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Revised 5/12/86

A)   Purpose and Scope

Bellamah Commumity Development is currently planning
development of their 51 acre Shenandoah Subdivision, Units
II and III, in northwest Albuquerque.   The Development
will consist of approximately 205 R1 lots intended for the
custom home market.   The purpose of this report is to
present an overall drainage management plan for the
project which is based on sound engineering practice and
which is acceptable to both the City of Albuquerque and
the Albuquerque Metropolitan Arroyo Flood Control
Authority.

B)   Site Location and Topography

Shenandoah II and III is located at the northern end of
Taylor Ranch.   This area is bounded on the east by Taylor
Ranch Drive, on the north by Calle Nortena Road, on the
west by Volcano Cliffs subdivision, on the south by
Shenandoah I subdivision.

The parcel lies along the bottom edge of the terrace area
or escarpment as defined in the Northwest Mesa Area Plan.
Topography is markedly varied across the parcel and tends
to slope in a southeast direction.

Soils are primarily gravelly sands and silts falling into
the soils hydrologic groups A and B.

C) Design Criteria

1) Engineering Parameters

In accordance with AMAFCA and City of Albuquerque Drainage Cirteria all hydrological analysis is based on the 100 year frequency - 6 hour duration storm as represented in the NOAA atlas for New Mexico. The rainfall values pertinent to the study are as follows:

	10 Year	100 Year
One Hour	1.25"	1.9"
Six Hour	1.45"	2.2"

A fraction impervious of 0.38 was selected for the project based on a "typical" lot, and a curve number of 70 was selected for the pervious areas. Developed offsite watersheds were assigned a fraction impervious of 0.35 for Volcano Cliffs and a curve number of 70 or 75 depending upon the soil type for the pervious area.

Watersheds with multiple land uses or a mixture of soil groups were assigned a composite number calculated by weighted averages based on area.

2) <u>Flood Control Regulations</u>

The drainage plan presented in this report has been designed to comply with the current City of Albuquerque Drainage Ordinance and associated technical criteria as published in the Development Process Manual. The key elements of the ordinance are as follows:

1) Street flow depths may not exceed a value of 0.2 feet above top of curb for any location for a 100 year event.

2) Street flow depths may not exceed a value of 0.5' at gutter line for any collector or arterial street for the 10 year event and the product of depth and velocity must be less than or equal to 6.5.

3) One twelve foot driving lane in each direction must be free from all flow for any arterial for the 10 year event.

D)   Computational Procedures

The analysis approach utilized follows standard
engineering practice.   Key points of confluence were
selected, and subsequently the associated individual and
aggregate contributing basins were defined.

Hydrological computations were accomplished by means of
our MODSCS Computer model.   This model is based upon the
Soil Conservation Service Triangular unit hydrograph
method, but the method has been modified to be more
applicable to developed watershed conditions.   The model
avoids the common pitfall of grappling for an appropriate
developed curve number by including percent impervious as
an input variable.   This fraction of the watrershed is
then modeled at a curve number of 95.   An assigned curve
number is applied to the balance of the watershed, and the
runoffs are combined to yield the composite hydrograph.
In addition the model has the capacity to route
hydrographs through reservoirs and channels, or to
translate hydrographs in time for summation with other sub
basins.

For basins with a mix of subcatchments and corresponding
variations in fractions impervious, a composite value was
calculated.

Times of concentration were estimated by using a combination of approximated street flow velocities and overland flow velocities (as applicable) from the upper subcatchment reaches to the confluence point of interest. A convenient formula for overland flow velocity takes the form:

$$V_o = KY^{0.5}$$

where V_o = overland flow velocity
Y = average ground slope in percent
K = a ground cover factor

Street velocities were estimated by use of the Manning equation for uniform flow.

For some watersheds with well defined stream beds the California Highways formula for time of concentration was used to estimate the parameter directly. The equation takes the form

$$T_c = \left[\frac{11.9\ L^3}{H}\right]^{.385}$$

where

T_c is time of concentration in hours
L is reach length in miles
H is differential elevation in feet.

All the characteristic hydrological parameters for each subcatchment of interest and each key point of confluence are contained in Appendix A as part of the computer model output, and a summary of parameters and peak flow rates are given in Table 1.

Following hydrological modeling street flow characteristics were analyzed by various methods. For uniform flow conditions the Manning equation with an n of 0.017 was used supplemented by DPM street capacity charts. At intersections the worst of two conditions was assumed. The theoretical hydraulic jump depth for upstream flow conditions was computed followed by the theoretical pool depth to accelerate the flow from 0 velocity head to downstream conditions. Whichever value was higher was assumed to be the potential flood depth. It should be noted that this approach is valid only for incoming supercritical flow conditions at tee intersections. Subcritical flow conditions are not considered critical at intersections unless normal flow depth is above required limits.

