

TABLE OF CONTENTS

APPENDIX

- C PUBLIC PARTICIPATION FOR ALTERNATE SELECTION
- D SSCAFCA AND RIO RANCH POLICIES, RESOLUTIONS AND ORDINANCES
- E REFERENCE DOCUMENT LIST
- F FUTURE CONDITIONS CRITERIA
- G HYDROLOGY
- H LATERAL EROSION ENVELOPE
- I STORMWATER QUALITY
- J COST ESTIMATE SUMMARY
- K PHOTOGRAPHS
To see example photos of the Black Arroyo Watershed, please refer to the text of this Plan and to Volume I – Black Arroyo Watershed Management Plan, December, 18, 2001 (BLRD-55).

APPENDIX C

PUBLIC PARTICIPATION for ALTERNATE SELECTION

To obtain input from elected officials, staff of other agencies and the general public regarding the selection of a preferred alternate for the BLWMP, several presentations and working meetings were conducted:

- SSCAFCA Board meetings – February 19, 2002, May 21, 2002.
- City of Rio Rancho Council meetings -
- Public Meeting conducted March 7 at 6:00 pm at the Rio Rancho Country Club
- Technical Team meetings including representatives from Rio Rancho, SSCAFCA and Bohannon-Huston, Inc to assist in coordination between the BLWMP and the Montoyas Arroyo WMP – February 13, 2002.
- Rio Rancho staff meeting March 7, 2002
- AMAFCA staff meeting on February 26, 2002

Minutes from these activities and comments from the public are included in this Appendix.

BLACK ARROYO WATERSHED MANAGEMENT PLAN

PUBLIC COMMENTS:

To help save the community money and water, I would like to see some type of astro lawn used. Its lifespan is 20 years and could be paid for in half the time. Our water source is too precious to let go.

Please return any comments regarding this project to SSCAFCA at the address below no later than March 28, 2002 for inclusion in the Watershed Management Plan.

ALTERNATE 'A'

DESCRIPTION

- No New Dams
- Stormwater Quality at Large Sites

ADVANTAGES/DISADVANTAGES

- Less Total Area
- Large Site Regional Multi-Use Potential
- Minimum Upgrade at Black Dam
- O&M Economy of Scale

FOLD HERE

ALTERNATE 'B' DESCRIPTION

- Upstream Detention Dams
- Stormwater Treatment at Upstream Sites

ADVANTAGES/DISADVANTAGES

- Less Capital Cost
- Distributed Multi-Use Opportunities
- No Upgrade at Black Dam
- Water Quality Treatment Flexibility
- Less Conveyance R.O.W.
- Less Risk
- Naturalistic Conveyance Opportunities



FOLD HERE

By: Name: _____
Address: _____
Phone: _____

PLACE
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SOUTHERN SANDOVAL COUNTY ARROYO
FLOOD CONTROL AUTHORITY
(SSCAFCA)
4200 MEADOWLARK, SUITE 6
RIO RANCHO, NEW MEXICO 87124

(505)892-5266
FAX: (505)892-7241

STAPLE OR TAPE HERE



LEGEND

-  WATERSHED BOUNDARY
-  PROPOSED ROADWAY CORRIDOR
-  MAJOR CONVEYANCES



SOUTHERN SANDOVAL COUNTY FLOOD CONTROL AUTHORITY BLACK ARROYO WATERSHED MANAGEMENT PLAN LOCATION MAP



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INCORPORATED
DESIGN • ENGINEERING • SURVEYING • EROSION CONTROL
8041 AMERICAN PARKWAY, SUITE 200
ALBUQUERQUE, NEW MEXICO 87110-4070
PHONE 505.267.0204 • FAX 505.267.0204

BLACK ARROYO WATERSHED MANAGEMENT PLAN

PUBLIC COMMENTS:

Would like to see some thought to football fields in this area. Fields need to be user friendly, ability to get equipment to field easily.

other concern is football season. If field built in or around a dam, seasons well season would impact field usage. Let of rain in Sept/Oct.

Please return any comments regarding this project to SSCAFCA at the address below no later than March 28, 2002 for inclusion in the Watershed Management Plan.

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- No New Dams
- Stormwater Quality at Large Sites

ADVANTAGES/DISADVANTAGES

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- Less Risk
- Naturalistic Conveyance Opportunities

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By: Name: Joe D. Shelton
Address: 1425 ALDER Dr. NE
Rio Rancho, NM 87124
Phone: (505) 891-8962

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SOUTHERN SANDOVAL COUNTY ARROYO
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4200 MEADOWLARK, SUITE 6
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LEGEND

-  WATERSHED BOUNDARY
-  PROPOSED ROADWAY CORRIDOR
-  MAJOR CONVEYANCES



SOUTHERN SANDOVAL COUNTY FLOOD CONTROL AUTHORITY BLACK ARROYO WATERSHED MANAGEMENT PLAN LOCATION MAP



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INCORPORATED

10001 AMERICAN PARKWAY NE, SUITE 400
ALBUQUERQUE, NEW MEXICO 87110-4071
PHONE 505.247.2004 • FAX 505.247.4040

BLACK ARROYO WATERSHED MANAGEMENT PLAN

PUBLIC COMMENTS:

*As a hot Air balloon pilot, we need spots
that we can cross the arroyos to facilitate our
chase vehicles to get to our balloons.*

Please return any comments regarding this project to SSCAFCA
at the address below no later than March 28, 2002 for
inclusion in the Watershed Management Plan.

ALTERNATE 'A'

DESCRIPTION

No New Dams
Stormwater Quality at Large Sites

ADVANTAGES/DISADVANTAGES

- Less Total Area
- Large Site Regional Multi-Use Potential
- Minimum Upgrade at Black Dam
- O&M Economy of Scale

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- Stormwater Treatment at Upstream Sites

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- No Upgrade at Black Dam
- Water Quality Treatment Flexibility
- Less Conveyance R.O.W.
- Less Risk
- Naturalistic Conveyance Opportunities

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By: Name: Commissioner Chris Economouly
Address: P.O. Box 15066
Rio Rancho, NM 87174
Phone: (505) 891-4225

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SOUTHERN SANDOVAL COUNTY ARROYO
FLOOD CONTROL AUTHORITY
(SSCAFCA)
4200 MEADOWLARK, SUITE 6
RIO RANCHO, NEW MEXICO 87124

(505)892-5266
FAX: (505)892-7241

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LEGEND

- WATERSHED BOUNDARY
- ===== PROPOSED ROADWAY CORRIDOR
- MAJOR CONVEYANCES



SOUTHERN SANDOVAL COUNTY FLOOD CONTROL AUTHORITY BLACK ARROYO WATERSHED MANAGEMENT PLAN LOCATION MAP



ASCG
INCORPORATED

8011 AMERICAN PARKWAY NE, SUITE 400
ALBUQUERQUE, NEW MEXICO 87110-4071
PHONE 505.262.2004 • FAX 505.262.2005

BLACK ARROYO WATERSHED MANAGEMENT PLAN

PUBLIC COMMENTS:

*Based on comments at council meeting + presentation. I recommend
alternate B.*

Please return any comments regarding this project to SSCAFCA
at the address below no later than March 28, 2002 for
inclusion in the Watershed Management Plan.

ALTERNATE 'A'

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- No New Dams
- Stormwater Quality at Large Sites

ADVANTAGES/DISADVANTAGES

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- Less Conveyance R.O.W.
- Less Risk
- Naturalistic Conveyance Opportunities

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By: Name: Michael Brown
Address: 4625 Rockaway Loop
Rio Rancho, NM 87124
Phone: 238-9138

PLACE
STAMP
HERE



SOUTHERN SANDOVAL COUNTY ARROYO
FLOOD CONTROL AUTHORITY
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4200 MEADOWLARK, SUITE 6
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FAX: (505)892-7241

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LEGEND

-  WATERSHED BOUNDARY
-  PROPOSED ROADWAY CORRIDOR
-  MAJOR CONVEYANCES



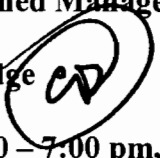
SOUTHERN SANDOVAL COUNTY FLOOD CONTROL AUTHORITY BLACK ARROYO WATERSHED MANAGEMENT PLAN LOCATION MAP



ASCG
INCORPORATED
8801 JEFFERSON PARKWAY NE, SUITE 400
ALBUQUERQUE, NEW MEXICO 87110-4070
PHONE 505.303.8884 • FAX 505.303.8885

MEMORANDUM

TO: The Black Arroyo Watershed Management Plan Record

FROM: Karen Jacobsen/Clint Dodge 

MEETING DATE: March 7, 2002, 6:00 – 7:00 pm, Rio Rancho Country Club

DATE: March 11, 2002

RE: Public Meeting for Black Arroyo WMP

This memo documents the open house/public meeting for the Black Arroyo WMP. In attendance to answer questions and give a brief overview of Alternatives were:

- Bob Foglesong, SSCAFCA
- Clint Dodge, ASCG
- Karen Jacobsen, ASCG

Two members of the public and the Rio Rancho Parks and Recreation Director attended. Public attendance is listed on the attached sign in sheet.

A brief overview was discussed with each public member of the existing situation of the watershed and a brief summary of Alternative A and Alternative B. The pond/dam and storm water quality sites shown on the drawings are possible locations only. The maps were put together to give the public an image for comparison of the two alternatives. Alternative B has sites scattered throughout the watershed and Alternative A has sites only at the downstream end of the watershed. The comments received are as follows.

The potential site at The West Branch crossing of Unser Boulevard is valuable land, planned by the City as an employment node. Why should that area be utilized for a pond/water quality site? Why not reclaim the land by using pipes?

This is potentially a valuable site if the Westside Corridor is implemented along 19th Avenue and if the merging arroyos can be effectively handled. This area is designated as a possible employment or commercial node by the City which would generate taxes and other benefits for the City.

Conversely, this is a valuable drainage site. At Unser Blvd, four conveyances converge; Unser Channel, West Branch, Tributary 'C' and Tributary 'A'. The total flow in these conveyances is large, in excess of 5000 cfs. Therefore piping or underground conveyance would require large box culvert structures. Placing the facilities further upstream would require multiple facilities with increased cost, O&M, etc.

The employment impact will be taken into consideration in the WMP.

The ponds in the north portion of the watershed, near Inca Road seem to make sense. The Unit 10 area is not quite as clear cut.

The Unit 10 area has the added challenge of being already subdivided with individually owned lots. There is little or no right-of-way existing for the arroyos in that quadrant. A dam on Tributary A provides the potential to pipe the outflow instead of purchasing right-of-way.

From Ed Chismar: He will have his team gather and brainstorm to collect comments regarding the two Alternates.

Comment sheets were provided. Comments were requested to be returned to SSCAFCA no later than March 20, 2002. Public comment sheets with a map of the watershed were handed to each individual in attendance for this purpose.

BLACK ARROYO WATERSHED MANAGEMENT PLAN

Public Meeting Sign in Sheet

Date: 3/7/2002, Rio Rancho Country Club, 6:00 to 7:00 pm

Name	Address	Phone	Neighborhood Assoc., Agency, Company, etc.
ED CHISMOR	RR P&R	896-8722	Parks & Recreation
JOE KELLEY	1924 RANCHO DR. NE	869-1936	
FRANZ SPRINGER	7629 Arroyo Del Oso NE APT. 87169	884-2787 292-1015	LAND OWNERS



BLACK ARROYO WATERSHED MANAGEMENT PLAN MEETING NOTES

MEETING Date: March 7, 2002
 Time: 10:00 AM
 Location: RRPW Conference Room

ATTENDED BY: See Sign in Sheet

COPIES TO: Attendees
 David Stoliker, SSCAFCA

Please review these meeting notes and let us know of any discrepancies or corrections. If you have any comments, please provide them by Mar 15.

This short meeting followed the Venada Watershed meeting to discuss several items regarding the Black Arroyo.

Public meeting – March 7 6:00 to 7:00 at Rio Rancho Country Club
City Council briefing at March 13 meeting.

Copies of Alternate 'A' and Alternate 'B' were provided. Input was requested from Parks & Rec, Planning & Public Works regarding the two basic alternates. A brief overview of the BLWMP status was provided. An Alternate between A and B is also possible. The water quality concept was presented. It was noted that alternate pond or dam sites are also available if they would work out better.

The City noted that a subdivision along the Sugar Channel has been submitted for review. SSCAFCA has not seen it yet. The City requested AHYMO results along the Sugar Channel. These are provided in a separate memo.

SSCAFCA indicated that their criteria requires the developer to convey fully developed flows from upstream. The WMP will be consistent with SSCAFCA policy.

**BLACK ARROYO WATERSHED MANAGEMENT PLAN
FUTURE CONDITIONS ALTERNATES REVIEW w/ AMAFCA
MEETING NOTES**

- c. Added Bernalillo Co. basins from AHYMO output from COA approved Drainage Plans for the development south of Black Arroyo Rd.
- d. Included Black Dam routing from State Engineer Approved Filing Sheet. The ultimate Black Dam volume of 304 AF is being used.
 - i. Confusion regarding the ultimate volume – AMAFCA indicated they thought the future volume was 480.61 AF. ASCG reviewed the “Record Drawings” provided which are the same we have been using. The 480 AF is the volume to the top of the embankment, the freeboard hydrograph volume. The pool volume to the emergency spillway elevation is 269.63 AF plus 34.50 sediment pool for a total volume of 304 AF.
 - ii. Contractors have been excavating material from the pool area and the current volume is estimated to be between the original volume of 150.3 + 67.6 AF and the approved future volume of 304 AF.
- e. Impact on Q
 - i. Q100 @ Black Dam increases from 9500+/- to 13,500+/- from DEVEX to Future Hydrology.

3. STORMWATER QUALITY ENHANCEMENT

- a. Stormwater quality treatment Best Management Practices (BMPs) are proposed in the WMP to address future EPA Phase II NPDES requirements.
- b. Stormwater quality enhancement allowance
 - i. The BLWMP proposes the concept of diverting a portion of the stormwater for treatment, establishing “set aside” areas for this stormwater quality treatment and modifying the hydrology and proposed hydraulic structures accordingly. The BLWMP is not identifying specific treatment systems.
 - ii. Capture and treat the “first flush”. The BLWMP assumes this is the volume equal to the first 0.25 in. of runoff of the drainage area at this particular site not captured in an upstream treatment diversion facility. This is close to the annual storm event and is consistent with other BMPs. (i.e. 1% of drainage area in treatment area, treat 80% of annual runoff). This is a “best estimate” until more local data is available.
 - iii. Within the system proposed, the stormwater entering a detention pond would be the remainder after the first flush stormwater quality volume was diverted
 - iv. The stormwater treatment volume is handled in AHYMO by removing the diverted volume from the front end of the hydrograph.
 - v. In practice, this volume would be added back to the system, presumably at a very slow flow rate. The current analysis level does not add this back into the flow. The effect is a reduction in

overall volume. The peak flow rate is relatively unchanged. Additional investigation of the implications of these assumptions will be included in the WMP.

- vi. Channels with unlined bottoms to infiltrate some of the runoff and reduce the volume, particularly for small storms may have potential advantages. This infiltration is not considered in the routing in AHYMO resulting in a conservative result. This is a detail beyond the WMP level.
- vii. Doing a series of hydrographs for 2, 5, 10 & 100 yr. storms with the diversion may help explain the concept at the public meeting.
- c. Sediment removal is currently an integral component of BMPs as proposed in the WMP for water quality enhancement. This may change as the requirements evolve.
- d. Possible bacteria treatment should be discussed in this section of the DMP.
- e. Floatable Controls at Black Dam were discussed. The concept would be to re-construct the outlet to trap floatables. This may be an opportunity for a joint SSCAFCA/AMAFCA project. This would trap floatables during major storms and those that bypass upstream stormwater quality diversions.

4. INTERIM CONDITIONS

- a. Sediment during interim conditions is a concern at the Black Dam. The Interim Conditions Drainage Plan should address. One option is to construct temporary sediment traps upstream from the dam or possibly within the dam ROW.
 - i. The City utilizes the sediment to re-plate roads, repair erosion damage, etc. and has indicated the desire to keep it available for these uses in the interim period.
 - ii. It was noted that the interim period (before the roads are paved and the ultimate drainage improvements are in place) may be on the order of 20 to 50 years.
- b. The concept of establishing erosion envelopes for the major facilities to manage construction during the interim period was discussed without noted problems.
- c. Drainage control BMP's for individual property owners should be addressed.



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**BLACK ARROYO WATERSHED MANAGEMENT PLAN
FUTURE CONDITIONS ALTERNATES REVIEW
TECHNICAL TEAM MEETING NOTES**

MEETING Date: February 13
 Time: 9:00 AM – 12:30 PM
 Location: SSCAFCA Office

ATTENDED BY: David Stoliker, SSCAFCA Bob Foglesong, SSCAFCA
 Ken Curtis, RRPW Robert Schulz, RRPW
 Howard Stone, BHI Karen Jacobsen, ASCG
 Clint Dodge, ASCG

COPIES TO: Attendees
 John Kelly, AMAFCA Loren Meinz, AMAFCA

This was a long and very productive meeting. Thanks to everyone! Please review these meeting notes and let us know of any discrepancies or corrections. If you have any comments, please provide them by Feb 26.

Draft copies of the following were distributed (if you need additional copies, please call):

3 - 11x17 watershed maps:

Future conditions runoff coefficient areas

Alternate 'A'

Alternate 'B'

ASCG memo "Proposed Plan Concept" with Alternate Summary Table, Alternate Cost Summary, Alternate Dam/Pond Data Summary.

Peak Flow rate Alternate 'A' and 'B' comparison table.

Copies of the Draft AHYMO Alternate 'A' and Alternate 'B' models as of 2/11/02 were distributed along with a basin map to SSCAFCA, Rio Rancho & BHI for review.

Copies of the above data will be provided to AMAFCA.

Discussion covered the following:

Note the name change from Drainage Management Plan to Black Arroyo Watershed Management Plan (BLWMP) to conform with the proposed SSCAFCA hierarchy plan. (BL is GIS ID for Black Arroyo Watershed)

1. FUTURE CONDITIONS CRITERIA SUMMARY

- a. The Criteria was approved by everyone present with the following change:

- i. Revise the criteria for the bulking factor for Unit 16 (Blighted Area in litigation) from 6% to 18%, (the same as Unit 10).
 - 1. This will provide safety factor if in fact Unit 16 does develop similar to Unit 10 or if it develops as proposed with a higher density than existing platting.
 - 2. This is a reasonable justifiable conservative assumption.
 - 3. Also, this keeps the options open.
 - b. ASCG will revise.

- 2. **OVERVIEW OF FUTURE CONDITIONS HYDROLOGY** – Changes from fully developed based on existing platting with existing facilities (DEVEX) hydrology
 - a. Revised runoff coefficients to include Rio Rancho “high density” areas (approximately 6% of watershed)
 - i. A map of the areas with increased density was distributed.
 - b. Routing conveyance by lined channel
 - i. Lined channels were assumed for all future developed alternates to provide “apples to apples” comparison. Once an alternate is selected, stable conveyance options will be discussed.
 - ii. The limits of lining assumed for the alternates is not clear on the maps. ASCG will address.
 - c. Added Bernalillo Co. basins from AHYMO output from COA approved Drainage Plans for the development south of Black Arroyo Rd. ASCG will provide approval data.
 - d. Included Black Dam routing from State Engineer Approved Filing Sheet. The ultimate Black Dam volume of 304 AF is being used. It is recognized that this volume is not currently available. Current conditions will be added to the summaries.
 - e. Impact on Q
 - i. Q100 @ Black Dam increases from 9500+/- to 13,500+/- from DEVEX to Future Hydrology.
 - ii. Is this reasonable? This is an expected result due to
 - 1. short routing lengths,
 - 2. increased impervious areas for 6% of watershed (item 2a)
 - 3. small basin sizes
 - 4. addition of Bernalillo Co. area (added approx. 700 cfs)
 - f. AHYMO Reality Check
 - i. The peak flow from the 10 SqM+/- Black Watershed is higher than peak flow from the 50+SqM Montoyas Watershed.
 - 1. Partially due to watershed shape, Black’s is more rectangular while Montoyas is longer and thinner.
 - 2. Minimum routing effect in Black model due to short routing lengths and size of basins. (The basins generally

follow the FEMA model with modifications for revised flow paths, new facilities, etc.)

- ii. SSCAFCA directed that ASCG and BHI exchange AHYMO models and review hydrology for consistency between Management Plans.

3. COMMON WMP ELEMENTS

- a. Stormwater quality treatment Best Management Practices (BMPs) are proposed in the WMP to address future EPA Phase II NPDES requirements.
- b. Stormwater quality enhancement allowance
 - i. The BLWMP proposes the concept of diverting a portion of the stormwater for treatment, establishing "set aside" areas for this stormwater quality treatment and modifying the hydrology and proposed hydraulic structures accordingly. The BLWMP is not identifying specific treatment systems.
 - ii. Capture and treat the "first flush". The BLWMP assumes this is the volume equal to the first 0.25 in. of runoff of the drainage area at this particular site not captured in an upstream treatment diversion facility. This is close to the annual storm event and is consistent with other BMPs. (i.e. 1% of drainage area in treatment area, treat 80% of annual runoff). This is a "best estimate" until more local data is available.
 - iii. Within the system proposed, the stormwater entering a detention pond would be the remainder after the first flush stormwater quality volume was diverted
 - iv. The stormwater treatment volume is handled in AHYMO by removing the diverted volume from the front end of the hydrograph. Currently this is a manual operation of hydrograph output, delete the data points up to the proper volume and insert the revised hydrograph in the model. Then repeat the process at the next downstream stormwater quality treatment site.
 - v. In practice, this volume would be added back to the system, presumably at a very slow flow rate. The current analysis level does not add this back into the flow. The effect is a reduction in overall volume. The peak flow rate is relatively unchanged. Additional investigation of the implications of these assumptions will be included in the WMP.
 - vi. Channels with unlined bottoms to infiltrate some of the runoff and reduce the volume, particularly for small storms may have potential advantages. This infiltration is not considered in the routing in AHYMO resulting in a conservative result. This is a detail beyond the WMP level.
- c. Sediment removal is currently an integral component of BMPs as proposed in the WMP for water quality enhancement. This may change as the requirements evolve.

- d. In many locations, the roadways are currently conveying the runoff, or will be expected to at full build out. Should the road paving be included as a WMP project element?
 - i. It was decided that SSCAFCA would not normally pave streets.
 - ii. Streets with known conveyance requirements will be designated.
 - iii. SSCAFCA and the City will work together to implement.
 - e. The level of detail (i.e. where does the arroyo end?), how this is established and how it is communicated in the WMP remains a “work-in-progress”. Both acreage and flow as criteria were briefly discussed (i.e. 40 Ac, 500 cfs, 2.5 fps, etc.). ASCG has used a variety of methods to date in the WMP to identify the “end of improvements”, including previous studies, field data and flow rates. ASCG will summarize this methods and results and provide a draft for review and inclusion in the WMP.
4. **ALTERNATE ‘A’ - NO NEW DAMS, ALL STORMWATER QUALITY DIVERSION AT COUNTY LINE.**
- a. The stormwater quality diversion at the County line is approximately 118 AF requiring an estimated 76 Ac of area. The area is estimated for planning based on an average depth of 2’ deep plus an additional 25% area.
 - b. Hydrology summary – The flow rates are on the flow rate summary sheet. Peak flow into Black Dam is 13,500 including the areas draining directly from Bernalillo Co.
 - c. Black Dam
 - i. The required detained volume in Black Dam is approximately 326 AF compared to the approved ultimate volume of 304 AF. Increased detention storage will be required either in Black Dam ROW or north of the County line (i.e. in conjunction with the water quality diversion facility).
 - ii. The inflow rates are higher than the design inflow rate (13,500 vs. 7980 cfs). Some modification of the grade control and inlet probably required, depending on how Unit 16 develops.
 - d. Effect on cost, ROW, existing deficiencies, etc. – See Alternate Summary dated Feb 7.
 - i. Since no upstream detention, peak flows must be carried through the watershed.
 - ii. For the cost estimate and ROW estimate, approximate methods were used to estimate size, cost, etc for alternates. This allows direct comparison of the alternates.
 - iii. ASCG has not checked to see if the proposed channels can be constructed within the available ROW north of Southern. ASCG will add this. Vertical wall channels are not acceptable unless access is strictly controlled. It is possible this could be a major determining factor on the feasibility of Alternate ‘A’.

5. **ALTERNATE 'B' - W/ UPSTREAM DAMS AND UPSTREAM WATER QUALITY DIVERSIONS.**
 - a. Stormwater quality enhancement allowance.
 - i. The treatment sites are distributed in the watershed at confluences or other logical locations.
 - ii. Proposed detention dams will each include a stormwater quality component.
 - b. Hydrology summary – The effect on the peak flows is shown on the Flow rates spreadsheet. Flow into Black Dam for Alt. 'B' is 10,690 cfs.
 - c. Dam/pond sites considered/identified
 - i. The proposed dams north of Tulip Rd will in actuality be north of Inca to avoid the gas lines in the Idalia ROW and to avoid cutting Inca.
 - ii. Diversions may be possible north of Inca to collect the runoff and consolidate to just one dam or move the dam location. These secondary opportunities for optimization would be the subject of the Facility Plan or other lower tiered plans.
 - iii. Also, note that undeveloped area is potentially available south of Tulip on Sugar Rd. for a facility if needed.
 - iv. SSCAFCA requested that all potential dam sites, considered but not included in Alternate 'B', be shown as possible alternate sites on the Alternate 'B' maps. During build out, proposed sites may become unavailable for a variety of reasons. Include Unser crossing, confluence of Ivory and Lisbon, at the bottom of the watershed and on the east branch up in Unit 16.
 - v. A pond at Snead Park was considered but was too small to accommodate the stormwater quality volume. The City thought there was quite a bit of area at the site. ASCG will re-evaluate and will add to map as alternate location.
 - d. Effect on cost, ROW, existing deficiencies, etc. – See Alternate Summary dated Feb 7.
 - i. Same assumptions as Alt 'A'.
 - ii. Due to reduced flow rates, more opportunity to reduce ROW impact, use naturalistic channel treatment, etc.
 - e. Black Dam Impact –
 - i. No additional volume required.
 - ii. The inflow rates are higher than the design inflow rate (10,500 vs. 7980 cfs). Some modification of the inlet and grade control may be required depending on how Unit 16 develops.
6. **OTHER WMP CONSIDERATIONS**
 - a. The WMP must be an implementable and supportable document.
 - b. Hierarchy – The hierarchy of the WMP within the overall SSCAFCA and City drainage management structure will be identified in the WMP. Interim and final facilities will be included.

- c. "Worst Case" scenarios will be identified and investigated and a method of handling proposed. (i.e. – what if the area above Inca develops prior to the dams?)
- d. 20th Ave Pond – Increased detention volume is required. Re-sculpting the pond and adjacent park will be proposed in the WMP.
- e. 19 Ave Dam – This is currently an undersized retention pond with no outlet (20AF+/- capacity, 31AF runoff)
 - i. Flood depth over 1' (could be as much as 3 or 4 ft. based on limited data – no survey done)
 - ii. SSCAFCA is in process of purchasing the lot to the east of the pond. A quick calculation indicates this may provide enough capacity to contain a single 100 year event. This uses all of ROW with no "aesthetic amenities".
 - iii. A gravity outfall is possible south through large developed lots to Westside Blvd. then west to Black Dam. Cuts will be in excess of 15' in some areas.
 - iv. A small pump station, say 5 or 10 cfs, could be installed to evacuate the pond over to the 20th Ave pond outfall.
 - v. (We did not talk about it, but this does not appear to be a State Engineer permitted pond.)
- f. Policy issues
 - i. City ordinance revisions update – Rio Rancho has implemented a grading permit requirement allowing Public Works to better manage development within existing platted areas where drainage is a consideration. ASCG will obtain a copy of the ordinance and utilize it as a component in developing recommendations regarding interim conditions control and implementation of the WMP.
 - ii. Communications - It is suggested that we increase communications during the next couple of months regarding the proposed implementation of the BLWMP to conform to both existing and proposed administrative controls.
 - iii. Both the interim conditions (i.e. prior to construction of the ultimate drainage system) and ultimate conditions will be addressed in the BLWMP.
 - iv. Rio Rancho is maintaining a map with impacted properties and other drainage type considerations, such as future proposed dam sites, to flag those building permits needing special attention.
 - v. ASCG will address meander limits or some other kind of interim ROW needs for major arroyos as well as ROW needs for ultimate drainage channels.
 - vi. Existing Platted areas
 - 1. Unit 10 – A need was identified for both interim and future ROW definition for drainage courses in detail (i.e. lot by lot) to implement development controls. The

BLWMP will identify major drainage courses and ROW for both interim and ultimate conditions. The more detailed analysis for smaller drainage ways may need to be a "local" study separate from the BLWMP. ASCG will evaluate and propose solution.

2. Unit 16 (Blighted Area) – Since it is assumed that this area will develop as new subdivisions, generic requirements will be identified but schematic level evaluation (i.e. channel alternatives, etc.) will not be included in WMP.

g. Priorities.

- i. Lisbon Channel is the highest priority because of historic damage and unstable channel reaches adjacent to existing homes.
- ii. The East Branch crossing at Southern Blvd. appears to be undersized. Road overtopping may be in excess of 1' deep for the 100 year event. Since Southern was just re-paved, the City requested any upgrade be scheduled later than 2006. ASCG will verify the field measurements and confirm the facility is undersized.
- iii. Unit 16 will be a low priority due to the continuing litigation.

Southern Sandoval County

Arroyo Flood Control Authority



BOARD OF DIRECTORS

John Chaney
Mark Conkling
Richard Deubel
Guy A. McDowell
William C. Yarbrough

David Stoliker
Executive Director

February 19, 2002

BLACK ARROYO WATERSHED MANAGEMENT PLAN RECOMMENDATION TO SOLICIT PUBLIC INPUT

BACKGROUND SUMMARY:

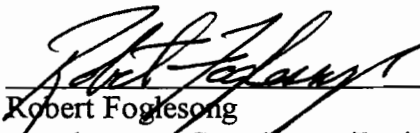
At the December 18, 2001 Board meeting, Volume I of the Black Arroyo Watershed Management Plan was accepted by the Board. Volume II of the plan is presently being prepared and evaluates alternative solutions for the Black Watershed. The proposed alternatives are summarized and compared in the attached memorandum from ASCG, Inc.

Staff recommends that the proposed alternatives be presented to the public to obtain comments.

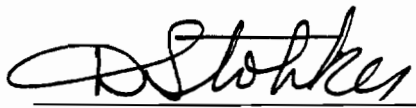
APPROVAL/ACTION:

Board is requested to approve the solicitation of public comments through the holding of public meeting(s).

Reviewed and recommended for approval action by the Executive Director:

By: 
Robert Foglesong
Development Coordinator/Drainage Engineer

Reviewed and approved for Board Action:

By: 
David Stoliker, P.E.
Executive Director

ACTION TAKEN: _____

C:\Land Development\Board Action Items\Black Watershed Management Plan BAI Feb 19 2002.doc

Southern Sandoval County Arroyo Flood Control Authority
4200 Meadowlark S.E., Suite 6 Rio Rancho, New Mexico 87124
(505) 892-5266 FAX (505) 892-7241

TO: David Stoliker, PE SSCAFCA Executive Director

DATE: February 7, 2002

FROM: Clint Dodge 

**RE: BLACK ARROYO WATERSHED MANAGEMENT PLAN
COMPARISON OF ALTERNATES
PROPOSED PLAN CONCEPT**

The attached data and information summarizes the status of the evaluation of alternatives for the Black Arroyo Drainage Management Plan (BLDMP). The purpose of this memorandum is to request consideration and input regarding these alternates and authorization to proceed to the next phase of the study, the solicitation of public comment.

Two fundamentally different concepts were identified and evaluated (see attached summary sheets for details):

- ALTERNATE 'A' – NO NEW DAMS
- ALTERNATE 'B' – NEW UPSTREAM DAMS DISTRIBUTED IN WATERSHED

Several drainage features are common to both alternatives and are proposed to be an integral part of the BLDMP:

- "First Flush" stormwater quality enhancement:
 - Divert, capture and treat first 0.25 inch of runoff
 - Equivalent to approximately 118 AF total volume in watershed
- Allow for future increased densities at locations identified by Rio Rancho planning.
- Stabilize conveyance channels, ditches, streets, etc. Utilize naturalistic treatment where feasible.
- Plan upgrades for incremental implementation over time to accommodate potential funding constraints.

Both alternates are conceptual in nature. Local modifications are anticipated as specific locations are identified and detailed analyses are performed. Specific locations for the diversions and detention facilities are not critical as long as the concept is maintained.

BLACK ARROYO WATERSHED DRAINAGE MANAGEMENT PLAN
ALTERNATE SUMMARY

Feb 7, 2002

	ALTERNATE A	ALTERNATE B
1.0 DESCRIPTION	No new dams Stormwater quality enhancement facilities at County line	Detention dams distributed upstream in watershed Stormwater quality enhancement facilities distributed in watershed
2.0 CONCEPTUAL COST	\$45 Million total Stormwater Quality - \$5M Stable Conveyance - \$40 M Dams - \$0.25M	\$40 Million total Stormwater Quality - \$5M Stable Conveyance - \$32M Dams - \$3M
3.0 ADVANTAGES	Less area impacted - 20 to 30 Ac. Stormwater Quality Enhancement in two large sites Sites could be either within Black Dam or in Sandoval Co. Potential large regional multi-use facility at stormwater quality site. Possible economy of scale for O&M at stormwater quality site.	At this level of detail, appears to be less cost. Less Risk - lower interim flows at existing deficiencies. Schedule Flexibility - lower flows allow incremental upgrade flexibility, build facilities as funding available. Reduced ROW - lower flows allow use of piping in road ROW. Increased Naturalistic Conveyance treatment due to lower flow rates. Potential multi-use recreational facilities distributed in watershed. Water Quality treatment flexibility due to distributed sites.
4.0 TOTAL AREA Water Quality Detention Conveyance	150 Ac 76 Ac (118 AF) NA 75 Ac	171 Ac 76 Ac (118 AF) 30 Ac (99 AF) 65 Ac
5.0 AMAFCA BLACK DAM (Capacity 304 AF) Dam Upgrade Inflow Q Detained Vol	Minimal (less than 30 AF) 13,500 cfs 326 AF	None 10,700 cfs 263 AF

MEMORANDUM

TO: The Black Arroyo Watershed Management Plan Record

FROM: Karen Jacobsen/Pierce Runnels/Clint Dodge 

MEETING DATE: March 13, 2002 Rio Rancho Council

RE: Rio Rancho Council Black Arroyo WMP Briefing

This memo documents the presentation to the Rio Rancho City Council of the Black Arroyo WMP Alternates 'A' and 'B'. A brief overview of Alternatives and following discussion were conducted by David Stoliker and Clint Dodge:

A brief overview was presented to the Council and public in attendance of the existing situation of the watershed and a brief summary of Alternative A and Alternative B. The pond/dam and storm water quality sites shown on the drawings are possible locations only. The maps were put together to give the public an image for comparison of the two alternatives. Alternative B has sites scattered throughout the watershed and Alternative A has sites only at the downstream end of the watershed. Following the presentation, the comments received are as follows.

Councilor Palmer – How does it mesh with the Montoyas WMP?

The Plans have been developed with consistent methodology. Each consultant is reviewing the others work to ensure consistency.

Councilor Bonitelle – The budget cost is very high - \$45Million. How long to implement?

It will take a very long time to implement, probably decades. The first priority project is the Lisbon Channel just north of Southern Blvd.

Councilor Bonitelle – A bond election for \$45 million will be very tough.

Once the Plan is accepted and the priorities defined, we intend to approach other funding sources such as the feds, state, etc. It is not proposed to go out for a

single bond election for the total amount. In fact, SSCAFCA has been very consistent on not raising taxes.

Comment sheets were provided to the Councilors and for the public.

APPENDIX D
SSCAFCA AND RIO RANCHO POLICIES,
RESOLUTIONS AND ORDINANCES

The following Drainage regulations and policies and support data relevant to the BLWMP are attached:

1. SSCAFCA Resolution 2001-6. "Drainage Design Criteria for Roadway Projects."
2. Memorandum of Agreement between the City of Rio Rancho and the Southern Sandoval County Arroyo Flood Control Authority (signed 09/12/94).
3. SSCAFCA Resolution No. 1994-8. "Drainage Policy."
4. City of Rio Rancho "Grading and Drainage Design Requirements and Policies for Land Development in Rio Rancho (Revised 03/18/93)."
5. Army Corps of Engineer letter to Rio Rancho Public Works dated 12/12/01.
6. City of Rio Rancho Notice to Building Permit Applications, 11/24/01, requiring Grading Permits and Grading Plans.
7. Section 9-12-8 of City of Rio Rancho Ordinances concerning Grading Permits.

**SOUTHERN SANDOVAL COUNTY ARROYO
FLOOD CONTROL AUTHORITY
(SSCAFCA)**

RESOLUTION 2001 - 6

DRAINAGE DESIGN CRITERIA FOR ROADWAY PROJECTS

WHEREAS, the Board of Directors of the Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA) met in regular session at the Rio Rancho Country Club, 500 Country Club Drive, Rio Rancho, New Mexico on March 20, 2001 at 1:00 p.m. as per law; and

WHEREAS, the Board of Directors, in 1994, adopted a Drainage Policy wherein it indicated that both public and privately built storm drainage facilities within SSCAFCA's jurisdiction will be designed to accommodate the 100-year storm runoff; and

WHEREAS, the Board of Directors now wishes to adopt a specific design criteria for roadway projects within SSCAFCA's jurisdiction.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE SOUTHERN SANDOVAL COUNTY ARROYO FLOOD CONTROL AUTHORITY that the Drainage Design Criteria for New Mexico State Highway and Transportation Department Projects (Revised Date: November 1998), is hereby adopted as the official design criteria for Collector, Minor and Major arterial roadway projects within the geographical jurisdiction of SSCAFCA.

A copy of said Criteria is attached hereto and incorporated herein by reference.

PASSED, ADOPTED AND SIGNED by the Board of Directors of SSCAFCA this 20th day of March, 2001.

**SOUTHERN SANDOVAL COUNTY
ARROYO FLOOD CONTROL AUTHORITY**

By: Wm. C. Yarbrough
Wm. C. Yarbrough
Chairman, Board of Directors

(SEAL)

ATTEST:

Richard Deibel
Secretary

DRAINAGE DESIGN CRITERIA

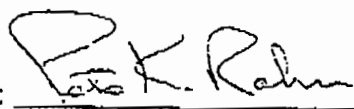
FOR

NEW MEXICO STATE HIGHWAY & TRANSPORTATION DEPARTMENT PROJECTS

REVISED DATE:

November, 1998

Approved for
Implementation:



NMSHTD
SECRETARY

12-16-98

Date

DRAINAGE DESIGN CRITERIA FOR NMSHTD PROJECTS

Effective Date: March 1996

Revised Date: November 1998

It is the Policy Administrative Memorandum Number 221, Rural/Urban Drainage, of the New Mexico State Highway & Transportation Department (NMSHTD) to design drainage structures to meet certain minimum standards. In general, drainage structures are designed to safely pass a flood flow, the magnitude of which is commensurate with an appropriate level of public safety and economic risk. This document establishes minimum standards in terms of design frequency floods and their effects on the transportation facility. Design frequency floods shall be estimated using the standard procedures described in the NMSHTD Drainage Manual, latest edition. Drainage Design Criteria for NMSHTD projects is subject to change without notice. All drainage designers are encouraged to verify that they are using the current Drainage Design Criteria by contacting the NMSHTD Drainage Section in Santa Fe.

Design frequency flood events have been selected for different roadways based on highway classification, location, average daily traffic (ADT), user safety, risk, and consideration of economic impacts. Drainage structures on most NMSHTD projects should be designed to pass the peak flow from the appropriate design frequency flood. In some instances, the NMSHTD may require a higher design standard. This is potentially the case in urban areas where a separate drainage policy is in effect.

Drainage Structures must also be designed to meet all applicable laws. There are laws concerning:

- Alterations of floodplains established in flood insurance studies.
- Construction in flood hazard areas.
- Encroachments or effects on the waters of the United States.
- Water pollution control, including sediment control.
- Protection of fish and wildlife.
- Protection of neighboring property owners.
- Prevention of adverse social and economic impacts.
- Protection of historic properties and archaeological sites.

Specific legal requirements for each project and possible problem locations should be identified early in the design process. In general, drainage structure design should include the following principles:

- Natural drainage onto and off of the highway right-of-way must be maintained.
- Significant diversion of the natural drainage path must be avoided.
- The legal system recognizes the 100-year frequency flood as a foreseeable event, therefore, the effects of the 100-year frequency flood must be evaluated.
- Drainage Structures should be sized to minimize the attenuation of peak flood flows and to promote the passage of sediment and debris.
- Consideration shall be given to future maintenance operations and to the preservation of the constructed highway.

- The level of hydrologic analysis is related to the importance of the drainage structure.
- Drainage structures should be designed to minimize upstream and downstream effects.
- Adverse effects on adjacent properties should be avoided.

Rural Drainage Design Criteria

Drainage Structure locations are considered rural when the watershed lands are undeveloped, or are used for agricultural purposes including rangeland. Design frequency flood magnitudes for rural areas are listed in Table I. The duration for all design frequency floods is 24 hours, except for the Rational methodology where the duration is one hour. Designers should use these flood magnitudes for design unless otherwise directed in writing by the NMSHTD Drainage Section. Maximum Water Surface limits shown in Table I should be observed. Hydrologic and Hydraulic analyses of drainage structures should be performed using the methods identified in the NMSHTD Drainage Manual, latest edition.

The engineer shall endeavor to match the width of the active channel when designing any structure. The engineer shall avoid decreasing the existing structure size and/or plugging structure unless justifiable.

Detention and retention ponds shall be designed for the 50-year storm with one foot of freeboard.

Developers are responsible for the additional runoff generated within the highway right-of-way as a result of new developments; they must ensure that no flows from new developments are allowed within the highway right-of-way.

Table I
Rural Drainage Design Criteria

Roadway Classification	Drainage Structure Type	Design Frequency Flood	Maximum Water Surface
Interstate, four-lane State or Federal Highways	Swales Inlets Rundown	50-year	Not to exceed the edge of driving lane. Limit the water spread to no more than one through-lane for the 100-year frequency flood. Design rundowns to contain water inside the rundowns.
	Crossing Culverts	50-year	Culvert soffit. Limit the 100-year water surface to the edge of shoulder. Existing structures: the water surface can get as high as the edge of shoulder for the design frequency flood.
	Bridges	50-year	A minimum of 2 feet of freeboard from the bottom chord of bridge is required and the 100-year discharge shall not overtop the bridge deck.
	Bridge Scour Analysis	100-year or overtopping	Check the 500-year flood for foundation design.
Two-lane State or Federal Highways	Swales Inlets Rundown	50-year	Not to exceed the edge of driving lane. Limit the water spread to no more than one-half of a through-lane for the 100-year frequency flood. Design rundowns to contain water inside the rundowns.
	Crossing Culverts	50-year	Culvert soffit. Limit the 100-year water surface to the edge of shoulder. Existing structures: the water surface can get as high as the edge of driving lane.
	Bridges	50-year	A minimum of 2 feet of freeboard from the bottom chord of bridge is required and the 100-year discharge shall not overtop the bridge deck.
	Bridge Scour Analysis	100-year or overtopping	Check the 500-year flood for foundation design.
Detours	All Structure Types	2-year	Top of detour culvert soffit.

See General Design Notes on next sheet.

GENERAL DESIGN NOTES:

1. The design frequency flood may be changed when a risk analysis indicates that an inappropriate design flood has been used.
2. Drainage structures must be sized such that the 100-year floodplain is not made worse on adjacent properties with high cost improvements.
3. Structure sizes should account for sediment bulking of the flow.
4. In no case shall a culvert size be less than a 24" circular pipe culvert or its equivalent hydraulic capacity.

Urban Drainage Design Criteria

Drainage Structure locations are considered urban when the watershed lands have been developed for human activity. Design frequency flood magnitudes for urban areas are listed in Table II. The duration for all design frequency floods is 24 hours, except for the Rational methodology where the duration is one hour. Designers should use these flood magnitudes for design unless otherwise directed in writing by the NMSHTD Drainage Section. Maximum water surface limits shown in Table II should be observed. Hydrologic and Hydraulic analyses of drainage structures should be performed using the methods identified in the NMSHTD Drainage Manual, latest edition.

The engineer shall endeavor to match the width of the active channel when designing any structure. The engineer shall avoid decreasing the existing structure size and/or plugging structure unless justifiable.

Detention and retention ponds shall be designed for the 100-year storm with one foot of freeboard.

Developers are responsible for the additional runoff generated within the highway right-of-way as a result of new developments; they must ensure that no flows from new developments are allowed within the highway right-of-way.

Urban Drainage Procedures

- A. Roadway projects within urban areas shall be designed and constructed with an adequate drainage system to enhance the safety, durability, and economy of maintenance without adversely affecting the adjacent properties.
- B. A complete evaluation of storm water accumulation shall be conducted within the project limits by the lead agency.
- C. The design of the drainage system for collection and disposal of the accumulated runoff shall be based on sound engineering principles.
- D. The cost of constructing the drainage system shall be prorated between the roadway project and the municipality based on the following principles:
 1. The cost of drainage structures to accommodate the existing drainage crossing the roadway within a natural or man-made channel shall be included in the roadway cost.
 2. To accommodate overland and street flow tributary to the roadway, a drainage system shall be designed based on a 10-year frequency storm. The responsibility for funding this system shall be as follows:
 - a. The cost of the drainage system required to accommodate the runoff from existing tributary drainage areas in existing condition shall be a participating

roadway cost.

1. The existing condition is defined as that "condition" prior to development of local streets and/or other facilities that divert or concentrate flow onto the right-of-way.
 2. If the existing condition cannot be reasonably defined, the participating amount will be based upon the flow generated within the NMSHTD right-of-way.
- b. The additional cost of the drainage system required to accommodate the runoff from the existing tributary drainage areas in a fully developed condition shall be borne by the municipality.
- E. All runoff diverted into the project limits shall be the financial responsibility of the municipality and community; this includes the case when the diverted runoff is discharged into the State's storm drain system and/or right-of-way.
- F. When a drainage system proves to be feasible and is recommended by the Department but the municipality does not agree to assume its prorated share, the project shall not proceed unless other agreements are reached.
- G. The participating storm drain system costs will be the product of the total cost and the ratio of the existing flow to the developed flow, or as negotiated in the Agreement with the local entity.

Table H
Urban Drainage Design Criteria

Roadway Classification	Drainage Structure Type	Design Frequency Flood	Maximum Water Surface
Interstate Highways	Swales Inlets Run-down	50-year	Not to exceed the edge of driving lane. Limit the water spread to no more than one through-lane for the 100-year frequency flood. Design run-downs to contain water inside the run-downs.
	Curb Drop Inlets	50-year	Limit the water spread to shoulder plus 1/3 of the driving lane. Trunkline shall be designed so that the 100-year hydraulic grade line is maintained below the grate elevation.
	Crossing Culverts	50-year	Culvert soffit. Limit the 100-year water surface to the edge of shoulder. Existing structures: the water surface can get as high as the edge of shoulder for the design frequency flood.
	Bridges	100-year	A minimum of 2 feet of freeboard from the bottom chord of bridge is required and the 100-year discharge shall not overtop the bridge deck.
	Bridge Scour Analysis	100-year or overtopping	Check the 500-year flood for foundation design.

Table II
Urban Drainage Design Criteria
(Continued)

Four-lane & Two-lane State or Federal Highways	Swales Runoff	50-year	Not to exceed the edge of driving lane. Limit the water spread to no more than one half through-lane for the 100-year frequency flood. Design runoffs to contain water inside the runoffs.
	Storm drain, inlets, and Trunklines	10-year	Maintain one-through lane open to traffic at all times and the 100-year storm shall be contained within the right-of-way. In no case shall the 100-year IGL at the trunkline exceed the inlet grate elevation.
	Crossing Culverts	50-year	Culvert soffit. Limit the 100-year water surface to the edge of shoulder. Existing structures; the water surface can get as high as the edge of driving lane for the design frequency flood.
	Bridges	50-year	A minimum of 2 feet of freeboard from the bottom chord of bridge is required and the 100-year discharge shall not overtop the bridge deck.
	Bridge Scour Analysis	100-year overtopping	Check the 500-year flood for foundation design.
Detours	All Structure Types	2-year	Top of detour culvert soffit.

General Design Notes:

1. The design frequency flood may be changed when a risk analysis indicates that an inappropriate design flood has been used.
2. Drainage structures must be sized such that the 100-year flood plain is not made worse on adjacent properties with high cost improvements.
3. Structure sizes should account for sediment bulking of the flow.
4. In no case shall a culvert size be less than a 24" circular pipe culvert or its equivalent hydraulic capacity.
5. For interstate highways, use the 100-year design if population exceeds 250,000.

July 21, 1994 11:19 am

D-R-A-F-T Version 7.2

MEMORANDUM OF AGREEMENT BETWEEN THE CITY OF RIO RANCHO
AND
THE SOUTHERN SANDOVAL COUNTY ARROYO FLOOD CONTROL AUTHORITY

THIS AGREEMENT, made and entered into effective this _____ day of _____, 1994,
by and between THE CITY OF RIO RANCHO, hereinafter called "City" and the SOUTHERN SANDOVAL
COUNTY ARROYO FLOOD CONTROL AUTHORITY, hereinafter called "Authority".

WITNESSETH:

WHEREAS, the City and the Authority are desirous of entering into an agreement under Sections
8 through 10 of the Authority's Resolution No. ¹⁹⁹⁴⁻⁸ hereinafter referred to as the "Drainage Policy", so
that the Board of Directors may appoint the City Engineer as Designee to act in the name, place and
stead of the Executive Engineer in the granting or denying of approvals or waivers under the Drainage
Policy; and

WHEREAS, the authority to enter into an agreement of this nature is conferred by
Section 72-19-22 N.M.S.A. 1978.

NOW, THEREFORE, IN CONSIDERATION OF THE MUTUAL COVENANTS AND PROMISES
HEREINAFTER CONTAINED, BE IT AGREED BETWEEN THE PARTIES:

1. APPOINTMENT

The Board of Directors of the Authority does hereby appoint the City Engineer to act, except as
hereinafter provided, in the name, place and stead of the Executive Engineer of the Authority in the
granting or denying of approvals or waivers under and pursuant to the standards, principles and
requirements set forth in the Drainage Ordinances of the City and the Drainage Policy of the Authority
as the same applies to the lands within the City limits and to those lands for which a petition for

D-R-A-F-T Version 7.2

annexation to the City is pending. The Designee shall receive no compensation from the Authority for the performance of his duties and shall exercise the powers delegated to him to the extent and in the manner hereinafter set forth. The City shall notify the Authority whenever there are changes in the position of Designee.

2. PROCEDURE.

A. General.

Following application for approval of plans for improvements within the City which may affect drainage as regulated by the Authority under its Drainage Policy, the Designee shall personally inspect the site to assure himself that the existing conditions appear to conform to the application and related drainage reports and plans. Except as hereinafter agreed, the Designee shall have sole authority for the decision on the application. Following the written decision made by the Designee, a copy of the notice of decision shall be delivered to the office of the Authority. Copies of all documentation submitted with the developmnet plan application shall be maintained as public records of the City and shall be available for inspection by the public. Conferences between the Executive Engineer, the Designee and an applicant may be held when deemed appropriate by the Designee or the Executive Engineer.

B. Concurrence by the Authority.

In the following matters, the decision on the application shall be with written concurrence of the Authority's Executive Engineer:

- (1) A decision which would, after taking into consideration the effect of previous and concurrent interbasin transfers, permit or result in the net transfer of storm runoff from more than 150 acres of land from one drainage basin, and when fully urbanized, would produce more than 500 CFS of storm runoff in the event of a 100 year storm.
- (2) A decision which would permit or result in a shifting of the point of discharge of any storm drainage facility which would carry more than 500 CFS in the event of a 100 year

D-R-A-F-T Version 7.2

storm.

- (3) A decision which would permit or result in an alteration of those portions of an arroyo which would carry more than 1000 CFS in the event of a 100 year storm.
- (4) A decision which would result in the discharge to or alteration of any facility which is constructed and maintained by the Authority or any facility maintained by the Authority.
- (5) A decision involving a case, project or facility in which the Executive Engineer has notified the Designee in writing that written concurrence is required.

When an application, meeting all of the requirements of the Drainage Policy, is submitted to the Executive Engineer for concurrence, the Executive Engineer shall have thirty (30) days to concur or refer the application to the Board of Directors of the Authority for its decision on the application.

3. COORDINATION.

The Designee and the Executive Engineer shall coordinate their respective storm drainage related activities and each shall apprise the other promptly of all activities and proposed programs of their respective entities pertaining to major drainage management of drainage basins situated wholly or partly within the City limits. They shall cooperate in encouraging innovative and/or aesthetically desirable approaches to storm drainage management. It is understood and agreed that the minimum criteria for hydrology calculations and drainage design shall be as described in Volume 2, Development Process Manual, City of Albuquerque, latest revision.

4. TERMINATION.

This agreement may be terminated by the City or the Authority by providing sixty (60) days written notice to the other party.

D-R-A-F-T Version 7.2

IN WITNESS WHEREOF, The City of Rio Rancho, by the Honorable Thomas Swisstack, Mayor of the City of Rio Rancho and the Southern Sandoval County Arroyo Flood Control Authority by John Chaney, Chairman of the Board of Directors have caused this Agreement to be effective on the date first above mentioned.

CITY OF RIO RANCHO

BY

THOMAS SWISSTACK, MAYOR

DATE:

8/2/94

ATTEST:

CITY CLERK
(SEAL)

APPROVED AS TO FORM:

CITY ATTORNEY

SOUTHERN SANDOVAL COUNTY ARROYO FLOOD CONTROL AUTHORITY

BY

JOHN CHANEY,
CHAIRMAN, BOARD OF DIRECTORS

DATE:

9/12/94

ATTEST:

SECRETARY
(SEAL)

APPROVED AS TO FORM:

SSCA ATTORNEY

***THE SOUTHERN SANDOVAL
COUNTY ARROYO FLOOD
CONTROL AUTHORITY***

DRAINAGE POLICY

RESOLUTION NO. 1994-8

**SOUTHERN SANDOVAL COUNTY ARROYO FLOOD CONTROL AUTHORITY
(SSCAFCA)
RESOLUTION 1994-8
ADOPTION OF DRAINAGE POLICY**

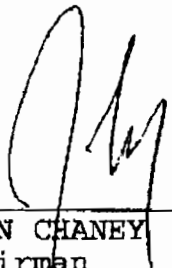
WHEREAS, the Board of Directors of Southern Sandoval County Arroyo Flood Control Authority (the Authority) met in regular session at 4020 Peggy Rd. S.E., Suite E, Rio Rancho, New Mexico on April 19, 1994 at 1:00 p.m.; and

WHEREAS, the Board of Directors of the Authority at its special meeting on April 15, 1994, approved by Motion the Drainage Policy subject to an appeal section; and

WHEREAS, the Board of Directors has approved the Appeal Section and now wishes to also adopt said Drainage Policy by Resolution in order to further formalize said approval.

NOW THEREFORE, BE IT RESOLVED by the Board of Directors of SSCAFCA that the Drainage Policy is hereby approved and adopted effective April 19, 1994.

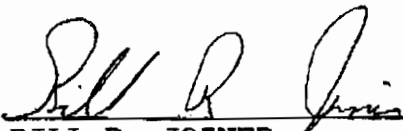
PASSED AND ADOPTED by the Board of Directors of SSCAFCA this 19th day of April, 1994.



JOHN CHANEY
Chairman
Southern Sandoval County Arroyo
Flood Control Authority

(SEAL)

ATTEST:



BILL R. JOINER
Secretary

TABLE OF CONTENTS

SECTION

INTRODUCTION

Section 1.	GENERAL STATEMENT.	5
Section 2.	BOUNDARIES.	6
Section 3.	DEFINITIONS.	7

DEVELOPMENT

Section 4.	DRAINAGE POLICY STATEMENT.	11
Section 5.	GENERAL DEVELOPMENT REQUIREMENTS.	11
Section 6.	MANDATORY COMPLIANCE WITH POLICY.	13
Section 7.	REQUIREMENTS FOR APPLICATIONS FOR DEVELOPMENT. .	13

DESIGNEE

Section 8.	APPOINTMENT OF DESIGNEE.	16
Section 9.	APPROVAL OF DEVELOPMENT PLAN BY DESIGNEE.	16
Section 10.	DESIGNEE WAIVERS.	18

CONCLUSION

Section 11.	DISTRIBUTION OF POLICY.	18
Section 12.	POLICY INTENT/DISCLAIMER.	19
Section 13.	APPEAL.	19
Section 14.	ENFORCEMENT/RESTORATION/PUBLIC NUISANCE.	20
Section 15.	SEVERABILITY CLAUSE.	21
Section 16.	EFFECTIVE DATE.	22

INTRODUCTION

Section 1. GENERAL STATEMENT.

The Authority will serve a public use and will promote the health, safety, prosperity, security and general welfare of the inhabitants within its territory.

The protection of life and property from flood damage shall be considered to be the Authority's primary objective in the planning, design, construction and maintenance of storm drainage facilities.

Subsidiary concerns, not limited to the following, include: watershed characteristics, sediment control, maintenance, multiple use, and appearance. The needs of the community in transportation, utility service, recreation, and open space shall be considered in the selection of watercourse and floodplain treatments. The Authority encourages consideration of such alternatives to lined storm drainage facilities as watershed management, natural or naturalistic watercourses, the prudent line and stabilized flood zones.

The Authority recognizes the interactions within the hydrologic system. Human activities such as storm drainage, irrigation, groundwater usage and recharge, and urban development may influence one another. The Authority will pursue its objective from a comprehensive hydrologic perspective.

In general, both public and privately-built storm drainage facilities will be designed to accommodate the 100-year runoff. However, the Board of Directors may require a more conservative design where the consequence of failure could be severe. Minor storm drainage facilities, such as storm sewers, streets and detention basins having adequate downstream capacity, may be designed to accommodate less than the 100-year runoff, in accordance with criteria adopted by public entities within their respective jurisdictions, and by the Executive Engineer of the Authority within other areas.

The Authority commits itself to cooperate with other public entities and with private developers to the end that urbanization proceeds in a responsible manner without unnecessary economic burden.

1 The Authority shall develop and update annually a schedule of Authority
2 funded projects. The Authority encourages other public agencies to do
3 likewise.

4
5 The standards set forth in this policy are intended to protect the capacity of
6 existing watercourses, and to insure storm drainage facility capacity under full
7 development.
8

9
10 **Section 2. BOUNDARIES.**

11
12 The Authority's territory is the following described area (see sketch map, Appendix
13 A):

14
15 Known as being that area within Sandoval County, New Mexico enclosed by
16 the following boundary:

17
18 A portion of southern Sandoval County bounded on the east by the Rio
19 Grande, on the south by the Bernalillo and Sandoval County lines, on the
20 west by the top of the Rio Puerco drainage and on the north by the top of the
drainage that lies on the southern boundary of the Zia Indian reservation and
State Highway 44.

23
24 The boundary of the authority is more particularly described as follows:
25 beginning at the intersection of the west bank of the Rio Grande and the
26 Sandoval county line in projected section 35, township 12 north, range 3 east,
27 that point also being the southeast corner of herein described boundary;
28 thence proceeding in a westerly direction along the Sandoval county line for
29 approximately fourteen and one-half miles to the top of the Rio Puerco
30 drainage in section 32, township 12 north, range 1 east; thence, in a northerly
31 direction along the top of the Rio Puerco drainage for approximately fourteen
32 miles to a point in the southeast corner of section 21, township 14 north,
33 range 1 east; thence, south for approximately one mile along the west
34 boundary of the Zia Indian reservation to a point in the southeast corner of
35 section 28, township 14 north, range 1 east; thence, in an easterly direction
36 along the southern boundary of the Zia Indian reservation for approximately
37 seven miles to a point in the southeast corner of section 33, township 14
38 north, range 2 east; thence, in a southeasterly direction for approximately four
39 miles to a point in the middle of the south boundary of section 11, township
40 13 north, range 2 east; thence, east for approximately four and one-quarter
41 miles to a point on the south side of state highway 44 in section 9, township

1 13 north, range 3 east; thence, in a southeasterly direction along the south
2 side of state highway 44 for approximately five miles to a point on the west
3 bank of the Rio Grande in the northeast corner of section 31, township 13
4 north, range 4 east; thence, in a southwesterly direction along the west bank
5 of the Rio Grande for a distance of approximately nine miles to a point in
6 section 35, township 12 north, range 3 east, which point is the southeast
7 corner and point of beginning of the authority.
8

9
10 **Section 3. DEFINITIONS.**

11
12 Unless the context otherwise requires, the following definitions apply to this
13 Policy:

- 14
15 A. **"Authority"** means the Southern Sandoval County Arroyo Flood
16 Control Authority.
17
18 B. **"Board of Directors"** means the Board of Directors of the Authority.
19
20 C. **"Channel Stability"** means a condition in which a watercourse neither
21 degrades nor meanders over a period of 30 years to the degree that
22 storm drainage facilities or adjacent property are endangered, nor
23 aggrades to the degree that storm drainage facility capacity is
24 significantly diminished as a result of one or more runoff events equal
25 to or less than the design runoff.
26
27 D. **"Downstream Capacity"** means the ability of downstream storm
28 drainage facilities to accept and safely convey the design runoff.
29
30 E. **"Design Runoff"** means the rate and volume of storm water discharge
31 and associated sediment from a design storm. The analysis procedure
32 to be used shall be in accord with generally accepted principles of
33 hydrology and approved by the Executive Engineer or the Designee.
34 The design runoff will be based upon full development of the lot, tract,
35 parcel of land or watershed. Computation of design runoff shall be
36 prepared by, or under the supervision of, an engineer.
37
38 F. **"Design Storm"** means the precipitation event for which a storm
39 drainage facility is designed or its adequacy assessed. Except where
40 explicitly noted, this event is the 100-year precipitation shown in
41 National Oceanic and Atmospheric Administration (NOAA) Atlas 2,

1 "Precipitation - Frequency Atlas of the Western United States, Volume
2 IV -New Mexico." The event must extend for a period long enough to
3 include all rainfall excess when the volume of design runoff is an
4 important consideration. This includes conditions when detention
5 storage is involved, when sediment processes are a significant factor,
6 and when combining and routing subbasin hydrographs to obtain
7 design runoff. When the peak rate of flow is the primary concern and it
8 is established that use of a longer duration would not increase the peak
9 flow, a 6-hour duration will be used.

10
11 G. "Designee" means an individual designated under provisions of this
12 regulation hereof to act on behalf of the Executive Engineer.

13
14 H. "Developed Areas" means any lot or parcel of land occupied by any
15 structure intended for human occupation or commercial enterprise.

16
17 I. "Engineer" means a professional engineer registered in New Mexico
18 competent in surface hydrology and drainage.

19
20 J. "Executive Engineer" means the Executive Engineer of the Authority.

21
22 K. "Flood Control" means watershed management or watercourse
23 treatment to reduce damages to the watercourse, storm drainage
24 facilities or adjacent property.

25
26 L. "Floodplain" means the watercourse and adjacent land areas required
27 to safely transport or store the design runoff.

28
29 M. "Freeboard" means that part of a storm drainage facility bank or wall
30 that serves to provide a factor of hydraulic capacity above the flow
31 depth and wave action of the design runoff.

32
33 N. "Full Development" means a hydrologic condition in which all areas
34 upstream and downstream of a point are assumed to be completely
35 developed areas, including any undeveloped areas which are yet to be
36 developed. Calculations for undeveloped areas are done in accordance
37 with mid-range development densities as established by the current
38 comprehensive plan for the area and/or a public body's population and
39 development projections and guidelines.
40

- 1 O. **"Maintenance"** means the cleaning, shaping, grading, repair and minor
2 replacement of storm drainage facilities.
3
4 P. **"Major Storm Drainage Facility"** means any storm drainage facility
5 having a design runoff exceeding 50 cubic feet per second or storage
6 exceeding 2 acre-ft.
7
8 Q. **"Major Subdivision"** means a subdivision of more than 5 acres or 5
9 lots.
10
11 R. **"Major Watercourse"** means a watercourse with a drainage area
12 greater than 320 acres.
13
14 S. **"Minor Storm Drainage Facility"** means any storm drainage facility
15 that is not a major storm drainage facility.
16
17 T. **"Minor Subdivision"** means any subdivision that is not a major
18 subdivision.
19
20 U. **"Minor Watercourse"** means any watercourse that is not a major
watercourse.
21
22
23 V. **"Multiple Use Facility"** means a storm drainage facility in which other
24 secondary uses are planned or allowed, including, but not limited to,
25 recreation, open space, transportation and utility location.
26
27 W. **"Natural Watercourse"** means a naturally occurring watercourse with
28 unimproved cross-sections, grade, and unlined bed and banks.
29
30 X. **"Naturalistic Watercourse"** means an improved watercourse
31 designed to emulate aesthetic qualities of a natural watercourse.
32
33 Y. **"Public Body"** means any municipality, county or any instrumentality,
34 agency or administrative body within the territory of the Authority.
35
36 Z. **"Prudent Line"** means that line which will not be disturbed by erosion,
37 scour or meandering of a natural watercourse over a period of 30 years
38 and which will not be disturbed by a design storm occurring at any time
39 during the 30 year period. The prudent line shall be located as to
40 include freeboard required to contain the design runoff.
41

- 1 AA. **"Sediment Control"** means watershed management or watercourse
2 treatment to reduce damages to the watercourse, storm drainage
3 facilities or adjacent property due to lack of channel stability.
4
- 5 AB. **"Stabilized Flood Zone"** means the portion of a natural watercourse
6 flooded by the design runoff when protected by sediment control
7 measures. The watercourse is in natural or naturalistic condition.
8 Stabilization will provide sediment control over a period of 30 years and
9 will not be disturbed by design runoff occurring at any time during the
10 30 year period. Stabilization includes freeboard required to contain the
11 design runoff.
12
- 13 AC. **"Storm Drainage Facility"** means any watercourse, street, storm
14 sewer, dam, diversion, dike or any other natural or man-made feature
15 used in the collection, transport, impoundment, or disposition of storm
16 surface waters, its associated sediment, or a combination thereof.
17
- 18 AD. **"Storm Drainage Facility Capacity"** means the ability of a storm
19 drainage facility to intercept and convey the design runoff with
20 appropriate freeboard. Capacity of streets (and associated borrow
ditches) and storm sewers may be determined by public entities in their
jurisdictions.
23
- 24 AE. **"Temporary Storm Drainage Facility"** means a nonpermanent storm
25 drainage facility constructed as part of a phased project to serve until
26 such a time that a permanent facility is in place, including, but not
27 limited to desilting ponds, berms, diversions, channels, detention and
28 retention ponds, bank protection and channel stabilization measures.
29
- 30 AF. **"Watercourse"** means any river, creek, arroyo, canyon, swale, canal,
31 bar ditch, draw, or wash, or any other channel, natural, improved or
32 artificial, which may regularly or occasionally carry water.
33
- 34 AG. **"Watercourse Treatment"** means the physical alteration of a
35 watercourse for any purpose.
36
- 37 AH. **"Watershed Management"** means regulation of the hydrologic system
38 within a basin or subbasin for the purpose of flood and sediment
39 control. Watershed management may include, but is not limited to,
40 promotion of infiltration and other hydrologic abstractions, attenuation of
41 peak discharge rate, and soil conservation.

DEVELOPMENT/ENFORCEMENT

Section 4. DRAINAGE POLICY STATEMENT.

Except as permitted by this policy, the natural topography, drainage pattern and perviousness of any lot, tract or parcel of land within the territory of the Authority may not be altered by grading, filling, excavating, or subdividing.

Section 5. GENERAL DEVELOPMENT REQUIREMENTS.

A. ALTERATION.

Alteration described in Section 4 will be permitted if it is shown that, in the event a design storm occurs upon such lot, tract, or parcel, the following standards will be met:

- 1) The storm surface waters emanating from higher lands and drainage through or along such lot, tract or parcel in a storm drainage facility will pass through said property in the storm drainage facility at a rate of flow, velocity, quantity and location which does not exceed the capacity of the storm drainage facilities on said property and the property downstream; or such waters will be able to pass through said property in the storm drainage facility at a rate of flow, velocity, and location of discharge reasonably similar to that which existed before such alteration.
- 2) The storm water runoff from such lot, tract, or parcel will discharge from such property into, and in such manner which will not exceed the capacity of storm drainage facilities downstream; or, will discharge from such property at a rate of flow, velocity and location reasonably similar to that which existed before such alteration. Reasonable similarity should exist for both the design runoff and runoff from more frequent events.

The standards set forth in subparagraph A1) are intended to protect existing watercourses and floodplains when the alteration is by encroachment. The standards set forth in subparagraph A2) are intended to prevent the allowable capacity of existing floodplain and

1 storm drainage facilities from being exceeded as a result of the
2 alteration.

3
4 **B. RUNOFF CONCENTRATION OR DIVERSION.**

5
6 If A1) and A2) are otherwise complied with and if no hazard is created
7 and no damage will ensue, storm water runoff may be concentrated
8 and diverted so that it enters a storm runoff facility at a different
9 location. Storm drainage facilities, satisfactory to the public body, shall
10 be designed and built for such concentration or diversion. If diversion
11 or concentration crosses private lands, an easement satisfactory to the
12 public body shall be furnished.

13
14 **C. DECISIONS.**

15
16 Determinations of reasonable similarity, satisfactory diversions facilities,
17 easements and other decisions or waivers permitted or required herein
18 shall be made by the Executive Engineer or the Designee in
19 accordance with locally applicable general engineering and public
20 safety practices.

21
22 **D. COSTS.**

23
24 Where the landowner desires changes to a floodplain or a watercourse,
25 the cost of such modification or alteration, including entrance and exit
26 structures and right-of-way acquisition, shall be paid for by the owner,
27 except where a public project, which would accomplish such
28 modification or alteration, has already been authorized and funded.
29 The design to modify or alter a floodplain or watercourse shall be
30 approved and construction monitored by the Executive Engineer or its
31 Designee.

32
33 **E. EMINENT DOMAIN.**

34
35 The Board of Directors of the Authority may authorize eminent domain
36 proceedings to acquire right-of-way for drainage improvement plans
37 which will be implemented at private expense, but owned by a public
38 body.
39

1 **B. APPLICATIONS FOR DEVELOPMENTS OF FIVE (5) ACRES OR**
2 **LESS.**

- 3
- 4 1) The applicable requirements in A 1)- 6) above plus,
- 5
- 6 2) **Drainage Plan.** A short detailed plan prepared with or on a
7 grading plan addressing on-site and off-site flood control and
8 sediment control issues. The plan shall identify and locate each
9 watercourse situated within or adjacent to the lot, tract or parcel,
10 and depict and compute the area draining into such property.
11 The plan shall include designs for proposed storm drainage
12 facilities and indicate right of way to be dedicated for drainage.
13 The plan is required for minor subdivisions, site development
14 plans and landscaping plans for development of 5 acres or less.
15 This plan shall be prepared by, or under the supervision of, and
16 sealed by an engineer.

17

18 **C. APPLICATIONS FOR DEVELOPMENTS OF MORE THAN FIVE (5)**
19 **ACRES.**

- 20
- 21 1) The applicable requirements in A 1)- 6) above plus,
- 22
- 23 2) **Conceptual Grading and Drainage Plan.** An initial plan
24 prepared in graphical format showing existing and proposed
25 grading, sediment control information and storm drainage
26 facilities in sufficient detail to determine the subsequent submittal
27 requirements. The plan should document the compatibility of the
28 proposed development within grading, flood hazard and
29 sediment constraints dictated by on-site physical features as well
30 as adjacent properties, streets, alleys and watercourses. The
31 plan is required for modification to comprehensive plans and the
32 development of area plans, sector plans, site development plans
33 and landscaping plans on tracts exceeding five (5) acres. This
34 plan shall be prepared by, or under the supervision of, and
35 sealed by an engineer.
- 36
- 37
- 38
- 39

DESIGNEE

Section 8. APPOINTMENT OF DESIGNEE.

The Board of Directors shall, when requested, authorize such persons as may be designated by the Chief Executive Officer of any public body within the boundaries of the Authority to act in the name, place and stead of the Executive Engineer in granting or denying approvals or waivers under this policy, provided that:

- A. Each person so authorized shall be as designated under the implementing joint powers agreement; and
- B. An agreement has been entered into between the Authority and such cooperating public body under the provisions of Section 72-19-22, N.M.S.A., 1978 and the Joint Powers Agreement Act; and
- C. Notices of all decisions and of drainage submittals, approved, modified or rejected by such Designee will be furnished to the Executive Engineer at the time of decision thereof and copies of all documentation shall be maintained on file in the offices of the public body; and
- D. The Designee and the Executive Engineer are required to coordinate their respective drainage related activities.

Section 9. APPROVAL OF DEVELOPMENT PLAN BY DESIGNEE.

No plat, replat, summary plat, development plan or subdivision of any land within the territory of the Authority may be approved by the governing authority of a public body without written approval of the Designee.

A. PLAT APPROVAL.

Plats, replats, summary plats or subdivisions require endorsement upon the documents. Such approval shall be granted if:

- 1). Documents prepared in accordance with Section 7 have been submitted and approved; and

- 1 2). The landowner dedicates or grants to the public body or the
2 Authority, without compensation, the right-of-way sufficient to
3 pass the design runoff. This dedication requirement may be
4 fulfilled in any one of the following ways:
- 5
- 6 a) permanent dedication of the natural floodplain and prudent
7 line limits, if applicable; or
- 8
- 9 b) permanent dedication of the right-of-way necessary for
10 improved storm drainage facilities built in accordance with
11 plans approved by the Executive Engineer or the
12 Designee; or
- 13
- 14 c) interim dedication of the 100-year natural floodplain,
15 effective until right-of-way is permanently dedicated for
16 improved storm drainage facilities.
- 17
- 18 3) Right-of-way may be dedicated in fee simple or as an easement
19 in a form acceptable to the Designee.
- 20

21 **B. OTHER REQUIREMENTS.**

22 Final approval of a development plan will be accepted by a public
23 body, and the landowner will be in compliance with this Section only
24 when the following conditions are met:

25

- 26
- 27 1) plans for the construction of improved storm drainage facilities
28 have been approved by the Designee; and
- 29
- 30 2) construction of the improved storm drainage facilities is
31 scheduled for completion within one year or other period agreed
32 to by the Designee; and
- 33
- 34 3) financial guarantees in the form of bonds, certificates of deposit,
35 or other like guarantees, acceptable to the Designee, are
36 provided which indicate that said improvements will be
37 constructed in accordance with the approved plans and
38 schedule.
- 39
- 40
- 41

Section 10. DESIGNEE WAIVERS.

The Designee may waive all or some of the above requirements of development plans when the Designee determines that there is no significant existing or anticipated drainage problems on the property or downstream of the property. If downstream capacity is not exceeded and public safety will not be impaired, compliance with some or all of the provisions of Section 5 may be waived in writing by the Executive Engineer or the Designee if one of the following situations exists:

- (1) Permanent zoning and construction are entirely for single family detached housing and the area is shown in a drainage management plan as being in compliance with this Regulation.
- (2) The lot, tract, or parcel is five (5) acres or less in area and less than twenty percent (20%) of the area is impervious and the lot, tract or parcel is not adjacent to or does not contain a major storm drainage facility.
- (3) An interim storm drainage solution will provide adequate safeguards pending completion of permanent protection in accordance with this Policy.

CONCLUSION

Section 11. DISTRIBUTION OF POLICY.

The Executive Engineer and/or Designee shall provide copies of this policy to all public entities and public bodies having jurisdiction to construct improvements, to issue building permits, or to review and approve subdivision plats; and shall make available copies of this policy to all persons, firms and corporations requesting the same; and shall seek the cooperation of all public entities and public bodies in the application and enforcement of this policy.

Section 12. POLICY INTENT/DISCLAIMER.

1 The degree of drainage control intended to be provided by this policy is
2 considered reasonable for regulatory purposes and is based on engineering
3 and scientific methods. Larger or higher intensity storms may occur on
4 occasion within any drainage area and flood hazards may be increased by
5 man-made or natural causes such as blockage or failure of storm drainage
6 facilities. This policy does not imply that the structures regulated herein nor
7 those areas which drain from the structures regulated will always be totally
8 free from excess drainage, flooding, or flood damages. This policy shall not
9 create a liability on the part of or a cause of action against the Authority or
10 any other public entity or public body or any officer or employee thereof or
11 any other person, firm, or corporation for any flood or drainage damages that
12 may result from compliance with this policy.

13 **Section 13. APPEAL.**

- 14
- 15
- 16 A. The procedure set forth herein applies only if a Designee has not been
17 appointed for a public body and the Executive Director of the Authority
18 is reviewing applications for development as set forth herein.
- 19
- 20 B. The Executive Director shall, within thirty (30) calendar days after the
21 submission to the Authority of a request in writing for the approval of a
22 plat, development plan or exemption, approve or deny the request and
23 mail a copy of the decision to the applicant. If the request is denied,
24 the reasons for such denial shall be stated in writing.

25

26 Any applicant aggrieved by a decision of the Executive Director or in
27 the absence of a decision by the Executive Director within the time
28 period, may appeal such decision to the Board of Directors of the
29 Authority as follows:

- 30
- 31 1. Such appeal shall be made by notice of appeal in writing
32 addressed to the Chairman of the Board of Directors of the
33 Authority. The Chairperson shall notify the applicant and the
34 Executive Director of the date, time and place of the appeal
35 hearing at least five (5) days prior to the hearing date.
- 36
- 37 2. Such hearing shall be conducted not earlier than ten (10) days
38 nor later than sixty (60) after the filing of the notice of appeal.
- 39

3. At the hearing, the Board of Directors may consider such facts, exhibits and witnesses as may be presented by the applicant and the Executive Director.
4. The decision of the Board of Directors shall be in writing and shall state the reasons therefor and a copy of said decision shall be promptly mailed or delivered to the applicant and to the Executive Director. Such decision shall be final.

Section 14. ENFORCEMENT/RESTORATION/PUBLIC NUISANCE.

A. ENFORCEMENT.

- 1) The Executive Engineer and the Designee are the enforcement officers and have the authority and duty to enforce this policy.
- 2) Whenever it is necessary to make an inspection to enforce any of the provisions of this policy, the enforcement officer(s) may enter such lands at all reasonable times to inspect the same or to perform any duty imposed upon the enforcement officer(s) by this policy; provided that the enforcement officer(s) shall first make a reasonable effort to locate the owner or other persons having charge or control of the lands and demand entry. If entry is refused, the enforcement officer(s) has the right to file a complaint in Court to obtain entry. No owner or occupant or any other person having charge, care or control of any lands, shall fail or neglect to promptly permit entry therein by the enforcement officer(s) for the purpose of inspection and examination pursuant to this policy.
- 3) In the event that the drainage or facilities on the land are found to be in violation of this policy, the enforcement officer(s), in addition to other remedies, may institute an appropriate action or proceeding in a court of proper jurisdiction to prevent the violation or to restrain, correct, or abate the violation; or to prevent an illegal act, conduct, or use of the land in violation of this policy.

1 **B. RESTORATION.**

2
3 Any watercourse or floodplain altered or encroached upon in violation
4 of this policy shall be restored to its original condition by the owner
5 upon demand of the enforcement officer(s). In the event such
6 restoration is not promptly performed, the enforcement officers) may
7 institute appropriate action or proceeding in a court of proper
8 jurisdiction.

9
10 **C. PUBLIC NUISANCE**

11
12 Land use which fails to comply with the provisions of this policy shall
13 be considered a public nuisance. Appropriate action to restrain, correct
14 or abate the use in violation of this policy may be instituted in a court of
15 proper jurisdiction by the Authority, or by the Designee where the land
16 is located, or by any citizen thereof.

17
18 **Section 15. SEVERABILITY CLAUSE.**

19
20 If any part or application of this policy is held to be invalid or
 unenforceable, the remainder of the policy shall not be affected thereby
 and it shall remain in full force and effect.

1
2 **Section 16. EFFECTIVE DATE.**
3

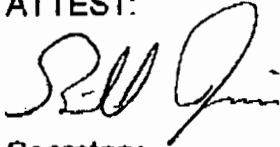
4 This policy shall take effect immediately.
5

6
7 **PASSED, APPROVED AND ADOPTED THIS** 19th *day of April* 1994.
8

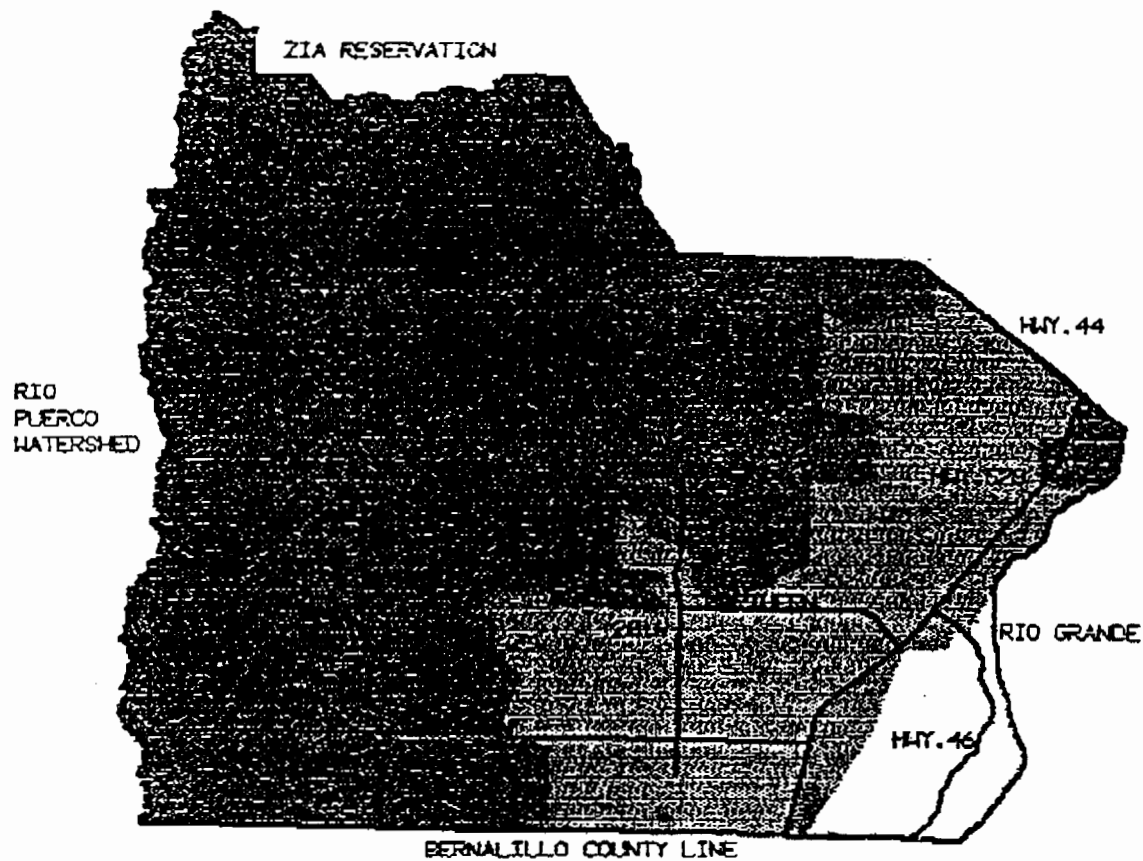
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10 
11
12 Chairperson, Board of Directors
13 Southern Sandoval County Arroyo
14 Flood Control Authority

15 (SEAL)
16

17 **ATTEST:**

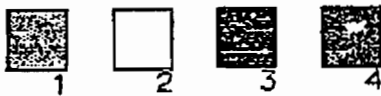
18 
19
20 Secretary

SOUTHERN SANDOVAL COUNTY ARROYO FLOOD CONTROL AUTHORITY
INCORPORATED ENTITIES WITHIN SSCAFCA BOUNDARY



— SSCAFCA BOUNDARY
— MAJOR ROADS and STREETS

SCALE: 1 in. = 3.7 mi.



