Herbert, Rowland & Grubic, Inc.
Engineering & Related Services
200 West Kensinger Drive, Suite 400
Cranberry Twp., PA 16066
(724) 779-4777
(724) 779-4711 Fax
www.hrg-inc.com

FEBRUARY 2019

TRAFFIC IMPACT STUDY
FOR
THE HARMONY SENIOR LIVING
AT ANDERSON DEVELOPMENT

ANDERSON TOWNSHIP
HAMILTON COUNTY, OHIO

HRG Project No. R001432.0446

TRAFFIC IMPACT STUDY
FOR
THE HARMONY SENIOR LIVING
AT ANDERSON DEVELOPMENT

ANDERSON TOWNSHIP
HAMILTON COUNTY, OHIO

PREPARED FOR:
SMITH/PACKETT MED-COM, LLC
ROANOKE, VIRGINIA 24014

PREPARED BY:
Herbert, Rowland & Grubic, Inc.

STAFF PROFESSIONAL: **THOMAS M. HURNEY, E.I.T.**

SUPERVISING ENGINEER: **DARREN S. MYER, P.E., PTOE**

FEBRUARY 2019

HRG PROJECT NUMBER: R001432.0446

Table of Contents

EXECUTIVE SUMMARY **1**

EXISTING TRANSPORTATION SYSTEM **2**

Roadway Network Description 2

Existing Traffic Volumes 2

PROJECTED TRAFFIC VOLUMES **3**

Background Traffic Volumes 3

Site Traffic Volumes 3

CHART A – PROPOSED DEVELOPMENT TRIP GENERATION SUMMARY 3

Site Traffic Distribution 3

Total Traffic Volumes 3

TRAFFIC ANALYSIS **3**

Turn Lane Warrant Analysis 3

Intersection Capacity Analysis 4

CHART B: UNSIGNALIZED INTERSECTIONS – LOS CRITERIA 4

CHART C: LEVEL-OF-SERVICE TABLE 4

Sight Distance Analysis 4

CONCLUSIONS **5**

Study Findings *5*

Recommendations *5*

LIST OF FIGURES

	FIGURE NO.
Location Map	1
2019 Existing Traffic Volumes	2
2020 Without Development	3
Development Volumes	4
2020 With Development	5

LIST OF APPENDICES

Appendix A: Site Plan

Appendix B: Traffic Count Data

Appendix C: Site Inventory Pictures

Appendix D: Trip Generation Calculation

Appendix E: Turn Lane Warrant Analysis

Appendix F: Capacity Analysis

Appendix G: Sight Distance Evaluation

EXECUTIVE SUMMARY

Overview of the Development

Herbert, Rowland & Grubic, Inc. (HRG) has been retained by the developer to provide traffic analysis related to the proposed Harmony Senior Living at Anderson Development in Anderson Township, Hamilton County.

The proposed site (see location map in Figure 1) will be located along the southern side of Clough Pike within existing vacant parcels. The development would be directly across from the existing Motz Turf Farm access driveway. The development will provide two (2) full access driveways. The western driveway will be located roughly 370 feet west of the Motz Turf Farm driveway, while the eastern driveway will be located roughly 240 feet to the east. A Site Plan is provided in Appendix A.

The peak periods analyzed in this study include the AM Peak (7:00-9:00 AM) and the PM Peak (4:00-6:00 PM).

The proposed development is anticipated to generate 23 AM Peak trips, 32 PM Peak trips, and 318 weekday trips based on *Institute of Transportation Engineers Trip Generation Manual, 10th Edition (ITE)*. Though the trips generated for this study were calculated using ITE, Harmony Senior Living Services (who operates the facility) has the flexibility to adjust shift change times for employees as necessary to alleviate the impact on AM and/or PM trips along Clough Pike.

Study Intersections

The study area and methodologies to be utilized in the Traffic Impact Study (TIS) were established based on discussion with the County. The traffic study for this project includes the following study intersections:

- Clough Pike & Western Driveway
- Clough Pike & Eastern Driveway

In terms of capacity and turn lane guidelines, it was assumed development volumes will use one (1) access to be conservative. The Sight Distance evaluation was completed for each driveway separately.

Study Findings

Based on the data collected and the analyses performed under various conditions, the following are the results found:

- Access to the development is adequately provided via two (2) full-access driveways.
- The development is projected to have a minimal impact on the study roadways. The new intersections are projected to operate at LOS "C" or better for all peak periods. The Clough Pike approaches continue to operate at LOS "A" at all times.
- No turn lanes are warranted at the study intersections.

Recommendations

The proposed development is projected to have minimal impact on the study roadways. Based on traffic engineering observations of the study area, data collected, and various analyses, HRG does not anticipate any mitigation will be required along Clough Pike. When constructing the access driveways, ensure any vegetation and site amenities be kept clear within the sight triangle.

Introduction

Herbert, Rowland & Grubic, Inc. (HRG) has been retained by the developer to provide traffic analysis related to the proposed Harmony Senior Living at Anderson Development in Anderson Township, Hamilton County. The proposed development is located on the south side of Clough Pike. A location map is shown in Figure 1. A Site Plan is provided in Appendix A.

This development study has been conducted in accordance with the Institute of Transportation Engineers (ITE) Traffic Access and Impact Study Guidelines. The study will address the following issues:

- Traffic conditions created by the proposed development onto the study intersections.
- The necessary improvements required (if any) for efficient traffic flow on the adjacent roadway network to accommodate the new traffic configuration.

Based on the discussion with the County Traffic Engineer, it was determined that the study area for analysis would examine the following intersections:

- Clough Pike and Western Driveway – New Intersection
- Clough Pike and Eastern Driveway – New Intersection

The analyses will examine Existing Conditions (2019) and Opening Year (2020) roadway conditions with the addition of the proposed development.

EXISTING TRANSPORTATION SYSTEM

Roadway Network Description

Clough Pike is a two-lane county roadway classified as a minor arterial roadway. Throughout the study area, Clough Pike is comprised of 11 foot travel lanes with 1 foot shoulders and the posted speed limit is 40 miles per hour.

Existing Traffic Volumes

HRG conducted a turning movement count within the study area during the AM peak (7:00-9:00 AM) and the PM peak (4:00-6:00 PM) periods during dates at the following intersection:

Tuesday, February 5 (PM peak period) and Wednesday February 6 (AM peak period), 2019

- Clough Pike and Motz Turf Driveway – Unsignalized

The turning movement counts can be found in Appendix B.

Since there are no intersecting roadways between the proposed access volumes, and to be conservative in the analysis, one (1) full access driveway was assumed (with exception of the sight distance evaluation). The peak hour traffic volumes for 2019 Existing Conditions are shown in Figure 2. Site inventory pictures at each proposed driveway are provided in Appendix C.

PROJECTED TRAFFIC VOLUMES

Background Traffic Volumes

Background traffic volumes represent the number of vehicles that will be using the study area roadways without the proposed development. Based on the rate provided by *Ohio-Kentucky-Indiana Regional Council of Governments (OKI)*, a linear annual growth rate of 0.15% accounts for the general trend of increasing vehicular trips that cannot be assigned to any specific development. The background traffic for this study has been developed by growing the existing traffic counts to the 2020 year using the 0.15% compounded annual growth rate.

The 2020 opening year Without Development background traffic volumes are shown on Figure 3.

Site Traffic Volumes

Based on the descriptions provided in the Trip Generation Manual, 10th Edition, the land use that is the most consistent with the anticipated use of the proposed Senior Center is Land Use 254, *Assisted Living.* A total of 122 beds is expected for the development

Chart A below shows a summary of the anticipated trips generated by the development. Detailed trip generation calculations for the proposed development is displayed in Appendix D.

