008
HARRISVILLE POND

HARRISVILLE POND DAM, BURRILLVILLE (008)

Harrisville Pond Dam (Figure 1) has historically been classified by DEM as having a **Low Hazard** potential. No supporting information regarding the determination of the hazard classification was found in the reports in DEM files.

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 Peter H. Baril and David M. Leone, accompanied by DEM senior engineer Paul Guglielmino, P.E., visited the site and the downstream river valley on January 29, 2004. A field checklist from the reconnaissance is provided in **Attachment I** and selected photographs are provided in **Attachment II**.

1.10 Site Description

Harrisville Pond Dam is located in the Pascoag River in the Town of Burrillville, Providence County, Rhode Island (See Locus Map, Figure 1). The following identification numbers are associated with the dam:

- Army Corps of Engineers Number RI00303
- DEM ID Number 008

The dam has a total length of approximately 550 feet, and a maximum height of approximately 20 feet. The dam is an earthen embankment with a 132 ft long spillway at the right abutment. The embankment portion of the dam tapers to about 4 to 6 ft high at its left abutment. The spillway is at the maximum section of the dam. Pertinent engineering data, as obtained from the DEM dam information database, is provided in **Table 1**.

The purpose of the dam and its impoundment is reportedly recreation. There is a small playground located immediately downstream of the left portion of the dam embankment. The area around the dam is a significantly urbanized portion of the Town of Burrillville.

TABLE 1. Pertinent Engineering Data

Dam	
Type	Earth Embankment
Length	Approximately 550 feet
Height	20 feet
Drainage Area	43 sq.mi.
Elevation (feet above approximate MSL)	
Normal Pool (Spillway)	Unknown
Top of Dam	Unknown
Storage (Acre-feet)	
Normal Pool	56
Top of Dam	100
Spillway	
Type	Broad Crested Concrete/Masonry
Length of Weir	132 ft

1.20 Downstream Description

Harrisville Pond Dam is located on the Clear River in the Town of Burrillville. The immediate downstream area is significantly urbanized, including commercial, residential, and industrial land uses.

1.21 Downstream Dams

There are no dams downstream of Harrisville Pond Dam that are anticipated to be affected by a potential dam failure.

1.22 Downstream Bridges

East Avenue (Route 107) spans the river about 100 ft downstream of the spillway. Bronco Highway (Route 102) crosses the river about 1.75 miles downstream. Victory Highway spans the river shortly downstream of Route 102, about 1.9 miles downstream.

In addition to these structures, there are several additional structures on or over the Clear River that are not expected to be affected by a dam failure at Harrisville Pond Dam, in GZA's opinion. See Section 2.30 for additional information.

1.23 Downstream Development

The right bank of the Clear River downstream of East Avenue is home to a large, unoccupied industrial complex. The industrial complex is partially protected by flood walls, estimated to be at least 15 ft high. However, the downstream portions of the complex immediately abuts the river.

There is a playground and park immediately downstream of the left portion of the dam embankment. Additionally, there are residential structures along Steere Street, which runs parallel to the downstream toe of the embankment.

Commercial and residential structures were observed near the Clear River in the Oakland section of the Town of Burrillville near Route 102 and Victory Highway. These structures (some appeared to be unoccupied) were estimated to range from 8 to 15 ft above the river.

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 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 Harrisville Pond Dam, a breach outflow sensitivity analysis was conducted to evaluate the peak breach outflow from the embankment section and the stone masonry spillway section. The embankment breach assumed a time to failure of 0.5 hrs and a trapezoidal breach shape (0.5 H : 1.0 V). The average breach width was assumed to equal three times the height of the dam, or about 60 feet. The spillway breach assumed a time to failure of 0.1 hrs, a rectangular breach shape, and a breach width equal to about the height of the dam, or about 20 feet. The results indicated that assuming a full breach of the embankment section would result in the most conservative peak breach outflow. Such an earthen embankment dam is assumed to fail due to piping under fair weather circumstances.

