Conservation Roundtable Water Information Session

Julie Bolthouse
Piedmont Environmental Council

Piedmont Environmental Council

What Water Issues Does PEC Get Involved In?

- Water supply and quality
- Groundwater and surface water
- Water conservation
- Well head protection
- TMDL implementation
- Citizen monitoring
- Education and outreach
- Fish barrier removal
- BMP implementation
- Recreational access
- Aquatic habitat enhancement

and the list goes on…

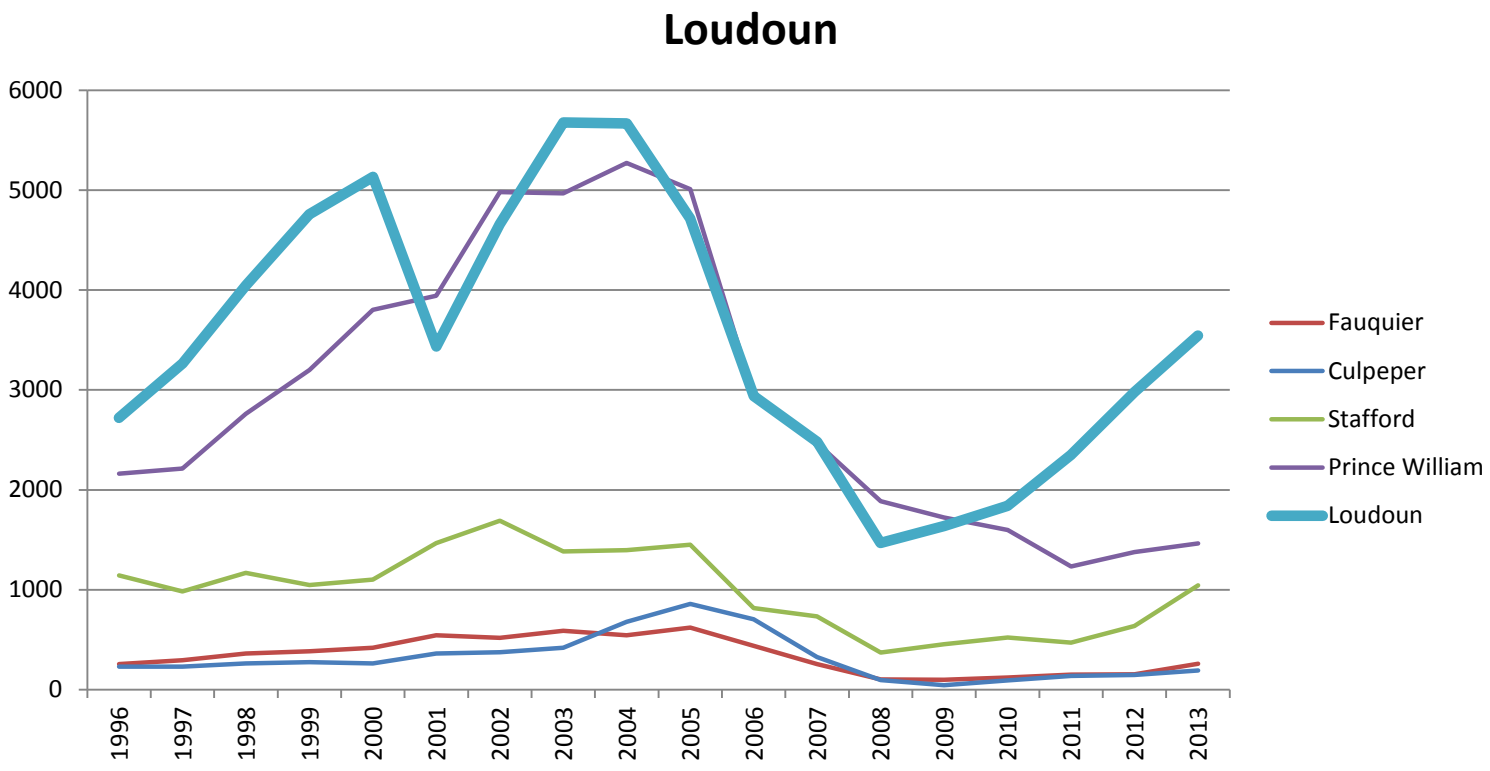
Water Demand in Fauquier County

Build Out Analysis of Service Districts

Why look at this now?

Renewed Residential Development Pressure

Why look at this now?



County Single Family Building Permit Approvals from census.gov

Why a Build Out Analysis?

- Planning for Future Infrastructure Needs (Roads, Water, Sewer, etc.)
- Planning for Future Service Needs (Schools, Police, Fire & Rescue, Solid Waste Handling, Parks and Rec., etc.)
- To better develop a vision for the Comprehensive Plan
- Assess how effectively the vision of the Comprehensive Plan has been implemented to date
- Comparing alternative development scenarios

Analyses Done

- Zoning Build-Out
- Land Use Build-Out
- Predicted Water Usage Under Existing Zoning
- Predicted Water Usage Under Existing Plans

Zoning Build-Out Methodology

Step 1)

Gross Density

- » Remove FEMA 100 Year Flood Plain
- » Remove Schools, Airport, Other Identified County Land
- » Calculate Maximum Density

Step 2)

Net Density calculated using

- » Estimated existing residential
- » Calculated remaining by-right development potential
  - Open Space Requirements
  - Minimum Lot Requirements
  - Minimum Road Frontage

Zoning Build-Out Methodology

Step 3)

Calculate Commercial, Industrial, and Mixed Use Potential

C-1/C-2/C-3 = 0.2	I-1/I-2 = 0.1	PCID = 0.15

Step 4)

PDR and MU-BLTN plans were pulled and approved DU and Commercial/Office square footage was applied when possible

Example: Bealeton

		Total Acreage		2606.95		County GIS Data					
Summary											
Zoning	Acreage w/floodplain removed	Gross Dwelling Units	Maximum Residential Density	Net Dwelling Units	GPD per Household	Residential Water Use	Comm/Ind Developed SqFt	FAR	Comm/Ind GPD per	Comm/Ind Water Use	Total GPD Used
RA	124.9630629	12	0.1	6	275	1650					1650.00
RR-2	13.62039044	6	0.5	3	275	825					825.00
V	0.003	0	1.4	0	275	0					0.00
R-1	114.6938925	103	0.9	79	275	21725					21725.00
R-2	8.798896119	17	2	12	275	3300					3300.00
R-4	161.0033873	640	4	484	275	133100					133100.00
GA	2.18	0	13	0	275	0					0.00
Existing Residential				1239	275	340725					340725.00
C-1	45.3342						394952	0.2	0.13	51343.70	51343.70
C-2	29.0788						253335	0.2	0.13	32933.49	32933.49
C-3	24.4794						213265	0.2	0.13	27724.39	27724.39
I-2	199.6385						869625	0.1	0.04	34785.01	34785.01
PRD	203.1044	1117	5.5	475	275	130625					130625.00
MU-BLTN	139.9676	770	5.5	382	275	105050	656150		0.13	85299.50	190349.50
Total	**1066.8655[illegible]9**		Students		GPD per Stude	Student Sewer Use					
		Schools	2,369		20	47380					47380
		2,665									
No Water or Sewer Area	234.2222		Total Res Units	2,680		Total SqFt of Comm/Ind	2,387,326			**Cumulative Total GPD**	**969,086**
School Acreage RA	100										
School Acreage R4	1			Existing Units as of 2016 (GIS 911 Addresses)							
					1,226						

Land Use Plan Build-Out Methodology

Step 1)

Reviewed Service District Land Use Plans

Step 2)

Applied Low, Medium, and High densities as described in Chapter 6 of Comp Plan to Land Uses in each Service District

Low = 1 Medium = 4 High = 7

Land Use Plan Build-Out Methodology

Step 3)

Calculated Commercial, Office, Industrial, and Mixed Uses Potential

Step 4)

A percentage (25 or 50%) of the land in Land Use categories with a mix of uses were calculated as residential at a medium density level of 4 DU/A

Example: Opal

Total Acreage		892.93	County GIS Data

Summary

Zoning	Acreage
Commercial	162.8217
Flex Office	131.4427
Hospitality	124.8973
Industrial	125.7041
Mixed Use	82.5431
LDR 1-3 Units Per Acre	158.4948
Park/Open Space	63.1756
Total	**849.0793**

GPD per Household	Residential Density	Dwelling Units	Residential Water Use	Comm/Ind Converted to Sq Ft	Estimated Target FAR	Developed Comm/Ind Sq Ft	Factor for Water Use	Comm/Ind Water Use	Total GPD Used	Assumptions
				7,092,513	0.20	1,418,503	0.13	184,405	184,405	
				5,725,644	0.20	1,145,129	0.09	103,062	103,062	
				5,440,526	0.20	1,088,105	0.13	141,454	141,454	
				5,475,671	0.10	547,567	0.04	21,903	21,903	
				3,595,577	0.20	719,115	0.13	93,485	93,485	
275	1	158	43450						43,450	
								Total Cumulative	**587,758**	

Total Res Units	158	Total Comm/Ind	4,918,419

Conversion Acres to Sq Ft

1 Acre = 43560

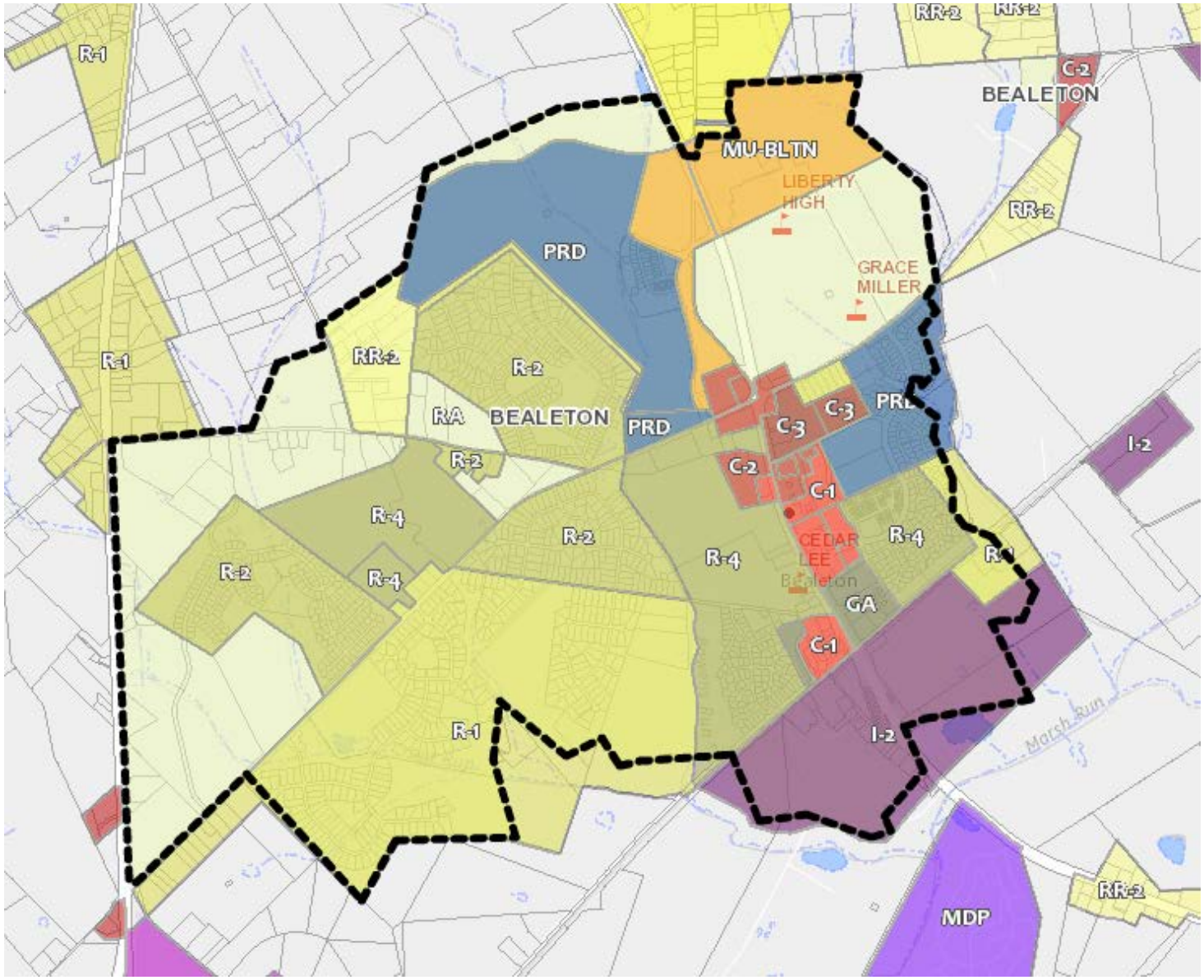
Existing Units as of 2010 (Pop and Demo Section of CP)	
	218

