HYDROLOGY J13/D2 9 PLANS

J13/D2

9 Plans

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

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

September 26, 1984

Mr. Elvidio Diniz
Resource Technology
7800 Marble, N.E. #5
Albuquerque, New Mexico 87110

RE: PRETREATMENT PLANT FOR PONDEROSA PRODUCTS, INC. (J13-D2A) RECEIVED AUGUST 15, 1985

Dear Mr. Diniz:

Based on the information provided on your August 15, 1984 submittal, you will find certain concerns listed that will need to be addressed before final approval is granted.

1. Complete information sheet with resubmittal designation.

2. Professional's stamp with signature and resubmittal date.

3. Vicinity map showing location of the development.

4. Legal description or current plat.

5. Beanchmarks - location, description and elevation of the

   a. Albuquerque Control Survey Vertical Datum.

   b. Temporary benchmark onsite.

6. Retention ponding not allowed, downstream conditions allow for positive drainage.

7. If existing 12" storm drain is to be removed, please identify on plan that it is deleted.

8. Details of pond, swales, proposed channels, pond outlets and all other significant drainage structures.

9. Pond fencing required for depths greater than 18".

10. Verification of adequacy of downstream systems needed to drain the pool.

If you have any questions, feel free to call me at 766-7644.

Sincerely yours,

Billy J. Goolsby

Billy J. Goolsby, P.E.
Civil Engineer/Hydrology

BJG:BJM:bm

INFORMATION SHEET

PROJECT TITLE Ponderosa Products Inc. TYPE OF SUBMITTAL Drainage

ZONE ATLAS PAGE NO. J-13 D2A CITY ADDRESS 1701 Bellamah Ave NW

LEGAL DESCRIPTION N/A OLD TOWN ADD'N LOT B2

ENGINEERING FIRM Resource Technology CONTACT Elvidio Diniz

ADDRESS 7800 Marble NE #5 PHONE 266-3320

OWNER E. J. Stewart CONTACT same

ADDRESS P.O. Box 25506 PHONE 843-7400

ARCHITECT N/A CONTACT

ADDRESS PHONE

SURVEYOR Resource Technology Inc. CONTACT

ADDRESS same as above PHONE

CONTRACTOR To be determined CONTACT

ADDRESS PHONE

PRE-DESIGN MEETING:

___ YES
X NO
___ COPY OF CONFERENCE RECAP SHEET PROVIDED

PLEASE CHECK TYPE OF APPROVAL EXPECTED WITH THIS SUBMITTAL:

___ SKETCH PLAT APPROVAL
___ PRELIMINARY PLAT APPROVAL
___ SITE DEVELOPMENT PLAN APPROVAL
___ FINAL PLAT APPROVAL
___ BUILDING PERMIT APPROVAL
___ CERTIFICATE OF OCCUPANCY APPROVAL
___ ROUGH GRADING PERMIT APPROVAL
___ GRADING/PAVING PERMIT APPROVAL
X OTHER Temp. Drainage + Grading (SPECIFY) (SEE PLAN FOR EXPLANATION)

RECEIVED AUG 15 1984 HYDROLOGY SECTION

DATE SUBMITTED: 14 August 1984

BY: Elvidio Diniz

needs legal on plan

Gardner, Mason & Garnand Engineers, Inc.

7833 LOMAS BLVD. N.E., SUITE 17/ALBUQUERQUE, N.M. 87110/ (505) 266-5868

January 9, 1981

Mr. William Kearney
P. O. Box 1293
City of Albuquerque
Albuquerque, New Mexico 87103

RE: Ponderosa Products, Inc.
Site Improvements

Dear Mr. Kearney:

As per our telephone conversation this afternoon, we are submitting this letter to certify that connection to an existing 12-inch diameter corrugated drain pipe located north of the intersection of 18th Street N.W. and Bellemah Avenue, N.W. was made by constructing a four (4) foot diameter manhole over the existing said drain pipe and installing a new 12-inch diameter R.C.P. drain through an 18-inch R.C.P. sleeve penetrating into the said new manhole with an outlet flap gate inside the new manhole in accordance with specifications, plans, and in the presence of our project inspector, Mr. Roman Welfl.

Backfilling, compaction, and asphalt replacement for said drain pipe was also performed in the presence of our project inspector and a representative of City Engineer's Inspection.

It is our recommendation that these connection improvements to the existing drain system be accepted. Please return a signed copy of this letter if acceptable.

Approved W Kearney Date 1-9-81

Sincerely,

Richard Mason

Richard Mason

c.c. Mr. Fred Aguirre
Mr. Sandy Eeds, AIA
Mr. Bernie Montoya

Attachment: C-7

Gardner, Mason & Garnand Engineers, Inc.
7833 LOMAS BLVD. N.E., SUITE 17/ALBUQUERQUE, N.M. 87110/ (505) 266-5868

December 15, 1980

Mr. Fred Aguirre
Building and Inspection
City of Albuquerque
Albuquerque, New Mexico 87103

RE: Ponderosa Products, Inc.
Site Improvements

Dear Fred:

Mr. Bernie Montoya of Building and Inspection called Friday afternoon November 21, 1980 regarding his inspection of the subject project. Most of his comments can be fulfilled except for one item, that is the proposed west ponding where there are existing railroad spurs.

In the original drainage report that was approved for Lot B-2, Replat of Lot B Duke City Lumber Company Addition and Lot B-1, Replat of Tract B, Lands of Freeway-Old Town, Ltd., on page 6-A, the presence of railroad spurs and other structures were mentioned for this existing ponding area. We assumed you were aware of the existing structures since we did not receive any comments during drainage report reviewal and it is this same ponding area that was recommended and approved to be used for the same purpose with some improvements. Also the owner of the railroad spur is well aware of water ponding in this area.

Bernie also advised that the Contractor obtain an excavation permit for trenching in the street at the intersection of Bellamah Avenue and 18th Street, N.W. We were advised that excavation permits were already obtained as follows: on October 7, 1980, C-03201 was obtained, which expired and on October 21, 1980 a new permit C-03497 was obtained. An inspection was made and approved by the City.

Bernie also indicated he found additional drop inlets and a pond configuration along the west side of the east parking lot to be different. Unfortunately, he was using the old plans and could not find the revised set that was submitted. However, we are resubmitting a composite-updated plans that show the following changes and modifications.

1. A paved twenty (20) foot wide truck access loop on the west side of the east parking lot with a ponding area inside the loop.

2. A six (6) foot wide asphalt walkway between the southern parking area and building complex.

3. Detailed truck ramp into the new building addition.

4. An asphlat paved access to the existing gas pumps in the northwestern corner.

5. The southern most east-west 12" RCP was shortened from 100 feet to 84 feet with a slight change in the invert elevations.

6. An additional drop inlet was installed at the owner's request between the existing building and the new building addition.

7. A manhole was installed near the truck ramp over two water mains.

8. A twelve (12) inch diameter ductile iron pipe was installed between above mentioned new manhole and southwestern drop inlet with slight invert elevation changes. The ductile iron pipe was used because of anticipated heavy loads, shallow cover, and to minimize relocating existing utilities.

9. A twelve (12) inch RCP was installed between the northeastern pond and drop inlet at the owner's request. This twelve (12) inch RCP was used to minimize maintenance that are associated with smaller diameter pipe.

10. The cleanouts originally planned for the east-west drain in the northwestern area were replaced by manholes (one with drain grate covers). This is to minimize maintenance and cost.

11. Connection to existing storm sewer manhole at the intersection of Bellamah Avenue and 18th Street was changed to a connection to an existing 12" diameter corrugated drain pipe with a new manhole and 12" RCP.

12. It is anticipated that the existing water main in the northeast ponding will be lowered.

We will be anticipating your response/ or approval of the site drainage runoff controls and improvements. Should you have additional questions, please call us.

Sincerely,

Richard Mason

Richard Mason, P.E.

RM/mg

c.c. Mr. Sandy Eeds, AIA

October 9, 1980

Mr. Bob Kielich
Assistant City Engineer/Design
P. O. Box 1293
Albuquerque, New Mexico 87103

RE: Ponderosa Products, Inc.
Storm pond drain pipe change

Dear Mr. Kielich:

This is to confirm our conversation this morning, that the City does not have any objections to a new pond drain pipe connection to an existing 12-inch diameter corrugated pipe which already drains a seepage pit into an existing City storm sewer system. This would be accomplished by constructing a manhole over the junction of the existing 12-inch corrugated pipe and the new pond drain pipe.

It was also understood that encroachment agreement will have to be executed and filed by the owner with the City Engineer as soon as possible. In the meantime construction will progress. For your information, a sketch is attached showning the change.

We appreciate your cooperation.

