrubbery or trees

The 0.7 to 1.5 foot depth in Table 2-4 is generally suitable for computing the wetted channel portion for the initial storm runoff, while the greater than 3 foot depth is suitable for the major runoff computations. A depth of flow of 2.0 feet or more will usually lay the grass down to form a relatively smooth bottom surface.

Care must be exercised in operation and maintenance in periods following completion of construction, and before the grass stand has matured. While an 0.07 n factor might be chosen for lower flows, before the grass is up, the effective n may be as low as 0.025. A runoff during this period would have higher velocities and erosion will result. For additional information on roughness coefficients, the reader is referred to Geological Survey Water Supply Paper 1849.

2.3.5 Trickle Channels. The low flows, and sometimes base flows, from urban areas must be given specific attention. Waterways which are normally dry prior to urbanization will often have a continuous base flow after urbanization because of lawn irrigation return flow, both overland and from ground water inflow. Continuous flow over grass will destroy a grass stand and may cause the channel profile to degrade.

Low flows must be carried in a trickle channel, or in an underground conduit. A trickle channel capacity should be approximately 0.5 to 1.0 percent of the major design flow. If an underdrain pipe is used it should be at least 24 inches in diameter, be provided with access manholes and be sloped so that a velocity of at least 3 feet per second is maintained at 1/2 full pipe depth.

A trickle channel is subject to erosion and must therefore be amply protected with appropriate erosion control devices. To prevent erosion, silting and excessive plant growth, concrete lined trickle channels are preferred.

Care must be taken to insure that low flows enter the trickle channel without the attendant problem of the flow paralleling the trickle channel, or bypassing the inlets.

EXHIBIT IV-6.3

APPENDIX "D"
5 of 5

Rfz

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Table 2-1 Values of n to be used with the Manning equation [2]

Surface	Best	Good	Fair	Bad
Uncoated cast-iron pipe	0.012	0.013	0.014	0.015
Coated cast-iron pipe	0.011	0.012[a]	0.013[a]	
Commercial wrought-iron pipe, black	0.012	0.013	0.014	0.015
Commercial wrought-iron pipe, galvanized	0.013	0.014	0.015	0.017
Smooth brass and glass pipe	0.009	0.010	0.011	0.013
Smooth lockbar and welded "OD" pipe	0.010	0.011[a]	0.013[a]	
Riveted and spiral steel pipe	0.013	0.015[a]	0.017[a]	
Vitrified sewer pipe	0.010 0.011	0.013[a]	0.015	0.017
Common clay drainage tile	0.011	0.012[a]	0.014[a]	0.017
Glazed brickwork	0.011	0.012	0.013[a]	0.015
Brick in cement mortar; brick sewers	0.012	0.013	0.015[a]	0.017
Neat cement surfaces	0.010	0.011	0.012	0.013
Cement mortar surfaces	0.011	0.012	0.013[a]	0.015
Concrete pipe	0.012	0.013	0.015[a]	0.016
Wood stave pipe	0.010	0.011	0.012	0.013
Plank flumes				
Planed	0.010	0.012[a]	0.013	0.014
Unplaned	0.011	0.013[a]	0.014	0.015
With battens	0.012	0.015[a]	0.016	
Concrete-lined channels	0.012	0.014[a]	0.016[a]	0.018
Cement-rubble surface	0.017	0.020	0.025	0.030
Dry-rubble surface	0.025	0.030	0.033	0.035
Dressed-ashlar surface	0.013	0.014	0.015	0.017
Semicircular metal flumes, smooth	0.011	0.012	0.013	0.015
Semicircular metal flumes, corrugated	0.0225	0.025	0.0275	0.030
Canals and ditches				
Earth, straight and uniform	0.017	0.020	0.0225[a]	0.025
Rock cuts, smooth and uniform	0.025	0.030	0.033[a]	0.035
Rock cuts, jagged and irregular	0.035	0.040	0.045	
Winding sluggish canals	0.0225	0.025[a]	0.0275	0.030
Dredged-earth channels	0.025	0.0275[a]	0.030	0.033
Canals with rough stony beds, weeds on earth banks	0.025	0.030	0.035[a]	0.040
Earth bottom, rubble sides	0.028	0.030[a]	0.033[a]	0.035
Natural-stream channels				
1. Clean, straight bank, full stage, no rifts or deep pools	0.025	0.0275	0.030	0.033
2. Same as (1), but some weeds and stones	0.030	0.033	0.035	0.040
3. Winding, some pools and shoals, clean	0.033	0.035	0.040	0.045
4. Same as (3), lower stages, more ineffective slope and sections	0.040	0.045	0.050	0.055
5. Same as (3), some weeds and stones	0.035	0.040	0.045	0.050
6. Same as (4), stony sections	0.045	0.050	0.055	0.060
7. Sluggish river reaches, rather weedy or with very deep pools	0.050	0.060	0.070	0.080
8. Very weedy reaches	0.075	0.100	0.125	0.150

[a]Values commonly used in designing.

EXHIBIT III.6.A

WASTEWATER ENGR: COLLECTION & PUMPING OF WASTEWATER, METCALF & EDDY, 1981

STREET CARRING CAPACITY (2 YEAR)

PROJECT: COUNTRY CLUB ESTATES
LOCATION: CITY OF GRAND JUNCTION. COLORADO
DATE: Feb-94

Street Information:				
	R.O.W. Width =	44.00	FT.	Flow Area = 3.76 SF.
	Flowline Width =	31.00	FT.	
	Classification =	URBAN		
	Mannings =	0.015		
	Max. Depth =	0.42	FT.	Above Gutter Flowline
	Str/ X-Slope =	1.00	%	
	Gutter Slope =	8.33	%	Drive Over Curb. Gutter and Walk
	Sidewalk Slope =	2.08	%	1/4" / FT.
	Roadside Slope =	2.08	%	1/4" / FT.

SLOPE OF STREET %	REDUCTION FACTOR FOR SLOPE	ALLOWABLE CAPACITY C.F.S.	VELOCITY F.P.S.
1.00	0.80	11.00	2.93
1.21	0.80	12.10	3.22
1.40	0.80	13.02	3.46

Formula: $Qa = F \times (1.49/N) \times R^{2/3} \times S^{1/2} \times A$

F = Reduction Factor For Slope
N = Mannings Coefficient = 0.0150
R = Hydraulic Radius = A/WP = 0.2234
A = Cross Sectional Area Sq.Ft. = 3.760
WP = Wetted Perimeter Ft. = 16.83
S = Street Slope FT./FT.

EXHIBIT IV-7.0

STREET CARRING CAPACITY (100 YEAR)

PROJECT: COUNTRY CLUB ESTATES
LOCATION: CITY OF GRAND JUNCTION. COLORADO
DATE: Feb-94

Street Information:

R.O.W. Width =	44.00	FT.	Flow Area = 15.49 SF.
Flowline Width =	31.00	FT.	
Classification =	URBAN		
Mannings =	0.015		
Max. Depth =	1.00	FT.	Above Gutter Flowline
Str/ X-Slope =	1.00	%	
Gutter Slope =	8.33	%	Drive Over Curb. Gutter and Walk
Sidewalk Slope =	2.08	%	1/4" / FT.
Roadside Slope =	2.08	%	1/4" / FT.

SLOPE OF STREET %	REDUCTION FACTOR FOR SLOPE	ALLOWABLE CAPACITY C.F.S.	VELOCITY F.P.S.
1.00	0.80	97.69	6.31
1.21	0.80	107.46	6.94
1.40	0.80	115.58	7.46

Formula: $Qa = F \times (1.49/N) \times R^{2/3} \times S^{1/2} \times A$

F = Reduction Factor For Slope
N = Mannings Coefficient = 0.0150
R = Hydraulic Radius = A/WP =0.7070
A = Cross Sectional Area Sq.Ft. = 15.490
WP = Wetted Perimeter Ft. = 21.91
S = Street Slope FT./FT.

