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January 21, 2010

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California Energy Commission
Attention: Eric K. Solorio, Project Manager
1516 Ninth Street, MS-15
Sacramento, CA 95814-5512

Transmitted by Email to: esolorio@energy.state.ca.us

Subject: Ridgecrest Solar Power Project (RSPP)
Scoping Comments on SA/DEIS (CEQA and NEPA)

Dear Mr. Solorio,

Attached are comments written pursuant to the CEQA and NEPA Scoping Hearings held for the proposed Ridgecrest Solar Power Project (RSPP) at Ridgecrest City Hall and at Inyokern Town Hall on January 5 and 6, 2010.

These comments are derived from 30+ years of professional engineering in county service involving public works and land development projects. My reason for comment, however, relates to real property interests in the Indian Wells Valley (IWV) whose roots reach back to 1909 when Robert R. Thompson envisioned development of the Indian Wells Valley (IWV) as a farming community similar to that of Fresno, Riverside, and Redlands and with apple, raisin, alfalfa, and fig production.

Although I am in support of alternative energy projects in general, such support is reserved for those projects whose impacted resources have been fully disclosed, evaluated, and <u>reasonably mitigated to the level of insignificance</u>. With such an approach, it is hoped that the risk for legal challenge is minimized and timely final approval or denial of a proposed project results.

These comments are directed toward satisfactory scoping of the Staff Analysis and Draft Environmental Impact Study (SA/DEIS) for the RSPP.

Please accept my appreciation of the professional manner and patience by which the January 5 and 6, 2010 Informational and Scoping Workshops and Hearings were conducted by CA-CEC, US-BLM, and RSPP.

Also, please verify that my Email address of rthompson777@sbcglobal.net has been added to the notification list for information related to this project.

If you have any questions, please feel free to call me at Cell (559) 907-1411.

Respectfully submitted,

Robert L. Thompson, P. E.

Attachment A

Scoping Comments for SA/DEIS

1. **Address in summary form the highest and best use for the project site for each of the RA's considered in the SA/DEIS.**

2. **Address in summary form by RA in the SA/DEIS the benefits afforded and disadvantages imposed by the proposed project to the present and future population living within the Indian Wells Valley.** A beneficial project is one in which the resources consumed by the proposed project from within the IWV are offset by comparable return in kind to those resources consumed by the IWV population, e.g., commercial and residential electricity and potable water. A project that simply consumes IWV resources while exporting the product to others outside of the IWV and not enhancing the IWV community is unacceptable.

3. **Address status of Brown Road as a County-maintained road within the proposed project area in terms of a public road <u>right-of-way</u> or <u>permitted encroachment</u> over federal lands and the effect the California Streets and Highways Code has on encroachments within, over, or under Brown Road.** Applicability of county franchise regulations to the project both on-site as well as off-site improvements should be discussed.

4. **Address potable and non-potable water use by the project and require a net-zero impact to potable groundwater resources within the IWV.** The SA/DEIS should consider offsetting project use of available potable groundwater, whether from on-site well(s) or by water service from others, by including in the project scope a requirement to treat an equivalent amount of non-potable water to potable standards.

5. **Include in the cumulative impacts discussion on potable groundwater resource impacts those impacts from the pending BRAC for China Lake and other pending city and county projects.** A list of such projects should be reviewed under SA prior to incorporation for DEIS preparation.

6. **Include in the project mitigation and monitoring plan a requirement for ensuring treatment of non-potable water at least compensates for the use of potable groundwater.**

7. **Include in the SA/DEIS a discussion of existing groundwater conditions in the IWV in terms of mounding near natural and man-made recharge areas and depressions near areas of significant groundwater withdrawal.**

8. **Address in the cumulative impacts discussion on potable groundwater the critically-stressed IWV aquifer(s) and the various approaches the current and future IWV population may rely upon to maintain the status quo.** A decision to accelerate the consumption of critically-limited potable groundwater for such a project as this should first be tempered with a reasonable estimation of future demands for the limited water resource. For example, if this project is allowed to show net-zero impact by funding an IWV-wide change-out to 'low-flow' faucets, showers, and toilets, that cost-effective alternative will not be available to IWV residents in the future, leaving consideration to the more costly approaches only.

9. **Add <u>Air Quality</u> as a Resource Area (RA) to the SA/DEIS**: Because of significant health, safety, and welfare issues related to PM 10 and 2.5 dust and because up to 2111 acres of native desert soils is proposed to be disturbed with project grading, the SA/DEIS should add this RA for identification of the level that wind-driven dust will be a significant issue during the construction and operational phases of the project.

10. **Address displacement of all historical recreational activities under the Land Use Resource Area in the SA/DEIS**: Existing recreational uses of public lands within the project area were cited in the scoping meetings, including, but not limited to, astronomy, camping, hiking, and Off-Highway Vehicle activities. Such activities an their extent should be disclosed and commensurate mitigation be required. Such mitigation should include similar qualities of experience within a reasonable distance from the project site.

11. **Address in the Biological Resource Area potential impacts to identified ESA species within the project site arising from perennial flash floods**. Viability of the El Paso Wash and other drainages within the project site as effective, long-term refuge areas should be evaluated given that mortality of Threatened Species during flash flood is potentially significant. The use of setback buffers from these drainages should be considered to allow adequate refuge from such hazards.

12. **Address the potential environmental impacts of a 'Cash for Grass' program if such a program is proposed to mitigate impacts to a critically-stressed aquifer.** If buyout of high water use crops in the valley such as alfalfa farming is to be considered, impacts to ESA species commonly present with such crops should be discussed and addressed. Viability of such a program depends on thorough identification of such reasonably foreseeable impacts prior to project approval.

