M10/D3

12 PLANS

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

May 20, 1982

To Whom It May Concern:

In early April I realized that the new Flood Hazard Maps (B & H) indicated flooding along Sage Road at a depth of approximately 1-3 feet. Even though an approved letter had been sent (3/26/82), I requested that Vic Chavez raise the FF elevation. The plans marked "GOOD, 5/20/82, BGB" reflect this change.

Brian G. Burnett BGB

BGB/br

MUNICIPAL DEVELOPMENT DEPARTMENT
Richard S. Heller, P.E., City Engineer ENGINEERING DIVISION Telephone (505) 766-7467

AN EQUAL OPPORTUNITY EMPLOYER

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.
6121 INDIAN SCHOOL RD., N.E. SUITE 120
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

RECEIVED
MAY 20 1982
CITY ENGINEER

LETTER OF TRANSMITTAL

TO: Mr. Brian Burnett
City of Albuquerque
P. O. Box 1293
Albuquerque, N. M. 87103

DATE: May 18, 1982
JOB NO. P02-100-50
RE: LDS Church

GENTLEMEN:

We are sending you X ATTACHED ___ UNDER SEPARATE COVER the following items:

___ SHOP DRAWINGS ___ CHANGE ORDER ___ SPECIFICATIONS
___ COPY OF LETTER ___ PLANS ___
X PRINTS ___ SAMPLES

COPIES	DATE	NO.	DESCRIPTION
2			Grading Plans

THESE ARE TRANSMITTED as checked below:

___ FOR APPROVAL
X FOR YOUR USE
___ AS REQUESTED
___ FOR REVIEW AND COMMENT
___ APPROVED AS SUBMITTED
___ APPROVED AS NOTED
___

___ RETURNED FOR CORRECTIONS
___ RESUBMIT ___ COPIES FOR APPROVAL
___ SUBMIT ___ COPIES FOR DISTRIBUTION
___ RETURN ___ CORRECTED PRINTS
___ PRINTS RETURNED AFTER LOAN TO US
___ FOR BIDS DUE _____ 19___

REMARKS:

COPY TO: _____

SIGNED: Victor J. Chavez

If enclosures are not as noted, kindly notify us at once.

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
David Rusk

January 17, 1979

Goldberg-Mann & Associates, Inc.
911 Pennsylvania St. N.E.
Albuquerque, N.M. 87110

M10-D3

Attention: Thomas T. Mann, Jr.

Dear Mr. Mann:

I want to confirm the understanding that the drainage and sewer facilities installed in the utility easement granted by the Latter Day Saints Church, on Indian School Rd. and Eastridge Drive, for service to the Donnette Addition, will be maintained by the City.

Very truly yours,

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/fs

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

March 26, 1982

Mr. Victor Chavez
Chavez-Grieves Consulting Engin.
6121 Indian School Rd. N.E., Suite 120
Albuquerque, N.M. 87110

RE: LATTER DAY SAINTS CHURCH DRAINAGE REPORT

Dear Vic:

The referenced report is approved.

Very truly yours,

BGB

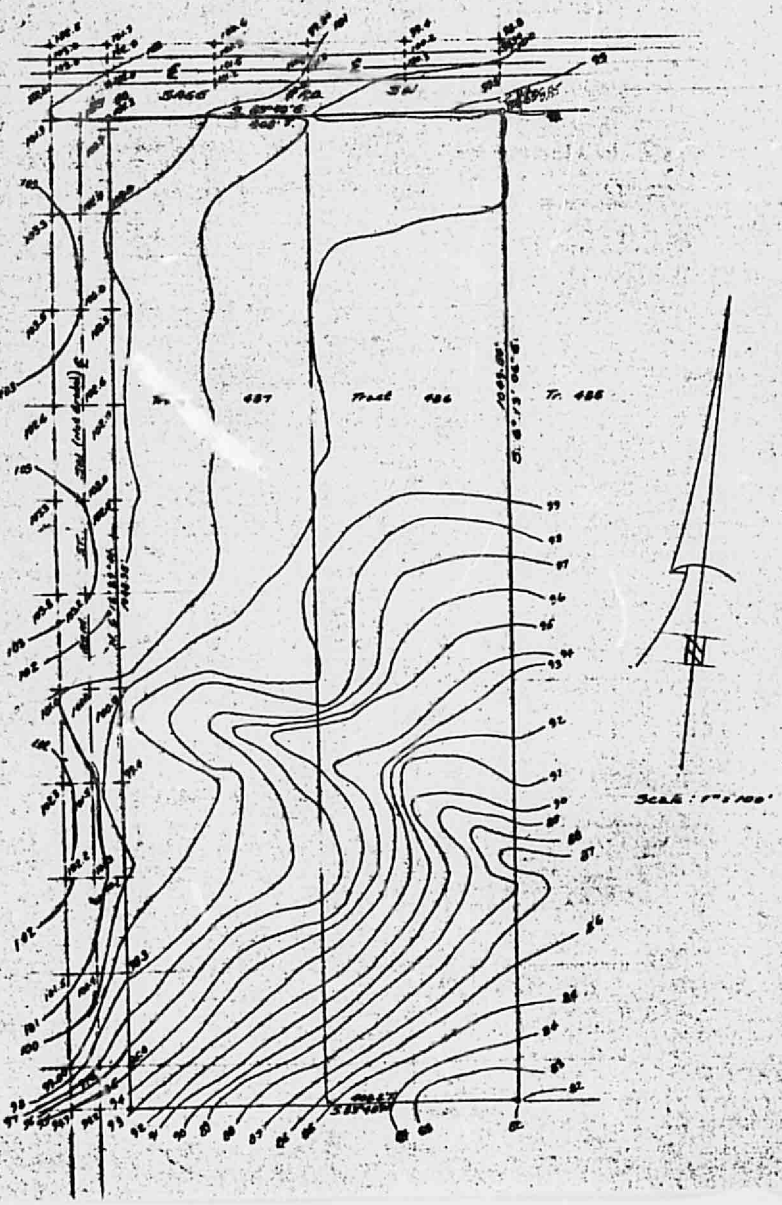
Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl

[illegible] COMPANY July, 1979 [illegible]

AUGMENTED OCT., 1961 to show more elevations on Sage Rd. and
82nd. St. SW and to tie into [illegible] sea level.
City of Albuquerque Bench Mark at 98th. Street , 150'-
North of Gibson Blvd. SW Station 5-M9 (Fire Hydrant top N. bonnet bolt.)

FOR MEAN SEA LEVEL ADD 4981.25' TO FIGURES SHOWN.
AFS OCT., 1961



City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

M10 - D3

March 9, 1982

Mr. Vic Chavez
Chavez-Grieves Consulting Engineers
6121 Indian School Rd. N.E., Suite 120
Albuquerque, New Mexico 87110

RE: LATTER DAY SAINTS CHURCH DRAINAGE REPORT

Dear Vic:

A review of the referenced report has resulted in the comments listed below:

a. What is the status of the street grades in 82nd Street? Has the Design Section been contacted to begin work on establishing these grades?

b. Please provide a clarification to the paragraph discussing flows being diverted to the south of the Phase 1 development. How much flow is being diverted? Does this diversion violate AMAFCA's ordinance that states that upland runoff must be accepted by the downstream property? A topography map defining the watershed would be helpful.

c. What type of plans does the Church have for expansion? Is there any way we can develop a drainage plan that would provide for this growth?

d. Will the widening of Sage Rd. require modification to the proposed culverts underneath the driveway? Please be advised that construction of this nature will require an approved Special Order No. 19.

e. We have had very little success with filter fabric and therefore recommend that it not be used as a pond liner. Using just the rip-rap blanket should prove adequate.

f. Please see that all elevations are adjusted to Mean Sea Level Designations.

If I can answer any questions concerning these matters, please call.

Very truly yours,

Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl

N/10-D3

March 4, 1982

Mr. Victor Chavez

Re: LDS Church

1. Mean Sea Level values
2. ~~Value~~ Capacity of pipes
3. Proposed street grades in 82nd St.
4. Proposed additions to layout
5. Street grades along Sage Rd
6. Flow depth in Sage and relative to FF elevation
7. Construction in ROW allowed? re (Sage Rd widening?)
8. No filter cloth in pond
9. What happens at intersection of 82nd & Sage i.e. Any flows down ~~Sage~~'s 82nd?

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.
6121 INDIAN SCHOOL RD., N.E. SUITE 220
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

March 17, 1982

RECEIVED
MAR 18 1982
CITY ENGINEER

Mr. Brian Burnett
Civil Engineer/Hydrology
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Latter Day Saints Church Drainage Report

Dear Mr. Burnett:

With regard to the comments in your letter dated March 9, 1982 on the above referenced project, I offer the following:

a. The street grades in 82nd Street have not been established. In fact, both 82nd and Sage, immediately adjacent to the property, are not within the City Limits of Albuquerque.

b. The southern portion of the site slopes from northwest to southeast with a poorly defined shallow arroyo. A reduced copy of the overall site topography is attached. The diverted flows referred to in the report consist of those generated immediately west of the site. Diversion around the developed portion of the site will not result in a change in the location of runoff to the downstream property.

c. Future development plans for the rest of the site are very tentative at this time. There has been some discussion of using the undeveloped portion for athletic fields, however, this is not definite. Due to this uncertainty, it would be unrealistic to establish drainage guidelines which may or may not be applicable. It would seem more efficient to implement the same drainage guidelines being used in the Phase I development.

d. The widening of Sage Road will eliminate the need for the culverts since the anticipated runoff can be handled by the road section. Installation of the culverts is planned to handle typical summer storm flows and to maintain access to the site. Plans will be prepared for the installation of the culverts in accordance with Special Order No. 19.

e. As suggested in your letter, the filter fabric will be eliminated in the installation of the rip-rap at the pond outlet.

f. Attached is a copy of the proposed grading plan with all elevations shown relative to Mean Sea Level.

Please call if you have any questions or require any additional information. Your assistance in this matter is appreciated.

Sincerely,

CHAVEZ-GRIEVES CONSULTING ENGINEERS, INC.

Victor J. Chavez

Victor J. Chavez, P. E.

VJC:mb
encl.

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.