EXHIBIT IV-7.1

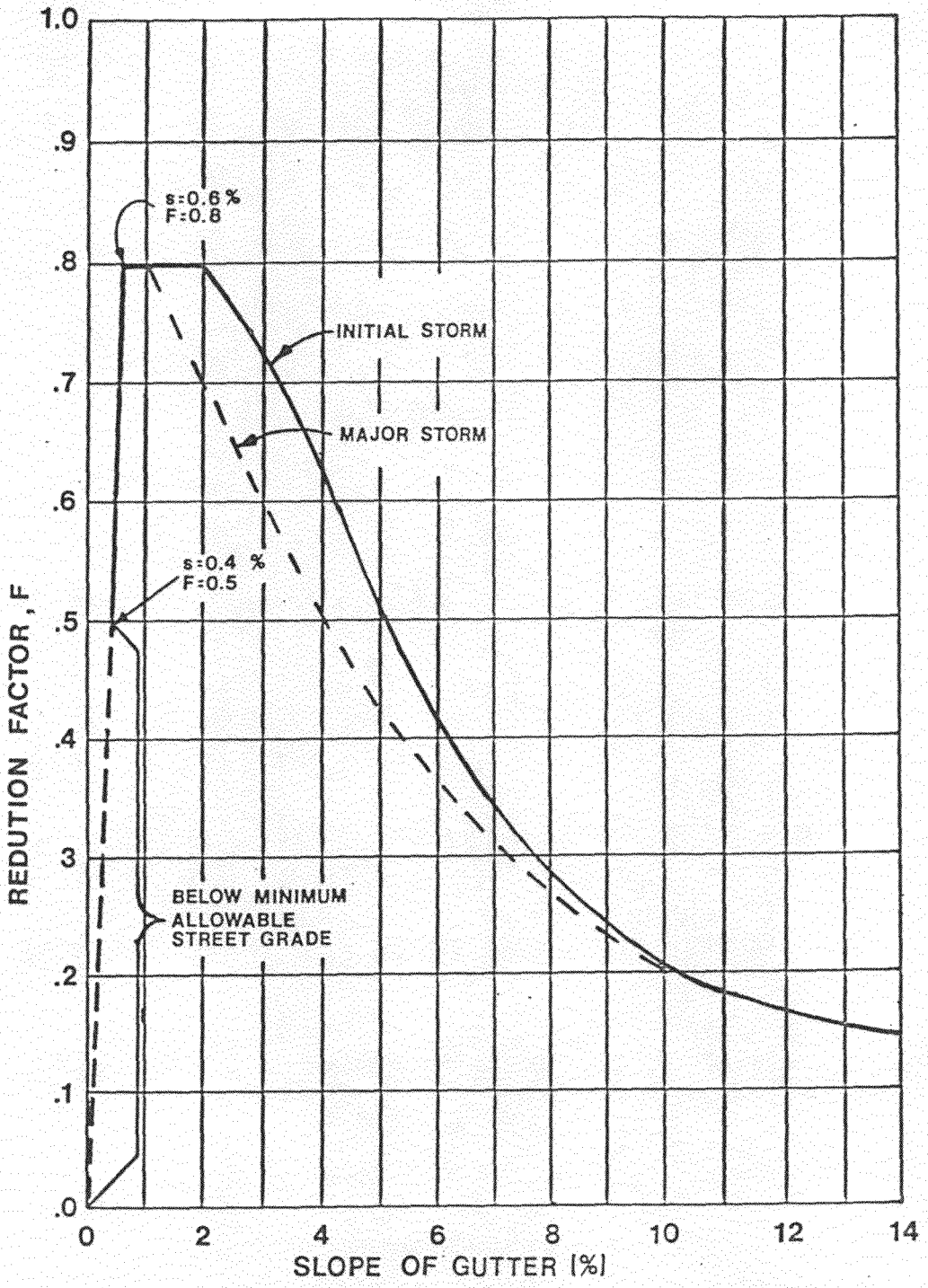


FIGURE 6-2 REDUCTION FACTOR FOR ALLOWABLE GUTTER CAPACITY LOCAL AND COLLECTOR STREETS

APPLY REDUCTION FACTOR FOR APPLICABLE SLOPE TO THE THEORETICAL GUTTER CAPACITY TO OBTAIN ALLOWABLE GUTTER CAPACITY APPROACHING ARTERIAL STREET

EXHIBIT IV-7.2

TABLE 2-1
REDUCTION FACTORS TO APPLY TO INLETS

Condition (1)	Inlet Type (2)	Percentage of Theoretical Capacity Allowed (3)
Sump	Curb Opening	80%
Sump	Grated	50%
Sump	Combination	65%
Continuous Grade	Curb Opening	80%
Continuous Grade	Deflector	75%
Continuous Grade	Longitudinal Bar Grated	60%
Continuous Grade	Transverse Bar Grate or Longitudinal Bar Grate Incorporating transverse bars	50%
Continuous Grade	Combination	110% of that listed for type of grate utilized

EXHIBIT IV-B.0

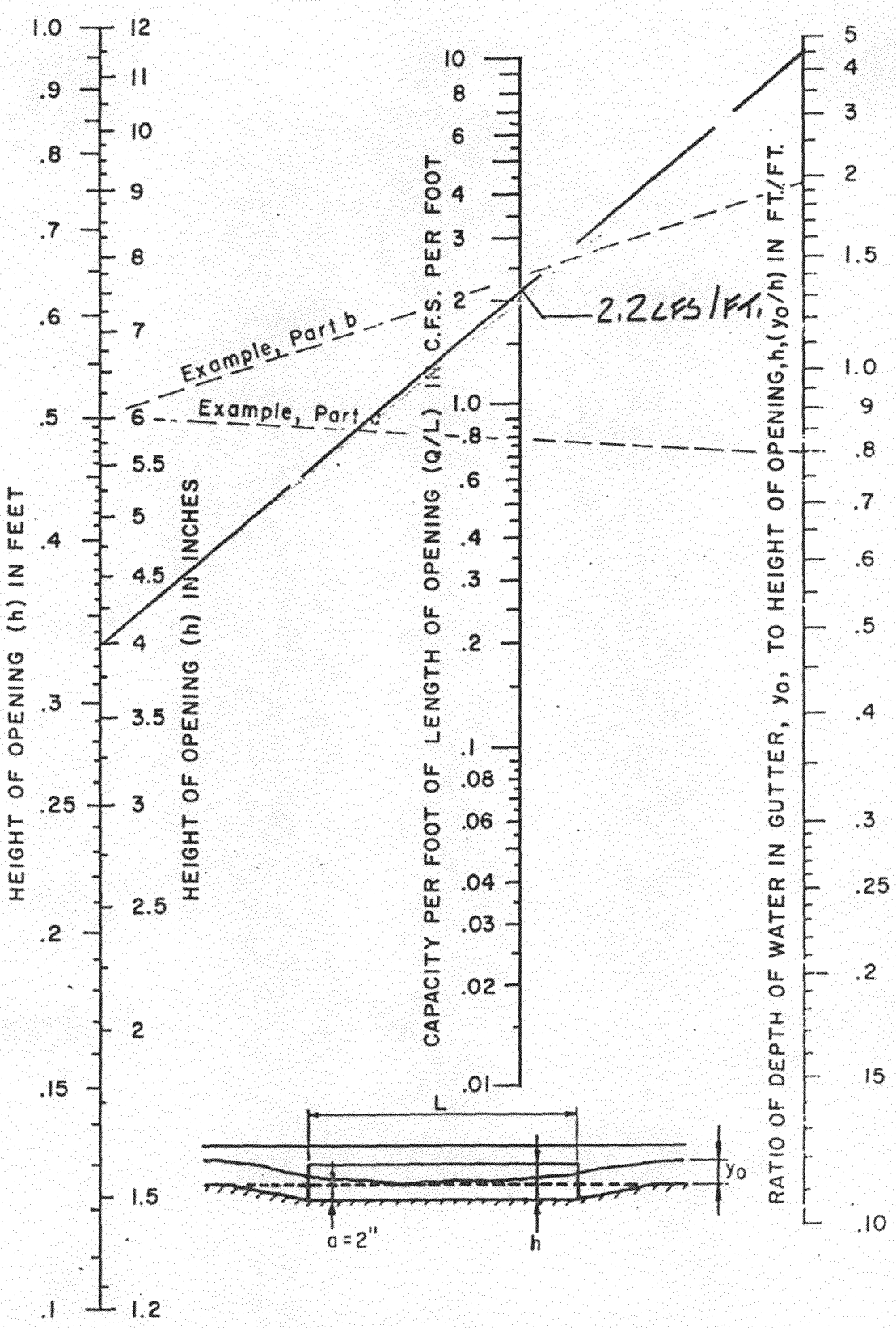


FIGURE 3-1. NOMOGRAPH FOR CAPACITY OF CURB OPENING INLETS IN SUMPS, DEPRESSION DEPTH 2"

Adapted from Bureau of Public Roads Nomograph.

10-15-68

EXHIBIT IV-8.1

DEPTH = 1.5' MAX.

