

**PURPOSE AND NEED  
FOR THE  
VROOMAN ROAD BRIDGE REPLACEMENT PROJECT**

**PERRY AND LEROY TOWNSHIPS, LAKE COUNTY, OHIO**

**(PID 5669)**



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**REVISED** – September 9, 2010

# **PURPOSE AND NEED**

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**September 9, 2010**

## PURPOSE AND NEED

The purpose of this project is to replace the existing, structurally-deficient and functionally-obsolete Vrooman Road Bridge (SFN 4337107) over the Grand River, that regularly closes during flood events with a bridge and roadway facility that meets current design standards and improves existing geometrics correcting existing roadway geometric deficiencies, while providing a safe, efficient route.

The existing Vrooman Road Bridge (SFN 4337107) is a structurally-deficient and functionally-obsolete bridge that regularly closes during flood events. The existing roadway approaches to the bridge are characterized by numerous geometric deficiencies, which can be directly linked to high accident rates at various points along the roadway. The existing Vrooman Road and SR-84 intersection is characterized by numerous geometric deficiencies, which can be directly linked to high accident rates at the intersection.

The Vrooman Road Bridge (SFN 4337107) has been identified as a structural deficient and functionally obsolete bridge in the studies listed below. Complete copies of these reports are available for review in the Lake County Engineer's Office (LCEO) project file and were include in Appendix B of the *2005 Vrooman Road Planning Study – LAK-Vrooman Road PID #5669*, TranSystems, Inc., December 2005 (Updated January 2007 and May 2008 by Michael Baker Corporation).

- *2002 Physical Condition Report – Vrooman Road Bridge Over the Grand River, SFN 4337107, Leroy Township, Lake County Ohio*, HNTB Ohio, Inc., December 2002
- *Bridge Inspection Report – Vrooman Road Bridge Over Grand River, Perry and Leroy Townships, SFN 4337107*, Richland Engineering Limited, August 2006

The ODOT BR86 Bridge Inspection Form in the *2002 Physical Condition Report – Vrooman Road Bridge Over the Grand River, SFN 4337107, Leroy Township, Lake County Ohio* (HNTB Ohio, Inc.) rated the Vrooman Road Bridge with a General Appraisal of 4 (Poor Condition – advanced section loss, deterioration, or spalling) and an Operational Status of P (Posted for load-carrying capacity restriction – may include other restrictions).

The ODOT BR86 Bridge Inspection Form in the August 2006, *Bridge Inspection Report – Vrooman Road Bridge Over Grand River, Perry and Leroy Townships, SFN 4337107* (Richland Engineering Limited) rated the Vrooman Road Bridge with a General Appraisal of 3 (Serious Condition – loss of section, deterioration, , or spalling have seriously affected primary structural components. Local failures or cracks in concrete or both may be present) and an Operational Status of X (Bridge closed for reasons other than condition or load-carrying capacity). The Operational Status of X was appropriate in the August 2006 inspection report because the bridge was closed as the result of the July 2006 Flood of the Grand River Valley. The bridge structure was inundated by the flood and large amounts of debris was entangled with the superstructures and trapped against the substructure. The bridge was reopened in December

2006 with the appropriate Operational Status of P (Posted for load-carrying capacity restriction – may include other restrictions).

The Vrooman Road approach roadway and the Vrooman Road / SR-84 intersection have geometric deficiencies that have been identified in the study listed below. Complete copies of this report are available for review in the Lake County Engineer's Office (LCEO) project file.

- *2005 Vrooman Road Planning Study – LAK-Vrooman Road PID #5669*, TranSystems, Inc., December 2005 (Updated January 2007 and May 2008 by Michael Baker Jr., Inc.).

## **INTRODUCTION:**

The Vrooman Road Bridge over the Grand River (SFN 4337107) is located in Perry and Leroy Townships, Lake County Ohio. The bridge is a two-span steel Warren Polygonal pony truss structure built in 1952. The bridge has an overall structure length of approximately 179'- 4" with each span approximately 88' - 4" center-to-center of truss bearing. The trusses are spaced 23'-0" +/- center-to-center. The existing superstructure bears on stone abutments dating from the previous bridge crossing built in 1879. A galvanized steel guardrail has been attached to the interior of the truss verticals, effectively reducing the roadway opening. In 1980 the structure underwent a major rehabilitation with the removal and replacement of the original timber deck and steel stringers with a new timber deck and asphalt wearing surface.

The bridge is currently posted with a 16 ton load limit. While the bridge is posted for no trucks, it is still regularly used by school buses and some emergency vehicles. Large vehicles are often trapped on the bridge when attempting to negotiate the sharp horizontal approach curves.

The bridge is located within the Grand River flood plain and the bridge deck is below the 100-year flood elevation. In 2006, the bridge was closed for approximately 5 months as a result of a single flood event with water levels over the 100-year flood elevation.

Vrooman Road is classified by NOACA as an urban arterial. Vrooman Road provides access to Perry and Leroy Townships, as well as southeastern Painesville from Interstate 90 (I-90). The north end of Vrooman Road is State Route 84 (South Ridge Road), in Perry Township. The south end of Vrooman Road is the five-point intersection of State Route 86 and County Roads 208 (Leroy Center Road) and 210 (Huntoon Road) in Leroy Township (**Figures 1 and 2**). The Vrooman Road Study Corridor begins at I-90, which crosses Vrooman Road east to west at a full service interchange within Leroy Township. This interchange was constructed along with I-90 in the early 1960's and was located specifically to provide access to the southeastern Painesville area. The vehicle traffic on Vrooman Road Bridge consists of cars and light truck traffic, commuter traffic, and other vehicular traffic.

The Grand River, a State designated Wild River utilized for non-motorized recreational use, is the centerpiece of a steep-sided, narrow valley crossed by Vrooman Road north of I-90,

adjacent to the Lake Metroparks' Indian Point and Mason's Landing Parks located just south of State Route 84 (Figure 3 and 4).



Figure 1. Map of the state of Ohio, showing the Project Area in relation to drainage areas and county boundaries (ODNR 2004).

