Attachment 2
Example With Four
Distinguishing Characteristics

E-015084

Draft Distinguishing Characteristics
(Characteristics 1,3,6, and 11 for demonstration)

1 In-Delta Water Quality

2 Export Water Quality

3 Diversion Effects on Fisheries

4 Delta Flow Circulation

5 Storage and Release of Water

6 Water Supply Opportunities

7 Water Transfer Opportunities

8 Operational Flexibility

9 South Delta Access to Water

10 Risk to Export Water Supplies

11 Total Cost

12 Assurances Difficulty

13 Habitat Impacts

14 Land Use Changes

15 Socio-economic Impacts

16 Consistency with Solution Principles

17 Ability to Phase Facilities

18 Brackish Water Habitat

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E-015085

DRAFT INITIAL ANALYSIS (Subject to Change)
DISTINGUISHING CHARACTERISTICS
DECISION MATRIX

Alternative	Alternative Variation	**In-Delta Water Quality ***	Export Water Quality	**Diversion Effects on Fisheries ***	Delta Flow Circulation	Storage and Release of Water	**Water Supply Opportunities ***	Water Transfer Opportunities	Operational Flexibility	South Delta Access to Water	Risk to Export Water Supplies	**Total Cost ***	Assurances Difficulty	Habitat Impacts	Land Use Changes	Socio-economic Impacts	Consistency with Solution Principles	Ability to Phase Facilities	Brackish Water Habitat
Existing Conditions																			
No-Action Alternative																			
Existing System Conveyance	1A																		
	1B	5-6		6			6					1							
	1C	5-6		4			3					4							
Modified Through Delta Conv.	**2A**	1-2		5			4					2							
	2B	1-2		3			1					5							
	2D																		
	2E																		
Dual Delta Conveyance	**3A**	3-4		2			4					3							
	3B	3-4		1			1					6							
	3E																		
	3H																		
	3I																		

* Table shows relative ranks for this example:
- 1 = best performing alternative
- 2-5 = middle performing alternatives
- 6 = least performing alternative

Other method for displaying results can be used such as:
- High, medium, and low
- Shaded graphic/circle of performance (similar to Consumer Reports ratings)
- Etc.

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1. In-Delta Water Quality

Western Delta
- Salinity (TDS)
- Flow Circulation (qualitative assessment)

South Delta
- Salinity (TDS)
- Flow Circulation (qualitative assessment)

Central Delta
- Salinity (TDS)
- Flow Circulation (qualitative assessment)

North Delta
- Salinity (TDS)
- Flow Circulation (qualitative assessment)

Table 1.1 Summary

	Western Delta		South Delta		Central Delta		North Delta		Relative
Alternative	TDS (mg/l)	Circulation	TDS (mg/l)	Circulation	TDS (mg/s)	Circulation	TDS (mg/s)	Circulation	Rank
Exist. Cond.									
No-action									
1A									
1B	1262 (rank 5-6	5-6	442 (rank 3-4)	5-6	188 (rank 3-4)	5-6	168(rank 1-2)	5-6	**5-6**
1C	1262 (rank 5-6	5-6	442 (rank 3-4)	5-6	188 (rank 3-4)	5-6	168(rank 1-2)	5-6	**5-6**
2A	1040 (rank 1-2	1-2	436 (rank 1-2)	1-2	112 (rank 1-2)	1-2	225 (rank 5-6)	1-2	**1-2**
2B	1040 (rank 1-2	1-2	436 (rank1-2)	1-2	112 (rank 1-2)	1-2	225 (rank 5-6)	1-2	**1-2**
2D									
2E									
3A	1093 (rank 3-4	3-4	537 (rank 5-6)	3-4	195 (rank 5-6)	3-4	213(rank 3-4)	3-4	**3-4**
3B	1093 (rank 3-4	3-4	537 (rank 5-6)	3-4	195 (rank 5-6)	3-4	213(rank 3-4)	3-4	**3-4**
3E									
3H									
3I									

TDS is average Sept-Dec mg/l in Dry & Critical years

Table shows relative ranks for Delta circulation for this example:
1 = best performing alternative
2-5 = middle performing alternatives
6 = least performing alternative

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In-Delta Water Quality
Supporting Information for Table 1.1

In-Delta water quality will vary with the storage and conveyance facilities. Preliminary Delta Simulation Model (DSM) runs provide an indication of in-Delta water quality for the various alternatives. These runs provide an initial evaluation of flow, circulation, and salinity as total dissolved solids (TDS) contained in *Status Reports on Technical Studies for the Storage and Conveyance Refinement Process, Delta Simulation Model Studies of Alternatives 1A, 1C, 2B, 2D, 2E, 3E, August 4, 1997.* Simulations were conducted for the hydrologic simulation period 1976-1991. TDS predictions were presented for mean monthly tidally-averaged values over the hydrologic period. Since the DSM model is not yet linked with DWRSIM, the evaluations consider only at the change due to Delta conveyance. Future runs will also include TDS changes due to the different hydrology between the alternatives.

For the purpose of this example, total dissolved solids (mg/l) in the higher salinity flow months of September through December period for the dry and critical years was used as an indicator for changes in salinity between the alternatives; other periods can also be evaluated in the detailed evaluations. The average of TDS at Emmaton and Jersey was used for the **Western Delta**. The average of Old River at Middle River and Old River at Tracy Road was used for the **Southern Delta**. The average of San Andreas Landing, Terminous, and Prisoner's Point was used for the **Central Delta**. Rio Vista was used for the **Northen Delta**.

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Location	Estimated Total Dissolved Solids (average Sept-Dec TDS in Dry and Critical Years mg/l)					
	Alternative 1B	Alternative 1C	Alternative 2A	Alternative 2B	Alternative 3A	Alternative 3A
Western Delta	**1262 mg/l** avg. 1321 & 1203	**1262 mg/l** avg. 1321 & 1203	**1040 mg/l** avg. 607 &1473	**1040 mg/l** avg. 607 &1473	**1093 mg/l** avg. 755 &1431	**1093 mg/l** avg. 755 &1431
Southern Delta	**442 mg/l** avg. 403 &480	**442 mg/l** avg. 403 &480	**436 mg/l** avg. 389 &484	**1093 mg/l** avg. 755 &1431	**537 mg/l** avg. 501 &573	**537 mg/l** avg. 501 &573
Central Delta	**188 mg/l** 275, 187, 103	**188 mg/l** 275, 187, 103	**112/mg/l** avg. 125,107, 103	**112/mg/l** avg. 125,107, 103	**195 mg/l** avg. 215,241, 130	**195 mg/l** avg. 215,241, 130
Northern Delta	168 mg/l	**168 mg/l**	**225 mg/l**	**225 mg/l**	**213 mg/l**	**213 mg/l**

Since the DSM and DWRSIM are not yet linked, alternatives 1B and 1C are similar, 2A and 2B are similar, and 3A and 3B are similar. See the following data sheets for a summary graph and more detailed information.

