MODEL GRID IMPACTS

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CE-QUAL-W2 Workshop

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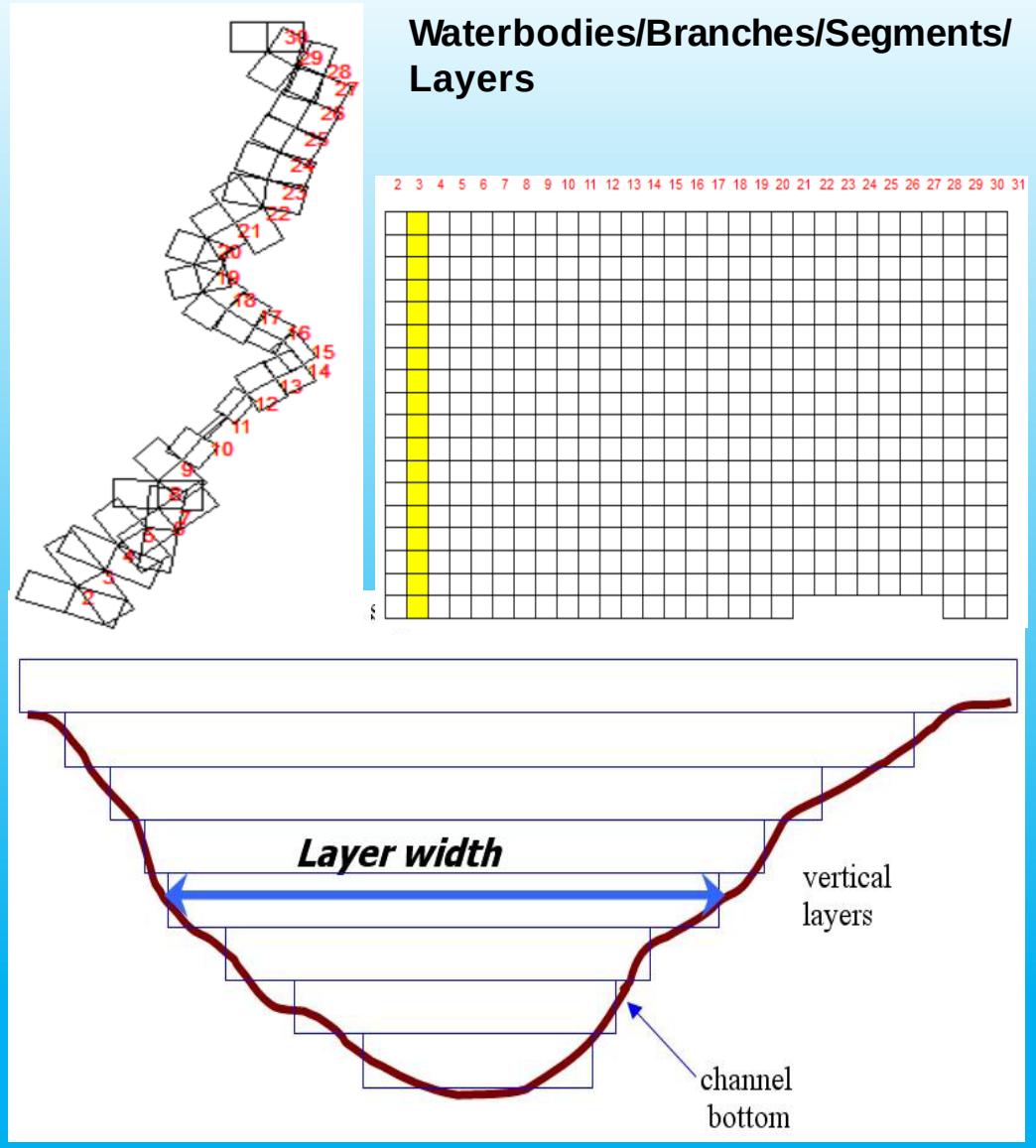
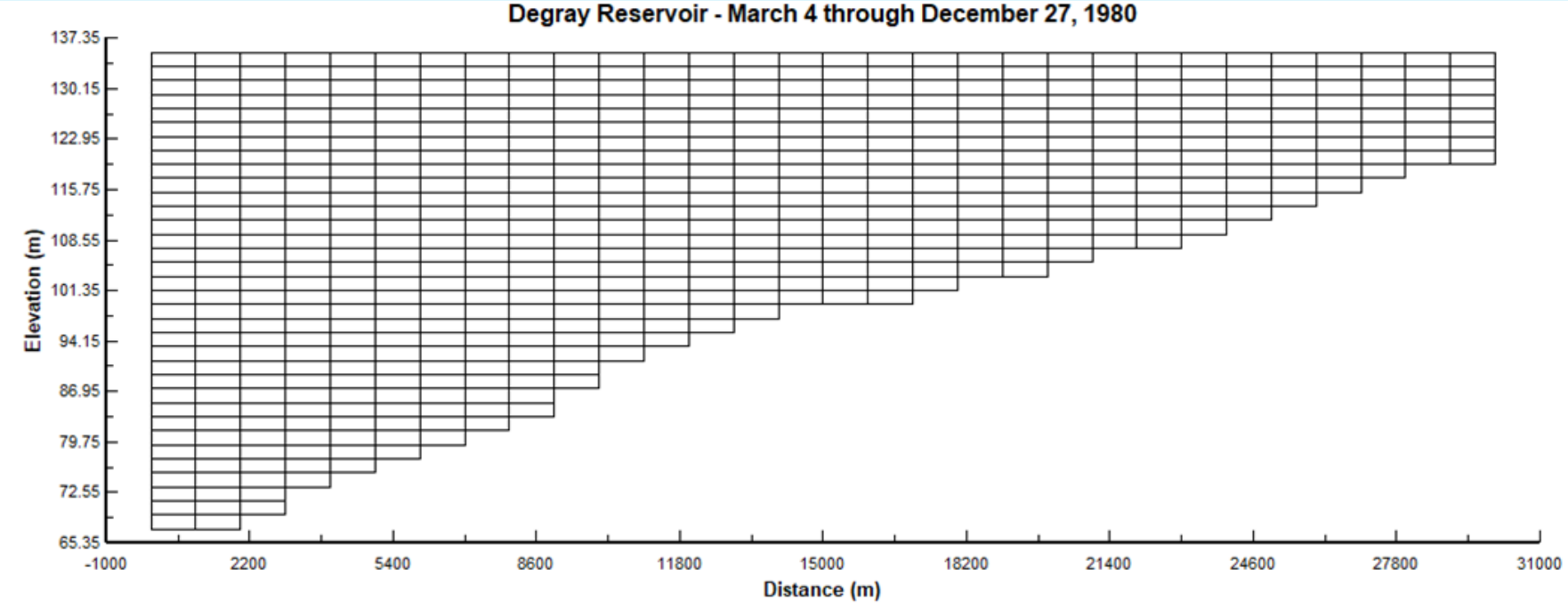
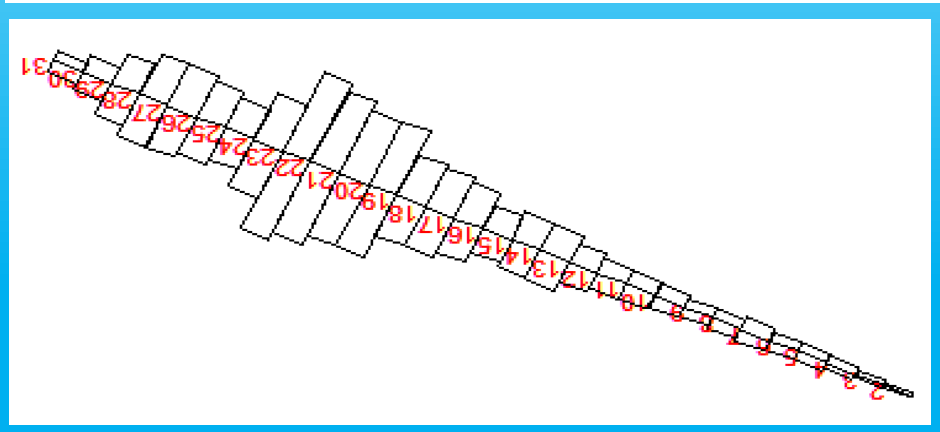
CE-QUAL-W2 Model Grids

