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COMPARISON OF DWRSIM VERSUS THE HISTORICAL MEASURED INFLOW TO THE DELTA

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Model Description

The DWR planning simulation model DWRSIM is a computer planning model designed to simulate the operation of the CVP-SWP system of reservoirs, pumping plants and conveyance facilities on a monthly time basis. It operates to meet various operational objectives for purposes of water supply, recreation, flood control and instream flow objectives as well as various physical, institutional, and legal constraints.

The inflows to reservoirs and downstream tributary inflows for the model are based on the historical hydrology for the water years 1922-1991. The demands for water upstream of the Delta and in the Delta itself have been adjusted to reflect estimated current and/or future land use patterns. This adjustment to the historical water use is developed using the Department's Consumptive Use and Depletion Study models.

Operational constraints for system operations such as minimum instream flows, conformance to the CVP-SWP Coordinated Operations Agreement and Delta export limitations are established through a combination of data inputs and programming instructions. Operational constraints to meet water quality objectives are predetermined using a separate program called MDO or (minimum Delta outflow). In this program controlling water quality objectives must be converted to monthly flow requirements, including carriage water for project exports.

Model Verification

Strictly speaking, model verification of DWRSIM cannot be achieved. A DWRSIM model simulation has converted land use changes over time to reflect present levels of development. In addition, project operation of today's facilities which include reservoirs and pumping plants are necessarily different than historical operations and facilities. Nonetheless, we can compare historical Delta inflows to those generated by DWRSIM and address the differences.

Comparison of Historic verses DWRSIM

Figure 1 shows the estimated historical Sacramento and San Joaquin Valley agricultural and urban land use with time. Also shown are the horizontal lines which reflect the level of agricultural and urban land use assumed in DWR's latest hydrology (HYD-C-01).

Two important aspects should be noted. First, agricultural land use increased throughout the period until about 1980. Second, agricultural land use has leveled off during the 1980-90 decade. Thus, if we compare historical Delta inflows with a DWRSIM model run we would expect historic Delta inflows to be considerably greater starting in 1922 with differences diminishing through 1980. Figures 2A through 2G show the comparison of annual historical measured Delta inflows versus DWRSIM operations study 1995-BDHEAR-100a. As expected, historical Delta inflows are generally greater than DWRSIM in the early years and compare favorably in the later years.

Figure 2G shows the comparison during the last ten years where land use has remained fairly constant. When we make the assumption that this historical land use reflects the level of upstream development now used in DWRSIM we see that Delta inflows compare extremely well. Figure 3 shows how these inflows compare on an average monthly basis (1982-91). Finally, Figure 4 is a monthly time series comparison for the past ten years. Table 1 shows the numerical comparison between historical measured and DWRSIM Delta inflows from 1982 through 1991.

Conclusions

The fact that the historical measured Delta inflows and DWRSIM compare favorably for the past ten years is an indication of the model's accuracy. Small differences can be explained when differences in imports (Trinity River), reservoir operations, and land use assumptions are examined more closely.

The importance of these comparisons show that DWRSIM is not creating a significant positive or negative bias when simulating inflows to the Delta. Therefore, a 70 year DWRSIM model run provides a fairly accurate representation of water supply available to the Delta under present conditions and facilities assuming the 70 year period of hydrology 1922 through 1991 were to repeat. While this information gives more confidence than ever before concerning the "absolute accuracy" of a DWRSIM run, one should still keep in mind that the best use of DWRSIM is to compare results from two operations studies to analyze alternative operations constraints.

Figure 1
CENTRAL VALLEY FLOOR AREA LAND USE FOR HYD-C-01
(Excluding Tulare Basin)

