

Zoning Map Amendment & Preliminary Development Plan Submittal

> City of Powell, Ohio February 19, 2021

TABLE OF CONTENTS

Section 1131.04, ZONING MAP AMENDMENT

• SECTION 1131.04, CONTENTS OF APPLICATION FOR ZONING MAP AMENDMENT

<u>TAB</u>

• 1	l	Application	
• 2	2	EXHIBIT A	LEGAL DESCRIPTION – Property subject to this Amendment
• 3	3	EXHIBIT A-1	LEGAL DESCRIPTION – That part of the property to be annexed to the City of Powell
• 4	1	EXHIBIT B	Pre- Annexation Agreement -Annexation is contingent on zoning set forth in pre-annexation agreement being granted as approved in the agreement
• 5	5	EXHIBIT C	Fiscal Impact Report- Shows why zoning should change to the proposed zoning
• 6	5	EXHIBIT D	Property Owners List (34.8± Acres in City of Powell)
• 7	7	EXHIBIT E	Property Owners List (35± Acres in Liberty Township)
• -		EXHIBIT F	Preliminary Development Plan (See Tab 5 – Preliminary Development Plan section of this submittal
• 8	3	EXHIBIT G	Statement of Compatibility



PLANNING AND ZONING COMMISSION (P&Z) ZONING MAP AMENDMENT APPLICATION

ALL ITEMS ON THIS APPLICATION MUST BE COMPLETED.

Application Fee: \$750.00* Per Fee Ordinance 2019-49

Applicant: Redwood USA, LLC		
Address/City/State/Zip: 7007 East Pleasant Valley Road, Independence, OH 44	131	
Email Address: jim@jimfreyadvisor.com		
Phone No: 614-206-1123 Cell Phone No: 614-206-1123	Fax No:	
Property Owner: Breagha Plana II, LLC	_	
Address/City/State/Zip: P. O. Box 245, Powell, OH 43065		
Email Address: steel@gfschemicals.com		
Phone No: 740-881-5440, ext. 118 Cell Phone No: 614-975-0300	Fax No:	740-881-9309
Architect/Designer for Applicant: Mann Parsons Gray Architects, Inc.		
Address/City/State/Zip: 3660 Embassy Parkway, Fairlawn, OH 44333		
Email Address: james@mpg-architects.com		
Phone No: 330-666-5770 Cell Phone No:	Fax No:	
Property Address: 3041 Home Road and Home Road, Powell, Ohio 430		
Lot Number/Subdivision: n/a Existing Use: vacant/industrial		Use: Planned Commercial (Mixed Use)
Zoning Map Change Request (attach necessary documents): From PI District to PC District in or		
1) in 34.8+/- acres in City of Powell, apartments, regional detention and acres in Liberty Township, apartments and commercial, including skilled living, and general offices.		
Checklist:		
☐ Zoning Map Amendment requirements set forth in Section 1131.04		
☐ Attach a list of contiguous property owners as well as directly across the street from and within 250 fee	t of property	у
☐ Attach 5 copies of a vicinity map		
☐ 1 digital copy (CD, USB, Email) of the complete application packet.		
☐ Attach statement of compatibility of proposed zoning and use with adjacent properties and comprehen	sive plan	
☐ Attach the required fee - \$750.00*		
*Does not include transcript cost, which actual cost incurred.		
☐ Post a public notice sign at least (10) days prior to a public hearing or public meeting, pursuant to ordin	ance 1107.	035
Public notice sign details found here.		

(See Over)

I agree to grant the City Staff, the Commission, Board or Council considering this application access to the property that is the subject of this application for the purposes of reviewing this application and posting public notice for this application.

e of Applicant.	Date: 2/17/203
Office Use	Office Use
	Type/Date:
	Base Fee: \$750.00
	Prepared by:
	Reviewed by:
Received	PAYOR:
	RECIEPT#

City of Powell · 47 Hall Street · Powell, Ohio 43065 · (614) 885-5380 · (614) 885-5339 fax · www.cityofpowell.us

LEGAL DESCRIPTION

Parcel I

Situated in the Township of Liberty County of Dissence and State of Qhip and bounded and described as follows:

Being in Range 19 Terurates 3 Section 2 part of Let 2 U.S. Aldstory Lands Beginning at a pix spale at the interescion of the contentine of Determine County Road No. 124 and the East late of Section 2

Therece S 2" 19 W along the section has 1335 20 foet to an den pape pressing over an iron pape at 30 00 feet.

Thance N. 87* 40" W 25,00 fact to an eron price (found)

Thence N. 2* 19 E. 1315 20 feet to a R.R. Spite on the certainine of Delaware County Rd. 124 passing ever an iron page (found) at 1305 20 feet.

Thatce 5 87" 40" E stong the center line of serd County Rd 25 00 feet to the point of beginning containing 0 766 acres to the serve more or less

Parcel 8

Situated in the Township of Liberty County of Delawore and State of Oliva, and bounded and described as follows:

Borrig in Reinge 19, Township 3, Section 2, part of Let 2 U.S. Mölting Laintin Beginning at an eric pipe (Ibund) on the Essastin regime-invery line of the Chicaspealate and Ohio Redinate, and from pipe being 5, 2° DV W. 1335-25 foot from the point of intersection with the containing of Delaware County Rd. 124 and the Easterfy right-of-way-free of C&O Redissed.

Theree S. 67° 40° E. 838.74 seet to an won pipe on the East line of Section 2, passing over an iron pipe of 813.74 host.

There S 2' 19' W along the Emsterly line of Section 2 1177 79 feet to a post, passing over a stone of 421.64 feet.

Thence H 87" 44"W 824 37 feet to a steel post on the Easterly right-of-way line of the CGO Hadrood.

There a dong the Eastedy ngot-st-very line of each relations with a tir 30" cours to the again which the light chief bears N. 0" 50" 30" E. 503 08 feet, an arc distance of 504 11 feet to an iron both to the power of language.

Thence N. 2" 00" E. 677.35 feet to the point of beginning, containing 22.61 acres, be the same more or less

Parcel III

Situated in the State of Oteo, County of Delawere and Tremptinp of Liberty Boung in Range 19 Television 3. Section 2, and past of Lot 2, U.S. Military Londo.

Beginning at a railroad aptite set on the centerfine of County Road No. 12s known as the G.I.H. and Columbias Road deld patint of beginning beam kiteth 87 degrees 40" West 55 00 feet from the point of waterleaden of the centerfine of County Road No. 124 and the section line between sections 2 and 1.

Thence South 2 degrees 16' West parelled with the section line 1335,20 feet to an iron pipe passing ever an Iron pipe at 30 00 feet.

There's North 57 degrees, 40' West 513.74 feet to an your pipe set on the dight-of-way line of the Choespeake and Ohio Radroed.

Thorse North 2 degrees 69 East along the said East right-of-way line. 1335 20 feet to a radioad spike set on the controlline of County Road file. 124, passing over an iron pipe at 1305,20 feet.

Thence South 17 degrees 40' East along the contentine of County Read No. 124 517.53 teel to the point of beginning, creatmening 25 00 acres of land, be the name more or less.

Parcel IV

Situated in the State of Othic County of Delaware, City of Powell, isocated in Firm Let 1, Section 2, Township 3 North, Range 19 Week, Unsted States Military Lunda, and being part of a 40 839 since that commyred in MI Hames of Cownell Othio LCC, an exceeded in Official Record Volume 428, Page 1362, Delaware County Recorder's Office, and being more particularly detectable as follows:

Beginning, for reference, at a retrood upite found at the intersection of containing of Ruthenford Road (T.R. 122) with the East time of the CSX Transportation, inc. marking the Southwest come of paid 49 539 acre bect.

Thence North 10" ST 41" West 748 18 lest, slong the Westerly line of said 40,638 acre tract and East line of the CSX Transportation, Src. to an eron per found;

Therce North 98" 35" 69" West 1154 01 feet along the Westerfy fire of and 49 936 acre tract and East him of the CSX Transporteson, Inc. to an iron pri set marking the PRINCIPAL PLACE OF SECINATING of the forem

Thronce continuing North 196" 35" is "Mines 30", 06 feet, along the Westerly bits of said 40 0.26 acre tract and Enol line of the CSX Transportation, fee. Its centron pen found,

Thence North 94° EJ 20° West 782.01 feet, along the Winsterly line of seed 40 530 acre fact and East line of the CSX Transportation Inc., to an Iron purification.

Thence North 35' 19' 13' East 10.89 feet, along the Westerly line of axed 40 636 eace tract and East line of the CSX Transportation, Inc. to an iron the found:

There is North 23" 55" 61" East 95,92 (set, blood the Westerly line of said 40 636 sore tract and East line of the CSX Transportation, Inc., to on ken per found.

Thence North 02' 03' 18" East 195 98 feet, stong the Westeldy line of and 49 0.38 acre stack and East line of the CSX Transportation, Inc. 16 on item pin found marking the Northwest corner of and 49 535 acre and and sol

There South 85" 24" 15" East 766 01 feet, along the Morth Sine of south 40,036 sore tract and South Sine of used 22.01 sore limit, to ankeep per found of the Chail Sine of Famil, 64 I and Weet Sine of a 25.245 sore that (Parcel III) conveyed to 0.0, Fredenick Simits Chansold Company, recorded in Doed Book 420 Plags 32, marking the Northeast conner of said 40,036 sore text and Southwest conner of 22.51 sore that

Thence South C4* 15 C4* West 973.92 feet, along the East tine of said 40.836 size wast and Ferm Lai 1 and West his of said 25.248 sore tract and 4 51.3172 size west conveyed to Beard of Trastees Liberty Township, are inconsed in Official Record 32, Page 1988, to an ison pro-found making the Southwest cames of waid 51.3172 size and and off 40 Notherwest cames of a 21.0170 size in text and and 40 Notherwest cames of a 21.0170 size in text cames yet of 51.3172 size and and and official Notherwest cames of a 21.0170 size in text cames yet of 51.3172 size and and and official size of 51.3172 size and and official size of 51.3172 size and 52.0170 size in text cames of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 51.3172 size and 52.0170 size in the control of 51.3172 size and 52.0170 size in the control of 51.3172 size and 5

Therece South 02" 31' 40" West 780.30 feet, along the East line of east 40.636 pare tract and Farm Lot 1 and Yest lines of east 21 976 pare tract and a 25 094 pare had conveyed to Board of Education of the Otenberg Local School Debnit, an recorded in Deed Book 697 Page 278, to an inso pan set (present on their parsoning an tran pan found at

Theorical storigition aim of a course 638 84 feet turning to the right (data angle = 47° 20° 15° redux = 164.43 feet) with a cherid bearing and distance of heigh 60° 60° 16° Weet 630° 36 feet, across said 40.836 note tend, to the prescript place of beginning, containing an area of 23.246 sourse.

LESS AND EXCEPTING FROM PARCELS I AND ELABOVE

Ghusted in the State of Chio, County of Delawate, Township at Utenty being a part of Form List 2 or Sychon 2 Township 3 North, Range 19 West, United States Matary Lands and being a part of Forces 11 5/20 acre and 25 00 acre percels conveyed to G. Frederick Smith Chemical Company as recorded in Book 4/20, Page 22 is the records of Delaware County being a part of is final being an the regist and in School of the centeration of DEL-CR124-4 11 (Home Road) and bounded and described as follows.

Beginning at the intersection of the centerfine of County Road 124 (home Road) and the East Bine of said Fear, Lot 3, losd pose located 22.33 feet list of station 26(1) 13 or of a proposed County Road 124 and being the TRUE FORMY OF ESCRIANTO, for the pareat home described.

1) Therice South 93 degrees 30 manufee 05 seconds Weet along the Earl line of said Form Lot 2 or distance of 122 74 feet to an iron pin set, located 99 18 leef right of statum 239-90 35 of proposed County Road 128 2) Thence South 65 degrees 10 metalins 23 sectorials West a distance of 715 67 feet to an wen par set located 156:00 feet right of station 233-50 00 of proposed County Road 124

 Therea Harth 66 dagrees 22 marker 05 seconds West a distance of 134 55 feet to an ean pin set fecated 150 00 feet right of streen 233+06-00 of proposed County Road 124

4) Thence North 03 degrees 28 minutes 47 seconds East along the East line of the CSX Risknord a distance of 278 00 feet to the cartedine of ensuing County Road 124 said pone located 77 99 teel left of station 231-64 \$6 of propieted Cauty Read 124.

5) Thence South 86 degrees 21 minutes 56 seconds East along the certifichis of around County Road 174 is detance of 832,39 feet to a point located 23 93 feet 68 of station 240-92 63 of proposed County Road 174

6) Theore South 85 degrees 38 require 27 seconds East along the contecting of washing County Road 124 a destance of 10.56 feet to the point of beginning and anchoring an erise of 3.555 secon more or lines.

Of the above described tract, 3.65¢ acres in focaled in Auditor's Permanent Parcel Number 315-240-01004-000 which includes 0.563 acres in the present road accupant and 0.071 acres in focaled in Auditor's Permanent Parcel Number 315-240-01-005-000 which includes 0.017 acros in the present road occupant.

Monuments released to as you got set are 3/4 inch dismoter a 30 inch long you been with a 1-1/2 inch diameter attraction cap marked "ROW"(S 87610")

Searings used in this description are based on the Oneo Lambor Projection North Zine Plane Coordinate System as admittabled by the National Goodsto Survey, North American Design of 1983 (1995 adjustment) from GPS observations made by American Consulting Truc.

Stations referred to herein are from the canadign of survey of proposed County Road 124 to found on Delarate County Engineer's Office Right of Way Plan DEL-CR1264 11

The description was prepared and reviewed on July 17 2006 by Charles P. Untertainer P.S. 7819 from a survey mode by American Computing, Inc. in 2003.



DESCRIPTION FOR A 35.336 ACRE ANNEXATION FROM LIBERTY TOWNSHIP TO CITY OF POWELL

Situated in the State of Ohio, County of Delaware, Township of Liberty, being in Farm Lot 2, Section 2, Township 3 North, Range 19 West of the United States Military Lands, being,

- All of that 21.587 acre tract as described in deed to Breagha Plana II, LLC, an Ohio limited liability company, recorded in Official Record volume 1084, page 393, (all records referenced herein are to the Delaware County Recorder's Office, unless otherwise stated), being known as Delaware County Auditor's number 319-240-01-004-000.
- All of that 13.749 acre tract as described in a deed to Breagha Plana II, LLC, an Ohio limited liability company, recorded in Official Record volume 1084, page 393, being known as Delaware County Auditor's number 319-240-01-005-000.

and being more particularly described as follows.

COMMENCING for reference at the northwest corner of Farm Lot 14, and in the asset line of the said Farm Lot 2, and being the east line of the said Section 2, and being the northeast corner of a 3.484 acre right-of-way taking known as 21-WDV as shown in the plan set DEL-CR124-4.11 on record with the Delaware County Engineer's Office as conveyed to Board of Commissioners of Delaware County, Ohio by the instrument conveyed as Official Record volume 952, page 672, and being the northwest corner of the Clay C. Darnell Subdivision as shown in Plat Book volume 5, page 79;

Thence along the said westerly line of Farm Lot 14, the westerly line of the said Clay C. Darnell Subdivsion, the said easterly line of Farm Lot 2, the said easterly line of Section 2, and the said easterly line of the 21-WDV tract, South 02 degrees 19 minutes 00 seconds West for a distance of 122.74 feet to the southeast corner of the said 21-WDV tract, being the northeast corner of 21.587 acre tract, and being the northwest corner of parcel conveyed to Board of Trustees of Liberty Township by the instrument filed as Deed Book volume 496, page 199, and being on the southerly right-of-way line of Home Road (Varied Width), and being the true **POINT OF BEGINNING** of the parcel herein described;

Thence along the easterly line of the said 21.587 acre tract and said 13.749 acre tract, the westerly line of the said Board of Trustees of Liberty Township tract, the said easterly line of Farm Lot 2, the said easterly line of Section 2, the said westerly line of Farm Lot 14, the westerly line of Section 1, the westerly lines of Farm Lots 15 and 16, South 02 degrees 19 minutes 00 seconds West for a distance of 1,890.25 feet to the southeast corner of the said 13.749 acre tract, the northeast corner of a 9.556 acre tract as conveyed to Breagha Plana II, LLC, an Ohio limited liability company by the instrument filed as Official Record volume 1084, page 393, and being on the existing northerly corporation line of a 9.556 acre tract annexed to City of Powell, Ohio, by Ordinance No. 2005-43 (08-16-2005), Resolution No. 05-773 as filed in Instrument Number 200500041967;

Thence along the said northerly corporation line, the southerly line of the said 13.749 acre tract, and the northerly line of the said 9.556 acre tract, North 87 degrees 29 minutes 09 seconds West for a distance of 842.53 feet to the southwest corner of the said 13.749 acre tract, the northeast corner of the said 9.556 acre tract, the northeast corner of the said existing corporation line, and on the easterly right-of-way line of CSX Transportation Inc.;

Thence along the westerly line of the said 13.749 acre tract, the westerly line of a said 21.587 acre tract, and the said easterly right-of-way line of CSX Transportation Inc., North 02 degrees 19 minutes 00 seconds East for a distance of 1784.53 feet, to the northwest corner of the said 21.587 acre tract, being the southwest corner of the said 21-WDV tract and being on the said southerly right-of-way line of Home Road;

Thence along the northerly line of the said 21.587 acre tract, the southerly line of the said 21-WDV tract, and the said southerly right-of-way line of Home Road; South 87 degrees 31 minutes 03 seconds East for a distance of 134.55 feet to an angle point;

Thence continuing along the last described line, North 84 degrees 01 minutes 25 seconds East for a distance of 715.46 feet to the TRUE POINT OF BEGINNING for this description.

The above description contains a total area of 35.336 acres (0.000 of which are within the present road occupied), of which:

- 21.587 acres is all of PID# 319-240-01-004-000
- 13.749 acres is all of PID# 319-240-01-005-000

Bearing described herein are based on the east line of Farm Lot 2, of Section 2, Range 19, Township 3, Liberty Township, being South 02 degrees 19 minutes 00 seconds West, as referenced in the deed filed as Official Record volume 1084, Page 393 on field in the records of Delaware County, Ohio.

This description was prepared by Andrew T. Jordan, Registered Professional Surveyor Number 8759.

American Structurepoint, Inc.

DELAWARE COUNTY ENGINEER Map Department

reby certify that this document true copy of the original on file in the Map Department

Chris E. Bauserman, P.E., P.S.

April 25, 2019



PRE-ANNEXATION AGREEMENT

This Pre-Annexation Agreement (the "Agreement") is made and entered into this day of _______, 2020, by and between Breagha Plana II, LLC (hereinafter the "Landowner"), Redwood USA LLC, an Ohio limited liability company, or its assigns (hereinafter the "Developer"), and the City of Powell, Ohio, an Ohio municipal corporation organized and existing under the Constitution and laws of the State of Ohio and its municipal charter (hereinafter the "City") ("Landowner, Developer and City are together the "Parties"), under the circumstances summarized in the following recitals.

BACKGROUND:

- A. Landowner is the record owner of approximately 70.069 +/- acres of land south of Home Road, between the CSX railroad tracks to the west and Liberty Road to the east (which land is depicted on Exhibit A and referred to herein as the "Property"); and
- B. The Property itself consists of four (4) parcels:
 - Two (2) to the south in the City, referred to hereafter as the "Powell Parcels", currently zoned as Planned Industrial District, consisting of:
 - 9.556 acres commonly known by Delaware County Auditor's parcel identification number ("PIN") 31924001005001; and
 - ii. 25.248 acres commonly known by PIN 31924001068004; and
 - Two (2) to the north in Liberty Township, referred to hereafter as the "Township Parcels", currently zoned as Industrial District, consisting of:
 - i. 21.516 acres commonly known by PIN 31924001004000, and
 - ii. 13.749 acres commonly known by PIN 31924001005000

- C. The Property provides the City with a growth corridor to the north that the City would not otherwise have; and
- D. Landowner is in a contractual relationship with Developer, which would prefer to purchase, rezone, and develop the entire Property within the City; and
- E. The Township Parcels would benefit from certain City services, including in particular police protection; and
- F. Landowner and Developer desire formal rezoning of both the Powell Parcels and Township Parcels as part of an overall development plan for the entire Property ("Property Development Plan", defined in greater detail below), and will refile an annexation petition for the Township Parcels concurrently with filing the Property Development Plan with the City; and
- G. The City is capable of providing and hereby agrees to offer its municipal services to the Township Parcels if the Landowner annexes the Township Parcels into the City; and
- H. The Parties agree that it is in their mutual interest to enter into this Agreement for the annexation, rezoning and development of the Powell Parcels and Township Parcels as part of an overall Property Development Plan, and that the Landowner can seek detachment under Ohio Revised Code ("ORC") Section 709.38 if the City does not grant the requested rezoning.
- I. The Olentangy Local School District Board of Education has entered into an access agreement with the Developer, complete with an approved form of easement for recording. Exhibit B.

Now THEREFORE, in consideration of the covenants and agreements contained herein, including the background recitals from above, the Parties covenant and agree as follows:

Section 1. Annexation Petitions and Related Approvals.

Petition(s) for Annexation; Annexation. The Landowner shall re-file its A. annexation petition, map, legal description and other related information, as may be required by the ORC, to annex the Township Parcels, but not including any of the road right-of-way of Home Road (County Road 124) to the City, the legal description of which is attached hereto as Exhibit A-1. The annexation process shall be an "Expedited Type II" annexation as provided in ORC Section 709.023. Landowner agrees that it will execute any necessary annexation petition, as appropriate, and will execute any other documents reasonably necessary to effectuate the annexation as may be required by law at its cost and expense. The annexation petition shall appoint Andrew Wecker, Esq., as the petitioner's agent and may be filed solely with respect to the Township Parcels or may be filed as a joint annexation petition with other parcels so long as all other parcels so joined are supported by one hundred percent (100%) of the owners of each parcel and the joinder of any such additional parcels will in no way affect the agreements of the parties memorialized in this Agreement or the Property Development Plan. The petition will be filed with the Commissioners. Landowner and Developer agree that all costs and expenses in petitioning for the annexation will be borne by Developer. Should the City desire for its own attorney and/or other outside contractors to represent its interests with regard to the annexation petition, those costs will be borne by City. Landowner further agrees that it will continue to support the annexation to the City throughout the process, including any appeal or court action, at no further expense to City, unless the City desires to retain its own attorneys; provided, however, Landowner's continued cooperation in the annexation of the Township Parcels shall be subject to and conditioned upon the City's performance of its duties and obligations as memorialized in this Agreement.

- B. <u>City Service Resolution</u>. Pursuant to and in accordance with the ORC, the City agrees to enact, prior to twenty (20) days after the date of filing the annexation petition(s) with the Commissioners, the appropriate Service Resolution stating the services that will be provided to the Township Parcels upon annexation. The Service Resolution, once adopted, shall be immediately certified and filed with the Clerk of the Commissioners.
- C. <u>Development Considerations</u>. The Powell Parcels are currently zoned under the City zoning ordinance for industrial uses. The intended use of the entire Property (including the Township Parcels) by the Landowner and Developer is that of a Planned Commercial District (PC) under the Powell Zoning Ordinance to include a multifamily rental community and an assisted living facility, skilled nursing facility, memory care facility, medical or medical related offices, professional offices, general offices, and/or similar facility, which may be referred to elsewhere in this document as the Property Development Plan. Landowner and Developer propose the Property Development Plan for the Powell Parcels and Township Parcels attached hereto as Exhibit C, that includes, but is not limited to, three hundred thirty-one (331) multifamily dwelling units and a density of 5.71± dwelling units per acre and incorporated herein by reference, together with an assisted living facility, skilled nursing facility, memory care facility, medical or medical related offices, professional offices, general offices, and/or similar facility on approximately twelve (12) acres.

Upon filing of an application to rezone the Property under the Powell Zoning Code, Council intends to enact legislation formally referring such application to the Powell Planning and Zoning Commission for its review and consideration in accordance with the applicable provisions of the Codified Ordinances. Such review and consideration shall occur during the pendency of the annexation process. The City's planning staff and administration agree that, if

the rezoning application and accompanying preliminary development plan is generally consistent with Exhibit C attached hereto, and with three hundred thirty-one (331) multi-family dwelling units and a density of 5.71± dwelling units per acre and incorporated herein by reference, together with an approximately twelve (12) acre assisted living facility, skilled nursing facility, memory care facility, medical or medical related offices, professional offices, general offices, and/or similar facility, as described above, City staff and administration will professionally review and timely process the application to rezone both the Township Parcels and Powell Parcels to a Planned Commercial (PC) Zoning District, with the aforementioned uses as permitted uses.

After the annexation petition has been approved by the Commissioners, a copy of the record is filed with the Clerk of the City and laid before Council, the City understands it has one hundred twenty (120) days to accept the annexation (ORC Section 709.04).

At the request of the Landowner or the Developer, the City agrees to delay acceptance of the annexation until legislative approval of the rezoning of both the Township Parcels and Powell Parcels can be accomplished contemporaneously with the acceptance of the re-filed annexation. If, for some reason, the rezoning ordinance cannot be approved in a form or substance acceptable to Developer and/or the Landowner, the City agrees, at the request of Developer and/or the Landowner, in the sole and absolute discretion of either the Developer or Landowner, to permit the Landowner to withdraw the petition to annex the Township Parcels to the City and/or to forbear from acceptance of the annexation by allowing the 120-day period to expire, thus effectively rejecting the annexation of the Township Parcels.

If the City's acceptance and approval of the annexation (after the City's initial passage of a service ordinance) occurs prior to or other than concurrently with the legislative approval of the rezoning, and the rezoning is subsequently not approved in accordance with Exhibit C, or consistent with three hundred thirty-one (331) multi-family dwelling units and a density of 5.71± dwelling units per acre and incorporated herein by reference, together with approximately twelve (12) acres of assisted living facility, skilled nursing facility, memory care facility, medical or medical related offices, professional offices, general offices, and/or similar facility, as described above (or as it may be modified acceptably to Developer), or is referred to a vote of the electorate, or a building, utility, or any access moratorium is enacted which would limit Landowner's use of the Township Parcels, or similar action is taken by the City, Delaware County, Liberty Township, or any other property owner that creates a lack of services to the Property, or if all governmental approvals, including but not limited to Federal, State of Ohio, Delaware County, and City government engineering approvals are not finalized within sixty (60) days after Council's acceptance of a Property Development Plan substantially similar to Exhibit C and consistent with the density described above, or Developer is unable to close on the Property with the Landowner, or Developer is unable to receive a construction loan, the City agrees, at the request of the Developer and/or the Landowner, in the sole and absolute discretion of either the Developer or Landowner: (i) to reconsider the ordinance accepting the annexation, and to rescind, repeal and reject the annexation approval within fourteen (14) days of any of the above described events occurring, and receipt of the request of Developer; and/or (ii) to detach the Township Parcels from the City and not oppose any owner's petition to detach its part of the Township Parcels from the City, as permitted under ORC Section 709.38.

D. Approval and Permit Regulation.

(i) <u>Compliance Statement</u>. Nothing in this Agreement shall exempt the parties hereto from the zoning, development plan and subdivision platting processes of

City. The execution and delivery of this Agreement shall not serve as a variance of the zoning, development plan and platting process mandated by the Codified Ordinances and the Subdivision Regulations of City, but will serve as a preliminary understanding and guide for the proposed zoning and development of the Property.

- (ii) <u>Council Action</u>. The obligations of and agreements by the City contained herein shall be effective and enforceable upon, and subject to, the approval of all necessary legislation and/or motions by Council. It is acknowledged that the initial legislation approving this Agreement is merely the first in a series of legislative acts implementing this Agreement (a "Council Action"). All subsequent Council Actions implementing this Agreement shall be considered to be in furtherance of this Council Action.
- (iii) <u>Permits</u>. Developer will obtain all necessary permits from all levels of government to allow Developer to build and develop the Powell Parcels (and eventually the entire Property) consistent with its intended use.
- (iv) Replatting and Other. City will cooperate with Developer to cause the Powell Parcels to be replatted from the currently effective plat, if any, to permit the development of the Powell Parcels generally in accordance with Exhibit C. The City agrees to allow the stormwater management for the Property to be designed to Delaware County Engineer's Office regulations of 100-year post-development peak discharge released at the 2-year predevelopment peak discharge rate. All other stormwater design regulations (excepting that of the stormwater release rate as described above) as set forth in Chapter 1111.05 of the Codified Ordinances for private storm sewers shall govern.

Stormwater post-construction management BMPs shall be designed in accordance with the current Ohio EPA General Construction Permit.

- E. <u>Tax Increment Financing</u>. The Parties agree that City may hereafter determine to:
- (i) create one or more tax increment financing areas ("TIF Area" or "TIF Areas"), which areas may include the Property,
- (ii) declare that the Improvement (as defined in Ohio Revised Code 5709.40)
 is a public purpose and that a certain portion of that Improvement be declared exempt
 from taxation for a certain period of time; and
- (iii) provide for owner(s) of the Property, and any successors and assigns, to make service payment in lieu of taxes (the "TIF Pilots") with respect to the real property included within a given TIF Area, which area may include the Property.

A list of the TIF Areas, together with their commencement and duration, contemplated by and among the City, Landowner and Developer is attached hereto as Exhibit D.

A list of the Improvements contemplated by and among the City, Landowner and Developer is attached hereto as Exhibit E.

Landowner and Developer each agree that if City determines to create one or more TIF Area on the Property, then each such Party shall consent to and agree to reasonably cooperate with City to create such a TIF Area on the Property. The Parties further agree that if one or more TIF Area is created, then the revenues received by the City from the TIF Pilots (the "TIF Revenues") shall be used by the City to pay the costs of public infrastructure improvements which shall hereafter be designated by the City in

its sole discretion as benefitting the TIF Area and for any other lawful purpose (which may include payments to the applicable school districts). The Parties agree that unless otherwise agreed to in writing by City, no City monies (other than TIF Revenues as may be used as described above) shall be required to be used to pay the costs of any public infrastructure improvements required to be constructed/installed to serve the Property.

Section 2. Miscellaneous

- A. <u>Intent of Parties</u>. This Agreement shall be binding upon the Parties and their respective successors and/or assigns, and by execution hereof, all Parties represent that they are duly authorized to sign it. By passage of Ordinance No. _____ on _____, the City authorized the execution of this Agreement.
- B. <u>Cancellation or Termination</u>. This Agreement may be cancelled or otherwise terminated by mutual written agreement of the Parties or pursuant to the terms of this Agreement as to conflict in law, impracticality and/or acts of God.
- C. Remedies. Except as otherwise limited by Chapter 2744 of the Ohio Revised Code as to action for or against the City, the Parties shall be afforded and do possess the right to seek every remedy available at law or in equity provided for under the laws of the State of Ohio as pertains to the terms and conditions, duties, obligations, privileges and rights of this Agreement and the enforcement thereof.
- D. <u>Enforcement</u>. Unless this Agreement is cancelled or otherwise terminated, this Agreement will be enforceable against any party hereto per the laws, ordinances, resolutions, regulations or policies in effect at the time of the execution of this Agreement.
- F. <u>Assignment of Agreement</u>. Developer may assign this Agreement, or any part thereof or any duty, obligation, privilege or right granted under this Agreement to any newly

formed entity of which Developer is a member, Developer's members are members, or to any affiliated entity of which Developer is a member or Developer's members are members.

- G. Relative Rights. The rights and obligations of the Parties shall be subject to the terms and conditions hereof, and will inure to the benefit of, and be binding on, the respective successors and assigns.
- H. Entire Agreement; Merger Clause; Statement of Incorporation. It is agreed that the Agreement merges all of the oral negotiations, representations, discussions and understandings between the Parties, their legal counsel, agents or representatives. This Agreement contains the entire agreement of the Parties with respect to its subject matter. All documents related to this Agreement and/or attached hereto as exhibits or addendums shall be incorporated into this Agreement by reference as if fully set out at length herein.
- I. <u>Severability</u>. If any clause, sentence, paragraph or part of this Agreement shall, for any reason, be adjudged by any court of competent jurisdiction to be invalid, such judgment shall not affect, impair, or invalidate the remainder of this Agreement and the remainder of said Agreement shall continue in full force or effect.
- J. <u>Cooperation</u>. The City will cooperate with Landowner to obtain any required and/or necessary permit from any government or governmental agency not a party to this Agreement.
- K. <u>Modifications or Amendment of Agreement</u>. No modifications, amendments, alterations or additions shall be made to this Agreement except in a writing signed by all Parties hereto.

L. <u>Recitals</u>. The Parties acknowledge and agree that the facts and circumstances as described in the Background hereto are an integral part of this Agreement and as such are incorporated herein by reference.

M. Executed Counterparts. This Agreement may be executed in several counterparts, each of which shall be regarded as an original and all of which shall constitute but one and the same agreement. It shall not be necessary in proving this Agreement to produce or account for more than one of those counterparts.

N. <u>Captions</u>. The captions and headings in this Agreement are for convenience only and in no way define, limit or describe the scope or intent of any provisions or sections of this Agreement.

O. <u>Survival of Representations and Warranties</u>. All representations and warranties of Landowner, Developer, and the City in this Agreement shall survive the execution and delivery of this Agreement.

P. <u>Effective Date</u>. This Agreement shall be effective when signed by all the Parties.

Q. <u>Time</u>. Time shall be of the essence in doing and performing all things to be done under the terms of this Agreement.

IN WITNESS WHEREOF,	the Partie	s have	caused	this	Agreement	to	be	executed	by
their duly authorized representatives	this	_ day o	f		, 2020.				

CITY OF POWELL, OHIO By: _____ Printed: ___ Andrew White Title: ___ City Manager

LANDOWNER
Breagha Plana II, LLC
By:
J. Steel Hutchinson, Member
DEVELOPER
REDWOOD USA LLC, AN OHIO
LIMITED LIABILITY CORPORATION
Ву:
David Conwill, Authorized Member

INDEX OF EXHIBITS

- A. Depiction of the Property (70.069 Acres)
- A-1. Description of Township Parcels (to be annexed)
- B. Access Agreement with Olentangy Local School District
- C. Development Plan
- D. TIF Areas
- E. List of Improvements

Exhibit A. Depiction of the Property (70.069 Acres)

Exhibit A-1. Description of Township Parcels (to be annexed)

Exhibit B. Access Agreement with Olentangy Local School District

AGREEMENT

BACKGROUND

- A. Olentangy owns certain real property commonly known as Olentangy Liberty Middle School ("Middle School") and located in Liberty Township, Delaware County, Ohio, and more particularly described on Exhibit A attached to this Agreement ("Olentangy Property").
- B. Redwood has under contract with the current record owner, Breagha Plana II, LLC ("Breagha"), certain real property adjacent to and west of Olentangy Property and more particularly described on Exhibit B attached to this Agreement ("Breagha Property").
- C. In return for Redwood providing certain public improvements to the Middle School, Olentangy is willing to grant an easement to Redwood from the Breagha Property east to Liberty Road. This easement is in an area not need for school purposes.
- D. Redwood and Olentangy desire to enter into this Agreement to create a perpetual casement over Olentangy Property to benefit Breagha Property.

AGREEMENT

For valuable consideration, the receipt and sufficiency of which is acknowledged, Redwood and Olentangy agree as follows:

- Subject to sections 2, through 5 below, Olentangy shall convey to Redwood an executed
 casement in recordable form (whether in counterpart or executed jointly on behalf of Redwood,
 with notary public acknowledgements), the form of which shall be the same or substantially
 the same as the attached Exhibit C ("Easement"), with the conceptual easement area depicted
 more or less as shown on attached Exhibit D.
- 2. The parties' obligations hereunder are specifically contingent upon Redwood successfully working with Breagha to annex, rezone and close on its acquisition with the conveyance of record ownership from Breagha to Redwood. Upon written notice by Redwood to Olentangy's Director of Business Management and Facilities (or the equivalent individual at the time of the written notice) that the contingencies have been met to the parties' mutual satisfaction, Olentangy shall then deliver the easement to a mutually selected escrow agent within ten (10) return receipt requested or hand delivery by a third-party courier service, FedEx or UPS and providing written confirmation of delivery.

- 3. After Olentangy's delivery of the easement to a mutually selected escrow agent, Redwood shall build a total of four (4) dugouts at two ball diamonds (whether baseball or softball) designated by Olentangy and at a time mutually agreeable to both Olentangy and Redwood, but in no event shall Redwood be required to commence construction of the dugouts before Redwood has commenced construction of the first phase or phase I of its intended development and vertical construction of the Breagha Property. When it builds the dugouts, Redwood and its agents, employees and contractors will consult with Olentangy to ensure that the dugouts satisfy all applicable legal requirements. Redwood shall use all commercially reasonable efforts to minimize interference with Olentangy's use of its premises during its construction of the dugouts. Redwood shall use its best efforts to protect trees and minimize any damage to Olentangy's premises. As soon as practicable after building the dugouts, Redwood shall at its own cost, remedy any damage occurring on Olentangy's premises. Specifically, Redwood shall, at its sole expense, restore the premises to its prior existing condition. This shall include without limitation returning the premises to its former grade and condition, restoring any trees, landscaping, driveways or pedestrian paths to a condition substantially equal to the condition existing prior to building the dugouts. Redwood also shall maintain an insurance policy covering its work to build the dugouts, and it shall name Olentangy as an additional insured on its policy. In entering this Agreement, Redwood donates the dugouts to Olentangy and the Olentangy accepts this donation without need for further action by the Board of Education.
- 4. Once Redwood has completed the four (4) dugouts at both ball diamonds to Olentangy's reasonable satisfaction and the dugouts have been unconditionally approved for use and occupancy by any and all jurisdictional state and/or local building inspection authorities, within ten (10) days of written notice by either Olentangy or Redwood of said governmental approval, it to Redwood for recording. Redwood shall pay all recording costs.
- If Redwood does not satisfy the conditions set forth in sections 2 through 4 of this Agreement
 within twelve (12) months after it receives zoning approval and closes on the Breagha Property,
 this Agreement (including the escrowed easement referenced herein) shall be null and void in
 its entirety.

As of the date of this Agreement, the name and contact information of Olentangy's Director of Business Management and Facilities is:

Jeff Gordon
Director, Business Management and Facilities
Olentangy Local School District
7840 Graphics Way
Lewis Center, OH 43035
Phone: (740) 657-4025
Email: (740) 657-4025

 Separately from the dugouts in section 3 above, and subject to Olentangy's written consent, Redwood may complete improvements in the easement area concurrent with its development program for the Breagha Property, which is expected to occur during a later phase in the project after the first phase or phase I area immediately to the south of Home Road is developed and

Redwood USA LLC

By

Wallace TARMACIEL Printed Name and Title

Board of Education of the Olentangy Local

School District

Printed Name and Title

By

List of Exhibits:

Exhibit A - Legal Description of Olentangy Property

Exhibit B - Legal Description of Breagha Property

Exhibit C - Suggested form of EMERGENCY ACCESS EASEMENT AGREEMENT (without

exhibits, but see Exhibits A and B above for reference)

Exhibit I) - Conceptual Easement Area

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EXHIBIT "A" FOR D 99050169 C

Description of a 28.094 acre tract of land, north of Powell, Ohio, west of County Road Mo. 9, in Liberty Township, County of Delaware, State of Ohio.

Situated in the State of Chio, County of Delaware, and Township of Liberty, being part of Lot 18, Section 1, Township 3, Range 19, United States Military Lands, containing 28.094 acres of land, more or leas, being out of 49.164 acres of land as described to Mary T. Monska et al from the Vella V. Arndt Estate in Delaware County, State of Chio; said 28.094 acres being more particularly described as follows:

Beginning at a railroad spike found at the intersection of the southerly line of said Lot 18 with the centerline of County Road Ng. 9 (Liberty Road), said spike being the northeasterly corner of C.B. & A.M. Marquette's land as recorded in Deed Book 227, Fages 606 and 607, Recorder's Office, Delaware County, Ohio, and being the true point of beginning;

thence N. 88 deg. 50' 05" W. along the southerly line of Lot 18, being the northerly line of Lot 19 of said C.B. £ A.M. Marquette's land, a distance of 2107.89 feet to an iron pin;

thence N. 00 deg. 36' 17" E. along the easterly line of the Chesapeake and Ohio (Ca O) Railroad's Z.00 sere tract as described in Deed Book 167. Page 222, a distance of 190.00 feet to an iron councy post;

thence N. 88 deg. 05' $43^{\rm H}$ W. along the northerly line of said C & O Railroad's 2.00 acre tract, a distance of 460.00 feet to an iron pin;

thence N. 00 deg. 12' 50" E. along the easterly line of C & O Railroad's land as recorded in Deed Book 199, Page 38, a distance of 311.50 feet to an iron pin;

thence S. 89 deg. 00' 00" E. a distance of 2570.40 feet to a railroad spike in the center of County Road No. 9 (Liberty Road);

thence S. 00 deg. 39' 53" W. with the centerline of County Road No. 9 (Liberty Road), a distance of 514.69 feet (passing over a railroad spike at 12.44 feet and 262.44 feet) to the true point of beginning and containing 28.094 acres of land, more or less.

Subject to all rights-of-way, easements and restrictions, if any, of previous record.

Description prepared by Vernon A. Rybski, Registered Surveyor No. 4041.





EXHIBIT "A" FOR D 99050167 C

Situated in the State of Ohio, County of Delaware, and Township of Liberty, being part of Lot 18, Section 1, Township 3, Range 19, United States Military Lands, containing 21.070 acres of land, more or less, being out of 49.164 acres of land as described to Mary T. Monska et al from the Vella V. Arndt Estate in Delaware County, State of Ohio; said 21.070 acres being more particularly described as follows:

Beginning at a railroad spike found at the intersection of the northerly line of said Lot 18 with the centerline of County Road No. 9 (Liberty Road), said spike being the southeasterly corner of University Court Incorporated's Lands recorded in Deed Book 362, Page 542, Recorder's Office, Delaware County, Ohio, and being the true point of beginning; thence from said true point of beginning S. 00 deg. 35' 53" W. with the centerline of County Road No. 9 (Liberty Road), a distance of 356.88 feet to a railroad spike; thence N. 89 deg. 00' 00" W. a distance of 2570.40 feet to an iron piu; thence N. 80 deg. 12' 50" E. along the easterly line of Chesapeake and Ohio (C & O) Railroad's land as recorded in Deed Book 199, Page 18, a distance of 355.91 feet to an iron pin; thence S. 89 deg. 00' 00" E. along the southerly line of Lot 17, land owned by University Court incorporated, a distance of 2573.21 feet to the true point of beginning and containing 21.070



WIG.

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FOR TRANSFER
CHRIS BAUSERMAN
BELVINGEODRIM PREMERT
7-13-59

Provisions contained in any deed or other instrument for the conveyance of a dwelling which restrict the color are invalid under factoral law and are unordered.

EXHIBIT A

Legal Description

Parcel 1

Situated in the Township of Liberty, County of Delaware and State of Ohio, and bounded and described as follows:

Being in Range 19, Township 3, Section 2, part of Lot 2, U.S. Military Lands. Beginning at a p.k. spike at the intersection of the centerline of Delaware County Road, No. 124 and the East line of Section 2, thence S. 2° 19' W. along the section line 1335.20 feet to an iron pipe, passing over an iron pipe at 30.00 feet; thence N. 87° 40' W. 25.00 feet to an iron pipe (found); thence N. 2° 19' E. 1335.20 feet to a R.R. Spike on the centerline of Delaware County Rd. No. 124 passing over an iron pipe (found) at 1305.20 feet; thence S. 87° 40' E. along the center line of said County Rd. 25.00 feet to the point of beginning, containing 0.766 acres, be the same more or less, but subject to all legal highways.

Parcel II

Situated in the Township of Liberty, County of Delaware and State of Ohio, and bounded and described as follows:

Being in Range 19, Township 3, Section 2, part of Lot 2, U.S. Military Lands. Beginning at an iron pipe (found) on the easterly right-of-way line of the Chesapeake and Ohio Railroad, said iron pipe being S. 2° 09° W. 1335.20 feet from the point of intersection with centerline of Delaware County Rd. No. 124 and the easterly right-of-way line of the C&O Railroad; thence S. 87° 40° E. 838.74 feet to an iron pipe on the East line of Section 2, passing over an iron pipe at 813.74 feet; thence S. 2° 19° W. along the easterly line of Section 2, 1177.79 feet to a post, passing over a stone at 421.64 feet; thence N. 87° 44° W. 824.37 feet to a steel post on the easterly right-of-way line of the C&O Railroad; thence along the easterly right-of-way line of said railroad with a 0° 30° curve to the right which the long chord bears N. 0° 50° 30" E. 503.08 feet, an arc distance of 504.11 feet to an iron bolt to the point of tangency; thence N. 2° 09° E. 677.35 feet to the point of beginning, containing 22.61 acres, be the same more or less, but subject to all legal highways.



Situated in the State of Ohio, County of Delaware and Township of Liberty. Being in Range 19, Township 3, Section 2, and part of Lot 2, U.S. Military Lands:

Beginning at a railroad spike set on the centerline of County Road No. 124, known as the G.I.H. and Columbus Road; said point of beginning bears North 87 degrees, 40' West 25.00 feet from the point of intersection of the centerline of County Road No. 124 and the section line between sections 2 and 1; thence South 2 degrees, 10' West parallel with the section line, 1335.20 feet to an iron pipe, passing over an iron pipe at 30.00 feet; thence North 87 degrees, 40' West 813.74 feet to an iron pipe

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set on the right-of-way line of the Chesapeake and Ohio Railroad; thence North 2 degrees 09' East along the said East right-of-way line, 1335.20 feet to a railroad spike set on the centerline of County Road No. 124, passing over an iron pipe at 1305.20 feet; thence South 87 degrees 40' East along the centerline of County Road No. 124, 817.53 feet to the point of beginning, containing 25.00 acres of land, be the same more or less, but subject to all legal highways.

Parcel IV

Situated in the State of Ohio, County of Delaware, City of Powell, located in Farm Lot 1, Section 2, Township 3 North, Range 19 West, United States Military Lands, and being part of a 40.636 acre tract conveyed to M/I Homes of Central Ohio LLC, as recorded in Official Record Volume 428, Page 1362, Delaware County Recorder's Office, and being more particularly described as follows:

Beginning, for reference, at a railroad spike found at the intersection of centerline of Rutherford Road (T.R. 122) with the east line of the CSX Transportation, Inc., marking the southwest corner of said 40.636 acre tract;

thence North 10° 53' 41" West 748.16 feet, along the westerly line of said 40.636 acre tract and east line of the CSX Transportation, Inc., to an iron pin found;

thence North 08° 35' 08" West 1154.01 feet along the westerly line of said 40.636 acretract and east line of the CSX Transportation, Inc., to an iron pin set marking the <u>PRINCIPAL PLACE OF BEGINNING</u> of the herein described tract;

thence continuing North 08° 35' 08" West 387.06 feet, along the westerly line of said 40.636 acre tract and east line of the CSX Transportation, Inc., to an iron pin found;

thence North 04° 13' 20" West 782.01 feet, along the westerly line of said 40.636 acre tract and east line of the CSX Transportation, Inc., to an iron pin found;

thence North 35° 19' 13" East 36.89 feet, along the westerly line of said 40.636 acre tract and east line of the CSX Transportation, Inc., to an iron pin found;

thence North 23° 58' 01" East 95.92 feet, along the westerly line of said 40.636 acre tract and east line of the CSX Transportation, Inc., to an iron pin found:

thence North 02° 03' 16" East 195.96 feet, along the westerly line of said 40.636 acre tract and east line of the CSX Transportation, Inc., to an iron pin found marking the northwest corner of said 40.636 acre tract and southwest corner of a 22.61 acre tract (Parcel II) conveyed to G. Frederick Smith Chemical Company, as recorded in Deed Book 420, Page 32;

thence South 86° 24' 15" East 708.91 feet, along the north line of said 40.636 acre tract and south line of said 22.61 acre tract, to an iron pin found in the east line of Farm Lot 1 and west line of a 25.248 acre tract (Parcel III) conveyed to G. Frederick Smith Chemical Company, recorded in Deed Book 420, Page 32, marking the northeast corner of said 40.636 acre tract and southeast corner of said 22.61 acre tract:

thence South 04° 15' 04" West 973.92 feet, along the east line of said 40.636 acre tract and Farm Lot 1 and west line of said 25.248 acre tract and a 51.3172 acre tract conveyed to Board of Trustees

{00063624-2}

Liberty Township, as recorded in Official Record 32, Page 1888, to an iron pin found marking the southwest corner of said 51.3172 acre tract and the northwest corner of a 21.070 acre tract conveyed to Board of Education of the Olentangy Local School District, as recorded in Deed Book 667, Page 663:

thence South 02° 31° 40" West 780.39 feet, along the east line of said 40.636 acre tract and Farm Lot 1 and west lines of said 21.070 acre tract and a 28.094 acre tract conveyed to Board of Education of the Olentangy Local School District, as recorded in Deed Book 667, Page 278, to an iron pin set (passing an iron pin found at 668.33 feet);

thence along the arc of a curve 638.84 feet turning to the right (delta angle=43° 20' 15", radius=864.43 feet), with a chord bearing and distance of North 60° 00' 16" West 638.36 feet, across said 40.636 acre tract, to the principal place of beginning, containing an area of 25.248 acres.

LESS AND EXCEPTING FROM PARCELS I AND III ABOVE:

Situated in the State of Ohio, County of Delaware, Township of Liberty, being a part of Farm Lot 2 in Section 2, Township 3 North, Range 19 West, United States Military Lands and being a part of record 13.820 acre and 25.00 acre parcels conveyed to G. Frederick Smith Chemical Company as recorded in Book 420, page 32 in the records of Delaware County, being a parcel of land lying on the right and left sides of the centerline of Right of Way and Construction of DEL-CR124-4.11 (Home Road) and bounded and described as follows:

Beginning at the intersection of the centerline of County Road 124 (Home Road) and the east line of said Farm Lot 2, said point located 22.83 feet left of station 240+13.09 of proposed County Road 124 and being the TRUE POINT OF BEGINNING for the parcel herein described;

- thence South 03 degrees 36 minutes 05 -seconds West along the east line of said Farm Lot 2
 a distance of 122.74 feet to an iron pin set, located 99.18 feet right of station 239+99.55 of
 proposed County Road 124;
- thence South 85 degrees 10 minutes 23 seconds West a distance of 715.67 feet to an iron pin set, located 150.00 feet right of station 233+00.00 of proposed County Road 124;
- 3) thence North 86 degrees 22 minutes 05 seconds West a distance of 134.55 feet to an iron pin set on the east line of the CSX Railroad at a point located 150.00 feet right of station 231+65.45 of proposed County Road 124:
- 4) thence North 03 degrees 28 minutes 47 seconds East along the east line of the CSX Railroad a distance of 228.00 feet to the centerline of existing County Road 124, said point located 77.99 feet left of station 231+64.84 of proposed County Road 124;
- 5) thence South 86 degrees 21 minutes 56 seconds East along the centerline of existing County Road 124 a distance of 832.39 feet to a point located 23.93 feet left of station 240+02.63 of proposed County Road 124;
- 6) thence South 86 degrees 38 minutes 27 seconds East along the centerline of existing County Road 124 a distance of 10.58 feet to the point of beginning and enclosing an area of 3.555 acres, more or less.

Of the above described tract, 3.484 acres is located in Auditor's Permanent Parcel Number 319-240-01-004-000 which includes 0.563 acres in the present road occupied and 0.071 acres is

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located in Auditor's Permanent Parcel Number 319-240-01-005-000 which includes 0.017 acres in the present road occupied

Monuments referred to as iron pins set are $\frac{1}{100}$ inch diameter x 30 inch long iron bars with a 1-1/2 inch diameter aluminum cap marked "R/W LS #7819".

Bearings used in this description are based on the Ohio Lambert Projection North Zone Plane Coordinate System as established by the National Geodetic Survey, North American Datum of 1983 (1995 adjustment) from GPS observations made by American Consulting, Inc.

Stations referred to herein are from the centerline of survey of proposed County Road 124 as found on Delaware County Engineer's Office Right of Way Plan DEL-CR124-4.11.

Grantor, for itself and its heirs, executors, administrators, successors and assigns, reserves all existing rights of ingress and egress to and from any residual area.

The description was prepared and reviewed on July 17, 2006 by Charles P. Unterreiner, P.S. 7819 from a survey made by American Consulting, Inc. in 2003.

WHEN RECORDED RETURN TO:

EMERGENCY ACCESS EASEMENT AGREEMENT

This EMERGENCY ACCESS EASEMENT AGREEMENT (this "Agreement") is made as of ________2019, by and between Redwood USA LIC, an Ohio limited liability company, or its assignee ("Redwood") and the Olentangy Local School District Board of Education ("Olentangy").

BACKGROUND

- A. Olentangy owns certain real property commonly known as Olentangy Liberty Middle School ("Middle School") and located in Liberty Township, Delaware County, Ohio, and more particularly described on Exhibit A attached to this Agreement ("Olentangy's Property"). Redwood owns certain real property adjacent to and west of Olentangy's Property and more particularly described on Exhibit B attached to this Agreement ("Redwood's Property").
- B. In return for Redwood providing certain public improvements to the Muddle School, Olentangy is willing to grant an easement to Redwood from the Redwood Property east to Liberty Road. This easement is in an area not need for school purposes.
- C. Redwood and Olentangy desire to enter into this Agreement to create an easement over Olentangy's Property to benefit Redwood's Property.

AGREEMENT'

For valuable consideration, the receipt and sufficiency of which is acknowledged, Redwood and Olentangy agree as follows

- Grant of Easements. Olentangy grants and conveys to Redwood a perpetual, non-exclusive easement over, across, along and through that portion of Olentangy 's Property for the sole purpose of ingress and egress of emergency vehicles to and from Redwood's Property ("Easement Area"). The easement granted herein shall not be used for any other purpose.
- 2) Location of Easement Area. The location of the Easement Area over Olentangy's Property is as shown on the drawing on Exhibit C-1 attached to this Agreement and is legally described on Exhibit C-2 attached to this Agreement.
- 3) Use of the Easement Area. As reasonably requested by Olentangy and/or required by local emergency service providers, Redwood shall install at Redwood's sole cost and expense, both on its own property and on Olentangy's Property, gates, bollards and signage ("Easement Area Improvements") to indicate that the driveway in the Easement Area is to be used only by emergency vehicles, and to deter other traffic from using the driveway for access to either property. Signs may read "Not an Exit Emergency Vehicles Only" or similar language.
 - a) Redwood shall use all commercially reasonable efforts to minimize interference with the use and occupancy of Olentangy's Property by Olentangy during Redwood's work to install the Easement Area Improvements. Redwood shall use its best efforts to protect trees and minimize any damage to the Easement Area and/or surrounding areas. As soon as practicable after installing these improvements, Redwood shall at its own cost, remedy any damage occurring on Olentangy's Property. Specifically, Redwood shall, at its sole expense, restore Olentangy's Property to its prior existing condition. This shall include without limitation returning the Easement Area to its former grade and condition, restoring any trees, landscaping, driveways or pedestrian paths to a condition substantially equal to the condition existing prior to Redwood's entry onto or use of the Easement Area or property adjacent to it.

b) Olentangy shall maintain, repair and replace (as needed) the paved areas in the Easement Area that exist as of the creation of this Agreement for the operation of the Middle School. Olentangy has no responsibility to maintain, repair or replace any gates, bollards and signage in connection with this Agreement except as it may choose to exercise its rights under section 3.e. below. The area of Olentangy's obligations is as shown on cross-hatched Subarea A on Exhibit C-1.

c) Redwood shall maintain, repair and replace (as needed) all other paved areas in the Easement Area, including the gates, bollards and signage located on each party's property, so as to keep such improvements and signage in good, safe condition and repair. The area of Redwood's obligations hereunder is as shown on cross-hatched Subarea B on Exhibit C-1. These obligations shall be subject to the conditions in section 3.a. of this Agreement.

d) As to snow plowing and removal, Olentangy shall be primarily responsible for Subarea A and Redwood shall be solely responsible for Subarea B, provided, however, Redwood shall have the right and obligation to plow and remove snow from Subarca A if school is not in session at the Middle School for any reason.

e) To the extent one party fails to so maintain, repair and/or replace its improvements and signage, the other party shall provide written notice and thirty (30) days to cure, after which the notifying party will have the right to perform such work, and the party failing to do so will reimburse the performing party within thirty (30) days after receiving an invoice for such work.

f) Redwood represents and warrants that it has, and shall maintain, a policy of insurance covering its work to construct, and install the Easement Area Improvements. Redwood shall name Olentangy as an additional insured on its policy of insurance.

- 4) Term. The Easement granted under this Agreement will be effective as of the date this Agreement is recorded by Redwood, and it will be perpetual.
- Compliance with Laws. Redwood and Olentangy shall comply at all times with all laws, statutes, ordinances, rules and regulations now or hereafter in effect regarding the Easement Area.
- 6) Liens. Neither party will permit any claim, lien or other encumbrance arising out of this Agreement to accrue against or attach to the other party's property.
- 7) Covenants Running With the Land. The easements and covenants set forth in this Agreement will be covenants and easements running with the land, and will be binding upon and will run with Olentangy's Property and Redwood's Property and will inure to the benefit of and be binding upon Redwood's and Olentangy's respective successors and assigns.
- 8) No Public Right. The easement established under this Agreement will be for the benefit of and be restricted solely to the entities indicated and their successors and assigns. Nothing in this Agreement is intended to create nor shall it be construed as creating any express or implied easement, dedication or any other rights in or for the benefit of the general public.
- Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but which when taken together shall constitute one and the same instrument.
- Exhibits. The exhibits attached to this Agreement are incorporated herein by this reference.

List of Exhibits:

Exhibit A - Legal Description of Olentangy's Property
Exhibit B - Legal Description of Redwood's Property

Exhibit C-1 – Drawing of Easement Area over Olentangy's Property (Cross-hatched to show Subarea A and Subarea B)

Exhibit C-2 – Legal Description of Easement Area over Olentangy's Property

Redwood USA LLC, an Ohio limited liability

5

Printed Name and Title

Board of Education of the Olentangy Local School District

24

Printed Name and Title

State of Ohio,
County of luys hegg, ss.:
Sworn to before me and subscribed in my presence this 25th day of November, 2019, by David Convell, the Author of Redwood USA LLC, an Ohio limited liability company, who acknowledged that the signing of the foregoing Easement Agreement was his/her and its voluntary act and deed.
In testimony thereof, I have hereunto affixed my hand and official seal on the date above written. Justin T. Smith
Notary Public, State of Ohio My Commission Expires April 10, 2024 State of Ohio.
County of <u>Relawage</u> , ss.:
Sworn to before me, and subscribed in my presence this 12th day of 16th Olentangy Local School District Board of Education, who acknowledged that the signing of the foregoing Easement Agreement was his/her and its voluntary act and deed.
In testimony thereof, I have be reunto affixed my hand and official seal on the date
KATHLEEN'S BOWSER NOTARY PUBLIC OHIO NOTARY PUBLIC OHIO NOTARY Public KATHLEEN'S BOWSER NOTARY Public KATHLEEN'S BOWSER NOTARY Public
The Mishiment prepared by Andrew Wester For Many
50 North Sandusky Street, Delaware, Ohio 43015-1926. 740-363-1313

G.\Data Chents\Business Entities Q-T\Redwood Living Inc -101.70 Acres 3011 Homs Road & South Olentangs - Emergency Access Ensement\DRAFT - OLSD-Redwood Emergency Access Ensement - 6.10-2019 docs

Exhibit C. Development Plan



Authorities

Audi Enhant Parent

Audi Enhant Parent

Audion

Audion

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Colombia Cho 4723

D. TIF Areas

- There will be approximately twelve (12) acres, closest to Home Road except for the
 private north-south road along the east portion of the Property, for assisted living facility,
 skilled nursing facility, memory care facility, medical or medical related offices,
 professional offices, general offices, and/or similar facility (the "Commercial Area").
- The balance of the Property will be multi-family/apartments, which the Developer currently plans to develop over three (3) phases.
- The first TIF Area will include the Commercial Area and Phases 1 and 2 of the multifamily/apartments, a total of 175 apartments ("TIF 1").
- The second TIF Area will be comprised of Phase 3 of the multi-family/apartments, 156
 apartments ("TIF 2").
- 5. Each TIF Area shall be exempt from taxation for a period commencing with respect to each TIF Area in the earlier of (i) the first tax year for which Improvements of at least \$5,000,000 in assessed value (e.g., 35% of true value) resulting from the completion of construction of new structure(s) on that TIF Area first appears on the tax list and duplicate of real and public utility property, or (ii) tax year 2022 as to TIF Area 1, and tax year 2027 as to TIF Area 2 (the earlier of (i) or (ii) being the "Commencement Date"), and ending on the earlier of the end of the ninth year after the year of such Commencement Date or the date on which the City can no longer require service payments in lieu of taxes (PILOTS), all in accordance with and as provided in the Ohio Revised Code as to tax increment financing, the Resolution and the TIF Agreement (the "TIF Exemption" and each tax year a Parcel is exempt pursuant to the Resolution an "Exemption Year").

E. List of Improvements

- Secondary emergency access and barrier/bollards on property owned by the Board of Education of the Olentangy Local School District ("Olentangy Board of Education") and commonly known as Olentangy Liberty Middle School, 7940 Liberty Road, Powell, OH 43065 ("Middle School"), with an ingress/egress easement to any local first responders. Estimated total cost: \$750,000.00
- 2. Twelve inch (12") sanitary sewer line extension of approximately 1,075 feet from an existing manhole located 44 feet north of Home Road approximately 725 feet east of the northeast corner of the property to be annexed. Estimated total cost: \$200,000.00
- 3. On Home Road, an eastbound right-hand turn lane into the property to be annexed and a center turn lane. Estimated total cost: \$250,000.00
- 4. Total estimated costs for items 1-3: \$1,200,000.00

G: Data Clients Business Entities Q-T/Redwood Living, Inc -101 70 Acres 3041 Home Road & South Pre-Annexation Agreement Redwood Preannexation Agreement 10-12 2020 doc

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FISCAL IMPACTS OF REDWOOD MIXED USE DEVELOPMENT IN POWELL, OHIO September 30, 2020

Bill LaFayette, Ph.D. Owner, Regionomics® LLC



Summary of Key Assumptions and Findings

Redwood Apartment Homes is proposing a mixed-use development on a 70-acre parcel on Home Road in Powell, Ohio. The development will be anchored by a 331-unit high-end apartment complex on approximately 58 acres. The acreage fronting Home Road will feature a skilled nursing and assisted living facilities and two office buildings.

The land is currently zoned industrial. A development plan was created in 2005, but it failed to reflect a stream right-of-way and wetlands on the property.

The apartments will be built in three phases: 87 units in 2022, 88 units in 2024, and the remaining 156 units in 2027. Rents will average \$23,190 per unit per year. The conversion of the property to multi-unit use will increase the land value to \$80,000 per acre from its current \$30,000 to \$40,000.

The skilled nursing and assisted living facilities are planned for 2022. Net construction costs will total \$20.25 million. Several alternatives are under consideration for the remaining 3.9 acres. It is suggested that this property be developed with two general-purpose office buildings of 29,000 square feet each and a cost for each of \$5.22 million. It is assumed that the first of these buildings will be built in 2027 and the second building in 2030. These developments will raise the land value of both sites to \$150,000 per acre.

The development will be covered by two 10-year, 75% TIFs. The first TIF, beginning in 2023, would cover the first two phases of the apartment development, the skilled nursing and assisted living facilities, and the office development. The second TIF will begin in 2028, and will cover the third phase of the apartment development. These TIFs will divert 75% of the total property tax revenue, not merely Powell's share, and will reimburse the developers for approximately \$1.2 million of off-site public improvements and will provide Powell approximately \$13 million for other public improvements.

Assumptions are also required for the industrial development. The land will accommodate as much as 943,200 square feet of industrial space. The Auditor's current land values are reasonable for industrial development, so no land value increase is assumed. At a per-square-foot construction cost of \$40, the maximum incremental value is \$37.7 million in 2022 dollars. The development is assumed to begin in 2027 with a 20-year buildout. A 10-year TIF amounting to 75% of the incremental value is assumed for the industrial development.

Powell's income tax rate is 0.75% on wage, salary, and business income earned in the city and 0.5% on income of all Powell residents. The property tax rate is 2.3 mills on the taxable value of all non-exempt property, or 0.0805% on market value. Based on rent, the income of the apartment households will average \$97,392 (total for 331 units of \$32,236,752), with \$61,421 of that total subject to municipal tax.

Currently, 8.1% of residents of southern Delaware County work from home, so their eligible income would be taxed at the full 0.75%. The 8.1% is likely to increase with a higher number of employees working at home, but there are no clear projections yet of the scale of this impact.

Projected payroll income for the assisted living and skilled nursing facilities is \$5 million. Employment will total roughly 120, with 90 to 100 of these full-time positions. Employment of the apartment complex will initially be two, with an increase to eight at full buildout. Wages for these workers will average \$45,636, so total apartment wages at their maximum will be \$365,000 in 2020 dollars.

The office buildings are assumed to house primarily establishments in the professional and technical services sector. The average Delaware County wage in this sector is \$86,094, with employment of 91 in each building. Total wages are \$7.8 million.

The alternative industrial development is assumed to begin in 2027 and occur over 20 years. Industry data indicates 469 square feet per employee. Vacancy is assumed to be 85% in the first year and 90% in each succeeding year. Annual wages average \$45,237. Employment is 1,031 by 2038 with total wages before inflation of \$46.6 million.

Construction workers' wages are also estimated using an economic impact model assuming that their employment will be long enough to create an income tax liability. The model shows construction earnings of \$43.35 per \$100 of construction cost.

Police and administration, building and information technology expenditure categories are also estimated, following from the author's fiscal analysis for the 2015 Powell Comprehensive Plan. The per household net police expenditures are \$400.05, and the administration expenses are \$313.04. Vehicle license and gasoline taxes contributed by the residents of the apartment complex total \$59.95 per household annually.

Roadway maintenance expenditures are a major category, but these are irrelevant for the Redwood plan because interior streets will be private. The industrial development access road will be public, however. Costs are \$4.98 per foot per year, or \$20,930 for the 4,200-foot road.

The net present value to Powell of the Redwood proposal is \$8.2 million, compared to \$1.14 million for the industrial alternative. It must be cautioned that these results are based on all of the assumptions outlined in this document, so each of the impacts could be significantly greater than or less than those estimated.

Characteristics of the Project

Redwood Apartment Homes is proposing a mixed-use development on a 70-acre parcel on Home Road in Powell, Ohio. The development will be anchored by a 331-unit high-end apartment complex on approximately 58 acres. The acreage fronting Home Road will feature a skilled nursing facility and an assisted living facility to be developed by Foundations Health Solutions and two office buildings. The current plan is that these will be medical office buildings that will draw clientele from the Foundations Health Solutions development. However, as argued below, general offices would be more appropriate for this site.

The acreage is currently zoned industrial, and a plan developed in 2005 divides the acreage into 31 industrial sites. However, the plan failed to reflect stream corridors and wetlands significantly impacting 14 of the 31 sites. Further, the construction of the Home Road railway overpass reduced the acreage and affected the visibility of any development. The property is divided north to south into four parcels as shown in Table 1. The market values assigned to these parcels reflect an industrial use, but if they are used instead for apartment, residential care, and office uses, the market value will be substantially higher. The values do not include \$592,300 in existing improvements on parcel 319-240-01-004-000, and \$23,800 on parcel 319-240-01-005-000. These improvements will be removed before redevelopment, but their value will reduce the increase in property value and tax receipts.

Table 1
Existing Parcels, Acreage, and Value (from North to South)

Parcel	Land market value	Acreage	Value per acre
319-240-01-004-000 (northern)	\$ 872,000	21.516	\$ 40,528
319-240-01-005-000	385,700	13.749	28,053
319-240-01-005-001	315,400	9.556	33,005
319-240-01-068-004 (southern)	772,600	25.248	30,600
All four parcels	\$ 2,345,700	70.069	\$ 33,477
Three southern parcels	\$ 1,473,700	48.553	\$ 30,352

Source: Delaware County Auditor.

The apartments will be constructed in three phases. The first phase, to be built in 2022, will total 87 units. The second phase, planned for 2024, will be 88 units. The final 156 units will be in the third phase, slated for 2027. Initial value per unit will average \$120,000.\(^1\) Rents are expected to average \$1.44 per square foot per month. At an average square footage of 1,342, this implies an average rent of \$23,190 per unit per year.\(^1\) Land accommodating multi-unit projects is generally valued much higher than the averages in Table 1. Regionomics analysis of a large sample of apartment projects yielded an average land value of \$80,000 per acre.

The Foundations Health Solutions project, planned for 2022, will occupy around 6.8 acres adjacent to Home Road. The skilled nursing building will be 64,700 square feet on approximately 4.1 acres. The assisted living facility will consist of 32,500 square feet on 2.7 acres. Construction cost, net of

 $^{^{1\,2}}$ This figure does not include the value of other improvements, such as the about 1%-1% miles of private streets.

² All dollar amounts in this study are net of inflation.

excavation, utilities, furnishings, certificates, soft costs, and contingency, will total \$20.25 million. Regionomics analysis suggested a per-acre land value of \$150,000.

The remaining 3.9 acres are under consideration for light industrial or medical office development. Industrial development would be likely to create noise and dirt, and would thus be incompatible with the medical focus of the adjacent development. A medical office development serving the adjacent facilities would initially seem a logical alternative, but the development would face stiff competition from nearby medical facilities, including existing developments on Route 23 and an additional project to be developed at Sawmill Parkway and Home Road by the Ohio State University Wexner Medical Center. An additional problem is the limited visibility of the site because of the railway overpass and the Foundations facilities. This presents a challenge for any operation needing to attract the public. While the skilled nursing and assisted living facilities would definitely provide a patient base, this would likely not be sufficient to justify the scale that this development would require to be feasible.

A better solution might be general offices of support businesses and back-office operations. This would be attractive for businesses wishing to attract the well-educated population of the Powell area. While the timing of such a project is uncertain, one three-story, 29,000-square-foot building is assumed to be built in 2027, and a second identical building in 2030. A developer contact suggested a construction cost of \$180 per square foot for general office space in Central Ohio, implying a total value for each building of \$5.22 million. Land values of commercial property along Liberty Street suggest that \$150,000 per acre for this parcel is reasonable.

The developers of this project make the reasonable assumption that the apartment project's value will increase 10% by the 2028 collection year and another 10% by the 2033 collection. Adjusting this increase by expected inflation (from the Congressional Budget Office's 10-Year Economic Projections issued in July 2020) implies an annual increase in value, net of inflation, of 1.9%. This same value increase is applied to the Foundations project, the office project, and the land.

Finally, the developers are proposing a tax increment financing (TIF) arrangement for the project. There would be two 10-year, 75% TIFs. The first TIF, beginning with the 2023 collection year, would cover the first two phases of the apartment development, the Foundations project, and the office development. The second TIF, beginning with the 2028 collection year, will cover the third phase of the apartment development. It is assumed that the TIF will apply to the improvements but not the increase in land value. The TIFs will collect 75% of all property tax revenues, not merely the revenues normally accruing to Powell.

In general, TIFs provide funding for improvements that make the site developable – improvements that the municipality would likely need to make in any case. Here the TIF revenues would reimburse the developers for three public improvements totaling approximately \$1.2 million:

- An emergency access road to be constructed to Liberty Road through the grounds of Olentangy Liberty Middle School;
- · An off-site sewer line linking to the site;
- An eastbound turn lane into the development from Home Road.

Because this analysis includes a comparison of net fiscal impact between the project outlined above and the previously proposed industrial development, assumptions are required for this development as well. Analysis of a large number of industrial projects yields an average of 13,556 square feet of building per acre, and a large range of per-acre land values. The approximately 69.5 developable acres would

accommodate as much as 943,200 square feet. The range of land values seems to be based largely on access and infrastructure; there is no relation between land value and the size of the parcel. Eliminating outlier values, such as those in the Rickenbacker area, produces an average per-acre value of \$32,000, close to the current value. Consequently, no initial land value increase is assumed with the industrial development. The development is assumed to begin in 2027 with a 20-year buildout.

The author's developer contact stated that construction costs for industrial space in Central Ohio range between \$32 and \$43 per square foot; \$40 is assumed. This results in a maximum incremental value of \$37.7 million in 2022 dollars.

As with the Redwood proposal, a TIF arrangement is likely on the industrial development. The projections assume a TIF with terms identical to those of the Redwood project: a 10-year TIF amounting to 75% of the value of the improvements. The TIF is assumed to begin with the initial development of the acreage; this implies a TIF beginning with the 2028 collection and continuing through 2037.

Employment and Wage Assumptions

Estimation of fiscal impacts requires an estimation of both revenues and costs. This requires in turn estimates of the number of apartment residents, employment, and earnings. Powell's income tax rate is 0.75%, with a credit of 0.25% for earnings taxed elsewhere. Thus, all Powell residents with wage, salary, and business earnings pay at least 0.5% of those earnings to Powell. The total effective property tax rate to all entities (needed for the TIF calculations) is 78.718775 mills on the taxable value of Class II property, or 2.7552% on the market value. The property tax rate is 2.3 mills on all non-exempt property, or 0.0805% on market value.

To estimate the number of households occupying the apartment project, it is assumed that the occupancy rate is 90% during the last half of the year in the first year and 95% in succeeding years. Some of these workers both live and work in Powell, and so pay the full 0.75%. This is irrelevant, though, for those working outside the home at a Powell-based business because the location of their employment is irrelevant to the taxes due at their place of residence.

However, this higher tax rate is relevant for those working from home. On average between 2014 and 2018, 8.1% of workers living in the southernmost census tracts of Delaware County worked at home. That percentage clearly does not reflect those working at home during the pandemic; some of these arrangements may become permanent. Generally, Ohio law specifies that tax is due to any municipality in which a worker is employed for more than 20 days. However, the Ohio General Assembly passed a law this spring that workers will continue to be taxed where they were taxed before they were sent home to work. But that is a temporary provision that expires 30 days after Ohio's health emergency is lifted.

In the long run, a greater shift to working and being taxed at home would benefit primarily residential communities such as Powell to the detriment of cities with a daily net influx of workers such as Columbus. Although many experts believe that a larger number will work from home even after the pandemic than before, no detailed estimates of the long-run impact seem as yet to exist. Consequently, the analysis assumes the historical 8.1%, with the result that the income tax estimate for the apartment complex is likely to be somewhat low.

The average income of the residents of the complex can be estimated from their rent. The average household in southern Delaware County pays 23.8% of their income in rent, according to the American Community Survey. With rent averaging \$1,932.48 per month or \$23,190 per year, household income will average \$97,392. This income includes categories of income that are not taxed, though, such as interest, dividends, and retirement income. The Internal Revenue Service's Statistics of Income suggests that at this income level, wage, salary, and self-employment income averages 63.1% of total income. This implies an average taxable income for the apartment residents of \$61,421. This income is taxed at 0.75% for 8.1% of the residents, and 0.5% for the remainder.

Employment and wages are also required for the commercial projects, including the industrial development proposed under the previous plan. Projected payroll income for the assisted living and skilled nursing facilities is \$5 million as given by Foundations Health Solutions. Employment will total roughly 120, with 90 to 100 of these full-time positions. Employment managing the apartment complex is estimated based on the employment per unit of a sample of complexes in Franklin County. (The Franklin County Auditor's website provides a unit count for all apartment complexes, but the Delaware County Auditor's site does not.) The average is 2.43 employees per 100 units, so it is assumed that employment will be two for the first phase, five when the second phase is added, and eight at full buildout. The average Delaware County wage of workers in the residential property management industry is \$45,636, so total apartment wages at their maximum will be \$365,000 in 2020 dollars.

The office buildings are assumed to house primarily establishments in the professional and technical services sector. The average Delaware County wage in this sector is \$86,094. The Building Owners and Managers Association (BOMA) Benchmarking Report gives an average of 288 square feet per office employee.³ It is conservatively assumed that this will be reduced 25% as a result of increased social distancing and possibly increased long-term working from home. It is also assumed that occupied square feet will be 85% for half of the first year of occupancy and 90% for succeeding years. (The BOMA report gives an average occupancy rate of 87.61%.) With an assumed occupancy rate, these assumptions imply employment of total wages of \$3.3 million for the workers in each of the two buildings.

Employment in industrial buildings is considerably less concentrated than in office buildings. The BOMA Benchmarking Report indicates 469 square feet per employee versus the 288 square feet per office worker. This suggests potential employment of 2,011 in a fully developed, fully leased park. Annual wages for warehouse employees in Delaware County average \$45,237.

The land has been untouched since being planned for an industrial development in 2005, and egress for large trucks onto Home Road is relatively difficult. Further, acreage is available in the development-ready Wolf Commerce Park and other nearby parks. These facts together suggest that industrial development of the property will occur relatively slowly. Development is assumed to begin in 2027 and occur over 20 years.