Sincerely,

Richard Mason, P.E.

Encl.

c.c. Mr. Sandy Eeds, AIA
Mr. Charles Coffee, Ponderosa Products, Inc.
Mr. Fred Aguirre, Building and Inspection

RM/mg

GARDNER ENGINEERS, INC.

July 2,1980

Mr. William Crescenti
Building and Inspection
City of Albuquerque
Albuquerque, New Mexico 87103

RE; Ponderosa Products, Inc.
Drainage Plans

Herewith are the final revised drawings and computations of proposed ponding volumes for the subject project.

Should you have any questions, please contact our office.

Sincerely

Richard Mason, PE

cc - Sandy Eeds

7833 LOMAS BLVD. N.E., SUITE 23/ ALBUQUERQUE, N.M. 87110/ [505] 266-5868

SUPPLEMENT TO STORM DRAINAGE
STUDY FOR LOT B-2, REPLAT OF LOT B
DUKE CITY LUMBER CO. ADDITION AND
LOT B-1, REPLAT OF TRACT B,
LANDS OF FREEWAY - OLD TOWN LTD.
ALBUQUERQUE, NEW MEXICO

PURPOSE AND INTRODUCTION

The purpose of this supplement to previous drainage study is to present those data relative to the estimated quantity and proposed means of proper handling of storm drainage as related to the first phase of development. This proposed phase of development includes an addition to a building, paved driveways and parking areas.

The overall site gently slopes southwesterly, with major portions of the undeveloped areas being flat with small depressions.

Presently, nearly all offsite areas along the property boundary drain onto the site where it combines with onsite runoffs.

PROPOSED DRAINAGE

The developed state will have to contend with the offsite flows from adjacent areas. For this phase of improvements, these offsite flows will be intercepted and retained along with onsite flows in ponding areas located along the property boundary and adjacent to proposed parking areas.

The onsite flows will drain into retention basins by ways of paved inverted driveways, curbs, inclined sections, drop inlets and through buried drain pipes.

DEVELOPED RUNOFF

The estimated total volume of runoff flows from this phase of improvement is estimated to be 16,671 cubic feet of which 7,379 cubic feet can be ponded in areas along the eastern property boundary and adjacent to proposed parking areas. The runoff from an area between the existing building and addition will be carried by inverted sloping pavement sections to drop inlets. From here flows will be conveyed through buried pipe into a large basin located along the western boundary. Other offsite runoff from the northern adjacent area would also naturally drain into this basin. In order, to minimize nuisances that will be associated with standing water in this basin, it will be drained at a considerable low rate into an existing storm sewer system as recommended in previous drainage study.

Provided that the site is developed in strict accordance with the drainage study recommendations, plans, drawings, specifications, and guidelines of the City of Albuquerque, the developed site will not create any flood drainage to surrounding properties.

NOTE: Coefficients: Pavement & Roof Areas = 0.90

Existing Surface Soils = 0.40

Gravelled Areas = 0.20

Maximum volume of available ponds were determined from plotted cross sections.

Reference is made to Storm Drainage Study by Gardner Engineers, Inc. February 1979, for Lot B-2, Replat of Lot B Duke City Lumber Company Addition and Lot B-1, Replat of Tract B, Lands of Freeway - Old Town, Ltd.

*6/30/80 Revised pond bottom elevations to provide positive discharge.

DRAINAGE FLOWS FOR
FIRST PHASE
OF DEVELOPMENT

BASIN TABULATION (BASED ON 100 YR. STORMS)

BASIN	AREA (ACRES) ON-SITE	AREA (ACRES) OFF-SITE	RUNOFF COEFFICIENT	A x C ON-SITE	A x C OFF-SITE	TOTAL A X C
1	0.40		0.90	0.360		0.360
	0.10		0.20	0.020		0.020
		0.11	0.40		0.044	0.044
						0.424

Required Ponding Vol. = $0.424 \times 43560 \times \frac{2.224}{12} = 3423\ ft^3$

* Available Maximum Ponding = $4165\ ft^3$

2	0.03		0.20	0.006		0.006
		0.09	0.40		0.036	0.036
						0.042

Required Ponding Vol. = $0.042 \times 43560 \times \frac{2.224}{12} = 339\ ft^3$

* Available Maximum Ponding = $380\ ft^3$

3	0.12		0.90	0.108		0.108
	0.04		0.20	0.008		0.008
	0.01	0.21	0.40	0.004	0.084	0.088
						0.204

Required Ponding Vol. = $0.204 \times 43560 \times \frac{2.224}{12} = 1647\ ft^3$

* Available Maximum Ponding = $1400\ ft^3$

4	0.26		0.90	0.234		0.234
	0.05		0.20	0.010		0.010
						0.244

Required Ponding Vol. = $0.244 \times 43560 \times \frac{2.224}{12} = 1970\ ft^3$

Available Maximum Ponding = $2000\ ft^3$

5	1.15		0.90	1.035		1.035
	0.29		0.40	0.116		0.116
						1.151

Required Ponding Vol. = $1.151 \times 43560 \times \frac{2.224}{12} = 9292\ ft^3$

6 Available Maximum Ponding = $38,400\ ft^3$

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

MAYOR
David P. Rusk

March 29, 1979

J13-D2

Gardner Engineers, Inc.
7833 Lomas Blvd. N.E.
Albuquerque, New Mexico 87110

Attention: Gil Gardner

Re: Drainage Report for Lands of Freeway-Old Town, Ltd.

Dear Gil:

Following our conversation of today 3/29/79 the drainage report is approved in concept. Since it appears that the actual implementation needs great care in order to prevent localized, but significant problems, please supply a grading plan with particular attention paid to pipe grades, invert elevations, and congruence with outside facilities. Timely review of said grading plan with expedite processing of the building permit application.

Very truly yours,

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/bb

cc - Dick Heller
Rich Leonard
Drainage File
Reading file

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

MAYOR
David Rusk

March 26, 1979

Gardner Engineers, Inc.
7833 Lomas Blvd. N.E.
Albuquerque, New Mexico 87110

Attention: Gil Gardner

Re: Drainage Report for Lands of Freeway-Old Town, Ltd.

Dear Gil:

I have reviewed the drainage report for the captioned development and I am not sure I follow clearly the exposition of the report.

The overall scheme appears consistent with the concepts I had an opportunity to discuss with Mr. Alex Garnand of your office. I would, nevertheless, like to have an opportunity to review the report with either you or Mr. Garnand at your earliest convenience.

Very truly yours,

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/ms

cc - Dick Heller
Rich Leonard
Drainage File

DRAINAGE REPORT

FOR

IMPROVEMENTS ON

PONDEROSA PRODUCTS, INC.

ALBUQUERQUE, NEW MEXICO

PREPARED FOR:

C. DAN DURAM
CHANT CORP.
6207 PAN AMERICAN FREEWAY, N.E.
ALBUQUERQUE, NEW MEXICO

BY:

A & E ENGINEERING INC.
5823 LOMAS BOULEVARD N.E.
ALBUQUERQUE, NEW MEXICO

MARCH 20, 1970

Theodore M. Conrardy

THEODORE M. CONRARDY
REGISTERED PROFESSIONAL
ENGINEER NO. 2933

Drainage Report

For

IMPROVEMENTS ON

PONDEROSA PRODUCTS, INC.

ALBUQUERQUE, NEW MEXICO

TABLE OF CONTENTS

General

Location and Description

Proposed Development

Proposed Drainage Plans

Discussion of Method

On-Site Drainage Calculations

Summary

Location Map

Plates

Drainage

GENERAL:

This drainage report consists of a hydrologic study of a probable 100-year storm affecting this proposed improvement at 1701 Bellama Ave. N.W. Albuquerque, New Mexico.

LOCATION AND DESCRIPTION:

The property under study is a parcel of land zoned M-2 Light Manufacturing and contains about 1.09 acres. It is located North of Bellama Ave. about 0.4 miles East of Rio Grande Blvd. N.W. This property is more particularly described as a portion of Tract no. 236, Lot B on the Middle Rio Grande Conservancy District Property Map no. 38.

The existing terrain for this parcel slopes to the North at about 0.4 percent grade.

PROPOSED DEVELOPMENT:

This parcel of land is to be improved with Office/Warehouse and gravel parking lot. It will be graded and landscaped to retain storm water generated by this improvement. A pond has been located to collect and retain the runoff.

PROPOSED DRAINAGE PLANS:

This parcel of land will drain to the North of this parcel where a pond has been designed to intercept the runoff.

There is not offsite runoff affecting this parcel of land.

DISCUSSION OF METHOD:

Development of this area will be controlled by the guidelines set forth in the recent Resolution of the Albuquerque Metropolitan Arroyo Flood Control Authority and the City of Albuquerque.