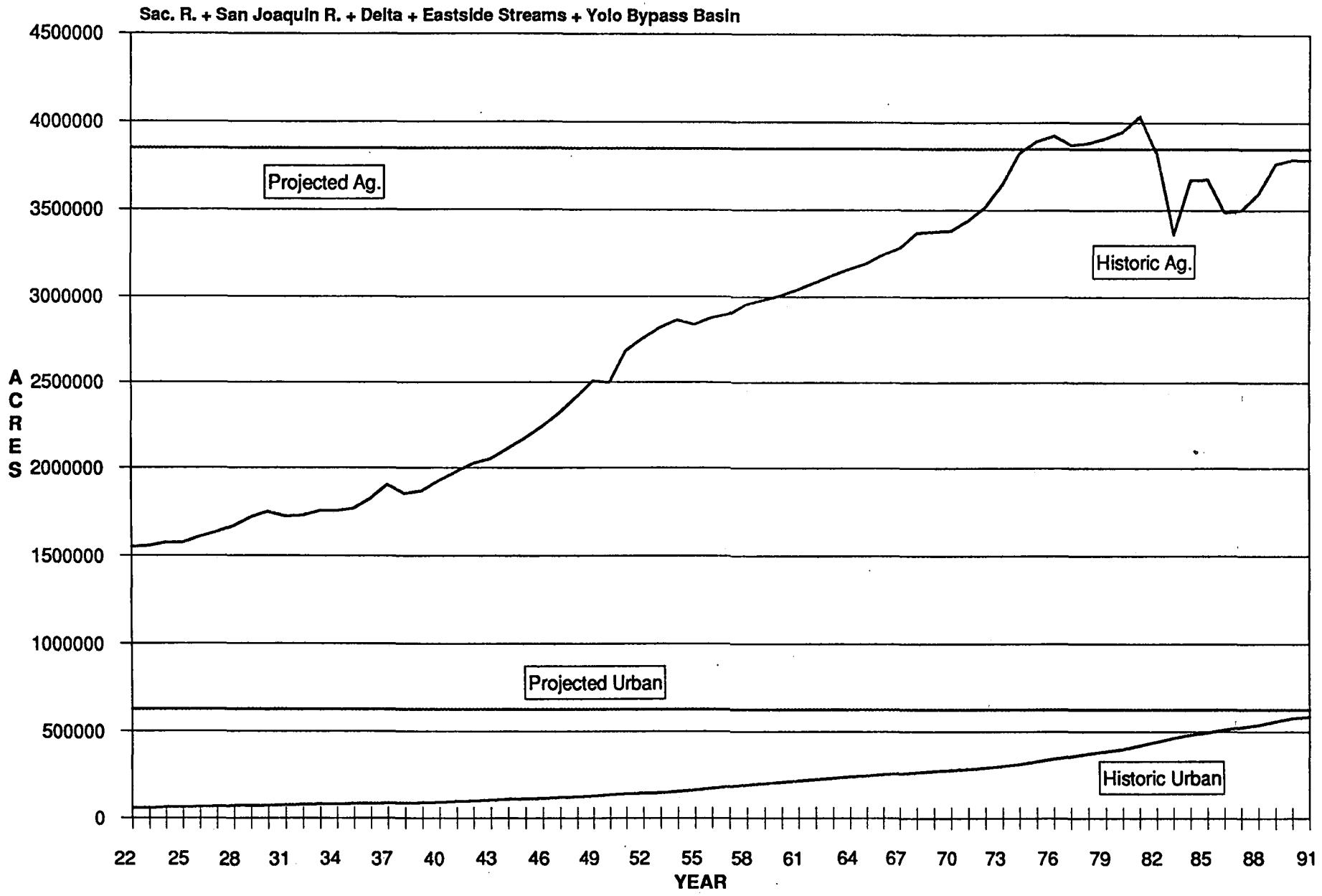
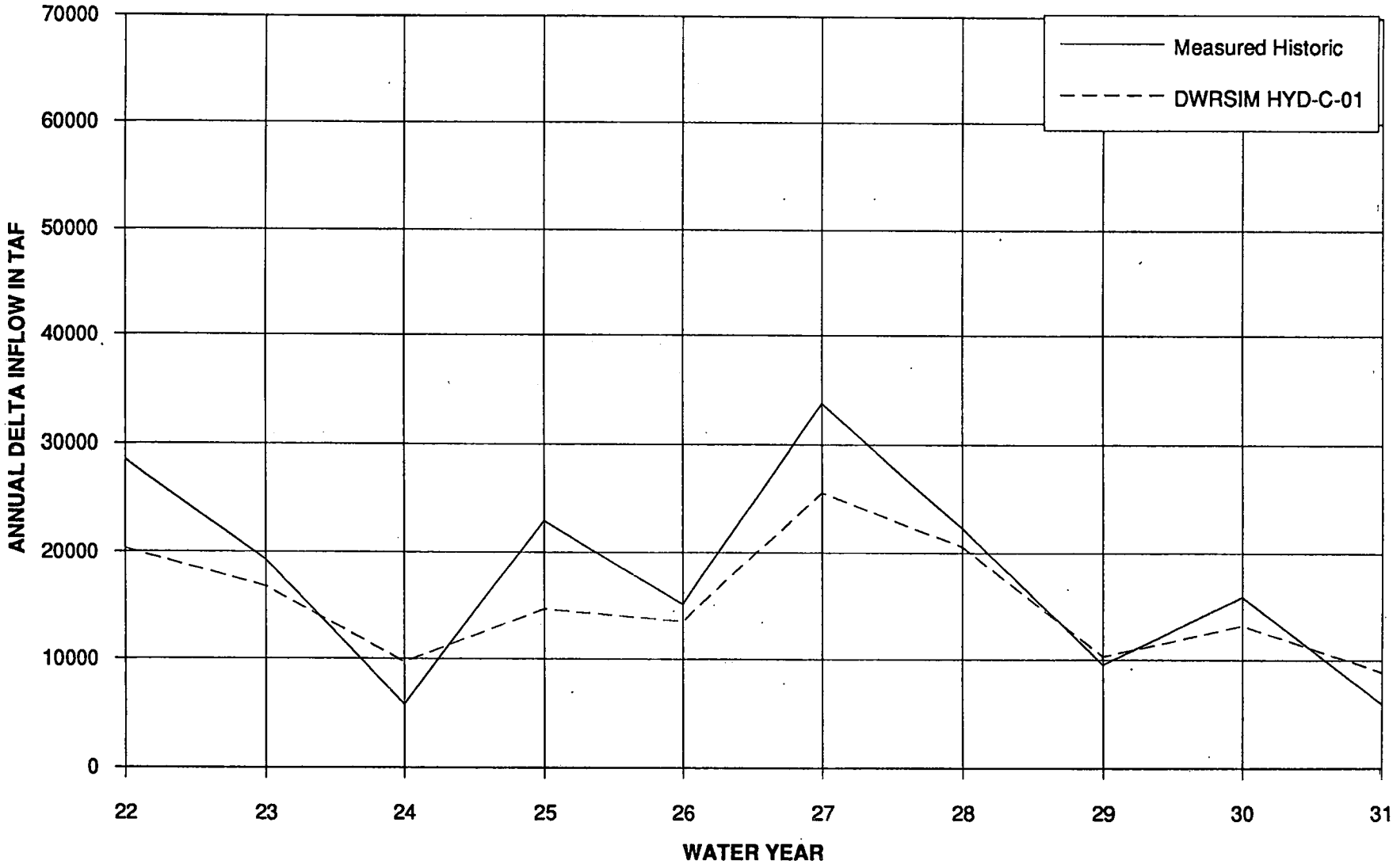
