DOWNTOWN PHASE 2 TRAFFIC IMPACT STUDY City of Hudson, Ohio

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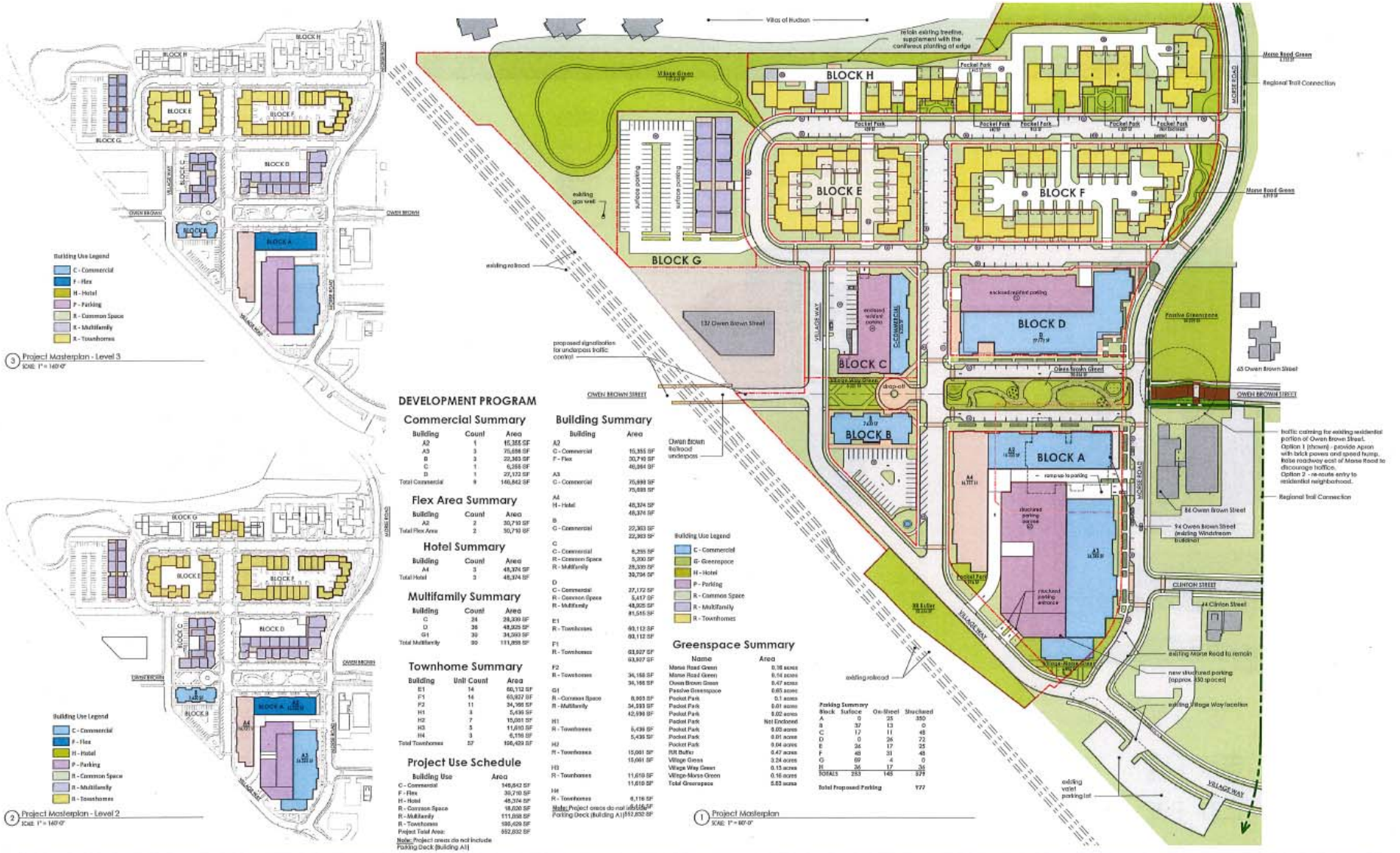
Chapter 1 Introduction

1.1 Purpose of Report

- The City of Hudson is planning to develop an area of the City downtown core that is located west of the existing First & Main downtown area.
- The proposed project consists of a mixed-use development with residential, office, and flex land uses. The flex land uses are expected to be comprised of 60% office, 20% retail, and 20% restaurant space.
- 2021 will be analyzed as the opening year of the development. The year 2041 will be analyzed as the design year for the twenty year analysis.
- The primary access to the development site will be through the adjacent local roadways of Morse Road, Owen Brown Street, Clinton Street, and Village Way.