The amount of storm water is computed by using a 100-year

storm, this being a storm consisting of 100-year 6 hours precipitation as shown by the rainfall frequency Maps for New Mexico, June 1967, published by the Special Studies Branch, Office of Hydrology, United States Weather Bureau.

The pond area was calculated so that the volume of water ponded would exceed the volume runoff resulting from a 100-year storm.

ON-SITE DRAINAGE CALCULATIONS

The amount of storm water is computed by using a 100-year storm, this being a storm consisting of 100-year 6 hours precipitation as shown by the rainfall frequency maps for New Mexico, June 1967, published by the Special Studies Branch, Office of Hydrology, United States Weather Bureau.

The 100-year 6 hour precipitation factor for this area is 2.8 inches.

The area is 1.09 acres = 47,600 square feet.

Volume of runoff before development, allowing 65% perculation:

$\frac{2.8}{12}$ x 47,600 sq. ft. x 0.35 = 3,887 cu. ft.

Volume of runoff after development:

Landscaped areas (grassed and rock gravel)

$\frac{2.8}{12}$ x 14,280 sq. ft. x 0.35 = 1166 cu. ft.

Paved areas (driveways, building, parking lots)

$\frac{2.8}{12}$ x 26,880 sq. ft. x 1.0 = 6271 cu. ft.

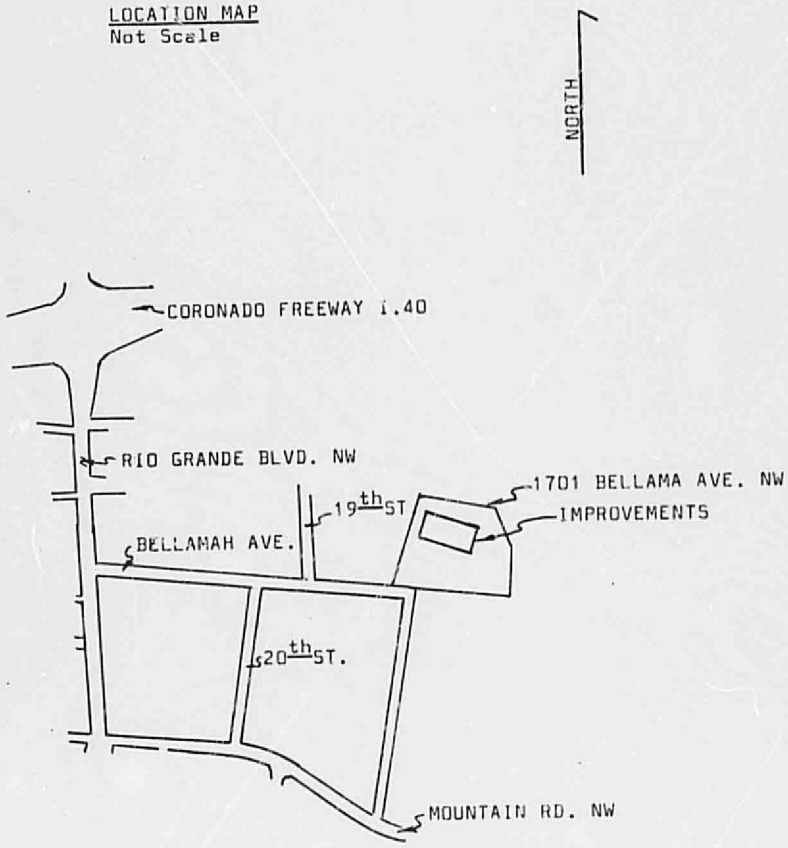
Runoff after development = 7,437 cu. ft.

Runoff before development = 3,877 cu. ft.

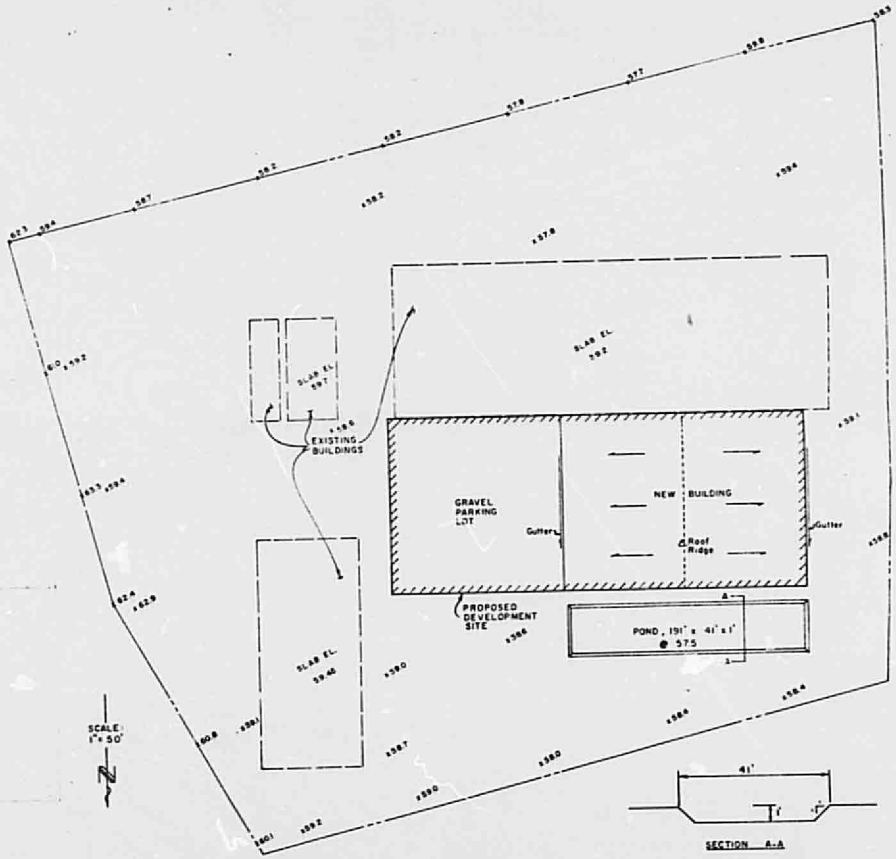
Providing for 100% retention

Capacity of ponding area 190 x 40 x 1 = 7,600 cu. ft.

LOCATION MAP
Not Scale



PONDEROSA PRODUCTS, INC.
PONDING PLAN



A & E ENGINEERING INC.
5823 Lomas N.E. Albuquerque New Mex.

STORM DRAINAGE STUDY

For lot B-2, replat of lot B
Duke City Lumber Co. Addition and
lot B-1, replat of tract B,
Lands of Freeway-Old Town, Ltd.,

ALBUQUERQUE, NEW MEXICO

GARDNER ENGINEERS INC.
ALBUQUERQUE, NEW MEXICO

FEBRUARY, 1979

STORM DRAINAGE STUDY

For lot B-2, Replat of lot B
Duke City Lumber Co. Addition and
lot B-1, replat of tract B.
Lands of Freeway-Old Town, Ltd.,

Albuquerque, New Mexico

GARDNER ENGINEERS INC.
ALBUQUERQUE, NEW MEXICO

FEBRUARY, 1979

TABLE OF CONTENTS

1. PURPOSE.....1

2. SCOPE.....1

3. LOCATION AND DESCRIPTION.....1

4. EXISTING DRAINAGE.....1

5. PROPOSED DRAINAGE

A. Criteria

1. General.....1
2. Design Storm.....2

B. Flood Protection.....2

C. Site Drainage.....2

6. CONCLUSIONS AND RECOMMENDATIONS.....2

APPENDIX

I. METHODOLOGY.....1-A

II. EXISTING CONDITIONS.....3-A

III. DEVELOPED CONDITIONS.....5-A through 8-A

FIGURE 1.....9-A

COMPUTER PRINTOUTS 1-7.....1-C through 10-C

ENCLOSURE .....Back Cover

STORM DRAINAGE STUDY

For lot B-2, Replat of lot B
Duke City Lumber Co. Addition and
lot B-1, replat of tract B,
Lands of Freeway-Old Town, Ltd.,

Albuquerque, New Mexico

1. PURPOSE

The purpose of this report is to present a master drainage plan for anticipated expansion and development at the project location necessary to satisfy drainage requirements.

2. SCOPE

The scope of this report includes an investigation of both existing and anticipated future conditions both on and off (adjacent to) the site with respect to the design storm runoff, drainage requirements, and recommendations fulfilling those requirements.

3. LOCATION AND DESCRIPTION

The project lies on lots B-2, replat of lot B, Duke City Lumber Company addition and B-1, replat of tract B, Lands of Freeway-Old Town, Ltd., within the city of Albuquerque, New Mexico.