- Defining the spatial resolution (Δx and Δz) for the model domain
- Depending on the objectives of the study, the grid discretization may be made coarser or finer.
- Increasing spatial resolution can severe penalty in terms of turnaround time for running the model
- Model results should not be a function of the grid resolution or the model timestep.



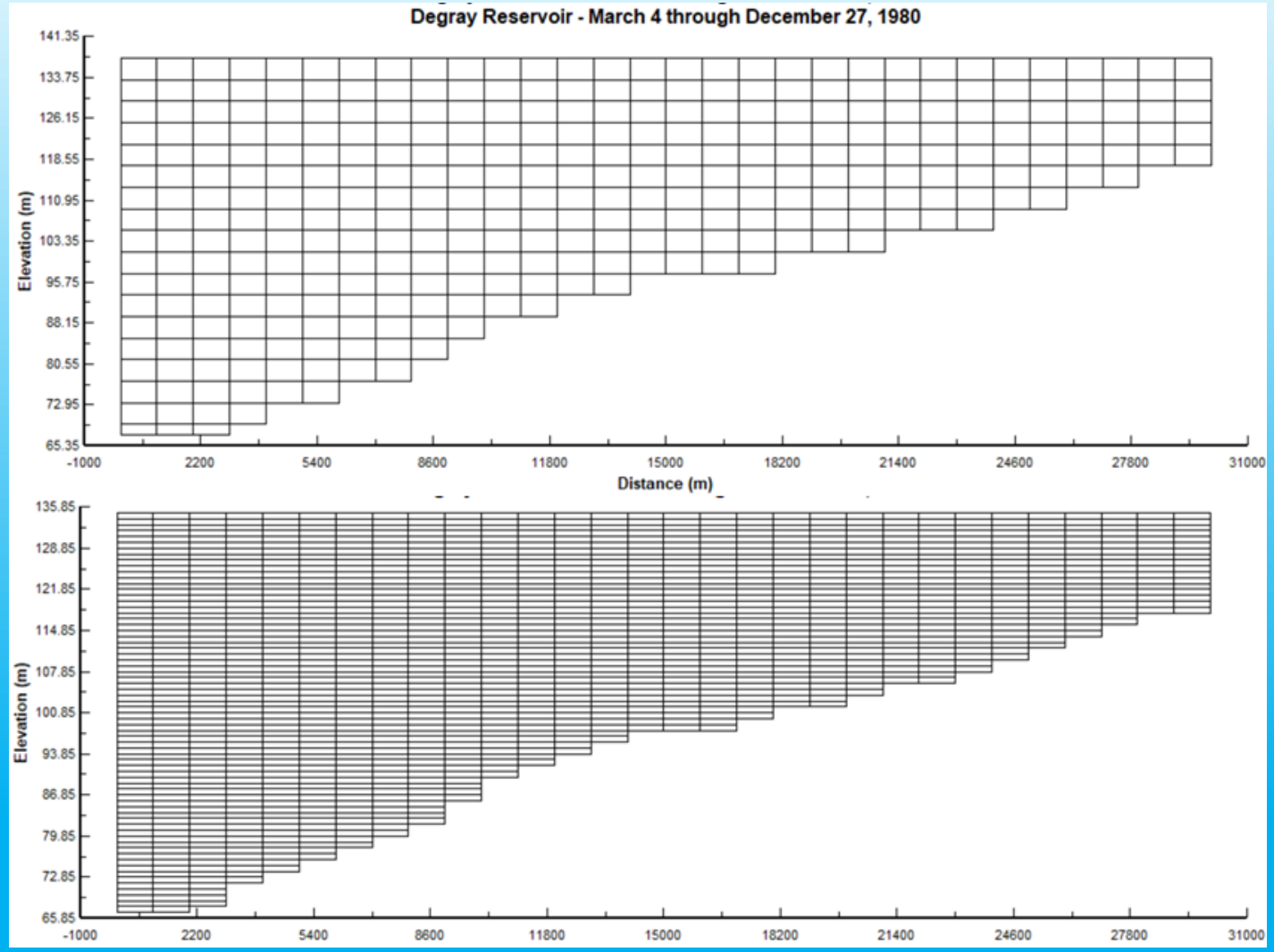
Model Grids - DeGray Reservoir





- Branch length **30 km**
- Segment lengths **1000 m**
- Maximum width **5530 m**
- Layer height **2 m**
- Upstream segment **2**
- Downstream segment **31**

