

ENGINEER'S REPORT
of the
EMBANKMENT FAILURE ON COUNTY ROAD 10

February 21, 2006

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A. INTRODUCTION

According to the Complaint, on or about August 27, 2004 a road slip occurred on the north side of Lancaster County Road 10 near the residence of Daniel Howard at 32125 Broadheadville Road, Lancaster County, Newport, Ohio.

In July of 2004 Mr. Howard had constructed a storage building/stable (shed) on his property north of the CR 10 roadway embankment. In the course of this construction, Mr. Howard hired Lowes' and Sons Excavating to construct a building pad for the shed.

The Lancaster County Engineer claims that Mr. Howard's contractor, Lowes' and Sons Excavating (Lowes) building pad construction caused the CR 10 roadway embankment to fail.

The purpose of my investigation was to determine the cause of the embankment failure and if Lowes' building pad construction caused or contributed to the failure of the CR 10 roadway embankment.

B. MATERIALS AVAILABLE FOR REVIEW

1. June 30, 2005 Barbara J. Yasso, Lancaster County Clerk of Courts, Court of Common Pleas, Lancaster County, York, Ohio, *Summons*.
2. Answer of defendant Harold Lowes to *Summons*
3. Answer and Cross-Claim of Daniel W. Howard.
4. Plaintiff, Lancaster County Engineer's *Responses to Interrogatories and Request for Production of Records*.
5. September 14, 2004 Report of K&B Laboratories (photos not attached).
6. November 11, 2004 Virginia Excavating Company pile driving Invoice #9334.
7. November 17, 2004 *Daily Crew Worksheet Detail File*.
8. January 19, 2005 Lancaster County Engineer Invoice Report for payment of K&B Laboratories, Inc.'s "Assessment of Slip on CR 10."
9. Map of Nockamixon Watershed Conservancy District including "slip area."
10. September 14, 2004 report of K&B Laboratories (duplicate of item #2.5, but with black and white photos attached.)
11. September 8, 2004 letter from Lancaster County Engineer to Verizon.
12. August 31, 2004 CR #10 "slip repair proposal" from Virginia Excavating, Company to Lancaster County Engineer.
13. Copies of seven (7) black and white photographs.

14. Plaintiff's *Answers to Interrogatories and Production of Records* proof of service to Jared P. Neff, Attorney for Defendant dated September 16, 2005 (no attachments.)
15. CR#8 *Project Worksheet Report*.
16. CR#44 *Project Worksheet Report*.
17. CR#16 *Project Worksheet Report*.
18. CR#60 *Project Worksheet Report*.
19. CR#45 *Project Worksheet Report*.
20. *Complaint* (similar to Item #1)
21. January 26, 2005 letter from Lancaster County Engineer to Lowes and Sons Excavating.
22. February 15, 2005 letter from Arnold & Smith, LLP (Attorney Decker for defendant Lowes) to Lancaster County Engineer.
23. Zoning Permit #2004-04 dated July 18, 2004.
24. Application for Zoning Certificate and Zoning Certificate #2004-04 dated July 18, 2004.
25. September 27, 2004 *Lancaster News Herald* newspaper article and photographs.
26. Copies of six (6) color photographs from K&B Laboratories report.
27. December 15, 2005 site inspection by John Messineo.

C. BACKGROUND

On July 18, 2004 Mr. Howard properly completed an *Application for Zoning Certificate* and properly obtained a *Zoning Certificate* and *Zoning Permit* from the Board of Moorefield Township Trustees & Moorefield Township Zoning Commissioner to construct the shed in question on his property just north of CR#10. Mr. Howard then contracted with Lowes and Sons Excavating to construct a building pad for his shed and then largely framed and completed the shed himself in July and August.

NOAA weather records for eastern Ohio in 2004 report heavy rain periods from August 18 through August 21, from August 28 through August 30, and from September 8 through September 10, with 2½" inches of rain falling on September 10 alone. On September 27, 2004, the *Lancaster News Herald* reported that Crystal Lake had crested at 7.98 feet above normal, only 6 inches below the highest level ever recorded. One of the photographs (Exhibit 1 –yellow arrow) in the September 27, 2004 newspaper article depicts the slip in question. Crystal Lake, a 2,270-acre lake of the Nockamixon Watershed Conservancy District (MWCD), is on the other side of a hillside adjacent to and south of the Howard residence. Mr. Howard stated that due to the heavy rains in August and September 2004, a spring on his property just southeast of the slip, had unusually high flow rates. Mr. Howard also stated that due to the high lake surface, the emergency spillway for Crystal Lake, which is approximately 3/10 of a mile southeast of the Howard residence and the incident slip, fLowesd across CR#10 closing the county road to local traffic.

Documents obtained through discovery from Plaintiff Lancaster County Engineer confirm that slips occurred throughout Lancaster County after the heavy rain incidents

of August and September 2004. These slip locations include CR#8, CR#44, CR#16, CR#60, and CR#45. It is my understanding that the Lancaster County Engineer repaired these other slips without requesting remedial compensation from adjacent property owners.

