LANSING BWL

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Dam Inundation Maps

Excerpt of the Lansing Board of Water & Light Moores Park and North Lansing Dam Emergency Action Plans - Dec 2020

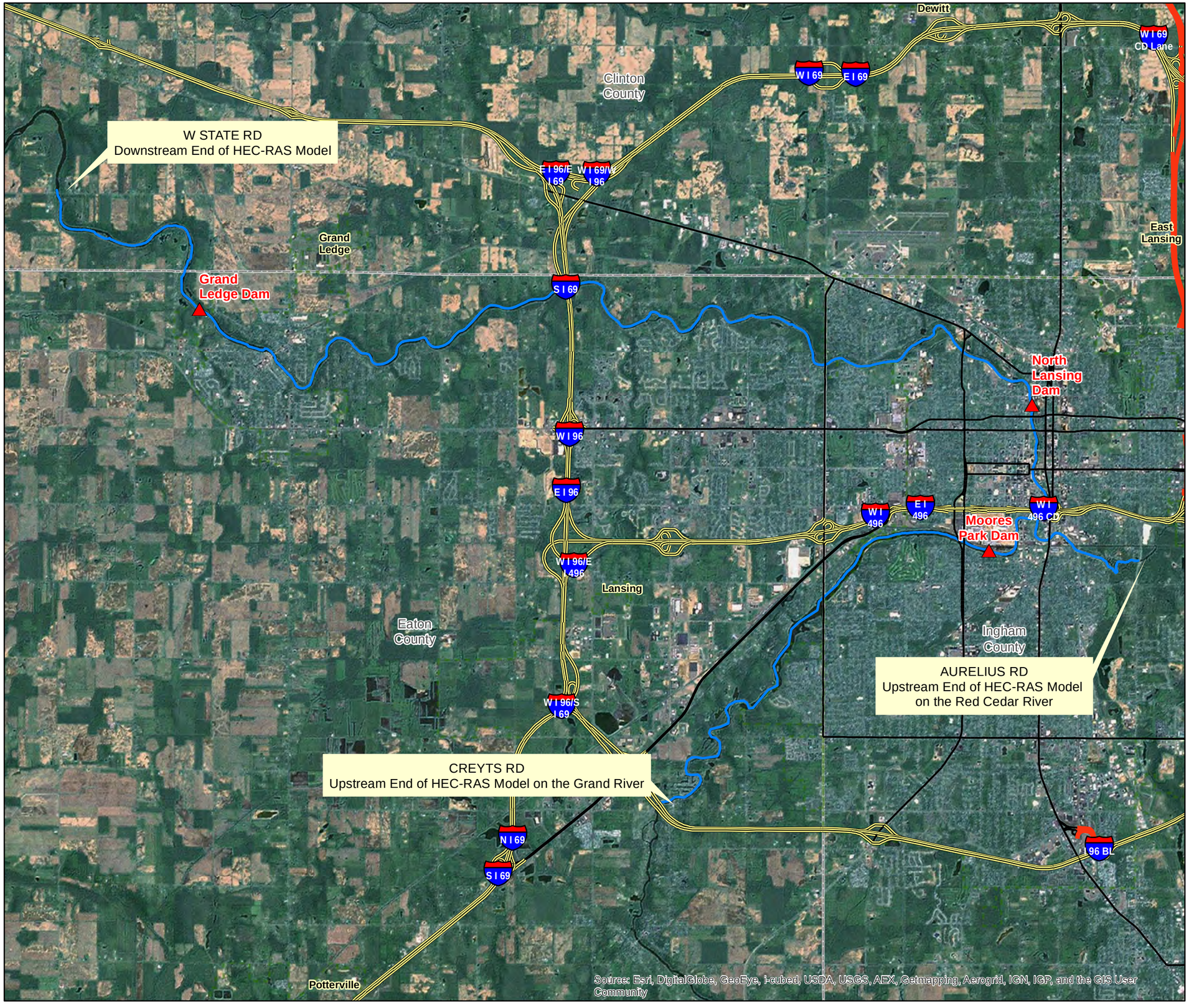
Executive Summary

The Lansing Board of Water and Light retained retained an engineering company to perform dam failure analyses on Moores Park Dam and North Lansing Dam and update the inundation maps. The Hydrologic Engineering Center - River Analysis System (HEC-RAS) model developed by the US Army Corps of Engineers was used to predict breach outflow hydrographs resulting from potential failures of Moores Park Dam and North Lansing Dam. The HEC-RAS model was initially calibrated using a 2013 flood event. Five breaching scenarios were investigated using the calibrated model: (1) failure of Moores Park Dam due to overtopping (wet weather condition) during the inflow design flood (IDF), (2) sunny day failure of Moores Park Dam, (3) sunny day failure of North Lansing Dam, (4) failure of Moores Park Dam due to overtopping during the inflow design flood (wet weather) with a cascading failure of North Lansing Dam, (5) sunny day failure of Moores Park Dam with a cascading failure of North Lansing Dam.

The sunny day failures of Moores Park Dam and North Lansing Dam produce a significantly higher flood wave than the wet weather breach that occurs during IDF. The sunny day peak flood wave is 6.4 feet, which occurs downstream of North Lansing Dam during the cascading dam failures. Of the three sunny day failure scenarios, the cascading failure produces a flood wave the furthest downstream which is greater than 2 feet until South Bridge Street in the City of Grand Ledge, 15.7 miles downstream of Moores Park Dam. The wet weather breach produced a smaller flood wave but higher peak water surface elevations due to flooding conditions prior to the breach. The peak flood wave during wet weather breach is 2.0 feet high, which occurs during the Moores Park Dam failure scenario immediately downstream of Moores Park Dam. The areas that exhibited the most inundated areas during the wet weather failures primary occur upstream of Saginaw Street on both the Grand and Red Cedar Rivers. Residential areas are flooded in the vicinity of the I-494 crossing of the Grand River near the confluence of the Grand and Red Cedar Rivers.

Large Figure 1: HEC-RAS model extents

Large Figure 1
HEC-RAS MODEL EXTENTS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



- Dam Location
- Modeled River
- City Boundary
- County Boundary
- Interstate
- Freeway
- County

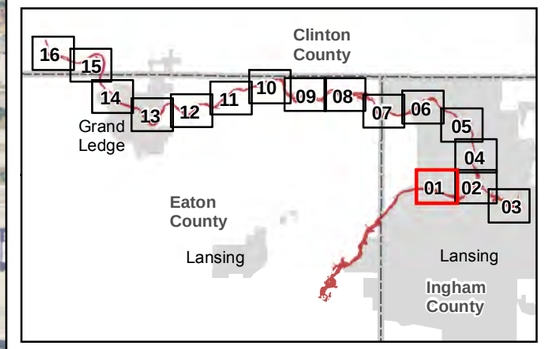
Miles
0 1 2 3 4

Kilometers
0 1 2 3 4

Large Figure 2: Moores Park Dam failure only inundation maps (set of 16 map panels)

Large Figure 2 – 1
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 120 - MOORES PARK DAM TAILWATER 0.05 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	< 5
TIME TO PEAK (MIN)	20	30
MAX ELEVATION (FT, NGVD 29)	829.94	824.69
INCREMENTAL RISE (FT)	1.94	6.26
PEAK FLOW (CFS)	13378	6583



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

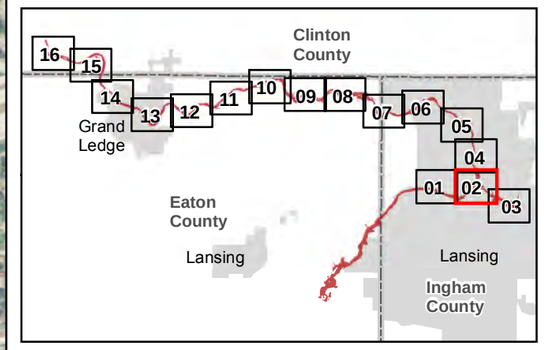
Barr Footer: ArcGIS 10.2 2013-11-11 15:15 File: I:\Projects\22\33\1013\Maps\For Report\Mapbooks\LrgFig02_Moores_Park_Dam_Failure_Mapbook.mxd User: mbs2

Large Figure 2 – 2
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 100 - CONFLUENCE 1.1 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	< 5
TIME TO PEAK (MIN)	60	55
MAX ELEVATION (FT, NGVD 29)	826.65	821.84
INCREMENTAL RISE (FT)	0.74	3.51
PEAK FLOW (CFS)	11537	3759

CROSS SECTION 206.01 - CEDAR AVE 1.8 MILES UPSTREAM OF CONFLUENCE		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	< 5
TIME TO PEAK (MIN)	55	60
MAX ELEVATION (FT, NGVD 29)	826.67	821.81
INCREMENTAL RISE (FT)	0.76	3.48
PEAK FLOW (CFS)	686	-983

CROSS SECTION 114.5 - ISLAND AVE 0.4 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	< 5
TIME TO PEAK (MIN)	20	30
MAX ELEVATION (FT, NGVD 29)	829.73	824.27
INCREMENTAL RISE (FT)	1.99	5.86
PEAK FLOW (CFS)	13263	6494



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
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- Dam
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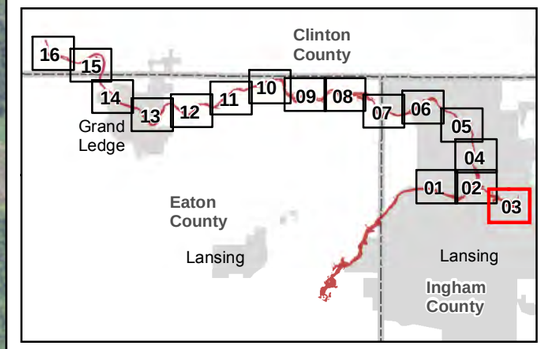
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 2 – 3
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

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CROSS SECTION 216 - AURELIUS RD
0.5 MILES UPSTREAM OF CONFLUENCE

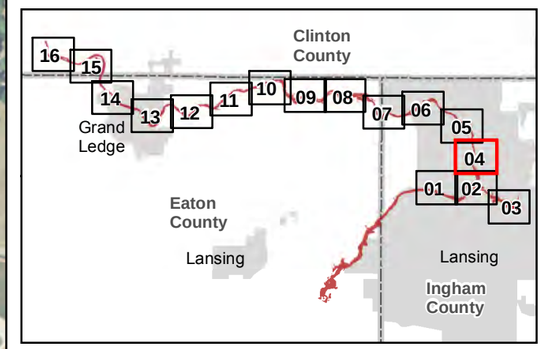
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	5	10
TIME TO PEAK (MIN)	55	110
MAX ELEVATION (FT, NGVD 29)	826.74	821.32
INCREMENTAL RISE (FT)	0.8	2.7
PEAK FLOW (CFS)	617	107

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 2 – 4
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

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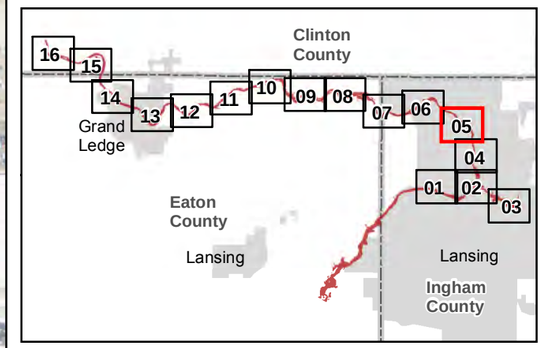
CROSS SECTION 89.1 - MICHIGAN AVE 1.8 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	8
TIME TO PEAK (MIN)	65	55
MAX ELEVATION (FT, NGVD 29)	824.93	821.36
INCREMENTAL RISE (FT)	0.57	3.06
PEAK FLOW (CFS)	11503	3746

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 2 – 5
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