Rankings in Table 1.1 for Delta circulation were estimated from the circulation vectors in the previously mentioned report. In general, circulation was improved the most with the alternative 2 variations. The alternative 3 variations generally improved Delta circulation over that with existing channels. The alternative 3 variations generally did not have Delta circulation comparable with the alternative 2 variations due flow in the isolated facility and resultant reduced Delta flow. These are vary preliminary assessments since the detailed modeling work is continuing.

These evaluations of in-Delta water quality will come from the impact analysis for the EIR/EIS and from workgroups of experts. Since development of this information is in progress, the following is a sample of the types of information that may ultimately support Table 1.1. **At this time it is for demonstration purposes only.**

Information in Table 1.1 and this supporting information will be updated as more detailed modeling becomes available.

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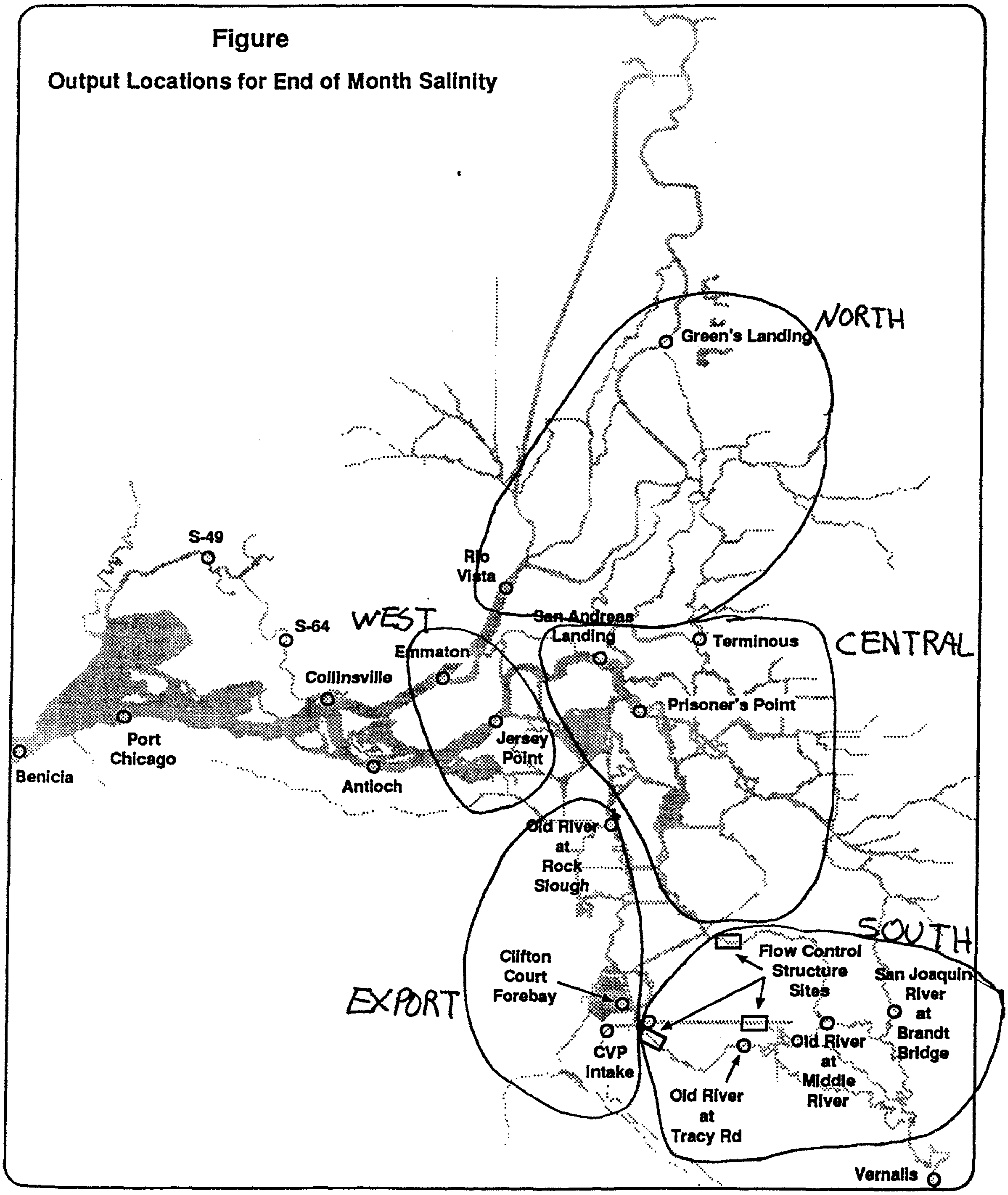
Figure

Output Locations for End of Month Salinity



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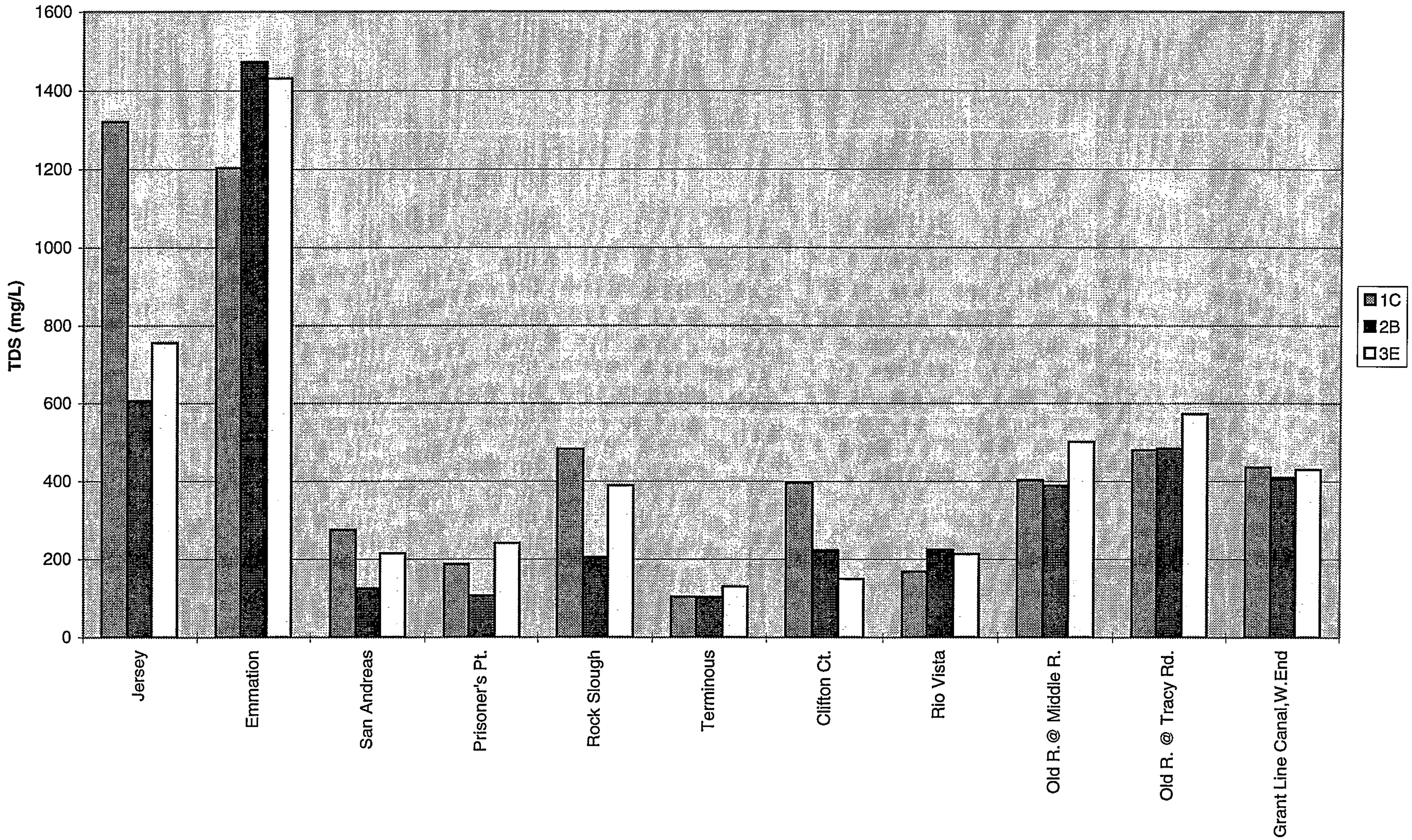
Average Sept-Dec TDS in Dry & Critical Years



