Water supply opportunities analyses demonstrating that new storage capacity is critical to achieving water supply benefits, and demonstrating water supply benefits associated with the alternatives, under two scenarios assuming operating criteria are very stringent or somewhat less so.

Water Supply Opportunities Under Existing Conditions and No Action

Average Annual System Deliveries

(in 1,000 acre-feet per year)

	Critical Dry Period	Long-Term
Existing Conditions	4,200	5,600
No Action	4,050	5,900

C-097107

C-097107

Alternative 1

Average Annual Water Supply Compared to No Action

(in 1,000 acre-feet per year)

	Critical Period	Long-Term
No Storage		
Assumption A	120	262
Assumption B	-357	-54
4.75 MAF Storage		
Assumption A	777	696
Assumption B	48	280

C-097108

C-097108

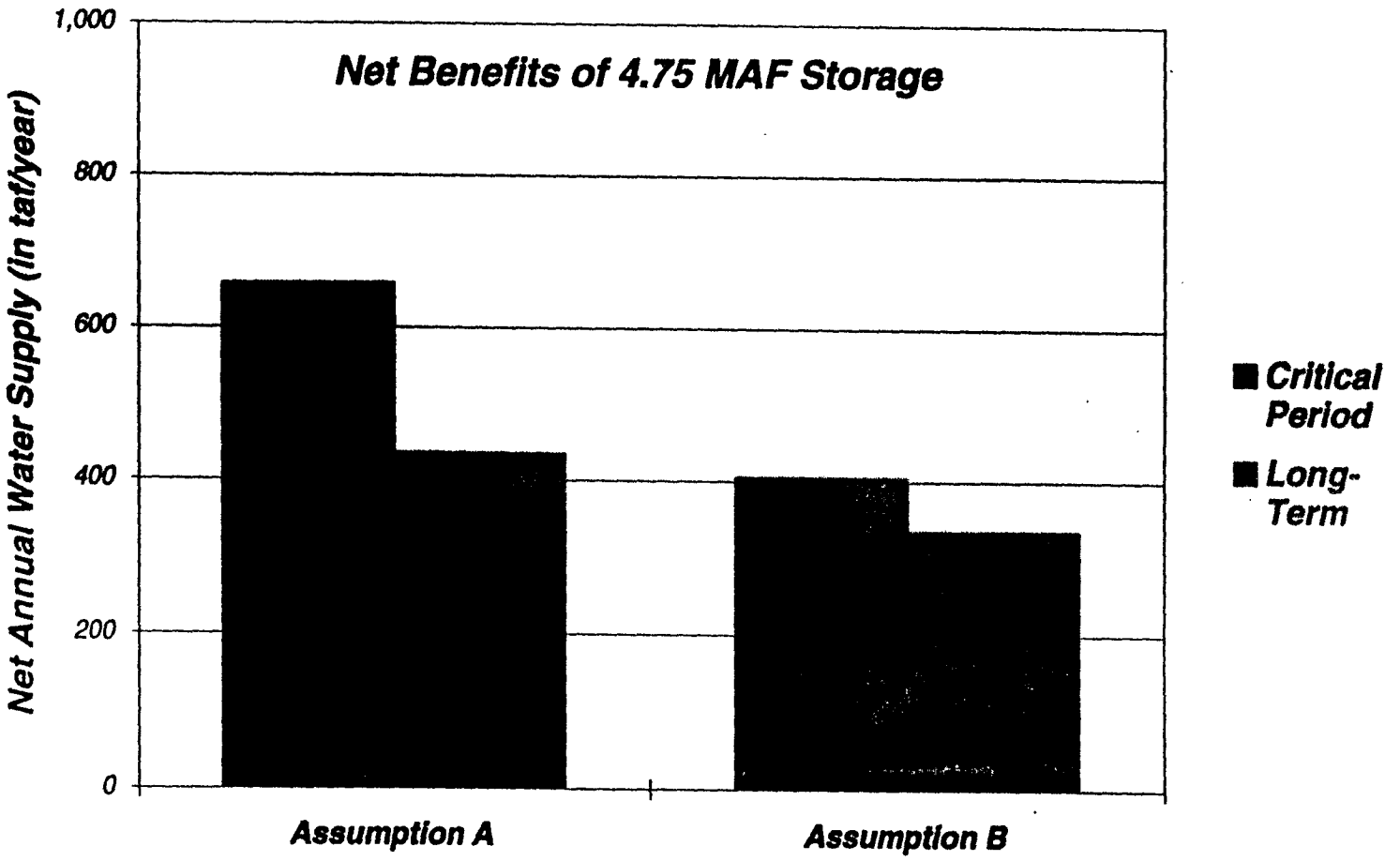
Alternative 1

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumption A (Emphasis on Water Supply)												
E/I Ratio	65%	35%-45%	35% of Delta Inflow				65% of Delta Inflow					
Assumption B (Emphasis on Ecosystem Protection)												
E/I Ratio	50%	25%	25% of Delta Inflow				65% of Delta Inflow				50%	

C-097109

C-097109

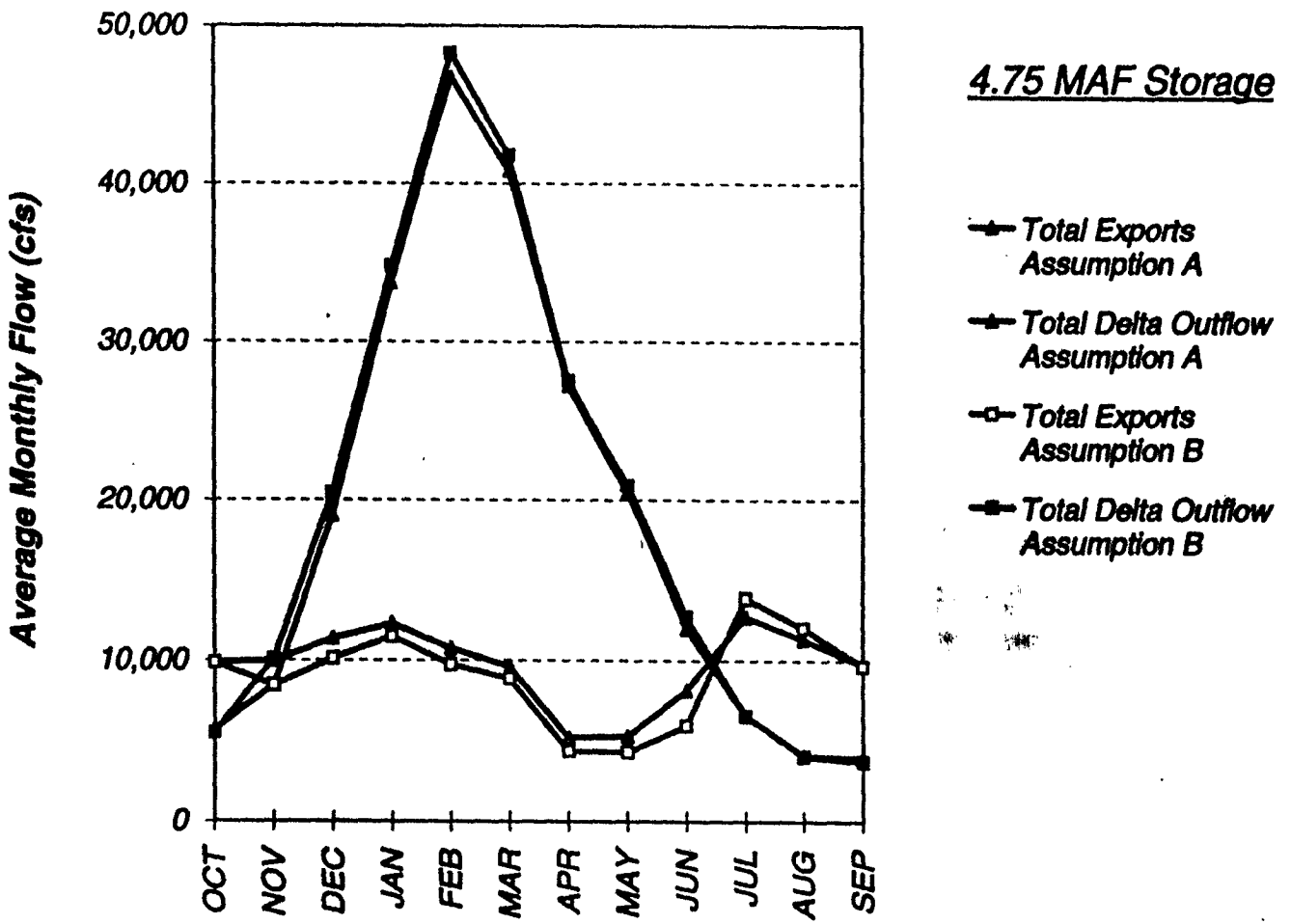
Alternative 1



C-097110

C-097110

Alternative 1



C-097111

C-097111

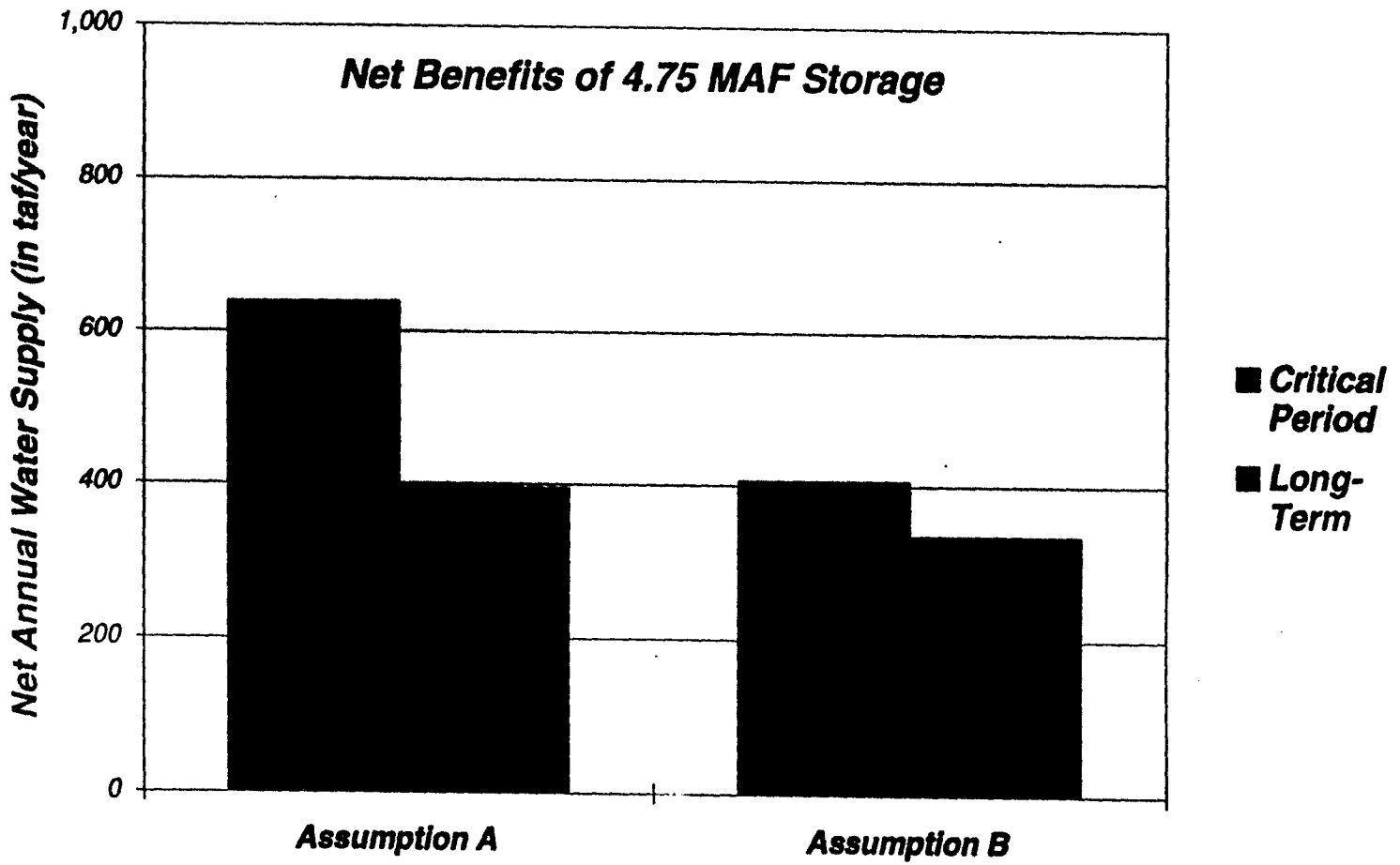
Alternative 2

Average Annual Water Supply
Compared to No Action
(in 1,000 acre-feet per year)

	Critical Period	Long-Term
No Storage		
Assumption A	*283*	*336*
Assumption B	*-357*	*-54*
4.75 MAF Storage		
Assumption A	*920*	*730*
Assumption B	*48*	*280*

C-097112
C-097112

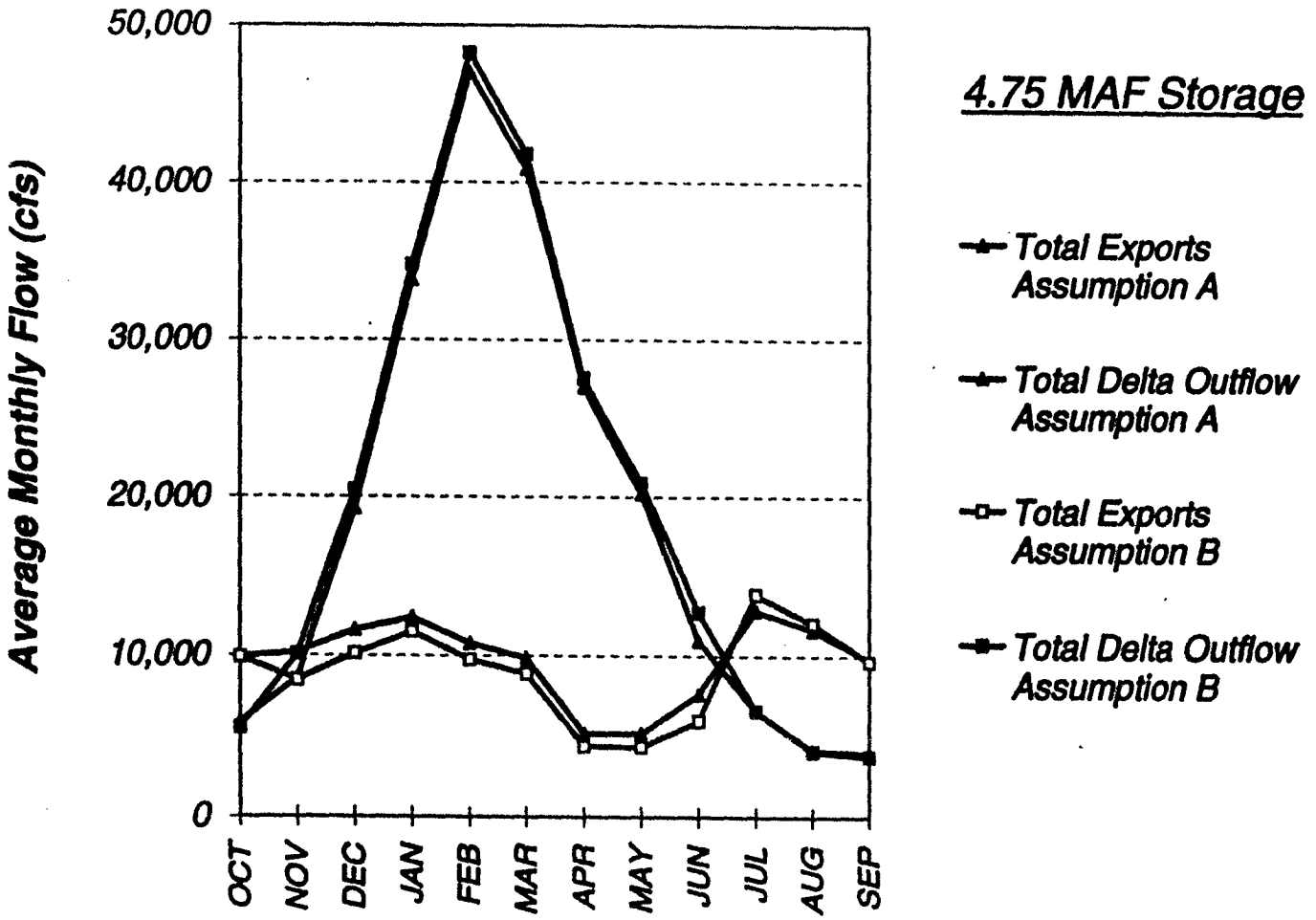
Alternative 2



C-097113

C—097113

Alternative 2



C-097114

C—097114

Alternative 2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumption A *(Emphasis on Water Supply)*												
E/I Ratio	65%	35%-45%	35% of Delta Inflow				65% of Delta Inflow					
Delta Outflow		X3 Requirement										
Assumption B *(Emphasis on Ecosystem Protection)*												
E/I Ratio	50%	25%	25% of Delta Inflow				65% of Delta Inflow				50%	
Delta Outflow		X2 Requirement										

C-097115

C-097115

Alternative 3
5,000 cfs Isolated Facility

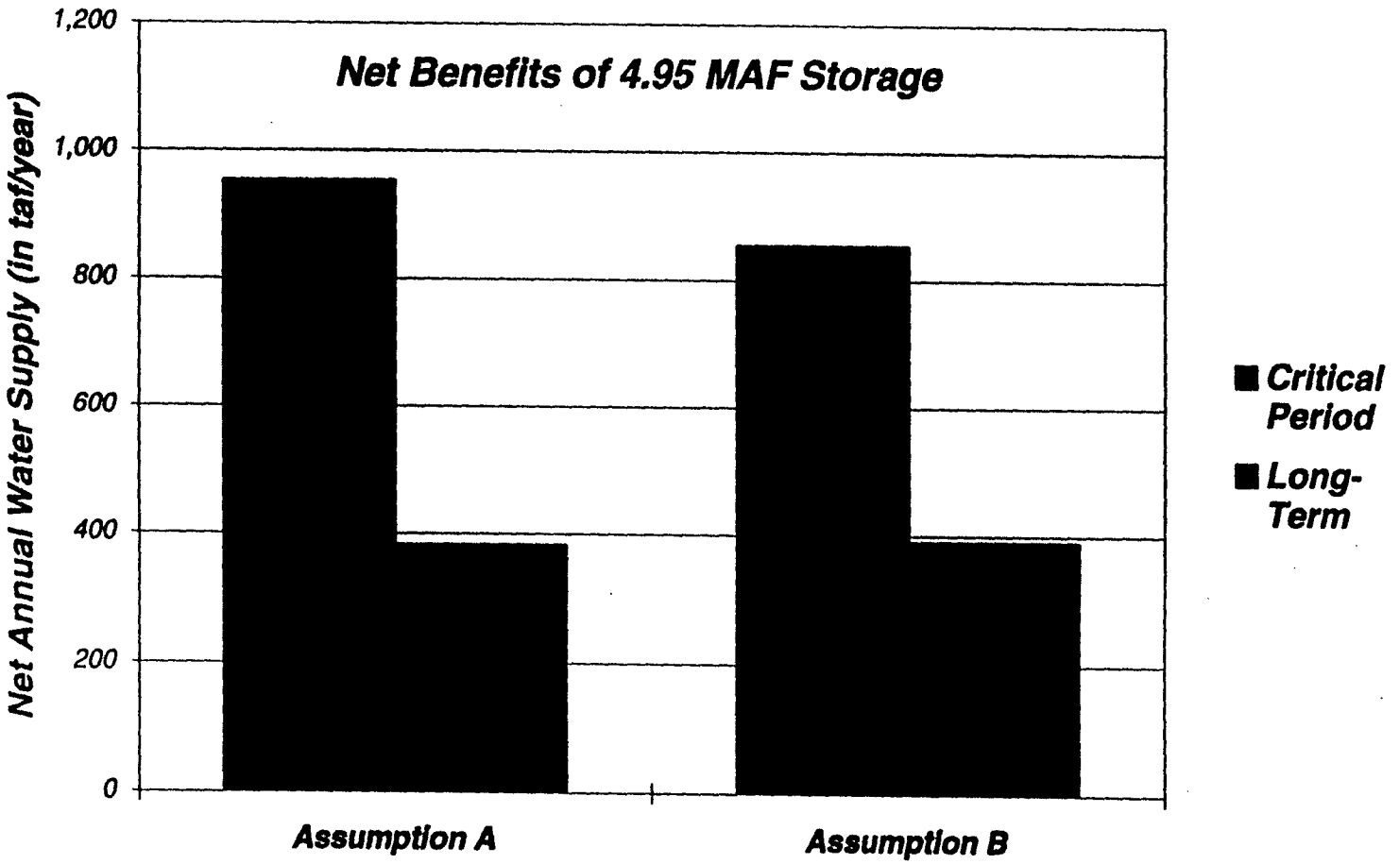
Average Annual Water Supply
Compared to No Action
(in 1,000 acre-feet per year)

	Critical Period	Long-Term
No Storage		
Assumption A	247	389
Assumption B	10	298
4.95 MAF Storage		
Assumption A	1,199	771
Assumption B	864	688

C-097116

C-097116

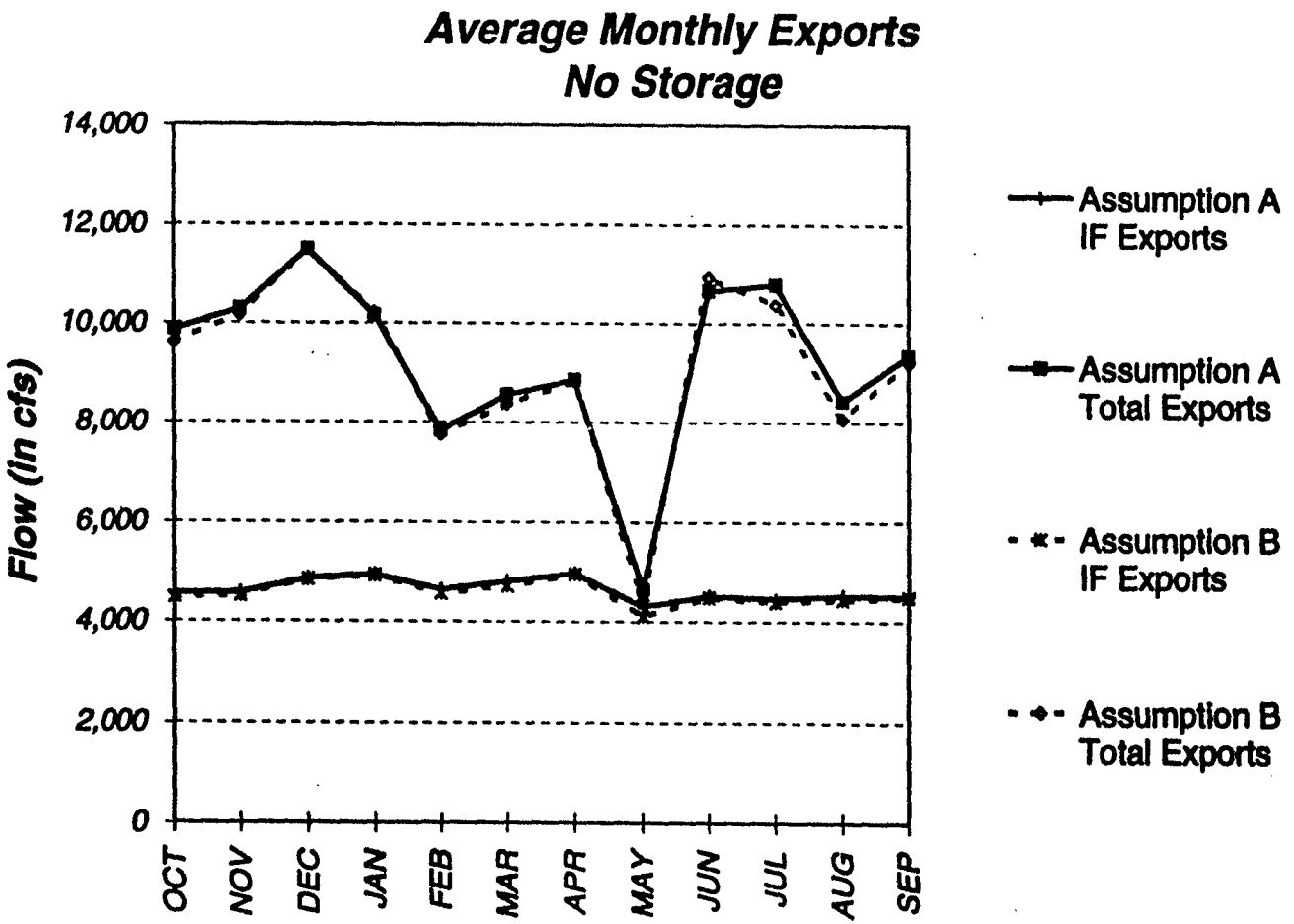
Alternative 3
5,000 cfs Isolated Facility



C-097117

C-097117

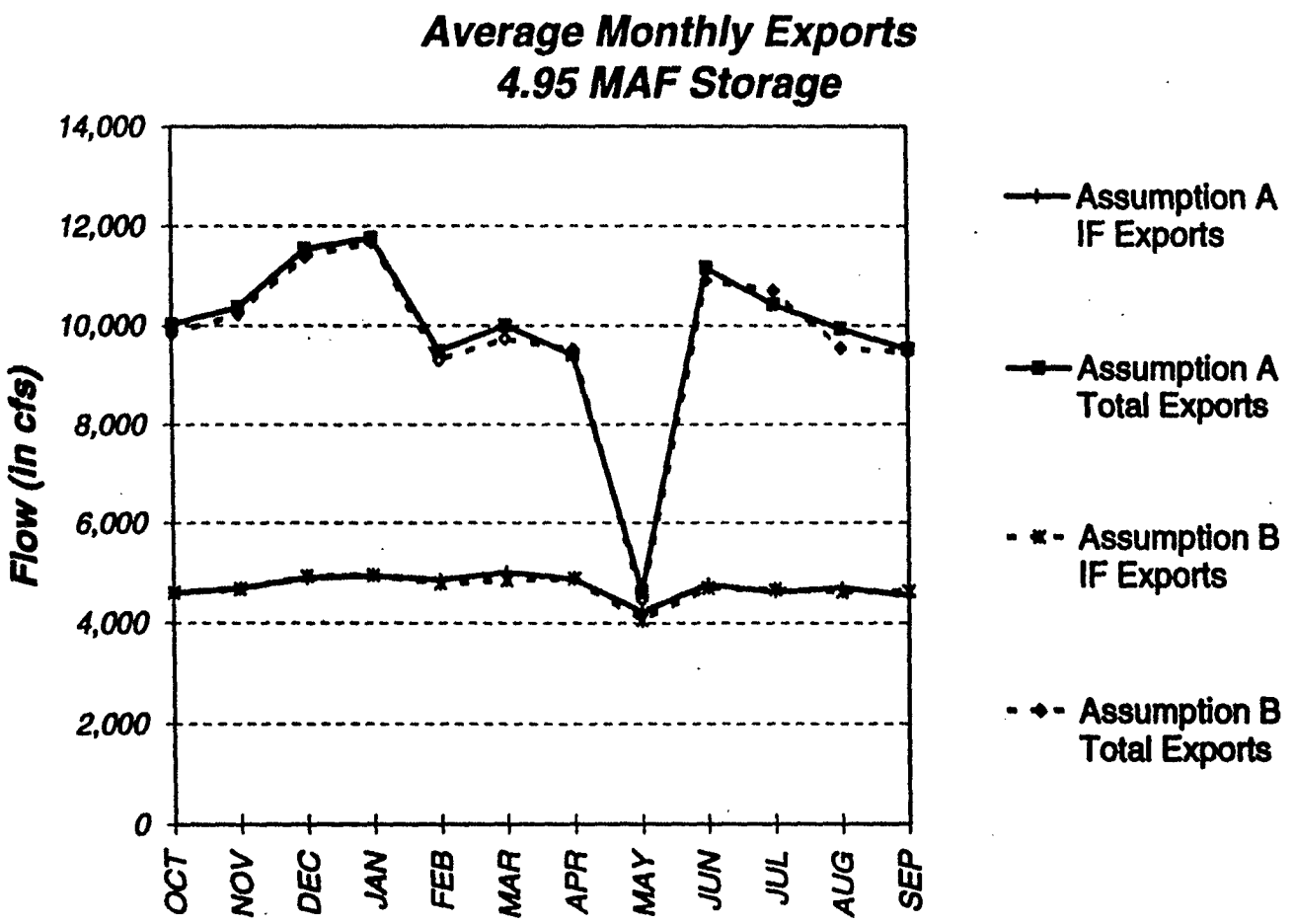
Alternative 3
5,000 cfs Isolated Facility



C-097118

C-097118

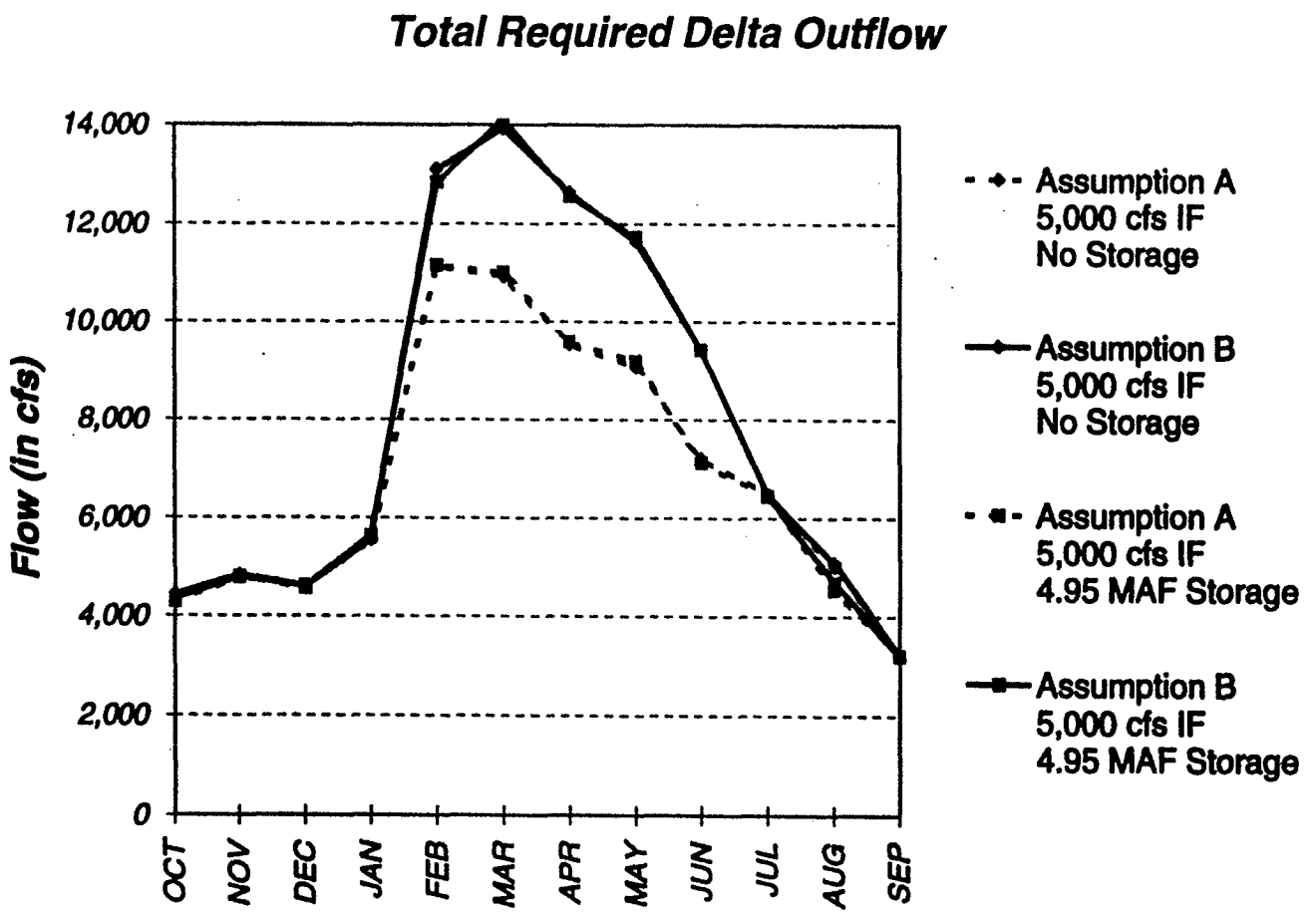
Alternative 3
5,000 cfs Isolated Facility



C-097119

C-097119

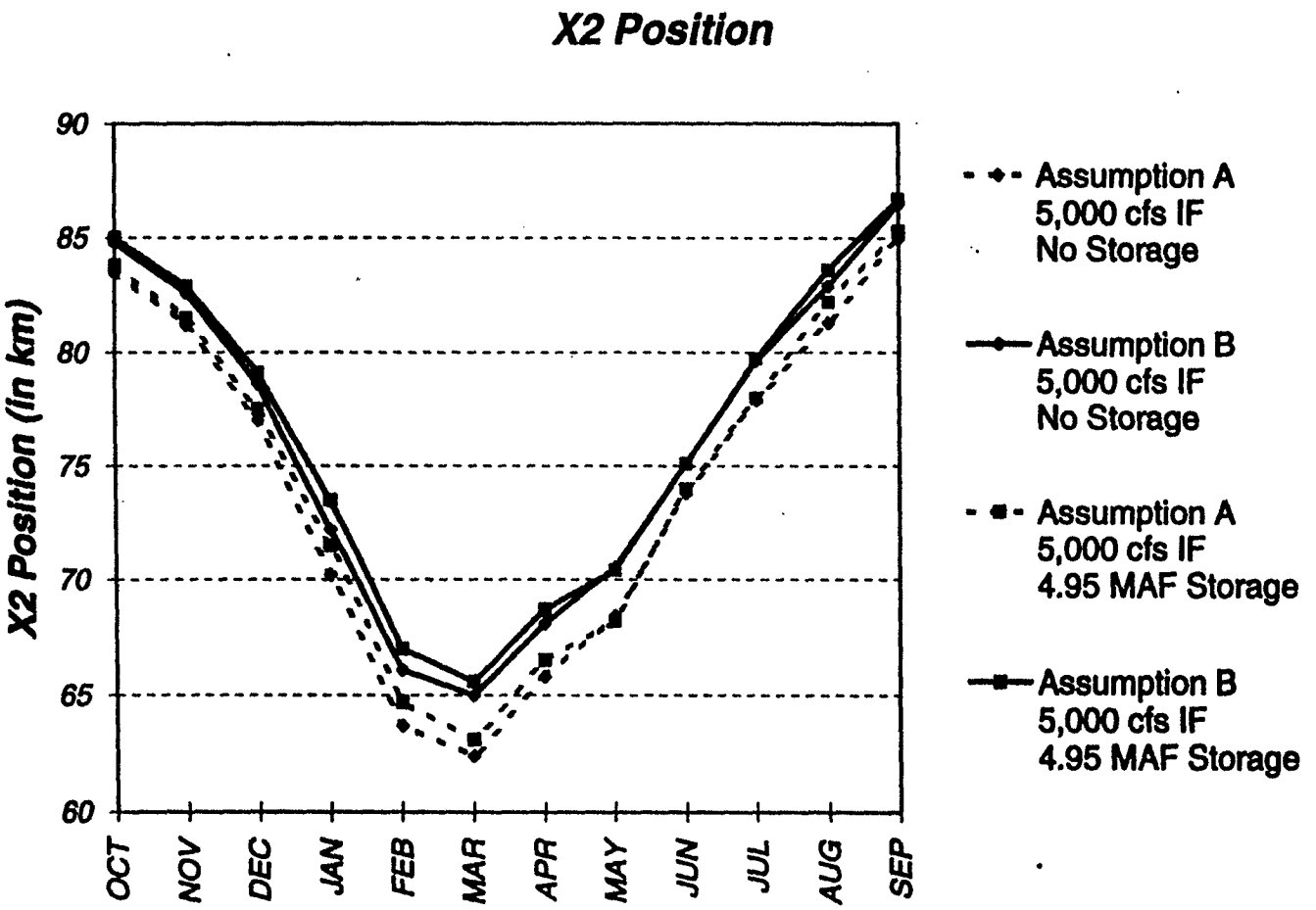
Alternative 3
5,000 cfs Isolated Facility



C-097120

C-097120

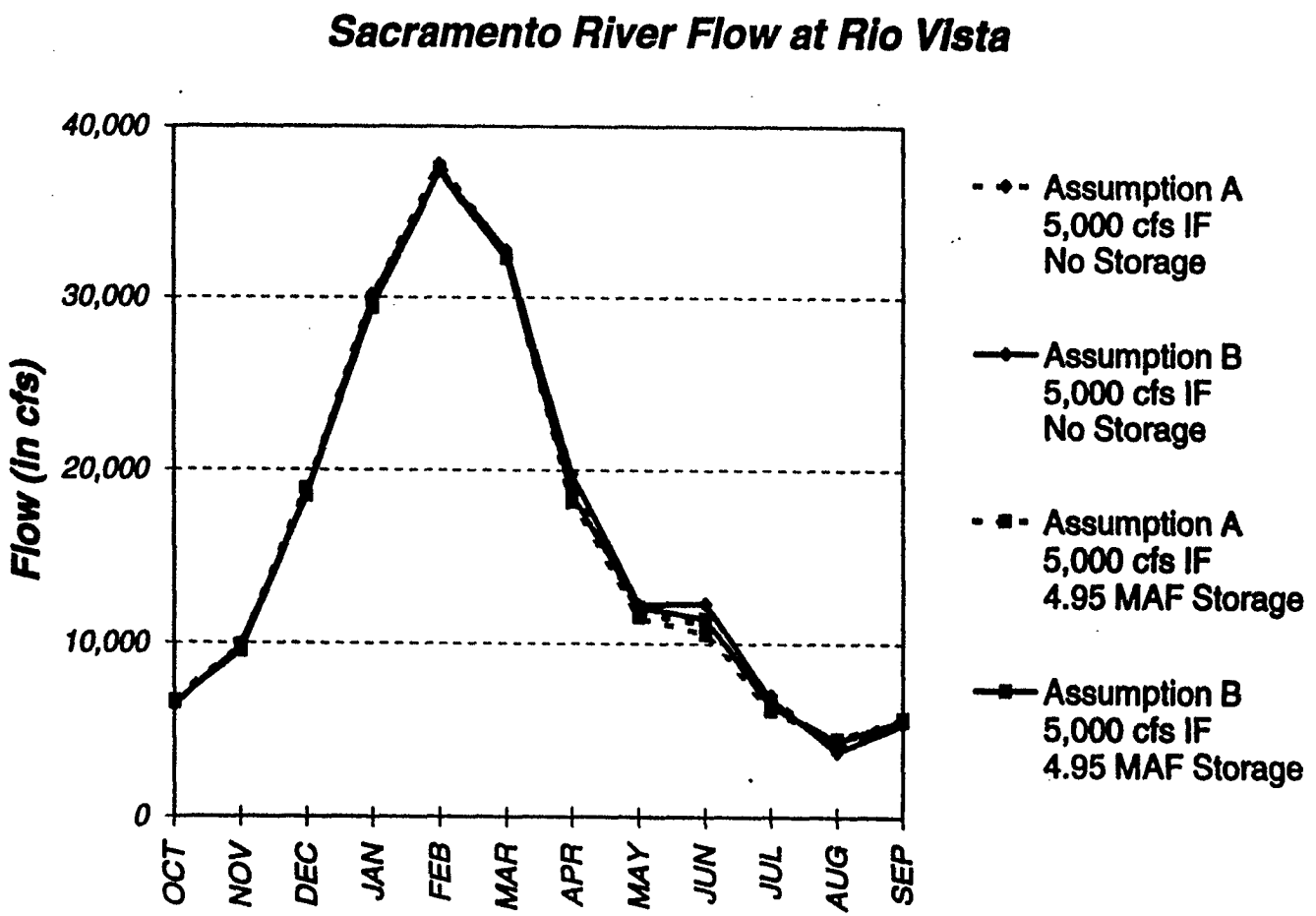
Alternative 3
5,000 cfs Isolated Facility



C-097121

C-097121

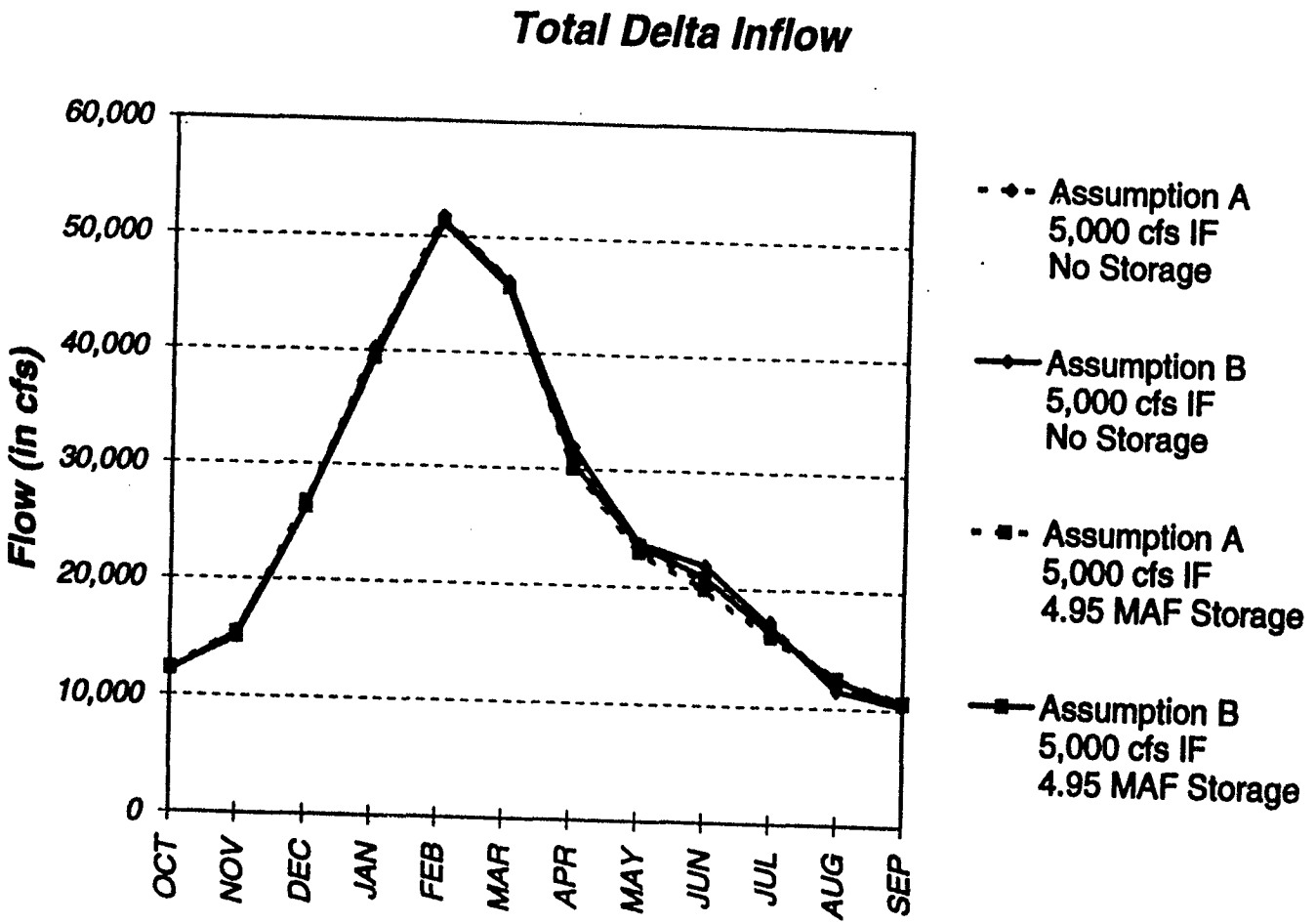
Alternative 3
5,000 cfs Isolated Facility