CHART A – PROPOSED DEVELOPMENT TRIP GENERATION SUMMARY

ITE Land Use Code	Variable	# of Beds	AM Peak Hour			PM Peak Hour			Weekday		
			Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
254-Assisted Living	Beds	122	14	9	23	12	20	32	159	159	318

Site Traffic Distribution

Proposed Development Trip Distribution

Distribution for the proposed development is based on the directional proportion of vehicles when collected during the turning movement counts.

The proportion of development traffic and development volumes are provided in Figure 4.

Total Traffic Volumes

The 2020 With Development scenario considers the background traffic and adds the proposed development. The peak hour volumes for the 2020 With Development scenario are depicted on Figure 5.

TRAFFIC ANALYSIS

Turn Lane Warrant Analysis

The Turn Lane Warrant Analysis is based on *ODOT Location and Design Manual, Volume 1, Section 401.6.1*. The results of the analysis for the proposed intersections conclude that a left turn lane is not warranted for the 2020 With Development scenario:

The results of this analysis is shown in Appendix E.

Intersection Capacity Analysis

The AM and PM peak hours were analyzed at the study area intersections to determine their capacity under existing and opening year (2020) traffic volume conditions. The capacities of each intersection in the study area were analyzed using the procedures outlined in the *2010 Highway Capacity Manual* as applied by Highway Capacity Software (HCS).

The *Highway Capacity Manual (HCM)* defines the Level of Service (LOS) as a function of the delay encountered by motorists, which is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. LOS is a designated letter grade that corresponds to a given average control delay per vehicle. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Unsignalized intersections are analyzed using unsignalized intersection capacity analyses. The LOS of an unsignalized intersection is determined by each vehicle's delay. Chart B describes each unsignalized intersection LOS by average control delay and its characteristics.

CHART B: UNSIGNALIZED INTERSECTIONS – LOS CRITERIA

LEVEL OF SERVICE	AVERAGE CONTROL DELAY (SEC/VEH)	EXPECTED DELAY TO MINOR STREET TRAFFIC
A	≤ 10	Little or no delay
B	> 10 and ≤ 15	Short traffic delays
C	> 15 and ≤ 25	Average traffic delays
D	> 25 and ≤ 35	Long traffic delays
E	> 35 and ≤ 50	Very long delays
F	> 50	Volume exceeds capacity

The results of the intersection capacity analyses for the study intersection for the AM and PM peak periods are summarized in Chart C.

CHART C: LEVEL-OF-SERVICE TABLE

Scenario	Clough Pike				Proposed Driveway		Overall	
2020 W/Development	EB		WB		NB			
AM	A	(0.0)	A	(0.3)	B	(14.7)	A	(0.3)
PM	A	(0.0)	A	(0.2)	C	(16.9)	A	(0.3)

The results of the intersection capacity analysis reveals that proposed intersection has an overall LOS of "A" with the approaches having a LOS grade of "C" or better. Clough Pike approaches continues to have a LOS of "A" at all times.

HCS Capacity Analysis for the 2020 Opening Year scenarios are shown in Appendix F.

Sight Distance Analysis

The proposed intersections are being designed to meet sight distance requirements for AASHTO Intersection Sight Distance and Hamilton County Sight Distance requirements. This evaluation determines sight line distances that are required for entering and exiting the proposed roadways. Based on a driver eye height of 3.5-feet, object heights of 4.25-feet, and 17-foot offset from the edge of the through lane, HRG

determined there will be sufficient sight distance at both the intersections. See Appendix G for sight distance calculations and photographs of each movement.

CONCLUSIONS

Study Findings

Based on the data collected and the analyses performed under various conditions, the following are the results found:

- Access to the development is adequately provided via two (2) full-access driveways.
- The development is projected to have a minimal impact on the study roadways. The new intersections are projected to operate at LOS "C" or better for all peak periods. The Clough Pike approaches continue to operate at LOS "A" at all times.
- No turn lanes are warranted at the study intersections.

Recommendations

The proposed development is projected to have minimal impact on the study roadways. Based on traffic engineering observations of the study area, data collected, and various analyses, HRG does not anticipate any mitigation will be required along Clough Pike. When constructing the access driveways, ensure any vegetation and site amenities be kept clear within the sight triangle.

FIGURES

1) LOCATION MAP
2) 2019 EXISTING PEAK HOUR VOLUMES
3) 2020 WITHOUT DEVELOPMENT VOLUMES
4) DEVELOPMENT VOLUMES
5) 2020 WITH DEVELOPMENT VOLUMES

LEGEND

1 – DATA COLLECTION LOCATION

– PROPOSED DEVELOPMENT

SOURCE: BING IMAGERY

FIGURE 1. LOCATION MAP

HARMONY SENIOR LIVING AT ANDERSON DEVELOPMENT

TRAFFIC IMPACT STUDY

CLOUGH PIKE, ANDERSON TOWNSHIP
HAMILTON COUNTY, OHIO

SCALE

0 500 1000 FEET

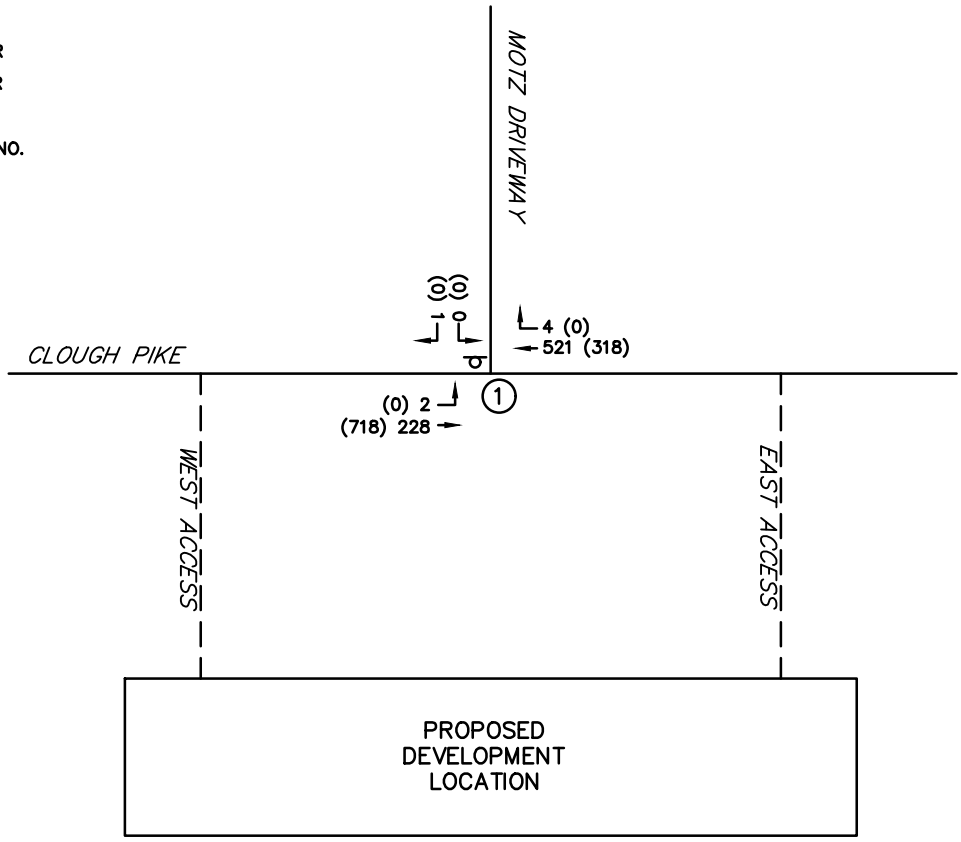
SCALE: 1" = 500'
JOB#: R001432.0446
FEB., 2019

