

# Country Squire Lakes Dam

## North Vernon, IN



Bayer Becker's design improvements for the Country Squires Lake Dam helped address deficiencies and bring the dam into compliance with the Indiana Department of Natural Resources' (IDNR) dam safety requirements. Constructed from 1975 - 1976, the earth embankment dam is approximately 35 feet in height and 750 feet in length and has been designated with a "High" hazard classification due to the potential damage to downstream properties, roads, and utilities should a sudden breach occur.

Two issues that posed significant concerns were seepage through the underlying geologic features for which the embankment structure was founded and the hydraulic capacity of the spillway system. Seepage has been a concern since the completion of the dam as existing solution channels were encountered during construction. These channels were filled with concrete in an attempt to provide a temporary seal. However, seepage reappeared at various locations on the downstream side of the dam. IDNR was concerned that a sudden failure could occur if a solution channel propagated to a point where it came in contact with the erodible earth embankment materials. Using HEC-HMS, Bayer Becker performed a hydrologic and hydraulic analysis which determined that a 100% Probable Maximum Precipitation storm event would overtop the dam's crest by 1.4 feet, producing velocities sufficient to quickly erode earth embankment materials, ultimately forming a breach. Once a breach is established, it is impossible to stop and will most likely lead to complete dam failure resulting in the near sudden release of the facility's entire storage capacity. In addition, the capacity of the primary spillway is relatively small compared to the runoff potential of the tributary drainage area. As a result, the auxiliary spillway is activated frequently, resulting in erosion of the embankment materials along the downstream side of the spillway crest and rendering the roadway impassable during the storm event.

Bayer Becker's design solution consisted of employing a large rock fill on the downstream side of the dam consisting of approximately 35,000 cubic yards. The large rock fill was designed as a buttress to the existing earth embankment. The rock embankment provides additional mass to such a degree that a localized failure due to seepage forces would not present an immediate dam safety concern and allow opportunity for repair. In addition, Bayer Becker determined that increasing the spillway capacity was not a viable solution based on the amount of available funding. Therefore, Bayer Becker developed a rock gradation for use in the exposed surface layer of the rock fill which accommodates overtopping conditions during the design storm event. The downstream portion of the auxiliary spillway was expanded and relocated a safe distance from the toe of the proposed embankment. The spillway was excavated into underlying limestone bedrock layers which were the source of the rock embankment material. Additional improvements to the facility included an extension of the primary spillway conduit, construction of an energy dissipation device, preparation of an operation and maintenance manual, and an emergency action plan.

Bayer Becker also provided construction phase services for the project. Bayer Becker's construction phase specialist served as the Resident Project representative. His duties included review of project schedules, attendance at job site meetings, serve as liaison between the project engineer, contractor and owner, coordinate shop drawing and submittal review, conduct observations of contractor's work, record daily observations and review progress payments.

As part of their construction phase services, Bayer Becker implemented an internet based records system that enabled the owner and engineer to review progress reports and photographs of the contractor's work in real-time. This real-time access to project information facilitated quick resolution to field issues and promoted team communication.



### Project Stats

<b>Client:</b>	Jennings County, Indiana
<b>Location:</b>	North Vernon, IN
<b>Year:</b>	2010
<b>Market:</b>	<a href="#">Storm Water Infrastructure</a>
<b>Project Size:</b>	750.00

## Services Provided:

### CONSTRUCTION PHASE SERVICES

Bidding Assistance  
Change Order Review & Recommendation  
Construction Quality Assurance  
Field Records & Reporting  
Meeting Document Preparation  
Meeting Facilitation  
Monitor Construction Code Compliance  
Owner Representation  
Post Construction As-builts  
Punchlist & Closeout  
Regular Site Visitation  
Submittal Review

### SURVEYING SERVICES

Easement Exhibits & Descriptions  
Topographic Surveys

### CIVIL ENGINEERING SERVICES

Dam Design  
Erosion Control Planning, Permitting & Inspection  
Flood Plain Analysis and Permitting  
Grading & Earthwork Analysis  
Hydrologic & Hydraulic Analysis