Powell will also earn income tax revenue from construction workers' wages, assuming that their employment will continue past the 20-day threshold. These wages must be estimated indirectly through an economic impact model. The author's impact model uses Regional Impact Modeling System (RIMS II)

https://www.boma.org/BOMA/Research-Resources/3-BOMA-Spaces/Newsroom/PR91818.aspx. A sample of industrial buildings and their employment in Central Ohio found a similar concentration.

multipliers for the Columbus MSA from the U.S. Bureau of Economic Analysis. The direct earnings estimate from this model is an approximation of construction worker wages. These are \$43.35 per \$100 of construction cost.

Impact on Expenditures

The assumptions discussed above provide the background for estimating revenues from each of the two development alternatives. An estimate of expenses is equally important. The approach for these estimates follow from the author's fiscal analysis for the 2015 Comprehensive Plan. This analysis both estimated the fiscal impacts of the development alternatives proposed in the plan and assessed the overall fiscal sustainability of the city's budget.

The analysis recognizes that some expenses are variable; these increase with increasing population and employment, while others do not. The hours spent by police officers patrolling the city and responding to calls – hence the patrol officers' payroll expenses – increase as population increases, as do the vehicle gasoline and oil expenditures. The salary of the chief, however, will not be affected, nor will the number of patrol vehicles. These expenditures are called fixed. Obviously, fixed expenditures will increase with a substantial increase in population and employment, but the increase contemplated in this development is not substantial in the context of the overall city.

The largest expenditures identified in the Comprehensive Plan were police and administration. (Administration was defined as administration and City Council, buildings, and information technology.) Road maintenance was also a substantial expenditure category, but this is not relevant for the apartment project because the streets are private and will not be maintained by the city. The original industrial plan contemplated a public street. Excluding road maintenance expenditures, police and administration expenditures comprised more than three-quarters of the total in 2015, so these are the expenditures included in the analysis.

The variable police expenditures are calculated net of variable revenues that support that activity, including fines, seizures of property, and permits. These are calculated per household and worker, with the total worker count divided by the 3.03 average household size. The number of jobs in Powell is not available, so the total private sector jobs in the 43065 ZIP code from the Census Bureau's ZIP Code Business Patterns are used as an approximation. The ZIP code employment overstates the number of jobs within the city limits, but this is offset somewhat because public sector jobs are not included. The per household net police expenditures are \$400.05, and the administration expenses are \$313.04.

Road maintenance expenses would arise with the public road in the industrial development. It is assumed that the road is constructed and road maintenance begins the year before the development begins. These expenses are measured not per capita but per foot. The total is \$4.98 per foot per year. At a length of 4,200 feet, the variable cost per year is \$20,930. A related factor that must be reflected in the current proposal, however, are the vehicle license and gasoline taxes contributed by the residents of the apartment complex. These revenues average \$59.95 per household.

Results

Because of the different timing of the various development elements, the evaluation is based on the net present value of the two alternatives as of 2022 with cash flows measured for 20 years, through 2041. The discount rate is 5%, the current rate on a lower-middle-grade corporate bond. This reflects the risk in the cash flows. As stated above, all dollar amounts are adjusted for inflation.

Table 2 lays out the net present value of the Redwood proposal, which is \$8.2 million. As revealed in the 2015 analysis, residential properties are not generally a net contributor of revenues to the city, primarily because of Powell's low income tax rate. The commercial components of the Redwood project do help to create a positive net present value for the project, as does the TIF and the lack of a need to maintain the interior roads.

The table also provides undiscounted cash flows. Because of the differences in timing of cash flows from this proposal and the industrial development alternative, it is not appropriate to compare the cash flows from these two projects, or use them as a basis for decision-making.

Appendix Table A-1 provides the calculated year-by-year cash flows.

Table 2

Net Present Value and Cash Flows of the Redwood Proposal

Component	Present value	Cash flows
Income tax		
Residential	\$ 933,498	\$ 1,712,714
Skilled nursing, assisted living facilities	435,080	743,019
Offices	785,809	1,581,493
Construction	159,422	196,621
Total	\$ 2,313,810	\$ 4,233,848
Property taxes		
TIF 1	\$ 6,555,439	\$ 9,642,350
TIF 2	2,491,307	4,572,540
Non-TIF	359,661	756,697
Total	\$ 9,406,407	\$ 14,971,586
Road-related household revenues (licenses, fees, etc.)	149,046	256,110
Total revenue	\$ 11,869,263	\$ 19,461,545
Costs		
Reimbursement for public improvements	\$ 1,013,330	\$ 1,200,000
Administration, buildings, IT	1,163,924	2,137,601
Police (net)	1,487,438	2,731,750
Total costs	\$ 3,664,692	\$ 6,069,351
Net revenue	\$ 8,204,571	\$ 13,392,193

Table 3 presents the present values and cash flows of the industrial development. The result is \$1.14 million. This is far less than the Redwood project because of the relatively low average wage, the low density of employment, and the lack of development until five years after the Redwood development. It must be cautioned that these results are based on all of the assumptions outlined above, so each of the impacts could be greater than or less than those estimated here. The annual cash flows are in Table A-2.

Table 3

Net Present Value and Cash Flows of the Industrial Development

Component	Present value	Cash flows
Income taxes	\$ 1,644,235	\$ 3,578,801
Property taxes		
TIF	\$ 1,428,626	\$ 2,800,219
Non-TIF	54,188	131,895
Total property taxes	\$ 1,482,814	\$ 2,932,114
Total revenue	\$ 3,127,050	\$ 6,510,915
Expenditures		
Reimbursement for public improvements	\$ 686,415	\$ 1,200,000
Administration, buildings, IT	490,833	1,072,294
Police (net)	627,260	1,370,340
Road maintenance	177,732	334,882
Total expenditures	\$ 1,982,239	\$ 3,977,516
Net revenue	\$ 1,144,810	\$ 2,533,399

Table A-1

Component	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	1031
Income tax											
Residential	1,712,714	12,852	27,437	40,091	54,835	54,835	17,609	103,218	103,218	103,218	1,712,714
Skilled nursing, assisted living facilities	743,019	19,410	38,085	38,085	38,085	38,085	38,085	38,085	38,085	38,085	743,019
Offices	1,581,493	0	0	0	0	0	27,717	58,695	86,411	117,389	1,581,493
Construction	196,621	91,288	0	25,748	0	0	62,615	0	16,970	0	196,621
Total	4,233,848	123,551	65,522	103,924	92,920	92,920	206,025	199,997	244,685	258,692	4,233,848
Property taxes											4
TIF 1	9,642,350	0	634,171	646,376	867,942	867,942	914,594	1,033,245	1,033,245	1,214,945	9,642,350
TIF 2	4,572,540	0	0	0	0	0	0	425,509	425,509	442,044	4,572,540
Non-TIF	756,697	0	6,772	7,408	10,176	10,176	10,720	17,367	17,367	19,665	756,697
Total	14,971,586	0	640,944	653,784	878,119	878,119	925,314	1,476,120	1,476,120	1,676,654	14,971,586
Road-related household revenues (licenses, fees, etc.)	256,110	2,347	4,955	7,329	296'6	296'6	14,176	18,852	18,852	18,852	256,110
Total revenue	19,461,545	125,898	711,421	765,037	981,006	981,006	1,145,515	1,694,969	1,739,657	1,954,198	19,461,545
Costs											
Reimbursement for public improvements	1,200,000	0	634,171	565,829	O	0	0	0	0	0	1,200,000
Administration, buildings, IT	2,137,601	24,182	37,908	50,310	64,297	64,302	90,849	120,470	124,946	129,951	2,137,601
Police (net)	2,731,750	30,904	48,445	64,294	82,168	82,175	116,100	153,955	159,674	166,071	2,731,750
Total costs	6,069,351	55,086	720,525	680,433	146,465	146,478	205,949	274,425	284,620	296,021	6,069,351
Net revenue	13,392,193	70,813	-9,104	84,604	834,540	834,528	938,565	1,420,544	1,455,036	1,658,176	13,392,193

Table A-1 (continued)

Annual Cash Flows of the Redwood Proposal

				1000	-					
Component	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Income tax										
Residential	103,218	103,218	103,218	103,218	103,218	103,218	103,218	103,218	103,218	103,218
Skilled nursing, assisted living facilities	38,085	38,085	38,085	38,085	38,085	38,085	38,085	38,085	38,085	38,085
Offices	117,389	117,389	117,389	117,389	117,389	117,389	117,389	117,389	117,389	117,389
Construction	0	0	0	0	0	0	0	0	0	0
Total	258,692	258,692	258,692	258,692	258,692	258,692	258,692	258,692	258,692	258,692
Property taxes										
TIF 1	1,214,945	0	0	0	0	0	0	0	0	0
TIF 2	442,044	468,059	468,059	468,059	495,606	495,606	0	0	0	0
Non-TIF	19,665	58,410	58,410	58,410	61,848	61,848	76,328	80,820	80,820	80,820
Total	1,676,654	526,469	526,469	526,469	557,454	557,454	76,328	80,820	80,820	80,820
Road-related household revenues (licenses, fees, etc.)	18,852	18,852	18,852	18,852	18,852	18,852	18,852	0	0	0
Total revenue	1,954,198	804,013	804,013	804,013	834,997	834,997	353,872	339,512	339,512	339,512
Costs										
Reimbursement for public improvements	0	0	0	0	0	0	0	0	0	0
Administration, buildings, IT	129,979	129,993	130,007	130,021	130,035	130,049	130,063	130,077	130,092	130,106
Police (net)	166,106	166,124	166,142	166,160	166,178	166,196	166,214	166,232	166,251	166,269
Total costs	296,085	296,117	296,149	296,181	296,213	296,245	296,278	296,310	296,342	296,374
Net revenue	1,658,112	968'209	507,864	507,832	538,784	538,752	57,594	43,203	43,170	43,138

Table A-2

Component Total Income taxes 3,578,801 Property taxes 2,800,219 Non-Tif 131,895 Total property taxes 2,932,114 Total revenue 6,510,915										
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
	0	0	0	0	0	39,182	58,310	97,491	116,620	155,801
2, 9	0	0	0	0	0	0	84,593	84,593	175,761	175,761
	0	0	0	0	O	0	824	824	1,712	1,712
	0	0	0	0	0	0	85,417	85,417	177,473	177,473
	0	0	0	0	٥	39,182	143,727	182,909	294,093	333,274
Expenditures										
Reimbursement for public 1,200,000	0	0	0	0	0	0	84,593	84,593	175,761	175,761
Administration, buildings, IT 1,072,294	0	0	0	0	0	8,436	17,871	26,322	35,775	44,241
Police (net) 1,370,340	0	0	0	0	0	10,780	22,839	33,639	45,718	56,538
Road maintenance 334,882	0	0	0	0	20,930	20,930	20,930	20,930	20,930	20,930
Total expenditures 3,977,516	0	0	0	0	20,930	40,146	146,234	165,485	278,184	297,471
Net revenue 2,533,399	0	0	0	0	-20,930	-964	-2,507	17,424	15,908	35,804

Component	2002	2033	2034	2035	2036	2037	2038	2039	2040	2041
Income taxes	174,929	214,111	233,239	272,421	291,549	330,731	349,859	389,040	408,168	447,350
Property taxes										
TIF	267,057	279,158	374,002	374,002	492,646	492,646	0	0	0	0
Non-TIF	2,601	2,719	3,643	3,643	4,798	4,798	23,180	24,386	28,529	28,529
Total property taxes	269,658	281,877	377,644	377,644	497,444	497,444	23,180	24,386	58,529	28,529
Total revenue	444,587	495,988	610,883	650,065	788,992	828,174	373,038	413,426	436,697	475,879
Expenditures										
Reimbursement for public improvements	267,057	279,158	133,076	0	0	0	0	0	0	0
Administration, buildings, IT	53,710	62,192	71,677	80,175	929'68	98,189	107,701	116,236	125,771	134,316
Police (net)	68,639	79,478	91,600	102,459	114,602	125,481	137,645	148,544	160,729	171,649
Road maintenance	20,930	20,930	20,930	20,930	20,930	20,930	20,930	20,930	20,930	20,930
Total expenditures	410,335	441,758	317,282	203,564	225,208	244,601	266,282	285,711	307,430	326,895
Net revenue	34,252	54,230	293,601	446,501	563,785	583,573	106,756	127,715	129,267	148,984

Rezoning Application

Owner	Parcel No.	Taxpayer/Tax Mailing Address
Craig A. Abbruzzese and Carolyn A. Abbruzzese	319-133-06-033-000	303 Balsamine Drive Powell, OH 43065
Board of Trustees of Liberty Township	319-133-02-001-000 319-132-01-017-000	10104 Brewster Lane Powell, OH 43065-7575
Board of Education of the Olentangy Local School District	319-133-02-002-000 319-133-02-003-000	814 Shanahan Road Lewis Center, OH 43035
City of Powell	319-240-01-068-002	47 Hall Street Powell, OH 43065
Joshua W. Herrman and Rachael N. Herrman	319-240-14-033-000	3229 Winding Woods Drive Powell, OH 43065
Gautham Jayaraman and Ginger Jayaraman	319-133-06-032-000	307 Balsamine Drive Powell, OH 43065
Michael C. Jones and Randi R. Jones	319-240-14-034-000	3239 Winding Woods Drive Powell, OH 43065
Kinsale Golf and Fitness Club, LLC	319-240-01-011-002 319-240-01-011-003	3982 Powell Road Powell, OH 43065-7662
Golf Village Property Owners Association, Inc.	319-240-14-038-000	3735 Attucks Drive Powell, OH 43065



Rezoning Application

Owner	Parcel No.	Taxpayer/Tax Mailing Address
Board of Commissioners of Delaware County, Ohio	319-132-01-007-000	P. O. Box 8006 Delaware, OH 43015-8006
Board of Trustees of Liberty Township	319-132-01-009-000 319-132-01-011-000 319-132-01-017-000	10104 Brewster Lane Powell, OH 43065-7575
Del-Co Water Company, Inc.	319-240-01-011-001	6658 Olentangy River Road Delaware, OH 43015-9400
Leonard G. Rodgers and Marilyn C. Rodgers	319-132-01-006-000	9661 Finlarig Drive Dublin, OH 43017
Joseph Indiciani	319-132-01-006-000	45 Ravine Ridge Drive Delaware, OH 43015-2885
Simes Landscape, Inc.	319-240-01-008-000	6326 North Section Line Road Radnor, OH 43066-9736
SS Powell, LLC	319-240-01-011-004	National Tax Search 303 East Wacker Drive, #900 Chicago, IL 60601-5222 And c/o Cogency Global Inc., Statutory Agent 3958-D Brown Park Drive Hilliard, OH 43026-1160
Kinsale Golf and Fitness Club, LLC	319-240-01-011-003 319-240-01-011-002	3982 Powell Road Powell, OH 43065-7662



STATEMENT OF COMPATIBILITY

The Property

The property, of $70\pm$ acres, is long and narrow, over 4,000 feet in north-south depth. It is arguably the most isolated tract in (or to be in) the City.

The property is bounded on its entire west boundary, of over 4,000 feet, by the railroad tracks, which are elevated above the level of the property and totally screen it from the uses on the west side of the railroad tracks except for a Del-Co water tank. The property's east boundary, of over 4,000 feet, is bounded, north to south, by a 150-200 foot deep ¾ acre residential lot, Liberty Park, a 25-acre wooded tract owned by Liberty Township, the Liberty/Powell YMCA tract owned by Liberty Township which has no structures within 700± feet of the property, an Olentangy Local School District Middle School (the proposed secondary access road to the property would be over 700 feet from the west end of the parking lot). The south end of the property, with 5± acres of wooded wetlands which will remain as is, has to its immediate south 12 acres of similar wooded wetlands owned by the City. The north boundary, the only road frontage, is the right-of-way line of Home Road, which road is elevated above the level of the property due to the overpass over the railroad tracks, effectively buffering, except for the Del-Co water tank, the uses on the north side of Home Road, which are the Korthals landscaping property, the vacant former Trucco excavating property and the Del-Co water tank.

All of the streets on the property will be private with the only regular access point being from Home Road on the northeast corner of the property, which further isolates the property.

The isolation of the property makes compatibility with adjacent properties essentially a non-factor.

The Comprehensive Plan

The Comprehensive Plan is consistent with/based upon the current zoning of the 34+ acres currently in the City, which zoning is Planned Industrial with a development plan of 30+ lots for small office warehouses. The fact that in the 16+ years since the 34+ acres currently in the City was zoned Planned Commercial and the 35+ acres to be annexed from Liberty Township remained zoned Industrial, that there was absolutely no development of the properties establishes that there is simply not a market for the property as it is zoned and has been zoned.

The Comprehensive Plan viewed the property as an employment center, for the purpose of generating income tax. The Fiscal Impact Report establishes that the mixed use proposed in the Pre-Annexation Agreement and the Development Plan has a positive fiscal impact several times greater than if the property could be developed (which it hasn't been able to be in over 15 years) as Planned Industrial.

PRELIMINARY DEVELOPMENT PLAN & TEXT TO CITY OF POWELL, OHIO

BREAGHA PLANA II, LLC TRACTS CITY OF POWELL AND LIBERTY TOWNSHIP DELAWARE COUNTY, OHIO

(3041 Home Road, Powell, Ohio 43065)

Submitted by: Applicant Redwood USA, LLC 7007 East Pleasant Valley Road Independence, OH 44131

Prepared by:

Real Estate Advisor: Jim Frey Real Estate Advisor, LLC

James Frey

5311 Gillen Way, Westerville, Ohio 43082

614-206-1123

Land Planning/Landscape Architecture: POD Design

Todd Foley

100 Northwoods Boulevard, Suite A, Columbus, Ohio 43235

614-255-3399

Engineer: American StructurePoint

Shawn Goodwin

2550 Corporate Exchange Drive, Suite 300, Columbus, Ohio 43231

614-901-2235

Architect: Mann Parsons Gray Architects, Inc.

James Keys

3660 Embassy Parkway, Fairlawn, Ohio 44333

330-666-5770

Attorney: Manos, Martin & Pergram Co., LPA

Stephen D. Martin

50 North Sandusky Street, Delaware, Ohio 43015

740-363-1313

Submittal Date: February 19, 2021



PLANNING AND ZONING COMMISSION (P&Z) PRELIMINARY DEVELOPMENT PLAN APPLICATION

ALL ITEMS ON THIS APPLICATION MUST BE COMPLETED.

Application Fee: \$500.00 + \$100.00 per acre Per Fee Ordinance 2019-49

Applicant: Redwood USA, LLC	
Address/City/State/Zip: 7007 East Pleasant Valley Road, Independent	dence, OH 44131
Email Address: jim@jimfreyadvisor.com	
Phone No: 614-206-1123 Cell Phone No: 614-206-112	.23 Fax No:
Property Owner: Breagha Plana II, LLC	
Address/City/State/Zip: P. O. Box 245, Powell, OH 43065	
Email Address: steel@gfschemicals.com	
Phone No: 740-881-5440, ext. 118 Cell Phone No: 614-975-030	00 Fax No: 740-881-9309
Architect/Designer for Applicant: POD Design, Todd Foley	
Address/City/State/Zip: 100 Northwoods Boulevard, Suite A, Colu	mbus, OH 43235
tfalou@naddaoign nat	
Phone No: 614-360-3055 Cell Phone No:	Fax No:
Property Address: 3041 Home Road and Home Road, Powell,	OH 43065
Lot Number/Subdivision: n/a Existing Use: vacant/indust	rial Proposed Use: Planned Commercial (Mixed Use)
Reason for Administrative Review (attach necessary documents):	
see attached Preliminary Plan and Text	
9	
Checklist:	
☐ Preliminary Plan requirements set forth in Section <u>1143.11(c)</u> .	
$\hfill \square$ Provide any other information that maybe useful to the Planning and Zoning Com	mission or City Staff in the space
below or attach additional pages.	
$\hfill \Box$ 5 copies of all drawings, text, any other items, and application.	
□ 1 digital copy (CD, USB, Email) of the complete application packet.	
☐ Attach the required fee - \$500.00 + \$100.00 per acre.	
$\hfill \square$ Post a public notice sign at least (10) days prior to a public hearing or public meet	ing, pursuant to ordinance 1107.035
Public notice sign details found <u>here</u> .	

(SEE OVER)

of Applicant:	7.13	Date: 2/17/202
Office Use	Office Use	
	Type/Date:	
	Base Fee:	\$500.00
	Per Acre:	\$100.00X () =
Received	Total:	
	Prepared by:	
	Reviewed by:	
	PAYOR:	
	RECIEPT#	-

City of Powell \cdot 47 Hall Street \cdot Powell, Ohio 43065 \cdot (614) 885-5380 \cdot (614) 885-5339 fax \cdot www.cityofpowell.us







Prelminary Development
Plan

City of Powell, Ohio February 19, 2021









Project Introduction

Redwood Living would like to bring our beautiful apartment homes to Powell.

Our combination of smart, single-story design, private attached garages, and Redwood's signature features firmly place our apartment homes in a singular category: the maintenance-free convenience of an apartment with a genuine feel of home.

As Redwood's CEO Steve Kimmelman puts it, "We offer a condominium atmosphere with the feel of a single-family home—and without association fees or property taxes to worry about."

Redwood's distinctive approach to apartment home development starts with site selection. We choose communities like Powell because they offer a positive atmosphere, beautiful surroundings, and an appreciation of the qualities that Redwood provides, including energy efficiency.

Being good environmental stewards is a worthwhile goal in itself, but saving money for our residents is also extremely important to us. Our commitment to using specific materials and building processes means there are significant savings for our residents, as documented by our score on the nationally-recognized HERS index. According to this measure, Redwood apartment homes are 40-45% more energy efficient than a home built to current building codes. We're designated "Energy Star" as a result.

Redwood began more than twenty years ago with a simple goal: **give people the kind of apartment that they really wanted to call home.** We listened carefully to what people who lived in apartments had to say about what would simplify and improve the quality of their living experience

We learned that people want a private attached garage, single-story convenience, open floor plans, large kitchens, an extra full bathroom and plenty of closet space. So that's what we provide.

We invite you to learn more about Redwood Living by visiting www.byRedwood.com, and watching our YouTube channel; youtube.com/RedwoodLivingTV.

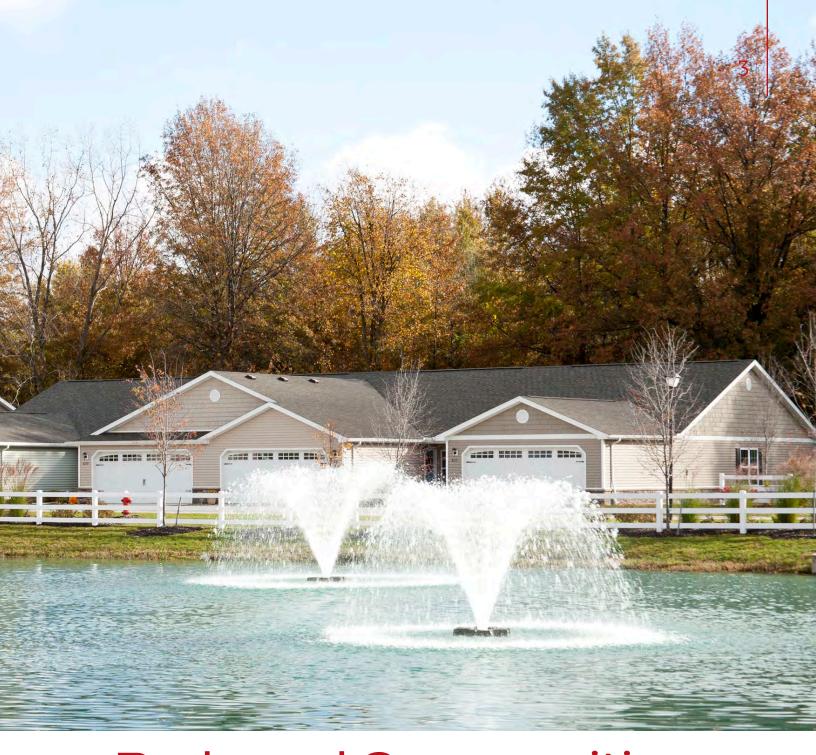












Redwood Communities: Peace, Quiet & Comfort



Who is Redwood?

- Founded in 1991
- Based in Cleveland, Ohio
- 12,000 Units; Owned and Managed
- Single story apartment developer
- 98% Leased Portfolio
- All communities are conventionally financed











Redwood Community Exteriors

- Attractive traditional architectural design
- Stone and shake siding accents
- Individual driveways to garages; no 'ribbon' parking lots
- Upgraded 'carriage-style' garage doors
- Personal outdoor patios







Redwood Community Exteriors

- All communities use extensive landscaping
- Stone accents on buildings
- 2x6 Exterior walls, filled with R-19 batt insulation
- Varied color siding and shake accent panels
- Lifetime dimensional shingles
- Energy Star certified windows
- Individual driveways to garages, no ribbon parking lots
- Carriage style garage doors with windowed panels
- Personal outdoor patio spaces















Redwood Community Interiors

- No stairs, single-story design
- No one living above or below the apartment home
- Spacious living areas with open floor plan
- Large windows for abundant natural interior light
- 2 bedroom, 2 full bath, with a den space
- Walk-in closets and kitchen pantry







Redwood Community Interiors

- Vaulted ceilings, quality finishes, open floor plans with waterproof LVT (Luxury Vinyl Tile)
- Energy efficiency certified throughout unit including high efficiency furnace
- Granite countertops in kitchen and baths
- LED lighting throughout the home
- Every bedroom has a ceiling fan and walk in closet
- Full size washer and dryer connections
- Smoke-free apartments















Who are our Residents?

- Residents who want a single-story design
- Residents who want private attached garages
- Those who want a 'peace and quiet' neighborhood
- Maintenance-free lifestyle
- Empty nesters
- Those who can afford \$1,775 \$2,200 rent
- Our design and features generate long-term residents





Why the Redwood Formula Works so Well?

- 24/7 On-site professional management
- Responsive to resident requests
- A unique neighborhood that sells 'quiet and privacy'
- All single-story homes
- Private driveways to attached garages
- Private streets maintaned by Redwood
- Attached single family rated construction
- State-of-the-art interior amenities and floor plans











Why Redwood is Good for Powell:

- Appeals to older residents and empty nesters who want to stay in the community but don't want to deal with maintenance issues
- Provides a distinctive condo-like community emphasizing peace and quiet
- Will provide positive tax revenues to community with a minimal impact to community services and public works (i.e. police, fire, maintenance, etc.)
- Additional revenue for local business
- Minimal impact to public schools (5-10% of residents with school age children)
- Low traffic volumes relative to traditional single family home developments





LEGAL DESCRIPTION

Parcel I

Schasted in the Township of Liberty County of Dissionale and State of Other and bounded and discribed as follows:

Being in Reinge 19 Touriship 2 Section 2 part of Let 2 U.S. Aldstory Lands Beginning at a pill opake at the intersection of the controllers of Delaware County Road No. 124 and the East late of Section 2

Therece S 2" 19 W along the section has 1335 20 foet to an den pape persong over an iron pape at 30 00 feet.

Thance N. 87* 40" W 25,00 fact to an eron price (found)

Thence N. 2* 19 E. 1315 20 feet to a R.R. Spite on the certainine of Delaware County Rd. 124 passing ever an iron page (found) at 1305 20 feet.

Thance 5 87° 40° E slong the center kno of serd County Rd 25 00 feet to the pione of beginning containing 0 766 acres, be the serve more or less

Parcel

Situated in the Township of Liberty County of Delawore and State of Olivo, and bounded and described as follows:

Bertig in Renge 19, Township 3, Section 2, part of Let 2 U.S. Military Liestic Beginning at an ero, pipe (Ibund) on the Essently right-showy line of the Chicaspealate and Ohio Redread, and from pipe being 5, 2° DV W. 1335,250 feet from the part of these better with the contasting of Dalametre County Rd. 124 and the Easterly highlight-showy line of CSO Redisped.

Thereo S. 67" 40" E. 838.74 feet to an eron pipe on the East line of Section 2, passing over an eron pipe of 813,74 feet.

There as 2° 19°W along the Emitedy line of Section 2.1177 79 feet to a post, patrong over a stone of 421.64 feet.

Thence H 87" 44"W 824 37 feet to a steel post on the Easterly right-of-way line of the CGO Hadrood.

There a dong the Eastedy ngot-st-very line of each relations with a tir 30" cours to the again which the light chief bears N. 0" 50" 30" E. 503 08 feet, an arc distance of 504 11 feet to an ion both to the point of language.

Thence N. 2" 00" E. 677.35 feet to the point of beginning, containing 22.61 acres, be the same more or less

Parcel III

Shasted in the State of Oteo, County of Delaware and Yevenbay of Liberty Borry in Range 19 Township 3 Section 2, and pest of Let 2, U.S. Nilstony Londs.

Beginning at a railroad aptite set on the centerfine of County Road No. 12s known as the G.I.H. and Columbias Road deld patint of beginning beam kiteth 87 degrees 40" West 55 00 feet from the point of waterleaden of the centerfine of County Road No. 124 and the section line between sections 2 and 1.

Thence South 2 degrees 16' West parelled with the section line 1335,20 feet to an iron pipe passing ever an Iron pipe at 30 00 feet.

There's North 57 degrees, 40' West 513.74 feet to an your pipe set on the dight-of-way line of the Choespeake and Ohio Radroed.

Thorse North 2 degrees 69 East along the said East right-of-way line. 1335 20 feet to a radioad spike set on the controlline of County Road file. 124, passing over an iron pipe at 1305,20 feet.

There South 17 degrees 40' East along the contentine of County Read No. 124, 817.53 feel to the point of beginning, contaming 25.00 zeros of land, be the same more or less.

Parcel IV

Situated in the State of Diric County of Delaware, City of Powell, isocated in Firm Let 1, Section 2, Township 3 North, Range 19 Week, Unsted States Military Lunda, and being part of a 40 839 since that commyred in MI Hames of Cownell Office Liq. on recorded in Official Record Volume 428, Page 1362, Delaware County Recorder's Office, and being more particularly detectable as follows:

Beginning, for reference, at a retrood upite found at the intersection of containing of Ruthenford Road (T.R. 122) with the East time of the CSX Transportation, inc. marking the Southwest come of paid 49 539 acre bect.

Thence North 10" ST 41" West 748 18 lest, slong the Westerly line of said 40,638 acre text and East line of the CSX Transportation, finc. to an iron put found;

Therce North 98" 35" 69" West 1154 01 feet along the Westerfy fire of and 49 936 acre tract and East him of the CSX Transporteson, Inc. to an iron pin set marking the PRINCIPAL PLACE OF SECINATING of the forest

Thronce continuing North 196" 35" is "Mines 30", 06 feet, along the Westerly bits of said 40 0.26 acre tract and Enol line of the CSX Transportation, fee. Its centron pen found,

Thence North 94° EJ 20° West 782.01 feet, along the Winsterly line of seed 40 530 acre fact and East line of the CSX Transportation Inc., to an Iron purification.

Thence North 35' 19' 13' East 10.89 feet, along the Westerly line of axed 40 636 eace tract and East line of the CSX Transportation, Inc. to an iron the found:

Theres North 23" 55" 61" East 95,92 (set, along the Westerly line of said 40 616 sere tract and East line of the CSK Transportation, Inc., to person per found.

Thence North 02' 03' 18" East 195 98 feet, stong the Westeldy line of and 49 0.38 acre stack and East line of the CSX Transportation, Inc. 16 on item pin found marking the Northwest corner of aud 49 535 acre and and sol

There South 85" 24" 15" East 766 01 feet, along the Morth Sine of south 40,036 sore tract and South Sine of used 22.01 sore limit, to ankeep per found of the Chail Sine of Famil, 64 I and Weet Sine of a 25.245 sore that (Parcel III) conveyed to 0.0, Fredenick Simits Chansold Company, recorded in Doed Book 420 Plags 32, marking the Northeast conner of said 40,036 sore text and Southwest conner of 22.51 sore that

Thence South C4* 15 C4* West 973.92 feet, along the East tine of said 40.836 size wast and Ferm Lai 1 and West his of said 25.248 sore tract and 4 51.3172 size west conveyed to Beard of Trastees Liberty Township, are inconsed in Official Record 32, Page 1988, to an ison pro-found making the Southwest cames of waid 51.3172 size and and off 40 Notherwest cames of a 21.010 size to test charveyed to Beard of Education at 91.000 size to set charveyed to Beard of Education at 91.000 size to set charveyed to Beard of Education at 91.000 size to set charveyed to Beard of Education at 91.000 size to set charveyed to Beard of Education at 91.000 size to 91.000 size to

Therece South 02" 31' 40" West 780.30 feet, along the East line of east 40.636 pare tract and Farm Lot 1 and Yest lines of east 21 976 pare tract and a 25 094 pare had conveyed to Board of Education of the Otenberg Local School Debrid, as recorded in Deed Book 697 Page 278, to an inso pan set (present on their parsoning an tran pan found at

Theorical storigition aim of a course 638 84 feet turning to the right (datts single = 47° 20° 15° redux = 164.43 feet) with a cherid bearing and distance of heath 60° 00° 16° Weet 630° 36 feet, across said 40.636 note that it is the prescriped place of beginning, containing an area of 25.246 sourse.

LESS AND EXCEPTING FROM PARCELS I AND ELABOVE

Ghusted in the State of Chio, County of Delawate, Township at Utenty being a part of Form List 2 or Sychon 2 Township 3 North, Range 19 West, United States Matary Lands and being a part of Forces 11 5/20 acre and 25 00 acre percels conveyed to G. Frederick Smith Chemical Company as recorded in Book 4/20, Page 22 is the records of Delaware County being a part of is final being an the regist and in School of the centeration of DEL-CR124-4 11 (Home Road) and bounded and described as follows.

Beginning at the intersection of the centerline of County Road 124 (home Road) and the East Sine of Ward Farm, Lot 3, was posse located 22.93 feet list of station 26(1) 13 or of a proposed County Road 124 and being the TRUE FORMY OF EXCENSION 5 or the pareat home described.

1) Therice South 93 degrees 30 manufee 05 seconds Weet along the Earl line of said Form Lot 2 or distance of 122 74 feet to an iron pin set, located 99 18 leef right of statum 239-90 35 of proposed County Road 128 2) Thence South 65 degrees 10 metalins 23 sectorials West a distance of 715 67 feet to an wen par set located 156:00 feet right of station 233-50 00 of proposed County Road 124

 Therea Harth 66 dagrees 22 marker 05 seconds West a distance of 134 55 feet to an ean pin set fecated 150 00 feet right of streen 233+06-00 of proposed County Road 124

4) Thence North 03 degrees 28 minutes 47 seconds East along the East line of the CSX Risknord a distance of 278 00 feet to the cartedine of ensuing County Road 124 said pone located 77 99 teel left of station 231-64 \$6 of propieted Cauty Read 124.

5) Thence South 86 degrees 21 minutes 56 seconds East along the certifichis of around County Road 174 is detance of 832,39 feet to a point located 23 93 feet 68 of station 240-92 63 of proposed County Road 174

6) Theore South 85 degrees 36 require 27 seconds East along the contecting of washing County Road 124 a destance of 10.56 feet to the point of beginning and anchoring an erise of 3.555 secon more or lena.

Of the above described tract, 3.65¢ acres in focaled in Auditor's Permanent Parcel Number 315-240-01004-000 which includes 0.563 acres in the present road accupant and 0.071 acres in focaled in Auditor's Permanent Parcel Number 315-240-01-005-000 which includes 0.017 acros in the present road occupant.

Monuments released to as you got set are 34 inch dismoter a 35 inch long you been with a 1-1/2 inch diameter attraction cap marked "ROW"(S 87610"

Searings used in time description are based on the Otto Lambort Projection North Zono Plane Coordinate System as admittational by the National Goodade Survey Horth American Datum of 1983 (1995 adjustment) from GPS observations made by American Committing Inc.

Stations referred to herein are from the canadign of survey of proposed County Road 124 to found on Delarate County Engineer's Office Right of Way Plan DEL-CR1264 11

The description was prepared and reviewed on July 17 2005 by Charles P. Lintertainer P.S. 7619 from a survey made by American Computing, Inc. to 2003.



DESCRIPTION FOR A 35.336 ACRE ANNEXATION FROM LIBERTY TOWNSHIP TO CITY OF POWELL

Situated in the State of Ohio, County of Delaware, Township of Liberty, being in Farm Lot 2, Section 2, Township 3 North, Range 19 West of the United States Military Lands, being,

- All of that 21.587 acre tract as described in deed to Breagha Plana II, LLC, an Ohio limited liability company, recorded in Official Record volume 1084, page 393, (all records referenced herein are to the Delaware County Recorder's Office, unless otherwise stated), being known as Delaware County Auditor's number 319-240-01-004-000.
- All of that 13.749 acre tract as described in a deed to Breagha Plana II, LLC, an Ohio limited liability company, recorded in Official Record volume 1084, page 393, being known as Delaware County Auditor's number 319-240-01-005-000.

and being more particularly described as follows.

COMMENCING for reference at the northwest corner of Farm Lot 14, and in the asset line of the said Farm Lot 2, and being the east line of the said Section 2, and being the northeast corner of a 3.484 acre right-of-way taking known as 21-WDV as shown in the plan set DEL-CR124-4.11 on record with the Delaware County Engineer's Office as conveyed to Board of Commissioners of Delaware County, Ohio by the instrument conveyed as Official Record volume 952, page 672, and being the northwest corner of the Clay C. Darnell Subdivision as shown in Plat Book volume 5, page 79;

Thence along the said westerly line of Farm Lot 14, the westerly line of the said Clay C. Darnell Subdivsion, the said easterly line of Farm Lot 2, the said easterly line of Section 2, and the said easterly line of the 21-WDV tract, South 02 degrees 19 minutes 00 seconds West for a distance of 122.74 feet to the southeast corner of the said 21-WDV tract, being the northeast corner of 21.587 acre tract, and being the northwest corner of parcel conveyed to Board of Trustees of Liberty Township by the instrument filed as Deed Book volume 496, page 199, and being on the southerly right-of-way line of Home Road (Varied Width), and being the true **POINT OF BEGINNING** of the parcel herein described;

Thence along the easterly line of the said 21.587 acre tract and said 13.749 acre tract, the westerly line of the said Board of Trustees of Liberty Township tract, the said easterly line of Farm Lot 2, the said easterly line of Section 2, the said westerly line of Farm Lot 14, the westerly line of Section 1, the westerly lines of Farm Lots 15 and 16, South 02 degrees 19 minutes 00 seconds West for a distance of 1,890.25 feet to the southeast corner of the said 13.749 acre tract, the northeast corner of a 9.556 acre tract as conveyed to Breagha Plana II, LLC, an Ohio limited liability company by the instrument filed as Official Record volume 1084, page 393, and being on the existing northerly corporation line of a 9.556 acre tract annexed to City of Powell, Ohio, by Ordinance No. 2005-43 (08-16-2005), Resolution No. 05-773 as filed in Instrument Number 200500041967;

Thence along the said northerly corporation line, the southerly line of the said 13.749 acre tract, and the northerly line of the said 9.556 acre tract, North 87 degrees 29 minutes 09 seconds West for a distance of 842.53 feet to the southwest corner of the said 13.749 acre tract, the northeast corner of the said 9.556 acre tract, the northeast corner of the said existing corporation line, and on the easterly right-of-way line of CSX Transportation Inc.;

Thence along the westerly line of the said 13.749 acre tract, the westerly line of a said 21.587 acre tract, and the said easterly right-of-way line of CSX Transportation Inc., North 02 degrees 19 minutes 00 seconds East for a distance of 1784.53 feet, to the northwest corner of the said 21.587 acre tract, being the southwest corner of the said 21-WDV tract and being on the said southerly right-of-way line of Home Road;

Thence along the northerly line of the said 21.587 acre tract, the southerly line of the said 21-WDV tract, and the said southerly right-of-way line of Home Road; South 87 degrees 31 minutes 03 seconds East for a distance of 134.55 feet to an angle point;

Thence continuing along the last described line, North 84 degrees 01 minutes 25 seconds East for a distance of 715.46 feet to the TRUE POINT OF BEGINNING for this description.

The above description contains a total area of 35.336 acres (0.000 of which are within the present road occupied), of which:

- 21.587 acres is all of PID# 319-240-01-004-000
- 13.749 acres is all of PID# 319-240-01-005-000

Bearing described herein are based on the east line of Farm Lot 2, of Section 2, Range 19, Township 3, Liberty Township, being South 02 degrees 19 minutes 00 seconds West, as referenced in the deed filed as Official Record volume 1084, Page 393 on field in the records of Delaware County, Ohio.

This description was prepared by Andrew T. Jordan, Registered Professional Surveyor Number 8759.

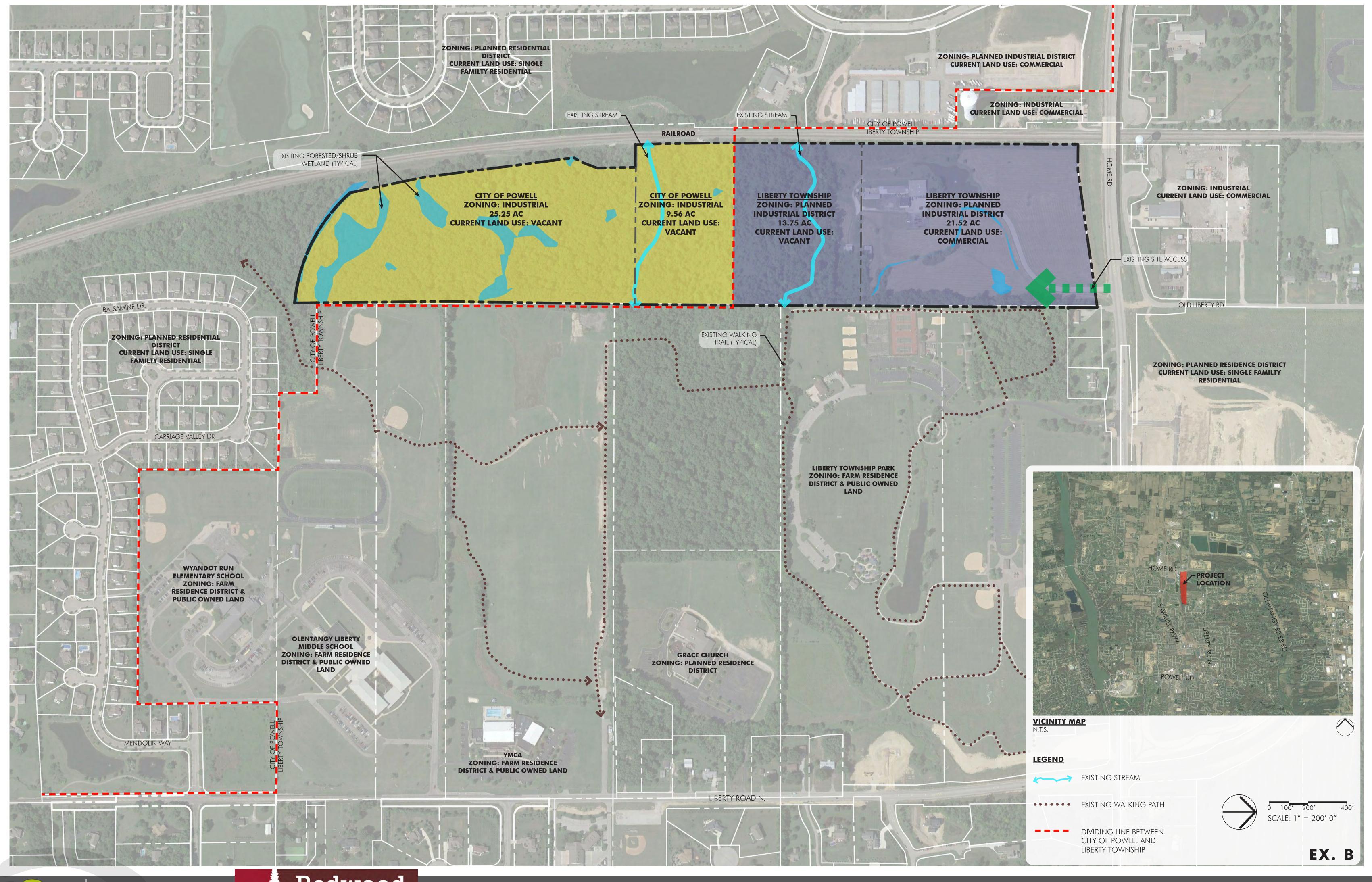
American Structurepoint, Inc.

DELAWARE COUNTY ENGINEER Map Department

reby certify that this document true copy of the original on file in the Map Department

Chris E. Bauserman, P.E., P.S.

April 25, 2019











2550 Corporate Exchange Drive, Suite 300 Columbus, Ohio 43231 TEL 614.901.2235 FAX 614.901.2236

www.structurepoint.com

MEMORANDUM

DATE: February 17, 2021

TO: City of Powell

FROM: Brian Johnson, El

RE: Home Road Planned Commercial District – Engineering Feasibility Memorandum

cc: Shawn Goodwin, PE; Ollie Damschroder

In addition to the Preliminary Development Plan (PDP) package submitted for the above referenced project, this memorandum provides further clarification on utility service, access and traffic for the project.

Sanitary Sewer

Gravity sanitary sewer service for the subject property is available from the existing 12" sanitary sewer and manhole in the northwest corner of the Home Road/Shasta Trail intersection. A proposed 12" sanitary sewer extension along the north side of Home Road, then south into the property will be provided with this project for sewer service. Per correspondence with the Delaware County Regional Sewer District (DCRSD), the existing 12" sanitary sewer has the capacity to service the project and proposed densities. See "Attachment A" for a sewer capacity letter dated February 2, 2021 from DCRSD

Water

Water service for the subject property will be provided by the existing 12" Del-Co watermain on the north side of Home Road. A public watermain extension will be provided into the property, then split into private systems to service the property. See "Attachment B" for a water capacity letter dated February 15, 2021 from Del-Co Water.

Home Road Access

A memorandum of understanding (MOU) to establish the scope of a Traffic Impact Study (TIS) was approved by the Delaware County Engineer's Office (DCEO) on April 22, 2019. After approved of the MOU, the TIS was completed on July 12, 2019 and provided to the DCEO for review. At the time of the initial TIS in 2019, the DCEO was beginning a Home Road Capital Improvement Project (CIP) to widen Home Road. We coordinated our efforts with this project to potentially incorporate our improvements within the Home Road CIP. At this time our project was put on hold. We are currently in the process of revising our MOU to re-establish a TIS scope with the DCEO and make it current. We will be resubmitting the MOU and coordinating on a revised TIS in the next few weeks and will keep City staff engaged in our discussion with the DCEO.

In addition to the TIS, we evaluated the proposed curb cut for Intersection Sight Distance (ISD) for both passenger cars and semi-trucks. Per ODOT ISD requirements, sight distance is compromised when looking west towards the Home Road overpass for semi-truck traffic. The proposed use has minimal semi-truck traffic and can accommodate the required ISD for the curb cut.

Attachment A



Delaware County

Regional Sewer District

Executive Director
Michael A. Frommer, P.E.

Director/Sanitary Engineer Tiffany M. Maag, P.E.

sent via email: sgoodwin@structurepoint.com

February 2, 2021

Shawn Goodwin, P.E. American Structurepoint Inc. 2550 Corporate Exchange Drive Suite 300 Columbus, OH 43231

Re: Request for Sewer Capacity

3041 Home Road

Parcel: 31924001004000, 31924001005001, 31924001068004

Dear Mr. Goodwin:

The Delaware County Regional Sewer District (the "County") has considered your request for approval to discharge sanitary sewage into the Delaware County Sanitary Sewer System from the above referenced location, representing 283 Equivalent Residential Unit(s) (ERU).

Capacity is available to serve the proposed development. Extensions from the existing sanitary sewer on the north side of Home Road will be necessary to provide service to the proposed buildings.

The current assessment of capacity availability is subject to periodic reevaluation by the County and shall not be valid after 18 months from the date of this letter.

If you have any questions, please feel free to contact me.

Sincerely,

Kelly Thie objects to the property of the prop

Kelly Thiel
Staff Engineer III
Delaware County Regional Sewer District

cc: Correspondence File

Attachment B

Officers
TIMOTHY D. McNAMARA
President
DAVID A. BENDER
Vice President
ROBERT W. JENKINS
Secretary
G. MICHAEL DICKEY
Treasurer
GLENN MARZLUF
General Manager/CEO

SHANE CLARK

Chief Operating Officer



6658 OLENTANGY RIVER ROAD DELAWARE, OHIO 43015

www.delcowater.org Phone (740) 548-7746 • Fax (740) 548-6203 Directors
BRUCE A. BLACKSTON
BRIAN P. COGHLAN
WILLIAM E. COLE
DOUGLAS D. DAWSON
J. MICHAEL SHEETS
PERRY K. TUDOR

February 15, 2021

Shawn Goodwin American Structurepoint, Inc. 2550 Corporate Exchange Drive Suite 300 Columbus, Ohio 43231 Via Email: sgoodwin@structurepoint.com

RE: Water Availability – Redwood Home Road

Dear Mr. Goodwin:

As requested, this is to inform you that Del-Co Water can provide water service to the site described below upon plan approval and payment of the required fees:

Development: Redwood Home Road

Proposed Land Use: ±331 multi-family units, 134 room skilled care/assisted living facility, and

commercial outlot(s)

Location: Southeast corner of Home Road and railroad tracks across from Old Liberty Rd.

Land Size: ±70 acres

This site can be served from an existing 12-inch waterline located on Home Road

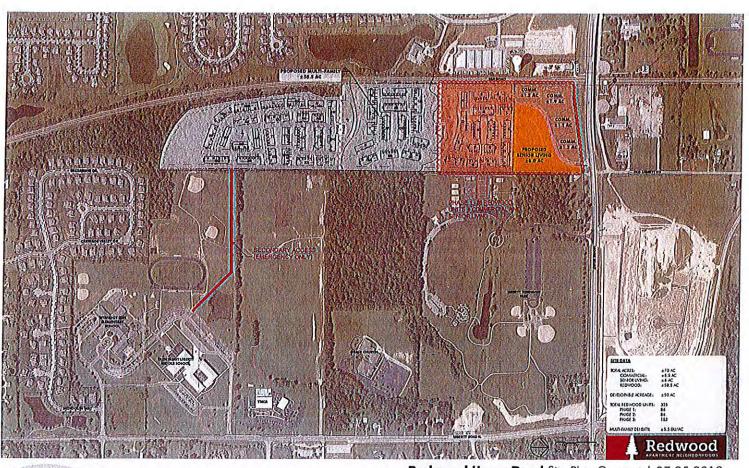
This letter of water availability is valid for a period of one year from the date of this letter. Del-Co makes no guarantee of water availability beyond this period. Contact our Engineering Department if you have any questions on the plan review process, or our Customer Service Department for information on tap fees.

Sincerely,

DEL-CO WATER COMPANY, INC.

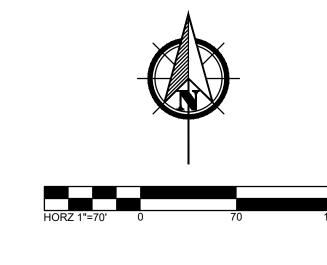
Shane F. Clark, P.E.

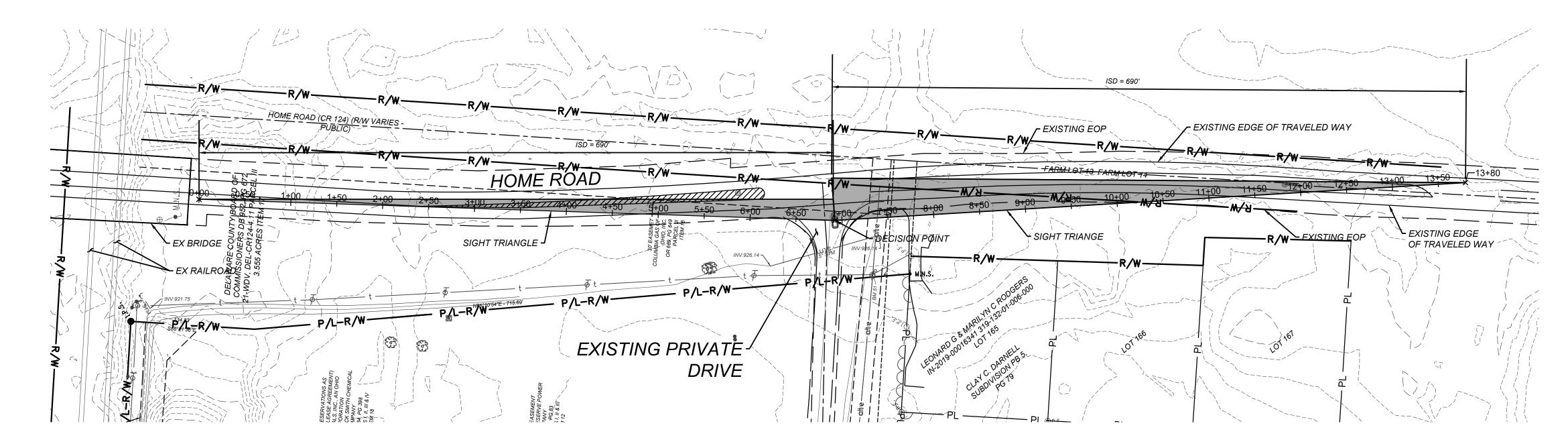
Deputy General Manager

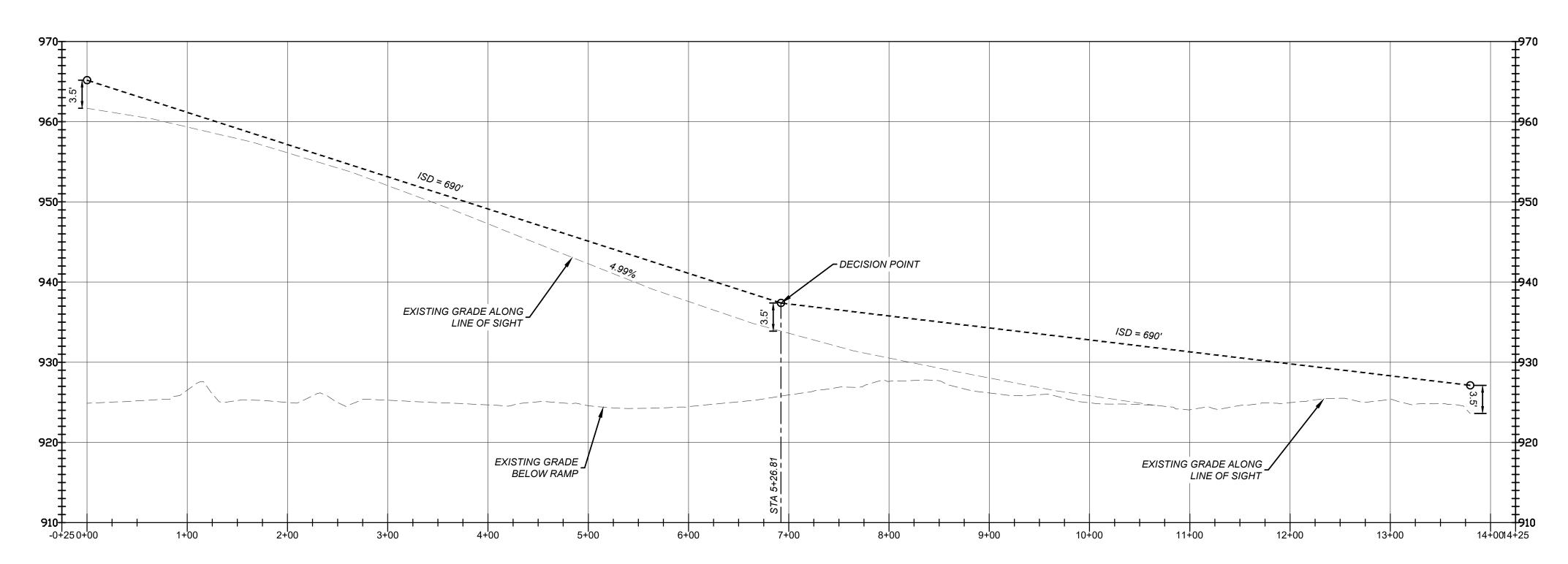


Redwood Home Road Site Plan Concept | 07.25.2019

Attachment C



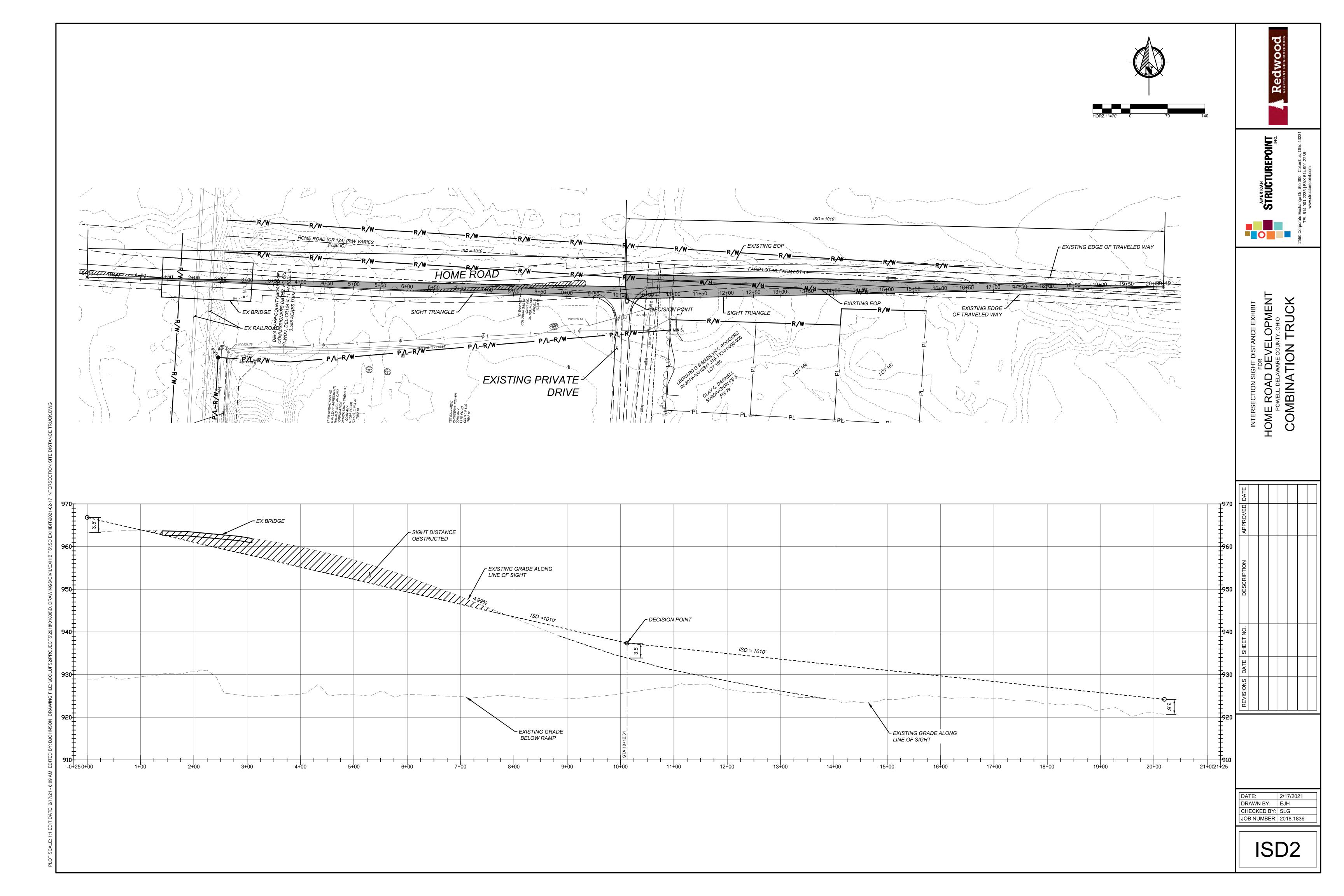




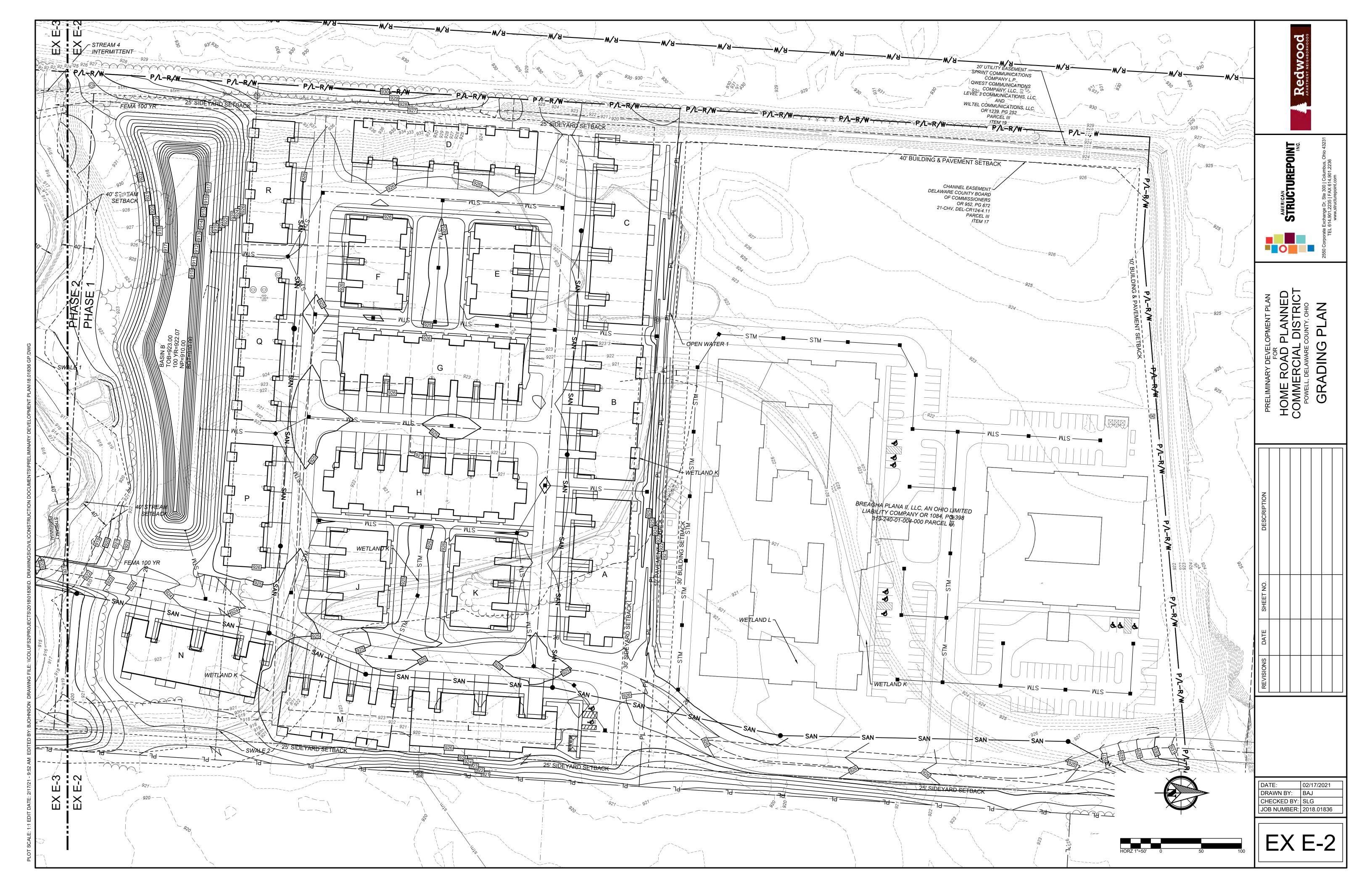


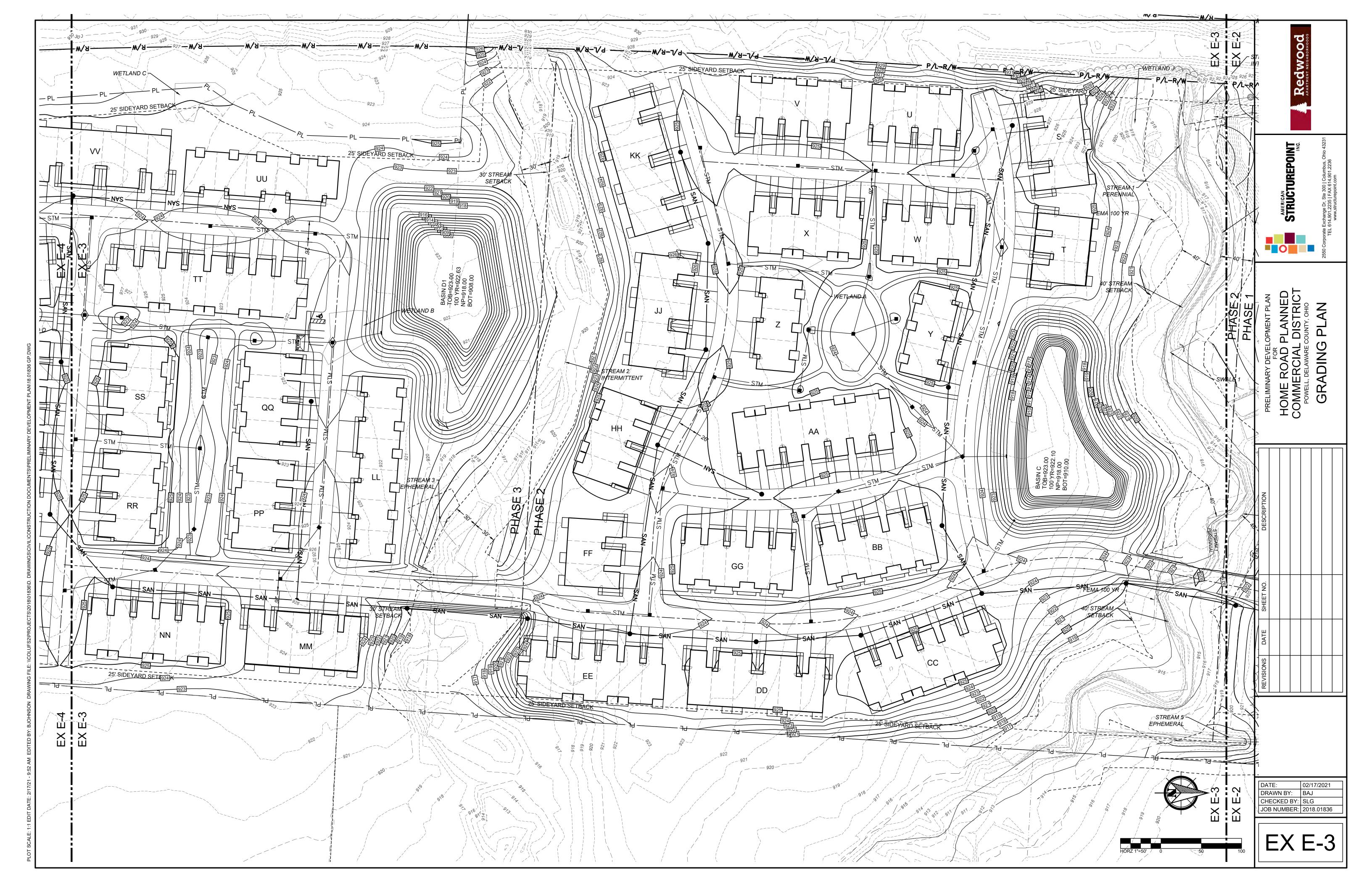
INTERSECTION SIGHT DISTANCE EXHIBIT
FOR
HOME ROAD DEVELOPMENT
POWELL, DELAWARE COUNTY, OHIO
PASSENGER CAR

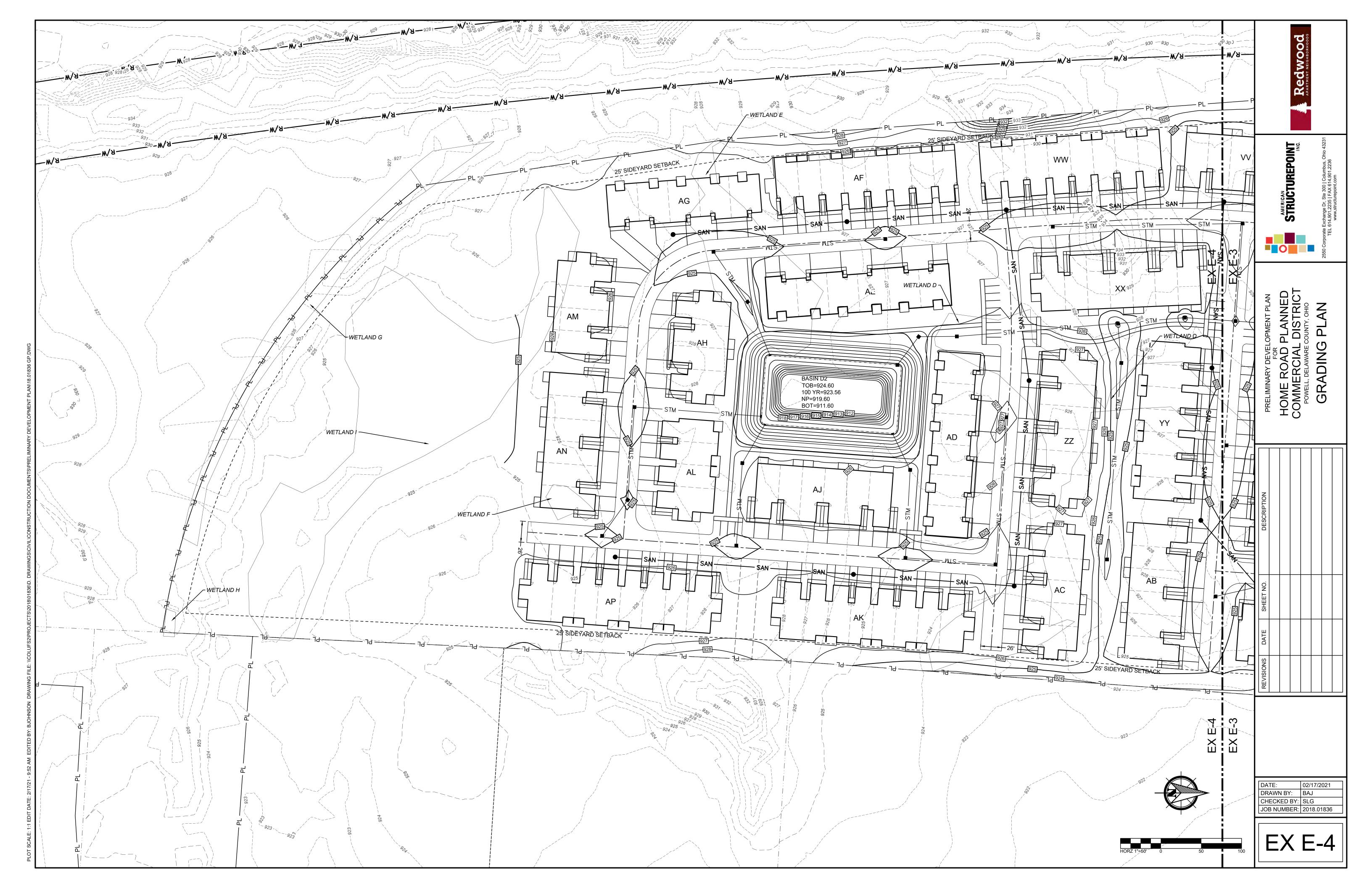
DRAWN BY: EJH
CHECKED BY: SLG
JOB NUMBER: 2018.1836











VICINITY MAP NO SCALE

① I.P.F. Iron Pin & Cap Found

ALTA/NSPS LAND TITLE SURVEY STATE OF OHIO, COUNTY OF DELAWARE, TOWNSHIP OF LIBERTY **QUARTER SECTION 2 TOWNSHIP 3 NORTH, RANGE 19 WEST,** FARM LOTS 1 & 2, UNITED STATES MILITARY LANDS

			•
AC	Air Conditioner	○I.P.F.	Iron Pin Found
©	Concrete Moument Found	●I.P.S.	Iron Pin Set
(Drain	⊚P.F.	Iron Pipe Found
	Drainage Inlet Square	•	Post
Œ	Electric Box	ϕ	Power Pole
Ē	Electric Meter	©	Sanitary Manhole
€	Guy Wire	4	Sign

GENERAL PROPERTY INFORMATION

Owners of Record: Breagha Plana II, LLC

Current Tax PIDs: 31924001004000, 31924001005000, 31924001005001, 31924001068004

Current Tax District: City of Powell

Current Deed Reference: Official Record volume 1084, Page 398

Current Site Address: 3041 Home Road, Powell, OH 43065

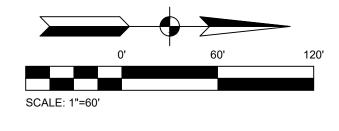
To: Redwood USA LLC; Lender TBD; First American Title Insurance Company; America Land Title Affiliates, LLC; and Bank - TBD; and all of their respective successors and/or assigns as they may appear:

This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2016 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes Items 1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, and 20 of Table A thereof. The field work was completed on March 17, 2019.

Date of Plat or Map: June 7, 2019 This document is not valid unless imprinted with a land surveyor's seal.