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CROSS SECTION 71.5 - E GRAND RIVER AVE 2.8 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	5	13
TIME TO PEAK (MIN)	80	80
MAX ELEVATION (FT, NGVD 29)	820.54	814.11
INCREMENTAL RISE (FT)	0.74	5.08
PEAK FLOW (CFS)	11463	3525

CROSS SECTION 75.5 -OAKLAND AVE 2.5 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	10
TIME TO PEAK (MIN)	70	60
MAX ELEVATION (FT, NGVD 29)	823.56	820.43
INCREMENTAL RISE (FT)	0.45	2.24
PEAK FLOW (CFS)	11493	3701

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

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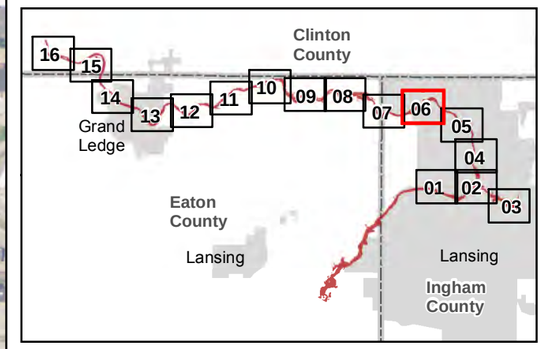
Large Figure 2 – 6
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



CROSS SECTION 58.3 - RAILROAD BRIDGE 4.2 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	10	25
TIME TO PEAK (MIN)	105	110
MAX ELEVATION (FT, NGVD 29)	816.71	810.81
INCREMENTAL RISE (FT)	0.53	4.56
PEAK FLOW (CFS)	11287	3126

EXPLANATION

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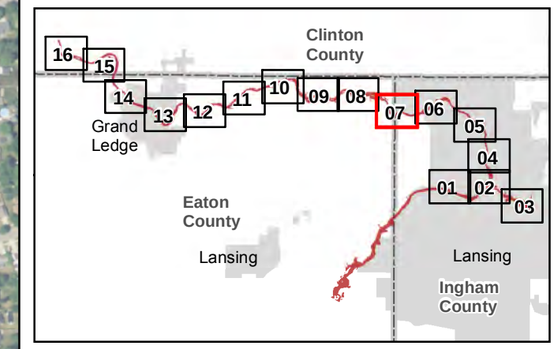
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 2 – 7
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 50.5 - WAVERLY RD 6.1 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	30	45
TIME TO PEAK (MIN)	135	115
MAX ELEVATION (FT, NGVD 29)	812.65	807.04
INCREMENTAL RISE (FT)	0.45	3.08
PEAK FLOW (CFS)	11139	2780



EXPLANATION

- Inundated Structure
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- Wet Weather Inundation Upstream of Moores Park Dam
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- Dam
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- County Boundaries

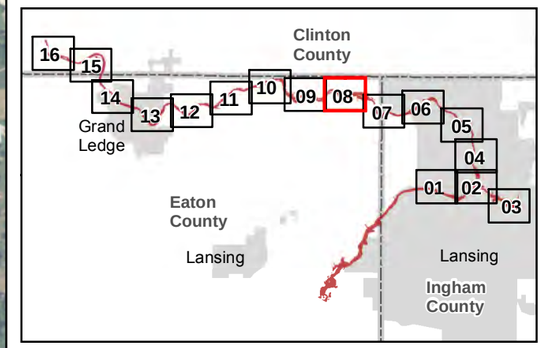
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 2 – 8
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 41 7.9 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	45	55
TIME TO PEAK (MIN)	180	200
MAX ELEVATION (FT, NGVD 29)	808.88	802.67
INCREMENTAL RISE (FT)	0.39	3.83
PEAK FLOW (CFS)	10861	2436



EXPLANATION

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Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

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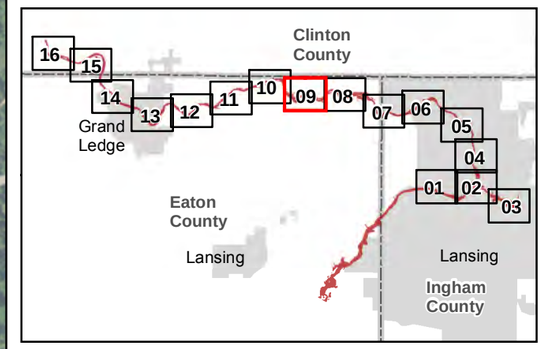
CROSS SECTION 35.4 - WEBSTER ROAD 9.3 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	55	60
TIME TO PEAK (MIN)	225	285
MAX ELEVATION (FT, NGVD 29)	806.24	799.97
INCREMENTAL RISE (FT)	0.39	3.21
PEAK FLOW (CFS)	10780	2386

Large Figure 2 – 9
MOORES PARK DAM FAILURE
ONLY INUNDATION
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
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- County Boundaries

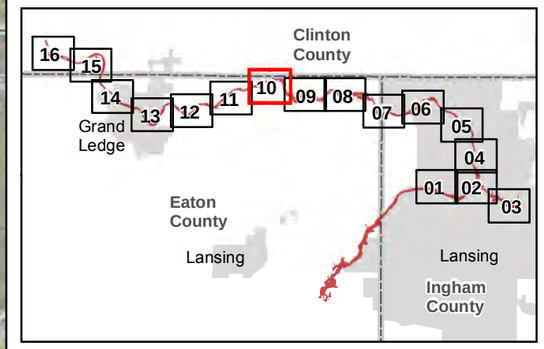
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Eaton County
Grand River
Ingersol Rd
Delta River Dr
Clinton St
Meister Ln
Vermont St
Webster Rd
354
Old River Trl
Willow Hwy
Willow Hwy
Toboggan Ln
Hilltop Dr
Armstrong Dr
Pony Trl
Lindy Dr
Briar Hill Dr
Willow Bend Dr
Piney Point Dr
LaRocque Cir
Claremont Ct
Marstoga Dr

Large Figure 2 – 10
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



Clinton County

Eaton Hwy

Steiner Way

69

96

Grand River

Dela River Dr

30.5

Eaton County

96

Old River Trl

CROSS SECTION 30.5 - I96 10.5 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	70	90
TIME TO PEAK (MIN)	250	335
MAX ELEVATION (FT, NGVD 29)	804	796.8
INCREMENTAL RISE (FT)	0.39	3.76
PEAK FLOW (CFS)	10739	2234

EXPLANATION

- Inundated Structure
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- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

N

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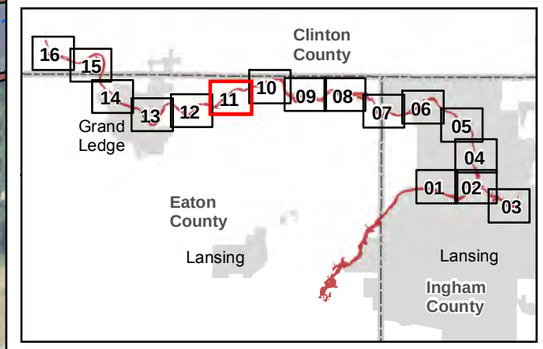
Large Figure 2 – 11
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
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CROSS SECTION 25 12 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	75	150
TIME TO PEAK (MIN)	255	345
MAX ELEVATION (FT, NGVD 29)	801.89	795.27
INCREMENTAL RISE (FT)	0.34	3.24
PEAK FLOW (CFS)	10708	2155

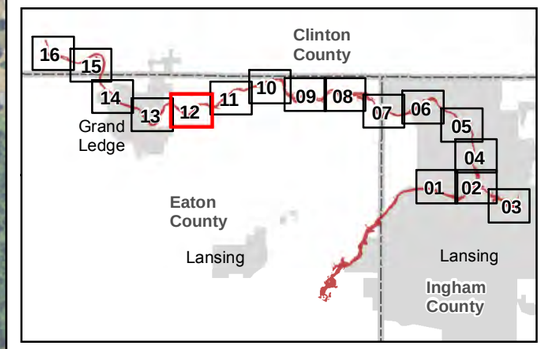
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

CROSS SECTION 20 13.6 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	100	200
TIME TO PEAK (MIN)	285	405
MAX ELEVATION (FT, NGVD 29)	798.33	792.43
INCREMENTAL RISE (FT)	0.3	2.88
PEAK FLOW (CFS)	10673	2102

Large Figure 2 – 12
MOORES PARK DAM FAILURE
ONLY INUNDATION
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
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- Model Cross Section Allignment
- Dam
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- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

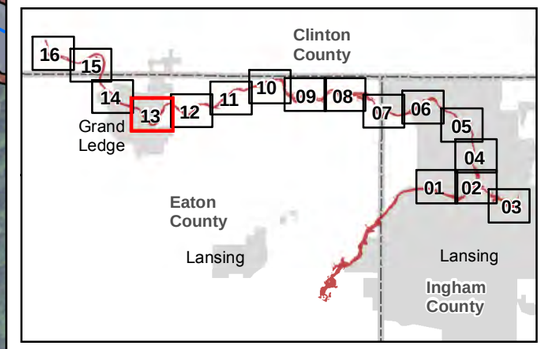
Feet
0 500 1,000 1,500

Meters
0 150 300

Eaton County
Grand River Dr
E Melody Ln
Sioux Dr
Chippewa Dr
Iroquois Dr
Grand Willow Dr
Crab Apple Ln
Cherry Ln
Grand River
20
Willow Hwy
Crescent Cir
Scofield Dr
Berner Ct
Silver Ridge Dr
Crescent Dr
Newberry Dr
Kingsgate Way
Dundee Dr
Carmel Ln
Crestline Dr
Grand Ledge

Large Figure 2 – 13
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 12.5 - S BRIDGE ST 15.7 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	120	250
TIME TO PEAK (MIN)	320	470
MAX ELEVATION (FT, NGVD 29)	794.79	789.99
INCREMENTAL RISE (FT)	0.26	1.65
PEAK FLOW (CFS)	10648	1987



EXPLANATION

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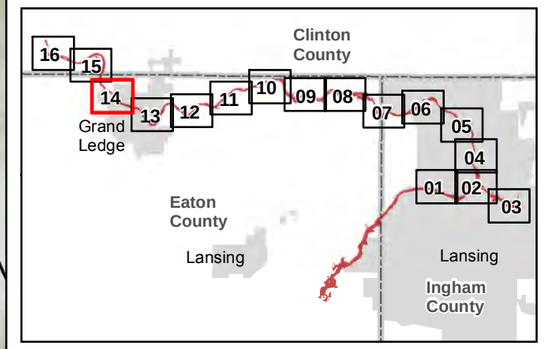
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 2 – 14
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 1.1 - GRAND LEDGE DAM 16.9 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	130	260
TIME TO PEAK (MIN)	325	480
MAX ELEVATION (FT, NGVD 29)	793.16	789.61
INCREMENTAL RISE (FT)	0.19	1.31
PEAK FLOW (CFS)	10644	1978



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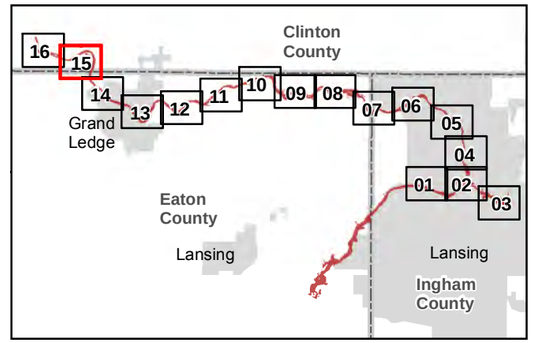
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 2 – 15
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



Grand River

Clinton County

Eaton County

Eaton Hwy

Oneida Rd

Lawson Rd

Erin Way

07

CROSS SECTION 0.7
18.3 MILES DOWNSTREAM OF MOORES PARK DAM

	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	140	305
TIME TO PEAK (MIN)	345	520
MAX ELEVATION (FT, NGVD 29)	782.64	778.01
INCREMENTAL RISE (FT)	0.23	2.01
PEAK FLOW (CFS)	10634	1959

