
C.9

**Aquatic Mitigation Cost Effective and
Incremental Cost Analysis**

C.9 Cost Effectiveness and Incremental Cost Analyses of Aquatic Mitigation Sites

Following identification of the recommended plan, including consideration of estimated environmental impacts in habitat units, cost estimates were developed for the individual mitigation measures. As required by ER 1105-2-100, C-3.e., mitigation costs must be justified by demonstrating cost effectiveness and reasonableness of incremental costs. The mitigation measures (ordered by river mile in summary table C.6.2) were developed by the inter-agency collaboration team for numerous potential mitigation sites and activities. The team evaluated impacts and benefits in habitat units, and focused on best development of the site based on combined professional expertise and familiarity with riverine processes and habitat. Thus the team evaluation produced what may be termed optimum development for each measure, thereby creating a single measure that is the cost effective alternative for the site or activity. The measures were further screened for engineering and other technical feasibility, reducing the number of options available to meet the mitigation targets identified for the lower waterway (Arkansas) and the upper waterway (Oklahoma).

The incremental cost analysis (ICA) was performed by dividing implementation costs for each item by its average annual habitat units to estimate the cost per AAHU. The measures were sorted in ascending order of cost per AAHU so that the incremental cost of each succeeding measure is greater than the previous measure. The amount of change from existing HUs were accumulated measure by measure until the mitigation targets were achieved. This ensures that the incremental costs of the measures included in the aquatic mitigation plan are the least costly of the measures available. ICA results are shown in the following tables.

Table C.9-1. Aquatic Mitigation Features – Arkansas Portion

Nav. Mile	Project	Future without Project AAHUs	Total AAHUs with 12-ft Project	AAHUs Effected by 12-ft Project	Total AAHUs with Mitigated 12-ft Project	Change in Mitigated 12-ft AAHUs Relative to Baseline (1)	Cost	Cost Per AAHU	Running Total AAHU's	Percent Mitigation	Running Total Cost	Incremental Change in AAHU's	Incremental Cost
23.6 R	Avoid RB disposal	3.558	3.145	-0.413	0.948	-2.610	\$0.00	\$0.00	0.948	0.03%	\$0.00	0.948	\$0.00
27L	Avoid aquatic disposal, utilize land	2.453	1.677	-0.776	1.677	-0.776	\$0.00	\$0.00	2.625	0.08%	\$0.00	1.677	\$0.00
35R	Notch modified dikes (2)	6.439	6.439	0.000	6.439	0.000	\$0.00	\$0.00	9.064	0.27%	\$0.00	6.439	\$0.00
36.4-37.0R	Extend disposal area u/s to 38.1R, avoid blocking entrance to chute at 36.4R and 38.1R	5.692	5.031	-0.661	3.434	-2.258	\$0.00	\$0.00	12.498	0.38%	\$0.00	3.434	\$0.00
37.8-38.4L	Avoid disposal, utilize RB.	5.692	5.031	-0.661	3.203	-2.489	\$0.00	\$0.00	15.701	0.47%	\$0.00	3.203	\$0.00
40R	Notch existing revetment/dike (1)	1.533	1.533	0.000	1.533	0.000	\$0.00	\$0.00	17.235	0.52%	\$0.00	1.533	\$0.00
39.8-40.0L	Avoid disposal, utilize right bank	1.518	1.342	-0.176	1.221	-0.297	\$0.00	\$0.00	18.455	0.55%	\$0.00	1.221	\$0.00
44-44.7R	Utilize AR44.3R-D for disposal and extend d/s to 43.0R	0.854	0.755	-0.099	0.755	-0.099	\$0.00	\$0.00	19.210	0.58%	\$0.00	0.755	\$0.00
45.4-46L	Avoid disposal in aquatic areas of AR45.3L-D, dispose on land or preferably on RB	8.348	7.379	-0.969	5.045	-3.304	\$0.00	\$0.00	24.254	0.73%	\$0.00	5.045	\$0.00
46.8-49.2L	Utilize land within cells for disposal at AR48.0L-D, avoid aquatic areas	11.289	9.979	-1.311	9.979	-1.311	\$0.00	\$0.00	34.233	1.03%	\$0.00	9.979	\$0.00
49.6-49.9	Utilize existing in-channel disposal	1.044	0.922	-0.121	0.922	-0.121	\$0.00	\$0.00	35.156	1.06%	\$0.00	0.922	\$0.00
64.8-65.3L	Utilize AR65.2L-D or in-channel disposal at AR65.5Channel-D	10.084	7.595	-2.489	7.595	-2.489	\$0.00	\$0.00	42.751	1.29%	\$0.00	7.595	\$0.00
65.2-65.6	Utilize AR65.2L-D or in-channel disposal at AR65.5Channel-D	2.548	1.919	-0.629	1.919	-0.629	\$0.00	\$0.00	44.670	1.34%	\$0.00	1.919	\$0.00
85.5-85.8R	Avoid disposal if possible and utilize in-channel disposal	6.210	5.033	-1.176	4.952	-1.258	\$0.00	\$0.00	49.621	1.49%	\$0.00	4.952	\$0.00
85.6-85.8	Utilize in-channel disposal	0.430	0.349	-0.081	0.349	-0.081	\$0.00	\$0.00	49.970	1.50%	\$0.00	0.349	\$0.00
87.7L	Investigate dredging channel into oxbow lake	69.697	69.697	0.000	69.697	0.000	\$0.00	\$0.00	119.667	3.60%	\$0.00	69.697	\$0.00
91.5L	Bank stab and revetment at 91.5 is needed (current – 0.3)	2.291	2.291	0.000	3.636	1.344	\$0.00	\$0.00	123.302	3.71%	\$0.00	3.636	\$0.00
96.0-98.2R	Enlarge and utilize RB disposal, investigate disposing behind modified revetment and dikes, investigate terrestrial disposal if needed	5.347	3.165	-2.181	3.165	-2.181	\$0.00	\$0.00	126.468	3.80%	\$0.00	3.165	\$0.00
100.6-101.3R	Utilize this area as alternative disposal site	4.710	2.788	-1.922	2.788	-1.922	\$0.00	\$0.00	129.256	3.89%	\$0.00	2.788	\$0.00
106.5-107.7L	Avoid aquatic disposal in AR107.1L, utilize land areas or in-channel disposal	49.007	33.483	-15.524	33.483	-15.524	\$0.00	\$0.00	162.739	4.89%	\$0.00	33.483	\$0.00
124.2-124.5L	Avoid disposal in AR124.8L-D, utilize in-channel disposal	3.500	3.500	0.000	0.133	-3.366	\$0.00	\$0.00	162.873	4.90%	\$0.00	0.133	\$0.00
124.8-125.1	Utilize in-channel disposal at AR124.8 Channel-D	2.800	2.800	0.000	2.933	0.133	\$0.00	\$0.00	165.806	4.99%	\$0.00	2.933	\$0.00
126.6-127.0R	Avoid disposal on RB	8.220	6.892	-1.327	6.892	-1.327	\$0.00	\$0.00	172.698	5.19%	\$0.00	6.892	\$0.00

