DRAINAGE PLAN
FOR
STONEBRIDGE SUBDIVISION
UNITS 5 & 6

AUGUST 31, 2000

PREPARED BY:

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8/31/00
Rick Beltrame, P.E. Date
10/13/00

TABLE OF CONTENTS

APPENDICES

PLATES

I. INTRODUCTION

This Drainage Study will address the developed storm runoff of the properties legally described as Parcel 25, Lands of Chris Eric Robertson; Parcels 26 and 30, Lands of Lincoln Road, Ltd.; Tract 29, Lands of Lincoln Road, Ltd.; Tract 28,Lands of Smith; Parcel 33 ("X"), Lands of Smith; and Tract 32, Lands of Ross.

Units 5 and 6 of Stonebridge Subdivision are bounded by Stonebridge Unit 3B on the south, Stonebridge Units 2 and 4 on the west, Westside Boulevard on the north, and Paradise Heights to the east. It is zoned R-1. See vicinity map for location. **(Plate 1)** This report follows the comprehensive drainage plan established by the Stonebridge Master study.

II. METHODOLOGY

Existing and proposed site hydrological conditions were analyzed for the 100-year, 6-hour storm in accordance with the revised Section 22.2, Hydrology, of the Development Process Manual (DPM) for the City of Albuquerque, dated January 1993. Street capacities were analyzed using Manning's equation, consistent with the revised DPM Section 22.2. All data and calculations supporting this study are located in **Appendix B.** The new rational method hydrologic procedures identified within the revised DPM Section 22.2 are utilized to determine peak flow rates for design of the storm drainage improvements within the projects. The 100-year, 6-hour storm is used as the design event. The results are included in **Appendix A**.

III. EXISTING CONDITIONS

A. Topography and Existing Drainage Patterns

Stonebridge Subdivision will be sited on undeveloped land with slopes ranging from approximately 2% to 10% to the northeast. Soils are highly absorptive sandy soils with occasional silt lenses. Vegetation is light, consisting of chamisa, weeds and desert grasses. The site is not located within a FEMA floodplain as shown on FIRM map 108. The existing drainage conditions were shown graphically in the Stonebridge Master Drainage Report.

B. Offsite Drainage

When Stonebridge Units 1, 2, 3, and 4 were built, the offsite flow from the west and south were accommodated in the streets and storm drain systems. The combined flow was collected and conveyed to temporary ponds that release the runoff at a controlled rate. These ponds will be removed and storm drain will be constructed with phases 5 and 6 to convey the runoff to the Black Arroyo. A connection to the Arroyo has been designed under the guidance of AMAFCA.

C. Black Arroyo Detention Facility

Just north and east of the proposed subdivision is the Black Arroyo Detention Facility. It has capacity for fully developed runoff from the Stonebridge Subdivision as well as all future development upstream. The connection to the Black Arroyo will be completed during this last phase of the project. Per agreement with AMAFCA, Station 4+00 will be the location of the connection. A preliminary design has been completed and is included as **Plate 4**.

IV. PROPOSED DEVELOPED CONDITIONS

The proposed development is a single-family, detached-unit residential subdivision with 189 lots on 40.1 acres, producing a density of 4.7 D.U. per acre. Proposed street configurations are shown on the Preliminary Plat. See **Plate 1**.

All flows generated by Unit 3B currently drain north to the terminus of Bandelier Drive, Rocky Mountain Drive, and Marble Stone Drive into three temporary detention ponds. With the development of Units 5 and 6, the ponds will be removed and the flow will be conveyed through additional storm drain. See **Plate 5**. An AHYMO analysis, shown in **Appendix A,** was performed to determine the flows created by this subdivision. The analysis that sized the storm drain and located the inlets is included in **Appendix B.**

V. CONCLUSION

The development of Stonebridge Units 5 and 6 substantially follows the master plan for the Stonebridge Subdivision. This report includes a detailed study of the existing and proposed runoff, street capacities, and pond volumes. Attached are the preliminary plat, proposed conditions basin map, grading plans and Black Arroyo Connection Design. This drainage plan maintains the overall drainage pattern and allows for safe management of storm runoff in our proposed as well as adaptable improvements for future development.

Stonebridge Subdivision
Units 5 & 6
Street Capacity & Inlet Design
8-28-00

Rocky Mountain Drive

- Offsite flow =
  14.68 cfs in street
  30 cfs in pipe (30")

- Basin R6
  Q = 12.74 cfs
  # lots = 17
  $Q/lot = \frac{12.74}{17} = 0.75$ cfs/lot
  S = 0.5%
  Capacity = 41.6 cfs - see PC stream output.
  No inlets required
  Add one inlet to relieve intersection further north
  Q at inlet = $14.68 + 4(.75) = 17.68$ cfs
  D = 0.49'
  Q in inlet = 5.2 cfs
  Q in street = 12.74 - 5.2 = 7.4 cfs + 14.68 = 22.08 cfs.

Basins R1, R2, R3 + R4 contribute to the intersection of Rocky Mtn + Rose Quartz

Basin R1 - Cobalt Drive

no offsite
Q = 8.64 cfs
S = 1.54%
the road can carry 35.9 cfs
No inlets reqd.