1 City of Rio Rancho
2 Village of Corrales
3 Town of Bernalillo



City of Rio Rancho

3900 Southern Blvd. • P.O. Box 15550
Rio Rancho, New Mexico 87124
(505) 891-7208

Department of
Public Works

GRADING AND DRAINAGE DESIGN REQUIREMENTS AND POLICIES FOR LAND DEVELOPMENT IN RIO RANCHO (Revised 3-18-93)

- 1 . All Grading and Drainage design for land development in Rio Rancho shall conform to the applicable requirements of the following City Ordinances:
Chapter 8, Article 4, "Flood and Erosion Control"
Chapter 8, Article 7, "Storm Drainage Requirements"
Chapter 9, Article 2, "Subdivisions",
and to the applicable provisions of the "Drainage Policy" of the Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA) and to the applicable requirements and policies listed hereinafter.
- 2 . Minimum criteria for hydrology and hydraulic calculations and design shall be as described in Volume 2, Development Process Manual, City of Albuquerque, latest revision, or the AHYMO version of the ARS HYMO Computer Program. Calculations shall accompany design submittals.
- 3 . Calculations shall be furnished for historic flows and developed flows for the 10 year and 100 year 6 hour storms. Calculations shall be furnished for sizing all conveyances and storage ponds on site as well as downstream infrastructure, if pertinent. Calculations should also address depth of flows in streets as required in Ordinance 8-7-7.
- 4 . Soil classifications may be obtained from USDA Soil Conservation Service maps or investigations performed by Geotechnical engineers, if necessary.
- 5 . Unless restricted by specific infrastructure limitations, maximum discharge permitted from a developed property in the event of a 100 year 6 hour storm shall be the amount of the historic or predeveloped runoff in all watersheds of the City. Due to infrastructure limitations, developed properties in the watershed area intercepted by the 7-Bar Channel adjacent to NMSR 528 south of High Resort Boulevard shall have discharge limited to 0.5 cfs per acre. Discharge limitations shall apply to all development projects except for Single Family Residential projects under 5 lots or 5 acres total.
- 6 . Detention Ponds or Retention Ponds shall not be constructed in public street right-of-way. Discharge from the detention ponds shall be conveyed to public infrastructure such as streets and channels by approved means such as pipe or channels. It is recommended that pipe sizes less than 6" diameter not be used due to maintenance concerns. To restrict flows, apertures in caps placed at the inlet end are suggested.
- 7 . Detention Ponds shall be sized to provide 1 foot of Freeboard and to empty within 24 hours. Retention ponds shall be sized to contain twice the volume of the 100 year 6 hour storm for the area drained plus 1 foot Freeboard. Percolation tests may be required to address design requirements. Ponds designed for water depths of 18 inches or more shall be fenced to acceptable standards.
- 8 . Surface drainage shall not be permitted to flow onto adjacent private property. Where drainage easements exist, underground pipelines may be permitted.

Black DMP
12-15

9. In Residential Subdivisions, on-site detention is not permitted on individual lots. Detention or Retention shall be provided in locations otherwise provided for by the developer. Minimum grades for drainage in lots shall be 1 percent unless paved swales are provided. Maximum grades for slopes shall be restricted to 25 percent. Retaining walls should be provided where necessary to accommodate this goal. Retaining walls in excess of 5 feet high (footer to ground surface) should be avoided. Individual certification to the design and construction of retaining walls in excess of this parameter is required. All retaining walls should be designed to relieve potential hydrostatic pressure by providing weepholes where necessary.
10. All embankment in subdivisions shall be placed and compacted in lifts of a maximum of 8 inches thick, wetted and compacted for 90% of optimum density per ASTM D1557 and 95% under all structures including driveways and parking lots. Slopes should be graded to a maximum of 4 to 1 when feasible. Access roads for maintenance shall be provided for drainage channels and adequate right-of-way shall be provided for the channels, maintenance roads and room for hiking-bikeway trails.
11. In projects affected by the 100 year flood plain, the proposed 100 year base flood line shall be delineated on the Grading and Drainage Improvement Plans. If there is a change to the Flood Insurance Maps as produced by the Federal Emergency Management Agency (FEMA), a Letter of Map Amendment (LOMA) or a Letter of Map Revision (LOMR) and a physical map revision shall be filed with the agency and the City Engineer's office. All new structures and substantial improvements to structures shall have its lowest floor elevation a minimum of 1.0 foot above the basic flood elevation.
12. All submittal documents, maps, plans, calculations, designs, etc. shall be made in triplicate. Following approvals or for consideration for joint concurrence when required, one set will be forwarded to Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA).
13. Drainage Plans are required for building permits, minor subdivisions, and site development plans for individual parcels for commercial, industrial, or multifamily projects and shall meet the following requirements:
 - (a) Furnish on 24" x 36" sheets with a Minimum Scale of 1" = 20" Show scale and north arrow.
 - (b) Show existing contour lines for predevelopment conditions and also for proposed development conditions. Vertical intervals shall not exceed 1 foot for slopes under 1 percent, 2 feet for slopes between 1 percent and 5 percent, and 5 feet for slopes in excess of 5 percent. Spot elevations shall be shown for pertinent items such as existing structures, curb and gutter, etc. Contours and elevations shall extend a minimum of 25 feet beyond project property lines.
 - (c) Show location and elevation of Bench Mark to mean sea level designation.
 - (d) Location map (smaller scale okay on same sheet or separate sheet)
 - (e) Watershed area including offsite if relevant (scale flexible)
 - (f) Soil type if pertinent
 - (g) Legal description (including recording book and page)
 - (h) Rights of ways and Easements
 - (i) Description and location of relevant off-site drainage facilities
 - (j) Professional Engineers stamp, signature, and date.

HEALTH, SAFETY AND SANITATION

- I. Removal of Litter by the City. The City shall remove litter from property in accordance to the provisions of Section 8-2-13.

8-2-4 Weed Control

- A. Accumulation or Growth of Weeds. It shall be unlawful for any person in control of any lot, parcel or tract, or portion thereof, within the City, which has been altered from its natural state or developed in any way, to maintain or allow the accumulation or growth of those weeds defined herein to a height greater than twelve inches. This requirement shall apply to the road Right-of-way that abuts the property line on any side of any lot.
- B. Method of Removal. The approved methods of controlling weeds shall be mowing, cutting, digging or other methods designed to remove the weeds but not disturb other vegetation or unnecessarily disturb the soil. The grading and tillage of lots is prohibited unless written permission of the City Engineer has been obtained.
- C. Removal of Weeds by the City. The City shall remove weeds from property in accordance to the provisions of Section 8-2-13.
- D. City's Responsibility. The City shall be responsible for weed control on dedicated open space, drainage rights-of-way and improved right-of-way of arterial roads, unless responsibility has otherwise been delegated. Eg., Via a development agreement, development plan, zone map amendment, etc.

8-2-5 Dust Control

- A. Prohibited Acts. No person shall discharge from any source whatsoever such quantities of airborne particulate matter which may cause injury, detriment, nuisance or annoyance to the public without taking reasonable precautions to prevent particulate matter generated by such activity from becoming airborne.
- B. Methods of Dust Control.
 - (1) All properties. No person or person in control of any property shall disturb, move or remove soil from or place soil onto any area without utilizing every reasonable method such as watering or the use of erosion control fencing, to limit the airborne particulate to the boundaries of the property.
 - (2) Grading permits. For projects involving fill or import soil in excess of five hundred (500) cubic yards or an area of one (1) or more acres, a grading permit must be obtained from the City Engineer's office before any soil is disturbed. Dust control measures shall conform to drainage control, flood control and erosion control policies, standards, criteria and procedures established by the City Engineer. It shall be considered a violation of this section and grounds for cancellation of the grading permit if the work schedule, pollution prevention measures or other relevant items are changed from those specified in the permit, unless the permittee has first obtained written approval of the City Engineer.

8-2-6 Water Waste

- A. Prohibited Acts.
 - (1) Water Waste. After the effective date of this article, no person, business firm, corporation, or municipal facility or operation shall waste, cause, or permit to be wasted or applied to non-beneficial uses, as defined in this article, any water furnished by any water supply system within the City of Rio Rancho.
 - (2) Fugitive Water Flow. After the effective date of this article, no person, firm, corporation, municipal, or other governmental facility or operation shall cause or permit the flow of excess fugitive water onto the adjacent property or public right-of-way.
- B. Exceptions.

HEALTH, SAFETY AND SANITATION

Article 4 Flood and Erosion Control

Section

- 8-4-1 Statutory Authority
- 8-4-2 Findings of Fact
- 8-4-3 Statement of Intent and Purpose
- 8-4-4 Definitions
- 8-4-5 General Provisions
- 8-4-6 Administration
- 8-4-7 Provisions for Flood Hazard Reduction

8-4-1 Statutory Authority

The Legislature of the State of New Mexico has in NMSA 78, Chapter 3, Article 41 delegated the responsibility to local governmental units to adopt regulations designed to minimize flood losses. Therefore, the City Council of Rio Rancho, New Mexico, does adopt this ordinance pursuant to said state statutes.

8-4-2 Findings of Fact

- A. Flood Hazards: The flood hazard areas of the City are subject to periodic inundation which could result in loss of life and property, health, and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of tax base, all of which adversely affect the public health, safety, and general welfare.
- B. Flood Losses: These flood losses are caused by the cumulative effect of urbanization which increases flood frequency, flood heights, and velocities, and/ or the occupancy of flood hazard areas by uses that are vulnerable to floods and hazardous to other lands because they are inadequately flood-proofed, elevated, or otherwise protected from flood damage. (96-018)
- C. Erosion Hazard: There exists within the City, areas which are subject to soil erosion caused by flowing water which results in loss of property, health, and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for erosion protection and relief, and impairment of the tax base, all of which adversely effect the public health, safety, and general welfare.
- D. Erosion Losses: These erosion losses are caused by the cumulative effects of urbanization, by inadequately treated flood and drainage facilities and by uses that allow the construction of facilities in areas of erosion hazard. (90-037)

8-4-3 Statement of Intent and Purpose

- A. Purpose: It is the purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in flood hazard areas, floodways, and erosion hazard areas by provisions designed:
 - (1) to protect human life and health;
 - (2) to minimize expenditure of public money for costly flood and erosion control projects;
 - (3) to minimize the need for rescue and relief efforts associated with flooding and erosion and generally undertaken at the expense of the general public;
 - (4) to minimize prolonged business interruptions;
 - (5) to minimize damage to public facilities and utilities, such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in areas of special flood and/or erosion hazard;
 - (6) to help maintain a stable tax base by providing for the second sound use and development of areas of special flood and/or erosion hazard so as to minimize future flood blight areas; (96-018)
 - (7) to ensure that potential buyers are notified that property is located in an area of special flood and/or erosion hazard; and (96-018)
 - (8) to ensure that those who occupy the areas of special flood and/or erosion hazard

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HEALTH, SAFETY AND SANITATION

assume responsibility for their actions.

- B. **Methods of Reducing Flood and Erosion Losses:** In order to accomplish its purposes, this ordinance includes methods and provisions for:
- (1) restricting or prohibiting uses which are dangerous to health, safety, and property in times of flood, or cause excessive increases in flood heights or velocities. (96-018)
 - (2) requiring that uses vulnerable to flood or erosion, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
 - (3) controlling the alteration of natural flood plains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;
 - (4) controlling filling, grading, dredging, and other development which may increase flood or erosion damage within the flood hazard areas, floodways, and erosion hazard areas; and
 - (5) preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood or erosion hazards in other areas.

8-4-4 Definitions

Unless specifically defined below, words or phrases in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application:

- A. "Alluvial Fan Flooding" means flooding occurring on the surface of an alluvial fan or similar landform which originates at the apex and is characterized by high-velocity flows; active processes of erosion, sediment transport, and deposition; and unpredictable flow paths.
- B. "Apex" means a point on an alluvial fan or similar landform below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur.
- C. "Appeal" means a request for a review of the Floodplain Administrator's interpretation of any provision of this ordinance or a decision on a request for a variance. (96-018)
- D. "Area of Erosion Hazard" means the land within the community that lies within 25 feet of the top of the bank of an unlined or untreated major channel.
- E. "Area of Shallow Flooding" means the area in which the base flood depths range from one to three feet; a clearly defined channel does not exist and the path of flooding is unpredictable and indeterminate and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow. (96-018)
- F. "Area of Special Flood Hazard" means the land in the flood plain within the community subject to a one percent or greater chance of flooding in any given year.
- G. "Base Flood" means the flood having a one percent chance of being equaled or exceeded in any given year.
- H. "Basement" means any area of the building having its floor subgrade (below ground level) on all sides.
- I. "City Administration" means the Mayor of the City of Rio Rancho or his designee.
- J. "Critical Feature" means an integral and readily identifiable part of a flood protection system without which the flood protection provided by the entire system would be compromised. (96-018)
- K. "Development" means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations or storage of equipment or materials. (96-018)
- L. "Elevated Building" means a nonbasement building (i) built, in the case of a building in Zones A1-30, AE, A, A99, AO, AH, B, C, X and D to have the top of the elevated floor elevated above the ground level by means of pilings, columns (post and piers), or shear walls parallel to the flow of water and (ii) adequately anchored so as not to impair the structural integrity of the building during a flood of up to the magnitude of the base flood. In the case of Zones A1-30, AE, A, A99, AO, AH, B, C, X, and D, "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of flood waters. (96-018)

HEALTH, SAFETY AND SANITATION

- M "Erosion" means the removal or deposition of soil from or to the bed or banks of a major channel.
- N. "Existing Construction" means for the purposes of determining rates, structures for which the "start of construction" commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. "Existing construction may also be referred to as "existing structures."
- O. "Existing Manufactured Home Park or Subdivision" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the floodplain management regulations adopted by a community.
- P. "Expansion To An Existing Manufactured Home Park or Subdivision" means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets and either final site grading or the pouring of concrete pads).
- Q. "Flood" or "Flooding" means a general and temporary condition of partial or complete inundation of normally dry land areas from:
- (1) the overflow of inland waters; and/or
 - (2) the unusual and rapid accumulation of runoff of surface waters from any source.
- R. "Floodplain Administrator" means the individual designated in Section 8-4-6b of this ordinance to administer and implement the provisions of this ordinance and other appropriate sections of 44 CFR (National Flood Insurance Program Regulations) pertaining to floodplain management. (96-018)
- S. "Flood Insurance Rate Map (FIRM)" means an official map of a community, on which the Federal Emergency Management Agency has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.
- T. "Flood Insurance Study" is the official report provided by the Federal Emergency Management Agency. The report contains flood profiles, water surface elevation of the base flood, as well as the Flood Insurance Rate Map. (96-018)
- U. "Floodplain or Flood-Prone Area" means any land area susceptible to being inundated by water from any source (see definition of flooding).
- V. "Floodplain Management" means the operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works and floodplain management regulations.
- W. "Floodplain Management Regulations" means zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a floodplain ordinance, grading ordinance and erosion control ordinance) and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction.
- X. "Flood Protection System" means those physical structural works for which funds have been authorized, appropriated and expended and which have been constructed specifically to modify flooding in order to reduce the extent of the areas within a community subject to a "special flood hazard" and the extent of the depths of associated flooding. Such a system typically includes dams, reservoirs, levees or dikes. These specialized flood modifying works are those constructed in conformance with sound engineering standards. (96-018)
- Y. "Flood Proofing" means any combination of structural and non-structural additions, changes or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.
- Z. "Floodway (Regulatory Floodway)" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.
- AA. "Functionally Dependent Use" means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers and ship building and ship repair facilities, but does not include long-term storage or related

HEALTH, SAFETY AND SANITATION

- manufacturing facilities.
- BB "Habitable Floor" means any floor usable for living purposes, which includes working, sleeping, eating, cooking, recreation, or a combination thereof. A floor used only for storage purpose is not a "habitable floor".
- CC "Highest Adjacent Grade" means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.
- DD "Historic Structure" means any structure that is:
- (a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing of the National Register;
 - (b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
 - (c) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or
 - (d) Individually listed on a local inventory or historic places in communities with historic preservation programs that have been certified either:
 - (1) By an approved state program as determined by the Secretary of the Interior or;
 - (2) Directly by the Secretary of the Interior in states without approved programs.
- EE "Levee" means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding.
- FF "Levee System" means a flood protection system which consists of a levee, or levees and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices.
- GG "Lowest Floor" means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirement of Section 60.3 of the National Flood insurance program regulations. (96-018)
- HH. "Major Channel" means any channel which would collect or convey a peak discharge of 100 cubic feet per second or more in the event of a one percent chance flood.
- II. "Manufactured Home" means a structure transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. The term "manufactured home" does not include a "recreational vehicle".
- JJ "Manufactured Home Park or Subdivision" means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.
- KK "Mayor" means the Mayor of the City of Rio Rancho or his designated representative.
- LL "Mean Sea Level" means, for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced.
- MM "New Construction" means, for the purpose of determining insurance rates, structures for which the "start of construction" commenced on or after the effective date of an initial FIRM or after December 31, 1974, whichever is later, and includes any subsequent improvements to such structures. For floodplain management purposes, "new construction" means structures for which the "start of construction" commenced on or after the effective date of a floodplain management regulation adopted by a community and includes any subsequent improvements to such structures.
- NN "New Manufactured Home Park or Subdivision" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets and either final site grading or the pouring of concrete pads) is completed on or after the effective date of floodplain management regulations adopted by a community.

HEALTH, SAFETY AND SANITATION

- OO "Professional Engineer" means a professional engineer registered in the State of New Mexico and formally trained as a civil engineer.
- PP "Recreational Vehicle" means a vehicle which is (i) built on a single chassis; (ii) 400 square feet or less when measured at the largest horizontal projections; (iii) designed to be self-propelled or permanently towable by a light duty truck; and (iv) designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel or seasonal use.
- QQ "Start of Construction", includes substantial improvement and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for basement, footings, piers or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor or other structural part of a building, whether or not that alteration affects the external dimensions of the building. (96-018)
- RR "Structure" means a walled and roofed building, including a gas or liquid storage tank, that is principally above ground as well as a manufactured home. (96-018)
- SS "Substantial Damage" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.
- TT "Substantial Improvements" means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before "start of construction" of the improvement. This includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either: (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local health, sanitary, or safety specifications which have been identified by the local code enforcement official and which are the minimum necessary conditions or (2) Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure". (90-042) (96-018)
- UU "Variance" - is a grant of relief to a person from the requirement of this ordinance when specific enforcement would result in unnecessary hardship. A variance, therefore, permits construction or development in a manner otherwise prohibited by this ordinance. (For full requirements see Section 60.6 of the National Flood Insurance Program regulations.) (96-018)
- VV "Violation" means the failure of a structure or other development to be fully compliant with the community's floodplain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in Section 60.3(b)(5), (c)(4), (c)(10), or (d)(3), is presumed to be in violation until such time as that documentation is provided. (96-018)
- WW "Water Surface Elevation" means the height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of riverine areas. (90-037) (96-018)

8-4-5 General Provisions

- A. Land to Which This Ordinance Applies: This ordinance shall apply to all areas of special flood hazards and areas of erosion hazard within the jurisdiction of the City of Rio Rancho, which includes its extraterritorial planning and platting jurisdiction.
- B. Basis for establishing the Areas of Special Flood Hazard. The areas of special flood hazard identified by the Federal Emergency Management Agency in a scientific and engineering

HEALTH, SAFETY AND SANITATION

report entitled, "The Flood Insurance Study for Sandoval County, New Mexico and Incorporated Areas," dated July 16, 1996, with accompanying Flood Insurance Rate Maps and (FIRM) and any revisions thereto are hereby adopted by reference and declared to be a part of this ordinance. (91-038) (96-018)

C. Enforcement, Procedures, and Penalties:

- (1) Any permit, license, or certificate issued in conflict with the provisions of this ordinance is void.
- (2) The Floodplain Administrator or his designee may make reasonable entry upon any lands and waters within the City's jurisdiction for the purpose of making any investigation, survey, removal, or repair contemplated by this ordinance. An investigation of any obstruction shall be made by the Floodplain Administrator or his designee either on his own initiative, or on the written request of any two title holders of land abutting the channel or drainageway involved.
- (3) Whenever necessary to make an inspection to enforce any of the provisions of this ordinance, the Floodplain Administrator or his designee may enter such buildings or premises at all reasonable times to inspect the same or to perform any duty imposed upon him by this ordinance; provided that if such building or premises be occupied, he shall first present proper credentials and demand entry; and if such building or premises be unoccupied he shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and demand entry. If entry is refused, the Floodplain Administrator or his authorized representative shall proceed to obtain a search warrant by filing a complaint made before the Municipal Court upon oath or affirmation. The complaint shall (1) set forth the particular building, premises, or portion thereof sought to be inspected, (2) state that the owner or occupant of the building, premises, or portion thereof, has refused entry, (3) state that inspection of the building, premises, or portion thereof is necessary to determine whether it complies with the requirements of this ordinance, (4) set forth the particular provisions of this ordinance sought to be enforced, (5) set forth any other reason necessitating the inspection, including knowledge or belief that a particular condition exists in building premises, or portion thereof which constitutes a violation of this ordinance, (6) state that the complainant is authorized by the City to make the inspection. Each inspector shall be furnished with an identification card signed by a representative of the City administration indicating his authority and must present same to the Municipal Court for the purpose of this subsection, and to other persons, when requested to do so during the performance of his duty. No owner or occupant or any other person having charge, care, or control of any building or premises shall fail or neglect, after proper demand is made as herein provided, to promptly permit entry therein by the authorized inspector for the purpose of inspection and examination pursuant to this ordinance.
- (4) The powers and duties of the Floodplain Administrator or his designee relative to obstructions in a flood or erosion hazard area shall include the following:
 - (a) where an obstruction to a floodway has been created by fallen trees, silt, debris, and like matter, the City may remove the obstruction in which case the cost of removal shall be borne by the City;
 - (b) where, after investigation, an order has been issued to the owner of an obstruction for its removal or repair and the order is not complied with, within such reasonable time as may be prescribed by the Floodplain Administrator or his designee, or, if the owner cannot be found or determined, the Floodplain Administrator or his designee may cause such removal or repairs to be made. The reasonable cost of the removal or repairs shall constitute a lien against the lots from which the obstruction was removed or on which it was repaired. The lien shall be imposed and foreclosed in the manner provided in 3-36-1 through 3-36-6 NMSA 1978.
- (5) A person who violates any provision of this ordinance shall be punished by a fine not to exceed \$300 or imprisonment for a period not to exceed 90 days, or both. Each day of violation is considered a separate offense. (96-018)

HEALTH, SAFETY AND SANITATION

- D. **Abrogation and Greater Restrictions:** Except as otherwise provided herein, this ordinance is not intended to repeal, abrogate, or impair any existing ordinances, easements, covenants, or deed restrictions. However, where this ordinance and any other ordinance, easement, covenant, or deed restriction conflicts or overlaps, whichever imposes the more stringent restrictions shall prevail.
- E. **Interpretation:** In the interpretation and application of this ordinance, all provisions shall be:
- (1) considered as minimum requirements;
 - (2) liberally construed in favor of the City of Rio Rancho; and
 - (3) Deemed neither to limit nor repeal any other powers granted under state statutes.
- F. **Warning and Disclaimer of Liability:** The degree of flood and erosion protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights and erosion may be increased by man-made or natural causes. This ordinance does not imply that land outside the area of special flood and/or erosion hazard, or uses permitted within such areas will be free from flooding, flood damages, or erosion damages. This ordinance shall not create liability on the part of the City of Rio Rancho, any officer or employee thereof, for any flood or erosion damages that result from reliance on this ordinance or any administrative decision lawfully made thereunder. (90-037)

8-4-6 Administration

- A. **Establishment of a Special Hazard Zone Development Permit:** A Special Hazard Zone Development Permit shall be obtained from the Floodplain Administrator or his/her designee before development begins within any area of special flood hazard or erosion hazard established in Section 8-4-5B.
- (1) Application for a Special Flood Hazard Zone Development Permit shall be presented to the Floodplain Administrator on forms furnished by him/her and may include, but not be limited to, plans in duplicate drawn to scale showing the location, dimensions, and elevation of proposed landscape alterations, existing and proposed structures, including the placement of manufactured homes, and the location of the foregoing in relation to areas of special flood hazard. Additionally, the following information is required:
 - (a) Elevation in relation to mean sea level, of the lowest floor (including basement) of all new and substantially improved structures;
 - (b) Elevation in relation to mean sea level to which any nonresidential structure shall be floodproofed;
 - (c) The shortest horizontal distance from bank of unlined or untreated drainage course to the proposed structure.
 - (d) A certificate from a registered professional engineer or architect that the nonresidential floodproofed structure shall meet the floodproofing criteria of Section 8-4-7B(2).
 - (e) Description of the extent to which any watercourse or natural drainage will be altered or relocated as a result of proposed development.
 - (2) The Floodplain Administrator or his/her designee will initially review completed applications to determine if the data provided is sufficient to pass make an informed decision on. The Floodplain Administrator may request submission of additional items that may include, but not be limited to hydrologic and or hydraulic analysis by a registered professional engineer in the State of New Mexico.
 - (3) Upon receiving sufficient data to evaluate a permit request the permit will be issued or denied based on all of the provisions of this ordinance and the following relevant factors:
 - (a) The danger to life and property due to flooding or erosion damage.
 - (b) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner.
 - (c) The danger that materials may be swept onto other lands to the injury of others.
 - (d) The safety of access to the property in times of flood for ordinary and emergency vehicles.
 - (e) The costs of providing governmental services during and after flood

HEALTH, SAFETY AND SANITATION

conditions including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electrical and water systems.

- (f) The expected heights, velocity, duration, rate of rise and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site.
- (g) The necessity to the facility of a waterfront location, where applicable.
- (h) The availability of alternative locations, not subject to flooding or erosion damage, for the proposed use.

(96-018)

B. Designation of the Floodplain Administrator: The City Engineer is hereby appointed as Floodplain Administrator to administer and implement this ordinance and may deny special hazard zone development permits in accordance with its provisions. (96-018)

C. Duties and Responsibilities of the Floodplain Administrator: Duties of the Floodplain Administrator shall include, but not be limited to:

- (1) Permit Review:
 - (a) review of all Special Hazard Zone Development permits to determine that the requirements of this ordinance have been satisfied.
 - (b) review all Special Hazard Zone Development permits to determine that all necessary permits have been obtained from those federal, state, or local governmental agencies from which prior approval is required.
 - (c) review all Special Hazard Zone Development permits to determine if the proposed development is located in the floodway. If located in the floodway, assure that the encroachment provisions of 8-4-7C are met.
 - (d) review all Special Hazard Zone Development permits to determine whether proposed building sites will be reasonably safe from flooding.
- (2) Use of Other Base Flood and Erosion Data: When base flood elevation data has not been provided in accordance with 8-4-5B, the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation data available from a federal, state, or other source, in order to administer 8-4-7B(1) and 8-4-7B(2).
- (3) Information to be Obtained and Maintained:
 - (a) obtain and record the actual elevation (in relation to mean sea level) of the lowest habitable floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.
 - (b) for all new substantially improved floodproofed structures:
 - (1) obtain and record the actual elevation (in relation to mean sea level); and
 - (2) maintain the floodproofing certifications required in 8-4-7B(2)
- (4) Alteration of Watercourses:
 - (a) whenever appropriate, notify adjacent communities and local flood control agencies, and the State Engineer prior to any alteration or relocation of a watercourse.
 - (b) require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.
- (5) Interpretation of Flood and Erosion Hazard Maps: Make interpretations where needed, as to the exact location of the boundaries of the areas of special flood and erosion hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in 8-4-6E. (96-018)

D. Variances: The Floodplain Administrator shall hear and evaluate requests for variances from the requirements of this ordinance in compliance with Section 60.6 of the National Flood Insurance Program Regulations. (96-018)

E. Appeals

The Governing Body shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the Floodplain Administrator in the enforcement or administration of this ordinance. (96-018)

HEALTH, SAFETY AND SANITATION

F. Review Consideration for Appeals:

- (1) In passing upon applications for variances and appeals, the Floodplain Administrator or the Governing Body shall consider all technical evaluations, all relevant factors, standards specified in other sections of this ordinance; and (96-018)
 - (a) the danger that materials may be swept onto other lands to the injury of others;
 - (b) the danger to life and property due to flooding or erosion damage;
 - (c) the susceptibility of the proposed facility and its contents to flood or erosion damage and the effect of such damage on the individual owner;
 - (d) the importance of the services provided by the proposed facility to the community;
 - (e) the availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;
 - (f) the compatibility of the proposed use with existing and anticipated development;
 - (g) the relationship of the proposed use to the comprehensive plan and flood plain management program of that area;
 - (h) the safety of access to the property in times of flood for ordinary and emergency vehicles;
 - (i) the expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters expected at the site; and
 - (j) the costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities, such as sewer, gas, electrical, and water systems, and streets and bridges.
- (2) Upon consideration of factors of 8-4-6F and the purposes of this ordinance, conditions to the granting of variances may be attached to approvals as deemed necessary to further the purposes of this ordinance.
- (3) The Floodplain Administrator or his designees shall maintain the records of all appeal actions, including technical information. (96-018)

G. Conditions for Variances:

- (1) Generally, variances may be issued for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level and not in designated floodway, providing items in 8-4-6F(1) have been fully considered. As the lot size increases beyond the one-half acre, the technical justification required for issuing the variance increases.
- (2) Variances may be issued for the reconstruction, rehabilitation, or restoration of structures listed on the New Mexico Cultural Properties Register, without regard to the procedures set forth in the remainder of this section.
- (3) Variances shall not be issued within any designated floodway if any increase in flood levels or adverse realignment during the base flood discharge would occur as a result of allowing such discharge variances.
- (4) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood and erosion hazard, to afford relief.
- (5) Variances shall only be issued upon:
 - (a) a showing of good and sufficient cause;
 - (b) a determination that failure to grant a variance would result in exceptional hardship to the applicant; and
 - (c) a determination that the granting of a variance will not result in increased flood heights, erosion hazard, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public as identified in Section 8-4-6F or conflict with existing local laws or ordinances.

H. Policies, Procedures, and Fees: The Floodplain Administrator shall establish policies, procedures, and fees to defray city costs, as required for the administration of this ordinance. (90-037) (96-018)

HEALTH, SAFETY AND SANITATION

8-4-7 Provisions for Flood Hazard Reduction

A. General Standards:

- (1) Anchoring and Structural Design:
 - (a) all new construction and substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads including the effects of buoyancy.
 - (b) all manufactured homes shall be elevated and anchored to resist flotation, collapse, or lateral movement by providing over-the-top and frame ties to ground anchors.
- (2) Construction Materials and Methods:
 - (a) all new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood and erosion damage.
 - (b) all new construction and substantial improvements shall be constructed using methods and practices that minimize flood and erosion damage.
 - (c) All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
- (3) Utilities:
 - (a) all new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;
 - (b) new and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from these systems into flood waters; and
 - (c) on-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding and out of erosion hazard areas.
- (4) Subdivision Proposals:
 - (a) all subdivision proposals shall be consistent with the need to minimize flood and erosion damage.
 - (b) all subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood and erosion damage;
 - (c) all subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and
 - (d) base flood elevation data shall be provided by the developer with subdivision proposals and other proposals for proposed development whenever the flood insurance rate maps indicate that the land in question is impacted by a special flood hazard area. The determination will be approved by the City Engineer. (96-018)
 - (e) all subdivision proposals shall have adequate erosion treatment of channels in accordance with generally accepted engineering standards. (96-018)

B. Specific Standards: In all areas of special flood hazards where base flood elevation data have been provided as set forth in Section 8-4-5B or Section 8-4-6C(2), the following standards are required:

- (1) Residential Construction: New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated a minimum of 1.0 foot above flood elevation and be completely outside the area of erosion hazard. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this subsection is satisfied. (96-018)
- (2) Nonresidential Construction: New construction and substantial improvement of any commercial, industrial, or other nonresidential structure shall either have the lowest floor, including basement, elevated a minimum of 1.0 foot above the base flood elevation; or together with attendant utility and sanitary facilities, shall:

HEALTH, SAFETY AND SANITATION

- (a) be flood proofed so that below 1.0 foot above the base flood level the structure is watertight with walls substantially impermeable to the passage of water;
 - (b) have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;
 - (c) be completely outside the area of erosion hazard; and
 - (d) be certified by a professional engineer that the standards of this subsection are satisfied. Such certifications shall be provided to the Floodplain Administrator. (96-018)
- (3) Enclosures: New construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria:
- (a) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
 - (b) The bottom of all openings shall be no higher than one foot above grade.
 - (c) Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.
- (4) Manufactured Homes:
- (a) All manufactured homes to be placed or substantially improved within Zone A shall be installed using methods and practices that minimize the potential for flood damage. For the purpose of this requirement, manufactured homes must be elevated such that the lowest floor of the home is a minimum of one foot above the base flood elevation, and anchored to resist floatation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and Local anchoring requirements for resisting wind forces.
 - (b) All manufactured homes to be placed or substantially improved within zones A1-30, AH, and AE on the community's FIRM shall be placed on a permanent foundation that is adequately anchored and designed to resist floatation, collapse, or lateral movement, such that the lowest floor of the home is elevated a minimum of one foot above the base flood elevation and the home is securely anchored in accordance with the provisions of Section (a) above.
- (5) Recreational Vehicles: Recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM shall either (i) be on the site for fewer than 180 consecutive days; (ii) be fully licensed and ready for highway use; or (iii) meet the permit requirements of Section 8-4-6A and the elevation and anchoring requirements for "manufactured homes" in paragraph (4) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

(96-018)

- C. Floodways: Located within areas of special flood hazard established in 8-4-5B are areas designed as floodways. Since the floodway is an extremely hazardous area due to the velocity of the flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

- (1) Encroachment Prohibitions: Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydraulic analysis performed in accordance with standard engineering practice that the proposed encroachment

HEALTH, SAFETY AND SANITATION

would not result in any increase in the flood levels within the community during the occurrence of the base flood discharge. (96-018)

- (2) Flood Hazard Reducers: If 8-4-7C(1) is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of 8-4-7.
- (3) Mobile Home Placement: Prohibit the placement of any mobile homes, within the regulatory floodway. (90-037) (96-018)
- (4) Hazardous Materials: Prohibit storage of hazardous materials within the regulatory floodway.

D. Standards For Areas of Shallow Flooding (AO/AH Zones): Located within the areas of special flood hazard established in Section 8-4-5B, are areas designated as shallow flooding. These areas have special flood hazards associated with base flood depths of 1 to 3 feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow; therefore, the following provisions apply:

- (1) All new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least one foot higher than the depth number specified in feet on the community's FIRM (as least three feet if no depth number is specified).
- (2) All new construction and substantial improvements of non-residential structures.
 - (i) have the lowest floor (including basement) elevated above the highest adjacent grade at least one foot higher than the depth number specified in feet on the community's FIRM (at least three feet if no depth number is specified).
 - (ii) together with the attendant utility and sanitary facilities be designed so that the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy to an elevation that equals or exceeds the sum of the elevation of the highest adjacent grade plus the flood depth number specified in feet on the FIRM plus one foot.
- (3) A registered professional engineer or architect shall submit a certification to the Floodplain Administrator that the standards of this section are satisfied.
- (4) Require within Zones AH or AO adequate drainage paths around structures on slopes, to guide flood waters around and away from proposed structures.

E. Special Requirements for Development Within Zones A1-30 and AE Without Designated Regulatory Floodways: When a regulatory floodway has not been designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community and it is also demonstrated that any proposed increase in the water surface elevation of the base flood will not increase the potential for flood damages to occur at any location in the community.

(96-018)

HEALTH, SAFETY AND SANITATION

Article 7 Storm Drainage Regulations

Sec.

- 8-7-1 Authority
- 8-7-2 Jurisdiction
- 8-7-3 Statement of Purpose and Intent
- 8-7-4 Short Title
- 8-7-5 Definitions
- 8-7-6 General Provisions
- 8-7-7 Surface Use of Streets for Drainage and Flood Control Purposes
- 8-7-8 Crossings
- 8-7-9 Financial Responsibility
- 8-7-10 Multiple Use of Rights-of-Way and Easements
- 8-7-11 Maintenance Responsibility
- 8-7-12 General Administration
- 8-7-13 Administrative Procedures, Criteria, and Standards
- 8-7-14 Enforcement
- 8-7-15 Appeals
- 8-7-16 Warning and Disclaimer of Liability
- 8-7-17 Interpretation

8-7-1 Authority
This article is adopted pursuant to statutory authorities.

8-7-2 Jurisdiction
This article shall apply to all, newly developed lands within the City of Rio Rancho and, with respect to planning and platting matters, it shall also apply to all lands within its extraterritorial planning and platting jurisdiction.

8-7-3 State of Purpose and Intent
It is the purpose of this article to promote the public health, safety, and general welfare, and to minimize public and private losses due to flooding by provisions designed:

- A. To establish policies, procedures, criteria, and requirements to complement and to supplement the Flood and Erosion Control article (R.O. 1987, 8-4-1 et seq.) for the assistance and guidance of the City officials, City staff, and all persons and entities within the jurisdiction of the City.
- B. As to storm drainage, to:
 - (1) Prevent the creation of public safety hazards and seek to eliminate existing problems.
 - (2) Prevent, to the extent feasible, the discharge of storm runoff from public facilities onto private property.
 - (3) Prevent the increased risk of damage to private property caused by storm runoff from other private property.
 - (4) Provide a reasonable level of public health and convenience at reasonable cost.
 - (5) Provide for timely and effective construction and maintenance of storm drainage facilities.

HEALTH, SAFETY AND SANITATION

8-7-4 Short Title

This article may be cited as "The Drainage Ordinance" and is referred to elsewhere herein as "the article".

8-7-5 Definitions

Unless specifically defined below, words or phrases used in this article shall be interpreted so as to give them the meaning they have in common usage and to give this article its most reasonable application:

- A. "Channel" means any arroyo, stream, swale, ditch, diversion, or water course that conveys storm runoff, including man-made facilities.
- B. "Channel stability" means a condition in which a channel neither degrades to the degree that structures, utilities, or private property are endangered, nor aggrades to the degree that flow capacity is significantly diminished as a result of one or more storm runoff events or moves laterally to the degree that adjacent property is endangered.
- C. "Channel treatment measure" means a physical alteration of a channel for any purpose.
- D. "CIP" means the City of Rio Rancho's Capital Improvement Program.
- E. "City engineer" means the chief administrative engineer of the City of Rio Rancho or that engineer's designee.
- F. "Comprehensive plan" means the Rio Rancho Comprehensive Plan and amendments thereto.
- G. "Conceptual grading and drainage plan" means a plan prepared in graphical format showing existing and proposed grading, drainage control, flood control, and erosion control information in sufficient detail to determine project feasibility.
- H. "Design storm" means a storm which deposits a stated amount of precipitation within a stated period over a defined area and which is used in calculating storm runoff and in designing drainage control, flood control and erosion control measures.
- I. "Developed land" means any lot or parcel of land occupied by any structure intended for human occupation, including structures intended for commercial enterprise.
- J. "Developer" means any individual, estate, trust, receiver, cooperative association, club, corporation, company, firm, partnership, joint venture, syndicate, or other entity engaging in the platting, subdivision, filling, grading, excavation, or construction of structures.
- K. "Downstream capacity" means the ability of downstream major facilities to accept and safely convey runoff generated upstream from the 100-year design storm.
- L. "Drainage" means storm drainage.
- M. "Drainage control" means the treatment and/or management of surface runoff from all storms up to and including a 10-year design storm.
- N. "Drainage plan" means a short, detailed plan prepared in graphical format with or on a detailed grading plan addressing on-site and off-site drainage control, flood control, and erosion control issues for lots or parcels of less than five (5) acres.
- O. "Drainage report" means a comprehensive analysis of the drainage, flood control, and erosion control constraints on and impacts resulting from a proposed platting, development, or construction project.
- P. "Erosion control" means treatment measures for the prevention of damages due to soil movement and to deposition from the 10-year design storm runoff.
- Q. "Erosion control plan" means a plan for the mitigation of damages due to soil erosion and to deposition from the 10-year design storm runoff.
- R. "Flood control" means the treatment measures necessary to protect life and property from the 100-years design storm runoff.
- S. "Flood hazard area" means an area subject to inundation from the 100-year design storm runoff.

HEALTH, SAFETY AND SANITATION

- T. "Floodway" means the channel of a river, arroyo, or other water course and adjacent land areas that must be reserved in order to safely discharge the 100-year design storm runoff.
- U. "Fully developed watershed" means a hydrological condition in which all areas upstream and downstream of a point in question are assumed completely developed, including any undeveloped areas which are assumed to be developed in accordance with mid-range development densities as established by the Comprehensive Plan, appropriate area plans or sector plans, adopted by the facilities master plans and the hydraulic and hydrologic standards established by this article.
- V. "Grading plan" means a plan describing the existing topography and proposed grading, including retaining wall locations and details, interfaces with adjacent properties, streets, alleys, and channels, referenced to mean sea level based on a City Bench Mark, and showing sufficient contours, spot elevations, and cross-sections to allow a clear understanding by reviewers, contractors, and inspectors.
- W. "Maintenance" means the cleaning, shaping, grading, repair, and minor replacement of drainage, flood control, and erosion control facilities, but not including the cost of power consumed in the normal operation of pump stations.
- X. "Major arroyo" means any channel whose watershed exceeds 320 acres in a 100-year design storm whether such watershed is in its natural or unaltered state or has been altered by development, runoff diversions, or detention facilities.
- Y. "Major facility" means any facility, including a street or alley, which would collect, divert, or convey a peak discharge of more than fifty (50) cubic feet per second (50 cfs) or store more than 2.0 acre-feet of runoff in the event of a 100-year design storm.
- Z. "Master planned facility" means any drainage control, flood control, or erosion control facility recommended in the Rio Rancho Comprehensive Plan, amendments thereto, or any voter-approved, general obligation bond financed drainage control, flood control, or erosion control facility.
- AA. "Minor facility" means any facility which would collect, divert, or convey a peak discharge of fifty cubic feet per second (50 cfs) or less in the event of the 100-year design storm.
- BB. "Multiple use facility" means a drainage control, flood control, or erosion control facility in which other secondary uses are planned or allowed, including but not limited to recreation, open space, transportation, and utility location.
- CC. "Nuisance waters" means those waters leaving a site and entering a public street which do not result from precipitation, such as landscape overwatering or car washing.
- DD. "One hundred year design storm", also referred to as a "100-year design storm", means that storm in which precipitation within a six- (6-) hour period and resulting runoff has a one percent (1%) chance of being equaled or exceeded in any given year.
- EE. "Temporary drainage facility" means a nonpermanent drainage control, flood control, or erosion control facility constructed as part of a phased project or to serve until such time that a permanent facility is in place, including but not limited to desilting ponds, berms, diversions, channels, detention ponds, bank protection, and channel stabilization measures.
- FF. "Ten year design storm", also referred to as a "10-year design storm", means that storm in which precipitation within a six- (6-) hour period and resulting runoff has a ten percent (10%) chance of being equaled or exceeded in any given year.

8-7-6 General Provisions

- A. The City endorses the goal of flood damage reduction through the regulation of development within flood hazard areas and the preservation of floodways. This article is intended to complement and supplement the Flood and Erosion Control article (R.O. 1987, 8-4-1 et seq.), and shall be administered in concert therewith.
- B. All developed land within the City of Rio Rancho shall be provided with adequate drainage,

HEALTH, SAFETY AND SANITATION

flood control, and erosion control facilities. The protection of life and property shall be considered with primary function in the planning, design, construction, and maintenance of drainage control, flood control, and erosion control facilities, but other concerns, not limited to the following shall be addressed: channel capacity, watershed characteristics, channel stability, maintenance, transitions between treatment types, multiple use goals, and appearance. The needs of the community in transportation, utility services, recreation, and open space shall be considered in planning, design, construction, and maintenance (especially in the selection of channel treatment measures). These needs shall always be considered subsidiary to the primary function of the drainage control, flood control, and/or erosion control facility.

- C. The design, construction, and maintenance of dams, levees, and diversions that fall within the jurisdiction of the state engineer of the State of New Mexico shall meet or exceed standards established by the state engineer.
- D. The design, construction, and maintenance of flood control facilities shall be coordinated with other affected flood control agencies.
- E. All major facilities shall be constructed within dedicated rights-of-way or recorded drainage easements granted to and accepted by the proper public authority.
- F. All detention ponds defined as minor facilities shall be constructed on private property unless otherwise authorized by the city engineer. Except as is necessary for the treatment of nuisance water, all ponds shall be designed and constructed to be emptied in twenty-four (24) hours or less. The use of individual lot ponding shall be governed by the standards established by the city engineer.
- G. Wherever flood control, drainage, or erosion control improvements are necessary within dedicated public open space, such improvements shall be designed and constructed in a manner reasonably consistent with the natural surroundings. All construction and maintenance activities in dedicated open space shall be performed so as to minimize the disruption and destruction of vegetation and adjacent land forms. Where such disturbance or destruction is unavoidable, revegetation shall be performed at the earliest practical time by those responsible for such disturbance and/or destruction.
- H. The city engineer is responsible for establishing criteria, procedures, and standards for design and construction of flood control, drainage control, and erosion control improvements within the City of Rio Rancho. The city engineer shall provide for variance from normal criteria and standards; when a variance is required or requested, the city engineer shall document the justification for his decision and place in the Public Records with the Municipal Clerk such actions and justifications; appeals of the city engineer's variance decisions is as provided in 8-7-15 of this article.

8-7-7 Surface Use of Streets for Drainage and Flood Control Purposes

- A. The surface of streets may be used for drainage and flood control purposes, to the extent such use does not interfere with the safe transportation of people and vehicles.
- B. The 100-year design storm runoff shall not exceed a depth of 0.87 feet at any point within the street right-of-way, or 0.2 feet above top of curb, in any street or enter private property, built in compliance with appropriate regulations, from a street, except in recorded drainage or flood control easements or rights-of-way (or historic channels and watercourses where easements or rights-of-way cannot be obtained).
- C. The 10-year design storm runoff shall not exceed a depth of 0.5 feet in any arterial street and shall flow such that one (1) twelve-foot (12-foot) driving lane in each direction is free of flowing or standing water. The 10-year design storm runoff shall not exceed a depth of 0.5 feet in any collector street. Arterial and collector streets that are in the State Highway system may require more stringent drainage criteria.

HEALTH, SAFETY AND SANITATION

- D. The product of depth times velocity shall not exceed 6.5 at any location in any street in the event of a 10-year design storm (with velocity calculated as the average velocity measured in feet per second and depth measured at the gutter flowline in feet).
- E. The discharge of nuisance waters to public streets shall be discouraged. Arterial and collector streets shall be protected from damages to the pavement surface and from the safety hazards created by surface flow of nuisance waters across them.
- F. All, newly developed land within the City of Rio Rancho shall be served by at least one (1) paved access that shall be an all-weather facility during a 100-year design storm, with all channel-crossing structures beneath the roadway being able to pass a 100-year design storm runoff event.

8-7-8 Crossings

- A. Channel crossing structures shall be provided on all arterial and collector streets to safely pass the 100-year design storm runoff from major arroyos, assuming a fully developed watershed.
- B. Streets other than arterials, collector, and sole access may cross major arroyos and other watercourses by means of a "dip section" or an "overflow section", provided depth times velocity (with velocity calculated as the average velocity measured in feet per second and depth measured in feet at the upstream edge of the roadway including sidewalk) does not exceed 6.5 for that portion of the 10-year storm runoff crossing on the street.
- C. Where feasible, temporary crossings shall be designed so they may be incorporated into the future permanent crossing structure so that they meet street design standards established by the city engineer.
- D. Crossing of major arroyos by arterial and collector streets shall be at public expense. Crossings of arroyos by streets other than arterials and collectors shall be constructed at developer expense and shall meet street design standards established by the city engineer.
- E. Temporary crossings required for access, including those on arterials and collectors, shall be constructed at developer expense.

8-7-9 Financial Responsibility

- A. The City of Rio Rancho may participate in the construction of permanent flood control facilities to the extent that public benefits are derived from such construction and are consistent with Capital Improvement Program (CIP) priorities. Reimbursement for private funding of such projects may also be available under these conditions.
- B. The City of Rio Rancho may participate in the costs of channel crossing structures for arterial and collector streets which are required for sole access to a development. The developer's share shall not exceed the cost required to meet the minimum street width standards established by the city engineer.
- C. The City of Rio Rancho shall not participate in the funding of flood control facilities in which the sole intent is the reclamation of undeveloped land located within a flood hazard area for private development purposes.
- D. The dedication of land for public purposes does not relieve a developer of responsibilities for the construction of drainage control, flood control, and erosion control facilities that would otherwise be necessary. The dedication of rights-of-way or easements for drainage control, flood control, or erosion control facilities does not relieve a developer of responsibilities that would otherwise exist for the construction of other public infrastructure.

8-7-10 Multiple Use of Rights-of-Way and Easements

- A. Multiple use is encouraged for drainage rights-of-way and drainage easements, e.g., for utility corridors and for recreation trails. Where multiple use is planned by the City, another

HEALTH, SAFETY AND SANITATION

public agency, or a public utility, the City may require that dedication statements include language which permits said use(s) in addition to the primary drainage function. However, land required to be dedicated for drainage rights-of-way and easements shall be limited to those land areas necessary for drainage control, flood control, erosion control, and necessary appurtenances.

- B. Drainage rights-of-way and easements may be credited for open space, except for any area which is exclusively used for the drainage control or flood control function.

8-7-11 Maintenance Responsibility

- A. Except as otherwise noted herein, all permanent major facilities shall be maintained by the City or other public body. The maintenance of multiple use facilities to which the general public is denied access shall be the responsibility of the owners and shall be performed to city engineer standards. The city engineer may allow private maintenance within public right-of-way or easement, provided that adequate guarantees and indemnifications are supplied.
- B. Minor facilities shall be maintained by their owners to city engineer standards.
- C. The maintenance of temporary facilities constructed at private expense (except crossing structures) is the responsibility of the developer until permanent facilities are in place.
- D. The developer shall be responsible for maintaining or replacing temporary crossing structures for a period of six (6) years or until a permanent structure is built, whichever comes first. The City shall maintain temporary crossings which are designated and built such that they may be directly incorporated into the ultimate facilities.

8-7-12 General Administration

- A. The design, construction, and maintenance of all drainage control, flood control, and erosion control facilities within the City of Rio Rancho shall be performed in accordance with procedures, criteria, and standards formulated by the city engineer and in accordance with the policies established by this article.
- B. All construction activities within the jurisdiction of the City of Rio Rancho shall conform to the requirements of the city engineer with respect to drainage control, flood control, and erosion control. Original construction and modifications and/or additions to existing structures constituting less than five hundred (500) square feet, in plain view, are excluded.
 - (1) Construction, grading, or paving on any lot within the jurisdiction of the City of Rio Rancho shall not increase the damage potential to upstream, downstream or adjacent properties or public facilities. Damages shall be defined as those caused by flooding from the 100-year design storm and all smaller storms and from erosion and sedimentation resulting from the 10-year design storm and all smaller storms.
 - (2) During the months of July, August, or September, any grading within or adjacent to a watercourse defined as a major facility shall provide for erosion control and the safe passage of the 10-year design storm runoff during the construction phase.
 - (3) Grading, cut, fill, or importation of material in excess of five hundred (500) cubic yards or grading of any area of one (1) acre or more shall conform to drainage control, flood control, and erosion control policies and to standards, criteria, and procedures established by the city engineer with respect to drainage, flood control, and erosion control. A grading permit, issued by the city engineer, shall be required for projects involving more than five hundred (500) cubic yards of material or one (1) acre or more in area. Applications for development of areas known to have been sanitary landfills shall be accompanied by a report which discusses potential health and soil mechanics problems and their solutions. Such reports shall be prepared by a New Mexico professional engineer, competent in soil

HEALTH, SAFETY AND SANITATION

- mechanics.
- (4) Paving an area larger than one thousand (1000) square feet shall require a paving permit. Applications for paving permit shall be accompanied by drainage plans, if deemed necessary by the city engineer. Repaving of existing paved areas in which no grading is planned is excluded.
 - (5) The city engineer shall not issue a grading or paving permit unless the proposed grading or paving is in compliance with the policies of this article and the standards and criteria of the city engineer as provided by 8-7-13 of this article.
- C. The City may participate with the private sector, other public bodies, and agencies operating within the jurisdiction of this policy, in order to accomplish the goals and implement the policies adopted in this article. This includes, but shall not be limited to, the development and adoption of master plans, participation in the construction of projects, and exercising control through the planning, platting, zoning, and permitting processes. Projects involving City funding shall be prioritized, funded and scheduled within the guidelines of the CIP and with CIP projects.
- D. It shall be the responsibility of the city engineer to produce, approve, make, and retain records of all drainage plans, drainage reports, design analyses, design drawings, as-built drawings, and maintenance schedules related to all drainage control, flood control, and erosion control facilities constructed within City rights-of-way or easements.
- E. Applications for all land use changes shall address drainage control, flood control, and erosion control in terms of the interactions of these parameters with other requirements and needs produced by the proposed land use changes.
- F. Requests for the platting of land for the purpose of subdivision or development shall be accompanied by appropriate drainage control, flood control, and erosion control information.
- G. (1) The city engineer shall not approve any plan or report pertaining to proposed construction, platting, or other development where the proposed activity or change in the land affected would result in downstream capacity being exceeded.
- (2) Downstream capacity is determined based on the assumption of fully developed watersheds. This assumption prevents "the first come, first served" approach where downstream development unduly constrains upstream development. Parameters used in the determination of downstream capacity include, but are not limited to:
- (a) channel stability;
 - (b) crossing structure hydraulic capacity;
 - (c) reservoir capacity;
 - (d) hydraulic capacity of street, storm-sewer, or channel;
 - (e) public safety; and
 - (f) maintenance constraints.
- (3) Planned public storm drainage facilities are assumed as in place in determining downstream capacity, provided that construction funds are available and design has progressed to the point where capacity can be ascertained.
- H. Temporary facilities are only allowed and/or required on a case-by-case basis as determined by the city engineer. The level of protection to be provided by temporary facilities shall be determined by considering:
- (1) the likelihood and consequences of a failure;
 - (2) length of time until permanent facilities will be in place; and
 - (3) the acceptance of maintenance responsibilities and legal liabilities.
- I. Requests for approval of development and/or platting proposals to the city engineer shall be accompanied by drainage control, flood control, and erosion control information and/or commitments. The particular nature, location and scope of the proposed development

HEALTH, SAFETY AND SANITATION

defines the degree of detail. One or more of the following levels of submittal may be required based on the following:

- (1) Conceptual Grading and Drainage Plan: A graphic representation of existing and proposed grading, drainage, flood control, and erosion control information. The information should be of sufficient detail to determine project feasibility. The purposes of this plan are to check the compatibility of the proposed development within grading, drainage, flood hazard, and erosion control constraints as dictated by on-site physical features as well as adjacent properties, streets, alleys, and channels. Modifications to the Comprehensive Plan and the development of area plans, sector plans, site development plans, and landscaping plans on tracts of five (5) acres or more are appropriate applications of conceptual grading and drainage plans.
- (2) Drainage Plans: A short detailed presentation required for approval of small, simple development approvals. Drainage plans are prepared in combination with the detailed grading plan and address both on-site and off-site drainage control, flood control, and erosion control issues. Drainage plans are required for building permits, site development plans, and landscaping plans for developments involving less than five (5) acres.
- (3) Drainage Report: A drainage report is a comprehensive analysis of the drainage control, flood control, and erosion control constraints on and impacts resulting from a proposed platting, development, or construction project. Drainage reports are required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more, platting or construction within a designated flood hazard area and for any platting or development adjacent to a major arroyo.
- (4) Erosion Control Plan: An erosion control plan is usually incorporated into the drainage plan or drainage report. Erosion control plans address all phases of each project from initial grading through and including final occupancy. Phased projects required special attention. All construction projects, both public and private, within the jurisdiction of this article, unless specifically excluded, require an approved erosion control plan prior to start of construction.

J. Drainage control considerations specifically address safety, convenience, and economics for both private property and public facilities.

- K. (1) The Rio Rancho 100-year design storm is the 100-year 6-hour storm as defined by the National Oceanic Atmospheric Administration (NOAA) and by the storm distributions for time and area as developed by the city engineer. The 100-year storm has a 1% probability of occurring in any year. Watersheds with times of concentration greater than six (6) hours will require the use of the 100-year 24-hour storm volumes and distributions. Detention basins with longer than six (6) hours evacuation times shall use a twenty-four (24) hour or longer storm volume and distribution.
- (2) Design circumstances may require larger or smaller storm volumes. Examples are emergency spillways for dams and erosion control plans, respectively. The sources for rainfall data are current NOAA publications and the city engineer. When the need for other design storms is apparent, the city engineer will provide requirements concerning appropriate storms, frequencies, and durations.

L. The city engineer shall, within 14 to 30 calendar days after the submission to him of a request in writing for the approval of a plat, development plan, drainage submittal, or exemption, approve or deny the request and mail a copy of his decision to the applicant. If the request is denied, the reasons for such denial shall be stated in writing. Appeal of such decisions is as provided in 8-7-15 of this article.

HEALTH, SAFETY AND SANITATION

- M. Grading or paving permits issued by the city engineer or approvals by the city engineer of drainage plans, erosion control plans or other improvement plans within the context of this Article 7 shall expire by limitation and become null and void if the work or improvements authorized is not commenced within 12 months of such approvals. In the event such authorized work or improvement is suspended or abandoned for a period of 12 months after the work or improvement is commenced, the said permit or approval shall expire and become null and void. Before the work or improvement is recommended, resubmittals must be made for approval by the city engineer. (91-037)

8-7-13 Administrative Procedures, Criteria, and Standards

- A. Rules concerning procedures, criteria, and standards shall be adopted, amended, or abolished in compliance with the policies of this ordinance and as provided by the procedures of this section. All rules and decisions shall be filed in the Public Records with the Municipal Clerk.
- B. Proposed rule changes relating to procedures, criteria, and standards pursuant to this article are initiated by the city engineer; or any person may submit such proposed rule changes to the city engineer. If a person other than an official of the City of Rio Rancho submits such a proposal, there may be a processing fee set by a rule of the city engineer. (For fee, Appendix D.)
- C. Prior to the adoption, amendment, or repeal of any rule pursuant to this article (hereafter, referred to as "rule change"), the city engineer shall:
- (1) publish summary notice of the proposed rule change and solicit local comments in a newspaper of general circulation, which has its principal office in the City of Rio Rancho, and also where appropriate in trade, industrial, or professional publication as will reasonably give public notice to interested persons;
 - (2) send the proposed rule change to all City departments and solicit written comments;
 - (3) send the proposed rule change to any person or group filing written request for notice of all such rule changes. A fee may be charged for requesting notices to cover reasonable City costs (for fee, see Appendix D);
 - (4) solicit written comment on proposed rule changes for a period of 30 days from the date of their distribution and consider all comments before ruling on proposed rule changes; and
 - (5) upon adoption of a contested rule change, issue a concise statement of his principal reasons for the rule change and statement of positions rejected in adopting the rule change together with the reasons for the rejection. All persons who submit any writing to be considered in connection with the proposed rule change shall promptly be given a copy of the decision, by mail or otherwise.
- D. If a proposed rule change is approved by the city engineer after receiving comments, notice shall be posted in a conspicuous place in City Hall and a reasonable effort shall be made to notify all interested parties. Proposed rule changes shall not take effect sooner than thirty (30) days from the date of posting of notice or sooner than ninety (90) days from original distribution for comment.
- E. In the event of an emergency, the Mayor may direct that rules concerning procedures, criteria, or standards take effect immediately upon their posting and distribution. The Mayor's finding of an emergency and brief statement of the reasons for this finding shall be incorporated in the emergency rule change. Upon adoption of an emergency rule change which change shall remain in effect for longer than sixty (60) days, notice to the public shall be given within seven (7) days and opportunity for public comment shall be given in the manner required in this section for proposed rules.

HEALTH, SAFETY AND SANITATION

- F. Appeal of the city engineer's rule-making decisions is as provided in 8-7-15 of this article. Regular rules, adopted under 8-7-13D of this section, do not take effect until an appeal is decided, if they are appealed prior to taking effect. Emergency rules, adopted under 8-7-13E of this section, and regular rules, which have taken effect prior to appeal, are in effect until such time as they may be reversed by appeal action.

8-7-14 Enforcement

- A. (1) Whenever necessary to make an inspection to enforce any of the provisions of this article, the city engineer or his authorized representative may enter such premises at all reasonable times to inspect the same or to perform any duty imposed upon him by this article, provided that, if such premises be occupied, he shall first present proper credentials and demand entry; and, if such premises be unoccupied, he shall first make a reasonable effort to locate the owner or other persons having charge or control of the premises and demand entry. If entry is refused or if the owner or other responsible person is not found, the city engineer or his authorized representative shall proceed to obtain a search warrant through the municipal court or district court, upon oath or affirmation.
- (2) The complaint shall:
- (a) set forth the particular premises, or portion thereof, sought to be inspected;
 - (b) state that the owner or occupant of the premises, or portion thereof, has refused entry;
 - (c) state that inspection of the premises, or portion thereof, is necessary to determine whether it complies with the requirements of this article;
 - (d) set forth the particular provisions of this article sought to be enforced;
 - (e) set forth any other reason necessitating the inspection, including knowledge or belief that a particular condition exists in the premises, or portion thereof, which constitutes a violation of this article; and
 - (f) state that the complainant is authorized by the City to make the inspection.
- (3) Each inspector shall be furnished with an identification card indicating his authority and must present same to the municipal court or district court for the purpose of this subsection 8-7-14A and to other persons, when requested to do so during the performance of his duties. No owner or occupant or any other person having charge, care, or control of any premises shall fail or neglect, after proper demand is made as herein provided, to promptly permit entry therein by the authorized inspector for the purpose of inspection and examination pursuant to this article.
- B. Where, after investigation, an order has been issued by the city engineer to the owner of the property on which a violation has occurred and the order is not complied with, within such reasonable time as may be prescribed by the city engineer, or if the responsible party or violator cannot be found or determined, the city engineer may cause such remedies as are necessary to be made. The reasonable cost of such remedies shall constitute a lien against the property on which the violation occurred and was remedied. The lien shall be imposed and foreclosed in the manner provided in 3-36-1 through 3-36-6 NMSA 1978, as amended.

8-7-15 Appeals

Any applicant, aggrieved by a decision as to actions, provided for in 8-7-6, 8-7-12, and 8-7-13 of this article, of the city engineer or absence of such decision, may appeal such decision to the Governing Body of the City of Rio Rancho. Such appeal shall be made by notice of appeal in writing addressed to the municipal clerk and delivered, by copy, to the office of the city engineer within thirty (30) days after the date of the decision was mailed to the applicant. The municipal clerk shall

HEALTH, SAFETY AND SANITTION

notify the applicant and the city engineer of the date, time, and place of the appeal hearing at least five (5) days prior to the hearing date. Such hearing shall be conducted not earlier than ten (10) days nor later than (30) days after the filing of the notice of appeal with the municipal clerk. At the hearing the Governing Body may consider such facts, exhibits, and engineering principles as may be presented by the appellant or city engineer or his designee, or of which the members may have knowledge or experience, and may affirm, reverse, or modify the decision appealed from, and attach as conditions to their decision such requirements as in their opinion may be necessary or appropriate in compliance with the policies of this article to safeguard persons and property from storm water runoff. Each decision of the Governing Body shall be in writing and shall state reasons therefor. A copy of the decision shall be promptly mailed to the appellant and to the city engineer.

8-7-16 Warning and Disclaimer of Liability

The degree of flood protection required by this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This article does not imply that land outside flood hazard areas or uses permitted within such areas will be free from flooding or flood damages. This article shall not create liability on the part of the City of Rio Rancho or on any officer or employee thereof for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder.

8-7-17 Interpretation

In the interpretation and application of this article, all provisions shall be:

- A. considered as minimum requirements;
- B. liberally construed in favor of the City of Rio Rancho;
- C. deemed neither to limit nor repeal any other powers granted under state statutes;
- D. not deemed to limit nor repeal any other article of R.O. 1987, adopted by the Governing Body, unless expressly so stated herein.

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PLANNING, ZONING, LAND USE MANAGEMENT

Article 2 Subdivisions

Section

- 9-2-1 Title
- 9-2-2 Authority and Jurisdiction
- 9-2-3 Purpose
- 9-2-4 Interpretation
- 9-2-5 Definitions
- 9-2-6 General Information and Guidance
- 9-2-7 Preapplication Procedure
- 9-2-8 Plans and Data for Preapplication
- 9-2-9 Preliminary Plat Procedure
- 9-2-10 Plans and Data for Preliminary Approval
- 9-2-11 Final Plat Procedure
- 9-2-12 Plans and Data for Final Approval
- 9-2-13 Summary Procedure
- 9-2-14 Required Improvements
- 9-2-15 Design Standards
- 9-2-16 Character of Development
- 9-2-17 Modifications and Exceptions
- 9-2-18 Vacation of a Plat
- 9-2-19 Construction Violations
- 9-2-20 Variance
- 9-2-21 Fees
- 9-2-22 Penalties
- 9-2-23 Appeals
- 9-2-24 Amendment Procedure
- 9-2-25 Public Records

9-2-1 Title

This article shall be known as "The Subdivision Regulations of the City of Rio Rancho" and is referred to elsewhere herein as "these regulations". The City of Rio Rancho shall hereinafter be referred to as "the City".

9-2-2 Authority and Jurisdiction

- A. Authority: These regulations are created pursuant to enabling legislation, 3-19-6, NMSA, 1978.
- B. Jurisdiction: These regulations are designed to accomplish the procedures for the processing, consideration, and filing of plats lying within the corporate boundaries of the City and/or within a radius of three miles from the City planning and platting jurisdiction pursuant to 3-19-5 and 3-20-5 NMSA, 1978. No subdivision of any land shall hereinafter be effected within the City area of jurisdiction except in accordance with the provisions of these regulations.

9-2-3 Purpose

These regulations are intended to create orderly, harmonious, and economically sound development of land in order to establish conditions favorable to the health, safety, convenience, and general welfare of citizens of the City and its area of jurisdiction. More specifically, provisions of these regulations are designed to achieve adequate provision for light and air, public open spaces, water supply, drainage, sanitation including sewer facilities; economy in governmental expenditures and efficiency in governmental operations; safe convenient circulation of people, goods, and vehicles; accurate and complete surveying, and preparation and recording of plats thereof; safety and suitability of land for contemplated development; and coordination of land development in accordance with orderly physical patterns as stated in official plans, policies, and such ordinances and codes in furtherance of plans and policies as may have been and may be hereafter adopted by the City.

PLANNING, ZONING, LAND USE MANAGEMENT

9-2-4 Interpretation

These regulations are held to be minimum requirements to carry out the purpose stated herein and are not intended to interfere with any other laws, covenants, or ordinances. Whenever any of the provisions of these regulations are more or less restrictive than other laws, covenants, or ordinances, then whichever is more restrictive shall govern.

9-2-5 Definitions

- A. **Word Forms:** Unless a contrary intention clearly appears, words used in the present tense include the future tense, and words used in the future tense include the present tense; the singular includes the plural, and the plural includes the singular; the word "may" is permissive, and the words "shall" and "will" are mandatory, subject to specific exceptions allowed by these regulations.
- B. **Definitions:** The following definitions apply:
- (1) "Alley" means a public thoroughfare which affords only a secondary means of access to abutting property.
 - (2) "Block" means property bounded on one side by a street and on the other sides by a street, railroad right-of-way, waterway, unsubdivided areas, or other definite barriers.
 - (3) "Centerline" means the line halfway between the street right-of-way lines.
 - (4) "Cul-de-sac" means a short street intersecting another street and terminating in a vehicular turnaround.
 - (5) "Easement" means an acquired or granted right of use which one person may have in the land of another.
 - (6) "Future street line" means a line, established by the City Council, running more or less parallel to the centerline of an existing or proposed street for the purpose of delineating the future boundaries of public right-of-way.
 - (7) "Lot" means a tract or parcel of land platted and placed on the Sandoval County Clerk's record in accordance with laws and ordinances, generally as a portion of a subdivision intended for development purposes.
 - (8) "Master plan" means a comprehensive plan or any of its parts, adopted by the City Council, for the physical development of the area within the planning and platting jurisdiction of the City for the general purpose of guiding and accomplishing coordinated and harmonious development.
 - (9) "Monument" means one or more of the following:
 - (a) "Bench mark" means a brass cap, set in a base which meets City standard, with the elevation (mean sea level datum, 1929) and the land surveyor's registration number inscribed thereon.
 - (b) "Permanent survey monument" means a brass cap set in a base which meets City standards, or a standard Bureau of Land Management monument marking sectionalized comers, containing coordinates referenced to the New Mexico Coordinate System and the land surveyor's registration number prescribed thereon.
 - (c) "Subdivision control monument" means a metal stake or pipe which meets City standards, with the land surveyor's registration number affixed thereto.
 - (10) "Municipal Clerk" means an appointed officer of the City as so designated by the City Council.
 - (11) "Open space" means an area reserved for public use, not to include dedication of public streets and right-of-way.
 - (12) "Person" means any individual, estate, trust, receiver, association, club, corporation, company, firm, utility, or other entity.
 - (13) "Planning commission" means the Planning and Zoning Commission of the City.
 - (14) "Plat" means a map, chart, survey, plan, or replat certification by a registered land surveyor which contains a description of subdivided land with ties to monuments or other points of reference acceptable to the Planning Commission, said plat to be placed on record.
 - (15) "Replat" means to prepare and record a new plat replacing all or a portion of a previously recorded plat that has been vacated.

PLANNING, ZONING, LAND USE MANAGEMENT

- (9) Location, dimensions, areas, and purposes of lots proposed to be dedicated or reserved for the public.
- (10) Reference to recorded subdivision plats of adjoining platted land by recorded name, date, book, and page number in the office of the Sandoval County Clerk.
- (11) Mileage of streets created:
 - (a) total;
 - (b) full-width streets; and
 - (c) half-width streets.
- (12) Certification by the Sandoval County Treasurer or by a duly qualified abstract company that the previous ten years' property taxes due and payable have been paid in full.
- (13) Statement that the subdivision is with the free consent and in accordance with the desire of the undersigned owner of the land, acknowledged in a manner required for acknowledgment of deeds.
- (14) Signed statements by the subdivider dedicating public rights-of-way, any sites for public use, and granting the shown easements for public use.
- (15) Certification and seal by a registered land surveyor, in accordance with the laws of the State of New Mexico, certifying the accuracy of the survey and plat, that he prepared or supervised preparation of the plat, that he has shown all easements of record, and that it meets design standards for surveying.
- (16) Certification that all monuments are in place.
- (17) Such other certificates, affidavits, endorsements, or dedications as may be required by the Planning Commission in the enforcement of these regulations.

9-2-13 Summary Procedure

- A. In accordance with the alternate summary procedures authorized by 3-20-8 NMSA 1978, the City Development Director, as administrative officer, may approve a subdivision as a combined preliminary and final plat in any case where no public purpose would be served by separate steps. Such summary approval shall be given only when one or both of the following conditions exist:
 - (1) The subdivision contains no more than two lots, provided, however, that submittal of a series of two lot subdivisions on a tract of land will be considered a subterfuge to defeat the purpose of these regulations and such plats shall not be approved.
 - (2) Resubdivisions, where the combination or recombination of portions of previously platted lots does not increase the total number of lots.
- B. In all cases, the subdivision plat being considered for approval under this summary procedure shall be prepared according to the standards for plans and data for both preliminary and final plats as contained herein.
- C. The City Development Department Director shall furnish the Planning and Zoning Commission with monthly reports documenting those subdivisions approved administratively.

9-2-14 Required Improvements

- A. Authorization: Receipt of the signed copy of the preliminary plat is authorization for the subdivider to proceed with the minimum improvements required by these regulations. Prior to the construction of any improvements or to the submission of any bond, the subdivider shall furnish the Planning Commission with all plans and data necessary for the construction of said improvements. These plans shall be examined by the Planning commission and will be approved if in accordance with the following requirements. Following the approval, construction can be started or the amount of bond determined.
- B. Installation Assurance: Plans for improvement shall be prepared by an engineer registered in accordance with the laws of New Mexico. The City is to be assured of the installation of these improvements in a satisfactory manner by one or more of the following methods:
 - (1) Complete installation of the improvements prior to approval of the final plat.
 - (2) Submission of a satisfactory bond, either a performance bond or a cash bond, or the establishment of an escrow account in an amount and with surety and conditions satisfactory to the Municipal Clerk providing for and securing to the City, the actual

PLANNING, ZONING, LAND USE MANAGEMENT

construction and installation of such improvements and utilities within a period not to exceed one year.

- (3) Completion of an approved assessment procedure whereby the City is put in an assured position to do said work and make said installations at the cost of the owners of the property within the subdivision.
- (4) Submission of an approved assessment procedure for the paving of streets together with an agreement between the subdivider and the City for a cash payment for other improvements with payment to be made as the work is completed.
- (5) The City may authorize a written agreement between the City and the subdivider, which would be recorded at the time of filing of the final plat, which would adequately restrict sales of any lots as to which there had not been completion of the improvements and installation of utilities, and which would establish a ten year time limit.
- (6) The subdivision may be developed in segments whereby the Planning Commission, at its discretion, may waive the use of a guarantee as required by the section on the initial segments, provided that such segments are not larger than twenty-five lots or 50 percent of the total number of lots in the subdivision, whichever is less. The Planning Commission shall grant final plat approval for each succeeding segment being contingent upon completion of the minimum improvements required by these regulations in each preceding segment. Completion of improvements in the final segment of the subdivision, which shall include at least twenty-five lots or 50 percent of the total number of lots in the subdivision, whichever is less, must be guaranteed through the use of one the other methods detailed under this section.

C. Installation of Improvements: The subdivider may prepare and secure approval of the preliminary plat and then install improvements in the area covered by the preliminary plat. Improvements must be installed only in that part of the area for which a final plat will be submitted for approval and filing. The improvements to be installed shall include the following:

- (1) Permanent markers: All subdivision boundary corners, and the four corners of all street intersections shall be marked with permanent monuments. A permanent monument shall be deemed to be concrete with a minimum dimension of 4 inches, extending 3 feet below the surface of the ground. Should conditions prohibit the placing of monuments on line, offset marking will be permitted; provided, however, that offset courses and distances are shown on the plat. A permanent benchmark shall be accessibly placed within the subdivision, the elevation of which shall be referred to the U.S.G.S. datum and accurately noted on the subdivision plat.
- (2) Street improvements: All streets shall be graded and the roadway improved by paving under the supervision of the city engineer and subject to his approval in accordance with the design standards provided herein.
- (3) Sidewalks: Sidewalks shall be provided by the developer and shall be constructed under the supervision of the city engineer and subject to his approval in accordance with the design standards of the City.
 - (a) Warrants: Sidewalks shall be required on both sides of arterial and collector streets when abutting land zoned R-3, C-1, C-2, M-1, or SU, and when abutting church and school grounds. Sidewalks shall be required on both sides of all local streets in a logical manner to facilitate pedestrian access.
- (4) Water and sewer mains: The subdivider shall make necessary arrangements to serve each lot from water and sewer mains of the central systems serving the City, where feasible and in conformity to City Council policy. Where, for any reason, municipal services cannot be provided, the subdivider shall present evidence that adequate water and sewer service to each lot will be provided in compliance with the requirements of the New Mexico Environmental Improvement Division and in conformity to the standard specifications of the City construction of all water and sewer lines shall be under the supervision and approval of the City Engineer.
- (5) Drainage: Construction of drainage improvements and other means of storm water management shall be under the supervision and approval of the city engineer.

PLANNING, ZONING, LAND USE MANAGEMENT

- (6) **Street lighting:** Street lighting shall be provided by the developer and shall be constructed under the supervision of the city engineer and subject to his approval in accordance with the design standards provided herein.
- (a) **Warrants:** Street lights shall be required at all arterial and collector intersections, park, school, and church sites, and any other high pedestrian-oriented land use.
- D. Approvals by the city engineer of improvement plans for streets, alleys, grading, drainage, water, sewer, street lighting or other improvements within the context of this Article 2 shall expire by limitation and become null and void if the work or improvements authorized is not commenced within twelve months of such approval. In the event such authorized work or improvement is suspended or abandoned for a period of twelve months after the work or improvement is commenced, the said approval shall expire and become null and void. Before the work or improvement is recommenced, resubmittal must be made for approval by the city engineer. (91-037)

9-2-15 Design Standards

All subdivisions within the City planning and platting jurisdiction shall conform to minimum design standards established by the City.

- A. **Street Standards:** The character, extent, width, and location of all streets shall conform to any master plan or policies established by the City Council and shall be consistent and appropriate in their relationship to existing and planned streets, topographic conditions, public convenience, safety, and the proposed uses of the land to be served by such streets.
- (1) Where an arterial or collector street is not shown and defined in a master plan of the City and there is not an adopted future street line, the arrangement of streets in a subdivision shall either:
 - (a) provide for the continuation or appropriate projection of existing principal situation where topographic or other conditions make continuance of, or conformance to, existing streets impractical.
 - (b) conform to a plan for the neighborhood properly approved by the City to meet a particular situation where topographic or other conditions make continuance of, or conformance to, existing streets impractical.
- (2) Minor street shall be so laid out that their use by through traffic will be discouraged.
- (3) Where a subdivision borders on or contains a railroad right-of-way or limited access highway right-of-way, the Planning Commission may require a street approximately parallel to such right-of-way. This distance shall be suitable for the appropriate use of the intervening land and shall also be determined with due regard for the requirements of approach grades and future grade separations.
- (4) Reserve strips controlling access to streets shall be prohibited except where their control is definitely placed in the City under conditions approved by the Planning Commission.
- (5) Half streets shall be prohibited, except where used as an addition to another half street which was platted and filed before the effective date of these regulations.
- (6) No street names shall be used which will duplicate or be confused with the names of existing streets within the jurisdiction of the City. Street name changes shall be subject to the approval of the City Council upon the recommendation of the Planning Commission. A street name shall only be changed if the applicant shows that there will be a public benefit which clearly outweighs the public confusion which would be created by the name change.
- (7) Streets shall be laid out to intersect as nearly as possible at 90 degree angles, and no street shall intersect any other street at less than 60 degrees.
- (8) Street jogs with centerline offsets shall be avoided, but where necessary shall have a minimum offset of 125 feet.
- (9) A minimum tangent 100 feet long shall be introduced between reverse curves on major streets.

PLANNING, ZONING, LAND USE MANAGEMENT

- (10) When connecting street lines deflect from each other at any one point by more than ten degrees, they shall be connected by a curve with a radius adequate to insure a sight distance of not less than 200 feet and of such greater radius as may be set by the Planning Commission for special cases.
- (11) Property lines at street intersections shall be rounded with a radius of 10 feet, or of greater radius where the Planning Commission may deem it necessary. Comparable cutoffs or chords in place of round corners may be permitted.
- (12) Dead end streets (cul-de-sacs), designed to be so permanently, shall not be longer than 500 feet and shall be provided at the closed end with a turn-around having an outside roadway diameter of at least 100 feet.
- (13) All street gradients shall be subject to approval of the City Engineer. Minimum street gradient shall not be less than $\frac{1}{2}$ percent, and the maximum not more than 10 percent. Within 100 feet of any intersection, the maximum gradient shall be 5 percent to provide adequate and safe sight distance and the intersection itself shall have a maximum gradient of 3 percent.
- (14) Streets and alleys shall be provided in accordance with the following minimum standards:

<u>Right-of-Street Type</u>	<u>Pavement Way Width</u>	<u>Width</u>
Arterial	86 feet	48 feet plus median
Collector	60 feet	42 feet
Local	50 feet	32 feet
Alley	20 feet	20 feet
Cul-de-sac less than 200 feet in length	40 feet	24 feet

- (15) The minimum radius at the centerline for horizontal curves on streets shall be as follows:

<u>Street Type</u>	<u>Curve Radius</u>
Arterial	400 feet
Collector	200 feet
Local	50 feet

- (16) All streets shall be graded and the roadway improved in all accordance with standard specifications of the City and with the supervision and approval of the City Engineer.
- (17) Alleys shall be provided in commercial and industrial districts, except that the Planning Commission may waive this requirement where other definite and assured provision is made for service access, such as off-street loading, unloading, and parking adequate for the uses proposed. Alleys may be provided in residential areas at the option of the subdivider, but are to be discouraged where they would serve no useful public purpose or where easements would better serve the purpose.
- (18) Curbs and gutters shall be provided on both sides of the street and constructed to standard specifications of the City under the supervision of the City Engineer and subject to his approval.
- (19) Sidewalk standards: The width and horizontal location shall conform to the following minimum design criteria:

- (a) Width: A 6 foot width is required on all arterials. A 4 foot width is required on all collectors and local streets.
- (b) Horizontal location: Sidewalks shall be located within the public right-of-way such that the property side edge is located on the property line. There shall be a $2\frac{1}{2}$ foot minimum separation between street side edge of the walk and the back of curb. Special locations shall be as identified in adopted plans.
- (c) Vertical location: The sidewalk must be located such that the top surface of the sidewalk will be 2 inches above the top of curb at the lowest point on the sidewalk.