EXPLANATION

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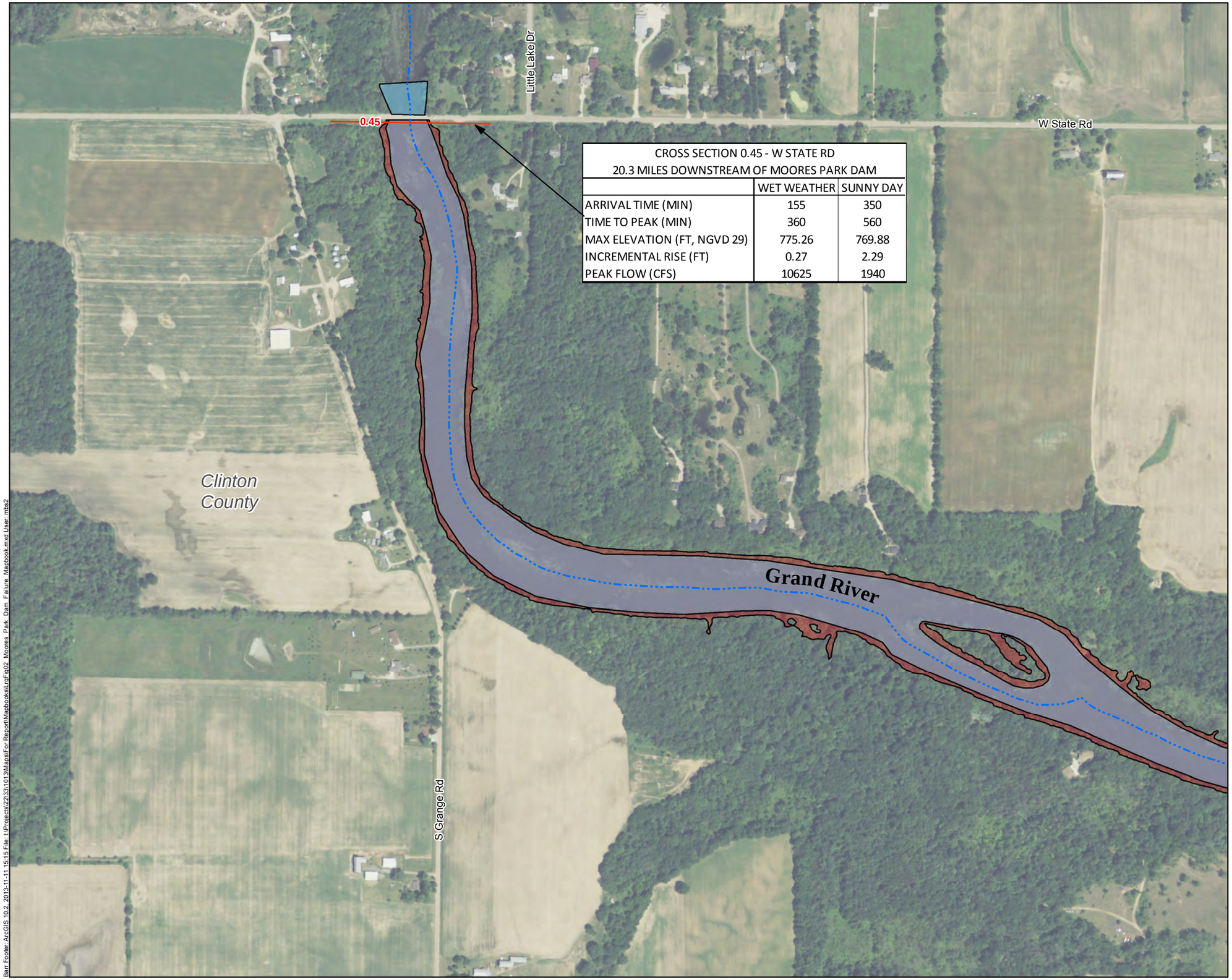
Imagery Source: NAIP, 2013

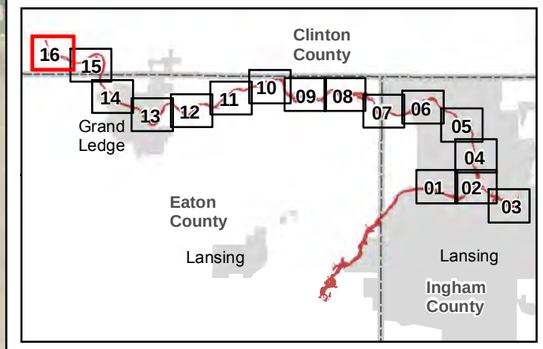
Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 2 – 16
MOORES PARK DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



CROSS SECTION 0.45 - W STATE RD 20.3 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	155	350
TIME TO PEAK (MIN)	360	560
MAX ELEVATION (FT, NGVD 29)	775.26	769.88
INCREMENTAL RISE (FT)	0.27	2.29
PEAK FLOW (CFS)	10625	1940



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

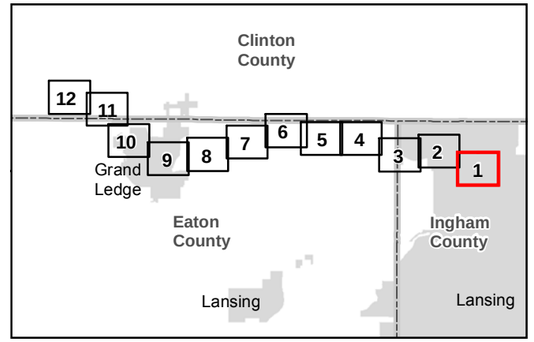
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 3: North Lansing Dam failure only inundation maps (set of 12 map panels)

Large Figure 3 – 01
NORTH LANSING DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Grand River

Lansing

Ingham County

CROSS SECTION 71.5 - E GRAND RIVER AVE 0.1 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	< 5
TIME TO PEAK (MIN)	10
MAX ELEVATION (FT, NGVD 29)	813.3
INCREMENTAL RISE (FT)	4.27
PEAK FLOW (CFS)	4269.62

71.5

75.5

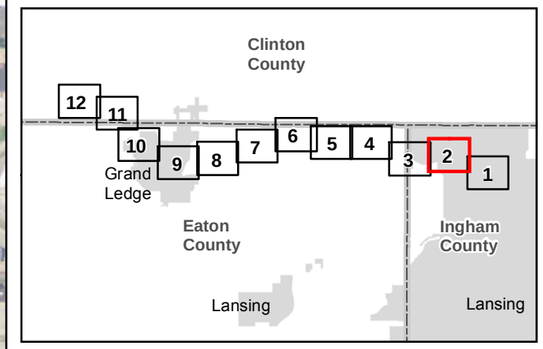
North Lansing Dam

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 3 – 02
NORTH LANSING DAM FAILURE
ONLY INUNDATION
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Grand River

58.3

Lansing

Ingham
County

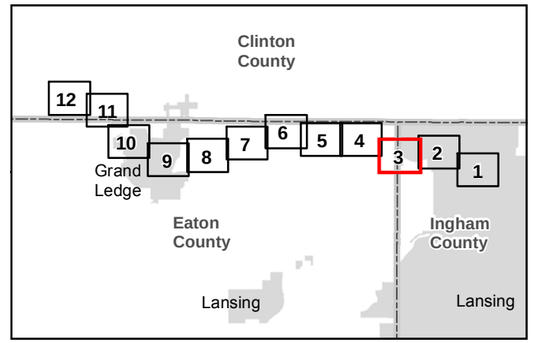
CROSS SECTION 58.3 - RAILROAD BRIDGE 1.5 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	5
TIME TO PEAK (MIN)	50
MAX ELEVATION (FT, NGVD 29)	809.03
INCREMENTAL RISE (FT)	2.78
PEAK FLOW (CFS)	1773.14

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 3 – 03
NORTH LANSING DAM FAILURE
ONLY INUNDATION
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Grand River

Eaton
County

Lansing

Ingham
County

50.5

CROSS SECTION 50.5 - WAVERLY RD 3.4 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	30
TIME TO PEAK (MIN)	110
MAX ELEVATION (FT, NGVD 29)	805.5
INCREMENTAL RISE (FT)	1.54
PEAK FLOW (CFS)	1297.24

Imagery Source: NAIP, 2013

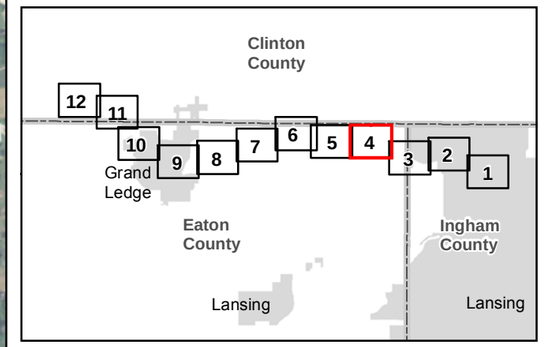
Feet
0 500 1,000 1,500

Meters
0 150 300

Barr Footer: ArcGIS 10.2 2013-11-08 15:37 File: I:\Projects\22\33\1013\Maps\For Report\Manbooks\LrgFig03_N. Lansing_Dam_Failure_Manbook.mxd User: mbs2

Large Figure 3 – 04
NORTH LANSING DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 41 5.2 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	55
TIME TO PEAK (MIN)	140
MAX ELEVATION (FT, NGVD 29)	800.67
INCREMENTAL RISE (FT)	1.83
PEAK FLOW (CFS)	1061.07



EXPLANATION

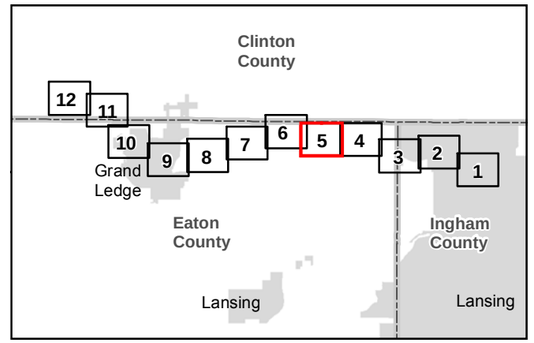
- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 3 – 05
NORTH LANSING DAM FAILURE
ONLY INUNDATION
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Eaton
County

Grand River

35.4

CROSS SECTION 35.4 - WEBSTER ROAD 6.6 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	80
TIME TO PEAK (MIN)	170
MAX ELEVATION (FT, NGVD 29)	798.05
INCREMENTAL RISE (FT)	1.29
PEAK FLOW (CFS)	1018.2

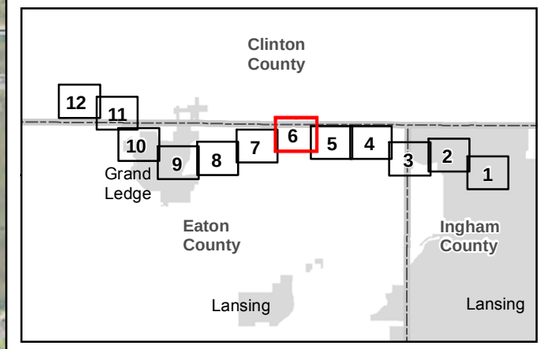
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

N

Meters
0 150 300

Large Figure 3 – 06
NORTH LANSING DAM FAILURE
ONLY INUNDATION
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



Clinton County

Grand River

30.5

Eaton County

CROSS SECTION 30.5 - I96 7.8 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	115
TIME TO PEAK (MIN)	300
MAX ELEVATION (FT, NGVD 29)	794.6
INCREMENTAL RISE (FT)	1.56
PEAK FLOW (CFS)	941.65

