DRAINAGE MANAGEMENT PLAN

RAINBOW TRIBUTARY OF THE CALABACILLAS ARROYO

A COMPONENT OF THE CALABACILLAS ARROYO WATERSHED

PREPARED FOR THE CITY OF RIO RANCHO, NEW MEXICO

SOUTHERN SANDOVAL COUNTY ARROYO FLOOD CONTROL AUTHORITY

OCTOBER 2004

PREPARED BY

ASCG
INCORPORATED
ENGINEERS • ARCHITECTS • SURVEYORS • PLANNERS
6501 Americas Parkway NE, Suite 400
Albuquerque, New Mexico 87110

ASCG Project #20289

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DRAINAGE MANAGEMENT PLAN FOR RAINBOW TRIBUTARY OF THE CALABACILLAS ARROYO

I, Clinton Dodge, Registered Professional Engineer No. 6410, hereby certify that these documents were prepared by me, or directly under my supervision, and are true and correct to the best of my knowledge and belief.

Clinton Dodge, P.E.
New Mexico P.E. No. 6410

This is a planning document. Although it is the intent of the City and SSCAFCA that a drainage system be completed to address the goals and recommendations of this Plan, this drainage plan does not obligate the City of Rio Rancho or SSCAFCA in any way. Drainage facility alignments, corridors, locations, treatments and cost estimates are recommended, but are conceptual only, and may be altered or revised based upon future project analysis, changed circumstances or otherwise. Land uses included in this document were assumed for the basis for hydrologic analysis only.

ACCEPTED BY:

City of Rio Rancho — Date 1/7/05

Southern Sandoval County Arroyo Flood Control Authority — Date 1-3-05

OCTOBER 2004

RAINBOW TRIBUTARY DRAINAGE MANAGEMENT PLAN
ABBREVIATIONS AND ACRONYMS

Ac	Acre
AF	Acre feet of runoff (volume of water covering one acre, one foot deep)
AF/Ac	Acre feet of runoff per acre
AHYMO	Arid-lands Hydrologic Model – Computer program to compute runoff rates and volumes
AMAFCA	Albuquerque Metropolitan Arroyo Food Control Authority
cfs	Cubic feet per second – flow rate (1 cfs = 1.98 AF per day, 1 cfs = 448.8 gallons per minute)
cfs/Ac	Cubic feet per second per acre
CLOMR	Conditional Letter of map Revision
CMP	Corrugated Metal Pipe
COA	City of Albuquerque
CY	Cubic yard
DPM	Development Process Manual
FEMA	Federal Emergency Management Administration
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
LOMR	Letter of Map Revision
NOAA	National Oceanic and Atmospheric Administration
NM	New Mexico
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
RCP	Reinforced Concrete Pipe
RD	Reference Document
ROW	Right-of-Way
SD	Storm Drain
SEO	State Engineers Office
SSCAFCA	Southern Sandoval County Arroyo Flood Control Authority
SWQ	Storm Water Quality
USGS	United States Geological Survey

RAINBOW TRIBUTARY OF THE CALABACILLAS ARROYO

DRAINAGE MANAGEMENT PLAN

TABLE OF CONTENTS

RAINBOW TRIBUTARY OF THE CALABACILLAS ARROYO DRAINAGE MANAGEMENT PLAN

October 2004

This Drainage Management Plan (DMP) is for the Rainbow Tributary of the Calabacillas Arroyo north of Southern Boulevard. The study area encompasses approximately 900 acres extending 2.4 miles north of Southern Boulevard and is located east of Rainbow Boulevard. The DMP study area is shown on Figures 1 and 2. Details of development of the DMP and technical data are included in the separately bound Technical Appendix.

I. Objectives/Goals:

A. Correct/Resolve Existing Facility Deficiencies. Existing deficiencies under current conditions identified in this plan include:

1. Vancouver to Pecos Loop Channel Freeboard. This is a minor freeboard deficiency for existing flows with adequate bank-full capacity to convey the 100-year runoff rate of 540 cfs.
2. Pecos Loop Crossing Freeboard. The existing 100-year flow equals bank full capacity with the water surface at the property line. Increased upstream runoff will potentially flood private property at this crossing.
3. Rainbow Park Channel Stability. The existing natural channel erodes and meanders within the undeveloped portion of the park and does not currently endanger structures other than park sidewalk, paving, etc.
4. Basin 71A Storm Drain just west of the Rainbow culvert outfalls directly onto Southern Blvd. exceeding the local street capacity.

B. Remove existing developed properties and areas subject to development from FEMA flood hazard areas. See Approximate FEMA flood hazard limits on Figure 2.

1. Existing Floodplain – Inca Rd to Vancouver Rd. This is approximately 450' wide and encompasses approximately 27 properties.
2. Vancouver Rd to Southern Blvd – The FEMA floodplain is contained within the channel ROW.

C. Improve conveyance between Inca Road and Vancouver Road.

1. Reduce culvert sizes at Inca, Tulip and Idalia Rd. crossings.
2. Minimize potential conflicts with existing utilities. Two large diameter (16" and 20") gas lines cross the flow path at Idalia Rd.

D. Identify a Drainage Management Plan for the undeveloped area north (upstream) of Inca Road.

II. Criteria

The DMP is based on the following City/SSCAFCA criteria, constraints and assumptions.

A. Protect existing and downstream facilities.

1. Include provision for eventual non-erosive conveyance of runoff.
2. Avoid diversion of runoff without constructed downstream facilities with adequate capacity.
3. Consider probable development sequences and potential funding constraints.

B. Hydrology

1. 100-year 24-hour return frequency design storm.
2. Land use coefficients based on existing platting with full development and paved streets.
3. Residential properties are assumed to discharge without detention ponding.
4. SSCAFCA adopted AHYMO land use parameters.
5. Bulking factor of 6% (assumes fully developed conditions with paved streets).

C. Stormwater Quality

1. Include interception and treatment of the first 0.25" of runoff in detention facilities where runoff is conveyed through a detention basin.
2. Incorporate debris removal in detention basins.

III. Alternates

An initial evaluation determined that the existing channel and crossing structures from Vancouver Rd. to Southern Blvd. were adequate for existing conditions, but inadequate to accept increased runoff from further development. This evaluation also determined that reduction of the peak runoff rate from the basin area upstream of Vancouver was preferable to re-constructing the existing channel between Vancouver Rd. and Southern Blvd. and re-constructing the crossing culverts at Pecos Loop and Southern Blvd.

Five alternates were defined and evaluated to accomplish the flow rate reduction using detention ponds upstream of Inca Rd. These alternates are illustrated and summarized on Figures 3 through 7 and Tables 2, 3 and 4. Technical data is defined in the separately bound Technical Appendix. The five alternates are:

- Local Alternate – This Alternate is a system of 4 ponds extending north of Inca Rd. connected by storm drains. Minor freeboard and channel improvements between Inca Rd. and Southern Boulevard are included. A restriction to limit runoff from development north of Pecos Loop to 0.5 cfs/acre until the ponds are constructed is included.
- Regional #1 Alternate – This Alternate consists of one large pond just north of Inca Rd. with a storm drain extending north to collect the runoff. Minor improvements to the channel system are the same as the 'Local' alternate.
- Regional #2 Alternate – This Alternate is similar to Regional #1 except the allowable flow in the streets is increased by using a modified street section and water blocks are included at selected intersections to divert the flow.
- Regional #3 Alternate – This Alternate is similar to Regional #2 except the pond is enlarged to reduce the outfall and reduce the size of the storm drain between Inca Rd. and Vancouver Rd.
- 'No Pond' Alternate – This Alternate does not reduce the flow rate in the system and provides a baseline estimate of the facilities required without detention.

Based on input from the City, it was determined that only the "Local" alternate (Figure 3) and the "Regional #1" Alternate (Figure 4) met City requirements. The Regional #2 and Regional #3 Alternates depend on controlling street runoff using water blocks at intersections. This effectively diverts the runoff out of the current path. Due to the unknown sequence and time table for paving the streets, the use of water blocks was discarded. The "No Pond" Alternate was discarded as too expensive and did not meet the DMP criteria.

The "Local" Alternate was selected based on lowest cost. The "Local" Alternate conceptual cost is approximately $2.6 million, about one-half the cost of the Regional #1 Alternate. The local pond outfall rates are significantly less than the "no pond" discharge resulting in reduced conveyance costs.

The "Local" Alternate utilizes four local public ponds upstream of Inca Rd. to limit the discharge into the lower portion of the basin. This is the proposed plan as summarized on Table 1 and on Figure 3. Table 1 identifies the project objectives and criteria as listed above, with the associated DMP element proposed to meet that objective/criteria.

