

PRELIMINARY DRAINAGE STUDY
For
Amazing Facts
Placer County, California

~~December 23, 2008~~
Updated April 29, 2011

Prepared By:



Phone (530) 272-8328

563 Brunswick Road, Suite 11 Grass Valley, CA 95945

Fax (530) 272-6039

Contents

	Page
Report – Section A	
Introduction	1
Site Characteristics.....	1
Inventory of existing downstream drainage conditions & facilities.....	2
Proposed Drainage Improvements	2
Impacts to Off Site Drainage and Proposed Mitigation Measures.....	3
Water Quality and Erosion Control.....	4
Design Details and Criteria.....	4
Summary Tables – Section B	
Table 1 - Comparison of before development flows to after development flows.....	b1
Table 2 - Small watershed peak flow worksheet - before development	b2
Table 3 - Small watershed peak flow worksheet – after development.....	b2
HEC-1 Calculations – Section C	
Before Development	
Existing pond B1 outlet discharge rating per HEC-RAS HEC-1 input data.....	c1-3
HEC -1 output data Q2-Q100	c4-9
After Development	
Proposed pond B1 outlet discharge rating per HEC-RAS HEC-1 input data.....	c10-12
HEC -1 output data Q2-Q100.....	c13-18
Exhibits – Section D	
Exhibit 1a-1b - Unit Peak Flow Values (Placer County SWMM).....	d1-2
Exhibit 2 - USDA soil types and soil map.....	d3-5
Exhibit 3 - Pictures of off site drainage facilities and creeks.....	d6
Maps – Section E (attached separately)	
Drain Map #1 - Drainage areas before development	folded
Drain Map #2 - Drainage areas after development	folded

Introduction

The project site is approximately 75.5 acres located south of Sierra College Boulevard between the San Juan Water District reservoir and Nightwatch Drive. The development is a proposed church comprised of a Multi-Use building and a ministry resource building in Phase 1 and a Worship building in Phase 2, along with associated parking lot, landscaping and utility service connections. The parking lot provides space for approximately 900 vehicles and connects to Sierra College Boulevard with two driveways.

This study provides calculations that show peak drainage flows to points at the property boundary where storm water discharges. These calculations compare the pre-development flows to the post development flows at the project boundary. This plan proposes to keep the drainage patterns essentially unchanged. The impacts and proposed mitigations to offset those impacts are listed herein. Calculations for peak drainage flow and drainage facilities sizing conform to the Placer County Stormwater Management Manual criteria.

Site Characteristics

The site drains to the south, toward an unnamed tributary to Miners Ravine. Ground slopes range from flat to 35%. Topographic features include a man-made pond located near the middle of the site, having a watershed area of about 44 acres. Based upon aerial photos and historical USGS topographic maps, the pond appears to have been constructed between 1968 and 1971. This report makes no expressed or implied warranty as to the structural integrity of the dam at this pond. The dam is approximately 17 feet high and 300 feet long. The pond has a bottom outlet slide gate valve of unknown size that is normally closed. The volume of the pond is estimated at 6 acre feet. The pond has a grass lined earthen spillway with a trapezoidal shaped cross section. The bottom width of the outlet trapezoid is 14 feet. The pond and dam are too small to be under the jurisdiction of California Division of Safety of Dams. An analysis of the structural integrity of the dam is proposed in the impact and mitigation section below as a condition of project approval.

Flood plains are limited to the flow lines of the natural swales, wetland seeps and the shoreline of ponds. The FEMA Flood Insurance Rate Map for Placer County (Placer County, CA Unincorporated Areas, Community-Panel Number 06061 C0418G) indicates that the project site is in zone D or X meaning it is beyond the 500 year flood plain or the flood hazard is undetermined. Wetlands and Vernal Pools have been mapped on the site as shown in the report entitled “ Kelley Property (Amazing Facts), Placer County, California – Revised Wetland Delineation” prepared on April 15, 2005 by ECORP Consulting, Inc.

The Soil Survey of Placer County (USDA Soil Conservation Service, 1980) shows the on site soil series to be comprised of the (106, 109) Andregg, and (144) Exchequer and (152,153) Inks and Xerofluent soils. These soils are classified as hydrologic group C and D.

Groundwater within a free flowing aquifer is not expected to affect the peak flow rates to the drainage system. Subsurface drains will be installed at various locations during construction as needed to intercept perched groundwater, if any, in order to stabilize subgrades.

Native vegetation consists of oak woodland with upland grasses and forbs.

Inventory of existing downstream drainage conditions and facilities

Drainage map #1 designates the pre-development locations where drainage discharges across the subdivision boundary at points A and B. The results of a field survey performed in August of 2007 are listed below and include an assessment of the conditions of off site, drainage facilities or drainage courses. Refer to the pictures at selected discharge points in Exhibit 3.

Point A and downstream: This is an unnamed intermittent drainage course flowing downstream to the south with a 32 acre watershed area. At point A, this drainage course is grass lined with some blackberry bushes and surrounding oaks. The flow line is stable with only minor erosion. The drainage course leaves the project boundary under a wire fence and continues south to a gravel driveway.

Point B and downstream: This is an unnamed intermittent drainage course flowing downstream to the south with a 55 acre watershed area. At point B, this drainage course has thick grass and no erosion. The drainage course leaves the project boundary under a split rail fence and continues south through a broad v shaped rip rap swale approximately 10 feet wide to a concrete driveway with two 15" diameter culverts. No downstream erosion is apparent.

Point C and downstream: This is the south road gutter of Sierra College Boulevard and it flows west. The watershed area is 1.5 acres.

Area D and downstream: Drainage run off from area D leaves the west property line as sheet flow with no defined drainage course and eventually combines with area C flow in the Sierra College Boulevard gutter.

Proposed Drainage Improvements

The existing drainage pattern and watershed boundaries are proposed to remain essentially the same with no significant areas being diverted to other drainage watersheds. This project proposes to develop the northwest corner of the property and add approximately 11.9 acres of impervious roof and parking lot area. Within watershed area B, there is an existing man-made pond (pond B1) that acts as a detention basin. This project proposes to continue using that pond as a detention basin, with a more restrictive concrete weir outlet. Drainage Map #1 and 2 lists the pond, dam and spillway data for this pond. Pond B1 will be designed to function in accordance with Placer County drainage and flood control standards. The detention basin outlet will be designed such that the downstream post development peak flows will be slightly less than the predevelopment peak flows.

The drainage system will generally consist of parking lot gutters, inlets and culverts directing drainage to temporary best management practices (BMP's) consisting of silt barriers and sediment basins. Permanent BMP's consist of rock slope protection, open clarifying basins and rock flow spreaders which discharge to a near sheet flow condition or to natural swales. Run off from roadway impervious surfaces will flow through BMP's prior to discharging off site or to on site wetlands, swales or ponds. No run off from the site will flow into the San Juan Water District water reservoir.

Impacts to Off Site Drainage and Proposed Mitigation

On site impacts: The project will impact, fill or disturb approximately 12.85 acres. The project will fill or disturb an undetermined amount of vernal pools that are waters of the U.S. The project will also disturb 0.03 acres of pond B1 outlet (see page C10). Part of the mitigation for this will include notifying the U.S. army corps of engineers as part of a nationwide 404 permit application and process.

Without more detention than presently provided by Pond B, peak run off from basin B would increase and affect downstream properties with deeper flows and higher velocities.

On site Mitigation: The vernal pools that are to remain undisturbed shall be surrounded with colored poly fence prior to the start of construction. A low profile permanent perimeter fence with signs should be constructed, since these pools are dry in the summer and have no identifying characteristic.

Off site impacts: The off site drainage summary Table 1 compares the before development to after development peak drainage flow to discharge points A and B. These points are shown on drainage maps #1 and #2 and further described below.

Point A and downstream: **Impact:** There is no increase to the peak drainage flow to this point.

Mitigation: No further mitigation is proposed other than the standard on site BMP improvements.

Point B and downstream : **Impact:** Without mitigation, the development will increase the peak run off at Point B. This increase will be mainly from impervious improvements increasing the run off and reducing the travel time of the drainage to this point. Pond B1 is proposed to remain and act as a detention pond. It is proposed to investigate the structural integrity of the dam at this pond.

CASE 1: If the dam is found to have the required integrity, including a non-seeping core, a new spillway is proposed with a lower spill elevation, to increase the available detention volume. A lower spill elevation will lower the pond's normal water surface by 1.8 feet. This could cause a loss of wetland habitat. The pond would be partially drained and there would be disturbance to the spillway area during construction. The drainage calculations herein are based on this case.

CASE 2: It is also possible that the dam will need to be rebuilt to meet structural requirements. If that were the case, it may be possible to rebuild the dam to an elevation 1.8 feet higher and set the new spillway at the same elevation as the existing. Then the normal pond's water surface would remain the same (no net loss), but the footprint of the dam would increase and there would be a loss of wetland habitat at the spillway. The dam would still remain non-jurisdictional with the State, but the larger footprint would be an impact to the surrounding environs. The entire pond would be drained and there would be disturbance to the pond during construction.

Mitigation: A new concrete weir is proposed at the spillway channel for CASE 1 or CASE 2. For either case, the pond spillway will discharge less than pre- development flow to Point B. Pond B1 will then function as a detention basin in accordance with Placer County drainage standards and the criteria listed in this report. For CASE 1, the US Army Corps 404 permit for the project will need to address the potential loss of wetland at the spillway and pond perimeter. For CASE 2, the dam slope should be planted with grass of like kind to the existing grass. Any trees removed should be

replanted with like kind in a compatible location. The 404 permit will need to address loss of wetland habitat at the spillway.

Point C and downstream : **Impact:** There is a decrease to the peak drainage flow at this point in the gutter of Sierra College Boulevard.

Mitigation: No further mitigation is proposed other than the standard on site BMP improvements and road frontage gutter improvements.

Area D and downstream : **Impact:** There is a decrease in the peak drainage flow from this area. The flow leaves the project as sheet flow with no identifiable flow channel.

Mitigation: No further mitigation is proposed other than the standard on site BMP improvements.

Sierra College Boulevard widening (offsite): **Impact:** The road widening that flows to the west is offset by the reductions in flow from areas C and D as described earlier, so there is no significant impact. Drainage impacts to the east from the road widening have already been addressed in the Placer County master traffic plan and road standard planned for this road. The proposed off site widening covers 0.50 acres with impervious surface in the drainage shed contributing to the gutter and road ditch flowing east.

Water Quality and Erosion Control

Erosion controls consist of temporary and permanent erosion controls collectively labeled BMP's. Seeding, mulching and landscaping are proposed to stabilize disturbed soils.