C-097122

C-097122

Alternative 3
5,000 cfs Isolated Facility



C-097123

C-097123

Alternative 3
15,000 cfs Isolated Facility

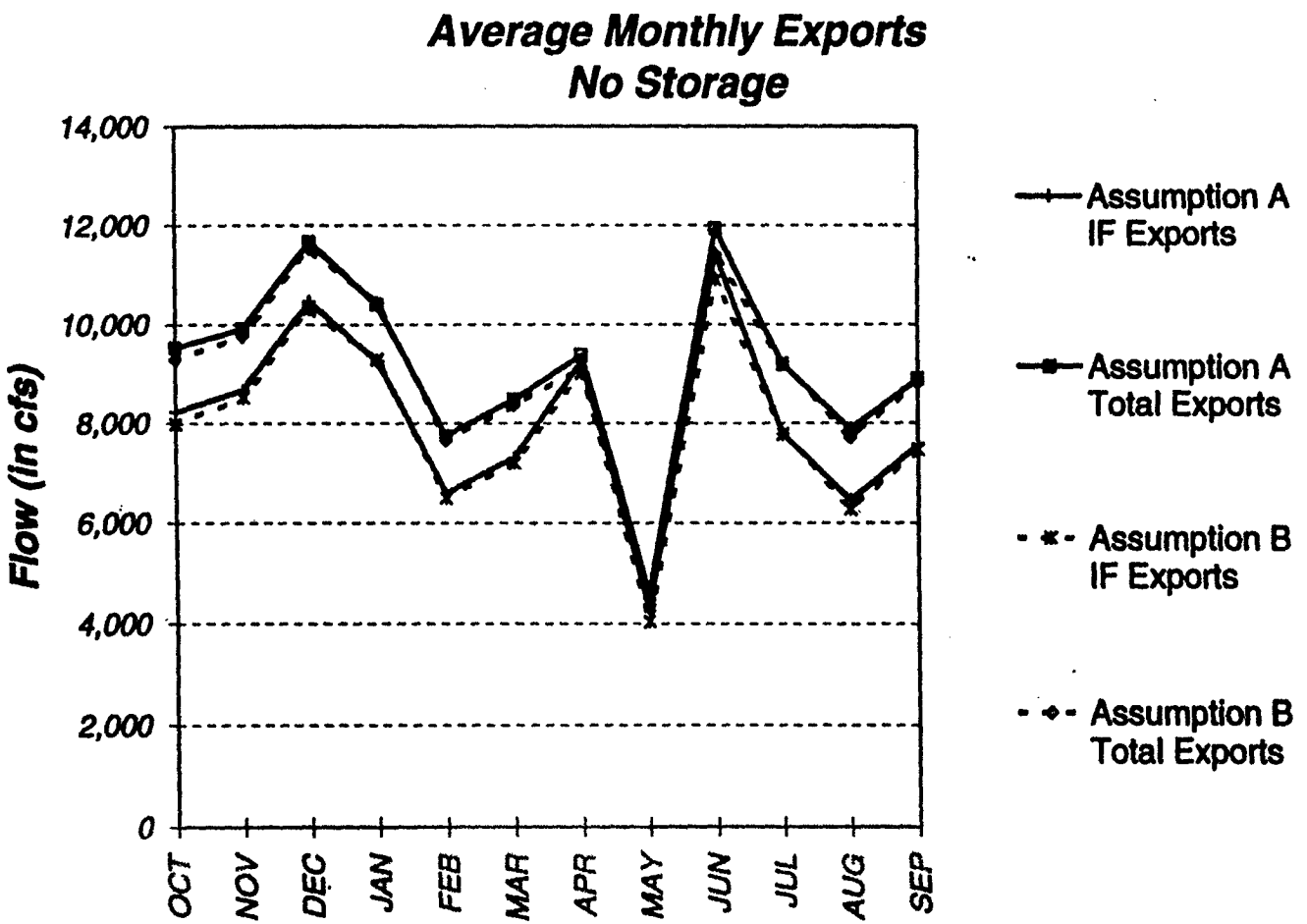
Average Annual Water Supply
Compared to No Action
(in 1,000 acre-feet per year)

	Critical Period	Long-Term
No Storage		
Assumption A	89	304
Assumption B	-121	189
4.95 MAF Storage		
Assumption A	864	681
Assumption B	616	611

C-097124

C-097124

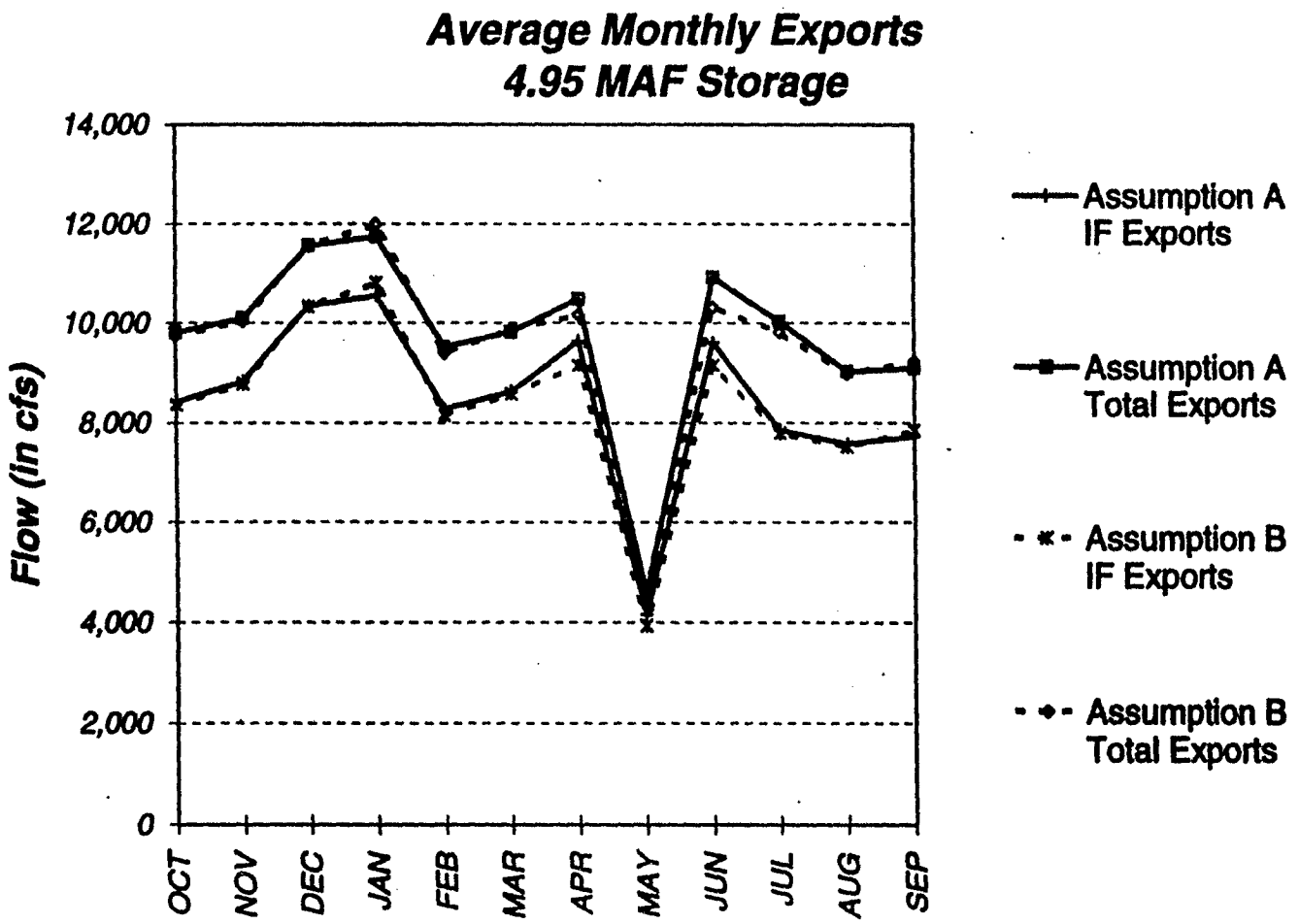
Alternative 3
15,000 cfs Isolated Facility



C-097125

C-097125

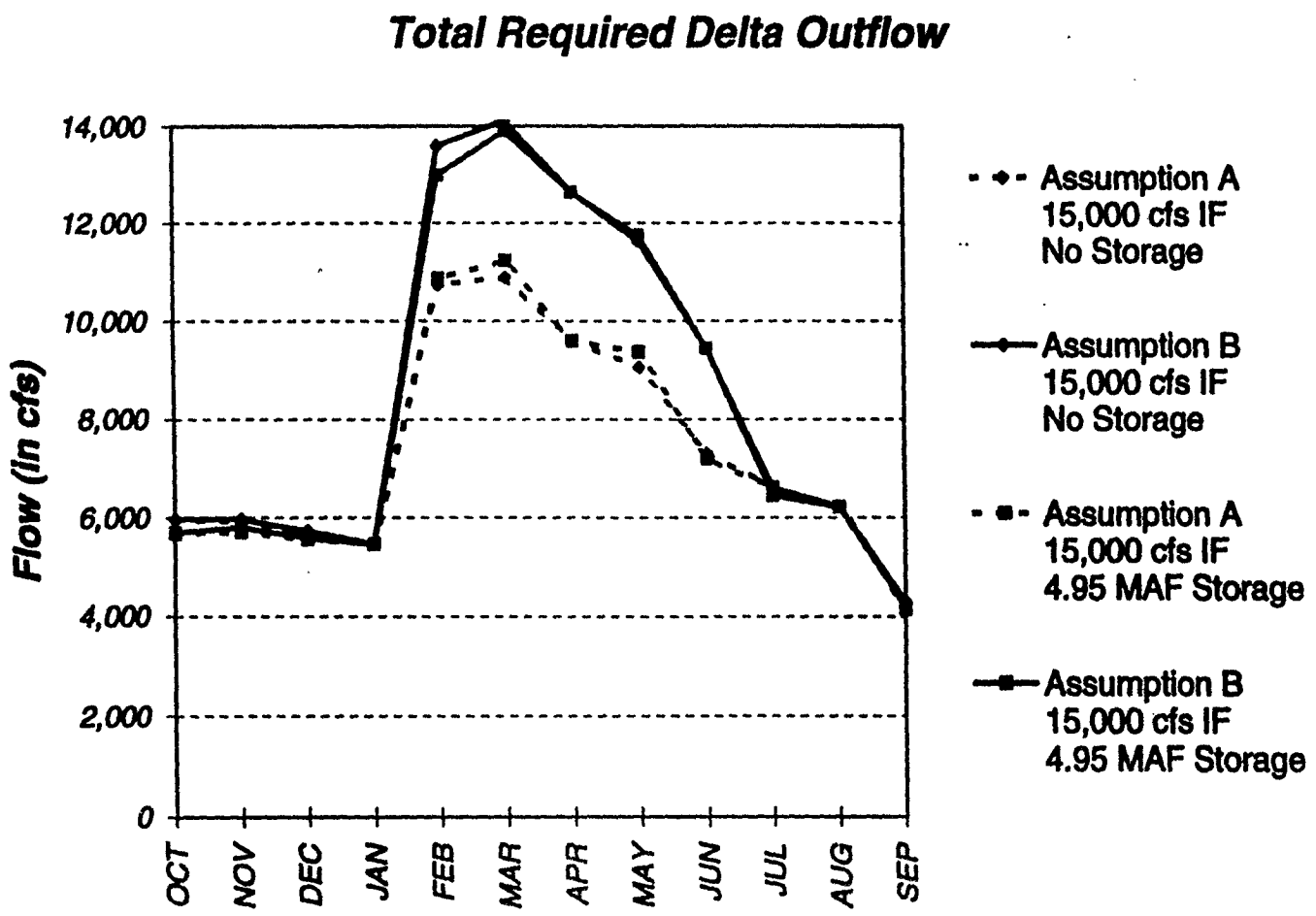
Alternative 3
15,000 cfs Isolated Facility



C-097126

C—097126

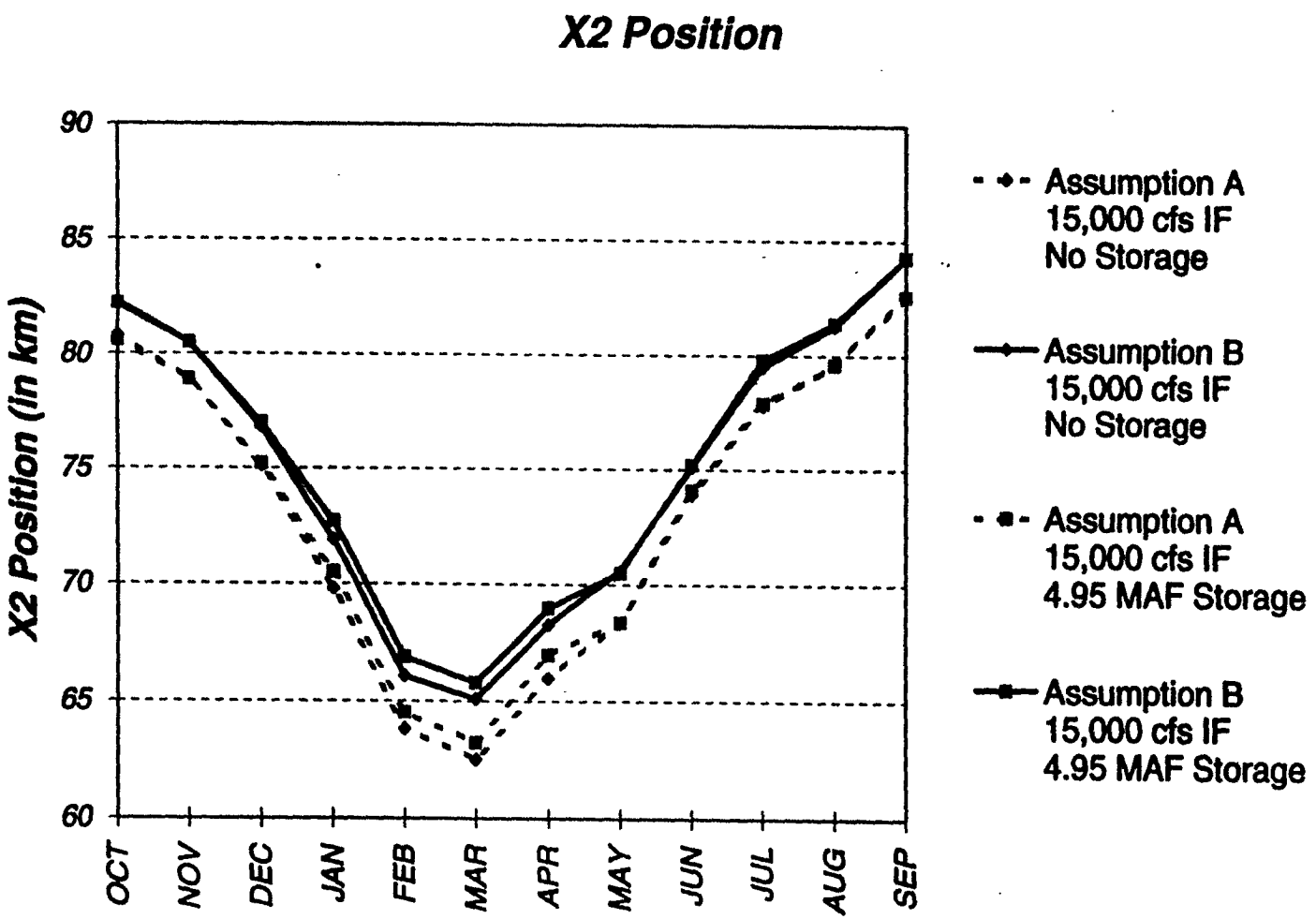
Alternative 3
15,000 cfs Isolated Facility



C-097127

C—097127

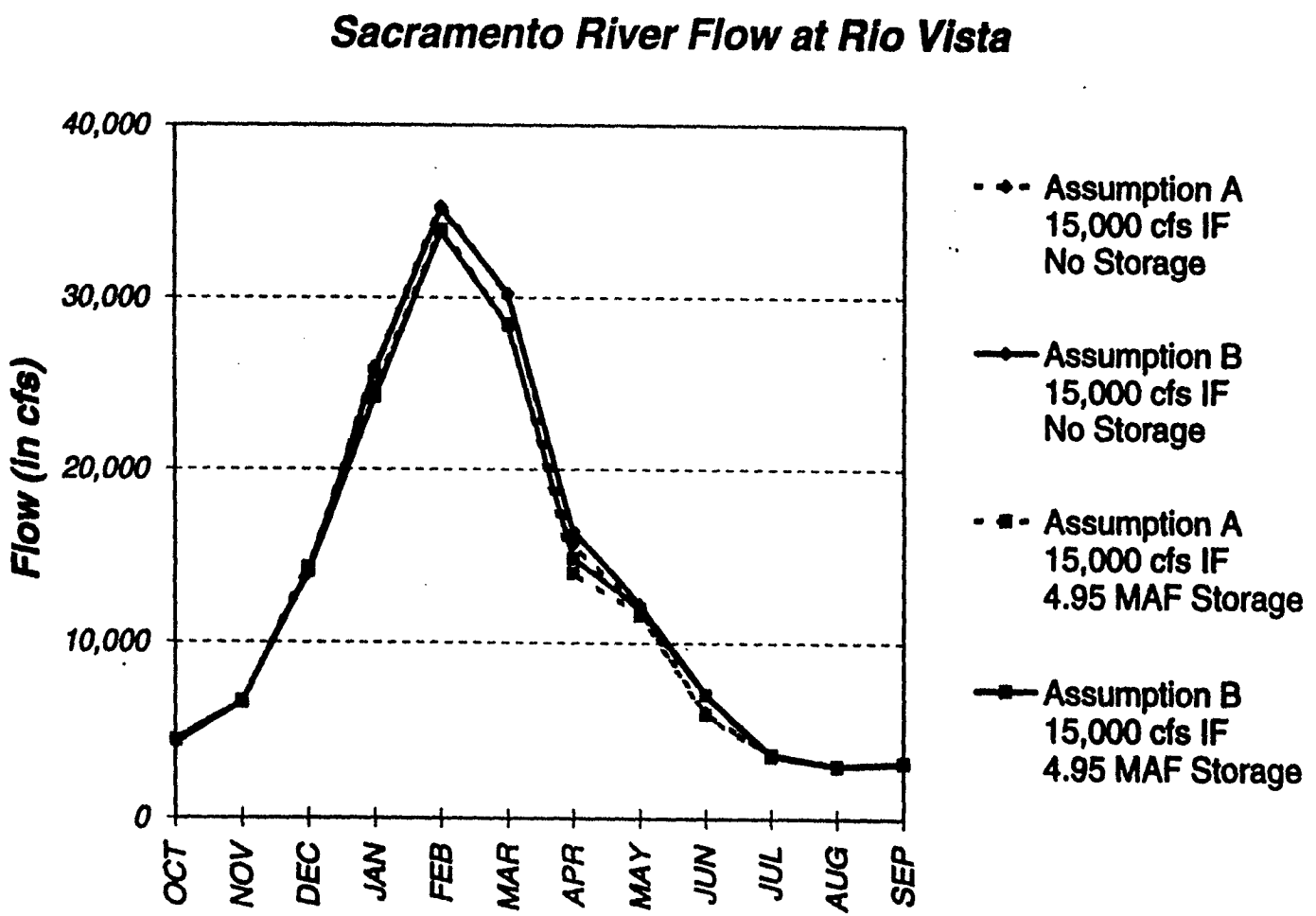
Alternative 3
15,000 cfs Isolated Facility



C-097128

C-097128

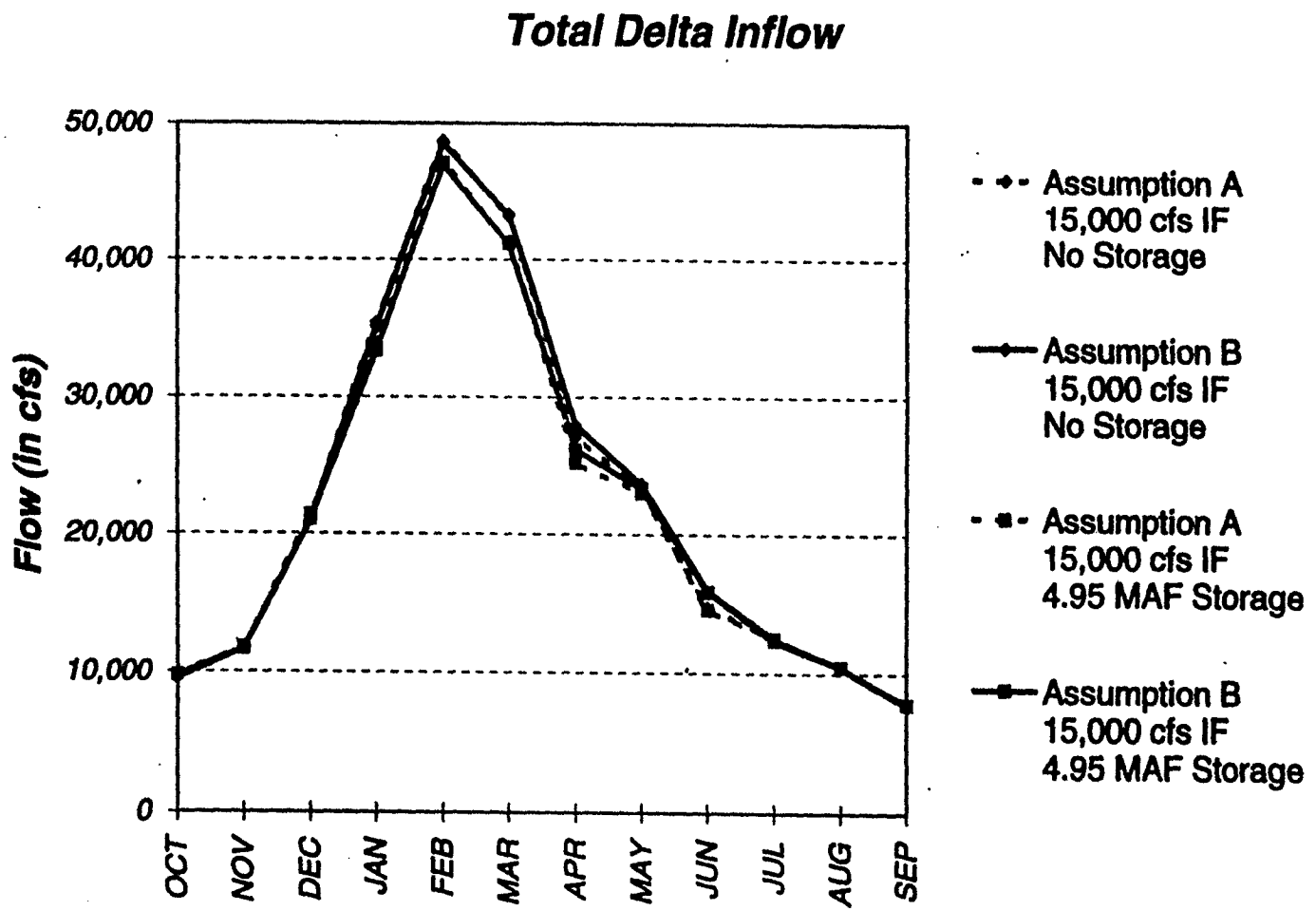
Alternative 3
15,000 cfs Isolated Facility



C-097129

C-097129

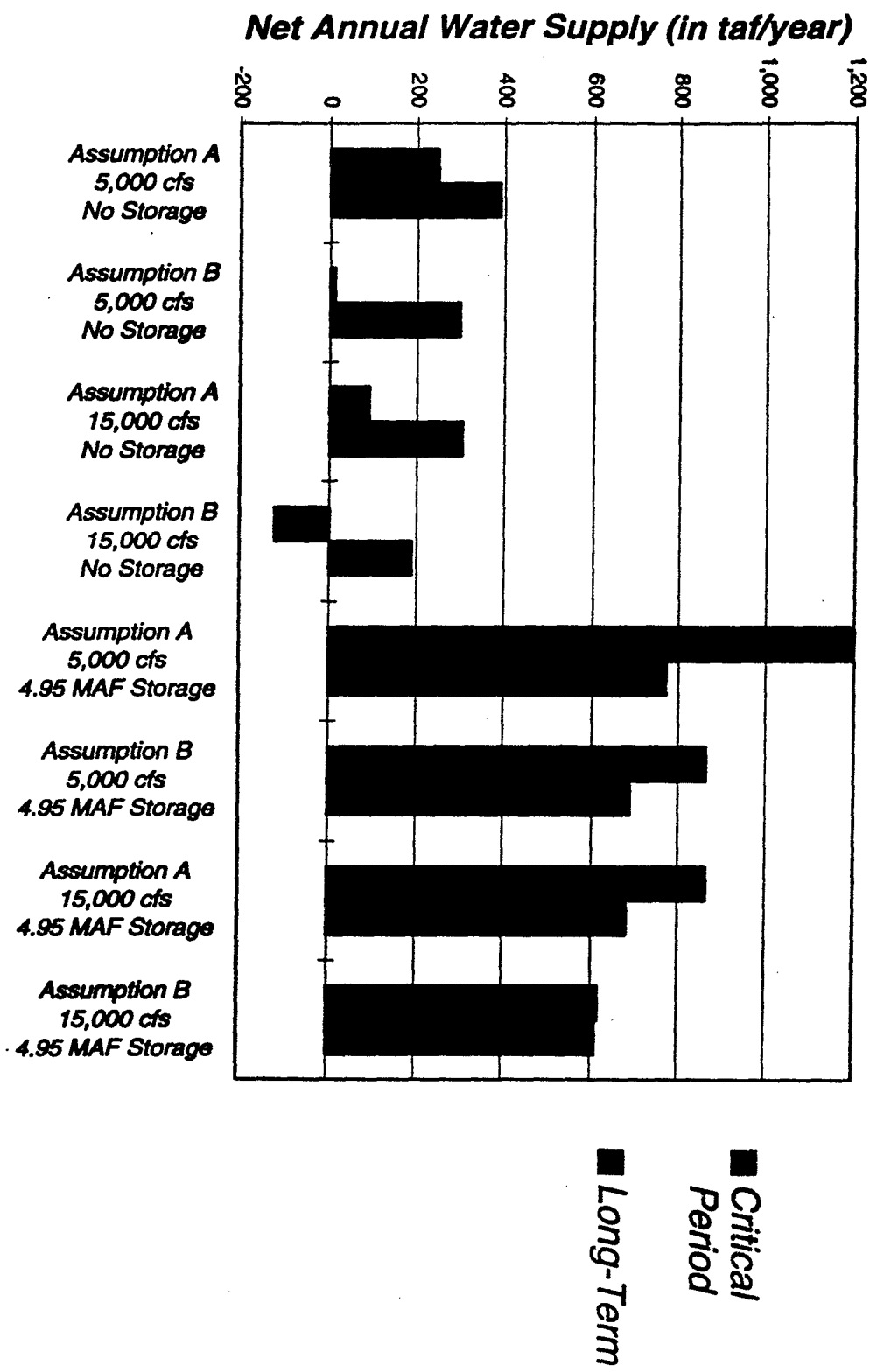
Alternative 3
15,000 cfs Isolated Facility



C-097130

C—097130

Alternative 3



Alternative 3

1,000 cfs thru Delta vs No thru Delta

Average Annual Water Supply
Compared to No Action
(in 1,000 acre-feet per year)

	Critical Period	Long-Term
4.95 MAF Storage[1]		
No Thru Delta Diversions	-86	299
1,000 cfs min. thru Delta	487	544

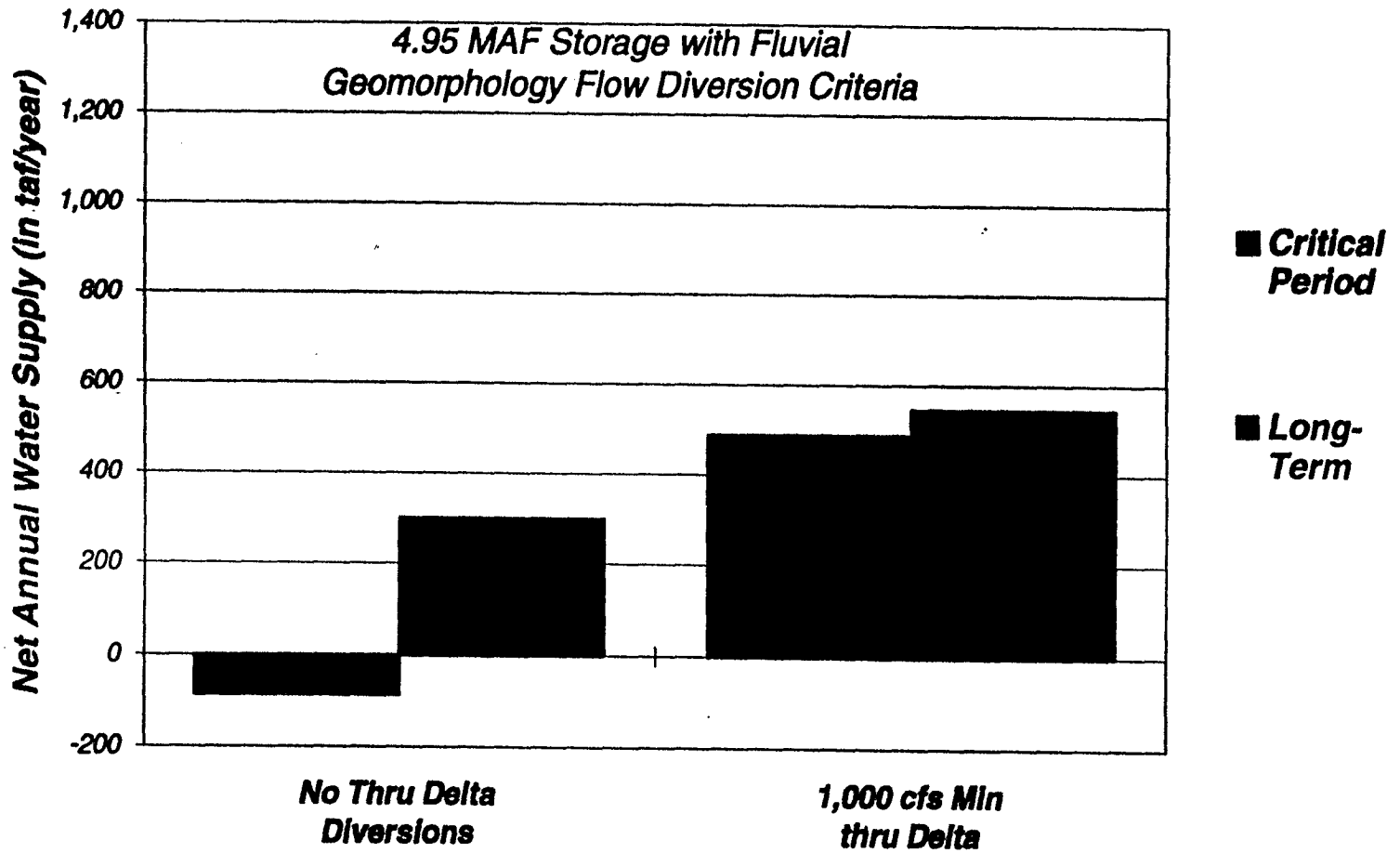
[1] Includes Fluvial Geomorphology Flow Criteria for diversions to Storage.