EXPLANATION

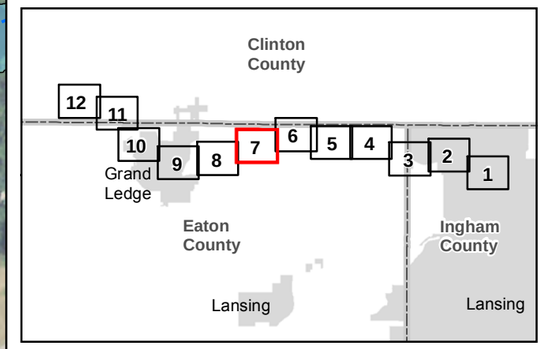
- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 3 – 07
NORTH LANSING DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Grand River

25

Eaton County

CROSS SECTION 25 9.3 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	125
TIME TO PEAK (MIN)	305
MAX ELEVATION (FT, NGVD 29)	793.28
INCREMENTAL RISE (FT)	1.25
PEAK FLOW (CFS)	883.73

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

CROSS SECTION 20 10.9 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	185
TIME TO PEAK (MIN)	390
MAX ELEVATION (FT, NGVD 29)	790.72
INCREMENTAL RISE (FT)	1.17
PEAK FLOW (CFS)	855.69

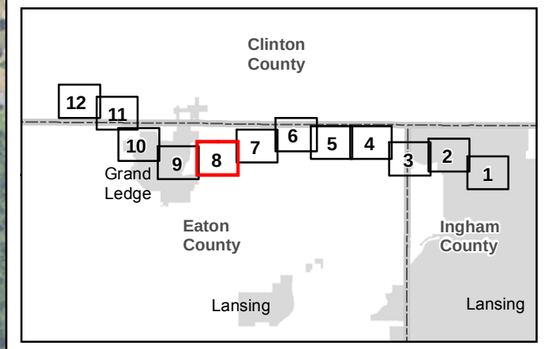
Eaton County

Grand River

20

Grand Ledge

Large Figure 3 – 08
NORTH LANSING DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

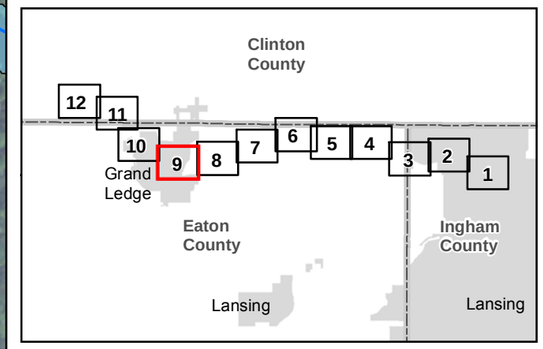
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 3 – 09
NORTH LANSING DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 12.5 - S BRIDGE ST 13 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	245
TIME TO PEAK (MIN)	475
MAX ELEVATION (FT, NGVD 29)	788.88
INCREMENTAL RISE (FT)	0.54
PEAK FLOW (CFS)	806.68



EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

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CROSS SECTION 1.1 - GRAND LEDGE DAM 14.2 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	250
TIME TO PEAK (MIN)	485
MAX ELEVATION (FT, NGVD 29)	788.76
INCREMENTAL RISE (FT)	0.46
PEAK FLOW (CFS)	801.77

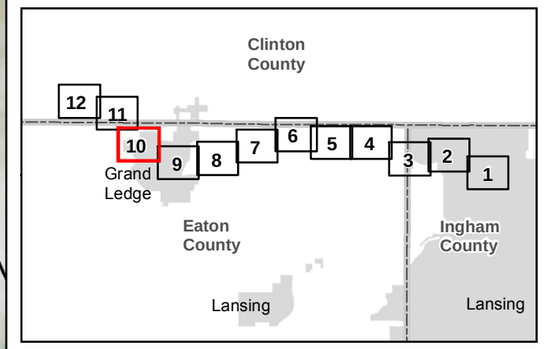
1.1

Eaton County

Grand Ledge

Grand River

Large Figure 3 – 10
NORTH LANSING DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

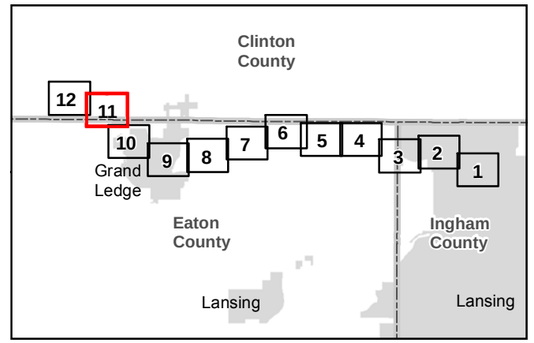
- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 3 – 11
NORTH LANSING DAM FAILURE
ONLY INUNDATION
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



Grand River

Clinton County

Eaton County

0.7

CROSS SECTION 0.7 15.6 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	300
TIME TO PEAK (MIN)	535
MAX ELEVATION (FT, NGVD 29)	776.74
INCREMENTAL RISE (FT)	0.74
PEAK FLOW (CFS)	793.79

EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

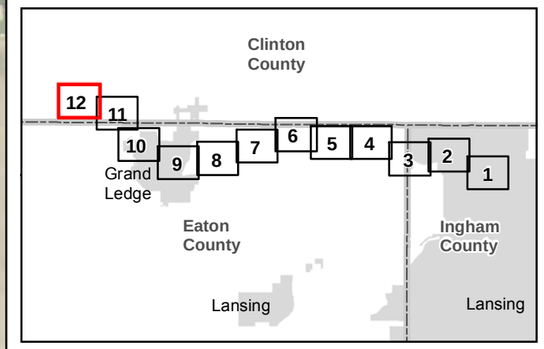
Feet
0 500 1,000 1,500

Meters
0 150 300

N

Large Figure 3 – 12
NORTH LANSING DAM FAILURE ONLY INUNDATION
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 0.45 - W STATE RD 17.6 MILES DOWNSTREAM OF NORTH LANSING DAM	
	SUNNY DAY
ARRIVAL TIME (MIN)	350
TIME TO PEAK (MIN)	585
MAX ELEVATION (FT, NGVD 29)	768.39
INCREMENTAL RISE (FT)	0.8
PEAK FLOW (CFS)	787.04



EXPLANATION

- Sunny Day Breach Inundation
- Sunny Day Inundation Upstream of North Lansing Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

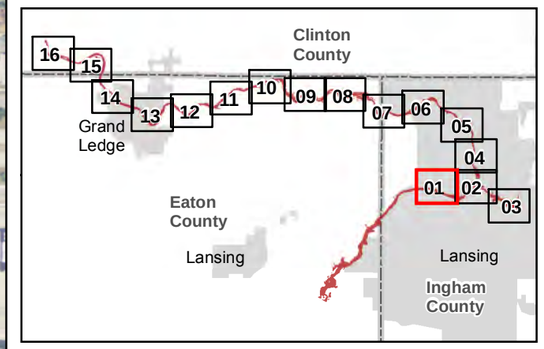
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4: Cascading dam failures inundation maps (set of 16 map panels)

Large Figure 4 – 1
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

CROSS SECTION 120 - MOORES PARK DAM TAILWATER 0.05 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	<5
TIME TO PEAK (MIN)	15	25
MAX ELEVATION (FT, NGVD 29)	829.94	824.66
INCREMENTAL RISE (FT)	1.94	6.23
PEAK FLOW (CFS)	13378	6581.18

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

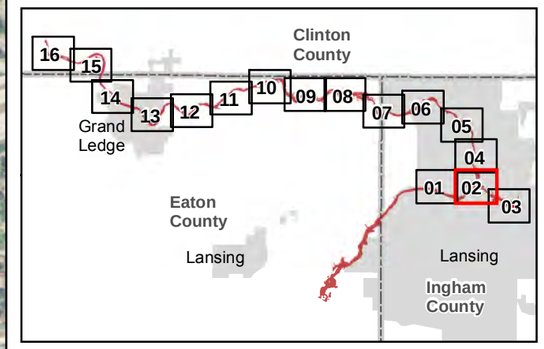
Meters
0 150 300

Large Figure 4 – 2
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 100 - CONFLUENCE 1.1 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	< 5
TIME TO PEAK (MIN)	45	35
MAX ELEVATION (FT, NGVD 29)	826.61	821.2
INCREMENTAL RISE (FT)	0.7	2.87
PEAK FLOW (CFS)	11609	4963

CROSS SECTION 206.01 - CEDAR AVE 1.8 MILES UPSTREAM OF CONFLUENCE		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	< 5
TIME TO PEAK (MIN)	50	45
MAX ELEVATION (FT, NGVD 29)	826.66	821.15
INCREMENTAL RISE (FT)	0.75	2.82
PEAK FLOW (CFS)	242	-893

CROSS SECTION 114.5 - ISLAND AVE 0.4 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	< 5
TIME TO PEAK (MIN)	15	30
MAX ELEVATION (FT, NGVD 29)	829.73	824.23
INCREMENTAL RISE (FT)	1.99	5.82
PEAK FLOW (CFS)	13263	6529



EXPLANATION

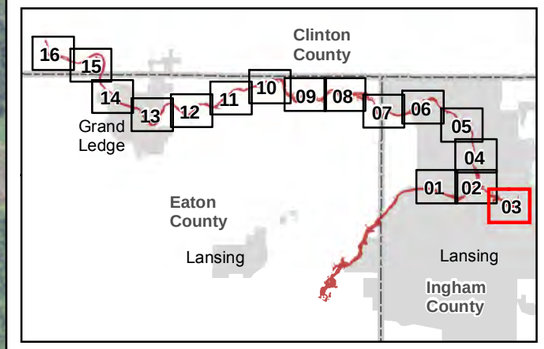
- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4 – 3
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

CROSS SECTION 216 - AURELIUS RD
0.5 MILES UPSTREAM OF CONFLUENCE

	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	5	10
TIME TO PEAK (MIN)	50	80
MAX ELEVATION (FT, NGVD 29)	826.73	820.54
INCREMENTAL RISE (FT)	0.79	1.92
PEAK FLOW (CFS)	617	107

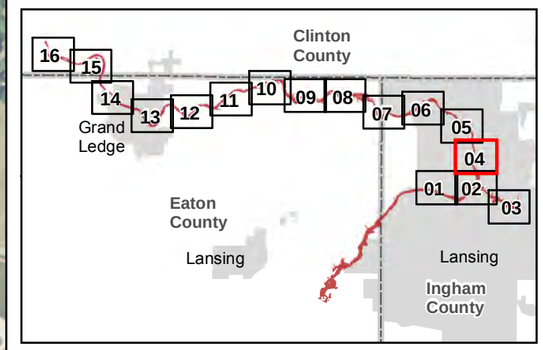
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Barr Footer: ArcGIS 10.2, 2013-11-05 09:12 File: I:\Projects\23\33\1013\Maps\For Report\Cascading_Failure_Inundation_Extents_Mapbook.mxd User: mhs2

Large Figure 4 – 4
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



CROSS SECTION 89.1 - MICHIGAN AVE 1.8 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	8
TIME TO PEAK (MIN)	45	35
MAX ELEVATION (FT, NGVD 29)	824.88	819.96
INCREMENTAL RISE (FT)	0.52	1.66
PEAK FLOW (CFS)	11426	4909

EXPLANATION

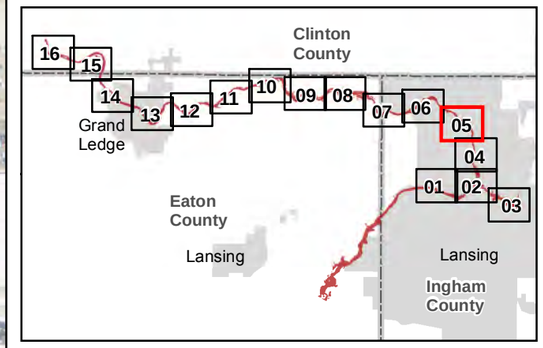
- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4 – 5
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

CROSS SECTION 71.5 - E GRAND RIVER AVE 2.8 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	5	13
TIME TO PEAK (MIN)	55	65
MAX ELEVATION (FT, NGVD 29)	821.27	815.26
INCREMENTAL RISE (FT)	1.47	6.23
PEAK FLOW (CFS)	13673	4708

