Table 6 Default TMDL Allocation of Phosphorus based upon 2004 Discharge Levels and Impact to Gulf Island Pond. Applies June to September

	Phosphorus Alloc Outfall in ppd			Assimilation Factors % P Remaining @ Twin Br.		Phosphorus Alloc Twin Br in ppd			2004 Discharge Levels in ppd		
Municipal	TP ppd	OP ppd	OPO4-P ppd	OP	OPO4-P	TP ppd	OP ppd	OPO4-P ppd	Total-P	Organic-P	Ortho-P
Berlin	13.1	1.7	11.4	60.70%	1.60%	1.2	1.0	0.2	13.1	1.7	11.4
Gorham	8.6	0.7	7.9	64.00%	3.90%	0.8	0.4	0.3	8.6	0.7	7.9
Bethel	5.0	0.5	4.5	65.50%	10.80%	0.8	0.3	0.5	5	0.5	4.5
Rumford-Mexico	21.0	3.0	18.0	82.80%	14.90%	5.2	2.5	2.7	21	3	18
Liv Falls	9.0	0.7	8.3	93.30%	98.40%	8.8	0.7	8.2	9	0.7	8.3
Paper Mills											
Fraser	135	59	76	62.10%	1.70%	37.9	36.6	1.3	133	57	76
Mead	142	45	97	79.60%	13.80%	49.2	35.8	13.4	140	43	97
IP	148	126	22.4	90.90%	97.60%	136.4	114.5	21.9	161	124	37
Total TMDL WLA (Point Sources) with clustering factor						240.3	191.9	48.4			
Total TMDL WLA (Point Sources) reduced by clustering factor						**208.2**	**163.1**	**45.0**			
Total TMDL LA (Non-Point Source + Natural)						**77.7**	**77.4**	**0.3**			
Explicit MOS 10%						**31.7**	**26.7**	**5**			
Total TMDL						**317**	**267**	**50**			

Implementation of Phosphorus TMDL in Licensing

Point Source	Licensing Recommendation	Comment
Berlin Gorham Bethel Rumford-Mexico	Monitor total-P and ortho-P from June-Sept for initial stage of phased TMDL. Re-evaluate appropriatenes of P-limits at end of initial phase.	These 4 points sources have a de-minimus contribution to algae problems on Gulf Island Pond but should still be monitored to assure phosphorus contributions do not increase significantly in the future.
Livermore Falls	Mass ortho-P limit as monthly average from June to Sept based upon loads in Table 6. Monitor total-P and ortho-P from June to Sept.	Ortho-P is significant contribution to algae problems on Gulf Island Pond in a river segment of demonstrated low phosphorus assimilation.
Fraser Paper MeadWestvaco International Paper	Mass ortho-P and total-P limit as monthly average from June to Sept based upon loads in Table 6. Monitor total-P and ortho-P.	Each mill has some responsibility for P-reductions. The mill with the most impact, IP has more responsibility and the mill with the least amount of impact, Fraser has less reponsibility.* Implement in stepped reductions with ongoing ambient monitoring as licensing requirements.

* Although only about 1/2 the size of the Maine mills, Fraser will be allowed total phosphorus levels similar to MWV. Fraser may be licensed as mass total-P only, due to the de-minimus impact of their ortho-P to Gulf Island Pond.

Summary of Allocation Method

1. Assign 2004 average summer discharges of phosphorus as initial allocations whenever possible (shaded boxes). Assignment priority inversely proportional to receiving water impact.
2. Inflate phosphorus TMDL by clustering factor which accounts for actual load going to Gulf Island Pond given unlikelyhood of all point sources simultaneously discharging monthly maximum loads.
3. Point source allocations inflated by clustering factor of 1.18 for organic-P and 1.07 for ortho-P. which accounts for simultaneous loads to the pond. Clustering factor derived from DMR's.*
4. Assign 10% explicit MOS for total TMDL of all phosphorus forms.
5. All point sources given 2004 discharge rates except IP whose ortho-P must be reduced from 37 to 22.4 ppd to meet ortho-P TMDL. IP is point source with highest impact to Gulf Island Pond.
6. All mill organic-P levels can be increased 2% from 2004 discharge levels and still meet TMDL for organic-P.

* The clustering factor eliminates the assumption used in implicit margins of safety by MDEP, which assumes that all point sources discharge their maximum loads simultaneously.

End Point of phased implementation of TMDL results when two summers of monitoring occurs without algae blooms during which both the river flow at Rumford < 2000 cfs or one summer when the flow < 1740 cfs for 30 consecutive days and river temperature at Turner Bridge > 24^{o}C for a minimum of 30 consecutive days in each given summer.

Figure 1
Summary of Chlorophyll-a Gulf Island Pond
Summer 2004

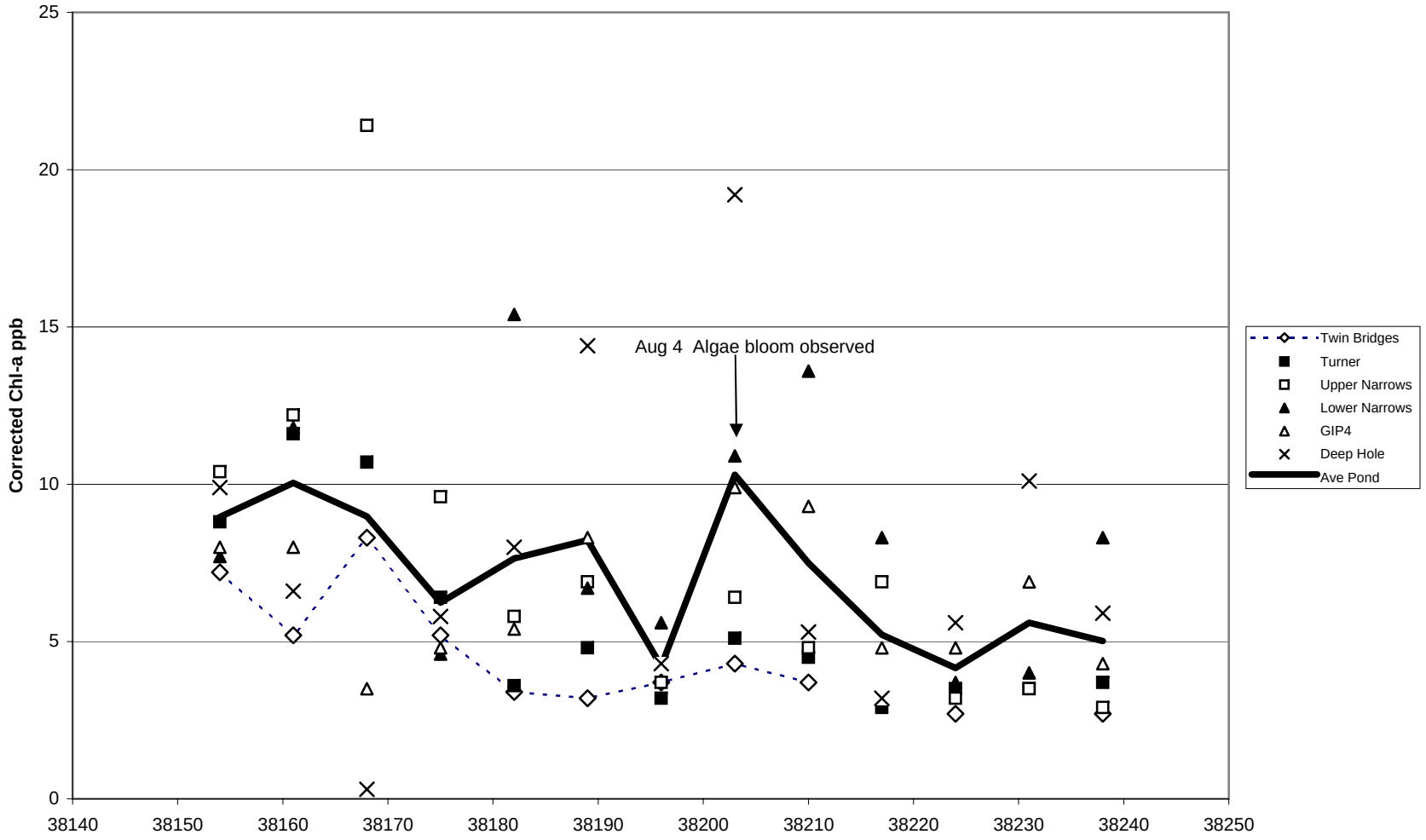


Figure 2- River Flow at Rumford
Vs
Calibration Data Sets

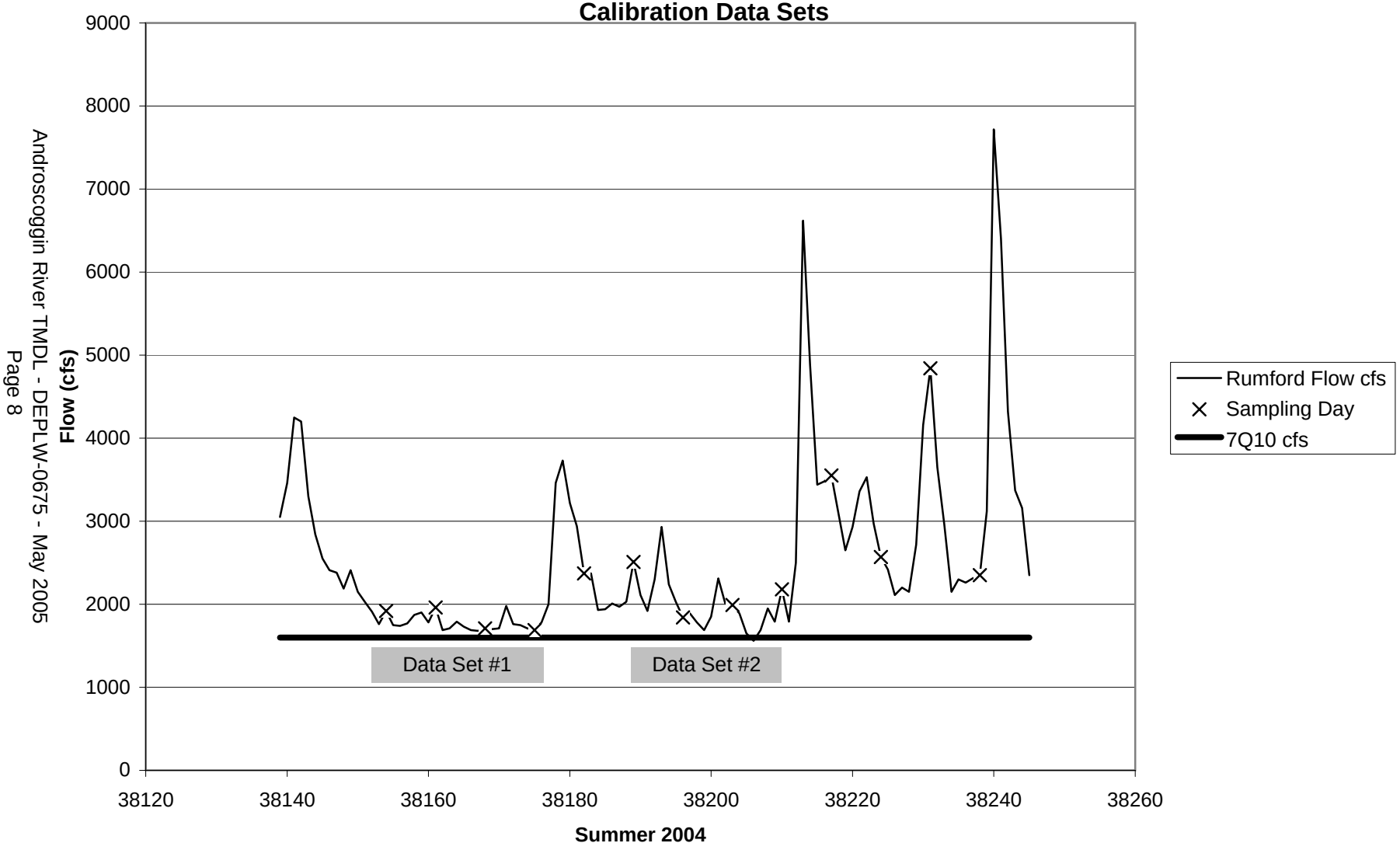
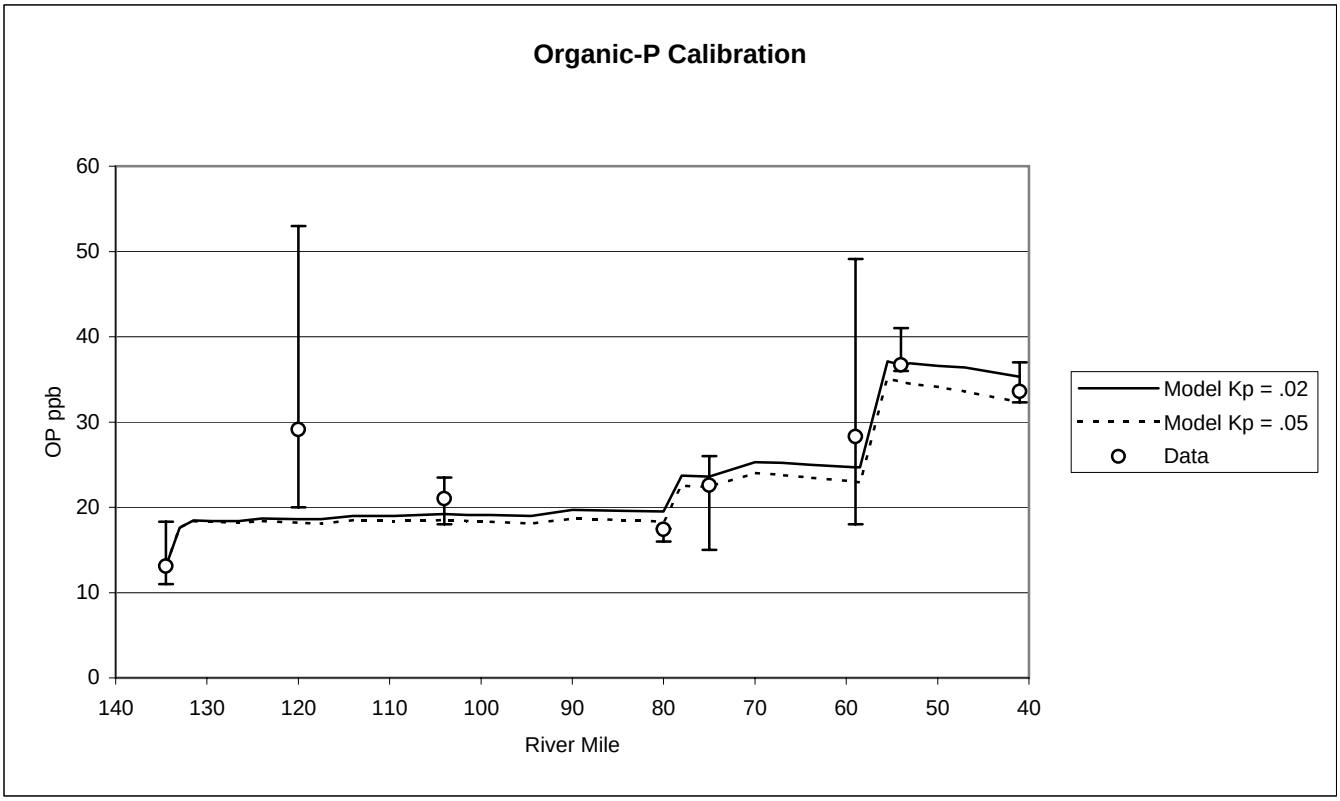


Figure 3 - Androscoggin River Model Calibration of Phosphorus Assimilation June 16 - July 7, 2004