1.1 Purpose of Report



TESTA COMPANIES | MKSK landscape architecture urban design | Testa Enterprises, 2335 Second Street, Cuyahoga Falls, Ohio 44221 | Hudson Downtown Phase 2 | Project Plans, 04-05-2018, Scale: As indicated | A1 | mota design

1.1 Purpose of Report

HUDSON - DOWNTOWN PHASE II
Data for Trip Generation Calculations

BLOCK	USE	Low-Rise (Units)	Mid-Rise (Units)	Office (SF)	Hotel (Rooms)	Flex Office (SF)	Retail (SF)	Restaurant (SF)	FLEX (SF)
	ITE LAND USE CODE	220	221	710	310	710	820	932	
A2	Commerical			15,355		18,426	6,142	6,142	30,710
A3	Commerical			75,698					
A4	Hotel				60				
B	Commerical			22,363					
C	Multi-Family		24	6,255					
D	Multi-Family		36	27,172					
E1	Townhome	14							
F1	Townhome	14							
F2	Townhome	11							
G1	Multi-Family		30						
H1	Townhome	3							
H2	Townhome	7							
H3	Townhome	5							
H4	Townhome	3							
	TOTAL	**57**	**90**	**146,843**	**60**	**18,426**	**6,142**	**6,142**	**30,710**

Chapter 1 Introduction

1.2 Study Objectives

- to adequately assess the traffic impacts associated with the proposed development and to identify the level of off-site access and traffic,
- to provide a comprehensive study which evaluates and documents the traffic impacts and off-site improvements, where warranted,
- and to provide a technically sound basis to identify mitigation requirements to off-site traffic impacts.

Chapter 2
Area Conditions

2.1 Functional Classification

- Functional classification is the grouping of roads, streets, and highways in a hierarchy based on the type of highway service they provide.
- The functional classification as determined by ODOT and AMATS will be used to apply growth and design hour factors to the study area roadways for use in forecasting future traffic volumes in the study area.

2.2 Transportation Network Study Area

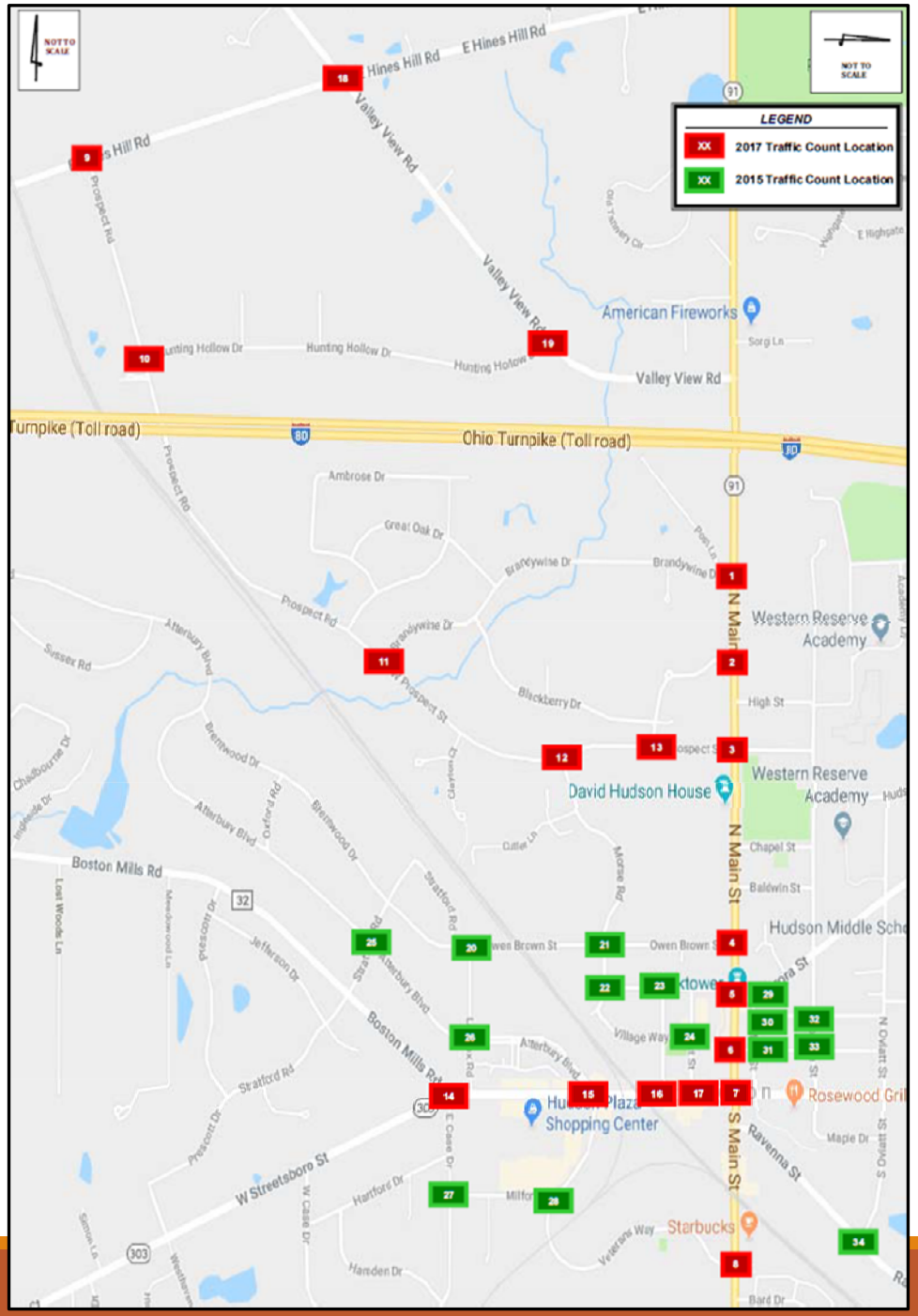
- 34 Intersections under study.