13. **Address impact of proposed above-ground changes to the view-shed by considering the use of patterns on buildings and fences that blend into the natural terrain and vegetation.** A variegated, pattern e.g., desert camouflage, as opposed to a single color as shown in the project materials is preferred and recommended for above ground fences and structures visible from off-site.

14. **Address project lighting impacts and consider lighting and security systems that minimize impacts to the naturally dark IWV and its recreational users.** The maintenance of project facilities should include the consideration of non-visible light for security purposes and 'as-needed' visible lighting for night-time inspection and repairs.

15. **Address the project's impact to discharge of surface runoff for the 100-year storm event for both on-site and downstream improvements.** An engineering drainage study which discloses all surface drainage design parameters should be presented for review and should mitigate all increases in discharge for both flow rate and volume upstream and downstream for the 2, 5, 10, 50, and 100-year flood events consistent with Kern County development standards. Design parameters should include but not be limited to, existing soil permeability, compacted surfaces, Manning's roughness coefficients for existing and proposed channels and drainages, time of concentration. Data from the FEMA Flood Insurance Study dated 9/26/2008 for the El Poso washes should be incorporated into the drainage study. If the project increases storm runoff, containment of the additional water should be considered.

16. **Consider interception of storm water discharges and methods as a mitigation measure for potable water usage by recharging or injection of such waters into the groundwater before they reach areas of non-potable groundwater.** Such methods would include detention levees, drain wells in areas where storm water is trapped or detained such as west of US 395.

17. **Address the need for setbacks of the project improvements from natural drainage channels to allow free passage of flood waters and evacuation by wildlife.**

18. **Identify and address how existing survey monumentation will be perpetuated within the project site.**

19. **Address in the SA/DEIR a rehabilitation plan that would return the project site to the pre-project conditions and include in the discussion the form of security that would guarantee such rehabilitation should the project fail for any reason.**

Vol P County No. 587.

Begins Sec 2.

Petition and Bond filed: Dec. 4, 1922.

23 161 Petition and bond accepted: Dec. 4, 1922.

Viewers:

Thornton - Hathaway - Cline

23 171 Report of viewers filed: Dec. 18, 1922.

Report of viewers presented: Dec. 18, 1922.

23 171 Hearing set for: Jan. 15, 1923.

Published in San Joaquin Valley Tribune.

23 171 Report of viewers approved: Dec. 18, 1922.

23 186 Declared a public highway: Jan. 15, 1923.

Description:

21-40 The road as laid out on the ground, is sixty feet in width, lying along and for thirty feet on each side of the following described center line:

Beginning at a point on the north boundary of Section Two (2), Township Twenty-five (25) South, Range Thirty-eight (38) East, M. D. B. & M., which point lies on the west side of and one hundred thirty (130) feet distant, measured at right angles, from the center line of the Southern Pacific Railroad, and running thence S 13°37' E., and parallel to said railroad to a point lying north of and one hundred thirty-two and forty-three hundredths (132.43) feet from the north boundary of reservation claimed by said railroad in

County Road No. 587. (cont.):

line of said Railroad, thence S13°37'E., and parallel to said railroad to the center line of Orchard Street, according to the map of the Town of Inyokern filed for record in the Office of the Recorder of Kern County, California July 25, 1914, thence westerly and along center line of said Orchard Street to the center line of Broadway, according to said map, thence southerly and along centerline of said Broadway, to the centerline of Locust Avenue, according to said map, thence easterly and along the center line of said Locust Avenue to a point lying on the west side of and one hundred thirty (130) feet from the center line of the Southern Pacific Railroad, thence southeasterly and parallel to Southern Pacific Railroad, to a point lying north of and 1288.65 feet from the north boundary of reservation claimed by Southern Pacific Railroad at Terese Station, thence N62°50'E., 260.0 feet thence S27°10'E., 1202.05 feet, thence S57°10'E. 100.0 feet to a point bearing N62°50'E., thirty feet from the northeast corner of the additional right of way of the Southern Pacific Railroad at Terese Station, thence S27°10'E., and parallel to Southern Pacific Railroad 3000.0 feet, thence S2°50'W., 100.0 feet; thence S27°10'E., and parallel to Southern Pacific Railroad 6314.0 feet thence S50°57'E., 691.80 feet, thence S64°29'E., 639.40 feet, thence S75°41½'E., 20500.0 feet, thence S76°34'E., County Road No. 587. (cont.)

thence S16°37'E., 728.60 feet; thence S6°55½'E., 1878.20 feet; thence S9°13½'E., 2308.20 feet; thence S2°43'W., 693.70 feet thence S0°11'E., 977.50 ft, thence S16°22½'E., 1497.60 feet; thence S29°52'W., 1244.80', thence S33°42'W., 1016.70 feet; thence S36°38'W., 988.90 ft, thence S28°00'W., 422.60 feet; thence S0°31'E., 579.75 feet, thence S27°01½'E., 906.30 feet; thence S20°01½'E., 1557.60 ft, thence S37°42½'E., 334.0 feet; thence S69°55'E., 434.20 ft, thence S46°40½'W., 1902.90 feet, thence S36°00'W., 775.0 ft thence S47°09'W., 1188.30 feet, thence S38°30'W., 795.10 ft, thence S32°59'W., 795.40 feet; thence S47°45'W., 779.75 ft, thence S66°27'W., 195.70 feet; thence S49°39'W., 555.45 ft, thence S61°52½'W., 494.30 feet; thence S23°25½'W., 321.75 ft thence S17°55½'W., 678.85 feet thence S55°33'W., 705.20 ft, thence S37°26½'W., 952.65 feet; thence S63°30'W., 382.85 ft, thence S80°25½'W., 667.90 feet, thence S69°08'W., 607.00 ft, thence S29°19'W., 1092.50 feet; thence S46°47'W., 552.80 ft, thence S62°35'W., 1556.40 feet, thence S78°01'W. 527.80 ft, thence S88°39'W., 579.50 feet; thence S37°06'W., 1489.60 ft, thence S18°13'W., 294.79 feet, thence S38°23'E., 398.50 ft, to an intersection with the Goler-Rand branch of the proposed road, thence S31°47'E., 1015.50 feet, thence S15°44'W., 219.90 feet, thence S12°22'E., 360.90 feet; thence S42°40'E., 419.80 feet, thence S53°00'E., 967.40 feet, thence S32°44'E., 511.00 feet, thence S14°44'E., 441.10 feet; thence S33°47'E., 16200.0 feet to the Randsburg-Johannesburg Highway.