On September 11, 2004 K&B Laboratories, Inc., visited the site of the incident slip. On September 14, 2004, K&B prepared a report containing their opinions regarding the incident slip.

On or about November 11, 2004, the Lancaster County Engineer hired Virginia Excavating Company to stabilize and repair the slip by driving 18 HP 12 x 53, 25-foot long piles and installed "used" guardrail lagging to contain the road bed. CR#10 was then repaved.

Based on K&B's reported opinions, the Lancaster County Engineer notified Lowes and Sons Excavating on January 26, 2005 that:

Lancaster County retained the services of a soils engineering specialist to investigate the cause of the road slip. It has been concluded that the excavation of the toe of the roadway embankment compromised its stability resulting in the slip. As contractor responsible for the excavation, it will be necessary for you to compensate Lancaster County for costs incurred in repair of this road bank slip in the amount of \$24,522.82.

D. SITE INSPECTION

On December 15, 2005, I met with Mr. Howard at his residence and conducted a site inspection of the incident slip.

The slip had already been repaired at the time of my site inspection. The repair consisted of 18 HP 12x53 H-pile driven into the top of the north side of the roadway embankment at the edge of the pavement. Reportedly the piles were driven to a depth of 25 feet. The piles were driven at approximately 6'-0" on-center, and sections of 24" deep steel highway guardrail were placed horizontally as lagging on the inside of the H-pile between the piles and the edge of pavement. Backfill varying in depth from 7/10 of a foot toward the south to 3 feet toward the north was then placed behind the guardrail lagging to level the roadbed and the pavement was then repaired. The length of the H-pile repair extended approximately 102 feet along the top of the embankment. I did not observe **any** remedial work done at the toe of the slope of the embankment, and the toe of slope appeared virtually identical to the photographs taken shortly after the slip occurred. I recorded the slope of the embankment at five locations along the repaired slip. For orientation purposes, I numbered the piles #1 through #18 with #1 being the northern-most pile and #18 being the southern-most pile. I measured the slope of the embankment slope at piles #1, #6, #10, #13 and #18 as listed in Table 1 below.

Table 1

Pile #	Engineer's Slope	Slope in Degrees
1	2 ½ to 1	24
6	2 ½ to 1	24
10	2 ¼ to 1	27
13	2 ¼ to 1	27
18	2 ½ to 1	23

At the time of my inspection there was a light cover of snow on the embankment slope, however high grass and other natural vegetation was visible along the entire length of the embankment. There is a shallow swale along the toe of the embankment slope that intercepts flow from Mr. Howard's springhouse. The springhouse is on the south side of CR#10 and east of the slip area. The flow from the spring is piped under CR#10 and is intercepted by the swale. The piped springhouse flow **pre-dates** the construction of the building pad and shed.

There is a roadside ditch along the south side of CR#10 that intercepts surface runoff from the steep hillside in the vicinity of the slip and immediately adjacent to the south side of the road, which is the opposite side of CR#10 from the slip. This ditch diverts water runoff to the west for a few hundred feet, however the corrugated metal culvert that drains this runoff under CR#10 has been buried and is plugged up.

I also observed the fractured condition of the bedrock of the steep hillside in the vicinity of the slip and immediately adjacent to the south side of the road and also in the vicinity of the emergency spillway of Crystal lake approximately 3/10 of a mile to the east along CR#10.

E. ANALYSIS

K&B does not claim to know if the soil slope that failed was a cut or a fill. It is evident from the steep hillside immediately adjacent to the south side of the road where the slip occurred and the relatively "flat" embankment slopes that I measured on the embankment slope that failed, that the slip occurred in an embankment "fill." It is evident from K&B's **own photographs** (Exhibits 2 and 3 – yellow arrows) taken prior to the H-pile repair work, that the incident slip occurred "high" on the embankment slope just below the pavement and not at the toe-of-the-slope (Exhibit 2 – pink arrow) as K&B claims. This "high" slope failure is known as a *shallow slope failure* and is likely to occur in shallow sloped (less than 53 degrees) fill embankments subjected to groundwater seepage, which is what likely occurred through the roadway embankment fill during the severe rain events of August and September of 2004. The "plugged" culvert on the south side of CR#10 would have only further contributed to a saturated and weak embankment slope, particularly "high" in the slope.

K&B's own statement:

We think that conducting a geotechnical investigation is necessary to determine subgrade condition and repair method.

Is evidence that their opinions are based on incomplete investigation and analysis and therefore without scientific or technical basis.

K&B's own photographic evidence confirms that the incident slip was a *shallow slope failure*, high in the roadway embankment just below the road surface and that Lowes' building pad construction did not cause the incident slip.

F. FINDINGS

Within the bounds of experience, reasonable engineering certainty, and subject to change if additional information becomes available, it is my professional opinion that:

- 1.1 Lowes' building pad construction for the Howard shed north of the toe of the CR#10 roadway embankment did not cause the incident slip.
- 1.2 The incident slip was a *shallow slope failure* that occurred at the top of the slope.
- 1.3 The incident slip was caused by seepage that occurred well above Lowes' building pad construction.

John R. Messineo, Jr., P.E.