

RE: M23-D018, LOPEZ/MONTOYA RESIDENCE
TO: CITY OF ALBUQUERQUE, HYDROLOGY
MR. GREG OLSEN, P.E.
FROM: WESTERN CIVIL
BROOKE M. GARCIA, P.E.
DATE: DECEMBER 16, 2013

Site Description:

The address of the site is 1509 Arenas Pl., Albuquerque, NM, located in the Four Hills subdivision located in southeast Albuquerque. See Figure 1.



Figure 1: Vicinity Map

The soil at the site is 100% Tesajo-Millett, a stony sandy loam. This soil is commonly found in alluvial fans, terraces, and floodplains. These soils are well drained. The hazard of water erosion is moderate with a low wind erosion potential. The soil map is included in Attachment A.

The site is in a Zone X according to the Federal Emergency Management Agency’s (FEMA) Flood Insurance Rate Map (FORM), included in Attachment B. Zone X (unshaded) designates areas of minimal flood hazard, which are the areas outside the significant flood hazard area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance flood.

Hydrology:

The site has been evaluated in three phases as a result of recent grading activities prior to the engineer’s involvement. The *historic condition*, which establishes the base runoff allowance for this site is based on the pre-graded condition. The topography for the historic condition is based on the Bernalillo County 2010 2-ft contours, as this is the most current (and only) information available. The *current condition* is based on survey data dated December 4, 2013. The survey represents the grading that was performed

recently in advance of a Grading Plan. *Proposed grading* represents the final proposed grading design. A Basin Map is included at Attachment C, which is included in addition to the Grading Plan to help identify the three sets of topographic data. Putting all three on one plan sheet proved too difficult to interpret.

The hydrology calculations for the historic and proposed conditions are included in Attachment D.

The final Grading Plan, incorporating comments received from the City of Albuquerque, is included in Attachment E.

Erosion protection measures have been designed in agreement with the National Pollution Discharge Elimination System Manual, August 2012.¹

The grading and erosion protection was established in accordance with the DPM² (Chapter 22, Section 5, 5A-B) guidelines which state that vegetation will be accepted if seeded per the COA Standard Specification for Public Works construction.

Response to City Comments (letter and mark-ups dated 11-19-2013):

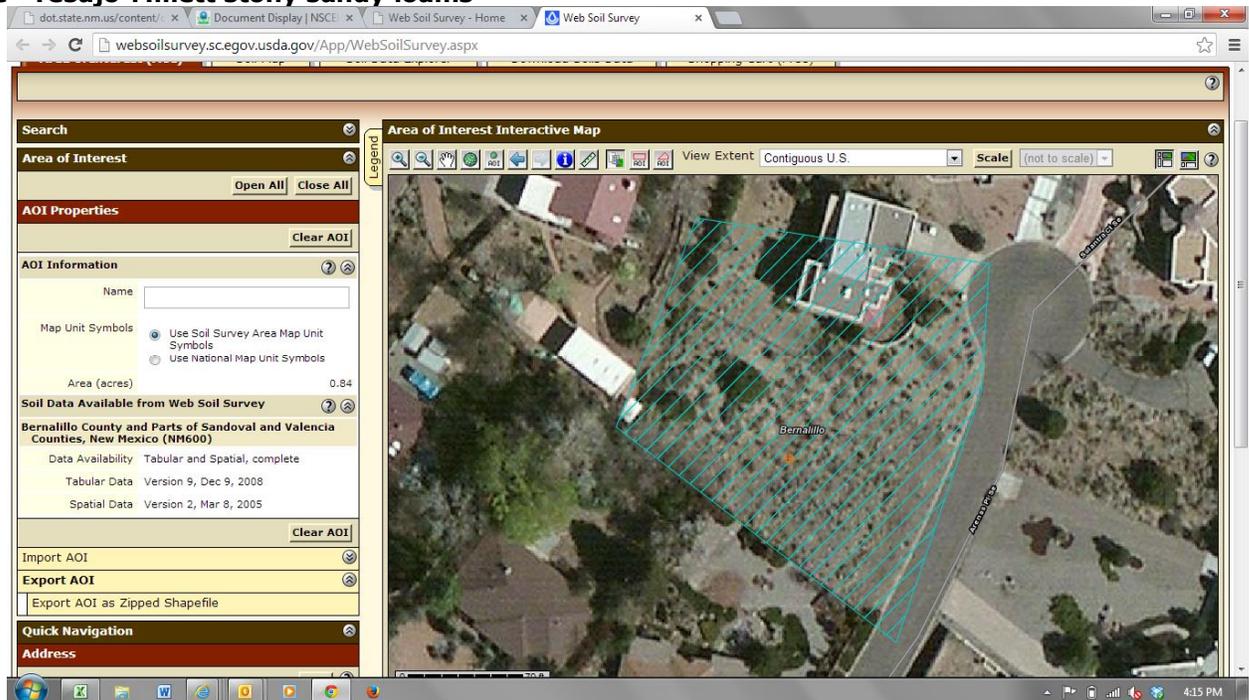
1. a-d. See Attachment F.; e. See page one of this memo for Vicinity Map. Flood Map included in Attachments.
2. Historic and Proposed drainage basins shown on attached basin map. Hydrology calcs attached. Pre- and post-design flows shown on Grading Plan.
3. 12" water block called out on Grading Plan.
4. Survey shows wall.
5. Spot elevations included as needed on Grading Plan.
6. Site slopes are limited to 3:1 everywhere. Erosion is designed in accordance with the DPM and City Specs. A wall has been included at the NE corner of the property to prevent installation of slopes steeper than recommended in the DPM.
7. Flow calculations included.
8. Easement drainage along southern border of the property limited to 18" rise along existing wall.

