Appendix B

DO Model Inputs, Calibration, Validation and Alternatives

Dams	KM		miles
DAM 1 (OLD MEADOWS GOLF COURSE DAM)	36.9	0.0	22.913
DAM 1 (OLD MEADOWS GOLF COURSE DAM)	36.9	100.0	22.913
DAM 2 (OLD OAK BROOK DAM)	20.0	0.0	12.427
DAM 2 (OLD OAK BROOK DAM)	20.0	100.0	12.427
DAM 3 (FLLERSBURG WOODS DAM)	17.2	0.0	10.7
DAM 3 (FLLERSBURG WOODS DAM)	17.2	100.0	10.7

Reach Label	Distance (km)	Elevation (m)
EGAN - SPR BK	41.8	203.6
SPR BRK - ADD N	37.3	202.7
IMPOUNDMENT - DAM 1	36.9	201.9
DAM 1 (OLD MEADOWS GOLF COURSE DAM)	36.9	201.8
SPR BRK - LAKE ST	34.9	200.3
LAKE ST - ADD S	34.0	199.5
ADD S - ST CHAR	29.1	198.6
CSO REACH	28.0	198.3
STEEP REACH	26.9	197.3
FLAT REACH - POOL	24.3	196.8
POOL - RT 88	23.2	196.6
RT 88 - 31ST	20.6	196.4
31ST - FULL PARK 1	20.1	196.8
DAM 2 (OLD OAK BROOK DAM)	20.0	196.8
31ST - FULL PARK 2	17.9	194.5
IMPOUNDMENT - DAM 3	17.3	194.3
DAM 3 (FLLERSBURG WOODS DAM)	17.2	194.2
DWN FR FULL PARK	10.8	190.9
TO CONF ADD CR	5.1	188.0
TO CONF DES PLA	0	187.1014383

Location	RM	km	Min	Max	minus	plus	Average	Min	Max	minus	plus	Average	
			July					August					
Busse Lake Dam	29.66	47.73314304											
JFK Blvd	28.68	46.15598592	21.92	24.56	1.35	1.29	23.27	22.84	25.85	1.13	1.88	23.97	26.97
Thorndale Ave	26.95	43.3718208	22.45	25.64	1.52	1.67	23.97	22.76	25.82	1.52	1.54	24.28	27.28
Butterfield Rd	16.13	25.95871872											
Footbridge Fullersburg Woods	11.15	17.9441856											
York Rd	10.6	17.0590464											
Wolf Rd	8.11	13.05177984	23.65	28.26	2.43	2.19	26.08	22.50	27.66	2.57	2.59	25.07	28.07

QUAL2K

Stream Water Quality Model

Salt Creek (8/15/2006)

Point Source Data:

= modified for Monthly Average of June 2005 DMR Condition

Name	Location km	Point Inflow m3/s	Temperature mean °C	nic Suspended mean mg/L	ssolved Oxyge mean mg/L	Fast CBOD mean mgO2/L	Organic N mean ugN/L	Ammonia N mean ugN/L	itrate + Nitrite mean ugN/L	Organic P mean ugP/L	Inorganic P mean ugP/L	pH mean s.u.
Egan	47.56	0.9031	25.20	2.09	7.20	4.10	1560.00	147.73	18710.00	600.00	3400.00	7.00
Nordic Park	3.70	0.0110	25.20	0.30	7.20	1.91	960.00	100.00	14400.00	440.00	2460.00	7.39
Itasca	0.16	0.0632	25.20	5.47	6.63	6.00	1640.00	201.33	24800.00	510.00	2890.00	6.90
Wood Dale N	40.67	0.0593	25.20	5.00	6.60	16.00	1800.00	380.00	13900.00	480.00	2720.00	6.70
Wood Dale S	38.14	0.0202	25.20	2.00	8.27	10.00	1150.00	250.00	22300.00	400.00	2210.00	6.83
Addision N	36.45	0.1244	25.20	5.34	7.20	4.50	1550.00	61.22	16700.00	460.00	2590.00	7.01
Addision S	33.88	0.0583	25.20	8.22	7.20	5.95	1420.00	136.75	12400.00	470.00	2630.00	7.26
SC SD	28.65	0.1062	25.20	3.46	7.20	10.06	1200.00	850.08	20400.00	820.00	4680.00	7.08
Elmhurst	28.21	0.2236	25.20	3.00	7.11	6.48	1310.00	383.22	17900.00	630.00	3570.00	7.17

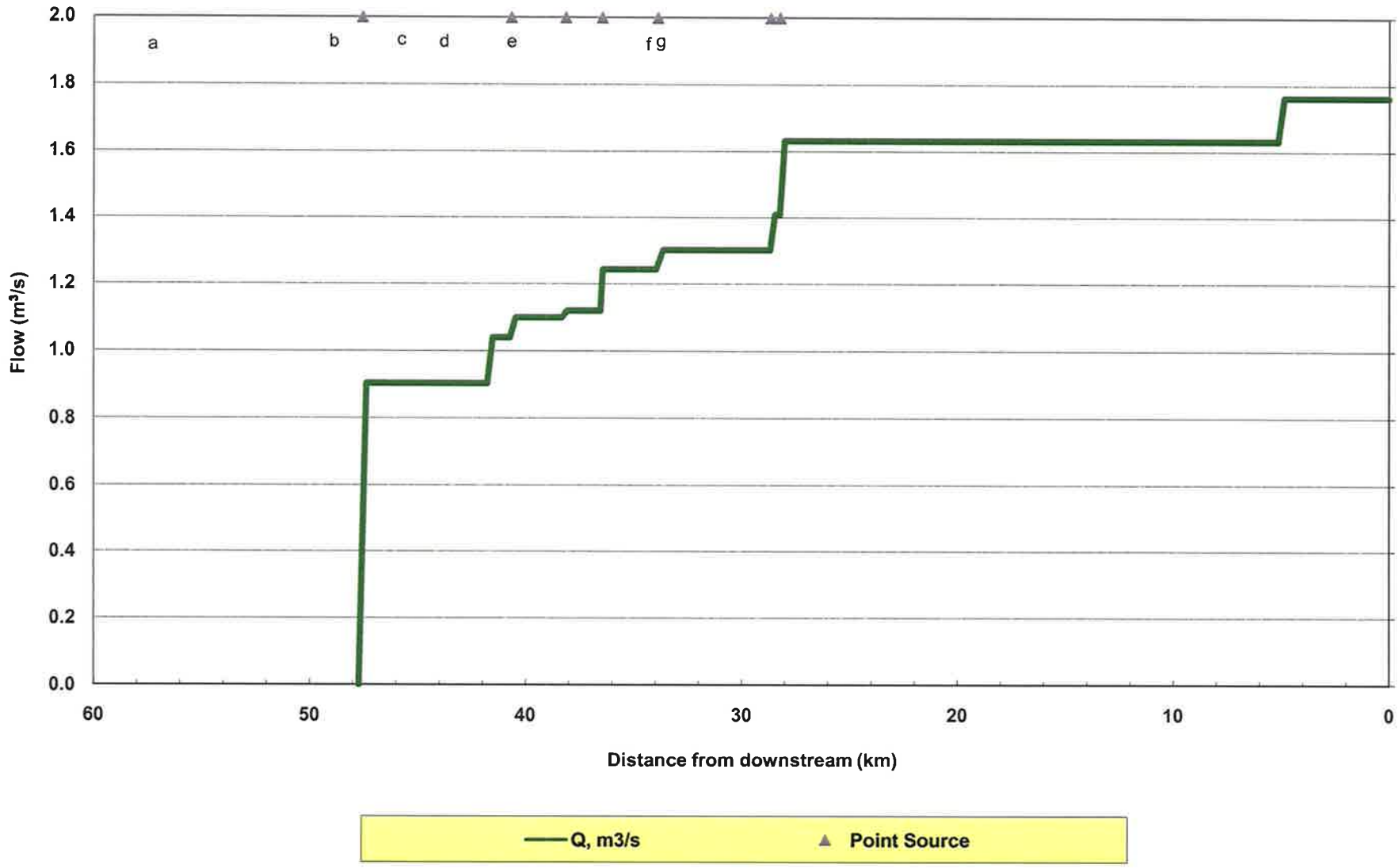
QUAL2K
Stream Water Quality Model
Salt Creek (8/15/2006)
Diffuse Source Data:

* The headwater of the mainstem (or tributary) where the diffuse source enters.

			Location		Diffuse	Diffuse		Spec	Inorg	Diss			
	Headwater	Headwater	Up	Down	Abstraction	Inflow	Temp	Cond	SS	Oxygen		Alk	pH
Name	ID*	Name	km	km	m3/s	m3/s	C	umhos	mgD/L	mg/L	kg/day	mgCaCO3/L	
IMPOUNDMENT - DAM 1	1	Mainstem headwater	37.30	37.23		0.0003	27.20			1167.78	33.63	100.00	7.00
IMPOUNDMENT - DAM 1	1	Mainstem headwater	37.23	37.15		0.0003	27.20			1209.31	34.83	100.00	7.00
IMPOUNDMENT - DAM 1	1	Mainstem headwater	37.15	37.00		0.0003	27.20			1279.88	36.86	100.00	7.00
DAM 1	1	Mainstem headwater	37.00	36.90		0.0003	27.20			1806.24	52.02	100.00	7.00
Total 1						0.001					157.34		
31ST - FULL PARK 3	1	Mainstem headwater	20.05	19.91		0.0002	27.30			648.85	11.21	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	19.91	19.73		0.0002	27.30			831.35	14.37	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	19.73	19.55		0.0002	27.30			831.35	14.37	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	19.55	19.38		0.0002	27.30			831.36	14.37	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	19.38	19.20		0.0002	27.30			831.40	14.37	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	19.20	19.02		0.0002	27.30			300.33	5.19	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	19.02	18.84		0.0002	27.30			400.58	6.92	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	18.84	18.66		0.0002	27.30			496.85	8.59	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	18.66	18.48		0.0002	27.30			587.87	10.16	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	18.48	18.31		0.0002	27.30			672.27	11.62	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	18.31	18.13		0.0002	27.30			751.38	12.98	100.00	7.00
31ST - FULL PARK 3	1	Mainstem headwater	18.13	17.95		0.0002	27.30			856.91	14.81	100.00	7.00
IMPOUNDMENT1 - DAM 3	1	Mainstem headwater	17.95	17.82		0.0002	27.30			732.65	12.66	100.00	7.00
IMPOUNDMENT1 - DAM 3	1	Mainstem headwater	17.82	17.74		0.0002	27.30			1219.27	21.07	100.00	7.00
IMPOUNDMENT2 - DAM 3	1	Mainstem headwater	17.74	17.65		0.0002	27.30			1434.02	24.78	100.00	7.00
IMPOUNDMENT2 - DAM 3	1	Mainstem headwater	17.65	17.56		0.0002	27.30			1621.07	28.01	100.00	7.00
IMPOUNDMENT2 - DAM 3	1	Mainstem headwater	17.56	17.46		0.0002	27.30			1830.73	31.64	100.00	7.00
IMPOUNDMENT2 - DAM 3	1	Mainstem headwater	17.46	17.30		0.0002	27.30			1715.98	29.65	100.00	7.00
DAM 3	1	Mainstem headwater	17.30	17.20		0.0002	27.30			1591.07	27.49	100.00	7.00
Total 3						0.004					314.24		