Street paving is recommended for non-erosive conveyance of runoff but is not included in the overall drainage system project. The drainage system will function without stable non-erosive street conveyance but the streets will erode with the associated continuing maintenance.

IV Drainage Management Plan

The proposed Drainage Management Plan is as follows:

A. Adoption of DMP by the Governing Bodies of Rio Rancho and SSCAFCA.

B. Develop an implementation plan to evaluate funding options:
   - Special Assessment District
   - Impact fees
   - Runoff restrictions to limit developed runoff to essentially the existing rate
   - Cash-in-lieu (i.e. require "on-lot" ponds or allow the property owner to contribute to the regional improvement in lieu of the on-lot pond)

C. Pursue right-of-way acquisition, depending on funding availability, development pressure, etc.

D. The proposed DMP includes the following improvements:

   1. Eliminate the FEMA floodplain on private property, Inca Road to Vancouver Road (shown on Figure 2).

      a. Acquire ROW – 1.4 acres+/-, $42,000.
      b. Construct Inca to Vancouver conveyance swale and 42", 54" and 60" storm drain - $442,000 (note; See Appendix 'G' for cost data) The combination swale and storm drain geometry should be investigated at the time of implementation to define the optimum system.
      c. Prepare and obtain approval of CLOMR/LOMR documents to remove FEMA flood hazard area.
      d. Consider including the area south of Southern Boulevard in the CLOMR/LOMR effort. Potential mapping deficiencies have been noted.

   2. Implement Rainbow Dam system in phases, as funds allow and as development occurs. Limit future discharges to downstream facility capacity. Start at the downstream end and incorporate multiple use and stormwater quality considerations. $2,204,000 construction plus $540,000 ROW.

      a. Inca to Vancouver, $313,000
      b. Inca Pond P-40 – 2.8 acres, 6.9 AF, $329,000
      c. Inca Rd to Sandia Blvd. - storm drain, $138,000.
      d. Sandia Pond P-33 – 5.7 acres, 15.3 AF, $649,000

e. Sandia to 5th Ave - storm drain, $168,000.
f. 5th Ave Pond P-20 – 4.4 acres, 17.0 AF, $654,000
g. 5th Ave to 9th Ave - storm drain, $158,000
h. 9th Ave Pond P-10 – 4.8 acres, 10.7 AF, $516,000
i. Acquire 1 acre ROW and construct swale 9th Ave to 10th Ave w/ Northern Blvd. Crossing, $132,000.

3. Implement Improvements downstream of Vancouver Rd. $255,000.
   a. Construct channel freeboard upgrade, Vancouver Road to Pecos Loop to correct existing deficiency and to match downstream facility capacity.
   b. Construct Park/Landscape channel below Pecos Loop (in conjunction with Rainbow Park development).
   c. Construct Basin R71A outfall diversion from Southern Blvd. to Rainbow Tributary.

4. As development occurs, pave streets to provide non-erosive conveyance. These costs are not included. Phase to match development.

TABLE 1
RAINBOW TRIBUTARY DMP FACILITY SUMMARY LOCAL ALTERNATE

OBJECTIVE/GOAL		PROPOSED DMP ELEMENT	
A.	Existing Conditions Deficiencies		
A1 & A2	Pecos Loop Crossing inadequate, Inadequate channel freeboard, Vancouver to Pecos Loop	1.	In Implementation Plan, evaluate temporarily limiting new development upstream of Pecos Loop to 0.5 cfs/acre. (Until Rainbow Dam System operational)
		2.	Upgrade channel and crossing freeboard.
		3.	Rainbow Dam system to reduce future flows to upgraded capacity. (Phase to match development pace)
A3.	Rainbow Park Channel Unstable		When park develops, stabilize with low flow channel and reinforced turf overbank flow.
A4.	Basin 71A Outfalls directly onto Southern.		Storm drain from existing outfall to Rainbow Channel.
B1 & B2	FEMA Floodplain – Inca Road to Vancouver Road	1.	50' ROW, storm drain and conveyance swale.
		2.	Rainbow Dam System – reduces future flows to SD/swale capacity.
C1 & C2	Minimize culvert sizes, Inca to Vancouver Roads	1.	Rainbow Dam system reduces future flow to SD/swale capacity.
D.	System for managing watershed upstream of Inca Road.	1.	Four local pond "Rainbow Dam System" mitigates the downstream effect of increased runoff due to upstream development.
		2.	Storm drain conveyance for "clean water" pond outfall flows between ponds.
		3.	Local surface conveyance in streets – future paving to provide non-erosive conveyance. Not part of drainage system.
		4.	ROW, shallow swale conveyance and crossing of Northern Blvd. between 9th Ave and 10th Ave.

Note: See Section I for listing of Objectives and Goals

TABLE 2
CONCEPTUAL COST ESTIMATE SUMMARY
RAINBOW TRIBUTARY DMP

LTERNATE	CONSTRUCTION COST	ROW / EASEMENT COST	ROW / EASEMENT ACRES	TOTAL
.OCAL' ALTERNATE(1)(2)	$2,902,000.00	$582,000.00	19.4	$3,484,000.00
REGIONAL 1' ALTERNATE	$4,598,000.00	$567,000.00	18.9	$5,165,000.00
REGIONAL 2' ALTERNATE	$5,004,000.00	$567,000.00	18.9	$5,571,000.00
REGIONAL 3' ALTERNATE	$3,997,000.00	$699,000.00	23.3	$4,696,000.00
NO PONDS' ALTERNATE	$6,806,000.00	$120,000.00	4.0	$6,926,000.00

1) Proposed Alternate
2) Unit Costs for Local Alternate
   Approximate cost per residential lot - $2,500
   Approximate cost per acre - $3,900
Note, see Techncial Appendix for detailed cost data.

TABLE 3
FLOW RATE SUMMARY (100 Yr/24 Hr Storm)
RAINBOW TRIBUTARY DRAINAGE MANAGEMENT PLAN

LOCATION	EXISTING CONDITIONS			- DEVELOPED CONDITIONS -									
				'LOCAL' (1) FIGURE 3		'REGIONAL #1' FIGURE 4		'REGIONAL #2' FIGURE 5		'REGIONAL #3' FIGURE 6		'NO POND' FIGURE 7	
	EXISTING FLOW	EXISTING CAPACITY	EXISTING SYSTEM	FLOW	SYSTEM	FLOW	SYSTEM	FLOW	SYSTEM	FLOW	SYSTEM	FLOW	SYSTEM
10th Ave to Northern		NA	Overland	140 cfs	48" SD	140 cfs	48" SD	140 cfs	Swale	140 cfs	Swale	140 cfs	48" SD
5TH St below 5th Ave.		NA	Overland	5 cfs	18" SD	737 cfs	90" SD	524 cfs	54" SD	524 cfs	54" SD	737 cfs	90" SD
4th St below Sandia		NA	Overland	47 cfs	30" SD	1016 cfs	96" SD	574 cfs	60" SD	574 cfs	60" SD	1016 cfs	96" SD
Inca Rd. crossing		NA	Overland	72 cfs	42" SD	184 cfs	54" SD	165 cfs	54" SD	38 cfs	Swale & 24"	1465 cfs	30' BW Ch
Tulip Rd. crossing		39 cfs	3-18" CMP	148 cfs	54" SD	186 cfs	54" SD	165 cfs	54" SD	52 cfs	Swale & 24"	1595 cfs	30' BW Ch
Vancouver Rd. crossing	368 cfs	Overland	Overland	220 cfs	60 " SD	203 cfs	60 " SD	178 cfs	60 " SD	115 cfs	Swale & 24"	1595 cfs	30' BW Ch
Channel Reach 4	368 cfs	125 cfs	Grade Cont.	280 cfs	1' Upgrade	246 cfs	1' Upgrade	314 cfs	1' Upgrade	195 cfs	1' Upgrade	1700 cfs	30' BW Ch
Channel Reach 5	425 cfs	200 cfs	PCC Sides	290 cfs	1' Upgrade	300 cfs	1' Upgrade	323 cfs	1' Upgrade	261 cfs	1' Upgrade	1745 cfs	30' BW Ch
Pecos Lp crossing	425 cfs	380 cfs	4- 48" CMP	345 cfs	4- 48" CMP	352 cfs	4- 48" CMP	460 cfs	4- 48" CMP	319 cfs	4- 48" CMP	1745 cfs	30' BW CBC
Rainbow Park Channel	425 - 540 cfs	NA	natural	430 cfs	channel	437 cfs	channel	465 cfs	channel	405 cfs	channel	1855 cfs	30' BW Ch
Southern Blvd. crossing	540 cfs	540 cfs	4- 48" CMP	452 cfs	4- 48" CMP	455 cfs	4- 48" CMP	548 cfs	4- 48" CMP	428 cfs	4- 48" CMP	1875 cfs	30' BW CBC

(1) Proposed Alternate

Footnotes:

Capacity @ design freeboard.