C-097132

C—097132

Alternative 3

1,000 cfs thru Delta vs No thru Delta

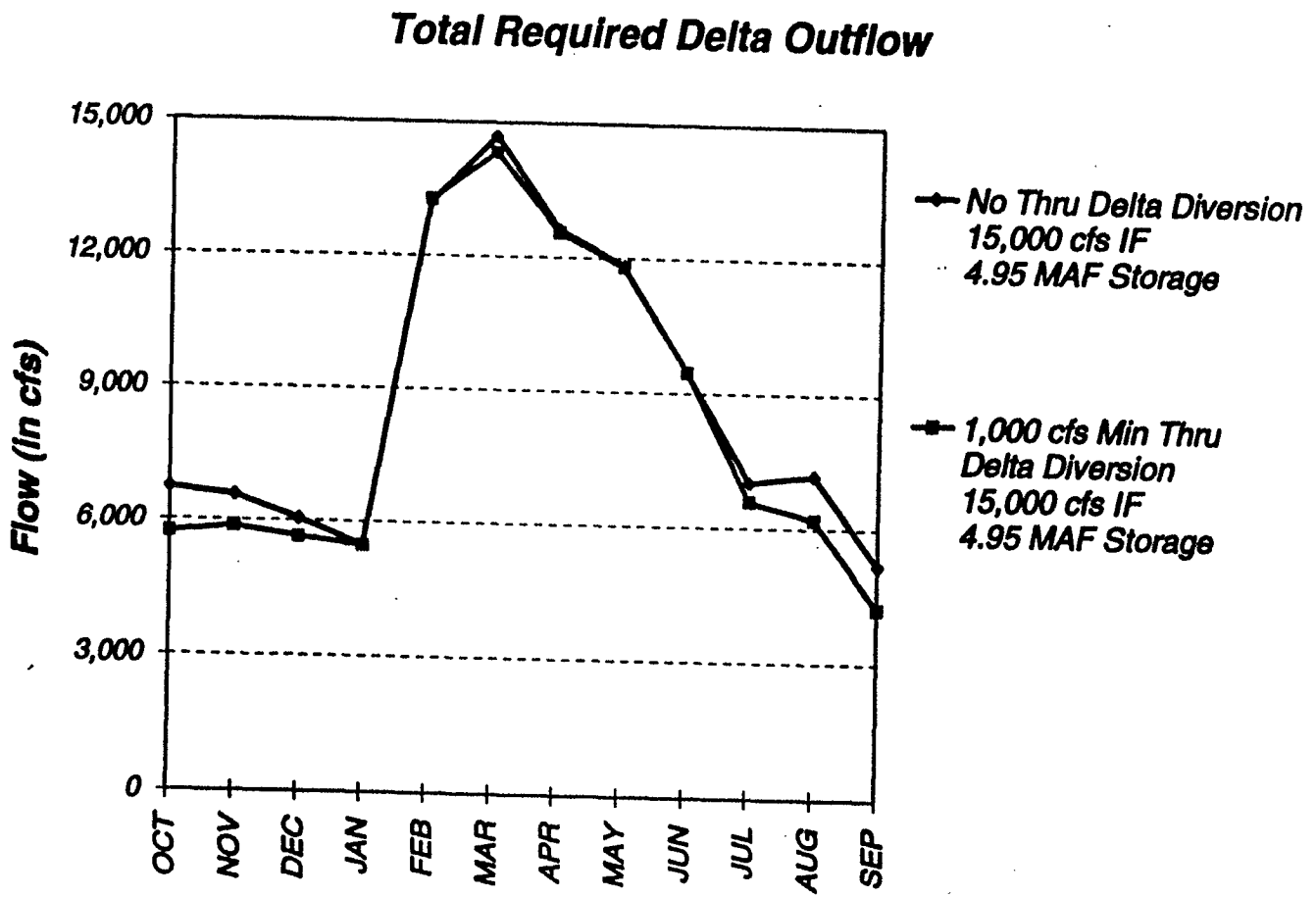


C-097133

C-097133

Alternative 3

1,000 cfs thru Delta vs No thru Delta

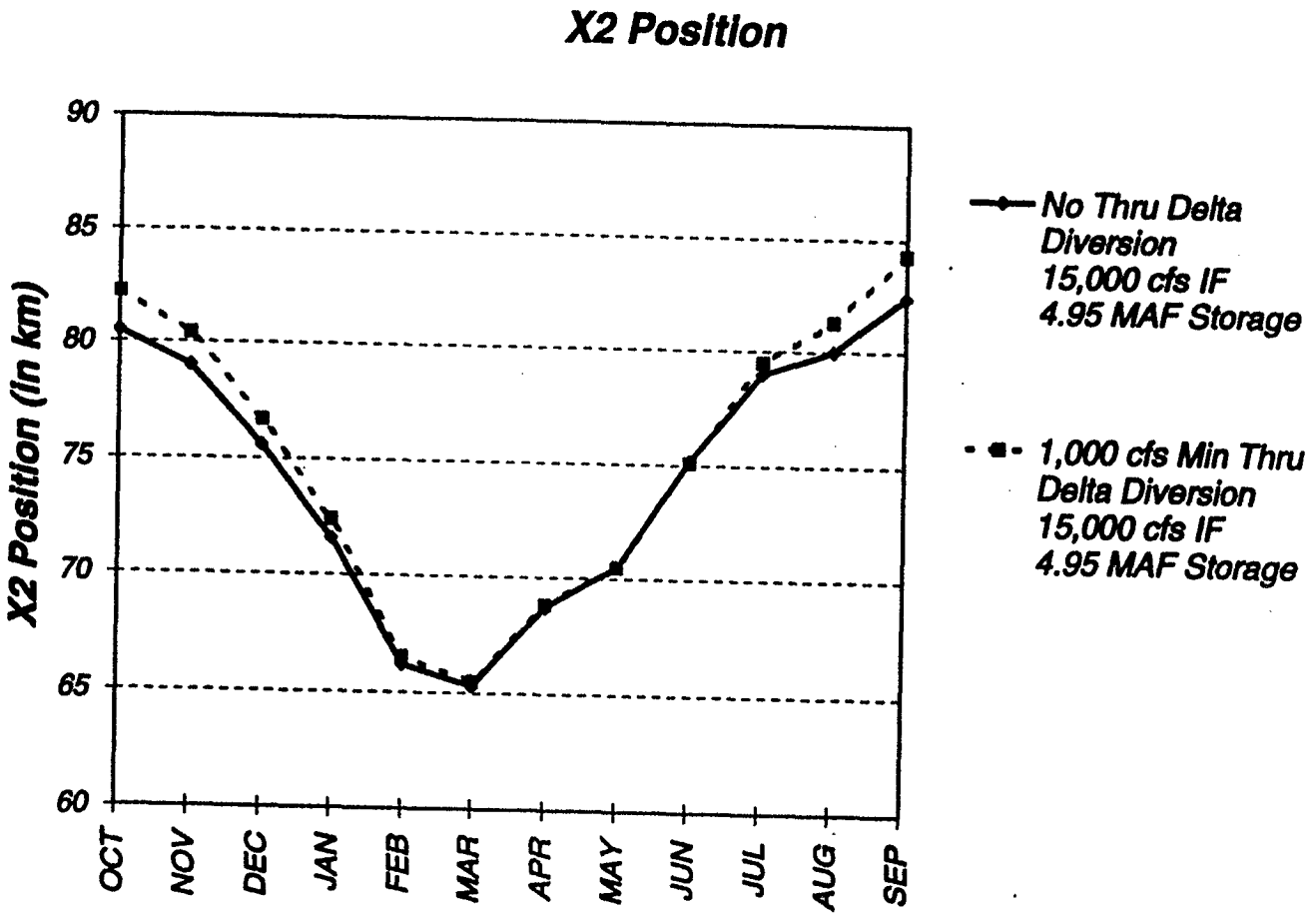


C-097134

C—097134

Alternative 3

1,000 cfs thru Delta vs No thru Delta

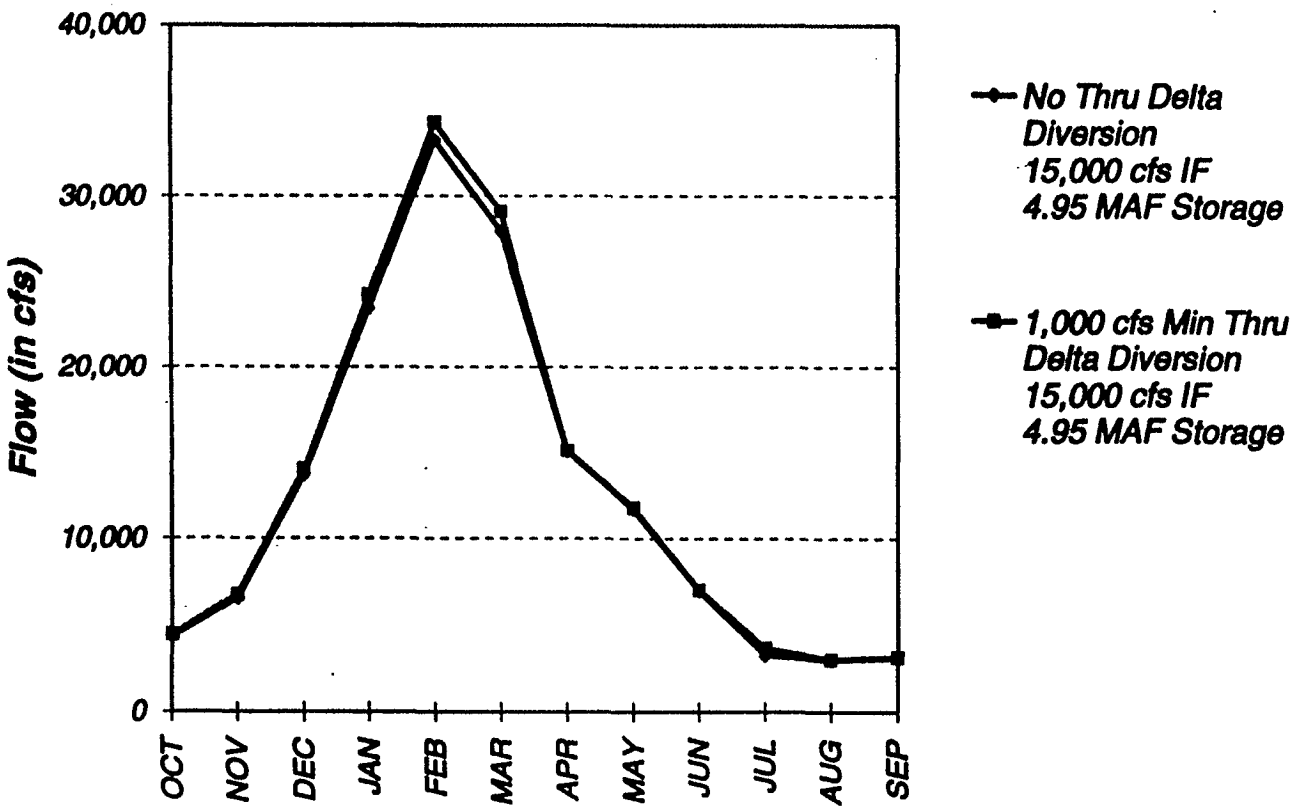


C-097135

C-097135

Alternative 3

1,000 cfs thru Delta vs No thru Delta

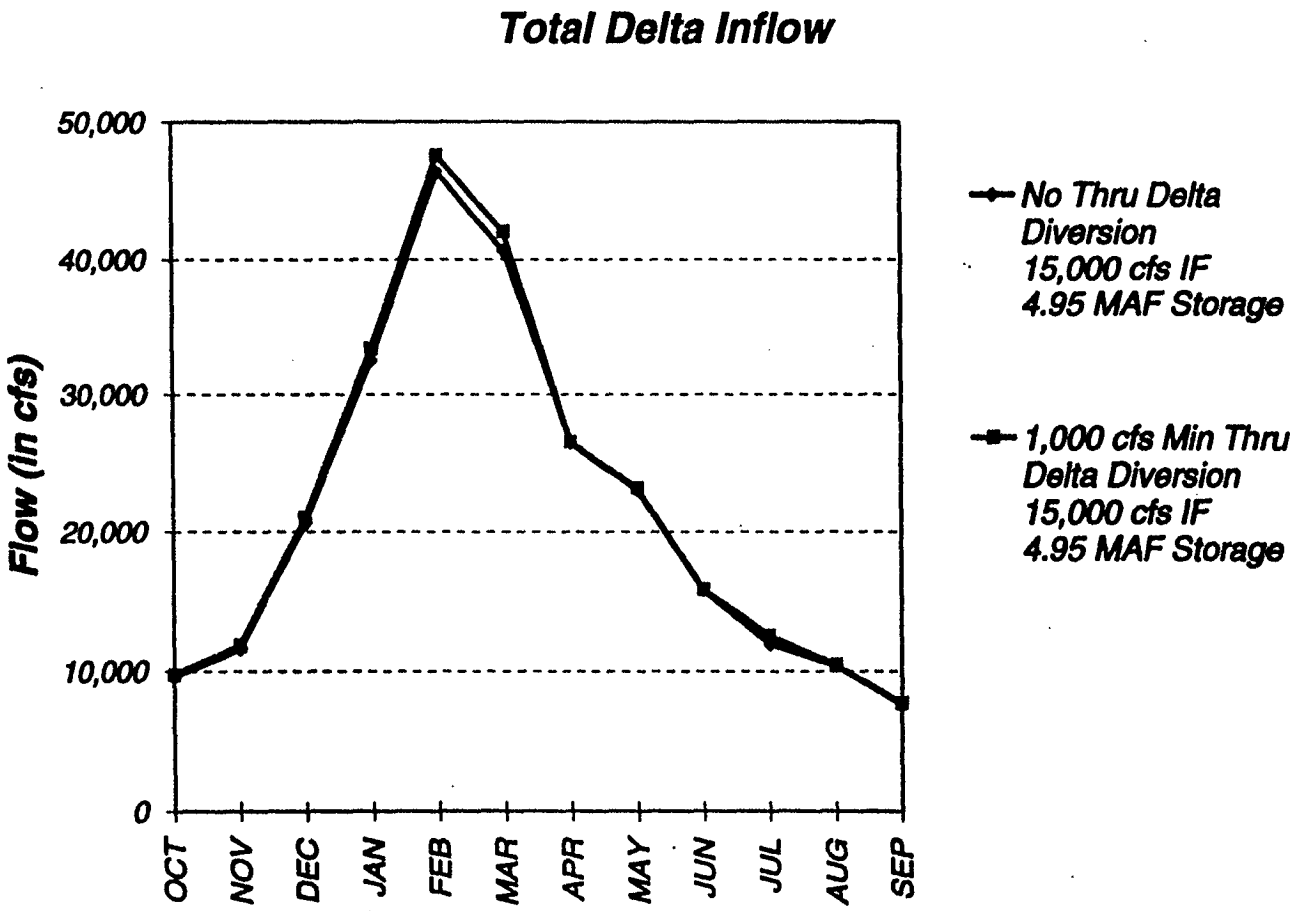


C-097136

C-097136

Alternative 3

1,000 cfs thru Delta vs No thru Delta



C-097137

C—097137

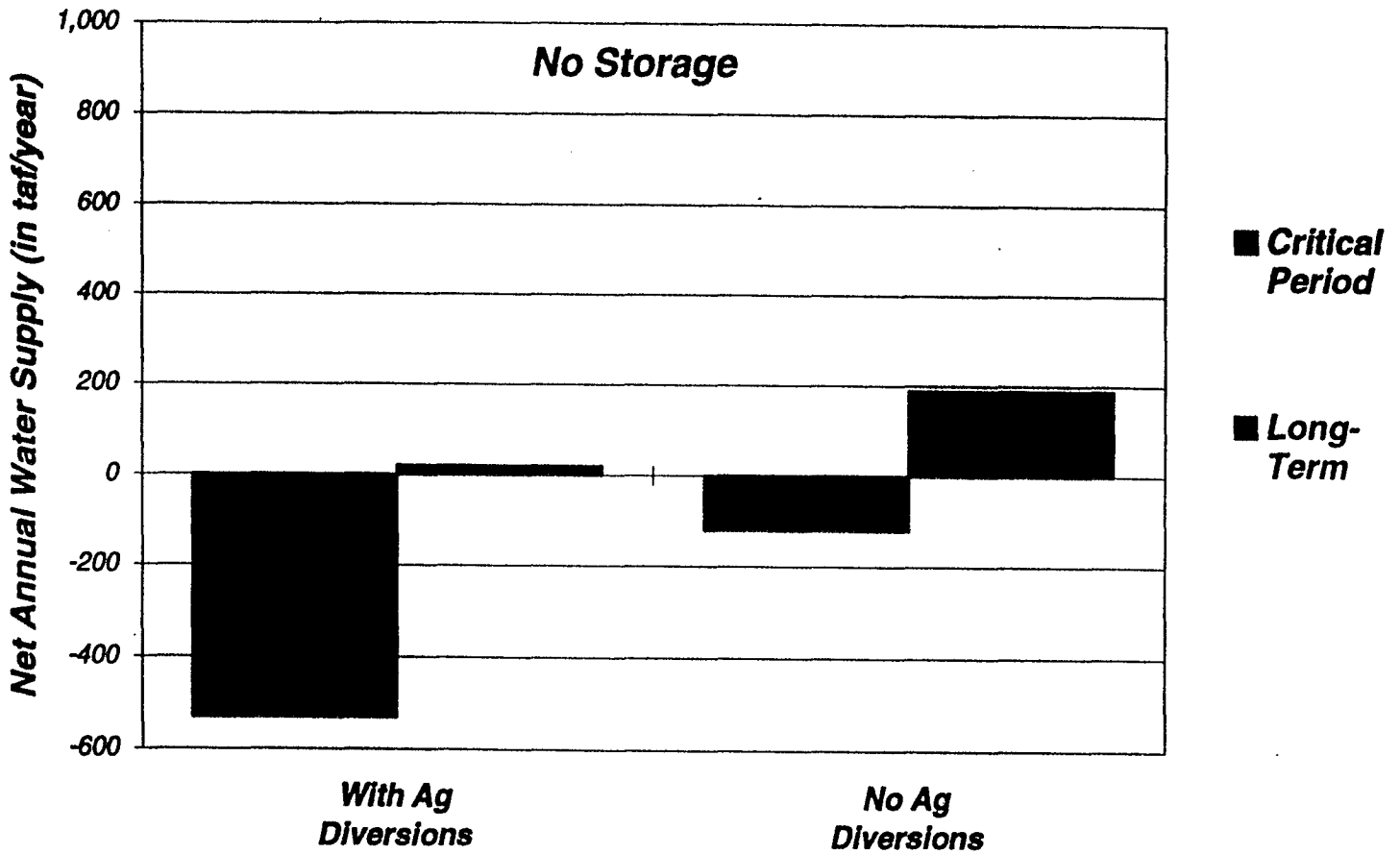
Alternative 3
With and without Delta Ag Diversions

Average Annual Water Supply
Compared to No Action
(in 1,000 acre-feet per year)

	Critical Period	Long-Term
No Storage		
With Delta Ag Diversions	-531	21
No Delta Ag Diversions	-121	189

C-097138
C—097138

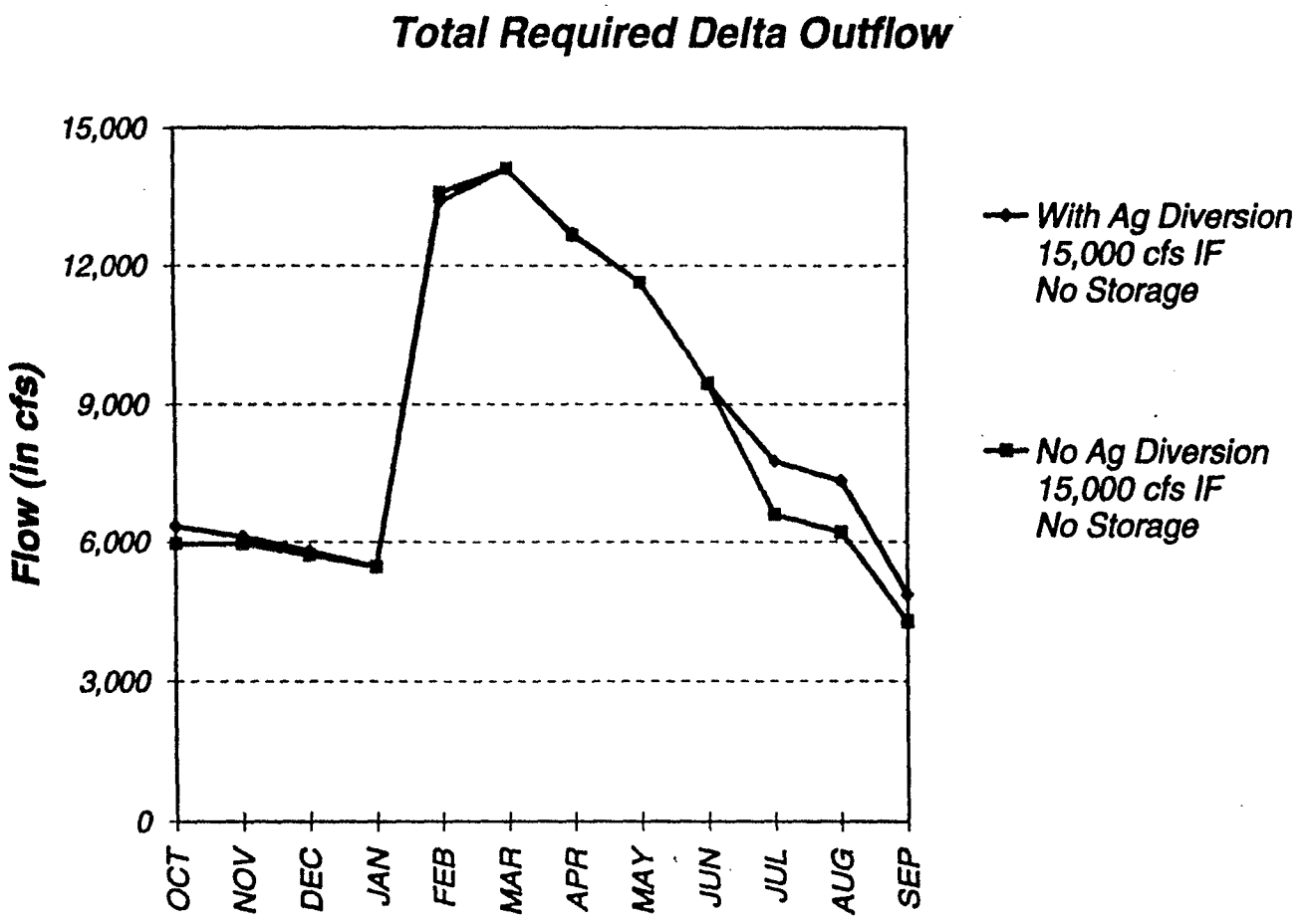
Alternative 3
With and without Delta Ag Diversions



C-097139

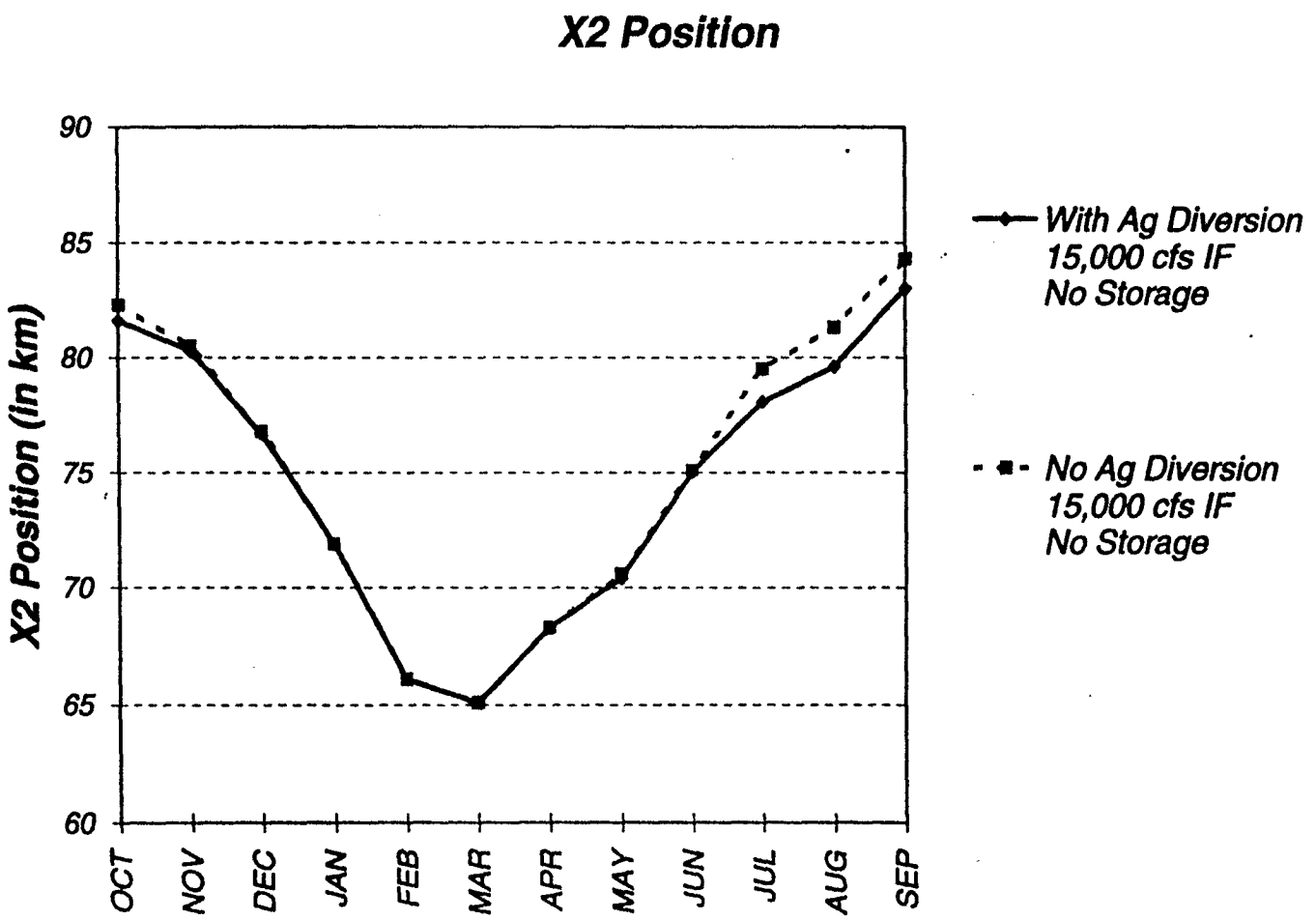
C—097139

Alternative 3
With and without Delta Ag Diversions



C-097140
C-097140

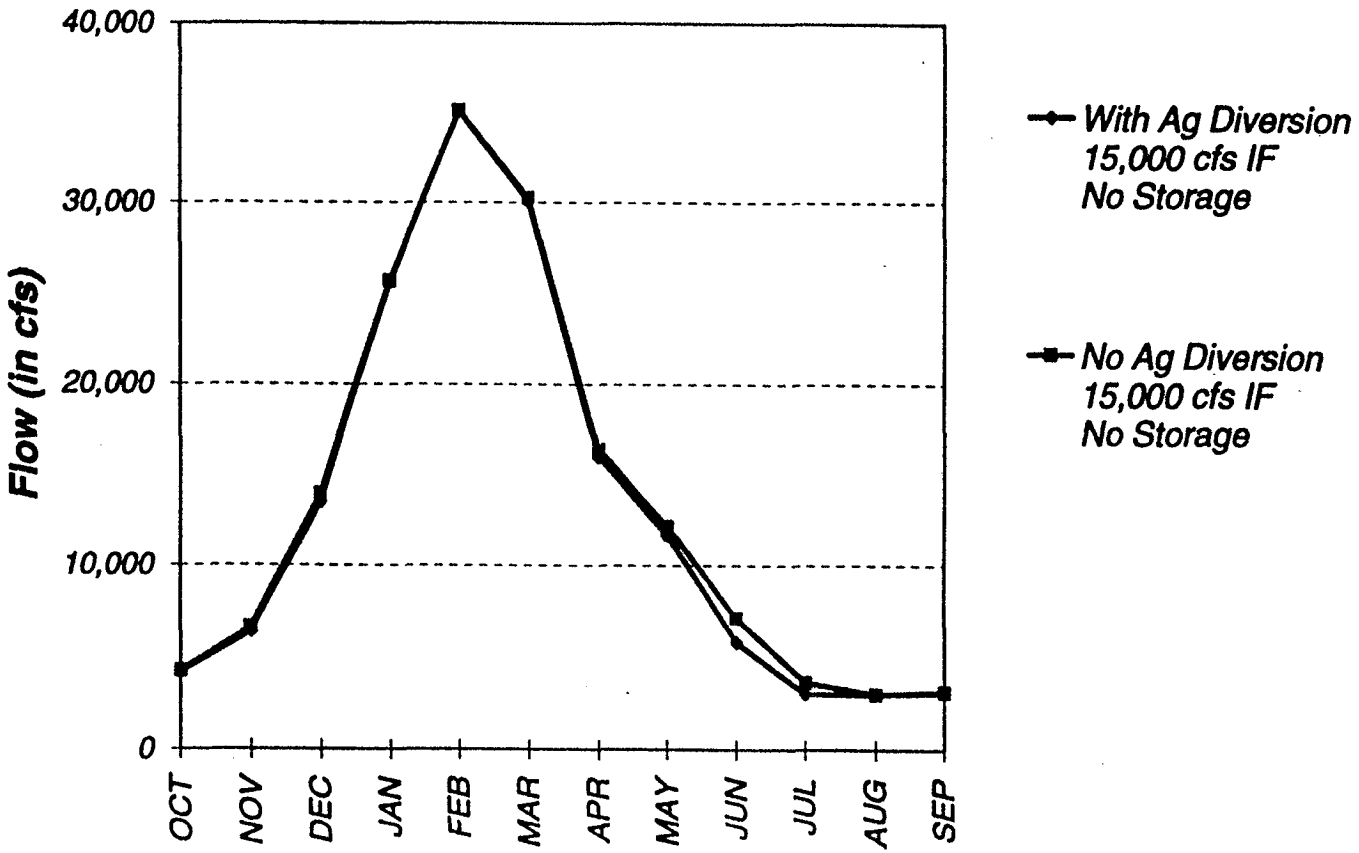
Alternative 3
With and without Delta Ag Diversions



C-097141

C-097141

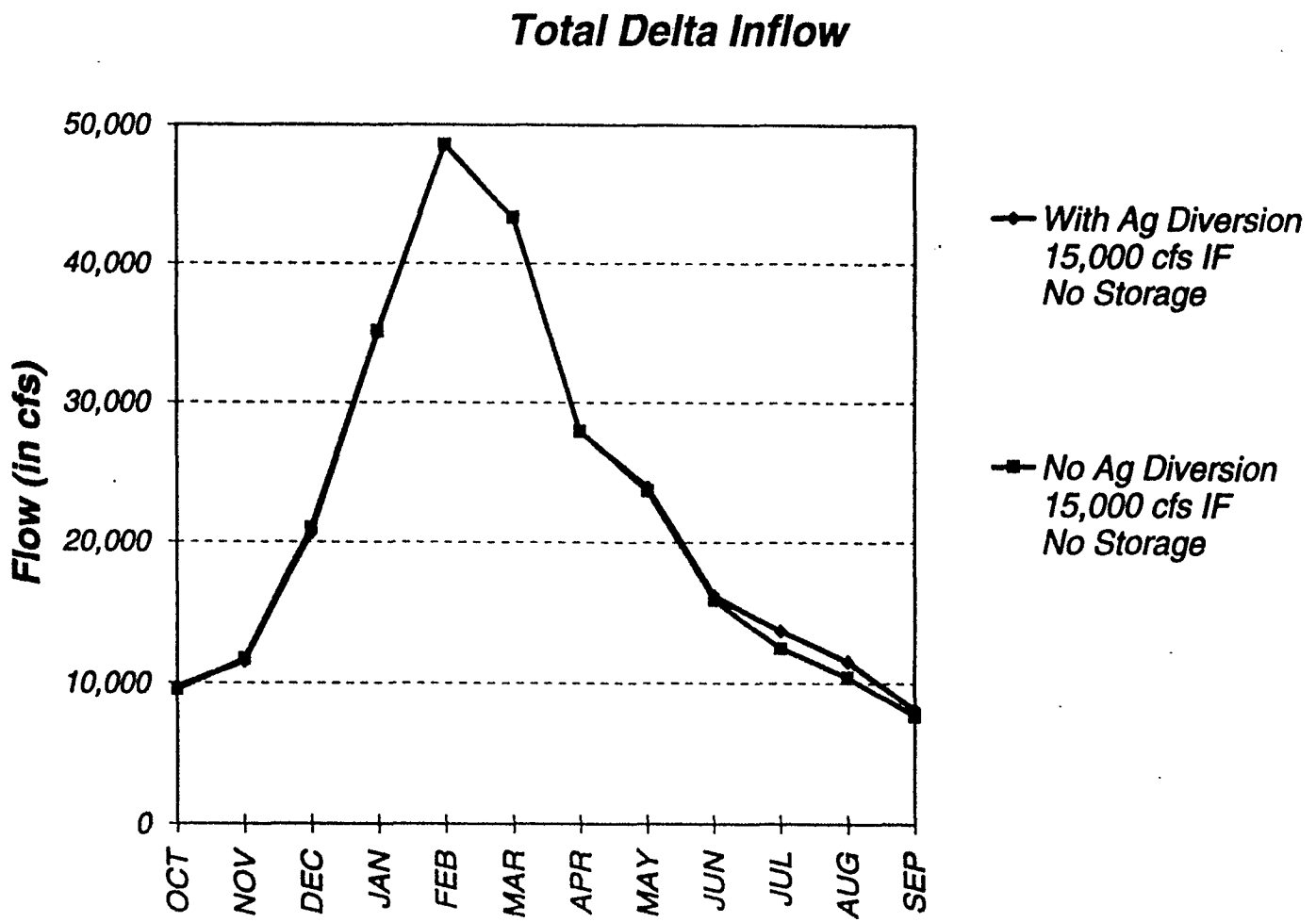
Alternative 3
With and without Delta Ag Diversions



C-097142

C-097142

Alternative 3
With and without Delta Ag Diversions

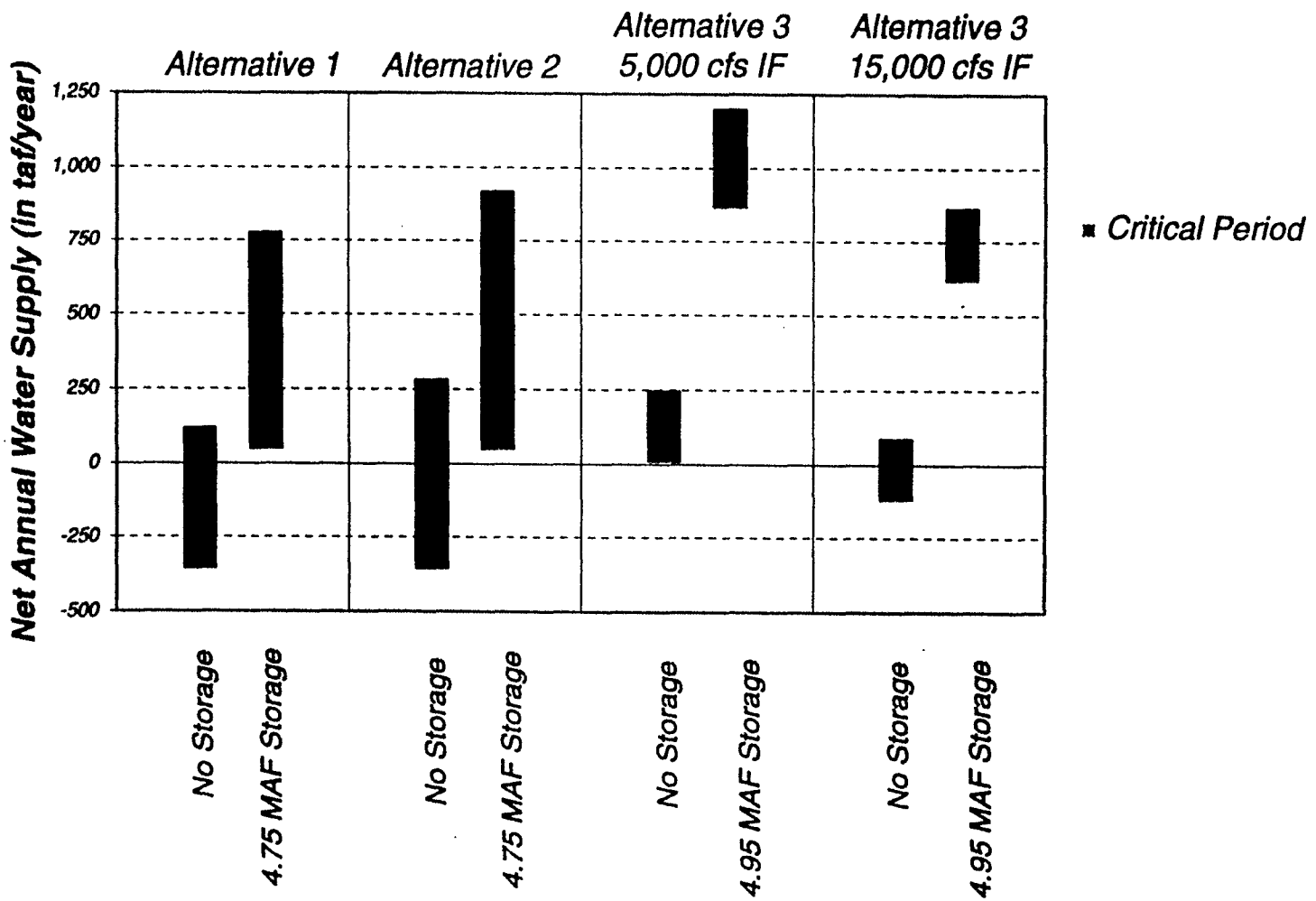


C-097143

C-097143

Comparison of Alternatives 1 - 3

Critical Period Water Supply Benefits

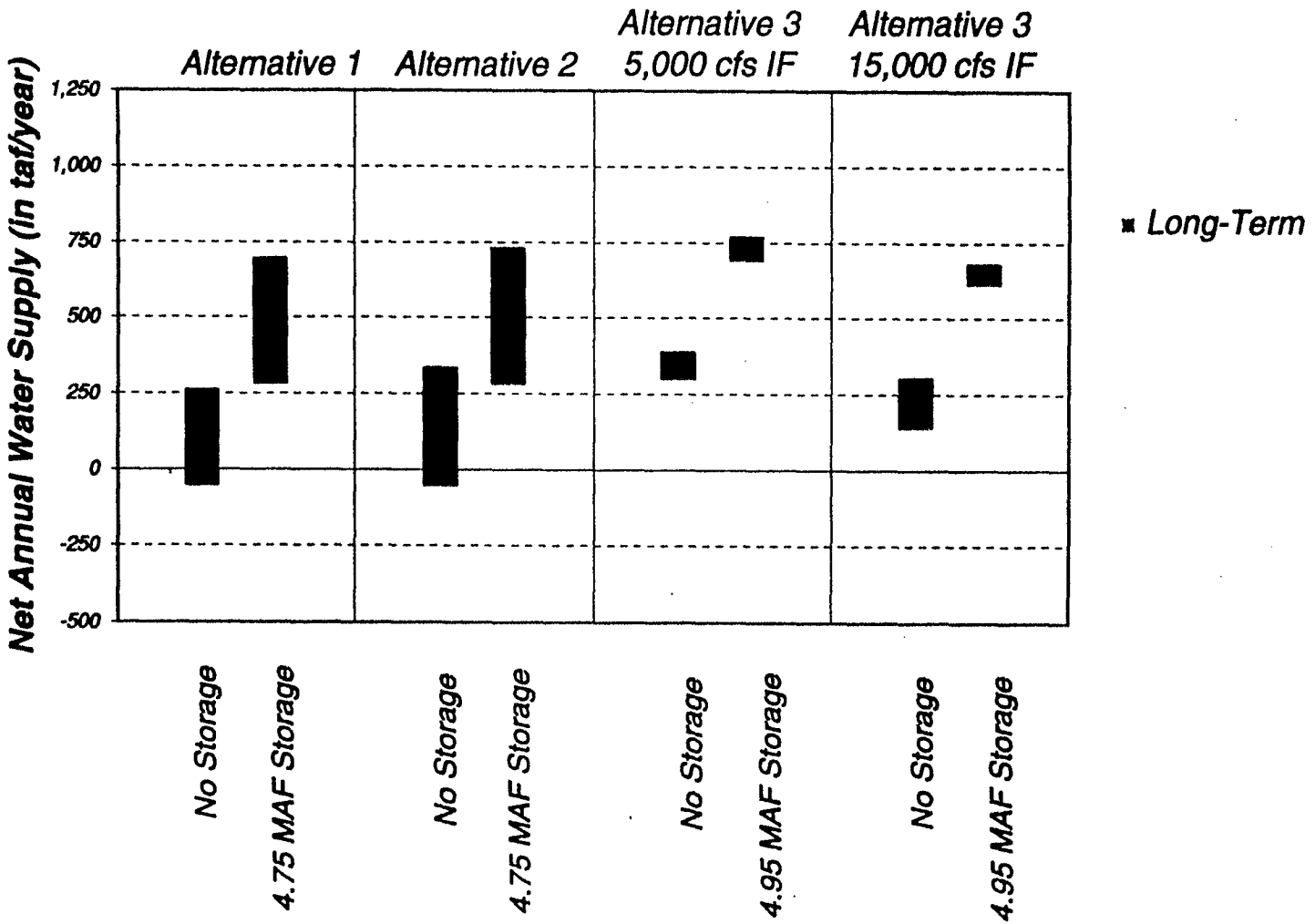


C-097144

C-097144

Comparison of Alternatives 1 - 3

Long-Term Period Water Supply Benefits



C-097145

C-097145

Alternative 3

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumption A *(Emphasis on Water Supply)*												
E/I Ratio[1]	65%	35%-45%	35% of Delta Inflow				65% of Delta Inflow					
Delta Outflow		X3 Requirement										
Rio Vista							3 K cfs			3-4 K cfs	3.5 - 4.5 K cfs	
Max IF Diversion					5 K cfs							
Assumption B *(Emphasis on Ecosystem Protection)*												
E/I Ratio[1]	65%	35%-45%	35% of Delta Inflow				65% of Delta Inflow					
Delta Outflow		X2 Requirement										
Rio Vista							3 K cfs			3-4 K cfs	3.5 - 4.5 K cfs	
Max IF Diversion					5 K cfs							

Notes:

[1] Isolated Facility Flow Excluded from E-I Ratio Computations.

C-097146

C-097146

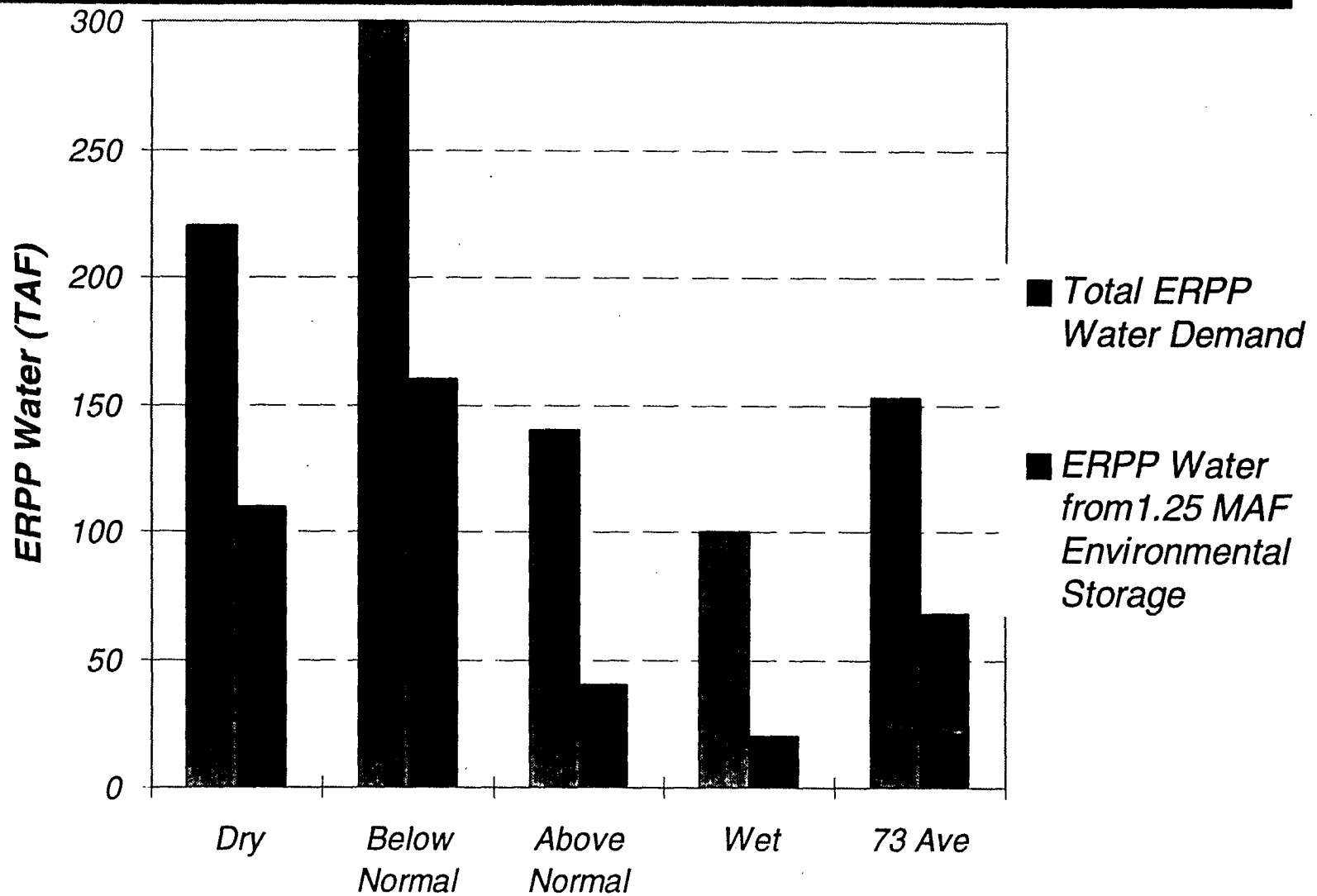
ERPP

- Environmental Flow Targets - ERPP
  - Flow Targets
    - March & April/May 10 Day Upstream Flow Event Targets
    - March & April/May 10 Day Delta Outflow Flow Event Target
    - 13,000 cfs May Freeport Flow Target
  - Operating Priorities
    - First Priority - New Environmental Storage
    - Second Priority - Water Acquisition from Willing Sellers (Modeled as "Add Water")

C-097147

C-097147

Total ERPP Demand Averages along with ERPP Flows from Environmental Storage



C-097148

C-097148

Estimated Water Supply Benefits for Alternative Variations

30-Oct-97

Alternative Variation	Delta Conveyance Components			Storage Components (Maximum Storage Volumes in MAF)						DWRSIM System Operation Study Results (in TAF/year)				
	CVP-SWP Improvements	South Delta Improvements	Isolated Conveyance Facility (Conveyance Capacity in CFS)	Sacramento Valley Ground Water Storage	Upstream Surface Storage Sacramento River Trib.	Upstream Surface Storage San Joaquin River Trib.	In-Delta Surface Storage	San Joaquin Valley Ground Water Storage	South of Delta Aqueduct Surface Storage	DWRSIM Study	1922-94WY Average Annual SWP(Ent+Int) & CVP Deliveries	1928-34WY Critical Period Average Annual SWP(Ent+Int) & CVP Deliveries	Net 1922-94WY Average Annual SWP(Ent+Int) & CVP Deliveries (Compared to No Action)	Net 1928-34WY Critical Period Average Annual SWP(Ent+Int) & CVP Deliveries (Compared to No Action)
No Action										516	5,890	4,140	0	0
1A	*									518	5,960	4,120	70	(20)
1B	*									518	5,960	4,120	70	(20)
1C	*	*		0.25[1]	3[2]			0.5[5]	1[5]	531	6,440	4,610	550	470
2A	*	*								528	6,160	4,280	270	140
2B	*	*		0.25[1]	3[2]	0.25[3]		0.5[5]	2[6]	532	6,490	4,690	600	550
2D	*	*							2[6]	530	6,270	4,540	380	400
2E	*	*		0.25[1]	3[2]	0.25[3]		0.5[5]	2[6]	532	6,490	4,690	600	550
3A	*	*	5,000							529	6,140	4,150	250	10
3B	*	*	5,000	0.25[1]	3[2]	0.25[3]	0.2[4]	0.5[5]	2[6]	533	6,420	4,600	530	460
3E	*	*	15,000	0.25[1]	3[2]	0.25[3]	0.2[4]	0.5[5]	2[6]	534	6,350	4,440	460	300
3H	*	*	5,000	0.25[1]	3[2]	0.25[3]		0.5[5]	2[6]	533	6,420	4,600	530	460
3I	*	*	15,000	0.25[1]	3[2]	0.25[3]	0.2[4]	0.5[5]	2[6]	534	6,350	4,440	460	300

[1] Solely Operated for CVP/SWP Water Supply Benefits
[2] 2 MAF of Storage Operated for CVP/SWP Water Supply Benefits, 1 MAF of Storage Operated for ERPP Flow Event Targets
[3] Solely Operated for ERPP Flow Event Targets
[4] Solely Operated for CVP/SWP Water Supply Benefits
[5] Solely Operated for CVP/SWP Water Supply Benefits
[6] Solely Operated for CVP/SWP Water Supply Benefits

C-097149

C-097149

Estimated Delta Exports for Alternative Variations

30-Oct-97

Alternative Variation	CVP/SWP Demands				Delta Operations Criteria												DWRSIM System Operation Study Results (In TAF/year)				
	CVP Demands (MAF)	SWP Demands (MAF)	SWP Interruptable Demands (TAF)	Joint Point Diversions (Surrogate Demand/Max. Wheeling)	Import/Export Limits	San Joaquin Pulse Flow Export Limits	Delta Outflow Requirement (X2)	Minimum Outflow	ERPP 10 Day Minimum Outflow	Delta Cross Channel	Rio Vista	Vernalis	Qwest	Hood Diversion Limit (Fraction of Sac. River Flow @ Freeport)	Minimum Thru-Delta Conveyance (Min Delta Exports before I.F. Diversion)	Maximum Allowable Conveyance thru I.F. (Fraction of Export thru I.F.)	DWRSIM Study	1922-94WY Average Annual SWP & CVP Exports	1928-34WY Critical Period Average Annual SWP & CVP Exports	Net 1922-94WY Average Annual SWP & CVP Exports (Compared to No Action)	Net 1928-34WY Critical Period Average Annual SWP & CVP Exports (Compared to No Action)
No Action	3.5	3.3-4.2	0-138		35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP	20K-40K	Open 7/1-11/1	3K-4.5K	WQCP	None				518	6,290	4,680	0	0
1A	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-11/1	3K-4.5K	WQCP	None				518	6,340	4,690	50	10
1B	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-11/1	3K-4.5K	WQCP	None				518	6,340	4,690	50	10
1C	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-11/1	3K-4.5K	WQCP	None				531	6,850	5,060	560	380
2A	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-11/1	3K-4.5K	WQCP	None				528	6,560	4,790	270	110
2B	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-11/1	3K-4.5K	WQCP	None				532	6,910	5,020	620	340
2D	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-11/1	3K-4.5K	WQCP	None				530	6,720	4,860	430	180
2E	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-11/1	3K-4.5K	WQCP	None				532	6,910	5,020	620	340
3A	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-9/1	3K-4.5K	WQCP	None	None	0K-1K	100%	529	6,530	4,640	240	(40)
3B	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-9/1	3K-4.5K	WQCP	None	None	0K-1K	100%	533	6,850	4,950	560	270
3E	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-9/1	3K-4.5K	WQCP	None	None	0K-1K	100%	534	6,780	4,770	490	90
3H	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-9/1	3K-4.5K	WQCP	None	None	0K-1K	100%	533	6,850	4,950	560	270
3I	3.5	3.3-4.2	0-138	*	35%-65%[1]	20%-50%[2]	1962 LOD[3]	WQCP[4]	20K-40K	Open 7/1-9/1	3K-4.5K	WQCP	None	None	0K-1K	100%	534	6,780	4,770	490	90

[1] Export Limits - Based on the WQCP, Export/Inflow Ratios are October thru. January = 35%, February = 35%-45%, March thru. June = 35%, July thru. September = 65%

[2] Vernalis - Based on CVPIA (b)(2) action, April 15 to May 15 total Delta export are limited to 1,500 cfs or 33 percent of the San Joaquin River flow in crl, dry, and BN years, 25% in AN years, & 20% in wet year at Vernalis, whichever is greater.