6121 INDIAN SCHOOL RD., N.E. SUITE 120
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

October 6, 1981

Mr. Chuck Easterling
Assistant City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Z-79-101-1
Proposed L.D.S. Church

M 10-D 3

Dear Mr. Easterling:

At the EPC hearing on August 20, 1981, the referenced application for approval of development plans was indefinitely deferred due to undefined drainage problems that make development detrimental. We hereby request that the application be reconsidered as a result of the subsequent investigation into planned improvements affecting the sites watershed area.

The site is located at the southeast corner of the intersection of 82nd Street and Sage Road, S.W. as shown on the attached area plan. The site is not indicated as being flood prone in the 1979 Flood Hazard Boundary Maps for the City of Albuquerque. They do, however, indicate flood plains both south and north of the site, draining the large basins located to the northwest.

Drainage projects presently being prepared for bidding by AMAFCA and scheduled for completion in the last quarter of 1982 will eliminate runoff from areas upstream of the power line channel and flows from the intersection of 98th Street and Sage Boulevard. These two improvements will also have the capacity to divert flows from proposed developments located west of 102nd Street.

For the purpose of this study, it has been assumed that basins A, B and C, as shown on the attached plan, while undeveloped and prior to completion of future drainage improvements, may drain to the vicinity of the site along Sage Boulevard. It should be noted, however, that actual flow paths are difficult to determine in this area and the above assumption will generate relatively conservative values.

The attached calculations indicate that the site will experience the highest probability of flooding following full development of the upstream basins. The resulting flows from sub-basin C can be contained in the existing road

section and will not present insurmountable problems in the development of the site.

We therefore request your approval in our efforts to reschedule a hearing on the proposed development plan for the November 16th meeting of the E.P.C. A detailed grading plan and additional runoff information will be forwarded as soon as possible.

Your timely assistance in this matter is appreciated.

Very truly yours,

Victor J. Chavez

Victor J. Chavez, P.E.

OK Chuck Easterling 10/6/81

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources

Sheet No. 1 of
Job No.
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Determine existing flows with an assumed 10% of the area consisting of impervious surfacing. See attached area Plan for Sub-basin deliniations.

Sub Basin	Area (Acres)	Length (feet)	Δ El. (feet)	Tc (hrs)	Rainfall (inches)
A	263	6000'	200	.38	2.2
B	207	5500'	200	.35	2.2
C	229	6000'	110	.48	2.2

Sub Basin	CN*	CN**	Direct Runoff (Inches)	Discharge (cfs/Ac./in.)	Q (cfs)
A	68	72	0.4	1.14	119.9
B	68	72	0.4	1.16	96.0
C	68	72	0.4	1.03	94.4
					310.3 cfs.

* Soil Type "A" ** Corrected for 10% Imp.
Ref.: "Peak Rates of Discharge for Small Watersheds"
Chapter 2 - Revised 10/73 - U.S. Dept. of Ag. Soil Cons. Serv.

Job Proposed U.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources.

Sheet No. 5 of
Job No.
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

With water approximately 1-foot deep $R_h \approx 1.0$

For Mannings Eq use $n = \frac{.03 + .018}{2} = .024$

$$V = \frac{1.48}{.024} (1.0)^{2/3} (.02)^{1/2}$$

$$= 61.67 (1.0)(.14)$$

$$= 8.6 \text{ f.p.s.}$$

Area req. = $380/8.6 = 44.2 \text{ ft}^2$

Ave. Depth = $44.2/86 = .51$

Use depth = .7 $\therefore R_h = .7$

$V = 61.67 (.79)(.14) = 6.8$

Area req = $380/6.8 = 55.9$

Ave. depth = .65 ok.

$\therefore$ Water can be contained within the street right of way. Some erosion protection will be required along road R/W.

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources

Sheet No. 2 of
Job No.
By VTC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

For fully developed conditions (80% impervious), Sub-Basins A & B will be diverted. Only Sub-Basin C will continue to contribute flow to the site.

Modified CN = 91

Direct Runoff = 1.4"

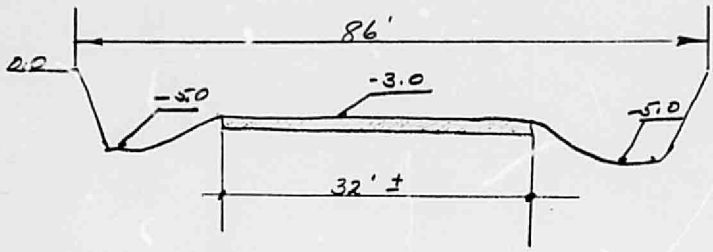
Q = 1.03 (1.4)(229) = 330 cfs.

Assume approximately 50% of the basins hydraulic length will be modified. From Page 4-2, TR-55, peak factor = 1.15

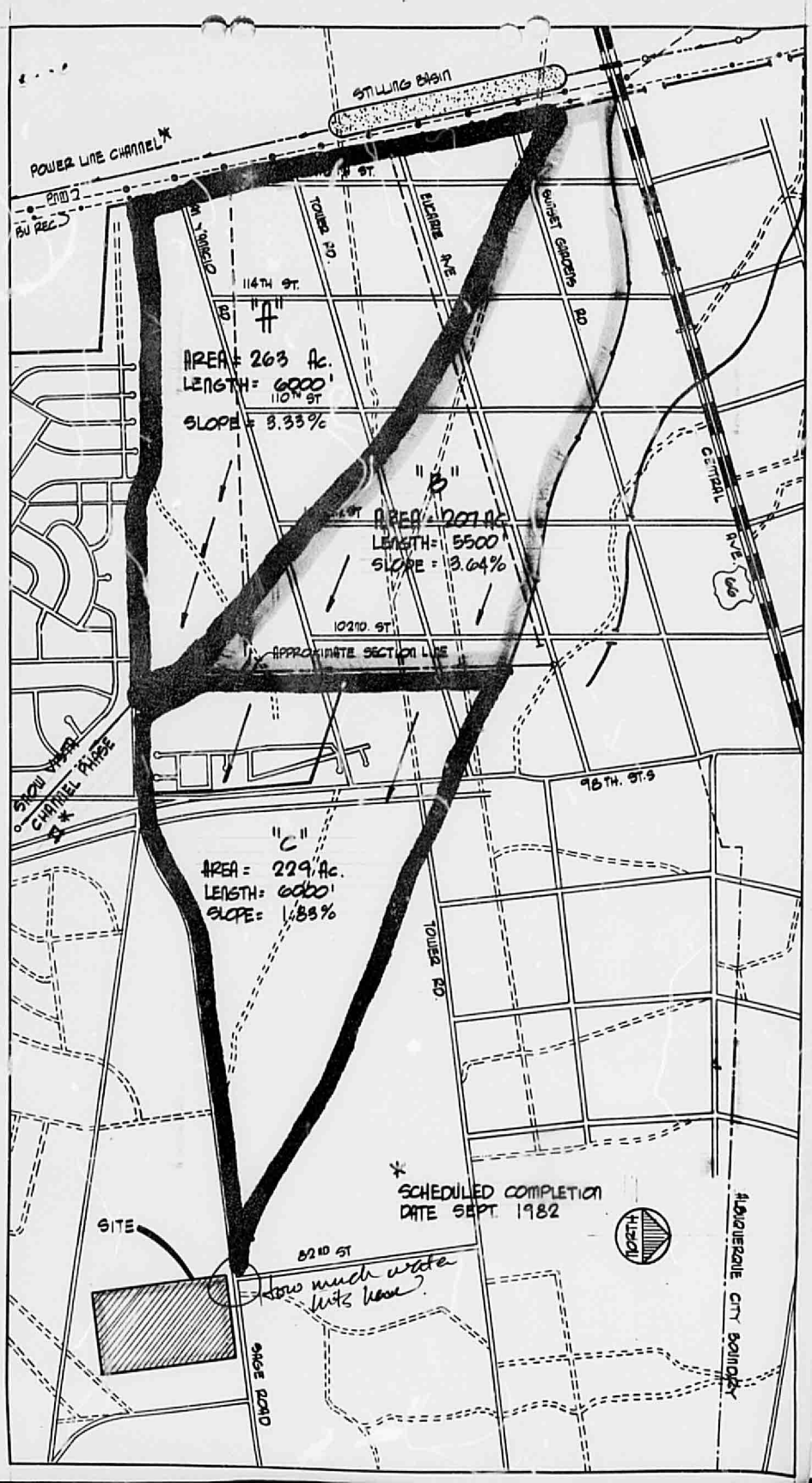
∴ Design Q = 330 (1.15) = 379.5 cfs. use 380

Existing Road Conditions.

Width = 86' slope = 2 %



Ref: "Urban hydrology for small Watersheds"
Technical Release # 55 - Soil Conservation Service


STILLING BASIN
POWER LINE CHANNEL*
BU REC
TOWER RD.
EUCLID AVE
QUIET GARDENS RD
114TH ST.
"A"
AREA = 263 Ac.
LENGTH = 6000'
110TH ST
SLOPE = 3.33%
"B"
AREA = 207 AC
LENGTH = 5500
SLOPE = 3.64%
CENTRAL AVE.
66
102ND. ST
APPROXIMATE SECTION LINE
SNOW VISTA CHANNEL PARK
98TH. ST.S
"C"
AREA = 229 Ac.
LENGTH = 6060'
SLOPE = 1.88%
TOWER RD.
SCHEDULED COMPLETION DATE SEPT. 1982
NORTH
SITE
82ND ST
How much water lots have
SAGE ROAD
ALBUQUERQUE CITY BOUNDARY

CHAVEZ GRIEVES

CONSULTING ENGINEERS, INC.

RECEIVED

FEB 22 1982

ENGINEERING

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH,
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

M10-03

JANUARY, 1982

Pl. call when complete

K Tousey 883-6523

7644

017 017

CHAVEZ GRIEVES

CONSULTING ENGINEERS, INC.