Also, beginning at the above described intersection with the Goler-Rand Road, and running thence S83°45'W., 490.40 feet; thence N74°53'W., 2696.80 feet thence N69°47'W.

Minutes Vol. Page	County Road No. 587 (Con't.)
	thence S83°37'W., 1307.40 feet; thence S88°17'W., 885.20 ft; thence N79°21'W., 439.70 feet; thence N85°49'W., 347.10 feet; thence N66°04'W., 572.70 feet; thence S58°28'W., 600.60 feet; thence S73°47'W., 377.0 feet; thence S83°46'W., 637.10 feet; thence S61°28'W., 515.90 feet; thence S78°19'W., 637.60 feet; thence N89°48'W., 597.30 feet; thence S63°36'W., 715.0 feet; thence S25°53'W., 1009.70 feet; thence S65°18'W., 1296.80 feet; thence S70°08'W., 1187.70 feet; thence S21°57'W., 1204.70 feet; thence S42°29'W., 1076.40 feet; thence S30°24'W., 885.0 feet; thence S13°44'W., 895.40 feet to intersect County Road No. 186.
	Total length — 41.4 Miles. ~~42.9 miles~~
	Width 60 feet
29-313	Portion Road No. 587 Abandoned - April 1, 1929.
	Description: (This portion parallels R.R. on westerly side)
	Beginning at a point in the north line of Section 8-T27S-R39E M.D.B.&M., and running thence southeasterly and parallel to the S.P.R.R., to a point lying north of and 1288.65 feet from the north boundary of reservation claimed by S.P.R.R., at Terese Station; thence N62°50'E across said R.R. Track to the easterly R/W line of said Railroad.
	Length - 1½ Miles Approximately 1.50 miles
	32.15 mi. to State 1933
9-1-57	For re-alignment of port Co. Rd 587 See: Co. Rd 1916
5-[illegible]-56	In re [illegible]

FLOOD INSURANCE STUDY

KERN COUNTY, CALIFORNIA
AND INCORPORATED AREAS

VOLUME 1 OF 3

Community Name	Community Number
KERN COUNTY,	
UNINCORPORATED AREAS	060075
ARVIN, CITY OF	060076
BAKERSFIELD, CITY OF	060077
CALIFORNIA CITY, CITY OF	060440
DELANO, CITY OF	060078
MARICOPA, CITY OF	060079
MCFARLAND, CITY OF	060080
RIDGECREST, CITY OF	060081
SHAFTER, CITY OF	060082
TAFT, CITY OF	065063
TEHACHAPI, CITY OF	060084
WASCO, CITY OF	060085

September 26, 2008

Federal Emergency Management Agency
FLOOD INSURANCE STUDY NUMBER
06029CV001A

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Dixie Wash								
A	0	379	2,151	2.1	2,414.0	2,414.0	2,414.9	0.9
B	170	439	1,639	2.8	2,414.3	2,414.3	2,415.0	0.7
C	1,550	115	432	10.7	2,421.7	2,421.7	2,421.8	0.1
D	2,925	200	852	5.4	2,430.1	2,430.1	2,430.9	0.8
E	4,655	90	396	11.6	2,440.9	2,440.9	2,441.9	1.0
F	5,735	150	773	5.9	2,449.3	2,449.3	2,449.8	0.5
G	7,135	325	709	6.5	2,455.8	2,455.8	2,456.6	0.8

[1] Feet Above Inyokern Road

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY
KERN COUNTY, CALIFORNIA
AND INCORPORATED AREAS

FLOODWAY DATA

LITTLE DIXIE WASH

Table 5 - SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs)			
		10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Antelope Creek					
At Tehachapi Western Corporate Limit	25.4	2,730	6,970	9,090	18,000
At Western Corporate Limits	4.8	650	1,150	1,380	1,900
Blackburn Creek					
At Tehachapi Boulevard and Dennison Road	10.1	2,410	5,780	7,450	11,850
At Western Corporate Limits	16.2	2,730	6,970	9,090	18,000
Downstream of Tehachapi Boulevard	28.2	3,310	8,250	12,030	23,000
Near Highline Road	4.5	--	--	5,290	--
Blackwells Corner					
At State Highway 46	14.3	500	1,460	2,550	6,000
Bodfish Creek					

-- Data Not Available

Table 5 - SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs)			
		10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
2,850 Feet above Confluence with Kern River	14.2	--	--	7,280	--
11,000 Feet above Confluence with Kern River	7.7	--	--	3,780	--
At Confluence with Kern River	16.8	--	--	8,530	--
Boron Avenue Creek					
At Confluence with Twenty Mule Team Creek	3.6	580	2,000	3,000	6,700
Breckenridge					
At Fairfax Road	14.0	520	1,200	1,600	2,900
Cache Creek					
At Downstream Limit of Study	163.4	1,900	5,300	7,800	16,400