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139.5-141R	Avoid disposal from 140R u/s to 141R to prevent blockage of opening between islands, utilize 140R d/s to tip of island	12.991	10.893	-2.098	8.912	-4.079	\$0.00	\$0.00	181.609	5.46%	\$0.00	8.912	\$0.00
141.5-142.5R	Utilize disposal behind raised and extended L-dikes at 142.0R	6.897	5.783	-1.114	0.000	-6.897	\$0.00	\$0.00	181.609	5.46%	\$0.00	0.000	\$0.00
143.7-144.2L	Construct L-dike or revetment and use disposal to slope and protect bank	6.509	3.833	-2.677	5.110	-1.399	\$0.00	\$0.00	186.720	5.61%	\$0.00	5.110	\$0.00
146.3R	Avoid disposal in this area	22.218	17.652	-4.566	16.823	-5.395	\$0.00	\$0.00	203.542	6.12%	\$0.00	16.823	\$0.00
146.6-147.8R	Utilize land within disposal cells	4.651	3.900	-0.751	3.900	-0.751	\$0.00	\$0.00	207.442	6.24%	\$0.00	3.900	\$0.00
147.8-150L	Avoid disposal from 149-150L that would block the entrance to backwater area, utilize disposal area d/s of 149L	28.322	16.676	-11.646	5.005	-23.316	\$0.00	\$0.00	212.448	6.39%	\$0.00	5.005	\$0.00
154-154.6L	Avoid RB disposal, Utilize land disposal within cells at AR154.1L-D	0.000	0.000	0.000	0.000	0.000	\$0.00	\$0.00	212.448	6.39%	\$0.00	0.000	\$0.00
155.4L	Utilize land within cell at AR155.4L-D	0.000	0.000	0.000	0.000	0.000	\$0.00	\$0.00	212.448	6.39%	\$0.00	0.000	\$0.00
163.6-165.2R	163.6-165.3 - Revetment is needed for bank stabilization	1.059	0.751	-0.307	0.751	-0.307	\$0.00	\$0.00	213.199	6.41%	\$0.00	0.751	\$0.00
164.2-164.7L	Avoid LB disposal, utilize disposal behind revetment on RB	11.379	8.076	-3.303	5.157	-6.221	\$0.00	\$0.00	218.356	6.57%	\$0.00	5.157	\$0.00
165.5-166.2R	Avoid disposal in AR166.0R-D	22.440	15.927	-6.513	13.008	-9.432	\$0.00	\$0.00	231.365	6.96%	\$0.00	13.008	\$0.00
176.2-176.4	Avoid disposal in AR176.2L-D, utilize RB land disposal on Lentz property	2.420	2.104	-0.316	2.104	-0.316	\$0.00	\$0.00	233.468	7.02%	\$0.00	2.104	\$0.00
179.3-179.7R	Utilize disposal at 179.6R behind revetment	11.010	6.602	-4.408	2.723	-8.287	\$0.00	\$0.00	236.191	7.10%	\$0.00	2.723	\$0.00
185.8-186.4	Avoid disposal in AR186.2L-D, create artificial gravel bar downstream of dikes from 185L-186L	7.446	5.282	-2.164	2.591	-4.855	\$0.00	\$0.00	238.782	7.18%	\$0.00	2.591	\$0.00
186.9-189.9R	*Existing least tern island - avoid construction during nesting, limited disposal to avoid elevating island and maintain fish access to backwater, notch revetment and dikes (3-6) for flow-through, fish passage and access	201.663	143.045	-58.618	143.045	-58.618	\$0.00	\$0.00	381.827	11.48%	\$0.00	143.045	\$0.00
190.5-192R	New dredge disposal alternative to 189.5L will create elevated vegetated shoreline on Sweeden Island	4.918	2.949	-1.969	5.262	0.344	\$0.00	\$0.00	387.089	11.64%	\$0.00	5.262	\$0.00
200.2L	Utilize land disposal within cells from 200.8L d/s to 200L, avoid disposal u/s of 200.8L	25.323	15.185	-10.138	15.185	-10.138	\$0.00	\$0.00	402.274	12.10%	\$0.00	15.185	\$0.00
204.6-205.1R	Utilize in-channel disposal (gravel)	18.615	13.204	-5.411	13.204	-5.411	\$0.00	\$0.00	415.478	12.49%	\$0.00	13.204	\$0.00
232R	No adverse impact, bank stabilization is needed at this area	0.364	0.364	0.000	0.349	-0.015	\$0.00	\$0.00	415.827	12.50%	\$0.00	0.349	\$0.00
233L	Utilize land disposal in AR233.0L-D if needed	0.000	0.000	0.000	0.000	0.000	\$0.00	\$0.00	415.827	12.50%	\$0.00	0.000	\$0.00

