Date: April 10, 2013

Subject: Lower Boise River Aquatox Model Segmentation

RE: April 9, 2013 Model Work Session

- Evaluate the pros/cons of a linked vs. un-linked model and identify what the logical segments for either scenario might be (as part of this evaluation, perhaps look at the 13 segment linked vs. the 4-segment unlinked to determine the differences in how boundary conditions, inputs, etc. are utilized in each).

The two options for model linkage are linked and un-linked. Considerations for linkage of model segments include:

1. **Boundary Condition Definition:** Linked model requires only the upstream boundary condition; whereas unlinked model requires boundary conditions for each segment
2. **Model Setup Complexity and Calibration:** Unlinked model analysis is only of the processes occurring in the segment; whereas the linked model needs to represent fate processing in upper reaches
3. **Ease of Scenarios:** Linked model supports scenario simulations with modifications to tributary and discharger inputs; whereas unlinked model requires creating a methodology external to the model for redefining mainstem river boundary conditions

**Table 1. Evaluation of Linkage Pros/Cons of Options**

| | Linked | Un-linked |
|---|---|---|
| Boundary Condition Definition | +<br>One | -<br>Multiple |
| Model Setup Complexity and Calibration | -<br>More moving parts | +<br>Less moving parts |
| Ease of Scenarios | +<br>Use power of model | -<br>Requires external methodology |

Multiple options are possible for model segmentation. Four possible options are shown in Figure 1 through Figure 4 consisting of 4, 7, 8 and 13 segments. The 4- and 13-segment options were created by Dr. Park. The 7- and 8-segment options are proposed by various model work sessions for discussion. Considerations for segmentation of model include:

1. **Physical Definition:** Physical characteristics, representation of tributaries, wider or narrower river sections, riffle, pool, or deep river sections
2. **Data:** Data availability to support model inputs and output review/calibration
3. **Target Locations:** Representation of specific locations of particular interest or used to evaluate to targets
4. **Boundary Conditions:** Segments selected based on supporting boundary condition data definition
5. **Representativeness:** Sufficient segments such that the area of concern is not affected by the boundary conditions
6. **Time:** Simulation run time

**Table 2. Evaluation of Segmentation Pros/Cons of Options**

| | 4-Segment | 7-Segment | 8-Segment | 13-Segment |
|---|---|---|---|---|
| Physical Definition | - Limited locations, tribs external | +/- Key locations but some tribs. lumped | +/- Key locations but some tribs. lumped | + Segments based on key tribs. |
| Data | + Data at key locations | +/- Data at key locations, some interpolation | +/- Data at key locations, some interpolation | - More data required, some interpolation |
| Target Locations | + Specific to locations | +/- Some extension of specific locations to longer reaches | +/- Some extension of specific locations to longer reaches | + Locations well defined |
| Boundary Conditions | + Data available | + Data available | + Data available | + Data available |
| Representativeness | +/- Locally good, not of LBR | +/- Some extension locally, good LBR | +/- Some extension locally, good LBR | + Locally and LBR |
| Time | + ~2 hours | +/- ~4-6 hours | +/- ~4-6 hours | - ~8-10 hours |

