

TITLE: ATechnical Information regarding Pacific Institute Proposal@

## Introduction

In February, 2000, a consortium of environmental organizations led by the Pacific Institute submitted an interim surplus criteria proposal for consideration by the Secretary. This proposal was further clarified in the Pacific Institute's letter of comment on the Draft Environmental Impact Statement (DEIS), which was submitted to Reclamation on September 8, 2000. As discussed in Section 2.2.3 of the Final EIS (FEIS), this alternative was considered as part of the NEPA analysis but not analyzed as an alternative in either the DEIS or the FEIS. Pursuant to 40 C.F.R. ' 1502.14, Section 2.2.3 of the FEIS discusses the reasons why the Pacific Institute proposal was eliminated from detailed study. As presented in Section 2.2.3, this decision is primarily based on the following two reasons: first, the alternative was determined to be beyond the purpose and need for interim surplus criteria due to the proposed delivery of additional water to Mexico; and secondly, the domestic aspects of the alternative (e.g., the surplus triggers and the amounts of water to be delivered within the Lower Division states) were similar to, and within the range of, the aspects of the other alternatives that were already analyzed in the DEIS and the FEIS.

This document summarizes Reclamation's modeling analysis of the Pacific Institute's alternative and presents a comparison to the other alternatives analyzed in the FEIS. As noted in Section 2.2.3 of the FEIS, the domestic effects of the alternative (e.g., effect on the elevations of lakes Powell and Mead) as shown on Figures 3 and 4 are similar to, and within the range of, the effects of the other alternatives analyzed in the FEIS. All information presented in this analysis is based upon information contained in the FEIS, and was presented to the Pacific Institute, along with other non-governmental organizations, on December 14, 2000, immediately prior to the publication of the FEIS.

# **Colorado River Interim Surplus Criteria Modeling Analysis of the Alternative Submitted by the Pacific Institute**

## **Background**

A set of interim surplus criteria (ISC) was submitted to Reclamation by the Pacific Institute on behalf of several non-governmental organizations (NGO's) in February 2000. Although the NGO Alternative was determined to be beyond the purpose and need of the action and was not analyzed in the Environmental Impact Statement (EIS), Reclamation agreed to model the alternative for discussion purposes. Reclamation's initial modeling of the alternative was discussed with some NGO representatives in August 2000 and several modeling assumptions were clarified. These clarifications were also included in public comments on the Draft EIS (DEIS) submitted by the Pacific Institute. This document presents initial results of the modeling study incorporating these comments and clarifications.

## **Modeling Assumptions**

For this study, key modeling assumptions were identical to those used for the Final EIS (FEIS) and are discussed in Section 3.3.3 of that document. Operating policies (with the exception of the ISC) were also identical and are documented in Attachment J of the FEIS. An additional demand point was added to the model to represent water deliveries to the Lower Colorado River delta. The NGO Alternative falls in the category of "multi-tiered trigger strategies", where various amounts of surplus water are made available depending upon Lake Mead's elevation at the beginning of each calendar year. The specific criteria modeled are as follows:

- **Baseline Delta Flows:** at elevation 1120.4 feet or greater, an annual flow of 32,000 acre-feet per year (afy) is delivered to the delta (at a constant rate each month).
- **Partial Domestic (M&I) Surplus:** at elevations between 1125 feet and 1145 feet, water is made available for a "partial domestic surplus".
- **Full Domestic (M&I) Surplus:** at elevations greater than 1145 feet and less than the "70R" elevation, water is made available for a "full domestic surplus".
- **Delta Flood Flows:** at elevations greater than or equal to the 70A1 elevation, an annual flow of 260,000 afy is delivered to the delta in May, June, and July (35%, 45%, and 20% respectively).
- **Quantified Surplus:** at elevations greater than or equal to the 70R elevation but less than that requiring flood control releases, water is made available for a "quantified surplus".
- **Flood Control Surplus:** when Lake Mead is high enough to require flood control releases as prescribed by the Army Corps of Engineers procedures, water is made available for a "full surplus".

The triggers used for this study are shown in Figure 1. It should be noted that both the 70R and Flood Control levels are computed by the model during the model run and therefore, the triggers shown are estimates for comparison only. The deliveries to the Lower Basin under each level are shown in Figure 2 and tabulated in Tables 1 through 4.

Note that the total Lower Basin deliveries represent deliveries within the U.S. plus the delta. Although the model meets the Treaty delivery to Mexico of 1.5 million acre-foot/year (maf), and up to 1.7 maf during years of flood control releases, those deliveries are not included in these totals.

The differences between the depletion schedules of the NGO Alternative and those of the Basin States Alternative can be summarized as follows:

- At the Flood Control level, the schedules are identical except for the additional 260 kaf to the delta.
- At the 70R level, the 260 kaf delivery to the delta is more than offset by reduced water made available to the basin states (particularly Arizona), since no water is made available for off-stream storage (including groundwater banking).
- At the Full M&I level, the 32 kaf delivery to the delta is offset by reduced water made available to MWD.
- At the Partial M&I level, the schedules were identical except that MWD was held to a constant 962 kaf for the ISC period under the NGO Alternative, resulting in more water delivered in the early years and less in the later years as compared to the Basin States Alternative.