E)   Offsite Flows

Volcano Cliffs Subdivision contributes a major portion of offsite flows to Shenandoah which presently enter the South branch of the Piedras Marcadas Arroyo.   Volcano Cliffs is platted and undeveloped at the present time.   A master drainage plan was prepared on July, 1985 for the Piedras Marcadas system as part of the Hughes Sector Plan. A flow rate of 383 cfs was determined to enter the South Branch at Taylor Ranch Drive for this entire basin (See Plate 2).

An intensive drainage evaluation was conducted on Volcano Cliffs assuming future development to determine the impacts on Shenandoah.   By using all streets as major conveyance systems it was determined that the drainage basins would be reduced in size (See Plate 3).   A vertical control field survey was done on Ridgeway Drive and Carter Road to determine existing road profiles. It was concluded that Ridgeway Drive can be used as a drainage conveyance since it can be graded to slope to Calle Nortena within basin 7.   Several between lot drainage easements do exist along the lots south of Ridgeway Drive, but it was concluded that their use would not be optimal due to the additional costs of drainage rundowns and maintenance factor to the City.

It was also determined that following development, a portion of basin 04 flowing into Carter and Verde Roads could easily be directed into the Mariposa System by a small storm drain on Verde Road and an additional easement acquisition on Lot 20, Unit 23, Volcano Cliffs Subdivision (See Plate 6).

Since it is now proposed that a major portion of this offsite flow be diverted into Calle Nortena which is a collector street an analysis was needed for downstream capacity. The results were that a depth of 0.5 feet resulted for 10 year flows and a depth of 0.7 feet for 100 year flows which do not exceed the City D.P.M. standards. The aforementioned Hughes Drainage study specifies catch basins to intercept this flow at the intersection of Calle Nortena and Golf Course Road and divert it to the Piedras Marcadas.

After diversion of the majority of developed offsite flows was evaluated as described above, a second drainage analysis was performed to determine the remaining developed offsite flows that will enter Shenandoah. It was determined that the offsite flows were reduced sufficiently that the 100 foot drainage right-of-way along the south boundary of Shenandoah, Unit II, will no longer be needed (See Plate 2).

F)   Onsite Drainage

Plate 6 illustrates the various subcatchments which are internal to the proposed development. Basins A, B, C, D, F and H are to be directed to the Southeast corner of Shenandoah via street conveyances. The proposed onsite street which runs through Basins D and F will be used as the major drainage conveyance system for undeveloped offsite as well as onsite flows.

The street capacity was analyzed at the most critical point which is where the streets in basins C and D intersected. These streets are classified as local streets, and the analysis resulted in a depth of 0.85 feet for a 100 year storm meeting the D.P.M. standards. The flow in this local street is proposed to be discharged at the southeast corner of Shenandoah (see Plate 6, Point F) into a riprap energy dissipator, across the dip section of Taylor Ranch Drive, and into the South Branch of the Piedras Marcadas.

Basins E and G are to be directed with streets into Taylor Ranch Road and down to the dip section and into the South Branch.

Shenandoah Unit II and Unit III could be constructed in two phases based on the developers option. Therefore, Plate 7 has been included to show appropriate interim measures if development of Unit II takes place before Unit III. This is to ensure that a cohesive system is the end result.

Desiltation ponds were provided between the undeveloped Unit III and the entrance of streets on developed Unit II. A temporary pond is also proposed between Unit II and Unit III to prevent runoff from Unit III into Unit II if phased construction does take place (See Plate 7).

G) Erosion Control

Control of excessive soil erosion into City streets and drainage improvements during construction will be accomplished by use of temporary lot line, water-trap berms. These will be windrowed into place following mass grading operations and left in place until each home is constructed and sold. Plate 3 illustrates the dimensions of these berms, and they will be located along those boundaries of each lot which are common to either City rights of way or public easement.

PLATE 3

OFFSITE BASINS, DEVELOPED CONDITIONS

LEGEND

① AREA/POINT DESIGNATION
▨▨ EXISTING DRAINAGE EASEMENT
▨▨ PROPOSED DRAINAGE EASEMENT
(FOR FUTURE STORM DRAIN-See PLATE 5)
– – – DRAINAGE BASIN BDY. (DEVELOPED)
—— SHENANDOAH PROPERTY BDY.
→ FLOW LEADER
∷∷ RIPRAP ENERGY DISSIPATORS