HRG
Herbert, Rowland & Grubic, Inc.
Engineering & Related Services
AN EMPLOYEE-OWNED COMPANY
200 West Kensinger Drive, Suite 400
Cranberry Township, PA 16066
(724) 779 - 4777
Fax (724) 779 - 4711
hrg@hrg-inc.com
www.hrg-inc.com

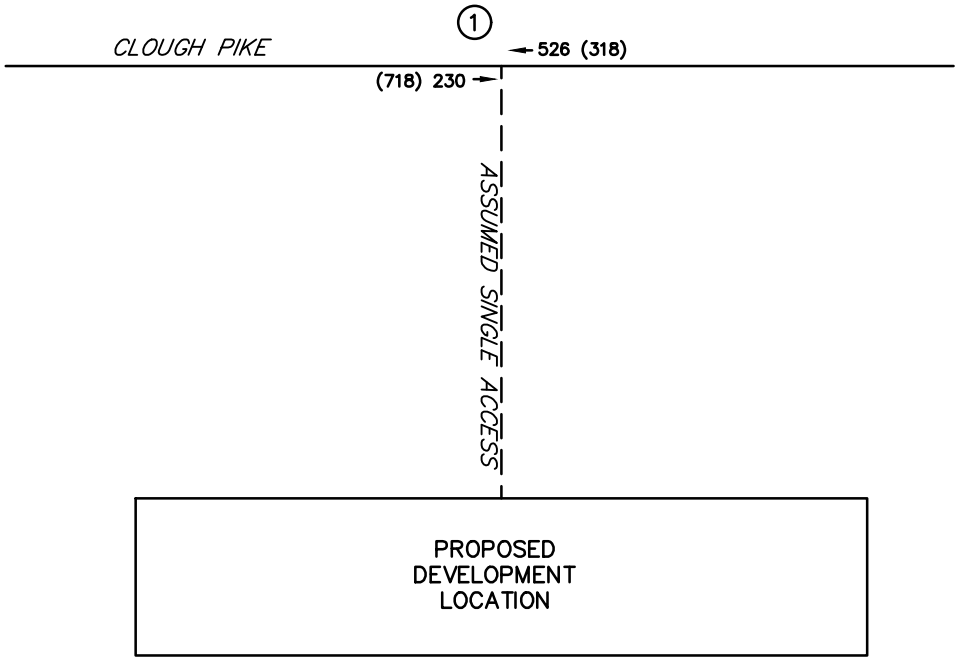
File name: P:\001\001432_0446\C3D\Plan Sets\Exh1\T001432044615Fig.dwg Layout:1-LocMap Feb 12, 2019 - 7:48am thurney

LEGEND

XX – AM PEAK HOUR
(YY) – PM PEAK HOUR
þ – STOP CONTROL
① – INTERSECTION NO.



ASSUMED SINGLE ACCESS POINT FOR CAPACITY AND TURN LANE ANALYSIS PURPOSES.



File name: P:\0014\001432_0446\C3D\Plan Sets\EXH\T00143204461TSFG.dwg Layout:2-2019 EXISTING Feb 12, 2019-8:29am thurney

HRG
Herbert Rowland & Grubic Inc.
Engineering & Related Services
AN EMPLOYEE-OWNED COMPANY
200 West Kensinger Drive, Suite 400
Cranberry Township, PA 16066
(724) 779-4777
Fax (724) 779-4711
hrg@hrg-inc.com
www.hrg-inc.com

2019 EXISTING CONDITIONS FOR HARMONY SENIOR LIVING AT ANDERSON DEVELOPMENT

ANDERSON TOWNSHIP HAMILTON COUNTY OHIO

PROJ. MGR. – DSM	
DESIGN–	
CADD– TMH	
CHECKED– CBM	
SCALE– NTS	
DATE– FEB. 2019	

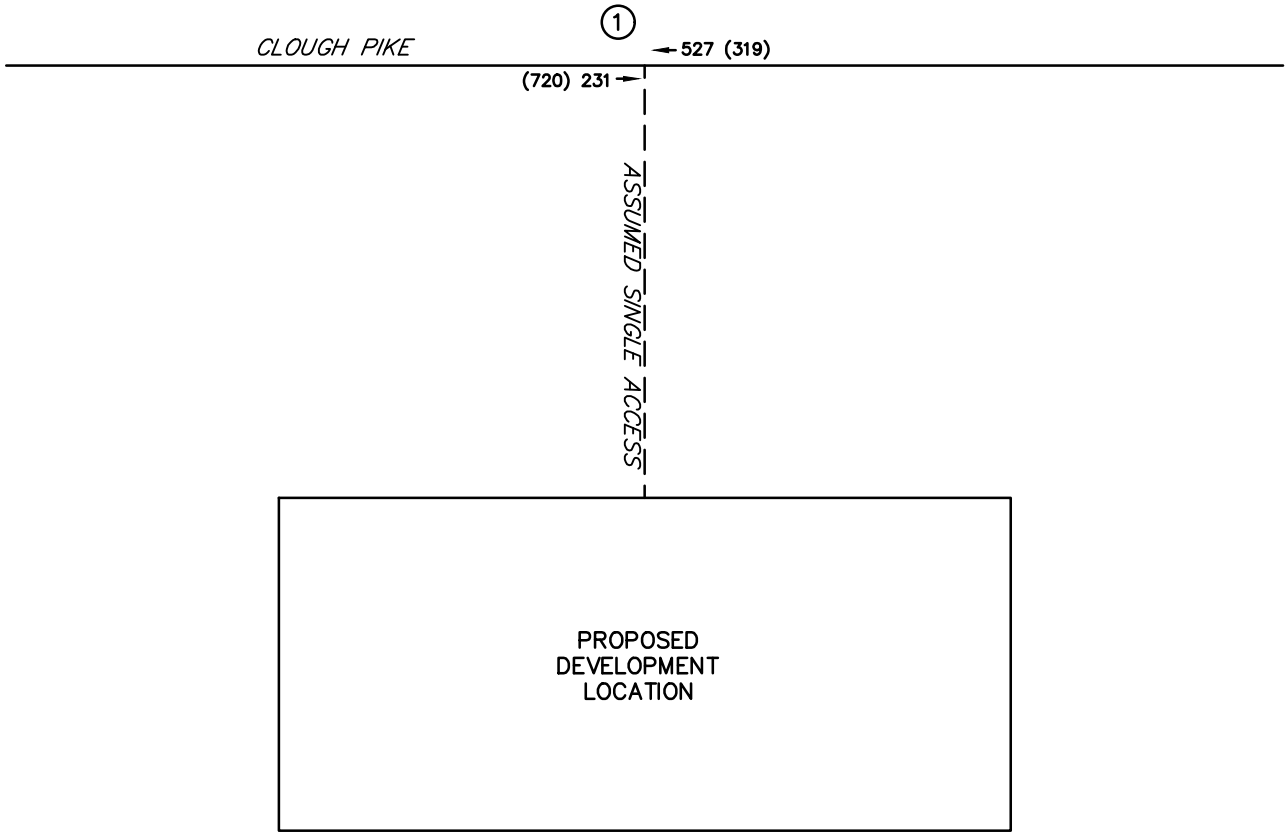
FIGURE NO. 2

SHEET NO. 2 OF 5

PROJECT R001432.0446

LEGEND

XX – AM PEAK HOUR
(YY) – PM PEAK HOUR
þ – STOP CONTROL
① – INTERSECTION NO.