### **Modeling Results**

A total of 85 simulations were made using the NGO alternative. Each simulation represents a different future hydrologic inflow assumption and standard statistical analyses were performed on the output (see Section 3.3.3.5 of the FEIS for a detailed explanation).

Figures 3 and 4 present the 50<sup>th</sup> percentile values for Lake Mead and Lake Powell elevations for the years 2002 through 2050 for the baseline conditions and all alternatives. The NGO Alternative values are very similar to the values of the Basin States and Six States alternatives since the triggers and total deliveries are very similar for those alternatives. For the 50<sup>th</sup> percentile Lake Mead elevations, the maximum difference between the NGO and Basin States alternatives is 2.4 feet with an average of 0.71 feet over the ISC period. For the 50<sup>th</sup> percentile Lake Powell elevations, the maximum difference between the NGO and Basin States alternatives is 0.65 feet with an average of 0.18 feet over the ISC period.

Figures 5 through 7 present the 50<sup>th</sup>, 75<sup>th</sup>, and 90<sup>th</sup> percentile values for the flows to the delta, often termed the “excess flows to Mexico” (see Section 3.16 of the FEIS for a discussion of excess flows to Mexico). At the 50<sup>th</sup> percentile, only the NGO Alternative produces any flow, owing to the delivery of 32 kaf when Lake Mead is above elevation 1120.4 feet. At the 75<sup>th</sup> percentile, the NGO Alternative shows some additional flows in the years 2010 through 2016. At the 90<sup>th</sup> percentile, the NGO Alternative flows are somewhat less than those of the Basin States Alternative, due to the delivery to the delta of 260 kaf when Lake Mead elevation exceeds the 70A1 trigger, which in turn, reduces the frequency and magnitude of flood control releases.

Figures 8 through 10 present the 50<sup>th</sup> percentile values for the annual deliveries for California, Arizona, and Nevada respectively. For California, the NGO Alternative values at the 50<sup>th</sup> percentile are 38 kaf less in each year of the ISC due to the reduction at the 70R and Full M&I levels for MWD. The Arizona deliveries at the 50<sup>th</sup> percentile are identical except for the year 2025 when the Basin States Alternative values reflect a shortage condition. The Nevada deliveries at the 50<sup>th</sup> percentile are also identical except for the year 2025 when the Basin States Alternative values reflect a shortage condition.

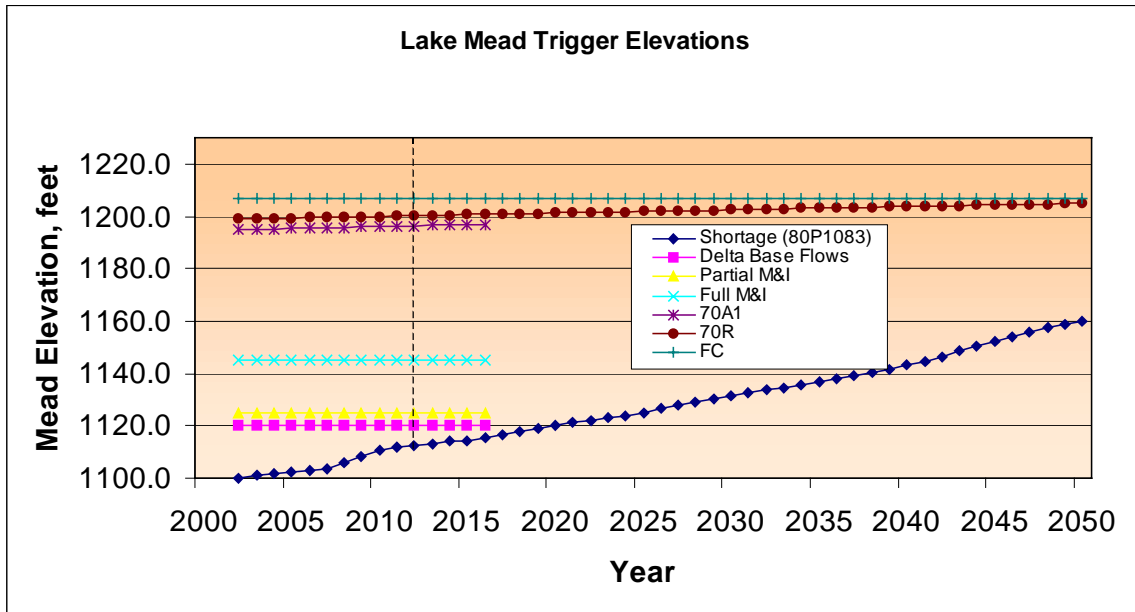
### **Future Work**

This study represents an initial step in the modeling and analysis of the NGO Alternative. A complete review of the depletion schedules is warranted to ensure that the alternative has been represented accurately. Additional analyses to quantify the effects of reduced deliveries for M&I and other uses at other percentiles should be performed. Further analyses of the effects on the frequency of occurrence of events of interest (e.g., flood control releases) should also be considered.

