CITY OF ALBUQUERQUE

Planning Department Alan Varela, Interim Director



Mayor Timothy M. Keller

January 28, 2022

Dan Skeehan, P.E. Kimley-Horn and Associates, Inc. 4582 S Ulster St, Suite 1500 Denver, CO 80237

RE: RV Storage Volcano Rd. NW Grading & Drainage Plans and Drainage Report Engineer's Stamp Date: 01/27/22 Hydrology File: K09D046

Dear Mr. Skeehan:

PO Box 1293 Based upon the information provided in your submittal received 12/17/2021, the Grading & Drainage Plans and Drainage Report are approved for Building Permit, Grading Permit, and Work Order. Please attach a copy of this approved plan in the construction sets for Building Permit processing along with a copy of this letter.

Albuquerque

PRIOR TO CERTIFICATE OF OCCUPANCY:

 NM 87103
 Engineer's Certification, per the DPM Part 6-14 (F): Engineer's Certification Checklist For Non-Subdivision is required.

www.cabq.gov

2. Please provide the Drainage Covenant with Exhibit A for the detention pond per Article 6-15(C) of the DPM prior to Permanent Release of Occupancy. Please submit the original copies along with the \$25.00 recording fee check made payable to Bernalillo County to Marion G. Velasquez (mgvelasquez@cabq.gov) on the 4th floor of Plaza de Sol. Please note that Hydrology will need a pdf copy of the recorded Drainage Covenant prior to Hydrology's approval of Permanent Release of Occupancy.

As a reminder, if the project total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Doug Hughes, PE, <u>jhughes@cabq.gov</u>, 924-3420) 14 days prior to any earth disturbance.

CITY OF ALBUQUERQUE

Planning Department Alan Varela, Interim Director



Mayor Timothy M. Keller

If you have any questions, please contact me at 924-3995 or <u>rbrissette@cabq.gov</u>.

Sincerely,

Renée C. Brissette

Renée C. Brissette, P.E. CFM Senior Engineer, Hydrology Planning Department

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

Final Drainage Report

RV Storage City of Albuquerque, New Mexico

Prepared for: Ben Lokhorst Macritchie, Inc. 715 5th Ave, Suite 1700 Calgary AB T2P 2X6, Canada

Prepared by: Kimley-Horn and Associates, Inc. 4582 S Ulster St, Suite 1500 Denver, CO 80237 (303) 228-2300 Contact: Dan Skeehan, P.E.

Project #: 096648005 Prepared: December 14, 2021	City of Albuquerque Planning Department Development Review Services HYDROLOGY SECTION APPROVED DATE: 01/28/22 BY:	
Kimley » H	THE CTTY OF ALBUQUERQUE FROM REQUIRING 'S CORRECTION, OR ERROR, OR DIMENSIONS IN PLANS, SPECIFICATIONS, OR CONSTRUCTIONS, SUCH APPROVED PLANS SHALL NOT BE CHANGED, MODIFIED OR ALTERED WITHOUT AUTHORIZATION.	

CERTIFICATION

DESIGN ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of this report.



SIGNATURE (Affix Seal):

State of New Mexico P.E. No. 21773

<u>1/27/2022</u> Date

OWNER/DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all of the requirements specified in this Drainage Report and Plan.

Name of Developer

Authorized Signature

Date

Printed Name

Title

Address:

TABLE OF CONTENTS

DESIGN ENGINEER'S STATEMENT 2 OWNER/DEVELOPER'S STATEMENT 2 TABLE OF CONTENTS 3 EXECUTIVE SUMMARY 4 INTRODUCTION 4 PURPOSE AND SCOPE OF STUDY 4 PROJECT REQUIREMENTS 4 PROJECT DESCRIPTION 4 LOCATION 4 LOCATION 4 LOCATION 4 DESIGN EHISTORY 6 DARAINAGE HISTORY 6 DRAINAGE HISTORY AND RELATED DOCUMENTS 6 EXISTING CONDITIONS 7 SITE INVESTIGATION 7 Porm of Analysis 7 DOWNStream Capacity 7 DOWNStream Capacity 7 DONSITE 9 CALCULATIONS 9 CONCLUSION 10 REFERENCES 10 APPENDIX A: FIGURES 12 APPENDIX A: FIGURES 12 APPENDIX A: FIGURES 12 APPENDIX D: REFERENCES 14 APPENDIX D: REFERENCES 16 APPENDIX D: REFERENCES 16 <t< th=""><th>CERTIFICATION</th><th>2</th></t<>	CERTIFICATION	2
OWNER/DEVELOPER S STATEMENT 2 TABLE OF CONTENTS 3 EXECUTIVE SUMMARY 4 INTRODUCTION 4 PURPOSE AND SCOPE OF STUDY 4 PROJECT REQUIREMENTS 4 PROJECT DESCRIPTION 4 LOCATION 4 LEGAL DESCRIPTION 4 LOCATION 4 LEGAL DESCRIPTION 5 BACKGROUND DOCUMENTS 6 PLANNING HISTORY 6 DRAINAGE HISTORY AND RELATED DOCUMENTS 6 EXISTING CONDITIONS 7 SITE INVESTIGATION 7 Form of Analysis 7 Downstream Capacity 7 DEVELOPED CONDITIONS 8 ONSITE 9 CONCLUSION 10 REFERENCES 10 APPENDIX A: FIGURES 12 APPENDIX A: FIGURES 12 APPENDIX C: HYDRAULCS 14	DESIGN ENGINEER'S STATEMENT	2
TABLE OF CONTENTS 3 EXECUTIVE SUMMARY 4 INTRODUCTION 4 PURPOSE AND SCOPE OF STUDY 4 PROJECT REQUIREMENTS 4 PROJECT DESCRIPTION 4 LOCATION 4 LEGAL DESCRIPTION 4 LEGAL DESCRIPTION 5 BACKGROUND DOCUMENTS 6 PLANNING HISTORY 6 DRAINAGE HISTORY AND RELATED DOCUMENTS 6 EXISTING CONDITIONS 7 SITE INVESTIGATION 7 Form of Analysis 7 DOWNStream Capacity 7 DEVELOPED CONDITIONS 8 ONSITE 9 CONCLUSION 10 REFERENCES 10 APPENDIX A: FIGURES 12 APPENDIX A: FIGURES 12 APPENDIX C: HYDRAULCS 14 APPENDIX D: REFERENCES 16 APPENDIX D: REFERENCES <	OWNER/DEVELOPER'S STATEMENT	2
EXECUTIVE SUMMARY 4 INTRODUCTION 4 PURPOSE AND SCOPE OF STUDY 4 PROJECT REQUIREMENTS. 4 PROJECT DESCRIPTION 4 LOCATION 5 BACKGROUND DOCUMENTS 6 PLANNING HISTORY 6 DRAINAGE HISTORY AND RELATED DOCUMENTS 6 EXISTING CONDITIONS 7 SITE INVESTIGATION 7 Form of Analysis 7 Downstream Capacity 7 DEVELOPED CONDITIONS 8 ONSITE 9 CALCULATIONS 9 CONCLUSION 10 REFERENCES 10 APPENDIX 11 APPENDIX A: FIGURES 12 APPENDIX C: HYDRAULICS 13 APPENDIX C: HYDRAULICS 14 APPENDIX C: HYDRAULICS 14 APPENDIX C: HYDRAULICS 14 </th <th>TABLE OF CONTENTS</th> <th>3</th>	TABLE OF CONTENTS	3
INTRODUCTION	EXECUTIVE SUMMARY	4
PURPOSE AND SCOPE OF STUDY 4 PROJECT REQUIREMENTS 4 PROJECT DESCRIPTION 4 LOCATION 4 LEGAL DESCRIPTION 5 BACKGROUND DOCUMENTS 6 PLANNING HISTORY 6 DRAINAGE HISTORY AND RELATED DOCUMENTS 6 EXISTING CONDITIONS 7 SITE INVESTIGATION 7 Form of Analysis 7 Downstream Capacity 7 DEVELOPED CONDITIONS 8 ONSITE 9 CONCLUSION 10 REFERENCES 10 APPENDIX 11 APPENDIX A: FIGURES 12 APPENDIX C: HYDRAULICS 14 APPENDIX F: GRADIN SEDIMENT CONTROL PLAN 15	INTRODUCTION	4
PROJECT DESCRIPTION 4 LOCATION 4 LEGAL DESCRIPTION 5 BACKGROUND DOCUMENTS 6 PLANNING HISTORY 6 DRAINAGE HISTORY AND RELATED DOCUMENTS 6 EXISTING CONDITIONS 7 SITE INVESTIGATION 7 Form of Analysis 7 Downstream Capacity 7 DEVELOPED CONDITIONS 8 OFFSITE 9 CALCULATIONS 9 CONCLUSION 10 REFERENCES 10 APPENDIX 11 APPENDIX A: FIGURES 12 APPENDIX C: HYDRAULICS 14 APPENDIX D: REFERENCES 16 APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN 14 APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN 15	PURPOSE AND SCOPE OF STUDY PROJECT REQUIREMENTS	4 4
LOCATION	PROJECT DESCRIPTION	4
BACKGROUND DOCUMENTS	LOCATION LEGAL DESCRIPTION	4 5
PLANNING HISTORY	BACKGROUND DOCUMENTS	6
EXISTING CONDITIONS 7 SITE INVESTIGATION 7 Form of Analysis 7 Downstream Capacity 7 DEVELOPED CONDITIONS 8 ONSITE 8 OFFSITE 9 CALCULATIONS 9 CONCLUSION 10 REFERENCES 10 APPENDIX 11 APPENDIX A: FIGURES 12 APPENDIX B: HYDROLOGY 13 APPENDIX C: HYDRAULICS 14 APPENDIX D: REFERENCES 16 APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN. 14	PLANNING HISTORY DRAINAGE HISTORY AND RELATED DOCUMENTS	6 6
SITE INVESTIGATION 7 Form of Analysis 7 Downstream Capacity 7 DEVELOPED CONDITIONS 8 ONSITE 8 OFFSITE 9 CALCULATIONS 9 CONCLUSION 10 REFERENCES 10 APPENDIX 11 APPENDIX A: FIGURES 12 APPENDIX B: HYDROLOGY 13 APPENDIX C: HYDRAULICS 14 APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN. 14 APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN. 15	EXISTING CONDITIONS	7
DEVELOPED CONDITIONS8ONSITE9OFFSITE9CALCULATIONS9CONCLUSION10REFERENCES10APPENDIX11APPENDIX A: FIGURES12APPENDIX B: HYDROLOGY13APPENDIX C: HYDRAULICS14APPENDIX D: REFERENCES16APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN14APPENDIX F: GRADING AND DRAINAGE PLAN15	SITE INVESTIGATION Form of Analysis Downstream Capacity	7 7 7
ONSITE8OFFSITE9CALCULATIONS9CONCLUSION10REFERENCES10APPENDIX11APPENDIX A: FIGURES12APPENDIX B: HYDROLOGY13APPENDIX C: HYDRAULICS14APPENDIX D: REFERENCES16APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN14APPENDIX F: GRADING AND DRAINAGE PLAN15	DEVELOPED CONDITIONS	8
CALCULATIONS9CONCLUSION10REFERENCES10APPENDIX11APPENDIX A: FIGURES12APPENDIX B: HYDROLOGY13APPENDIX C: HYDRAULICS14APPENDIX D: REFERENCES16APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN14APPENDIX F: GRADING AND DRAINAGE PLAN15	ONSITE OFFSITE	8 9
CONCLUSION10REFERENCES10APPENDIX11APPENDIX A: FIGURES12APPENDIX B: HYDROLOGY13APPENDIX C: HYDRAULICS14APPENDIX D: REFERENCES16APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN14APPENDIX F: GRADING AND DRAINAGE PLAN15	CALCULATIONS	9
REFERENCES10APPENDIX11APPENDIX A: FIGURES12APPENDIX B: HYDROLOGY13APPENDIX C: HYDRAULICS14APPENDIX D: REFERENCES16APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN14APPENDIX F: GRADING AND DRAINAGE PLAN15	CONCLUSION	10
APPENDIX11APPENDIX A: FIGURES12APPENDIX B: HYDROLOGY13APPENDIX C: HYDRAULICS14APPENDIX D: REFERENCES16APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN14APPENDIX F: GRADING AND DRAINAGE PLAN15	REFERENCES	10
APPENDIX A: FIGURES12APPENDIX B: HYDROLOGY13APPENDIX C: HYDRAULICS14APPENDIX D: REFERENCES16APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN14APPENDIX F: GRADING AND DRAINAGE PLAN15	APPENDIX	11
APPENDIX B: HYDROLOGY 13 APPENDIX C: HYDRAULICS 14 APPENDIX D: REFERENCES 16 APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN 14 APPENDIX F: GRADING AND DRAINAGE PLAN 15	APPENDIX A: FIGURES	12
APPENDIX C: HYDRAULICS 14 APPENDIX D: REFERENCES 16 APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN 14 APPENDIX F: GRADING AND DRAINAGE PLAN 15	APPENDIX B: HYDROLOGY	13
APPENDIX D: REFERENCES	APPENDIX C: HYDRAULICS	14
APPENDIX E: EROSION AND SEDIMENT CONTROL PLAN		
	APPENDIX E: ERUSION AND SEDIMENT CONTROL PLAN APPENDIX F: GRADING AND DRAINAGE PLAN	14

EXECUTIVE SUMMARY

The project is located on the northwestern corner of Volcano Rd and Central Ave within the City of Albuquerque. The RV parking facility will consist of canopied spots and associated facilities to operate the RV parking facility. Only canopied RV storage will be provided for the development. Stormwater runoff from the project will be retained on-site for water quality and to reduce the allowed site runoff. The site has no major offsite flows being conveyed to the project site per the AMAFCA Amole-Hubbell Drainage Master Plan Update Final Report completed by Wilson & Company Engineers & Architects, dated May 2013 (AMAFCA). Onsite flow will be directed to the proposed onsite private retention pond. The pond has been designed to infiltrate the storm water quality volume required per the City of Albuquerque Development Process Manual, dated September 2020 (DPM) and infiltrate the excess volume being capture in the pond to meet the allowable site peak discharge per the DPM. The site will outfall into Volcano Road as the site has done historically.