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236.6L	Utilize this site for disposal	0.000	0.000	0.000	0.000	0.000	\$0.00	\$0.00	415.827	12.50%	\$0.00	0.000	\$0.00
239.5R	239RB-Maintain fish access through revetment. Modified revetment along RB will have no adverse impacts	27.373	27.373	0.000	26.266	-1.107	\$0.00	\$0.00	442.093	13.29%	\$0.00	26.266	\$0.00
241.8-242.2R	Utilize this site for disposal	5.685	3.777	-1.907	0.000	-5.685	\$0.00	\$0.00	442.093	13.29%	\$0.00	0.000	\$0.00
243.8-246.8L	Avoid disposal (none currently scheduled) in AR245.6L-D, notch dike d/s of most d/s island at 244.5L	88.234	49.229	-39.005	49.229	-39.005	\$0.00	\$0.00	491.322	14.77%	\$0.00	49.229	\$0.00
249.7L	Alternative disposal site for AR248.0R-D	0.874	0.487	-0.386	-0.060	-0.933	\$0.00	\$0.00	491.262	14.77%	\$0.00	-0.060	\$0.00
254.1-254.5L	Alternative disposal site inside closed revetment at 254.1L, no previously approved disposal area indicated on map	0.728	0.406	-0.322	-0.193	-0.921	\$0.00	\$0.00	491.069	14.77%	\$0.00	-0.193	\$0.00
255.7-256.1R	Avoid, use AR256.2L-D for disposal instead of AR256.0R-D	1.467	0.975	-0.492	0.975	-0.492	\$0.00	\$0.00	492.044	14.79%	\$0.00	0.975	\$0.00
255.9-256.2L	Prefer to use this terrestrial area for disposal	0.000	0.000	0.000	0.000	0.000	\$0.00	\$0.00	492.044	14.79%	\$0.00	0.000	\$0.00
271.2-273R	Utilize this RB site for disposal	1.323	0.559	-0.763	-1.028	-2.351	\$0.00	\$0.00	491.016	14.76%	\$0.00	-1.028	\$0.00
278.9-280.3L	At AR279.5L-D avoid disposal in aquatic areas, utilize land within disposal area and AR280.0R-D,	131.189	85.914	-45.275	85.914	-45.275	\$0.00	\$0.00	576.930	17.35%	\$0.00	85.914	\$0.00
283.5-284.7R	Recommend constructing new disposal at 284R	1.746	0.738	-1.007	0.738	-1.007	\$0.00	\$0.00	577.668	17.37%	\$0.00	0.738	\$0.00
284.7-287.4	Avoid disposal in d/s cells on LB and RB, prefer disposal d/s in new area	46.658	19.733	-26.924	15.704	-30.954	\$0.00	\$0.00	593.372	17.84%	\$0.00	15.704	\$0.00
288.4-289L	Avoid disposal in AR289.0L-D and place dredged gravel along right bank downstream and extend downstream gravel bar at 289.7R	7.776	3.289	-4.487	-0.741	-8.517	\$0.00	\$0.00	592.631	17.82%	\$0.00	-0.741	\$0.00
288.8-289.8R	Utilize this alternative disposal area	6.348	2.685	-3.663	-1.345	-7.693	\$0.00	\$0.00	591.287	17.78%	\$0.00	-1.345	\$0.00
290.5-291.4R	Utilize dry cells in this disposal area	1.640	1.074	-0.566	0.000	-1.640	\$0.00	\$0.00	591.287	17.78%	\$0.00	0.000	\$0.00
291.8-292.3L	Avoid disposal at 292.3L	5.261	3.446	-1.816	3.446	-1.816	\$0.00	\$0.00	594.732	17.88%	\$0.00	3.446	\$0.00
189.2	189.2 - Notch revetment and dikes for fish passage and access to backwater	67.852	67.852	0.000	88.160	20.309	\$726.00	\$8.23	682.893	20.53%	\$726.00	88.160	\$8.23
187.2R	Notch long L-dike at 187.2R (2)	82.208	82.208	0.000	82.208	0.000	\$726.00	\$8.83	765.101	23.00%	\$1,452.00	82.208	\$8.83
283.1-283.9L	283.9L - Notch modified revetment in upper cell (High priority)	21.579	21.579	0.000	41.715	20.135	\$726.00	\$17.40	806.815	24.26%	\$2,178.00	41.715	\$17.40
135-138.2R	Avoid disposal in aquatic areas, utilize island disposal, (*potential existing tern site), notch two lower dikes	86.607	72.621	-13.987	81.698	-4.909	\$1,452.00	\$17.77	888.513	26.72%	\$3,630.00	81.698	\$17.77
24-25L	Notch modified revetment (2) and modified dike (1)	92.917	92.917	0.000	118.441	25.524	\$2,178.00	\$18.39	1006.954	30.28%	\$5,808.00	118.441	\$18.39

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134.5R	Notch existing dike (1) at 134.7R for fish passage and access to Mill Bayou	35.402	35.402	0.000	35.402	0.000	\$726.00	\$20.51	1042.356	31.34%	\$6,534.00	35.402	\$20.51
235-236.8R	Notch existing dike and raised dike (2-3) in AR236.0R-D, place dredged material on existing islands within disposal area	105.624	70.187	-35.437	100.346	-5.278	\$2,178.00	\$21.70	1142.702	34.36%	\$8,712.00	100.346	\$21.70
238.5-241.2	Maintain and/or notch existing and modified dikes (3)	74.279	74.279	0.000	96.925	22.646	\$2,178.00	\$22.47	1239.627	37.27%	\$10,890.00	96.925	\$22.47
279-280.1L	Notch modified revetment at 279L and 280.2L to maintain high value for backwater area	67.644	67.644	0.000	91.534	23.890	\$2,178.00	\$23.79	1331.161	40.02%	\$13,068.00	91.534	\$23.79
58.3L	Notch revetment at 58.3L	17.112	17.112	0.000	28.093	10.981	\$726.00	\$25.84	1359.254	40.87%	\$13,794.00	28.093	\$25.84
180.2R	Notch existing dike at 180.2R for fish passage and access to backwater	15.414	15.414	0.000	22.889	7.475	\$726.00	\$31.72	1382.143	41.56%	\$14,520.00	22.889	\$31.72
134.2R	Notch existing revetment (1) at 134.2R and	13.247	13.247	0.000	22.012	8.765	\$726.00	\$32.98	1404.155	42.22%	\$15,246.00	22.012	\$32.98
305.3-306R	Notch revetment at 305.7 and 306R	24.497	24.497	0.000	38.550	14.054	\$1,278.00	\$33.15	1442.705	43.38%	\$16,524.00	38.550	\$33.15
32L	Notch revetment (4) and existing dike (1)	84.322	84.322	0.000	107.485	23.163	\$3,630.00	\$33.77	1550.190	46.61%	\$20,154.00	107.485	\$33.77
100.3-101.1L	Notch existing dikes (2), *Existing tern island on LB, avoid work during nesting season	39.718	39.718	0.000	39.718	0.000	\$1,452.00	\$36.56	1589.908	47.80%	\$21,606.00	39.718	\$36.56
19.8L	Notch existing revetment (1)	9.505	9.505	0.000	16.963	7.458	\$726.00	\$42.80	1606.871	48.31%	\$22,332.00	16.963	\$42.80
27.8-28.5L	Notch modified revetment (1) and existing dike (1)	33.116	22.641	-10.474	32.256	-0.859	\$1,452.00	\$45.01	1639.127	49.28%	\$23,784.00	32.256	\$45.01
275.2-276.6R	Notch dikes (2) that connect to shoreline	31.740	31.740	0.000	31.740	0.000	\$1,452.00	\$45.75	1670.867	50.24%	\$25,236.00	31.740	\$45.75
39.8L	Notch modified revetment at 39.3L and 39.7L	24.469	24.469	0.000	31.190	6.722	\$1,452.00	\$46.55	1702.057	51.18%	\$26,688.00	31.190	\$46.55
148.7-150.4R	Avoid disposal, notch dike at 149R	22.383	13.179	-9.204	13.537	-8.846	\$726.00	\$53.63	1715.594	51.58%	\$27,414.00	13.537	\$53.63
290R	Notch existing dike if feasible	13.490	13.490	0.000	13.490	0.000	\$726.00	\$53.82	1729.084	51.99%	\$28,140.00	13.489	\$53.82
238.5-239.9L	*Existing tern island at 239.5L, avoid disposal in AR238.5L-D, alternately use 240.1-241.0 L, investigate terrestrial disposal, create and/or extend island, notch land side of dikes, do not cut off backwater at 241.1L	89.120	59.221	-29.900	78.331	-10.790	\$4,303.93	\$54.95	1807.414	54.34%	\$32,443.93	78.331	\$54.95
70.0-70.7L	Notch two longest existing dikes (2)	14.815	14.815	0.000	23.203	8.387	\$1,452.00	\$62.58	1830.617	55.04%	\$33,895.93	23.203	\$62.58
37.5-38.6L	Notch raised L-dikes	10.671	10.671	0.000	10.671	0.000	\$726.00	\$68.04	1841.288	55.36%	\$34,621.93	10.671	\$68.04
242-244.1L	Avoid disposal in AR242.2L-D at entrance to Hartman Lake, utilize AR241.8R-D and AR244.0R-D if needed, deepen notch in modified revetment	12.531	8.327	-4.204	9.118	-3.413	\$726.00	\$79.63	1850.405	55.64%	\$35,347.93	9.118	\$79.63