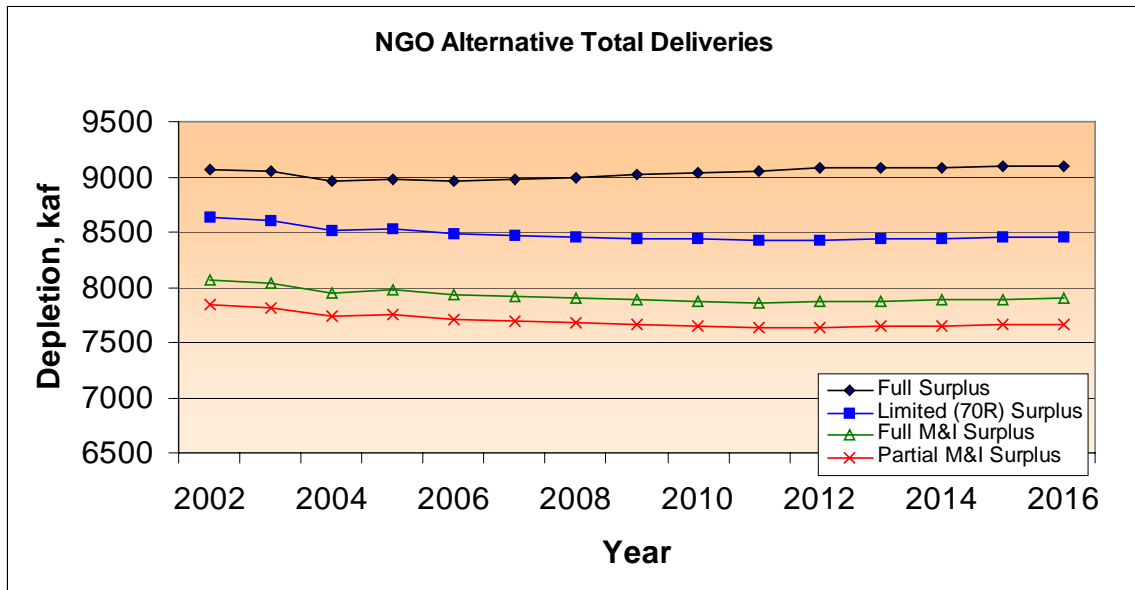
### **References**

Colorado River Interim Surplus Criteria, Final Environmental Impact Statement, Volumes I and II, U.S. Bureau of Reclamation, December, 2000

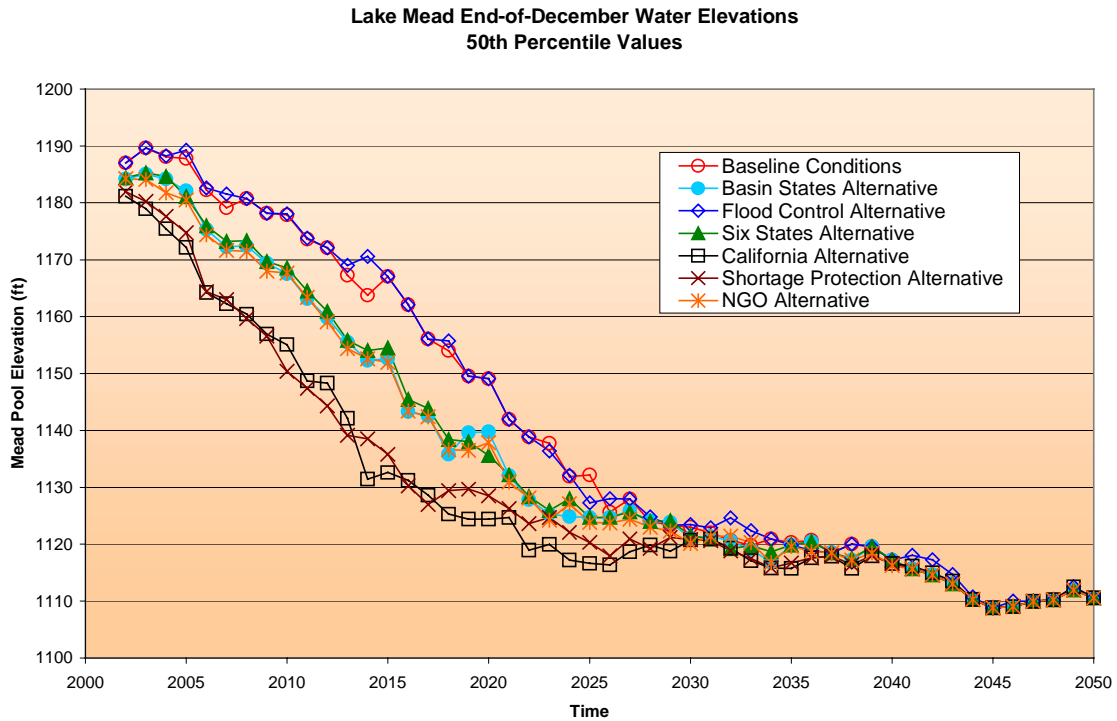
**Figure 1. NGO Alternative Lake Mead Triggers**