CROSS SECTION 75.5 -OAKLAND AVE 2.5 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	<5	10
TIME TO PEAK (MIN)	45	15
MAX ELEVATION (FT, NGVD 29)	823.51	818.74
INCREMENTAL RISE (FT)	0.4	0.55
PEAK FLOW (CFS)	11352	1116

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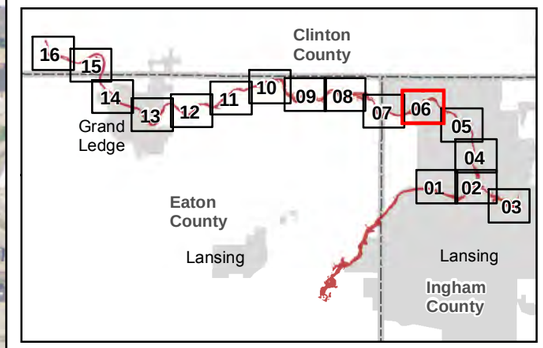
Large Figure 4 – 6
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



CROSS SECTION 58.3 - RAILROAD BRIDGE 4.2 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	15	15
TIME TO PEAK (MIN)	95	100
MAX ELEVATION (FT, NGVD 29)	817.07	811.75
INCREMENTAL RISE (FT)	0.89	5.5
PEAK FLOW (CFS)	12170	4092

EXPLANATION

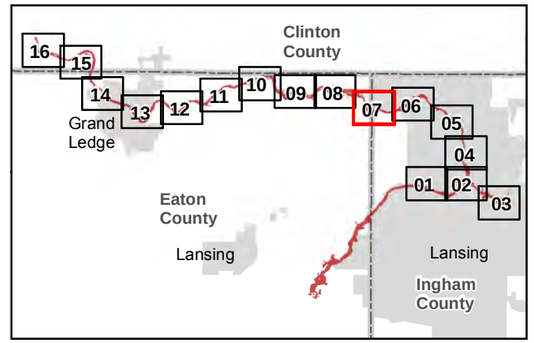
- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4 – 7
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

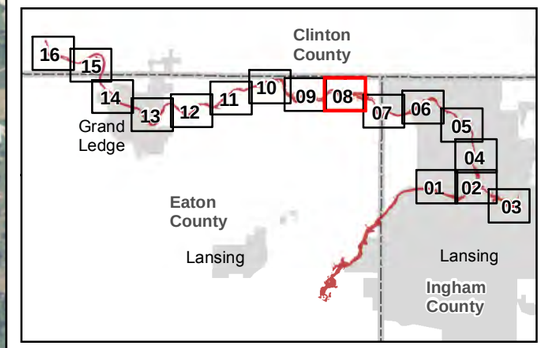
Feet
0 500 1,000 1,500

Meters
0 150 300

CROSS SECTION 50.5 - WAVERLY RD 6.1 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	30	40
TIME TO PEAK (MIN)	125	140
MAX ELEVATION (FT, NGVD 29)	812.94	807.78
INCREMENTAL RISE (FT)	0.74	3.82
PEAK FLOW (CFS)	11832	3654

Large Figure 4 – 8
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 41 7.9 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	50	70
TIME TO PEAK (MIN)	175	200
MAX ELEVATION (FT, NGVD 29)	809.12	803.38
INCREMENTAL RISE (FT)	0.63	4.54
PEAK FLOW (CFS)	11351	3106



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

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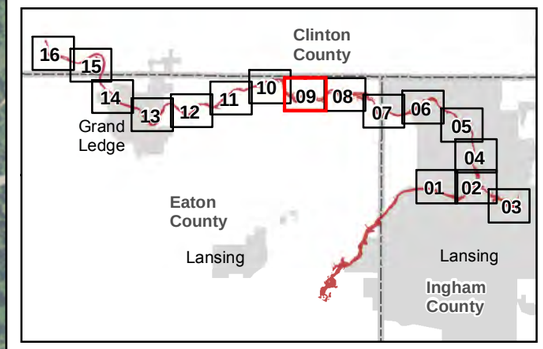
Large Figure 4 – 9
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

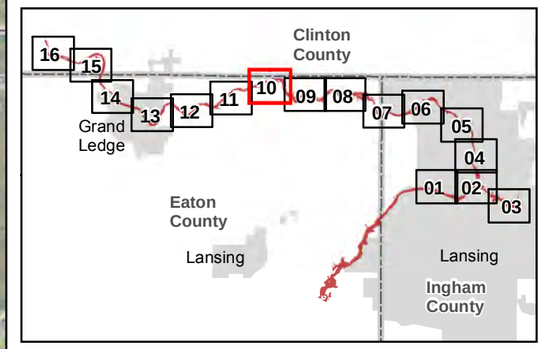
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

CROSS SECTION 35.4 - WEBSTER ROAD 9.3 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	70	95
TIME TO PEAK (MIN)	225	255
MAX ELEVATION (FT, NGVD 29)	806.48	800.72
INCREMENTAL RISE (FT)	0.63	3.96
PEAK FLOW (CFS)	11240	2986

Large Figure 4 – 10
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Clinton County
Eaton County
Grand River
Eaton Hwy
Steiner Way
Dela River Dr
Old River Trl
69
96
96
30.5

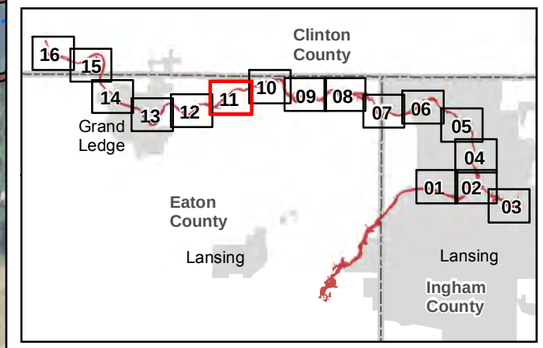
CROSS SECTION 30.5 - I96 10.5 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	80	130
TIME TO PEAK (MIN)	245	305
MAX ELEVATION (FT, NGVD 29)	804.23	797.52
INCREMENTAL RISE (FT)	0.62	4.48
PEAK FLOW (CFS)	11175	2817

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4 – 11
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

N River Hwy

Grand River

25

Eaton County

CROSS SECTION 25
12 MILES DOWNSTREAM OF MOORES PARK DAM

	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	85	135
TIME TO PEAK (MIN)	255	315
MAX ELEVATION (FT, NGVD 29)	802.1	795.91
INCREMENTAL RISE (FT)	0.55	3.88
PEAK FLOW (CFS)	11119	2716

Willow Hwy
Nixon Rd
Vista Ave
Amor Ln
Broadbent Rd

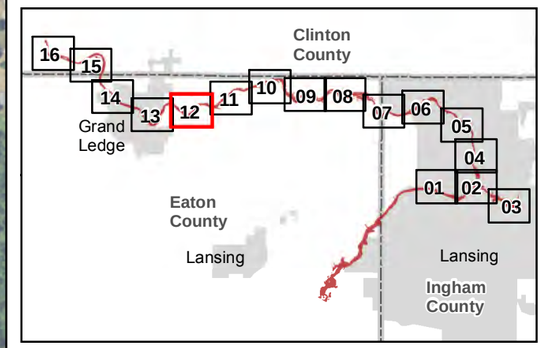
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4 – 12
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 20 13.6 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	105	180
TIME TO PEAK (MIN)	280	365
MAX ELEVATION (FT, NGVD 29)	798.52	792.95
INCREMENTAL RISE (FT)	0.49	3.4
PEAK FLOW (CFS)	11074	2647



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

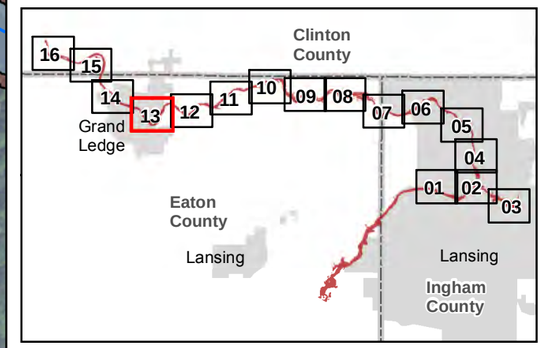
Feet
0 500 1,000 1,500

Meters
0 150 300

Eaton County
Grand River
Grand Ledge
20
Willow Hwy
Grand River Dr
E Melody Ln
Sioux Dr
Chippewa Dr
Iroquois Dr
Grand Willow Dr
Crab Apple Ln
Cherry Ln
Berner Ct
Silver Ridge Dr
Crescent Cir
Crescent Dr
Newberry Dr
Carmel Ln
Kingsgate Way
Crestline Dr
Dundee Dr
Scofield Dr

Large Figure 4 – 13
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 12.5 - S BRIDGE ST 15.7 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	120	230
TIME TO PEAK (MIN)	310	420
MAX ELEVATION (FT, NGVD 29)	794.95	790.39
INCREMENTAL RISE (FT)	0.42	2.05
PEAK FLOW (CFS)	11032	2500



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

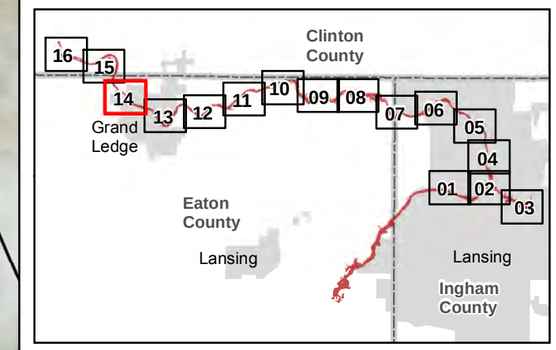
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4 – 14
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 1.1 - GRAND LEDGE DAM 16.9 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	125	235
TIME TO PEAK (MIN)	325	440
MAX ELEVATION (FT, NGVD 29)	793.28	789.91
INCREMENTAL RISE (FT)	0.31	1.61
PEAK FLOW (CFS)	11026	2484



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4 – 15
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

Grand River

Clinton County

Eaton County

Eaton Hwy

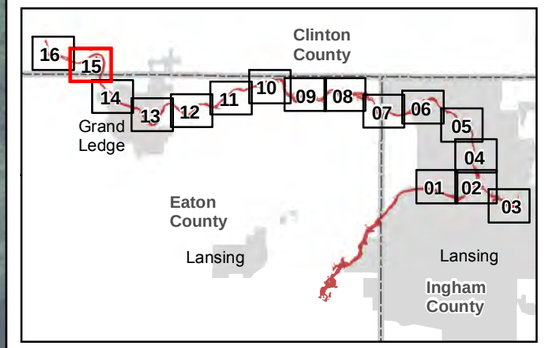
Oneida Rd

Lawson Rd

Erin Way

CROSS SECTION 0.7
18.3 MILES DOWNSTREAM OF MOORES PARK DAM

	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	150	780
TIME TO PEAK (MIN)	350	475
MAX ELEVATION (FT, NGVD 29)	782.79	778.42
INCREMENTAL RISE (FT)	0.38	2.42
PEAK FLOW (CFS)	11010	2461



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

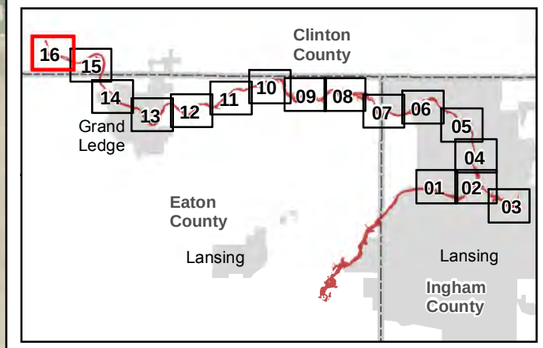
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 4 – 16
CASCADING DAM FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 0.45 - W STATE RD 20.3 MILES DOWNSTREAM OF MOORES PARK DAM		
	WET WEATHER	SUNNY DAY
ARRIVAL TIME (MIN)	170	330
TIME TO PEAK (MIN)	370	515
MAX ELEVATION (FT, NGVD 29)	775.42	770.38
INCREMENTAL RISE (FT)	0.43	2.79
PEAK FLOW (CFS)	10998	2430