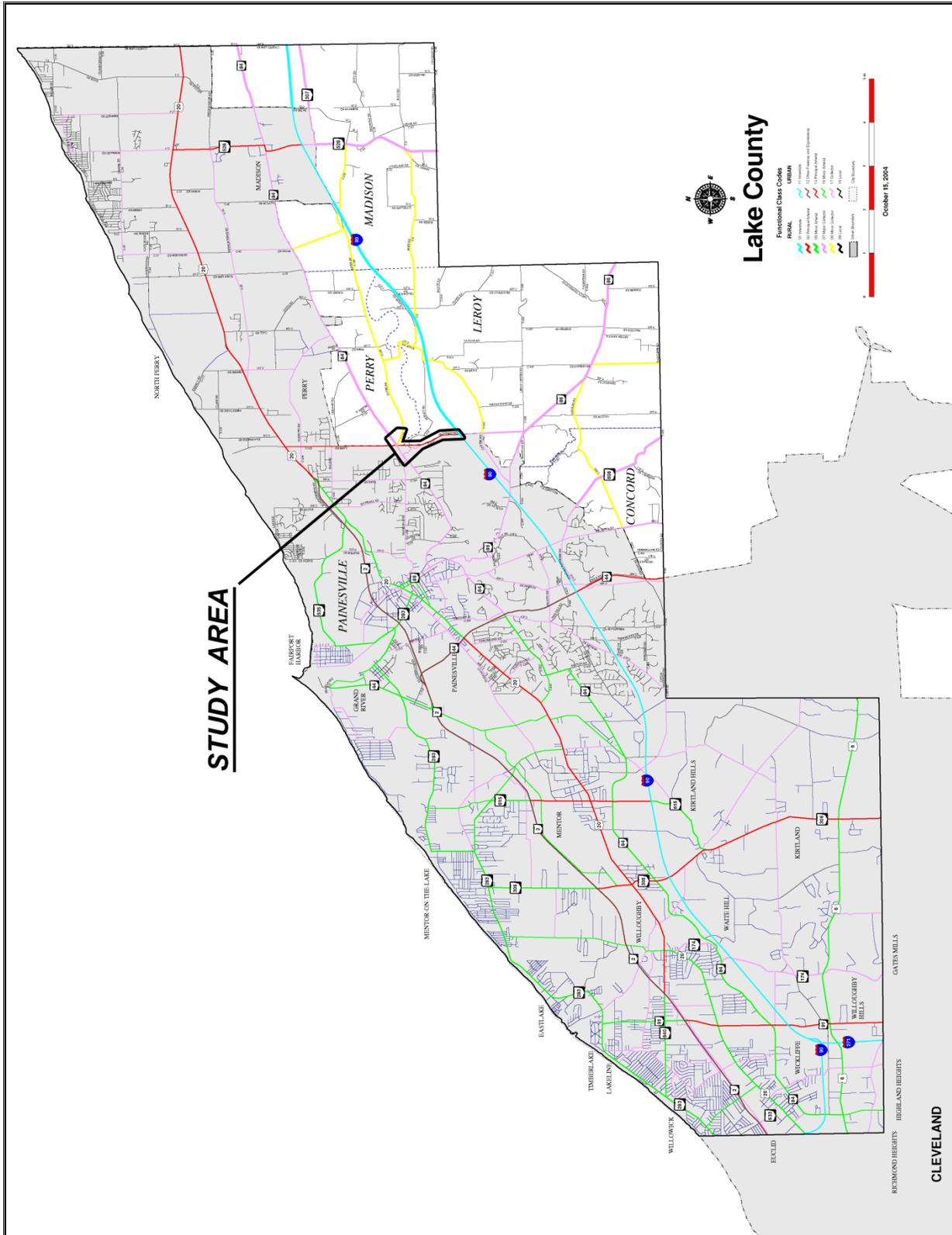


Figure 2. Map of Lake County, Ohio, showing the project's Study Area (ODOT 2004).

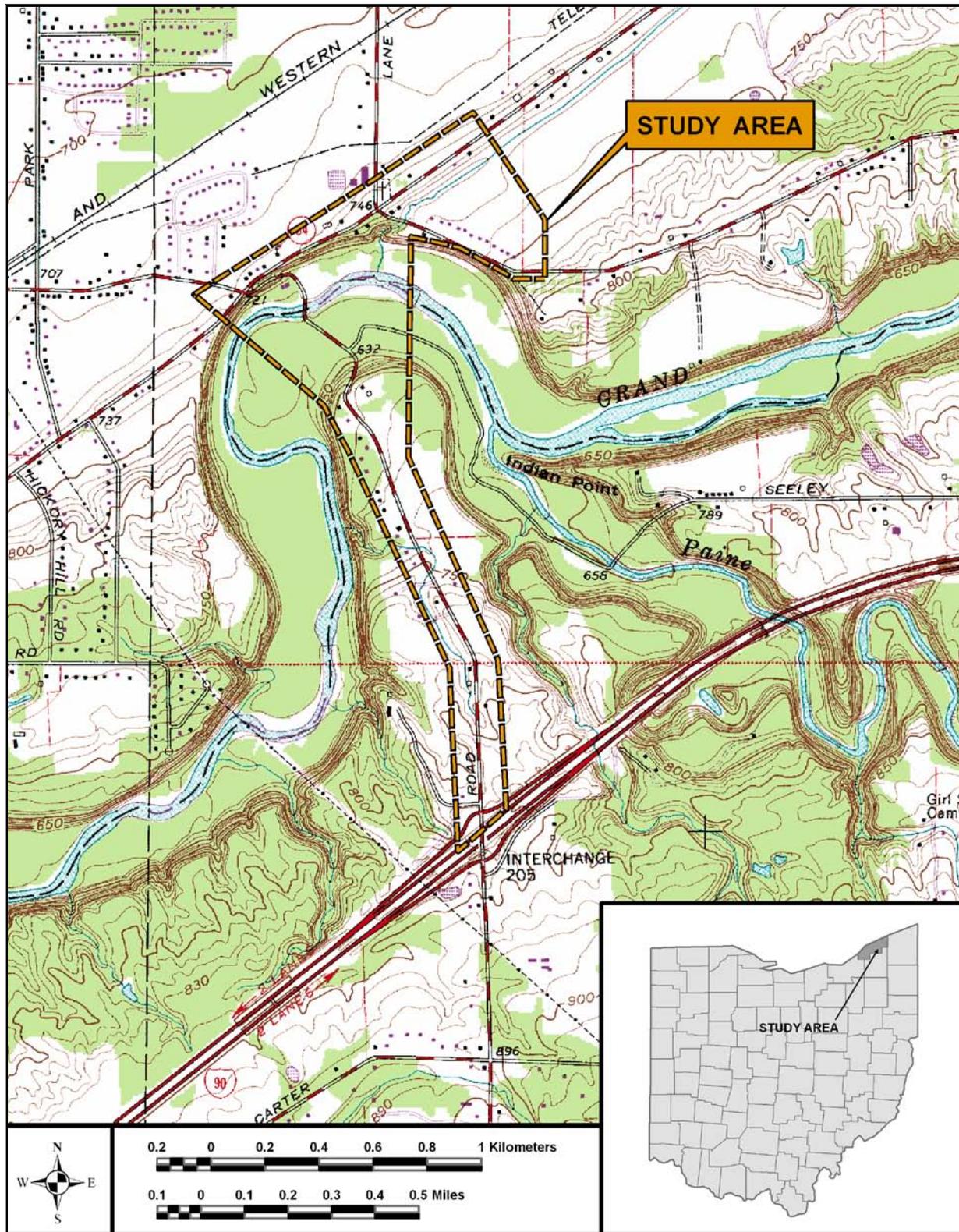


Figure 3. Location of the project's Study Area in Lake County, Ohio, from the USGS 1960 (photo revised 1985) Painesville, Ohio quadrangle.

Possible improvements to Vrooman Road have been proposed and studied in various forms since construction of the existing bridge. These studies were prepared to address the same issues faced today. They also were completed to evaluate feasible solutions to utilize the I-90 / Vrooman Road interchange for its intended purpose of providing connectivity between Southeast Painesville and I-90. These reports including the following:

*Conceptual Engineering Report by Carroll V. Hidl & Assoc. for the Lake County Planning Commission, dated October, 1957*

*State Highway Department Report, dated February 29, 1960*

*Capitol Engineering Report for the LCEO, dated May 10, 1963*

*Capitol Engineering Report for the LCEO, dated October 15, 1963*

*Ohio Department of Highways, Preliminary Engineering Report, March 1968*

*CT Consultants Vrooman Road North Improvement Report, July 1984*

Improvements contemplated by these reports were not advanced through design and construction due to lack of funding in the highway program in the late 1960's.