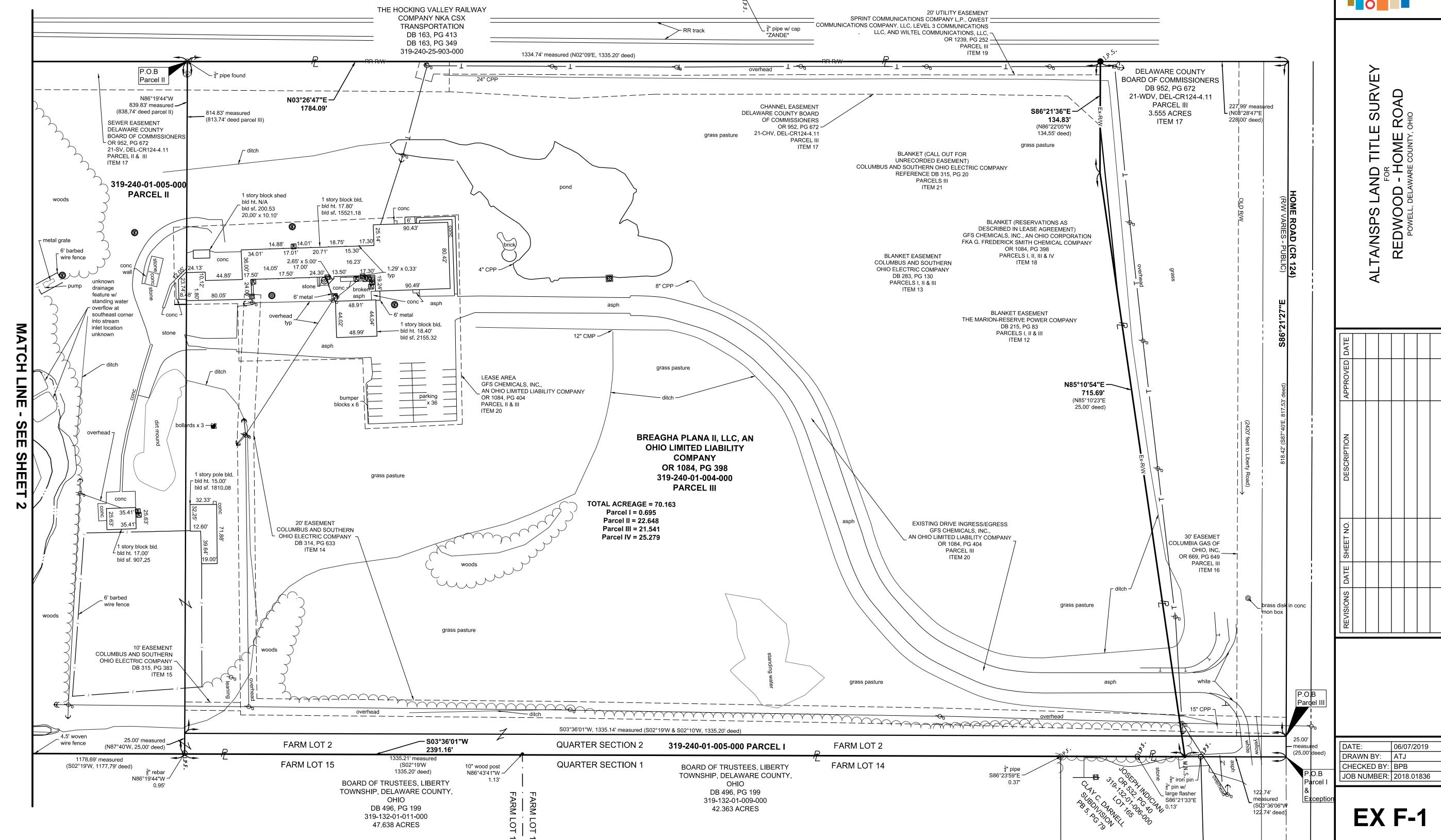
Andrew T. Jordan Professional Land Surveyor 8759 Red

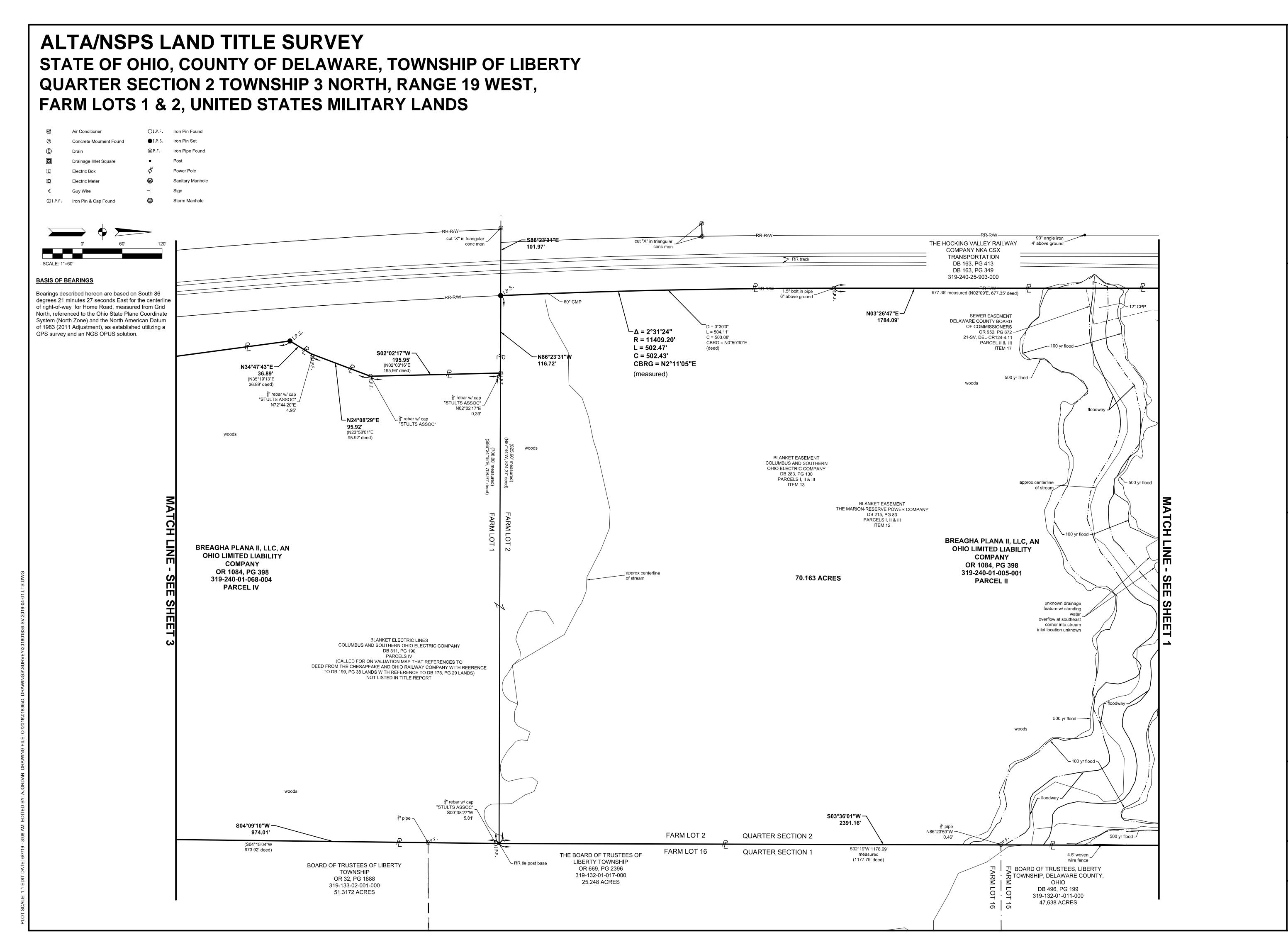




Bearings described hereon are based on South 86 degrees 21 minutes 27 seconds East for the centerline of right-of-way for Home Road, measured from Grid North, referenced to the Ohio State Plane Coordinate System (North Zone) and the North American Datum of 1983 (2011 Adjustment), as established utilizing a GPS survey and an NGS OPUS solution.

To the best of my knowledge and belief there are no gaps or cores between Parcels I, II, III, and IV.







STRUCTUREPOINT
INC.
2550 Corporate Exchange Drive | Suite 300
Columbus, Ohio 43231
TEL 614.901.2235 | FAX 614.901.2236
www.structurepoint.com

TA/NSPS LAND TITLE SURV
FOR
REDWOOD - HOME ROAD
POWELL, DELAWARE COUNTY, OHIO

REVISIONS DATE SHEET NO. DESCRIPTION APPROVED DA

DATE: 06/07/2019
DRAWN BY: ATJ
CHECKED BY: BPB
JOB NUMBER: 2018.01836

EX F-2

ALTA/NSPS LAND TITLE SURVEY STATE OF OHIO, COUNTY OF DELAWARE, TOWNSHIP OF LIBERTY QUARTER SECTION 2 TOWNSHIP 3 NORTH, RANGE 19 WEST, FARM LOTS 1 & 2, UNITED STATES MILITARY LANDS **BASIS OF BEARINGS** Bearings described hereon are based on South 86 degrees 21 minutes 27 seconds East for the centerline of right-of-way for Home Road, measured from Grid North, referenced to the Ohio State Plane Coordinate System (North Zone) and the North American Datum of 1983 (2011 Adjustment), as established utilizing a GPS survey and an NGS OPUS solution. THE HOCKING VALLEY RAILWAY COMPANY NKA CSX COMPANY NRA 000 TRANSPORTATION DB 163, PG 413 DB 163, PG 349 319-240-25-903-000 **782.01'** (N04° 13'20"W 782.01' deed) N08°35'21"W **─ 387.06'** (N08°35'08"W P.O.B Parcel IV $\Delta = 43^{\circ}20'51"_{\neg}$ R = 864.43' edge of water ~ L = 653.99' BLANKET ELECTRIC LINES __Δ = 43°20'15" C = 638.50'R = 864.43' L = 638.84' COLUMBUS AND SOUTHERN OHIO ELECTRIC COMPANY DB 311, PG 190 CBRG = N60°01'00"W C = 638.36' PARCELS IV (CALLED FOR ON VALUATION MAP THAT REFERENCES TO CBRG = N60°00'16"W DEED FROM THE CHESAPEAKE AND OHIO RAILWAY COMPANY WITH REERENCE TO DB 199, PG 38 LANDS WITH REFERENCE TO DB 175, PG 29 LANDS) NOT LISTED IN TITLE REPORT CITY OF POWELL, A MUNICIPAL CORPORATION OR 640, PG 2472 38.135 ACRES 319-240-01-068-002 /-- \$02°37'24"W 780.10' N87°22'36"W ¬ S04°09'10"W ─\ 974.01' RR Tie post RR Tie post FARM LOT 1 QUARTER SECTION 2 - N80°25'52"E FARM LOT 1 (S02°31'40"W, 780.39' deed) (S04°15'04"W 973.92' deed) 4.89' FARM LOT 18 QUARTER SECTION 1 FARM LOT 17 BOARD OF EDUCATION OF THE BOARD OF EDUCATION OF THE 5/8 rebar w/ cap _∫ OLENTANGY LOCAL SCHOOL DISTRICT N87°22'36"W -OLENTANGY LOCAL SCHOOL DISTRICT BOARD OF TRUSTEES OF LIBERTY "PATRIDGE" OR 667, PG 278 319-133-02-003-000 OR 667, PG 663 TOWNSHIP 319-133-02-002-000 OR 32, PG 1888 319-133-02-001-000 51.3172 ACRES





ALTA/NSPS LAND TITLE SURVIFOR FOR ROAD POWELL, DELAWARE COUNTY, OHIO

DA-				
APPROVED DAT				
DESCRIPTION				
REVISIONS DATE SHEET NO.				
DATE				
REVISIONS				

 DATE:
 06/07/2019

 DRAWN BY:
 ATJ

 CHECKED BY:
 BPB

 JOB NUMBER:
 2018.01836

EX F-3

SURVEYOR'S NOTES

- 1. This plat of an **ALTA/NSPS LAND TITLE SURVEY** is based upon the First American Title Insurance Company commitment for title insurance having Commitment No. 451-010069 and the effective date of May 17, 2019 at 8:00 am issued by America Land Title Affiliates, LLC
- 2. No comment is made regarding the following Exceptions in Schedule BII of the commitment for title insurance: 1 11, 22 26.
- 3. The following notes are keyed the Exceptions in Schedule B Section II of the above reference commitment for title insurance and pertain only to the location of the item in relation to the subject premises. The undersigned makes no assumptions or assertions as to what rights exist or do not exist as described in the below documents.

Item 12: Easement granted to The Marion-Reserve Power Company, recorded May 31, 1946, in Volume 215, Page 83. (as to Parcels I, II, III, and IV).

Surveyor's Notes: Easement affects subject property and is blanket in nature, affects parcels I, II & III covering the lands within Farm Lot 2, see plat.

Item 13: Easement for Pole Line Along granted to Columbus and Southern Ohio Electric Company, recorded June 23, 1959, in Volume 283, Page 130. (as to Parcels I, II, III, and IV).

Surveyor's Notes: Fasement affects subject property and is blanket in nature, affects parcels I, II & III.

Surveyor's Notes: Easement affects subject property and is blanket in nature, affects parcels I, II & III, exact location is unclear, nothing to plat.

Item 14: Right of Way and Easement granted to Columbus and Southern Ohio Electric Company, recorded November 13, 1964, in Volume 314, Page 633. (as to Parcel III).

Surveyor's Notes: Easement affects parcel III of subject property, 20' easement, see plat.

Item 15: Easement granted to Columbus and Southern Ohio Electric Company, recorded December 15,

1964, in Deed Volume 315, Page 383. (as to Parcels I, II, III, and IV).

Surveyor's Notes: Easement affects parcel III of subject property, 10' easement, see plat.

Item 17: Easement and Reservation recorded February 11, 2010, in Official Record Book 952, Page 672. (as to Parcels I, II, and III)

Surveyor's Notes: Affects subject parcel, 21-WDV was a warranty deed take by eminent domain, 21-CHV affects parcel III of subject property, see plat, 21-SV affects parcels II & III of subject property, see plat, 21-TV has expired and is no longer affecting subject property.

Item 18: Deed Recital recorded November 30, 2011, in Book 1084, Page 398. (as to Parcels I, II, III, and IV). **Surveyor's Notes:** Affects all buildings on parcels II & III with reservation subject to the terms and conditions of a Ground Lease, see plat.

Item 19: Easement Deed by Court Order in Settlement of Landowner Action (Active Railroad Lines) recorded August 06, 2013, in Book 1239, Page 252. (as to Parcels I, II, III, and IV).

Surveyor's Notes: Easement affects parcel III of subject property, 20' easement, see plat.

Item 20: Reservation, Lease and the terms, covenants and conditions thereof between Breagha Plana II, LLC, as Lessor and GFS Chemicals, Inc., as Lessee, disclosed by Memorandum of Lease, recorded November 30, 2011, in Book 1084, Page 404. (as to Parcel II & III).

Surveyor's Notes: Easement affects parcel III of subject property, building lease area and ingress/egress over drive, see plat.

Easement not listed in title report to Columbus and Southern Ohio Electric Company recorded May 19, 1964, in Deed Volume 311, Page 190. (as to Parcel IV). Electric Lines Easement blanket in nature as called out for on railroad valuation map page V-2-H.V./15 for The Hocking Valley RY. CO., for deed of easement from Chesapeake and Ohio Railway Company with reference to the lands in Deed Volume 199, Page 38, with references to the lands in Deed Volume 175, Page 29.

**Surveyor's Notes: Affects parcel IV of subject parcel and is blanket in nature.

- 4. The purpose of this survey was to prepare an ALTA/NSPS Land Title Survey for the site.
- 5. This plat of an **ALTA/NSPS LAND TITLE SURVEY** represents the conditions of the site on: March 17, 2019 (date of latest field activity).
- 6. The accuracy of any flood hazard data shown on this survey is subject to map scale uncertainty and to any other uncertainty in location or elevation on the referenced Flood Insurance Rate Map. Flood Insurance Rate Map having Community-Panel Number 39041C0229K (effective date April 15, 2009) of the National Flood Insurance Program indicates this site to be within zones "AE" (areas determined to be within the regulatory floodway), "AE" (areas determined to be within the 100 year flood plain), "X" (areas within the 500 year flood plain), and "X" (areas determined to be outside 500-year floodplain).

7. Encroachments: There are no known encroachments to show.

8. The subject property is adjacent to the rights-of-way for Home Road (CR-124) (a public street) on the north

9. Discussion of Certain ALTA Table A Items:

- Item 6: No zoning information provided by client.
- Item 9: There are currently 36 delineated parking spaces on the subject property.
- Item 11: The locations of any underground utilities shown on this plat are based upon above ground evidence (including, but not limited to, manholes, inlets, and marks made on the ground by others) or plan information provided by the utility owners and are speculative in nature. There may be underground utilities for which there is no above ground evidence, for which the above ground evidence was not observed (i.e. buried or paved over), or for which no plans were provided.

Observed evidence of Electric and Telecommunications (which may or may not include telephone, cable TV and fiber optic lines), Sanitary Sewer and Storm Drainage exist on or adjacent to the subject property.

Item 16: No observed evidence of building construction or earth moving work currently exists on site.

- Item 17: The undersigned has not been made aware of any proposed changes to the public right-of-way width or location. There is no evidence of recent sidewalk construction.
- Item 18: No wetlands areas were delineated by appropriate authorities. This survey only certifies that the undersigned was not made aware of any wetlands.
- Item 19: The undesigned is not aware of any offsite easements or servitudes.
- 10. American Structurepoint, Inc. makes no warranty, either expressed or implied, as to our staking, findings, recommendations, plans, specifications, or professional advice except that the work was performed pursuant to generally accepted standards of practice and degree of care exercised by members of the same profession on projects of comparable size and complexity. As used in this survey, the word certify (certified, certification, and/or certificate) shall be interpreted as meaning a professional opinion regarding the conditions of those facts and/or findings which are the subject of the certification and does not constitute a warranty or guarantee, either express or implied.
- 11. This Plat of an ALTA/NSPS LAND TITLE SURVEY represents a survey made under my supervision and in compliance with the Minimum Standards for Boundary Surveys as established by Chapter 4733-37 of the Ohio Administrative Code with corners established as shown and is true and correct to the best of my knowledge.

LEGAL DESCRIPTION

Parcel I

Situated in the Township of Liberty, County of Delaware and State of Ohio, and bounded and described as follows:

follows:

Being in Range 19, Township 3, Section 2, part of Lot 2, U.S. Military Lands. Beginning at a p.k. spike at the

Thence S. 2° 19' W. along the section line 1335.20 feet to an iron pipe, passing over an iron pipe at 30.00 feet;

intersection of the centerline of Delaware County Road, No. 124 and the East line of Section 2,

Thence N. 87° 40' W. 25.00 feet to an iron pipe (found);

Thence N. 2° 19' E. 1335.20 feet to a R.R. Spike on the centerline of Delaware County Rd. 124 passing over an iron pipe (found) at 1305.20 feet;

Thence S. 87° 40' E. along the center line of said County Rd. 25.00 feet to the point of beginning, containing 0.766 acres, be the same more or less.

Parcel II

Situated in the Township of Liberty, County of Delaware and State of Ohio, and bounded and described as follows:

Being in Range 19, Township 3, Section 2, part of Lot 2, U.S. Military Lands. Beginning at an iron pipe (found) on the Easterly right-of-way line of the Chesapeake and Ohio Railroad, said iron pipe being S. 2° 09' W. 1335.20 feet from the point of intersection with the centerline of Delaware County Rd. 124 and the Easterly right-of-way line of C&O Railroad;

Thence S. 87° 40' E. 838.74 feet to an iron pipe on the East line of Section 2, passing over an iron pipe at 813.74 feet;

Thence S. 2° 19' W. along the Easterly line of Section 2,1177.79 feet to a post, passing over a stone at 421.64 feet;

Thence N 87° 44' W. 824.37 feet to a steel post on the Easterly right-of-way line of the C&O Railroad;

Thence along the Easterly right-of-way line of said railroad with a 0° 30' curve to the right which the long chord bears N. 0° 50' 30" E. 503.08 feet, an arc distance of 504.11 feet to an iron bolt to the point of tangency;

Thence N. 2° 09' E. 677.35 feet to the point of beginning, containing 22.61 acres, be the same more or less.

Parcel III

Situated in the State of Ohio, County of Delaware and Township of Liberty. Being in Range 19, Township 3, Section 2, and part of Lot 2, U.S. Military Lands:

Beginning at a railroad spike set on the centerline of County Road No. 124, known as the G.I.H. and Columbus Road; said point of beginning bears North 87 degrees, 40' West 25.00 feet from the point of intersection of the centerline of County Road No. 124 and the section line between sections 2 and 1;

Thence South 2 degrees, 10' West parallel with the section line, 1335.20 feet to an iron pipe, passing over an iron pipe at 30.00 feet;

Thence North 87 degrees, 40' West 813.74 feet to an iron pipe set on the right-of-way line of the Chesapeake and Ohio Railroad;

Thence North 2 degrees 09' East along the said East right-of-way line, 1335.20 feet to a railroad spike set on the centerline of County Road No. 124, passing over an iron pipe at 1305.20 feet;

Thence South 87 degrees 40' East along the centerline of County Road No. 124, 817.53 feet to the point of beginning, containing 25.00 acres of land, be the same more or less.

Parcel IV

Situated in the State of Ohio, County of Delaware, City of Powell, located in Farm Lot 1, Section 2, Township 3 North, Range 19 West, United States Military Lands, and being part of a 40.636 acre tract conveyed to M/I Homes of Central Ohio LLC, as recorded in Official Record Volume 428, Page 1362, Delaware County Recorder's Office, and being more particularly described as follows:

Beginning, for reference, at a railroad spike found at the intersection of centerline of Rutherford Road (T.R. 122) with the East line of the CSX Transportation, Inc., marking the Southwest corner of said 40.636 acre tract;

Thence North 10° 53' 41" West 748.16 feet, along the Westerly line of said 40.636 acre tract and East line of the CSX Transportation, Inc., to an iron pin found;

the CSX Transportation, Inc., to an iron pin set marking the PRINCIPAL PLACE OF BEGINNING of the herein described tract;

Thence North 08° 35' 08" West 1154.01 feet along the Westerly line of said 40.636 acre tract and East line of

Thence continuing North 08° 35' 8" West 387.06 feet, along the Westerly line of said 40.636 acre tract and East line of the CSX Transportation, Inc., to an iron pin found;

Thence North 04° 13' 20" West 782.01 feet, along the Westerly line of said 40.636 acre tract and East line of the CSX Transportation, Inc., to an iron pin found;

Thence North 35° 19' 13" East 36.89 feet, along the Westerly line of said 40.636 acre tract and East line of the CSX Transportation, Inc., to an iron pin found;

Thence North 23° 58' 01" East 95.92 feet, along the Westerly line of said 40.636 acre tract and East line of the

CSX Transportation, Inc., to an iron pin found;

Thence North 02° 03' 16" East 195.96 feet, along the Westerly line of said 40.636 acre tract and East line of the

CSX Transportation, Inc., to an iron pin found marking the Northwest corner of said 40.636 acre tract and Southwest corner of a 22.61 acre tract (Parcel II) conveyed to G. Frederick Smith Chemical Company, as recorded in Deed Book 420, Page 32;

Thence South 86° 24' 15" East 708.91 feet, along the North line of said 40.636 acre tract and South line of said

22.61 acre tract, to an iron pin found in the East line of Farm Lot 1 and West line of a 25.248 acre tract (Parcel III) conveyed to G. Frederick Smith Chemical Company, recorded in Deed Book 420, Page 32, marking the

Northeast corner of said 40.636 acre tract and Southeast corner of 22.61 acre tract;

Thence South 04° 15' 04" West 973.92 feet, along the East line of said 40.636 acre tract and Farm Lot 1 and West line of said 25.248 acre tract and a 51.3172 acre tract conveyed to Board of Trustees Liberty Township, as recorded in Official Record 32, Page 1888, to an iron pin found marking the Southwest corner of said 51.3172 acre tract and the Northwest corner of a 21.070 acre tract conveyed to Board of Education of the

Thence South 02° 31' 40" West 780.39 feet, along the East line of said 40.636 acre tract and Farm Lot 1 and West lines of said 21.070 acre tract and a 28.094 acre tract conveyed to Board of Education of the Olentangy Local School District, as recorded in Deed Book 667, Page 278, to an iron pin set (passing an iron pin found at 668.33 feet):

Thence along the arc of a curve 638.84 feet turning to the right (delta angle = 43° 20' 15", radius = 864.43 feet), with a chord bearing and distance of North 60° 00' 16" West 638.36 feet, across said 40.636 acre tract, to the principal place of beginning, containing an area of 25.248 acres.

LESS AND EXCEPTING FROM PARCELS I AND III ABOVE:

Olentangy Local School District, as recorded in Deed Book 667, Page 663;

Situated in the State of Ohio, County of Delaware, Township of Liberty, being a part of Farm Lot 2 in Section 2, Township 3 North, Range 19 West, United States Military Lands and being a part of record 13.820 acre and 25.00 acre parcels conveyed to G. Frederick Smith Chemical Company as recorded in Book 420, Page 32 in the records of Delaware County, being a parcel of land lying on the right and left sides of the centerline of Right of Way and Construction of DEL-CR124-4.11 (Home Road) and bounded and described as follows:

Beginning at the intersection of the centerline of County Road 124 (home Road) and the East line of said Farm Lot 2, said point located 22.83 feet left of station 240+13.09 of a proposed County Road 124 and being the TRUE POINT OF BEGINNING for the parcel herein described;

1) Thence South 03 degrees 36 minutes 05 seconds West along the East line of said Farm Lot 2 a distance of 122.74 feet to an iron pin set, located 99.18 feet right of station 239+99.55 of proposed County Road 124;

2) Thence South 85 degrees 10 minutes 23 seconds West a distance of 715.67 feet to an iron pin set, located 150.00 feet right of station 233+00.00 of proposed County Road 124;

3) Thence North 86 degrees 22 minutes 05 seconds West a distance of 134.55 feet to an iron pin set, located 150.00 feet right of station 233+00.00 of proposed County Road 124;

4) Thence North 03 degrees 28 minutes 47 seconds East along the East line of the CSX Railroad, a distance of 228.00 feet to the centerline of existing County Road 124, said point located 77.99 feet left of station 231+64.84 of proposed County Road 124;

5) Thence South 86 degrees 21 minutes 56 seconds East along the centerline of existing County Road 124 a distance of 832.39 feet to a point located 23.93 feet left of station 240+02.63 of proposed County Road 124;

6) Thence South 86 degrees 38 minutes 27 seconds East along the centerline of existing County Road 124 a distance of 10.58 feet to the point of beginning and enclosing an area of 3.555 acres, more or less.

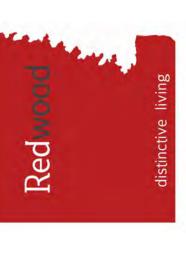
Of the above described tract, 3.484 acres is located in Auditor's Permanent Parcel Number 319-240-01004-000 which includes 0.563 acres in the present road occupied and 0.071 acres is located in Auditor's Permanent Parcel Number 319-240-01-005-000 which includes 0.017 acres in the present road occupied.

Monuments referred to as iron pins set are 3/4 inch diameter x 30 inch long iron bars with a 1-1/2 inch diameter aluminum cap marked "R/W LS #7819".

Bearings used in this description are based on the Ohio Lambert Projection North Zone Plane Coordinate System as established by the National Geodetic Survey, North American Datum of 1983 (1995 adjustment) from GPS observations made by American Consulting, Inc.

Stations referred to herein are from the centerline of survey of proposed County Road 124 as found on Delaware County Engineer's Office Right of Way Plan DEL-CR124-4.11.

The description was prepared and reviewed on July 17, 2006 by Charles P. Unterreiner, P.S. 7819 from a survey made by American Consulting, Inc. in 2003.



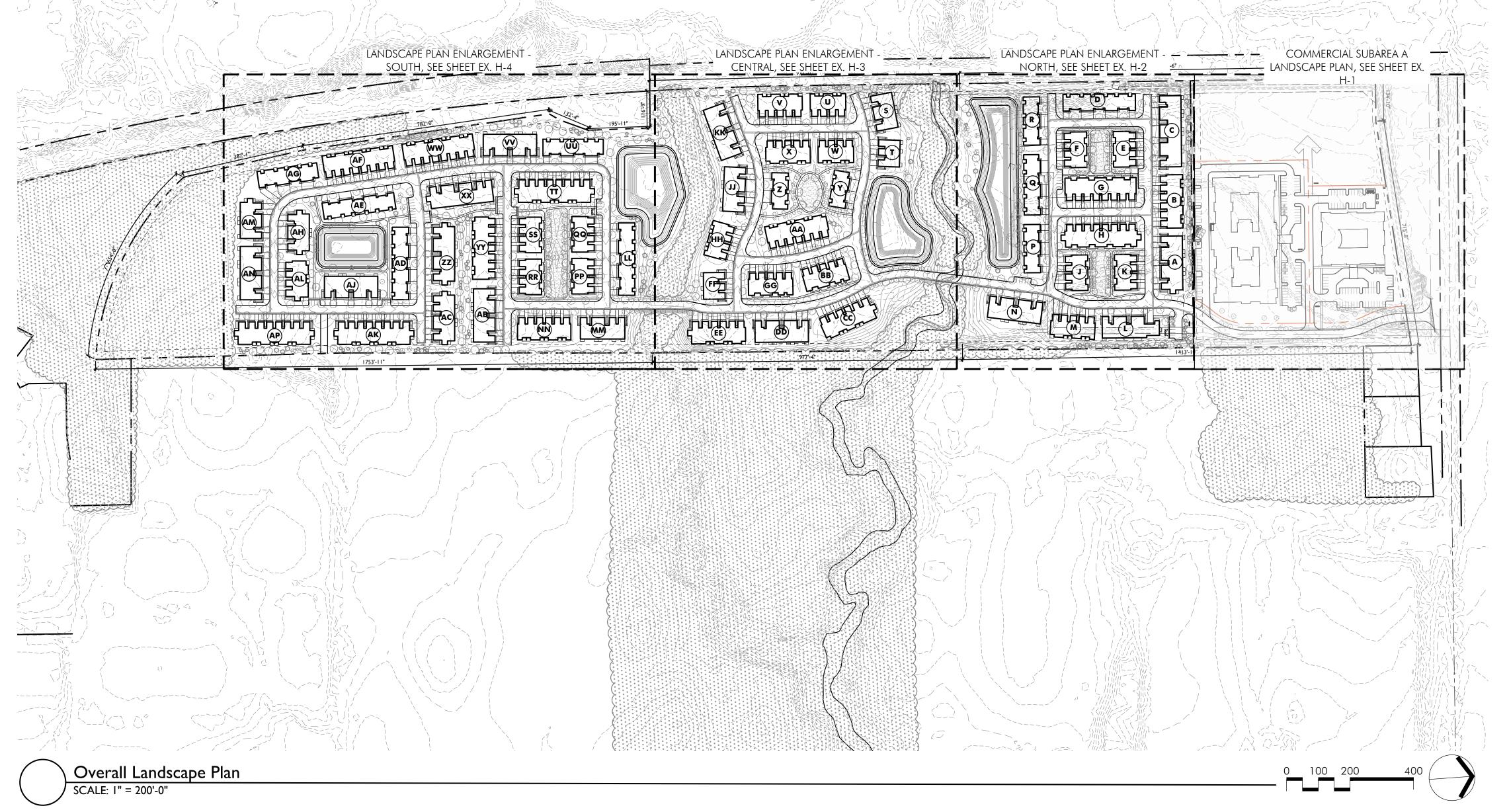
STRUCTUREPOINT
STRUCTUREPOINT
INC.
Columbus, Ohio 43231
TEL 614.901.2235 | FAX 614.901.2236

ALTA/NSPS LAND TITLE SURVE
FOR
REDWOOD - HOME ROAD
POWELL, DELAWARE COUNTY, OHIO

DATE	APPROVED DATE	DESCRIPTION	REVISIONS DATE SHEET NO.	DATE	REVISIONS

DATE: 06/07/2019
DRAWN BY: ATJ
CHECKED BY: BPB
JOB NUMBER: 2018.01836

FX F-4



CONCE	PTUAL PLANT PALETTE				
SYMBOL BOTANICAL NAME COMMON NAME					
DECIDUOU	S TREES				
AM GR	Amelanchier x grandiflora 'Autumn Brilliance"	Autumn Brilliance Serviceberry			
AC FR	Acer x. freemanii 'Autumn Blaze'	Autumn Blaze Maple			
GL TR	Gleditsia triacanthos f. i. 'Skyline'	Skyline Honeylocust			
LI TU	Liriodendron tulipifera	Tulip Tree			
MA VI	Magnolia virginiana	Sweetbay Magnolia			
QU CO	Quercus coccinea	Scarlet Oak			
QU MU	Quercus muehlenbergii	Chinkapin Oak			
UL PA	Ulmus x 'Patriot'	Patriot Elm			
EVERGREEN TREES					
PI AB	Picea abies	Norway Spruce			
PI GL	Picea glauca	White Spruce			
PI OM	Picea omorika	Serbian Spruce			
SHRUBS, ORNAMENTAL GRASSES					
CH CO	Chamaecyparis p. compacta variegata	Dwarf Variegated False Cypress			
HY PA	Hydrangea paniculata 'Limelight'	Limelight Hydrangea			
PE HA	Pennisetum a. 'Hameln'	Dwarf Fountain Grass			
PE LB	Pennisetum a. 'Little Bunny'	Little Bunny Fountain Grass			
**	Plant palette meant for conceptual use only, no	t limited to list above.			

PLANTING LEGEND

EXISTING TREES TO remain

ZONING REQUIREMENTS - RESIDENTIAL AREA

1145.30(A)(1) MINIMUM REQUIRED TREES - ALL RESIDENCES AND RESIDENTIAL LAND USES, PER DWELLING UNIT: 1/2" IN TRUNK DIAMETER FOR EVERY 150 SQUARE FEET OR FRACTION THEREOF OF BUILDING GROUND COVERAGE, WITH A MINIMUM OF 11/2" OF TOTAL TRUNK DIAMETER:

REDWOOD UNITS: 1700 - 1800 SF EACH = 6" OF TREE CAL. PER UNIT REQUIRED PROPOSED UNITS: 331 = (6X331)/2 = 993

REQUIRED: (933) 2" CAL. TREES

PROPOSED: 861 TREES (MIX OF DECIDUOUS AND EVERGREEN, MIN 2" CAL. AND 6' HT) IN ADDITION TO ± 13 AC PRESERVED WOODLANDS + WETLANDS

ZONING REQUIREMENTS - COMMERCIAL AREA

1145.30(A)(3) MINIMUM REQUIRED TREES - ALL OFFICE USES, INSTITUTIONAL USES, CONVALESCENT AND NURSING HOMES AND CHILD DAY-CARE FACILITIES, INCLUDING RELATED PARKING, LOADING AND TRASH STORAGE AREAS OVER 19,501 SQUARE FEET: A TOTAL TRUNK DIAMETER BEGINNING AT 28", PLUS 1" OF TRUNK DIAMETER FOR EVERY 2,000 SQUARE FEET OVER 19,500 SQUARE FEET OR FRACTION

LOT #1 & LOT #2 BUILDINGS: TOTAL 97,200 SF (97,200 SF - 19,500)/2000 = (39 + 28)/2 = 34

REQUIRED: (34) 2" CAL. TREES PROPOSED: 70 TREES (MIX OF DECIDUOUS AND EVERGREEN, MIN 2" CAL. AND 6' HT)

1145.31 - REQUIRED LANDSCAPING OF PARKING AREAS - PARKING AREAS WITH MORE THAN TEN PARKING SPACES REQUIRE NO LESS THAN ONE DECIDUOUS TREE OF ONE AND ONE-HALF INCH TRUNK DIAMETER OR MORE, MEASURED 24 INCHES FROM THE GROUND, FOR EVERY EIGHT PARKING SPACES. NO MORE THAN EIGHT PARKING SPACES SHALL BE PROVIDED SIDE-BY-SIDE IN ANY AISLE WITHOUT INTERJECTION OF SUCH A "PLANTING BAY".

LOT #1: 69 PARKING SPACES: REQUIRED (69/8): 9 TREES 20 TREES PROPOSED:

LOT #2: 85 PARKING SPACES: REQUIRED (85/8): 11 TREES 22 TREES PROPOSED:

1145.32 - REQUIRED LANDSCAPING AROUND BUILDING FOUNDATIONS

ALL NONRESIDENTIAL BUILDINGS IN RESIDENTIAL ZONING DISTRICTS SHALL BE PLANTED: AT A MINIMUM, AT LEAST 70 PERCENT OF THE LINEAL FOOTAGE AROUND THE PERIMETER OF A STRUCTURE SHALL BE LANDSCAPED IN THIS MANNER. A MINIMUM OF FIVE SHRUBS SHALL BE PLANTED IN EVERY 40 FEET OF LINEAL BUILDING PERIMETER. A MINIMUM OF TEN PERENNIAL OR ANNUAL PLANTS AND/OR FLOWERS SHALL BE PLANTED IN EVERY 40 FEET OF LINEAL BUILDING PERIMETER.

LOT #1: 770 LF REQUIRED: $770 \, \text{LF} / 40 = 19x5 = 96 \, \text{SHRUBS}$

GRASSES

770 LF / 40 = 19x10 = 190 PLANTSPROPOSED: ±3,130 SF MIXTURE OF SHRUBS, PERENNIALS, AND ORNAMENTAL

LOT #1: 1440 LF

REQUIRED: 1440 / 40 = 36x5 = 180 SHRUBS

1440 / 40 = 36x10 = 360 PLANTSPROPOSED: $\pm 4,660$ SF MIXTURE OF SHRUBS, PERENNIALS, AND ORNAMENTAL GRASSES

NOTE: THE PLAN AS SHOWN IS CONCEPTUAL IN NATURE

AND IS PROVIDED TO ILLUSTRATE DESIRED LAYOUT AND

LANDSCAPING ARE SUBJECT TO CHANGE BASED UPON

QUALITY OF THE PROJECT. FINAL LAYOUT AND

FINAL ZONING APPROVAL AND ENGINEERING.

100 Northwoods Blvd, Ste A Columbus, Ohio 43235 p 614.255.3399

Cincinnati

20 Village Square Floor 3 Cincinnati, Ohio 45246 p 614.360.3066

PODdesign.net

Project Name

Home Road Planned Commercial District

Home Road

Powell, Ohio 43065

Prepared For



7007 Pleasant Valley Rd. Independence, OH 44131

Project Info

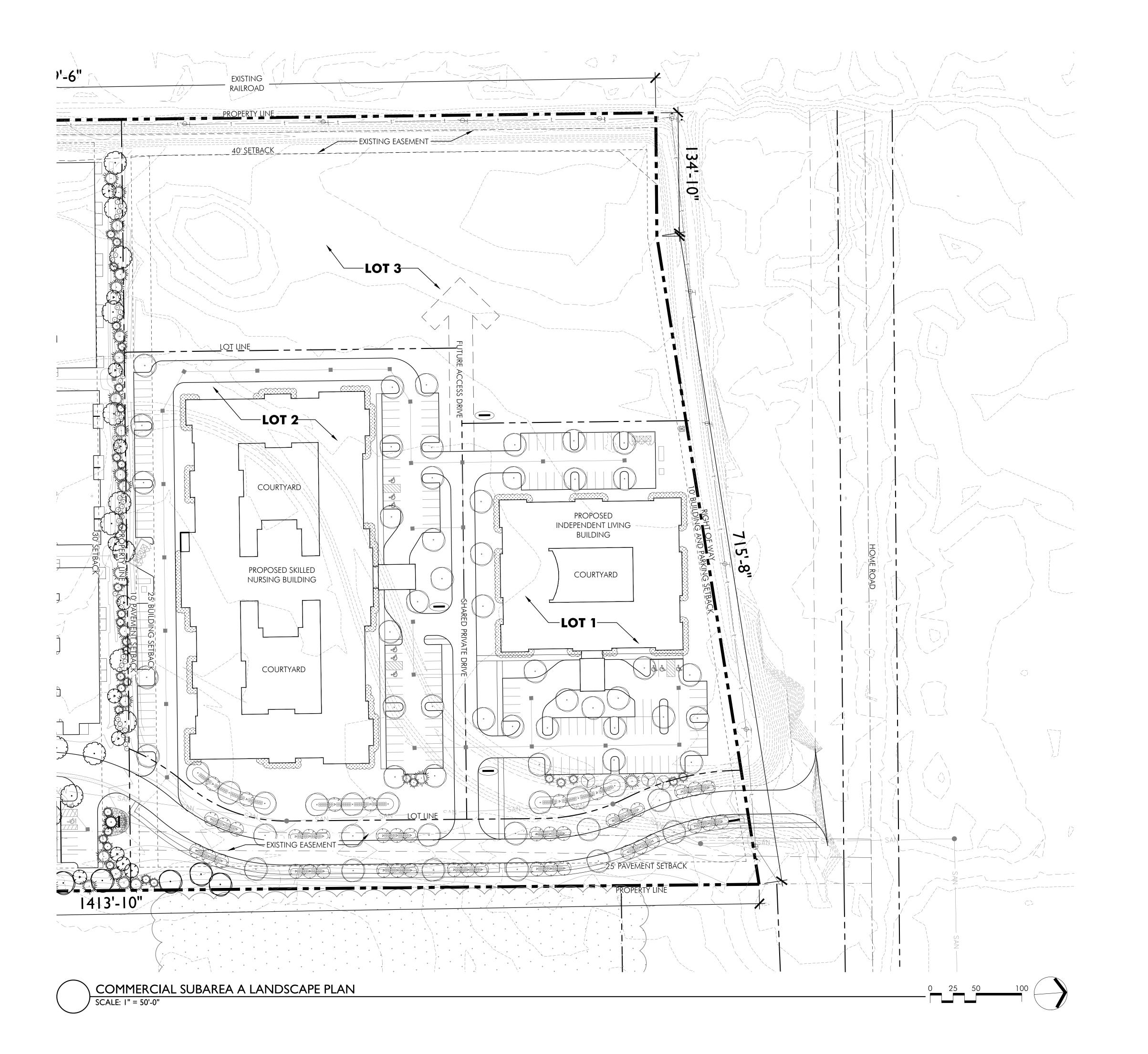
18067 Project # 02/19/21 ZM, SO, TF Scale As Noted

Revisions

Sheet Title OVERALL LANDSCAPE PLAN

Sheet #

EX. G



PLANTING LEGEND





PROPOSED ORNAMENTAL TREE



PROPOSED EVERGREEN TREE



PROPOSED FOUNDATION PLANTING (SHRUBS AND PERENNIALS)

EXISTING TREES TO REMAIN



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Project Name

Home Road Planned Commercial **District**

Home Road Powell, Ohio 43065

Prepared For



Redwood Living 7007 Pleasant Valley Rd. Independence, OH 44131

Project Info

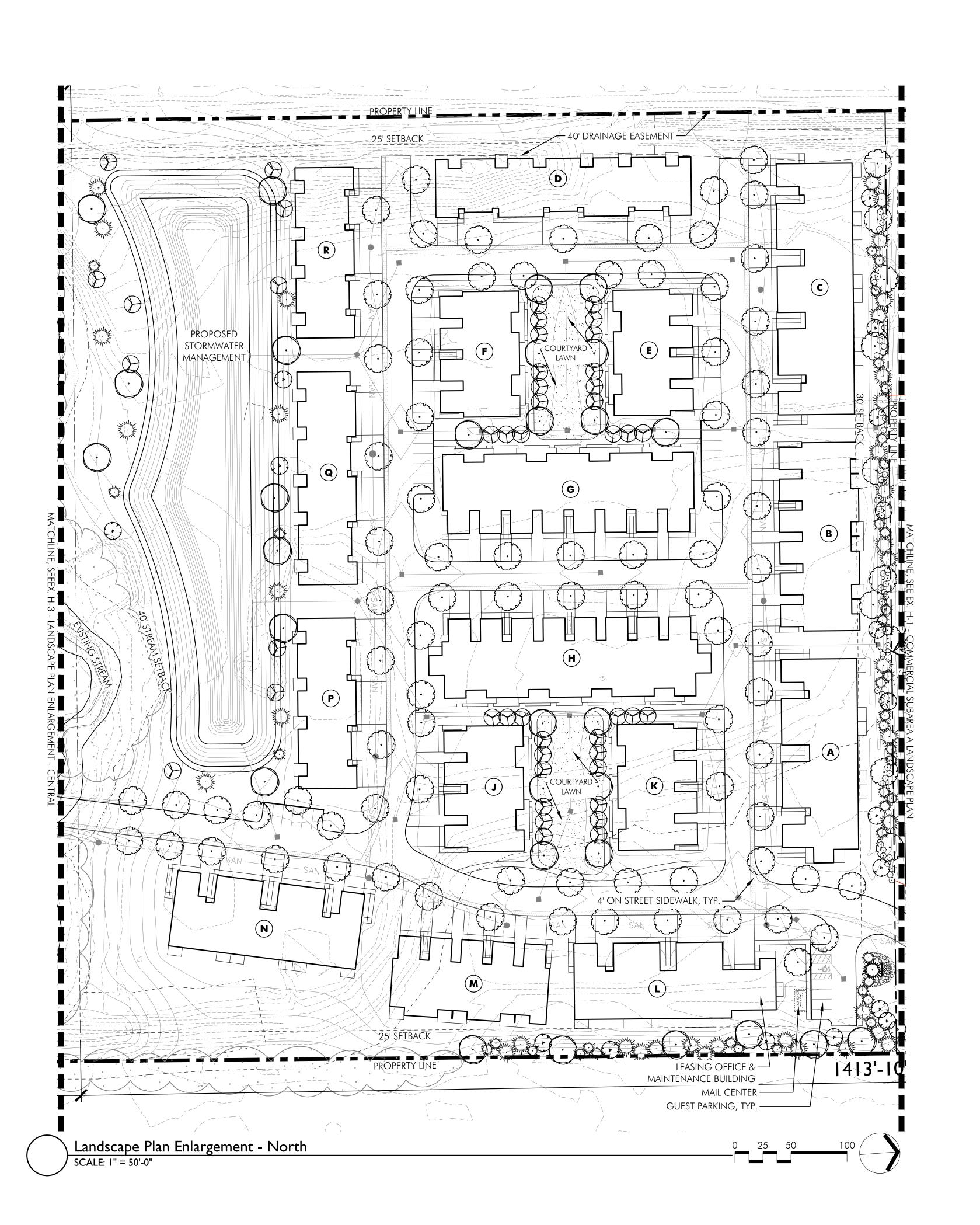
02/19/21 ZM, SO, TF As Noted

Revisions

PLAN

Sheet Title COMMERCIAL **SUBAREA A LANDSCAPE**

Sheet #



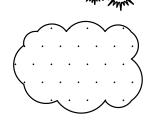
PLANTING LEGEND



PROPOSED ORNAMENTAL TREE



PROPOSED EVERGREEN TREE





Acer rubrum Red Maple



Acer rubrum Red Maple



Acer saccharum Sugar Maple





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Cincinnati

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Project Name

Planned

District

Home Road

Home Road

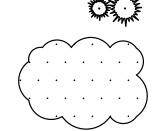
Commercial

Powell, Ohio 43065

100 Northwoods Blvd, Ste A

Columbus, Ohio 43235

Cincinnati, Ohio 45246



EXISTING TREES TO REMAIN

MAPLE GLEN NEIGHBORHOOD

*Not exclusive to these specific Maple species, for design intent only.



Prepared For



Project Info

02/19/21 ZM, SO, TF As Noted

Revisions

Sheet Title LANDSCAPE PLAN ENLARGEMENT - NORTH

Sheet #





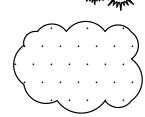




PROPOSED ORNAMENTAL TREE



PROPOSED EVERGREEN TREE



OAK GROVE NEIGHBORHOOD

*Not exclusive to these specific Oak species, for design intent only.



Red Oak



Quercus rubrum Red Oak



White Oak

PROPOSED DECIDUOUS TREE





EXISTING TREES TO REMAIN

Project Name

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Floor 3

100 Northwoods Blvd, Ste A

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Cincinnati, Ohio 45246

Home Road Planned Commercial **District**

Home Road Powell, Ohio 43065

Prepared For



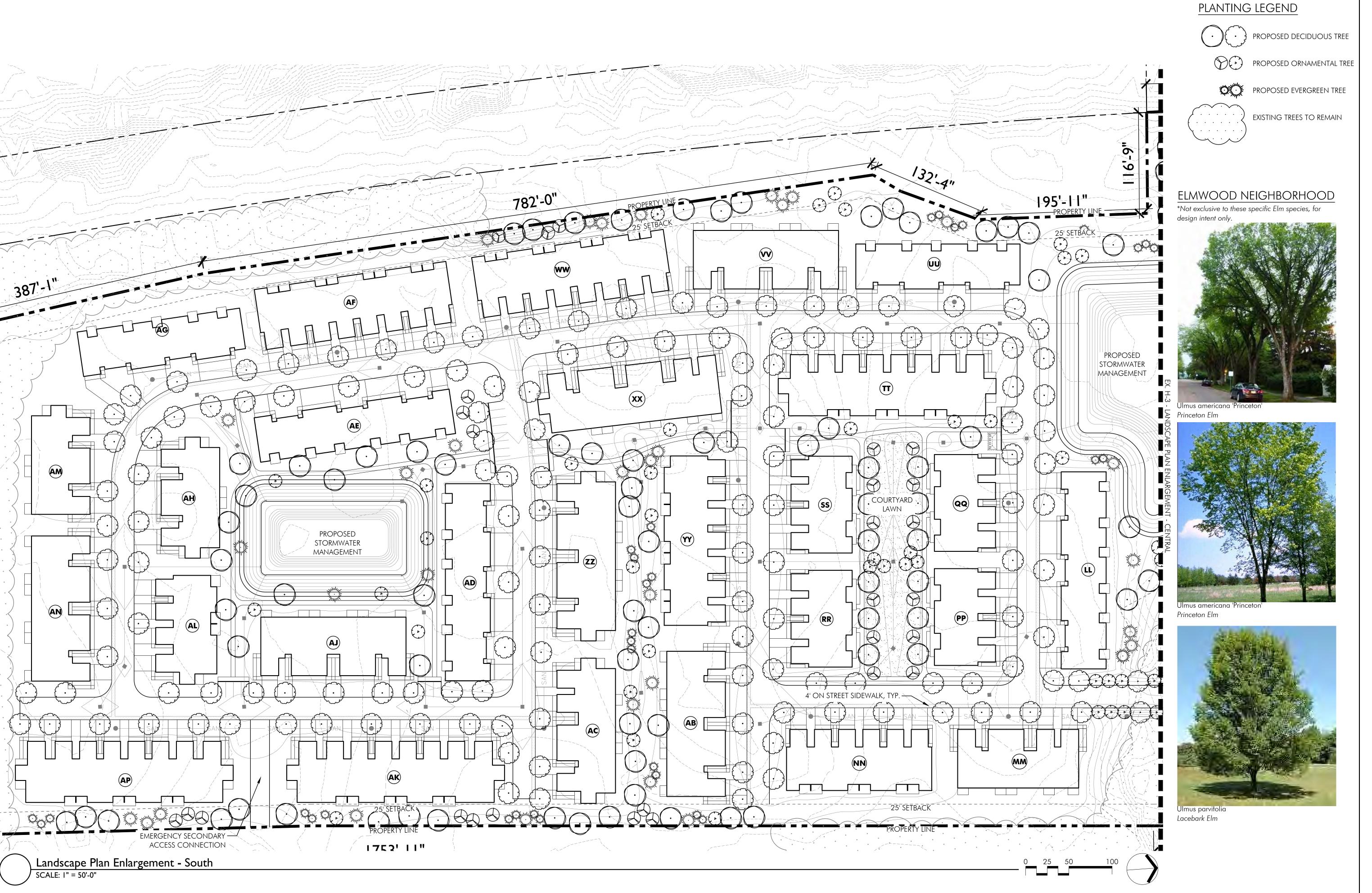
Independence, OH 44131

Project Info 02/19/21 ZM, SO, TF As Noted

Revisions

Sheet Title LANDSCAPE **PLAN ENLARGEMENT** - CENTRAL

Sheet





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Project Name

Home Road Planned Commercial District

Home Road Powell, Ohio 43065

Prepared For



Redwood Living 7007 Pleasant Valley Rd. Independence, OH 44131

Durata at Ind

Project Info

Project # 18067

Date 02/19/21

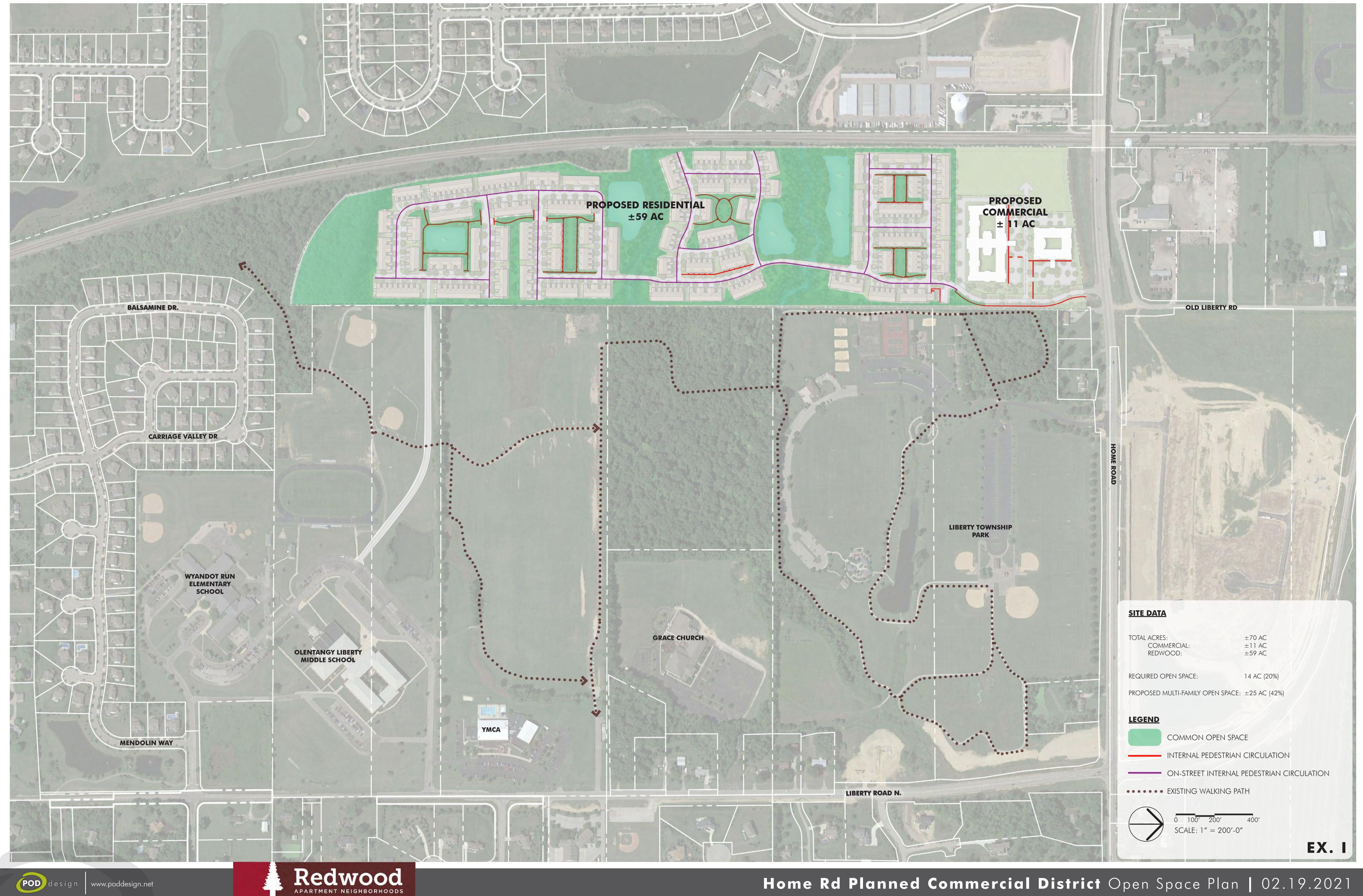
By ZM, SO, TF

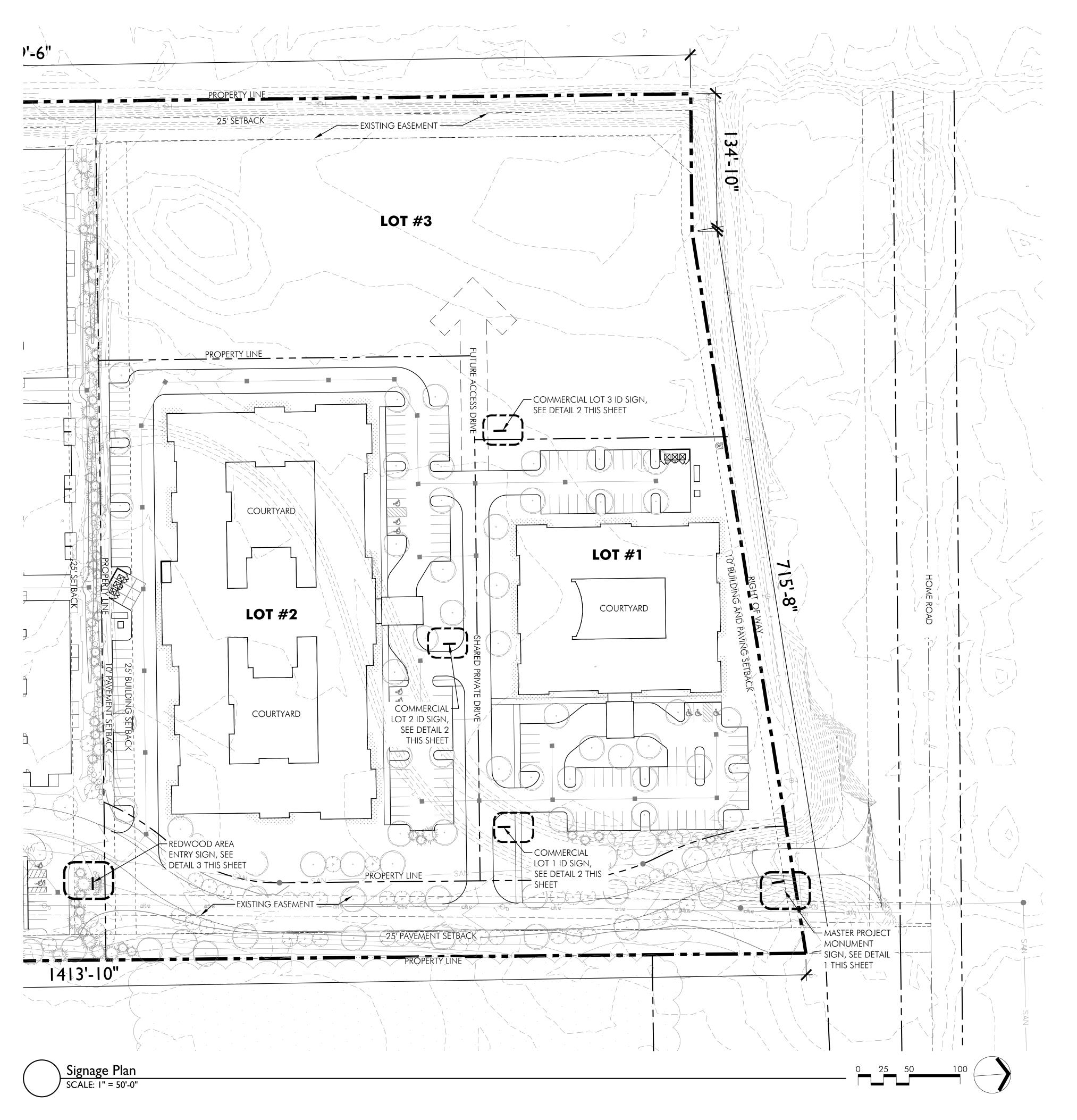
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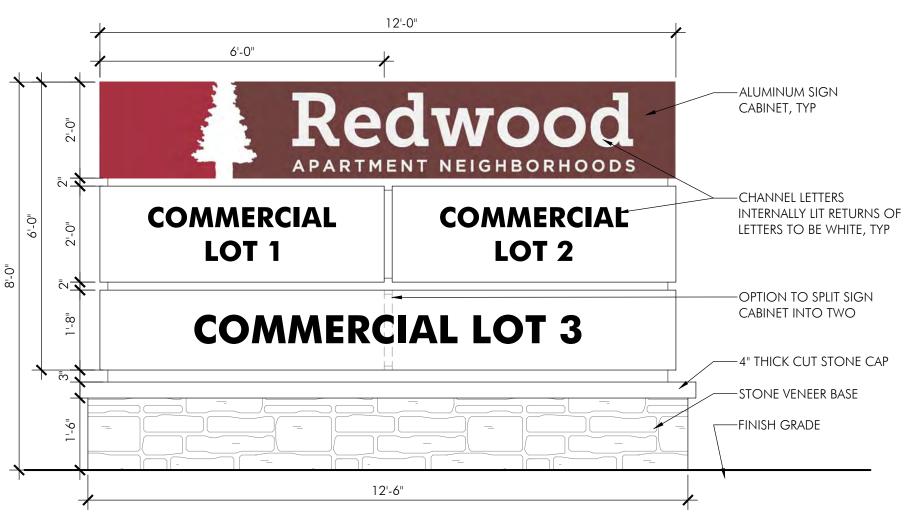
Revisions

LANDSCAPE
PLAN
ENLARGEMENT
- SOUTH

Sheet #





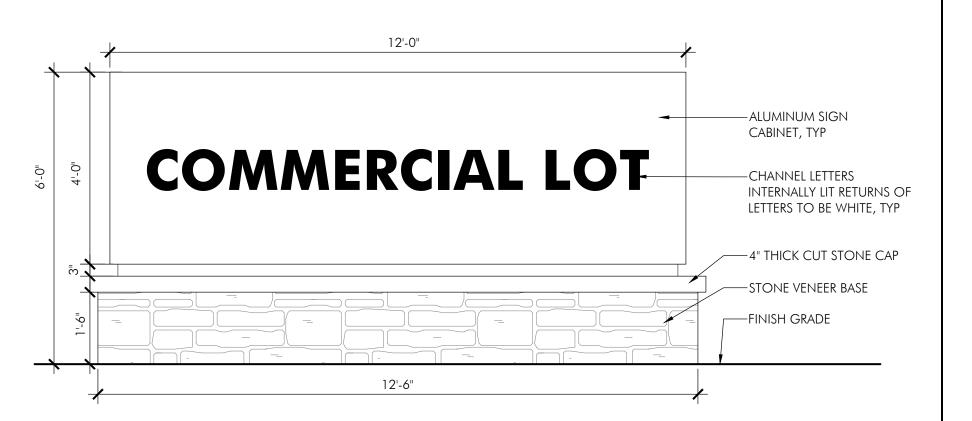


TES:

TOTAL SIGN FACE AREA NOT TO EXCEED 72 SQUARE FEET, OR 10'

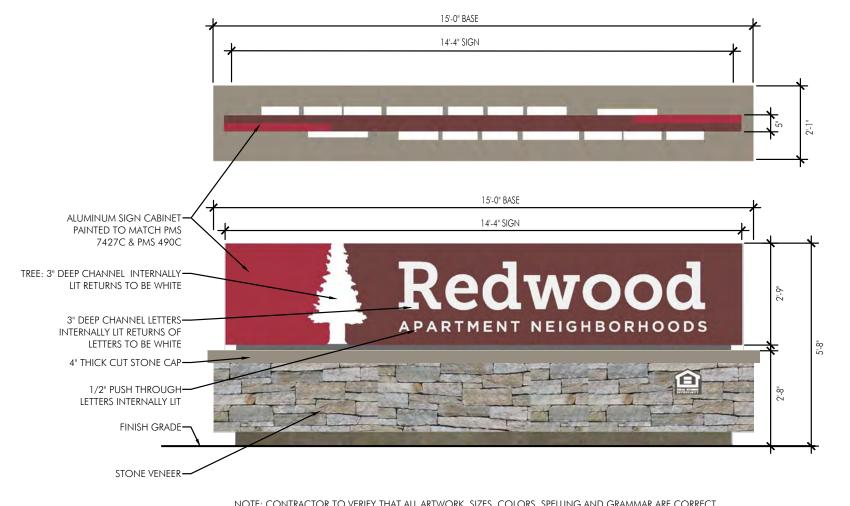
Master Project Monument Sign

1/2"=1'-0"



1. TOTAL SIGN FACE AREA NOT TO EXCEED 48 SQUARE FEET, OR 8' HEIGHT
2. SIGN BASE NOT TO EXCEED 2' HEIGHT AND SHALL BE COMPRISED OF BRICK, STONE, STUCCO OR OTHER PERMANENT MATERIAL

Commerical Lot Monument Sign



NOTE: CONTRACTOR TO VERIFY THAT ALL ARTWORK, SIZES, COLORS, SPELLING AND GRAMMAR ARE CORRECT.
ONCE APPROVED BY OWNER, THE ARTWORK IS FINAL AND WILL BE PRINTED AS PICTURED. THE DESIGN SHOWN IS THE
PROPERTY OF A SIGN ABOVE, INC. NO TRANSMITTAL OR DISCLOSURE SHALL BE MADE TO ANY PERSON, FIRM, OR

Monument Entry Sign (40SF)

POD desig

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Cincinnati

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Project Name

Home Road Planned Commercial District

Home Road

Powell, Ohio 43065

Prepared For



Independence, OH 44131

Project Info

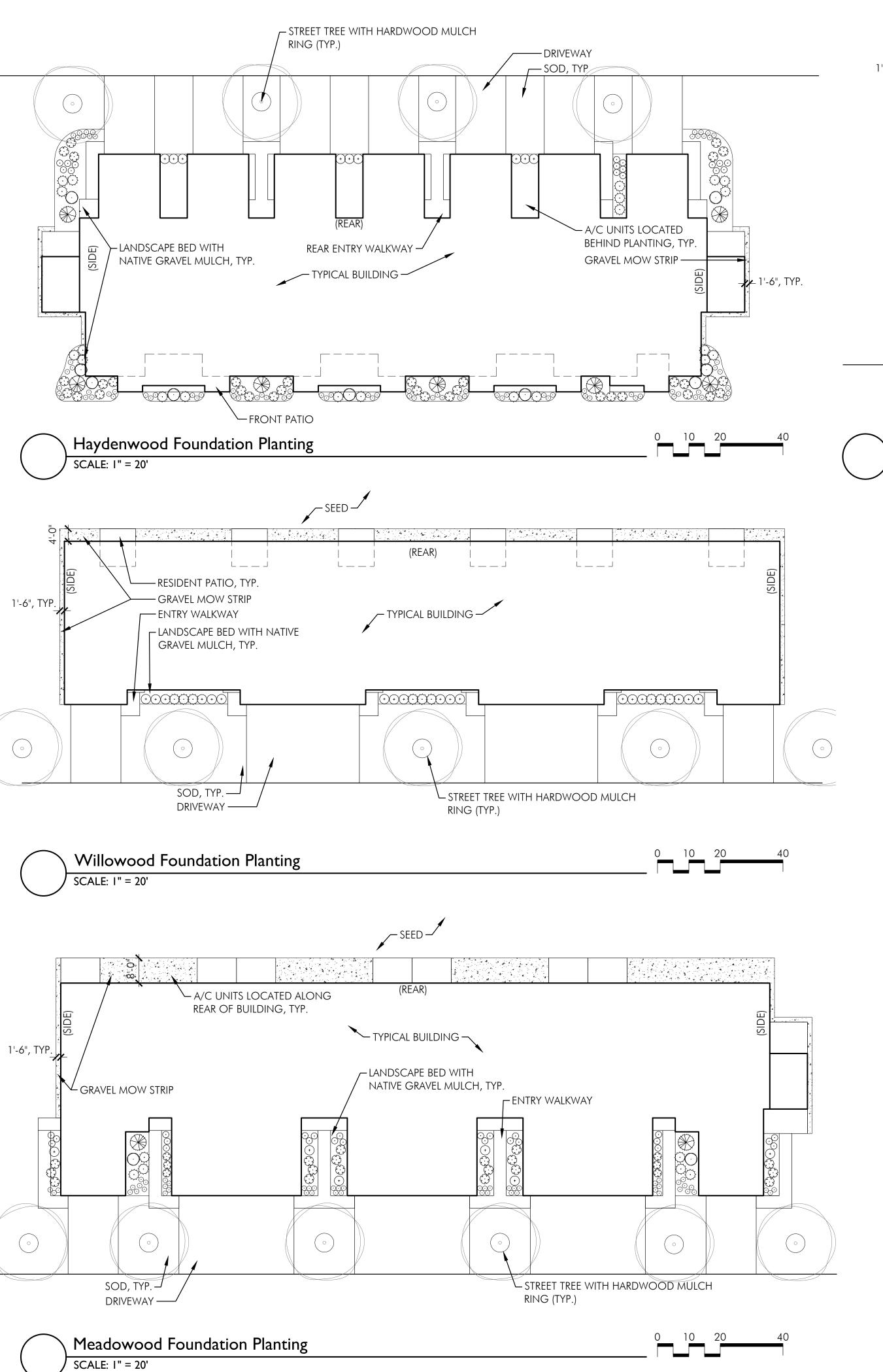
Project # 18067
Date 02/19/21
By ZM, SO, TF
Scale As Noted

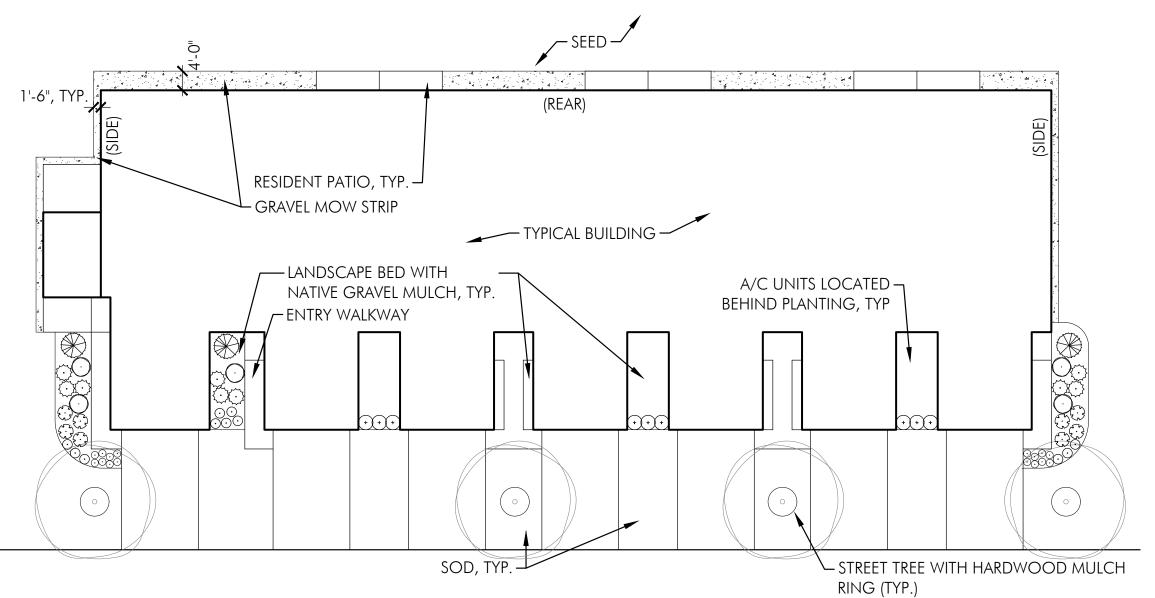
Revisions

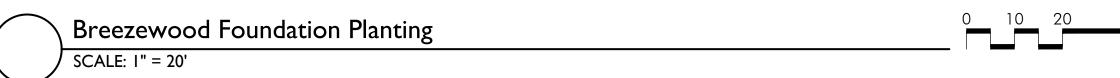
SIGNAGE PLAN

Sheet #

EX. J









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Project Name

Home Road Planned Commercial District

Home Road

Powell, Ohio 43065

Prepared For



Independence, OH 44131

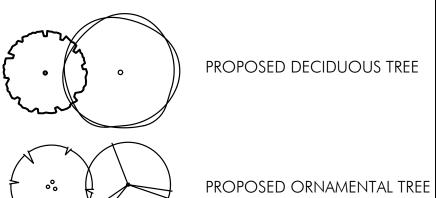
Project Info

Project # 18067
Date 02/19/21
By ZM, SO, TF
Scale As Noted

Revisions

TYPICAL UNIT LANDSCAPE PLAN



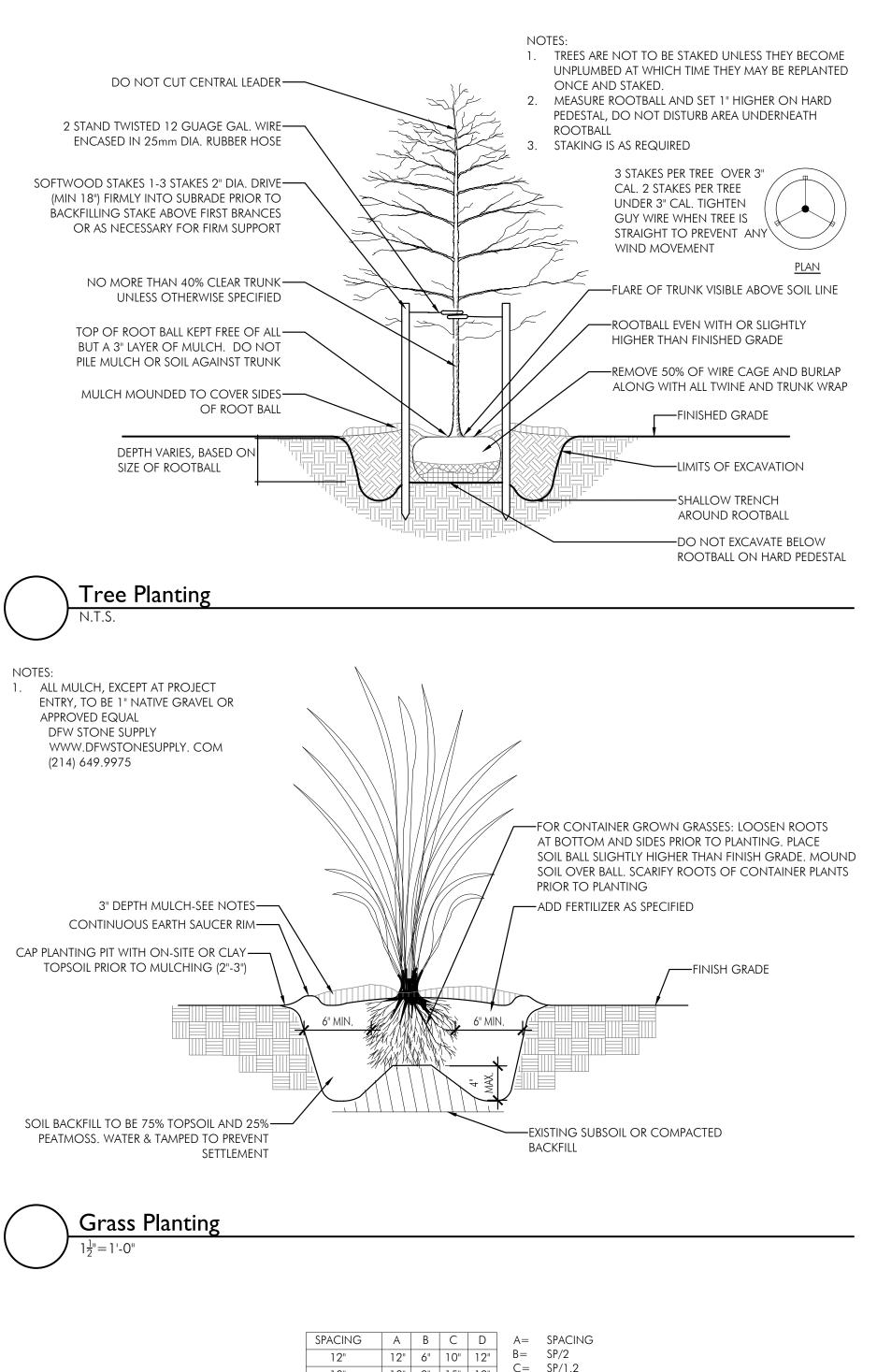


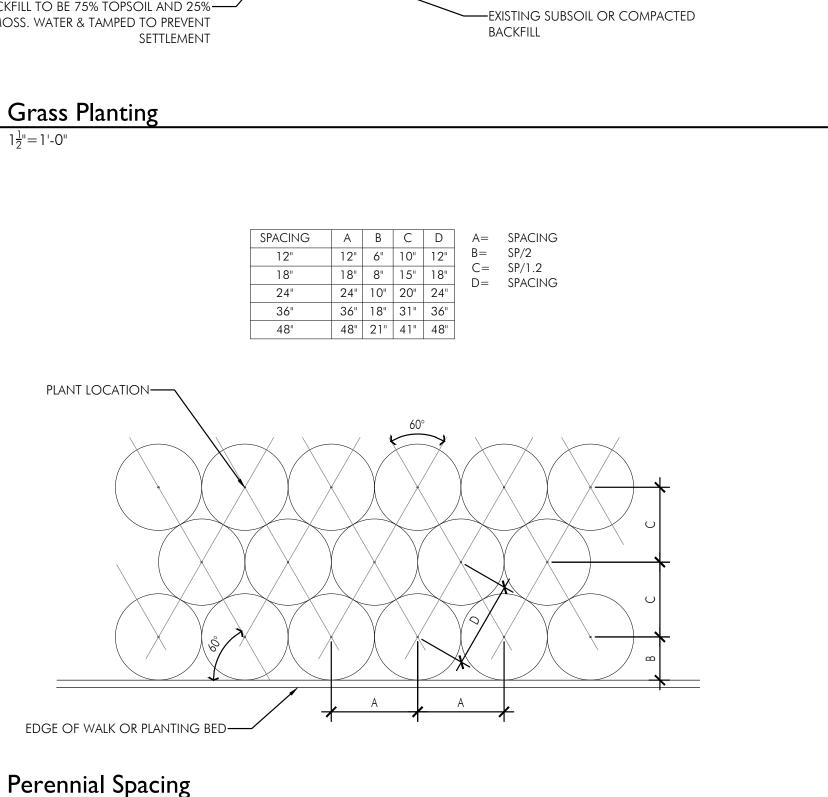
 DECIDUOUS SHRUBS

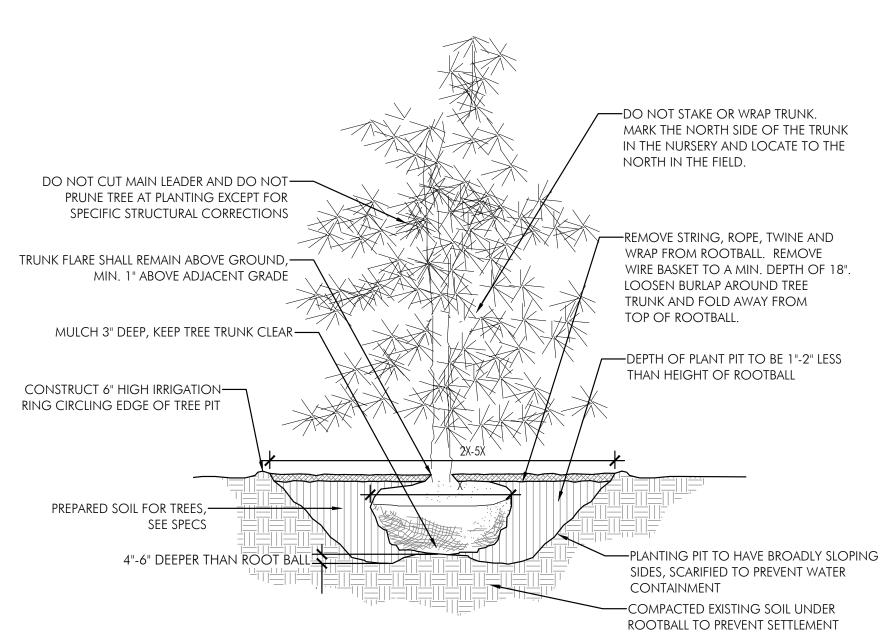
EVERGREEN SHRUBS

Sheet #

EX. K

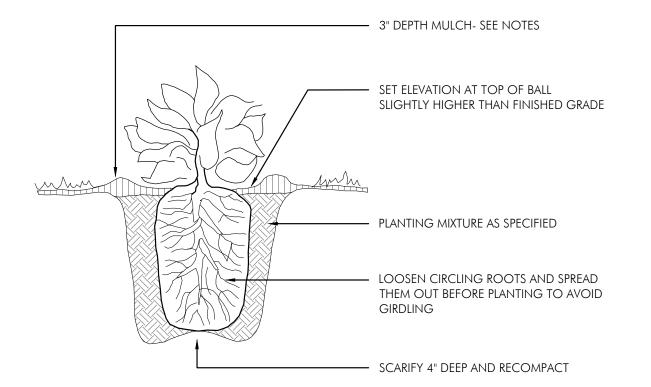






Evergreen Planting

 ALL MULCH, EXCEPT AT PROJECT
 ENTRY, TO BE 1" NATIVE GRAVEL OR APPROVED EQUAL DFW STONE SUPPLY www.dfwstonesupply. com (214) 649.9975



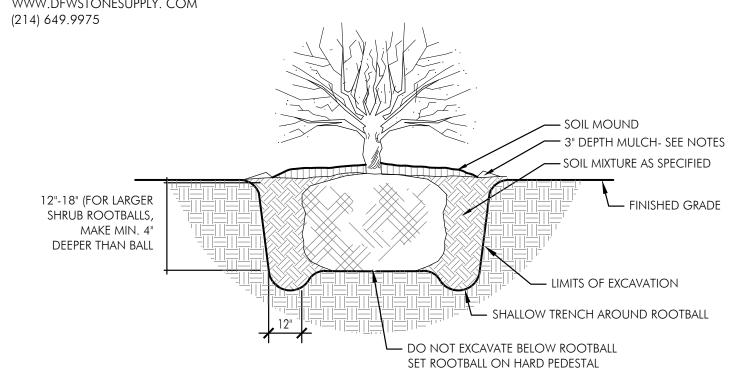
Perennial Planting

1. DO NOT PRUNE SHRUBS DURING INSTALLATION

2. MEASURE ROOTBALL AND SET 1" HIGHER ON HARD PEDESTAL, DO NOT DISTURB AREA UNDERNEATH ROOTBALL

3. ALL MULCH, EXCEPT AT PROJECT ENTRY, TO BE 1" NATIVE GRAVEL OR APPROVED EQUAL DFW STONE SUPPLY

WWW.DFWSTONESUPPLY. COM



THE AMOUNT OF PRUNING SHALL BE LIMITED TO 1/3 OF THE

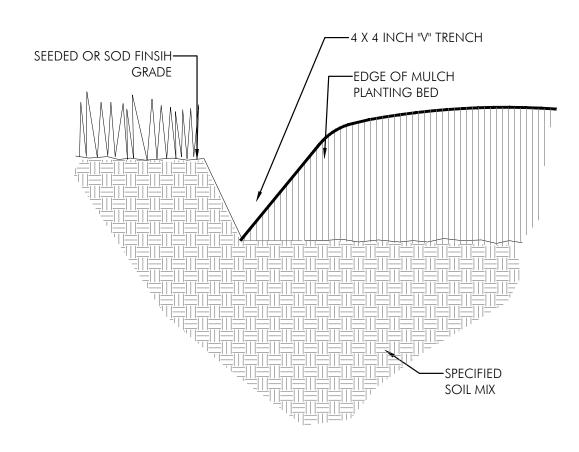
SHRUB IN HOLE. SET TOP OF BALL 1-3" ABOVE FINISH GRADE.