Estimated Zoned Units

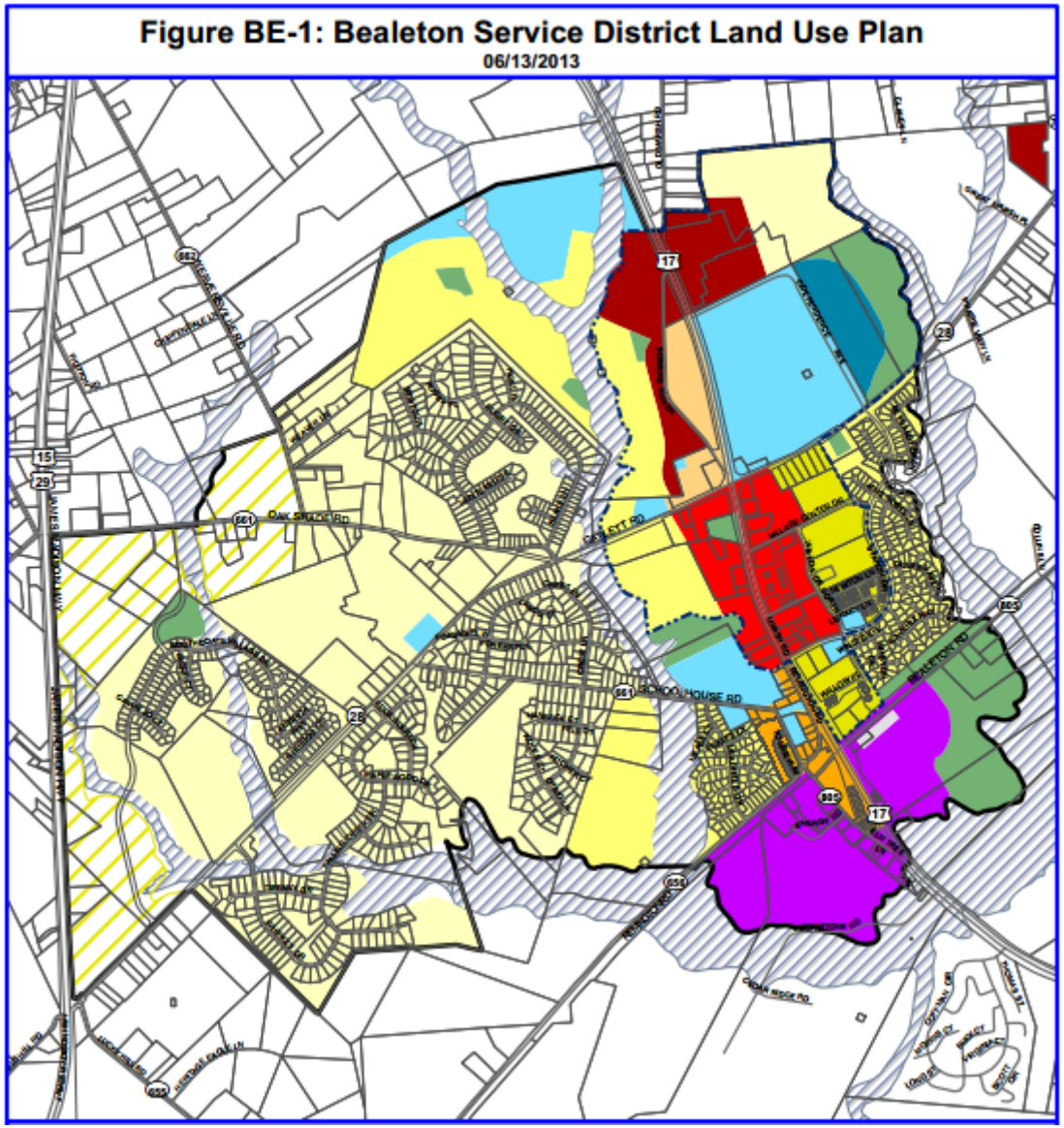
Total Res Units	277	Total SqFt of Comm/Ind	2,426,076

RA/RC left	285	(about 25 acres are planned for residential, 125 for light industrial, and the rest (135 acres) for mixed commercial)

Bealeton


R-1
RR-2
RR-2
C-2
BEALETON
MU-BLTN
LIBERTY HIGH
RR-2
PRD
GRACE MILLER
R-1
RR-2
R-2
RA
BEALETON
PRD
C-3
C-3
PRD
I-2
R-2
C-2
C-1
R-4
R-2
R-4
CEDAR LEE
R-4
R-1
R-2
R-4
GA
C-1
R-1
I-2
MDP
RR-2

Bealeton



Land Use Category	Acreage	FAR
Commercial Office/Mixed Use	39.7797	0.3
Flex Industrial	149.7537	0.2
HDR 7-20 Units Per Acre	72.5658	
Institutional/Office/Mixed Use	49.9798	0.3
LDR 1-3 Units Per Acre	1047.1266	
MDR 4-6 Units Per Acre	263.6153	
Mixed Use	36.0667	0.3
Town Center	84.3643	0.4
Residential / No Sewer & Water	234.2222	
Park/Open Space	137.2215	
School,Church,Fire,Rescue,Rec.	156.385	
School Expansion	28.1722	
Virginia Railway Express	2.3404	
Total	**2301.5932**	

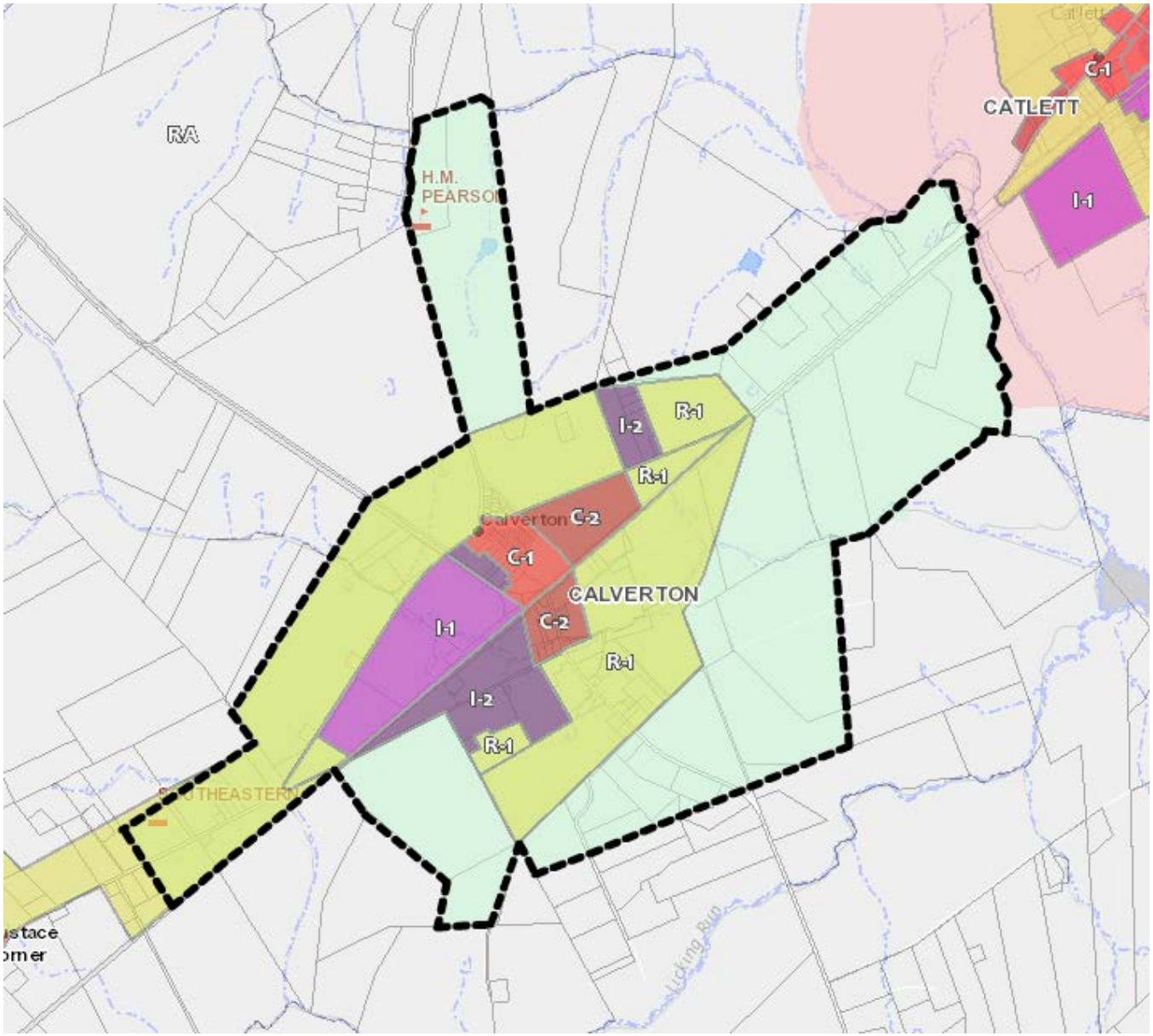
Results: Bealeton

	Residential	Commercial/Institution/Industrial
Existing	1,226	
Zoning	2,680	2,387,326 sq ft
Land Use	2,839	3,640,349 sq ft