HRG
Herbert Rowland & Grubic Inc.
Engineering & Related Services
AN EMPLOYEE-OWNED COMPANY
200 West Kensinger Drive, Suite 400
Cranberry Township, PA 16066
(724) 779-4777
Fax (724) 779-4711
hrg@hrg-inc.com
www.hrg-inc.com

2020 WITHOUT DEVELOPMENT FOR HARMONY SENIOR LIVING AT ANDERSON DEVELOPMENT

ANDERSON TOWNSHIP HAMILTON COUNTY OHIO

PROJ. MGR. – DSM	
DESIGN–	
CADD– TMH	
CHECKED– CBM	
SCALE– NTS	
DATE– FEB. 2019	

FIGURE NO. 3

SHEET NO. 3 OF 5

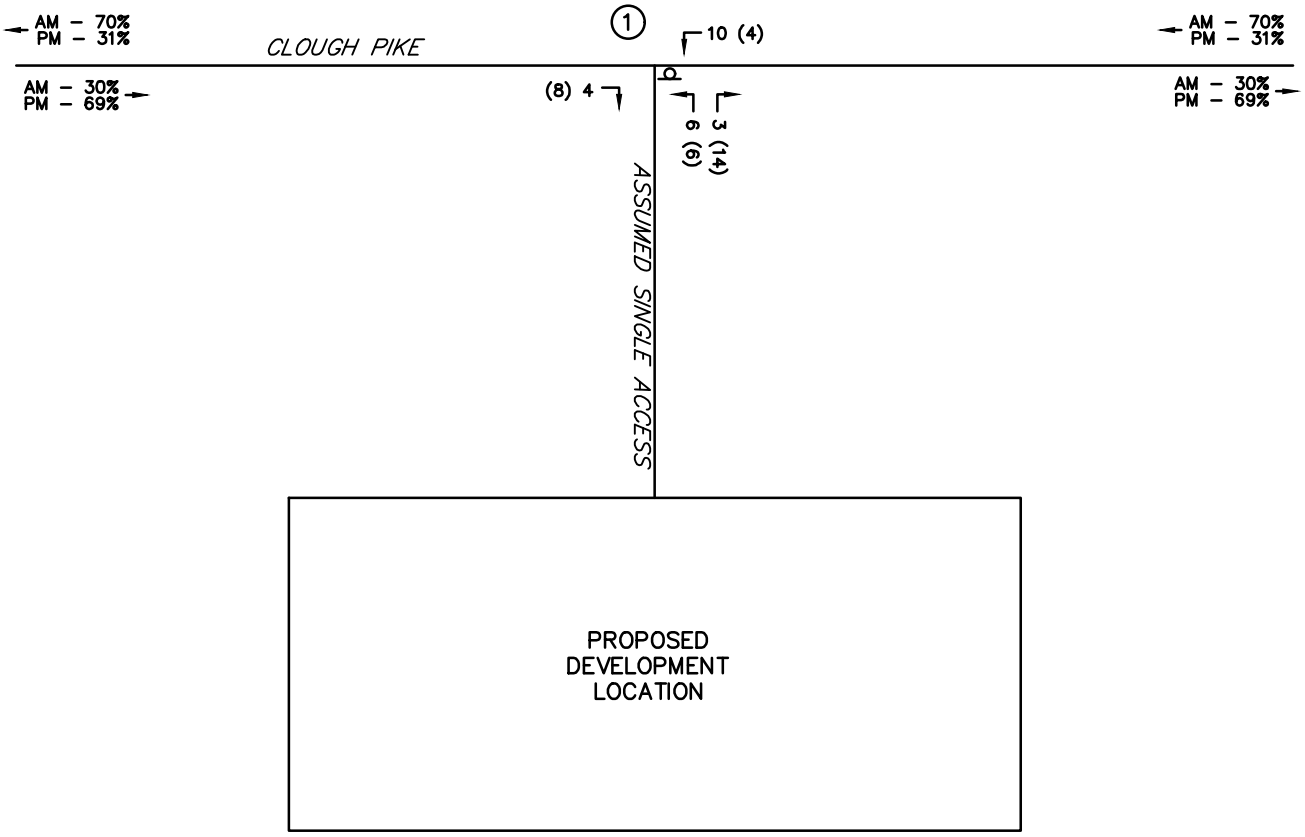
PROJECT R001432.0446

File name: P:\0014\001432_0446\C3D\Plan Sets\EXH\T00143204461TSFG.dwg Layout:3-2020 NO BUILD Feb 12, 2019-9:29am thurney

LEGEND

XX – AM PEAK HOUR
(YY) – PM PEAK HOUR
þ – STOP CONTROL
① – INTERSECTION NO.

NOTE: TO BE CONSERVATIVE, THE DEVELOPMENT WAS ANALYZED ASSUMING ONE ACCESS DRIVEWAY FOR CAPACITY AND TURN LANE ANALYSES.



File name: P:\0014\001432_0446\C3D\Plan Sets\EXH\T00143204461TSFG.dwg Layout: 4– DEVELOPMENT VOLUMES Feb 12, 2019–9:29am thurney

HRG
Herbert Rowland & Grubic Inc
Engineering & Related Services
AN EMPLOYEE-OWNED COMPANY
200 West Kensinger Drive, Suite 400
Cranberry Township, PA 16066
(724) 779-4777
Fax (724) 779-4711
hrg@hrg-inc.com
www.hrg-inc.com