[3] X2 - Based on CVPIA (b)(2) action, Additional Chipps Island X2 days in May and June required to approximate a 1962 Level of Development are assumed as described in Table III-14 (Page III-29) PEIS Administrative Draft

[4] NDOI - Based on the WQCP, NDOI (cfs) are 3,000-4,000 in Oct., 3,500-4,500 from Nov.thru Dec.,4,500 in Jan.,4,000-8,000 in July, 3,000-4,000 in Aug. and 3,000 in Sept.

C-097150

C-097150

Estimated ERPP Water Acquision for Alternative Variations

30-Oct-97

Alternative Variation	Sacramento-San Joaquin Basin/Imports Criteria								ERPP Flow Targets (In CFS)								DWRSIM System Operation Study Results (In TAF/year)				
	Trinity Imports (taf per year)	Whiskeytown/Clear Creek (cfs)	Shasta/Upper Sacramento (cfs)	Oroville/Feather River (cfs)	Folsom/American River (cfs)	Melones/Stanislaus River (taf per year)	New Don Pedro/Tuolumne River (cfs)	Lake McClure/Merced River (cfs)	Sacramento River @ Knights Landing (March - 10 days)	Feather River @ Gridley (March - 10 days)	Yuba River @ Marysville (March - 10 days)	American River @ Nimbus Dam (March - 10 days)	Sacramento River @ Freeport (May - 31 days)	Stanislaus River @ Goodwin (San Joaquin Pulse Flow Period - 10 days)	Tuolumne River @ La Grange (San Joaquin Pulse Flow Period - 10 days)	Merced River @ Shaffer Bridge (San Joaquin Pulse Flow Period - 10 days)	DWRSIM Study	1922-94WY Average Annual Total ERPP Water Acquisitions	1928-34WY Critical Period Annual Total ERPP Water Acquisoins	Net 1922-94WY Average Annual ERPP Acquisions (Compared to Alternative 1A)	Net 1927-34WY Critical Period Annual ERPP Acquisions (Compared to Alternative 1A)
No Action	340[1]	52-200	3.25-5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	None	None	None	None	None	None	None	None	516	0	0	0	0
1A	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	518	153	72	0	0
1B	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	518	153	72	0	0
1C	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	531	90	47	(63)	(25)
2A	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	528	153	75	0	3
2B	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	532	85	43	(68)	(29)
2D	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	530	152	71	(1)	(0)
2E	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	532	85	43	(68)	(29)
3A	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	529	153	71	(0)	(1)
3B	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	533	85	33	(68)	(38)
3E	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	534	92	40	(61)	(32)
3H	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	533	85	33	(68)	(38)
3I	340[1]	52-200	3.25-5.5K[2]	1-1.7K[3]	.25-4.5K[4]	98-467[5]	50-300[6]	15-180	7.5-17.5K	5-9K	2.5-3.5K	3.5-7K	13K	2.75-3.5K	2.75-5.5K	1.25-3.75K	534	92	40	(61)	(32)

[1] Trinity River minimum fish flows below Lewiston Dam are maintained at 340 TAF/year for all years, based on a May 1991 letter agreement between the USBR and the U.S. Fish and Wildlife Service.

[2] Sacramento River navigation control point (NCP) flows are maintained at 5,000 cfs in wet and above normal water years and 4,000 cfs in all other years. This criterion is relaxed to 3,500 cfs when Shasta carryover storage drops below 1.9 MAF and is further relaxed to 3,250 cfs when Shasta carryover storage drops below 1.2 MAF. Flow objectives between 3,250 cfs and 5,500 cfs are maintained below Keswick Dam on the Sacramento River.

[3] Feather River fishery flows are maintained per an agreement between DWR and the Calif. Dept. of Fish & Game (August 26, 1983). In normal years these minimum flows are 1,700 cfs from October through March and 1,000 cfs from April through September.

[4] Flow objectives between 250 cfs and 4,500 cfs are maintained below Nimbus Dam on the American River. Flow requirements during October through February are triggered by Folsom carryover storage.

[5] Stanislaus River required minimum fish flows below New Melones Reservoir are met as a function of New Melones Reservoir storage and range from 98 TAF/year up to 467 TAF/year, according to the Interim Operations Plan provided by USBR Staff.

[6] Tuolumne River minimum fishery flows below New Don Pedro Dam are maintained per an agreement between TID, MID, City of San Francisco, DFG and others (FERC Agreement 2299). Base flows range from 50 cfs to 300 cfs

C-097151

C-097151

Estimated ERPP Water Deliveries from Environmental Storage and SWP Interruptable Deliveries for Alternative Variations

30-Oct-97

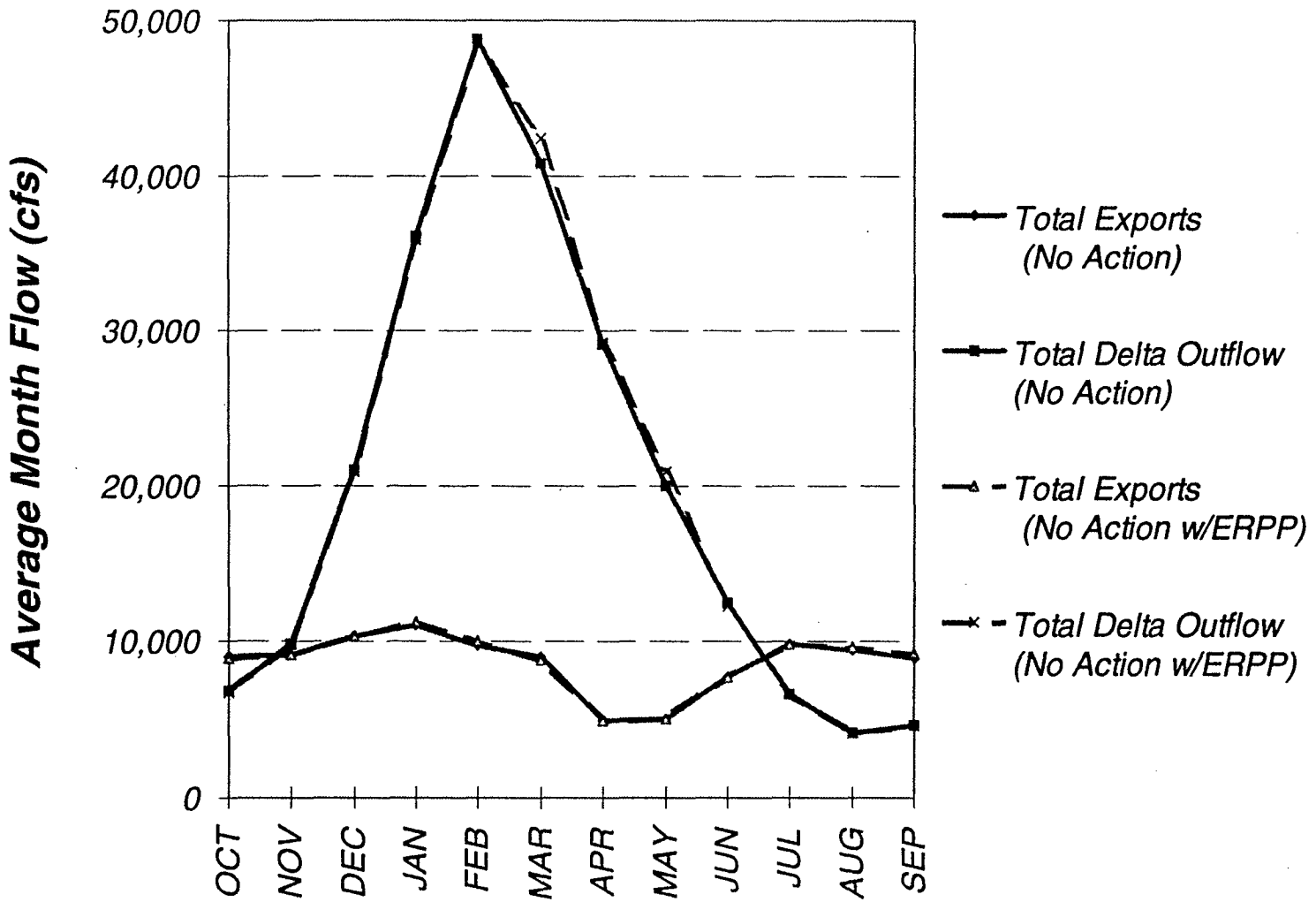
Alternative Variation	Geomorphology Criteria		Storage Filling and Discharge Assumptions						Storage Filling and Discharge Priorities (filling priority,discharge priority)					DWRSIM System Operation Study Results (in TAF/year)				
	Sacramento River Tributary Surface Storage (MAF)	San Joaquin River Tributary Surface Storage Criteria	Sacramento Valley Ground Water Storage - Inlet/Outlet Capacity (cfs)	Upstream Surface Storage Sacramento River Trib. - Inlet/Outlet Capacity (cfs)	Upstream Surface Storage San Joaquin River Trib. - Inlet/Outlet Capacity (cfs)	In-Delta Surface Storage (cfs)	San Joaquin Valley Ground Water Storage (cfs)	South of Delta Aqueduct Surface Storage (cfs)	Tributary Groundwater Storage	Aqueduct Groundwater Storage	Aqueduct Surface Storage	Tributary Surface Storage	Delta Surface Storage	DWRSIM Study	1922-94WY Average Annual Total ERPP Water from Env. Storage	1928-34WY Critical Period Average Annual Total ERPP Water from Env. Storage	Net 1922-94WY Average Annual Interruptable Deliveries	Net 1927-34WY Critical Period Average Annual Interruptable Deliveries
No Action														516	0	0	121	48
1A														518	0	0	99	51
1B														518	0	0	99	51
1C	1.5		500	5000[2]			500[5]	3500[6]	1,4	2,3	3,2	4,1		531	56	20	70	5
2A														528	0	0	261	134
2B	1.5	0	500[1]	5000[2]	5000[3]		500[5]	3500[6]	1,4	2,3	3,2	4,1		532	59	21	84	4
2D											1,1			530	0	0	96	31
2E	1.5	0	500[1]	5000[2]	5000[3]		500[5]	3500[6]	1,4	2,3	3,2	4,1		532	59	21	84	4
3A														529	0	0	256	144
3B	1.5	0	500[1]	5000[2]	5000[3]	5000[4]	500[5]	3500[6]	1,5	2,4	3,3	4,2	5,1	533	59	30	104	3
3E	1.5	0	500[1]	5000[2]	5000[3]	5000[4]	500[5]	3500[6]	1,5	2,4	3,3	4,2	5,1	534	58	25	95	5
3H	1.5	0	500[1]	5000[2]	5000[3]	5000[4]	500[5]	3500[6]	1,4	2,3	3,2	4,1		533	59	30	104	3
3I	1.5	0	500[1]	5000[2]	5000[3]	5000[4]	500[5]	3500[6]	1,5	2,4	3,3	4,2	5,1	534	58	25	95	5

[1] Solely Operated for CVP/SWP Water Supply Benefits
[2] 2 MAF of Storage Operated for CVP/SWP Water Supply Benefits, 1 MAF of Storage Operated for ERPP Flow Event Targets
[3] Solely Operated for ERPP Flow Event Targets
[4] Solely Operated for CVP/SWP Water Supply Benefits
[5] Solely Operated for CVP/SWP Water Supply Benefits
[6] Solely Operated for CVP/SWP Water Supply Benefits

C-097152

C-097152

Average Monthly Delta Outflow and Exports with ERPP Flow Targets



C-097153

C-097153

Potential Action to Improve Water Supply Opportunities

Action	Net Incremental Increase in Average Annual Water Supply (in taf/year)	
	Critical Dry Period	Long-Term
	Low - High	Low - High
Improved Coordination of SWP-CVP Operations	0 - 10	0 - 50
Increase in Permitted Banks PP Capacity	100 - 150	150 - 250
Isolated Facility	0 - 200	0 - 300
Storage -- 4.75 MAF (Includes Increased Permitted Banks PP Capacity)	550 - 800	550 - 700

C-097154

C-097154

Improved SWP-CVP Coordination

- Joint Points of Diversion
- Increased Wheeling of CVP Water through SWP Facilities

C-097155

C-097155

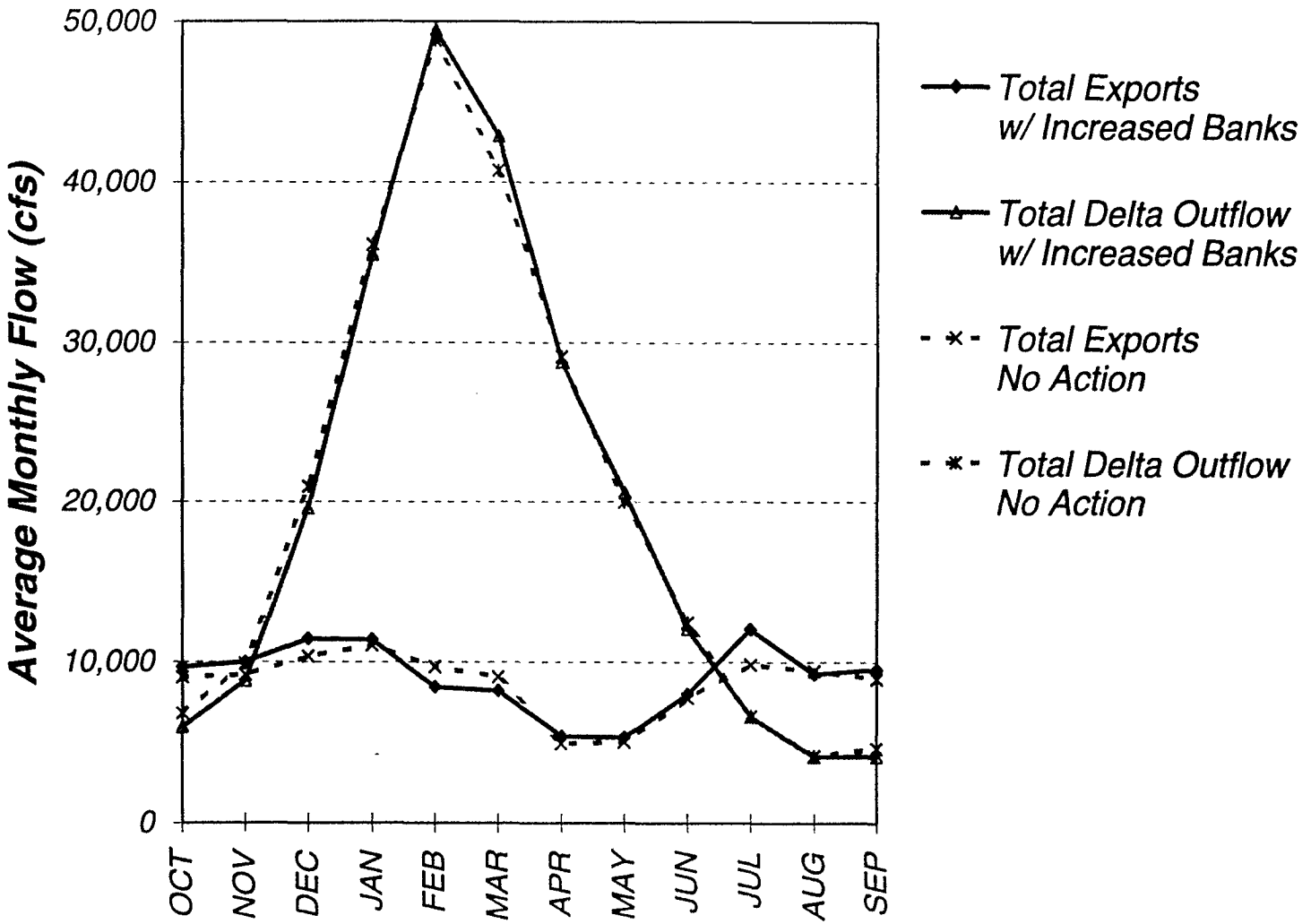
Increase Permitted Banks Pumping Plant Capacity

- South Delta Improvements
  - Channel Enlargements
  - Barriers
  - Fish Screens
- Banks Pumping Plant Permitted Capacity Increased to 10,300 cfs

C-097156

C-097156

Average Monthly Delta Outflow and Exports with Increased Permitted Banks Pumping Plant Capacity



C-097157

C-097157

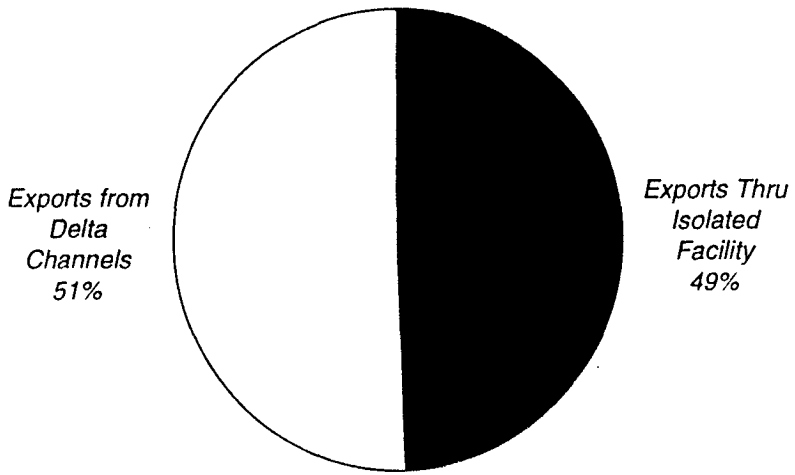
Isolated Conveyance Facility

- Initial Delta Standards with Isolated Facility
  - Minimum South Delta Export
    - 1,000 cfs July thru. March
  - Sensitivity Analysis on Export - Inflow Ratio Standard
    - Include IF Flows in E-I Ratio
    - Exclude IF Flows from E-I Ratio
  - Delta Cross Channel Gates closed Sept. thru. June
- Capacity 5,000 to 15,000 cfs
- Two Project Operation Modes
  - Dual Conveyance
  - Fully Isolated Conveyance

C-097158
C-097158

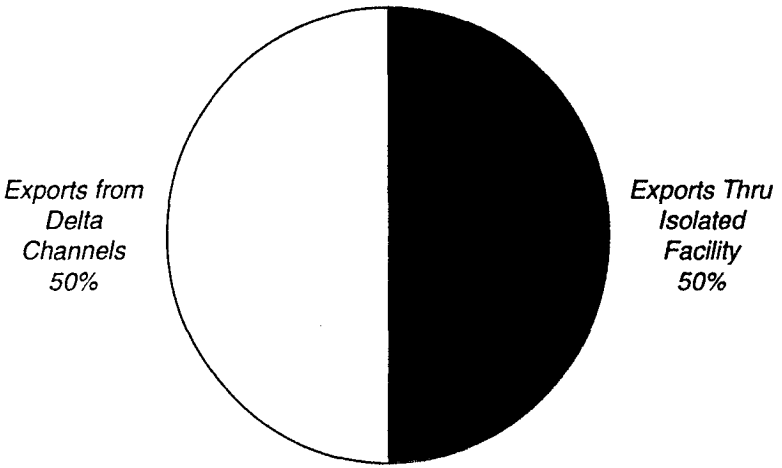
Isolated Facility System Operations

5,000 cfs Isolated Facility with E-I Ratio



- 1922-94 Average Annual Results
  - Min. Required Outflow = 5,640 taf
  - Flow at Rio Vista = 11,670 taf
  - Total System Deliveries = 6,130 taf
  - Nov-June X2 Position = 71.9 km

5,000 cfs Isolated Facility without E-I Ratio

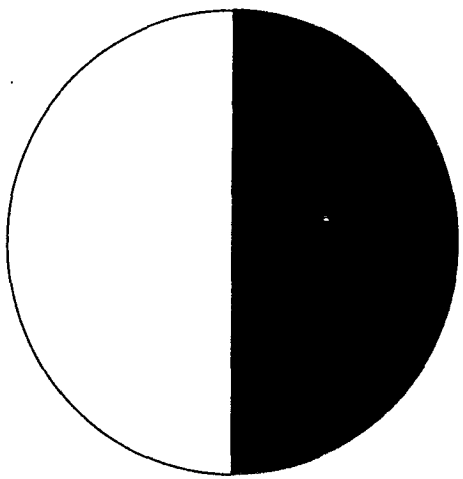


- 1922-94 Average Annual Results
  - Min. Required Outflow = 5,620 taf
  - Flow at Rio Vista = 11,700 taf
  - Total System Deliveries = 6,260 taf
  - Nov-June X2 Position = 72.3 km

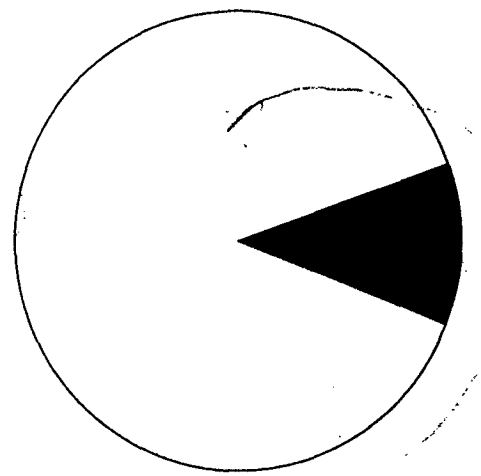
C-097159
C-097159

Isolated Facility System Operations

5,000 cfs Isolated Facility



15,000 cfs Isolated Facility

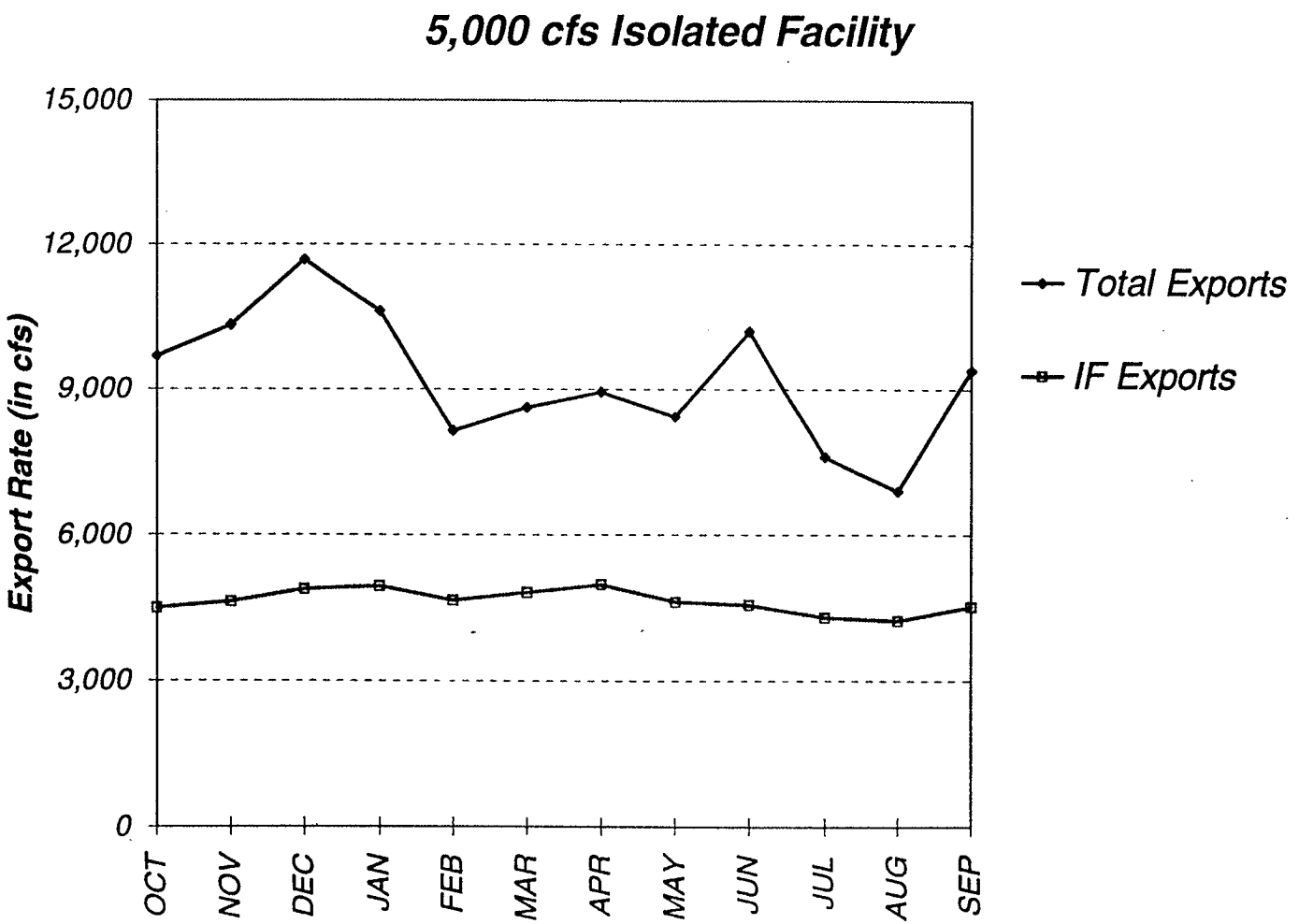


- 1922-94 Average Annual Results
  - Min. Required Outflow = 5,620 taf
  - Flow at Rio Vista = 11,700 taf
  - Total System Deliveries = 6,260 taf
  - Nov-June X2 Position = 72.3 km

- 1922-94 Average Annual Results
  - Min. Required Outflow = 5,930 taf
  - Flow at Rio Vista = 9,570 taf
  - Total System Deliveries = 6,180 taf
  - Nov-June X2 Position = 71.9 km

C-097160
C-097160

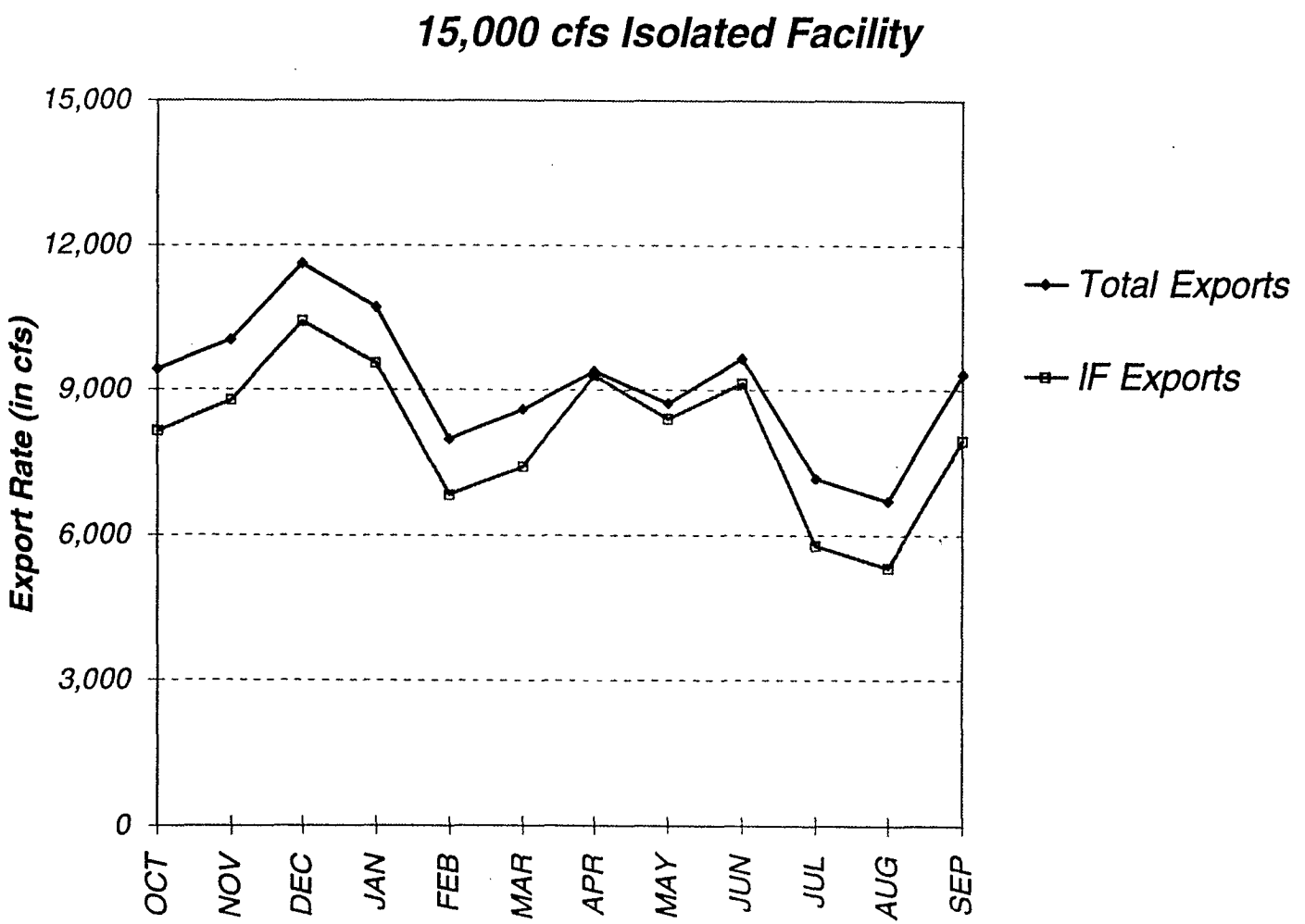
Isolated Facility System Operations



C-097161

C-097161

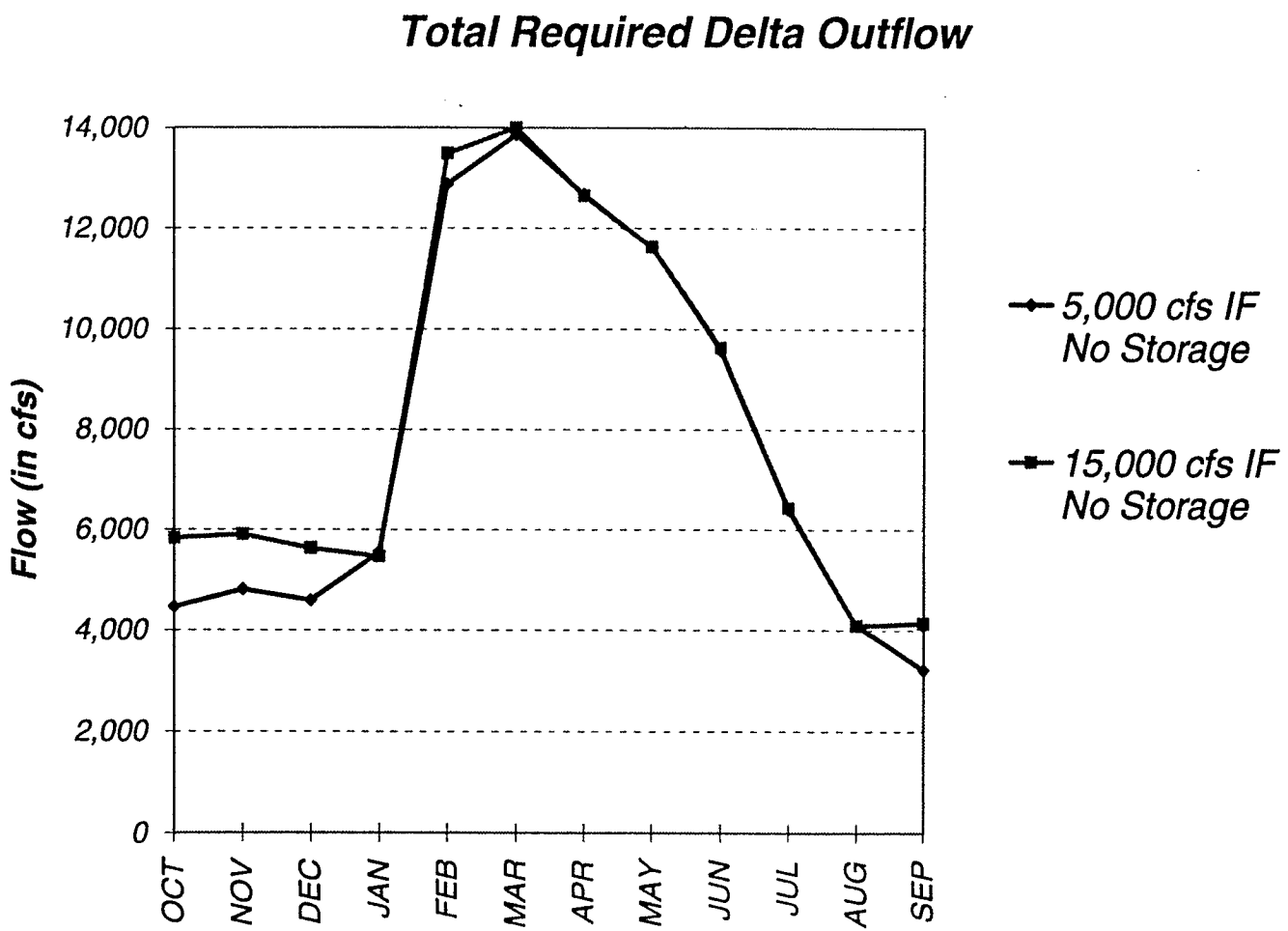
Isolated Facility System Operations



C-097162

C-097162

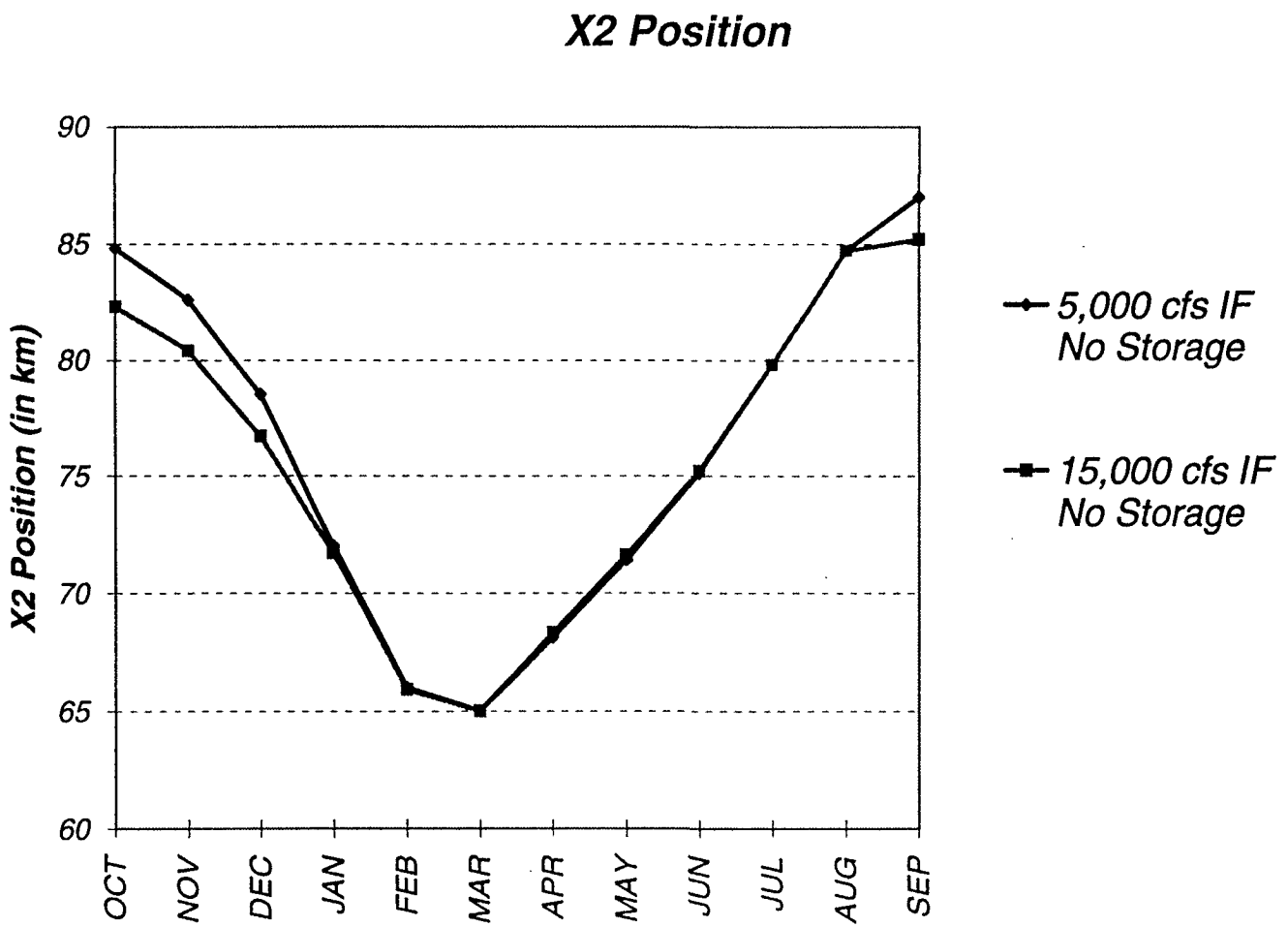
Isolated Facility Operations
5,000 vs. 15,000 cfs Capacity



C-097163

C-097163

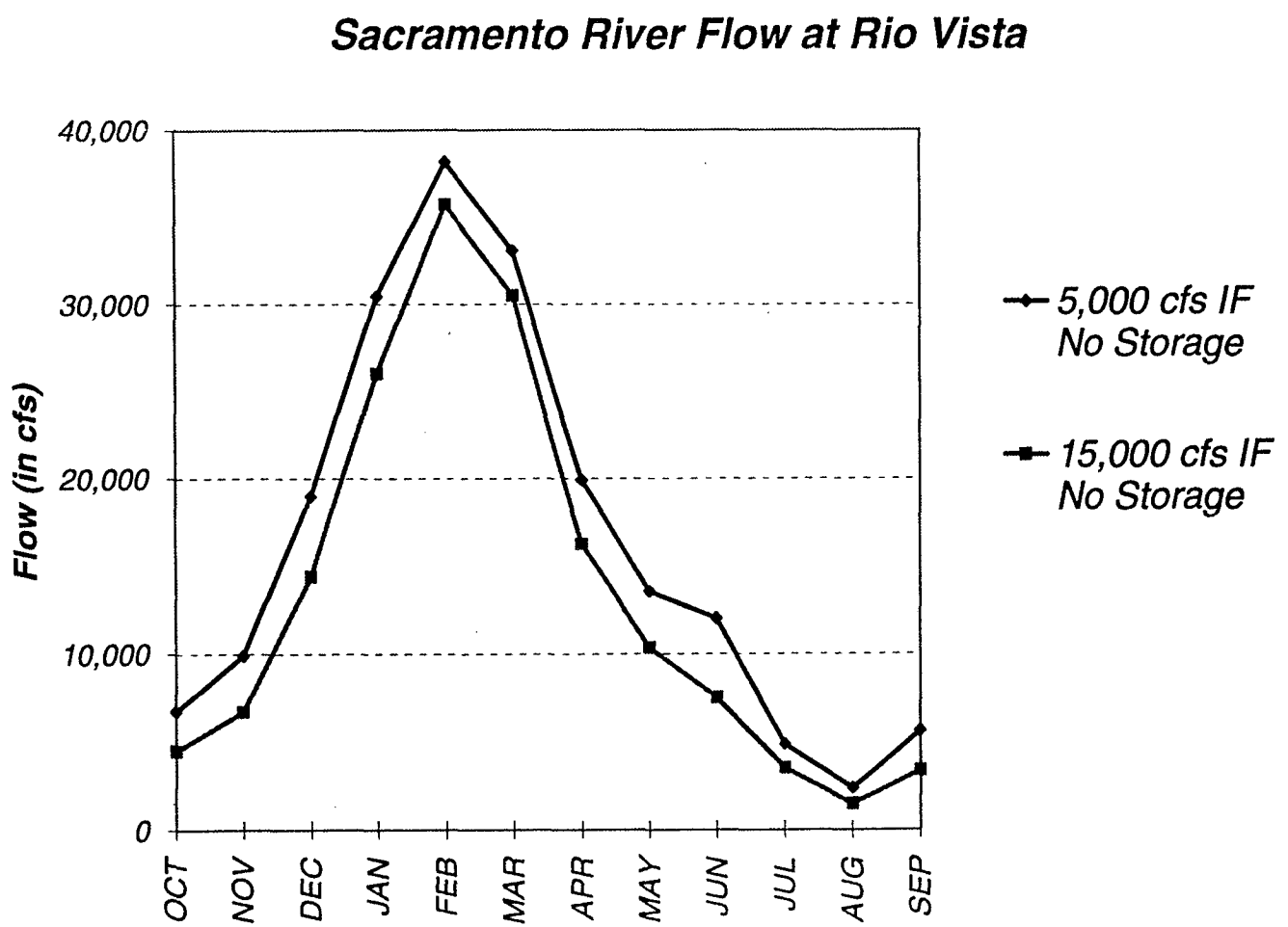
Isolated Facility Operations
5,000 vs. 15,000 cfs Capacity



C-097164

C—097164

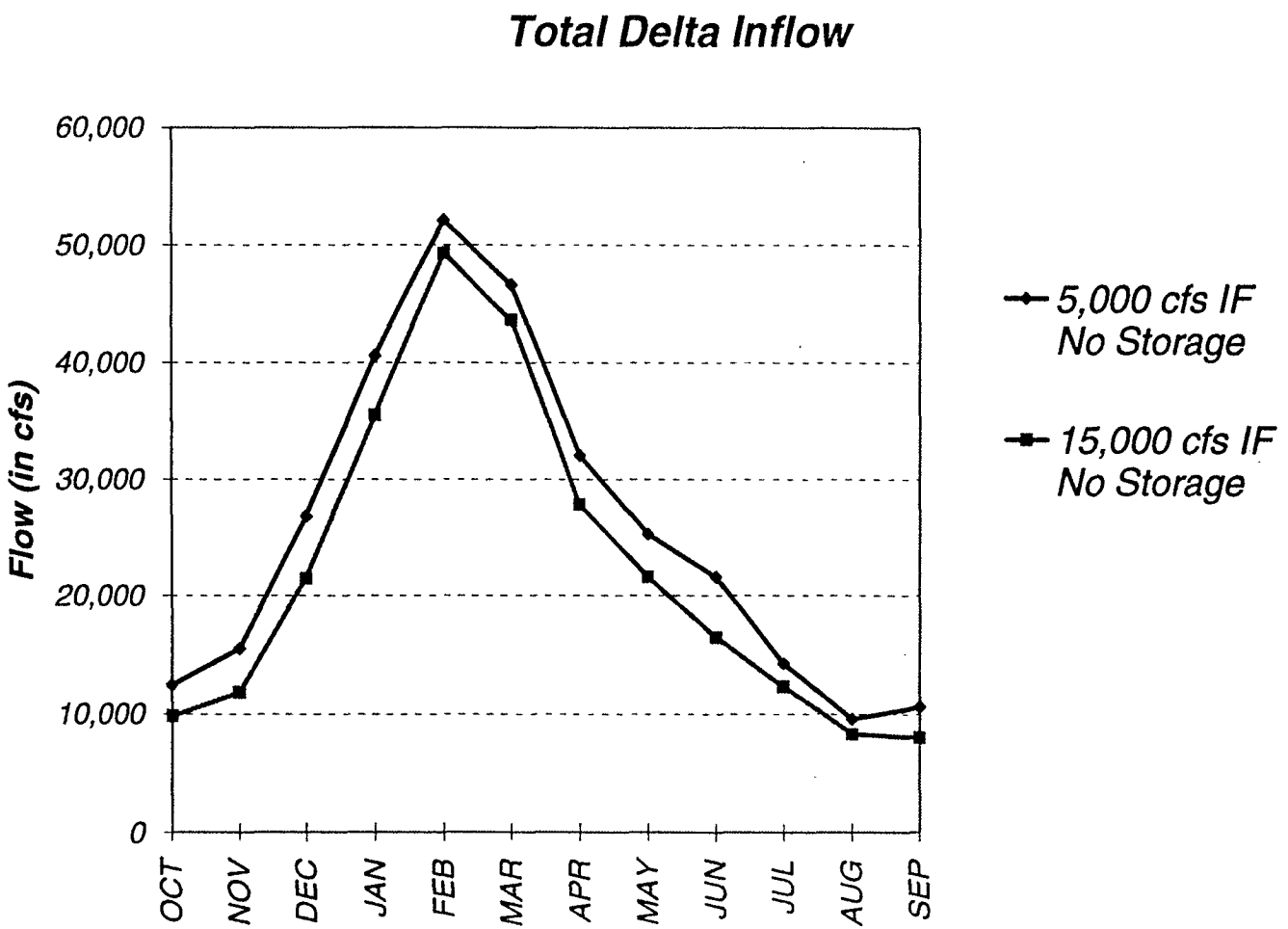
Isolated Facility Operations
5,000 vs. 15,000 cfs Capacity



