



MONTGOMERY COUNTY DEPARTMENT OF PARKS
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

Item No. _____

January 25, 2007

MEMORANDUM

TO: Montgomery County Planning Board

VIA: Mary Bradford, Director of Parks *Mary Bradford*
Michael F. Riley, Chief, Park Development Division *MR*
Doug Alexander, Project Management Section Supervisor *DA*

FROM: Andrew Frank, Project Manager *RAF*

SUBJECT: Remedial Measures Program for Lake Needwood Dam

STAFF RECOMMENDATION

The purpose of this item is to update the Board regarding ongoing efforts to respond to the seepage event that occurred in June 2006 and to provide an opportunity for public comment. No action is required by the Planning Board.

SUMMARY OF INVESTIGATION FINDINGS

- Long term stability of dam is determined to be very good
- Seepage occurred through weathered rock foundation, not through the actual dam embankment
- Maryland Department of the Environment (MDE) Dam Safety Division has approved the remedial measures program consisting of a grout curtain along the embankment and a surface filter on the downstream face of the dam
- Grout curtain will be installed in early 2007 and surface filter is planned for summer/fall 2007
- Staff has been maintaining ongoing discussions with interested residents via on-line communications

PROJECT DESCRIPTION

Facility Background

Lake Needwood (Upper Rock Creek Site #5) is a 74-acre lake located within Rock Creek Regional Park at 15700 Needwood Lake Circle in Rockville, Maryland 20855. The dam embankment and outlet controls were designed and constructed by the USDA Soil Conservation Service now known as the Natural Resource Conservation Service (NRCS) between 1964 and 1965. The dam was constructed as a flood control structure that captures floodwaters of a 12.8 square-mile watershed within the upper Rock Creek, as well as providing a recreational amenity.

The dam consists of a compacted earth embankment approximately 65 feet high and 425 feet long with grassed slopes and gravel road along the crest. At the time of construction, cement grout was injected into the weathered rock on the western (right side) third of the dam to form an impervious curtain to reduce groundwater flow around the dam. The riser structure is designed to release the 100-year floodwater through the 42-inch principle spillway over a ten-day period, thereby significantly reducing the level of flooding downstream. Flows exceeding a 100-year flood event would flow through a 180-foot wide grassed emergency spillway located beyond the eastern (left) abutment between the dam and visitor parking lot. There has never been flow through this spillway, and the highest water level on record was about one foot below its crest during Hurricane Agnes in 1972.

Lake Needwood is classified as a High Hazard Dam structure by the MDE Dam Safety Division, which has regulatory authority over the operation and maintenance of the facility. Lake Needwood is one of 66 dams in the State of Maryland classified as a High Hazard Dam due to the potential loss of life (greater than six people) and flooding of houses, buildings, and major roadways that could occur as a result of a dam failure. Since its construction, MDE and M-NCPPC have conducted annual inspections to ensure the facility remains in proper operational condition. M-NCPPC also maintains an Emergency Action Plan (EAP) for Lakes Needwood and Frank to provide guidance on monitoring, communications, and public safety issues during significant storm events.

In 1999, based on MDE recommendations, M-NCPPC installed nine groundwater monitoring wells along the downstream face of the embankment to monitor groundwater levels within the dam. M-NCPPC has also conducted underwater inspections of the riser structure and closed circuit television inspections of the principle spillway at various times at the request of MDE. The Rock Creek Service Area of the Northern Region maintains the facility, with technical support provided by the Park Development Division. Based on historical records and discussions with MDE, this facility has generally been considered to be in very good condition prior to the significant storm events in June 2006.

Seepage Event in June 2006

Between June 25 and June 27, 2006, several major storms passed through Montgomery County resulting in over ten inches of rain during this period. As a result, the reservoir elevation of Lake Needwood rose approximately 23 feet above its normal level, which was approximately four feet below the emergency spillway crest. On June 27, concentrated seeps were observed along the downstream eastern (left) side of the dam, the MDE Dam Safety Division was contacted, and one of their engineers visited the site to assess the situation. Based on historic knowledge of earthen dam failures, engineers on site determined that the integrity of the dam could be jeopardized. Consequently, in the early morning of June 28, residents within the downstream inundation limits were evacuated, and MDE requested that M-NCPPC immediately contact a qualified engineering firm to assist in response to the emergency situation. M-NCPPC contacted URS for these services based on their recent work to install monitoring wells on the dam and conduct inspections of the facility. Over the next several days, M-NCPPC and URS personnel, with participation of multiple agencies and contractors, were able to stabilize and monitor the seep by installation of large quantities of stone aggregate, filter fabric, and a monitoring weir. Evacuated residents were allowed to return to their homes on the evening of June 29.