TRANSPLANTING. REMOVE DEAD AND INJURED LIMBS. REMOVE

BURLAP AND WIRE OR TWINE FROM TOP AND SIDES OF BALL. CENTER

BRANCHES TO COMPENSATE FOR LOSS OF ROOTS FROM

Shrub Planting



Mulch Edge Treatment at Lawn



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Project Name

Home Road Planned Commercial District

Home Road

Powell, Ohio 43065

Prepared For



Independence, OH 44131

Project Info

Project # 02/19/21

ZM, SO, TF Scale As Noted

Revisions

Sheet Title PLANTING

DETAILS

Sheet #

EX. L

POWELL

Healthcare Center Powell, Ohio



25000 Country Club Blvd Suite 255 N. Olmstead, Ohio 44070



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STREET PERSPECTIVE

POWELL

Healthcare
Center
Powell, Ohio



25000 Country Club Blvd Suite 255 N. Olmstead, Ohio 44070



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DRIVE PERSPECTIVE

POWELL

Healthcare
Center
Powell, Ohio







25000 Country Club Blvd Suite 255 N. Olmstead, Ohio 44070



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BUILDING 1

POWELL

Healthcare
Center
Powell, Ohio







25000 Country Club Blvd Suite 255 N. Olmstead, Ohio 44070



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BUILDING 2

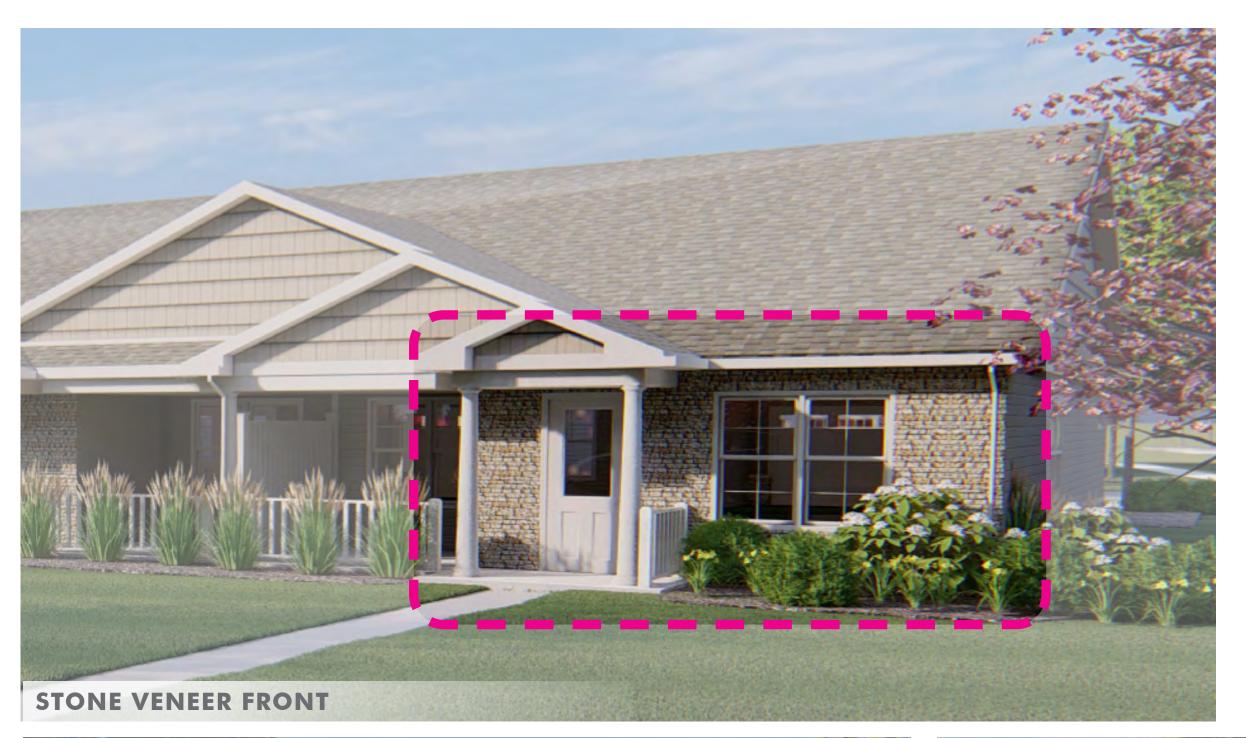




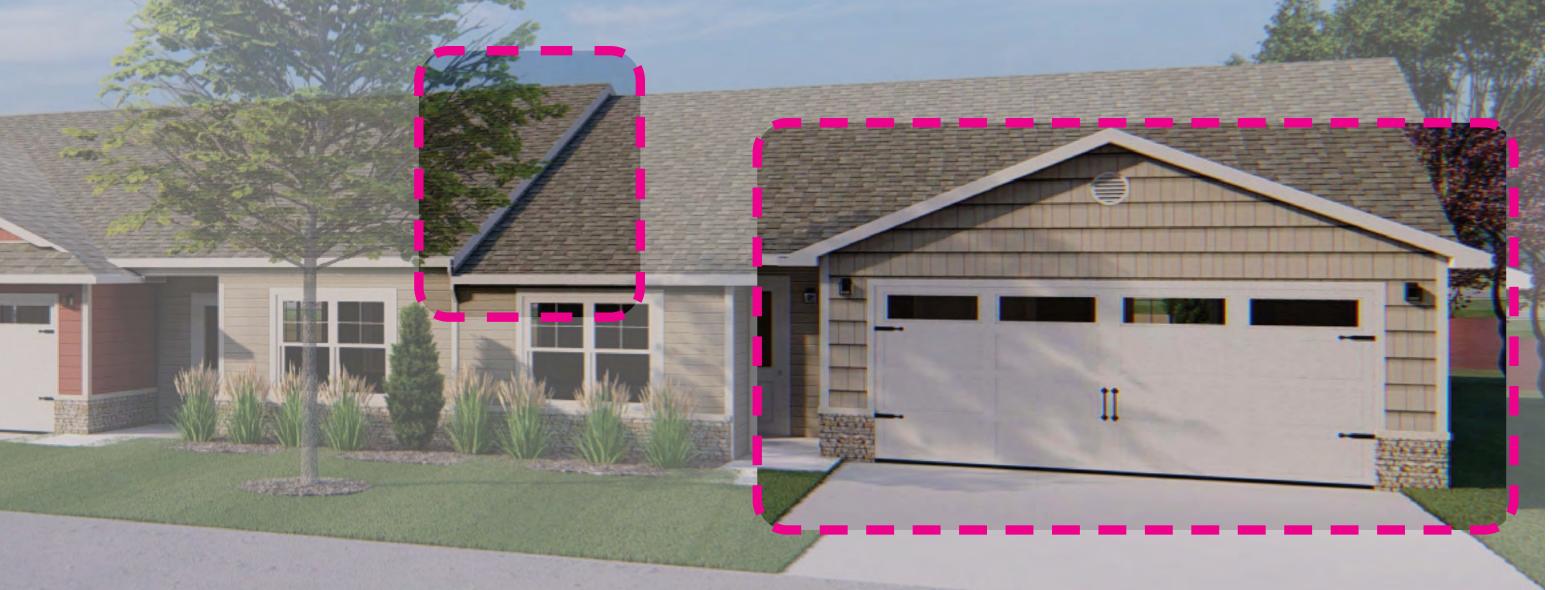


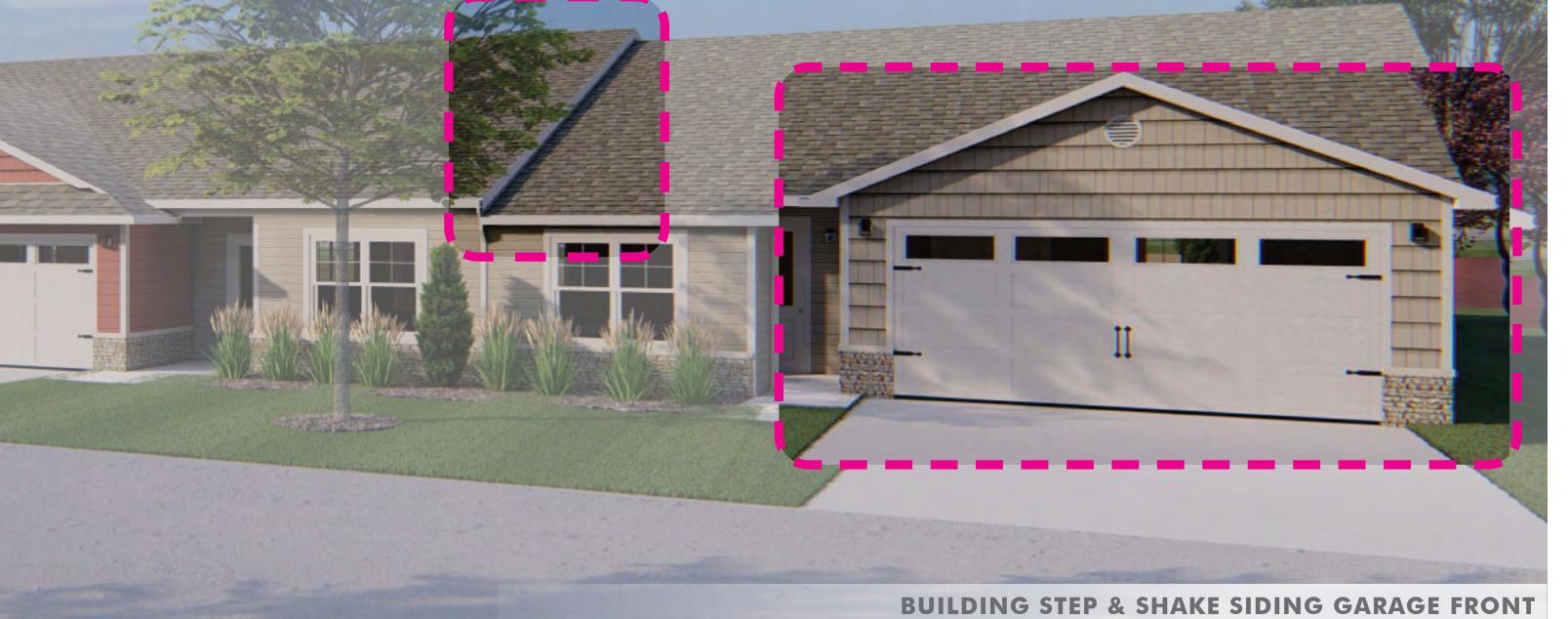


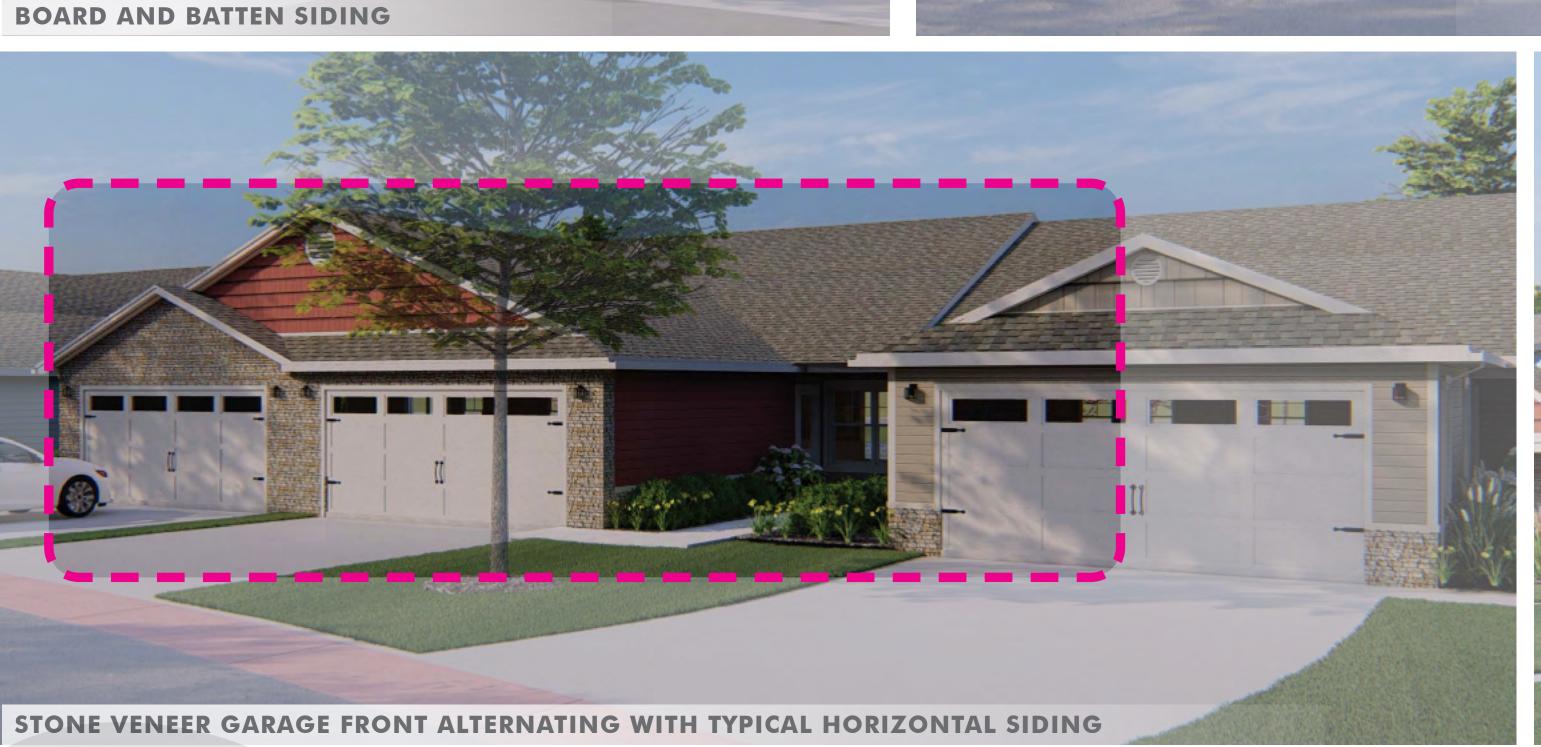
EX. N-1













EXTERIOR FINISH MATERIAL SELECTIONS HORIZONTAL SIDING SHAKE SIDING CORNER TRIM STONE VENEER OVERHEAD GARAGE DOOR SINGLE HUNG WINDOW STANDARD WHITE SLIDING PATIO DOOR SUNROOM PORCH METAL & GLASS PRIVACY FENCE





Architectural Materials























SIDING COLORS - BY NORANDEX













FRONT: <u>MOCHA</u> SIDES AND REAR: <u>SIERRA</u>

BUILDING FRONT SIDING COLORS WILL VARY BETWEEN THE ABOVE 5 OPTIONS
 SHAKES BY FOUNDRY SPECIALTY SIDING - TO MATCH SIDING COLORS

EX. N-2

Traffic Impact Study

Redwood Home Road Development Redwood Acquisition LLC

July 12, 2019





Traffic Impact Study Redwood Home Road Development

Prepared for

Redwood Acquisition, LLC

Prepared by



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I certify that this Traffic Impact Study has been prepared by me or under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.

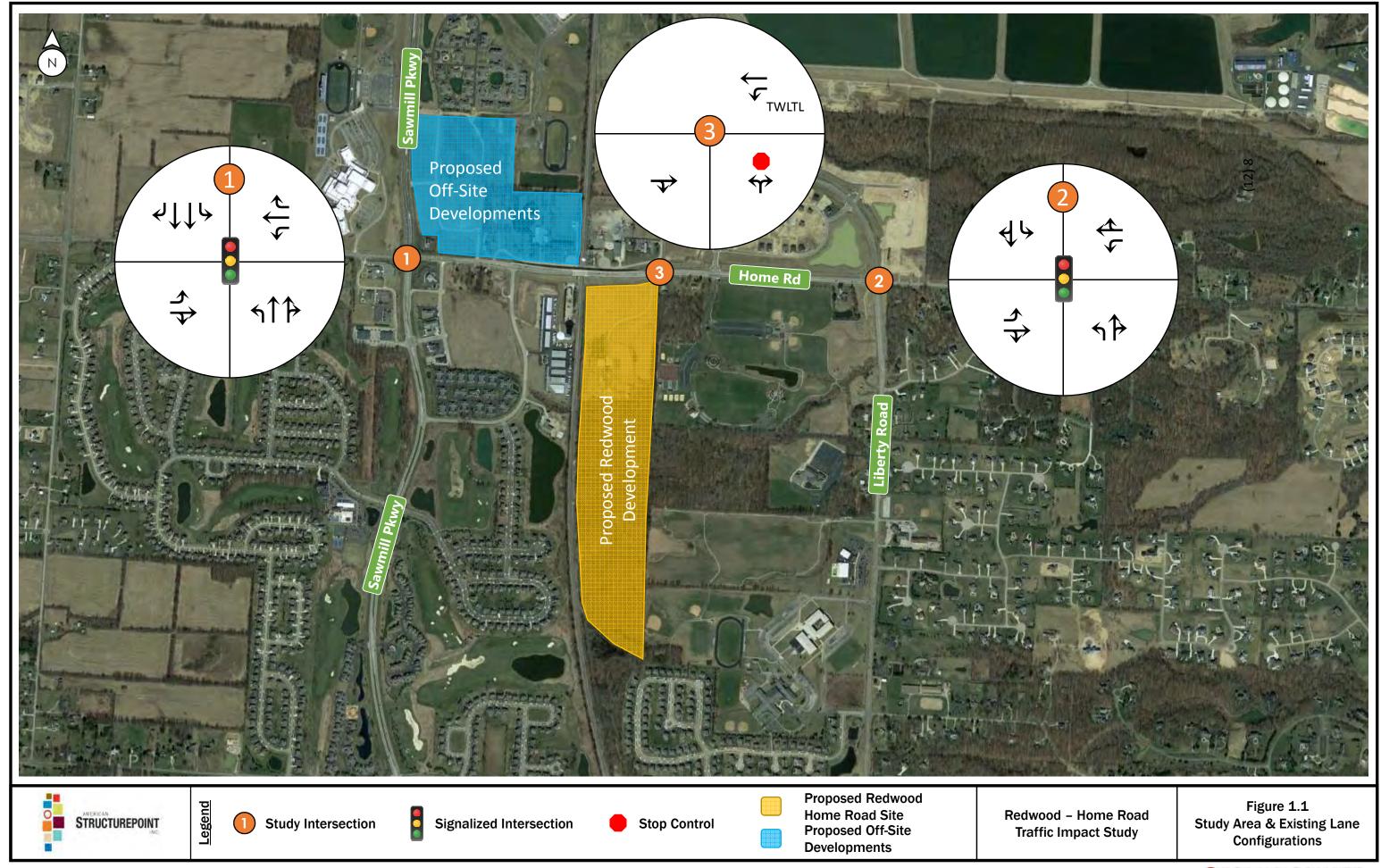
Jeremy Chapman, PhD, PTOE, PE

Ohio Registration #84147



TABLE OF CONTENTS

Execu	utive Su	ımmary	ii
1.0	Stud	y Purpose and Scope	1
	1.1	Purpose	1
	1.2	Scope	1
2.0	Back	ground Information	
	2.1	Surrounding Roadway Network	4
	2.2	Proposed Development	
	2.3	Off-Site Developments	
3.0	Traff	ic Forecast	5
	3.1	Existing Traffic Data	5
	3.2	Background Traffic Growth	5
	3.3	Added Trips for Off-Site Developments	5
	3.4	Trip Generation	5
	3.5	Trip Distribution and Assignment	7
	3.6	Total Traffic Volumes	g
4.0	Capa	icity Analysis	22
	4.1	Capacity Analysis Summary for AM Peak Hours	22
	4.2	Capacity Analysis Summary for PM Peak Hours	25
	4.3	Turn Lane Warrant Analysis	27
	4.4	Queuing Analysis	
5.0	Findi	ings and Recommendations	30
	5.1	Home Rd & Sawmill Pkwy	30
	5.2	Home Rd & Liberty Rd N	31
	5.3	Home Rd & Access Rd	31





LIST OF FIGURES

Figure 3.1 – Trip Distribution and Assignment	8
Figure 3.2 – 2020 Background Traffic Volumes	10
Figure 3.3 – Added Off-Site Trips (Proposed Ambulatory Facility and Retail)	11
Figure 3.4 - Added Off-Site Trips (Existing Single-Family and Proposed Low-Rise	Multi-Family
Apartment)	12
Figure 3.5 – Added Redwood Development Site Trips for Opening Year	13
Figure 3.6 – 2020 No-Build Volumes (With Apartments) – Scenario 1A	14
Figure 3.7 – 2020 No-Build Volumes (Without Apartments) – Scenario 1B	15
Figure 3.8 – 2020 Build Volumes (With Apartments) – Scenario 2A	16
Figure 3.9 – 2020 Build Volumes (Without Apartments) – Scenario 2B	17
Figure 3.10 – 2040 Background Traffic Volumes	18
Figure 3.11 – Added Redwood Development Site Trips for Horizon Year	19
Figure 3.12 – 2040 No-Build Volumes (With Apartments) – Scenario 3	20
Figure 3.13 – 2040 Build Volumes (With Apartments) – Scenario 4	21
Figure 5.1 – Proposed Lane Configurations and Traffic Control (Opening Year Build)	32
Figure 5.2 – Proposed Lane Configurations and Traffic Control (Horizon Year No-Build)	33
LIST OF TABLES	
Table 1.1 – Study Intersections	1
Table 1.2 – Study Scenarios	
Table 3.1 – Base Trip Generation Comparison	6
Table 3.2 –Trip Generation with Reductions	7
Table 3.3 –Total Traffic Volume Computations	9
Table 4.1 – LOS Thresholds	22
Table 4.2 – Capacity Analysis Results Summary (AM)	23
Table 4.3 – Capacity Analysis Results Summary (PM)	25
Table 4.4 – Queuing Analysis Summary (AM)	
Table 4.5 –Queuing Analysis Summary (PM)	29
Table 4.6 – Turn Lane Length Computation	30

LIST OF APPENDICES

Appendix A – Memorandum of Understanding and Site Plan

Appendix B - Raw Traffic Data

Appendix C - Trip Generation

Appendix D – Capacity Analysis Results

Appendix E - Turn Lane Warrant Analysis Results

Appendix F – Queue Analysis Results



Executive Summary

Study Purpose and Scope

The purpose of this traffic study is to determine the operational impacts of the proposed Redwood residential development located in Delaware County, Ohio on the surrounding roadway network. This study identifies the effects of the proposed development and provides necessary recommendations for roadway improvements.

Background Information

The proposed 70-acre Redwood site is expected to have 334 dwelling units and would be located south of Home Road in Delaware County, OH. This facility will have 8 acres dedicated to a senior assisted-living facility while the remaining 62 acres is proposed as multi-family housing. The proposed development will occur in three phases with expected groundbreaking in late 2019 or early 2020.

Traffic Forecast

Intersection turning movement counts for this study were utilized from the recently completed OSU Southern Delaware County Ambulatory TIS report dated January 16, 2019. As agreed upon with Delaware County Engineer's Office, a linear annual growth rate of 3.0% was applied to each roadway to determine the opening year (2020) and horizon year (2040) background volumes. Additional site trips generated from proposed developments in the OSU study were added to the projected background traffic to arrive at nobuild scenario volumes for opening and horizon year scenarios. New site trips generated by the proposed Redwood development were added in to the no-build scenarios to determine the total traffic volumes for build scenarios.

Capacity Analysis

A capacity analysis was performed for all signalized and unsignalized study intersections in each scenario using Highway Capacity Software (HCS - Version 7). All analyses were reported using the methodology outlined in the Highway Capacity Manual (HCM 6).

Under the Delaware County Engineer's Office standards, development impacts that increase the average delay by more than 5 seconds (where LOS is D or worse) require mitigation. Capacity improvements have been identified for the locations not meeting this criteria.

Findings and Recommendations

Based on a review of the capacity analysis, queuing analysis, and turn lane warrants, the following improvements have been identified for the study intersections. These improvements are solely based on AM and PM peak hour operations of a typical weekday which is assumed to represent the worst-case.

Home Rd & Sawmill Pkwy

• This intersection operates at an acceptable LOS and delay in the opening year no-build scenarios (1A and 1B) in AM and PM peak hours.



- With the added Redwood development volumes (scenarios 2A and 2B), the AM peak operates at an acceptable LOS whereas the PM peak hour has certain failing movements which could not be mitigated with optimizing signal timings. An eastbound right turn lane was thus added to enable the intersection to operate at an acceptable LOS in the PM peak hour. With these improvements, the AM peak operates at a lower delay than before. The length of this added eastbound right turn lane for 2020 build scenarios was found to be 325' based on ODOT's Location and Design Manual and observed 95th percentile queues.
- The intersection starts failing in both the AM and PM peak hours for scenario 3 (2040 no-build). To mitigate this, the following improvements were needed:
 - Northbound Approach
 - Add an additional left turn lane (Turn lane length same as existing 600')
 - Convert existing shared thru-right lane to a thru lane,
 - Add a dedicated right turn lane (Turn lane length determined to be 415' for no-build and 455' for build)
 - o Westbound Approach: Convert existing right turn lane to a shared thru-right turn lane.
 - Eastbound Approach: Add an additional thru lane (a dedicated right turn lane was already added for 2020 build scenario but turn lane length would be increased to 375')
 - Right-turn overlap phases would also be needed on all approaches.
- With these improvements, both no-build and build scenario in the horizon year would operate at LOS D with difference in delays not exceeding 5 seconds and thus not requiring any additional mitigation.

Home Rd & Liberty Rd N

- This intersection operates at an acceptable LOS and delay in the opening year no-build scenarios (1A and 1B) in AM and PM peak hours.
- With the added Redwood development volumes (scenarios 2A and 2B), the AM peak operates at an acceptable LOS whereas the PM peak hour has certain failing movements which could not be mitigated with optimizing signal timings. An eastbound right turn lane was thus added to enable the intersection to operate at an acceptable LOS in the PM peak hour. With these improvements, the AM peak operates at a lower delay than before. The length of this added eastbound right turn lane for 2020 build scenarios was found to be 430' based on ODOT's Location and Design Manual and observed 95th percentile queues.
- The intersection starts failing in the PM peak hours for scenario 3 (2040 no-build) with northbound approach failing in AM peak hour. To mitigate this, the following improvements were needed:
 - Westbound Approach: Convert existing shared thru-right lane to a thru lane, and add another shared thru-right lane.
 - Eastbound Approach: Add an additional thru lane (a dedicated right turn lane was already added for 2020 build scenario but with turn lane length increased to 480')

Home Rd & Liberty Rd N

• This intersection operates at an acceptable LOS and delay in the opening year build scenarios (2A and 2B) in AM and PM peak hours.



- Turn lane warrants performed showed that eastbound right and westbound left turn lanes are warranted for the horizon year build scenario. These turn lanes were taken in to consideration while analyzing the intersection and was found to be operating at an acceptable LOS in both peak hours.
- It is also assumed that Home Road would be converted to a 4 lane roadway between Sawmill Pkwy and Liberty Road.
- Turn lane lengths for eastbound right and westbound left turn lanes were estimated to be 225' and 180' respectively.



1.0 Study Purpose and Scope

1.1 Purpose

The purpose of this traffic study is to determine the operational impacts of the proposed Redwood development located in Delaware County, Ohio on the surrounding roadway network. This study identifies the effects of the proposed development and provides necessary recommendations for roadway improvements. The study area and existing lane configurations at the study intersections are shown on **Figure 1.1**.

1.2 Scope

The study focuses on three intersections adjacent to the study area that are expected to carry the most traffic from this proposed development. The study intersections are listed in **Table 1.1**.

Table 1.1 - Study Intersections

No.	Intersection Name
1	Home Road & Sawmill Parkway
2	Home Road & Liberty Road N
3	Home Road & Access Road

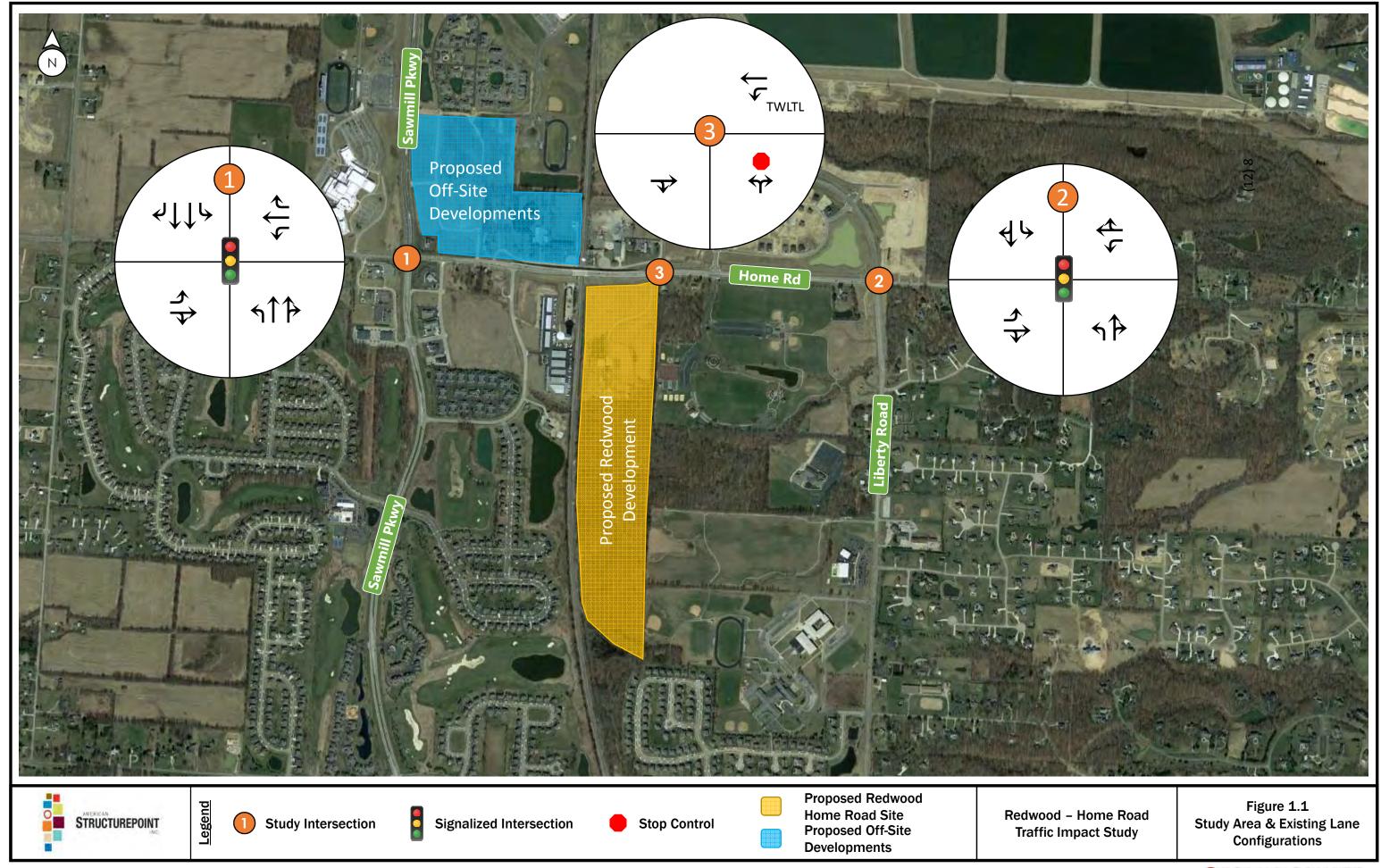
Capacity analysis was performed for the scenarios listed in **Table 1.2**. The study scenarios focus on the opening year (2020), and the horizon year (2040) no-build and build traffic conditions. All scenarios account for the expected background traffic growth in the area including added trips from the OSU study.

Table 1.2 – Study Scenarios

			Traffic Volumes									
Scenario	Scenario Description	Year	Background Growth	Added Site Trips from OSU Study	Existing Single Family and Proposed Multi-Family Housing from OSU Study	Added Site Trips from Redwood						
1A	Opening Year No-Build	2020	X	Х	X	-						
1B	Opening Year No-Build	2020	X	X	-	-						
2A	Opening Year Build	2020	X	Х	X	X						
2B	Opening Year Build	2020	X	Х	-	X						
3	Horizon Year No-Build	2040	Х	Х	Х	-						
4	Horizon Year Build	2040	X	X	X	X						



The study procedures followed the Delaware County Engineer's Office standards and the Memorandum of Understanding between the developer, and Delaware County, OH. All analysis results and recommendations have been summarized and are documented in this TIS.





2.0 Background Information

2.1 Surrounding Roadway Network

The following sections document the current roadway conditions of the streets within the vicinity of the study area. The existing roadway network and intersection lane configuration is shown in **Figure 1.1**. The Delaware County Thoroughfare Plan (December 2001) was utilized to determine the functional classifications of the study roadways listed below.

2.1.1 Home Road

Home Road is an undivided 2-lane east/west roadway that forms the northern boundary of the proposed development and provided direct access to the proposed Redwood development. It is classified as a Major Arterial around the study area with the posted speed limit being 50 mph.

2.1.2 Sawmill Parkway

Sawmill Parkway is a divided 4-lane north/south roadway. The intersection of Sawmill Pkwy & Home Rd would serve as one of the two signalized intersections through which the new Redwood development patrons would enter or exit. It is classified as a Major Arterial around the study area. There are dedicated left turn lanes at all approaches and dedicated right turn lanes at westbound and southbound approaches. The posted speed limit on Sawmill Pkwy north and south of Home Rd is 45 mph.

2.1.3 Liberty Road N

Liberty Road N is a north/south 2-lane local roadway that is classified as a minor arterial. There are dedicated left turn lanes at all approaches and the posted speed limit north and south of Home Road is 50 mph.

2.2 Proposed Development

The proposed residential development by Redwood is to be located on a parcel just south of Home Road, and west of Olentangy Liberty Middle School in Delaware County, Ohio. A conceptual site plan/layout of the proposed development is shown in **Figure 1.1** and is included in **Appendix A.**

The proposed development will consist primarily of 334 dwelling units (DU's) of low-rise multi-family houses. The proposed development is expected to break ground in late 2019 or early 2020 and expected to be completed in three phases with about 100 DU's complete by the opening year of 2020, 134 DU's by 2021, and the remaining 100 DU's by 2022.

2.3 Off-Site Developments

At the northeast quadrant of Home Rd & Sawmill Pkwy, an ambulatory care facility is proposed along with neighboring out-lots being occupied by retail businesses. Additionally, a 215-unit apartment development is also proposed along Old Home Rd and east of the proposed ambulatory care facility site. The conceptual site layout of these proposed developments are shown in **Figure 1.1.**



3.0 Traffic Forecast

Based on discussions with the Delaware County Engineer's Office, raw traffic volumes for the two study intersections were utilized from the OSU South Delaware County Ambulatory Facility TIS (dated January 16, 2019). These raw volumes were projected to obtain the opening year (2020) and horizon year (2040) baseline traffic volumes by applying an annual linear background traffic growth rate of 3% for all roadway segments as agreed upon in the MoU. Generated trips for the off-site developments, and proposed apartments were then added to these baseline volumes to be evaluated in no-build scenarios for Redwood's TIS. Finally, the proposed Redwood residential development generated trips in the opening build and horizon build phases were then added to estimate the opening year (2020) and horizon year (2040) build total traffic volumes. The following sections of the report provide greater detail of these steps.

3.1 Existing Traffic Data

Intersection turning movement counts for the two study intersections were utilized from OSU South Delaware County Ambulatory Facility TIS dated January 16, 2019. The raw data from the traffic counts is provided in **Appendix B**.

3.2 Background Traffic Growth

Based on discussions with the Delaware County Engineer's Office, a linear annual growth rate of 3% was assumed for all roadway segments at the two study intersection. These two signalized intersections were used to estimate counts at the intersection of Home Rd & Access Road. The linear annual growth rates were applied to the existing counts to forecast the opening year (2020) and horizon year (2040) background traffic volumes.

3.3 Added Trips for Off-Site Developments

As agreed upon in the MoU, trips generated from the off-site developments (ambulatory care facility and retail businesses) were directly added to the projected background traffic to arrive at no-build scenario volumes for Redwood Home Road TIS. For the opening year scenarios, the proposed apartment development along Old Home Road was treated separately and referred to as A (with apartments) and B (without apartments).

3.4 Trip Generation

The Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th Edition* was used to calculate the generated trips for the proposed Redwood development. AM and PM peak hour trips were forecasted based on ITE land use codes #220 (Multi-family Housing – Low-Rise). **Table 3.1** shows the comparison of total number of AM peak hour and PM peak hour trips for the build scenarios that are generated by the development.



Table 3.1 – Base Trip Generation Comparison

ITE Land				AM	Peak Tr	ips	PM Peak Trips			
Use Code	Phase	Description	Size	Total Trips	Enter	Exit	Total Trips	Enter	Exit	
220	Initial Build (Phase 1)	Multi-Family Housing (Low-Rise)	100 DU	48	11	37	59	37	22	
220	Full Build (Phase 1, 2, 3)	Multi-Family Housing (Low-Rise)	334 DU	150	35	115	173	109	64	

^{*}DU - Dwelling Units

The trip generation estimate used in this study is based on the latest site plan available. All calculations documented in this study are based on the land use types and sizes provided in **Table 3.1**. Any significant changes to land use size or roadway connectivity may require additional analysis. The following sections describe the methodology used to calculate internal trips and mode reduction trips, which were removed from the total trips identified in **Table 3.1**.

3.4.1 Internal Trips

Internal trips are trips which have origins and destinations within a development, but never actually travel outside of the development on public roadways. These trips are usually removed from the total trip ends generated by a development. Most internal trips happen when there are mixed use developments like retail and residential uses within the study area. For the Redwood Home Road development, no internal trips were assumed to be generated and hence no reductions were done.

3.4.2 Mode Choice Reduction Trips

Mode choice reduction trips consist of those trips made on a transportation mode other than a passenger car. The reduction of total trips due to mode choice is common in urban areas where census data shows that workers over the age of 16 choose to walk, bike or take public transportation to work, rather than drive. Based on a review of census data and routes operated by Delaware County Transit Agency (DATA) for communities near the proposed Redwood development, no mode choice reduction for the Redwood Home Road development was done.

3.4.3 Pass-By Trips

Pass-by trips consist of those that are an intermediate stop enroute from a trip origin to a trip destination. Pass-by trips begin and end outside the study area and are trips that are currently on the roadway. These trips are typically associated with retail land use types. The proposed development does not intend to have any retail land use types and hence no pass-by trips were computed. The resulting new trips after internal, mode choice and pass-by trip reductions are summarized in **Table 3.2**.

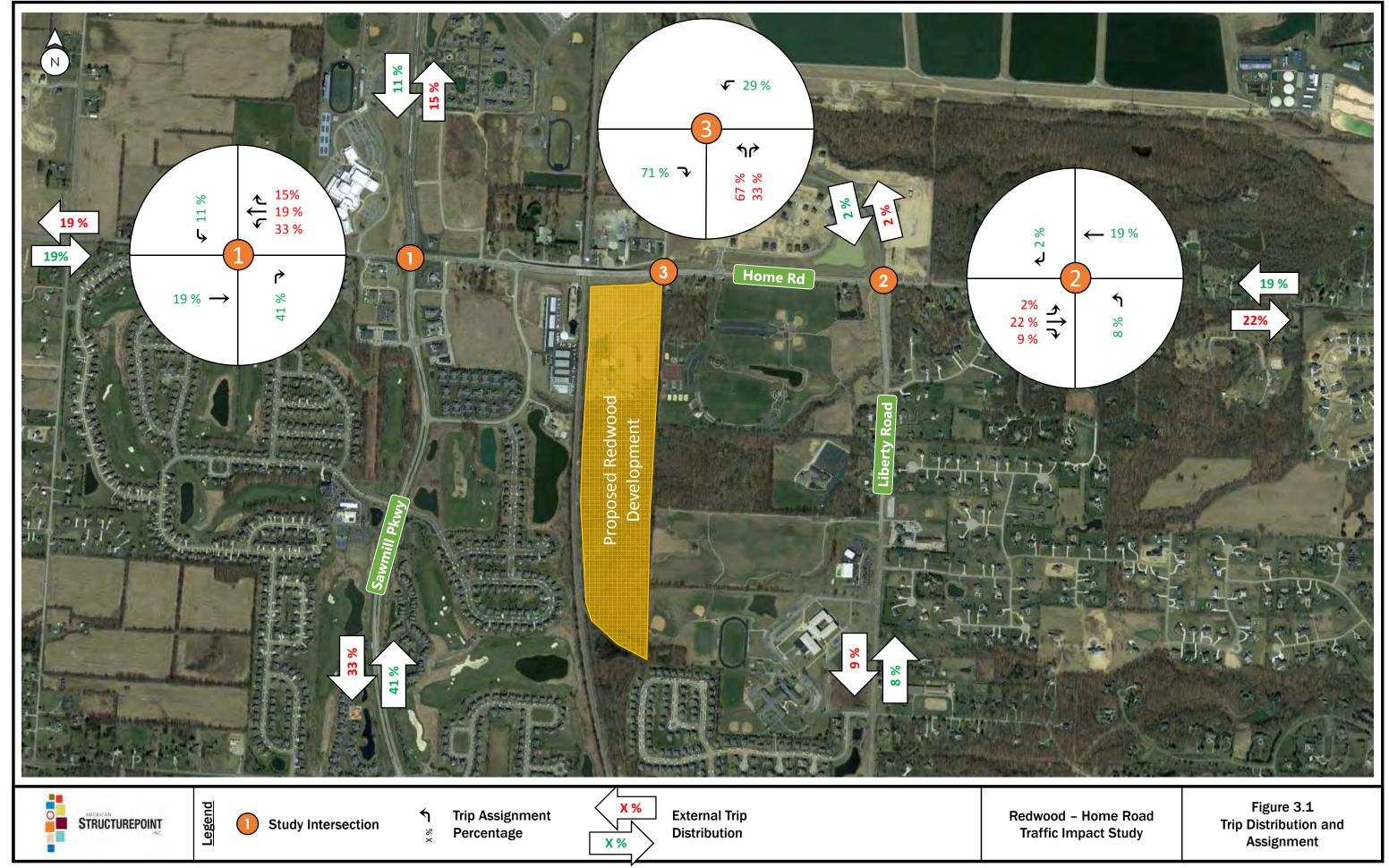


Table 3.2 -Trip Generation with Reductions

			Initial Bu	uild Trips	Trips Full Build Trips								
	· ·	AM Pea	k	PM Peak			Į.	AM Peal	k	PM Peak			
	Enter	Enter Exit <i>Total</i>			Exit	Total	Enter	Exit	Total	Enter	Exit	Total	
Total	11	37	48	37	22	59	35	115	150	109	64	173	
Internal	0	0	0	0	0	0	0	0	0	0	0	0	
Mode Reduction	0	0	0	0	0	0	0	0	0	0	0	0	
Pass-By	0	0	0	0	0	0	0	0	0	0	0	0	
New Site Trips	11	37	48	37	22	59	35	115	150	109	64	173	

3.5 Trip Distribution and Assignment

Trip distribution percentages from the OSU study were used to distribute trip ends generated from the proposed Redwood development. The trip assignment percentages were adjusted for each movement at certain intersections based on the distribution percentages observed. **Figure 3.1** shows the trip distribution and assignment percentages along the roadway segments.



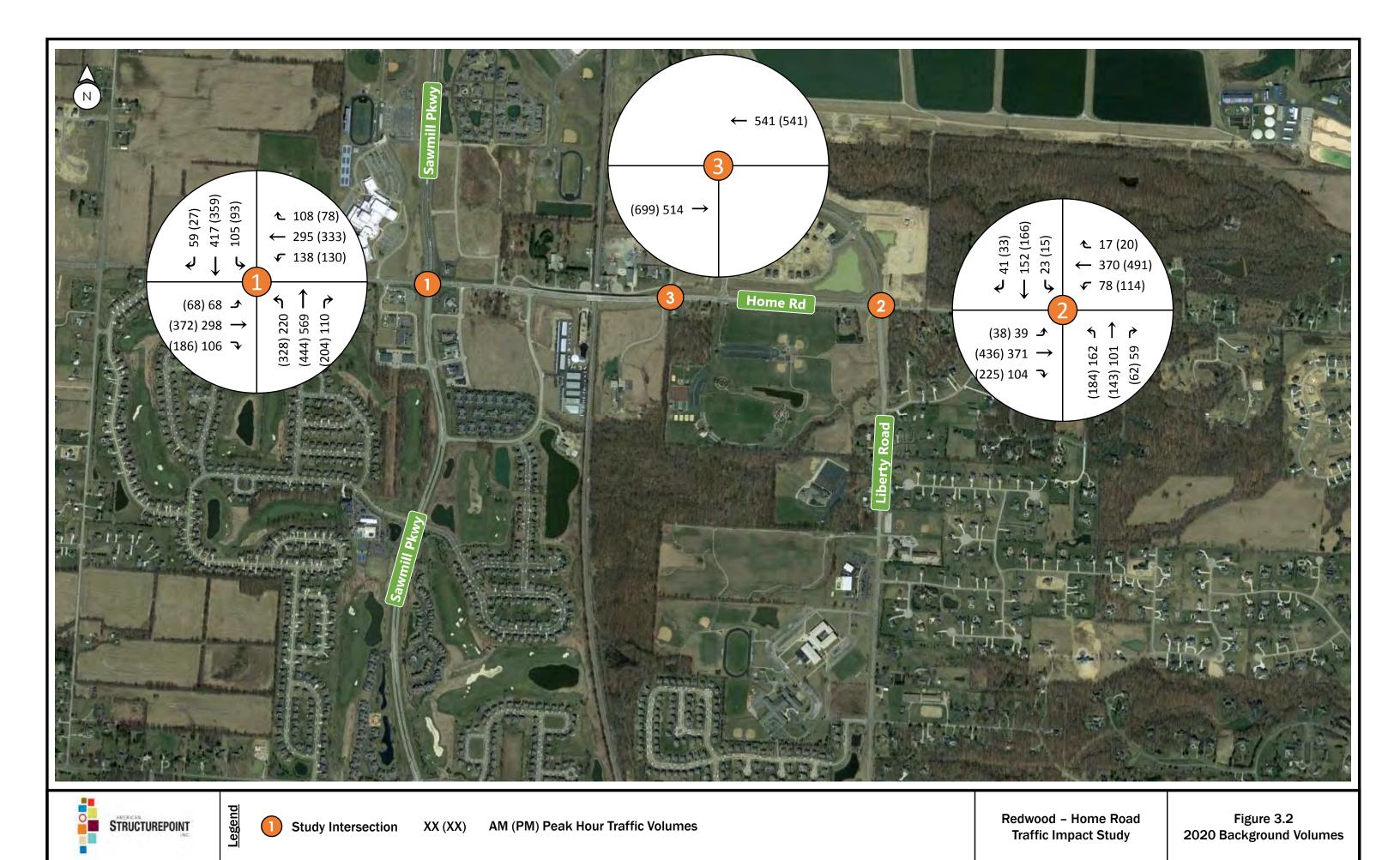


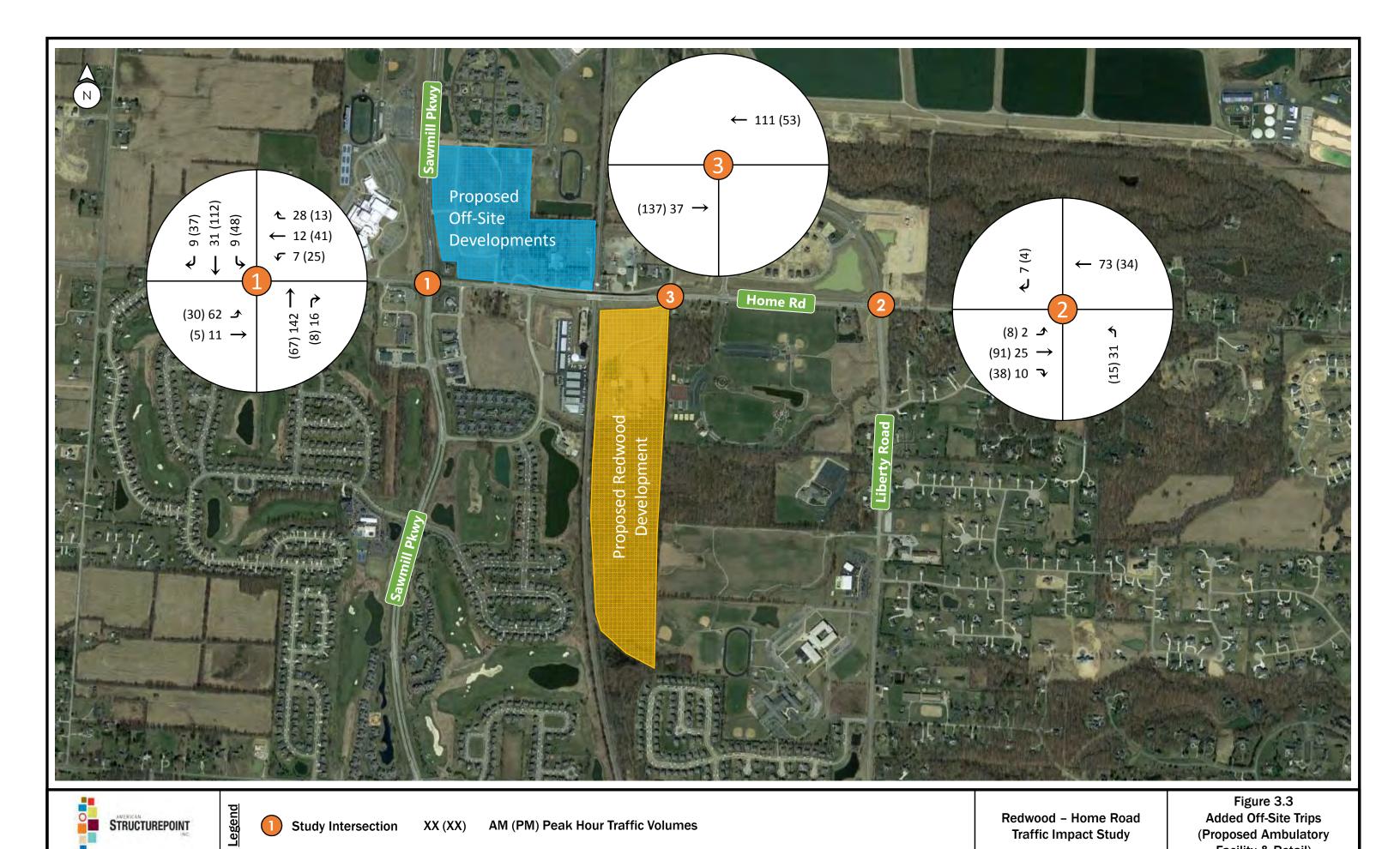
3.6 Total Traffic Volumes

After applying the background growth rates for each roadway segment to the raw traffic volumes and adding trips generated by the proposed off-site and Redwood Home Road development, the 2020 and 2040 total traffic volumes were obtained for each scenario at the study intersections. These volumes are shown graphically in **Figures 3.2 to 3.6**.

Table 3.3 – Total Traffic Volume Computations

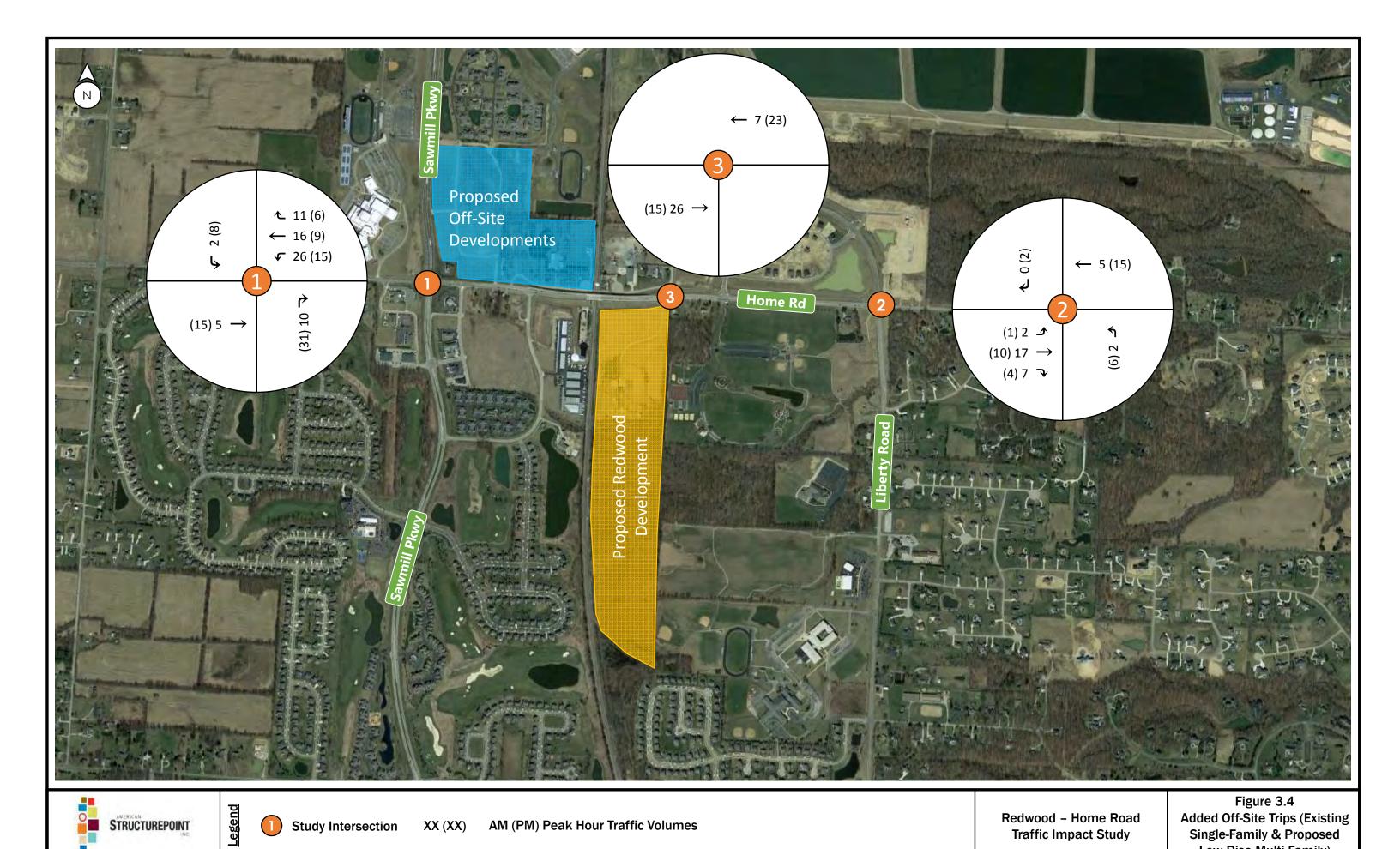
Figure No.	Figure Description	Formula
3.2	2020 Background Traffic Volumes	А
3.3	Added Off-Site Trips (Proposed Ambulatory Facility and Retail)	В
3.4	Added Off-Site Trips (Existing Single-Family and Proposed Low-Rise Multi-Family Apartment)	С
3.5	Added Redwood Development Site Trips for Opening Year	D
3.6	2020 No-Build Volumes (With Apartments) – Scenario 1A	E = A + B + C
3.7	2020 No-Build Volumes (Without Apartments) – Scenario 1B	F = A + B
3.8	2020 Build Volumes (With Apartments) – Scenario 2A	G = A + B + C + D
3.9	2020 Build Volumes (Without Apartments) – Scenario 2B	H = A + B + D
3.10	2040 Background Traffic Volumes	I I
3.11	Added Redwood Development Site Trips for Horizon Year	J
3.12	2040 No-Build Volumes (With Apartments) – Scenario 3	K = I + B + C
3.13	2040 Build Volumes (With Apartments) – Scenario 4	L = I + B + C + J



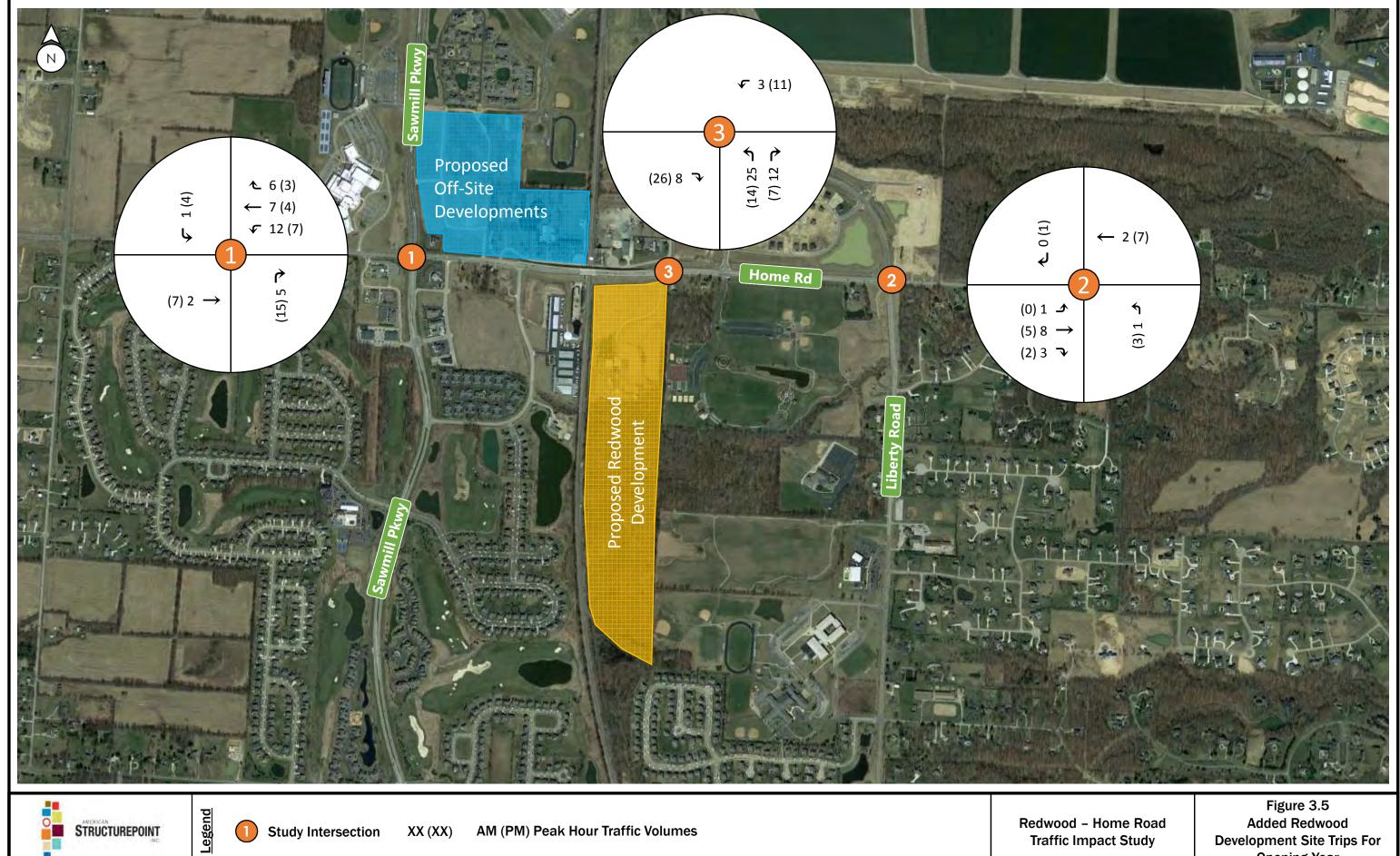


O Defining the built environment.

Facility & Retail)



Low-Rise Multi-Family)



STRUCTUREPOINT

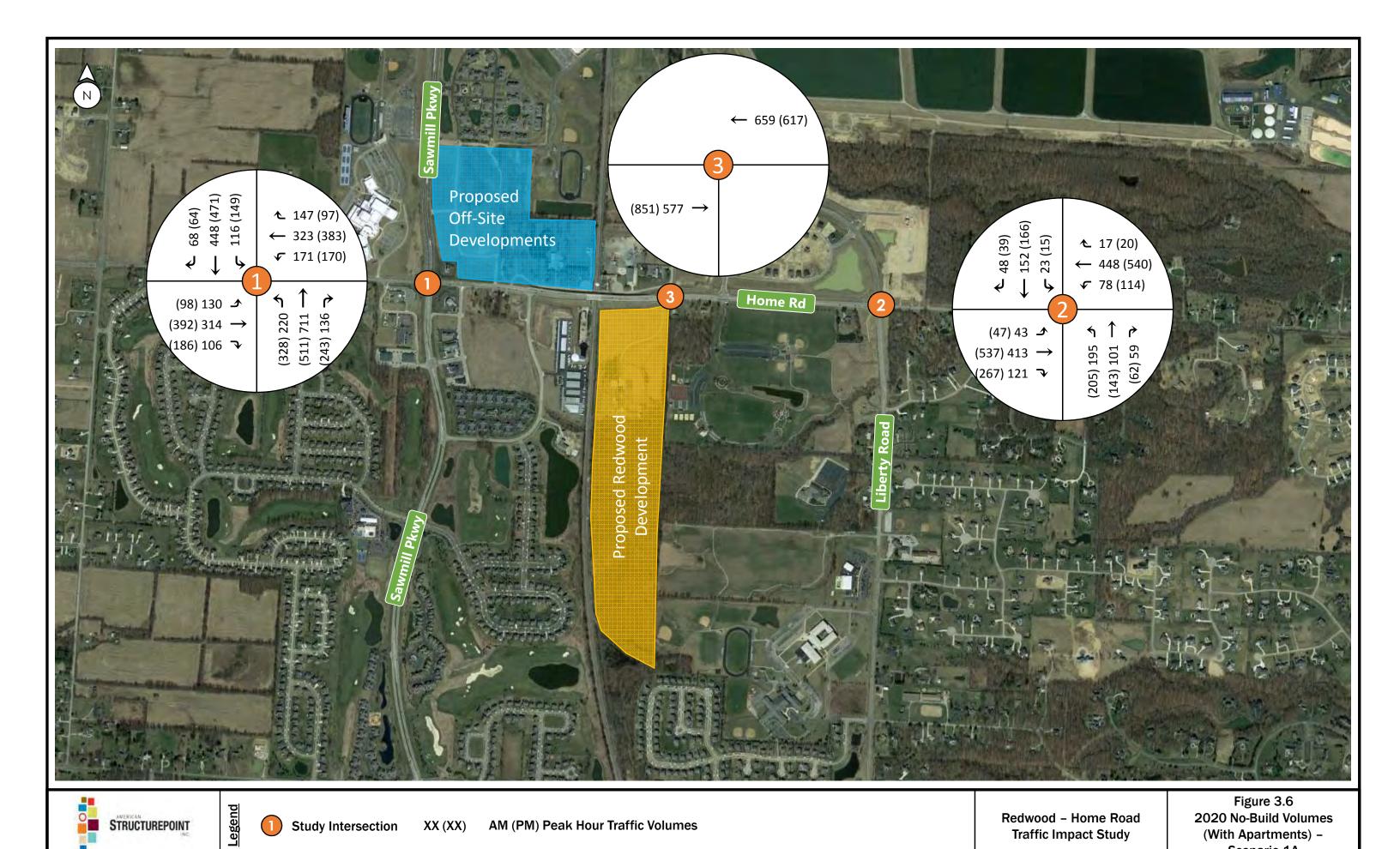
Study Intersection

XX (XX)

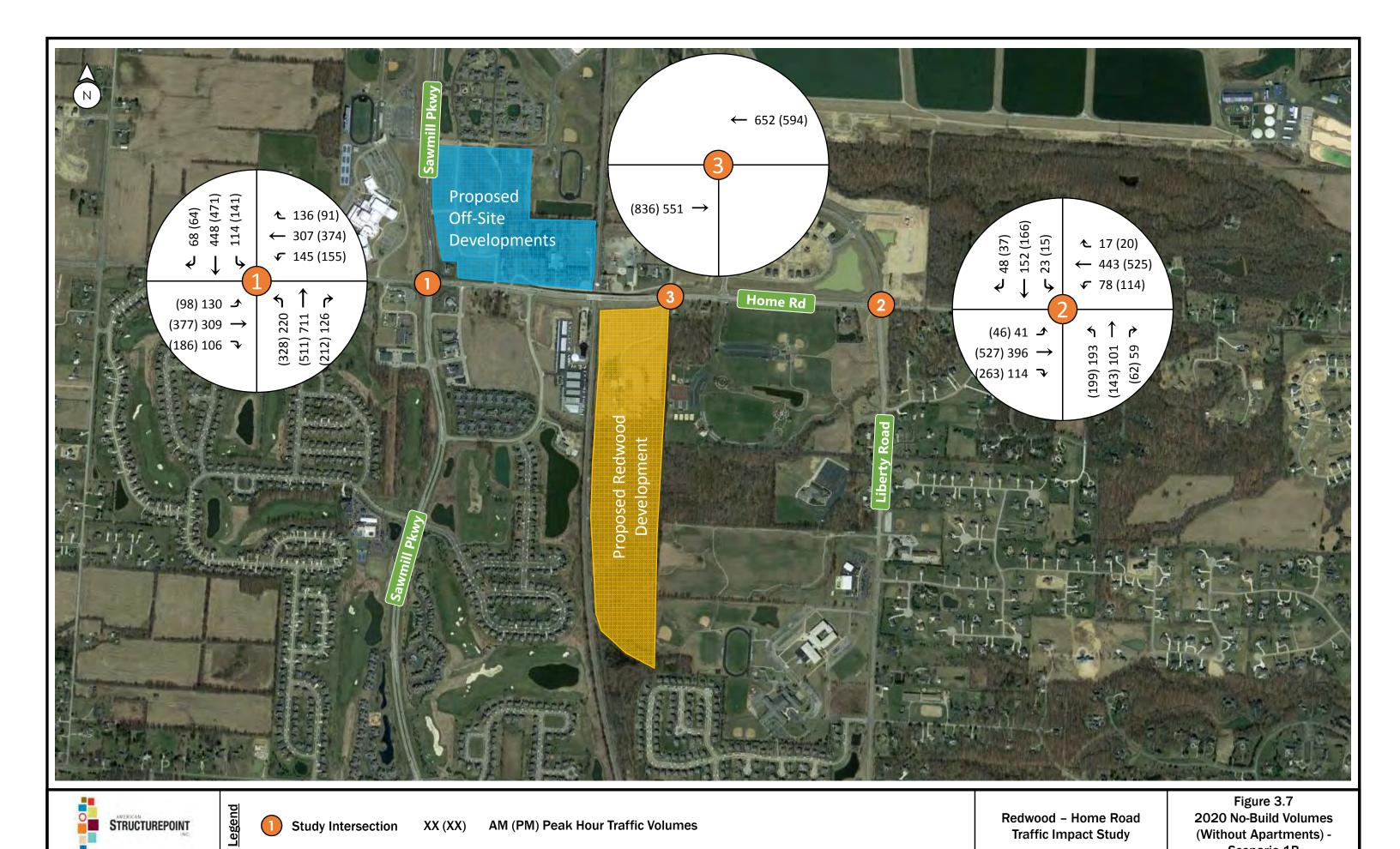
AM (PM) Peak Hour Traffic Volumes

Redwood - Home Road **Traffic Impact Study**

Figure 3.5 Added Redwood **Development Site Trips For Opening Year**

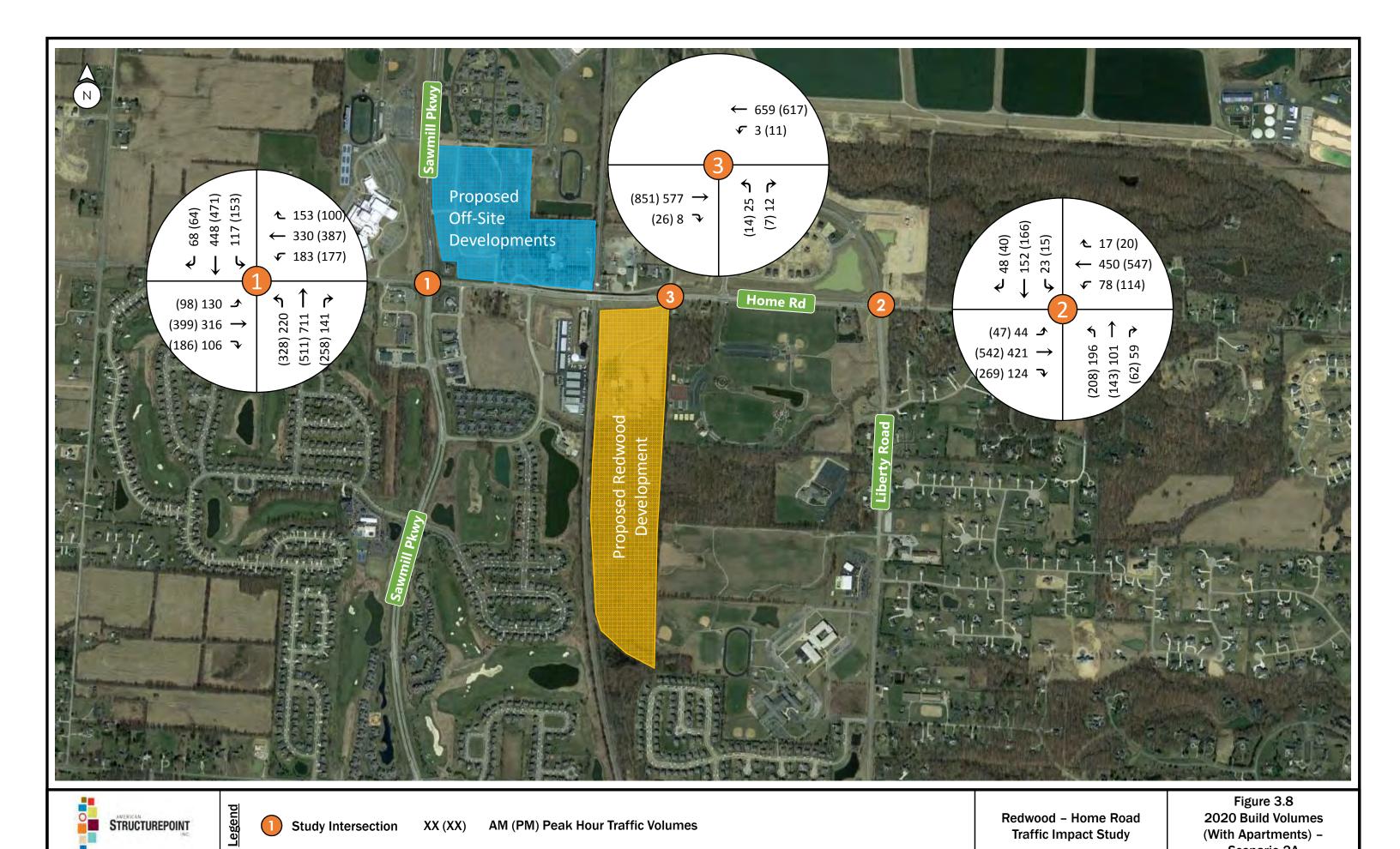


Scenario 1A



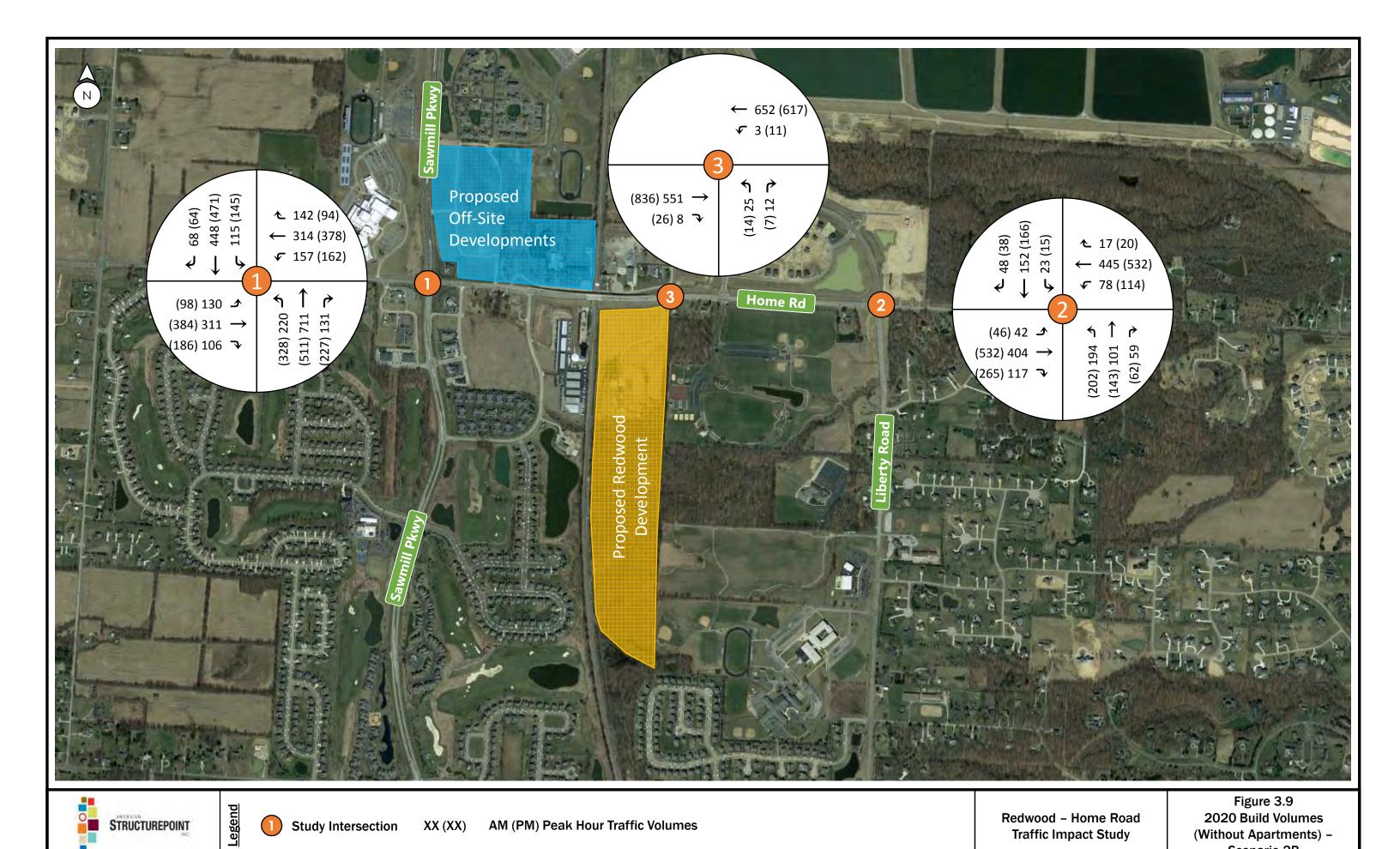
O Defining the built environment.