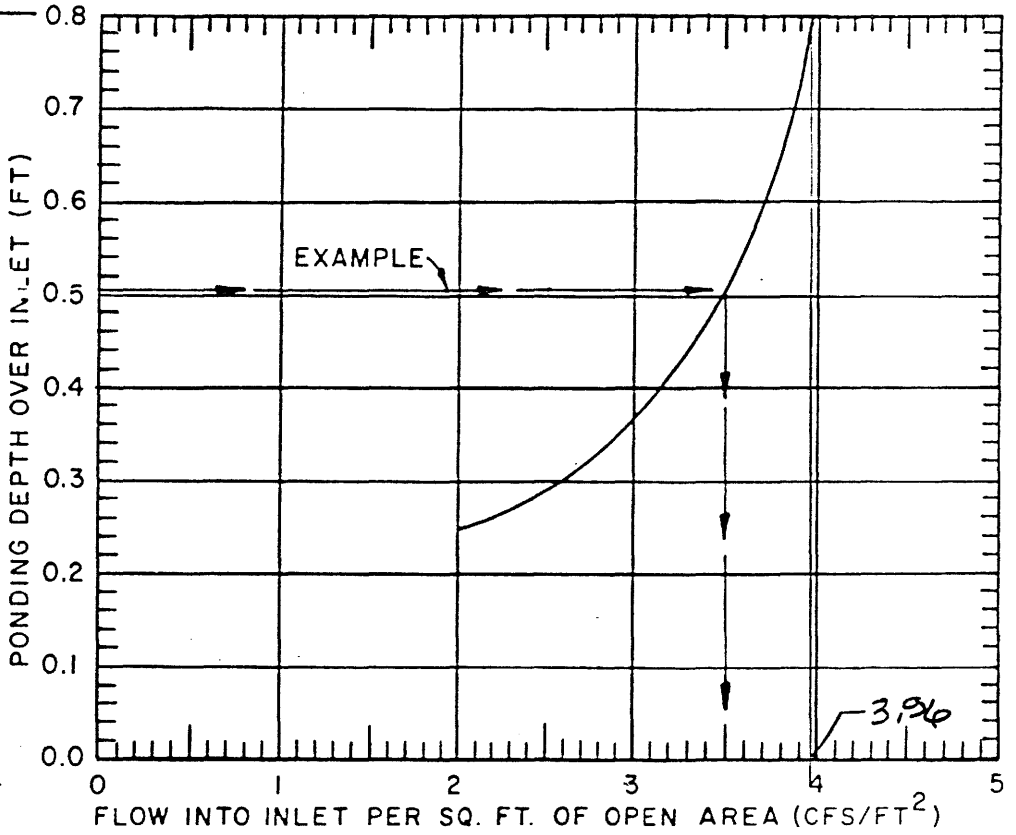


FIGURE 4-1. CAPACITY OF GRATED INLET IN SUMP

EXHIBIT IV-8.2

PROJECT: COUNTRY CLUB ESTATES

SUBJECT: FINAL DRAINAGE

DATE: 01-Feb-94

INLET DESIGN
============

INLET NO.	A & B		
CONDITION:	SUMP		
TYPE:	TYPE C		
Q2 =	1.2 CFS	AT EACH INLET	
Q100 =	6.6 CFS	AT EACH INLET	
CURB OPENING L =	2.75 FT.	33"	
GRATE AREA W =	4.02 SF.	33" x 17 1/2"	
DEPTH OVER FL.Yo =	1.50 FT.		
OPENING H =	0.33 FT.		
Yo/H =	4.55		
CURB OPENING CAPACITY PER LF. (FIGURE 3-1) =	2.20	SINGLE INLET CAPACITY =	6.05 CFS
GRATE CAPACITY PER SF. (FIGURE 4-1) =	3.96	SINGLE INLET CAPACITY =	15.92 CFS
		SUB-TOTAL =	21.96
		REDUCTION FACTOR =	0.65
		TOTAL Qc =	14.27

INLET NO. A & B USE SINGLE
****

EXHIBIT III-8.3

Improved Inlets

Culvert capacity may be increased through the use of special inlet designs. The Federal Highway Administration has developed extensive data[19,20] on these. While these designs increase the flow, their use has not been as expected. The increased costs of the special treatments is apparently responsible.

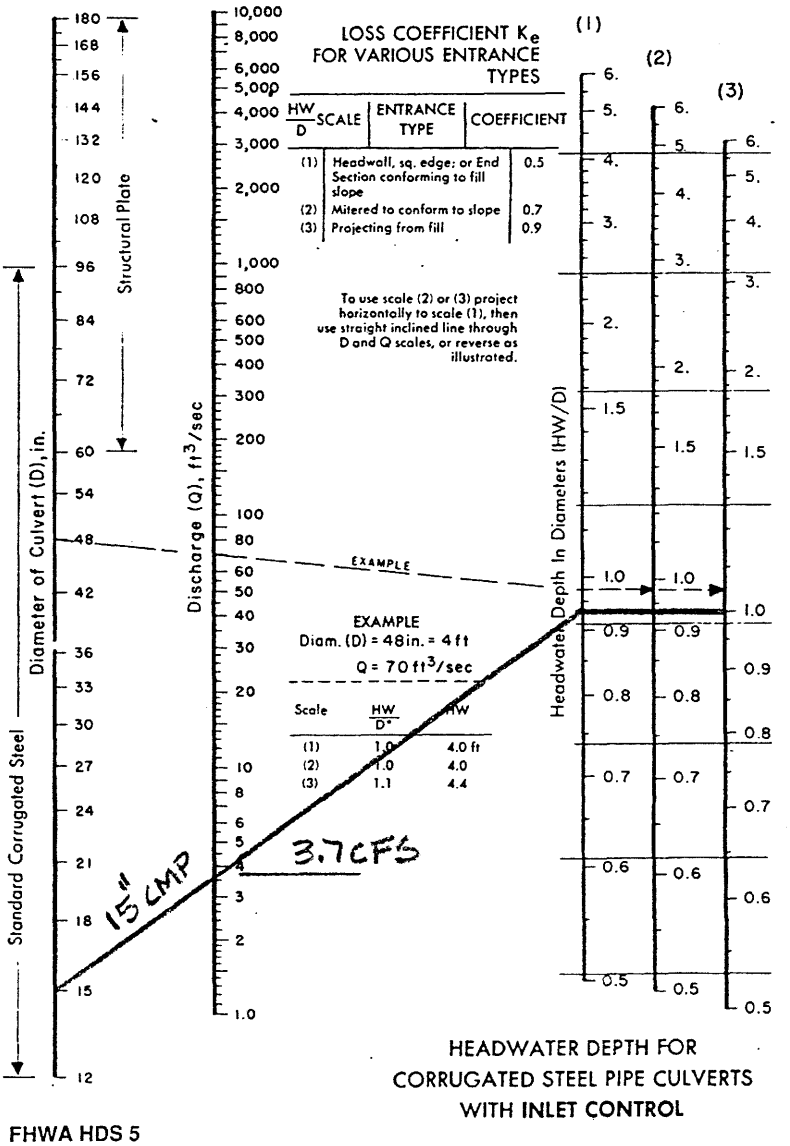


Figure 3.28 *Inlet control* nomograph for corrugated steel *pipe* culverts. The manufacturers recommend keeping *HW/D* to a maximum of 1.5 and preferably to no more than 1.0 for diameters greater than 4 to 5 feet.

EXHIBIT IV -9.0

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER

Comment: STORM SEWER HEADWALL TO MANHOLE SS-1

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0167 ft/ft
Manning's n.....	0.013
Discharge.....	13.20 cfs

Computed Results:

Depth.....	1.19 ft
Velocity.....	8.75 fps
Flow Area.....	1.51 sf
Critical Depth....	1.36 ft
Critical Slope....	0.0138 ft/ft
Percent Full.....	79.58 %
Full Capacity.....	13.57 cfs
QMAX @.94D.....	14.60 cfs
Froude Number.....	1.38 (flow is Supercritical)

EXHIBIT IV-9.1

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER

Comment: STORM SEWER INLET A TO MANHOLE SS-1

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0160 ft/ft
Manning's n.....	0.013
Discharge.....	13.20 cfs

Computed Results:

Depth.....	1.22 ft
Velocity.....	8.57 fps
Flow Area.....	1.54 sf
Critical Depth....	1.36 ft
Critical Slope....	0.0138 ft/ft
Percent Full.....	81.37 %
Full Capacity.....	13.29 cfs
QMAX @.94D.....	14.29 cfs
Froude Number.....	1.32 (flow is Supercritical)

EXHIBIT IV-9.2

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: STORM SEWER

Comment: STORM SEWER INLET A TO INLET B

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0080 ft/ft
Manning's n.....	0.013
Discharge.....	6.60 cfs

Computed Results:

Depth.....	0.93 ft
Velocity.....	5.76 fps
Flow Area.....	1.15 sf
Critical Depth....	0.99 ft
Critical Slope....	0.0065 ft/ft
Percent Full.....	61.79 %
Full Capacity.....	9.40 cfs
QMAX @.94D.....	10.11 cfs
Froude Number.....	1.14 (flow is Supercritical)

EXHIBIT IV-9.3

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: COUNTRY CLUB ESTATES

Comment: REAR YARD SWALE ALONG SOUTH BOUNDARY

Solve For Discharge

Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0048 ft/ft
Depth.....	1.00 ft

Computed Results:

Discharge.....	3.44 cfs
Velocity.....	1.72 fps
Flow Area.....	2.00 sf
Flow Top Width...	4.00 ft
Wetted Perimeter.	4.47 ft
Critical Depth...	0.71 ft
Critical Slope...	0.0292 ft/ft
Froude Number....	0.43 (flow is Subcritical)

Open Channel Flow Module. Version 3.16 (c) 1990
Haestad Methods. Inc. * 37 Brookside Rd * Waterbury. Ct 06708

EXHIBIT IV-10.0

Table 3.4
Entrance Loss Coefficient for Box Culverts

Type of Structure and Design of Entrance	Coefficient
Headwall Parallel to Embankment (no wingwalls):	
Square-edged on three edges	0.50
Three edges rounded to radius of 1/12 barrel dimension	0.20
Wingwalls at 15 to 45 degrees to Barrel:	
Square-edge top corner	0.40
Top corner rounded to radius of 1/12 barrel dimension	0.20

Source: "Street and Highway Drainage," Institute of Transportation and Traffic Engineering, University of California at Berkeley, 1969.