REBUILD INTERSECTION
TO PROVIDE WATER
BLOCK

SCALE:
1" = 500'
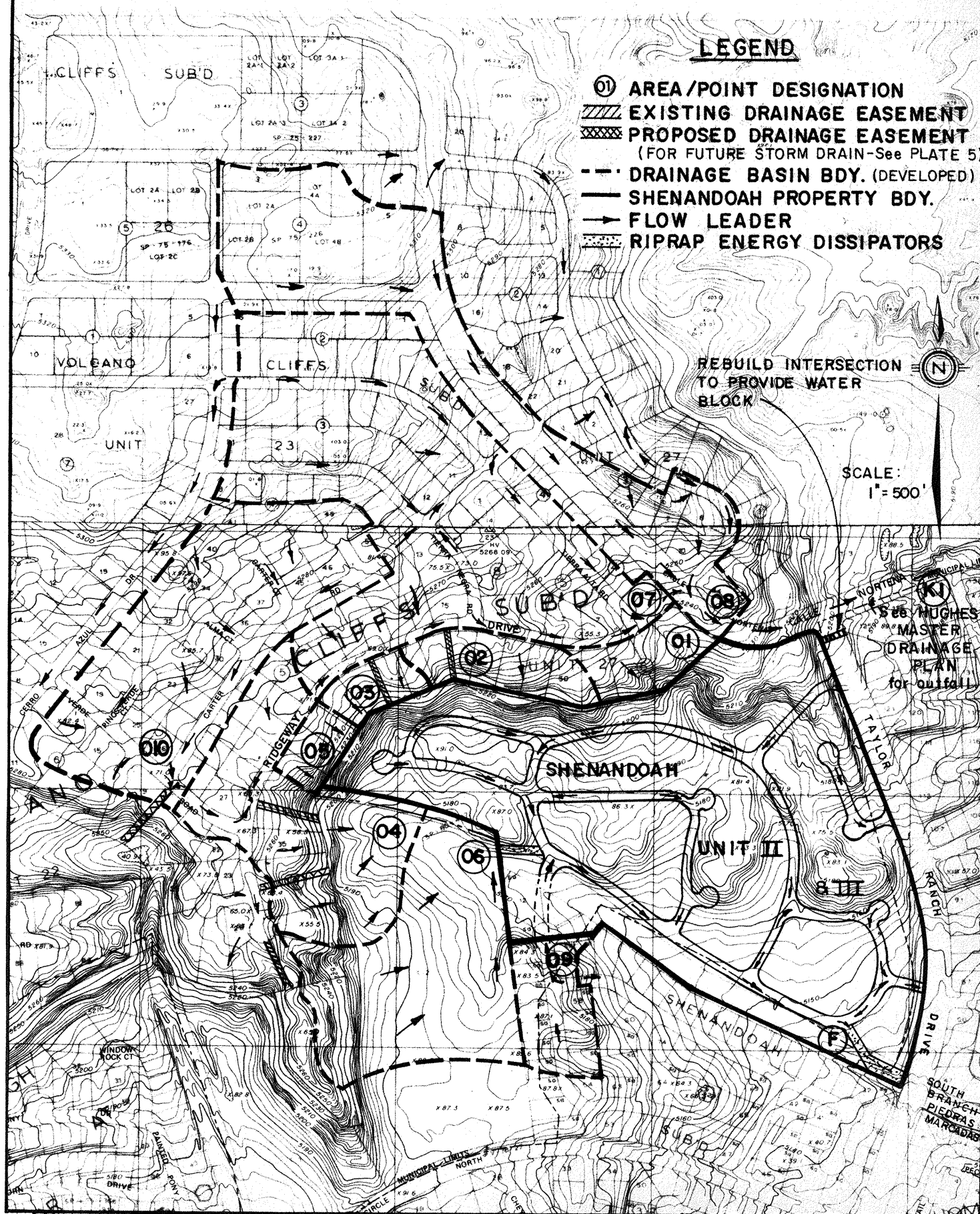
PLATE 2
OFFSITE BASINS, UNDEVELOPED CONDITIONS

LEGEND

- – – DRAINAGE BASIN BOUNDARY (UNDEVELOPED)
- ——— SHENANDOAH PROPERTY BOUNDARY
- → FLOW LEADER
- (03) AREA/POINT DESIGNATION

SCALE: 1" = 500

N

SHENANDOAH UNIT II & III

EXISTING 100' DRAINAGE (PROPOSED TO BE VACATED) R.O.W.