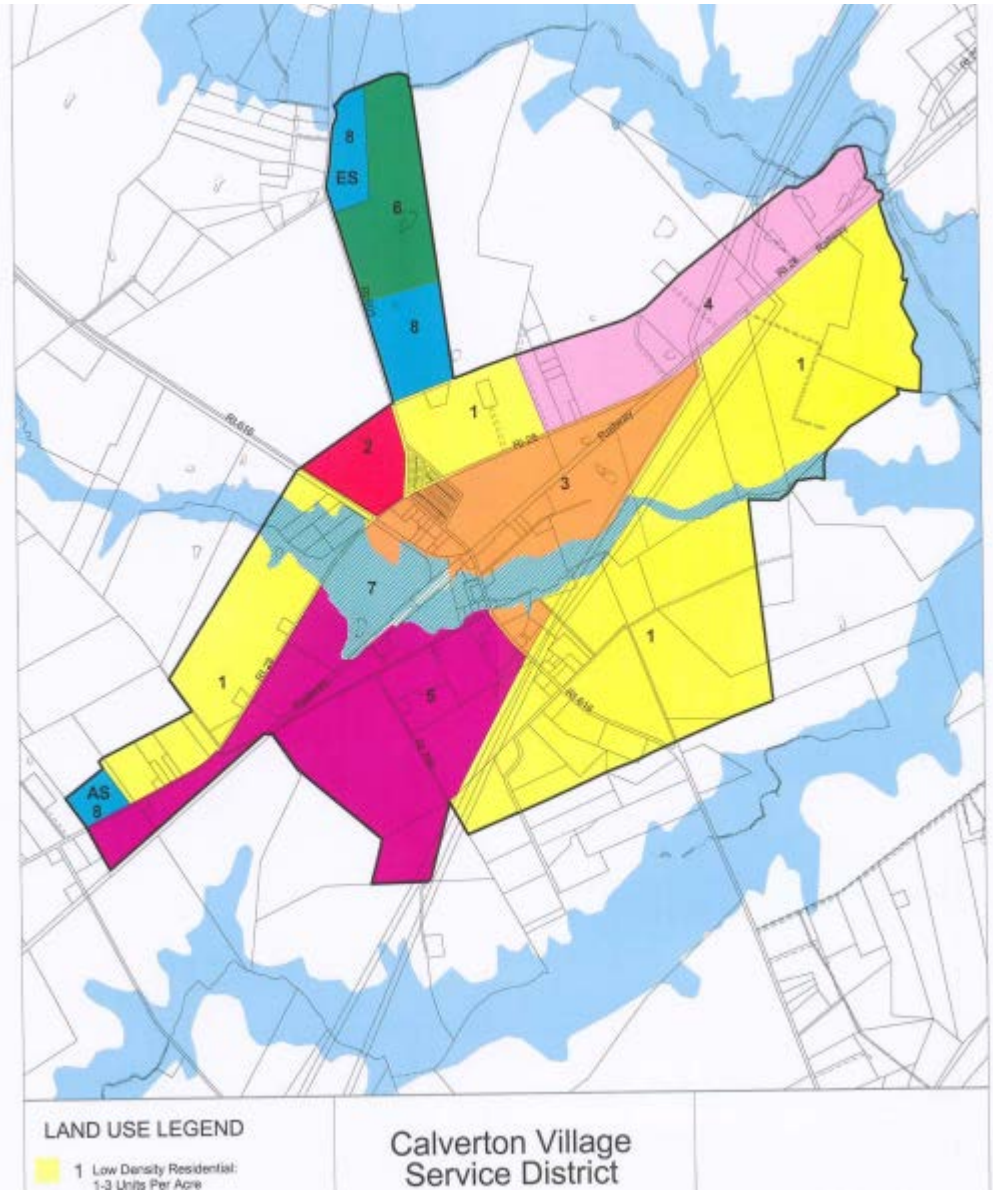
Available land in RA zoning: **123 acres**

- 18 acres institutional/office/mixed-use
- 105 acres low density residential
- Much of it is in no water and sewer area

Calverton


RA
H.M.
PEARSON
CATLETT
C-1
I-1
I-2
R-1
R-1
Calverton
C-2
C-1
CALVERTON
I-1
C-2
R-1
I-2
R-1
SOUTHEASTERN
stace
orner
Licking Run

Calverton



Zoning	Acreage	FAR
Commercial	35.8046	0.2
Industrial	277.3887	0.1
Mixed Use	172.9669	0.2
Office/High Tech	166.4709	0.2
LDR 1-3 Units Per Acre	745.2266	
Park\Open Space	219.9678	
School	74.1278	
Total	**1691.9533**	

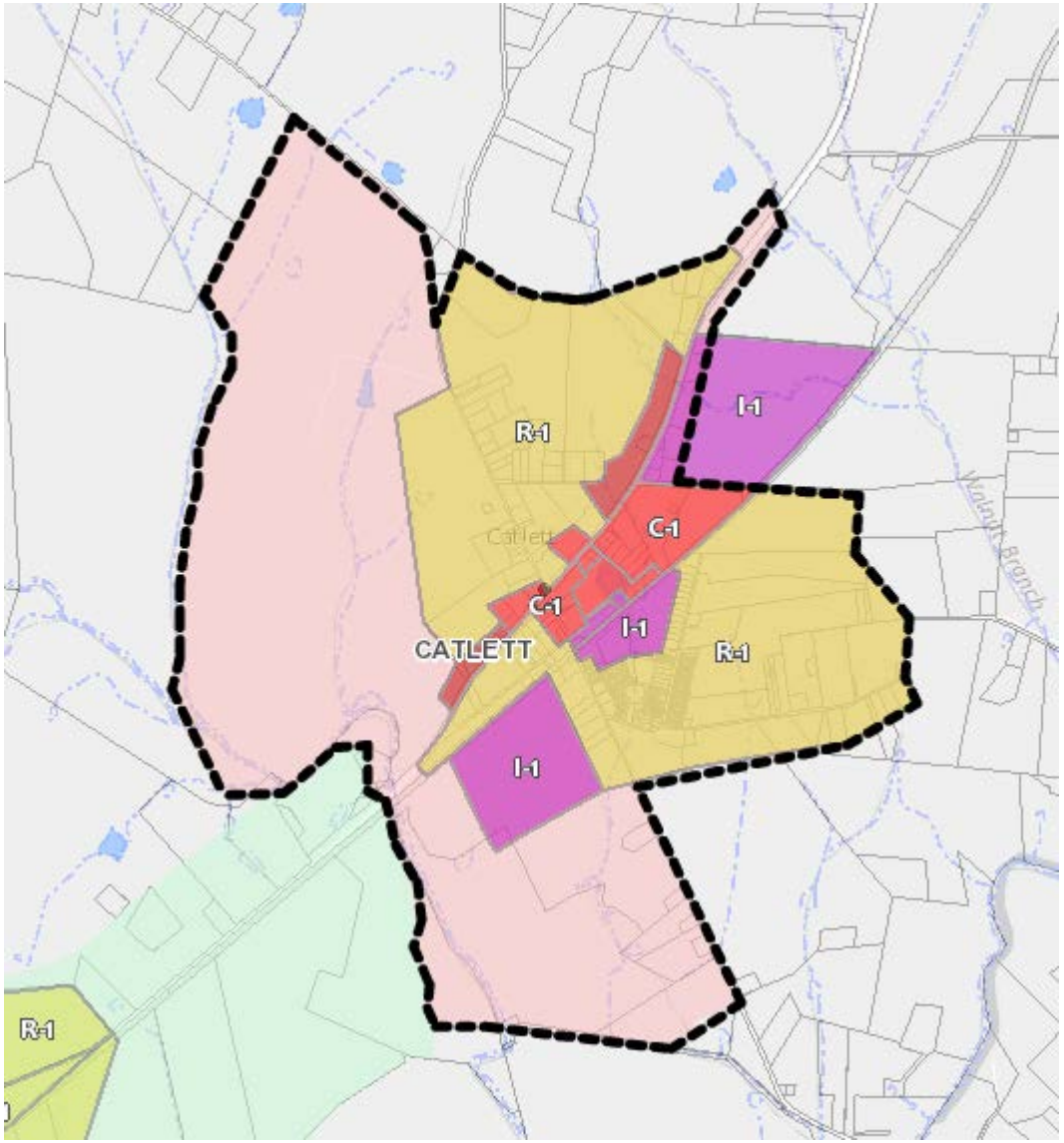
Results: Calverton

	Residential	Commercial/Institution/Industrial
Existing	50	
Zoning	380	1,183,389 sq ft
Land Use	1,090	3,723,973 sq ft

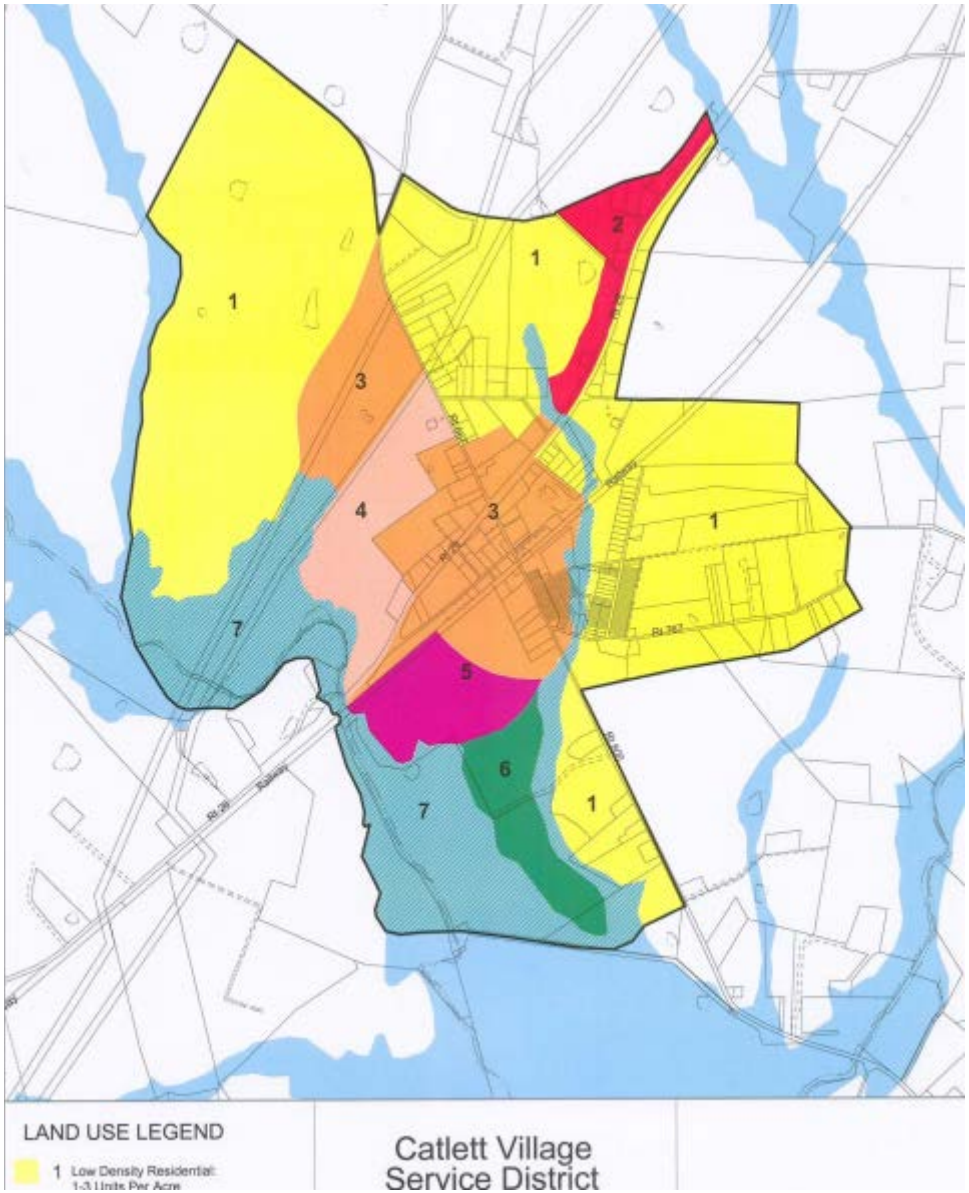
Available land in RA zoning: **723 acres**

- 110 office/high tech
- 110 are planned for industrial
- 503 acres low density residential.