Table 3.5
Entrance Loss Coefficient for Pipe Culverts

Type of Structure and Design of Entrance	Coefficient
Concrete Pipe Projecting from Fill (no headwall):	
Socket end of pipe	0.20
Square cut end of pipe	0.50
Concrete Pipe with Headwall or Headwall and Wingwalls:	
Socket end of pipe	0.10
Square cut end of pipe	0.50
Rounded entrance, with rounding radius = 1/12 of diameter	0.10
Corrugated Metal Pipe:	
Projecting from fill (no headwall)	0.80
With headwall or headwall and wingwalls, square edge	0.50

3.2.4 COFQ: Weir Flow Coefficient

Weir flow over a roadway is computed in the special culvert method using exactly the same methods used in the HEC-2 special bridge method. The standard weir equation is used:

$$Q = CLH^{1.5} \qquad \text{(IV-7)}$$

in which:

Q = flow rate (cfs)

C = COFQ = weir flow coefficient

L = weir length (feet)

H = weir head (feet)

EXHIBIT IV-11.0

HYDRAULIC REPORT FOR

COUNTRY CLUB ESTATES

12TH. STREET CHANNEL

100 YEAR STORM

IMPROVED CONDITION

FEBRUARY 2. 1994

1/13

EXHIBIT IV-12.0

Run date: 02-01-1994

Water Surface Profile Analysis File: c:12THST.OPC

Flow factor = 1 / Tolerance (ft/100) = 0.0100 / Max iterations = 27

SECTION 1 **CHANNEL** **STA 0 + 0** **BASE Q = 75.3**

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	75.3	17.7	4.3	614	0.035	50	24
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL = 79.05	VEL HD = 0.282	JUMP ELEV = N/A
CRWSEL = 79.05	EN LOSS = 0.000	STA JUMP = N/A
TOP WID = 24	EN GD LN = 79.33	JMP LOSS = N/A
CHNL SLP = 0.2000 %	DEPTH = 1.05	Critical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	82.00	5	70.00	79.10
2	40.00	81.00	6	74.00	79.80
3	49.00	78.00	7	79.00	82.00
4	59.00	78.00			

STA OF LEFT OVERBANK = 40 STA OF RIGHT OVERBANK = 79

2/13

SECTION 2 CHANNEL STA 0 + 50 BASE Q = 75.3

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	75.3	12.8	5.9	436	0.035	50	18
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL =	79.45	VEL HD =	0.535	JUMP ELEV =	79.55
CRWSEL =	79.55	EN LOSS =	0.649	STA JUMP =	49.40
TOP WID =	17	EN GD LN =	79.98	JMP LOSS =	0.025
CHNL SLP =	0.2000 %	DEPTH =	1.35	Supercritical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	82.80	5	50.00	78.10
2	27.00	82.00	6	55.00	78.14
3	38.00	81.60	7	58.00	79.00
4	43.00	81.00	8	72.00	80.00

STA OF LEFT OVERBANK = 43 STA OF RIGHT OVERBANK = 79

3/13

SECTION 3 CHANNEL STA 1 + 0 BASE Q = 74.6

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	74.6	16.6	4.5	579	0.035	50	22
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL =	80.70	VEL HD =	0.315	JUMP ELEV =	N/A
CRWSEL =	80.70	EN LOSS =	1.034	STA JUMP =	N/A
TOP WID =	22	EN GD LN =	81.02	JMP LOSS =	N/A
CHNL SLP =	1.2000 %	DEPTH =	2.00	Critical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	84.50	6	51.00	78.70
2	18.00	84.00	7	56.00	80.00
3	32.00	83.30	8	72.00	81.00
4	43.00	82.00	9	80.00	82.30
5	47.00	80.00	10	91.00	83.00

STA OF LEFT OVERBANK = 43 STA OF RIGHT OVERBANK = 80

4/13

SECTION 4 **CHANNEL** **STA 1 + 50** **BASE Q = 68.6**

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	68.6	13.2	5.2	600	0.035	50	12
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL =	81.39	VEL HD =	0.419	JUMP ELEV =	N/A
CRWSEL =	N/A	EN LOSS =	0.790	STA JUMP =	N/A
TOP WID =	10	EN GD LN =	81.81	JMP LOSS =	N/A
CHNL SLP =	0.6000 %	DEPTH =	2.39	Subcritical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	84.50	6	56.00	81.30
2	30.00	85.10	7	67.00	81.90
3	44.00	84.00	8	75.00	82.10
4	50.00	79.00	9	79.00	83.00
5	52.00	79.00	10	93.00	84.00

STA OF LEFT OVERBANK = 44 STA OF RIGHT OVERBANK = 79

5/13

SECTION 5 **CHANNEL** **STA 2 + 0** **BASE Q = 68.6**

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	68.6	14.5	4.7	677	0.035	50	12
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL = 82.04 VEL HD = 0.350 JUMP ELEV = N/A

CRWSEL = N/A EN LOSS = 0.589 STA JUMP = N/A

TOP WID = 11 EN GD LN = 82.39 JMP LOSS = N/A

CHNL SLP = 1.0000 % DEPTH = 2.54 Subcritical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	86.60	4	51.00	79.50
2	30.00	86.00	5	60.00	82.90
3	41.00	85.00	6	94.00	85.00

STA OF LEFT OVERBANK = 41 STA OF RIGHT OVERBANK = 60

6/13

SECTION 6 **CULVERT** **STA 2 + 94** **BASE Q = 68.6**

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
STRUCT	68.6	6.9	9.9	2267	0.013	94	1
CHANNEL	68.6	22.5	3.0	2712	0.013	94	21

WSEL = 85.30	VEL HD = 0.144	No. STRUC = 1
CRWSEL = N/A	EN LOSS = 3.050	CULV HEIGHT = 3.00
TOP WID = 19	EN GD LN = 85.44	CULV WIDTH = 3.00
CHNL SLP = 3.1915 %	DEPTH = 2.80	INV EL UP = 82.50
INV EL DN = 79.50	ENT COEFF = 0.50	WEIR COEFF = 2.70
CULV SLP = 3.191 %	TOP CHORD = 86.20	ORF COEFF = 0.62
Inlet control	FLOW TYPE = Normal flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	88.40	6	50.00	82.50
2	25.00	88.00	7	51.00	84.20
3	35.00	87.20	8	57.00	85.00
4	42.00	86.00	9	72.00	86.00
5	46.00	82.50	10	74.00	87.00

7/13

SECTION 7 **CHANNEL** **STA 3 + 50** **BASE Q = 68.6**

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	56	0
CHANNEL	68.6	16.0	4.3	637	0.035	56	18
RIGHT OB	0.0	0.0	0.0	0	0.035	56	0

WSEL = 85.27 VEL HD = 0.284 JUMP ELEV = N/A

CRWSEL = N/A EN LOSS = 0.108 STA JUMP = N/A

TOP WID = 17 EN GD LN = 85.55 JMP LOSS = N/A

CHNL SLP = 2.6786 % DEPTH = 1.27 Subcritical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	89.40	5	54.00	84.00
2	30.00	89.00	6	70.00	87.00
3	38.00	88.00	7	90.00	88.00
4	46.00	84.00			

STA OF LEFT OVERBANK = 38 STA OF RIGHT OVERBANK = 70

8/13

SECTION 8 CHANNEL STA 4 + 0 BASE Q = 68.6

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	68.6	14.5	4.7	547	0.035	50	17
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL = 86.50 VEL HD = 0.348 JUMP ELEV = N/A

CRWSEL = 86.50 EN LOSS = 1.296 STA JUMP = N/A

TOP WID = 16 EN GD LN = 86.85 JMP LOSS = N/A

CHNL SLP = 2.0000 % DEPTH = 1.50 Critical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	89.60	5	54.00	85.00
2	34.00	89.00	6	54.00	86.00
3	40.00	88.00	7	76.00	88.00
4	47.00	85.00	8	90.00	88.70

STA OF LEFT OVERBANK = 40 STA OF RIGHT OVERBANK = 76

9/13

SECTION 9 **CHANNEL** **STA 4 + 50** **BASE Q = 68.6**

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.000	50	0
CHANNEL	68.6	20.3	3.4	930	0.035	50	18
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL = 87.12	VEL HD = 0.177	JUMP ELEV = N/A
CRWSEL = N/A	EN LOSS = 0.453	STA JUMP = N/A
TOP WID = 17	EN GD LN = 87.30	JMP LOSS = N/A
CHNL SLP = 0.0000 %	DEPTH = 2.12	Subcritical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	90.00	5	54.00	86.40
2	40.00	89.00	6	76.00	89.00
3	47.00	85.00	7	85.00	89.50
4	53.00	85.00			

STA OF LEFT OVERBANK = 40 STA OF RIGHT OVERBANK = 76

10/13

SECTION 10 CHANNEL STA 5 + 0 BASE Q = 68.6

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	68.6	28.9	2.4	1668	0.035	50	18
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL = 87.36 VEL HD = 0.088 JUMP ELEV = N/A

CRWSEL = N/A EN LOSS = 0.151 STA JUMP = N/A

TOP WID = 16 EN GD LN = 87.45 JMP LOSS = N/A

CHNL SLP = 0.0000 % DEPTH = 2.36 Subcritical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	89.90	5	58.00	87.00
2	42.00	89.00	6	76.00	90.00
3	47.00	85.00	7	93.00	90.60
4	57.00	85.00			

STA OF LEFT OVERBANK = 42 STA OF RIGHT OVERBANK = 76

11/13

SECTION 11 **CHANNEL** **STA 5 + 50** **BASE Q = 68.6**

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	68.6	11.3	6.1	536	0.035	50	10
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL = 87.75 VEL HD = 0.572 JUMP ELEV = N/A