SOUTH BRANCH RIEDRAS MARCADAS
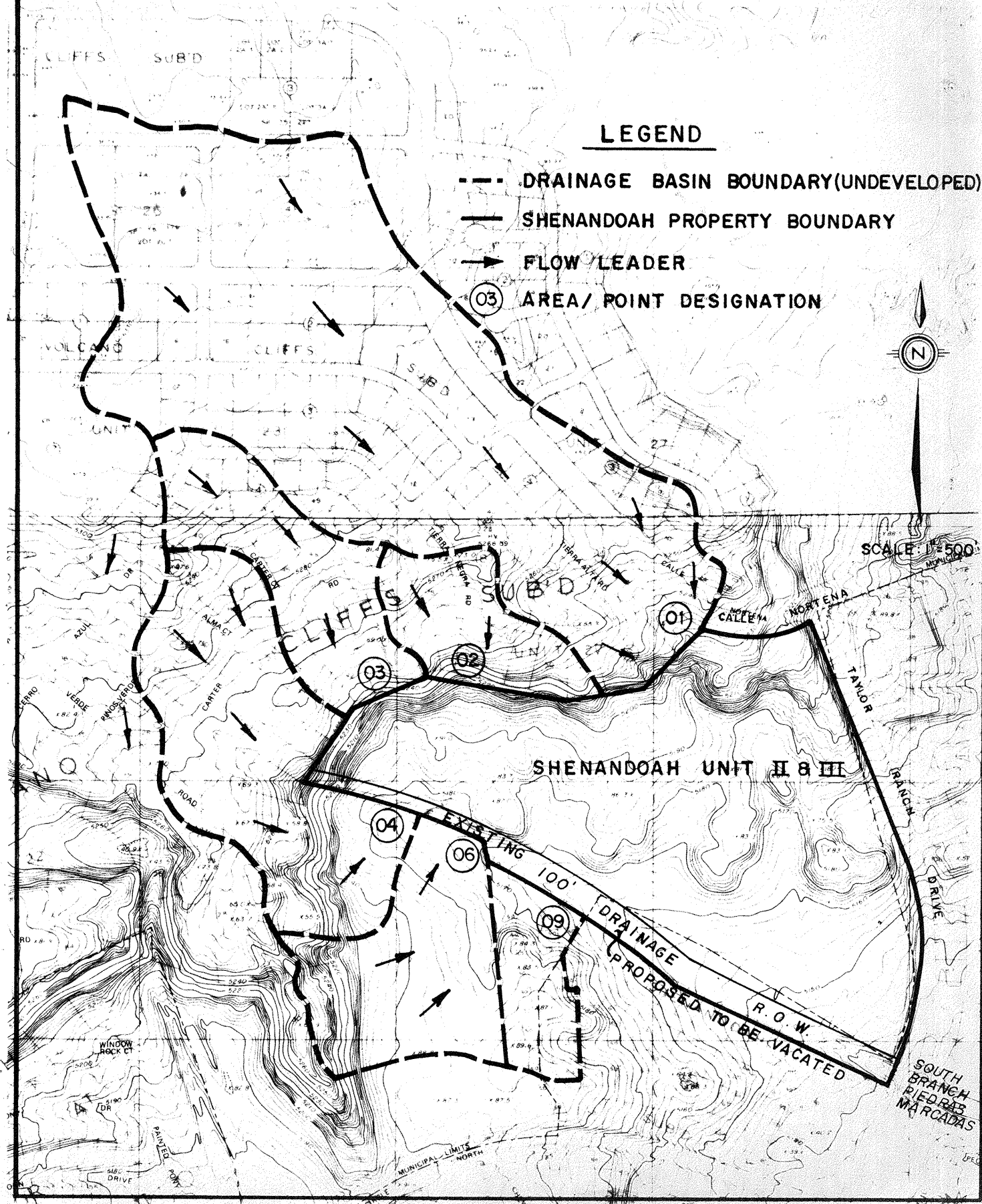
City of Albuquerque

P.O. BOX 1293   ALBUQUERQUE, NEW MEXICO 87103

November 10, 1993

Ellery A. Biathrow, Jr., P.E.
Sivage Thomas Homes, Inc.
5141 Masthead NE
Albuquerque, N.M. 87109

RE: GRADING PLAN FOR SHENANDOAH UNIT 3 LOTS 37-43 (D-11/D10A)
      RECEIVED OCTOBER 27, 1993 FOR PAVING PERMIT APPROVAL
      ENGINEER'S STAMP DATED 10-27-93

Dear Mr. Biathrow:

Based on the information included in the submittal referenced above, City Hydrology has determined that a Grading Permit is more appropriate for this project than a Paving Permit.

The following comments must be addressed prior to grading permit approval:

1. Provide additional spot elevations for each lot at the bottom of the depression, at the top of the depression, at the upstream and downstream invert of the swale on both sides of the building pad and the top of curb adjacent to each property corner. These elevations should be presented in a format compatible with the DPM checklist for Engineer's Certification.

2. Provide additional spot elevations for Lot 93 at the pad and along the common border with Lot 43.

If you have any questions about this project, you may contact me at 768-2727.

Sincerely,

John P. Curtin, P.E.
Civil Engineer/Hydrology

WPHYD/8095/JPC

PUBLIC WORKS DEPARTMENT

City of Albuquerque

November 16, 1993

Ellery A. Biathrow, Jr., P.E.
Sivage Thomas Homes, Inc.
5141 Masthead NE
Albuquerque, N.M. 87109

RE: GRADING PLAN FOR SHENANDOAH UNIT 3 LOTS 37-43 (D-11/D10A)
     RECEIVED NOVEMBER 16, 1993 FOR GRADING PERMIT APPROVAL
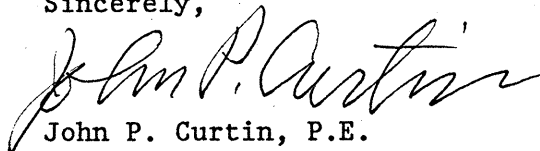   ENGINEER'S STAMP DATED 11-15-93

Dear Mr. Biathrow:

Based on the information included in the submittal referenced above, City
Hydrology APPROVES this project for Grading Permit.

The Contractor must obtain a "Topsoil Disturbance Permit" from the
Environmental Health Department prior to any grading.

Engineer's Certification of grading per DPM checklist is required for this
project.