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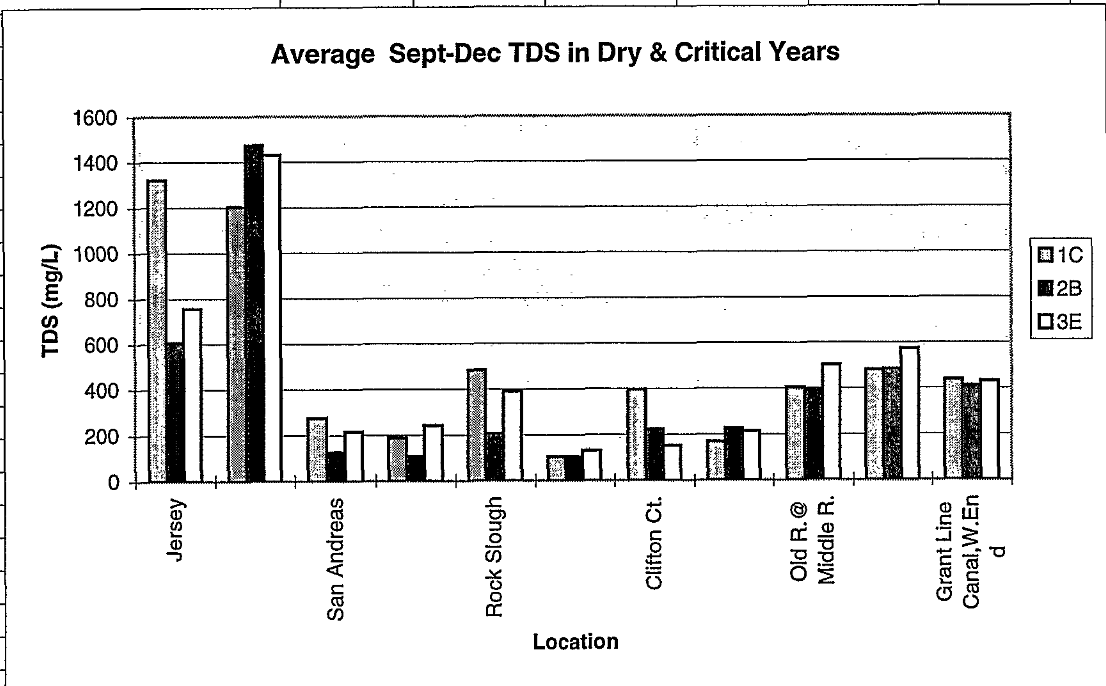
Summary TDS in mg/l at sample stations

Location	Alternative 1C	2B	3E	Delta Location
Jersey	1321	607	755	West
Emmation	1203	1473	1431	West
San Andreas	275	125	215	Central
Prisoner's Pt.	187	107	241	Central
Rock Slough	483	205	389	Export
Terminous	103	103	130	Central
Clifton Ct.	396	223	150	Export
Rio Vista	168	225	213	North
Old R.@ Middle R.	403	389	501	South
Old R. @ Tracy Rd.	480	484	573	South
Grant Line Canal,W.End	436	410	430	

Since Delta Simulation Modeling (DSM) and DWRSIM are not yet linked DSM represents changes in Delta configuration only. Hydrology changes when linked with DWRSIM will result in further TDS changes.



File: 0822TDS.XLS

Predicted Dry (D) and Critical (C) Year TDS Response to Alternatives

Note: See Summary Sheet or computations and graph resulting from these data in mg/l

Alternative 1C — Location: Jersey

Year Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	478	554	452	1704	797
C	1977	724	1239	1611	1328	1226
D	1981	1218	1445	1499	1650	1453
D	1985	1478	204	180	1671	883
D	1987	1511	1532	1807	1283	1533
C	1988	1583	1233	1675	1425	1479
D	1989	657	1418	2048	1793	1479
C	1990	2037	1758	1800	1465	1765
C	1991	853	1245	1593	1395	1272
Average		1171	1181	1407	1524	
Overall Average:			1321			

Alternative 2B — Location: Jersey

Year Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	161	185	122	950	355
C	1977	400	610	783	960	688
D	1981	287	368	405	801	465
D	1985	686	130	123	915	464
D	1987	417	459	474	840	548
C	1988	706	631	566	957	715
D	1989	512	733	944	783	743
C	1990	715	590	540	956	700
C	1991	495	718	893	1019	781
Average		487	492	539	909	
Overall Average:			607			

Alternative 1C — Location: Emmaton

Year Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	193	254	251	1674	593
C	1977	1087	1643	1882	1829	1610
D	1981	654	936	677	1504	943
D	1985	506	114	125	1502	562
D	1987	984	1137	978	1715	1204
C	1988	1494	1566	697	1888	1411
D	1989	1105	1687	1928	1219	1485
C	1990	1302	1288	1121	1775	1372
C	1991	1019	1728	1974	1868	1647
Average		927	1150	1070	1664	
Overall Average:			1203			

Alternative 2B — Location: Emmaton

Year Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	169	276	249	2155	712
C	1977	1275	2088	2231	2154	1937
D	1981	811	1266	825	1990	1223
D	1985	569	110	125	2051	714
D	1987	1458	1446	1335	1971	1553
C	1988	2010	1668	841	2209	1682
D	1989	1123	2021	2358	1829	1833
C	1990	1854	1557	1345	2186	1736
C	1991	1131	1973	2183	2180	1867
Average		1156	1378	1277	2081	
Overall Average:			1473			