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 7,690 cfs. The outflow is about 130 percent of the published FEMA 500-year flood estimate of 5,800 cfs and about 200 percent of the published FEMA 100-year flood estimate of 3,900 cfs for the Clear River at Sherman Road (near the headwaters of Harrisville Pond).

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 Clear River downstream of Harrisville Pond Dam is relatively gently sloping. Typical Mannings "n" roughness coefficients used in the analysis generally ranged from 0.030 to 0.04 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 hypothetical dam failure flood wave may overtop the banks of the Clear River to the confluence with the Branch River, about 2.3 miles downstream.

2.32 Potential Effects of Dam Break

Results of the analysis indicate a peak flood depth at the immediate toe of the dam of about 9 feet. As the flood wave progresses downstream, it is expected to attenuate. Thus, peak flood flows 1.7 miles downstream of the dam are predicted to decrease to about 2,500 cfs. The extent of flooding due to the hypothetical dam break is likely to include portions of the unoccupied industrial complex downstream of the dam. Shallow flooding of commercial and residential structures may also occur in the vicinity of the Oakland section of town, near Route 102 and Victory Highway. Note that if the dam were to fail at its embankment section, shallow overland flow would likely occur at the playground and Steere Street as the flood wave works its way back to the river channel. Such a failure would likely result in some flooding of the residential structure opposite the dam and playground on Steere Street.

2.40 Recommended Hazard Potential Classification

GZA recommends that Harrisville Pond Dam be classified as ***Significant Hazard*** based on the aforementioned analyses, site / downstream valley reconnaissance, site-specific GIS

mapping and other existing data, and professional judgment. A potential dam failure of Harrisville Pond Dam would likely result in no probable loss of human life, but cause widespread, major economic losses, including some scour damage to East Avenue (Route 107) bridge, and flooding of the unoccupied mill buildings abutting the river downstream of the spillway. Commercial and residential buildings at Steere Street, Route 102 (Bronco Highway), and Victory Highway are also susceptible to shallow flooding as a result of the hypothetical dam failure. Note that if the unoccupied industrial complex downstream of East Avenue (Route 107) is renovated and/or becomes occupied, a ***High Hazard*** classification is recommended.

ATTACHMENT I

FIELD RECONNAISSANCE CHECKLIST

DAM HAZARD POTEN .L FIELD CHECKLIST

Name of Dam:	HARRISVILLE POND DAM	RI DEM ID NO.	008
Location:	Burrillville (Town)		Pascoag River (River or Stream)
	Burrillville (Downstream Communities)		Branch River (Major Confluence)
Classification Data:	Intermediate (Size)		1854 (Date Built)

PHYSICAL DATA:	Gravity / Earth (Type of Dam)	about 20 ft (Height of Dam)	550 ft (Length of Dam)
	Broad Crested / Stepped (Type of Spillway)	132 ft (Length of Spillway)	
	Recreation (Purpose of Dam)	About 3 to 5 in. over spillway (Pool at Inspection)	56 ac-ft (Normal Pool Storage Capacity)
	U/S: D/S: (Embankment Slopes (H:V))	Likely Bedrock (Foundation (if known, note rock/soil surroundings))	100 ac-ft (Maximum Pool Storage Capacity)

Name	Title/Position	Representing
Peter H. Baril	Associate Principal / Hydrologist	GZA GeoEnvironmental, Inc.
David M. Leone	Asst. Project Mgr / Hydrologist	GZA GeoEnvironmental, Inc.
Paul W. Guglielmino	DEM Dam Safety Senior Engineer	RIDEM Office of Compliance & Inspection