Temporary BMP's: These will include straw logs, silt fence, water bars or diversion berms directing storm water to flow spreaders, gravel bags, straw mulch, and inlet filters. The primary sediment barriers are shown on the preliminary drainage plan. A gravel construction entry will reduce tracked mud onto Sierra College Boulevard. Sediment traps will be installed to protect wetlands and pond B1.

Permanent BMP's: These will include inlets, culverts, open clarifying basins, erosion mat-lined, rock lined or seeded ditches, rock flow spreaders, and detention basins.

Detention basin Water Quality: The detention basin, pond B1, should continue with water quality equal to its existing state once construction is completed and soils are vegetated and stabilized. Refer to other environmental documents for proposed habitat management and mosquito/vector control for open water or wet areas.

Design Details and Criteria

1. Culverts 30" in diameter and less are designed for 50% blockage at the inlet, as in the case of a FES (flared end section). However where there is a grated inlet or OMP inlet with 8" maximum size opening, the inlet is designed for 50% blockage, but the culvert connected to such an inlet may be sized without blockage (figuring that large objects cannot enter through the inlet openings and then block the culvert).
2. Lined ditches, vegetative sediment basins or grass swales are sized for the 100 year storm flow with no overtopping, taking into consideration the slope of the water surface at curves in the ditches.
3. Where HEC-1 computer program is not used, the following Placer County formulas are used to determine peak discharge from contributing areas:

$$\text{Sheet flow : } t_r = \frac{.355(nL)^6}{S^{.3}}$$

$$\text{Channel flow: } t_r = \frac{.00735Ln^{.75}(1+z)^{25}}{S^{.375}(A_c z)^{25}}$$

$$\text{Peak Discharge: } Q = qA - A_p F_i$$

SECTION B
SUMMARY TABLES

SUMMARY TABLE 1
COMPARISON OF BEFORE DEVELOPMENT FLOWS TO AFTER DEVELOPMENT FLOWS

Discharge Location	Before Development Peak Flow cfs					After Development Peak Flow cfs					Remark
	Basin Size ac.	Q ₂	Q ₁₀	Q ₂₅	Q ₁₀₀	Basin Size ac.	Q ₂	Q ₁₀	Q ₂₅	Q ₁₀₀	
Point A (basin A)	32.09		25		48.8	32.03		25		48.7	No change in flow
Point B (basin B1, B2)	55.1	6	20	29	46	56.96	6	18	26	44	Slight decrease in flow
Point C (basin C)	1.8		1.8		3.6	0.74		1.5		2.7	Slight decrease in flow
Point D (basin D)	0.91		1.4		2.7	0.09		0.2		0.4	Decrease in flow

Notes:

1. It is proposed to construct a more restrictive spillway weir at pond B1 in Basin B1. This will utilize the detention volume in pond B1 and enable the after development flows to point B to be lower than the before development flows.

**SMALL WATERSHED PEAK FLOW WORKSHEET
FOR PLACER COUNTY
SUMMARY TABLE 2 - DRAINAGE AREAS BEFORE DEVELOPMENT**

c:\engr\afacts\befdareas

Watershed Data						Time of Concentration											Flow			
refer to drainage map and soil type						Overland Flow				Channel Flow							see Exhibits 1a-1b			
Watershed Basin	Elev.	Total Area (ac.)	Perv. Area	Soil Type	F _i	Length ft.	Slope ft/ft	N	t _{r min.}	Area (ac.)	Length ft.	Slope ft/ft	n	Z	t _{r min.}	Total Time (min.)	q ₁₀	q ₁₀₀	Q ₁₀ cfs	Q ₁₀₀ cfs
A	400	32.09	32.09	C/D	0.18	600	0.062	0.5	25.05	18	1570	0.11	0.08	4	2.77	27.82	0.96	1.7	25.0	48.8
B1	430	44.14	44.14	C/D	0.16	See HEC - 1 calculations														
B2	330	10.96	10.96	C	0.23	See HEC - 1 calculations														
C	520	1.8	1.8	D	0.15	240	0.02	0.5	20.30	0.8	520	0.015	0.015	20	1.77	22.07	1.16	2.13	1.8	3.6
D	517	0.91	0.91	D	0.15	140	0.02	0.5	14.69	0.8	0	0.02	0.07	6	0.00	14.69	1.73	3.14	1.4	2.7
B1,B2	400	55.1	55.1	C/D	0.18	See HEC - 1 calculations														

b2

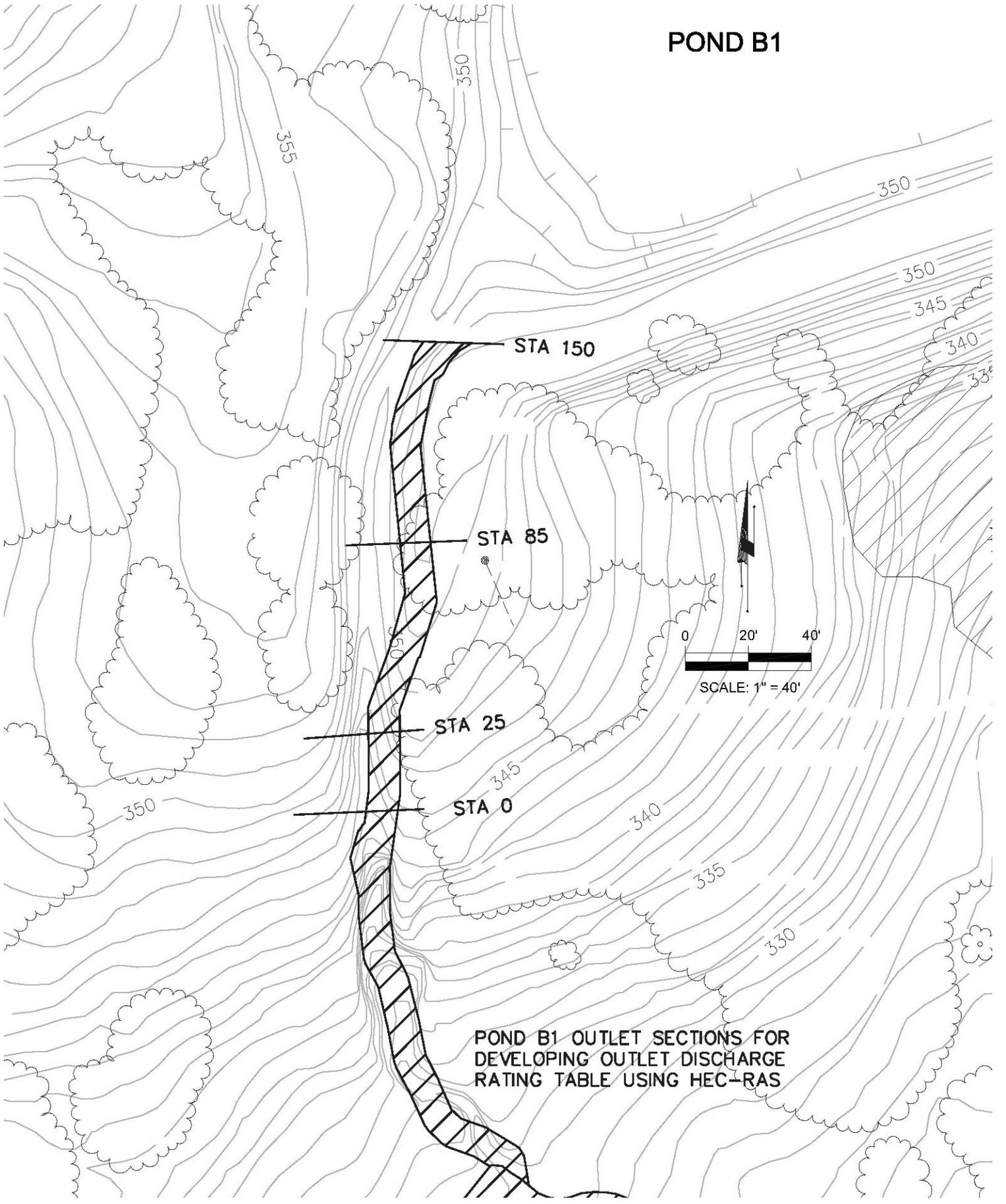
**SMALL WATERSHED PEAK FLOW WORKSHEET
FOR PLACER COUNTY
SUMMARY TABLE 3 - DRAINAGE AREAS AFTER DEVELOPMENT**

Watershed Data						Time of Concentration											Flow			
refer to drainage map and soil type						Overland Flow				Channel Flow							see Exhibits 1a-1b			
Watershed Basin	Elev.	Total Area (ac.)	Perv. Area	Soil Type	F _i	Length ft.	Slope ft/ft	N	t _{r min.}	Area (ac.)	Length ft.	Slope ft/ft	n	Z	t _{r min.}	Total Time (min.)	q ₁₀	q ₁₀₀	Q ₁₀ cfs	Q ₁₀₀ cfs
A	400	32.03	31.78	C/D	0.18	600	0.062	0.5	25.05	18	1570	0.11	0.08	4	2.77	27.82	0.96	1.7	25.0	48.7
B1	430	46	34.12	C/D	0.16	See HEC - 1 calculations														
B2	330	10.96	10.96	C	0.23	See HEC - 1 calculations														
C	520	0.74	0.51	D	0.15	50	0.02	0.5	7.92	0.4	520	0.015	0.015	20	2.11	10.02	2.1	3.8	1.5	2.7
D	517	0.09	0.09	D	0.15	12	0.02	0.5	3.36	0.8	0	0.02	0.07	6	0.00	5.00	2.54	4.98	0.2	0.4
B1,B2	400	56.96	45.08	C/D	0.18	See HEC - 1 calculations														