Situated at the Northeast corner of 18th Street NW, and Bellamah Avenue NW, the project site is at present occupied by several structures related to the manufacture, storage, and shipping of lumber products. There are no significant paved areas within the site. Surface soils are high in silt, clay, and organic material rendering them somewhat impervious. The relief or lack of relief across the site has a compensating effect in that numerous closed depressions serve to retard the existing runoff.

4. EXISTING DRAINAGE

At present, all adjacent areas, with a few minor exceptions, drain on to the site. The site contributes a significant amount of runoff to the adjacent R.O.W. where it ponds to a depth necessary to spill onto the property across the intersection. The intersection is the low point along the right-of-way and is drained by an 18" storm sewer whose capacity is not adequate to handle the existing design storm peak runoff.

5. PROPOSED DRAINAGE

A. Criteria

1. General: Resolution No. 1972-2, Albuquerque Metropolitan Arroyo Flood Control Authority. City of Albuquerque Drainage Guide Lines.

5. PROPOSED DRAINAGE (cont'd)

A. Criteria (Cont'd)

2. Design Storm: 100 year frequency; intensity duration as shown on Chart 1, "1963 Master Plan of Drainage for the City of Albuquerque and Environs". (See Fig 1 of this report) prepared by Gordon Herkenhoff and Associates, Inc., Consulting Engineers.

B. Flood Protection: A peak runoff on the site of 7.64 CFS from adjacent properties is effectively conveyed to retention basins and a compensating peak runoff is released from the site by means of control structures to insure a peak runoff equal to or less than flow on to the site.

C. Site Drainage: Due to the inadequacy of storm sewerage in the area of the site, the city of Albuquerque requires total retention of all flows from any subsequent site development as well as retention of all flows resulting from existing conditions prior to approval of any subsequent site improvements.

Considering the alternatives, this is certainly a valid approach to the problem and a welcome opportunity to reduce the nuisance flooding that plagues the area residents.

Through the use of control structures in retention basins the net peak flow from the site is less than zero, meeting city as well as AMAFCA 72-2 requirements, while at the same time, allowing the retention basins to drain at a controlled rate considerably less than the existing storm sewerage capacities, thus precluding nuisance problems associated with standing water in retention basins.

6. CONCLUSIONS AND RECOMMENDATIONS

It is recommended that the several drainage facilities described in the appendix or thier operational equivalent be installed concurrent or prior to subsequent site improvements.

In conclusion, implementation of the recommendations outlined in the appendix or thier operational equivalent will satisfy all city and AMAFCA requirements as well as reduce the flooding potential to adjacent properties.

APPENDIX

I METHODOLOGY

Peak Runoff (Q) Calculated by "Rational" method.

$$Q = C \times A \times I$$

Where:

Q = Flow (CFS)*
C = Estimated Runoff Coeffecient (Dimensionless)
A = Contributing Area (Acres)
I = Rainfall Intensity (Inches per Hour)

*CFS $\approx$ Acre Inches per Hour

Note: Where areas consist of a composite of surfaces with differing runoff coeffecients (C) is a weighted runoff coeffecient.

Intensity (I) ascertained by trial and error using Yarnell Equation.

$$I = \frac{a}{(b + Tc)}$$ (See Fig. 1)

Where:

I = Intensity (Inches per Hour)
a = Yarnell Coefecient (Inches - Minutes per hour)
b = " " (Minutes)
Tc = Time of Concentration (Minute)

Time of Concentration (Tc) is calculated as the summation of the flow-time from the most remote point in the contributing area consisting of a combination of overland (sheet) flow and channel flow.

Overland flow time (Tc (sheet)) is calculated as the integral over the length (L) of the flow path of the reciprocal of the velocity. (V) Where velocity varies along the path as a function of Intensity (I), distance along the path (L '), slope (S) and n (Manning's roughness Coeffecient). All expressions used for flow or velocity are derived from Manning's Formula.

Channel Flow Time (Tc (Channel)) is calculated solving Manning's Equation for flow depth, the flow being known based on an assumed intensity, and, in turn, Velocity for a typical section. In the event the contributing area is broken into subreaches, the average velocity is used since flow time is equal to the reciprocal of the average velocity times the length of the reach.

The summation of flow times is substituted into the expression for intensity and the calculation repeated until substantial agreement is arrived at between Tc and Flow Time.

For peak flows through retention basins routings were performed using the modified "Pull's" method where the inflow hydrographs were triangular using Q_p = ACI and Time To Peak = Tc at the inlet of the basin. The hydrograph base was selected such that the volume under the curve would equal the Average Intensity corresponding to the length of base, as per the Yarnell Expression, times the ΣAC for the contributing drainage area times the base.

Outflow curves for the proposed facilities were generated as necessary using a polynomial curve fit to describe otherwise discontinuous functions.

All calculations were performed by computer with the programs "CRVFIT", Drainage, "Pulls", and "Pulls 2".

II EXISTING CONDITIONS

The site is divided into a north basin that drains to the low area adjacent to the west property line, and a south basin that drains to the adjacent R.O.W. (See Enclosure)

BASIN TABULATION

Basin ID	Area (A) Onsite	Area (A) Offsite		Runoff Coeffecient (C)		A x C Onsite		A x C Offsite		Total A x C
1-N-E	.467	.573		.4		.187		.229		.416
	.134	.004		.9		.121		.004		.124
	1.178		x	.46	=	.307	+	.233	=	.540
2-N-E	--	2.240		.4		--		.896		.896
	--	.102		.9		--		.092		.092
	2.342		X	.42	=	00	+	.988	=	.988
3-N-E	1.440	.832		.4		.576		.333		.909
	.551	.098		.9		.496		.088		.584
	2.921		x	.51	=	1.072	+	.421	=	1.493
N-E	6.441		x	.47	=	1.379	+	1.642	=	3.021
1-S-E	.303	.125		.4		.121		.050		.171
	.156	.003		.9		.140		.003		.143
	.587		x	.54	=	.261	+	.053	=	.314
2-S-E	2.827	.173		.4		1.131		.069		1.200
	.903	.043		.9		.812		.039		.851
	3.946		x	.52	=	1.943	+	.108	=	2.051
3-S-E	1.327	--		.4		.[illegible]		--		.531
	.451	--		.9		.406		--		.406
	1.778		x	.53	=	.937	+	00	=	.937
4-S-E	2.658	--		.4		1.063		--		1.063
	--	1.138		.9		--		1.024		1.024
	3.796	--	x	.55	=	1.063	+	1.024	=	2.087
5-S-E	.257	--		.4		.103		--		.103
	.257		x	.4	=	.103	+	00	=	.103
S-E	10.364		x	.53	=	4.307	+	1.185	=	5.492

Coeffecients: .9--Paved and/or Roofed Areas
.4--Existing Surface Soils

From computer printout #1 the peak flow into the west side depression is 8.14 CFS. The resulting peak flow off the site is 1.7 CFS at 1 hour 40 minutes after the beginning of the storm, after having been routed through the depression. The routing is shown on print out #2.

From computer print out #3 the peak flow running off the site is 14.49 CFS with a time of concentration of 46.7 minutes; Thus precluding the routed runoff from the north basins from participating in the peak site runoff.

The existing peak is much greater than the storm sewer capacity to drain the intersection and no doubt contributes to the flooding on the R.O.W. as well as some adjacent property.

Note: Tc for the north basins (print out #1) is controlling for the calculation of peak flow on to the site from adjacent properties and can be calculated as follows:

$$Qp\ (On) = {}^{*}\Sigma AC\ (\text{offsite existing})\ \ I_{Tc}\ \ (\text{Nth. Exst.})$$

$$Qp = (1.642 + 1.185) \times 2.701 \text{ inches / hour} = 7.64 \text{ CFS}$$

Existing flood plain maps indicate that the minor depressions on the site do not drain. However, they also show the site not to lie in an area of general flooding.

*From Basin Tabulation

III. Developed Conditions

As shown in the enclosure, a great deal of structural expansion, as well as paved traffic and parking areas are presently envisioned for the site.