¹ <http://dot.state.nm.us/content/dam/nmdot/Infrastructure/NPDESM.pdf>

² City of Albuquerque, Development Process Manual (DPM), Volume II, Chapter 22.

Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico

Te—Tesajo-Millett stony sandy loams



Map Unit Setting

- *Elevation:* 5,300 to 7,000 feet
- *Mean annual precipitation:* 10 to 14 inches
- *Mean annual air temperature:* 53 to 55 degrees F
- *Frost-free period:* 130 to 155 days

Map Unit Composition

- *Millett and similar soils:* 40 percent
- *Tesajo and similar soils:* 40 percent

Description of Tesajo

Setting

- *Landform:* Alluvial fans, terraces, flood plains
- *Landform position (three-dimensional):* Tread, rise, talf
- *Down-slope shape:* Linear, concave
- *Across-slope shape:* Linear
- *Parent material:* Alluvium derived from igneous and sedimentary rock

Properties and qualities

- *Slope:* 3 to 20 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* Rare
- *Frequency of ponding:* None

- *Calcium carbonate, maximum content:* 5 percent
- *Maximum salinity:* Nonsaline (0.0 to 2.0 mmhos/cm)
- *Sodium adsorption ratio, maximum:* 2.0
- *Available water capacity:* Low (about 3.6 inches)

Interpretive groups

- *Farmland classification:* Not prime farmland
- *Land capability (nonirrigated):* 6s
- *Hydrologic Soil Group:* B
- *Ecological site:* Gravelly (R035XG114NM)

Typical profile

- *0 to 9 inches:* Very stony sandy loam
- *9 to 60 inches:* Very gravelly loam

Description of Millett

Setting

- *Landform:* Fan terraces, stream terraces
- *Landform position (three-dimensional):* Riser, tread
- *Down-slope shape:* Concave
- *Across-slope shape:* Linear
- *Parent material:* Alluvium derived from igneous and sedimentary rock

Properties and qualities

- *Slope:* 3 to 15 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.60 to 2.00 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 35 percent
- *Gypsum, maximum content:* 5 percent
- *Maximum salinity:* Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
- *Sodium adsorption ratio, maximum:* 4.0
- *Available water capacity:* Low (about 5.5 inches)

Interpretive groups

- *Farmland classification:* Not prime farmland
- *Land capability (nonirrigated):* 6s
- *Hydrologic Soil Group:* B
- *Ecological site:* Gravelly (R035XG114NM)

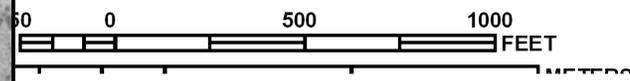
Typical profile

- *0 to 4 inches:* Very stony sandy loam
- *4 to 10 inches:* Gravelly sandy clay loam
- *10 to 60 inches:* Very gravelly sandy clay loam

Attachment B: FEMA Flood Zone Data



MAP SCALE 1" = 500'



N F I P
 NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0386G

FIRM
 FLOOD INSURANCE RATE MAP
 BERNALILLO COUNTY,
 NEW MEXICO
 AND INCORPORATED AREAS

PANEL 386 OF 825

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ALBUQUERQUE, CITY OF	350002	0386	G
BERNALILLO COUNTY UNINCORPORATED AREAS	350001	0386	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.



