021
CHERRY VALLEY POND DAM

CHERRY VALLEY POND DAM, GLOCESTER (021)

Cherry Valley Pond Dam (Figure 1) has been classified by DEM as having a **Significant Hazard** potential. The following report summarizes GZA's evaluation of the dam's potential impact area due to failure of the dam.

1.00 SUMMARY OF SITE AND POTENTIAL DOWNSTREAM IMPACT AREA

In addition to compiling background information and GIS mapping data, GZA performed field reconnaissance of the dam and its associated downstream area (Figure 2). GZA representatives David M. Leone and Bryant B. Furtado visited the site and the downstream river valley on November 8, 2007. A field checklist from the reconnaissance is provided in **Attachment I** and selected photographs are provided in **Attachment II**.

1.10 Site Description

Cherry Valley Pond Dam is located on Chepachet River in the Town of Glocester, Providence County, Rhode Island (See Locus Map, Figure 1). The following identification numbers are associated with the dam:

- DEM ID Number 021
- NID ID Number RI 01307

The dam is an earthen embankment and has a total length of approximately 300 feet, and a maximum height of approximately 8 feet. The spillway is a drop inlet structure connected to a 5-foot wide and 2.5-foot high culvert. Victory Highway (State Route 102) traverses the top of dam. Pertinent engineering data, as obtained from the DEM dam information database, is provided in **Table 1**.

The purpose of the dam is recreation.

TABLE 1. Pertinent Engineering Data

Dam	
Type	Earthen
Length	Approximately 300 feet
Height	Approximately 8 feet
Drainage Area	230 acres
Elevation (feet above approximate MSL)	
Normal Pool (Spillway)	+/- 505 ft
Top of Dam	+/- 508 ft
Storage (Acre-feet)	
Normal Pool	77
Top of Dam	86

Primary Spillway	
Type	Uncontrolled Drop Inlet Culvert
Weir Length	5-ft wide by 2.5-ft high culvert

1.20 Downstream Description

Cherry Valley Pond Dam is located on Chepachet River and within the Town of Glocester. Discharge from the dam flows through a wooded area within a low densely residential section of Glocester.

1.21 Downstream Dams

Keech Pond Dam (022) is a 15-foot high, 800-foot long earthen embankment dam located approximately 1 mile downstream of Cherry Valley Pond Dam.

1.22 Downstream Bridges

Chepachet River is culverted under Victory Highway (State Route 102) beneath Cherry Pond Dam via a box culvert. A 4-foot diameter pipe conveys flow from Chepachet River under Lakeview Road about ¾ miles downstream of Cherry Valley Pond Dam.

1.23 Downstream Development

Chepachet River flows through a wooded area between Cherry Valley Pond and Keech Pond. There is one private residence located on the right bank of the Chepachet River about 300 ft downstream of Cherry Valley Pond Dam likely at a higher elevation than the dam break flood zone. Another house located near the confluence of the Chepachet River with Keech Pond is at a relatively low elevation.

2.00 DAM HAZARD POTENTIAL ASSESSMENT

To further evaluate the extent of flooding due to a potential dam failure, GZA performed a limited hydraulic investigation of the hypothetical dam break flood. The analysis was performed with the National Weather Service (NWS) Simplified Dam Break (SMPDBK) model, which estimates the peak dam break flood outflow, peak water surface elevations, and the timing of the flood wave as it travels downstream, given breach characteristics specific to the dam and the geometry of the downstream channel and overbank. SMPDBK output summaries are provided in **Attachment III**.

Please note that the approximate extent of hypothetical dam break flooding generated with SMPDBK is not generally applicable for emergency planning nor other hydraulic design purposes. Detailed hydraulic modeling using state-of-the-practice unsteady flow models such as the NWS DAMBRK or FLDWAV computer programs, which is not in the scope of this study, should be performed when generating inundation maps for Emergency Action Plans or for use in spillway design / inflow design flood (IDF) studies.