Scenario 1B



O Defining the built environment.

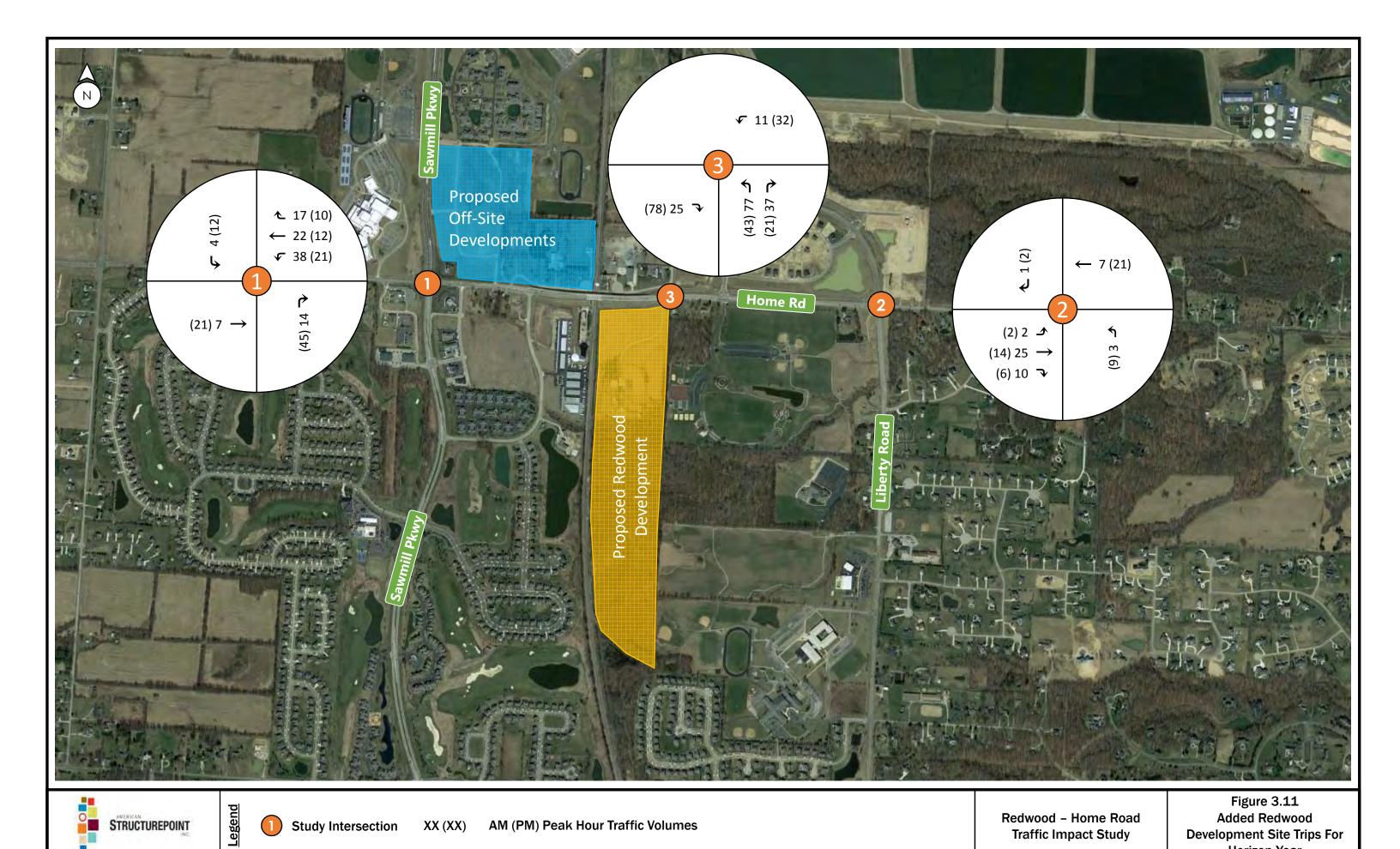
Scenario 2A



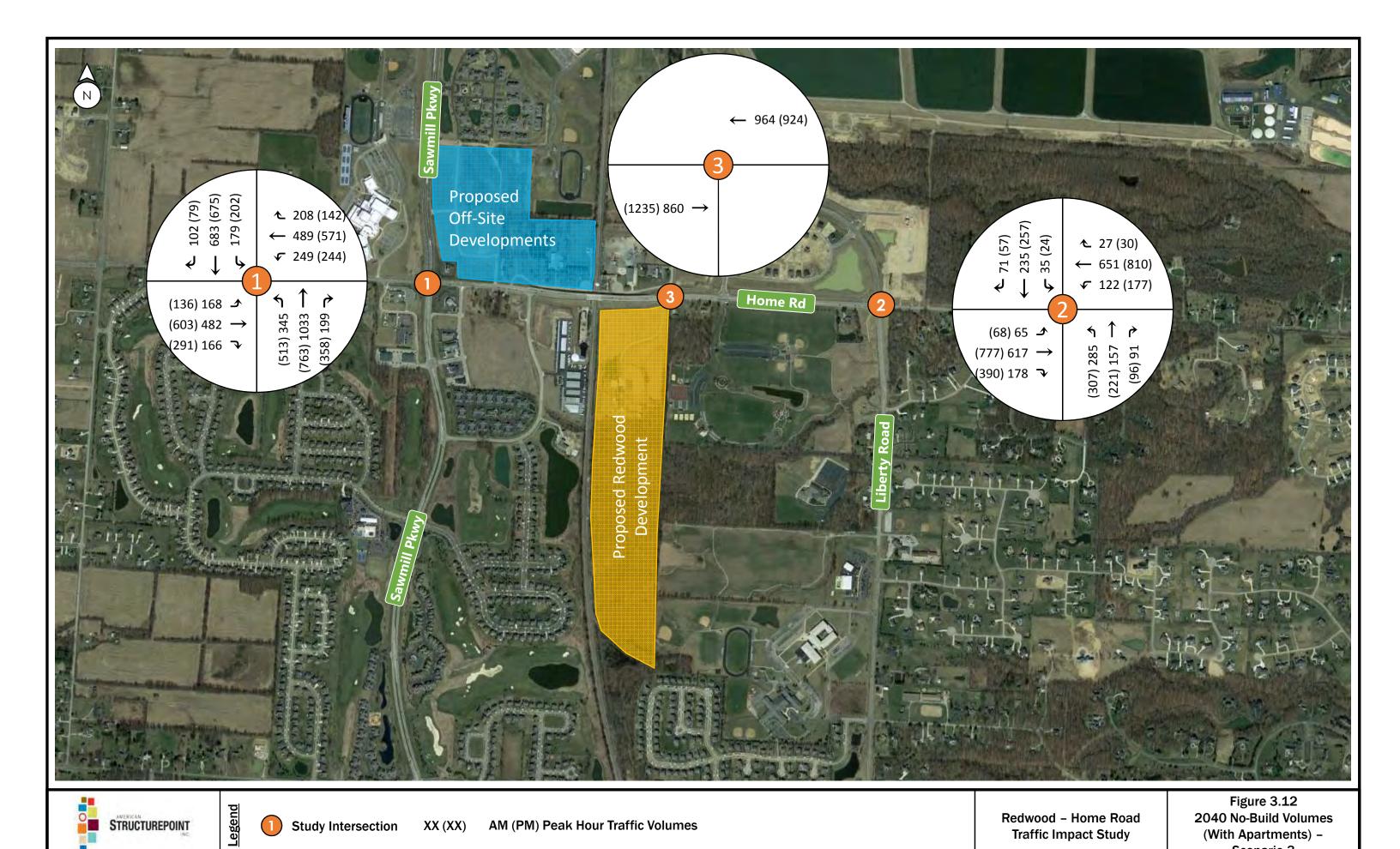
O Defining the built environment.

Scenario 2B

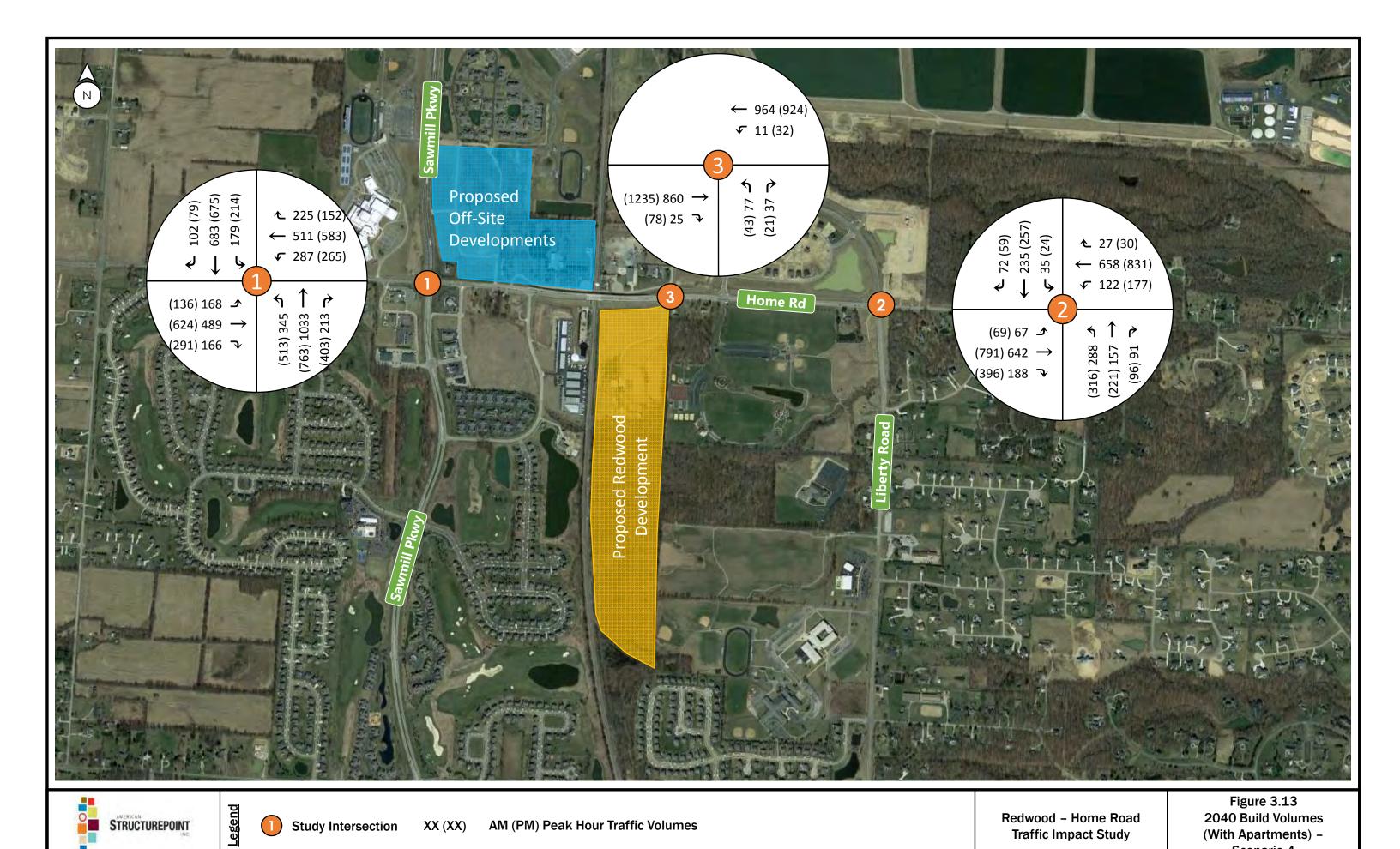




Horizon Year



Scenario 3



O Defining the built environment.

Scenario 4



4.0 Capacity Analysis

A capacity analysis has been performed for the two signalized study intersections for all scenarios while the unsignalized intersection has only been evaluated for opening year (2020) and horizon year (2040) build scenarios. The capacity analysis of signalized and stop controlled intersections was performed using HCS7 based on the methodology outlined in the *Highway Capacity Manual* (HCM 6).

The standard parameter used to evaluate traffic operating conditions is referred to as the level-of-service (LOS). There are six LOS (A through F) which relate to driving conditions from best to worst, respectively. LOS for signalized and unsignalized intersections is defined in terms of control delay per vehicle, which is a direct correlation to driver discomfort, frustration, fuel consumption, and lost travel time. **Table 4.1** provides the LOS criteria as defined in the *Highway Capacity Manual*.

Signalized / Roundabout Intersection **Unsignalized Intersection** LOS **Control Delay per Vehicle (seconds) Control Delay per Vehicle (seconds)** ≤ 10 ≤ 10 Α В > 10 and ≤ 20 > 10 and ≤ 15 > 20 and ≤ 35 > 15 and ≤ 25 C D > 35 and ≤ 55 > 25 and ≤ 35 > 55 and ≤ 80 Ε > 35 and ≤ 50 F > 80 > 50

Table 4.1 - LOS Thresholds

As agreed upon in the MoU, development impacts that increase average delay by more than 5 seconds (where LOS is D or worse) for the intersection require mitigation that restores the average no-build delay. Improvements were identified for the locations not meeting the criteria.

The performance measures evaluated in this study include: LOS, average vehicle delay, and 95th percentile queue length. Poor operating conditions are indicated in red font in the Capacity Analysis summary tables. Capacity analysis reports from HCS are provided in **Appendix D**.

4.1 Capacity Analysis Summary for AM Peak Hours

Table 4.2 shows the capacity analysis summary for AM peak hours for all scenarios evaluated. The following section summarizes the results by each intersection.



Table 4.2 – Capacity Analysis Results Summary (AM)

	Intersection			EB	;	WI	В	NB		SB		Overall	
Int. ID		Scenario	Control Type	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS
		1A		43.8	D	35.8	D	42.1	D	35.6	D	39.5	D
		2A		44.1	D	36.3	D	42.6	D	35.7	D	39.9	D
		2A**		29.4	С	33.4	С	42.6	D	35.7	D	36.4	D
	Home Rd &	1B		39.6	D	25.5	С	43.1	D	35.1	D	36.6	D
1	Sawmill	2B	Signal	39.8	D	26.0	С	43.5	D	35.2	D	36.9	D
	Pkwy	2B**		27.7	С	23.8	С	43.5	D	<i>35.2</i>	D	34.1	С
		3		166.8	F	67.5	Ε	135.7	F	56.4	Ε	109.0	F
		3**		45.0	D	65.1	Ε	39.3	D	33.3	С	45.0	D
		4		45.3	D	66.2	Ε	39.2	D	33.6	С	45.4	D
	Home Rd & Liberty Rd N	1A		38.2	D	28.2	С	36.6	D	38.7	D	34.7	С
		2A		38.7	D	28.3	С	36.7	D	38.7	D	35.0	С
		2A**		21.3	С	27.8	С	36.7	D	38.7	D	28.9	С
		1B		46.3	D	39.3	D	29.7	С	35.3	D	39.0	D
2		2B	Signal	48.8	D	39.5	D	29.7	С	35.3	D	40.0	D
	Liberty Na IV	2B**		31.0	С	39.0	D	29.7	С	35.3	D	33.9	С
		3		48.4	D	55.3	Ε	130.5	F	68.9	Ε	72.1	Ε
		3**		28.7	С	35.1	D	31.0	С	37.4	D	32.4	С
		4		29.1	С	35.4	D	31.4	С	37.5	D	32.7	С
	Lloma Dd ⁰	2A		-	-	8.8	Α	16.7	С	-	-	-	-
3	Home Rd & Access Rd	2B	OWSC	-	-	8.7	Α	16.3	С	-	-	-	-
	7.00033 110	4		-	-	10.1	В	25.7	D	-	-	-	-
*refe	*refers to LOS for left turn movement; **refers to with improvements results for the same scenario,												

4.1.1 Home Road & Sawmill Pkwy

For scenario 1A (2020 no-build with apartments), the intersection operates at LOS D and control delay of 39.5 seconds. With added volumes from the Redwood Development, scenario 2A (2020 build scenario) would operate at LOS D and control delay of 39.9 seconds. While there are no improvements needed based on the AM peak results, PM peak results do require mitigation. Thus, the AM scenarios were also evaluated with these improvements and the intersection is expected to operate at LOS D and control delay of 36.4 seconds.

For scenario 1B (2020 no-build without apartments), the intersection operates at LOS D and control delay of 36.6 seconds. With added volumes from the Redwood Development, scenario 2B (2020 build without apartments) would operate at LOS D and control delay of 36.9 seconds. While there are no improvements needed based on the AM peak results, PM peak results do require mitigation. Thus, the AM scenarios were also evaluated with these improvements and the intersection is expected to operate at LOS C and control delay of 34.1 seconds.



For scenario 3 (2040 no-build), the intersection would operate at a failing intersection LOS with eastbound and northbound approaches failing. To mitigate this, the following improvements were identified:

- Northbound Approach: Add an additional left turn lane, convert existing shared thru-right lane to a thru lane, and add a dedicated right turn lane.
- Westbound Approach: Convert existing right turn lane to a shared thru-right turn lane.
- Eastbound Approach: Add an additional thru lane (a dedicated right turn lane was already added for 2020 build scenario)
- Right-turn overlap phases would be needed on all approaches.

With this mitigation, the intersection would operate at LOS D and a control delay of 45.0 seconds.

For scenario 4 (2040 build), the intersection would operate at LOS D and a control delay of 45.4 seconds. Improvements identified in scenario 3 were included while evaluating scenario 4. No further improvements were identified as the delay for build scenario did not increase by more than 5 seconds in comparison to delay for no-build scenario.

4.1.2 Home Road & Liberty Rd N

For scenario 1A (2020 no-build with apartments), the intersection operates at LOS C and control delay of 34.7 seconds. With added volumes from the Redwood Development, scenario 2A (2020 build with apartments) would operate at LOS C and intersection delay of 35.0 seconds. While there are no improvements needed based on the AM peak results, PM peak results do require mitigation. Thus, the AM scenarios were also evaluated with these improvements and the intersection is expected to operate at LOS C and control delay of 28.9 seconds.

For scenario 1B (2020 no-build without apartments), the intersection operates at LOS D and control delay of 39.0 seconds. With added volumes from the Redwood Development, scenario 2B (2020 build without apartments) would operate at LOS D and control delay of 40.0 seconds. While there are no improvements needed based on the AM peak results, PM peak results do require mitigation. Thus, the AM scenarios were also evaluated with these improvements and the intersection is expected to operate at a LOS of C and delay of 33.9 seconds.

For scenario 3 (2040 no-build), the intersection would operate at LOS E with the northbound approach failing. To mitigate this, the following improvements were identified:

- Westbound Approach: Convert existing shared thru-right lane to a thru lane, and add another shared thru-right lane.
- Eastbound Approach: Add an additional thru lane (a dedicated right turn lane was already added for 2020 build scenario)

With this mitigation, the intersection would operate at LOS C and a control delay of 32.4 seconds.

For scenario 4 (2040 build), the intersection would operate at LOS C and a control delay of 32.7 seconds. Improvements identified in scenario 3 were included while evaluating scenario 4. No further improvements were identified as the delay for build scenario did not exceed by more than 5 seconds in comparison to delays for no-build scenario.



4.1.3 Home Road & Access Road

The northbound approach and westbound left movements are expected to operate at an acceptable LOS and delay in the 2020 build scenarios 2A and 2B. For the 2040 build scenario, the northbound approach is expected to operate at LOS D and a delay of 25.7 seconds.

4.2 Capacity Analysis Summary for PM Peak Hours

Table 4.3 shows the capacity analysis summary for PM peak hours for all scenarios evaluated. The following section summarizes the results by each intersection.

Table 4.3 – Capacity Analysis Results Summary (PM)

link				EE	3	WI	В	N	В	SB		Over	all
Int. ID	Intersection	Scenario	Control Type	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS
		1A		59.8	Ε	36.4	Ε	58.5	Ε	58.4	Ε	53.4	D
		2A		62.0	Ε	41.1	Ε	60.2	Ε	59.5	Ε	55.8	Ε
		2A**		28.4	С	23.8	С	60.2	Ε	59.5	Ε	44.5	D
	Home Rd &	1B		46.0	D	38.7	D	53.9	D	58.1	Ε	49.5	D
1	Sawmill	2B	Signal	47.1	D	43.2	D	55.0	D	58.9	Ε	51.3	D
	Pkwy	2B**		25.5	С	26.6	С	55.0	D	58.9	Ε	42.8	D
		3		241.2	F	73.1	Ε	213.8	F	150	F	175.2	F
		3**		45.8	D	57.1	Ε	47.0	D	47.2	D	49.2	D
		4		47.3	D	61.6	Ε	47.0	D	47.4	D	50.7	D
		1A		25.2	С	25.4	С	67.1	Ε	65.4	Ε	37.7	D
		2A		28.2	С	26.3	С	69.1	Ε	66.0	Ε	39.5	D
		2A**		21.6	С	27.6	С	50.2	D	50.0	D	32.0	С
	Llama a Dal O	1B		27.2	С	27.2	С	56.2	Ε	56.3	Ε	36.2	D
2	Home Rd & Liberty Rd N	2B	Signal	28.7	С	27.9	С	57.2	Ε	56.6	Ε	37.1	D
	Liberty Na N	2B**		21.0	С	26.1	С	57.2	Ε	56.6	Ε	33.7	С
		3		35.0	С	65.0	Ε	236.4	F	181.9	F	107.6	F
		3**		45.2	D	43.7	D	45.2	D	34.0	С	43.5	D
		4		48.3	D	45.1	D	47.9	D	34.1	С	45.7	D
	Harra Dal C	2A		-	-	10.1	В*	19.7	С	-	-	-	-
3	Home Rd & Access Rd	2B	OWSC	-	-	10.0	В*	19.3	С	-	-	-	-
	ACCESS NU	4		-	-	13.2	В*	33.3	D	-	-	-	-
*refe	ers to LOS for le	ft turn move	ment; **re	efers to "	With I	mprover	nents'	' results i	for the s	same scend	ario		

^{4.2.1} Home Road & Sawmill Pkwy

For scenario 1A (2020 no-build with apartments), the intersection operates at LOS D and control delay of 53.4 seconds. With added volumes from the Redwood Development, scenario 2A (2020 build with apartments) would operate at LOS E and control delay of 55.8 seconds. There are some movements which operate at failing LOS and these could be mitigated by adding an eastbound right turn lane and an overlap



phase for the same to relieve these heavy right turn volumes. Post mitigation, the intersection would operate at LOS D and control delay of 44.5 seconds.

For scenario 1B (2020 no-build without apartments), the intersection operates at LOS D and intersection delay of 49.5 seconds. With added volumes from the Redwood Development, scenario 2B (2020 build without apartments) would operate at LOS D and control delay of 51.3 seconds. There are some movements which operate at failing LOS and these could be mitigated by adding an eastbound right turn lane and an overlap phase for the same to relieve these heavy right turn volumes. Post mitigation, the intersection would operate at LOS D and control delay of 42.8 seconds.

For scenario 3 (2040 no-build), the intersection would operate at a failing intersection LOS with all approaches except the westbound one failing as well. To mitigate this, the following improvements were needed:

- Northbound Approach: Add an additional left turn lane, convert existing shared thru-right lane to a thru lane, and add a dedicated right turn lane.
- Westbound Approach: Convert existing right turn lane to a shared thru-right turn lane.
- Eastbound Approach: Add an additional thru lane (a dedicated right turn lane was already added for 2020 build scenario)
- Right-turn overlap phases would be needed on all approaches.

With this mitigation, the intersection would operate at LOS D and a control delay of 49.2 seconds.

For scenario 4 (2040 build), the intersection would operate at LOS D and a control delay of 50.7 seconds. Improvements identified in scenario 3 were included while evaluating scenario 4. No further improvements were identified as the delays for build scenario did not exceed by more than 5 seconds in comparison to delays for no-build scenario.

4.2.2 Home Road & Liberty Rd N

For scenario 1A (2020 no-build with apartments), the intersection operates at LOS D and control delay of 37.7 seconds. With added volumes from the Redwood Development, scenario 2A (2020 build with apartments) would operate at LOS D and control delay of 39.5 seconds. There are some movements which operate at failing LOS and these could be mitigated by installing an eastbound right turn lane and an overlap phase for the same to relieve these heavy right turn volumes. Post mitigation, the intersection would operate at LOS C and control delay of 32.0 seconds.

For scenario 1B (2020 no-build without apartments), the intersection operates at LOS D and control delay of 36.2 seconds. With added volumes from the Redwood Development, scenario 2B (2020 build without apartments) would operate at LOS D and control delay of 37.1 seconds. There are some movements which operate at failing LOS and these could be mitigated by installing an eastbound right turn lane and an overlap phase for the same to relieve the heavy right turn volumes. Post mitigation, the intersection would operate at LOS C and control delay of 33.7 seconds.

For scenario 3 (2040 no-build), the intersection would operate at a failing intersection LOS with northbound and southbound approaches failing. To mitigate this, the following improvements were needed:



- Westbound Approach: Convert existing shared thru-right lane to a thru lane, and add another shared thru-right lane.
- Eastbound Approach: Add an additional thru lane (a dedicated right turn lane was already added for 2020 build scenario)

With this mitigation, the intersection would operate at LOS D and a control delay of 43.5 seconds.

For scenario 4 (2040 build), the intersection would operate at LOS D and a control delay of 45.7 seconds. Improvements identified in scenario 3 were included while evaluating scenario 4. No further improvements were identified as the delays for build scenario did not exceed by more than 5 seconds in comparison to delays for no-build scenario.

4.2.3 Home Road & Access Road

The northbound approach and westbound left movements are expected to operate at an acceptable LOS and delay in the 2020 build scenarios 2A and 2B. For the 2040 build scenario, the northbound approach is expected to operate at LOS D and a delay of 33.3 seconds.

4.3 Turn Lane Warrant Analysis

Left turn and right turn lane warrants were evaluated at Home Road & Access Road for the 2040 build condition based on Delaware County Engineer's Office standards. Ohio DOT's Location and Design Manual (January 2019) was used to evaluate the turn lane warrants. Based on the warrant analysis, it was observed that both left turn and right turn lanes are warranted for the 2040 build scenarios. For the westbound approach, a two-way left turn lane (TWLTL) exists as of today on Home Road and would work without restriping it to a dedicated left turn lane. Detailed analysis results are attached in **Appendix E**.

4.4 Queuing Analysis

Table 4.4 and **Table 4.5** shows the queuing analysis summary for all study intersections in all scenarios evaluated. Wherever 95th percentile queues have exceeded existing storage lengths, they have been highlighted in red. Additionally, queues observed at newly added capacity analysis driven turn lanes are also highlighted. The required turn lane lengths for these newly added turn lanes are computed using procedures outlined in Ohio DOT's Location and Design Manual and the averaged with the observed 95th percentile queues. These have been discussed in **Table 4.6**.



Table 4.4 – Queuing Analysis Summary (AM)

				95th I	Percent	ile Que	ues (Exi	sting St	orage L	ength)	in ft. <i>F</i>	AM Peal	k Hour	
Int. ID	Intersection	Scenario		EB			WB			NB			SB	
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
		1A	100 (375)	4!	51	158 (500)	350	176 (300)	175 (600)	45	56	106 (500)	236	61
		2A	100 (375)	4!	55	166 (500)	345	176 (300)	174 (600)	46	61	107 (500)	236	61
		2A**	100 (375)	302	69	147 (500)	345	176 (300)	174 (600)	46	51	107 (500)	236	61
		1B	97 (375)	42	26	135 (500)	229	100 (300)	178 (600)	45	55	103 (500)	235	59
1	Home Rd & Sawmill Pkwy	2В	97 (375)	43	30	143 (500)	224	100 (300)	178 (600)	46	60	104 (500)	235	59
		2B**	97 (375)	290	68	128 (500)	224	100 (300)	178 (600)	46	50	104 (500)	235	59
		3	209 (375)	13	43	334 (500)	397	182 (300)	459 (600)	11	25	247 (500)	400	94
		3**	220 (375)	270	147	259 (500)	46	51	214 (600)	496	134	169 (500)	318	79
		4	220 (375)	275	147	177 (500)	44	41	214 (600)	496	145	177 (500)	318	79
		1A	25 (550)	4	76	48 (325)	38	34	198 (325)	16	59	19 (325)	21	L7
		2A	25 (550)	48	84	48 (325)	38	36	199 (325)	16	69	19 (325)	21	17
		2A**	26 (550)	289	40	47 (325)	38	36	199 (325)	16	69	19 (325)	21	17
		1B	27 (550)	44	48	57 (325)	44	48	157 (325)	16	63	17 (325)	20	08
2	Home Rd & Liberty Rd N	2B	27 (550)	40	56	57 (325)	45	52	158 (325)	16	63	17 (325)	20	08
		2B**	27 (550)	348	85	55 (325)	45	52	158 (325)	16	63	17 (325)	20	08
		3	47 (550)	5!	59	165 (325)	75	52	(325)	28	87	(325)	41	L4
		3**	41 (550)	249	136	96 (325) 97	32	29	(325)	22	22	26 (325)	30)7
		4	42 (550)	256	145	(325)	33	33	251 (325)	22	22	26 (325)	30)7
		2A	-	-	-	0	-	-		10		-	-	-
3	Home Rd & Access Rd	2В	-	-	-	0	-	-		10		-	-	-
		4	-	-	-	5	-	-		11		-	-	-
*Refers to	results for the"With Imp	rovements"	scenari	0	XX	Refers t	to newly	v added	capacit	y-drivei	n turn la	ıne quei	ues	



Table 4.5 – Queuing Analysis Summary (PM)

			,		Percent	ile Que				_		M Peak	Hour	
Int. ID	Intersection	Scenario		EB	Creciie	ne que	WB	Jenig Je	orage L	NB		IVI Cui	SB	
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Righ
		1A	81 (375)		56	239 (500)	317	85 (300)	399 (600)		15	210 (500)	334	79
		2A	81 (375)	77	77	269 (500)	317	87 (300)	399 (600)	53	35	223 (500)	334	79
		2A**	81 (375)	406	127	159 (500)	315	89 (300)	399 (600)	53	35	223 (500)	334	79
		1B	77 (375)	65	51	331 (500)	352	78 (300)	400 (600)	46	58	196 (500)	335	78
1	Home Rd & Sawmill Pkwy	2B	77 (375)	66	56	362 (500)	352	80 (300)	400 (600)	48	35	207 (500)	335	78
		2B**	77 (375)	371	118	153 (500)	352	80 (300)	400 (600)	48	35	207 (500)	335	78
		3	152 (375)	23	03	436 (500)	445	87 (300)	1297 (600)	12	58	305 (500)	701	99
		3**	174 (375)	384	276	305 (500)	53	38	357 (600)	443	329	209 (500)	424	84
		4	176 (375)	402	276	360 (500)	54	44	357 (600)	443	378	(500)	424	84
		1A	25 (550)	45	53	77 (325)	40	60	103 (325)	28	35	17 (325)	30)7
		2A	26 (550)	49	95	175 (325)	40	67	114 (325)	28	35	17 (325)	31	LO
		2A**	29 (550)	329	269	76 (325)	5(06	(325)	25	59	16 (325)	27	71
	Home Rd & Liberty Rd	1B	24 (550) 27	5:	15	75 (325) 57	47	73	106 (325) 158	27	79	17 (325) 17	28	34
2	N	2В	(550) 26	46	56	(325)	4.	52	(325) 117	16	53	(325)	20	8
		2B**	(550) 52	337	280	(325)		80	(325)	27		(325)	28	
		3	(550) 65		46	(325)		52	(325)		14	(325)	71	
		3**	(550) 69	387	422	(325)		79	(325)		41	(325)		23
		4	(550)	423	448	(325)		96	(325)		41	(325)		26
2	Home Rd & Access Rd	2A	-	-	-	3	-	-		8		-	-	-
3		2B	-	-	-	3	-	-		8		-	-	-
**Refers to results for the"With Improvements" scenario XX Refers to newly added capacity-driven turn lane queues													-	



Table 4.6 below shows the final computed turn lane lengths for capacity-driven or warrant analysis driven turn lanes. Spreadsheets showing computations are attached in **Appendix F**.

Table 4.6 – Turn Lane Length Computation

				Turn Lane Length	Computation	
Int. ID	Intersection	Scenario	Movement	L&D Manual Computation	95th	
				Includes Taper	Percentile Queues	Average
		2A		550	98	325
		2B	רחח	525	93	310
1	Hama Dd Q Carresill Dlarar	3	EBR	540	212	375
1	Home Rd & Sawmill Pkwy	4		450	212	330
		3	NDD	595	232	415
		4	NBR	645	262	455
		2A		700	155	425
2	Harris a Del O Librardo Del N	2B	EDD	675	183	430
2	Home Rd & Liberty Rd N	3	EBR	640	279	460
		4		665	297	480
2	Hama Dd Q Aasaa Dd	4	EBR	450	0	225
3	Home Rd & Access Rd	4	WBL	350	5	180

5.0 Findings and Recommendations

Based on a review of the capacity analysis, queue analysis, and turn lane warrant analysis, following improvements have been identified for the study intersections. These improvements are solely based on AM and PM peak hour operations of a typical weekday which is assumed to represent the worst-case. The proposed lane configuration for study intersections in opening year build and horizon year no-build are graphically depicted in **Figure 5.1** and **Figure 5.2**.

5.1 Home Rd & Sawmill Pkwy

- This intersection operates at an acceptable LOS and delay in the opening year no-build scenarios (1A and 1B) in AM and PM peak hours.
- With the added Redwood development volumes (scenarios 2A and 2B), the AM peak operates at an acceptable LOS whereas the PM peak hour has certain failing movements which could not be mitigated with optimizing signal timings. An eastbound right turn lane was thus added to enable the intersection to operate at an acceptable LOS in the PM peak hour. With these improvements, the AM peak operates at a lower delay than before. The length of this added eastbound right turn lane for 2020 build scenarios was found to be 325' based on ODOT's Location and Design Manual and observed 95th percentile queues.
- The intersection starts failing in both the AM and PM peak hours for scenario 3 (2040 no-build). To mitigate this, the following improvements were needed:
 - Northbound Approach



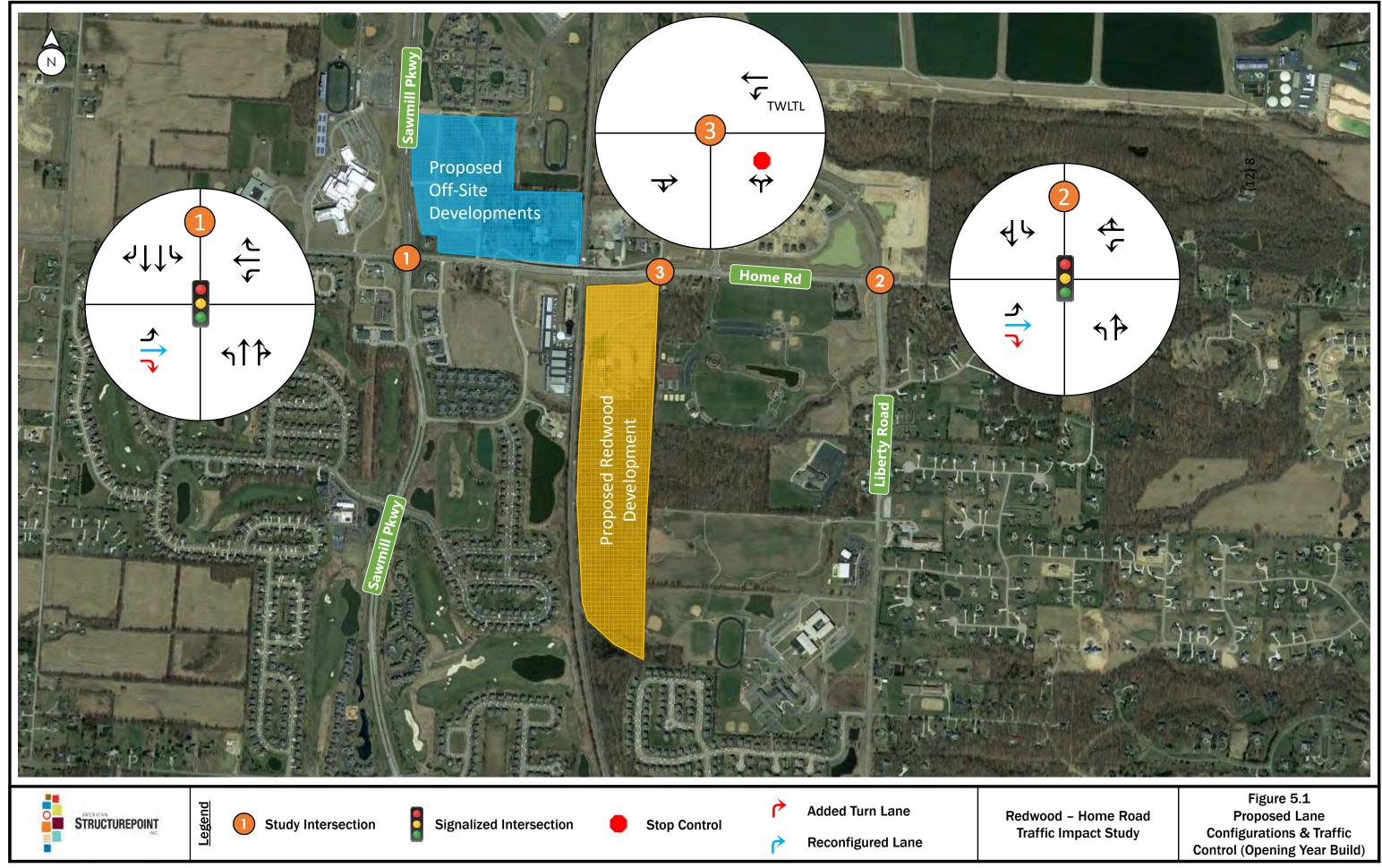
- Add an additional left turn lane (Turn lane length same as existing 600')
- Convert existing shared thru-right lane to a thru lane,
- Add a dedicated right turn lane (Turn lane length determined to be 415' for no-build and 455' for build)
- Westbound Approach: Convert existing right turn lane to a shared thru-right turn lane.
- Eastbound Approach: Add an additional thru lane (a dedicated right turn lane was already added for 2020 build scenario but turn lane length would be increased to 375')
- o Right-turn overlap phases would also be needed on all approaches.
- With these improvements, both no-build and build scenario in the horizon year would operate at LOS D with difference in delays not exceeding 5 seconds and thus not requiring any additional mitigation.

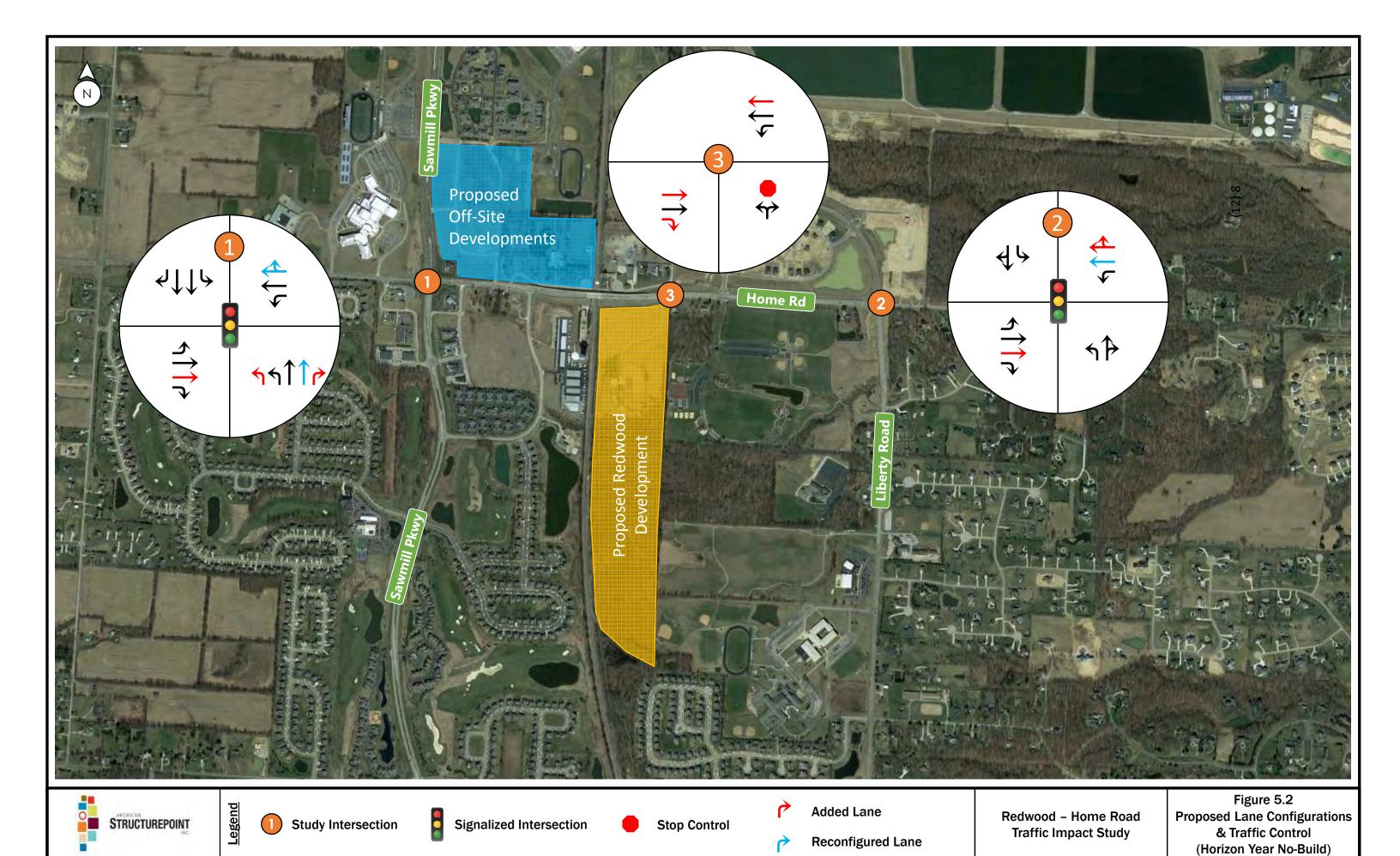
5.2 Home Rd & Liberty Rd N

- This intersection operates at an acceptable LOS and delay in the opening year no-build scenarios (1A and 1B) in AM and PM peak hours.
- With the added Redwood development volumes (scenarios 2A and 2B), the AM peak operates at an acceptable LOS whereas the PM peak hour has certain failing movements which could not be mitigated with optimizing signal timings. An eastbound right turn lane was thus added to enable the intersection to operate at an acceptable LOS in the PM peak hour. With these improvements, the AM peak operates at a lower delay than before. The length of this added eastbound right turn lane for 2020 build scenarios was found to be 430' based on ODOT's Location and Design Manual and observed 95th percentile queues.
- The intersection starts failing in the PM peak hours for scenario 3 (2040 no-build) with northbound approach failing in AM peak hour. To mitigate this, the following improvements were needed:
 - Westbound Approach: Convert existing shared thru-right lane to a thru lane, and add another shared thru-right lane.
 - o Eastbound Approach: Add an additional thru lane (a dedicated right turn lane was already added for 2020 build scenario but with turn lane length increased to 480')
- With these improvements, both no-build and build scenario in the horizon year would operate at LOS D with difference in delays not exceeding 5 seconds and thus not requiring any additional mitigation.

5.3 Home Rd & Access Rd

- This intersection operates at an acceptable LOS and delay in the opening year build scenarios (2A and 2B) in AM and PM peak hours.
- Turn lane warrants performed showed that eastbound right and westbound left turn lanes are warranted for the horizon year build scenario. These turn lanes were taken in to consideration while analyzing the intersection and was found to be operating at an acceptable LOS in both peak hours.
- It is also assumed that Home Road would be converted to a 4 lane roadway between Sawmill Pkwy and Liberty Road.
- Turn lane lengths for eastbound right and westbound left turn lanes were estimated to be 225' and 180' respectively.







Appendix A – Site Plan





APPROVED

By mlove at 1:24 pm, Apr 22, 2019

March 28, 2019

Mr. John Piccin, PE, PS Deputy Development Engineer Delaware County Engineer's Office 50 Channing Street Delaware, Ohio 43015

Subject: Redwood – Home Road Traffic Impact Study

Memorandum of Understanding

Dear Mr. Piccin:

This Memorandum of Understanding is submitted to document the scope of the above captioned Traffic Impact Study (TIS) for a proposed site on Home Road in Delaware County, Ohio. Following your concurrence, American Structurepoint, Inc. ("we") will prepare a traffic impact study in accordance with the methodologies and assumptions described below.

Proposed Development & Access Plan

Redwood is planning to develop a nearly 70 acre parcel along Home Road with up to 343 multi-family dwelling units on the south side of Home Road. The facility will have approximately 8 acres dedicated to a senior assisted living facility with the remaining 62 acres proposed as multi-family housing. This mixed-use development is proposed to occur in 3 phases, with a planned groundbreaking in late 2019 or early 2020.

Intersections to Analyze

Access to the public street serving the site will be examined, consisting of a single access point to Home Road. In addition to the site access point, the following intersections comprise the study area for this TIS:

- 1. Home Road/Sawmill Parkway
- 2. Home Road/Liberty Road N.

Data Collection

We will utilize turning-movement traffic counts from the recently completed OSU Southern Delaware County Ambulatory TIS (dated January 16, 2019) for the study area intersections listed above. We do not anticipate performing any additional traffic counts given the available data.

Mr. John Piccin, PE, PS March 28, 2019 Page 2

Trip Generation

Site-generated trip ends will be forecast using data and methodology contained in the <u>ITE Trip Generation Manual</u>, 10th Edition. Weekday afternoon peak hour traffic volumes will be estimated using trip generation rates published for ITE land use code #220 (Multifamily Housing – Low Rise). The land will be rezoned for a planned-use development (PUD) with the proposed use specific to this land use code.

This study will not consider the effects of pass-by and internal trip reduction percentages for this site, as the only proposed use is residential.

Trip Distribution

Site generated traffic volumes will be assigned to the existing street system based on trip generation volumes from the OSU study. Traffic will be assigned to the site access point and study area intersection for analysis. Trip distribution will follow the same patterns as in the OSU Study.

Traffic Projections

Based on input received from Delaware County, opening day (2020) and design year (2040) traffic projections will be used in traffic analyses. Site-generated traffic volumes and other projected traffic will be combined with existing traffic at study area intersections to provide design volumes for analysis. Background traffic volumes (from the OSU Study) will be forecast to horizon year conditions by applying a linear growth rate of 3.0% per year (from MORPC approved growth rates for the immediate area) and evaluated for growth (non-development) related impacts.

Traffic Analyses

Intersection Capacity Analyses

Highway Capacity Software (HCS) will be used to evaluate operational characteristics of study area intersections and the roadway segments surrounding the proposed development site. Development impacts that increase average delay by more than 5 seconds (where Level of Service is D or worse) for the entire intersection require mitigation under Delaware County standards. Mitigation will be identified that restores the no-build average delay.

Traffic Signal Warrant Analysis

At the direction of the Delaware County Engineer's Office, a traffic signal warrant analysis shall not be performed for the proposed driveway entrance on Home Road. This intersection will remain unsignalized.

Queue Analyses

Turn lanes at the study intersections will be analyzed to determine if adequate storage is available based on traffic volume projections. Storage requirements will be calculated using tables provided in the Location and Design Manual § 401 (Ohio Department of Transportation, 2010). Results will be averaged with anticipated 95th percentile queues obtained from HCS reports.

Turn Lane Warrants

Left and right turn lane warrants will be evaluated at the planned access point (where public street access onto Home Road is desired) for 2040 Build conditions, based on Delaware County Engineer's Office standards.

Turn Lane Length Calculations

Lengths of all capacity driven or warranted turn lanes will be determined using storage calculations provided in the <u>Location and Design Manual</u> § 401 (Ohio Department of Transportation, 2010). The lengths will be based on the maximum volume for the 2040 Build condition for either AM or PM peak conditions.

Mr. John Piccin, PE, PS March 28, 2019 Page 3

Report Preparation

A detailed report including applicable figures and tables will be prepared to summarize study methodologies, analysis, findings and recommendations. The report will be submitted to Delaware County for review. Please signify your concurrence with the scope of work outlined herein by signing below and returning this Memorandum of Understanding to me.

Should you have questions or comments during your review or if I may be of further assistance in this matter, please contact me at (317) 547-5580 at your convenience.

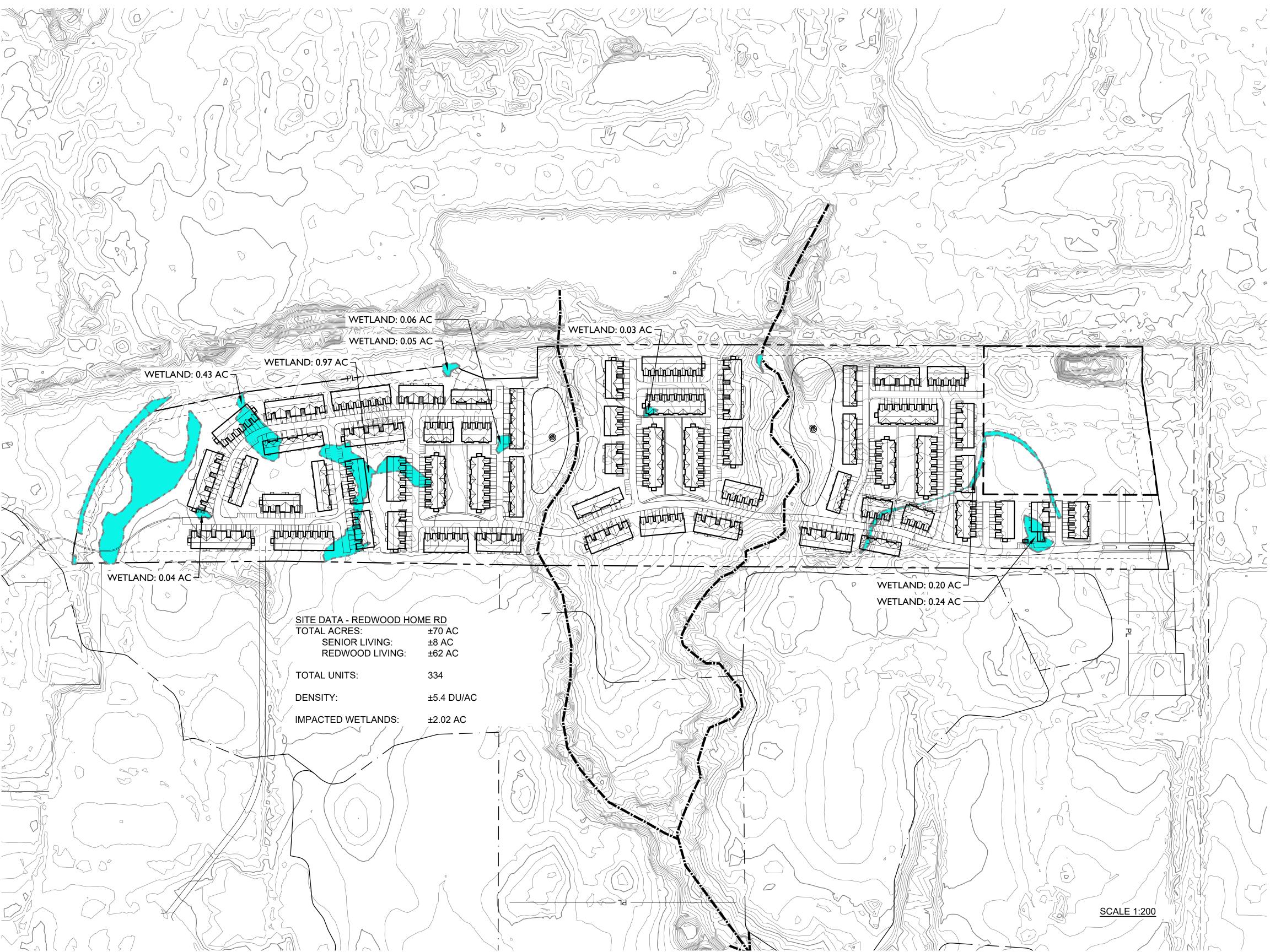
Sincerely,

Jeremy R. Chapman, PE, PhD, PTOE Senior Traffic Engineer

Enclosures: Proposed Concept Site Plan

ACCEPTANCE AND APPROVAL OF MEMORANDUM OF UNDERSTANDING

BY:	
	Delaware County Engineer's Office
DATE:	





Appendix B – Raw Traffic Data

Southen Del. Co. Ambulatory - TMC

Wed Apr 25, 2018

Full Length (4PM-6PM, 7AM-9AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

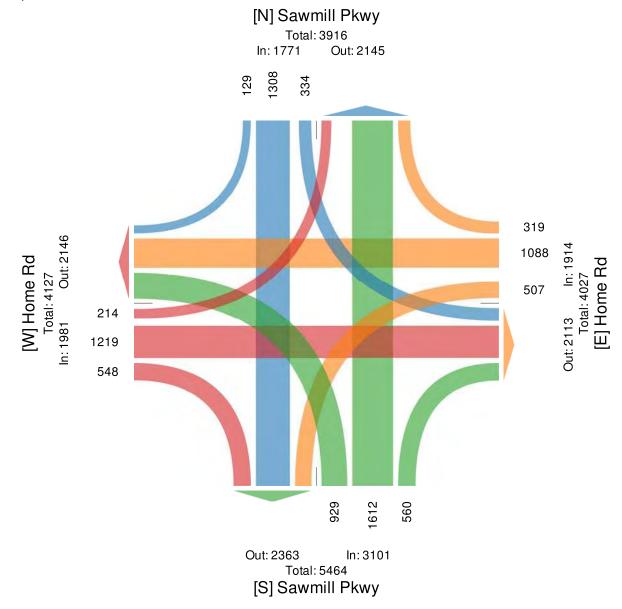
""	Home Rd Eastboun					Home Ro Westbou					Sawmill Northbo	,				Sawmill Southbo	,				
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2018-04-25 7:00AM	9	56	26	0	91	24	109	35	0	168	87	185	15	0	287	32	83	6	0	121	667
7:15AM	27	63	23	0	113	35	68	23	0	126	49	138	19	0	206	35	113	11	0	159	604
7:30AM	19	81	24	0	124	33	51	12	0	96	28	73	32	0	133	20	101	26	0	147	500
7:45AM	9	81	27	0	117	38	50	32	0	120	44	141	38	0	223	12	96	13	0	121	581
Hourly Total	64	281	100	0	445	130	278	102	0	510	208	537	104	0	849	99	393	56	0	548	2352
8:00AM	3	84	36	0	123	34	72	27	0	133	41	71	18	0	130	18	77	11	0	106	492
8:15AM	10	60	26	0	96	26	40	13	0	79	22	42	26	0	90	7	68	9	0	84	349
8:30AM	5	79	17	0	101	37	55	6	0	98	34	45	28	0	107	4	56	8	0	68	374
8:45AM	10	79	32	0	121	37	52	14	0	103	24	108	26	0	158	17	66	2	0	85	467
Hourly Total	28	302	111	0	441	134	219	60	0	4 13	121	266	98	0	485	46	267	30	0	343	1682
4:00PM	8	64	35	0	107	27	72	12	0	111	55	86	37	0	178	35	112	8	0	155	551
4:15PM	16	73	38	0	127	38	72	23	0	133	66	94	30	0	190	22	58	5	0	85	535
4:30PM	13	67	44	0	124	26	62	31	0	119	76	113	42	0	231	29	81	1	0	111	585
4:30PM 4:45PM	16	90	52	0	158	30	87	20	0	137	76	103	38	0	217	36	108	9	0	153	665
Hourly Total	53	294	169	0	516	121	293	86	0	500	273	396	147	0	816	122	359	23	0	504	2336
5:00PM 5:15PM	21	77	35	0	133	20	80	21	0	121	77	93	55	0	225	29	77	5	0	111	590
5:15PM	14	86	49	0	149	37	81	16	0	134	73	120	45	0	238	13	75	4	0	92	613
5:30PM	13	98	39	0	150	36	66	17	0	119	83	103	54	0	240	10	79	7	0	96	605
5:45PM	21	81	45	0	147	29	71	17	0	117	94	97	57	0	248	15	58	4	0	77	589
Hourly Total	69	342	168	0	579	122	298	71	0	491	327	413	211	0	951	67	289	20	0	376	2397
Total	214	1219	548	0	1981	507	1088	319	0	1914	929	1612	560	0	3101	334	1308	129	0	1771	8767
% Approach	10.8%	61.5%	27.7%	0%	-	26.5%	56.8%	16.7%)%	-	30.0%	52.0%	18.1%	0%	-	18.9%	73.9%	7.3%	0%	-	-
% Total	2.4%	13.9%	6.3%	0%	22.6%	5.8%	12.4%	3.6% ()%	21.8%	10.6%	18.4%	6.4%	0%	35.4 %	3.8%	14.9%	1.5%	0%	20.2%	-
Lights	202	1176	538	0	1916	488	1034	275	0	1797	916	1564	542	0	3022	299	1262	125	0	1686	8421
% Lights	94.4%	96.5%	98.2%	0%	96.7%	96.3%	95.0%	86.2% ()%	93.9%	98.6%	97.0%	96.8%	0%	97.5%	89.5%	96.5%	96.9%	0%	95.2%	96.1%
Articulated Trucks	0	3	2	0	5	5	8	0	0	13	0	1	4	0	5	0	0	0	0	0	23
% Articulated Trucks	0%	0.2%	0.4%	0%	0.3%	1.0%	0.7%	0% 0)%	0.7%	0%	0.1%	0.7%	0%	0.2%	0%	0%	0%	0%	0%	0.3%
Buses and Single-Unit Trucks	12	40	8	0	60	14	46	44	0	104	13	47	14	0	74	35	46	4	0	85	323
% Buses and Single-Unit Trucks	5.6%	3.3%	1.5% (0%	3.0%	2.8%	4.2%	13.8% ()%	5.4 %	1.4%	2.9%	2.5%	0%	2.4 %	10.5%	3.5%	3.1%	0%	4.8%	3.7%

^{*}L: Left, R: Right, T: Thru, U: U-Turn

Full Length (4PM-6PM, 7AM-9AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements



Wed Apr 25, 2018

AM Peak (7AM - 8AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

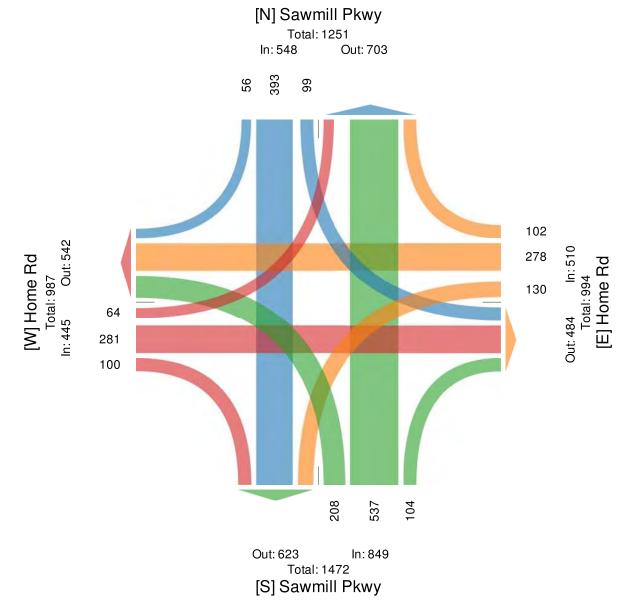
All Movements

O .	Home Ro					Home Ro					Sawmill	5				Sawmill	,				
Direction	Eastbour					Westbou					Northbo					Southbo					
Гime	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2018-04-25 7:00AM	9	56	26	0	91	24	109	35	0	168	87	185	15	0	287	32	83	6	0	121	60
7:15AM	27	63	23	0	113	35	68	23	0	126	49	138	19	0	206	35	113	11	0	159	60
7:30AM	19	81	24	0	124	33	51	12	0	96	28	73	32	0	133	20	101	26	0	147	50
7:45AM	9	81	27	0	117	38	50	32	0	120	44	141	38	0	223	12	96	13	0	121	5
Total	64	281	100	0	445	130	278	102	0	510	208	537	104	0	849	99	393	56	0	548	235
% Approach	14.4%	63.1%	22.5%	0%	-	25.5%	54.5%	20.0%	0%	-	24.5%	63.3%	12.2%	0%	-	18.1%	71.7%	10.2%	0%	-	
% Total	2.7%	11.9%	4.3%	0%	18.9%	5.5%	11.8%	4.3%	0%	21.7%	8.8%	22.8%	4.4%	0%	36.1%	4.2%	16.7%	2.4%	0%	23.3%	
PHF	0.593	0.867	0.926	-	0.897	0.855	0.638	0.729	-	0.759	0.598	0.726	0.684	-	0.740	0.707	0.869	0.538	-	0.862	0.88
Lights	59	272	98	0	429	125	262	99	0	486	205	527	98	0	830	88	369	54	0	511	22
% Lights	92.2%	96.8%	98.0%	0%	96.4%	96.2%	94.2%	97.1%	0%	95.3%	98.6%	98.1%	94.2%	0%	97.8%	88.9%	93.9%	96.4%	0%	93.2%	95.9
Articulated Trucks	0	0	0	0	0	1	5	0	0	6	0	1	2	0	3	0	0	0	0	0	
% Articulated Trucks	0%	0%	0%	0%	0 %	0.8%	1.8%	0%	0%	1.2%	0%	0.2%	1.9%	0%	0.4 %	0%	0%	0%	0%	0 %	0.4
Buses and Single-Unit Trucks	5	9	2	0	16	4	11	3	0	18	3	9	4	0	16	11	24	2	0	37	8
% Buses and Single-Unit Trucks	7.8%	3.2%	2.0%	0%	3.6%	3.1%	4.0%	2.9%	0%	3.5%	1.4%	1.7%	3.8%	0%	1.9 %	11.1%	6.1%	3.6%	0%	6.8%	3.7
L: Left, R: Right, T: Thru, U: U-T	Turn					-															-

AM Peak (7AM - 8AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements



Wed Apr 25, 2018

PM Peak (4:45PM - 5:45PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

Leg	Home R	d				Home R	d				Sawmill	Pkwy				Sawmill	Pkwy				
Dire ction	Eastbou	nd				Westbou	ınd				Northbo	und				Southbo	und				
Tim e	L	T	R	U	App	L	T	R	U	App	L	T	R	U	Арр	L	T	R	U	App	Int
2018-04-25 4:45PM	16	90	52	0	158	30	87	20	0	137	76	103	38	0	217	36	108	9	0	153	60
5:00PM	21	77	35	0	133	20	80	21	0	121	77	93	55	0	225	29	77	5	0	111	59
5:15PM	14	86	49	0	149	37	81	16	0	134	73	120	45	0	238	13	75	4	0	92	6
5:30PM	13	98	39	0	150	36	66	17	0	119	83	103	54	0	240	10	79	7	0	96	60
Total	64	351	175	0	590	123	314	74	0	511	309	419	192	0	920	88	339	25	0	452	247
% Approach	10.8%	59.5%	29.7%	0%	-	24.1%	61.4%	14.5%	0%	-	33.6%	45.5%	20.9%	0%	-	19.5%	75.0%	5.5%	0%	-	
% Total	2.6%	14.2%	7.1%	0% 23	.9%	5.0%	12.7%	3.0%	0%	20.7%	12.5%	16.9%	7.8%	0%	37.2%	3.6%	13.7%	1.0%	0%	18.3%	
PHF	0.762	0.895	0.841	- 0.	934	0.831	0.902	0.881	-	0.932	0.931	0.873	0.873	-	0.958	0.611	0.785	0.694	-	0.739	0.93
Lights	62	343	175	0	580	123	309	66	0	498	309	416	189	0	914	80	338	25	0	443	243
% Lights	96.9%	97.7%	100%	0% 98	.3%	100%	98.4%	89.2%	0%	97.5%	100%	99.3%	98.4%	0%	99.3%	90.9%	99.7%	100%	0%	98.0%	98.5
Articulate d Trucks	0	2	0	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	
% Articulated Trucks	0%	0.6%	0% (0% 0	.3%	0%	0.3%	0%	0%	0.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0 %	0.1
Buses and Single-Unit Trucks	2	6	0	0	8	0	4	8	0	12	0	3	3	0	6	8	1	0	0	9	(3)
% Buses and Single-Unit Trucks	3.1%	1.7%	0% (0% 1	4 %	0%	1.3%	10.8%	0%	2.3%	0%	0.7%	1.6%	0%	0.7%	9.1%	0.3%	0%	0%	2.0%	1.4
L: Left, R: Right, T: Thru, U: U-	Γurn		•			•					·		•			·					
, 3 ,																					

Southen Del. Co. Ambulatory - TMC

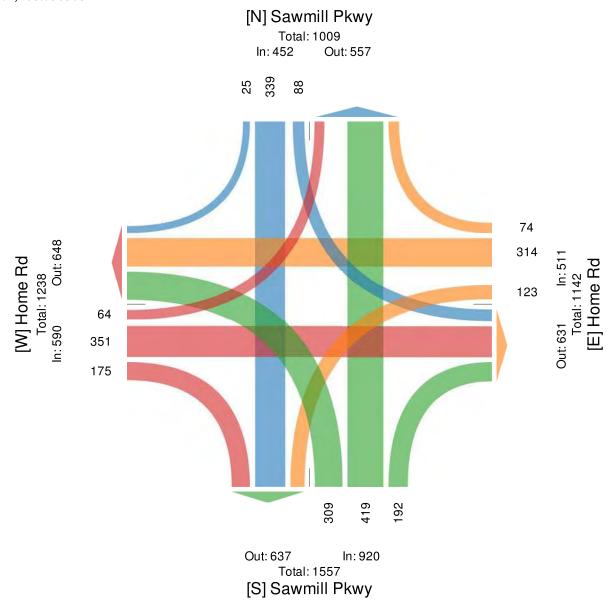
Wed Apr 25, 2018

PM Peak (4:45PM - 5:45PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 516868, Location: 40.195862, -83.096305



Page B7 of 58

Count data is 1 hour off; we used miovision but the time zone was not set to eastern...so add 1 hour to everything...for instance, the count time started at 1:00 AM, not 12:00 AM...so we have count data from 1:00 AM - 1:00 AM (24 hours).