As a result of the seep, MDE ordered that M-NCPPC retain the services of a qualified engineering team to perform geotechnical and geophysical investigations of the dam, submit an updated EAP, continue daily monitoring of the observation wells, lake levels, and seepage data, and submit results of the forensic analysis with a recommended remedial measures program to address the seepage on the eastern (left) abutment. In order to meet the mandates of MDE and ensure public safety, M-NCPPC has retained URS to conduct the required analysis and develop proposed remedial actions for review and approval by MDE.

Summary of Investigations and Remedial Measures

The investigations began with a review of historic boring logs, construction documents, previous inspections, and all other available facility records. A geologic reconnaissance of the area surrounding the dam site indicated that joint orientations of existing bedrock were characterized by two sets of nearly vertical fractures through which groundwater can flow. The review of the construction documents and design assumptions confirmed that the facility, as constructed, is stable and is expected to perform appropriately throughout the full range of possible flood conditions.

An initial technical meeting was held in August 2006 with representatives from MDE, NRCS, Montgomery County, and the URS design team to review records, monitoring data, and consider various alternatives for rehabilitation of the dam. At that meeting it was determined that additional subsurface exploration would be needed to determine the feasibility of the preferred options and verify the conditions of the underlying weathered rock foundation. The results of this investigation indicated the ability for water to pass through relatively open

flowpaths within the existing bedrock, which is the likely cause of the recent seepage event. On the other hand, the subsurface exploration within the dam embankment itself did not reveal any significant defects that would be able to produce the amount of seepage observed during the June 2006 event. Therefore, based on the subsurface information, it was determined that the seepage occurred through the fractured rock beneath the dam rather than through the embankment itself. Additionally, a review of the monitoring well data indicates that the existing stone blanket installed below the downstream side of the dam may not be functioning to convey seepage water to the toe of dam, as designed.

A second technical meeting was held in late October 2006, where the installation of a grout curtain into the bedrock foundation and abutments together with construction a new surface drainage/filter blanket on the downstream slope was selected as the preferred means of rehabilitating the dam. The grout curtain installation consists of drilling a series of holes down through the embankment into underlying bedrock and injecting cement grout to fill the fractures in the rock, which will significantly reduce the potential for water from the reservoir to flow around the dam and create another seepage occurrence on the downstream side of the dam. The downstream surface filter will collect any residual water from the reservoir that might flow around the grout curtain or come from the rock abutments along the downstream side of the dam and safely convey it to the outfall.

URS prepared a detailed report entitled "Investigation & Development of Repair Alternatives", dated November 30, 2006 that was submitted to MDE for review and approval. MDE approved the report on December 13, 2006 and staff advertised an RFP for the Grout Curtain Installation on December 29, 2006. Pending contract award, staff anticipates the grout curtain installation will begin in February 2007 and will be completed in early spring. Design of the surface filter is ongoing, and construction is anticipated to occur over the summer and fall of 2007.

Community Outreach

Over the course of the response and remedial measures development, staff has worked to keep local residents informed about the dam status and plans for rehabilitation. We have been able to carry on a productive on-line discussion for several months to provide information about the dam and answer particular questions residents raised. We anticipate continuing this dialogue throughout the implementation phase of the project.