The project was resurrected in the mid 1980's with the advancement of new replacement studies completed by CT Consultants for the LCEO. These Studies include previous engineering and environmental investigation and studies initiated in the early 1990's. The project proceeded into the environmental clearance phase until Native American burial sites were identified within the project limits by the environmental studies. The project was then suspended pending additional studies of this important cultural resource. The project was subsequently delayed due to lack of funding.

The events of September 11, 2001 heightened the awareness of the need for safe and efficient transportation routes and infrastructure. As such, the project was revived in 2003 to provide a direct north-south route from northern Lake County to I-90. The need to address Vrooman Road's many deficiencies, along with renewed interest in providing a better transportation route led to the LCEO to evaluate deficiencies along Vrooman Road (County Road 227) between State Route 84 (SR-84) and I-90 in Lake County, Ohio, and preparing a planning study to identify the Preferred Alternative for replacement.

This planning study was initiated to follow ODOT's Project Development Process (PDP) guidance and follow ODOT's Planning Study Process. As such, the study meets the intent of Steps 1 through 4 of the current PDP for Major Projects (the project has since been reclassified to follow the Minor PDP). The objectives of this study were to perform in-depth analysis of deficiencies in the roadway corridor, explore replacement alternatives for the structurally deficient Vrooman Road Bridge, and recommend a Preferred Alternative for further

development. Literature review and field review information gathered during this step was included in the Red Flag Summary and Mapping in Appendix D of the Planning Study.

This Vrooman Road Planning Study served to document the results of the project's preliminary engineering and environmental studies, the Draft Purpose and Need, the Existing and Future Conditions Report, the Planning Study Report/Strategic Plan, and the Public Involvement Plan activities, goals, and results.

### **2004 Public Involvement Process**

The Vrooman Road January 2004 Public Involvement Plan was created to distribute information and to solicit input. The Public Involvement Plan summarized how two-way communication would be maintained throughout the Vrooman Road Planning Study and outlined the purpose of public involvement activities:

- Educate the public and decision-makers about the study process and their role within it
- Solicit input on the problems that the study should be designed to solve
- Provide information on the needs identified during the technical analysis
- Solicit input on the alternatives that should be considered
- Provide information on the potential impacts and benefits of each alternative
- Solicit input on the recommended solution
- Provide information on the chosen solution and rationale used in decision-making

### ***Stakeholder Committee***

In accordance with ODOT's PDP, the project's Stakeholder Committee was assembled to provide a group of individuals representing various viewpoints and perspectives to be involved in regular progress meetings, providing input and feedback to the study team from the group or agency they represent. The purpose was to create a mutual understanding between the Project Team and Stakeholders concerning the problem to be addressed, the "critical success factors" for any solution and the process to be followed in analyzing and evaluating solutions. Inclusion of all stakeholders was intended to secure their understanding of and "buy-in" to not only the process and the issues, but also the results.

In 2004, the Project Team worked with the LCEO and ODOT to identify appropriate representatives for the Stakeholder Committee. The Project Team contacted these individuals by letter to explain the study, request their involvement, and invite them to the first Stakeholder Committee meeting. A total of six stakeholder meetings were held throughout the Vrooman Road Planning Study.

Stakeholders included:

- Lake County Engineer's Office (LCEO)
- Local Fire and Safety Officials
- Local business owners or community groups
- County Administration

- County Planning and Zoning
- County's Project Manager
- Lake County Metroparks
- Northeast Ohio Area-wide Coordinating Agency (NOACA)
- Ohio Department of Transportation (ODOT)
- Ohio Department of Natural Resources (ODNR)
- Federal Highway Administration (FHWA)
- Communities of Perry, Painesville, Madison, and Leroy Townships

As other citizens and business owners expressed interest, they were included, as appropriate. Residents along River Road and on SR-84 became involved subsequent to the July 2004 Public Involvement Meeting. A complete list of stakeholders and details of public involvement at each stage are included in the appropriate sections of Planning Study. A project mailing list of all stakeholders, residents, property and business owners, and interested citizens was kept current throughout the progress of the planning study and project. This list was used to notify these entities and individuals of the July 2004 Public Involvement Meeting. The intent of this general public meeting was to present the conceptual alternative solutions under consideration and solicit feedback from citizens.

### ***Stakeholder Meeting Goals and Objectives***

A total of six Stakeholder Committee Meetings were held during 2004 and early 2005.

- Stakeholder Committee Meeting – 1 (January 21, 2004)
- Stakeholder Committee Meeting – 2 (February 11, 2004)
- Stakeholder Committee Meeting – 3 (March 31, 2004)
- Stakeholder Committee Meeting – 4 (June 9, 2004)
- Stakeholder Committee Meeting – 5 (July 28, 2004)
- Stakeholder Committee Meeting – 6 (February 16, 2005)
- Stakeholder Committee Meeting – 7 (November 12, 2009)

Stakeholder Committee Meeting – 1 f was held on January 21, 2004. During this initial meeting, the Project Team explained the purpose of the study, the planning study process, and the role of the Stakeholder Committee in conjunction with the project. The Project Team solicited input from the group concerning their perception of the situation, the nature of the problems to be solved, and the factors that would define success. This information was used by the LCEO to develop a project Problem Statement outlining the definition of the problem to be solved and the desired project goals for the Vrooman Road Project.

## Project Problem Statement

### **The Vrooman Road Project will:**

- Provide acceptable traffic operation for future traffic volumes;
- Correct identified accident problems;
- Eliminate flooding of a new bridge spanning across Grand River;
- Reduce dangerous current steep grade near Vrooman's intersection with State Route 84.
- Accommodate transit needs; improve safety for truck travel;
- Provide safe and good access to Perry Township and northern Lake County providing unrestricted weight limits;
- Eliminate or avoid current geotechnical problems near Vrooman's intersection with State Route 84;
- Provide an aesthetically pleasing bridge to complement the scenic Grand River;
- Minimize short and long term impacts on the Grand River;
- Try to implement an alternative transportation plan (for pedestrians and bicyclists) without using funds from license plate and gas funds;
- Bring bridge up to standards;
- Keep utilities along Vrooman Road consistent with future plans and minimize the impacts thereof.

The problem statement and project goals were used by the LCEO to develop the Purpose and Need statement; develop, evaluate, and refine conceptual solutions and feasible alternatives; select the Preferred Alternative; and guide technical studies.

As part of Stakeholder Committee Meeting # 2, held on February 11, 2004, the Draft Purpose and Need Primary and Secondary Goals were developed by the LCEO. The LCEO explained that the Purpose and Need was a document that establishes the needs that the project is intended to address; used to justify impacts; manage controversy; coordinate and communicate with stakeholders; establishes project termini; and provides the basis or foundation with which to evaluate the alternatives. Those alternatives that do not meet the primary needs of the project may be eliminated from further consideration as part of the study. The Purpose and Need is not final until approved in the NEPA document, and may be refined throughout the PDP.

The Stakeholder Committee identified primary needs of concern and secondary goals to use in the development of the project's Purpose and Need. The LCEO refined the project's problem statement into the Purpose and Need Goals, including both primary and secondary goals. The primary project goals identify major issues that need to be addressed by an alternative in order for it to satisfy the Project Purpose and Need. Secondary project goals are desirable objectives that may be met if they can be reasonably accommodated. These goals were developed into the Project Purpose and Need Statement by the LCEO.