DLZ 8430 West Bryn Mawr Avenue, Suite 100

Chicago, Illinois, United States 60631 (773) 283-2600 sslezakdlz@gmail.com

Count Name: Home Road Signal Timing Study Site Code: 10121702 Start Date: 10/12/2017 Page No: 1

Turning Movement Data

									10	irning	woven	ient Da	ala									1
				Liberty Road	I				Home Road	t				Liberty Roa	d				Home Road			
	Start Time			Southbound					Westbound	I				Northbound	d				Eastbound			
	Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
	12:00 AM	0	1	1	0	2	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	5
	12:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
	12:30 AM	0	2	0	0	2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	3
	12:45 AM	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	0	0	0	0	0	3
	Hourly Total	0	3	1	0	4	0	3	0	0	3	2	2	0	0	4	0	2	0	0	2	13
	1:00 AM	0	0	0	0	0	0	2	0	0	2	0	1	0	0	1	0	2	0	0	2	5
	1:15 AM	0	0	0	0	0	1	0	1	0	2	0	0	0	0	0	0	2	0	0	2	4
	1:30 AM	0	1	1	0	2	1	0	0	0	1	0	0	0	0	0	0	2	0	0	2	5
	1:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
	Hourly Total	0	1	1	0	2	2	2	1	0	5	0	1	1	0	2	0	6	0	0	6	15
	2:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	2:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ď	2:30 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
 Page	2:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
B48	Hourly Total	0	0	1	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	3
	3:00 AM	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	0	1	1	0	2	5
of (3:15 AM	0	0	0	0	0	0	2	0	0	2	0	1	1	0	2	0	3	0	0	3	7
58	3:30 AM	0	0	0	0	0	0	2	0	0	2	1	1	1	0	3	2	2	0	0	4	9
	3:45 AM	1	0	1	0	2	0	5	0	0	5	1	0	3	0	4	0	4	0	0	4	15
	Hourly Total	1	1	1	0	3	0	9	1	0	10	2	3	5	0	10	2	10	1	0	13	36
	4:00 AM	0	2	0	0	2	0	10	3	0	13	0	0	2	0	2	2	8	0	0	10	27
	4:15 AM	0	1	3	0	4	2	10	1	0	13	0	1	0	0	1	1	9	0	0	10	28
	4:30 AM	0	3	4	0	7	0	7	3	0	10	5	1	3	0	9	2	14	0	0	16	42
	4:45 AM	0	4	2	0	6	1	10	0	0	11	2	1	2	0	5	2	14	0	0	16	38
	Hourly Total	0	10	9	0	19	3	37	7	0	47	7	3	7	0	17	7	45	0	0	52	135
	5:00 AM	2	5	4	0	11	1	12	2	0	15	3	8	5	0	16	7	30	1	0	38	80
	5:15 AM	2	6	7	0	15	1	28	3	0	32	4	9	4	0	17	3	30	1	0	34	98
	5:30 AM	2	9	11	0	22	2	55	4	0	61	5	14	12	0	31	8	46	2	0	56	170
	5:45 AM	2	26	8	0	36	1	79	9	0	89	19	11	81	0	111	14	60	2	0	76	312
	Hourly Total	8	46	30	0	84	5	174	18	0	197	31	42	102	0	175	32	166	6	0	204	660
	6:00 AM	4	30	7	0	41	6	82	13	0	101	10	22	81	0	113	25	70	6	0	101	356
	6:15 AM	9	30	5	0	44	2	96	14	0	112	8	19	10	0	37	32	100	11	0	143	336
	6:30 AM	10	44	7	0	61	3	68	25	0	96	18	25	21	0	64	16	80	10	0	106	327
	6:45 AM	15	35	2	0	52	5	93	20	0	118	18	27	37	0	82	22	90	9	0	121	373
	Hourly Total	38	139	21	0	198	16	339	72	0	427	54	93	149	0	296	95	340	36	0	471	1392
	7:00 AM	2	22	3	0	27	4	77	19	0	100	17	27	17	0	61	21	91	5	0	117	305
	7:15 AM	2	33	6	0	41	3	88	11	0	102	12	13	14	0	39	6	62	2	0	70	252
	7:30 AM	11	34	12	0	57	3	87	14	0	104	12	13	5	0	30	16	76	4	0	96	287
	7:45 AM	8	31	7	0	46	3	77	19	0	99	19	13	10	0	42	20	82	3	0	105	292
	Hourly Total	23	120	28	0	171	13	329	63	0	405	60	66	46	0	172	63	311	14	0	388	1136
	8:00 AM	6	19	5	0	30	3	81	30	0	114	14	17	20	0	51	24	61	3	0	88	283

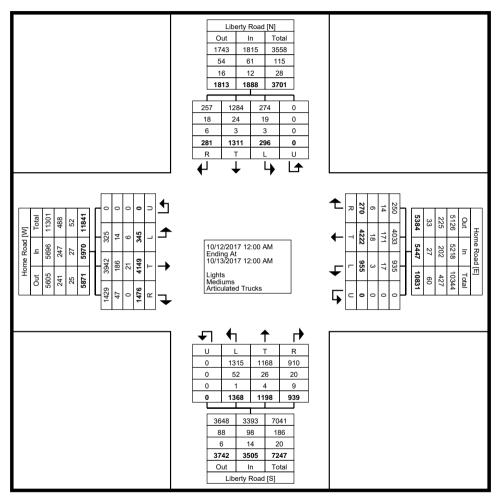
	8:15 AM	6	20	5	0	31	4	71	20	0	95	12	14	9	0	35	12	67	3	0	82	243
	8:30 AM	2	13	10	0	25	2	55	8	0	65	12	14	5	0	31	11	66	2	0	79	200
_	8:45 AM	5	20	10	0	35	4	52	14	0	70	15	16	12	0	43	9	63	6	0	78	226
	Hourly Total	19	72	30	0	121	13	259	72	0	344	53	61	46	0	160	56	257	14	0	327	952
	9:00 AM	0	20	6	0	26	5	34	17	0	56	8	12	9	0	29	5	47	0	0	52	163
	9:15 AM	3	7	2	0	12	5	54	14	0	73	8	14	10	0	32	15	52	3	0	70	187
	9:30 AM	3	7	5	0	15	3	40	16	0	59	12	8	9	0	29	11	56	2	0	69	172
	9:45 AM	2	10	0	0	12	1	42	8	0	51	17	13	13	0	43	14	50	5	0	69	175
	Hourly Total	8	44	13	0	65	14	170	55	0	239	45	47	41	0	133	45	205	10	0	260	697
_	10:00 AM	1	14	2	0	17	2	50	12	0	64	17	8	5	0	30	5	56	5	0	66	177
	10:15 AM	2	17	1	0	20	5	45	10	0	60	13	14	13	0	40	12	58	1	0	71	191
	10:30 AM	4	18	4	0	26	2	56	14	0	72	13	17	14	0	44	16	62	1	0	79	221
	10:45 AM	6	16	6	0	28	7	56	15	0	78	14	16	12	0	42	15	43	4	0	62	210
		13	65	13	0	91	16	207	51	0	274	57	55	44	0	156	48	219	11	0	278	799
	Hourly Total					•					•										•	
	11:00 AM	7	11	2	0	20	3	53	6	0	62	10	12	10	0	32	23	57	4	0	84	198
	11:15 AM	5	20	4	0	29	4	55	12	0	71	18	20	9	0	47	15	57	4	0	76	223
	11:30 AM	3	17	3	0	23	5	59	13	0	. 77	13	11	15	0	39	18	64	4	0	86	225
_	11:45 AM	4	9	2	0	15	8	61	9	0	78	12	14	10	0	36	11	51	10	0	72	201
	Hourly Total	19	57	11	0	87	20	228	40	0	288	53	57	44	0	154	67	229	22	0	318	847
	12:00 PM	7	16	4	0	27	4	53	12	0	69	13	17	16	0	46	26	80	7	0	113	255
	12:15 PM	3	14	6	0	23	2	47	10	0	59	18	14	9	0	41	12	53	1	0	66	189
	12:30 PM	4	13	4	0	21	7	57	12	0	76	17	8	10	0	35	13	73	4	0	90	222
	12:45 PM	3	12	6	0	21	2	61	12	0	75	5	12	8	0	25	30	77	6	0	113	234
Ţ	Hourly Total	17	55	20	0	92	15	218	46	0	279	53	51	43	0	147	81	283	18	0	382	900
age	1:00 PM	2	9	6	0	17	4	52	11	0	67	13	16	13	0	42	23	61	7	0	91	217
	1:15 PM	3	17	4	0	24	3	64	4	0	71	7	24	25	0	56	12	57	5	0	74	225
B49	1:30 PM	4	25	4	0	33	7	65	12	0	84	15	14	20	0	49	22	71	8	0	101	267
으	1:45 PM	1	16	4	0	21	4	50	14	0	68	17	17	21	0	55	59	96	10	0	165	309
58	Hourly Total	10	67	18	0	95	18	231	41	0	290	52	71	79	0	202	116	285	30	0	431	1018
-	2:00 PM	7	27	6	0	40	3	56	24	0	83	16	20	15	0	51	20	51	8	0	79	253
	2:15 PM	4	12	4	0	20	12	87	17	0	116	18	29	24	0	71	22	69	4	0	95	302
	2:30 PM	4	32	3	0	39	4	76	21	0	101	25	17	8	0	50	24	75	6	0	105	295
	2:45 PM	0	27	5	0	32	6	80	14	0	100	17	23	22	0	62	21	70	6	0	97	291
_		15	98	18	0		25	299	76	0	400	76	89	69	0	234	87	265	24	0	376	
_	Hourly Total			6		131			-							-					-	1141
	3:00 PM	4	29		0	39	5	76	23	0	104	11	33	32	0	76	18	68	11	0	97	316
	3:15 PM	9	28	6	0	43	10	107	20	0	137	11	21	29	0	61	22	93	3	0	118	359
	3:30 PM	10	35	5	0	50	5	86	23	0	114	24	31	32	0	87	44	84	9	0	137	388
_	3:45 PM	8	36	7	0	51	2	105	35	0	142	17	40	34	0	91	57	104	8	0	169	453
_	Hourly Total	31	128	24	0	183	22	374	101	0	497	63	125	127	0	315	141	349	31	0	521	1516
	4:00 PM	5	39	3	0	47	7	116	27	0	150	14	30	41	0	85	47	99	5	0	151	433
	4:15 PM	10	46	3	0	59	4	117	22	0	143	14	40	61	0	115	48	96	16	0	160	477
	4:30 PM	7	31	1	0	39	5	112	21	0	138	12	21	33	0	66	54	101	6	0	161	404
_	4:45 PM	10	39	4	0	53	6	117	37	0	160	20	31	56	0	107	56	62	10	0	128	448
	Hourly Total	32	155	11	0	198	22	462	107	0	591	60	122	191	0	373	205	358	37	0	600	1762
				•	0	50	5	90	28	0	123	19	23	44	0	86	62	61	12	0	135	394
	5:00 PM	5	36	9																		
	5:00 PM 5:15 PM	5 3	36 31	4	0	38	6	115	16	0	137	27	34	36	0	97	45	66	7	0	118	390
	t					•	6 4	115 55	16 15	0	137 74	27 22	34 34	36 32	0	97 88	45 23	66 68	7	0	118 94	390 283
	5:15 PM	3	31	4	0	38															_	
	5:15 PM 5:30 PM 5:45 PM	3	31 21	4 3	0	38 27	4	55	15	0	74	22	34	32	0	88	23	68	3	0	94	283 294
Ι	5:15 PM 5:30 PM 5:45 PM Hourly Total	3 3 4	31 21 19 107	4 3 4	0 0	38 27 27 142	4 5	55 71 331	15 22	0	74 98	22 32 100	34 20 111	32 34	0 0 0	88 86	23 29	68 49 244	3 5 27	0 0 0	94 83	283 294 1361
1	5:15 PM 5:30 PM 5:45 PM Hourly Total 6:00 PM	3 3 4 15 7	31 21 19 107 13	4 3 4 20 2	0 0 0 0	38 27 27 142 22	4 5 20 3	55 71 331 60	15 22 81 28	0 0 0 0	74 98 432 91	22 32 100 12	34 20 111 24	32 34 146 30	0 0 0	88 86 357 66	23 29 159 56	68 49 244 88	3 5 27 12	0 0 0 0	94 83 430 156	283 294 1361 335
I	5:15 PM 5:30 PM 5:45 PM Hourly Total	3 3 4 15	31 21 19 107	4 3 4 20	0 0 0	38 27 27 142	4 5 20	55 71 331	15 22 81	0 0 0	74 98 432	22 32 100	34 20 111	32 34 146	0 0 0	88 86 357	23 29 159	68 49 244	3 5 27	0 0 0	94 83 430	283 294 1361

_	6:45 PM	1	9	3	0	13	2	49	7	0	58	12	14	32	0	58	17	44	5	0	66	195
	Hourly Total	19	46	8	0	73	15	205	65	0	285	90	81	135	0	306	159	284	39	0	482	1146
	7:00 PM	1	15	1	0	17	2	42	7	0	51	8	9	27	0	44	14	38	3	0	55	167
	7:15 PM	0	12	2	0	14	4	35	6	0	45	7	18	10	0	35	21	42	2	0	65	159
	7:30 PM	2	11	1	0	14	0	34	4	0	38	10	15	6	0	31	16	33	5	0	54	137
_	7:45 PM	0	6	0	0	6	3	27	8	0	38	5	11	7	0	23	4	25	1	0	30	97
	Hourly Total	3	44	4	0	51	9	138	25	0	172	30	53	50	0	133	55	138	11	0	204	560
	8:00 PM	1	8	2	0	11	5	31	6	0	42	9	8	7	0	24	13	33	2	0	48	125
	8:15 PM	0	9	2	0	11	4	36	7	0	47	15	13	13	0	41	14	25	1	0	40	139
	8:30 PM	0	4	5	0	9	1	29	7	0	37	6	4	4	0	14	8	21	2	0	31	91
	8:45 PM	2	7	2	0	11	2	15	0	0	17	7	5	0	0	12	2	4	2	0	8	48
	Hourly Total	3	28	11	0	42	12	111	20	0	143	37	30	24	0	91	37	83	7	0	127	403
_	9:00 PM	2	5	1	0	8	1	25	1	0	27	1	7	3	0	11	2	13	2	0	17	63
	9:15 PM	2	2	0	0	4	1	11	4	0	16	2	9	3	0	14	5	7	0	0	12	46
	9:30 PM	0	3	0	0	3	0	8	2	0	10	1	10	5	0	16	5	13	0	0	18	47
_	9:45 PM	2	5	0	0	7	0	8	0	0	8	1	2	3	0	6	0	6	1	0	7	28
	Hourly Total	6	15	1	0	22	2	52	7	0	61	5	28	14	0	47	12	39	3	0	54	184
	10:00 PM	0	3	0	0	3	2	9	1	0	12	3	3	0	0	6	3	7	2	0	12	33
	10:15 PM	0	1	0	0	1	3	11	0	0	14	2	0	0	0	2	2	4	0	0	6	23
	10:30 PM	1	3	0	0	4	0	6	3	0	9	2	1	2	0	5	1	6	0	0	7	25
	10:45 PM	0	1	1	0	2	1	5	2	0	8	1	1	0	0	2	0	5	0	0	5	17
	Hourly Total	1	8	1	0	10	6	31	6	0	43	8	5	2	0	15	6	22	2	0	30	98
	11:00 PM	0	2	0	0	2	1	5	0	0	6	0	1	1	0	2	0	4	0	0	4	14
D	11:15 PM	0	0	0	0	0	1	3	0	0	4	1	0	2	0	3	1	5	1	0	7	14
Page	11:30 PM	0	0	1	0	1	0	3	0	0	3	0	0	0	0	0	2	0	0	0	2	6
	11:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	2
B50	Hourly Total	0	2	1	0	3	2	12	0	0	14	1	1	3	0	5	3	9	2	0	14	36
앜_	Grand Total	281	1311	296	0	1888	270	4222	955	0	5447	939	1198	1368	0	3505	1476	4149	345	0	5970	16810
58	Approach %	14.9	69.4	15.7	0.0	-	5.0	77.5	17.5	0.0	-	26.8	34.2	39.0	0.0	_	24.7	69.5	5.8	0.0	-	-
	Total %	1.7	7.8	1.8	0.0	11.2	1.6	25.1	5.7	0.0	32.4	5.6	7.1	8.1	0.0	20.9	8.8	24.7	2.1	0.0	35.5	-
	Lights	257	1284	274	0	1815	250	4033	935	0	5218	910	1168	1315	0	3393	1429	3942	325	0	5696	16122
	% Lights	91.5	97.9	92.6	-	96.1	92.6	95.5	97.9	-	95.8	96.9	97.5	96.1	-	96.8	96.8	95.0	94.2	-	95.4	95.9
	Mediums	18	24	19	0	61	14	171	17	0	202	20	26	52	0	98	47	186	14	0	247	608
	% Mediums	6.4	1.8	6.4	-	3.2	5.2	4.1	1.8	-	3.7	2.1	2.2	3.8	-	2.8	3.2	4.5	4.1	-	4.1	3.6
	Articulated Trucks	6	3	3	0	12	6	18	3	0	27	9	4	1	0	14	0	21	6	0	27	80
_	% Articulated Trucks	2.1	0.2	1.0	-	0.6	2.2	0.4	0.3	-	0.5	1.0	0.3	0.1	-	0.4	0.0	0.5	1.7	-	0.5	0.5

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Count Name: Home Road Signal Timing Study Site Code: 10121702 Start Date: 10/12/2017 Page No: 4



Turning Movement Data Plot

DLZ 8430 West Bryn Mawr Avenue, Suite 100

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Count Name: Home Road Signal Timing Study Site Code: 10121702 Start Date: 10/12/2017 Page No: 5

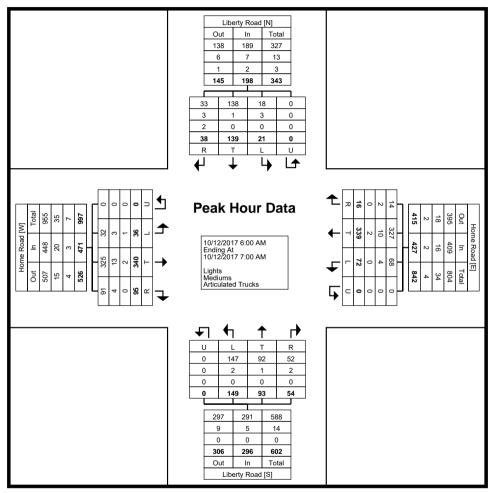
Turning Movement Peak Hour Data (6:00 AM)

	i	i							,				(٠,							1
				Liberty Road	d				Home Road					Liberty Road	i				Home Road			İ
	Start Time			Southbound	t				Westbound					Northbound					Eastbound			ĺ
_	Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
	6:00 AM	4	30	7	0	41	6	82	13	0	101	10	22	81	0	113	25	70	6	0	101	356
	6:15 AM	9	30	5	0	44	2	96	14	0	112	8	19	10	0	37	32	100	11	0	143	336
	6:30 AM	10	44	7	0	61	3	68	25	0	96	18	25	21	0	64	16	80	10	0	106	327
	6:45 AM	15	35	2	0	52	5	93	20	0	118	18	27	37	0	82	22	90	9	0	121	373
	Total	38	139	21	0	198	16	339	72	0	427	54	93	149	0	296	95	340	36	0	471	1392
	Approach %	19.2	70.2	10.6	0.0	-	3.7	79.4	16.9	0.0	-	18.2	31.4	50.3	0.0	-	20.2	72.2	7.6	0.0	-	-
	Total %	2.7	10.0	1.5	0.0	14.2	1.1	24.4	5.2	0.0	30.7	3.9	6.7	10.7	0.0	21.3	6.8	24.4	2.6	0.0	33.8	-
	PHF	0.633	0.790	0.750	0.000	0.811	0.667	0.883	0.720	0.000	0.905	0.750	0.861	0.460	0.000	0.655	0.742	0.850	0.818	0.000	0.823	0.933
	Lights	33	138	18	0	189	14	327	68	0	409	52	92	147	0	291	91	325	32	0	448	1337
	% Lights	86.8	99.3	85.7	-	95.5	87.5	96.5	94.4	-	95.8	96.3	98.9	98.7	-	98.3	95.8	95.6	88.9	_	95.1	96.0
ַ	Mediums	3	1	3	0	7	2	10	4	0	16	2	1	2	0	5	4	13	3	0	20	48
age	% Mediums	7.9	0.7	14.3	-	3.5	12.5	2.9	5.6	-	3.7	3.7	1.1	1.3	-	1.7	4.2	3.8	8.3	-	4.2	3.4
ω_	Articulated Trucks	2	0	0	0	2	0	2	0	0	2	0	0	0	0	0	0	2	1	0	3	7
52	% Articulated Trucks	5.3	0.0	0.0	-	1.0	0.0	0.6	0.0	-	0.5	0.0	0.0	0.0	-	0.0	0.0	0.6	2.8	-	0.6	0.5
10	70 Articulated Trucks	5.5	0.0	0.0		1.0	0.0	0.0	0.0		0.5	0.0	0.0	0.0		0.0	0.0	0.0			0.0	0.5

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Count Name: Home Road Signal Timing Study Site Code: 10121702 Start Date: 10/12/2017 Page No: 6



Turning Movement Peak Hour Data Plot (6:00 AM)

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Count Name: Home Road Signal Timing Study Site Code: 10121702 Start Date: 10/12/2017 Page No: 7

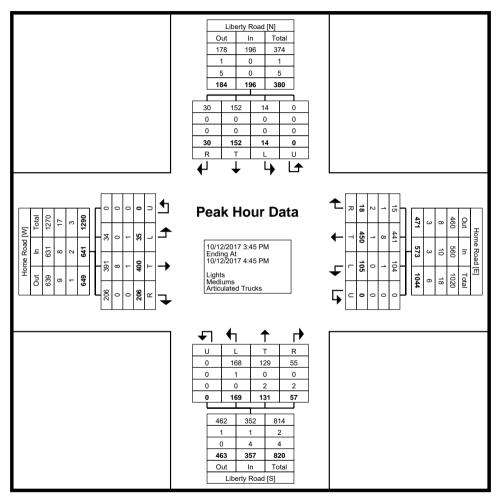
Turning Movement Peak Hour Data (3:45 PM)

						_	,				`		,							
		Liberty Road	d				Home Road					Liberty Road	t				Home Road			i
		Southbound	i				Westbound					Northbound					Eastbound			i
Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
8	36	7	0	51	2	105	35	0	142	17	40	34	0	91	57	104	8	0	169	453
5	39	3	0	47	7	116	27	0	150	14	30	41	0	85	47	99	5	0	151	433
10	46	3	0	59	4	117	22	0	143	14	40	61	0	115	48	96	16	0	160	477
7	31	1	0	39	5	112	21	0	138	12	21	33	0	66	54	101	6	0	161	404
30	152	14	0	196	18	450	105	0	573	57	131	169	0	357	206	400	35	0	641	1767
15.3	77.6	7.1	0.0	-	3.1	78.5	18.3	0.0	-	16.0	36.7	47.3	0.0	-	32.1	62.4	5.5	0.0	-	-
1.7	8.6	0.8	0.0	11.1	1.0	25.5	5.9	0.0	32.4	3.2	7.4	9.6	0.0	20.2	11.7	22.6	2.0	0.0	36.3	-
0.750	0.826	0.500	0.000	0.831	0.643	0.962	0.750	0.000	0.955	0.838	0.819	0.693	0.000	0.776	0.904	0.962	0.547	0.000	0.948	0.926
30	152	14	0	196	15	441	104	0	560	55	129	168	0	352	206	391	34	0	631	1739
100.0	100.0	100.0	-	100.0	83.3	98.0	99.0	-	97.7	96.5	98.5	99.4	-	98.6	100.0	97.8	97.1	-	98.4	98.4
0	0	0	0	0	1	8	1	0	10	0	0	1	0	1	0	8	0	0	8	19
0.0	0.0	0.0	-	0.0	5.6	1.8	1.0	-	1.7	0.0	0.0	0.6	-	0.3	0.0	2.0	0.0	-	1.2	1.1
0	0	0	0	0	2	1	0	0	3	2	2	0	0	4	0	1	1	0	2	9
0.0	0.0	0.0	-	0.0	11.1	0.2	0.0	-	0.5	3.5	1.5	0.0	-	1.1	0.0	0.3	2.9	-	0.3	0.5
	8 5 10 7 30 15.3 1.7 0.750 30 100.0 0 0.0 0	8 36 5 39 10 46 7 31 30 152 15.3 77.6 1.7 8.6 0.750 0.826 30 152 100.0 100.0 0 0 0 0	Right Thru Left 8 36 7 5 39 3 10 46 3 7 31 1 30 152 14 15.3 77.6 7.1 1.7 8.6 0.8 0.750 0.826 0.500 30 152 14 100.0 100.0 100.0 0 0 0 0.0 0.0 0.0 0 0 0 0 0 0 0 0 0	8 36 7 0 5 39 3 0 10 46 3 0 7 31 1 0 30 152 14 0 15.3 77.6 7.1 0.0 1.7 8.6 0.8 0.0 0.750 0.826 0.500 0.000 30 152 14 0 100.0 100.0 - - 0 0 0 0 0.0 0.0 - - 0 0 0 0	Southbound Right Thru Left U-Turn App. Total 8 36 7 0 51 5 39 3 0 47 10 46 3 0 59 7 31 1 0 39 30 152 14 0 196 15.3 77.6 7.1 0.0 - 1.7 8.6 0.8 0.0 11.1 0.750 0.826 0.500 0.000 0.831 30 152 14 0 196 100.0 100.0 100.0 - 100.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Southbound Right Thru Left U-Turn App. Total Right 8 36 7 0 51 2 5 39 3 0 47 7 10 46 3 0 59 4 7 31 1 0 39 5 30 152 14 0 196 18 15.3 77.6 7.1 0.0 - 3.1 1.7 8.6 0.8 0.0 11.1 1.0 0.750 0.826 0.500 0.000 0.831 0.643 30 152 14 0 196 15 100.0 100.0 100.0 - 100.0 83.3 0 0 0 0 0 1 0.0 0 0 0 0 5.6 0 0 0 0 0 2	Liberty Road Southbound Right Thru Left U-Turn App. Total Right Thru 8 36 7 0 51 2 105 5 39 3 0 47 7 116 10 46 3 0 59 4 117 7 31 1 0 39 5 112 30 152 14 0 196 18 450 15.3 77.6 7.1 0.0 - 3.1 78.5 1.7 8.6 0.8 0.0 11.1 1.0 25.5 0.750 0.826 0.500 0.000 0.831 0.643 0.962 30 152 14 0 196 15 441 100.0 100.0 100.0 - 100.0 83.3 98.0 0 0 0 0 0 1 8	Southbound Westbound Right Thru Left U-Turn App. Total Right Thru Left 8 36 7 0 51 2 105 35 5 39 3 0 47 7 116 27 10 46 3 0 59 4 117 22 7 31 1 0 39 5 112 21 30 152 14 0 196 18 450 105 15.3 77.6 7.1 0.0 - 3.1 78.5 18.3 1.7 8.6 0.8 0.0 11.1 1.0 25.5 5.9 0.750 0.826 0.500 0.000 0.831 0.643 0.962 0.750 30 152 14 0 196 15 441 104 100.0 100.0 100.0 8	Liberty Road Southbound Home Road Westbound Right Thru Left U-Turn App. Total Right Thru Left U-Turn 8 36 7 0 51 2 105 35 0 5 39 3 0 47 7 116 27 0 10 46 3 0 59 4 117 22 0 7 31 1 0 39 5 112 21 0 30 152 14 0 196 18 450 105 0 15.3 77.6 7.1 0.0 - 3.1 78.5 18.3 0.0 1.7 8.6 0.8 0.0 11.1 1.0 25.5 5.9 0.0 0.750 0.826 0.500 0.000 0.831 0.643 0.962 0.750 0.000 30 152 14 </th <th>Liberty Road Southbound Home Road Westbound Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total 8 36 7 0 51 2 105 35 0 142 5 39 3 0 47 7 116 27 0 150 10 46 3 0 59 4 117 22 0 143 7 31 1 0 39 5 112 21 0 138 30 152 14 0 196 18 450 105 0 573 15.3 77.6 7.1 0.0 - 3.1 78.5 18.3 0.0 - 1.7 8.6 0.8 0.0 11.1 1.0 25.5 5.9 0.0 32.4 0.750 0.826 0.500 0.000 0.831</th> <th>Liberty Road Southbound Home Road Westbound Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total Right 8 36 7 0 51 2 105 35 0 142 17 5 39 3 0 47 7 116 27 0 150 14 10 46 3 0 59 4 117 22 0 143 14 7 31 1 0 39 5 112 21 0 138 12 30 152 14 0 196 18 450 105 0 573 57 15.3 77.6 7.1 0.0 - 3.1 78.5 18.3 0.0 - 16.0 1.7 8.6 0.8 0.0 11.1 1.0 25.5 5.9 0.0</th> <th>Liberty Road Southbound Home Road Westbound Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total Right Thru 8 36 7 0 51 2 105 35 0 142 17 40 5 39 3 0 47 7 116 27 0 150 14 30 10 46 3 0 59 4 117 22 0 143 14 40 7 31 1 0 39 5 112 21 0 138 12 21 30 152 14 0 196 18 450 105 0 573 57 131 15.3 77.6 7.1 0.0 - 3.1 78.5 18.3 0.0 - 16.0 36.7 1.7 8.6 <</th> <th> Liberty Road Southbound Right Thru Left U-Turn App. Total Thru Left U-Turn Left U-Turn App. Total Thru Left U-Turn App. Total Thru Left U-Turn App. Total Thru Left U-Turn Thru Left Thru Left Thru Left U-Turn Thru Left Thru Left</th> <th> Liberty Road Southbound Northbound N</th> <th> Right Thru Left U-Turn App. Total App. Total Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total App. Total Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total App. Total App. Total Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total App</th> <th> Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total Thru U</th> <th> Right Thru Left U-Turn App. Total Right Thru Left U-Turn Left U-Turn App. Total Right Thru U-Turn App. Total Right Thru U-Turn App. Total Thru Left U-Turn App. Total Right Thru U-Turn App. Total Thru U-Turn D.GT /th> <th> Liberty Road Southbound Right Thru Left U-Turn App. Total Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total Thru</th> <th> Right Thru</th> <th> Right Thru Left U-Turn App. Total /th>	Liberty Road Southbound Home Road Westbound Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total 8 36 7 0 51 2 105 35 0 142 5 39 3 0 47 7 116 27 0 150 10 46 3 0 59 4 117 22 0 143 7 31 1 0 39 5 112 21 0 138 30 152 14 0 196 18 450 105 0 573 15.3 77.6 7.1 0.0 - 3.1 78.5 18.3 0.0 - 1.7 8.6 0.8 0.0 11.1 1.0 25.5 5.9 0.0 32.4 0.750 0.826 0.500 0.000 0.831	Liberty Road Southbound Home Road Westbound Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total Right 8 36 7 0 51 2 105 35 0 142 17 5 39 3 0 47 7 116 27 0 150 14 10 46 3 0 59 4 117 22 0 143 14 7 31 1 0 39 5 112 21 0 138 12 30 152 14 0 196 18 450 105 0 573 57 15.3 77.6 7.1 0.0 - 3.1 78.5 18.3 0.0 - 16.0 1.7 8.6 0.8 0.0 11.1 1.0 25.5 5.9 0.0	Liberty Road Southbound Home Road Westbound Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total Right Thru 8 36 7 0 51 2 105 35 0 142 17 40 5 39 3 0 47 7 116 27 0 150 14 30 10 46 3 0 59 4 117 22 0 143 14 40 7 31 1 0 39 5 112 21 0 138 12 21 30 152 14 0 196 18 450 105 0 573 57 131 15.3 77.6 7.1 0.0 - 3.1 78.5 18.3 0.0 - 16.0 36.7 1.7 8.6 <	Liberty Road Southbound Right Thru Left U-Turn App. Total Thru Left U-Turn Left U-Turn App. Total Thru Left U-Turn App. Total Thru Left U-Turn App. Total Thru Left U-Turn Thru Left Thru Left Thru Left U-Turn Thru Left Thru Left	Liberty Road Southbound Northbound N	Right Thru Left U-Turn App. Total App. Total Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total App. Total Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total App. Total App. Total Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total App	Right Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total Thru U	Right Thru Left U-Turn App. Total Right Thru Left U-Turn Left U-Turn App. Total Right Thru U-Turn App. Total Right Thru U-Turn App. Total Thru Left U-Turn App. Total Right Thru U-Turn App. Total Thru U-Turn D.GT Thru U-Turn D.GT	Liberty Road Southbound Right Thru Left U-Turn App. Total Thru Left U-Turn App. Total Right Thru Left U-Turn App. Total Thru	Right Thru	Right Thru Left U-Turn App. Total Thru Left U-Turn App. Total Thru Left U-Turn App. Total Thru Left U-Turn App. Total

DLZ 8430 West Bryn Mawr Avenue, Suite 100

Chicago, Illinois, United States 60631 (773) 283-2600 sslezakdlz@gmail.com

Count Name: Home Road Signal Timing Study Site Code: 10121702 Start Date: 10/12/2017 Page No: 8



Turning Movement Peak Hour Data Plot (3:45 PM)



Appendix C – Trip Generation

Project Information 2018.01836 Redwood Home Road TIS -Project Name: Opening Year (Phase 1) No: 2018.01836 Date: 7/3/2019 City: Delaware State/Province: Ohio Zip/Postal Code: 43015 Country: **United States** Client Name: Redwood Acquisitions American Structurepoint Analyst's Name:

Edition: American Structurepoint Trip Generation Manual, 10th Ed

Land Use	Size	Initial Build -	Initial Build -	al Build - PM Peak		
Land Ose	Size	Entry	Exit	Entry	Exit	
220 - Multifamily Housing (Low-Rise) (General Urban/Suburban)	100 Dwelling Units	11	37	37	22	
Reduction		0	0	0	0	
Internal		0	0	0	0	
Pass-by		0	0	0	0	
Non-pass-by		11	37	37	22	
Total		11	37	37	22	
Total Reduction		0	0	0	0	
Total Internal		0	0	0	0	
Total Pass-by		0	0	0	0	
Total Non-pass-by		11	37	37	22	

Project Information 2018.01836 Redwood Home Road TIS -Project Name: Horizon Year (Phases 1-3) 2018.01836 No: Date: 7/3/2019 City: Delaware State/Province: Ohio Zip/Postal Code: 43015 United States Country: Client Name: Redwood Acquisitions Analyst's Name: American Structurepoint Edition: Trip Generation Manual, 10th Ed

Land Use	Size	Full Build -	AM Peak	Full Build - PM Peak		
Land Ose	Size	Entry	Exit	Entry	Exit	
220 - Multifamily Housing (Low-Rise)		35	115	109	64	
(General Urban/Suburban)	334 Dwelling Units	35	115	109	04	
Reduction		0	0	0	0	
Internal		0	0	0	0	
Pass-by		0	0	0	0	
Non-pass-by		35	115	109	64	
Total		35	115	109	64	
Total Reduction		0	0	0	0	
Total Internal		0	0	0	0	
Total Pass-by		0	0	0	0	
Total Non-pass-by		35	115	109	64	



Appendix D – Capacity Analysis Results

HCS7 Signalized Intersection Results Summary																		
													,					
General Inform						Interse	ction	Info	rmatio	n		1111 4741	<u> </u>					
Agency American Structurepoint									Duratio	n, h		0.25		2++4				
Analyst SBG					Analysis Date Jul 8, 2019							Other		△		<u>*</u> _ }_		
Jurisdiction		Delaware County, 0	HC	Time F	Period	AM P	eak		PHF			0.92		\$ *	w∯t	←		
Urban Street Home Rd				Analys	sis Yea	build	- 2020 f (With ments)	Vo-	Analysi	nalysis Period 1> 7:00								
Intersection		Home Rd & Sawmi	ll Pkwy	File Na	ame	Sc1A	_Int 1 &	2_AN	1.xus									
Project Descrip	tion	Redwood Home Ro	d TIS												_			
Demand Inform	nation				EB			W	'B			NB			SB			
Approach Move	ement			L	Т	R	L	1	R		L	Т	R	L	Т	R		
Demand (v), v				130	314	106	171	32	23 14	7 2	20	711	136	116	448	68		
Signal Informa	tion					5					II:							
		Deference Dhase		-	ر فيا	<u>ا</u>	Ħ.,,	Ħ	20	2	11/2		_	7	< ,	▲ □		
Cycle, s	100.0	Reference Phase	2	-	"	"	ˈ =] '	ٔ ا	۱ ۱	191	"	7	1	\ 2	3	4		
Offset, s	79	Reference Point	Begin	Green		0.7	29.7	7.5			2.5			<u> </u>	I L			
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	3.9			.8	`_			7_	V		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.6	0.0	1.0	2.2	2 2.2	2 1	.0		5	6	7	8		
Timer Results				EBI		EBT	WB	L	WBT	1	NBL		NBT	SBI		SBT		
Assigned Phase	e			5		2	1		6		3		8	7		4		
Case Number				1.1		4.0	1.1		3.0		1.1	4.0		1.1		3.0		
Phase Duration	1. S			13.8	3	35.9	14.5	5	36.6	2	1.3	1.3 36.0		13.6		28.3		
Change Period	·	c). S		6.5		6.2	6.5		6.2		3.1	_	5.8		6.1			
Max Allow Head		,		4.0		0.0	4.0	_	0.0		1.0	4.0		4.0		5.8 4.0		
Queue Clearan				7.4			9.9				1.4		25.7	7.3		14.3		
Green Extension		, - ,		0.0		0.0	0.0		0.0		0.3		2.5	0.0		3.8		
Phase Call Pro		(0)		1.00)		1.00)		1	1.00		1.00	1.00		1.00		
Max Out Proba	bility			1.00)		1.00)		1	.00	(0.93	1.00)	0.58		
Movement Gro	un Pos	eulte			EB			WE	2			NB			SB			
Approach Move	•	Juito		L	T	R	L	T	R	L	Т	T	R	L	T	R		
Assigned Move				5	2	12	1	6	16	3	+	8	18	7	4	14		
Adjusted Flow F) veh/h		141	457	12	200	378		23	_	474	447	126	487	74		
		ow Rate (<i>s</i>), veh/h/	In	1781	1789		1781	187			-	1870	1765	1781	1781	1585		
Queue Service		· ,	11.1	5.4	24.1		7.9	18.9	_	9.4	_	23.7	23.7	5.3	12.3	3.4		
Cycle Queue C		<u> </u>		5.4	24.1		7.9	18.9		9.4	\rightarrow	23.7	23.7	5.3	12.3	3.4		
Green Ratio (g		5 /iiio (g t), 5		0.37	0.30		0.38	0.30		_	_	0.30	0.30	0.30	0.22	0.30		
Capacity (c), v	· · ·			297	531		267	569		43	-	565	533	233	801	472		
Volume-to-Capa		itio (X)		0.475	0.859		0.750	0.66		_	_	0.838	0.839	0.541	0.608	0.156		
		/In (95 th percentile)	100.5			157.7	350.	_	_	-	455.9	430.8	105.8	235.8	60.6		
	• •	· · · · · · · · · · · · · · · · · · ·		4.0	17.8		6.2	13.8		6.9	-	17.9	17.2	4.2	9.3	2.4		
Back of Queue (Q), veh/ln (95 th percentile) Queue Storage Ratio (RQ) (95 th percentile)				0.27	0.00		0.32	0.00	_	_	_	0.00	0.00	0.21	0.00	0.00		
Uniform Delay (d 1), s/veh					33.2		25.5	36.0				32.6	32.6	28.4	34.8	25.8		
Incremental Delay (d 2), s/veh					16.4		7.9	4.2		1.5	=	13.9	14.6	2.5	3.4	0.7		
Initial Queue Delay (d 3), s/veh					0.0		0.0	0.0	0.0	0.0)	0.0	0.0	0.0	0.0	0.0		
Control Delay (d), s/veh					49.6		33.4	40.8	3 27.3	23.	8	46.5	47.2	30.9	38.2	26.6		
Level of Service (LOS)				С	D		С	D	С	С		D	D	С	D	С		
Approach Delay, s/veh / LOS				43.8	3	D	35.8	3	D	4	2.1		D	35.6	6	D		
Intersection De	lay, s/ve	eh / LOS				3	9.5							D				
Multimodal Results					EB			WE	3			NB		SB				
Pedestrian LOS		/LOS		2.8		С	3.0	- 1	C		2.4	145	В	2.3		В		
Bicycle LOS So				1.5		A	1.6	_	В		1.4		A	1.1		A		
	J. J , LC	-		1.0			1.0							1.1		•		

HCS7 Signalized Intersection Results Summary																		
General Inform						Inte	ersect	ion Inf	ormatic	n		1 1	ta la					
Agency American Structurepoint						Duration, h 0.25									7. 4	R.		
Analyst SBG					Analysis Date Jul 8, 2019						е	Other				<u>.</u> ⊱		
Jurisdiction		Delaware County, 0	OH	Time F	Period	AM P	eak		PHI	F		0.92		→	~			
Urban Street Home Rd				Analys	sis Yea	build	- 2020 f (With ments)	Vo-	Ana	alysis Period 1> 7:00				1 1 t				
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc1A	_Int 1 &	2_AN	∕l.xus	s								
Project Descrip	tion	Redwood Home Ro	d TIS															
Demand Inform	nation				EB			W	/B			NB			SB			
Approach Move	ment			L	Т	R	L	1	ГΪ	R	L	Т	R	L	Т	R		
Demand (v), v				43	413	121	78	44	18	17	195	101	59	23	152	48		
Signal Informa	tion				T													
Cycle, s	100.0	Reference Phase	2	1		<u>a</u> 3	∄	Ħ	71	1	_		_	7	\	小		
Offset, s	34	Reference Point	Begin				_		1	<u> </u>			1	2	3	4		
Uncoordinated	No	Simult. Gap E/W	On	Green		1.4	38.8	9.2		19.6	0.0			A				
Force Mode	Fixed	Simult. Gap E/W	On	Yellow Red	1.4	0.0	5.2 1.0	3.9		5.2 1.0	0.0		^ _	Y	7	Y		
1-010e Mode	rixeu	Simuit. Gap N/S	Uil	IVEU	1.4	0.0	1.0	1.3	,	1.0	10.0		5	9		0		
Timer Results				EBI		EBT	WB	L	W	ВТ	NBI		NBT	SBI		SBT		
Assigned Phase				5		2	1	\neg	6	3	3		8	7		4		
Case Number				1.1		4.0	1.1		4.	.0	1.1		4.0	1.1		4.0		
Phase Duration	. S			12.8	3	45.0	14.2	_	46		15.0	.0 25.8		15.0	15.0 2			
Change Period,	·	c). S		5.7		6.2	7.1	_		.2	5.8		6.2	6.3		6.2		
Max Allow Head		·		4.0		0.0	4.0		0.0			4.0		4.0	4.0			
Queue Clearan				3.4			4.7				11.2		4.0 10.8	3.0		13.1		
Green Extensio		, - ,		0.0		0.0	0.0		0.	.0	0.0		0.9	0.0		0.7		
Phase Call Prol		(0)		1.00			1.00)			1.00)	1.00	1.00		1.00		
Max Out Proba	bility			1.00			1.00)			1.00 0.09		0.09	0.07	7	0.29		
Movement Gro	un Ras	eulte			EB			WE	2			NB			SB			
Approach Move		Juito		L	T	R	L	T		R	L	T	R	L	T	R		
Assigned Move				5	2	12	1	6	+	16	3	8	18	7	4	14		
Adjusted Flow F) veh/h		46	569	12	85	505		10	212	174	10	25	217	17		
		ow Rate (<i>s</i>), veh/h/	In	1781	1797		1781	185	_		1781	1754		1781	1793			
Queue Service		· , ,		1.4	29.9		2.7	22.3	_		9.2	8.8		1.0	11.1			
Cycle Queue C				1.4	29.9		2.7	22.	_		9.2	8.8		1.0	11.1			
Green Ratio (g		C Time (g v), 3		0.46	0.39		0.46	0.40	_	_	0.29	0.20		0.28	0.20			
Capacity (c), v				340	697		274	747	_		312	344		333	351			
Volume-to-Capa		itio (X)		0.135	_		0.310	0.67	_		0.680	0.506		0.075	0.619			
		/In (95 th percentile)	24.5	475.2		47.9	383.	-		197.3	168.7		19.1	216.8			
	· · ·	eh/ln (95 th percent		1.0	18.7		1.9	15.	_		7.8	6.6		0.8	8.5			
		RQ) (95 th percen		0.04	0.00		0.15	0.00	_		0.61	0.00		0.06	0.00			
Uniform Delay (d 1), s/veh					34.3		20.3	24.0	_		30.3	35.9		26.7	36.8			
Incremental Delay (d 2), s/veh				17.8 0.1	5.6		0.6	4.9	_		5.9	1.2		0.1	3.3			
Initial Queue Delay (d 3), s/veh					0.0		0.0	0.0			0.0	0.0		0.0	0.0			
Control Delay (d), s/veh					39.9		21.0	29.4	4		36.2	37.1		26.8	40.1			
Level of Service (LOS)				В	D		С	С			D	D		С	D			
Approach Delay, s/veh / LOS				38.2	2	D	28.2	2	C	2	36.6	6	D	38.7	7	D		
Intersection Delay, s/veh / LOS						3	34.7						С					
Multimodal Results					EB			WE	3			NB		SB				
Pedestrian LOS		/LOS		2.3		В	2.3		E	3	2.3		В	2.3		В		
Bicycle LOS Sc				1.5		В	1.5				1.1		A	0.9		A		
Bioyolo Loo Goole / Loo						_			•					0.5				

HCS7 Signalized Intersection Results Summary General Information Intersection Information Duration, h 0.25 Agency American Structurepoint Analyst SBG Analysis Date Jul 8, 2019 Area Type Other Jurisdiction Delaware County, OH Time Period PM Peak PHF 0.92 **Urban Street** Home Rd Sc1A - 2020 No-**Analysis Period** 1>7:00 Analysis Year build (With Apartments) Home Rd & Sawmill Pkwv File Name Intersection Sc1A Int 1 & 2 PM.xus **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Т Approach Movement L R L R L R L R 98 392 186 170 383 97 328 511 243 149 471 64 Demand (v), veh/h **Signal Information** حلاء Cycle, s 120.0 Reference Phase 2 542 0 Offset, s Reference Point Begin Green 7.3 2.9 44.0 8.9 5.9 20.3 Uncoordinated No Simult, Gap E/W On Yellow 3.9 0.0 5.2 3.9 3.9 4.8 Force Mode Fixed Simult. Gap N/S 0.0 2.2 2.2 On Red 2.6 1.0 1.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT 6 8 **Assigned Phase** 5 2 1 3 7 4 4.0 4.0 Case Number 1.1 1.1 3.0 1.1 1.1 3.0 Phase Duration, s 13.8 50.2 16.7 53.1 27.0 38.1 15.0 26.1 Change Period, (Y+Rc), s 6.5 6.2 6.5 6.2 6.1 5.8 6.1 5.8 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g s), s 6.4 12.0 21.2 28.5 10.9 18.7 Green Extension Time (g_e), s 0.0 0.0 0.0 0.0 0.0 2.1 0.0 1.0 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 1.00 1.00 1.00 **Movement Group Results** FB **WB** NB SB Approach Movement L Т R L Т R L Т R L Т R 5 2 12 7 4 **Assigned Movement** 1 6 16 3 8 18 14 223 127 387 Adjusted Flow Rate (v), veh/h 107 628 502 357 433 162 512 70 Adjusted Saturation Flow Rate (s), veh/h/ln 1781 1870 1666 1781 1781 1768 1870 1585 1781 1781 1585 Queue Service Time (g_s), s 4.4 41.9 10.0 23.5 5.3 19.2 26.4 26.5 8.9 16.7 4.2 4.4 41.9 23.5 19.2 26.4 26.5 8.9 4.2 Cycle Queue Clearance Time (g c), s 10.0 5.3 16.7 Green Ratio (g/C) 0.43 0.37 0.45 0.39 0.47 0.36 0.27 0.27 0.24 0.17 0.23 225 397 503 448 213 602 328 648 731 737 365 Capacity (c), veh/h Volume-to-Capacity Ratio (X) 0.325 0.969 0.989 0.687 0.173 0.899 0.860 0.862 0.760 0.850 0.191 81.4 755.7 238.5 317.2 84.7 398.5 515.4 468.9 210.3 333.7 78.9 Back of Queue (Q), ft/ln (95 th percentile) Back of Queue (Q), veh/ln (95 th percentile) 3.2 29.8 9.4 12.5 3.3 15.7 20.3 18.8 8.3 13.1 3.1 Queue Storage Ratio (RQ) (95 th percentile) 0.22 0.00 0.48 0.00 0.28 0.66 0.00 0.00 0.42 0.00 0.00 23.3 37.3 22.1 17.4 41.7 41.7 39.6 48.4 37.2 Uniform Delay (d 1), s/veh 27.9 32.7 Incremental Delay (d 2), s/veh 0.6 28.5 44.1 3.3 0.3 22.7 17.2 19.2 14.6 14.0 1.2 0.0 0.0 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 54.2 Control Delay (d), s/veh 23.9 65.9 71.9 25.4 17.7 55.3 58.9 60.9 62.4 38.4 Level of Service (LOS) С Ε Ε C В Ε Ε Ε D Ε D Approach Delay, s/veh / LOS 59.8 Ε 36.4 D 58.5 Ε 58.4 Ε Intersection Delay, s/veh / LOS 53.4 D **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.8 С 2.9 С 2.4 В 2.3 В Bicycle LOS Score / LOS 1.7 В 1.7 1.5 Α 1.1

		HCS	7 Sig	nalize	d Int	tersec	tion F	Resu	ılts	Sun	nmar	У				
	4.								1.4.						444	u III
General Inforn	nation										ion Info	v	n		ĄĮ.	
Agency		American Structure	epoint			1				ation,		0.25				L
Analyst		SBG		-		e Jul 8				а Тур	e	Other				.×. }-
Jurisdiction		Delaware County, (OH	Time F		PM F			PHF			0.92		_ *	w∳t	~
Urban Street		Home Rd		Analys	sis Yea	build	- 2020 (With tments)	No-	Ana	ılysis	Period	1> 7:0	00	T I	ነ ነ	* C
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc1A	_Int 1 &	2_PN	∕l.xus	3						
Project Descrip	tion	Redwood Home Ro	d TIS													
Demand Inform	nation				EB			W	/B			NB			SB	
Approach Move				L	T	R	L		<u>-</u>	R	L	T	R	L	T	R
Demand (v), v				47	537	_			\rightarrow	20	205	143	62	15	166	39
								1								
Signal Informa			1		1 2		늴 .		7				_	_	K .	\mathbf{A}
Cycle, s	120.0	Reference Phase	2		L. ,	7 '	′ቹ '	ا (۲	S	51	7 8			♦ ,	3	4
Offset, s	0	Reference Point	Begin	Green	7.1	2.2	58.6	7.	5	2.2	18.0			K		
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	4.3		0.0	5.2		>	₹		N/Z
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.4	0.0	1.0	2.0)	0.0	1.0		5	6	7	8
Timer Results				EBI		EBT	WB		WE	ЭТ	NBI		NBT	SBI		SBT
Assigned Phase				5	_	2	1	<u>'L</u>	6	_	3		8	7	-	4
	е									_	_					
Case Number				1.1 12.8		4.0	1.1 15.0	-	4.0	_	1.1		4.0	1.1	,	4.0 24.2
	hase Duration, s hange Period, (Y+R c), s					64.8	7.1		67. 6.2	$\overline{}$	16.0 5.8		26.4 6.2	13.8 6.3		6.2
Max Allow Hea		,		5.7 4.0		0.0	4.0		0.0	_	4.0		4.0	4.0		4.0
Queue Clearan				3.5		0.0	6.0		0.0		12.2		16.3	2.9		16.3
Green Extension		, - ,		0.0		0.0	0.1	_	0.0	0	0.0		0.6	0.0	_	0.3
Phase Call Pro		(g e), s		1.00		0.0	1.0	_	0.0		1.00	$\overline{}$	1.00	1.00	_	1.00
Max Out Proba				1.00			1.0				1.00		1.00	0.32		1.00
Movement Gro		sults			EB		-	WE		_		NB			SB	
Approach Move				L	T	R	L	Т	\rightarrow	R	L	T	R	L	T	R
Assigned Move		\		5	2	12	1	6	\rightarrow	16	3	8	18	7	4	14
Adjusted Flow I		,-		47	805	-	124	609	\rightarrow		223	223		16	223	
		ow Rate (s), veh/h/	In	1781	1765		1781	185	\rightarrow	_	1781	1774		1781	1808	
Queue Service				1.5	48.3		4.0	28.	_	_	10.2	14.3		0.9	14.3	
Cycle Queue C Green Ratio (g		e nme (<i>g c</i>), s		1.5 0.55	48.3 0.49	_	4.0 0.55	0.5	\rightarrow		10.2 0.23	14.3 0.17		0.9	14.3 0.15	
Capacity (c), v	· · ·			368	862		235	942	_		247	299		209	271	
Volume-to-Cap		tio (V)		0.128		+	0.526	0.64	\rightarrow	-	0.903	0.746		0.078	0.821	
		/In(95 th percentile	١	25.2	452.8	_	77.1	459	_		102.9	285.1		17.3	307.4	
	• •	eh/In (95 th percentile		1.0	17.8		3.0	18.	_		4.1	11.2		0.7	12.1	
		RQ) (95 th percen		0.05	0.00		0.24	0.0	\rightarrow		0.32	0.00		0.7	0.00	
				16.3	18.1		24.7	21.	_		44.0	47.5		38.4	49.4	
	Jniform Delay (<i>d</i> ₁), s/veh ncremental Delay (<i>d</i> ₂), s/veh				7.6		2.2	3.4	_		32.8	9.8		0.2	18.0	
Initial Queue De	nitial Queue Delay (d ₃), s/veh				0.0		0.0	0.0			0.0	0.0		0.0	0.0	
Control Delay (Control Delay (d), s/veh				25.7		26.9	25.	1		76.8	57.3		38.6	67.4	
	evel of Service (LOS)				С		С	С			E	E		D	Ę	
	Approach Delay, s/veh / LOS				2	С	25.4	4	С	;	67.1		E	65.4		E
Intersection De	ntersection Delay, s/veh / LOS					3	7.7							D		
Multimodal Po	lultimodal Results				EB			WE	3			NB			SB	
	edestrian LOS Score / LOS				-	В	2.3	- 1	, В		2.3	110	В	2.3		В
Bicycle LOS So				2.3		В	1.7	_	В	-	1.2		A	0.9		A
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HCS7 Signalized Intersection Results Summary General Information Intersection Information Duration, h 0.25 Agency American Structurepoint Analyst SBG Analysis Date Jul 8, 2019 Area Type Other Jurisdiction Delaware County, OH Time Period AM Peak PHF 0.92 **Urban Street** Home Rd Sc1B - 2020 No-**Analysis Period** 1>7:00 Analysis Year build (Without Apartments) Home Rd & Sawmill Pkwv File Name Intersection Sc1B Int 1 & 2 AM.xus **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Т R Approach Movement L L R L R L R 130 309 106 145 307 136 220 711 126 114 448 68 Demand (v), veh/h **Signal Information** حلاء Cycle, s 100.0 Reference Phase 2 542 90 Offset, s Reference Point Begin 1.3 Green 7.5 29.5 7.5 0.7 22.8 Uncoordinated No Simult, Gap E/W On Yellow 4.3 0.0 5.2 3.9 3.9 4.8 Force Mode Fixed Simult. Gap N/S 2.2 2.2 On Red 2.2 0.0 1.0 1.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT 6 8 **Assigned Phase** 5 2 1 3 7 4 1.1 4.0 4.0 Case Number 1.1 3.0 1.1 1.1 3.0 Phase Duration, s 15.3 37.0 14.0 35.7 20.4 35.4 13.6 28.6 Change Period, (Y+Rc), s 6.5 6.2 6.5 6.2 6.1 5.8 6.1 5.8 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g s), s 7.3 9.4 11.4 25.4 7.2 14.2 Green Extension Time (g_e), s 0.1 0.0 0.0 0.0 0.2 2.3 0.0 3.9 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 0.98 1.00 0.55 **Movement Group Results** FB **WB** NB SB Approach Movement L Т R L Т R L Т R L Т R 5 2 12 16 18 7 4 **Assigned Movement** 1 6 3 8 14 443 124 487 Adjusted Flow Rate (v), veh/h 141 451 183 388 172 239 467 74 Adjusted Saturation Flow Rate (s), veh/h/ln 1781 1870 1585 1781 1772 1781 1781 1788 1870 1781 1585 7.4 Queue Service Time (g_s), s 5.3 23.3 16.0 6.6 9.4 23.4 23.4 5.2 12.2 3.3 23.3 7.4 23.4 23.4 5.2 12.2 Cycle Queue Clearance Time (g c), s 5.3 16.0 6.6 9.4 3.3 Green Ratio (g/C) 0.38 0.31 0.37 0.29 0.37 0.39 0.30 0.30 0.30 0.23 0.32 586 423 554 524 231 363 551 257 552 812 501 Capacity (c), veh/h 0.704 0.844 Volume-to-Capacity Ratio (X) 0.389 0.819 0.714 0.293 0.566 0.844 0.536 0.600 0.148 96.8 426.4 134.7 228.3 99.9 454.7 430.9 103 234.7 58.7 Back of Queue (Q), ft/ln (95 th percentile) 177.7 Back of Queue (Q), veh/ln (95 th percentile) 3.8 16.8 5.3 9.0 3.9 7.0 17.9 17.2 4.1 9.2 2.3 Queue Storage Ratio (RQ) (95 th percentile) 0.26 0.00 0.27 0.00 0.33 0.30 0.00 0.00 0.21 0.00 0.00 22.2 32.0 21.5 17.9 33.0 33.0 28.3 Uniform Delay (d 1), s/veh 24.0 22.8 34.5 24.5 Incremental Delay (d 2), s/veh 0.7 12.8 6.0 4.8 8.0 1.8 14.6 15.3 2.4 3.3 0.6 0.0 0.0 0.0 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 37.8 Control Delay (d), s/veh 22.8 44.8 30.0 26.4 18.7 24.5 47.6 48.3 30.7 25.2 Level of Service (LOS) С D С С В С D D С D С Approach Delay, s/veh / LOS 39.6 D 25.5 С 43.1 D 35.1 D Intersection Delay, s/veh / LOS 36.6 D **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.8 С 3.0 С 2.4 В 2.3 В Bicycle LOS Score / LOS 1.4 1.5 Α 1.5 Α 1.1

	HCS7 S					ersec	tion F	Resu	ılts	Sun	nmar	y				
General Informat	tion								Inte	ersect	ion Infe	ormatic	n		1 1	ta la
Agency		American Structure	point						Du	ration,	h	0.25			7. 4	R.
Analyst		SBG		Analys	is Date	Jul 8,	2019		Are	еа Тур	е	Other				<u>.</u>
Jurisdiction		Delaware County, 0	ЭH	Time F	Period	AM P	eak		PH	łF		0.92		*	w∯L	
Urban Street		Home Rd		Analys	sis Yea	build	- 2020 I (Without ments)		Ana	alysis	Period	1> 7:0	00	7	1	T T T T T T T T T T T T T T T T T T T
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc1B	_Int 1 &	2_AN	∕l.xu	IS				7		
Project Description	n	Redwood Home Ro	TIS	,											_	
Demand Informat	tion				EB			W	/B			NB			SB	
Approach Moveme	ent			L	Т	R	L	T -	Г	R	L	Т	R	L	Т	R
Demand (v), veh				41	396	114	78	44	13	17	193	101	59	23	152	48
Signal Information	on				1	1 5	:		ι							
	00.0	Reference Phase	2	1	1 ×	- 2		.	21	1				4	\	4
	90	Reference Point	Begin						<u>\</u>	13			1	2	3	4
	No	Simult. Gap E/W	On	Green		1.4	31.8	14		21.6	0.0		_	5 -		
F		Simult. Gap E/W	On	Yellow Red	1.4	0.0	5.2 1.0	3.9		5.2	0.0		_	Y		Y
Force Mode Fi	ixeu	Simult. Gap N/S	On	Neu	1.4	10.0	1.0	1.3	9	1.0	10.0		9	0	,	
Timer Results				EBI		EBT	WB	L	W	/BT	NBI		NBT	SBI		SBT
Assigned Phase				5		2	1		(6	3		8	7		4
Case Number				1.1		4.0	1.1		4	.0	1.1		4.0	1.1		4.0
Phase Duration, s	;			12.8	3	38.0	14.2	2	39	9.4	20.0) :	27.8	20.0		27.8
Change Period, (nange Period, (Y+R c), s					6.2	7.1		6	5.2	5.8		6.2	6.3		6.2
Max Allow Headwa	ay (N	/AH), s		4.0		0.0	4.0		0	0.0	4.0		4.0	4.0		4.0
Queue Clearance	Time	(gs), s		3.5			5.1				10.6	;	10.6	2.9		12.8
Green Extension T	Time ((ge), s		0.0		0.0	0.0		0	0.0	0.2		1.0	0.0		0.9
Phase Call Probab	bility			1.00			1.00	5			1.00		1.00	1.00		1.00
Max Out Probabilit	ity			1.00)		1.00)			1.00)	0.03	0.00)	0.09
Movement Group	o Resi	ults			EB			WE	3			NB			SB	
Approach Moveme				L	Т	R	L	Т	Т	R	L	Т	R	L	Т	R
Assigned Moveme				5	2	12	1	6	\top	16	3	8	18	7	4	14
Adjusted Flow Rat), veh/h		44	552		85	500)		210	174		25	217	
		w Rate (<i>s</i>), veh/h/	ln	1781	1798		1781	185	8		1781	1754		1781	1793	
Queue Service Tin		· · ·		1.5	29.9	1	3.1	24.0	6		8.6	8.6		0.9	10.8	
Cycle Queue Clea		,		1.5	29.9		3.1	24.0	=		8.6	8.6		0.9	10.8	
Green Ratio (g/C		,		0.39	0.32	Î	0.39	0.3	\rightarrow		0.36	0.22		0.35	0.22	
Capacity (c), veh				258	572		215	617	-		427	379		449	387	
Volume-to-Capacit	ity Rat	tio (X)		0.172	0.966		0.395	0.81	1		0.491	0.459		0.056	0.561	
Back of Queue (C	Q), ft/l	In (95 th percentile)	26.9	447.2		56.6	448	.4		157.1	162.8		16.7	207.7	
Back of Queue (C	੨), ve	h/ln (95 th percent	ile)	1.1	17.6		2.2	17.	7		6.2	6.4		0.7	8.2	
		RQ) (95 th percen		0.05	0.00		0.17	0.0	0		0.48	0.00		0.05	0.00	
Uniform Delay (d	1), s/	veh		21.7	27.3		24.5	30.	5		24.4	34.1		21.8	35.0	
Incremental Delay	ncremental Delay (d 2), s/veh				20.9		1.2	11.	1		0.9	0.9		0.1	1.8	
Initial Queue Delay	nitial Queue Delay (d 3), s/veh				0.0		0.0	0.0			0.0	0.0		0.0	0.0	
	Control Delay (d), s/veh				48.2		25.7	41.0	6		25.2	35.0		21.9	36.8	
<u>`</u>	Level of Service (LOS)				D		С	D			С	С		С	D	
	Approach Delay, s/veh / LOS				3	D	39.3	3	[D	29.7		С	35.3	3	D
Intersection Delay,	ntersection Delay, s/veh / LOS					39	9.0							D		
Multimodal Resul	ultimodal Results				EB			WE	3			NB			SB	
	edestrian LOS Score / LOS					В	2.3	-		В	2.3		В	2.3		В
Bicycle LOS Score				2.3 1.5		Α	1.5	_		Α	1.1		Α	0.9		Α

HCS7 Signalized Intersection Results Summary General Information Intersection Information Duration, h 0.25 Agency American Structurepoint Analyst SBG Analysis Date Jul 8, 2019 Area Type Other Jurisdiction Delaware County, OH Time Period PM Peak PHF 0.92 **Urban Street** Home Rd Sc1B - 2020 No-**Analysis Period** 1>7:00 Analysis Year build (Without Apartments) Home Rd & Sawmill Pkwv File Name Sc1B_Int 1 & 2_PM.xus Intersection **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Т R Approach Movement L L R L R L R 98 377 186 155 374 91 328 511 212 141 471 64 Demand (v), veh/h **Signal Information** حلاء Cycle, s 120.0 Reference Phase 2 517 100 Offset, s Reference Point Begin Green 7.5 1.0 45.8 7.9 6.9 20.2 Uncoordinated No Simult, Gap E/W On Yellow 4.3 0.0 5.2 3.9 3.9 4.8 Force Mode Fixed Simult. Gap N/S 2.2 2.2 2.2 On Red 0.0 1.0 1.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT 6 8 **Assigned Phase** 5 2 1 3 7 4 4.0 4.0 Case Number 1.1 1.1 3.0 1.1 1.1 3.0 Phase Duration, s 15.0 53.0 14.0 52.0 27.0 39.0 14.0 26.0 Change Period, (Y+Rc), s 6.5 6.2 6.5 6.2 6.1 5.8 6.1 5.8 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g s), s 6.2 9.5 21.2 26.7 9.9 18.8 Green Extension Time (g_e), s 0.1 0.0 0.0 0.0 0.0 3.1 0.0 0.9 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 0.70 1.00 1.00 **Movement Group Results** FB **WB** NB SB Approach Movement L Т R L Т R L Т R L Т R 5 2 12 7 4 **Assigned Movement** 1 6 16 3 8 18 14 373 Adjusted Flow Rate (v), veh/h 107 612 207 499 121 357 413 153 512 70 Adjusted Saturation Flow Rate (s), veh/h/ln 1781 1870 1683 1781 1585 1781 1765 1870 1585 1781 1781 7.5 Queue Service Time (g_s), s 4.2 38.8 24.6 4.9 19.2 24.6 24.7 7.9 16.8 4.2 4.2 7.5 24.6 4.9 19.2 24.6 24.7 7.9 4.2 Cycle Queue Clearance Time (g c), s 38.8 16.8 Green Ratio (g/C) 0.45 0.39 0.44 0.38 0.45 0.36 0.28 0.28 0.23 0.17 0.24 396 517 466 215 599 345 689 212 714 709 379 Capacity (c), veh/h 0.699 Volume-to-Capacity Ratio (X) 0.309 0.889 0.977 0.171 0.901 0.798 0.801 0.714 0.854 0.184 650.7 330.7 352.3 78.2 400.2 468.4 429.3 196.2 334.6 Back of Queue (Q), ft/ln (95 th percentile) 77 77.7 Back of Queue (Q), veh/ln (95 th percentile) 3.0 25.6 13.0 13.9 3.1 15.8 18.4 17.2 7.7 13.2 3.1 Queue Storage Ratio (RQ) (95 th percentile) 0.21 0.00 0.66 0.00 0.26 0.67 0.00 0.00 0.39 0.00 0.00 22.0 34.2 24.8 17.2 40.3 40.3 40.7 36.3 Uniform Delay (d 1), s/veh 32.3 32.7 48.5 Incremental Delay (d 2), s/veh 0.5 15.9 43.4 3.7 0.3 23.0 12.1 13.5 10.7 14.4 1.1 0.0 0.0 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 Control Delay (d), s/veh 22.5 50.0 75.7 28.5 17.5 55.8 52.4 53.8 51.4 62.9 37.4 Level of Service (LOS) С D Ε С В Ε D D D Ε D Approach Delay, s/veh / LOS 46.0 D 38.7 D 53.9 D 58.1 Ε Intersection Delay, s/veh / LOS 49.5 D **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.8 С 2.9 С 2.4 В 2.3 В Bicycle LOS Score / LOS 1.4 1.7 В 1.6 Α 1.1

	HCS7 S					ersec	tion F	Resu	ılts	Sun	nmar	y				
General Inform	nation								Inte	ersect	ion Inf	ormatio	n		Y / Y	ta la
Agency		American Structure	point						Dur	ration,	h	0.25			7. 4	R.
Analyst		SBG		Analys	sis Date	Jul 8,	2019		Are	а Тур	е	Other		<i>∆</i> ,		<u>.</u>
Jurisdiction		Delaware County, 0	OH	Time F	Period	PM P	eak		PHI	F		0.92		*	w∯L	
Urban Street		Home Rd		Analys	sis Year	build (- 2020 (Withou ments)		Ana	alysis l	Period	1> 7:0	00	7	1	7 2
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc1B	Int 1 &	2_PN	/l.xus	s		"		7 "		<u> </u>
Project Descrip	tion	Redwood Home Ro	SIT E												_	
Demand Inform	nation				EB			W	/B			NB			SB	
Approach Move	ment			L	Т	R	L	1 -	Г	R	L	Т	R	L	Т	R
Demand (v), v				46	527	263	114	52	25	20	199	143	62	15	166	37
Signal Informa	tion			l	T			•								
Cycle, s	120.0	Reference Phase	2	1	100	1-2		Ħ	71				_	7	\	▲ │
	110			ł	"	R	 	· '	1	1 51	7 5		1	Y 2	3	4
Offset, s	-	Reference Point	Begin	Green		1.2	57.6	8.0		1.3	19.6	<u> </u>		<u> </u>		•
Uncoordinated	No	Simult. Gap E/W	On	Yellow	-	0.0	5.2	4.3		0.0	5.2		^ _	Y	> _	Ψ
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.4	0.0	1.0	2.0	,	0.0	1.0		5	6	1	8
Timer Results				EBI	_	EBT	WB	L	W	ВТ	NBI		NBT	SBI	_	SBT
Assigned Phase				5		2	1		6	3	3		8	7		4
Case Number				1.1		4.0	1.1		4.	.0	1.1		4.0	1.1		4.0
Phase Duration	. s			14.2	2	65.0	13.0	_	63	3.8	16.2	2	27.1	14.9		25.8
	hange Period, (Y+R c), s					6.2	5.7	_	6.	$\overline{}$	5.8		6.2	6.3		6.2
Max Allow Head		·		7.1 4.0		0.0	4.0		0.		4.0		4.0	4.0		4.0
Queue Clearan				3.4			6.1	$\overline{}$			12.4		16.2	2.8		15.9
Green Extensio		, - ,		0.0	\neg	0.0	0.0		0.	.0	0.0		0.7	0.0		0.6
Phase Call Prol		(0)		1.00)		1.00	5			1.00		1.00	1.00		1.00
Max Out Proba	bility			1.00)		1.00	0			1.00		0.73	0.05	5	1.00
Movement Gro	un Res	sulte			EB			WE	3			NB			SB	
Approach Move		Juito		L	T	R	L	T	, T	R	L	T	R	L	T	R
Assigned Move				5	2	12	1	6	+	16	3	8	18	7	4	14
Adjusted Flow F) veh/h		44	750	12	124	592	,	10	216	223	10	16	221	14
_		ow Rate (<i>s</i>), veh/h/	In	1781	1765		1781	185	\rightarrow		1781	1774		1781	1811	
Queue Service		· , ,		1.4	43.2		4.1	29.	\rightarrow		10.4	14.2		0.8	13.9	
Cycle Queue C				1.4	43.2		4.1	29.	_		10.4	14.2		0.8	13.9	
Green Ratio (g		5 /iiio (g t), 5		0.54	0.49		0.54	0.4	\rightarrow		0.25	0.17		0.0	0.16	
Capacity (c), v				360	865		249	892	-		269	309		233	296	
Volume-to-Capa		atio (X)		0.121	0.867		0.498	0.66	\rightarrow		0.803	0.721		0.070	0.746	
		/In (95 th percentile)	24.2	514.6	-	75.1	472	-		105.7	279.3		16.7	283.6	
	· · ·	eh/In (95 th percent		1.0	20.3		3.0	18.	_		4.2	11.0		0.7	11.2	
		RQ) (95 th percen		0.04	0.00		0.23	0.0	_		0.33	0.00		0.05	0.00	
	•)	17.0	22.2		23.4	23.	_		41.6	46.8		36.4	47.8	
	Jniform Delay (d 1), s/veh ncremental Delay (d 2), s/veh				5.6		1.5	3.9	_		16.0	8.0		0.1	9.9	
Initial Queue De	nitial Queue Delay (d 3), s/veh				0.0	İ	0.0	0.0			0.0	0.0		0.0	0.0	
Control Delay (Control Delay (<i>d</i>), s/veh				27.8		24.9	27.	7		57.6	54.8		36.5	57.7	
Level of Service	evel of Service (LOS)				С		С	С			E	D		D	E	
Approach Delay	Approach Delay, s/veh / LOS				2	С	27.2	2	C	2	56.2	2	Е	56.3	3	Е
Intersection De	ntersection Delay, s/veh / LOS					36	5.2							D		
Multimodal Po	lultimodal Results				EB			WE	3			NB			SB	
	ultimodal Results edestrian LOS Score / LOS					В	2.3	- 1	, E	3	2.3		В	2.3		В
Bicycle LOS Sc				2.3		В	1.7		E	_	1.2		A	0.9		A
,				5										0.5		

HCS7 Signalized Intersection Results Summary 1474747 **General Information Intersection Information** American Structurepoint Duration, h 0.25 Agency Analyst SBG Analysis Date Jul 8, 2019 Area Type Other PHF 0.92 Jurisdiction Delaware County, OH Time Period AM Peak **Urban Street** Home Rd Analysis Year Sc2A - 2020 Build **Analysis Period** 1>7:00 (With Apartments) Home Rd & Sawmill Pkwy Sc2A Int 1 & 2 AM.xus Intersection File Name **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Approach Movement L Т R L R L R L R Demand (v), veh/h 130 316 106 183 330 153 220 711 141 117 448 68 Ж. Signal Information Cycle, s 100.0 Reference Phase 2 542 Offset, s 79 Reference Point Begin Green 7.3 0.7 29.7 7.5 22.5 1.6 Uncoordinated No Simult, Gap E/W On Yellow 3.9 0.0 5.2 3.9 3.9 4.8 Force Mode Fixed Simult. Gap N/S On Red 2.6 0.0 1.0 2.2 2.2 1.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT **Assigned Phase** 5 2 1 6 3 8 4 7 Case Number 1.1 4.0 1.1 3.0 1.1 4.0 1.1 3.0 Phase Duration, s 13.8 35.9 14.5 36.6 21.3 36.0 13.6 28.3 6.5 6.2 6.5 6.2 6.1 5.8 5.8 Change Period, (Y+Rc), s 6.1 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g_s), s 7.4 10.0 11.4 25.9 7.4 14.3 Green Extension Time (g_e), s 0.0 0.0 0.0 0.0 0.3 2.4 0.0 3.9 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 0.96 1.00 0.59 **Movement Group Results** EB **WB** NB SB Approach Movement L Т R L Т R L Т R L Т R **Assigned Movement** 5 2 12 16 3 18 7 4 1 6 8 14 477 449 127 487 Adjusted Flow Rate (v), veh/h 141 459 207 374 173 239 74 1781 1789 1781 1870 1585 1781 1870 1762 1781 1781 1585 Adjusted Saturation Flow Rate (s), veh/h/ln Queue Service Time (g_s), s 5.4 24.2 8.0 18.7 8.7 9.4 23.9 23.9 5.4 12.3 3.4 Cycle Queue Clearance Time (q c), s 5.4 24.2 8.0 18.7 8.7 9.4 23.9 23.9 5.4 12.3 3.4 Green Ratio (g/C) 0.37 0.30 0.38 0.30 0.38 0.40 0.30 0.30 0.30 0.22 0.30 300 531 266 569 601 436 565 532 232 801 472 Capacity (c), veh/h Volume-to-Capacity Ratio (X) 0.470 0.863 0.781 0.657 0.288 0.549 0.844 0.844 0.549 0.608 0.156 107.2 Back of Queue (Q), ft/ln (95 th percentile) 100.4 454.5 166.2 345.3 176.4 174.2 460.6 434.7 235.8 60.6 Back of Queue (Q), veh/ln (95 th percentile) 4.0 17.9 6.5 13.6 6.9 6.9 18.1 17.4 4.2 9.3 2.4 Queue Storage Ratio (RQ) (95 th percentile) 0.27 0.00 0.33 0.00 0.59 0.29 0.00 0.00 0.21 0.00 0.00 32.7 Uniform Delay (d 1), s/veh 23.9 33.2 26.2 36.5 26.5 22.4 32.7 28.5 34.8 25.8 Incremental Delay (d 2), s/veh 1.1 16.8 9.8 4.0 8.0 1.5 14.3 15.1 2.7 3.4 0.7 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 25.0 36.0 40.6 23.8 47.0 47.8 31.2 Control Delay (d), s/veh 50.0 27.4 38.2 26.6 Level of Service (LOS) С D D D С С D D С D С 44.1 Approach Delay, s/veh / LOS 36.3 D 42.6 D 35.7 D D Intersection Delay, s/veh / LOS 39.9 D **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.8 С 3.0 С 2.4 В 2.3 В Bicycle LOS Score / LOS 1.5 Α 1.7 В 1.4 Α 1.1 Α

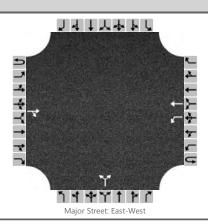
HCS7 Signalized Intersection Results Summary 1444444 **General Information Intersection Information** American Structurepoint Duration, h 0.25 Agency Analyst SBG Analysis Date Jul 8, 2019 Area Type Other PHF 0.92 Jurisdiction Delaware County, OH Time Period AM Peak **Urban Street** Home Rd Analysis Year Sc2A - 2020 Build **Analysis Period** 1>7:00 (With Apartments) Home Rd & Sawmill Pkwy Sc2A Int 1 & 2 AM - With Improvements.xus Intersection File Name **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Approach Movement L Т R L R L R L R Demand (v), veh/h 130 316 106 183 330 153 220 711 141 117 448 68 Ж. Signal Information Cycle, s 100.0 Reference Phase 2 Offset, s 79 Reference Point Begin Green 7.3 0.7 29.7 7.5 1.6 22.5 Uncoordinated No Simult, Gap E/W On Yellow 3.9 0.0 5.2 3.9 3.9 4.8 Force Mode Fixed Simult. Gap N/S On Red 2.6 0.0 1.0 2.2 2.2 1.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT **Assigned Phase** 5 2 1 6 3 8 4 7 Case Number 1.1 3.0 1.1 3.0 1.1 4.0 1.1 3.0 Phase Duration, s 13.8 35.9 14.5 36.6 21.3 36.0 13.6 28.3 6.5 6.2 6.5 6.2 6.1 5.8 5.8 Change Period, (Y+Rc), s 6.1 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g_s), s 7.4 10.0 11.4 25.9 7.4 14.3 Green Extension Time (g_e), s 0.0 0.0 0.0 0.0 0.3 2.4 0.0 3.9 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 0.96 1.00 0.59 **Movement Group Results** EB **WB** NB SB Approach Movement L Т R L Т R L Т R L Т R **Assigned Movement** 5 2 12 16 3 18 7 4 1 6 8 14 477 449 127 487 Adjusted Flow Rate (v), veh/h 141 343 115 207 374 173 239 74 1781 1870 1610 1781 1870 1585 1781 1870 1762 1781 1781 1585 Adjusted Saturation Flow Rate (s), veh/h/ln Queue Service Time (g_s), s 5.4 15.8 4.2 8.0 18.7 8.7 9.4 23.9 23.9 5.4 12.3 3.4 Cycle Queue Clearance Time (q c), s 5.4 15.8 4.2 8.0 18.7 8.7 9.4 23.9 23.9 5.4 12.3 3.4 Green Ratio (g/C) 0.37 0.30 0.45 0.38 0.30 0.38 0.40 0.30 0.30 0.30 0.22 0.30 300 555 723 359 569 601 436 565 532 232 801 472 Capacity (c), veh/h Volume-to-Capacity Ratio (X) 0.470 0.618 0.159 0.578 0.657 0.288 0.549 0.844 0.844 0.549 0.608 0.156 107.2 Back of Queue (Q), ft/ln (95 th percentile) 100.4 301.5 68.5 146.7 345.3 176.4 174.2 460.6 434.7 235.8 60.6 Back of Queue (Q), veh/ln (95 th percentile) 4.0 11.9 2.7 5.8 13.6 6.9 6.9 18.1 17.4 4.2 9.3 2.4 Queue Storage Ratio (RQ) (95 th percentile) 0.27 0.00 0.00 0.29 0.00 0.59 0.29 0.00 0.00 0.21 0.00 0.00 30.3 32.7 Uniform Delay (d 1), s/veh 23.9 16.3 23.8 36.5 26.5 22.4 32.7 28.5 34.8 25.8 Incremental Delay (d 2), s/veh 1.1 5.1 0.5 1.6 4.0 8.0 1.5 14.3 15.1 2.7 3.4 0.7 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 25.0 25.4 40.6 23.8 47.0 47.8 31.2 Control Delay (d), s/veh 35.4 16.8 27.4 38.2 26.6 Level of Service (LOS) С D В С D С С D D С D С 29.4 С 33.4 С 42.6 D 35.7 Approach Delay, s/veh / LOS D Intersection Delay, s/veh / LOS 36.4 D **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.8 С 3.0 С 2.4 В 2.4 В Bicycle LOS Score / LOS 1.5 Α 1.7 В 1.4 Α 1.1 Α

HCS7 Signalized Intersection Results Summary General Information Intersection Information Agency American Structurepoint Duration, h 0.25 Analyst SBG Analysis Date Jul 8, 2019 Area Type Other PHF 0.92 Jurisdiction Delaware County, OH Time Period AM Peak **Urban Street** Home Rd Analysis Year Sc2A - 2020 Build **Analysis Period** 1>7:00 (With Apartments) Home Rd & Liberty Rd N Sc2A Int 1 & 2 AM.xus Intersection File Name **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Approach Movement L R L R L R L R 17 Demand (v), veh/h 44 421 124 78 450 196 101 59 23 152 48 Ж, Signal Information Cycle, s 100.0 Reference Phase 2 **SAZ** Offset, s 34 Reference Point Begin Green 7.1 38.8 9.2 0.0 1.4 19.6 Uncoordinated No Simult, Gap E/W On Yellow 4.3 0.0 5.2 3.9 5.2 0.0 Force Mode Fixed Simult. Gap N/S On Red 1.4 0.0 1.0 1.9 1.0 0.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT **Assigned Phase** 5 2 1 6 3 8 4 7 Case Number 1.1 4.0 1.1 4.0 1.1 4.0 1.1 4.0 Phase Duration, s 12.8 45.0 14.2 46.4 15.0 25.8 15.0 25.8 Change Period, (Y+Rc), s 5.7 6.2 7.1 6.2 5.8 6.2 6.2 6.3 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g_s), s 3.5 4.7 11.2 10.8 3.0 13.1 Green Extension Time (g_e), s 0.0 0.0 0.0 0.0 0.0 0.9 0.0 0.7 1.00 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 0.09 0.07 0.29 **Movement Group Results** EB **WB** NB SB Approach Movement L Т R L Т R L Т R ī Т R **Assigned Movement** 5 2 12 3 7 4 14 1 6 16 8 18 47 25 Adjusted Flow Rate (v), veh/h 577 85 508 213 174 217 1781 1797 1781 1858 1781 1754 1781 1793 Adjusted Saturation Flow Rate (s), veh/h/ln Queue Service Time (g_s), s 1.5 30.4 2.7 22.5 9.2 8.8 1.0 11.1 Cycle Queue Clearance Time (g c), s 1.5 30.4 2.7 22.5 9.2 8.8 1.0 11.1 Green Ratio (g/C) 0.46 0.39 0.46 0.40 0.29 0.20 0.28 0.20 339 697 269 747 312 344 333 Capacity (c), veh/h 351 Volume-to-Capacity Ratio (X) 0.138 0.828 0.316 0.680 0.684 0.506 0.075 0.619 Back of Queue (Q), ft/ln (95 th percentile) 24.9 483.8 47.9 386 198.7 168.7 19.1 216.8 Back of Queue (Q), veh/ln (95 th percentile) 1.0 19.0 1.9 15.2 7.8 6.6 0.8 8.5 Queue Storage Ratio (RQ) (95 th percentile) 0.05 0.00 0.15 0.00 0.61 0.00 0.06 0.00 35.9 Uniform Delay (d 1), s/veh 17.8 34.5 20.5 24.6 30.4 26.7 36.8 Incremental Delay (d 2), s/veh 0.1 5.9 0.7 4.9 6.0 1.2 0.1 3.3 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 17.9 40.4 21.2 36.4 37.1 26.8 40.1 Control Delay (d), s/veh 29.5 Level of Service (LOS) В D С С D D С D Approach Delay, s/veh / LOS 38.7 28.3 38.7 D С 36.7 D D Intersection Delay, s/veh / LOS 35.0 С **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.3 В 2.3 В 2.3 В 2.3 В Bicycle LOS Score / LOS 1.5 В 1.5 Α 1.1 Α 0.9 Α