C-097165

C-097165

Isolated Facility Operations
5,000 vs. 15,000 cfs Capacity



C-097166

C-097166

Storage

- New Storage Fill & Discharge Criteria
  - Tributary Groundwater - Fill First & Discharge Last
  - Aqueduct Groundwater - Fill Second & Discharge Fourth
  - Aqueduct Surface Storage - Fill Third & Discharge Third
  - Tributary Surface Storage - Fill Fourth & Discharge Second
  - Delta Surface Storage - Fill Last & Discharge First

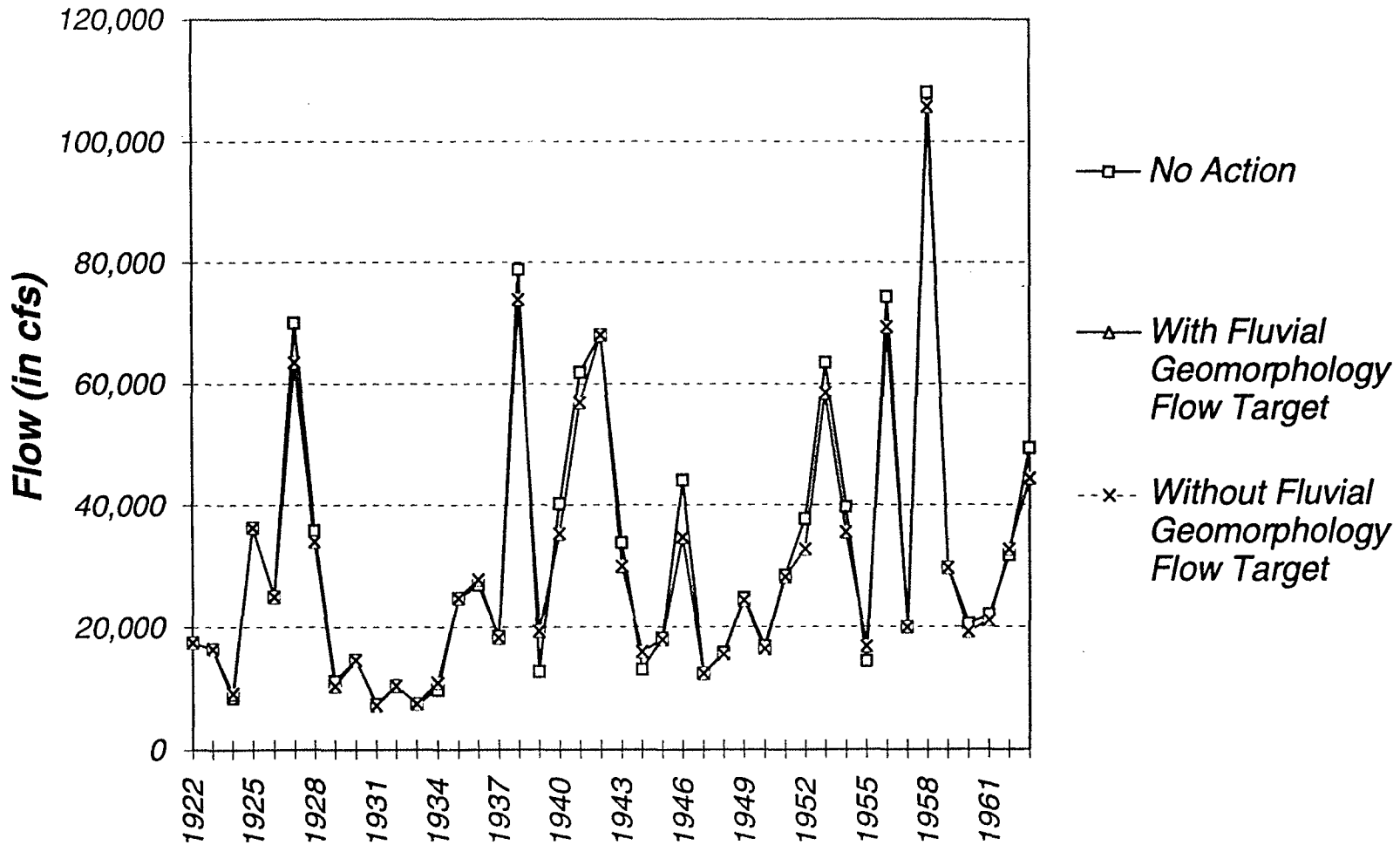
C-097167
C-097167

Storage

- New Storage Physical Facility Criteria
  - North and South of Delta Groundwater - Storage 250 (NDGS) & 500 (SDGS) TAF & Inlet/Outlet Capacity 500 cfs
  - Sacramento River Basin Surface - Storage 3.0 MAF & Inlet/Outlet Capacity 5,000 cfs
  - Off-Aqueduct Surface - Storage 2.0 MAF & Inlet/Outlet Capacity 3,500 cfs
  - San Joaquin River Basin Surface - Storage 250 TAF & Inlet/Outlet Capacity 5,000 cfs
  - Delta Surface Storage - Storage 200 TAF & Inlet/Outlet Capacity 5,000 cfs
- Fluvial Geomorphology Criteria
  - North Delta Surface - 60,000 CFS above Chico Landing / 0 cfs Below Chico Landing
  - Other Storage - No Criteria

C-097168
C-097168

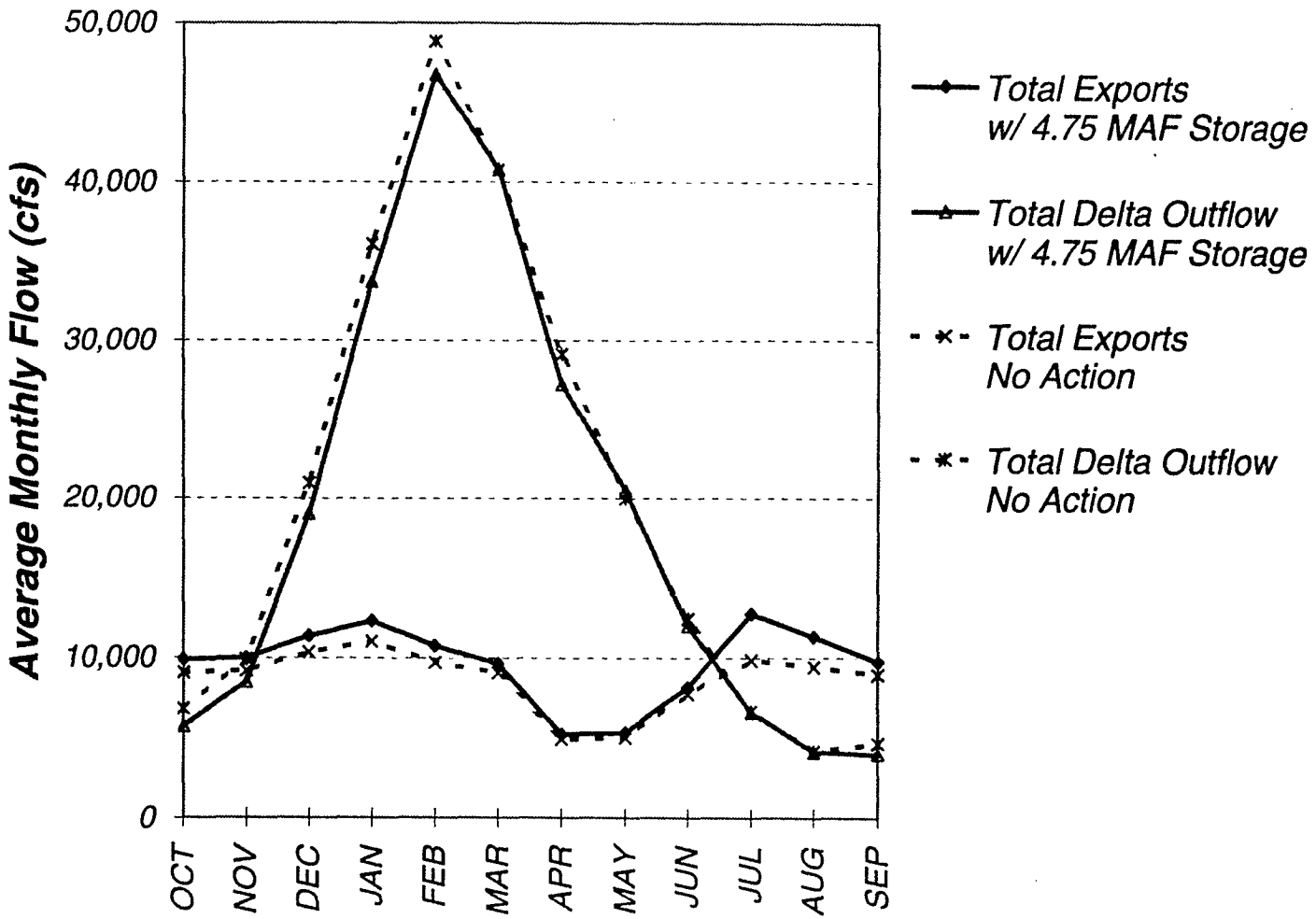
Maximum Annual Monthly Flow at Wilkins Slough



C-097169

C-097169

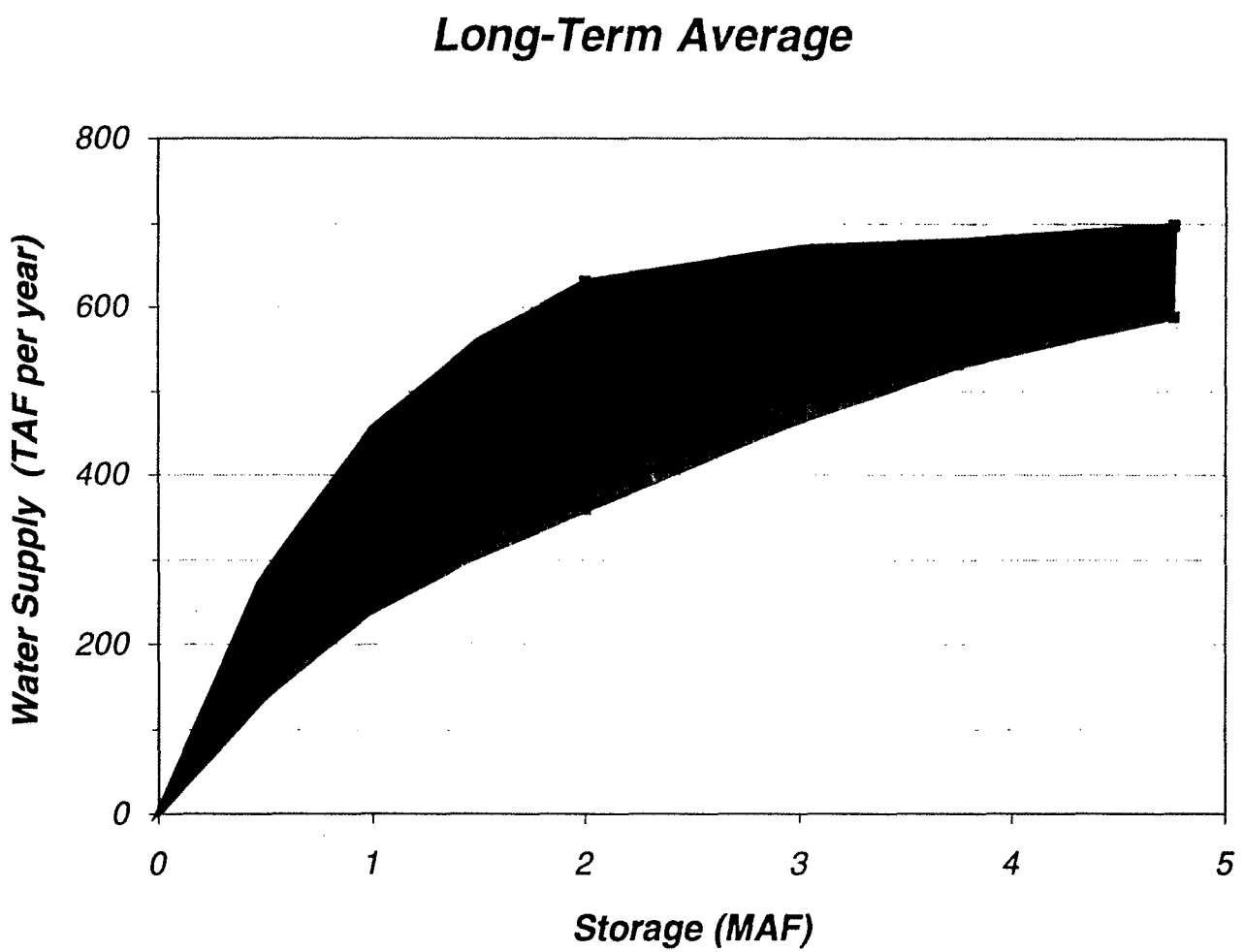
Average Monthly Delta Outflow and Exports with 4.75 MAF Storage



C-097170

C-097170

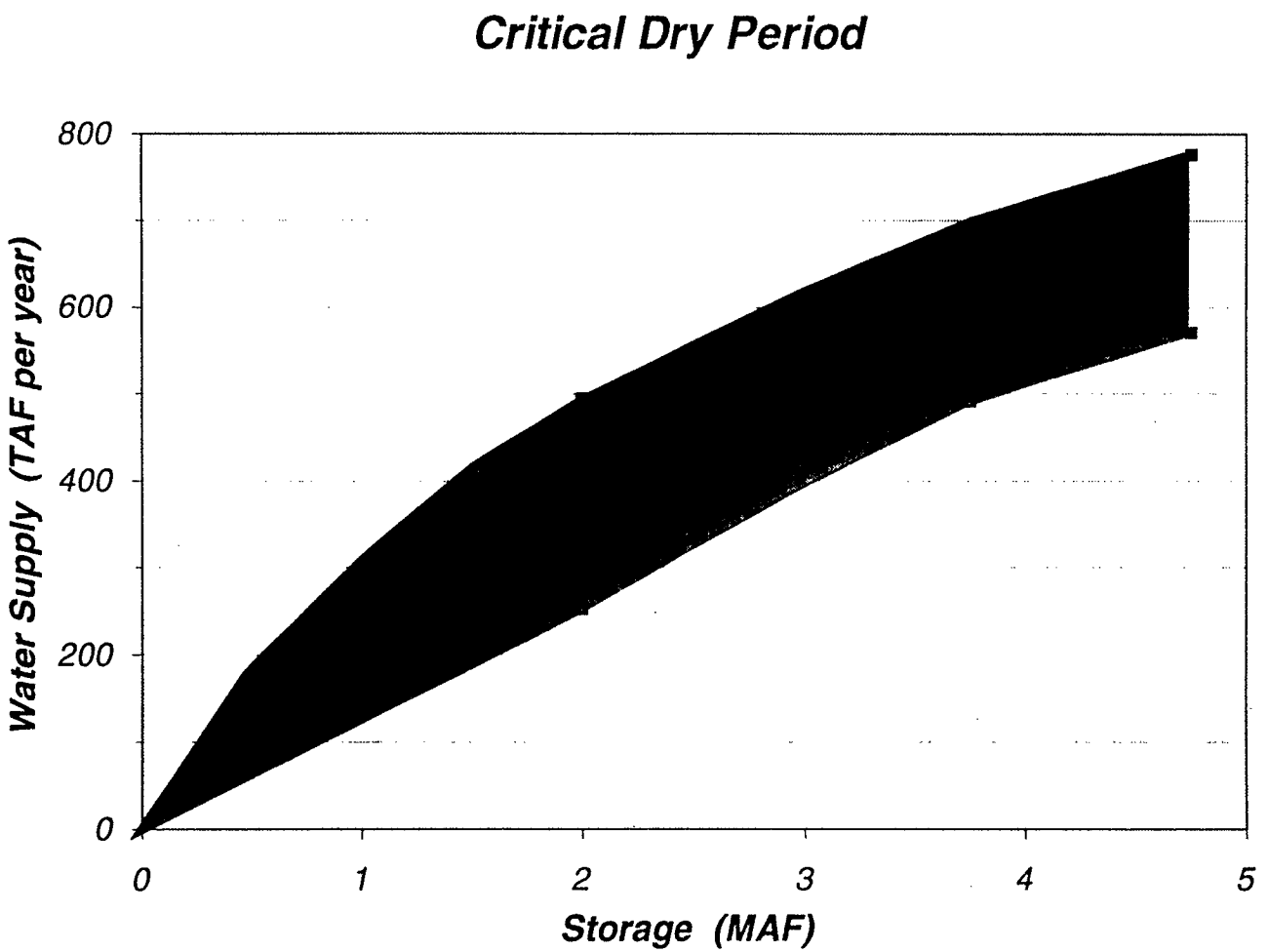
Water Supply versus Storage



C-097171

C—097171

Water Supply versus Storage



C-097172

C—097172

Water Supply Opportunities Under Program Alternatives Compared to No Action

Alternative	Net Increase in Average Annual Water Supply (in taf/year)	
	Critical Dry Period	Long-Term
	Low - High	Low - High
Alternative 1		
Improved Coordination of SWP-CVP Operations	0 - 10	0 - 50
With Increase in Permitted Banks PP Capacity	100 - 150	150 - 300
With Storage	550 - 800	550 - 750
Alternative 2		
Improved Coordination of SWP-CVP Operations	0 - 10	0 - 50
With Increase in Permitted Banks PP Capacity	100 - 150	150 - 300
With Storage	550 - 800	550 - 750
Alternative 3		
Improved Coordination of SWP-CVP Operations	0 - 10	0 - 50
Isolated Facility	0 - 200	0 - 350
With Storage	450 - 850	400 - 850

C-097173
C-097173

Summary

- Increasing permitted Banks Pumping Plant capacity could provide improved water supply, if water users can accept unscheduled deliveries.
- An Isolated Conveyance Facility can provide similar improvements in water supply, if diversions are excluded from existing E-I ratios. However, without moderate south Delta diversions, storage releases to met Rio Vista flow requirement reduce potential water supply benefits.

C-097174
C-097174

Summary

- Water supply benefits of storage are dependent on diversion and release criteria.
- There is no obvious break point in the benefits versus storage volume relationship.
- Increased system storage allows improvements in scheduled project deliveries, leaving water users less dependent on local storage.

C-097175
C-097175

Summary

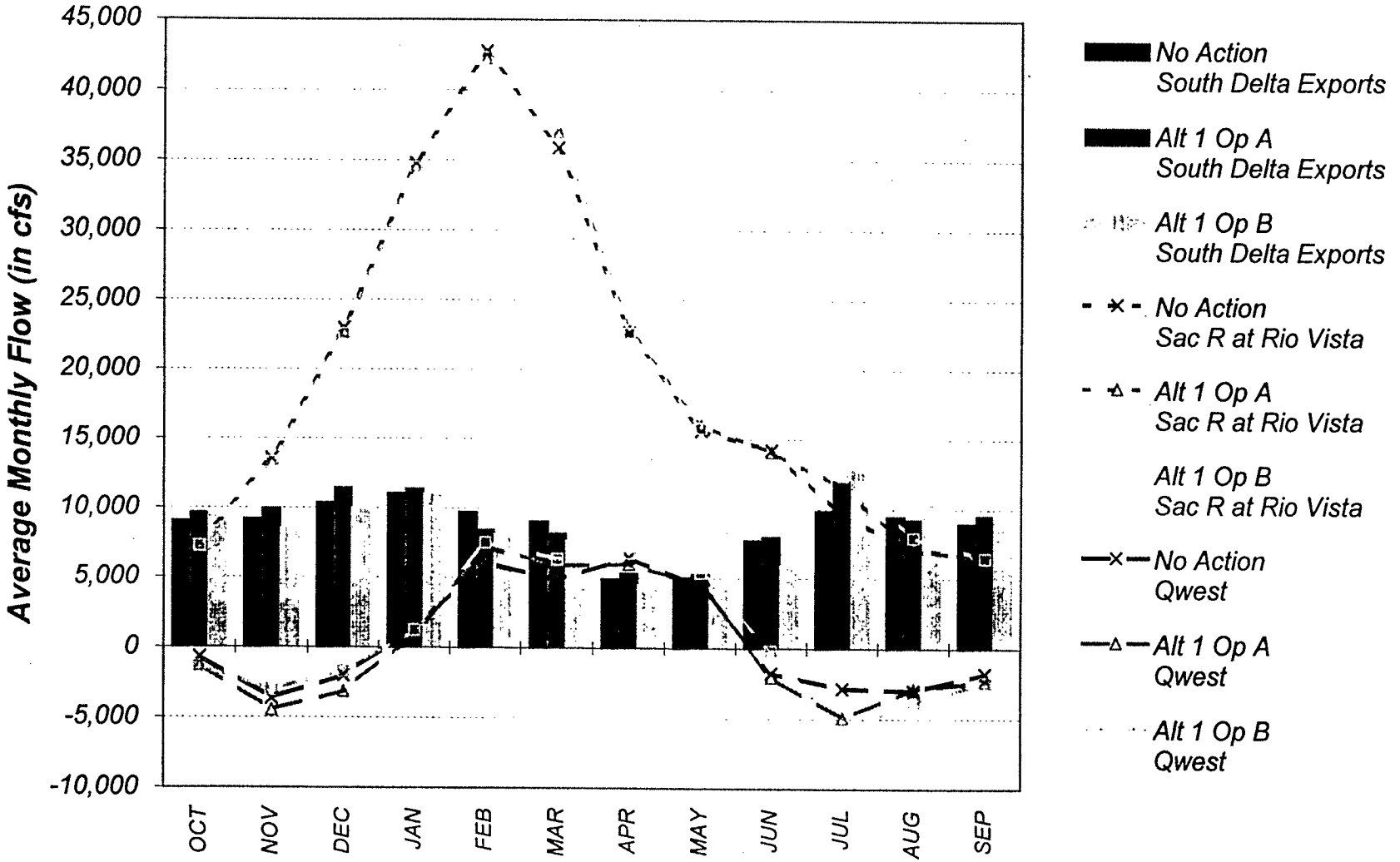
- Water supply opportunities are dependent on operating requirements. Adjustments in Bay-Delta standards could have significant impacts on the potential water supply benefits of new facilities.

C-097176

C-097176

C-097177

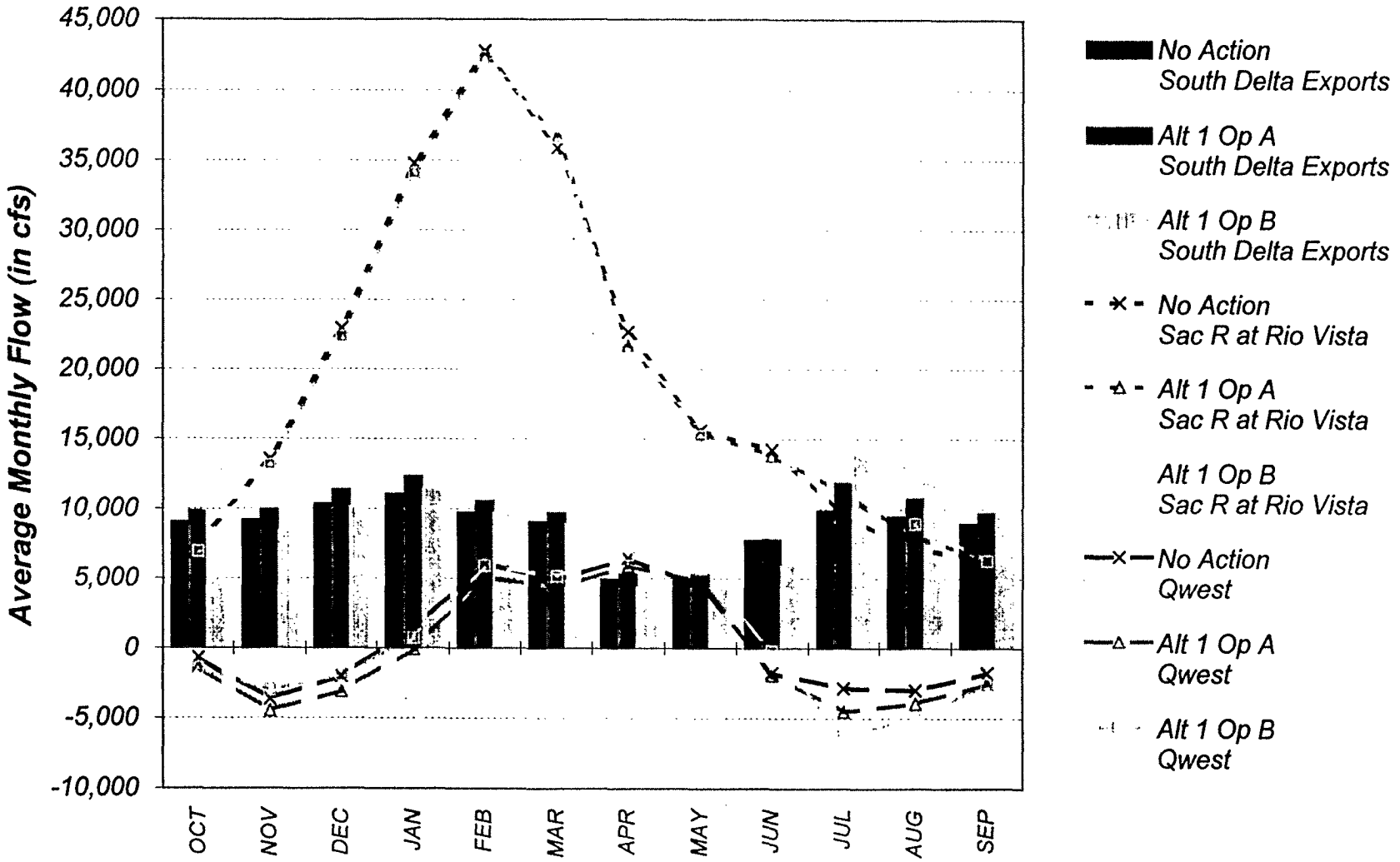
Alternative 1 -- No Storage
73-Year Averages



C-097177

C-097178

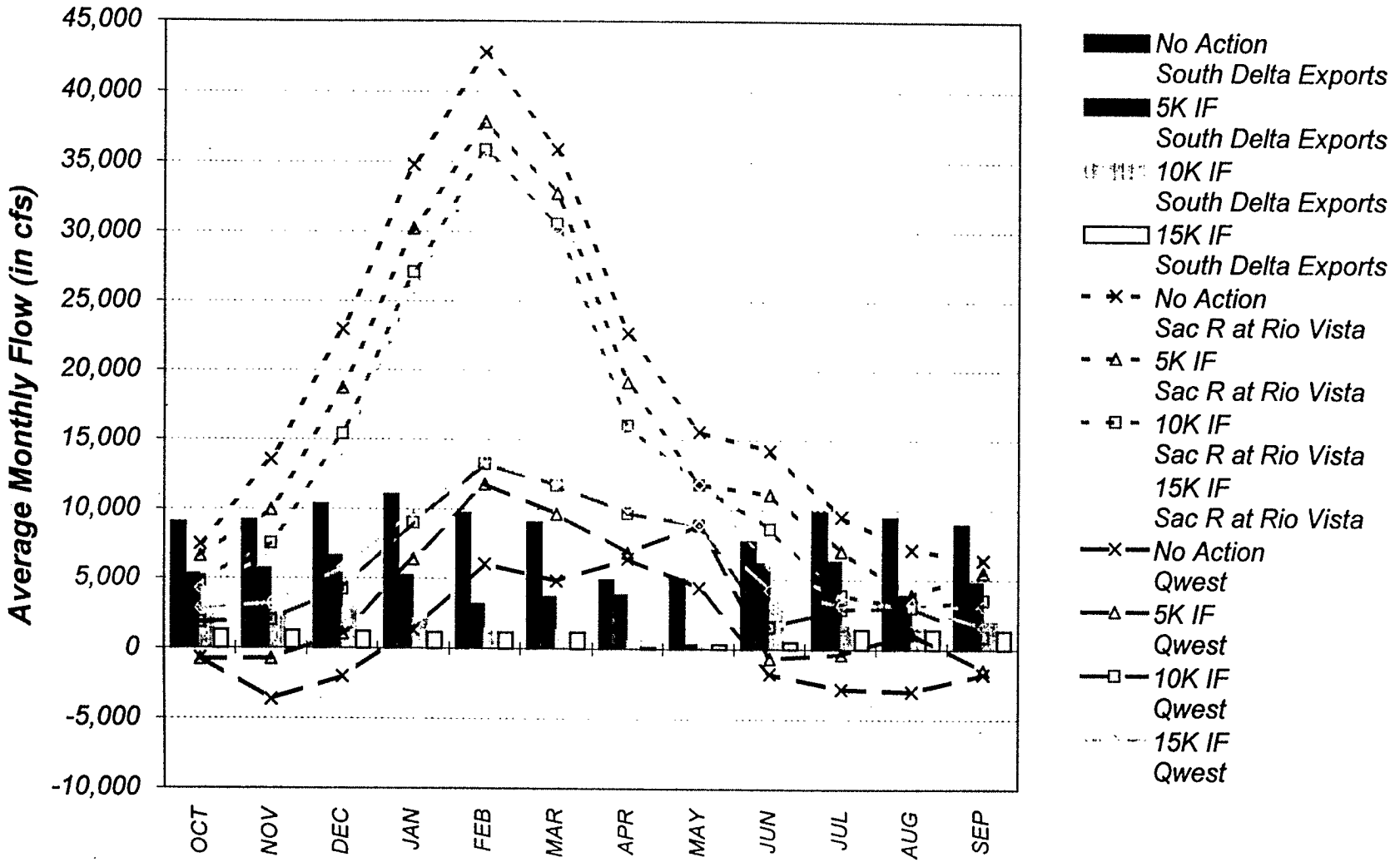
Alternative 1 -- 4.75 MAF Storage
73-Year Averages



C-097178

C-097179

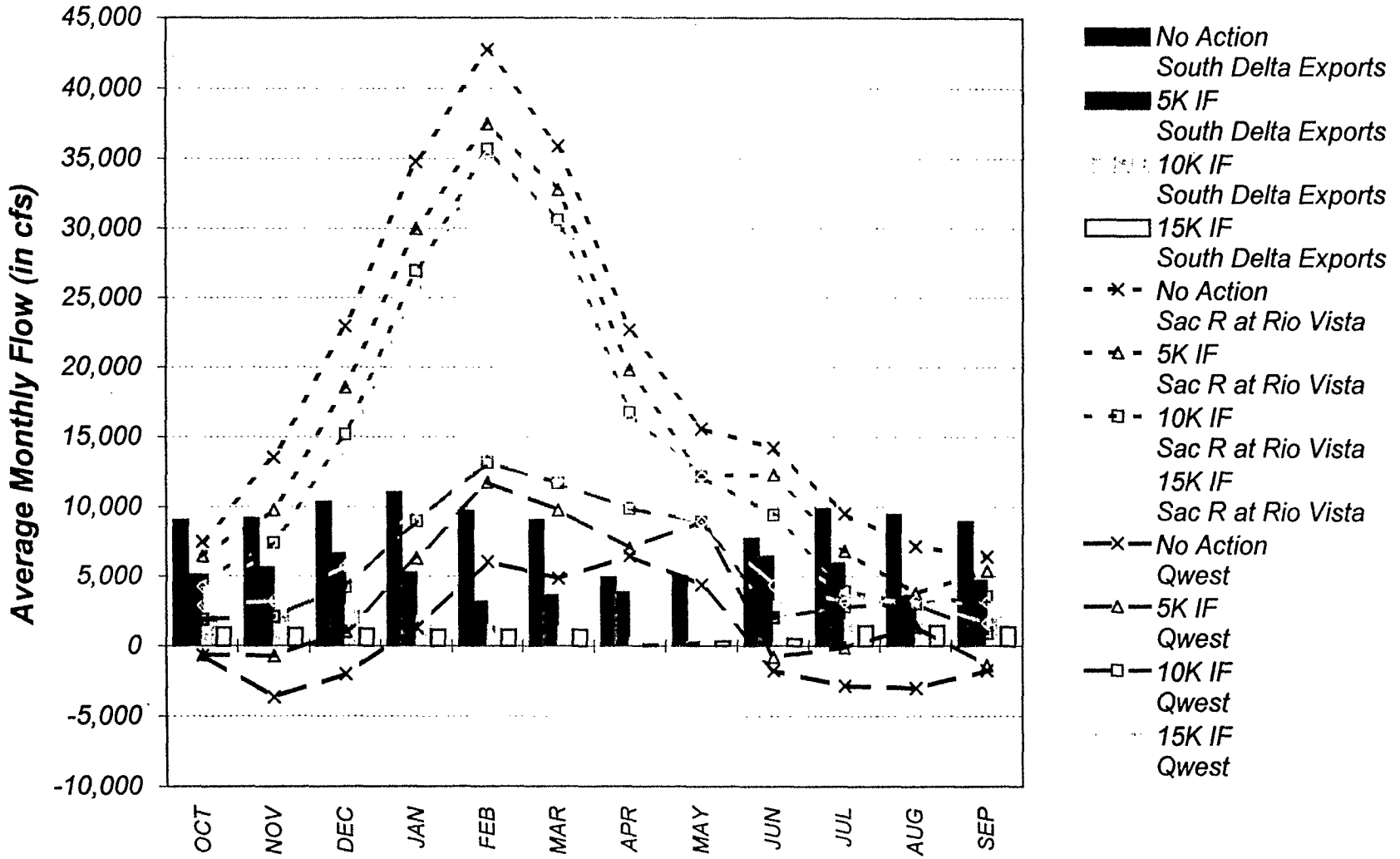
Alternative 3 -- No Storage, Operations Criteria A
73-Year Averages



C-097179

C-097180

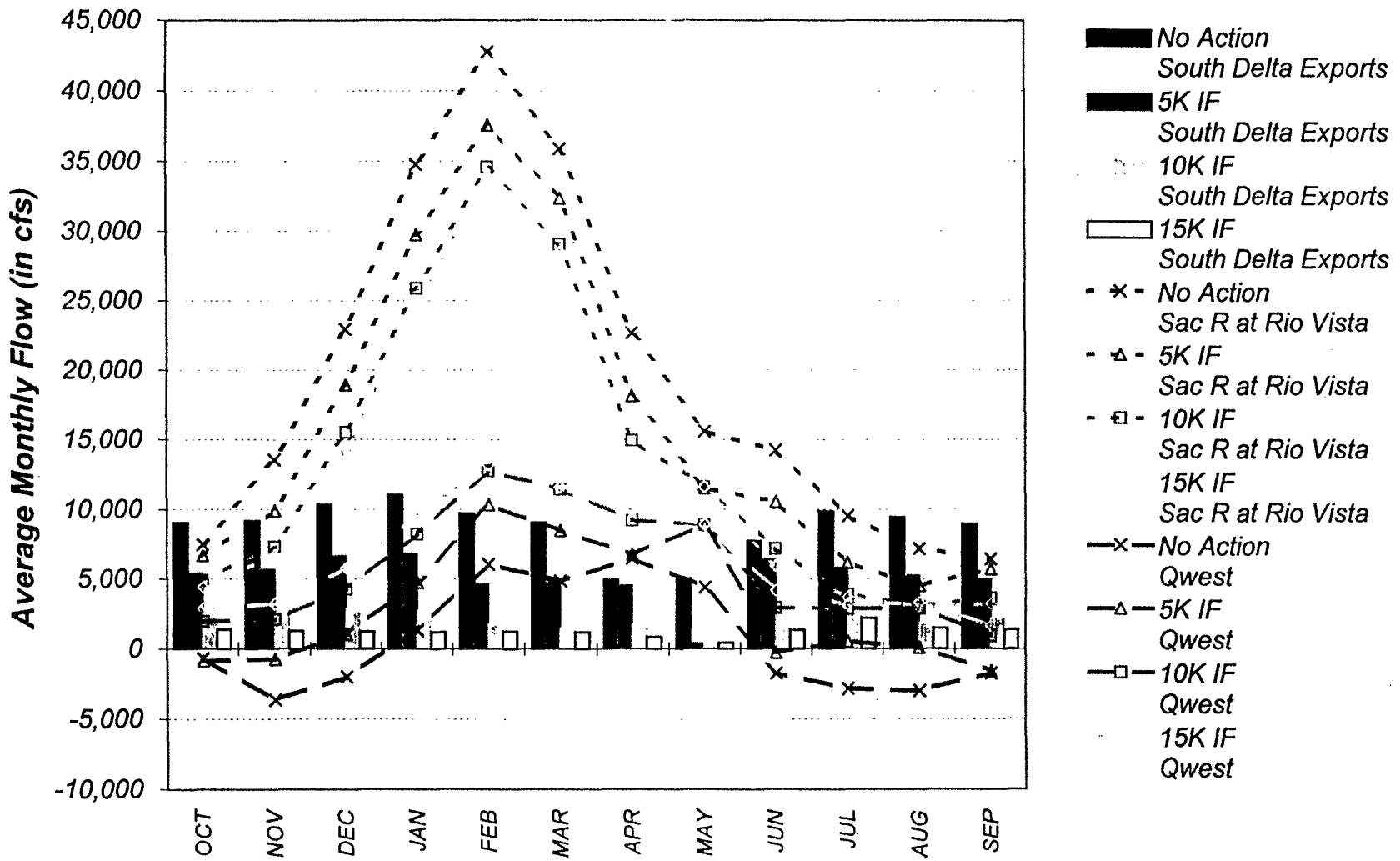
Alternative 3 -- No Storage, Operations Criteria B
73-Year Averages



C-097180

C-097181

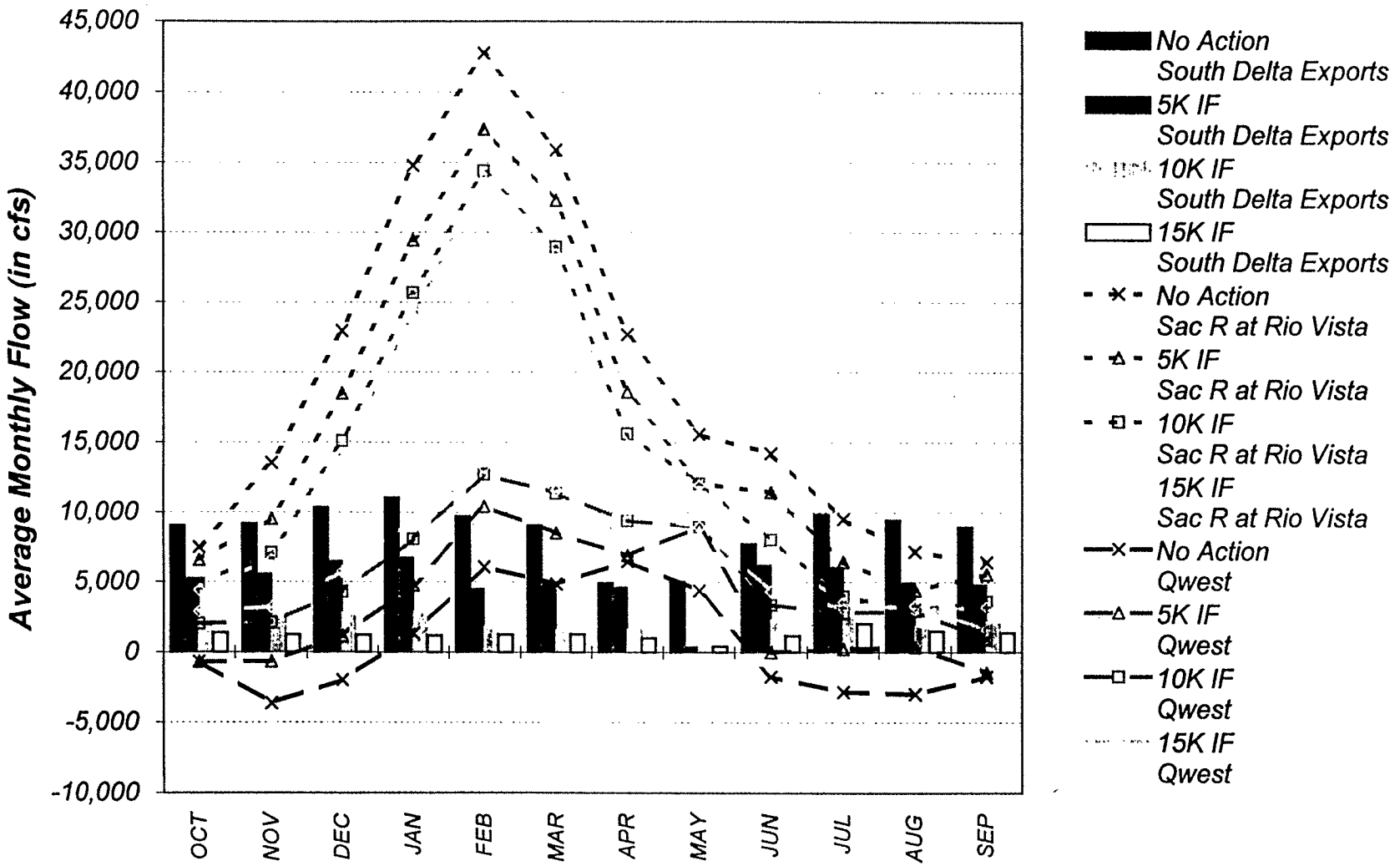
Alternative 3 -- 4.95 MAF Storage, Operations Criteria A
73-Year Averages