Chapter 2
Area Conditions

2.3 Traffic

- The weekday traffic counts were conducted in fifteen (15) minute intervals between the hours of 7 AM - 10 AM, 11 AM - 2 PM, and 3 PM - 6 PM.
- The AM peak hour of traffic was determined to be 7:00 AM to 8:00 AM.
- The PM peak hour of traffic was found to be 5:00 PM to 6:00 PM.
- Average daily traffic was calculated for roadway using expansion factors to account for daily and seasonal variations according to the recommendations and latest data from the Ohio Department of Transportation.

2.3 Traffic


NOT TO SCALE
LEGEND
XX 2017 Traffic Count Location
XX 2015 Traffic Count Location
Hines Hill Rd
E Hines Hill Rd
Valley View Rd
Prospect Rd
Hunting Hollow Dr
American Fireworks
Turnpike (Toll road)
Ohio Turnpike (Toll road)
Ambrose Dr
Great Oak Dr
Brandywine Dr
N Main St
Western Reserve Academy
Sussex Rd
Atterbury Blvd
Blackberry Dr
High St
David Hudson House
Chadbourne Dr
Brentwood Dr
Oxford Rd
Stratford Rd
Cutler Ln
Chapel St
Baldwin St
Boston Mills Rd
Jefferson Dr
Owen Brown St
Hudson Middle Sch
Village Way
Hudson Plaza Shopping Center
Rosewood Gri
W Streetsboro St
Hartford Dr
Maple Dr
Ravenna St
S Main St
Veterans Way
Starbucks
Hayden Dr
Bard Dr

Chapter 2
Area Conditions

2.4 Crash Data

- ODOT GIS Crash Analysis Tool (GCAT) was used to collect crash information at the study area intersections.
- The years 2014 through 2016 at the 34 study area intersections in the City of Hudson were reviewed using the ODOT GCAT portal.

2.4 Crash Data

- An intersection crash diagram was prepared for the each intersection based on the results from the ODOT GIS Crash Analysis Tool (GCAT).

Chapter 3
Traffic Signal Warrant Analysis

3.1 Traffic Signal Control

- A properly placed traffic signal can improve the safety and efficiency of flow through an intersection.
- An unnecessary signal can be the source of danger and annoyance to all who use the intersection.
- Criteria that has been established by extensive research and experience and documented in the latest edition of the **Ohio Manual of Uniform Traffic Control Devices (OMUTCD)** is used to analyze the need for traffic signal control.