(96-019)

PLANNING, ZONING, LAND USE MANAGEMENT

- (d) Transverse slope: Sidewalks shall have a minimum transverse slope of 1/4 inch per foot, sloping toward the street.
 - (e) Sidewalk materials: Sidewalk materials and specific design specifications must be approved by the City Engineer prior to construction.
 - (20) Walkways, bike paths, bridle paths, and water courses shall provide a minimum right-of-way width of 10 feet and a minimum pavement width, if any, of 10 feet.
 - (21) Street numbers designating building numbers shall be in compliance with 9-1-20 (Building Permits and Building Numbering, Administration of the Zoning article) and building numbers shall be designated during plat approval procedure.
 - (22) Street lights shall consist of 100 watt, high pressure sodium vapor, pink lights and shall be located at warranted locations and at mid-block locations where blocks exceed 500 feet in length. In new subdivisions, the developer shall submit a plat to the authorized utility franchisee for design of the street lighting system. The authorized utility franchisee shall submit the completed design to the City Engineer through the City Development Department for approval. Following approval, the authorized utility franchisee shall install the street lights in conjunction with the installation of electrical service to the subdivision.
- B. Drainage: Adequate provision shall be made for drainage of storm water subject to the approval of the City Engineer in accordance with the master drainage plan and requirements pursuant to the National Flood Insurance Program of the Federal Emergency Management Agency.
- C. Easements: Easements of at least 5 feet in width shall be provided and dedicated on each side of all rear lot lines (except where there are alleys) and along side lot lines where necessary for poles, wires, conduits, storm and sanitary sewers, gas, water, and other mains. An adequate easement shall be dedicated along all important watercourses for the purpose of widening, deepening, sloping, improving, or protecting the channel for drainage purposes. Where a cut or fill road slope is outside the normal right-of-way of the street, then a slope easement shall be provided of sufficient width to permit maintenance of the slopes.
- D. Blocks: The lengths, widths, and shapes of blocks shall be determined with due regard to provision of adequate building sites suitable to the special needs of the type of use contemplated; to zoning requirements as to lot sizes and dimensions; to needs for convenient access, circulation, control, and safety of street traffic; and to limitations and opportunities to topography.
- E. Lots: The lot arrangement and design shall be such that all lots will provide satisfactory and desirable building sites properly related to topography and the character of adjacent development. All side lines of lots shall be at right angles to straight street lines or radial to curved street lines unless a variation of this rule will give a better street and lot plan. Lots of double frontage shall not be permitted.
- F. Public Sites and Open Spaces: The Planning and Zoning Commission shall require adequate provision for suitable park land, playgrounds, or other public recreational use in each subdivision.
- (1) When any subdivider receives final plat approval for a subdivision within the corporate limits of the City of Rio Rancho, said subdivider shall dedicate to the City a portion of such land suitable for the purpose of parks, or recreational facilities, for the future residents of the subdivision. The dedicated land shall conform to City standards as defined in this article.
 - (2) The exact amount of land dedicated shall be determined by the recommendations of the City Development Department, and the Planning and Zoning Commission. Said dedication shall be generally based upon 3 acres per 1000 persons and 2.83 persons per dwelling in single family areas and shall be generally equivalent in other areas.
 - (3) Utilities: The subdivider shall provide utility availability for the development of the dedicated land.
 - (4) For subdivisions containing twenty-five acres or less, in lieu of the land required to be dedicated, the City may accept payment of a fee based upon the fair market value of the amount of land which would otherwise be required to be dedicated. However,

PLANNING, ZONING, LAND USE MANAGEMENT

submittal of subsequent subdivisions, involving adjacent or contiguous land will be considered a subterfuge to defeat the purposes of this article and the subdivider must comply with the requirement for public sites and open spaces. "Fair Market Value" shall be determined in an appraisal obtained by the City of Rio Rancho from a certified appraiser. The appraisal shall be obtained after the site is platted into lots and before the plat is approved by the Planning and Zoning Commission.

- (5) The dedication of land required by this subsection shall be by warranty deed and by dedication on a plat of the subdivision filed of record with the County Clerk of Sandoval County, New Mexico.
- (6) Notwithstanding any other provisions of this chapter or article, any requests for waivers or variances from the requirements for public sites or open space for recreational use shall be submitted to the Planning and Zoning Commission through the City Development Department. The Planning and Zoning Commission shall make and submit recommendations to the Governing Body for its approval, disapproval, or modification at an open meeting.

9-2-16 Character of Development

- A. The Planning Commission shall confer with the subdivider regarding the type and character of development that will be permitted in the subdivision, and may agree with the subdivider as to certain minimum restrictions to be placed upon the property:
 - (1) to prevent the construction of substandard buildings, and
 - (2) to control the type and use of structures and the use of lots which, unless so controlled, would clearly depreciate the character and value of the proposed subdivision and of adjoining property.
- B. The Planning Commission shall have power to agree with the subdivider upon the use, height, area, or bulk restrictions governing building and premises, providing that, in the case of subdivisions beyond the corporate limits, the Planning Commission may require the subdivider to conform to the land use plans adopted by the City. Deed restrictions and covenants shall not contain reversionary clauses wherein any lot shall return to the subdivider because of a violation of the terms of the restrictions and covenants.

9-2-17 Modifications and Exceptions

Whenever the tract to be subdivided is of such unusual size or shape or is surrounded by such development or unusual conditions that the strict application of these regulations would result in real difficulties and substantial hardships, the Planning Commission may vary or modify the requirements, so that the subdivider is allowed to develop his property in a reasonable manner, but at the same time so that the public welfare and interests of the City are protected and the general intent and spirit of these regulations are preserved. However, such relief may not be granted if it is detrimental to the public good or impairs the intent and purpose of these regulations or the desirable developments of the community in accordance with plans and policies of the City Council. Any modification granted shall be entered in the records of the Planning Commission setting forth the reasons which justified the modifications. Further, in granting modifications and exceptions, the Planning Commission may place conditions which will in its judgment substantially secure the objectives of the standards or requirements involved.

9-2-18 Vacation of Plat

- A. **Necessity:** Nothing in this section requires that a vacation be undertaken if a replat, accomplishing the elimination of lot lines is duly approved. A vacation is required when no replatting is undertaken but elimination of lot lines, right-of-way, or easement lines dividing a parcel is to be accomplished.
- B. **Application Procedure:** Any plat filed in the office of the Sandoval County Clerk and within the planning and platting jurisdiction of the City may be vacated according to the following procedures:

PLANNING, ZONING, LAND USE MANAGEMENT

- (1) The subdivider of land proposed to be vacated, exclusive of public rights-of-way, shall sign a duly acknowledged statement declaring the plat or a portion of the plat is to be vacated and shall apply to the Planning Commission for approval.
 - (2) Where a public right-of-way is proposed to be vacated:
 - (a) the Planning Commission shall mail letters to franchised utilities and to the owner(s) of record of all lots adjacent to the public right-of-way to be vacated, informing them of the nature of the proposed vacation, and notifying them of the date, time, and place of the hearing. At least fifteen days shall be allowed for such comments before a decision is reached.
 - (b) if the public right-of-way proposed for vacation is paved, or if the entire width of the right-of-way is proposed for vacation, the applicant shall post and maintain one or more signs, as provided and where instructed by the Planning Commission at least fifteen days prior to the date of the hearing. The applicant is responsible for removing such signs within five days after the hearing is completed. Failure to properly post signs is grounds for deferral of the request. No one except the applicant, the agent of the applicant, or the City shall remove or tamper with any such required sign during the period it is required to be maintained under this paragraph.
 - (c) in considering the vacation of all or part of a public right-of-way, the Planning Commission shall determine whether or not the vacation will adversely affect the interests of persons owning contiguous land or land within the subdivision being vacated.
 - (3) The rights-of-way of any public or private utility, including drainage, existing prior to the vacation, total or partial, of any plat are not affected by the vacation of a plat unless an authorized representative of the utility involved agrees in writing to have the rights vacated.
- C. **Public Hearing:** A decision on approval and endorsement shall be made at a hearing by the Planning Commission. Public notice in a newspaper of general circulation in the City shall be published at least fifteen days before the date of the hearing; the notice shall indicate the location of the proposed vacation where a map of the proposed vacation may be viewed and information on the hearing. If approved by the Planning Commission, the statement of vacation is endorsed "approved". Such endorsement shall be within ten days of the conclusion of the hearing.
- D. **Recording:** The vacation is in full force and effect only after the approved statement declaring the vacation has been recorded in the office of the Sandoval County Clerk. The Sandoval County Clerk shall be requested to mark the original plat with the words "vacated" or "partially vacated" and refer on the plat to the volume and page on which the statement of vacation is recorded. Submittal for recording is the applicant's responsibility. The applicant shall also provide certified proof of the recording by the Sandoval County Clerk to the Municipal Clerk.

9-2-19 Construction Violations

Construction which violates any provision of these regulations is strictly prohibited and no building permit shall be authorized except in those cases where modifications or exceptions have been granted by the Planning Commission prior to start of construction. Violations without authorization by the Planning Commission shall bring cause for legal action by the City to have the construction violation stopped, corrected and/or removed, and a penalty assessed.

9-2-20 Variance

- A. Variance from the strict application of design standards may be allowed in cases where unusual conditions exist, or a variance would provide an improved design. Financial gain, loss, or monetary savings cannot be considered solely as a basis for a variance request.
- B. A request for a variance shall be submitted to the Planning and Zoning Commission through the City Development Department.

PLANNING, ZONING, LAND USE MANAGEMENT

- C. The Planning and Zoning Commission shall approve or disapprove the variance request at one of its regular meetings, or at a special hearing if necessary.
- D. Public notice shall be given at least fifteen days before the meeting in a newspaper of general circulation in the area, and owners of property within 300 feet of the property line of the proposed variance shall be notified by certified mail at least fifteen days before the meeting.

9-2-21 Fees

- A. General Fees: See Appendix D.
- B. Land Dedication Fee: The fees received under this article shall be placed in a separate "Public Site and/or Open Space Purchase and Improvement Account", and shall be used by the City only for acquisitions, development, and improvement of public site and/or open space facilities to serve the subdivision for which the fees have been paid.
- C. Payment in Lieu of Land Dedication: Payment in lieu of land dedication shall be paid at the time the Planning and Zoning Commission approves the certified appraisal.

9-2-22 Penalties

- A. Transferring Lots in Unapproved Subdivision: Any owner or agent of the owner, of any land located within the planning and platting jurisdiction of the City, who leases, transfers, sells, agrees to sell or negotiates to sell land by reference to or exhibition of a plat of such land before being duly approved by the Planning Commission and duly recorded in the office of the Sandoval County Clerk, shall upon conviction be subject to a fine not exceeding the maximum according to state law. Each and every lot or portion thereof so leased, transferred, sold, agreed to be sold, or negotiated to be sold shall be prosecuted and treated as a separate offense. The description by metes and bounds in the instrument of transfer or other document used in the process of selling or transferring shall not exempt the transaction from such penalties.
- B. Improper Recordings: Any person who records with the Sandoval County Clerk any plat in violation of these regulations shall upon conviction be subject to a fine not exceeding the maximum according to state law.

9-2-23 Appeals

- A.
 - (1) Appeal of any action or decision by the City Development Department may be filed with the Governing Body within 30 days after the date of the determination by the Commission.
 - (2) Appeal of any action or decision by the Planning and Zoning Commission may be filed with the Governing Body within 30 days after the date of the determination by the Commission.
- B.
 - (1) The Planning and Zoning Commission shall give public notice of the time and place of hearing of the appeal and written notice to the appellant, City Development Department, and a representative of the opponents, if any, at least 15 days before the date of the hearing. The appeal must be presented within three months after the date of filing.
 - (2) The Governing Body shall give public notice of the time and place of hearing of the appeal and written notice to the appellant, members of the Commission and a representative of the opponents, if any, at least 15 days before the date of the hearing. The appeal must be presented within three months after the date of filing.
- C. An appeal shall stay all proceedings in furtherance of the action appealed unless the City Development Department or Commission from whom the appeal is taken certifies that, by reason of facts stated in the certificate, a stay would cause imminent peril of life or property. Upon certification, the proceedings shall not be stayed except by order of the District Court after notice to the City Development Department or the Commission from whom the appeal was taken and on due cause shown.
- D. When an appeal alleges that there is an error in any order, requirement, decision, or determination by the Department or the Commission in the enforcement of 3-21-1 through 3-21-14 NMSA 1978, or any article, resolution, rule, or regulation adopted pursuant to those

PLANNING, ZONING, LAND USE MANAGEMENT

sections, the Planning and Zoning Commission, by majority vote of its members present, or the Governing Body, by majority vote of its members present, may:

- (1) authorize, in appropriate cases and subject to appropriate conditions and safeguards, special exceptions to the terms of the zoning article or resolutions:
 - (a) which are not contrary to the public interest;
 - (b) where, owing to special conditions, a literal enforcement of the zoning chapter will result in unnecessary hardship; and
 - (c) so that the spirit of the zoning chapter is observed and substantial justice done; or
- (2) in conformity with 3-21-1 through 3-21-14 NMSA 1978, reverse any order, requirement, decision, or determination of the Department or Commission. The language of Ordinance No. 87-1 (R.O. 1987) 9-2-15, 9-2-21, and 9-2-23 existing prior to this amendment shall continue to apply to any subdivision procedure which has been applied for prior to the effective date of this amendment.

9-2-24 Amendment Procedures

The City Council may, from time to time, amend or modify these regulations after public hearing, due notice of which shall be given as required by law.

9-2-25 Public Records

The Planning Commission shall keep public records of findings, decisions, and recommendations concerning all subdivision plats filed with it for review, including such actions as may be taken by the City Council through appeals or amendments to these regulations.

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HEALTH, SAFETY AND SANITATION

Article 7 Storm Drainage Regulations

Sec.

- 8-7-1 Authority
- 8-7-2 Jurisdiction
- 8-7-3 Statement of Purpose and Intent
- 8-7-4 Short Title
- 8-7-5 Definitions
- 8-7-6 General Provisions
- 8-7-7 Surface Use of Streets for Drainage and Flood Control Purposes
- 8-7-8 Crossings
- 8-7-9 Financial Responsibility
- 8-7-10 Multiple Use of Rights-of-Way and Easements
- 8-7-11 Maintenance Responsibility
- 8-7-12 General Administration
- 8-7-13 Administrative Procedures, Criteria, and Standards
- 8-7-14 Enforcement
- 8-7-15 Appeals
- 8-7-16 Warning and Disclaimer of Liability
- 8-7-17 Interpretation

8-7-1 Authority

This article is adopted pursuant to statutory authorities.

8-7-2 Jurisdiction

This article shall apply to all, newly developed lands within the City of Rio Rancho and, with respect to planning and platting matters, it shall also apply to all lands within its extraterritorial planning and platting jurisdiction.

8-7-3 State of Purpose and Intent

It is the purpose of this article to promote the public health, safety, and general welfare, and to minimize public and private losses due to flooding by provisions designed:

- A. To establish policies, procedures, criteria, and requirements to complement and to supplement the Flood and Erosion Control article (R.O. 1987, 8-4-1 et seq.) for the assistance and guidance of the City officials, City staff, and all persons and entities within the jurisdiction of the City.
- B. As to storm drainage, to:
 - (1) Prevent the creation of public safety hazards and seek to eliminate existing problems.
 - (2) Prevent, to the extent feasible, the discharge of storm runoff from public facilities onto private property.
 - (3) Prevent the increased risk of damage to private property caused by storm runoff from other private property.
 - (4) Provide a reasonable level of public health and convenience at reasonable cost.
 - (5) Provide for timely and effective construction and maintenance of storm drainage facilities.

HEALTH, SAFETY AND SANITATION

8-7-4 Short Title

This article may be cited as "The Drainage Ordinance" and is referred to elsewhere herein as "the article".

8-7-5 Definitions

Unless specifically defined below, words or phrases used in this article shall be interpreted so as to give them the meaning they have in common usage and to give this article its most reasonable application:

- A. "Channel" means any arroyo, stream, swale, ditch, diversion, or water course that conveys storm runoff, including man-made facilities.
- B. "Channel stability" means a condition in which a channel neither degrades to the degree that structures, utilities, or private property are endangered, nor aggrades to the degree that flow capacity is significantly diminished as a result of one or more storm runoff events or moves laterally to the degree that adjacent property is endangered.
- C. "Channel treatment measure" means a physical alteration of a channel for any purpose.
- D. "CIP" means the City of Rio Rancho's Capital Improvement Program.
- E. "City engineer" means the chief administrative engineer of the City of Rio Rancho or that engineer's designee.
- F. "Comprehensive plan" means the Rio Rancho Comprehensive Plan and amendments thereto.
- G. "Conceptual grading and drainage plan" means a plan prepared in graphical format showing existing and proposed grading, drainage control, flood control, and erosion control information in sufficient detail to determine project feasibility.
- H. "Design storm" means a storm which deposits a stated amount of precipitation within a stated period over a defined area and which is used in calculating storm runoff and in designing drainage control, flood control and erosion control measures.
- I. "Developed land" means any lot or parcel of land occupied by any structure intended for human occupation, including structures intended for commercial enterprise.
- J. "Developer" means any individual, estate, trust, receiver, cooperative association, club, corporation, company, firm, partnership, joint venture, syndicate, or other entity engaging in the platting, subdivision, filling, grading, excavation, or construction of structures.
- K. "Downstream capacity" means the ability of downstream major facilities to accept and safely convey runoff generated upstream from the 100-year design storm.
- L. "Drainage" means storm drainage.
- M. "Drainage control" means the treatment and/or management of surface runoff from all storms up to and including a 10-year design storm.
- N. "Drainage plan" means a short, detailed plan prepared in graphical format with or on a detailed grading plan addressing on-site and off-site drainage control, flood control, and erosion control issues for lots or parcels of less than five (5) acres.
- O. "Drainage report" means a comprehensive analysis of the drainage, flood control, and erosion control constraints on and impacts resulting from a proposed platting, development, or construction project.
- P. "Erosion control" means treatment measures for the prevention of damages due to soil movement and to deposition from the 10-year design storm runoff.
- Q. "Erosion control plan" means a plan for the mitigation of damages due to soil erosion and to deposition from the 10-year design storm runoff.
- R. "Flood control" means the treatment measures necessary to protect life and property from the 100-years design storm runoff.
- S. "Flood hazard area" means an area subject to inundation from the 100-year design storm

HEALTH, SAFETY AND SANITATION

runoff.

- T. "Floodway" means the channel of a river, arroyo, or other water course and adjacent land areas that must be reserved in order to safely discharge the 100-year design storm runoff.
- U. "Fully developed watershed" means a hydrological condition in which all areas upstream and downstream of a point in question are assumed completely developed, including any undeveloped areas which are assumed to be developed in accordance with mid-range development densities as established by the Comprehensive Plan, appropriate area plans or sector plans, adopted by the facilities master plans and the hydraulic and hydrologic standards established by this article.
- V. "Grading plan" means a plan describing the existing topography and proposed grading, including retaining wall locations and details, interfaces with adjacent properties, streets, alleys, and channels, referenced to mean sea level based on a City Bench Mark, and showing sufficient contours, spot elevations, and cross-sections to allow a clear understanding by reviewers, contractors, and inspectors.
- W. "Maintenance" means the cleaning, shaping, grading, repair, and minor replacement of drainage, flood control, and erosion control facilities, but not including the cost of power consumed in the normal operation of pump stations.
- X. "Major arroyo" means any channel whose watershed exceeds 320 acres in a 100-year design storm whether such watershed is in its natural or unaltered state or has been altered by development, runoff diversions, or detention facilities.
- Y. "Major facility" means any facility, including a street or alley, which would collect, divert, or convey a peak discharge of more than fifty (50) cubic feet per second (50 cfs) or store more than 2.0 acre-feet of runoff in the event of a 100-year design storm.
- Z. "Master planned facility" means any drainage control, flood control, or erosion control facility recommended in the Rio Rancho Comprehensive Plan, amendments thereto, or any voter-approved, general obligation bond financed drainage control, flood control, or erosion control facility.
- AA. "Minor facility" means any facility which would collect, divert, or convey a peak discharge of fifty cubic feet per second (50 cfs) or less in the event of the 100-year design storm.
- BB. "Multiple use facility" means a drainage control, flood control, or erosion control facility in which other secondary uses are planned or allowed, including but not limited to recreation, open space, transportation, and utility location.
- CC. "Nuisance waters" means those waters leaving a site and entering a public street which do not result from precipitation, such as landscape overwatering or car washing.
- DD. "One hundred year design storm", also referred to as a "100-year design storm", means that storm in which precipitation within a six- (6-) hour period and resulting runoff has a one percent (1%) chance of being equaled or exceeded in any given year.
- EE. "Temporary drainage facility" means a nonpermanent drainage control, flood control, or erosion control facility constructed as part of a phased project or to serve until such time that a permanent facility is in place, including but not limited to desilting ponds, berms, diversions, channels, detention ponds, bank protection, and channel stabilization measures.
- FF. "Ten year design storm", also referred to as a "10-year design storm", means that storm in which precipitation within a six- (6-) hour period and resulting runoff has a ten percent (10%) chance of being equaled or exceeded in any given year.

8-7-6 General Provisions

- A. The City endorses the goal of flood damage reduction through the regulation of development within flood hazard areas and the preservation of floodways. This article is intended to complement and supplement the Flood and Erosion Control article (R.O. 1987,

HEALTH, SAFETY AND SANITATION

8-4-1 et seq.), and shall be administered in concert therewith.

- B. All developed land within the City of Rio Rancho shall be provided with adequate drainage, flood control, and erosion control facilities. The protection of life and property shall be considered with primary function in the planning, design, construction, and maintenance of drainage control, flood control, and erosion control facilities, but other concerns, not limited to the following shall be addressed: channel capacity, watershed characteristics, channel stability, maintenance, transitions between treatment types, multiple use goals, and appearance. The needs of the community in transportation, utility services, recreation, and open space shall be considered in planning, design, construction, and maintenance (especially in the selection of channel treatment measures). These needs shall always be considered subsidiary to the primary function of the drainage control, flood control, and/or erosion control facility.
- C. The design, construction, and maintenance of dams, levees, and diversions that fall within the jurisdiction of the state engineer of the State of New Mexico shall meet or exceed standards established by the state engineer.
- D. The design, construction, and maintenance of flood control facilities shall be coordinated with other affected flood control agencies.
- E. All major facilities shall be constructed within dedicated rights-of-way or recorded drainage easements granted to and accepted by the proper public authority.
- F. All detention ponds defined as minor facilities shall be constructed on private property unless otherwise authorized by the city engineer. Except as is necessary for the treatment of nuisance water, all ponds shall be designed and constructed to be emptied in twenty-four (24) hours or less. The use of individual lot ponding shall be governed by the standards established by the city engineer.
- G. Wherever flood control, drainage, or erosion control improvements are necessary within dedicated public open space, such improvements shall be designed and constructed in a manner reasonably consistent with the natural surroundings. All construction and maintenance activities in dedicated open space shall be performed so as to minimize the disruption and destruction of vegetation and adjacent land forms. Where such disturbance or destruction is unavoidable, revegetation shall be performed at the earliest practical time by those responsible for such disturbance and/or destruction.
- H. The city engineer is responsible for establishing criteria, procedures, and standards for design and construction of flood control, drainage control, and erosion control improvements within the City of Rio Rancho. The city engineer shall provide for variance from normal criteria and standards; when a variance is required or requested, the city engineer shall document the justification for his decision and place in the Public Records with the Municipal Clerk such actions and justifications; appeals of the city engineer's variance decisions is as provided in 8-7-15 of this article.

8-7-7 Surface Use of Streets for Drainage and Flood Control Purposes

- A. The surface of streets may be used for drainage and flood control purposes, to the extent such use does not interfere with the safe transportation of people and vehicles.
- B. The 100-year design storm runoff shall not exceed a depth of 0.87 feet at any point within the street right-of-way, or 0.2 feet above top of curb, in any street or enter private property, built in compliance with appropriate regulations, from a street, except in recorded drainage or flood control easements or rights-of-way (or historic channels and watercourses where easements or rights-of-way cannot be obtained).
- C. The 10-year design storm runoff shall not exceed a depth of 0.5 feet in any arterial street and shall flow such that one (1) twelve-foot (12-foot) driving lane in each direction is free of flowing or standing water. The 10-year design storm runoff shall not exceed a depth of

HEALTH, SAFETY AND SANITATION

0.5 feet in any collector street. Arterial and collector streets that are in the State Highway system may require more stringent drainage criteria.

- D. The product of depth times velocity shall not exceed 6.5 at any location in any street in the event of a 10-year design storm (with velocity calculated as the average velocity measured in feet per second and depth measured at the gutter flowline in feet).
- E. The discharge of nuisance waters to public streets shall be discouraged. Arterial and collector streets shall be protected from damages to the pavement surface and from the safety hazards created by surface flow of nuisance waters across them.
- F. All, newly developed land within the City of Rio Rancho shall be served by at least one (1) paved access that shall be an all-weather facility during a 100-year design storm, with all channel-crossing structures beneath the roadway being able to pass a 100-year design storm runoff event.

8-7-8 Crossings

- A. Channel crossing structures shall be provided on all arterial and collector streets to safely pass the 100-year design storm runoff from major arroyos, assuming a fully developed watershed.
- B. Streets other than arterials, collector, and sole access may cross major arroyos and other watercourses by means of a "dip section" or an "overflow section", provided depth times velocity (with velocity calculated as the average velocity measured in feet per second and depth measured in feet at the upstream edge of the roadway including sidewalk) does not exceed 6.5 for that portion of the 10-year storm runoff crossing on the street.
- C. Where feasible, temporary crossings shall be designed so they may be incorporated into the future permanent crossing structure so that they meet street design standards established by the city engineer.
- D. Crossing of major arroyos by arterial and collector streets shall be at public expense. Crossings of arroyos by streets other than arterials and collectors shall be constructed at developer expense and shall meet street design standards established by the city engineer.
- E. Temporary crossings required for access, including those on arterials and collectors, shall be constructed at developer expense.

8-7-9 Financial Responsibility

- A. The City of Rio Rancho may participate in the construction of permanent flood control facilities to the extent that public benefits are derived from such construction and are consistent with Capital Improvement Program (CIP) priorities. Reimbursement for private funding of such projects may also be available under these conditions.
- B. The City of Rio Rancho may participate in the costs of channel crossing structures for arterial and collector streets which are required for sole access to a development. The developer's share shall not exceed the cost required to meet the minimum street width standards established by the city engineer.
- C. The City of Rio Rancho shall not participate in the funding of flood control facilities in which the sole intent is the reclamation of undeveloped land located within a flood hazard area for private development purposes.
- D. The dedication of land for public purposes does not relieve a developer of responsibilities for the construction of drainage control, flood control, and erosion control facilities that would otherwise be necessary. The dedication of rights-of-way or easements for drainage control, flood control, or erosion control facilities does not relieve a developer of responsibilities that would otherwise exist for the construction of other public infrastructure.

HEALTH, SAFETY AND SANITATION

8-7-10 Multiple Use of Rights-of-Way and Easements

- A. Multiple use is encouraged for drainage rights-of-way and drainage easements, e.g., for utility corridors and for recreation trails. Where multiple use is planned by the City, another public agency, or a public utility, the City may require that dedication statements include language which permits said use(s) in addition to the primary drainage function. However, land required to be dedicated for drainage rights-of-way and easements shall be limited to those land areas necessary for drainage control, flood control, erosion control; and necessary appurtenances.
- B. Drainage rights-of-way and easements may be credited for open space, except for any area which is exclusively used for the drainage control or flood control function.

8-7-11 Maintenance Responsibility

- A. Except as otherwise noted herein, all permanent major facilities shall be maintained by the City or other public body. The maintenance of multiple use facilities to which the general public is denied access shall be the responsibility of the owners and shall be performed to city engineer standards. The city engineer may allow private maintenance within public right-of-way or easement, provided that adequate guarantees and indemnifications are supplied.
- B. Minor facilities shall be maintained by their owners to city engineer standards.
- C. The maintenance of temporary facilities constructed at private expense (except crossing structures) is the responsibility of the developer until permanent facilities are in place.
- D. The developer shall be responsible for maintaining or replacing temporary crossing structures for a period of six (6) years or until a permanent structure is built, whichever comes first. The City shall maintain temporary crossings which are designated and built such that they may be directly incorporated into the ultimate facilities.

8-7-12 General Administration

- A. The design, construction, and maintenance of all drainage control, flood control, and erosion control facilities within the City of Rio Rancho shall be performed in accordance with procedures, criteria, and standards formulated by the city engineer and in accordance with the policies established by this article.
- B. All construction activities within the jurisdiction of the City of Rio Rancho shall conform to the requirements of the city engineer with respect to drainage control, flood control, and erosion control. Original construction and modifications and/or additions to existing structures constituting less than five hundred (500) square feet, in plain view, are excluded.
 - (1) Construction, grading, or paving on any lot within the jurisdiction of the City of Rio Rancho shall not increase the damage potential to upstream, downstream or adjacent properties or public facilities. Damages shall be defined as those caused by flooding from the 100-year design storm and all smaller storms and from erosion and sedimentation resulting from the 10-year design storm and all smaller storms.
 - (2) During the months of July, August, or September, any grading within or adjacent to a watercourse defined as a major facility shall provide for erosion control and the safe passage of the 10-year design storm runoff during the construction phase.
 - (3) Grading, cut, fill, or importation of material in excess of five hundred (500) cubic yards or grading of any area of one (1) acre or more shall conform to drainage control, flood control, and erosion control policies and to standards, criteria, and

HEALTH, SAFETY AND SANITATION

procedures established by the city engineer with respect to drainage, flood control, and erosion control. A grading permit, issued by the city engineer, shall be required for projects involving more than five hundred (500) cubic yards of material or one (1) acre or more in area. Applications for development of areas known to have been sanitary landfills shall be accompanied by a report which discusses potential health and soil mechanics problems and their solutions. Such reports shall be prepared by a New Mexico professional engineer, competent in soil mechanics.

- (4) Paving an area larger than one thousand (1000) square feet shall require a paving permit. Applications for paving permit shall be accompanied by drainage plans, if deemed necessary by the city engineer. Repaving of existing paved areas in which no grading is planned is excluded.
 - (5) The city engineer shall not issue a grading or paving permit unless the proposed grading or paving is in compliance with the policies of this article and the standards and criteria of the city engineer as provided by 8-7-13 of this article.
- C. The City may participate with the private sector, other public bodies, and agencies operating within the jurisdiction of this policy, in order to accomplish the goals and implement the policies adopted in this article. This includes, but shall not be limited to, the development and adoption of master plans, participation in the construction of projects, and exercising control through the planning, platting, zoning, and permitting processes. Projects involving City funding shall be prioritized, funded and scheduled within the guidelines of the CIP and with CIP projects.
- D. It shall be the responsibility of the city engineer to produce, approve, make, and retain records of all drainage plans, drainage reports, design analyses, design drawings, as-built drawings, and maintenance schedules related to all drainage control, flood control, and erosion control facilities constructed within City rights-of-way or easements.
- E. Applications for all land use changes shall address drainage control, flood control, and erosion control in terms of the interactions of these parameters with other requirements and needs produced by the proposed land use changes.
- F. Requests for the platting of land for the purpose of subdivision or development shall be accompanied by appropriate drainage control, flood control, and erosion control information.
- G.
 - (1) The city engineer shall not approve any plan or report pertaining to proposed construction, platting, or other development where the proposed activity or change in the land affected would result in downstream capacity being exceeded.
 - (2) Downstream capacity is determined based on the assumption of fully developed watersheds. This assumption prevents "the first come, first served" approach where downstream development unduly constrains upstream development. Parameters used in the determination of downstream capacity include, but are not limited to:
 - (a) channel stability;
 - (b) crossing structure hydraulic capacity;
 - (c) reservoir capacity;
 - (d) hydraulic capacity of street, storm sewer, or channel;
 - (e) public safety; and
 - (f) maintenance constraints.
 - (3) Planned public storm drainage facilities are assumed as in place in determining downstream capacity, provided that construction funds are available and design has progressed to the point where capacity can be ascertained.
- H. Temporary facilities are only allowed and/or required on a case-by-case basis as

HEALTH, SAFETY AND SANITATION

determined by the city engineer. The level of protection to be provided by temporary facilities shall be determined by considering:

- (1) the likelihood and consequences of a failure;
- (2) length of time until permanent facilities will be in place; and
- (3) the acceptance of maintenance responsibilities and legal liabilities.

I. Requests for approval of development and/or platting proposals to the city engineer shall be accompanied by drainage control, flood control, and erosion control information and/or commitments. The particular nature, location and scope of the proposed development defines the degree of detail. One or more of the following levels of submittal may be required based on the following:

- (1) Conceptual Grading and Drainage Plan: A graphic representation of existing and proposed grading, drainage, flood control, and erosion control information. The information should be of sufficient detail to determine project feasibility. The purposes of this plan are to check the compatibility of the proposed development within grading, drainage, flood hazard, and erosion control constraints as dictated by on-site physical features as well as adjacent properties, streets, alleys, and channels. Modifications to the Comprehensive Plan and the development of area plans, sector plans, site development plans, and landscaping plans on tracts of five (5) acres or more are appropriate applications of conceptual grading and drainage plans.
- (2) Drainage Plans: A short detailed presentation required for approval of small, simple development approvals. Drainage plans are prepared in combination with the detailed grading plan and address both on-site and off-site drainage control, flood control, and erosion control issues. Drainage plans are required for building permits, site development plans, and landscaping plans for developments involving less than five (5) acres.
- (3) Drainage Report: A drainage report is a comprehensive analysis of the drainage control, flood control, and erosion control constraints on and impacts resulting from a proposed platting, development, or construction project. Drainage reports are required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more, platting or construction within a designated flood hazard area and for any platting or development adjacent to a major arroyo.
- (4) Erosion Control Plan: An erosion control plan is usually incorporated into the drainage plan or drainage report. Erosion control plans address all phases of each project from initial grading through and including final occupancy. Phased projects required special attention. All construction projects, both public and private, within the jurisdiction of this article, unless specifically excluded, require an approved erosion control plan prior to start of construction.

J. Drainage control considerations specifically address safety, convenience, and economics for both private property and public facilities.

- K.
- (1) The Rio Rancho 100-year design storm is the 100-year 6-hour storm as defined by the National Oceanic Atmospheric Administration (NOAA) and by the storm distributions for time and area as developed by the city engineer. The 100-year storm has a 1% probability of occurring in any year. Watersheds with times of concentration greater than six (6) hours will require the use of the 100-year 24-hour storm volumes and distributions. Detention basins with longer than six (6) hours evacuation times shall use a twenty-four (24) hour or longer storm volume and distribution.
 - (2) Design circumstances may require larger or smaller storm volumes. Examples are emergency spillways for dams and erosion control plans, respectively. The

HEALTH, SAFETY AND SANITATION

sources for rainfall data are current NOAA publications and the city engineer. When the need for other design storms is apparent, the city engineer will provide requirements concerning appropriate storms, frequencies, and durations.

- L. The city engineer shall, within 14 to 30 calendar days after the submission to him of a request in writing for the approval of a plat, development plan, drainage submittal, or exemption, approve or deny the request and mail a copy of his decision to the applicant. If the request is denied, the reasons for such denial shall be stated in writing. Appeal of such decisions is as provided in 8-7-15 of this article.
- M. Grading or paving permits issued by the city engineer or approvals by the city engineer of drainage plans, erosion control plans or other improvement plans within the context of this Article 7 shall expire by limitation and become null and void if the work or improvements authorized is not commenced within 12 months of such approvals. In the event such authorized work or improvement is suspended or abandoned for a period of 12 months after the work or improvement is commenced, the said permit or approval shall expire and become null and void. Before the work or improvement is recommended, resubmittals must be made for approval by the city engineer. (91-037)

8-7-13 Administrative Procedures, Criteria, and Standards

- A. Rules concerning procedures, criteria, and standards shall be adopted, amended, or abolished in compliance with the policies of this ordinance and as provided by the procedures of this section. All rules and decisions shall be filed in the Public Records with the Municipal Clerk.
- B. Proposed rule changes relating to procedures, criteria, and standards pursuant to this article are initiated by the city engineer; or any person may submit such proposed rule changes to the city engineer. If a person other than an official of the City of Rio Rancho submits such a proposal, there may be a processing fee set by a rule of the city engineer. (For fee, Appendix D.)
- C. Prior to the adoption, amendment, or repeal of any rule pursuant to this article (hereafter, referred to as "rule change"), the city engineer shall:
 - (1) publish summary notice of the proposed rule change and solicit local comments in a newspaper of general circulation, which has its principal office in the City of Rio Rancho, and also where appropriate in trade, industrial, or professional publication as will reasonably give public notice to interested persons;
 - (2) send the proposed rule change to all City departments and solicit written comments;
 - (3) send the proposed rule change to any person or group filing written request for notice of all such rule changes. A fee may be charged for requesting notices to cover reasonable City costs (for fee, see Appendix D);
 - (4) solicit written comment on proposed rule changes for a period of 30 days from the date of their distribution and consider all comments before ruling on proposed rule changes; and
 - (5) upon adoption of a contested rule change, issue a concise statement of his principal reasons for the rule change and statement of positions rejected in adopting the rule change together with the reasons for the rejection. All persons who submit any writing to be considered in connection with the proposed rule change shall promptly be given a copy of the decision, by mail or otherwise.
- D. If a proposed rule change is approved by the city engineer after receiving comments, notice shall be posted in a conspicuous place in City Hall and a reasonable effort shall be made to notify all interested parties. Proposed rule changes shall not take effect sooner

HEALTH, SAFETY AND SANITATION

than thirty (30) days from the date of posting of notice or sooner than ninety (90) days from original distribution for comment.

- E. In the event of an emergency, the Mayor may direct that rules concerning procedures, criteria, or standards take effect immediately upon their posting and distribution. The Mayor's finding of an emergency and brief statement of the reasons for this finding shall be incorporated in the emergency rule change. Upon adoption of an emergency rule change which change shall remain in effect for longer than sixty (60) days, notice to the public shall be given within seven (7) days and opportunity for public comment shall be given in the manner required in this section for proposed rules.
- F. Appeal of the city engineer's rule-making decisions is as provided in 8-7-15 of this article. Regular rules, adopted under 8-7-13D of this section, do not take effect until an appeal is decided, if they are appealed prior to taking effect. Emergency rules, adopted under 8-7-13E of this section, and regular rules, which have taken effect prior to appeal, are in effect until such time as they may be reversed by appeal action.

8-7-14 Enforcement

- A. (1) Whenever necessary to make an inspection to enforce any of the provisions of this article, the city engineer or his authorized representative may enter such premises at all reasonable times to inspect the same or to perform any duty imposed upon him by this article, provided that, if such premises be occupied, he shall first present proper credentials and demand entry; and, if such premises be unoccupied, he shall first make a reasonable effort to locate the owner or other persons having charge or control of the premises and demand entry. If entry is refused or if the owner or other responsible person is not found, the city engineer or his authorized representative shall proceed to obtain a search warrant through the municipal court or district court, upon oath or affirmation.
- (2) The complaint shall:
 - (a) set forth the particular premises, or portion thereof, sought to be inspected;
 - (b) state that the owner or occupant of the premises, or portion thereof, has refused entry;
 - (c) state that inspection of the premises, or portion thereof, is necessary to determine whether it complies with the requirements of this article;
 - (d) set forth the particular provisions of this article sought to be enforced;
 - (e) set forth any other reason necessitating the inspection, including knowledge or belief that a particular condition exists in the premises, or portion thereof, which constitutes a violation of this article; and
 - (f) state that the complainant is authorized by the City to make the inspection.
- (3) Each inspector shall be furnished with an identification card indicating his authority and must present same to the municipal court or district court for the purpose of this subsection 8-7-14A and to other persons, when requested to do so during the performance of his duties. No owner or occupant or any other person having charge, care, or control of any premises shall fail or neglect, after proper demand is made as herein provided, to promptly permit entry therein by the authorized inspector for the purpose of inspection and examination pursuant to this article.
- B. Where, after investigation, an order has been issued by the city engineer to the owner of the property on which a violation has occurred and the order is not complied with, within such reasonable time as may be prescribed by the city engineer, or if the responsible

HEALTH, SAFETY AND SANITATION

party or violator cannot be found or determined, the city engineer may cause such remedies as are necessary to be made. The reasonable cost of such remedies shall constitute a lien against the property on which the violation occurred and was remedied. The lien shall be imposed and foreclosed in the manner provided in 3-36-1 through 3-36-6 NMSA 1978, as amended.

8-7-15 Appeals

Any applicant, aggrieved by a decision as to actions, provided for in 8-7-6, 8-7-12, and 8-7-13 of this article, of the city engineer or absence of such decision, may appeal such decision to the Governing Body of the City of Rio Rancho. Such appeal shall be made by notice of appeal in writing addressed to the municipal clerk and delivered, by copy, to the office of the city engineer within thirty (30) days after the date of the decision was mailed to the applicant. The municipal clerk shall notify the applicant and the city engineer of the date, time, and place of the appeal hearing at least five (5) days prior to the hearing date. Such hearing shall be conducted not earlier than ten (10) days nor later than (30) days after the filing of the notice of appeal with the municipal clerk. At the hearing the Governing Body may consider such facts, exhibits, and engineering principles as may be presented by the appellant or city engineer or his designee, or of which the members may have knowledge or experience, and may affirm, reverse, or modify the decision appealed from, and attach as conditions to their decision such requirements as in their opinion may be necessary or appropriate in compliance with the policies of this article to safeguard persons and property from storm water runoff. Each decision of the Governing Body shall be in writing and shall state reasons therefor. A copy of the decision shall be promptly mailed to the appellant and to the city engineer.

8-7-16 Warning and Disclaimer of Liability

The degree of flood protection required by this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This article does not imply that land outside flood hazard areas or uses permitted within such areas will be free from flooding or flood damages. This article shall not create liability on the part of the City of Rio Rancho or on any officer or employee thereof for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder.

8-7-17 Interpretation

In the interpretation and application of this article, all provisions shall be:

- A. considered as minimum requirements;
- B. liberally construed in favor of the City of Rio Rancho;
- C. deemed neither to limit nor repeal any other powers granted under state statutes;
- D. not deemed to limit nor repeal any other article of R.O. 1987, adopted by the Governing Body, unless expressly so stated herein.



City of Rio Rancho

3900 Southern Blvd. • P.O. Box 15550
Rio Rancho, New Mexico 87124
(505) 891-7208

Department of
Public Works

GRADING AND DRAINAGE DESIGN REQUIREMENTS AND POLICIES FOR LAND DEVELOPMENT IN RIO RANCHO (Revised 3-18-93)

- 1 . All Grading and Drainage design for land development in Rio Rancho shall conform to the applicable requirements of the following City Ordinances:
Chapter 8, Article 4, "Flood and Erosion Control"
Chapter 8, Article 7, "Storm Drainage Requirements"
Chapter 9, Article 2, "Subdivisions",
and to the applicable provisions of the "Drainage Policy" of the Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA) and to the applicable requirements and policies listed hereinafter.
- 2 . Minimum criteria for hydrology and hydraulic calculations and design shall be as described in Volume 2, Development Process Manual, City of Albuquerque, latest revision, or the AHYMO version of the ARS HYMO Computer Program. Calculations shall accompany design submittals.
- 3 . Calculations shall be furnished for historic flows and developed flows for the 10 year and 100 year 6 hour storms. Calculations shall be furnished for sizing all conveyances and storage ponds on site as well as downstream infrastructure, if pertinent. Calculations should also address depth of flows in streets as required in Ordinance 8-7-7.
- 4 . Soil classifications may be obtained from USDA Soil Conservation Service maps or investigations performed by Geotechnical engineers, if necessary.
- 5 . Unless restricted by specific infrastructure limitations, maximum discharge permitted from a developed property in the event of a 100 year 6 hour storm shall be the amount of the historic or predeveloped runoff in all watersheds of the City. Due to infrastructure limitations, developed properties in the watershed area intercepted by the 7-Bar Channel adjacent to NMSR 528 south of High Resort Boulevard shall have discharge limited to 0.5 cfs per acre. Discharge limitations shall apply to all development projects except for Single Family Residential projects under 5 lots or 5 acres total.
- 6 . Detention Ponds or Retention Ponds shall not be constructed in public street right-of-way. Discharge from the detention ponds shall be conveyed to public infrastructure such as streets and channels by approved means such as pipe or channels. It is recommended that pipe sizes less than 6" diameter not be used due to maintenance concerns. To restrict flows, apertures in caps placed at the inlet end are suggested.
- 7 . Detention Ponds shall be sized to provide 1 foot of Freeboard and to empty within 24 hours. Retention ponds shall be sized to contain twice the volume of the 100 year 6 hour storm for the area drained plus 1 foot Freeboard. Percolation tests may be required to address design requirements. Ponds designed for water depths of 18 inches or more shall be fenced to acceptable standards.
- 8 . Surface drainage shall not be permitted to flow onto adjacent private property. Where drainage easements exist, underground pipelines may be permitted.

9. In Residential Subdivisions, on-site detention is not permitted on individual lots. Detention or Retention shall be provided in locations otherwise provided for by the developer. Minimum grades for drainage in lots shall be 1 percent unless paved swales are provided. Maximum grades for slopes shall be restricted to 25 percent. Retaining walls should be provided where necessary to accommodate this goal. Retaining walls in excess of 5 feet high (footer to ground surface) should be avoided. Individual certification to the design and construction of retaining walls in excess of this parameter is required. All retaining walls should be designed to relieve potential hydrostatic pressure by providing weepholes where necessary.
10. All embankment in subdivisions shall be placed and compacted in lifts of a maximum of 8 inches thick, wetted and compacted for 90% of optimum density per ASTM D1557 and 95% under all structures including driveways and parking lots. Slopes should be graded to a maximum of 4 to 1 when feasible. Access roads for maintenance shall be provided for drainage channels and adequate right-of-way shall be provided for the channels, maintenance roads and room for hiking-bikeway trails.
11. In projects affected by the 100 year flood plain, the proposed 100 year base flood line shall be delineated on the Grading and Drainage Improvement Plans. If there is a change to the Flood Insurance Maps as produced by the Federal Emergency Management Agency (FEMA), a Letter of Map Amendment (LOMA) or a Letter of Map Revision (LOMR) and a physical map revision shall be filed with the agency and the City Engineer's office. All new structures and substantial improvements to structures shall have its lowest floor elevation a minimum of 1.0 foot above the basic flood elevation.
12. All submittal documents, maps, plans, calculations, designs, etc. shall be made in triplicate. Following approvals or for consideration for joint concurrence when required, one set will be forwarded to Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA).
13. Drainage Plans are required for building permits, minor subdivisions, and site development plans for individual parcels for commercial, industrial, or multifamily projects and shall meet the following requirements:
 - (a) Furnish on 24" x 36" sheets with a Minimum Scale of 1" = 20" Show scale and north arrow.
 - (b) Show existing contour lines for predevelopment conditions and also for proposed development conditions. Vertical intervals shall not exceed 1 foot for slopes under 1 percent, 2 feet for slopes between 1 percent and 5 percent, and 5 feet for slopes in excess of 5 percent. Spot elevations shall be shown for pertinent items such as existing structures, curb and gutter, etc. Contours and elevations shall extend a minimum of 25 feet beyond project property lines.
 - (c) Show location and elevation of Bench Mark to mean sea level designation.
 - (d) Location map (smaller scale okay on same sheet or separate sheet)
 - (e) Watershed area including offsite if relevant (scale flexible)
 - (f) Soil type if pertinent
 - (g) Legal description (including recording book and page)
 - (h) Rights of ways and Easements
 - (i) Description and location of relevant off-site drainage facilities
 - (j) Professional Engineers stamp, signature, and data.

PLANNING, ZONING, LAND USE MANAGEMENT

official business, e.g., distribution of all articles upon which United States postage has been paid, notices of violation, utility bills, telephone directories or package delivery notices.

- D. Dropping litter from aircraft. No person in aircraft shall throw out, drop or deposit within the City any litter.
- E. Posting or affixing notices and posters. It shall be unlawful to post or affix any notice, poster, or other paper or device calculated to attract the attention of the public to any lamp post, public utility pole, street median, public right-of-way, tree in the public right-of-way, or upon any public structure or building except as may be authorized or required by law.
- F. Unlawful dumping or disposal of solid waste. It shall be unlawful to dispose of solid waste in any manner other than as specified in Chapter 8, Article 1; Solid Waste Ordinance of the City of Rio Rancho.
 - 1. Unlawful to dump in arroyo, stream bed, drainage ditch, fountains or body of water. It shall be unlawful for any person to place or dump solid waste or debris in any arroyo, stream bed, drainage ditch, public fountain or any public body of water within the boundaries of the City.
 - 2. Dumping on property. It shall be unlawful for any person to place or dump solid waste or debris on any property within the City whether owned by such person or not.
 - 3. Vacant lots or lands which have been the subject of repeated dumping shall be secured to prevent future occurrences of dumping. Methods of securing vacant lots or lands must be approved and may include permanent fencing, ditch or berm, or placement of four foot high posts at four foot intervals. Signs stating "no dumping" shall be erected in accordance with applicable ordinances on vacant lands which have been subject to dumping on more than one occasion.
- G. Transportation of solid waste. No person shall drive or move any vehicle within the City that has been loaded with solid waste unless such solid waste is covered or securely loaded in such a manner to prevent littering.

9-12-8

Exterior Premises; Dust Control

- A. Prohibited acts. No person shall discharge from any source whatsoever such quantities of airborne particulate matter which may cause injury, detriment, nuisance or annoyance to the public without taking reasonable precautions to prevent particulate matter generated by such activity from becoming airborne.
- B. Methods of dust control.
 - 1. All properties. No person or person in control of any property shall disturb, move onto, or remove soil from any area without utilizing every reasonable method, such as watering or the use of erosion control fencing, to limit the airborne particulate to the boundaries of the property.
 - 2. Grading permits. For projects involving fill or import soil in excess of five hundred cubic yards or an area of one or more acres, a grading permit must first be obtained from the City engineer's office before any soil is disturbed. Dust control measures shall conform to drainage control, flood control and erosion control policies, standards, criteria and procedures established by the City engineer. It shall be considered a violation of this section and grounds for cancellation of the grading permit if the work schedule, pollution prevention measures, and other relevant items are changed from those specified in the permits, unless the permittee has first obtained written approval of the City engineer.

9-12-9

Exterior Premises: Water Waste

- A. Prohibited acts.
 - (1) Water waste. After the effective date of this article, no person, business firm, corporation, or municipal facility or operation shall waste, cause, or permit to be wasted or applied to non-beneficial uses, as defined in this article, any water

NOTICE!

TO: Building Permit Applicants

RE: GRADING AND DRAINAGE REQUIREMENTS

Effective Nov. 24, 2001, changes have been made to city grading and drainage requirements.

Grading Permits:

Grading permits are required prior to any construction or development related grading. This includes clearing and grubbing.

For residential, commercial and other structural construction, the permit will be issued and administered concurrently with the building permit.

When grading is the only construction (no structures), an independent grading permit is required.

Grading a site prior to obtaining a permit is illegal and is subject to enforcement action.

In addition, certain sites are subject to Army Corps of Engineers 404 permit requirements. Attached is a letter from the Corps of Engineers explaining their requirements.

Grading Plans:

An engineered grading and drainage plan, prepared by a New Mexico licensed engineer, is required when any one of the following conditions applies:

- 1 - Grading will disturb an area greater than one acre.
- 2 - Grading will involve the excavation, removal or placement of over 500 cubic yards of material.
- 3 - Grading will modify the public drainage system, defined as "The path the storm runoff or other flow will follow from the furthest upstream parcels of land to city limits."
- 4 - A building pad or first floor elevation (including basements) will be less than one foot above the adjoining street or road.

Grading plans are required to be submitted with the building (or grading) permit application.

Enforcement:

Grading will be inspected prior to footing construction and again prior to a Certificate of Occupancy being issued. A Certificate of Occupancy will not be issued until all requirements of the grading and drainage plan have been implemented.



DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA NE
ALBUQUERQUE, NEW MEXICO 87109-3435
FAX (505) 342-3498

December 12, 2001

REPLY TO
ATTENTION OF:

Operations Division
Regulatory Branch

Mr. Robert Schulz
City of Rio Rancho
Department of Public Works
P.O. Box 15550
Rio Rancho, NM 87174-0550

Dear Mr. Schulz:

This is in reference to our December 6, 2001 meeting regarding compliance with regulations pursuant to Section 404 of the Clean Water Act (33 CFR 320-331). As discussed, it is important for public and/or private individuals and entities to notify the Corps of Engineers prior to depositing soil, rock, debris, or other fill material into jurisdictional waters. In most cases, the actions above require a Section 404 permit or verification of an existing general permit. The placement of fill or dredged material in jurisdictional waters without authorization is a violation of federal law and subject to enforcement actions.

An example of a jurisdictional water is an arroyo which is a part of a drainage system ultimately draining to the Rio Grande (ex. - Black's Arroyo, Arroyo de los Montoyas). In other words, a jurisdictional water is an interstate water and its tributaries and subtributaries. Note that a channel does not need constant water flow to be jurisdictional. Also, there is no size criteria defining a jurisdictional water so smaller, unnamed arroyos may also be jurisdictional waters. Finally, wetlands adjacent to jurisdictional waters are themselves jurisdictional.

We are available to answer questions regarding jurisdiction, whether in general or site-specific. We can make site visits, although early notification is recommended. There are no fees associated with our desk or field jurisdictional determinations.

If you have any questions please feel free to write or call me at (505) 342-3279, or e-mail at: ed.l.paulsgrove@usace.army.mil.

Sincerely,

A handwritten signature in black ink, reading "Edward L. Paulsgrove".

Edward L. Paulsgrove
Regulatory Project Manager

APPENDIX E
REFERENCE DOCUMENTS LIST
"Black Arroyo Watershed Management Plan"

Date Last Rev.: June 26, 2002

Reference Documents (RD) Number	ASCG Job No. 98003.01 Task 0430 REFERENCE DOCUMENTS (Author, Client, Title, Date)
<u>RD-1</u>	Hub Resource Conservation & Development Council, Inc. Rio Rancho Critical Area Treatment A Sediment Reduction Demonstration June 1990
<u>RD-2</u>	Soil Conservation Service, USDA Central Rio Grande Soil & Water Conserv. Dist. Alb. Environ. Health & Energy Dept. - Air Pollution Control Division Critical Area Treatment for Urban Development No Date
<u>RD-3</u>	Hub Resource Conservation & Development Area Council Project, Measure 154 Rio Rancho Land Treatment Analysis Plan Black Arroyo Watershed No Date but Calcs Show 1987-1988 April 1988 from BLARD-1
<u>RD-4</u>	Southern Sandoval County Arroyo Flood Control Authority Drainage Policy Resolution 1994-8 April 20, 1994
<u>RD-5</u>	Bohannon-Huston, Inc. Black Arroyo Drainage Management Study November 1986
<u>RD-6</u>	Corps of Engineers Albuquerque District, US Army Rio Rancho Specifications for Southern Boulevard at Black's Arroyo Section 8(a) July 1994
<u>RD-7</u>	Corps of Engineers, US Army FILE LABELED 1992-1995 Corps Army Recon Black Arroyo This file contains: Section 14 Detailed Project Report Southern Boulevard at Black's Arroyo in Rio Rancho, New Mexico January 1992

BLACK ARROYO WATERSHED MANAGEMENT PLAN

Reference Documents (RD) Number	ASCG Job No. 98003.01 Task 0430 REFERENCE DOCUMENTS (Author, Client, Title, Date)
<u>RD-8</u>	SSCAFCA, The Corps of Engineers, The Village of Corrales, AMAFCA and Rio Rancho Correspondence FILE LABELED 1992-1995 Corps Army Recon Black Arroyo
<u>RD-9</u>	Local Cooperation Agreement between the Dept. of the Army and SSCAFCA FILE LABELED 1992-1995 Corps Army Recon Black Arroyo May 1990
<u>RD-10</u>	Plats and Land Ownership Listings FILE LABELED 1992-1995 Corps Army Recon Black Arroyo
<u>RD-11</u>	Corps of Engineers, US Army FILE LABELED 1992-1995 Corps Army Recon Black Arroyo This file contains: Water Resources Assistance September 14, 1988
<u>RD-12</u>	Soil Conservation Service, USDA Rio Rancho Soil Survey Information for the Black Arroyo Watershed Area March 1992
<u>RD-13</u>	Federal Emergency Management Agency Flood Insurance Study Sandoval County, New Mexico July 16, 1996
<u>RD-14</u>	Leedshill-Herkenhoff, Inc. Southern Sandoval County Arroyo Flood Control Authority and the City of Rio Rancho Black's Arroyo Drainage Management Plan Unit 10 Urgent Issues Evaluation Report June 1998
<u>RD-15</u>	Resource Technology, Inc. Federal Emergency Management Agency Rio Rancho FEMA Restudy Black's Arroyo HEC-2 and AHYMO 94 Data Files Basin Maps (Exhibits M-1, 2, 3, 4, 5, 6, and 8), HEC-2 Maps and AHYMO Schematic Volumes 4 thru 8 of 8 Technical Backup (Black 3 ring binders) March 1994

BLACK ARROYO WATERSHED MANAGEMENT PLAN

Reference Documents (RD) Number	ASCG Job No. 98003.01 Task 0430 REFERENCE DOCUMENTS (Author, Client, Title, Date)
<u>RD-16</u>	Bohannon-Huston, Inc. AMAFCA Black Arroyo Project Golf Course Rd. to North of the County Line September 1990 AMAFCA Ref. # 368.1.0
<u>RD-17</u>	Easterling & Associates AMAFCA Final Design Memorandum for Black Arroyo Channel (Golf Course Road to FD#2) March 1990 AMAFCA Ref.# 368.1.1.0
<u>RD-18</u>	Bohannon-Huston, Inc. AMAFCA Black Arroyo Drainage Studies 1988 AMAFCA Ref.# 368.3.1
<u>RD-19</u>	Bohannon-Huston, Inc. AMAFCA Black Arroyo Detention Dam – Final 1991 AMAFCA Ref. #368.3.1
<u>RD-20</u>	NMED – Surface Water Quality Bureau General Release DRAFT: Middle Rio Grande Total Maximum Daily Load (TMDL) for Fecal Coliform in Stormwater September 2000
<u>RD-21</u>	Bohannon-Huston, Inc. AMAFCA Black Arroyo Watershed Models - Appendix to Black Arroyo Final Hydrology and Sediment Issues (Appendix to BLARD-19) August 1991 AMAFCA Ref. # 368.3.2
<u>RD-22</u>	Bohannon-Huston, Inc. AMAFCA Black Arroyo Detention Dam Additional Calculations - Addendum to Final Project (Addendum to BLARD-16), 1991 AMAFCA Ref. # 368.3.3
<u>RD-23</u>	Bohannon-Huston, Inc. AMAFCA Final Construction Report - Black Arroyo Detention Dam November 1992 AMAFCA Ref.# 368.3.4

BLACK ARROYO WATERSHED MANAGEMENT PLAN

Reference Documents (RD) Number <u>RD-24</u>	ASCG Job No. 98003.01 Task 0430 REFERENCE DOCUMENTS (Author, Client, Title, Date) Unknown Excerpts from S.C.S. Corrales Watershed Workplan for FWD-2 Black's Diversion Channel 1964-1971 AMAFCA Ref.#368.4
<u>RD-25</u>	Bohannon-Huston, Inc. AMAFCA Black Arroyo Sediment Issues - Final May 1990 AMAFCA Ref.# 368.5
<u>RD-26</u>	Community Sciences American Service Corporation Black Arroyo Proposal for Extension of Improved Channel October 1983 AMAFCA Ref.#368.7
<u>RD-27</u>	Federal Emergency Management Agency National Flood Insurance Program Regulations for Floodplain Management and Flood Hazard Identification (Not current) Revised as of October 1, 1990
<u>RD-28</u>	City of Rio Rancho Planning & Zoning Grading and Drainage Design Requirements and Policies for Land Development in Rio Rancho Revised 3-18-93
<u>RD-29</u>	U.S. Department of Agriculture Soil Conservation Service Engineering Division Earth Dams and Reservoirs Technical Release No. 60 210-VI Revised October 1985
<u>RD-30</u>	Gannet Fleming West, Inc. City of Rio Rancho Western Hills Drive/Southern Boulevard Intersection Drainage Analysis, Proj. No. TPU-4096(1), CN 2061 May 21, 1992
<u>RD-31</u>	Cinfran Engineering, Inc. City of Rio Rancho Drainage Report Unser Boulevard Reconstruction (Formerly 20th Street) From Southern Blvd. north to Northern Blvd. Proj. No. TPU-4081(2) CN 2927 April 1995 Rev. December 1995
<u>RD-32</u>	Easterling & Associates, Inc. City of Rio Rancho Specifications and Contract Documents for Lisbon and Ivory Channel Improvements Tarpon to 15th Street RFB #99-PW-227 December 1998

BLACK ARROYO WATERSHED MANAGEMENT PLAN

Reference Documents (RD) Number <u>RD-33</u>	ASCG Job No. 98003.01 Task 0430 REFERENCE DOCUMENTS (Author, Client, Title, Date) Vinyard & Associates, Inc. Bohannon –Huston, Inc. Preliminary Geotechnical Investigation Black Arroyo Detention Dams Proj #90-1-11 1990???
<u>RD-34</u>	Vinyard & Associates, Inc. Bohannon-Huston, Inc. Geotechnical Investigation Black Arroyo Detention Dam Proj #90-1-93, February 28, 1991
<u>RD-35</u>	Dr. Richard Heggen, AMAFCA Black Reservoir Storm of June 21, 1994 and In-situ Sediment Sampling Results, by Vinyard & Associates, Inc. October 24, 1994
<u>RD-36</u>	State Engineer, Santa Fe, NM New Mexico Dam Safety Design Criteria 1999 Edition
<u>RD-37</u>	Leedshill-Herkenhoff, Inc. SSCAFCA DRAFT: Black's Arroyo Flow Characteristics into the Spanish Trails Development February 4, 1999
<u>RD-38</u>	Mussetter, et. al. Resource Consultants & Engineers, Inc. AMAFCA Sediment and Erosion Design Guide March 1994
<u>RD-39</u>	Bohannon-Huston, Inc. AMAFCA Black's Arroyo & 7-Bar Channel Drainage Studies Additional Services HYMO Input and Output Supporting Information/Calculations for BLARD-49 February 1982 and May 1988
<u>RD-40</u>	Community Sciences Corporation Curb, Inc. PRELIMINARY Rio Rancho/Unser Blvd Gateway Master Drainage Plan and Interim Recommendations Unser-McMahon Vicinity to Unit 10, Rio Rancho, NM January 9, 2001
<u>RD-41</u>	Easterling & Associates, Inc. City of Rio Rancho CONSTRUCTION DRAWINGS for RD-32 Lisbon and Ivory Channel Improvements Southern Boulevard Improvements Tarpon to 15th Street November 1998

BLACK ARROYO WATERSHED MANAGEMENT PLAN

Reference Documents (RD) Number	ASCG Job No. 98003.01 Task 0430 REFERENCE DOCUMENTS (Author, Client, Title, Date)
<u>RD-42</u>	Easterling & Associates, Inc. ABQ Development RECORD DRAWINGS Seven-Bar Ranch Black Arroyo Channel (Stamp Date 3/8/90) Record Drawing Date February 1, 1991 NOT PART OF THE BLACK ARROYO WATERSHED
<u>RD-43</u>	Easterling & Associates, Inc. AMAFCA RECORD DRAWINGS Black Arroyo Channel Seven Bar Channel Confluence Reconstruction (Stamp Date 11/9/90) Record Drawing Date April 22, 1991 NOT PART OF THE BLACK ARROYO WATERSHED
<u>RD-44</u>	U.S. Dept. of Agriculture Soil Conservation Service Central Rio Grande Soil and Water Conservation District Corrales Watershed District Sandoval Soil and Water Conservation District Half Size Set RECORD DRAWINGS Corrales Watershed Floodwater Diversion No. 2 (Black Diversion Channel) Dated 1973 AS BUILT DATE February 27, 1975 BLACK DAM OUTFALL NOT PART OF THE BLACK ARROYO WATERSHED
<u>RD-45</u>	Unit 10 Parcel Maps Sandoval County Recorder Book 3 (?) Pages 1, 4, 12, 14, 73, 74, 75, and 114
<u>RD-46</u>	FEMA Flood Insurance Rate Maps Sandoval County Map Numbers 350146 0025 A Effective Date April 15, 1992
<u>RD-47</u>	U.S.G.S. QUAD MAPS Of New Mexico SKY VILLAGE NE, photorevised 1978 SKY VILLAGE SE, photorevised 1972 BENAVIDEZ RANCH, 1954 SKY VILLAGE, 1954 VOLCANO RANCH, photorevised 1967 and 1972 LOS GRIEGOS, photorevised 1967 and 1972 ALAMEDA, photorevised 1967 and 1972 LOMA MACHETE, 1990 BERNALILLO, photorevised 1972
<u>RD-48</u>	City of Rio Rancho GIS Information Earth Data, LLC Autocad v13 Electronic Copy Data Base CDs #5 and #526 5/28/97 and 11/04/98

BLACK ARROYO WATERSHED MANAGEMENT PLAN

Reference Documents (RD) Number	ASCG Job No. 98003.01 Task 0430 REFERENCE DOCUMENTS (Author, Client, Title, Date)
<u>RD-49</u>	Bohannon-Huston, Inc. AMAFCA Black Arroyo Drainage Management Study Final Draft November 1986 AMAFCA Ref # 368.0
<u>RD-50</u>	Gannett Fleming West, Inc. City of Rio Rancho Unser Boulevard Extension Sandoval County Line North to Southern Boulevard City of Rio Rancho SP-M4081(203) April 1990 AMAFCA Ref # 344.2.5
<u>RD-51</u>	Bohannon-Huston, Inc. AMAFCA RECORD DRAWINGS Plans for Construction of Black Arroyo Detention Dam Stamp dated 9/14/91 Record Dwg Stamp 11/9/92 AMAFCA Ref # NW-04-114 Calabacillas
<u>RD-52</u>	Resource Technology, Incorporated AMAFCA Calabacillas Arroyo Drainage Management Plan February 1987
<u>RD-53</u>	City of Rio Rancho Department of Public Works New Mexico State Highway and Transportation Dept. CONSTRUCTION PLANS (half size) TPU-4081(2), CN 2927 Dated 8/26/96 Unser Blvd. Reconstruction Southern Blvd. Intersection and North just past Abrazo Rd, approx. 1.66 miles.
<u>RD-54</u>	Wilson & Company City of Rio Rancho Golf Course Road Final Drainage Report February 2002
<u>RD-55</u>	ASCG SSCAFCA Black Arroyo Watershed Management Plan, Volume 1 December 18, 2001

BLACK ARROYO WATERSHED MANAGEMENT PLAN

APPENDIX F
FUTURE CONDITIONS CRITERIA SUMMARY

Southern Sandoval County

Arroyo Flood Control Authority



BOARD OF DIRECTORS

John Chaney
Mark Conkling
Richard Deubel
Guy A. McDowell
William C. Yarbrough

David Stoliker
Executive Director

BLACK ARROYO DRAINAGE MANAGEMENT PLAN FUTURE CONDITIONS CRITERIA SUMMARY

Date: January 24, 2002

A. PURPOSE

The purpose of this Criteria Summary is to identify the key assumptions, constraints, objectives and other criteria for the development of the future "improved" conditions in the Black Arroyo Drainage Management Plan (BLDMP).

B. BACKGROUND

Volume 1 of the BLDMP evaluated existing conditions runoff, developed conditions runoff with existing facilities and existing facility capacity. Two meetings have been conducted (Jan. 3 and Jan. 17, 2002) to review the Volume 1 results and discuss criteria for future conditions.

C. GENERAL

1. Watershed limits extend from the Black Dam just south of the Sandoval/Bernalillo County line north to approximately Northern Blvd. and approximately from Golf Course Rd. west to Baltic Avenue.
2. The boundary includes the areas in Bernalillo County draining to the Black Dam either directly or via the Black Arroyo Rd. storm drain. Hydrographs from the drainage plans for these areas are directly imported into the AHYMO model.
3. SSCAFCA Drainage Criteria and Rio Rancho Drainage Criteria were utilized in preparing the DMP.

D. BLACK DAM

1. Two limiting boundaries will be considered:
 - a. No improvements.
 - i. Storage and discharge per State Engineer approved filing sheet.
 - ii. Dams and other improvements will be required in Sandoval Co. to limit runoff to the capacity of the Black Dam.
 - iii. Water quality improvements would be upstream from Black Dam.
 - b. Upgrade Possible.
 - i. Increased storage volume and/or water quality enhancements possible, either at the dam site or in Sandoval County but in conjunction with Black Dam.
 - ii. Cost sharing may be required.

Southern Sandoval County Arroyo Flood Control Authority
4200 Meadowlark S.E., Suite 6 Rio Rancho, New Mexico 87124
(505) 892-5266 FAX (505) 892-7241

- iii. This could range from no new ponds to a select few new ponds in Sandoval County.
 - 2. Black Dam characteristics not Included in the BLDMP
 - a. Revision of principal or emergency spillway flow rate
 - b. Reduction of Black Dam capacity from the ultimate condition approved volume.
 - c. Dam safety analysis.
- E. HYDROLOGY
- 1. AHYMO 97.
 - 2. Design Storm
 - a. 100 year return frequency, 24 hour storm for pond volumes
 - b. 100 year return frequency, 6 hour or 24 hour storm for conveyance, which ever is higher.
 - 3. Runoff coefficients (land use)
 - a. Existing platting with the following revisions to allow for planned higher density. The areas designated for upgrades for increased density are:
 - West side of Golf Course Road, south of Southern Blvd.
 - West side of Unser Blvd. north of 5th St to Abrazo Rd.
 - The Urban Center node at Unser and Southern Blvds.
 - An Urban Center in the vicinity of 19th Ave. and Unser Blvd.
 - Along Northern Blvd between 7th St. and 13th St.
 - b. SSCAFCA adopted land use parameters are used unless development does not conform. Non-conforming areas will be identified in calculations.
 - 4. Sediment bulking –
 - a. 18% bulking of runoff from Unit 10 (west of Unser, south of Southern) and estate lots. The rationale is that vegetation on existing development in these areas is typically sparse with runoff in bar ditches generating significant sediment. Since this is individual housing for the most part, build out may precede street paving and other sediment reduction conveyances.
 - b. 6% bulking of runoff from Unit 16 'Blighted' area. Rationale is that when this gets developed, it will be a new subdivision with streets, etc. preceding development.
 - c. 6% bulking of runoff from other fully developed areas,
 - d. 3% un-bulking of outflow from ponds.
 - 5. Improvements
 - a. Potential Dams/Ponds – concept for initial evaluation, schematic design for selected alternate.
 - b. Conveyance facilities – Lined channels used for routing representing "worse case". Routing for schematic design for selected alternate.

not
Twp
CA

18%
CA

92

F. HYDRAULICS

1. Methodology

- a. Culvert capacities estimated from inlet control nomographs.
- c. Channel capacities and channel concept designs estimated from normal depth calculations.
- d. HEC-RAS models for the major trunk arroyos will be developed when needed for detailed hydraulic data.

G. INTERIM SEDIMENT ISSUES

Sediment control prior to the full development build out and prior to completion of the drainage facilities will be addressed at a concept level.

H. STORMWATER QUALITY

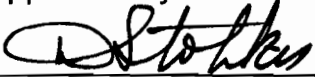
Stormwater quality enhancements will be discussed. Additional right-of-way for future stormwater quality enhancements will be included at dam sites.

I. RIGHT OF WAY

Right-of-way estimates will include an allowance for trails and multiuse potential.


Clinton Dodge, PE Project Manager

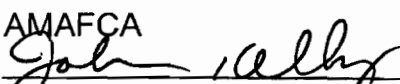
Approved By SSCAFCA:

 2-13-02
David Stoliker, PE, Executive Director Date

Concurrence By:

Rio Rancho Public Works
 2-13-02
Kenneth Curtis III, PE, Director Date

Rio Rancho City Development
 5/6/02
Art Corsie, Director Date

AMAFCA
 2-28-02
John Kelly, PE, Executive Engineer Date

93

APPENDIX G HYDROLOGY

A. HYDROLOGY

1. EXISTING CONDITIONS

The existing conditions hydrology is located in Volume I of the Black Arroyo Watershed Management Plan.

2. FUTURE CONDITIONS

The Future Conditions AHYMO model for the BLWMP is attached as part of this Appendix. The enclosed calculations are the detail behind the assumptions listed in the Technical Basis section of this report.

1. Modifications to the DEVEX Model for Future Conditions Hydrology
2. Rainfall Calculations for the 2, 5 and 10 year – 24 hour events.
3. Runoff Coefficients – Platted Land Use for Higher Density Areas
4. Sub-basin Area Calculations for selected sub-basins
5. New AHYMO Land Treatment Values
6. New Tp Measurements for selected sub-basins
7. Developed Conditions AHYMO Input Data File printout
8. Developed Conditions AHYMO Output Summary File printout

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	ENGINEERS	ARCHITECTS	BLDMP			OF	
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COMPUTATIONS		CD	WMS		2/5/02		
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS			
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VII Future Conditions Hydrology
 modifications to DENEX
 Revised 400 ac. platted areas
 to high density at
 Rio Rancho direction
 Modified select basin
 boundaries to allow
 comparison of alternatives
 and add analysis points
 at critical locations.
 Edited ATYMO for increased
 clarity
 Revised routing from
 earthen channels to
 lined channels.
 Changed routing for Golf
 Course Rd. to match
 storm drain design.
 Modified 19th Ave pond
 runoff coefficients
 to better represent actual
 developed land use.



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Added Basins in Bernalillo
County (via punch hyd)
Ridgerview Village, Los Suenos,
Park Hill, Stonebridge S.O.

Added routing of flow through
Black Dam using future
conditions approved
filing sheet rating curves.



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3.0 REFERENCES

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5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

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VII

Option 1 - No new detention
Dams

"Future Baseline"

Results

Increased detention volume
at bottom of watershed
approximately 118 AF

Storm water quality enhancement
(SQE) diversion estimated
at approximately 120 AF

Estimated concrete channel
sizes and costs for comparison

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VIII

Option 2 Dispersed Dams

Modified "Future Baseline"
by:

Added 4 dams

- Lisbon Cr. @ Tulip
54 AF
Rout 5 cfs
- Sunset @ Tulip w/ diversion
of N. Sugar
20 AF
Rout 5 cfs
- Tributary 'A' @ 10th St + 1-
42 AF
Rout 5 cfs
- East Branch @ MLK School
50 AF
Rout = 1970 cfs

Estimated channel sizes and
costs.



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REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

IX Option 3 Investigate
East Branch Ponds North
of Southern Blvd

Modified Option 2

Added Sneed Pond @
Sneed Park
5 AF Qout = 170 cfs

Added East Branch Pond @
Southern Blvd.
6 AF Qout 1600 cfs

Added Golf Course Dam
w/ diversion of Basins
214 & 215.

34 AF Qout = 5 cfs

Added Urser Gateway Pond
12 AF Qout = 660
(not a factor in comparison)

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	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS		9.0 ATTACHMENTS	
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IX

Option 4

Modified Option 2

Does not include East Branch
Ponds north of Southern.

Estimated Stormwater
Quality Enhancement (SQE)
diversion volumes. Added
SQE diversions/extended
detention:

- Park @ confluence of
Lisbon & Ivory
22 AF Area 14 Ac.
- West Branch @ User
20 AF Area 13 Ac.
- West Branch @
County Line
8 AF Area 5 Ac
- East Branch @ Confluence
w/ Trib "B"
42 AF Area 26 Ac.

Took out East Branch
MLK Dam

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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Added diversion of Trib 'C'
 @ old avulsion into
 West Branch @ confluence of
 Lisbon & Ivary (Park WRE
 location)

Diversion of GCR after Basin
 500 & 510 (13th Ave & 18th Ave)
 to East Branch

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COMPUTATIONS		COMPUTED BY: KMJ	CHECKED BY: CO	JOB/TASK NO. 98301	DATE: 2/28/02	
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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

Rainfall - Black Arroyo Watershed
for 2yr, 5yr & 10yr 24HR EVENTS

Using NOAA Precipitation-Frequency
Atlas of the Western U.S.
VOL IV - New Mexico

$$2 \text{ yr} - 6 \text{ HR} = 0.9 \text{ in} = X_1$$

$$5 \text{ yr} - 6 \text{ HR} = 1.2 \text{ in}$$

$$10 \text{ yr} - 6 \text{ HR} = 1.4 \text{ in}$$

$$100 \text{ yr} - 6 \text{ HR} = 2.2 \text{ in} = X_3$$

$$2 \text{ yr} - 24 \text{ HR} = 1.0 \text{ in} = X_2$$

$$5 \text{ yr} - 24 \text{ HR} = 1.5 \text{ in}$$

$$10 \text{ yr} - 24 \text{ HR} = 2.0 \text{ in}$$

$$100 \text{ yr} - 24 \text{ HR} = 2.7 \text{ in} = X_4$$

$$Y_2 = -0.011 + 0.942 [(X_1)(X_1/X_2)]$$

$$Y_2 = -0.011 + 0.942 [(0.9)(0.9/1.0)]$$

$$Y_2 = 0.75 \text{ in} = 2 \text{ yr} - 1 \text{ HR}$$

$$Y_{100} = 0.494 + 0.755 [(X_3)(X_3/X_4)]$$

$$Y_{100} = 0.494 + 0.755 [(2.2)(2.2/2.7)]$$

$$Y_{100} = 1.8 \text{ in} = 100 \text{ yr} - 1 \text{ HR}$$

torn Basi
 and Yellowstone Riv
 Upper Missouri Rive
 and upper Yellowstc
 From generalized 4
 and Lewis Range o
 West of Continental
 Mountainous region
 and Continental Div
 River Valley below
 Orographic region e
 Western slopes of C
 Eel River Basin; sou
 and Gladstone Cree
 Russian River, Cact
 Santa Cruz Mountai
 Diablo, Gabilan, ant
 San Rafael, San Be
 Santa Ana, Santa R
 Northern Sierra Nev
 Southern Sierra Ne
 Southeastern deser
 Spillover zone east
 Spillover zone east

portant. Next, an examination was made of factors that combined
 topographic and meteorologic considerations, such as distance and
 direction to moisture sources. Each factor considered was a meas-
 ure of some physical reality, and each was understandably related
 to variation in the precipitation-frequency regime.
 Finally, various climatological and meteorological factors that
 could be indexes of variation of the precipitation-frequency values
 were considered. The procedure used for developing interpolating
 equations was a multiple-regression screening technique. This proc-
 ess was done by computer using a least-squares technique. The
 computer program was capable of accepting a total of 174 inde-
 pendent variables for as many locations as data were available.
 The number of variables screened for the various relations ranged
 between 60 and 100. This does not mean that 60 or more com-
 pletely different factors could be identified. For example, several
 factors might involve different measures of slope. Moreover, these
 measures of slope might be over different distances or have differ-
 ent orientations. In each instance, the practice was to permit the
 computer to select the most critical of the various measures of each
 factor.

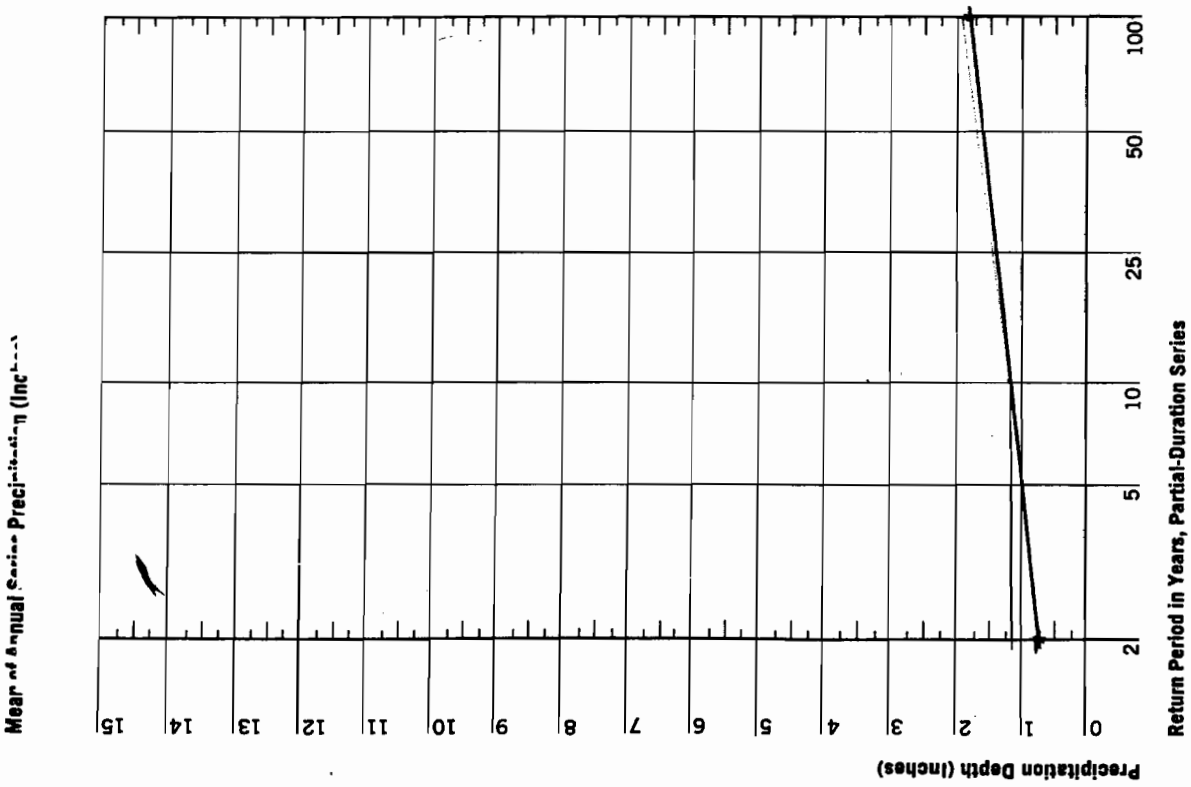


Figure 6. Precipitation depth versus return period for
 partial-duration series.

Numbers in par
 Two different e
 Two different e

Table 3. Statis
 inters

 ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION <i>Black</i>			SHEET NO. <i>3</i> OF	
COMPUTATIONS		COMPUTED BY: <i>KMJ</i>	CHECKED BY:	JOB/TASK NO. <i>98003</i>	DATE: <i>2/28/02</i>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	
<i>FROM FIGURE 6</i> $5_{yr} - 1_{HR} = 1.0 in$ $10_{yr} - 1_{HR} = 1.2 in$ <i>FOR USE IN AHQ/MO</i>						



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Black Arroyo - Future Conditions

SHEET NO.

OF 11

COMPUTED BY:

AJ

CHECKED BY:

VMS

JOB/TASK NO.

98301

DATE:

02-04-02

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

FUTURE CONDITIONS

RUN-OFF COEFFICIENTS

The following calculations are the future conditions and have been changed from the DEVEX MODEL



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Black Arroyo - Land Use Calc.

SHEET NO.

OF 15

COMPUTED BY:

AJ

CHECKED BY:

WMS

JOB/TASK NO.

98301 / 1130

DATE:

01/23/01

IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

CHECKED BY:

DATED

PLATTED LAND USE

- ①.0 Black Arroyo DMP-P Land use
- ②.0 Convert Land use to high Density
- ③.0 Rio Rancho City Planning / Meeting with City Personnel
- ④.0 Plat given to ASGB was accurate
- ⑤.0 Each Sub-division was given a number. The sub-basins were divided into one or several different platted areas such as Commercial, Estate, 1 acre, 1/2 acre, 1/4 acre, 1/6 acre, or 1/8 acre lots. The purpose of these calculations was to convert the platted areas along the attached corridors to high density use. The attached map shows the areas to be converted. The following calculations were placed into the attached spreadsheet by sub-basin & platted use to adjust the A, B, C, & D's for future runoff coefficients.