EXPLANATION

- Inundated Structure
- Sunny Day Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

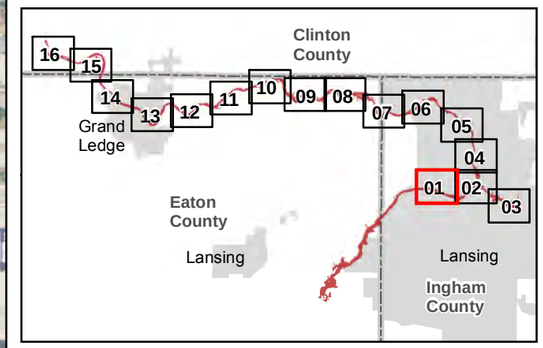
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 5: Wet weather cascading dam failure and non-failure inundation maps (set of 16 map panels)

Large Figure 5 – 1
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



CROSS SECTION 120 - MOORES PARK DAM TAILWATER 0.05 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	<5
TIME TO PEAK (MIN)	-	15
MAX ELEVATION (FT, NGVD 29)	828	829.94
INCREMENTAL RISE (FT)	-	1.94
PEAK FLOW (CFS)	9581.12	13378

EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

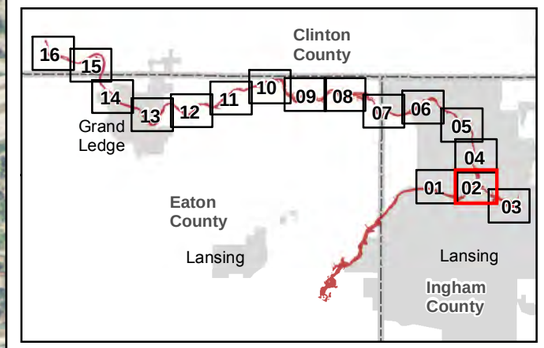
Meters
0 150 300

Large Figure 5 – 2
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 100 - CONFLUENCE 1.1 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	<5
TIME TO PEAK (MIN)	-	45
MAX ELEVATION (FT, NGVD 29)	825.91	826.61
INCREMENTAL RISE (FT)	-	0.7
PEAK FLOW (CFS)	10176.17	11609

CROSS SECTION 206.01 - CEDAR AVE 1.8 MILES UPSTREAM OF CONFLUENCE		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	<5
TIME TO PEAK (MIN)	-	50
MAX ELEVATION (FT, NGVD 29)	825.91	826.66
INCREMENTAL RISE (FT)	-	0.75
PEAK FLOW (CFS)	622.77	242

CROSS SECTION 114.5 - ISLAND AVE 0.4 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	<5
TIME TO PEAK (MIN)	-	15
MAX ELEVATION (FT, NGVD 29)	827.74	829.73
INCREMENTAL RISE (FT)	-	1.99
PEAK FLOW (CFS)	9580.45	13263



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

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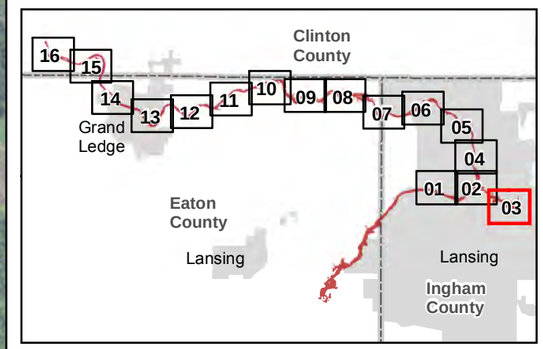
Large Figure 5 – 3
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



CROSS SECTION 216 - AURELIUS RD 0.5 MILES UPSTREAM OF CONFLUENCE		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	5
TIME TO PEAK (MIN)	-	50
MAX ELEVATION (FT, NGVD 29)	825.94	826.73
INCREMENTAL RISE (FT)	-	0.79
PEAK FLOW (CFS)	617	617

EXPLANATION

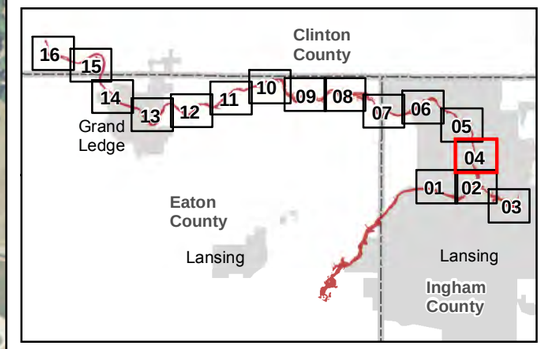
- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 5 – 4
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

CROSS SECTION 89.1 - MICHIGAN AVE 1.8 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	<5
TIME TO PEAK (MIN)	-	45
MAX ELEVATION (FT, NGVD 29)	824.36	824.88
INCREMENTAL RISE (FT)	-	0.52
PEAK FLOW (CFS)	10175.28	11426

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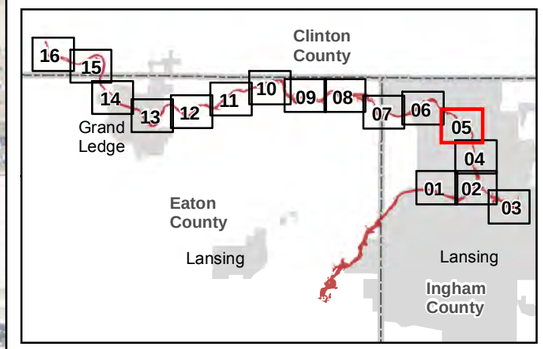
Large Figure 5 – 5
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

CROSS SECTION 71.5 - E GRAND RIVER AVE 2.8 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	5
TIME TO PEAK (MIN)	-	55
MAX ELEVATION (FT, NGVD 29)	819.8	821.27
INCREMENTAL RISE (FT)	-	1.47
PEAK FLOW (CFS)	10174.63	13673

CROSS SECTION 75.5 -OAKLAND AVE 2.5 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	<5
TIME TO PEAK (MIN)	-	45
MAX ELEVATION (FT, NGVD 29)	823.11	823.51
INCREMENTAL RISE (FT)	-	0.4
PEAK FLOW (CFS)	10175.99	11352

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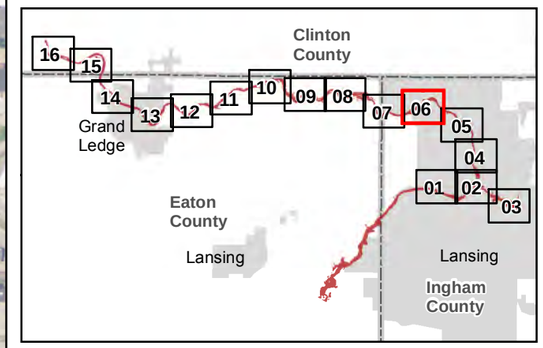
Large Figure 5 – 6
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



CROSS SECTION 58.3 - RAILROAD BRIDGE 4.2 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	15
TIME TO PEAK (MIN)	-	95
MAX ELEVATION (FT, NGVD 29)	816.18	817.07
INCREMENTAL RISE (FT)	-	0.89
PEAK FLOW (CFS)	10162.59	12170

EXPLANATION

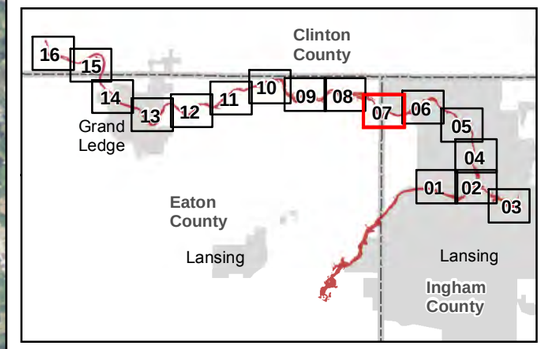
- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 5 – 7
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

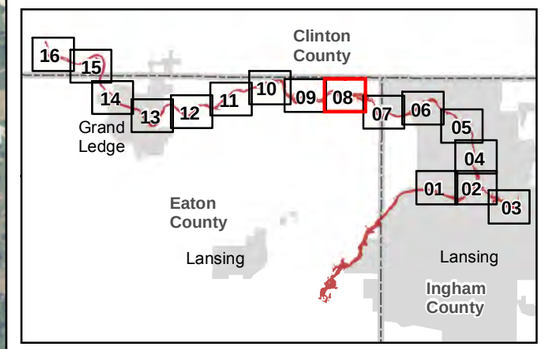
Feet
0 500 1,000 1,500

Meters
0 150 300

CROSS SECTION 50.5 - WAVERLY RD 6.1 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	30
TIME TO PEAK (MIN)	-	125
MAX ELEVATION (FT, NGVD 29)	812.2	812.94
INCREMENTAL RISE (FT)	-	0.74
PEAK FLOW (CFS)	10143.99	11832

Large Figure 5 – 8
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 41 7.9 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	50
TIME TO PEAK (MIN)	-	175
MAX ELEVATION (FT, NGVD 29)	808.49	809.12
INCREMENTAL RISE (FT)	-	0.63
PEAK FLOW (CFS)	10095.36	11351



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

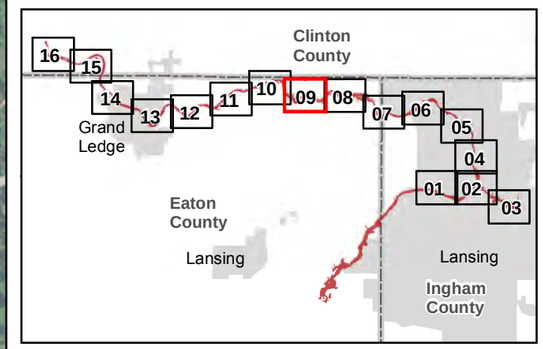
Feet
0 500 1,000 1,500

Meters
0 150 300

Barr Footer: ArcGIS 10.2 2013-11-25 10:38 File: I:\Projects\22\33\10\13\Mapsl\For Report\Mapbooks\LogFig\05_Wet Weather_Cascading_Failure_and_Non_Failure_Inundation_Mapbook.mxd User: jrv

CROSS SECTION 35.4 - WEBSTER ROAD 9.3 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	70
TIME TO PEAK (MIN)	-	225
MAX ELEVATION (FT, NGVD 29)	805.85	806.48
INCREMENTAL RISE (FT)	-	0.63
PEAK FLOW (CFS)	10082.02	11240

Large Figure 5 – 9
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

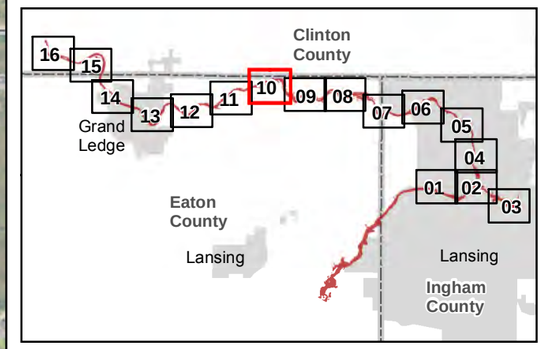
- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 5 – 10
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



Clinton County

Eaton Hwy

69

96

Steiner Way

Grand River

30.5

Dela River Dr

Eaton County

96

Old River Trl

CROSS SECTION 30.5 - I96 10.5 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	80
TIME TO PEAK (MIN)	-	245
MAX ELEVATION (FT, NGVD 29)	803.61	804.23
INCREMENTAL RISE (FT)	-	0.62
PEAK FLOW (CFS)	10070.15	11175

EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

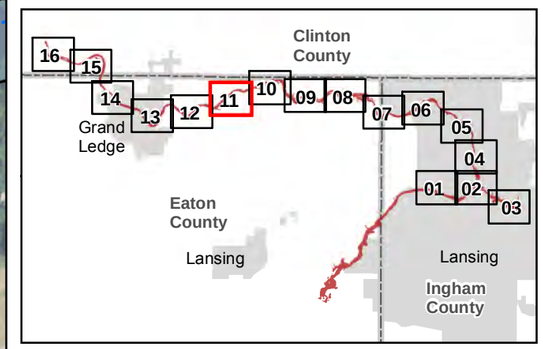
Feet
0 500 1,000 1,500

Meters
0 150 300

N

Barr Footer: ArcGIS 10.2, 2013-11-25 10:38 File: I:\Projects\22\33\1013\Maps\For Report\Manbooks\LrgFig05_Wet Weather Cascading Failure and Non Failure_Inundation_Manbook.mxd User: jrv

Large Figure 5 – 11
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Grand River

25

CROSS SECTION 25 12 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	85
TIME TO PEAK (MIN)	-	255
MAX ELEVATION (FT, NGVD 29)	801.55	802.1
INCREMENTAL RISE (FT)	-	0.55
PEAK FLOW (CFS)	10060.24	11119

N River Hwy
Eaton County
Willow Hwy
Nixon Rd
Vista Ave
Amor Ln
Broadbent Rd

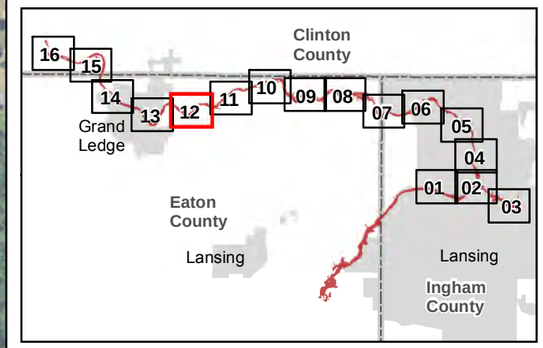
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 5 – 12
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 20 13.6 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	105
TIME TO PEAK (MIN)	-	280
MAX ELEVATION (FT, NGVD 29)	798.03	798.52
INCREMENTAL RISE (FT)	-	0.49
PEAK FLOW (CFS)	10049.82	11074



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

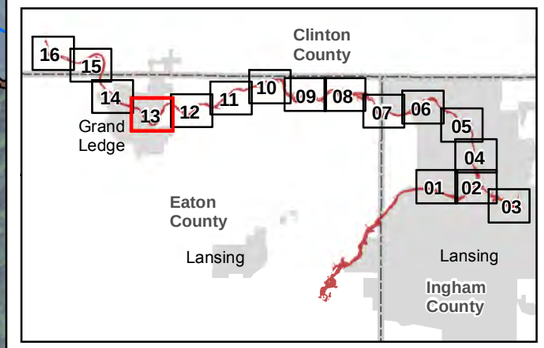
Feet
0 500 1,000 1,500

Meters
0 150 300

Eaton County
Grand River Dr
E Melody Ln
Sioux Dr
Chippewa Dr
Iroquois Dr
Grand Willow Dr
Crab Apple Ln
Cherry Ln
Grand Ledge
Willow Hwy
Grand River
20
Berner Ct
Silver Ridge Dr
Crescent Dr
Crescent Cir
Scofield Dr
Carmel Ln
Newberry Dr
Kingsgate Way
Dundee Dr
Crestline Dr

Large Figure 5 – 13
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 12.5 - S BRIDGE ST 15.7 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	120
TIME TO PEAK (MIN)	-	310
MAX ELEVATION (FT, NGVD 29)	794.53	794.95
INCREMENTAL RISE (FT)	-	0.42
PEAK FLOW (CFS)	10040.31	11032



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

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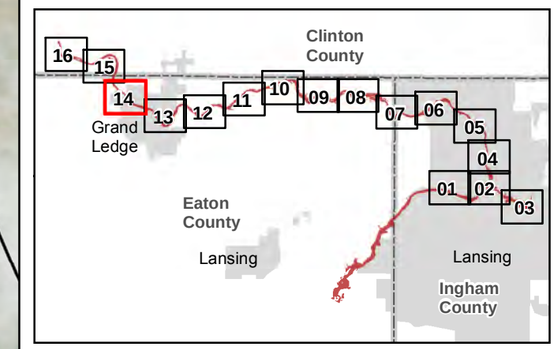
Large Figure 5 – 14
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 1.1 - GRAND LEDGE DAM 16.9 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	125
TIME TO PEAK (MIN)	-	325
MAX ELEVATION (FT, NGVD 29)	792.97	793.28
INCREMENTAL RISE (FT)	-	0.31
PEAK FLOW (CFS)	10039.14	11026



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

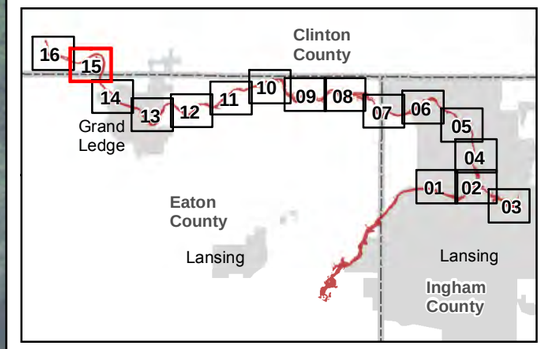
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Barr Footer: ArcGIS 10.2 2013-11-25 10:38 File: I:\Projects\22\33\10\13\Maps\For Report\Mapbooks\LgFig05 Wet Weather Cascading Failure and Non Failure Inundation Mapbook.mxd User: jrv

Large Figure 5 – 15
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



CROSS SECTION 0.7 18.3 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	150
TIME TO PEAK (MIN)	-	350
MAX ELEVATION (FT, NGVD 29)	782.41	782.79
INCREMENTAL RISE (FT)	-	0.38
PEAK FLOW (CFS)	10035.74	11010

EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

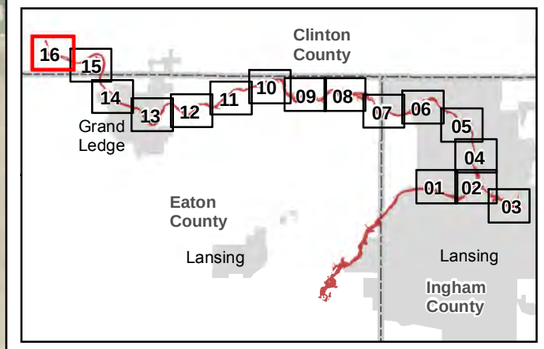
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 5 – 16
WET WEATHER CASCADING FAILURE AND NON FAILURE
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013

CROSS SECTION 0.45 - W STATE RD 20.3 MILES DOWNSTREAM OF MOORES PARK DAM		
	NO FAILURE	FAILURE
ARRIVAL TIME (MIN)	-	170
TIME TO PEAK (MIN)	-	370
MAX ELEVATION (FT, NGVD 29)	774.99	775.42
INCREMENTAL RISE (FT)	-	0.43
PEAK FLOW (CFS)	10032.41	10998



EXPLANATION

- Inundated Structure
- Wet Weather No Breach Inundation
- Wet Weather Breach Inundation
- Wet Weather Inundation Upstream of Moores Park Dam
- Model Cross Section Allignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

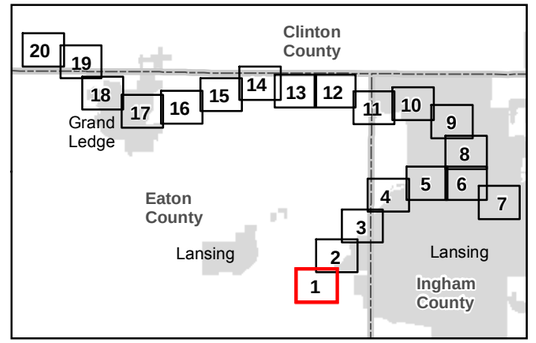
Feet
0 500 1,000 1,500

Meters
0 150 300

Barr Footer: ArcGIS 10.2, 2013-11-25 10:38 File: I:\Projects\22\33\10\13\Maps\For ReportMapbooks\LrgFig05_Wet Weather_Cascading_Failure_and_Non_Failure_Inundation_Mapbook.mxd User: jrv

Large Figure 6: Cross sections use in HEC-RAS model (set of 20 map panels)

Large Figure 6 – 01
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

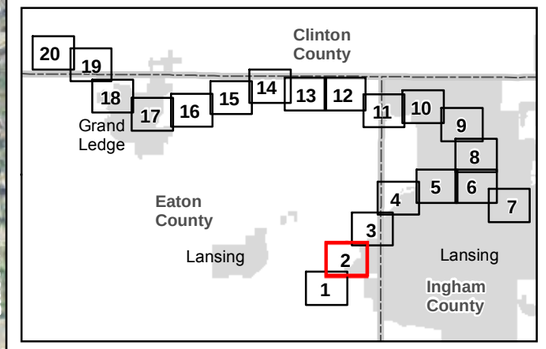
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 02
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

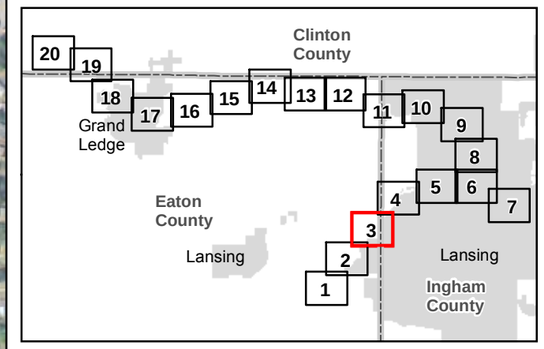
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 03
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

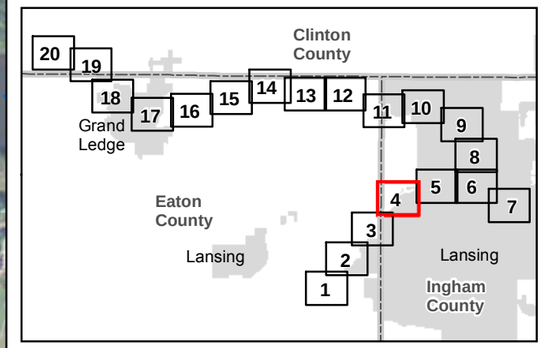
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 04
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

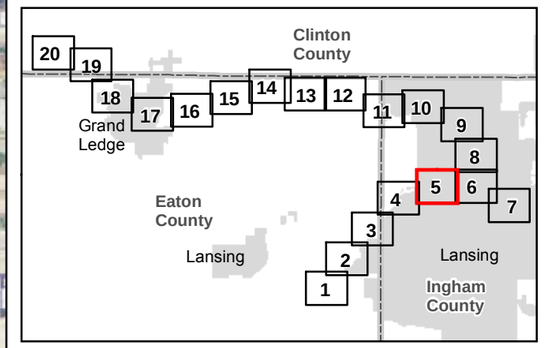
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 05
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

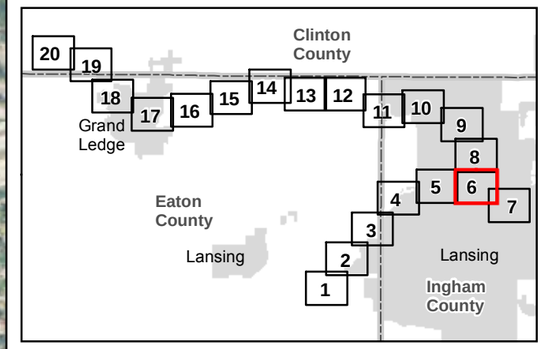
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 06
HEC-RAS CROSS SECTIONS
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