In conjunction with this submittal, approval is also being requested for the Site Development Plan for Building Permit, Grading Permit, and Building Permit.

INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to provide the hydrologic and hydraulic calculations and to document and finalize the drainage design methodology in support of the proposed RV Storage ("the Site"); for Macritchie, Inc. The Site is located within the jurisdictional limits of City of Albuquerque ("the City"). Thus, the guidelines for the hydrologic and hydraulic design components were based on the criteria for the City of Albuquerque, described below.

PROJECT REQUIREMENTS

Offsite roadway improvements on the frontage road of the property are required and will be included as part of this development. The required infrastructure improvements to the existing Volcano Road include demolition of existing asphalt pavement, construction of new curb, gutter, pavement, and sidewalk towards the construction of a cul-de-sac to end Volcano Road prior to its existing intersection to Central Road. Additionally, upsize of the existing water main and extension of the existing sewer is required. The approved infrastructure list is located in **Appendix D.**

PROJECT DESCRIPTION

LOCATION

The Site is located within Section 21, Township 10 North, Range 2 East of the New Mexico Principle Meridian, County of Bernalillo, State of New Mexico. More specifically, this site is located north of Volcano Rd and south of Avalon Rd, City Zone Atlas page K9. A vicinity map of the site is shown below.



LEGAL DESCRIPTION

Current legal description: *Parcel 1:*

A certain tract of land situated within the Town of Atrisco Grant, Projected Section 21, Township 10 North, Range 2 East of the N.M.P.M., City of Albuquerque, Bernalillo County, New Mexico as the same is shown and designated on the quitclaim deed filed in the Office of the County Clerk of Bernalillo County, New Mexico on September 28, 1994, in Book 94-27, page 6350, said tract being more particularly described by metes and bounds as follows:

Beginning as the southwest corner of said tract, being a set 5/8 rebar with plastic cap stamped Is 8911, also being a point on the northerly right of way line of Volcano Road northwest being the true place of point and beginning, whence for a tie to the ACS Control Station S 64° 57' 12" W, a distance of 1244.30 feet;

Thence, N 15° 19' 45" W, a distance of 1009.53 feet to the northwest corner of said tract, also being a point on the southerly boundary of Sundance Subdivision Unit 2, being a set 5/8" rebar with plastic cap stamped "8911";

Thence, S 83° 32' 41" E, a distance of 228.21 feet along southerly boundary of the Sundance Subdivision Unit 2 to the northeast corner of said tract, being a 5/8" rebar with plastic cap stamped "8911";

Thence, N 14° 53' 31" W, a distance of 1017.19 feet distance to the southeast corner of said tract also being a point on the northerly right of way line of Volcano Road northwest, being a set 5/8" rebar with plastic cap stamped "8911";

Thence; N 68° 43' 02" W, a distance of 97.76 feet distance along said right of way set 5/8" rebar with plastic cap stamped "8911";



Thence, S 89° 48' 54" W, a distance of 130.19 feet distance along said right of way to a set 5/8" rebar with plastic cap stamped "8911"; being the southwest corner of said tract and being the true point of beginning.

Parcel 2:

A certain tract of land situated within the Town of Atrisco Grant, Projected Section 21, Township 10 North, Range 2 East, of the N.M.P.M., City of Albuquerque Bernalillo County, New Mexico as the same is shown and designated on the quitclaim deed filed in the office of the County Clerk of Bernalillo County, New Mexico on September 28, 1994, in Book 94-27, page 6350, said tract being more particularly described by metes and bounds as follows:

Beginning at the southeast corner of said tract, being a set 5/8" rebar with plastic cap stamped "8911" and being a point on the northerly right of way line of Volcano Road northwest, being the true place and point of beginning, whence for a tie to the ACS Control Station "7-k9", bears S 64° 57' 12" W, a distance of 1244.30 feet distance;

Thence, N 89° 48' 54" W, a distance of 211.54 feet along said right of way to the southwest corner of said tract being a found 5/8" rebar set on concrete "disturbed",

Thence, N 15° 19' 45" W, a distance of 1035.88 feet to the northwest corner of said tract, also being point on the southerly boundary of Sundance Subdivision, Unit 2, found an aluminum cap,

Thence, S 83° 32' 41" E, a distance of 219.89 feet along said right subdivision to the northeast corner of said tract, being a set 5/8" rebar with plastic cap stamped "8911";

Thence, S 15° 19' 45" E, a distance of 1009.53 feet distance to a set 5/8" rebar with plastic cap stamped "8911", being the southeast corner of said tract and the northerly right of way line of Volcano Road northwest, being the true place and point of beginning.

FLOOD HAZARD ZONE

The site is within Zone X as identified in FEMA FIRMETTE 35001C0328J, effective 11/4/2016. No flood hazards are identified near or within proximity of the site.

BACKGROUND DOCUMENTS

PLANNING HISTORY

The Site is current an existing vacant undeveloped property and is currently zoned as NR-BP. The Site is identified within the AMAFCA with a future land use of Light Industrial. This aligns with what is being proposed for the Site – commercial RV Storage. Please refer to **Appendix D** for excerpts from the AMAFCA.

DRAINAGE HISTORY AND RELATED DOCUMENTS

The following AMAFCA Final Report dated May 2013 was used to determine the allowable developed discharge for the Site. Per the AMAFCA the Site is located within the Tierra Bayita Basin and sub-basin TB210. Per the AMAFCA report the proposed developed flow determined for sub-basin TB210 was determined to have an overall area of 47 acres and a peak runoff of 175.08 cfs for the 100-yr, 6-hr storm, which equates to a runoff of 3.73 cfs/acre. There are no known recommendations or requirements mentioned for the Site beyond the proposed peak flow determine for the sub-basin TB210. Refer to **Appendix D** for the excerpts from the AMAFCA Final Report.



EXISTING CONDITIONS

SITE INVESTIGATION AND EVALUATION

The site is vacant and undeveloped. The existing Site drains from the northwest to the southeast and ultimately outfalls to Volcano Road. Runoff sheet flows to the east and south sides of the property. Along the west side of the site is an existing berm that directs runoff south from the property to the west to Volcano Road. There are no storm drain facilities located within Volcano Road adjacent to the Site.

The property to the east is an existing concrete plant and the east property line of the site is the east boundary of sub-basin TB 210. To the north is Avalon Rd NW which is a dirt road and acts as the north basin boundary of sub-basin TB 210, to the west is a Department of Transportation maintenance yard, and to the south is Volcano Road which acts as the south boundary of sub-basin TB 210. Sub-basin TB 210 outfall is located near the southeast corner of the site in Volcano Road to analysis Point 10.



FORM OF ANALYSIS

The existing and proposed drainage conditions at the Site were analyzed by calculating onsite runoff using the Peak Discharge Rate for Small Watersheds per Section 6-2(A)(5) of the DPM. These calculations are provided in **Appendix B**.

DOWNSTREAM CAPACITY

The site outfalls into the flowline of Volcano Road where flows will be conveyed in the existing roadway as they have done historically.

DEVELOPED CONDITIONS

ONSITE

The proposed development will include 430 canopied RV parking spots, paved drive aisles, as well as the facilities required to operate the RV storage facility. The proposed site will maintain the historic drainage pattern as much as practical. The proposed grading will continue to drain the site from the northwest to the southeast to a proposed retention pond. Runoff will sheet flow to concrete valley gutters and into the proposed pond.

The pond is design to drain within the required 96-hours per the DMP. The proposed improvements will produce a peak 100-hr, 6-hr flow of 40.14 cfs. The allowed 100-yr, 6-hr peak flow for the site per the AMAFCA is 36.76 cfs. This was determined by taking the ratio of the areas, which was determined by dividing the site area (10 acres) by the TB 210 basin area (47 acres). By doing that the ratio was determined to be 0.21. This value was then multiplied by the TB 210 basin peak flow of 175.08 cfs, and resulted in a allowable peak discharge of 36.76 cfs.

The proposed retention pond is designed to drain the required storm water quality volume (SWQV) (0.32 ac-ft) within the required 96-hours. In addition to the pond has been oversized to accommodate an additional 0.11 ac-ft to reduce the peak flow from 40.14 to 36 cfs which, is below the allowable peak flow for the site. Refer to **Appendix B** for the site peak flows and **Appendix C** for SWQV, spillway sizing, and pond drain time calculations. The proposed pond will be a private pond that will be privately operated and maintained. Measures will be taken during construction to reduce the potential of stormwater pollution.

The pond is designed to have 1-ft of freeboard while the conveying the 100-yr, 6-hr peak flow discharging through a 40' wide pond spillway. The spillway will be lined with riprap to reduce the potential of erosion to the spillway and the landscape downstream of the spillway. It is not anticipated that downstream properties will be negatively impacted as the peak site discharge is discharging into Volcano Road as the site has historically done. The required pond volume for the site is the SWQV (0.32 ac-ft) plus reduce peak flow volume (0.09 ac-ft) which totals a required pond volume of 0.41 ac-ft. The proposed pond is designed to provide 0.50 ac-ft of storage which is proposed to infiltrate through percolation rates as provided by the Albuquerque Design Manual, 0.83 in/hr. A summary of the retention pond design is below:

Description	Value
SWQV Required:	0.32 ac-ft
Detention Vol Required:	0.09 ac-ft
Required SWQV + Retention Vol	0.41 ac-ft
Provided SWQV + Retention Vol:	0.50 ac-ft
Bottom of Pond Surface Ara	9,748 sf
Bottom of Pond EL:	5110.50
Spillway EL:	5112.50
Spillway WSE:	5112.30

Top of Pond EL (berm):	5114.00
Side Slopes:	3:1 Max

OFFSITE

Runoff tributary to basin TB210, less site runoff, will continue to drain southeast to the flowline of Volcano Road and totals approximately 138.32 cfs (175.08 cfs – 36.76 cfs). Site development includes the construction of a cul-de-sac to terminate the intersection of Volcano Road with Central Ave NW which would effectively prevent the existing TB210 runoff from traveling to analysis point 10. A 26' wide curb cut is proposed along the eastern edge of the cul-de-sac at the location of the existing Volcano road section and the vacated pavement within Volcano Road ROW will be converted to a Type L rip-rap section to disperse and reduce the erosive flows until the edge of ROW vacation. Refer below for the riprap sizing chart.



Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

The stormwater design is to serve as a temporary remedy until stormwater infrastructure within Central Ave SW and Volcano Road is constructed.

CALCULATIONS

The peak flow for existing and proposed conditions was determined using the Peak Discharge Rate for Small Watersheds per Section 6-2(A)(5) of the DMP. The site was determined to be precipitation Zone 1. The pond was sized for the required SWQV as described in Section 6-12 of the DMP for new development and sized to detain additional volume per Section 6-2(A)(7) of the DMP to meet the allowable site discharge per the AMAFCA Final Report. Refer to **Appendix B** for peak flows, **Appendix C** for pond calculations and **Appendix D** for the excerpts from the AMAFCA.