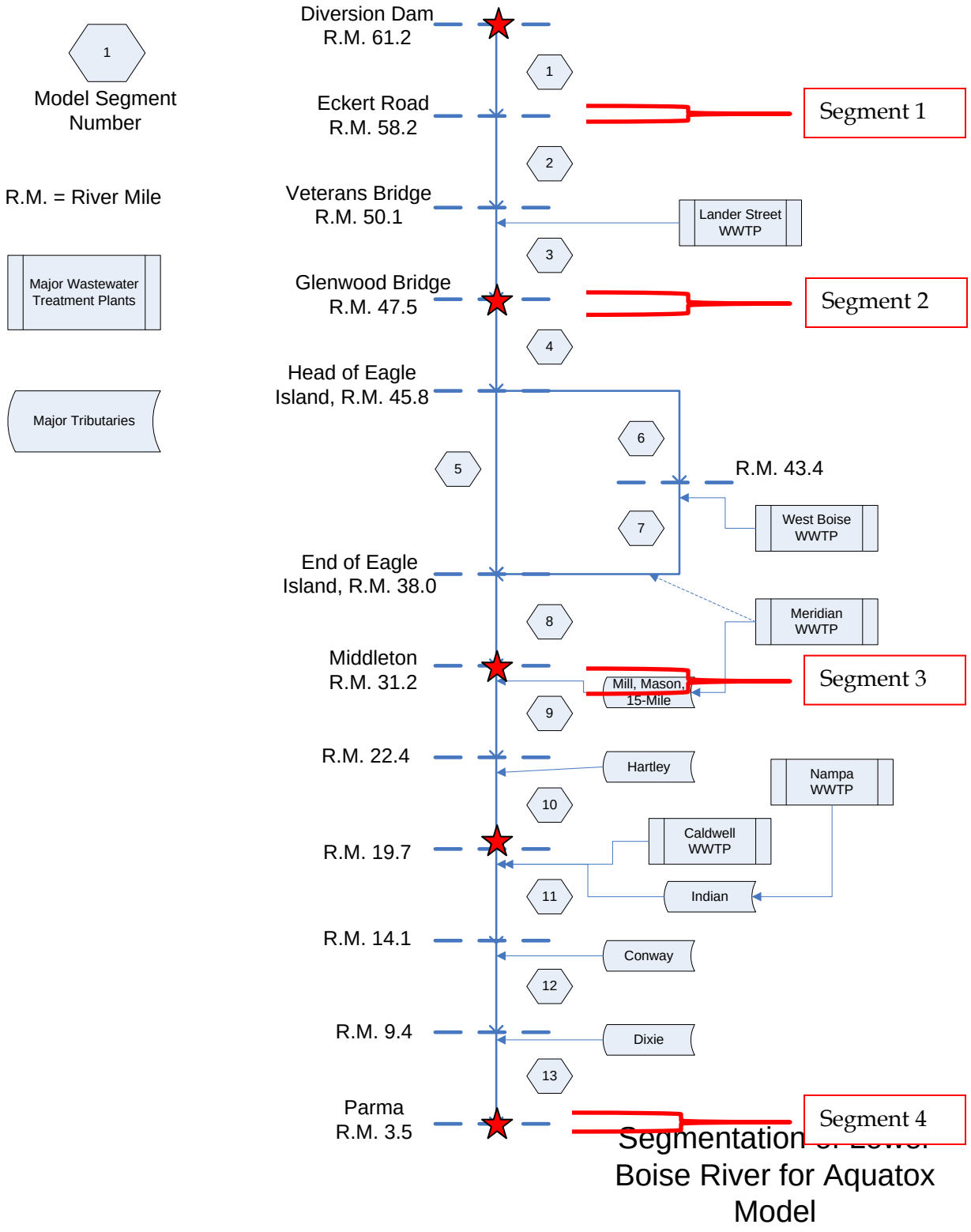


**Figure 1. Lower Boise River 4-Segment Unlinked Aquatox Model Option**

Stars indicate locations of greatest data; red brace line indicates segment.