The Stakeholder Committee's expressed primary needs or concerns include:

- Improve the bridge condition

- Eliminate safety and community impacts associated with closure of Vrooman Road due to flooding
- Eliminate existing geometric deficiencies (steep grade, substandard curves)

The Stakeholder Committee's expressed secondary project goals include:

- Reduce number of accidents
- Reduce maintenance problems associated with slope adjacent to Vrooman Road at SR-84
- Provide acceptable traffic operation for future traffic volumes
- Accommodate transit needs/school transportation
- Provide an aesthetically pleasing bridge to complement the scenic Grand River;
- Minimize short and long term impacts on the Grand River;
- Accommodate pedestrians and bicyclists
- Accommodate future plans for utilities along Vrooman Road

The Stakeholder Committee recommended that alternatives should not be discarded based upon failure to meet secondary project goals; however, these factors should be considered if possible in the evaluation of alternatives, along with other criteria such as impacts on residences and communities, consistency with local development goals, cemeteries, park property, historic and archaeological resources, streams, floodplain, and project cost.

#### **PROJECT PURPOSE:**

The Purpose of this project was developed based on the results of the technical analysis and input from the project's Stakeholder Committee. The current Vrooman Road Bridge is a structurally-deficient and functionally-obsolete bridge that regularly closes during flood events, while the existing roadway and bridge approaches exhibit numerous geometric and roadway deficiencies.

## Project Purpose

The purpose of this project is to replace the existing, structurally-deficient and functionally-obsolete Vrooman Road Bridge (SFN 4337107) over the Grand River, that regularly closes during flood events with a bridge and roadway facility that meets current design standards and improves existing geometrics correcting existing roadway geometric deficiencies, while providing a safe, efficient route.

### **The primary Purpose of the Vrooman Road Project is to:**

- Provide a structurally sufficient crossing of the Grand River that meets the current design standards
- Improve the existing geometrics and correct existing roadway deficiencies

### **Secondary goals of the Vrooman Road Bridge Project are:**

- Reduce maintenance problems and safety concerns associated with slope adjacent to Vrooman Road at SR-84
- Provide an acceptable level of service for existing and design year traffic volumes.
- Reduce number of accidents

## **PROJECT NEED:**

### **Bridge Condition**

The Vrooman Road Bridge (SFN 4337107) is a structurally deficient and functionally obsolete low-level bridge that carries Vrooman Road over the Grand River. The bridge is a two-span steel Warren Polygonal pony truss structure built in 1952. The bridge has an overall structure length of approximately 179'- 4" with each span approximately 88' - 4" center-to-center of truss bearing. The trusses are spaced 23'-0" +/- center-to-center. The existing superstructure bears on stone abutments dating from the previous bridge crossing built in 1879. A galvanized steel guardrail has been attached to the interior of the truss verticals, effectively reducing the roadway opening. In 1980 the structure underwent a major rehabilitation with the removal and replacement of the original timber deck and steel stringers with a new timber deck and asphalt wearing surface.

The bridge is currently posted with a 16 ton load limit. While the bridge is posted for no trucks, it is still regularly used by school buses and some emergency vehicles. Large vehicles are often trapped on the bridge when attempting to negotiate the sharp horizontal approach curves.

The superstructure bears on stone abutments dating from the previous bridge crossing. The stone abutments have a concrete abutment cap that the bridge rests on. The south abutment was reinforced with steel sheet piling in the 1990s to stabilize shifting masonry units. Three of the four stone wingwalls have been retained from the previous bridge crossing, with the southeast wing wall constructed from steel sheet pile. The existing abutments have exhibited deterioration due to scour during flood events and remain susceptible to scour.

The current weight limit of 16 tons is too low to allow standard emergency vehicles to traverse the bridge safely. If prompt attention is to be given to emergencies, it is imperative that standard emergency vehicles are able to cross the bridge safely. The current bridge is unacceptable for this purpose because of the load limit and geometric constraints. (2008 Vrooman Road Updated Planning Study).

The bridge is located within the Grand River flood plain and the bridge deck and approach roadways are below the 100-year flood elevation. See **Figures 4A and 4B**. Over the last 5 years, the bridge and Vrooman Road have been closed on average 2 to 3 times annually in the spring and/or fall, with the typical closure lasting 1 to 2 days. In 2005 the bridge was closed 4 times. In 2006 the bridge was closed from July to December due to extensive damage to the bridge and approach roadway caused by severe flooding of the Grand River. Following a flood event and bridge closure, debris and mud needs to be removed from Vrooman Road, the approaches, and often from the bridge, the abutments and the center pier. This long-term exposure to flooding has resulted degradation to the bridge members and an increase in maintenance and associated cost to the bridge.

In the 2002 *Physical Condition Report* (HNTB Ohio Inc.), the Vrooman Road Bridge was rated a 4 (poor condition) on a scale from 1 (that could assume an imminent failure condition), to 9 (excellent condition). This overall rating is mainly due to the condition of the superstructure (steel trusses, rated as 4), the condition of the substructure (stone abutments rated as a 5) and the condition of the deck (roadway, rated as 6). The condition of all parts of the bridge was reported, as presented in **Table 1**.

**TABLE 1: VROOMAN ROAD BRIDGE CONDITION**

Bridge Parts	2002 Condition*			2006 Condition**		
	Good	Fair	Poor	Good	Fair	Poor
Bearings			X			X
Channel and Scour		X			X	
Wearing Surface & Floor	X				X	
Floor Beam Connections			X			X
Floor Beams		X			X	
Lower Lateral Bracing			X			X
Abutments, Abutment Seats and Backwalls		X			X	
Pier and Pier Seat		X			X	
Trusses		X			X	
Railing		X				X
Wingwalls		X			X	

\* 2002 Physical Condition Report, HNTB Ohio, Inc.

\*\*2006 Physical Condition Report, Richland Engineering, Ltd.

In a *2006 Bridge Inspection Report* (Richland Engineering, Ltd.), the Vrooman Road Bridge was rated a 3 (serious condition) on a scale from 1 (that could assume an imminent failure condition), to 9 (excellent condition). This overall rating is mainly due to the condition of the superstructure (steel trusses, rated as 3), the condition of the substructure (stone abutments rated as a 5) and the condition of the deck (roadway, rated as 5). The condition of all parts of the bridge was reported, as presented in **Table 1**:

### **Closure Due to Flooding**

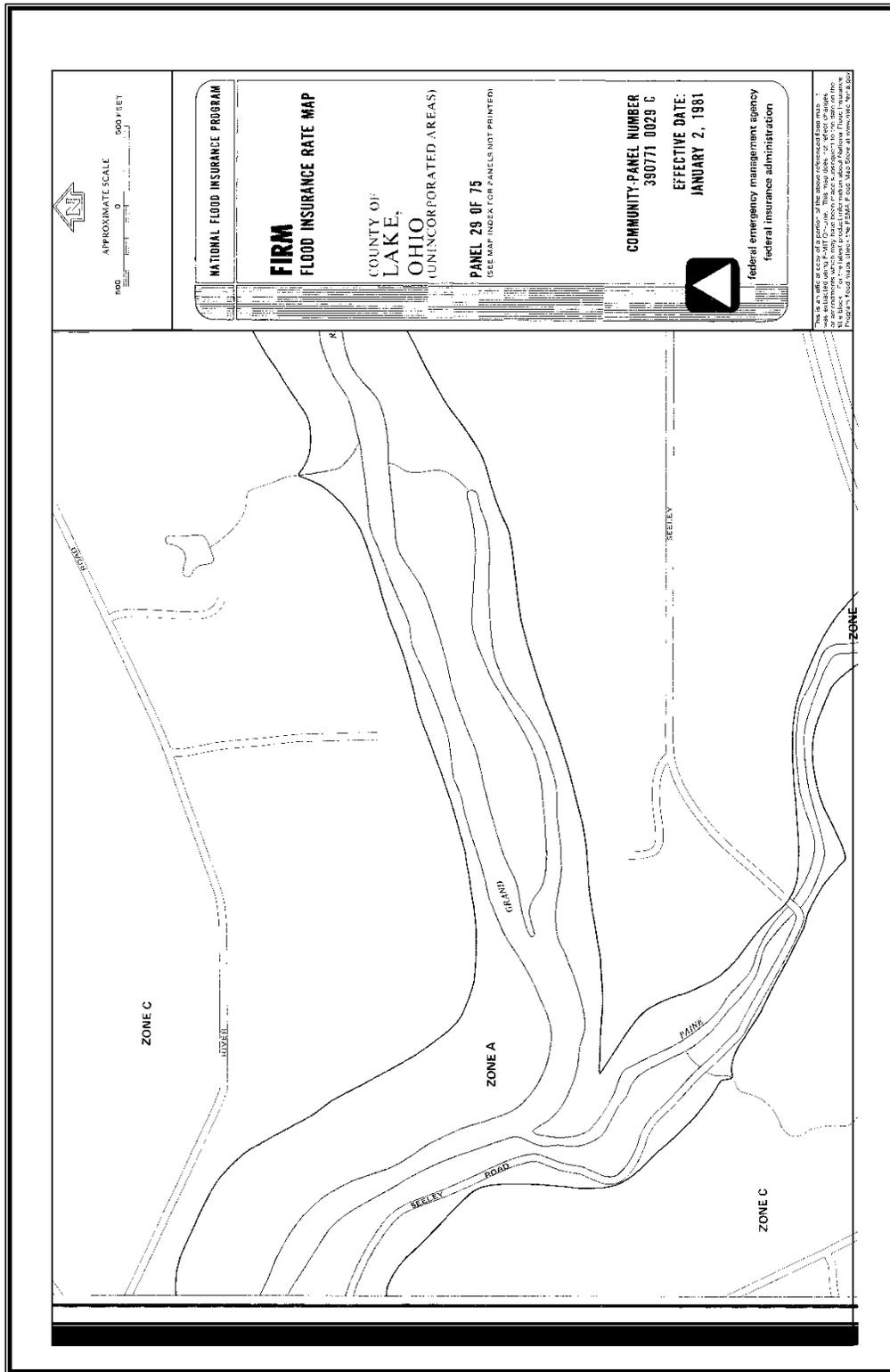
The Vrooman Road Bridge represents a recurrent maintenance problem for the Lake County Engineer. The maintenance issues are due in part to the bridge structure being below the 100-year flood elevation and subject to repeated flooding. The bridge and Vrooman Road have been closed on average 2 to 3 times annually over the last 5 years in the spring and/or fall (total 10-15 times), with the typical closure lasting 1 to 2 days. Flooding is more prevalent during the months of April through May and October through November as a result of winter thaw and increased rainfall, respectively. The Lake County engineer reports that this route was closed 4 times for over 20 days in 2005. The Vrooman Road Bridge was closed in July, 2006 to December, 2006, due to severe damage to the approach roadway and possible scour damage to the substructure resulting from an extreme flood event. Several times a year, the river empties its banks and floods the approaches, forcing closure. Following a flood event and bridge closure, debris and mud needs to be removed from the Vrooman Road, the approaches, and often from the bridge, the abutments and the center pier. When the Vrooman Road Bridge is closed, the nearest alternative crossings of the Grand River are Blair Road, located approximately 2 miles to the east; and SR-84 located approximately 4 miles to the west. National Flood Plain maps are included as **Figures 4A and 4B**.

Normal water surface elevation for the Grand River under the Vrooman Road Bridge (SFN 4337107) is 628.3 +/- . The 25 year flood level elevation is 641.02, and the 100 year flood level elevation is 641.66. Refer to Figures 6A and 6B. Existing roadway elevation at the crossing is approximately 641.0. Existing low point elevations (sumps) in the approach roadway to the north and south of the bridge are approximately 632.0 and 631.0, respectively.

The minimum profile for a replacement structure would need to be established so that the low structure elevation would provide one foot of freeboard above the 25 year flood level. So the low structure elevation would need to be above elevation 642.02. Structure depth would then determine the roadway profile elevation. Structure depth is a function of span length and span arrangement. The minimum structure depth for a 240' continuous span structure would be in the range of 7.75' to 9.00'. This would then establish the required low profile elevation somewhere between 649.75 and 651.00, representing a change in profile grade elevation of at least 10' on the approaches and at least 8.75' at the bridge. Current design criteria prohibit a profile that allows the approaches to flood.



FIGURE 4B: FLOOD PLAIN MAP



### **Existing Roadway Deficiencies**

Vrooman Road is classified as an Urban Arterial/Collector within the Project Limits. Replacement of the Vrooman Road Bridge will necessitate the replacement of the approach roadways to meet current design standards. Each approach has inadequate geometrics, steep grades, unacceptable curves and poor sight distance as compared to applicable roadway standards for its functional classification. The north approach is flanked by a retaining wall that accommodates the differences in grade between SR-84 and Vrooman Road. The retaining wall itself is in poor condition and has exhibited signs of movement. The cost of maintaining this wall is escalating each year. The replacement of the Vrooman Road Bridge will require that the approach roadways be replaced to meet the design requirements for an Urban Arterial/Collector roadway.

The existing roadway is approximately 30' wide including two 10'-6" lanes and 4'-6" graded shoulders. The paved shoulder width is approximately 1'-6". Existing roadway conditions are shown in **Photographs 1 through 14**. The LCEO estimates that the stretch of Vrooman Road within the Project Study area requires approximately \$75,000 more in annual maintenance costs than similar lengths of non-deficient roadway. Additional costs are attributable to: increased salting and plowing because of steep grades; special pavement and drainage treatments because of steep grades; repair costs resulting from flooding; guide rail maintenance costs resulting from high number of accidents; and costs associated with closing, cleaning and reopening the road during flood events. ODOT maintenance personnel indicate that no above normal maintenance is required on SR-84 within the Project Limits.

The following photographs document some of the existing roadway conditions and deficiencies:



Photograph 1 - Vrooman Road south of the existing bridge, looking south west.



Photograph 2 - Vrooman Road Bridge and the southern approach, looking north.



Photograph 3 - Vrooman Road south of the existing bridge, looking southeast. Seeley Road is on the left side of Vrooman Road.



Photograph 4 - Vrooman Road at the intersection of Seeley Road, looking south. The intersection is at the curve at the bottom of the hillside.



Photograph 5 - Vrooman Road at the southern hillside, looking southwest. Approaches to Vrooman Road Bridge are characterized by steep grades and curving alignment.



Photograph 6 - Vrooman Road at the top of the southern hillside, looking south.



Photograph 7 - Vrooman Road Bridge at the northern approach, looking northwest.



Photograph 8 - Vrooman Road north of the Vrooman Road Bridge, looking northwest. This section of Vrooman Road includes the entrance to Mason's Landing Park on the left and the bottom of the northern hillside, from SR-84 in the background.