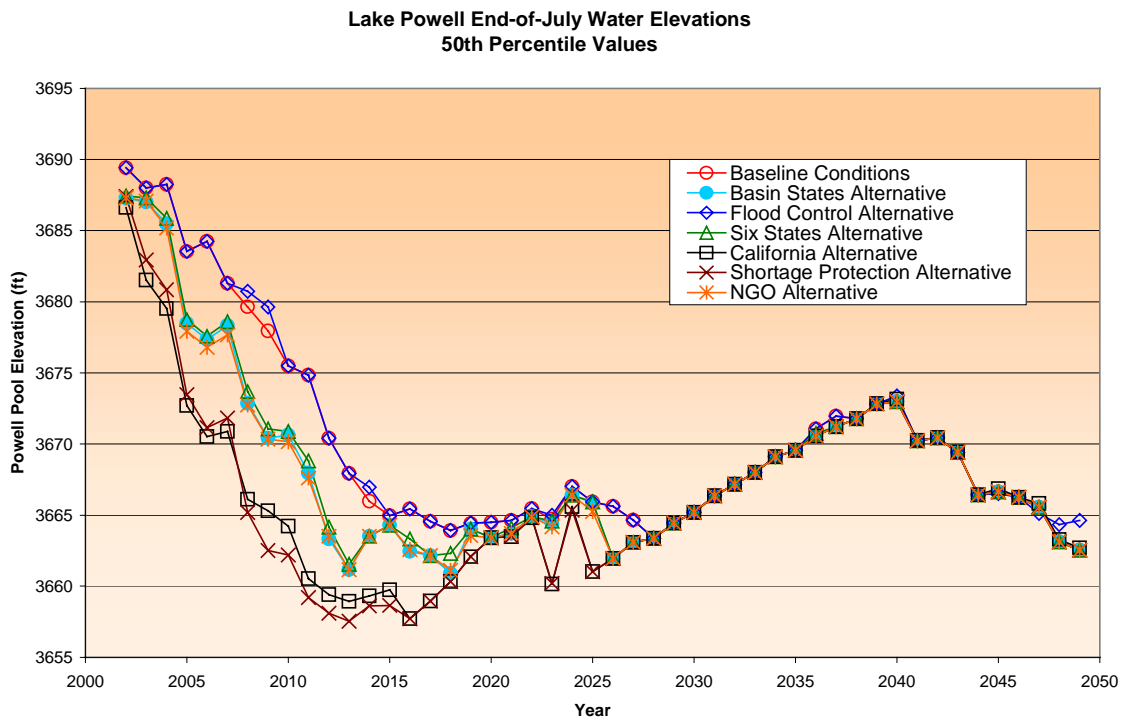
**Figure 2. NGO Alternative: U.S. Lower Basin Deliveries (incl. Delta flows)**



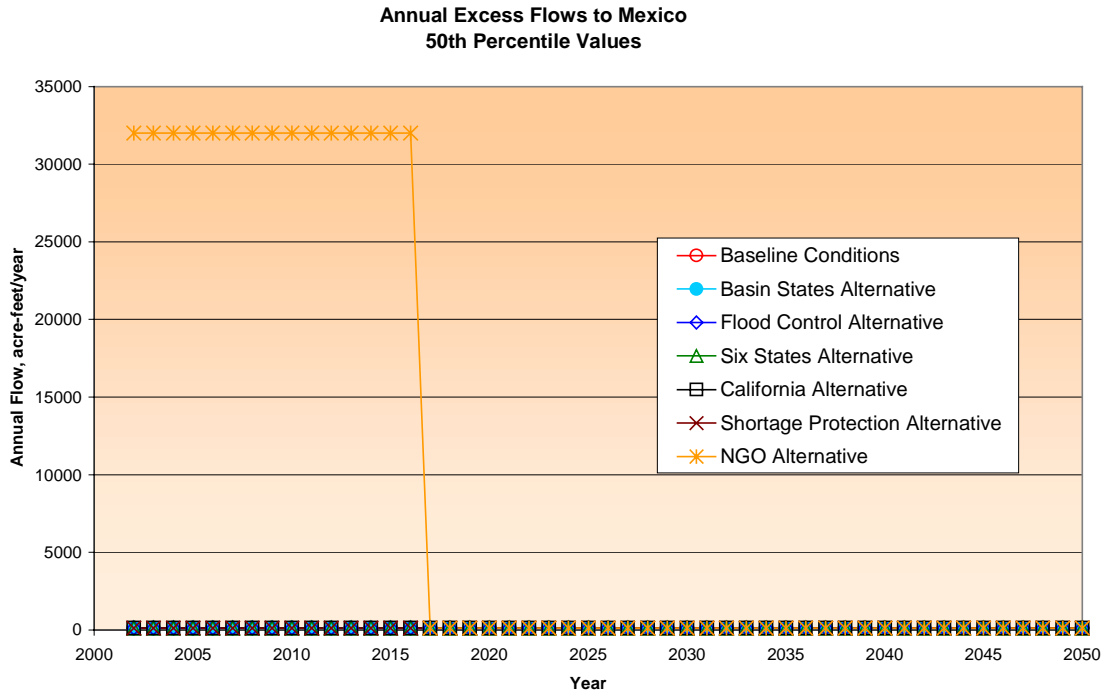
**Figure 3. Comparison of 50<sup>th</sup> Percentile Lake Mead Elevation Values**