2.10 Potential Dam Failure Mechanisms and Breach Description

As specified by the DEM, the simplified hypothetical dam failure analysis assumed starting pool elevations in the impoundment coincident with the top of dam elevation and average stream flow conditions prevailing (i.e., assumed about 1 to 2 cfs per square mile of drainage area). Dam breach parameters such as time of breach formation, breach shape, and the average width of the breach were selected according to these conditions and based upon the type of materials used in constructing the dam, in accordance with the recommended range of values published in the Federal Energy Regulatory Committee (FERC) guidelines and based on engineering judgment. For Cherry Valley Pond Dam, primarily an earth embankment structure, a time to failure of 0.5 hrs and a trapezoidal breach shape (0.5 H : 1.0 V) was utilized. Such an earthen embankment dam is assumed to fail due to piping under fair weather circumstances. The average breach width was assumed to equal three times the height of the dam, or about 24 feet.

2.20 Estimated Peak Outflow from Dam Break

The peak outflow from the hypothetical dam break was estimated using the breach outflow approximation equation developed by the National Weather Service as part of their SMPDBK computer model (see Attachment III), using the breach parameters described above and top-of-dam pool reservoir characteristics. The estimated peak breach outflow is approximately 1,400 cfs. Although there is no published FEMA 100-yr flood estimate for the Chepachet River in the vicinity of the dam, the peak dam break outflow is expected to be greater than the 100-yr flood, given the dam's small contributory watershed area of less than 1 square miles.

2.30 Estimated Approximate Flood Impact Area

Several riverine cross sections, developed by GZA from USGS 7.5 minute quadrangle maps, were input into the SMPDBK model to preliminarily estimate approximate peak water surface elevations. The results of the analysis are provided as the approximate inundation area depicted in **Figure 2**.

2.31 Downstream Extent of Flooding

The first half of the flood plain between Cherry Valley Pond and Keech Pond is characterized as a swampy area. The second portion is characterized as steeply sloping. Typical Mannings "n" roughness coefficients used in the analysis were 0.040 for the channel areas, and 0.080 for the overbank areas. These values are consistent with the range of values used in the FEMA Flood Insurance studies for the downstream communities.

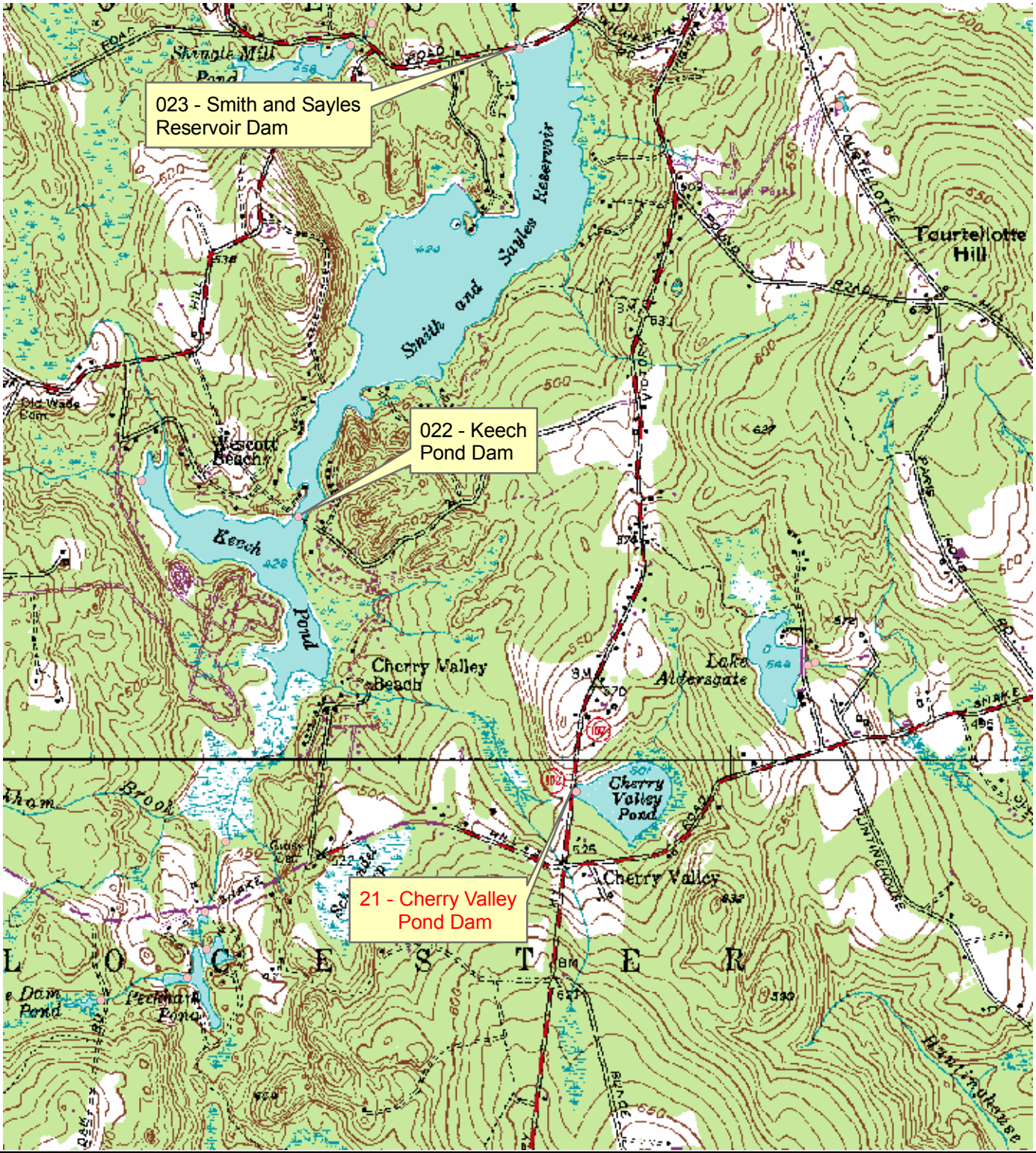
The SMPDBK analysis was ended at Keech Pond, about 3/4 miles downstream of Cherry Valley Pond Dam. Dam break flooding is expected to dissipate within Keech Pond which is significantly larger in surface area and storage capacity than Cherry Valley Pond. The