C—097181

C-097182

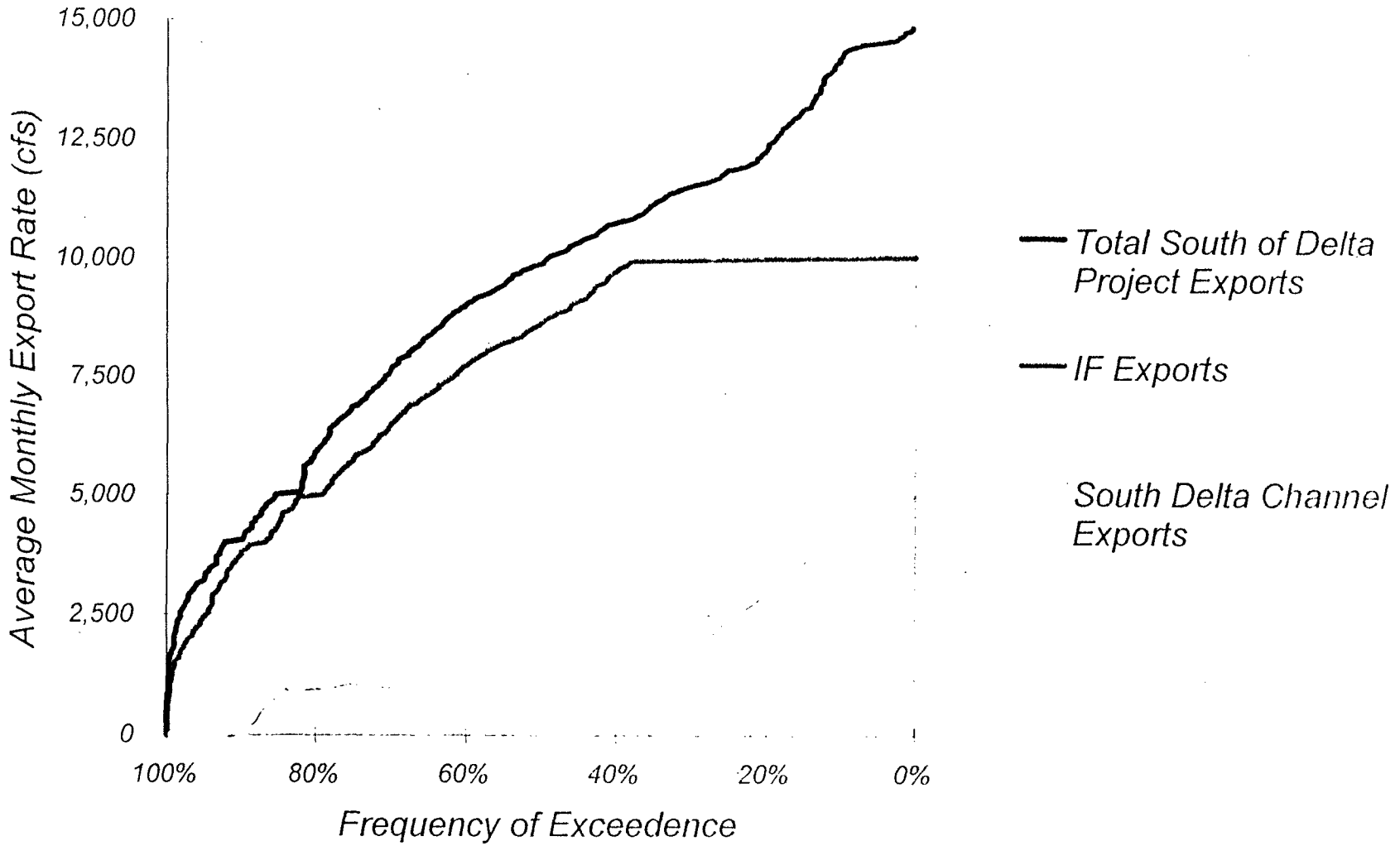
Alternative 3 -- 4.95 MAF Storage, Operations Criteria B
73-Year Averages



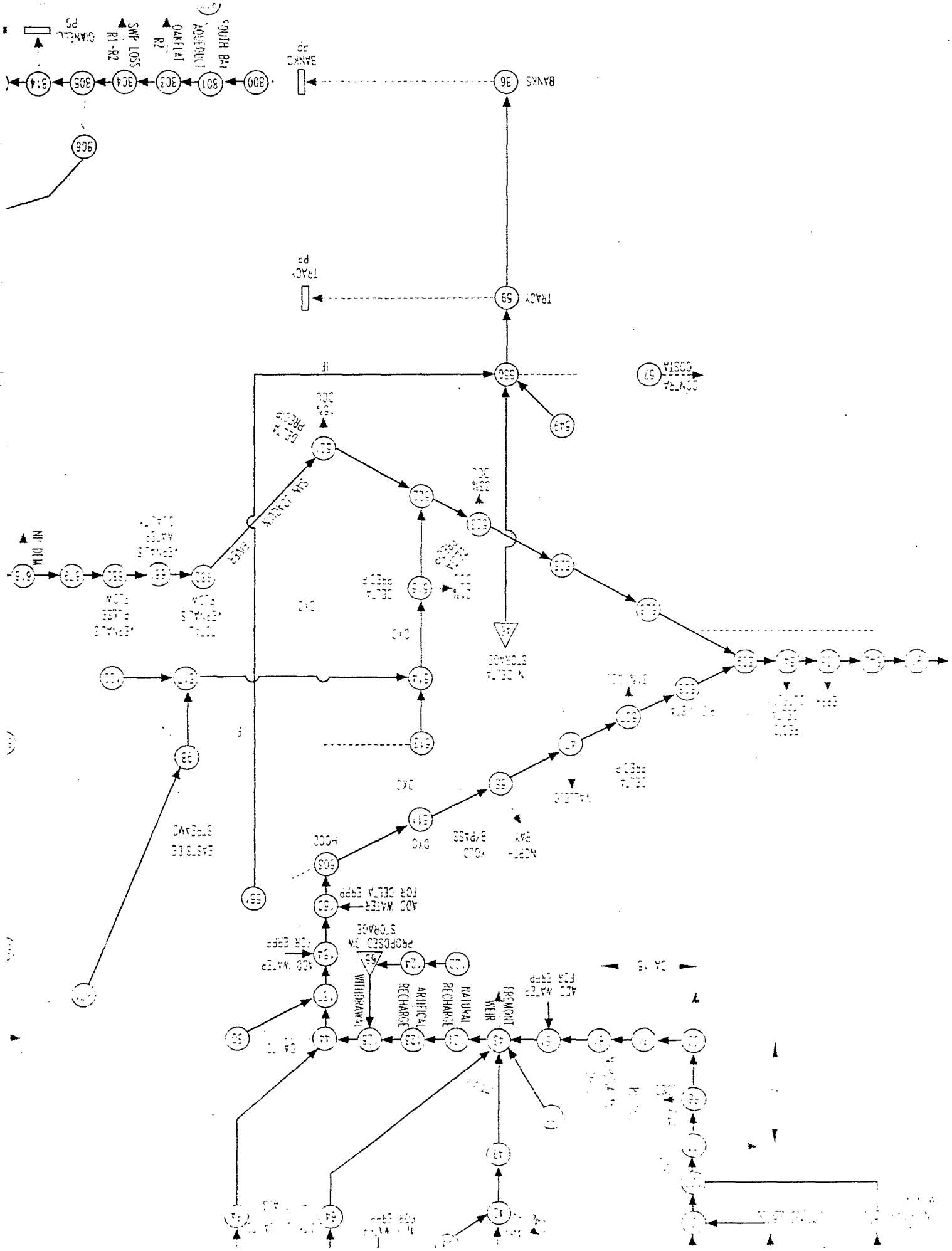
C—097182

C-097183

Frequency of Delta Export Rates with 10,000 cfs Isolated Facility



C—097183


BANKS
TRACY
COSTA
NATURAL RECHARGE
ARTIFICIAL RECHARGE
WITHDRAWAL
PROPOSED SW STORAGE
ADD WATER FOR DELTA EXPP
ADD WATER FCR EXPP
ADD WATER FCA EXPP
FREMONT WEIR
SOUTH BAY AQUEDUCT
SWP LOSS R1-R2
GIANELLI PG
BANKS PP
TRACY PP
IN DIM
SWP
SWP DEMCY
DXC
DXC
DXC
DXC
HCCC
EASTSIDE STREAMS
NORTH BAY
SOLO BYPASS
DELTA EXPORTS
DELTA EXPORTS
DELTA EXPORT

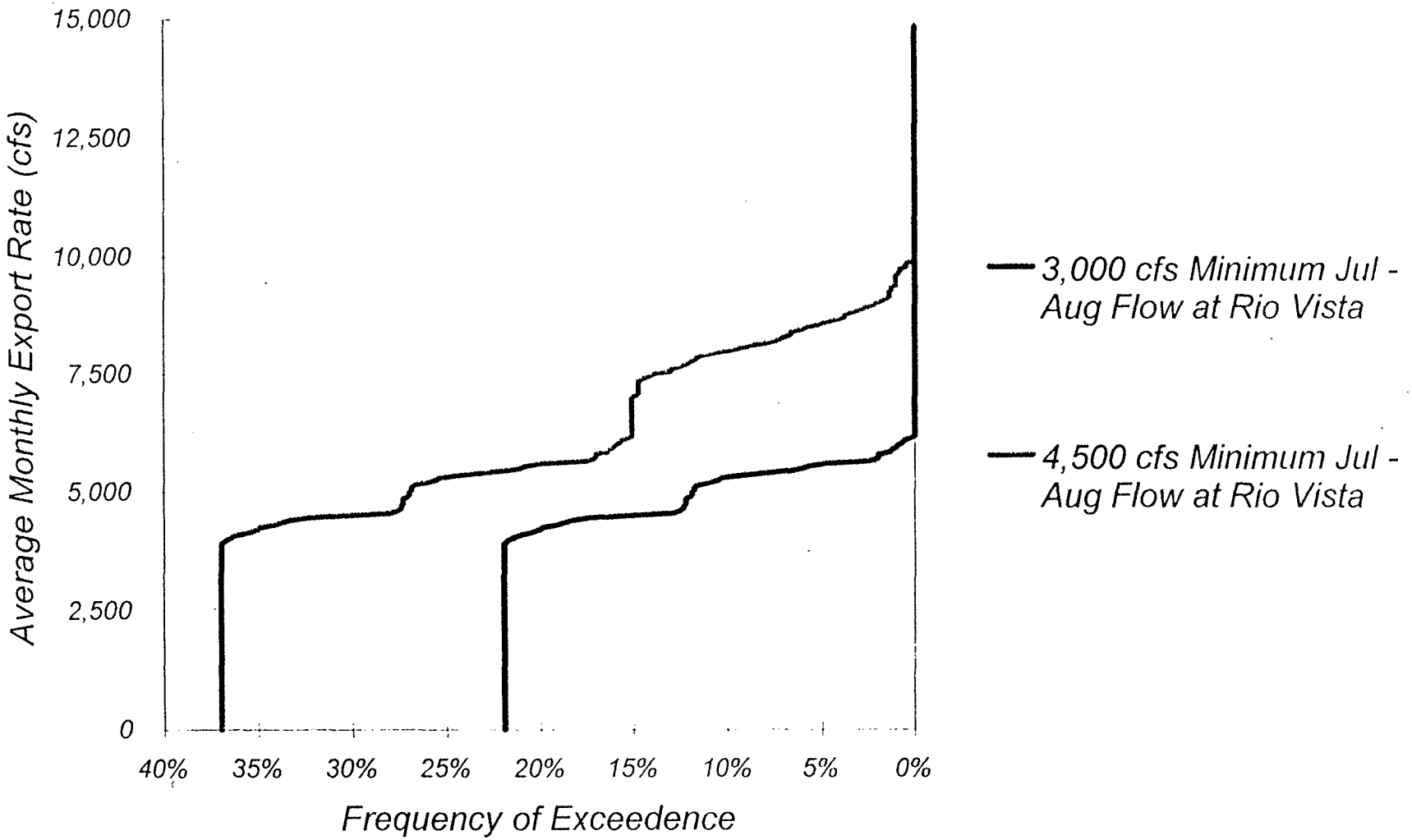
Cross-Delta Flow = a * (Sac Flow Upstream of X-Channel) + b

	a	b
Gates Open	0.293	2090
Gates Closed	0.133	829

	(1)	(2)	(3)	(1)+(2)+(3)	(1)+(3)
	Rio Vista Minimum	Other Sac River Diversions (net)	X-Delta Flow	Total Required Flow above X-Channel	Potential Sac River Exportable Project Releases
Gates Open	3000	1500	3410	7910	6410
	4000	1500	3700	9200	7700
	4500	1500	3850	9850	8350
Gates Closed	3000	1500	1430	5930	4430
	4000	1500	1560	7060	5560
	4500	1500	1630	7630	6130

C-097186

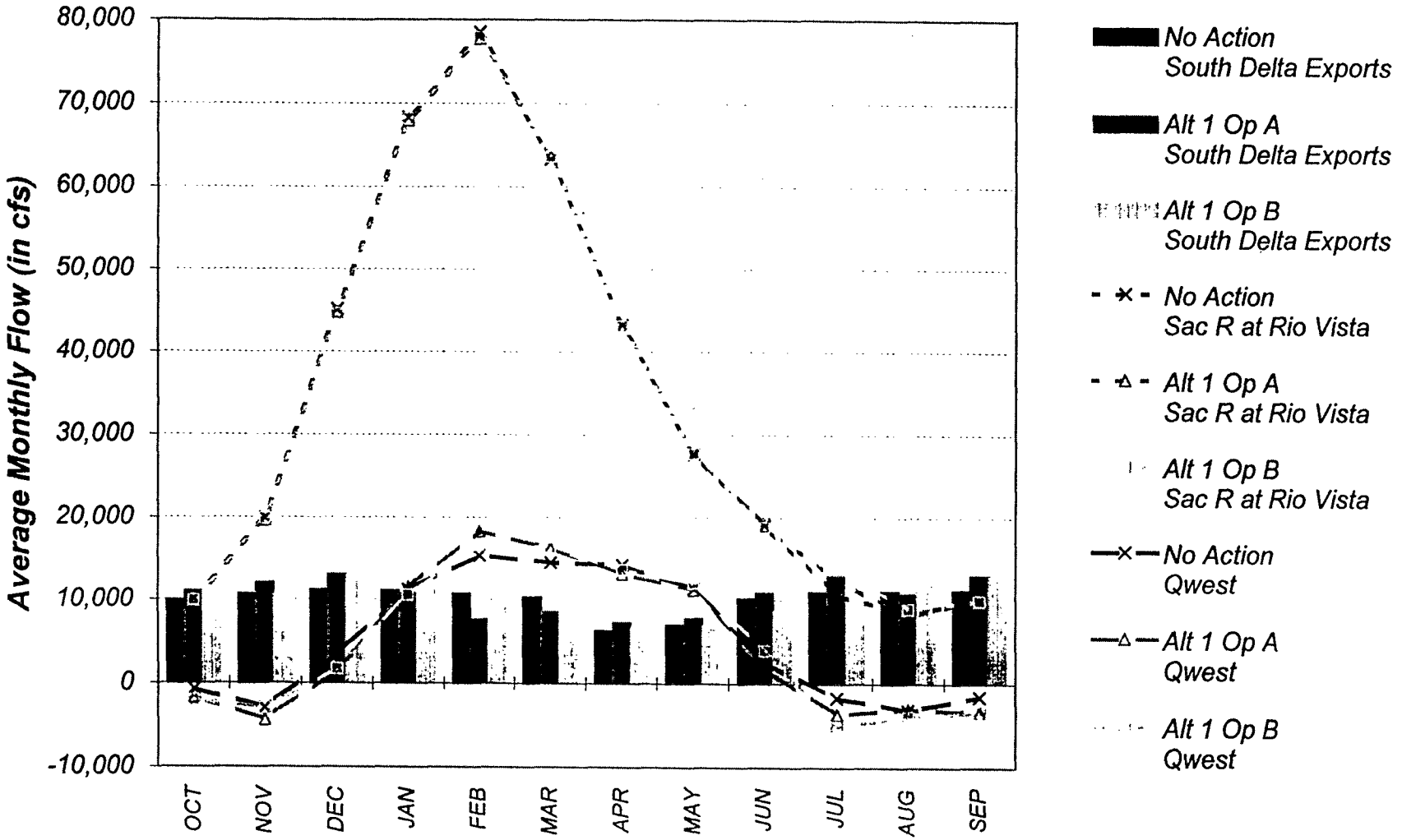
Potential South Delta Channel Exports with 10,000 cfs Isolated Facility



C—097186

C-097187

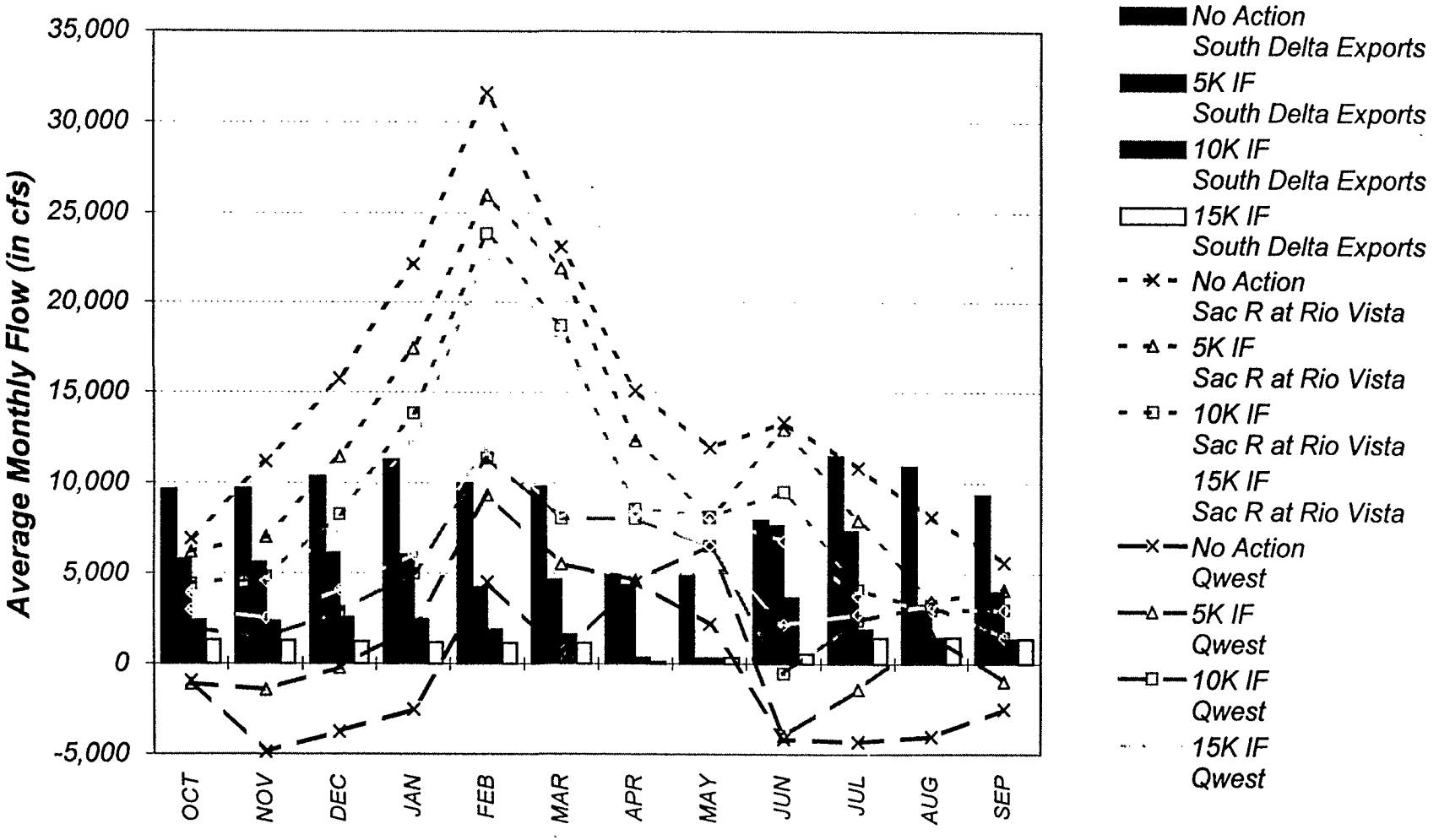
Alternative 1 -- No Storage
Wet Year Averages



C—097187

C-097188

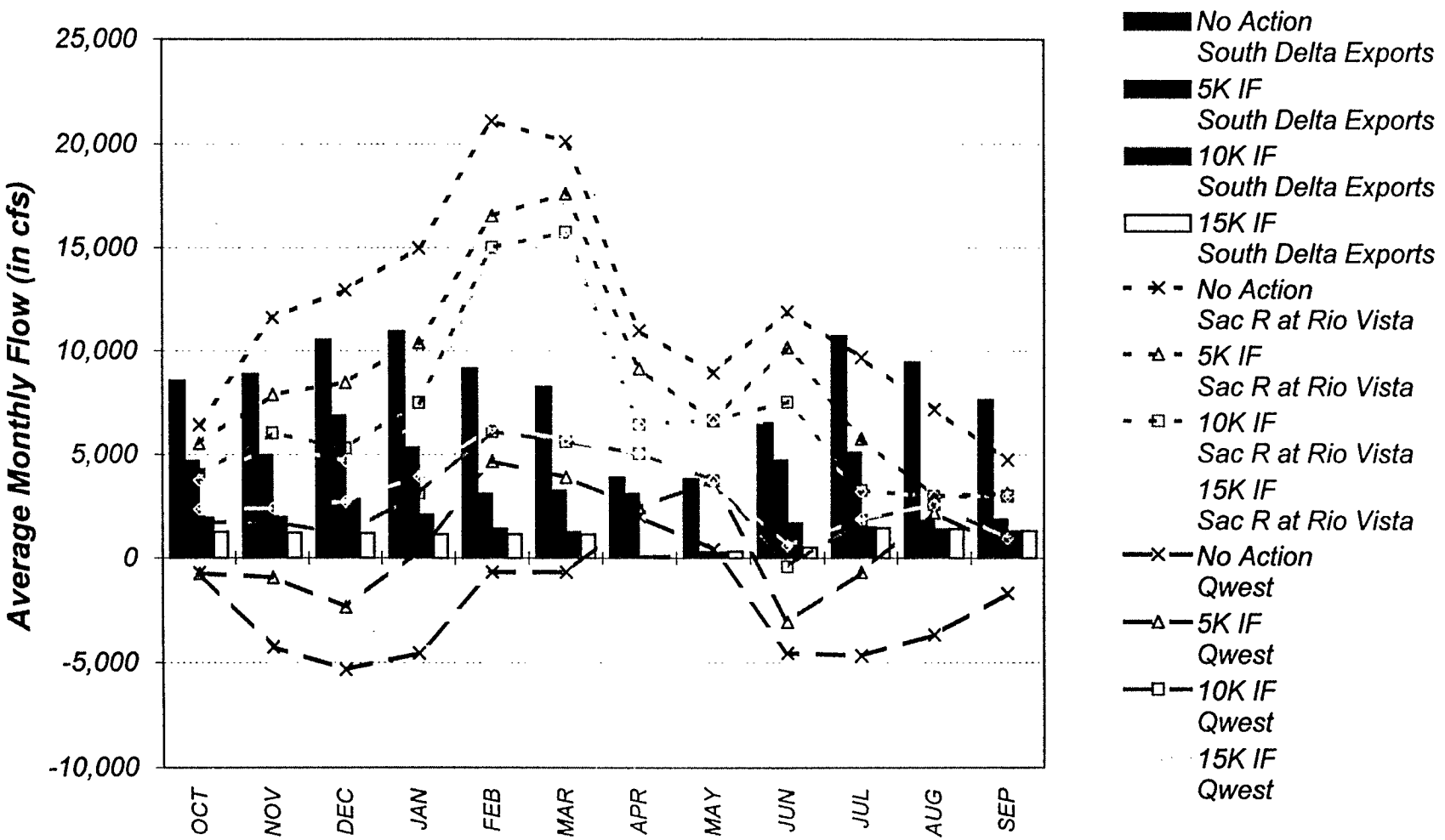
Alternative 3 -- No Storage, Operations Criteria B
Below Normal Year Averages



C-097188

C-097189

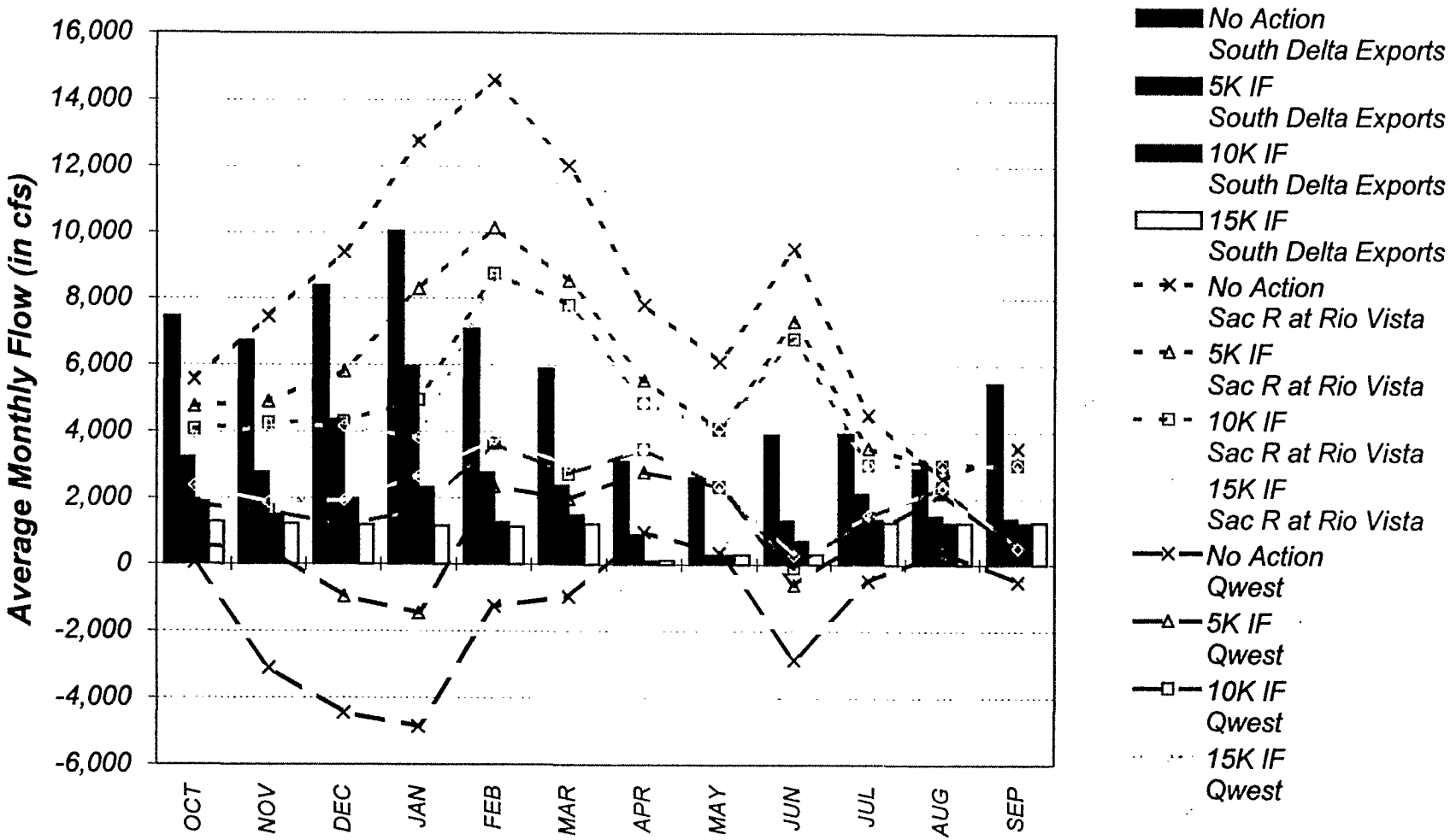
Alternative 3 -- No Storage, Operations Criteria B
Dry Year Averages



C—097189

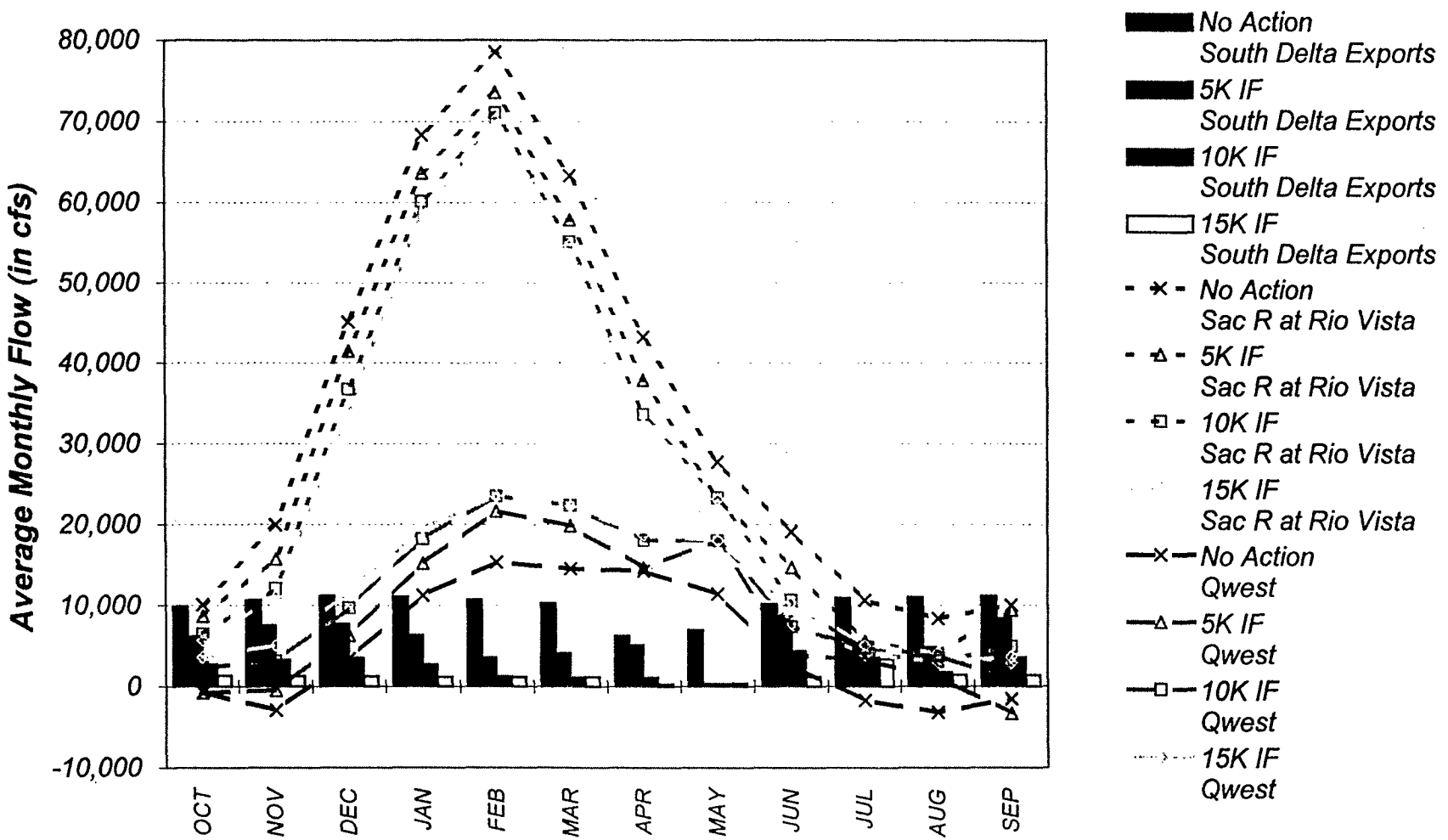
C-097190

Alternative 3 -- No Storage, Operations Criteria B
Critical Year Averages



C—097190

Alternative 3 -- 4.95 MAF Storage, Operations Criteria A
Wet Year Averages

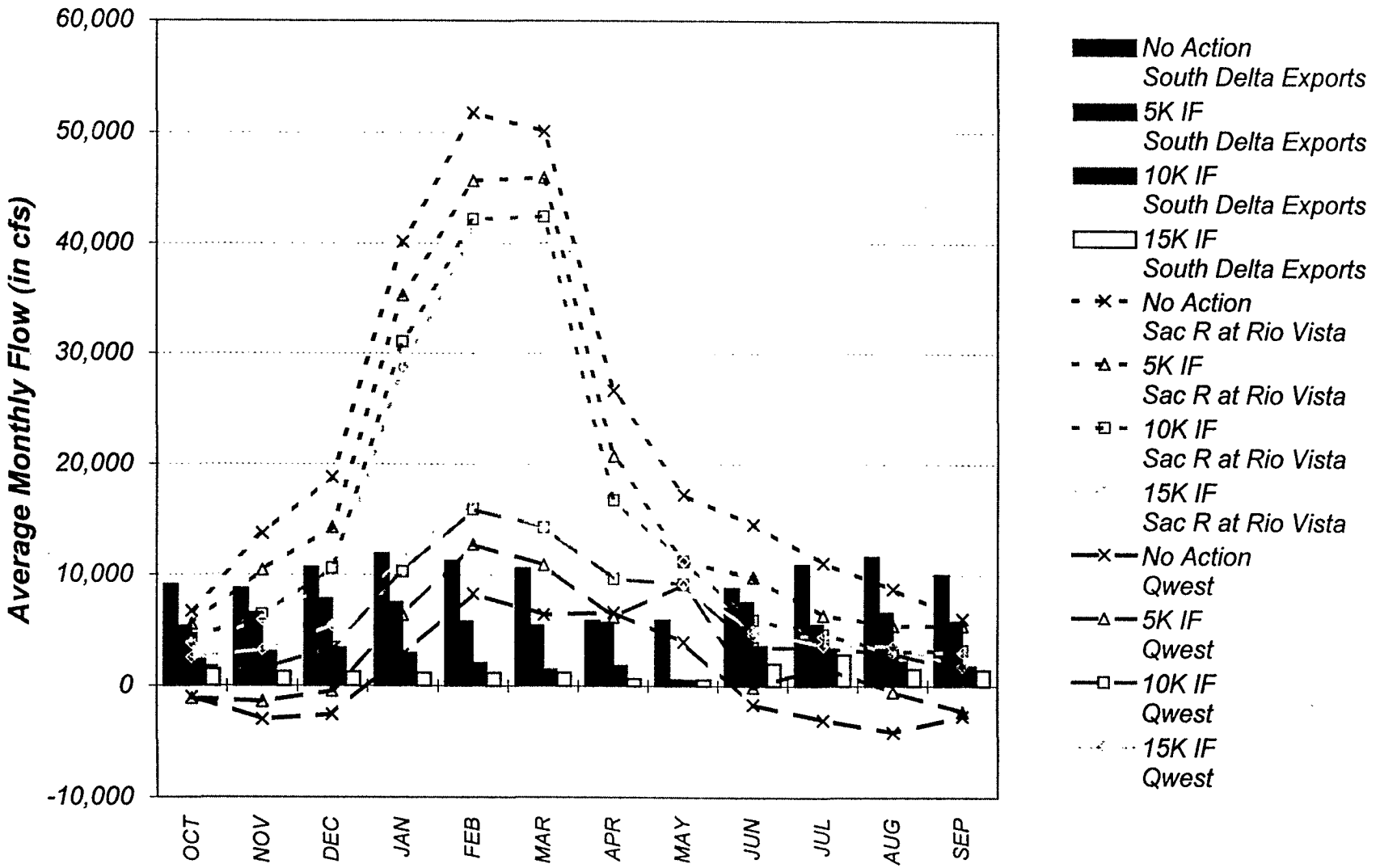


C-097191

C-097191

C-097192

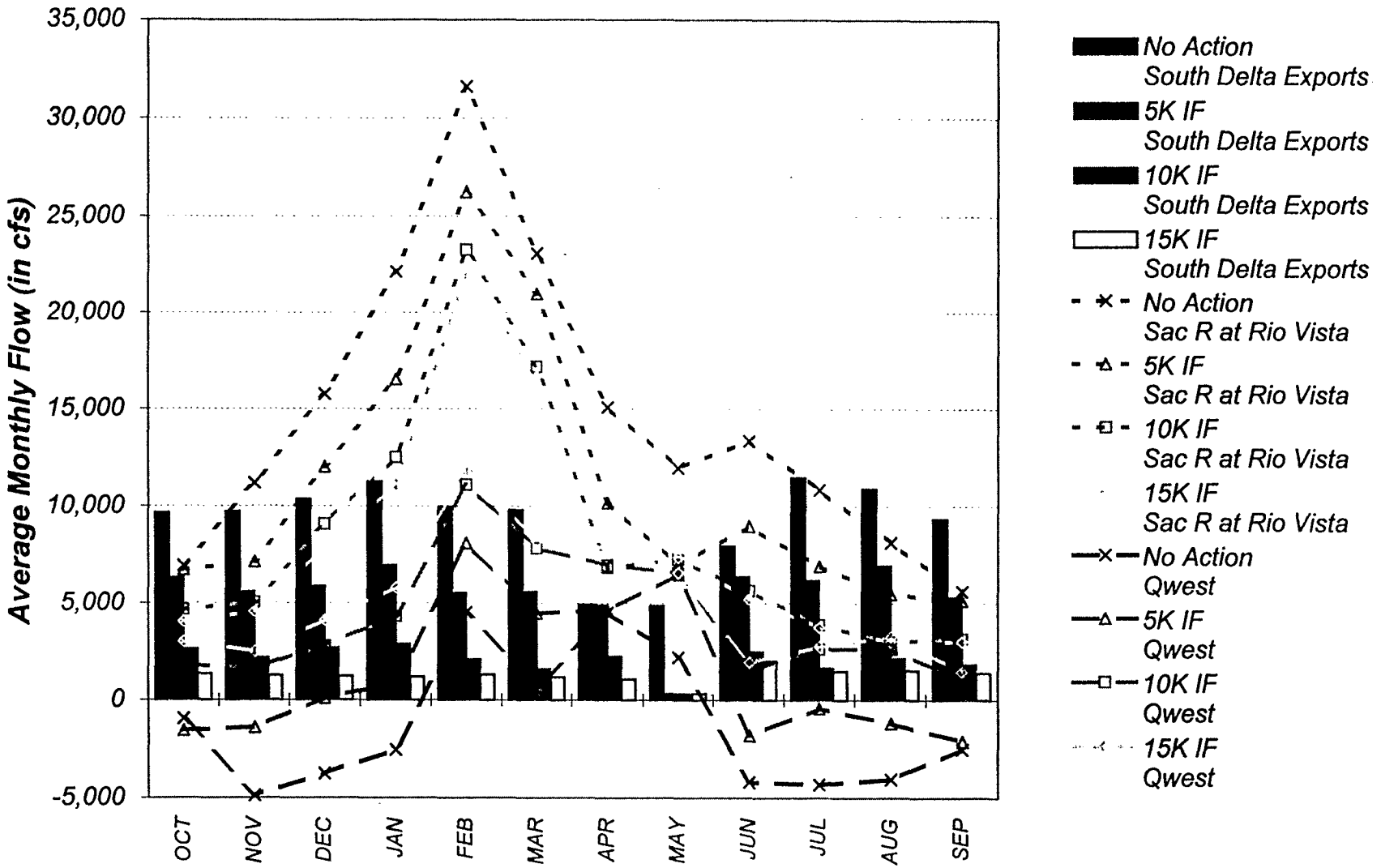
Alternative 3 -- 4.95 MAF Storage, Operations Criteria A
Above Normal Year Averages



C-097192

C-097193

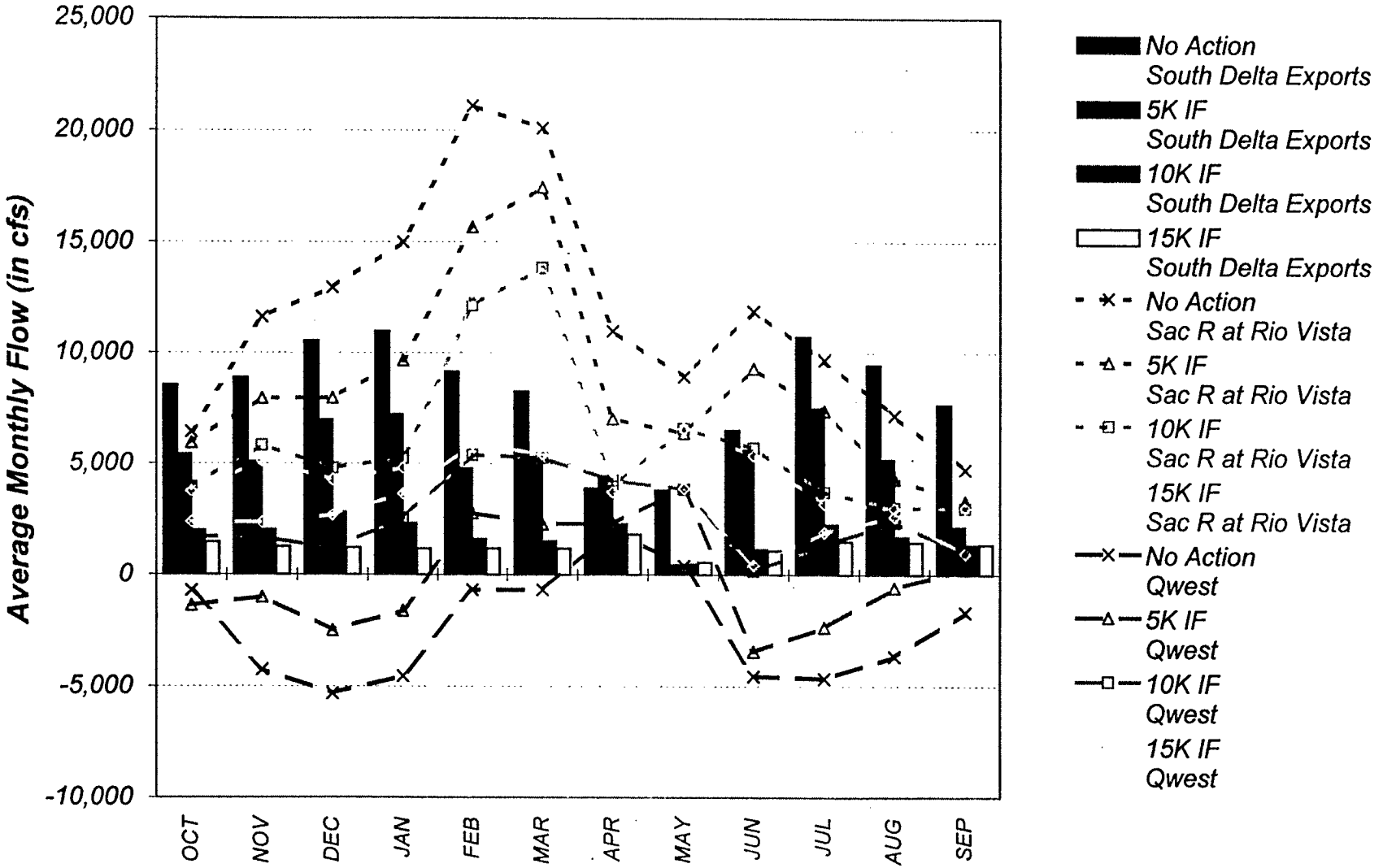
Alternative 3 -- 4.95 MAF Storage, Operations Criteria A
Below Normal Year Averages