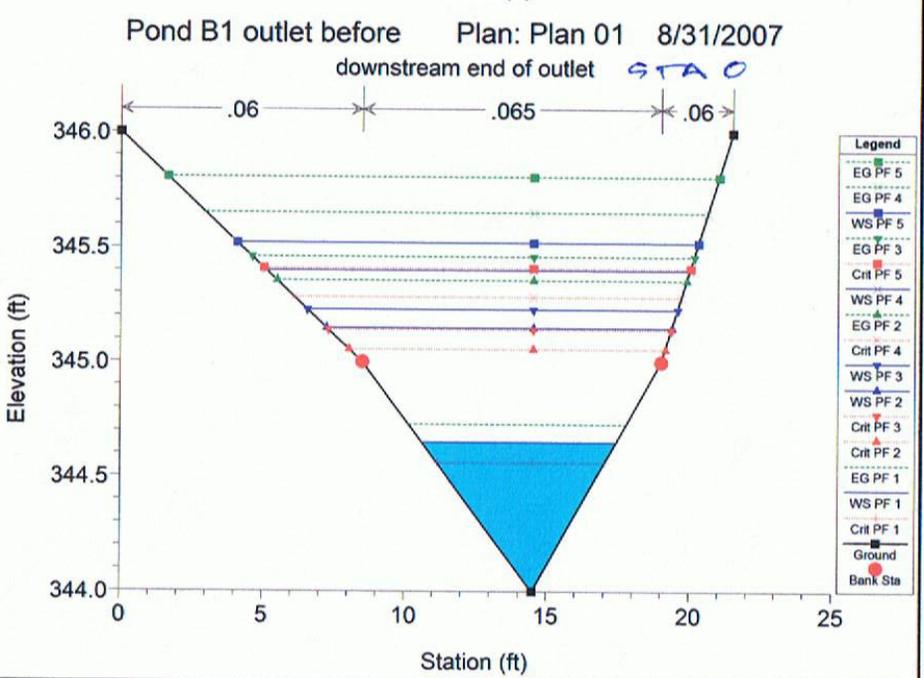
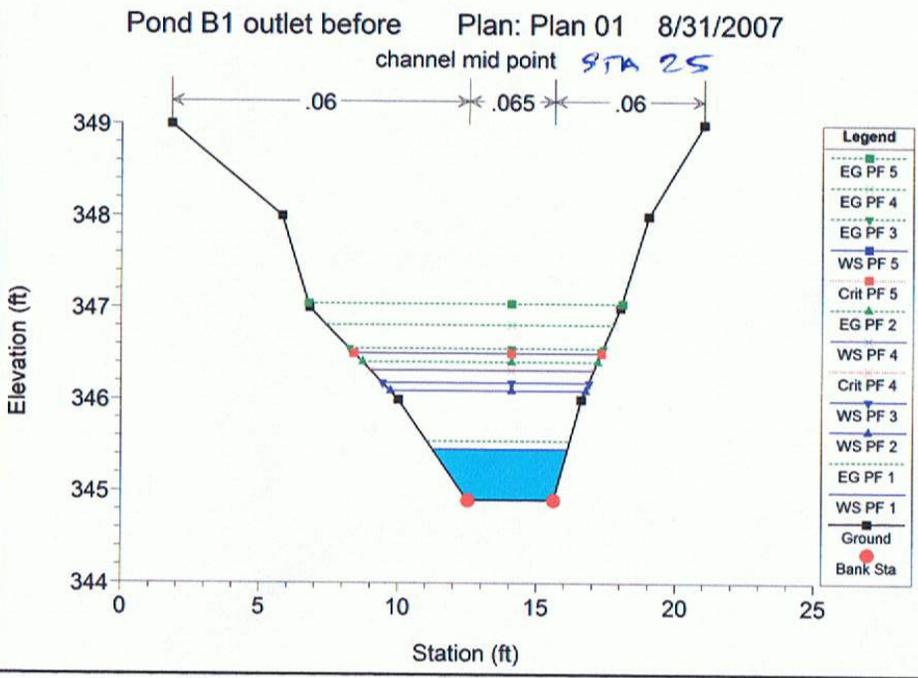
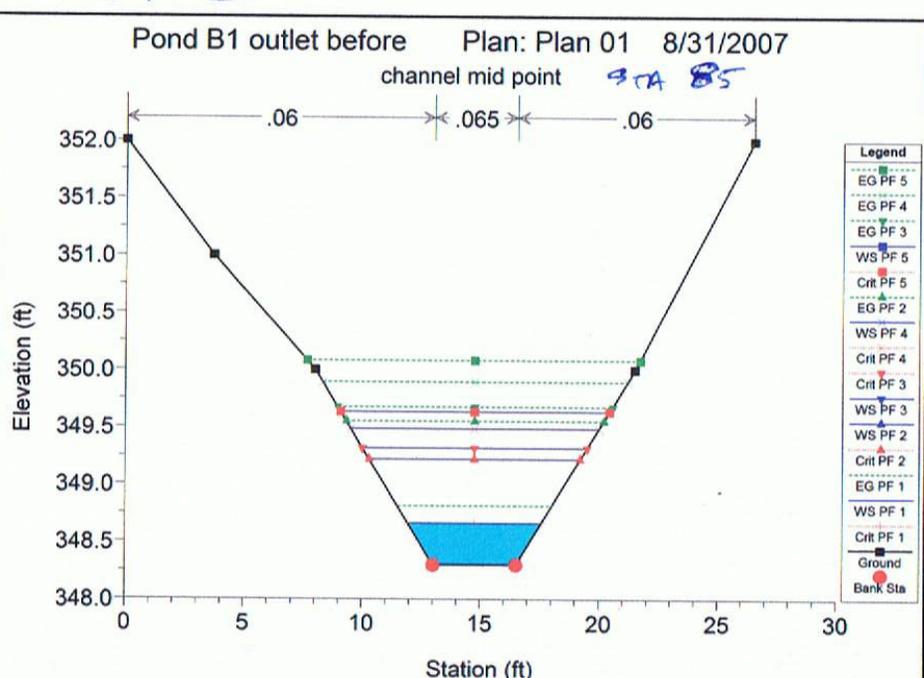
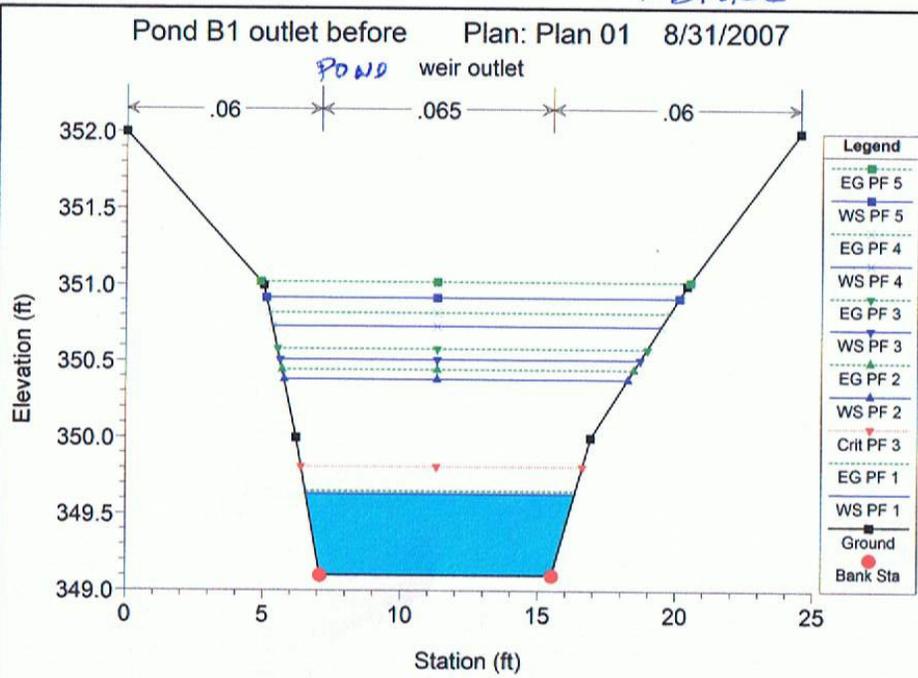
SECTION C

HEC-1 CALCULATIONS

POND B1



BEFORE DEVELOPMENT



HEC-RAS Plan: Plan 01 River: Pond B1 Outlet Reach: 1

BEFORE DEVELOPMENT - EXISTING SPILLWAY

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	150	PF 1	5.00	349.10	349.63		349.65	0.005	1.06	4.85	9.76	0.26
1	150	PF 2	25.00	349.10	350.38		350.45	0.006	2.08	13.04	12.50	0.32
1	150	PF 3	30.00	349.10	350.51	349.81	350.58	0.006	2.24	14.67	13.10	0.33
1	150	PF 4	40.00	349.10	350.73		350.82	0.006	2.52	17.64	14.12	0.35
1	150	PF 5	50.00	349.10	350.92		351.02	0.007	2.76	20.40	15.01	0.36
1	85	PF 1	5.00	348.30	348.66	348.66	348.81	0.079	3.28	1.66	5.63	0.96
1	85	PF 2	25.00	348.30	349.22	349.22	349.55	0.056	5.14	5.72	8.92	0.94
1	85	PF 3	30.00	348.30	349.32	349.32	349.68	0.054	5.38	6.62	9.49	0.94
1	85	PF 4	40.00	348.30	349.49	349.49	349.89	0.051	5.81	8.30	10.48	0.94
1	85	PF 5	50.00	348.30	349.63	349.63	350.08	0.049	6.16	9.90	11.35	0.94
1	25	PF 1	5.00	344.90	345.46		345.55	0.025	2.45	2.24	4.88	0.58
1	25	PF 2	25.00	344.90	346.10		346.41	0.036	4.92	6.00	7.05	0.79
1	25	PF 3	30.00	344.90	346.18		346.56	0.040	5.40	6.63	7.45	0.84
1	25	PF 4	40.00	344.90	346.32	346.32	346.82	0.048	6.32	7.68	8.07	0.93
1	25	PF 5	50.00	344.90	346.51	346.51	347.05	0.045	6.68	9.26	8.92	0.93
1	0	PF 1	5.00	344.00	344.65	344.56	344.73	0.045	2.25	2.22	6.82	0.70
1	0	PF 2	25.00	344.00	345.15	345.06	345.36	0.046	3.65	6.95	12.15	0.80
1	0	PF 3	30.00	344.00	345.23	345.14	345.46	0.045	3.87	7.96	13.03	0.80
1	0	PF 4	40.00	344.00	345.40	345.28	345.65	0.038	4.08	10.33	14.90	0.76
1	0	PF 5	50.00	344.00	345.52	345.41	345.81	0.037	4.40	12.20	16.22	0.77

BEFORE DEVELOPMENT INPUT - BASIN B

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 17DEC08 TIME 14:32:29 *
*
*****
    