estimated surcharge storage capacity at Keech Pond is therefore capable of containing the maximum volume of Cherry Valley Pond. GZA estimated that the water surface elevation within Keech Pond may rise by about 1 foot if Cherry Valley Pond Dam were to fail.

2.32 Potential Effects of Dam Break

A potential dam failure of Cherry Valley Pond Dam would, by default, result in the destruction of Victory Highway (State Route 102) at top of the dam. Also, the Lakeview Road crossing is expected to be washed away due to its limited culvert discharge capacity. In addition, a house located near the confluence of the Chepachet River with Keech Pond may experience some shallow flooding. Loss of life is not expected due to the hypothetical dam failure of Cherry Valley Pond Dam, in GZA's opinion. Results of the analysis indicate a peak flood depth of about 6 feet about 0.5 miles downstream of Cherry Valley Pond Dam. Then the flood wave attenuates to less than 1 foot at Keech Pond approximately ¾ miles downstream of Cherry Valley Pond.

FIGURES



SOURCE : SCANNED USGS TOPOGRAPHIC QUADRANGLES DISTRIBUTED BY THE RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM, RIGIS.
DATA SET CREDIT: This DRG was produced through an Innovative Partnership agreement between The Land Information Technology Company, Ltd., of Aurora, CO and the USGS.