DEVELOPMENT VOLUMES FOR HARMONY SENIOR LIVING AT ANDERSON DEVELOPMENT

ANDERSON TOWNSHIP HAMILTON COUNTY OHIO

PROJ. MGR. – DSM	
DESIGN–	
CADD– TMH	
CHECKED– CBM	
SCALE– NTS	
DATE– FEB. 2019	

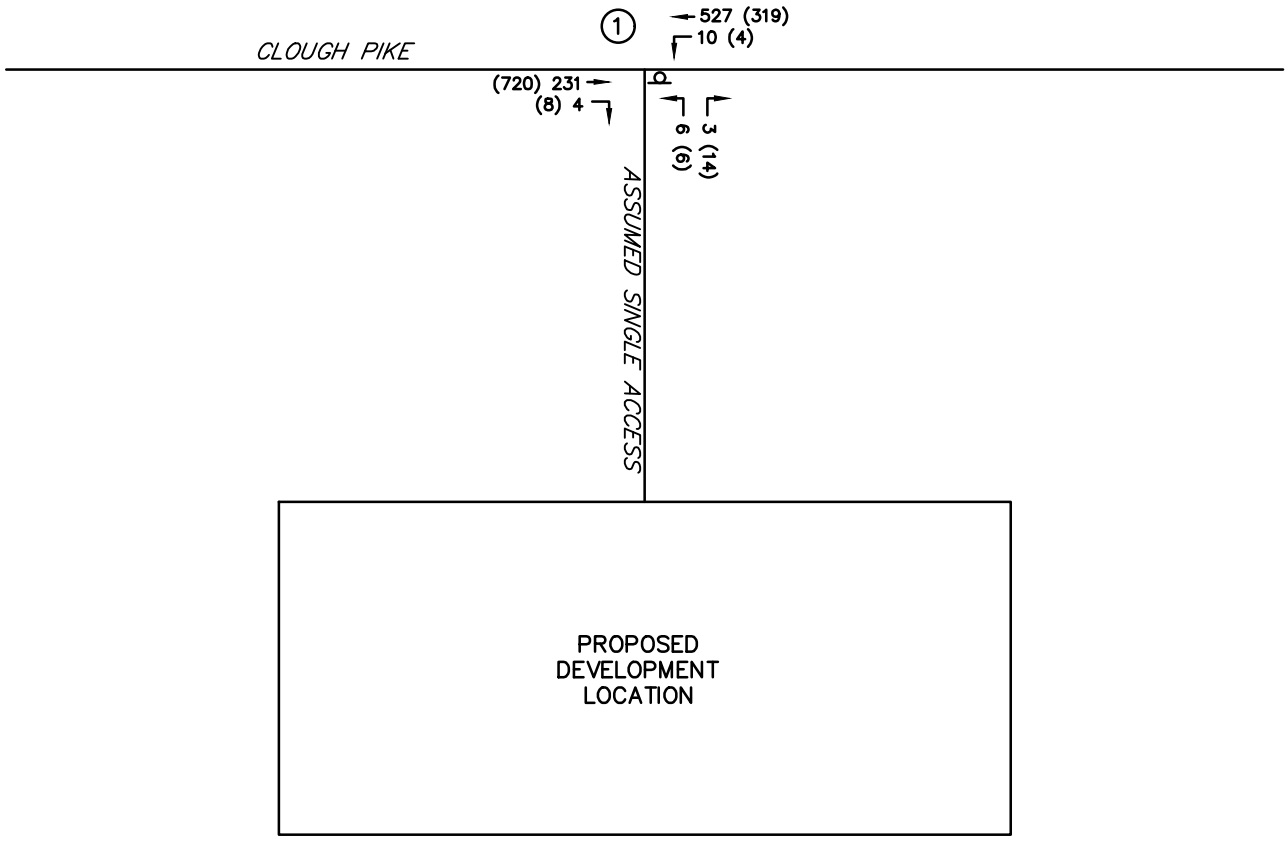
FIGURE NO. 4

SHEET NO. 4 OF 5

PROJECT R001432.0446

LEGEND

XX – AM PEAK HOUR
(YY) – PM PEAK HOUR
– STOP CONTROL
① – INTERSECTION NO.



File name: P:\0014\001432_0446\C3D\Plan Sets\EXH\T00143204461TSFG.dwg Layout:5– 2020 BUILD Feb 12, 2019–9:30am thurney

HRG
Herbert Rowland & Grubic Inc.
Engineering & Related Services
AN EMPLOYEE-OWNED COMPANY
200 West Kensinger Drive, Suite 400
Cranberry Township, PA 16066
(724) 779-4777
Fax (724) 779-4711
hrg@hrg-inc.com
www.hrg-inc.com

2020 WITH DEVELOPMENT FOR HARMONY SENIOR LIVING AT ANDERSON DEVELOPMENT

ANDERSON TOWNSHIP HAMILTON COUNTY OHIO

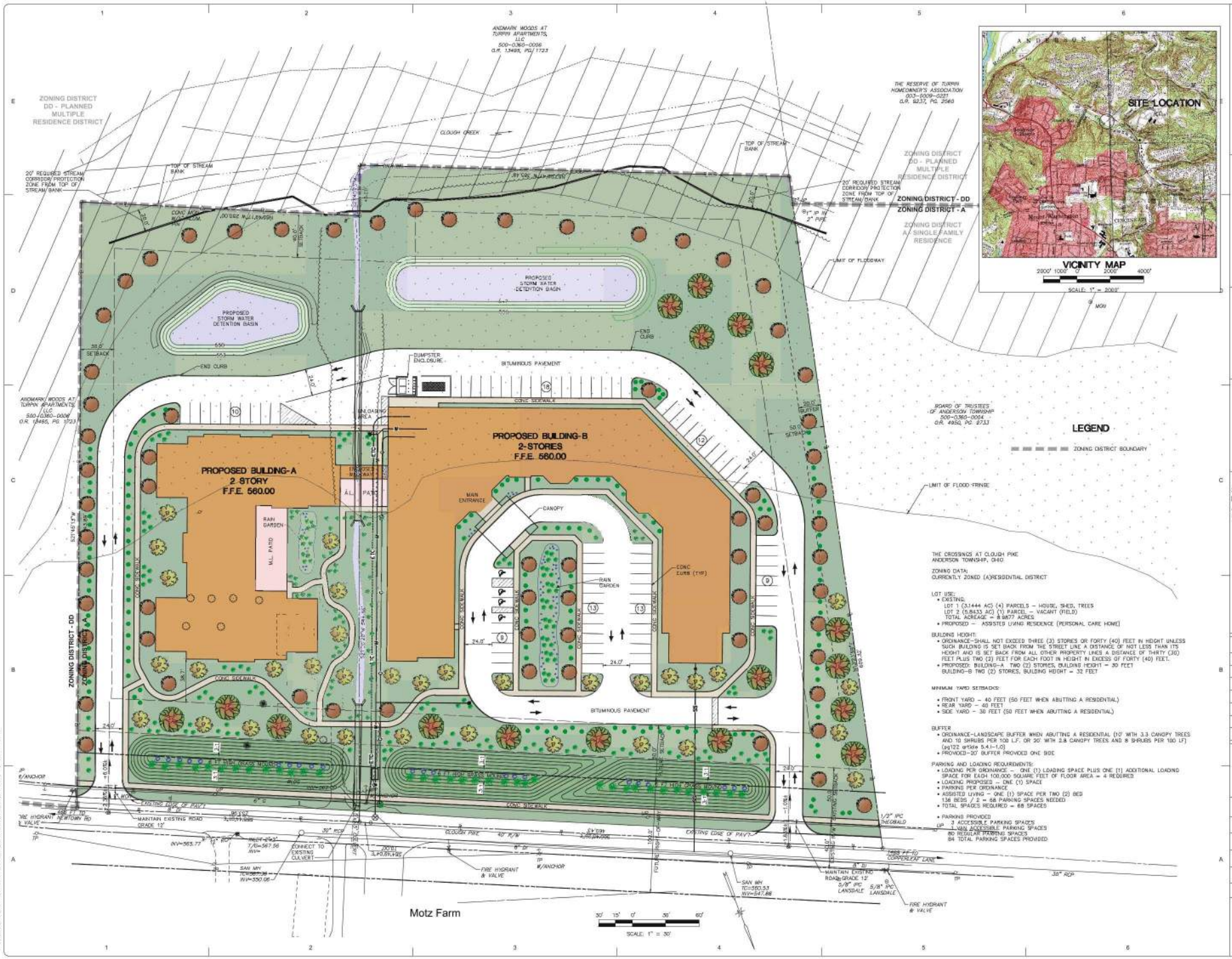
PROJ. MGR. – DSM	
DESIGN–	
CADD– TMH	
CHECKED– CBM	
SCALE– NTS	
DATE– FEB. 2019	

FIGURE NO. 5

SHEET NO. 5 OF 5

PROJECT R001432.0446

APPENDIX A
SITE PLAN



THE CROSSINGS AT CLOUGH PIKE
ANDERSON TOWNSHIP, OHIO

ZONING DATA:
CURRENTLY ZONED (A)RESIDENTIAL DISTRICT

LOT USE:
- EXISTING:
  LOT 1 (3.1444 AC) (4) PARCELS – HOUSE, SHED, TREES
  LOT 2 (5.8433 AC) (1) PARCEL – VACANT (FIELD)
  TOTAL ACREAGE = 9.0877 ACRES
- PROPOSED – ASSISTED LIVING RESIDENCE (PERSONAL CARE HOME)

BUILDING HEIGHT:
- ORDINANCE–SHALL NOT EXCEED THREE (3) STORIES OR FORTY (40) FEET IN HEIGHT UNLESS SUCH BUILDING IS SET BACK FROM THE STREET LINE A DISTANCE OF NOT LESS THAN ITS HEIGHT AND IS SET BACK FROM ALL OTHER PROPERTY LINES A DISTANCE OF THIRTY (30) FEET PLUS TWO (2) FEET FOR EACH FOOT IN HEIGHT IN EXCESS OF FORTY (40) FEET.
- PROPOSED: BUILDING–A TWO (2) STORIES, BUILDING HEIGHT = 30 FEET
  BUILDING–B TWO (2) STORIES, BUILDING HEIGHT = 32 FEET

MINIMUM YARD SETBACKS:
- FRONT YARD – 40 FEET (50 FEET WHEN ABUTTING A RESIDENTIAL)
- REAR YARD – 40 FEET
- SIDE YARD – 30 FEET (50 FEET WHEN ABUTTING A RESIDENTIAL)