RECEIVED

FEB 22 1982

ENGINEERING

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH,
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

M10-03

JANUARY, 1982

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.
6121 INDIAN SCHOOL RD., N.E. SUITE 120
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

February 18, 1982

Mr. Ken Towery
Paragon Resources
4500 Bogan Road, N. E.
Albuquerque, New Mexico 87109

RECEIVED
FEB 18 1982
CITY ENGINEER

Re: LATTER DAY SAINTS CHURCH
Drainage Report

Dear Mr. Towery:

Transmitted herewith are four (4) Drainage Reports for the proposed Latter Day Saints Church project. Presented is development criteria for the project as required by the City Hydrologist and the Interim Drainage Guidelines of the City of Albuquerque.

Please feel free to call should you have any questions, or if we can be of any further assistance in this matter.

Sincerely,

Victor J. Chavez

Victor J. Chavez, P. E.

VJC:mb

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.

6121 INDIAN SCHOOL RD. N.E.
SUITE 220
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

JANUARY, 1982

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH

TABLE OF CONTENTS

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SCOPE 1
DESIGN CRITERIA 1
LOCATION AND DESCRIPTION. 2
EXISTING DRAINAGE CONDITIONS. 2
PROPOSED DRAINAGE CONDITIONS. 3
CONCLUSIONS AND RECOMMENDATIONS 3

PRELIMINARY DRAINAGE STUDY . . . . . Appendix A
CALCULATIONS. . . . . Appendix B
PLATES. . . . . Appendix C

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

PURPOSE

The purpose of this report is to transmit drainage data and development guidelines to the proposed construction of the Latter Day Saints Church site such that the development will neither be susceptible to flooding nor will it increase the threat of flooding to downstream areas.

SCOPE

The scope of this report is limited to an investigation of the study site and those areas which might contribute flow to the site or are affected by flows from the site. Site development has been reviewed as it relates to the associated watershed's hydrologic and hydraulic conditions. Conclusions of this report are intended to provide construction guidelines for the proposed development. Guidelines are limited to the first phase of development.

DESIGN CRITERIA

Ponding volumes have been sized to maintain the existing undeveloped runoff conditions in the event of a 100-year frequency storm. Pond drains and overflows have been sized in accordance with the City of Albuquerque Interim Drainage Guidelines published November 13, 1979. Design storm is the 100-year frequency storm with intensity and duration as shown on the curves of Chart 1 "1963 Master Plan of Drainage for the City of Albuquerque and Environs" as prepared by Gordon Herkenhoff and Associates, Inc. Consulting Engineers.

Analysis of storm runoff is based on the Rational Formula, Q = CIA, where:

Q = Runoff quantity in cubic feet per second
C = Runoff coefficient; non-dimensional
I = Intensity in inches per hour
A = Contributing area in acres

Storm routing is based on "Design Procedures, Routing of Runoff Through A Ponding Area", City of Albuquerque.

LOCATION AND DESCRIPTION

The study site is located on the West Mesa area of Albuquerque at the southeast corner of the intersection of Sage Road and 82nd Street S. W. The parcel of land consists of Tracts 486 and 487 in Unit 7, Town of Atrisco Grant, containing approximately 9.84 acres. The first phase of development includes only the northernmost 427.00 feet of the tract (4.0 Ac.).

The site and surrounding property are presently undeveloped. The site has a sparse vegetational cover of grass, cacti, and yucca plants with some scattered trash and debris. Soil conditions consist of silty to very silty, calcareous sand overlying silty, fine to coarse-grained sand. Underlying soils have a high dry strength but will consolidate with an increase in moisture. Site grading should provide sufficient slope to prevent ponding adjacent to the building.

EXISTING DRAINAGE CONDITIONS

Runoff from the site is directed to the east by the existing topography. Flows can best be described as sheet flows with no well defined courses.

As outlined in our letter to Mr. Chuck Easterling dated October 6, 1981, a copy of which is included in Appendix A, the site is not located in a flood prone area and, if properly developed, will not be flooded by flows from upstream areas. Anticipated peak flows will result in an average depth of flow in Sage Road of approximately .65 feet.

Flows from areas immediately west of the site are diverted to the south of the Phase I development by means of a berm along the west side of the property. Runoff is accumulated in a shallow arroyo located in the southern portion of the property and transported to the east through adjacent properties.

PROPOSED DRAINAGE CONDITIONS

Development plans for the site involve the construction of a Latter Day Saints Church facility with associated parking areas, walkways, and landscaping. The developed coefficient of runoff for Phase I of the project is 0.64. Increased runoff is to be routed to a relatively shallow landscaped ponding area located south and east of the parking area. Maximum anticipated water depth in the event of a 100-year storm will be approximately 0.6 feet.

Flow from the pond will be restricted by a low concrete wall with three 4-inch diameter drains. Flow through the drains is significantly less than the existing undeveloped conditions which will serve in restricting smaller annual storms. Due to the soil characteristics, and the relatively flat bottom of the pond, small storms will remain on the site and be disposed of through percolation.

Sage Road is presently only partially developed and 82nd Street is undeveloped. As a result, storm flows are not restricted to the street proper. Culverts will be installed at the Sage entrance to the site to allow annual storm runoff to pass without disrupting access to the property. The culverts have not been designed to pass a 100-year storm.

CONCLUSIONS AND RECOMMENDATIONS

It is the conclusion of this report that, provided the site is developed as outlined in the attached grading plan, the site will not be susceptible to flooding nor increase the threat of flooding to downstream areas.

VICTOR CHAVEZ
STATE OF NEW MEXICO
No. 5713
REGISTERED PROFESSIONAL ENGINEER

APPENDIX A

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.

6121 INDIAN SCHOOL RD., N.E. SUITE 120
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

October 6, 1981

Mr. Chuck Easterling
Assistant City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Z-79-101-1
Proposed L.D.S. Church

Dear Mr. Easterling:

At the EPC hearing on August 20, 1981, the referenced application for approval of development plans was indefinitely deferred due to undefined drainage problems that make development detrimental. We hereby request that the application be reconsidered as a result of the subsequent investigation into planned improvements affecting the sites watershed area.

The site is located at the southeast corner of the intersection of 82nd Street and Sage Road, S.W. as shown on the attached area plan. The site is not indicated as being flood prone in the 1979 Flood Hazard Boundary Maps for the City of Albuquerque. They do, however, indicate flood plains both south and north of the site, draining the large basins located to the northwest.

Drainage projects presently being prepared for bidding by AMAFCA and scheduled for completion in the last quarter of 1982 will eliminate runoff from areas upstream of the power line channel and flows from the intersection of 98th Street and Sage Boulevard. These two improvements will also have the capacity to divert flows from proposed developments located west of 102nd Street.

For the purpose of this study, it has been assumed that basins A, B and C, as shown on the attached plan, while undeveloped and prior to completion of future drainage improvements, may drain to the vicinity of the site along Sage Boulevard. It should be noted, however, that actual flow paths are difficult to determine in this area and the above assumption will generate relatively conservative values.

The attached calculations indicate that the site will experience the highest probability of flooding following full development of the upstream basins. The resulting flows from sub-basin C can be contained in the existing road

section and will not present insurmountable problems in the development of the site.

We therefore request your approval in our efforts to reschedule a hearing on the proposed development plan for the November 16th meeting of the E.P.C. A detailed grading plan and additional runoff information will be forwarded as soon as possible.

Your timely assistance in this matter is appreciated.