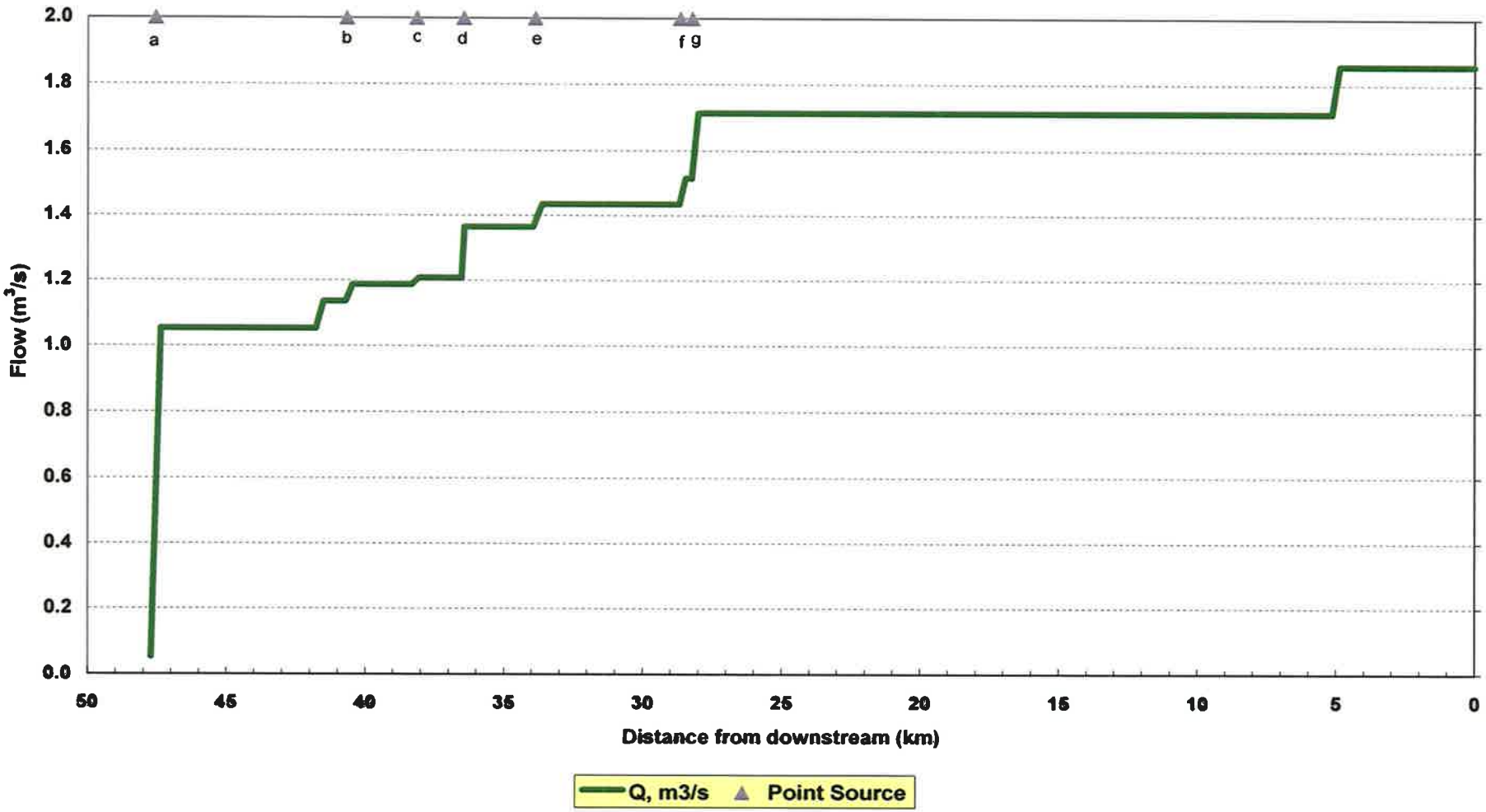
Salt Creek (8/15/2006) Mainstem

All Dams Removed



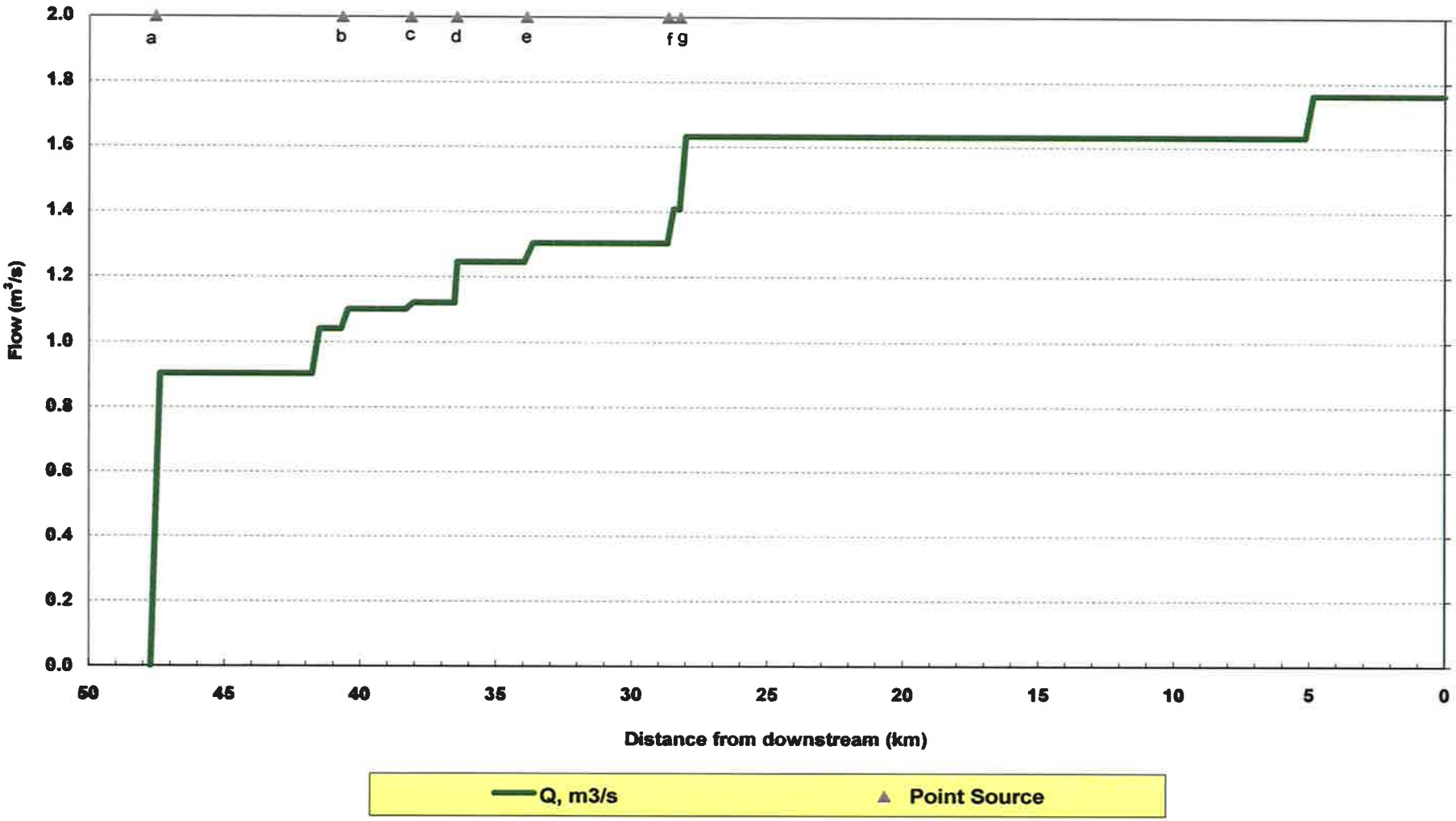
Salt Creek (8/2/2007) Mainstem

Model Predicted Flow: 2007 Calibration Run



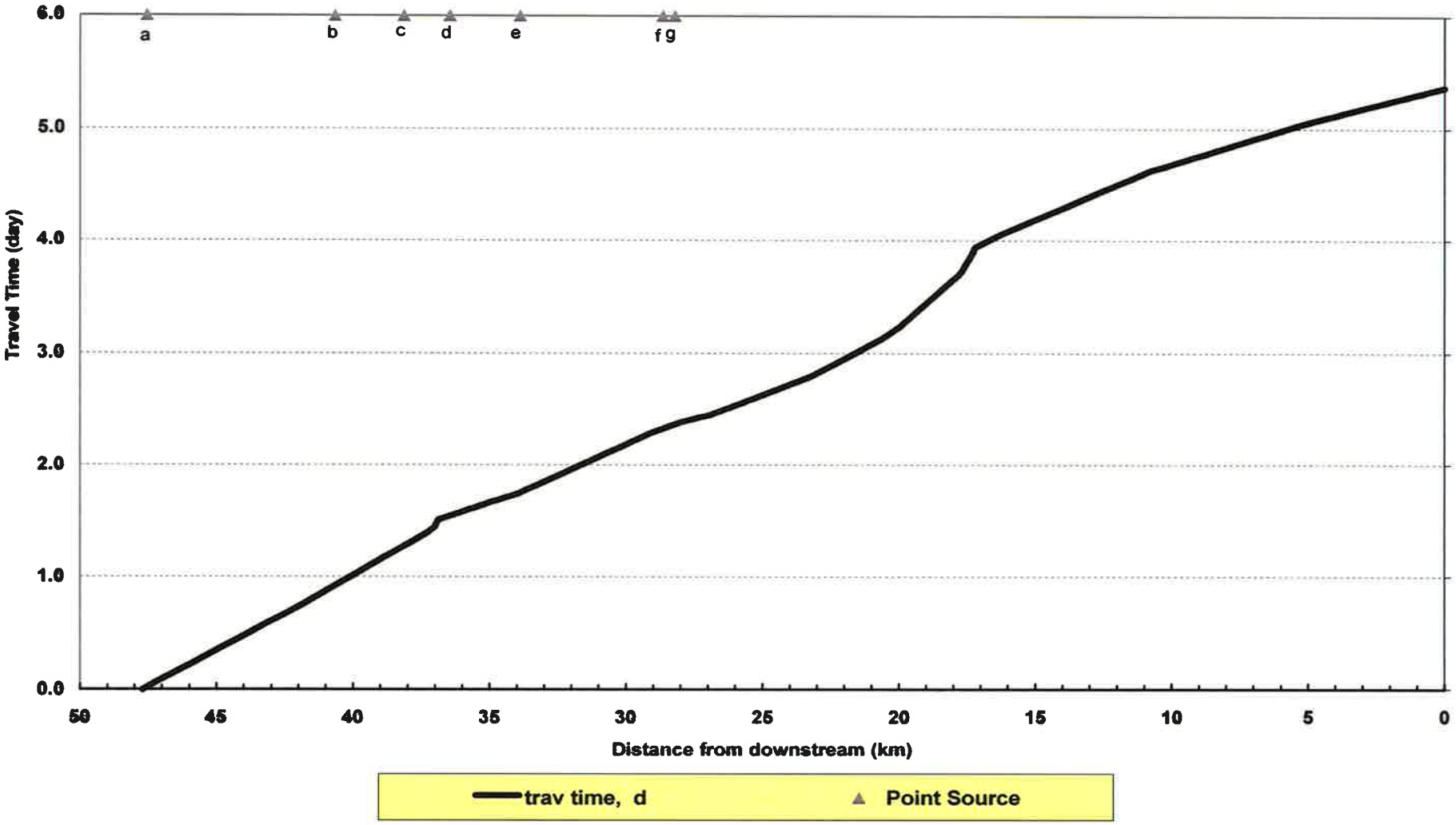
Salt Creek Mainstem

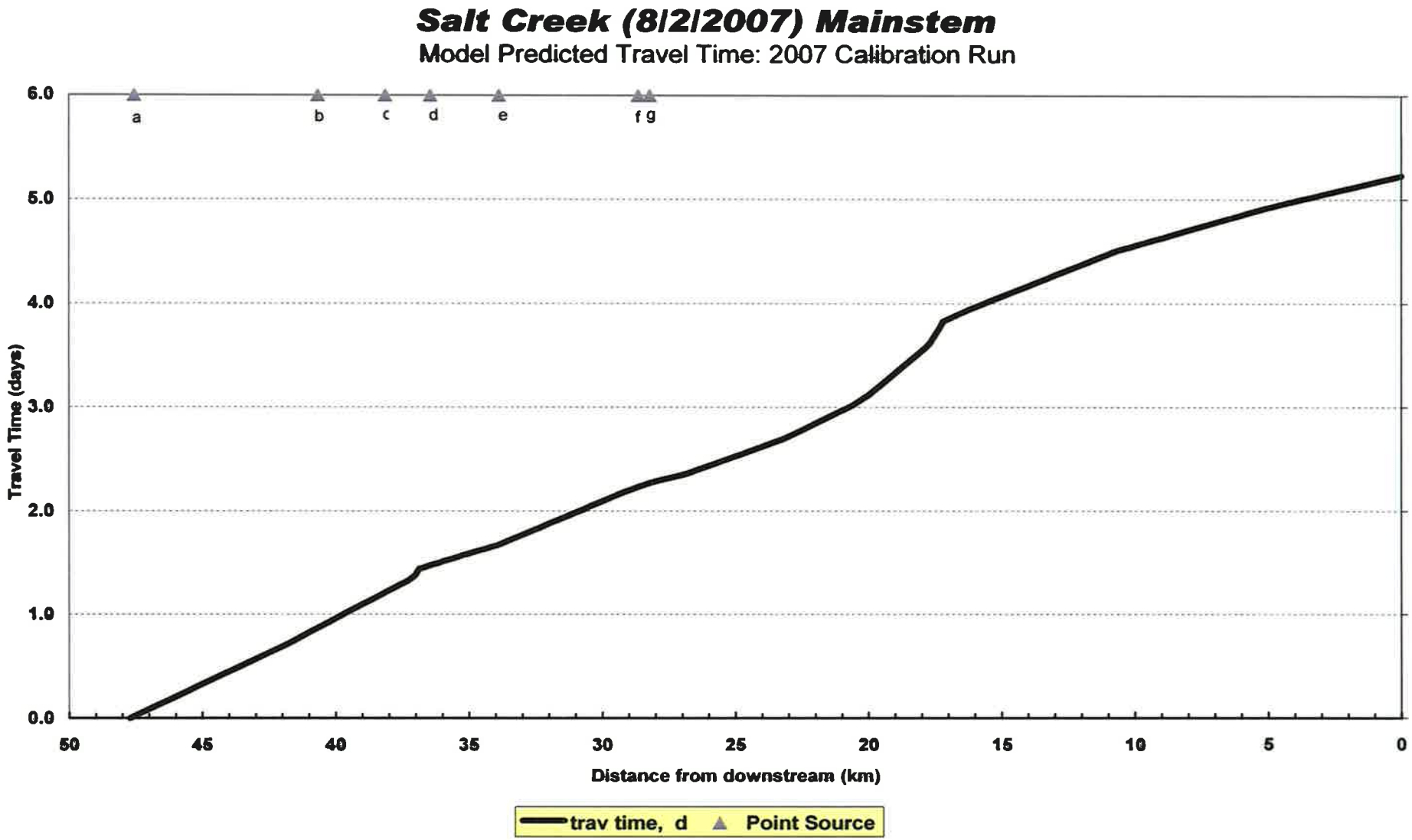
Monthly Average of June 2005 DMR Condition with 3° C Increased Plant Discharge and Air Temperature

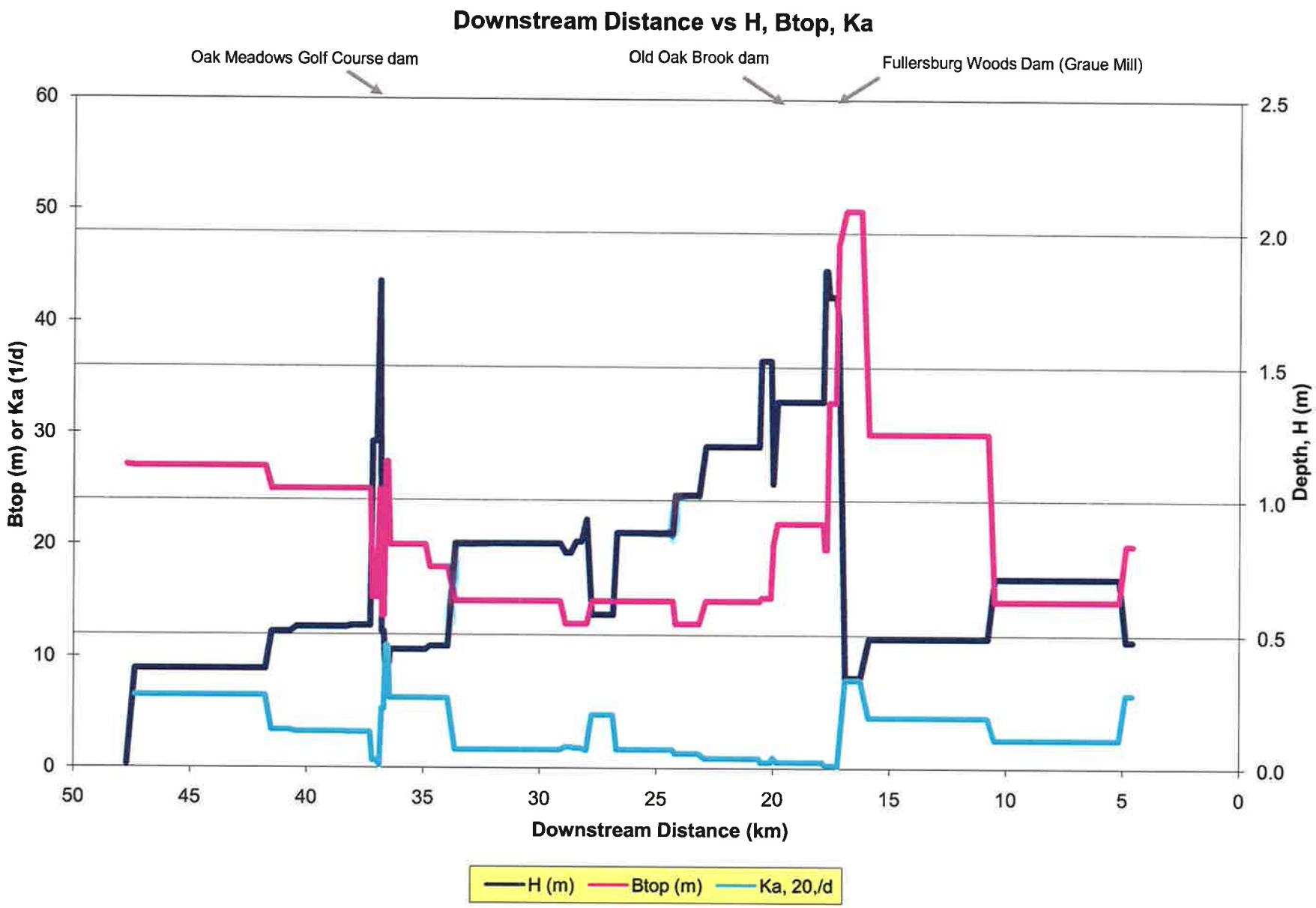


Salt Creek Mainstem

Monthly Average of June 2005 DMR Condition with 3° C Increased Plant Discharge and Air Temperature

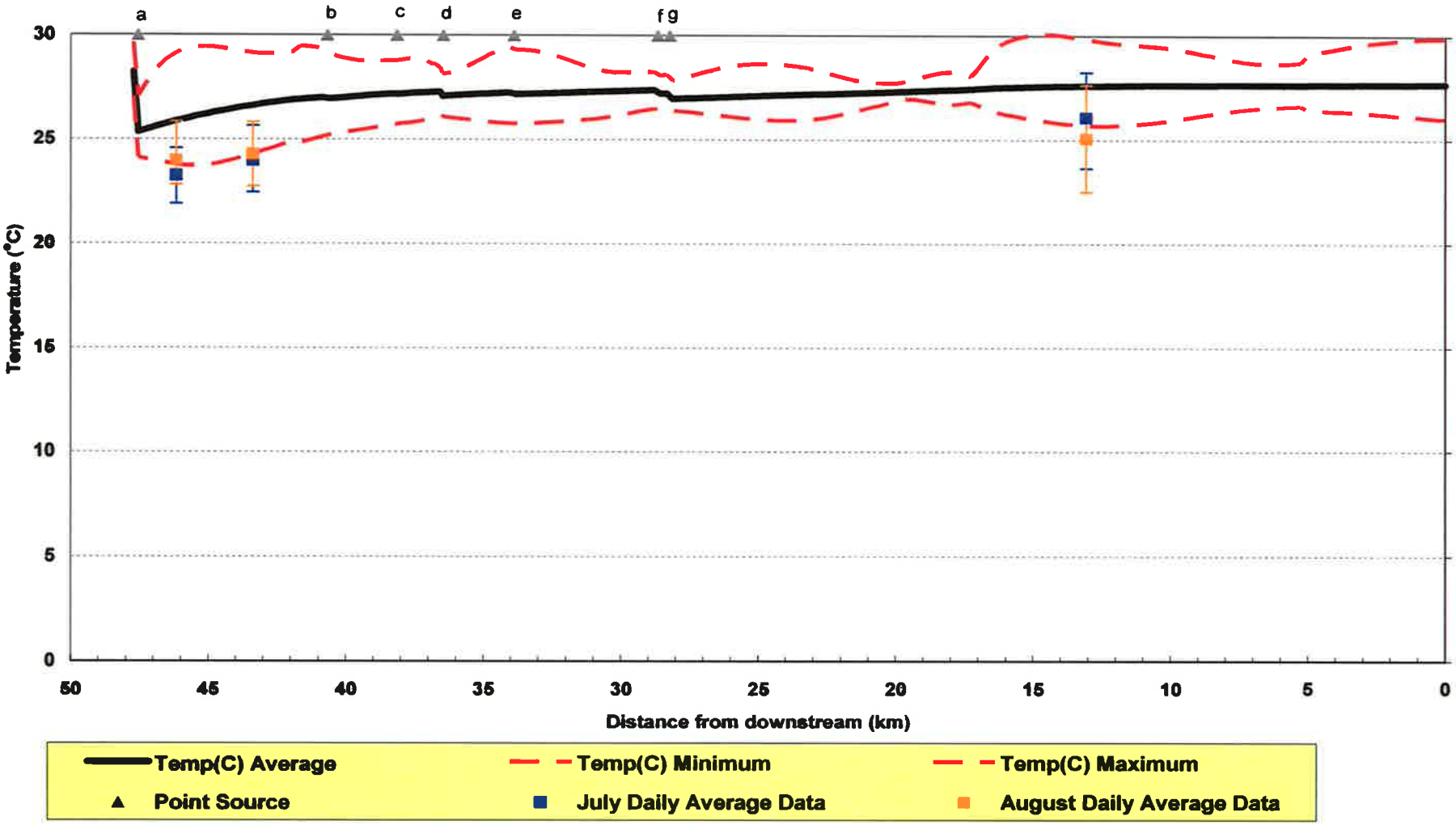



Salt Creek (8/2/2007) Mainstem
Model Predicted Travel Time: 2007 Calibration Run
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Travel Time (days)
a
b
c
d
e
f g
50
45
40
35
30
25
20
15
10
5
0
Distance from downstream (km)
trav time, d
Point Source


Downstream Distance vs H, Btop, Ka
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
Btop (m) or Ka (1/d)
Depth, H (m)
Downstream Distance (km)
60
50
40
30
20
10
0
2.5
2.0
1.5
1.0
0.5
0.0
50
45
40
35
30
25
20
15
10
5
0
H (m)
Btop (m)
Ka, 20,/d

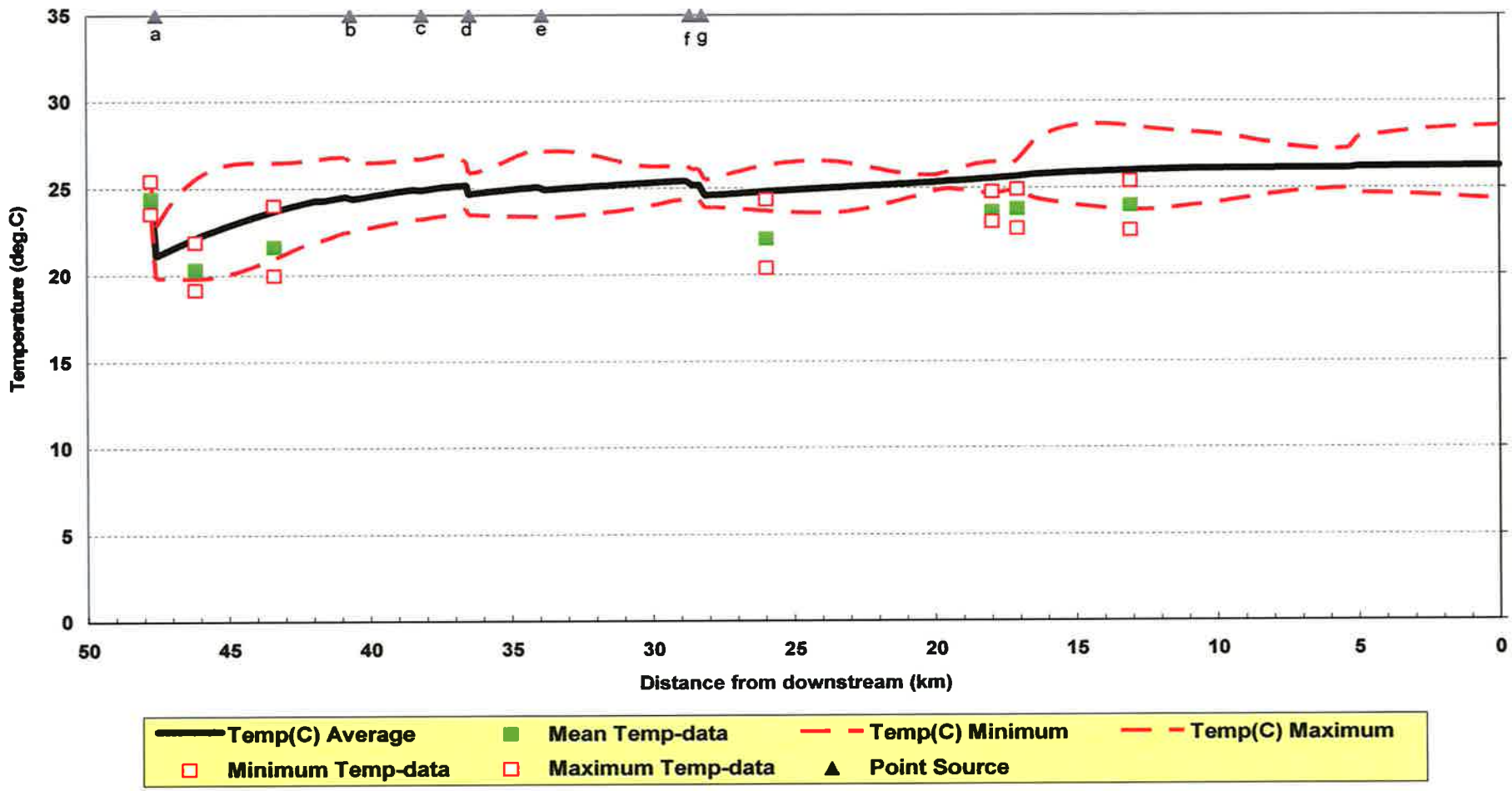
Salt Creek Mainstem

Monthly Average of June 2005 DMR Condition with 3° C Increased Plant Discharge and Air Temperature