```

```

*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*
*****
    
```

```

X X XXXXXXX XXXXX X
X X X X X XX
X X X X X X
XXXXXXX XXXX X XXXXX X
X X X X X X
X X X X X X
X X XXXXXXX XXXXX XXX
    
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
* PDP Vers 1.6 8/13/94
* I=BB2.DAT O=PBB2.DAT
* Input File Name = BB2.DAT
1 ID AMAZING FACTS BASIN B
2 ID BEFORE DEVELOPMENT
3 ID 2 YEAR STORM EVENT
4 ID C:\HEC1\AFACFS\BB2.DAT
5 IT 5 17AUG07 1200 260
6 IO 2 2
* *****
7 KK B1
8 KM Basin runoff calculation for area B1
9 BA .0690
* PI E=430 R=2
*
* Placer Design Precipitation - depths in inches
* Return period in years 2 Time interval in minutes 5
* Elevation in feet 430 W of Crest
* Duration in minutes 1300 Maximum depth at 650 minutes
* Cloudburst 1-hr Factor 1.00
*
10 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
11 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
12 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
13 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
14 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.005 0.005 0.005 0.005
15 PI 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005
16 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006
17 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.007
18 PI 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007
19 PI 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008
20 PI 0.009 0.009 0.009 0.009 0.009 0.009 0.009 0.010 0.010 0.010
21 PI 0.011 0.011 0.011 0.012 0.012 0.012 0.013 0.013 0.015 0.016
22 PI 0.017 0.018 0.019 0.020 0.022 0.024 0.028 0.031 0.044 0.133
23 PI 0.060 0.036 0.028 0.026 0.023 0.021 0.020 0.018 0.017 0.017
24 PI 0.016 0.015 0.013 0.013 0.012 0.012 0.011 0.011 0.011 0.011
25 PI 0.010 0.010 0.010 0.010 0.009 0.009 0.009 0.009 0.009 0.009
26 PI 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.007
27 PI 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007
28 PI 0.007 0.007 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006
29 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006
30 PI 0.006 0.006 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005
31 PI 0.005 0.005 0.005 0.005 0.005 0.004 0.004 0.004 0.004 0.004
32 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
33 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
34 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
35 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
36 LU 0 .14 0
37 UK 600 .13 .5 100
38 RK 1030 .095 .07 TRAP 8 5
    