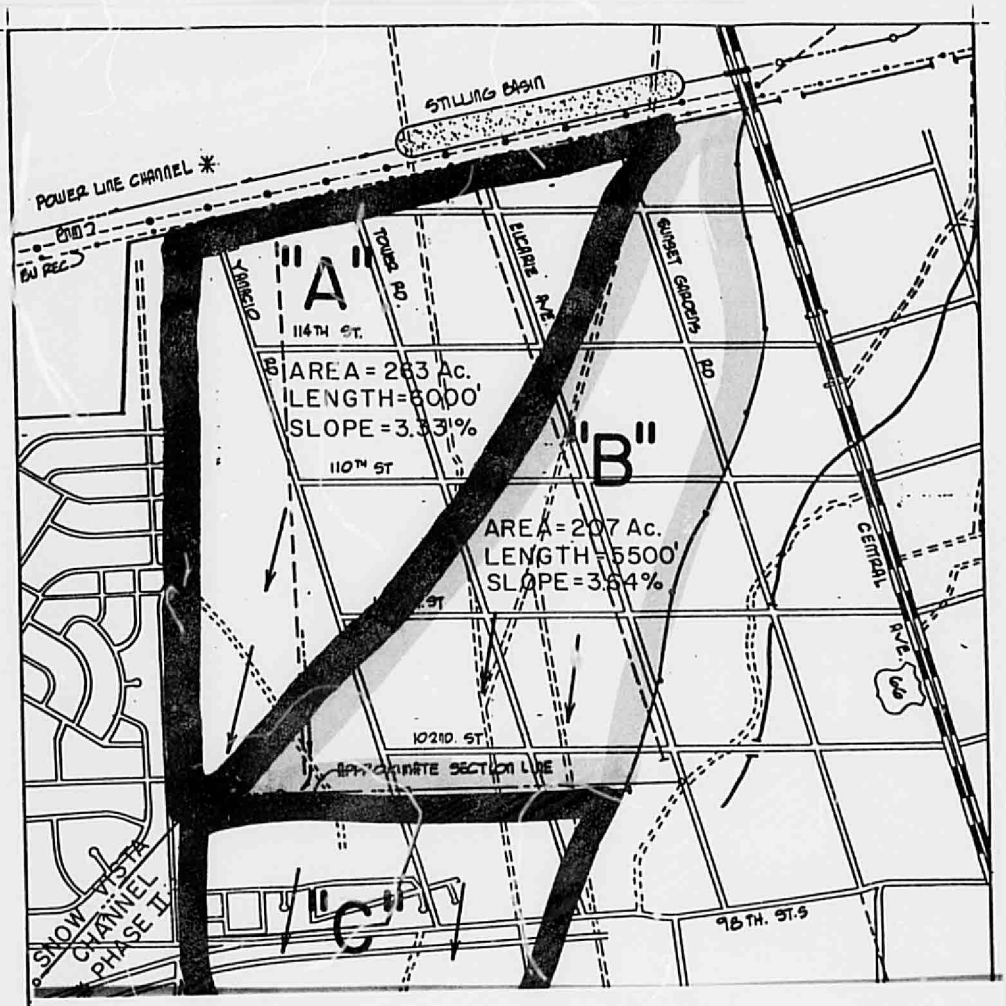
Very truly yours,

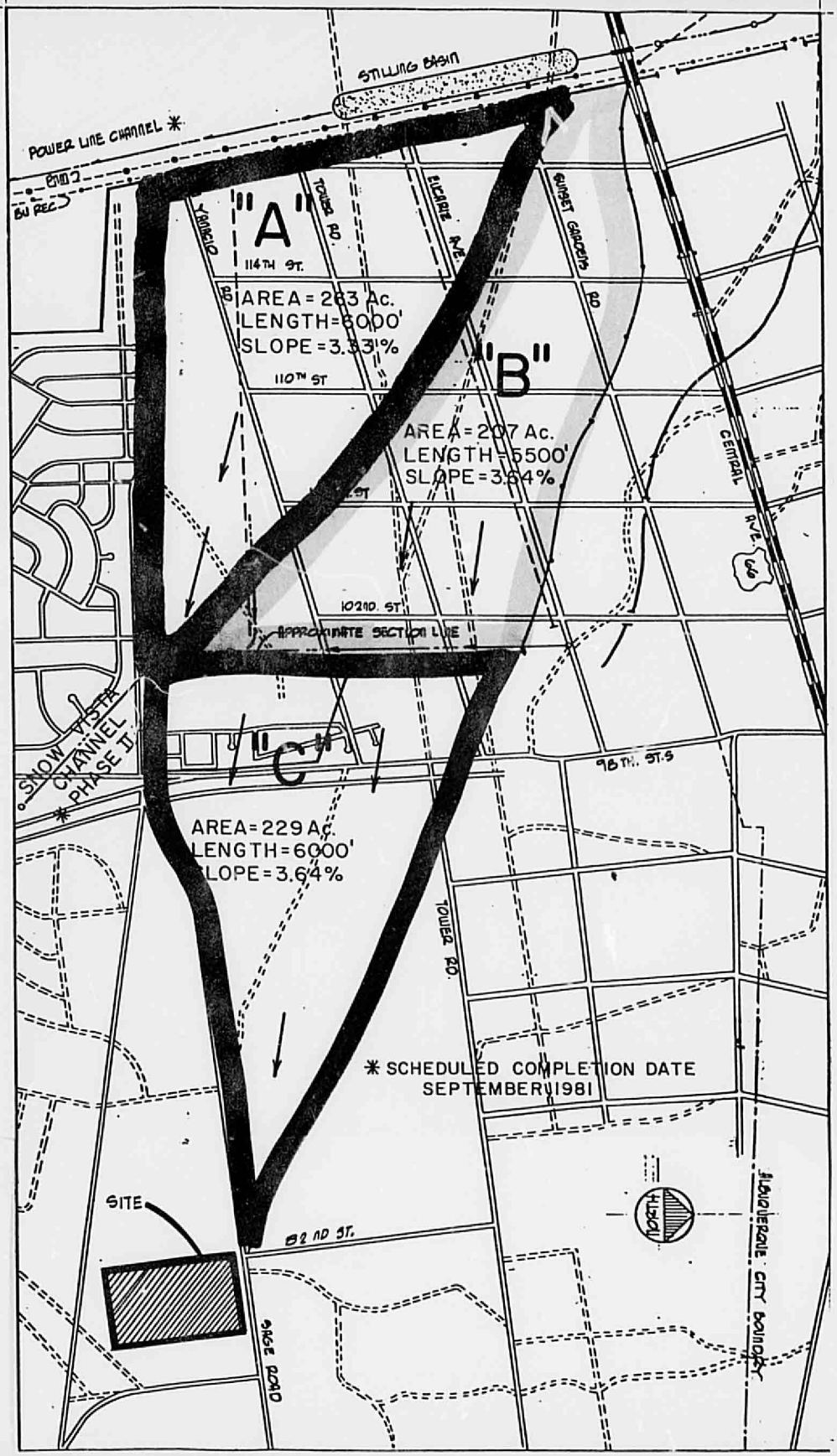
Victor J. Chavez

Victor J. Chavez, P.E.

APPROVED:

BY: Charles M. Easterling Date: 10/6/81


STILLING BASIN
POWER LINE CHANNEL
"A"
AREA = 263 Ac.
LENGTH=6000'
SLOPE = 3.53%
"B"
AREA = 207 Ac.
LENGTH = 5500'
SLOPE = 3.64%
"C"
114TH ST.
110TH ST
102ND. ST
98TH. ST.S
TOWER RD.
ELCIRIE AVE.
SUNSET GARDENS
CENTRAL AVE.
SNOW VISTA CHANNEL PHASE II


STILLING BASIN
POWER LINE CHANNEL *
BNDZ
BU REC
"A"
114TH ST.
AREA = 283 Ac.
LENGTH = 6000'
SLOPE = 3.33%
TOWER RD.
EUCALYPTUS AVE.
SUNSET GARDENS RD
YRANCIO RD
110TH ST
"B"
AREA = 207 Ac.
LENGTH = 5500'
SLOPE = 3.54%
CENTRAL AVE.
66
102ND. ST.
APPROXIMATE SECTION LINE
SNOW VISTA CHANNEL PHASE II *
"C"
98TH. ST.S
AREA = 229 Ac.
LENGTH = 6000'
SLOPE = 3.64%
TOWER RD.
* SCHEDULED COMPLETION DATE
SEPTEMBER 1981
SITE
82ND ST.
SAGE ROAD
NORTH
ALBUQUERQUE CITY BOUNDARY

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources

Sheet No. 1 of ____
Job No. ____
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Determine existing flows with an assumed 10% of the area consisting of impervious surfacing. See attached area Plan for Sub-basin deliniations.

Sub Basin	Area (Acres)	Length (feet)	Δ El. (feet)	Tc (hrs)	Rainfall (inches)
A	263	6000'	200	.38	2.2
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Sub Basin	CN*	CN**	Direct Runoff (Inches)	Discharge (cfs/Ac./in.)	Q (cfs)
A	68	72	0.4	1.14	119.9
B	68	72	0.4	1.16	96.0
C	68	72	0.4	1.03	94.4
					310.3 cfs

* Soil Type "A" ** Corrected for 10% Imp.
Ref.: "Peak Rates of Discharge for Small Watersheds"
Chapter 2 - Revised 10/73 - U.S. Dept. of Ag. Soil Cons. Se

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources.

Sheet No. 3 of
Job No.
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

With water approximately 1-foot deep $R_h \approx 1.0$

For Mannings Eq use $n = \frac{.03+.018}{2} = .024$

$$V = \frac{1.48}{.024}(1.0)^{2/3}(.02)^{1/2}$$

$$= 61.67(1.0)(.14)$$

$$= 8.6 \text{ f.p.s.}$$

Area req. = $380/8.6 = 44.2 \text{ ft}^2$

Ave. Depth = $44.2/86 = .51$

Use depth = .7 $\therefore R_h = .7$

$V = 61.67(.79)(.14) = 6.8$

Area req = $380/6.8 = 55.9$

Ave. depth = .65 ok.

$\therefore$ Water can be contained within the street right of way. Some erosion protection will be required along road R/W.

APPENDIX B

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. D-1 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Existing Conditions.

Area = 4.0 Acres.
Slope = 1.0 %
Length = 400'
Tc = 17 min.
i = 189/25+17 = 4.5 in/hr.
C = 0.4

Q = 0.4 (4.5)(4.0) = 7.2 cfs.

Vol. = .4 (2.2)(4.0)(43,560)/12 = 12,778 ft³

Developed Conditions.

Coefficient of Runoff.

	Area	Coeff.		Product
Paving	1.28	(.90)	=	1.15
Concrete	0.20	(.95)	=	0.19
Roof	0.38	(.95)	=	0.36
Landscaping	2.14	(.40)	=	0.86
	4.00			2.56

C = 2.56/4.00 = 0.64

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. 02 of ____
Job No. ____
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Developed Conditions. (cont.)

$T_c = 10$ min

$i = 189/35 = 5.4$ in./hr.

$Q = 0.64(5.4)(4.0) = 13.82$ c.f.s.

$Vol. = .64(2.2)(4.0)(43{,}560)/12 = 20{,}444$ ft^3

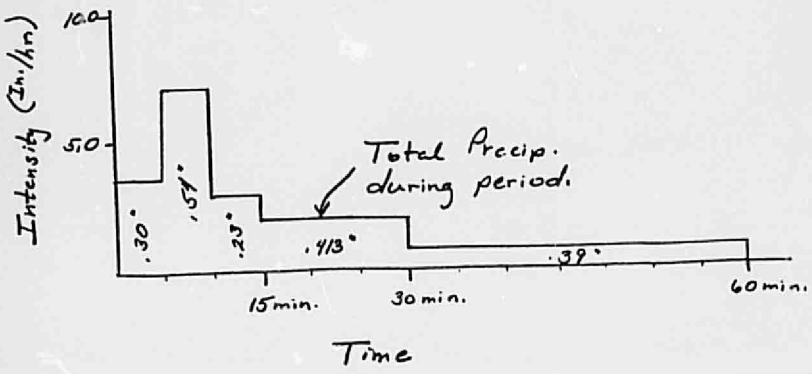
$\Delta Q = 6.6$ cfs

$\Delta V = 7666$ ft^3

Minimize Ponding utilizing routing of runoff through a ponding area.

Ref: Design Procedures
Routing of runoff through a ponding area
City of Albuquerque.

Design Storm



Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. D-3 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Routing.

Runoff = .64 (in.)(4.0)(43560)/12 = 9293 (in.)

Time (min.)	Rainfall (in.)	Runoff (ft^3)	Δ Runoff (ft^3)	Flow from Pond ($ft.^3$)	Net to Pond (ft^3)	Vol. Pond
5	.30	2788	2788	720	2068	2068
10	.84	7806	5018	1440	3578	5646*
15	1.07	9944	2138	2160	-220	
20	1.21	11245	1301	2100		
25	1.35	12545	1300	2000		
30	1.48	13754				
35	1.55	14404				
40	1.61	14962				

* Max Storage Vol. Required.

Determine Storage Vol. Available.