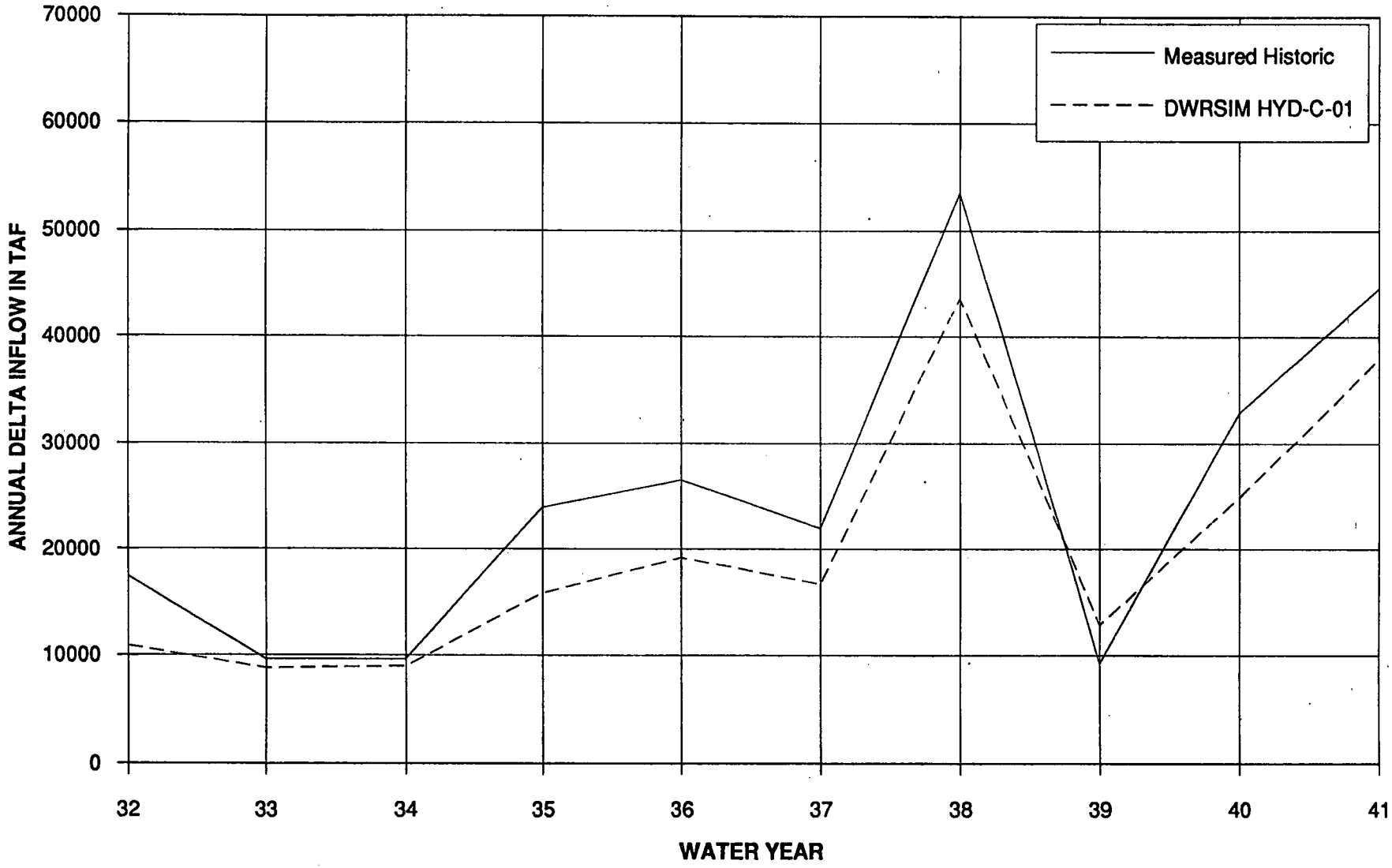