Catlett



Catlett



Zoning	Acreage	FAR
Commercial	37.4004	0.2
Industrial	46.272	0.1
Mixed Use	188.7459	0.2
Office	68.7768	0.2
LDR 1-3 Units Per Acre	727.983	
Park\Open Space	44.3872	
Park\Open Space\Floodplane	246.1332	
Total	**1359.6985**	

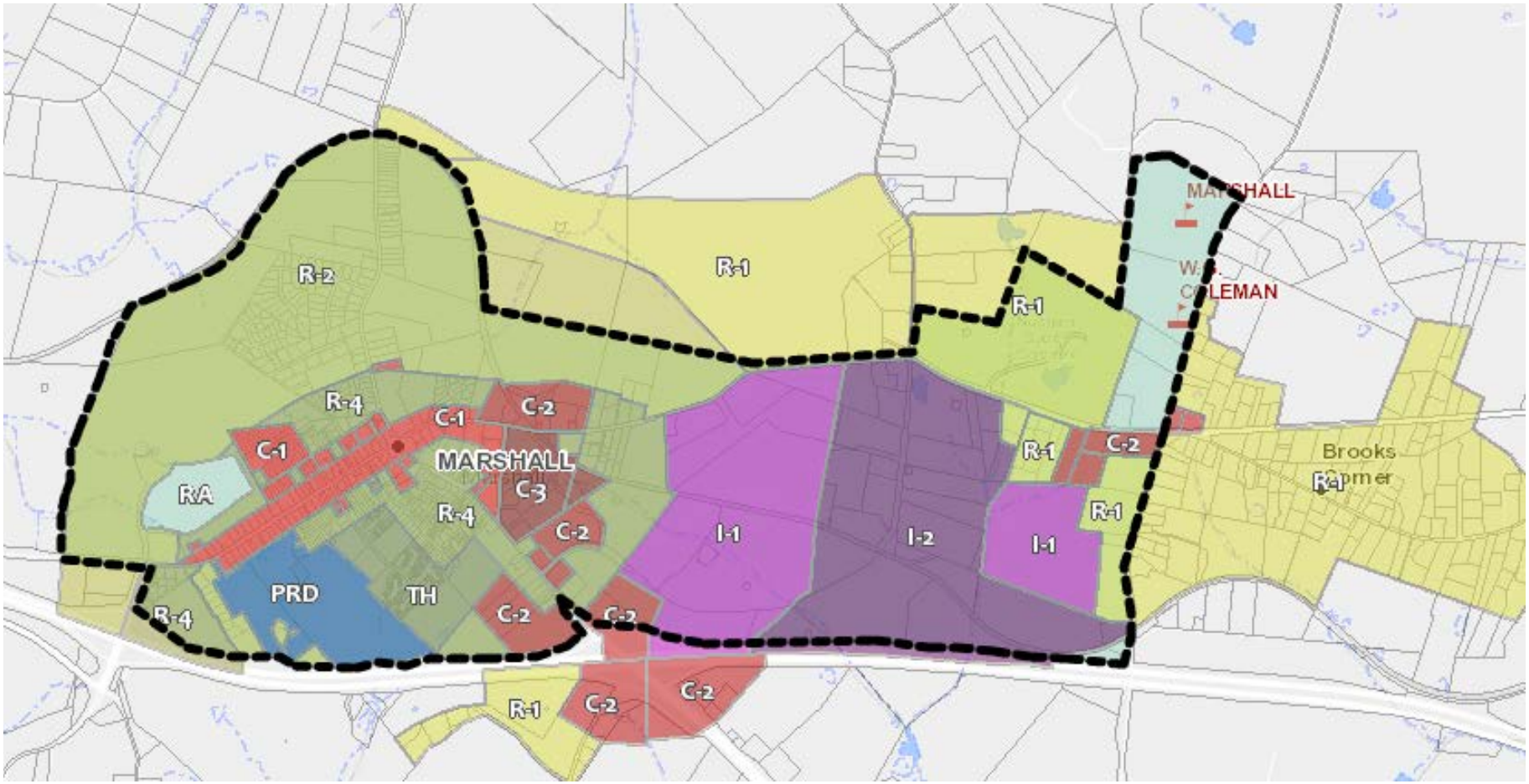
Results: Catlett

	Residential	Commercial/Institution/Industrial
Existing	115	
Zoning	473	1,068,175 sq ft
Land Use	1,104	1,948,754 sq ft

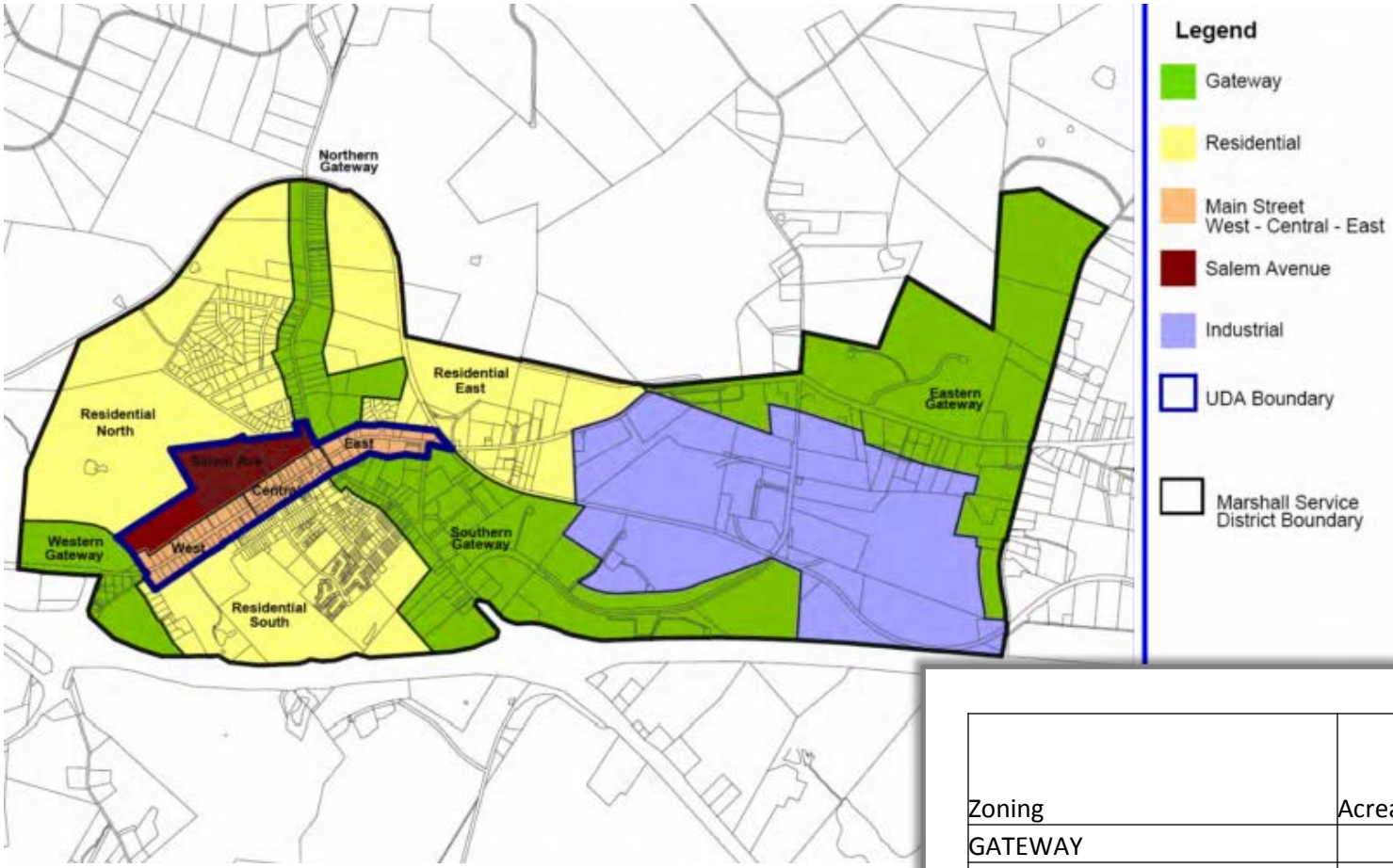
Available land in RA zoning: **291 acres**

- 16 industrial
- 10 mixed-use
- 265 low density residential

Marshall


R-2
R-1
R-1
R-4
C-1
C-2
C-1
MARSHALL
C-3
RA
R-4
C-2
I-1
I-2
I-1
R-1
C-2
R-1
Brooks
R-1
PRD
TH
R-4
C-2
C-2
R-1
C-2
C-2

Marshall



Zoning	Acreage	FAR
GATEWAY	572.4987	0.3
INDUSTRIAL	351.2131	0.2
MAIN STREET	49.0643	0.52
RESIDENTIAL	588.1234	
SALEM AVENUE	41.9205	0.4
Total	**1602.82**	

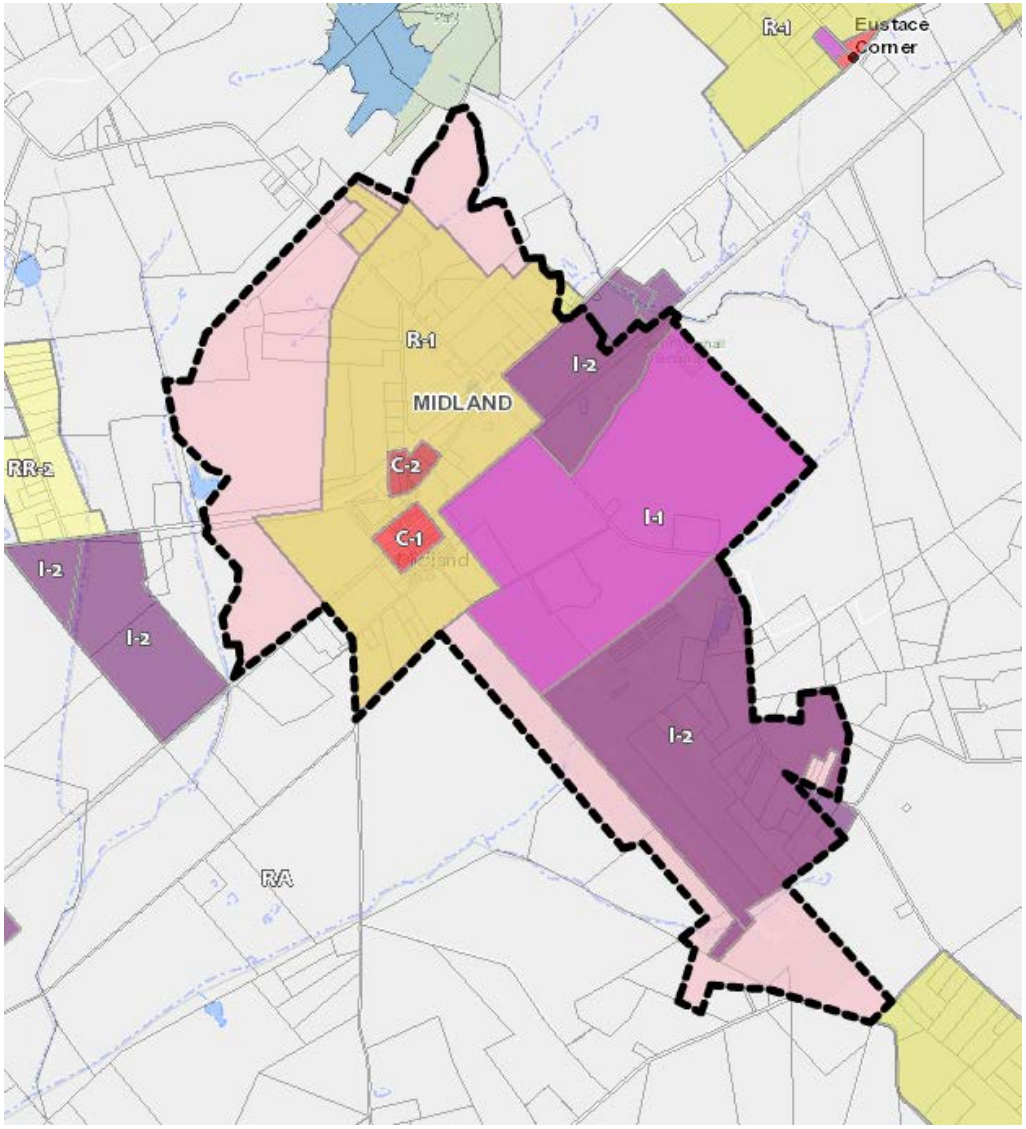
Results: Marshall

	Residential	Commercial/Institution/Industrial
Existing	630	
Zoning	1,701	3,369,596 sq ft
Land Use	2,903	6,123,514 sq ft