Alternative 1C — Location: San Andreas

Year Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	147	165	142	318	193
C	1977	132	202	294	235	216
D	1981	231	297	395	325	312
D	1985	420	179	115	354	267
D	1987	271	288	452	238	312
C	1988	252	201	486	254	298
D	1989	131	237	432	403	301
C	1990	391	340	417	262	353
C	1991	147	211	294	249	225
Average		236	236	336	293	
Overall Average:			275			

Alternative 2B — Location: San Andreas

Year Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	100	101	100	151	113
C	1977	110	117	132	170	132
D	1981	103	105	106	133	112
D	1985	117	106	106	143	118
D	1987	106	109	108	154	119
C	1988	120	123	117	164	131
D	1989	124	130	144	125	131
C	1990	118	115	112	163	127
C	1991	118	135	153	176	146
Average		113	116	120	153	
Overall Average:			125			

Alternative 1C						
Year		Location:		Prisoner's Point		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	123	132	125	187	**142**
C	1977	144	145	200	149	**160**
D	1981	155	195	273	193	**204**
D	1985	272	173	112	217	**194**
D	1987	168	190	301	154	**203**
C	1988	159	155	331	158	**201**
D	1989	130	153	273	244	**200**
C	1990	230	220	283	161	**224**
C	1991	125	149	200	155	**157**
Average		**167**	**168**	**233**	**180**	
Overall Average:			**187**			

Alternative 2B						
Year		Location:		Prisoner's Point		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	101	101	100	109	**103**
C	1977	126	110	104	112	**113**
D	1981	106	102	101	106	**104**
D	1985	103	107	106	108	**106**
D	1987	105	103	101	110	**105**
C	1988	107	107	108	111	**108**
D	1989	119	106	107	105	**109**
C	1990	104	103	102	111	**105**
C	1991	108	110	107	114	**110**
Average		**109**	**105**	**104**	**110**	
Overall Average:			**107**			

Alternative 1C						
Year		Location:		Rock Slough		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	214	226	223	525	**297**
C	1977	296	394	621	419	**433**
D	1981	363	494	665	523	**511**
D	1985	600	234	129	579	**386**
D	1987	439	525	784	428	**544**
C	1988	468	462	789	470	**547**
D	1989	297	437	807	631	**543**
C	1990	651	638	783	460	**633**
C	1991	310	419	625	452	**452**
Average		**404**	**425**	**603**	**499**	
Overall Average:			**483**			

Alternative 2B						
Year		Location:		Rock Slough		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	122	113	103	264	**151**
C	1977	211	224	251	291	**244**
D	1981	142	152	139	228	**165**
D	1985	180	117	110	257	**166**
D	1987	165	172	158	253	**187**
C	1988	225	229	169	288	**228**
D	1989	233	231	270	218	**238**
C	1990	205	191	171	284	**213**
C	1991	204	240	283	300	**257**
Average		**187**	**185**	**184**	**265**	
Overall Average:			**205**			

Alternative 1C						
Year		Location:		Terminous		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	99	100	99	104	**101**
C	1977	105	99	99	104	**102**
D	1981	102	100	99	102	**101**
D	1985	100	118	121	103	**111**
D	1987	103	100	99	106	**102**
C	1988	104	100	119	106	**107**
D	1989	106	100	102	102	**103**
C	1990	101	99	100	105	**101**
C	1991	104	103	100	106	**103**
Average		**103**	**102**	**104**	**104**	
Overall Average:			**103**			

Alternative 2B						
Year		Location:		Terminous		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	100	101	100	103	**101**
C	1977	105	100	100	104	**102**
D	1981	102	101	100	102	**101**
D	1985	101	107	124	102	**109**
D	1987	103	101	100	105	**102**
C	1988	103	100	114	105	**106**
D	1989	107	100	101	101	**102**
C	1990	101	100	100	105	**102**
C	1991	104	102	100	105	**103**
Average		**103**	**101**	**104**	**104**	
Overall Average:			**103**			

Alternative 1C						
Year		Location:		Clifton Court		
Class	Year	Oct	Nov	Dec	Sep	Average

Alternative 2B						
Year		Location:		Clifton Court		
Class	Year	Oct	Nov	Dec	Sep	Average

C	1976	211	224	244	386	266	C	1976	153	151	160	256	180
C	1977	308	343	460	341	363	C	1977	248	242	269	287	262
D	1981	294	400	518	389	400	D	1981	165	179	165	231	185
D	1985	463	270	172	445	338	D	1985	187	159	156	249	188
D	1987	343	435	603	350	433	D	1987	186	199	180	259	206
C	1988	376	414	636	365	448	C	1988	236	253	187	276	238
D	1989	331	368	586	457	436	D	1989	276	248	267	215	252
C	1990	482	531	628	357	500	C	1990	214	215	196	274	225
C	1991	319	368	481	354	381	C	1991	247	260	298	284	272
Average		347	373	481	383		Average		212	212	209	259	
Overall Average:			396				Overall Average:			223			
Alternative 1C							Alternative 2B						
Year		Location:		Rio Vista			Year		Location:		Rio Vista		
Class	Year	Oct	Nov	Dec	Sep	Average	Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	102	104	105	200	128	C	1976	101	103	102	330	159
C	1977	142	190	235	226	198	C	1977	180	341	364	329	304
D	1981	120	137	126	185	142	D	1981	121	174	123	319	184
D	1985	112	107	108	192	130	D	1985	114	108	110	317	162
D	1987	139	153	145	226	166	D	1987	189	191	168	306	214
C	1988	171	187	125	239	181	C	1988	274	224	128	346	243
D	1989	143	200	238	162	186	D	1989	149	289	376	265	270
C	1990	158	160	156	223	174	C	1990	218	188	172	336	229
C	1991	135	209	252	237	208	C	1991	145	265	310	330	263
Average		136	161	166	210		Average		166	209	206	320	
Overall Average:			168				Overall Average:			225			
Alternative 1C							Alternative 2B						
Year		Location:		Old River at Middle Riv			Year		Location:		Old River at Middle River		
Class	Year	Oct	Nov	Dec	Sep	Average	Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	203	239	438	510	348	C	1976	191	201	438	510	335
C	1977	295	321	483	533	408	C	1977	282	331	483	534	408
D	1981	225	250	378	487	335	D	1981	209	200	378	487	319
D	1985	281	316	469	486	388	D	1985	198	202	469	486	339
D	1987	259	283	476	499	379	D	1987	237	247	476	499	365
C	1988	282	354	583	520	435	C	1988	259	362	583	520	431
D	1989	340	385	577	501	451	D	1989	322	393	577	501	448
C	1990	290	318	581	520	427	C	1990	223	239	581	520	391
C	1991	315	390	607	529	460	C	1991	298	422	607	529	464
Average		277	317	510	509		Average		247	289	510	510	
Overall Average:			403				Overall Average:			389			
Alternative 1C							Alternative 2B						
Year		Location:		Old River at Tracy Roa			Year		Location:		Old River at Tracy Road		
Class	Year	Oct	Nov	Dec	Sep	Average	Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	249	543	439	495	432	C	1976	314	571	439	494	455
C	1977	356	372	483	515	432	C	1977	418	435	483	517	463
D	1981	339	365	378	485	392	D	1981	373	397	378	483	408