Figure 2A
ANNUAL DELTA INFLOW FOR 1922-1931
HISTORIC & DWRSIM



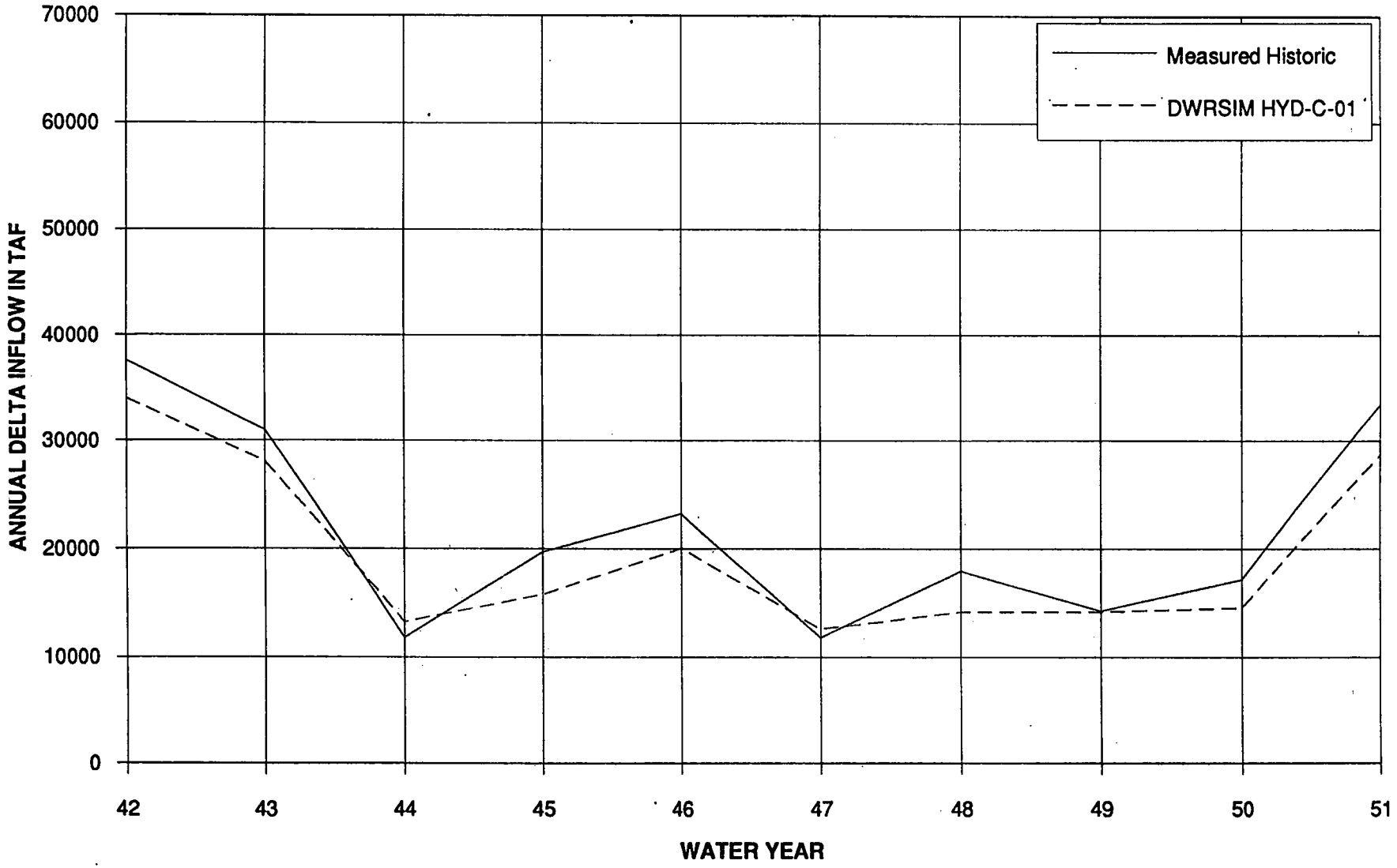
DWRSIM run: 1995-bdhear-100a using HYD-C-01

Figure 2B
ANNUAL DELTA INFLOW FOR 1932-1941
HISTORIC & DWRSIM



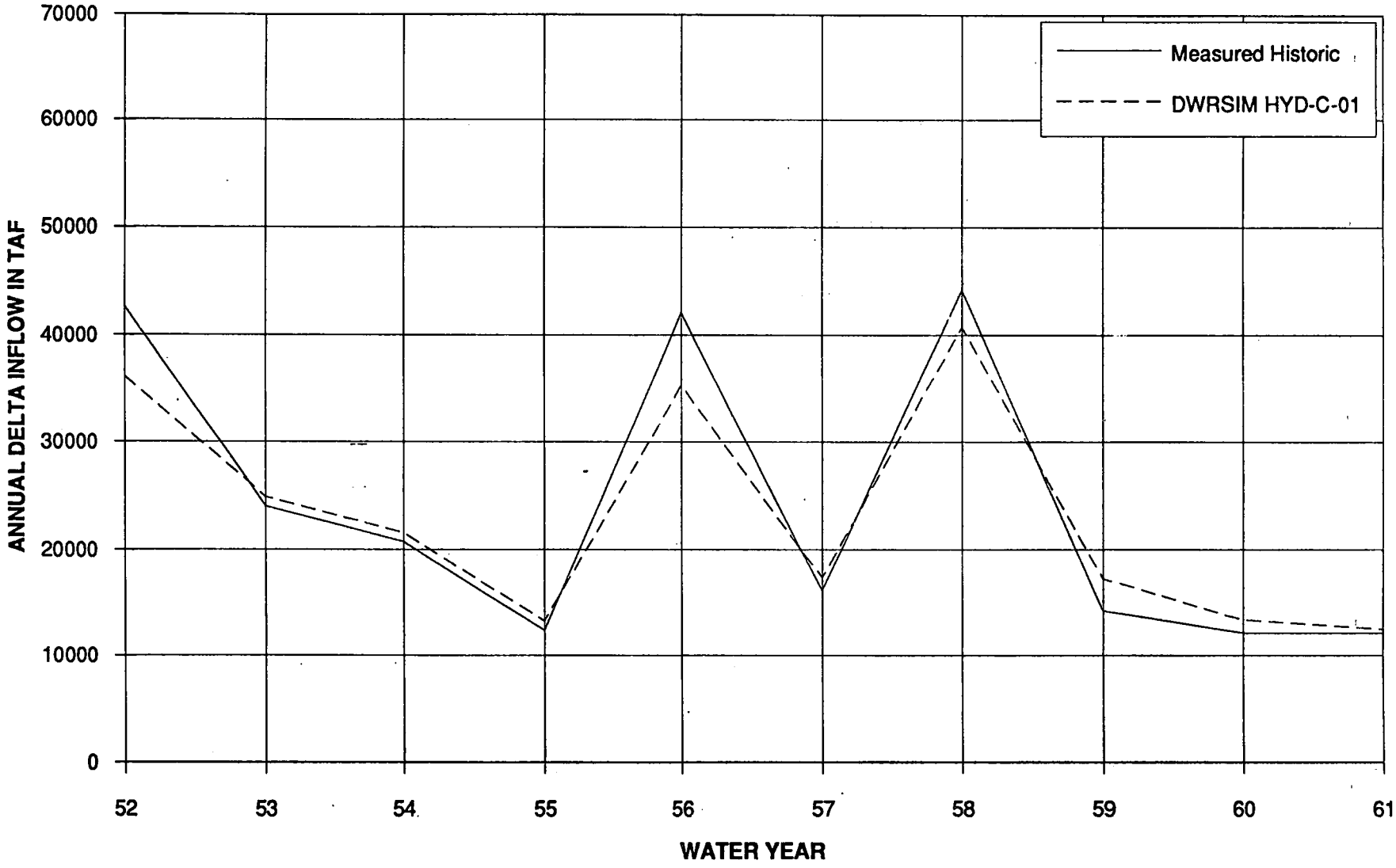
DWRSIM run: 1995-bdhear-100a using HYD-C-01