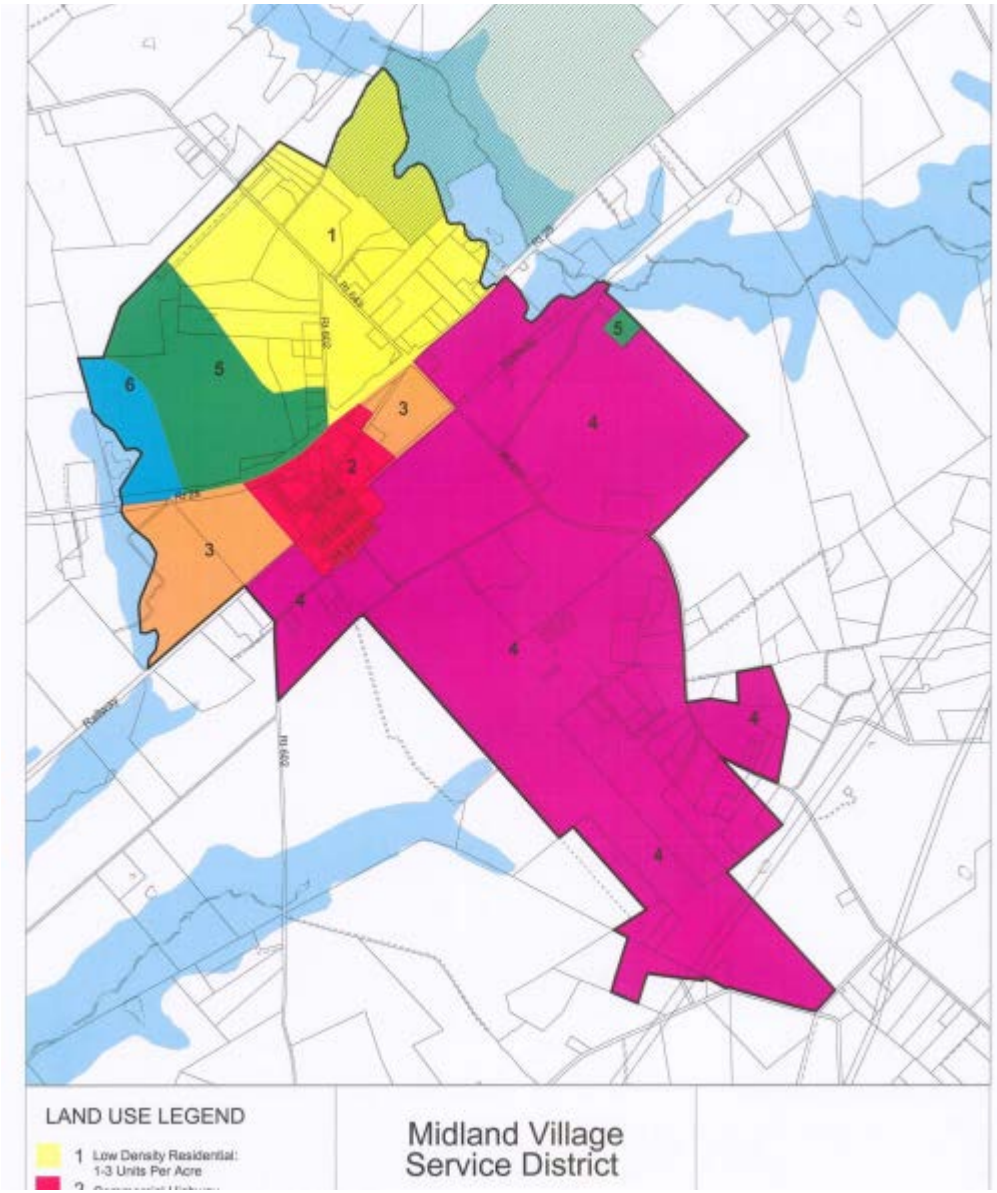
Available land in RA zoning: **None**

Only RA remaining is the Middleburg Humane Site and the Middle and Elementary school sites.

Midland



Midland



Zoning	Acreage	FAR
Commercial Highway	63.6924	0.2
Industrial	896.891	0.1
Mixed Use	102.1562	0.2
LDR 1-3 Units Per Acre	286.0814	
Park\Open Space	127.2114	
School	35.7285	
Total	**1511.761**	

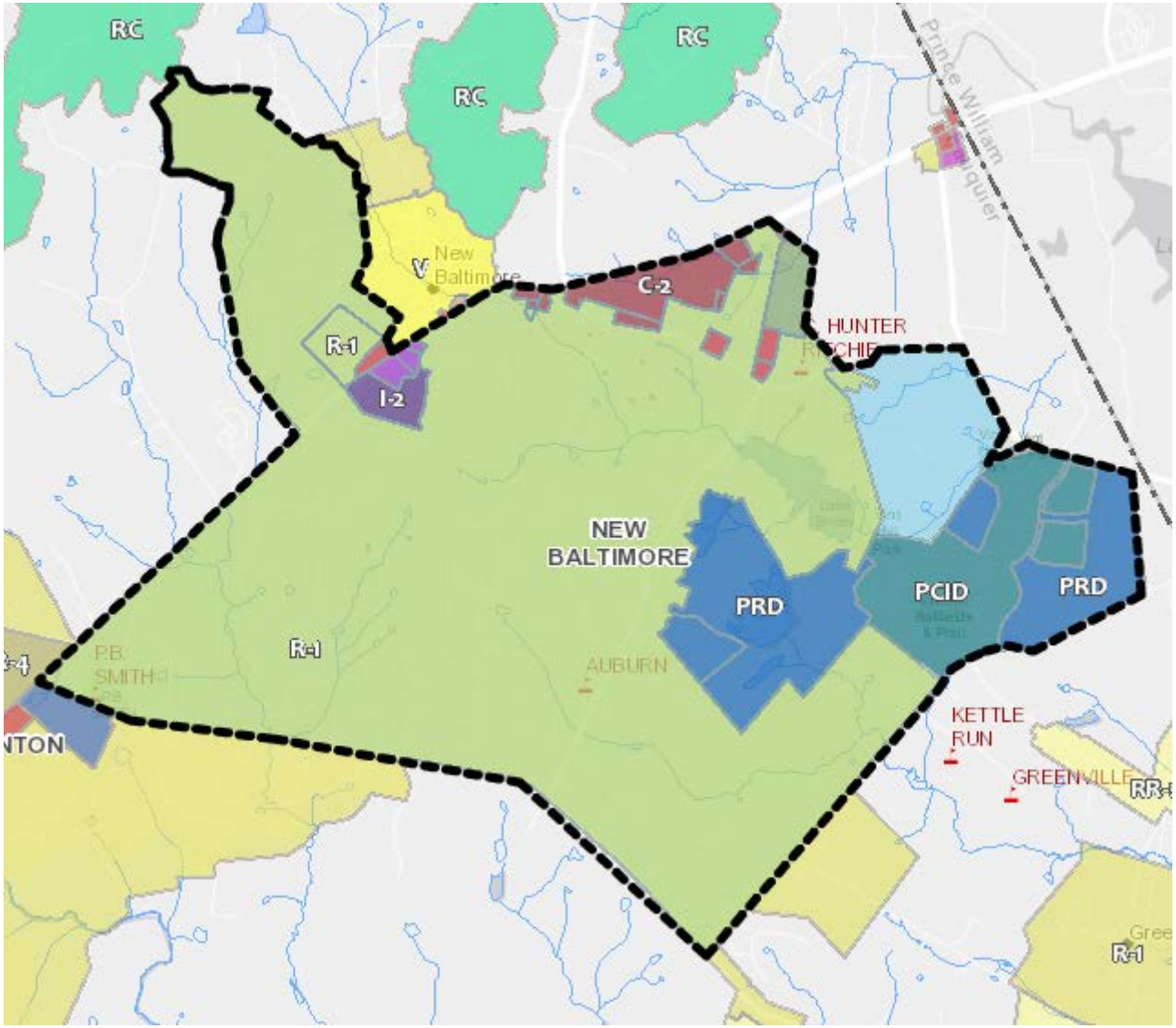
Results: Midland

	Residential	Commercial/Institution/Industrial
Existing	55	
Zoning	221	3,179,062 sq ft
Land Use	490	4,906,738 sq ft

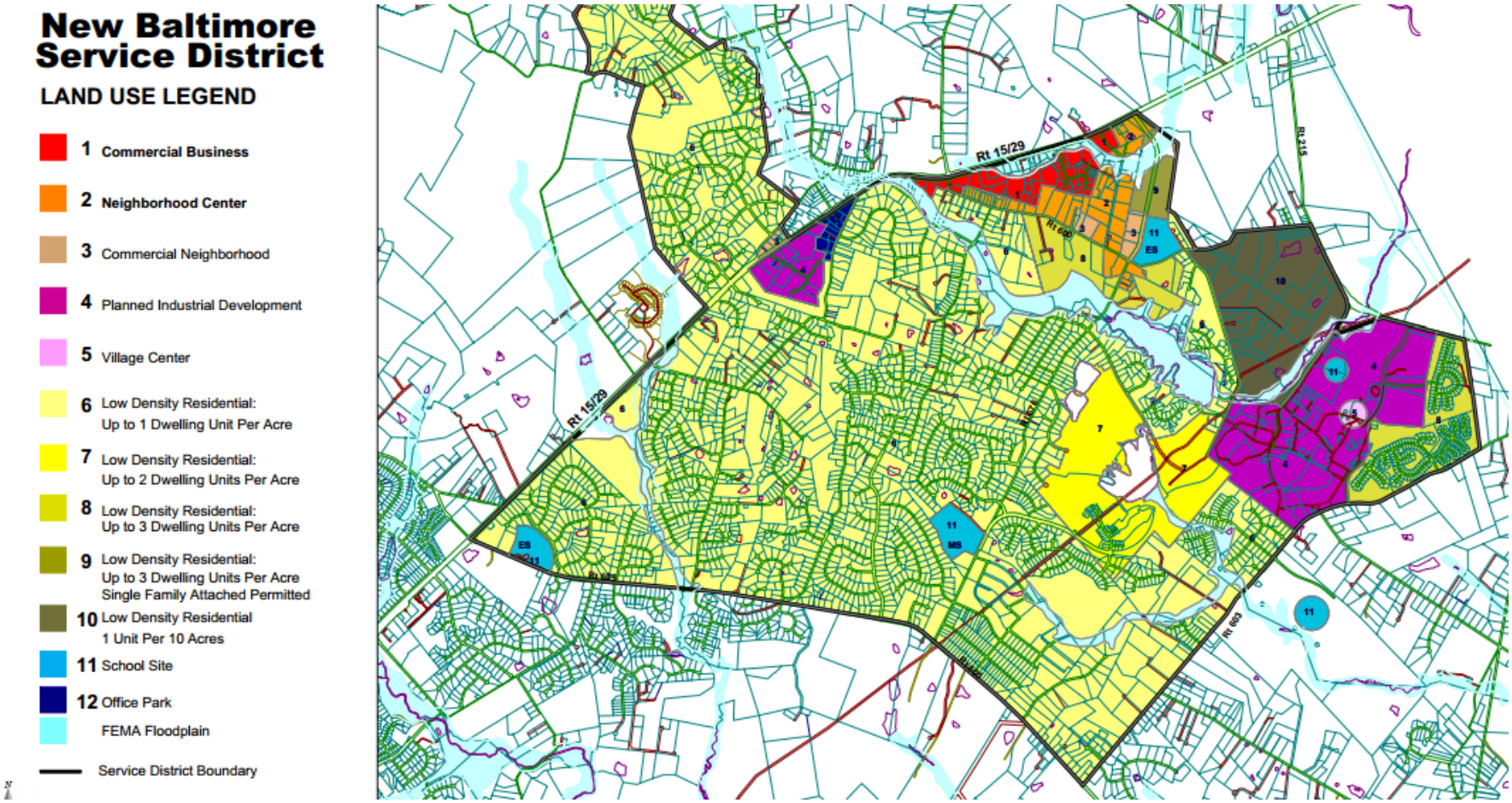
Available land in RA zoning: **157 acres**