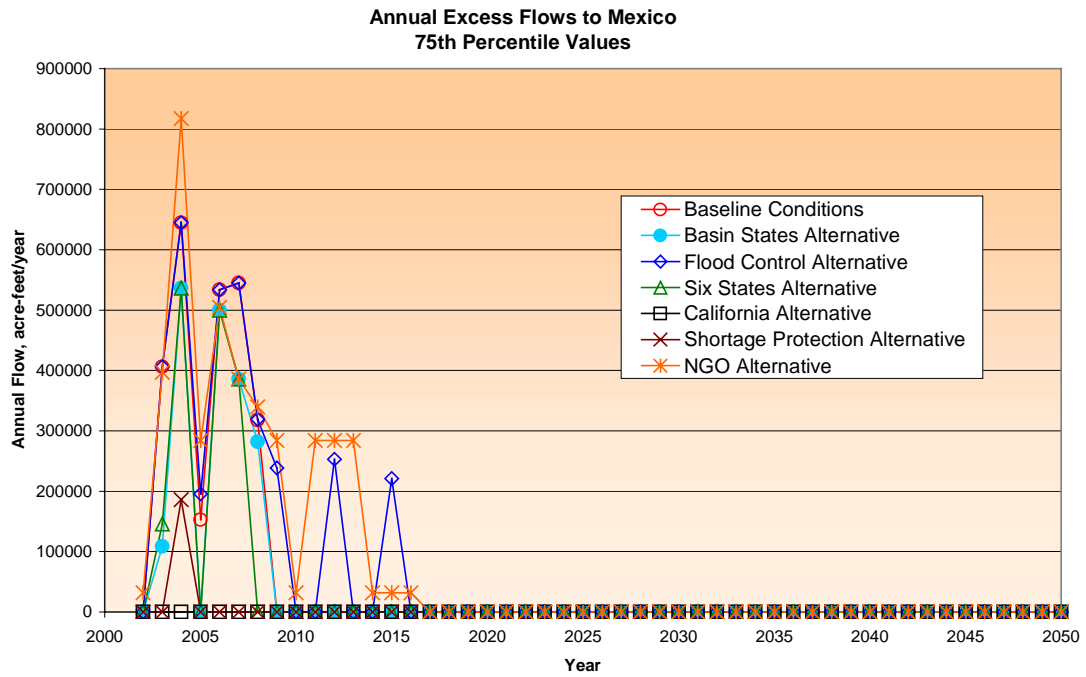
**Figure 4. Comparison of 50<sup>th</sup> Percentile Lake Powell Elevation Values**



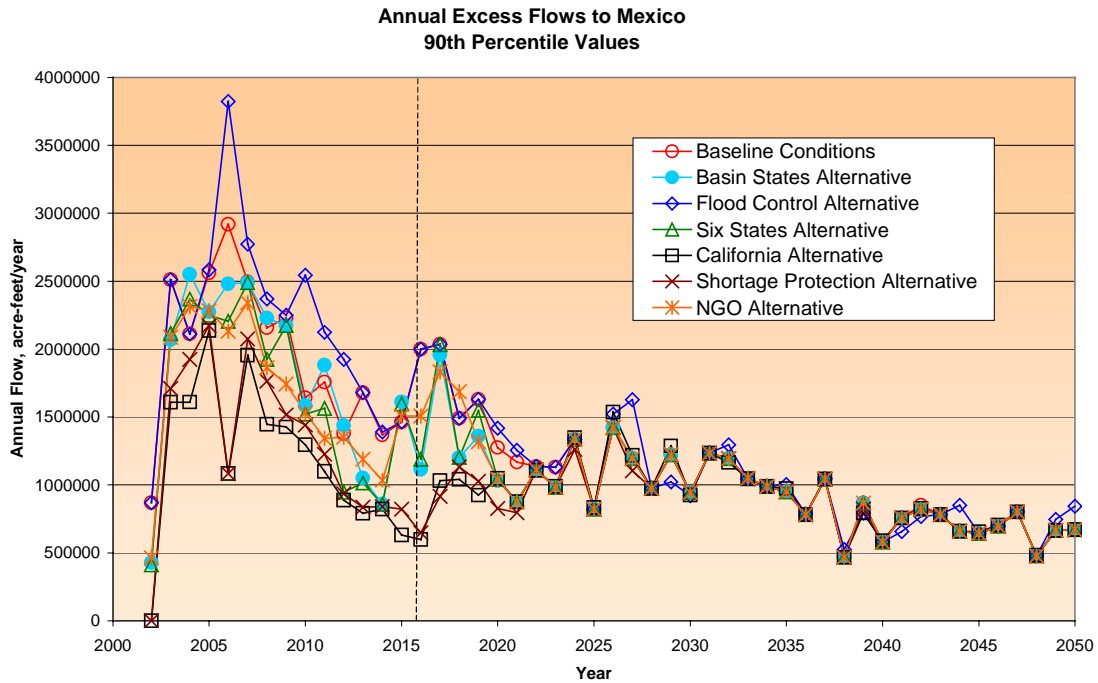
**Figure 5. Comparison of 50<sup>th</sup> Percentile Flows to the Delta**