D	1985	467	910	475	487	**585**
D	1987	373	628	477	496	**494**
C	1988	385	447	584	511	**482**
D	1989	416	473	579	486	**489**
C	1990	462	493	581	512	**512**
C	1991	385	527	607	516	**509**
Average		**381**	**529**	**511**	**500**	
Overall Average:			**480**			

Alternative 1C

Year Class	**Year**	**Location: Oct**	**Nov**	**Grant Line Canal, Wes Dec**	**Sep**	**Average**
C	1976	242	224	423	493	**346**
C	1977	342	339	480	519	**420**
D	1981	316	389	380	483	**392**
D	1985	430	324	462	485	**425**
D	1987	351	427	485	494	**439**
C	1988	371	409	587	511	**470**
D	1989	392	364	575	484	**454**
C	1990	440	525	583	511	**515**
C	1991	368	365	586	519	**460**
Average		**361**	**374**	**507**	**500**	
Overall Average:			**436**			

Alternative 3E

Year Class	**Year**	**Location: Oct**	**Nov**	**Jersey Dec**	**Sep**	**Average**
C	1976	172	178	167	1161	**420**
C	1977	557	813	1054	1171	**899**
D	1981	356	503	437	934	**558**
D	1985	375	154	160	975	**416**
D	1987	503	625	656	962	**687**
C	1988	920	853	593	1142	**877**
D	1989	739	993	1284	873	**972**
C	1990	957	847	783	1182	**942**
C	1991	737	964	1192	1210	**1026**
Average		**591**	**659**	**703**	**1068**	
Overall Average:			**755**			

Alternative 3E

Year Class	**Year**	**Location: Oct**	**Nov**	**Emmaton Dec**	**Sep**	**Average**
C	1976	196	316	257	2018	**697**
C	1977	1265	2027	2151	1973	**1854**
D	1981	1057	1246	968	1831	**1276**
D	1985	715	115	146	1799	**694**
D	1987	1558	1417	1341	1800	**1529**
C	1988	1903	1614	966	2032	**1629**

D	1985	327	810	474	482	**523**
D	1987	390	646	477	495	**502**
C	1988	420	471	584	512	**497**
D	1989	468	516	579	479	**511**
C	1990	360	385	581	513	**460**
C	1991	456	578	607	516	**539**
Average		**392**	**534**	**511**	**499**	
Overall Average:			**484**			

Alternative 2B

Year Class	**Year**	**Location: Oct**	**Nov**	**Grant Line Canal, West End Dec**	**Sep**	**Average**
C	1976	298	208	439	492	**359**
C	1977	399	279	484	520	**421**
D	1981	332	215	378	481	**352**
D	1985	307	326	469	479	**395**
D	1987	358	225	476	492	**388**
C	1988	400	274	584	510	**442**
D	1989	441	304	579	477	**450**
C	1990	346	245	581	511	**421**
C	1991	443	289	605	519	**464**
Average		**369**	**263**	**511**	**498**	
Overall Average:			**410**			

D	1989	1126	1975	2311	1655	**1767**
C	1990	1747	1527	1369	2007	**1663**
C	1991	1130	1896	2058	1986	**1768**
Average		**1189**	**1348**	**1285**	**1900**	
Overall Average:			**1431**			

Alternative 3E

Year		Location:		San Andreas		
Class	**Year**	**Oct**	**Nov**	**Dec**	**Sep**	**Average**
C	1976	182	139	129	272	**181**
C	1977	204	248	267	273	**248**
D	1981	217	183	173	215	**197**
D	1985	163	141	149	227	**170**
D	1987	223	196	187	228	**209**
C	1988	219	216	181	269	**221**
D	1989	186	241	309	207	**236**
C	1990	222	213	205	272	**228**
C	1991	185	235	285	285	**248**
Average		**200**	**201**	**209**	**250**	
Overall Average:			**215**			

Alternative 3E

Year		Location:		Prisoner's Point		
Class	**Year**	**Oct**	**Nov**	**Dec**	**Sep**	**Average**
C	1976	273	265	239	165	**236**
C	1977	314	325	277	158	**269**
D	1981	243	267	263	153	**232**
D	1985	282	321	288	156	**262**
D	1987	297	280	247	153	**244**
C	1988	271	279	246	164	**240**
D	1989	225	279	271	149	**231**
C	1990	232	281	234	160	**227**
C	1991	220	274	247	160	**225**
Average		**262**	**286**	**257**	**158**	
Overall Average:			**241**			

Alternative 3E

Year		Location:		Rock Slough		
Class	**Year**	**Oct**	**Nov**	**Dec**	**Sep**	**Average**
C	1976	241	231	287	425	**296**
C	1977	382	410	467	433	**423**
D	1981	267	298	340	334	**310**
D	1985	290	297	350	345	**321**
D	1987	304	362	392	343	**350**
C	1988	445	469	445	429	**447**
D	1989	416	454	569	321	**440**
C	1990	431	462	466	436	**449**
C	1991	418	447	557	451	**468**

Average		355	381	430	391	
Overall Average:			389			
Alternative 3E						
Year		Location:		Terminous		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	105	102	99	114	105
C	1977	142	163	136	112	138
D	1981	203	154	117	114	147
D	1985	114	145	268	113	160
D	1987	168	129	109	115	130
C	1988	132	121	187	117	139
D	1989	116	124	129	109	120
C	1990	114	113	110	116	113
C	1991	115	127	118	114	119
Average		134	131	141	114	
Overall Average:			130			
Alternative 3E						
Year		Location:		Clifton Court		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	113	115	135	165	132
C	1977	147	143	168	196	164
D	1981	113	119	123	156	128
D	1985	116	122	126	157	130
D	1987	118	130	136	188	143
C	1988	135	162	141	191	157
D	1989	181	153	174	146	164
C	1990	127	142	157	182	152
C	1991	155	165	211	199	183
Average		134	139	152	176	
Overall Average:			150			
Alternative 3E						
Year		Location:		Rio Vista		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	106	106	104	288	151
C	1977	176	303	320	281	270
D	1981	209	176	147	265	199
D	1985	121	108	114	255	150
D	1987	240	186	183	251	215
C	1988	246	214	150	292	226
D	1989	151	266	340	229	247
C	1990	215	191	178	291	219
C	1991	150	242	279	277	237
Average		179	199	202	270	
Overall Average:			213			

Alternative 3E						
Year		Location:		Old River at Middle River		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	468	454	438	509	**467**
C	1977	524	493	483	533	**508**
D	1981	442	427	378	487	**434**
D	1985	466	567	469	485	**497**
D	1987	498	417	476	499	**473**
C	1988	540	483	583	520	**532**
D	1989	574	482	577	501	**534**
C	1990	520	466	581	520	**522**
C	1991	571	472	607	529	**545**
Average		**511**	**473**	**510**	**509**	
Overall Average:			**501**			