Data Supplied by : RIGIS

0 1,000 2,000 4,000 6,000 Feet

N W E S

GZA

PROJ. MGR.: DML
DESIGNED BY: BBF
REVIEWED BY: PHB
OPERATOR: BBF

DATE: 11-02-07

CHERRY VALLEY POND DAM

SITE LOCUS

JOB NO. 01.0017085.30

FIGURE NO. 1

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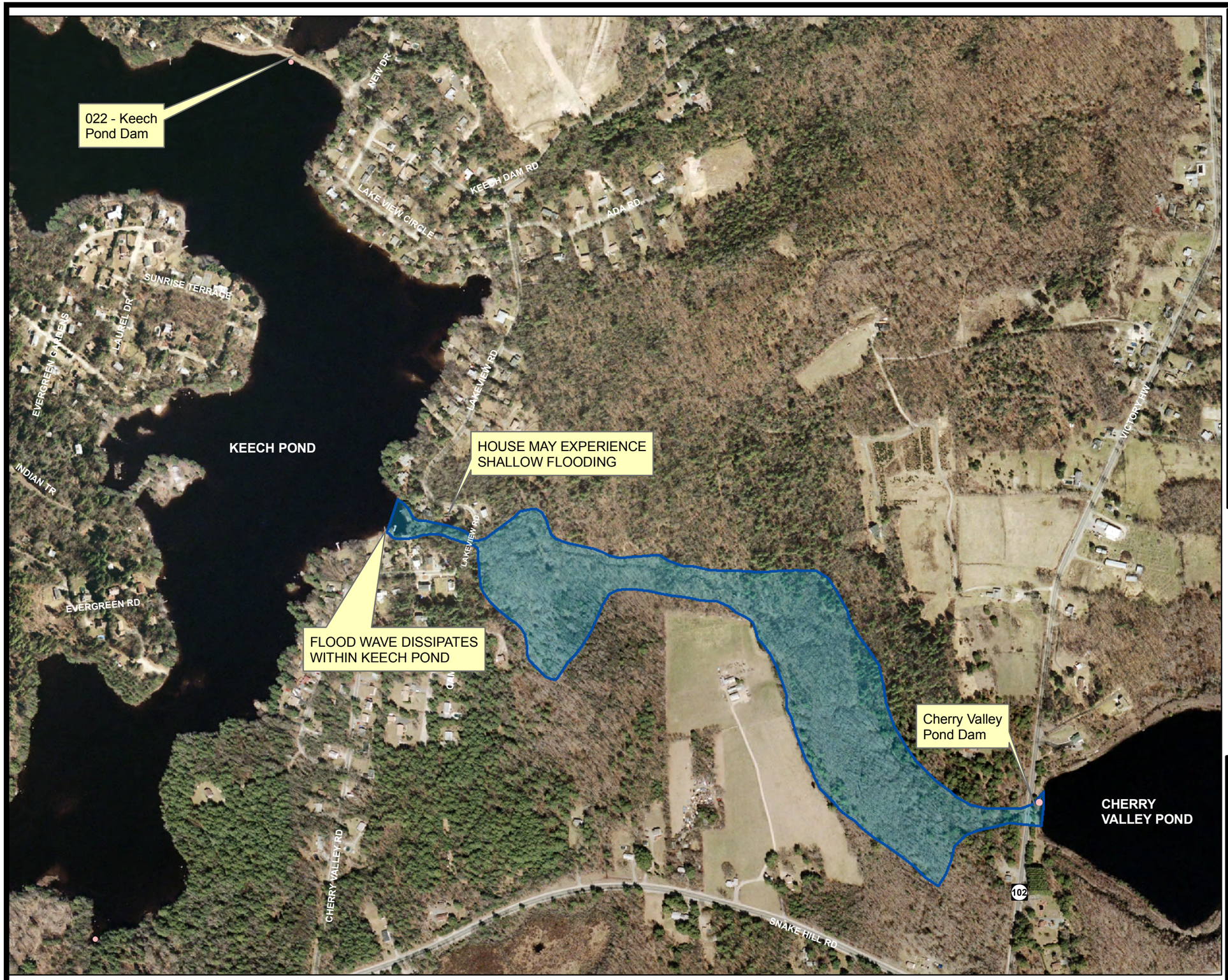


LEGEND

- BRIDGE
- SCHOOLS
- PUBLIC SAFETY BUILDINGS (FIRE, POLICE, TOWN HALLS)
- HOSPITALS
- APPROX. FLOOD HAZARD AREA
- WATER SUPPLY WITHDRAWALS
- DAMS