Model Grids - DeGray Reservoir



Bathymetry Files

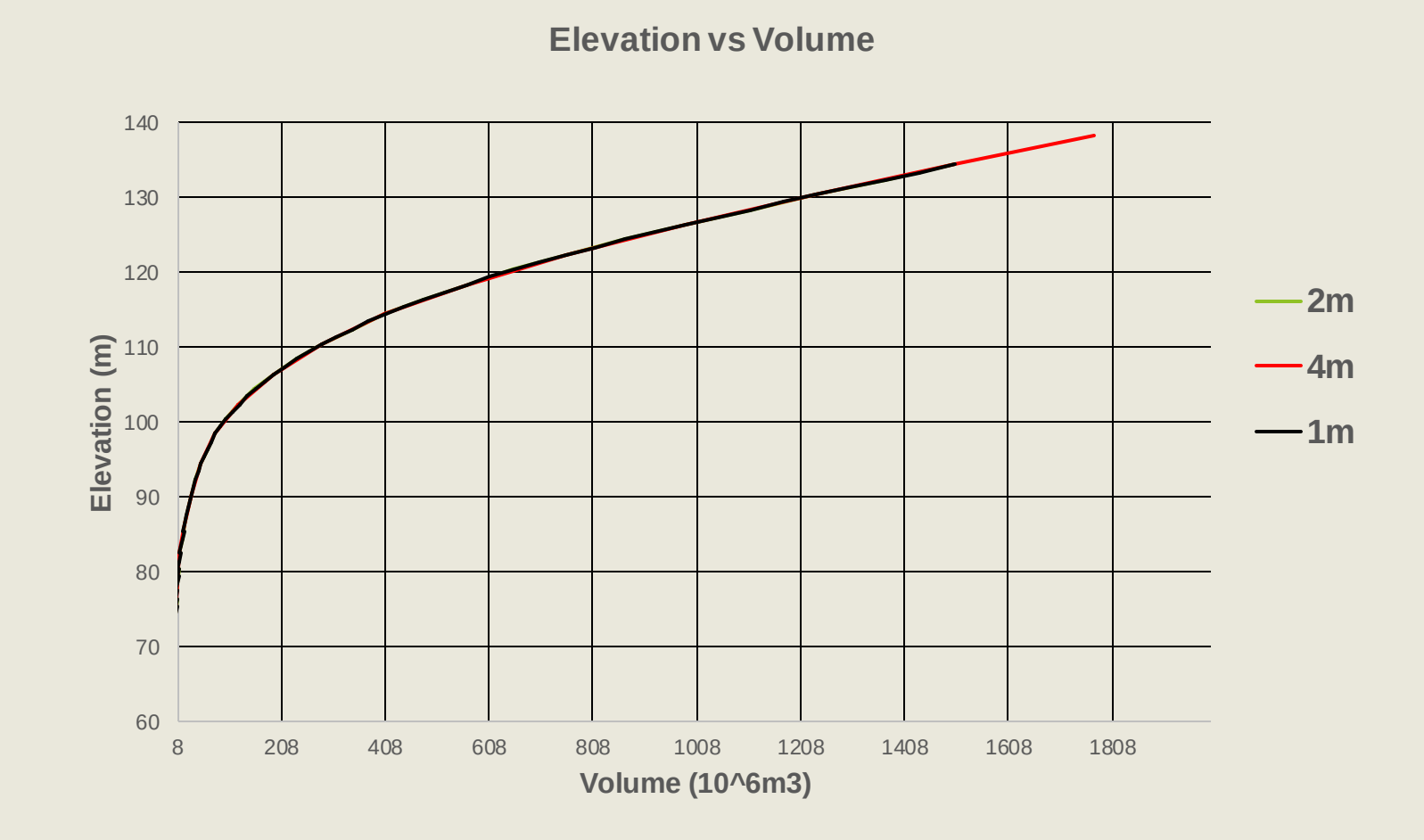
Segment		1		2		3		4		5		6		7		8		9		10	
DLX		1000		1000		1000		1000		1000		1000		1000		1000		1000		1000	
ELWS		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8	
PHI0		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14	
Friction		70		70		70		70		70		70		70		70		70		70	
Layer	DZ #1	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top
1	2.00	.00	136.35	.00	136.35	.00	136.35	.00	136.35	.00	136.35	.00	136.35	.00	136.35	.00	136.35	.00	136.35	.00	136.35
2	2.00	.00	134.35	171.00	134.35	298.00	134.35	513.00	134.35	645.00	134.35	726.00	134.35	900.00	134.35	799.00	134.35	685.00	134.35	944.00	134.35
3	2.00	.00	132.35	171.00	132.35	298.00	132.35	513.00	132.35	645.00	132.35	726.00	132.35	900.00	132.35	799.00	132.35	684.00	132.35	934.00	132.35
4	2.00	.00	130.35	171.00	130.35	298.00	130.35	513.00	130.35	645.00	130.35	726.00	130.35	900.00	130.35	799.00	130.35	683.00	130.35	920.00	130.35
5	2.00	.00	128.35	159.00	128.35	271.00	128.35	458.00	128.35	581.00	128.35	672.00	128.35	844.00	128.35	751.00	128.35	623.00	128.35	840.00	128.35
6	2.00	.00	126.35	134.00	126.35	212.00	126.35	338.00	126.35	440.00	126.35	558.00	126.35	735.00	126.35	658.00	126.35	608.00	126.35	705.00	126.35
7	2.00	.00	124.35	107.00	124.35	150.00	124.35	214.00	124.35	295.00	124.35	448.00	124.35	658.00	124.35	646.00	124.35	535.00	124.35	624.00	124.35
8	2.00	.00	122.35	79.00	122.35	100.00	122.35	125.00	122.35	183.00	122.35	353.00	122.35	603.00	122.35	624.00	122.35	492.00	122.35	574.00	122.35
9	2.00	.00	120.35	43.00	120.35	70.00	120.35	100.00	120.35	113.00	120.35	265.00	120.35	537.00	120.35	501.00	120.35	343.00	120.35	506.00	120.35