CRWSEL = 87.75 EN LOSS = 0.871 STA JUMP = N/A

TOP WID = 8 EN GD LN = 88.32 JMP LOSS = N/A

CHNL SLP = 2.0000 % DEPTH = 1.75 Critical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	90.30	5	51.00	86.00
2	22.00	90.00	6	53.00	88.00
3	44.00	89.00	7	79.00	91.00
4	46.00	86.00	8	90.00	91.00

STA OF LEFT OVERBANK = 44 STA OF RIGHT OVERBANK = 53

12/13

SECTION 12 CHANNEL STA 6 + 0 BASE Q = 68.6

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.035	50	0
CHANNEL	68.6	31.6	2.2	1877	0.035	50	19
RIGHT OB	0.0	0.0	0.0	0	0.035	50	0

WSEL = 88.46 VEL HD = 0.073 JUMP ELEV = N/A

CRWSEL = N/A EN LOSS = 0.208 STA JUMP = N/A

TOP WID = 17 EN GD LN = 88.53 JMP LOSS = N/A

CHNL SLP = 0.0000 % DEPTH = 2.46 Subcritical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	0.00	90.00	5	50.00	86.00
2	31.00	90.00	6	52.00	90.00
3	35.00	88.00	7	63.00	91.00
4	42.00	86.00	8	84.00	92.00

STA OF LEFT OVERBANK = 31 STA OF RIGHT OVERBANK = 52

REVIEW COMMENTS

FILE #21-94 **TITLE HEADING:** Final Plan/Plat - Country Club Estates

LOCATION: SE corner of G Road & 12th Street

PETITIONER: Sidney Gottlieb

PETITIONER'S ADDRESS/TELEPHONE: 477 Elkwood Terrace
Englewood, NJ 07631
201-569-0916

PETITIONER'S REPRESENTATIVE: Tom Logue

STAFF REPRESENTATIVE: Kathy Portner

NOTE: WRITTEN RESPONSE BY THE PETITIONER TO THE REVIEW COMMENTS IS REQUIRED ON OR BEFORE 5:00 P.M., FEBRUARY 22, 1994.

MESA COUNTY PLANNING **2/3/94**
Mike Joyce **244-1642**

No comments.

CITY DEVELOPMENT ENGINEER **2/10/94**
Jody Kliska **244-1591**

See attached comments and red-lined drawings.

CITY POLICE DEPARTMENT **2/10/94**
Mark Angelo **244-3587**

Big problem - golf cart easement. It is my understanding that the golf cart easement was provided to keep the golf carts off of "G" Road as much as possible for safety reasons. Where the proposed golf cart easement is proposed does not do this. I would recommend the connection to the golf cart easement be across Lot 14, somehow. Maybe you can make Lot 15 smaller and make the connection between Lot 13-14; or make Lots 13 & 15 bigger and eliminating Lot 14, making it an easement only. The increase of Lots 13 & 15 can also benefit Lots 10-12 and 16-21. You may be able to change the driveway access to Lots 13 & 15 to incorporate the golf cart easement. The existing proposed cart easement duping onto Westcliff Drive to me is not acceptable.

CITY PARKS & RECREATION DEPARTMENT **2/4/94**
Don Hobbs **244-1542**

We assume the unit numbers have not changed. If they have, we will require $225 open space fee for each additional unit.

U.S. WEST **2/8/94**
Leon Peach **244-4964**

New or additional telephone facilities necessitated by this project may result in a "contract" and up-front monies required from developer, prior to ordering or placing of said facilities. For more information, please call Leon Peach, 244-4964.

UTE WATER **2/11/94**
Gary R. Mathews **242-7491**

Ute Water has a 10" main on the west side of 27 Road and an 18" main on the north side of G Road. Water mains will be installed in oil 2-3 feet from curb and run around the cul-de-sac. Policies and fees in effect at the time of application will apply. As-builts and construction plans required.

PUBLIC SERVICE COMPANY **2/7/94**
Dale Clawson **244-2695**

GAS: No objections.
ELECTRIC: Require additional easements as follows:
The easterly ten (10) feet of Lot 5
The northerly ten (10) feet of Lot 8

CITY UTILITY ENGINEER **2/14/94**
Bill Cheney **244-1590**

WATER - Ute Water - Construct to City standards unless Ute Water standards are more stringent.
SEWER
1. Locate manholes in asphalt i right-of-way not in multi-purpose easement as shown.
2. Denote manhole numbers on profile for "Line B".
3. All taps on new sewer construction shall be wyes.
4. Elevation of line into MH on 12th is lower than existing north/south flow line. Is this a drop manhole? Show more detail for inverts, flowline to existing, etc.
5. Show proposed rim elevations for new manholes.
6. Maintain 72" cover on all sewer lines unless otherwise approved.
7. What does "Sewer Service (Common trench)" mean?
8. Reference manhole locations by distance and bearing or coordinates.
9. Provide "benchmark" on sewer and water plan sheet.

GRAND JUNCTION FIRE DEPARTMENT **2/14/94**
George Bennett **244-1400**

An additional fire hydrant is required at the intersection of Club Place and 12th Street (27 Road). The fire hydrant can be placed at the NW corner of Lot 22 or the SW corner of Lot 1.

U.S. POSTAL SERVICE **2/14/94**
Cheryl Fiegel **244-3435**

This is territory delivered by a rural carrier and as such must have curbside delivery or centralized delivery - behind the sidewalk delivery will not be extended.

GRAND VALLEY WATER USERS **2/15/94**
G.W. Klapwyk **242-5065**

Grand Valley Water Users Association has no ditches, pipelines or other facilities located within the Country Club Estates proposed development area. However, any existing return-flow ditches located there should be properly dealt with for the good of the development and neighboring property owners.

COMMUNITY DEVELOPMENT DEPARTMENT **2/16/94**
Kathy Portner **244-1446**

See attached comments.

CITY PROPERTY AGENT **2/16/94**
Tim Woodmansee **244-1565**

This replat should be accompanied by a dedication describing the subject property by metes and bounds and appropriate dedications for all easements and rights-of-ways.

RESPONSE TO REVIEW COMMENTS

February 24, 1994

Title: COUNTRY CLUB ESTATES, Final Plat and Plan

File No: 21-94

Location: SE Corner 12th. Street and G Road

RESPONSE TO COUNTY PLANNING:

Comments do not require response.

RESPONSE TO DEVELOPMENT ENGINEER:

PLAT

Computer generated outerboundary closure is attached.
The legal description on the dedication sheet is the exact property description per the ownership documents.

STREET PLAN

The curb ramp has been relocated to the Westcliff Drive Pedestrian Path location. Since the Pathway will be constructed to meet City Standards it is assumed that all maintenance of the path will be done by the City.

An alternative location for the Cart Path has been added to the Site Development Plans between Lots 14 and 15.

Compacted Class 6 ABC has been added to the ends of the Curbwalk at the intersection of Club Court and 12th. Street.

SITE DEVELOPMENT PLAN

A separate Tract has been added to the Final Plat which describes the median area which will be conveyed to the HOA for maintenance. R4-7 signs have been added at each end of the median.

The stone wall has been relocated outside of the multi-purpose easement.

IMPROVEMENT AGREEMENT

A revised Improvement Agreement is attached.

DRAINAGE REPORT
Requested area calculations for the drainage fee are attached.

RESPONSE TO POLICE DEPARTMENT:
An alternative location for the Cart Path has been added to the Site Development Plans between Lots 14 and 15.

RESPONSE TO CITY PARKS:
$4950.00 will be paid to the City Parks and Recreation Department prior to the Recording of the Final Plat.

RESPONSE TO U.S. WEST:
Comments do not require response.

RESPONSE TO UTE WATER:
Water Plans have been change in response to comments.

RESPONSE TO PUBLIC SERVICE CO:
The requested 10 ft. utility easements have been added to Lots 5 and 8.

RESPONSE TO CITY UTILITY ENGINEER:

1. Manholes have been relocated in the asphalt.

2. Manhole numbers have been added to the profile.

3. A note has been added to the detail for service connections indicating that all services will by wye type connections.

4. The elevation for the existing Manhole in 12th. Street have been changed.

5. Rim elevations for Manholes have been added to the profiles.

6. Sewer mains have been lowered to maintain a min. of 72" of cover.

7. The common Sewer Service Trench Detail has been revised.

8. Manhole locations have been added to the Coordinate List.

9. Bench Mark information has been added to the plans.

RESPONSE TO FIRE DEPARTMENT:
An additional fire hydrant has been added to the Water Plans.

RESPONSE TO U.S. POSTAL SERVICE:

Comments do not require a response.

RESPONSE TO BRAND VALLEY WATER USERS:

Comments do not require a response.

RESPONSE TO COMMUNITY DEVELOPMENT:

1. The proposal calls for the escrow payment to the City in leu of actual street improvements to 12th. Street and G Road.

2. $4950.00 will be paid to the City Parks and Recreation Department prior to the Recording of the Final Plat.

3. Building Setback requirements on the Site Development Plan has been changed in response to comments. Maximum building heights have also been added to the plan.

4. A separate Tract has been added to the Final Plat which describes the median area, which will be conveyed to the HOA for maintenance.

5. The boundary fence has been changed in response to comments.

6. A note has been added to the Site Development Plan which indicates that no direct driveway access will be allowed onto 12th. Street and G Road.