2' freeboard at grade controls

Storm Drain (SD) sizes based on Mannings n value of 0.13

Paved street conveyance required for all alternates.

TABLE 4
POND SUMMARY
RAINBOW TRIBUTARY DRAINAGE MANAGEMENT PLAN
(100 Yr/24Hr Storm)

'LOCAL' POND ALTERNATE (1)

Location	SWQ Area	Inflow	Outflow	Total Volume	SWQ Volume	Total Footprint	SWQ Footprint
Pond P10	124 acres	349 cfs	5 cfs	10.7 AF	2.6 AF	3.3 Ac	1.5 Ac
Pond P20	181 acres	409 cfs	5 cfs	17.0 AF	3.8 AF	6.3 Ac	2.2 Ac
Pond P33	189 acres	448 cfs	47 cfs	15.3 AF	4.0 AF	5.7 Ac	2.3 Ac
Pond P40	120 acres	310 cfs	72 cfs	6.9 AF	2.5 AF	2.8 Ac	1.4 Ac

'REGIONAL #1' POND ALTERNATE

	SWQ Area	Total Inflow	Outflow	Total Volume	SWQ Volume	Total Footprint	SWQ Footprint
P40 Dam	614 Acres	1465 cfs	184 cfs	42 AF	12.8 AF	16.2 Ac	7.4 Ac

'REGIONAL #2' POND ALTERNATE

	SWQ Area	Total Inflow	Outflow	Total Volume	SWQ Volume	Total Footprint	SWQ Footprint
P40 Dam	577 Acres	1156 cfs	165 cfs	38 AF	12.0 AF	16.0 Ac	7.0 Ac

'REGIONAL #3' POND ALTERNATE

-DEVELOPED CONDITIONS-(ULTIMATE)

	SWQ Area	Total Inflow	Outflow	Total Volume	SWQ Volume	Total Footprint	SWQ Footprint
P40 Dam	614 Acres	1245 cfs	5 cfs	57 AF	12.8 AF	22 Ac.	7.4 Ac

(1) Proposed Alternate
SWQ - Storm Water Quality
SWQ Area - The upstream area not captured by an upstream SWQ facility.
SWQ Volume - The volume equal to 0.25" of runoff from the SWQ area.

APPENDIX A

FIGURES

Southern Sandoval County Arroyo Flood Control Authority Boundary

Montoyas Arroyo Watershed

SANTA ANA

TOWN OF BERNALILLO

UNSER BLVD

Venada Arroyo Watershed

US 550

PASEO DEL VOLCAN

RIO RANCHO CITY LIMITS

SANDOVAL COUNTY

STATE LAND OFFICE

CITY OF RIO RANCHO

IDALIA RD

Barranca Arroyo Watershed

NM 528

RIO GRANDE

RIO PUERCO WATERSHED

Rainbow Tributary Of The Calabacillas Arroyo DMP Study Area

NORTHERN BLVD

NMSR 448

VILLAGE OF CORRALES

RAINBOW BLVD

10TH ST

UNSER BLVD

LISBON AVE

WESTERN HILLS DR

BROADMOOR DR

MCFORD RD

Calabacillas Arroyo Watershed

SOUTHERN BLVD

Black Arroyo Watershed

GOLF COURSE RD

Rio Rancho Urban Center Watershed

SANDOVAL COUNTY

BERNALILLO COUNTY

NM528 Watershed

CURRENT AS OF: OCTOBER 2002

CITY OF ALBUQUERQUE

NORTH

ASCG INCORPORATED

0 4000' 8000'

1" = 8000'

CITY OF RIO RANCHO

RAINBOW TRIBUTARY DRAINAGE MANAGEMENT PLAN

VICINITY MAP

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FIGURE 1

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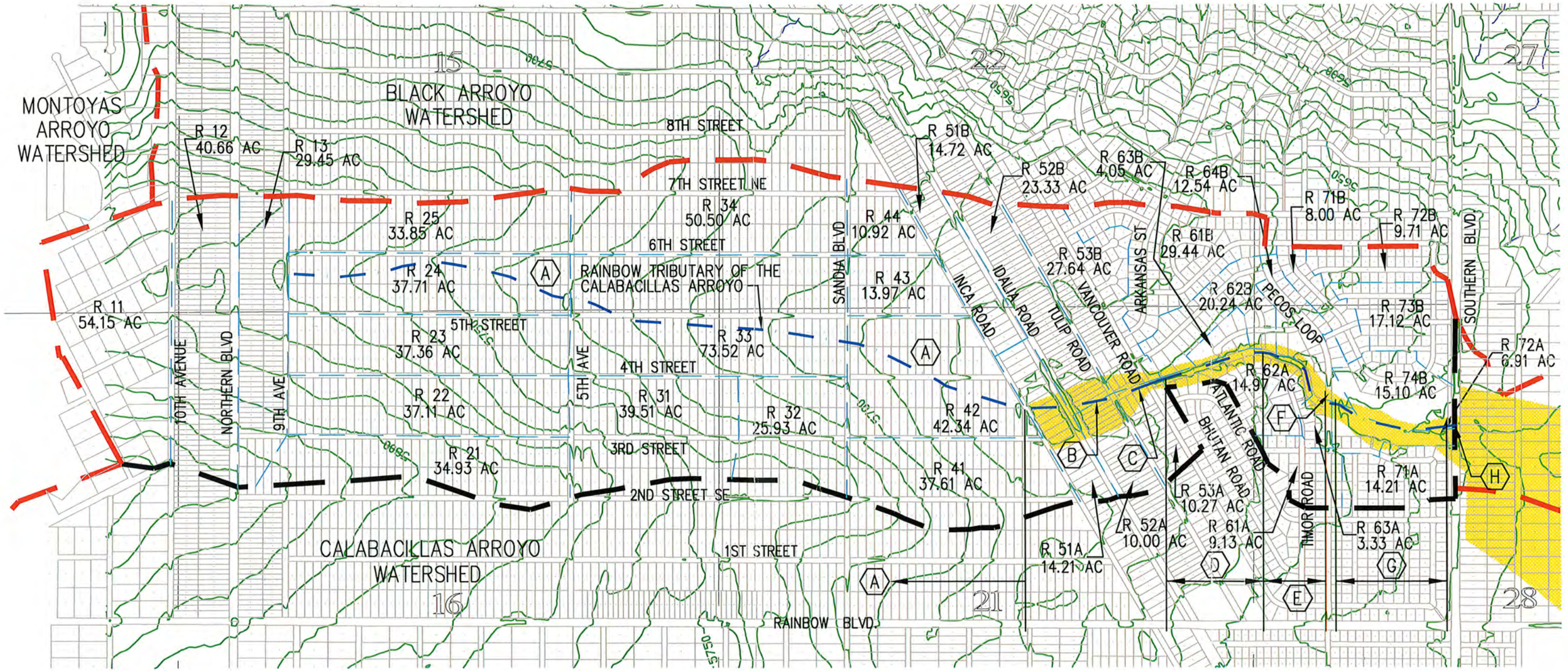

LEGEND

- 22 — SECTION NUMBERS
- SECTION LINES
- WATERSHED BOUNDARY
- RAINBOW TRIBUTARY STUDY BOUNDARY
- R 21 — BASIN NUMBERS
- BASIN BOUNDARIES
- LOT LINES
- FLOW ARROW
- STORM DRAINS
- CHANNELS/ARROYOS
- DETENTION PONDS/DAMS W/INTEGRATED SWQ
- APPROXIMATE FIRM 100 YEAR FLOOD HAZARD

EXISTING FACILITIES KEYED NOTES

A REACH 1 – OVERLAND FLOW – POORLY DEFINED FLOW PATH

B REACH 2 – OVERLAND FLOW

C REACH 3 – TULIP ROAD CROSSING, 3 – 18" CMP
TULIP TO VANCOUVER CONVEYANCE, 1 – 18" CMP
VANCOUVER ROAD CROSSING – NO CULVERT,
CONCRETE RUNDOWN TO CHANNEL