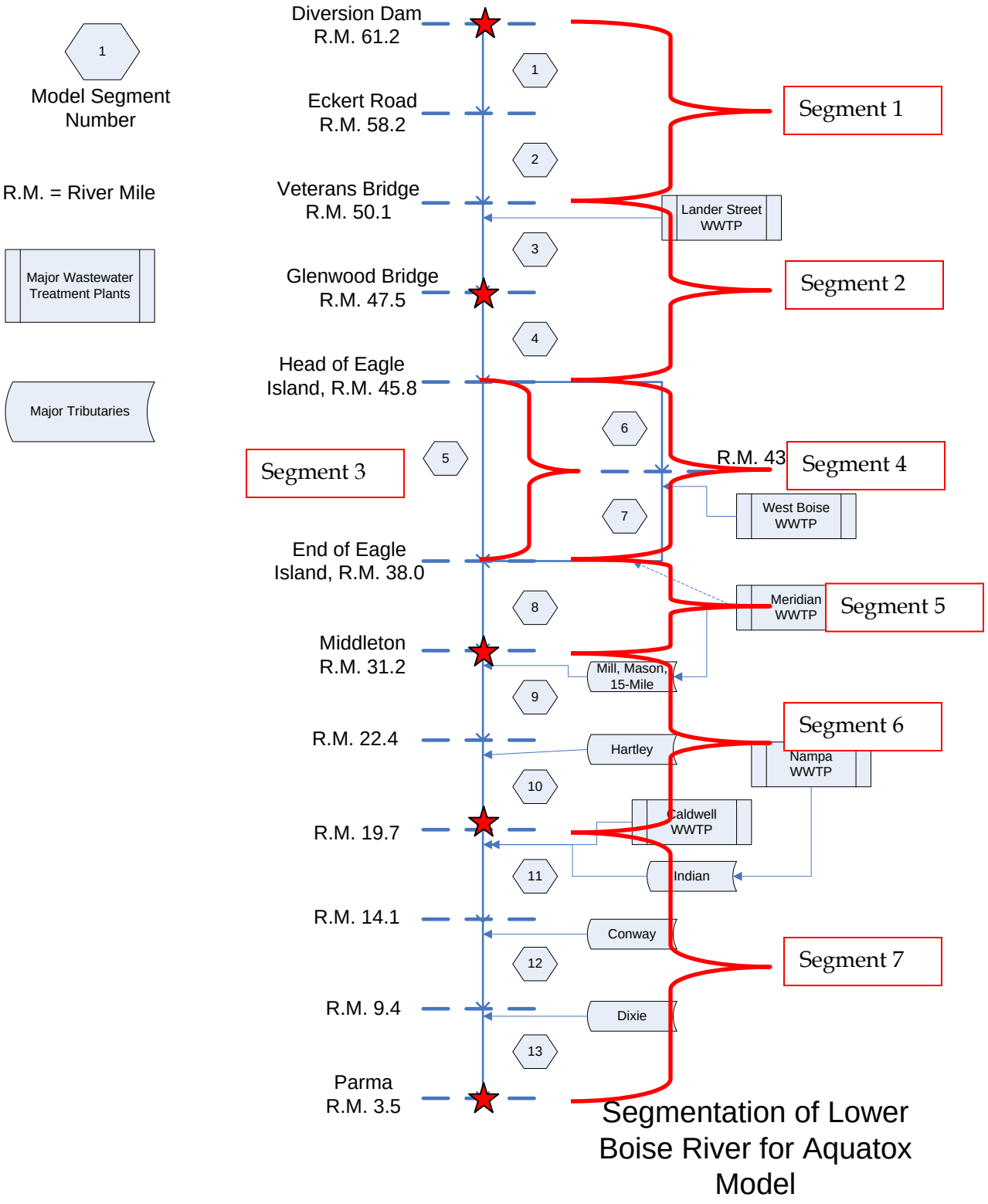


**Figure 2. Lower Boise River 7-Segment Linked Aquatox Model Option**

Stars indicate locations of greatest data; red brace line indicates segment.