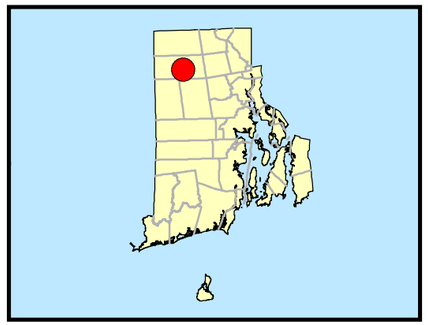
N W E S

SOURCE

DIGITAL AERIAL OTHOPHOTOGRAPHY PROVIDED BY THE RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM, (RIGIS) AND THE RHODE ISLAND DEPARTMENT OF TRANSPORTATION, (RIDOT). ORTHOPHOTO IMAGES WERE ORIGINALLY PRODUCED BY CHAS. H. SELLS UNDER CONTRACT TO THE (RIDOT). THE IMAGES WERE OBTAINED ON APRIL 14, 2003 AND WERE RELEASED IN NOVEMBER 2005.

RIGIS©

0 250 500 1,000 Feet



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CHERRY VALLEY POND DAM
GLOCESTER, RHODE ISLAND

DAM FAILURE INUNDATION MAP

Proj. Mgr.: DML Designed By: BBF Reviewed By: PHB Operator: BBF	Dwg. Date: 11-02-07 Job No.: 17085.30	Figure No.: 2

ATTACHMENT I

FIELD RECONNAISSANCE CHECKLIST

DAM HAZARD POTENTIAL FIELD CHECKLIST

Name of Dam:	Cherry Valley Pond	RI DEM ID NO.	021
Location:	Glocester (Town)	Chepachet River (River or Stream)	
	Chepachet (Downstream Communities)	Keech Pond (Major Confluence)	
Classification Data:	Intermediate (Size)		1958 (Date Built)

PHYSICAL DATA:	Earth (Type of Dam)	8 ft (Height of Dam)	300 ft (Length of Dam)
	Uncontrolled Drop Inlet Culvert (Type of Spillway)	5 ft (Length of Spillway)	
	Recreation (Purpose of Dam)	~1 inch below spillway (Pool at Inspection)	77 acre-ft (Normal Pool Storage Capacity)
	~ 3 ft (Freeboard)		86 acre-ft (Maximum Pool Storage Capacity)

Name	Title/Position	Representing
Bryant B. Furtado	Project Engineer	GZA GeoEnvironmental, Inc.
David M. Leone	Project Mgr / Hydrologist	GZA GeoEnvironmental, Inc.

DATE OF INSPECTION: 11/8/2007

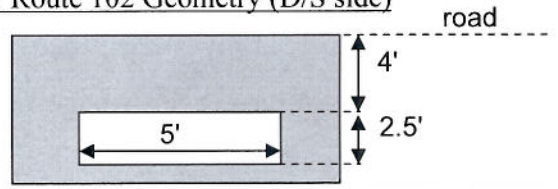
WEATHER: Cloudy TEMPERATURE: 30 ° F

Name of Dam: Cherry Valley Pond I.D. No.: 021 Inspection Date: 8-Nov-07

STRUCTURAL CONDITION	1	Earth Condition	Upstream slope of embankment in poor condition due to erosion.
	2	Outlet Condition	Fair - minor concrete spalling.
	3	Unusual Movement	None observed.
	4	Seepage / Wet Area	None observed.
	5	Embankment Slides/Erosion	Upstream slope of embankment eroded.
	6	Vegetation / Pest Control	Large trees on top of dam and D/S slope, and mostly brush on the U/S slope.
DAM & IMMEDIATE DOWNSTREAM AREA	7	Vicinity Description	Wooded area. House lying on a higher elevation on the right overbank discharge channel.
	8	Dam Roads & Utilities	Dam supports Victory Highway (Route 102) roadway.
	9	Discharge Channel	Crosses private driveway about 50 ft D/S of dams' outlet.
	10	Structures (Gatehouses, etc.)	None observed.
	11	Adjacent Land Use	Residential.
	12	Adjacent Population Density	Low.
	13	Downstream Constrictions	Culvert under Victory Highway Route 102. See note below for culvert geometry.
	14	Downstream Access / Use	No formal access.
	15	Property / Infrastructure / Utility Description & Distance	See above.
GENERAL DOWNSTREAM AREA	17	Land Use Classification	Residential.
	18	Population Density	Moderately populated near Keech Pond shoreline otherwise low.
	19	Property / Infrastructure	House on right channel overbank D/S of Lakeview Road may experience shallow flooding.
	21	Downstream Dams	Keeck Pond Dam (022), Smith and Sayles Reservoir Dam (023).
	22	Downstream Bridges	Culvert, 4 ft diameter pipe, under Lakeview Road about 3/4 miles D/S of dam.
	23	Upstream Dams	None.
	24	Channel Description (depth, Manning's n, width, overbank)	Channel about 10 ft to 20 ft wide, and 5 ft to 10 ft high. Typical Manning's n.