10	2.00	.00	118.35	.00	118.35	.00	118.35	70.00	118.35	90.00	118.35	205.00	118.35	484.00	118.35	453.00	118.35	299.00	118.35	435.00	118.35
11	2.00	.00	116.35	.00	116.35	.00	116.35	.00	116.35	70.00	116.35	154.00	116.35	405.00	116.35	380.00	116.35	257.00	116.35	363.00	116.35
12	2.00	.00	114.35	.00	114.35	.00	114.35	.00	114.35	.00	114.35	70.00	114.35	203.00	114.35	266.00	114.35	208.00	114.35	292.00	114.35
13	2.00	.00	112.35	.00	112.35	.00	112.35	.00	112.35	.00	112.35	.00	112.35	70.00	112.35	127.00	112.35	144.00	112.35	228.00	112.35
14	2.00	.00	110.35	.00	110.35	.00	110.35	.00	110.35	.00	110.35	.00	110.35	.00	110.35	70.00	110.35	100.00	110.35	120.00	110.35
15	2.00	.00	108.35	.00	108.35	.00	108.35	.00	108.35	.00	108.35	.00	108.35	.00	108.35	.00	108.35	70.00	108.35	70.00	108.35
16	2.00	.00	106.35	.00	106.35	.00	106.35	.00	106.35	.00	106.35	.00	106.35	.00	106.35	.00	106.35	.00	106.35	.00	106.35
17	2.00	.00	104.35	.00	104.35	.00	104.35	.00	104.35	.00	104.35	.00	104.35	.00	104.35	.00	104.35	.00	104.35	.00	104.35
18	2.00	.00	102.35	.00	102.35	.00	102.35	.00	102.35	.00	102.35	.00	102.35	.00	102.35	.00	102.35	.00	102.35	.00	102.35
19	2.00	.00	100.35	.00	100.35	.00	100.35	.00	100.35	.00	100.35	.00	100.35	.00	100.35	.00	100.35	.00	100.35	.00	100.35
20	2.00	.00	98.35	.00	98.35	.00	98.35	.00	98.35	.00	98.35	.00	98.35	.00	98.35	.00	98.35	.00	98.35	.00	98.35
21	2.00	.00	96.35	.00	96.35	.00	96.35	.00	96.35	.00	96.35	.00	96.35	.00	96.35	.00	96.35	.00	96.35	.00	96.35
22	2.00	.00	94.35	.00	94.35	.00	94.35	.00	94.35	.00	94.35	.00	94.35	.00	94.35	.00	94.35	.00	94.35	.00	94.35
23	2.00	.00	92.35	.00	92.35	.00	92.35	.00	92.35	.00	92.35	.00	92.35	.00	92.35	.00	92.35	.00	92.35	.00	92.35
24	2.00	.00	90.35	.00	90.35	.00	90.35	.00	90.35	.00	90.35	.00	90.35	.00	90.35	.00	90.35	.00	90.35	.00	90.35