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Land Use - Calcs

SHEET NO.

OF 2/5

COMPUTED BY:

AJ

CHECKED BY:

LMD

JOB/TASK NO.

98301 / 1130

DATE:

1-23-01

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Sub-basin 101

Estate lots → 9.51 acres
1 acre lots → 8.80 acres
1/2 acre lots → 0.78 acres
1/4 acre lots → 19.62 acres

Sub-basin 201

Estate lots → 2.81 acres
1 acre lots → 1.60 acres
1/4 acre lots → 18.45 acres

Sub-basin 350

1 Acre lot → 2.41 Acres
1/4 acre lot → 13.48 Acres

Sub-basin 420

Estate lots → 17.77 acres
1 acre lots → 1.99 acres

Sub-basin 121

Estate lots → 19.92 acres
1 acre lots → 7.03 acres
1/2 acre lots → 20.71 acres
1/4 acre lots → 16.38 acres

Sub-basin 250

1/2 acre lots → 0.46 acres
1/4 acre lots → 0.44 acres

Sub-basin 251

1 Acre lots → 0.71 Acres
1/2 acre lots → 2.08 Acres
1/4 acre lots → 5.29 Acres

 LEEDSHILL - HERKENHOFF, INC. ENGINEERS ARCHITECTS ALBUQUERQUE • SANTA FE COMPUTATIONS	NAME OF PROJECT/CALCULATION Land Use Calcs			SHEET NO. OF 3/5	
	COMPUTED BY: AJ	CHECKED BY: LMB	JOB/TASK NO. 98301	DATE: 1-23-01	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Sub-basin 252

Estate Lots → 1.21 acres
 1/4 acre lots → 4.05 acres

Sub-basin 218

Estate lots → 3.90 acres
 1 acre lots → 0.91 acres
 1/2 acre lots → 3.26 acres
 1/4 acre lots → 6.02 acres

Sub-basin 500

1 acre lot → 0.98 acres
 1/2 acre lot → 7.22 acres
 1/4 acre lot → 2.91 acres

Sub-basin 510

Estate lot → 4.00 acres
 1 acre lot → 1.00 acres
 1/2 acre lot → 11.95 acres

Sub-basin 520

Estate lots → 0.99 acres
 1/2 acre lots → 12.90 acres
 1/4 acre lots → 0.27 acres

Sub-basin 530C

1 acre lot → 0.87 acres
 1/2 acre lots → 3.46 acres

Sub-basin 106 A

1 acre lot → 7.48 acres
 1/2 acre lot → 1.55 acres
 1/4 acre lot → 15.28 acres



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Land Use Calcs

SHEET NO.

OF 4/5

COMPUTED BY:

AJ

CHECKED BY:

KMS

JOB/TASK NO.

98301

DATE:

1-23-01

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Sub-basin 106B

1/2 acre lot → 1.21 acres

1/4 acre lots → 11.86 acres

Sub-basin 211

Estate lots → 6.41 acres

1 acre lot → 3.93 acres

1/2 acre lot → 2.08 acres

1/4 acre lot → 12.43 acres

1/6 acre lot → 2.44 acres

Sub-basin 105

1 acre lot → 1.61 acres

1/4 acre lot → 1.21 acres

Sub-basin 104

1 acre lot → 6.54 acres

1/4 acre lot → 3.89 acres

Sub-basin 103

1 acre lot → 13.51 acres

1/2 acre lot → 0.80 acres

1/4 acre lot → 17.49 acres

Sub-basin 201

1/4 acre lot → 1.31 acres

Sub-basin 157

Estate lot → 1.50 acres

1/2 acre lot → 1.53 acres

Sub-basin 158

1 acre lot → 14.80 acres

1/4 acre lot → 5.01 acres



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Land Use Calcs

SHEET NO.

OF 5/5

COMPUTED BY:

AJ

CHECKED BY:

LMJ

JOB/TASK NO.

98301

DATE:

1-23-01

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Sub-basin 160

Estate lot → 8.00 acres
1 acre lot → 2.00 acres
1/2 acre lot → 3.00 acres

Sub-basin 159

Estate lot → 4.73 acres
1 acre lot → 5.46 acres

Sub-basin 155

Estate lot → 8.54 acres
1 acre lot → 2.15 acres
1/2 acre lot → 2.00 acres

Sub-basin 120

Estate lot → 1.19 acres
1 acre lot → 1.23 acres

TOTAL AREA = 408.31 acres



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Black Arroyo Area of Sub-basins

COMPUTED BY:

AJ

CHECKED BY:

KWA

JOB/TASK NO.

98301

SHEET NO.

OF 1/8

DATE:

01/23/02

IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

CHECKED BY:

DATED

AREA OF SUB-BASINS

①.0 Black Arroyo DMP-P Areas

②.0 Calculate entire area of Sub-basins

③.0 Rio Rancho - City Planning

④.0 Plot given to ASIG was accurate

⑤.0 The attached calculations are areas of the Sub-basins that drain into the Black Arroyo Dam. Some of the Sub-basins were divided further and these are the areas that were changed from the DOVER model.

 LEEDSHILL - HERKENHOFF, INC. ENGINEERS ARCHITECTS ALBUQUERQUE • SANTA FE COMPUTATIONS	NAME OF PROJECT/CALCULATION <i>Area of Sub-basins</i>			SHEET NO. OF <i>2/8</i>	
	COMPUTED BY: <i>AJ</i>	CHECKED BY: <i>WMS</i>	JOB/TASK NO.	DATE: <i>01-23-02</i>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Sub-basin 101

$$\begin{aligned} \text{area} &= 9469026.66 \text{ Ft}^2 \\ &= 217.38 \text{ acres} \end{aligned}$$

Sub-basin 102

$$\begin{aligned} \text{area} &= 7078879.06 \text{ Ft}^2 \\ &= 162.51 \text{ acres} \end{aligned}$$

Sub-basin 103

$$\begin{aligned} \text{area} 103 \text{ A} &= 5025049.45 \text{ Ft}^2 \\ &= 115.36 \text{ acres} \\ \text{area} 103 \text{ B} &= 2496600.80 \text{ Ft}^2 \\ &= 57.31 \text{ acres} \\ \text{total} &= 172.67 \text{ acres} \end{aligned}$$

Sub-basin 104

$$\begin{aligned} \text{area} 104 \text{ A} &= 5115278.70 \text{ Ft}^2 \\ &= 117.43 \text{ acres} \\ \text{area} 104 \text{ B} &= 989946.72 \text{ Ft}^2 \\ &= 22.73 \text{ acres} \\ \text{total area} &= 140.16 \text{ acres} \end{aligned}$$

Sub-basin 105

$$\begin{aligned} \text{area} 105 &= 4207910.16 \text{ Ft}^2 \\ &= 96.60 \text{ acres} \end{aligned}$$

Sub-basin 106

$$\begin{aligned} \text{area} 106 \text{ A1} &= 3241505.67 \text{ Ft}^2 \\ &= 74.41 \text{ acres} \\ \text{area} 106 \text{ A2} &= 3789831.55 \text{ Ft}^2 \\ &= 87.00 \text{ acres} \\ \text{area} 106 \text{ A3} &= 1351645.18 \text{ Ft}^2 \\ &= 31.03 \text{ acres} \\ \text{area} 106 \text{ B} &= 4244353.25 \text{ Ft}^2 \\ &= 97.44 \text{ acres} \\ \text{TOTAL} &= 289.88 \text{ acres} \end{aligned}$$



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Area of Sub-basins

SHEET NO.

OF 3/8

COMPUTED BY:

AJ

CHECKED BY:

KMS

JOB/TASK NO.

DATE:

01-23-02

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	8.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Sub-basin 107

$$\begin{aligned}\text{area} &= 997445.76 \text{ Ft}^2 \\ &= 22.90 \text{ acres}\end{aligned}$$

Sub-basin 108

$$\begin{aligned}\text{area} &= 1872150.49 \text{ Ft}^2 \\ &= 42.98 \text{ acres}\end{aligned}$$

Sub-basin 109

$$\begin{aligned}\text{area} &= 2407090.63 \text{ Ft}^2 \\ &= 55.26 \text{ acres}\end{aligned}$$

Sub-basin 110

$$\begin{aligned}\text{area} &= 1421046.07 \text{ Ft}^2 \\ &= 32.62 \text{ acres}\end{aligned}$$

Sub-basin 111

$$\begin{aligned}\text{area} &= 3231873.48 \text{ Ft}^2 \\ &= 74.19 \text{ acres}\end{aligned}$$

Sub-basin 112

$$\begin{aligned}\text{area} &= 2051968.97 \text{ Ft}^2 \\ &= 47.11 \text{ acres}\end{aligned}$$

Sub-basin 113

$$\begin{aligned}\text{area} &= 1328547.96 \text{ Ft}^2 \\ &= 30.50 \text{ acres}\end{aligned}$$

Sub-basin 114

$$\text{area} = 1948116.59$$

Sub-basin 115

$$\text{area} = 3491072.52$$

Sub-basin 116

$$\text{area} = 899469.12$$

Sub-basin 117

$$\text{area} = 3509699.05$$



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

SHEET NO.
OF 4/8

COMPUTED BY:

CHECKED BY:

JOB/TASK NO.

DATE:

01-23-02

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Sub-basin 118

$$118A \text{ area} = 4830524.31 \text{ Ft}^2$$

$$118B \text{ area} = 1731451.47 \text{ Ft}^2$$

$$\text{TOTAL} = 6561975.78 \text{ Ft}^2$$

Sub-basin 119

$$\text{area} = 2407731.21$$

Sub-basin 120

$$\text{area} = 5971840.96$$

Sub-basin 121

$$\text{area} = 7196767.33$$

Sub-basin 150

$$= 2435040.30$$

Sub-basin 151

$$\text{area} = 4216292.64$$

Sub-basin 152

$$\text{area} = 5532306.76$$

Sub-basin 153

$$\text{area} = 4087371.32$$

Sub-basin 154

$$\text{area} = 6108617.27$$

Sub-basin 155

$$\text{area} = 3473326.99$$

Sub-basin 156

$$\text{area} = 6396068.17$$

Sub-basin 157

$$\text{area} = 5268298.65$$

Sub-basin 158

$$\text{area} = 2272251.63$$



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

SHEET NO.

OF

415/8

COMPUTED BY:

CHECKED BY:

JOB/TASK NO.

DATE:

01-23-02

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS		9.0 ATTACHMENTS
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

Sub-basin 159

area = 1671388.94

Sub-basin 160

area = 3507122.00

Sub-basin 161

area = 2056840.72

Sub-basin 201

area = 6925651.50

Sub-basin 202

area = 3455798.80

Sub-basin 203

area = 1562994.46

Sub-basin 204

area = 417134.06

Sub-basin 205

area = 2548243.75

Sub-basin 211

area = 5048605.74

Sub-basin 213

area = 3011341.40

Sub-basin 214

area = 5323784.05

Sub-basin 215

area = 3072432.81

Sub-basin 216

area = 2691163.22

Sub-basin 217

217A 5303159.11

217B 1855871.94

TOTAL = 7159031.05



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

SHEET NO.

OF

6/8

COMPUTED BY:

CHECKED BY:

JOB/TASK NO.

DATE:

01-23-02

IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

CHECKED BY:

DATED

Sub-basin 218

$$218A = 4614074.44$$

$$218B = 3785418.78$$

$$TOTAL = 8399493.22$$

Sub-basin 212

$$area = 2772748.54$$

Sub-basin 219

$$area = 4515797.97$$

Sub-basin 220

$$area = 2449361.02$$

Sub-basin 250

$$area = 1392163.13$$

Sub-basin 251

$$area = 4548755.46$$

Sub-basin 252

$$area = 3030950.67$$

Sub-basin 253

$$area = 1951454.74$$

Sub-basin 254

$$area = 1621726.95$$

Sub-basin 255

$$area = 2988323.09$$

Sub-basin 256

$$area = 1374923.12$$

Sub-basin 300

$$area = 4133876.72$$

Sub-basin 310

$$2228216.56$$



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

SHEET NO.

OF

7/8

COMPUTED BY:

CHECKED BY:

JOB/TASK NO.

DATE:

01-23-02

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

Sub-basin 320

2143176.118

Sub-basin 330

area = 1763645.50

Sub-basin 340

area = 1278449.71

Sub-basin 350

area = 1324729.48

Sub-basin 360

406599.34

Sub-basin 400

113334.44

Sub-basin 410

area = 1011379.81

Sub-basin 420

area = 1437147.20

Sub-basin 430

area = 121389.23

Sub-basin 440

area = 294867.79

Sub-basin 500

728780.66

Sub-basin 510

area = 1136411.26

Sub-basin 520

area = 1143293.43



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

SHEET NO.
OF 8/8

COMPUTED BY:

CHECKED BY:

JOB/TASK NO.

DATE:

01-23-02

IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

CHECKED BY:

DATED

Sub-basin 530

530A = 4105560.67

530B = 2029144.27

530C = 707107.18

530D = 279751.02

TOTAL = 6414455.96

Sub-basin 540

area = 1280608.46

Sub-basin 550

area = 1385288.62

Sub-basin 620

area = 1571173.02

Sub-basin 650

area = 1520769.97

Sub-basin 19th AVE

area = 16286959.65

BLACK ARROYO DRAINAGE MANAGEMENT PLAN
TABLE III-1
BLACK ARROYO LAND TREATMENT VALUES FOR AHYMO
FUTURE CONDITIONS

NEW AHYMO LAND TREATMENT
PERCENTAGES

MODEL: BL10D14B.DAT

	SUB-BASIN	A (%)	B (%)	C (%)	D (%)	TOTAL
WEST BRANCH	101	17	16	17	50	100.00
WEST BRANCH	102	26	23	22	29	100.00
WEST BRANCH	103	20	19	22	39	100.0
WEST BRANCH	104	11	20	23	46	100.0
WEST BRANCH	105	0	27	28	45	100.0
WEST BRANCH	106	43	25	25	38	101.0
WEST BRANCH	107	0	27	24	49	100.0
WEST BRANCH	108	2	20	19	59	100.0
WEST BRANCH	109	2	22	25	51	100.0
WEST BRANCH	110	1	27	24	48	100.0
WEST BRANCH	111	3	24	19	54	100.0
WEST BRANCH	112	0	26	22	52	100.0
WEST BRANCH	113	0	26	17	57	100.0
WEST BRANCH	114	0	32	25	43	100.0
WEST BRANCH	115	0	27	21	52	100.0
WEST BRANCH	116	2	18	19	61	100.0
WEST BRANCH	117	6	26	21	47	100.0
WEST BRANCH	118	9	26	26	39	100.0
WEST BRANCH	119	8	39	23	30	100.0
WEST BRANCH	120	5	28	28	39	100.0
WEST BRANCH	120.1/121	0	11	19	70	100.0
WEST BRANCH	150	19	23	25	33	100.0
WEST BRANCH	151	9	28	28	35	100.0
WEST BRANCH	152	15	26	26	33	100.0
WEST BRANCH	153	7	27	27	39	100.0
WEST BRANCH	154	13	29	28	30	100.0
WEST BRANCH	155	1	18	23	58	100.0
WEST BRANCH	156	4	30	29	37	100.0
WEST BRANCH	157	7	22	25	46	100.0
WEST BRANCH	157.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
WEST BRANCH	158	3	4	17	76	100.0
WEST BRANCH	159	3	10	20	67	100.0
WEST BRANCH	160	16	22	24	38	100.0
WEST BRANCH	161	1	30	28	41	100.0
WEST BRANCH	162	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
EAST BRANCH	201	2	17	24	57	100.0
EAST BRANCH	202	0	14	17	69	100.0
EAST BRANCH	203	0	21	17	62	100.0
EAST BRANCH	204	0	19	16	65	100.0
EAST BRANCH	205	0	24	18	58	100.0

**NEW AHYMO LAND TREATMENT
PERCENTAGES**

MODEL: BL10D14B.DAT

	SUB-BASIN	A (%)	B (%)	C (%)	D (%)	TOTAL
EAST BRANCH	211	0	10	18	72	100.0
EAST BRANCH	212	0	23	15	62	100.0
EAST BRANCH	213	0	19	16	65	100.0
EAST BRANCH	214	1	22	18	59	100.0
EAST BRANCH	215	3	19	18	60	100.0
EAST BRANCH	216	0	25	17	58	100.0
EAST BRANCH	217	0	62	7	31	100.0
EAST BRANCH	218	3	20	25	52	100.0
EAST BRANCH	219	1	29	28	42	100.0
EAST BRANCH	220	7	30	28	35	100.0
EAST BRANCH	250	0	15	31	54	100.0
EAST BRANCH	251	2	21	25	52	100.0
EAST BRANCH	252	1	24	26	49	100.0
EAST BRANCH	253	0	28	29	43	100.0
EAST BRANCH	254	0	30	28	42	100.0
EAST BRANCH	255	1	19	22	58	100.0
EAST BRANCH	256	26	26	25	23	100.0
EAST BRANCH	257	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
WEST BRANCH	300	0	17	18	65	100.0
WEST BRANCH	310	0	17	18	65	100.0
WEST BRANCH	320	0	28	14	58	100.0
19th AVE POND	319	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
WEST BRANCH	330	0	15	18	67	100.0
WEST BRANCH	340	0	18	18	64	100.0
WEST BRANCH	350	0	0	15	85	100.0
WEST BRANCH	360	0	27	16	57	100.0
WEST BRANCH	400	0	50	50	0	100.0
WEST BRANCH	410	0	19	17	64	100.0
WEST BRANCH	420	0	0	15	85	100.0
WEST BRANCH	430	0	26	15	59	100.0
WEST BRANCH	440	0	24	17	59	100.0
EAST BRANCH	500	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
EAST BRANCH	510	4	28	27	42	101.0
EAST BRANCH	520	0	30	28	42	100.0
EAST BRANCH	530	0	29	28	43	100.0
EAST BRANCH	540	7	29	27	37	100.0
EAST BRANCH	550	3	42	42	13	100.0

**NEW AHYMO LAND TREATMENT
PERCENTAGES**

MODEL: BL10D14B.DAT

	SUB-BASIN	A (%)	B (%)	C (%)	D (%)	TOTAL
WEST BRANCH	600	0	17	17	66	100.0
WEST BRANCH	610	36	18	21	25	100.0
WEST BRANCH	620	20	24	26	30	100.0
WEST BRANCH	630	43	20	20	17	100.0
WEST BRANCH	640	15	23	17	45	100.0
WEST BRANCH	650	1	45	45	9	100.0
WEST BRANCH	660	0	25	16	59	100.0

NEW SUB-BASINS AFTER FIELD INVESTIGATION

WEST BRANCH	106A	21	18	23	38	100.0
WEST BRANCH	106B	6	19	26	49	100.0
WEST BRANCH	106C	40	20	15	25	100.0
EAST BRANCH	217A	2	46	12	40	100.0
EAST BRANCH	217B	2	57	10	31	100.0
EAST BRANCH	500	0	14	25	61	100.0
EAST BRANCH	510	5	17	25	53	100.0
EAST BRANCH	520	4	20	28	48	100.0
EAST BRANCH	530A	0	28	29	43	100.0
EAST BRANCH	530B	5	24	27	44	100.0
EAST BRANCH	530C	1	23	31	45	100.0
19th AVE POND	319	0	26	29	45	100.0

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION <i>Black Future</i>			SHEET NO. <i>T1</i> OF	
COMPUTATIONS		COMPUTED BY: <i>KMJ</i>	CHECKED BY: <i>CD</i>	JOB/TASK NO. <i>98301</i>	DATE: <i>1/8/02</i>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS		9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

New TPs

✓ *BASIN 101*

LCODE = 1

NK = 4

ISLOPE = 0

LENGTH = 400

SLOPE = 0.025

K = 1

LENGTH = 1300

SLOPE = 0.014

K = 2

LENGTH = 1100

SLOPE = 0.029

K = 3

LENGTH = 2200

SLOPE = 0.023

K = 4

KN = 0.0

CD = 0.0

Qp = 420 cfs

✓ *BASIN 102*

LCODE = 1

NK = 4

ISLOPE = 0

L = 400

SLOPE = 0.030

K = 1

L = 1500

S = 0.013

K = 2

L = 1200

S = 0.033

K = 3

L = 3000

S = 0.030

K = 4

KN = 0.0

CD = 0.0

Qp = 320 cfs

ASCCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION Black Future TP		SHEET NO. T2 OF	
COMPUTATIONS		COMPUTED BY: KMJ	CHECKED BY:	JOB/TASK NO. 98301	DATE: 1/9/02
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

✓ BASIN 103A - adjust size of Basin

COMPUTE LT TP

LCODE = 7 NK = 4 ISLOPE = 0

L = 400 S = 0.038 K = 1

L = 1400 S = 0.038 K = 2

L = 2500 S = 0.028 K = 3

L = 1500 S = 0.02 K = 4

KN = 0.0 CD = 0.0 Qp = 175 cfs

✓ BASIN 103B Adjust Basin Area
LCODE = 1 NK = 3 ISLOPE = 0

~~L = 400 S = 0.038 K = 0.7~~

L = 400 S = 0.025 K = 2

L = 1300 S = 0.046 K = 3

L = 800 S = 0.031 K = 4

KN = 0.0 CD = 0.0 Qp = 175 cfs

✓ BASIN 104A = Adjust BASIN AREA
LCODE = 1 NK = 3 ISLP = 0

L = 400 S = 0.05 K = 1.0

L = 1400 S = 0.034 K = 3

L = 2200 S = 0.032 K = 4

4200

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION <i>Black Future</i>			SHEET NO. <i>73</i> OF	
COMPUTATIONS		COMPUTED BY: <i>UMJ</i>	CHECKED BY:	JOB/TASK NO. <i>98301</i>	DATE: <i>1/9/02</i>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

✓ BASIN 104 B - Adjust Basin Area
 LCODE = 1 NK = 2 ISLP = 0.0
 L = 200 S = 0.05 K = 1.0
 L = 1800 S = 0.028 K = 3.0

✓ BASIN 106 A 1 - Adjust Basin Area
 LCODE = 1 NK = 3 ISLP = 0.0
 L = 400 S = 0.025 K = 1
 L = 1500 S = 0.053 K = 1.0
 L = 1700 S = 0.012 K = 3.0

✓ BASIN 106 A 2 - Adjust BASIN AREA
 LCODE = 1 NK = 3 ISLP = 0.0
 L = 400 S = 0.050 K = 1
 L = 900 S = 0.044 K = 2
 L = 2200 S = 0.032 K = 3

✓ BASIN 106 B - Adjust Basin Area
 LCODE = 1 NK = 3 ISLP = 0.0
 L = 400 S = 0.030 K = 1
 L = 1400 S = 0.032 K = 2.0
 L = 2900 S = 0.034 K = 3.0
 KN = 0.0 CD = 0.0 Qp = 285 cfs

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION <i>Black Future</i>			SHEET NO. <i>T4</i> OF	
COMPUTATIONS		COMPUTED BY: <i>KNTJ</i>	CHECKED BY:	JOB/TASK NO. <i>98301</i>	DATE: <i>1/1/02</i>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

✓ Basin 105 -
 LCODE = 1. NK = 3 ISLOPE = 0.0

$L = 400$ $S = 0.025$ $K = 1.0$
 $L = 1000$ $S = 0.033$ $K = 2$
 $L = 800$ $S = 0.044$ $K = 3$

ok Basin 106C
 LCODE = 1 NK = 3 ISLOPE = 0.0

$L = 400$ $S = 0.013$ $K = 1.0$
 $L = 900$ $S = 0.061$ $K = 2$
 $L = 1000$ $S = 0.03$ $K = 3$

✓ Basin 107
 LCODE = 1 NK = 2 ISLOPE = 0.0
 $L = 800$ $S = 0.063$ $K = 2$
 $L = 1000$ $S = 0.03$ $K = 4$

✓ Basin 108
 LCODE = 1 NK = 3 ISLP = 0.0
 $L = 400$ $S = 0.075$ $K = 1.$
 $L = 1000$ $S = 0.032$ $K = 2$
 $L = 1500$ $S = 0.032$ $K = 3.$

✗ TP'S CALCULATED IN FEMA STUDY
 SEE BLARD - 15

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION Black Future			SHEET NO. 75 OF	
COMPUTATIONS		COMPUTED BY: KMJ	CHECKED BY:	JOB/TASK NO. 98301	DATE: 1/10/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

✓ Basin 109

LCODE = 1	NK = 3	ISLP = 0.0
L = 400	S = 0.013	K = 1
L = 800	S = 0.025	K = 2
L = 2400	S = 0.048	K = 3

✓ Basin 110

LCODE = 1	NK = 4	ISLP = 0.0
L = 400	S = 0.063	K = 1
L = 1600	S = 0.044	K = 2
L = 800	S = 0.05	K = 3
L = 1200	S = 0.042	K = 4

✓ Basin 111

LCODE = 1	NK = 3	ISLOPE = 0.0
L = 400	S = 0.025	K = 2
L = 1400	S = 0.046	K = 3
L = 2400	S = 0.029	K = 4
KN = 0.0	CD = 0.0	Qp = 240 cfs

✓ Basin 113

LCODE = 1	NK = 3	ISLOPE = 0.0
L = 300	S = 0.05	K = 2
L = 1000	S = 0.04	K = 3
L = 1500	S = 0.04	K = 4

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION <i>Black Future</i>			SHEET NO. <i>T6</i> OF	
COMPUTATIONS		COMPUTED BY: <i>KMJ</i>	CHECKED BY:	JOB/TASK NO. <i>98301</i>	DATE: <i>1/10/02</i>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

✓ *Basin 112*

<i>LCODE = 1</i>	<i>NK = 3</i>	<i>ISLP = 0.0</i>
<i>L = 300</i>	<i>S = 0.025</i>	<i>K = 1.0</i>
<i>L = 1700</i>	<i>S = 0.033</i>	<i>K = 2.0</i>
<i>L = 1800</i>	<i>S = 0.033</i>	<i>K = 3</i>

✓ *Basin 114*

<i>LCODE = 1</i>	<i>NK = 3</i>	<i>ISLP = 0.0</i>
<i>L = 400</i>	<i>S = 0.013</i>	<i>K = 1</i>
<i>L = 800</i>	<i>S = 0.043</i>	<i>K = 3</i>
<i>L = 1000</i>	<i>S = 0.04</i>	<i>K = 4</i>

✓ *Basin 115*

<i>LCODE = 1</i>	<i>NK = 4</i>	<i>ISLP = 0.0</i>
<i>L = 400</i>	<i>S = 0.013</i>	<i>K = 1</i>
<i>L = 1600</i>	<i>S = 0.034</i>	<i>K = 2</i>
<i>L = 1800</i>	<i>S = 0.034</i>	<i>K = 3</i>
<i>L = 1300</i>	<i>S = 0.031</i>	<i>K = 4</i>
<i>KN = 0.0</i>	<i>CD = 0.0</i>	<i>Qp = 240 cfs</i>

✓ *Basin 116*

<i>LCODE = 1</i>	<i>NK = 2</i>	<i>ISLP = 0.0</i>
<i>L = 200</i>	<i>S = 0.025</i>	<i>K = 2</i>
<i>L = 1800</i>	<i>S = 0.028</i>	<i>K = 4</i>

 ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION <u>Block Future</u>			SHEET NO. <u>T7</u> OF	
COMPUTATIONS		COMPUTED BY: <u>KMJ</u>	CHECKED BY:	JOB/TASK NO. <u>98301</u>	DATE: <u>1/10/02</u>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS		9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

✓ BASIN 117
 LCODE = 1.0 NK = 3 ISLP = 0.0
 L = 400 S = 0.063 K = 1
 L = 1200 S = 0.050 K = 2
 L = 1200 S = 0.033 K = 3

✓ BASIN 118A - Adjust AREA
 LCODE = 1. NK = 4 ISLP = 0.0
 L = 400 S = 0.050 K = 1
 L = 600 S = 0.083 K = 2
 L = 2000 S = 0.050 K = 3
 L = 2000 S = 0.050 K = 4
 ? Q_P = 300 g/s

✓ BASIN 118B - Adjust Area
 LCODE = 1 NK = 3 ISLP = 0.0
 L = 400 S = 0.042 K = 1
 L = 1600 S = 0.042 K = 2
 L = 1000 S = 0.042 K = 4

✓ Basin 150, LCODE NK = 3 ISLP = 0.0
 L = 400 S = 0.045 K = 1
 L = 400 S = 0.045 K = 2
 L = 2200 S = 0.045 K = 3

COMPUTATIONS

NAME OF PROJECT/CALCULATION

Black Future

SHEET NO. 78

OF

COMPUTED BY:

KMJ

CHECKED BY:

JOB/TASK NO.

98301

DATE:

1/10/02

IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

CHECKED BY:

DATED

Basin 151

LCODE = 1

NK = 3

ISLP = 0.0

L = 400

S = 0.041

K = 1

L = 1600

S = 0.041

K = 2

L = 3000

S = 0.041

K = 3

KN = 0.0

CD = 0.0

Qp = 260 cfs

Basin 152

LCODE = 1

NK = 4

ISLP = 0.0

L = 400

S = 0.013

K = 1

L = 1600

S = 0.022

K = 2

L = 2700

S = 0.048

K = 3

L = 700

S = 0.043

K = 4

KN = 0.0

CD = 0.0

Qp = 300 cfs

Basin 119

LCODE = 1

NK = 3

ISLP = 0.0

L = 400

S = 0.025

K = 1

L = 1600

S = 0.029

K = 2

L = 1700

S = 0.029

K = 4

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES COMPUTATIONS		NAME OF PROJECT/CALCULATION Black Future		SHEET NO. T9 OF	
IDENTIFY/ADDRESS THESE ELEMENTS		1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS
6.0 SKETCHES		7.0 CALCULATIONS		8.0 CONCLUSIONS	
5.0 CRITERIA / REQUIREMENTS		9.0 ATTACHMENTS		DATE: 1/10/02	
REVISION #		SUPERSEDES CALC TITLE		CHECKED BY:	
DATED		DATED		DATED	

Basin 120

LCODE = 1

NK = 3

ISLP = 0.0

L = 400

S = 0.04

K = 1

L = 1600

S = 0.05

K = 2

L = 3000

S = 0.05

K = 3

KN = 0.0

CD = 0.0

Qp = 375 cfs

Basin 153

LCODE = 1

NK = 3

ISLP = 0.0

L = 400

S = 0.013

K = 1

L = 1600

S = 0.012

K = 2

L = 4500

S = 0.012

K = 3

KN = 0.0

CD = 0.0

Qp = 250 cfs

Basin 154

LCODE = 1

NK = 3

ISLOPE = 0.0

L = 400

S = 0.025

K = 1

L = 1600

S = 0.037

K = 2

L = 2500

S = 0.037

K = 4

KN = 0.0

CD = 0.0

Qp = 350 cfs

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES COMPUTATIONS		NAME OF PROJECT/CALCULATION			SHEET NO. <i>F10</i>	
		<i>Black Future</i>			OF	
		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.		DATE:
		<i>KMJ</i>		<i>98301</i>		<i>1/10/02</i>
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

Basin 155

✓ *LCODE = 1 NK = 4 ISLOPE = 0.0*

<i>L = 400</i>	<i>S = 0.038</i>	<i>K = 1</i>
<i>L = 1600</i>	<i>S = 0.038</i>	<i>K = 2</i>
<i>L = 3500</i>	<i>S = 0.038</i>	<i>K = 3</i>
<i>L = 1000</i>	<i>S = 0.038</i>	<i>K = 4</i>

KN = 0.0 CD = 0.0 Qp = 225 cfs

Basin 156

✓ *LCODE = 1 NK = 2 ISLP = 0.0*

<i>L = 250</i>	<i>S = 0.04</i>	<i>K = 2</i>
<i>L = 3500</i>	<i>S = 0.04</i>	<i>K = 3</i>

Basin 157

✓ *LCODE = 1 NK = 2 ISLP = 0.0*

<i>L = 400</i>	<i>S = 0.026</i>	<i>K = 2</i>
<i>L = 3000</i>	<i>S = 0.026</i>	<i>K = 3</i>

Basin 158

✓ *LCODE = 1 NK = 2 ISLP = 0.0*

<i>L = 500</i>	<i>S = 0.029</i>	<i>K = 2</i>
<i>L = 2100</i>	<i>S = 0.029</i>	<i>K = 3</i>

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION Black Future			SHEET NO. T11 OF	
COMPUTATIONS		COMPUTED BY: KMJ	CHECKED BY:	JOB/TASK NO. 98301	DATE: 1/10/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

Basin 201

LCODE = 1 NK = 3 ISLP = 0.0

L = 400 S = 0.023 K = 1

L = 1600 S = 0.023 K = 2

L = 4000 S = 0.023 K = 3

KN = 0.0 CD = 0.0 Qp = 400 cfs

Basin 121

LCODE = 1 NK = 3 ISLOPE = 0.0

L = 1300 S = 0.021 K = 2

L = 1300 S = 0.021 K = 3

L = 4200 S = 0.021 K = 4

KN = 0.0 CD = 0.0 Qp = 450 cfs

Basin 250

LCOD = 1 NK = 3 ISLOPE = 0.0

L = 500 S = 0.024 K = 2

L = 3000 S = 0.024 K = 3

L = 1500 S = 0.024 K = 4

KN = 0.0 CD = 0.0 Qp = 100 cfs

ASCCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION Black Future			SHEET NO. T12 OF	
COMPUTATIONS		COMPUTED BY: KMJ	CHECKED BY:	JOB/TASK NO. 98301	DATE: 1/10/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS		9.0 ATTACHMENTS
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

Basin 251

LCODE = 1 NK = 3 ISLP = 0.0

L = 400 S = 0.020 K = 2

L = 2000 S = 0.020 K = 3

L = 2300 S = 0.020 K = 4

KN = 0.0 CD = 0.0 Qp = 300 cfs

Basin 252

LCODE = 1 NK = 2 ISLP = 0.0

L = 700 S = 0.018 K = 2

L = 2300 S = 0.018 K = 3

Basin 254

LCODE = 1 NK = 2 ISLP = 0.0

L = 400 S = 0.025 K = 2

L = 1400 S = 0.025 K = 3

Basin 253

LCODE = 1 NK = 2 ISLOPE = 0.0

L = 500 S = 0.020 K = 2

L = 2000 S = 0.020 K = 3

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION <i>Black Future</i>			SHEET NO. <i>713</i> OF	
COMPUTATIONS		COMPUTED BY: <i>KMJ</i>	CHECKED BY:	JOB/TASK NO. <i>98301</i>	DATE: <i>1/10/02</i>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

Basin 218A

$LCODE = 1$	$NK = 3$	$ISLOPE = 0.0$
$L = 300$	$S = 0.021$	$K = 1$
$L = 1600$	$S = 0.021$	$K = 2$
$L = 1600$	$S = 0.021$	$K = 3$

Basin 218B

$LCODE = 1$	$NK = 3$	$ISLP = 0.0$
$L = 300$	$S = 0.030$	$K = 1$
$L = 1500$	$S = 0.030$	$K = 2$
$L = 1500$	$S = 0.030$	$K = 3$

Basin 219

$LCODE = 1$	$NK = 3$	$ISLP = 0.0$
$L = 300$	$S = 0.017$	$K = 2$
$L = 5000$	$S = 0.017$	$K = 3$
$L = 1000$	$S = 0.017$	$K = 4$
$KN = 0.0$	$CD = 0.0$	$Q_p = 280 cfs$

Basin 220

$LCODE = 1$	$NK = 2$	$ISLP = 0.0$
$L = 1000$	$S = 0.022$	$K = 2$
$L = 1500$	$S = 0.022$	$K = 4$

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION BLACK FUTURE			SHEET NO. T14 OF	
COMPUTATIONS		COMPUTED BY: KMJ	CHECKED BY:	JOB/TASK NO. 98301	DATE: 1/10/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA/ REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

✓ Basin 255

$LCODE = 1.$	$NK = 3$	$ISLP = 0.0$
$L = 500$	$S = 0.023$	$K = 2$
$L = 1500$	$S = 0.023$	$K = 3$
$L = 1500$	$S = 0.023$	$K = 4$

✓ Basin 256

$LCODE = 1$	$NK = 2$	$ISLP = 0.0$
$L = 1000$	$S = 0.030$	$K = 2$
$L = 1000$	$S = 0.030$	$K = 4$

✓ Basin 160

$LCODE = 1$	$NK = 2$	$ISLP = 0.0$
$L = 1200$	$S = 0.019$	$K = 2$
$L = 2000$	$S = 0.019$	$K = 4$

✓ Basin 161

$LCODE = 1$	$NK = 3$	$ISLP = 0.0$
$L = 500$	$S = 0.017$	$K = 1$
$L = 1000$	$S = 0.017$	$K = 2$
$L = 1500$	$S = 0.017$	$K = 3$

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES COMPUTATIONS		NAME OF PROJECT/CALCULATION BLACK FUTURE			SHEET NO. T15 OF	
		COMPUTED BY: KMJ	CHECKED BY:	JOB/TASK NO. 98301	DATE: 1/10/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

Basin 159



LCODE = 1

NK = 2

TSLOPE = 0.0

L = 1400

S = 0.050

K = 2

L = 3200

S = 0.625

K = 4

KN = 0.0

CD = 0.0

Qp = 120 cfs

DEVELOPED CONDITIONS AHYMO INPUT DATA FILE PRINTOUT

BLACK ARROYO WATERSHED MANAGEMENT PLAN

J:\SSCA\CA\98003\98003_01\REPORT\APPENDIX G.doc

```

                                BL10D35B
START                          0.0 HRS  PUNCH CODE=0  PRINT LINES=-1
*
* -----HYDROLOGY MODEL-----
*S * * * FUTURE CONDITIONS MODEL - ALTERNATE B * * * * *
*S * * * 3 DAMS ON THE WEST BRANCH * * * * *
*S * * * UNSER GATEWAY DAM, AND WATER QUALITY DIVERSIONS * * * * *
*S * * * ROUTING WITH MCUNGE METHOD AFTER WATER QUALITY DIVERSIONS ARE * * * * *
*S * * * UTILIZED TO ADJUST FOR THE UNSTABLE HYDROGRAPHS WITH A STEEP SLOPE * * *
*S * * * AFTER MODIFICATION TO REDIRECT THE FIRST FLUSH OF 0.25" RUNOFF FOR SWQ *
*LH *****
*LH FILE MODIFIED BY LH/ASCG TO REFLECT FULL DEVELOPMENT WITHIN THE BLACK *
*LH ARROYO WATERSHED USING THE SSCAFCA LAND TREATMENTS FOR LOTS AND *
*LH ZONING DEVELOPED FOR THE MONTOYAS ARROYO STUDY. *
*LH THIS MODEL IS INTENDED TO PROVIDE A BIG PICTURE STUDY FOR THE BLACK *
*LH ARROYO AND SHOULD NOT BE USED TO DEVELOP DETAILED SOLUTIONS. *
*LH THE FEMA RESTUDY MODEL HAS BEEN ADDED TO IVORY AND LISBON CROSSING DESIGN *
*LH MODEL AND CHANGED TO DEVELOPED CONDITIONS. *
*LH *
*LH THE FOLLOWING THINGS WERE CHANGED IN THE MODEL: *
*LH *
*LH MODIFIED PRINT LINE COMMAND AND ROUTES CHANGED TO MANNINGS ROUTE FOR *
*LH ALL WELL DEFINED CHANNELS (ALSO CHANGED IN RESTUDY MODEL PORTION) *
*LH MODIFIED SLOPE FOR ROUTING THRU BASIN 103 FROM 0.0179 TO 0.0214 FT/FT. *
*LH SEE RUN CHRONOLOGY FOR OTHER CHANGES IN THE MODEL. *
*LH*****
* ORIGINAL AHYMO MODEL DEVELOPED FOR:
* FEMA RE-STUDY
* SANDOVAL COUNTY, NEW MEXICO
*
* RESTUDY AREA: CITY OF RIO RANCHO
* FLOODING SOURCE: BLACK ARROYO
*
*****
*LH ALL SEDIMENT BULKING WAS MODIFIED TO USE THE SEDIMENT BULK COMMAND AND
* NOT THE DIVIDE HYD COMMANDS IN THE PREVIOUS FEMA RESTUDY MODELS.
* SEE RUNCHRONOLOGY FOR AN EXPLANATION OF THE BULKING FACTORS.
*
*
RAINFALL                      TYPE=2  RAIN QUARTER=0.0  RAIN ONE=1.799
                              RAIN SIX=2.205    RAIN DAY=2.703    DT=.05
*
*****
*S BEGINNING OF THE BLACK ARROYO WEST BRANCH
*****
*S LISBON CHANNEL NORTH OF TULIP
*S * * * * *
* BULK FOR SEDIMENT
SEDIMENT BULK                CODE=1  BULK FACTOR=1.18
*
COMPUTE LT TP                LCODE=1  NK=4  ISLOPE=0
                              L=400    S=0.025    K=1
                              L=1300   S=0.014    K=2
                              L=1100   S=0.029    K=3
                              L=2200   S=0.023    K=4
                              KN=0.0   CD=0.0   Qp=420 cfs
*
COMPUTE NM HYD               ID=1    HYD=101    DA=0.3397  SQ MI
                              PER A=17    B=16    C=17    D=50
                              TP=0.0 HRS    RAIN=-1
*
PRINT HYD                    ID=1    CODE=1
*
*C ROUTE HYD.  101  TO  101.90
*
COMPUTE RATING CURVE CID=1  VS NO=1  NSEGS=3
                              ELMIN=0  ELMAX=6.3  CH SLP=.015 ft/ft  FP SLP=.015ft/ft
                              N=.045 DIST=15 N=-0.013 DIST=49  N=.045 DIST=64
                              DIST    ELEV
                              0        6.3
                              15       6.0
                              27       0.0
                              37       0.0
                              49       6.0
                              64       6.3

```

BL10D35B

```

*
COMPUTE TRAVEL TIME ID=2 REACH=1 NO VS=1
L=760 SLP=0.015
ROUTE ID=2 HYD=101.90 INFLOW ID=1 DT=0.00
*
PRINT HYD ID=2 CODE=1
*
COMPUTE LT TP LCODE=1 NK=4 ISLOPE=0
L=400 S=0.038 K=1
L=1500 S=0.013 K=2
L=1200 S=0.033 K=3
L=3000 S=0.030 K=4
KN=0.0 CD=0.0 Qp=320 cfs
*
COMPUTE NM HYD ID=1 HYD=102 DA=0.2539 SQ MI
PER A=26 B=23 C=22 D=29
TP=0.0 HRS RAIN=-1
*
PRINT HYD ID=1 CODE=1
*
*C COMBINE HYD.'S 101.9 AND 102 AT 102.10
*
ADD HYD ID=3 HYD=102.10 ID I=1 ID II=2
*
PRINT HYD ID=3 CODE=1
*
*C ROUTE HYD. 102.9 TO 102.90 (103A)
*
COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3
ELMIN=0 ELMAX=6.3 CH SLP=.015 ft/ft FP SLP=.015ft/ft
N=.045 DIST=15 N=-0.013 DIST=49 N=.045 DIST=64
DIST ELEV
0 6.3
15 6.0
27 0.0
37 0.0
49 6.0
64 6.3
*
COMPUTE TRAVEL TIME ID=4 REACH=1 NO VS=1
L=1500 SLP=0.015
ROUTE ID=4 HYD=102.90 INFLOW ID=3 DT=0.00
*
PRINT HYD ID=4 CODE=1
*
COMPUTE LT TP LCODE=1 NK=4 ISLOPE=0
L=400 S=0.038 K=1
L=1600 S=0.038 K=2
L=2500 S=0.028 K=3
L=1500 S=0.02 K=4
KN=0.0 CD=0.0 Qp=175 cfs
*
COMPUTE NM HYD ID=1 HYD=103A DA=0.1803 SQ MI
PER A=20 B=19 C=22 D=39
TP=0.0 HRS RAIN=-1
*
PRINT HYD ID=1 CODE=1
*
*C COMBINE HYD.'S 102.91 AND 103A AT 103A.90
*S * * * * *
*S START OF LISBON CHANNEL AT TULIP AND INFLOW TO DAM
*S * * * * *
ADD HYD ID=3 HYD=103A.90 ID I=1 ID II=4
*
PRINT HYD ID=3 CODE=1
*
*S ROUTE 103A.90 THRU LISBON @ TULIP DAM/POND
ROUTE RESERVOIR ID=4 HYD NO=TULIS.DAM INFLOW ID=3 CODE=24
OUTFLOW(cfs) STORAGE(ac ft) ELEV(ft)
0 0.0 5590
5 60 5598
30000 80 5600
*

```



```

PRINT HYD          ID=4      CODE=1
*
*S *****DIVIDE HYD TO UNBULK BY 3% *****
DIVIDE HYD          ID=4      %=-97      ID I=4  HYD=UNBULK
                                      ID II=51 HYD=SEDIMENT
*
*S ROUTE IN PIPE TO LISBON CHANNEL
*
*S * * * * * AP=TULIS.90 * * * * *
COMPUTE RATING CURVE  CID=1  VS NO=1  CODE=-1  SLP=0.015
                      DIA=24  IN  N=0.013
*
COMPUTE TRAVEL TIME  ID=3      REACH=1  NO VS=1
                      L=1100  SLP=0.015
ROUTE                ID=3      HYD=TULIS.90  INFLOW ID=4  DT=0.00
*
PRINT HYD            ID=3      CODE=1
*S * * * * *
*S START OF LISBON CHANNEL AT TULIP
*S * * * * *
* ADJUST SEDIMENT BULK
SEDIMENT BULK        CODE=1  BF=1.06
*
COMPUTE LT TP        LCODE=1  NK=3  ISLOPE=0
                      L=400   S=0.025  K=2
                      L=1300  S=0.046  K=3
                      L=800   S=0.031  K=4
*
COMPUTE NM HYD        ID=1      HYD=103B      DA=0.0895  SQ MI
                      PER A=20  B=19  C=22  D=39
                      TP=0.0   HRS      RAIN=-1
*
PRINT HYD            ID=1      CODE=1
*
*S ADD 103B TO PREVIOUS HYDROGRAPHS FOR TOTAL Q IN LISBON CHANNEL AT
*S DOWNSTREAM END OF BASIN 103B
*
ADD HYD              ID=3      HYD=103B.10  ID I=1  ID II=3
*
PRINT HYD            ID=3      CODE=1
*
*S ROUTE 103B.10 THRU 104B TO 104B.90
*
COMPUTE RATING CURVE  CID=1  VS NO=1  NSEGS=3
                      ELMIN=0  ELMAX=6.3  CH SLP=.015 ft/ft  FP SLP=.015ft/ft
                      N=.045  DIST=15  N=-0.013  DIST=49  N=.045  DIST=64
                      DIST  ELEV
                        0     6.3
                        15    6.0
                        27    0.0
                        37    0.0
                        49    6.0
                        64    6.3
*
COMPUTE TRAVEL TIME  ID=4      REACH=1  NO VS=1
                      L=350   SLP=0.015
ROUTE                ID=4      HYD=104B.90  INFLOW ID=3  DT=0.00
*
PRINT HYD            ID=4      CODE=1
*
*S * * * * *
*S START OF SUNSET CHANNEL
*S * * * * *
* COMPUTE 106A1 AND ROUTE AS 106A.90 TO DAM AT 104A (TUSUN.DAM)
*
* ADJUST SEDIMENT BULK
SEDIMENT BULK        CODE=1  BF=1.18
*
COMPUTE LT TP        LCODE=1  NK=3  ISLOPE=0
                      L=400   S=0.025  K=1
                      L=1500  S=0.053  K=1
                      L=1700  S=0.012  K=3
*
COMPUTE NM HYD        ID=1      HYD=106A1      DA=0.1166  SQ MI

```

```

                                BL10D35B
PER A=22    B=20    C=24    D=34
TP=0.0    RAIN=-1

*
PRINT HYD                ID=1    CODE=1
*
COMPUTE RATING CURVE      CID=1    VS NO=1    CODE=-1    SLP=0.026
                          DIA=72    IN    N=0.013
COMPUTE TRAVEL TIME      ID=3    RN=1    NO VS=1    L=2900 FT    SLP=0.026
ROUTE                    ID=3    HYD=106A.90    INFLOW ID=1    DT=0.0
PRINT HYD                ID=3    CODE=1
*
*
COMPUTE LT TP            LCODE=1    NK=3    ISLOPE=0
                          L=400    S=0.05    K=1
                          L=1600    S=0.034    K=3
                          L=2200    S=0.032    K=4
                          KN=0.0    CD=0.0    QP=200 CFS
*
*
COMPUTE NM HYD            ID=1    HYD=104A    DA=0.1834    SQ MI
PER A=11    B=20    C=23    D=46
TP=0.0    HRS    RAIN=-1
*
*
PRINT HYD                ID=1    CODE=1
*
* COMBINE HYDS 106A1 AND 104A AT 104.10
*
ADD HYD                    ID=1    HYD=104.10    ID I=3    ID II=1
*
PRINT HYD                ID=1    CODE=1
*S * * * * *
*S ROUTE 104.10 THROUGH PROPOSED SUNSET @ TULIP POND/DAM
*S * * * * *
ROUTE RESERVOIR          ID=2    HYD NO=TUSUN.DAM    INFLOW ID=1    CODE=24
                          OUTFLOW(cfs)    STORAGE(ac ft)    ELEV(ft)
                          0                0.0                5600
                          5                22                5608
                          15000            30                5610
*
*
PRINT HYD                ID=2    CODE=1
*S * * * * * DIVIDE HYD TO UNBULK BY 3% * * * * *
DIVIDE HYD                ID=2    %=-97    ID I=2    HYD=UNBULK
                                ID II=52    HYD=SEDIMENT
*S ROUTE IN PIPE TO LISBON CHANNEL
*
COMPUTE RATING CURVE      CID=1    VS NO=1    CODE=-1    SLP=0.026
                          DIA=24    IN    N=0.013
COMPUTE TRAVEL TIME      ID=3    RN=1    NO VS=1    L=2900 FT    SLP=0.026
ROUTE                    ID=3    HYD=TUSUN.90    INFLOW ID=2    DT=0.0
PRINT HYD                ID=3    CODE=1
*
* ADJUST SEDIMENT BULK
SEDIMENT BULK            CODE=1    BF=1.06
*
COMPUTE LT TP            LCODE=1    NK=3    ISLOPE=0
                          L=400    S=0.05    K=1
                          L=900    S=0.044    K=2
                          L=2200    S=0.032    K=3
*
*
COMPUTE LT TP            LCODE=1    NK=2    ISLOPE=0
                          L=200    S=0.05    K=1
                          L=1800    S=0.028    K=3
*
COMPUTE NM HYD            ID=1    HYD=104B    DA=0.0355    SQ MI
PER A=11    B=20    C=23    D=46
TP=0.0    HRS    RAIN=-1
*
*
PRINT HYD                ID=1    CODE=1
*
* C COMBINE HYD.'S TUSUN.90 AND 104B AT 104.20
*
ADD HYD                    ID=5    HYD=104.20    ID I=1    ID II=3
*
PRINT HYD                ID=5    CODE=1
* * * * *

```

```

                                BL10D35B
*S LISBON CHANNEL AFTER SUNSET CHANNEL CONFLUENCE (HYD=104B.1)
* * * * *
* COMBINE HYDS 104.20 AND 103B AT 104.30
*
ADD HYD                ID=3      HYD=104.30      ID I=5      ID II=4
*
PRINT HYD              ID=3      CODE=1
*
*C ROUTE HYD. 104.30      TO 104.90(105)
*
COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3
                      ELMIN=0 ELMAX=6.3 CH SLP=.015 ft/ft FP SLP=.015ft/ft
                      N=.045 DIST=15 N=-0.013 DIST=49 N=.045 DIST=64
                      DIST      ELEV
                        0        6.3
                        15       6.0
                        27       0.0
                        37       0.0
                        49       6.0
                        64       6.3
*
COMPUTE TRAVEL TIME ID=4 REACH=1 NO VS=1
                      L=3000 SLP=0.015
ROUTE                ID=4 HYD=104.90 INFLOW ID=3 DT=0.00
*
PRINT HYD              ID=4      CODE=1
*
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
*
* ADJUST SEDIMENT BULK
SEDIMENT BULK          CODE=1 BF=1.06
*
COMPUTE NM HYD          ID=1      HYD=105      DA=0.1509 SQ MI
                      PER A=0      B=27      C=28      D=45
                      TP=.233      HRS      RAIN=-1
*
PRINT HYD              ID=1      CODE=1
*
* * * * *
*S LISBON CHANNEL AFTER SUB-BASIN 105
* * * * *
*C COMBINE HYD.'S 104.90      AND 105      AT 105.10
*
ADD HYD                ID=5      HYD=105.10      ID I=1      ID II=4
*
PRINT HYD              ID=5      CODE=1
*
*C ROUTE HYD. 105.10      TO 105.90 (106C)
*
COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3
                      ELMIN=0 ELMAX=6.3 CH SLP=.015 ft/ft FP SLP=.015ft/ft
                      N=.045 DIST=15 N=-0.013 DIST=54 N=.045 DIST=69
                      DIST      ELEV
                        0        6.3
                        15       6.0
                        27       0.0
                        42       0.0
                        54       6.0
                        69       6.3
*
COMPUTE TRAVEL TIME ID=4 REACH=1 NO VS=1
                      L=960 SLP=0.015
ROUTE                ID=4 HYD=105.90 INFLOW ID=5 DT=0.00
*
PRINT HYD              ID=4      CODE=1
*
* * * * *
*S START OF SUGAR CHANNEL AT TULIP
* * * * *
*
COMPUTE LT TP          LCODE=1 NK=3 ISLOPE=0
                      L=400 S=0.05 K=1
                      L=900 S=0.044 K=2
                      L=2200 S=0.032 K=3

```

```

*
* COMPUTE NM HYD      ID=1      HYD=106A2      DA=0.1359      SQ MI
*                     PER A=21      B=18      C=23      D=38
*                     TP=0.0      RAIN=-1
*
* PRINT HYD           ID=1      CODE=1
*
* S * * * * *
* S BALI CHANNEL
* S * * * * *
* COMPUTE LT TP       LCODE=1      NK=3      ISLOPE=0
*                     L=400      S=0.03      K=1
*                     L=1400     S=0.032     K=2
*                     L=2900     S=0.034     K=3
*                     KN=0.0      CD=0.0      QP=285 CFS
*
*
* COMPUTE NM HYD      ID=3      HYD=106B      DA=0.1522 SQ MI
*                     PER A=5      B=20      C=26      D=49
*                     TP=0.0      RAIN=-1
*
* PRINT HYD           ID=3      CODE=1
*
* S * * * * *
* S SUGAR CHANNEL INCLUDING CONFLUENCE WITH BALI CHANNEL
* S * * * * *
*
* * * * * COMBINE HYDS 106A2 AND 106B AT 106B.10 * * * *
*
* ADD HYD              ID=5      HYD=106B.10      ID I=1      ID II=3
*
* PRINT HYD            ID=5      CODE=1
*
* S ROUTE 106B.10 TO 106C.90 (TO CONFLUENCE OF LISBON & SUGAR CHLS) (106C)
*
* COMPUTE RATING CURVE CID=1      VS NO=1      CODE=-1      SLP=0.026
*                     DIA=84 IN      N=0.013
* COMPUTE TRAVEL TIME  ID=1      RN=1      NO VS=1      L=960 FT      SLP=0.026
* ROUTE                ID=1      HYD=106B.90      INFLOW ID=5      DT=0.0
* PRINT HYD            ID=1      CODE=1
*
* COMPUTE LT TP       LCODE=1      NK=3      ISLOPE=0
*                     L=400      S=0.02      K=1
*                     L=1600     S=0.0438     K=2
*                     L=2300     S=0.0413     K=4
*
*
* COMPUTE NM HYD      ID=3      HYD=106C      DA=0.0484 SQ MI
*                     PER A=40      B=20      C=15      D=25
*                     TP=0.0      RAIN=-1
*
* PRINT HYD           ID=3      CODE=1
*
* * COMBINE HYDS 106C.90 AND 106C AT 106C.91
*
* ADD HYD              ID=5      HYD=106C.10      ID I=1      ID II=3
*
* PRINT HYD            ID=5      CODE=1
*
* S * * * * * AP 106.90 * * * * *
* S LISBON CHANNEL AFTER CONFLUENCE WITH SUGAR CHANNEL
* S * * * * *
* C COMBINE HYD.'S 105.90      AND 106C.91 AT 106.90
*
* ADD HYD              ID=5      HYD=106.20      ID I=5      ID II=4
*
* PRINT HYD            ID=5      CODE=1
*
* C ROUTE HYD. 106.20      TO 106.90
*
* COMPUTE RATING CURVE CID=1      VS NO=1      NSEGS=3
*                     ELMIN=0      ELMAX=6.3      CH SLP=.015 ft/ft      FP SLP=.015ft/ft
*                     N=.045      DIST=15      N=-0.013      DIST=54      N=.045      DIST=69
*                     DIST      ELEV
*                     0      6.3
*                     15     6.0
*                     27     0.0

```

42 0.0
54 6.0
69 6.3

```

*
* COMPUTE TRAVEL TIME ID=2 REACH=1 NO VS=1
* L=1380 SLP=0.015
* ROUTE ID=2 HYD=106.91 INFLOW ID=5 DT=0.00
*
* PRINT HYD ID=2 CODE=1
*
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
* COMPUTE NM HYD ID=1 HYD=107 DA=0.0358 SQ MI
* PER A=0 B=27 C=24 D=49
* TP=.135 HRS RAIN=-1
*
* PRINT HYD ID=1 CODE=1
* S * * * * *
* S LISBON CHANNEL AFTER ADDING SUB-BASIN 107
* S * * * * *
* C COMBINE HYD.'S 107 AND 106.91 AT 107.10
*
* ADD HYD ID=5 HYD=107.10 ID I=1 ID II=2
*
* PRINT HYD ID=5 CODE=1
*
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
* COMPUTE NM HYD ID=1 HYD=109 DA=0.0864 SQ MI
* PER A=2 B=22 C=25 D=51
* TP=.212 HRS RAIN=-1
*
* PRINT HYD ID=1 CODE=1
* S * * * * *
* S BALTIC CHANNEL
* S FLOW AT CASCADE RD @ 600 FT. W. OF COMANCHE RD. (HYD. 109)
* S * * * * *
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
* COMPUTE NM HYD ID=3 HYD=110 DA=0.0509 SQ MI
* PER A=1 B=27 C=24 D=48
* TP=.169 HRS RAIN=-1
*
* PRINT HYD ID=3 CODE=1
* S * * * * *
* S ARKANSAS CHANNEL INCLUDING FLOW FROM BALTIC CHANNEL
* S * * * * *
* C COMBINE HYD.'S 109 AND 110 AT 110.10
*
* ADD HYD ID=6 HYD=110.10 ID I=1 ID II=3
*
* PRINT HYD ID=6 CODE=1
*
* C ROUTE HYD. 110.10 TO 110.90
*
* COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLP=0.039
* DIA=54 IN N=0.013
* COMPUTE TRAVEL TIME ID=2 RN=1 NO VS=1 L=1130 FT SLP=0.039
* ROUTE ID=2 HYD=110.90 INFLOW ID=6 DT=0.0
* PRINT HYD ID=2 CODE=1
*
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
* COMPUTE NM HYD ID=1 HYD=108 DA=0.0672 SQ MI
* PER A=2 B=20 C=19 D=59
* TP=.189 HRS RAIN=-1
*
* PRINT HYD ID=1 CODE=1
*
* C COMBINE HYD.'S 108.90 AND 108 AT 108.10
* S * * * * *
* S ARKANSAS CHANNEL INCLUDING FLOW FROM BALTIC CHANNEL BEFORE CONFLUENCE
* S WITH LISBON CHANNEL
* S * * * * *
* S LISBON AVE. @ 250 FT. N. OF HOOD RD.
* S
* ADD HYD ID=6 HYD=108.10 ID I=1 ID II=2
*