CONCLUSION

The proposed development will maintain the historic drainage patterns onsite. The site will include proposed landscaping, paved drive isles, curb and gutter, canopies over parking stalls, and the proposed retention pond. The pond will account for the required SWQV and additional storage to reduce the site peak discharge for the 100-yr, 6-hr storm is equal or less than the allowable discharge determined from the AMAFCA Final Report. The site will not have any significant offsite flows being conveyed onto the site. The pond spillway will be lined with riprap to reduce the potential of erosion. The proposed pond will be a private pond that will be privately operated and maintained.

REFERENCES

- 1. City of Albuquerque "Development Process Manual" (DPM), dated September 2020
- 2. AMAFCA Amole-Hubbell Drainage Master Plan Update Final Report (AMAFCA), dated May 2013
- 3. Flood Insurance Rate Map, Bernalillo County, Colorado and Incorporated Areas, Map Number 35001C0328J, Effective Date November 4, 2016, prepared by the Federal Emergency Management Agency (FEMA).

APPENDIX

APPENDIX A: FIGURES

Site Vicinity Map



National Flood Hazard Layer FIRMette



Legend



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020







APPENDIX B: HYDROLOGY

Section 6-2(A)(3) Abstractions

Initial abstraction is the precipitation depth that must be exceeded before direct runoff begins. Initial abstraction may be intercepted by vegetation, retained in surface depressions, or absorbed on the watershed surface. Initial abstractions are shown in <u>TABLE 6.2.11</u>.

TABLE 6.2.11 Initial Abstraction			
Treatment	Initial Abstraction (inches)		
А	0.65		
В	0.50		
С	0.35		
D	0.10		

Infiltration is the only significant abstraction after the initial abstraction. After initial abstraction is satisfied, treat infiltration as a constant loss rate as specified in <u>TABLE 6.2.12</u>.



*Treatment D infiltration rate is applicable from 0 to 3 hours; use uniform reduction from 3 to 6 hours, with no infiltration after 6 hours.

Runoff from a previous event can saturate a channel bed or pond bottom, rendering it minimally pervious for several days. Do not anticipate additional bed losses for design purposes.

Section 6-2(A)(4) Excess Precipitation & Volumetric Runoff

Excess precipitation, E, is the depth of precipitation remaining after abstractions are removed. Excess precipitation does not depend on watershed area.

Excess precipitation is determined by subtracting the initial abstraction and infiltration from the design storm hydro graph. *FIGURE 6.2.4* illustrates the development of excess precipitation.



Kimley »Horn

Peak Discharge Rate for Small Watersheds - Exisitng Conditions

Project Name:	RV Storage
Project Number:	96648005

Per : DPM Chapter 6, Section 6-2(A)(5)

The peak discharge rate is given in <u>TABLE 6.2.14</u> for small watersheds, less than or equal to 40 acres, where the time of concentration is assumed to be 12 minutes.

TABLE 6.2.14 Peak Discharge				
Zone	Land Treatment			
	А	В	С	D
100-YE	AR PEAK DISCHA	ARGE (CSF/ACRE)		
1	1.54	2.16	2.87	4.12
2	1.71	2.36	3.05	4.34
3	1.84	2.49	3.17	4.49
4	2.09	2.73	3.41	4.78
2-YEA	R PEAK DISCHAR	GE (CSF/ACRE)		
1	0.00	0.02	0.50	1.56
2	0.00	0.08	0.61	1.66
3	0.00	0.15	0.71	1.73
4	0.00	0.28	0.87	1.88
10-YEAR PEAK DISCHARGE (CSF/ACRE)				
1	0.30	0.81	1.46	2.57
2	0.41	0.95	1.59	2.71
3	0.51	1.07	1.69	2.81
4	0.70	1.28	1.89	3.04

 Determine the peak rate of discharge.
 Determine the area in each treatment, A_A, A_B, A_C, A_D
 Multiply the peak rate for each treatment by the respective areas and sum to compute the total Q.

EQUATION 6.6 Total $Q_p = Q_{PR}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$

Existing Project Site Q_P Assumptions:

t_c is 12 minutes

100-yr Peak Discharge (CFS/ACRE)

Site is in Zone 1 Per Table 6 2 1/

Per Table 6.2.14				
		Land Tre	eatment	
Zone	Α	В	С	D
1	1.54	2.16	2.87	4.12

Basin EX-1

Eq 6.6:

Q _{PA} =	1.54	cfs/ac
A _A =	10	acres
Q _{PB} =	2.16	cfs/ac
A _B =	0	acres
Q _{PC} =	2.87	cfs/ac
A _C =	0	acres
Q _{PD} =	4.12	cfs/ac
A _D =	0	acres

Total $Q_p = 15.40$ cfs

Kimley »Horn

Peak Discharge Rate for Small Watersheds - Proposed Conditions

Project Name: **RV Storage** 96648005 Project Number:

Per : DPM Chapter 6, Section 6-2(A)(5)

The peak discharge rate is given in TABLE 6.2.14 for small watersheds, less than or equal to 40 acres, where the time of concentration is assumed to be 12 minutes.

TABLE 6.2.14 Peak Discharge				
Zone	Land Treatment			
	А	В	C	D
100-YE	AR PEAK DISCHA	ARGE (CSF/ACRE)		
1	1.54	2.16	2.87	4.12
2	1.71	2.36	3.05	4.34
3	1.84	2.49	3.17	4.49
4	2.09	2.73	3.41	4.78
2-YEAF	R PEAK DISCHAR	GE (CSF/ACRE)		
1	0.00	0.02	0.50	1.56
2	0.00	0.08	0.61	1.66
3	0.00	0.15	0.71	1.73
4	0.00	0.28	0.87	1.88
10-YEAR PEAK DISCHARGE (CSF/ACRE)				
1	0.30	0.81	1.46	2.57
2	0.41	0.95	1.59	2.71
3	0.51	1.07	1.69	2.81
4	0.70	1.28	1.89	3.04

To determine the peak rate of discharge,

Determine the area in each treatment, A_A, A_B, A_C, A_D
 Multiply the peak rate for each treatment by the respective areas and sum to compute the total Q_p.

EQUATION 6.6 Total $Q_p = Q_{PA}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$

Proposed Project Site Q_P Assumptions:

Basin PR-1

 t_c is 12 minutes

100-yr Peak Discharge (CFS/ACRE)

Site is in Zone 1 Por Table 6 2 14

Per Table 6.2.14				
		Land Tr	eatment	
Zone	Α	В	С	D
1	1.54	2.16	2.87	4.12

Eq 6.6:

Q _{PA} =	1.54	cfs/ac
A _A =	0	acres
Q _{PB} =	2.16	cfs/ac
A _B =	0	acres
Q _{PC} =	2.87	cfs/ac
A _C =	0.85	acres
Q _{PD} =	4.12	cfs/ac
A _D =	9.15	acres

Total $Q_p = 40.14$ cfs

APPENDIX C: HYDRAULICS

Kimley Horn Project Name: RV Storage Project Number: 96648005

Hyd Per

Hydrograph for Small Watersheds

rograph for Small Watershed : DPM, Chapter 6, Section 6-2(A)(7)				Determine Required Pond Volume:			
				Allowskie Site Discharge (O.)	26.76	-f-	т
Base time, t _a , for a small watershed hydrograph is,				Allowable Site Discharge (Q _A) =	36.76	cfs	-
EQUATION 6.8 $t_{a} = (2.107 * E * A_{T} / Q_{p}) - (0.25 * A_{D} / A_{T})$		E =	2.13 inches	Required Pond Volume:	0.09	ac-ft	-
Where t_s is in hours, E is the excess precipitation in inches (from <u>TABLE 6.2.13</u>).		A _t =	10 acres	Pond Volume for Designed Discharge	0.11	ac-ft	
in acres. Using the time of concentration, t_c (hours), the time to peak in hours is:		A _D =	9.15 acres	Solve for:		Required Po	nd Volume
EQUATION 6.9 $\mathbf{t_p} = (0.7 * t_o) + ((1.6 - (A_o / A_1)) / 12)$		Q _p	40.14 cfs				
FIGURE 6.2.5 Time to Peak in 10-years	Ea 6 8-	t.=	0.89 brs	Q _p - Q _A = Require Pond Volume A =	3.38	cfs	
	Lq 0.0.		0.05	nequie Fond Volume H _{A1} -	502	cu. n.	
$T_p = 0.7t_c + (1.6 - A_c/A_g)/12$ 0.2% - A. (A.				Require Pond Volume A _{A2} =	2,781	cu. ft.	
		t _c =	12 minutes				
Required Pond Volume (CF) Allowable Discharge (CFS)	Eq 6.9:	t _p =	0.20 hrs	Require Pond Volume A _{A3} =	712	cu. ft.	
Pond Discharge (CFS)				Leading Leg.			
		0.25 x A _D /A _T =	0.23 hrs	Slope of line =	203.66		
		=		Intersection point of lines =	0.18		
$T_p = 0.7t_c + (1.6 - A_c/A_g)/12$		$(t_p + (0.25 \times A_p/A_T) =$	0.43 hrs				
(225 - A ₂ /A ₂		$t_{b} - (t_{p} + (0.25 \times A_{D}/A_{T}) =$	0.46 hrs				
				Slope of line	-86.55		
ee al a a a a a a a a a a a a a a a a a	Area 1:	1.5*T _p *Q _p =	42,716 cu. ft.	Intersection point of lines =	0.46		
$=$ $T_s = 2.107 \cdot E \cdot A_{\gamma}/O_s \cdot .25 \cdot A_{\gamma}/A_{\gamma} \rightarrow$ TIME (HOUR)	Area 2:	(0.25*A _D /A _T)*Q _p =	33,053 cu. ft.	Total Required Pond Volume -	0.09	ac-ft	
	Area 3:	1.5*(t _b - (t _p + (0.25 x A _n /A _n))*Q _n =	100,511 cu. ft.	Total Required Folia Volume =	0.05	ac-It	=
		i i provinci provinci provinci i provinci i provinci i provinci i provinci i	, .				
		Site Total Volume =	4.05 ac-ft	=			
				Solve for:	Pond	olume for D	esigned Discharge
				$Q_p - Q_D =$	4.14	cfs	
				Pond Volume for Design Discharge A _{A1} =	454	cu. ft.	
				Pond Volume for Design Discharge A _{A2} =	3,407	cu. ft.	
				Pond Volume for Design Discharge A _{A3} =	1068	cu. ft.	
				Leading Leg:			
				Slope of line = Intersection point of lines =	203.66 0.18		
				Falling Leg:	06.55		
				Slope of line Intersection point of lines =	-86.55		
				Total Provided Pond Volume =	0.11	ac-ft	
							-
		Time to Peak in 100-year	Storm				
45							
40		•					
				e			
35							
30							
23							
ö				Time to Peak in 100-years Allowable Discharge			
20				Pond Volume for Designed E	Discharge		
			\mathbf{N}				
15							
10							
5							

Project Description		
Solve For	Headwater Elevation	
Input Data		
(Discharge)	<mark>36.76</mark> cf <mark>s</mark>	
Crest Elevation	0.00 ft	
Tailwater Elevation	0.35 ft	
Crest Surface Type	Gravel	
Crest Breadth	5.00 ft	
Crest Length	40.0 ft	
Results		
Headwater Elevation	0.49 ft	
Headwater Height Above Crest	0.49 ft	
Tailwater Height Above Crest	0.35 ft	
Weir Coefficient	2.69 ft^(1/2)/s	
Submergence Factor	1.000	
Adjusted Weir Coefficient	2.69 ft^(1/2)/s	
Flow Area	19.6 ft ²	
Velocity	1.88 ft/s	
Wetted Perimeter	41.0 ft	
Top Width	40.00 ft	

Worksheet for Spillway

Outlet Structure.fm8 2/17/2021 Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 FlowMaster [10.03.00.03] Page 1 of 1

Kimley »Horn

Storm Water Quality Volume (SWQC)

Project Name: RV Storage Project Number: 96648005

Per Drainage, Flood Control, and Erosion Control Manual, Chapter 6, Section 6-12

SWQV:

New Development

SWQV: (Impervious area x 0.42)/12

Impervious Area = 9.15 acres

SWQV = 0.32 ac-ft

Kimley **»Horn**

Project Name: RV Storage Project Number: 96648005 **Retention Pond Drain Time**

Retention Pond Drain Time										
Pond	Volume	Percolation Rate*	Pond Bottom	Drain Time						
Folia	cf	inches/hr	Sq. Ft.	hr						
A	21,780	0.83	9,380	34						