Bottom of Pond @ 95.5'

Area of 95.5' Contour = 227(12) = 2724 ft^2

Area of 96.0' Contour = 325(22) + 223(31) = 14063 ft^2

$$Vol = \left(\frac{2724 + 14063}{2}\right) .5 = 4197\ ft^3$$

100-Year Water Surface Elev $\approx \frac{5646-4197}{14063} + 96 = 96.1$

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

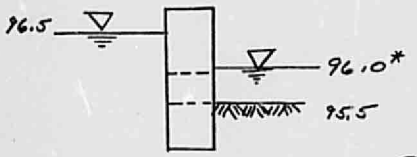
Sheet No. 7-4 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Determine Drain Sizes

Design $Q = 7.2$ cfs.

Ck. 4" ϕ Opening.



* Water Surface Elevation in street as shown on Sht. 3 of the Prelim. Drng. Study

$$Q = Ca\sqrt{2g\Delta h}$$

$C = 0.60$ (King's Handbook of Hydraulics)

$a = \pi(2)^2/144 = 0.09 \text{ ft}^2$

$\Delta h = 0.5'$

$g = 32.2 \text{ ft/sec}^2$

$Q = 0.6(0.09)\sqrt{2(32.2)(.5)}$

$= .31$ cfs. for 3 - 4"ϕ Drains, $Q = 1.0$ cfs.

Ck. Flow rates over wier.

for 10' wide broad-crested wier $C \approx 2.5$

$Q = 2.5(10)(H)^{1.5} = 7.2 - 1.0 = 6.2$ cfs

$\therefore H = .39'$

Set. Wier elev. @ 96.1

Max. Water Surface Elev. = 96.5

APPENDIX C

CHAVEZ GRIEVES

CONSULTING ENGINEERS, INC.

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

RECEIVED
FEB 22 1982
ENGINEERING

JANUARY, 1982

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.
6121 INDIAN SCHOOL RD., N.E. SUITE 120
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

February 18, 1982

Mr. Ken Towery
Paragon Resources
4500 Bogan Road, N. E.
Albuquerque, New Mexico 87109

RECEIVED
FEB 19 1982
CITY ENGINEER

Re: LATTER DAY SAINTS CHURCH
Drainage Report

Dear Mr. Towery:

Transmitted herewith are four (4) Drainage Reports for the proposed Latter Day Saints Church project. Presented is development criteria for the project as required by the City Hydrologist and the Interim Drainage Guidelines of the City of Albuquerque.

Please feel free to call should you have any questions, or if we can be of any further assistance in this matter.

Sincerely,

Victor J. Chavez

Victor J. Chavez, P.E.

VJC:mb

Theresa,
Please send
copy to
Mr. Towery - Tel
Return report
to me
B

CHAVEZ / GRIEVES CONSULTING ENGINEERS, INC.

6121 INDIAN SCHOOL RD. N.E.
SUITE 220
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

JANUARY, 1982

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH

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PURPOSE 1
SCOPE 1
DESIGN CRITERIA 1
LOCATION AND DESCRIPTION. 2
EXISTING DRAINAGE CONDITIONS. 2
PROPOSED DRAINAGE CONDITIONS. 3
CONCLUSIONS AND RECOMMENDATIONS 3

PRELIMINARY DRAINAGE STUDY . . . . . Appendix A
CALCULATIONS. . . . . Appendix B
PLATES. . . . . Appendix C

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

PURPOSE

The purpose of this report is to transmit drainage data and development guidelines to the proposed construction of the Latter Day Saints Church site such that the development will neither be susceptible to flooding nor will it increase the threat of flooding to downstream areas.

SCOPE

The scope of this report is limited to an investigation of the study site and those areas which might contribute flow to the site or are affected by flows from the site. Site development has been reviewed as it relates to the associated watershed's hydrologic and hydraulic conditions. Conclusions of this report are intended to provide construction guidelines for the proposed development. Guidelines are limited to the first phase of development.

DESIGN CRITERIA

Ponding volumes have been sized to maintain the existing undeveloped runoff conditions in the event of a 100-year frequency storm. Pond drains and overflows have been sized in accordance with the City of Albuquerque Interim Drainage Guidelines published November 13, 1979. Design storm is the 100-year frequency storm with intensity and duration as shown on the curves of Chart 1 "1963 Master Plan of Drainage for the City of Albuquerque and Environs" as prepared by Gordon Herkenhoff and Associates, Inc. Consulting Engineers.

Analysis of storm runoff is based on the Rational Formula, Q = CIA, where:

Q = Runoff quantity in cubic feet per second

C = Runoff coefficient; non-dimensional

I = Intensity in inches per hour

A = Contributing area in acres

Storm routing is based on "Design Procedures, Routing of Runoff Through A Ponding Area", City of Albuquerque.

LOCATION AND DESCRIPTION

The study site is located on the West Mesa area of Albuquerque at the southeast corner of the intersection of Sage Road and 82nd Street S. W. The parcel of land consists of Tracts 486 and 487 in Unit 7, Town of Atrisco Grant, containing approximately 9.84 acres. The first phase of development includes only the northernmost 427.00 feet of the tract (4.[illegible] Ac.).

The site and surrounding property are presently undeveloped. The site has a sparse vegetational cover of grass, cacti, and yucca plants with some scattered trash and debris. Soil conditions consist of silty to very silty, calcareous sand overlying silty, fine to coarse-grained sand. Underlying soils have a high dry strength but will consolidate with an increase in moisture. Site grading should provide sufficient slope to prevent ponding adjacent to the building.

EXISTING DRAINAGE CONDITIONS

Runoff from the site is directed to the east by the existing topography. Flows can best be described as sheet flows with no well defined courses.

As outlined in our letter to Mr. Chuck Easterling dated October 6, 1981, a copy of which is included in Appendix A, the site is not located in a flood prone area and, if properly developed, will not be flooded by flows from upstream areas. Anticipated peak flows will result in an average depth of flow in Sage Road of approximately .65 feet.

Flows from areas immediately west of the site are diverted to the south of the Phase I development by means of a berm along the west side of the property. Runoff is accumulated in a shallow arroyo located in the southern portion of the property and transported to the east through adjacent properties.

PROPOSED DRAINAGE CONDITIONS

Development plans for the site involve the construction of a Latter Day Saints Church facility with associated parking areas, walkways, and landscaping. The developed coefficient of runoff for Phase I of the project is 0.64. Increased runoff is to be routed to a relatively shallow landscaped ponding area located south and east of the parking area. Maximum anticipated water depth in the event of a 100-year storm will be approximately 0.6 feet.

Flow from the pond will be restricted by a low concrete wall with three 4-inch diameter drains. Flow through the drains is significantly less than the existing undeveloped conditions which will serve in restricting smaller annual storms. Due to the soil characteristics, and the relatively flat bottom of the pond, small storms will remain on the site and be disposed of through percolation.

Sage Road is presently only partially developed and 82nd Street is undeveloped. As a result, storm flows are not restricted to the street proper. Culverts will be installed at the Sage entrance to the site to allow annual storm runoff to pass without disrupting access to the property. The culverts have not been designed to pass a 100-year storm.

CONCLUSIONS AND RECOMMENDATIONS

It is the conclusion of this report that, provided the site is developed as outlined in the attached grading plan, the site will not be susceptible to flooding nor increase the threat of flooding to downstream areas.

VICTOR H. CHAVEZ
STATE OF NEW MEXICO
NO. 5713
REGISTERED PROFESSIONAL ENGINEER

APPENDIX A

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.

6121 INDIAN SCHOOL RD., N.E. SUITE 120
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

October 6, 1981

Mr. Chuck Easterling
Assistant City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Z-79-101-1
Proposed L.D.S. Church

Dear Mr. Easterling:

At the EPC hearing on August 20, 1981, the referenced application for approval of development plans was indefinitely deferred due to undefined drainage problems that make development detrimental. We hereby request that the application be reconsidered as a result of the subsequent investigation into planned improvements affecting the sites watershed area.

The site is located at the southeast corner of the intersection of 82nd Street and Sage Road, S.W. as shown on the attached area plan. The site is not indicated as being flood prone in the 1979 Flood Hazard Boundary Maps for the City of Albuquerque. They do, however, indicate flood plains both south and north of the site, draining the large basins located to the northwest.

Drainage projects presently being prepared for bidding by AMAFCA and scheduled for completion in the last quarter of 1982 will eliminate runoff from areas upstream of the power line channel and flows from the intersection of 98th Street and Sage Boulevard. These two improvements will also have the capacity to divert flows from proposed developments located west of 102nd Street.

For the purpose of this study, it has been assumed that basins A, B and C, as shown on the attached plan, while undeveloped and prior to completion of future drainage improvements, may drain to the vicinity of the site along Sage Boulevard. It should be noted, however, that actual flow paths are difficult to determine in this area and the above assumption will generate relatively conservative values.

The attached calculations indicate that the site will experience the highest probability of flooding following full development of the upstream basins. The resulting flows from sub-basin C can be contained in the existing road

section and will not present insurmountable problems in the development of the site.

We therefore request your approval in our efforts to reschedule a hearing on the proposed development plan for the November 16th meeting of the E.P.C. A detailed grading plan and additional runoff information will be forwarded as soon as possible.

Your timely assistance in this matter is appreciated.