DATE OF INSPECTION: 1/29/2004

WEATHER: Partly Cloudy TEMPERATURE: 25 deg. F

Name of Dam: HARRISVILLE POND DAM I.D. No.: 008 Inspection Date: 29-Jan-04

STRUCTURAL CONDITION	1	Concrete Condition	Obscured by snow and ice
	2	Outlet Condition	Obscured by snow and ice
	3	Unusual Movement	Obscured by snow and ice
	4	Seepage / Wet Area	Obscured by snow and ice
	5	Embankment Slides/Erosion	Obscured by snow and ice. Left embankment tapers to only about 6 ft high
	6	Vegetation / Pest Control	Obscured by snow and ice
DAM & IMMEDIATE DOWNSTREAM AREA	7	Vicinity Description	Urbanized portion of Harrisville section of Town
	8	Dam Roads & Utilities	None
	9	Discharge Channel	To natural channel (Clear River)
	10	Structures (Gatehouses, etc.)	None
	11	Adjacent Land Use	Industrial / Residential
	12	Adjacent Population Density	Significant; Condos / apartment building, commercial & industrial facilities
	13	Downstream Constrictions	East Ave (Rt 107) downstream of spillway.
	14	Downstream Access / Use	Playground immediately downstream of 6 ft high section of dam.
	15	Property / Infrastructure / Utility Description & Distance	Several properties downstream of smaller section of left embankment, including residential structures Maximum section of dam is at spillway; failure at left embankment may result in shallow flooding only
GENERAL DOWNSTREAM AREA	17	Land Use Classification	Mixed use; urbanized
	18	Population Density	Significant. Industrial complex downstream of Route 107 is not occupied.
	19	Property / Infrastructure	Industrial complex (unoccupied) forms the river's right bank. Residential area about 0.7 miles downstream; banks are steep & deep in this area.
	21	Downstream Dams	No significant dams anticipated to be affected by a dam breach at Harrisville
	22	Downstream Bridges	Route 107 (span). Route 102 (Bronco Highway) further downstream.
	23	Upstream Dams	N/A
	24	Channel Description (depth, Manning's n, width, overbank)	Clear River is wide, low gradient.

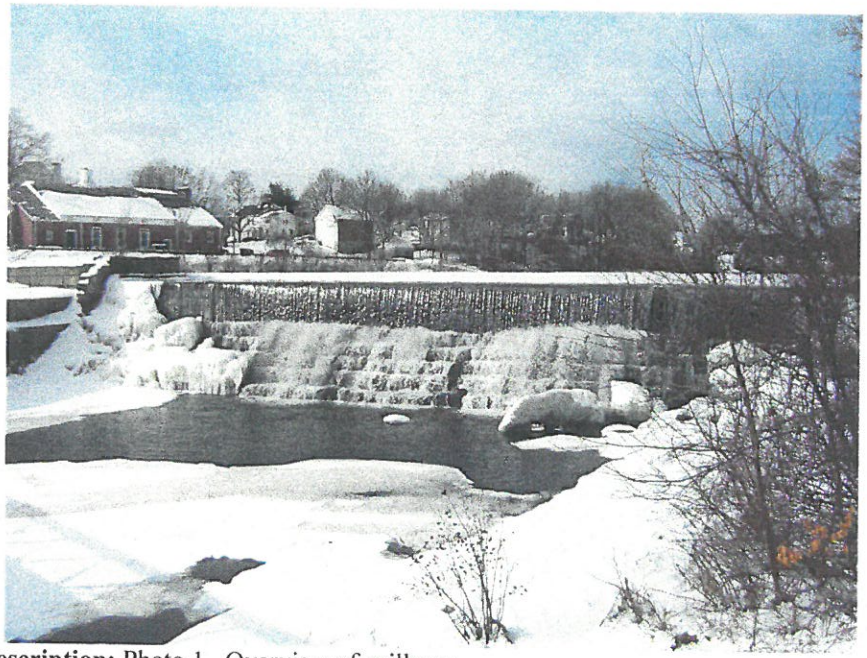
ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

Note: Spillway section appears to present max dam height. Embankment tapers down to about 6' high at left abutment. Failure may result in shallow overland flow (since there is no defined channel) and associated shallow flooding.