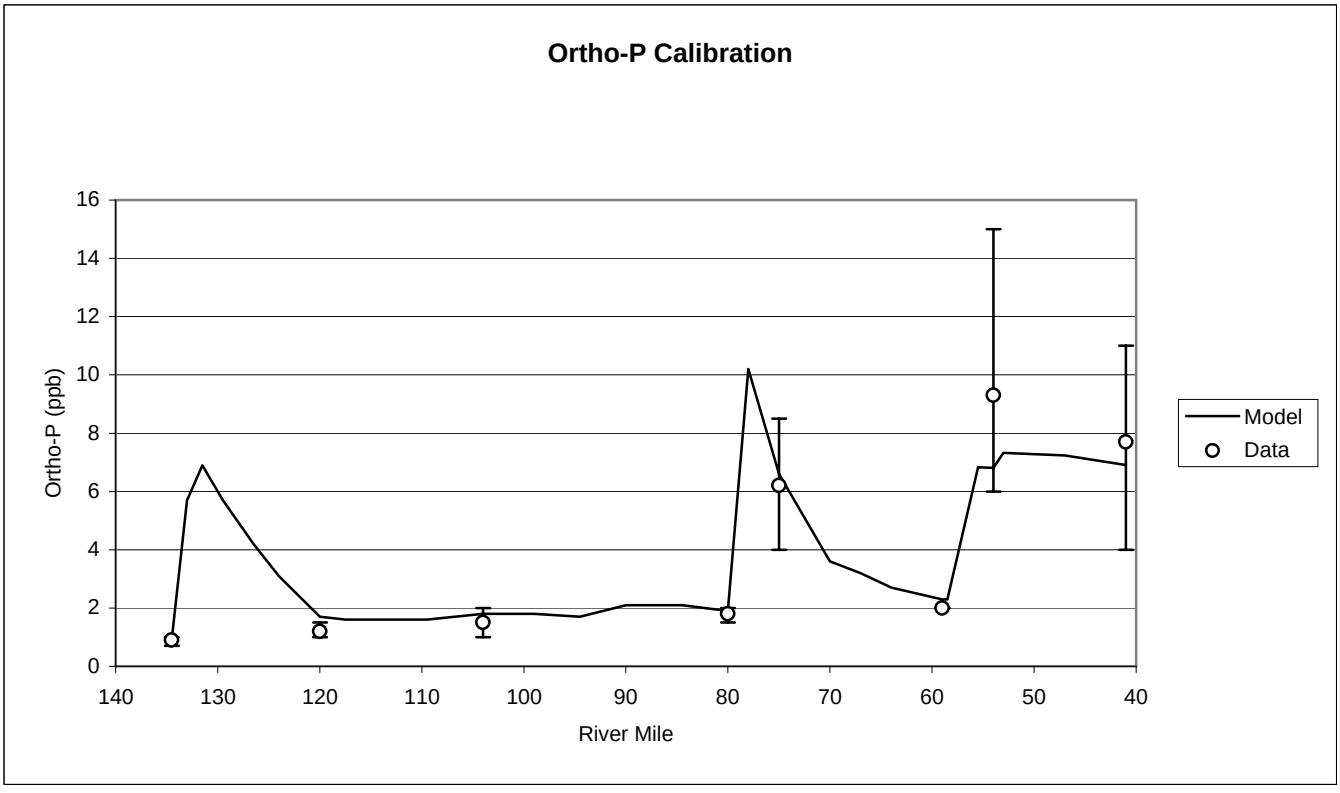
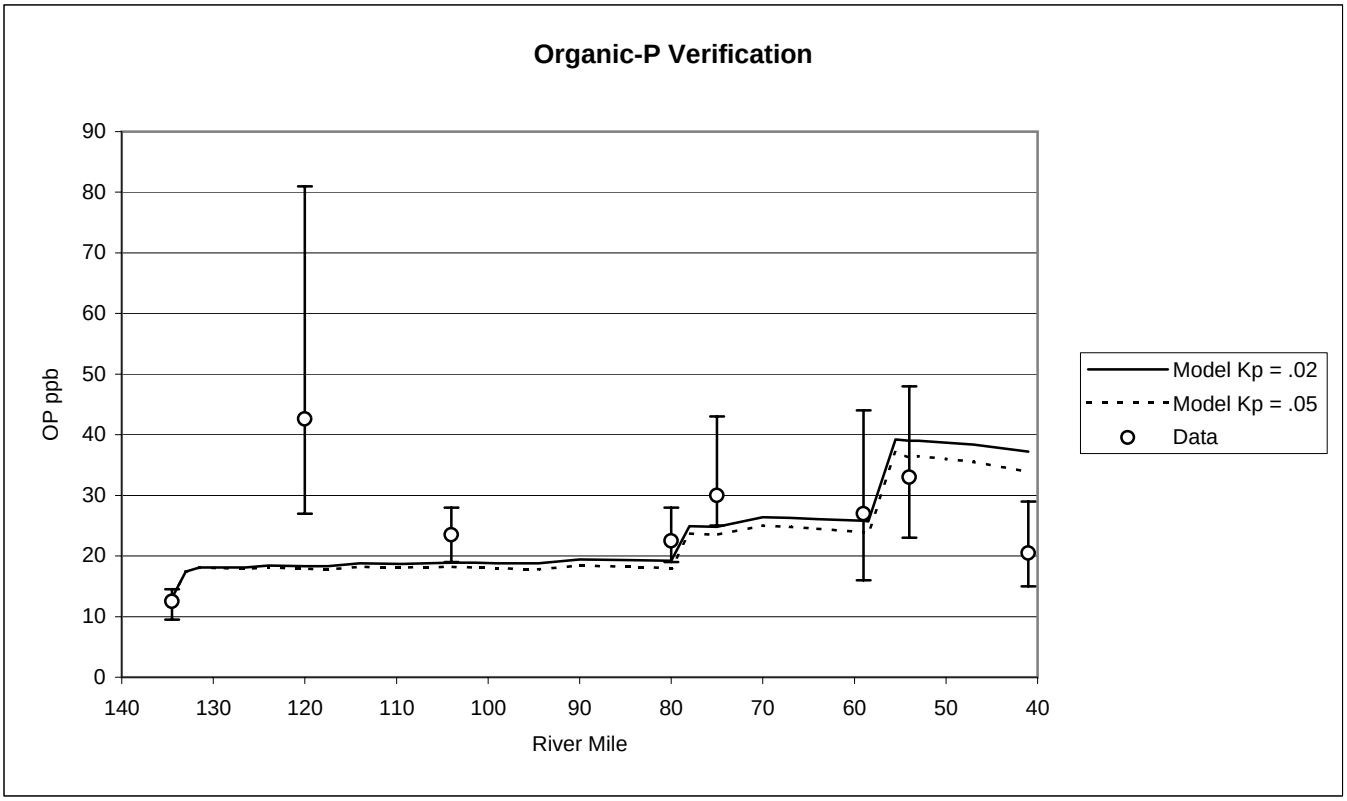


Figure 4 - Androscoggin River Model Verification of Phosphorus Assimilation July 21 - August 11, 2004



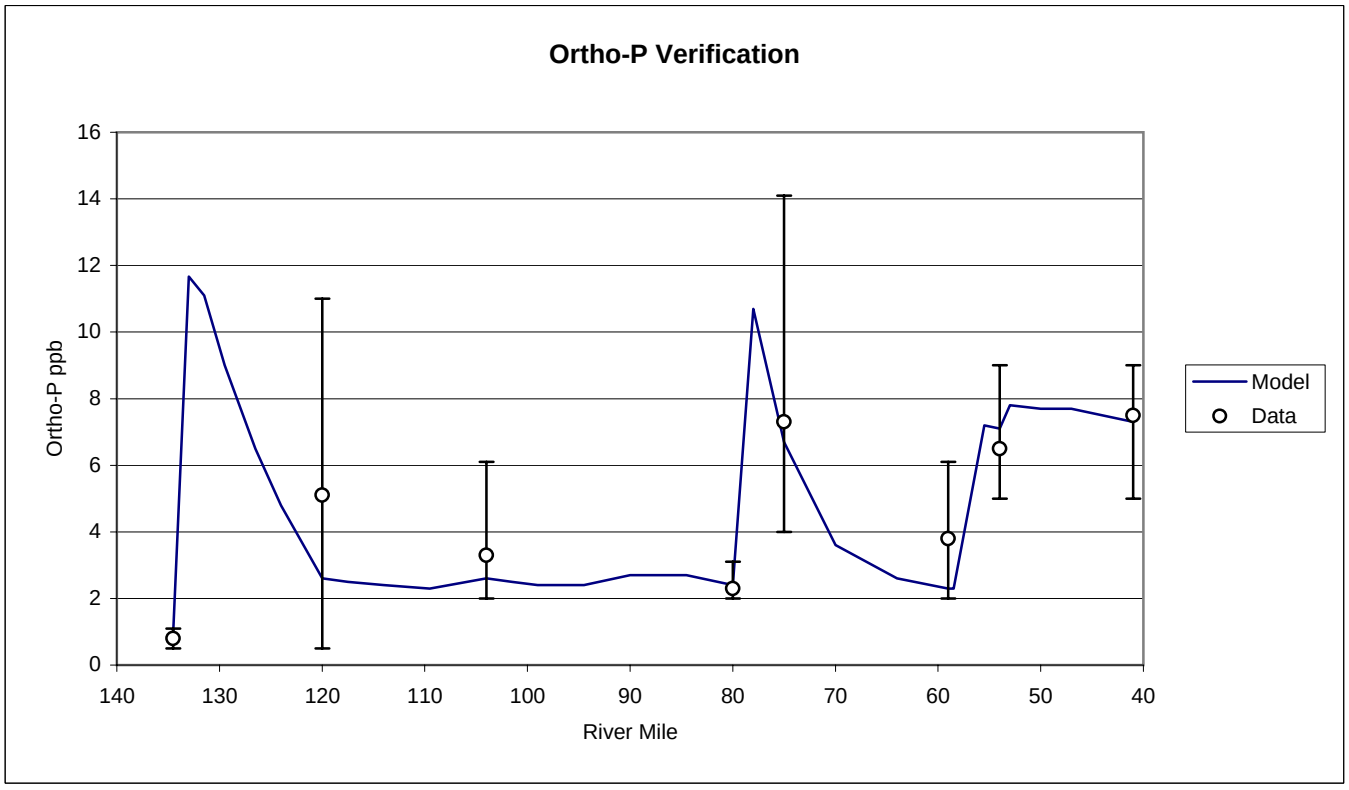
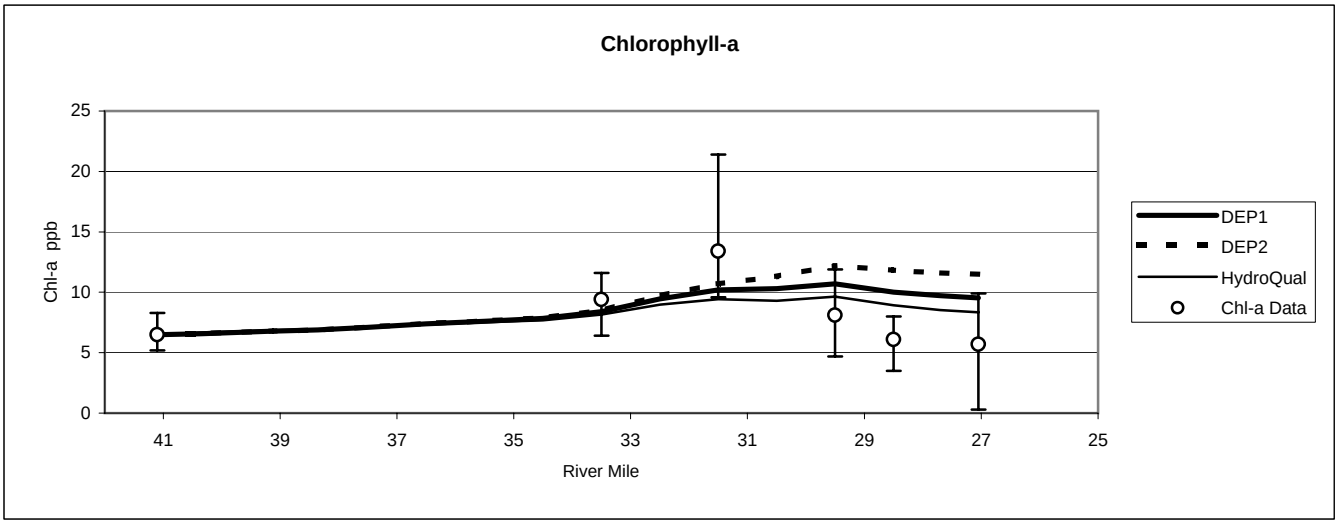
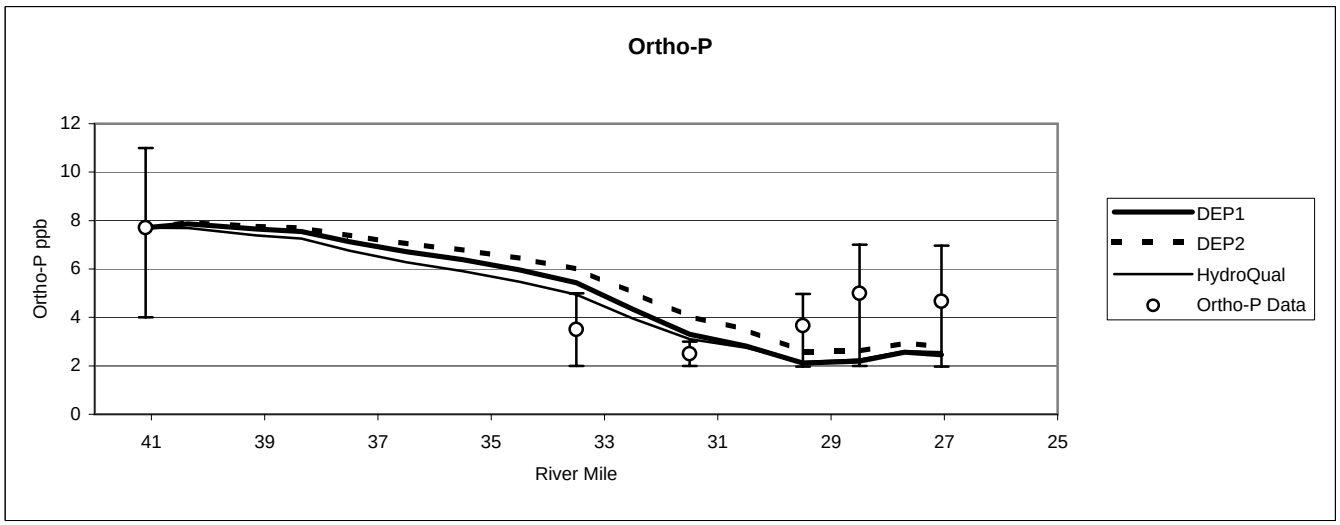


Figure 5 Gulf Island Pond Model Calibration June 16 to July 7, 2004





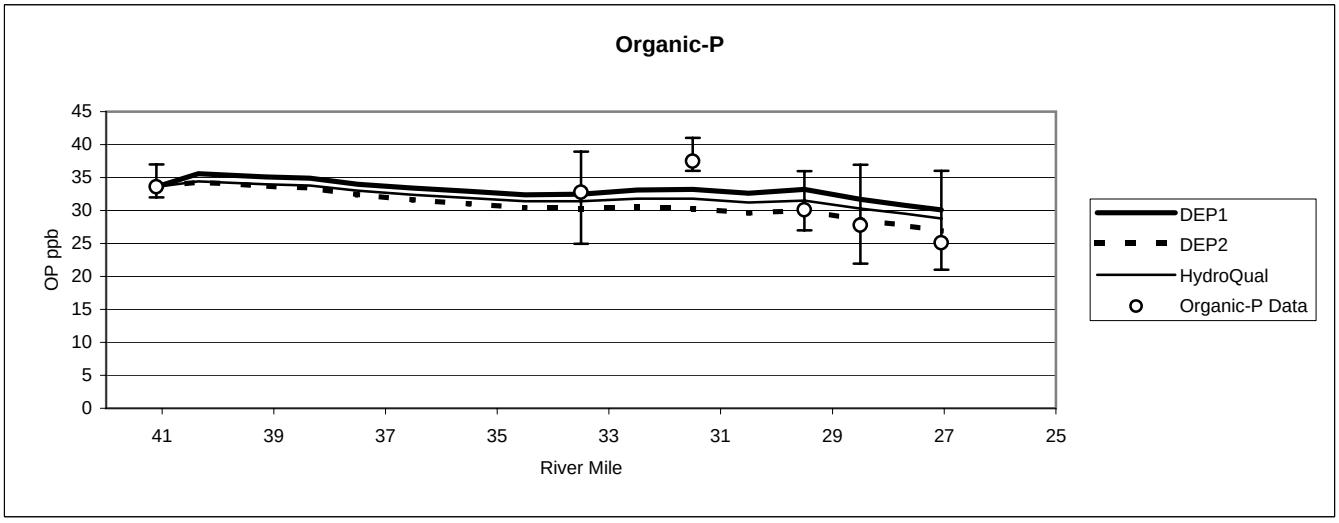
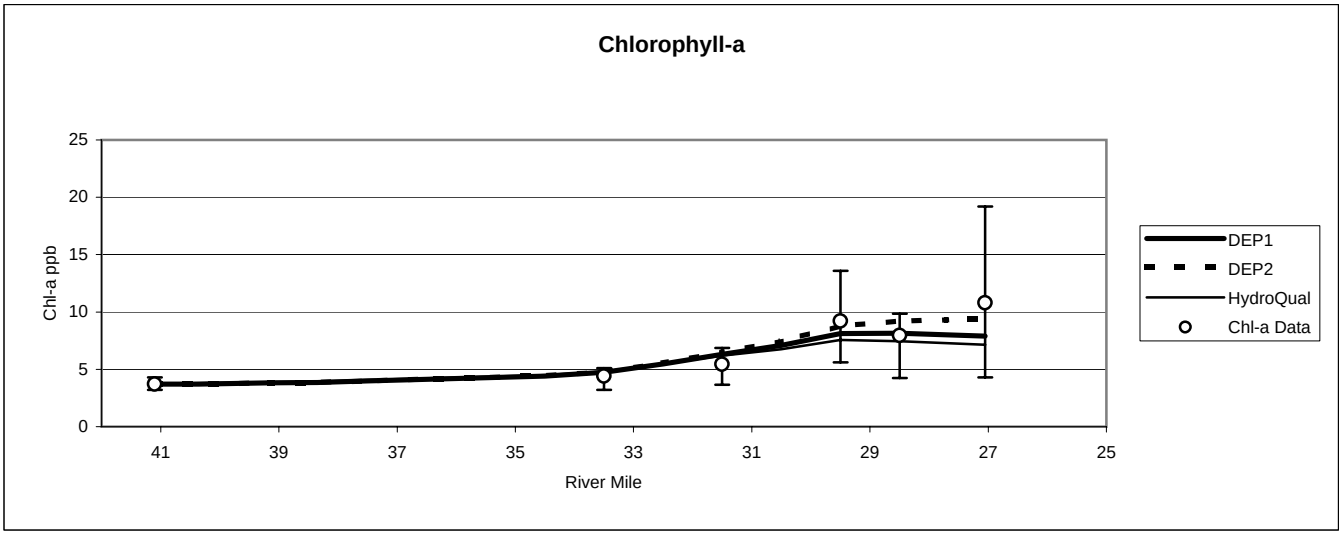
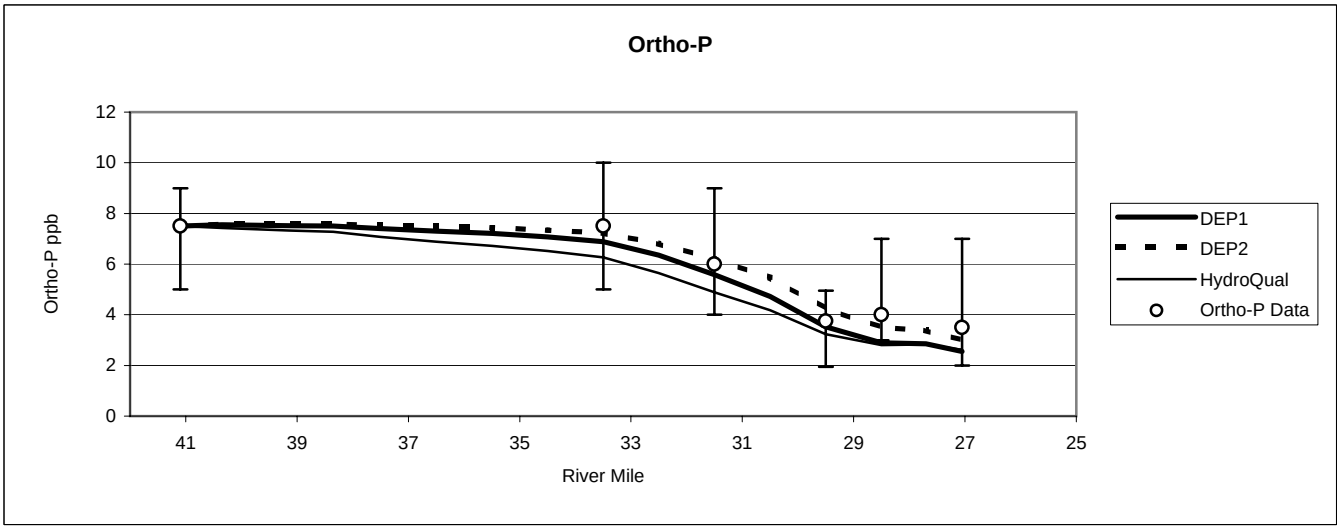