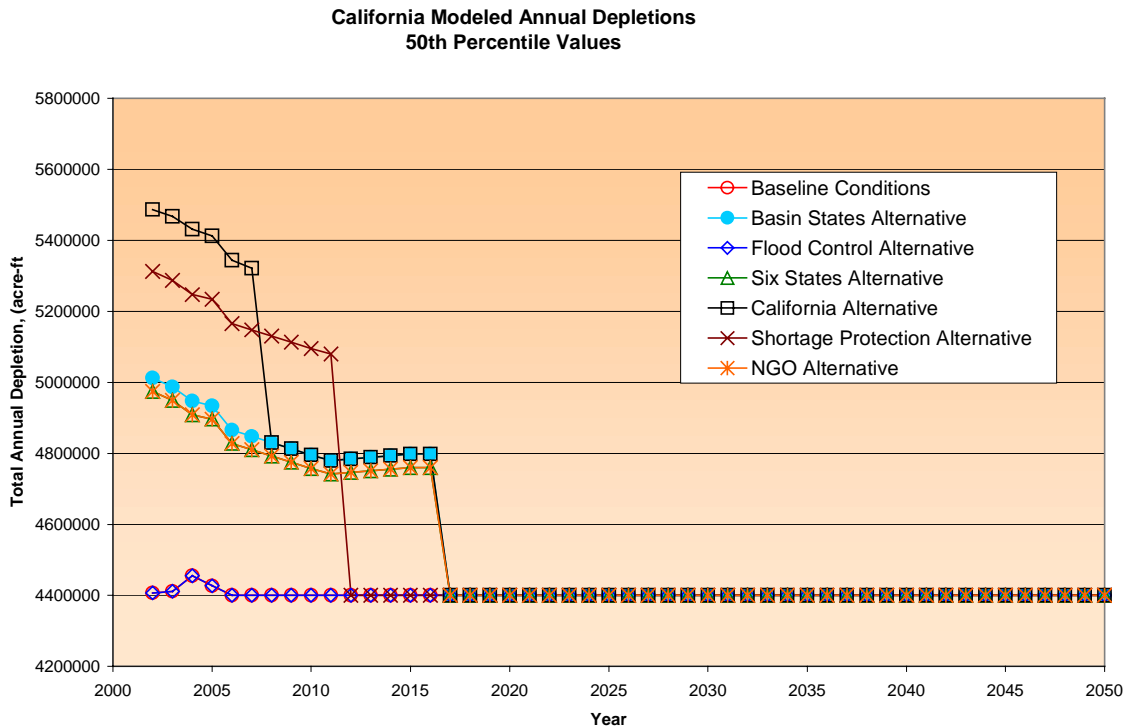
**Figure 6. Comparison of 75<sup>th</sup> Percentile Flows to the Delta**