```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

39 KK Res1
40 KM Reservoir 1 routing operation
41 RS 1 ELEV 349.1
42 SA 1.38 1.71 1.91
43 SE 347 350 352
44 SQ 0 5 25 30 40 50
45 SE 349.1 349.63 350.38 350.51 350.73 350.92
* *****

46 KK B1B
47 KM Kinematic wave channel routing from pt B1 to B
48 RK 1020 .044 .07 TRAP 4 3
* *****

49 KK B2
50 KM Basin runoff calculatin for area B2
51 BA .0171
* PI E=330
*
* Placer Design Precipitation - depths in inches
* Return period in years 2 Time interval in minutes 5
* Elevation in feet 330 W of Crest
* Duration in minutes 1300 Maximum depth at 650 minutes
* Cloudburst 1-hr Factor 1.00
*

52 PI 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.004 0.004 0.004
53 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
54 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
55 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
56 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
57 PI 0.004 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005
58 PI 0.005 0.005 0.005 0.005 0.005 0.006 0.006 0.006 0.006 0.006
59 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006
60 PI 0.006 0.006 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007
61 PI 0.007 0.007 0.007 0.007 0.008 0.008 0.008 0.008 0.008 0.008
62 PI 0.008 0.009 0.009 0.009 0.009 0.009 0.009 0.009 0.010 0.010
63 PI 0.010 0.011 0.011 0.011 0.012 0.012 0.013 0.013 0.015 0.016
64 PI 0.017 0.018 0.019 0.020 0.021 0.024 0.027 0.031 0.043 0.132
65 PI 0.060 0.035 0.028 0.025 0.023 0.021 0.019 0.018 0.017 0.016
66 PI 0.015 0.015 0.013 0.012 0.012 0.011 0.011 0.011 0.011 0.010
67 PI 0.010 0.010 0.010 0.009 0.009 0.009 0.009 0.009 0.008 0.008
68 PI 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.007 0.007 0.007
69 PI 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.006 0.006
70 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006
71 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.005 0.005 0.005 0.005
72 PI 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.004
73 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
74 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
75 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
76 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
77 PI 0.004 0.004 0.004 0.003 0.003 0.003 0.003 0.003 0.003 0.003
78 LU 0 .14 0
79 UK 600 .16 .5 100
80 RK 540 .059 .07 .004 TRAP 2 3

HEC-1 INPUT

1

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

81 RK 1020 .044 .07 TRAP 4 3
* *****

82 KK B1B2
83 KM Combining two hydrographs at point B
84 HC 2
* *****
85 ZZ

**BEFORE DEVELOPMENT OUTPUT - BASIN B
Q2 STORM**

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
+									
+	HYDROGRAPH AT								
	B1	11.	11.58	3.	1.	1.	.07		
+	ROUTED TO								
+	Res1	4.	12.33	3.	1.	1.	.07		
								349.55	12.33
+	ROUTED TO								
	B1B	4.	12.42	3.	1.	1.	.07		
+	HYDROGRAPH AT								
	B2	3.	11.50	1.	0.	0.	.02		
+	2 COMBINED AT								
1	B1B2	6.	11.83	3.	1.	1.	.09		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL			
						DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
	B1 MANE	1.30	11.06	697.22	.40	5.00	11.06	695.00	.40
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1512E+01 OUTFLOW= .1477E+01 BASIN STORAGE= .2157E-01 PERCENT ERROR= .9									
	B1B MANE	2.09	4.28	745.06	.39	5.00	4.28	745.00	.39
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1450E+01 EXCESS= .0000E+00 OUTFLOW= .1447E+01 BASIN STORAGE= .2587E-02 PERCENT ERROR= .0									
	B2 MANE	2.01	3.11	690.88	.42	5.00	3.10	690.00	.42
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3903E+00 OUTFLOW= .3822E+00 BASIN STORAGE= .1479E-02 PERCENT ERROR= 1.7									

*** NORMAL END OF HEC-1 ***

BEFORE DEVELOPMENT OUTPUT - BASIN B
Q10 STORM

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
+									
	HYDROGRAPH AT								
+		B1	32.	11.17	7.	2.	2.	.07	
	ROUTED TO								
+		Res1	16.	11.75	7.	2.	2.	.07	
+									350.04 11.75
	ROUTED TO								
+		B1B	16.	11.83	7.	2.	2.	.07	
	HYDROGRAPH AT								
+		B2	9.	11.17	2.	1.	1.	.02	
	2 COMBINED AT								
+		B1B2	20.	11.58	8.	3.	3.	.09	
1									

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME
							PEAK	TIME TO PEAK	
							(CFS)	(MIN)	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
B1	MANE	1.04	32.10	672.53	.99	5.00	32.07	670.00	.99
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3703E+01 OUTFLOW= .3653E+01 BASIN STORAGE= .2395E-01 PERCENT ERROR= .7									
B1B	MANE	1.45	15.92	708.18	.98	5.00	15.90	710.00	.98
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3613E+01 EXCESS= .0000E+00 OUTFLOW= .3610E+01 BASIN STORAGE= .3699E-02 PERCENT ERROR= .0									
B2	MANE	1.53	8.71	670.41	1.01	5.00	8.70	670.00	1.01
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9333E+00 OUTFLOW= .9230E+00 BASIN STORAGE= .1694E-02 PERCENT ERROR= .9									

*** NORMAL END OF HEC-1 ***

BEFORE DEVELOPMENT OUTPUT - BASIN B
Q25 STORM

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
+									
	HYDROGRAPH AT								
+		B1	45.	11.08	10.	3.	3.	.07	
	ROUTED TO								
+		Res1	23.	11.67	9.	3.	3.	.07	
+								350.30	11.67
	ROUTED TO								
+		B1B	23.	11.67	9.	3.	3.	.07	
	HYDROGRAPH AT								
+		B2	12.	11.08	2.	1.	1.	.02	
	2 COMBINED AT								
+		B1B2	29.	11.42	11.	4.	4.	.09	
1									

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME
							PEAK	TIME TO PEAK	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
B1	MANE	.91	44.96	665.39	1.41	5.00	44.95	665.00	1.41
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5233E+01 OUTFLOW= .5180E+01 BASIN STORAGE= .3634E-01 PERCENT ERROR= .3									
B1B	MANE	1.40	22.89	701.43	1.39	5.00	22.88	700.00	1.39
CONTINUITY SUMMARY (AC-FT) - INFLOW= .5115E+01 EXCESS= .0000E+00 OUTFLOW= .5112E+01 BASIN STORAGE= .4845E-02 PERCENT ERROR= .0									
B2	MANE	1.45	12.28	668.04	1.43	5.00	12.20	665.00	1.43
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1319E+01 OUTFLOW= .1307E+01 BASIN STORAGE= .2550E-02 PERCENT ERROR= .7									

*** NORMAL END OF HEC-1 ***

BEFORE DEVELOPMENT OUTPUT - BASIN B
Q100 STORM

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

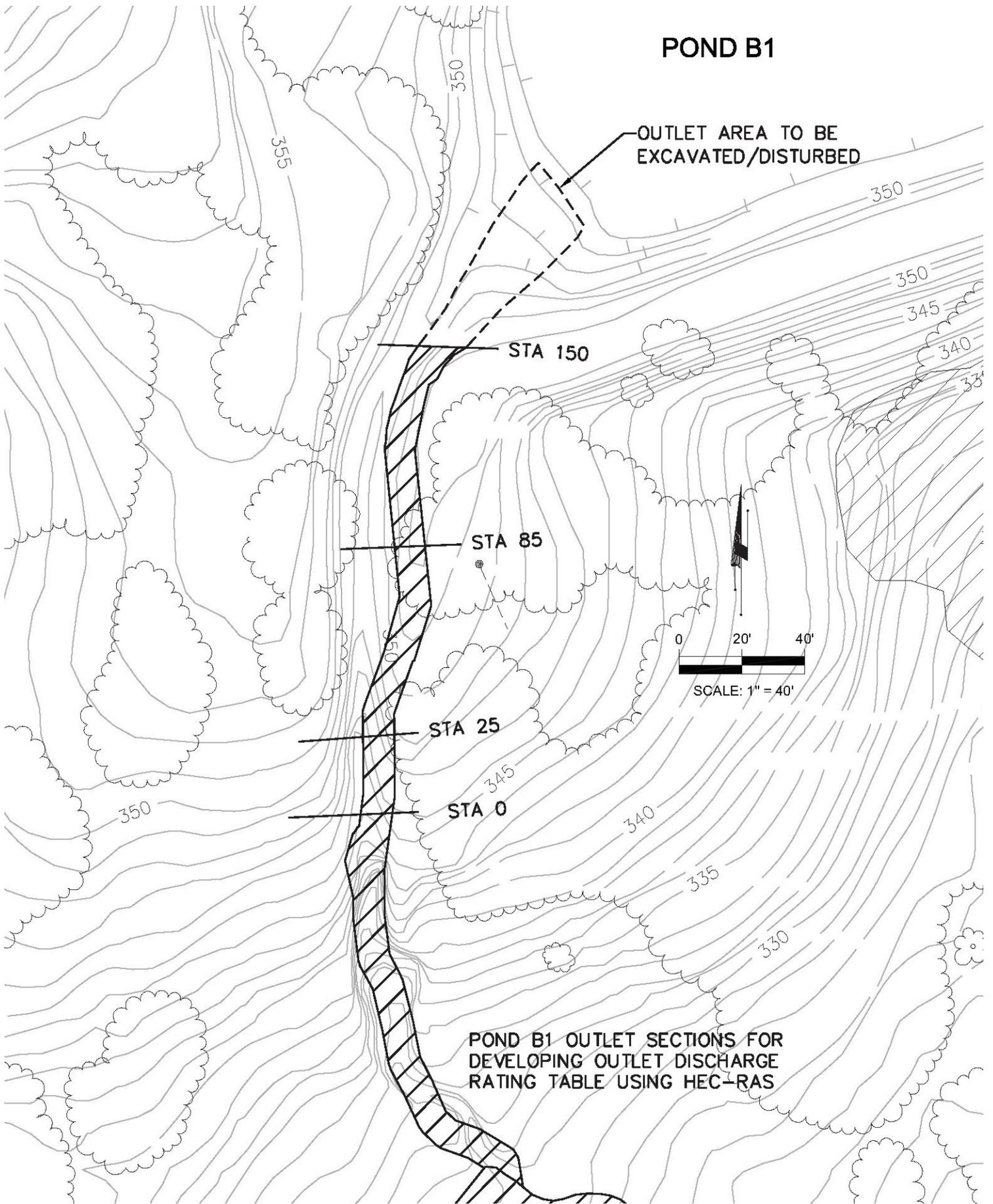
OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
+									
	HYDROGRAPH AT								
+		B1	66.	11.08	13.	4.	4.	.07	
	ROUTED TO								
+		Res1	37.	11.50	13.	4.	4.	.07	
+									350.66 11.50
	ROUTED TO								
+		B1B	37.	11.50	13.	4.	4.	.07	
	HYDROGRAPH AT								
+		B2	18.	11.08	3.	1.	1.	.02	
	2 COMBINED AT								
+		B1B2	46.	11.42	16.	5.	5.	.09	
1									

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

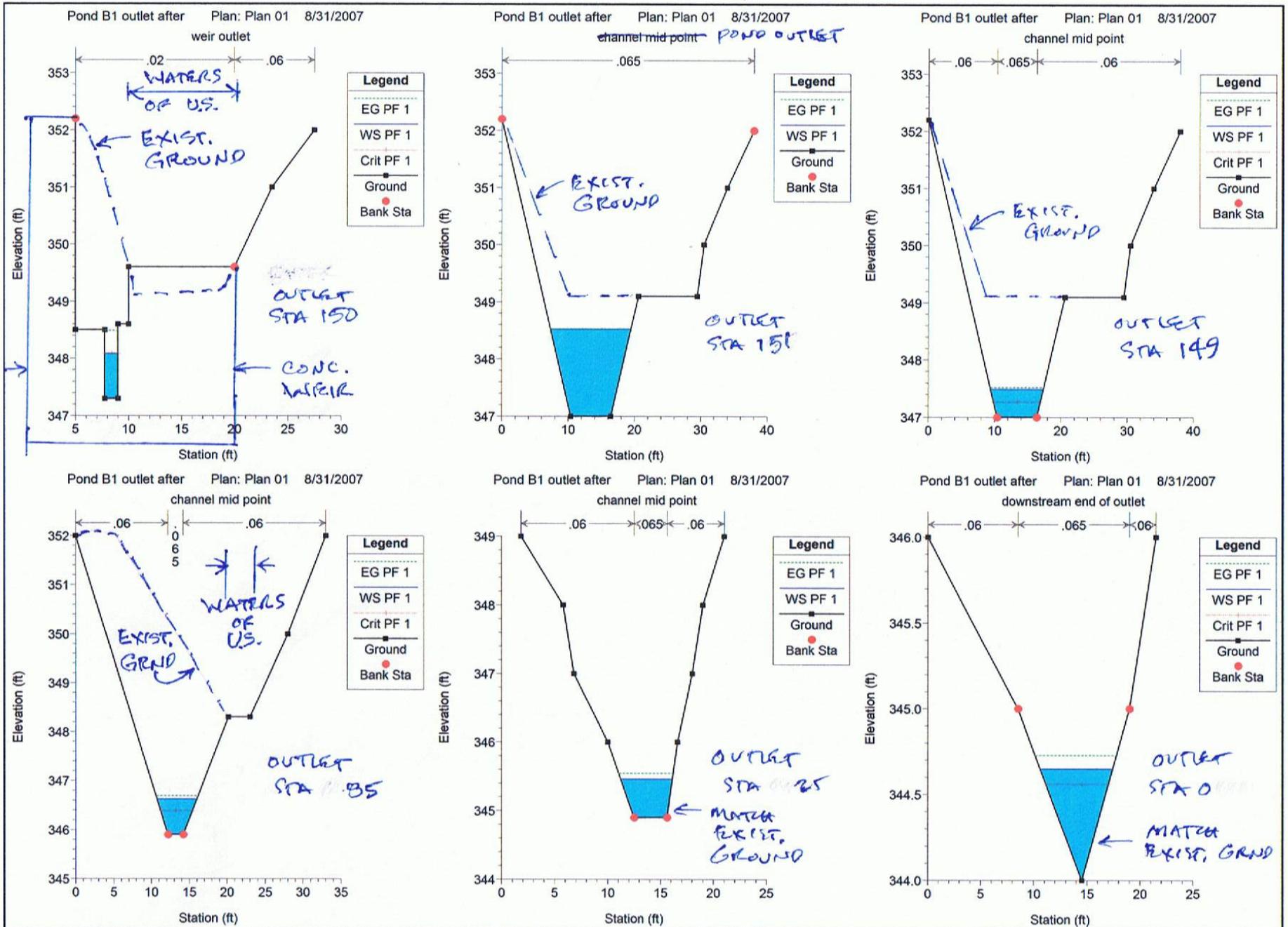
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME
							PEAK	TIME TO PEAK	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
B1	MANE	.88	66.02	662.39	2.14	5.00	65.62	665.00	2.15
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7945E+01 OUTFLOW= .7862E+01 BASIN STORAGE= .4754E-01 PERCENT ERROR= .4									
B1B	MANE	1.19	36.70	692.32	2.10	5.00	36.60	690.00	2.10
CONTINUITY SUMMARY (AC-FT) - INFLOW= .7752E+01 EXCESS= .0000E+00 OUTFLOW= .7746E+01 BASIN STORAGE= .8539E-02 PERCENT ERROR= .0									
B2	MANE	1.27	18.09	665.04	2.16	5.00	18.09	665.00	2.16
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1991E+01 OUTFLOW= .1973E+01 BASIN STORAGE= .3390E-02 PERCENT ERROR= .7									

*** NORMAL END OF HEC-1 ***

POND B1



AFTER DEVELOPMENT



c11

HEC-RAS Plan: Plan 01 River: Pond B1 Outlet Reach: 1

AFTER DEVELOPMENT - NEW SPILLWAY

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	151	PF 1	5.00	347.00	348.53		348.53	0.000	0.36	13.82	12.11	0.06
1	151	PF 2	15.00	347.00	349.28		349.29	0.001	0.58	25.76	23.87	0.10
1	151	PF 3	25.00	347.00	349.69		349.70	0.001	0.70	35.82	25.15	0.10
1	151	PF 4	35.00	347.00	350.05		350.06	0.001	0.78	44.95	26.37	0.11
1	151	PF 5	104.00	347.00	350.88		350.92	0.002	1.51	68.82	30.95	0.18
1	150	PF 1	5.00	347.30	348.09	348.09	348.49	0.019	5.07	0.99	1.25	1.00
1	150	PF 2	15.00	347.30	348.93	348.93	349.26	0.013	4.56	3.29	5.00	0.99
1	150	PF 3	25.00	347.30	349.18	349.18	349.65	0.013	5.52	4.53	5.00	1.02
1	150	PF 4	35.00	347.30	349.42	349.42	350.00	0.013	6.10	5.74	5.00	1.00
1	150	PF 5	104.00	347.30	350.30	350.30	350.86	0.008	6.03	17.76	16.75	0.99
1	149	PF 1	5.00	347.00	347.49	347.27	347.53	0.012	1.54	3.43	7.96	0.39
1	149	PF 2	15.00	347.00	347.94		348.01	0.010	2.22	7.41	9.76	0.40
1	149	PF 3	25.00	347.00	348.26		348.35	0.010	2.61	10.73	11.04	0.41
1	149	PF 4	35.00	347.00	348.52		348.63	0.009	2.92	13.68	12.06	0.42
1	149	PF 5	104.00	347.00	349.63		349.82	0.008	4.02	34.32	24.96	0.44
1	85	PF 1	5.00	345.90	346.63	346.39	346.69	0.015	2.26	2.64	5.27	0.47
1	85	PF 2	15.00	345.90	347.15	346.80	347.26	0.014	3.14	6.04	7.64	0.49
1	85	PF 3	25.00	345.90	347.51		347.65	0.013	3.57	9.10	9.27	0.50
1	85	PF 4	35.00	345.90	347.81		347.96	0.012	3.86	11.99	10.58	0.49
1	85	PF 5	104.00	345.90	348.94		349.18	0.012	5.27	28.74	18.76	0.53
1	25	PF 1	5.00	344.90	345.46		345.55	0.025	2.45	2.24	4.88	0.58
1	25	PF 2	15.00	344.90	345.86		346.06	0.031	3.90	4.42	6.14	0.70
1	25	PF 3	25.00	344.90	346.10		346.41	0.036	4.92	6.00	7.05	0.79
1	25	PF 4	35.00	344.90	346.26	346.21	346.69	0.043	5.82	7.24	7.82	0.88
1	25	PF 5	104.00	344.90	347.23	347.23	347.94	0.039	7.95	16.84	11.66	0.92
1	0	PF 1	5.00	344.00	344.65	344.56	344.73	0.045	2.25	2.22	6.82	0.70
1	0	PF 2	15.00	344.00	344.98	344.87	345.12	0.045	2.97	5.04	10.29	0.75
1	0	PF 3	25.00	344.00	345.15	345.06	345.36	0.046	3.65	6.95	12.15	0.80
1	0	PF 4	35.00	344.00	345.30	345.21	345.55	0.044	4.08	8.89	13.80	0.80
1	0	PF 5	104.00	344.00	346.00	345.93	346.43	0.036	5.59	21.25	21.50	0.80

c12

AFTER DEVELOPMENT INPUT - BASIN B

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 31AUG07 TIME 13:27:56 *
*
*****
    
```

```

*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*
*****
    
```

```

X X XXXXXXX XXXXX X
X X X X X XX
X X X X X
XXXXXXXX XXXX X XXXXX X
X X X X X
X X X X X
X X XXXXXXX XXXXX XXX
    
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW. THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
* PDP Vers 1.6 8/13/94
* I=AB2.DAT O=PAB2.DAT
* Input File Name = AB2.DAT
1 ID AMAZING FACTS BASIN B
2 ID AFTER DEVELOPMENT
3 ID 2 YEAR STORM EVENT
4 ID C:\HEC1\AFACHTS\AB2.DAT
5 IT 5 17AUG07 1200 260
6 IO 2 2
* *****
7 KK B1
8 KM Basin runoff calculation for area B1
9 BA .0719
* PI E=430 R=2
*
* Placer Design Precipitation - depths in inches
* Return period in years 2 Time interval in minutes 5
* Elevation in feet 430 W of Crest
* Duration in minutes 1300 Maximum depth at 650 minutes
* Cloudburst 1-hr Factor 1.00
*
10 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
11 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
12 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
13 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
14 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.005 0.005 0.005 0.005
15 PI 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.006
16 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006
17 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.007
18 PI 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007
19 PI 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008
20 PI 0.009 0.009 0.009 0.009 0.009 0.009 0.009 0.010 0.010 0.010
21 PI 0.011 0.011 0.011 0.012 0.012 0.012 0.013 0.013 0.015 0.016
22 PI 0.017 0.018 0.019 0.020 0.022 0.024 0.028 0.031 0.044 0.133
23 PI 0.060 0.036 0.028 0.026 0.023 0.021 0.020 0.018 0.017 0.017
24 PI 0.016 0.015 0.013 0.013 0.012 0.012 0.011 0.011 0.011 0.011
25 PI 0.010 0.010 0.010 0.010 0.009 0.009 0.009 0.009 0.009 0.009
26 PI 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.007
27 PI 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007 0.007
28 PI 0.007 0.007 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006
29 PI 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006
30 PI 0.006 0.006 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005
31 PI 0.005 0.005 0.005 0.005 0.005 0.004 0.004 0.004 0.004 0.004
32 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
33 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
34 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
35 PI 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004
36 LU 0 .14 25.8
37 UK 600 .238 .5 100
38 RK 1030 .095 .07 TRAP 8 5
    
```