Figure 6 Gulf Island Pond Model Calibration July 21 to August 11, 2004





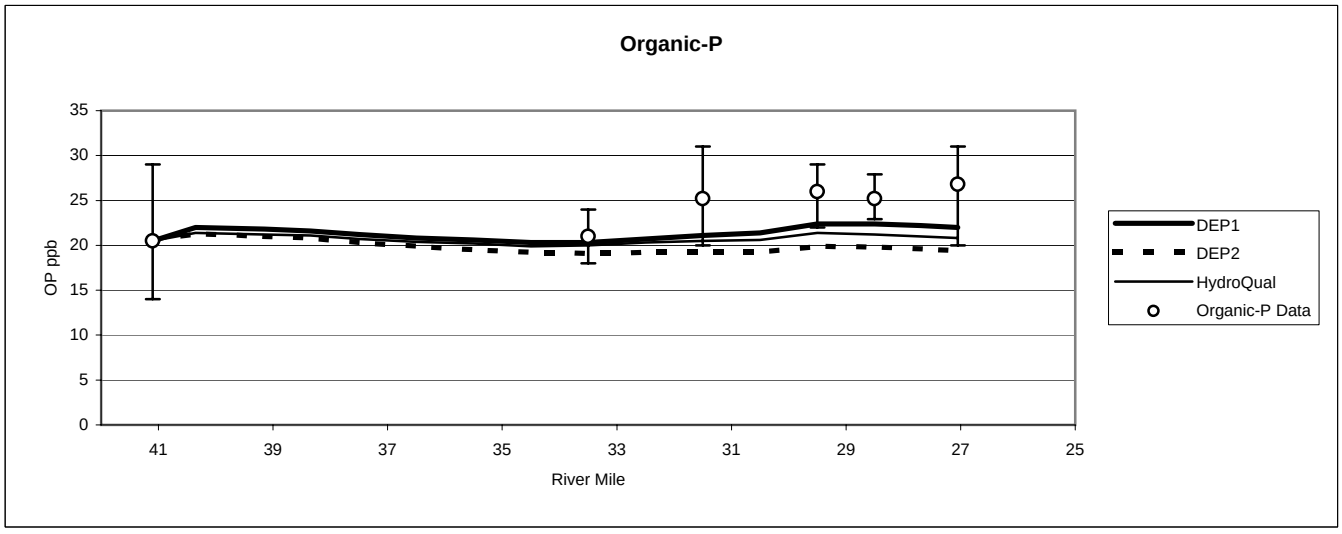
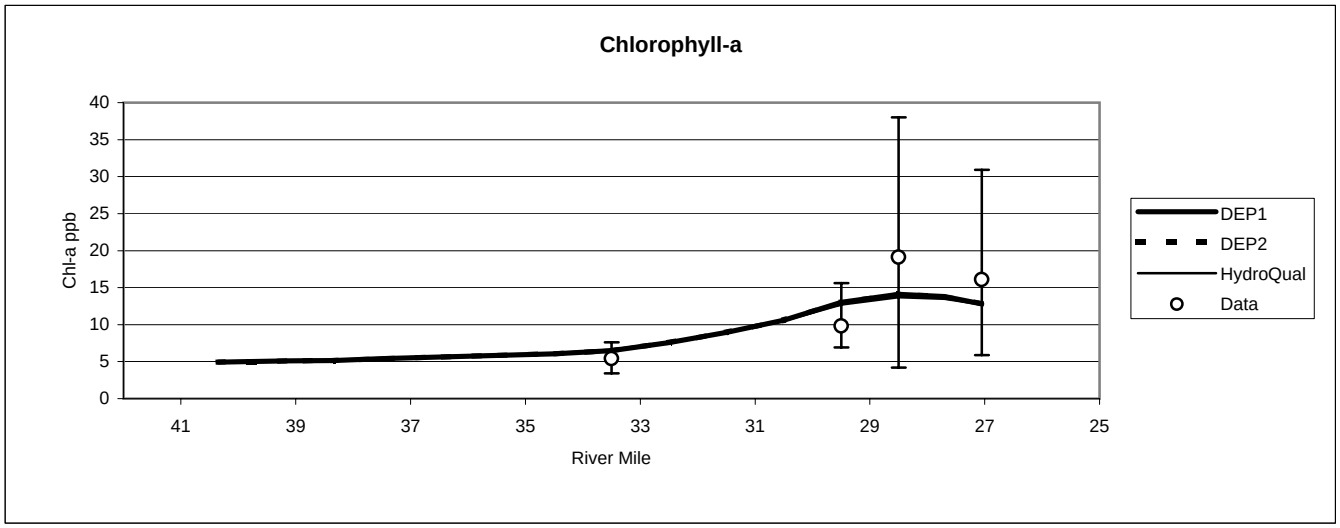
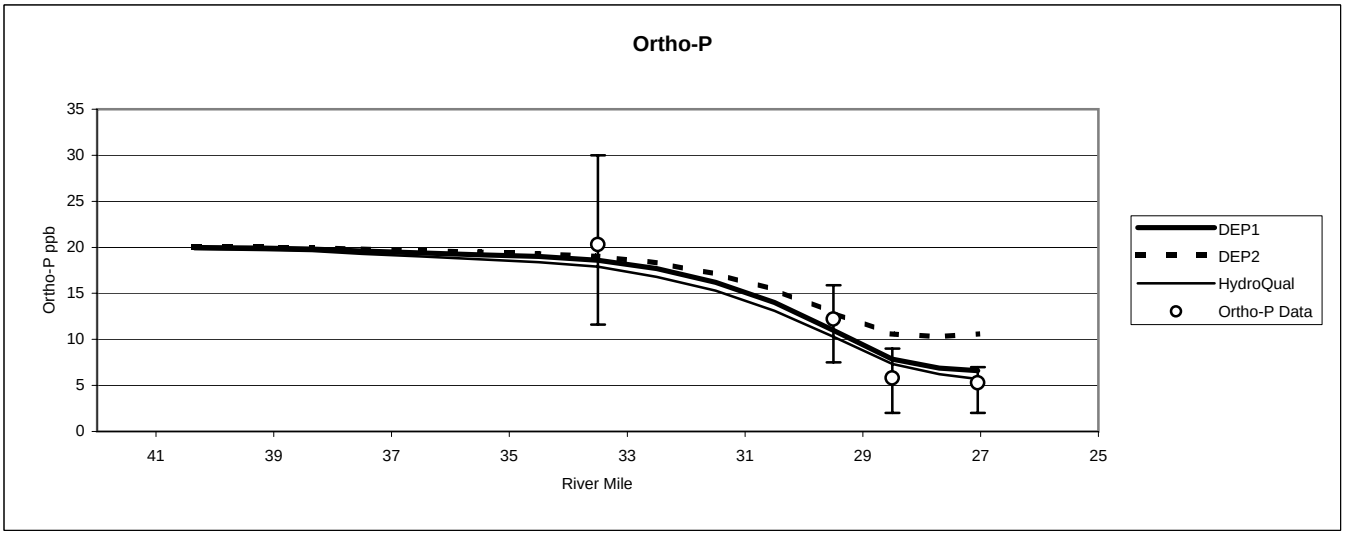


Figure 7 Gulf Island Pond Model Calibration August 1998





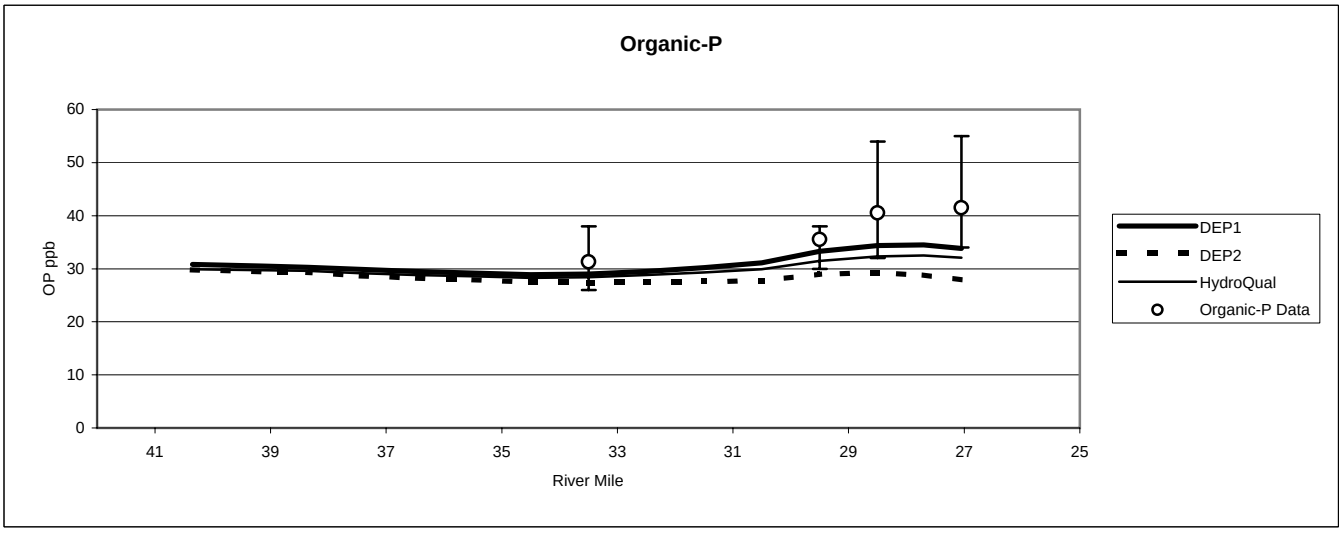
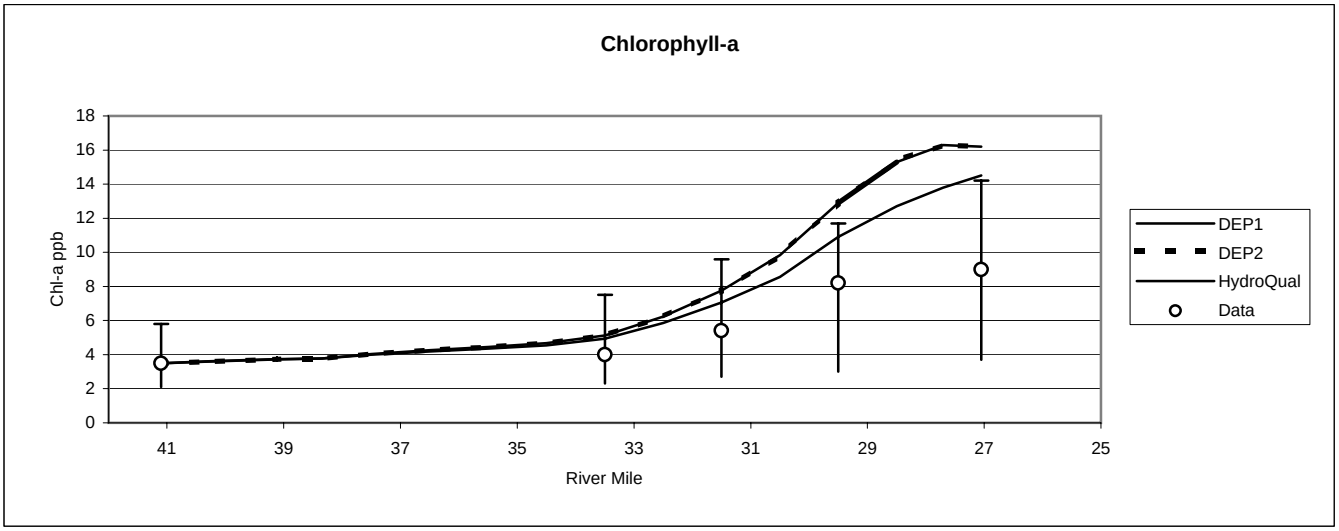
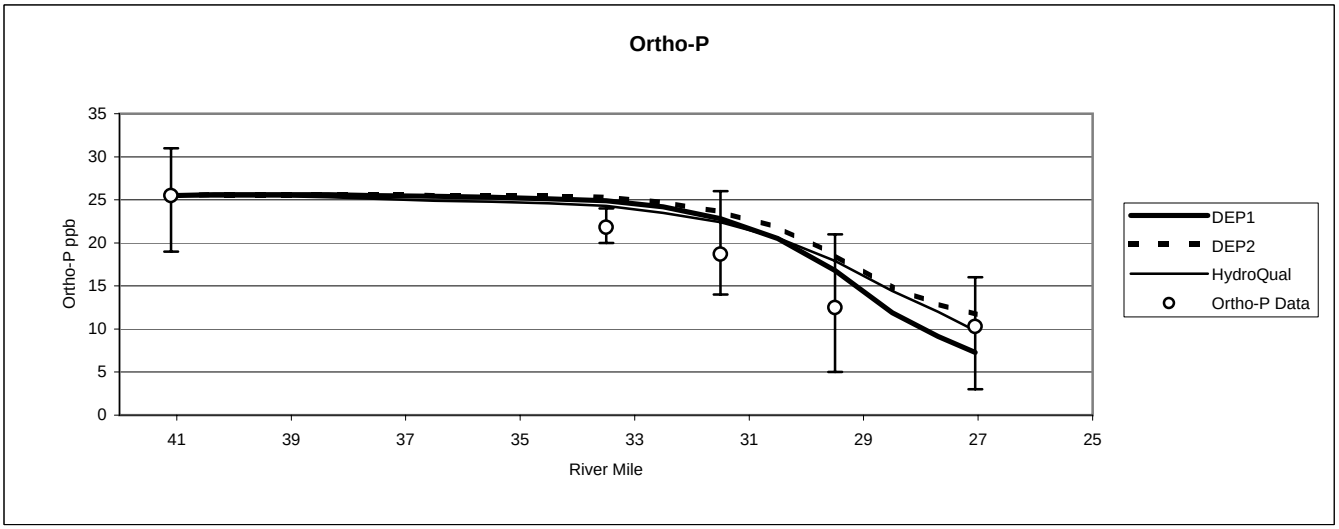


Figure 8 Gulf Island Pond Model Calibration August 2000





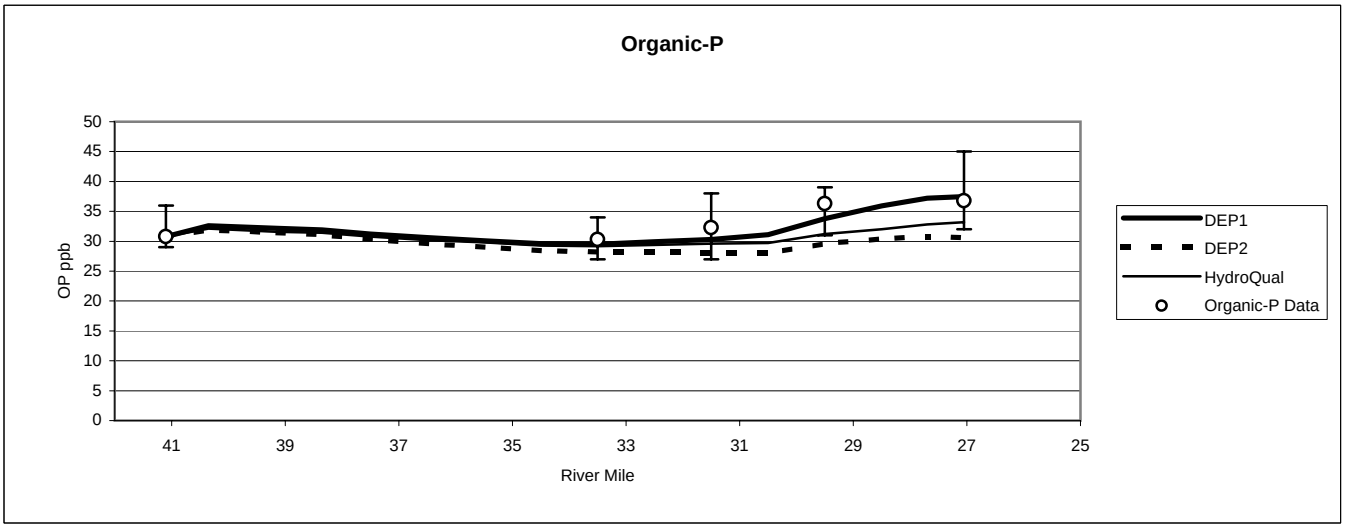


Figure 9
Model Prediction of Chlorophyll-a in Gulf Island Pond
Using Alternate Rates