BUFFER
- ORDINANCE–LANDSCAPE BUFFER WHEN ABUTTING A RESIDENTIAL (10' WITH 3.3 CANOPY TREES AND 10 SHRUBS PER 100 LF, OR 20' WITH 2.8 CANOPY TREES AND 8 SHRUBS PER 100 LF) (pg122 of Sec 5.4.1–1.0)
- PROVIDED–30' BUFFER PROVIDED ONE SIDE

PARKING AND LOADING REQUIREMENTS:
- LOADING PER ORDINANCE – ONE (1) LOADING SPACE PLUS ONE (1) ADDITIONAL LOADING SPACE FOR EACH 100,000 SQUARE FEET OF FLOOR AREA = 4 REQUIRED
- LOADING PROPOSED – ONE (1) SPACE
- PARKING PER ORDINANCE
- ASSISTED LIVING – ONE (1) SPACE PER TWO (2) BED
  136 BEDS / 2 = 68 PARKING SPACES NEEDED
- TOTAL SPACES REQUIRED = 68 SPACES
- PARKING PROVIDED
  3 ACCESSIBLE PARKING SPACES
  1 VAN ACCESSIBLE PARKING SPACES
  80 REGULAR PARKING SPACES
  84 TOTAL PARKING SPACES PROVIDED

H.F. LENZ COMPANY
Engineering
1407 Scalp Avenue
Johnstown, PA 15904
Phone: 814-269-6000
FAX: 814-269-6001
www.hflenz.com

Consultants:

Seal:

Seal:

Project Identification:

SMITH PACKETT HARMONY SENIOR LIVING AT ANDERSON

HAMILTON COUNTY, ANDERSON TWP.
CINCINNATI, OHIO

No.:	Date:	Description:

Sheet Title:

PRELIMINARY SITE PLAN

EXHIBIT G

Project No.:	2018-0034.01
Cadd Drawing File:	EXH-G.dwg
Drawn By:	REA
Checked By:	JRH
Date:	5/23/2018

Copyright: © 2018 H.F. LENZ COMPANY

Drawing Number:

EXH-G

Sheet 0 of 00

APPENDIX B
TRAFFIC COUNT DATA

Herbert, Rowland, & Grubic, Inc.

200 West Kensinger Drive
Cranberry Township, PA 16066

Building Relationships, Designing Solutions

File Name : Clough Pike AM Peak
Site Code : 00000000
Start Date : 2/6/2019
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Clough Pike Eastbound					Clough Pike Westbound					Northbound					Motz Driveway Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	46	0	0	46	0	176	0	0	176	0	0	0	0	0	0	0	0	0	0	222
07:15 AM	0	44	0	0	44	0	142	1	0	143	0	0	0	0	0	0	0	1	0	1	188
07:30 AM	0	76	0	0	76	0	107	1	0	108	0	0	0	0	0	0	0	0	0	0	184
07:45 AM	2	62	0	0	64	0	96	2	0	98	0	0	0	0	0	0	0	0	0	0	162
Total	2	228	0	0	230	0	521	4	0	525	0	0	0	0	0	0	0	1	0	1	756
08:00 AM	0	52	0	0	52	0	127	1	0	128	0	0	0	0	0	0	0	0	0	0	180
08:15 AM	1	68	0	0	69	0	135	1	0	136	0	0	0	0	0	0	0	0	0	0	205
08:30 AM	0	56	0	0	56	0	112	0	0	112	0	0	0	0	0	1	0	0	0	1	169
08:45 AM	1	47	0	0	48	0	116	0	0	116	0	0	0	0	0	0	0	0	0	0	164
Total	2	223	0	0	225	0	490	2	0	492	0	0	0	0	0	1	0	0	0	1	718
Grand Total	4	451	0	0	455	0	1011	6	0	1017	0	0	0	0	0	1	0	1	0	2	1474
Apprch %	0.9	99.1	0	0		0	99.4	0.6	0		0	0	0	0		50	0	50	0		
Total %	0.3	30.6	0	0	30.9	0	68.6	0.4	0	69	0	0	0	0	0	0.1	0	0.1	0	0.1	
Cars	4	445	0	0	449	0	1002	6	0	1008	0	0	0	0	0	1	0	1	0	2	1459
% Cars	100	98.7	0	0	98.7	0	99.1	100	0	99.1	0	0	0	0	0	100	0	100	0	100	99
Heavy Vehicles	0	6	0	0	6	0	9	0	0	9	0	0	0	0	0	0	0	0	0	0	15
% Heavy Vehicles	0	1.3	0	0	1.3	0	0.9	0	0	0.9	0	0	0	0	0	0	0	0	0	0	1

	Clough Pike Eastbound					Clough Pike Westbound					Northbound					Motz Driveway Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	46	0	0	46	0	**176**	0	0	**176**	0	0	0	0	0	0	0	0	0	0	**222**
07:15 AM	0	44	0	0	44	0	142	1	0	143	0	0	0	0	0	0	0	**1**	0	**1**	188
07:30 AM	0	**76**	0	0	**76**	0	107	1	0	108	0	0	0	0	0	0	0	0	0	0	184
07:45 AM	**2**	62	0	0	64	0	96	**2**	0	98	0	0	0	0	0	0	0	0	0	0	162
Total Volume	2	228	0	0	230	0	521	4	0	525	0	0	0	0	0	0	0	1	0	1	756
% App. Total	0.9	99.1	0	0		0	99.2	0.8	0		0	0	0	0		0	0	100	0		
PHF	.250	.750	.000	.000	.757	.000	.740	.500	.000	.746	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.851
Cars	2	222	0	0	224	0	515	4	0	519	0	0	0	0	0	0	0	1	0	1	744
% Cars	100	97.4	0	0	97.4	0	98.8	100	0	98.9	0	0	0	0	0	0	0	100	0	100	98.4
Heavy Vehicles	0	6	0	0	6	0	6	0	0	6	0	0	0	0	0	0	0	0	0	0	12
% Heavy Vehicles	0	2.6	0	0	2.6	0	1.2	0	0	1.1	0	0	0	0	0	0	0	0	0	0	1.6

Herbert, Rowland, & Grubic, Inc.

200 West Kensinger Drive
Cranberry Township, PA 16066

Building Relationships, Designing Solutions

File Name : Clough Pike PM Peak
Site Code : 00000000
Start Date : 2/5/2019
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Clough Pike Eastbound					Clough Pike Westbound					Northbound					Motz Driveway Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	109	0	0	109	0	71	0	0	71	0	0	0	0	0	0	0	0	0	0	180
04:15 PM	0	129	0	0	129	0	64	0	0	64	0	0	0	0	0	1	0	1	0	2	195
04:30 PM	0	121	0	0	121	0	62	0	0	62	0	0	0	0	0	1	0	0	0	1	184
04:45 PM	0	163	0	0	163	0	71	0	0	71	0	0	0	0	0	1	0	1	0	2	236
Total	0	522	0	0	522	0	268	0	0	268	0	0	0	0	0	3	0	2	0	5	795
05:00 PM	0	177	0	0	177	0	71	0	0	71	0	0	0	0	0	0	0	0	0	0	248
05:15 PM	0	195	0	0	195	0	84	0	0	84	0	0	0	0	0	0	0	0	0	0	279
05:30 PM	0	185	0	0	185	0	84	0	0	84	0	0	0	0	0	0	0	0	0	0	269
05:45 PM	0	161	0	0	161	0	79	0	0	79	0	0	0	0	0	0	0	0	0	0	240
Total	0	718	0	0	718	0	318	0	0	318	0	0	0	0	0	0	0	0	0	0	1036
Grand Total	0	1240	0	0	1240	0	586	0	0	586	0	0	0	0	0	3	0	2	0	5	1831
Apprch %	0	100	0	0		0	100	0	0		0	0	0	0		60	0	40	0		
Total %	0	67.7	0	0	67.7	0	32	0	0	32	0	0	0	0	0	0.2	0	0.1	0	0.3	
Cars	0	1237	0	0	1237	0	583	0	0	583	0	0	0	0	0	3	0	2	0	5	1825
% Cars	0	99.8	0	0	99.8	0	99.5	0	0	99.5	0	0	0	0	0	100	0	100	0	100	99.7
Heavy Vehicles	0	3	0	0	3	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	6
% Heavy Vehicles	0	0.2	0	0	0.2	0	0.5	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.3