Alternative 3E						
Year		Location:		Old River at Tracy Road		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	554	569	439	521	**521**
C	1977	634	550	483	553	**555**
D	1981	622	474	379	504	**495**
D	1985	549	1096	476	503	**656**
D	1987	643	635	477	519	**569**
C	1988	676	542	586	541	**586**
D	1989	724	550	580	509	**591**
C	1990	573	488	581	542	**546**
C	1991	714	682	607	553	**639**
Average		**632**	**621**	**512**	**527**	
Overall Average:			**573**			

Alternative 3E						
Year		Location:		Grant Line Canal, West End		
Class	Year	Oct	Nov	Dec	Sep	Average
C	1976	311	288	439	515	**388**
C	1977	366	360	483	541	**438**
D	1981	291	274	379	496	**360**
D	1985	328	370	472	494	**416**
D	1987	307	326	476	509	**405**
C	1988	350	390	584	529	**463**
D	1989	363	400	578	503	**461**
C	1990	331	401	581	530	**461**
C	1991	359	406	607	539	**478**
Average		**334**	**357**	**511**	**517**	
Overall Average:			**430**			

E-015099

3. Diversion Effects on Fisheries

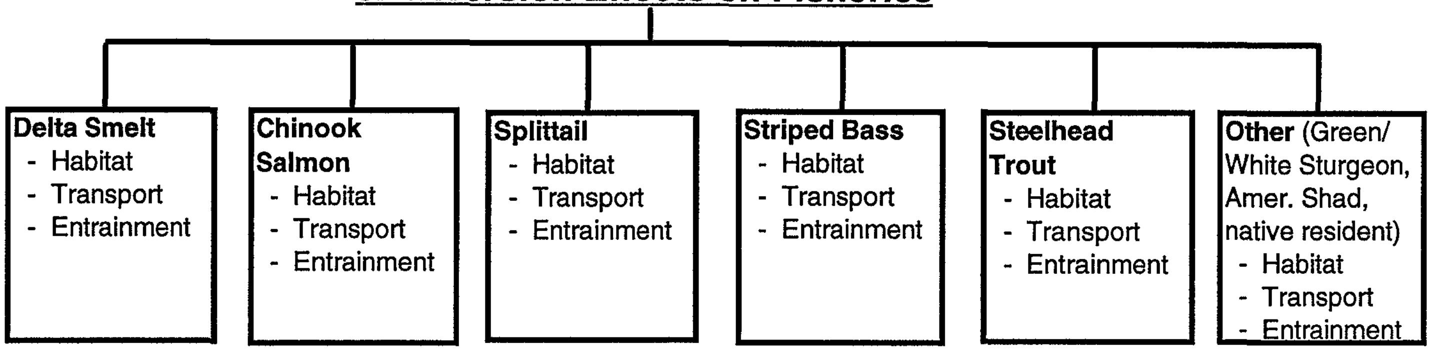


Table 3.1 Summary

	Delta Smelt			Chinook Salmon			Splittail			Striped Bass			Steelhead Trout			Other			Relative Rank
Alternative	Habitat	Trans.	Entrain.	Habitat	Trans.	Entrain.	Habitat	Trans.	Entrain.	Habitat	Trans.	Entrain.	Habitat	Trans.	Entrain.	Habitat	Trans.	Entrain.	
Exist. Cond.																			
No-action	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1A																			
1B	0.3	0.1	0.1	0.3	0.1	0.3	0.4	0.4	0.4	0.3	0.1	0.4	0.8	0.1	0.3	0.6	0.1	0.4	**6**
1C	0.4	0.3	0.3	0.4	0.3	0.4	0.5	0.5	0.4	0.4	0.3	0.5	0.9	0.3	0.4	0.8	0.4	0.5	**4**
2A	0.4	0.5	0.2	0.4	0.4	0.4	0.4	**xx**	0.5	0.4	**xx**	0.4	0.8	0.4	0.4	0.6	**xx**	0.5	**5**
2B	0.5	0.6	0.3	0.5	0.5	0.5	0.5	**xx**	0.5	0.5	**xx**	0.5	0.9	0.5	0.5	0.8	**xx**	0.5	**3**
2D																			
2E																			
3A	0.7	0.7	0.6	0.7	0.6	0.6	0.5	0.7	0.6	0.7	0.7	0.6	0.8	0.6	0.6	0.9	0.6	0.6	**2**
3B	0.8	0.8	0.7	0.8	0.7	0.7	0.7	0.8	0.7	0.8	0.8	0.7	0.9	0.7	0.7	1	0.8	0.7	**1**
3E																			
3H																			
3I																			

Values are on a scale from 0 to 1; with 1 representing the best performance achievable from the range of alternatives.
Rationale for rankings are provided on the following sheets.
"xx" indicates performance worse than the no-action alternative; need to look for ways to mitigate; for this example scored as "0".

E-015099

Diversion Effects on Fisheries
Supporting Information for Table 3.1

Evaluations for diversion effects on fisheries must consider differing diversion structures and conveyance facilities. Each alternative will have different effects on fish habitat, transport, and entrainment due to diversions. Habitats will differ in residence time of water, water source, tidal and net flows, salinity, temperature, nutrients, and foodweb organisms. Each of these factors will have time and spatial distributions, with time varying on annual and seasonal basis. Transport will vary simply as a function of changed tidal and net flow rates and routes available from the differing export approaches among the alternatives. Entrainment will vary with the location, amount, and timing of diversions as well as intake structures among the alternatives.

These evaluations will come from the impact analysis for the EIR/EIS and from workgroups of experts. Since development of this information is in progress, the following is a sample of the types of information that may ultimately support Table 3.1. **At this time it is for demonstration purposes only.** Expert consideration of habitat, transport, and entrainment as shown below may result in qualitative scoring similar to that shown in Table 3.1; rationale for each scoring will be provided.

Delta Smelt

Habitat

Habitat is defined as the physical, chemical, and biological conditions at the sites where delta smelt are migrating, spawning, and rearing over their one-year life cycle. Location, timing, and amount of exports that differ among the alternatives affect habitat conditions at many places in the Delta: especially conditions such as food web, currents, water chemistry, temperature, total dissolved solids, turbidity, etc. Delta smelt would be sensitive to each of these, but early in their life cycle they would be particularly sensitive to food web productivity. Flows and residence time are important habitat factors for Delta smelt. Alternatives that maintain positive net downstream flows in the Delta in spring are good for delta smelt. Early spring Delta inflow and outflow pulses and increased late spring and summer residence time will benefit foodweb productivity.

Transport/Migration

Different arrays of exports among the alternatives would affect tidal and freshwater flows above and below diversion sites. Such changes would affect transport of delta smelt, particularly larvae. For example, negative (reverse) net flows in the Delta may draw larvae upstream into the Delta where they would be subject to poor habitat and higher diversion rates. Also, reduced flows downstream from Hood would potentially reduce the transport of larval smelt from the lower Sacramento River downstream to nursery areas in the western Delta and Suisun Bay and Marsh. Upstream net transport anywhere in the Delta will have adverse effects. Alternatives that allow reduced diversions from the Delta in spring would benefit delta smelt transport downstream to the Bay. Barriers such as Hood diversion screens and south Delta barriers would hinder a small portion of upstream migrating adult smelt in winter and spring.