Chapter 3
Traffic Signal Warrant Analysis

3.2 Traffic Signal Warrants

- The OMUTCD provides nine (9) sets of criteria, called warrants.
  - Warrant 1 – Eight Hour Vehicular Volume
  - Warrant 2 – Four Hour Vehicular Volume
  - Warrant 3 – Peak Hour Vehicular Volume
  - Warrant 4 – Pedestrian Volume
  - Warrant 5 – School Crossing
  - Warrant 6 – Coordinated Signal System
  - Warrant 7 – Crash Experience
  - Warrant 8 - Roadway Network
  - Warrant 9 – Intersection Near a Grade Crossing

Chapter 3
Traffic Signal Warrant Analysis

3.3 Traffic Signal Warrant Analysis

- The following intersections were determined to warrant traffic signal control:

1. North Main Street (SR 91) & East/West Prospect Street
2. North Main Street (SR 91) & Clinton Street/Aurora Street
3. North Main Street (SR 91) & East/West Streetsboro Road (SR 303)
4. North Main Street (SR 91) & Veterans Way
5. West Streetsboro Road (SR 303) & Boston Mills Road/East Case Drive
6. West Streetsboro Road (SR 303) & Milford Drive/Atterbury Boulevard
7. West Streetsboro Road (SR 303) & Library Street

- The above mentioned intersections are currently operating under traffic signal control.

- The remaining intersections under study were determined to not warrant traffic signal control and are currently operating under stop sign control.

Chapter 4
Projected Traffic Conditions

4.1 Site Traffic

- Calculating future total driveway trips requires an estimate of the traffic generated by the proposed development.
- The most widely accepted method of determining the amount of traffic that the proposed development will generate is to compare the proposed land use with existing facilities of the same use.
- The Institute of Transportation Engineers (ITE) has prepared a manual titled **"Trip Generation Manual"**, which is a compilation of similar traffic generation studies to aide in making such a comparison.
- The most recent update of this manual is the 10TH edition and was utilized for this study.

4.1 Site Traffic

Site Plan - March 30, 2018 TIS

ITE TRIP GENERATION		SIZE	TRIP ENDS			
ITE Code	Description		Weekday Peak Hour Between 7-9 AM (Enter/Exit)		Weekday Peak Hour Between 4-6 PM (Enter/Exit)	
220	Multifamily Housing (Low-Rise)	45	8	19	18	13
	Internal Trip Reduction	Units	--	--	--	--
	Driveway Volumes Less Internal Trip Reduction		8	19	18	13
221	Multifamily Housing (Mid-Rise)	168	15	42	44	28
	Internal Trip Reduction	Units	--	--	--	--
	Driveway Volumes Less Internal Trip Reduction		15	42	44	28
310	Hotel	60	22	18	23	16
	Internal Trip Reduction	Rooms	-1	-12	-17	-12
	Driveway Volumes Less Internal Trip Reduction		21	6	6	4
710	General Office Building	162,754	224	31	44	200
	Internal Trip Reduction	Sq Ft	-47	-29	-7	-11
	Driveway Volumes Less Internal Trip Reduction		177	2	37	189
820	Shopping Center	21,504	101	62	93	93
	Internal Trip Reduction	Sq Ft	-20	-17	-56	-33
	Driveway Volumes Less Internal Trip Reduction		81	45	37	60
	Diverted Trip Reduction (AM-NA / PM - 26%)		0	0	10	16
932	High-Turnover Restaurant	21,504	172	130	195	180
	Internal Trip Reduction	Sq Ft	-30	-40	-41	-65
	Driveway Volumes Less Internal Trip Reduction		142	90	154	115
	Diverted Trip Reduction (AM-NA / PM - 26%)		0	0	40	30
TOTAL DRIVEWAY VOLUMES			**444**	**204**	**296**	**409**
TOTAL DIVERTED TRIP REDUCTION			**0**	**0**	**50**	**46**
TOTAL NEW TRIPS			**444**	**204**	**246**	**363**
			648		**609**	