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142.5-143.4R	Notch modified dikes (2) at entrance to beaver dam channel for flow-through	11.991	11.991	0.000	18.217	6.226	\$1,452.00	\$79.71	1868.622	56.19%	\$36,799.93	18.217	\$79.71
27.5-29R	Notch modified dikes (4) and existing dike (1)	43.173	29.517	-13.656	42.052	-1.120	\$3,630.00	\$86.32	1910.675	57.45%	\$40,429.93	42.052	\$86.32
31.8-33.1L	Avoid LB disposal, utilize RB, notch modified revetment (4) and existing dike (1) across backwater	38.022	25.995	-12.026	29.703	-8.319	\$3,630.00	\$122.21	1940.377	58.34%	\$44,059.93	29.703	\$122.21
189.9.190.5L	Notch modified revetment in two places (2)	13.525	13.525	0.000	10.995	-2.530	\$1,452.00	\$132.06	1951.372	58.67%	\$45,511.93	10.995	\$132.06
101.5-103.7L	Avoid disposal, notch existing dikes (10-12) for flow-through and to enhance diversity	82.702	54.599	-28.102	54.599	-28.102	\$7,260.00	\$132.97	2005.971	60.31%	\$52,771.93	54.599	\$132.97
105.2-106.0L	*Existing tern island(s), avoid work during nesting season, construct high water notches in dikes (4) to restore and maintain islands	2.162	2.162	0.000	21.582	19.420	\$2,904.00	\$134.56	2027.554	60.96%	\$55,675.93	21.582	\$134.56
280.6-280.9	280.8L - Notch modified dikes (3)	11.850	11.850	0.000	16.034	4.185	\$2,178.00	\$135.83	2043.588	61.45%	\$57,853.93	16.034	\$135.83
161.2-162.2L	Notch existing dikes (3-4) from 161.2-162.2L	13.337	13.337	0.000	20.621	7.284	\$2,904.00	\$140.83	2064.209	62.07%	\$60,757.93	20.621	\$140.83
275-276L	Notch modified dikes (3)	10.157	10.157	0.000	13.744	3.587	\$2,178.00	\$158.47	2077.953	62.48%	\$62,935.93	13.744	\$158.47
48.7-50.2R	Utilize land within cells for disposal in 49.4R-D, avoid aquatic areas, notch existing revetments/dikes in two most u/s cells (2)	5.118	4.524	-0.594	8.593	3.475	\$1,452.00	\$168.97	2086.546	62.74%	\$64,387.93	8.593	\$168.97
64-65R	Avoid disposal in AR64.5R-D, notch existing revetments and/or dikes (3)	11.677	8.794	-2.882	12.105	0.428	\$2,178.00	\$179.93	2098.651	63.10%	\$66,565.93	12.105	\$179.93
150-151.7L	Avoid disposal from 150-151L that would block side channel and backwater entrance, construct a series of tern islands where feasible, notch existing dike at 150.8L for fish passage and backwater entrance	62.810	36.983	-25.827	76.463	13.653	\$13,805.40	\$180.55	2175.113	65.40%	\$80,371.33	76.463	\$180.55
145.2-146.2L	Notch modified dikes (7)	17.130	17.130	0.000	26.566	9.436	\$5,082.00	\$191.30	2201.679	66.20%	\$85,453.33	26.566	\$191.30
113-114L	Notch underwater dikes on backside of islands (4)	9.040	9.040	0.000	14.853	5.813	\$2,904.00	\$195.51	2216.533	66.65%	\$88,357.33	14.853	\$195.51
38.8L	Avoid disposal, utilize RB, notch modified revetment	4.269	3.774	-0.496	3.652	-0.617	\$726.00	\$198.78	2220.185	66.76%	\$89,083.33	3.652	\$198.78
131.8-132.5R	Notch upper end of modified revetment (1)	3.540	3.540	0.000	3.540	0.000	\$726.00	\$205.07	2223.725	66.86%	\$89,809.33	3.540	\$205.07
174.1-176.7R	Utilize land disposal on Lentz property, notch existing dikes (4))	7.943	6.905	-1.039	12.314	4.370	\$2,904.00	\$235.84	2236.039	67.23%	\$92,713.33	12.314	\$235.84
43.4-44.1L	Avoid disposal in LB aquatic areas, utilize land and RB disposal, notch existing dikes/revetments (3)	10.388	9.182	-1.206	9.182	-1.206	\$2,178.00	\$237.20	2245.221	67.51%	\$94,891.33	9.182	\$237.20
82.5-	Notch existing dikes along RB (14)	23.570	23.570	0.000	37.968	14.398	\$10,164.00	\$267.70	2283.189	68.65%	\$105,055.33	37.968	\$267.70