7. No changes are requested to the Westcliff Drive R.O.W.

8. An Avigation Easement is attached.

9. An alternative location for the Cart Path has been added to the Site Development Plans between Lots 14 and 15. Since the Pathway will be constructed to meet City Standards it is assumed that all maintenance of the path will be done by the City.

10. Street names have been changed.

11. The stone wall and sign has been relocated outside of the multi-purpose easement.

RESPONSE TO CITY PROPERTY AGENT:

If the legal description within the dedication on the final plat is described by metes and bounds it will not coincide with the description contained within the Warranty Deed. Therefore, no change will be made.

STAFF REVIEW

FILE: #21-94

DATE: February 16, 1994

STAFF: Kathy Portner

REQUEST: Final Plat/Plan--Country Club Estates

LOCATION: SE corner of G Road and 12th Street

APPLICANT: Sidney Gottlieb

EXISTING LAND USE: Undeveloped

PROPOSED LAND USE: Residential

SURROUNDING LAND USE:

NORTH:	Residential
SOUTH:	Undeveloped
EAST:	Residential and Undeveloped
WEST:	Undeveloped

EXISTING ZONING: Planned Residential, 6 units per acre (PR-6)

PROPOSED ZONING: Same

SURROUNDING ZONING:

NORTH:	Planned Residential
SOUTH:	Highway Oriented
EAST:	RSF-5
WEST:	County--R-1-B

RELATIONSHIP TO COMPREHENSIVE PLAN:

No plan exists for this area.

STAFF ANALYSIS:

The following comments are offered for the developer's response:

1. Half street improvements will be required for the frontage along 12th Street and G Road.

2. Parks and Open Space fees of $225 per unit must be paid prior to recording the plat.

3. A 25' setback along 12th Street and G Road will be required as agreed upon with the preliminary plan. The proposed setbacks shown on the plat do not match the building envelopes shown on the site plan. Please make them consistent. The approved front yard setback for internal streets is 20' with a 15' rear yard setback (as per the preliminary plan approval). Please include dimensions on the site plan. Lot 12 appears to be unbuildable. Maximum building height must be indicated on the plat and/or site plan. A maximum height of 25' was indicated and approved with the preliminary plan. Maximum height will be measured from the approved grading of the site to the highest point on the roof, excluding chimneys and antennas.

4. All open space tracts must be dedicated to the homeowners association and maintained by the home owners association. The City is evaluating the proposed landscaped median in the entryway as to how it should be dedicated. Development and maintenance of the median will be the responsibility of the developer and homeowners association.

5. The proposed boundary fence must be designed in accordance with site distance triangle requirements at the entry, the corner of 12th and G Road and at the corner of Westcliff Drive and G Road. The fence along the south property line must be off-set 10' to the north and along the east property line from lot 14 south must be off-set 10' to the west so that the utility easement is unrestricted to allow access for sewer line maintenance and repair. The homeowners will be responsible for maintaining the 10' strip.

6. The plat and/or site plan must include a note indicating lots 1 and 22 will not be allowed driveway access onto the entry drive and that no driveway access will be allowed onto 12th Street, G Road or Westcliff Drive.

7. As determined with the preliminary plan approval, the ROW for Westcliff Drive will remain; however, improvements will not be required.

8. The subdivision is located within the Airport Area of Influence. The Avigation Easement must be recorded with the final plat. Residential development is allowed within the area of influence.

9. The pedestrian/golf cart easement access to Westcliff Drive is not acceptable as the only connection. An easement will be required to tie into the easement that was required of the Horizon Park East Subdivision that is adjacent to lot 14 of this development. Lots at the east end of S. Club Ct. must be reconfigured to allow for that access. Fences and/or gates will not be allowed to cross this easement. The pedestrian easement between lot 9 and 10 should also be retained to provide access the future developments to the east. The easement must be a minimum of 12' wide. The easement may not be fenced. Both pedestrian/golf cart easements must be developed with a paved path a minimum of 8' wide. Maintenance of the paths will be the responsibility of the homeowners.

10. To avoid confusion, the proposed street shown as Club Place and S. Club Ct. should be "Club Ct." and the street shown as N. Club Ct. can remain as N. Club Ct.

11. The subdivision sign as proposed is acceptable. The stone wall proposed for the sign cannot exceed 30" in height.

STAFF RECOMMENDATION:

STAFF REVIEW

FILE: #21-94

DATE: February 23, 1994

STAFF: Kathy Portner

REQUEST: Final Plat/Plan--Country Club Estates

LOCATION: SE corner of G Road and 12th Street

APPLICANT: Sidney Gottlieb

EXISTING LAND USE: Undeveloped

PROPOSED LAND USE: Residential

SURROUNDING LAND USE:

NORTH:	Residential
SOUTH:	Undeveloped
EAST:	Residential and Undeveloped
WEST:	Undeveloped

EXISTING ZONING: Planned Residential, 6 units per acre (PR-6)

PROPOSED ZONING: Same

SURROUNDING ZONING:

NORTH:	Planned Residential
SOUTH:	Highway Oriented
EAST:	RSF-5
WEST:	County--R-1-B

RELATIONSHIP TO COMPREHENSIVE PLAN:

No plan exists for this area.

STAFF ANALYSIS:

The proposal is for 22 single family lots on approximately 5 acres at the southeast corner of 27 Road and G Road. One access to the development is being proposed off of 12th Street. The property is zoned Planned Residential not to exceed 6 units per acre (PR-6). The proposed density is 4.4 units per acre.

The petitioner has responded to the comments and conditions made at the preliminary plan approval with the submittal of the final plan and plat. The City has agreed that improvements to West Cliff Drive should not be required at this time but the ROW will remain.

The petitioner has adequately responded to review comments with the following exception:

1. A computer generated outer boundary closure must be provided.

2. Minor maintenance and repair of the two proposed pathways will be the responsibility of the homeowner's association. Pathways may not be blocked by a fence or gate.

3. The required signage at the end of the median must be shown on the plans.

4. The proposed maximum building height of 25' must be shown on the plat and/or site plan.

5. Direct access from lots onto 12th Street, G Road or West Cliff Drive will be prohibited.

STAFF RECOMMENDATION:

Staff recommends approval of the final plan and plan for Country Club Estates subject to the following conditions:

1. A computer generated outer boundary closure must be provided.

2. Minor maintenance and repair of the two proposed pathways will be the responsibility of the homeowner's association. Pathways may not be blocked by a fence or gate.

3. The required signage at the end of the median must be shown on the plans.

4. The proposed maximum building height of 25' must be shown on the plat and/or site plan.

5. Direct access from lots onto 12th Street, G Road or West Cliff Drive will be prohibited.

6. All other review comments as agreed to in the response to comments dated February 24, 1994 be adequately addressed prior to recording the final plat.

SUGGESTED PLANNING COMMISSION MOTION:

Mr. Chairman, on item #21-94, Final Plan and Plat for Country Club Estates, I move we approve this subject to the staff recommendation as presented.

T A L
THOMAS A. LOGUE
LAND DEVELOPMENT CONSULTANTS

February 28, 1994

Kathy Portner
Community Development Dept.
City of Grand Junction, CO 81501
250 North 5th. Street
Grand Junction, CO 81501

RE: COUNTRY CLUB ESTATES, File No. 21-94

Dear Ms. Portner:

At the request of Mr. Sid Gottlieb, the applicant, we are hereby requesting that the Final Plat and Plan application for Country Club Estates be removed from the March 1, 1994, Planning Commission meeting. Further, we would request that no other action be taken with the application.

This was a difficult decision to make, however, given the unanticipated high development costs associated with the development the applicant has not other alternative available.

We will be looking foreword to working with the Staff and Planning Commission on a new development plan.

We would like to take this opportunity to thank you for your effort an apologize for any inconvenience which may have been created.