BASIN TABULATION

Basin ID	Area (A) Onsite	Area (A) Offsite	Runoff Coeffecient (C)	A x C Onsite	A x C Offsite	Total A x C
1-C-D	.220	--	.2	044	--	.044
	--	.097	.4	--	.039	.039
	.361	.007	.9	.325	.006	.331
	.685		x .60 =	.369 +	.045 =	.414
Ponding Volume = .414 x 43560 x $\frac{2.224}{12}$ = 3342 cubic feet						
2-C-D	.103	--	.2	.021	--	.021
	--	.080	.4	--	.032	.032
	.111	--	.9	.100	--	.100
	.294		x .52 =	.121 +	.032 =	.153
Ponding Volume = .153 x 43560 . $\frac{2.224}{12}$ = 1235 cubic feet						
3-C-D	--	.069	.4	--	.028	.028
	--	.003	.9	--	.003	.003
	.072		x .43 =	-- +	.031 =	.031
Ponding Volume = .031 x 43560 x $\frac{2.224}{12}$ = 250 cubic feet						
Existing = >500 cubic feet OK						
4-C-D	.430	--	.2	.086 +	-- =	.086
	--	.102	.4	--	.041	.041
	3.307	.167	.9	2.976	.150	3.126
	4.006		x .81 =	3.062 +	.191 =	3.253
Ponding Volume = 3.253 x 43560 x $\frac{2.224}{12}$ = 26,262 cubic feet						

For basin 4CD grades along the boundary should prevent flow off the site and not hinder existing flow onto the site. A 12" RCP drain to the basin in 1SD should be provided. For the combined routing see printout 7-1 & 7-2.

BASIN TABULATION (cont'd)

Basin ID	Area (A) Onsite	Offsite		Runoff Coeffecient (C)		A x C Onsite	Offsite		Total A x C
1-S-D	.213	--		.2		.043	--		.043
	1.740	1.026		.9		1.566	.923		2.489
	2.979		x	.85	=	1.609	+ .923	=	2.532
1-S-D-D	.452	--		.9		.407	--		.407
2-S-D-D	.052	--		.2		.010	--		.010
	.017	--		.4		.007	--		.007
	.027	--		.9		.024	--		.024
	.548		x	.82	=	.448	+ --	=	.448
1-N-D	.097	--		.2		.019	--		.019
	--	3.620		.4		--	1.448		1.448
	4.290	.200		.9		3.861	.180		4.041
	8.027		x	.67	=	3.880	+ 1.628	=	5.508

Additional Coeffecient .2--Grassed and/or gravelled surface

For most basins, some storm sewerage would be in order in that surface flow gradients will not be adequate to convey all flow to the ponding areas. A six-inch P.V.C. under drain should be provided to reduce the nuisance of long-term standing water in the ponds where shown in the enclosure.

For basin 1-N-D, using the identical intensity as for existing conditions (entire flow path is offsite) the peak flow into the depression adjacent to the west property line is calculated as:

$$Qp = 5.508 \times 2.701 = 14.88 \text{ CFS @ } Tp \approx 45 \text{ minutes}$$

The depression, due to the presence of structural foundations, railroad spurs, and a large sanitary sewer interseptor, cannot be significantly altered with respect to grade and the area is, therefore, unsuitable for any semi-permanent ponding.

It is recommended that the entire depression be paved and, if possible, lined to include an epoxy coating of adjacent foundation walls. Since the only controlled outflow from the intersection is the 18" storm sewer, an 18" drain tieing directly into the existing storm sewer manhole is the only way the depression can be drained by gravity flow.

A curve fit for the head v.s. flow was calculated using the mean slope of the line, partial flow expression for the head from 0 to the diameter of the pipe and pressure flow expressions assuming a free energy surface at the soffet of the 18" line where the line empties into a 24" main in Rio Grande NW R.O.W. (See Computer Printout #4.)

A "pulls" routing was performed for the depression with a resultant peak outflow of 4.44 CFS (See computer printout #5-1 through 5-3.) Assuming the total capacity of the 18" storm sewer is available is warranted in that the majority of the flow introduced is displaced in time enough for the local flows to have vacated the line.

From computer printout #6 the peak flow direct into the retention basin proposed for basin 1-S-D is 11.15 CFS at Tc ≈ 18 minutes.

The proposed retention area should include the following features: A curb opening = 2 1/2 feet wide in the vicinity of the existing railroad spur where it cuts through the south-west corner of the site and a volume of 12,300 cubic feet at the crest elevation and approximately 22,900 cubic feet at an elevation .92" above the crest.

A six-inch P.V.C. under-drain should also be provided to minimize the nuisance of standing water over long periods. To insure compliance with city guidelines, a simultaneous routing was performed on the basins in 4CD and 1SD so as to account for flows introduced by the 12" drain between the basins, as well as the 6" drain to the storm sewer. The outflow from the basin in 1SD is controlled through the use of a 2 1/2" wide wier and the 6" drain to the proposed additional drop inlet. These being referred to as devices 1 and 2 respectively of basin 1 on printout 7-1 and 7-2 of the appendix. The resulting peak outflow from computer printout #7-1 and 7-2 is 2.31 CFS.

There are two areas that have a direct runoff to the right of way, basin 1SDD and 2SDD. Since vehicular access is necessary to the building in the area of 1SDD and transition grades must be provided for a proposed additional railroad spur to accommodate Dock Heights, the truck loading area and railroad spur will be lower than the surrounding finished terrain.

It is therefore proposed to provide a slotted drain to intercept surface flows that would otherwise collect in the low area. However, any storm event that would back up the city storm sewer to the elevation of the intercepting grate would cause greater nuisance flooding than would be encountered without the interseptor. It is therefore recommended that a contractor's pump be acquired and used in the event the existing city sewerage becomes overtaxed.

Lastly, an additional drop inlet should be constructed upstream of the proposed railroad spur to intercept gutter flow that would otherwise enter the site at the spur.

It is also recommended that where the existing spur exits the site onto the R.O.W., and where the proposed spur enters the site from the R.O.W., check structures, to an elevation of 1' above the gutter elevation, or the maximum elevation that would not interfere with the undercarriage of anticipated rolling stock, whichever is lower, be constructed so as to minimize nuisance drainage from the R.O.W. onto the site.

The peak runoff from the site results from a combination of all the aforementioned flow sources where the direct is calculated using Yarnell's expression: (See the following tabulation.)

RUNOFF TABULATION

Time	North Basin Q	South Basin Q	Direct Q	Total	
3	0.03	0.00	3.02	3.05	
6	0.36	0.00	2.73	3.09	
9	0.87	0.00	2.49	3.36	
12	1.43	0.00	2.29	3.72	
15	2.02	0.00	2.12	4.14	
18	2.58	0.00	1.97	4.55	
21	3.08	0.05	1.84	4.97	
24	3.51	0.21	1.73	5.45	
27	3.85	0.29	1.63	5.77	
30	4.09	0.50	1.54	6.13	
33	4.22	0.78	1.46	6.46	
36	4.27	1.07	1.39	6.73	
39	4.28	1.34	1.32	6.94	
42	4.28	1.59	1.26	7.13	
45	4.27	1.80	1.21	7.28	
48	4.26	1.98	1.16	7.40	
51	4.26	2.12	1.11	7.49	
54	4.26	2.22	1.07	7.55	
57	4.27	2.28	1.03	7.58	
60	4.28	2.31	1.00	*7.59	Qp < 7.64
63	4.30	2.31	0.96	7.57	OK
66	4.32	2.30	0.93	7.55	
69	4.33	2.30	0.90	7.53	
72	4.35	2.29	0.87	7.51	
75	4.37	2.28	0.85	7.50	
78	4.39	2.27	0.82	7.48	
81	4.40	2.25	0.80	7.45	
84	4.42	2.24	0.78	7.44	
87	4.43	2.22	0.76	7.41	
90	4.43	2.21	0.74	7.38	
93	4.44	2.20	0.72	7.36	
96	4.44	2.17	0.70	2.31	
99	4.43	2.15	0.68	7.26	

Since the peak runoff is less than the peak flow onto the property the project has an effective runoff of less than 0.