Figure 2C
ANNUAL DELTA INFLOW FOR 1942-1951
HISTORIC & DWRSIM



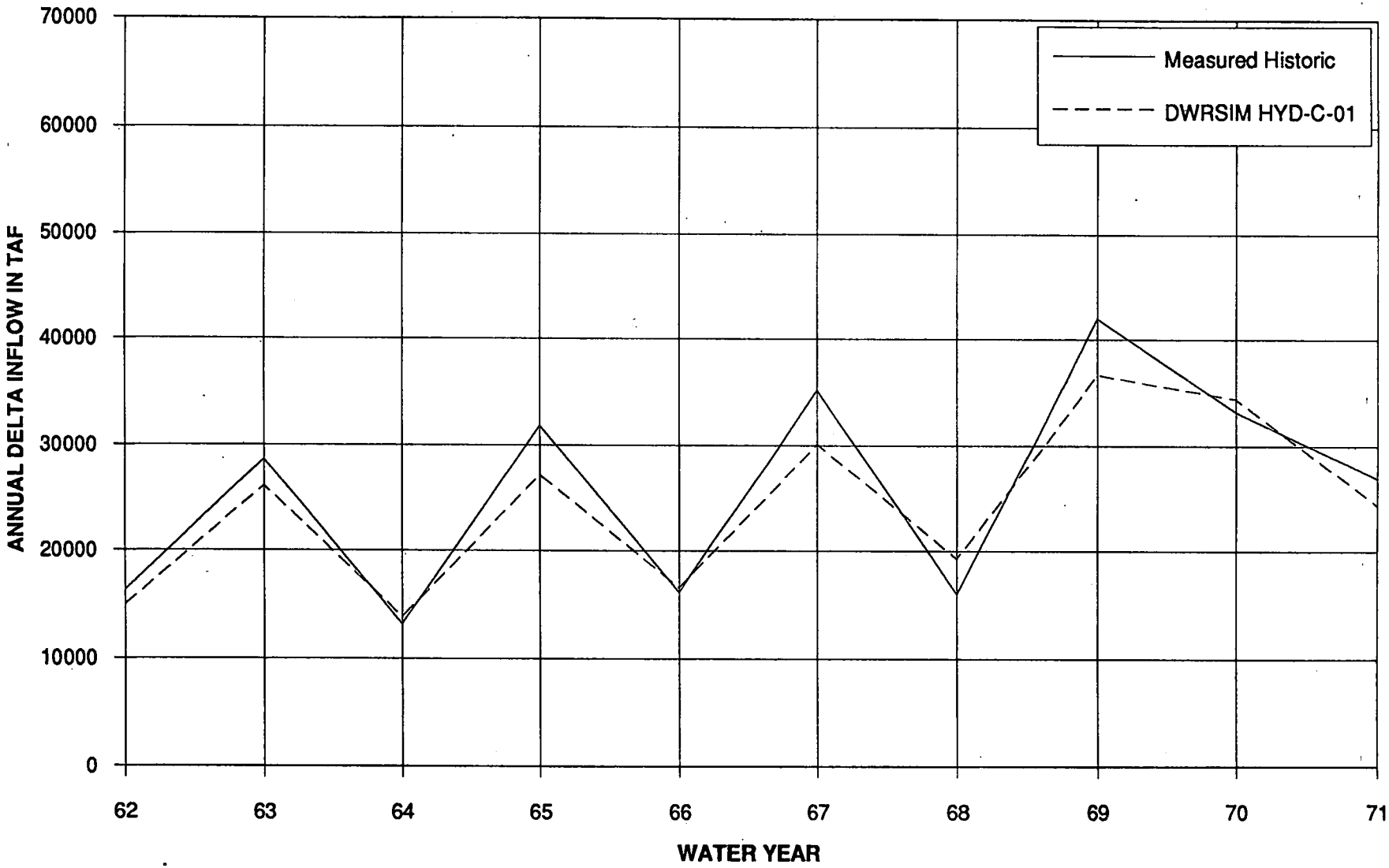
DWRSIM run: 1995-bdhear-100a using HYD-C-01