D REACH 4 – EARTHEN CHANNEL WITH GRADE CONTROL STRUCTURES

E REACH 5 – EARTHEN BOTTOM CONCRETE SIDE SLOPE CHANNEL
WITH GRADE CONTROL STRUCTURES

F PECOS LOOP CROSSING, 4 – 48" CMP

G REACH 6 – EARTHEN CHANNEL

H SOUTHERN BOULEVARD CROSSING, 4 – 48" CMP

NORTH

0 500' 1000'

1" = 1000'

CITY OF RIO RANCHO

RAINBOW TRIBUTARY
DRAINAGE MANAGEMENT PLAN

STUDY AREA & DRAINAGE BASIN MAP

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FIGURE 2

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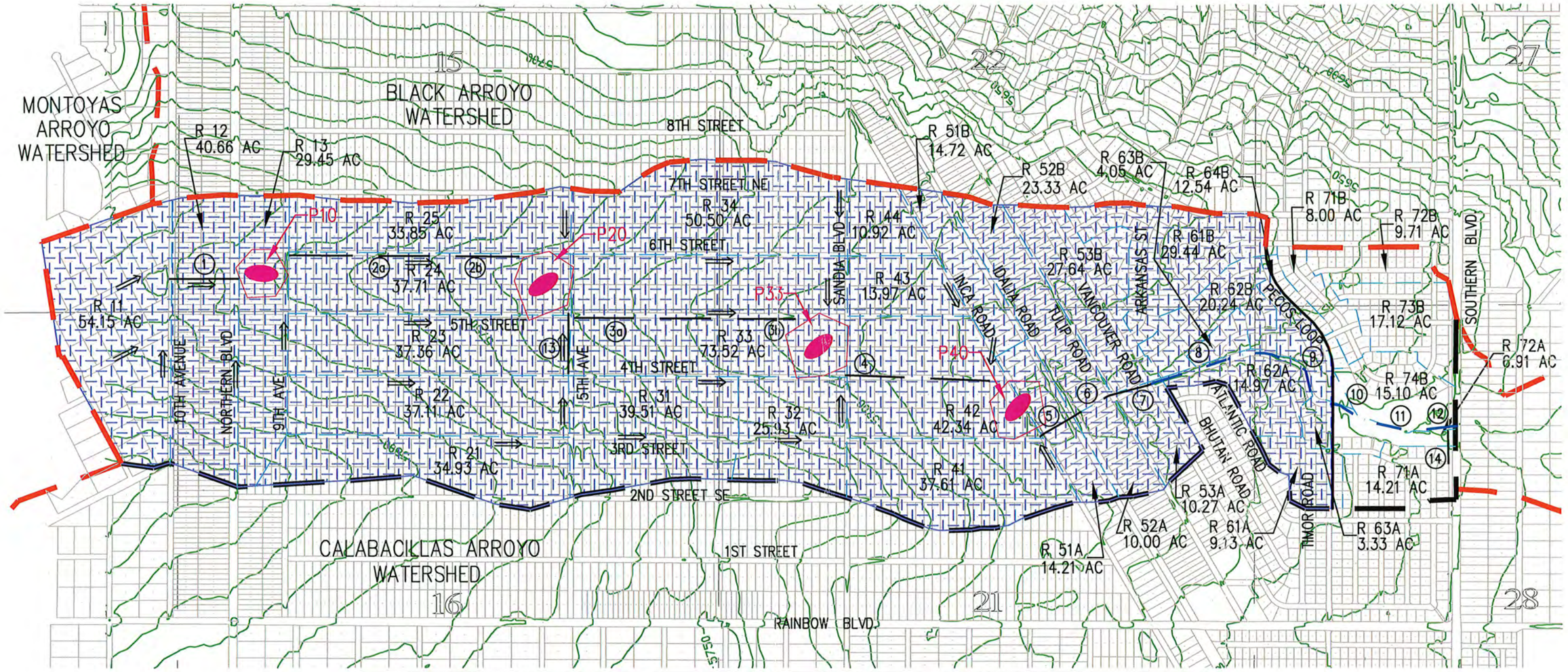

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- DETENTION PONDS/DAMS W/INTEGRATED SWQ
- TEMPORARY RUNOFF RESTRICTION TO 0.5 CFS/AC

CONVEYANCE

	FACILITY FLOW–CFS	FACILITY	ROW–AC	L–FT	INLETS
1	140	48" SD	0.3	600	6
2a	5–10	18" SD	–	1700	–
2b	40	30" SD	–	600	4
3a	5	18" SD	–	1700	–
3b	40	30" SD	–	600	4
4	47	30" SD	–	1100	–
5	72	42" SD	0.4	500	4
6	148	54" SD	0.4	500	8
7	220	60" SD	0.5	500	–
8	280	(*)	–	–	–
9	290	(*)	–	–	–
10	345	4–48"CMP	–	–	–
11	430	(*)	–	–	–
12	452	4–48" CMP	–	–	–
13	40	1–30" SD	–	700	4
14	40	1–30" SD	–	400	–

PONDS

	INFLOW Q CFS	OUTFLOW Q CFS	TOTAL VOL AC FT	SWQ VOL AC FT	TOTAL AREA (AC)
P10	349	5	10.7	2.6	4.8
P20	409	5	17.0	3.8	4.4
P33	448	47	15.3	4.0	5.7
P40	310	72	6.9	2.5	2.8

(*) 8 – EXTEND GRADE CONTROLS 1' VERTICAL
(*) 9 – EXTEND SIDE WALL LINING 1' VERTICAL
(*) 11 – PARK LANDSCAPE CHANNEL

NORTH

0 500' 1000'
1" = 1000'

CITY OF RIO RANCHO
RAINBOW TRIBUTARY DRAINAGE MANAGEMENT PLAN
'LOCAL' ALTERNATE & PROPOSED DRAINAGE PLAN

ASCG INCORPORATED
6501 AMERICAS PARKWAY NE, SUITE 400
ALBUQUERQUE, NEW MEXICO 87110-8275
PHONE: 505.347.4004 • FAX: 505.345.4545

FIGURE 3

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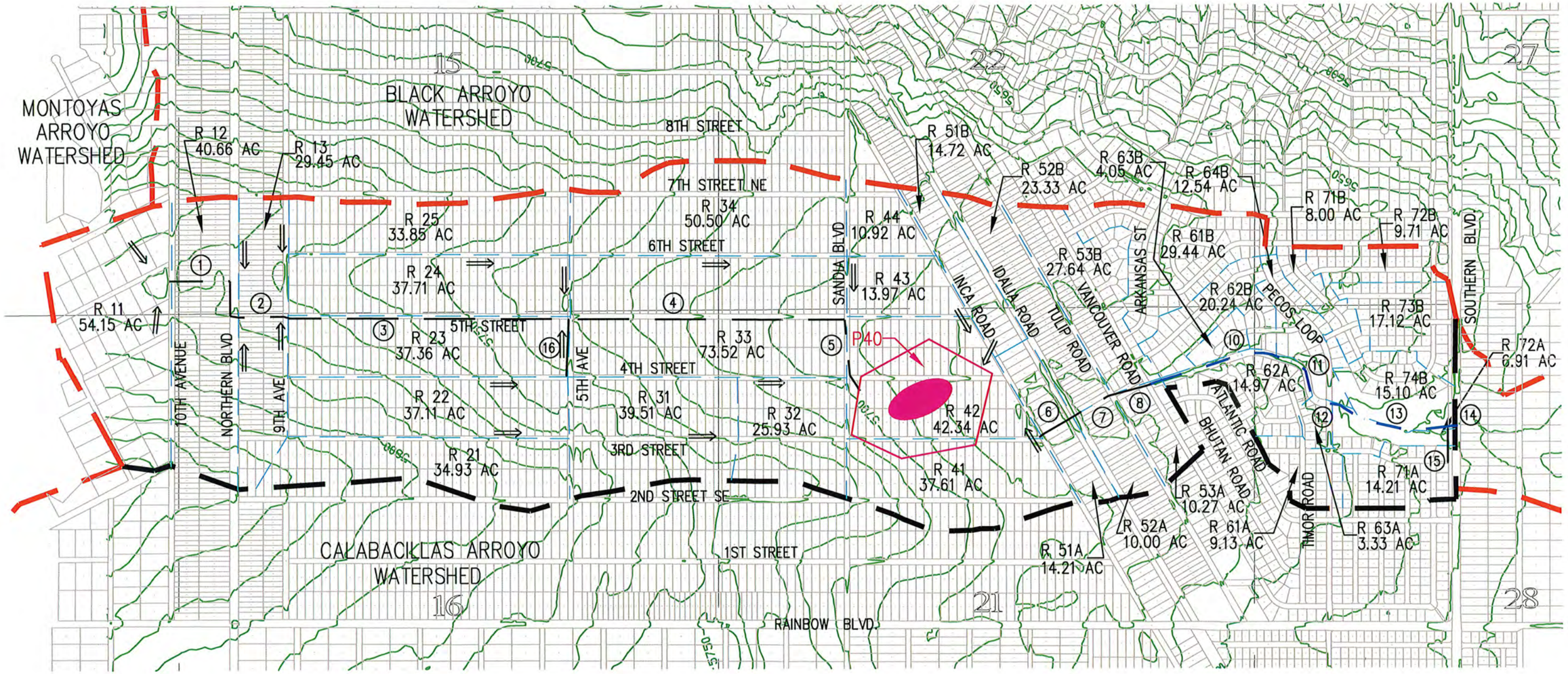