Site Plan - Current

ITE TRIP GENERATION		SIZE	TRIP ENDS			
ITE Code	Description		Weekday Peak Hour Between 7-9 AM (Enter/Exit)		Weekday Peak Hour Between 4-6 PM (Enter/Exit)	
220	Multifamily Housing (Low-Rise)	57	9	24	23	16
	Internal Trip Reduction	Units	--	--	--	--
	Driveway Volumes Less Internal Trip Reduction		9	24	23	16
221	Multifamily Housing (Mid-Rise)	90	9	23	24	16
	Internal Trip Reduction	Units	--	--	--	--
	Driveway Volumes Less Internal Trip Reduction		9	23	24	16
310	Hotel	60	22	18	23	16
	Internal Trip Reduction	Rooms	-1	-11	-6	-4
	Driveway Volumes Less Internal Trip Reduction		21	7	17	12
710	General Office Building	165,269	227	31	44	203
	Internal Trip Reduction	Sq Ft	-27	-20	-3	-4
	Driveway Volumes Less Internal Trip Reduction		200	11	41	199
820	Shopping Center	6,142	51	43	38	38
	Internal Trip Reduction	Sq Ft	-15	-15	-23	-14
	Driveway Volumes Less Internal Trip Reduction		36	28	15	24
	Diverted Trip Reduction (AM-NA / PM - 26%)		0	0	4	6
932	High-Turnover Restaurant	6,142	49	37	56	51
	Internal Trip Reduction	Sq Ft	-19	-16	-15	-25
	Driveway Volumes Less Internal Trip Reduction		30	21	41	26
	Diverted Trip Reduction (AM-NA / PM - 26%)		0	0	11	7
TOTAL DRIVEWAY VOLUMES			**305**	**114**	**161**	**293**
TOTAL DIVERTED TRIP REDUCTION			**0**	**0**	**15**	**13**
TOTAL NEW TRIPS			**305**	**114**	**146**	**280**
			419		**426**	

Site Plan	AM ENTER	AM EXIT	AM TOTAL	PM ENTER	PM EXIT	PM TOTAL
3/3/3018	444	204	648	246	363	609
Current	305	114	419	146	280	426
DIFFERENCE	**-139**	**-90**	**-229**	**-100**	**-83**	**-183**

Chapter 4
Projected Traffic Conditions

4.1 Site Traffic

- The directional distribution for the new generated traffic is a function of several variables including size and type of the proposed development, the prevailing operating conditions on the existing roadways, population distribution within the defined area of influence and current land uses.

- The distribution of traffic for the analysis contained in this report also included a review of available data from the following organizations that can currently be found at the following web addresses:

AMATS:	http://amatsplanning.org/
Summit County:	https://co.summitoh.net/
ODOT TIMS:	http://odot.ms2soft.com/tcds/tsearch.asp?loc=Odot&mod=
On The Map:	https://onthemap.ces.census.gov/

Chapter 4
Projected Traffic Conditions

4.2 Non-Site Traffic – Background Traffic

- Design of new roadways or improvements to existing roadways should not usually be based on current traffic volumes alone, but should consider future traffic volumes expected to make use of the facilities.
- Roadways should be designed to accommodate the traffic volume that is likely to occur within the design life of the facility.
- It is believed that the maximum design period is in the range of 15 to 24 years. Therefore, a period of twenty years is widely used as a basis for design.
- The years 2021 and 2041 (design year) will be analyzed for the proposed development.

Chapter 4
Projected Traffic Conditions

4.2 Non-Site Traffic – Design Hour Traffic

- The traffic patterns on any roadway typically show considerable variation in the traffic volumes experienced during the various hours of the day and in the hourly volumes experienced throughout the year.
- It would be wasteful to predicate a design on the maximum peak hour traffic that occurs during the year and the use of the average hourly traffic would result in an inadequate design.
- ODOT recommends using the 30TH highest hour as a design control for urban streets.
- The ODOT Peak Hour to Design Hour charts will be used to determine the deign hour factors for the study area roadways. These charts are based on the functional classification of the roadway, the day of the week and the month that the traffic data was collected.

Chapter 4
Projected Traffic Conditions

4.3 Future Traffic

- No-Build Conditions
  - In order to estimate the future traffic considering non-project traffic conditions, the previously discussed historical growth rates and design hour factors were applied to the traffic data collected for this report.
  - This traffic is the expected traffic if the proposed development **is not** constructed, the "No-Build" condition.

- Build Conditions
  - In order to estimate the future traffic considering project traffic conditions, the sum of the No-Build volumes were added to the new and diverted link generated traffic to equal the future Build peak hour volumes.
  - These traffic volumes are the expected volumes if the proposed development **is** constructed, or the "Build" condition.