-- Data Not Available

Table 5 - SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Caliente Creek					
Above Bealville Road Bridge	186.1	1,800	7,550	19,800	56,000
At State Highway 58	467.8	3,600	16,000	27,000	87,500
Caliente Creek Near Loraine					
Back Canyon Just Upstream of Confluence of Weaver Creek	20.0	325	1,800	3,350	12,300
Downstream of Indian Creek Confluence	124.0	1,650	9,050	16,900	61,000
Upstream of Sand Canyon Confluence	51.0	800	4,000	7,650	26,000
Upstream of Unnamed Tributary Confluence	47.0	770	3,800	7,100	24,000
Calvert Wash					
At Confluence With North El Paso Wash	12.8	--	--	1,425	--

-- Data Not Available

Table 5 - SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Cane, Chollo, and Short Canyon Creeks (Combined)					
At Kelso Creek Floodplain	21.55	--	--	3,800[1]	--
City of McFarland					
Basin 1	24.3	--	--	1,900	--
Basin 2	12.8	--	--	1,200	--
Basin 3	5.2	--	--	700	--
Basin 4	22.3	--	--	2,800	--
Basin 5	7.1	--	--	800	--
Basin 6	4.2	--	--	850	--
Claymine Wash					

[1] Represents 80 Percent Reduction in Flow

-- Data Not Available

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		10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
At State Highway 58	4.2	--	--	3,200	--
Cottonwood Creek					
At Mouth	51	500	3,750	7,800	34,000
Cuddy Creek					
At Lebec Road	46.4	850	3,900	7,750	25,000
Doyle Street					
At Beardsley Canal	2.7	--	--	650	--
East China Lake and College Heights Washes (Combined)					
At East Ridgecrest Boulevard	20.2	480	3,350	5,800	14,100
East Nicolls Peak					
At Apex of Alluvial Fan	1.0	140	820	1,540	5,480

-- Data Not Available

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Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
El Paso Wash					
At North Downs Street and Ridgecrest-Inyoken Road	12.7	240	1,670	3,000	7,050
Erskine Creek					
At State Highway 179	37.7	850	2,300	7,700	25,000
Grapevine Canyon Creek	11.0	520	4,330	9,200	42,000
Great Circle Creek					
At Confluence with Yerba Rusche Creek	3.66	560	1,970	3,000	8,200
Hawthorne Boulevard					
At Union Avenue	3.0	310	680	1,050	1,950
Indian Creek					
At Confluence With Caliente Creek	58.0	1,200	5,750	10,200	34,000

-- Data Not Available

Table 5 - SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Indian Wells Canyon Creek	17.0	730	6,930	15,400	77,100
Jawbone Canyon Wash					
At Munsey Road	280.4	6,000	25,000	36,000	60,000
Kelso Creek					
At State Highway 178	159.5	2,850	11,000	22,700	68,000
Kern River					
At Gaging Station 5.8 Miles Northeast of Bakersfield Post Office	2,407.0	2,800	7,000	10,200	28,700
At Kernville Gaging Stations	1,009.0	13,400	44,000	69,000	186,000
At Stockdale Highway	--	2,800	7,000	10,200	28,700
Little Dixie Wash					
At Old Highway 395	215.0	9,000	19,500	27,000	53,600

-- Data Not Available

Table 5 - SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs)			
		10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Flow Past Airport	--	--	--	6,000	--
Split Flow Through Inyokern	--	--	--	1,185	--
McFarland					
Along State Highway 99	4.2	--	--	2,550	--
North El Paso Wash					
Above Confluence With South El Paso Wash	6.9	--	--	2,000	--
North Ridgecrest Wash					
At Ridgecrest Corporate Limits	6.9	--	--	1,800	--
North Sandy Creek					
At Confluence with Sandy Creek	3.3	14	1,260	2,230	4,400

-- Data Not Available

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Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs)			
		10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Poso Creek					
At State Highway 58	368.0	2,900	11,500	19,000	52,000
Ridgecrest Wash					
At North China Lake Boulevard	10.8	230	1,600	2,700	6,750
Sand Canyon Creek	18.1	710	6,640	14,700	72,700
Sandy Creek					
At East End of Taft Airport	14.0	1,260	1,600	2,100	--
Just below Confluence with North Sandy Creek	20.2	1,274	2,980	4,440	--
Sheetflow At Mohave	20.0	--	--	13,300	--
Short Canyon Creek	4.8	350	2,610	5,300	22,600
South El Paso Wash					

-- Data Not Available

Table 5 - SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
At Ridgecrest Corporate Limits	12.7	--	--	3,000	--
South Fork Kern River					
Near Onyx	530	3,700	12,000	21,500	76,100
South Ridgecrest Wash					
At Las Flores Avenue	2.5	--	--	880	--
Tierra del Sol Creek					
At Confluence with Cache Creek	2.69	450	1,700	2,800	9,290
At North Loop Boulevard	1.96	445	1,680	2,765	9,175
At South Loop Boulevard	1.32	360	1,350	2,225	7,380
Twenty Mule Team Creek					
At AT&SF	44.1	--	--	7,300	--
Unnamed Tributary to Caliente Creek					

-- Data Not Available

Table 5 - SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
At Confluence With Caliente Creek	2.0	90	450	600	1,550
Upper Sycamore Creek					
At Lower End of Valley Road	14.9	260	990	2,900	10,000
Ward Street					
At Norris Road	5.9	--	--	1,300	--
Weaver Creek					
At Confluence With Caliente Creek	26.0	525	2,550	4,500	14,600
West China Lake Wash					
At East Ridgecrest Boulevard	1.8	70	500	860	2,100
Yerba Rusche Creek					
At Mendiburu Road	5.02	780	2,350	3,600	8,200

-- Data Not Available

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were performed to provide estimates of the flood elevations of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Cross sections were determined from topographic maps and field surveys. All bridges, dam, and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed, selected cross-section locations are also shown on the FIRM.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Roughness factors (Manning's "n"values) used in hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas. A summary of the Manning's "n" values used for floodplain modeling of the streams studied in detail is shown in Table 6. The dimensions of structures that produce backwater were identified through field measurements. The dimensions of backwater-producing structures were identified through field measurements.