Segment		1		2		3		4		5		6		7		8		9		10	
DLX		1000		1000		1000		1000		1000		1000		1000		1000		1000		1000	
ELWS		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8	
PHI0		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14	
Friction		70		70		70		70		70		70		70		70		70		70	
Layer	DZ #1	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top
1	4.00	.00	206.35	.00	206.35	.00	206.35	.00	206.35	.00	206.35	.00	206.35	.00	206.35	.00	206.35	.00	206.35	.00	206.35
2	4.00	.00	202.35	171.00	202.35	298.00	202.35	513.00	202.35	645.00	202.35	726.00	202.35	900.00	202.35	799.00	202.35	684.50	202.35	939.00	202.35
3	4.00	.00	198.35	171.00	198.35	298.00	198.35	513.00	198.35	645.00	198.35	726.00	198.35	900.00	198.35	799.00	198.35	684.50	198.35	939.00	198.35
4	4.00	.00	194.35	171.00	194.35	298.00	194.35	513.00	194.35	645.00	194.35	726.00	194.35	900.00	194.35	799.00	194.35	684.50	194.35	939.00	194.35
5	4.00	.00	190.35	171.00	190.35	298.00	190.35	513.00	190.35	645.00	190.35	726.00	190.35	900.00	190.35	799.00	190.35	684.50	190.35	939.00	190.35
6	4.00	.00	186.35	171.00	186.35	298.00	186.35	513.00	186.35	645.00	186.35	726.00	186.35	900.00	186.35	799.00	186.35	684.50	186.35	939.00	186.35
7	4.00	.00	182.35	171.00	182.35	298.00	182.35	513.00	182.35	645.00	182.35	726.00	182.35	900.00	182.35	799.00	182.35	684.50	182.35	939.00	182.35
8	4.00	.00	178.35	171.00	178.35	298.00	178.35	513.00	178.35	645.00	178.35	726.00	178.35	900.00	178.35	799.00	178.35	684.50	178.35	939.00	178.35
9	4.00	.00	174.35	171.00	174.35	298.00	174.35	513.00	174.35	645.00	174.35	726.00	174.35	900.00	174.35	799.00	174.35	684.50	174.35	939.00	174.35
10	4.00	.00	170.35	171.00	170.35	298.00	170.35	513.00	170.35	645.00	170.35	726.00	170.35	900.00	170.35	799.00	170.35	684.50	170.35	939.00	170.35
11	4.00	.00	166.35	171.00	166.35	298.00	166.35	513.00	166.35	645.00	166.35	726.00	166.35	900.00	166.35	799.00	166.35	684.50	166.35	939.00	166.35
12	4.00	.00	162.35	171.00	162.35	298.00	162.35	513.00	162.35	645.00	162.35	726.00	162.35	900.00	162.35	799.00	162.35	684.50	162.35	939.00	162.35
13	4.00	.00	158.35	171.00	158.35	298.00	158.35	513.00	158.35	645.00	158.35	726.00	158.35	900.00	158.35	799.00	158.35	684.50	158.35	939.00	158.35
14	4.00	.00	154.35	171.00	154.35	298.00	154.35	513.00	154.35	645.00	154.35	726.00	154.35	900.00	154.35	799.00	154.35	684.50	154.35	939.00	154.35
15	4.00	.00	150.35	171.00	150.35	298.00	150.35	513.00	150.35	645.00	150.35	726.00	150.35	900.00	150.35	799.00	150.35	684.50	150.35	939.00	150.35
16	4.00	.00	146.35	171.00	146.35	298.00	146.35	513.00	146.35	645.00	146.35	726.00	146.35	900.00	146.35	799.00	146.35	684.50	146.35	939.00	146.35
17	4.00	.00	142.35	171.00	142.35	298.00	142.35	513.00	142.35	645.00	142.35	726.00	142.35	900.00	142.35	799.00	142.35	684.50	142.35	939.00	142.35
18	4.00	.00	138.35	171.00	138.35	298.00	138.35	513.00	138.35	645.00	138.35	726.00	138.35	900.00	138.35	799.00	138.35	684.50	138.35	939.00	138.35
19	4.00	.00	134.35	171.00	134.35	298.00	134.35	513.00	134.35	645.00	134.35	726.00	134.35	900.00	134.35	799.00	134.35	684.50	134.35	939.00	134.35
20	4.00	.00	130.35	165.00	130.35	284.50	130.35	485.50	130.35	613.00	130.35	699.00	130.35	872.00	130.35	775.00	130.35	653.00	130.35	880.00	130.35
21	4.00	.00	126.35	120.50	126.35	181.00	126.35	276.00	126.35	367.50	126.35	503.00	126.35	696.50	126.35	652.00	126.35	571.50	126.35	664.50	126.35