C—097193

C-097194

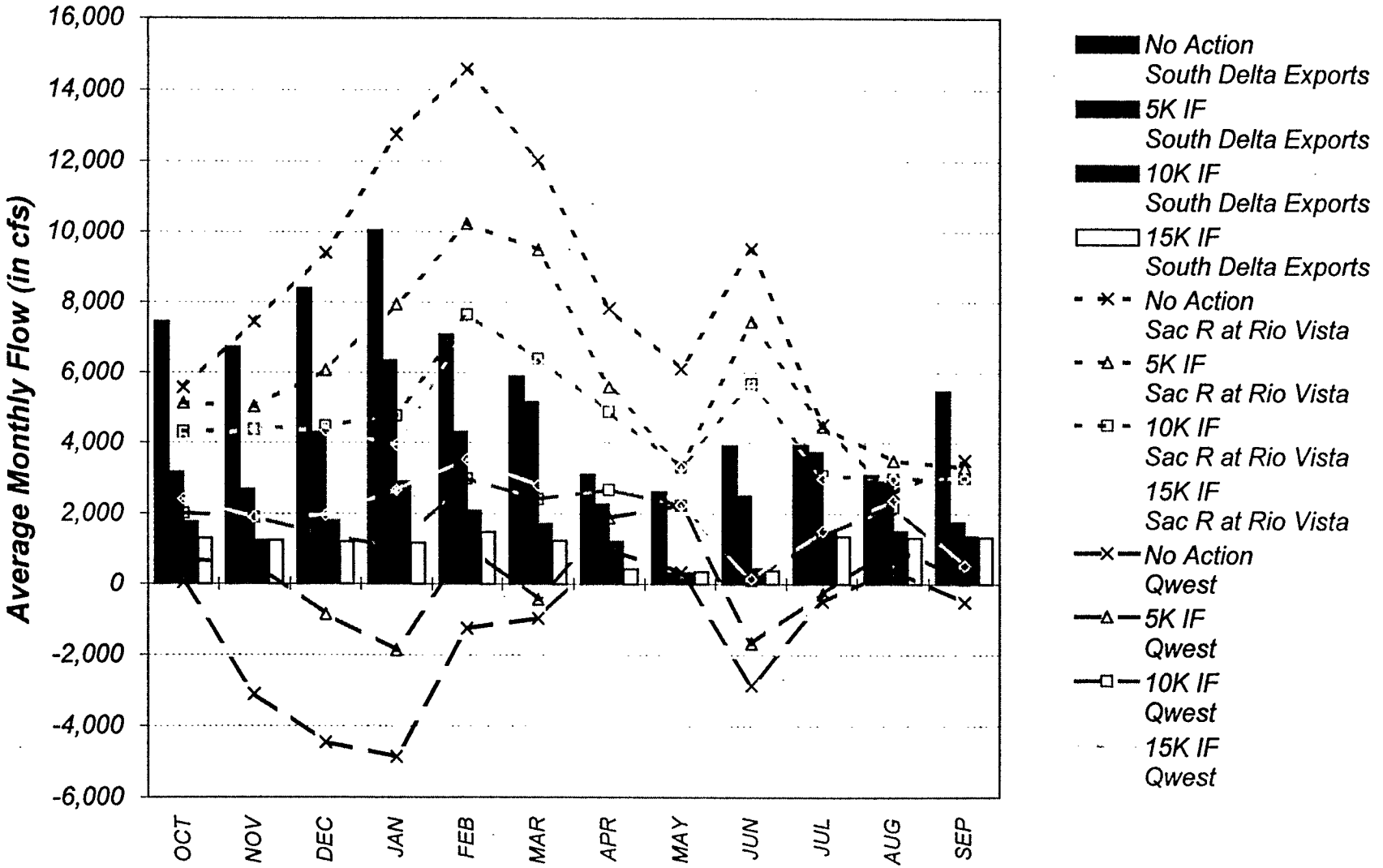
Alternative 3 -- 4.95 MAF Storage, Operations Criteria A
Dry Year Averages



C—097194

C-097195

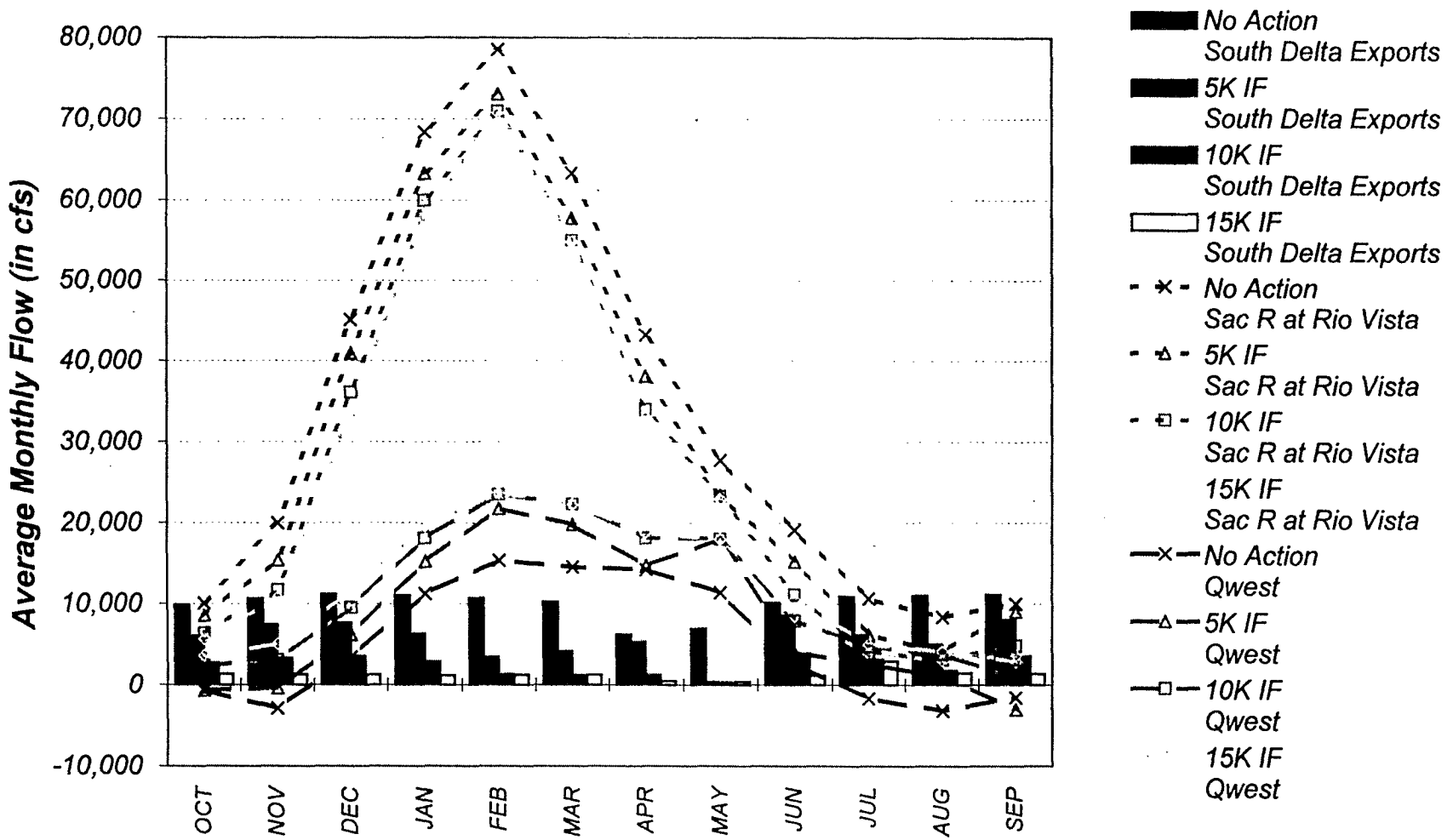
Alternative 3 -- 4.95 MAF Storage, Operations Criteria A
Critical Year Averages



C—097195

C-097196

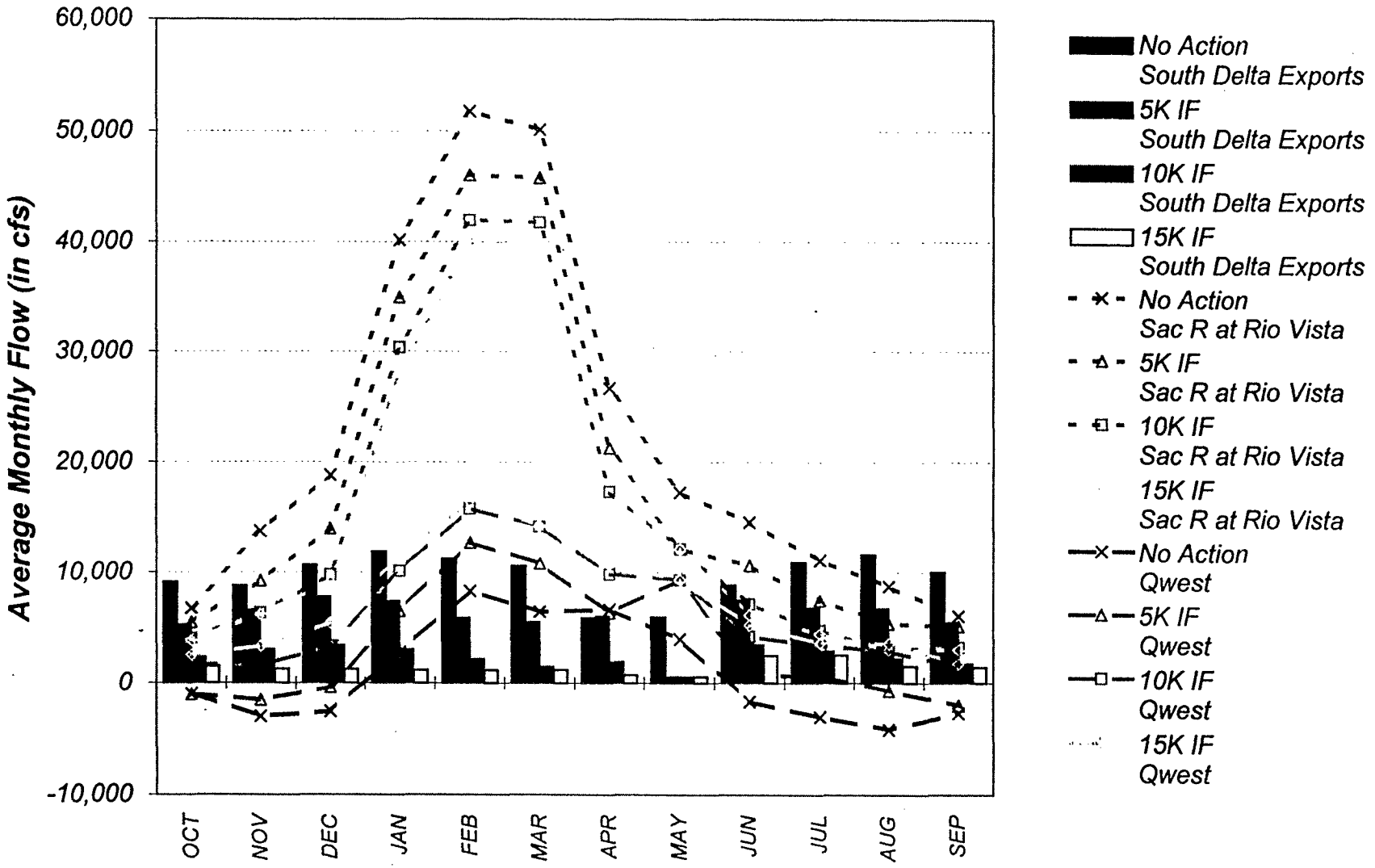
Alternative 3 -- 4.95 MAF Storage, Operations Criteria B
Wet Year Averages



C—097196

C-097197

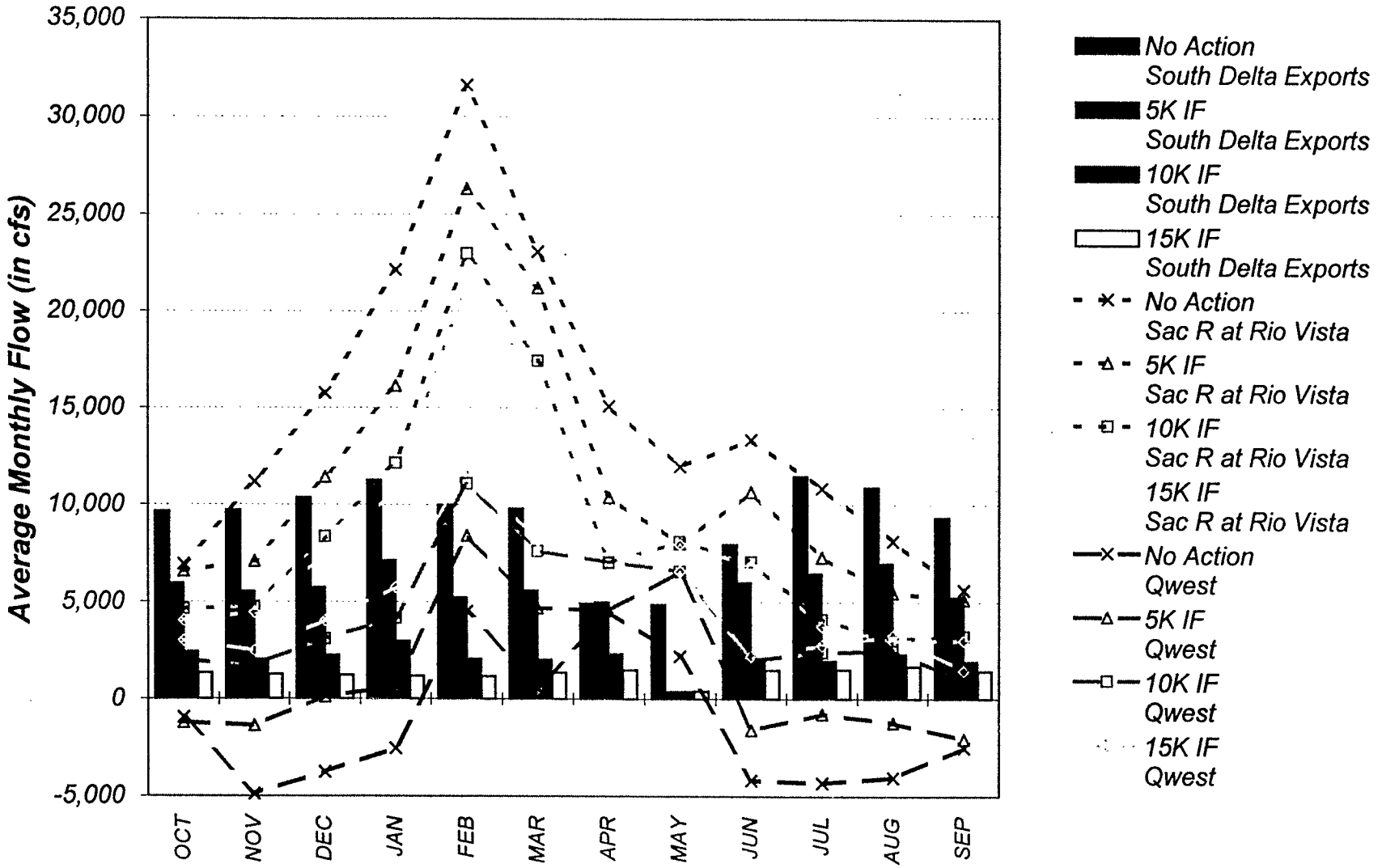
Alternative 3 -- 4.95 MAF Storage, Operations Criteria B
Above Normal Year Averages



C-097197

C-097198

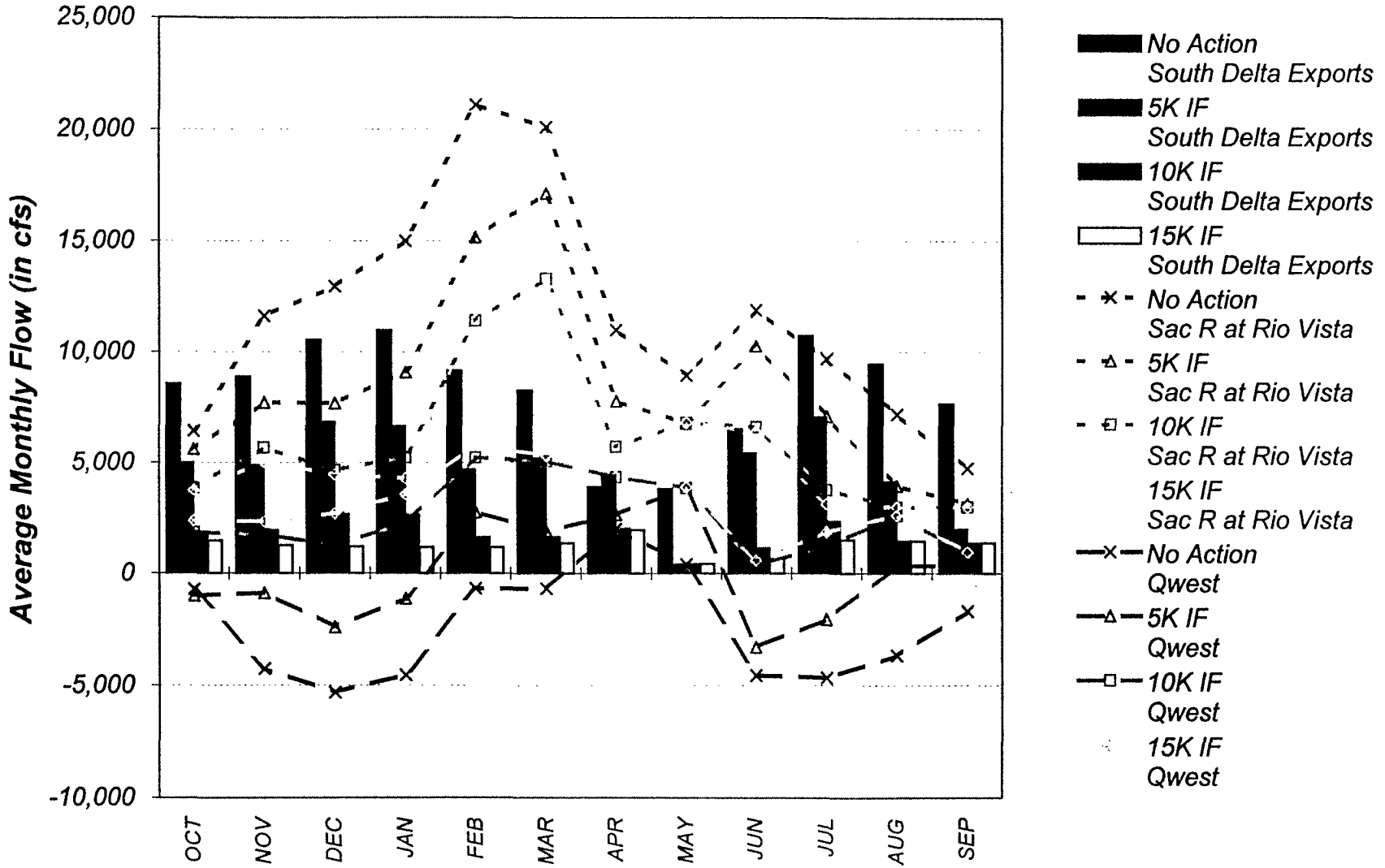
Alternative 3 -- 4.95 MAF Storage, Operations Criteria B
Below Normal Year Averages



C—097198

C-097199

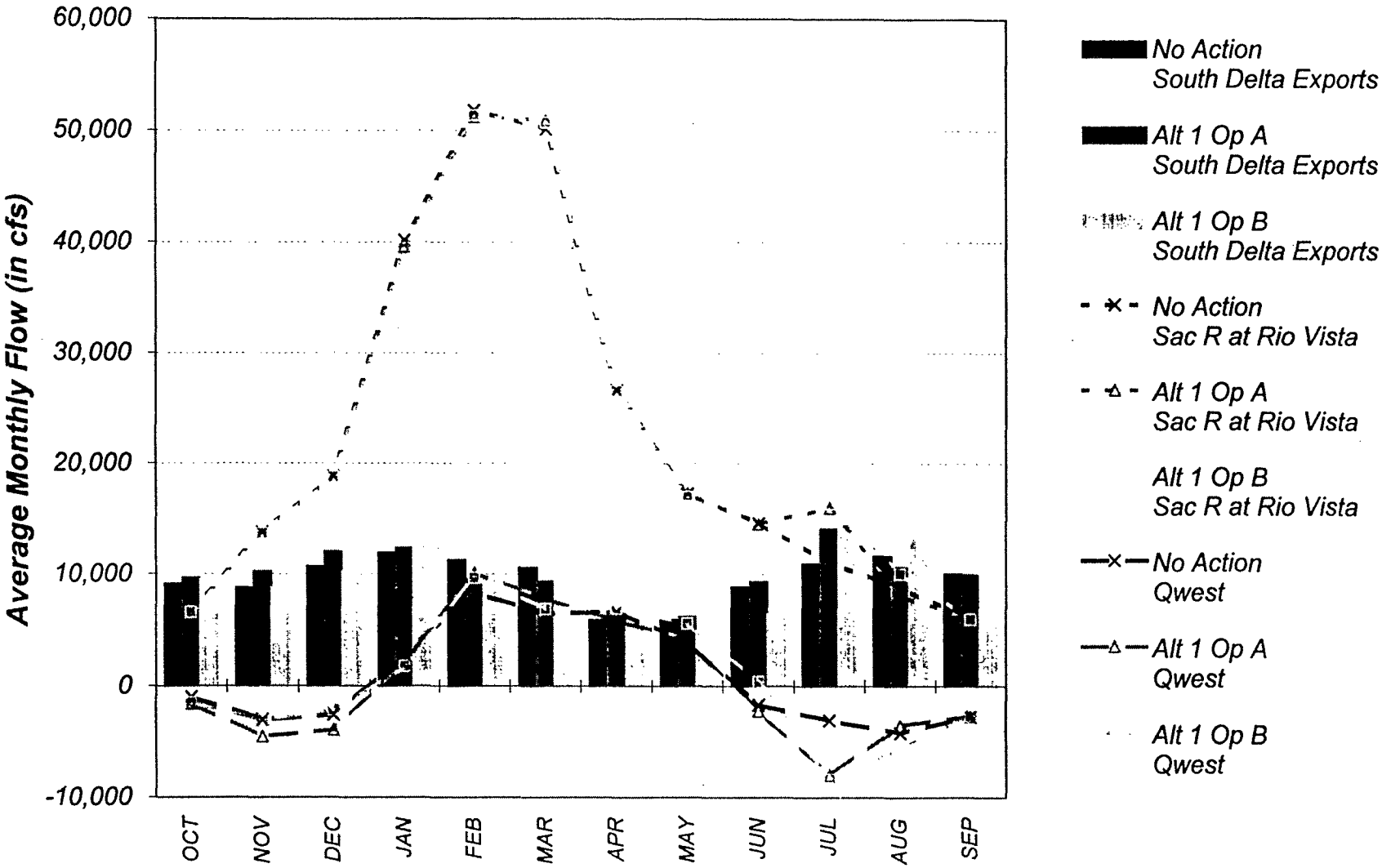
Alternative 3 -- 4.95 MAF Storage, Operations Criteria B
Dry Year Averages



C—097199

C-097200

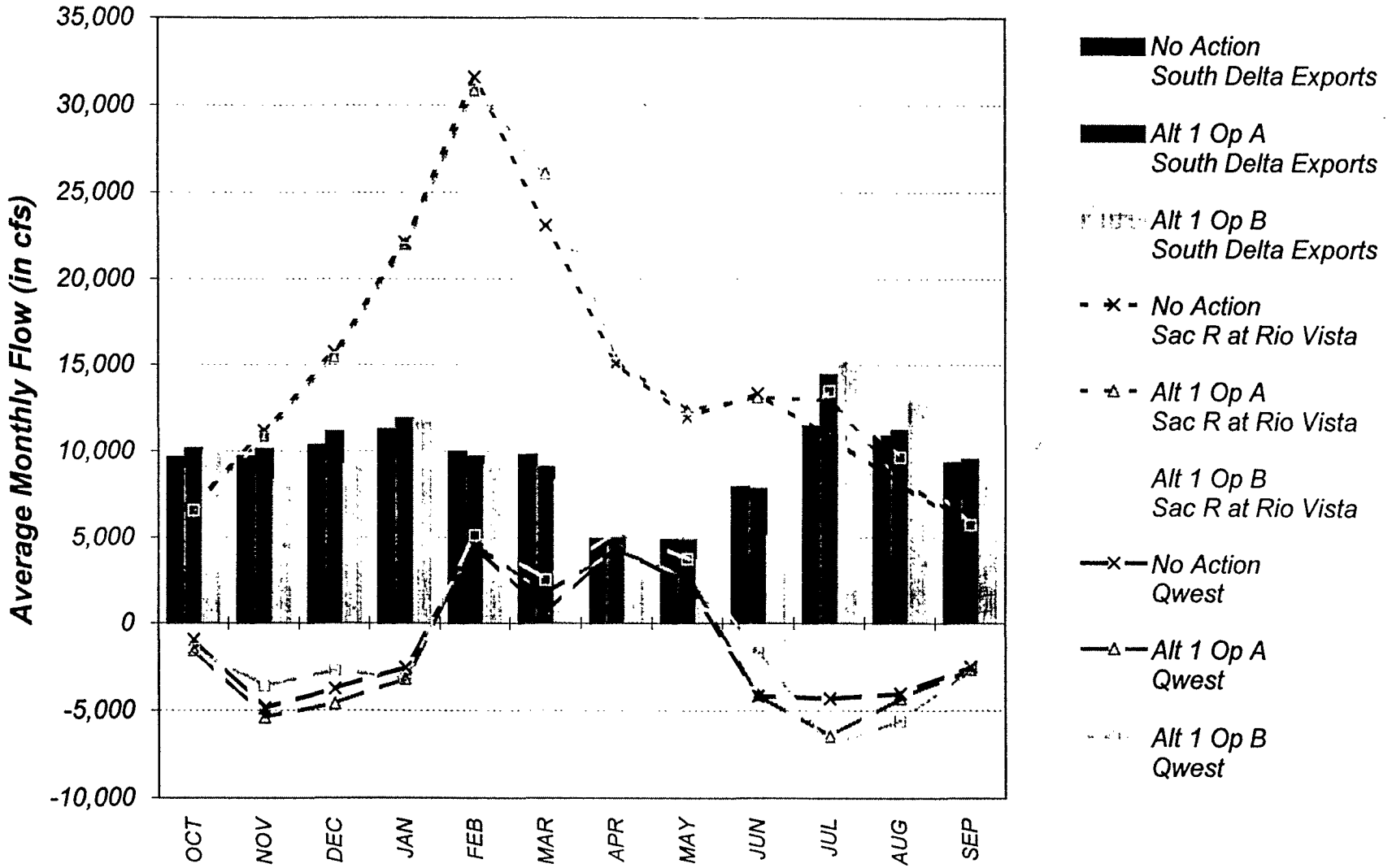
Alternative 1 -- No Storage
Above Normal Year Averages



C—097200

C-097201

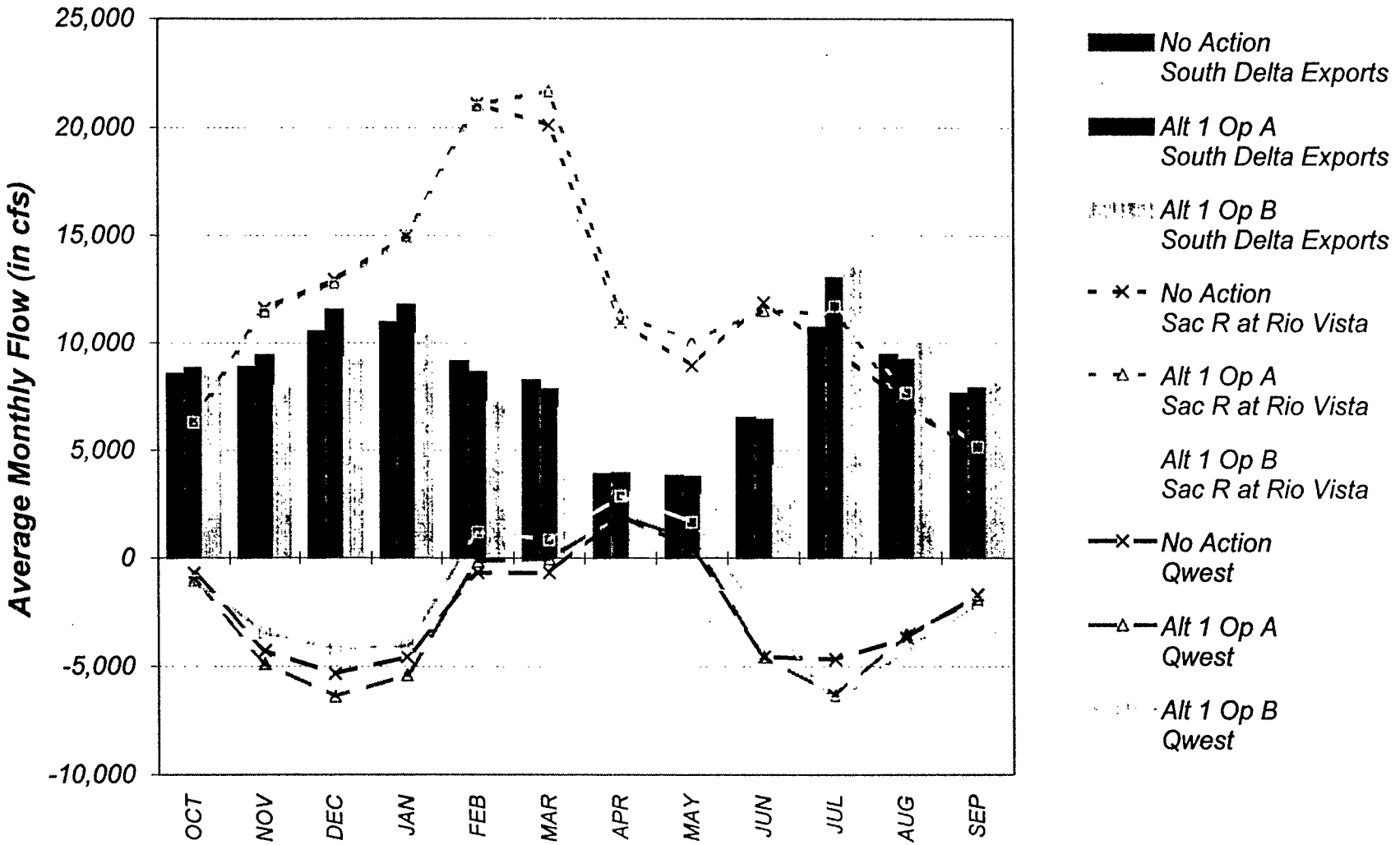
Alternative 1 -- No Storage
Below Normal Year Averages



C—097201

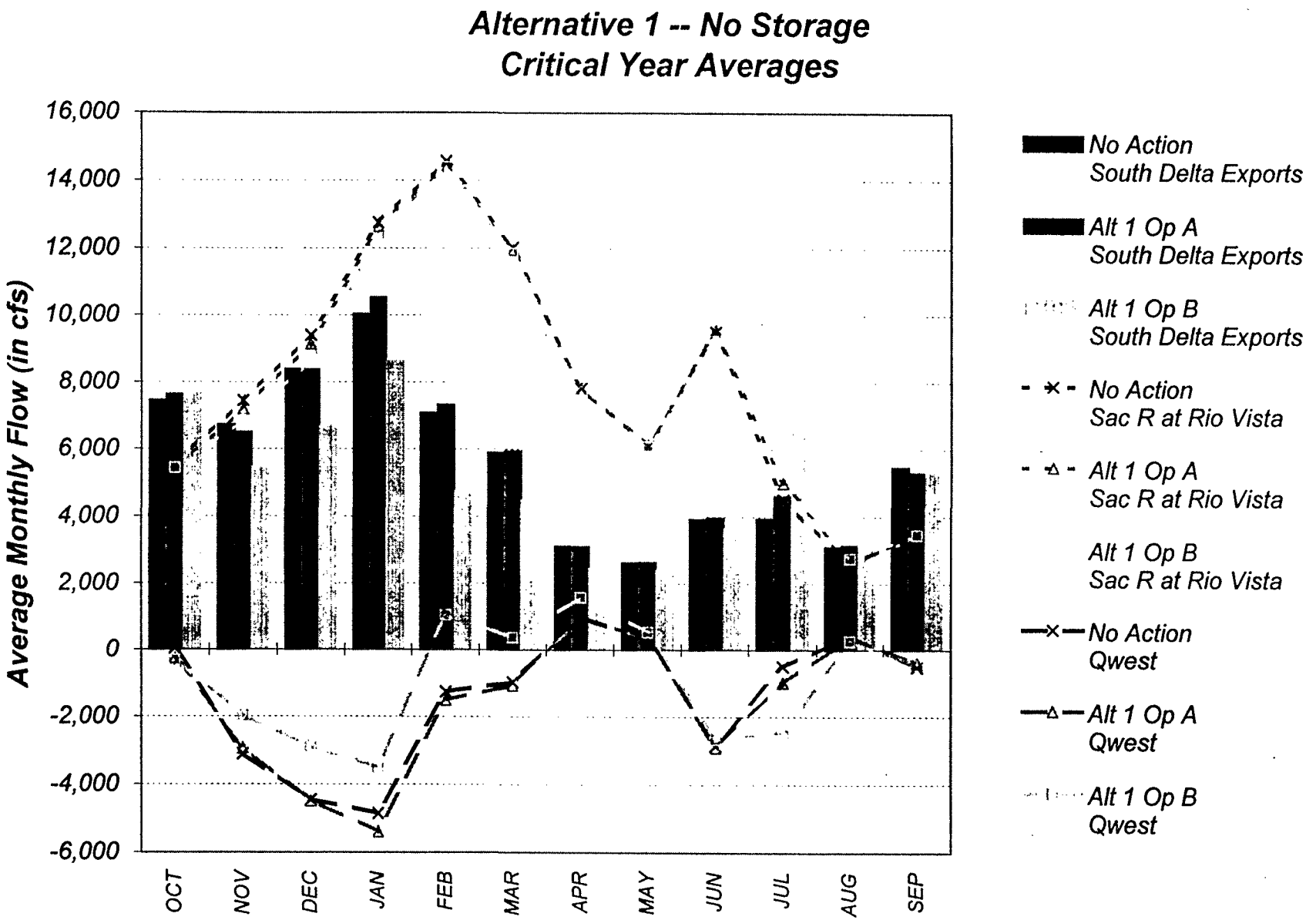
C-097202

Alternative 1 -- No Storage
Dry Year Averages



C-097202

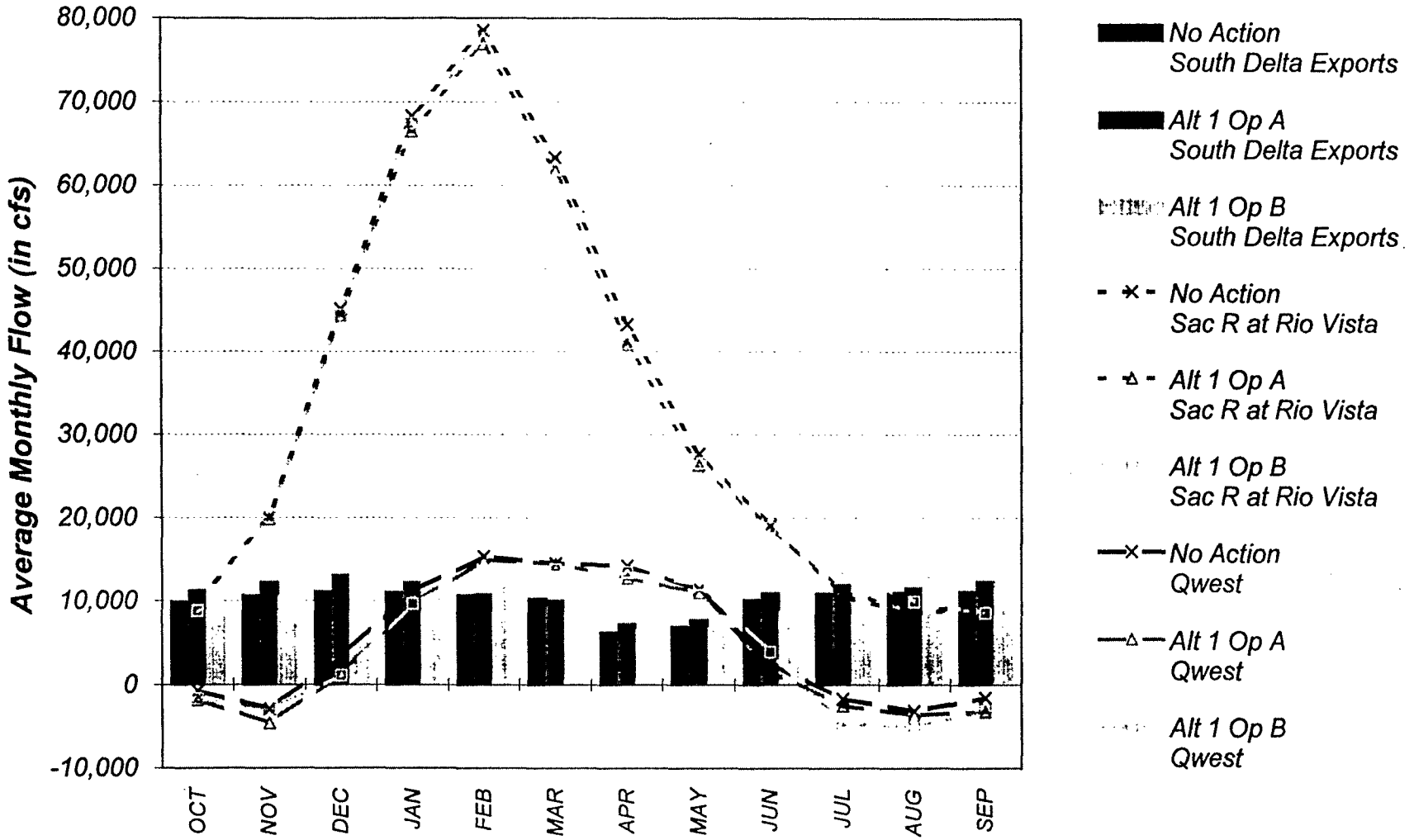
C-097203



C—097203

C-097204

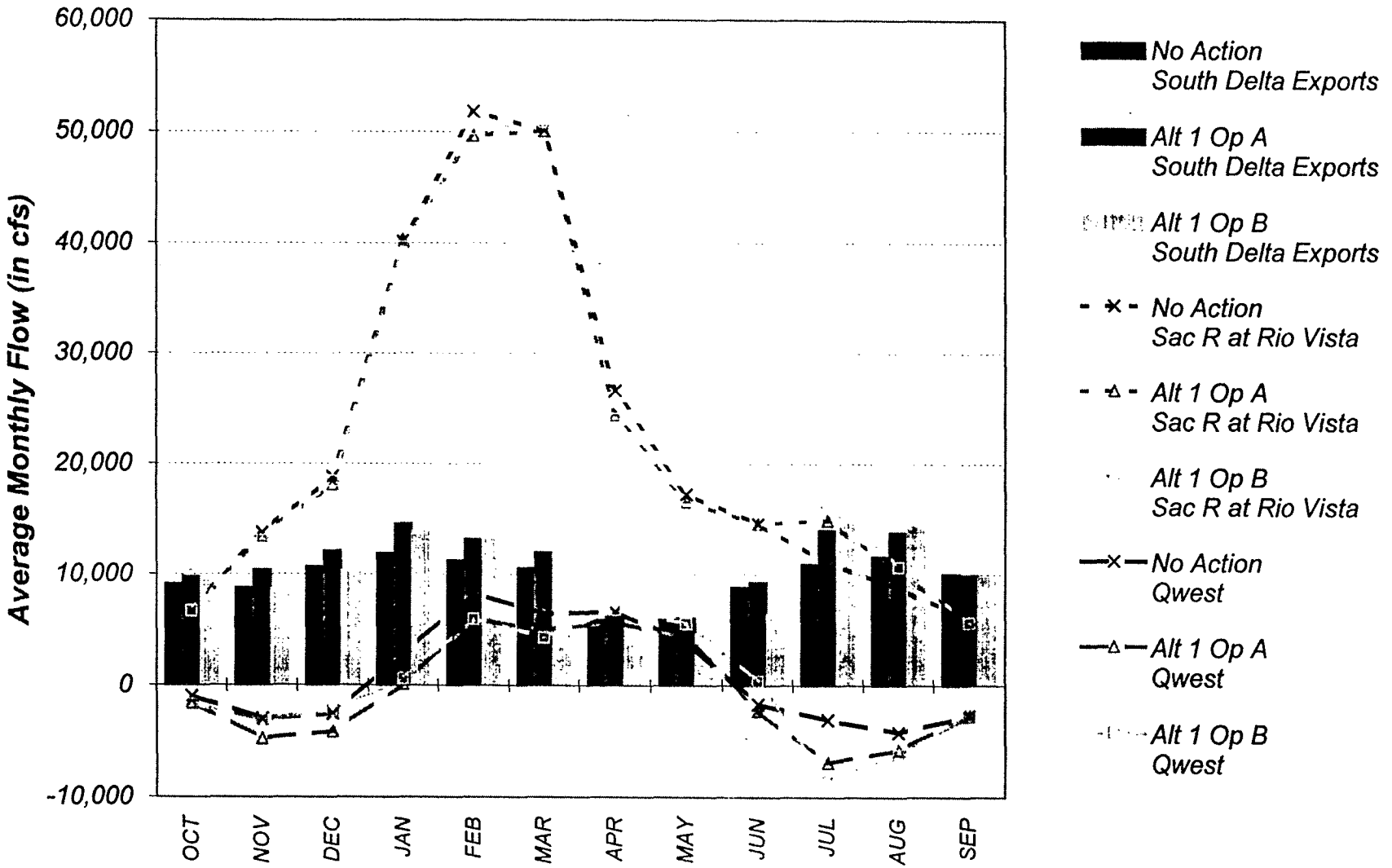
Alternative 1 -- 4.75 MAF Storage
Wet Year Averages