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

39      KK      Res1
40      KM      Reservoir 1 routing operation
41      RS      1      ELEV      347.3
42      SA      1.27    1.38    1.71    1.91
43      SE      346      347      350      352
44      SQ      0        5        15       25       35       104
45      SE      347.3    348.53   349.28   349.69   350.05   350.88
* *****

46      KK      B1B
47      KM      Kinematic wave channel routing from pt B1 to B
48      RK      1020    .044     .07      TRAP     4       3
* *****

49      KK      B2
50      KM      Basin runoff calculatin for area B2
51      BA      .0171
* PI E=330
*
* Placer Design Precipitation - depths in inches
* Return period in years      2      Time interval in minutes      5
* Elevation in feet          330     W of Crest
* Duration in minutes        1300    Maximum depth at      650 minutes
* Cloudburst 1-hr Factor    1.00
*
52      PI      0.003    0.003    0.003    0.003    0.003    0.003    0.003    0.004    0.004    0.004
53      PI      0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
54      PI      0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
55      PI      0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
56      PI      0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
57      PI      0.004    0.005    0.005    0.005    0.005    0.005    0.005    0.005    0.005    0.005
58      PI      0.005    0.005    0.005    0.005    0.005    0.006    0.006    0.006    0.006    0.006
59      PI      0.006    0.006    0.006    0.006    0.006    0.006    0.006    0.006    0.006    0.006
60      PI      0.006    0.006    0.006    0.007    0.007    0.007    0.007    0.007    0.007    0.007
61      PI      0.007    0.007    0.007    0.007    0.008    0.008    0.008    0.008    0.008    0.008
62      PI      0.008    0.009    0.009    0.009    0.009    0.009    0.009    0.010    0.010    0.010
63      PI      0.010    0.011    0.011    0.011    0.012    0.012    0.012    0.013    0.013    0.016
64      PI      0.017    0.018    0.019    0.020    0.021    0.024    0.027    0.031    0.043    0.132
65      PI      0.060    0.035    0.028    0.025    0.023    0.021    0.019    0.018    0.017    0.016
66      PI      0.015    0.015    0.013    0.012    0.012    0.011    0.011    0.011    0.011    0.010
67      PI      0.010    0.010    0.010    0.009    0.009    0.009    0.009    0.009    0.008    0.008
68      PI      0.008    0.008    0.008    0.008    0.008    0.008    0.007    0.007    0.007    0.007
69      PI      0.007    0.007    0.007    0.007    0.007    0.007    0.007    0.006    0.006    0.006
70      PI      0.006    0.006    0.006    0.006    0.006    0.006    0.006    0.006    0.006    0.006
71      PI      0.006    0.006    0.006    0.006    0.006    0.005    0.005    0.005    0.005    0.005
72      PI      0.005    0.005    0.005    0.005    0.005    0.005    0.005    0.005    0.005    0.004
73      PI      0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
74      PI      0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
75      PI      0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
76      PI      0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
77      PI      0.004    0.004    0.004    0.003    0.003    0.003    0.003    0.003    0.003    0.003
78      LU      0        .14     0
79      UK      600     .16     .5      100
80      RK      540     .059    .07     .004    TRAP     2       3

```

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

81      RK      1020    .044     .07      TRAP     4       3
* *****

82      KK      B1B2
83      KM      Combining two hydrographs at point B
84      HC      2
* *****
85      ZZ

```

AFTER DEVELOPMENT OUTPUT - BASIN B
Q2 STORM

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
+									
+	HYDROGRAPH AT								
	B1	18.	11.17	5.	2.	2.	.07		
+	ROUTED TO								
+	Res1	4.	12.50	3.	1.	1.	.07	348.33	12.50
+	ROUTED TO								
	B1B	4.	12.50	3.	1.	1.	.07		
+	HYDROGRAPH AT								
	B2	3.	11.50	1.	0.	0.	.02		
+	2 COMBINED AT								
1	B1B2	6.	11.67	4.	2.	2.	.09		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME	
						DT	PEAK		
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
	B1 MANE	1.11	17.55	672.98	.81	5.00	17.52	670.00	.81
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3261E+01 OUTFLOW= .3119E+01 BASIN STORAGE= .1292E+00 PERCENT ERROR= .4									
	B1B MANE	2.04	4.20	753.79	.69	5.00	4.20	755.00	.69
CONTINUITY SUMMARY (AC-FT) - INFLOW= .2651E+01 EXCESS= .0000E+00 OUTFLOW= .2641E+01 BASIN STORAGE= .1163E-01 PERCENT ERROR= -.1									
	B2 MANE	2.01	3.11	690.88	.42	5.00	3.10	690.00	.42
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3903E+00 OUTFLOW= .3822E+00 BASIN STORAGE= .1479E-02 PERCENT ERROR= 1.7									

AFTER DEVELOPMENT OUTPUT - BASIN B
Q10 STORM

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT								
+		B1	42.	11.08	9.	3.	3.	.07	
+	ROUTED TO								
+		Res1	13.	11.92	7.	3.	3.	.07	
+									349.13 11.92
+	ROUTED TO								
+		B1B	13.	11.92	7.	3.	3.	.07	
+	HYDROGRAPH AT								
+		B2	9.	11.17	2.	1.	1.	.02	
+	2 COMBINED AT								
1		B1B2	18.	11.50	9.	3.	3.	.09	

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME	
						DT	PEAK		
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
B1	MANE	.90	41.99	664.50	1.57	5.00	41.81	665.00	1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6184E+01 OUTFLOW= .6003E+01 BASIN STORAGE= .1572E+00 PERCENT ERROR= .4

B1B MANE 1.55 13.05 718.03 1.38 5.00 13.03 715.00 1.38

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5296E+01 EXCESS= .0000E+00 OUTFLOW= .5282E+01 BASIN STORAGE= .1589E-01 PERCENT ERROR= .0

B2 MANE 1.53 8.71 670.41 1.01 5.00 8.70 670.00 1.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9333E+00 OUTFLOW= .9230E+00 BASIN STORAGE= .1694E-02 PERCENT ERROR= .9

*** NORMAL END OF HEC-1 ***

AFTER DEVELOPMENT OUTPUT - BASIN B
Q25 STORM

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
+									
+	HYDROGRAPH AT								
	B1	57.	11.00	12.	4.	4.	.07		
+	ROUTED TO								
+	Res1	20.	11.67	10.	4.	4.	.07	349.49	11.67
+	ROUTED TO								
	B1B	20.	11.75	10.	4.	4.	.07		
+	HYDROGRAPH AT								
	B2	12.	11.08	2.	1.	1.	.02		
+	2 COMBINED AT								
1	B1B2	26.	11.50	12.	5.	5.	.09		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME
							PEAK	TIME TO PEAK	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
B1	MANE	.94	57.66	664.12	2.02	5.00	57.08	660.00	2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7952E+01 OUTFLOW= .7756E+01 BASIN STORAGE= .1630E+00 PERCENT ERROR= .4

B1B MANE 1.45 20.08 703.39 1.80 5.00 20.07 705.00 1.80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6915E+01 EXCESS= .0000E+00 OUTFLOW= .6895E+01 BASIN STORAGE= .1757E-01 PERCENT ERROR= .0

B2 MANE 1.45 12.28 668.04 1.43 5.00 12.20 665.00 1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1319E+01 OUTFLOW= .1307E+01 BASIN STORAGE= .2550E-02 PERCENT ERROR= .7

*** NORMAL END OF HEC-1 ***

AFTER DEVELOPMENT OUTPUT - BASIN B

Q100 STORM

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	B1	83.	11.00	15.	6.	6.	.07		
ROUTED TO	Res1	33.	11.50	14.	5.	5.	.07	349.99	11.50
ROUTED TO	B1B	33.	11.50	14.	5.	5.	.07		
HYDROGRAPH AT	B2	18.	11.08	3.	1.	1.	.02		
2 COMBINED AT	B1B2	44.	11.33	17.	7.	7.	.09		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