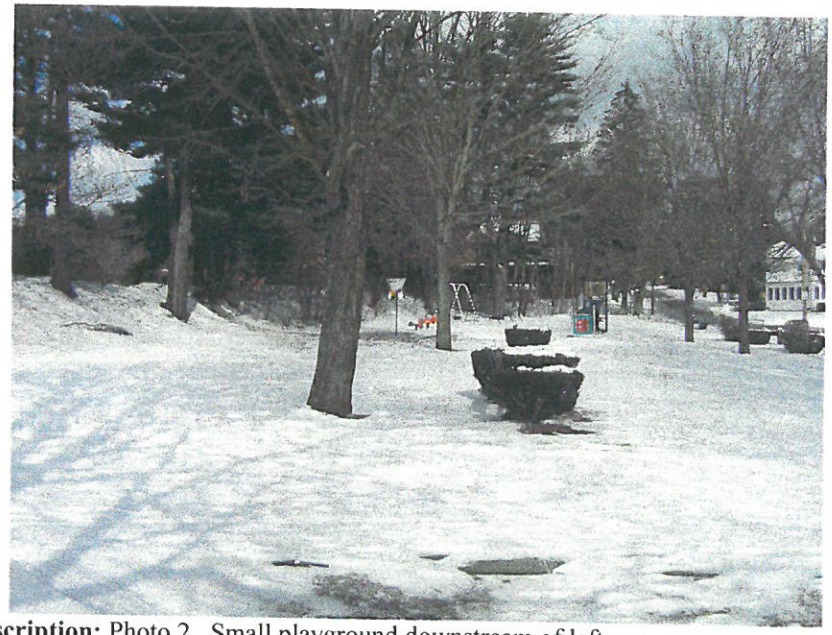
19. Unoccupied industrial complex abutting river should be monitored for renovation and re-occupation. Would trigger a High Hazard rating.