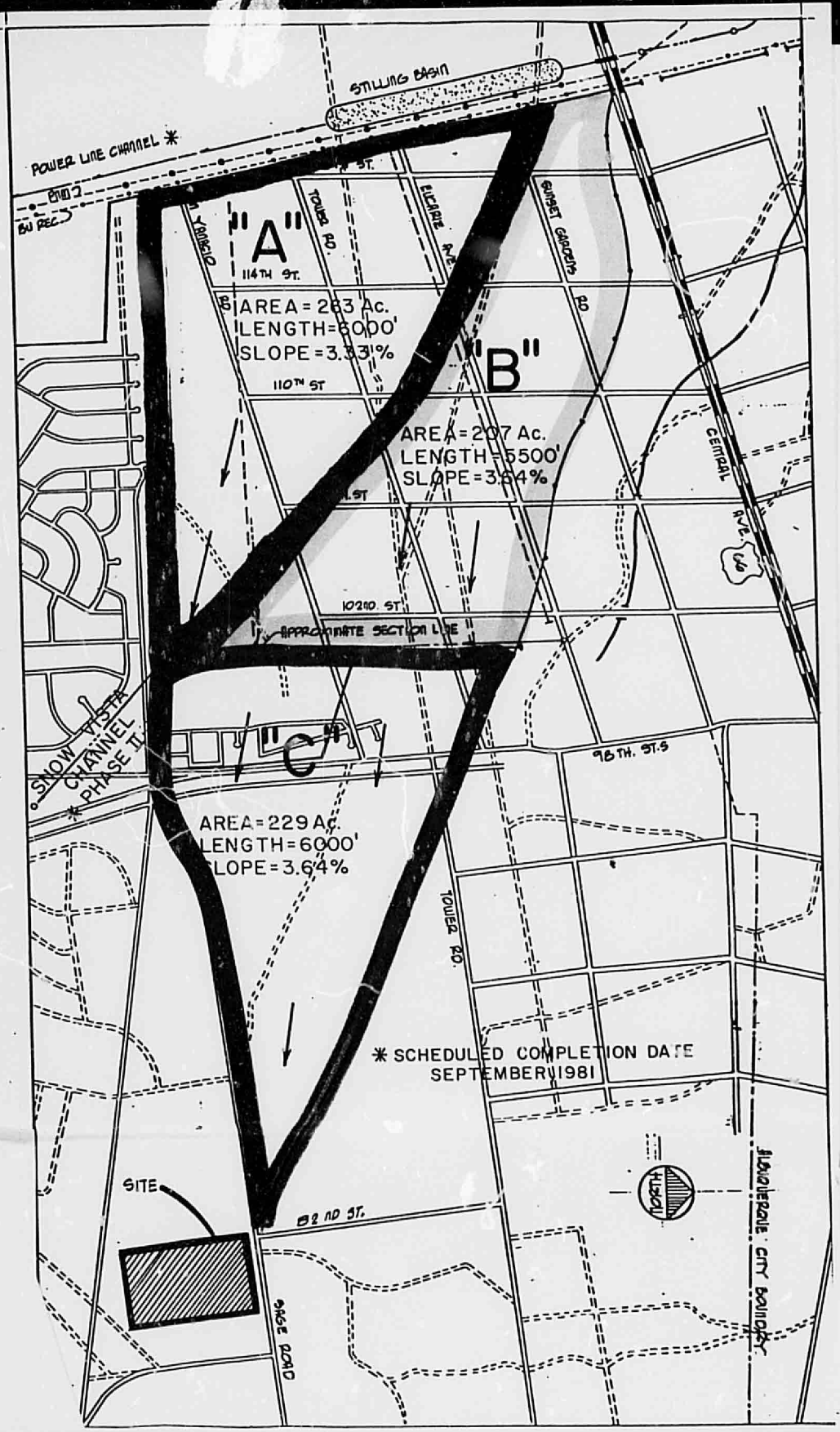
Very truly yours,

Victor J. Chavez

Victor J. Chavez, P.E.

APPROVED:

BY: Charles M. Easterling Date: 10/6/81


STILLING BASIN
POWER LINE CHANNEL *
BU REC
"A"
114TH ST.
AREA = 283 Ac.
LENGTH = 6000'
SLOPE = 3.33%
TOWER RD.
ELCARE AVE.
SUNSET GARDENS RD
"B"
110TH ST
AREA = 207 Ac.
LENGTH = 5500'
SLOPE = 3.54%
CENTRAL AVE.
102ND ST
APPROXIMATE SECTION LINE
SNOW VISTA CHANNEL PHASE II *
"C"
98TH. ST.S
AREA = 229 Ac.
LENGTH = 6000'
SLOPE = 3.64%
TOWER RD.
* SCHEDULED COMPLETION DATE
SEPTEMBER 1981
SITE
82ND ST.
SAGE ROAD
NORTH
ALBUQUERQUE CITY BOUNDARY

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources

Sheet No. 1 of ____
Job No. ____
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Determine existing flows with an assumed 10% of the area consisting of impervious surfacing. See attached area Plan for Sub-basin deliniations.

Sub Basin	Area (Acres)	Length (feet)	Δ El. (feet)	Tc (hrs)	Rainfall (inches)
A	263	6000'	200	.38	2.2
B	207	5500'	200	.35	2.2
C	229	6000'	110	.48	2.2

Sub Basin	CN*	CN**	Direct Runoff (Inches)	Discharge (cfs/Ac./in.)	Q (cfs)
A	68	72	0.4	1.14	119.9
B	68	72	0.4	1.16	96.0
C	68	72	0.4	1.03	94.4
					310.3 cfs.

* Soil Type "A" ** Corrected for 10% Imp.
Ref.: "Peak Rates of Discharge for Small Watersheds"
Chapter 2 - Revised 10/73 - U.S. Dept. of Ag. Soil Cons. Se

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources

Sheet No. 2 of
Job No.
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

For fully developed conditions (80% impervious), Sub-Basins A & B will be diverted. Only Sub-Basin C will continue to contribute flow to the site.

Modified CN = 91

Direct Runoff = 1.4"

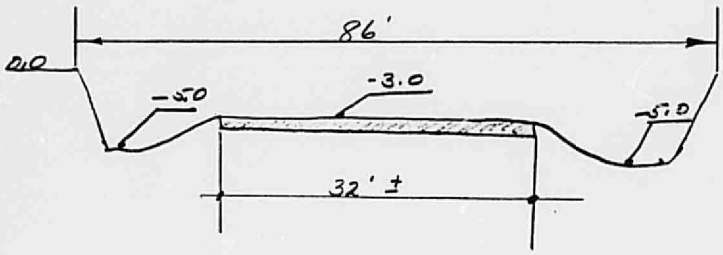
Q = 1.03 (1.4)(229) = 330 cfs.

Assume approximately 50% of the basins hydraulic length will be modified. From Page 4-2, TR-55, peak factor = 1.15

∴ Design Q = 330 (1.15) = 379.5 cfs. use 380

Existing Road Conditions.

Width = 86' slope = 2%



Ref: "Urban hydrology for small Watersheds"
Technical Release # 55 - Soil Conservation Service

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources.

Sheet No. 3 of
Job No.
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

With water approximately 1-foot deep $R_h \approx 1.0$

For Mannings Eq use $n = \frac{.03 + .018}{2} = .024$

$$V = \frac{1.48}{.024} (1.0)^{2/3} (.02)^{1/2}$$

$$= 61.67 (1.0)(.14)$$

$$= 8.6 \text{ f.p.s.}$$

Area req. $= 380/8.6 = 44.2 \text{ ft}^2$

Ave. Depth $= 44.2/86 = .51$

Use depth $= .7$ $\therefore R_h = .7$

$V = 61.67 (.79)(.14) = 6.8$

Area req $= 380/6.8 = 55.9$

Ave. depth $= .65$ ok.

$\therefore$ Water can be contained within the street right of way. Some erosion protection will be required along road R/W.

APPENDIX B

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. D-1 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Existing Conditions.

Area = 4.0 Acres.
Slope = 1.0 %
Length = 400 '
Tc = 17 min.
i = 189/25+17 = 4.5 in/hr.
C = 0.4

Q = 0.4 (4.5)(4.0) = 7.2 cfs.

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Developed Conditions.

Coefficient of Runoff.

	Area	Coeff.		Product
Paving	1.28	(.90)	=	1.15
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Landscaping	2.14	(.40)	=	0.86
	4.00			2.56

C = 2.56/4.00 = 0.64

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. D-2 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Developed Conditions. (cont.)

$T_c = 10$ min

$i = 189/35 = 5.4$ in./hr.

$Q = 0.64(5.4)(4.0) = 13.82$ c.f.s.

$Vol. = .64(2.2)(4.0)(43,560)/12 = 20,444$ ft^3

$\Delta Q = 6.6$ cfs

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Ref: Design Procedures
Routing of runoff through a ponding area.
City of Albuquerque.

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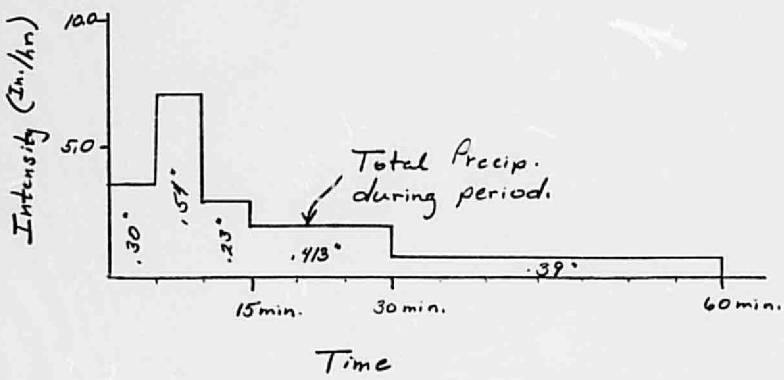

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. 0-3 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Routing.

Runoff = .64 (in.)(4.0)(43560)/12 = 9293 (in.)

Time (min.)	Rainfall (in.)	Runoff (ft^3)	ΔRunoff (ft^3)	Flow from Pond ($ft.^3$)	Net to Pond (ft^3)	Vol. in Pond
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Area of 96.0' Contour = 325(22) + 223(31) = 14063 ft^2

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100-Year Water Surface Elev $\approx \frac{5646-4197}{14063} + 96 = 96.1$

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

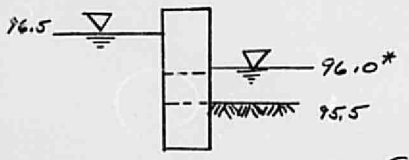
Sheet No. D-4 of
Job No.
By VTC Date 7/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Determine Drain Sizes

Design $Q = 7.2$ cfs.

Ck. 4" ϕ Opening.



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for 10' wide broad-crested wier $C \approx 2.5$

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$\therefore H = .39'$

Set. Wier elev. @ 96.1

Max. Water Surface Elev. = 96.5

APPENDIX C

CHAVEZ GRIEVES

CONSULTING ENGINEERS, INC.

F21-D22

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

RECEIVED

APR 07 1982

ENGINEERING

JANUARY, 1982

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.

