



GALAX EAST SITE EVALUATION REPORT

PREPARED FOR

**CITY OF GALAX
111 EAST GRAYSON STREET
GALAX, VIRGINIA 24333**

PREPARED BY

**THE LANE GROUP
119 NORTH MAIN STREET
GALAX, VIRGINIA 24333**

MAY 2019

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Geotechnical Site Investigation

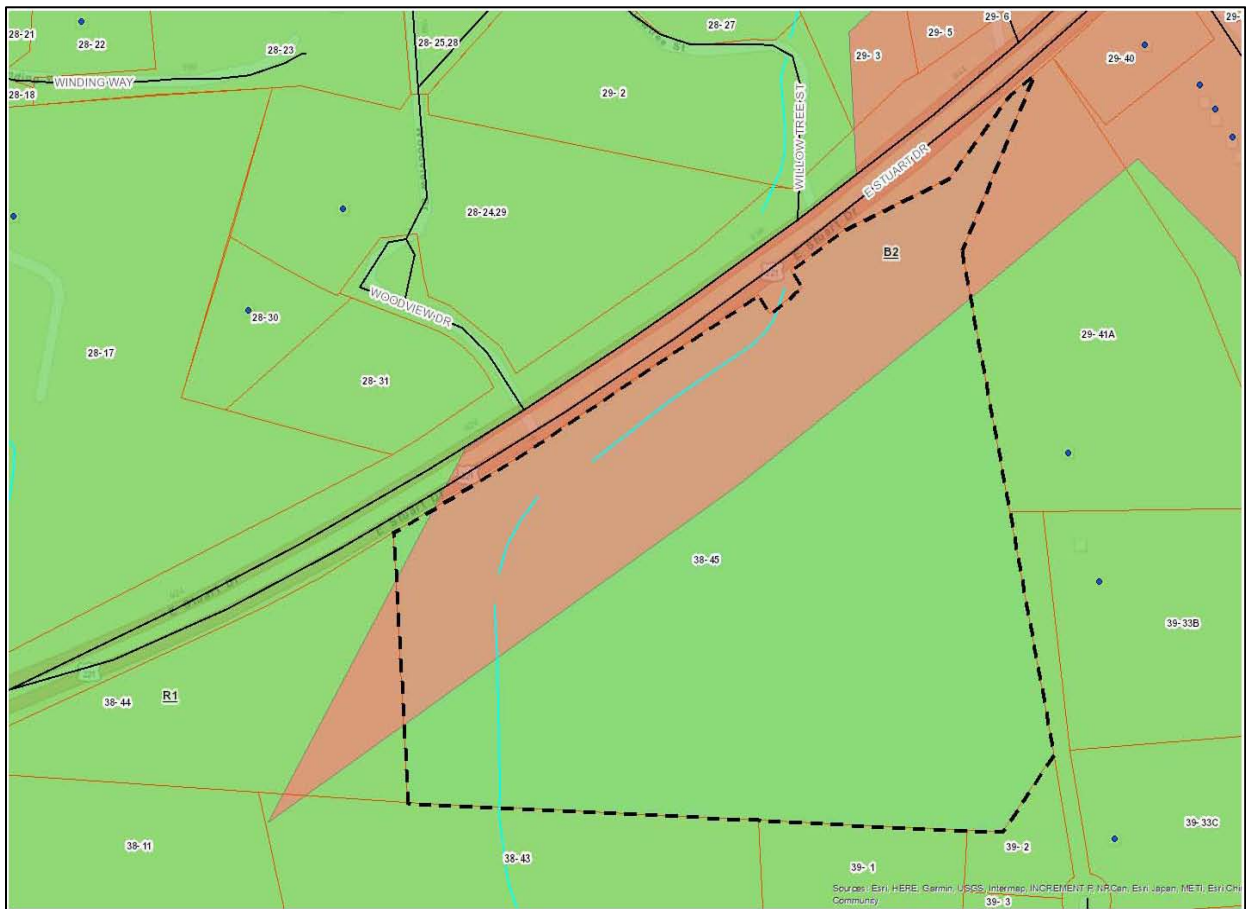
PURPOSE

This Galax East Site Evaluation Report has been prepared by The Lane Group for the City of Galax in order to investigate potential development options for a 20.81 +/- acre parcel originally developed by the Bartlett family. The City has acquired the property and desires for the property to be developed in a manner that is most beneficial to the City and its residents. Accordingly, development considerations have been evaluated and are discussed herein.