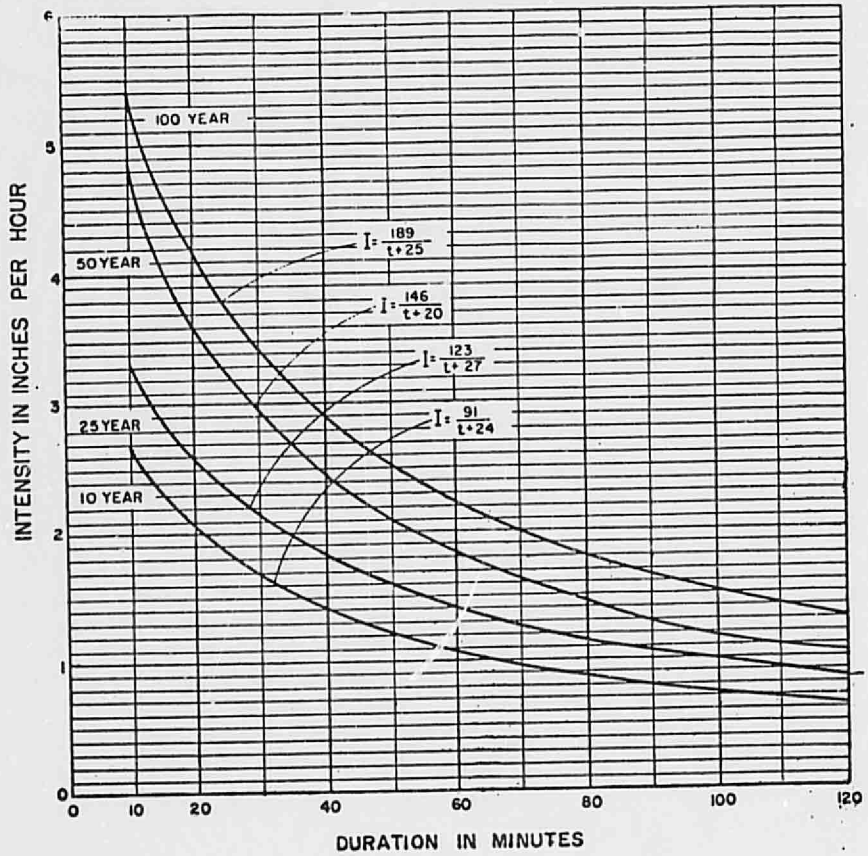


Fig. 1

MASTER PLAN OF DRAINAGE
CITY OF ALBUQUERQUE - NEW MEXICO
AND ENVIRONS

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA - 1961)

GORDON HERKENHOFF & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

1

GARDNER ENGINEERS, INC.
7833 Lomas Blvd. N.E., Suite 23
Albuq., New Mexico. 87110
Ph#(505)266-5868

Job No.78-068 Ponderosa Nth. Exst. #'s 1 - 3
23:05 02/15/79

Storm No. 1 I = 189 / (25 + Tc) Tc = 44.98 min.
I = 2.701 in/hr.
Tc(sheet) =12.789 min. for N =0.080 S = 0.700 % & L = 90.00 ft.
Tc(channel) =32.198 min.

Basin 1
Area= 1.178 ac. Coef.=0.460 Length= 210.00 ft.
S= 0.400 % N=0.035
Section

Pt. No. 1	X= 0	Y= .5
Pt. No. 2	X= 75	Y= 0
Pt. No. 3	X= 115	Y= 0
Pt. No. 4	X= 190	Y= .5

Q= 1.46 cfs Dn= 0.070 ft. Tc(channel)=17.28 min. V= 0.405 fps

Basin 2
Area= 2.342 ac. Coef.=0.420 Length= 305.00 ft.
S= 0.100 % N=0.030
Section

Pt. No. 1	X= 0	Y= .5
Pt. No. 2	X= 50	Y= 0
Pt. No. 3	X= 100	Y= .5

Q= 4.12 cfs Dn= 0.304 ft. Tc(channel)=11.93 min. V= 0.446 fps

Basin 3
Area= 2.921 ac. Coef.=0.510 Length= 190.00 ft.
S= 1.000 % N=0.035
Section

Pt. No. 1	X= 0	Y= 1
Pt. No. 2	X= 20	Y= 0
Pt. No. 3	X= 40	Y= 1

Q= 8.14 cfs Dn= 0.493 ft. Tc(channel)= 2.98 min. V= 1.674 fps

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Albuq., New Mexico. 87110
Ph#(505)266-5868

2

Job No.78-068 Ponderosa Nth. Exst.
23:45 02/15/79

Storage Curve

Elev.	Area
54.6	0
55	776.7
56	8155.3
57	18454.4
58	27122.3

Outflow Functions
Q(out) # 1 =+4.5000000E+01 * H ** 1.500
for Crest @ 57.3

T(min)	I(cfs)	W.S. Elev	S(cu.ft.)	O(cfs)	
5.00	0.90	54.973	135.1	0.00	
10.00	1.81	55.234	541.2	0.00	
15.00	2.71	55.441	1218.9	0.00	
20.00	3.62	55.641	2169.6	0.00	
25.00	4.52	55.837	3392.8	0.00	
30.00	5.43	56.031	4885.3	0.00	
35.00	6.33	56.218	6646.6	0.00	
40.00	7.24	56.397	8682.2	0.00	
45.00	8.14	56.573	10995.3	0.00	PEAK IN
50.00	7.57	56.731	13349.2	0.00	
55.00	7.00	56.865	15541.0	0.00	
60.00	6.43	56.979	17558.8	0.00	
65.00	5.86	57.078	19403.7	0.00	
70.00	5.29	57.164	21080.2	0.00	
75.00	4.72	57.238	22579.6	0.00	
80.00	4.15	57.302	23899.8	0.00	
85.00	3.58	57.353	24981.2	0.54	
90.00	3.01	57.387	25721.6	1.15	
95.00	2.44	57.405	26127.8	1.54	
100.00	1.87	57.412	26278.2	1.70	PEAK OUT
105.00	1.31	57.411	26256.7	1.67	
110.00	0.74	57.403	26084.9	1.50	

3

GARDNER ENGINEERS, INC.
7833 Lomas Blvd. N.E., Suite 23
Albuq., New Mexico. 87110
Ph#(505)266-5868

Job No.78-068 Ponderosa Sth. Exst. #'s 1 - 5
23:25 02/15/79

Storm No. 1 I = 189 / (25 + Tc) Tc = 46.68 min.
I = 2.634 in/hr.
Tc(sheet) = 5.866 min. for N =0.080 S = 3.000 % & L = 50.00 ft.
Tc(channel) =40.818 min.

Basin 1
Area= 0.587 ac. Coef.=0.540 Length= 180.00 ft.
S= 0.333 % N=0.035
Section

Pt. No. 1	X= 0	Y= 1
Pt. No. 2	X= 50	Y= 0
Pt. No. 3	X= 90	Y= 0
Pt. No. 4	X= 140	Y= 1

Q= 0.83 cfs Dn= 0.056 ft. Tc(channel)=17.10 min. V= 0.350 fps

Basin 2
Area= 3.946 ac. Coef.=0.520 Length= 385.00 ft.
S= 0.104 % N=0.035
Section

Pt. No. 1	X= 0	Y= 1
Pt. No. 2	X= 60	Y= 0
Pt. No. 3	X= 70	Y= 0
Pt. No. 4	X= 130	Y= 1

Q= 6.24 cfs Dn= 0.378 ft. Tc(channel)=14.98 min. V= 0.505 fps

Basin 3
Area= 1.778 ac. Coef.=0.530 Length= 210.00 ft.
S= 0.286 % N=0.030
Section

Pt. No. 1	X= 0	Y= 1
Pt. No. 2	X= 45	Y= 0
Pt. No. 3	X= 90	Y= 1

Q= 8.72 cfs Dn= 0.445 ft. Tc(channel)= 4.73 min. V= 0.973 fps

Basin 4
Area= 3.796 ac. Coef.=0.550 Length= 230.00 ft.
S= 0.261 % N=0.035
Section

Pt. No. 1	X= 0	Y= 1
Pt. No. 2	X= 35	Y= 0
Pt. No. 3	X= 60	Y= 0
Pt. No. 4	X= 95	Y= 1