Chapter 5
Traffic Analysis

5.1 Capacity & LOS at Study Area Intersections

- The capacity analyses were performed in order to estimate the maximum amount of traffic that can be accommodated by a roadway facility while maintaining recommended operational qualities.

- Existing, No-Build, and Build peak hour traffic volumes were analyzed to determine the level-of-service (LOS) at the study area intersections.

- The capacity analysis procedures and the resulting level of service grades and delays are a recognized traffic engineering standard for measuring the efficiency of intersection operations by such organizations as the Institute of Transportation Engineers, American Association of State Highway and Transportation Officials, and the Ohio Department of Transportation.

Chapter 5
Traffic Analysis

5.2 Turn Lane Length Analysis

- An analysis was performed to determine the necessary turn lane storage length in order to accommodate the proposed turn lanes at the following intersections:

  North Main Street & Prospect Street

  North Main Street & State Route 303

  South Main Street & Veterans Way

  Morse Road & Owen Brown Street

- The analysis was performed in accordance with the procedure recommended by the Ohio Department of Transportation in their **Location and Design Manual, Volume 1, Section 401**.

Chapter 5
Traffic Analysis

5.3 Development Site Plan

- The site proposes to use Morse Road and Owen Brown Street and an extension of Village Way to provide access to and throughout the development.
- The site plan also proposes to eliminate the direct route of Owen Brown Street through the development.
- On-street parking, lane width, traffic control, and pedestrian accommodations for then internal portions of the development were reviewed.

Chapter 5
Traffic Analysis

5.4 Owen Brown Street

- It is our opinion that the development traffic will not have a significant impact on the residential portion of Owen Brown Street between Morse Road and North Main Street.
  - Less than 25% of the site generated traffic is expected to originate or be destined for the north along SR 91.
  - The roadway is located near the beginning of the downtown core area where congestion in the North Main Street corridor occurs during the peak hours and has been observed to block the intersection of Owen Brown Street and North Main Street on occasion.
  - Owen Brown Street is approximately 20 feet wide and permits on-street parking making it impossible for eastbound and westbound vehicles to pass side by side where vehicles are parked.
  - There is an all-way stop intersection located approximately half-way between Morse Road and North Main Street.
  - The Owen Brown Street at North Main Street only has stop sign control on the Owen Brown Street approach. Left turn vehicles from Owen Brown Street to northbound North Main Street must wait for an adequate gap in the north-south through traffic stream.

Chapter 5
Traffic Analysis

5.4 Owen Brown Street

The following scenarios were analyzed and reviewed:

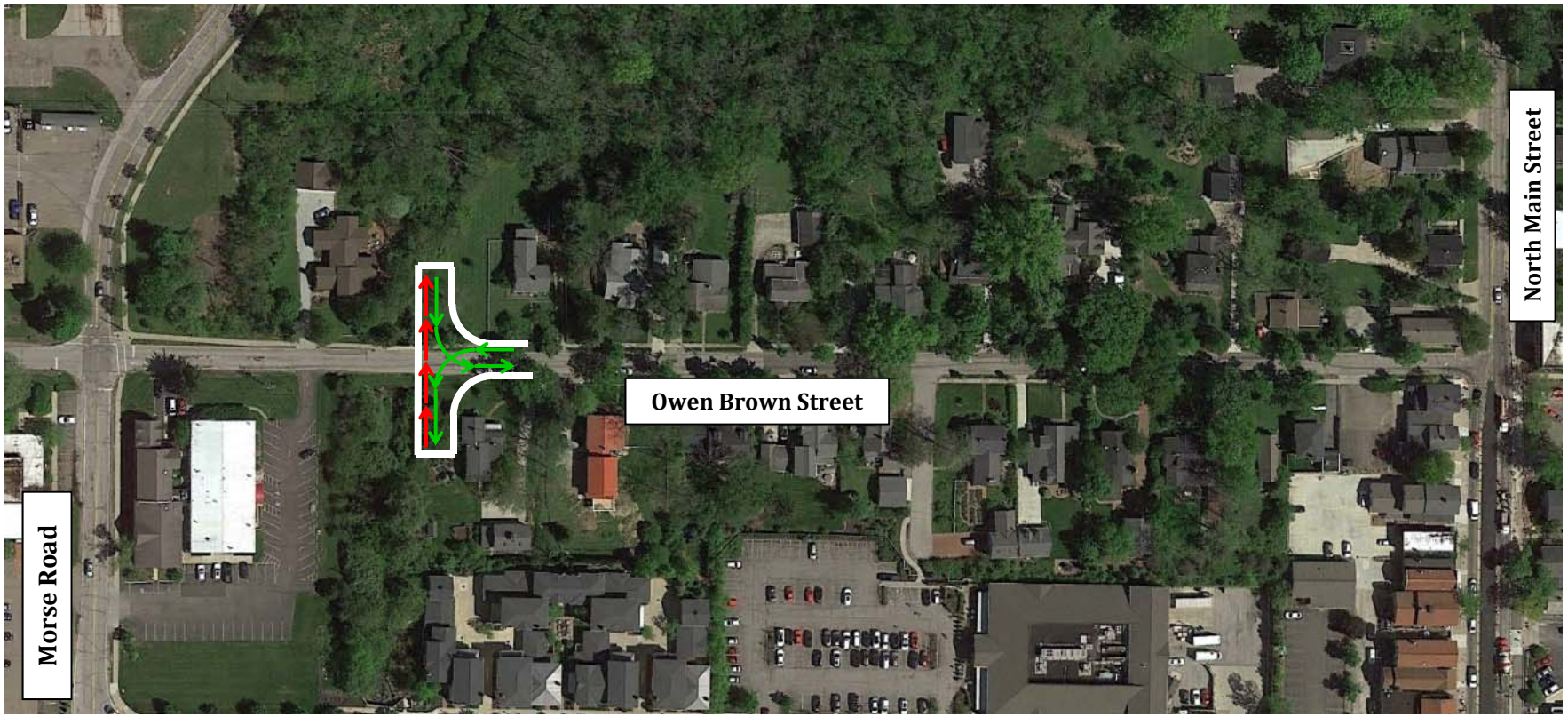
1. Existing & No-Build Conditions w/out the proposed development
2. Build Conditions with the proposed development
   - Current Site Plan
3. Left Turn Restrictions at State Route 91
4. Closure of Owen Brown Street @ State Route 91
5. Closure of Owen Brown Street @ Brandywine Creek Tributary culvert
6. Close Owen Brown between Morse & Village Way
   - This scenario is now reflected in the current site plan
7. Turn restrictions @ Owen Brown & Morse
8. Close Owen Brown east of rail road overpass to Village Way
   - This scenario is now reflected in the current site plan

5.4 Owen Brown Street

Owen Brown Closure at SR 91 w/ Hammerhead style turnaround.

5.4 Owen Brown Street

Owen Brown Closure at Culvert w/ Hammerhead style turnaround.



5.4 Owen Brown Street

HUDSON DOWNTOWN PHASE 2 PROJECT

Owen Brown Street Alternatives Matrix

EVALUATION CRITERIA	Scenario 2 Build	Scenario 3 No Left Turns @ SR 91	Scenario 4 Close Owen Brown @ SR 91	Scenario 5 Close Owen Brown @ Brandywine Creek	Scenario 7 Turn Restrictions @ Owen Brown & Morse
Intersection Operation	OB & Morse requires stop sign control.	OB & Morse requires stop sign control.	OB & Morse requires stop sign control.	OB & Morse requires stop sign control.	OB & Morse requires stop sign control.
Owen Brown Vehicular Volumes	580 Vehicles Per Day	290 Vehicles Per Day	260 Vehicles Per Day	260 Vehicles Per Day	270 Vehicles Per Day
Emergency Access	No Change	Physical left turn restriction would need to be mountable or response routes would likely be altered.	Physical barrier would need to mountable or response from 91 would be impacted.	If culvert were removed only access would be via SR 91	No Change
School Bus/ Service/Maintenance Access	No Change	Routes would likely be altered.	Routes would likely be altered.	If culvert were removed only access would be via SR 91.	No Change
Right-of-Way	Roundabout at OB & Morse will require additional ROW.	Roundabout at OB & Morse will require additional ROW. Possible ROW impact to widen approach to construct island to prohibit left turns at OB & 91.	Roundabout at OB & Morse will require additional ROW. ROW would be needed at OB & 91 to provide vehicle turnaround.	Roundabout at OB & Morse will require additional ROW. ROW would be needed to provide a vehicle turn around east and west of the creek.	None
Local Access	No access restriction to local residents.	Local access impacted by restriction.	Local residents would have no direct access to 91.	Local residents would have to use 91 to access downtown core area to the west.	No access restriction to local residents.
Intersection Safety	No change at 91 & OB	Vehicular conflicts at 91 & OB are reduced.	Vehicular conflicts at 91 & OB are eliminated.	No change at 91 & OB	No change at 91 & OB Vehicular conflict at Morse & OB reduced.
Travel Time - Local Residents	No Change	Increased travel time for residents that make left turns at 91.	Increased travel time for residents that use intersection of 91 & OB.	Increased travel time for residents that use intersection of Morse & Village Way.	Increase travel time for residents that travel west on OB past Morse.