6121 INDIAN SCHOOL RD., N.E. SUITE 120
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

February 18, 1982

RECEIVED
APR 07 1982
CITY ENGINEER

Mr. Ken Towery
Paragon Resources
4500 Bogan Road, N. E.
Albuquerque, New Mexico 87109

Re: LATTER DAY SAINTS CHURCH
Drainage Report

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Sincerely,

Victor J. Chavez

Victor J. Chavez, P. E.

VJC:mb

CHAVEZ / GRIEVES CONSULTING ENGINEERS, INC.

6121 INDIAN SCHOOL RD. N.E.
SUITE 220
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

JANUARY, 1982

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH

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CALCULATIONS. . . . . Appendix B
PLATES. . . . . Appendix C

DRAINAGE REPORT
FOR
LATTER DAY SAINTS CHURCH
SAGE ROAD, S. W.
ALBUQUERQUE, NEW MEXICO

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DESIGN CRITERIA

Ponding volumes have been sized to maintain the existing undeveloped runoff conditions in the event of a 100-year frequency storm. Pond drains and overflows have been sized in accordance with the City of Albuquerque Interim Drainage Guidelines published November 13, 1979. Design storm is the 100-year frequency storm with intensity and duration as shown on the curves of Chart 1 "1963 Master Plan of Drainage for the City of Albuquerque and Environs" as prepared by Gordon Herkenhoff and Associates, Inc. Consulting Engineers.

Analysis of storm runoff is based on the Rational Formula, Q = CIA, where:

Q = Runoff quantity in cubic feet per second

C = Runoff coefficient; non-dimensional

I = Intensity in inches per hour

A = Contributing area in acres

Storm routing is based on "Design Procedures, Routing of Runoff Through A Ponding Area", City of Albuquerque.

LOCATION AND DESCRIPTION

The study site is located on the West Mesa area of Albuquerque at the southeast corner of the intersection of Sage Road and 82nd Street S. W. The parcel of land consists of Tracts 486 and 487 in Unit 7, Town of Atrisco Grant, containing approximately 9.84 acres. The first phase of development includes only the northernmost 427.00 feet of the tract (4.0 Ac.).

The site and surrounding property are presently undeveloped. The site has a sparse vegetational cover of grass, cacti, and yucca plants with some scattered trash and debris. Soil conditions consist of silty to very silty, calcareous sand overlying silty, fine to coarse-grained sand. Underlying soils have a high dry strength but will consolidate with an increase in moisture. Site grading should provide sufficient slope to prevent ponding adjacent to the building.

EXISTING DRAINAGE CONDITIONS

Runoff from the site is directed to the east by the existing topography. Flows can best be described as sheet flows with no well defined courses.

As outlined in our letter to Mr. Chuck Easterling dated October 6, 1981, a copy of which is included in Appendix A, the site is not located in a flood prone area and, if properly developed, will not be flooded by flows from upstream areas. Anticipated peak flows will result in an average depth of flow in Sage Road of approximately .65 feet.

Flows from areas immediately west of the site are diverted to the south of the Phase I development by means of a berm along the west side of the property. Runoff is accumulated in a shallow arroyo located in the southern portion of the property and transported to the east through adjacent properties.

PROPOSED DRAINAGE CONDITIONS

Development plans for the site involve the construction of a Latter Day Saints Church facility with associated parking areas, walkways, and landscaping. The developed coefficient of runoff for Phase I of the project is 0.64. Increased runoff is to be routed to a relatively shallow landscaped ponding area located south and east of the parking area. Maximum anticipated water depth in the event of a 100-year storm will be approximately 0.6 feet.

Flow from the pond will be restricted by a low concrete wall with three 4-inch diameter drains. Flow through the drains is significantly less than the existing undeveloped conditions which will serve in restricting smaller annual storms. Due to the soil characteristics, and the relatively flat bottom of the pond, small storms will remain on the site and be disposed of through percolation.

Sage Road is presently only partially developed and 82nd Street is undeveloped. As a result, storm flows are not restricted to the street proper. Culverts will be installed at the Sage entrance to the site to allow annual storm runoff to pass without disrupting access to the property. The culverts have not been designed to pass a 100-year storm.

CONCLUSIONS AND RECOMMENDATIONS

It is the conclusion of this report that, provided the site is developed as outlined in the attached grading plan, the site will not be susceptible to flooding nor increase the threat of flooding to downstream areas.

VICTOR J. CHAVEZ
STATE OF NEW MEXICO
NO. 6313
REGISTERED PROFESSIONAL ENGINEER

APPENDIX A

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.

6121 INDIAN SCHOOL RD., N.E. SUITE 120
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

October 6, 1981

Mr. Chuck Easterling
Assistant City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Z-79-101-1
Proposed L.D.S. Church

Dear Mr. Easterling:

At the EPC hearing on August 20, 1981, the referenced application for approval of development plans was indefinitely deferred due to undefined drainage problems that make development detrimental. We hereby request that the application be reconsidered as a result of the subsequent investigation into planned improvements affecting the sites watershed area.

The site is located at the southeast corner of the intersection of 82nd Street and Sage Road, S.W. as shown on the attached area plan. The site is not indicated as being flood prone in the 1979 Flood Hazard Boundary Maps for the City of Albuquerque. They do, however, indicate flood plains both south and north of the site, draining the large basins located to the northwest.

Drainage projects presently being prepared for bidding by AMAFCA and scheduled for completion in the last quarter of 1982 will eliminate runoff from areas upstream of the power line channel and flows from the intersection of 98th Street and Sage Boulevard. These two improvements will also have the capacity to divert flows from proposed developments located west of 102nd Street.

For the purpose of this study, it has been assumed that basins A, B and C, as shown on the attached plan, while undeveloped and prior to completion of future drainage improvements, may drain to the vicinity of the site along Sage Boulevard. It should be noted, however, that actual flow paths are difficult to determine in this area and the above assumption will generate relatively conservative values.

The attached calculations indicate that the site will experience the highest probability of flooding following full development of the upstream basins. The resulting flows from sub-basin C can be contained in the existing road

section and will not present insurmountable problems in the development of the site.

We therefore request your approval in our efforts to reschedule a hearing on the proposed development plan for the November 16th meeting of the E.P.C. A detailed grading plan and additional runoff information will be forwarded as soon as possible.

Your timely assistance in this matter is appreciated.

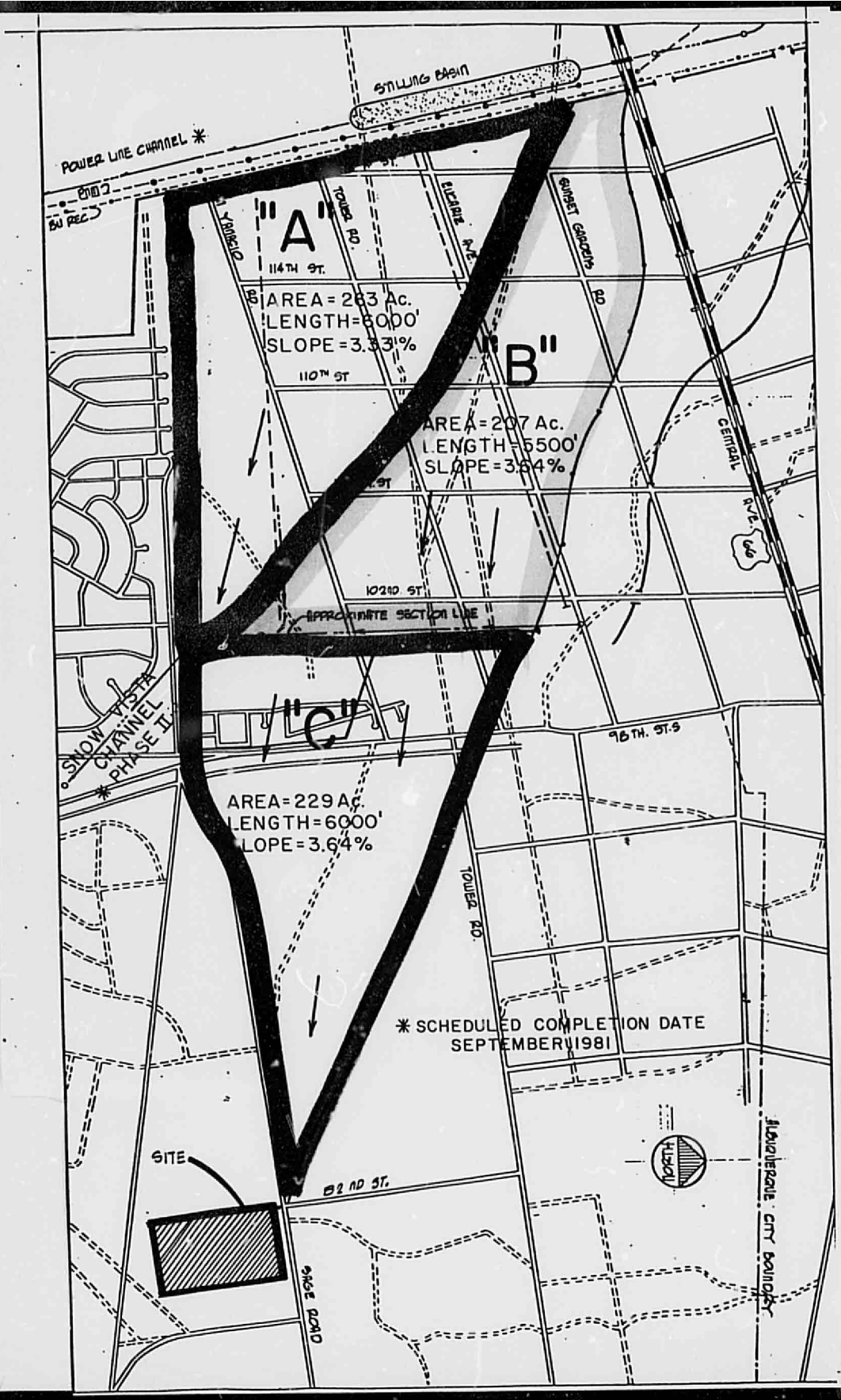
Very truly yours,

Victor J. Chavez

Victor J. Chavez, P.E.