- 50 possible future regional ball field park
- 107 low density residential

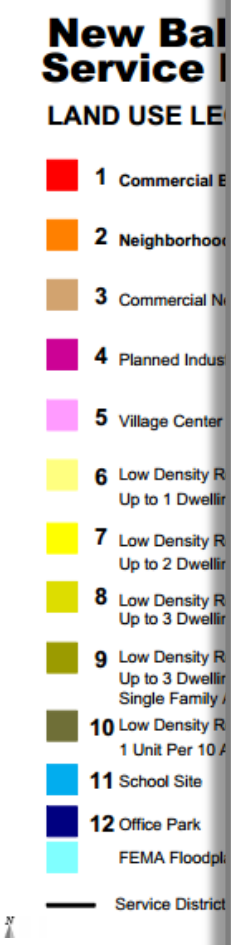
New Baltimore



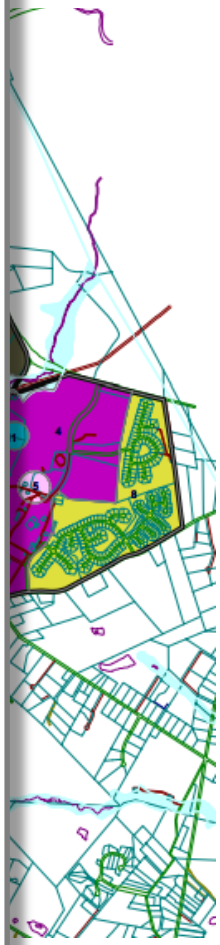
New Baltimore



New Baltimore



Zoning	Acreage	FAR
Commercial Business	104.3639	0.2
Commercial Neighborhood	36.3102	0.3
Neighborhood Center	140.8526	0.3
Office Park	20.3031	0.4
Planned Industrial Development	544.6439	0.2
Village Center	11.5093	0.4
LDR 1 unit per 10 acres	324.1133	
LDR Single Fam Attach Permit	39.7886	
LDR up to 1 dwl unit per acre	4829.677	
LDR up to 2 dwl units per acre	361.4875	
LDR up to 3 dwl units per acre	341.1912	
School Site	90.8092	
New School	26.7909	
Total	**6871.84**	



Results: New Baltimore

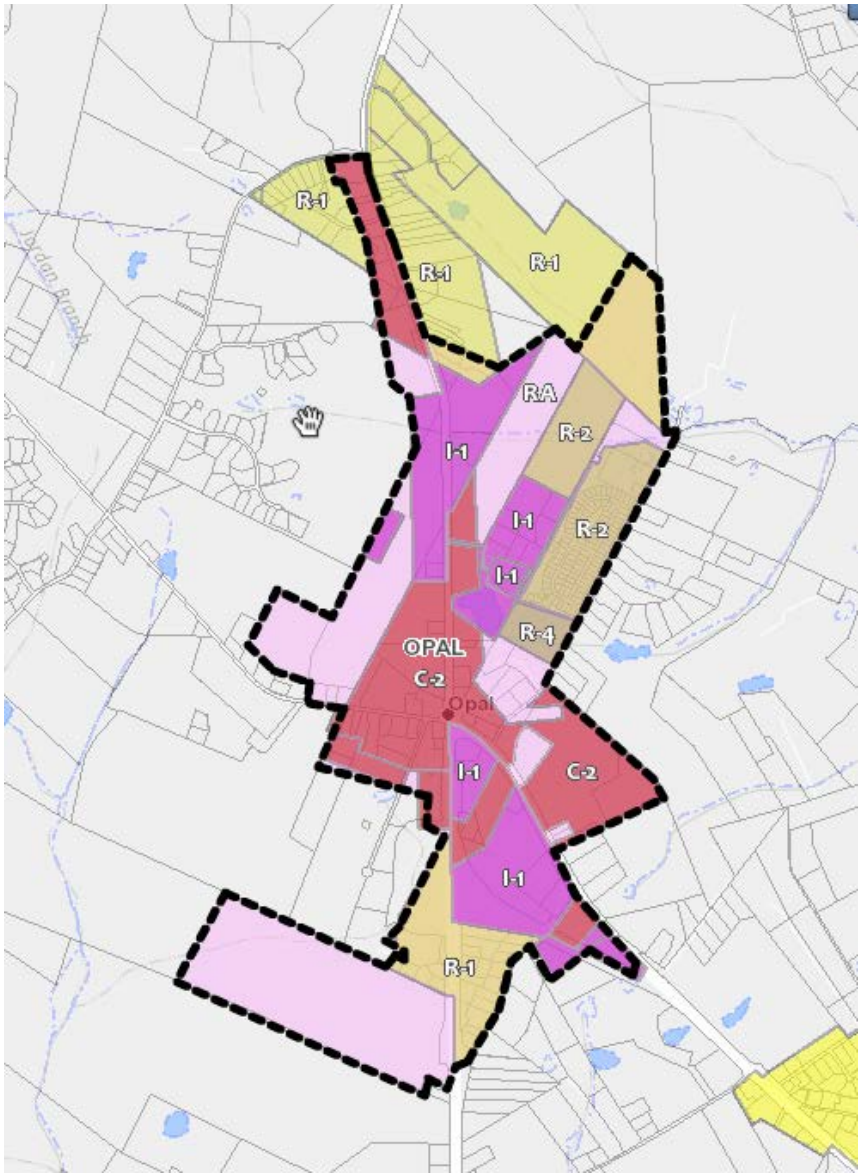
	Residential	Commercial/Institution/Industrial
Existing	2,578	
Zoning	4,434	4,189,078 sq ft
Land Use	7,026*	7,553,153 sq ft

Available land in RA zoning: **None**

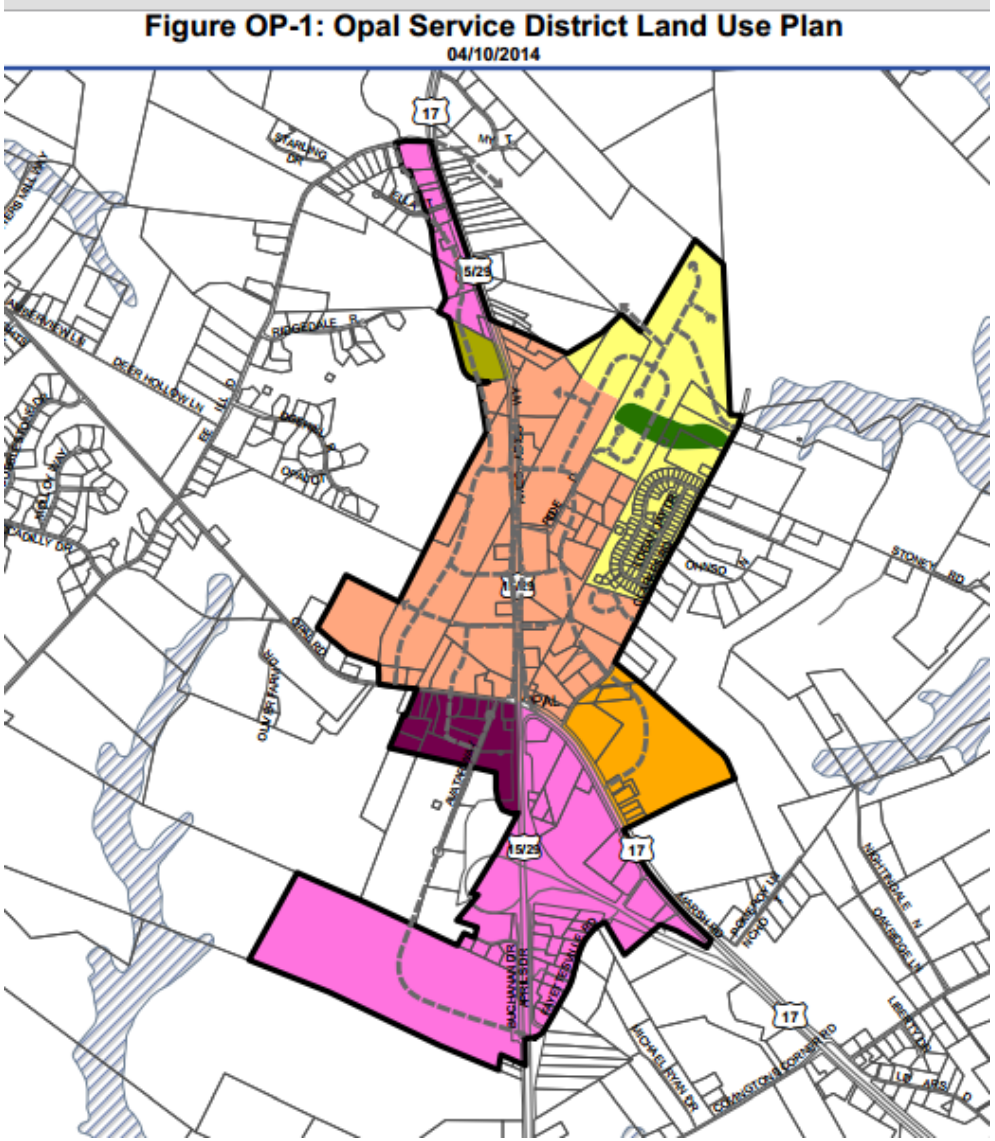
Only 320 acre no sewer and water area planned to remain rural agricultural

*Much of that estimate comes from areas that have *already* built out at a significantly lower density than "LDR up to 1 dwl unit per acre".