Pond Volume 0.5 ac-ft

Kimley »Horn STAGE-STORAGE ANALYSIS

PROJECT NAME: PROJECT NUMBER: CALCULATED BY: DATE: RV Storage - Albuquerque 96648005 MEJ 12/14/2021

PRISMOIDAL METHOD

ELEV.	AREA	ACCUM. VOL.
(FT)	(SQ FT)	(AC-FT)
0	9380	0.00
0.5	10070	0.11
1	10774	0.23
1.5	11809	0.36
2	12457	0.50

$V = (A1 + A2 + \sqrt{A1xA2}) Dept$	h
3	

APPENDIX E: REFERENCES

Current DRC Project Number: 096648005 FIGURE 12

INFRASTRUCTURE LIST

(Rev. 2-16-18) EXHIBIT "A"

Date Preliminary Plat Approved:_____ Date Preliminary Plat Expires:_____

Date Site Plan Approved:_

DRB Project No.: 2020-004757
DRB Application No.:

Date Submitted: April 30, 2021

TO SUBDIVISION IMPROVEMENTS AGREEMENT EVELOPMENT REVIEW BOARD (D.R.B.) REQUIRED INFRASTRUCTURE LIS

,

Albuquerque - RV Storage PROPOSED NAME OF PLAT AND/OR SITE DEVELOPMENT PLAN

Section 21, Township 10 North, Range 2 East, City of Albuquerque, Bernalillo County, New Mexico. Tracts C48 and C49, Unit 4 EXISTING LEGAL DESCRIPTION PRIOR TO PLATTING ACTION

Following is a summary of PUBLIC/PRIVATE Intrastructure required to be constructed or financially guaranteed for the above development. This Listing is not necessarily a complete listing. During the SIA process and/or in the review of the construction drawings, if the DRC Chair determines that appurtenant items and/or unforeseen items have not been included in the infrastructure listing, the DRC Chair may include those items in the listing and related financial guarantee. Likewise, if the DRC Chair determines that appurtenant or non-essential items can be deleted from the listing, those items may be deleted as well as the related portions of the financial guarantees. All such revisions require approval by the DRC Chair, the User Department and agent/owner. If such approvals are obtained, these revisions to the listing will be incorporated administratively. In addition, any unforeseen items which arise during construction which are necessary to complete the project and which normally are the Subdivider's responsibility will be required as a condition of project acceptance and close out by the City.

Financially	Constructed	Size	Type of Improvement	Location	From	То	Priva	ate	City Cnst
Guaranteed DRC #	Under DRC #						Inspector	P.E.	Engineer
		8"	Replace (upsize) existing water main (Approx. 325')	Volcano Road NE	Existing main in Central Avenue at Volcano Road	Southwestern property corner of development site	/	/	/
		8"	Extend public sanitary sewer collector line (Aprox. 505')	Volcano Road NE	Existing manhole #K09791	Southwetern property corner of development site	/	/	/
		7,330 S.F., 26' wide from face of curb to fae of curb.	Asphalt pavement; (96- foot diameter cul-de-sac)	Cul-de-sac at end of Volcano Road NE	Edge of existing pavement	Southern property line of development site	/	/	1
		6" curb and gutter	Construct new curb and gutter	Improvements shown along Volcano Road NE	Southwestern property line corner extention of development site	Southern property line of development site	/	/	/
		6' concrete sidewalk	Construct new concrete sidewalk	Improvements shown along north side of Volcano Road NE	Southern property line of development site	~10' southwest of southeastern property corner of development site	/	/	/
		6' concrete sidewalk	Construct new concrete sidewalk	From cul-de-sac to frontage road	Southern property line of development site	~ 10.5' South from southwestern property corner of development site	/	/	/
		890 S.F.	Demolotion of existing asphalt pavement	Abutting proposed paving improvements	Existing edge of pavement (~20' south of south property line of development site)	Limits of new curb and gutter in cul-de- sac beyond existing edge of asphalt and southen property line of development site	/	/	/
							/	/	/
							/	/	/

PAGE 1 OF 2

ncially Constructed						Construction Certifica
anteed Under	Size	Type of Improvement	Location F	rom	То	Private C
RC # DRC #						Inspector P.E. E
						/ /
						1 1
			Approva	of Creditable Items:		Approval of Creditable Item
			Impact F	ee Admistrator Signature	Date	City User Dept. Signature
2						
3						
23 AGENT / OWNEI	R	1	DEVELOPMEN	T REVIEW BOARD MEMBE	R APPROVALS	
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PAGE 2 OF 2 (Rev. 2-16-18)

PR-2020-004757_SI-2021-00307_Infrastructure List_Approved_5-5-21

Final Audit Report

2021-05-05

Created:	2021-05-05
Ву:	Jay Rodenbeck (jrodenbeck@cabq.gov)
Status:	Signed
Transaction ID:	CBJCHBCAABAAoAWSC4COM2vAri-zEGEYCtYLbyo6_HJ_

"PR-2020-004757_SI-2021-00307_Infrastructure List_Approved_ 5-5-21" History

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Agreement completed.

2021-05-05 - 6:44:25 PM GMT



RESOLUTION 2014-03 ADOPTION OF THE AMOLE-HUBBELL DRAINAGE MANAGEMENT PLAN 2013 UPDATE

WHEREAS, July 1999, the Amole Hubbell Drainage Management Plan (DMP) was adopted by the AMAFCA Board of Directors; and

WHEREAS, the DMP identified existing drainage facilities that were to be expanded and new facilities to be constructed to address existing and future runoff quantities; and

WHEREAS, since adoption by the Board, the watershed has experienced rapid growth and many facilities identified in the DMP have been constructed, often in conjunction with development; and

WHEREAS, the aforementioned development has dictated that AMAFCA re-assess the validity of the DMP; and

WHEREAS, in November 2011, the Board engaged Wilson & Company to prepare an update to the Amole Hubbell DMP (DMP Update); and

WHEREAS, the City of Albuquerque (CITY), Bernalillo County (COUNTY) and AMAFCA all have jurisdiction in the watershed; and

WHEREAS, accordingly AMAFCA entered into a funding agreement with the CITY and the COUNTY for the preparation of the DMP Update; and

WHEREAS, AMAFCA, the COUNTY and the CITY desire to address stormwater control through the Amole Hubbell DMP Update; and

WHEREAS, AMAFCA desires to adopt the Amole Hubbell DMP Update, subject to certain limitations.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY THAT:

The improvements recommended by the Amole Hubbell Drainage Management Plan Update, prepared by Wilson & Company, dated November, 2013 are hereby adopted, subject to the following conditions:

- 1. Modifications to the adopted plan may be made as circumstances dictate, but major deviations shall be approved by the AMAFCA Board of Directors.
- 2. The DMP Update utilizes various criteria to establish general project priorities from a technical perspective. It identifies drainage and flood control infrastructure necessary to provide protection to the community from storm water runoff. It does not necessarily reflect

RESOLUTION 2014-03 ADOPTION OF THE AMOLE-HUBBELL DRAINAGE MANAGEMENT PLAN 2013 UPDATE

the priorities to be used by the AMAFCA Board of Directors for funding and construction. Specific projects, if any, will be funded and scheduled by AMAFCA Board of Directors action based on evaluation of public safety needs, cost sharing benefits, orderly development of flood control infrastructure, overall community needs and regional planning requirements.

PASSED, ADOPTED, AND SIGNED this 23th day of January 2014.



ATTEST:

Buie M. Thomas

Bruce M. Thomson, Secretary/Treasurer

ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY

Danny Hernandez, Chair, Board of Directors



Table of Contents

Executive Summary 1. Literature Review 1.1 Amole-Hubbell DMP 1999..... 1.2 Other Researched Documents..... 2. Hydrologic Analysis 2.1 Methodology..... 2.2 Hydrologic Characteristics..... 2.2.1 Watershed Delineation..... 2.2.2 Precipitation 2.2.3 Sediment Bulking 2.2.4 Land Use..... 3. Basin Evaluation..... 3.1 Powerline Basin..... 3.2 South Powerline Basin 3.3 Snow Vista Basin 3.4 Amole Basin 3.5 Amole Del Norte 3.5.1 98th & Central Basin 3.5.2 Unser/214 Basin..... 3.5.3 Tierra Bayita Area 3.5.4 Atrisco Business Park Basin 3.5.5 Tower/Sage Area 3.5.6 South Amole del Norte Basin 3.6 Borrega Basin.....

3.7 Rio Bravo Basin.....

AMOLE-HUBBELL DRAINAGE MASTER PLAN UPDATE **NOVEMBER 2013**

I, Tyler J. Ashton, do hereby certify that this report was prepared by me or under my direction and that I am a duly registered Professional Engineer under the laws of the State of New Mexico.

Tyler J. Ashton, P.E. State of New Mexico P.E. No. 16205

3-26-14

Date





Amole-Hubbell Plan Update 2013 Report

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0	•	•	•	•	•	•		1	•	•	•	•					•	•	•	•		•	•	•	•	3	0		1			•		•	•	•	•	•		•	•	•		•	•		•	•	•		•	•	• •		•	1	
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		•	•	•	•	•			•		•	•	•	•	i.			•	•	•	•	•		•	•		i.					•		•	•	•		•			-							•		•		•			•••	ŝ	39
					•	•			•												•	•						•																		•••			•				•••		• •		43
																																																									47
																																	ĺ																Ĩ							1	51
•			•			•				•	•	•	•		•				•	•		•			•						0			•			•	•	•								- 14	1		•		•				1	57
	-		•	1		-		2.5				•	•									•	•		•	8.5	•	•			53		1.5	1		0	•	•		•	-	•					9.8		•	80		15			•	3	
																																																								. 1	01

Amole-Hubbell Plan Update 2013 Report

List of Figures

Figure 2-1: Amole-Hubbell Watershed Overall Basin Map	7
Figure 2-2: Proposed Land Use Map	
Figure 3-1: Powerline Basin - Proposed Basin Map	11
Figure 3-2: Powerline Basin - Proposed Hydrologic Model Diagram	12
Figure 3-3 South Powerline Basin - Proposed Basin Map	15
Figure 3-4: South Powerline Basin - Proposed Hydrologic Model Diagram	16
Figure 3-5: Snow Vista Basin - Proposed Basin Map	20
Figure 3-6: Snow Vista Basin - Proposed Hydrologic Model Diagram	21
Figure 3-7: Amole Basin - Proposed Basin Map	28
Figure 3-8: Amole Basin - Proposed Hydrologic Model Diagram	29
Figure 3-9 - 98th & Central Basin Proposed Basin Map	32
Figure 3-10: 98th & Central Area - Proposed Hydrologic Model Diagram	33
Figure 3-11: Unser/214 - Proposed Basin Map	36
Figure 3-12: Unser/214 Area - Proposed Hydrologic Model Diagram	37
Figure 3-13: Tierra Bayita Area - Proposed Basin Map	40
Figure 3-14: Tierra Bayita Basin - Proposed Hydrologic Model Diagram	41
Figure 3-15: Atrisco Business Park Area - Proposed Basin Map	44
Figure 3-16: Atrisco Business Park Area - Proposed Hydrologic Model Diagram	45
Figure 3-17: Tower/Sage Area - Proposed Basin Map	48
Figure 3-18: Tower/Sage Area - Proposed Hydrologic Model Diagram	49
Figure 3-19: South Amole del Norte Area - Proposed Basin Map	53
Figure 3-20: South Amole del Norte - Proposed Hydrologic Model Diagram	54
Figure 3-21: Borrega Basin - Proposed Basin Map	58
Figure 3-22: Borrega Basin - Proposed Hydrologic Model Diagram	59
Figure 3-23: Rio Bravo Basin - Proposed Basin Map	62
Figure 3-24: Rio Bravo Basin - Proposed Hydrologic Model Diagram	63