ATTACHMENT II

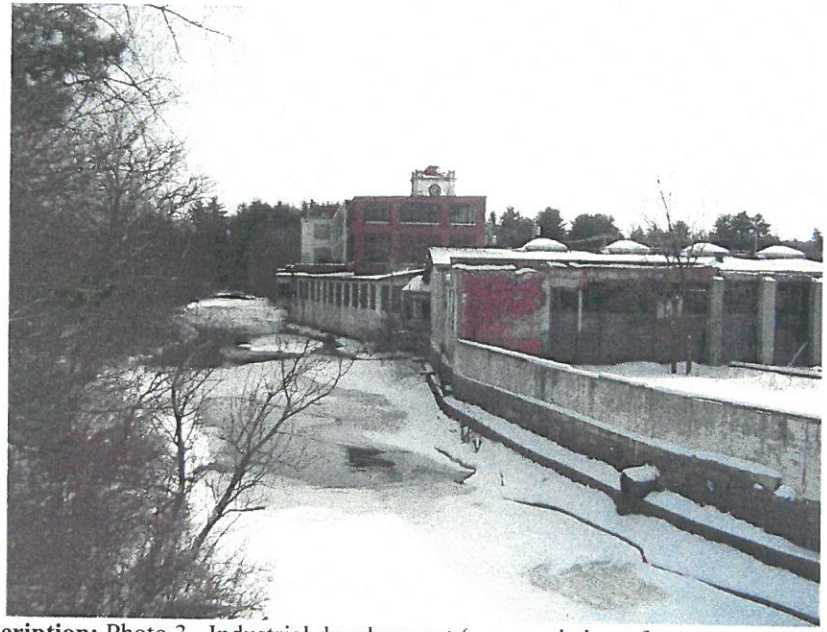
FIELD PHOTOGRAPHS



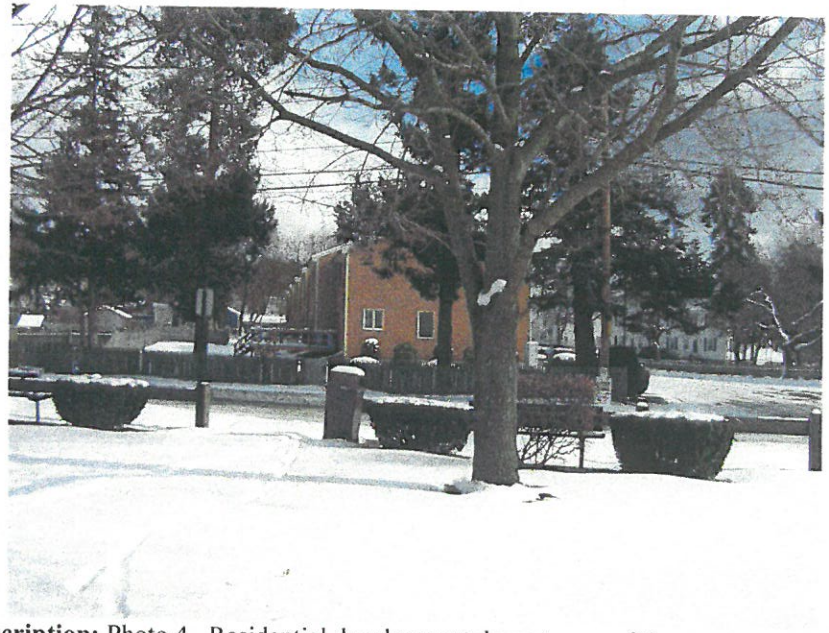
Description: Photo 1. Overview of spillway.



Description: Photo 2. Small playground downstream of left dam embankment.

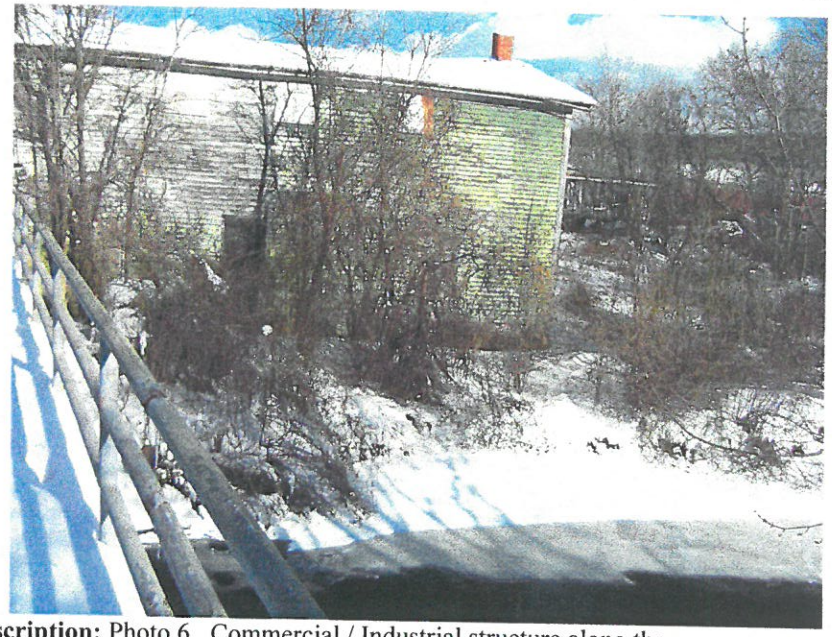


Description: Photo 3. Industrial development (unoccupied as of GZA's visit on 1/29/2004) along the right river bank.



Description: Photo 4. Residential development downstream of the left dam embankment.

Description: Photo 5. Commercial / industrial structure on the left bank of the river about 2 miles downstream.



Description: Photo 6. Commercial / Industrial structure along the left riverbank near Victory Highway.