HCS7 Signalized Intersection Results Summary General Information Intersection Information Agency American Structurepoint Duration, h 0.25 Analyst SBG Analysis Date Jul 8, 2019 Area Type Other PHF 0.92 Jurisdiction Delaware County, OH Time Period AM Peak **Urban Street** Home Rd Analysis Year Sc2A - 2020 Build **Analysis Period** 1> 7:00 (With Apartments) Home Rd & Liberty Rd N Sc2A Int 1 & 2 AM - With Improvements.xus Intersection File Name **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Approach Movement L R L R L R L R 17 Demand (v), veh/h 44 421 124 78 450 196 101 59 23 152 48 Ж, Signal Information Cycle, s 100.0 Reference Phase 2 **SAZ** Offset, s 34 Reference Point Begin Green 7.1 9.2 0.0 1.4 38.8 19.6 Uncoordinated No Simult, Gap E/W On Yellow 4.3 0.0 5.2 3.9 5.2 0.0 Force Mode Fixed Simult. Gap N/S On Red 1.4 0.0 1.0 1.9 1.0 0.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT **Assigned Phase** 5 2 1 6 3 8 4 7 Case Number 1.1 3.0 1.1 4.0 1.1 4.0 1.1 4.0 Phase Duration, s 12.8 45.0 14.2 46.4 15.0 25.8 15.0 25.8 5.7 6.2 7.1 6.2 5.8 6.2 6.2 Change Period, (Y+Rc), s 6.3 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g_s), s 3.5 4.7 11.2 10.8 3.0 13.1 Green Extension Time (g_e), s 0.0 0.0 0.0 0.0 0.0 0.9 0.0 0.7 1.00 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 0.09 0.07 0.29 **Movement Group Results** EΒ **WB** NB SB Approach Movement L Т R L Т R L Т R L Т R **Assigned Movement** 5 2 12 3 7 4 14 1 6 16 8 18 47 25 Adjusted Flow Rate (v), veh/h 446 131 85 508 213 174 217 1781 1870 1610 1781 1858 1781 1754 1781 1793 Adjusted Saturation Flow Rate (s), veh/h/ln Queue Service Time (g_s), s 1.5 18.4 2.8 2.7 22.5 9.2 8.8 1.0 11.1 Cycle Queue Clearance Time (g c), s 1.5 18.4 2.8 2.7 22.5 9.2 8.8 1.0 11.1 Green Ratio (g/C) 0.46 0.39 0.48 0.46 0.40 0.29 0.20 0.28 0.20 339 726 773 391 747 312 344 333 Capacity (c), veh/h 351 Volume-to-Capacity Ratio (X) 0.138 0.615 0.170 0.217 0.680 0.684 0.506 0.075 0.619 Back of Queue (Q), ft/ln (95 th percentile) 26.1 288.6 39.7 47 386 198.7 168.7 19.1 216.8 Back of Queue (Q), veh/ln (95 th percentile) 1.0 11.4 1.6 1.9 15.2 7.8 6.6 0.8 8.5 Queue Storage Ratio (RQ) (95 th percentile) 0.05 0.00 0.00 0.14 0.00 0.61 0.00 0.06 0.00 22.6 35.9 Uniform Delay (d 1), s/veh 18.6 8.3 17.2 24.6 30.4 26.7 36.8 Incremental Delay (d 2), s/veh 0.1 2.7 0.3 0.3 4.9 6.0 1.2 0.1 3.3 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 18.7 25.4 17.5 36.4 37.1 26.8 40.1 Control Delay (d), s/veh 8.6 29.5 Level of Service (LOS) В C Α В С D D С D Approach Delay, s/veh / LOS 21.3 С 27.8 38.7 С 36.7 D D Intersection Delay, s/veh / LOS 28.9 С **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.3 В 2.3 В 2.3 В 2.4 В Bicycle LOS Score / LOS 1.5 В 1.5 Α 1.1 Α 0.9 Α

	HCS7 Two-Way Sto	p-Control Report	
General Information		Site Information	
Analyst	SBG	Intersection	Home Rd & Access Rd
Agency/Co.	American Structurepoint	Jurisdiction	Delaware County
Date Performed	7/5/2019	East/West Street	Home Rd
Analysis Year	2020	North/South Street	Access Rd
Time Analyzed	Sc2A - AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Redwood Home Rd TIS		

Lanes



Vehicle Volumes and Adjustments

Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	T	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	Т				LR					
Volume, V (veh/h)			577	8		3	659			25		12				
Percent Heavy Vehicles (%)						2				0		0				
Proportion Time Blocked																
Percent Grade (%)										()					
Right Turn Channelized		N	lo			N	lo			N	lo		No			
Median Type/Storage	L				Only								1			

Critical and Follow-up Headways

Base Critical Headway (sec)								
Critical Headway (sec)								
Base Follow-Up Headway (sec)								
Follow-Up Headway (sec)								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			3				40			
Capacity, c (veh/h)			947				348			
v/c Ratio			0.00				0.11			
95% Queue Length, Q ₉₅ (veh)			0.0				0.4			
Control Delay (s/veh)			8.8				16.7			
Level of Service, LOS			А				С			
Approach Delay (s/veh)			0	.0		16	5.7			
Approach LOS						(2			

HCS7 Signalized Intersection Results Summary 1474747 **General Information Intersection Information** American Structurepoint Duration, h 0.25 Agency Analyst SBG Analysis Date Jul 8, 2019 Area Type Other PHF 0.92 Jurisdiction Delaware County, OH Time Period PM Peak **Urban Street** Home Rd Analysis Year Sc2A - 2020 Build **Analysis Period** 1>7:00 (With Apartments) Home Rd & Sawmill Pkwy Sc2A Int 1 & 2 PM.xus Intersection File Name **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Approach Movement L R L R L R L R Demand (v), veh/h 98 399 186 177 387 100 328 511 258 153 471 64 Ж. Signal Information Cycle, s 120.0 Reference Phase 2 Offset, s 0 Reference Point Begin Green 7.3 2.9 44.0 8.9 5.9 20.3 Uncoordinated No Simult, Gap E/W On Yellow 3.9 0.0 5.2 3.9 3.9 4.8 Force Mode Fixed Simult. Gap N/S On Red 2.6 0.0 1.0 2.2 2.2 1.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT **Assigned Phase** 5 2 1 6 3 8 4 7 Case Number 1.1 4.0 1.1 3.0 1.1 4.0 1.1 3.0 Phase Duration, s 13.8 50.2 16.7 53.1 27.0 38.1 15.0 26.1 6.5 6.2 6.2 6.1 5.8 5.8 Change Period, (Y+Rc), s 6.5 6.1 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g_s), s 6.4 12.2 21.2 29.3 10.9 18.7 Green Extension Time (g_e), s 0.0 0.0 0.0 0.0 0.0 1.7 0.0 1.0 1.00 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 1.00 1.00 1.00 SB **Movement Group Results** EB **WB** NB Approach Movement L Т R L Т R L Т R L Т R **Assigned Movement** 5 2 12 16 3 18 7 4 14 1 6 8 230 393 Adjusted Flow Rate (v), veh/h 107 636 504 130 357 443 166 512 70 1781 1781 1781 1870 1585 1781 1870 1658 1781 1585 Adjusted Saturation Flow Rate (s), veh/h/ln 1769 Queue Service Time (g_s), s 4.4 42.6 10.2 23.6 5.4 19.2 27.2 27.3 8.9 16.7 4.2 Cycle Queue Clearance Time (q c), s 4.4 42.6 10.2 23.6 5.4 19.2 27.2 27.3 8.9 16.7 4.2 Green Ratio (g/C) 0.43 0.37 0.45 0.39 0.47 0.36 0.27 0.27 0.24 0.17 0.23 327 649 220 731 397 503 446 209 602 365 Capacity (c), veh/h 737 Volume-to-Capacity Ratio (X) 0.326 0.980 1.045 0.689 0.177 0.899 0.879 0.881 0.797 0.850 0.191 Back of Queue (Q), ft/ln (95 th percentile) 81.4 777.3 268.7 317.2 86.8 398.5 534.7 484.7 222.7 333.7 78.9 Back of Queue (Q), veh/ln (95 th percentile) 3.2 30.6 10.6 12.5 3.4 15.7 21.1 19.4 8.8 13.1 3.1 Queue Storage Ratio (RQ) (95 th percentile) 0.22 0.00 0.54 0.00 0.29 0.66 0.00 0.00 0.45 0.00 0.00 22.2 17.4 42.0 40.2 Uniform Delay (d 1), s/veh 23.4 37.6 29.3 32.7 42.0 48.4 37.2 Incremental Delay (d 2), s/veh 0.6 30.8 59.5 3.2 0.3 22.7 19.2 21.4 19.1 14.0 1.2 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 23.9 68.4 88.8 25.4 61.2 59.3 38.4 Control Delay (d), s/veh 17.7 55.3 63.4 62.4 Level of Service (LOS) С Ε F С В Ε F Ε Ε F D Approach Delay, s/veh / LOS 62.0 Ε 41.1 D 60.2 Ε 59.5 Ε Intersection Delay, s/veh / LOS 55.8 Ε **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.8 С 2.9 С 2.4 В 2.3 В Bicycle LOS Score / LOS 1.7 В 1.7 В 1.5 Α 1.1 Α

	HCS7 Sig	nalize	ed Int	ersec	tion F	Resu	lts Sur	nmar	у				
Canaval Information							Intoroco	tion Inf				4 4 4	b. L
General Information	A man win a m. Ot muse tumo marinet						Intersec		- U	on			
Agency	American Structurepoint			1.10	0040	_	Duration	<u>, </u>	0.25				L
Analyst	SBG			Jul 8,			Area Typ	e	Other			wÎ.	<u>5</u>
Jurisdiction	Delaware County, OH	Time F		PM P			PHF	<u> </u>	0.92	20	- 4	W+1	¥
Urban Street	Home Rd	Analys	sis Year	(With	- 2020 E Apartme vements	ents)	Analysis	Period	1> 7:0	00		4 1 4 Y	7
Intersection	Home Rd & Sawmill Pkwy	File Na	ame	Sc2A	Int 1 &	2_PM	- With In	nproven	าents.xเ	JS			
Project Description	Redwood Home Rd TIS												
Demand Information			EB			W	D.		NB			SB	
Approach Movement		L	Т	R		T			T	R	L	T	R
Demand (v), veh/h		98	399	186	177	38	_	328	511	258	153	471	64
Demand (v), venin		30	333	100	177	30	7 100	320	311	230	100	471	04
Signal Information			2	5	<u> </u>		<u> </u>		u .				1
Cycle, s 120.0	Reference Phase 2		P	7 2		~ ~ ~					A -	' ('	₹D
Offset, s 0	Reference Point Begin	Green	7 3	2.9	44.0	8.9	5.9	20.3		1	¥ 2 .	↓ [3]	4
Uncoordinated No	Simult. Gap E/W On	Yellow		0.0	5.2	3.9		4.8	_4	7	→	\ _	KÎZ
Force Mode Fixed	Simult. Gap N/S On	Red	2.6	0.0	1.0	2.2		1.0		5	6	7	8
		I ===			\.)A/DT	N.D.		N.D.T.	0.01		ODT
Timer Results		EBI 5	_	EBT 2	WB 1	<u> </u>	WBT 6	NBI 3	_	NBT 8	SBI 7	-	SBT 4
Assigned Phase Case Number		1.1		3.0	1.1		3.0	1.1		4.0	1.1		3.0
	nase Duration, s				16.7	7	53.1	27.0	,	38.1	15.0	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	26.1
Change Period, (Y+R	- \ c	13.8 6.5		50.2 6.2	6.5		6.2	6.1	,	5.8	6.1	,	5.8
Max Allow Headway (<u>, </u>	4.0		0.0	4.0	_	0.2	4.0		4.0	4.0		4.0
Queue Clearance Time	·	6.4		0.0	12.2		0.0	21.2		29.3	10.9		18.7
Green Extension Time	· - /	0.0	_	0.0	0.0		0.0	0.0		1.7	0.0		1.0
Phase Call Probability	· • · · · · · · · · · · · · · · · · · ·	1.00		0.0	1.00		0.0	1.00		1.00	1.00		1.00
Max Out Probability		1.00			1.00			1.00		1.00	1.00		1.00
Movement Group Res	sults		EB	1		WB			NB	1		SB	
Approach Movement		L	Т	R	L	Т	R	L	T	R	L	T	R
Assigned Movement		5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v	· · · · · · · · · · · · · · · · · · ·	107	434	202	230	504		357	443	393	166	512	70
Adjusted Saturation Fl		1781	1870	1610	1781	1870	_	1781	1870	1658	1781	1781	1585
Queue Service Time (4.4	22.9	7.9	10.2	23.5		19.2	27.2	27.3	8.9	16.7	4.2
Crosp Ratio (g/C)	ce ilme ($g \ \varepsilon$), s	4.4	22.9	7.9	10.2	23.5	_	19.2	27.2	27.3	8.9	16.7	4.2
Green Ratio (g/C) Capacity (c), veh/h		0.43	0.37 686	0.54 871	0.45 379	0.39 731		0.36	0.27 503	0.27 446	0.24 209	0.17 602	0.23 365
Volume-to-Capacity Ra	atio (X)	0.325	0.632	-	0.608	0.689		0.899	0.879	0.881	0.797	0.850	0.191
Back of Queue (Q), fl	<u> </u>	81.4	405.5		157.8	314.6		398.5	534.7	484.7	222.7	333.7	78.9
	reh/ln (95 th percentile)	3.2	16.0	5.1	6.2	12.4	_	15.7	21.1	19.4	8.8	13.1	3.1
	(RQ) (95 th percentile)	0.22	0.00	0.00	0.2	0.00	_	0.66	0.00	0.00	0.45	0.00	0.00
Uniform Delay (d 1), s	. , , ,	23.3	31.3	14.5	22.1	21.9		32.7	42.0	42.0	40.2	48.4	37.2
Incremental Delay (d :		0.6	4.4	0.6	1.7	3.3	0.3	22.7	19.2	21.4	19.1	14.0	1.2
Initial Queue Delay (d	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/v	·	23.9	35.7	15.1	23.9	25.2		55.3	61.2	63.4	59.3	62.4	38.4
Level of Service (LOS)		С	D	В	С	С	В	E	E	E	E	E	D
Approach Delay, s/veh	28.4	1	С	23.8	3	С	60.2		E	59.5	5	Е	
Intersection Delay, s/ve	ntersection Delay, s/veh / LOS				1.5						D		
	hultim and all De analis												
Multimodal Results						WB			NB			SB	
Pedestrian LOS Score		2.8	_	С	2.9		С	2.4		В	2.5		В
Bicycle LOS Score / LO	05	1.7		В	1.7		В	1.5		Α	1.1		Α

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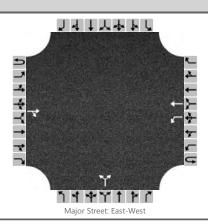
HCS7 Signalized Intersection Results Summary General Information Intersection Information Agency American Structurepoint Duration, h 0.25 Analyst SBG Analysis Date Jul 8, 2019 Area Type Other PHF 0.92 Jurisdiction Delaware County, OH Time Period PM Peak **Urban Street** Home Rd Analysis Year Sc2A - 2020 Build **Analysis Period** 1>7:00 (With Apartments) Home Rd & Liberty Rd N Sc2A Int 1 & 2 PM.xus Intersection File Name **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Approach Movement L Т R L R L R L R 47 62 40 Demand (v), veh/h 542 269 114 547 20 208 143 15 166 Signal Information ٨, Cycle, s 120.0 Reference Phase 2 $\mathbb{N}\Lambda Z$ Offset, s 0 Reference Point Begin Green 7.1 2.2 58.6 7.5 2.2 18.0 Uncoordinated No Simult, Gap E/W On Yellow 4.3 0.0 5.2 4.3 0.0 5.2 Force Mode Fixed Simult. Gap N/S On Red 1.4 0.0 1.0 2.0 0.0 1.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT **Assigned Phase** 5 2 1 6 3 8 4 7 Case Number 1.1 4.0 1.1 4.0 1.1 4.0 1.1 4.0 Phase Duration, s 12.8 64.8 15.0 67.0 16.0 26.4 13.8 24.2 Change Period, (Y+Rc), s 5.7 6.2 7.1 6.2 5.8 6.2 6.2 6.3 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g_s), s 3.5 6.0 12.2 16.3 2.9 16.4 Green Extension Time (g_e), s 0.0 0.0 0.1 0.0 0.0 0.6 0.0 0.3 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 1.00 0.32 1.00 **Movement Group Results** EB **WB** NB SB Approach Movement L Т R L Т R L Т R L Т R **Assigned Movement** 5 2 12 3 7 4 14 1 6 16 8 18 124 226 224 Adjusted Flow Rate (v), veh/h 48 832 616 223 16 1781 1781 1859 1781 1774 1781 1807 Adjusted Saturation Flow Rate (s), veh/h/ln 1765 Queue Service Time (g_s), s 1.5 52.9 4.0 29.4 10.2 14.3 0.9 14.4 Cycle Queue Clearance Time (q c), s 1.5 52.9 4.0 29.4 10.2 14.3 0.9 14.4 Green Ratio (g/C) 0.55 0.49 0.55 0.51 0.23 0.17 0.21 0.15 363 862 209 942 246 299 209 Capacity (c), veh/h 271 Volume-to-Capacity Ratio (X) 0.133 0.966 0.593 0.654 0.920 0.746 0.078 0.826 467.4 Back of Queue (Q), ft/ln (95 th percentile) 25.9 494.9 174.7 113.8 285.1 17.3 310 Back of Queue (Q), veh/ln (95 th percentile) 1.0 19.5 6.9 18.4 4.5 11.2 0.7 12.2 Queue Storage Ratio (RQ) (95 th percentile) 0.05 0.00 0.54 0.00 0.35 0.00 0.05 0.00 47.5 38.4 Uniform Delay (d 1), s/veh 16.5 18.7 26.4 21.8 44.3 49.5 Incremental Delay (d 2), s/veh 0.0 10.1 4.4 3.5 36.4 9.8 0.2 18.5 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 16.5 30.8 38.6 68.0 Control Delay (d), s/veh 28.8 25.4 80.7 57.3 Level of Service (LOS) В С С С F F D F Approach Delay, s/veh / LOS 28.2 С 26.3 69.1 Ε 66.0 Ε С Intersection Delay, s/veh / LOS 39.5 D **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.3 В 2.3 В 2.3 В 2.3 В Bicycle LOS Score / LOS 2.0 В 1.7 В 1.2 Α 0.9 Α

	HCS7 Sig	nalize	d Int	ersec	tion F	Resu	Its Su	mmar	у				
General Information							Intersec	tion Inf	orm sti-	n e		I 석 사쇼 I	Ja ly
	A mana wina a ma Calmus a tu una manimat								- v	on	- 1	41	
Agency	American Structurepoint	Δ.		1.10	0040		Duration	<u> </u>	0.25				L.
Analyst	SBG	-		Jul 8,			Area Typ	oe	Other				
Jurisdiction	Delaware County, OH	Time F		PM P		2 11 1	PHF	<u> </u>	0.92	20		W+L	~ <u>*</u>
Urban Street	Home Rd	Analys	sis Year	(With	- 2020 E Apartme vements	ents)	Analysis	Period	1> 7:0	00	T T	় ়	F (*)
Intersection	Home Rd & Liberty Rd N	File Na	ame	Sc2A	Int 1 &	2 PN	1 - With Ir	nproven	nents.xu	JS			
Project Description	Redwood Home Rd TIS					_		•					
Demand Information			EB			W	D		NB			SB	
Approach Movement		L	Т	R	1	T		+ -	T	R	L	T	R
Demand (v), veh/h		47	542	269	114	_	_	208	143	62	15	166	40
Demand (v), ven/n		47	342	203	114	J4	20	200	143	02	10	100	40
Signal Information					<u> </u>	<u> </u>	<u>L</u>		u .				
Cycle, s 120.0	Reference Phase 2		P	5 ۲				- 1	121 ×		A -	1	A
Offset, s 0	Reference Point Begin	Green	7 1	2.2	54.6	7.5	5 2.2	22.0		1	Y 2	3	4
Uncoordinated No	Simult. Gap E/W On	Yellow		0.0	5.2	4.3		5.2		7	}		KŤ2
Force Mode Fixed	Simult. Gap N/S On	Red	1.4	0.0	1.0	2.0		1.0		5	6	7	8
T D		EDI		EDT	NA/D		MOT	ND		NDT	ODI		ODT
Timer Results		EBI 5	-	EBT 2	WB 1	L	WBT 6	NB	_	NBT 8	SBI 7	-	SBT 4
Assigned Phase Case Number		1.1		3.0	1.1	_	4.0	1.1		4.0	1.1	_	4.0
Phase Duration, s		12.8	2	60.8	15.0		63.0	16.0		30.4	13.8		28.2
Change Period, (Y+R	- \ c	5.7)	6.2	7.1		6.2	5.8		6.2	6.3		6.2
Max Allow Headway (<u>, </u>	4.0		0.0	4.0	_	0.2	4.0		4.0	4.0		4.0
Queue Clearance Time		3.6		0.0	6.3		0.0	12.2		15.8	2.8		15.9
Green Extension Time	, - ,	0.0	_	0.0	0.0	_	0.0	0.0		1.0	0.0	_	0.8
Phase Call Probability	(9 °), °	1.00		0.0	1.00		0.0	1.00		1.00	1.00		1.00
Max Out Probability		1.00			1.00			1.00		0.13	0.30		0.37
Movement Group Res	ults		EB			WE	3		NB	vi		SB	
Approach Movement		L	T	R	L	Т	R	L	Т	R	L	Т	R
Assigned Movement		5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v	/·	48	556	276	124	616		226	223		16	224	
Adjusted Saturation Flo	· /·	1781	1870	1610	1781	1859	_	1781	1774		1781	1807	
Queue Service Time (g	•	1.6	24.6	14.0	4.3	31.4	_	10.2	13.8		0.8	13.9	
Cycle Queue Clearance	e IIme (<i>g c</i>), s	1.6	24.6	14.0	4.3	31.4		10.2	13.8		0.8	13.9	
Green Ratio (g/C)		0.51	0.45	0.54	0.52	0.47	_	0.27	0.20		0.25	0.18	
Capacity (c), veh/h	tio (V)	323	851	869	391	880		290	358		253	331	
Volume-to-Capacity Ra		0.149	0.654	_	0.317	0.70 505.		0.780	0.623		0.065	0.676 270.6	
Back of Queue (Q), ft/ Back of Queue (Q), ve	· · · · · · · · · · · · · · · · · · ·	28.9	329 13.0	268.4	76.4 3.0	19.9	_	4.4	10.2		16.4 0.6	10.7	
	RQ) (95 th percentile)	0.05	0.00	0.00	0.24	0.00		0.34	0.00		0.05	0.00	
Uniform Delay (d 1), s	· · · · · · · · · · · · · · · · · · ·	19.1	19.5	21.0	17.7	24.9		40.4	43.7		35.2	45.7	
Incremental Delay (d 2)		0.1	2.3	0.6	0.5	4.6		12.8	3.3		0.1	5.4	
Initial Queue Delay (d 2	<u>, </u>	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (d), s/ve	<u>, </u>	19.2	21.8	21.6	18.2	29.5		53.2	47.1		35.3	51.0	
Level of Service (LOS)		В	C	C	B	C		D	D		D	D	
Approach Delay, s/veh		21.6		С	27.6		С	50.2		D	50.0		D
	ntersection Delay, s/veh / LOS				2.0						С		
Multimodal Results						WE			NB			SB	
	destrian LOS Score / LOS				2.3		В	2.3		В	2.5		В
Bicycle LOS Score / LC)S	2.0		В	1.7		В	1.2		Α	0.9		Α

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	HCS7 Two-Way Sto	p-Control Report	
General Information		Site Information	
Analyst	SBG	Intersection	Home Rd & Access Rd
Agency/Co.	American Structurepoint	Jurisdiction	Delaware County
Date Performed	7/5/2019	East/West Street	Home Rd
Analysis Year	2020	North/South Street	Access Rd
Time Analyzed	Sc2A - PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Redwood Home Rd TIS		

Lanes



Approach		Eastb	ound			Westl	oound			North	bound		Southbound U L T 10 11 0 0 No					
Movement	U	L	T	R	U	L	Т	R	U	L	Т	R	U	L	Т	R		
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12		
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0		
Configuration				TR		L	Т				LR							
Volume, V (veh/h)			851	26		11	617			14		7						
Percent Heavy Vehicles (%)						2				0		0						
Proportion Time Blocked																		
Percent Grade (%)										()							
Right Turn Channelized		N	lo			N	lo			N	lo		No					
Median Type/Storage				Left	Only								1					

Critical and Follow-up Headways

Base Critical Headway (sec)								
Critical Headway (sec)								
Base Follow-Up Headway (sec)								
Follow-Up Headway (sec)								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					12				23			
Capacity, c (veh/h)					721				268			
v/c Ratio					0.02				0.09			
95% Queue Length, Q ₉₅ (veh)					0.1				0.3			
Control Delay (s/veh)					10.1				19.7			
Level of Service, LOS					В				С			
Approach Delay (s/veh)				0	.2		19).7				
Approach LOS								(

		HCS	7 Sig	nalize	d Int	ersec	tion F	Resu	ılts Suı	nmar	y				
													,		
General Inform	nation								Intersec	tion Inf	ormatio	on		1111 4741	ta la
Agency		American Structure	point						Duration	, h	0.25			2++4	
Analyst		SBG		Analys	is Date	Jul 8,	2019		Area Typ	е	Other		△		<u>~</u> }_
Jurisdiction		Delaware County, 0	ЭH	Time F	Period	AM P	eak		PHF		0.92		*	w∯t	←
Urban Street		Home Rd		Analys	sis Yea	(With	- 2020 I out ments)	Build	Analysis	Period	1> 7:0	00		\	7
Intersection		Home Rd & Sawmi	II Pkwy	File Na	ame	Sc2B	Int 1 &	2_AN	∕l.xus				7		
Project Descrip	tion	Redwood Home Ro	TIS											_	
Demand Inform	nation				EB			W	′B		NB			SB	
Approach Move	ement				Т	R	L	1	ΓR	L	Т	R	L	Т	R
Demand (v), v				130	311	106	157	31	_	220	711	131	115	448	68
0: 11.6	4.									1 11:					
Signal Informa				-	Ľ.	۔ مُل	1.5	H	20	- 215	1	_	A	Κ.	$oldsymbol{\wedge}$
Cycle, s	100.0	Reference Phase	2			R	- ₹ '	، ا ،	5 5	12 5		1	♦ 2	3	4
Offset, s	90	Reference Point	Begin	Green		1.3	29.5	7.5	5 0.7	22.8				ΙÌ	
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	3.9		4.8		~	7	7_	V
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.2	0.0	1.0	2.2	2 2.2	1.0		5	6	7	8
Timer Results				EBI	T	EBT	WB	L	WBT	NBI		NBT	SBI		SBT
Assigned Phase	e			5		2	1	_	6	3		8	7		4
Case Number	se Number					4.0	1.1		3.0	1.1		4.0	1.1		3.0
	ase Duration, s					37.0	14.0	_	35.7	20.4		35.4	13.6		28.6
	ase Duration, s ange Period, (Y+R c), s					6.2	6.5		6.2	6.1		5.8	6.1		5.8
	nase Duration, s nange Period, (Y+R c), s nax Allow Headway (<i>MAH</i>), s					0.0	4.0		0.0	4.0		4.0	4.0		4.0
Queue Clearan		·		4.0 7.3		0.0	9.5		0.0	11.4		25.7	7.3		14.2
Green Extensio		, - ,		0.1		0.0	0.0	_	0.0	0.2	_	2.2	0.0		3.9
Phase Call Prol		(90),0		1.00		0.0	1.00	-	0.0	1.00	_	1.00	1.00	_	1.00
Max Out Proba				1.00			1.00			1.00		1.00	1.00		0.56
				'											
Movement Gro		sults			EB		<u> </u>	WE			NB		.	SB	
Approach Move				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Move				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F		·		141	453	-	191	383		239	470	445	125	487	74
		ow Rate (s), veh/h/	ın	1781	1789	-	1781	187	_	1781	1870	1768	1781	1781	1585
Queue Service		- ,		5.3	23.5	-	7.5	15.0		9.4	23.7	23.7	5.3	12.2	3.3
Cycle Queue C Green Ratio (g		e iime (<i>g c</i>), s		5.3 0.38	23.5		7.5	15.0 0.29	_	9.4	0.30	0.30	5.3 0.30	12.2 0.23	3.3 0.32
Capacity (c), v				368	551		255	552		423	554	523	230	812	501
Volume-to-Capa		tio (V)		0.384	0.823	-	0.749	0.69	_	0.566	0.850	0.850	0.544	0.600	0.148
		/In(95 th percentile	`	96.8	429.8	_	143	223.	_	177.7	460	435.3	104.4	234.7	58.7
	· · ·	eh/In(95 th percentile		3.8	16.9		5.6	8.8		7.0	18.1	17.4	4.1	9.2	2.3
		RQ) (95 th percen		0.26	0.00		0.29	0.0		0.30	0.00	0.00	0.21	0.00	0.00
			uic)	22.1	32.1		25.0	21.4		22.8	33.1	33.1	28.3	34.5	24.5
	niform Delay (d 1), s/veh						7.7	4.6		1.8	15.0	15.8	2.6	3.3	0.6
Initial Queue De	itial Queue Delay (d ₃), s/veh						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	ontrol Delay (<i>d</i>), s/veh						32.6	26.0		24.5	48.1	48.9	31.0	37.8	25.2
Level of Service				С	D		С	С	В	С	D	D	С	D	С
Approach Delay	pproach Delay, s/veh / LOS				3	D	26.0)	С	43.5	5	D	35.2	2	D
Intersection De	ersection Delay, s/veh / LOS					36	5.9						D		
Multimodal Re	culto				EB			WE	2		NB			SB	
Pedestrian LOS		/1.08		2.8		С	3.0		C	2.4		В	2.3		В
Bicycle LOS Sc				1.5		A	1.6	_	В	1.4		A	1.1		A
210,010 200 00	.5,5 / LC			1.5		, ,	1.0			1.7		, ,	1.1		, ,

		HCS	7 Sig	nalize	d Int	ersec	tion F	Resu	lts Sur	nmar	у				
General Inform	ation							1	Intersec	tion Inf	ormatic	n.		4 4 4	Ja U
	iation	American Structure	noint					<u> </u>	Duration.		0.25	ΣΠ			
Agency Analyst		SBG	point	Analye	sia Data	Jul 8,	2010	-	Area Typ		Other				<u>L</u>
Jurisdiction			1 ⊔	Time F		AM P		Ì	PHF	-	0.92		→	wli	≥
Urban Street		Delaware County, C Home Rd	ЛП	-			- 2020 I	Duild	Analysis	Dorind	1> 7:0	20	- 3		. ←
Orban Street		nome Ru		Analys	sis Year	(Without Apartr With		.	Analysis	Period	1 7.0	JU		4147	
Intersection		Home Rd & Sawmi	l Pkwy	File N	ame	Sc2B_	_Int 1 &	2_AM	- With In	nproven	nents.xı	ıs			
Project Descrip	tion	Redwood Home Ro	ITIS												
Damand Inform					- FD			١٨/	D.		ND			CD	
Demand Inform				-	EB	I D	1	W	-		NB T	T D	1 .	SB	В
Approach Move				130	311	106	157	31		220	711	121	115	448	R 68
Demand (v), v	en/n		-	130	311	100	157	31	4 142	220	/ / / /	131	115	440	00
Signal Informa	tion				2	12		U	l, rs		,				
Cycle, s	100.0	Reference Phase	2	1	P7 6	\exists			- N		, 121		A -	· /	Φ
Offset, s	90	Reference Point	Begin	Green	7.5	1.3	29.5	7.5	0.7	22.8		1	2 .	3	4
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	3.9		4.8	<u> </u>	,	→	L	κtz
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.2	0.0	1.0	2.2		1.0		5	6	7	8
Timer Results				EBI		EBT	WB	L	WBT	NBI	-	NBT	SBI	-	SBT
Assigned Phase	е			5		2	1		6	3		8	7		4
Case Number				1.1		3.0	1.1		3.0	1.1		4.0	1.1		3.0
Phase Duration	<u> </u>			15.3	3	37.0	14.0)	35.7	20.4	<u> </u>	35.4	13.6	5	28.6
Change Period,		,		6.5		6.2	6.5		6.2	6.1		5.8	6.1		5.8
Max Allow Head		· · · · · · · · · · · · · · · · · · ·		4.0		0.0	4.0		0.0	4.0		4.0	4.0		4.0
Queue Clearan		, - ,		7.3			9.5			11.4		25.7	7.3		14.2
Green Extensio		(g e), s		0.1	_	0.0	0.0		0.0	0.2	_	2.2	0.0		3.9
Phase Call Prol				1.00			1.00			1.00		1.00	1.00		1.00
Max Out Probal	bility			1.00)		1.00)		1.00)	1.00	1.00)	0.56
Movement Gro	up Res	sults			EB			WB			NB			SB	
Approach Move				L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Move	ment			5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F	Rate (v), veh/h		141	338	115	191	383	173	239	470	445	125	487	74
Adjusted Satura	ation Flo	ow Rate (s), veh/h/l	n	1781	1870	1610	1781	1870	1585	1781	1870	1768	1781	1781	1585
Queue Service	Time (g	g s), S		5.3	15.3	4.2	7.5	15.6	6.6	9.4	23.7	23.7	5.3	12.2	3.3
Cycle Queue C	learanc	e Time (<i>g ε</i>), s		5.3	15.3	4.2	7.5	15.6	6.6	9.4	23.7	23.7	5.3	12.2	3.3
Green Ratio (g.				0.38	0.31	0.45	0.37	0.29		0.39	0.30	0.30	0.30	0.23	0.32
Capacity (c), v				368	576	726	347	552		423	554	523	230	812	501
Volume-to-Capa				0.384	0.587	0.159	0.552	0.69		0.566	0.850	0.850	0.544	0.600	0.148
	• •	In (95 th percentile)		96.8	290.3	68	128	223.0		177.7	460	435.3	104.4	234.7	58.7
		eh/ln (95 th percenti		3.8	11.4	2.7	5.0	8.8	3.9	7.0	18.1	17.4	4.1	9.2	2.3
		RQ) (95 th percent	ile)	0.26	0.00	0.00	0.26	0.00		0.30	0.00	0.00	0.21	0.00	0.00
Uniform Delay (· · · · · ·			22.1	29.2	16.2	22.8	21.4		22.8	33.1	33.1	28.3	34.5	24.5
Incremental De	• .	,		0.7	4.3	0.5	1.2	4.6	0.8	1.8	15.0	15.8	2.6	3.3	0.6
Initial Queue De		,		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (2 11		22.7	33.6	16.7	24.0 C	26.0 C		24.5 C	48.1	48.9	31.0 C	37.8	25.2
Level of Service Approach Delay		/108		C 27.7	C	B C			C B		D	D D	35.2	D	D
Intersection Delay				27.7			23.8 1.1	ر	U	43.5	,		35.∠ C	-	U
milersection Del	ay, S/VE	ai / LO3				34	t. I								
Multimodal Re	sults				EB			WB			NB			SB	
Pedestrian LOS		/LOS		2.8	-	С	3.0		С	2.4		В	2.4		В
	20010						3.0					_	<u> </u>		

 Bicycle LOS Score / LOS
 1.5
 A
 1.6
 B
 1.4
 A
 1.1
 A

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General InformationAgencyAmerican StructurepointDuration, h0.25AnalystSBGAnalysis DateJul 8, 2019Area TypeOtherJurisdictionDelaware County, OHTime PeriodAM PeakPHF0.92Urban StreetHome RdAnalysis YearSc2B - 2020 Build (Without Apartments)Analysis Period1> 7:00IntersectionHome Rd & Liberty Rd NFile NameSc2B_Int 1 & 2_AM.xusProject DescriptionRedwood Home Rd TIS	*
Agency American Structurepoint Duration, h 0.25 Analyst SBG Analysis Date Jul 8, 2019 Area Type Other Jurisdiction Delaware County, OH Time Period AM Peak PHF 0.92 Urban Street Home Rd Analysis Year Sc2B - 2020 Build (Without Apartments) Intersection Home Rd & Liberty Rd N File Name Sc2B_Int 1 & 2_AM.xus Project Description Redwood Home Rd TIS Demand Information EB WB NB SB	
Analyst SBG Analysis Date Jul 8, 2019 Area Type Other Jurisdiction Delaware County, OH Time Period AM Peak PHF 0.92 Urban Street Home Rd Analysis Year Sc2B - 2020 Build (Without Apartments) Intersection Home Rd & Liberty Rd N File Name Sc2B_Int 1 & 2_AM.xus Project Description Redwood Home Rd TIS Demand Information EB WB NB SB	
Jurisdiction Delaware County, OH Time Period AM Peak PHF 0.92 Urban Street Home Rd Analysis Year Sc2B - 2020 Build (Without Apartments) 1> 7:00 Intersection Home Rd & Liberty Rd N File Name Sc2B_Int 1 & 2_AM.xus Project Description Redwood Home Rd TIS Demand Information EB WB NB SB	* * * *
Urban Street Home Rd Analysis Year Sc2B - 2020 Build (Without Apartments) Intersection Home Rd & Liberty Rd N File Name Sc2B_Int 1 & 2_AM.xus Project Description Redwood Home Rd TIS Demand Information EB WB NB SB	
Comparis Comparis	T
Intersection Home Rd & Liberty Rd N File Name Sc2B_Int 1 & 2_AM.xus Project Description Redwood Home Rd TIS Demand Information EB WB NB SB	F
Demand Information EB WB NB SB	
Approach Movement	R
Demand (v), veh/h 42 404 117 78 445 17 194 101 59 23 152	48
Signal Information	
Cycle a 400 0 Peference Phase 2	小
Officet c 00 Peference Point Pegin	4
Green 7.1 1.4 31.8 14.2 21.6 0.0	
Uncoordinated No Simult. Gap E/W On Yellow 4.3 0.0 5.2 3.9 5.2 0.0 Force Mode Fixed Simult. Gap N/S On Red 1.4 0.0 1.0 1.9 1.0 0.0	Y
Poice Mode Prixed Simult. Gap 14/5 On Red 1.4 0.0 1.0 1.9 1.0 0.0	
Timer Results EBL EBT WBL WBT NBL NBT SBL	SBT
Assigned Phase 5 2 1 6 3 8 7	4
Case Number 1.1 4.0 1.1 4.0 1.1 4.0 1.1	4.0
Phase Duration, s 12.8 38.0 14.2 39.4 20.0 27.8 20.0 2	27.8
	6.2
	4.0
	12.8
Green Extension Time (g e), s 0.0 0.0 0.0 0.0 0.2 1.0 0.0	0.9
Phase Call Probability 1.00 1.00 1.00 1.00	1.00
Max Out Probability 1.00 1.00 1.00 0.03 0.00 0	0.09
Movement Group Results EB WB NB SB	
Approach Movement L T R L T R L T R L T	R
Assigned Movement 5 2 12 1 6 16 3 8 18 7 4	14
Adjusted Flow Rate (v), veh/h 45 560 85 502 211 174 25 217	
Adjusted Saturation Flow Rate (s), veh/h/ln	
Queue Service Time (g s), s 1.6 30.7 3.1 24.7 8.6 8.6 0.9 10.8	
Cycle Queue Clearance Time (<i>g c</i>), s 1.6 30.7 3.1 24.7 8.6 8.6 0.9 10.8	
Green Ratio (g/C) 0.39 0.32 0.39 0.33 0.36 0.22 0.35 0.22	
Capacity (c), veh/h 256 572 208 617 427 379 449 387	
Volume-to-Capacity Ratio (<i>X</i>) 0.176 0.980 0.408 0.814 0.494 0.459 0.056 0.561	
Back of Queue (Q), ft/ln (95 th percentile) 27.4 466.2 56.8 452.2 158 162.8 16.7 207.7	
Back of Queue (Q), veh/ln (95 th percentile) 1.1 18.4 2.2 17.8 6.2 6.4 0.7 8.2	
Queue Storage Ratio (RQ) (95 th percentile) 0.05 0.00 0.17 0.00 0.49 0.00 0.05 0.00	
Uniform Delay (d 1), s/veh 21.8 27.6 24.6 30.6 24.4 34.1 21.8 35.0	
Incremental Delay (d 2), s/veh 0.2 23.4 1.3 11.3 0.9 0.9 0.1 1.8	
Initial Queue Delay (d 3), s/veh 0.0 <	
Control Delay (<i>d</i>), s/veh 21.9 51.0 25.9 41.8 25.3 35.0 21.9 36.8	
Level of Service (LOS) C D C D C C D	
Approach Delay, s/veh / LOS 48.8 D 39.5 D 29.7 C 35.3	D
Intersection Delay, s/veh / LOS 40.0 D	
Multimodal Results EB WB NB SB	
Pedestrian LOS Score / LOS 2.3 B 2.3 B 2.3	В
Bicycle LOS Score / LOS 1.5 A 1.5 A 1.1 A 0.9	Α

Agency							Intersec	tion Inf	ormatic	\n		4 사하	Ja L
	American Structurepoint					\rightarrow	Duration		0.25	711		41	
	SBG	Analye	sia Data	Jul 8,	2010		Area Typ		Other				L A
	-	Time F		AM P		_	PHF	e	0.92			wli	<u>,</u>
	Delaware County, OH Home Rd	ļ	sis Year		- 2020 I		Analysis	Dorind	1> 7:0	20	-		~ <u>-</u>
Orban Street	nome ku	Arraiys	sis real	(Without Apartr With		.	Arialysis	Period	1>7.0	JO		<u>ጎ</u> † ਬਾਰਦਾ	F
Intersection	Home Rd & Liberty Rd N	File Na	ame	Sc2B	Int 1 &	2_AM	- With In	nproven	nents.xu	ıs			
Project Description	Redwood Home Rd TIS			,									
Danier d lufa martina			ED			١٨/٢			ND			OD	
Demand Information		-	EB	Τ.		WE	1	+ -	NB T		+ .	SB	
Approach Movement		42	404	117	78	44:	_	194	101	R 59	23	152	R 48
Demand (v), veh/h		42	404	117	10	44	5 17	194	101	59	23	152	40
Signal Information				15				,					
Cycle, s 100.0	Reference Phase 2	1	P 6	5 ۲	147	~ K	N 1243				A -	· /	4
Offset, s 90	Reference Point Begin	Green	7 1	1.4	31.8	14.				1	Y 2 .	3	4
Uncoordinated No	Simult. Gap E/W On	Yellow		0.0	5.2	3.9		0.0		>	→		κtz
Force Mode Fixed	Simult. Gap N/S On	Red	1.4	0.0	1.0	1.9		0.0		5	6	7	8
Timer Results		EBI		EBT	WB	L	WBT	NBI	-	NBT	SBI	-	SBT
Assigned Phase		5		2	1		6	3		8	7		4
Case Number		1.1		3.0	1.1		4.0	1.1		4.0	1.1		4.0
Phase Duration, s		12.8		38.0	14.2	_	39.4	20.0	_	27.8	20.0	_	27.8
Change Period, (Y+R c	,	5.7		6.2	7.1		6.2	5.8		6.2	6.3		6.2
Max Allow Headway (M	·	4.0		0.0	4.0		0.0	4.0		4.0	4.0	_	4.0
Queue Clearance Time	1 = /	3.5		2.0	5.1			10.6		10.6	2.9		12.8
Green Extension Time ((<i>g</i> e), S	0.0		0.0	0.0		0.0	0.2		1.0	0.0		0.9
Phase Call Probability		1.00			1.00			1.00		1.00	1.00		1.00
Max Out Probability		1.00	,		1.00	,		1.00	' '	0.03	0.00	,	0.09
Movement Group Res	ults		EB			WB			NB			SB	
Approach Movement		L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Movement		5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	45	434	126	85	502		211	174		25	217	
Adjusted Saturation Flo	w Rate (s), veh/h/ln	1781	1870	1610	1781	1858	3	1781	1754		1781	1793	
Queue Service Time (g	· ·	1.5	20.5	5.1	3.1	24.7		8.6	8.6		0.9	10.8	
Cycle Queue Clearance	e Time (<i>g c</i>), s	1.5	20.5	5.1	3.1	24.7	_	8.6	8.6		0.9	10.8	
Green Ratio (g/C)		0.39	0.32	0.46	0.39	0.33		0.36	0.22		0.35	0.22	
Capacity (c), veh/h		256	595	741	306	617		427	379		449	387	
Volume-to-Capacity Rat		0.176		_	0.277	0.814		0.494	0.459		0.056	0.561	
Back of Queue (Q), ft/l		27.4	347.5		55.3	452.2		158	162.8		16.7	207.7	
Back of Queue (Q), ve	,	1.1	13.7	3.4	2.2	17.8	_	6.2	6.4		0.7	8.2	
Queue Storage Ratio (0.05	0.00	0.00	0.17	0.00		0.49	0.00		0.05	0.00	
Uniform Delay (d 1), s/		21.6	29.9	18.3	21.9	30.6		24.4	34.1		21.8	35.0	
Incremental Delay (d 2		0.2	5.7	0.4	0.5	11.3		0.9	0.9		0.1	1.8	
Initial Queue Delay (d s Control Delay (d), s/ve	,	0.0 21.8	0.0 35.6	0.0	0.0 22.4	0.0 41.8		0.0 25.3	0.0 35.0		0.0 21.9	0.0 36.8	
Level of Service (LOS)	d I	21.6 C	35.6 D	16.6 B	22.4 C	41.6 D		25.3 C	35.0 C		C C	D D	
Approach Delay, s/veh /	/LOS	31.0		С	39.0		D	29.7		С	35.3		D
Intersection Delay, s/vell/		31.0			39.0 3.9	,	U	29.1			C 35.5		U
oroodon bolay, 5/Vel				3.									
Multimodal Results			EB			WB			NB			SB	
	LOS	2.3		В	2.3	-	В	2.3		В	2.4		В

 Bicycle LOS Score / LOS
 1.5
 A
 1.5
 A
 1.1
 A
 0.9
 A

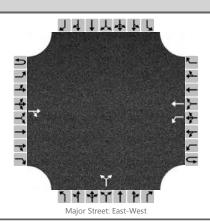
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	HCS7 Two-Way Sto	p-Control Report	
General Information		Site Information	
Analyst	SBG	Intersection	Home Rd & Access Rd
Agency/Co.	American Structurepoint	Jurisdiction	Delaware County
Date Performed	7/5/2019	East/West Street	Home Rd
Analysis Year	2020	North/South Street	Access Rd
Time Analyzed	Sc2B - AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Redwood Home Rd TIS		

Lanes



Vehicle Volumes and Adjustments

Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration		TR 551 8				L	Т				LR					
Volume, V (veh/h)						3	652			25		12				
Percent Heavy Vehicles (%)		551 8				2				0		0				
Proportion Time Blocked																
Percent Grade (%)										()					
Right Turn Channelized		No				Ν	lo			Ν	lo			Ν	lo	
Median Type/Storage				Left	Only								1			

Critical and Follow-up Headways

Base Critical Headway (sec)								
Critical Headway (sec)								
Base Follow-Up Headway (sec)								
Follow-Up Headway (sec)								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			3				40			
Capacity, c (veh/h)			970				358			
v/c Ratio			0.00				0.11			
95% Queue Length, Q ₉₅ (veh)			0.0				0.4			
Control Delay (s/veh)			8.7				16.3			
Level of Service, LOS			А				С			
Approach Delay (s/veh)			0	.0		16	5.3			
Approach LOS						(2			

HCS7 Signalized Intersection Results Summary General Information Intersection Information Duration, h 0.25 Agency American Structurepoint Analyst SBG Analysis Date Jul 8, 2019 Area Type Other Jurisdiction Delaware County, OH Time Period PM Peak PHF 0.92 **Urban Street** Home Rd Sc2B - 2020 Build Analysis Period 1>7:00 Analysis Year (Without Apartments) Home Rd & Sawmill Pkwv File Name Intersection Sc2B Int 1 & 2 PM.xus **Project Description** Redwood Home Rd TIS ΕB WB NB SB **Demand Information** Т R Approach Movement L L R L R L R 98 384 186 162 378 94 328 511 227 145 471 64 Demand (v), veh/h **Signal Information** حلاء Cycle, s 120.0 Reference Phase 2 542 100 Offset, s Reference Point Begin Green 7.5 1.0 45.8 7.9 6.9 20.2 Uncoordinated No Simult, Gap E/W On Yellow 4.3 0.0 5.2 3.9 3.9 4.8 Force Mode Fixed Simult. Gap N/S 2.2 2.2 2.2 On Red 0.0 1.0 1.0 **Timer Results EBL EBT WBL WBT NBL NBT** SBL SBT 6 8 **Assigned Phase** 5 2 1 3 7 4 1.1 4.0 4.0 Case Number 1.1 3.0 1.1 1.1 3.0 Phase Duration, s 15.0 53.0 14.0 52.0 27.0 39.0 14.0 26.0 Change Period, (Y+Rc), s 6.5 6.2 6.5 6.2 6.1 5.8 6.1 5.8 Max Allow Headway (MAH), s 4.0 0.0 4.0 0.0 4.0 4.0 4.0 4.0 Queue Clearance Time (g s), s 6.2 9.5 21.2 27.4 9.9 18.8 Green Extension Time (g_e), s 0.1 0.0 0.0 0.0 0.0 2.8 0.0 0.9 Phase Call Probability 1.00 1.00 1.00 1.00 1.00 1.00 Max Out Probability 1.00 1.00 1.00 0.78 1.00 1.00 **Movement Group Results** FB **WB** NB SB Approach Movement L Т R L Т R L Т R L Т R 5 2 12 7 4 **Assigned Movement** 1 6 16 3 8 18 14 423 380 158 Adjusted Flow Rate (v), veh/h 107 620 214 500 124 357 512 70 Adjusted Saturation Flow Rate (s), veh/h/ln 1781 1870 1585 1870 1674 1781 1781 1585 1781 1767 1781 7.5 7.9 Queue Service Time (g_s), s 4.2 39.5 24.8 5.0 19.2 25.3 25.4 16.8 4.2 4.2 39.5 7.5 24.8 5.0 19.2 25.3 25.4 7.9 4.2 Cycle Queue Clearance Time (g c), s 16.8 Green Ratio (g/C) 0.45 0.39 0.44 0.38 0.45 0.36 0.28 0.28 0.23 0.17 0.24 689 207 396 517 463 210 599 344 714 709 379 Capacity (c), veh/h 0.701 Volume-to-Capacity Ratio (X) 0.310 0.899 1.038 0.175 0.901 0.817 0.819 0.751 0.854 0.184 361.5 666.1 351.8 80.2 400.2 484.8 441.9 206.5 334.6 Back of Queue (Q), ft/ln (95 th percentile) 77 77.7 Back of Queue (Q), veh/ln (95 th percentile) 3.0 26.2 14.2 13.9 3.2 15.8 19.1 17.7 8.1 13.2 3.1 Queue Storage Ratio (RQ) (95 th percentile) 0.21 0.00 0.72 0.00 0.27 0.67 0.00 0.00 0.41 0.00 0.00 Uniform Delay (d 1), s/veh 22.0 34.4 24.8 17.2 40.6 40.6 41.4 36.3 32.4 32.7 48.5 Incremental Delay (d 2), s/veh 0.5 17.0 59.9 3.6 0.3 23.0 13.3 14.9 14.0 14.4 1.1 0.0 0.0 0.0 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 Control Delay (d), s/veh 22.5 51.4 92.3 28.5 17.6 55.8 53.9 55.5 55.5 62.9 37.4 Level of Service (LOS) С D F С В Ε D Ε Ε Ε D Approach Delay, s/veh / LOS 47.1 D 43.2 D 55.0 D 58.9 Ε Intersection Delay, s/veh / LOS 51.3 D **Multimodal Results** FB WB NB SB Pedestrian LOS Score / LOS 2.8 С 2.9 С 2.4 В 2.3 В Bicycle LOS Score / LOS 1.4 1.7 В 1.6 Α 1.1

		HCS	7 Sig	nalize	d Int	ersec	tion F	Resu	Its Sur	nmar	у				
General Inform	ation							1	Intersec	tion Inf	ormatic	\n	Į.	4 4 4	یا ط
	iation	American Structure	noint						Duration		0.25)[]			
Agency Analyst		SBG	point	Analya	via Data	Jul 8,	2010	-	Area Typ		Other				L A
Jurisdiction			Л Ц	Time F		PM P			PHF		0.92		→	wli	<u>≯</u>
Urban Street		Delaware County, 0 Home Rd	П	-	sis Year		- 2020 I	Duild	Analysis	Doriod	1> 7:0	20	- -		÷ ÷
Orban Street		nome Ru		Analys	is real	(Without Apartr With			Allalysis	renou	1 7.0	J0		4 1 4 7	
Intersection		Home Rd & Sawmi	l Pkwy	File Na	ame	Sc2B	Int 1 &	2_PN	1 - With In	nproven	nents.xı	ıs			
Project Descrip	tion	Redwood Home Ro	TIS												
D	4.				ED			10/	<u> </u>		ND			0.0	
Demand Inform					EB	Τ.	+ -	W	-	—	NB			SB	
Approach Move				98	384	186	162	37	_	328	511	R 227	145	471	R 64
Demand (v), v	en/n		-	90	304	100	102	31	0 94	320	511	227	145	4/1	04
Signal Informa	tion				2	2									
Cycle, s	120.0	Reference Phase	2	1	12 6	\exists			3725		1 ₇		A -	· /	4
Offset, s	100	Reference Point	Begin	Green	7.5	1.0	45.8	7.9		20.2		1	2 .	3	4
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	3.9		4.8		>	→	L	κtz
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.2	0.0	1.0	2.2		1.0		5	6	7	8
Timer Results				EBI		EBT	WB	L	WBT	NB	L L	NBT	SBI	-	SBT
Assigned Phase	е			5		2	1		6	3		8	7		4
Case Number				1.1		3.0	1.1		3.0	1.1		4.0	1.1		3.0
Phase Duration				15.0)	53.0	14.0)	52.0	27.0)	39.0	14.0)	26.0
Change Period,	•	,		6.5		6.2	6.5		6.2	6.1		5.8	6.1		5.8
Max Allow Head		· · · · · · · · · · · · · · · · · · ·		4.0		0.0	4.0		0.0	4.0	_	4.0	4.0		4.0
Queue Clearan		· · · ·		6.2			9.5			21.2		27.4	9.9		18.8
Green Extensio		(g e), s		0.1		0.0	0.0		0.0	0.0		2.8	0.0		0.9
Phase Call Prol				1.00	_		1.00			1.00		1.00	1.00		1.00
Max Out Probal	bility			1.00)		1.00)	_	1.00)	0.78	1.00)	1.00
Movement Gro	oup Res	sults			EB			WE	<u> </u>		NB			SB	
Approach Move				L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Move	ment			5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F	Rate (v), veh/h		107	417	202	214	500	124	357	423	380	158	512	70
Adjusted Satura	ation Flo	ow Rate (s), veh/h/l	n	1781	1870	1610	1781	1870	1585	1781	1870	1674	1781	1781	1585
Queue Service	Time (g	g s), s		4.2	21.0	7.5	7.5	24.8	5.0	19.2	25.3	25.4	7.9	16.8	4.2
Cycle Queue C	learanc	e Time (<i>g շ</i>), s		4.2	21.0	7.5	7.5	24.8	5.0	19.2	25.3	25.4	7.9	16.8	4.2
Green Ratio (g.	· ·			0.45	0.39	0.56	0.44	0.38	0.45	0.36	0.28	0.28	0.23	0.17	0.24
Capacity (c), v				344	729	908	363	714		396	517	463	210	599	379
Volume-to-Capa				0.310		-	0.590	0.70	_	0.901	0.817	0.819	0.751	0.854	0.184
		/In (95 th percentile)		77	371.3		153.3	351.	_	400.2	484.8	441.9	206.5	334.6	77.7
		eh/ln (95 th percenti		3.0	14.6	4.7	6.0	13.9		15.8	19.1	17.7	8.1	13.2	3.1
		RQ) (95 th percent	ile)	0.21	0.00	0.00	0.31	0.00		0.67	0.00	0.00	0.41	0.00	0.00
Uniform Delay (`			22.0	28.7	13.0	26.1	24.8		32.7	40.6	40.6	41.4	48.5	36.3
Incremental De	• .	·		0.5	3.2	0.6	1.6	3.6		23.0	13.3	14.9	14.0	14.4	1.1
Initial Queue De		,		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (22.5 C	32.0 C	13.6 B	27.7 C	28.5 C		55.8 E	53.9 D	55.5 E	55.5 E	62.9	37.4 D
Level of Service Approach Delay						C			C B	_		D E		E	
Intersection Delay				25.5	,		26.6 2.8	J	U	55.0	,		58.9 D	,	Е
microcolon Del	iay, 5/VE	л / LOO				42	0								
Multimodal Re	sults				EB			WE	3		NB			SB	
Pedestrian LOS		/LOS		2.8	-	С	2.9	-	С	2.4		В	2.5		В
		-				-			-						

 Bicycle LOS Score / LOS
 1.7
 B
 1.6
 B
 1.4
 A
 1.1
 A

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		HCS	7 Sig	nalize	d Int	ersec	tion F	Resu	ılts	Sun	nmar	y				
General Informat	tion								Inte	ersect	ion Info	ormatic	n		1 1	ta la
Agency		American Structure	point						Dur	ration,	h	0.25			7. 4	R.
Analyst		SBG		Analys	is Date	Jul 8,	2019		Are	а Тур	е	Other		<i>∆</i> ,		<u>.</u>
Jurisdiction		Delaware County, 0	DΗ	Time F	Period	PM P	eak		PHI	F		0.92		*	w∯t	
Urban Street		Home Rd		Analys	sis Year	(With	- 2020 I out ments)	Build	Ana	alysis l	Period	1> 7:0	00	7	1	* * * * * * * * * * * * * * * * * * *
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc2B	Int 1 &	2_PN	/l.xus	s				7		
Project Description	n	Redwood Home Ro	TIS	,											_	
Demand Informa	tion				EB			V	/B			NB			SB	
Approach Movemo	ent			L	Т	R	L	-	Г	R	L	Т	R	L	Т	R
Demand (v), veh				46	532	265	114	53	32	20	202	143	62	15	166	38
Signal Information	nn -				T	7				T						
	20.0	Reference Phase	2	1	D .	-2		Ħ	71		- 1		_	7	\	▲ │
	110	Reference Point		ł	"	R	 		1	S↑	71 Y		1	Y 2	3	4
		Simult. Gap E/W	Begin	Green		1.2	57.6	8.		1.3	19.6	5		<u> </u>		•
	No	<u> </u>	On	Yellow	-	0.0	5.2	4.3		0.0	5.2		^ _	Y	> _	Ψ
Force Mode F	ixed	Simult. Gap N/S	On	Red	1.4	0.0	1.0	2.0	J	0.0	1.0		5	6	7	8
Timer Results				EBI	-	EBT	WB	L	WI	ВТ	NBL	-	NBT	SBI	-	SBT
Assigned Phase						2	1		6	3	3		8	7		4
Case Number	se Number					4.0	1.1		4.	.0	1.1		4.0	1.1		4.0
Phase Duration, s	;			14.2	2	65.0	13.0)	63	3.8	16.2	2	27.1	14.9)	25.8
Change Period, (Y+R c	:), s		7.1		6.2	5.7		6.	.2	5.8		6.2	6.3		6.2
Max Allow Headw	ay (N	<i>ЛАН</i>), s		4.0		0.0	4.0		0.	.0	4.0		4.0	4.0		4.0
Queue Clearance	Time	(g s), s		3.4			6.1				12.4		16.2	2.8		16.0
Green Extension	Time ((g _e), s		0.0		0.0	0.0		0.	.0	0.0		0.7	0.0		0.6
Phase Call Probal	bility			1.00)		1.00)			1.00		1.00	1.00)	1.00
Max Out Probabili	ity			1.00)		1.00)			1.00)	0.73	0.05	5	1.00
Movement Group	p Res	ults			EB			WE	3			NB			SB	
Approach Movemo	ent			L	Т	R	L	Т	Т	R	L	Т	R	L	Т	R
Assigned Moveme				5	2	12	1	6		16	3	8	18	7	4	14
Adjusted Flow Rat), veh/h		45	777		124	600)		220	223		16	222	
-		w Rate (s), veh/h/	n	1781	1765		1781	185	\rightarrow		1781	1774		1781	1810	
Queue Service Tir		· ,		1.4	46.3		4.1	29.	_		10.4	14.2		0.8	14.0	
Cycle Queue Clea		· ·		1.4	46.3		4.1	29.			10.4	14.2		0.8	14.0	
Green Ratio (g/C		, , , , , , , , , , , , , , , , , , , ,		0.54	0.49		0.54	0.4	_		0.25	0.17		0.24	0.16	
Capacity (c), veh				355	865		229	892	_		268	309		233	296	
Volume-to-Capaci	ity Rat	tio (X)		0.126	0.898		0.541	0.67	'3		0.818	0.721		0.070	0.750	
Back of Queue (C	Q), ft/l	In (95 th percentile)	24.9	544.1		77.7	480	.4		117.2	279.3		16.7	285.4	
Back of Queue (0	Q), ve	h/In (95 th percent	ile)	1.0	21.4		3.1	18.	9		4.6	11.0		0.7	11.2	
Queue Storage Ra	atio (/	RQ) (95 th percen	tile)	0.05	0.00		0.24	0.0	0		0.36	0.00		0.05	0.00	
Uniform Delay (d	1), s/	veh		17.2	22.6		24.9	24.	0		41.9	46.8		36.4	47.9	
Incremental Delay		<u> </u>		0.1	6.7		2.6	4.0			17.8	8.0		0.1	10.2	
Initial Queue Dela	ay (<i>d</i> a	3), s/veh		0.0	0.0		0.0	0.0	_		0.0	0.0		0.0	0.0	
Control Delay (d)	, .	h		17.3	29.3		27.4	28.	0		59.6	54.8		36.5	58.1	
Level of Service (I				В	С		С	С			E	D		D	E	
Approach Delay, s				28.7		С	27.9)		3	57.2	2	E	56.6	5	Е
Intersection Delay	, s/vel	h / LOS				37	7.1							D		
Multimodal Resu	ılts				EB			WE	3			NB			SB	
Pedestrian LOS S		LOS		2.3	-	В	2.3	- 11	Е	3	2.3		В	2.3		В
Bicycle LOS Score				2.0		В	1.7	_	Е	_	1.2		Α	0.9		Α

Analyst SBG Jurisdiction Delawa Urban Street Home I Intersection Home I Project Description Redwo Demand Information Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+R c), s Max Allow Headway (MAH), s Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Movement Group Results	can Structurepoint are County, OH Rd Rd & Liberty Rd N ood Home Rd TIS ence Phase 2 ence Point Begin t. Gap E/W On t. Gap N/S On	Time F Analys File Na L 46	Period sis Year	(Withouth) Apartr With Improv	eak - 2020 E out nents) - vements	I I Build /	Intersect Duration, Area Typ PHF Analysis - With Im	h e Period	0.25 Other 0.92 1> 7:0	00		,	* * * * * * * * * * * * * * * * * * *
Agency Analyst SBG Jurisdiction Delawa Urban Street Intersection Project Description Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	are County, OH Rd Rd & Liberty Rd N Dod Home Rd TIS ence Phase 2 ence Point Begin t. Gap E/W On	Time F Analys File Na L 46	Period sis Year ame	PM Pe Sc2B (Witho Apartr With Impro Sc2B	eak - 2020 E out nents) - vements Int 1 &	Build /	Duration, Area Typ PHF Analysis	h e Period	0.25 Other 0.92 1> 7:0	00		CONTRACTOR SANCTOR	* * * * * * * * * * * * * * * * * * *
Analyst Jurisdiction Delawa Urban Street Intersection Project Description Approach Movement Demand (v), veh/h Signal Information Cycle, s Offset, s 110 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	are County, OH Rd Rd & Liberty Rd N Dod Home Rd TIS ence Phase 2 ence Point Begin t. Gap E/W On	Time F Analys File Na L 46	Period sis Year ame	PM Pe Sc2B (Witho Apartr With Impro Sc2B	eak - 2020 E out nents) - vements Int 1 &	Build /	Area Typ PHF Analysis - With Im	e Period	Other 0.92 1> 7:0	00		* [‡] i ↑ † SII 1 1	**************************************
Jurisdiction Urban Street Intersection Project Description Pemand Information Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Refere Offset, s 110 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	Rd & Liberty Rd N pod Home Rd TIS ence Phase 2 ence Point Begin t. Gap E/W On	Time F Analys File Na L 46	Period sis Year ame	PM Pe Sc2B (Witho Apartr With Impro Sc2B	eak - 2020 E out nents) - vements Int 1 &	Build /	PHF Analysis - With Im	Period	0.92 1> 7:0	00		1 ≯	* * * * * * * * * * * * * * * * * * *
Intersection Home Project Description Redwo Demand Information Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Refere Offset, s 110 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	Rd & Liberty Rd N pod Home Rd TIS ence Phase 2 ence Point Begin t. Gap E/W On	File No	ame EB	Sc2B (Without Apartr With Improverse Sc2B_	- 2020 E out nents) - vements Int 1 &	Build /	Analysis - With Im		1> 7:0			1 † 	* T
Intersection Project Description Redwo Demand Information Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Refere Offset, s 110 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	Rd & Liberty Rd N pod Home Rd TIS ence Phase 2 ence Point Begin t. Gap E/W On	File Na L 46	eme EB T	(Without Apartr With Improvement Sc2B_	out ments) - vements Int 1 &	2_PM	- With Im		nents.xu			\ \ \rho\	***
Project Description Pemand Information Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Refere Offset, s 110 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	ence Phase 2 ence Point Begin t. Gap E/W On	L 46	EB T	R	L	WE		iprovem		IS			
Demand Information Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Refere Offset, s 110 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	ence Phase 2 ence Point Begin t. Gap E/W On	46 Green	Т		+	- II	3		NR				
Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Reference Offset, s 110 Reference Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+R c), s Max Allow Headway (MAH), s Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results	ence Point Begin t. Gap E/W On	46 Green	Т		+	- II	3		NR				
Approach Movement Demand (v), veh/h Signal Information Cycle, s 120.0 Reference Offset, s 110 Reference Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+R c), s Max Allow Headway (MAH), s Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results	ence Point Begin t. Gap E/W On	46 Green	Т		+	- II	3		NIK			0.0	
Demand (v), veh/h Signal Information Cycle, s 120.0 Refered Offset, s 110 Refered Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+R c), s Max Allow Headway (MAH), s Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results	ence Point Begin t. Gap E/W On	46 Green			+				1		<u> </u>	SB	
Signal Information Cycle, s 120.0 Refere Offset, s 110 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	ence Point Begin t. Gap E/W On	Green	3 2	265	■ 114		R	L	T 440	R	L	T	R
Cycle, s Offset, s 110 Refere Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	ence Point Begin t. Gap E/W On		2 6			532	2 20	202	143	62	15	166	38
Cycle, s Offset, s 110 Reference Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	ence Point Begin t. Gap E/W On		10				,						I
Offset, s Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	t. Gap E/W On			\blacksquare			<u> </u>	- 1			A -	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Φ
Uncoordinated No Simult Force Mode Fixed Simult Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	t. Gap E/W On		7 2	1.2	57.6	8.6	1.3	19.6		1	2 .	3	4
Timer Results Assigned Phase Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results	t. Gap N/S On	■ Yellow	4.3	0.0	5.2	4.3		5.2	<u>'</u>	,	→		KŤ2
Assigned Phase Case Number Phase Duration, s Change Period, (Y+R c), s Max Allow Headway (MAH), s Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results	,	Red	1.4	0.0	1.0	2.0		1.0		5	6	7	8
Assigned Phase Case Number Phase Duration, s Change Period, (Y+R c), s Max Allow Headway (MAH), s Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results													
Case Number Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results		EBI		EBT	WBI		WBT	NBL	-	NBT	SBL	-	SBT
Phase Duration, s Change Period, (Y+Rc), s Max Allow Headway (MAH), s Queue Clearance Time (gs), Green Extension Time (ge), s Phase Call Probability Max Out Probability Movement Group Results		5		2	1		6	3		8	7		4
Change Period, (Y+R c), s Max Allow Headway (MAH), s Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results		1.1		3.0	1.1		4.0	1.1		4.0	1.1		4.0
Max Allow Headway (MAH), s Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results		14.2		65.0	13.0		63.8	16.2	! :	27.1	14.9	1	25.8
Queue Clearance Time (g s), Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results		7.1	_	6.2	5.7	6.2		5.8		6.2	6.3		6.2
Green Extension Time (g e), s Phase Call Probability Max Out Probability Movement Group Results		4.0		0.0	4.0			4.0		4.0		_	4.0
Phase Call Probability Max Out Probability Movement Group Results		3.5		0.0		6.1		12.4		16.2	2.8	_	16.0
Max Out Probability Movement Group Results	S	0.0	_	0.0	1.00		0.0	0.0		0.7	0.0		0.6
Movement Group Results		1.00						1.00			1.00		1.00
		1.00)		1.00)		1.00		0.73	0.05		1.00
<u>'</u>			EB			WB			NB			SB	
Approach Movement		L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Movement		5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	h	45	519	258	124	600		220	223		16	222	
Adjusted Saturation Flow Rate	e (s), veh/h/ln	1781	1870	1610	1781	1858		1781	1774		1781	1810	
Queue Service Time (g_s), s		1.5	22.5	13.0	4.1	29.8		10.4	14.2		0.8	14.0	
Cycle Queue Clearance Time	(g c), s	1.5	22.5	13.0	4.1	29.8		10.4	14.2		0.8	14.0	
Green Ratio (g/C)		0.54	0.49	0.58	0.54	0.48		0.25	0.17		0.24	0.16	
Capacity (c), veh/h		355	916	929	420	892		268	309		233	296	
Volume-to-Capacity Ratio (X)		0.126			0.295	0.673	_	0.818	0.721		0.070	0.750	
Back of Queue (Q), ft/ln (95 t	·	25.5	336.7	280.4	72.2	480.4		117.2	279.3		16.7	285.4	
Back of Queue (Q), veh/ln (9		1.0	13.3	11.2	2.8	18.9	_	4.6	11.0		0.7	11.2	
Queue Storage Ratio (RQ) (95 th percentile)		0.05	0.00	0.00	0.22	0.00		0.36	0.00		0.05	0.00	
Uniform Delay (d 1), s/veh		17.5	20.0	19.8	16.2	24.0		41.9	46.8		36.4	47.9	
Incremental Delay (d 2), s/ver		0.1	1.7	0.5	0.4	4.0	+	17.8	8.0		0.1	10.2	
Initial Queue Delay (d 3), s/ve Control Delay (d), s/veh	0.0 17.6	0.0 21.7	20.3	0.0 16.6	0.0 28.0		0.0 59.6	0.0 54.8		0.0 36.5	0.0 58.1		
• , ,	17.6 B	21.7 C	20.3 C	10.0 B	26.0	+	59.6 E	D D		36.5 D	56.1 E		
Approach Delay, s/veh / LOS	Level of Service (LOS)			С	26.1		С	57.2		E	_		E
Intersection Delay, s/veh / LOS		21.0		33			<u> </u>	51.2	56.6 E				
sissesian Bolay, Siveri i Eoc	5												
Multimodal Results	5		EB			WB			NB			SB	
Pedestrian LOS Score / LOS	6			В	2.3		В	2.3		В	2.5		В

 Bicycle LOS Score / LOS
 2.0
 B
 1.7
 B
 1.2
 A
 0.9
 A

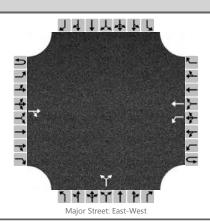
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	HCS7 Two-Way Sto	p-Control Report							
General Information		Site Information							
Analyst	SBG	Intersection	Home Rd & Access Rd						
Agency/Co.	American Structurepoint	Jurisdiction	Delaware County						
Date Performed	7/5/2019	East/West Street	Home Rd						
Analysis Year	2020	North/South Street	Access Rd						
Time Analyzed	Sc2B - PM Peak Hour	Peak Hour Factor	0.92						
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25						
Project Description	Redwood Home Rd TIS								

Lanes



Vehicle Volumes and Adjustments

Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	Т				LR					
Volume, V (veh/h)			836	26		11	594			14		7				
Percent Heavy Vehicles (%)						2				0		0				
Proportion Time Blocked																
Percent Grade (%)										()					
Right Turn Channelized		Ν	lo			Ν	lo			Ν	lo			Ν	lo	
Median Type/Storage				Left	Only								1			

Critical and Follow-up Headways

Base Critical Headway (sec)								
Critical Headway (sec)								
Base Follow-Up Headway (sec)								
Follow-Up Headway (sec)								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			12				23			
Capacity, c (veh/h)			731				275			
v/c Ratio			0.02				0.08			
95% Queue Length, Q ₉₅ (veh)			0.1				0.3			
Control Delay (s/veh)			10.0				19.3			
Level of Service, LOS			В				С			
Approach Delay (s/veh)			0	.2		19).3			
Approach LOS						(

		HCS	7 Sig	nalize	d In	tersec	tion F	Resu	ılts Su	mmar	у						
General Inform	nation								Interse	rtion Inf	ormatic	n e	<u> </u>		La La		
	iation	American Structure	noint						Duration		0.25	/ 111		TIT			
Agency Analyst		SBG	point	Analys	sic Dat	te Jul 8,	2010		Area Ty		Other				L A		
Jurisdiction		Delaware County, (<u>Л</u>	Time F		AM F			PHF) e	0.92			wit	` _ ⊱		
Urban Street		Home Rd	УП					•	Analysis	Doriod	1> 7:0	20			~ -		
Orban Street		nome Ru		Analysis Year Sc3 - 2040 No- build (With Apartments)					Analysis	Period	1 > 7.0	JU		ጎ †			
Intersection		Home Rd & Sawmi	II Pkwy	File Na	ame	Sc3_	Int 1 & 2	_AM.	xus								
Project Descrip	tion	Redwood Home Ro	TIS														
Demand Inform	nation				EB			W	'B		NB			SB			
Approach Move	ement			L	Т	R	L	1	R	L	Т	R	L	Т	R		
Demand (v), v				168	482	_	249	48	39 208	345	1033	_	175	683	102		
Ciamal Inform	4!			1						1 11:							
Signal Informa		D (D)			Ľ	:	∃. ,	Ħ	20		si L	_	A	Κ.	人		
Cycle, s	100.0	Reference Phase	2	-		٬ ۱ ۱	" 📑 '	• •	7 8	12l S	17	1	♀ ₂	3	4		
Offset, s	79	Reference Point	Begin	Green		0.7	29.7	7.5		22.			<u> </u>	I L			
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	3.9		4.8		~		7_	Ŷ		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.6	0.0	1.0	2.2	2 2.2	1.0		5	6	7	8		
Timer Results				EBI	_	EBT	WB	L	WBT	NB	L	NBT	SBI		SBT		
Assigned Phase	<u> </u>			5		2	1	\neg	6	3		8	7	\neg	4		
Case Number				1.1		4.0	1.1		3.0	1.1		4.0	1.1		3.0		
Phase Duration				13.8		35.9	-	14.5		21.3			13.6		28.3		
Change Period	, (Y+R	c), S		6.5		6.2	6.5		6.2	6.1		5.8	6.1		5.8		
Max Allow Head		·		4.0		0.0	4.0			4.0		4.0	4.0		4.0		
Queue Clearan		· · · · · · · · · · · · · · · · · · ·		9.2			10.0	0		17.2	2	32.2			22.4		
Green Extension	n Time	(g e), s		0.0		0.0	0.0	,	0.0	0.0	0.0		0.0		0.1		
Phase Call Pro	bability			1.00			1.00	0		1.00)	1.00	1.00		1.00		
Max Out Proba	bility			1.00)		1.00	0		1.00)	1.00	1.00)	1.00		
Movement Gro	un Res	ults		l E				WE	3		NB			SB			
Approach Move				L	T	R	L	T	R	L	T	R	L	T	R		
Assigned Move				5	2	12	1	6	16	3	8	18	7	4	14		
Adjusted Flow I), veh/h		183	704		269	528	_	375	686	653	190	742	111		
		ow Rate (s), veh/h/	ln	1781	1788	_	1781	187	_	1781	1870	1765	1781	1781	1585		
Queue Service				7.2	29.7	_	8.0	27.8	_	15.2	30.2	30.2	7.5	20.4	5.3		
Cycle Queue C		•		7.2	29.7		8.0	27.8		15.2	30.2	30.2	7.5	20.4	5.3		
Green Ratio (g	/C)	,		0.37	0.30		0.38	0.30	0.38	0.40	0.30	0.30	0.30	0.22	0.30		
Capacity (c), v	/eh/h			207	531		215	569	601	358	565	533	206	801	472		
Volume-to-Capa	acity Ra	tio (X)		0.882	1.326	3	1.252	0.92	8 0.374	1.048	1.215	1.225	0.925	0.927	0.235		
Back of Queue	(Q), ft/	In (95 th percentile)	208.7	1342 5		333.8	397	181.8	458.7	1124.7	1078. 3	247.4	400.3	93.7		
Back of Queue	(Q), ve	eh/ln (95 th percent	ile)	8.2	52.9		13.1	15.0	3 7.2	18.1	44.3	43.1	9.7	15.8	3.7		
Queue Storage	Ratio (RQ) (95 th percen	tile)	0.56	0.00		0.67	0.00	0.61	0.76	0.00	0.00	0.49	0.00	0.00		
Uniform Delay ((d 1), s	/veh		26.5	35.2		28.0	41.	1 28.7	25.8	34.9	34.9	31.6	37.9	26.5		
	ncremental Delay (d 2), s/veh			32.8	159.6	3	117.2	3.3	0.2	60.8	112.3	117.0	42.3	18.3	1.2		
Initial Queue De	- ` `	·		0.0	0.0		0.0	0.0	_	0.0	0.0	0.0	0.0	0.0	0.0		
Control Delay (59.3	194.7	7	145.2	44.4	_	86.6	147.2	151.9	73.9 E	56.2	27.7		
Level of Service				E	F		F	D	С	F	F	F F		E	С		
Approach Delay				166.	8	F	67.5	5	E	135.	7	F	56.4	1	E		
Intersection De	lay, s/ve	eh / LOS				10	09.0						F				
Multimodal Re	eulte				EB			\^/	2		NB		SB				
Pedestrian LOS		/1.0S		2.8		С	3.0		C	2.4		В	2.3		В		
Bicycle LOS So				2.0		В	2.2		В	1.9		В	1.3		A		
Dioyole LOG 30	,515 / LC	,,		2.0		٦	2.2		U	1.8		J	1.3		7.		