List of Tables

Table 0-1:Summary of Recommendations from 1 Table 0-2:Summary of Recommendations for 207 Table 2-1: NOAA Precipitation Depths..... Table 2-2: Land Treatment Type Percentage Sur Table 3-1: Powerline Basin - Proposed Sub-Basi Table 3-2: South Powerline Basin - Proposed Su Table 3-3: Snow Vista Basin - Proposed Sub-Bas Table 6-1: Amole Analysis Characteristics..... Table 3-5: Amole Design Characteristics Table 3-6: Hubbell Design Characteristics Table 3-7: Hubbell Analysis Characteristics...... Table 3-8: Amole Basin - Proposed Sub-Basin P Table 3-9: 98th & Central Area - Proposed Sub-E Table 3-10: Unser/214 Area - Proposed Sub-Bas Table 3-11: Tierra Bayita Area - Proposed Sub-B Table 3-12: Atrisco Business Park Area - Propos Table 3-13: Tower/Sage Area - Proposed Sub-Ba Table 3-14: South Amole del Norte Area - Propos Table 3-15: Borrega Basin - Proposed Sub-Basir Table 3-16: Rio Bravo Basin - Proposed Sub-Bas

List of Photos

Photo 2: Pond SV10 Inlet	17
Photo 3: Pond SV8	17
Photo 4: Pond SV4	18
Photo 5: Bridge at Benavides Road	18

Appendix

Appendix A - Existing Conditions Appendix B - Hydrology Appendix C - Hydraulics Appendix D - Cost Estimates Appendix E - Literature Review Documents



1999 Amole-Hubbell Report	i
13 Amole-Hubbell Update Report	ii
· · ·	6
mmary	6
in Peak Discharge and Volumes	12
b-Basin Peak Discharge and Volumes	16
sin Peak Discharge and Volumes	23
	25
	26
	26
eak Discharge and Volumes	30
Basin Peak Discharge and Volumes	33
sin Peak Discharge and Volumes	37
Basin Peak Discharge and Volumes	42
sed Sub-Basin Peak Discharge and Volumes	45
asin Peak Discharge and Volumes	
sed Sub-Basin Peak Discharge and Volumes	55
n Peak Discharge and Volumes	50
sin Peak Discharge and Volumes	00 63



Executive Summary

The objective of the Amole-Hubbell Drainage Master Plan (DMP) Update is to evaluate the 1999 Amole-Hubbell Report's recommendations and determine what has been done to date and what infrastructure is still needed. In 2011 the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) contracted Wilson & Company to update the original 1999 Amole-Hubbell DMP by Leedshill-Herkenhoff, Inc. The contract was separated into two phases. Phase I Services included literature review/as-built collection and existing hydrologic/hydraulic analysis. Phase II Services analyzed existing facilities for adequacy and provided recommendations for proposed drainage facilities identified in the original DMP.

Approximately 20 square miles (sq. mi.) are analyzed and encompass the area generally bounded by Interstate 40 (I-40) to the north, Westgate Dam basin divided to the west, Gun Club Road to the south, and Coors Boulevard to the east. The project area is separated into the following nine basins as in the original DMP:

- 1. Powerline Channel Basin (PL)
- 2. South Powerline Basin (SP)
- Snow Vista Basin (SV) 3.
- Amole Basin (AA) 4.
- 5. Amole del Norte Basin (ADN)
- Borrega Basin (BR) 6.
- Rio Bravo Basin (RB) 7.
- 8. Sacate Blanco (SB)
- 9. Amole-Hubbell Detention (AH)

A total of 80 reports were gathered for the literature review. Key information was taken from these reports, such as sub-basin boundaries, stage-storage-outflow tables, and existing/proposed infrastructure, and these analysis points aided in the existing and proposed condition modeling.

The table below summarizes the recommendations from the 1999 report and also states whether the recommendation has been completed or if it is still needed today.

Table 0-1:Summary of Recommendations from 1999 Amole-Hubbell Report										
Project Identification	Description from 1999 Report	Status 2013								
1999 Deficiencies Updated Recommendations										
BR1	A 51 ac-ft Borrega Detention Basin	Completed								
BR4	Borrega Inlet Freeboard Upgrade	Completed								
AA1	Blake Rd. profile regrading	Completed								
AA2	Westgate Heights Earthen Channel regrading	Completed								

Table 0-1:Summary of Recommendations from 1999 Amole-Hubbell Report									
Project Identification	Description from 1999 Report	Status 2013							
AA3	Earthen channel bank improvements	Completed							
SV1A	Snow Vista Channel/Benavides Rd. Inlet	Not completed, still needed							
SV1B	Westgate Heights Benavides Rd. Storm Drain	Not completed, still needed							
PL2	Powerline Channel Freeboard Upgrade	Not completed, still needed							
1999 Amole-Hubbell System Sto	rage Capacity Recommendations								
AH1	Stage 1 Revise emergency spillway, connect Guac and Amole Basins, provide 150 ac-ft additional storage	Not completed, still needed							
AH2	Stage 2 Increase Guac storage by 300 ac-ft	Not completed, still needed							
AH3	Stage 3 Increase Guac storage to 862 ac-ft	Not completed, still needed							
AH4	PMF Spillway improvements at Hubbell Lake Dam	Not completed, still needed							
1999 Amole Arroyo Stabilization									
PL1	Additional detention on Powerline Channel (58 ac-ft)	Not completed, still needed							
AA4	Stabilize Amole Arroyo mid reach	Completed							
AA5	Construct Amole Arroyo below Snow Vista	Completed							
SV2	Maintain runoff constraints in Snow Vista Basin	Completed, still needed							
SV3	Snow Vista Channel freeboard upgraded	Not completed, still needed							
AA6	Construct channel for lower reach of Amole Arroyo	Completed							
AA7	Increase freeboard of transition and chute into Amole Basin	Completed							
1999 South Powerline Channel/	Detention								
SP1	Construct diversion channel with detention basins	Partially completed, still needed							
1999 South Rio Bravo Arroyo at	Hubbell Lake								
RB1	Convey South Rio Bravo Arroyo discharge across the Gun Club Lateral	Partially completed, still needed							
1999 Development Driven Impro	vements/Facilities								
AD1	Tower/Sage Detention Basin	Completed							
SB1	Sacate Blanco Diversion Channel	Not completed, still needed							
SB2	S. Sacate Blanco Arroyo Conveyance	Not completed, still needed							
SB3	Sacate Blanco Avulsion Conveyance	Not needed							
BR2	N. and S. Borrega Arroyo Conveyance	Not completed, still needed							
RB2	S. Rio Bravo Arroyo Conveyance	Not needed							
BR3	Borrega "6B" Diversion Storm Drain	Partially completed, still needed							
ADN	Amole del Norte Basin Controls	Still needed, continued enforcement required							



Amole-Hubbell Drainage Master



The 20 sq. mi. watershed was reevaluated utilizing the information obtained through the literature review process. Based on the updated data the watershed was divided into seven basins for the updated DMP. The original Sacate Blanco Basin and Amole-Hubbell basin were incorporated into the South Powerline and Amole Basins respectively resulting in the follow basins for evaluation:

- 1. Powerline Channel Basin (PL)
- South Powerline Basin (SP) 2.
- 3. Snow Vista Basin (SV)
- 4. Amole Basin (AA)
- Amole del Norte Basin (ADN) 5.
- Borrega Basin (BR) 6.
- Rio Bravo Basin (RB) 7.

The updated watershed basins and hydrological analysis for the proposed conditions model resulted in additional recommendations to those presented in the original DMP. .

These recommendations, along with the recommendations that are still needed, are summarized in Table 0-2 including conceptual costs by basin.

Table 0-2:Summary of Recommendations for 2013 Amole-Hubbell Update Report											
Project Identification	Description of Project	Cost									
Powerline Basin											
Pond PL1	Increase Pond storage to 21 ac-ft	\$328,200									
Sediment Removal PL1- PL6	Remove sediment from existing ponds to design conditions, see Figure 3-1	\$/yr- AMAFCA									
South Powerline											
Sediment Removal	Remove sediment from existing ponds to design conditions, see Figure 4-1	\$/yr- COA									
Pond SP8	Construct 17.5 ac-ft pond	\$\$\$/Developer Cost									
Pond SP1	Combine ponds SP1A and SP!B	\$\$\$/Developer Cost									
Snow Vista Basin											
Sediment Removal	Remove sediment from existing ponds to design conditions, see Figure 5-1	\$/yr-AMAFCA/COA									
SV4A	Route Basins SV229 and SV230 to Amole Arroyo	\$\$\$ Developer Cost									
SV1	Westgate Heights Benavides Rd. Storm Drain	\$2,434,000									
SV2	Maintain runoff constraints in Snow Vista Basin	Developer Cost									
Pond SV8	Increase Pond size to 4 ac-ft, reconstruct outlet structure	\$212,500									
Pond SV205	Construct 28 ac-ft pond	\$1,080,300									

Table 0-2:	Summary of Recommendations for 2013 Amole	-Hubbell Update Report
Project Identification	Description of Project	Cost
Amole Basin		
AH1-4	A GuacAmole/Hubbell Lake System Analysis is needed to address capacity/discharge.	\$\$\$
Amole del Norte Basin		
Pond NE3	Relocate pond spillway	\$222,800
Pond Modifications	Install orifice plates in Ponds NE2 and NE3	\$
98 th & Central Storm Drain	Install Storm drain per Figure 7-1	\$\$\$/Developer Cost
Unser/214 Area		
Basin 202.1 restriction	Restrict future development to 2.0 cfs/ac.	\$\$
West I-40 Diversion	Complete construction of channel	\$3,000,000
Pond U1	Install orificeplate in Pond	\$
Unser Storm Drain	Upsize 42" to 60"	\$\$\$
Tierra Bayita	•	·
Pond TB1	Construct detention pond	\$\$\$
Basin 202.1 and 202.2 restrictions	Restrict future developments to 2.05 cfs/ac	Developer cost
Coors N-S Pond	Increase volume to 75 ac-ft.	\$\$/AMAFCA
Atrisco Business Park Basin	·	
Basin Restrictions	Continue to restrict all development to 0.1 cfs/ac	Developer cost
Tower/Sage Basin		
Tower Road Storm drain	Complete storm drain	\$\$\$
Pond TS2	Install storm drain in Sage Rd.	\$\$\$
South Amole del Norte		
Pond SA2	5 ac-ft expansion of pond	\$175,900
Pond SA3	Increase pond size by 1 ac-ft	\$61,800
Borrega Basin		
Pond B1	Construct 6 ac-ft pond	\$
Borrega Dam Expansion	Expand Borrega Dam to ultimate condition	\$540,700
Rio Bravo Basin		
Amole Hubbell Analysis	GuacAmole/Hubbell System analysis	\$\$\$
\$) < \$25,000 \$\$) \$25,000 - \$100,000 \$\$\$) \$100,000 - \$300,000		



Amole-Hubbell Plan Update

2013 Report



1. Literature Review

The following documents were included in the Phase I Literature Review to develop the existing conditions study and identify critical drainage features in the study area. These resources were revisited to guide and inform proposed recommendations.

1.1 Amole-Hubbell DMP 1999

Wilson & Company, Inc., Engineers & Architects (Wilson & Company) was contracted by Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) to update the Amole-Hubbell Drainage Management Plan (DMP) dated July 1999 (original Amole-Hubbell DMP). The original DMP was prepared by Leedshill-Herkenhoff, Inc. and was prepared for AMAFCA. Four volumes were prepared and include the following:

"Amole-Hubbell Drainage Management Plan Volume I" July 1999 "Amole-Hubbell Drainage Management Plan Volume II" July 1999 "Amole-Hubbell Drainage Management Plan Volume III" July 1999 "Amole-Hubbell Drainage Management Plan Volume IV" July 1999

1.2 Other Researched Documents

Wilson & Company researched documents at City of Albuquerque's (COA's) Drainage Division, COA's Maps and Records, and Bernalillo County Public Works Department.

Continued efforts for investigating drainage patterns and problems at a macro level led to researching site development drainage reports and plans for areas within the Amole-Hubbell Watershed. These reports and plans are not summarized in this section, yet are referenced throughout the text. Valuable insight into the hydrologic patterns and proposed development is provided in these reports and is helpful in sub-basin delineation, as well as in determining the existing and proposed infrastructure. Drainage reports, construction plan sets, and basin maps were acquired to aid in the hydrologic and hydraulic analysis. The list is provided below. The COA categorizes their drainage reports by the zone atlas number, followed by the number that represents the order in which the reports were submitted. For example, a file number of M-09/D023 is a drainage report located in zone M-9 and was the 23rd drainage report submitted in that zone.