Project Funding

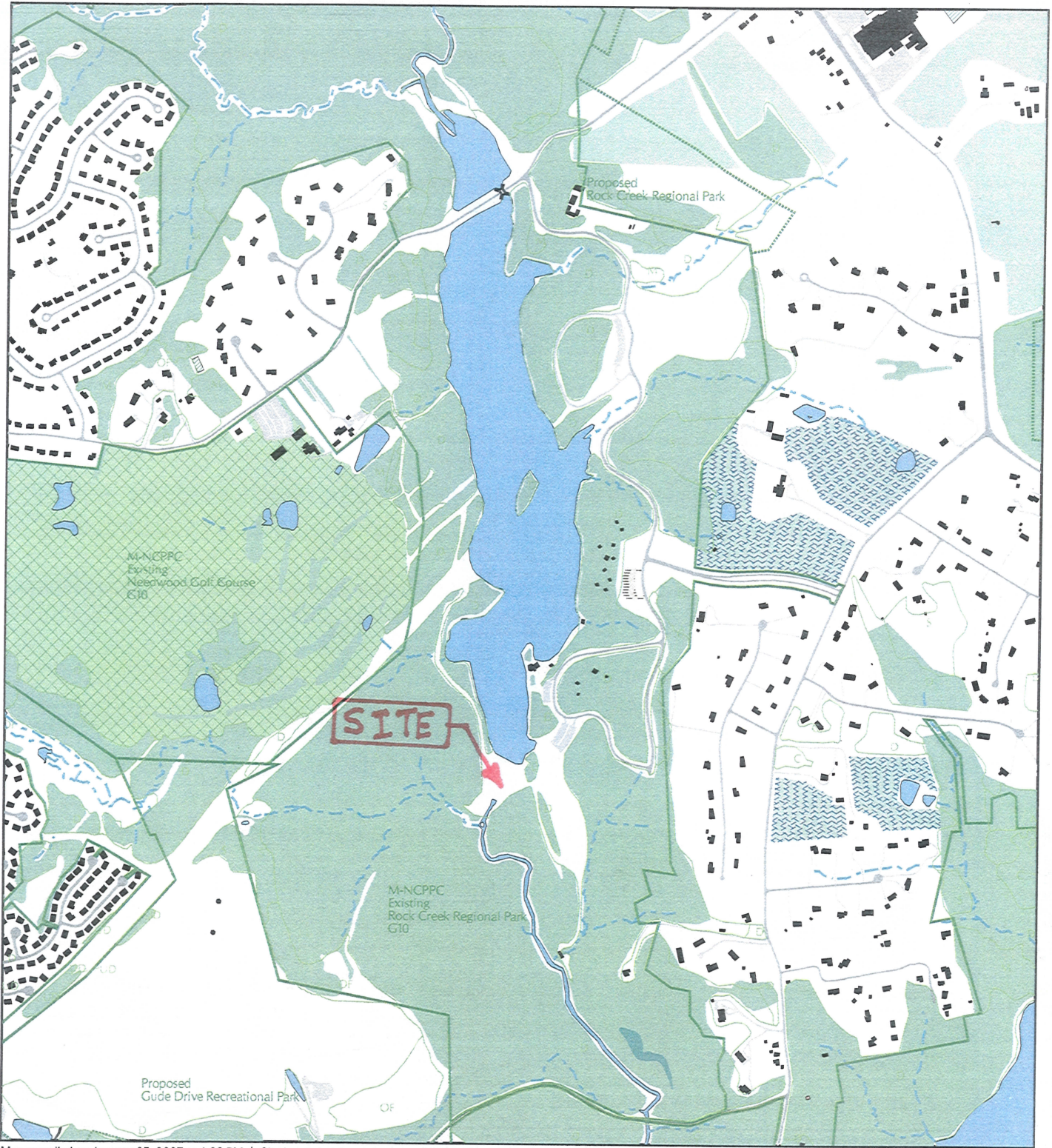
Design and construction is funded through PDF #078710, Lake Needwood Dam Remediation, created as a FY07 Special Appropriation and Amendment for \$3.8 million. The County Council approved this special appropriation in November 2006 simultaneously with the consideration of the Board's expenditure plan for FY07 Program Open Space funds. The Parks Department is investigating potential reimbursement of some costs through the Federal Emergency Management Agency (FEMA) and NRCS. This cost does not include any funds

for the proposed dredging of the forebay and upper portion of the lake, which will start design in FY07 and will require a new PDF request for construction, if approved by the Planning Board.

ATTACHMENTS

- A - Vicinity Map
- B - Lake Needwood Remedial Measures Sketch
- C - MDE Acceptance of Forensic Analysis and Remedial Measures (12/13/06)

LAKE NEEDWOOD - VICINITY MAP



Map compiled on January 25, 2007 at 4:03 PM | Site located on base sheet no - 221NW06