C-097204

C-097205

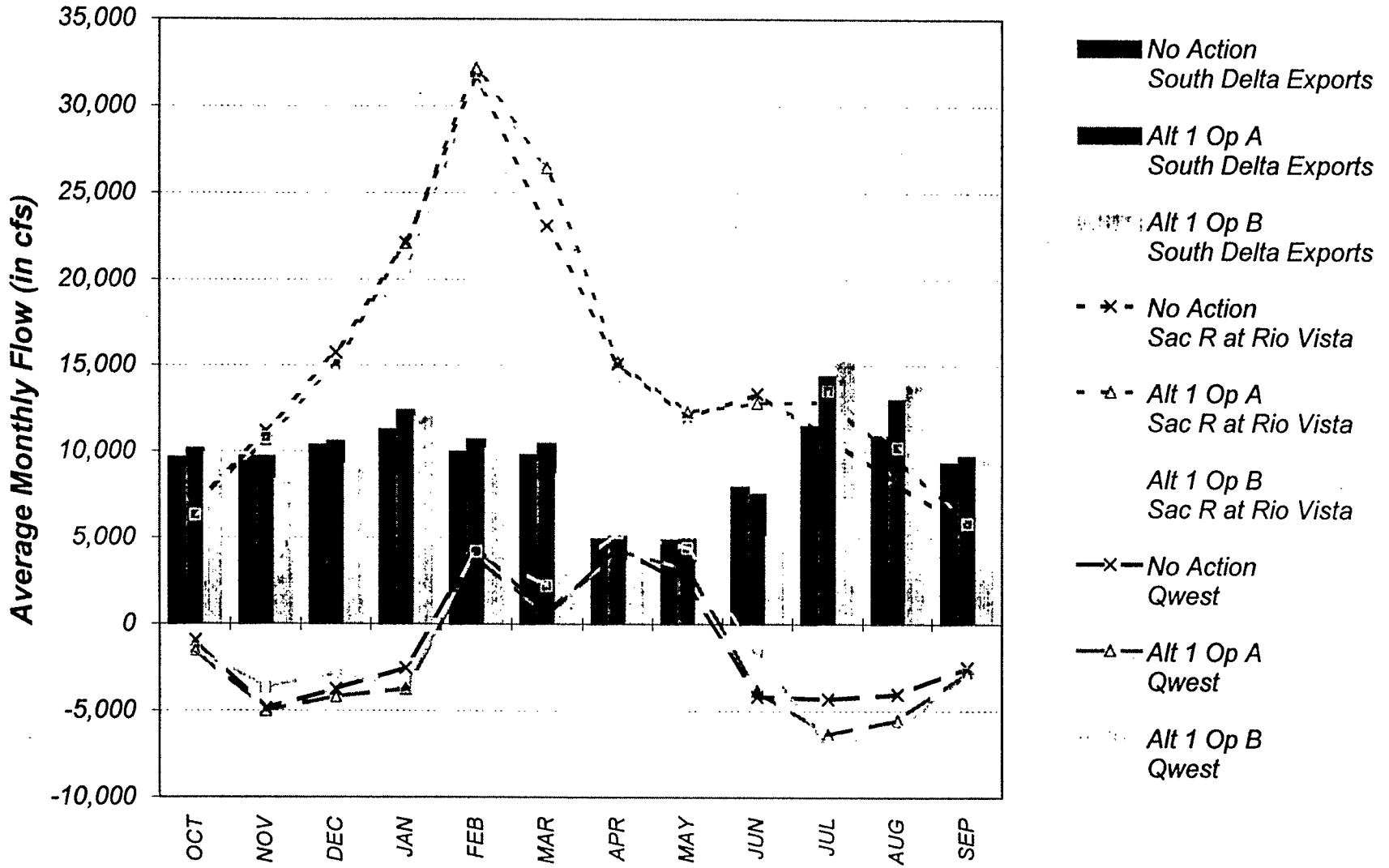
Alternative 1 -- 4.75 MAF Storage
Above Normal Year Averages



C—097205

C-097206

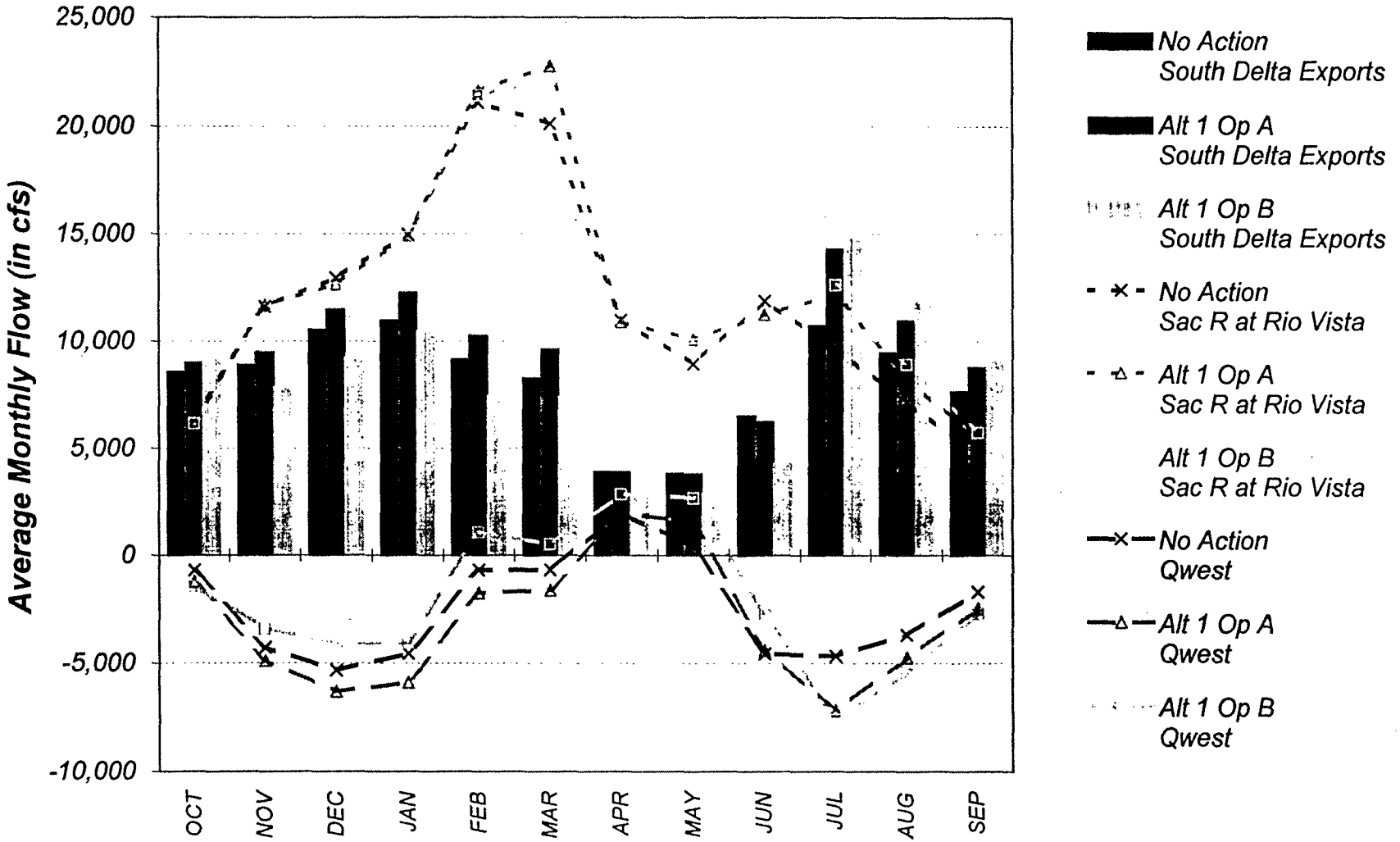
Alternative 1 -- 4.75 MAF Storage
Below Normal Year Averages



C-097206

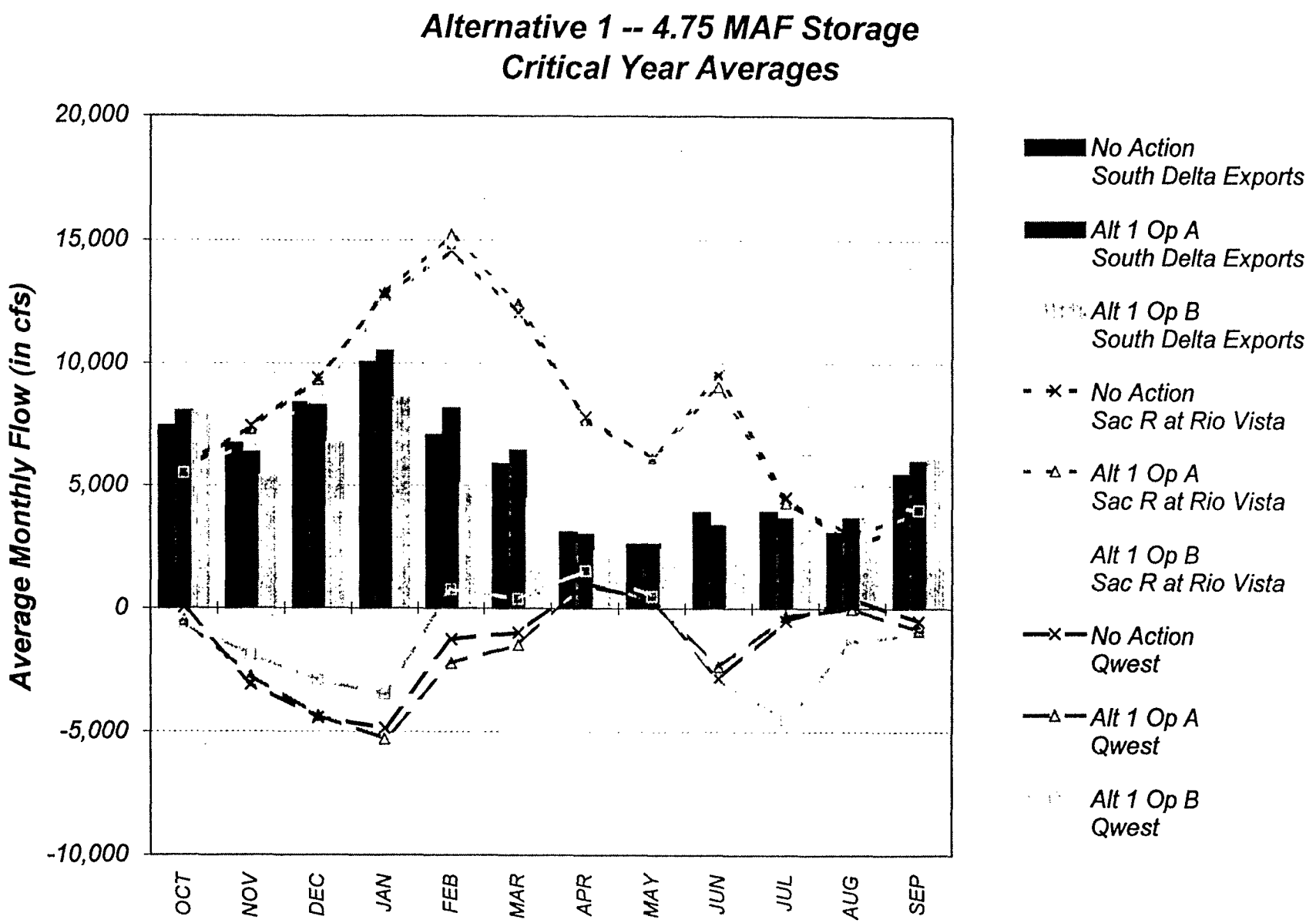
C-097207

Alternative 1 -- 4.75 MAF Storage
Dry Year Averages



C—097207

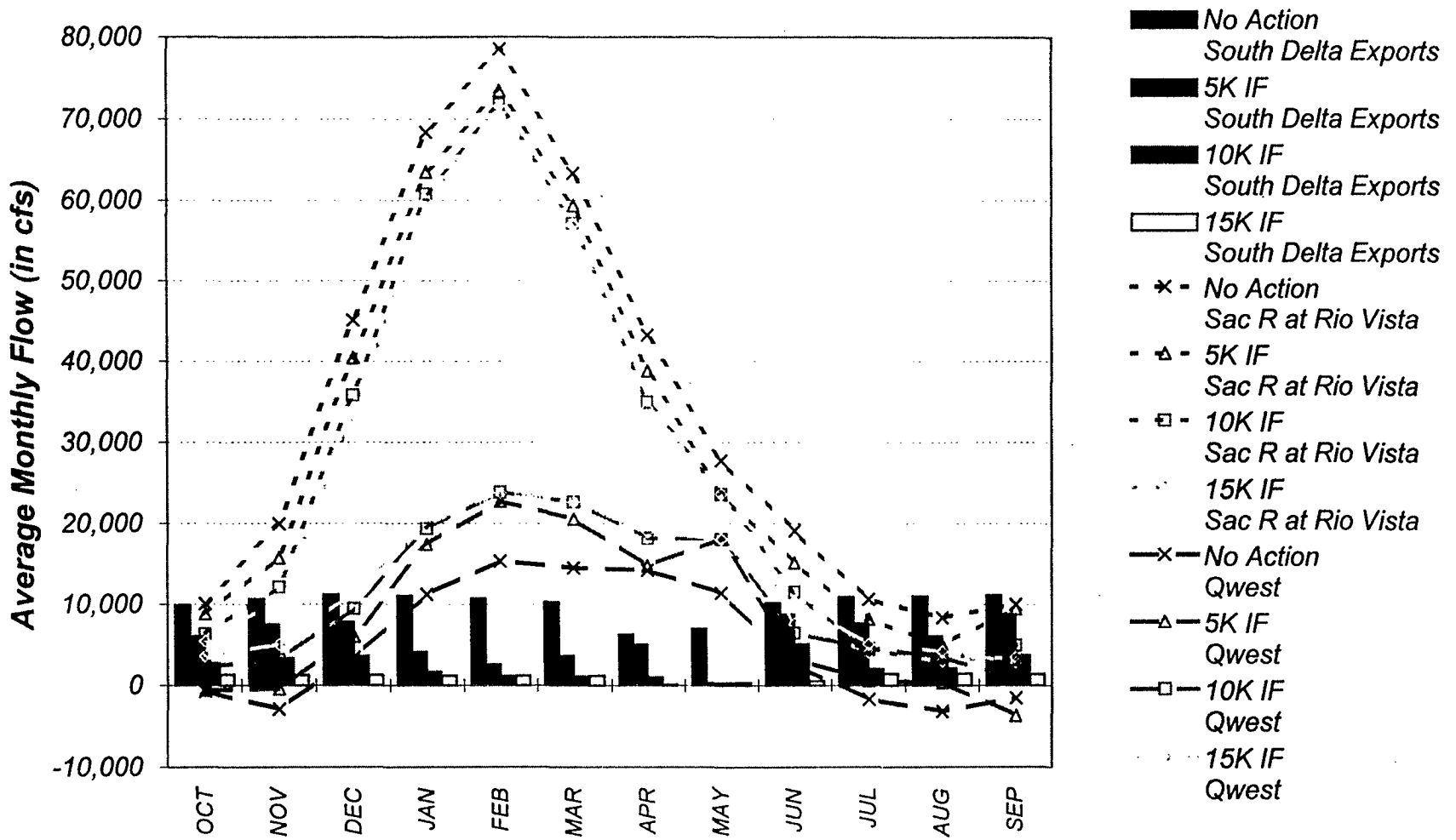
C-097208



C—097208

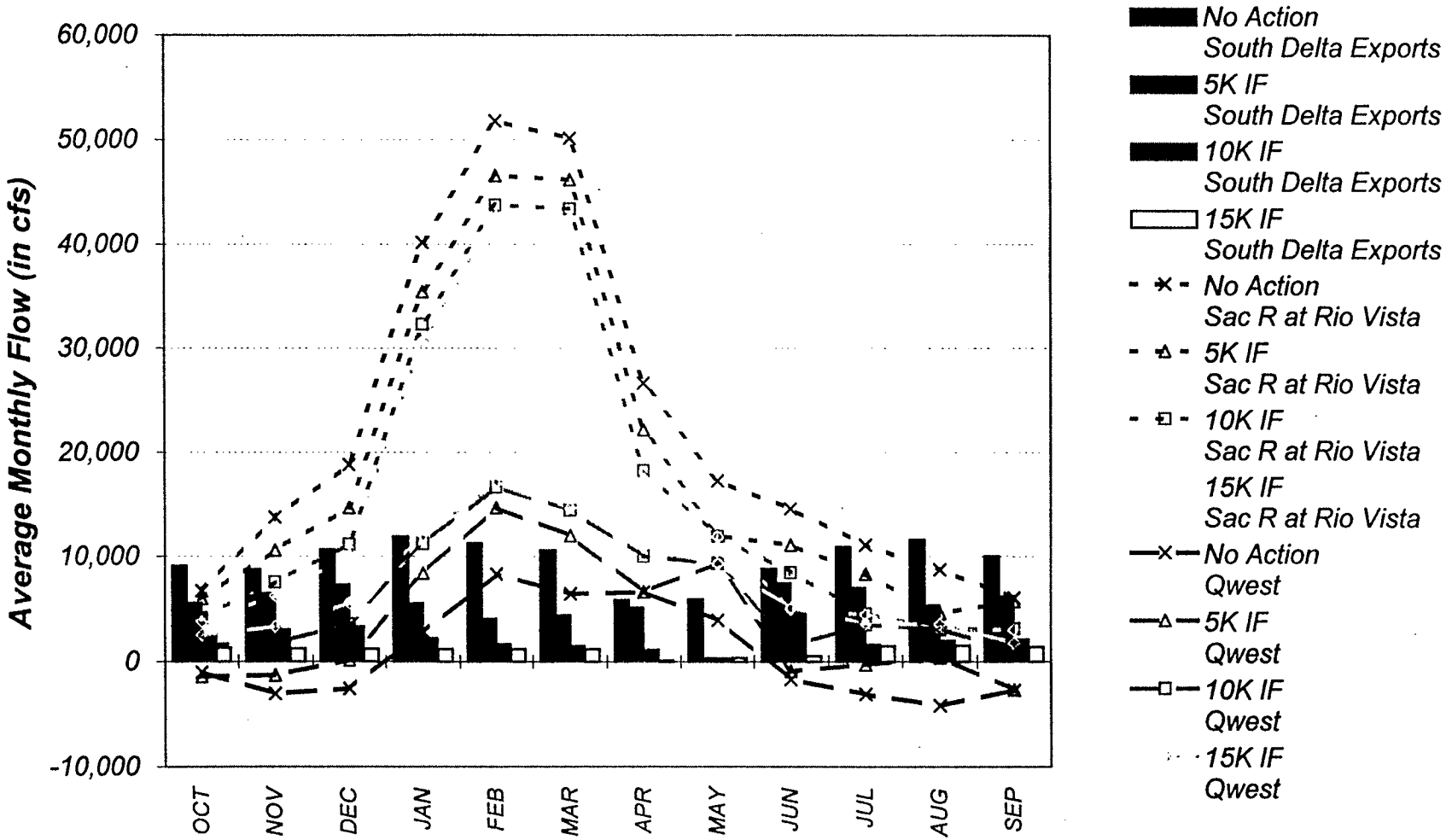
C-097209

Alternative 3 -- No Storage, Operations Criteria A
Wet Year Averages



C—097209

Alternative 3 -- No Storage, Operations Criteria A
Above Normal Year Averages

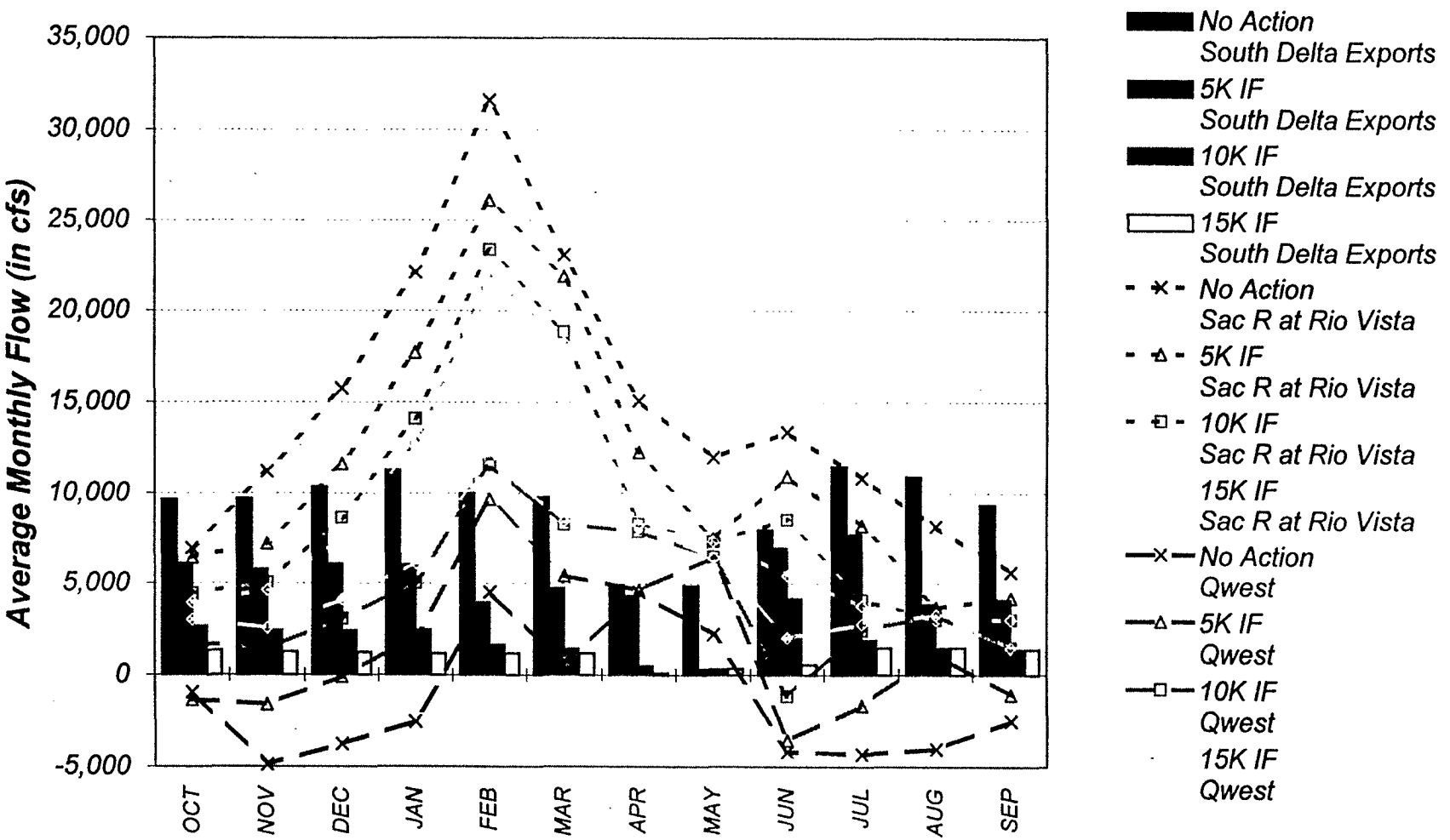


C-097210

C-097210

C-097211

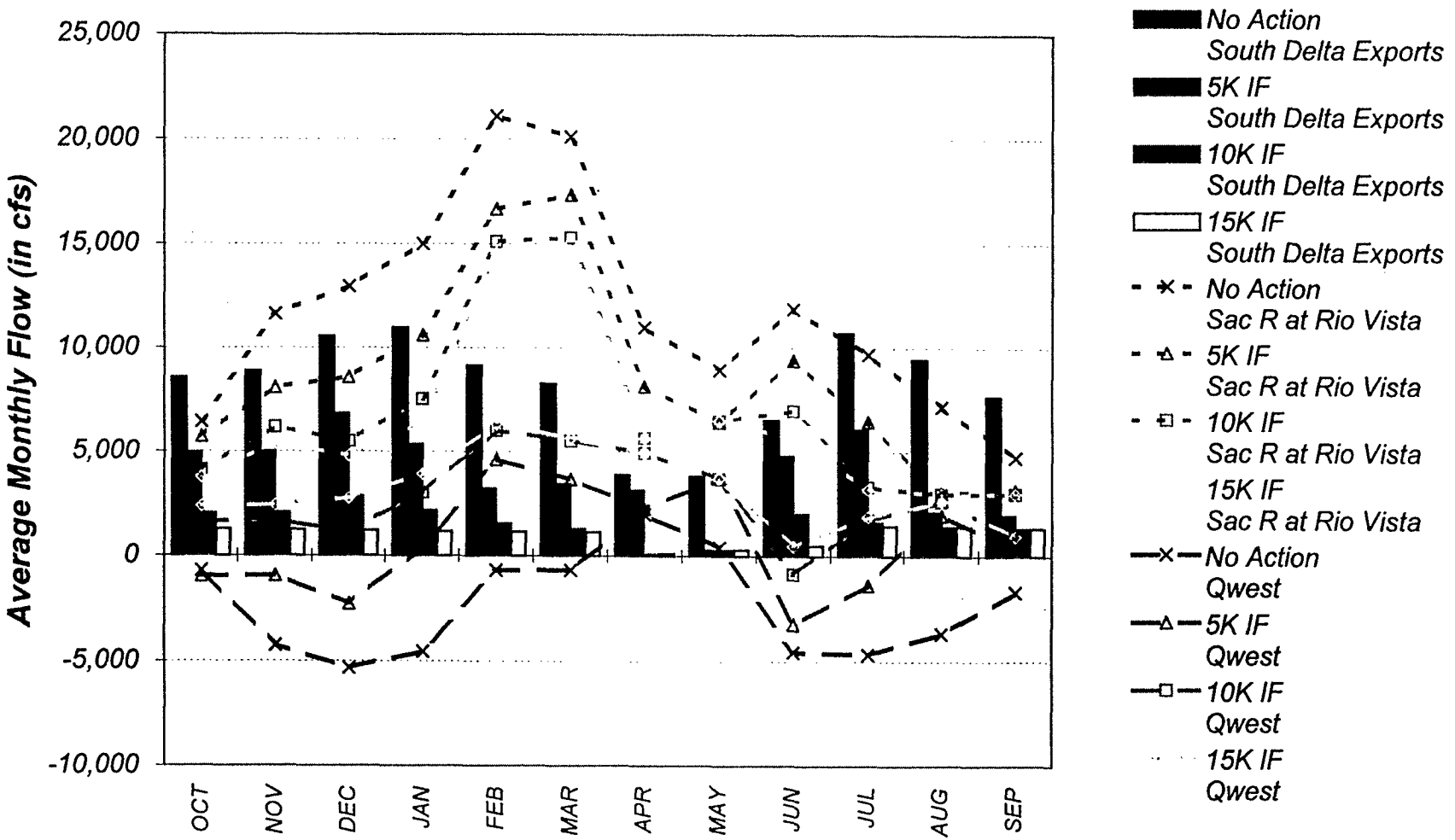
Alternative 3 -- No Storage, Operations Criteria A
Below Normal Year Averages



C-097211

C-097212

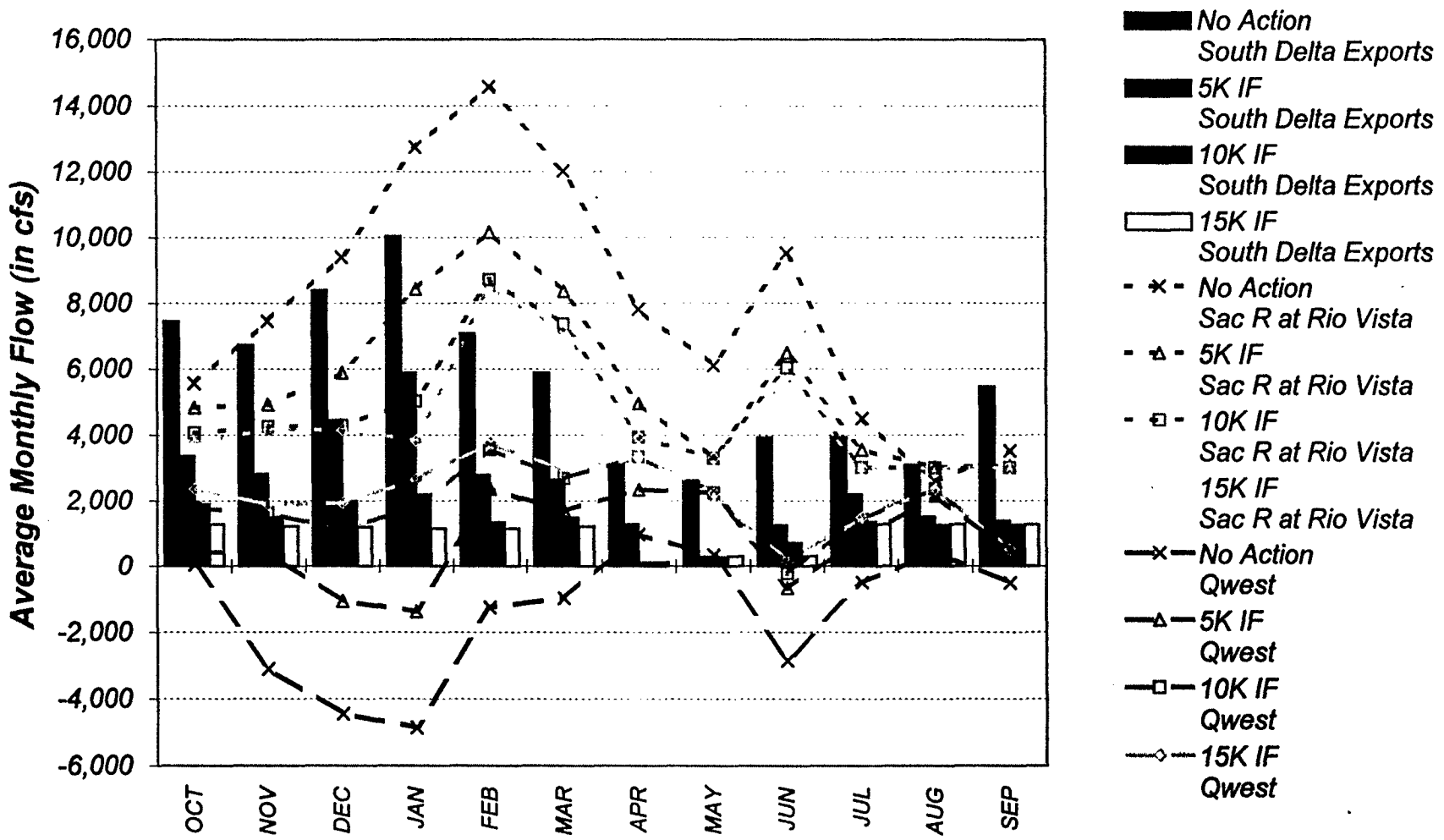
Alternative 3 -- No Storage, Operations Criteria A
Dry Year Averages



C—097212

C-097213

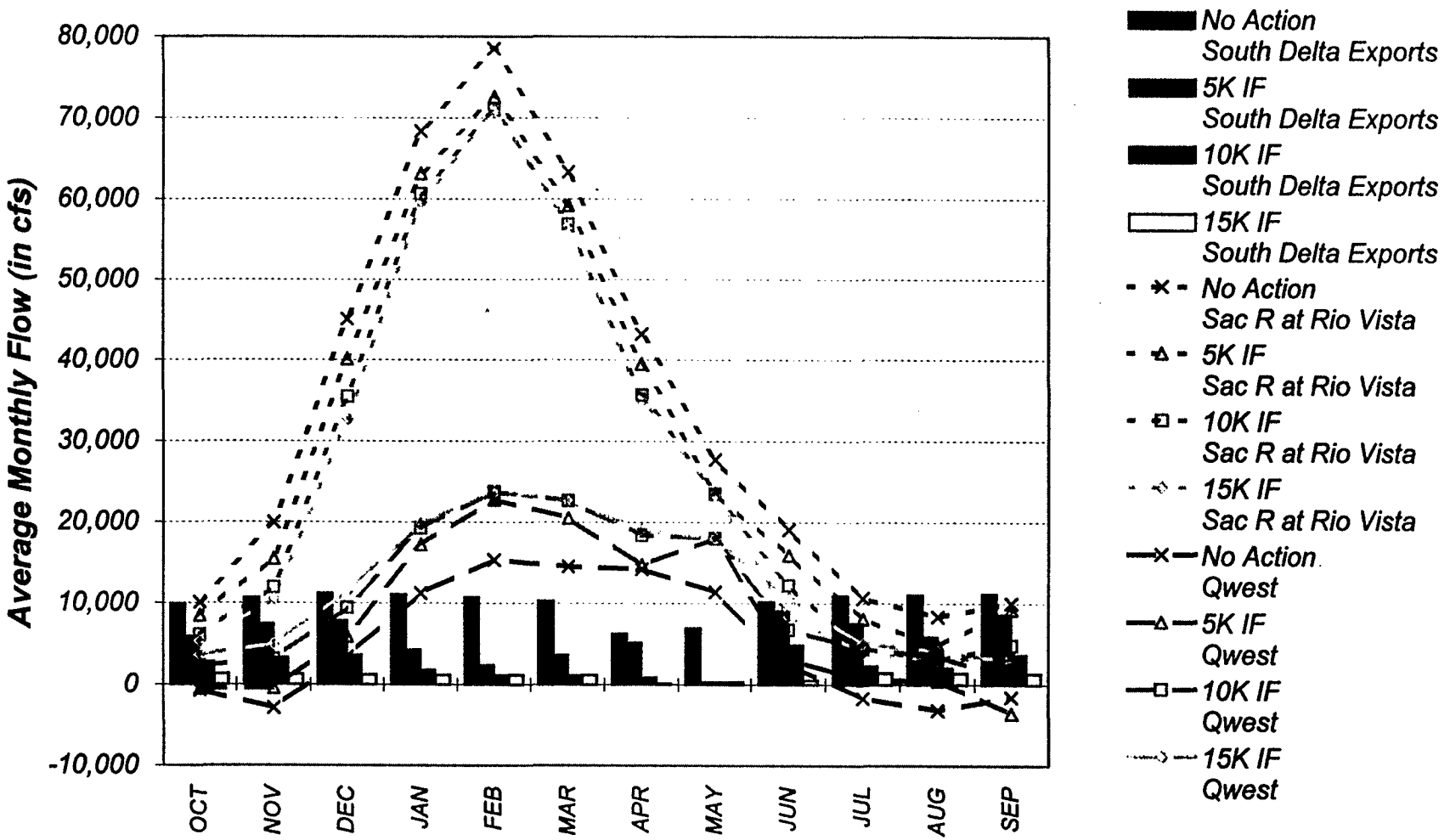
Alternative 3 -- No Storage, Operations Criteria A
Critical Year Averages



C—097213

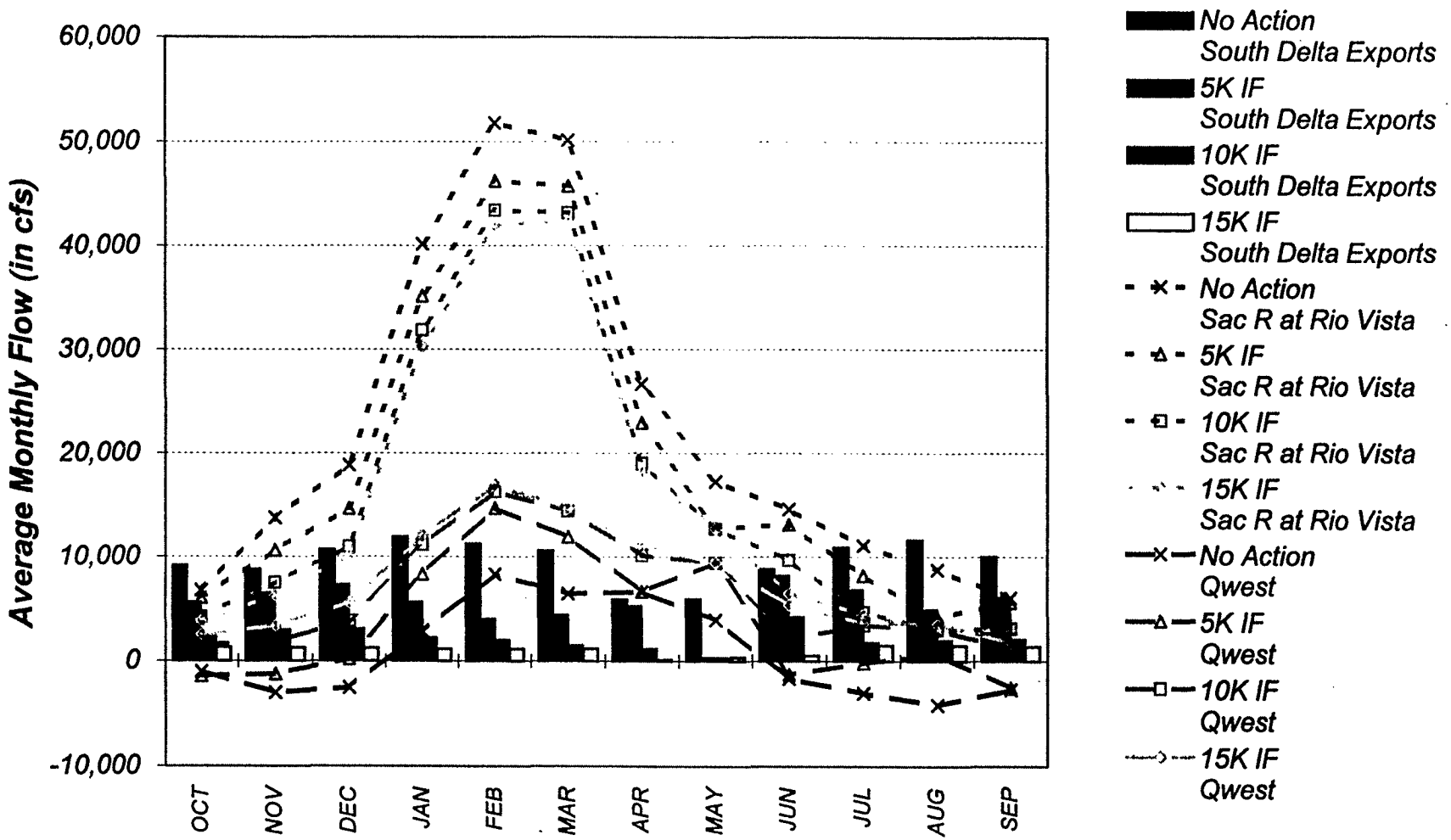
C-097214

Alternative 3 -- No Storage, Operations Criteria B
Wet Year Averages



C—097214

Alternative 3 -- No Storage, Operations Criteria B
Above Normal Year Averages

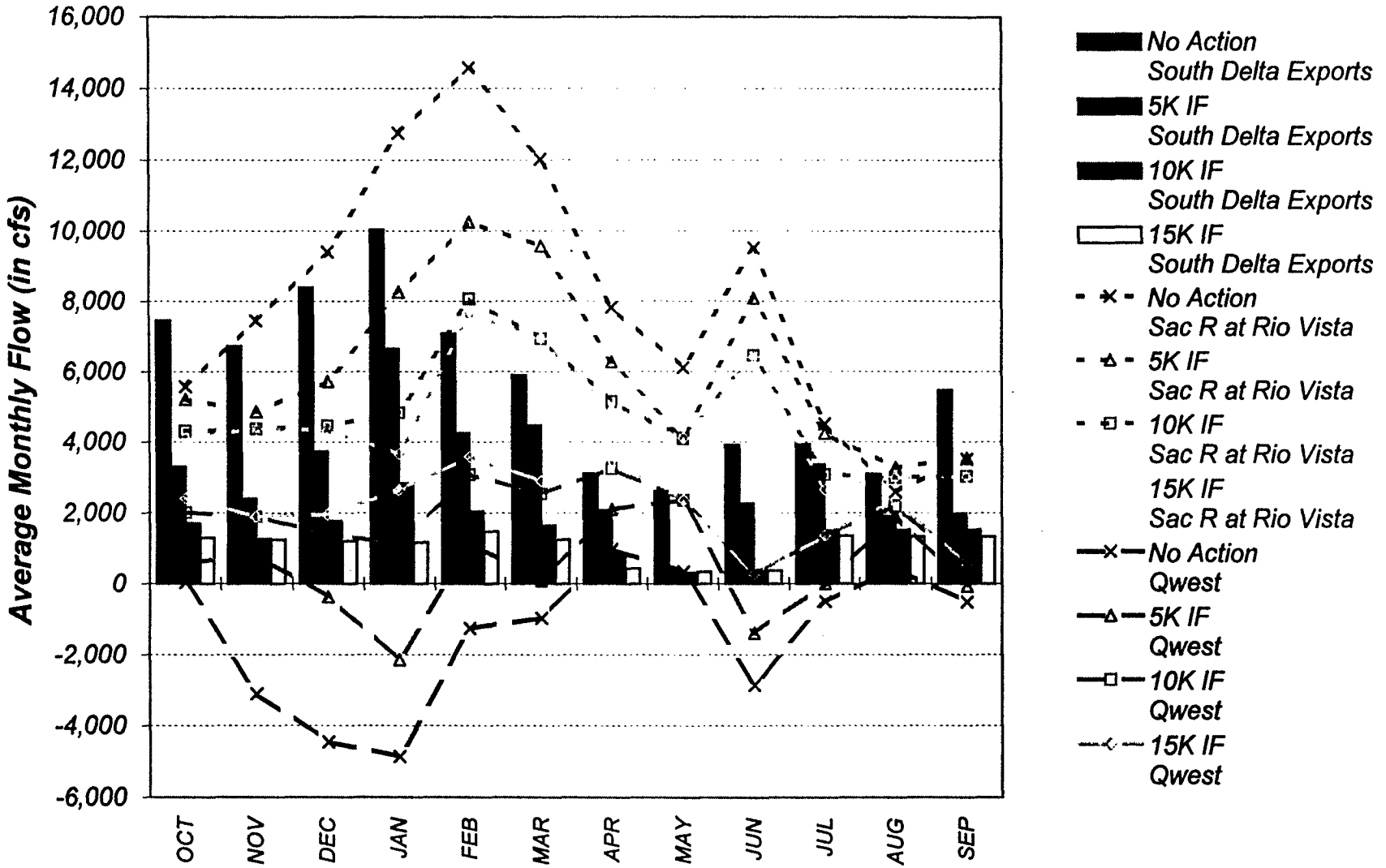


C-097215

C-097215

C-097216

Alternative 3 -- 4.95 MAF Storage, Operations Criteria B
Critical Year Averages



C-097216