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- CHANNELS/ARROYOS
- DETENTION PONDS/DAMS W/INTEGRATED SWQ

CONVEYANCE					
	FACILITY FLOW–CFS	FACILITY		FACILITY FLOW–CFS	FACILITY
1	141	48" SD	10	246	EXTEND GRADE CONTROL 1'
2	262	60"SD	11	300	EXTEND SLOPE PAVING 1'
3	350	66" SD	12	352	30–48" CMP
4	737	90"SD	13	437	PARK LANDSCAPE CHANNEL
5	1016	96" SD	14	455	3–48" CMP
6	184	54" SD + SWALE	15	41	30" SD
7	186	54" SD + SWALE	16	40	30" SD
8	203	60" SD + SWALE			

NOTE: STREET FLOW LIMITED TO 120 CFS.

PONDS					
	INFLOW Q CFS	OUTFLOW Q CFS	TOTAL VOL AC FT	SWQ VOL AC FT	TOTAL AREA (AC)
P40	1465	183	42	12.8	16.2

NORTH

0 500' 1000'

1" = 1000'

CITY OF RIO RANCHO

RAINBOW TRIBUTARY
DRAINAGE MANAGEMENT PLAN

'REGIONAL #1' ALTERNATE

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FIGURE 4

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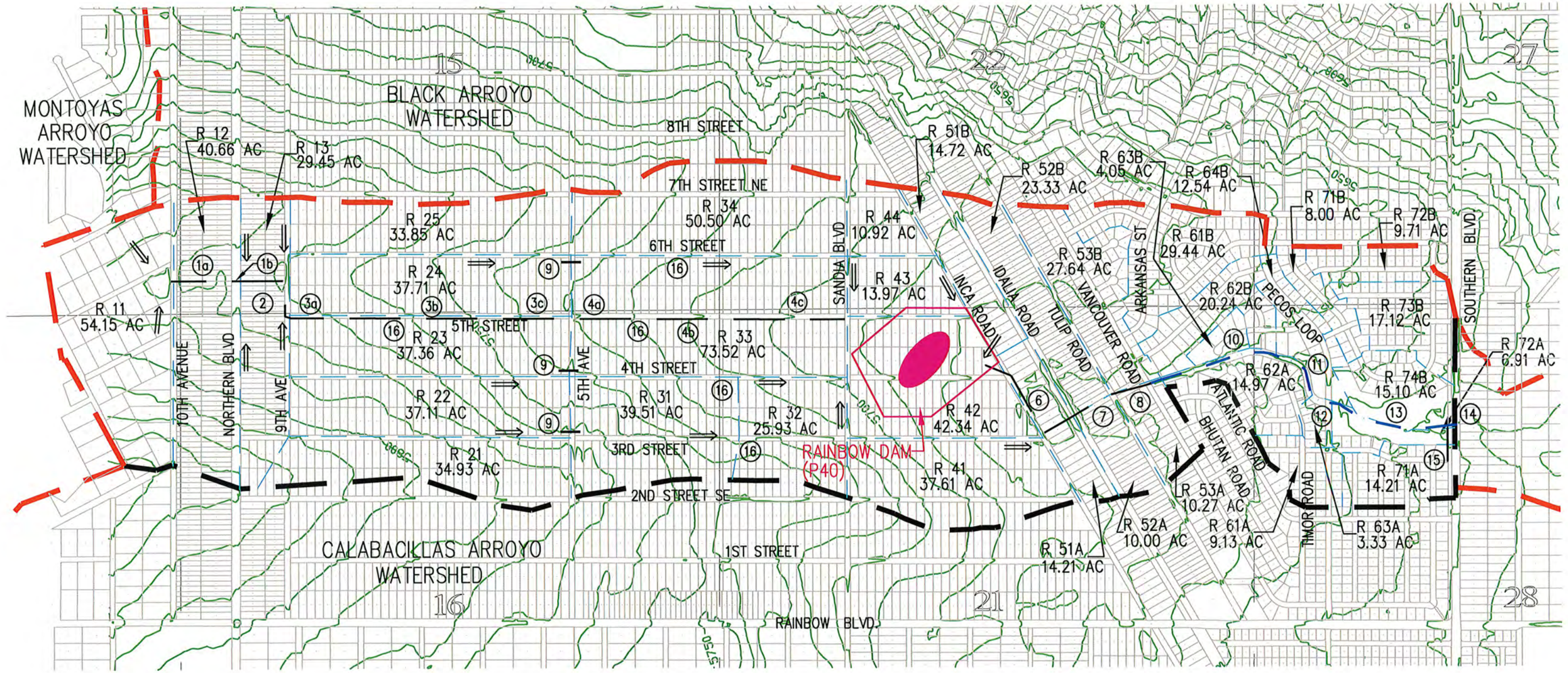

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- DETENTION PONDS/DAMS W/INTEGRATED SWQ

CONVEYANCE RB100D6B.DAT/SUM					
	FACILITY FLOW-CFS	FACILITY		FACILITY FLOW-CFS	FACILITY
1a	141	SWALE IN 50' ROW	7	178	60" SD + SWALE
1b	200	SHALLOW BOX CROSSING	8	242	60" SD + SWALE
2	265	SWALE IN 50' ROW	9	0	WATER BLOCK
3a	346-385	42" SD + STREET-L=900	10	314	EXTEND GRADE CONTROL 1'
3b	385-464	48" SD + STREET-L=1800'	11	323	EXTEND SLOPE PAVING 1'
4a	464-524	54" SD + STREET-L=1400'	12	460	30-48" CMP
4b	524-574	60" SD + STREET-L~1500'	13	465	PARK LANDSCAPE CHANNEL
5	165	54" SD	14	548	3-48" CMP (EXISTING)
6	165	54" SD	15	41	30" SD
			16	120+	STREET CONVEYANCE DESIGN

NOTE: STREET FLOW LIMITED TO 300 CFS.

PONDS					
	INFLOW Q CFS	OUTFLOW Q CFS	TOTAL VOL AC FT	SWQ VOL AC FT	TOTAL AREA (AC)
P40	1156	165	38	12.8	16.2

NORTH ASCG INCORPORATED

0 500' 1000'

1" = 1000'