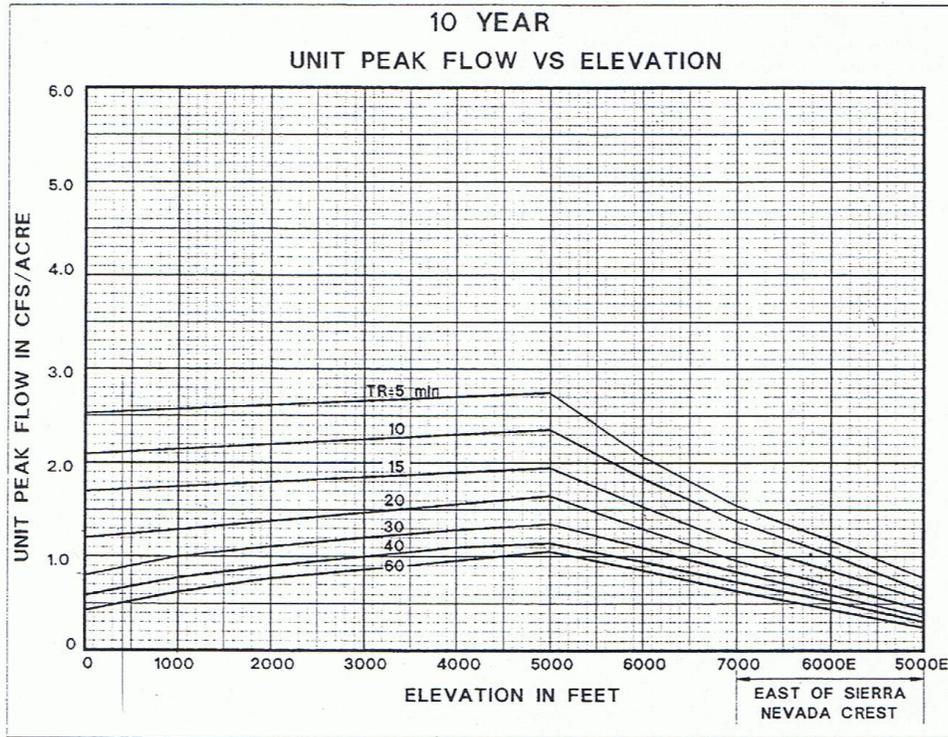
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL			
						DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
B1	MANE	.84	83.47	660.37	2.81	5.00	83.40	660.00	2.81
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1098E+02 OUTFLOW= .1076E+02 BASIN STORAGE= .1740E+00 PERCENT ERROR= .4									
B1B	MANE	1.27	33.32	692.81	2.54	5.00	33.25	690.00	2.53
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9744E+01 EXCESS= .0000E+00 OUTFLOW= .9725E+01 BASIN STORAGE= .2103E-01 PERCENT ERROR= .0									
B2	MANE	1.27	18.09	665.04	2.16	5.00	18.09	665.00	2.16
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1991E+01 OUTFLOW= .1973E+01 BASIN STORAGE= .3390E-02 PERCENT ERROR= .7									

*** NORMAL END OF HEC-1 ***

SECTION D

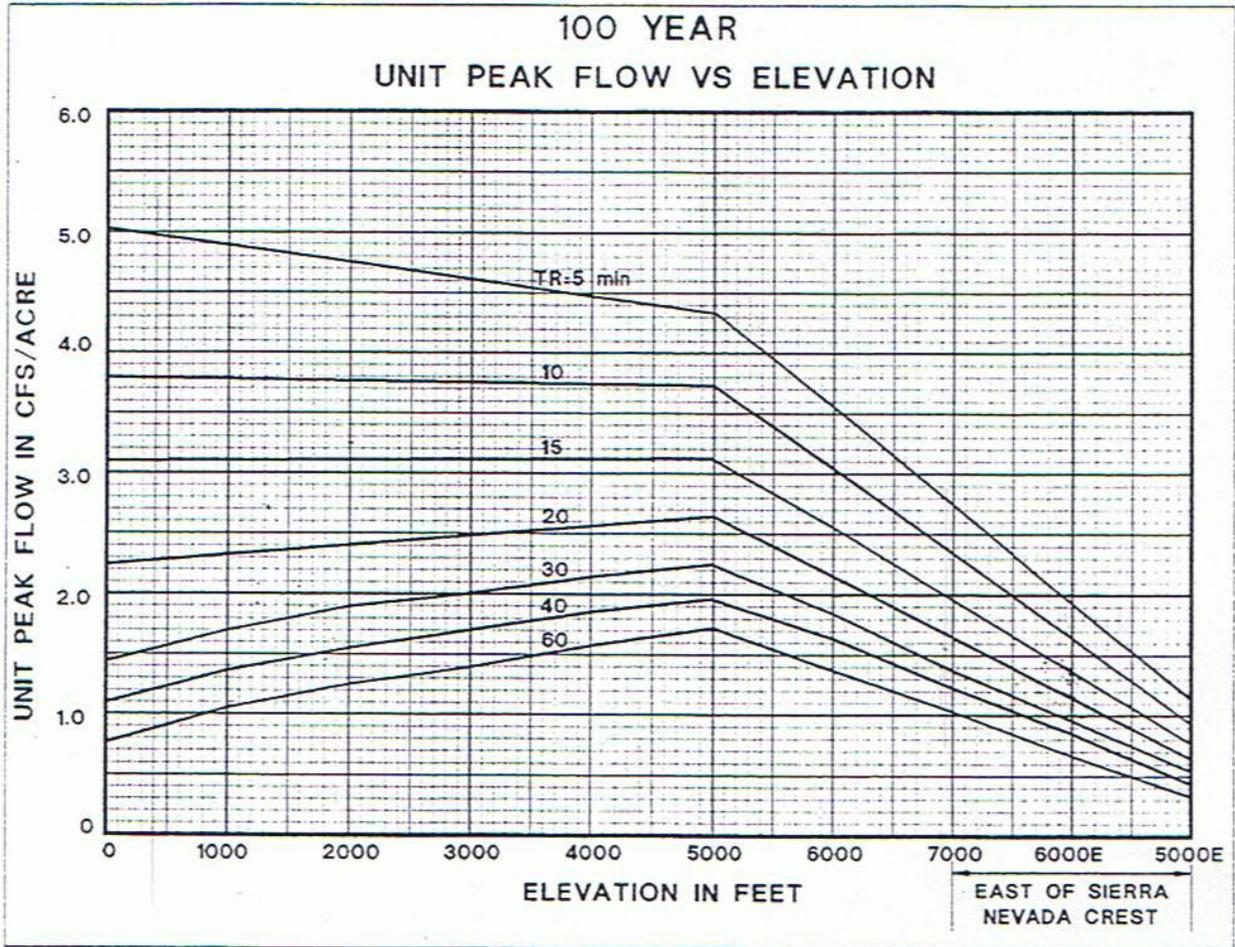
EXHIBITS

FIGURE 5-3A



**EXHIBIT 1a
UNIT PEAK FLOW VALUES**

RE 5-3C



**EXHIBIT 1b
UNIT PEAK FLOW VALUES**
d2

EXHIBIT 2

USDA SOIL TYPES AND SOIL MAP

TABLE 13.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Depth	Hard-ness	Uncoated steel	Concrete
								In		In			
100, 101, 102, 103 Aiken	B	None-----	---	---	>6.0	---	---	>60	---	---	---	High-----	High.
104*: Alamo-----	D	Occasional	Long-----	Dec-Apr	0-1.0	Perched	Dec-Apr	>60	---	20-40	Rip- pable	High-----	Low.
Fiddymont-----	D	None-----	---	---	>6.0	---	---	21-38	Rip- pable	20-37	Rip- pable	Moderate	Moderate
105----- Alamo variant	D	None-----	---	---	1.0-2.5	Apparent	Dec-Apr	36-60	Rip- pable	---	---	High-----	Low.
106, 107, 108, 109, 110, 111 Andregg	C	None-----	---	---	>6.0	---	---	24-40	Rip- pable	---	---	Moderate	Moderate
112*: Andregg-----	C	None-----	---	---	>6.0	---	---	24-40	Rip- pable	---	---	Moderate	Moderate
Rock outcrop.													
113*: Andregg-----	C	None-----	---	---	>6.0	---	---	24-40	Rip- pable	---	---	Moderate	Moderate
Shenandoah-----	D	None-----	---	---	1.0-2.5	Apparent	Dec-May	32-40	Rip- pable	---	---	High-----	High.
114----- Auburn	C/D	None-----	---	---	>6.0	---	---	12-28	Hard	---	---	Moderate	Moderate
115*: Auburn-----	C/D	None-----	---	---	>6.0	---	---	12-28	Hard	---	---	Moderate	Moderate
Argonaut-----	D	None-----	---	---	>6.0	---	---	22-34	Rip- pable	---	---	High-----	Moderate
116*: Auburn-----	C/D	None-----	---	---	>6.0	---	---	12-28	Hard	---	---	Moderate	Moderate
Argonaut-----	D	None-----	---	---	>6.0	---	---	22-34	Rip- pable	---	---	High-----	Moderate
Rock outcrop.													
117*: Auburn-----	C/D	None-----	---	---	>6.0	---	---	12-28	Hard	---	---	Moderate	Moderate

Placer County, California, Western Part

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Depth	Hard-ness	Uncoated steel	Concrete
141*: Fiddymnt-----	D	None-----	---	---	>6.0	---	---	21-38	Rip-pable	20-37	Rip-pable	Moderate	Moderate
142*: Cometa-----	D	None-----	---	---	>6.0	---	---	>60	---	---	---	High-----	Moderate
Ramona-----	B	None-----	---	---	>6.0	---	---	>60	---	---	---	Moderate	Moderate
143----- Dubakella	D	None-----	---	---	>6.0	---	---	21-33	Hard	---	---	High-----	Low.
✓ 144----- Exchequer	D	None-----	---	---	>6.0	---	---	8-20	Hard	---	---	Low-----	Moderate
145*: Exchequer-----	D	None-----	---	---	>6.0	---	---	8-20	Hard	---	---	Low-----	Moderate
Rock outcrop.													
146----- Fiddymnt	D	None-----	---	---	>6.0	---	---	21-38	Rip-pable	20-37	Rip-pable	Moderate	Moderate
147*: Fiddymnt-----	D	None-----	---	---	>6.0	---	---	21-38	Rip-pable	20-37	Rip-pable	Moderate	Moderate
Kaseberg-----	D	None-----	---	---	>6.0	---	---	11-21	Hard	10-20	Hard	Moderate	Moderate
148*: Henneke-----	D	None-----	---	---	>6.0	---	---	10-20	Hard	---	---	High-----	Moderate
Rock outcrop.													
149, 150----- Horseshoe	B	None-----	---	---	>6.0	---	---	>60	---	---	---	High-----	High.
151*: Horseshoe-----	B	None-----	---	---	>6.0	---	---	>60	---	---	---	High-----	High.
Rubble land.													
✓ 152, 153----- Inks	D	None-----	---	---	>6.0	---	---	12-20	Rip-pable	---	---	Moderate	Moderate
154*: Inks-----	D	None-----	---	---	>6.0	---	---	12-20	Rip-pable	---	---	Moderate	Moderate
Exchequer-----	D	None-----	---	---	>6.0	---	---	8-20	Hard	---	---	Low-----	Moderate
155----- Inks variant	B	None-----	---	---	>6.0	---	---	30-54	Rip-pable	---	---	Moderate	Moderate

d4

See footnote at end of table.