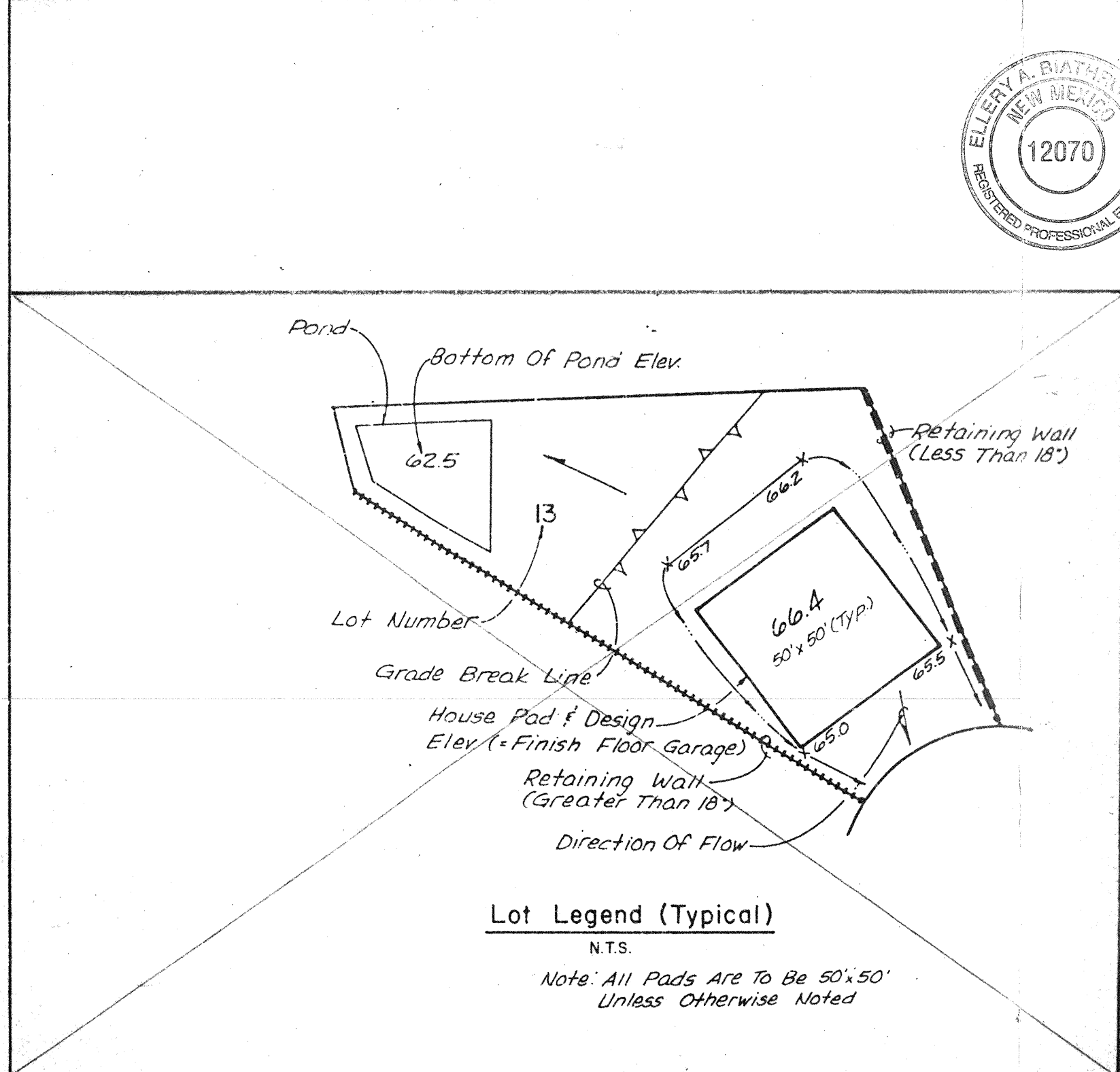If you have any questions about this project, you