CITY OF RIO RANCHO

RAINBOW TRIBUTARY
DRAINAGE MANAGEMENT PLAN

'REGIONAL #2' ALTERNATE

ASCG INCORPORATED
DRAINAGE · ARROYOS · SURVEYING · PLANNING

FIGURE 5

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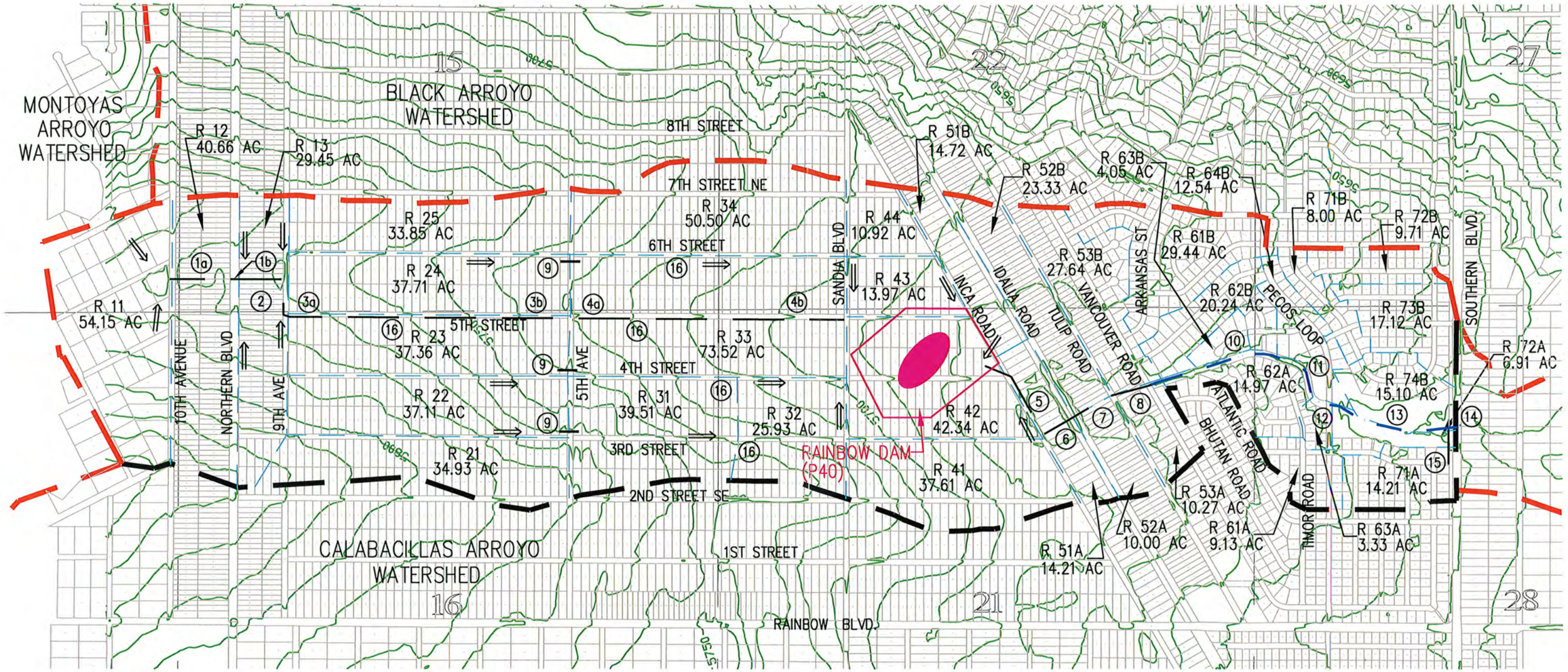

LEGEND

- 22 — SECTION NUMBERS
- SECTION LINES
- WATERSHED BOUNDARY
- RAINBOW TRIBUTARY STUDY BOUNDARY
- R 21 — BASIN NUMBERS
- BASIN BOUNDARIES
- LOT LINES
- FLOW ARROW
- STORM DRAINS
- CHANNELS/ARROYOS
- DETENTION PONDS/DAMS W/INTEGRATED SWQ

CONVEYANCE					
	FACILITY FLOW–CFS	FACILITY		FACILITY FLOW–CFS	FACILITY
1a	141	SWALE IN 50' ROW			
1b	200	SHALLOW BOX CROSSING	8	115	24" SD + SWALE
2	265	SWALE IN 50' ROW	9	0	WATER BLOCK
3a	346–385	42" SD + STREET–L=900	10	195	EXTEND GRADE CONTROL 1'
3b	385–464	48" SD + STREET–L=1800'	11	261	EXTEND SLOPE PAVING 1'
4a	464–524	54" SD + STREET–L=1400'	12	319	30–48" CMP (EXISTING)
4b	524–574	60" SD + STREET–L~1500'	13	405	PARK LANDSCAPE CHANNEL
5	5	24" SD	14	428	3–48" CMP (EXISTING)
6	38	24" SD + SWALE	15	41	30" SD
7	52	24" SD + SWALE	16	120–300	STREET CONVEYANCE DESIGN

NOTE: STREET FLOW LIMITED TO 300 CFS. PAVED STREET CONVEYANCE REQUIRED.
DATA IS SUBALTERNATE 3b. BASIN R41 IS DIVERTED INTO P40.

PONDS					
	INFLOW Q CFS	OUTFLOW Q CFS	TOTAL VOL AC FT	SWQ VOL AC FT	TOTAL AREA (AC)
P40	1245	5	57	12.8	22

NORTH ASCG ORIENTATION

0 500' 1000'

1" = 1000'

CITY OF RIO RANCHO

RAINBOW TRIBUTARY DRAINAGE MANAGEMENT PLAN

'REGIONAL #3' ALTERNATE

ASCG INCORPORATED

FIGURE 6

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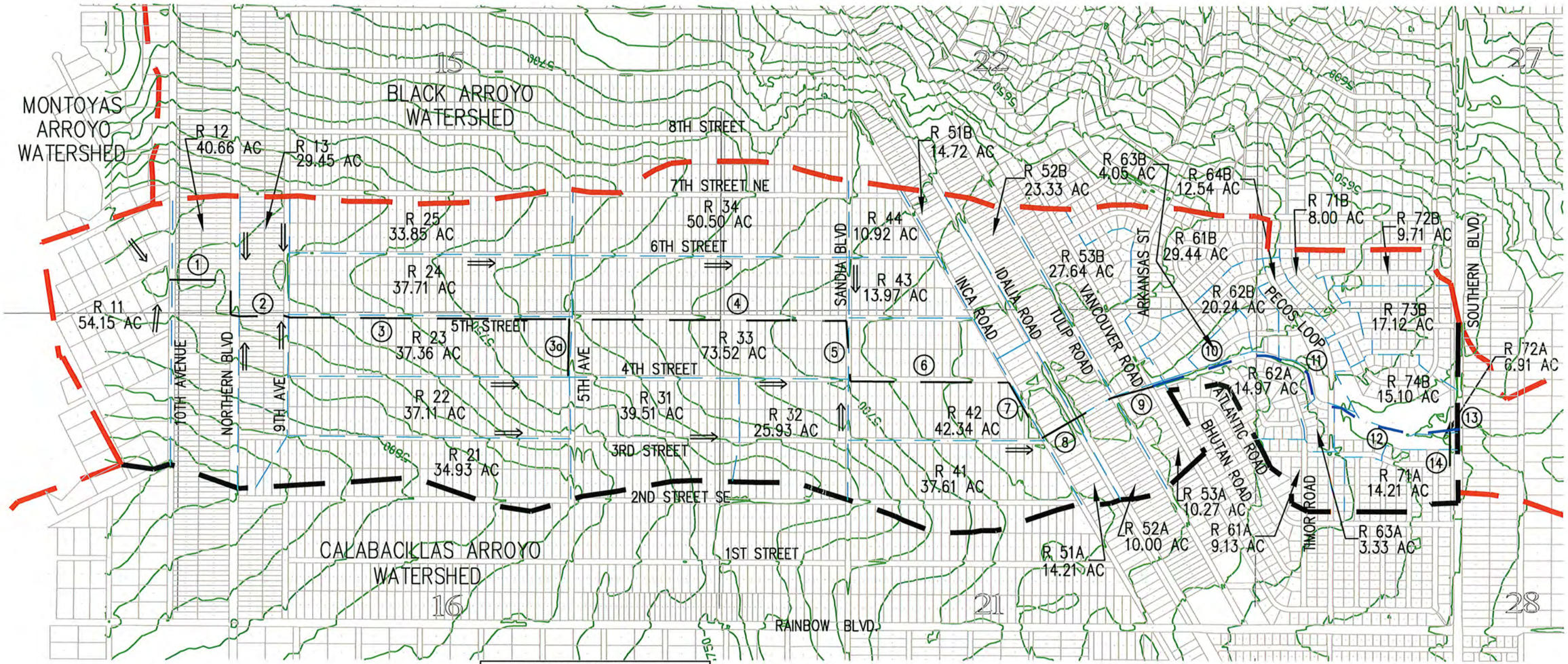

LEGEND

22	SECTION NUMBERS
	SECTION LINES
	WATERSHED BOUNDARY
	RAINBOW TRIBUTARY STUDY BOUNDARY
R 21	BASIN NUMBERS
	BASIN BOUNDARIES
	LOT LINES
	FLOW ARROW
	STORM DRAINS
	CHANNELS/ARROYOS
	DETENTION PONDS/DAMS W/INTEGRATED SWQ

CONVEYANCE		
	FACILITY FLOW–CFS	FACILITY
1	141	48" SD
2	262	60" SD
3	350	66" SD
3a	40	30" SD
4	737	90" SD
5	1016	96" SD
6	1164	102" SD
7	1265	102" SD
8	1465	10' BW PCC CH
9	1595	10' BW PCC CH
10	1681	30' BW PCC CH
11	1710	30' BW PCC CH
12	1797	30' BW PCC CH
13	1887	30' BW PCC CH
14	40	30" SD

NORTH

0 500' 1000'

1" = 1000'