Photograph 9 - Vrooman Road at the bottom of the northern hillside looking southeast. Vrooman Road Bridge is in the background and Mason's Landing Park entrance on the right.



Photograph 10 - Vrooman Road at the base of the northern hillside, looking northwest. This curve in the road is at the bottom of a steep grade.



Photograph 11 - Vrooman Road at the bottom of the northern hillside, looking west. The retaining wall is on the left side of the roadway.



Photograph 12 - The intersection of SR-84, Vrooman Road, and Madison Avenue at the top of the northern hillside, looking northeast. Note poor intersection geometry.



Photograph 13 - The intersection of SR-84, Vrooman Road, and Madison Avenue at the top of the northern hillside, looking west along Madison Avenue.



Photograph 14 - The intersection of SR-84, Vrooman Road, and Madison Avenue at the top of the northern hillside, looking south west along SR-84.



Photograph 15 - The southern approach roadway to the, looking north along Vrooman Road.

### **Geometrics**

Vrooman Road passes through the Grand River Valley between I-90 and SR-84. The Valley is flanked by steep sided shale cliffs that constrain the geometrics of Vrooman Road. On the southern, more gradual slope of the Grand River Valley, Vrooman Road is forced to traverse a series of curves into the valley bottom; while on the northern end, the roadway makes a sharp turn north of the bridge and then continues up a steep slope to the SR-84 intersection at a considerable grade. This section of Vrooman Road is classified by ODOT as an Urban Arterial/Collector with a design speed of 45 MPH.

### **Grade**

The acceptable grade for Vrooman Road given its classification and description as a level road in the ODOT's *Location and Design Manual Volume I* is an 8% grade. Currently, Vrooman Road has a 12% grade on the south side of the Grand River Valley and a 15% grade on the north side. The steep grades make it difficult for motorists with standard transmission vehicles to operate the vehicle safely and properly on the hills, especially at the intersection with SR-84. All vehicle types are affected in poor weather conditions. Vehicles have slid backwards when forced to stop while climbing the grade north of the river in snowy or icy conditions.

The steep grade also lends itself to problems concerning sight distance to the bridge. A driver approaching the Vrooman Road Bridge is unable to see it until they are almost upon it, making a dangerous approach for motorists traveling southbound from SR-84. This becomes a problem if the bridge or roadway is too icy, if there is an accident, or any other obstruction on the bridge or roadway. Further, during the summer months when the Indian Point's and Mason's Landing

Parks have the most visitors, issues with poor sight distance pose a danger for pedestrians and bicyclists utilizing the road.

**Alignment (Horizontal Curves)**

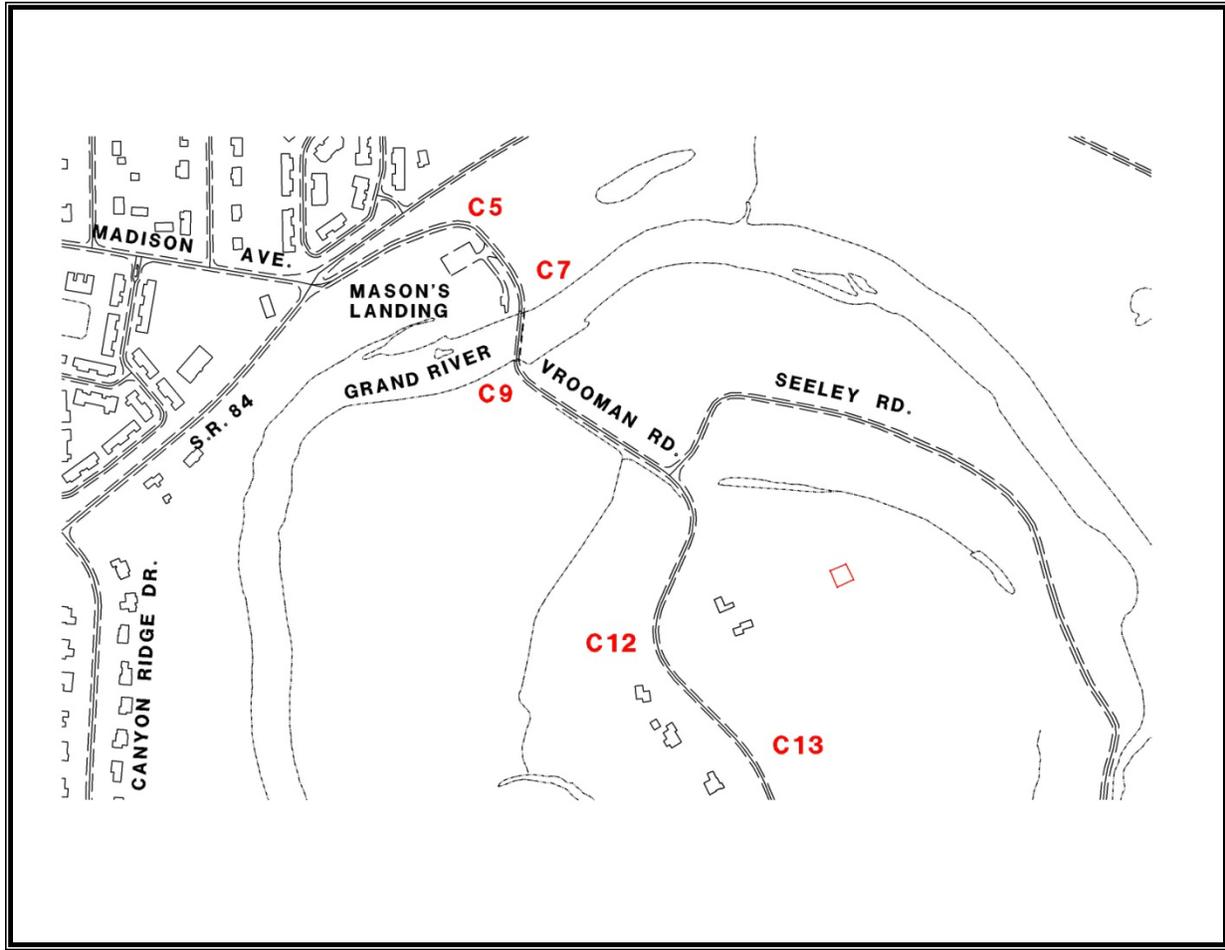
Horizontal curves near the Grand River Valley on the north side approaching State Route 84 are presented in **Table 2**:

**TABLE 2: HORIZONTAL CURVES**

Curve	Existing		Minimum Acceptable		Check
	D <sub>c</sub>	Radius (Feet)	D <sub>c</sub>	Radius (Feet)	Yes/No
C5	34° +/-	165 +/-	8°30'	674	No
C7	35° +/-	160 +/-	8°30'	674	No
C9	Unknown	70 +/-	8°30'	674	No
C12	26° +/-	240 +/-	8°30'	674	No
C13	9° +/-	715 +/-	8°30'	674	No

All of the five curves are below the minimum acceptable radius based on applicable design criteria for Vrooman Road as given by ODOT's *Location and Design Manual Volume I*. **Figure 5** shows the locations of the curves.

Figure 5: Map of Existing Horizontal Curve Locations



### ***Sight Distance***

The sight distance from Vrooman Road at the intersection of Vrooman Road and SR-84 is practically non-existent due to the angular approach of Vrooman Road up the Grand River Valley. The proper site distance for a left turn is 500 feet and for a right turn is 430 feet as given in the Ohio Department of Transportation's *Location and Design Manual Volume I*.