- 1. "Amole-Hubbell Drainage Management Plan Volume I, II, III, & IV" July 1999
- 2000
- 3. "West I-40 DMP" 2006
- 4. "Final Design Report for Amole Arroyo including Revisions to the Amole-Hubbell Drainage Management Plan" August 2003, File M-09/D023
- 6. "Anderson Hills Subdivision Drainage Report", File P-09/D002
- 7. "Drainage Report for Ceja Vista Subdivision" January 9, 2007
- 8. "El Rancho Subdivisions Drainage Reports"
- 9. "Rio Bravo Sector Development Plan"
- 10. "Facility Plan for Arroyos" AMAFCA #376.04.00
- down to the Amole Dam" July 2004, File J-08
- 12. "Arenal/Unser Drainage Management Plan" June 1997
- 13. "Borrega/PaakWeree Village Final Design Report"
- 15. "Unser Diversion-Design Analysis Report" September 1993



Amole-Hubbell Drainage Master

2. "Borrega Detention Dam and North Borrega Channel-Design Analysis Report" April

5. "Drainage Report for Anderson Heights Subdivision" April 2004, File P-08/D003

11. "Drainage Report for the Amole Channel from Confluence with Snow Vista Channel 14. "Amole del Norte Tower/Sage Drainage Master Plan" April 1995, AMAFCA #359.03 16. "Drainage Study for Sierra Ranch Subdivision" December 16, 2004, File N-08/D003



- 17. "Talavera Subdivision Drainage Management Plan" January 2009
- 18. "Southwest Valley Flood Damage Reduction Study Volume I, II, and III"
- 19. "Drainage Report for Sunrise Ranch Subdivision" June 2000, File L-09/D006
- 20. "Final Design Report Amole del Norte Storm Diversion Facilities Tierra Bayita Drainage Facilities Phase III" March 1998
- 21. "Anderson Heights Grading & Drainage Plan" COA #753981
- 22. "Anderson Heights Unit 9 Grading and Drainage Plan" COA #753981
- 23. "Preliminary Design Report for Amole del Norte Storm Diversion Facilities Tierra Bayita Drainage Facilities" October 31, 1990 COA #4076-01
- 24. "Design Report for Amole del Norte Storm Diversion Facilities Tierra Bayita Drainage Facilities Phase IIIC"
- 25. "Design Report for Amole Arroyo including Revisions to the Amole-Hubbell Drainage Management Plan" February 2003
- 26. "El Rancho Grande Units 14 & 15" October 10, 2003, File N-09/D005
- 27. "Sunrise Ranch Unit 4 Pond Reclamation" August 6, 2002, File L-09/D006
- 28. "Sunrise Ranch Unit 2 Supplemental Information" November 21, 00, File L-09/D006
- 29. "Master Drainage Plan Sunrise Terrace Units III, IV, & V" March 1994: Revised June 1994, File L-08/D01A
- 30. "Drainage Study for Timarron West Subdivision" April 6, 2000, File M-08/D005A
- 31. "Drainage Study for the Timarron West Subdivision Unit 5" May 25, 2000, File M-08/D005B
- 32. "Master Drainage Study Gibson Blvd. Corridor Between 118th Street and the Amole Arroyo" May 8, 2003, File N-09
- 33. "Sierra Ranch Unit 2 Offsite Pond" June 2002, File N-08/D003
- 34. "Sierra Ranch Subdivision Unit I Grading and Drainage Plan" N-08/D003
- 35. "Anderson Heights Units 4 & 6" File N-08/D003A

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- 36. "Drainage Study for Sun Gate Subdivision" January 8, 2004, File N-09/D007
- 37. "Arrowwood Development Phase I Grading and Drainage Plan" COA #747281
- 38. "Longford at Arrowwood Grading and Drainage Plan" COA #747281
- 39. "Tracts 29, 30, 31 at Arrowwood Drainage Master Plan" October 11, 2004, File N-09/D008A
- 40. "Drainage Report for Sun Gate Estates" September 8, 2004, File N-09/D008B
- 41. "118th Street Powerline Ponds Revisions to Ponds #5 and #6" File P-08/D003
- 42. "Anderson Heights Grading and Drainage Plan" COA #753981
- 43. "As-builts for Anderson Heights Grading and Drainage Plan" File P-08/D003
- 44. "Supplemental Drainage Information for Ceja Vista Unit 1, 2, 3" April 2010, DRB 1004428
- 45. "Drainage Management Plan for Anderson Hills The Highlands, The Meadows, The

- Mesa Volume II" August 19, 2003, File P-09/D002 46. "Sunrise Estates Units 2 & 3"
- 47. "Timarron West Unit 5 Grading & Erosion Control Plan"
- 48. "Timarron West Unit 4 Grading & Erosion Control Plan"

- 52. "Unser Towne Crossing Plan Set" COA #26048
- 53. "Preliminary Drainage Report for Paradise RV Park-Phase I" August 2011, File K-09/D003
- Avenue" February 2007, File K-9/D033
- 55. "Drainage Masterplan for Avalon Subdivision" February 1998, File K-9/D012
- 56. "Zanios Food Warehouse Addition Phase 4 Grading and Drainage Plan"
- 57. "Unser Crossing Plan Set"
- 58. "Central and Unser Site Plan" File K-10/D055
- 09/D006
- 61. "Drainage Analysis for Bluewater Road near 90th Street" December 2001, File K-09/D022
- 63. "Town of Atrisco Grant, Unit 5 Plan Set" File K-09/D026
- 64. "Drainage Report for Southwynd Subdivision" January 2002, File L10-D020
- 09/D18
- 67. "Sunset West, Unit 2 Temporary Retention Pond Reclamation Improvements" File L-09/D004A
- 68. "Supplemental Information for Sage & Unser Marketplace" File M-10/D019
- 09/D013
- 70. "Drainage Report for Sunset West Unit 2" April 1994, File M-09/D004
- 71. "Drainage Report for Blake Road Subdivision" June 1998, File N-10/D003
- 72. "Casa del Sueno & Casa de Ver" File N-10/D001
- 74. "Revision to the Master Drainage Plan for the Rio Bravo Sector Development Plan"

Amole-Hubbell Drainage Master 2013 Report

49. "Drainage Report for Meridian Business Park II A Supplement to the Master Drainage Plan for Atrisco Business Park" August 2007, File J-10/D002G 50. "Master Drainage Plan for Atrisco Business Park" September 1992, File J-10/D002 51. "Master Drainage Plan for Atrisco Business Park" October 1993, File J-10/D002 54. "Drainage Report for Commercial Development NW Corner of 98th Street & Central 59. "West Ridge Mobile Home Park" October 1997, File K-09/D006 60. "West Ridge Mobile Home Park Detention Pond Grading and Drainage Plan" File K-62. "Drainage Report for Clifford West Business Park" September 1997, File K-09/D023 65. "Sunset West Unit III Units 17, 18, and 19 Grading and Drainage Plan" File L-09/D012A 66. "Drainage Report & Grading Plan for Valle del Canto Subdivision" August 1997, File L-69. "Truman Middle School Phase I Improvements Grading and Drainage Plan" File M-

73. "Master Drainage Plan for the West Side Transit Facility" February 2001, File S-9/D016



March 2000, AMAFCA #377.05.03

- 75. "Final Drainage Report for PaakWeree Village" March 2000, AMAFCA #358.02.05
- 76. "Westgate Diversion Channels Snow Vista Channel-Phase I"
- 77. "Westgate Diversion Channels Snow Vista Channel-Phase II & III"
- 78. "Amole del Norte Storm Diversion Facilities Tierra Bayita Drainage Facilities" June 1995
- 79. "Master Drainage Report Tracts B, C, & D PaakWeree Bulk Land Plat" County #PWDN 70112
- 80. "Paradise RV Park Drainage Report" August 2011



Amole-Hubbell Drainage Master

2013 Report



2. Hydrologic Analysis

2.1 Methodology

The Arid-lands Hydrologic Model-S4 (AHYMO) was used to calculate the 100-year peak flow rates and volumetric runoff. The unit hydrograph procedure is utilized in the AHYMO program to compute individual sub-basin runoff hydrographs. AHYMO's hydrologic methodology is discussed in the COA's Development Process Manual (DPM), Chapter 22-Drainage, Flood Control and Erosion Control (July 1997). The basin's physical properties input into the command include sub-basin area, percent of land treatment types, rainfall distribution, and the time to peak. Previous computations for the rainfall distribution and time to peak are linked into the command. The "Rainfall" and "Compute LT TP" commands compute the rainfall distribution and the time to peak, respectively. The AHYMO computations for 24-hour storm will be used for volumes; the 6-hour storm computations will be used for peak flow rates.

Hydrographs were routed using the channel, pipe, and reservoir routing commands. A rating curve command, followed by the computed travel time for channels and pipes, was used to account for the discharge relations based on headwater and slope. Ponds were modeled using the route reservoir command. Input of the route reservoir command requires stage, storage, and discharge for each incremental elevation.

2.2 Hydrologic Characteristics

2.2.1 Watershed Delineation

The Amole-Hubbell Watershed is divided into seven sub-basin for evaluation. The following list outlines the seven basins that were delineated:

- 1. Powerline Basin (PL)
- 2. South Powerline Basin (SP)
- 3. Snow Vista Basin (SV)

- 4. Amole Basin (A)
- 5. Amole del Norte Basin
 - o 98th & Central Basin (NE)
 - Unser/214 Basin (U)
 - Tierra Bayita Basin (TB)
 - Atrisco Business Park Basin (AB)
 - Tower/Sage Basin (TS)
 - South Amole del Norte Basin (SA)
- 6. Borrega Basin (B)
- 7. Rio Bravo Basin (RB)

The basin boundaries vary slightly from the original DMP. Basin variations are due to drainage infrastructure realignments, constructed development since the adopted Amole-Hubbell DMP routed runoff differently, and master plans differing from the original DMP. The basin names were kept the same as those used in the original Amole-Hubbell DMP. The existing sub-basin identifications are 100 series; the proposed sub-basin identifications are 200 series.

Resources used to define sub-basins included 2010 Bernalillo County Light Detection and Ranging (LIDAR) mapping data, 2010 Bernalillo County Orthoimagery, and the latest COA parcel shapefile. LIDAR point and breakline files were provided by AMAFCA. By using the mapping data, contour intervals of 2-ft were generated in AutoCAD.

2.2.2 Precipitation

The precipitation depths for the 0.25-, 1-, 6-, and 24-hour storms, 100-year storm frequency were obtained from the original Amole-Hubbell DMP. Rainfall amounts were gathered from the COA DPM and the National Oceanographic and Atmospheric Administration (NOAA), Atlas 14. Table 2-1 lists the precipitation depths used to determine the rainfall distribution.



Table 2-1: NOAA Precipitation Depths								
Storm Duration for 100-Year Frequency (hr)	Precipitation Depth (in)							
0.25	1.46							
1	1.87							
6	2.20							
24	2.66							

2.2.3 Sediment Bulking

Sediment is gathered into flowing water when the land surface erodes. Sediment bulking factors are applied to both the existing and proposed conditions to account for the increase in runoff due to sediment transport. Two factors influence sediment bulking: pervious area and slope of the terrain. An undeveloped site produces more sediment due to the higher percentage of pervious area. Existing conditions produce a higher bulking factor due to the undeveloped sites. All basins have undeveloped areas, but the basins' undeveloped percentages vary. Basins with a higher percentage of undeveloped sites than developed sites were allocated a 12% bulking factor. These basins include the Powerline Basin, South Powerline Basin, and Borrega Basin. An increase of impervious area reduces land surface erosion. Therefore, a bulking factor of 6% was applied for the basins that have a higher percentage of developed sites than undeveloped sites. These basins include the Amole Basin, Amole del Norte Basin, Rio Bravo Basin, and Snow Vista Basin. An increase of impervious area in a fully-developed watershed reduces land surface erosion.

2.2.4 Land Use

A sub-basin's land condition is recognized in AHYMO by either land treatment or curve number. Land treatment percentages were input into AHYMO_97 under this analysis. COA's 1997 DPM describes and classifies the land treatments into four categories (A, B, C, and D). A 2010 orthoimagery, 2010 LIDAR, digitized parcel base map, and current zoning were used to help determine the land use for the existing condition. Table 2-2 distributes the land treatment percentages accordingly. The right column of the table (Methodology/Notes) presents the procedure used to distribute the land treatment percentages. Land treatment percentages were weighted for sub-basins with two or more land uses. Each basin may

contain a land treatment or a mixture of land treatments. For an illustration of the existing land uses, refer to Figure A-2 (Existing Land Use Map). For the proposed conditions, various sector plans were used to determine proposed land uses. Land treatments were determined by using Table 2-2. Refer to Figure 2-2 (Proposed Land Use Map) for an illustration of the proposed land uses.