CITY OF RIO RANCHO

RAINBOW TRIBUTARY DRAINAGE MANAGEMENT PLAN

'NO POND' ALTERNATE

ASCG INCORPORATED

FIGURE 7

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APPENDIX B

REFERENCE DOCUMENTS

RAINBOW TRIBUTARY DMP
APPENDIX 'B'
REFERENCE DOCUMENTS

#1 LOMR Submittal for Rainbow Park Channel – Arroyo
City of Rio Rancho, New Mexico
Resource Technology, Inc.
July 11, 1994

#2 Black Arroyo Watershed Management Plan
Southern Sandoval County Arroyo Flood Control Authority
ASCG Incorporated
August, 2002

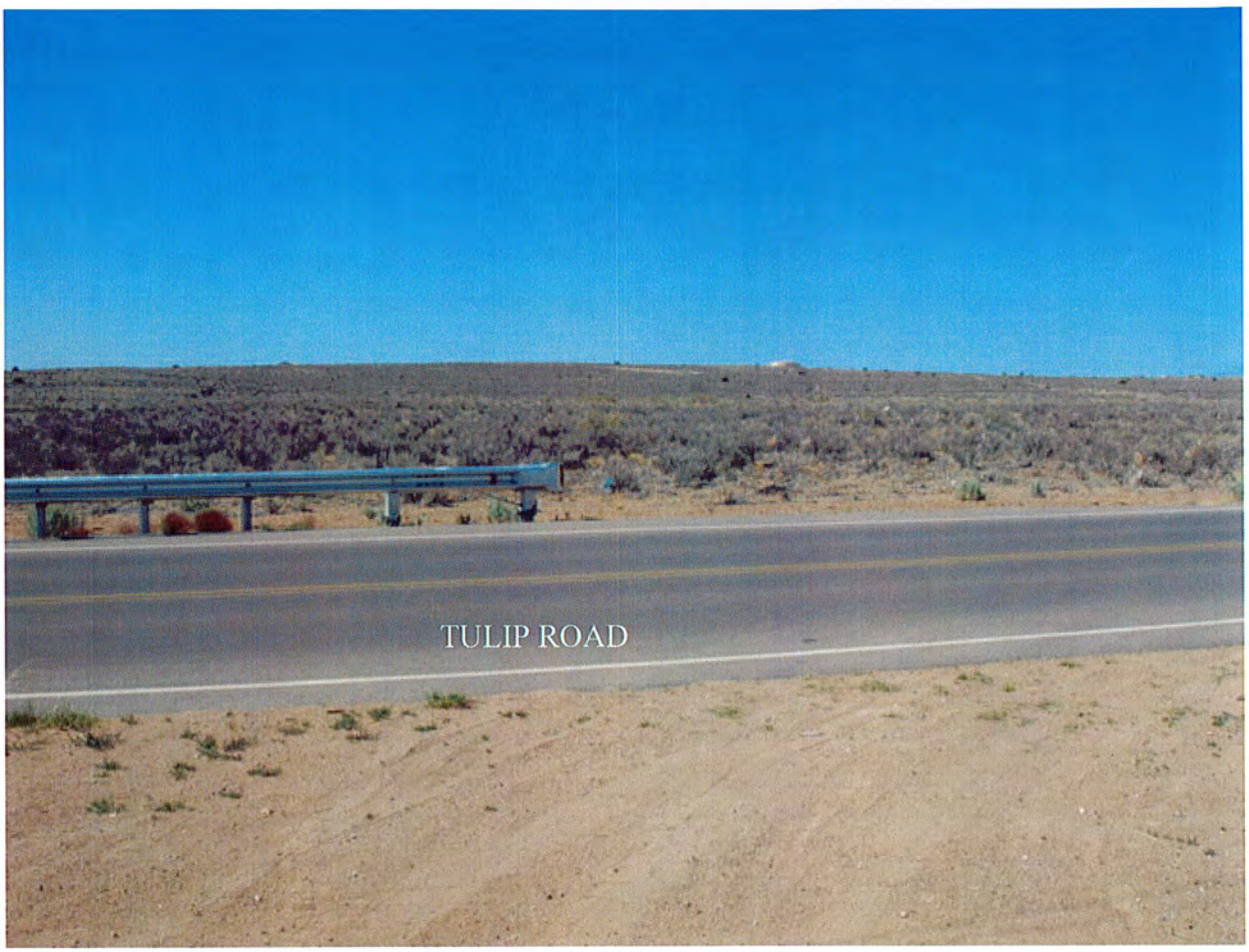
#3 AHYMO_97 Computer Program
User's Manual
Anderson-Hydro
August, 1997

#4 Flood Insurance Rate Map Number 35043C0900 C
Federal Emergency Management Agency
July 16, 1996