may contact me at 768-2727.
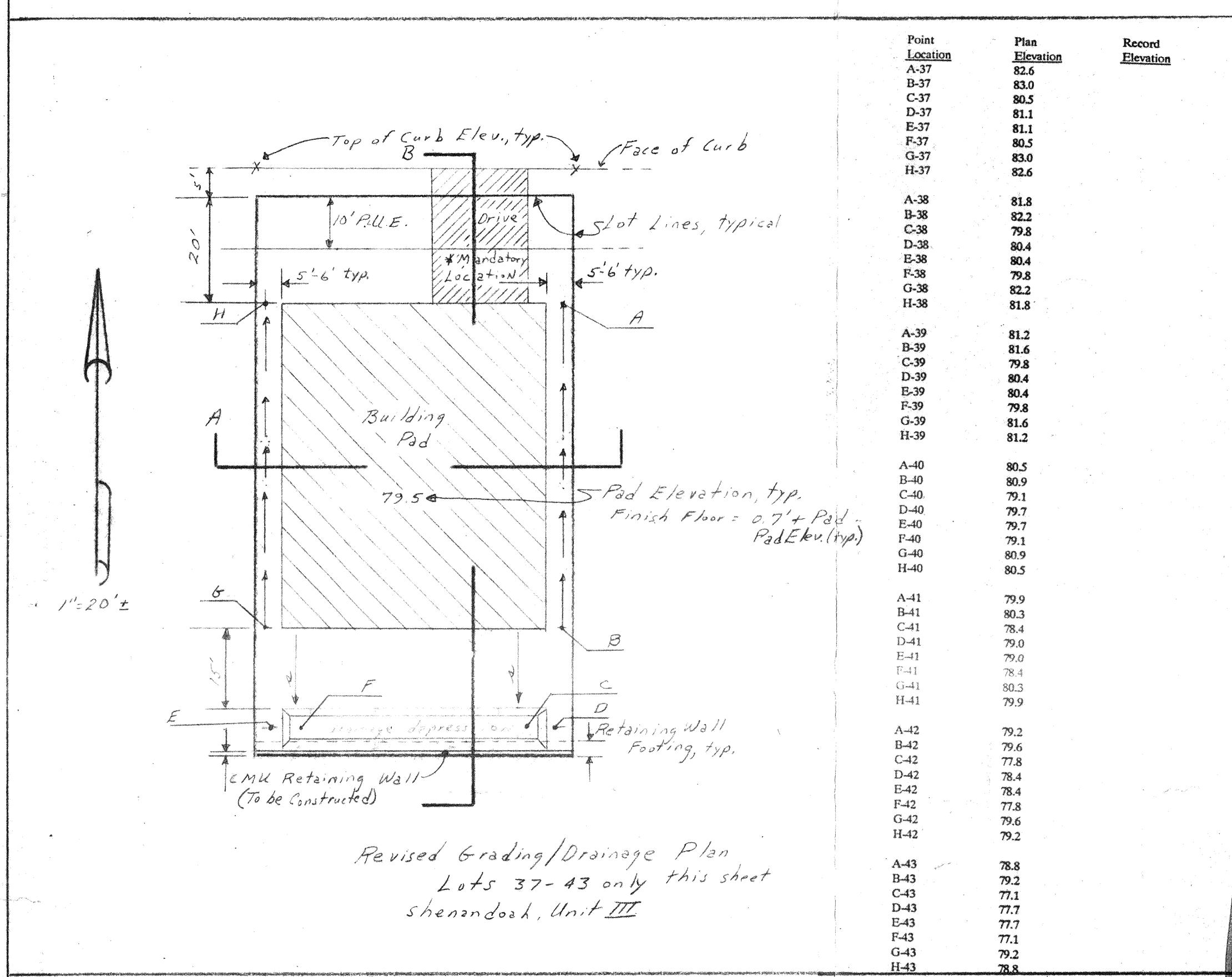