Entrainment

Differing export arrays would increase risk to all life stages of delta smelt due to diversions at export facilities. All life stages would be vulnerable to losses at diversion facilities regardless of the screening technology. Each alternative diversion would result in a different level of risk to delta smelt; this risk would vary with water year type. In cases involving late juveniles and adults (2 mo+ in age), screening technology would be an important factor. Alternatives that draw any water from the western Delta would have greatest impact, followed by alternatives drawing water from the central Delta.

E-015101

Chinook Salmon

Chinook salmon include four races: winter, spring, fall, and late fall. Each race is faced with different levels of risk to survival due to differing export scenarios. For example, an alternative that shifts exports from the south Delta from spring to late fall and winter would increase the risks to spring and winter run salmon, and reduce the risk to fall and late-fall salmon. Alternatives that take San Joaquin water would have greater effects on San Joaquin salmon.

Habitat

Export regimes would provide differing arrays of flows, temperatures, water temperature, water chemistry, and food web productivity that would affect fry and juvenile salmon growth and survival in the Delta. This potential would vary with water year type as well. Sensitive periods would be December through April for food supply and November, May, and June for migrating habitat conditions, particularly flow and temperature.

Transport/Migration

Export effects of flows would provide varying degrees of support for migrating fry, juvenile, and smolt salmon. For example, alternatives that provided greater net downstream flows in the lower San Joaquin River in the spring would potentially improve transport of San Joaquin salmon to the Bay. Negative (reverse) net flows in the Delta would hinder downstream migration and transport of salmon. Barriers would be hindrances to upstream migrating salmon depending on the effectiveness of upstream passage facilities. Hood diversion and Old River barrier are potential hindrances in fall and winter.

Entrainment

Export arrays each differ in the risk loss of salmon young to exports. Arrays that draw salmon into the south Delta present much greater risks to salmon. Exports that favor San Joaquin water will lead to proportionally greater losses of San Joaquin salmon. Unscreened north Delta diversions will lead to greater losses of Sacramento salmon.

Splittail

Splittail will be very sensitive to seasonal flow changes especially in late winter and early spring. Export arrays that reduce flows in these seasons will increase risks to splittail.

E—015102

Habitat

Splittail need bank overflows (high flows outside main channel) for spawning and marshes for rearing, both of which will change little by differing alternative export arrays. Alternatives which depend on higher winter exports allow flooding of upstream habitats in the Sacramento and San Joaquin Valleys in dry and moderate water-year types, greatly benefiting splittail. Alternatives that increase shallow water and tidal wetlands to a greater extent (2d, 2e, 3h) would also benefit splittail.

Transport/Migration

Export arrays that reduce net downstream flows into and through the Delta in late winter and early spring will be more detrimental to splittail. Hood and Old River barriers could block upstream adult splittail migration. Splittail probably have trouble with ladders as they have not been observed upstream of Red Bluff diversion dam.

Entrainment

Alternatives that focus exports in late winter and early spring near the mouths of the rivers would increase risk of entrainment to larval and juvenile splittail. Late winter exports from the south Delta will be a risk to upstream migrating adult splittail. San Joaquin splittail will benefit from less San Joaquin water being exported.

E-015103

Striped Bass

Striped bass are very sensitive to export array differences, particularly in early life stages.

Habitat

Export array difference will affect food web productivity which will greatly influence striped bass survival. April-May flows in the Sacramento River need be maintained at levels above 13,000 cfs to maintain downstream transport to rearing habitat.

Transport/Migration

Export arrays that reduce net downstream transport into and through the Delta to the Bay in April-June will increase the risk to striped bass. Adult striped bass may be blocked from moving upstream at Hood diversion during spring migration into the Sacramento River.

Entrainment

Export arrays that increase exports from the lower Sacramento River (north Delta) in late April and May would increase risk to larval entrainment into the central Delta (2a, 2b, 2d, 2e) or at the pumps (alt 3). Summer south Delta exports would be especially harmful to striped bass. Spring and summer export reductions from the central, western, and southern Delta would reduce risk to striped bass.

Steelhead

The greatest risk to steelhead are exports from the south Delta.

Habitat

Not an important concern because steelhead spend little time in the Delta.

Transport/Migration

Export arrays that reduce net downstream transport through the Delta in winter and spring would be detrimental to steelhead. Arrays of particular concern are those that would change net transport direction. Like salmon, adult steelhead may be hindered from moving upstream by barriers such as the Hood diversion and Old River barrier.

E-015104

Entrainment

Export arrays that divert large amounts of water from the south Delta in winter and spring have greater potential risk to juvenile and adult steelhead. Screening provides good protection for steelhead at points of diversions.

Other options: green and white sturgeon, American shad, native resident fishes.

Habitat

Similar to delta smelt considerations.

Transport/Migration

Sturgeon and American shad adults would be blocked by barriers such as the Hood diversions, as they do not readily ascend ladders.

Entrainment

Increased diversions from the North Delta will draw more larval sturgeon and shad into the Central Delta or pumping plants. Sturgeon and shad spawn primarily in Sacramento system.

Information in Table 3.1 and this supporting information will be updated as more detailed modeling becomes available.

6. Water Supply Opportunities

CALFED environmental water supply benefits (acre-feet);
- avg. year water supply
- critical year water supply

CALFED agricultural/Urban water supply benefits (acre-feet)
- avg. year water supply
- critical year water supply

Assumes 1/3 of developed supply allocated to environmental uses and 2/3 to ag./urban uses.
Water acquired from willing sellers for ecosystem needs is accounted for separately.
No regional breakdown is available at this time.

Table 6.1 Summary

	Envir. Water Benefits		Ag./Urban Water Benefits		Relative
Alternative	Crit. Yr. (TAF)	Avg. Yr. (TAF)	Crit. Yr. (TAF)	Avg. Yr. (TAF)	Rank
Exist. Cond.					
No-action	0	0	0	0	
1A					
1B	0	40-50	0	70-100	**6**
1C	150-200	180-240	300-410	360-490	**3**
2A	30-40	90-130	70-90	190-250	**4**
2B	150-210	200-280	310-420	410-560	**1**
2D					
2E					
3A	30-40	90-130	70-90	190-250	**4**
3B	150-210	200-280	310-420	410-560	**1**
3E					
3H					
3I					

Water supply opportunity increase over the no-action alternative:
- Avg. Yr. no-action water supply approximately 6.2 million acre-feet
- Critical Yr. no-action water supply approximately 4.3 million acre-feet

E-015106

Water Supply Opportunities
Supporting Information for Table 6.1

Preliminary system modeling of new storage and conveyance facilities has been conducted with DWRSIM, including combinations of 1) isolated Delta conveyance, 2) Sacramento River tributary surface storage, and 3) south of Delta off-aqueduct surface storage. While modeling of complete program alternatives is ongoing, results of this preliminary modeling may be used for initial PEIR/EIS evaluations. While modeling of complete program alternatives is ongoing, results of this preliminary modeling may be used for initial approximations of water supply opportunities. This information will be updated as modeling progresses. Since development of this information is in progress, the following is a sample of how information may ultimately support Table 6.1. **At this time it is for demonstration purposes only.**