**Figure 7. Comparison of 90<sup>th</sup> Percentile Flows to the Delta**

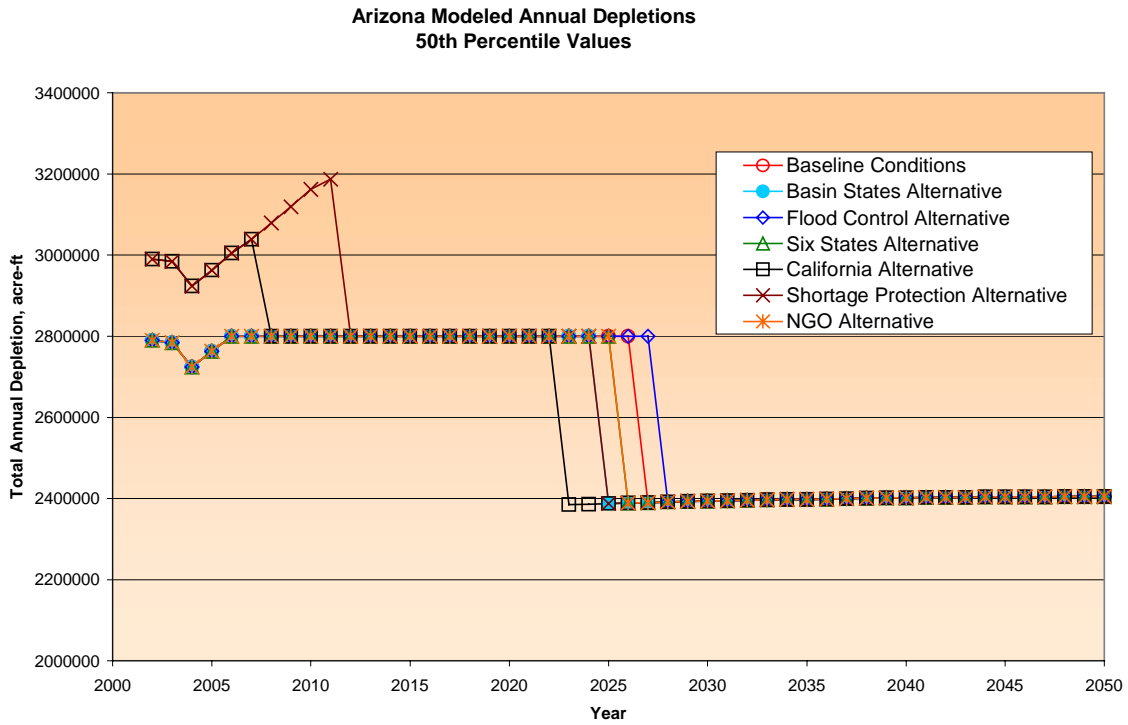


**Figure 8. Comparison of 50<sup>th</sup> Percentile California Annual Depletions**

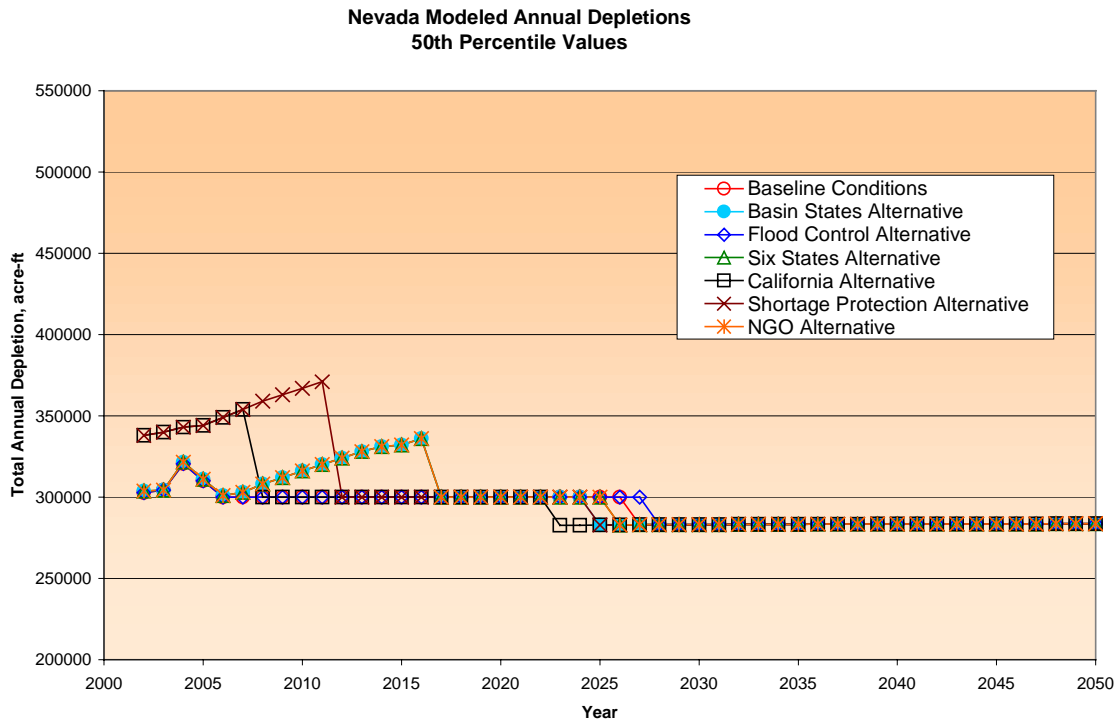




**Figure 9. Comparison of 50<sup>th</sup> Percentile Arizona Annual Depletions**



**Figure 10. Comparison of 50<sup>th</sup> Percentile Nevada Annual Depletions**



**Table 1. NGO Alternative: Full (Flood Control) Surplus Schedules, kaf**

Date	CA Other	MWD	IID	CVWD	CA Total	AZ Other	CAP	AZ Total	NV Other	SNWP	NV Total	Delta	Total LB
2002	444	1250	3209	585	5487	1332	1658	2990	26	312	338	260	9075
2003	445	1250	3189	585	5468	1337	1647	2984	26	314	340	260	9052
2004	446	1250	3152	585	5432	1342	1582	2924	27	316	343	260	8959
2005	447	1250	3132	585	5413	1348	1615	2963	28	316	344	260	8980
2006	449	1250	3061	585	5344	1353	1652	3005	28	321	349	260	8958
2007	451	1250	3036	585	5322	1359	1680	3039	28	326	354	260	8975
2008	454	1250	3011	585	5299	1364	1715	3079	29	330	359	260	8997
2009	456	1250	2986	585	5276	1369	1750	3119	29	334	363	260	9018
2010	459	1250	2961	585	5254	1375	1787	3162	29	338	367	260	9043
2011	463	1250	2936	585	5233	1375	1812	3187	29	342	371	260	9051
2012	468	1250	2931	585	5233	1376	1835	3211	29	345	374	260	9078
2013	472	1250	2926	585	5233	1376	1835	3211	29	349	378	260	9082
2014	477	1250	2921	585	5232	1377	1835	3212	29	353	382	260	9086
2015	482	1250	2916	585	5232	1378	1835	3213	29	357	386	260	9091
2016	482	1250	2911	585	5227	1378	1835	3213	29	361	390	260	9090