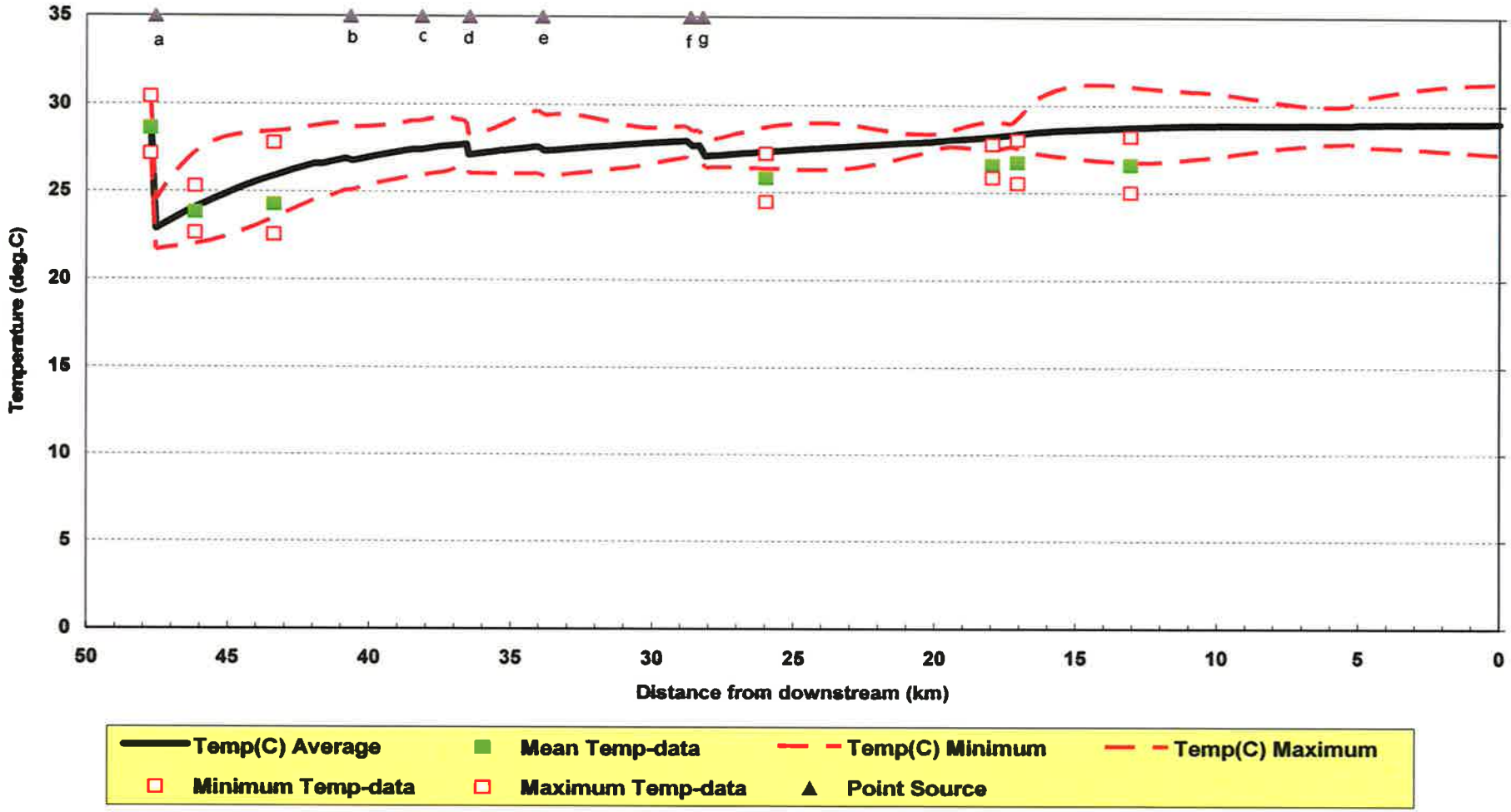
Salt Creek (6/20/2006) Mainstem

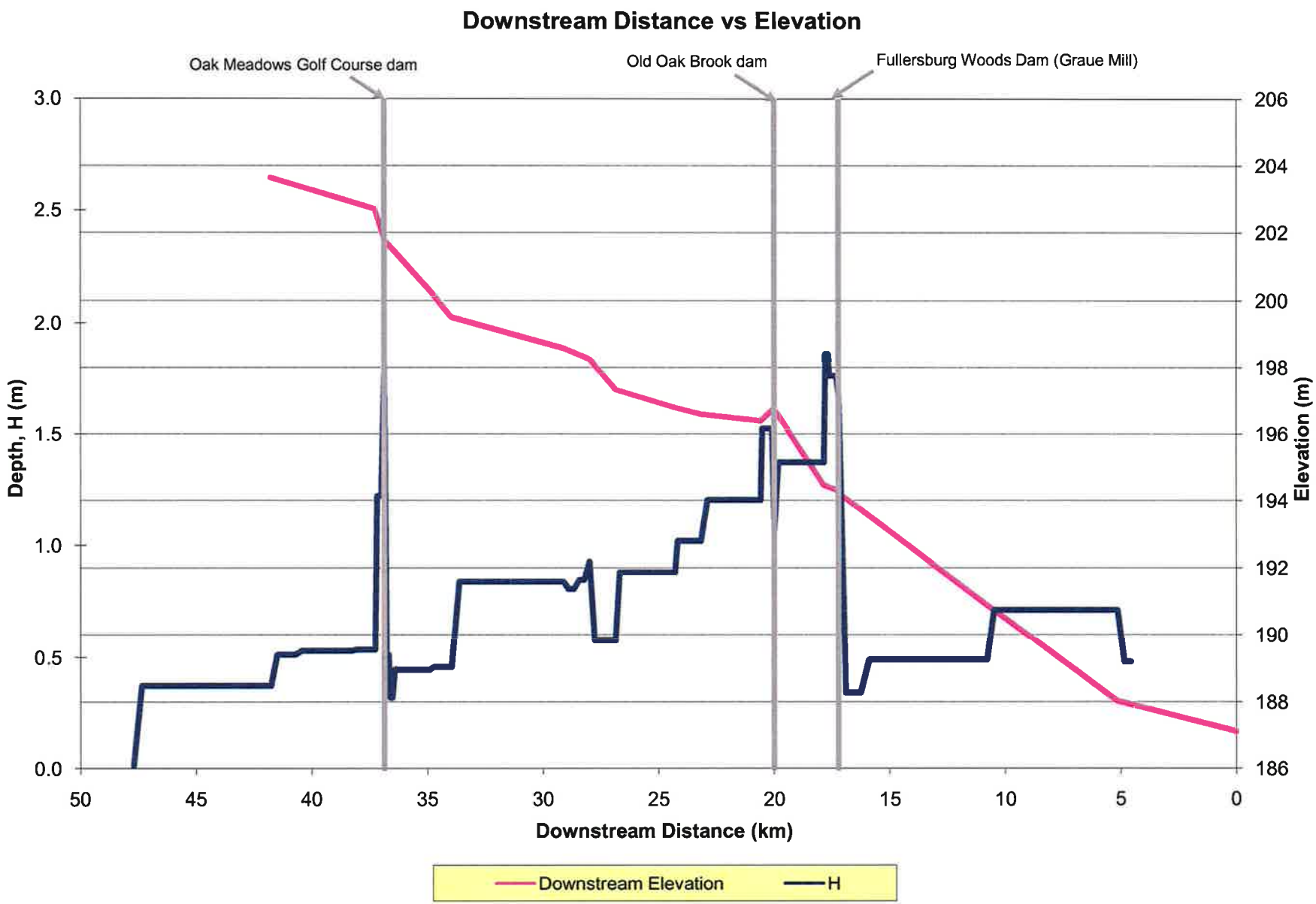
Comparisons of Observed and Predicted Water Temperature:
2006 Validation Run (6/19/06 to 6/21/06)



Salt Creek (8/2/2007) Mainstem

Comparisons of Observed and Predicted Water Temperature:
2007 Calibration Run




Downstream Distance vs Elevation
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
Depth, H (m)
Elevation (m)
Downstream Distance (km)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
206
204
202
200
198
196
194
192
190
188
186
50
45
40
35
30
25
20
15
10
5
0
Downstream Elevation
H

Salt Creek (8/15/2006) Mainstem

Monthly Average of June 2005 DMR Condition with 3°C Increased Plant Discharge and Air Temperature

Note: A ratio of 2 of ultimate CBOD to CBOD5 was used to convert from permitted maximum CBOD5 concentration for point source input.

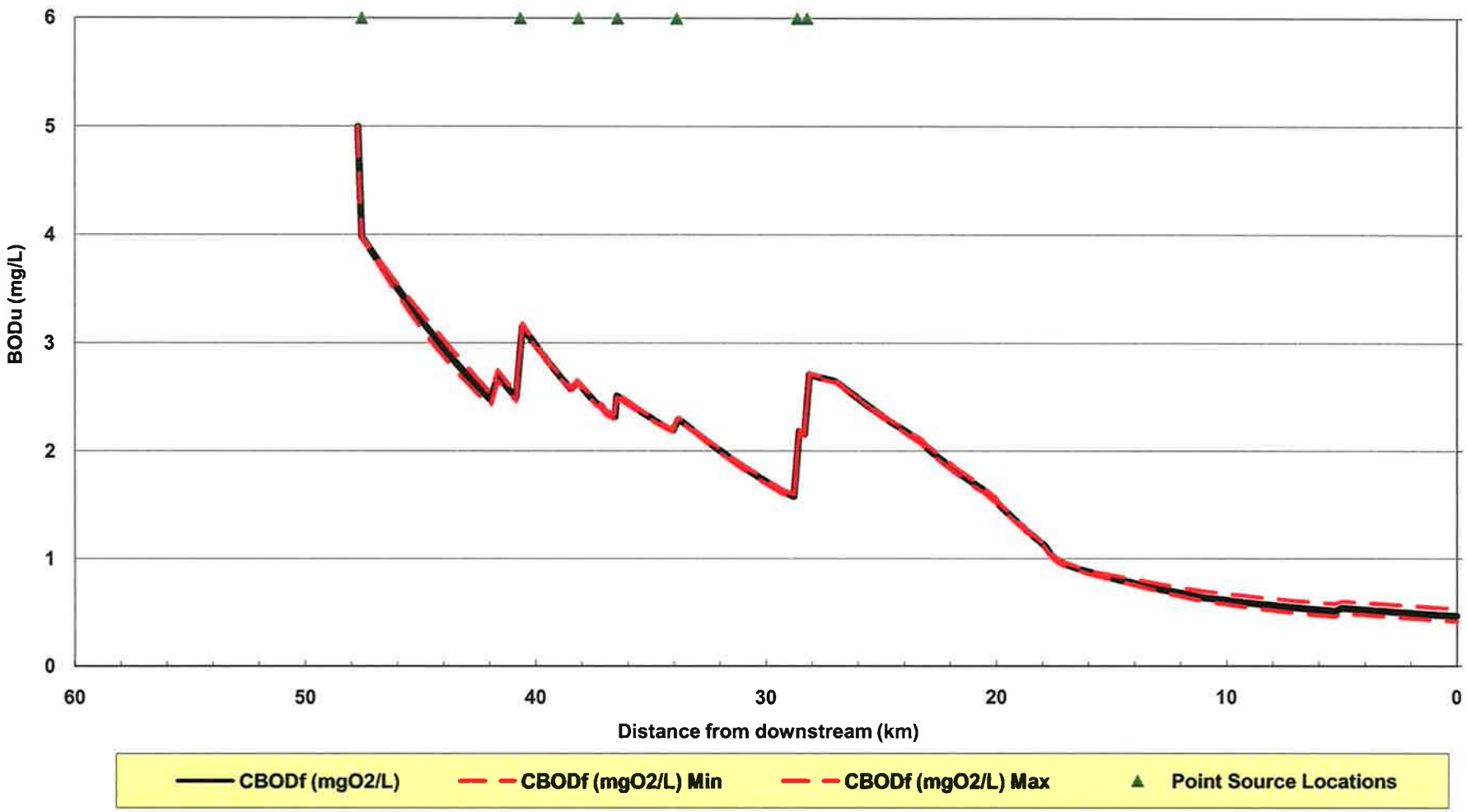
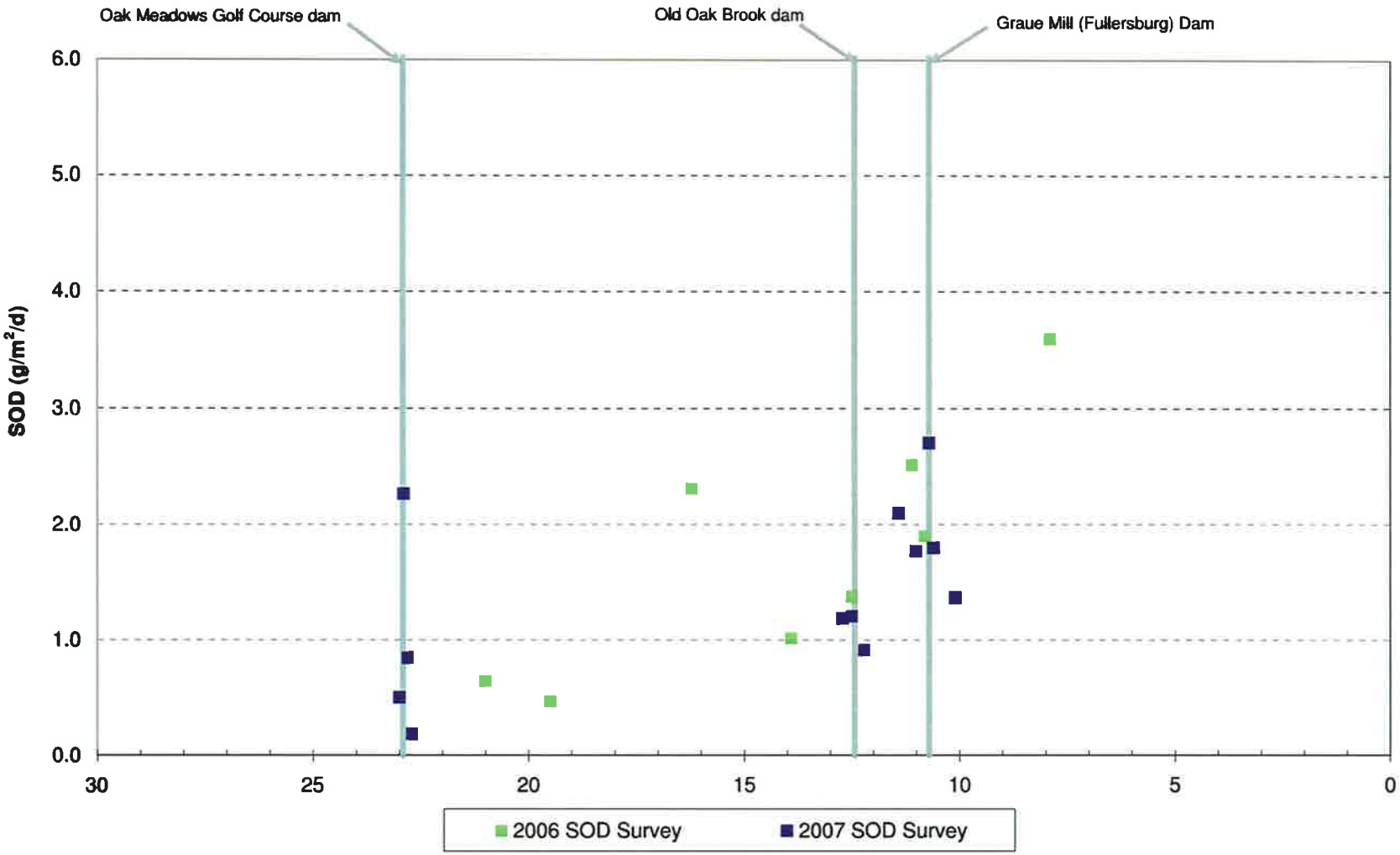
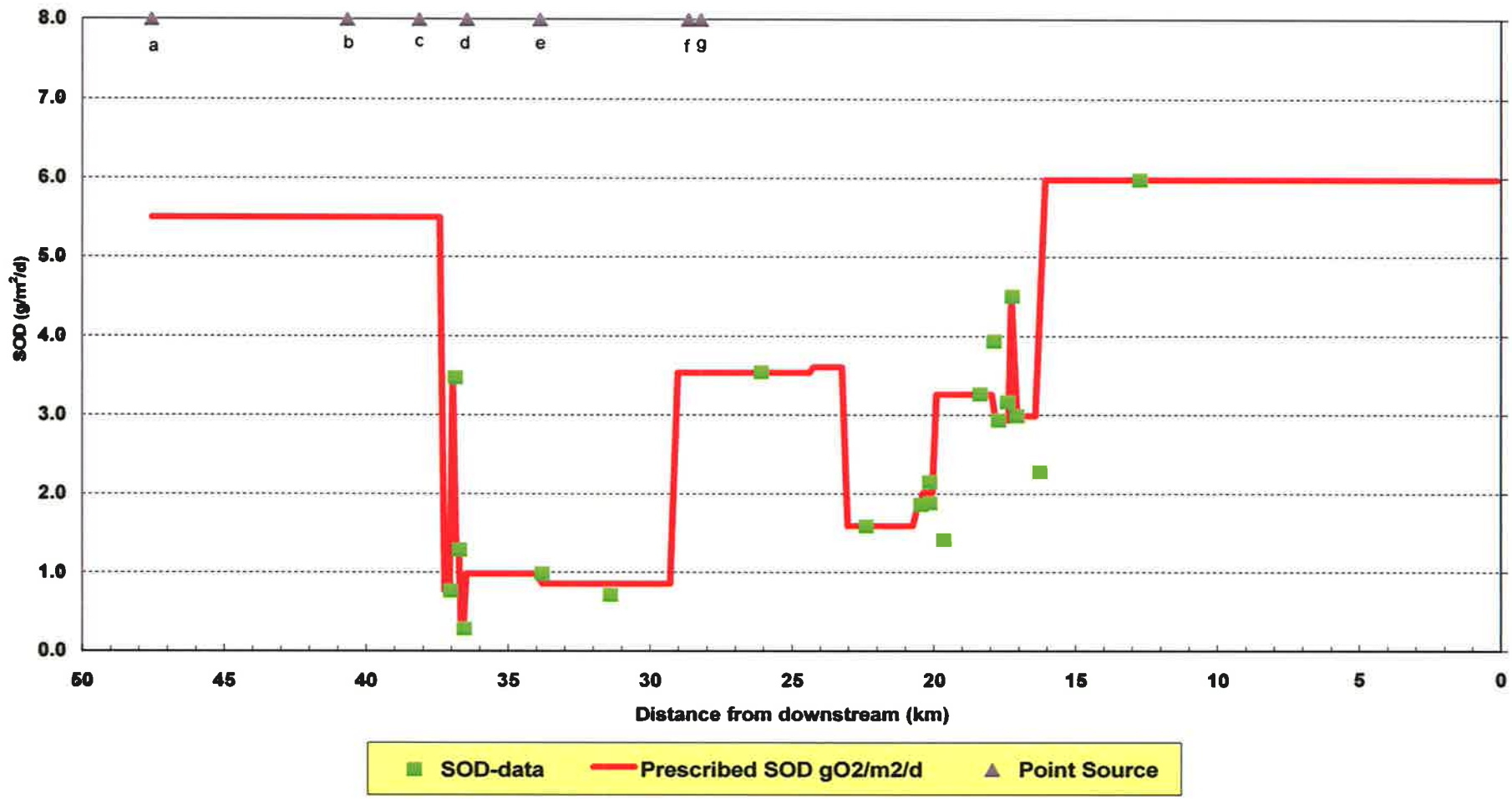