ATTACHMENT III

SMPDBK OUTPUT SUMMARY

SIMPLIFIED DAMBREAK MODEL (SMPDBK) VERSION: 9/91
BY D.L. FREAD, J.M. LEWIS, & J.N. WETMORE - PHONE: (301) 427-7640
NWS HYDROLOGIC RESEARCH LAB W/OH3, 1325 EAST-WEST HIGHWAY,
SILVER SPRING, MD 20910

***** DISTANCE TO PRIMARY POINT OF INTEREST MOVED TO THE CROSS SECTION
***** CLOSEST TO THIS LOCATION (MI 2.80)

THE DATA FOR THIS DAM IS AS FOLLOWS:

TYPE OF DAM (IDAM)	EARTH	
DAM BREACH ELEVATION (HDE)		340.00 FT
FINAL BREACH ELEVATION (BME)		320.00 FT
SURFACE AREA OF RESERVOIR (SA)		21.00 ACRES
FINAL BREACH WIDTH (BW)		60.00 FT
TIME OF DAM FAILURE (TFM)		30.00 MINUTES
NON-BREACH FLOW (QO)		43.00 CFS
DISTANCE TO PRIMARY PT OF INTEREST (DISTTN)		2.80 MILES
DEAD STORAGE EQUIV. MANN. N (CMS)		.50

CROSS SECTION NO. 1

FLOOD DEPTH (FLD)	5.00 FT			
ELEV.(FT) (HS)	320.0	323.0	340.0	350.0
TWIDTHS(FT) (BS)	60.0	60.0	800.0	1500.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 2

REACH LENGTH (D)	.01 MI			
FLOOD DEPTH (FLD)	5.00 FT			
ELEV.(FT) (HS)	319.9	323.0	340.0	350.0
TWIDTHS(FT) (BS)	60.0	60.0	800.0	1500.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 3

REACH LENGTH (D)	.38 MI			
FLOOD DEPTH (FLD)	5.00 FT			
ELEV.(FT) (HS)	315.0	318.0	320.0	330.0
TWIDTHS(FT) (BS)	.0	60.0	200.0	800.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 4

REACH LENGTH (D)	1.70 MI			
FLOOD DEPTH (FLD)	5.00 FT			
ELEV.(FT) (HS)	306.0	309.0	310.0	320.0
TWIDTHS(FT) (BS)	.0	60.0	500.0	1150.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 5

REACH LENGTH (D)	2.51 MI			
FLOOD DEPTH (FLD)	5.00 FT			
ELEV.(FT) (HS)	303.0	306.0	310.0	320.0
TWIDTHS(FT) (BS)	.0	60.0	1100.0	1500.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

CROSS SECTION NO. 6

REACH LENGTH (D)	2.80 MI			
FLOOD DEPTH (FLD)	5.00 FT			
ELEV.(FT) (HS)	296.0	299.0	310.0	320.0
TWIDTHS(FT) (BS)	.0	60.0	400.0	600.0
INACTIVE TW(FT) (BSS)	.0	.0	.0	.0
MANNING N (CM)	.040	.040	.080	.080