The extreme grade on the approach makes mathematical calculations of site distance difficult to perform, but estimates of the existing sight distance were developed based upon field observations. If traffic were to stop at the stop bar, sight distance to the right would be an estimated 50', as the driver must look up and over their right shoulder through guiderail to see oncoming traffic. This is further limited if vegetation has grown up near the guiderail. Pulling up beyond the stop bar to be at SR-84 is dangerous because the vehicle would then be in traffic, but the driver would only be able to see approximately 150'. To the left, the driver can see only about 130' along eastbound SR-84, but that would be limited by vegetative growth as well.

### **Retaining Wall**

A retaining wall is located on the north side of the Grand River Valley along the south side of Vrooman Road and roughly parallel to SR-84. This wall was constructed in or around 1972, and is approximately 250' long and 25' high. The wall is structurally deficient and exhibits some signs of movement. LCEO has repaired the retaining wall twice over the last 5 years, at a total cost of approximately \$10,000, for an average annual cost of \$2000. Repairs have included installing additional bracing and tiebacks. Photographs 15 through 17 show the existing condition of the retaining wall. The wall is a critical structure supporting Vrooman Road out of the river valley. This retaining wall structure stabilizes the intersection of Vrooman Road and SR-84. Failure of this retaining could possibly result in the closure of both SR-84 and Vrooman Road.



Photograph 15 - The base of the Vrooman Road retaining wall, looking west.



Photograph 16 - The base of the Vrooman Road retaining wall, looking east.



Photograph 17 - The base of the Vrooman Road retaining wall, looking down from the top.

### **Traffic Volumes and Levels of Service**

Traffic volumes and levels of service (LOS) were obtained, reviewed and calculated as part of the *Vrooman Road Planning Study* (2005). Traffic counts were used to develop existing, opening day, and design year traffic data for the project for use during the study phase. The existing traffic operations were analyzed to determine the presence of any deficiencies under existing conditions for use in the Purpose and Need document and to establish the base condition against which the alternatives were measured. An analysis output was included in *Updated Vrooman Road Planning Study* (2008).

### **Traffic Volumes**

Turning movement counts collected February 2004 at the study intersections were the basis of a capacity analyses. The official, ODOT certified volumes were developed by ODOT's Office of Technical Services (OTS). The average daily traffic calculated for Opening Year is 5,210 vehicles per day (VPD) and 5,910 VPD for the Design Year. The number of vehicles that use Vrooman Road to access the park and natural areas was not counted or calculated as part of this effort.

The truck traffic calculated for Opening Year is 157 vehicles per day (VPD), with 16 vehicles in the Peak Hours; for the Design Year it is 178 VPD with 18 vehicles in the Peak Hours. The Opening Year is 2012 and the Design Year is 2032. Using historic traffic data on Vrooman Road, an annual growth rate of 2% per year was calculated. This rate was applied to all the AM and PM Peak Hours to determine the Opening Year and Design Year Peak Hours. These assumptions were certified by ODOT.

### **Level of Service**

Based upon traffic counts conducted in 2004, existing Vrooman Road through the study area currently services approximately 5,200 vehicles per day. The Opening Year (2012) traffic volume is not expected to grow and will remain 5,200 vehicles per day. By the Design Year (2032), this is estimated to increase to approximately 5,900 vehicles per day.

Capacity analyses are performed to estimate the maximum amount of traffic that can be accommodated by a roadway facility while maintaining prescribed operational qualities. This analysis is a set of procedures used to estimate the traffic-carrying ability of a roadway facility. This is accomplished using the level of service concept, which generally describes conditions in terms of factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Each level of service is given a letter designation: A to F. Level of service "A" represents the best operation and "F" the worst. The signalized intersection capacity analyses were performed using *Highway Capacity Software (HCS2000)* version 4.1d. The results of the analysis are presented in **Tables 3 and 4**:

**TABLE 3: MADISON AVENUE/VROOMAN ROAD AND STATE ROUTE 84 INTERSECTIONS**

Time Period	EB SR-84		WB SR-84		NB Vrooman Rd		SB Madison Ave		Intersection Total	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
2010 AM Peak	10.2	B	13.2	B	12.9	B	13.3	B	12.6	B
2010 PM Peak	12.2	B	12.7	B	12.7	B	13.1	B	12.7	B
2030 AM Peak	9.8	A	27.1	C	19.6	B	26.3	C	21.9	C
2030 PM Peak	12.2	B	12.7	B	12.7	B	13.1	B	12.7	B

The 2010 Opening Day No Build conditions were analyzed using *HCS2000* for the AM and PM peak hours and the results showed no capacity deficiencies. All intersections were found to operate overall at LOS C or better. Level of service “C” or better is considered acceptable for a facility of this classification.

The 2030 No Build conditions were analyzed for the AM and PM Peak Hour and limited capacity deficiencies were found. The SR-84 and Vrooman Road/Madison Road intersection was found to be operating at an overall LOS C during AM Peak hours and LOS B for PM peak hours. The level of service for the intersection at SR-84 and River Road/Lane Road was found to be LOS B for both AM and PM peak hours. Neither intersection had any deficient approaches. This analysis indicates that the existing number and configuration of lanes are adequate for design year traffic. However, it should be noted for all these analyses that the HCS results do not take into consideration inefficiencies resulting from the poor geometrics of the intersection.

**TABLE 4: RIVER ROAD/LANE ROAD AND STATE ROUTE 84 INTERSECTIONS**

Time Period	EB SR-84		WB SR-84		NB River Rd		SB Lane Rd		Intersection Total	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
2010 AM Peak	11.2	B	11.8	B	11.4	B	10.5	B	11.4	B
2010 PM Peak	12.4	B	8.9	A	11.9	B	12.5	B	11.7	B
2030 AM Peak	11.9	B	13.2	B	13.2	B	11.4	B	12.6	B
2030 PM Peak	16.4	B	7.3	A	14.6	B	15.9	B	14.5	B

While Level of Service and capacity have been analyzed for the *Updated Vrooman Road Planning Study (2008)*, there does not appear to be a problem associated with roadway capacity. Rather, these appear to be problems caused by inadequacy in the characteristics of

the roadway. If the existing structure is replaced and the geometrics of the approaches and roadway are brought up to standard, any capacity and Level of Service issues will be addressed.

## **Safety**

A secondary purpose for replacing the Vrooman Road Bridge and its approaches is to improve safety, both on the bridge itself and at the Vrooman Road / Madison Avenue / SR-84 intersection, and the Vrooman Road and Seeley Road intersection. A bridge structure, roadways and approach roadways designed to meet current design standards would eliminate structural and operational deficiencies, and result in improved safety on the bridge and at these intersections.

In 2004, the most recent three years of collision data were obtained from the Ohio Department of Public Safety and local jurisdictions. The data were analyzed to identify any patterns in the history. An accident analysis summary follows showing current accident patterns in the study area.

As shown in **Figure 6**, accidents along Vrooman Road and SR-84 are located at four major points, three of them are intersections and one is the Vrooman Road Bridge over the Grand River.