Figure 16
Comparison of 20°C-Temperature Corrected SOD in Salt Creek



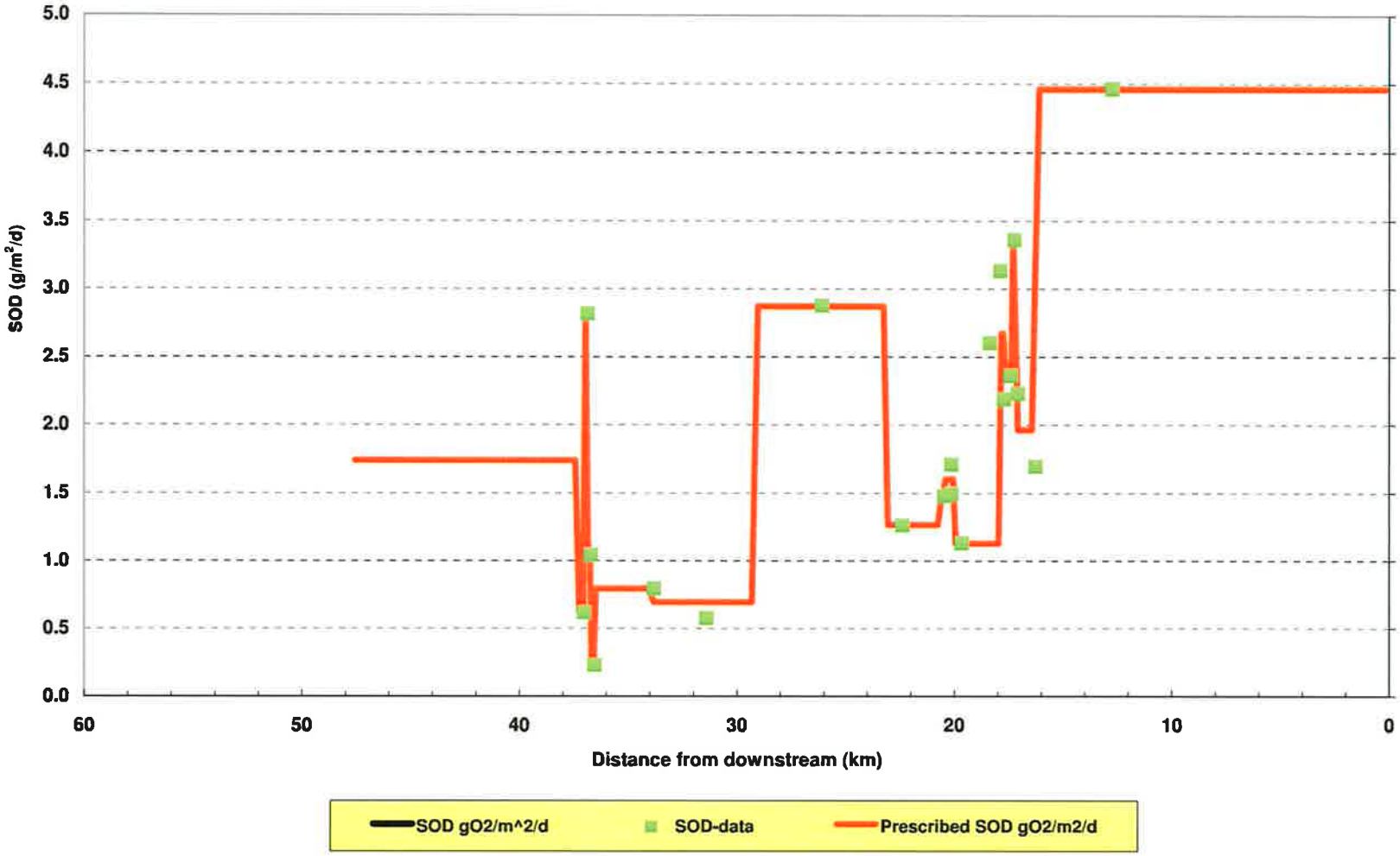
Salt Creek (8/2/2007) Mainstem

Model Input of Sediment Oxygen Demand (SOD): 2007 Calibration Run



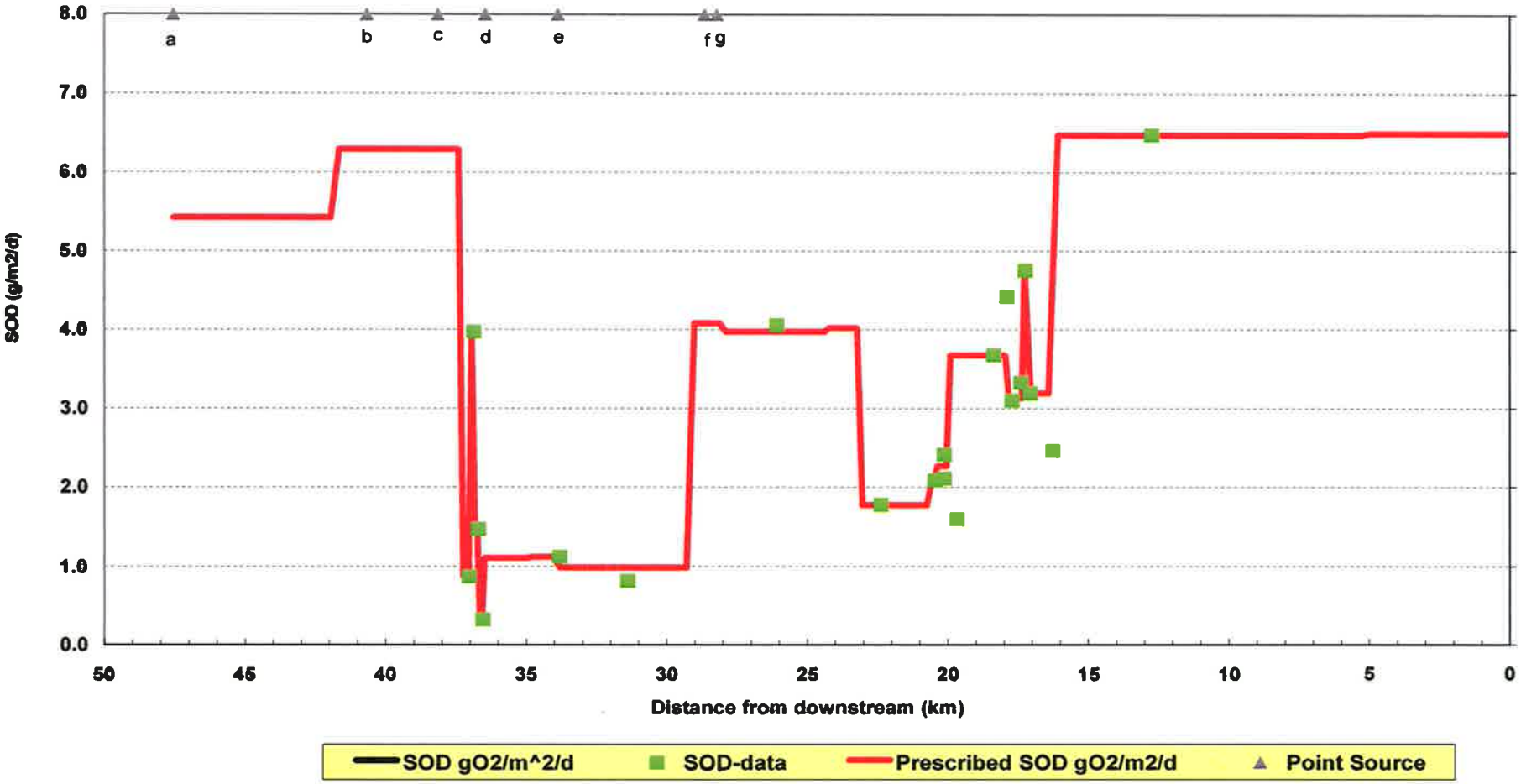
Salt Creek

Model Input of Sediment Oxygen Demand (SOD): Validation Run (6/19/06 to 6/21/06)



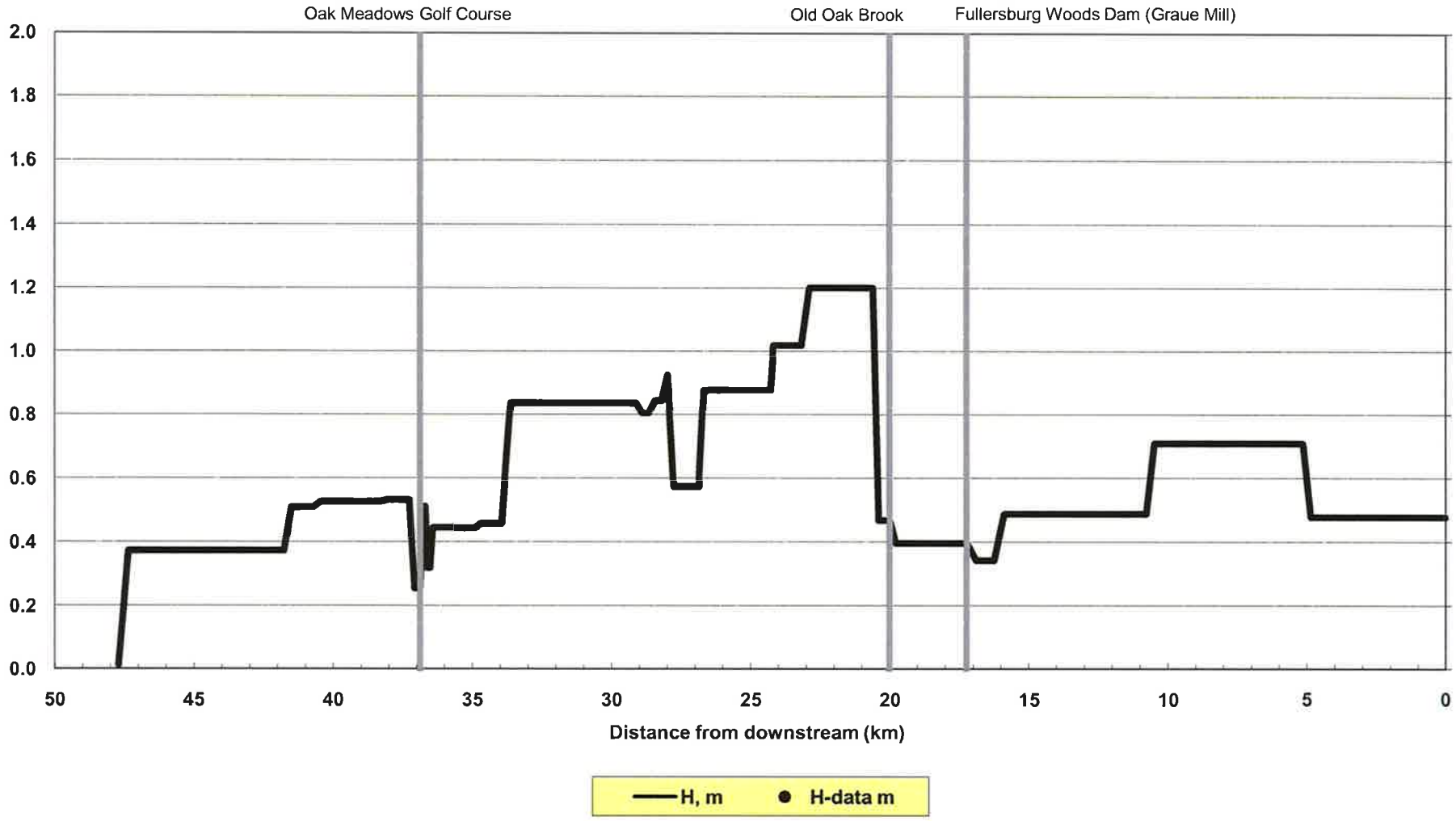
Salt Creek Mainstem

Monthly Average of June 2005 DMR Condition with 3° C Increased Plant Discharge and Air Temperature



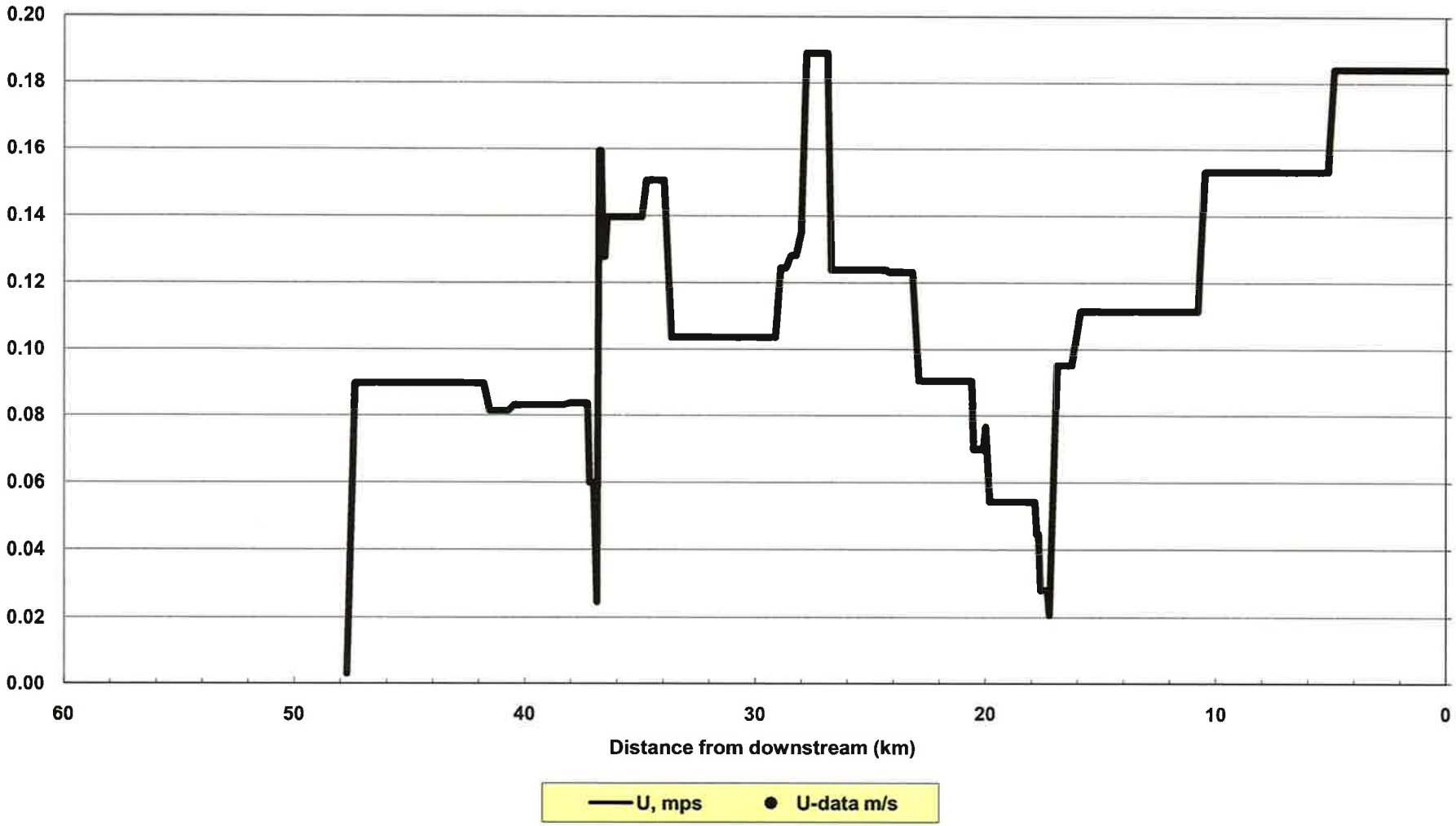
Salt Creek (8/15/2006) Mainstem

All Dams Removed



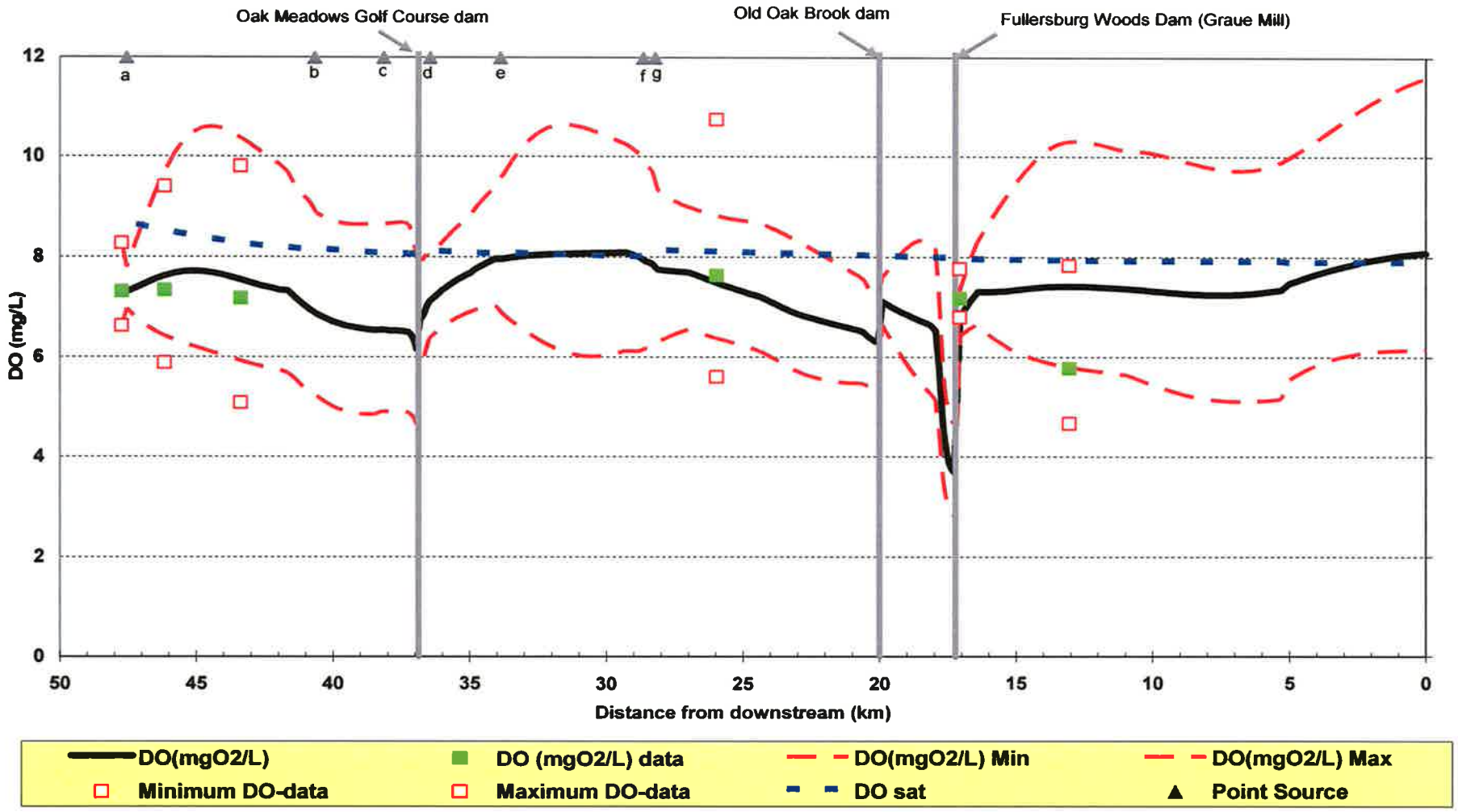
Salt Creek (8/15/2006) Mainstem

Monthly Average of June 2005 DMR Condition



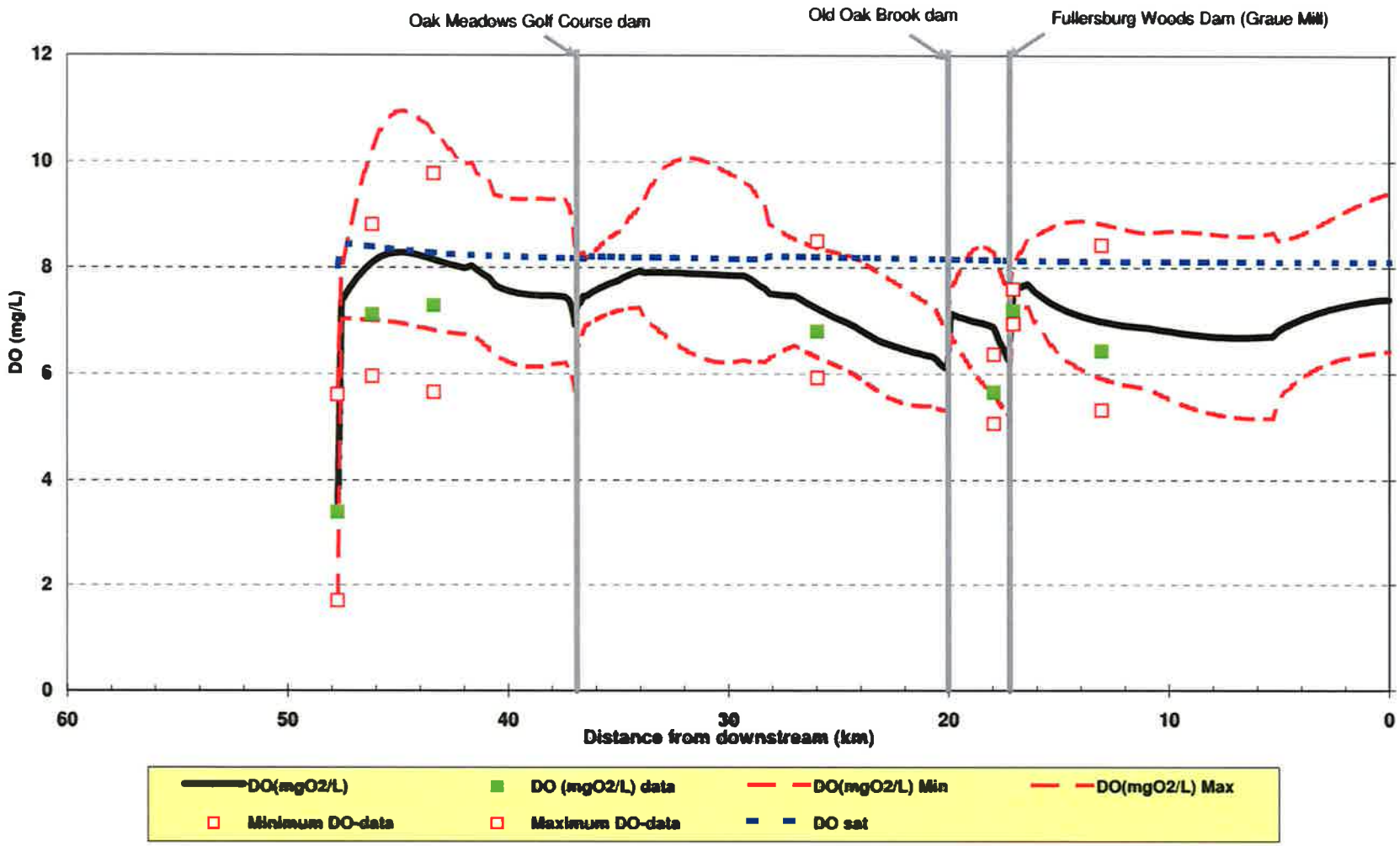
Salt Creek (6/20/2006) Mainstem

Comparisons of Observed and Predicted Dissolved Oxygen: 2006 Validation Run (6/19/06 to 6/21/06)