Figure 2D
ANNUAL DELTA INFLOW FOR 1952-1961
HISTORIC & DWRSIM



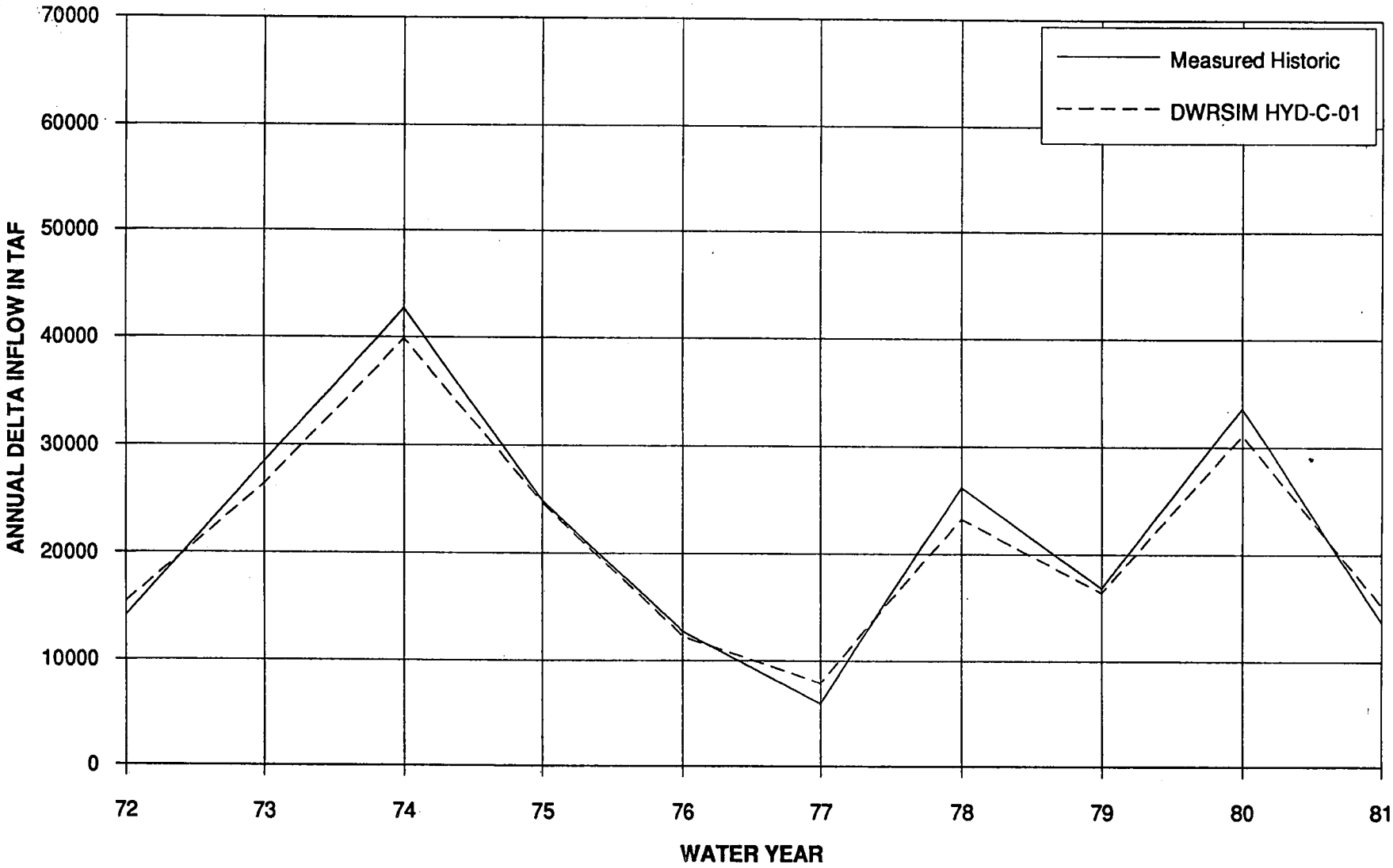
DWRSIM run: 1995-bdhear-100a using HYD-C-01