	Clough Pike Eastbound					Clough Pike Westbound					Northbound					Motz Driveway Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	177	0	0	177	0	71	0	0	71	0	0	0	0	0	0	0	0	0	0	248
05:15 PM	0	**195**	0	0	**195**	0	**84**	0	0	**84**	0	0	0	0	0	0	0	0	0	0	**279**
05:30 PM	0	185	0	0	185	0	84	0	0	84	0	0	0	0	0	0	0	0	0	0	269
05:45 PM	0	161	0	0	161	0	79	0	0	79	0	0	0	0	0	0	0	0	0	0	240
Total Volume	0	718	0	0	718	0	318	0	0	318	0	0	0	0	0	0	0	0	0	0	1036
% App. Total	0	100	0	0		0	100	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.921	.000	.000	.921	.000	.946	.000	.000	.946	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.928
Cars	0	716	0	0	716	0	316	0	0	316	0	0	0	0	0	0	0	0	0	0	1032
% Cars	0	99.7	0	0	99.7	0	99.4	0	0	99.4	0	0	0	0	0	0	0	0	0	0	99.6
Heavy Vehicles	0	2	0	0	2	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	4
% Heavy Vehicles	0	0.3	0	0	0.3	0	0.6	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0.4

APPENDIX C
SITE INVENTORY

Sight Inventory Pictures

Intersection 1: Clough Pike & West Proposed Driveway

Driveway Location

Eastbound Approach

Westbound Approach

Northbound Approach

Intersection 2: Clough Pike & East Proposed Driveway

Driveway Location

Eastbound Approach

Westbound Approach

Northbound Approach

APPENDIX D
TRIP GENERATION CALCULATION

TRIP GENERATION SUMMARY

Trip Generation Clough Pike Senior Development

254 Assisted Living

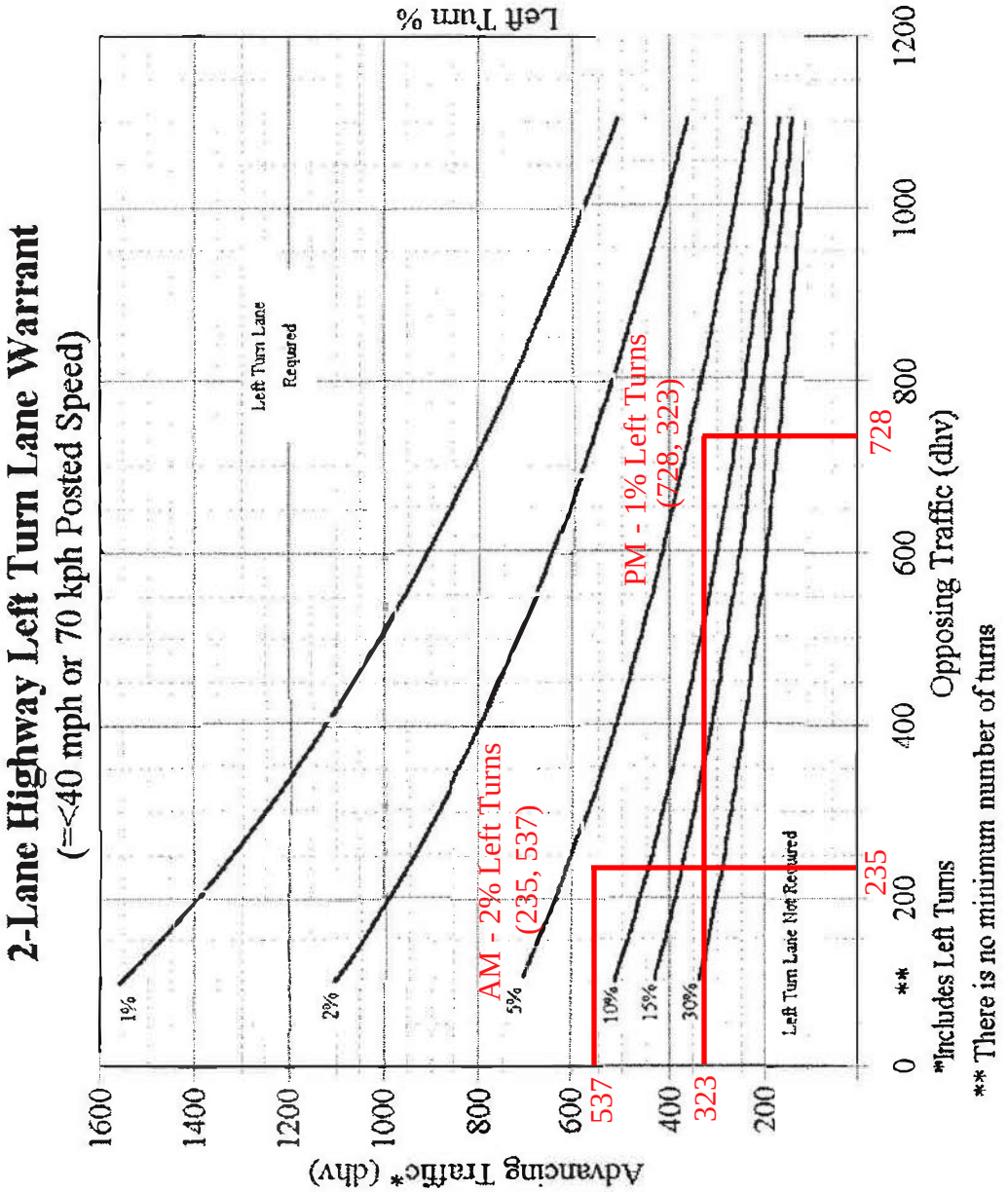
ITE Land Use Code	Description	Variable	# of Beds	Time Period	ITE Rate	ITE Equation	R^2 Value	Percent Entering	Percent Exiting	Total Trips (Rate)	Total Trips (Equation)	Use Rate or Equation	Total Trips Entering	Total Trips Exiting
254	Assisted Living	Beds	122	Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.	0.19	N/A	N/A	63%	37%	23	N/A	Rate	14	9
254	Assisted Living	Beds	122	Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.	0.26	N/A	N/A	38%	62%	32	N/A	Rate	12	20
254	Assisted Living	Beds	122	Weekday	2.60	N/A	N/A	50%	50%	318	N/A	Rate	159	159

APPENDIX E
TURN LANE WARRANT ANALYSIS

2-LANE LEFT TURN LANE WARRANT (LOW SPEED)

401-5a

REFERENCE SECTION
401.6.1



APPENDIX F
CAPACITY ANALYSIS

HCS 2010 Two-Way Stop Control Summary Report

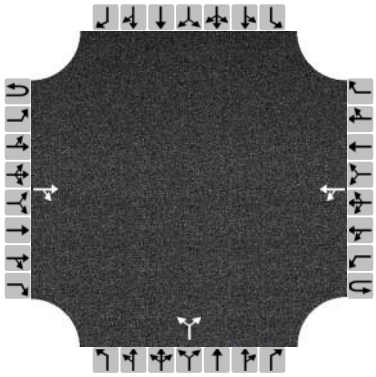
General Information

Analyst	TMH
Agency/Co.	HRG, Inc.
Date Performed	2/7/2019
Analysis Year	2020
Time Analyzed	AM Peak
Intersection Orientation	East-West
Project Description	Clough Pike Development

Site Information

Intersection	Clough Pike
Jurisdiction	Hamilton County
East/West Street	Clough Pike
North/South Street	Proposed Driveway
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			231	4		10	527			6		3				
Percent Heavy Vehicles						2				2		2				
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						632					11					
Capacity						1279					382					
v/c Ratio						0.49					0.03					
95% Queue Length						0.0					0.1					
Control Delay (s/veh)						7.8					14.7					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.3				14.7							
Approach LOS					A				B							

Copyright © 2019 University of Florida. All Rights Reserved.