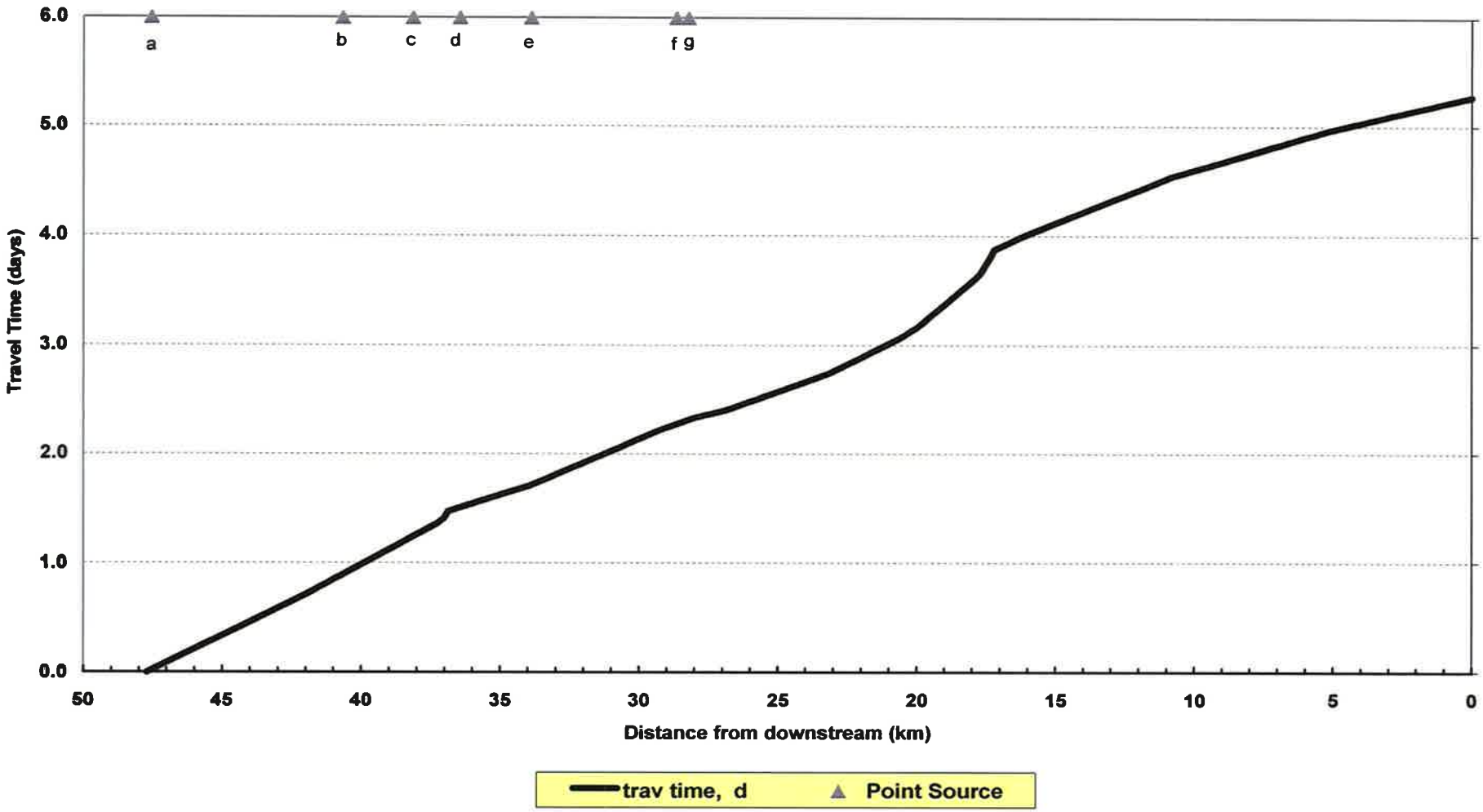
Salt Creek

Comparisons of Observed and Predicted Dissolved Oxygen: Calibration Run (8/13/06 to 8/17/06)



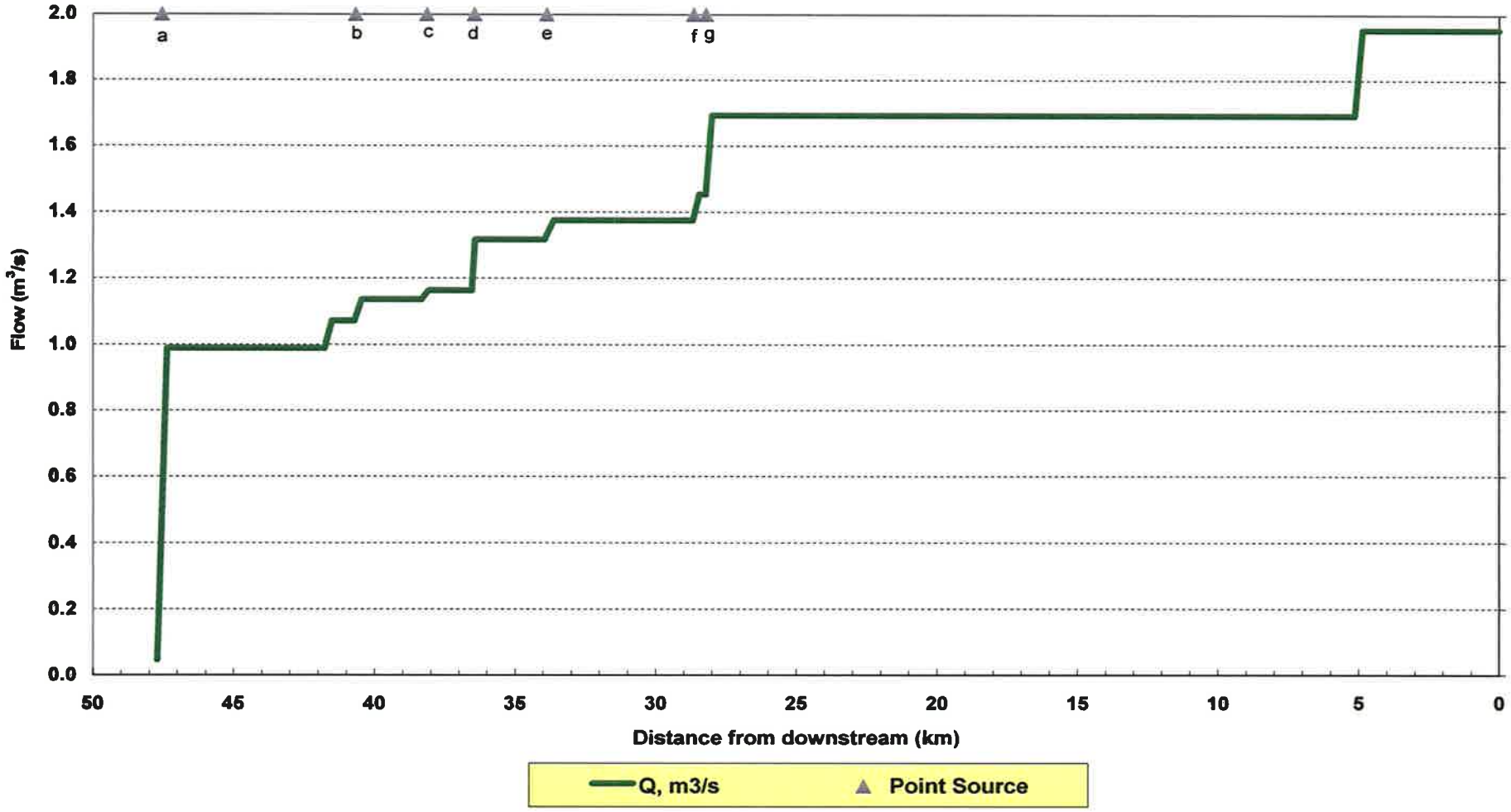
Salt Creek (6/20/2006) Mainstem

Model Predicted Travel Time: 2006 Validation Run (6/19/06 to 6/21/06)



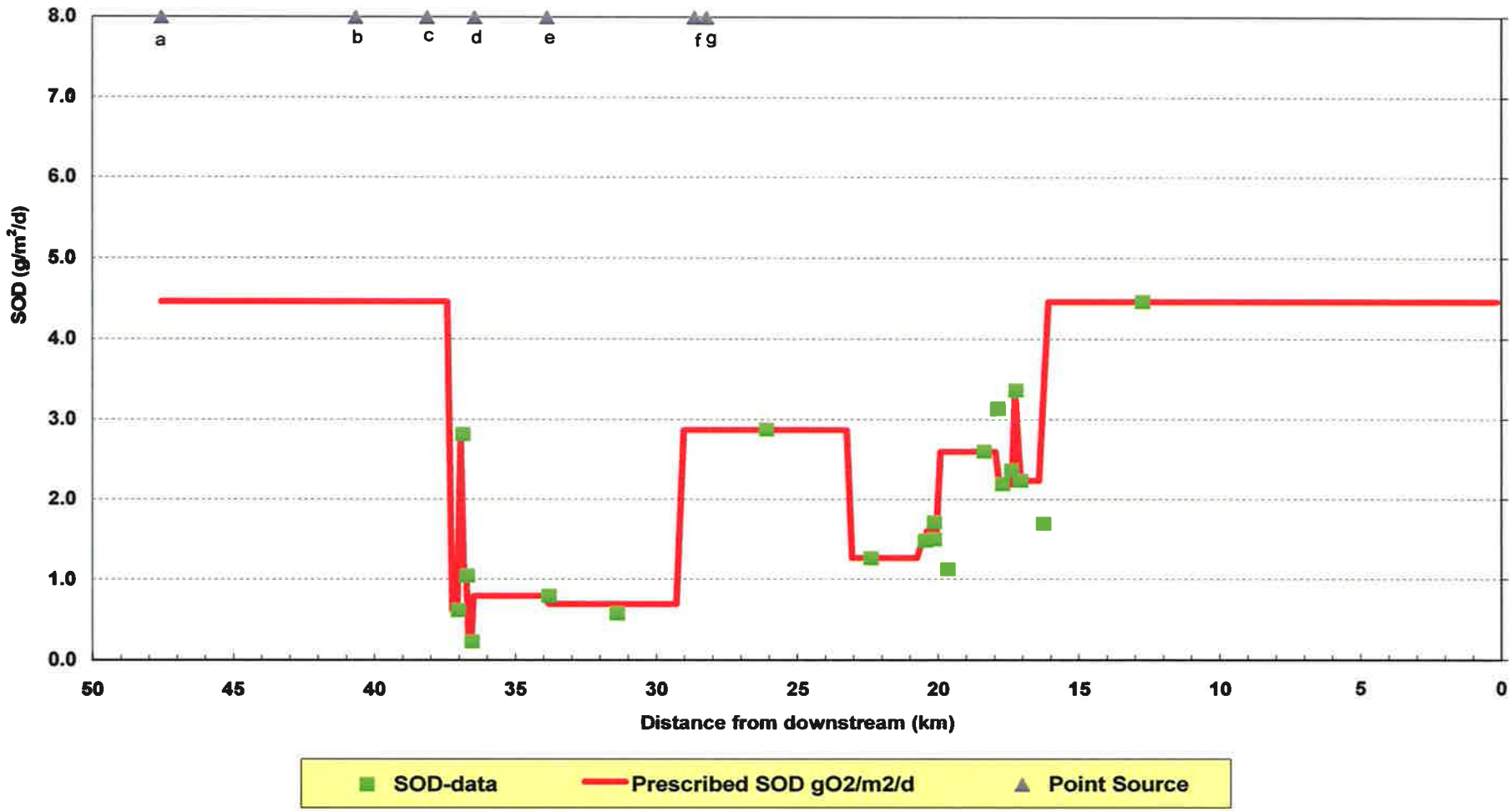
Salt Creek (6/20/2006) Mainstem

Model Predicted Flow: 2006 Validation Run (6/19/06 to 6/21/06)



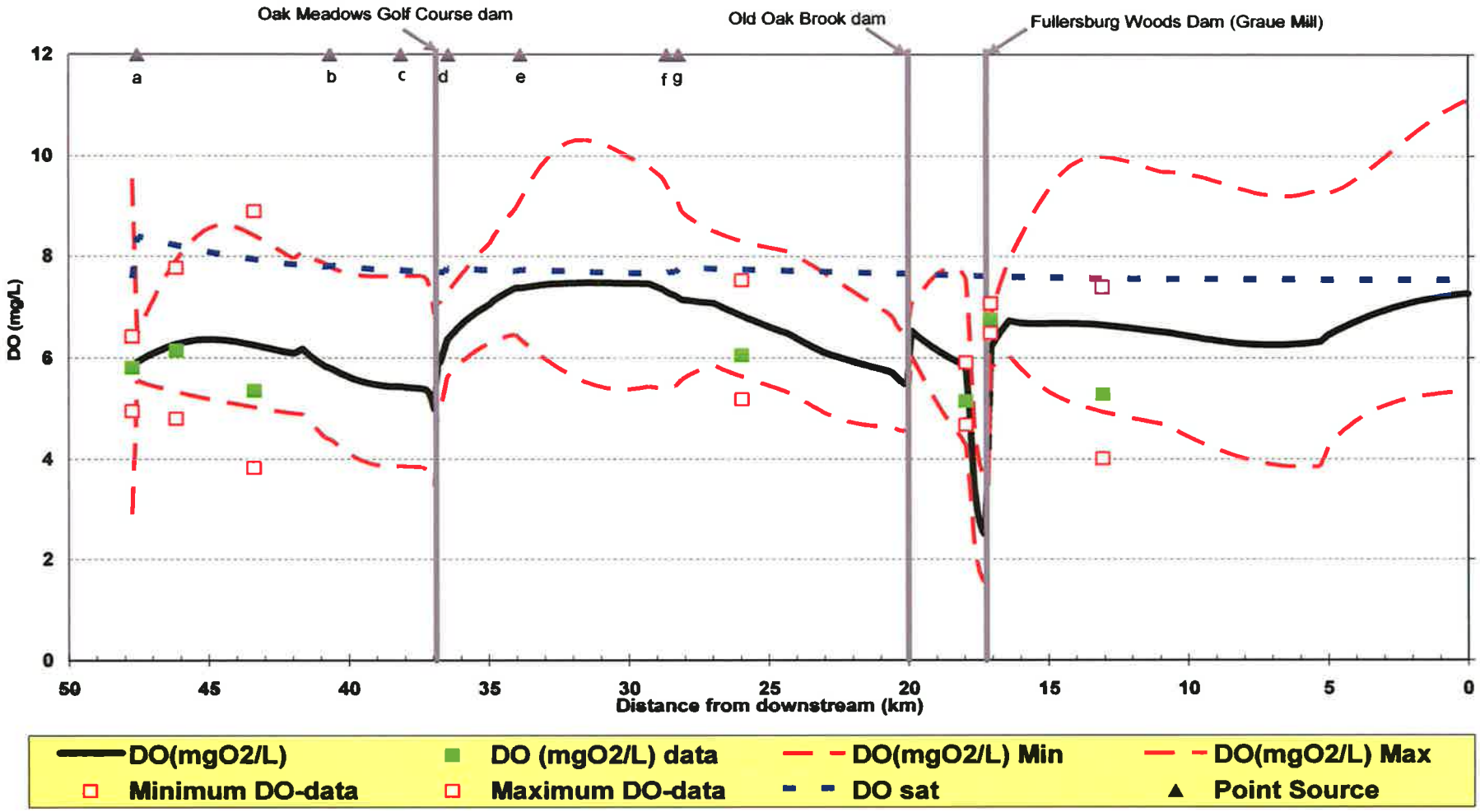
Salt Creek (6/20/2006) Mainstem

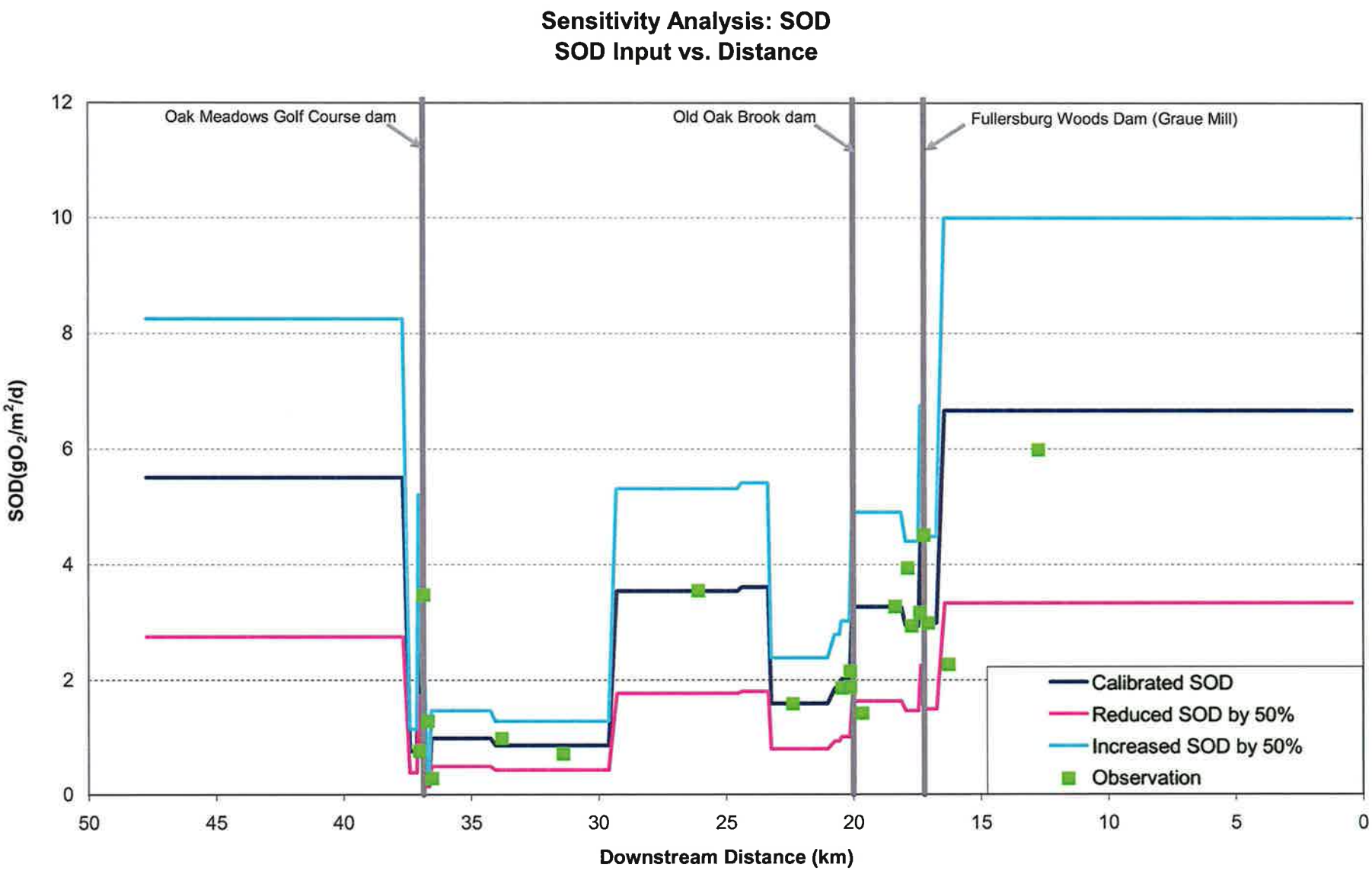
Model Input of Sediment Oxygen Demand (SOD): 2006 Validation Run (6/19/06 to 6/21/06)