Figure 2E
ANNUAL DELTA INFLOW FOR 1962-1971
HISTORIC & DWRSIM



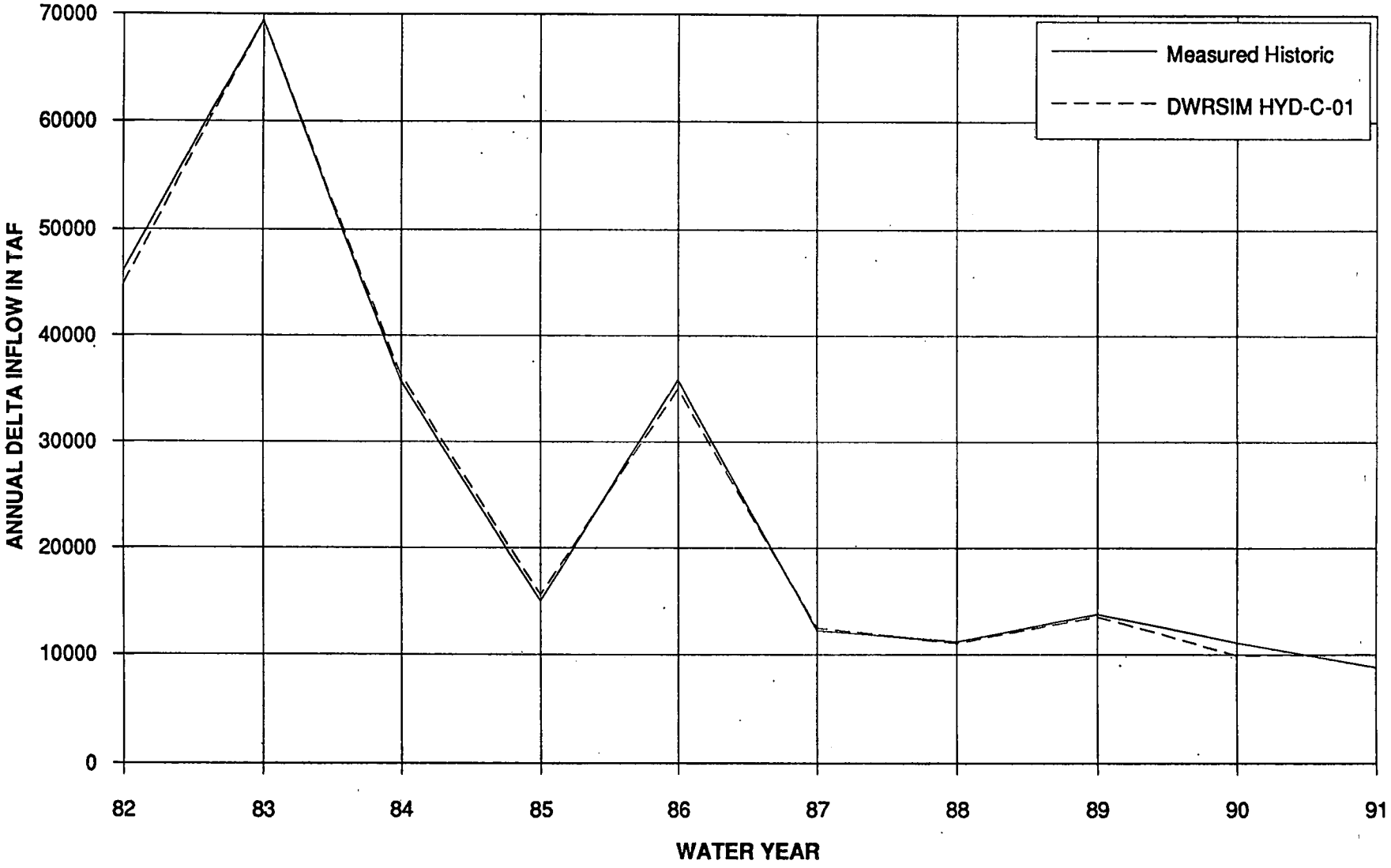
DWRSIM run: 1995-bdhear-100a using HYD-C-01

Figure 2F
ANNUAL DELTA INFLOW FOR 1972-1981
HISTORIC & DWRSIM



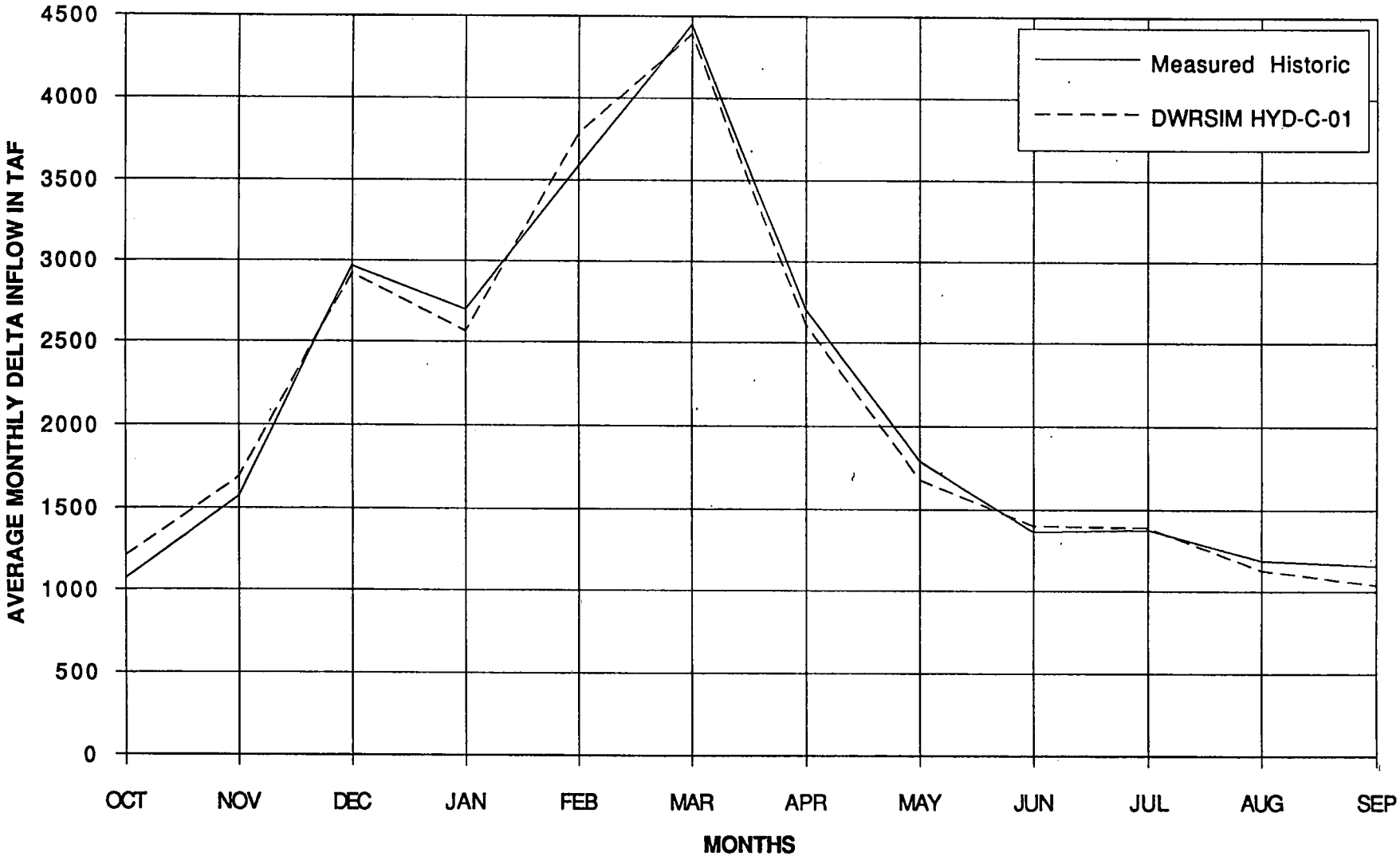
DWRSIM run: 1995-bdhear-100a using HYD-C-01