Table C.9-1. Aquatic Mitigation Features – Arkansas Portion

Nav. Mile	Project	Future without Project AAHUs	Total AAHUs with 12-ft Project	AAHUs Effected by 12-ft Project	Total AAHUs with Mitigated 12-ft Project	Change in Mitigated 12-ft AAHUs Relative to Baseline (1)	Cost	Cost Per AAHU	Running Total AAHU's	Percent Mitigation	Running Total Cost	Incremental Change in AAHU's	Incremental Cost
85.5R													
126.7-127.4L	Utilize LB for disposal and notch modified dikes (4)	3.609	3.026	-0.583	10.734	7.125	\$2,904.00	\$270.54	2293.923	68.97%	\$107,959.33	10.734	\$270.54
165.8-167.0L	Avoid aquatic disposal, dispose on land within cells, notch existing revetment (4)	9.262	6.574	-2.688	10.718	1.456	\$2,904.00	\$270.94	2304.642	69.30%	\$110,863.33	10.718	\$270.94
91.4-91.7R	Recommend constructing island downstream at 90.5-91.0L behind underwater revetment, if proposed location must be utilized, place disposal off bank and create island(s) and notch backside of existing dikes	29.788	17.635	-12.154	28.207	-1.581	\$7,669.67	\$271.91	2332.849	70.14%	\$118,533.00	28.207	\$271.91
122.9-123.6R	Notch existing dikes (2-4) for flow-through and access	4.374	4.374	0.000	7.986	3.611	\$2,178.00	\$272.74	2340.834	70.38%	\$120,711.00	7.986	\$272.74
94	Notch existing revetment (1)	1.591	1.591	0.000	2.383	0.792	\$726.00	\$304.69	2343.217	70.45%	\$121,437.00	2.383	\$304.69
169.6-172L	Notch raised dike at 170.1L and existing dikes at 170.7L and 171L, utilize land within cells for disposal or create/enhance tern island, (*existing tern island)	45.727	32.455	-13.272	32.455	-13.272	\$9,929.60	\$305.95	2375.672	71.43%	\$131,366.60	32.455	\$305.95
251.8-253.8L	Notch dikes (5-10) on left and right bank up and downstream	14.982	14.982	0.000	22.545	7.563	\$7,260.00	\$322.02	2398.217	72.11%	\$138,626.60	22.545	\$322.02
133.5-135.2L	Avoid aquatic disposal on LB, utilize land disposal on island or construct another island on RB, notch longest existing dike for flow-through (*potential existing tern site)	23.015	19.298	-3.717	15.561	-7.455	\$5,327.80	\$342.39	2413.778	72.58%	\$143,954.40	15.561	\$342.39
188.9-190.4L	*Existing least tern island, avoid disposal, notch raised revetment (1) and existing dike (1), utilize area upstream at 191R for disposal	40.705	28.873	-11.832	41.166	0.461	\$14,600.00	\$354.66	2454.944	73.81%	\$158,554.40	41.166	\$354.66
116.6-116.8R	Notch existing dikes 116.6 to 116.8R (2) *may have already been done	2.333	2.333	0.000	3.993	1.660	\$1,452.00	\$363.65	2458.936	73.93%	\$160,006.40	3.993	\$363.65
36-36.5L	Notch modified dikes (3) and existing dike (1)	7.727	7.727	0.000	7.727	0.000	\$2,904.00	\$375.83	2466.663	74.17%	\$162,910.40	7.727	\$375.83
82.6R	Notch existing dike and maintain entrance to backwater at 82.6R by periodically dredging	18.425	18.425	0.000	44.376	25.951	\$17,388.00	\$391.83	2511.039	75.50%	\$180,298.40	44.376	\$391.83
155.6R	Notch existing revetment (2)	2.056	2.056	0.000	3.416	1.360	\$1,452.00	\$425.10	2514.455	75.60%	\$181,750.40	3.416	\$425.10
31.7-32.8R	*Existing tern island – enhance/create islands where feasible and avoid June-August construction, utilize disposal area and extend d/s to NM 31.0R	27.474	18.784	-8.690	21.941	-5.533	\$9,622.25	\$438.56	2536.396	76.26%	\$191,372.65	21.941	\$438.56
193.6-195L	Notch existing dikes (5) in AR194.1L-D	5.475	3.283	-2.192	7.021	1.546	\$3,630.00	\$517.00	2543.417	76.47%	\$195,002.65	7.021	\$517.00
46.5-46.7L	Notch modified revetment (1)	1.227	1.227	0.000	1.227	0.000	\$726.00	\$591.93	2544.643	76.51%	\$195,728.65	1.227	\$591.93

Table C.9-1. Aquatic Mitigation Features – Arkansas Portion

Nav. Mile	Project	Future without Project AAHUs	Total AAHUs with 12-ft Project	AAHUs Effected by 12-ft Project	Total AAHUs with Mitigated 12-ft Project	Change in Mitigated 12-ft AAHUs Relative to Baseline (1)	Cost	Cost Per AAHU	Running Total AAHU's	Percent Mitigation	Running Total Cost	Incremental Change in AAHU's	Incremental Cost
80.0-82.0L	Place disposal along dike fields to create islands and notch backside of dikes (9) at 80-82L	10.786	10.786	0.000	10.786	0.000	\$6,534.00	\$605.81	2555.429	76.84%	\$202,262.65	10.786	\$605.81
123.7L	Notch existing dike for access and fish passage	0.875	0.875	0.000	1.198	0.323	\$726.00	\$606.08	2556.627	76.87%	\$202,988.65	1.198	\$606.08
281.9-283.3L	Place disposal on lower end of disposal area on existing sand bars, construct islands where feasible, avoid disposal from 283.2-283.5L	33.481	21.926	-11.555	17.398	-16.082	\$10,732.17	\$616.85	2574.025	77.39%	\$213,720.82	17.398	\$616.85
244R	Utilize two downstream cells for disposal if needed and notch two existing upper dikes for fish passage and access	2.184	1.219	-0.965	2.323	0.139	\$1,452.00	\$625.10	2576.348	77.46%	\$215,172.82	2.323	\$625.10
48.7-48.9R	Notch modified dikes (4)	3.496	3.496	0.000	4.456	0.960	\$2,904.00	\$651.74	2580.804	77.60%	\$218,076.82	4.456	\$651.74
45.4-47.3R	Construct islands where feasible in AR46.5R-D, utilize two most d/s cells for disposal first, notch dikes/revetments (4-8)	32.255	28.511	-3.744	28.511	-3.744	\$19,244.50	\$674.99	2609.315	78.46%	\$237,321.32	28.511	\$674.99
35.3-36.5L	*Existing tern island – enhance/create islands where feasible and avoid June-August construction	13.803	12.201	-1.602	28.469	14.666	\$19,244.50	\$675.98	2637.784	79.31%	\$256,565.82	28.469	\$675.98
42.8-44.6R	Notch existing and modified dikes (10-12)	10.671	10.671	0.000	10.671	0.000	\$7,260.00	\$680.38	2648.454	79.63%	\$263,825.82	10.671	\$680.38
117.1-117.7R	Notch existing dikes (3)	1.750	1.750	0.000	3.194	1.445	\$2,178.00	\$681.84	2651.648	79.73%	\$266,003.82	3.194	\$681.84
98.5R	Notch existing revetment to access backwater (1)	0.637	0.637	0.000	0.953	0.317	\$726.00	\$761.72	2652.602	79.76%	\$266,729.82	0.953	\$761.72
94.3-96.3L	Avoid aquatic disposal in uppermost cells of AR95.5L-D, extend disposal area d/s to create a series of islands for a braided system and terns, notch existing dikes (5) to enhance backwater areas	65.750	43.408	-22.342	60.160	-5.591	\$46,017.99	\$764.93	2712.761	81.57%	\$312,747.81	60.160	\$764.93
23-24L	Construct string of islands	15.938	14.088	-1.850	18.468	2.530	\$14,433.38	\$781.54	2731.229	82.12%	\$327,181.19	18.468	\$781.54
181.8-184.9R	Notch existing and raised dikes (8-10) and create a series of islands for braided system and terns	37.027	26.265	-10.763	36.261	-0.767	\$30,269.00	\$834.76	2767.490	83.21%	\$357,450.19	36.261	\$834.76
23-24L	Construct string of islands	13.282	11.740	-1.542	15.390	2.108	\$14,433.38	\$937.84	2782.880	83.67%	\$371,883.57	15.390	\$937.84
99.4L	Notch existing revetment to access backwater (1)	0.382	0.382	0.000	0.635	0.254	\$726.00	\$1,142.58	2783.515	83.69%	\$372,609.57	0.635	\$1,142.58
164.5-165.2L	165 - Notch on upstream end of revetment for flow in and out of Plummerville cutoff, and notch raised dikes (3), maintain entrance by periodically dredging	29.056	29.056	0.000	43.676	14.620	\$50,500.00	\$1,156.24	2827.192	85.01%	\$423,109.57	43.676	\$1,156.24
275.7-276.4R	Notch modified dikes (2) that connect to shoreline and extend RB disposal downstream within dike field	1.913	1.253	-0.660	1.253	-0.660	\$1,452.00	\$1,158.90	2828.444	85.04%	\$424,561.57	1.253	\$1,158.90