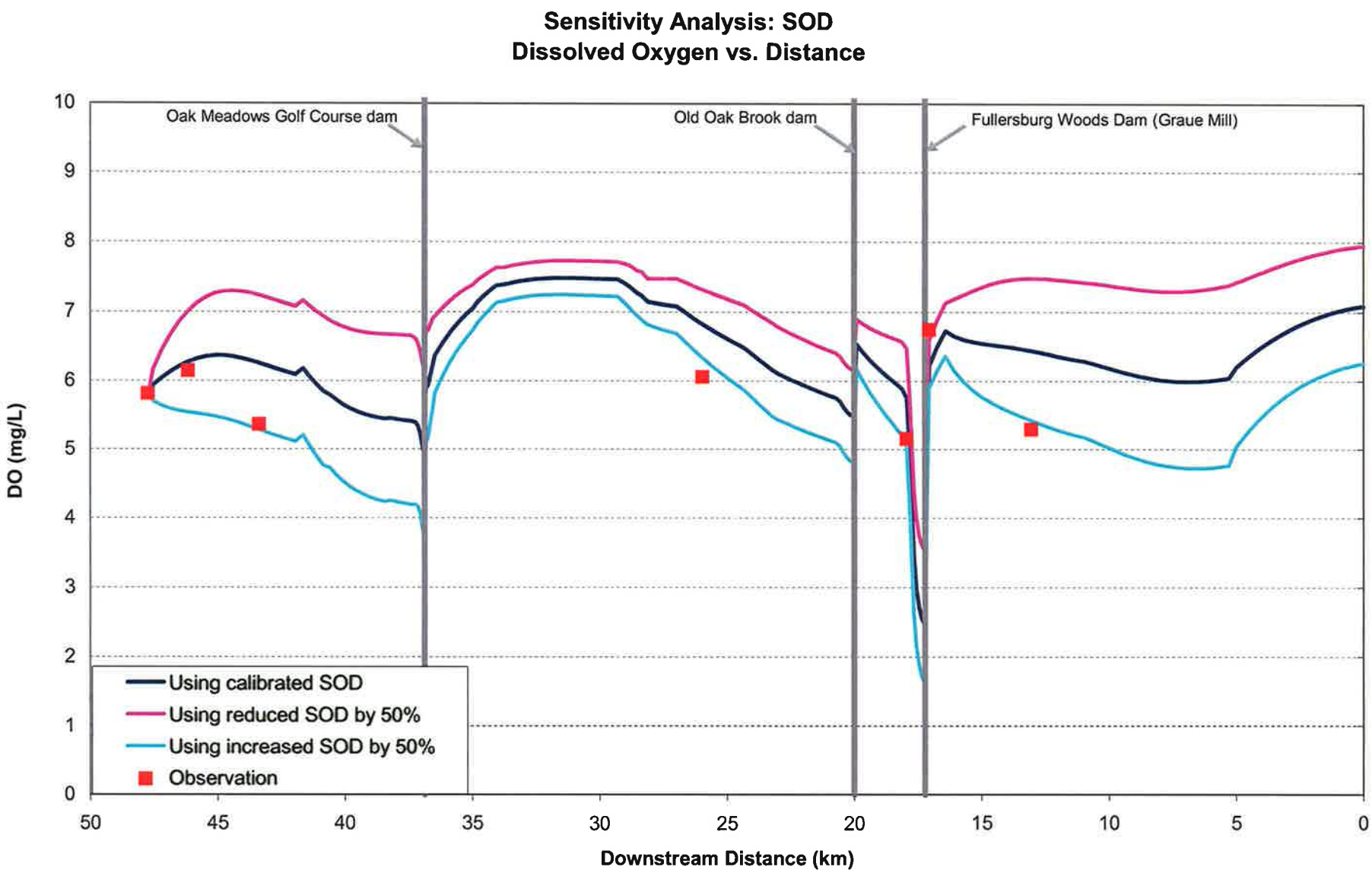


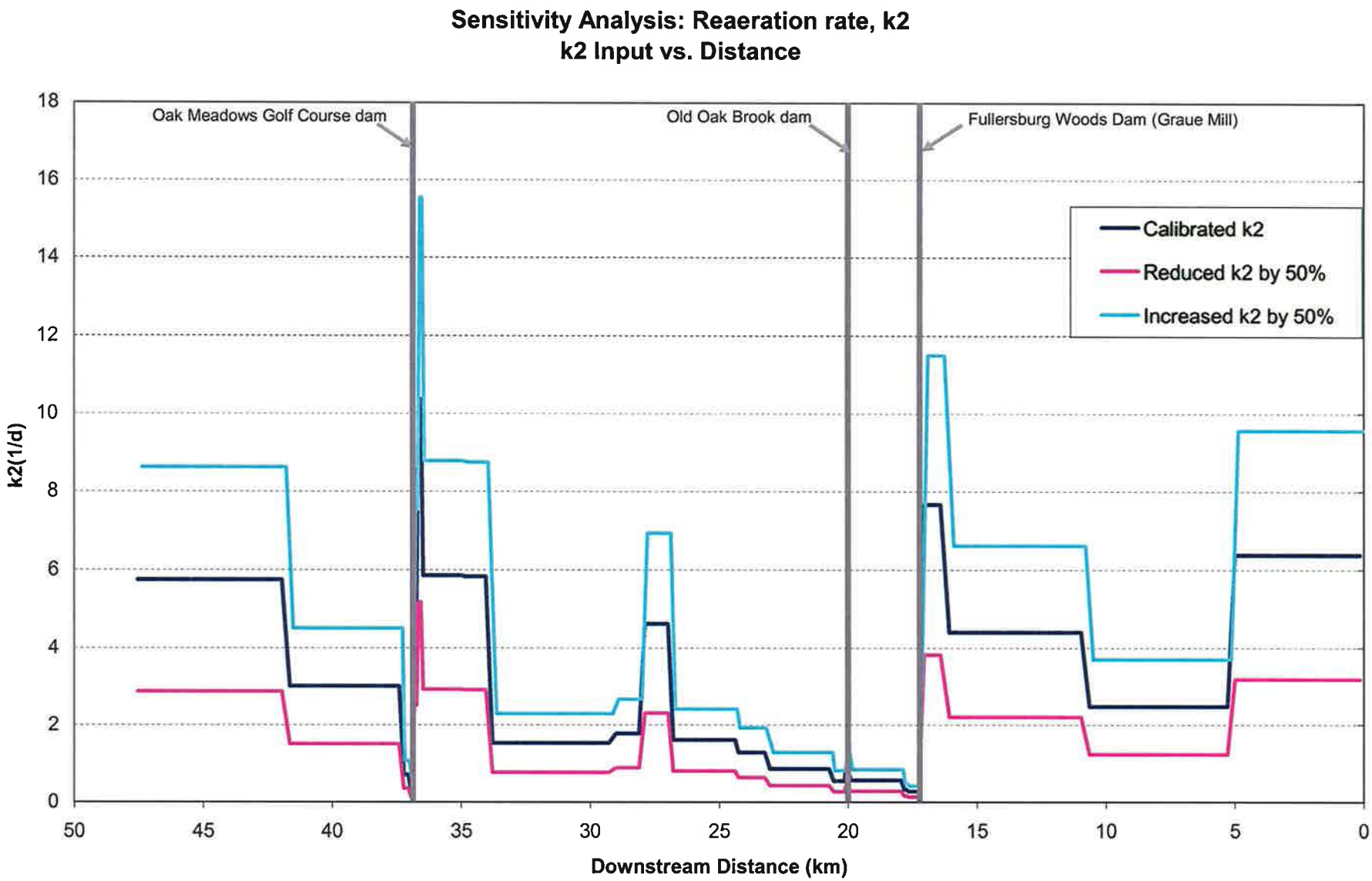
Salt Creek (8/2/2007) Mainstem

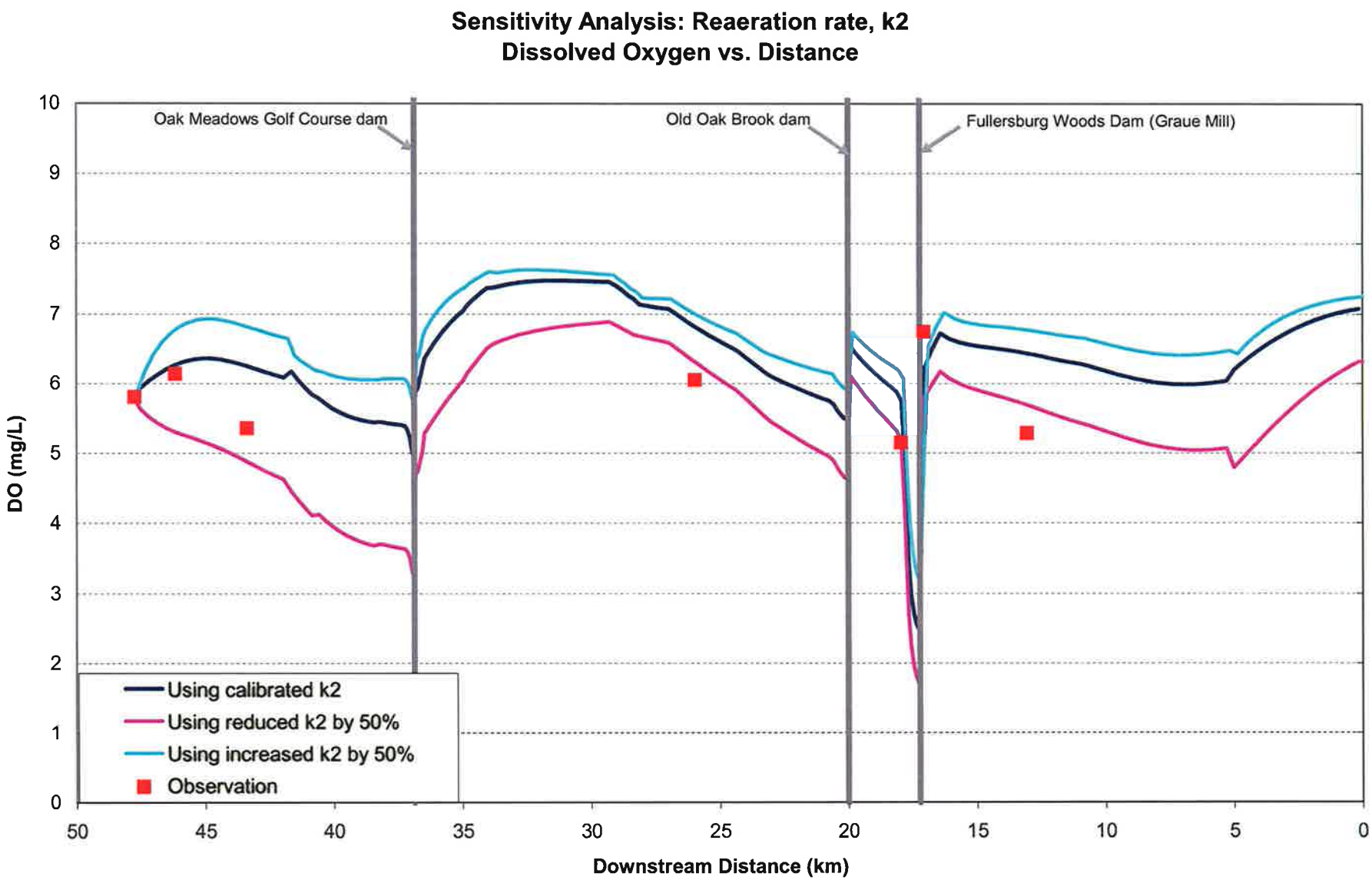
Comparisons of Observed and Predicted Dissolved Oxygen: 2007 Calibration Run

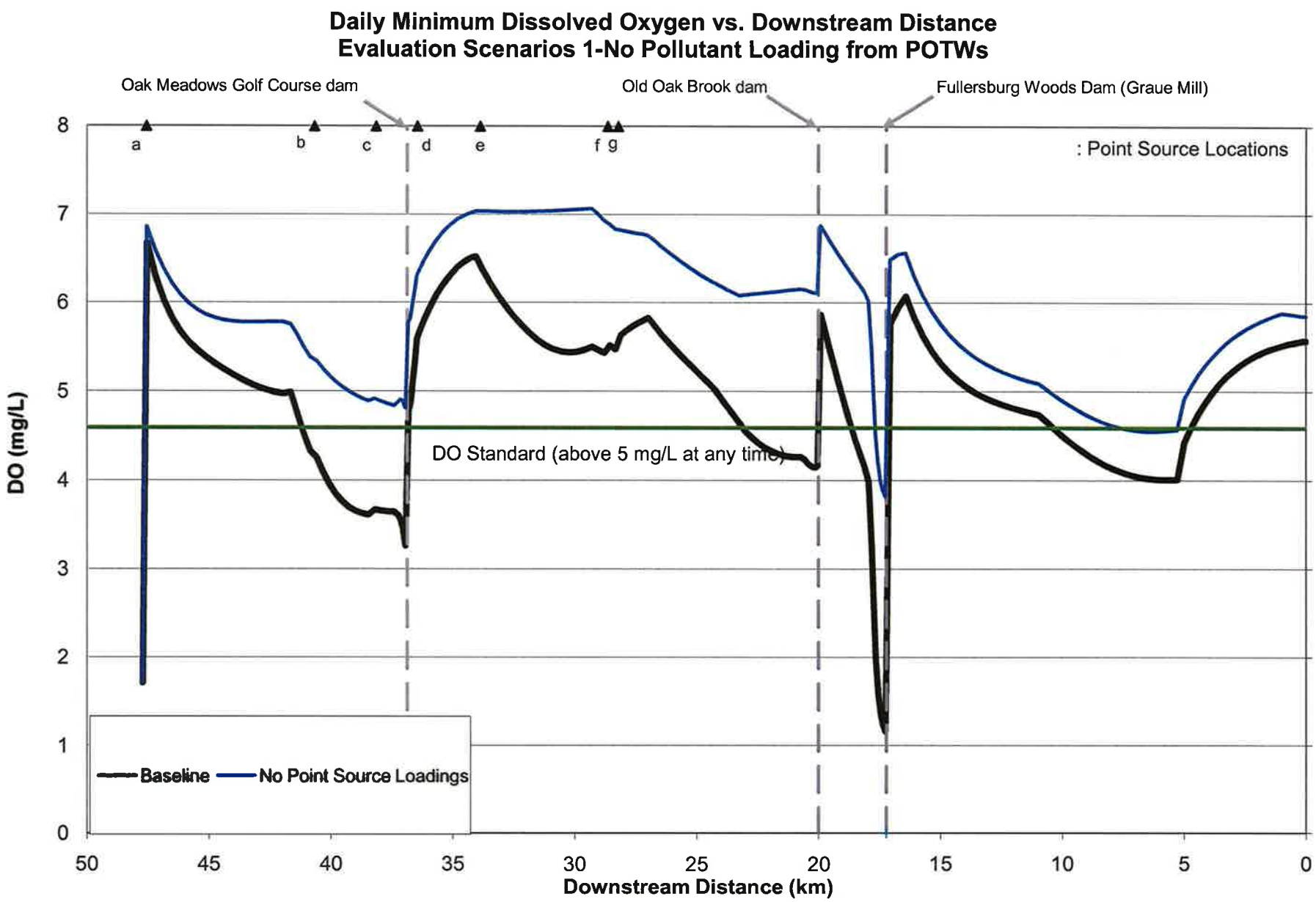



Sensitivity Analysis: SOD
SOD Input vs. Distance
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
SOD(gO2/m2/d)
Downstream Distance (km)
Calibrated SOD
Reduced SOD by 50%
Increased SOD by 50%
Observation
0
2
4
6
8
10
12
50
45
40
35
30
25
20
15
10
5
0


Sensitivity Analysis: SOD
Dissolved Oxygen vs. Distance
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
DO (mg/L)
Downstream Distance (km)
Using calibrated SOD
Using reduced SOD by 50%
Using increased SOD by 50%
Observation
0
1
2
3
4
5
6
7
8
9
10
50
45
40
35
30
25
20
15
10
5
0

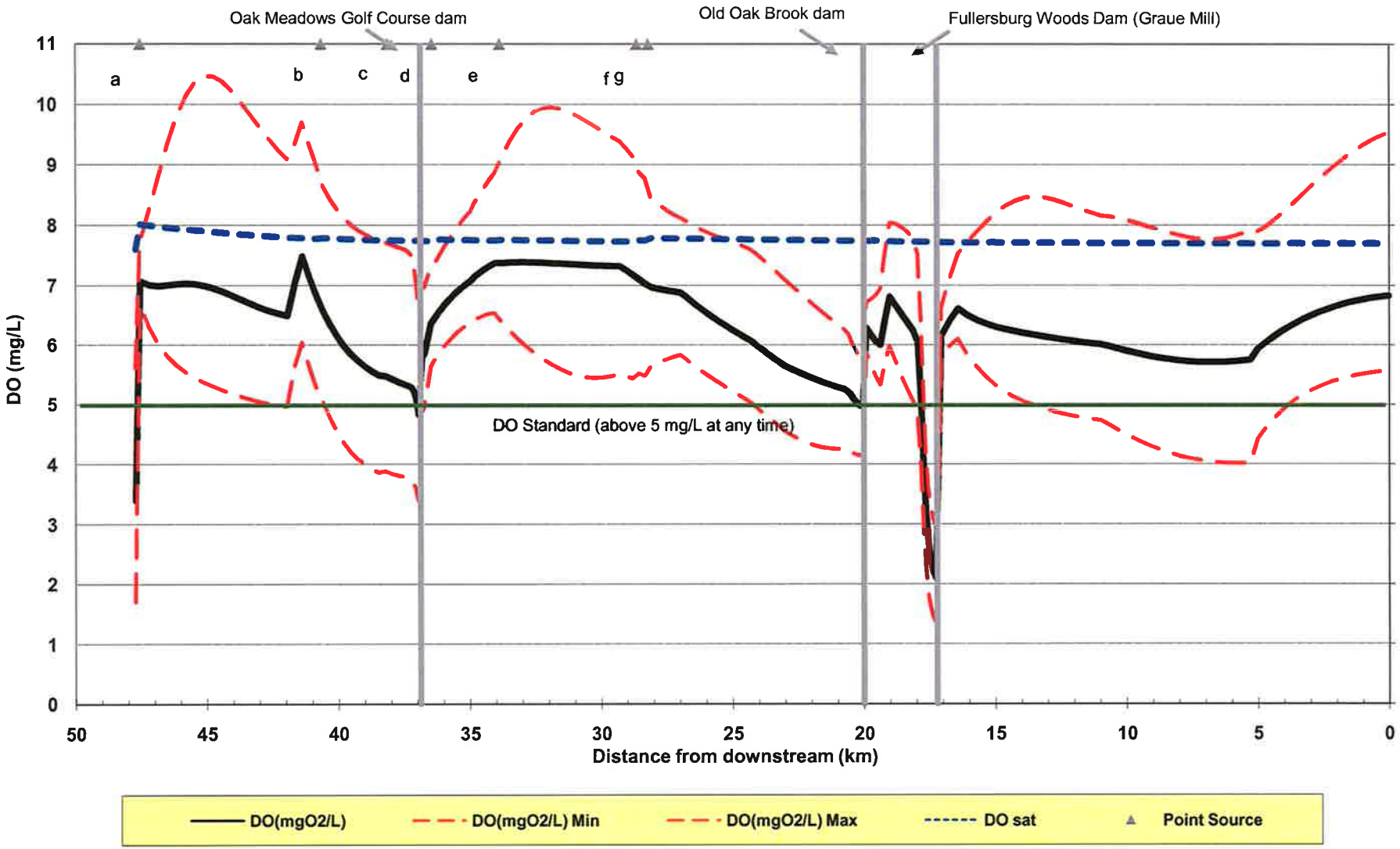

Sensitivity Analysis: Reaeration rate, k2
k2 Input vs. Distance
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
Calibrated k2
Reduced k2 by 50%
Increased k2 by 50%
k2(1/d)
Downstream Distance (km)
0
2
4
6
8
10
12
14
16
18
50
45
40
35
30
25
20
15
10
5
0


Sensitivity Analysis: Reaeration rate, k2
Dissolved Oxygen vs. Distance
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
DO (mg/L)
Downstream Distance (km)
Using calibrated k2
Using reduced k2 by 50%
Using increased k2 by 50%
Observation
0
1
2
3
4
5
6
7
8
9
10
50
45
40
35
30
25
20
15
10
5
0


Daily Minimum Dissolved Oxygen vs. Downstream Distance
Evaluation Scenarios 1-No Pollutant Loading from POTWs
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f g
: Point Source Locations
DO Standard (above 5 mg/L at any time)
Baseline
No Point Source Loadings
DO (mg/L)
Downstream Distance (km)
0
1
2
3
4
5
6
7
8
50
45
40
35
30
25
20
15
10
5
0