Chapter 5
Traffic Analysis

5.5 Owen Brown Street & Norfolk Southern Overpass

- The operational analysis results indicate that widening the underpass to accommodate two 9 foot travel lanes would not be sufficient to allow the roadway segment to operate with a levels-of-service D or better.

- The use of traffic signal control on each side of the rail overpass at Owen Brown Street to control right-of-way through the tunnel would be expected to operate with level-of service D or better.

Chapter 5
Traffic Analysis

5.5 Owen Brown Street & Norfolk Southern Overpass

- There are four (4) ways in which pedestrians can be accommodated in the public right of way. These include:
  - Sidewalks – Would require widening of underpass
  - Off-Road Paths – Would require a separate underpass facility
  - Shared-Use Paths – Would require widening or separate underpass facility
  - Shared Streets – Currently the method in use.

Chapter 5
Traffic Analysis

5.6 Improvements To Accommodate Study Area Traffic

	LOCATION	CONDITION	IMPROVEMENT
3.	SR 91 &M Prospect	2021 Build	Eastbound Left Turn Lane
5.	SR 91 & Clinton/Aurora	2041 No-Build	Align Clinton/Aurora Approaches
7.	SR 91 & SR 303	2021 No-Build	2ND Northbound Left Turn Lane
8.	SR 91 & Veterans Way	2041 Build	Westbound Left Turn Lane
18.	Hines Hill & Valley View	2021 No-Build 2041 No-Build	Single Lane Roundabout Second East-West Through Lanes
21.	Owen Brown & Morse	2019 Build	Single Lane Roundabout or Traffic Signal Control Northbound Left Turn Lane Eastbound Left Turn Lane Southbound Left Turn Lane

Chapter 6
Conclusions

- The AM peak hour of traffic was determined to be 7:00 AM to 8:00 AM. The PM peak hour of traffic was found to be 5:00 PM to 6:00 PM at the study intersections.

- 2021 will be analyzed as the opening year for the full build out of the development. The year 2041 will be analyzed as the design year for the twenty year analysis.

- The primary access to the development site will be through the adjacent local roadways of Morse Road, Owen Brown Street, Clinton Street, and Village Way.

Chapter 6
Conclusions

- The proposed development is expected to generate the following average hourly traffic during the AM and PM peak periods based upon the rates established by studies from the Institute of Transportation Engineers.

	TRIP ENDS			
	Weekday Peak Hour Between 7-9 AM (Enter/Exit)		Weekday Peak Hour Between 4-6 PM (Enter/Exit)	
TOTAL DRIVEWAY VOLUMES	305	114	161	293
TOTAL DIVERTED TRIP REDUCTION	0	0	15	13
TOTAL NEW TRIPS	**305**	**114**	**146**	**280**
	419		**426**	

Chapter 6
Conclusions

- The following table summarizes the recommended intersection improvements in the study area.

	LOCATION	CONDITION	IMPROVEMENT
3.	SR 91 &M Prospect	2021 Build	Eastbound Left Turn Lane
5.	SR 91 & Clinton/Aurora	2041 No-Build	Align Clinton/Aurora Approaches
7.	SR 91 & SR 303	2021 No-Build	2ND Northbound Left Turn Lane
8.	SR 91 & Veterans Way	2041 Build	Westbound Left Turn Lane
18.	Hines Hill & Valley View	2021 No-Build 2041 No-Build	Single Lane Roundabout Second East-West Through Lanes
21.	Owen Brown & Morse	2019 Build	Single Lane Roundabout or Traffic Signal Control Northbound Left Turn Lane Eastbound Left Turn Lane Southbound Left Turn Lane