HCS 2010 Two-Way Stop Control Summary Report

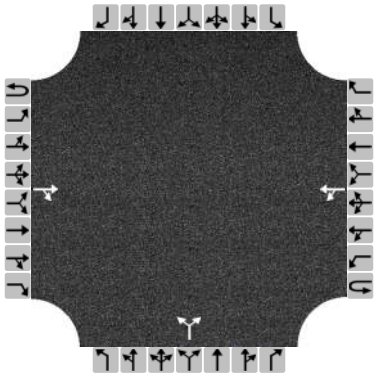
General Information

Analyst	TMH
Agency/Co.	HRG, Inc.
Date Performed	2/7/2019
Analysis Year	2020
Time Analyzed	PM Peak
Intersection Orientation	East-West
Project Description	Clough Pike Development

Site Information

Intersection	Clough Pike
Jurisdiction	Hamilton County
East/West Street	Clough Pike
North/South Street	Proposed Driveway
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			720	8		4	319			6		14				
Percent Heavy Vehicles						2				2		2				
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						347					21					
Capacity						830					324					
v/c Ratio						0.42					0.06					
95% Queue Length						0.0					0.2					
Control Delay (s/veh)						9.4					16.9					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.2				16.9							
Approach LOS					A				C							

Copyright © 2019 University of Florida. All Rights Reserved.

APPENDIX G
SIGHT DISTANCE EVALUATION

Western Driveway

TYPICAL INTERSECTION SIGHT DISTANCE CONDITIONS **

Plate No. 31

** For approaches to a two lane through roadway

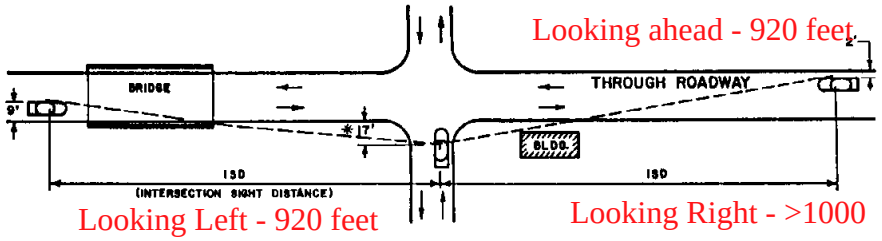


DIAGRAM A - HORIZONTAL COMPONENTS

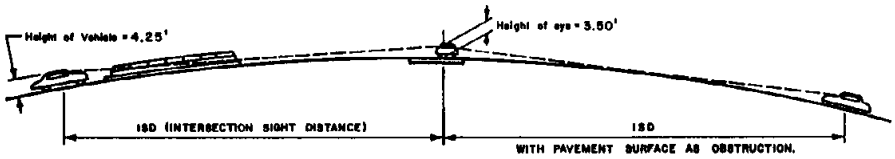


DIAGRAM B - VERTICAL COMPONENTS

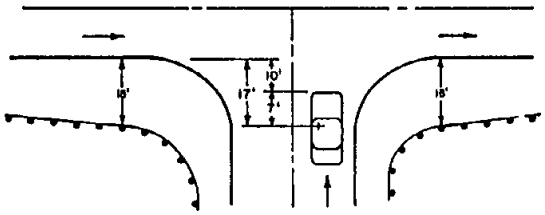


DIAGRAM C - WAITING VEHICLE

INTERSECTION SIGHT DISTANCE (ISD) FOR APPROACHES TO A TWO LANE THROUGH ROADWAY

Design Speed M.P.H.	ISD Ft.
55	755
50	690
45	[illegible]
40	560
35	495
30	430

*For Restricted Conditions 15' Minimum May Be Used

NOTE:

Sight distances listed in this table may be modified if necessary, in specific instances, to meet special conditions. However, this will be approved only after the submission of an analysis prepared by the applicants experienced registered engineer. The analysis shall demonstrate that the modification meets AASHTO standards.

Western Access – Sight Distance Photo Log

Western Driveway Access Location

Looking Left (SIGHT DISTANCE – 920 FT)

: Looking Right (SIGHT DISTANCE >1000 FT)

Vehicle making a left turn into driveway continuously seeing a vehicle approaching from the opposite direction (SIGHT DISTANCE – 920 FT)

TYPICAL INTERSECTION SIGHT DISTANCE CONDITIONS **

Plate No. 31

** For approaches to a two lane through roadway

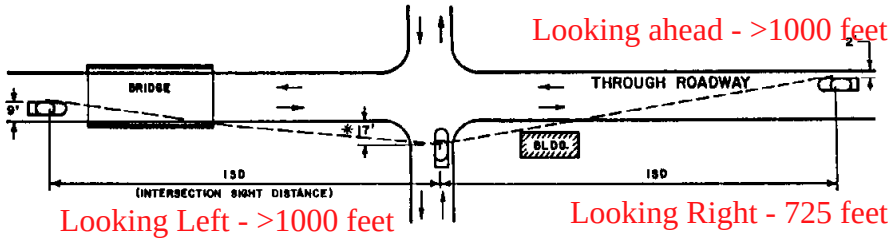


DIAGRAM A - HORIZONTAL COMPONENTS

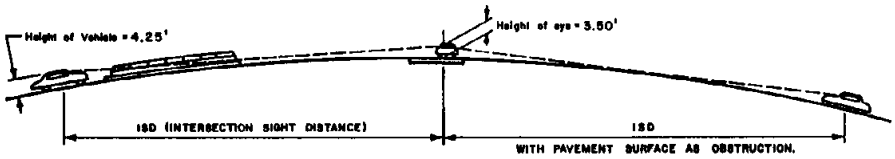


DIAGRAM B - VERTICAL COMPONENTS

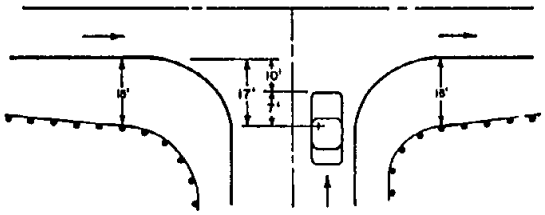


DIAGRAM C - WAITING VEHICLE

INTERSECTION SIGHT DISTANCE (ISD) FOR APPROACHES TO A TWO LANE THROUGH ROADWAY

Design Speed M.P.H.	ISD Ft.
55	755
50	690
45	[illegible]
40	560
35	495
30	430

*For Restricted Conditions 15' Minimum May Be Used

NOTE:

Sight distances listed in this table may be modified if necessary, in specific instances, to meet special conditions. However, this will be approved only after the submission of an analysis prepared by the applicants experienced registered engineer. The analysis shall demonstrate that the modification meets AASHTO standards.

Eastern Access – Sight Distance Photo Log

Eastern Driveway Access Location

Looking Left (SIGHT DISTANCE – >1000 FT)

: Looking Right (SIGHT DISTANCE 725 FT)

Vehicle making a left turn into driveway continuously seeing a vehicle approaching from the opposite direction (SIGHT DISTANCE – >1000 FT)