Basin R2- Rose Quartz

offsite flow = 8.64 cfs from Cobalt D1.

$Q_{R2} = 4.74$ cfs

total Q = 13.38 cfs.

S = 2.97%

a road at 2.97% can convey 30.9 cfs.

13.38 < 30.9 cfs

No inlets required.

Basin R3- Argonite

off-basin flow = ϕ.

$Q_{R3} = 5.19$ cfs.

S = 2.91%

at slope of 2.91%, the road can convey 30.6 cfs.

5.19 < 30.6

No inlets required.

Rose Quartz after (east) Argonite

13.38 + 5.19 = 18.57 off-basin

Basin R4: 6.91 cfs

25.48 cfs

at 4.18%, Rose Quartz carries 25.8 cfs.

Install inlets

See grating capacity nomograph

the grates convey 7.2 cfs each

use 2-type A inlets

14.4 cfs in pipe

10.08 cfs in street

Intersection of Rose Quartz and Rocky Mountain

Q in Rocky Mountain 22.08cfs.

Q in Rose Quartz = 10.08

32.16 cfs.

S = 3.43%

Capacity = 28.1 cfs.

Inlets required.

★ Install one inlet in Rocky Mountain before intersection

Q = 22.08

S = 3.43%

D = 0.40'

inlet take 6 cfs.

Q in road = 32.16 - 6 = 26.16 < 28.1 ok

Install inlets at terminus of Rocky Mountain in sump.

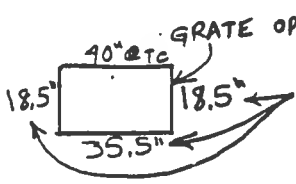
A double grate can convey 23 cfs

A single grate can convey 15.8 cfs

38.8 cfs > 26.16

★ use 1 double 'C' and 1 single 'C'

If they were to overflow, the water would discharge into Quarry Road without flooding.



GRATE OPEN AREA = 4.56 SF/GRATE

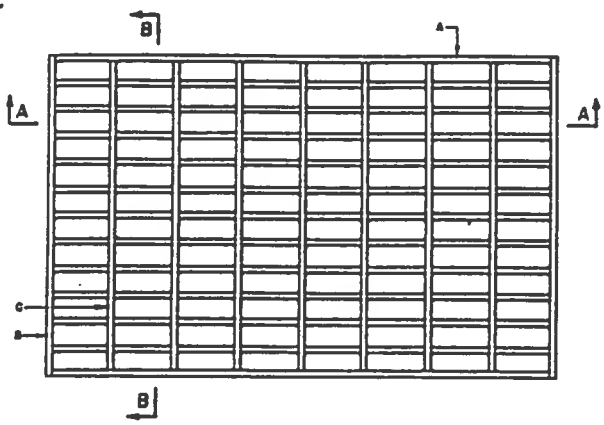
NET OPEN AREA FOR WEIR

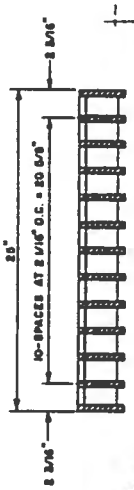
GRATE @ 10" (0.83') BELOW TC

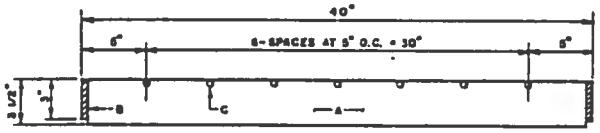
EQUATION	SGL C	DBL C	TRPL C	QDPL C
1) ORIFICE	$22.0\ h^{0.5}$	$43.9\ h^{0.5}$	$65.9\ h^{0.5}$	$87.8\ h^{0.5}$
2) 3-SIDED WEIR ($h \le 0.83'$)	$19.9\ h^{1.5}$	$29.7\ h^{1.5}$	$39.5\ h^{1.5}$	$49.2\ h^{1.5}$
3) 4-SIDED WEIR ($h > 0.83'$)	ADD TO 2): $11(h-.83)^{1.5}$	ADD TO 2): $22(h-.83)^{1.5}$	ADD TO 2): $33(h-.83)^{1.5}$	ADD TO 2): $44(h-.83)^{1.5}$

1) $Q = 0.6A\sqrt{2gh}$

2) & 3) $Q = 3.3\ P\ h^{1.5}$







GRATE CAPACI. (Q) IN CFS

HEAD (h) IN FEET

QUADRUPLE GRATE

TRIPLE GRATE

DOUBLE GRATE

SINGLE GRATE

23.

15.0

TC 0.83

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY JPK DATE 4/9/92

SUBJECT RATING CURVE FOR TYPE C INLETS CH'D _____ DATE B-1

W/ SUMP, NO CLOGGING FACTOR

Basin O Quarry Rd

no offsite flow

Q_o = 2.76 cfs

S= 2.81 %, 6.28 %

at 2.81% the road capacity = 34.6 cfs

at 6.28% the road capacity = 18.7 cfs

no inlets regd.