Table C.9-1. Aquatic Mitigation Features – Arkansas Portion

Nav. Mile	Project	Future without Project AAHUs	Total AAHUs with 12-ft Project	AAHUs Effected by 12-ft Project	Total AAHUs with Mitigated 12-ft Project	Change in Mitigated 12-ft AAHUs Relative to Baseline (1)	Cost	Cost Per AAHU	Running Total AAHU's	Percent Mitigation	Running Total Cost	Incremental Change in AAHU's	Incremental Cost
169.4-169.7L	Notch raised dikes (4)	1.799	1.799	0.000	2.434	0.635	\$2,904.00	\$1,192.90	2830.879	85.12%	\$427,465.57	2.434	\$1,192.90
42.3-43.3L	Construct islands and notch existing (3) dikes	4.743	4.193	-0.551	17.920	13.177	\$21,422.50	\$1,195.45	2848.799	85.66%	\$448,888.07	17.920	\$1,195.45
22.8R	Maintain entrance to Coal Pile by periodically dredging	118.280	118.280	0.000	140.595	22.315	\$193,784.00	\$1,378.32	2989.393	89.88%	\$642,672.07	140.595	\$1,378.32
61.0-62.1L	*Probable tern island on RB, avoid aquatic areas in AR61.4L-D, utilize land within disposal cells or enhance/create tern islands on RB	9.978	7.515	-2.463	6.913	-3.065	\$9,622.25	\$1,391.97	2996.306	90.09%	\$652,294.32	6.913	\$1,391.97
78.7L	Dredge mouth of Pastoria Bend chute and periodically dredge to maintain and notch existing dike (1) if needed to open access to backwater	11.504	11.504	0.000	21.621	10.116	\$30,274.00	\$1,400.23	3017.927	90.74%	\$682,568.32	21.621	\$1,400.23
38.8-39.6R	*Existing tern island, notch existing dikes (5) and enhance/construct tern islands where feasible	1.755	1.551	-0.204	13.651	11.896	\$19,244.50	\$1,409.77	3031.578	91.15%	\$701,812.82	13.651	\$1,409.77
50.9L	Maintain entrance to Swan Lake by periodically dredging	38.463	38.463	0.000	42.991	4.528	\$61,202.00	\$1,423.59	3074.569	92.44%	\$763,014.82	42.991	\$1,423.59
279-280.1R	Utilize AR280.0R-D for disposal and construction of string of islands, notch modified dikes (4) to create and maintain backwater channel	9.737	6.376	-3.360	7.423	-2.314	\$10,732.17	\$1,445.84	3081.992	92.67%	\$773,746.99	7.423	\$1,445.84
180.4-181.3R	Extend disposal area upstream to raised dike at 181.5R and dispose along bank downstream of dike, notch existing dikes (2)	5.285	3.169	-2.116	1.344	-3.940	\$2,178.00	\$1,619.94	3083.336	92.71%	\$775,924.99	1.344	\$1,619.94
273.7-276L	Avoid disposal in AR274.0L-D and AR275.0L-D, alternatively use RB disposal to create or enlarge islands,	6.559	4.296	-2.264	3.939	-2.621	\$6,708.00	\$1,703.11	3087.275	92.83%	\$782,632.99	3.939	\$1,703.11
46.2R	Notch modified revetment/dike (1)	0.368	0.368	0.000	0.368	0.000	\$726.00	\$1,973.09	3087.643	92.84%	\$783,358.99	0.368	\$1,973.09
78.9-79.7L	79.0L - First option - Inquire about upland disposal on Pine Bluff Arsenal property first to avoid any impacts, second option - investigate island disposal upstream on LB at 80.1, third option to place in proposed location and notch modified dikes (4)	2.247	0.872	-1.375	1.243	-1.004	\$2,904.00	\$2,336.25	3088.886	92.88%	\$786,262.99	1.243	\$2,336.25
19.0R	Construct island	7.969	7.044	-0.925	7.044	-0.925	\$19,244.50	\$2,732.09	3095.930	93.09%	\$805,507.49	7.044	\$2,732.09
92.6L	Notch existing revetment (1) and maintain entrance to backwater by periodically dredging	3.310	3.310	0.000	6.195	2.885	\$17,188.00	\$2,774.41	3102.125	93.27%	\$822,695.49	6.195	\$2,774.41
276.8-277.5R	Avoid backwater disposal in 277.0R-D, place disposal on land and d/s along bottom end to extend island	1.162	0.761	-0.401	0.761	-0.401	\$2,236.00	\$2,939.41	3102.886	93.30%	\$824,931.49	0.761	\$2,939.41
42.1-42.7L	*Existing tern island, use disposal to enhance/construct tern islands, notch backside of existing dikes to maintain	5.408	4.780	-0.628	6.259	0.851	\$19,244.50	\$3,074.71	3109.145	93.48%	\$844,175.99	6.259	\$3,074.71