Q= 14.22 cfs Dn= 0.389 ft. Tc(channel)= 3.99 min. V= 0.944 fps

Basin 5
Area= 0.257 ac. Coef.=0.400 Length= 0.00 ft.
S= 1.000 % N=0.035
Section

Pt. No. 1	X= 0	Y= 0
Pt. No. 2	X= 50	Y= 0

Q= 14.49 cfs Dn= 0.199 ft. Tc(channel)= 0.00 min. V= 1.448 fps

1.012665850E-01 X**0

-2.011903401E+00 X**1

1.158638167E+01 X**2

-9.144655014E+00 X**3

2.780522019E+00 X**4

-2.959811054E-01 X**5

Pt.	X	Y	F(X)	Error	%
1	.07	1.62502023E-02	1.41262633E-02	-.0021239389958	-13.07023108125
2	.14	7.08093834E-02	2.26425030E-02	-4.81668804E-02	-68.02330155627
3	.21	.1652629426089	.1103143577636	-.0549485848453	-33.24918700942
4	.28	.2985025670236	.2621337399349	-.0363688270887	-12.18375689407
5	.35	.4682424298963	.4645157259644	-.0037267039319	-.7958919768816
6	.42	.6714526759127	.7052388616736	.0337862857609	5.031820112534
7	.49	.9045547009645	.9733854676294	.0688307666649	7.609353706471
8	.56	1.163525260136	1.259281944485	.095756684349	8.229875846254
9	.63	1.443951668348	1.554439078328	.110487740998	7.651738794444
10	.7	1.741059427432	1.851492346036	.110432918604	6.342857507563
11	.77	2.049717156682	2.144142220606	.094425063924	4.606736281451
12	.84	2.364420765514	2.427094476515	.062673711001	2.650700413189
13	.91	2.679253437577	2.696000495067	.01674705749	.6250647278131
14	.98	2.987812422936	2.947397569729	-.040414853207	-1.352656977284
15	1.05	3.283084005384	3.178649211492	-.104434793892	-3.180996700686
16	1.12	3.557228381831	3.387885454188	-.169342927643	-4.760530094383
17	1.19	3.801190299608	3.573943159882	-.227247139726	-5.97831525955
18	1.26	4.003926932032	3.736306324197	-.267620607835	-6.683953338259
19	1.33	4.150633129744	3.875044391651	-.275586748093	-6.639631580978
20	1.4	4.217478194352	3.990762510998	-.226715683354	-5.375621945304
21	1.47	4.143644577777	4.084521940062	-.05912263715	-1.426826940399
22	1.54	3.94342080267	4.157800253796	.214379451126	5.436382822266
23	1.61	3.981787162206	4.212421694145	.230634531939	5.792236564729
24	1.68	4.019787355481	4.250499470883	.230712115402	5.7394109439
25	1.75	4.057431670585	4.274376064244	.216944393659	5.346840348089
26	1.82	4.094729922675	4.286563353075	.191833608075	4.684890376108
27	1.89	4.131691483863	4.289683808643	.15799232478	3.823913895727
28	1.96	4.168325310722	4.28640902318	.118083712458	2.832881400937
29	2.03	4.204639969628	4.27940179194	.074761822312	1.778079047244
30	2.1	4.240643660015	4.271255553028	.03061187013	.721868484675 2
31	2.17	4.276344236675	4.26443475662	-.011909480055	-.2784967578817
32	2.24	4.311749228414	4.261215397775	-.050533830664	-1.172003008222
33	2.31	4.346865857938	4.263625094 17	-.083240763768	-1.914960490809
34	2.38	4.381701058389	4.273383505 66	-.108317552729	-2.472043420708
35	2.45	4.416261489458	4.291842616 21	-.124418873248	-2.817289545581
36	2.52	4.450553555225	4.319927039 84	-.130626512 41	-2.935062141741
37	2.59	4.484583403 13	4.358074325 71	-.126509077 42	-2.820977246888
38	2.66	4.518355966621	4.406175262 98	-.112181703641	-2.482798602893
39	2.73	4.551879943449	4.463514187 52	-.088365769929	-1.941302515646
40	2.8	4.585157841794	4.528709285 56	-.056448556234	-1.231114787794
41	2.87	4.618195947808	4.599652900 44	-.018543047368	-.401521450747 5
42	2.94	4.650999376461	4.673451836 99	.022462461629	.482744837664
43	3.01	4.683573055767	4.746367667 39	.062794611623	1.34074158501
44	3.08	4.715921749445	4.813757036 46	.097835287015	2.074574011465
45	3.15	4.748050085 03	4.870011967 03	.121961912	2.568673678383
46	3.22	4.779962416 51	4.908500164 9	.128537748 39	2.689095377529
47	3.29	4.811663130502	4.921505324 6	.109842194098	2.282832175048
48	3.36	4.843166353001	4.900167434 8	.057011081799	1.177147249514
49	3.43	4.874446105743	4.834423083 3	-.040023022443	-.8210783661316
50	3.5	4.905536283199	4.712945762 4	-.192590519799	-3.925982985752

4

GARDNER ENGINEERS, INC.
7833 Lomas Blvd. N.E., Suite 23
Albuq., New Mexico. 87110
Ph#(505)266-5868

5-1

Job No.78-068 Ponderosa -IND- Developed
09:30 03/05/79

Storage Curve

Elev.	Area
54.5	90
55	2920
56	6600
57	27800
58	35900

Outflow Functions
Q(out) # 1 =+1.0125653E-01 * H ** 0.000 -2.0119034E+00 * H ** 1.000 +1.1586381E+01 * H ** 2.000
-9.1446550E+00 * H ** 3.000 +2.7805220E+00 * H ** 4.000 -2.9598110E-01 * H ** 5.000
for Crest @ 54.5

T(min)	I(cfs)	W.S. Elev	S(cu.ft.)	O(cfs)
3.00	0.99	54.658	85.5	0.03
6.00	1.98	54.818	316.4	0.36
9.00	2.98	54.964	652.0	0.87
12.00	3.97	55.102	1069.6	1.43
15.00	4.96	55.240	1562.0	2.02
18.00	5.95	55.380	2129.3	2.58
21.00	6.94	55.521	2777.9	3.08
24.00	7.94	55.667	3521.3	3.51
27.00	8.93	55.818	4377.2	3.85
30.00	9.92	55.976	5355.6	4.09
33.00	10.91	56.122	6480.6	4.22
36.00	11.90	56.245	7772.9	4.27
39.00	12.90	56.357	9232.5	4.28
42.00	13.89	56.465	10878.9	4.28
45.00	14.88	56.568	12696.9	4.27
48.00	14.25	56.663	14559.5	4.26
51.00	13.62	56.744	16304.4	4.26
54.00	13.00	56.814	17930.8	4.26
57.00	12.37	56.876	19439.9	4.27
60.00	11.74	56.931	20848.7	4.28
63.00	11.11	56.97[illegible]	22133.4	4.30

5-2

69.00	9.86	57.058	24341.5	4.33
72.00	9.23	57.091	25284.6	4.35
75.00	8.60	57.119	26096.1	4.37
78.00	7.97	57.144	26800.9	4.39
81.00	7.34	57.164	27396.6	4.40
84.00	6.72	57.181	27881.4	4.42
87.00	6.09	57.192	28224.9	4.43
90.00	5.46	57.200	28454.6	4.43
93.00	4.83	57.204	28569.6	* 4.44 PEAK OUTFLOW
96.00	4.20	57.204	28569.6	* 4.44
99.00	3.58	57.201	28483.3	4.43
102.00	2.95	57.194	28282.3	4.43
105.00	2.32	57.184	27967.2	4.42
108.00	1.69	57.169	27539.0	4.41
111.00	1.06	57.150	26999.1	4.39
114.00	0.44	57.128	26349.3	4.38
117.00	0.00	57.102	25591.6	4.36
120.00	0.00	57.074	24811.9	4.34
123.00	0.00	57.047	24038.2	4.33
126.00	0.00	57.020	23270.6	4.31
129.00	0.00	56.991	22482.4	4.30
132.00	0.00	56.963	21708.6	4.29
135.00	0.00	56.934	20926.0	4.28
138.00	0.00	56.904	20161.6	4.27
141.00	0.00	56.874	19390.8	4.27
144.00	0.00	56.843	18615.5	4.26
147.00	0.00	56.811	17837.7	4.26
150.00	0.00	56.777	17059.4	4.26
153.00	0.00	56.743	16282.6	4.26
156.00	0.00	56.708	15509.4	4.26
159.00	0.00	56.672	14742.0	4.26
162.00	0.00	56.635	13982.7	4.26

165.00	0.00	56.596	13215.0	4.27
168.00	0.00	56.555	12443.7	4.27
171.00	0.00	56.512	11674.0	4.28
174.00	0.00	56.466	10895.0	4.28
177.00	0.00	56.418	10130.4	4.28
180.00	0.00	56.366	9358.0	4.28
183.00	0.00	56.311	8590.8	4.28
186.00	0.00	56.249	7819.1	4.27
189.00	0.00	56.181	7055.9	4.25
192.00	0.00	56.102	6296.4	4.20
195.00	0.00	56.005	5548.2	4.12
198.00	0.00	55.892	4821.7	3.97
201.00	0.00	55.775	4125.7	3.76
204.00	0.00	55.658	3474.2	3.49
207.00	0.00	55.542	2878.0	3.15
210.00	0.00	55.429	2344.7	2.76
213.00	0.00	55.321	1882.6	2.35
216.00	0.00	55.223	1495.7	1.94
219.00	0.00	55.134	1177.7	1.57
222.00	0.00	55.057	925.3	1.24
225.00	0.00	54.990	725.6	0.97

5-3

GARDNER ENGINEERS, INC.
7833 Lomas Blvd. N.E., Suite 23
Albuq., New Mexico. 87110
Ph#(505)266-5863

6

Job No.78-068 Ponderosa Sth. Dev.
11:15 02/16/79

Storm No. 1 I = 189 / (25 +Tc) Tc = 17.920 min.
I = 4.404 in/hr.
Tc(sheet) =17.920 min. for N =0.045 S = 0.600 % & L = 360.00 ft.
Tc(channel) = 0.000 min.