```

```

PRINT HYD          ID=6      CODE=1
*S * * * * AP 108.91 * * * * *
*S LISBON CHANNEL AFTER ADDING ARKANSAS CHANNEL FLOWS
*S * * * * *
*C COMBINE HYD.'S 108.10 AND 107.10 AT 108.91
*
ADD HYD            ID=5      HYD=108.20 ID I=5 ID II=6
*
PRINT HYD          ID=5      CODE=1
*
*C ROUTE HYD. 108.91 TO 108.90
*
COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3
ELMIN=0 ELMAX=6.3 CH SLP=.015 ft/ft FP SLP=.015ft/ft
N=.045 DIST=15 N=-0.013 DIST=54 N=.045 DIST=69
DIST ELEV
0 6.3
15 6.0
27 0.0
42 0.0
54 6.0
69 6.3
*
COMPUTE TRAVEL TIME ID=2 REACH=1 NO VS=1
L=2710 SLP=0.015
ROUTE ID=2 HYD=108.90 INFLOW ID=5 DT=0.00
*
PRINT HYD          ID=2      CODE=1
*
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
COMPUTE NM HYD ID=1 HYD=111 DA=0.1159 SQ MI
PER A=3 B=24 C=19 D=54
TP=.190 HRS RAIN=-1
*
PRINT HYD          ID=1      CODE=1
*
*C COMBINE HYD.'S 108.92 AND 111 AT 111.10
*
SOUTHERN BLVD. @ 450 FT. W. OF TARPON AVE.
*S * * * * * AP 111.10 * * * * *
*S LISBON CHANNEL DISCHARGE @ SOUTHERN BLVD
*S * * * * *
ADD HYD            ID=5      HYD=111.10 ID I=1 ID II=2
*
PRINT HYD          ID=5      CODE=1
*
*C ROUTE HYD. 111.10 TO 111.90
*S * * * * *
*S START OF LISBON ARROYO
*S * * * * *
COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3
ELMIN=0 ELMAX=6.3 CH SLP=.02 ft/ft FP SLP=.02ft/ft
N=.045 DIST=15 N=-0.013 DIST=49 N=.045 DIST=64
DIST ELEV
0 6.3
15 6.0
27 0.0
37 0.0
49 6.0
64 6.3
*
COMPUTE TRAVEL TIME ID=2 REACH=1 NO VS=1
L=1940 SLP=0.02
ROUTE ID=2 HYD=111.90 INFLOW ID=5 DT=0.00
*
PRINT HYD          ID=2      CODE=1
*
* ADJUST SEDIMENT BULK FOR UNIT 10 AREA
SEDIMENT BULK CODE=1 BULK FACTOR=1.18
*
COMPUTE LT TP LCODE=1 NK=2 ISLOPE=0
L=200 S=0.025 K=2
L=1800 S=0.028 K=4
*

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                                BL10D35B
COMPUTE NM HYD      ID=1    HYD=116    DA=0.0319    SQ MI
                    PER A=2    B=18    C=19    D=61
                    TP=0.0    HRS    RAIN=-1

*
PRINT HYD          ID=1    CODE=1
*
*C    COMBINE HYD.'S    111.90    AND    116    AT    116.10
*
ADD HYD            ID=5    HYD=116.10    ID I=1    ID II=2
*
PRINT HYD          ID=5    CODE=1
*S * * * * *
*S * * * * END LISBON CHANNEL AND LISBON ARROYO WATERSHED * * * * *
*S * * * * *
*S * * * * *
*S * * * * START IVORY WATERSHED * * * * *
*S * * * * *
* ADJUST SEDIMENT BACK TO PREVIOUS FACTOR
SEDIMENT BULK      CODE=1    BULK FACTOR=1.06
* * * * *
*S * * * * PECOS/RODEO CHANNEL * * * * *
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
COMPUTE NM HYD      ID=1    HYD=114    DA=0.0698    SQ MI
                    PER A=0    B=32    C=25    D=43
                    TP=.172    HRS    RAIN=-1

*
PRINT HYD          ID=1    CODE=1
*
*C    ROUTE HYD. 114    TO 114.90
*
COMPUTE RATING CURVE    CID=1    VS NO=1    CODE=-1    SLP=0.042
                        DIA=66    IN    N=0.013
COMPUTE TRAVEL TIME    ID=2    RN=1    NO VS=1    L=1760 FT    SLP=0.042
ROUTE                  ID=2    HYD=114.90    INFLOW ID=1    DT=0.0
PRINT HYD              ID=2    CODE=1
*S * * * * *
*S * * * * SPUR CHANNEL * * * * *
*S * * * * *
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
COMPUTE NM HYD      ID=1    HYD=115    DA=0.1252    SQ MI
                    PER A=0    B=27    C=21    D=52
                    TP=.212    HRS    RAIN=-1

*
PRINT HYD          ID=1    CODE=1
*
*C    COMBINE HYD.'S    114.90    AND    115    AT    115.10
*
ADD HYD            ID=6    HYD=115.10    ID I=1    ID II=2
*
PRINT HYD          ID=6    CODE=1
*S * * * * *
*S * * * * IVORY CHANNEL * * * * *
*S * * * * *
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
COMPUTE NM HYD      ID=1    HYD=113    DA=0.0477    SQ MI
                    PER A=0    B=26    C=17    D=57
                    TP=.139    HRS    RAIN=-1

*
PRINT HYD          ID=1    CODE=1
*S * * * * *
*S * * * * CONFLUENCE OF IVORY AND SPUR * * * * *
*S * * * * *
*C    COMBINE HYD.'S    115.10    AND    113    AT    113.10
*
ADD HYD            ID=6    HYD=113.10    ID I=1    ID II=6
*
PRINT HYD          ID=6    CODE=1
*S * * * * * AP 113.90 * * * * *
*C    ROUTE HYD. 113.10    TO 113.90
*
COMPUTE RATING CURVE    CID=1    VS NO=1    CODE=-1    SLP=0.042
                        DIA=66    IN    N=0.013
COMPUTE TRAVEL TIME    ID=2    RN=1    NO VS=1    L=1480 FT    SLP=0.042

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                                BL10D35B
ROUTE                          ID=2  HYD=113.90  INFLOW ID=6 DT=0.0
PRINT HYD                      ID=2  CODE=1
*
* TP'S CALCULATED IN FEMA STUDY SEE BLARD-15
COMPUTE NM HYD                 ID=1    HYD=112    DA=0.0736    SQ MI
                                PER A=0    B=26    C=22    D=52
                                TP=.168    HRS    RAIN=-1
*
PRINT HYD                      ID=1    CODE=1
*
*C    COMBINE HYD.'S  113.90    AND  112    AT  112.10
*
*S * * * * *
*S    SOUTHERN BLVD. @ 1900 FT. E. OF PECOS LP.
*S * * * * *
*S    IVORY CHANNEL @ SOUTHERN BLVD
*S * * * * *
ADD HYD                        ID=6    HYD=112.10    ID I=1    ID II=2
*
PRINT HYD                      ID=6    CODE=1
*S * * * * *
*S * * * IVORY ARROYO
*S * * * * *
*C    ROUTE HYD.  112.10    TO  112.90
*
COMPUTE RATING CURVE          CID=1  VS NO=1  CODE=-1  SLP=0.027
                                DIA=84  IN  N=0.013
COMPUTE TRAVEL TIME           ID=2  RN=1  NO VS=1  L=2360 FT  SLP=0.027
ROUTE                         ID=2  HYD=112.90  INFLOW ID=6 DT=0.0
PRINT HYD                      ID=2  CODE=1
*
* ADJUST SEDIMENT BULK FACTOR FOR UNIT 10 AREA
SEDIMENT BULK                 CODE=1  BULK FACTOR=1.18
*
COMPUTE LT TP                  LCODE=1  NK=3    ISLOPE=0
                                L=400    S=0.063    K=1
                                L=1200   S=0.050    K=2
                                L=1200   S=0.033    K=3
*
COMPUTE NM HYD                 ID=1    HYD=117    DA=0.1259    SQ MI
                                PER A=6    B=26    C=21    D=47
                                TP=0.0    HRS    RAIN=-1
*
PRINT HYD                      ID=1    CODE=1
*
*C    COMBINE HYD.'S  112.90    AND  117    AT  117.10
*
ADD HYD                        ID=6    HYD=117.10    ID I=1    ID II=2
*
PRINT HYD                      ID=6    CODE=1
*S * * * * *
*S * * * CONFLUENCE OF IVORY AND LISBON ARROYOS IN PARK * * * * *
*S * * * * *
*C    COMBINE HYD.'S  117.10    AND  116.10    AT  117.20
*
ADD HYD                        ID=5    HYD=117.20    ID I=5    ID II=6
*
* RE-DIRECT SUB-BASIN 118A
*
COMPUTE LT TP                  LCODE=1  NK=4    ISLOPE=0
                                L=400    S=0.05    K=1
                                L=600    S=0.083    K=2
                                L=2000   S=0.050    K=3
                                L=2000   S=0.050    K=4
                                KN=0.0    CD=0.0    QP=300 CFS
*
COMPUTE NM HYD                 ID=1    HYD=118A    DA=0.1733    SQ MI
                                PER A=9    B=26    C=26    D=39
                                TP=0.0    HRS    RAIN=-1
*
PRINT HYD                      ID=1    CODE=1
*
* ROUTE 118A TO AP 117.30 AT 118A.90
*

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                                BL10D35B
COMPUTE RATING CURVE      CID=1 VS NO=1 CODE=-1 SLP=0.0267
                          DIA=60 IN N=0.013
COMPUTE TRAVEL TIME      ID=2 RN=1 NO VS=1 L=1600 FT SLP=0.0267
ROUTE                    ID=2 HYD=118A.90 INFLOW ID=1 DT=0.0
PRINT HYD                 ID=2 CODE=1
*
*C   COMBINE HYD.'S      118A.90   AND 117.20   AT 117.30
*
*S ***** AP 118A.10 *****
ADD HYD                    ID=5   HYD=118A.10   ID I=5   ID II=2
*
PRINT HYD                  ID=5   CODE=0
PUNCH HYD                  ID=5
*
*S PUNCH AND ADJUST HYDROGRAPH TO DELETE "FIRST FLUSH" RUNOFF AND SEND TO
*S WATER QUALITY PONDS WHICH IS ESSENTIALLY OUT OF THE SYSTEM THROUGH TIMING.
*
RECALL HYD                 ID= 5 HYD=118A.10
                          DT= .050000 HRS DA= 2.6577 SQ MI
                          PEAK= 2797.592CFS RO= 1.1555 INCHES NO PTS=600
                          FLOW RATES

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.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	2400.000	2797.592	2513.672	2124.370
1770.360	1485.860	1262.853	1088.776	952.434
841.898	750.610	663.286	570.149	478.637
397.535	330.866	280.285	241.821	211.474
187.978	168.664	151.818	137.679	125.610
114.296	104.363	96.441	89.785	83.844
78.448	73.528	69.052	65.015	61.337
57.997	54.965	52.226	49.760	47.546
45.535	43.684	42.003	40.470	39.057
37.782	36.661	35.664	34.756	33.929
33.181	32.497	31.879	31.312	30.802
30.362	29.961	29.599	29.268	28.994
28.735	28.509	28.315	28.148	28.018
27.904	27.834	27.788	27.729	27.702
27.692	27.685	27.672	27.688	27.716
27.749	27.804	27.880	27.947	28.013
28.095	28.196	28.312	28.420	28.551
28.690	28.821	28.935	29.072	29.238
29.388	29.520	29.675	29.846	30.015
30.177	30.328	30.460	30.547	30.619
30.662	30.695	30.707	30.715	30.704
30.666	30.620	30.570	30.519	30.468
30.419	30.375	30.331	30.262	30.198
30.129	30.068	30.003	29.950	29.889
29.811	29.733	29.658	29.585	29.517
29.454	29.398	29.349	29.302	29.232
29.174	29.134	29.073	29.019	28.954
28.875	28.824	28.769	28.696	28.623
28.553	28.487	28.426	28.370	28.321
28.278	28.236	28.170	28.115	28.077
28.018	27.965	27.907	27.860	27.804
27.735	27.694	27.649	27.587	27.524
27.462	27.404	27.349	27.298	27.253
27.213	27.174	27.109	27.055	27.019
26.960	26.913	26.887	26.834	26.765
26.723	26.678	26.646	26.606	26.548
26.487	26.427	26.369	26.318	26.295
26.241	26.179	26.138	26.104	26.075
26.051	26.025	25.973	25.926	25.869
25.825	25.800	25.753	25.715	25.667
25.605	25.571	25.530	25.475	25.450
25.419	25.371	25.322	25.274	25.226
25.181	25.138	25.099	25.064	25.035
25.010	24.983	24.930	24.885	24.862
24.840	24.792	24.750	24.701	24.661
24.616	24.581	24.541	24.513	24.477
24.427	24.404	24.375	24.332	24.317

BL10D35B

24.296	24.256	24.215	24.172	24.129
24.087	24.047	24.010	23.977	23.948
23.924	23.898	23.846	23.801	23.779
23.757	23.709	23.673	23.655	23.615
23.587	23.578	23.546	23.521	23.484
23.429	23.399	23.367	23.345	23.314
23.265	23.218	23.202	23.180	23.141
23.099	23.063	23.058	23.050	23.025
22.997	22.970	22.942	22.915	22.888
22.857	22.796	22.744	22.715	22.692
22.671	22.624	22.589	22.573	22.534
22.505	22.494	22.461	22.434	22.400
22.380	22.379	22.351	22.304	22.282
22.256	22.239	22.213	22.171	22.155
22.133	22.097	22.088	22.073	22.037
21.999	21.959	21.924	21.920	21.912
21.888	21.862	21.837	21.813	21.788
21.764	21.740	21.712	21.656	21.608
21.581	21.562	21.549	21.535	21.496
21.468	21.455	21.418	21.390	21.379
21.345	21.322	21.319	21.292	21.272
21.244	21.224	21.197	21.178	21.153
21.138	21.117	21.106	21.084	21.047
21.034	21.013	20.977	20.967	20.950
20.913	20.874	20.838	20.833	20.823
20.795	20.765	20.736	20.707	20.678
20.649	20.628	20.640	20.649	20.636
20.590	20.549	20.526	20.505	20.485
20.469	20.457	20.450	20.441	20.403
20.372	20.362	20.349	20.310	20.280
20.272	20.267	20.236	20.210	20.175
20.153	20.149	20.122	20.100	20.073
20.054	20.028	20.012	19.989	19.975
19.956	19.947	19.931	19.925	19.908
19.874	19.864	19.845	19.810	19.802
19.786	19.755	19.753	19.743	19.713
19.680	19.649	19.648	19.642	19.617
19.589	19.561	19.533	19.505	19.483
19.493	19.500	19.489	19.478	19.465
19.451	19.435	19.412	19.357	19.309
19.281	19.259	19.243	19.233	19.229
19.224	19.192	19.166	19.160	19.158
19.152	19.120	19.095	19.093	19.091
19.061	18.984	18.565	17.843	17.010
16.109	15.176	14.253	13.375	12.578
11.883	11.295	10.809	10.412	10.093
9.836	9.629	9.462	9.327	9.217
9.126	9.051	8.987	8.934	8.889
8.851	8.817	8.788	8.763	8.741
8.722	8.704	8.688	8.674	8.662
8.651	8.640	8.631	8.621	8.613
8.605	8.597	8.590	8.583	8.576
8.570	8.564	8.557	8.551	8.546
8.540	8.534	8.529	8.523	8.518
8.512	8.507	8.502	8.497	8.491
8.486	8.481	8.476	8.470	8.465
8.460	8.455	8.450	8.444	8.439
8.434	8.429	8.424	8.419	8.414
8.408	8.403	8.398	8.393	8.388
8.383	8.378	8.372	8.367	8.362
8.357	8.352	8.347	8.342	8.337
8.331	8.326	8.321	8.316	8.311
8.306	8.301	8.296	8.291	8.286
8.281	8.276	8.271	8.266	8.261
8.256	8.251	8.246	8.241	8.236
8.230	8.225	8.220	8.215	8.210
8.205	8.200	8.195	8.190	8.186

*
 PRINT HYD ID=5 CODE=0
 PLOT HYD ID=5 ID=0 QSCALE=0 TSCALE=4
 *
 *C ROUTE HYD. 118A.10 TO 118.91
 *
 COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3

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                                BL10D35B
ELMIN=0  ELMAX=4.8  CH SLP=.024 ft/ft  FP SLP=.024 ft/ft
N=.045 DIST=15 N=-0.013 DIST=78  N=.045 DIST=93
    DIST    ELEV
    0       4.8
    15      4.5
    24      0.0
    69      0.0
    78      4.5
    93      4.8

*
*COMPUTE TRAVEL TIME  ID=2      REACH=1  NO VS=1
*                      L=1800    SLP=0.024
ROUTE MCUNGE          ID=2      HYD=118.91  INFLOW ID=5  DT=0.00
                      L=1800    NO VS=1  SLP=0.024

*
PRINT HYD              ID=2      CODE=1
*S * * * * *
*S * * * START OF WEST BRANCH ARROYO * * * * *
*S * * * * *
COMPUTE LT TP          LCODE=1    NK=3      ISLOPE=0
                      L=400      S=0.025      K=1
                      L=1100     S=0.029      K=2
                      L=1700     S=0.029      K=4
COMPUTE NM HYD         ID=1      HYD=119      DA=0.0864  SQ MI
PER A=8                B=39      C=23      D=30
TP=0.0                 HRS      RAIN=-1

*
PRINT HYD              ID=1      CODE=1
*
*C COMBINE HYD. 'S 118.91      AND 119      AT 119.10
*
ADD HYD                ID=5      HYD=119.10      ID I=1      ID II=2
*
PRINT HYD              ID=5      CODE=1
*
COMPUTE LT TP          LCODE=1    NK=3      ISLOPE=0
                      L=400      S=0.030      K=1
                      L=600      S=0.050      K=2
                      L=1690     S=0.0178     K=4
COMPUTE NM HYD         ID=1      HYD=120B      DA=0.0864  SQ MI
PER A=5                B=28      C=28      D=39
TP=0.0                 HRS      RAIN=-1

*
PRINT HYD              ID=1      CODE=1
*
*C ROUTE HYD. 119.10      TO 119.90
*
COMPUTE RATING CURVE  CID=1      VS NO=1  NSEGS=3
ELMIN=0  ELMAX=4.8  CH SLP=.024 ft/ft  FP SLP=.024 ft/ft
N=.045 DIST=15 N=-0.013 DIST=78  N=.045 DIST=93
    DIST    ELEV
    0       4.8
    15      4.5
    24      0.0
    69      0.0
    78      4.5
    93      4.8

*
COMPUTE TRAVEL TIME  ID=4      REACH=1  NO VS=1
                      L=2400    SLP=0.024
ROUTE                ID=4      HYD=119.90  INFLOW ID=5  DT=0.00
*
PRINT HYD            ID=4      CODE=1
*
* COMBINE HYDS 119.90 AND 120B AT 120B.10
*
ADD HYD              ID=4      HYD=120B.10  ID=1  ID II=4
*
PRINT HYD            ID=4      CODE=1
*
*S * * * * *
*S * * * START OF TRIBUTARY "C" * * * * *
*S * * * * *

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                                BL10D35B
COMPUTE LT TP                LCODE=1  NK=3  ISLOPE=0
                              L=400   S=0.042      K=1
                              L=600   S=0.042      K=2
                              L=2000  S=0.042      K=4
*
COMPUTE NM HYD               ID=1    HYD=118B      DA=0.0620  SQ MI
                              PER A=9    B=26      C=26      D=39
                              TP=0.0    HRS        RAIN=-1
*
PRINT HYD                    ID=1    CODE=1
*
*
*C  ROUTE HYD.  118B        TO 118B.90
*
COMPUTE RATING CURVE        CID=1  VS NO=1  CODE=-1  SLP=0.023
                              DIA=72 IN  N=0.013
COMPUTE TRAVEL TIME        ID=2  RN=1  NO VS=1  L=3200 FT  SLP=0.023
ROUTE                      ID=2  HYD=118B.90  INFLOW ID=1  DT=0.0
PRINT HYD                  ID=2  CODE=1
*
COMPUTE LT TP                LCODE=1  NK=3  ISLOPE=0
                              L=400   S=0.04      K=1
                              L=1600  S=0.05      K=2
                              L=3000  S=0.05      K=3
                              KN=0.0  CD=0.0      QP=375 CFS
COMPUTE NM HYD              ID=1    HYD=120A      DA=0.1278  SQ MI
                              PER A=5    B=28      C=28      D=39
                              TP=0.0    HRS        RAIN=-1
*
PRINT HYD                    ID=1    CODE=1
*
*C  COMBINE HYD.'S 118B.90  AND 120A      AT 120A.10
*
ADD HYD                      ID=5    HYD=120A.10  ID I=2    ID II=1
*
PRINT HYD                    ID=5    CODE=1
*
*S * * * * *
*S * * * CONFLUENCE OF TRIBUTARY "C" WITH WEST BRANCH ARROYO * * * * *
*S * * * * *
*C  COMBINE HYD.'S 120B.10  AND 120A.10  AT 120A.20
*
ADD HYD                      ID=5    HYD=120A.20  ID I=4    ID II=5
*
PRINT HYD                    ID=5    CODE=1
*
COMPUTE LT TP                LCODE=1  NK=4  ISLOPE=0
                              L=400   S=0.038      K=1
                              L=1600  S=0.038      K=2
                              L=3500  S=0.038      K=3
                              L=1000  S=0.038      K=4
                              KN=0.0  CD=0.0      QP=225 CFS
*
COMPUTE NM HYD              ID=1    HYD=155      DA=0.1245  SQ MI
                              PER A=1    B=18      C=23      D=58
                              TP=0.0    HRS        RAIN=-1
*
PRINT HYD                    ID=1    CODE=1
*
*C  COMBINE HYD.'S 155      AND 120A.20  AT 155.10
*
ADD HYD                      ID=9    HYD=155.10  ID I=1    ID II=5
*
PRINT HYD                    ID=9    CODE=1
*S * * * * *
*S * * * URBAN AREA WEST OF UNSER, EAST OF LISBON CHANNEL, NORTH OF * * * * *
*S * * * SOUTHERN AND SOUTH OF TULIP * * * * *
*S * * * * *
* ADJUST SEDIMENT FOR NORTHERN URBAN AREA
SEDIMENT BULK                CODE=1  BULK FACTOR=1.06
* * * * *
*S ALL 300 AND 400 SERIES BASINS ARE COMPUTED WITH ORIGINAL TP'S FROM * * *
*S THE FEMA RESTUDY MODEL * * *

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                                BL10D35B
COMPUTE RATING CURVE CID=1 VALLEY SECTION=1 NUMBER OF SEGMENTS=3
      MINIMUM ELEV=0.0 FT MAXIMUM ELEV=1.5 FT
      CHANNEL SLOPE=0.0043 FLOOD PLAIN SLOPE=0.0043
      N=0.030 DIST=16.7 N=-0.017 DIST=48.1 N=0.030 DIST=64
      DIST ELEV DIST ELE DIST ELEV DIST ELEV
      0.0 1.5 8.0 .9 16.7 .7 16.9 0.0
      18.9 0.1 32.0 0.4 45.1 0.1 47.9 0.0
      48.1 0.7 56.0 0.9 64.0 1.5
COMPUTE TRAVEL TIME ID=3 REACH NO=1 VALLEY SECTIONS=1
      LENGTH=875 FT SLOPE=0.0043
ROUTE ID=3 HYD NO=320.90 INFLOW ID=10 DT=0.0
PRINT HYD ID=3 CODE=1
** ADD THE ROUTED FLOW FROM BASIN 320 TO THE FLOW AT THE INTERSECTION OF
** WEXFORD AND ARCTURUS
ADD HYD ID=4 HYD=320.10 ID I=4 ID II=3
PRINT HYD ID=4 CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 400 THE DETENTION POND SITE
COMPUTE NM HYD ID=2 HYD=400 DA=0.0041 SM
      %A=0.0 %B=50.0 %C=50.0 %D=0.0 TP=0.13333
      MASS RAINFALL=-1
PRINT HYD ID=2 CODE=1
** ADD THE FLOW IN WEXFORD AT THE INTERSECTION WITH ARCTURUS TO THE DETENTION
** POND TO BE LOCATED ON THE SOUTH SIDE OF WEXFORD
ADD HYD ID=4 HYD=400.1 ID I=4 ID II=2
PRINT HYD ID=4 CODE=1
** ROUTE THE FLOW THROUGH THE DETENTION POND
*S ***** AP 400.30 *****INFLOW INTO WEXFORD POND*****
*S*****
ROUTE RESERVOIR ID=5 HYD NO=400.90 INFLOW ID=4 CODE=24
      OUTFLOW(cfs) STORAGE(ac ft) ELEV(ft)
      0 0.0 31.5
      10.00 0.01 32
      60.0 0.19 33
      78.0 0.60 34
      92.0 1.23 35
      102.0 2.35 36
      120.0 5.52 38
      FLOW OVER SPILLWAY NIC 135.0 9.19 40
      142.0 11.25 41
      145.0 12.50 41.5
*S ***** AP 400.OUT (BEFORE DIVIDE) *****
PRINT HYD ID=5 CODE=1
*
*S *****DIVIDE HYD TO UNBULK TO 3% *****
DIVIDE HYD ID=5 %=-97 ID I=1 HYD=UNBULK
      ID II=53 HYD=SEDIMENT
*S DIVIDE INTO PIPE AND SPILLWAY FLOWS AP 400.OUT PIPE AND SPILL *****
DIVIDE HYD ID=1 Q=135 ID I=1 HYD NO=400.81 PIPE
      ID II=3 HYD NO=400.82 SPILL
*
** ROUTE THE OUTFLOW FROM THE POND (400.81) THROUGH A 42" STORM DRAIN
** TO THE CHANNEL ADJACENT TO 20TH. OUTFALL TO CHANNEL BELOW ZARAGOSA ST.
COMPUTE RATING CURVE CID=1 VALLEY SECTION NO=1 CODE=-1 SLOPE=0.018
      PIPE DIA=42 N=0.013
COMPUTE TRAVEL TIME ID=6 REACH=1 NUMBER OF VALLEY SECTIONS=1
      LENGTH=900 FT SLOPE=0.018
ROUTE ID=6 HYD NO=400.9 INFLOW ID=1 DT=0.0
PRINT HYD ID=6 CODE=1
* ROUTE THE FLOW OVER THE SPILLWAY (400.82) THROUGH THE STREET TILL IT DUMPS
* INTO THE STORM DRAIN
COMPUTE RATING CURVE CID=1 VALLEY SECTION=1 NUMBER OF SEGMENTS=3
      MINIMUM ELEV=0.0 FT MAXIMUM ELEV=1.5 FT
      CHANNEL SLOPE=0.0330 FLOOD PLAIN SLOPE=0.0330
      N=0.030 DIST=16.7 N=-0.017 DIST=48.1 N=0.030 DIST=64
      DIST ELEV DIST ELE DIST ELEV DIST ELEV
      0.0 1.5 8.0 .9 16.7 .7 16.9 0.0
      18.9 0.1 32.0 0.4 45.1 0.1 47.9 0.0
      48.1 0.7 56.0 0.9 64.0 1.5
COMPUTE TRAVEL TIME ID=2 REACH NO=1 VALLEY SECTIONS=1
      LENGTH=900 FT SLOPE=0.0330
ROUTE ID=2 HYD NO=400.91 INFLOW ID=3 DT=0.0
PRINT HYD ID=2 CODE=1
*
ADD HYD ID=6 HYD=400.20 ID I=2 ID II=6

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PRINT HYD          ID=6   CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 410 THE EASTERN ONSITE RESIDENTIAL AREA
COMPUTE NM HYD      ID=3   HYD=410  DA==0.0363 SM
                     %A=0   %B=19   %C=17   %D=64   TP=0.1689
                     MASS RAINFALL=-1
PRINT HYD          ID=3   CODE=1
** ADD THE FLOW FROM BASIN 410 TO THE ROUTED FLOW FROM THE POND OUTFALL AT
** THE HEAD OF THE 20TH STORM DRAIN BELOW ZARAGOSA STREET
ADD HYD             ID=4   HYD=410.1  ID I=6   ID II=3
PRINT HYD          ID=4   CODE=1
** ROUTE THE COMBINED FLOW DOWN THE 20TH STORM DRAIN. ASSUME A 60" PIPE
** WITH ADEQUATE INLET CAPACITY
COMPUTE RATING CURVE CID=1 VALLEY SECTION NO=1 CODE=-1 SLOPE=0.006
                     PIPE DIA=60 N=0.013
COMPUTE TRAVEL TIME ID=2 REACH=1 NUMBER OF VALLEY SECTIONS=1
                     LENGTH=1200 FT SLOPE=0.006
ROUTE              ID=2 HYD NO=410.9 INFLOW ID=4 DT=0.0
PRINT HYD          ID=2 CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 420 THE BASIN CONTRIBUTING FLOW TO SOUTHERN
** BOULEVARD BETWEEN 20TH STREET AND TARPON.
COMPUTE NM HYD      ID=3   HYD=420  DA==0.0516 SM
                     %A=0   %B=0    %C=15   %D=85   TP=0.133
                     MASS RAINFALL=-1
PRINT HYD          ID=3   CODE=1
** ADD THE FLOW FROM BASIN 420 TO THE ROUTED FLOW IN THE 20TH STORM DRAIN
** AT THE INTERSECTION OF SOUTHERN AND 20TH STREET
ADD HYD             ID=14  HYD=420.1  ID I=2   ID II=3
PRINT HYD          ID=14  CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 330 THE UPPER AREA OF THE WATERSHED THAT
** CONTRIBUTES FLOW TO TARPON AVE.
COMPUTE NM HYD      ID=2   HYD=330  DA==0.0633 SM
                     %A=0   %B=15   %C=18   %D=67   TP=0.1622
                     MASS RAINFALL=-1
PRINT HYD          ID=2   CODE=1
** ROUTE THE FLOW FROM BASIN 330 DOWN TARPON AVE FROM ALGADONES CT. TO
** SOUTHERN BOULEVARD
COMPUTE RATING CURVE CID=1 VALLEY SECTION=1 NUMBER OF SEGMENTS=3
                     MINIMUM ELEV=0.0 FT MAXIMUM ELEV=1.5 FT
                     CHANNEL SLOPE=0.0249 FLOOD PLAIN SLOPE=0.0249
                     N=0.030 DIST=16.7 N=-0.017 DIST=48.1 N=0.030 DIST=64
                     DIST ELEV DIST ELEV DIST ELEV DIST ELEV
                     0.0 1.5 8.0 .9 16.7 .7 16.9 0.0
                     18.9 0.1 32.0 0.4 45.1 0.1 47.9 0.0
                     48.1 0.7 56.0 0.9 64.0 1.5
COMPUTE TRAVEL TIME ID=3 REACH NO=1 VALLEY SECTIONS=1
                     LENGTH=2150 FT SLOPE=0.0249
ROUTE              ID=3 HYD NO=330.9 INFLOW ID=2 DT=0.0
PRINT HYD          ID=3 CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 340 THE LOWER AREA OF THE WATERSHED THAT
** CONTRIBUTES FLOW TO TARPON AVE.
COMPUTE NM HYD      ID=1   HYD=340  DA==0.0458 SM
                     %A=0   %B=18   %C=18   %D=64   TP=0.1527
                     MASS RAINFALL=-1
PRINT HYD          ID=1   CODE=1
** ADD THE ROUTED FLOW FROM BASIN 330 TO THE FLOW FROM BASIN 340 AT THE
** INTERSECTION OF TARPON AVE AND SOUTHERN BOULEVARD
ADD HYD             ID=4   HYD=340.1  ID I=1   ID II=3
PRINT HYD          ID=4   CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 430 THE LOWER AREA OF THE ONSITE WATERSHED THAT
** CONTRIBUTES FLOW DIRECTLY TO SOUTHERN BOULEVARD
COMPUTE NM HYD      ID=2   HYD=430  DA==0.0044 SM
                     %A=0   %B=26   %C=15   %D=59   TP=0.1333
                     MASS RAINFALL=-1
PRINT HYD          ID=2   CODE=1
** ADD THE FLOW FROM BASIN 430 TO THE FLOW IN THE SOUTHERN BOULEVARD NEAR THE
** INTERSECTION OF TARPON AVE AND SOUTHERN BOULEVARD
ADD HYD             ID=4   HYD=430.1  ID I=2   ID II=4
PRINT HYD          ID=4   CODE=1
** ROUTE THE FLOW FROM BASINS 330, 340 AND 430 DOWN SOUTHERN FROM TARPON TO THE
** GRADE BREAK IN SOUTHERN. ASSUME A PIPE SIZE, STORM DRAIN SIZES UNAVAILABLE
COMPUTE RATING CURVE CID=1 VALLEY SECTION NO=1 CODE=-1 SLOPE=0.013
                     PIPE DIA=60 N=0.013
COMPUTE TRAVEL TIME ID=3 REACH=1 NUMBER OF VALLEY SECTIONS=1
                     LENGTH=950 FT SLOPE=0.013

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BL10D35B

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ROUTE          ID=3 HYD NO=430.9  INFLOW ID=4  DT=0.0
PRINT HYD      ID=3 CODE=1
* ROUTE THE FLOW DOWN SOUTHERN FROM THE GRADE BREAK TO 20TH. ASSUME A PIPE SIZE.
* STORM DRAIN SIZES UNAVAILABLE
COMPUTE RATING CURVE CID=1  VALLEY SECTION NO=1  CODE=-1  SLOPE=0.006
                    PIPE DIA=66  N=0.013
COMPUTE TRAVEL TIME ID=2  REACH NO=1  VALLEY SECTIONS=1
                    LENGTH=700 FT  SLOPE=0.006
ROUTE          ID=2 HYD NO=430.91  INFLOW ID=3  DT=0.0
PRINT HYD      ID=2 CODE=1
** ADD THE ROUTED FLOW FROM SOUTHERN TO THE ROUTED FLOW AT THE INTERSECTION OF
** SOUTHERN AND 20TH
ADD HYD        ID=10  HYD=430.2  ID I=2  ID II=14
PRINT HYD      ID=10 CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 440 THE NORTH WEST AREA OF THE ONSITE WATERSHED
COMPUTE NM HYD ID=2  HYD=440 DA=0.0106 SM
                    %A=0  %B=24  %C=17  %D=59  TP=0.1333
                    MASS RAINFALL=-1
PRINT HYD      ID=2 CODE=1
** ROUTE THE FLOW WHICH RUNS WEST FROM THE INTERSECTION POLARIS AND WEXFORD
** DOWN WEXFORD STREET TO THE WESTERN SAG POINT IN WEXFORD STREET
COMPUTE RATING CURVE CID=1  VALLEY SECTION=1  NUMBER OF SEGMENTS=3
                    MINIMUM ELEV=0.0 FT  MAXIMUM ELEV=1.5 FT
                    CHANNEL SLOPE=0.007  FLOOD PLAIN SLOPE=0.007
                    N=0.030  DIST=16.7  N=-0.017  DIST=48.1  N=0.030  DIST=64.0
                    DIST  ELEV  DIST  ELEV  DIST  ELEV
                    0.0    1.5    8.0    0.9    16.7    0.7
                    16.9    0.0    18.9    0.1    32.0    0.4
                    45.1    0.1    47.9    0.0    48.1    0.7
                    56.0    0.9    64.0    1.5
COMPUTE TRAVEL TIME ID=3  REACH NO=1  VALLEY SECTIONS=1
                    LENGTH=300 FT  SLOPE=0.007
ROUTE          ID=3 HYD NO=440.9  INFLOW ID=11  DT=0.0
PRINT HYD      ID=3 CODE=1
** ROUTE THE FLOW FROM THE WESTERN SAG POINT IN WEXFORD STREET THROUGH THE
** STREETS OF THE PROPOSED RESIDENTIAL AREA AND A 30' WIDE DRAINAGE EASEMENT
** CHANNEL TO THE UNDEVELOPED AREA LOCATED SOUTH OF THE PROPOSED RESIDENTIAL
** AREA
COMPUTE RATING CURVE CID=1  VALLEY SECTION=1  NUMBER OF SEGMENTS=3
                    MINIMUM ELEV=0.0 FT  MAXIMUM ELEV=1.5 FT
                    CHANNEL SLOPE=0.035  FLOOD PLAIN SLOPE=0.035
                    N=0.030  DIST=16.7  N=-0.017  DIST=48.1  N=0.030  DIST=64.0
                    DIST  ELEV  DIST  ELEV  DIST  ELEV  DIST  ELEV
                    0.0    1.5    8.0    0.9    16.7    .7    16.9    0.0
                    18.9    0.1    32.0    0.4    45.1    0.1    47.9    0.0
                    48.1    0.7    56.0    0.9    64.0    1.5
COMPUTE TRAVEL TIME ID=5  REACH NO=1  VALLEY SECTIONS=1
                    LENGTH=600 FT  SLOPE=0.035
ROUTE          ID=5 HYD NO=440.91  INFLOW ID=3  DT=0.0
PRINT HYD      ID=5 CODE=1
** ADD THE FLOW FROM BASIN 440 TO THE ROUTED FLOW FROM WEXFORD AT THE
** THE SOUTH END OF THE EASEMENT CHANNEL
ADD HYD        ID=4  HYD=440.1  ID I=5  ID II=2
PRINT HYD      ID=4 CODE=1
** ROUTE THE COMBINED FLOW IN AN EARTHEN SWALE TO THE STORM DRAIN THAT
** HAS BEEN CONSTRUCTED WITHIN BASIN 420 (ASSUMED DEVELOPED CONDITIONS
** AND SMALL POND HAS BEEN DEMOLISHED WITH NEW CONSTRUCTION) ASSUME A PIPE SIZE.
** STORM DRAIN SIZES UNAVAILABLE
COMPUTE RATING CURVE CID=1  VALLEY SECTION NO=1  CODE=-1  SLOPE=0.004
                    PIPE DIA=42  N=0.013
COMPUTE TRAVEL TIME ID=2  REACH NO=1  VALLEY SECTIONS=1
                    LENGTH=500 FT  SLOPE=0.004
ROUTE          ID=2 HYD NO=440.92  INFLOW ID=4  DT=0.0
PRINT HYD      ID=2 CODE=1
** ROUTE THE FLOW IN THE ASSUMED STORM DRAIN TO THE INTERSECTION OF SOUTHERN AND
** 20TH STREET. (ASSUME A PIPE SIZE.)
COMPUTE RATING CURVE CID=1  VALLEY SECTION NO=1  CODE=-1  SLOPE=0.023
                    PIPE DIA=42  N=0.013
COMPUTE TRAVEL TIME ID=3  REACH NO=1  VALLEY SECTIONS=1
                    LENGTH=950 FT  SLOPE=0.023
ROUTE          ID=3 HYD NO=440.93  INFLOW ID=2  DT=0.0
PRINT HYD      ID=3 CODE=1
** ADD THE FLOW FROM THE STORM DRAIN CHANNEL TO THE FLOW AT THE
** INTERSECTION OF SOUTHERN AND 20TH

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                                BL10D35B
ADD HYD                      ID=14  HYD=440.2  ID I=3  ID II=10
PRINT HYD                    ID=14  CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 350 THE BASIN CONTRIBUTING TO 20TH STREET
** BETWEEN 2ND STREET AND WEXFORD.
COMPUTE NM HYD               ID=2  HYD=350.0  DA=0.0475  SM
                              %A=0  %B=0  %C=15  %D=85  TP=0.2111
                              MASS RAINFALL=-1
PRINT HYD                    ID=2  CODE=1
** ROUTE THE FLOW FROM BASINS 350, 700 L.F. DOWN 20TH STREET FROM 5TH STREET
** (ASSUME A PIPE SIZE.)
COMPUTE RATING CURVE CID=1  VALLEY SECTION NO=1  CODE=-1  SLOPE=0.0214
                              PIPE DIA=42  N=0.013
COMPUTE TRAVEL TIME          ID=3  REACH NO=1  VALLEY SECTIONS=1
                              LENGTH=700 FT  SLOPE=0.0214
ROUTE                        ID=3  HYD NO=350.9  INFLOW ID=2  DT=0.0
PRINT HYD                    ID=3  CODE=1
** ROUTE THE ROUTED FLOW FROM BASINS 350, FROM 700 L.F. DOWN 20TH STREET FROM
** 5TH STREET TO SOUTHERN BOULEVARD (ASSUME A PIPE SIZE.)
COMPUTE RATING CURVE CID=1  VALLEY SECTION NO=1  CODE=-1  SLOPE=0.0263
                              PIPE DIA=42  N=0.013
COMPUTE TRAVEL TIME          ID=2  REACH NO=1  VALLEY SECTIONS=1
                              LENGTH=2360 FT  SLOPE=0.0263
ROUTE                        ID=2  HYD NO=350.91  INFLOW ID=3  DT=0.0
PRINT HYD                    ID=2  CODE=1
** COMPUTE HYDROGRAPH FOR BASIN 360 THE BASIN CONTRIBUTING TO 20TH STREET
** BETWEEN 5TH STREET AND SOUTHERN.
COMPUTE NM HYD               ID=3  HYD=360.0  DA=0.0145  SM
                              PER A=0  B=27  C=16  D=57  TP=0.1366
                              MASS RAINFALL=-1
PRINT HYD                    ID=3  CODE=1
** ADD THE FLOW FROM BASIN 360 TO THE ROUTED FLOW IN 20TH STREET FROM BASIN
** 350
ADD HYD                      ID=4  HYD=360.1  ID I=2  ID II=3
PRINT HYD                    ID=4  CODE=1
*S ADD THE TOTAL FLOW IN 20TH STREET AT THE NORTH SIDE OF SOUTHERN TO THE
*S TOTAL FLOW ROUTED TO THE INTERSECTION FROM THE NORTH AND THE WEST
*S THIS FLOW IS ROUTED UNDER SOUTHERN TO THE UNSER CHANNEL
*S ***** AP 360.20 *****
ADD HYD                      ID=5  HYD=360.20  ID I=4  ID II=14
PRINT HYD                    ID=5  CODE=1
*
*C  ROUTE HYD.  360.20  TO  360.90
*
*  SIMPLIFIED CROSS SECTION 2-4x6 CBC
COMPUTE RATING CURVE RC=-1  VS NO=1  NSEGS=1
                              ELMIN=0  ELMAX=3  CH SLP=.021 ft/ft  FP SLP=.021 ft/ft
                              N=.015  DIST=12.1
                              DIST  ELEV  DIST  ELEV  DIST  ELEV  DIST  ELEV
                                0      4      0.1      0      12      0      12.1      4
COMPUTE TRAVEL TIME          ID=2  REACH=1  NO VS=1
                              L=120  SLP=0.0210
ROUTE                        ID=2  HYD=360.90  INFLOW ID=5  DT=0.05
*S CONCRETE LINED PORTION OF UNSER CHANNEL
* SIMPLIFIED CROSS SECTION (TRAP. CHANNEL)
COMPUTE RATING CURVE RC=-1  VS NO=1  NSEGS=3
                              ELMIN=0  ELMAX=8  CH SLP=0.021  FP SLP=0.021
                              N=0.045  DIST=15  N=-0.015  DIST=78  N=0.045  DIST=93
                              DIST  ELEV
                                0      10
                                15      8
                                39      0
                                54      0
                                78      8
                                93      10
COMPUTE TRAVEL TIME          ID=5  REACH=1  NO VS=1
                              L=1320  SLP=0.0210
ROUTE                        ID=5  HYD=360.91  INFLOW ID=2  DT=0.05
*S EARTH LINED PORTION OF UNSER CHANNEL
* SIMPLIFIED CROSS SECTION (TRAP. CHANNEL)
COMPUTE RATING CURVE RC=-1  VS NO=1  NSEGS=3
                              ELMIN=0  ELMAX=8  CH SLP=0.021  FP SLP=0.021
                              N=0.045  DIST=15  N=-0.030  DIST=78  N=0.045  DIST=93
                              DIST  ELEV
                                0      10

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BL10D35B

15 8
39 0
54 0
78 8
93 10

COMPUTE TRAVEL TIME

ID=2 REACH=1 NO VS=1
L=4240 SLP=0.0210

ROUTE

ID=2 HYD=360.92 INFLOW ID=5 DT=0.05

PRINT HYD

ID=2 CODE=1

*

SEDIMENT BULK

CODE=1 BULK FACTOR=1.18

*

COMPUTE LT TP

LCODE=1 NK=3 ISLOPE=0
L=1300 S=0.021 K=2
L=1300 S=0.021 K=3
L=4200 S=0.021 K=4
KN=0.0 CD=0.0 QP=400 CFS

*

COMPUTE NM HYD

ID=1 HYD=121 DA=0.2581 SQ MI
PER A=0 B=11 C=19 D=70
TP=0.0 HRS RAIN=-1

*

PRINT HYD

ID=1 CODE=1
*C COMBINE HYD.'S 360.99 AND 121 AT 121.10

*

ADD HYD

ID=5 HYD=121.10 ID I=1 ID II=2

*

PRINT HYD

ID=5 CODE=1

*S * * * * *

*S * * * CONFLUENCE OF UNSER CHANNEL WITH WEST BRANCH ARROYO * * * * *

*S * * * * *

*C COMBINE HYD.'S 155.10 AND 121.10 AT 121.20

*

ADD HYD

ID=5 HYD=121.20 ID I=5 ID II=9

*

PRINT HYD

ID=5 CODE=1

*S * * * * *

*S * * * START OF TRIBUTARY "A" * * * * *

*S * * * * *

COMPUTE LT TP

LCODE=1 NK=3 ISLOPE=0
L=400 S=0.013 K=1
L=1600 S=0.012 K=2
L=4500 S=0.012 K=3
KN=0.0 CD=0.0 QP=250 CFS

*

COMPUTE NM HYD

ID=1 HYD=153 DA=0.1466 SQ MI
PER A=7 B=27 C=27 D=39
TP=0.0 HRS RAIN=-1

*

PRINT HYD

ID=1 CODE=1

*

*C ROUTE HYD. 153 TO 153.90

*

COMPUTE RATING CURVE

CID=1 VS NO=1 CODE=-1 SLP=0.027
DIA=66 IN N=0.013

COMPUTE TRAVEL TIME

ID=4 RN=1 NO VS=1 L=740 FT SLP=0.027

ROUTE

ID=4 HYD=153.90 INFLOW ID=1 DT=0.0

PRINT HYD

ID=4 CODE=1

*

COMPUTE LT TP

LCODE=1 NK=3 ISLOPE=0
L=400 S=0.045 K=1
L=400 S=0.045 K=2
L=2200 S=0.045 K=3

*

COMPUTE NM HYD

ID=1 HYD=150 DA=0.0873 SQ MI
PER A=19 B=23 C=25 D=33
TP=0.0 HRS RAIN=-1

*

PRINT HYD

ID=1 CODE=1

*

*C ROUTE HYD. 150 TO 150.9

*

COMPUTE RATING CURVE

CID=1 VS NO=1 CODE=-1 SLP=0.033
DIA=84 IN N=0.013

```

                                BL10D35B
COMPUTE TRAVEL TIME      ID=2  RN=1  NO VS=1  L=2680 FT  SLP=0.033
ROUTE                    ID=2  HYD=150.90  INFLOW ID=1  DT=0.0
PRINT HYD                ID=2  CODE=1
*
COMPUTE LT TP            LCODE=1  NK=4  ISLOPE=0
                        L=400    S=0.013  K=1
                        L=1600   S=0.022  K=2
                        L=2700   S=0.048  K=3
                        L=700    S=0.043  K=4
                        KN=0.0   CD=0.0   QP=300 CFS
*
COMPUTE NM HYD           ID=1    HYD=152    DA=0.1984  SQ MI
PER A=15  B=26  C=26  D=33
TP=0.0    HRS    RAIN=-1
*
PRINT HYD                ID=1    CODE=1
*
*C  COMBINE HYD.'S  150.90    AND  152    AT  152.10
*
ADD HYD                  ID=6    HYD=152.10    ID I=1    ID II=2
*
PRINT HYD                ID=6    CODE=1
*
*C  ROUTE HYD.  152.10    TO  152.90
*
COMPUTE RATING CURVE     CID=1  VS NO=1  CODE=-1  SLP=0.027
DIA=66  IN  N=0.013
COMPUTE TRAVEL TIME      ID=2  RN=1  NO VS=1  L=340 FT  SLP=0.027
ROUTE                    ID=2  HYD=152.90  INFLOW ID=6  DT=0.0
PRINT HYD                ID=2  CODE=1
*
COMPUTE LT TP            LCODE=1  NK=3  ISLOPE=0
                        L=400    S=0.041  K=1
                        L=1600   S=0.041  K=2
                        L=3000   S=0.041  K=3
                        KN=0.0   CD=0.0   QP=260 CFS
*
COMPUTE NM HYD           ID=1    HYD=151    DA=0.1513  SQ MI
PER A=9   B=28  C=28  D=35
TP=0.0    HRS    RAIN=-1
*
PRINT HYD                ID=1    CODE=1
*
*C  ROUTE HYD.  151    TO  151.90
*
COMPUTE RATING CURVE     CID=1  VS NO=1  CODE=-1  SLP=0.033
DIA=84  IN  N=0.013
COMPUTE TRAVEL TIME      ID=3  RN=1  NO VS=1  L=480 FT  SLP=0.033
ROUTE                    ID=3  HYD=151.90  INFLOW ID=1  DT=0.0
PRINT HYD                ID=3  CODE=1
*
*C  COMBINE HYD.'S  152.91    AND  151.90    AT  152.10
*
ADD HYD                  ID=6    HYD=152.10    ID I=2    ID II=3
*
PRINT HYD                ID=6    CODE=1
*
*C  ROUTE HYD.  152.10    TO  152.91
*
COMPUTE RATING CURVE     CID=1  VS NO=1  CODE=-1  SLP=0.033
DIA=84  IN  N=0.013
COMPUTE TRAVEL TIME      ID=2  RN=1  NO VS=1  L=620 FT  SLP=0.033
ROUTE                    ID=2  HYD=152.91  INFLOW ID=6  DT=0.0
PRINT HYD                ID=2  CODE=1
*
*C  COMBINE HYD.'S  153.90    AND  152.91    AT  153.10
*S  ***** AP 153.10 *****
*
ADD HYD                  ID=6    HYD=153.10    ID I=4    ID II=2
*
PRINT HYD                ID=6    CODE=1
*S  *****
*S  ROUTE HYD.  THROUGH TRIBUTARY "A" DAM
*S  *****

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                                BL10D35B
ROUTE RESERVOIR      ID=2 HYD NO=TRIBA.DAM INFLOW ID=6 CODE=24
                     OUTFLOW(cfs)      STORAGE(ac ft)      ELEV(ft)
                           0              0.0              10
                           5              50              20
                           1000          70              22

*
PRINT HYD            ID=2      CODE=1
*S *****DIVIDE HYD TO UNBULK BY 3% *****
DIVIDE HYD           ID=2      %=-97      ID I=2 HYD=UNBULK
                                      ID II=54 HYD=SEDIMENT

*
*C   ROUTE HYD. UNBULK TO 153.91 IN A PIPE
*
COMPUTE RATING CURVE  CID=1 VS NO=1 CODE=-1 SLP=0.026
                     DIA=24 IN N=0.013

*
COMPUTE TRAVEL TIME  ID=6      REACH=1 NO VS=1
                     L=2100 SLP=0.026
ROUTE                ID=6 HYD=153.91 INFLOW ID=2 DT=0.00
*
PRINT HYD            ID=6      CODE=1
*
COMPUTE LT TP        LCODE=1 NK=3 ISLOPE=0
                     L=400 S=0.025 K=1
                     L=1600 S=0.037 K=2
                     L=2500 S=0.037 K=4
                     KN=0.0 CD=0.0 QP=350 CFS

*
COMPUTE NM HYD       ID=1 HYD=154 DA=0.2191 SQ MI
                     PER A=13 B=29 C=28 D=30
                     TP=0.0 HRS RAIN=-1

*
PRINT HYD            ID=1 CODE=1
*
*C   COMBINE HYD.'S 154 AND 153.91 AT 154.10
*
ADD HYD              ID=6 HYD=154.10 ID I=1 ID II=6
*
PRINT HYD            ID=6 CODE=1
*
*C   ROUTE HYD. 154.10 TO 154.90 IN A PIPE
*
COMPUTE RATING CURVE  CID=1 VS NO=1 CODE=-1 SLP=0.026
                     DIA=60 IN N=0.013

*
COMPUTE TRAVEL TIME  ID=2 REACH=1 NO VS=1
                     L=3200 SLP=0.026
ROUTE                ID=2 HYD=154.90 INFLOW ID=6 DT=0.00
*
PRINT HYD            ID=2 CODE=1
*
COMPUTE LT TP        LCODE=1 NK=2 ISLOPE=0
                     L=1400 S=0.05 K=2
                     L=3200 S=0.025 K=4
                     KN=0.0 CD=0.0 QP=120 CFS

COMPUTE NM HYD       ID=1 HYD=159 DA=0.0600 SQ MI
                     PER A=3 B=10 C=20 D=67
                     TP=0.0 HRS RAIN=-1

*
PRINT HYD            ID=1 CODE=1
*
*C   COMBINE HYD.'S 154.90 AND 159 AT 159.10
*
ADD HYD              ID=6 HYD=159.10 ID I=1 ID II=2
*
PRINT HYD            ID=6 CODE=1
*
*C   COMBINE HYD.'S 121.20 AND 159.10 AT 159.20
*****
*S * * * CONFLUENCE OF TRIB. "A" WITH WEST BRANCH ARROYO * * * * *
*****
*S   BLACK ARROYO @ UNSER BLVD. (WEST BRANCH)
*S ***** AP 159.20 *****
ADD HYD              ID=5 HYD=159.20 ID I=5 ID II=6

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BL10D35B

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*
PRINT HYD          ID=5    CODE=1
PUNCH HYD          ID=5
*
*S PUNCH AND ADJUST HYDROGRAPH TO DELETE "FIRST FLUSH" RUNOFF AND SEND TO
*S WATER QUALITY PONDS WHICH IS ESSENTIALLY OUT OF THE SYSTEM THROUGH TIMING.
*
RECALL HYD          ID= 5 HYD=      159.20 DT= .050000 HRS DA= 4.8223 SQ MI
PEAK= 5161.144CFS RO= 1.2186 INCHES NO PTS=600
FLOW RATES
      .000      .000      .000      .000      .000
      .000      .000      .000      .000      .000
      .000      .000      .000      .000      .000
      .000      .000      .000      .000      .000
      .000      .000      .000      .000      .000
      .000      .000      .000      .000      .000
1000.000 2524.153 3288.788 5161.144 4663.998
3826.873 3250.050 2786.467 2414.111 2120.276
1885.953 1694.527 1513.538 1327.000 1150.686
994.768 856.276 742.599 656.947 589.622
530.388 479.768 440.669 409.502 382.704
359.265 338.363 319.474 302.727 287.951
274.777 262.872 252.147 242.445 233.439
225.005 217.009 209.497 202.495 196.015
189.982 184.215 178.618 173.091 167.410
161.321 153.720 143.803 130.880 117.289
106.344 98.239 91.759 86.152 81.379
77.381 74.017 71.206 68.791 66.729
64.904 63.316 61.946 60.760 59.765
58.892 58.190 57.611 57.053 56.603
56.248 55.947 55.663 55.470 55.349
55.263 55.235 55.268 55.293 55.309
55.369 55.497 55.681 55.849 56.062
56.298 56.521 56.703 56.935 57.263
57.576 57.833 58.127 58.474 58.826
59.151 59.448 59.710 59.883 60.033
60.152 60.274 60.368 60.458 60.506
60.484 60.430 60.369 60.311 60.253
60.194 60.135 60.066 59.929 59.793
59.650 59.535 59.417 59.321 59.207
59.044 58.869 58.704 58.556 58.422
58.298 58.183 58.077 57.968 57.799
57.647 57.551 57.423 57.301 57.159
56.984 56.871 56.762 56.613 56.450
56.294 56.155 56.028 55.910 55.803
55.705 55.604 55.443 55.298 55.208
55.085 54.968 54.840 54.737 54.620
54.466 54.371 54.280 54.147 54.000
53.859 53.733 53.620 53.516 53.420
53.331 53.239 53.086 52.947 52.862
52.743 52.641 52.584 52.476 52.315
52.204 52.112 52.051 51.968 51.833
51.688 51.550 51.427 51.327 51.294
51.191 51.044 50.934 50.855 50.793
50.736 50.672 50.545 50.419 50.288
50.196 50.159 50.076 49.993 49.884
49.738 49.653 49.571 49.458 49.399
49.338 49.233 49.112 48.995 48.892
48.801 48.716 48.637 48.565 48.497
48.435 48.368 48.239 48.122 48.069
48.037 47.943 47.843 47.731 47.645
47.554 47.483 47.404 47.345 47.266
47.148 47.087 47.026 46.933 46.893
46.850 46.762 46.657 46.554 46.465
46.385 46.309 46.239 46.174 46.112
46.055 45.993 45.867 45.754 45.703
45.673 45.581 45.493 45.451 45.370
45.302 45.278 45.212 45.148 45.058
44.932 44.866 44.810 44.778 44.723
44.612 44.497 44.458 44.424 44.344
44.243 44.155 44.149 44.143 44.085
44.007 43.930 43.864 43.806 43.753
43.694 43.569 43.454 43.398 43.373
43.344 43.242 43.148 43.103 43.020

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BL10D35B

42.952	42.928	42.861	42.797	42.716
42.667	42.672	42.618	42.503	42.438
42.386	42.362	42.312	42.219	42.180
42.138	42.061	42.036	42.006	41.930
41.836	41.743	41.673	41.680	41.683
41.633	41.560	41.487	41.426	41.372
41.324	41.280	41.228	41.109	41.000
40.951	40.932	40.919	40.891	40.794
40.706	40.669	40.593	40.531	40.512
40.450	40.398	40.388	40.333	40.280
40.211	40.163	40.108	40.071	40.023
39.992	39.949	39.923	39.874	39.785
39.750	39.713	39.641	39.619	39.592
39.517	39.423	39.341	39.339	39.338
39.283	39.206	39.130	39.064	39.005
38.951	38.913	38.946	38.974	38.937
38.807	38.686	38.632	38.613	38.600
38.582	38.561	38.540	38.509	38.413
38.327	38.302	38.296	38.226	38.157
38.144	38.146	38.083	38.012	37.929
37.881	37.883	37.839	37.792	37.727
37.682	37.630	37.595	37.549	37.521
37.481	37.458	37.423	37.404	37.364
37.282	37.254	37.224	37.157	37.140
37.117	37.056	37.045	37.027	36.962
36.879	36.807	36.815	36.822	36.774
36.704	36.634	36.573	36.519	36.480
36.513	36.540	36.512	36.460	36.409
36.369	36.335	36.293	36.185	36.086
36.045	36.029	36.018	36.002	35.984
35.958	35.867	35.787	35.768	35.779
35.783	35.712	35.646	35.638	35.645
35.588	35.427	34.526	32.934	31.204
29.590	28.122	26.731	25.381	24.074
22.816	21.627	20.531	19.542	18.664
17.896	17.227	16.649	16.149	15.717
15.344	15.018	14.734	14.485	14.267
14.072	13.900	13.749	13.615	13.495
13.388	13.292	13.206	13.130	13.061
12.999	12.942	12.891	12.846	12.804
12.766	12.733	12.702	12.674	12.648
12.623	12.600	12.580	12.561	12.542
12.526	12.511	12.497	12.483	12.471
12.458	12.447	12.435	12.425	12.414
12.404	12.395	12.386	12.377	12.368
12.360	12.351	12.343	12.335	12.326
12.318	12.311	12.304	12.297	12.290
12.282	12.275	12.267	12.260	12.253
12.245	12.239	12.232	12.226	12.219
12.212	12.205	12.198	12.191	12.183
12.176	12.170	12.163	12.156	12.150
12.143	12.136	12.130	12.123	12.116
12.109	12.103	12.097	12.090	12.084
12.077	12.071	12.064	12.058	12.050
12.044	12.037	12.031	12.024	12.018
12.011	12.004	11.997	11.991	11.984

*

*

PRINT HYD ID=5 CODE=1
PLOT HYD ID=5 ID=0 QSCALE=0 TSCALE=4

*

*C ROUTE HYD. 159.20 TO 159.90

*

COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3
ELMIN=0 ELMAX=5.3 CH SLP=.017 ft/ft FP SLP=.017 ft/ft
N=.045 DIST=15 N=-0.013 DIST=100 N=.045 DIST=115

DIST	ELEV
0	5.3
15	5.0
25	0.0
90	0.0
100	5.0
115	5.3

*

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                                BL10D35B
*COMPUTE TRAVEL TIME  ID=2      REACH=1    NO VS=1
*                      L=2830    SLP=0.017
ROUTE MCUNGE           ID=2      HYD=159.90  INFLOW ID=5  DT=0.00
                      L=2830    NO VS=1    SLP=0.017
PRINT HYD             ID=2      CODE=1
*
COMPUTE LT TP          LCODE=1    NK=2      ISLOPE=0
                      L=500      S=0.02      K=2
                      L=2000     S=0.02      K=3
*
COMPUTE NM HYD         ID=1      HYD=253    DA=0.0700 SQ MI
                      PER A=0    B=28      C=29    D=43
                      TP=0.0     HRS      RAIN=-1
*
PRINT HYD             ID=1      CODE=1
*
* ADD 159.90 AND 253 AT 253.10
*
ADD HYD               ID=5      HYD=253.10    ID I=1      ID II=2
*
PRINT HYD             ID=5      CODE=1
*
*C ROUTE HYD. 253.10 TO 253.90
*
COMPUTE RATING CURVE  CID=1      VS NO=1    NSEGS=3
                      ELMIN=0    ELMAX=5.3  CH SLP=.017 ft/ft  FP SLP=.017 ft/ft
                      N=.045 DIST=15 N=-0.013 DIST=100 N=.045 DIST=115
                      DIST      ELEV
                      0         5.3
                      15        5.0
                      25        0.0
                      90        0.0
                      100       5.0
                      115       5.3
*
COMPUTE TRAVEL TIME  ID=4      REACH=1    NO VS=1
                      L=2830    SLP=0.017
ROUTE               ID=4      HYD=253.90  INFLOW ID=5  DT=0.00
PRINT HYD          ID=4      CODE=1
*
COMPUTE LT TP          LCODE=1    NK=2      ISLOPE=0
                      L=1200     S=0.019     K=2
                      L=2000     S=0.019     K=4
*
COMPUTE NM HYD         ID=1      HYD=160     DA=0.1258 SQ MI
                      PER A=16    B=22      C=24    D=38
                      TP=0.0     HRS      RAIN=-1
*
PRINT HYD             ID=1      CODE=1
*
*C COMBINE HYD. 'S 160.90 AND 160 AT 160.10
*
ADD HYD               ID=5      HYD=160.10    ID I=1      ID II=4
*
PRINT HYD             ID=5      CODE=1
*****
*S * * * WEST BRANCH
*****
*
*****
*S * * * START OF TRIBUTARY "E"
*****
COMPUTE LT TP          LCODE=1    NK=2      ISLOPE=0
                      L=250      S=0.04      K=2
                      L=3500     S=0.04      K=3
*
COMPUTE NM HYD         ID=1      HYD=156     DA=0.2294 SQ MI
                      PER A=4      B=30      C=29    D=37
                      TP=0.0     HRS      RAIN=-1
*
PRINT HYD             ID=1      CODE=1
*
*C ROUTE HYD. 156 TO 156.90
*

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                                BL10D35B
COMPUTE RATING CURVE      CID=1  VS NO=1  CODE=-1  SLP=0.021
                           DIA=72 IN  N=0.013
COMPUTE TRAVEL TIME      ID=2  RN=1  NO VS=1  L=3660 FT  SLP=0.021
ROUTE                     ID=2  HYD=156.90  INFLOW ID=1  DT=0.0
PRINT HYD                 ID=2  CODE=1
*
COMPUTE LT TP            LCODE=1  NK=2  ISLOPE=0
                           L=400    S=0.026    K=2
                           L=3000   S=0.026    K=3
*
COMPUTE NM HYD           ID=1    HYD=157    DA=0.1889  SQ MI
                           PER A=7    B=22    C=25    D=46
                           TP=0.0    HRS      RAIN=-1
*
PRINT HYD                 ID=1    CODE=1
*
*C  COMBINE HYD.'S      157    AND    156.90    AT  157.10
*
ADD HYD                   ID=6    HYD=157.10    ID I=1    ID II=2
*
PRINT HYD                 ID=6    CODE=1
*
COMPUTE LT TP            LCODE=1  NK=2  ISLOPE=0
                           L=500    S=0.029    K=2
                           L=2100   S=0.029    K=3
*
COMPUTE NM HYD           ID=1    HYD=158    DA=0.0816  SQ MI
                           PER A=3    B=4    C=17    D=76
                           TP=0.0    HRS      RAIN=-1
*
PRINT HYD                 ID=1    CODE=1
*
* ROUTE 158 TO 158.9 FOR PROPOSED UNSER GATEWAY POND
COMPUTE RATING CURVE      CID=1  VS NO=1  CODE=-1  SLP=0.012
                           DIA=72 IN  N=0.013
COMPUTE TRAVEL TIME      ID=3  RN=1  NO VS=1  L=1000 FT  SLP=0.012
ROUTE                     ID=3  HYD=158.90  INFLOW ID=1  DT=0.0
PRINT HYD                 ID=3  CODE=1
*
* ADD 157.10 AND 158.90 FOR PROPOSED UNSER GATEWAY POND
*
ADD HYD                   ID=6    HYD=158.1  ID I=3  ID II=6
*
PRINT HYD                 ID=6    CODE=1
*
* ROUTE THROUGH PROPOSED UNSER GATEWAY POND
*S UNSER GATEWAY DAM
ROUTE RESERVOIR          ID=3  HYD NO=GATE.POND INFLOW ID=6  CODE=24
                           OUTFLOW(cfs)  STORAGE(ac ft)  ELEV(ft)
                           0              0.0            10
                           400             6              13
                           700            12              16
                           1200           15              17
*
PRINT HYD                 ID=3    CODE=1
*S *****DIVIDE HYD TO UNBULK BY 3% *****
DIVIDE HYD                ID=3    %=-97    ID I=3  HYD=UNBULK
                           ID II=55  HYD=SEDIMENT
*
*C  ROUTE POND OUTFALL TO WEST BRANCH
* THIS BASIN FLOW CROSSES UNSER IN 3-40" CMP SQUASH PIPES
*
COMPUTE RATING CURVE      CID=1  VS NO=1  CODE=-1  SLP=0.033
                           DIA=84 IN  N=0.013
COMPUTE TRAVEL TIME      ID=2  RN=1  NO VS=1  L=1880 FT  SLP=0.033
ROUTE                     ID=2  HYD=158.91  INFLOW ID=3  DT=0.0
PRINT HYD                 ID=2  CODE=1
*
* CHANGED HYD NO. 157.1 TO 620
COMPUTE LT TP            LCODE=1  NK=3  ISLOPE=0
                           L=400    S=0.0125   K=1
                           L=2000   S=0.0225   K=2
                           L=1900   S=0.0158   K=3
*

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                                BL10D35B
COMPUTE NM HYD      ID=1    HYD=620    DA=0.0564    SQ MI
                    PER A=20    B=24    C=26    D=30
                    TP=0.0      RAIN=-1

*
PRINT HYD          ID=1    CODE=1
*
*C    COMBINE HYD.'S  158.92    AND  620    AT    620.10
*
ADD HYD            ID=6    HYD=620.10    ID I=1    ID II=2
*
PRINT HYD          ID=6    CODE=1
*
*
*C    COMBINE HYD.'S  620.10    AND  160.9    AT  620.20
*
ADD HYD            ID=5    HYD=620.20    ID I=5    ID II=6
*
PRINT HYD          ID=5    CODE=1
*
*C    ROUTE HYD.    620.20    TO  620.90
*

COMPUTE RATING CURVE CID=1    VS NO=1    NSEGS=3
                    ELMIN=0    ELMAX=5.3    CH SLP=.017 ft/ft    FP SLP=.017 ft/ft
                    N=-.045 DIST=15 N=-0.013 DIST=100 N=.045 DIST=115
                    DIST    ELEV
                    0      5.3
                    15     5.0
                    25     0.0
                    90     0.0
                    100    5.0
                    115    5.3

*
COMPUTE TRAVEL TIME ID=2    REACH=1    NO VS=1
                    L=760    SLP=0.017
ROUTE              ID=2    HYD=620.90    INFLOW ID=5    DT=0.00
PRINT HYD          ID=2    CODE=1
*
COMPUTE LT TP      LCODE=1    NK=3    ISLOPE=0
                    L=500    S=0.017    K=1
                    L=1000   S=0.017    K=2
                    L=1500   S=0.017    K=3

*
COMPUTE NM HYD      ID=1    HYD=161    DA=0.0738    SQ MI
                    PER A=1    B=30    C=28    D=41
                    TP=0.0    HRS    RAIN=-1

*
PRINT HYD          ID=1    CODE=1
*
*C    COMBINE HYD.'S  620.90    AND  161    AT  161.10
*S * * * * AP 620.20 * * * * *
ADD HYD            ID=5    HYD=161.10    ID I=1    ID II=2
*
PRINT HYD          ID=5    CODE=1
PUNCH HYD          ID=5

*
*S PUNCH AND ADJUST HYDROGRAPH TO DELETE "FIRST FLUSH" RUNOFF AND SEND TO
*S WATER QUALITY PONDS WHICH IS ESSENTIALLY OUT OF THE SYSTEM THROUGH TIMING.
*
RECALL HYD          ID= 5 HYD=    161.10 DT=    .050000 HRS DA=    5.6332 SQ MI
                    PEAK=    5987.481CFS RO= 1.2274 INCHES NO PTS=600
                    FLOW RATES
                    .000    .000    .000    .000    .000
                    .000    .000    .000    .000    .000
                    .000    .000    .000    .000    .000
                    .000    .000    .000    .000    .000
                    .000    .000    .000    .000    .000
                    .000    .000    .000    .000    .000
                    .000    1100.000  2290.771  4008.697  5388.152
                    5987.481  5232.585  4251.804  3725.109  3238.890
                    2863.520  2543.813  2276.957  2028.074  1789.953
                    1562.279  1354.851  1171.297  1013.254  888.634
                    785.909   695.926   624.146   569.075   523.775
                    485.048   451.415   419.864   388.996   359.486

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BL10D35B

335.291	318.135	304.375	291.712	280.035
269.263	259.239	249.829	240.969	232.648
224.867	217.604	210.803	204.375	198.215
192.216	186.250	180.028	173.024	164.642
154.706	144.094	134.077	125.170	117.438
110.842	104.877	99.317	94.368	90.054
86.320	83.090	80.297	77.879	75.787
73.981	72.428	71.104	69.973	69.007
68.186	67.489	66.896	66.398	65.988
65.658	65.405	65.228	65.115	65.053
65.033	65.050	65.110	65.211	65.353
65.535	65.749	65.983	66.229	66.497
66.789	67.101	67.432	67.780	68.146
68.526	68.916	69.302	69.666	69.992
70.276	70.516	70.720	70.895	71.044
71.161	71.241	71.280	71.284	71.260
71.216	71.161	71.099	71.025	70.931
70.817	70.685	70.543	70.400	70.258
70.113	69.958	69.790	69.611	69.427
69.246	69.072	68.908	68.754	68.601
68.443	68.283	68.122	67.962	67.805
67.641	67.473	67.307	67.142	66.974
66.803	66.626	66.449	66.275	66.110
65.956	65.811	65.667	65.517	65.367
65.215	65.063	64.914	64.767	64.621
64.472	64.324	64.180	64.037	63.892
63.742	63.587	63.429	63.274	63.126
62.987	62.857	62.727	62.589	62.450
62.307	62.165	62.033	61.908	61.780
61.647	61.512	61.379	61.256	61.135
61.010	60.874	60.728	60.578	60.438
60.310	60.185	60.060	59.933	59.810
59.697	59.596	59.497	59.391	59.273
59.145	59.020	58.903	58.794	58.690
58.577	58.458	58.336	58.212	58.093
57.983	57.877	57.769	57.655	57.533
57.407	57.282	57.163	57.050	56.945
56.847	56.756	56.662	56.558	56.451
56.348	56.249	56.153	56.053	55.947
55.836	55.725	55.618	55.517	55.421
55.322	55.223	55.126	55.028	54.935
54.850	54.768	54.683	54.591	54.490
54.383	54.276	54.172	54.074	53.981
53.894	53.812	53.727	53.630	53.529
53.432	53.337	53.246	53.159	53.073
52.986	52.906	52.831	52.758	52.683
52.597	52.502	52.405	52.313	52.230
52.149	52.061	51.970	51.881	51.795
51.710	51.621	51.535	51.460	51.395
51.335	51.273	51.203	51.128	51.051
50.975	50.894	50.801	50.701	50.605
50.519	50.440	50.361	50.281	50.197
50.109	50.028	49.952	49.877	49.803
49.727	49.658	49.596	49.531	49.462
49.389	49.314	49.245	49.176	49.107
49.041	48.972	48.905	48.845	48.785
48.719	48.644	48.560	48.478	48.411
48.356	48.307	48.255	48.195	48.127
48.058	47.989	47.924	47.853	47.769
47.680	47.591	47.515	47.454	47.398
47.336	47.270	47.197	47.120	47.047
46.979	46.912	46.854	46.799	46.744
46.688	46.628	46.565	46.501	46.440
46.381	46.327	46.276	46.228	46.174
46.116	46.057	45.995	45.934	45.879
45.823	45.762	45.691	45.619	45.555
45.499	45.446	45.389	45.324	45.251
45.176	45.104	45.045	45.006	44.981
44.953	44.904	44.835	44.756	44.682
44.622	44.576	44.540	44.508	44.470
44.418	44.359	44.299	44.239	44.180
44.124	44.075	44.029	43.981	43.927
43.863	43.801	43.744	43.690	43.638
43.584	43.527	43.468	43.411	43.357

43.306	43.259	43.215	43.175	43.137
43.093	43.045	42.995	42.941	42.889
42.841	42.793	42.749	42.710	42.669
42.621	42.564	42.504	42.453	42.408
42.367	42.320	42.264	42.199	42.133
42.077	42.040	42.017	41.999	41.977
41.945	41.904	41.860	41.805	41.736
41.659	41.583	41.516	41.464	41.426
41.395	41.360	41.312	41.257	41.204
41.161	41.125	41.086	41.046	41.008
40.970	40.921	40.763	40.339	39.549
38.378	36.904	35.251	33.534	31.821
30.145	28.521	26.962	25.478	24.080
22.781	21.590	20.511	19.544	18.686
17.930	17.267	16.688	16.184	15.744
15.361	15.027	14.735	14.479	14.254
14.057	13.883	13.730	13.594	13.473
13.366	13.271	13.185	13.109	13.040
12.979	12.923	12.873	12.829	12.789
12.752	12.719	12.688	12.660	12.635
12.611	12.589	12.569	12.551	12.533
12.518	12.503	12.489	12.475	12.463
12.451	12.439	12.428	12.417	12.407
12.398	12.388	12.379	12.370	12.362
12.353	12.345	12.336	12.328	12.321
12.313	12.306	12.298	12.291	12.283
12.276	12.269	12.261	12.254	12.247
12.240	12.234	12.227	12.220	12.213
12.206	12.199	12.192	12.185	12.178
12.171	12.164	12.158	12.151	12.144
12.137	12.131	12.124	12.117	12.111
12.104	12.098	12.091	12.085	12.078
12.072	12.065	12.058	12.052	12.045
12.038	12.032	12.025	12.019	12.012

Page 29

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*
PRINT HYD          ID=11      CODE=1
*****
*S END OF THE BLACK'S ARROYO WEST BRANCH
* * * * *
*S * * * * *
* * * * *
*S BEGINING OF THE BLACK'S ARROYO EAST BRANCH
*****
* * * * *
*S * * * START OF LEMA CHANNEL
* * * * *
SEDIMENT BULK      CODE=1    BULK FACTOR=1.06
*
COMPUTE LT TP      LCODE=1    NK=3    ISLOPE=0
                   L=400      S=0.021    K=2
                   L=1600     S=0.021    K=3
                   L=4000     S=0.021    K=4
                   KN=0.0      CD=0.0      QP=400 CFS
*
COMPUTE NM HYD      ID=1      HYD=201      DA=0.2484    SQ MI
PER A=2      B=17      C=24      D=57
TP=0.0      HRS      RAIN=-1
*
PRINT HYD          ID=1      CODE=1
*
*C ROUTE HYD.      201      TO 201.9
*
COMPUTE RATING CURVE RC=-1 VS NO=1 NSEGS=3
ELMIN=0 ELMAX=8 CH SLP=.0255ft/ft FP SLP=.0255ft/ft
N=.025 DIST=50 N=-.017 DIST=70 N=.025 DIST=120
DIST ELEV DIST ELEV DIST ELEV DIST ELEV
0 8 50 0 70 0 120 8
*
COMPUTE TRAVEL TIME ID=2 REACH=1 NO VS=1
L=1100 SLP=0.0255
ROUTE ID=2 HYD=201.90 INFLOW ID=1 DT=0.05
*
PRINT HYD          ID=2      CODE=1
*
COMPUTE NM HYD      ID=1      HYD=204      DA=0.0150    SQ MI
PER A=0      B=19      C=16      D=65
TP=.133      HRS      RAIN=-1
*
PRINT HYD          ID=1      CODE=1
*
*C COMBINE HYD.'S 201.9 AND 204 AT 204.10
*
ADD HYD            ID=5      HYD=204.10 ID I=1 ID II=2
*
PRINT HYD          ID=5      CODE=1
* * * * *
*S * * * START OF SNEAD CHANNEL
* * * * *
COMPUTE NM HYD      ID=1      HYD=205      DA=0.0914    SQ MI
PER A=0      B=24      C=18      D=58
TP=.210      HRS      RAIN=-1
*
PRINT HYD          ID=1      CODE=1
* * * * *
*S * * * CONFLUENCE OF LEMA AND SNEAD
* * * * *
*C COMBINE HYD.'S 205 AND 204.9 AT 205.10
*
ADD HYD            ID=5      HYD=205.10 ID I=5 ID II=1
*
PRINT HYD          ID=5      CODE=1
*
*C ROUTE HYD.      205.10 TO 205.90
*
COMPUTE RATING CURVE RC=-1 VS NO=1 NSEGS=3
ELMIN=0 ELMAX=6 CH SLP=.0186ft/ft FP SLP=.0186ft/ft
N=.045 DIST=35 N=-.013 DIST=50 N=.045 DIST=85
DIST ELEV DIST ELEV DIST ELEV DIST ELEV

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                                BL10D35B
0      6      35      0      50      0      85      6
*
COMPUTE TRAVEL TIME ID=2      REACH=1      NO VS=1
L=860      SLP=0.0186
ROUTE ID=2      HYD=205.90      INFLOW ID=5      DT=0.05
*
PRINT HYD ID=2      CODE=1
*
COMPUTE NM HYD ID=1      HYD=202      DA=0.1239      SQ MI
PER A=0      B=14      C=17      D=69
TP=.215      HRS      RAIN=-1
*
PRINT HYD ID=1      CODE=1
*
*C      ROUTE HYD. 202      TO 202.9
*
COMPUTE RATING CURVE RC=-1      VS NO=1      NSEGS=3
ELMIN=0      ELMAX=4      CH SLP=.0178ft/ft      FP SLP=.0178ft/ft
N=.017      DIST=70      N=.017      DIST=110      N=.017      DIST=180
DIST      ELEV      DIST      ELEV      DIST      ELEV      DIST      ELEV
0      4      70      0      110      0      180      4
*
COMPUTE TRAVEL TIME ID=4      REACH=1      NO VS=1
L=3380      SLP=0.0178
ROUTE ID=4      HYD=202.90      INFLOW ID=1      DT=0.05
*
PRINT HYD ID=4      CODE=1
*
COMPUTE NM HYD ID=1      HYD=203      DA=0.0539      SQ MI
PER A=0      B=21      C=17      D=62
TP=.255      HRS      RAIN=-1
*
PRINT HYD ID=1      CODE=1
*
*C      COMBINE HYD.'S 202.90      AND 203      AT 203.10
*
*S      WESTERN HILLS DR. @ BLACK'S ARROYO (EAST BRANCH)
*S * * * AP 203.10 * * * * *
ADD HYD ID=5      HYD=203.10      ID I=4      ID II=1
*
PRINT HYD ID=5      CODE=1
*
ADD HYD ID=5      HYD=203.20      ID I=5      ID II=2
*
PRINT HYD ID=5      CODE=1
*
*C      ROUTE HYD. 203.20      TO 203.91
*
COMPUTE RATING CURVE RC=-1      VS NO=1      NSEGS=3
ELMIN=0      ELMAX=8      CH SLP=.0238ft/ft      FP SLP=.0238ft/ft
N=.045      DIST=30      N=.013      DIST=55      N=.045      DIST=85
DIST      ELEV      DIST      ELEV      DIST      ELEV      DIST      ELEV
0      8      30      0      55      0      85      8
*
COMPUTE TRAVEL TIME ID=2      REACH=1      NO VS=1
L=3200      SLP=0.0238
ROUTE ID=2      HYD=203.91      INFLOW ID=5      DT=0.05
*
PRINT HYD ID=2      CODE=1
*
COMPUTE NM HYD ID=1      HYD=212      DA=0.0995      SQ MI
PER A=0      B=23      C=15      D=62
TP=.213      HRS      RAIN=-1
*
PRINT HYD ID=1      CODE=1
*
*C      COMBINE HYD.'S 212      AND 203.91      AT 212.10
*
ADD HYD ID=5      HYD=212.10      ID I=1      ID II=2
*
PRINT HYD ID=5      CODE=1
*
COMPUTE NM HYD ID=1      HYD=211      DA=0.1811      SQ MI
A=0      B=10      C=18      D=72

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      TP=0.212  HRS    RAIN=-1
*
PRINT HYD          ID=1  CODE=1
*
*S  ROUTE HYD 211 THRU 213 IN SOUTHWESTERN CHANNEL (ADJACENT TO SOUTHERN BLVD.)* * * *
*
COMPUTE RATING CURVE  RC=-1  VS NO=1  NSEGS=3
      ELMIN=0  ELMAX=6  CH SLP=0.015 ft/ft  FP SLP=0.015 ft/ft
      N=.045  DIST=10  N=-.013  DIST=20  N=.045  DIST=30
      DIST  ELEV  DIST  ELEV  DIST  ELEV  DIST  ELEV
        0      6    10      0    20      0    30      6
*
COMPUTE TRAVEL TIME  ID=4  REACH=1  NO VS=1  L=1500  SLOPE=0.015
ROUTE                ID=4  HYD=211.90  ID IN=1  DT=0.00
PRINT HYD            ID=4  CODE=1
*
COMPUTE NM HYD       ID=1  HYD=213      DA=0.108  SQ MI
      PER A=0      B=19      C=16      D=65
      TP=.219      HRS      RAIN=-1
*
PRINT HYD            ID=1  CODE=1
*
*  ADD BASIN 213 TO ROUTED BASIN 211
*
ADD HYD              ID=1  HYD=213.10  ID I=4  ID II=1
*
PRINT HYD            ID=1  CODE=1
*
*C  ROUTE HYD.  213.10  TO  213.90
*
COMPUTE RATING CURVE  RC=-1  VS NO=1  NSEGS=3
      ELMIN=0  ELMAX=6  CH SLP=.013 ft/ft  FP SLP=.013 ft/ft
      N=.045  DIST=10  N=-.013  DIST=20  N=.045  DIST=30
      DIST  ELEV  DIST  ELEV  DIST  ELEV  DIST  ELEV
        0      6    10      0    20      0    30      6
*
COMPUTE TRAVEL TIME  ID=4  REACH=1  NO VS=1
      L=400  SLP=0.0130
ROUTE          ID=4  HYD=213.90  INFLOW ID=1  DT=0.05
*
PRINT HYD          ID=4  CODE=1
*
*  ADD 212 TO BASIN 213
*
ADD HYD              ID=4  HYD=213.20  ID I=5  ID II=4
*
PRINT HYD            ID=4  CODE=1
*
*****
*S * * * START OF NICKLAUS CHANNEL * * * * *
*****
COMPUTE NM HYD       ID=1  HYD=214      DA=0.1909  SQ MI
      PER A=1      B=22      C=18      D=59
      TP=.240      HRS      RAIN=-1
*
PRINT HYD            ID=1  CODE=1
*
*  LEMA RD. @ 150 FT. W. OF NICKLAUS DR. (HYD. 214)
*
*C  ROUTE HYD.  214      TO  214.9
*
COMPUTE RATING CURVE  RC=-1  VS NO=1  NSEGS=3
      ELMIN=0  ELMAX=6  CH SLP=.0214ft/ft  FP SLP=.0214ft/ft
      N=.045  DIST=10  N=-.013  DIST=20  N=.045  DIST=30
      DIST  ELEV  DIST  ELEV  DIST  ELEV  DIST  ELEV
        0      6    10      0    20      0    30      6
*
COMPUTE TRAVEL TIME  ID=2  REACH=1  NO VS=1
      L=2240  SLP=0.0214
ROUTE          ID=2  HYD=214.90  INFLOW ID=1  DT=0.05
*
PRINT HYD            ID=2  CODE=1
*

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                                BL10D35B
COMPUTE NM HYD      ID=1    HYD=216    DA=0.0966    SQ MI
                    PER A=0    B=25    C=17    D=58
                    TP=.197    HRS    RAIN=-1

*
PRINT HYD          ID=1    CODE=1
*
*S    COMBINE HYD.'S    214.9    AND    216    AT    216.1
*
*S
*S    CASPER DR. @ 150 FT. W. OF NICKLAUS DR.
*S * * * * * AP 216.10 * * * * *
ADD HYD            ID=6    HYD=216.10    ID I=1    ID II=2
*
PRINT HYD          ID=6    CODE=1
*
COMPUTE NM HYD      ID=1    HYD=215    DA=0.1102    SQ MI
                    PER A=3    B=19    C=18    D=60
                    TP=.277    HRS    RAIN=-1

*
PRINT HYD          ID=1    CODE=1
*
*C    ROUTE HYD.    215    TO    215.9
*
COMPUTE RATING CURVE RC=-1    VS NO=1    NSEGS=3
                    ELMIN=0    ELMAX=4    CH SLP=.0194ft/ft    FP SLP=.0194ft/ft
                    N=.017    DIST=70    N=-.017    DIST=110    N=.017    DIST=180
                    DIST    ELEV    DIST    ELEV    DIST    ELEV    DIST    ELEV
                    0    4    70    0    110    0    180    4

*
COMPUTE TRAVEL TIME ID=3    REACH=1    NO VS=1
                    L=2320    SLP=0.0194
ROUTE              ID=3    HYD=215.90    INFLOW ID=1    DT=0.05
*
PRINT HYD          ID=3    CODE=1
*
*C    COMBINE HYD.'S    216.1    AND    215.9    AT    216.20
*
ADD HYD            ID=6    HYD=216.20    ID I=6    ID II=3
*
PRINT HYD          ID=6    CODE=1
* * * * *
*S * * * AFTER SNEAD AND NICKLAUS CONFLUENCE * * * * *
* * * * *
*C    COMBINE HYD.'S    216.20    AND    213.20    AT    216.30
*S * * * * * AP 216.30 * * * * *
ADD HYD            ID=5    HYD=216.30    ID I=6    ID II=4
*
PRINT HYD          ID=5    CODE=1
*
COMPUTE LT TP      LCODE=1    NK=3    ISLOPE=0
                    L=400    S=0.015    K=0.7
                    L=1600    S=0.015    K=2
                    L=800    S=0.0063    K=3

*
COMPUTE NM HYD      ID=2    HYD=217B    DA=0.0666    SQ MI
                    PER A=2    B=57    C=10    D=31
                    TP=0.0    RAIN=-1

*
PRINT HYD          ID=2    CODE=1
*
*S ROUTE 217B DOWN SOUTHERN TO THE PLAYERS CHANNEL
COMPUTE RATING CURVE CID=1    VS=1    NO SEGS=1
                    MINEL=0.0    MAX ELEV=1.5
                    CH SLP=0.025    FP SLP=0.025
                    N=0.017    DIST=80
                    DIST    ELEV
                    0    1.5
                    20.0    0.7
                    20.1    0.0
                    22.1    0.1
                    40.0    0.5
                    57.9    0.1
                    59.9    0.0
                    60.0    0.7

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      80.0      1.5
COMPUTE TRAVEL TIME  ID=3  REACH NO=1  VS=1
                      L=1000  SLP=0.025
ROUTE               ID=3  HYD=217B.90  INFLOW ID=2  DT=0.0
PRINT HYD           ID=3  CODE=1
*
COMPUTE LT TP       LCODE=1  NK=3  ISLOPE=0
                      L=400   S=0.0375  K=0.7
                      L=1600  S=0.0125  K=2
                      L=2000  S=0.0175  K=4
*
COMPUTE NM HYD      ID=1   HYD=217A   DA=0.1902  SQ MI
PER A=2             B=46    C=12    D=40
TP=0.0              RAIN=-1
*
PRINT HYD           ID=1   CODE=1
*
*S  COMBINE HYD.'S 217A AND 217B AT PLAYERS CHANNEL
ADD HYD              ID=1  HYD=217A.10  ID I=1  ID II=3
*
PRINT HYD           ID=1  CODE=1
* * * * *
*S * * * EAST BRANCH CROSSING SOUTHERN BLVD. * * * * *
* * * * *
*C  COMBINE HYD.'S 216.30 AND 217A.10 AT 217.20
    SOUTHERN BLVD. @ 2100 FT. W. OF GOLF COURSE RD.
*S  ***** AP 217.20 *****
ADD HYD              ID=5  HYD=217.20  ID I=5  ID II=1
*
*C  ROUTE HYD. 217.20 TO 217.90
*
COMPUTE RATING CURVE CID=1  VS NO=1  NSEGS=3
                      ELMIN=0  ELMAX=6.3  CH SLP=.016 ft/ft  FP SLP=.016 ft/ft
                      N=.045 DIST=15 N=-0.013 DIST=54 N=.045 DIST=69
                      DIST  ELEV
                        0     6.3
                        15    6.0
                        27    0.0
                        42    0.0
                        54    6.0
                        69    6.3
*
COMPUTE TRAVEL TIME ID=2  REACH=1  NO VS=1
                      L=3640  SLP=0.016
ROUTE               ID=2  HYD=217.90  INFLOW ID=5  DT=0.00
PRINT HYD           ID=2  CODE=1
*
SEDIMENT BULK       CODE=1  BULK FACTOR=1.18
*
COMPUTE LT TP       LCODE=1  NK=3  ISLOPE=0
                      L=300   S=0.021  K=1
                      L=1600  S=0.021  K=2
                      L=1600  S=0.021  K=3
*
COMPUTE NM HYD      ID=1   HYD=218A   DA=0.1655  SQ MI
PER A=3             B=20    C=25    D=52
TP=0.0              HRS    RAIN=-1
*
PRINT HYD           ID=1   CODE=1
*
*S  COMBINE HYDS 218A AND 217.90 AT 218.10
*
ADD HYD              ID=2  HYD=218.10  ID I=1  ID II=2
*
PRINT HYD           ID=2  CODE=1
* * * * *
*S * * * START OF GOLF COURSE CHANNEL * * * * *
* * * * *
SEDIMENT BULK       CODE=1  BULK FACTOR=1.06
*S  GOLF COURSE ROAD STORM DRAIN SYSTEM WITH TWO OUTFALLS UPSTREAM OF
*S  23RD AVENUE PONDS
*
COMPUTE LT TP       LCODE=1  NK=3  ISLOPE=0
                      L=300   S=0.0167  K=1

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                                BL10D35B
                                L=1000 S=0.014 K=2
                                L=1400 S=0.014 K=4
*
COMPUTE NM HYD      ID=3      HYD=500      DA=0.0261 SQ MI
PER A=0      B=0      C=26.5      D=73.5
TP=0.0      RAIN=-1
*
PRINT HYD          ID=3      CODE=1
*
*S ROUTE 500 IN STORM DRAIN TO EAST BRANCH
*
COMPUTE RATING CURVE CID=1 VALLEY SECTION NO=1 CODE=-1 SLOPE=0.013
PIPE DIA=36 N=0.013
COMPUTE TRAVEL TIME ID=4 REACH NO=1 VALLEY SECTIONS=1
LENGTH=1900 FT SLOPE=0.013
ROUTE              ID=4 HYD NO=500.90 INFLOW ID=3 DT=0.0
PRINT HYD          ID=4 CODE=1
*
*S COMBINE 218A.10 AND 500.90 AT 500.10
*
ADD HYD            ID=3 HYD=500.10 ID I=4 ID II=2
*
PRINT HYD          ID=3 CODE=1
*
*S ROUTE 500.10 THROUGH 218B (EAST BRANCH) TO 500.90
*
COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3
ELMIN=0 ELMAX=6.3 CH SLP=.02 ft/ft FP SLP=.02 ft/ft
N=.045 DIST=15 N=-0.013 DIST=59 N=.045 DIST=74
DIST      ELEV
0          6.3
15         6.0
27         0.0
47         0.0
59         6.0
74         6.3
*
COMPUTE TRAVEL TIME ID=4 REACH=1 NO VS=1
L=3000 SLP=0.02
ROUTE      ID=4 HYD=500.90 INFLOW ID=3 DT=0.00
PRINT HYD  ID=4 CODE=1
*
*S COMPUTE 219 ON EAST BRANCH
*
SEDIMENT BULK      CODE=1 BULK FACTOR=1.18
*
COMPUTE LT TP      LCODE=1 NK=3 ISLOPE=0
L=400 S=0.017 K=2
L=1600 S=0.017 K=3
L=4000 S=0.017 K=4
KN=0.0 CD=0.0 QP=280 CFS
*
COMPUTE NM HYD      ID=1 HYD=219 DA=0.1620 SQ MI
PER A=1 B=29 C=28 D=42
TP=0.0 HRS RAIN=-1
*
PRINT HYD          ID=1 CODE=1
*
COMPUTE LT TP      LCODE=1 NK=3 ISLOPE=0
L=500 S=0.03 K=1
L=1500 S=0.03 K=2
L=1500 S=0.03 K=3
*
COMPUTE NM HYD      ID=2 HYD=218B DA=0.1358 SQ MI
PER A=3 B=20 C=25 D=52
TP=0.0 HRS RAIN=-1
*
PRINT HYD          ID=2 CODE=1
*
*S COMBINE 219 AND 218B AT 219.10
ADD HYD            ID=2 HYD=219.10 ID I=2 ID II=1
*
*S COMBINE 500.90 AND 219.10 AT 500.20
*

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                                BL10D35B
ADD HYD                        ID=3  HYD=500.20  ID I=2  ID II=4
*
PRINT HYD                      ID=3  CODE=1
*
*S NEXT SECTION OF GOLF COURSE ROAD STORM DRAIN
*
SEDIMENT BULK                  CODE=1  BULK FACTOR=1.06
*
COMPUTE LT TP                  LCODE=1  NK=3  ISLOPE=0
                                L=300   S=0.0167  K=1
                                L=1000  S=0.015   K=2
                                L=1900  S=0.021   K=4
*
COMPUTE NM HYD                 ID=1  HYD=510  DA=0.0408 SQ MI
                                PER A=2.5  B=8.0  C=21.5  D=68
                                TP=0.0  RAIN=-1
*
PRINT HYD                      ID=1  CODE=1
*
*S ROUTE 510 TO 510.90 (EAST BRANCH)
*
COMPUTE RATING CURVE CID=1  VALLEY SECTION NO=1  CODE=-1  SLOPE=0.0231
                                PIPE DIA=36  N=0.013
COMPUTE TRAVEL TIME ID=2  REACH NO=1  VALLEY SECTIONS=1
                                LENGTH=1300 FT  SLOPE=0.0231
ROUTE                          ID=2  HYD NO=510.90  INFLOW ID=1  DT=0.0
PRINT HYD                      ID=2  CODE=1
*
*S COMBINE 510.90 AND 500.20 AT 510.10
*
ADD HYD                        ID=2  HYD=510.10  ID I=2  ID II=3
*
PRINT HYD                      ID=2  CODE=1
*
*C ROUTE HYD. 510.10 TO 510.91
*
COMPUTE RATING CURVE CID=1  VS NO=1  NSEGS=3
                                ELMIN=0  ELMAX=6.3  CH SLP=.025 ft/ft  FP SLP=.025 ft/ft
                                N=.045  DIST=15  N=-0.013  DIST=59  N=.045  DIST=74
                                DIST      ELEV
                                0          6.3
                                15         6.0
                                27         0.0
                                47         0.0
                                59         6.0
                                74         6.3
*
COMPUTE TRAVEL TIME ID=5  REACH=1  NO VS=1
                                L=2400  SLP=0.025
ROUTE                          ID=5  HYD=510.91  INFLOW ID=2  DT=0.00
PRINT HYD                      ID=5  CODE=1
*
SEDIMENT BULK                  CODE=1  BULK FACTOR=1.18
*
COMPUTE LT TP                  LCODE=1  NK=2  ISLOPE=0
                                L=1000  S=0.022  K=2
                                L=1500  S=0.022  K=4
*
COMPUTE NM HYD                 ID=1  HYD=220  DA=0.0878  SQ MI
                                PER A=7  B=30  C=28  D=35
                                TP=0.0  HRS  RAIN=-1
*
PRINT HYD                      ID=1  CODE=1
*
*C COMBINE HYD. 'S 510.91 AND 220 AT 220.10
*
ADD HYD                        ID=5  HYD=220.10  ID I=1  ID II=5
*
PRINT HYD                      ID=5  CODE=1
*
*****
*S ***** START OF TRIBUTARY "B" *****
*****
COMPUTE LT TP                  LCODE=1  NK=3  ISLOPE=0

```

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                                BL10D35B
                                L=500    S=0.024    K=2
                                L=3000   S=0.024    K=3
                                L=1500   S=0.024    K=4
                                KN=0.0   CD=0.0     QP=100 CFS
*
*
COMPUTE NM HYD      ID=1    HYD=250    DA=0.0500    SQ MI
PER A=0    B=15    C=31    D=54
TP=0.0    HRS    RAIN=-1
*
*
PRINT HYD          ID=1    CODE=1
*
*
*C    ROUTE HYD.    250    TO    250.90
*
COMPUTE RATING CURVE    CID=1    VS NO=1    CODE=-1    SLP=0.020
DIA=60    IN    N=0.013
COMPUTE TRAVEL TIME    ID=4    RN=1    NO VS=1    L=3000 FT    SLP=0.020
ROUTE    ID=4    HYD=250.90    INFLOW ID=1    DT=0.0
PRINT HYD          ID=4    CODE=1
*
*
*****
*S * * * START OF TRIBUTARY "D"
*****
COMPUTE LT TP      LCODE=1    NK=3    ISLOPE=0
L=400    S=0.02    K=2
L=2000   S=0.02    K=3
L=2300   S=0.02    K=4
KN=0.0    CD=0.0    QP=300 CFS
*
*
COMPUTE NM HYD      ID=2    HYD=251    DA=0.1631    SQ MI
PER A=2    B=21    C=25    D=52
TP=0.0    HRS    RAIN=-1
*
*
PRINT HYD          ID=2    CODE=1
*
*
*****
*S * * * CONFLUENCE OF TRIBUTARY "B" AND TRIBUTARY "D"
*****
* COMBINE 250.90 AND 251
*
ADD HYD            ID=6    HYD=251.10    ID I=2    ID II=4
*
PRINT HYD          ID=6    CODE=1
*
*
COMPUTE LT TP      LCODE=1    NK=2    ISLOPE=0
L=700    S=0.018    K=2
L=2300   S=0.018    K=3
*
*
COMPUTE NM HYD      ID=1    HYD=252    DA=0.1088    SQ MI
PER A=2    B=24    C=26    D=48
TP=0.0    HRS    RAIN=-1
*
*
PRINT HYD          ID=1    CODE=1
*
*
*C    ROUTE HYD.    252    THROUGH 254
*
COMPUTE RATING CURVE    CID=1    VS NO=1    CODE=-1    SLP=0.020
DIA=60    IN    N=0.013
COMPUTE TRAVEL TIME    ID=4    RN=1    NO VS=1    L=1840 FT    SLP=0.020
ROUTE    ID=4    HYD=252.90    INFLOW ID=1    DT=0.0
PRINT HYD          ID=4    CODE=1
*
*
*C    COMBINE HYD. 'S    251.10    AND    252.90    AT    252.10
*
ADD HYD            ID=6    HYD=252.10    ID I=6    ID II=4
*
PRINT HYD          ID=6    CODE=1
*
*
COMPUTE LT TP      LCODE=1    NK=2    ISLOPE=0
L=400    S=0.025    K=2
L=1400   S=0.025    K=3
*
*
COMPUTE NM HYD      ID=1    HYD=254    DA=0.0581    SQ MI
PER A=0    B=30    C=28    D=42

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                                BL10D35B
                                TP=0.0   HRS   RAIN=-1
*
PRINT HYD                      ID=1   CODE=1
*
*C   COMBINE HYD.'S   254   AND   252.10   AT   254.10
*
ADD HYD                      ID=6   HYD=254.10   ID I=1   ID II=6
*
PRINT HYD                      ID=6   CODE=1
*
*C   ROUTE HYD.   254.10   TO   254.90
*
COMPUTE RATING CURVE CID=1   VS NO=1   NSEGS=3
                                ELMIN=0   ELMAX=5.8   CH SLP=.02 ft/ft   FP SLP=.02 ft/ft
                                N=.045 DIST=15 N=-0.013 DIST=60   N=.045 DIST=75
                                DIST   ELEV
                                0       5.3
                                15      5.0
                                25      0.0
                                50      0.0
                                60      5.0
                                75      5.3
*
COMPUTE TRAVEL TIME ID=2   REACH=1   NO VS=1
                                L=680   SLP=0.02
ROUTE ID=2   HYD=254.90   INFLOW ID=6   DT=0.00
PRINT HYD ID=2   CODE=1
*
COMPUTE LT TP                LCODE=1   NK=3   ISLOPE=0
                                L=500    S=0.023   K=2
                                L=1500   S=0.023   K=3
                                L=1500   S=0.023   K=4
*
COMPUTE NM HYD              ID=1   HYD=255   DA=0.1072   SQ MI
                                PER A=1   B=19   C=22   D=58
                                TP=0.0   HRS   RAIN=-1
*
PRINT HYD                      ID=1   CODE=1
*
*C   COMBINE HYD.'S   255   AND   254.90   AT   255.10
*
ADD HYD                      ID=6   HYD=255.10   ID I=1   ID II=2
*
PRINT HYD                      ID=6   CODE=1
*
*C   ROUTE HYD.   255.10   TO   255.90
*
COMPUTE RATING CURVE CID=1   VS NO=1   NSEGS=3
                                ELMIN=0   ELMAX=5.8   CH SLP=.02 ft/ft   FP SLP=.02 ft/ft
                                N=.045 DIST=15 N=-0.013 DIST=60   N=.045 DIST=75
                                DIST   ELEV
                                0       5.3
                                15      5.0
                                25      0.0
                                50      0.0
                                60      5.0
                                75      5.3
*
COMPUTE TRAVEL TIME ID=2   REACH=1   NO VS=1
                                L=1660   SLP=0.02
ROUTE ID=2   HYD=255.90   INFLOW ID=6   DT=0.00
PRINT HYD ID=2   CODE=1
*
COMPUTE LT TP                LCODE=1   NK=2   ISLOPE=0
                                L=1000   S=0.030   K=2
                                L=1000   S=0.030   K=4
*
COMPUTE NM HYD              ID=1   HYD=256   DA=0.0494   SQ MI
                                PER A=26   B=26   C=25   D=23
                                TP=0.0   HRS   RAIN=-1
*
PRINT HYD                      ID=1   CODE=1
*
*C   COMBINE HYD.'S   256   AND   255.90   AT   256.10

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BL10D35B

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*
ADD HYD          ID=6    HYD=256.10    ID I=1    ID II=2
*
PRINT HYD        ID=6    CODE=1
* * * * *
*S * * * CONFLUENCE OF EAST BRANCH AND TRIBUTARY "B" * * * * *
* * * * *
*C    COMBINE HYD.'S 256.10    AND 220.10    AT 256.20
*S * * * * *
ADD HYD          ID=5    HYD=256.20    ID I=6    ID II=5
*
PRINT HYD        ID=5    CODE=1
PUNCH HYD        ID=5
*
*S PUNCH AND ADJUST HYDROGRAPH TO DELETE "FIRST FLUSH" RUNOFF AND SEND TO
*S WATER QUALITY PONDS WHICH IS ESSENTIALLY OUT OF THE SYSTEM THROUGH TIMING.
*
RECALL HYD       ID= 5 HYD=      256.20 DT= .050000 HRS DA= 2.7303 SQ MI
PEAK= 4421.742CFS RO= 1.8587 INCHES NO PTS=552
FLOW RATES
.000 .000 .000 .000 .000
.000 .000 .000 .000 .000
.000 .000 .000 .000 .000
.000 .000 .000 .000 .000
.000 .000 .000 .000 .000
.000 .000 .000 .000 .000
.000 724.225 4320.292 4421.742 4132.278
3666.688 3185.732 2756.763 2395.456 2096.372
1856.080 1659.592 1481.685 1301.881 1127.181
971.064 833.221 717.400 618.666 538.905
478.841 428.374 381.431 342.132 311.434
284.904 261.161 240.071 220.228 198.717
178.497 163.243 151.193 140.530 130.963
122.528 115.065 108.365 102.280 96.725
91.637 86.950 82.631 78.643 74.968
71.614 68.645 66.009 63.560 61.226
59.004 56.924 54.999 53.218 51.576
50.080 48.711 47.455 46.296 45.246
44.282 43.407 42.618 41.908 41.282
40.727 40.253 39.851 39.487 39.174
38.909 38.687 38.493 38.343 38.232
38.157 38.120 38.122 38.143 38.173
38.220 38.298 38.414 38.549 38.711
38.894 39.086 39.270 39.467 39.700
39.951 40.200 40.456 40.730 41.019
41.312 41.596 41.861 42.084 42.277
42.437 42.581 42.704 42.814 42.898
42.943 42.952 42.934 42.900 42.858
42.810 42.758 42.698 42.612 42.510
42.393 42.280 42.167 42.064 41.957
41.834 41.696 41.551 41.407 41.272
41.144 41.025 40.912 40.803 40.675
40.545 40.428 40.309 40.197 40.077
39.943 39.821 39.706 39.583 39.453
39.317 39.183 39.057 38.938 38.827
38.723 38.622 38.504 38.381 38.272
38.161 38.055 37.945 37.840 37.734
37.617 37.512 37.412 37.305 37.190
37.069 36.949 36.837 36.731 36.632
36.540 36.450 36.341 36.227 36.125
36.019 35.922 35.842 35.753 35.645
35.540 35.440 35.357 35.278 35.183
35.075 34.959 34.845 34.741 34.665
34.581 34.481 34.381 34.288 34.209
34.141 34.077 33.993 33.899 33.794
33.699 33.627 33.555 33.484 33.402
33.300 33.209 33.122 33.031 32.958
32.888 32.809 32.720 32.624 32.528
32.438 32.353 32.275 32.201 32.132
32.067 32.003 31.918 31.828 31.753
31.694 31.627 31.554 31.469 31.386
31.303 31.229 31.156 31.091 31.022
30.939 30.868 30.800 30.727 30.671
30.618 30.556 30.484 30.403 30.321

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BL10D35B

30.245	30.172	30.104	30.040	29.978
29.920	29.862	29.782	29.696	29.624
29.568	29.504	29.437	29.380	29.314
29.253	29.206	29.152	29.100	29.036
28.954	28.882	28.816	28.767	28.718
28.650	28.569	28.505	28.451	28.392
28.323	28.250	28.202	28.168	28.130
28.080	28.022	27.963	27.907	27.856
27.805	27.731	27.649	27.578	27.524
27.482	27.421	27.353	27.292	27.225
27.163	27.116	27.063	27.011	26.951
26.897	26.865	26.825	26.765	26.707
26.650	26.608	26.566	26.510	26.463
26.417	26.363	26.324	26.287	26.239
26.179	26.110	26.043	26.005	25.982
25.953	25.911	25.858	25.804	25.752
25.706	25.663	25.619	25.552	25.475
25.410	25.362	25.330	25.301	25.249
25.188	25.135	25.076	25.022	24.983
24.937	24.894	24.863	24.823	24.784
24.735	24.689	24.641	24.602	24.561
24.526	24.490	24.459	24.423	24.372
24.329	24.288	24.240	24.206	24.174
24.129	24.071	24.007	23.967	23.941
23.909	23.864	23.809	23.751	23.697
23.646	23.603	23.588	23.587	23.574
23.524	23.451	23.387	23.341	23.311
23.290	23.269	23.248	23.224	23.175
23.119	23.075	23.045	23.005	22.961
22.928	22.906	22.873	22.831	22.774
22.724	22.694	22.660	22.627	22.583
22.541	22.497	22.459	22.420	22.388
22.354	22.327	22.297	22.274	22.246
22.202	22.167	22.133	22.091	22.063
22.035	21.999	21.975	21.951	21.916
21.868	21.814	21.783	21.766	21.742
21.705	21.657	21.606	21.557	21.515
21.501	21.502	21.494	21.473	21.441
21.406	21.375	21.344	21.289	21.225
21.171	21.132	21.106	21.086	21.067
21.044	20.998	20.944	20.904	20.883
20.874	20.846	20.809	20.782	20.766
20.739	20.668	20.310	19.560	18.510
17.300	16.056	14.825	13.604	12.385
11.173	9.982	8.833	7.749	6.749
5.843	5.035	4.325	3.706	3.172
2.713	2.322	1.988	1.703	1.460
1.254	1.078	.929	.801	.692
.598	.518	.449	.390	.339
.294	.255	.222	.193	.168
.145	.126	.110	.096	.084
.074	.064	.056	.049	.042
.037	.032	.027	.024	.020
.017	.015	.013	.011	.009
.007	.006	.005	.004	.003
.003	.002	.002	.002	.001
.001	.001			

*

PRINT HYD
PLOT HYD

ID=5 CODE=1
ID=5 ID=0 QSCALE=0 TSCALE=6

*

*C ROUTE HYD. 256.20 TO 256.90

*

COMPUTE RATING CURVE CID=1 VS NO=1 NSEGS=3

ELMIN=0 ELMAX=4.3 CH SLP=.027 ft/ft FP SLP=.027 ft/ft
N=.045 DIST=15 N=-0.013 DIST=86 N=.045 DIST=101

DIST	ELEV
0	4.3
15	4.0
23	0.0
78	0.0
86	4.0
101	4.3

*

```

                                BL10D35B
*COMPUTE TRAVEL TIME ID=2 REACH=1 NO VS=1
*
L=1540 SLP=0.02
ROUTE MCUNGE ID=2 HYD=256.90 INFLOW ID=5 DT=0.00
L=1540 NO VS=1 SLP=0.027
PRINT HYD ID=2 CODE=1
*
SEDIMENT BULK CODE=1 BULK FACTOR=1.06
*
COMPUTE LT TP LCODE=1 NK=3 ISLOPE=0
L=400 S=0.025 K=1
L=1100 S=0.045 K=2
L=1300 S=0.023 K=3
*
COMPUTE NM HYD ID=1 HYD=540 DA=0.0459 SQ MI
PER A=7 B=29 C=27 D=37
TP=0.0 RAIN=-1
*
PRINT HYD ID=1 CODE=1
*
*C COMBINE HYD.'S 256.90 AND 540 AT 540.10
*
ADD HYD ID=6 HYD=540.10 ID I=1 ID II=2
*
PRINT HYD ID=6 CODE=1
*
SEDIMENT BULK CODE=1 BULK FACTOR=1.18
*
COMPUTE LT TP LCODE=1 NK=3 ISLOPE=0
L=400 S=0.05 K=1
L=300 S=0.033 K=2
L=2500 S=0.030 K=3
*
COMPUTE NM HYD ID=1 HYD=530B DA=0.0728 SQ MI
PER A=5 B=24 C=27 D=44
TP=0.0 RAIN=-1
*
* COMBINE HYD.'S 530B AND 540.10 AT 540.20
*
ADD HYD ID=4 HYD=540.20 ID I=1 ID II=6
*
PRINT HYD ID=4 CODE=1
*
*S REMAINDER OF GOLF COURSE ROAD STORM DRAIN SYSTEM
*
SEDIMENT BULK CODE=1 BULK FACTOR=1.06
*
* COMPUTE 520
COMPUTE LT TP LCODE=1 NK=3 ISLOPE=0
L=400 S=0.05 K=1
L=400 S=0.0375 K=2
L=2400 S=0.0167 K=4
*
COMPUTE NM HYD ID=1 HYD=520 DA=0.0409 SQ MI
PER A=0 B=0 C=24.5 D=75.5
TP=0.0 RAIN=-1
*
*S ROUTE 520 TO 530C AT 520.90
COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLOPE=0.0092
PIPE DIA=54 N=0.025
COMPUTE TRAVEL TIME ID=3 REACH=1 NO VS=1
LENGTH=1300 FT SLOPE=0.01
ROUTE ID=3 HYD NO=520.90 INFLOW ID=1 DT=0.0
PRINT HYD ID=3 CODE=10
*
* COMPUTE 530A
COMPUTE LT TP LCODE=1 NK=3 ISLOPE=0
L=400 S=0.0275 K=1
L=1000 S=0.03 K=2
L=1200 S=0.025 K=3
*
COMPUTE NM HYD ID=2 HYD=530A DA=0.1473 SQ MI
PER A=10 B=33 C=30 D=27
TP=0.0 RAIN=-1
*S ***** AP 530A.90 (20PP.IN) *****

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BL10D35B

*S ROUTE 530A THROUGH 20TH AVENUE PARK POND SIZE AND VOLUME ARE ASSUMED
 *S BASED ON FIELD INVESTIGATION BUT NOT ON A COMPREHENSIVE SURVEY.
 *S THIS POND HAS AN OVERFLOW ON THE TWO LOTS ON THE SOUTH EDGE AND
 *S IS MODELED WITH THE PROPOSED EXPANSION.