APPROVED:

BY: Charles M. Easterling Date: 10/6/81


STILLING BASIN
POWER LINE CHANNEL *
BU REC
"A"
114TH ST.
AREA = 283 Ac.
LENGTH = 6000'
SLOPE = 3.33%
TOWER RD.
ELCAJON AVE.
SUNSET GARDENS RD
"B"
110TH ST
AREA = 207 Ac.
LENGTH = 5500'
SLOPE = 3.64%
CENTRAL AVE.
66
102ND ST
APPROXIMATE SECTION LINE
"C"
SNOW VISTA CHANNEL PHASE II
98TH. ST.S
AREA = 229 Ac.
LENGTH = 6000'
SLOPE = 3.64%
TOWER RD.
* SCHEDULED COMPLETION DATE
SEPTEMBER 1981
SITE
82 ND ST.
SAGE ROAD
NORTH
ALBUQUERQUE CITY BOUNDARY

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources

Sheet No. 1 of ____
Job No. ____
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Determine existing flows with an assumed 10% of the area consisting of impervious surfacing. See attached area Plan for Sub-basin deliniations.

Sub Basin	Area (Acres)	Length (feet)	Δ El. (feet)	Tc (hrs)	Rainfall (inches)
A	263	6000'	200	.38	2.2
B	207	5500'	200	.35	2.2
C	229	6000'	110	.48	2.2

Sub Basin	CN*	CN**	Direct Runoff (Inches)	Discharge (cfs/Ac./in.)	Q (cfs)
A	68	72	0.4	1.14	119.9
B	68	72	0.4	1.16	96.0
C	68	72	0.4	1.03	94.4
					310.3 cfs.

* Soil Type "A" ** Corrected for 10% Imp.
Ref.: "Peak Rates of Discharge for Small Watersheds"
Chapter 2 - Revised 10/73 - U.S. Dept. of Ag. Soil Cons. Se

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources

Sheet No. 2 of
Job No.
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

For fully developed conditions (80% impervious), Sub-Basins A & B will be diverted. Only Sub-Basin C will continue to contribute flow to the site.

Modified CN = 91

Direct Runoff = 1.4"

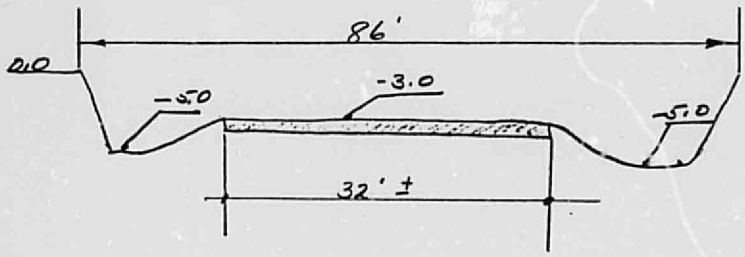
Q = 1.03 (1.4)(229) = 330 cfs.

Assume approximately 50% of the basins hydraulic length will be modified. From Page 4-2, TR-55, peak factor = 1.15

∴ Design Q = 330 (1.15) = 379.5 cfs. use 380

Existing Road Conditions.

Width = 86' slope = 2%



Ref: "Urban hydrology for small Watersheds"
Technical Release # 55 - Soil Conservation Service

Job Proposed L.D.S. Church
Subject Drainage Study (Prelim.)
Client Paragon Resources

Sheet No. 3 of
Job No.
By VJC Date 10/81

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

With water approximately 1-foot deep $R_h \approx 1.0$

For Mannings Eq use $n = \frac{.03+.018}{2} = .024$

$$V = \frac{1.48}{.024}(1.0)^{2/3}(.02)^{1/2}$$

$$= 61.67(1.0)(.14)$$

$$= 8.6 \text{ f.p.s.}$$

Area req. = 380/8.6 = 44.2 ft^2

Ave. Depth = 44.2/86 = .51

Use depth = .7 ∴ $R_h = .7$

$V = 61.67(.79)(.14) = 6.8$

Area req = 380/6.8 = 55.9

Ave. depth = .65 ok.

∴ Water can be contained within the street right of way. Some erosion protection will be required along road R/W.

APPENDIX B

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. 1 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Existing Conditions.

Area = 4.0 Acres.
Slope = 1.0 %
Length = 400'
Tc = 17 min.
i = 189/25+17 = 4.5 in/hr.
C = 0.4

Q = 0.4 (4.5)(4.0) = 7.2 cfs.

Vol. = .4 (2.2)(4.0)(43,560)/12 = 12,778 ft³

Developed Conditions.

Coefficient of Runoff.

	Area	Coeff.		Product
Paving	1.28	(.90)	=	1.15
Concrete	0.20	(.95)	=	0.19
Roof	0.38	(.95)	=	0.36
Landscaping	2.14	(.40)	=	0.86
	4.00			2.56

C = 2.56/4.00 = 0.64

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. D-2 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Developed Conditions. (cont.)

$T_c = 10$ min

$i = 189/35 = 5.4$ in./hr.

$Q = 0.64(5.4)(4.0) = 13.82$ c.f.s.

$Vol. = .64(2.2)(4.0)(43,560)/12 = 20,444$ ft^3

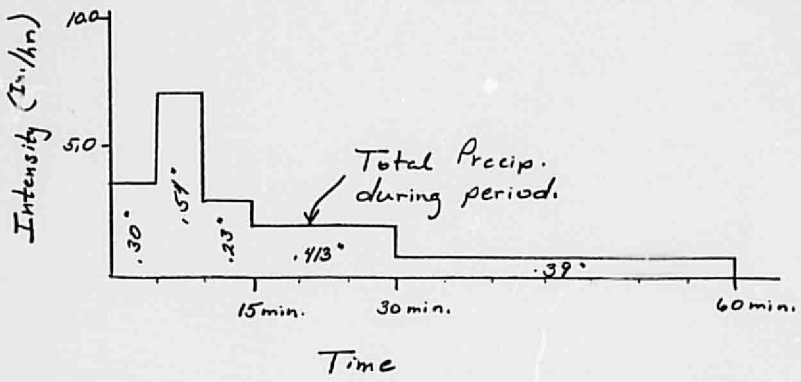
$\Delta Q = 6.6$ cfs.

$\Delta V = 7666$ ft^3

Minimize Ponding utilizing routing of runoff through a ponding area.

Ref: Design Procedures
Routing of runoff through a ponding area.
City of Albuquerque.

Design Storm



Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

Sheet No. 03 of
Job No.
By VJC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Routing. Runoff = .64 (in.)(4.0)(43560)/12 = 9293 (in.)

Time (min.)	Rainfall (in.)	Runoff (ft^3)	ΔRunoff (ft^3)	Flow from Pond ($ft.^3$)	Net to Pond (ft^3)	Vol. in Pond
5	.30	2788	2788	720	2068	2068
10	.84	7806	5018	1440	3578	5646*
15	1.07	9944	2138	2160	-220	
20	1.21	11245	1301	2100		
25	1.35	12545	1300	2000		
30	1.48	13754				
35	1.55	14404				
40	1.61	14962				

* Max Storage Vol. Required.

Determine Storage Vol. Available.

Bottom of Pond @ 95.5'

Area of 95.5' Contour = 227(12) = 2724 ft^2

Area of 96.0' Contour = 325(22) + 223(31) = 14063 ft^2

$$Vol = \left(\frac{2724 + 14063}{2}\right) .5 = 4197\ ft^3$$

100-Year Water Surface Elev = $\frac{5646-4197}{14063} + 96 = 96.1$

Job L.D.S. Church
Subject Drainage Study
Client Paragon Resources

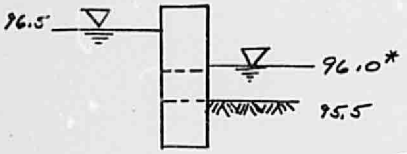
Sheet No. D-4 of
Job No.
By VTC Date 1/82

CHAVEZ-GRIEVES / CONSULTING ENGINEERS, Inc. Albuquerque, NM

Determine Drain Sizes

Design $Q = 7.2$ cfs.

Ck. 4" ϕ Opening.



* Water Surface Elevation in street as shown on Sht. 3 of the Prelim. Drng. Study.

$$Q = Ca\sqrt{2g\Delta h}$$

$C = 0.60$ (King's Handbook of Hydraulics)

$a = \pi(2)^2/144 = 0.09 \text{ ft}^2$

$\Delta h = 0.5'$

$g = 32.2 \text{ ft/sec}^2$

$Q = 0.6(0.09)\sqrt{2(32.2)(.5)}$

$= .31$ cfs. for 3 - 4" ϕ Drains, $Q = 1.0$ cfs.

Ck. Flow rates over wier.

for 10' wide broad-crested wier $C = 2.5$

$Q = 2.5(10)(H)^{1.5} = 7.2 - 1.0 = 6.2$ cfs

$\therefore H = .39'$

Set. Wier elev. @ 96.1

Max. Water Surface Elev. = 96.5

APPENDIX C

M10-D3

CHAVEZ GRIEVES / CONSULTING ENGINEERS, INC.
6121 INDIAN SCHOOL RD., N.E. SUITE 220
ALBUQUERQUE, N.M. 87110
PH. (505) 881-7376

June 21, 1983

Bernie Montoya
City Hydrology Department
123 Central N.W.
Albuquerque, New Mexico 87103

RE: Latter Day Saints Church
Sage and 82nd Street S.W.

Dear Bernie;

On May 18, 1982, a copy of the grading plan for the above referenced project was transmitted to the City with mean sea level elevations indicated in red. Subsequent to this, and based on information provided to Mr. Brian Burnett, we were asked to raise the building finished floor elevation an additional foot. This was done by changing the reference elevation from 94.83 to 93.85 in the field. As a result, the actual finished floor is approximately 5086.14, or 0.89 feet above the M.S.L.E. shown in red. This same change occured for elevations throughout the site.

The overall construction of the site drainage facilities is in general conformance with the approved drainage plan.

I hope that this is sufficient information to clear up any questions. If I can be of any further assistance, please feel free to call.

Sincerely,

Victor J. Chavez

Victor J. Chavez, P.E.

VJC/dlk
cc: Ken Towery, Paragon Resources