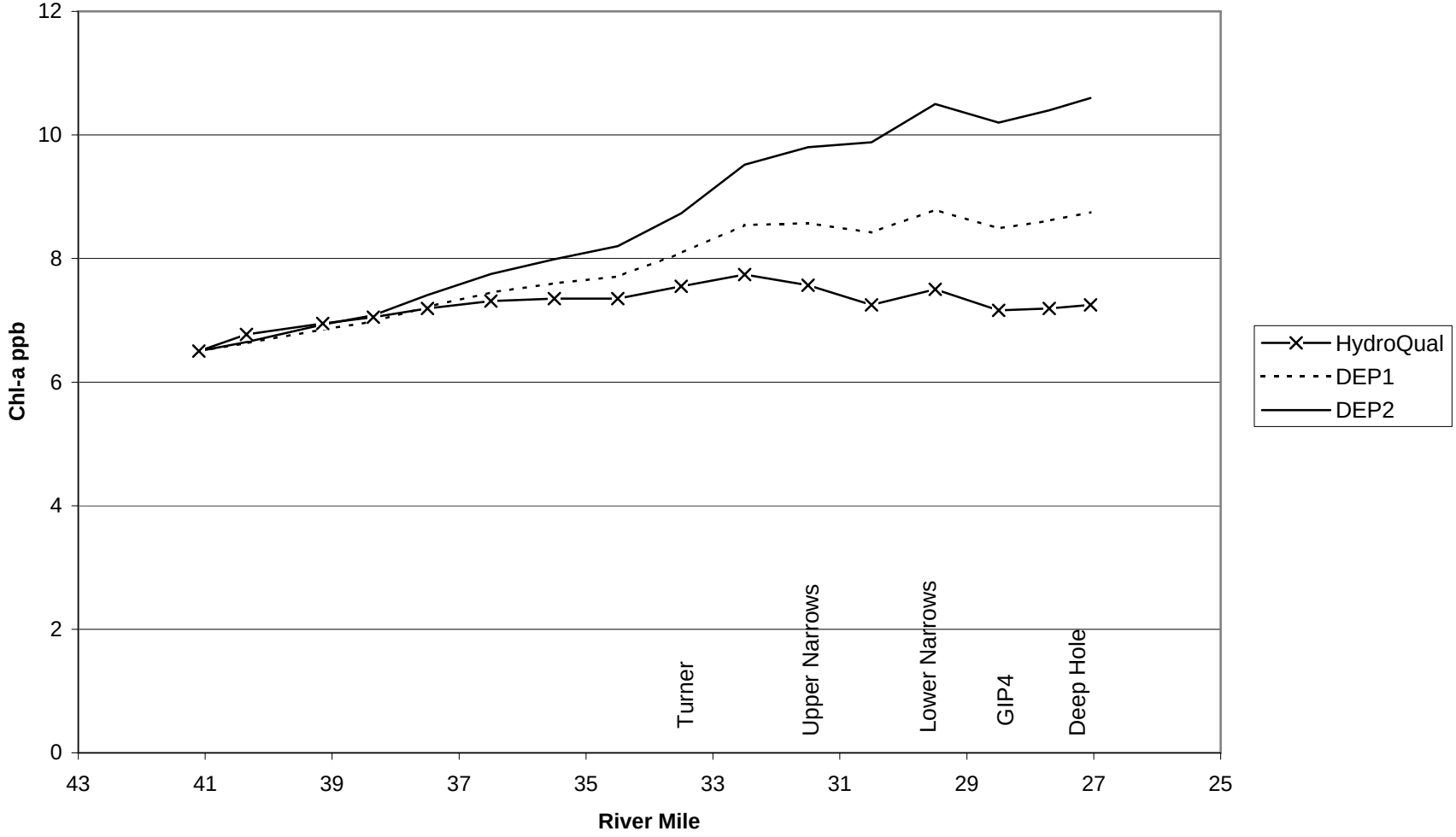


Figure 9a Model Predicted Chlorophyll-a

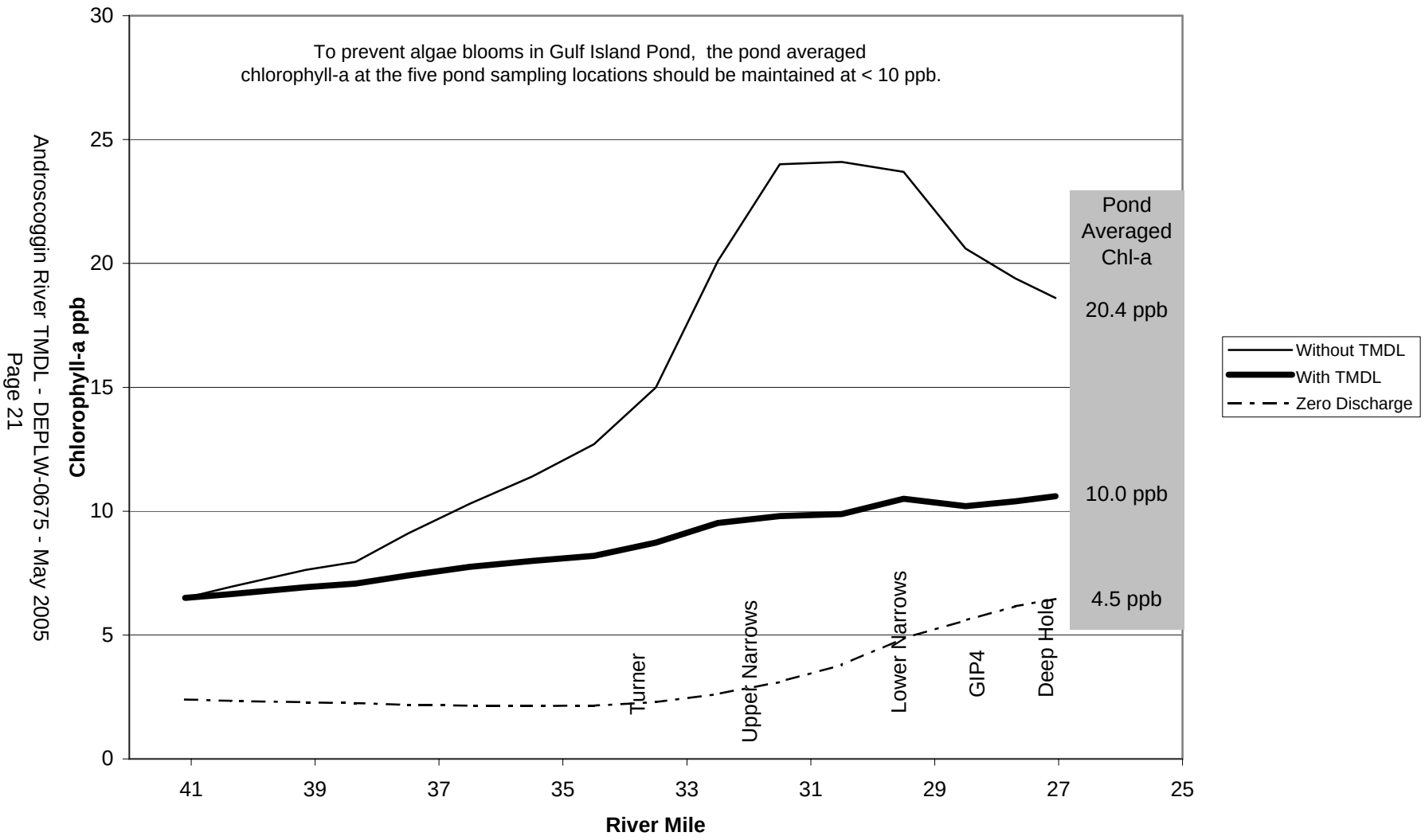
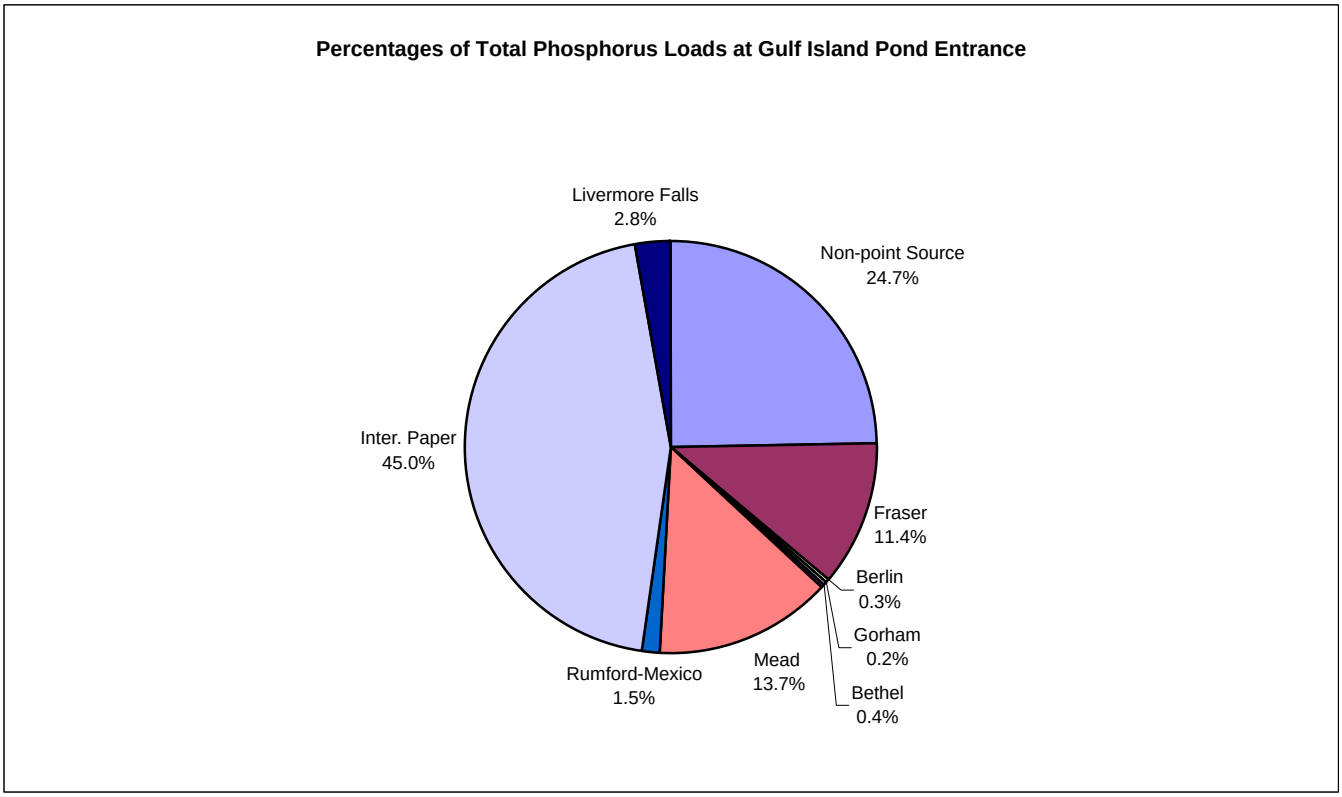


Figure 10 - Phosphorus Component Analysis Summer 2004



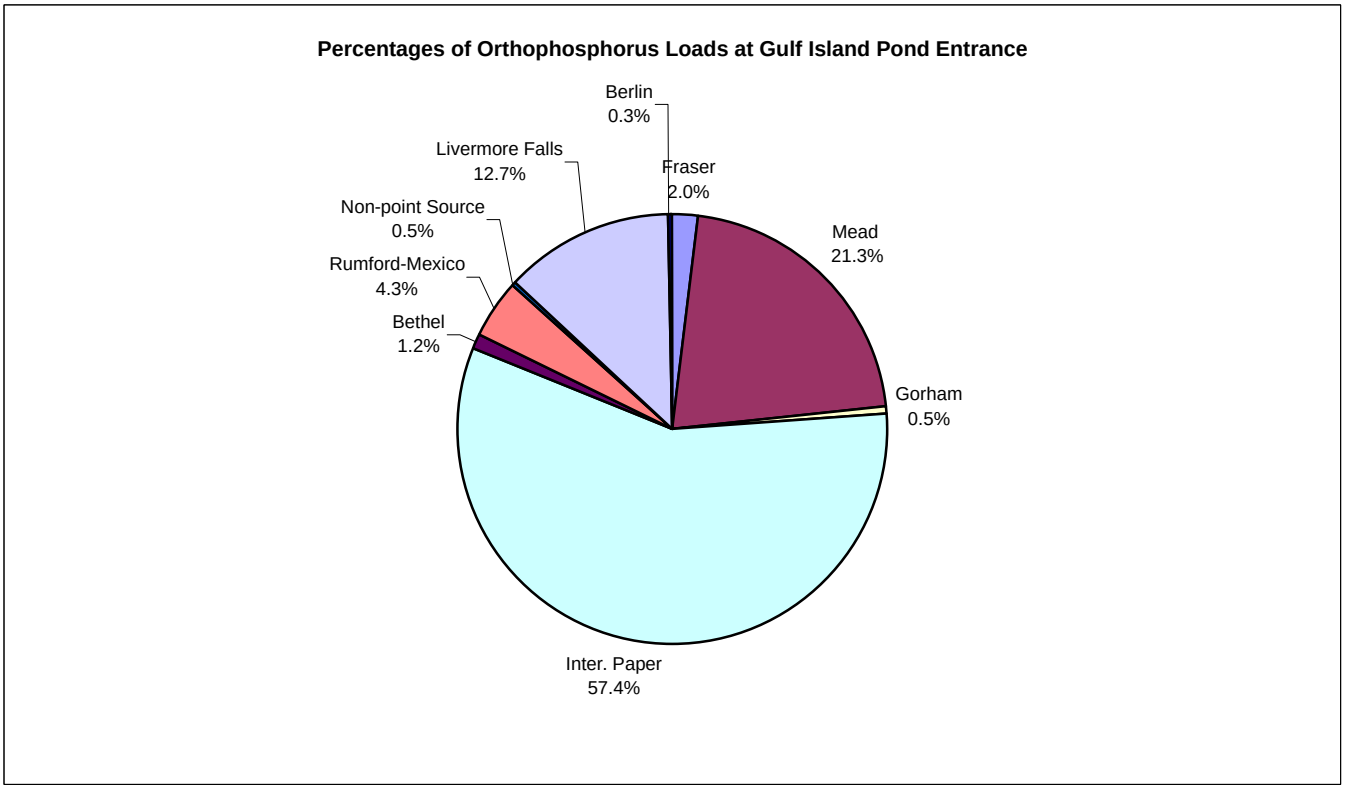
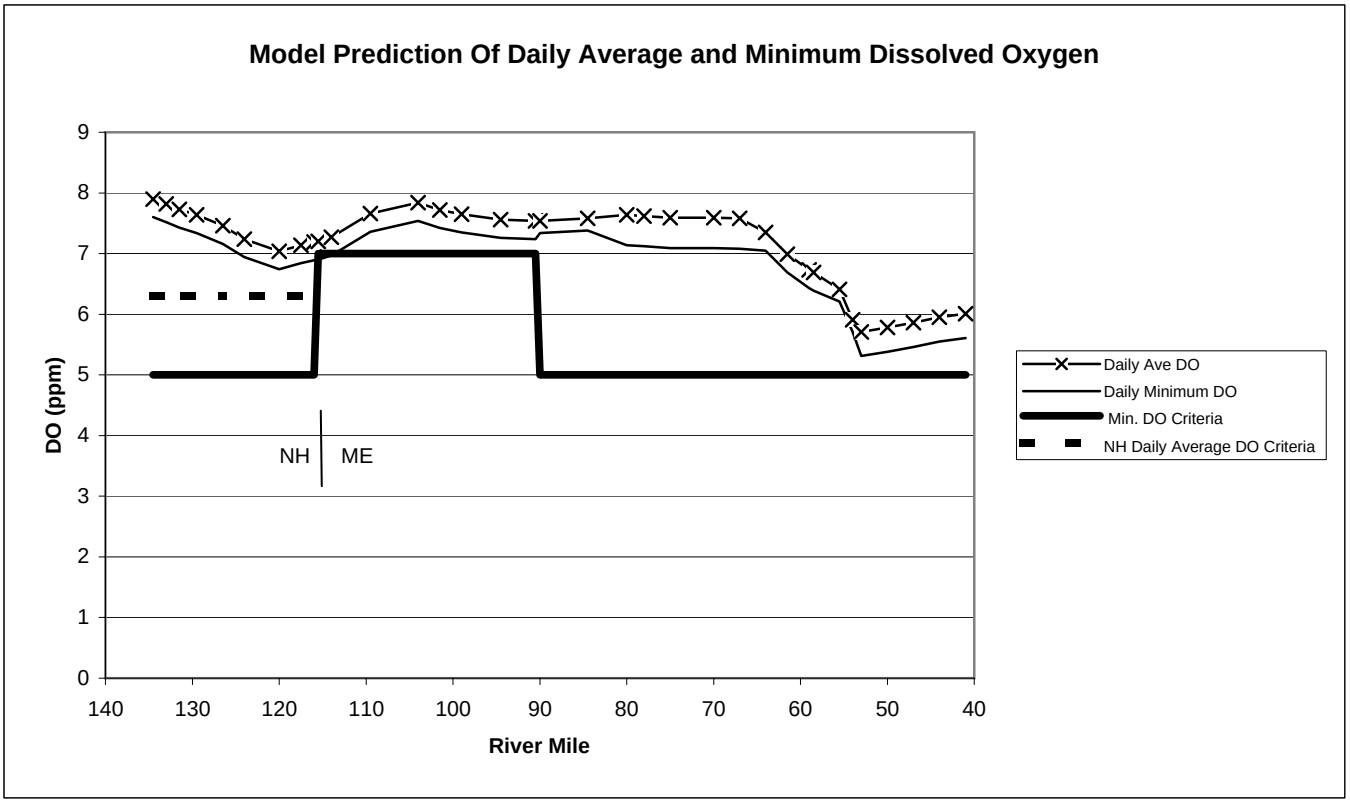