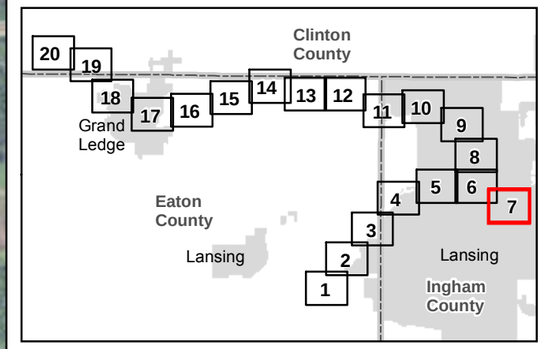
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 07
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

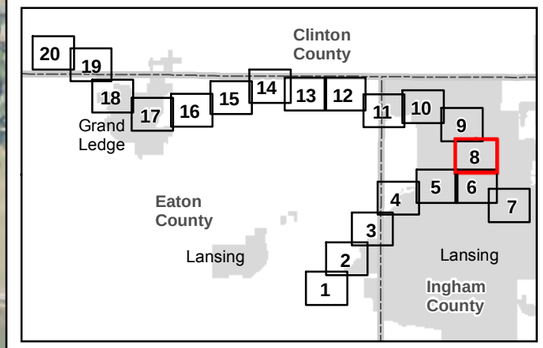
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 08
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

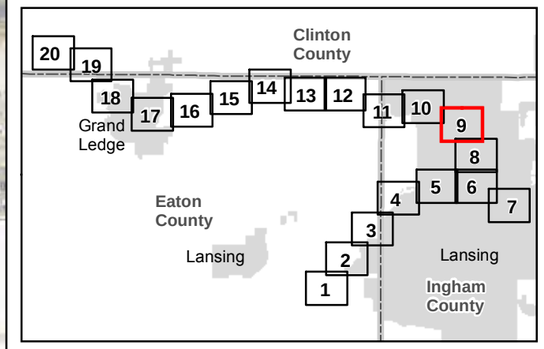
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 09
HEC-RAS CROSS SECTIONS
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

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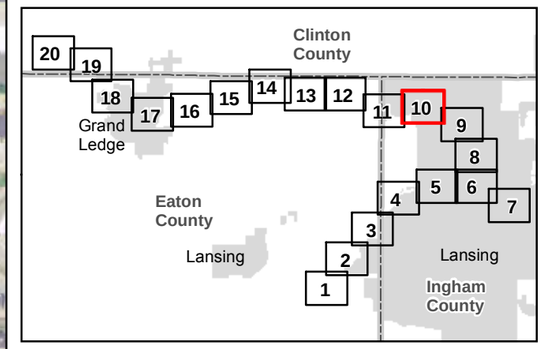
Large Figure 6 – 10
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

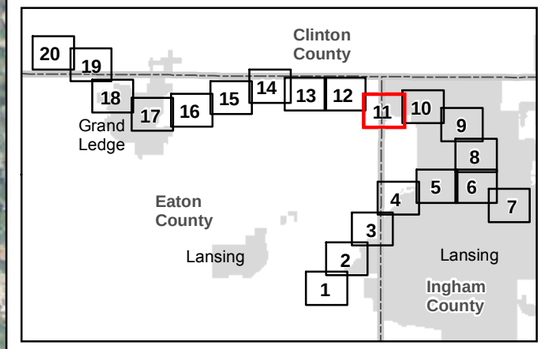
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 11
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

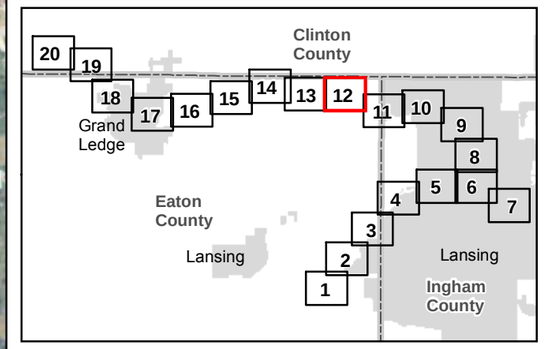
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 12
HEC-RAS CROSS SECTIONS
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

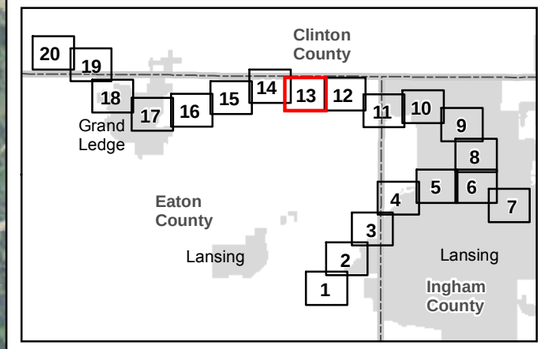
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Delta River Dr
Barnstable Ln
Clydesdale Rd
W Broadmoor Dr
E Broadmoor Dr
Carriage Hill Dr
Baywood Dr
White Oaks Dr
Eaton
County
Grand River
40
41
45
47
Attenborough Ct
Cheltingham Blvd
Sugartree Trl
Walmar Dr
Whitehaven Dr
Claremont Ct
Cawdor Ct
Walters Way
Castlebury Cir
Rockdale Ave
Bollman Dr
River Ridge Dr
Boxwood Ln
Holiday Ln
River Ct
Greenbriar Rd
Birchwood Way
Elmwood Rd
Willow Hwy
Wayland Dr
Clearview Ave
Edmund Way
Grand Woods Dr

Large Figure 6 – 13
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

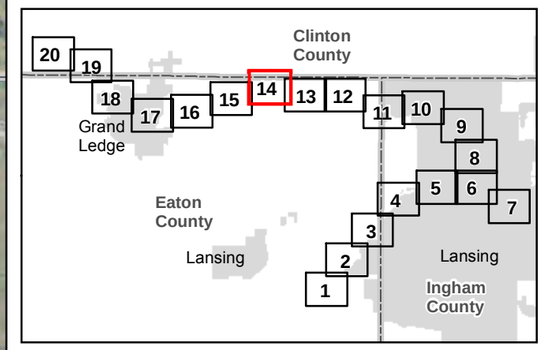
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 14
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

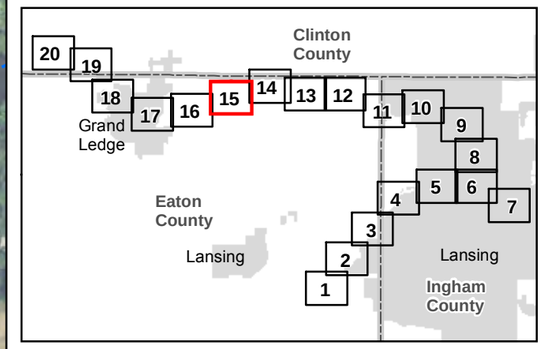
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 15
HEC-RAS CROSS SECTIONS
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

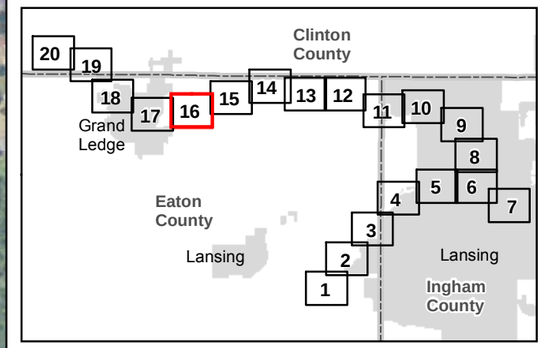
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

N River Hwy
Grand River
Eaton
County
Nixon Rd
Willow Hwy
Vista Ave
Amor Ln
Broadbent Rd
20
21
22
23
24
25

Large Figure 6 – 16
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

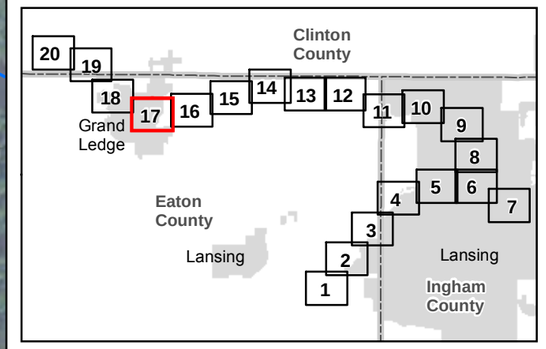
Feet
0 500 1,000 1,500

Meters
0 150 300

Bar Footer: ArcGIS 10.2, 2013-11-26 13:04 File: I:\Projects\2233\1013\Maps\For Report\Mapbooks\LorF\p06 Cross Section Alignments Manbook.mxd User: jrv

Eaton County
Grand River Dr
E Melody Ln
Sioux Dr
Chippewa Dr
Iroquois Dr
Grand Willow Dr
Crab Apple Ln
Cherry Ln
Grand Ledge
Grand River
Willow Hwy
Crescent Cir
Scofield Dr
Berner Ct
Silver Ridge Dr
Crescent Dr
Newberry Dr
Kingsgate Way
Dundee Dr
Carmel Ln
Crestline Dr
17
18
19
20
21
22

Large Figure 6 – 17
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

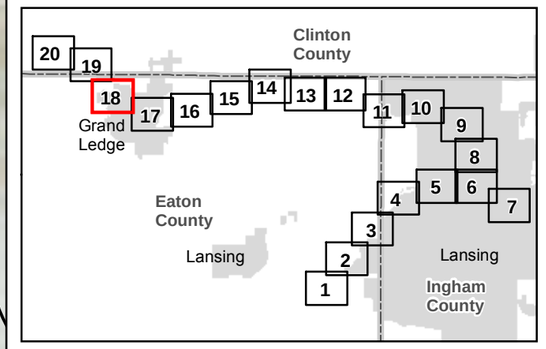
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 18
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

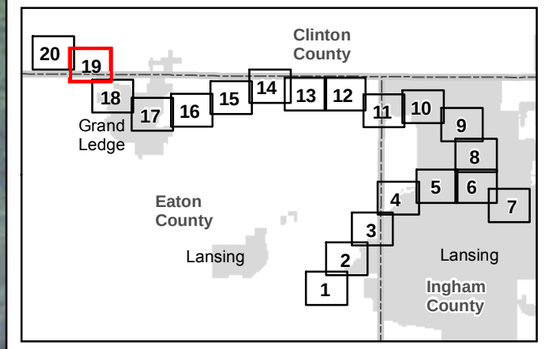
Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Barr Footer: ArcGIS 10.2, 2013-11-26 13:04 File: I:\Projects\2233\1013\Maps\For Report\Mapbooks\LrgFig06_Cross_Section_Alignments_Mapbook.mxd User: jrv

Large Figure 6 – 19
HEC-RAS CROSS SECTIONS
Moores Park Dam and North
Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

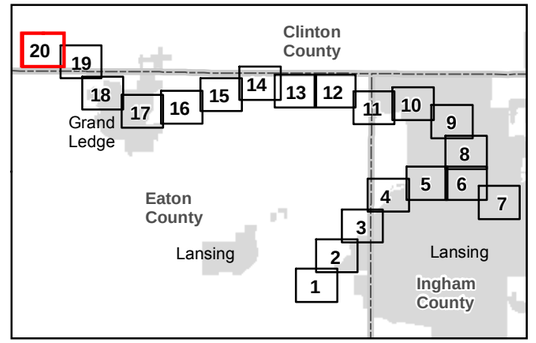
- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300

Large Figure 6 – 20
HEC-RAS CROSS SECTIONS
Moores Park Dam and North Lansing Dam Break Model
Lansing Board of Water and Light
November 2013



EXPLANATION

- Model Cross-Section Alignment
- Dam
- River Centerline
- Corporate Limits
- County Boundaries

Imagery Source: NAIP, 2013

Feet
0 500 1,000 1,500

Meters
0 150 300