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	HCS7 Sig	nalize	d Inte	ersec	tion R	Resu	Its Sur	nmar	у					
General Information							Intersec	tion Inf	ormatio	nn .	Į.	4741	Ja Lj	
Agency	American Structurepoint					\rightarrow	Duration.		0.25	711		W V V V		
Analyst	SBG	Analys	sis Date	Jul 8	2019	_	Area Typ		Other				t_ ≰E	
Jurisdiction	Delaware County, OH	Time F		_	AM Peak				0.92		→	w∮t	<u>}</u>	
Urban Street	Home Rd	ļ	sis Year		2040 No		PHF Analysis	Period	1> 7:0	00	₹			
orban check	Tionic Ita	7 thatye	33 TCUI	build (Apartr With	build (With Apartments) -			renou				4 1 4 Y	F. C	
Intersection	Home Rd & Sawmill Pkwy	File Na	ame	Sc3_I	nt 1 & 2	_AM -	With Imp	roveme						
Project Description	Redwood Home Rd TIS													
Demand Information			EB			WI	D		NB			SB		
Approach Movement		L	Т	R	L	T			T	R	L	T	R	
Demand (v), veh/h		168	482	166	249	48		345	1033		175	683	102	
Demand (v), ven/n		100	402	100	249	40	9 200	343	1033	199	173	003	102	
Signal Information			2	5	,		\ \ \						1	
Cycle, s 100.0	Reference Phase 2	1	10	1 2	14			12	12	\frown	A -	• `	4	
Offset, s 90	Reference Point Begin	Green	7.0	3.8	19.3	9.0	4.9	30.5		1	2 .	3	4	
Uncoordinated No	Simult. Gap E/W On	Yellow		0.0	5.2	3.9		4.8	<u> </u>	, .	→		۲z	
Force Mode Fixed	Simult. Gap N/S On	Red	2.6	0.0	1.0	2.2		1.0		5	6	7	8	
Timer Results		EBI	-	EBT 2	WB	L	WBT	NBI	_	NBT	SBI	-	SBT	
Assigned Phase			5		1	_	6	3		8	7		4	
Case Number				3.0			4.0	2.0		3.0	1.1		3.0	
Phase Duration, s		14.4 6.5		25.5	18.2		29.3	20.0		41.2	15.1		36.3	
Change Period, (Y+Rc), s			_	6.2	6.5	_	6.2	6.1		5.8	6.1	_	5.8	
Max Allow Headway (/	,	4.0		0.0	4.0		0.0	4.0		4.0	4.0		4.0	
Queue Clearance Time	(•)	9.9		2.2	0.0			12.5 0.2		31.7	9.2		20.3	
Green Extension Time	(<i>g</i> _e), S	1.00		0.0		_	0.0			2.8	0.0	_	6.6	
Phase Call Probability)		1.00		1.00	1.00		1.00	
Max Out Probability		1.00			1.00			1.00	,	1.00		,	0.67	
Movement Group Res	sults		EB			WB			NB			SB		
Approach Movement		L	Т	R	L	Т	R	L	Т	R	L	Т	R	
Assigned Movement		5	2	12	1	6	16	3	8	18	7	4	14	
Adjusted Flow Rate (v), veh/h	183	524	180	288	424	382	375	1123	216	190	742	111	
Adjusted Saturation Flo	ow Rate (s), veh/h/ln	1781	1781	1610	1781	1870	1680	1730	1781	1610	1781	1781	1585	
Queue Service Time (7.9	13.9	8.4	11.7	22.6		10.5	29.7	8.2	7.2	18.3	4.6	
Cycle Queue Clearanc	e Time (<i>g c</i>), s	7.9	13.9	8.4	11.7	22.6		10.5	29.7	8.2	7.2	18.3	4.6	
Green Ratio (g/C)		0.27	0.19	0.33	0.31	0.23		0.14	0.35	0.47	0.39	0.30	0.38	
Capacity (c), veh/h		213	687	535	328	432		481	1261	758	251	1086	609	
Volume-to-Capacity Ra	,	0.858	0.762		0.879	0.982		0.780	0.891	0.285	0.759	0.684	0.182	
Back of Queue (Q), ft	/In (95 th percentile) eh/In (95 th percentile)	219.5 8.6	270.2 10.6	146.5 5.9	259.3 10.2	460.9 18.1		213.8 8.4	496.1 19.5	133.9 5.4	169.1 6.7	317.7 12.5	78.9 3.1	
	· · · · · · · · · · · · · · · · · · ·		0.00	0.98	0.52	0.00		0.4	0.00		0.7	0.00	0.00	
Uniform Delay (d 1), s	RQ) (95 th percentile)	0.59	38.2	25.1	31.4	38.1		41.6	30.5	0.00 16.2	25.0	30.5	20.4	
		27.8	7.8	1.7	16.3	30.8		8.0	9.7	0.9	12.6	3.5	0.7	
- ` `	Incremental Delay (d 2), s/veh Initial Queue Delay (d 3), s/veh			0.0	0.0	0.0	_	0.0	0.0	0.9	0.0	0.0	0.0	
Control Delay (d), s/ve	0.0 59.9	0.0 46.0	26.8	47.7	68.9		49.6	40.2	17.1	37.6	34.0	21.1		
Level of Service (LOS)		E	D	C	D	E	E	D	D	В	D	C	C	
Approach Delay, s/veh		45.0		D	65.1		E	39.3		D	33.3		С	
Intersection Delay, s/ve					5.0									
Multimodal Results			EB			WB			NB			SB		
Pedestrian LOS Score	3.1		С	3.0		С	2.8		С	3.0		С		

 Bicycle LOS Score / LOS
 1.2
 A
 1.3
 A
 1.9
 B
 1.3
 A

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HCS7™ Streets Version 7.2

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		HCS	7 Sig	nalize	d Int	tersec	tion F	Resu	ılts	Sun	nmar	у				
	4.								1.4						4141	u I
General Inform	nation											ormatic	on		ĄĮ.	ts 2
Agency		American Structure	epoint			1				ration,		0.25				K.
Analyst		SBG		-		e Jul 8				а Тур -	e	Other				<u>.</u>
Jurisdiction		Delaware County, (OH	Time F		AM F			PHI			0.92		_ ₹ - ₹	w∳t	~
Urban Street		Home Rd		Analys	sis Yea	build	2040 No (With ments)	0-	Ana	alysis	Period	1> 7:0	00	7	<u>ነ</u> ነ	* C
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc3_	Int 1 & 2	_AM.	xus							
Project Descrip	tion	Redwood Home Ro	SITE													
Demand Inform	nation				EB			W	'B			NB			SB	
Approach Move				L	T	R	L	T 7	1	R	L	T	R	L	T	R
Demand (v), v				65	617				-	27	285	157	91	35	235	71
																_
Signal Informa			1	4	1 2		늴 .	H	7	125			_		K .	\mathbf{A}
Cycle, s	100.0	Reference Phase	2		L. ,	7 '	ገቼ '	<u>"</u>	?	54	2	K		♦ ,	3	4
Offset, s	34	Reference Point	Begin	Green	7.1	1.4	38.8	9.2	2	19.6	0.0			K		
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	3.9		5.2	0.0		≯ │	₹		W
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.4	0.0	1.0	1.9	9	1.0	0.0		5	6	7	8
Timer Results				EBL		EBT	WB		۱۸/	ВТ	NBI		NBT	SBI		SBT
Assigned Phase				5	-	2	1		6		3	-	8	7	-	4
	=			_				_	_	_	_			_		
Case Number				1.1	,	4.0	1.1	_	4.	_	1.1		4.0	1.1		4.0
Phase Duration		\ -		12.8	3	45.0	14.2	_	46	_	15.0		25.8	15.0		25.8
Change Period,		·		5.7		6.2	7.1		6.		5.8		6.2	6.3		6.2
Max Allow Head Queue Clearan		·		4.0 3.8	_	0.0	4.0 6.4		0.	.0	4.0		4.0 16.6	4.0 3.6		4.0 20.3
		, - ,		0.0	-	0.0	0.0	_	0.	0	0.0		0.7	0.0		0.0
Green Extension Phase Call Prol		(<i>g e)</i> , s		1.00		0.0	1.00	-	0.	.0	1.00		1.00	1.00	_	1.00
Max Out Proba				1.00			1.00				1.00		1.00	0.20		1.00
Wax Out 1 Tobal	Dility			1.00	,		1.00				1.00		1.00	0.20	,	1.00
Movement Gro		ults			EB			WE	3			NB			SB	
Approach Move				L	T	R	L	Т	\perp	R	L	T	R	L	Т	R
Assigned Move	ment			5	2	12	1	6		16	3	8	18	7	4	14
Adjusted Flow F	Rate (v), veh/h		58	704		133	737			310	270		38	333	
		ow Rate (s), veh/h/	ln	1781	1798		1781	185	7		1781	1754		1781	1795	
Queue Service				1.8	38.8	<u> </u>	4.4	39.3	-		9.2	14.6		1.6	18.3	
Cycle Queue C		e Time (<i>g c</i>), s		1.8	38.8	_	4.4	39.3	\rightarrow		9.2	14.6		1.6	18.3	
Green Ratio (g				0.46	0.39		0.46	0.40	-		0.29	0.20		0.28	0.20	
Capacity (c), v				198	698		198	747	_		236	344		260	352	
Volume-to-Capa				0.290	1.010		0.668	0.98	\rightarrow		1.313	0.784		0.146	0.945	
	<u> </u>	In (95 th percentile	,	47.1	559	-	164.9	751.			608.6	287.4		29.4	413.9	
		eh/ln (95 th percent		1.9	22.0	-	6.5	29.6	_		24.0	11.3		1.2	16.3	
	•	RQ) (95 th percen	tile)	0.09	0.00	-	0.51	0.00			1.87	0.00		0.09	0.00	
Uniform Delay (22.3	37.9		23.3	29.6	_		33.2	38.2		27.7	39.7	
Incremental De	- 1	<u> </u>		0.1	12.6	+	8.3	30.0	=		167.9	11.3		0.3	33.9	
Initial Queue De		•		0.0	0.0	-	0.0	0.0	_		0.0	0.0		0.0	0.0	
Control Delay (en		22.4	50.5		31.6	59.6	0		201.0	49.4		27.9	73.6	
Level of Service Approach Delay		/108		C 49.4	F	D	C 55.1	E	E		F	D	F	C 68.0	E	E
Intersection Delay				48.4			55.3 2.1	3	E		130.	0	Г	68.9 E		Е
micraection De	ay, ə/ve						<u> </u>									
Multimodal Re	sults				EB			WE	3			NB			SB	
Pedestrian LOS	Score	/LOS		2.3		В	2.3		E	3	2.3		В	2.3		В
Bicycle LOS Sc	ore / LC)S		2.0		В	1.9		Е	3	1.4		Α	1.1		Α

		HCS	7 Sig	nalize	d Int	ersec	tion F	Resu	lts Sur	nmar	у				
General Inform	ation								Intersec	tion Inf	ormatic	\n		4 사하	þa l <u>i</u>
Agency	iation	American Structure	noint					-	Duration		0.25	/ 111		47	
Analyst		SBG	point	Analys	eic Date	Jul 8,	2010	_	Area Typ		Other				₹_
Jurisdiction		Delaware County, C)H	Time F		AM P		_	PHF	-	0.92			w‡ı	. <u>*</u> -
Urban Street		Home Rd	Л		sis Year		2040 No		Analysis	Poriod	1> 7:0	<u> </u>			~ ←
Olbali Street		Home IXu		Analys	ois Teal	build (Aparti With		.	Allalysis	renou	1-7.0	,		ጎ ሶ 14 የቀጥ	r **
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc3_I	nt 1 & 2	_AM -	With Imp	roveme	ents.xus	i			
Project Descript	tion	Redwood Home Rd	I TIS			,									
Damand Info	4!							١٨/٢			ND			OD	
Demand Inforn				-	EB	Т В		WE	-		NB T		-	SB	
Approach Move				65	617	178	122	65°	R 1 27	285	157	91	35	235	71
Demand (v), v	en/n		-	00	017	1/0	122	00	1 21	200	107	91	35	233	7 1
Signal Informa	tion					8					,				
Cycle, s	100.0	Reference Phase	2	1	P 6	1 2	743		- N. F.		, 121		A -	, \ \	4
Offset, s	80	Reference Point	Begin	Green	7 1	2.2	27.6	8.2	4.7	25.8		1	2	3	4
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	4.3		5.2		, l	\rightarrow		кŤа
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.4	0.0	1.0	2.0		1.0		5	6	7	8
The state of the s															
Timer Results				EBI	_	EBT	WB	L	WBT	NBI	-	NBT	SBI	-	SBT
Assigned Phase	9			5		2	1		6	3		8	7		4
Case Number				1.1		3.0	1.1		4.0	1.1		4.0	1.1		4.0
Phase Duration				12.8	3	33.8	15.0)	36.0	19.2	2	36.7	14.5	5	32.0
Change Period,	(Y+R	c), s		5.7		6.2	7.1		6.2	5.8		6.2	6.3		6.2
Max Allow Head	dway(<i>N</i>	<i>ИАН</i>), s		4.0		0.0	4.0		0.0	4.0		4.0	4.0		4.0
Queue Clearand		· - ,		4.5			7.2			14.6	3	14.6	3.4		18.9
Green Extensio		(g e), s		0.0		0.0	0.0		0.0	0.0		1.9	0.0		1.3
Phase Call Prob	•			1.00)		1.00			1.00		1.00	1.00		1.00
Max Out Probat	oility			1.00)		1.00)		1.00)	0.02	0.33	3	0.35
Movement Gro	up Res	sults			EB			WB			NB			SB	
Approach Move				L	T	R	L	Т	R	L	Т	R	L	Т	R
Assigned Move				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F), veh/h		70	668	193	133	371	366	310	270		38	333	
		ow Rate (s), veh/h/l	n	1781	1781	1610	1781	1870		1781	1754		1781	1795	
Queue Service	Time (g	g s), S		2.5	16.1	8.2	5.2	17.4	17.4	12.6	12.6		1.4	16.9	
Cycle Queue Cl				2.5	16.1	8.2	5.2	17.4	17.4	12.6	12.6		1.4	16.9	
Green Ratio (g	/C)			0.35	0.28	0.41	0.35	0.30	0.30	0.40	0.31		0.34	0.26	
Capacity (c), v	eh/h			274	983	660	302	557	549	404	535		394	463	
Volume-to-Capa				0.257	0.679	0.292	0.440	0.666		0.766	0.504		0.096	0.718	
	· /·	In (95 th percentile)		40.8	249.3		96.3	328.6		246.7	221.8		26.3	306.7	
	<u> </u>	eh/In (95 th percenti		1.6	9.8	5.4	3.8	12.9		9.7	8.7		1.0	12.1	
		RQ) (95 th percent	tile)	0.07	0.00	0.00	0.30	0.00		0.76	0.00		0.08	0.00	
Uniform Delay (19.7	29.1	20.4	24.0	30.7		24.0	28.5		22.8	33.8	
Incremental Del		,		0.4	2.7	0.8	1.0	6.2	6.3	8.6	0.8		0.1	5.3	
Initial Queue De	_ ``			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (eh		20.1	31.8	21.2	25.0	36.9		32.5	29.3		22.9	39.1	
Level of Service				С	С	С	C	D	D	C	С		C	D	
Approach Delay				28.7		С	35.1	1	D	31.0)	С	37.4		D
Intersection Del	ay, s/ve	en / LOS				32	2.4						С		
Multimodal Res	eulte				EB			WB			NB			SB	
Pedestrian LOS		/1.08		2.3	-	В	2.3		В	2.8		С	3.0		С
i euestilali LUS	Score	1 LU3		∠.3		ט	∠.3		ט	2.8		<u> </u>	3.0		<u> </u>

 Bicycle LOS Score / LOS
 1.3
 A
 1.2
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 1.4
 A
 1.1
 A

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HCS7™ Streets Version 7.2

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		HCS	7 Sig	nalize	d In	tersec	tion F	Resu	ılts Suı	nmar	у				
General Inforn	nation								Intersec	tion Inf	ormatic	n e	ليا	4741	Įs Į _s
Agency	iation	American Structure	noint						Duration		0.25	/ 11		JIII	
Analyst		SBG	ропп	Δnalve	sie Da	te Jul 8,	2010		Area Typ		Other				₹.
Jurisdiction		Delaware County, (<u> </u>	Time F		PM P		-	PHF	,,,	0.92			w‡£	~
Urban Street		Home Rd	J11	Analys			2040 N	0-	Analysis	Period	1> 7:0	20	- ₹ - ₹		~ ←
Olbali Street		Tione itu		Allalys	515 166	build		U-	Allalysis	i enou	1 7.0	JO		\ \ \ \ \	
Intersection		Home Rd & Sawmi	ll Pkwy	File Na	ame	Sc3_	Int 1 & 2	_PM.	xus] _		
Project Descrip	tion	Redwood Home Ro	d TIS												
Demand Inform	mation				EB			W	'B		NB			SB	
Approach Move					T	R	L	7	ıi .	L	T	R	L	T	R
Demand (v), v				136	603	_	244			513	763	358	202	675	79
Demand (V), V	CHIT			100	000	201	277	01	1 142	010	700	000	202	070	10
Signal Informa	ation				2	5	닐 _ :	╝	20						T
Cycle, s	120.0	Reference Phase	2		Γ'	4	7≅ •	, ات	5 5	ral sy	12		♣ .	`	stz
Offset, s	0	Reference Point	Begin	Green	7.3	2.9	44.0	8.8		20.3		1	X Z		4
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	3.9		4.8		> '	├	7-	心
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.6	0.0	1.0	2.2	2 2.2	1.0		5	6	7	8
Times December				EDI		EDT	WD		WDT	ND		NDT	ODI		CDT
Timer Results				EBI	-	EBT 2	WB 1	<u> </u>	WBT	NBI	-	NBT	SBL 7	-	SBT
Assigned Phase Case Number	e			5 1.1		4.0	1.1	-	3.0	1.1		4.0	1.1		3.0
Phase Duration				13.8		50.2	16.7	_	53.1	27.0		38.1	15.0		26.1
Change Period		,) e		6.5		6.2	6.5		6.2	6.1	<u> </u>	5.8	6.1		5.8
Max Allow Head		·		4.0	_	0.2	4.0		0.0	4.0		4.0	4.0		4.0
Queue Clearan		· · · · · · · · · · · · · · · · · · ·		8.2		0.0	12.2	_	0.0	22.9		34.3	10.9		22.3
Green Extension		, = ,		0.0	_	0.0	0.0	_	0.0	0.0	_	0.0	0.0		0.0
Phase Call Pro		(g e), s		1.00	_	0.0	1.00	_	0.0	1.00	_	1.00	1.00		1.00
Max Out Proba				1.00			1.00			1.00		1.00	1.00		1.00
Movement Gro	•	sults			EB			WE			NB			SB	
Approach Move				L	Т	R	L	Т	R	L	T	R	L	T	R
Assigned Move				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow I				148	972		291	681	_	558	642	576	220	734	86
		ow Rate (s), veh/h/	ln	1781	1767		1781	187		1781	1870	1668	1781	1781	1585
Queue Service				6.2	44.0		10.2	40.9		20.9	32.3	32.3	8.9	20.3	5.3
Cycle Queue C		e lime (<i>g c</i>), s		6.2	44.0	_	10.2	40.9	_	20.9	32.3	32.3	8.9	20.3	5.3
Green Ratio (g				0.43	0.37		0.45	0.39		0.36	0.27	0.27	0.24	0.17	0.23
Capacity (c), v		tio (V)		194	648		211	731		370	503	449 1.284	192	602	365
		/In (95 th percentile	١	0.762 152.4	1.500 2302		1.376 436.2	0.93 445.		1.506 1297	1.275 1258	1141.9	1.143 304.9	1.218 700.7	0.236 98.7
Dack of Queue	(\(\varphi \)), IU	iii (95 tii percentile)	132.4	5		430.2	445.	1 00.5	1291	1230	1141.9	304.9	700.7	90.7
Back of Queue	(Q), ve	eh/In (95 th percent	ile)	6.0	90.6		17.2	17.5	5 3.4	51.1	49.5	45.7	12.0	27.6	3.9
Queue Storage	Ratio (RQ) (95 th percen	tile)	0.41	0.00		0.87	0.00	0.29	2.16	0.00	0.00	0.61	0.00	0.00
Uniform Delay	(d 1), s	/veh		29.2	38.0		30.7	28.4	18.9	35.4	43.9	43.9	43.0	49.9	37.6
Incremental De	lay (<i>d</i> 2), s/veh		16.2	233.0)	172.1	2.8	0.1	241.4	138.7	144.0	108.7	112.6	1.5
Initial Queue De		,		0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (45.4	271.0)	202.7	31.	1 18.9	276.8	182.5	187.8	151.6	162.4	39.1
Level of Service				D	F		F	С	В	F	F	F	F	F	D
Approach Delay				241.	2	F	73.	1	E	213.	8	F	150.0	0	F
Intersection De	lay, s/ve	eh / LOS				17	75.2			L			F		
Multimodal Re	eulte				EB			WE	2		NID			SB	
Pedestrian LOS		/1.08		2.8	-	С	2.9		C	2.4	NB	В	2.3		В
Bicycle LOS So				2.3		В	2.9		В	2.4		В	1.3		A
Dicycle LOS SC	JOIG / LC	,,,		2.3		ט	2.2		D	2.0		U	1.3		

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	HCS7 Sig	nalize	d Inte	ersec	tion F	Resu	Its Sur	nmar	у				
General Information							Intersec	tion Inf	ormatic	nn .	Į.	4\\\ \	b L
Agency	American Structurepoint						Duration.		0.25	711		W V V V	
Analyst	SBG	Analys	is Date	Jul 8,	2019		Area Typ		Other				t_ AL
Jurisdiction	Delaware County, OH	Time F		PM Pe			PHF		0.92		→	w∮t	<u>}</u> -
Urban Street	Home Rd	ļ	is Year		2040 No	0-	Analysis	Period	1> 7:0	<u> </u>	₹		
orban check	Tiome ita	7 thaty	, , , , , , , , , , , , , , , , , , ,	build (Apartr With		.	7 thury 313	renou				4 1 4 Y	7
Intersection	Home Rd & Sawmill Pkwy	File Na	ame	Sc3_I	nt 1 & 2	_PM -	· With Imp	roveme	nts.xus	5			
Project Description	Redwood Home Rd TIS												
Demand Information			EB			W	R		NB			SB	
Approach Movement		L	T	R	L	T			T	R	L	T	R
Demand (v), veh/h		136	603	291	244	_		513	763	358	202	675	79
Demand (v), venn		130	000	231		37	1 172	313	700	330	202	013	13
Signal Information			2	I S	٠,	<u>-</u>			a l				1
Cycle, s 120.0	Reference Phase 2		Pe	5 ۲			- L R1	12	12	\rightarrow	A -	1) '	47
Offset, s 90	Reference Point Begin	Green	91	1.9	26.8	16.	2 5.7	29.2		1	¥ 2 .	3	4
Uncoordinated No	Simult. Gap E/W On	Yellow		4.3	5.2	3.9		4.8		,	→		t ≥
Force Mode Fixed	Simult. Gap N/S On	Red	2.6	2.2	1.0	2.2		1.0		5	6	7	8
								ı					
Timer Results		EBI	-	EBT	WB	L	WBT	NBI	-	NBT	SBI	-	SBT
Assigned Phase		5		2	1		6	3		8	7	_	4
Case Number		1.1		3.0	1.1		4.0	2.0		3.0	1.1		3.0
Phase Duration, s	\	15.6		33.0	24.0		41.4	28.0)	40.7	22.3	3	35.0
Change Period, (Y+R		6.5		6.2	6.5	_	6.2	6.1		5.8	6.1		5.8
Max Allow Headway (, ·	4.0		0.0	4.0	_	0.0	4.0		4.0	4.0	_	4.0
Queue Clearance Time Green Extension Time	, - ,	9.6		0.0	18.3		0.0	20.9		27.8 4.7	12.5 0.2		25.6 2.7
Phase Call Probability	(<i>g e)</i> , s	1.00		0.0	1.00	_	0.0	1.00		1.00	1.00		1.00
Max Out Probability		1.00			1.00			1.00		0.80	1.00		1.00
max out i robubliky		1.00			1.00			1.00		0.00	1.00		1.00
Movement Group Res	sults		EB			WB	}		NB			SB	
Approach Movement		L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Movement		5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	148	655	316	325	492	458	558	829	389	220	734	86
Adjusted Saturation Flo	<u>, , , , , , , , , , , , , , , , , , , </u>	1781	1781	1610	1781	1870	1741	1730	1781	1610	1781	1781	1585
Queue Service Time (. , ,	7.6	21.0	17.4	16.3	30.8		18.9	25.8	21.5	10.5	23.6	4.7
Cycle Queue Clearanc	e Time (g c), s	7.6	21.0	17.4	16.3	30.8		18.9	25.8	21.5	10.5	23.6	4.7
Green Ratio (g/C)		0.30	0.22	0.41	0.39	0.29		0.18	0.29	0.44	0.38	0.24	0.32
Capacity (c), veh/h	4: - / \/ \	206	795	653	357	549		631	1036	703	339	867	506
Volume-to-Capacity Ra	· ,	0.718	0.824		0.911	0.89		0.883	0.801		0.647	0.847	0.170
Back of Queue (Q), ft	oh/ln (95 th percentile) ch/ln (95 th percentile)	173.6 6.8	383.5 15.1	276 11.0	304.7 12.0	538. 21.2		356.7 14.0	442.8 17.4	329.3 13.2	209 8.2	424.3 16.7	83.9 3.3
	RQ) (95 th percentile)	0.46	0.00	0.00	0.61	0.00		0.59	0.00	0.00	0.42	0.00	0.00
Uniform Delay (d 1), s	· · · · · · · · · · · · · · · · · · ·	35.0	44.4	26.4	31.7	46.6		47.8	39.3	25.1	29.4	43.3	29.4
Incremental Delay (d z		11.4	9.5	2.6	16.6	12.1		13.9	6.5	3.1	4.2	10.0	0.7
Initial Queue Delay (d	·	0.0	0.0	0.0	0.0	0.0	_	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/ve	, ·	46.4	53.8	28.9	48.3	58.7		61.7	45.8	28.2	33.6	53.3	30.1
Level of Service (LOS)		D	D	С	D	E	E	E	D	С	С	D	С
Approach Delay, s/veh		45.8	3	D	57.1	1	E	47.0)	D	47.2	2	D
Intersection Delay, s/ve	eh / LOS			49	9.2						D		
Multimodal Results			EB			WB			NB			SB	
Pedestrian LOS Score	/ LOS	3.1		С	3.0		С	2.8		С	3.0		С

 Bicycle LOS Score / LOS
 1.4
 A
 1.3
 A
 2.0
 B
 1.3
 A

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HCS7™ Streets Version 7.2

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		HCS	7 Sig	nalize	d Int	ersec	tion F	Resu	ılts	Sun	nmar	У				
	4.								1.4.						4141	u III
General Inform	nation											ormatic	n	_	ĄĮ.	
Agency		American Structure	epoint			1				ation,		0.25				L
Analyst		SBG		-		Jul 8,				а Тур	e	Other				.x.
Jurisdiction		Delaware County,	OH	Time F		PM P			PHF			0.92		*	w∳t	~
Urban Street		Home Rd		Analys	sis Yea	build	2040 No (With ments)	0-	Ana	ılysis	Period	1> 7:0	00	Z Z	ነ ነ	* C
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc3_l	nt 1 & 2	_PM.	xus							
Project Descrip	tion	Redwood Home Ro	d TIS													
Demand Inform	nation				EB			W	'B			NB			SB	
Approach Move				L	T	R	L	T -	1	R	L	T	R	L	T	R
Demand (v), v				68	777	390		8	_	30	307	221	96	24	257	57
Signal Informa			1		1 2	_ 5	늴 . :	님	7				_	_	K .	\mathbf{A}
Cycle, s	120.0	Reference Phase	2		T	7 4	7≅'	"]	s l	51	7 8			€ ,	3	4
Offset, s	0	Reference Point	Begin	Green	7.1	2.2	58.6	7.5	5	2.2	18.0			K		
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	4.3		0.0	5.2		>	₹		N/Z
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.4	0.0	1.0	2.0)	0.0	1.0		5	6	7	8
Timer Results				EBI		EBT	WB		WE	эт	NBI	_	NBT	SBL	_	SBT
					-		-	L		_		-			-	
Assigned Phase	e 			5		2	1	_	6		3	_	8	7	_	4
Case Number				1.1		4.0	1.1	_	4.0		1.1		4.0	1.1		4.0
Phase Duration		\ 0		12.8		64.8	15.0 7.1	_	67. 6.2	_	16.0 5.8		26.4 6.2	13.8 6.3		24.2 6.2
Change Period		·		5.7				_								
Queue Clearan				4.0 3.6		0.0	4.0 9.9		0.0	0	4.0 12.2		4.0 22.2	4.0 3.4		4.0 20.0
Green Extension		, - ,		0.0	_	0.0	0.0	_	0.0	0	0.0		0.0	0.0		0.0
Phase Call Pro		(<i>g e)</i> , s		1.00		0.0	1.00	_	0.0		1.00	$\overline{}$	1.00	1.00	_	1.00
Max Out Proba				1.00			1.00			-	1.00		1.00	0.83		1.00
	y													0.00		
Movement Gro		ults			EB			WE	-			NB			SB	
Approach Move				L	Т	R	L	Т	_	R	L	T	R	L	T	R
Assigned Move				5	2	12	1	6	_	16	3	8	18	7	4	14
Adjusted Flow I	Rate (v), veh/h		51	881		192	913	3		334	345		26	341	
		ow Rate (s), veh/h/	ln	1781	1764		1781	185	8		1781	1774		1781	1811	
Queue Service				1.6	58.6		7.9	57.2	_		10.2	20.2		1.4	18.0	
Cycle Queue C		e Time (<i>g c</i>), s		1.6	58.6		7.9	57.2	_		10.2	20.2		1.4	18.0	
Green Ratio (g				0.55	0.49	-	0.55	0.5	_		0.23	0.17		0.21	0.15	
Capacity (c), v				174	862		177	942	\rightarrow		211	299		171	272	
Volume-to-Capa				0.296			1.085	0.97		_	1.578	1.154		0.152	1.256	
	· ,	In (95 th percentile		52.2	546.2		389.2	952.	_		676	643.8		34.1	718.4	
		eh/ln (95 th percent		2.1	21.5		15.3	0.00	_		26.6	25.3		1.3	28.3	
Uniform Delay (RQ) (95 th percen	uie)	0.09 27.0	0.00		1.20 36.6	28.		-	2.08 43.5	0.00 49.9		0.10 39.1	0.00 51.0	
Incremental De	<u> </u>			0.1	15.6		92.2	22.9	_		281.8	100.5		0.4	141.7	
Initial Queue De	- '	,		0.0	0.0		0.0	0.0	\rightarrow		0.0	0.0		0.0	0.0	
Control Delay (·		27.1	35.4		128.8	51.0	_		325.2	150.4		39.5	192.7	
Level of Service				С	F		F	D			F	F		D	F	
Approach Delay		/ LOS		35.0		С	65.0		E		236.		F	181.		F
Intersection De						10	7.6							F		
AA 10 =								,				A 15			0.5	
Multimodal Re		/1.00		0.0	EB		2.2	WE			0.0	NB	D	0.0	SB	
Pedestrian LOS Bicycle LOS So				2.3		С	2.3		B B		2.3 1.6		В	2.3		B A
Dicycle LOS SC	OIE / LC	73		2.7		U	∥ ∠.3		В	'	1.0		D	1.1		А

	НС	S7 Sig	nalize	d Int	ersec	tion F	Resul	ts Sur	nmar	у				
General Information	on .							Intersec	tion Inf	ormatic	\n		4 사하	Ja L
Agency	American Structu	ırenoint					-	Duration.		0.25	/11		47	
Analyst	SBG	перопп	Analys	eic Date	Jul 8,	2010	_	Area Typ		Other				r_ A
Jurisdiction	Delaware County	, OH	Time F		PM Pe		_	PHF	-	0.92			w‡ı	
Urban Street	Home Rd	/, OH		sis Year		2040 No		Analysis	Poriod	1> 7:0	20			~ ←
Orban Street	Home Ru		Allalys	sis icai	build (Apartr With		.	Allalysis	reliou	1 - 7.0	,		<u>ጎ</u> † ਬਾਹਕਾ	F (*
Intersection	Home Rd & Libe	rty Rd N	File Na	ame	Sc3_I	nt 1 & 2	_PM -	With Imp	roveme	ents.xus	i			
Project Description	Redwood Home	Rd TIS			,									
Damand Informati				ED			١٨/٦			ND			OD	
Demand Informati	-		-	EB		+ -	WE	-		NB T		+ -	SB	
Approach Moveme			68	777	390	177	810	R 30	307	221	96	24	257	R 57
Demand (v), veh/h	1		00	111	390	177	010	30	307	221	96	24	257	37
Signal Information	1				R					,				
	0.0 Reference Phas	e 2	1	P7 6	1 2	143		. Isas				A -	· /	4
Offset, s 9	0 Reference Point	Begin	Green	7 1	0.7	30.8	11.2	2 2.3	36.9		1	Y 2 .	3	4
Uncoordinated N	o Simult. Gap E/W	/ On	Yellow		4.3	5.2	3.9	0.0	5.2		,	→		κtz
Force Mode Fix	ed Simult. Gap N/S	On	Red	1.4	2.8	1.0	1.9	0.0	1.0		5	6	7	8
Timer Results			EBI		EBT	WB	L	WBT	NBI	-	NBT	SBI		SBT
Assigned Phase			5		2	1		6	3		8	7		4
Case Number			1.1		3.0	1.1		4.0	1.1		4.0	1.1		4.0
Phase Duration, s			12.8		37.0	20.6		44.8	17.0		43.1	19.3	_	45.4
Change Period, (Y	,		5.7		6.2	7.1		6.2	5.8	_	6.2	6.3		6.2
Max Allow Headwa	- , ,		4.0		0.0	4.0		0.0	4.0		4.0	4.0		4.0
Queue Clearance T	, - ,		5.4			10.9			13.2		22.0	3.0	_	20.8
Green Extension Ti	, - ,		0.0		0.0	0.1		0.0	0.0		2.1	0.0		2.3
Phase Call Probabi			1.00			1.00			1.00		1.00	1.00		1.00
Max Out Probability			1.00	,		1.00)		1.00)	0.03	0.00	,	0.01
Movement Group	Results			EB			WB			NB			SB	
Approach Moveme	nt		L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Movemer	nt		5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate	e (v), veh/h		70	795	399	192	459	454	334	345		26	341	
Adjusted Saturation	n Flow Rate (s), veh	/h/ln	1781	1781	1610	1781	1870	1846	1781	1774		1781	1811	
Queue Service Tim	, - ,		3.4	25.3	25.9	8.9	26.5	26.5	11.2	20.0		1.0	18.8	
Cycle Queue Clear	()		3.4	25.3	25.9	8.9	26.5	26.5	11.2	20.0		1.0	18.8	
Green Ratio (g/C)			0.32	0.26	0.35	0.39	0.32		0.40	0.31		0.42	0.33	
Capacity (c), veh/l			217	914	564	292	602	594	386	545		399	592	
Volume-to-Capacity			0.321	0.870	_	0.659	0.764		0.865	0.632		0.065	0.577	_
), ft/ln (95 th percent		65	386.7	422.3	213.4	478.5		247.2	341.2		19.3	323.3	
), veh/ln (95 th perce		2.6	15.2	16.9	8.4	18.8	18.7	9.7	13.4		0.8	12.7	
	tio (RQ) (95 th perc	entile)	0.12	0.00	0.00	0.66	0.00 36.6	0.00	0.76	0.00		0.06	0.00	
Uniform Delay (d 1	·		31.6	39.2	39.8 4.8	29.4 5.4	8.9	36.6 9.0	34.4 18.1	35.7 2.4		22.5 0.1	33.5 1.4	
Incremental Delay (Initial Queue Delay	, ,		0.5	7.4	0.0	0.0	0.0	0.0	0.0	0.0		0.1	0.0	
Control Delay (d),	· · · · · · · · · · · · · · · · · · ·		32.1	46.6	44.6	34.8	45.5	45.6	52.5	38.1		22.6	34.9	
Level of Service (Lo			C	D 40.0	D	C	45.5 D	43.0 D	D D	D D		C C	C C	
Approach Delay, s/v			45.2		D	43.7		D	45.2		D	34.0		С
Intersection Delay,			70.2			3.5		5	70.2			D 34.0		
Multimodal Result	s			EB			WB			NB			SB	
					В	2.3		В	2.8		С	3.0		С

 Bicycle LOS Score / LOS
 1.6
 B
 1.4
 A
 1.6
 B
 1.1
 A

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HCS7™ Streets Version 7.2

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	HCS7 Sig	nalize	d Inte	ersec	tion R	Resu	lts Sur	nmar	у				
Conoral Information							Interces	tian Inf	- w ti -				ba la
General Information	Ananiaan Otmustumanaint						Intersec		V	on	- 1		
Agency	American Structurepoint	A = = b /=	is Data	1	2010		Duration	<u>, </u>	0.25				L
Analyst	SBG	+		Jul 8,			Area Typ	e	Other			, N , L	<u>}</u>
Jurisdiction	Delaware County, OH	Time F		AM P		.:11	PHF	Davia	0.92	20	4	";"	. ¥ ←
Urban Street	Home Rd	Analys	sis Year	(With	2040 Bu Apartme vements	ents)	Analysis	Period	1> 7:0	JU		1 1 4 Y	r r
Intersection	Home Rd & Sawmill Pkwy	File Na	ame	Sc4_I	nt 1 & 2	_AM ·	- With Imp	roveme	nts.xus	i	1		
Project Description	Redwood Home Rd TIS												
Demand Information			ГР			W	D		NB			CD	
Approach Movement		L	EB T	R	+ -	VV T	11	+ -	T	R	L	SB T	R
		168	489	166	287	51	_	345	1033	_	179	683	102
Demand (v), veh/h		100	409	100	201	31	1 223	343	1033	213	179	003	102
Signal Information			2		<u> </u>	<u> </u>			,				1
Cycle, s 100.0	Reference Phase 2	1	7 6	7 2	74	- , ,		12	12	$\overrightarrow{\rightarrow}$	A -	• `	4
Offset, s 90	Reference Point Begin	Green	70	3.8	19.3	9.0) 4.9	30.5		1	2 .	→ 1 ³	4
Uncoordinated No	Simult. Gap E/W On	Yellow		0.0	5.2	3.9		4.8		7	}		†z
Force Mode Fixed	Simult. Gap N/S On	Red	2.6	0.0	1.0	2.2		1.0		5	6	7	8
							1115						
Timer Results		EBI	-	EBT	WB	L	WBT	NBI	-	NBT	SBI	-	SBT
Assigned Phase		5		2	1		6	3		8	7		4
Case Number		1.1		3.0 25.5	1.1 18.2		4.0 29.3	2.0		3.0	1.1 15.1		3.0
Phase Duration, s Change Period, (Y+R	\ 0	14.4 6.5		6.2	6.5	_	6.2	20.0 6.1	,	41.2 5.8	6.1		5.8
Max Allow Headway (/	,	4.0		0.0	4.0	_	0.2	4.0	_	4.0	4.0	-	4.0
Queue Clearance Time	· · · · · · · · · · · · · · · · · · ·	9.9		0.0	13.7	_	0.0	12.5		31.7	9.4		20.3
Green Extension Time	, - ,	0.0	_	0.0	0.0	_	0.0	0.2		2.9	0.0	_	6.7
Phase Call Probability	(<i>g e)</i> , 3	1.00		0.0	1.00		0.0	1.00		1.00	1.00		1.00
Max Out Probability		1.00			1.00			1.00		1.00	1.00		0.68
ar car resaming													
Movement Group Res	sults		EB			WE	3		NB	1		SB	
Approach Movement		L	T	R	L	Т	R	L	T	R	L	T	R
Assigned Movement		5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v	,	183	532	180	310	419		375	1123	232	195	742	111
Adjusted Saturation Flo		1781	1781	1610	1781	1870		1730	1781	1610	1781	1781	1585
Queue Service Time (7.9	14.2	8.4	11.7	22.2		10.5	29.7	8.9	7.4	18.3	4.6
Cycle Queue Clearanc	e Time (g $_{c}$), s	7.9	14.2	8.4	11.7	22.2		10.5	29.7	8.9	7.4	18.3	4.6
Green Ratio (g/C)		0.27	0.19	0.33	0.31	0.23		0.14	0.35	0.47	0.39	0.30	0.38
Capacity (c), veh/h	tia (V)	213	687	535	325	432	_	481	1261	758	251	1086	609
Volume-to-Capacity Ra		0.858	0.773		0.954	0.97		0.780	0.891	0.305	0.776	0.684	0.182
Back of Queue (Q), ft	eh/ln (95 th percentile)	219.5 8.6	274.9 10.8	146.5 5.9	177.3 7.0	441. 17.4		213.8	496.1 19.5	145.3 5.8	177.3 7.0	317.7 12.5	78.9
<u> </u>	RQ) (95 th percentile)	0.59	0.00	0.98	0.35	0.00		0.36	0.00	0.00	0.35	0.00	0.00
Uniform Delay (d 1), s	, ,	32.1	38.3	25.1	32.8	37.3	_	41.6	30.5	16.3	25.0	30.5	20.4
Incremental Delay (d 2)		27.8	8.3	1.7	28.8	28.2		8.0	9.7	1.0	14.2	3.5	0.7
Initial Queue Delay (d	•	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/ve	<u>, </u>	59.9	46.5	26.8	61.6	65.5	_	49.6	40.2	17.4	39.2	34.0	21.1
Level of Service (LOS)		E	D	C	E	E	E	D	D	В	D	С	C
Approach Delay, s/veh		45.3		D	66.2		E	39.2		D	33.6		С
Intersection Delay, s/ve					5.4						D		
Multimodal Results			EB			WE			NB			SB	
Pedestrian LOS Score		3.1		С	3.0		С	2.8		С	3.0		С
Bicycle LOS Score / LO	DS	1.2		Α	1.4		Α	1.9		В	1.4		Α

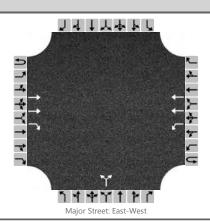
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		HCS	7 Sig	nalize	d Int	ersec	tion F	Resu	lts Sur	nmar	у				
Conoral Inform	otion							1	Interces	tion Inf	ormatic	\n	1 .		ЫŲ
General Inform	ation	A Ot t							Intersec		- Ir	on	- 1	ĄĻ	
Agency		American Structure	point			1.10	0040	_	Duration		0.25				<u></u>
Analyst		SBG	21.1	_		Jul 8,			Area Typ	e e	Other			už,	
Jurisdiction		Delaware County, C)H	Time F		AM P			PHF	D : 1	0.92	20			
Urban Street		Home Rd		Analys	sis Year	(With - With	2040 Bu Apartmo vements	ents)	Analysis	Period	1> 7:0	00		<u>ጎ</u> ታ 1 ቀ ተ ቀ ዋ	14 T
Intersection		Home Rd & Liberty	Rd N	File Na	ame	Sc4_I	nt 1 & 2	_AM -	With Imp	oroveme	nts.xus	;	7		
Project Descript	ion	Redwood Home Ro							•				7		
Demand Inform					EB			W	-		NB			SB	-
Approach Move				L	T	R	L	Т	R	L	T	R	L	T	R
Demand (v), ve	eh/h			67	642	188	122	65	8 27	288	157	91	35	235	72
Ciamal Informa	4!			1	1	T -	<u> </u>	<u> </u>		11111	_				
Signal Informa		Reference Phase	2		La .	4 8	≒ ₹	Ħ	7			_	7	\	人
Cycle, s	100.0						 	126	1 28			1	7 2] 3	4
Offset, s	80 No	Reference Point	Begin	Green		2.2	27.6	8.2		25.8					
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	5.2	4.3		5.2			V	7	Y
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.4	0.0	1.0	2.0	0.0	1.0		5	6	7	8
Timer Results				EBI		EBT	WB		WBT	NBI		NBT	SBI		SBT
Assigned Phase	<u> </u>			5	_	2	1		6	3		8	7		4
Case Number	,			1.1		3.0	1.1		4.0	1.1		4.0	1.1		4.0
Phase Duration	<u> </u>			12.8	3	33.8	15.0		36.0	19.2	_	36.7	14.5		32.0
Change Period,		,) e		5.7		6.2	7.1	_	6.2	5.8		6.2	6.3		6.2
Max Allow Head		•		4.0		0.0	4.0	_	0.0	4.0	_	4.0	4.0		4.0
Queue Clearand				4.5		0.0	7.2		0.0	14.8		14.6	3.4		18.9
Green Extension		, - ,		0.0		0.0	0.0	_	0.0	0.0	_	1.9	0.0		1.3
Phase Call Prob		(<i>g e)</i> , s		1.00		0.0	1.00		0.0	1.00		1.00	1.00		1.00
Max Out Probat				1.00			1.00	_		1.00		0.02	0.33		0.36
Wax Out 1 Tobak	Jilley			1.00			1.00			1.00		0.02	0.00		0.00
Movement Gro	up Res	ults			EB			WB			NB			SB	
Approach Move	ment			L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Move	ment			5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F	Rate (v), veh/h		72	685	201	133	375	370	313	270		38	334	
Adjusted Satura	ition Flo	ow Rate (s), veh/h/l	n	1781	1781	1610	1781	1870	1844	1781	1754		1781	1795	
Queue Service	Time (g	g s), S		2.5	16.6	8.6	5.2	17.6	17.6	12.8	12.6		1.4	16.9	
Cycle Queue Cl	earance	e Time (<i>g c</i>), s		2.5	16.6	8.6	5.2	17.6	17.6	12.8	12.6		1.4	16.9	
Green Ratio (g/	/C)			0.35	0.28	0.41	0.35	0.30	0.30	0.40	0.31		0.34	0.26	
Capacity (c), v	eh/h			271	983	660	296	557	550	403	535		394	463	
Volume-to-Capa	acity Ra	tio (X)		0.264	0.697	0.304	0.449	0.67	2 0.673	0.776	0.504		0.096	0.721	
Back of Queue	(Q), ft/	In (95 th percentile))	41.5	256.2	144.5	96.5	332.	324.6	251.1	221.8		26.3	307.9	
Back of Queue	(Q), ve	eh/In (95 th percent	ile)	1.6	10.1	5.8	3.8	13.1	13.0	9.9	8.7		1.0	12.1	
Queue Storage	Ratio (RQ)(95 th percen	tile)	0.08	0.00	0.00	0.30	0.00	0.00	0.77	0.00		0.08	0.00	
Uniform Delay (19.8	29.4	20.6	24.2	30.8		24.0	28.5		22.8	33.8	
Incremental Del	- ,	·		0.4	2.9	0.8	1.1	6.4	6.5	9.2	0.8		0.1	5.4	
Initial Queue De		·		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (eh		20.2	32.3	21.4	25.2	37.2	37.3	33.2	29.3		22.9	39.2	
Level of Service				С	С	С	С	D	D	С	С		С	D	
Approach Delay				29.1	I	С	35.4	1	D	31.4	1	С	37.5	5	D
Intersection Del	ay, s/ve	h / LOS				32	2.7						С		
Multimodal Res		/ 1 00			EB			WB			NB			SB	
Pedestrian LOS				2.3		В	2.3		В	2.8		С	3.0		С
Bicycle LOS Sc	ore / LC)5		1.3		Α	1.2		Α	1.4		A	1.1		Α

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	HCS7 Two-Way Sto	p-Control Report	
General Information		Site Information	
Analyst	SBG	Intersection	Home Rd & Access Rd
Agency/Co.	American Structurepoint	Jurisdiction	Delaware County
Date Performed	7/5/2019	East/West Street	Home Rd
Analysis Year	2040	North/South Street	Access Rd
Time Analyzed	Sc4 - AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Redwood Home Rd TIS		

Lanes



Vehicle Volumes and Adjustments

Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	1	0	1	2	0		0	1	0		0	0	0
Configuration			Т	R		L	Т				LR					
Volume, V (veh/h)			860	25		11	964			77		37				
Percent Heavy Vehicles (%)						2				0		0				
Proportion Time Blocked																
Percent Grade (%)										()					
Right Turn Channelized	No					N	lo			N	lo			N	lo	
Median Type/Storage				Left	Only								1			

Critical and Follow-up Headways

Base Critical Headway (sec)								
Critical Headway (sec)								
Base Follow-Up Headway (sec)								
Follow-Up Headway (sec)								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			12				124			
Capacity, c (veh/h)			711				296			
v/c Ratio			0.02				0.42			
95% Queue Length, Q ₉₅ (veh)			0.1				2.0			
Control Delay (s/veh)			10.1				25.7			
Level of Service, LOS			В				D			
Approach Delay (s/veh)			0	.1		25	5.7			
Approach LOS						[)			

	HCS7 Sig	nalize	d Inte	ersec	tion R	Resu	ılts Sur	nmar	у					
General Information						1	Intersec	tion Inf	o rm otic	\n		4 사하 1	ЬŲ	
	A man win a m. Other rate reason a limb								-tr	on				
Agency	American Structurepoint	Δ		1.10	0040	-	Duration.	·					L	
Analyst	SBG	+		Jul 8,			Area Typ	<u>е</u>	Other				<u>}</u>	
Jurisdiction	Delaware County, OH	Time F		PM Pe			PHF	D · ·	0.92	20	-3	***	¥	
Urban Street	Urban Street Home Rd		sis Year	(With	2040 Bu Apartme vements	ents)	Analysis	Period 1> 7:00				4 1 4 Y		
Intersection Home Rd & Sawmill Pkwy			ame	Sc4_I	nt 1 & 2	_PM	- With Imp	roveme	ents.xus	,				
Project Description	Redwood Home Rd TIS					_								
					1									
Demand Information			EB			W	В		NB			SB		
Approach Movement		L	T	R	L	T		L	T	R	L	T	R	
Demand (v), veh/h		136	624	291	265	58	3 152	513	763	403	214	675	79	
		1	1.7	_	_			1 11:					_	
Signal Information	D. C. D. O.	-	ر ھا] }	≓		20		9	_	A	Κ .	人	
Cycle, s 120.0	Reference Phase 2	-	2	2	, 📑 "	, p.	S 12 51	r r	17		\rightarrow 2 -]]	4	
Offset, s 90	Reference Point Begin	Green		1.9	26.8	16		29.2						
Uncoordinated No	Simult. Gap E/W On	Yellow		4.3	5.2	3.9		4.8	<u>`</u> _	~		/	P	
Force Mode Fixed	Simult. Gap N/S On	Red	2.6	2.2	1.0	2.2	2 0.0	1.0		5	6	7	8	
Timer Results		EBI		EBT	WB		WBT	NBI		NBT	SBI		SBT	
		5 5	-			L			-			-		
Assigned Phase	•			2	1		6	3		8	7	_	4	
Case Number				3.0	1.1	+	4.0	2.0		3.0	1.1		3.0	
Phase Duration, s				33.0	24.0	_	41.4	28.0)	40.7	22.3	5	35.0	
Change Period, (Y+R	<u>, </u>	6.5		6.2	6.5	_	6.2	6.1		5.8	6.1		5.8	
Max Allow Headway (A		4.0		0.0	4.0		0.0	4.0		4.0	4.0		4.0	
Queue Clearance Time	, - ,	9.6	_		19.5	_		20.9		27.8	13.2	_	25.6	
Green Extension Time (g e), s		0.0		0.0	0.0		0.0	0.3		4.8	0.2		2.7	
Phase Call Probability	·)		1.00			1.00		1.00	1.00		1.00	
Max Out Probability		1.00)		1.00)		1.00)	0.81	1.00)	1.00	
Marray and One Page	lt-					١٨/٦	,		NID			C.D.		
Movement Group Res	suits		EB			WE	1	<u> </u>	NB -		-	SB		
Approach Movement		L	T	R	L	Т	R	L	T	R	L	T	R	
Assigned Movement	\ 1.11	5	2	12	1	6	16	3	8	18	7	4	14	
Adjusted Flow Rate (v	,·	148	678	316	347	500		558	829	438	233	734	86	
Adjusted Saturation Flo	· ,·	1781	1781	1610	1781	187		1730	1781	1610	1781	1781	1585	
Queue Service Time (g	•	7.6	21.9	17.4	17.5	31.4		18.9	25.8	25.3	11.2	23.6	4.7	
Cycle Queue Clearance	e iime (<i>g c</i>), s	7.6	21.9	17.4	17.5	31.4		18.9	25.8	25.3	11.2	23.6	4.7	
Green Ratio (g/C)		0.30	0.22	0.41	0.39	0.29		0.18	0.29	0.44	0.38	0.24	0.32	
Capacity (c), veh/h	4:- / V)	203	795	653	351	549	_	631	1036	703	339	867	506	
Volume-to-Capacity Ra		0.728	0.853		0.991	0.91		0.883	0.801	0.623	0.685	0.847	0.170	
Back of Queue (Q), ft/		175.6	401.6	276	360.3	544.	_	356.7	442.8	378.3	223.8	424.3	83.9	
Back of Queue (Q), ve		6.9	15.8	11.0	14.2	21.4		14.0	17.4	15.1	8.8	16.7	3.3	
	RQ) (95 th percentile)	0.47 35.1	0.00	0.00	0.72	0.00		0.59	0.00	0.00	0.45	0.00	0.00	
	Jniform Delay (d 1), s/veh		44.7	26.4	32.3	46.8		47.8	39.3	26.2	29.6	43.3	29.4	
	ncremental Delay (d 2), s/veh		11.2	2.6	31.4	12.6		13.9	6.5	4.1	5.6	10.0	0.7	
	itial Queue Delay (d 3), s/veh		0.0	0.0	0.0	0.0	_	0.0	0.0	0.0	0.0	0.0	0.0	
	Control Delay (d), s/veh		55.9	28.9	63.7	59.5	_	61.7	45.8	30.3	35.3	53.3	30.1	
Level of Service (LOS)		D	E	C	E	E	E	E	D	C	D	D	C	
Approach Delay, s/veh		47.3	3	D	61.6	j	Е	47.0)	D	47.4		D	
Intersection Delay, s/ve	en / LOS			50).7							D		
Marie L. I. B.						167			115			00		
Multimodal Results	/1.00	2.	EB	_		WE			NB	_	2.0	SB		
Pedestrian LOS Score		3.1		С	3.0	_	С	2.8		С	3.0		C	
Bicycle LOS Score / LO	10	1.4		Α	1.4		Α	2.0		В	1.4		Α	

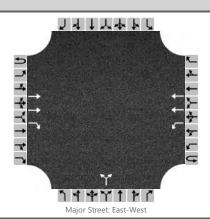
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		HCS	7 Sig	nalize	d Int	ersec	tion F	Resu	ılts Su	mmar	у				
General Information	ior								Intersec	tion Inf	ormatia	\n		I of Trape 1	Ja ly
		Nanamiaan Otmustuma	:						Duration		0.25)fi		41	
Agency	_	American Structure	JOINL	A b	is Data	1	2010	-		·					K.
Analyst	_	SBG	\	-		Jul 8,			Area Type Other				, ř.	-X	
Jurisdiction		Delaware County, C)H	Time F		PM P		.:11	PHF	Daniad	0.92	20		.,,,	· ·
Urban Street		Home Rd		Analys	sis Year Sc4 - 2040 Build (With Apartments) - With Improvements			Period	1> 7:0	JO		<u> </u>	h (*		
Intersection	Intersection Home Rd & Liberty Rd N			File Na	ame	Sc4_I	nt 1 & 2	_PM	- With Im	proveme	ents.xus	;	7		
Project Description	n F	Redwood Home Rd	TIS	,											
Demand Informati	ion				EB			W	В		NB			SB	
Approach Moveme	ent			L	Т	R	L	T	R	L	T	R	L	Т	R
Demand (v), veh/h	'h			69	791	396	177	83	30	316	221	96	24	257	59
		1	1			<u> </u>	1 111	1 11:							
Signal Information	1	Reference Phase	2		L ,	- - €	≒ ,	Ħ		- 1		_	7	~	▲
							_₹	100				1	2 2] 3	4
	-	Reference Point	Begin	Green		0.7	30.8	11		36.9)		4		
\vdash	_	Simult. Gap E/W	On	Yellow	-	4.3	5.2	3.9		5.2		^ _	Y	>	Ψ.
Force Mode Fix	xed	Simult. Gap N/S	On	Red	1.4	2.8	1.0	1.9	0.0	1.0		5	6	7	8
Timer Results				EBI		EBT	WB	L	WBT	NB		NBT	SBI	L	SBT
Assigned Phase				5		2	1		6	3		8	7		4
Case Number	Case Number		1.1		3.0	1.1		4.0	1.1		4.0	1.1		4.0	
Phase Duration, s		12.8	3	37.0	20.6	3	44.8	17.0) .	43.1	19.3	3	45.4		
Change Period, (Y+R c), s		5.7		6.2	7.1		6.2	5.8		6.2	6.3		6.2		
Max Allow Headwa	ay (M.	<i>AH</i>), s		4.0		0.0	4.0		0.0	4.0		4.0	4.0		4.0
Queue Clearance T	Time ((gs), s		5.6			10.9	9		13.2	2	22.0	3.0		20.9
Green Extension Ti	Green Extension Time (g_{e}), s			0.0		0.0	0.1		0.0	0.0		2.2	0.0		2.3
Phase Call Probabi	Phase Call Probability		1.00)		1.00)		1.00)	1.00	1.00)	1.00	
Max Out Probability	.y			1.00)		1.00)		1.00)	0.03	0.00)	0.01
Mayamant Craun	Beer	ulto			ГР			WE))		ND			CD	
Movement Group Approach Movement		IIIS		1	EB T	R	L	T	R		NB T	R	L	SB T	R
Assigned Movemer				5	2	12	1	6	16	1 3	8	18	7	4	14
Adjusted Flow Rate		veh/h		74	850	425	192	471		343	345	10	26	343	14
Adjusted Flow Nate			n	1781	1781	1610	1781	187		1781	1774		1781	1810	
Queue Service Tim		· ,·	11	3.6	27.7	27.8	8.9	27.4		11.2	20.0		1.0	18.9	
Cycle Queue Clear	· · ·	·		3.6	27.7	27.8	8.9	27.4		11.2	20.0		1.0	18.9	
Green Ratio (g/C)		(9 0), 0		0.32	0.26	0.35	0.39	0.32	_	0.40	0.31		0.42	0.33	
Capacity (c), veh/l				211	914	564	277	602		384	545		399	591	
Volume-to-Capacity		o(X)		0.351	0.929	+	0.694	0.78	_	0.894			0.065	0.581	
Back of Queue (Q	-	· ,		69.3	422.8		256.1	495.		277.6	341.2		19.3	325.5	
Back of Queue (Q		<u> </u>		2.7	16.6	17.9	10.1	19.5		10.9	13.4		0.8	12.8	
Queue Storage Rat				0.13	0.00	0.00	0.79	0.00	_	0.85	0.00		0.06	0.00	
Uniform Delay (d 1				31.9	39.8	40.3	29.7	36.9		35.2	35.7		22.5	33.6	
	cremental Delay (d 2), s/veh			0.6	11.1	5.4	7.3	9.8	9.9	22.4	2.4		0.1	1.4	
	ue Delay (d 3), s/veh			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
	ontrol Delay (d), s/veh		32.4	50.9	45.8	37.0	46.7	7 46.8	57.7	38.1		22.6	35.0		
Level of Service (Lo	OS)			С	D	D	D	D	D	E	D		С	D	
Approach Delay, s/	/veh /	LOS		48.3	3	D	45.1	1	D	47.9		D	34.1	1	С
Intersection Delay,	s/veh	I/LOS				45	5.7						D		
Multimodal Result		1.00		0.0	EB		0.0	WE			NB			SB	
Pedestrian LOS Score				2.3		В	2.3		В	2.8		С	3.0		C
Bicycle LOS Score	· / LOS	S		1.6		В	1.4		Α	1.6		В	1.1		Α

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	HCS7 Two-Way Stop-Control Report							
General Information		Site Information						
Analyst	SBG	Intersection	Home Rd & Access Rd					
Agency/Co.	American Structurepoint	Jurisdiction	Delaware County					
Date Performed	7/5/2019	East/West Street	Home Rd					
Analysis Year	2040	North/South Street	Access Rd					
Time Analyzed	Sc4 - PM Peak Hour	Peak Hour Factor	0.92					
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25					
Project Description	Redwood Home Rd TIS							

Lanes



Vehicle Volumes and Adjustments

Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	1	0	1	2	0		0	1	0		0	0	0
Configuration			Т	R		L	Т				LR					
Volume, V (veh/h)			1235	78		32	924			43		21				
Percent Heavy Vehicles (%)						2				0		0				
Proportion Time Blocked																
Percent Grade (%)										()					
Right Turn Channelized		N	lo			N	lo			N	lo			N	lo	
Median Type/Storage				Left	Only				:	1						

Critical and Follow-up Headways

Base Critical Headway (sec)								
Critical Headway (sec)								
Base Follow-Up Headway (sec)								
Follow-Up Headway (sec)								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			35				70			
Capacity, c (veh/h)			473				196			
v/c Ratio			0.07				0.36			
95% Queue Length, Q ₉₅ (veh)			0.2				1.5			
Control Delay (s/veh)			13.2				33.3			
Level of Service, LOS			В				D			
Approach Delay (s/veh)			0	.4		33	3.3			
Approach LOS						[)			



Appendix E – Turn Lane Warrant Analysis

Left Turn Lane Warrant at Home Rd & Access Rd | Scenario 4

Project Name: Redwood Home Rd TIS Project Number: 2018.01836

Direction: WB

Intersection: Home Rd & Access Rd Date: 7/5/2019

Major Street:Home Rd# of approach lanes:2Minor Street:Access Rd# of approach lanes:2

Scenario 4

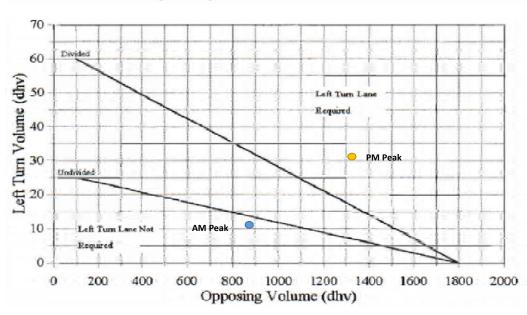
 AM
 PM

 Opposing Traffic:
 885
 1313

 Left Turns
 11
 32

 Left Turn Lane Warranted?
 NO
 YES

4-Lane Highway Left Turn Lane Warrant



Source: Figure 401-5c, Ohio DOT Location and Design Manual, January 2019



Defining the built environment.

Right Turn Lane Warrant - Home Rd & Access Rd | Scenario 4

Project Name: Redwood Home Rd TIS Project Number: 2018.01836

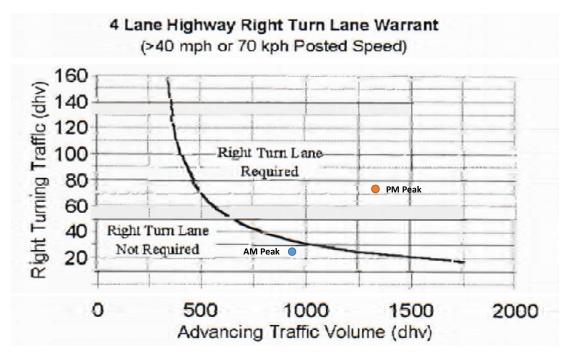
Direction: EB

Intersection: Home Rd & Access Rd Date: 7/5/2019

Major Street:Home Rd# of approach lanes:2Minor Street:Access Rd# of approach lanes:2

Scenario 4

AM PM
Advancing Traffic Volume (Including RTs): 885 1313
Right Turns 25 78
Right Turn Lane Warranted? NO YES



^{*} data point for PM peak lies outside of the graph limits Source: Figure 401-6d, Ohio DOT Location and Design Manual, January 2019



O Defining the built environment.



Appendix F – Queue Analysis Results

Turnilana	Design		Turn La	ane Length (ft)	*	
Turn Lane	Speed (mph)	Existing	Required	Proposed	Taper	W/O Taper
	Sav	vmill Pkwy &	Home Rd			
Eastbound Right Turn Lane	55	0	550	550	50	500



Intersection: Sawmill Pkwy & Home Rd

Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2020Design Speed:55Peak HourSc2A - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 3 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	150	200

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	150	315

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 9 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	350	400

Accommodating Thru Blockage (ft) 400

Greater of Total Turn length and Blockage Length (ft): 400

Final Conclusion:

Use Blockage Length	<u>400</u> <u>ft</u>



Intersection: Sawmill Pkwy & Home Rd

Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2020Design Speed:55Peak HourSc2A - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 7 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	275	325

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	275	440

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 14 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	500	550

Accommodating Thru Blockage (ft) 550

Greater of Total Turn length and Blockage Length (ft): 550

Final Conclusion:

Use Blockage Length	<u>550</u> <u>ft</u>



	Design Speed	Turn Lane Length (ft)*				
Turn Lane	(mph)		Required	Proposed	Taper	W/O Taper
L	iberty Rd N &	Home Rd				
Eastbound Right Turn Lane 55		0	700	700	50	650



Intersection: Liberty Rd N & Home Rd

Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2020Design Speed:55Peak HourSc2A - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 4 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	175	225

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	175	340

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 12 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	450	500

Accommodating Thru Blockage (ft) 500

Greater of Total Turn length and Blockage Length (ft): 500

Final Conclusion:

Use Blockage Length	<u>500</u> <u>ft</u>



Intersection: Liberty Rd N & Home Rd

Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2020Design Speed:55Peak HourSc 2A - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 9 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	350	400

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	350	515

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 515

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 19 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	650	700

Accommodating Thru Blockage (ft) 700

Greater of Total Turn length and Blockage Length (ft): 700

Final Conclusion:

Use Blockage Length	<u>700</u> <u>ft</u>



	Design		Turn l	Lane Lengtl	h (ft)*	
Turn Lane Speed (mph		Existing	Required	Proposed	Taper	W/O Taper
Sawmill Pkwy & Home Rd						
Eastbound Right Turn Lane 55 0 525				525	50	475



Intersection: Sawmill Pkwy & Home Rd

Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2020Design Speed:55Peak HourSc2B - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 3 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	150	200

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	150	315

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 9 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	350	400

Accommodating Thru Blockage (ft) 400

Greater of Total Turn length and Blockage Length (ft): 400

Final Conclusion:

Use Blockage Length	<u>400</u> <u>ft</u>



Intersection: Sawmill Pkwy & Home Rd

Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2020Design Speed:55Peak HourScB - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 7 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	275	325

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	275	440

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 13 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	475	525

Accommodating Thru Blockage (ft) 525

Greater of Total Turn length and Blockage Length (ft): 525

Final Conclusion:

Use Blockage Length	<u>525</u> <u>ft</u>



	Design Speed	sign Speed		Turn Lane Length (ft)*		
Turn Lane	(mph)	Existing	Required	Proposed	Taper	W/O Taper
Liberty Rd N & Home Rd						
Eastbound Right Turn Lane 55		0	675	675	50	625



Intersection: Liberty Rd N & Home Rd

Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2020Design Speed:55Peak HourSc 2B - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 4 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	175	225

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	175	340

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 12 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	450	500

Accommodating Thru Blockage (ft) 500

Greater of Total Turn length and Blockage Length (ft): 500

Final Conclusion:

Use Blockage Length	<u>500</u> <u>ft</u>



Intersection: Liberty Rd N & Home Rd

Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2020Design Speed:55Peak HourSc 2B - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 9 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	350	400

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	350	515

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 515

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 18 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	625	675

Accommodating Thru Blockage (ft) 675

Greater of Total Turn length and Blockage Length (ft): 675

Final Conclusion:

Use Blockage Length	<u>675</u> <u>ft</u>



Time Lane	Design Speed	Turn Lane Length (ft)*				
Turn Lane	(mph)	Existing	Required	Proposed	Taper	W/O Taper
Sawmill Pkwy & Home Rd						
Northtbound Right Turn Lane	50	0	595	595	145	450
Sawmill Pkwy & Home Rd						
Eastbound Right Turn Lane 55 0 540 540 165 375						375



Movement Analyzed: Northbound Right Turn

NBR

Speed Limit:45Design Year2040Design Speed:50Peak HourSc3 - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 6 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBR	50	250	300

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
NBR	225

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBR	145	250	395

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 395

Check for Blockage:

Direction Analyzed: NBT

Average Vehicles per Cycle: 15 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBT	50	525	<i>575</i>

Accommodating Thru Blockage (ft) 575

Greater of Total Turn length and Blockage Length (ft): 575

Final Conclusion:

	Use Blockage Length	<u>575</u> <u>ft</u>
--	---------------------	----------------------



Movement Analyzed: Northbound Right Turn

NBR

Speed Limit:45Design Year2040Design Speed:50Peak HourSc3 - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 12 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBR	50	450	500

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
NBR	225

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBR	145	450	595

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 595

Check for Blockage:

Direction Analyzed: NBT

Average Vehicles per Cycle: 13 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBT	50	475	525

Accommodating Thru Blockage (ft) 525

Greater of Total Turn length and Blockage Length (ft): 595

Final Conclusion:

Use Condition C	<u>595</u> <u>ft</u>



Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc3 - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 5 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	200	250

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	200	365

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 7 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	275	325

Accommodating Thru Blockage (ft) 325

Greater of Total Turn length and Blockage Length (ft): 325

Final Conclusion:

	Use Blockage Length	<u>325</u> <u>ft</u>
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Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc3 - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 10 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	375	425

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	375	540

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 540

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 11 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	400	450

Accommodating Thru Blockage (ft) 450

Greater of Total Turn length and Blockage Length (ft): 540

Final Conclusion:

	Use Condition C	<u>540</u> <u>ft</u>
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Turn Lane	Design Speed		Turn	Lane Length	n (ft)*	
	(mph)	Existing	Required	Proposed	Taper	W/O Taper
Liberty Rd N & Home Rd						
Eastbound Right Turn Lane	55	0	640	640	165	475



Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc3 - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 5 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	200	250

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	200	365

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: EBT

Average Vehicles per Cycle: 9 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	350	400

Accommodating Thru Blockage (ft) 400

Greater of Total Turn length and Blockage Length (ft): 400

Final Conclusion:

Use Blockage Length	<u>400</u> <u>ft</u>



Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc3 - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 13 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	475	525

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	475	640

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 640

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 13 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	475	525

Accommodating Thru Blockage (ft) 525

Greater of Total Turn length and Blockage Length (ft): 640

Final Conclusion:

Use Condition C	<u>640</u> <u>ft</u>



	Design Speed (mph)	Turn Lane Length (ft)*				
Turn Lane		Existing	Required	Proposed	Taper	W/O Taper
Sawmill Pkwy & Home Rd						
Northtbound Right Turn Lane	50	0	645	645	145	500
Sawmill Pkwy & Home Rd						
Eastbound Right Turn Lane	55	0	450	450	50	400



Movement Analyzed: Northbound Right Turn

NBR

Speed Limit:45Design Year2040Design Speed:50Peak HourSc4 - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 6 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBR	50	250	300

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
NBR	225

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBR	145	250	395

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 395

Check for Blockage:

Direction Analyzed: NBT

Average Vehicles per Cycle: 15 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBT	50	525	575

Accommodating Thru Blockage (ft) 575

Greater of Total Turn length and Blockage Length (ft): 575

Final Conclusion:

Use Blockage Length	<u>575</u> <u>ft</u>



Movement Analyzed: Northbound Right Turn

NBR

Speed Limit:45Design Year2040Design Speed:50Peak HourSc4 - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 14 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBR	50	500	550

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
NBR	225

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBR	145	500	645

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 645

Check for Blockage:

Direction Analyzed: NBT

Average Vehicles per Cycle: 13 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
NBT	50	475	525

Accommodating Thru Blockage (ft) 525

Greater of Total Turn length and Blockage Length (ft): 645

Final Conclusion:

Use Condition C	<u>645</u> ft



Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc4 - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 5 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	200	250

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	200	365

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 7 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	275	325

Accommodating Thru Blockage (ft) 325

Greater of Total Turn length and Blockage Length (ft): 325

Final Conclusion:

	Use Blockage Length	<u>325</u> ft
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Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc4 - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 10 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	375	425

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	375	540

Condition C is greater than Condition B

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 11 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	400	450

Accommodating Thru Blockage (ft) 450

Greater of Total Turn length and Blockage Length (ft): 450

Final Conclusion:

Use Blockage Length	<u>450</u> <u>ft</u>



Turn Long	Design Speed	ign Speed		Turn Lane Length (ft)*		
Turn Lane	(mph)	Existing	Required	Proposed	Taper	W/O Taper
Liberty		Rd N & Ho	me Rd			
Eastbound Right Turn Lane	55	0	665	665	165	500



Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc4 - AM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 100 seconds

Average Vehicles per Cycle: 6 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	250	300

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	250	415

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 9 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	350	400

Accommodating Thru Blockage (ft) 400

Greater of Total Turn length and Blockage Length (ft): 400

Final Conclusion:

Use Blockage Length	<u>400</u> <u>ft</u>



Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc4 - PM

Type of Traffic Control: SIGNALIZED

Turn Demand Volume Type: HIGH

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 120 seconds

Average Vehicles per Cycle: 14 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	500	550

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	500	665

Condition C is greater than Condition B

Conclusion: Use Condition C
Total Turn Length (ft) 665

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 14 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	500	550

Accommodating Thru Blockage (ft) 550

Greater of Total Turn length and Blockage Length (ft): 665

Final Conclusion:

Use Condition C	<u>665</u> <u>ft</u>



	Design Speed	Turn l	ane Length (ft)*			
Turn Lane	(mph)	Existing	Required	Proposed	Taper	W/O Taper
Access Rd & Home Rd						
Eastbound Right Turn Lane	55	0	450	450	50	400
Access Rd & Home Rd						
Westbound Left Turn Lane	55	0	400	400	50	350



Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc4 - AM

Type of Traffic Control: UNSIGNALIZED THROUGH ROAD

Turn Demand Volume Type: LOW

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 60 seconds

Average Vehicles per Cycle: 1 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	50	100

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	50	215

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 8 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	325	375

Accommodating Thru Blockage (ft) 375

Greater of Total Turn length and Blockage Length (ft): 375

Final Conclusion:

	Use Blockage Length	<u>375</u> <u>ft</u>
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Movement Analyzed: Eastbound Right Turn

EBR

Speed Limit:50Design Year2040Design Speed:55Peak HourSc4 - PM

Type of Traffic Control: UNSIGNALIZED THROUGH ROAD

Turn Demand Volume Type: LOW

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 60 seconds

Average Vehicles per Cycle: 2 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	50	100	150

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
EBR	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBR	165	100	265

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: **EBT**

Average Vehicles per Cycle: 11 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
EBT	50	400	450

Accommodating Thru Blockage (ft) 450

Greater of Total Turn length and Blockage Length (ft): 450

Final Conclusion:

Use Blockage Length	<u>450</u> <u>ft</u>



Movement Analyzed: Westbound Left Turn

WBL

Speed Limit:50Design Year2040Design Speed:55Peak HourSc4 - AM

Type of Traffic Control: UNSIGNALIZED THROUGH ROAD

Turn Demand Volume Type: LOW

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 60 seconds

Average Vehicles per Cycle: 1 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
WBL	50	50	100

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
WBL	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
WBL	165	50	215

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: WBT

Average Vehicles per Cycle: 9 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
WBT	50	350	400

Accommodating Thru Blockage (ft) 400

Greater of Total Turn length and Blockage Length (ft): 400

Final Conclusion:

Use Blockage Length	<u>400</u> <u>ft</u>



Movement Analyzed: Westbound Left Turn

WBL

Speed Limit:50Design Year2040Design Speed:55Peak HourSc4 - PM

Type of Traffic Control: UNSIGNALIZED THROUGH ROAD

Turn Demand Volume Type: LOW

Applicable Condition(s): CONDITION B or C (Whichever is greater)

Cycle Length: 60 seconds

Average Vehicles per Cycle: 1 veh/cyc

CONDITION A STORAGE ONLY

Length = 50' (diverging taper) + Storage Length (Figure 401-10)

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
WBL	50	50	100

CONDITION B HIGH SPEED DECELERATION ONLY

Movement	Turn Lane Length (ft)
WBL	285

CONDITION C MODERATE SPEED DECELERATION AND STORAGE

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
WBL	165	50	215

Condition B is greater than Condition C

Conclusion: Use Condition B
Total Turn Length (ft) 285

Check for Blockage:

Direction Analyzed: WBT

Average Vehicles per Cycle: 8 veh/cyc

Movement	(Diverging Taper) (ft)	Plus Storage Length (ft)	Total Length (ft)
WBT	50	325	375

Accommodating Thru Blockage (ft) 375

Greater of Total Turn length and Blockage Length (ft): 375

Final Conclusion:

	Use Blockage Length	<u>375</u> ft
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