**Table 2. NGO Alternative: Limited (70R) Surplus Schedules, kaf**

Date	CA Other	MWD	IID	CVWD	CA Total	AZ Other	CAP	AZ Total	NV Other	SNWP	NV Total	Delta	Total LB
2002	444	1212	3130	489	5274	1332	1458	2790	26	278	304	260	8628
2003	445	1212	3110	483	5249	1337	1447	2784	26	278	304	260	8598
2004	446	1212	3073	478	5209	1342	1382	2724	27	295	322	260	8515
2005	447	1212	3053	485	5196	1348	1415	2763	28	283	311	260	8530
2006	449	1212	2982	485	5128	1353	1447	2800	28	273	301	260	8489
2007	451	1212	2957	490	5110	1359	1441	2800	28	275	303	260	8473
2008	454	1212	2932	495	5093	1364	1436	2800	29	279	308	260	8461
2009	456	1212	2907	500	5075	1369	1431	2800	29	283	312	260	8447
2010	459	1212	2882	505	5057	1375	1425	2800	29	287	316	260	8433
2011	463	1212	2857	510	5042	1375	1425	2800	29	291	320	260	8422
2012	468	1212	2852	515	5047	1376	1424	2800	29	295	324	260	8431
2013	472	1212	2847	520	5051	1376	1424	2800	29	299	328	260	8439
2014	477	1212	2842	525	5056	1377	1423	2800	29	302	331	260	8447
2015	482	1212	2837	530	5060	1378	1422	2800	29	303	332	260	8452
2016	482	1212	2832	535	5060	1378	1422	2800	29	307	336	260	8456

**Table 3. NGO Alternative: Full M&I Surplus Schedules, kaf**

Date	CA Other	MWD	IID	CVWD	CA Total	AZ Other	CAP	AZ Total	NV Other	SNWP	NV Total	Delta	Total LB
2002	444	1212	2959	360	4974	1332	1458	2790	26	278	304	32	8100
2003	445	1212	2939	354	4949	1337	1447	2784	26	278	304	32	8070
2004	446	1212	2902	350	4909	1342	1382	2724	27	295	322	32	7987
2005	447	1212	2882	356	4896	1348	1415	2763	28	283	311	32	8002
2006	449	1212	2811	356	4828	1353	1447	2800	28	273	301	32	7961
2007	451	1212	2786	361	4810	1359	1441	2800	28	275	303	32	7945
2008	454	1212	2761	366	4793	1364	1436	2800	29	279	308	32	7933
2009	456	1212	2736	371	4775	1369	1431	2800	29	283	312	32	7919
2010	459	1212	2711	376	4757	1375	1425	2800	29	287	316	32	7905
2011	463	1212	2686	381	4742	1375	1425	2800	29	291	320	32	7894
2012	468	1212	2681	386	4747	1376	1424	2800	29	295	324	32	7903
2013	472	1212	2676	391	4751	1376	1424	2800	29	299	328	32	7911
2014	477	1212	2671	396	4756	1377	1423	2800	29	302	331	32	7919
2015	482	1212	2666	401	4760	1378	1422	2800	29	303	332	32	7924
2016	482	1212	2661	406	4760	1378	1422	2800	29	307	336	32	7928

**Table 4. NGO Alternative: Partial M&I Surplus Schedules, kaf**

Date	CA Other	MWD	IID	CVWD	CA Total	AZ Other	CAP	AZ Total	NV Other	SNWP	NV Total	Delta	Total LB
2002	444	962	2959	360	4724	1332	1458	2790	26	278	304	32	7850
2003	445	962	2939	354	4699	1337	1447	2784	26	278	304	32	7820
2004	446	962	2902	350	4659	1342	1382	2724	27	295	322	32	7737
2005	447	962	2882	356	4646	1348	1415	2763	28	283	311	32	7752
2006	449	962	2811	356	4578	1353	1447	2800	28	273	301	32	7711
2007	451	962	2786	361	4560	1359	1441	2800	28	274	302	32	7694
2008	454	962	2761	366	4543	1364	1436	2800	29	275	304	32	7679
2009	456	962	2736	371	4525	1369	1431	2800	29	277	306	32	7663
2010	459	962	2711	376	4507	1375	1425	2800	29	279	308	32	7647
2011	463	962	2686	381	4492	1375	1425	2800	29	281	310	32	7634
2012	468	962	2681	386	4497	1376	1424	2800	29	283	312	32	7641
2013	472	962	2676	391	4501	1376	1424	2800	29	285	314	32	7647
2014	477	962	2671	396	4506	1377	1423	2800	29	287	316	32	7654
2015	482	962	2666	401	4510	1378	1422	2800	29	287	316	32	7658
2016	482	962	2661	406	4510	1378	1422	2800	29	289	318	32	7660