Respectfully,

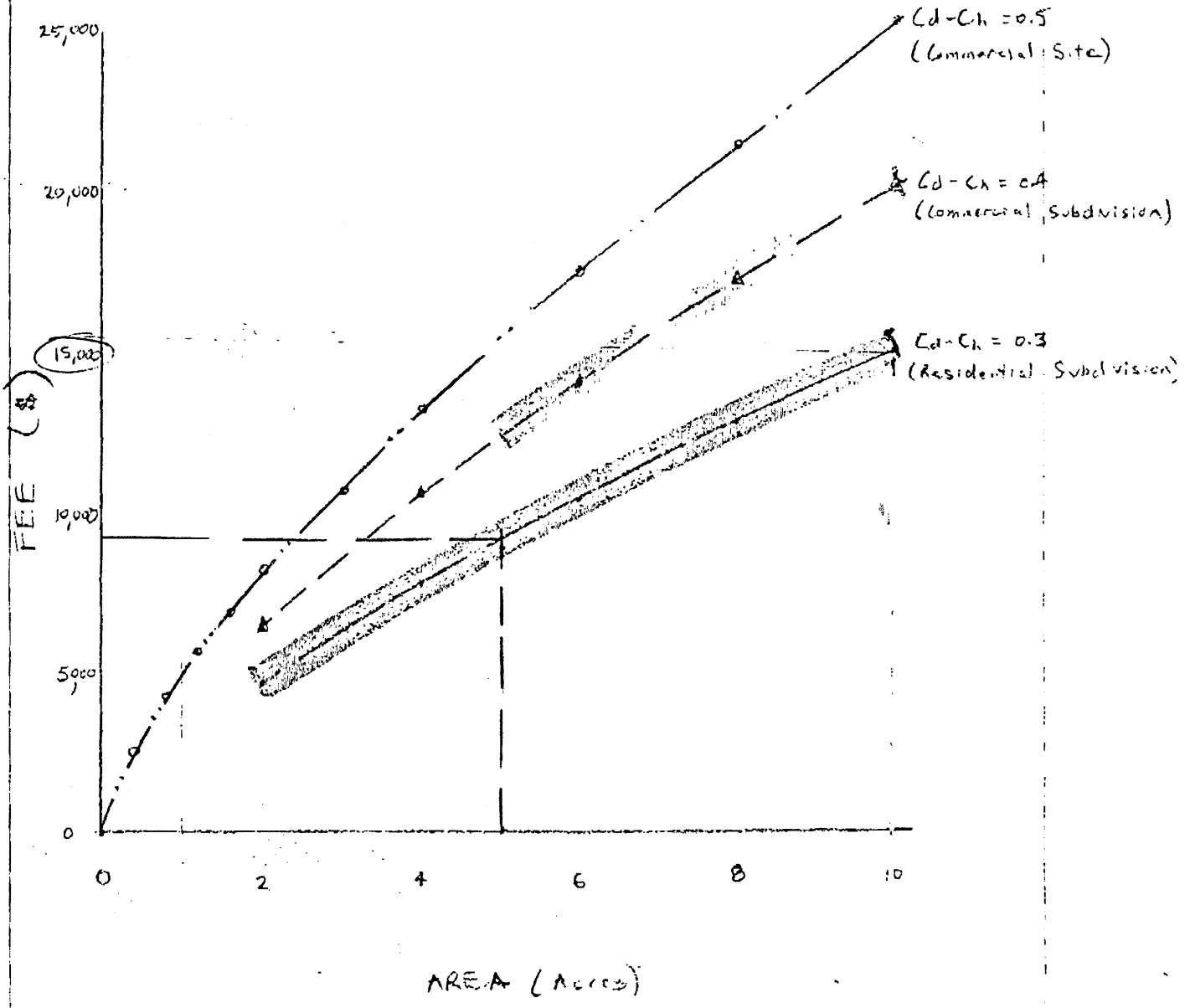
Thomas A. Logue

Thomas A. Logue

xc: Sid Gottlieb

227 SOUTH 9TH STREET • GRAND JUNCTION, COLORADO 81501
(303) 245-4099

DRAINAGE FEE CHART



$$\text{Drainage Fee} = 10{,}000\,(C_{100d} - C_{100h})\,A^{0.7}$$

$$10{,}000\,(0.3)\,5^{0.7} = \$9255.00$$

DEVELOPMENT IMPROVEMENTS AGREEMENT

1. **Parties:** The parties to this Development Improvements Agreement ("the Agreement") are COUNTRY CLUB ESTATES, LLC. ("the Developer") and **THE CITY OF GRAND JUNCTION**, Colorado ("the City").

THEREFORE, for valuable consideration, the receipt and adequacy of which is acknowledged, the Parties agree as follows:

2. **Effective Date:** The Effective Date of the Agreement will be the date that this agreement is recorded which is not sooner than recordation of the Final Plat for Country Club Estates.

RECITALS

The Developer seeks permission to develop property within the City to be known as COUNTRY CLUB ESTATES, which property is more particularly described on Exhibit "A" attached and incorporated by this reference (the "Property"). The City seeks to protect the health, safety and general welfare of the community by requiring the completion of various improvements in the development and limiting the harmful effects of substandard developments. The purpose of this Agreement is to protect the City from the cost of completing necessary improvements itself and is not executed for the benefit of materialmen, laborers, or others providing work, services or material to the development or for the benefit of the purchasers or users of the development. The mutual promises, covenants, and obligations contained in this Agreement are authorized by state law, the Colorado Constitution and the City's land development ordinances.

DEVELOPER'S OBLIGATION

3. **Improvements:** The Developer will design, construct and install, at its own expense, those on-site and off-site improvements listed on Exhibit "B" attached and incorporated by this reference. The Developer agrees to pay the City for inspection services performed by the City, in addition to amounts shown on Exhibit B. The City estimates that $ 750.00 will be required for City inspection of the required improvements. The Developer's obligation to complete the improvements is and will be independent of any obligations of the City contained herein.

4. **Security:** To secure the performance of its obligations under this Agreement (except its obligations for warranty under paragraph 6), the Developer will enter into an agreement which complies with either option identified in paragraph 28, or other written agreement between the City and the Developer.

5. **Standards:** The Developer will construct the Improvements according to the standards and specifications required by the City Engineer or as adopted by the City.

c. Developer's insolvency, the appointment of a receiver for the Developer or the filing of a voluntary or involuntary petition in bankruptcy respecting the Developer; in such event the City may immediately declare a default without prior notification to the Developer;

d. Notification to the City, by any lender with a lien on the property, of a default on an obligation; the City may immediately declare a default without prior notification to the Developer;

e. Initiation of any foreclosure action of any lien or initiation of mechanics lien(s) procedure(s) against the Property or a portion of the Property or assignment or conveyance of the Property in lieu of foreclosure; the City may immediately declare a default without prior notification to the Developer.

13. **Measure of Damages:** The measure of damages for breach of this Agreement by the Developer will be the reasonable cost of satisfactorily completing the Improvements plus reasonable City administrative expenses. For improvements upon which construction has not begun, the estimated costs of the Improvements as shown on Exhibit "B" will be prima facie evidence of the minimum cost of completion; however, neither that amount or the amount of a letter of credit, the subdivision improvements disbursement agreement or cash escrow establish the maximum amount of the Developer's liability.

14. **City's Rights Upon Default:** When any event of default occurs, the City may draw on the letter of credit, escrowed collateral, or proceed to collect any other security to the extent of the face amount of the credit or full amount of escrowed collateral, cash, or security less ninety percent (90%) of the estimated cost (as shown on Exhibit "B") of all improvements previously accepted by the City or may exercise its rights to disbursement of loan proceeds or other funds under the improvements disbursement agreement. The City will have the right to complete improvements itself or it may contract with a third party for completion, and the Developer grants to the City, its successors, assigns, agents, contractors, and employees, a nonexclusive right and easement to enter the Property for the purposes of constructing, reconstructing, maintaining, and repairing such improvements. Alternatively, the City may assign the proceeds of the letter of credit, the improvements disbursement agreement, the escrowed collateral, cash, or other funds or assets to a subsequent developer (or a lender) who has acquired the development by purchase, foreclosure or otherwise who will then have the same rights of completion as the City if and only if the subsequent developer (or lender) agrees in writing to complete the unfinished improvements and provides reasonable security for the obligation. In addition, the City may also enjoin the sale, transfer, or conveyance of lots within the development, until the improvements are completed or accepted. These remedies are cumulative in nature and are in addition to any other remedies the City has at law or in equity.

15. **Indemnification:** The Developer expressly agrees to indemnify and hold the City, its officers, employees and assigns harmless from and against all claims, costs and liabilities

of every kind and nature, for injury or damage received or sustained by any person or entity in connection with, or on account of the performance of work at the development or the Property pursuant to this Agreement. The Developer further agrees to aid and defend the City in the event that the City is named as a defendant in an action concerning the performance of work pursuant to this Agreement. The Developer further agrees to aid and defend the City in the event that the City is named as a defendant in an action concerning the performance of work pursuant to this Agreement except where such suit is brought by the Developer against the City. The Developer is not an agent or employee of the City.

16. **No Waiver:** No waiver of any provision of this Agreement by the City will be deemed or constitute a waiver of any other provision, nor will it be deemed or constitute a continuing waiver unless expressly provided for by a written amendment to this Agreement signed by both City and Developer; nor will the waiver of any default under this Agreement be deemed a waiver of any subsequent default or defaults of the same type. The City's failure to exercise any right under this Agreement will not constitute the approval of any wrongful act by the Developer or the acceptance of any improvement.

17. **Amendment or Modification:** The parties to this Agreement may amend or modify this Agreement only by written instrument executed on behalf of the City by the City Manager or his designee and by the Developer or his authorized officer. Such amendment or modification will be properly notarized before it may be effective.

18. **Attorney's Fees:** Should either party be required to resort to litigation to enforce the terms of this Agreement, the prevailing party, plaintiff or defendant, will be entitled to costs, including reasonable attorney's fees and expert witness fees, from the opposing party. If the court awards relief to both parties, the attorney's fees may be equitably divided between the parties by the decision maker.

19. **Vested Rights:** The City does not warrant by this Agreement that the Developer is entitled to any other approval(s) required by the City, if any, before the Developer is entitled to commence development or to transfer ownership of property in the development.

20. **Third Party Rights:** No person or entity who or which is not a party to this Agreement will have any right of action under this Agreement.

21. **Time:** For the purpose of computing the Abandonment and Completion Periods, and time periods for City action, such times in which war, civil disasters, or acts of God occur or exist will not be included if such times prevent the Developer or City from performing its obligations under the Agreement.

22. **Severability:** If any part, term, or provision of this Agreement is held by the courts to be illegal or otherwise unenforceable, such illegality or unenforceability will not affect the validity of any other part, term, or provision and the rights of the parties will be construed as if the part, term, or provision was never part of the Agreement.