ROUTE RESERVOIR	ID=7 HYD=530A.90	INFLOW ID=2	CODE=5
	OUTFLOW(CFS)	STORAGE(AF)	ELEV(FT)
	0.0	0.0	5230
	25	0.13	5232
	45	0.29	5234
	50.9	0.75	5236
	58.8	1.82	5238
	65.7	10.65	5240
	72.0	32.89	5242

PRINT HYD ID=7 CODE=10

*S*****DIVIDE HYD TO UNBULK TO 3% *****

DIVIDE HYD ID=7 %=-97 ID I=7 HYD=UNBULK
 ID II=57 HYD=SEDIMENT

*S ***** AP 20PP.OUT *****
 PRINT HYD ID=7 CODE=10

*S ROUTE 530A.90 "UNBULKED" THROUGH STORM DRAIN TO GOLF COURSE ROAD SYSTEM.
 *S OUTFALL PIPE IS 48" CMP.

COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLOPE=0.0092
 PIPE DIA=4 N=0.025

COMPUTE TRAVEL TIME ID=99 REACH=1 NO VS=1
 LENGTH=1300 FT SLOPE=0.01

ROUTE ID=99 HYD NO=530A.91 INFLOW ID=7 DT=0.0
 PRINT HYD ID=99 CODE=10

*S PUNCH HYDROGRAPH FOR GOLF COURSE ROAD STORM DRAIN DESIGN MODEL
 PUNCH HYD ID=99

*S COMBINE 530A.91 AND 520.90 AT STORM DRAIN OUTFALL TO GCR SYSTEM

ADD HYD ID=3 HYD=530A.10 ID I=99 ID II=3

PRINT HYD ID=3 CODE=10

*S ROUTE COMBINED HYDROGRAPHS IN PIPE TO 23RD AVENUE

COMPUTE RATING CURVE CID=1 VS NO=1 CODE=-1 SLOPE=0.01
 PIPE DIA=5.5 N=0.013

COMPUTE TRAVEL TIME ID=2 REACH=1 NO VS=1
 LENGTH=1900 FT SLOPE=0.0263

ROUTE ID=2 HYD NO=530A.92 INFLOW ID=3 DT=0.0
 PRINT HYD ID=2 CODE=10

*S COMPUTE 530C

COMPUTE LT TP LCODE=1 NK=2 ISLOPE=0
 L=400 S=0.02 K=1
 L=500 S=0.06 K=2

COMPUTE NM HYD ID=1 HYD=530C DA=0.0253 SQ MI
 PER A=4.4 B=14.8 C=25.6 D=55.2
 TP=0.0 RAIN=-1
 PRINT HYD ID=1 CODE=1

*S COMPUTE 530D 23RD AVE. POND BASIN

COMPUTE LT TP LCODE=1 NK=2 ISLOPE=0
 L=400 S=0.02 K=1
 L=500 S=0.06 K=2

COMPUTE NM HYD ID=3 HYD=530D DA=0.0100 SQ MI
 PER A=0 B=50 C=50 D=0
 TP=0.0 RAIN=-1
 PRINT HYD ID=3 CODE=1

*S ADD 530D TO 530C

ADD HYD ID=3 HYD=530D.10 ID I=1 ID II=3
 PRINT HYD ID=3 CODE=1

*S ADD ROUTED 520 AND 530A TO 530C

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                                BL10D35B
**S ***** AP 530D.20 (GC.IN) *****
ADD HYD                      ID=2  HYD=530D.20      ID I=2  ID II=3
*
PRINT HYD                    ID=2  CODE=10
*S ***** AP 530.90 (GC.OUT) *****
*S ROUTE COMBINED FLOW THROUGH 23RD AVENUE PONDS
*S THE PONDS ARE COMBINED AND TREATED AS ONE TEN ACRE FOOT POND FOR
*S FOR THIS MODEL.
ROUTE RESERVOIR              ID=3  HYD=530.90  INFLOW ID=2  CODE=5
                                OUTFLOW(CFS)      STORAGE(AF)      ELEV(FT)
                                0              0.0              100
                                5              1              100.5
                                10             2              101
                                15             3              101.5
                                20             5              103
                                21             7.5             104
                                85             12              104.5
                                300            12.1             106
PRINT HYD                    ID=3  CODE=10
*
*S THIS RESERVOIR NOT UNBULKED
*
* ROUTE FLOW IN CHANNEL TO EAST BRANCH
*
* SIMPLIFIED CROSS SECTION
COMPUTE RATING CURVE RC=-1  VS NO=1  NSEGS=3
                        ELMIN=0  ELMAX=4  CH SLP=.016ft/ft  FP SLP=.016ft/ft
                        N=.045 DIST=36  N=-.03 DIST=59  N=.045 DIST=95
                        DIST  ELEV  DIST  ELEV
                        0      4      36      3
                        40     0      55     0
                        59     3      95     4
COMPUTE TRAVEL TIME ID=2  REACH=1  NUMBER OF VALLEY SECTIONS=1
                        LENGTH=600 FT  SLOPE=0.016
*
ROUTE                    ID=2      HYD NO=530.91  INFLOW HYD  ID=3      DT=0.0
*
PRINT HYD                ID=2      CODE=10
*
*S COMBINE ROUTED FLOW WITH ALL EAST BRANCH FLOW 530B, ETC.
*S ***** AP 530.92 *****
ADD HYD                  ID=1  HYD=530.92      ID I=2  ID II=4
*
PRINT HYD                ID=1      CODE=10
*
*S ROUTE IN EAST BRANCH TO BLACK DAM
*
COMPUTE RATING CURVE CID=1  VS NO=1  NSEGS=3
                        ELMIN=0  ELMAX=4.3  CH SLP=.027 ft/ft  FP SLP=.027 ft/ft
                        N=.045 DIST=15  N=-0.013 DIST=86  N=.045 DIST=101
                        DIST  ELEV
                        0      4.3
                        15     4.0
                        23     0.0
                        78     0.0
                        86     4.0
                        101    4.3
*
COMPUTE TRAVEL TIME ID=2  REACH=1  NO VS=1
                        L=1540  SLP=0.02
ROUTE                    ID=2  HYD=530.93  INFLOW ID=1  DT=0.00
PRINT HYD                ID=2  CODE=1
*
SEDIMENT BULK            CODE=1  BULK FACTOR=1.18
*
* COMPUTE 550
COMPUTE LT TP            LCODE=1  NK=3  ISLOPE=0
                        L=400  S=0.045  K=1
                        L=500  S=0.044  K=2
                        L=2000 S=0.023  K=3
*
COMPUTE NM HYD           ID=1  HYD=550  DA=0.0497 SQ MI
                        PER A=3  B=42  C=42  D=13
                        TP=0.0  RAIN=-1

```


BL10D35B

*S ADD 550 TO EAST BRANCH FLOWS

*

ADD HYD ID=1 HYD=550.10 ID I=1 ID II=2

*

PRINT HYD ID=1 CODE=10

*

*S ADD WEST BRANCH AND EAST BRANCH FLOWS

*S THIS IS TOTAL FLOW INTO THE BLACK DAM/EXCLUDING SOME PORTIONS

*S OF BERNALILLO COUNTY

*

ADD HYD ID=97 HYD=DAM.10 ID I=11 ID II=1

*

PRINT HYD ID=97 CODE=1

*

*S RECALL HYDROGRAPHS FROM BERNALILLO COUNTY SUBDIVISIONS

*S THESE ARE PUNCH HYDROGRAPHS AND FLOWS DRAIN DIRECTLY TO THE DAM POOL

*S VIA PIPES.

*S TEXT TAKEN FROM MODEL RECEIVED 1/9/02 * * * * *

*S Ridgeview Village(DB4), Los Suenos(DB3), and the Park Hill(DB2)

*S Subdivisions have free developed discharge based on R-1, 5 du/acre density.

*S Flow from some commercial sites east of Unser between McMahon and

*S Black Arroyo Blvd. is restricted to historic as per Ridgeview Unit 1 Plan.

*S Developed flow is accommodated from the residential tracts and

*S other commercial tracts. * * * * *

RECALL HYD ID=18 HYD=AP5

DT= .050000 HRS DA= .3809 SQ MI

PEAK= 850.596CFS RO= 1.5721 INCHES NO PTS=162

FLOW RATES

.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.013	.292	2.391
17.665	69.711	190.370	384.806	632.716
832.012	850.596	729.688	578.766	459.055
380.216	326.673	286.659	254.529	227.980
205.284	184.443	157.361	123.441	91.489
68.298	53.196	43.560	37.295	32.061
27.919	24.782	22.149	19.760	17.599
15.610	13.804	12.416	11.415	10.597
9.860	9.185	8.581	8.053	7.592
7.182	6.812	6.472	6.166	5.896
5.663	5.463	5.287	5.127	4.982
4.846	4.723	4.612	4.513	4.425
4.353	4.297	4.245	4.192	4.141
4.096	4.061	4.035	4.015	4.001
3.991	3.981	3.969	3.959	3.957
3.960	3.972	3.992	4.011	4.028
4.045	4.064	4.085	4.107	4.132
4.161	4.191	4.219	4.245	4.274
4.310	4.354	4.395	4.433	4.474
4.518	4.562	4.604	4.648	4.697
4.751	4.788	4.691	4.366	3.857
3.285	2.729	2.219	1.773	1.400
1.098	.856	.667	.518	.404
.315	.246	.192	.150	.117
.091	.071	.054	.042	.032
.024	.018	.014	.010	.008
.006	.004	.004	.003	.002
.002	.002	.002	.001	.001
.001	.001			

* * * * *

*S STONEBRIDGE SUBDIVISION FROM MODEL RECEIVED 1/15/02

*

RECALL HYD ID=19 HYD=AP15

DT= .050000 HRS DA= .2385 SQ MI

PEAK= 359.506CFS RO= 1.3854 INCHES NO PTS=565

FLOW RATES

.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.000	.000
.000	.000	.000	.720	7.642
29.164	67.712	123.014	205.408	304.581

BL10D35B

359.506	341.129	290.929	245.703	210.837
184.680	164.554	148.500	135.508	124.817
115.958	106.680	88.719	69.855	56.588
47.831	41.713	37.053	33.213	29.975
27.235	24.889	22.838	21.043	19.472
18.102	16.888	15.808	14.840	13.950
13.156	12.431	11.758	11.149	10.620
10.137	9.662	9.245	8.860	8.500
8.171	7.850	7.564	7.323	7.087
6.841	6.613	6.396	6.198	6.029
5.921	5.805	5.727	5.654	5.560
5.495	5.414	5.345	5.286	5.228
5.183	5.124	5.065	5.025	4.995
4.947	4.898	4.860	4.814	4.791
4.767	4.732	4.685	4.662	4.638
4.609	4.593	4.583	4.556	4.548
4.537	4.517	4.504	4.478	4.471
4.463	4.446	4.440	4.443	4.452
4.458	4.359	3.809	3.133	2.674
2.387	2.201	2.070	1.962	1.873
1.799	1.733	1.671	1.618	1.572
1.527	1.494	1.462	1.429	1.401
1.374	1.347	1.322	1.298	1.275
1.252	1.230	1.208	1.187	1.165
1.144	1.125	1.105	1.085	1.066
1.048	1.031	1.013	.996	.979
.963	.947	.931	.915	.900
.885	.870	.855	.841	.826
.813	.799	.785	.772	.759
.746	.734	.722	.709	.697
.686	.674	.663	.652	.641
.630	.619	.609	.599	.589
.579	.569	.559	.550	.541
.532	.523	.514	.505	.497
.488	.480	.472	.464	.456
.449	.441	.434	.426	.419
.412	.405	.398	.392	.385
.379	.372	.366	.360	.354
.348	.342	.336	.330	.325
.319	.314	.309	.304	.298
.293	.289	.284	.279	.274
.270	.265	.261	.256	.252
.248	.243	.239	.235	.231
.227	.224	.220	.216	.213
.209	.205	.202	.199	.195
.192	.189	.186	.182	.179
.176	.173	.170	.168	.165
.162	.159	.157	.154	.151
.149	.146	.144	.141	.139
.137	.134	.132	.130	.128
.126	.123	.121	.119	.117
.115	.113	.112	.110	.108
.106	.104	.102	.101	.099
.097	.096	.094	.093	.091
.089	.088	.086	.085	.084
.082	.081	.079	.078	.077
.075	.074	.073	.072	.071
.069	.068	.067	.066	.065
.064	.063	.062	.061	.060
.059	.058	.057	.056	.055
.054	.053	.052	.051	.050
.049	.049	.048	.047	.046
.045	.045	.044	.043	.042
.042	.041	.040	.040	.039
.038	.038	.037	.036	.036
.035	.035	.034	.033	.033
.032	.032	.031	.031	.030
.030	.029	.029	.028	.028
.027	.027	.026	.026	.025
.025	.025	.024	.024	.023
.023	.023	.022	.022	.021
.021	.021	.020	.020	.020
.019	.019	.019	.018	.018
.018	.018	.017	.017	.017

BL10D35B

.016	.016	.016	.016	.015
.015	.015	.015	.014	.014
.014	.014	.013	.013	.013
.013	.012	.012	.012	.012
.012	.011	.011	.011	.011
.011	.011	.010	.010	.010
.010	.010	.010	.009	.009
.009	.009	.009	.009	.008
.008	.008	.008	.008	.008
.008	.008	.007	.007	.007
.007	.007	.007	.007	.007
.006	.006	.006	.006	.006
.006	.006	.006	.006	.006
.005	.005	.005	.005	.005
.005	.005	.005	.005	.005
.005	.005	.004	.004	.004
.004	.004	.004	.004	.004
.004	.004	.004	.004	.004
.004	.003	.003	.003	.003
.003	.003	.003	.003	.003
.003	.003	.003	.003	.003
.003	.003	.003	.003	.003
.003	.002	.002	.002	.002
.002	.002	.002	.002	.002
.002	.002	.002	.002	.002
.002	.002	.002	.002	.002
.002	.002	.002	.002	.002
.002	.002	.002	.002	.002
.002	.002	.002	.002	.002
.002	.001	.001	.001	.001
.001	.001	.001	.001	.001
.001	.001	.001	.001	.001
.001	.001	.001	.001	.001

*
 *S ADD RECALL HYDROGRAPHS
 *
 ADD HYD ID=98 HYD=DIRECT.PEPE ID I=18 ID II=19
 *
 PRINT HYD ID=98 CODE=1
 *
 *S ADD RECALL HYDS TO EAST AND WEST BRANCH FLOWS FOR TOTAL INTO BLACK DAM
 *
 ADD HYD ID=99 HYD=DAM.IN ID I=98 ID II=97
 *
 PRINT HYD ID=99 CODE=1
 *
 *S ROUTE FLOWS THROUGH BLACK DAM RATING CURVE TAKEN FROM BLACK DAM
 *S FILING SHEET RECORD DRAWINGS - BLARD-51 Stamp dated 9/14/91
 *S Record Dwg Stamp 11/9/92 AMAFCA Ref # NW-04-114 Calabacillas
 *S THIS IS THE FUTURE CONDITIONS RATING CURVE
 *

ROUTE RESERVOIR	ID=91	HYD NO=DAM.R	INFLOW ID=99	CODE=4.2
	OUTFLOW (CFS)	STORAGE (AF)	ELEV (FT)	
	0	0	5146	
	140	3.6	5148	
	400	17.06	5150	
	750	43.17	5152	
	1180	77.19	5154	
	1510	113.16	5156	
	1850	150.22	5158	
	2120	188.37	5160	
	2380	227.61	5162	
	2620	267.94	5164	
	2783	304.13	5165.75	
	2783.01	354.13	5165.76	
	2783.02	404.13	5165.77	
	2783.03	454.13	5165.78	
	2783.04	504.13	5165.79	
	2783.05	554.13	5165.80	
	2783.06	604.13	5165.81	
	2783.07	654.13	5165.82	
	2783.08	704.13	5165.83	
	2783.09	754.13	5165.84	

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                                BL10D35B
                2783.1          804.13          5165.85
                2850           309.36          5166
                3000           352.16          5168
                7000           396.55          5170
                12000          442.53          5172
                18000          490.36          5174
                21427.53       515.11          5175

* * * * *
*S EMERGENCY SPILLWAY CREST IS AT ELEV 5165.75 FT
PRINT HYD          ID=91  CODE=1
*
*S *
*S *
*S * * * * *
*S *
*S *
*S * * * * *
*S 19TH AVENUE POND * SELF CONTAINED BASIN * * * * *
* AFTER FIELD INVESTIGATIONS, IT APPEARS THAT WHEN THIS POND OVERFLOWS
* THE RUNOFF FLOWS TO THE BLACK DIVERSION CHANNEL. STORM DRAIN MAPS FOR
* THE CITY OF RIO RANCHO ARE UNAVAILABLE AT THIS TIME, AND DESIGN REPORTS
* OR CRITERIA WERE NOT FOUND DURING THE LITERATURE SEARCH.
*S ***** AP 19P.IN *****
*S ***CHANGE 1 TO SSCAFCA TREATMENT TYPE PERCENTAGES FOR 1/2 ACRE LOTS
*S ***CHANGE 2 USE LT TP TO GET TP USE 200 FT AROUND HOUSE K=.07 MAX OUT
*S ***2000FT FOR SHALLOW FLOW IN STREET AT STREET SLOPE AND REST
*
SEDIMENT BULK          CODE=1  BULK FACTOR=1.06
*
COMPUTE LT TP          LCODE=1 NK=3 ISLOPE=0
                        LENGTH=230 FT SLOPE=.010 K=.7
                        LENGTH=2000 FT SLOPE=.018 K=2
                        LENGTH=6000 FT SLOPE=.018 K=3
COMPUTE NM HYD  ID=90  HYD=319 DA=0.5842 SQ MI
                        PER A=33 B=28 C=21 D=18
                        TP=0.0 HRS      RAIN=-1
*
PRINT HYD              ID=90  CODE=1
*
*S * * * * * ROUTE VOLUME INTO POND TO CHECK VOLUME * * * * *
*
ROUTE RESERVOIR        ID=99  HYD NO=319.90  INFLOW ID=90 CODE=5
                        OUTFLOW (CFS)  STORAGE (AF)  ELEV (FT)
                        0                0.0          5217.0
                        0.01             0.0          5218.0
                        0.02             1.7          5220.0
                        0.03             15.0         5230.0
                        0.04             19.0         5232.0
                        0.05             28.5         5234.0
                        0.06             70.0         5240.0
*S ***** AP 19P.OUT *****
PRINT HYD              ID=99  CODE=1
* * * * *
*
FINISH

```

DEVELOPED CONDITIONS AHYMO OUTPUT SUMMARY FILE PRINTOUT

BLACK ARROYO WATERSHED MANAGEMENT PLAN

J:\SSCA\CA\98003\98003_01\REPORT\APPENDIX G.doc

BL10D35B

□(sl6.66H

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =07/05/2002
INPUT FILE = BL10D35B.DAT USER NO.= AHYMO-I-9702a01000i17-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE =
START										1
*S	* FUTURE CONDITIONS MODEL - ALTERNATE B									
*S	* 3 DAMS ON THE WEST BRANCH									
*S	* UNSEER GATEWAY DAM, AND WATER QUALITY DIVERSIONS									
*S	* ROUTING WITH MCUNGE METHOD AFTER WATER QUALITY DIVERSIONS ARE									
*S	* UTILIZED TO ADJUST FOR THE UNSTABLE HYDROGRAPHS WITH A STEEP SLOPE									
*S	* AFTER MODIFICATION TO REDIRECT THE FIRST FLUSH OF 0.25" RUNOFF FOR SWQ									
RAINFALL	TYPE= 2									
*S	* BEGINNING OF THE BLACK ARROYO WEST BRANCH									
*S	* LISBON CHANNEL NORTH OF TULIP									
*S	* SEDIMENT BULK									
ROUTE	101.00 - 1			.33970	604.11	33.162	1.83038	1.600	2.779	1.18
ROUTE	101.90 1 2			.33970	610.91	33.162	1.83038	1.600	2.810	50.00
ROUTE	102.00 - 1			.25390	391.99	18.503	1.36638	1.550	2.412	29.00
ADD HYD	102.10 1& 2 3			.59360	992.87	51.664	1.63191	1.600	2.613	
ROUTE	102.90 3 4			.59360	1007.91	51.664	1.63192	1.600	2.653	
ROUTE	103A - 1			.18030	322.15	15.389	1.60035	1.550	2.792	39.00
*S	* START OF LISBON CHANNEL AT TULIP AND INFLOW TO DAM									
*S	* ADD HYD									
ROUTE	103A.90 1& 4 3			.77390	1308.70	67.053	1.62456	1.600	2.642	
ROUTE	103A.90 THRU LISBON @ TULIP DAM/POND									
ROUTE	RESERVOIR TULIS.DAM 3 4			.77390	4.85	11.055	.26785	22.600	.010	58.221
*S	* DIVIDE HYD									
ROUTE	UNBULK 4 4			.75068	4.71	10.724	.26785	22.600	.010	
ROUTE	SEDIMENT and 51			.02322	.15	.332	.26785	22.600	.010	
*S	* ROUTE IN PIPE TO LISBON CHANNEL									
*S	* AP=TULIS.90									
ROUTE	TULIS.90 4 3			.75068	4.71	10.706	.26741	22.650	.010	
*S	* START OF LISBON CHANNEL AT TULIP									
*S	* SEDIMENT BULK									
ROUTE	103B - 1			.08950	170.91	6.862	1.43760	1.500	2.984	1.06
ROUTE	103B TO PREVIOUS HYDROGRAPHS FOR TOTAL Q IN LISBON CHANNEL AT									
ROUTE	DOWNSTREAM END OF BASIN 103B									
ROUTE	103B.10 1& 3 3			.84018	171.17	17.568	.39206	1.500	.318	
ROUTE	103B.10 THRU 104B TO 104B.90									
ROUTE	104B.90 3 4			.84018	171.34	17.562	.39193	1.500	.319	
*S	* START OF SUNSET CHANNEL									
*S	* SEDIMENT BULK									
ROUTE	106A1 - 1			.11660	197.48	9.284	1.49286	1.550	2.646	1.18
ROUTE	106A.90 1 3			.11660	193.08	9.284	1.49286	1.600	2.587	34.00
ROUTE	104A - 1			.18340	423.66	17.444	1.78336	1.500	3.609	46.00
ROUTE	104.10 3& 1 1			.30000	568.80	26.727	1.67045	1.500	2.963	
*S	* ADD HYD									

BL10D35B

*S ROUTE 104.10 THROUGH PROPOSED SUNSET @ TULIP POND/DAM									
*S	*	*	*	*	*	*	*	*	*
ROUTE RESERVOIR	TUSUN.DAM	1	2	.30000	4.84	10.363	.64772	3.600	.025 AC-FT= 21.290
*S *****DIVIDE HYD TO UNBULK BY 3% *****									
DIVIDE HYD	UNBULK	2	2	.29100	4.69	10.053	.64772	3.600	.025
	SEDIMENT and 52			.00900	.15	.311	.64772	3.600	.025
*S ROUTE IN PIPE TO LISBON CHANNEL									
COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE NOTATION
ROUTE	TUSUN.90	2	3	.29100	4.69	10.020	.64562	3.700	.025
SEDIMENT BULK									
COMPUTE NM HYD	104B	-	1	.03550	73.53	3.033	1.60200	1.500	PK BF = 1.06
ADD HYD	104.20 1& 3	5		.32650	73.90	13.053	.74960	1.500	PER IMP= 46.00
*S LISBON CHANNEL AFTER SUNSET CHANNEL CONFLUENCE (HYD=104B.1)									
ADD HYD	104.30 5& 4	3		1.16668	245.24	30.616	.49203	1.500	.328
ROUTE	104.90	3	4	1.16668	230.04	30.528	.49061	1.550	.308
SEDIMENT BULK									
COMPUTE NM HYD	105.00	-	1	.15090	235.75	13.137	1.63231	1.600	PK BF = 1.06
*S LISBON CHANNEL AFTER SUB-BASIN 105									
ADD HYD	105.10 1& 4	5		1.31758	449.99	43.664	.62137	1.550	.534
ROUTE	105.90	5	4	1.31758	454.27	43.637	.62098	1.600	.539
*S *****									
*S START OF SUGAR CHANNEL AT TULIP									
*S	*	*	*	*	*	*	*	*	*
COMPUTE NM HYD	106A2	-	1	.13590	238.59	10.280	1.41829	1.500	2.743 PER IMP= 38.00
*S *****									
*S BALI CHANNEL									
*S	*	*	*	*	*	*	*	*	*
COMPUTE NM HYD	106B	-	3	.15220	277.45	13.697	1.68735	1.550	2.848 PER IMP= 49.00
*S *****									
*S SUGAR CHANNEL INCLUDING CONFLUENCE WITH BALI CHANNEL									
*S	*	*	*	*	*	*	*	*	*
ADD HYD	106B.10 1& 3	5		.28810	509.62	23.977	1.56043	1.550	2.764
*S ROUTE 106B.10 TO 106C.90 (TO CONFLUENCE OF LISBON & SUGAR CHLS) (106C)									
ROUTE	106B.90	5	1	.28810	515.18	23.977	1.56043	1.550	2.794
COMPUTE NM HYD	106C	-	3	.04840	65.44	2.828	1.09551	1.550	2.113 PER IMP= 25.00
ADD HYD	106C.10 1& 3	5		.33650	580.62	26.804	1.49356	1.550	2.696
*S ***** AP 106.90 *****									
*S LISBON CHANNEL AFTER CONFLUENCE WITH SUGAR CHANNEL									
*S	*	*	*	*	*	*	*	*	*
ADD HYD	106.20 5& 4	5		1.65408	1024.63	70.441	.79849	1.550	.968
ROUTE	106.91	5	2	1.65408	1014.34	70.401	.79804	1.550	.958
COMPUTE NM HYD	107.00	-	1	.03580	77.64	3.240	1.69687	1.500	3.389 PER IMP= 49.00
*S *****									
*S LISBON CHANNEL AFTER ADDING SUB-BASIN 107									
*S	*	*	*	*	*	*	*	*	*
ADD HYD	107.10 1& 2	5		1.68988	1084.00	73.641	.81708	1.550	1.002
ROUTE	109.00	-	1	.08640	146.71	7.983	1.73247	1.600	2.653 PER IMP= 51.00
COMPUTE NM HYD									
*S *****									
*S BALITIC CHANNEL									
*S FLOW AT CASCADE RD @ 600 FT. W. OF COMANCHE RD. (HYD. 109)									
*S	*	*	*	*	*	*	*	*	*
COMPUTE NM HYD	110.00	-	3	.05090	96.43	4.545	1.67415	1.550	2.960 PER IMP= 48.00
*S *****									
*S ARKANSAS CHANNEL INCLUDING FLOW FROM BALITIC CHANNEL									
*S	*	*	*	*	*	*	*	*	*

COMMAND	HYDROGRAPH IDENTIFICATION	FROM TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 3
ADD HYD	110.10	1& 3	6	.13730	241.25	1.71084	1.550	2.746	59.00
ROUTE	110.90	6	2	.13730	239.79	1.71085	1.550	2.729	
COMPUTE NM HYD	108.00	-	1	.06720	129.00	1.86858	1.550	2.999	
*S	ARKANSAS CHANNEL INCLUDING FLOW FROM BAL TIC CHANNEL BEFORE CONFLUENCE								
*S	WITH LISBON CHANNEL								
*S	LISBON AVE. @ 250 FT. N. OF HOOD RD.								
*S	ADD HYD	108.10	1& 2	6	.20450	368.79	1.76267	1.550	2.818
*S	AP 108.91								
*S	LISBON CHANNEL AFTER ADDING ARKANSAS CHANNEL FLOWS								
*S	ADD HYD	108.20	5& 6	5	1.89438	1452.79	.91916	1.550	1.198
ROUTE	108.90	5	2	1.89438	1458.67	.91838	1.600	1.203	
COMPUTE NM HYD	111.00	-	1	.11590	212.69	1.76879	1.550	2.867	54.00
*S	AP 111.10								
*S	LISBON CHANNEL DISCHARGE @ SOUTHERN BLVD								
*S	ADD HYD	111.10	1& 2	5	2.01028	1660.27	.96741	1.600	1.290
*S	START OF LISBON ARROYO								
*S	ROUTE	111.90	5	2	2.01028	1670.31	.96695	1.600	1.298
SEDIMENT BULK									PK BF = 1.18
COMPUTE NM HYD	116.00	-	1	.03190	82.45	2.12321	1.500	4.038	61.00
ADD HYD	116.10	1& 2	5	2.04218	1727.26	.98501	1.600	1.322	
*S	END LISBON CHANNEL AND LISBON ARROYO WATERSHED								
*S	START IVORY WATERSHED								
*S	SEDIMENT BULK								PK BF = 1.06
*S	PECOS/RODEO CHANNEL								
COMPUTE NM HYD	114.00	-	1	.06980	127.15	1.58353	1.550	2.846	43.00
ROUTE	114.90	1	2	.06980	127.78	1.58354	1.550	2.860	
*S	SPUR CHANNEL								
*S	COMPUTE NM HYD	115.00	-	1	.12520	212.95	1.74541	1.600	2.658
ADD HYD	115.10	1& 2	6	.19500	337.98	1.68746	1.550	2.708	52.00
*S	IVORY CHANNEL								
*S	COMPUTE NM HYD	113.00	-	1	.04770	105.78	1.82988	1.500	3.465
*S	CONFLUENCE OF IVORY AND SPUR								
*S	ADD HYD	113.10	1& 6	6	.24270	434.44	1.71545	1.550	2.797
*S	AP 113.90								
ROUTE	113.90	6	2	.24270	433.51	1.71546	1.550	2.791	52.00
COMPUTE NM HYD	112.00	-	1	.07360	143.46	1.74862	1.550	3.046	
*S									

[illegible]

BL10D35B									
ROUTE	300.91	3	2	1.4830	225.65	15.727	1.98837	1.700	2.377
COMPUTE NM HYD	310.00	-	3	.08000	190.81	8.484	1.98837	1.500	3.727
ADD HYD	310.10	2& 3	4	.22830	316.90	24.210	1.98836	1.650	2.169
COMPUTE NM HYD	320.00	-	2	.07690	136.10	7.547	1.84007	1.550	2.765
DIVIDE HYD	320.80	2	10	.07077	105.44	6.946	1.84007	1.550	2.328
	320.81	and 11		.00613	30.66	.601	1.84007	1.550	7.821
ROUTE	320.90	10	3	.07077	101.92	6.946	1.84008	1.600	2.250
ADD HYD	320.10	4& 3	4	.29907	418.44	31.156	1.95327	1.600	2.186
COMPUTE NM HYD	400.00	-	2	.00410	6.55	.181	.82952	1.500	2.495
ADD HYD	400.10	4& 2	4	.30317	423.22	31.337	1.93807	1.600	2.181
*S ***** AP 400.30 *****INFLOW INTO WEXFORD POND*****									
*S *****									
ROUTE RESERVOIR	400.90	4	5	.30317	142.73	31.337	1.93807	2.150	.736
*S *****DIVIDE HYD TO UNBULK TO 3% *****									
*S *****									
DIVIDE HYD	UNBULK	5	1	.29408	138.45	30.397	1.93807	2.150	.736
	SEDIMENT	and 53		.00910	4.28	.940	1.93807	2.150	.736
*S DIVIDE INTO PIPE AND SPILLWAY FLOWS AP 400 OUT PIPE AND SPILL *****									
DIVIDE HYD	400.81	1	1	.29308	135.00	30.293	1.93807	1.950	.720
	400.82	and 3		.00100	3.45	.104	1.93808	2.150	5.367
ROUTE	400.90	1	6	.29308	135.01	30.293	1.93807	2.000	.720
PAGE = 5									
COMMAND	HYDROGRAPH		FROM TO	AREA	PEAK	RUNOFF	RUNOFF	TIME TO	CFS
	IDENTIFICATION		ID NO.	(SQ MI)	DISCHARGE	VOLUME	(INCHES)	PEAK	PER
					(CFS)	(AC-FT)		(HOURS)	ACRE
ROUTE	400.91	3	2	.00100	3.18	.104	1.94581	2.250	4.958
ADD HYD	400.20	2& 6	6	.29408	138.18	30.398	1.93810	2.250	.734
COMPUTE NM HYD	410.00	-	3	.03630	75.89	3.805	1.96557	1.550	3.266
ADD HYD	410.10	6& 3	4	.33038	176.55	34.203	1.94111	1.550	.835
ROUTE	410.90	4	2	.33038	175.22	34.203	1.94111	1.600	.829
COMPUTE NM HYD	420.00	-	3	.05160	137.89	6.523	2.37033	1.500	4.176
ADD HYD	420.10	2& 3	14	.38198	292.02	40.726	1.99910	1.550	1.195
COMPUTE NM HYD	330.00	-	2	.06330	136.57	6.844	2.02732	1.550	3.371
ROUTE	330.90	2	3	.06330	127.36	6.844	2.02733	1.600	3.144
COMPUTE NM HYD	340.00	-	1	.04580	100.54	4.809	1.96890	1.500	3.430
ADD HYD	340.10	1& 3	4	.10910	223.41	11.654	2.00279	1.550	3.200
COMPUTE NM HYD	430.00	-	2	.00440	10.06	.437	1.86246	1.500	3.572
ADD HYD	430.10	2& 4	4	.11350	232.31	12.091	1.99734	1.550	3.198
ROUTE	430.90	4	3	.11350	230.64	12.091	1.99735	1.550	3.175
ROUTE	430.91	3	2	.11350	227.12	12.091	1.99735	1.600	3.127
ADD HYD	430.20	2&14	10	.49548	517.00	52.817	1.99869	1.550	1.630
COMPUTE NM HYD	440.00	-	2	.01060	24.32	1.056	1.86858	1.500	3.585
ROUTE	440.90	11	3	.00613	32.39	.602	1.84133	1.600	8.261
ROUTE	440.91	3	5	.00613	30.09	.602	1.84133	1.650	7.674
ADD HYD	440.10	5& 2	4	.01673	46.73	1.658	1.85854	1.600	4.365
ROUTE	440.92	4	2	.01673	45.10	1.658	1.85859	1.650	4.213
ROUTE	440.93	2	3	.01673	45.92	1.658	1.85859	1.650	4.290
ADD HYD	440.20	3&10	14	.51220	549.65	54.474	1.99412	1.550	1.677
COMPUTE NM HYD	350.00	-	2	.04750	100.75	6.005	2.37033	1.550	3.314
ROUTE	350.90	2	3	.04750	102.01	6.005	2.37034	1.600	3.356
ROUTE	350.91	3	2	.04750	100.48	6.005	2.37034	1.600	3.305
COMPUTE NM HYD	360.00	-	3	.01450	32.38	1.413	1.82682	1.500	3.489
ADD HYD	360.10	2& 3	4	.06200	123.52	7.418	2.24321	1.600	3.113
*S ADD THE TOTAL FLOW IN 20TH STREET AT THE NORTH SIDE OF SOUTHERN TO THE									
*S TOTAL FLOW ROUTED TO THE INTERSECTION FROM THE NORTH AND THE WEST									
*S THIS FLOW IS ROUTED UNDER SOUTHERN TO THE UNSER CHANNEL									
*S *****									
ADD HYD	360.20	4&14	5	.57420	667.44	61.892	2.02101	1.550	1.816

[illegible]

*S * * * WEST BRANCH										BL10D35S										
*S * * * START OF TRIBUTARY "E"																				
COMPUTE NM HYD	156.00	-	1	.22940	514.34	19.986														
ROUTE	156.90	1	2	.22940	486.72	19.986														
COMPUTE NM HYD	157.00	-	1	.18890	434.83	18.170														
ADD HYD	157.10	1 & 2	6	.41830	892.01	38.156														
COMPUTE NM HYD	158.00	-	1	.08160	229.28	10.606														
ROUTE	158.90	1	3	.08160	226.70	10.606														
ADD HYD	158.10	3 & 6	6	.49990	1118.71	48.762														
*S UNSER GATEWAY DAM																				
ROUTE RESERVOIR	GATE POND	6	3	.49990	682.21	48.762														
*S *****	DIVIDE HYD TO UNBULK BY 3%	*****																		
DIVIDE HYD	UNBULK	3	3	.48490	661.74	47.299														
	SEDIMENT and	55		.01500	20.47	1.463														
ROUTE	158.91	3	2	.48490	660.02	47.299														
COMPUTE NM HYD	620.00	-	1	.05640	74.45	4.271														
ADD HYD	620.10	1 & 2	6	.54130	733.33	51.570														
ADD HYD	620.20	5 & 6	5	5.55940	5882.90	361.989														
ROUTE	620.90	5	2	5.55940	5903.54	361.956														
COMPUTE NM HYD	161.00	-	1	.07380	131.55	6.796														
*S * * * * AP	620.20	* * * * *	* * * * *	* * * * *	* * * * *	* * * * *														
ADD HYD	161.10	1 & 2	5	5.63320	5987.48	368.752														
*S PUNCH AND ADJUST HYDROGRAPH TO DELETE "FIRST FLUSH" RUNOFF AND SEND TO																				
*S WATER QUALITY PONDS WHICH IS ESSENTIALLY OUT OF THE SYSTEM THROUGH TIMING.																				
RECALL HYD	161.10	-	5	5.63320	5987.48	360.406														
ROUTE MCUNE	161.90	5	2	5.63320	5987.48	360.406														
COMPUTE NM HYD	650.00	-	1	.05450	102.89	3.186														
*S BLACK'S ARROYO (WEST BRANCH) @ DAM																				
*S * * * * AP	650.99	* * * * *	* * * * *	* * * * *	* * * * *	* * * * *														
ADD HYD	650.99	1 & 2	11	5.68770	6021.11	363.592														

BL10D35B

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COMPUTE NM HYD      211.00      -      1      .18110      351.25      20.522
*S ROUTE HYD 211 THRU 213 IN SOUTHWESTERN CHANNEL (ADJACENT TO SOUTHERN BLVD.) *
ROUTE      211.90      1      4      .18110      355.70      20.523
COMPUTE NM HYD      213.00      -      1      .10800      197.70      11.415
ADD HYD      213.10      4& 1      1      .28910      553.41      31.937
ROUTE      213.90      1      4      .28910      555.44      31.937
ADD HYD      213.20      5& 4      4      .92120      1645.73      96.368
*S * * * START OF NICKLAUS CHANNEL
COMPUTE NM HYD      214.00      -      1      .19090      317.28      19.025
ROUTE      214.90      1      2      .19090      314.21      19.025
COMPUTE NM HYD      216.00      -      1      .09660      178.97      9.527
*S COMBINE HYD. 'S 214.9 AND 216 AT 216.1
*S
*S CASPER DR. @ 150 FT. W. OF NICKLAUS DR.
*S * * * AP 216.10 * * * * *
ADD HYD      216.10      1& 2      6      .28750      480.64      28.552
COMPUTE NM HYD      215.00      -      1      .11020      169.39      11.060
ROUTE      215.90      1      3      .11020      156.35      11.060
ADD HYD      216.20      6& 3      6      .39770      607.15      39.612
*S * * * AFTER SNEAD AND NICKLAUS CONFLUENCE
*S * * * * *
ADD HYD      216.30      6& 4      5      1.31890      2237.66      135.980
COMPUTE NM HYD      217B -      2      .06560      78.28      4.620
*S ROUTE 217B DOWN SOUTHERN TO THE PLAYERS CHANNEL
ROUTE      217B.90      2      3      .06560      77.03      4.620
COMPUTE NM HYD      217A -      1      .19020      252.57      15.015
*S COMBINE HYD. 'S 217A AND 217B AT PLAYERS CHANNEL
ADD HYD      217A.10      1& 3      1      .25680      329.49      19.635
*S * * * EAST BRANCH CROSSING SOUTHERN BLVD.
*S SOUTHERN BLVD. @ 2100 FT. W. OF GOLF COURSE RD.
*S * * * * *
ADD HYD      217.20      5& 1      5      1.57570      2556.33      155.615
ROUTE      217.90      5      2      1.57570      2559.39      155.615
SEDIMENT BULK
COMPUTE NM HYD      218A -      1      .16550      315.15      17.182
*S COMBINE HYDS 218A AND 217.90 AT 218.10

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COMMAND	HYDROGRAPH IDENTIFICATION	FROM TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE =
ADD HYD	218.10	1& 2 2	1.74120	2843.16	172.797	1.650	2.551	8
SEDIMENT BULK								
*S * * * START OF GOLF COURSE CHANNEL								
*S GOLF COURSE ROAD STORM DRAIN SYSTEM WITH TWO OUTFALLS UPSTREAM OF								
*S 23RD AVENUE PONDS								
COMPUTE NM HYD	500.00	- 3	.02610	58.68	3.044	1.550	3.513	PER IMP= 73.50
ROUTE	500.90	3 4	.02610	55.71	3.044	1.600	3.335	
*S COMBINE 218A.10 AND 500.90 AT 500.10								
ADD HYD	500.10	4& 2 3	1.76730	2892.49	175.841	1.650	2.557	
*S ROUTE 500.10 THROUGH 218B (EAST BRANCH) TO 500.90								
ROUTE	500.90	3 4	1.76730	2894.36	175.841	1.650	2.559	
*S COMPUTE 219 ON EAST BRANCH								
SEDIMENT BULK								
COMPUTE NM HYD	219.00	- 1	.16200	316.97	15.106	1.550	3.057	PER IMP= 42.00
COMPUTE NM HYD	218B -	2	.13580	284.42	14.098	1.550	3.272	PER IMP= 52.00
*S COMBINE 219 AND 218B AT 219.10								
ADD HYD	219.10	2& 1 2	.29780	601.38	29.204	1.550	3.155	

PK BF = 1.18
PK BF = 1.06
PK BF = 1.18

BL10D35B

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*S IS MODELED WITH THE PROPOSED EXPANSION.
ROUTE RESERVOIR 530A.90 2 7 .14730 60.72
*S*****DIVIDE HYD TO UNBULK TO 3% *****
DIVIDE HYD UNBULK 7 7 .14288 58.89
SEDIMENT and 57 .00442 1.82
*S ***** AP 20PP.OUT *****
*S ROUTE 530A.90 "UNBULKED" THROUGH STORM DRAIN TO GOLF COURSE ROAD SYSTEM.
*S OUTFALL PIPE IS 48" CMP.
ROUTE 530A.91 7 99 .14288 58.87
*S PUNCH HYDROGRAPH FOR FOR GOLF COURSE ROAD STORM DRAIN DESIGN MODEL
*S COMBINE 530A.91 AND 520.90 AT STORM DRAIN OUTFALL TO GCR SYSTEM
ADD HYD 530A.10 99& 3 3 .18378 149.83
*S ROUTE COMBINED HYDROGRAPHS IN PIPE TO 23RD AVENUE
ROUTE 530A.92 3 2 .18378 147.00
*S COMPUTE 530C
COMPUTE NM HYD 530C - 1 .02530 57.11
*S COMPUTE 530D 23RD AVE. POND BASIN
COMPUTE NM HYD 530D - 3 .01000 15.95
*S ADD 530D TO 530C
ADD HYD 530D.10 1& 3 3 .03530 73.06
*S ADD ROUTED 520 AND 530A TO 530C
ADD HYD 530D.20 2& 3 2 .21908 208.53
*S ***** AP 530.90 (GC.OUT) *****
*S ROUTE COMBINED FLOW THROUGH 23RD AVENUE PONDS
*S THE PONDS ARE COMBINED AND TREATED AS ONE TEN ACRE FOOT POND FOR
*S FOR THIS MODEL.
ROUTE RESERVOIR 530.90 2 3 .21908 49.03
*S THIS RESERVOIR NOT UNBULKED
ROUTE 530.91 3 2 .21908 48.99
*S COMBINE ROUTED FLOW WITH ALL EAST BRANCH FLOW 530B, ETC.
*S ***** AP 530.92 *****
ADD HYD 530.92 2& 4 1 3.06808 4518.15
*S ROUTE IN EAST BRANCH TO BLACK DAM
ROUTE 530.93 1 2 3.06808 5374.75
SEDIMENT BULK
COMPUTE NM HYD 550.00 - 1 .04970 92.92
*S ADD 550 TO EAST BRANCH FLOWS
ADD HYD 550.10 1& 2 1 3.11778 5417.37
*S ADD WEST BRANCH AND EAST BRANCH FLOWS
*S THIS IS TOTAL FLOW INTO THE BLACK DAM/EXCLUDING SOME PORTIONS
*S OF BERNALILLO COUNTY
ADD HYD DAM.10 11& 1 97 8.80548 10849.66
*S RECALL HYDROGRAPHS FROM BERNALILLO COUNTY SUBDIVISIONS
*S THESE ARE PUNCH HYDROGRAPHS AND FLOWS DRAIN DIRECTLY TO THE DAM POOL
*S VIA PIPES.
*S TEXT TAKEN FROM MODEL RECEIVED 1/9/02 * * * * *
*S Ridgeview Village(DB4), Los Suenos(DB3), and the Park Hill (DB2)

COMMAND IDENTIFICATION NO. NO. FROM TO HYDROGRAPH ID ID AREA DISCHARGE PEAK RUNOFF
(SQ MI) (CFS) (AC-FT)
TIME TO CFS PAGE =
PEAK PER 10
(HOURS) ACRE NOTATION

*S Subdivisions have free developed discharge based on R-1, 5 du/acre density.
*S Flow from some commercial sites east of Unser between McMahon and
*S Black Arroyo Blvd. is restricted to historic as per Ridgeview Unit 1 Plan.
*S Developed flow is accommodated from the residential tracts and
*S other commercial tracts. * * * * *
RECALL HYD AP5 - 18 .38090 850.60 31.937 1.57209 1.550 3.489
*S STONEBRIDGE SUBDIVISION FROM MODEL RECEIVED 1/15/02

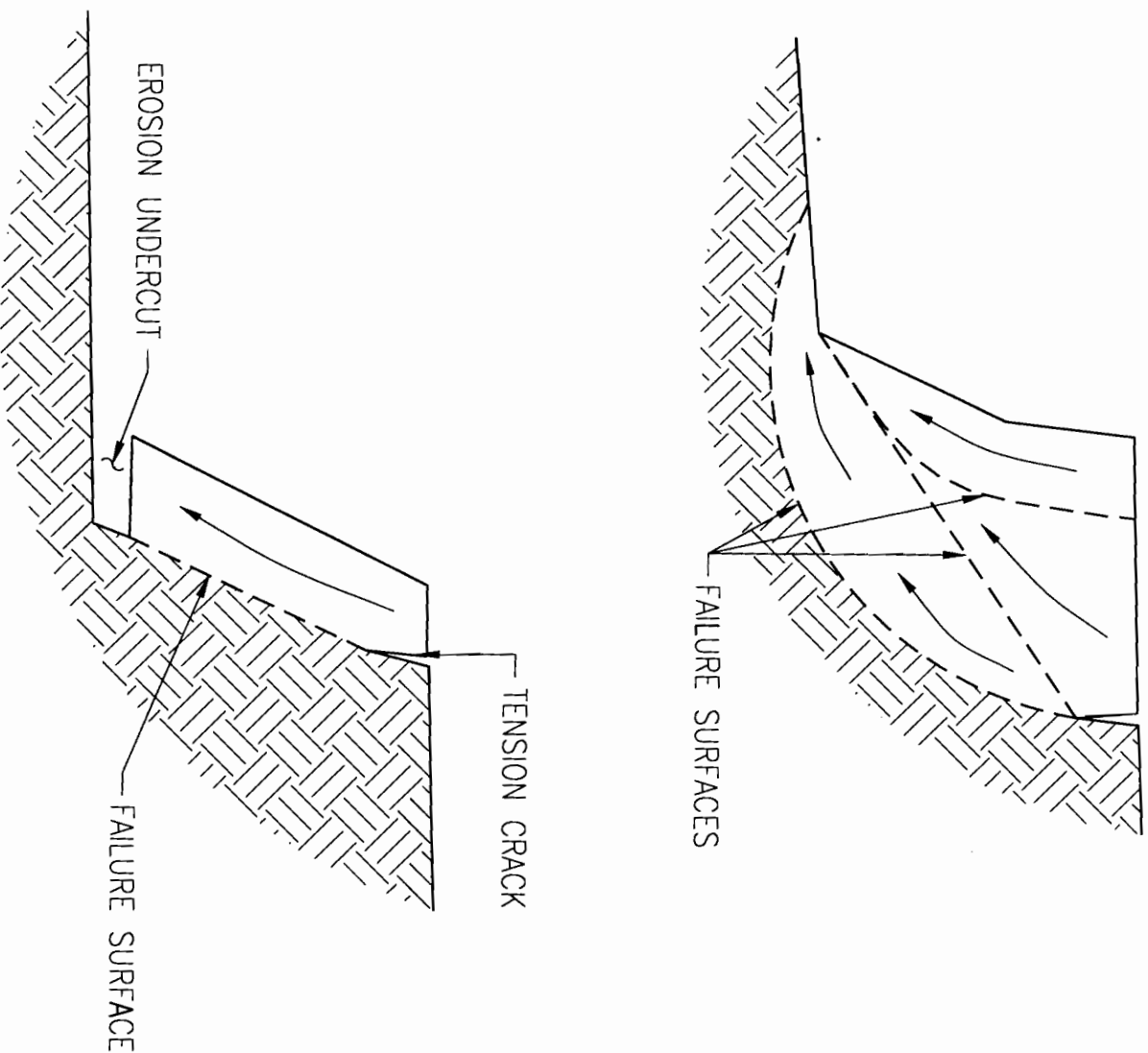
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BL10D35B									
RECALL HYD	AP15	-	19	.23850	359.51	17.620	1.38518	1.500	2.355
*S ADD RECALL HYDROGRAPHS									
ADD HYD	DIRECT.Pipe	18&19	98	.61940	1191.72	49.556	1.50012	1.550	3.006
*S ADD RECALL HYDS TO EAST AND WEST BRANCH FLOWS FOR TOTAL INTO BLACK DAM									
ADD HYD	DAM.IN	98&97	99	9.42488	11519.55	677.750	1.34833	1.700	1.910
*S ROUTE FLOWS THROUGH BLACK DAM RATING CURVE TAKEN FROM BLACK DAM									
*S FILING SHEET RECORD DRAWINGS - BLARD-51 Stamp dated 9/14/91									
*S Record Dwg Stamp 11/9/92 AMAFCA Ref # NW-04-114 Calabacillas									
*S THIS IS THE FUTURE CONDITIONS RATING CURVE									
ROUTE RESERVOIR	DAM.R	99	91	9.42488	2657.68	677.781	1.34839	2.300	.441 AC-FT= 276.307
*S EMERGENCY SPILLWAY CREST IS AT ELEV 5165.75 FT									
*S *									
*S *									
*S *									
*S *									
*S *									
*S *									
*S *									
*S *									
*S 19TH AVENUE POND * SELF CONTAINED BASIN									
*S ***** AP 19P.IN *****									
*S ***CHANGE 1 TO SSCAFCA TREATMENT TYPE PERCENTAGES FOR 1/2 ACRE LOTS									
*S ***CHANGE 2 USE LT TP TO GET TP USE 200 FT AROUND HOUSE K=.07 MAX OUT									
*S ***2000FT FOR SHALLOW FLOW IN STREET AT STREET SLOPE AND REST									
SEDIMENT BULK									
COMPUTE NM HYD	319.00	-	90	.58420	630.44	30.966	.99385	1.600	1.686 PER IMP= 18.00
*S * * * * *									
*S * * * * *									
ROUTE RESERVOIR	319.90	90	99	.58420	.05	.117	.00377	25.050	.000 AC-FT= 30.867
*S ***** AP 19P.OUT *****									
FINISH									
END									

APPENDIX H LATERAL EROSION ENVELOPE (LEE)

The Lateral Erosion Envelope defined in the BLWMP is based on the data in Chapter 3, Section 3.4.5, "Approximate Maximum Erosion Distance based on Optimal Bend Shape" of the AMAFCA Sediment and Erosion Design Guide, Nov 1994.

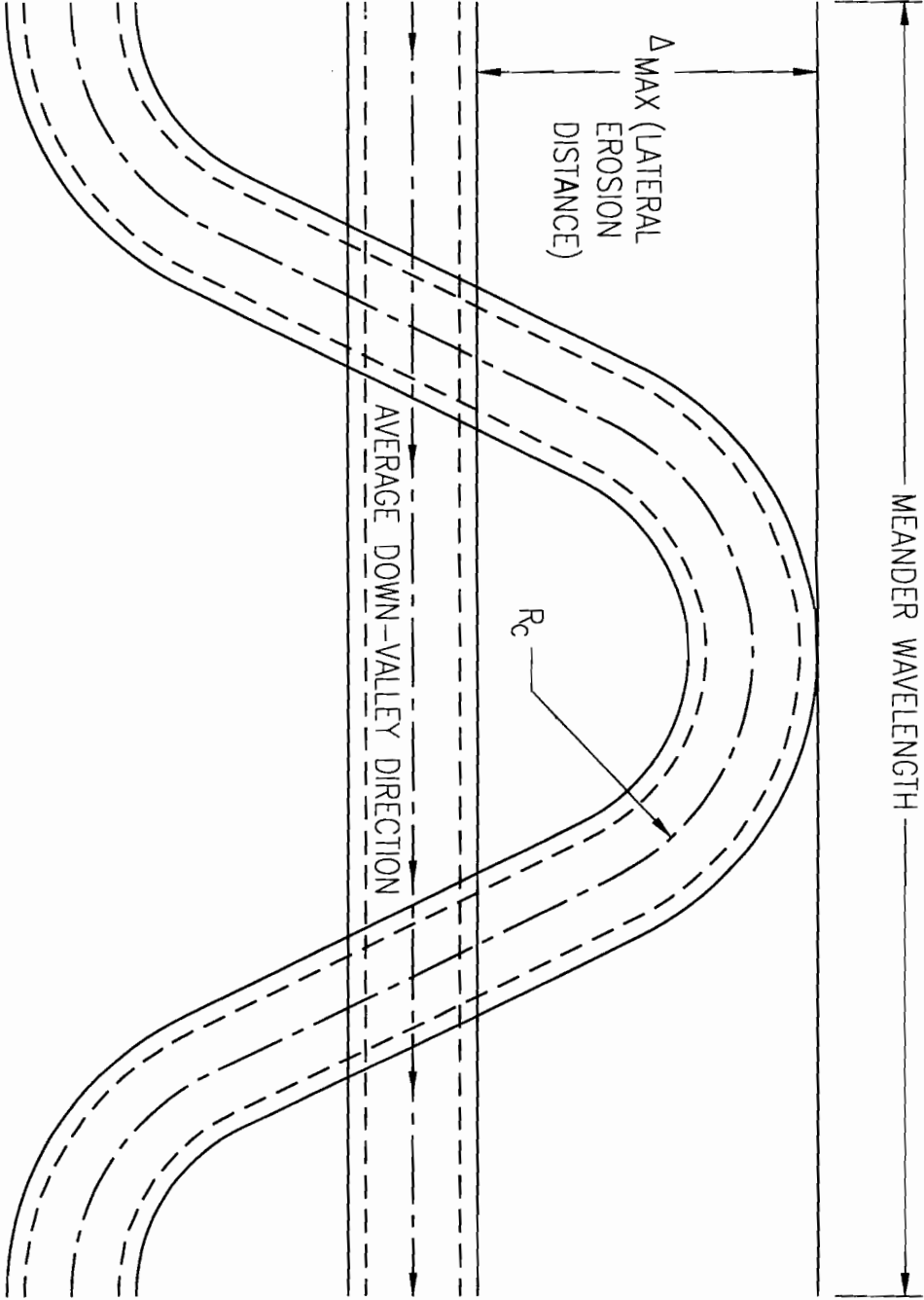
The Lateral Erosion Envelopes are shown on the Proposed Facilities Maps in the BLWMP.



EXAMPLES OF BANK
FAILURE MECHANISMS

SCALE: NONE

FROM:
SEDIMENT AND EROSION
DESIGN GUIDE (1994)



SCHEMATIC OF AN
IDEALIZED MEANDER BEND

SCALE: NONE

FROM:
SEDIMENT AND EROSION
DESIGN GUIDE (1994)

SOUTHERN SANDOVAL COUNTY FLOOD CONTROL AUTHORITY	
BLACK ARROYO DRAINAGE MANAGEMENT PLAN	
EXAMPLES OF BANK DYNAMICS	
	ASCCG INCORPORATED DESIGNED - ENGINEERED - CONSTRUCTED - MAINTAINED AND OPERATED BY THE FLOOD CONTROL AUTHORITY
FIGURE: -	



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

BLACK DMP

SHEET NO. 1
OF

COMPUTED BY:

KMJ

CHECKED BY:

TSA

JOB/TASK NO.

98301

DATE:

10/19/01

IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY: 	DATED

1.0 BLACK ARROYO EROSION LIMITS

2.0 DETERMINE MAXIMUM EROSION LIMITS
FOR NATURAL ARROYOS

3.0 BLARD - 38 "SEDIMENT AND EROSION DESIGN GUIDE"
APPROXIMATE MAXIMUM EROSION DISTANCE BASED ON
OPTIMAL BEND SHAPE.

4.0 ASSUMPTIONS

a.) The determination regarding critical slope was based on field visits and observations relating to Aggradation and Degradation of the arroyo.

Aggrading arroyos are assumed to have $S < S_c$ and degrading arroyos are assumed to have $S > S_c$.

b) Reaches of Arroyos are the same as a facility from the Facility ID portion of the project.

c.) Q_D = Dominant Discharge (see Reference)
EQ. 3.77

Q_{100} is DEVEK Q IN ATHYMO FOR THAT FACILITY

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION			SHEET NO. 1a
		Black DMP			OF
COMPUTATIONS		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.	DATE:
		KMJ		98301	2/26/02
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

4.0 Assumptions

d.) ASSUME ARROYOS ARE ALL FLOWING SUPERCRITICAL.

5.0 W_b = Channel width associated w/ Q_D

S_c = Critical slope

S_o = Existing Slope

if $S_o \geq S_c$ flow is SuperCritical

$\Delta_{max} + \frac{1}{2} W_b$ = Offset Distance from ϕ of Arroyo (O.D.)

O.D. is then "smoothed" to determine Max Envelope, in the average downstream direction



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ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Block DMP

SHEET NO. 2
OF

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TJA

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98301

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IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

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DATED

7.0 Calculations

FACILITY - 35-BL-07A

TRIB "A" Unseen to 11th St
ARRAYO (LOWER)

$$\text{DEVEX } Q_{100} = 1066 \text{ cfs}$$

$$S_o \sim 150' / 5800$$

$$= .026$$

DOMINANT DISCHARGE, Q_D

$$Q_D = 0.2 Q_{100}$$

$$S_c \sim 0.037 Q_D^{-1.33} = .018$$

$$S_o \sim \therefore S_c$$

$$Q_D = 0.2 (1066) = 213.2 \text{ cfs} \quad \text{use } 215 \text{ cfs}$$

MAXIMUM DEVIATION OF A CHANNEL FROM
A STRAIGHT LINE, $\Delta_{\max}$

$$\Delta_{\max} = 11.5 Q_D^{0.4} \quad \text{for } Q_D \leq 200 \text{ cfs} \quad \text{EQ. (3.81a)}$$

$$\Delta_{\max} = [0.92 + 4.6 \log(Q_D)] Q_D^{0.4} \quad \text{for } 200 \text{ cfs} < Q_D < 2000 \text{ cfs} \quad \text{(3.81b)}$$

$$\Delta_{\max} = 16.1 Q_D^{0.4} \quad \text{for } Q_D \geq 2000 \text{ cfs} \quad \text{(3.81c)}$$

Using EQ. 3.81b FROM THE DESIGN GUIDE

$$\Delta_{\max} = [0.92 + 4.6 \log(215)] (215)^{0.4}$$

$$\Delta_{\max} = 99.8 \text{ ft} \approx 100'$$

$$W_D = 4.6 Q_D^{0.4} \approx 40'$$

$$\Delta_{\max} + \frac{1}{2} W_D = 120 \text{ ft}$$

$$\begin{aligned} \lambda &= \{0.8 \\ &\quad + 4 \log(Q_D)\} \\ &\quad * W_D \\ &= \{0.8 + 4 \log 215\} \\ &\quad * 40' \\ &= 400' + \end{aligned}$$



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COMPUTED BY:

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10/19/01

IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

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FACILITY 35-BL-06A WEST BRANCH
(JUST PRIOR TO CONFLUENCE W/ ~~TRIB'X~~ ARROYO)

$$DEVEX Q_{100} = 3619 \text{ cfs}$$

$$Q_D = 0.2(3619) = 723.8 \text{ USE } 725 \text{ cfs}$$

USE EQ 3.81b

$$\Delta_{max} = [0.92 + 4.4 \log(725)] (725)^{0.4}$$

$$\Delta_{max} = 196 \text{ ft} \quad \underline{\text{use } 200 \text{ ft}}$$

$$S_c = 0.037 Q_D^{-0.133} = 0.015 \text{ ft/ft}$$

$$S_o = 100' / 4300' = 0.023 \text{ ft/ft}$$

thus supercritical

$$W_D = 4.4 Q_D^{0.4}$$

$$W_D = 64' \text{ use } 65'$$

$$W_{D/2} = 32.5 \text{ ft}$$

$$\Delta_{max} + W_{D/2} = 232.5 \text{ ft} \quad (\text{offset distance})$$
$$= \boxed{235 \text{ ft}}$$

LH	LEEDSHILL - HERKENHOFF, INC.		NAME OF PROJECT/CALCULATION			SHEET NO. 4	
	ENGINEERS ARCHITECTS		Black			OF	
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COMPUTATIONS		KUJ	TSA	98301	10/19/01		
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED		

FACILITY 34-BL-01A TRIB 'A' VIVA ARROYO (UPPER)

$$\text{DEVEX } Q_{100} = 865 \text{ cfs}$$

$$S_c = 0.037 (Q_D)^{-1.33}$$

$$Q_D = 0.2 (865) = 173 \text{ use } 175 \text{ cfs}$$

$$S_c = 0.019$$

$$S_o = \frac{170}{2800} = 0.061$$

$$\Delta_{\max} = 11.5 Q_D^{0.4}$$

Super Critical

$$\Delta_{\max} = 11.5 (175)^{0.4} = 90.7 \text{ use } \underline{95 \text{ ft}}$$

$$W_D = 4.6 Q_D^{0.4} = 36 \text{ ft}$$

$$\Delta_{\max} + \frac{1}{2} W_D \approx 115 \text{ ft}$$

FACILITY 26-BL-08A ~~IVORY CHANNEL / WEST BRANCH~~
IVORY ARROYO

$$\text{DEVEX } Q_{100} = 731 \text{ cfs}$$

$$Q_D = 0.2 (731) = 146.2 \text{ cfs use } \underline{150 \text{ cfs}}$$

use EQ 3.81a

$$\Delta_{\max} = 11.5 Q_D^{0.4} = 11.5 (150)^{0.4}$$

$$\Delta_{\max} = 85.3 \text{ ft use } \underline{90 \text{ ft}}$$

$$S_c = 0.037 Q_D^{-1.33}$$

$$= 0.019 \text{ ft/ft}$$

$$S_o = \frac{70}{2400} = 0.029$$

$$W_D = 4.6 Q_D^{0.4} = 34 \text{ ft}$$

Super Critical

$$\text{offset distance} = \frac{1}{2} (34) + (90) = \underline{107 \text{ ft}}$$

LH	LEEDSHILL - HERKENHOFF, INC.		NAME OF PROJECT/CALCULATION			SHEET NO. 5	
	ENGINEERS ARCHITECTS		Black DMP			OF	
ALBUQUERQUE • SANTA FE		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.	DATE:		
COMPUTATIONS		KMS	TJA	98301	10/19/01		
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS		9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED		

FACILITY 26-BL-01A LISBON ^{ARROYO} ~~CHANNEL~~
(WEST BRANCH)

$$\text{DEVEL } Q_{100} = 2068 \text{ cfs} \quad Q_D = 0.2(2068) = 413.6 \text{ cfs}$$

USE 415 cfs

USE EQ. 3.81b

$$\Delta_{\max} = [0.92 + 4.6 \log(415)](415)^{0.4}$$

$$W_D = 4.6 Q_D^{0.4}$$

$$W_D = 51 \text{ ft}$$

$$\Delta_{\max} = 144.5 \quad \text{use } \underline{145 \text{ ft}}$$

$$S_c = 0.037 Q_D^{-1.33}$$

$$S_c = .017$$

$$\Delta_{\max} + \frac{1}{2} W_D = 26 + 145 = \underline{170' \pm}$$

$$S_0 = \frac{60}{1800} = 0.033$$

Super Critical

FACILITY 25-BL-01A EAST BRANCH
(UPPER)

$$\text{DEVEL } Q_{100} = 1950 \text{ cfs}$$

$$Q_D = 0.2(1950) = 390 \text{ cfs}$$

USE EQ 3.81b

$$\Delta_{\max} = [0.92 + 4.6 \log(390)](390)^{0.4}$$

$$\Delta_{\max} = 139.6 \text{ ft} \quad \text{USE } \underline{140 \text{ ft}}$$

$$W_D = 4.6 Q_D^{0.4} \approx 52 \text{ ft}$$

$$S_c = 0.037 Q_D^{-1.33} = 0.0167$$

$$S_0 = \frac{40}{2300} = 0.0174 \quad \text{superCritical}$$

$$\Delta_{\max} + \frac{1}{2} W_D = 140 + 26 = \underline{166 \text{ ft}}$$

LH	LEEDSHILL - HERKENHOFF, INC.		NAME OF PROJECT/CALCULATION		SHEET NO. <u>6</u>
	ENGINEERS ARCHITECTS		<u>Black DMP</u>		OF
ALBUQUERQUE • SANTA FE		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.	DATE:
COMPUTATIONS		<u>KMJ</u>	<u>73A</u>	<u>98301</u>	<u>10/19/01</u>
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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

FACILITY 36-BL-08A

TRIB 'B'
~~GALAXY~~ ARROYO
(Upper)

$$\text{DEVER } Q_{100} = 790 \text{ cfs}$$

$$Q_D = 0.2 (790) = 158 \text{ cfs use } 160 \text{ cfs}$$

Use EQ. 3.81a

$$\Delta_{\max} = 11.5 Q_D^{0.4} = 11.5 (160)^{0.4}$$

$$W_D = 4.6 Q_D^{0.4}$$

$$W_D = 35 \text{ ft}$$

$$\Delta_{\max} = 87.6 \text{ ft use } \underline{90 \text{ ft}}$$

$$S_c = 0.037 Q_D^{-1.33}$$

$$S_c = 0.019 \text{ ft/ft}$$

$$S_0 = 12\% / 5000 = 0.024 \text{ ft/ft} \therefore \text{SUPER CRITICAL}$$

$$\Delta_{\max} + \frac{1}{2} W_D = \boxed{110 \text{ ft}}$$

FACILITY 36-BL-09A

LOWER TRIB 'B'

$$\text{DEVER } Q_{100} = 2634 \text{ cfs}$$

$$Q_D = 0.2 (2634) = 526.8 \text{ cfs use } \underline{530 \text{ cfs}}$$

Use EQ. 3.81b

$$\Delta_{\max} = [0.92 + 4.6 \log(530)] (530)^{0.4}$$

$$W_D = 4.6 Q_D^{0.4}$$

$$W_D = 57 \text{ ft}$$

$$\Delta_{\max} = 165.4 \text{ use } \underline{170 \text{ ft}}$$

$$S_c = 0.037 Q_D^{-1.33}$$

$$S_c = 0.0141$$

$$S_0 = 4\% / 2000 = 0.02 \text{ ft/ft}$$

$$\Delta_{\max} + \frac{1}{2} W_D = \boxed{200 \text{ ft}}$$

LH	LEEDSHILL - HERKENHOFF, INC.		NAME OF PROJECT/CALCULATION			SHEET NO. <u>7</u>	
	ENGINEERS ARCHITECTS		<u>Black DMP</u>			OF	
ALBUQUERQUE • SANTA FE		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.	DATE:		
COMPUTATIONS		<u>KMJ</u>	<u>TSR</u>	<u>98301</u>	<u>10/19/01</u>		
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS			
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED		

FACILITY 34-BL-07A East BRANCH
(CROSSING 18th AVENUE)

$$\text{DEVEX } Q_{100} = 2051 \text{ cfs}$$

$$Q_D = 0.2(2051) = 410.2 \text{ cfs use } 410 \text{ cfs}$$

USE EQ. 3.81b

$$\Delta_{\max} = [0.92 + 4.6 \log(410)] (410)^{0.4}$$

$$W_D = 4.6 Q_D^{0.4}$$

$$W_D = 51 \text{ ft}$$

$$S_c = 0.037 Q_D^{-1.33}$$

$$S_c = 0.017$$

$$\Delta_{\max} = 143.6 \text{ cfs use } \underline{145 \text{ ft}}$$

$$S_0 = 5\% / 2800 = 0.018$$

SUPER CRITICAL

$$\Delta_{\max} + \frac{1}{2} W_D = \boxed{170 \text{ ft}}$$

FACILITY 36-BL-02A East Branch
(LOWER)

$$\text{DEVEX } Q_{100} = 2681 \text{ cfs}$$

$$Q_D = 0.2(2681) = 536.2 \text{ use } 540 \text{ cfs}$$

USE EQ. 3.81b

$$\Delta_{\max} = [0.92 + 4.6 \log(540)] 540^{0.4}$$

$$\Delta_{\max} = 167.1 \text{ use } \underline{170 \text{ ft}}$$

$$S_0 = 4\% / 1500 = 0.0267 \text{ ft/ft}$$

$$S_c = 0.037 Q_D^{-1.33} = 0.016 \text{ ft/ft}$$

} Super Critical

$$W_D = 4.6 Q_D^{0.4} = 57 \text{ ft}$$

$$\Delta_{\max} + \frac{1}{2} W_D \approx \boxed{200 \text{ ft}}$$

LH	LEEDSHILL - HERKENHOFF, INC.		NAME OF PROJECT/CALCULATION			SHEET NO. <u>8</u>	
	ENGINEERS ARCHITECTS		<u>Black DMP</u>			OF	
ALBUQUERQUE • SANTA FE		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.	DATE:		
COMPUTATIONS		<u>KMJ</u>	<u>TSA</u>	<u>98301</u>	<u>10/19/01</u>		
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS		9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED		

FACILITY 36-BL-01A

WEST BRANCH
(LOWER)

$$\text{DEVELOP } Q_{100} = 5924 \text{ cfs}$$

$$Q_D = 0.2(5924) = 1184.8 \text{ use } 1185 \text{ cfs}$$

USE EQ. 3.81b

$$W_D = 78 \text{ ft}$$

$$\Delta_{\max} = [0.92 + 4.6 \log(1185)] 1185^{0.4} \quad S_C = 0.014 \text{ ft/ft}$$

$$\Delta_{\max} = 255.4 \text{ ft use } \underline{255 \text{ ft}}$$

$$S_0 = 90/4500 = 0.02 \text{ ft/ft}$$

Super Critical

$$\Delta_{\max} + \frac{1}{2} W_D = \boxed{300 \text{ ft}}$$

FACILITY 36-BL-05A

East Branch

(PRIOR TO CONFLUENCE W/ ~~Galaxy~~ Arroyo)
TRIB "B"

$$\text{DEVELOP } Q_{100} = 2121 \text{ cfs}$$

$$Q_D = 0.2(2121) = 424.2 \text{ use } 424 \text{ cfs}$$

USE EQ. 3.81b

$$\Delta_{\max} = [0.92 + 4.6 \log(424)] (424)^{0.4}$$

$$\Delta_{\max} = 146.2 \text{ ft use } \underline{150 \text{ ft}}$$

$$S_0 = 40/3000 = 0.02 \text{ ft/ft}$$

$$S_C = 0.017 \text{ ft/ft}$$

} SUPER CRITICAL

$$W_D = 52 \text{ ft}$$

$$\Delta_{\max} + \frac{1}{2} W_D = \boxed{176 \text{ ft}}$$

LH	LEEDSHILL - HERKENHOFF, INC.		NAME OF PROJECT/CALCULATION			SHEET NO. <u>8a</u>	
	ENGINEERS ARCHITECTS		<u>Black DMP</u>			OF	
ALBUQUERQUE • SANTA FE		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.	DATE:		
COMPUTATIONS		<u>KMJ</u>		<u>98301</u>	<u>2/22/01</u>		
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS		9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED		

FACILITY 14-BL-01A North Lisbon Arroyo

$$\text{DEVELOP } Q_{100} = 962 \text{ cfs}$$

$$Q_D = 0.2 Q_{100} = 192.4 \text{ cfs}$$

$$\Delta_{\max} = 11.5 Q_D^{0.4} = 94.3 \text{ ft} \quad \text{use } \underline{95 \text{ ft}}$$

$$W_D = 4.6 Q_D^{0.4} = 38 \text{ ft}$$

$$\Delta_{\max} + \frac{1}{2} W_D = \boxed{115 \text{ ft}}$$

FACILITY 22-BL-05A North Sunset Arroyo

$$\text{DEVELOP } Q_{100} = 251 \text{ cfs}$$

$$Q_D = 0.2 Q_{100} = 50.2 \text{ cfs}$$

$$\Delta_{\max} = 11.5 (50.2)^{0.4} = \underline{55 \text{ ft}}$$

$$W_D = 22 \text{ ft} \quad \Delta_{\max} + \frac{1}{2} W_D = 66 \text{ ft} \quad \text{use } \boxed{70 \text{ ft}}$$

IN BASIN 106A1

Undefined Arroyo ABOVE SUGAR CHANNEL

$$\text{DEVELOP } Q_{100} = 185 \text{ cfs (+/-)}$$

$$Q_D = 37 \text{ cfs}$$

$$\Delta_{\max} = 48.8 \text{ ft} \quad \text{USE } \underline{50 \text{ ft}}$$

$$W_D = 20 \text{ ft} \quad \Delta_{\max} + \frac{1}{2} W_D = \boxed{60 \text{ ft}}$$

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION Black WMP			SHEET NO. 86 OF	
COMPUTATIONS		COMPUTED BY: KMJ	CHECKED BY:	JOB/TASK NO. 98301	DATE: 2/25/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

TRIB 'C' UPPER (TO DIVERSION)

$$\text{DEVEK } Q_{100} = 240 \text{ cfs } \pm (\text{Ratio Area})$$

$$Q_D = 0.2 (240) = 48 \text{ cfs}$$

$$\Delta_{\max} = 11.5 Q_D^{0.4} = 54 \text{ ft}$$

$$W_D = 4.6 Q_D^{0.4} = 22 \text{ ft}$$

$$\Delta_{\max} + \frac{1}{2} W_D = \boxed{65 \text{ ft}}$$

TRIB "C" LOWER (TO WEST BRANCH)

$$\text{DEVEK } Q_{100} = 615 \text{ cfs}$$

$$Q_D = 123 \text{ cfs}$$

$$\Delta_{\max} = 11.5 Q_D^{0.4} \approx 80 \text{ ft}$$

$$W_D = 4.6 Q_D^{0.4} = 32 \text{ ft}$$

$$\Delta_{\max} + \frac{1}{2} W_D = \boxed{96 \text{ ft}}$$

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COMPUTATIONS		COMPUTED BY: KMJ	CHECKED BY:	JOB/TASK NO. 98301	DATE: 2/20/02
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

TRIB "E"

$$Q_{\text{DEVEK (100)}} = 585 \text{ cfs}$$

$$Q_D = 117 \text{ cfs}$$

$$\Delta_{\text{max}} = 11.5 Q_D^{0.4} = 77 \text{ ft}$$

$$W_D = 4.6 Q_D^{0.4} = 31 \text{ ft}$$

$$\Delta_{\text{max}} + \frac{1}{2} W_D = \boxed{95 \text{ ft}}$$

LEEDSHILL - HERKENHOFF, INC. ENGINEERS ARCHITECTS ALBUQUERQUE • SANTA FE COMPUTATIONS	NAME OF PROJECT/CALCULATION <i>Black AMP</i>			SHEET NO. <i>9</i> OF	
	COMPUTED BY: <i>KMS</i>	CHECKED BY: <i>TSA</i>	JOB/TASK NO. <i>98301</i>		DATE: <i>10/19/01</i>
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

CONCLUSIONS

MAX EROSION DISTANCES

REDUCED FACILITY ID	DEVELOP Q ₁₀₀	MAX. DEVIATION FROM DISTANCE STRAIGHT LINE		
		DEVELOP	FUTURE	W/DAMS
35-BL-07A	1006 cfs	120 ~~100~~ ft	120 ft	75 ✓
35-BL-06A	3619 cfs	235 ~~200~~ ft	240	200 ✓
34-BL-01A	865 cfs	115 95 ft	95	95 ✓
26-BL-08A	731 cfs	110 90 ft	90	90 ✓
26-BL-01A	2068 cfs	170 145 ft	190	135 ✓
25-BL-01A	1950 cfs	165 140 ft	175	175 ✓
36-BL-08A	790 cfs	110 90 ft	90	90 ✓
36-BL-09A	2634 cfs	200 176 ft	110	110 ✓
36-BL-07A	2051 cfs	170 145 ft	190	145 ✓
36-BL-02A	2681 cfs	200 176 ft	225	160 ✓
36-BL-01A	5924 cfs	300 255 ft	320	280 ✓
36-BL-05A	2121 cfs	175 150 ft	190	145 ✓
14-BL-01A	962 cfs	115 95 ft		
22-BL-05A	251 cfs	70 55 ft		
N. SUGAR?	185 cfs	60 50 ft		

LH	LEEDSHILL - HERKENHOFF, INC.		NAME OF PROJECT/CALCULATION			SHEET NO. 10	
	ENGINEERS ARCHITECTS		Black BMP			OF	
	ALBUQUERQUE • SANTA FE		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.	DATE:	
	COMPUTATIONS		KMJ	CD	98301	1/24/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS			
REVISION #	SUPERSEDES CALC TITLE				CHECKED BY:	DATED	

Continuation

Using BL10D14.SUM, which is
FUTURE FLOWS WITH SEDIMENT, FREE
DISCHARGE.