CALFED operation studies 472 through 510 provide an initial evaluation of potential water supply benefits using DWRSIM. The model studies include elements of storage and conveyance facilities associated with Bay-Delta Program alternatives. However, many storage and conveyance facilities and operational parameters are not yet included in the model studies. Post-processing analysis has been used for adjusting DWRSIM results considering several adjustment factors for current institutional and model limitations. Specific adjustments include:

- **CVPIA Delta (b)(2) Actions**
  Critical Years: 110 taf; 73-year average: 260 taf; shifted from total water supply to environmental water supply.
- **Sacramento River Flow Event Target for Fluvial Geomorphology**
  Critical Years: 17 taf; 73-year average; 93 taf; subtracted from total water supply.
- **Groundwater/In Delta/ San Joaquin Storage**
  Critical Years: 20 taf; 73-year average; 90 taf; added to total water supply.
- **15,000 cfs Isolated Conveyance Facility**
  Critical Years: 10 taf; 73-year average: 10 taf; added to total water supply.
- **Joint SWP/CVP Diversion**
  Critical Years; 5 taf; 73-year average: 130 taf; added to total water supply.

Information in Table 6.1 and this supporting information will be updated as more detailed modeling becomes available.

E-015107

11. Total Cost

First Cost (present value and annualized costs for time sequence):
- Study, design & permitting
- Construction
- Mitigation
- Other

Annual Costs (present value and annualized costs for time sequence:)
- Operation and maintenance
- Monitoring
- Reoccurring annual purchases
- Other

Table 11.1 Summary

Alternative	First Cost (Pres. value $Million)	Annual Cost $ Million/YR	Relative Rank
Exist. Cond.			
No-action	-		-
1A			
1B	300	3	**1**
1C	5,200	42	**4**
2A	1,100	9	**2**
2B	8,600	69	**5**
2D			
2E			
3A	1,500	12	**3**
3B	9,500	76	**6**
3E			
3H			
3I			

For this example, cost of the 4 common programs are not included.
Table includes $ for storage and conveyance for demonstration purposes only; all facilities not part of common programs.

Total Cost
Supporting Information for Table 11.1

Estimating of costs for the alternatives is in progress. At this time, only preliminary estimates of storage and conveyance facility costs are available. **At this time it is for demonstration purposes only.** Therefore, Table 11.1 does not currently include costs for any of the 4 common programs. The estimates in Table 11.1 were derived from:

<u>CVP-SWP Improvements</u>
Cost were taken from, CALFED's "Facility Descriptions and Updated Cost Estimates for an **Improved Through Delta Conveyance Facility**", (Table 4), June 24, 1997. To account for mitigation, costs were increased by 15 percent.

<u>South Delta Improvements</u>
Cost were taken from, CALFED's "Facility Descriptions and Updated Cost Estimates for an **Improved Through Delta Conveyance Facility**", (Table 4), June 24, 1997. To account for mitigation, costs were increased by 15 percent.

<u>North Delta Improvements</u>
Costs were taken from, DWR's, "Draft Environmental Impact Report and Impact Statement **North Delta Program**", November 1990. Costs are from Table H-1, Alternative 5A and included only enlarging the North Fork of the Mokelumne River. The cost were increased by 15 percent for mitigation and 11 percent for escalation (increase in costs) from November 1990 to October 1996.

<u>Alternative 2B - Intake, Pumping Plant, Glanville and Mc Cormack-Williamson Tracks</u>
Cost were taken from, CALFED's "Facility Descriptions and Updated Cost Estimates for an **Improved Through Delta Conveyance Facility**", (Table 4), June 24, 1997. To account for mitigation, costs were increased by 15 percent.

<u>3.0 MAF Upstream Storage Sacramento River</u>
To forecast a general cost of 3.0 MAF of surface storage in the Sacramento Valley, the cost of two large storage complexes were averaged (Colusa and Thomas-Newville). The 3.3 MAF Colusa Reservoir complex is offstream with conveyance facilities of a new canal paralleling the Tehama-Colusa (T-C) Canal from RedBluff diversion Dam to Funks Reservoir and a new connection from the Sacramento River at

E-015109

Chico landing to the T-C Canal (conveyance options 2b & 4). The 3.08 MAF Thomes-Newville complex is offstream with a new canal adjacent to the T-C canal from RedBluff to Sour Grass Canal (conveyance option 2f). The cost of these facilities were derived from CALFED's, "Facility Descriptions and Updated Cost Estimates for: Sites/Colusa Reservoir, June 24, 1997; Thomes-Newville Reservoir Project, June 23,1997; Chico Landing Intertie, March 25, 1997; Tehama-Colusa Canal Enlargement, June 24,1997; and, Tehama-Colusa Canal Extension, June 25,1996.

500 TAF Upstream Storage San Joaquin River

Cooperstown, a proposed 609 TAF offstream reservoir, was used to estimate the general cost for 500 TAF of storage in the San Joaquin valley.

2.0 MAF Aqueduct Storage

Garzas, proposed 2.0 MAF offstream reservoir, was used to estimate the general cost for 2.0 MAF of storage on the aqueduct.

1.0 MAF Aqueduct Storage

The general cost of 1.0 MAF of aqueduct storage was derived by combining the cost of a 600 TAF offstream Sunflower reservoir and a 401 TAF offstream Ingram reservoir.

500 TAF Groundwater storage in the Sacramento Valley

The cost of 500 TAF active groundwater storage was estimated by summing the cost of: Butte Basin (pg B-5); and Stoney Creek Fan (pg B-12) from the CALFED report "CALFED Bay-Delta Program Storage and Conveyance Inventories", February 5, 1997. To account for mitigation, costs were increased by 15 percent.

500 TAF Groundwater storage in the San Joaquin Valley

The cost of 500 TAF active groundwater storage was estimated by summing the cost of: Southeastern San Joaquin County (pg B-16); and Kern County (pg B-20) from the CALFED report "CALFED Bay-Delta Program Storage and Conveyance Inventories", February 5, 1997. To account for mitigation, costs were increased by 15 percent.

200 TAF In-Delta Storage
Cost were taken from, CALFED's "Facility Descriptions and Updated Cost Estimates for the **In-Delta Storage Project**", (Table 3, June 24, 1997. To account for mitigation, costs were increased by 15 percent.

5,000 cfs Isolated Facility
Cost were taken from, CALFED's "Facility Descriptions and Updated Cost Estimates for an **Isolated Delta Conveyance Facility**", (Table 3), March 28,1997. To account for mitigation, costs were increased by 15 percent.

General Allowances (assume that all of these are included in the above figures)
Contingency Costs (15%)
Engineering, Legal, and Project Administration (35%)
Mitigation Costs (15%)
Operation and Maintenance (0.8%)

Cost estimates for the four common programs are not available at this time.

Information in Table 11.1 and this supporting information will be updated as more detailed costs become available.