(I) shall provide, among other things, for the bank to guarantee and warrant to the City that it shall:

a. have available money equal to the estimated costs of the required improvements, in an amount equal to the amount agreed upon in the Improvements Agreement:

b. only pay such amounts to contractors who have constructed required Improvements;

c. only pay such amounts after the bank has received the written approval of the City Engineer, or his designee: the City Engineer shall inspect within three (3) working days of request:

d. in the event the bank disburses without the City Engineer having approved such disbursement, the Bank shall pay, in addition to all other sums it would otherwise be obligated to pay, to the City the amount of the wrongful disbursement if the City Engineer determines that the work is not acceptable, based on the approved plans and specifications. The City shall use such money to cause the work to be constructed in accordance with the approved plans and specifications:

~~II. An alternative agreement may be executed for a development which is expected~~ to require not more than 10 transactions shall contain the following provisions:

a. The Finance Department of the City will act as disbursing agent and will account for disbursements to Developer contractors as required improvements are completed and accepted.

b. The City will accept a cash deposit from the Developer equal to the City approved estimate of the required improvements, for purposes of securing and guaranteeing the construction of the required sewer, water, streets, and on-site improvements in the development plan. Such deposit(s), currently estimated at approximately $_____ shall be given to the City's Finance Department, commingled with other funds of the City and specifically invested in the short term market. Interest income shall be allocated to the Developer's escrow account monthly, in the same manner as other short-term investments of the city.

c. Such interest income shall be used to reimburse the General Fund of the City for accounting and transaction costs incurred in making payments to the appropriate contractors. For purposes of this agreement, the City's costs shall be one hundred dollars ($100.00) for each check disbursement or other ~~transaction which is made. In any event the amount retained by the City for~~

23. **Benefits:** The benefits of this Agreement to the Developer are personal and may not be assigned without the express written approval of the City. Such approval may not be unreasonably withheld, but any unapproved assignment is void. Notwithstanding the foregoing, the burdens of this Agreement are personal obligations of the Developer and also will be binding on the heirs, successors, and assigns of the Developer, and shall be a covenant(s) running with the Property. There is no prohibition on the right of the City to assign its rights under this Agreement. The City will expressly release the original Developer's guarantee or obligations under the improvements disbursement agreement if it accepts new security from any developer or lender who obtains the Property. However, no other act of the City will constitute a release of the original Developer from his liability under this Agreement.

24. **Notice:** Any notice required or permitted by this Agreement will be deemed effective when personally delivered in writing or three (3) days after notice is deposited with the U.S. Postal Service, postage prepaid, certified, and return receipt requested, and addressed as follows:

If to Developer: Sidney Gottlieb, Country Club Estates, LLC.
477 Elkwood Terrace
Englewood, NJ. 07631

If to City: City of Grand Junction
Community Development Director
250 N. 5th Street
Grand Junction, Colorado 81501

25. **Recordation:** Developer will pay for any costs to record a copy of this Agreement in the Clerk and Recorder's Office of Mesa County, Colorado.

26. **Immunity:** Nothing contained in this Agreement constitutes a waiver of the City's sovereign immunity under any applicable state law.

27. **Personal Jurisdiction and Venue:** Personal jurisdiction and venue for any civil action commenced by either party to this Agreement whether arising out of or relating to the Agreement, letter of credit, improvements disbursements agreement, or cash escrow agreement or any action to collect security will be deemed to be proper only if such action is commenced in Mesa County. The Developer expressly waives his right to bring such action in or to remove such action to any other court whether state or federal.

28. The **improvements guarantee** required by the City Code to ensure that the improvements described in the improvements agreement are constructed (to city standards) may be in the form of an agreement: (I) between a bank doing business in Mesa County and the City or as described in (II), below. The agreement between a bank and the City

~~its transaction costs shall not be less than two percent (2%) of the amount~~ deposited. After all required improvements have been made and accepted by the City, any surplus funds remaining in the account (in excess of the two percent minimum or the calculated transaction costs) shall be returned to the developer within thirty (30) days of said acceptance date. Any transaction costs which are not covered by the amount of the deposit plus accrued interest shall be paid to the City by the Developer in like manner within thirty (30) days of completion of the improvements. No guarantee as to the level of interest income or rate of return on the funds so deposited is either implied or made in this agreement: the City agrees only to keep the funds ~~invested as with other City funds~~.

d. in any event, the Developer promises to construct the required improvements to the satisfaction of the City Engineer, in accordance with the approved plans and specifications.

29. a. Conditions of Acceptance: The City shall have no responsibility or liability with respect to any street, or other improvement(s), notwithstanding the use of the same by the public, unless the street or other improvements shall have been accepted by the City.

Prior to requesting final acceptance of streets, storm drainage facilities, or other required improvements, the Developer shall furnish to the City Engineer as-built drawings in reproducible form and copies of results of all construction control tests required by City specifications.

b. Phased Development: If the City allows a street to be constructed in stages, the Developer of the first one-half street opened for traffic shall construct the adjacent curb, gutter and sidewalk in the standard location and shall construct the required width of pavement from the edge of gutter on his side of the street to enable an initial two-way traffic operation without on-street parking. That Developer is also responsible for end-transitions, intersection paving, drainage facilities, and adjustments to existing utilities necessary to open the street to traffic.

Attest:

City of Grand Junction
250 North Fifth Street
Grand Junction CO 81501

By: _____

Neva B. Lockhart
City Clerk

Mark K. Achen
City Manager

Attest:

Exhibit B

IMPROVEMENTS LIST/DETAIL

DATE: FEBRUARY 1, 1994
NAME OF DEVELOPMENT: COUNTRY CLUB ESTATES
LOCATION: S.E. G Road & 12th Street
PRINTED NAME OF PERSON PREPARING: THOMAS A. LOGUE

	UNITS	TOTAL QTY.	UNIT PRICE	TOTAL AMOUNT
I. SANITARY SEWER				
1. Clearing and grubbing	LS			1000.00
2. Cut and remove asphalt				-0-
3. PVC sanitary sewer main (incl. trenching, bedding & backfill)	LF	786	24.50	19,257
4. Sewer Services (incl. trenching, bedding, & backfill)	LF	750	18.00	13,500
5. Sanitary sewer manhole(s)	EA	5	1200.00	6,000
6. Connection to existing manhole(s)	EA	1	500.00	500
7. Aggregate Base Course				-0-
8. Pavement replacement				-0-
9. Driveway restoration				-0-
10. Utility adjustments				-0-
II. DOMESTIC WATER				
1. Clearing and grubbing	Inc. Above			
2. Cut and remove asphalt	LF	48	12.00	576
3. Water Main (incl. excavation, bedding, backfill, valves and appurtenances)	LF	1181	15.00	17,715
4. Water services (incl. excavation, bedding, backfill, valves, and appurtenances)	EA	22	500.00	11,000
5. Connect to existing water line	EA	1	2500.00	2500
6. Aggregate Base Course	CY	8	16.00	128
7. Pavement Replacement	SY	25	4.00	100
8. Utility adjustments				-0-
III. STREETS				
1. Clearing and grubbing	Inc. Above			-0-
2. Earthwork, including excavation and embankment construction	CY	4325	2.00	8650
3. Utility relocations				-0-
4. Aggregate sub-base course (square yard)				-0-
5. Aggregate base course (square yard)	CY	205	17.00	3485
6. Sub-grade stabilization	SY	3825	2.00	7650
7. Asphalt or concrete pavement (square yard)	TON	950	25.00	
8. Curb, gutter & sidewalk (linear feet)	LF	1450	19.00	23,750
9. Driveway sections (square yard)				-0-
10. Crosspans & fillets	SF	805	8.00	6440
11. Retaining walls/structures				-0-
12. Storm drainage system	LS			4200

13. Signs and other traffic control devices	EA	4	150.00	600
14. Construction staking	LS			3000
15. Dust control	LS			1000
16. Street lights (each)	EA	2	750.00	1500
IV. LANDSCAPING				
1. Design/Architecture	LS			500
2. Earthwork (includes top soil, fine grading, & berming	LS			500
3. Hardscape features (includes walls, fencing, and paving)	LS			8000
4. Plant material and planting	LS			2000
5. Irrigation system	LS			2000
6. Other features (incl. statues, water displays, park equipment, and outdoor furniture)				-0-
7. Curbing	LS			800
8. Retaing walls and structures	Above			
9. One year maintenance agreement	LS			500
V. MISCELLANEOUS				
1. Design/Engineering	LS			10,000
2. Surveying	LS			2,000
3. Developer's inspection costs	LS			750
4. Quality control testing	LS			5,000
5. Construction traffic control	LS			4,000
6. Rights-of-way/Easements				-0-
7. City inspection fees	LS			750
8. Permit fees	LS			100
9. Recording costs	LS			100
10. Bonds				-0-
11. Newsletters				-0-
12. General Construction Supervision	LS			5,000
13. Other _____				
14. Other _____				

TOTAL ESTIMATED COST OF IMPROVEMENTS: $ 171,551.00

_____ _____

SIGNATURE OF DEVELOPER — DATE

(If corporation, to be signed by President and attested to by Secretary together with the corporate seals.)

I have reviewed the estimated costs and time schedule shown above and, based on the plan layouts submitted to date and the current costs of construction, I take no exception to the above.

_____ _____

CITY ENGINEER — DATE

_____ _____

COMMUNITY DEVELOPMENT — DATE