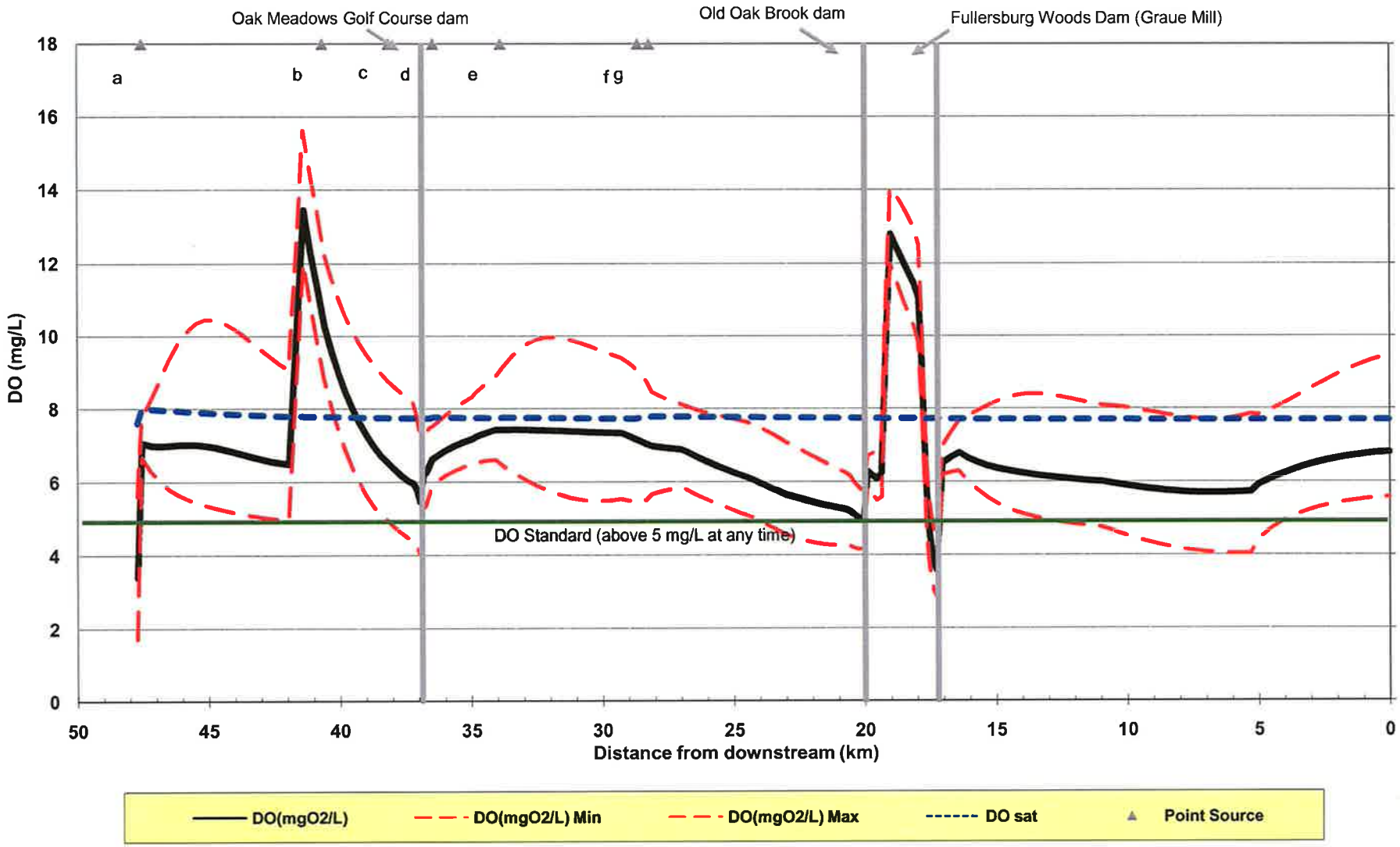
Salt Creek (8/15/2006) Mainstem

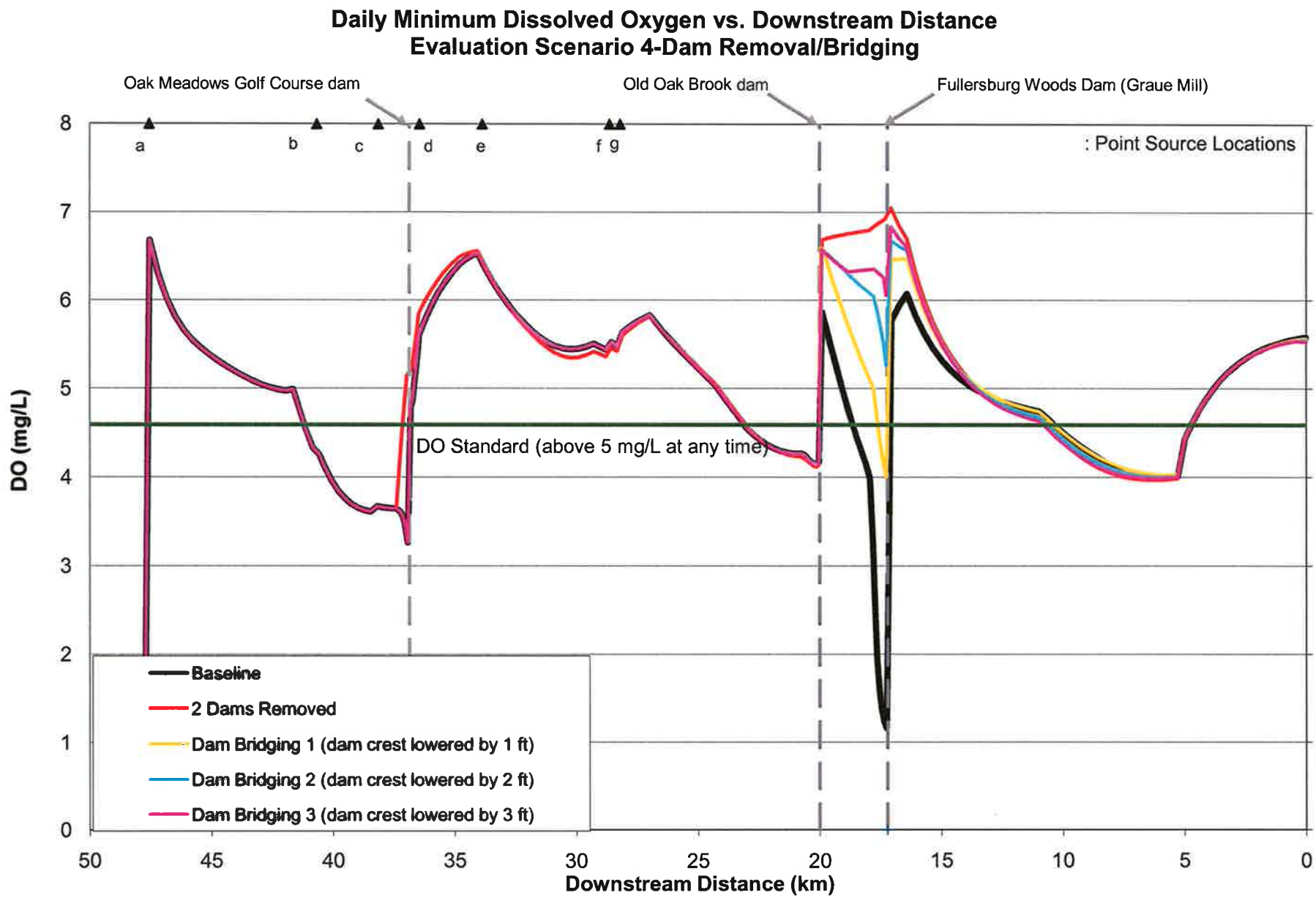
Aeration Alternative 3 in Oak Meadows Dam and Graue Mill Dam Impoundments

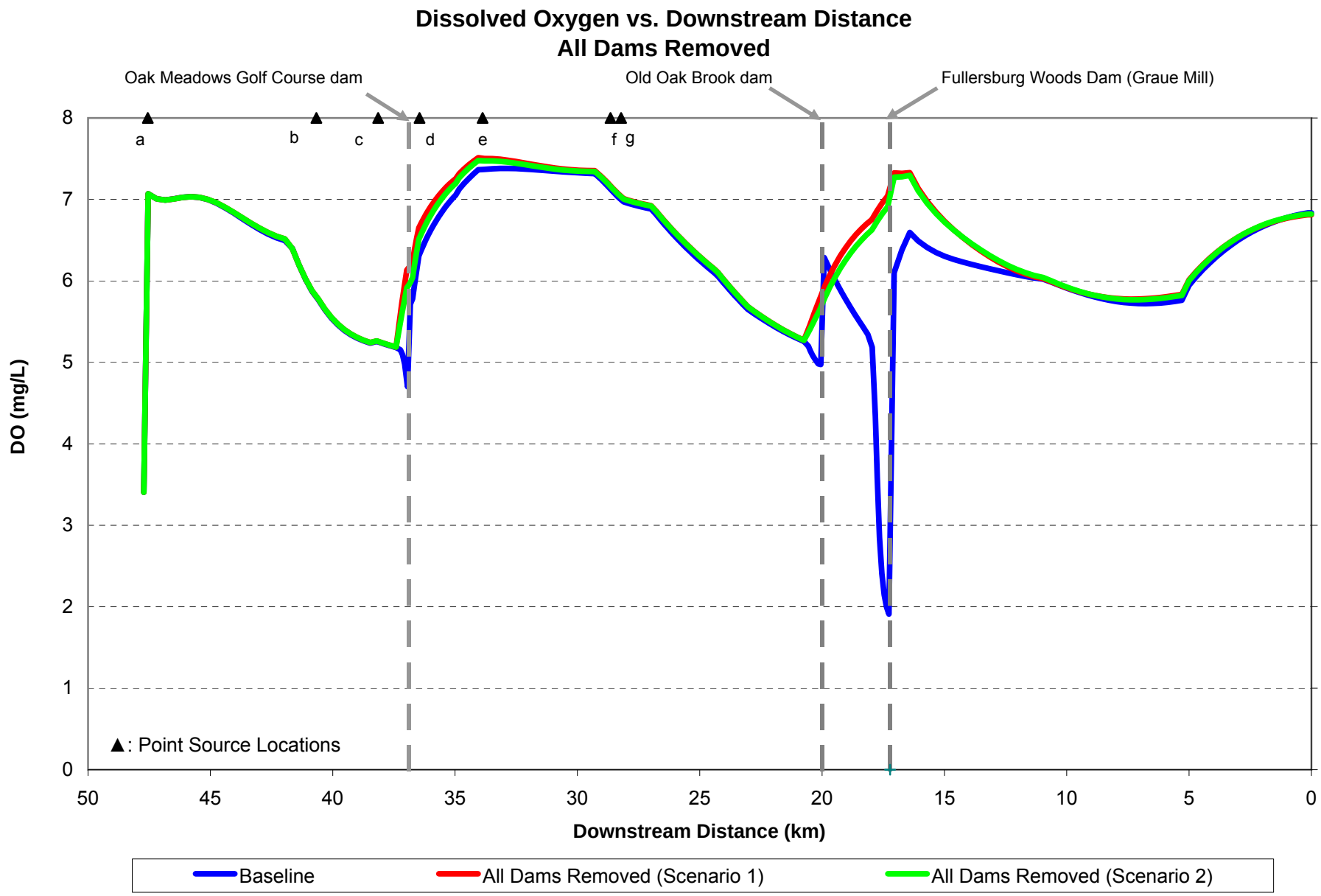


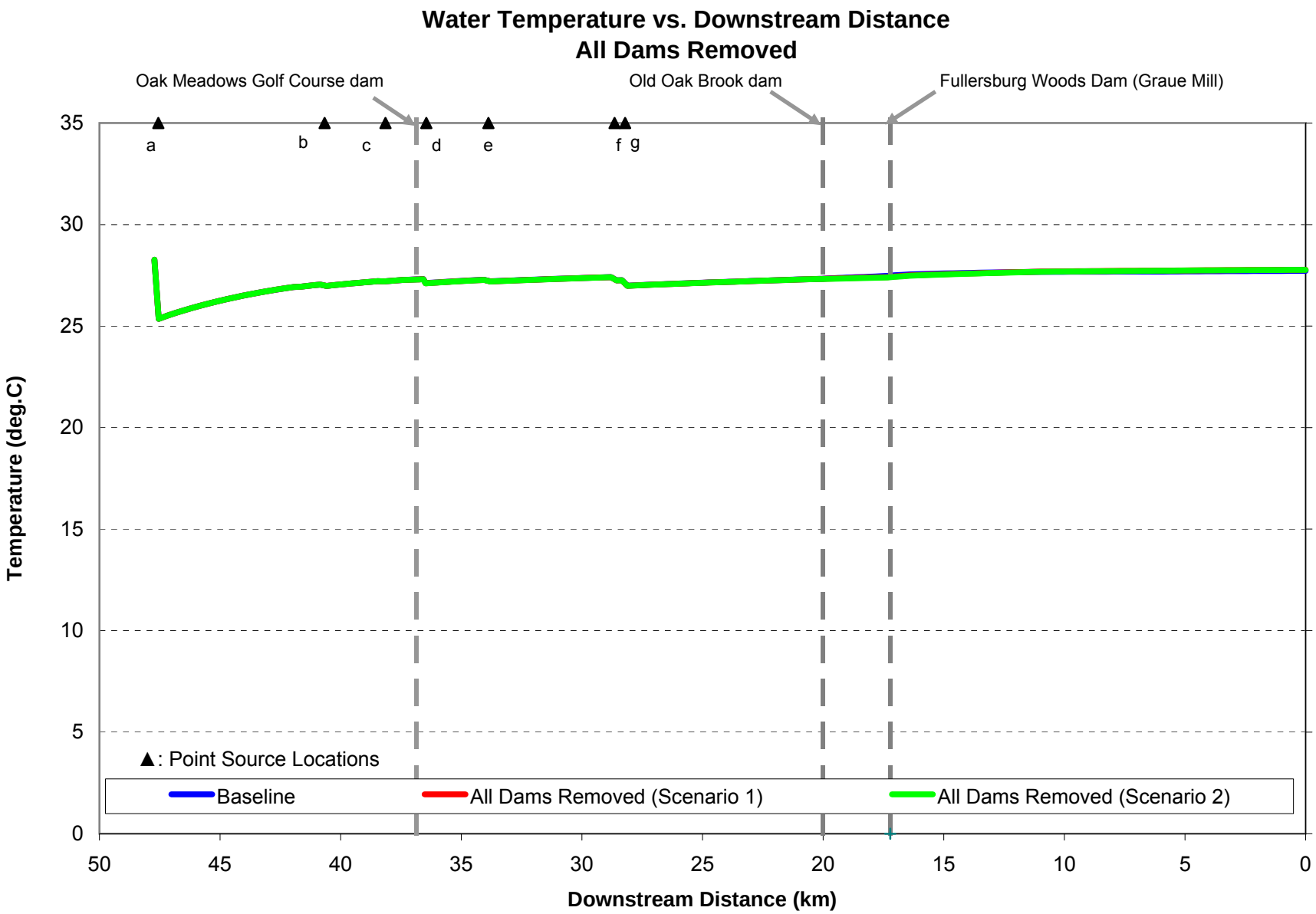
Salt Creek (8/15/2006) Mainstem

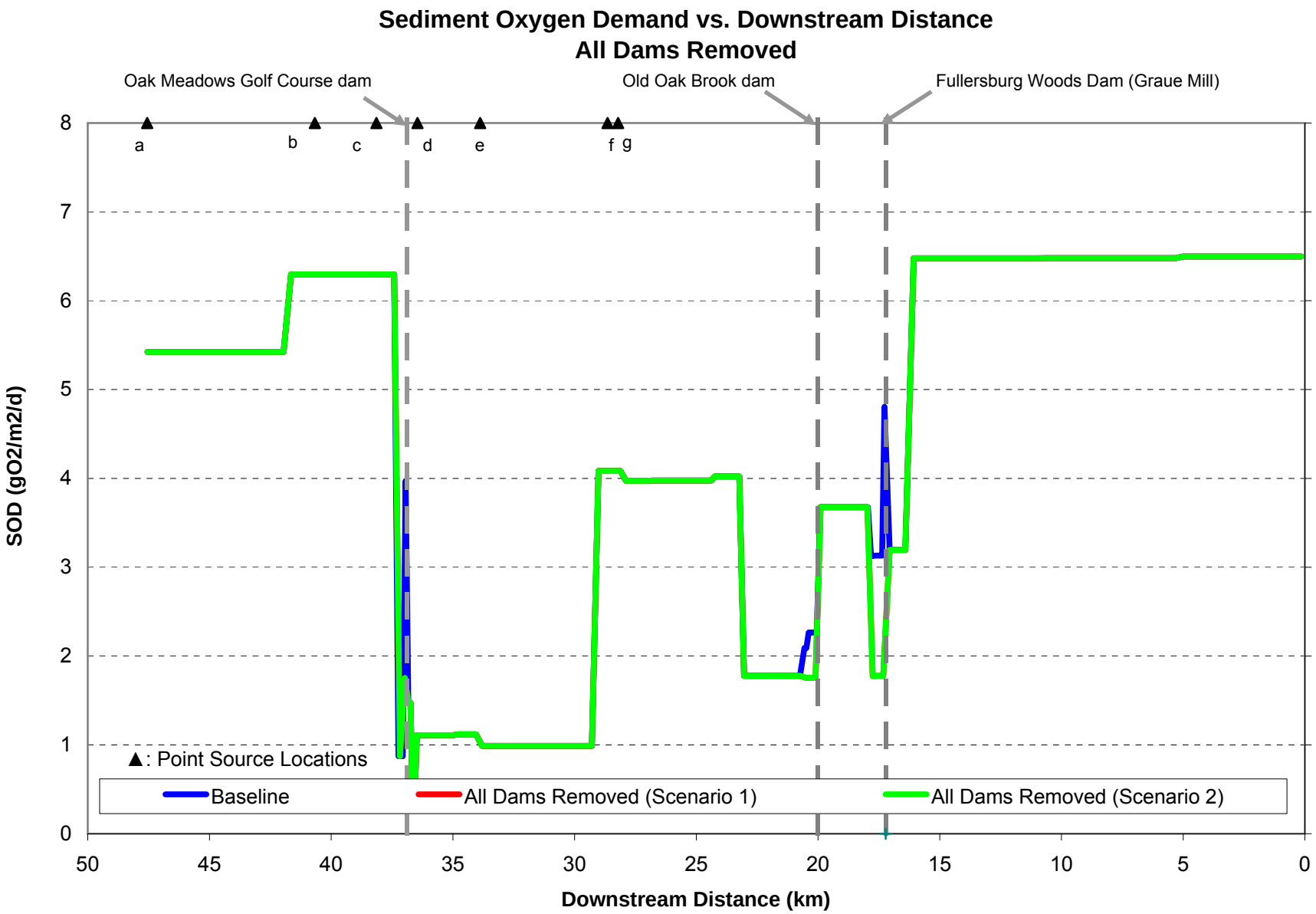
Oxygen Addition Alternative 4 in Oak Meadows Dam and Graue Mill Dam Impoundments