Figure 11 Model Predictions of Dissolved Oxygen in the Androscoggin River at 10-Year Low Flow



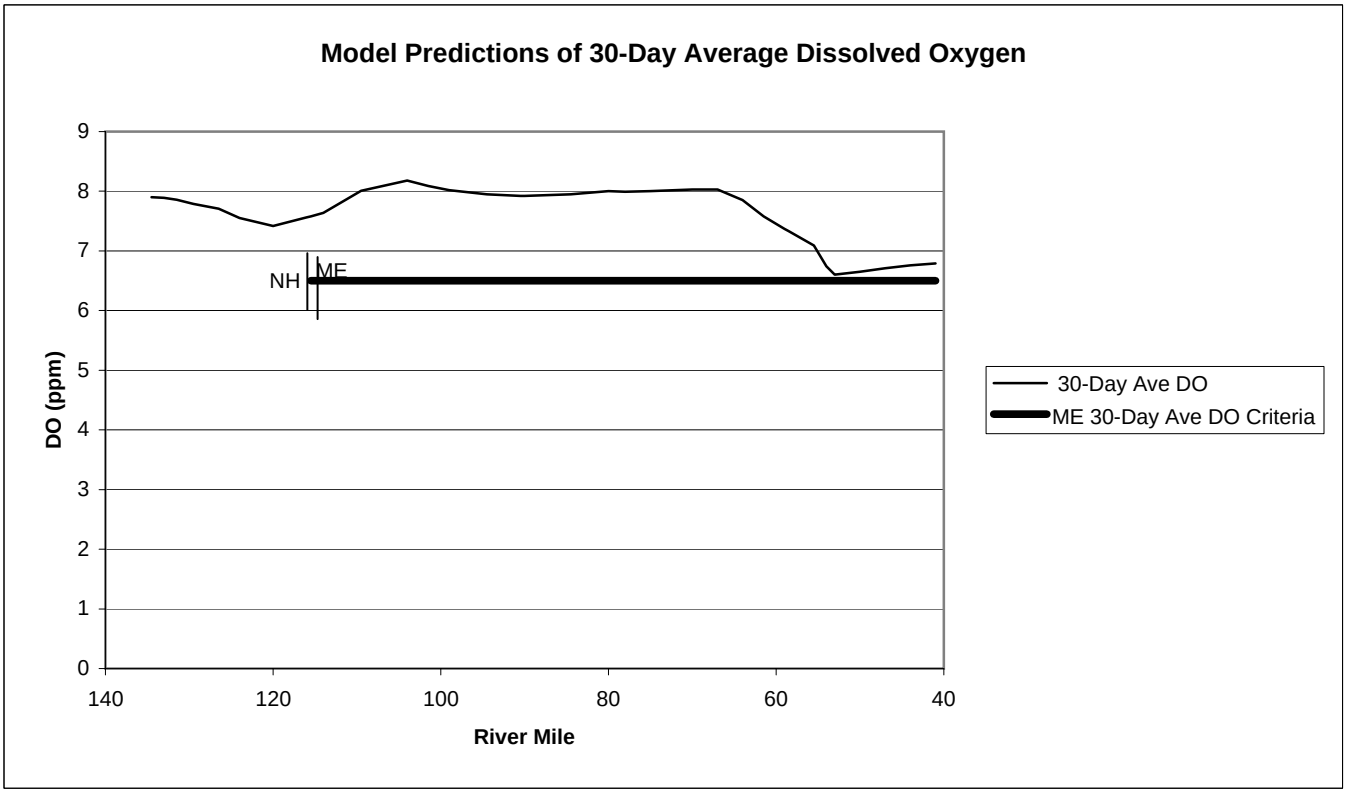


Figure 12 - Model Prediction of Minimum Dissolved Oxygen in Gulf Island Pond

Current Licensed Loading of Point Sources with GIPOP @ Upper Narrows @ 92000 ppd O2 Injection

DO Compliance Depth = 10 feet

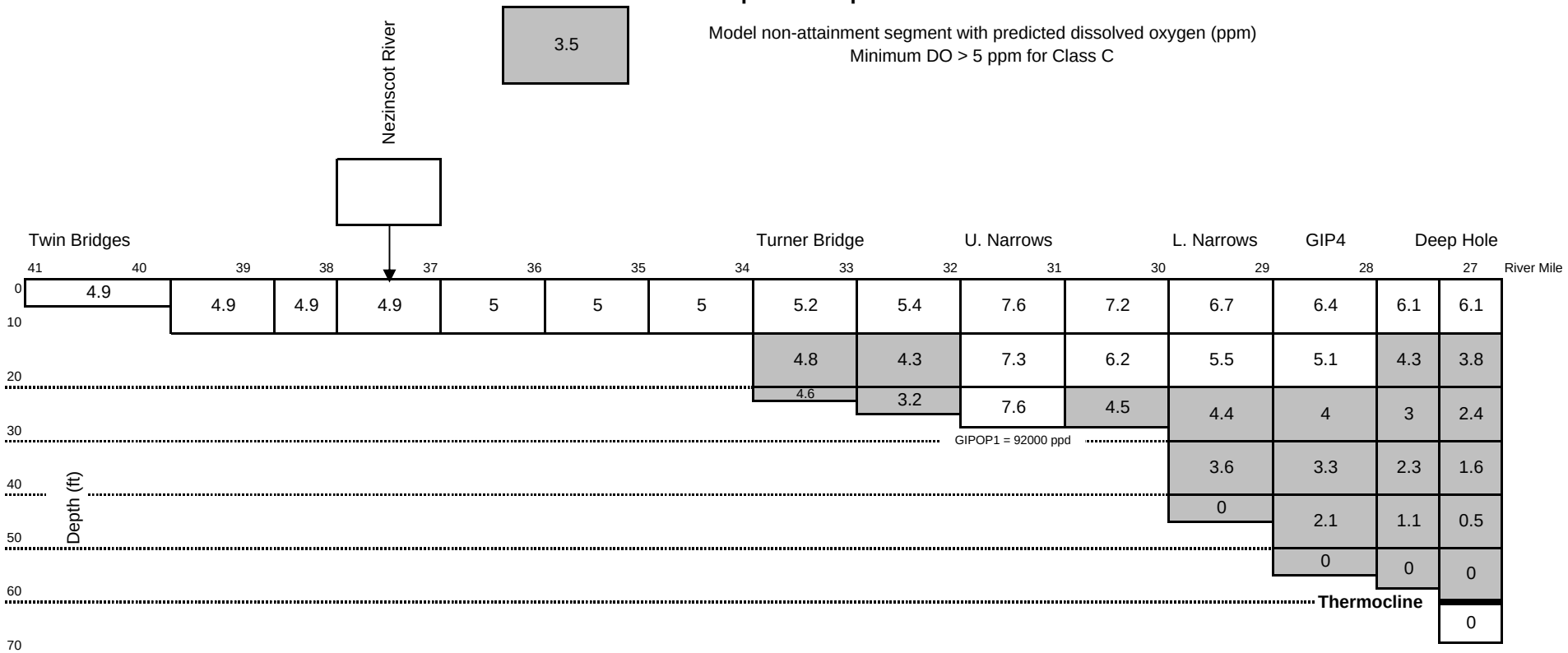


Figure 13 - Model Prediction of 30-Day Average Dissolved Oxygen in Gulf Island Pond

Current Licensed Loading of Point Sources with GIPOP @ Upper Narrows @ 92000 ppd O2 Injection

DO Compliance Depth = 10 feet

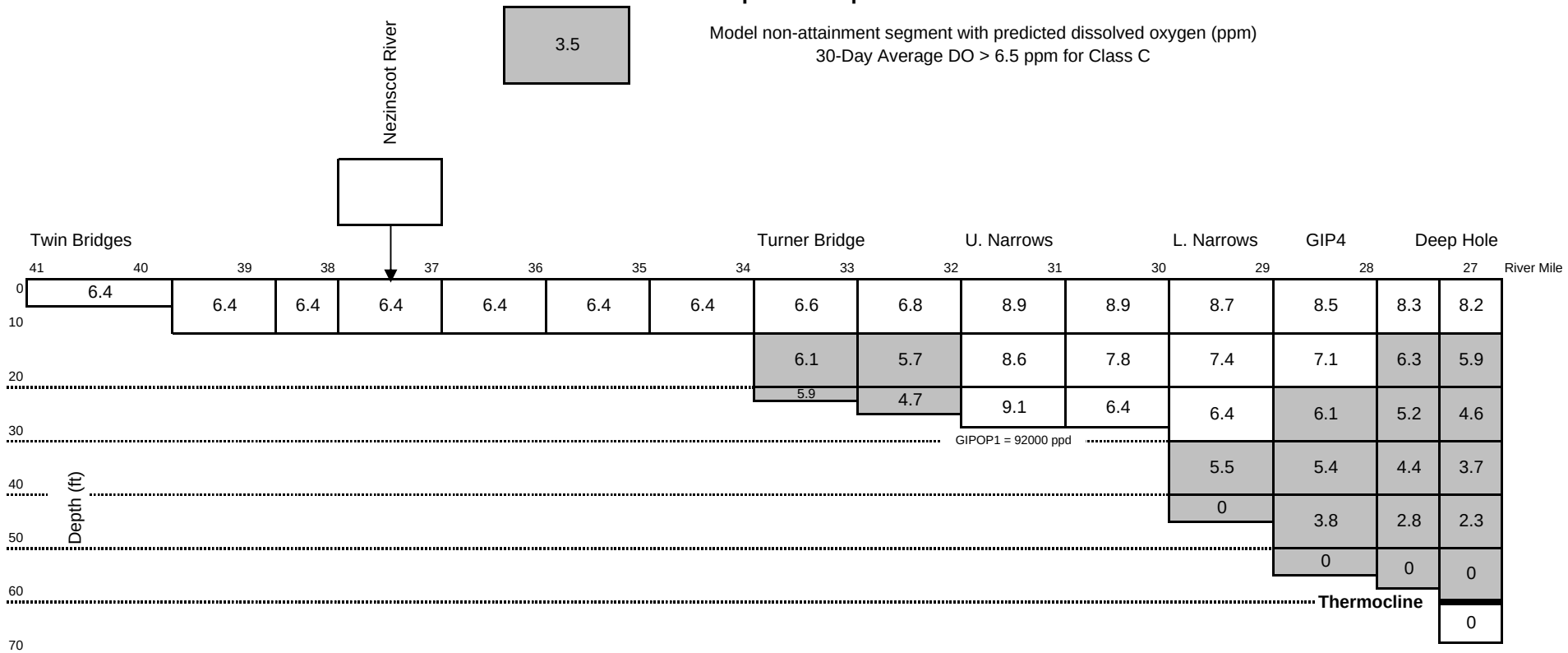


Figure 14 - Model Prediction of Minimum Dissolved Oxygen in Gulf Island Pond

TMDL for Phosphorus, BOD, and TSS Implemented with GIPOP @ Upper Narrows @ 92000 ppd O2 Injection

DO Compliance Depth = 20 feet

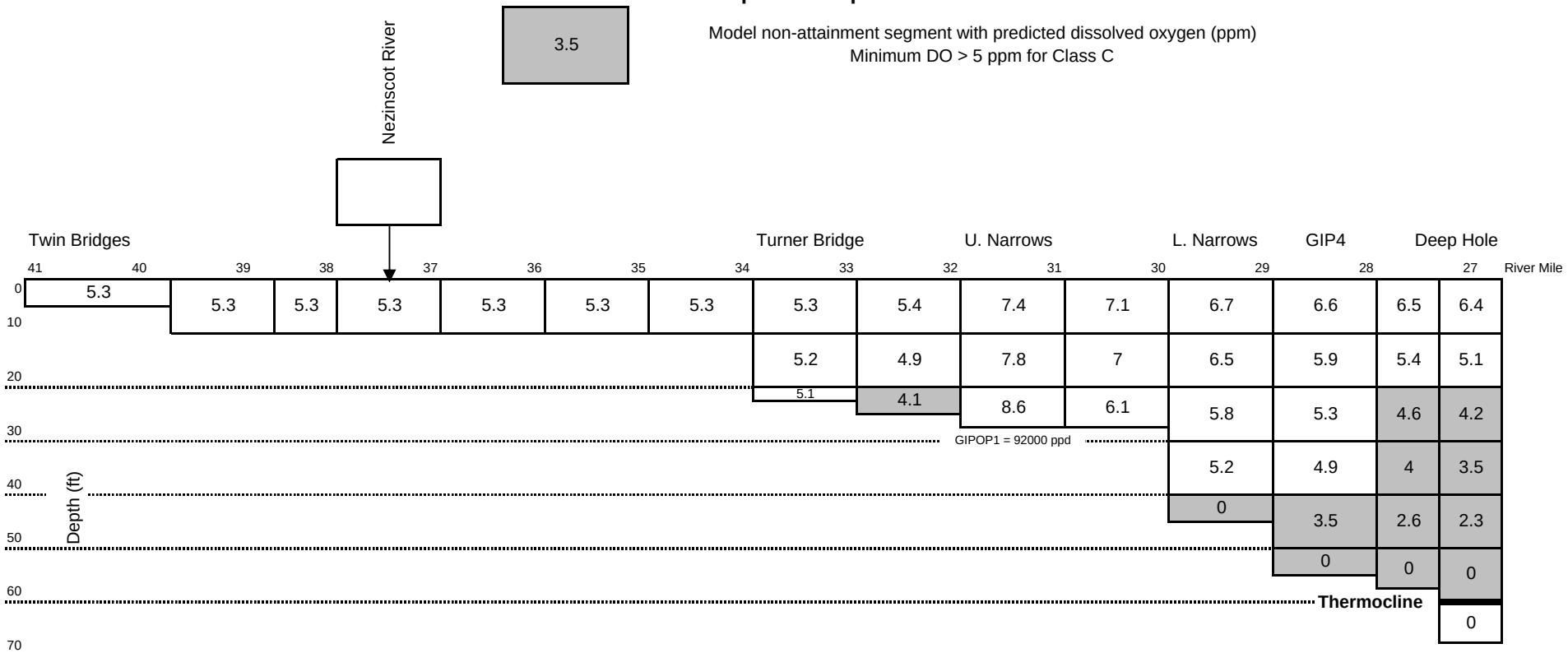


Figure 15 - Model Prediction of 30-Day Average Dissolved Oxygen in Gulf Island Pond

TMDL for Phosphorus, BOD, and TSS Implemented with GIPOP @ Upper Narrows @ 92000 ppd O2 Injection

DO Compliance Depth = 20 feet

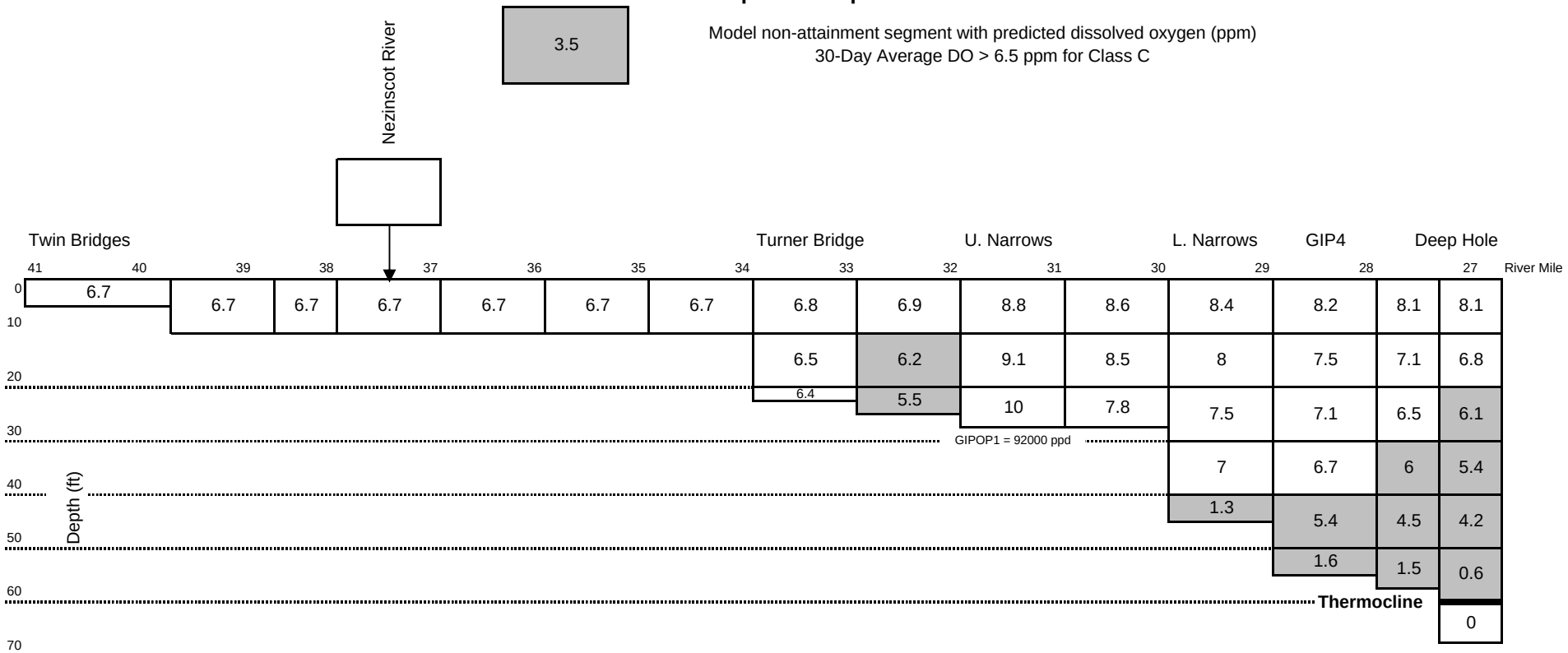


Figure 16 - Model Prediction of Minimum Dissolved Oxygen in Gulf Island Pond

TMDL for Phosphorus, BOD, and TSS Implemented with O2 Injection at GIPOP1= 30,000 ppd; GIPOP2=150,000