All qualifying bench marks within a given jurisdiction that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First of Second Order Vertical and have a vertical stability classification of A, B, or C are shown and labeled on the Firm with their 6-character NSRS Permanent Identifier.

- Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classifications. NSRS vary widely in vertical stability classifications. NSRS vertical stability classifications are as follows:

    - Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)

    - Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)

    - Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument blow frost line)

    - Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS bench marks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM in the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

Kern County

Cross sections for the backwater analyses for most flooding sources in Kern County were obtained from aerial photographs at the negative scales of 1:2,400; 1:6,000 and 1:9,600. Cross sections used in the backwater computations for the stream sources in the Loraine, Mojave, and Inyokern areas were derived from photogrammetric compilation of aerial photographs, flown in November 1984 and January 1985 at a scale of 1:14,400 (Rick Engineering Company, January 1985). The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Aerial reconnaissance (November 15, 1978) of the Kern River was supplied by the California DWR. Photographs were taken from 3,000 feet, with a negative scale of 1:6,000. Photogrammetric models were controlled (horizontally and vertically) by the California DWR.

For Blackburn and Antelope Creeks, channel and floodplain geometry was obtained using mapping developed by the NRCS. Photogrammetric models were field checked and controlled (vertically and horizontally) by field survey to third-order accuracy. Cross sections for the backwater analyses were obtained from NRCS data and supplemented by an existing map (U.S. Department of Agriculture, 1977, Mason, Vancuren and Wachob Civil Engineering, 1977, Cooper Aerial Survey, 1979 respectively). For Erskine Creek, cross sections for the backwater analysis were developed using a map at a scale of 1:2,400, with a contour interval of 2 feet (Aerial Photometrics, 1976).

Structural geometry of the Friant-Kern Canal and bridges near McFarland was obtained by the study contractor during field reconnaissance. Caliente and Inyokern bridges also were field surveyed (Rick Engineering Company, 1985).

In developing the flood risk data for the area east of the AT&SF Railway in the vicinity of the Mohave Airport, it was assumed that that flow paths for discharges originating from the alluvial fans to the west would be altered when they are intercepted by the railroad bed. The effect of this change in flow direction is that the flows tend to parallel the railroad in a swale along the western side of the railroad bed. Because the swale is too small to carry the total accumulated discharge, some flow will spill over the railroad bed and travel in an unpredictable manner toward the southeast.

The hydraulic modeling of this flood hazard was accomplished with the HEC-2 computer program (U.S. Department of the Army, Corps of Engineers, 1976). Because the flow paths are unpredictable and the flow depths average 1.0 foot, the area east of the railroad was designated Zone AO, Depth 1 foot. Although the elevations produced by the HEC-2 computer program were not shown on the FIRM, the velocities from that program are given below for use as a guide in managing development in this area. North of Highway 14, velocities range from 3 to 4.5 feet per second. South of Highway 14, velocities range from 5.5 through the shopping center to 2.5 feet per second above the Southern Pacific Railroad Grade. Through the Town of Mojave, flow velocities range from 3 to 6 feet per second.

For the study of the Caliente Creek (Loraine), Mojave, and Inyokern areas, starting water-surface elevations were based on approximate hydraulic computations using Manning's equation and existing studies where applicable.

Areas subject to alluvial fan flooding include Grapevine Canyon, Short Canyon, and Indian Wells Canyon. Topographic mapping at a scale of 1:1,000, with contour intervals of 5 and 20 feet, were used to determine alluvial fan boundaries.

The KCWA has identified Short, Cane, and Chollo Canyon Creeks, which are tributaries to Kelso Creek, as alluvial fans. The toes of these tributary fans are included in the analysis of the Kelso Creek floodplain. Alluvial fan depth, width, and velocity were computed using discharge probabilities from log-Pearson Type III analyses In accordance with U.S. Water Resources Council Bulletin 17A (U.S. Water Resources Council, 1977) and FEMA special flood hazard guidelines for alluvial fans (U.S. Department of Housing and Urban Development, no date).

In accordance with FEMA guidelines, the alluvial fan is characterized by unstable channel systems due to slope and soil conditions. Consequently, flows rarely spread evenly over the surface of an alluvial fan and can be concentrated in an identifiable temporary channel or confined to only portions of the fan surface. The ability of scour and deposit sediment makes flow paths prone to lateral migration and relocation to any portion of the fan during a single runoff event and subsequent events. This erratic, unpredictable behavior subjects all portions of the fan to potential flood hazard, regardless of location. As the fan widens, the probability of flooding at a given depth and velocity at a specific point, generally decreases.

Because the area east of China Lake Naval Weapons Center is undeveloped, the hydraulic analyses of the fans assumed unobstructed flow. U.S. Highway 395 and State Highway 14, although crossing the base of the fans perpendicularly, would not obstruct natural flows, because they are not elevated. There are several small culverts under U.S. Highway 395 that would convey nuisance water from the more frequent storms. During 1-percent annual chance peak flows, these would become silted and be considered ineffective.