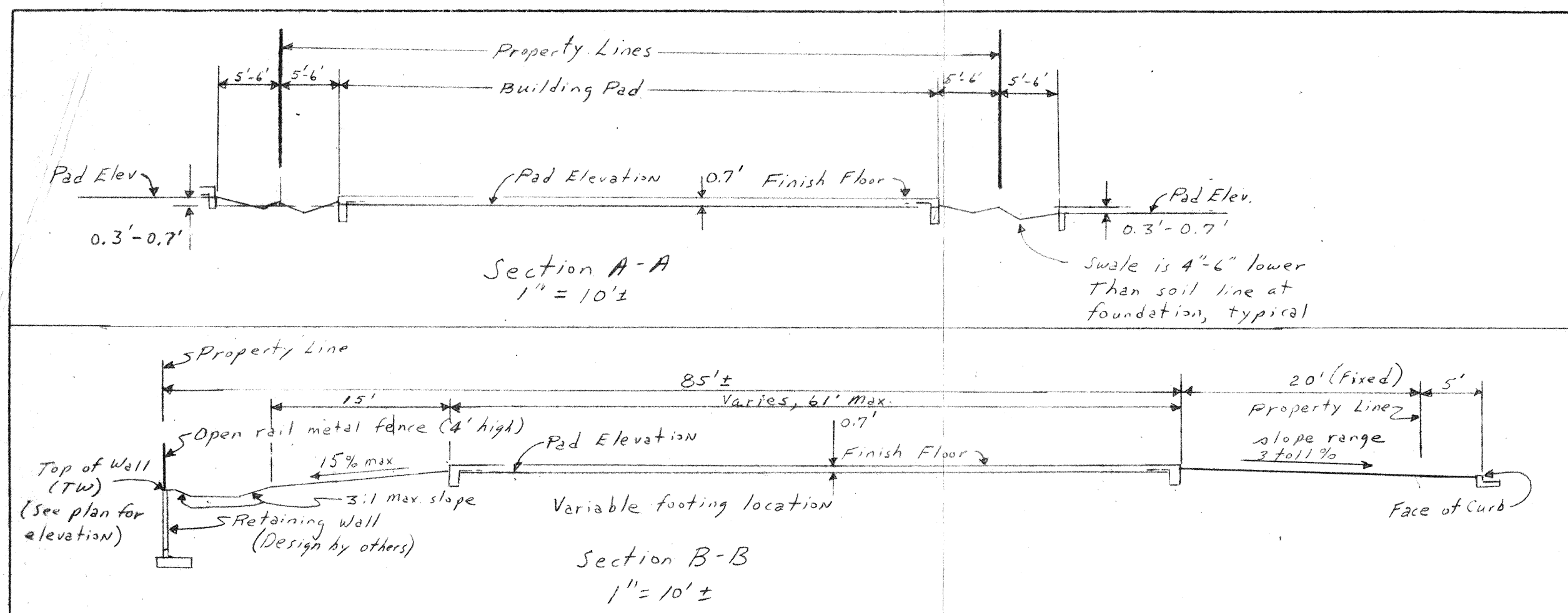
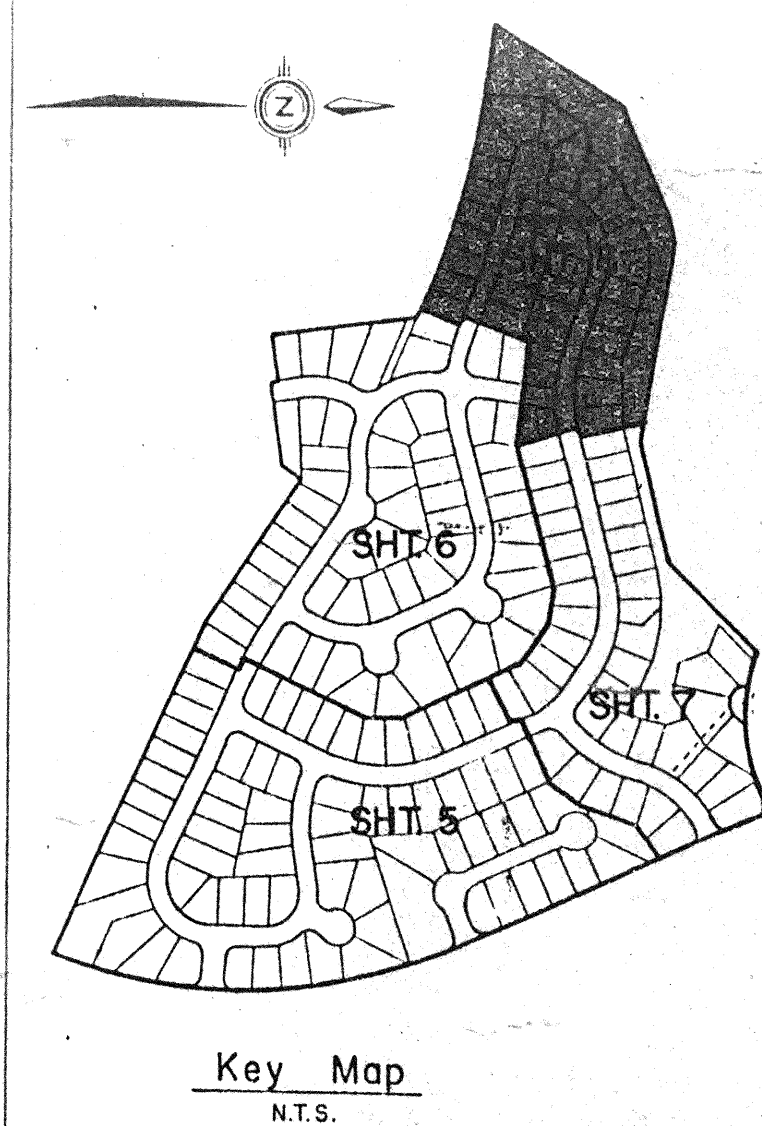Sincerely,