DO Compliance Depth = 60 feet

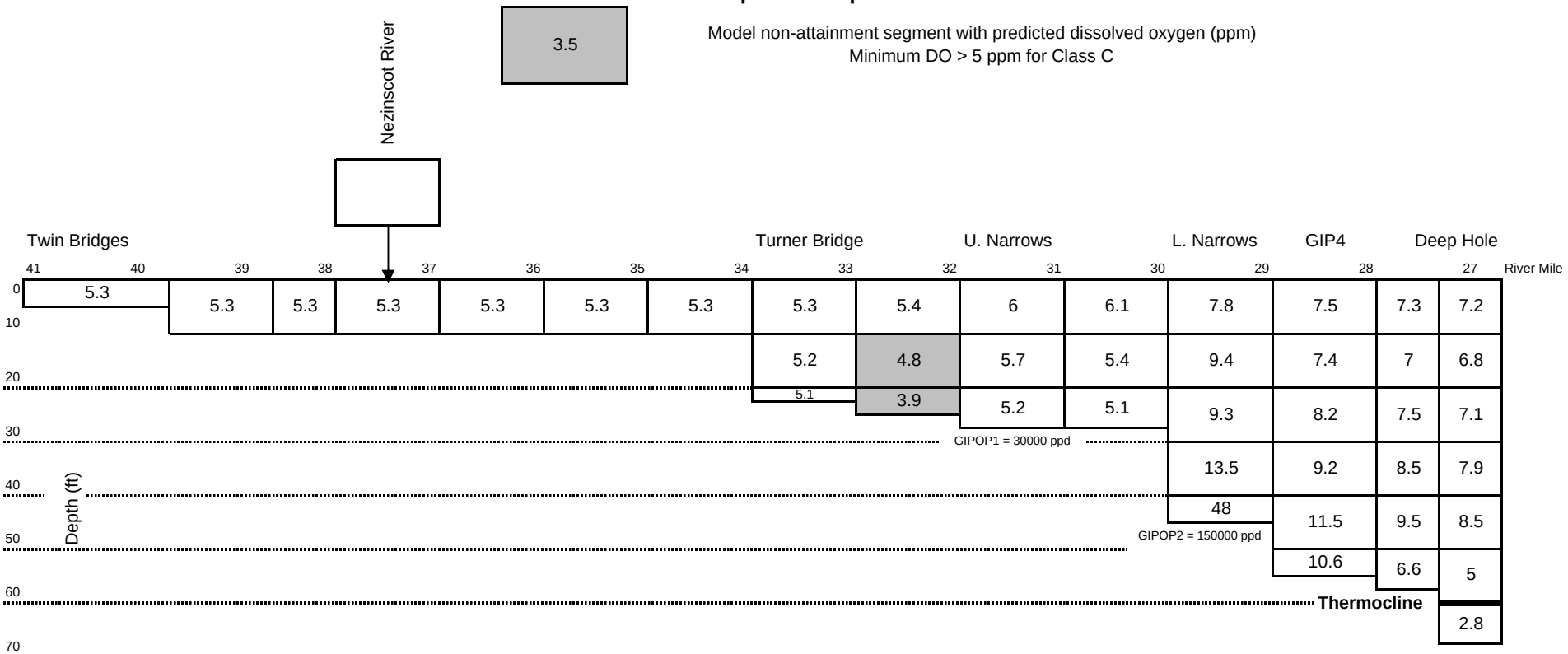


Figure 17 - Model Prediction of Minimum Dissolved Oxygen in Gulf Island Pond

TMDL for Phosphorus, BOD, and TSS Implemented with O2 Injection at GIPOP1= 105,000 ppd; GIPOP2=105,000

DO Compliance Depth = 60 feet

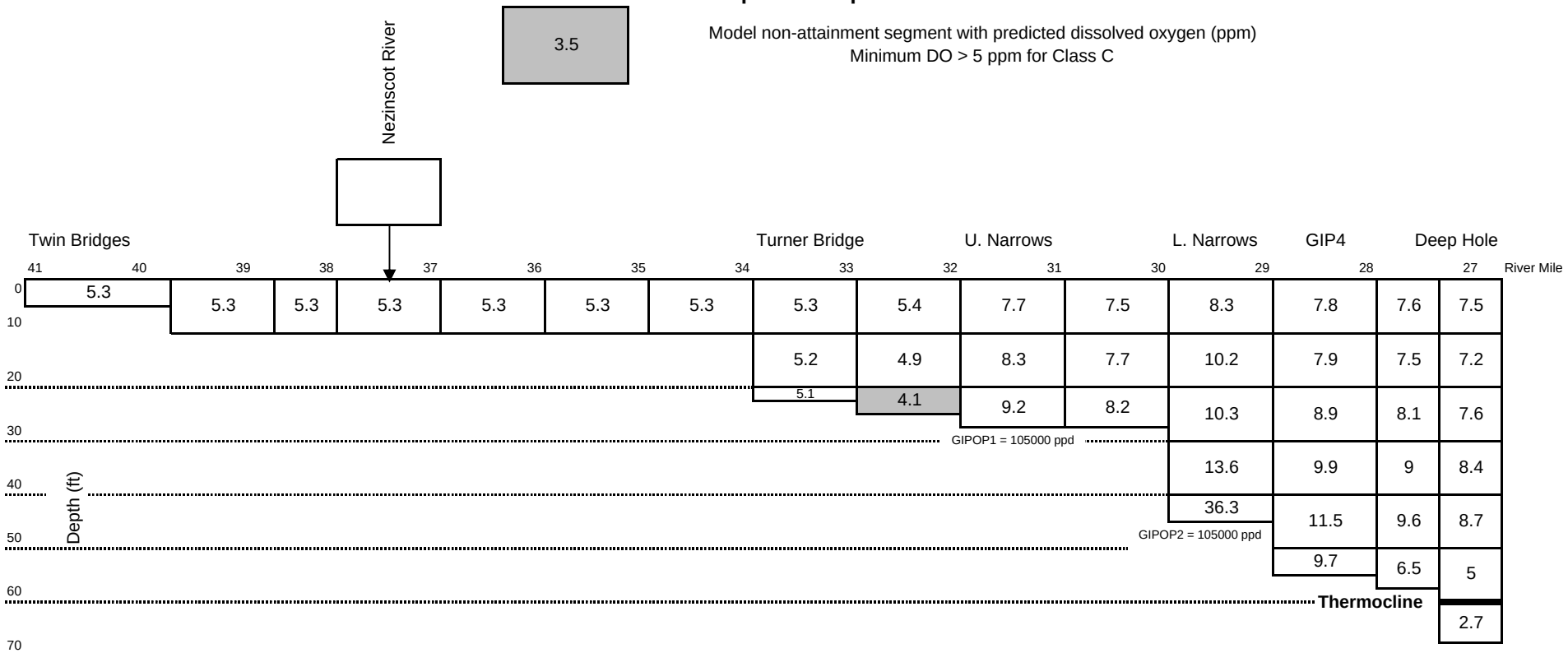


Figure 18 - Model Prediction of 30-Day Average Dissolved Oxygen in Gulf Island Pond

TMDL for Phosphorus, BOD, and TSS Implemented with O2 Injection at GIPOP1= 30,000 ppd; GIPOP2=150,000

DO Compliance Depth = 60 feet

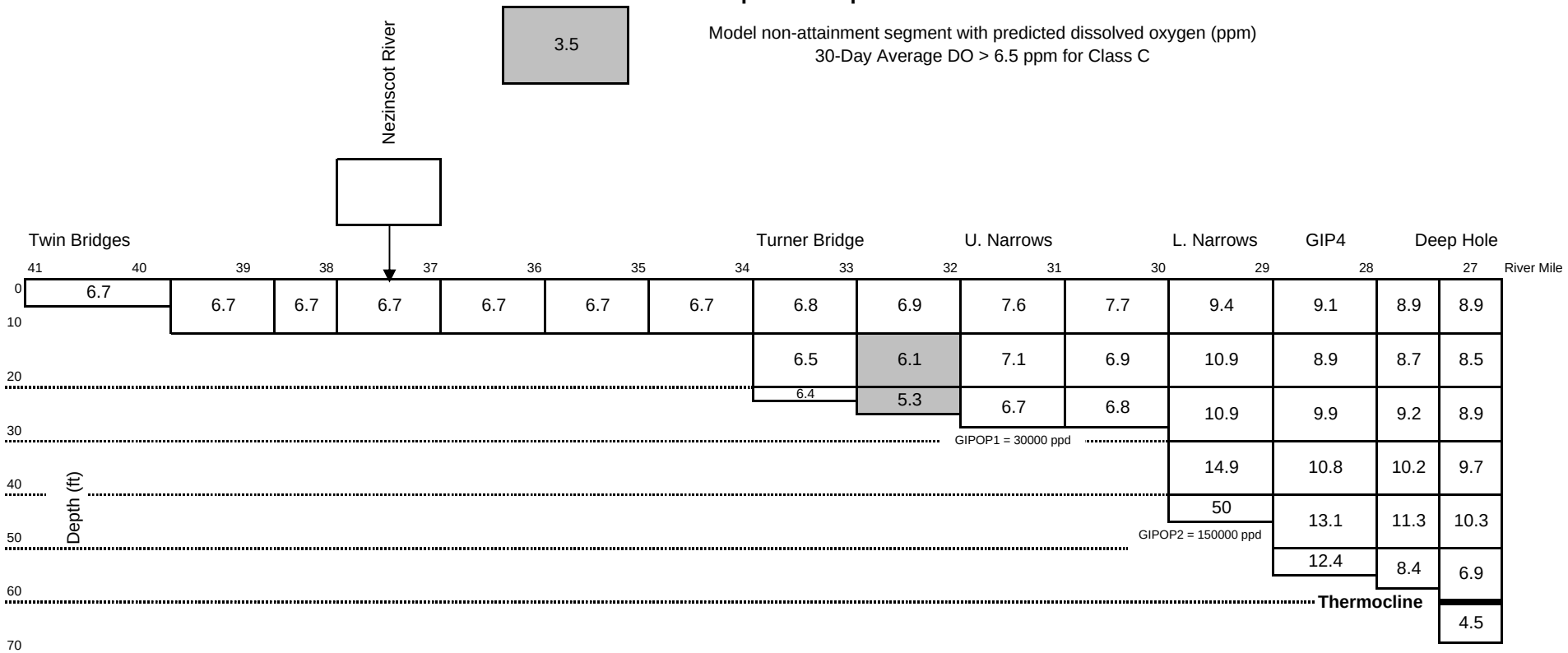


Figure 19 - Model Prediction of 30-Day Average Dissolved Oxygen in Gulf Island Pond

TMDL for Phosphorus, BOD, and TSS Implemented with O2 Injection at GIPOP1= 105,000 ppd; GIPOP2=100,000

DO Compliance Depth = 60 feet

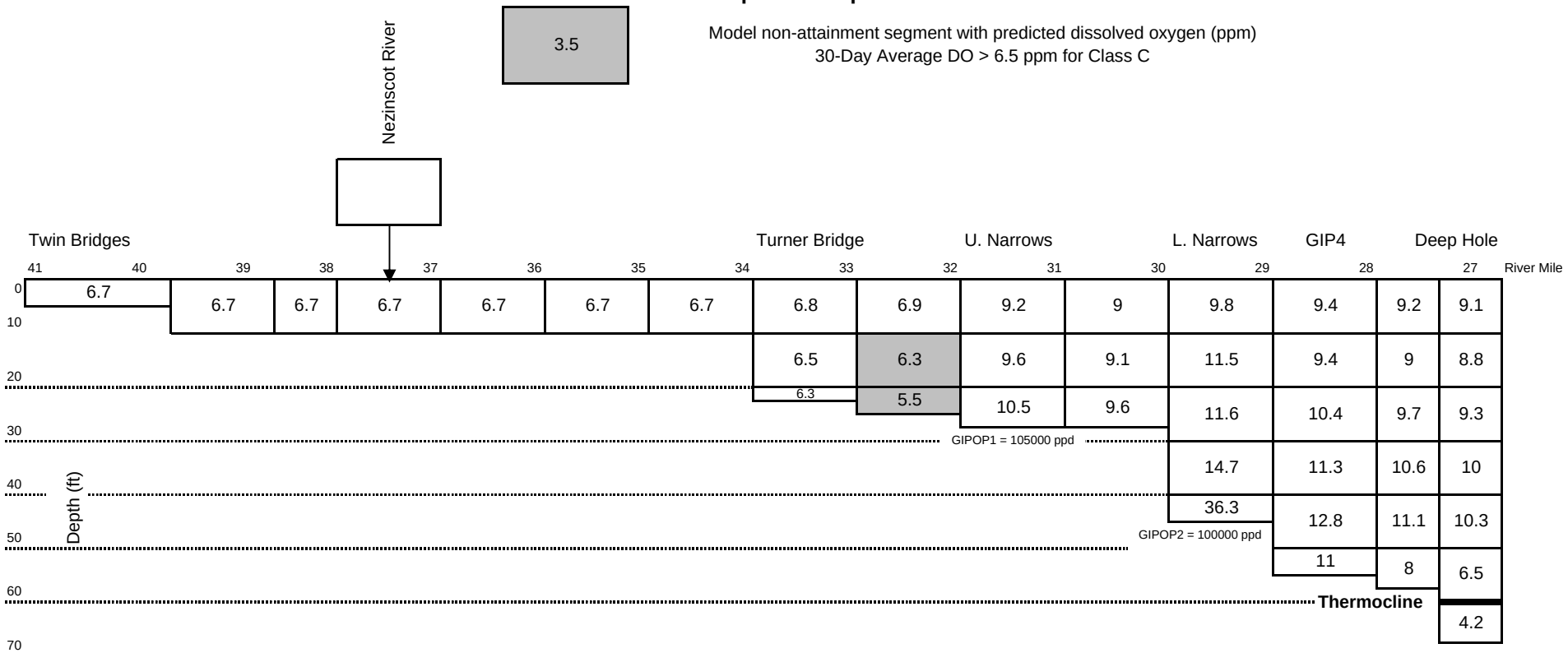


Figure 20 - Model Prediction of Minimum Dissolved Oxygen in Gulf Island Pond

TMDL for Phosphorus, BOD, and TSS Implemented with O2 Injection at GIPOP1= 50,000 ppd; GIPOP2=65,000 ppd; GIPOP3 = 42,000 ppd

DO Compliance Depth = 60 feet

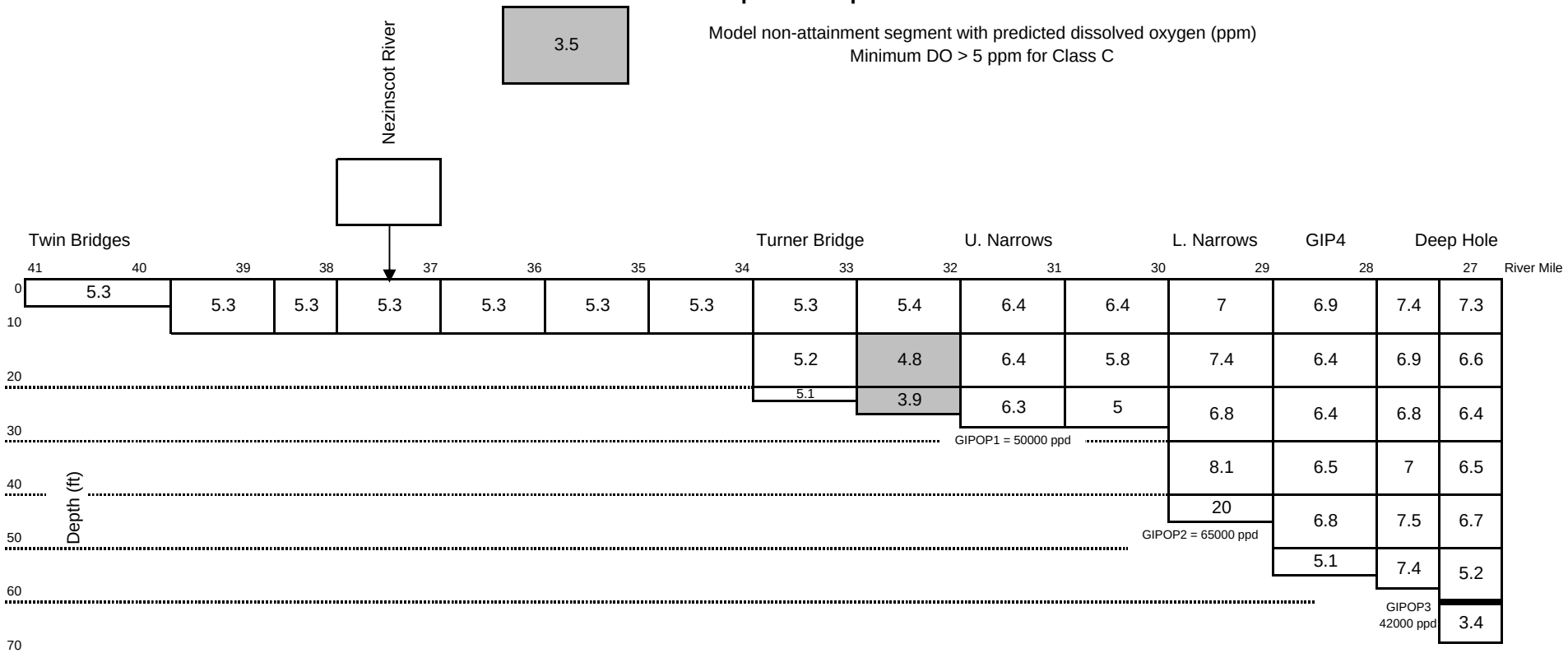


Figure 21 - Model Prediction of 30-Day Average Dissolved Oxygen in Gulf Island Pond