Opal



Opal



Zoning	Acreage	FAR
Commercial	162.8217	0.2
Flex Office	131.4427	0.2
Hospitality	124.8973	0.2
Industrial	125.7041	0.1
Mixed Use	82.5431	0.2
LDR 1-3 Units Per Acre	158.4948	
Park/Open Space	63.1756	
Total	**849.0793**	

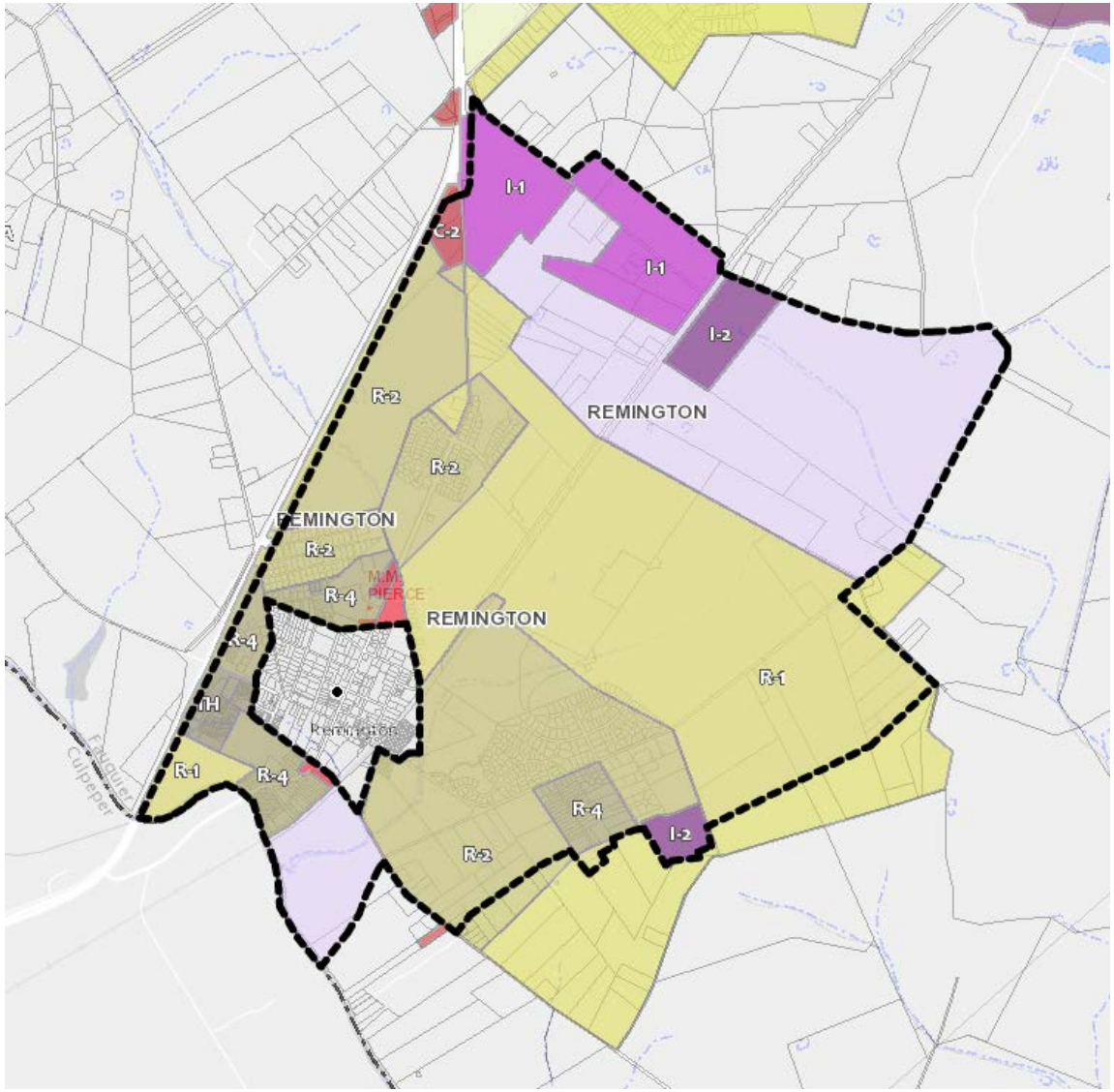
Results: Opal

	Residential	Commercial/Institution/Industrial
Existing	123	
Zoning	255	2,426,076 sq ft
Land Use	158	4,918,419 sq ft

Available land in RA zoning: **285 acres**

- 25 low density residential
- 125 light industrial
- 135 mixed commercial

Remington


I-1
C-2
I-1
I-2
REMINGTON
R-2
R-2
REMINGTON
R-2
R-4
REMINGTON
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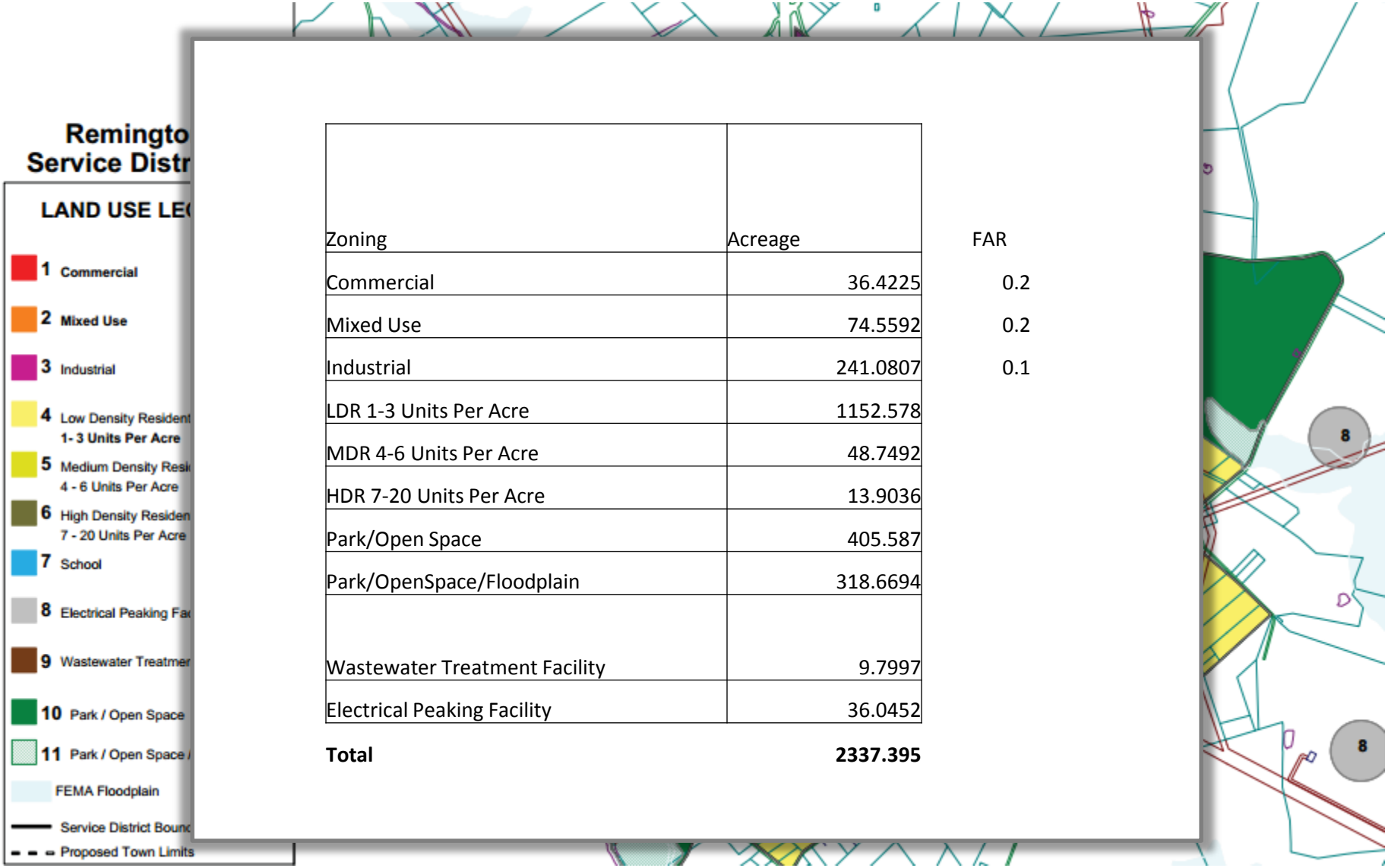
R-2

Remington



Zoning	Acreage	FAR
Commercial	36.4225	0.2
Mixed Use	74.5592	0.2
Industrial	241.0807	0.1
LDR 1-3 Units Per Acre	1152.578	
MDR 4-6 Units Per Acre	48.7492	
HDR 7-20 Units Per Acre	13.9036	
Park/Open Space	405.587	
Park/OpenSpace/Floodplain	318.6694	
Wastewater Treatment Facility	9.7997	
Electrical Peaking Facility	36.0452	
Total	**2337.395**	

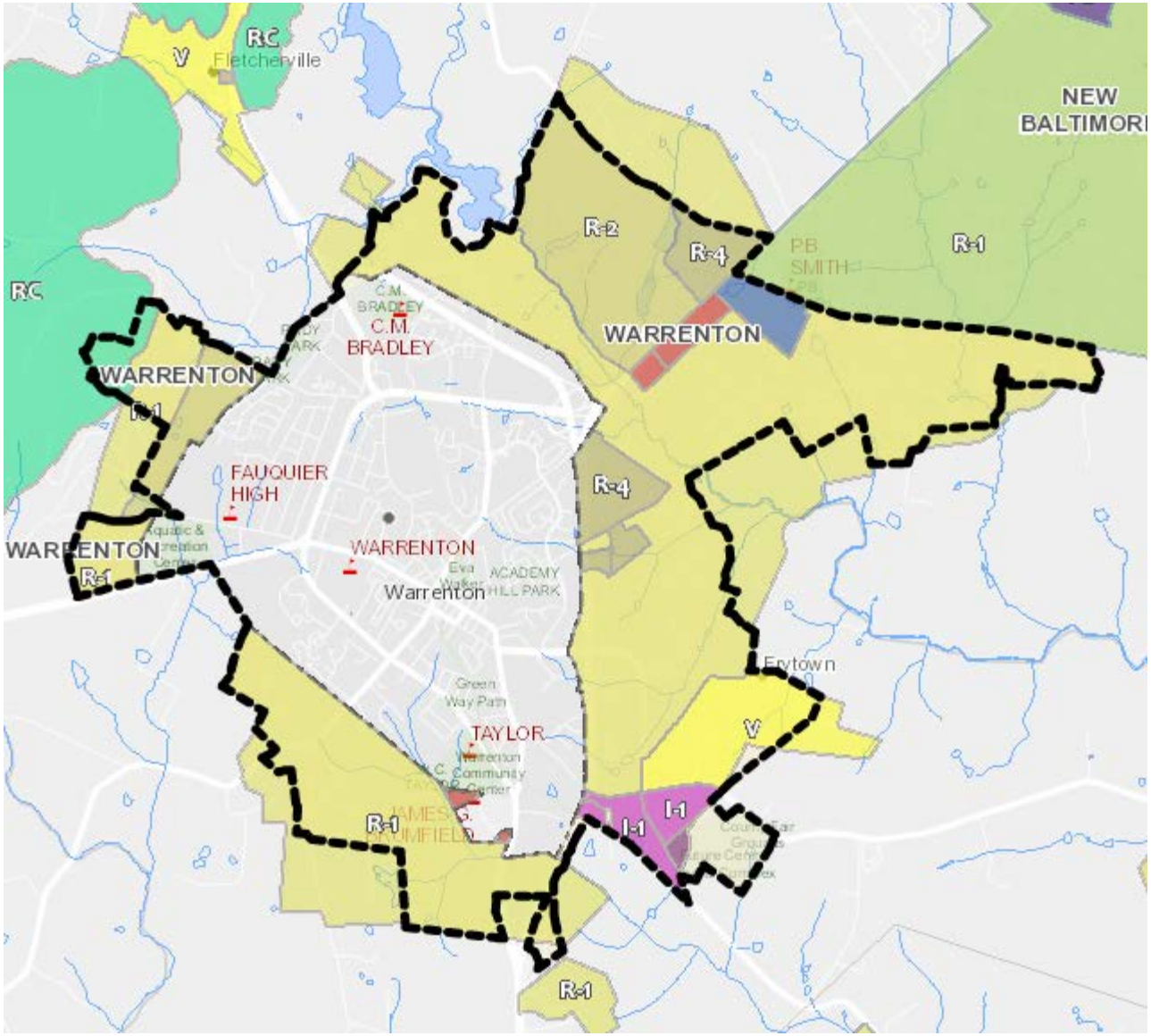
Results: Remington

	Residential	Commercial/Institution/Industrial
Existing	650	
Zoning	1,578	1,030,171 sq ft
Land Use	1,592	1,692,240 sq ft