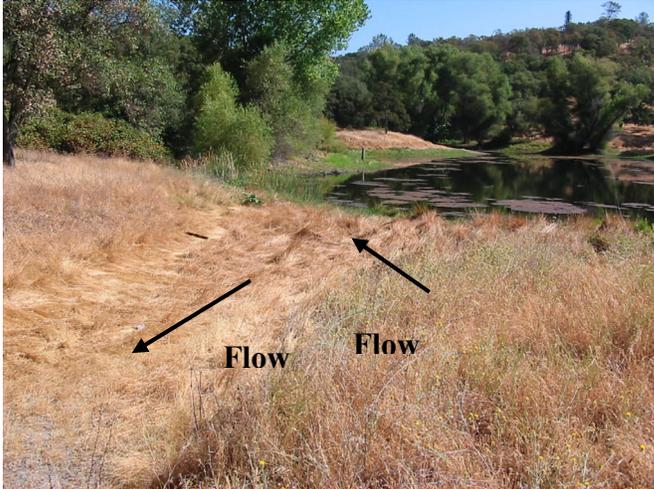
12 30 USDA SOIL MAP (Joins lower inset sheet 16)



USDA SOIL MAP
d5

EXHIBIT 3

PHOTOS



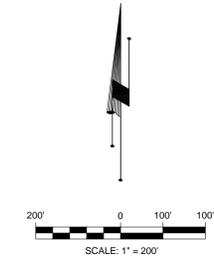
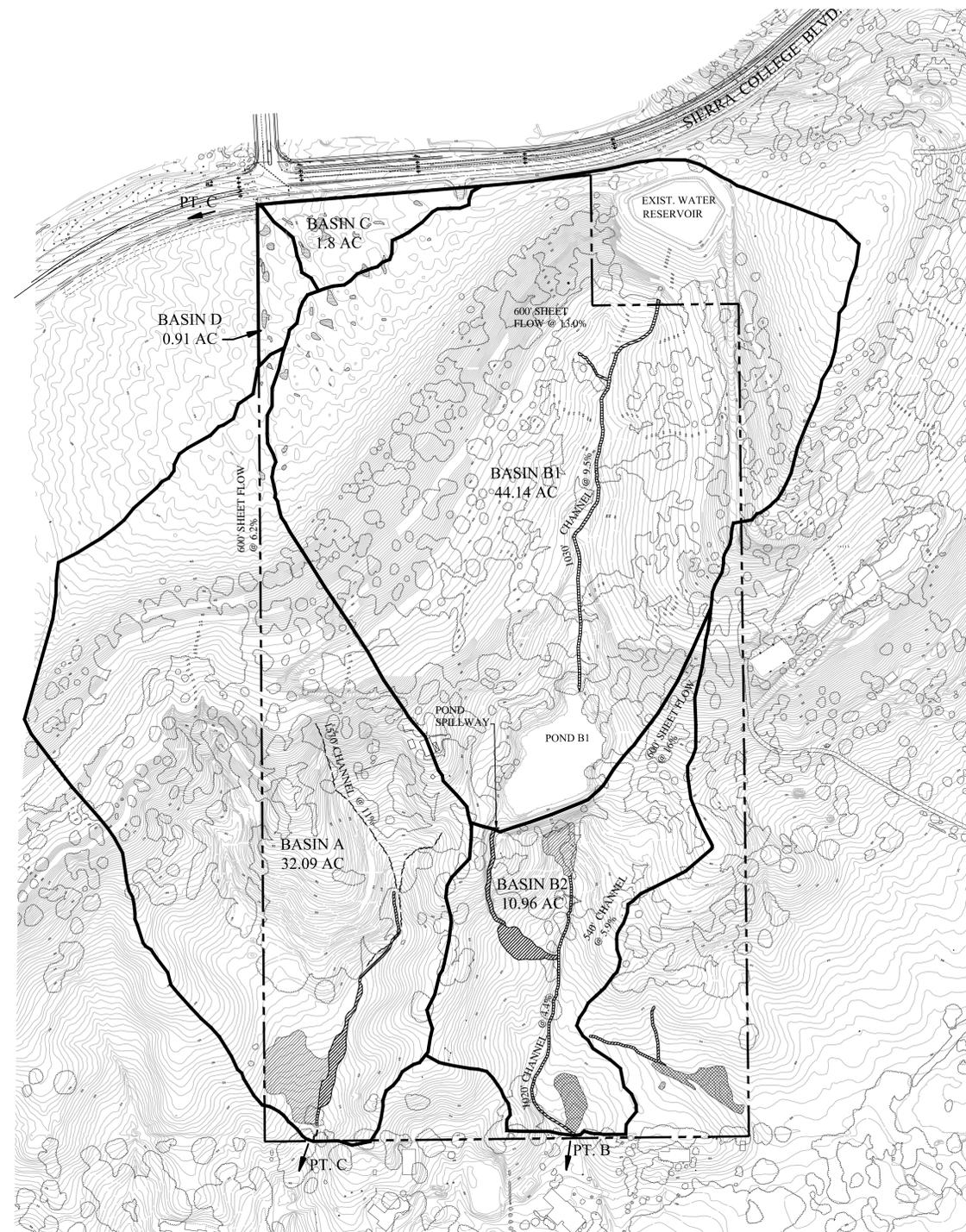
Outlet of onsite pond looking upstream



Basin A looking downstream



Basin B looking downstream



AMAZING FACTS

PLACER COUNTY, CALIFORNIA

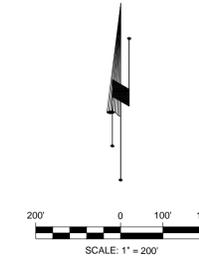
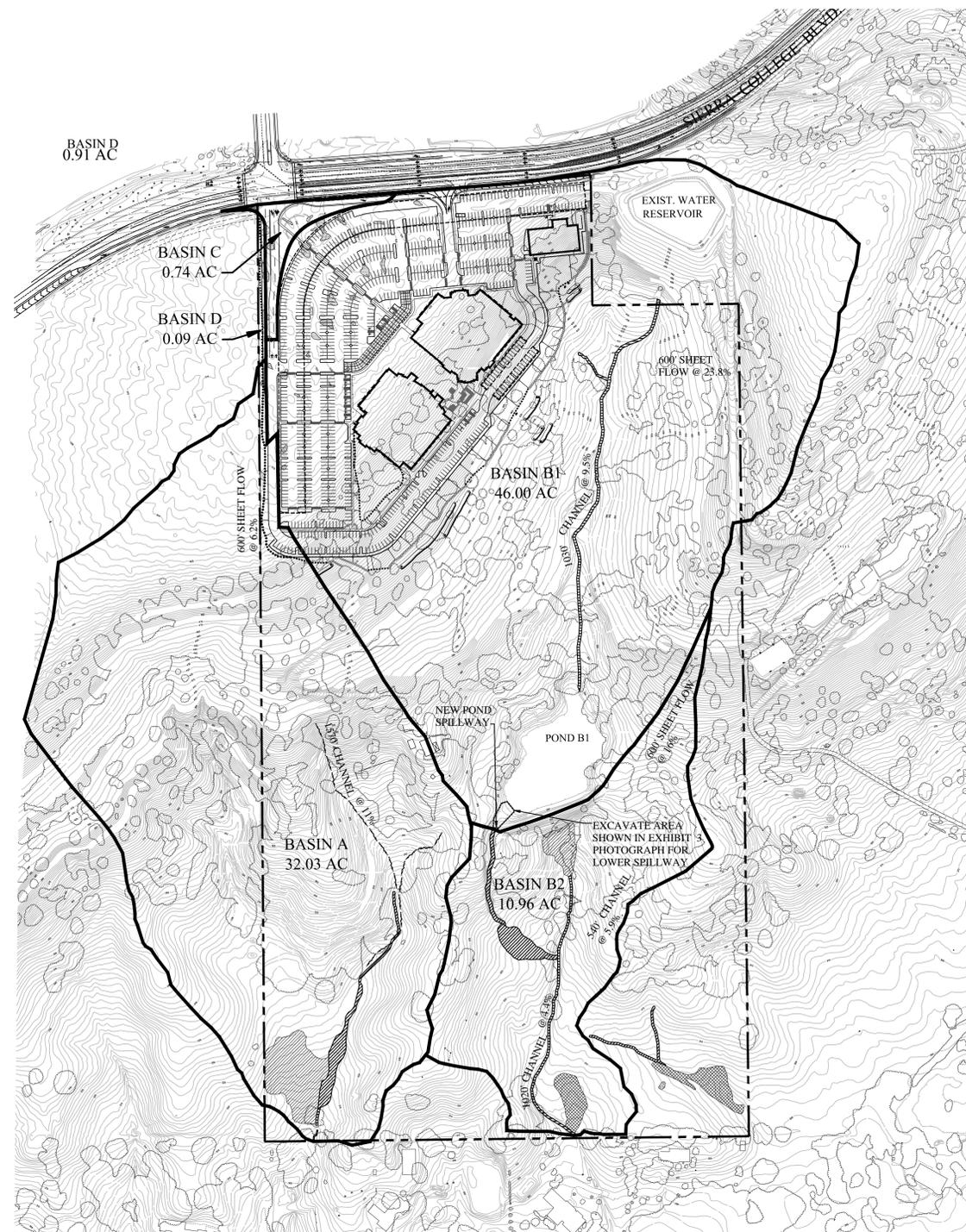
DECEMBER 23, 2008

PRELIMINARY DRAINAGE MAP NO.1 - BEFORE DEVELOPMENT DRAINAGE AREAS

POND B1 DATA

THIS POND ACTS AS A DETENTION BASIN.	TOP OF DAM ELEVATION = 352
POND SURFACE = 1.38 AC	DAM SIZE = 17' HIGH X 300' LONG
SPILLWAY ELEVATION = 349.1	POND VOLUME = 6 AC-FT±

SPILLWAY - TRAPEZOIDAL SHAPE, 8' BOTTOM WIDTH, GRASS LINED



AMAZING FACTS

PLACER COUNTY, CALIFORNIA

DECEMBER 23, 2008

PRELIMINARY DRAINAGE MAP NO.2 - AFTER DEVELOPMENT DRAINAGE AREAS

POND B1 DATA

SPILLWAY - CONCRETE WEIR WITH 1.25' WIDE BOTTOM SLOT, 5' WIDE TOP WIDTH, FOLLOWED BY A GRASS LINED SWALE.
 LOWER WEIR SPILL ELEVATION = 347.3
 UPPER WEIR SPILL ELEVATIONS = 348.6 CONCRETE AND 349.6 EARTH
 FREEBOARD AT 100-YR STORM = 2' @ $Q_{100} = 33$ CFS
 MAX OUTLET WEIR RATING = 104 CFS AT W.S. ELEVATION = 350.86 (1.14' FREE BOARD)