From 2000 to 2002, the total number of accidents at these four locations is as follows:

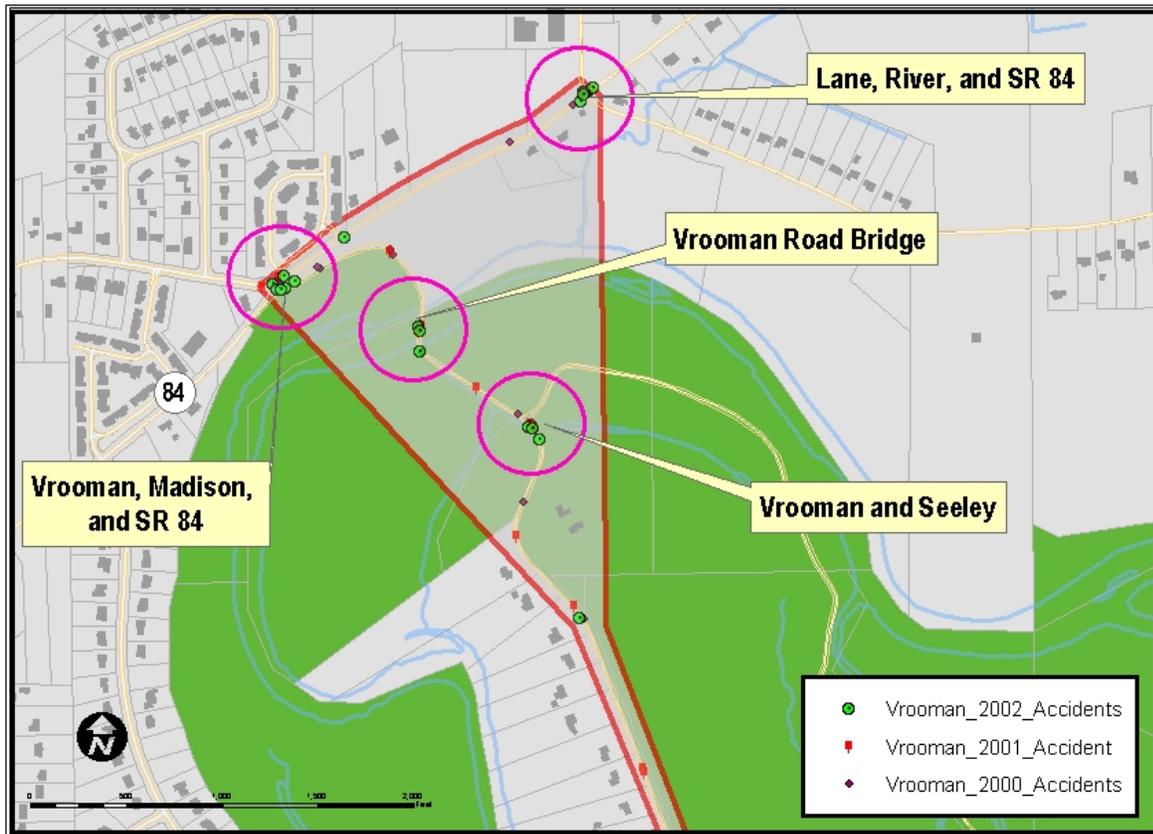
- Location 1: Vrooman, Madison, and State Route 84 – 12 total accidents
- Location 2: Lane, River, and State Route 84 – 10 total accidents
- Location 3: Vrooman Road Bridge – 8 total accidents
- Location 4: Vrooman and Seeley – 8 total accidents

Over a three-year period, eight accidents or more at a given intersection/location is noteworthy. Geometric problems at Locations 1 and 4 may be the cause for increased crash numbers over this time period. Geometric problems along with substandard lane widths may contribute to accidents at the Vrooman Road Bridge location. The high accident numbers at the intersection of Lane, River, and SR-84 (Location 2) may be caused by the unusual intersection angles of the two side roads. Anecdotal evidence from the County Sheriff and LCEO suggest that a substantially higher number of accidents occur, but go unreported, along this stretch of Vrooman Road.

The Vrooman Road, Madison Avenue and SR-84 intersection had an accident rate of 3.425 accidents per million vehicles entering the intersection. The Lane Road, River Road and SR-84 intersection had an accident rate of 2.854 accidents per million vehicles entering intersection. The Vrooman Road and Seeley Road intersection had an accident rate of 2.283 accidents per million vehicles entering intersection. The state average accident rate for similar intersections during the same period was 0.20 accidents per million vehicles entering intersections. The accident rate for Vrooman Road between Seeley Road and SR-84 was 2.283 accidents per

million vehicle miles. The state average accident rate for two-lane, undivided urban collectors for the same period was 2.186 accidents per million vehicle miles.

FIGURE 6: THREE YEAR ACCIDENT LOCATIONS (2000-2002)



### THREE YEAR ACCIDENT LOCATIONS (2000-2002)

VROOMAN ROAD CORRIDOR STUDY

#### PURPOSE AND NEED SUMMARY:

##### Summary

The purpose of this project is to replace the structurally-deficient and functionally-obsolete bridge that regularly closes during flood events with a facility that meets current design standards and improves existing geometrics correcting existing roadway deficiencies. The current Vrooman Road Bridge is a structurally-deficient and functionally-obsolete bridge that regularly closes during flood events, while the existing roadway and bridge approaches experience geometrics and roadway deficiencies. The Vrooman Road Bridge (SFN 4337107) has been identified as a structural deficient bridge in the 2002 *Physical Condition Report* with a general summary rating of 4 (Poor), and in the 2006 *Bridge Inspection Report* with a general summary rating of 3 (Poor). Vrooman Road is classified as an Urban Arterial/Collector with approach roadways that do not meet current design standards for an Urban Arterial/Collector. Each approach has inadequate geometrics, steep grades, unacceptable curves and poor sight distance as compared to applicable roadway standards for its functional classification.

Secondary goals of the Vrooman Road Bridge Project are:

- Reduce maintenance problems and safety concerns associated with slope adjacent to Vrooman Road at SR-84. The retaining wall located on the south side of Vrooman Road and roughly parallel to SR-84, is deteriorated and the. LCEO has repaired the retaining wall twice since 2000, at a total cost of approximately \$10,000. Repairs have included installing additional bracing and tiebacks. The wall is a critical structure supporting Vrooman Road/SR-84 and the buildings and structures near the intersection from sliding into the valley. This could possibly result in the closure of both SR-84 and Vrooman Road.
- Provide an acceptable level of service for existing and design year traffic volumes. While Level of Service and capacity were analyzed for the *Updated Vrooman Road Planning Study* (2008), they do not appear to be a problem associated with roadway capacity. Rather, these appear to be problems caused by inadequacy in the characteristics of the roadway. If the existing structure is replaced and the geometrics of the approaches and roadway are brought up to standard, any capacity and Level of Service issues will be addressed.
- Reduce number of accidents. Accidents along Vrooman Road and SR-84 are located at four major points, three of them are intersections and one is the Vrooman Road Bridge over the Grand River. A bridge structure, roadway and approach roadways designed to meet current design standards would eliminate structural and operational deficiencies, and result in improved safety on the bridge and at the three intersections.

### **Logical Termini**

The logical termini for the project were established based on the scope of the problems identified in the various studies cited above. These termini include only the portion of the existing Vrooman Road Bridge (SFN 4337107) and roadway facility and that will require improvements based on the studies completed to date. The northern terminus of the project is SR-84 at the intersections of Vrooman Road and Madison Avenue; and Lane Road and River Road. The southern terminus of the project is Vrooman Road at the intersection with Interstate 90. These termini correspond to the area containing the Road Bridge and its approaches, and the roadway that will require improvement to address the problems identified above.