TMDL for Phosphorus, BOD, and TSS Implemented with O2 Injection at GIPOP1= 50,000 ppd; GIPOP2=65,000 ppd; GIPOP3 = 42,000 ppd

DO Compliance Depth = 60 feet

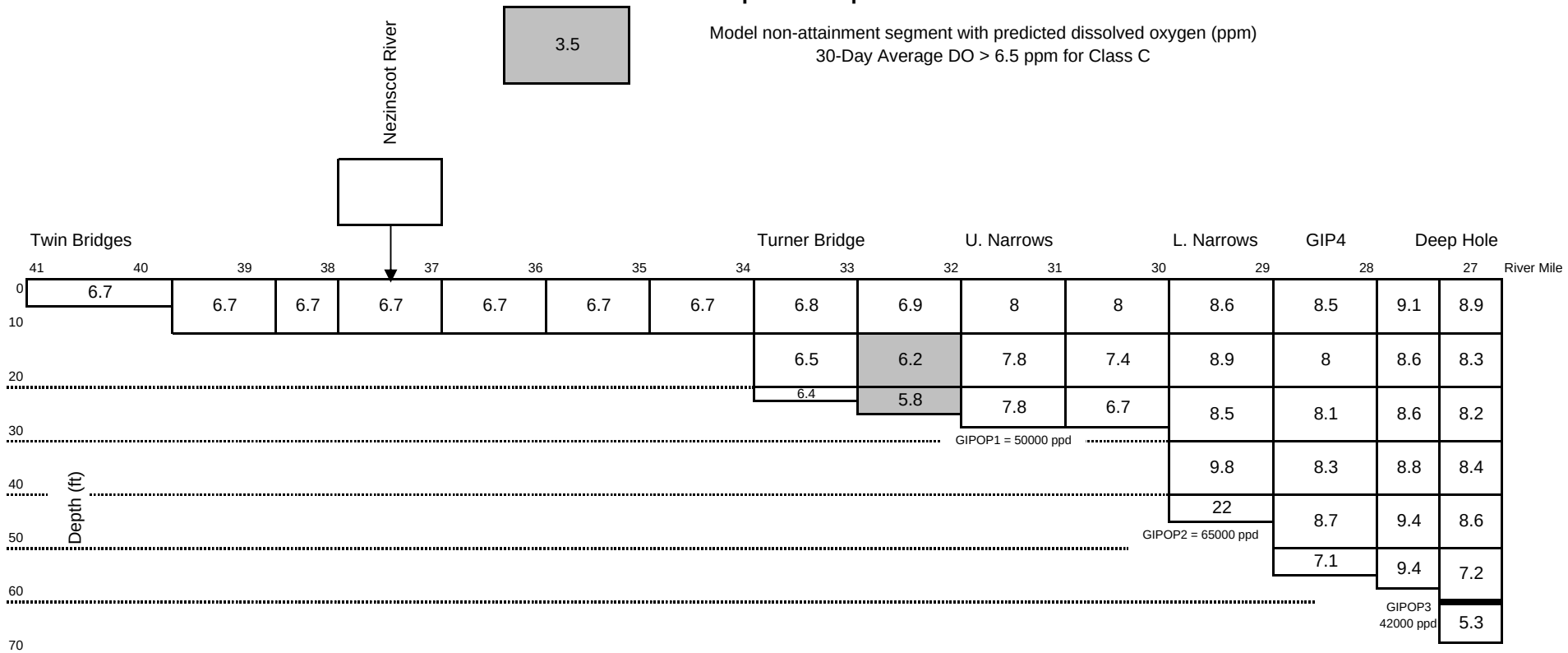


Figure 22 - Model Prediction of Minimum Dissolved Oxygen in Gulf Island Pond

Point Sources at Zero Discharge with No Oxygen Injection

DO Compliance Depth = 30 feet

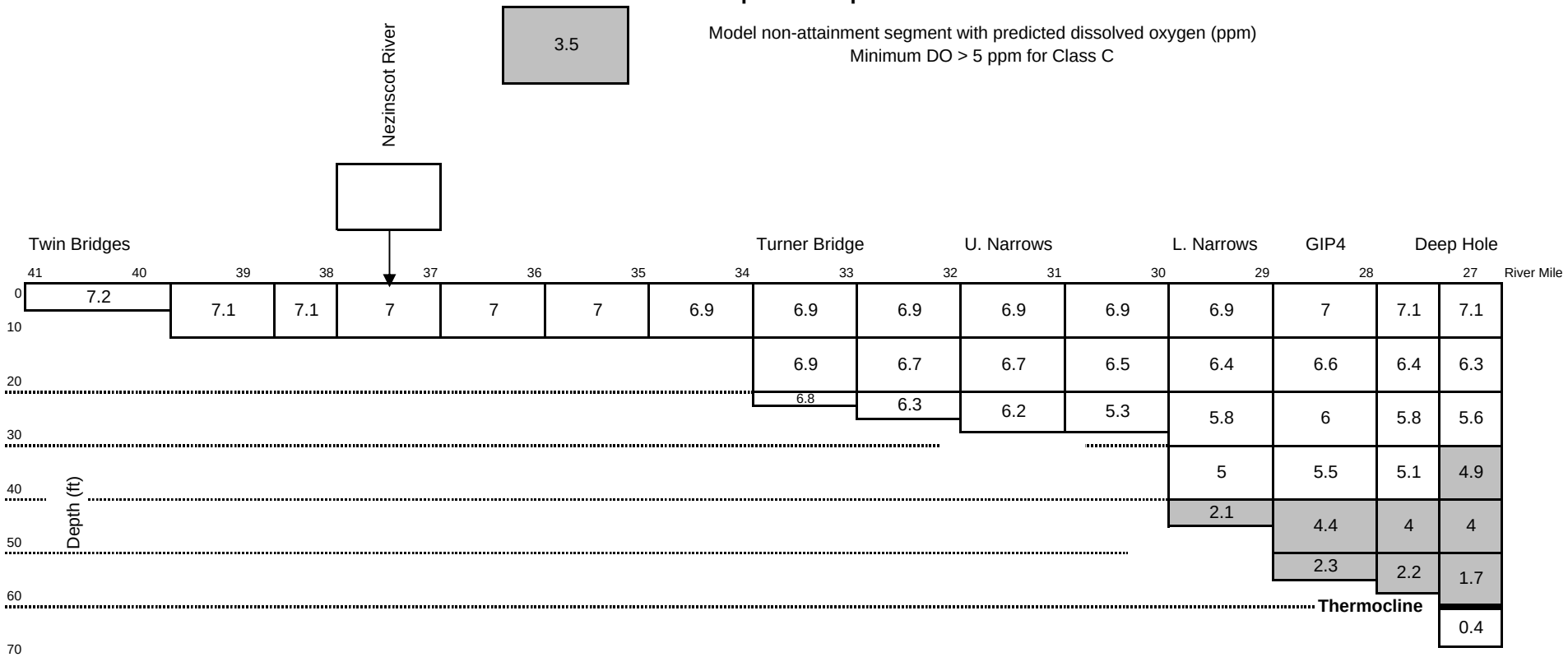


Figure 23 - Model Prediction of 30-Day Average Dissolved Oxygen in Gulf Island Pond

Point Sources at Zero Discharge with No Oxygen Injection

DO Compliance Depth = 20 feet

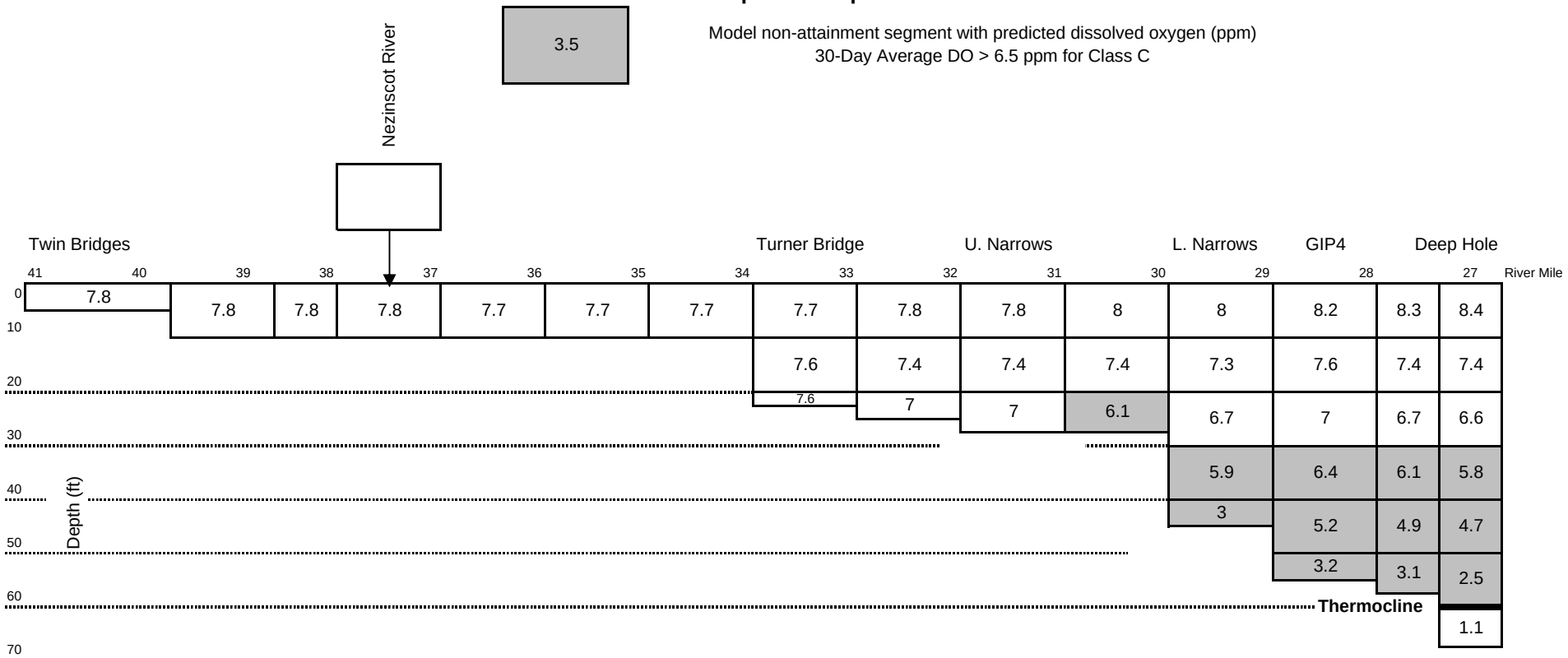


Figure 24 - Model Prediction of Minimum Dissolved Oxygen in Gulf Island Pond

Point Sources at Zero Discharge with Oxygen Injection at GIPOP2 = 55,000 ppd

DO Compliance Depth = 60 feet

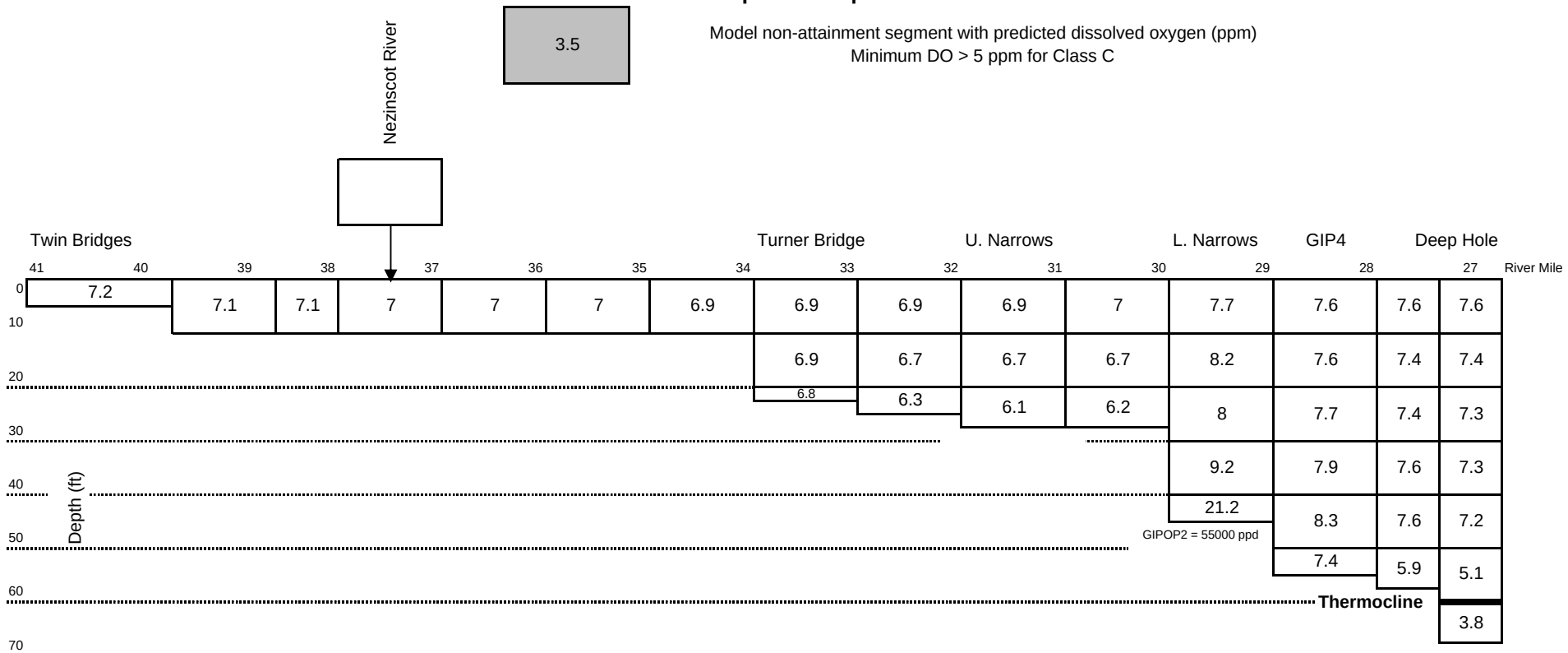


Figure 25 - Model Prediction of 30-Day Average Dissolved Oxygen in Gulf Island Pond