Basin 1
Area= 2.979 ac. Coef.=0.850 Length= 0.00 ft.
S= 1.000 % N=0.020
Section

Pt. No. 1	X= -10	Y= 1
Pt. No. 2	X= 0	Y= 0
Pt. No. 3	X= 10	Y= 1

Q= 11.15 cfs Dn= 0.584 ft. Tc(channel)= 0.00 min. V= 3.259 fps

GARDNER ENGINEERS, INC.
7833 Lomas Blvd. N.E., Suite 23
Albuq., New Mexico. 87110
Ph#(505)266-5868

7-1

Job No.78-068 Ponderosa 4CD & 1SD Developed.
06:40 03/04/79

Storage Curve # 1

Elev.	Area
56	10
56.08	790
56.5	3090
57	9200
57.3	18200
57.5	24200
58	33200

Outflow Functions
Q(out) # 1 =+7.5000000E+00 * H' ** 1.500
Crest @ 57.5
Q(out) # 2 =+6.9142711E-01 * H' ** 0.540
Crest @ 57.3

Storage Curve # 2

Elev.	Area
56.66	10
56.74	1210
57.32	11270
57.66	13890
57.82	15120
58.32	18720
58.5	29540
59	48540

Outflow Functions
Q(out) # 1 =+3.1023146E+00 * dE ** 0.540
Crest @ 57.66
Q(out) # 2 =+1.7219627E+02 * H' ** 2.500
Crest @ 58.5

T	Inflow(cfs)		W.S. Elev		Storage(ft^3)		Outflow(cfs)			Res2to1		
(min)	Res1	Res2	Res1	Res2	Res1	Res2	Res1	O(1)	O(2)	O(1)	O(2)	
3.0	1.86	2.39	56.201	56.825	167	214	0.00	0.00	0.00	0.00	0.00	
6.0	3.72	4.78	56.440	56.984	670	859	0.00	0.00	0.00	0.00	0.00	
9.0	5.57	7.16	56.662	57.142	1505	1935	0.00	0.00	0.00	0.00	0.00	
12.0	7.43	9.55	56.850	57.299	2677	3438	0.00	0.00	0.00	0.00	0.00	
15.0	9.29	11.94	57.027	57.461	4181	5376	0.00	0.00	0.00	0.00	0.00	
18.0	11.15	14.33	57.177	57.645	6021	7738	0.00	0.00	0.00	0.00	0.00	PEAK INFLOW (DIRECT)
21.0	10.38	13.34	57.307	57.805	8150	10035	0.05	0.00	0.05	2.13	0.00	
24.0	9.61	12.35	57.414	57.929	10308	11955	0.21	0.00	0.21	2.17	0.00	
27.0	8.85	11.37	57.502	58.035	12328	13688	0.29	0.00	0.29	2.21	0.00	
30.0	8.08	10.38	57.577	58.127	14177	15249	0.50	0.16	0.35	2.25	0.00	
33.0	7.31	9.39	57.641	58.205	15863	16625	0.78	0.40	0.39	2.28	0.00	
36.0	6.54	8.40	57.696	58.271	17352	17811	1.07	0.65	0.42	2.30	0.00	
39.0	5.77	7.42	57.743	58.325	18672	18825	1.34	0.90	0.45	* 2.32	0.00	PEAK INFLOW FROM BASIN 4CD
42.0	5.01	6.43	57.782	58.366	19801	19651	1.59	1.12	0.47	2.32	0.00	
45.0	4.24	5.44	57.814	58.395	20754	20296	1.80	1.32	0.48	2.31	0.00	
48.0	3.47	4.45	57.839	58.415	21518	20765	1.98	1.48	0.50	2.30	0.00	
51.0	2.70	3.46	57.859	58.427	22113	21061	2.12	1.61	0.51	2.28	0.00	
54.0	1.93	2.48	57.873	58.431	22534	21185	2.22	1.71	0.51	2.27	0.00	
57.0	1.17	1.49	57.881	58.429	22806	21132	2.28	1.77	0.52	2.24	0.00	
60.0	0.40	0.50	57.885	58.420	22938	20903	* 2.31	1.79	0.52	2.21	0.00	PEAK OUTFLOW
63.0	0.00	0.00	57.885	58.406	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.18	0.00	

66.0	0.00	0.00	57.884	58.389	22897	20150	2.30	1.79	0.52	2.14	0.00
69.0	0.00	0.00	57.883	58.372	22867	19773	2.30	1.78	0.52	2.11	0.00
72.0	0.00	0.00	57.882	58.354	22837	19399	2.29	1.77	0.52	2.07	0.00
75.0	0.00	0.00	57.881	58.336	22806	19029	2.28	1.77	0.52	2.03	0.00
78.0	0.00	0.00	57.879	58.317	22746	18662	2.27	1.75	0.51	1.98	0.00
81.0	0.00	0.00	57.877	58.298	22685	18316	2.25	1.74	0.51	1.94	0.00
84.0	0.00	0.00	57.875	58.279	22625	17973	2.24	1.73	0.51	1.90	0.00
87.0	0.00	0.00	57.874	58.261	22564	17632	2.22	1.71	0.51	1.86	0.00
90.0	0.00	0.00	57.872	58.242	22504	17294	2.21	1.70	0.51	1.82	0.00
93.0	0.00	0.00	57.870	58.225	22443	16976	2.20	1.69	0.51	1.77	0.00
96.0	0.00	0.00	57.867	58.207	22353	16660	2.17	1.67	0.51	1.73	0.00
99.0	0.00	0.00	57.864	58.190	22263	16346	2.15	1.65	0.51	1.69	0.00
102.0	0.00	0.00	57.861	58.173	22173	16052	2.13	1.63	0.51	1.65	0.00
105.0	0.00	0.00	57.858	58.156	22083	15760	2.11	1.61	0.50	1.61	0.00
108.0	0.00	0.00	57.855	58.140	21993	15469	2.09	1.59	0.50	1.57	0.00
111.0	0.00	0.00	57.852	58.123	21904	15181	2.07	1.57	0.50	1.53	0.00
114.0	0.00	0.00	57.849	58.108	21815	14912	2.05	1.55	0.50	1.49	0.00
117.0	0.00	0.00	57.846	58.092	21725	14644	2.03	1.53	0.50	1.45	0.00
120.0	0.00	0.00	57.842	58.076	21607	14378	2.00	1.50	0.50	1.42	0.00
123.0	0.00	0.00	57.838	58.062	21488	14130	1.97	1.48	0.49	1.38	0.00
126.0	0.00	0.00	57.834	58.047	21370	13884	1.94	1.45	0.49	1.34	0.00
129.0	0.00	0.00	57.831	58.032	21252	13639	1.92	1.43	0.49	1.31	0.00
132.0	0.00	0.00	57.827	58.019	21134	13412	1.89	1.40	0.49	1.27	0.00
135.0	0.00	0.00	57.823	58.005	21017	13187	1.86	1.38	0.49	1.24	0.00
138.0	0.00	0.00	57.819	57.991	20900	12963	1.84	1.35	0.49	1.20	0.00
141.0	0.00	0.00	57.815	57.979	20783	12756	1.81	1.33	0.48	1.17	0.00
144.0	0.00	0.00	57.811	57.966	20667	12550	1.78	1.30	0.48	1.13	0.00
147.0	0.00	0.00	57.807	57.953	20550	12345	1.76	1.28	0.48	1.10	0.00
150.0	0.00	0.00	57.803	57.942	20434	12157	1.73	1.25	0.48	1.07	0.00
153.0	0.00	0.00	57.799	57.930	20319	11970	1.70	1.23	0.48	1.03	0.00
156.0	0.00	0.00	57.795	57.918	20203	11784	1.68	1.20	0.47	1.00	0.00
159.0	0.00	0.00	57.792	57.907	20088	11615	1.65	1.18	0.47	0.97	0.00
162.0	0.00	0.00	57.788	57.897	19973	11446	1.63	1.16	0.47	0.94	0.00
165.0	0.00	0.00	57.784	57.886	19858	11278	1.60	1.13	0.47	0.91	0.00
168.0	0.00	0.00	57.780	57.875	19744	11111	1.57	1.11	0.47	0.87	0.00
171.0	0.00	0.00	57.776	57.865	19630	10960	1.55	1.09	0.46	0.84	0.00
174.0	0.00	0.00	57.772	57.856	19516	10809	1.52	1.06	0.46	0.81	0.00
177.0	0.00	0.00	57.767	57.846	19374	10659	1.49	1.04	0.46	0.79	0.00
180.0	0.00	0.00	57.763	57.837	19261	10525	1.47	1.01	0.46	0.76	0.00
183.0	0.00	0.00	57.758	57.828	19120	10391	1.44	0.98	0.45	0.74	0.00
186.0	0.00	0.00	57.754	57.820	19008	10261	1.41	0.96	0.45	0.71	0.00

7-2

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