Flows from Indian Wells Canyon are contained in a well-defined channel above State Highway 14. During the storm of 1945, flow broke through a dirt bank just upstream of State Highway 14 and flowed northerly. This bank has since been reinforced with large boulders and dirt.

The 1-percent annual chance flooding for the approximate-study reach of the Poso Creek split flow was estimated using normal-depth calculations. The flooding for the Kern River Flood Canal approximate study was based on a HEC-2 analysis prepared by the California DWR. The 1-percent annual chance flooding for other approximate studies was estimated using normal-depth calculations.

Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for the streams studied by detailed methods were calculated using the slope-area method.

In the revisions within the unincorporated areas of Kern County, cross section data for the backwater analyses were obtained from topographic maps compiled from aerial photographs (Flood Boundary Map, no date). All bridges and culverts were surveyed to obtain elevation data and structural geometry.

Water-surface elevations of floods of the 1-percent annual chance recurrence interval were computed using the USACE HEC-2 step-backwater computer program (U.S. Department of the Army, 1973). The starting water-surface elevation for Bodfish Creek was determined using the slope area method.

Channel and overbank roughness factors (Manning's "n"values) used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the stream and floodplain areas. The channel "n" values for the Bodfish Creek ranged from 0.07 to 0.1, and the overbank "n" values ranged from 0.075 to 0.1.

The analysis of Bodfish Creek showed that at each road crossing the culvert capacity was inadequate, causing a portion of the flows to be diverted down the road. At Upper Bodfish Canyon Road about half of the total flow is diverted west along the road and through swales north and south of the road for a distance of about 1,400 feet, where it is intercepted by an unnamed tributary, which carries the overflow back to the main channel. The Lake Isabella Road crossing diverts some flow north along the road and through the commercial area northwest of Lake Isabella Road.

The hydraulic analysis of East Nicolls Peak was performed using the alluvial fan procedures adopted by FEMA (Flood Insurance Study, 1985). The apex of the fan is located 5,100 feet up-fan of Kelso Valley Road. The right side of the alluvial fan is defined by a wide shallow swale. Many of the possible flood paths across the fan enter the swale well above the toe of the fan (in the Kelso Creek floodplain). Thus the probability of a given flood inundating a given point within the swale is greater than the probability of that flood inundating a given point at the same elevation but not within the swale. The flooding analysis performed for East Nicolls Peak alluvial fan included the effects of the swale.

City of Bakersfield

In the City of Bakersfield, analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Water-surface elevations of floods of the selected recurrence intervals on Cottonwood Creek and the 10-, 2-, and 1-percent annual chance floods on the Kern River were computed through use of the USACE HEC-2 step-backwater computer program (U.S. Department of the Army, Corps of Engineers, December 1968 with updates).

The California DWR, Reclamation Board, provided the cross-section information used for the backwater analysis along the Kern River. These cross sections were digitized from aerial photographs flown in April 1977 at a flight height of 6,000 feet, with a negative scale of 1:12,000 (1K. Curtis Services, Inc., Aerial Photography, Scale 1:12,000, April

1:9,600. Photogrammetric models were controlled (horizontally and vertically) by the study contractor. Digitized cross sections, accurate to within 1 foot, were provided by the Cooper Aerial Survey Company. Topographic mapping was compiled at a scale of 1:4,800, with a 4-foot contour interval (Cooper Aerial Survey Company, November 1981).

Structural geometry of the canal and bridges was obtained by the study contractor during field reconnaissance and verified by additional Arrow Surveying field measurements.

City of Ridgecrest

For all detailed flooding sources in the City of Ridgecrest, channel and flood plain geometry was obtained using aerial photogrammetry (Cooper Aerial Survey Company, May 22, 1979). Digitized cross sections, accurate to within 1 foot, were obtained from aerial photographs (Cooper Aerial Survey Company, May 22, 1979).

Flooding from El Paso Wash was evaluated for the 10-, 2-, 1-, and 0.2-percent annual chance events along the reach between Ridgecrest-Inyokern Road and the China Lake spur track. The other flooding sources were only evaluated for the 1-percent annual chance event, because flooding depths were less than 3 feet.

Water-surface elevations were calculated using the USACE HEC-2 step-backwater computer program (U.S. Department of the Army, Corps of Engineers, December 1968, With Updates). Averages depths of flooding were obtained from normal-depth calculations.

Dimensions of significant bridges and culverts were obtained from field measurements taken during field reconnaissance in June 1979. Water-surface elevations for the referenced events are shown on the flood profiles for El Paso Wash. No profiles are plotted for shallow flooding areas. Starting water-surface elevations for backwater analysis were obtained using the slope-area method. Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

The results of the analysis showed that Ridgecrest is generally subject to shallow flooding of less than 1 foot. The City of Ridgecrest requires all new development to be elevated at least 1 foot above the curb elevation. Therefore, it was decided that these shallow flooding areas would be Zone X.

City of Shafter

In the City of Shafter, ground elevations at street intersections in the study area were obtained by surveys performed in February 1987 (Surveys by Gill and Pulver Engineers, February 1988).