Segment		1		2		3		4		5		6		7		8		9		10	
DLX		1000		1000		1000		1000		1000		1000		1000		1000		1000		1000	
ELWS		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8		123.8	
PHI0		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14		5.14	
Friction		70		70		70		70		70		70		70		70		70		70	
Layer	DZ #1	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top	Width	Elev-top
1	1.00	.00	135.35	.00	135.35	.00	135.35	.00	135.35	.00	135.35	.00	135.35	.00	135.35	.00	135.35	.00	135.35	.00	135.35
2	1.00	.00	134.35	171.00	134.35	298.00	134.35	513.00	134.35	645.00	134.35	726.00	134.35	900.00	134.35	799.00	134.35	685.25	134.35	946.50	134.35
3	1.00	.00	133.35	171.00	133.35	298.00	133.35	513.00	133.35	645.00	133.35	726.00	133.35	900.00	133.35	799.00	133.35	684.75	133.35	941.50	133.35
4	1.00	.00	132.35	171.00	132.35	298.00	132.35	513.00	132.35	645.00	132.35	726.00	132.35	900.00	132.35	799.00	132.35	684.25	132.35	936.50	132.35
5	1.00	.00	131.35	171.00	131.35	298.00	131.35	513.00	131.35	645.00	131.35	726.00	131.35	900.00	131.35	799.00	131.35	683.75	131.35	930.50	131.35
6	1.00	.00	130.35	171.00	130.35	298.00	130.35	513.00	130.35	645.00	130.35	726.00	130.35	900.00	130.35	799.00	130.35	683.25	130.35	923.50	130.35
7	1.00	.00	129.35	168.00	129.35	291.25	129.35	499.25	129.35	629.00	129.35	712.50	129.35	886.00	129.35	787.00	129.35	668.00	129.35	900.00	129.35
8	1.00	.00	128.35	162.00	128.35	277.75	128.35	471.75	128.35	597.00	128.35	685.50	128.35	858.00	128.35	763.00	128.35	638.00	128.35	860.00	128.35
9	1.00	.00	127.35	152.75	127.35	256.25	127.35	428.00	127.35	545.75	127.35	643.50	127.35	816.75	127.35	727.75	127.35	619.25	127.35	806.25	127.35
10	1.00	.00	126.35	140.25	126.35	226.75	126.35	368.00	126.35	475.25	126.35	586.50	126.35	762.25	126.35	681.25	126.35	611.75	126.35	738.75	126.35
11	1.00	.00	125.35	127.25	125.35	196.50	125.35	307.00	125.35	403.75	125.35	530.50	125.35	715.75	125.35	655.00	125.35	589.75	125.35	684.75	125.35
12	1.00	.00	124.35	113.75	124.35	165.50	124.35	245.00	124.35	331.25	124.35	475.50	124.35	677.25	124.35	649.00	124.35	553.25	124.35	644.25	124.35
13	1.00	.00	123.35	100.00	123.35	137.50	123.35	191.75	123.35	267.00	123.35	424.25	123.35	644.25	123.35	640.50	123.35	524.25	123.35	611.50	123.35
14	1.00	.00	122.35	86.00	122.35	112.50	122.35	147.25	122.35	211.00	122.35	376.75	122.35	616.75	122.35	629.50	122.35	502.75	122.35	586.50	122.35
15	1.00	.00	121.35	70.00	121.35	92.50	121.35	118.75	121.35	165.50	121.35	331.00	121.35	586.50	121.35	593.25	121.35	454.75	121.35	557.00	121.35
16	1.00	.00	120.35	52.00	120.35	77.50	120.35	106.25	120.35	130.50	120.35	287.00	120.35	553.50	120.35	531.75	120.35	380.25	120.35	523.00	120.35
17	1.00	.00	119.35	32.25	119.35	52.50	119.35	92.50	119.35	107.25	119.35	250.00	119.35	523.75	119.35	489.00	119.35	332.00	119.35	488.25	119.35
18	1.00	.00	118.35	10.75	118.35	17.50	118.35	77.50	118.35	95.75	118.35	220.00	118.35	497.25	118.35	465.00	118.35	310.00	118.35	452.75	118.35
19	1.00	.00	117.35	.00	117.35	.00	117.35	52.50	117.35	85.00	117.35	192.25	117.35	464.25	117.35	434.75	117.35	288.50	117.35	417.00	117.35
20	1.00	.00	116.35	.00	116.35	.00	116.35	17.50	116.35	75.00	116.35	166.75	116.35	424.75	116.35	398.25	116.35	267.50	116.35	381.00	116.35
21	1.00	.00	115.35	.00	115.35	.00	115.35	.00	115.35	52.50	115.35	133.00	115.35	354.50	115.35	351.50	115.35	244.75	115.35	345.25	115.35

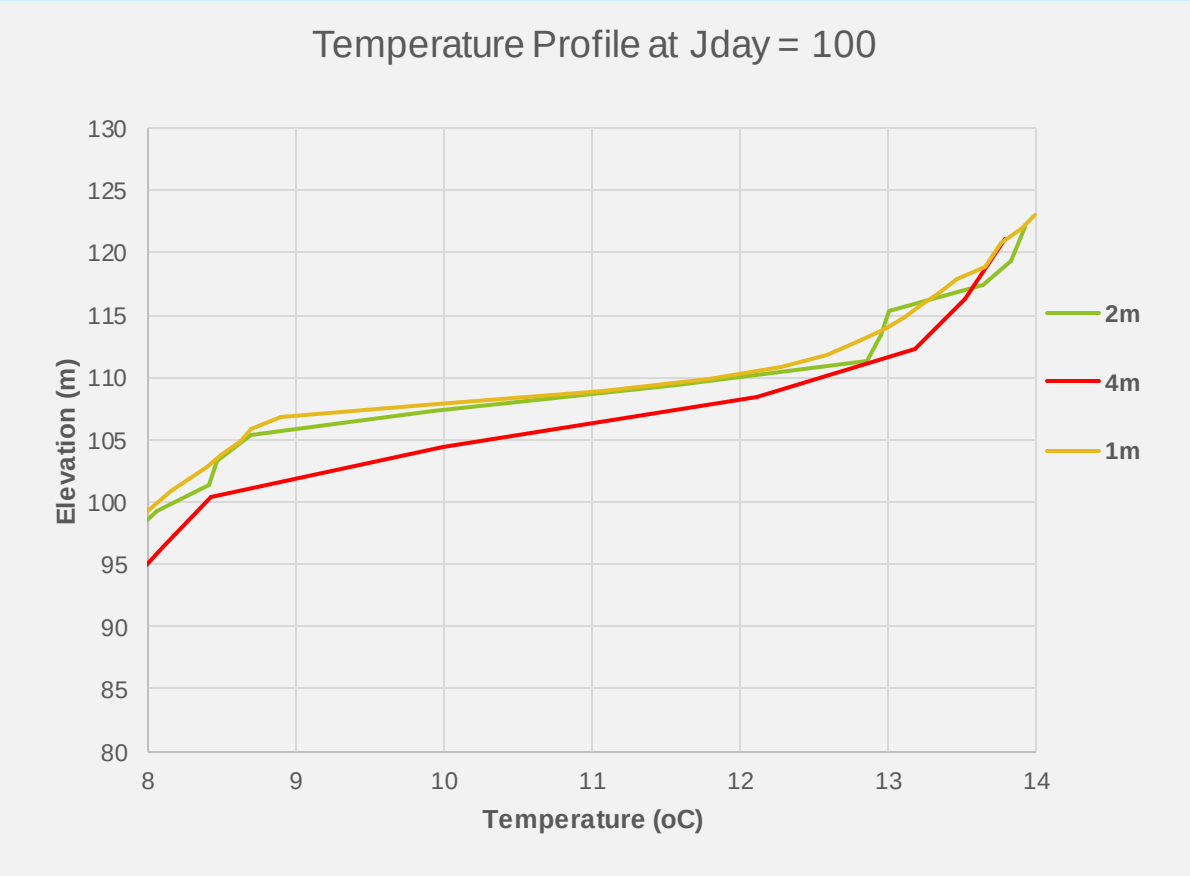
1. segment lengths
2. water surface elevations
3. segment orientations
4. bottom friction
5. layer heights for each segment, and
6. average widths for each grid cell.