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

Culvert under Route 102 Geometry (D/S side)



ATTACHMENT II

FIELD PHOTOGRAPHS

CHERRY VALLEY POND DAM (#021)

Photo 1: View of Cherry Valley Pond.

Photo 2: View of spillway from top of dam.

Photo 3: View of crest looking toward the left abutment.

Photo 4: Victory Highway (Route 102) on top of dam.

Photo 5: View of dams' outlet looking upstream.

Photo 6: View of private driveway with culvert about 50 ft downstream of the dams' outlet.

Photo 7: 4-foot diameter pipe under Lakeview Road.

Photo 8: Note house near the stream, about ¾ miles downstream of dam in a relatively low elevation.

ATTACHMENT III

SMPDBK OUTPUT SUMMARY

CHERRY VALLEY POND DAM (#021)

THE DATA FOR THIS DAM IS AS FOLLOWS:

TYPE OF DAM (IDAM)	EARTH	
DAM BREACH ELEVATION (HDE)		508.00 FT
FINAL BREACH ELEVATION (BME)		500.00 FT
SURFACE AREA OF RESERVOIR (SA)		25.00 ACRES
FINAL BREACH WIDTH (BW)		24.00 FT
TIME OF DAM FAILURE (TFM)		30.00 MINUTES
NON-BREACH FLOW (QO)		1.00 CFS
DISTANCE TO PRIMARY PT OF INTEREST (DISTTN)		1.18 MILES
DEAD STORAGE EQUIV. MANN. N (CMS)		.50

CROSS SECTION NO. 1
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	500.0	508.0	510.0	520.0
TWIDTHS(FT) (BS)	24.0	300.0	570.0	1100.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 2
REACH LENGTH (D) .46 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	480.0	483.0	490.0	500.0
TWIDTHS(FT) (BS)	5.0	15.0	470.0	1700.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 3
REACH LENGTH (D) .73 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	441.0	444.0	446.0	448.0
TWIDTHS(FT) (BS)	5.0	65.0	100.0	160.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 4
REACH LENGTH (D) .93 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	426.0	430.0	440.0	450.0
TWIDTHS(FT) (BS)	870.0	1800.0	2500.0	3000.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.080	.080	.080	.080

CROSS SECTION NO. 5
REACH LENGTH (D) 1.18 MI
FLOOD DEPTH (FLD) 5.00 FT

ELEV.(FT) (HS)	425.9	430.0	440.0	450.0
TWIDTHS(FT) (BS)	2500.0	2700.0	3300.0	4100.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.080	.080	.080	.080

AN ASTERISK (*) BESIDE A PARAMETER IMPLIES THAT A DEFAULT VALUE WAS COMPUTED

NAME OF DAM: CHERRY VALLEY POND D NAME OF RIVER: CHEPACKET RIVER

RVR MILE FROM DAM	MAX FLOW (CFS)	MAX ELEV (FT-MSL)	MAX DEPTH (FT)	TIME(HR) MAX DEPTH	TIME(HR) FLOOD	TIME(HR) DEFLOOD	FLOOD DEPTH(FT)
.00	1422.	503.31	3.31	.50	.00	.00	5.00
.46	1265.	485.94	5.94	.63	.38	1.35	5.00
.73	1253.	444.71	3.71	.66	.00	.00	5.00
.93	1240.	426.75	.75	.73	.00	.00	5.00
1.18	1228.	426.64	.74	1.06	.00	.00	5.00

ANALYSIS IS COMPLETE