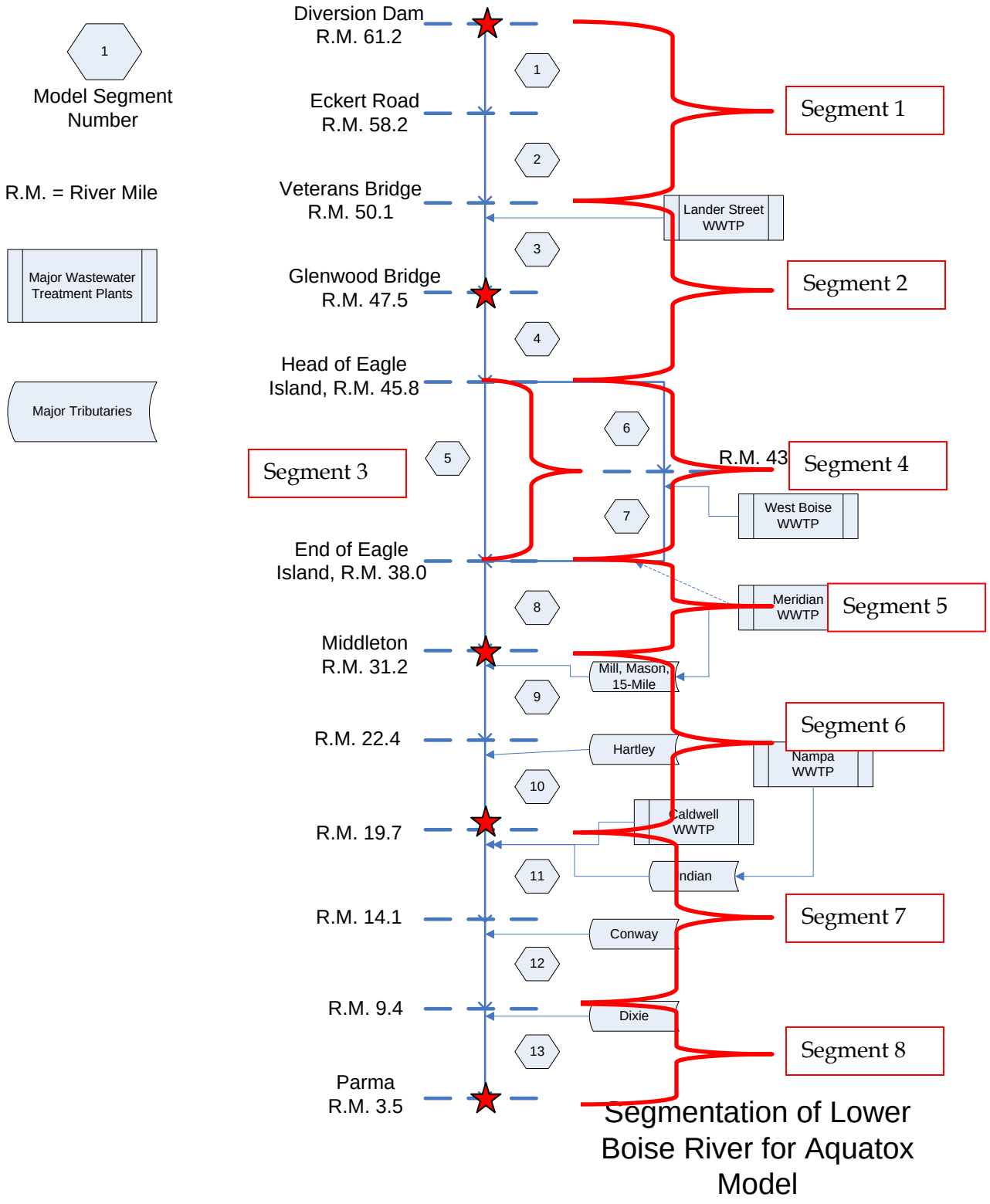


**Figure 3. Lower Boise River 8-Segment Linked Aquatox Model Option**

Stars indicate locations of greatest data; red brace line indicates segment.

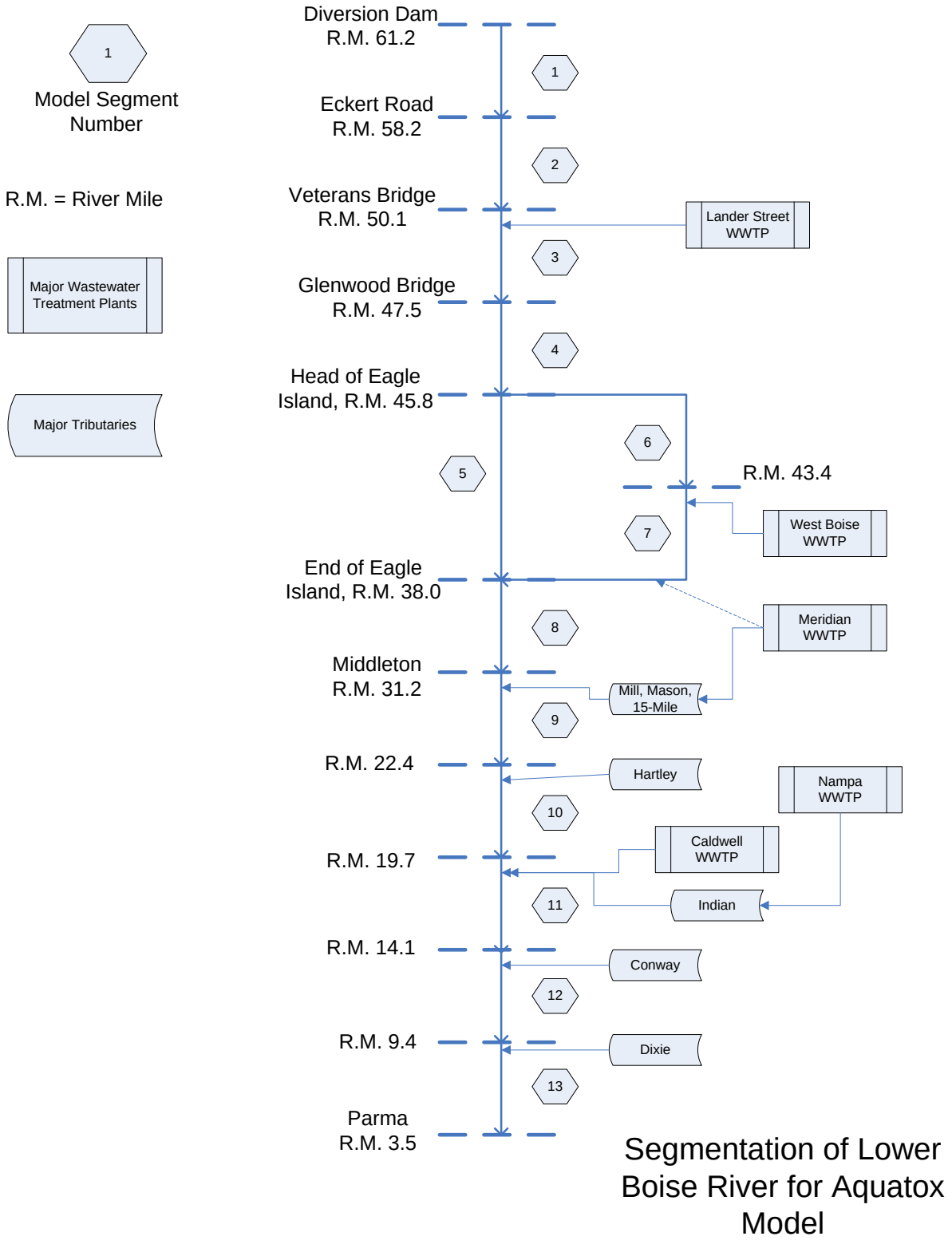


**Figure 4. Lower Boise River 13-Segment Linked Aquatox Model Option**