Basin P Quarry Rd

offsite flow = 2.76 cfs

Q_p = 2.76 cfs

Total = 5.52 cfs

S = 6.28%, 2.61%

at 6.28% the road capacity = 18.7 cfs

at 2.61% the road capacity = 37.4 cfs

Basin Z3 Bandelier

offsite flow = 14.37 cfs

Q_{z3} = 4.96 cfs

Total = 14.33 cfs

S= .5%, 4%

at .5% the road capacity = 40 cfs

at 4% the road capacity = 23.3 cfs

Add inlets to relieve intersection

Add 1 single A inlet on each side of roadway

$Q_{in\ inlet} = 6.6$ per inlet

$Q_{in\ street} = 19.33 - (6.6 * 2) = 6.1$ cfs

Add 1 single inlet to relieve intersection of Bandelier and Quarry

$Q = 6.1 + 5.52 = 11.62$ cfs

$Q_{in\ inlet} =$

Basin Z2 - Marble Stone

offsite flow = 29.21 cfs

Q_{Z2} = 3.46 cfs

total = 32.67 cfs.

S = 2.44%

at 2.44%, the road capacity = 31.9 cfs

Inlet required, Q @ inlet = 31.9 cfs

Use 2 type-A inlets

$Q_{in\ inlet}$ = 7.8 cfs per inlet

$Q_{in\ street}$ = 32.67 − (7.8 * 2) = 17.07 cfs

Basin Q Marble Stone

offsite Flow = 17.07 cfs + 8 cfs

Q_Q = 6.48 cfs

total = 31.55 cfs

S = 2.44 %

at 2.44 %, the road capacity = 31.9 cfs

No inlets reqd. 31.55 cfs < 31.9 cfs

Basin Q Sunstone

no offsite Flow = 8 cfs

Q = 3.24 cfs

S = 7.7%

at 7.7%, the road capacity = 15.1 cfs

No inlets reqd 11.24 cfs < 15.1 cfs

Basin E1 Marble Stone

Offsite Flow = 31.55

Q_{E1} = 7.99 cfs

total = 39.54 cfs

S = 0.5 %

at 0.5% the road capacity = 41.1 cfs

Place inlets at low point in Marble Stone
Use 1 double A on each side
of the roadway

$Q_{in\ inlet}$ = 27 cfs per inlet

Total = 54 cfs > 39.54 cfs

If inlets overflow, the water
would discharge into Tract A-2 (Park Site)

Basin E1 Blue Stone

no offsite flow

Q_{E1} = 4 cfs

S = 5%

at 5% the roadway capacity = 18.6 cfs

no inlets reqd

Basin Chris Manganite

no off site Flow

Q_{chris} = 12.52 cfs

s = 1.1 %

at 1.1 % the road capacity = 14.2 cfs

no inlets reqd

Basin Chris River Ridge

no offsite Flow

Q_{chris} = 12.52 cfs

s = 4.0%

at 4.0% the road capacity = 25.2 cfs

no inlets reqd.

Basin I Manganite

no offsite Flow

Q_I = 12.30 cfs

s = 8% & 2.13%

at 8% the road capacity = 4.6 cfs

at 2.13% the road capacity = 12.6 cfs

no inlets reqd.

Basin K Argonite

no offsite Flow

Q_K = 12.30 cfs

S = 7.46 % & 3.83 %

at 7.46 % the road capacity = 15.7 cfs

at 3.83 % the road capacity = 27.2 cfs

Add inlets to relieve intersection

Add 1 single A inlet on each side of roadway

Q_{in} inlet = 4.2 cfs per inlet

Q_{in} street = 12.3 - (4.2 * 2) = 3.9 cfs

Basin M Tanzanite

no offsite Flow

Q_M = 9.25 cfs

S = 5.97 %

at 5.97% the road capacity = 20.1 cfs

no inlets required

Basin L Tanzanite

offsite Flow = 9.25 cfs

Q_L = 3.25 cfs

Total = 12.5 cfs

S = 0.78 %

at 0.78% the roadway capacity = 40.9 cfs

Add 1 single A inlet on each side of roadway to relieve intersection Q_{in} inlet = 4 cfs per inlet

Q_{in} street = 12.5 - (4 * 2) = 4.5 cfs

Basin H River Ridge

Offsite Flow = 24.82 + 3.9 + 4.5 = 33.22 cfs

Q_H = 9.07 cfs

Total = 42.29 cfs

S = 4%, 3.33%, 2.9%

at 4% the roadway capacity = 25.2 cfs

Add 1 single A inlet on each side of roadway

$Q_{in\ inlet}$ = 6.4 cfs per inlet

$Q_{in\ street}$ = 24.82 cfs − (6.4*2) cfs = 12.02 cfs

at 3.33% the roadway capacity = 27.0 cfs

$Q_{in\ street}$ = 18 cfs < 27.0 cfs

no inlets reqd.

at 2.9% the roadway capacity = 29.5 cfs

$Q_{in\ street}$ = 29.5 = 29.5 cfs

Place double A inlet in sump condition at cul-de-sac terminus

$Q_{in\ inlet}$ = 38 cfs

IF inlet overflows it would flow to the west away from homes and into the Black Arroyo