Table 2-2: Land Treatment Type Percentage Summary											
	Land Tr	eatment	Percenta	iges (%)							
Layer	Туре	Туре	Туре	Туре	Methodology/Notes						
	A	B	С	D							
Land Use 1 Du/Ac	0	41	42	17	DPM for D, Split B & C						
Land Use 4 Du/Ac	0	29	29	42	DPM for D, Split B & C						
Land Use 5 Du/Ac	0	25	26	49	DPM for D, Split B & C						
Land Use 6 Du/Ac	0	21	22	57	DPM for D, Split B & C						
Land Use 7 Du/Ac	0	18	18	64	DPM for D, Split B & C						
Land Use 8 Du/Ac	0	14	15	71	DPM for D, Split B & C						
Land Use 9 Du/Ac	0	10	11	79	DPM for D, Split B & C						
Land Use Commercial	0	5	5	90	DPM for D, Split B & C						
Land Use Heavy Industrial	0	10	10	80	DPM for D, Split B & C						
Land Use Light Industrial	0	15	15	70	DPM for D, Split B & C						
Land Use Mobile Homes	0	20	20	60	DPM for D, Split B & C						
Land Use Open Space	79	8	8	5	DPM for 5 Ac						
Land Use Platted Mass Graded	0	0	95	5	Assumed 5% D, Remaining C						
Land Use Platted Undeveloped	79	8	8	5	Treatment from SSCAFCA Table						
Land Use School	0	25	25	50	DPM for D, Split B & C						
Land Use Townhomes	0	15	15	70	DPM for D, Split B & C						
Land Use Slope 0 to 10	100	0	0	0	DPM						
Land Use Slope 10 to 20	0	100	0	0	DPM						
Land Use SU-1	0	5	5	90	DPM for D, Split B & C						
Land Use SU-2	0	5	5	90	DPM for D, Split B & C						

Amole-Hubbell Drainage Master 2013 Report





Figure 2-1: Amole-Hubbell Watershed Overall Basin Map



Amole-Hubbell Drainage Master 2013 Report





Figure 2-2: Proposed Land Use Map



Amole-Hubbell Drainage Master 2013 Report

LEGEND

COMMERCIAL HEAVY INDUSTRIAL LIGHT INDUSTRIAL RESIDENTIAL ESTATES 4 DU/AC RESIDENTIAL ESTATES 5 DU/AC RESIDENTIAL ESTATES 6 DU/AC RESIDENTIAL ESTATES 7 DU/AC **RESIDENTIAL ESTATES 8 DU/AC** RESIDENTIAL ESTATES 9 DU/AC PLATTED UNDEVELOPED LOTS PLATTED MASS GRADED LOTS ESCARPMENT 0 TO 10% SLOPES ESCARPMENT 10 TO 20% SLOPES

Site Proposed land use Light Industrial

SAD 214

POND



3.5.3 Tierra Bayita Area

Existing Conditions

The Tierra Bayita Basin is approximately 1.40 sq. mi. and is irregularly shaped with I-40 bounding the north, 98th Street bounding the west, Eucariz Avenue being the most southern boundary, and Coors Boulevard being the most eastern boundary. Several land uses in Tierra Bayita Basin include industrial, commercial, undeveloped platted lots, mass graded platted lots, and residential. Main storm drain systems have been constructed in the Tierra Bayita Basin. Stub-outs have been set along the storm drain portion on Bluewater Road. Most developments are allowed free discharge to the public storm drain. The developments in Sub-Basin TB103 and TB105 were required to construct Pond TB2 and Pond TB3, respectively. There are three major storm drain systems which convey runoff to the Tierra Bayita Channel.

Runoff from Sub-Basin TB101 and Sub-Basin TB102 is retained in Pond TB1. Once these sub-basins are developed, the storm drain on Bluewater Road will intercept its controlled runoff release. From the Bluewater Road and 90th Street intersection, this storm drain system bends 90 degrees and follows 90th Street to Volcano Road, then bends at 90th Street to Bridge, then finally it runs along Bridge Boulevard until outletting into the Tierra Bayita Channel. Pond TB2 and TB3 release a controlled rate into this system. A lateral is extended from 90th Street on Central Avenue to the two cell pond located in the 98th & Central Area.

The second major storm drain in the Tierra Bayita Basin is on Sunset Garden Road, which begins near its intersection with 86th Street and runs east to Unser Boulevard, then north on Unser Boulevard until emptying into the Tierra Bayita Channel. This system receives free discharge from its respective drainage area. The third system begins in the Unser/214 Area. The portion in the Tierra Bayita Basin is in Unser Boulevard from Avalon Road to Tierra Bayita Channel. Refer to Appendix A for hydrologic data and existing hydrologic model diagram.

Proposed Conditions

Per the Bluewater Road near 90th Street Drainage Analysis by Tierra West dated 12-20-01 basins 202.1 and 202.2 have been restricted to 2.05 cfs/ac. To achieve this restriction, ponds were created in AHYMO to reduce runoff to the restricted rate. Also, in the proposed condition TB 101 has been shifted to the 98th & Central Basin. The Coors North South pond in the proposed condition is overtopping. The pond needs to be increased in size to hold 75 acft of runoff. Refer to Table 3-11 for hydrologic data and Figure 3-14 for proposed hydrologic model diagram.

Recommendations:

Below are the recommendations from 1999 Amole-Hubbell DMP for the basin along with the status of the recommendation:

No recommendations from the 1999 Amole Hubbell DMP

Additional Recommendations for the basin based on updated basin analysis are below:

- Restrict future basin flows to 2.5 cfs/acre for basins 202.1 and 202.2.
- Increase volume of Coors N-S Pond to 75 ac-ft.









Amole-Hubbell Drainage Master







Figure 3-14: Tierra Bayita Basin - Proposed Hydrologic Model Diagram



Figure 3-14: Tierra Bayita Basin - Proposed Hydrologic Model Diagram



	Table 3-11: Tie	erra Bayita Area -	Proposed Sub-Basin Pea	k Discharge and Volumes	
	Sub-Basin	Area (ac)	Q _{100yr-6hr} (cfs)	V _{100yr-24hr} (ac-ft)	
ſ	TB202.1	88	286.10	11.871	
ſ	TB202.2	56	234.77	9.208	
	TB203	32	123.90	4.854	
	TB204	25	106.80	4.584	
	TB205	29	115.37	4.583	
	TB206	16	64.63	2.570	
	TB207	44	180.99	7.480	
	TB208	32	125.02	5.303	
	TB209	20	85.75	3.659	
	TB210	47	175.08	7.917 ←	Site is 10 acres of sub-
	TB211	15	66.05	2.870	basin TB210.
	TB212	44	159.66	7.680	
	TB213	30	133.59	5.771	
	TB214	17	68.55	2.713	
	TB215	72	195.06	9.623	
	TB216	21	89.82	3.817	
	TB217	12	50.87	2.147	
	TB218	23	73.14	2.353	
	TB219	15	58.43	2.347	
	TB220	24	96.97	3.995	
	TB221	37	137.45	5.770	
	TB222	45	155.17	7.233	
	TB223	46	129.70	6.937	
	TB224	102	236.51	15.234	
	TB202.1	88	286.10	11.871	



Amole-Hubbell Prainage Master 2013 Report



Appendix A



Amole-Hubbell Plan Update

2013 Report





Figure A-1: Existing Amole-Hubbell Watershed Overall Basin Map



Amole-Hubbell Drainage Master

2013 Report







Amole-Hubbell Drainage Master 2013 Report

Appendix A-2





Figure A-11: 98th & Central, Unser/214 and Tierra Bayita Area - Existing Basin Map



Amole-Hubbell Drainage Master



Table A-5: 98th & Central Area - Existing Sub-Basin Peak Discharge and Volumes									
Sub-Basin	Area (ac)	Q _{100yr-6hr} (cfs)	V _{100yr-24hr} (ac-ft)						
NE101	92.9344	174.96	6.135						
NE102	48.6656	104.16	3.213						
NE103	41.2224	86.91	2.721						
NE104	26.8608	50.09	1.773						
NE105	54.0096	107.10	3.565						
NE106	36.7424	112.05	4.958						
NE107	27.68	62.04	1.933						
NE108	28.9408	66.03	2.060						
NE109	27.7504	70.00	2.429						
NE110	83.104	226.50	11.018						
NE111	15.0784	21.87	0.995						



Figure A-12: 98th & Central Area - Existing Hydrologic Model Diagram



Amole-Hubbell Drainage Master

2013 Report



Table A-6: Unser/214 Area - Existing Sub-Basin Peak Discharge and Volumes										
Sub-Basin	Area (ac)	Q _{100yr-6hr} (cfs)	V _{100yr-24hr} (ac-ft)							
U101	29	87.84	3.250							
U102	83	210.77	6.342							
U103	34	124.08	4.785							
U104	32	113.20	4.336							
U105	50	87.38	3.688							
U106	62	185.29	8.330							
U107	29	114.78	4.611							
U108	25	100.24	3.901							
U109	21	85.46	3.341							



Figure A-13: Unser/214 Area - Existing Hydrologic Model Diagram



Amole-Hubbell Plan Update

2013 Report





Figure A-14: Tierra Bayita Area - Existing Hydrologic Model Diagram





Amole-Hubbell Drainage Master

2013 Report

Figure A-14 Continued: Tierra Bayita Area - Existing Hydrologic Model Diagram



Х	ayita Area -	- Existing Sub-Basin Peak	Dis	charge and Volumes	
	Area (ac)	Q _{100yr-6hr} (cfs)		V _{100yr-24hr} (ac-ft)	
	38	72.00		2.541	
	127	262.15		9.045	
	32	95.47		3.466	
	25	65.34		2.276	
	29	114.69		4.547	
	16	63.21		2.493	
	44	167.57		6.744	
	32	125.04		5.303	
	20	64.51		2.501	
	47	151.15		6.595	-
	15	59.32		2.489	_
	44	129.57		6.200	
	30	81.29		2.917	
	17	68.45		2.708	
	72	161.37		8.077	
	21	72.69		2.883	
	12	36.81		1.381	
	23	73.05		2.350	
	15	58.42		2.347	
	24	96.96		3.996	
	37	126.91		5.266	
	45	155.20		7.233	
	46	129.72		6.937	
	102	229.28		14.742	
	84	193.74		6.855	