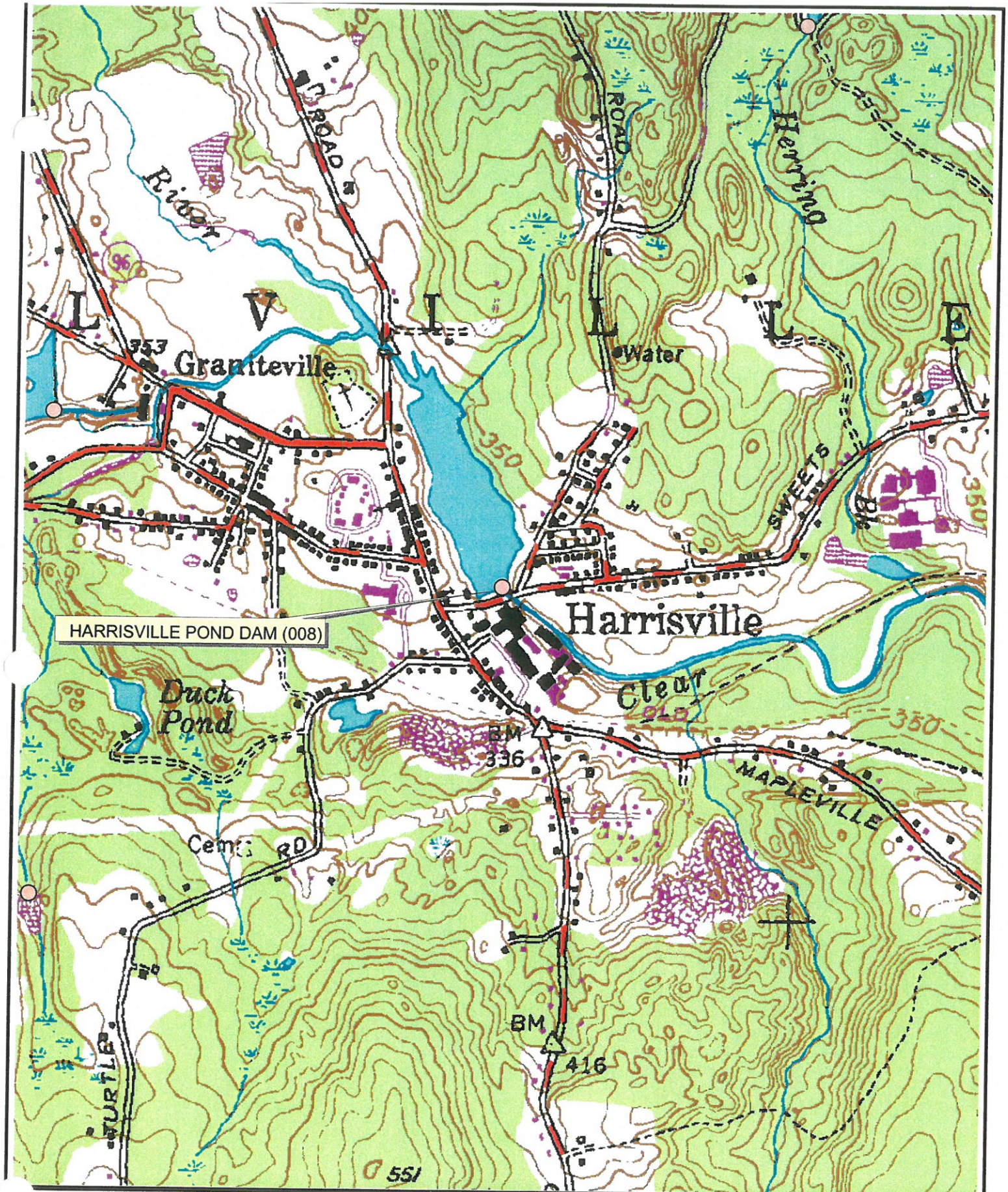
AN ASTERISK (*) BESIDE A PARAMETER IMPLIES THAT A DEFAULT VALUE WAS COMPUTED

NAME OF DAM: HARRISVILLE NAME OF RIVER: PASCOAG

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	7691.	330.47	10.47	.50	.09	.64	5.00
.01	5997.	329.02	9.12	.50	.13	.77	5.00
.38	5337.	324.31	9.31	.73	.29	1.14	5.00
1.70	2522.	311.78	5.78	1.77	1.54	2.51	5.00
2.51	1761.	308.80	5.80	2.76	2.52	3.89	5.00
2.80	1743.	302.25	6.25	2.78	2.43	4.55	5.00