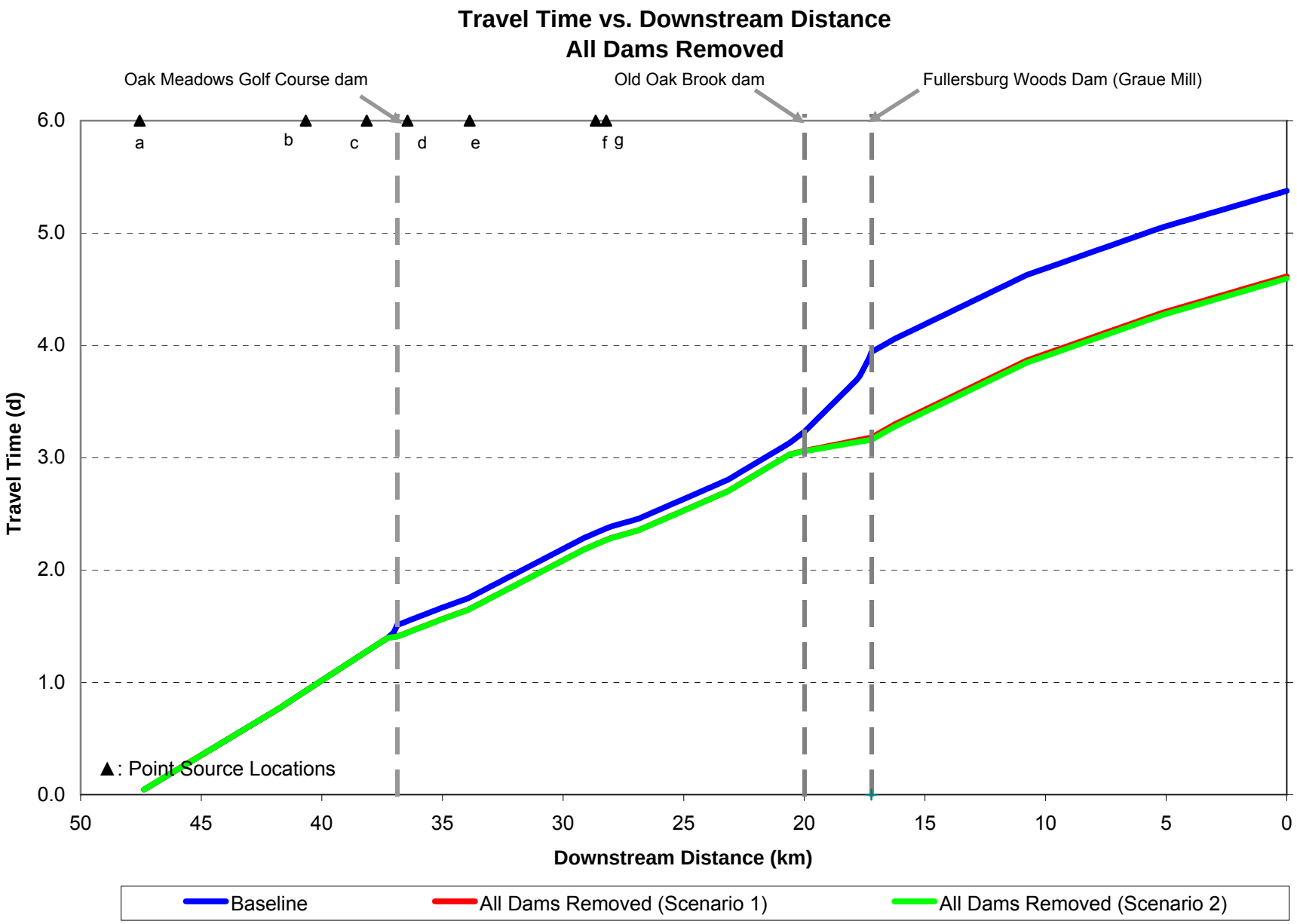


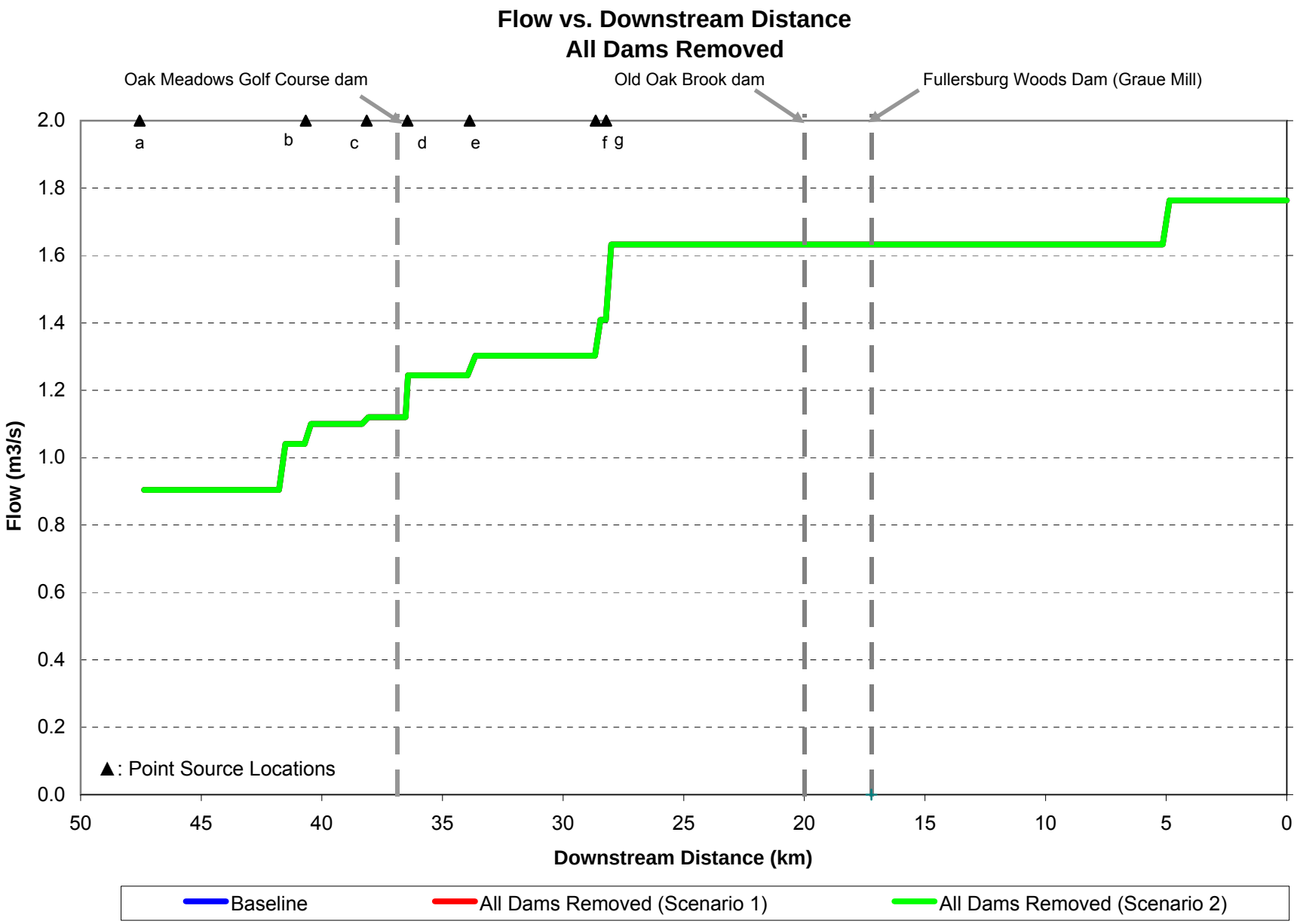

Daily Minimum Dissolved Oxygen vs. Downstream Distance
Evaluation Scenario 4-Dam Removal/Bridging
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f g
: Point Source Locations
DO Standard (above 5 mg/L at any time)
DO (mg/L)
Downstream Distance (km)
Baseline
2 Dams Removed
Dam Bridging 1 (dam crest lowered by 1 ft)
Dam Bridging 2 (dam crest lowered by 2 ft)
Dam Bridging 3 (dam crest lowered by 3 ft)

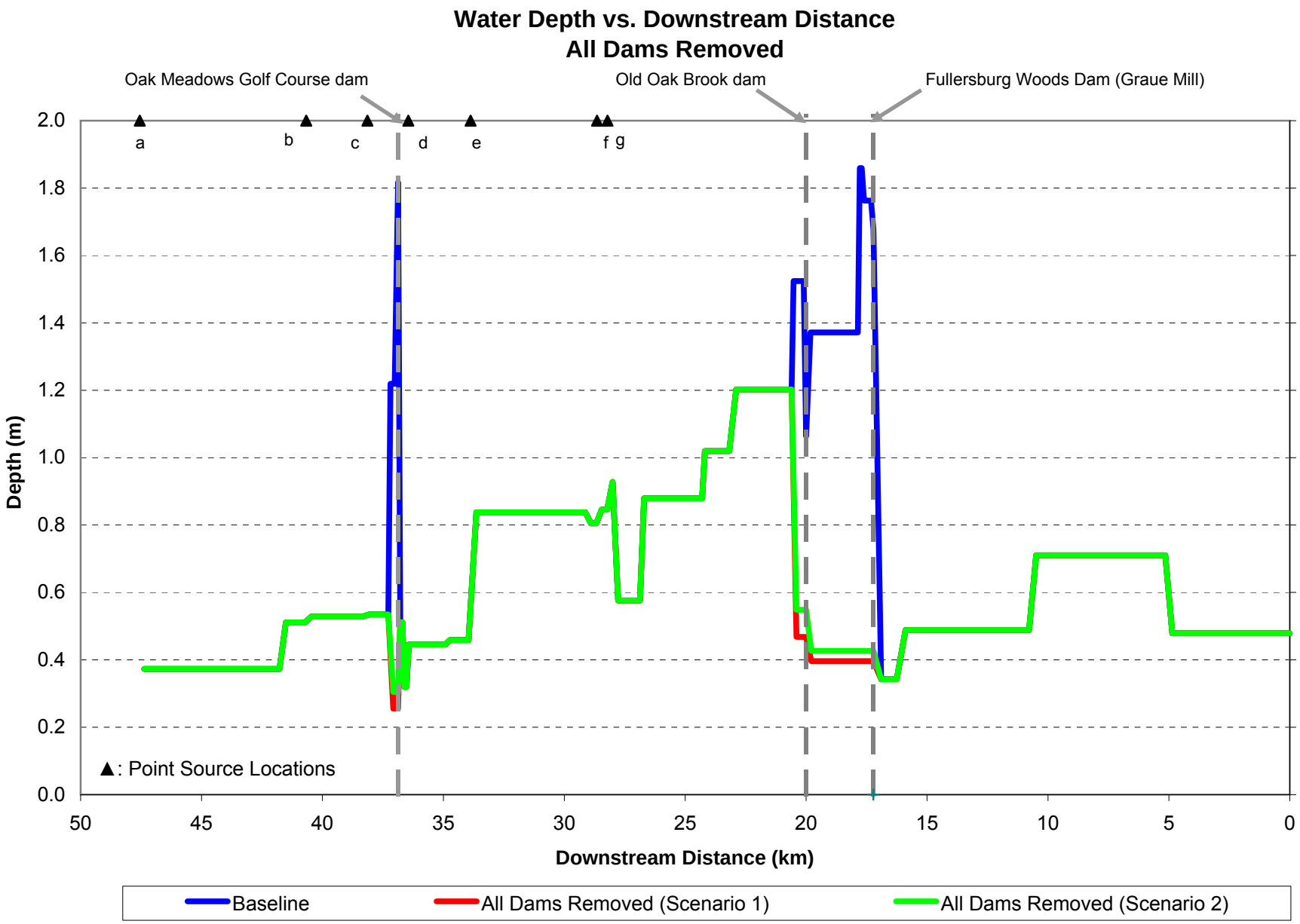

Dissolved Oxygen vs. Downstream Distance
All Dams Removed
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f
g
▲: Point Source Locations
DO (mg/L)
Downstream Distance (km)
0
1
2
3
4
5
6
7
8
50
45
40
35
30
25
20
15
10
5
0
Baseline
All Dams Removed (Scenario 1)
All Dams Removed (Scenario 2)

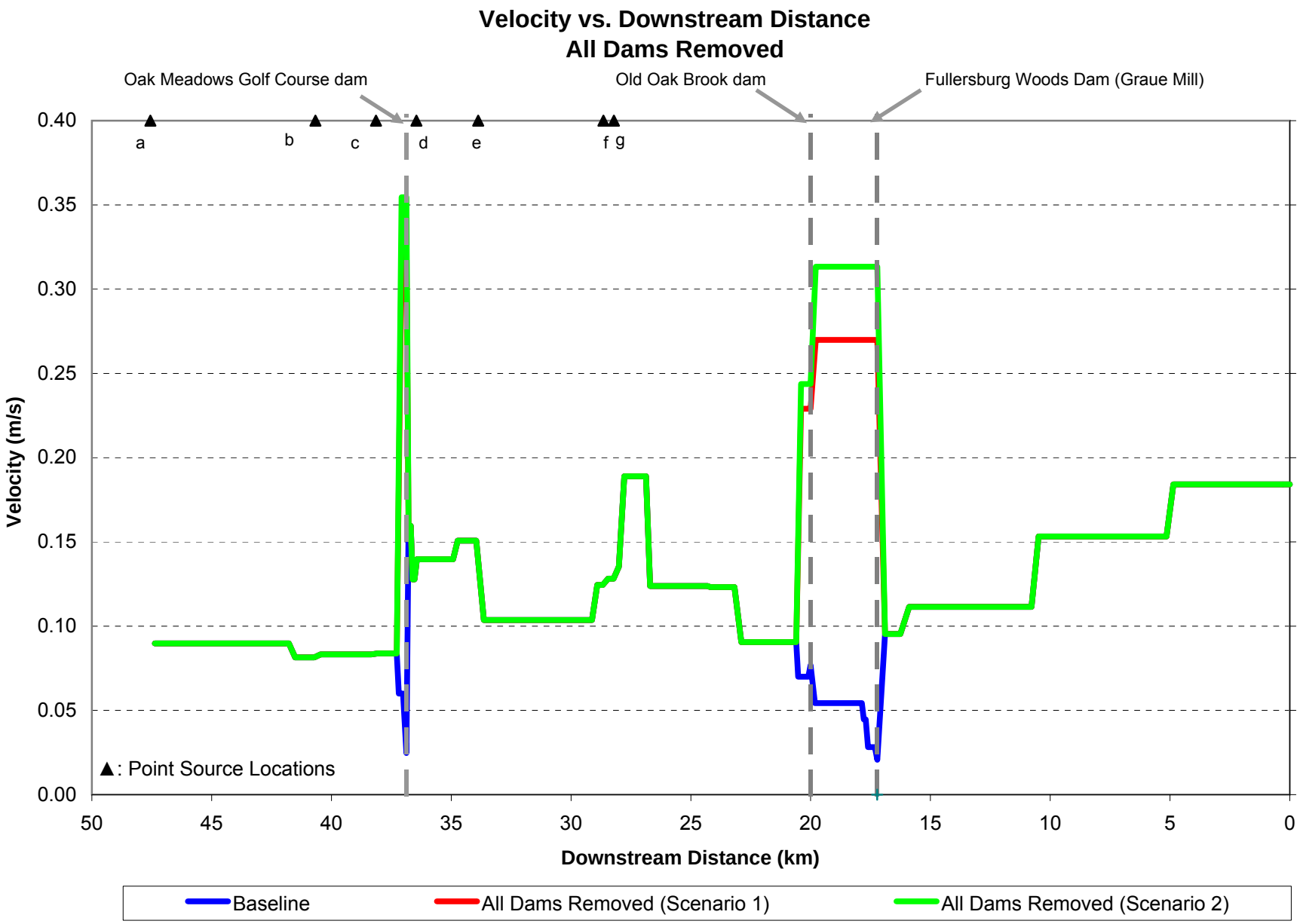

Water Temperature vs. Downstream Distance
All Dams Removed
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f
g
35
30
25
20
15
10
5
0
Temperature (deg.C)
▲: Point Source Locations
Baseline
All Dams Removed (Scenario 1)
All Dams Removed (Scenario 2)
50
45
40
35
30
25
20
15
10
5
0
Downstream Distance (km)

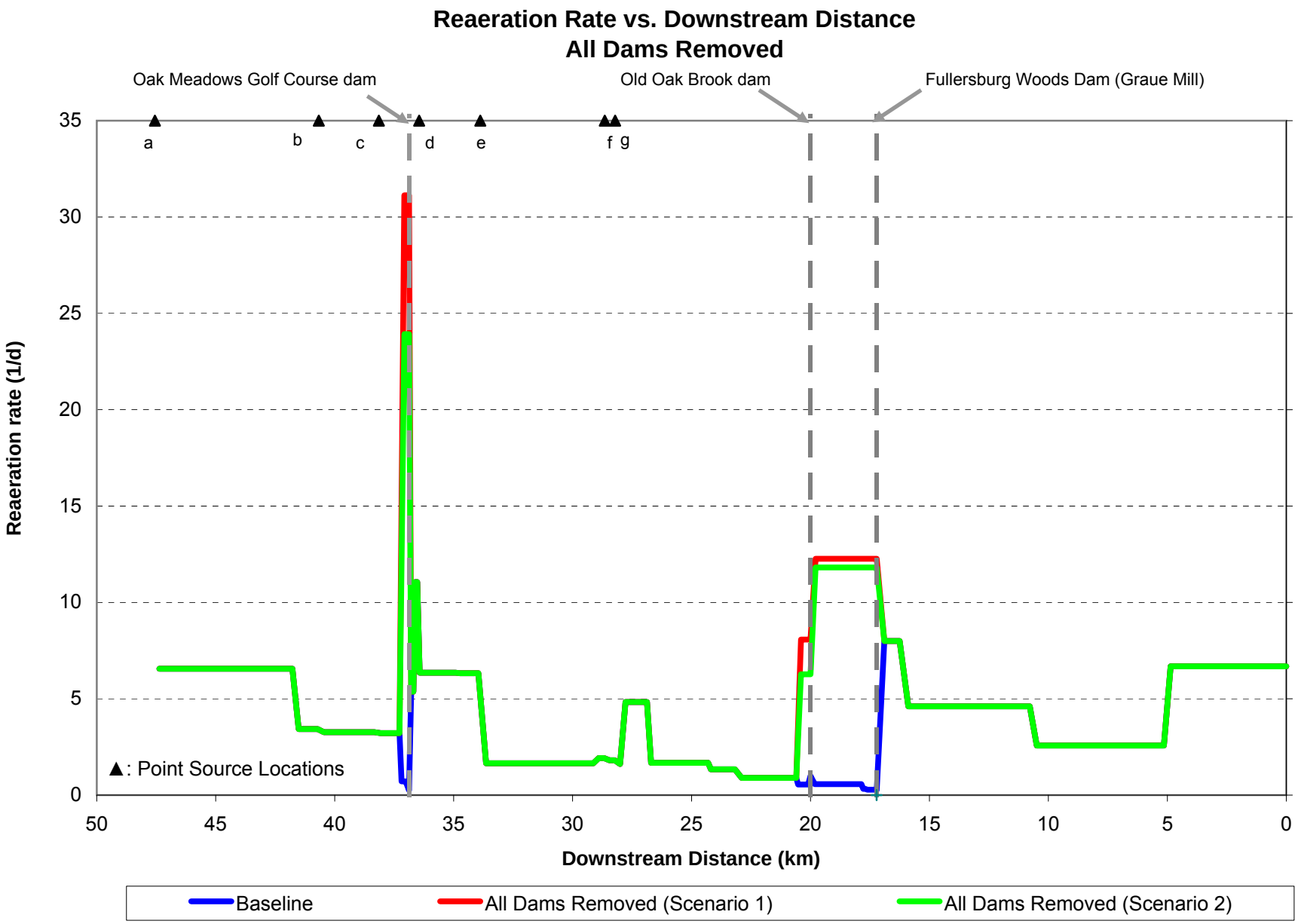

Sediment Oxygen Demand vs. Downstream Distance
All Dams Removed
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f
g
SOD (gO2/m2/d)
Downstream Distance (km)
▲: Point Source Locations
Baseline
All Dams Removed (Scenario 1)
All Dams Removed (Scenario 2)
0
1
2
3
4
5
6
7
8
50
45
40
35
30
25
20
15
10
5
0


Travel Time vs. Downstream Distance
All Dams Removed
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f
g
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Travel Time (d)
▲: Point Source Locations
50
45
40
35
30
25
20
15
10
5
0
Downstream Distance (km)
Baseline
All Dams Removed (Scenario 1)
All Dams Removed (Scenario 2)


Flow vs. Downstream Distance
All Dams Removed
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f
g
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Flow (m3/s)
▲: Point Source Locations
50
45
40
35
30
25
20
15
10
5
0
Downstream Distance (km)
Baseline
All Dams Removed (Scenario 1)
All Dams Removed (Scenario 2)


Water Depth vs. Downstream Distance
All Dams Removed
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f
g
▲: Point Source Locations
Depth (m)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
50
45
40
35
30
25
20
15
10
5
0
Downstream Distance (km)
Baseline
All Dams Removed (Scenario 1)
All Dams Removed (Scenario 2)


Velocity vs. Downstream Distance
All Dams Removed
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f
g
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Velocity (m/s)
▲: Point Source Locations
50
45
40
35
30
25
20
15
10
5
0
Downstream Distance (km)
Baseline
All Dams Removed (Scenario 1)
All Dams Removed (Scenario 2)


Reaeration Rate vs. Downstream Distance
All Dams Removed
Oak Meadows Golf Course dam
Old Oak Brook dam
Fullersburg Woods Dam (Graue Mill)
a
b
c
d
e
f
g
▲: Point Source Locations
Reaeration rate (1/d)
Downstream Distance (km)
35
30
25
20
15
10
5
0
50
45
40
35
30
25
20
15
10
5
0
Baseline
All Dams Removed (Scenario 1)
All Dams Removed (Scenario 2)