Point Sources at Zero Discharge with Oxygen Injection at GIPOP2 = 65,000 ppd

DO Compliance Depth = 60 feet

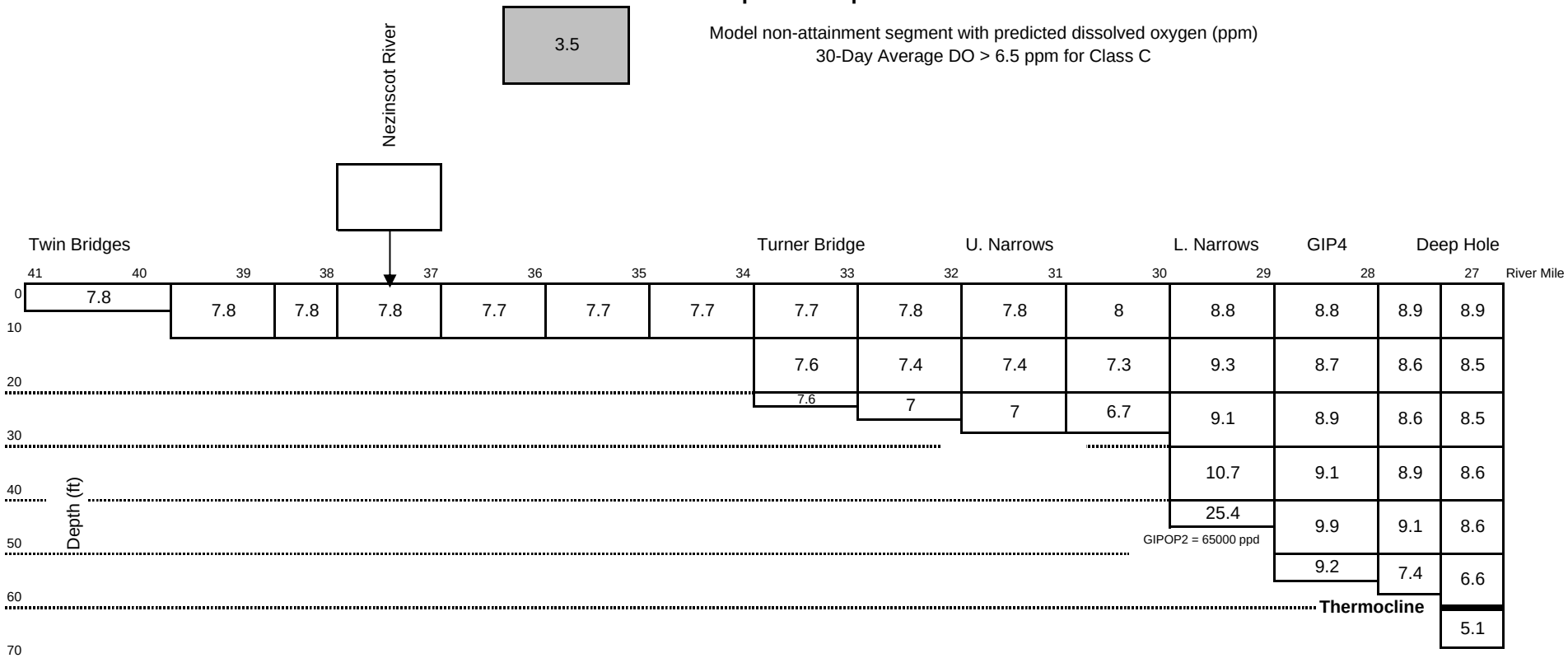


Figure 26 - Model Prediction of Minimum Dissolved Oxygen in Gulf Island Pond

Point Sources at Zero Discharge with Oxygen Injection at GIPOP1 = 90,000 ppd

DO Compliance Depth = 60 feet

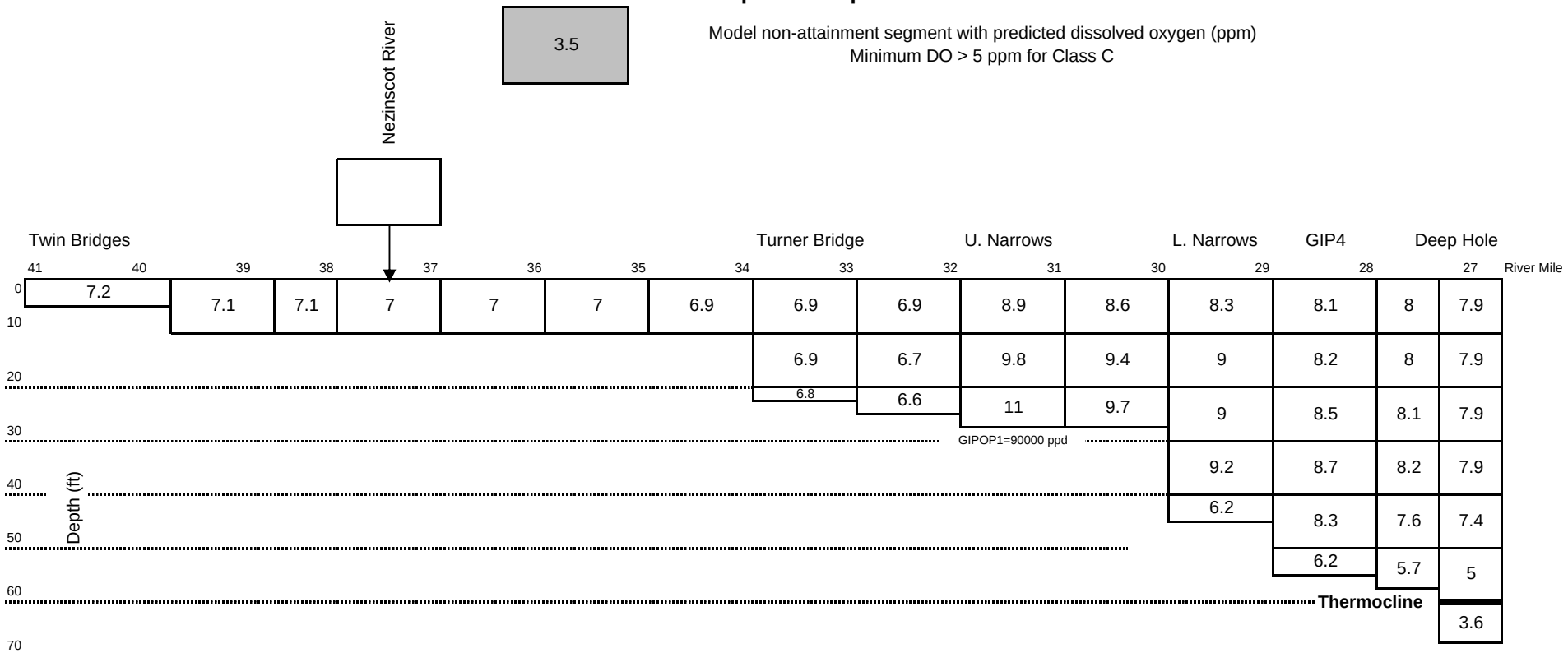


Figure 27 - Model Prediction of 30-Day Average Dissolved Oxygen in Gulf Island Pond

Point Sources at Zero Discharge with Oxygen Injection at GIPOP1 = 105,000 ppd

DO Compliance Depth = 60 feet

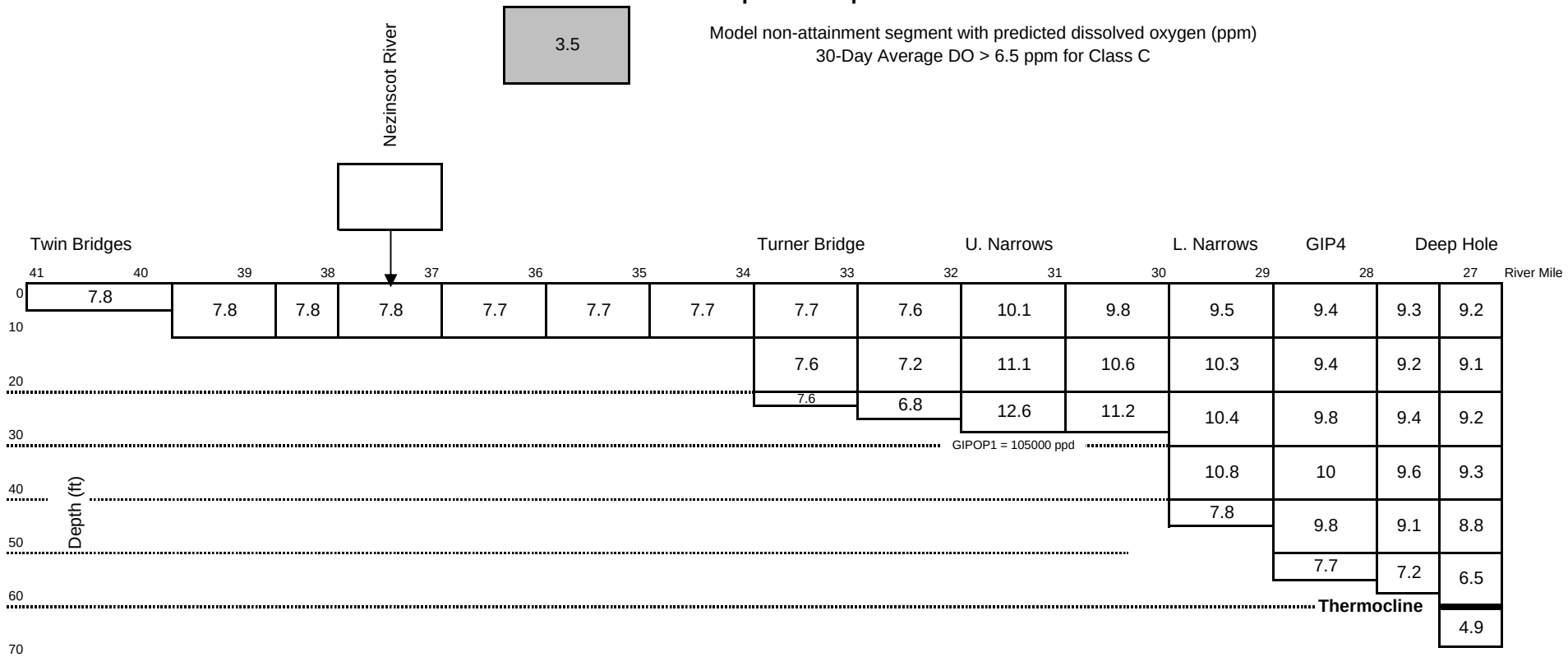


Figure 28
Androscoggin River Flow at Rumford
During Aquatic Life Criteria Evaluations
June to August

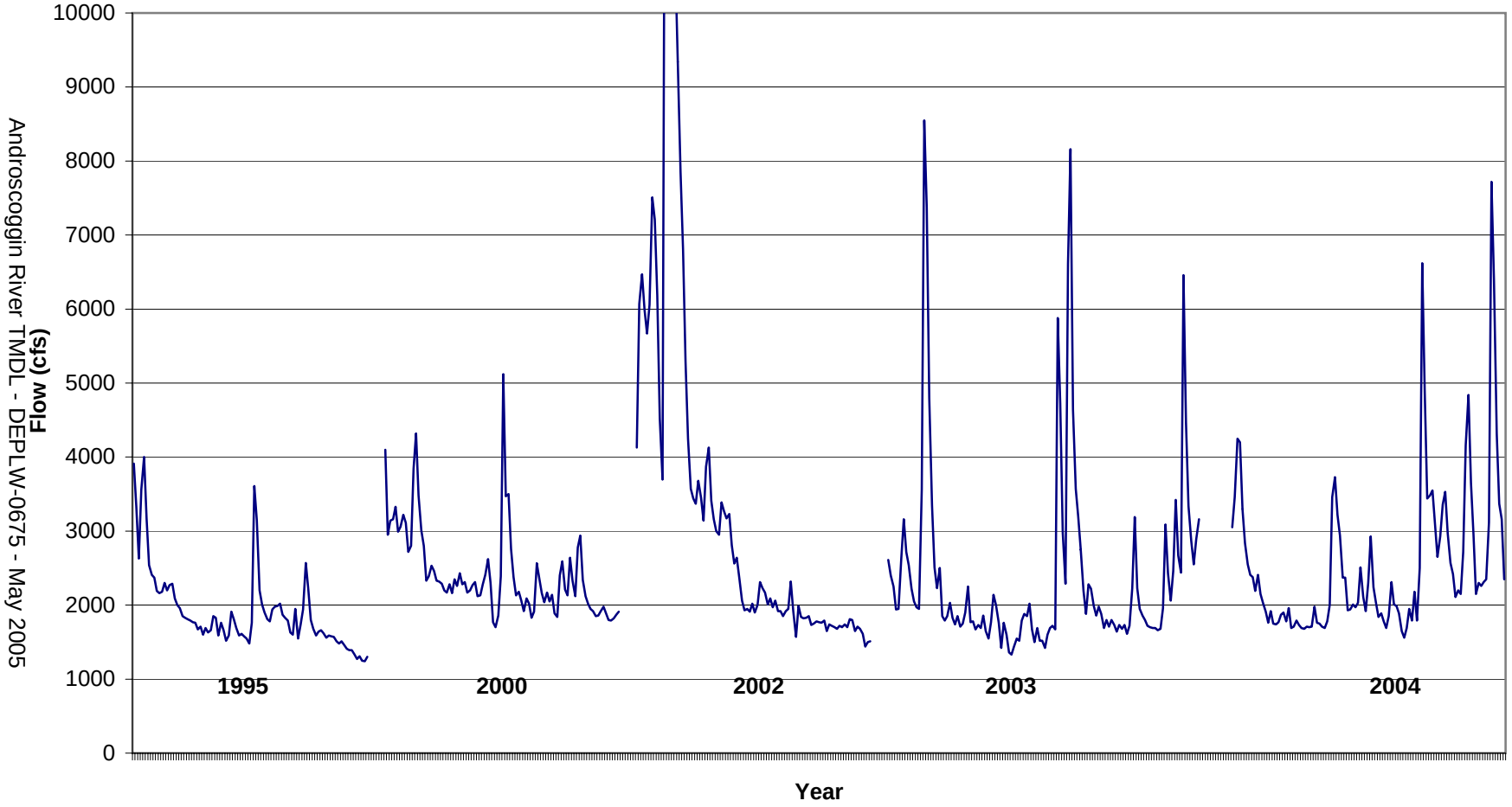
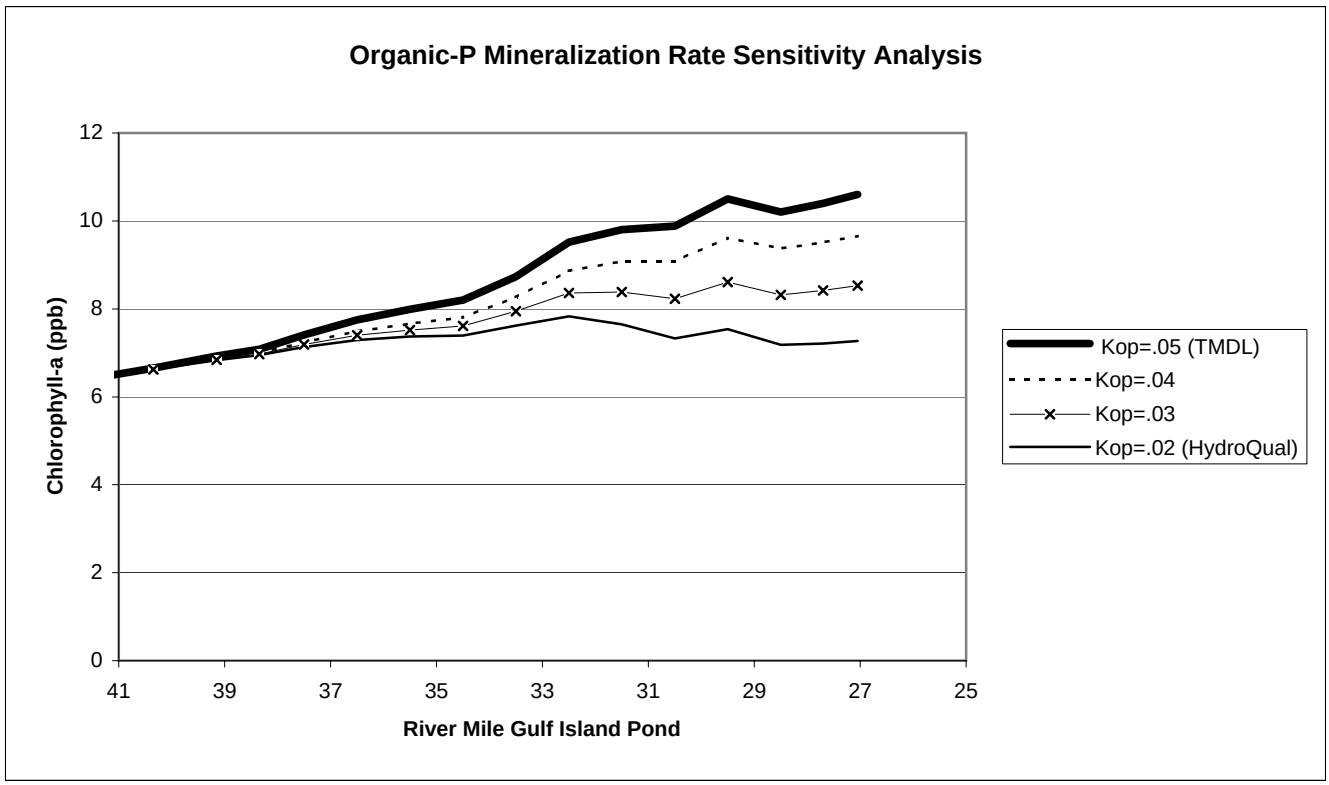


Figure 29 - Water Quality Model Sensitivity Analysis at 7Q10 Flow for TMDL Loads



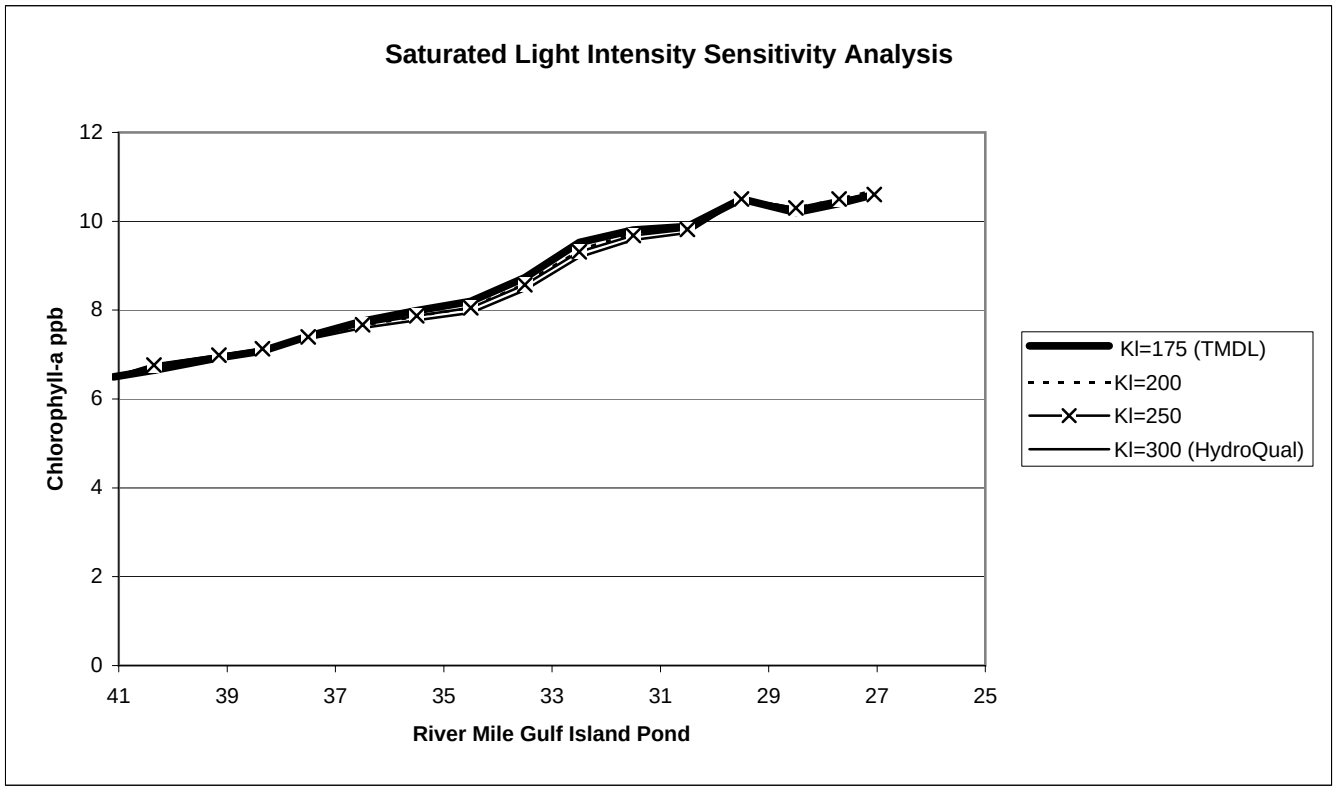


Figure 30 - Water Quality Model Sensitivity Analysis at 7Q10 Flow for TMDL Loads