ANALYSIS IS COMPLETE

FIGURES



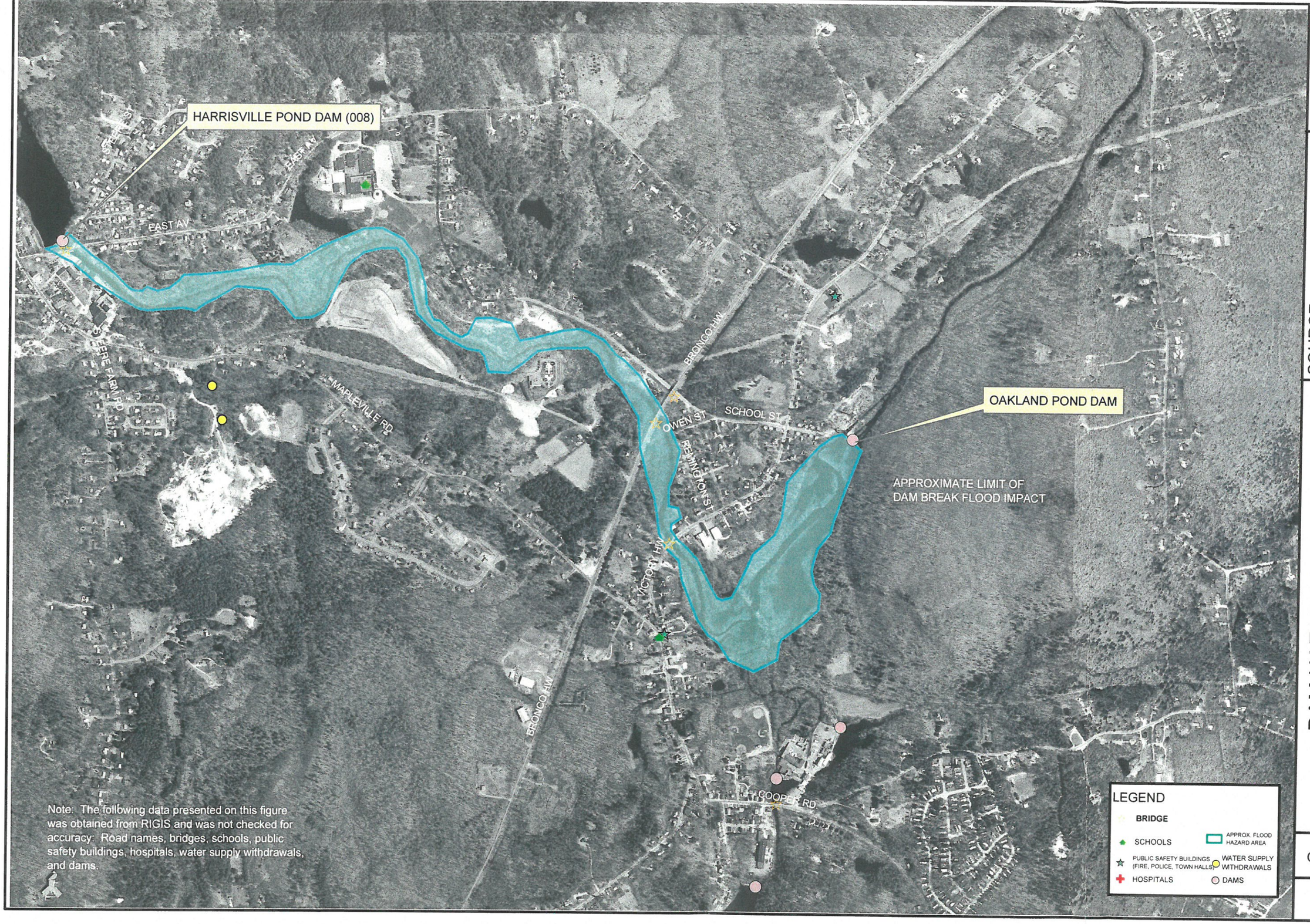
SOURCE: RIGIS

FIGURE 1. LOCUS MAP
HARRISVILLE POND DAM (008)
BURRILLVILLE, RI

SCALE
500 0 500 1000 1500 Feet

RHODE ISLAND DEM
OFFICE OF COMPLIANCE & INSPECTION

GZA



DATE OF MAP: APRIL 1997

SOURCE RIGIS

SCALE 0 500 1,000 2,000 Feet

DAM HAZARD POTENTIAL CLASSIFICATION MAP

HARRISVILLE POND DAM
BURRILLVILLE, RHODE ISLAND

GZA NO. 17085.10

FIGURE 2