Appendix A-17



Appendix B



Amole-Hubbell Drainage Master 2013 Report



		FROM	TO		PEAK	RONOFF		TIME TO	CES	PAGE =	3			FROM	TO		PEAK	RUNOFF		TIME TO	CFS	PAGE =	4
	HYDROGRAPH	ID	ID	AREA	DISCHARGE	VOLUME	RUNOFF	PEAK	PER				HYDROGRAPH	ID	ID	AREA	DISCHARGE	VOLUME	RUNOFF	PEAK	PER		
COMMAND	IDENTIFICATION	NO.	NO.	(SQ MI)	(CFS)	(AC-FT)	(INCHES)	(HOURS)	ACRE	NOTATI	ON	COMMAND	IDENTIFICATION	NO.	NO.	(SQ MI)	(CFS)	(AC-FT)	(INCHES)	(HOURS)	ACRE	NOTATI	ON
				CONTRACTOR CONTRACTOR	212/21-22/07	1000		1.1.2.1.1.1.2.2.2.1.1	12010000000														
ROUTE MCUNGE	U206SUMRt	1	2	0.17626	344,43	18.512	1.96923	1.667	3.053	CCODE =	0.2	COMPUTE NM HYD	TB216	1.00	1	0.03257	89-82	3.817	2.19729	1.533	4.309	PER IMP=	82.40
COMPUTE NM HYD	0 0208	-	1	0.03976	98.33	3.902	1.84009	1.533	3.864	PER IMP=	56.50	ROUTE MCUNGE	TB216RT	1	3	0.03257	89.27	3,809	2.19265	1.600	4.283	CCODE =	0.1
ADD HYD	U208SUMB	26 1	1	0,21602	411.84	22.414	1,94546	1,633	2.979			ADD HYD	TB213SUMA	26 3	1	1.38507	809.90	120,192	1.62707	1.633	0.914		
COMPUTE NM HYD	0 0209	-	2	0.03339	85.47	3.341	1.87591	1.533	4.000	PER IMP=	58.20	*S APTER					0.000.000	2010-000 / 2010-000	(*************************************	100.00319161			
ADD HYD	U209SUM	16 2	1	0.24941	480.60	25.754	1,93614	1.567	3.011			COMPUTE NM HYD	TB 21 2			0.04712	122 60	E 331	2 29622	1 500	4 420	DED TMD-	99 10
POUTE DESEBUOT	P PONDU214	0.254.50	30	0 24941	137.74	25 754	1,93614	2.000	0.863	BC-FT=	11.000	ADD UVD	TRAIDCIMP	1. 0	- 51	1 43010	015.05	TOF OCO	1 640002	2,000	0.000	FER INF.	03+14
ADD HVD	TIDOSSIMA	10+20	4.2	0 64676	226.00	66 102	1 89483	1.600	0 648	100 0.0	あれたのれたい	ADD HID	182133008	- FM +	÷.	1.4321.9	913193	125,905	1104909	1,000	0.333	anone -	10.000
ADD RID	-020650PA	10620	-4 Z -	10104020	220100	001103	1103403	1,000	0.040			ROUTE MCUNGE	IB2135UMBRI	1	2	1,43219	884-55	125,699	1+64063	1+633	0,965	CCODR =	0+2
S APUS												COMPUTE NM HYD	TB214	100 T	1	0.02685	68.55	2.713	1.89453	1.533	3,989	PER IMP=	60,76
												ADD HYD	TB214SUM	2% I	1	1,45904	931.52	128,412	1,65021	1,633	0,998		
.5	END OF OF	NSEH-21	L4 BAS	TØ								*S APTB7											
*5*********	************	******	*****	***********	***********	**********	-					ROUTE MCUNGE	TB214SUMRT	1	10	1,45904	887,60	127,822	1,64264	1,667	0,951	CCODE =	0.2
*2***********		******		***********	*************	*********					• • • •	ROUTE MCUNGE	UNBASINRT	4.2	11	0.54526	224.57	55,089	1,89435	1.633	0.644	CCODE =	0.1
*5********	TIERRA B2	AYITA I	BASIN									COMPUTE NM HYD	TB210	-	1	0.07272	175.08	7.917	2.04123	1.567	3.76Z	PER IMP=	71.83
* - * * * * * * * * * * * * *	**************	******	*****	***********	********	***********						COMPUTE NM HYD	TB211	-	2	0.02330	66.05	2,870	2.30948	1.533	4.429	PER IMP=	90.00
COMPUTE NM HYD	TB202.1		1	0.13801	286.10	13.441	1,82608	1.567	3.239	PER IMP=	63.00	ADD HYD	TB 211 SUM	1.4 2	1	0.09602	238-63	10.787	2,10631	1.533	2,883		
ROUTE RESERVOI	R PondTB1A	1	30	0.13801	180.05	13.441	1,82608	1.733	2.038	AC-FT=	2.194	AS ADTRA	104440011		752								
ROUTE MCUNGE	PONDTRIRT	3.0	1	0.13801	180.05	13.438	1.82563	1.766	2.038	CCODE =	0.1	DOUTE MODICE	TRODUCTION		80	0.09603	226 24	10 760	2 10200	1.600	3 044	00000 -	10.11
COMPUTE NM HYD	TR20.2.2	1.123	- 81	0.08784	224.77	10 586	2.25974	1 522	4 176	DED IMD-	86 90	CONDUCT NOUNGE	TB2TISUNKI	-	- E2	0.05002	250.24	10,103	2,10200	1,000	3,011	DED THE	75 00
DOUTE DECEDIOT	D DondEDID	10	20	0.00704	114.06	10 500	2 25073	1 739	2,020	20-77-	0.530	COMPUTE NM HID	18414		*	0.06855	109-00	1.680	2+10008	1-207	3.039	LEE THE	10.20
ROOTE RESERVOI	Fondibib	·	20	0.00704	114100	20.000	5.20710	1.100	2.025 2.025	NC - E I -	6.13.20	ADD HYD	TB212SUMA	16 2	1	0,16457	394 - 32	18.449	2,10191	1,600	3.799		
ADD HID	IB202.250M	1430	1	0,22585	294,11	24.024	1,99440	1, 133	2.035	0.0.0.0.0	S 23	*S APTB5						7/222 2/2/2					
ROOTE MCONGE	TB202.2SOMRT	+	2	0.22585	593191	23-803	1,98114	1,933	2.033	CCODR =	0.2	ADD HYD	TB212SUMB	114 1	1	0.70983	615,80	73,537	1,94247	1,600	1,356		
COMPUTE NM HYD) TB103	1.2	1	0.04991	123.90	4.854	1,82356	1.533	3,879	PER IMP=	57.00	*S APTB6											
ROUTE RESERVOI	R PondTB2	1	30	0.04991	66.57	4-854	1.82355	1.667	2.084	AC-FT=	1.918	ROUTE MCUNGE	TE212SUMBRT	1	2	0.70983	612.49	73.532	1,94232	1.633	1.348	CCODE =	0.2
*S Outflow equ	als to 49.4 cf	s From	"DMP	for Avalon Sub	division" on 1	Pg 3						ADD HYD	TB215SUMA	10.6 2	1	2,16887	1491-18	201.351	1.74069	1.633	1.074		
ADD HYD	PONDTB2SUM	2430	1	0.27576	355.53	28.717	1,95261	1.733	2.014			COMPUTE NM HYD	TB215	-	2	0.11272	195.06	9,623	1,60072	1.633	2,704	PER IMP=	36.70
ROUTE MCUNGE	PONDTB2SUMRT	1	2	0.27576	344.83	28.170	1.91538	1.900	1.954	CCODE =	0.2	ADD HYD	TB215SUMB	16 2	1.0	2,28159	1686.25	210,974	1,73378	1,633	1,155		
COMPUTE NM HYD	TB204	-	Т	0.03918	106.93	4.584	2.19364	1.533	4.265	PER IMP-	83.50	COMPUTE NM HYD	TB217	-	1	0.01861	50.97	2.147	2.16346	1.533	4,271	PER TMP-	0.00
BOUTE MCUNGE	TB204BT	1	3	0.03918	106.92	4.593	2,19316	1.533	4.264	CCODE =	0.2	BOUTE MCDUCE	7501757	4	58	0.01061	80.00	2.7.45	2 16146	1 547	4 265	CCODR -	0.1
COMPUTE NM HYD	TR205	- C.	1	0.04575	115.37	4.583	1,87843	1.533	3,040	PED IMP-	60,80	COMPUTE NM UVD	1021 (61	÷	20	0.03600	05 07	2.123	2,10140	1,007	4,200	DED THD	73.00
DONTE DECEDUOT	D DondTD3		30	0.04575	21 22	4 503	1 07040	1 000	1 004	AC-FT-	0. 4.20	COMPUTE NM HID	18220		÷.	0.03690	30.91	21990	2.03025	1,000	4,100	FAR INP=	11,00
KOOTE KESERVOI	anded new most			41 Jac 15 7 1	6	8.000	4+07044	1+000	11004	Wr -t I -	619EV	ADD HID	1822050M	28 1		0.05551	143-04	0.141	2.07421	1,033	4.026	1111 C 11 C 11 C 11 C 11 C 11 C 11 C 1	12212125
-S Pond never	graded per proj	posed k	SGD WL	th date 12-/-1	u Santana sa							COMPUTE NM HYD	TH218	-	2	0.03573	73.14	2.353	1,23479	1,533	3,198	PER IMP=	17.12
"S Fond likely	Will be modif:	red bet	r pran	, but left as	existing							ROUTE MCUNGE	TB218RT	2	3	0,03573	71.94	2.347	1,23144	1.567	3,146	CCODE =	0.1
*5 Assumed ex1	sting 30" RCP (outlet	with	0.5% alope	1.22 658	1200	121 222 232	(i) 2323				COMPUTE NM HYD	TB219		2	0,02285	58.43	2.347	1,92566	1,533	3,995	PER IMP=	64.00
ADD HYD	PONDTB3SUM	3630	1	0.08493	129+96	9.166	2,02348	1,567	2.391			ADD HYD	TB219SUM	24 3	2	0.05858	126-10	4,693	1,50222	1,567	3,363		
ROUTE MCUNGE	PondTB3SUMRT	1	3	0.08493	129,92	9.166	Z.02347	1,567	2.390	CCODE =	0.2	ADD HYD	TB221SUMA	1.6 2	1	0.11409	267.16	10,834	1,78052	1.533	3.659		
ADD HYD	TB206SUMA	26.3	1	0.36069	407.53	37.335	1.94083	1.800	1.765			*5 APTB8											
ROUTE MCUNGE	TB206SUMART	1	2	0.36069	400,53	36,930	1,91978	1,833	1.735	CCODE =	0.2	ROUTE MCUNGE	TB221SUMART	1	2	0.11409	267.14	10,823	1,77867	1.567	3,659	CCODE =	0.1
COMPUTE NM HYD	TB206		1	0.02559	64.63	2.570	1.88298	1.533	3.946	PER IMP=	61.10	COMPUTE NM HYD	TB221		1	0.05769	137.45	5,770	1.87544	1.533	3,723	PER IMP-	60.54
ADD HYD	TB206SUMB	26 1	1	0,38628	417,80	39.500	1,91734	1,766	1.690			ADD HYD	TB221SUMB	26 1	1	0 17179	401.85	16.593	1,81116	1.567	3.655	A STATE OF A	
*S APTRI												DOUTE MOUNCE	TP321 CHMPDT		20	0 77170	205 05	76 560	1 00004	1 600	2 471	CCODR -	0.2
ROUTE MOUNCE	TR206 SUMBRT	1	10	0.38628	412:09	39.069	1.89639	1.833	1.667	CCODE	0.2	COMPLETE NM UND	TDAALSONDAL	-	20	0.07064	125 17	10.000	1 01076	4 ECT	2 422	DED IMD-	62 60
DOUTE MOUNCE	NEDACTNET	1.00		0 01630	21 00	61 027	1.40100	14 76B	0.042	000000 -	0.5	COMPUTE NP HID	10666		÷.	0.07064	100-11	1.600	4+24210	A+307	2.40X	LTW THE	03100
CONDUCT NH UND	NEDAOINKI		- 20	0.01000	100.00	7.400	2.05000	1 630	4 356	DED THE	72.00	ADD HID	15222SUMA	28.1	1.	0,24242	0.00 - 22	23,802	1,84094	1,600	3,546		
COMPUTE NM HID	18207		-	0.06805	100.25	7.450	2.00089	1.555	9.130	PER IMP-	12.30	*S APTB9		1243			S123 - 537	2201 2221	- 20 N. 26				
COMPUTE NM HID	18206	1.57	8	0.05040	125+02	0-303	1,97290	1,033	3.870	PER INDE	67.20	ADD HYD	TB222SUMB	100 1	1	2,52401	2210.89	234,776	1,74407	1,633	1,369		
ADD HYD	TB208SUMA	26 3	2	0.11845	306.01	12.783	2.02344	1.533	4.037			*S APTBIO											
ADD HYD	TB208SUMB	14 2	1	0,93533	315.55	73,820	1.47983	1,533	0.527			ROUTE MCUNGE	TB222SUMBRT	1	2	2,52401	2205.93	234,732	1,74375	1,633	1,366	CCODE =	0.1
*S APTB2												COMPUTE NM HYD	TB223	-	1	0.07133	129-70	6,937	1,82355	1.633	2.841	PER IMP=	57.00
ROUTE MCUNGE	TB2085UMBRT	1	2	0.93533	314.41	73.819	1,47981	1.533	0.525	CCODE =	0.2	COMPUTE NM HYD	TB224	-	3	0.15974	236.51	15.234	1,78814	1.733	2.313	PER IMP=	54.40
ADD HYD	TB209SUMA	108 2	1	1.32161	677.91	112.888	1.60156	1.567	0.801			ADD HYD	TB224SUMA	10 3	1	0.23107	355.12	22.171	1,79907	1.700	2,401		
COMPUTE NM HYD	TB209		2	0.03089	85.75	3.659	2,22091	1,500	4.338	PER IMP=	84.00	ADD HYD	TB224 SHMB	26 1	43	2,75508	2549.14	256,903	1,74838	1.667	1,445		
ADD HYD	TB209SUMB	14 2	1	1.35250	757.08	116,547	1,61571	1.567	0.875			* C***********	*************		******	*********	************	***********	+ 1 / 49 / 9	-+ × × × /	*****V		
ROUTE MCUNGE	TB209.5UMBRT	1	2	1.35250	723.70	116.383	1.61345	1.633	0.836	CCODE =	0.2	* ************	** THE OF	TTPDDA	DAVITS	BASTN							
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APPENDIX E: EROSION AND SEDIMENT CONTROL PLANS





APPENDIX F: GRADING AND DRAINAGE PLAN