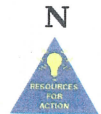
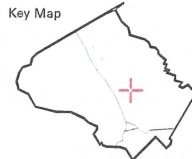
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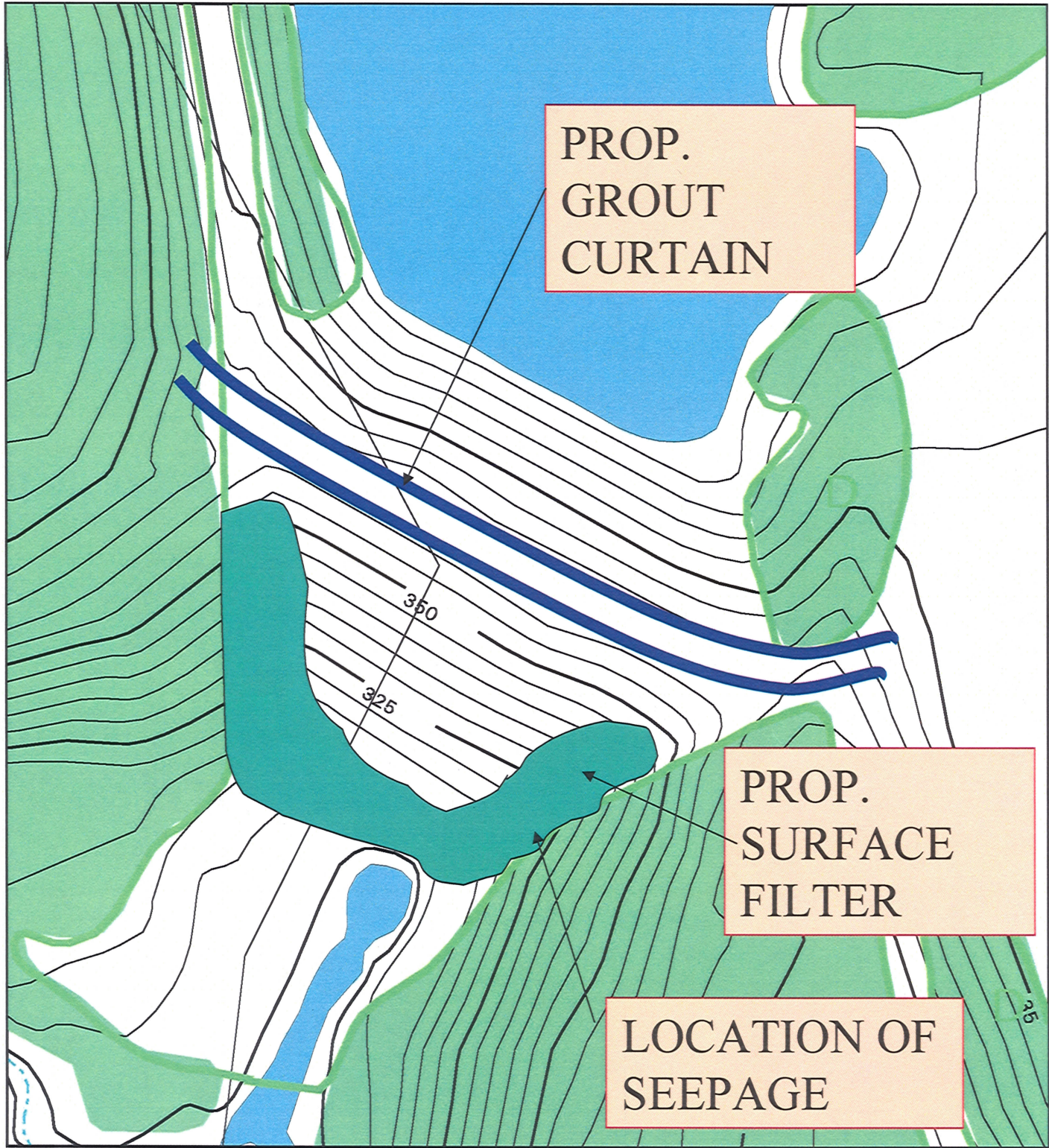
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Key Map



1 inch = 1200 feet
1 : 14400

LAKE NEEDWOOD REMEDIAL MEASURES



Map compiled on October 16, 2006 at 9:28 AM | Site located on base sheet no - 221NW06

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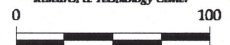
Key Map



N



Research & Technology Center



1 inch = 100 feet
1 : 1200



MARYLAND DEPARTMENT OF THE ENVIRONMENT

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Kendl P. Philbrick
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Michael S. Steele
Lt. Governor

Jonas A. Jacobson
Deputy Secretary

December 13, 2006

Mr. Mike Riley, P.E.
Division Chief
Park Development Division, MNCPPC
9500 Brunett Avenue
Silver Spring, MD 20901

Ref: Lake Needwood Dam - MD Dam No. 46
Acceptance of Forensic Analysis and remedial measures

Dear Mr. Riley:

The Maryland Department of the Environment's Dam Safety Division (MDE) received copies of the 'Investigation & Development of Repair Alternatives' report, submitted by URS Corporation on December 4, 2006.

Dam Safety Division reviewed the report and comments were sent to the Maryland-National Capital Park and Planning Commission' (MNCPPC) on December 8, 2006. It is our understanding from the phone and email communication with the URS staff that MDE's comments will be incorporated in the final version of the report that will be completed by January 2007.

The forensic analysis and the recommended remedial measures in the report satisfy 'condition 5', stipulated in MDE's letter dated July 25, 2006 sent to MNCPPC. With this approval from MDE, the remedial grouting work and construction of the blanket drain on the dam should be able to commence at the earliest.

Please do not hesitate to contact me at 410-537-3538 if there are any questions.

Sincerely,

M.Q. Cas Taherian, Chief
Dam Safety Division

MQT/vpd

Cc: Bob Summers, Ph.D., Director, MDE Water Management Administration
Ken Pensyl, Program Administrator, Sediment, Stormwater and Dam Safety Program
Thomas C. Boone, Chief, MDE WMA Compliance Program
Allan Stahl, P.E., USDA Natural Resources Conservation Service
Greg Zamensky, P.E., URS Corp.
Hal Van Aller, P.E., MDE Dam Safety Division
Visty P. Dalal, MDE Dam Safety Division