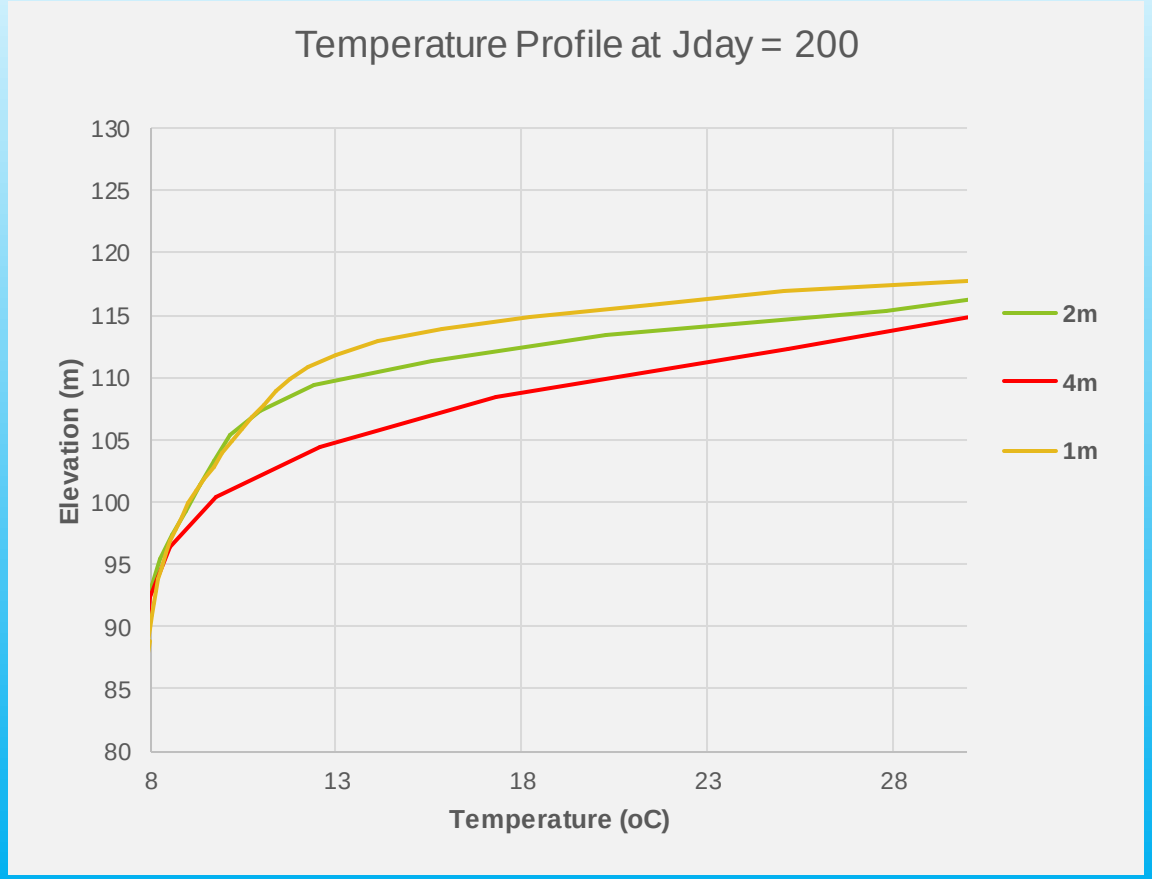
Reservoir Elevation vs Volume



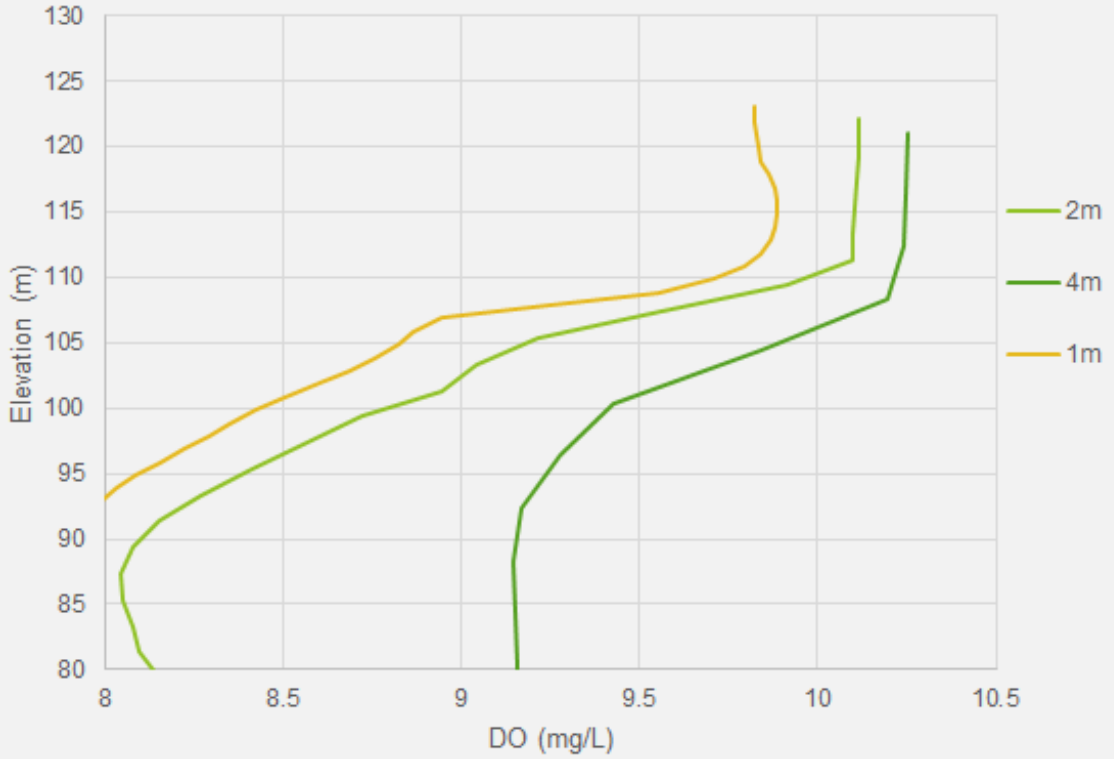
From this comparison, the model grid was determined to be an accurate representation of the reservoir's bathymetry.

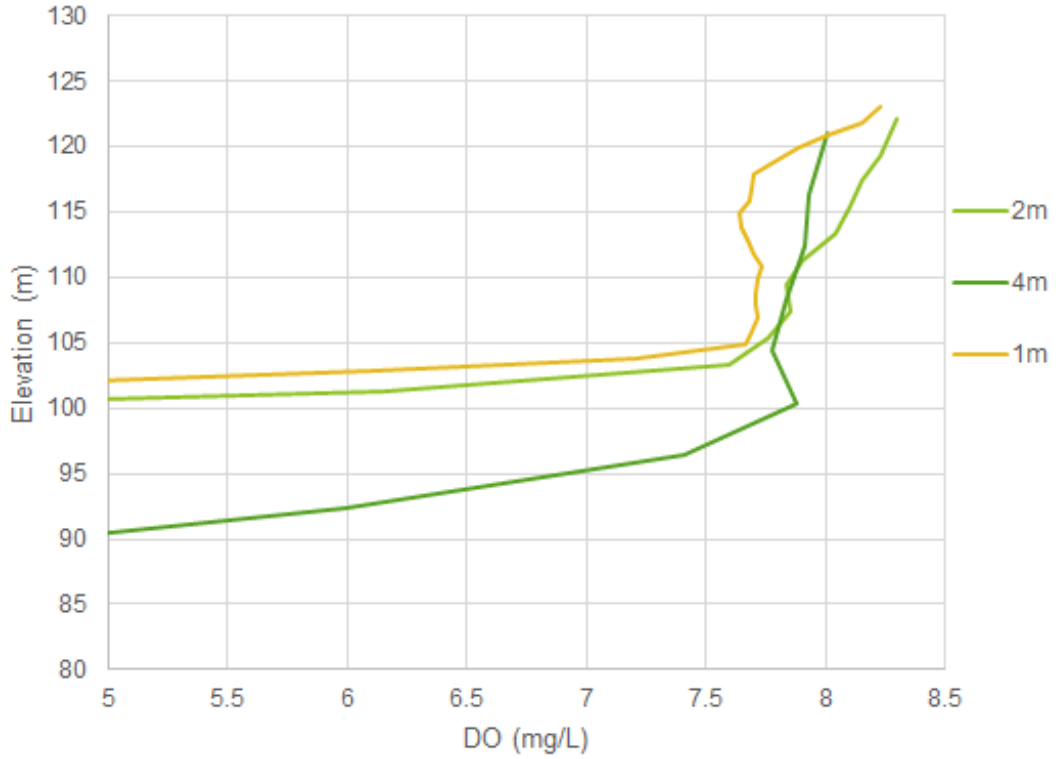
Predicted Water Temperature Profiles





Predicted Dissolved Oxygen (DO) Profiles





Hands-on Exercises

- Review the differences of bathymetry files
  - Layer height = 2 m (bth1.csv)
  - Layer height = 1 m (bth1-1m.csv)
  - Layer height = 4 m (bth1-4m.csv)

- Run the DeGray reservoir W2 model with the new bathymetry files and note the differences in run time.

- Compare the differences of predicted 1) water temperature, dissolved oxygen profiles (**spr.csv**) and 2) withdrawal (**two_31.csv**) for the 2 m, 1 m and 4 m layer heights

Questions?