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Nav. Mile	Project	Future without Project AAHUs	Total AAHUs with 12-ft Project	AAHUs Effected by 12-ft Project	Total AAHUs with Mitigated 12-ft Project	Change in Mitigated 12-ft AAHUs Relative to Baseline (1)	Cost	Cost Per AAHU	Running Total AAHU's	Percent Mitigation	Running Total Cost	Incremental Change in AAHU's	Incremental Cost
	flow and islands 42.5L												
168.7-169.5L	Utilize AR169.4R-D for disposal first, AR169.0L-D second, construct tern islands where feasible	1.426	1.240	-0.186	4.205	2.779	\$13,148.00	\$3,126.82	3113.350	93.61%	\$857,323.99	4.205	\$3,126.82
146.5-147.5L	* Existing tern island – enhance/construct a series of islands along LB where feasible, notch dikes (5), move disposal from LB to RB for excess disposal	5.448	4.568	-0.880	7.273	1.826	\$23,009.00	\$3,163.52	3120.623	93.83%	\$880,332.99	7.273	\$3,163.52
110.4	Install culvert through structure at Willow Beach Lake for fish passage	27.191	27.191	0.000	46.537	19.346	\$156,898.00	\$4,472.00	3167.160	95.23%	\$1,037,230.99	46.537	\$4,472.00
90.5-91.0L	Construct island(s) at 90.5-91.0L behind underwater revetment	2.673	1.583	-1.091	1.583	-1.091	\$7,669.67	\$4,472.00	3168.742	95.28%	\$1,044,900.66	1.583	\$4,472.00
42.8-43R	Utilize this disposal area, notch existing and modified dikes (10-12) and extend disposal u/s	1.423	1.258	-0.165	1.258	-0.165	\$7,260.00	\$5,771.83	3170.000	95.31%	\$1,052,160.66	1.258	\$5,771.83
70.6L	Maintain channel to backwater by periodically dredging	12.583	12.583	0.000	14.939	2.356	\$88,053.00	\$5,894.16	3184.939	95.76%	\$1,140,213.66	14.939	\$5,894.16
132.2L	Maintain entrance to Rector Chute by periodically dredging	13.082	13.082	0.000	15.532	2.450	\$91,787.00	\$5,909.43	3200.471	96.23%	\$1,232,000.66	15.532	\$5,909.43
169.2-169.8R	Utilize AR169.4R-D for disposal first, AR169.0L-D second, construct tern islands where feasible	2.506	2.179	-0.328	2.179	-0.328	\$13,148.00	\$6,034.83	3202.650	96.30%	\$1,245,148.66	2.179	\$6,034.83
243.7-244.2L	Notch revetment and dike at u/s end to Hartman lake to allow flow-through and fish passage	16.727	16.727	0.000	51.738	35.011	\$321,000.00	\$6,204.31	3254.388	97.85%	\$1,566,148.66	51.738	\$6,204.31
285.6-286.2L	Extend disposal area to 286.2L dike, place disposal behind dikes on LB from 286.2-285.6L to create islands and maintain gravel instream, notch modified (2) and existing (2) dikes	7.036	2.976	-4.060	0.974	-6.062	\$6,708.00	\$6,887.38	3255.362	97.88%	\$1,572,856.66	0.974	\$6,887.38
75.3L	Maintain channel to backwater by periodically dredging	2.022	2.022	0.000	2.401	0.379	\$16,662.00	\$6,939.85	3257.763	97.95%	\$1,589,518.66	2.401	\$6,939.85
44.6L	Maintain a 1/2 mile boating lane at the entrance to Little Bayou Meto (44.6L) and 1/2 mile lane at u/s end of Bayou Meto by periodically dredging	28.100	28.100	0.000	33.401	5.301	\$237,977.00	\$7,124.87	3291.164	98.96%	\$1,827,495.66	33.401	\$7,124.87
222.5R	Construct islands along RB if feasible	0.000	0.000	0.000	0.000	0.000	\$7,155.86	\$7,155.86	3291.164	98.96%	\$1,834,651.52	0.000	\$7,155.86
225.5L	Construct islands along LB if feasible	0.000	0.000	0.000	0.000	0.000	\$7,155.86	\$7,155.86	3291.164	98.96%	\$1,841,807.38	0.000	\$7,155.86
88.2R	Maintain entrance to Tar Camp Creek by periodically dredging	8.987	8.987	0.000	10.694	1.708	\$96,892.00	\$9,060.02	3301.858	99.28%	\$1,938,699.38	10.694	\$9,060.02
276.0R	Maintain entrance to Courthouse Slough by periodically dredging	7.046	7.046	0.000	8.299	1.253	\$91,787.00	\$11,059.37	3310.158	99.53%	\$2,030,486.38	8.299	\$11,180.00
102-104R	Utilize RB disposal as alternative, construct/enhance tern islands if feasible	5.283	3.128	-2.155	3.128	-2.155	\$30,678.66	\$11,180.00	3313.285	99.62%	\$2,061,165.04	3.128	\$9,809.31
158.8-	Utilize existing island for disposal and/or	2.382	1.690	-0.691	-0.076	-2.458	\$1,000.00	\$13,122.35	3313.209	99.62%	\$2,062,165.04	-0.076	\$13,122.35

Table C.9-1. Aquatic Mitigation Features – Arkansas Portion

Nav. Mile	Project	Future without Project AAHUs	Total AAHUs with 12-ft Project	AAHUs Effected by 12-ft Project	Total AAHUs with Mitigated 12-ft Project	Change in Mitigated 12-ft AAHUs Relative to Baseline (1)	Cost	Cost Per AAHU	Running Total AAHU's	Percent Mitigation	Running Total Cost	Incremental Change in AAHU's	Incremental Cost
159.2R	construct tern islands												
15.3R	Reconnect Lower Merrisach Lake to Canal with culvert or water control structure for fish passage	22.055	22.055	0.000	26.216	4.161	\$356,639.00	\$13,603.96	3339.425	100.41%	\$2,418,804.04	26.216	\$356,639.00
*227.2,229,230,233,5,233.3,234	Construct islands where feasible in Lake Dardanelle	0.000	0.000	0.000	0.000	0.000	\$14,311.72	\$14,311.72	3339.425	100.41%	\$2,433,115.76	0.000	\$14,311.72
**32.2R	Maintain entrance to oxbow lake by avoiding disposal and periodically dredging	2.146	2.146	0.000	2.041	-0.105	\$39,111.00	\$19,162.20	3341.466	100.47%	\$2,472,226.76	2.041	\$19,162.20
*61.5-62.5R	Place disposal in string of islands along RB	3.280	1.839	-1.441	0.758	-2.521	\$19,244.50	\$25,373.60	3342.225	100.49%	\$2,491,471.26	0.758	\$25,373.60
**71.3L	Dredge canals at Lake Langhofer	5.618	5.618	0.000	7.239	1.622	\$299,844.00	\$41,418.56	3349.464	100.71%	\$2,791,315.26	7.239	\$41,418.56
**110.4L	Install culvert through land mass at Willow Beach Park to connect oxbow lake to river	3.263	3.263	0.000	5.584	2.321	\$320,272.00	\$57,351.03	3355.048	100.88%	\$3,111,587.26	5.584	\$57,351.03
***131.0L	Dredge upper end of Rector Brake to improve habitat	5.139	5.139	0.000	8.136	2.997	\$533,708.00	\$65,602.34	3363.184	101.12%	\$3,645,295.26	8.136	\$65,602.34
***116.2R	Dredge backwater at 116.2R	0.350	0.350	0.000	0.733	0.383	\$96,895.00	\$132,145.16	3363.917	101.15%	\$3,742,190.26	0.733	\$132,145.16
		Mitigation Target HU											
Totals		3325.836	2728.237	-597.599	3363.917	38.081	\$3,742,190.26						