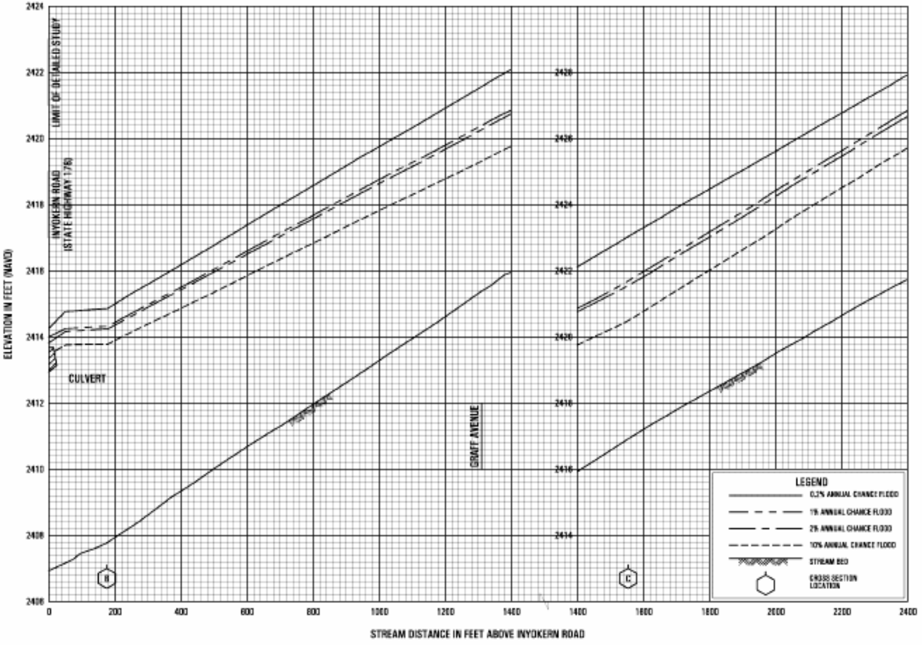
Flooding in the Walker Street detailed study region, north of Lerdo Highway and east of Shafter Avenue, is ponding due to inadequate local drainage facilities. The recently completed drainage system involves an increased capacity in the drop inlets and the culverts draining the intersection of Kannel Avenue and Lerdo Highway, and the construction of a second drainage sump (66 acre-feet) downslope of the existing drainage slope. In order to determine the depth of flooding at the lower end of the Walker Street

Table 6 – MANNING'S "N" VALUES

Stream	Left Overbank "n"	Channel "n"	Right Overbank "n"
Caliente Creek	0.025 - 0.059	0.024 - 0.060	0.025 - 0.059
Caliente Creek near Loraine	0.020 - 0.045	0.020 - 0.040	0.020 - 0.045
Caliente Creek Tributary 1	0.020 - 0.045	0.020 - 0.040	0.020 - 0.045
Calvert Wash	0.040	0.030	0.040
Claymine Road	0.025 - 0.070	0.025 - 0.070	0.025 - 0.070
Cottonwood Creek	0.055 - 0.06	0.045	0.055 - 0.06
Cuddy Creek	0.035 - 0.050	0.030 - 0.045	0.035 - 0.050
Doyle Street	0.010 - 0.060	0.010 - 0.060	0.010 - 0.060
East China Lake and College	0.040 - 0.055	0.030 - 0.055	0.040 - 0.055
El Paso Wash	0.040 - 0.055	0.03 - 0.055	0.040 - 0.055
Erskine Creek	0.035 - 0.070	0.035 - 0.070	0.035 - 0.070
Great Circle Creeks	0.065 - 0.090	0.050 - 0.060	0.065 - 0.090
Hawthorne	0.012 - 0.046	0.012 - 0.046	0.012 - 0.046
Jawbone Canyon Wash	0.045	0.030 - 0.045	0.045
Kelso Creek	0.035 - 0.050	0.035 - 0.050	0.035 - 0.050
Kern River at Kernville	0.040 - 0.065	0.036 - 0.041	0.040 - 0.065
Kern River – with consideration of Levees	0.035 - 0.065	0.030 - 0.065	0.035 - 0.065
Kern River – without consideration of Levees	0.035 - 0.065	0.030 - 0.065	0.035 - 0.065
Little Dixie Wash (Lower Reach)	0.025 - 0.045	0.025 - 0.035	0.025 - 0.045
McFarland East of State Highway 99	0.025 - 0.045	0.025 - 0.030	0.025 - 0.045

Table 7 - STREAM CONVERSION FACTORS

Stream Name	Elevation (feet NAVD above NGVD)
20 Mule Team Creek	2.6
Antelope Creek	2.8
Blackburn Creek	2.8
Bodfish Creek	3.2
Boron Avenue Creek	2.6
Cache Creek	2.7
Caliente Creek	2.7
Caliente Creek near Loraine	2.9
Caliente Creek Tributary 1	2.9
Calvert Wash	2.7
Cottonwood Creek	2.8
Cuddy Creek	3.1
El Paso Wash	2.7
Erskine Creek	3.2
Indian Creek	2.9
Jawbone Canyon Wash	2.6
Kern River at Kernville	3.3
Kern River – with consideration of Levees	2.7
Kern River – without consideration of Levees	2.7
Little Dixie Wash	2.7
North El Paso Wash	2.7
North Ridgecrest Wash	2.7
North Sandy Creek	2.7
Poso Creek	2.7
Ranger Station Creek	3.2
Sandy Creek	2.7
Sheet Flow 1	2.7
Sheet Flow 2	2.7
Sheet Flow 3	2.7
South Branch Poso Creek	2.7
South El Paso Wash	2.7
South Fork Kern River	3.1

