

# Analysis/Subject Matter (continued)

## 4. Bridge Impacts

**Goal:** The intent of this section of the study is to address the geometric issues associated with the bridges that will fall within the reservoir pool. The item is largely a cost related item in distinguishing the dollars associated with the removal or replacing of the bridges.

**Summary:** At this stage of the investigations, it appears likely that one to three bridges would be removed (a traffic study in a further phase would confirm the number) while one to three others would require full reconstruction or raising of the deck (where practical).

**Next Steps:** A traffic study should be completed to determine if one or more bridges can be removed with no replacement necessary (i.e., traffic volumes are low enough that bridge replacement(s) is not warranted). The bridges that could possibly be raised (at substantially lower costs should be investigated by a bridge structural engineer) would require investigation. All transportation agencies will require input and coordination on the signoff of any removal or replacement.

### BRIDGE EVALUATIONS

Bridges along the proposed reservoir pool required evaluation for cost to remove, raise or replace as a portion of the overall estimated cost of the project. The bridges include from west to east:

1. S.R. 9 – 4 lane (Scatterfield Road)
2. Rangeline Road – 2 lane
3. S.R. 32 – 4 lane
4. Greenhill Road – 2 lane
5. Madison C. R. 400 East – 2 lane
6. Madison C. R. 500 East – 2 lane
7. I-69 – Dual 2 lane bridges
8. Delaware C. R. 900 West – 2 lane



*S.R. 9 – 4 lane (Scatterfield Road)*



*C.R. 400 East - 2 lane*



*C.R. 500 East - 2 lane*



*Greenhill Road - 2 lane*

# Analysis/Subject Matter (continued)

At this time, plans were available for all the bridges except the Delaware County Road 900 West bridge. It appears though that based on contour data, that the Delaware County bridge will not require adjustment for the reservoir and can be used as currently constructed.

The Interstate 69 bridges also appear to have adequate clearance to provide the recommended freeboard for the bridge during the 100-year flood when the normal pool of the reservoir is 870. However, a normal pool elevation of 875 creates a 100-year elevation that partially submerges the Interstate structure. The rebuilding of the Interstate bridges is an unlikely option with the regulatory agencies and IN-DOT when the lower normal pool of 870 requires no change in the bridge structure.

The remainder of the bridge plans (bridges 1-6 above) were reviewed to determine the cost/viability of leaving each bridge in place, removing the bridge or reconstruction the bridge.

In general, these six bridges have demolition costs in the \$600K to \$1.2M range. The cost to fully reconstruct (bridge and raised approaches) ranges from \$3.5M to \$7.5 M. The total layout of costs are shown in the Table Below and as Appendix D. Bridge experts believe that although one or two of the bridges could possibly be raised that there would only be a minimal cost savings versus reconstruction. It should be noted that the SR 9 bridge as proposed would be routed over the dam using it as a causeway, however, a savings of 3-4 million is likely if the bridge were reconstructed downstream of the dam on a new alignment. Note that other state roads in Indiana have been constructed on dams so this type of structure has already had a precedent set if it comes to fruition.

The estimated costs associated with the project in this preliminary phase will be as follows:

Removal of the bridges 1 thru-6	-\$5.5 M
Likely replacement of 4 bridges (with SR 9 downstream of dam)	-\$21.0 M
Total estimate (not replacing 2 of the CR bridges)	-\$26.5 M

Note that the two bridges not to be replaced are estimated based on current traffic volumes. A traffic study would be warranted in a future phase of this project to confirm that traffic could be properly rerouted with the loss of these two bridges. It is important to note that the cost is not the only reason for not rebuilding in place, but that a reservoir that is chopped up by many bridge crossings loses much of its recreational and economic value.



*I-69 - Dual 2 lane bridges*



*S.R. 32 - 4 lane*



*Rangeline Road - 2 lane*

# Analysis/Subject Matter (continued)

## 5. Dam Options

Three feasible options from the investigation have been outlined below; Principal features for each option are detailed below:

- Option 1: Uncontrolled Spillway; Pool at 870 ft

*Principal Features:*

- a. Earth Embankment to 890 ft; 30 ft top width, 3:1 side slopes
- b. 700 ft long spillway with crest at 870 ft, 3:1 side slopes
- c. Stilling Basin/Training Walls
- d. Intake Tower for drawdown and Discharge Piping

- Option 2: Uncontrolled Spillway; Pool at 875 ft

*Principal Features:*

- a. Earth Embankment to 890 ft; 30 ft top width, 3:1 side slopes
- b. 1100 ft long spillway with crest at 875 ft, 3:1 side slopes
- c. Stilling Basin/Training Walls
- d. Intake Tower for drawdown and Discharge Piping

- Option 3: Gated Spillway; Pool can be set either at 870 ft or 875 ft

*Principal Features:*

- a. Earth Embankment to 890 ft; 30 ft top width, 3:1 side slopes
- b. 530 ft long spillway with crest at 870 ft ; 3:1 side slopes
- c. Spillway divided into 15 bays, each bay with 30' clear span
- d. Each bay houses a 30'X30' vertical gate
- e. Crane Bridge over the spillway for maintenance/operational purposes
- f. Stilling Basin/Training Walls
- g. Intake Tower for drawdown and Discharge Piping

The earth embankment section will be a zoned section with an impervious core. The spillway section will be constructed with roller compacted concrete with a concrete finish. The stilling basin, intake tower, and the piers for spillway bays (Option 3) will be constructed of reinforced concrete.

Estimated construction costs are detailed in Appendix E and discussed more thoroughly in the estimate cost analysis section for each of the options above. Note that the costs for the spillway include the stilling basin, training walls, gates, crane bridge, piers and other items as required by the specific option under consideration. The estimated total construction costs in 2011 dollars are as follow:

- Option 1: \$58.5 Million
- Option 2: \$75.9 Million
- Option 3: \$76.4 Million