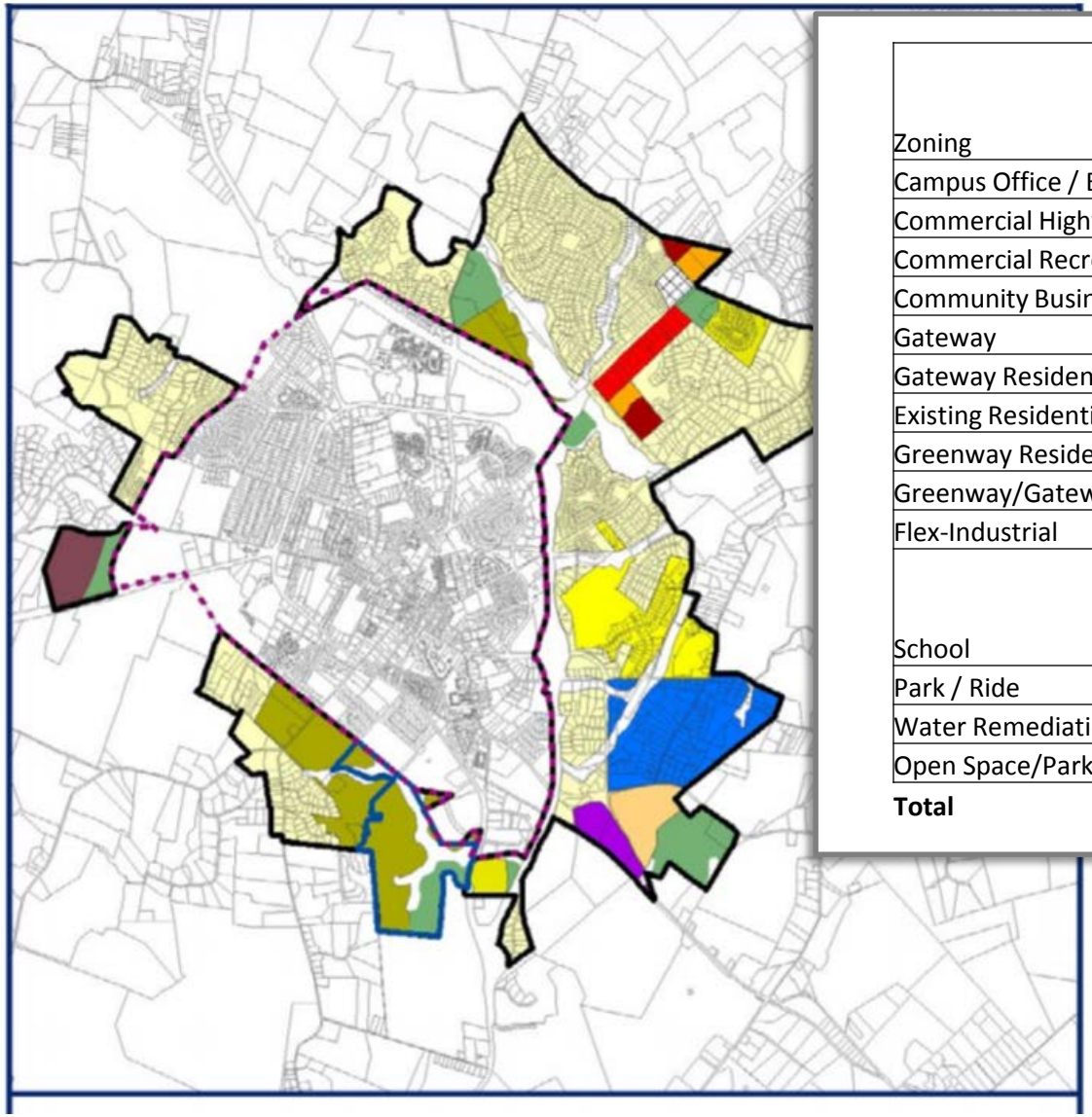
Available land in RA zoning: **248 acres**

- 25 industrial
- 220 low density residential

Warrenton


RC
V
Fletcherville
NEW
BALTIMORE
R-2
R-4
R-1
P.B.
SMITH
RC
C.M.
BRADLEY
WARRENTON
WARRENTON
R-1
FAUQUIER
HIGH
R-4
WARRENTON
R-1
WARRENTON
Warrenton
ACADEMY
HILL PARK
Eva
Walker
Green
Way Path
TAYLOR
Community
Center
Fayetown
V
I-1
I-1
R-1
R-1

Warrenton



Zoning	Acreage	FAR
Campus Office / Employment	63.1446	0.4
Commercial Highway	51.7789	0.3
Commercial Recreation	26.5222	
Community Business	30.8585	0.3
Gateway	61.7844	
Gateway Residential	69.9831	
Existing Residential	2087.057	
Greenway Residential	201.8091	
Greenway/Gateway Residential	285.8879	
Flex-Industrial	42.5134	0.2
School	1.7357	
Park / Ride	16.4005	
Water Remediation	244.1225	
Open Space/Park	263.6453	
Total	**3447.243**	

Results: Warrenton

	Residential	Commercial/Institution/Industrial
Existing	1,891	
Zoning	2,489	1,037,654 sq ft
Land Use	2,703	2,550,514 sq ft

Available land in RA zoning: **None**

Except possibly 53 acres of RC in the northwest corner of the service district

Water Usage Methodology

Step 1)

Removed all “No Water and Sewer Areas”

Step 2)

Apply 275 gpd per emu (Source: Water Supply Plan (2011) Fauquier County Planning)

Step 3)

Apply gal/sf/day factor (Source: Methods for Estimating Commercial, Industrial, and Institutional Water Use (Fall 2009, University of Florida, Conserve Florida Water Clearinghouse)

Assumptions

Factors used to calculate water usage

The gpd per emu used for previous studies were reviewed before selecting this source. Others include:

- 231. 2 used in 1998 WSA Water and Sewer Planning in New Baltimore
- 260 used in Business Development Strategies Report (2007)
- 227.2 to 284 calculated by multiplying average household size of 2.84 by 80 to 100 gpd/person (average water use given by USGS)
- 370 used for FCWSA estimates, mentioned in Water Supply Plan (2011)

The gal/sf/day factor used was selected as the most accurate source. Others resources reviewed:

- 1000 gal/acre Business Development Strategies Report (2007)
- Design Guidelines for Wastewater Facilities, Maryland Department of the Environment Engineering and Capital Projects Program (2013)

Assumptions

Inflow/Infiltration problem is not included in analysis - sewer usage is equal to water use

Areas served by the Town of Warrenton and areas served outside the service districts not integrated into this analysis

Water usage in mixed-use categories is calculated using commercial water usage factor

Current State of Water Infrastructure

Service District	Existing Capacity (mgd)
Bealeton	0.5
Calverton	0
Catlett	0.031
Marshall	0.217
Midland	0
New Baltimore & Vint Hill	1.106 + 0.336 = 1.442
Opal	0.088
Remington	0.047
Totals	2.175
Town of Warrenton	2

WSA Water Summit Presentation given 09.23.14 (Capacities, slide 15) w/updates

Estimated Water Needs for Build-Out of Current Zoning

Service District	Existing Capacity (mgd)	Estimated Need Zoned Land (mgd)
Bealeton	0.5	0.969
Calverton	0	0.215
Catlett	0.031	0.205
Marshall	0.217	0.764
Midland	0	0.206
New Baltimore	1.442	1.655
Opal	0.088	0.316
Remington	0.047	0.500
Totals	2.175	4.830
Town of Warrenton	2	No analysis done

Estimated Water Needs for Build-Out of Current Land Use Plans

Service District	Existing Capacity (mgd)	Estimated Need Planned (mgd)
Bealeton	0.5	1.192
Calverton	0	0.530
Catlett	0.031	0.515
Marshall	0.217	1.268
Midland	0	0.421
New Baltimore	1.442	2.544
Opal	0.088	0.588
Remington	0.047	0.574
Totals	2.175	7.632
Town of Warrenton	2	No analysis done

Current State of Sewer Infrastructure

Service District	Existing Capacity (mgd)
Marshall Wastewater Treatment Plant	0.64
Remington Wastewater Treatment Plant	2
Vint Hill Wastewater Treatment Plant	0.95
Totals	3.59
Town of Warrenton	2.5

Updated from Table 1.1: Wastewater Treatment Plants in Business Development Strategies Report 2007

Estimated Sewer Needs for Current Zoning

Service District	Existing Capacity (mgd)	Estimated Need Zoned Land (mgd)*
Marshall Wastewater Treatment Plant	0.64	0.764
Remington Wastewater Treatment Plant	2	1.785
Vint Hill Wastewater Treatment Plant	0.95	1.811*
Totals	3.59	4.36
Town of Warrenton	2.5	No analysis done

** Most of the service district is not planned to be served by public sewer but this number was included for reference if this service were demanded. Further analysis of the AB.1, AB.2, and AB.3 areas should be done to compare with what's available.*

Estimated Sewer Needs for Current Land Use Plans

Service District	Existing Capacity (mgd)	Estimated Need Planned (mgd)*
Marshall Wastewater Treatment Plant	0.64	1.268
Remington Wastewater Treatment Plant	2	2.354
Vint Hill Wastewater Treatment Plant	0.95	2.544*
Totals	3.59	4.416
Town of Warrenton	2.5	N/A

** Most of the service district is not planned to be served by public sewer but this number was included for reference if this service were demanded. Further analysis of the AB.1, AB.2, and AB.3 areas should be done to compare with what's available.*

Conclusions

- The County should conduct a build-out analysis of the service districts to help guide growth and infrastructure development

- Zoned residential is outpacing the Service District Land Use Plans for Bealeton, Opal, and Remington.

- All the service districts are lagging behind the amount of commercial, office, and industrial described in the Service District Land Use Plans.

Conclusions

- Every district has undeveloped zoned land that is predicted to demand much higher quantities of water than the existing capacity.

- We need more that three times the existing capacity to meet the estimated needs of the planned land use.

Conclusions

- The Marshall Wastewater Treatment plant will likely be over the allowed capacity when the zoning is built out and about twice the current capacity would be needed to meet the land use plan.

- The Remington Wastewater Treatment Plant 2 mgd capacity is just enough to meet the needs of current zoning in Bealeton, Remington, and Opal.

Questions?