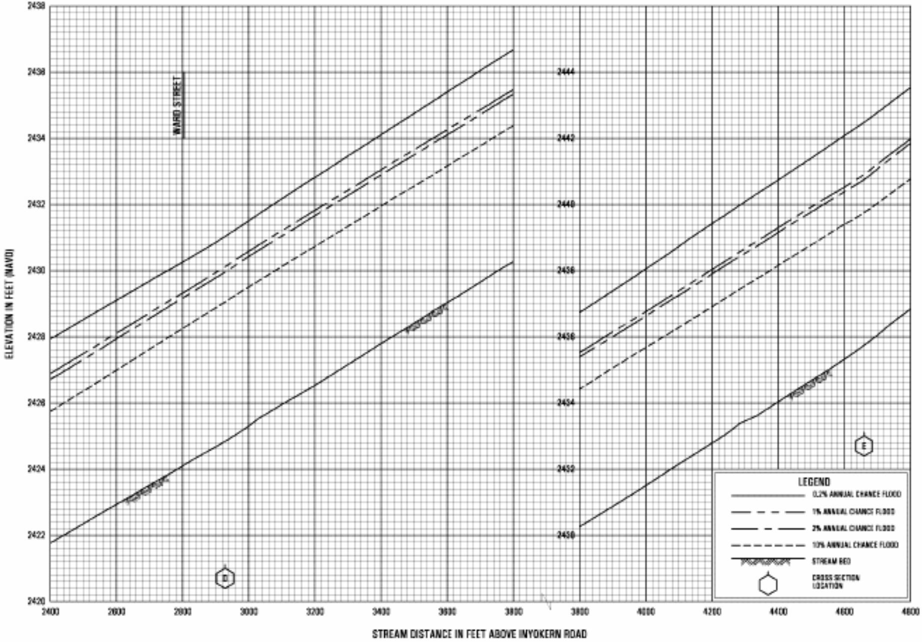


FLOOD PROFILES

LITTLE DIXIE WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERN COUNTY, CA



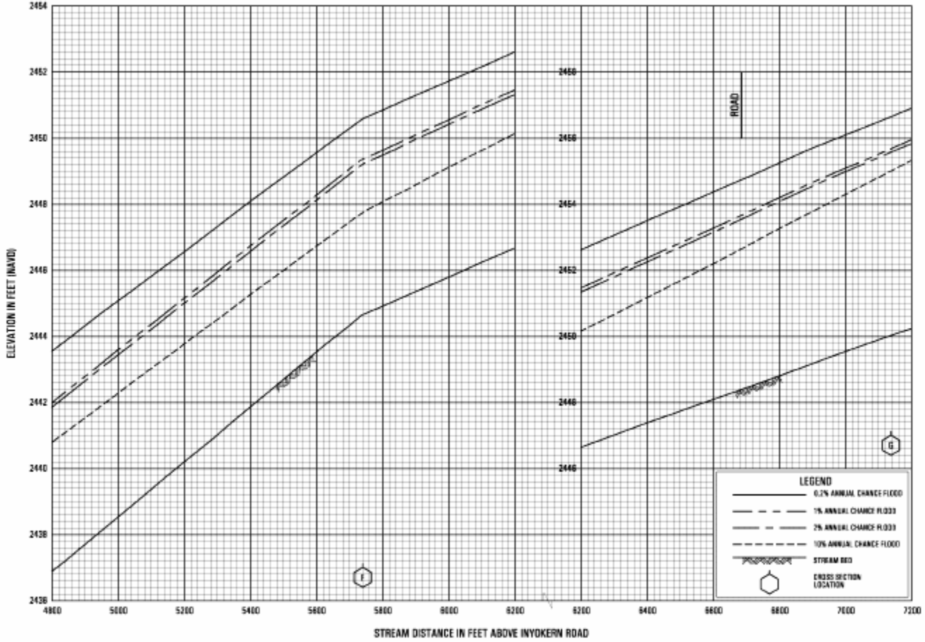
FLOOD PROFILES

LITTLE DIXIE WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERN COUNTY, CA

149P



FLOOD PROFILES

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERN COUNTY, CA

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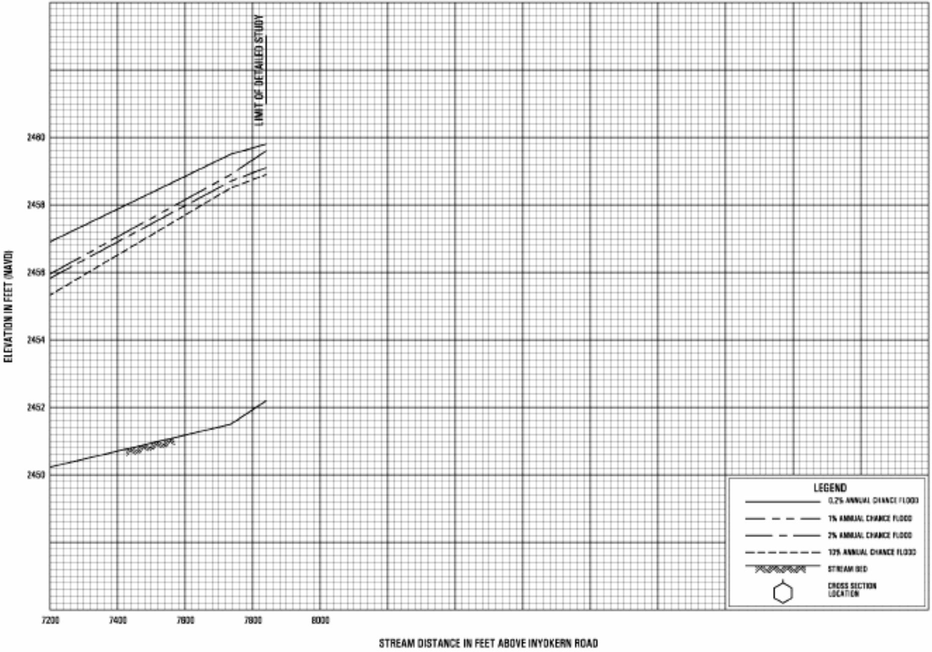

FLOOD PROFILES

FEDERAL EMERGENCY MANAGEMENT AGENCY