Cut-off point for 100% mitigation (1) Negative numbers represent minimization of impacts by implementing mitigation measure. Island creation benefits T&E species

- * Features retained due to terrestrial and T&E species habitat improvement opportunities
- ** Features retained for contribution to environmental sustainability
- *** Mitigation Features dropped from consideration due to Incremental Cost Analysis (ICA)

Source: USACE, 2005

Table C.9-2. Aquatic Mitigation Features – Oklahoma Portion

Nav. Mile	Project	Future without Project AAHUs	Total AAHUs with 12-ft Project	AAHUs Effected by 12-ft Project	Total AAHUs with Mitigated 12-ft Project	Change in Mitigated 12-ft AAHUs Relative to Baseline (1)	Cost	Cost Per AAHU	Running Total AAHU's	Percent Mitigation	Running Total Cost	Incremental Change in AAHU's	Incremental Cost
311.5-313.7	New Dikes, designed to maintain variable habitat (J-hook)	0.758	0.720	-0.038	2.034	1.276	\$0.00	\$0.00	\$2.03	0.3863%	\$0.00	2.034	\$0.000
314.8-315.8	New & existing dikes LD recommend J-hook design	0.875	0.831	-0.044	1.445	0.570	\$0.00	\$0.00	\$3.48	0.6607%	\$0.00	1.445	\$0.000
348.3	Add to existing island + riprap (beneficial use of dredge material)	15.941	6.444	-9.497	3.222	-12.719	\$0.00	\$0.00	\$6.70	1.2726%	\$0.00	3.222	\$0.000
353.5-354.3	Restore bank, stabilize w/riprap (beneficial use of dredge material)	0.996	0.403	-0.594	0.403	-0.594	\$0.00	\$0.00	\$7.10	1.3491%	\$0.00	0.403	\$0.000
355	Create 3 - 10 acre tern island w/riprap (beneficial use of dredge material)	12.011	4.855	-7.156	4.039	-7.972	\$0.00	\$0.00	\$11.14	2.1162%	\$0.00	4.039	\$0.000
sbc 6.6	expand island, design to avoid impacts to mussels; height of disposal will be 1 - 2 ft below water surface (beneficial use of dredge material)	2.214	0.895	-1.319	0.895	-1.319	\$0.00	\$0.00	\$12.04	2.2862%	\$0.00	0.895	\$0.000
sbc 6.9	expand island, design to avoid impacts to mussels; height of disposal will be 1 - 2 ft below water surface (beneficial use of dredge material)	2.214	0.895	-1.319	0.895	-1.319	\$0.00	\$0.00	\$12.93	2.4561%	\$0.00	0.895	\$0.000
395 - 401.4	Impacts to Verdigris	9.000	0.000	-9.000	0.000	-9.000	\$0.00	\$0.00	\$12.93	2.4561%	\$0.00	0.000	\$0.000
367.4	alternative disposal site for 367.5 - create tern island/w riprap	6.310	2.551	-3.759	2.551	-3.759	\$0.00	\$0.00	\$15.48	2.9405%	\$0.00	2.551	\$0.000
392.1-393.0	Notch and design new dikes to create variable habitat, create tern island in middle cell	13.284	5.370	-7.914	5.126	-8.158	\$0.00	\$0.00	\$20.61	3.9141%	\$0.00	5.126	\$0.000
393.8-394.6	Notch added dikes to avoid fill, design to minimize fill (J-hook)	9.686	9.201	-0.485	10.033	0.347	\$0.00	\$0.00	\$30.64	5.8196%	\$0.00	10.033	\$0.000
401.4 - 421.7	Impacts to Verdigris	29.000	0.000	-29.000	0.000	-29.000	\$0.00	\$0.00	\$30.64	5.8196%	\$0.00	0.000	\$0.000
421.7 - 445	Impacts to Verdigris	33.900	0.000	-33.900	0.000	-33.900	\$0.00	\$0.00	\$30.64	5.8196%	\$0.00	0.000	\$0.000
379 - 380	dredge upper end of oxbow; maintain upper/lower openings to reconnect to backwater area	89.667	89.667	0.000	127.760	38.093	\$10,000.00	\$78.27	\$158.40	30.0838%	\$10,000.00	127.760	\$78.272
408.9	dredge mouth of Billy Creek Cutoff to reconnect to backwater area	39.923	39.923	0.000	57.432	17.508	\$5,000.00	\$87.06	\$215.83	40.9912%	\$15,000.00	57.432	\$87.060
320-321	Notch 3 interior dikes to create variable habitat	14.127	14.127	0.000	22.434	8.307	\$2,190.00	\$97.62	\$238.27	45.2519%	\$17,190.00	22.434	\$97.620
321-323	Notch 5 dikes to create variable habitat	23.614	23.614	0.000	31.640	8.026	\$3,650.00	\$115.36	\$269.91	51.2609%	\$20,840.00	31.640	\$115.361
310.4	Notch parallel dikes (1) for scour	3.033	3.033	0.000	5.972	2.939	\$730.00	\$122.24	\$275.88	52.3950%	\$21,570.00	5.972	\$122.244
323-324	Notch 9 dikes to create variable habitat	33.576	33.576	0.000	45.702	12.126	\$6,570.00	\$143.76	\$321.58	61.0747%	\$28,140.00	45.702	\$143.758
414.7	Dredge at culvert structure to reconnect backwater area	25.169	25.169	0.000	30.172	5.003	\$5,000.00	\$165.71	\$351.75	66.8051%	\$33,140.00	30.172	\$165.715
326.7-328.1	notch 7 dikes interior/exterior to create variable habitat	16.620	16.620	0.000	27.712	11.092	\$5,110.00	\$184.39	\$379.47	72.0682%	\$38,250.00	27.712	\$184.394
309.8-310.3	Notch 4 dikes for scour to create variable habitat	6.999	6.999	0.000	14.700	7.701	\$2,950.00	\$200.69	\$394.17	74.8599%	\$41,200.00	14.700	\$200.687

For this analysis, IWR plan was not as appropriate as the development of sorted matrices in spreadsheets presented in this report. The number of measures exceeded the 26 solutions (or plans) that IWR allows. Each IWR solution/plan may have up to 20 scales. As noted above, an optimum/single scale was identified for each measure. The value of IWR plan is in being to analyze assorted combinations of measures at various scales to identify the incremental cost of each plan. IWR Report 94-PS-2 (Cost Effectiveness Analysis for Planners) notes that "ICA is not applicable in avoidance planning since only one level of output is considered" (page 56). Additionally the IWR report says, "if you have a defined target level of output ...then you may also use "lowest cost" as the selection rule...In this case, selection of the lowest cost solution (either lowest average cost or lowest total cost) makes economic sense" (page 58). The ICA presented here combines the measures with lowest average cost resulting in the lowest total cost being the recommended mitigation plan.