Figure 2G
ANNUAL DELTA INFLOW FOR 1982-1991
HISTORIC & DWRSIM



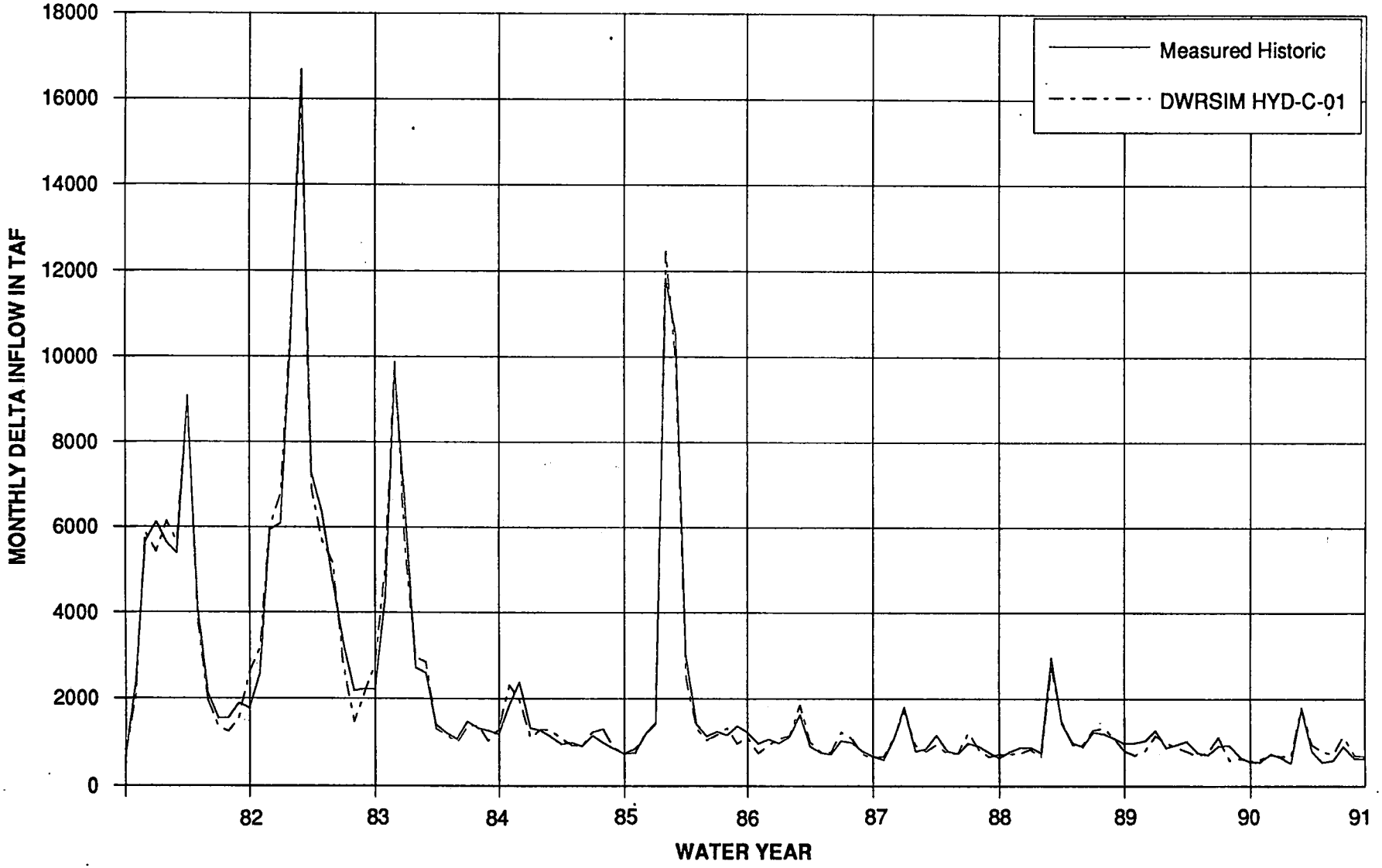
DWRSIM run: 1995-bdhear-100a using HYD-C-01

Figure 3
AVERAGE MONTHLY DELTA INFLOW FOR 1982-1991
HISTORIC & DWRSIM



DWRSIM run 1995-bdhear-100a using HYD-C-01

Figure 4
MONTHLY DELTA INFLOW FOR 1982-1991
HISTORIC & DWRSIM



DWRSIM run: 1995-bdhear-100a using HYD-C-01

Table 1
Annual Delta Inflow for 1982-1991
Historic and DWRSIM

	MEASURED	DWRSIM
YEAR	HISTORIC	HYD-C-01
1982	46086	44944
1983	69452	69448
1984	35708	36308
1985	14989	15554
1986	35866	35201
1987	12251	12433
1988	11234	10979
1989	13767	13535
1990	11114	10592
1991	8871	10219
AVERAGE	25934	25921

DWRSIM run: 1995-bdhear-100a using HYD-C-01