7.0 CALCULATIONS

FACILITY 35-BL-07A TRIBUTARY 'A' (LOWER)

$$Q_{FUT} = 1475 \text{ cfs} \quad (HYD = 159.90)$$

DOMINANT DISCHARGE, Q_D

$$Q_D = 0.2(Q_{FUT}) = 295 \text{ cfs}$$

MAX DEVIATION, Δ_{MAX}

FOR $200 \text{ cfs} < Q_D < 2000 \text{ cfs}$

$$\Delta_{MAX} = [0.92 + 4.6 \log(Q_D)] Q_D^{0.4}$$

$$\Delta_{MAX} = [0.92 + 4.6 \log(295)] 295^{0.4}$$

$$\Delta_{MAX} = 119.4' \text{ USE } 120' \text{ MAX DEVIATION}$$



LEEDSHILL - HERKENHOFF, INC.
ENGINEERS ARCHITECTS
ALBUQUERQUE • SANTA FE
COMPUTATIONS

NAME OF PROJECT/CALCULATION

Black DMP

SHEET NO. 11

OF

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JOB/TASK NO.

98301

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1/24/02

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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

FACILITY 35-BL-06A WEST BRANCH

$$Q_{FUT} = 5177 \text{ cfs} \quad (H_{4D} = 155.90)$$

$$Q_D = 0.2 (5177) = 1035.4 \text{ cfs}$$

$$\Delta_{MAX} = [0.92 + 4.6 \log (1035)] (1035)^{0.4}$$

$$\Delta_{MAX} = 237.6' \quad \underline{\underline{UDL 240'}}$$

OO ——— OO ——— OO ——— OO ——— OO ——— OO ——— OO ———

FACILITY 34-BL-01A UPPER TRIB 'A'

$$Q_{FUT} = 985 \text{ cfs} \quad (AP 153)$$

$$Q_D = 0.2 (985) = 197 \text{ cfs}$$

$$\Delta_{max} = 11.5 Q_D^{0.4}$$

$$= 11.5 (197)^{0.4} = \underline{\underline{95 \text{ ft}}}$$

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COMPUTATIONS		KMJ		98301	1/24/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

FACILITY 26-BL-08A IVORY ARROYO

FUTURE. $Q = 827 \text{ cfs}$ ($H_{YD} = 117.90$)

$$Q_D = 0.2(827) = 165.4 \text{ cfs}$$

$$\Delta_{max} = 11.5 Q_D^{0.4} = (11.5)(165)^{0.4} = 88.7 \approx 90 \text{ ft}$$

FACILITY 26-BL-01A LISBON ARROYO

FUTURE $Q = 3,350 \text{ cfs}$ ($H_{YD} = 116.90$)

$$Q_D = 0.2(3,350) = 670 \text{ cfs}$$

$$\Delta_{max} = [0.92 + 4.6 \log Q_D] Q_D^{0.4}$$

$$\Delta_{max} = [0.92 + 4.6 \log(670)] (670)^{0.4}$$

$$\Delta_{max} = 187.9 \text{ ft} \approx \underline{\underline{190 \text{ ft}}}$$



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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
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Facility 25-BL-01A East Branch

$$\text{FUTURE } Q = \frac{2881 \text{ cfs}}{3699 \text{ cfs}} \quad (HYD = \frac{218A^{.90} 217.91}{2188.92})$$

$$Q_D = 0.2 \left(\frac{2881}{3699} \right) = \frac{576}{620 \text{ cfs}}$$

$$\Delta_{max} = \left[0.92 + 4.6 \log \left(\frac{576}{620} \right) \right] \frac{620^{0.4}}{576}$$

$$\Delta_{max} = 180 \text{ ft} \\ \underline{173 \text{ ft}}$$

Facility 36-BL-08A Upper TRIB 'B'

$$\text{FUTURE } Q = 850 \text{ cfs} \quad (HYD = 254.93)$$

$$Q_D = 0.2(850) = 170$$

$$\Delta_{max} = 11.5 (170)^{0.4} = 89.7 \approx \underline{90 \text{ ft}}$$

Facility 36-BL-09A Lower TRIB 'B'

$$\text{FUTURE } Q = 1183 \text{ cfs} \quad (HYD = 256.90)$$

$$Q_D = 0.2(1183) = 237 \text{ cfs}$$

$$\Delta_{max} = \left[0.92 + 4.6 \log (237) \right] (237)^{0.4} = \underline{105.5}$$

$$\underline{\underline{\text{USE } 110 \text{ ft}}}$$



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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

FACILITY 36-BL-07A East BRANCH

$$\text{FUTURE } Q = 3466 \text{ cfs} \quad (H_{1/D} = \overset{219.90}{\cancel{220.90}})$$

$$Q_D = 0.2(3466) = 693 \text{ cfs}$$

$$\Delta_{\max} = [0.92 + 4.4 \log(693)] (693)^{0.4}$$

$$\Delta_{\max} = 191.4 \text{ use } \underline{190 \text{ ft}}$$

FACILITY 36-BL-02A LOWER E. BRANCH

$$\text{FUTURE } Q = 4,580 \text{ cfs} \quad (H_{1/D} = 256.91')$$

$$Q_D = 914 \text{ cfs} \quad \text{use } \underline{225 \text{ ft}} = \Delta_{\max}$$

FACILITY 36-BL-01A LOWER W. BRANCH

$$\text{FUTURE } Q = 9136 \text{ cfs} \quad (H_{1/D} = 140.94)$$

$$Q_D = 1827 \text{ cfs} \quad \Delta_{\max} = \underline{320 \text{ ft}}$$

FACILITY 36-BL-05A E. BRANCH

$$\text{FUTURE } Q = 3470 \text{ cfs} \quad (H_{1/D} = \overset{220.90}{\cancel{256.90}})$$

$$Q_D = 694 \text{ cfs} \quad \Delta_{\max} = \underline{190 \text{ ft}}$$

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COMPUTATIONS		ICMS				1/25	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS		9.0 ATTACHMENTS	
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USING BL10D15B.SUM - FUTURE FLOWS
WITH DAMS AND SEDIMENT

FACILITY 35-BL-07A LOWER TRIB'A'

$$Q = 526.75 \text{ cfs} \quad (H_{4D} = 159.90)$$

$$Q_D = 0.2(527) = 105 \text{ cfs}$$

$$\Delta_{max} = 11.5 Q_D^{0.4} = 11.5(105)^{0.4} = 74 \text{ ft}$$

USE 75 ft

FACILITY 35-BL-06A West Branch

$$Q = 3,714 \text{ cfs} \quad Q_D = 743 \text{ cfs}$$

$$\Delta_{max} = [0.92 + 4.6 \log(743)] 743^{0.4} = 198 \text{ ft}$$

USE 200 ft



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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

FACILITY 34-BL-01A UPPER TRIB "A"

$$Q = 983 \text{ cfs} \quad Q_D = 0.2(983) = 197 \text{ cfs}$$

$$\Delta_{\max} = 11.5 (197)^{0.4} = \underline{\underline{95 \text{ ft}}}$$

FACILITY 26-BL-08A IVORY ARROYO

$$Q = 827 \text{ cfs} \quad Q_D = 0.2(827) = 165 \text{ cfs}$$

$$\Delta_{\max} = 11.5 (165)^{0.4} = 88.7 \text{ ft USE } \underline{\underline{90 \text{ ft}}}$$

FACILITY 26-BL-01A LISBON ARROYO

$$Q = 1740 \text{ cfs} \quad Q_D = 0.2(1740) = 348 \text{ cfs}$$

$$\Delta_{\max} = [0.92 + 4.6 \log(348)] (348)^{0.4}$$

$$\Delta_{\max} = 131 \text{ ft USE } \underline{\underline{135 \text{ ft}}}$$

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	ENGINEERS ARCHITECTS					OF	
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COMPUTATIONS							
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS		
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS			
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FACILITY 25-BL-01A East Branch

$$Q = 2559 + 321.25 = 2880$$

$$Q_D = 574 \quad \Delta_{max} = \underline{173 \text{ ft}} \quad (\text{see sheet 13})$$

FACILITY 36-BL-08A Upper TRIB 'B'

same as w/o Dams

$$Q = 850 \text{ cfs}$$

$$\Delta_{max} = \underline{90 \text{ ft}}$$

(see sheet 13)

FACILITY 36-BL-09A LOWER TRIB 'B'

same as w/o Dams $Q = 1183 \text{ cfs}$

$$\Delta_{max} = 106 \text{ ft} \quad \text{USE } \underline{110 \text{ ft}}$$

FACILITY 36-BL-07A East Branch

$$Q = 2084^{40} \text{ cfs} \quad Q_D = 0.2 \left(2084^{2040} \right)^{408} = 417 \text{ cfs}$$

$$\Delta_{max} = \left[0.92 + 4.6 \log \left(417^{408} \right) \right] \left(417 \right)^{0.4}$$

$$\Delta_{max} = \underline{145 \text{ ft}} \quad 143 \text{ ft} \quad \text{USE } \underline{145 \text{ ft}}$$



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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

FACILITY 36-BL-02A LOWER E. BRANCH

$$Q = 2505 \text{ cfs} \quad Q_D = 501 \text{ cfs}$$

$$\Delta_{\max} = [0.92 + 4.6 \log(501)] (501)^{0.4}$$

$$\Delta_{\max} = \underline{160 \text{ ft}} \quad \text{OK}$$

FACILITY 36-BL-01A LOWER W. BRANCH

$$Q = 6850 \text{ cfs} \quad Q_D = 0.2(6850) = 1370 \text{ cfs}$$

$$\Delta_{\max} = [0.92 + 4.6 \log(1370)] (1370)^{0.4}$$

$$\Delta_{\max} = 276 \text{ ft} \quad \text{use } \underline{280 \text{ ft}} \quad \text{OK}$$

FACILITY 36-BL-05A E. BRANCH

$$Q = 2084 \quad Q_D = 417 \text{ cfs}$$

$$\Delta_{\max} = \underline{145 \text{ ft}}$$

APPENDIX I STORM WATER QUALITY

The BLWMP includes stormwater quality detention as an integral part of the system. The detention in these facilities is accounted for in the overall system to limit the volume detained in Black Dam. In the event the storm water quality facilities are not constructed, the detention generated by these facilities is required as part of the BLWMP.

Definitions:

Volume – V_{wq} , extended detention volume in Acre-Feet (AF). The detained volume is 0.25" of untreated runoff from drainage basin areas upstream from the stormwater quality facility. $V_{wq} = DA * 0.25/12$ in AF, where DA = Drainage Area
Area – A_{wq} , area of storm water quality detention – average 2' depth with 125% overall site allowance. $A_{wq} = V_{wq} * 1.25/2$ in acres.

The following calculations are the supporting data for the Storm Water Quality.

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COMPUTATIONS		COMPLETED BY: CP	CHECKED BY: WMS	JOB/TASK NO.		DATE: 1/25/02
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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	
1. Stormwater Quality Concept 2. Determine guidelines for stormwater quality volume or rate for BLOMP 3. "The First Flush of Runoff & Its Effects on Control Structure Design", City of Austin Environmental and Conservation Services Dept. June 1990 "Maryland Stormwater Design Manual", Maryland Department of the Environment, 2000. "Urban Storm Drainage, Criteria Manual, Volume 3 Best Management Practices" UDFCD, Denver CO. 1999 4. Specific treatment BMP's are not included. Allowance for ROW will be included for future defined facilities.						

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COMPUTATIONS		COMPUTED BY: CD	CHECKED BY: VWD	JOB/TASK NO.	DATE: 1/25/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
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5.0 The stormwater treatment criteria have not been defined for SSCAFCA or Albuquerque Metro area.

It is assumed capture of floatables and sediment will be required.

It is also assumed that future treatment for TSS, metals, organics, etc will be required at some level.

Most of the pollutants are in the 1st flush runoff. The "1st Flush" runoff has not been established locally. The 1st flush runoff estimates range from the first 0.1" of runoff to 0.5" runoff and higher.

The volume of runoff to be treated ranges from 0.1" to 90% of the annual storm. Locally the annual

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COMPUTATIONS						
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS		9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	
storm is approximately 0.7". At Roskos Field, the wetland area is approximately 50% of the pond area. ⇒ For the concept planning, use $V_{wq} = 0.25''$ runoff volume (Austin Study) determine area based on extended volume depth of average 2'. Other treatment systems such as filtration should take less area. $A_{wq} = (V_{wq} * 1.25) / 2$ Acres $V_{wq} = \text{Drainage Area} * 0.25'' / 12$ Acre-Feet (AF)						

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COMPUTATIONS		COMPUTED BY: CD/PR	CHECKED BY: WMS	JOB/TASK NO. 983001	DATE: 5/02	
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	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

Temporal Rainfall Distribution Estimate

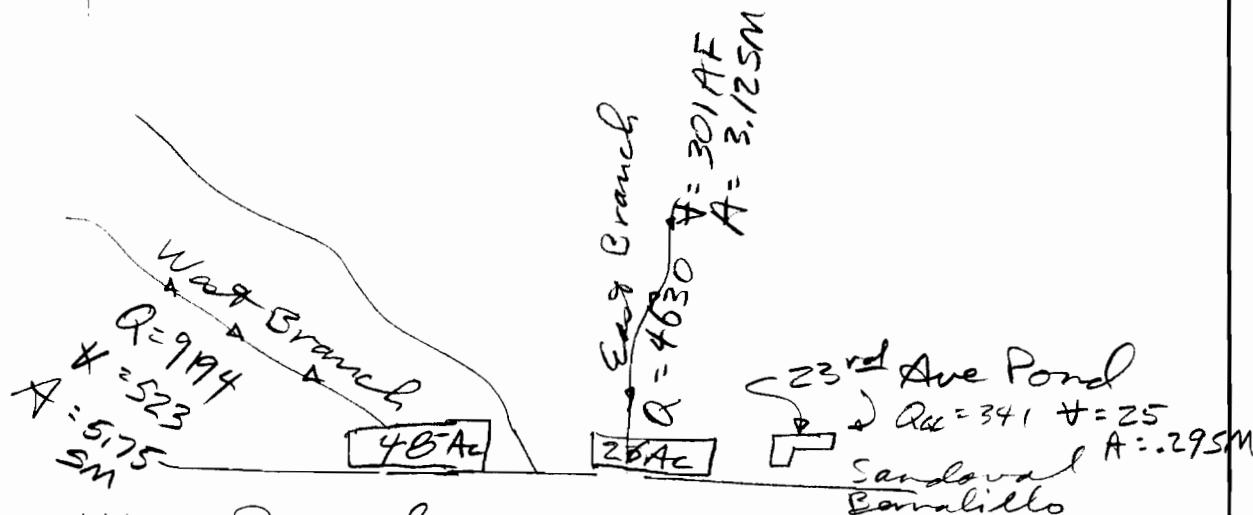
limited data '83-'99 Corrales

not statistically validated

Precip.	#/YR	Rain Vol.	Runoff @ 50%	Accum. Vol
0.1" - 0.2"	29.6	4.44"	2.22"	2.22"
.2 - .4"	4.9	1.47	0.74	2.96"
.4 - .6"	2.0	1.0	0.5	3.46"
.6 - .8"	0.9	0.63	0.32	3.78"
.8 - 1.0"	0.4	0.36	0.18	3.96"
1.0 - 1.2"	0.3	0.33	0.17	4.13"
1.2 - 1.4"	0.1	0.13	0.07	4.19"
1.4 - 1.6"	0.1	0.15	0.07	4.3"
1.6 - 1.8"	0.1	0.17	0.08	4.4"
2.8	0.01	0.028	0.01	4.4"
		8.96"	4.36"	

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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
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Wq & Awg - Various Options
 Future Baseline Option
 Wwq, Awg



West Branch

$$Wwq = \frac{0.25}{12} 5.75 (640) = 76 \text{ AF}$$

Awg ~ 48 Ac. @ 2' deep 38 Ac w/25%
 put all WQ & treatment @ bottom. no new dams
 upstream

East Branch

$$Wwq = \frac{0.25}{12} (3.12) (640) = 42 \text{ AF}$$

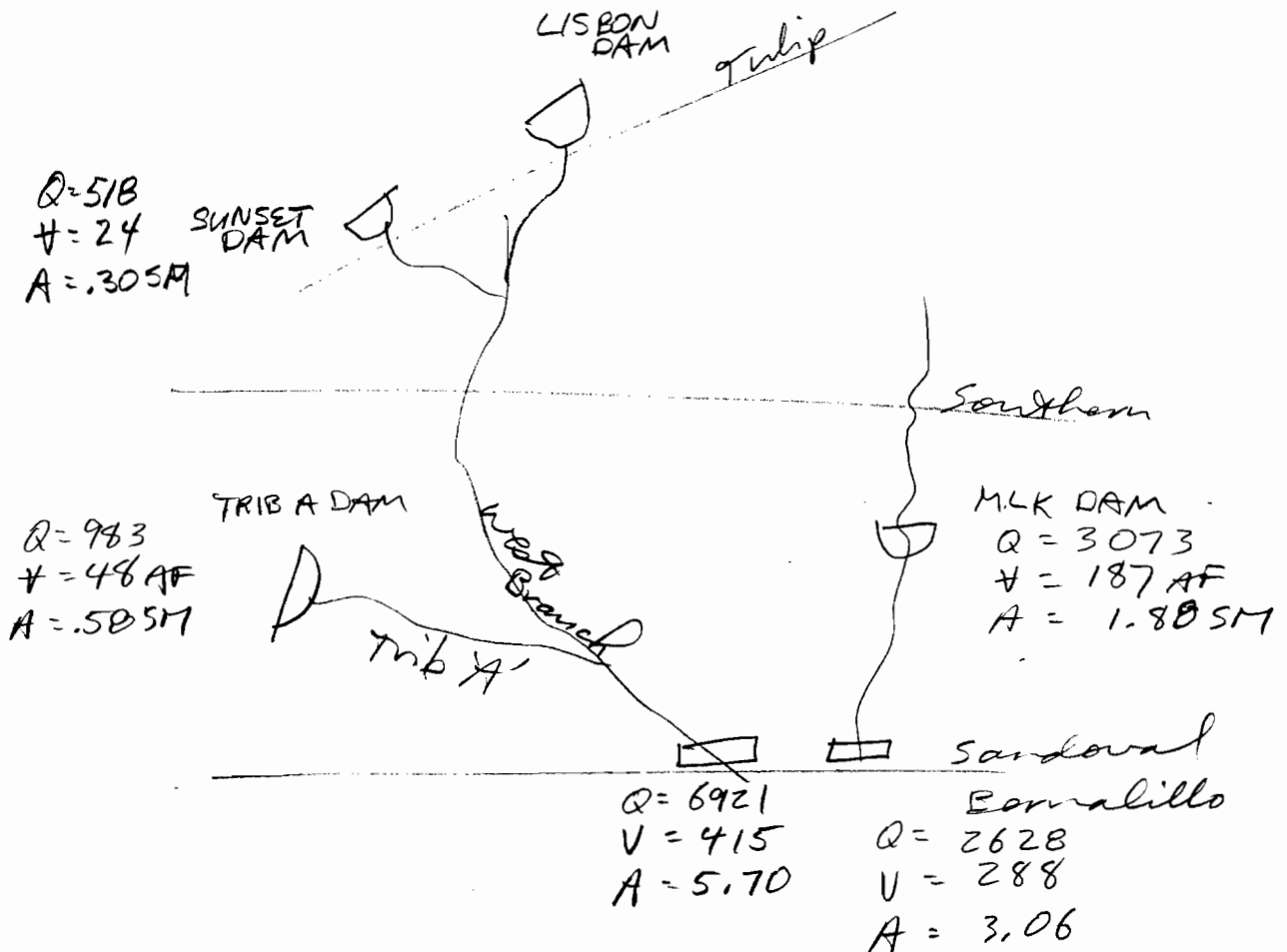
$$Awg \sim 214 \text{ Ac} @ 2' \text{ depth} + 25\% \text{ buffer} = 26 \text{ Ac}$$

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IDENTIFY/ADDRESS THESE ELEMENTS		1.0 SUBJECT		2.0 PURPOSE		
3.0 REFERENCES		4.0 ASSUMPTIONS		5.0 CRITERIA / REQUIREMENTS		
6.0 SKETCHES		7.0 CALCULATIONS		8.0 CONCLUSIONS		
9.0 ATTACHMENTS		REVISION #		SUPERSEDES CALC TITLE		
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WQ Vol
 4 DAM OPTION

Concept - two @ each dam
 plus two @ bottom for
 untreated area.

$$Q = 1219 \quad V = 62AF \quad A = 0.775M$$



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		<u>BLDMP</u>			OF	
COMPUTATIONS		COMPUTED BY:	CHECKED BY:	JOB/TASK NO.	DATE:	
		<u>LD</u>	<u>WMS</u>		<u>1/25/02</u>	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS		
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

LISBON/TULIP DAM

$$V_{wa} = \frac{0.25}{12} (0.77)(640) = 10 \text{ AF}$$

$$A_{wa} = \frac{10}{2} (1.25) = 6 \text{ Ac.}$$

SUNSET DAM

$$V_{wa} = \frac{0.25}{12} (0.30)(640) = 4 \text{ AF}$$

$$A_{wa} = \frac{4}{2} (1.25) = 2.5 \text{ Ac.}$$

Trib 'A' DAM

$$V_{wa} = \frac{0.25}{12} (0.58)(640) = 7.7 \text{ AF}$$

$$A_{wa} = \frac{7.7}{2} (1.25) = 5 \text{ Ac.}$$

West Branch @ County Line

$$A_{\text{Basin}} = 5.7 - 0.58 - 0.30 - 0.77 = 4.05 \text{ SF}$$

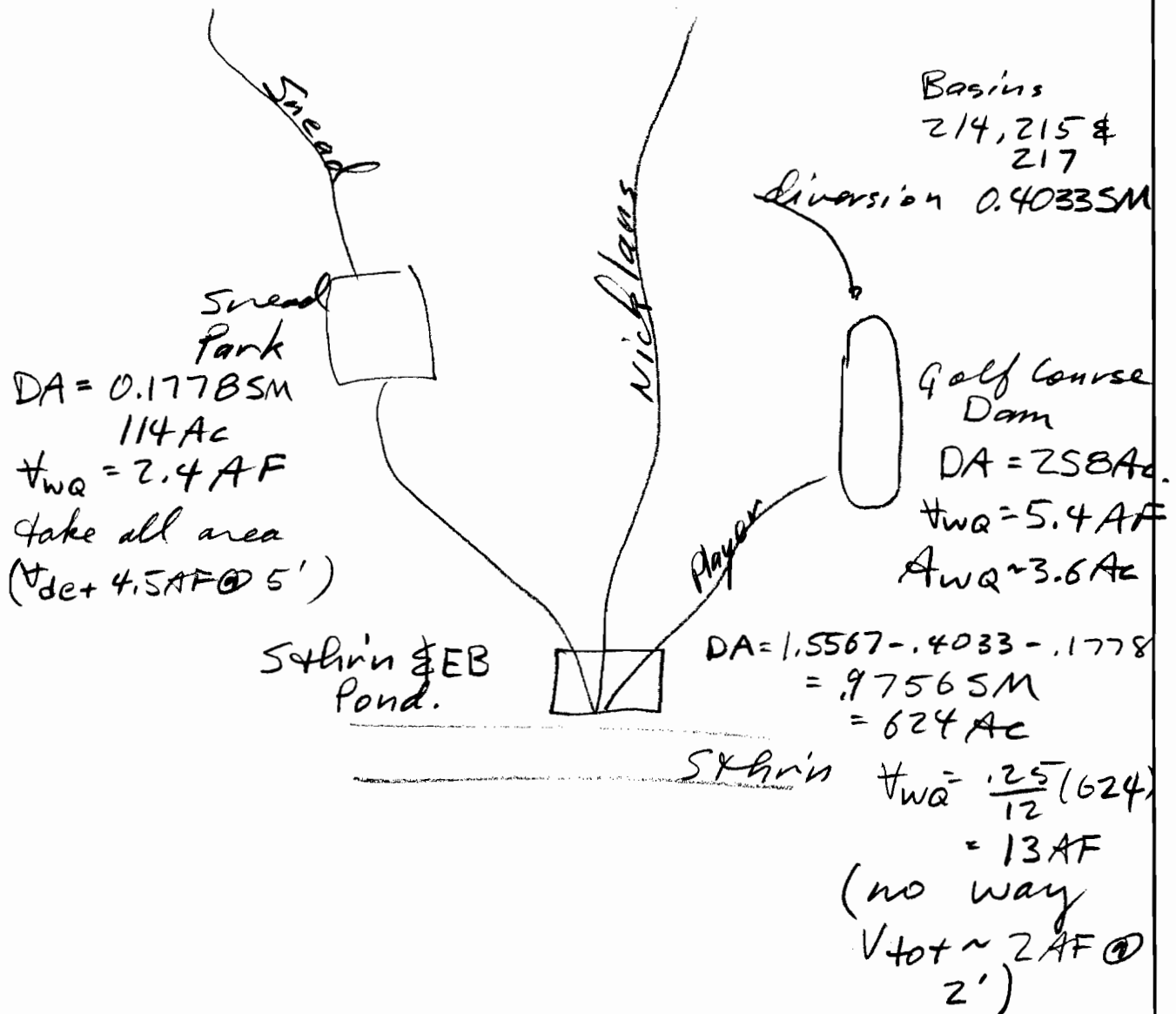
$$V_{wa} = \frac{0.25}{12} (4.05)(640) = 54 \text{ AF}$$

$$A_{wa} = \frac{54}{2} (1.25) = 34 \text{ Ac}$$

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COMPUTATIONS		COMPUTED BY: <u>CD</u>	CHECKED BY: <u>WMS</u>	JOB/TASK NO.	DATE: <u>1/25/02</u>	
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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS		9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	
<u>East BRANCH MLK DAM</u> $V_{wa} = 1.88 (640) \frac{(0.25)}{12} = 25 AF$ $A_{wa} = \frac{25}{2} (1.25) = 16 Ac.$ <u>East Branch @ Co. Line</u> $V_{wa} = (3.06 - 1.88)(640) \left(\frac{0.25}{12} \right) = 16 AF$ $A_{wa} = \frac{16}{2} (1.25) = 10 Ac.$ <u>Golf Course Rd</u> $A = 0.2855 M = 182 Ac.$ $V_{wa} = \frac{.25(182)}{12} = 3.8 AF$ $A = 2.3 Ac.$						

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IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT 6.0 SKETCHES	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

East Branch Ponds
 N. of Southern
 $V_{WQ} = ?$



COMPUTATIONS

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BLOMP

SHEET NO.

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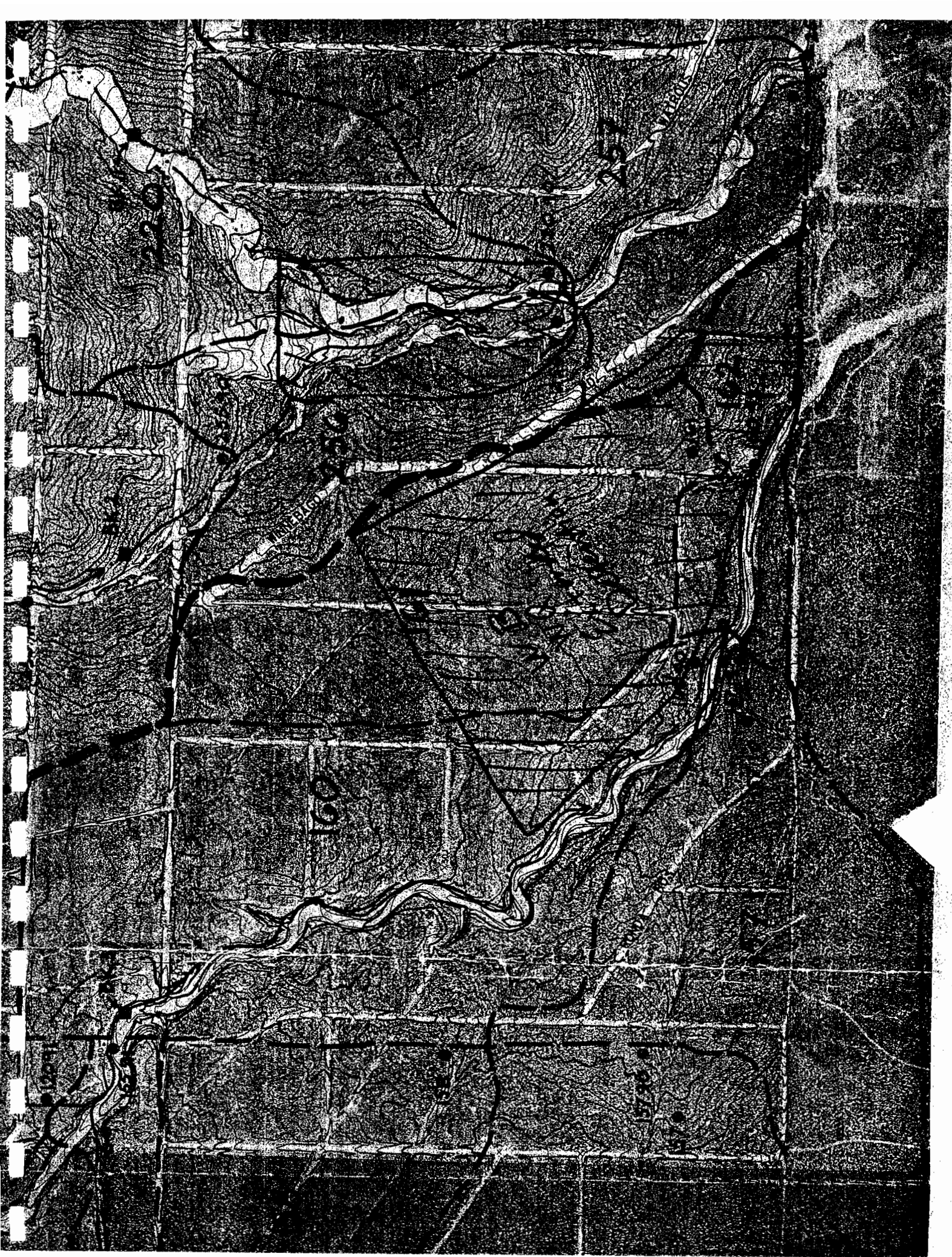
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1/30/02

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	6.0 SKETCHES	7.0 CALCULATIONS	8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED

- 1.0 Water Quality Detention
Concept @ County line
- 2.0 develop conceptual "extended
detention" concept for
AHYMO @ land requir'ts
for Option 3 w/ upstream
Dams



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THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

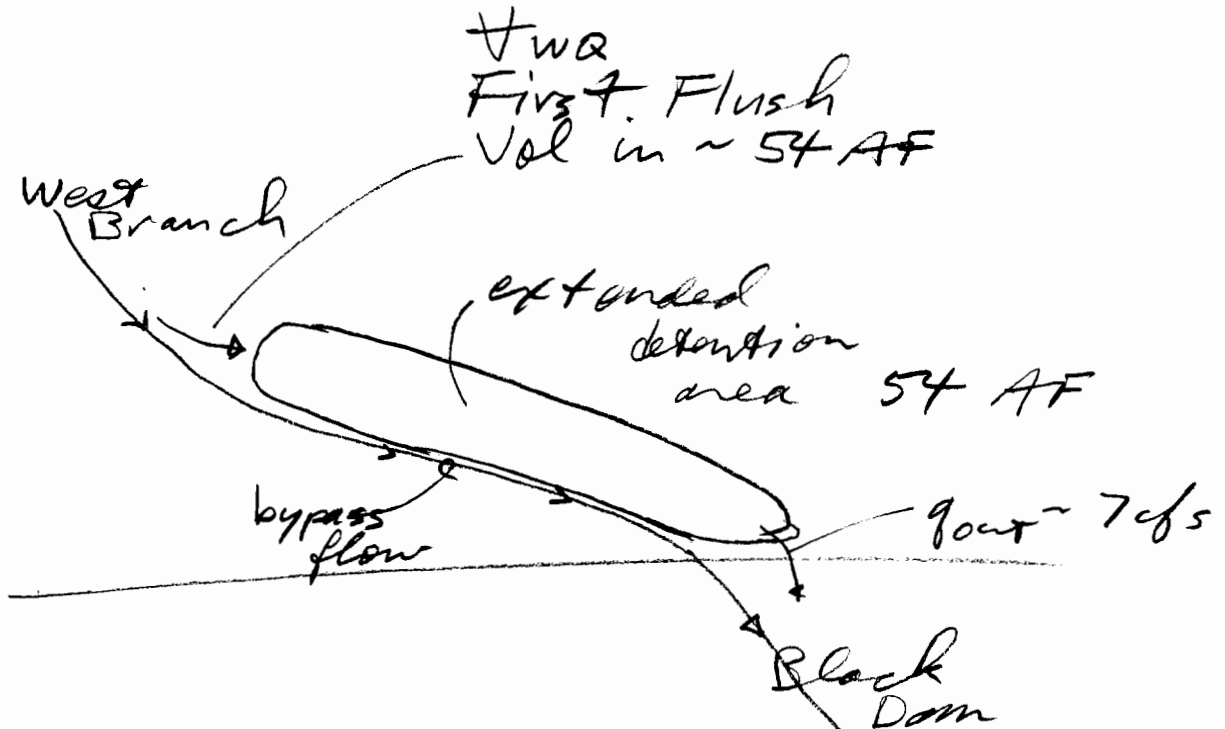
9.0 ATTACHMENTS

REVISION #

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DATED



Divert 1st 0.25" runoff
from WS below upstream
dams. 2600 acres * 0.25" = 54 AF

Detain 4 days +/-
gout = 7 cfs

Area @ 2' deep avg + 25%.
~ 34 acres

Rating Curve

El	gout	#
0	0	0
2'	5	54
4	6	100

COMPUTATIONS

NAME OF PROJECT/CALCULATION

BLDMP

SHEET NO.

OF

COMPUTED BY:

CD

CHECKED BY:

KMS

JOB/TASK NO.

DATE:

1/30/02

IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

CHECKED BY:

DATED

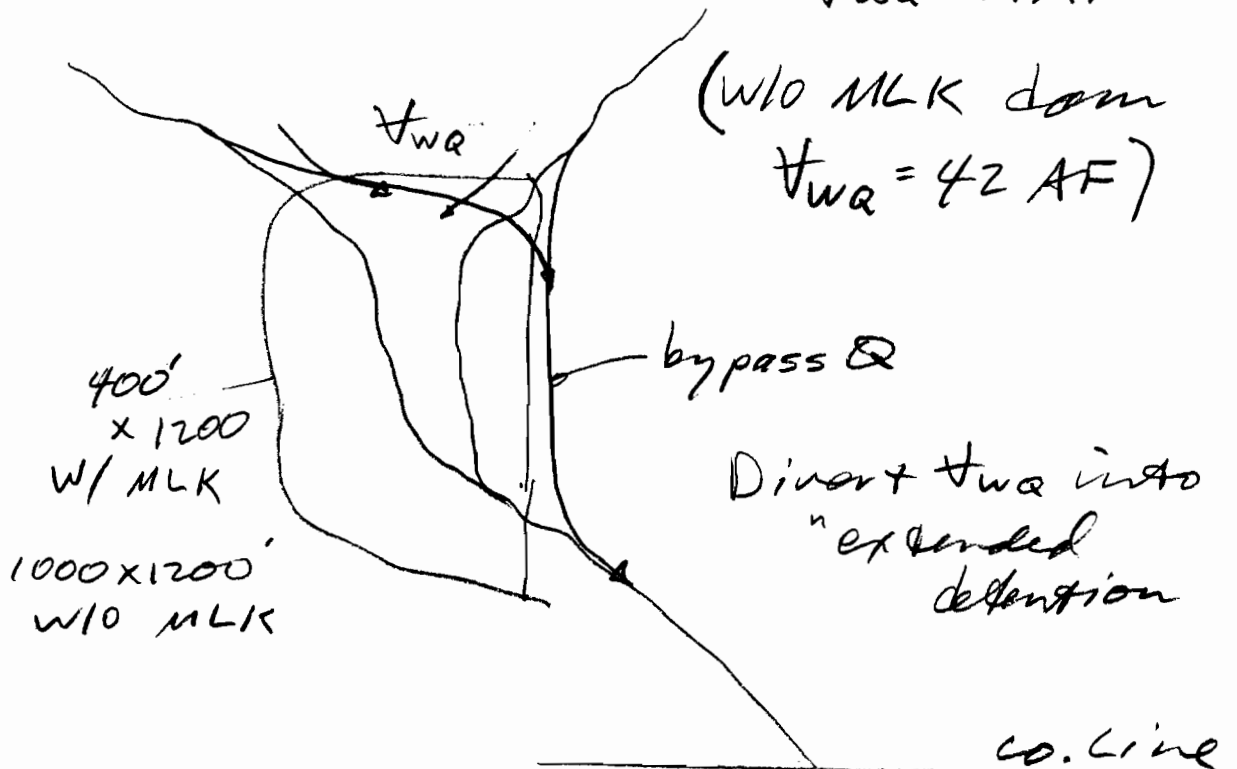
East Branch

(w/ MLK dam)

$\nabla_{wa} = 17 \text{ AF}$

(w/o MLK dam)

$\nabla_{wa} = 42 \text{ AF}$



Rating Curve for
diverted flow

EL	q	H
0	0	0
2	5	42
4	5	80

ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES COMPUTATIONS		NAME OF PROJECT/CALCULATION BLOMP			SHEET NO. OF 							
COMPUTED BY: CD		CHECKED BY: VMS		JOB/TASK NO. 		DATE: 1/30/02						
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS							
6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS		9.0 ATTACHMENTS							
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:		DATED						
1.0 Water quality ponds for extended detention dispersed in WS rather than at county line Two locations - west branch - already in model. <table style="margin-left: 150px; border: none;"> <tr> <td style="padding-right: 20px;">① Lisbon & Tulip</td> <td style="text-align: right;">10 AF</td> </tr> <tr> <td>② Sunset & Tulip</td> <td style="text-align: right;">4 AF</td> </tr> <tr> <td>③ Trib A' Dam</td> <td style="text-align: right;">8 AF</td> </tr> </table> need 54 add'l two use new extended detention ② Park & ④ Unser then add remainder ④ Co. line.							① Lisbon & Tulip	10 AF	② Sunset & Tulip	4 AF	③ Trib A' Dam	8 AF
① Lisbon & Tulip	10 AF											
② Sunset & Tulip	4 AF											
③ Trib A' Dam	8 AF											

COMPUTATIONS

NAME OF PROJECT/CALCULATION

BLOMP

SHEET NO.

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1.0 SUBJECT

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6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

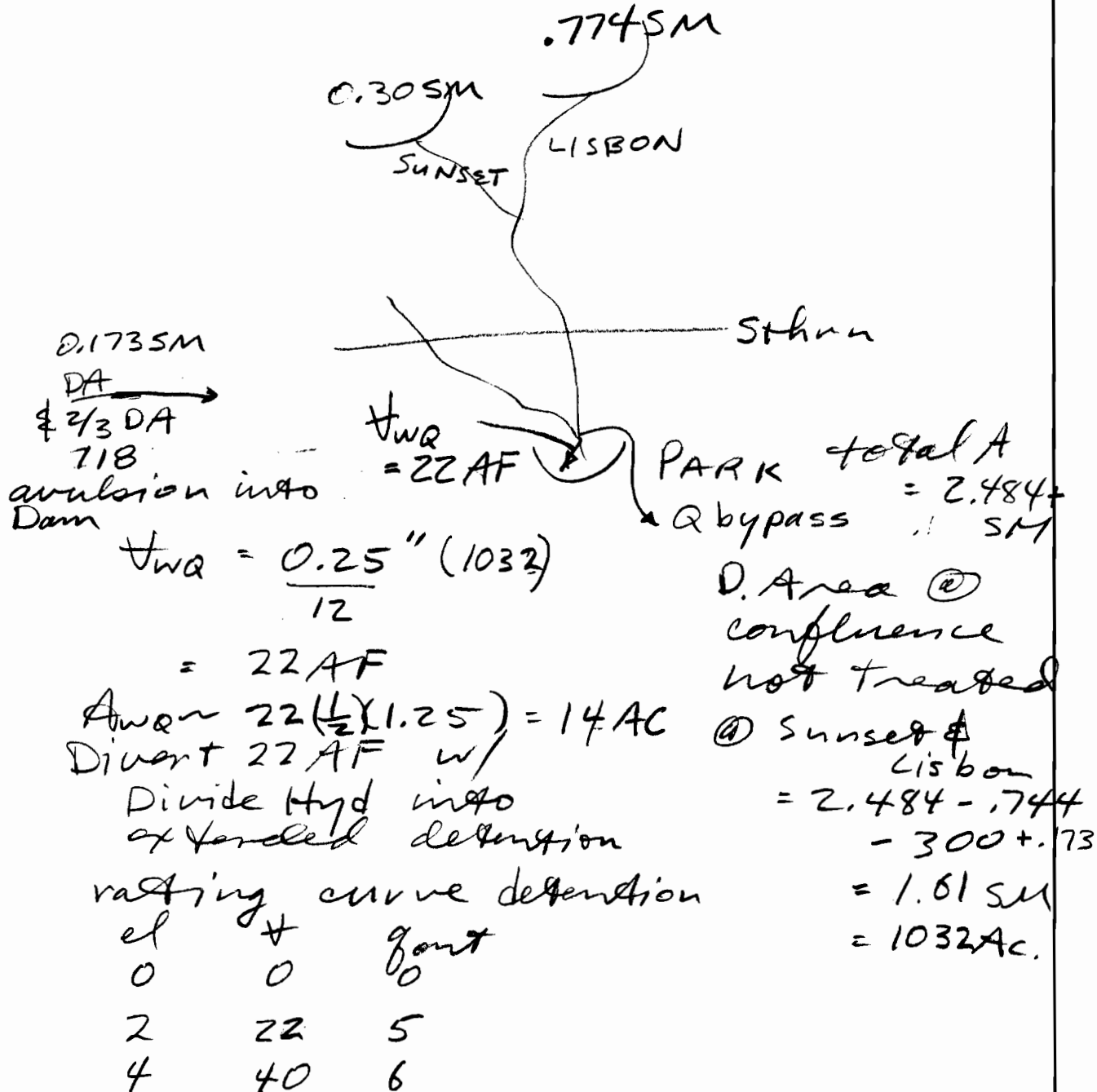
REVISION #

SUPERSEDES CALC TITLE

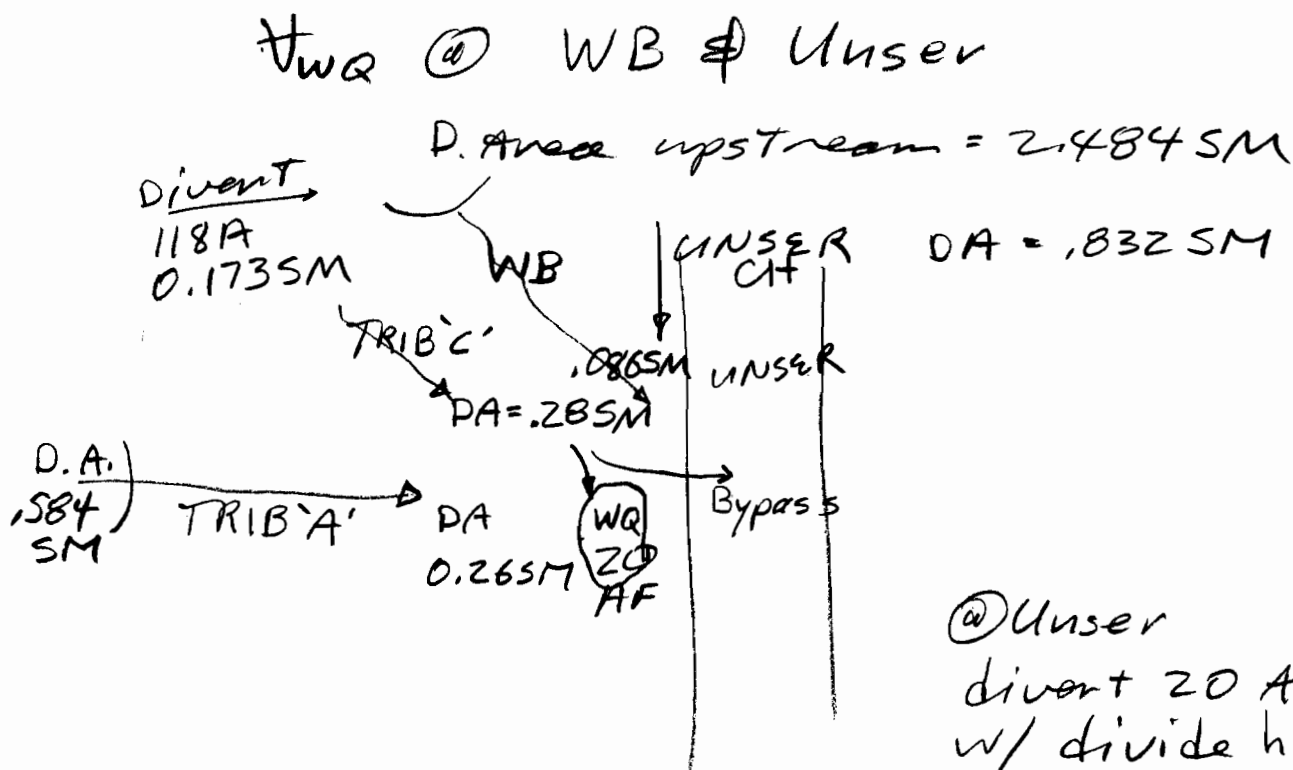
CHECKED BY:

DATED

① Park Pond



ASCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION BLOMP			SHEET NO. OF	
COMPUTATIONS		COMPUTED BY: CD	CHECKED BY: WMS	JOB/TASK NO.	DATE: 1/30/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	



@Unser
 divert 20 AF
 w/ divide hyd
 into WQ
 extended
 detention

Untreated flows @
 0.25" @Unser
 & WB

Unser Channel	0.832 SM
West Branch	0.086 SM
Trib 'C'	0.28 SM
Trib 'A'	0.26 SM
	<u>1.45 SM</u>

rafting curve

el	+	g
0	0	0
2	20	5
4	40	6

933 Ac

$$Two = \frac{0.25(933)}{12} = 20 AF$$

$$A_{wq} @ 2' w/ 1.25 = 13 Ac$$

COMPUTATIONS

NAME OF PROJECT/CALCULATION

BLDMP

SHEET NO.

OF

COMPUTED BY:

CP

CHECKED BY:

KMS

JOB/TASK NO.

DATE:

1/30/02

IDENTIFY/ADDRESS
THESE ELEMENTS

1.0 SUBJECT

2.0 PURPOSE

3.0 REFERENCES

4.0 ASSUMPTIONS

5.0 CRITERIA / REQUIREMENTS

6.0 SKETCHES

7.0 CALCULATIONS

8.0 CONCLUSIONS

9.0 ATTACHMENTS

REVISION #

SUPERSEDES CALC TITLE

CHECKED BY:

DATED

WQ - west branch @
County Line

Upstream DA treated

= 1.45 @ User

0.58 @ Trib 'A'

1.074 upstream from Park

1.61 @ Park

.418 @ Gateway

5.1 SM

DA total WB @ Co. Line = 5.703 SM

treat 0.6 SM = 384 ac.

$W_{WQ} = 384 \left(\frac{.25}{12} \right) = 8 \text{ ACF}$

$A_{WQ} = 5 \text{ ACF}$

valving curve
el 9 ft
0 0
2 5 8
4 6 16

Divert BAF
into
extended
detention.

ASCCG INCORPORATED ENGINEERS • ARCHITECTS • SURVEYORS • INSPECTION SERVICES		NAME OF PROJECT/CALCULATION BLTMD			SHEET NO. OF	
COMPUTATIONS		COMPUTED BY: CHS	CHECKED BY: CD	JOB/TASK NO.	DATE: 6/29/02	
IDENTIFY/ADDRESS THESE ELEMENTS	1.0 SUBJECT	2.0 PURPOSE	3.0 REFERENCES	4.0 ASSUMPTIONS	5.0 CRITERIA / REQUIREMENTS	
	6.0 SKETCHES	7.0 CALCULATIONS		8.0 CONCLUSIONS	9.0 ATTACHMENTS	
REVISION #	SUPERSEDES CALC TITLE			CHECKED BY:	DATED	

AREA into 23RD AVE PONDS = 0.21908 sm

AREA into 20th AVE POND = 0.14730 sm

AREA into 19th AVE POND = 0.58420 sm

V_{WQ} - 20th AVE POND

$$0.14730 \text{ sm} \times 640 \text{ ACRES/sm} = 94.3 \text{ acrus}$$

$$94.3 \text{ acres} \times \frac{0.25 \text{ in}}{12 \text{ in/ft}} = 1.96 \text{ ac-ft}$$

$$\approx \underline{\underline{2 \text{ ac-ft}}}$$

V_{WQ} - 23RD AVE PONDS

$$(0.21908 - 0.1473) \text{ sm} \times 640 \frac{\text{ac}}{\text{sm}} \times \frac{0.25 \text{ in}}{12 \text{ in/ft}}$$

$$= 0.96 \text{ ac-ft} \approx \underline{\underline{1 \text{ ac-ft}}}$$

V_{WQ} - 19th AVE POND

$$(0.58420 \text{ sm}) \times 640 \times \frac{0.25}{12} = 7.8 \text{ ac-ft}$$

$$\approx 8 \text{ ac-ft}$$

WEST BRANCH PARK POND
VOLUME CALCULATION FROM PUNCH HYDROGRAPH

PUNCH HYD FROM AP 117.30 - CONFL. OF IVORY AND LISBON ARROYOS

RECALL HYD ID= 5 HYD= 117.30 DT= .050000 HRS DA= 2.6577 SQ MI

PEAK= 2809.319CFS RO= 1.1476 INCHES NO PTS=600

DT=.05 hrs	TIME (sec)	FLOWRATES (cfs)	VOLUME (cf)	CUM. VOL. (cf)	CUM. VOL. (AF)
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0	0	0	0
0.05	180.00	0.302	54.36	54.360	0.001
0.05	180.00	2.670	480.6	534.960	0.012
0.05	180.00	7.387	1329.66	1864.620	0.043
0.05	180.00	12.830	2309.4	4174.020	0.096
0.05	180.00	19.640	3535.2	7709.220	0.177
0.05	180.00	35.317	6357.06	14066.280	0.323
0.05	180.00	74.332	13379.76	27446.040	0.630
0.05	180.00	157.138	28284.84	55730.880	1.279
0.05	180.00	341.827	61528.86	117259.740	2.692
0.05	180.00	741.836	133530.48	250790.220	5.757
0.05	180.00	1428.290	257092.2	507882.420	11.659
0.05	180.00	2221.369	399846.42	907728.840	20.839
0.05	180.00	2749.576	494923.68	1402652.520	32.200

WATER QUALITY WEST BRANCH AT UNSER CROSSING

RECALL HYD ID= 5 HYD= 159.2 DT= .050000 HRS DA= 4.8223 SQ MI
 PEAK= 590 1.286CFS R O= 1.2562 INC HES NO P TS=600

DT=.05 hrs	TIME (sec)	FLOWRATE S (cfs)	VOLUME (cf)	CUM. VOL. (cf)	CUM. VOL. (AF)
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.562	101.16	101.16	0.00
0.05	180.00	5.459	982.62	1083.78	0.02
0.05	180.00	15.044	2707.92	3791.70	0.09
0.05	180.00	24.237	4362.66	8154.36	0.19
0.05	180.00	32.793	5902.74	14057.10	0.32
0.05	180.00	55.649	10016.82	24073.92	0.55
0.05	180.00	118.028	21245.04	45318.96	1.04
0.05	180.00	245.218	44139.24	89458.20	2.05
0.05	180.00	498.631	89753.58	179211.78	4.11
0.05	180.00	963.509	173431.62	352643.40	8.10
0.05	180.00	1628.316	293096.88	645740.28	14.82
0.05	180.00	1200.000	216000.00	861740.28	19.78

WATER QUALITY WEST BRANCH AT COUNTY LINE

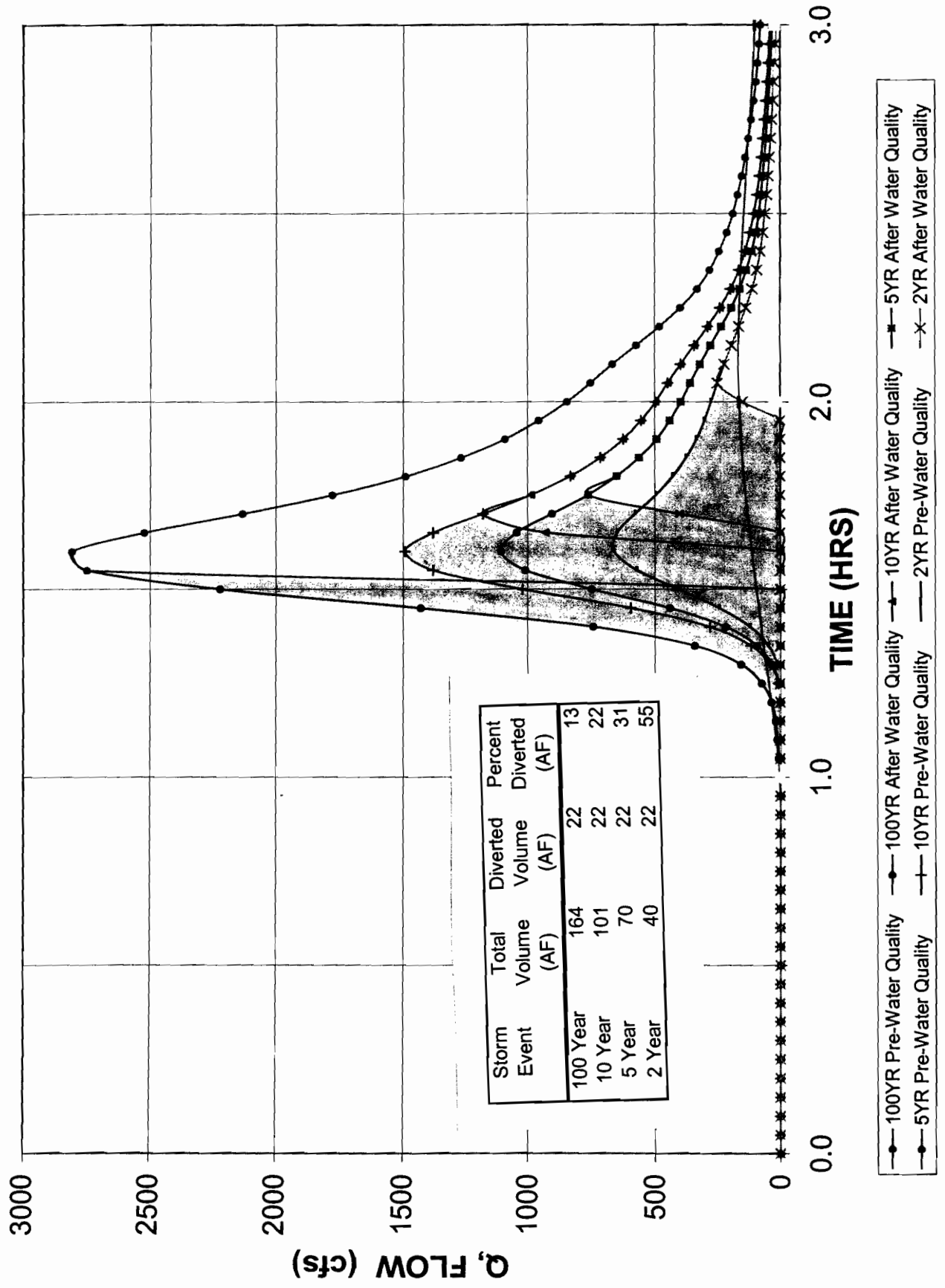
RECALL HYD ID= 5 HYD= 620.2 DT= .050000 HRS DA= 5.6332 SQ MI
 PEAK= 7331.324CFS RO= 1.2597 INCHES NO PTS=600

DT=.05 hrs	TIME (sec)	FLOWRATES	VOLUME (cf)	CUM. VOL. (cf)	CUM.
		(cfs)			VOL. (AF)
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.000	0.00	0.00	0.00
0.05	180.00	0.057	10.26	10.26	0.00
0.05	180.00	0.684	123.12	133.38	0.00
0.05	180.00	2.553	459.54	592.92	0.01
0.05	180.00	5.423	976.14	1,569.06	0.04
0.05	180.00	8.723	1,570.14	3,139.20	0.07
0.05	180.00	13.998	2,519.64	5,658.84	0.13
0.05	180.00	26.452	4,761.36	10,420.20	0.24
0.05	180.00	54.470	9,804.60	20,224.80	0.46
0.05	180.00	116.811	21,025.98	41,250.78	0.95
0.05	180.00	256.598	46,187.64	87,438.42	2.01
0.05	180.00	526.480	94,766.40	182,204.82	4.18
0.05	180.00	894.708	161,047.44	343,252.26	7.88
0.05	180.00	30.000	5,400.00	348,652.26	8.00

WATER QUALITY FLOWS - EAST BRANCH AT COUNTY LINE

RECALL HYD		ID= 5	HYD=	256.99	DT= .050000	HRS DA=	2.6634	SQ MI
PEAK=		436	0.655CFS	R	O= 1.8525	INC HES	NO P	TS=552
		FLOWRATE			CUM. VOL.		CUM.	
DT=.05 hrs	TIME (sec)	S (cfs)	VOLUME (cf)		(cf)	VOL. (AF)		
0.05	180.00	0.00	0.00		0.00	0.00		
0.05	180.00	0.00	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0	0.00		0.00	0.00		
0.05	180.00	0.19	34.20		34.20	0.00		
0.05	180.00	1.886	339.48		373.68	0.01		
0.05	180.00	60.71	10,927.80		11,301.48	0.26		
0.05	180.00	12.138	2,184.84		13,486.32	0.31		
0.05	180.00	19.808	3,565.44		17,051.76	0.39		
0.05	180.00	33.366	6,005.88		23,057.64	0.53		
0.05	180.00	63.627	11,452.86		34,510.50	0.79		
0.05	180.00	129.353	23,283.54		57,794.04	1.33		
0.05	180.00	296.126	53,302.68		111,096.72	2.55		
0.05	180.00	711.271	128,028.78		239,125.50	5.49		
0.05	180.00	1503.122	270,561.96		509,687.46	11.70		
0.05	180.00	2547.251	458,505.18		968,192.64	22.23		
0.05	180.00	3521.348	633,842.64		1,602,035.28	36.78		
0.05	180.00	1265	227,700.00		1,829,735.28	42.00		

SAMPLE HYDROGRAPH (HYD 117.30)



APPENDIX J

COST ESTIMATE SUMMARY

The following support data relevant to the BLWMP are attached.

1. Summary tables that tabulates the conveyance facilities physical characteristics and the costs for the components.
2. Charts and printout files for the channel flow curves that were utilized to conceptually size the channels. Curves are based on Channel slope and discharge rates, and used to determine flow depth and bottom width. A criteria was to maintain velocities of less than 30 fps to avoid erosion in the proposed facility.

COST ESTIMATE SUMMARY SHEET

TOTAL W/
50% MISC
& 25%
Eng/Test
(\$000)

		Length	Q	S _o	BW	depth	Misc.	PCC \$	Exc/Emb \$	ROW (ac)

CONVEYANCE (Channels, Storm Drains, Arroyos)

Key Map 1

15 BL 50C	Upgd	2000	570	2.3	10	4.5		\$ 109,203	\$ 216,000	\$610	4
22 BL 51S	New	1300	200	0.8	54" RCP		160K	\$ 156,000	\$ 91,000	\$763	
22 BL 52C	Upgd	3800	370	4.5	10	3.5		\$ 161,338	\$ 248,267	\$768	7
22 BL 53C	Upgd	1200	1455	2	15	5		\$ 72,865	\$ 226,667	\$562	3
22 BL 54C	Upgd	3500	585	2.6	10	4		\$ 169,825	\$ 298,667	\$878	7
22 BL 55C	Upgd	4300	1025	1	10	5.5		\$ 286,825	\$ 693,733	\$1,839	9

Key Map 2

14 BL 51C	Upgd	3500	1310	2.5	10	4.5		\$ 191,043	\$ 378,000	\$1,067	7
23 BL 50C	Upgd	2000	250	2.5	10	3.5	Gas Pipe Xing	\$ 84,954	\$ 130,667	\$404	4
23 BL 51C	Upgd	4500	75	2.7	10	3		\$ 163,763	\$ 216,000	\$712	8

Key Map 3

27 BL 50C		3000	380	3	10	4		\$ 145,576	\$ 256,000	\$753	6
27 BL 51C	Upgd	4800	580	4.2	10	4		\$ 232,872	\$ 409,600	\$1,205	9
34 BL 51C		4000	815	4	20	3.5		\$ 169,895	\$ 479,111	\$1,217	8

Key Map 4

25 BL 50C	Upgd	1800	60	2.2	10	3		\$ 65,556	\$ 86,400	\$285	3
25 BL 51C	New	2500	2900	1.6	25	5.5		\$ 166,899	\$ 907,500	\$2,014	6
25 BL 52X	Upgd										
25 BL 53X	Upgd										
26 BL 50C		1400	380	2.9	10	3.5		\$ 59,493	\$ 91,467	\$283	3
26 BL 51C		2300	830	2.7	10	4.5	20' Deep	\$ 125,571	\$ 248,400	\$701	5
26 BL 52C		1800	1730	2	15	5	20' Deep	\$ 109,238	\$ 340,000	\$842	4
26 BL 54C	Upgd	3000	1665	2.5	20	4.5		\$ 163,833	\$ 594,000	\$1,421	7
35 BL 50C		4000	410	2.3	10	4		\$ 194,074	\$ 341,333	\$1,004	8
35 BL 51C		6000	530	2.5	10	4		\$ 291,069	\$ 512,000	\$1,506	11
35 BL 52C		4500	3485	2.8	45	4.5		\$ 245,847	\$ 1,903,500	\$4,030	13
35 BL 54C		5500	1120	3.3	15	4		\$ 266,855	\$ 664,889	\$1,747	11
36 BL 50C	New	1500	4425	2.7	65	4.5		\$ 82,308	\$ 904,500	\$1,850	5
36 BL 51C	New	3000	3550	1.8	35	5		\$ 182,124	\$ 1,233,333	\$2,654	8
36 BL 53C	New	4000	1185	2	15	4.5		\$ 218,357	\$ 612,000	\$1,557	8
36 BL 54C	New	3000	355	2	10	4		\$ 145,576	\$ 256,000	\$753	6
36 BL 55C	New	1000	110	2	10	3		\$ 36,457	\$ 48,000	\$158	2
36 BL 56C	Upgd	1500	90	3.3	10	3		\$ 54,644	\$ 72,000	\$237	3
36 BL 57C	New	3500	3440	1.7	35	5		\$ 212,435	\$ 1,438,889	\$3,096	9
36 BL 61C	New	4100	6155	1.7	55	5.5		\$ 273,803	\$ 3,141,967	\$6,405	13
36 BL 63C	New	4500	735	1.6	10	5		\$ 272,882	\$ 600,000	\$1,637	9
36 BL 63C	New										

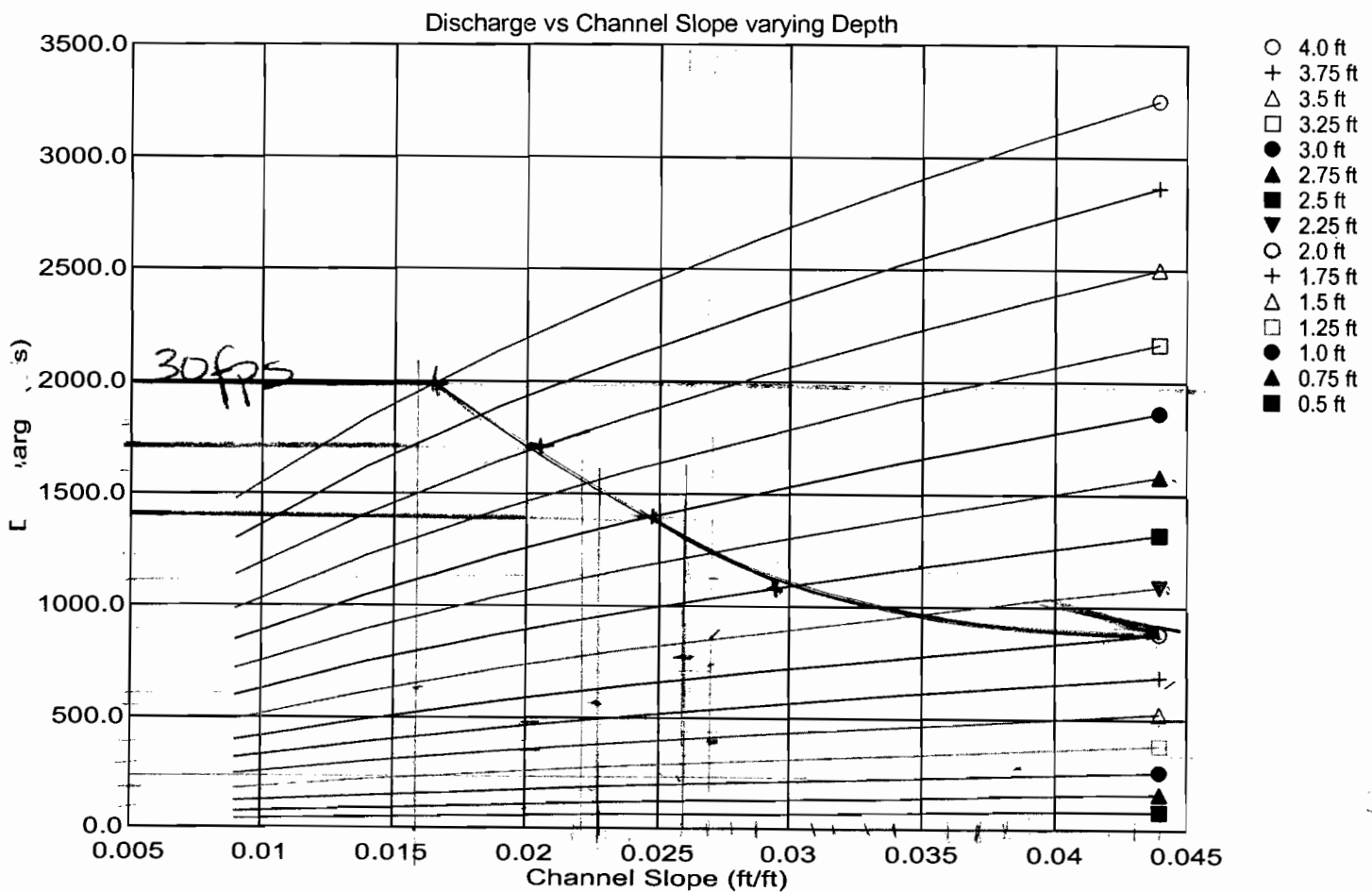
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	10.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth <i>w/o FB</i>	0.50	4.00	0.25 ft



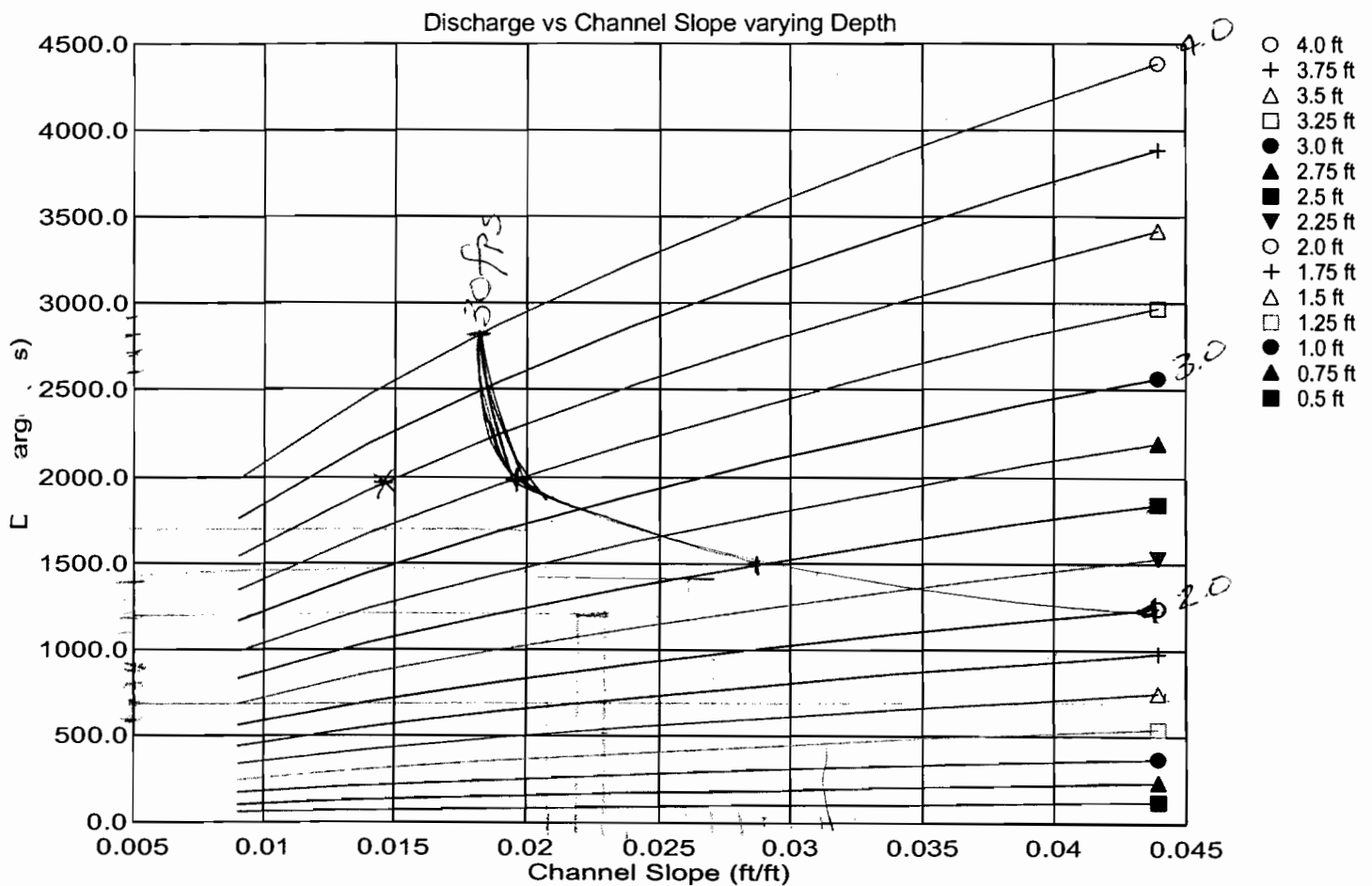
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	15.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth <i>W/O FB</i>	0.50	4.00	0.25 ft



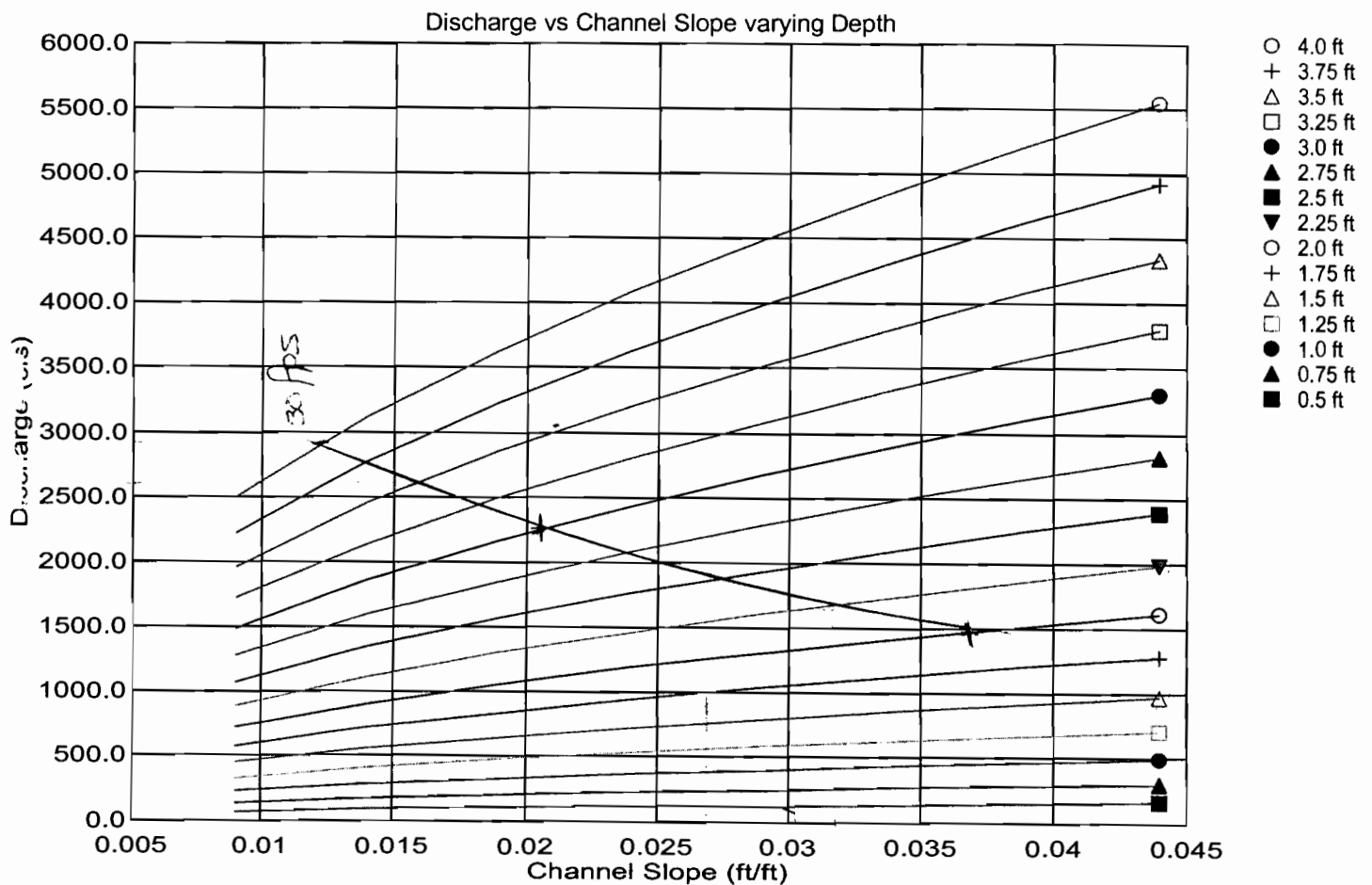
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	20.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth <i>w/o PB</i>	0.50	4.00	0.25 ft



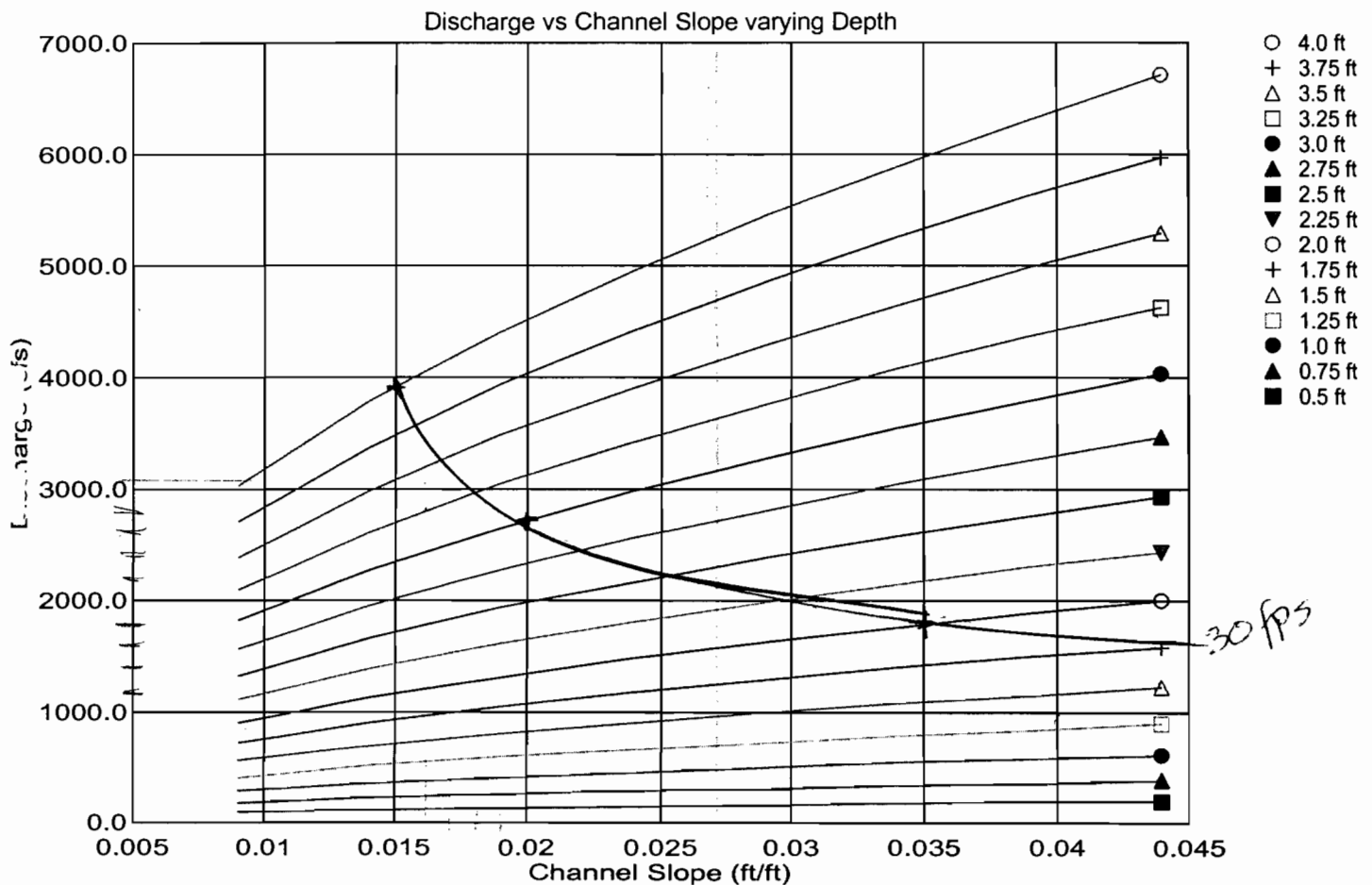
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	25.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



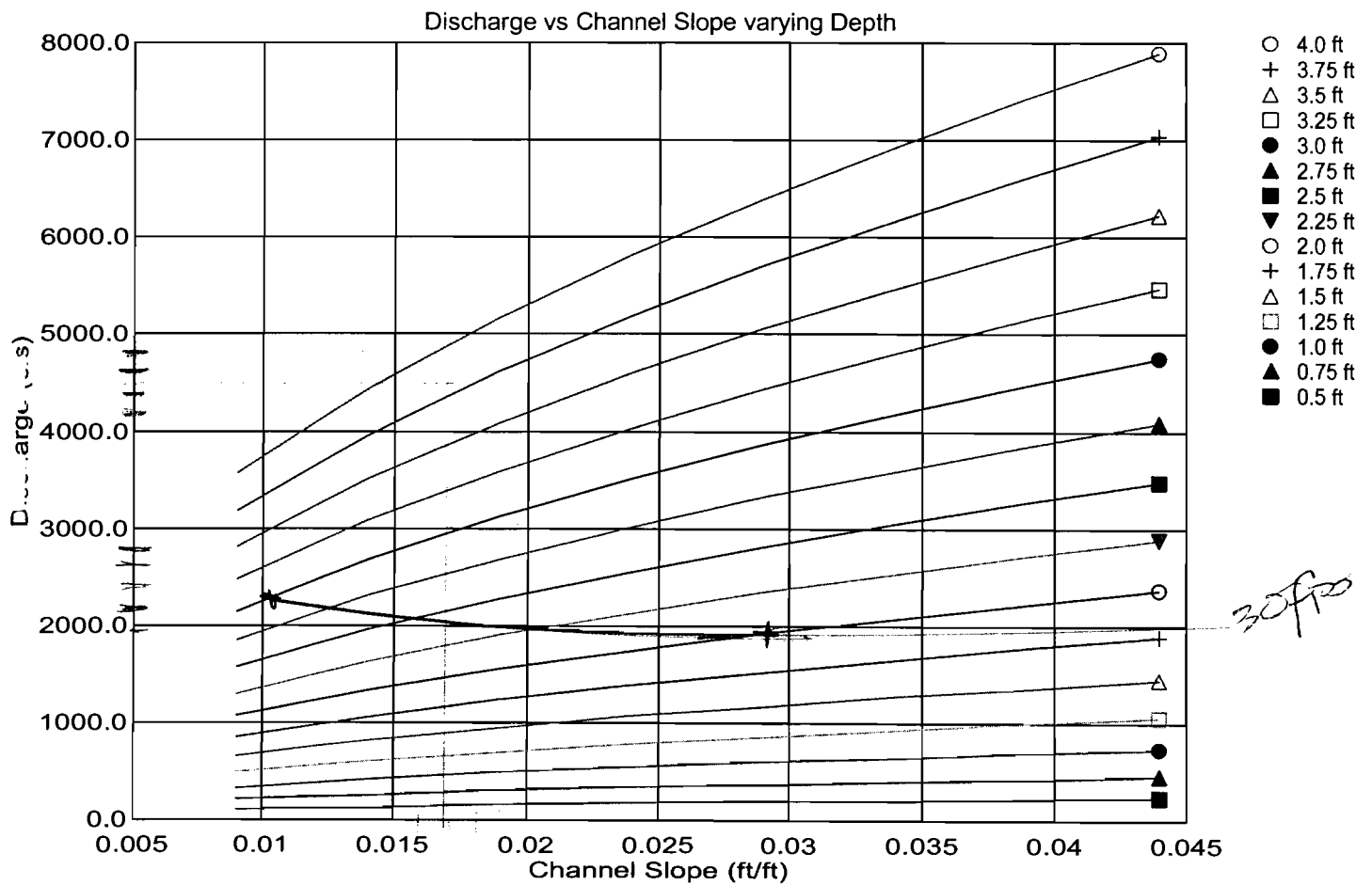
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	30.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