John P. Curtin, P.E.
Civil Engineer/Hydrology

xc: Alan Martinez

WPHYD/8095/JPC

Section A-A
1"=10'±

Property Lines
Building Pad
Pad Elevation   0.7' Finish Floor
Pad Elev.
Pad Elev.
0.3'-0.7'
0.3'-0.7'
Swale is 4"-6" lower Than soil line at foundation, typical

Section B-B
1"=10'±

Property Line
Top of Wall (TW) (See plan for elevation)
Open rail metal fence (4' high)
15% max slope
Retaining Wall (Design by others)
3:1 max slope
Pad Elevation
Finish Floor
Variable footing location
85'± Varies, 61' Max.
15'
0.7'
20' (Fixed)
5'
Property Line
slope range 3 to 11%
Face of Curb

Point Location	Plan Elevation	Record Elevation
A-37	82.6	
B-37	83.0	
C-37	80.5	
D-37	81.1	
E-37	81.1	
F-37	80.5	
G-37	83.0	
H-37	82.6	
A-38	81.8	
B-38	82.2	
C-38	80.4	
D-38	80.4	
E-38	80.4	
F-38	79.8	
G-38	83.2	
H-38	81.8	
A-39	81.2	
B-39	81.6	
C-39	79.8	
D-39	80.4	
E-39	80.4	
F-39	79.8	
G-39	81.6	
H-39	81.2	
A-40	80.5	
B-40	80.9	
C-40	79.1	
D-40	79.7	
E-40	79.7	
F-40	79.1	
G-40	80.9	
H-40	80.5	
A-41	79.9	
B-41	80.3	
C-41	78.4	
D-41	79.0	
E-41	79.0	
F-41	78.4	
G-41	80.3	
H-41	79.9	
A-42	79.2	
B-42	79.6	
C-42	77.8	
D-42	78.4	
E-42	78.4	
F-42	77.8	
G-42	79.6	
H-42	79.2	
A-43	78.8	
B-43	79.2	
C-43	77.1	
D-43	77.7	
E-43	77.7	
F-43	77.1	
G-43	79.2	
H-43	78.4	

Top of Curb Elev., typ.
Face of Curb
10' P.U.E.
Slot Lines, typical
"M" Mandatory Location
5'-6" typ.
5'-6" typ.
Building Pad
Pad Elevation, typ.
Finish Floor= 0.7'+Pad
79.5± Pad Elev.(typ)
CMU Retaining Wall (To be Constructed)
Retaining Wall Footing, typ.
1"=20'±

Revised Grading/Drainage Plan
Lots 37-43 only this sheet
Shenandoah, Unit III

Lot Legend (Typical)
N.T.S.

Pond
Bottom Of Pond Elev.
62.5
Retaining Wall (Less Than 18')
13
Lot Number
60.4
Grade Break Line
House Pad & Design Elev.(+Finish Floor&Garage)
60.4 (TYP.)
50'x50' (TYP.)
Retaining Wall (Greater Than 18')
Direction Of Flow

Note: All Pads are to Be 50'x50' Unless Otherwise Noted

Notes to the October, 1993 revision of grading/drainage plan for Lots 37 - 43, Unit III of Shenandoah Subdivision.

1. The December, 1985 Drainage Management Plan for Shenandoah, Units II and III, prepared by Community Sciences Corporation was the basis of the initial grading and drainage plan; said plan serving as the basis of this revised grading plan for Lots 37 - 43 of Unit III.

2. The existing curb and gutter construction depicted on the initial plan was installed as part of the original construction. The "as-built" conditions are reported as being identical to the plan design, this according to the construction record office for the City of Albuquerque.

3. Changes to the original grading plan consist of the following:

   a. The pad grade for Lots 37 - 43 have been lowered from 0.3 feet to 0.7 feet.
   b. A retaining wall is placed along the southerly property line for Lots 37 - 43, the wall height ranging from 2.8 feet at Lot 37 to 8.0 feet at Lot 43.
   c. The point of drainage flow change was relocated from the center of building pad to the rear of the building pad and a rear yard drainage depression was included, these items included as a result of a pre-design meeting with city hydrology staff.

4. The above changes were made for the following reasons:

   a. Compaction testing of the fill material placed as part of the original grading plan has an average relative compaction value in the low 80 percentile range, a value considered too low to adequately support residential structures.
   b. Reworking of soils to raise the compaction value will shrink the soil volume, therefore lowering the pad elevation will compensate for the shrinkage factor. In addition, furthering lowering of the pad will generate additional fill material to fill behind the retaining wall, the retaining wall providing both increased rear yard area and reducing the erosion potential of soils within each lot area.

5. The principal drainage features of the original grading plan have been maintained in the revised plan, unless otherwise noted above.

(R) = Record Value

Site
North
TAYLOR RANCH ROAD N.W.
RICHMOND HILL ROAD N.W.
CHESAPEAKE ROAD N.W.
ROANOKE AVENUE N.W.
TRACT B
TRACT C
TRACT T-2
See Sheet 6
See Sheet 7
Match Line

NOV 1 6 1993
HYDROLOGY DIVISION

Approved for Rough Grading (±1')
11-16-93
Hydrology Date

LEGAL DESCRIPTION
T11N
R2E
SEC 23
UNIFORM PROPERTY CODE
1-011-063

D-11-Z

Albuquerque Geographic Information System
City of Albuquerque
© Planning Department June 30, 1993
Scale: 1" = 750

Key Map
N.T.S.
SHT. 6
SHT. 7
SHT. 5

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION

TITLE: SHENANDOAH- UNIT 3
GRADING PLAN

SCALE: 1" = 50'

community sciences corporation
LAND PLANNING · ENGINEERING · SURVEYING
P.O. Box 1326 Corrales, N.M. 87048

DESIGNED BY: C.S.C.
DRAWN BY: C.S.S.
CHECKED BY:

APPROVALS	ENGINEER	DATE	APPROVALS	ENGINEER	DATE
City Engineer		10/9/86			
A.C.E.-Design		10/9/86	Traffic	N.A. DWH	10/3/86
A.C.E.-Hydrology		"	Water Utilities	N.A. WIW	10/3/86

DRAWING NO.	MAP NO.	SHEET
3027	D-11	8 OF 43

REVISIONS
DATE May, 1986
REMARKS
BY