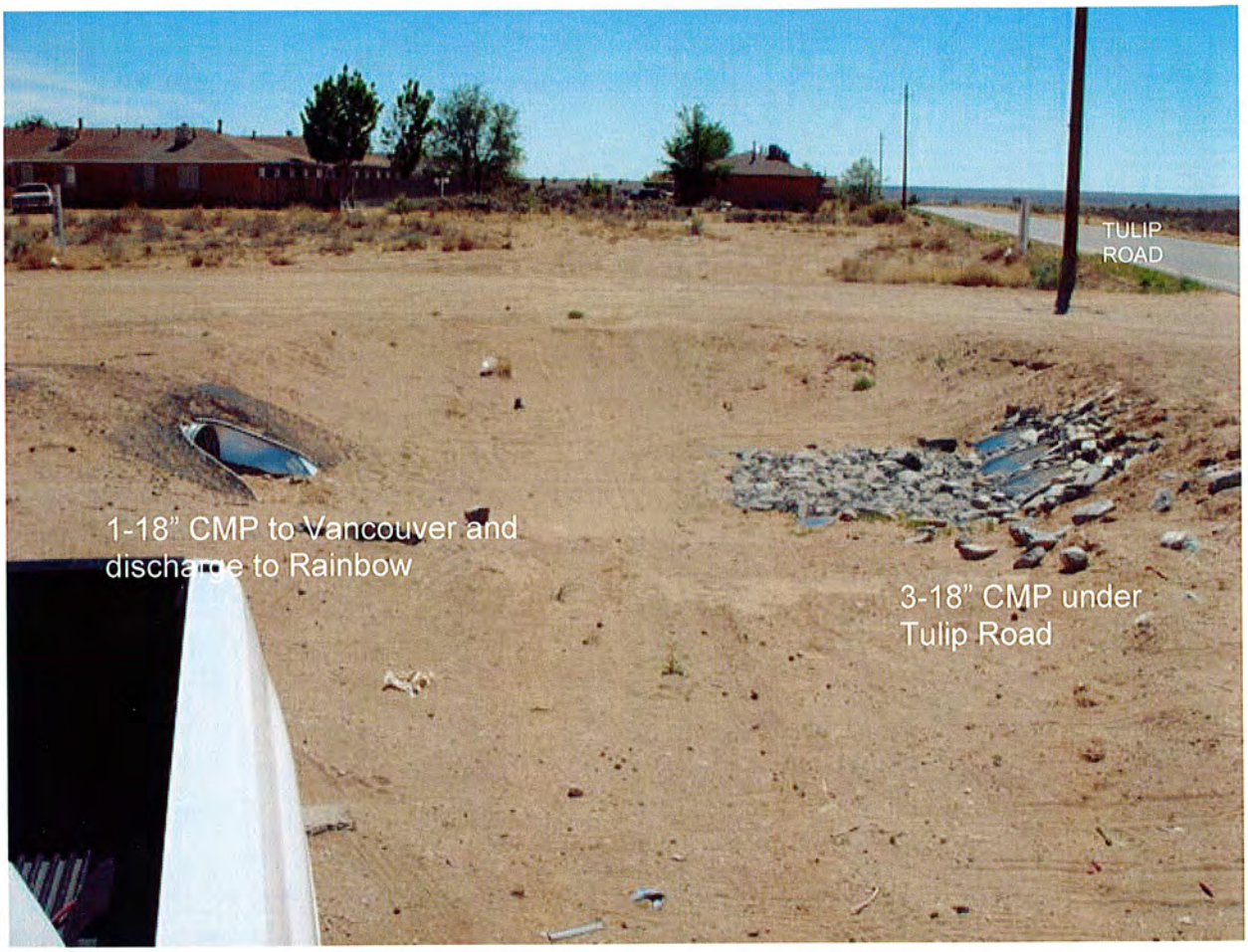
APPENDIX C

2002 PHOTOGRAPHS

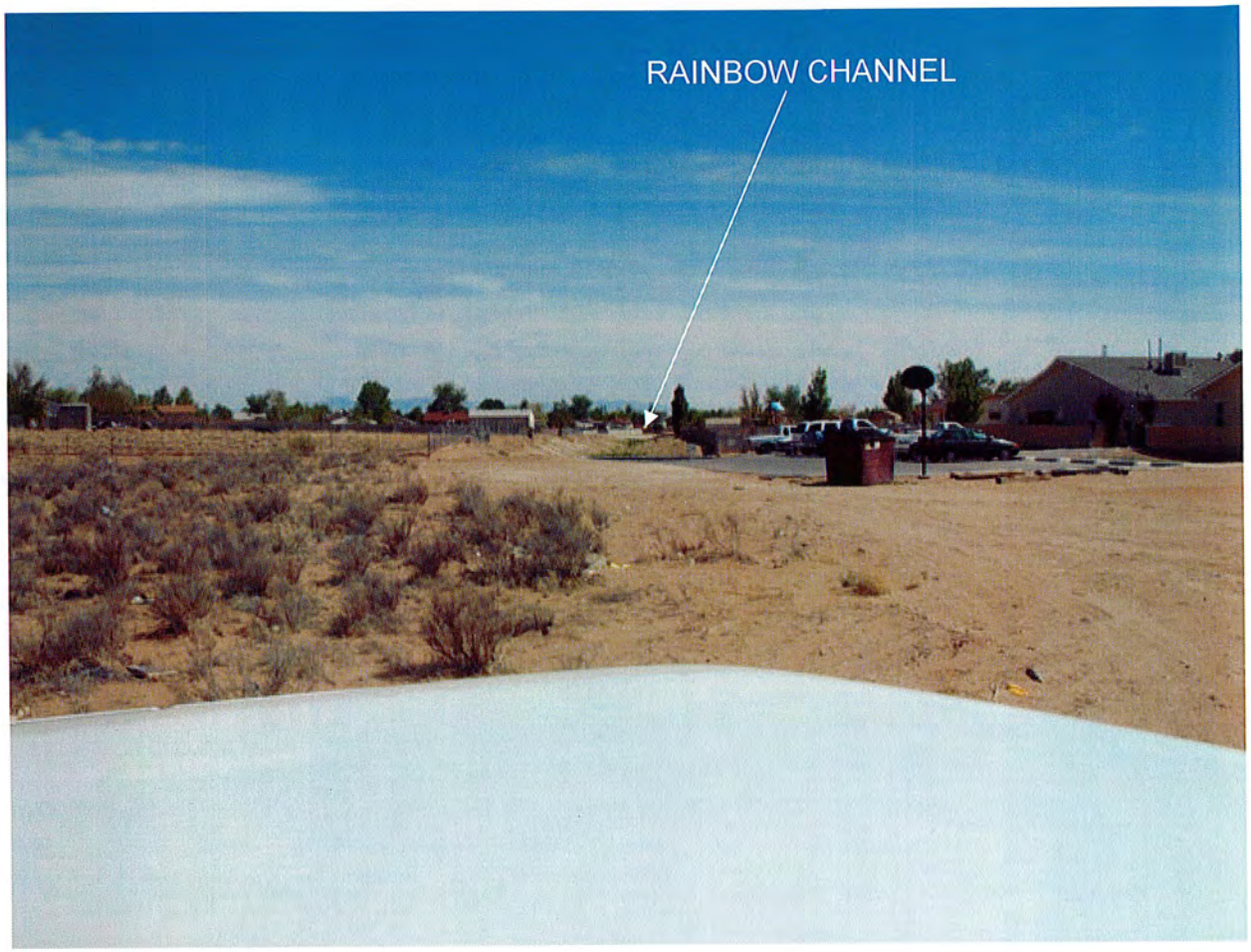
LOOKING NORTHWEST AT TULIP RD.



LOOKING NORTH NORTHEAST AT TULIP ROAD



JUST SOUTH OF TULIP ROAD



LOOKING SOUTH TOWARD VANCOUVER ROAD AND RAINBOW CHANNEL

RAINBOW CHANNEL LOOKING SOUTH AT VANCOUVER ROAD

GRADE CONTROL IN EARTHEN CHANNEL
SOUTH OF VANCOUVER ROAD

TRANSITION FROM EARTHEN TO PAVED SIDE SLOPE CHANNEL LOOKING SOUTHWESTERLY

EARTHEN BOTTOM, PAVED SIDE SLOPE CHANNEL WITH GRADE CONTROL NORTH OF PECOS LOOP

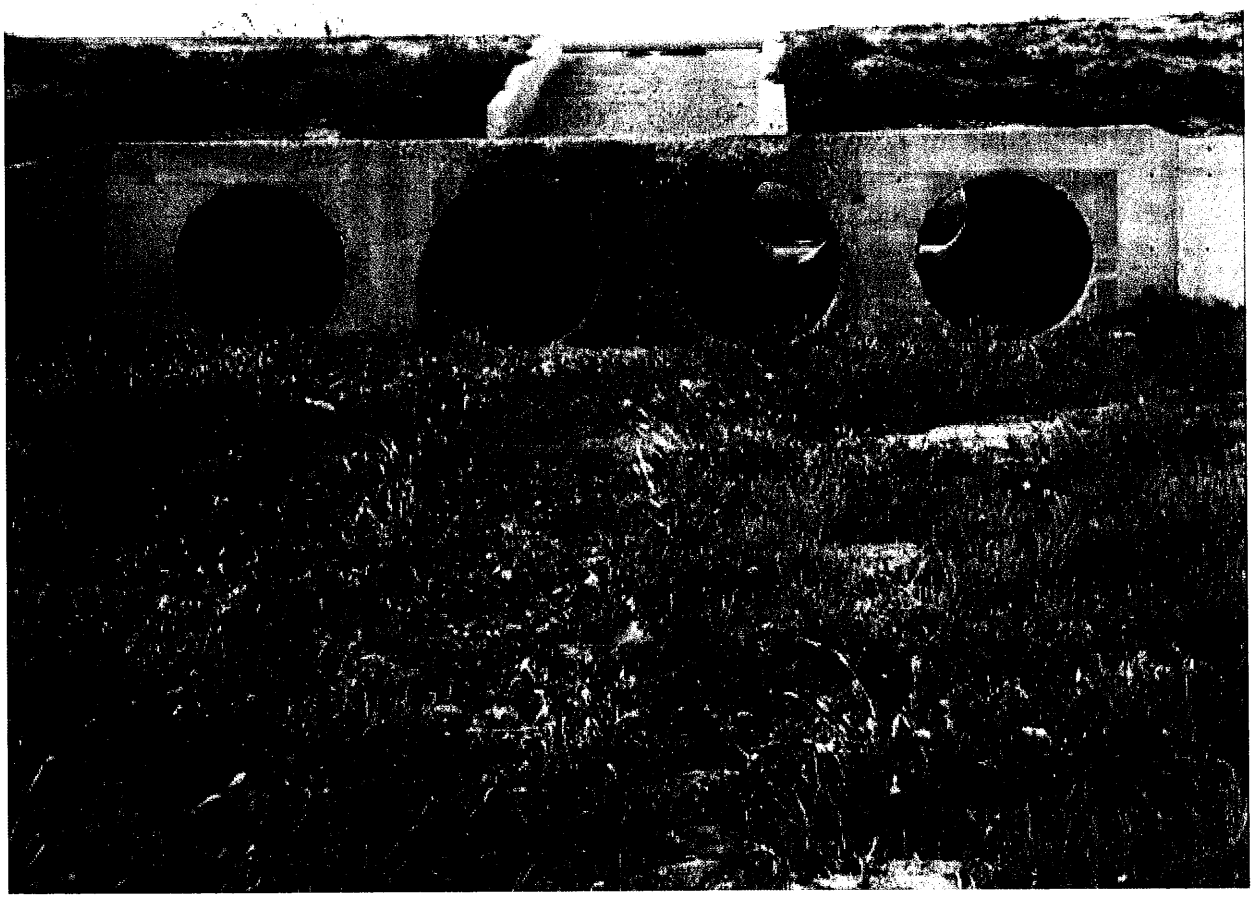
4-48" CULVERT INLET AT PECOS LOOP

4-48" CULVERT OUTLET AT PECOS LOOP

"PARK CHANNEL" SOUTH OF PECOS LOOP

"PARK CHANNEL" EXPOSED UTILITY
NORTH OF SOUTHERN BOULEVARD

"PARK CHANNEL" UNDERMINING OF SIDEWALK



4-48" CULVERTS UNDER SOUTHERN BOULEVARD