MAP NUMBER
 35001C0386G

MAP REVISED
 SEPTEMBER 26, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Attachment C: Basin Map

Western Civil PN: 2013.02
Engineer: Brooke Marshall Garcia, NMPE# 17621
Date: 16-Dec-13
Project Name: G&D Plan Lopez/Montoya Residence
Location: 1509 Arenas Pl SE, Albuquerque, NM 87123
Lat: 35° 2'50.97"N
Long: 106°29'0.39"W
FEMA Flood Zone: Zone X
Abq Zone: 3
Design Storm: 100-yr, 6-hr

Acreage

	Total Size (acre)	Land Treatment A		Land Treatment B		Land Treatment C		Land Treatment D	
		Historic	Proposed	Historic	Proposed	Historic	Proposed	Historic	Proposed
Basin A	0.38	0.38	0.00	0.00	0.24	0.00	0.06	0.00	0.08
Basin B	0.04	0.04	0.00	0.00	0.04	0.00	0.00	0.00	0.00
Basin C	0.06	0.06	0.00	0.00	0.06	0.00	0.00	0.00	0.00
Total	0.49	0.49	0.00	0.00	0.35	0.00	0.06	0.00	0.08

Volumetric Runoff (E * A) ft³

	Design V (P- H*, ft ³)	Land Treatment A (E = 0.66 in.)		Land Treatment B (E = 0.92 in.)		Land Treatment C (E = 1.29 in.)		Land Treatment D (E = 2.36 in.)	
		Historic (ft ³)	Proposed (ft ³)						
Basin A (main pond)	870	910	0	0	798	0	269	0	713
Basin B (easement)	42	107	0	0	150	0	0	0	0
Basin C	61	154	0	0	215	0	0	0	0
Subtotals		1171	0	0	1163	0	269	0	713

Total Design V, ft³ **973**

* P=Proposed, H = Historic

Pond Size Estimates

Basin A Pond:

A_top	567 ft ²			
A_bottom	60 ft ²			
A_ave	314 ft ²			
Depth	3 ft			
Volume	941 ft ³	>	870 ft ³	OK

Basin B Pond:

A_west (vertically)	14 ft ²			
A_east	0 ft ²			
A_ave	7 ft ²			
Length	9 ft			
Volume	64 ft ³	>	42 ft ³	OK

Total detention area **1005 ft³** > **973 ft³** **OK***

* Flow discharging from Basin C will not be captured, but the overall storage of the site compensates. The design detention volume (proposed - historic condition) is achieved.

		Peak Discharge, Qp (cfs)							
		Land Treatment A (q = 1.87 cfs/acre)		Land Treatment B (q = 2.60 cfs/acre)		Land Treatment C (q = 3.45 cfs/acre)		Land Treatment D (q = 5.02 cfs/acre)	
		Historic		Proposed		Historic		Proposed	
	Max Qp (P-E, cfs)	Historic	Proposed	Historic	Proposed	Historic	Proposed	Historic	Proposed
Basin A	0.71	0.71	0.00	0.00	0.62	0.00	0.20	0.00	0.42
Basin B	0.08	0.08	0.00	0.00	0.12	0.00	0.00	0.00	0.00
Basin C	0.12	0.12	0.00	0.00	0.17	0.00	0.00	0.00	0.00
<i>Subtotals</i>		0.91	0.00	0.00	0.91	0.00	0.20	0.00	0.42

Allowable Discharge, Qp (cfs) **0.91**

Basin C will discharge the Proposed peak flow. Basins A and B are detained from discharge in excess of allowable rates. The sum of the peak discharge for the site is less than the maximum discharge rate, therefore complies with COA DPM requirements.

Weir Calculation for Pond Discharge, Q_{weir}

The downstream side of the pond acts as a broad crested weir after it is full. It's volume exceeds the capture requirement for the basin. The spillway was designed given the potential for volumetric exceedence. The discharge rate is estimated according to a 1.5" max depth of flow , beyond which the entire pond would be under water.

$$Q_{\text{weir}} = 2/3 c_d b(2g)^{1/2} h^{3/2}$$

c_d = discharge constant for the weir, average 0.62 for rectangular

b = weir width

h = head on weir

$$\text{Max } Q_{\text{weir}} = \quad \mathbf{0.84} \quad \text{cfs}$$

$$\text{Vmax} = \quad \mathbf{0.34} \quad \text{f/s}$$

Pond Rundown Revetment Design

The Federal Highway Administration's program, HEC 11, was consulted to ensure adequate revetment size for the rundowns into the pond in Basin B. The average depth (less than 0.5 in) combined with the relatively slow average velocity (0.124 ft/s), resulted in a revetment D50 less than 3 in.