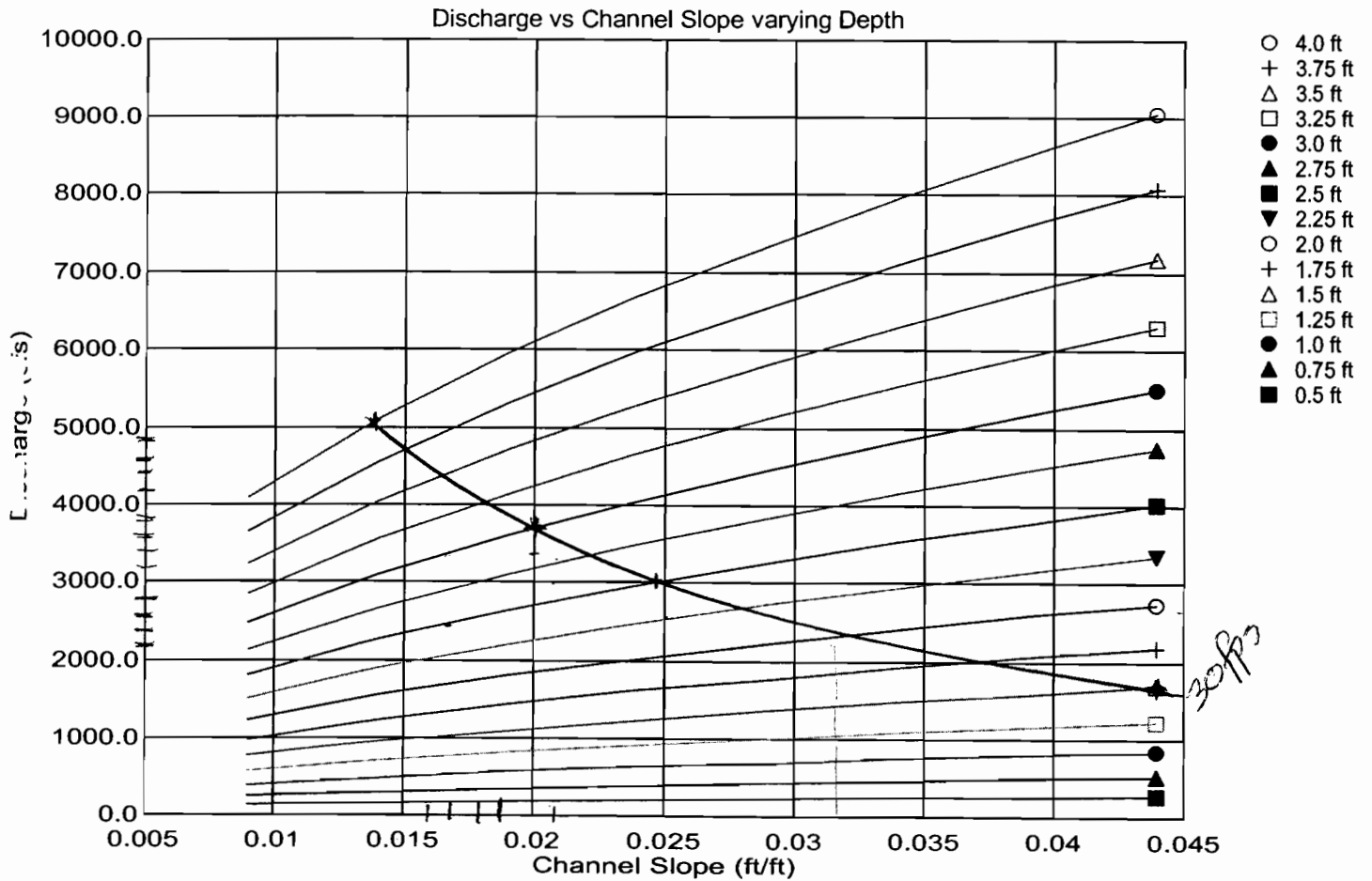
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	35.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



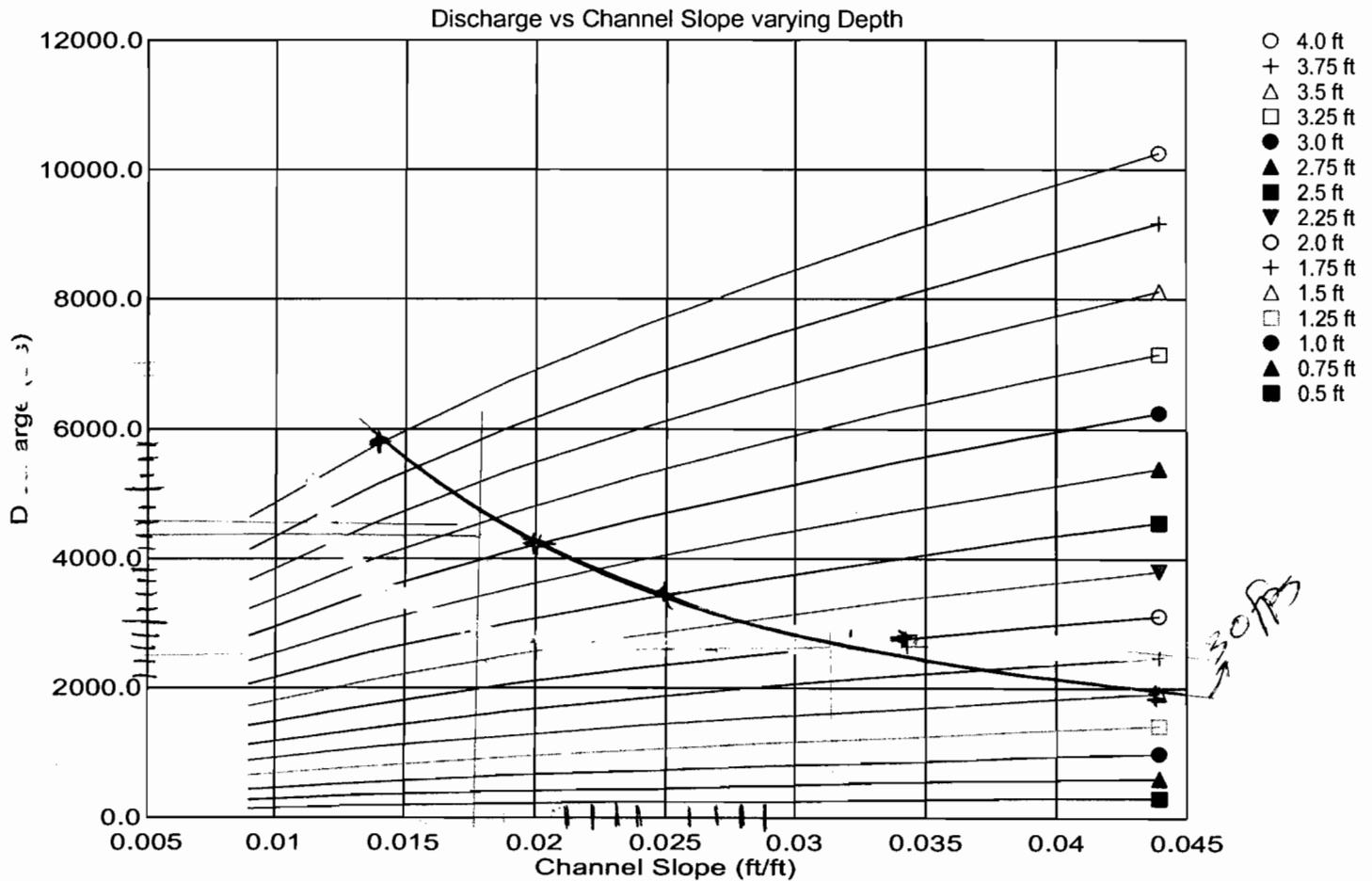
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\frmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	40.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



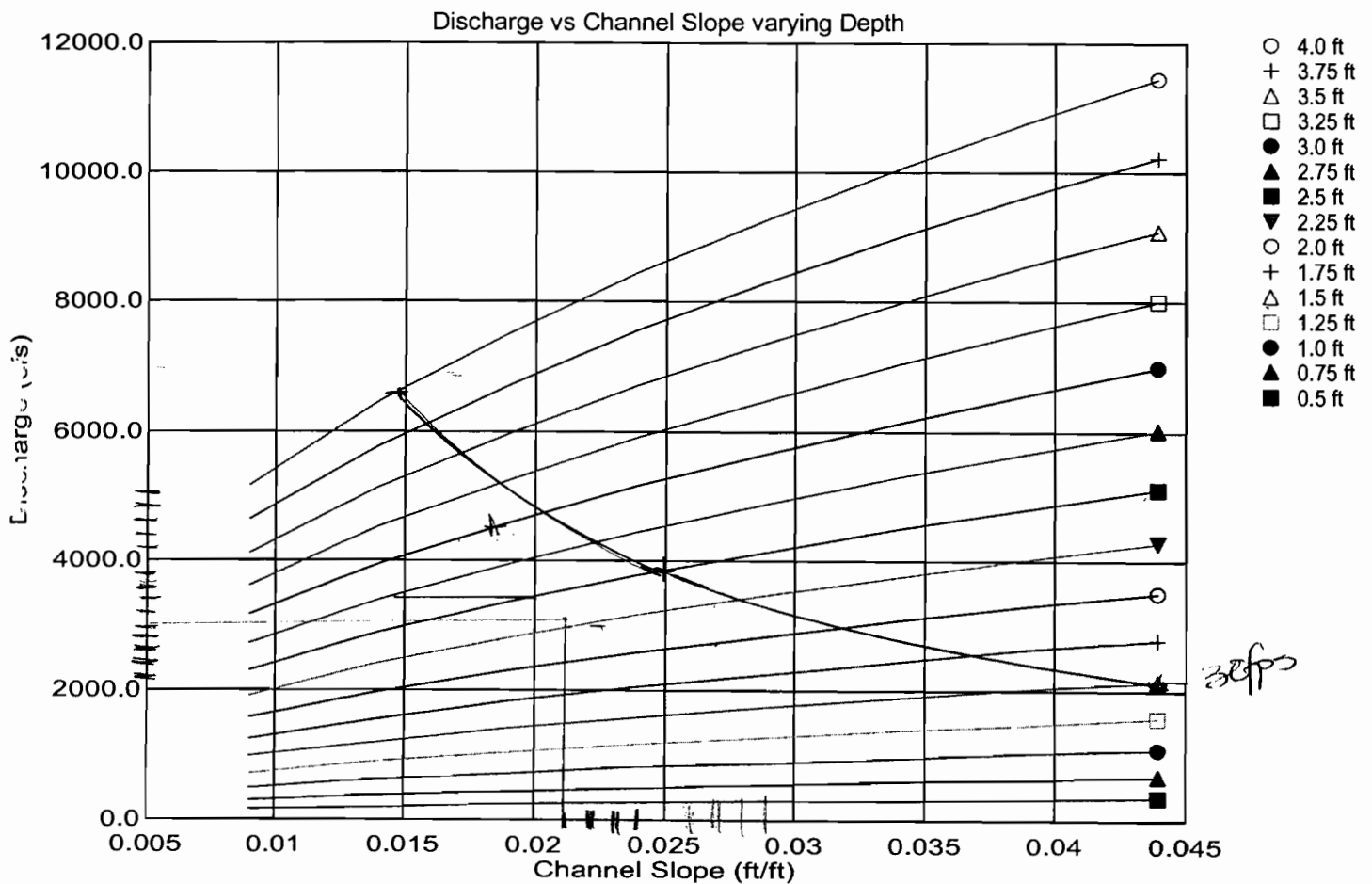
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	45.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



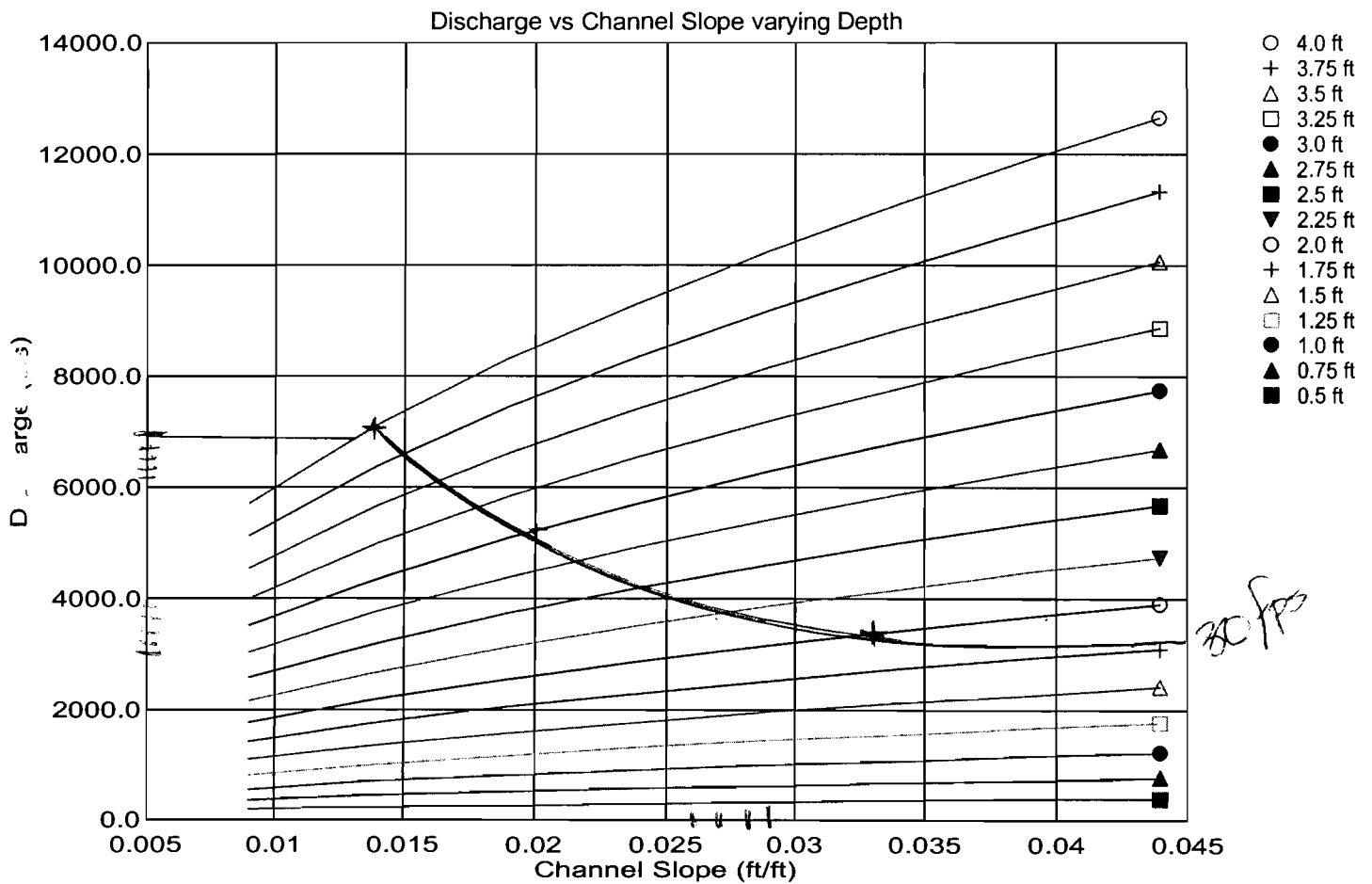
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	50.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



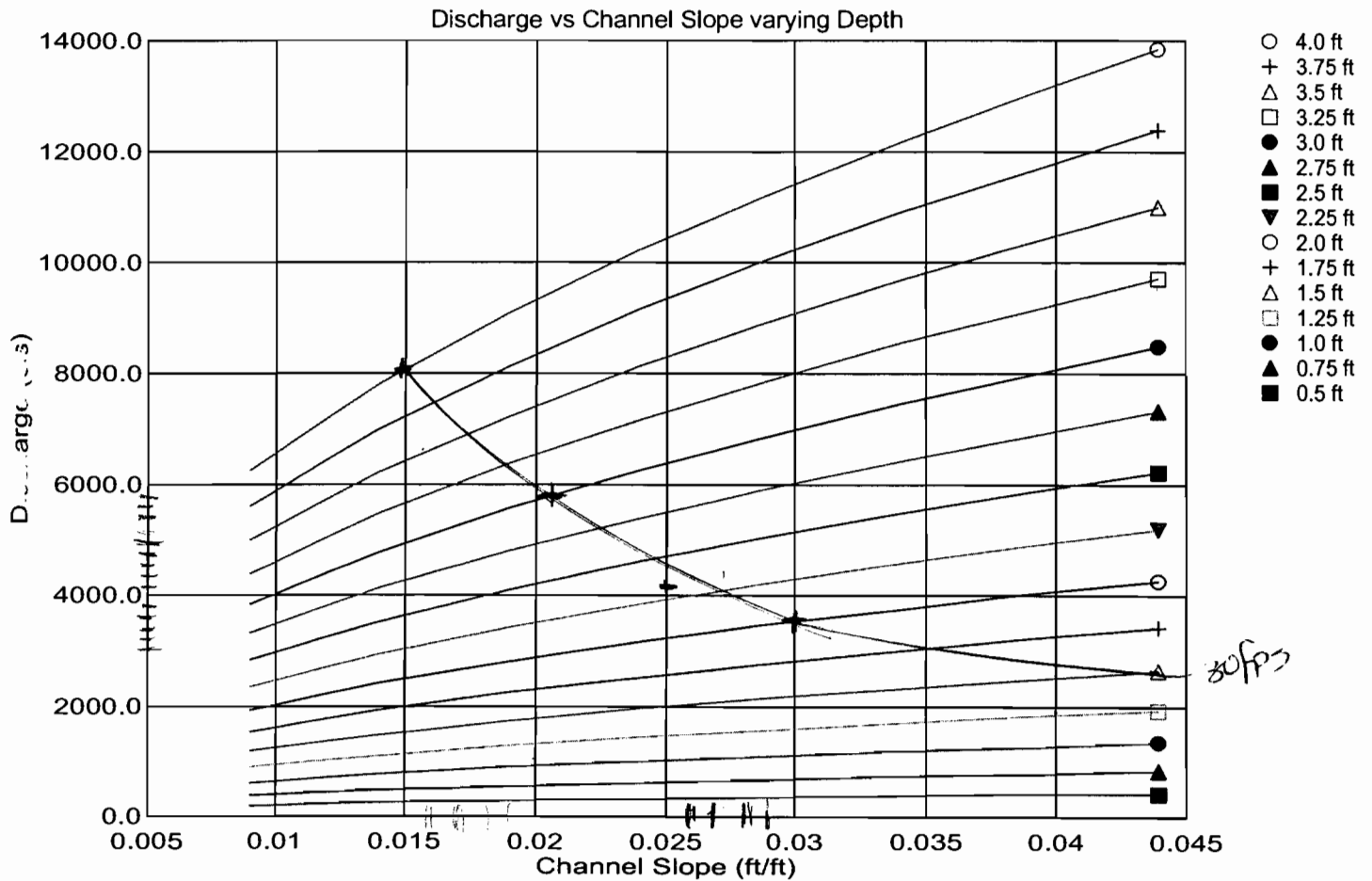
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	55.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



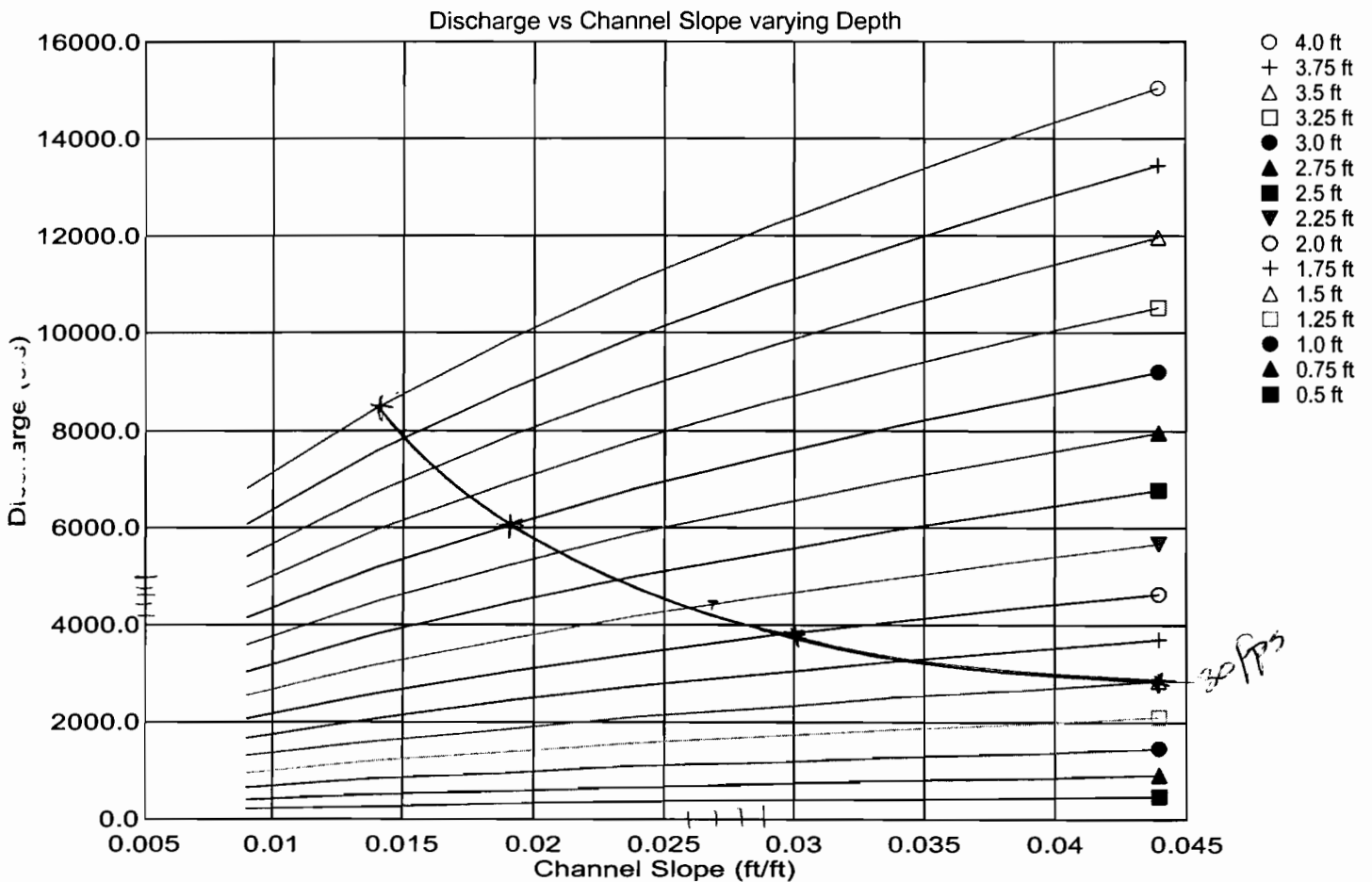
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	60.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



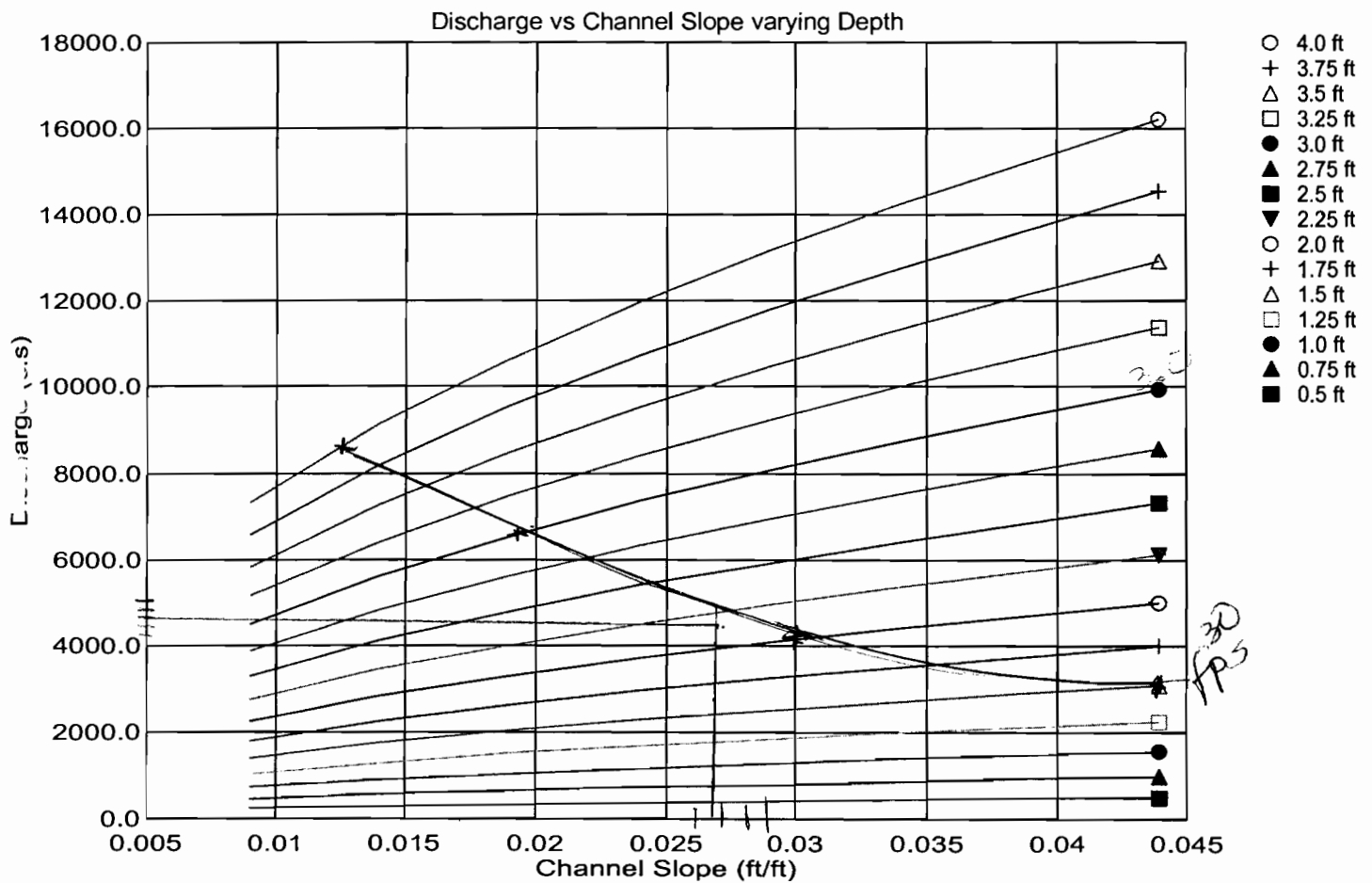
CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	65.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft



CHANNEL FLOW CURVES

Plotted Curves for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V
Bottom Width	70.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.009000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.25 ft

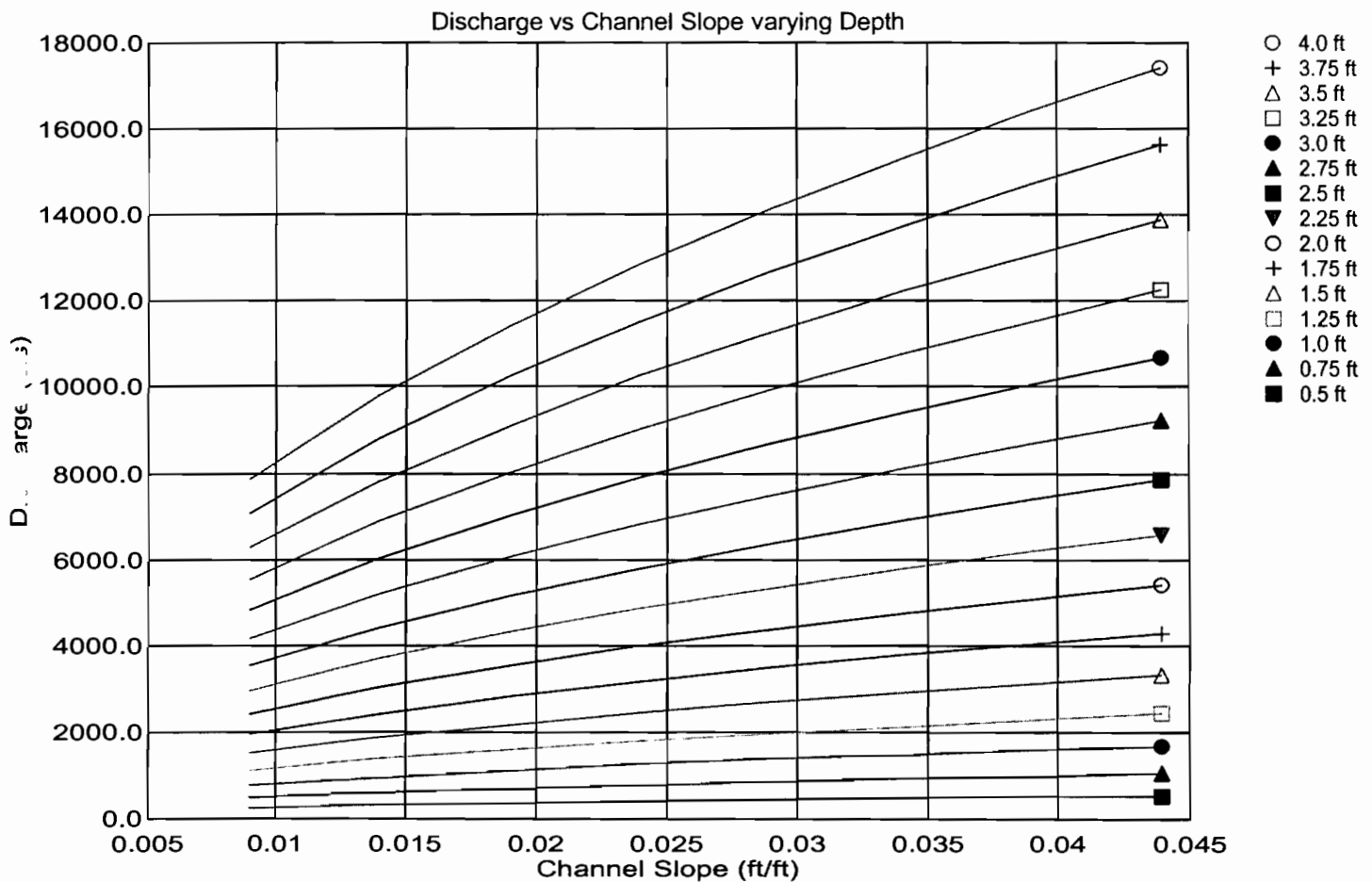


Table
Rating Table for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\black.fm2
Worksheet	GENERAL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.013
Left Side Slope	2.000000 H : V
Right Side Slope	2.000000 H : V

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.045000	0.005000 ft/ft
Depth	0.50	4.00	0.50 ft
Bottom Width	10.00	70.00	5.00 ft

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
10.00	0.50	0.005000	26.08	4.74
10.00	0.50	0.010000	36.89	6.71
10.00	0.50	0.015000	45.18	8.21
10.00	0.50	0.020000	52.17	9.49
10.00	0.50	0.025000	58.33	10.60
10.00	0.50	0.030000	63.89	11.62
10.00	0.50	0.035000	69.01	12.55
10.00	0.50	0.040000	73.78	13.41
10.00	0.50	0.045000	78.25	14.23
10.00	1.00	0.005000	85.60	7.13
10.00	1.00	0.010000	121.06	10.09
10.00	1.00	0.015000	148.27	12.36
10.00	1.00	0.020000	171.20	14.27
10.00	1.00	0.025000	191.41	15.95
10.00	1.00	0.030000	209.68	17.47
10.00	1.00	0.035000	226.48	18.87
10.00	1.00	0.040000	242.12	20.18
10.00	1.00	0.045000	256.81	21.40
10.00	1.50	0.005000	174.71	8.96
10.00	1.50	0.010000	247.07	12.67
10.00	1.50	0.015000	302.60	15.52
10.00	1.50	0.020000	349.41	17.92
10.00	1.50	0.025000	390.65	20.03

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
10.00	1.50	0.030000	427.94	21.95
10.00	1.50	0.035000	462.23	23.70
10.00	1.50	0.040000	494.14	25.34
10.00	1.50	0.045000	524.12	26.88
10.00	2.00	0.005000	293.64	10.49
10.00	2.00	0.010000	415.27	14.83
10.00	2.00	0.015000	508.60	18.16
10.00	2.00	0.020000	587.28	20.97
10.00	2.00	0.025000	656.60	23.45
10.00	2.00	0.030000	719.27	25.69
10.00	2.00	0.035000	776.90	27.75
10.00	2.00	0.040000	830.54	29.66
10.00	2.00	0.045000	880.92	31.46
10.00	2.50	0.005000	443.57	11.83
10.00	2.50	0.010000	627.31	16.73
10.00	2.50	0.015000	768.29	20.49
10.00	2.50	0.020000	887.15	23.66
10.00	2.50	0.025000	991.86	26.45
10.00	2.50	0.030000	1,086.53	28.97
10.00	2.50	0.035000	1,173.59	31.30
10.00	2.50	0.040000	1,254.62	33.46
10.00	2.50	0.045000	1,330.72	35.49
10.00	3.00	0.005000	626.03	13.04
10.00	3.00	0.010000	885.33	18.44
10.00	3.00	0.015000	1,084.31	22.59
10.00	3.00	0.020000	1,252.05	26.08
10.00	3.00	0.025000	1,399.84	29.16
10.00	3.00	0.030000	1,533.44	31.95
10.00	3.00	0.035000	1,656.31	34.51
10.00	3.00	0.040000	1,770.67	36.89
10.00	3.00	0.045000	1,878.08	39.13
10.00	3.50	0.005000	842.65	14.16
10.00	3.50	0.010000	1,191.68	20.03
10.00	3.50	0.015000	1,459.51	24.53
10.00	3.50	0.020000	1,685.29	28.32
10.00	3.50	0.025000	1,884.22	31.67
10.00	3.50	0.030000	2,064.05	34.69
10.00	3.50	0.035000	2,229.43	37.47
10.00	3.50	0.040000	2,383.36	40.06
10.00	3.50	0.045000	2,527.94	42.49
10.00	4.00	0.005000	1,095.15	15.21
10.00	4.00	0.010000	1,548.78	21.51
10.00	4.00	0.015000	1,896.86	26.35
10.00	4.00	0.020000	2,190.30	30.42
10.00	4.00	0.025000	2,448.83	34.01

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
10.00	4.00	0.030000	2,682.56	37.26
10.00	4.00	0.035000	2,897.50	40.24
10.00	4.00	0.040000	3,097.55	43.02
10.00	4.00	0.045000	3,285.45	45.63
15.00	0.50	0.005000	38.76	4.85
15.00	0.50	0.010000	54.82	6.85
15.00	0.50	0.015000	67.14	8.39
15.00	0.50	0.020000	77.52	9.69
15.00	0.50	0.025000	86.67	10.83
15.00	0.50	0.030000	94.94	11.87
15.00	0.50	0.035000	102.55	12.82
15.00	0.50	0.040000	109.63	13.70
15.00	0.50	0.045000	116.28	14.54
15.00	1.00	0.005000	125.51	7.38
15.00	1.00	0.010000	177.50	10.44
15.00	1.00	0.015000	217.39	12.79
15.00	1.00	0.020000	251.02	14.77
15.00	1.00	0.025000	280.65	16.51
15.00	1.00	0.030000	307.43	18.08
15.00	1.00	0.035000	332.07	19.53
15.00	1.00	0.040000	354.99	20.88
15.00	1.00	0.045000	376.53	22.15
15.00	1.50	0.005000	252.38	9.35
15.00	1.50	0.010000	356.92	13.22
15.00	1.50	0.015000	437.14	16.19
15.00	1.50	0.020000	504.77	18.70
15.00	1.50	0.025000	564.35	20.90
15.00	1.50	0.030000	618.21	22.90
15.00	1.50	0.035000	667.74	24.73
15.00	1.50	0.040000	713.85	26.44
15.00	1.50	0.045000	757.15	28.04
15.00	2.00	0.005000	417.87	11.00
15.00	2.00	0.010000	590.96	15.55
15.00	2.00	0.015000	723.77	19.05
15.00	2.00	0.020000	835.74	21.99
15.00	2.00	0.025000	934.39	24.59
15.00	2.00	0.030000	1,023.57	26.94
15.00	2.00	0.035000	1,105.58	29.09
15.00	2.00	0.040000	1,181.92	31.10
15.00	2.00	0.045000	1,253.61	32.99
15.00	2.50	0.005000	622.07	12.44
15.00	2.50	0.010000	879.73	17.59
15.00	2.50	0.015000	1,077.45	21.55
15.00	2.50	0.020000	1,244.13	24.88
15.00	2.50	0.025000	1,390.98	27.82

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
15.00	2.50	0.030000	1,523.74	30.47
15.00	2.50	0.035000	1,645.83	32.92
15.00	2.50	0.040000	1,759.47	35.19
15.00	2.50	0.045000	1,866.20	37.32
15.00	3.00	0.005000	865.75	13.74
15.00	3.00	0.010000	1,224.35	19.43
15.00	3.00	0.015000	1,499.52	23.80
15.00	3.00	0.020000	1,731.50	27.48
15.00	3.00	0.025000	1,935.87	30.73
15.00	3.00	0.030000	2,120.64	33.66
15.00	3.00	0.035000	2,290.55	36.36
15.00	3.00	0.040000	2,448.71	38.87
15.00	3.00	0.045000	2,597.24	41.23
15.00	3.50	0.005000	1,150.03	14.94
15.00	3.50	0.010000	1,626.39	21.12
15.00	3.50	0.015000	1,991.92	25.87
15.00	3.50	0.020000	2,300.07	29.87
15.00	3.50	0.025000	2,571.56	33.40
15.00	3.50	0.030000	2,817.00	36.58
15.00	3.50	0.035000	3,042.71	39.52
15.00	3.50	0.040000	3,252.79	42.24
15.00	3.50	0.045000	3,450.10	44.81
15.00	4.00	0.005000	1,476.23	16.05
15.00	4.00	0.010000	2,087.70	22.69
15.00	4.00	0.015000	2,556.90	27.79
15.00	4.00	0.020000	2,952.46	32.09
15.00	4.00	0.025000	3,300.95	35.88
15.00	4.00	0.030000	3,616.01	39.30
15.00	4.00	0.035000	3,905.73	42.45
15.00	4.00	0.040000	4,175.40	45.38
15.00	4.00	0.045000	4,428.68	48.14
20.00	0.50	0.005000	51.46	4.90
20.00	0.50	0.010000	72.78	6.93
20.00	0.50	0.015000	89.13	8.49
20.00	0.50	0.020000	102.92	9.80
20.00	0.50	0.025000	115.07	10.96
20.00	0.50	0.030000	126.05	12.01
20.00	0.50	0.035000	136.15	12.97
20.00	0.50	0.040000	145.55	13.86
20.00	0.50	0.045000	154.38	14.70
20.00	1.00	0.005000	165.63	7.53
20.00	1.00	0.010000	234.23	10.65
20.00	1.00	0.015000	286.87	13.04
20.00	1.00	0.020000	331.25	15.06
20.00	1.00	0.025000	370.35	16.83

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
20.00	1.00	0.030000	405.70	18.44
20.00	1.00	0.035000	438.20	19.92
20.00	1.00	0.040000	468.46	21.29
20.00	1.00	0.045000	496.88	22.59
20.00	1.50	0.005000	330.73	9.59
20.00	1.50	0.010000	467.72	13.56
20.00	1.50	0.015000	572.84	16.60
20.00	1.50	0.020000	661.46	19.17
20.00	1.50	0.025000	739.53	21.44
20.00	1.50	0.030000	810.12	23.48
20.00	1.50	0.035000	875.03	25.36
20.00	1.50	0.040000	935.44	27.11
20.00	1.50	0.045000	992.19	28.76
20.00	2.00	0.005000	543.54	11.32
20.00	2.00	0.010000	768.68	16.01
20.00	2.00	0.015000	941.44	19.61
20.00	2.00	0.020000	1,087.08	22.65
20.00	2.00	0.025000	1,215.39	25.32
20.00	2.00	0.030000	1,331.39	27.74
20.00	2.00	0.035000	1,438.07	29.96
20.00	2.00	0.040000	1,537.36	32.03
20.00	2.00	0.045000	1,630.62	33.97
20.00	2.50	0.005000	803.06	12.85
20.00	2.50	0.010000	1,135.70	18.17
20.00	2.50	0.015000	1,390.95	22.26
20.00	2.50	0.020000	1,606.13	25.70
20.00	2.50	0.025000	1,795.70	28.73
20.00	2.50	0.030000	1,967.09	31.47
20.00	2.50	0.035000	2,124.70	34.00
20.00	2.50	0.040000	2,271.41	36.34
20.00	2.50	0.045000	2,409.19	38.55
20.00	3.00	0.005000	1,109.31	14.22
20.00	3.00	0.010000	1,568.81	20.11
20.00	3.00	0.015000	1,921.39	24.63
20.00	3.00	0.020000	2,218.63	28.44
20.00	3.00	0.025000	2,480.50	31.80
20.00	3.00	0.030000	2,717.25	34.84
20.00	3.00	0.035000	2,934.97	37.63
20.00	3.00	0.040000	3,137.61	40.23
20.00	3.00	0.045000	3,327.94	42.67
20.00	3.50	0.005000	1,462.84	15.48
20.00	3.50	0.010000	2,068.77	21.89
20.00	3.50	0.015000	2,533.71	26.81
20.00	3.50	0.020000	2,925.68	30.96
20.00	3.50	0.025000	3,271.01	34.61

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
20.00	3.50	0.030000	3,583.21	37.92
20.00	3.50	0.035000	3,870.31	40.96
20.00	3.50	0.040000	4,137.53	43.78
20.00	3.50	0.045000	4,388.52	46.44
20.00	4.00	0.005000	1,864.50	16.65
20.00	4.00	0.010000	2,636.80	23.54
20.00	4.00	0.015000	3,229.40	28.83
20.00	4.00	0.020000	3,728.99	33.29
20.00	4.00	0.025000	4,169.14	37.22
20.00	4.00	0.030000	4,567.06	40.78
20.00	4.00	0.035000	4,932.99	44.04
20.00	4.00	0.040000	5,273.59	47.09
20.00	4.00	0.045000	5,593.49	49.94
25.00	0.50	0.005000	64.17	4.94
25.00	0.50	0.010000	90.75	6.98
25.00	0.50	0.015000	111.15	8.55
25.00	0.50	0.020000	128.34	9.87
25.00	0.50	0.025000	143.49	11.04
25.00	0.50	0.030000	157.19	12.09
25.00	0.50	0.035000	169.78	13.06
25.00	0.50	0.040000	181.51	13.96
25.00	0.50	0.045000	192.52	14.81
25.00	1.00	0.005000	205.84	7.62
25.00	1.00	0.010000	291.11	10.78
25.00	1.00	0.015000	356.53	13.20
25.00	1.00	0.020000	411.69	15.25
25.00	1.00	0.025000	460.28	17.05
25.00	1.00	0.030000	504.21	18.67
25.00	1.00	0.035000	544.61	20.17
25.00	1.00	0.040000	582.21	21.56
25.00	1.00	0.045000	617.53	22.87
25.00	1.50	0.005000	409.42	9.75
25.00	1.50	0.010000	579.01	13.79
25.00	1.50	0.015000	709.14	16.88
25.00	1.50	0.020000	818.84	19.50
25.00	1.50	0.025000	915.50	21.80
25.00	1.50	0.030000	1,002.87	23.88
25.00	1.50	0.035000	1,083.23	25.79
25.00	1.50	0.040000	1,158.02	27.57
25.00	1.50	0.045000	1,228.27	29.24
25.00	2.00	0.005000	670.00	11.55
25.00	2.00	0.010000	947.52	16.34
25.00	2.00	0.015000	1,160.47	20.01
25.00	2.00	0.020000	1,339.99	23.10
25.00	2.00	0.025000	1,498.16	25.83

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
25.00	2.00	0.030000	1,641.15	28.30
25.00	2.00	0.035000	1,772.64	30.56
25.00	2.00	0.040000	1,895.04	32.67
25.00	2.00	0.045000	2,009.99	34.65
25.00	2.50	0.005000	985.50	13.14
25.00	2.50	0.010000	1,393.71	18.58
25.00	2.50	0.015000	1,706.94	22.76
25.00	2.50	0.020000	1,971.00	26.28
25.00	2.50	0.025000	2,203.65	29.38
25.00	2.50	0.030000	2,413.97	32.19
25.00	2.50	0.035000	2,607.39	34.77
25.00	2.50	0.040000	2,787.42	37.17
25.00	2.50	0.045000	2,956.50	39.42
25.00	3.00	0.005000	1,355.18	14.57
25.00	3.00	0.010000	1,916.51	20.61
25.00	3.00	0.015000	2,347.24	25.24
25.00	3.00	0.020000	2,710.36	29.14
25.00	3.00	0.025000	3,030.28	32.58
25.00	3.00	0.030000	3,319.50	35.69
25.00	3.00	0.035000	3,585.47	38.55
25.00	3.00	0.040000	3,833.03	41.22
25.00	3.00	0.045000	4,065.54	43.72
25.00	3.50	0.005000	1,779.00	15.88
25.00	3.50	0.010000	2,515.88	22.46
25.00	3.50	0.015000	3,081.32	27.51
25.00	3.50	0.020000	3,558.00	31.77
25.00	3.50	0.025000	3,977.96	35.52
25.00	3.50	0.030000	4,357.64	38.91
25.00	3.50	0.035000	4,706.79	42.02
25.00	3.50	0.040000	5,031.77	44.93
25.00	3.50	0.045000	5,336.99	47.65
25.00	4.00	0.005000	2,257.35	17.10
25.00	4.00	0.010000	3,192.38	24.18
25.00	4.00	0.015000	3,909.85	29.62
25.00	4.00	0.020000	4,514.70	34.20
25.00	4.00	0.025000	5,047.59	38.24
25.00	4.00	0.030000	5,529.36	41.89
25.00	4.00	0.035000	5,972.39	45.25
25.00	4.00	0.040000	6,384.75	48.37
25.00	4.00	0.045000	6,772.05	51.30
30.00	0.50	0.005000	76.89	4.96
30.00	0.50	0.010000	108.74	7.02
30.00	0.50	0.015000	133.17	8.59
30.00	0.50	0.020000	153.78	9.92
30.00	0.50	0.025000	171.93	11.09

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
30.00	0.50	0.030000	188.34	12.15
30.00	0.50	0.035000	203.43	13.12
30.00	0.50	0.040000	217.47	14.03
30.00	0.50	0.045000	230.67	14.88
30.00	1.00	0.005000	246.12	7.69
30.00	1.00	0.010000	348.06	10.88
30.00	1.00	0.015000	426.29	13.32
30.00	1.00	0.020000	492.23	15.38
30.00	1.00	0.025000	550.33	17.20
30.00	1.00	0.030000	602.86	18.84
30.00	1.00	0.035000	651.16	20.35
30.00	1.00	0.040000	696.12	21.75
30.00	1.00	0.045000	738.35	23.07
30.00	1.50	0.005000	488.32	9.87
30.00	1.50	0.010000	690.59	13.95
30.00	1.50	0.015000	845.79	17.09
30.00	1.50	0.020000	976.64	19.73
30.00	1.50	0.025000	1,091.91	22.06
30.00	1.50	0.030000	1,196.13	24.16
30.00	1.50	0.035000	1,291.97	26.10
30.00	1.50	0.040000	1,381.17	27.90
30.00	1.50	0.045000	1,464.96	29.60
30.00	2.00	0.005000	796.93	11.72
30.00	2.00	0.010000	1,127.04	16.57
30.00	2.00	0.015000	1,380.33	20.30
30.00	2.00	0.020000	1,593.87	23.44
30.00	2.00	0.025000	1,782.00	26.21
30.00	2.00	0.030000	1,952.08	28.71
30.00	2.00	0.035000	2,108.49	31.01
30.00	2.00	0.040000	2,254.07	33.15
30.00	2.00	0.045000	2,390.80	35.16
30.00	2.50	0.005000	1,168.84	13.36
30.00	2.50	0.010000	1,653.00	18.89
30.00	2.50	0.015000	2,024.50	23.14
30.00	2.50	0.020000	2,337.69	26.72
30.00	2.50	0.025000	2,613.62	29.87
30.00	2.50	0.030000	2,863.07	32.72
30.00	2.50	0.035000	3,092.47	35.34
30.00	2.50	0.040000	3,305.99	37.78
30.00	2.50	0.045000	3,506.53	40.07
30.00	3.00	0.005000	1,602.53	14.84
30.00	3.00	0.010000	2,266.32	20.98
30.00	3.00	0.015000	2,775.67	25.70
30.00	3.00	0.020000	3,205.07	29.68
30.00	3.00	0.025000	3,583.37	33.18

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
30.00	3.00	0.030000	3,925.39	36.35
30.00	3.00	0.035000	4,239.91	39.26
30.00	3.00	0.040000	4,532.65	41.97
30.00	3.00	0.045000	4,807.60	44.51
30.00	3.50	0.005000	2,097.38	16.20
30.00	3.50	0.010000	2,966.14	22.90
30.00	3.50	0.015000	3,632.77	28.05
30.00	3.50	0.020000	4,194.76	32.39
30.00	3.50	0.025000	4,689.88	36.22
30.00	3.50	0.030000	5,137.51	39.67
30.00	3.50	0.035000	5,549.14	42.85
30.00	3.50	0.040000	5,932.28	45.81
30.00	3.50	0.045000	6,292.14	48.59
30.00	4.00	0.005000	2,653.31	17.46
30.00	4.00	0.010000	3,752.35	24.69
30.00	4.00	0.015000	4,595.67	30.23
30.00	4.00	0.020000	5,306.62	34.91
30.00	4.00	0.025000	5,932.99	39.03
30.00	4.00	0.030000	6,499.26	42.76
30.00	4.00	0.035000	7,020.00	46.18
30.00	4.00	0.040000	7,504.70	49.37
30.00	4.00	0.045000	7,959.94	52.37
35.00	0.50	0.005000	89.61	4.98
35.00	0.50	0.010000	126.73	7.04
35.00	0.50	0.015000	155.21	8.62
35.00	0.50	0.020000	179.22	9.96
35.00	0.50	0.025000	200.37	11.13
35.00	0.50	0.030000	219.49	12.19
35.00	0.50	0.035000	237.08	13.17
35.00	0.50	0.040000	253.45	14.08
35.00	0.50	0.045000	268.83	14.93
35.00	1.00	0.005000	286.43	7.74
35.00	1.00	0.010000	405.07	10.95
35.00	1.00	0.015000	496.10	13.41
35.00	1.00	0.020000	572.85	15.48
35.00	1.00	0.025000	640.47	17.31
35.00	1.00	0.030000	701.60	18.96
35.00	1.00	0.035000	757.81	20.48
35.00	1.00	0.040000	810.14	21.90
35.00	1.00	0.045000	859.28	23.22
35.00	1.50	0.005000	567.34	9.95
35.00	1.50	0.010000	802.35	14.08
35.00	1.50	0.015000	982.67	17.24
35.00	1.50	0.020000	1,134.69	19.91
35.00	1.50	0.025000	1,268.62	22.26

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
35.00	1.50	0.030000	1,389.71	24.38
35.00	1.50	0.035000	1,501.05	26.33
35.00	1.50	0.040000	1,604.69	28.15
35.00	1.50	0.045000	1,702.03	29.86
35.00	2.00	0.005000	924.19	11.85
35.00	2.00	0.010000	1,307.00	16.76
35.00	2.00	0.015000	1,600.74	20.52
35.00	2.00	0.020000	1,848.37	23.70
35.00	2.00	0.025000	2,066.54	26.49
35.00	2.00	0.030000	2,263.79	29.02
35.00	2.00	0.035000	2,445.17	31.35
35.00	2.00	0.040000	2,613.99	33.51
35.00	2.00	0.045000	2,772.56	35.55
35.00	2.50	0.005000	1,352.80	13.53
35.00	2.50	0.010000	1,913.14	19.13
35.00	2.50	0.015000	2,343.11	23.43
35.00	2.50	0.020000	2,705.59	27.06
35.00	2.50	0.025000	3,024.94	30.25
35.00	2.50	0.030000	3,313.66	33.14
35.00	2.50	0.035000	3,579.16	35.79
35.00	2.50	0.040000	3,826.28	38.26
35.00	2.50	0.045000	4,058.39	40.58
35.00	3.00	0.005000	1,850.90	15.05
35.00	3.00	0.010000	2,617.57	21.28
35.00	3.00	0.015000	3,205.86	26.06
35.00	3.00	0.020000	3,701.81	30.10
35.00	3.00	0.025000	4,138.74	33.65
35.00	3.00	0.030000	4,533.77	36.86
35.00	3.00	0.035000	4,897.03	39.81
35.00	3.00	0.040000	5,235.14	42.56
35.00	3.00	0.045000	5,552.71	45.14
35.00	3.50	0.005000	2,417.31	16.44
35.00	3.50	0.010000	3,418.59	23.26
35.00	3.50	0.015000	4,186.90	28.48
35.00	3.50	0.020000	4,834.61	32.89
35.00	3.50	0.025000	5,405.26	36.77
35.00	3.50	0.030000	5,921.17	40.28
35.00	3.50	0.035000	6,395.59	43.51
35.00	3.50	0.040000	6,837.18	46.51
35.00	3.50	0.045000	7,251.92	49.33
35.00	4.00	0.005000	3,051.47	17.74
35.00	4.00	0.010000	4,315.44	25.09
35.00	4.00	0.015000	5,285.31	30.73
35.00	4.00	0.020000	6,102.95	35.48
35.00	4.00	0.025000	6,823.31	39.67

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
35.00	4.00	0.030000	7,474.56	43.46
35.00	4.00	0.035000	8,073.44	46.94
35.00	4.00	0.040000	8,630.87	50.18
35.00	4.00	0.045000	9,154.42	53.22
40.00	0.50	0.005000	102.33	4.99
40.00	0.50	0.010000	144.72	7.06
40.00	0.50	0.015000	177.24	8.65
40.00	0.50	0.020000	204.66	9.98
40.00	0.50	0.025000	228.82	11.16
40.00	0.50	0.030000	250.66	12.23
40.00	0.50	0.035000	270.74	13.21
40.00	0.50	0.040000	289.43	14.12
40.00	0.50	0.045000	306.99	14.98
40.00	1.00	0.005000	326.76	7.78
40.00	1.00	0.010000	462.11	11.00
40.00	1.00	0.015000	565.96	13.48
40.00	1.00	0.020000	653.52	15.56
40.00	1.00	0.025000	730.65	17.40
40.00	1.00	0.030000	800.39	19.06
40.00	1.00	0.035000	864.52	20.58
40.00	1.00	0.040000	924.21	22.01
40.00	1.00	0.045000	980.28	23.34
40.00	1.50	0.005000	646.46	10.02
40.00	1.50	0.010000	914.23	14.17
40.00	1.50	0.015000	1,119.70	17.36
40.00	1.50	0.020000	1,292.92	20.05
40.00	1.50	0.025000	1,445.53	22.41
40.00	1.50	0.030000	1,583.49	24.55
40.00	1.50	0.035000	1,710.37	26.52
40.00	1.50	0.040000	1,828.46	28.35
40.00	1.50	0.045000	1,939.38	30.07
40.00	2.00	0.005000	1,051.66	11.95
40.00	2.00	0.010000	1,487.26	16.90
40.00	2.00	0.015000	1,821.52	20.70
40.00	2.00	0.020000	2,103.31	23.90
40.00	2.00	0.025000	2,351.57	26.72
40.00	2.00	0.030000	2,576.02	29.27
40.00	2.00	0.035000	2,782.42	31.62
40.00	2.00	0.040000	2,974.53	33.80
40.00	2.00	0.045000	3,154.97	35.85
40.00	2.50	0.005000	1,537.17	13.66
40.00	2.50	0.010000	2,173.89	19.32
40.00	2.50	0.015000	2,662.46	23.67
40.00	2.50	0.020000	3,074.34	27.33
40.00	2.50	0.025000	3,437.22	30.55

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
40.00	2.50	0.030000	3,765.28	33.47
40.00	2.50	0.035000	4,066.97	36.15
40.00	2.50	0.040000	4,347.78	38.65
40.00	2.50	0.045000	4,611.51	40.99
40.00	3.00	0.005000	2,100.00	15.22
40.00	3.00	0.010000	2,969.85	21.52
40.00	3.00	0.015000	3,637.30	26.36
40.00	3.00	0.020000	4,200.00	30.43
40.00	3.00	0.025000	4,695.74	34.03
40.00	3.00	0.030000	5,143.92	37.27
40.00	3.00	0.035000	5,556.07	40.26
40.00	3.00	0.040000	5,939.69	43.04
40.00	3.00	0.045000	6,299.99	45.65
40.00	3.50	0.005000	2,738.36	16.65
40.00	3.50	0.010000	3,872.62	23.54
40.00	3.50	0.015000	4,742.98	28.83
40.00	3.50	0.020000	5,476.72	33.29
40.00	3.50	0.025000	6,123.16	37.22
40.00	3.50	0.030000	6,707.58	40.78
40.00	3.50	0.035000	7,245.02	44.04
40.00	3.50	0.040000	7,745.25	47.08
40.00	3.50	0.045000	8,215.08	49.94
40.00	4.00	0.005000	3,451.26	17.98
40.00	4.00	0.010000	4,880.81	25.42
40.00	4.00	0.015000	5,977.75	31.13
40.00	4.00	0.020000	6,902.51	35.95
40.00	4.00	0.025000	7,717.24	40.19
40.00	4.00	0.030000	8,453.81	44.03
40.00	4.00	0.035000	9,131.16	47.56
40.00	4.00	0.040000	9,761.62	50.84
40.00	4.00	0.045000	10,353.77	53.93
45.00	0.50	0.005000	115.05	5.00
45.00	0.50	0.010000	162.71	7.07
45.00	0.50	0.015000	199.28	8.66
45.00	0.50	0.020000	230.11	10.00
45.00	0.50	0.025000	257.27	11.19
45.00	0.50	0.030000	281.82	12.25
45.00	0.50	0.035000	304.40	13.23
45.00	0.50	0.040000	325.42	14.15
45.00	0.50	0.045000	345.16	15.01
45.00	1.00	0.005000	367.11	7.81
45.00	1.00	0.010000	519.17	11.05
45.00	1.00	0.015000	635.85	13.53
45.00	1.00	0.020000	734.21	15.62
45.00	1.00	0.025000	820.88	17.47

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
45.00	1.00	0.030000	899.23	19.13
45.00	1.00	0.035000	971.27	20.67
45.00	1.00	0.040000	1,038.34	22.09
45.00	1.00	0.045000	1,101.32	23.43
45.00	1.50	0.005000	725.63	10.08
45.00	1.50	0.010000	1,026.20	14.25
45.00	1.50	0.015000	1,256.84	17.46
45.00	1.50	0.020000	1,451.27	20.16
45.00	1.50	0.025000	1,622.57	22.54
45.00	1.50	0.030000	1,777.43	24.69
45.00	1.50	0.035000	1,919.85	26.66
45.00	1.50	0.040000	2,052.40	28.51
45.00	1.50	0.045000	2,176.90	30.23
45.00	2.00	0.005000	1,179.28	12.03
45.00	2.00	0.010000	1,667.75	17.02
45.00	2.00	0.015000	2,042.57	20.84
45.00	2.00	0.020000	2,358.56	24.07
45.00	2.00	0.025000	2,636.95	26.91
45.00	2.00	0.030000	2,888.63	29.48
45.00	2.00	0.035000	3,120.08	31.84
45.00	2.00	0.040000	3,335.51	34.04
45.00	2.00	0.045000	3,537.84	36.10
45.00	2.50	0.005000	1,721.86	13.77
45.00	2.50	0.010000	2,435.07	19.48
45.00	2.50	0.015000	2,982.34	23.86
45.00	2.50	0.020000	3,443.72	27.55
45.00	2.50	0.025000	3,850.19	30.80
45.00	2.50	0.030000	4,217.67	33.74
45.00	2.50	0.035000	4,555.61	36.44
45.00	2.50	0.040000	4,870.15	38.96
45.00	2.50	0.045000	5,165.57	41.32
45.00	3.00	0.005000	2,349.63	15.36
45.00	3.00	0.010000	3,322.88	21.72
45.00	3.00	0.015000	4,069.68	26.60
45.00	3.00	0.020000	4,699.26	30.71
45.00	3.00	0.025000	5,253.93	34.34
45.00	3.00	0.030000	5,755.39	37.62
45.00	3.00	0.035000	6,216.53	40.63
45.00	3.00	0.040000	6,645.75	43.44
45.00	3.00	0.045000	7,048.89	46.07
45.00	3.50	0.005000	3,060.25	16.81
45.00	3.50	0.010000	4,327.85	23.78
45.00	3.50	0.015000	5,300.51	29.12
45.00	3.50	0.020000	6,120.50	33.63
45.00	3.50	0.025000	6,842.92	37.60

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
45.00	3.50	0.030000	7,496.05	41.19
45.00	3.50	0.035000	8,096.66	44.49
45.00	3.50	0.040000	8,655.69	47.56
45.00	3.50	0.045000	9,180.75	50.44
45.00	4.00	0.005000	3,852.26	18.17
45.00	4.00	0.010000	5,447.92	25.70
45.00	4.00	0.015000	6,672.31	31.47
45.00	4.00	0.020000	7,704.52	36.34
45.00	4.00	0.025000	8,613.91	40.63
45.00	4.00	0.030000	9,436.07	44.51
45.00	4.00	0.035000	10,192.12	48.08
45.00	4.00	0.040000	10,895.84	51.40
45.00	4.00	0.045000	11,556.78	54.51
50.00	0.50	0.005000	127.78	5.01
50.00	0.50	0.010000	180.71	7.09
50.00	0.50	0.015000	221.32	8.68
50.00	0.50	0.020000	255.56	10.02
50.00	0.50	0.025000	285.72	11.20
50.00	0.50	0.030000	312.99	12.27
50.00	0.50	0.035000	338.07	13.26
50.00	0.50	0.040000	361.41	14.17
50.00	0.50	0.045000	383.33	15.03
50.00	1.00	0.005000	407.47	7.84
50.00	1.00	0.010000	576.25	11.08
50.00	1.00	0.015000	705.75	13.57
50.00	1.00	0.020000	814.93	15.67
50.00	1.00	0.025000	911.12	17.52
50.00	1.00	0.030000	998.09	19.19
50.00	1.00	0.035000	1,078.06	20.73
50.00	1.00	0.040000	1,152.49	22.16
50.00	1.00	0.045000	1,222.40	23.51
50.00	1.50	0.005000	804.86	10.12
50.00	1.50	0.010000	1,138.24	14.32
50.00	1.50	0.015000	1,394.05	17.54
50.00	1.50	0.020000	1,609.71	20.25
50.00	1.50	0.025000	1,799.71	22.64
50.00	1.50	0.030000	1,971.49	24.80
50.00	1.50	0.035000	2,129.45	26.79
50.00	1.50	0.040000	2,276.48	28.63
50.00	1.50	0.045000	2,414.57	30.37
50.00	2.00	0.005000	1,307.02	12.10
50.00	2.00	0.010000	1,848.40	17.11
50.00	2.00	0.015000	2,263.82	20.96
50.00	2.00	0.020000	2,614.04	24.20
50.00	2.00	0.025000	2,922.58	27.06

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
50.00	2.00	0.030000	3,201.53	29.64
50.00	2.00	0.035000	3,458.05	32.02
50.00	2.00	0.040000	3,696.81	34.23
50.00	2.00	0.045000	3,921.06	36.31
50.00	2.50	0.005000	1,906.78	13.87
50.00	2.50	0.010000	2,696.59	19.61
50.00	2.50	0.015000	3,302.64	24.02
50.00	2.50	0.020000	3,813.56	27.73
50.00	2.50	0.025000	4,263.68	31.01
50.00	2.50	0.030000	4,670.63	33.97
50.00	2.50	0.035000	5,044.86	36.69
50.00	2.50	0.040000	5,393.18	39.22
50.00	2.50	0.045000	5,720.33	41.60
50.00	3.00	0.005000	2,599.67	15.47
50.00	3.00	0.010000	3,676.49	21.88
50.00	3.00	0.015000	4,502.76	26.80
50.00	3.00	0.020000	5,199.34	30.95
50.00	3.00	0.025000	5,813.03	34.60
50.00	3.00	0.030000	6,367.86	37.90
50.00	3.00	0.035000	6,878.07	40.94
50.00	3.00	0.040000	7,352.97	43.77
50.00	3.00	0.045000	7,799.00	46.42
50.00	3.50	0.005000	3,382.78	16.96
50.00	3.50	0.010000	4,783.98	23.98
50.00	3.50	0.015000	5,859.15	29.37
50.00	3.50	0.020000	6,765.57	33.91
50.00	3.50	0.025000	7,564.13	37.92
50.00	3.50	0.030000	8,286.09	41.53
50.00	3.50	0.035000	8,950.00	44.86
50.00	3.50	0.040000	9,567.96	47.96
50.00	3.50	0.045000	10,148.35	50.87
50.00	4.00	0.005000	4,254.21	18.34
50.00	4.00	0.010000	6,016.36	25.93
50.00	4.00	0.015000	7,368.51	31.76
50.00	4.00	0.020000	8,508.42	36.67
50.00	4.00	0.025000	9,512.71	41.00
50.00	4.00	0.030000	10,420.65	44.92
50.00	4.00	0.035000	11,255.59	48.52
50.00	4.00	0.040000	12,032.73	51.87
50.00	4.00	0.045000	12,762.64	55.01
55.00	0.50	0.005000	140.50	5.02
55.00	0.50	0.010000	198.70	7.10
55.00	0.50	0.015000	243.36	8.69
55.00	0.50	0.020000	281.01	10.04
55.00	0.50	0.025000	314.18	11.22

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
55.00	0.50	0.030000	344.16	12.29
55.00	0.50	0.035000	371.74	13.28
55.00	0.50	0.040000	397.40	14.19
55.00	0.50	0.045000	421.51	15.05
55.00	1.00	0.005000	447.84	7.86
55.00	1.00	0.010000	633.34	11.11
55.00	1.00	0.015000	775.68	13.61
55.00	1.00	0.020000	895.67	15.71
55.00	1.00	0.025000	1,001.39	17.57
55.00	1.00	0.030000	1,096.97	19.25
55.00	1.00	0.035000	1,184.86	20.79
55.00	1.00	0.040000	1,266.67	22.22
55.00	1.00	0.045000	1,343.51	23.57
55.00	1.50	0.005000	884.11	10.16
55.00	1.50	0.010000	1,250.32	14.37
55.00	1.50	0.015000	1,531.33	17.60
55.00	1.50	0.020000	1,768.22	20.32
55.00	1.50	0.025000	1,976.93	22.72
55.00	1.50	0.030000	2,165.62	24.89
55.00	1.50	0.035000	2,339.14	26.89
55.00	1.50	0.040000	2,500.64	28.74
55.00	1.50	0.045000	2,652.33	30.49
55.00	2.00	0.005000	1,434.85	12.16
55.00	2.00	0.010000	2,029.18	17.20
55.00	2.00	0.015000	2,485.23	21.06
55.00	2.00	0.020000	2,869.69	24.32
55.00	2.00	0.025000	3,208.42	27.19
55.00	2.00	0.030000	3,514.64	29.79
55.00	2.00	0.035000	3,796.25	32.17
55.00	2.00	0.040000	4,058.36	34.39
55.00	2.00	0.045000	4,304.54	36.48
55.00	2.50	0.005000	2,091.88	13.95
55.00	2.50	0.010000	2,958.36	19.72
55.00	2.50	0.015000	3,623.24	24.15
55.00	2.50	0.020000	4,183.75	27.89
55.00	2.50	0.025000	4,677.58	31.18
55.00	2.50	0.030000	5,124.03	34.16
55.00	2.50	0.035000	5,534.59	36.90
55.00	2.50	0.040000	5,916.72	39.44
55.00	2.50	0.045000	6,275.63	41.84
55.00	3.00	0.005000	2,850.02	15.57
55.00	3.00	0.010000	4,030.54	22.02
55.00	3.00	0.015000	4,936.39	26.97
55.00	3.00	0.020000	5,700.05	31.15
55.00	3.00	0.025000	6,372.85	34.82

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
55.00	3.00	0.030000	6,981.10	38.15
55.00	3.00	0.035000	7,540.45	41.20
55.00	3.00	0.040000	8,061.08	44.05
55.00	3.00	0.045000	8,550.07	46.72
55.00	3.50	0.005000	3,705.82	17.08
55.00	3.50	0.010000	5,240.83	24.15
55.00	3.50	0.015000	6,418.67	29.58
55.00	3.50	0.020000	7,411.65	34.16
55.00	3.50	0.025000	8,286.47	38.19
55.00	3.50	0.030000	9,077.38	41.83
55.00	3.50	0.035000	9,804.69	45.18
55.00	3.50	0.040000	10,481.65	48.30
55.00	3.50	0.045000	11,117.47	51.23
55.00	4.00	0.005000	4,656.91	18.48
55.00	4.00	0.010000	6,585.87	26.13
55.00	4.00	0.015000	8,066.01	32.01
55.00	4.00	0.020000	9,313.83	36.96
55.00	4.00	0.025000	10,413.18	41.32
55.00	4.00	0.030000	11,407.06	45.27
55.00	4.00	0.035000	12,321.03	48.89
55.00	4.00	0.040000	13,171.74	52.27
55.00	4.00	0.045000	13,970.74	55.44
60.00	0.50	0.005000	153.23	5.02
60.00	0.50	0.010000	216.70	7.10
60.00	0.50	0.015000	265.40	8.70
60.00	0.50	0.020000	306.46	10.05
60.00	0.50	0.025000	342.63	11.23
60.00	0.50	0.030000	375.33	12.31
60.00	0.50	0.035000	405.41	13.29
60.00	0.50	0.040000	433.40	14.21
60.00	0.50	0.045000	459.69	15.07
60.00	1.00	0.005000	488.21	7.87
60.00	1.00	0.010000	690.44	11.14
60.00	1.00	0.015000	845.61	13.64
60.00	1.00	0.020000	976.42	15.75
60.00	1.00	0.025000	1,091.67	17.61
60.00	1.00	0.030000	1,195.87	19.29
60.00	1.00	0.035000	1,291.69	20.83
60.00	1.00	0.040000	1,380.87	22.27
60.00	1.00	0.045000	1,464.64	23.62
60.00	1.50	0.005000	963.39	10.19
60.00	1.50	0.010000	1,362.44	14.42
60.00	1.50	0.015000	1,668.65	17.66
60.00	1.50	0.020000	1,926.79	20.39
60.00	1.50	0.025000	2,154.21	22.80

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
60.00	1.50	0.030000	2,359.82	24.97
60.00	1.50	0.035000	2,548.90	26.97
60.00	1.50	0.040000	2,724.89	28.83
60.00	1.50	0.045000	2,890.18	30.58
60.00	2.00	0.005000	1,562.74	12.21
60.00	2.00	0.010000	2,210.05	17.27
60.00	2.00	0.015000	2,706.75	21.15
60.00	2.00	0.020000	3,125.49	24.42
60.00	2.00	0.025000	3,494.40	27.30
60.00	2.00	0.030000	3,827.93	29.91
60.00	2.00	0.035000	4,134.63	32.30
60.00	2.00	0.040000	4,420.11	34.53
60.00	2.00	0.045000	4,688.23	36.63
60.00	2.50	0.005000	2,277.12	14.01
60.00	2.50	0.010000	3,220.33	19.82
60.00	2.50	0.015000	3,944.09	24.27
60.00	2.50	0.020000	4,554.24	28.03
60.00	2.50	0.025000	5,091.79	31.33
60.00	2.50	0.030000	5,577.78	34.32
60.00	2.50	0.035000	6,024.69	37.08
60.00	2.50	0.040000	6,440.66	39.63
60.00	2.50	0.045000	6,831.36	42.04
60.00	3.00	0.005000	3,100.63	15.66
60.00	3.00	0.010000	4,384.95	22.15
60.00	3.00	0.015000	5,370.45	27.12
60.00	3.00	0.020000	6,201.26	31.32
60.00	3.00	0.025000	6,933.22	35.02
60.00	3.00	0.030000	7,594.96	38.36
60.00	3.00	0.035000	8,203.50	41.43
60.00	3.00	0.040000	8,769.91	44.29
60.00	3.00	0.045000	9,301.89	46.98
60.00	3.50	0.005000	4,029.27	17.18
60.00	3.50	0.010000	5,698.24	24.30
60.00	3.50	0.015000	6,978.90	29.76
60.00	3.50	0.020000	8,058.53	34.36
60.00	3.50	0.025000	9,009.72	38.42
60.00	3.50	0.030000	9,869.65	42.09
60.00	3.50	0.035000	10,660.44	45.46
60.00	3.50	0.040000	11,396.49	48.60
60.00	3.50	0.045000	12,087.80	51.55
60.00	4.00	0.005000	5,060.22	18.60
60.00	4.00	0.010000	7,156.23	26.31
60.00	4.00	0.015000	8,764.55	32.22
60.00	4.00	0.020000	10,120.44	37.21
60.00	4.00	0.025000	11,314.99	41.60

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
60.00	4.00	0.030000	12,394.95	45.57
60.00	4.00	0.035000	13,388.08	49.22
60.00	4.00	0.040000	14,312.46	52.62
60.00	4.00	0.045000	15,180.65	55.81
65.00	0.50	0.005000	165.96	5.03
65.00	0.50	0.010000	234.70	7.11
65.00	0.50	0.015000	287.44	8.71
65.00	0.50	0.020000	331.91	10.06
65.00	0.50	0.025000	371.09	11.25
65.00	0.50	0.030000	406.51	12.32
65.00	0.50	0.035000	439.08	13.31
65.00	0.50	0.040000	469.39	14.22
65.00	0.50	0.045000	497.87	15.09
65.00	1.00	0.005000	528.59	7.89
65.00	1.00	0.010000	747.54	11.16
65.00	1.00	0.015000	915.55	13.66
65.00	1.00	0.020000	1,057.19	15.78
65.00	1.00	0.025000	1,181.97	17.64
65.00	1.00	0.030000	1,294.78	19.33
65.00	1.00	0.035000	1,398.52	20.87
65.00	1.00	0.040000	1,495.09	22.31
65.00	1.00	0.045000	1,585.78	23.67
65.00	1.50	0.005000	1,042.70	10.22
65.00	1.50	0.010000	1,474.60	14.46
65.00	1.50	0.015000	1,806.00	17.71
65.00	1.50	0.020000	2,085.39	20.45
65.00	1.50	0.025000	2,331.54	22.86
65.00	1.50	0.030000	2,554.07	25.04
65.00	1.50	0.035000	2,758.72	27.05
65.00	1.50	0.040000	2,949.19	28.91
65.00	1.50	0.045000	3,128.09	30.67
65.00	2.00	0.005000	1,690.70	12.25
65.00	2.00	0.010000	2,391.01	17.33
65.00	2.00	0.015000	2,928.37	21.22
65.00	2.00	0.020000	3,381.39	24.50
65.00	2.00	0.025000	3,780.51	27.40
65.00	2.00	0.030000	4,141.34	30.01
65.00	2.00	0.035000	4,473.16	32.41
65.00	2.00	0.040000	4,782.01	34.65
65.00	2.00	0.045000	5,072.09	36.75
65.00	2.50	0.005000	2,462.47	14.07
65.00	2.50	0.010000	3,482.46	19.90
65.00	2.50	0.015000	4,265.13	24.37
65.00	2.50	0.020000	4,924.95	28.14
65.00	2.50	0.025000	5,506.26	31.46

Table
 * Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
65.00	2.50	0.030000	6,031.80	34.47
65.00	2.50	0.035000	6,515.09	37.23
65.00	2.50	0.040000	6,964.93	39.80
65.00	2.50	0.045000	7,387.42	42.21
65.00	3.00	0.005000	3,351.44	15.73
65.00	3.00	0.010000	4,739.65	22.25
65.00	3.00	0.015000	5,804.86	27.25
65.00	3.00	0.020000	6,702.88	31.47
65.00	3.00	0.025000	7,494.05	35.18
65.00	3.00	0.030000	8,209.32	38.54
65.00	3.00	0.035000	8,867.08	41.63
65.00	3.00	0.040000	9,479.30	44.50
65.00	3.00	0.045000	10,054.32	47.20
65.00	3.50	0.005000	4,353.04	17.27
65.00	3.50	0.010000	6,156.13	24.43
65.00	3.50	0.015000	7,539.68	29.92
65.00	3.50	0.020000	8,706.08	34.55
65.00	3.50	0.025000	9,733.69	38.63
65.00	3.50	0.030000	10,662.72	42.31
65.00	3.50	0.035000	11,517.06	45.70
65.00	3.50	0.040000	12,312.25	48.86
65.00	3.50	0.045000	13,059.12	51.82
65.00	4.00	0.005000	5,464.01	18.71
65.00	4.00	0.010000	7,727.28	26.46
65.00	4.00	0.015000	9,463.95	32.41
65.00	4.00	0.020000	10,928.03	37.42
65.00	4.00	0.025000	12,217.91	41.84
65.00	4.00	0.030000	13,384.05	45.84
65.00	4.00	0.035000	14,456.42	49.51
65.00	4.00	0.040000	15,454.57	52.93
65.00	4.00	0.045000	16,392.04	56.14
70.00	0.50	0.005000	178.68	5.03
70.00	0.50	0.010000	252.69	7.12
70.00	0.50	0.015000	309.49	8.72
70.00	0.50	0.020000	357.36	10.07
70.00	0.50	0.025000	399.55	11.25
70.00	0.50	0.030000	437.68	12.33
70.00	0.50	0.035000	472.75	13.32
70.00	0.50	0.040000	505.39	14.24
70.00	0.50	0.045000	536.05	15.10
70.00	1.00	0.005000	568.98	7.90
70.00	1.00	0.010000	804.66	11.18
70.00	1.00	0.015000	985.50	13.69
70.00	1.00	0.020000	1,137.95	15.80
70.00	1.00	0.025000	1,272.27	17.67

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
70.00	1.00	0.030000	1,393.70	19.36
70.00	1.00	0.035000	1,505.37	20.91
70.00	1.00	0.040000	1,609.31	22.35
70.00	1.00	0.045000	1,706.93	23.71
70.00	1.50	0.005000	1,122.02	10.25
70.00	1.50	0.010000	1,586.77	14.49
70.00	1.50	0.015000	1,943.39	17.75
70.00	1.50	0.020000	2,244.03	20.49
70.00	1.50	0.025000	2,508.90	22.91
70.00	1.50	0.030000	2,748.37	25.10
70.00	1.50	0.035000	2,968.58	27.11
70.00	1.50	0.040000	3,173.54	28.98
70.00	1.50	0.045000	3,366.05	30.74
70.00	2.00	0.005000	1,818.69	12.29
70.00	2.00	0.010000	2,572.02	17.38
70.00	2.00	0.015000	3,150.07	21.28
70.00	2.00	0.020000	3,637.38	24.58
70.00	2.00	0.025000	4,066.72	27.48
70.00	2.00	0.030000	4,454.87	30.10
70.00	2.00	0.035000	4,811.81	32.51
70.00	2.00	0.040000	5,144.04	34.76
70.00	2.00	0.045000	5,456.08	36.87
70.00	2.50	0.005000	2,647.92	14.12
70.00	2.50	0.010000	3,744.73	19.97
70.00	2.50	0.015000	4,586.33	24.46
70.00	2.50	0.020000	5,295.84	28.24
70.00	2.50	0.025000	5,920.93	31.58
70.00	2.50	0.030000	6,486.05	34.59
70.00	2.50	0.035000	7,005.74	37.36
70.00	2.50	0.040000	7,489.45	39.94
70.00	2.50	0.045000	7,943.76	42.37
70.00	3.00	0.005000	3,602.42	15.80
70.00	3.00	0.010000	5,094.59	22.34
70.00	3.00	0.015000	6,239.57	27.37
70.00	3.00	0.020000	7,204.83	31.60
70.00	3.00	0.025000	8,055.25	35.33
70.00	3.00	0.030000	8,824.08	38.70
70.00	3.00	0.035000	9,531.10	41.80
70.00	3.00	0.040000	10,189.17	44.69
70.00	3.00	0.045000	10,807.25	47.40
70.00	3.50	0.005000	4,677.08	17.35
70.00	3.50	0.010000	6,614.39	24.54
70.00	3.50	0.015000	8,100.94	30.06
70.00	3.50	0.020000	9,354.16	34.71
70.00	3.50	0.025000	10,458.27	38.81

Table
Rating Table for Trapezoidal Channel

Rating Table				
Bottom Width (ft)	Depth (ft)	Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
70.00	3.50	0.030000	11,456.46	42.51
70.00	3.50	0.035000	12,374.39	45.92
70.00	3.50	0.040000	13,228.78	49.09
70.00	3.50	0.045000	14,031.24	52.06
70.00	4.00	0.005000	5,868.22	18.81
70.00	4.00	0.010000	8,298.91	26.60
70.00	4.00	0.015000	10,164.05	32.58
70.00	4.00	0.020000	11,736.44	37.62
70.00	4.00	0.025000	13,121.74	42.06
70.00	4.00	0.030000	14,374.14	46.07
70.00	4.00	0.035000	15,525.85	49.76
70.00	4.00	0.040000	16,597.83	53.20
70.00	4.00	0.045000	17,604.65	56.43