BACKGROUND INFORMATION

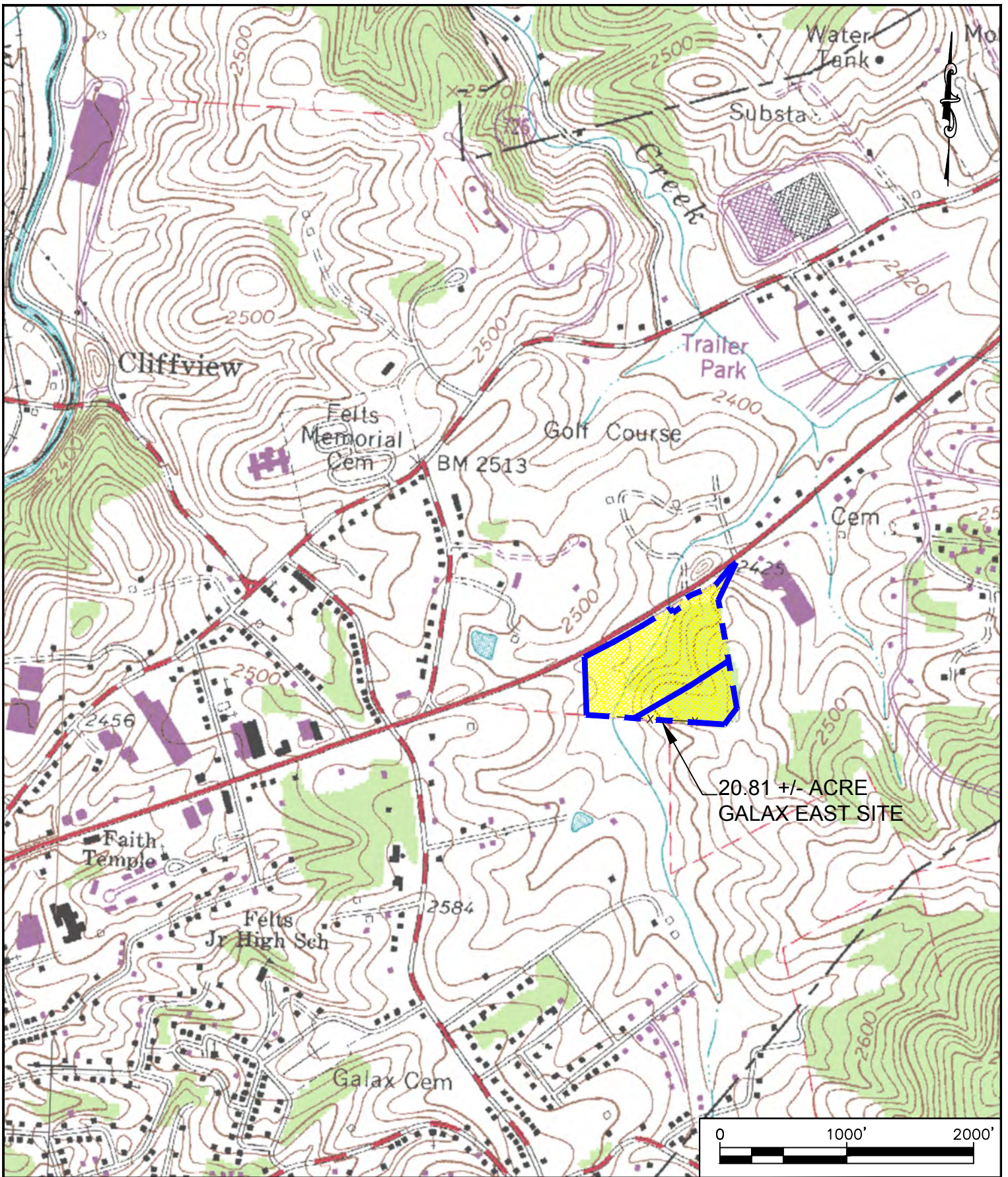
The Galax East Site is located in eastern Galax, on the south side of US Route 58 – East Stuart Drive. A vicinity map of the site is provided as Figure 1.

The property includes approximately 20.81 +/- acres, and is listed as Galax City Tax Parcel 38-45. The property includes a mixture of zoning classifications. The frontage property adjoining Route 58 (600 foot depth) is zoned B2 and is estimated to contain about 16.29 +/- acres. The remaining back section of property is zoned R1 and is estimated to contain about 4.52 +/- acres.



Excerpt from City of Galax GIS Website

The principal access to the site is provided by an entrance to 4-lane divided Route 58, East Stuart Drive. At the existing entrance location, Route 58 has a crossover so that the property can be accessed from both eastbound and westbound lanes. However, there are no turn lanes provided to access the site. A secondary minor access to the southern R1 portion of the site would be available off of Holly Tree Court.





Existing Route 58 Entrance – Looking West



Existing Route 58 Entrance – Looking East

VDOT’s 2017 Daily Traffic Volume Estimate Report for the City of Galax lists the Annual Average Daily Traffic (AADT) for Route 58 at this location to be 19,000 vehicles/day.

An existing conditions map of the site, particularly the B2 frontage portion of the property, is provided as Figure 2.

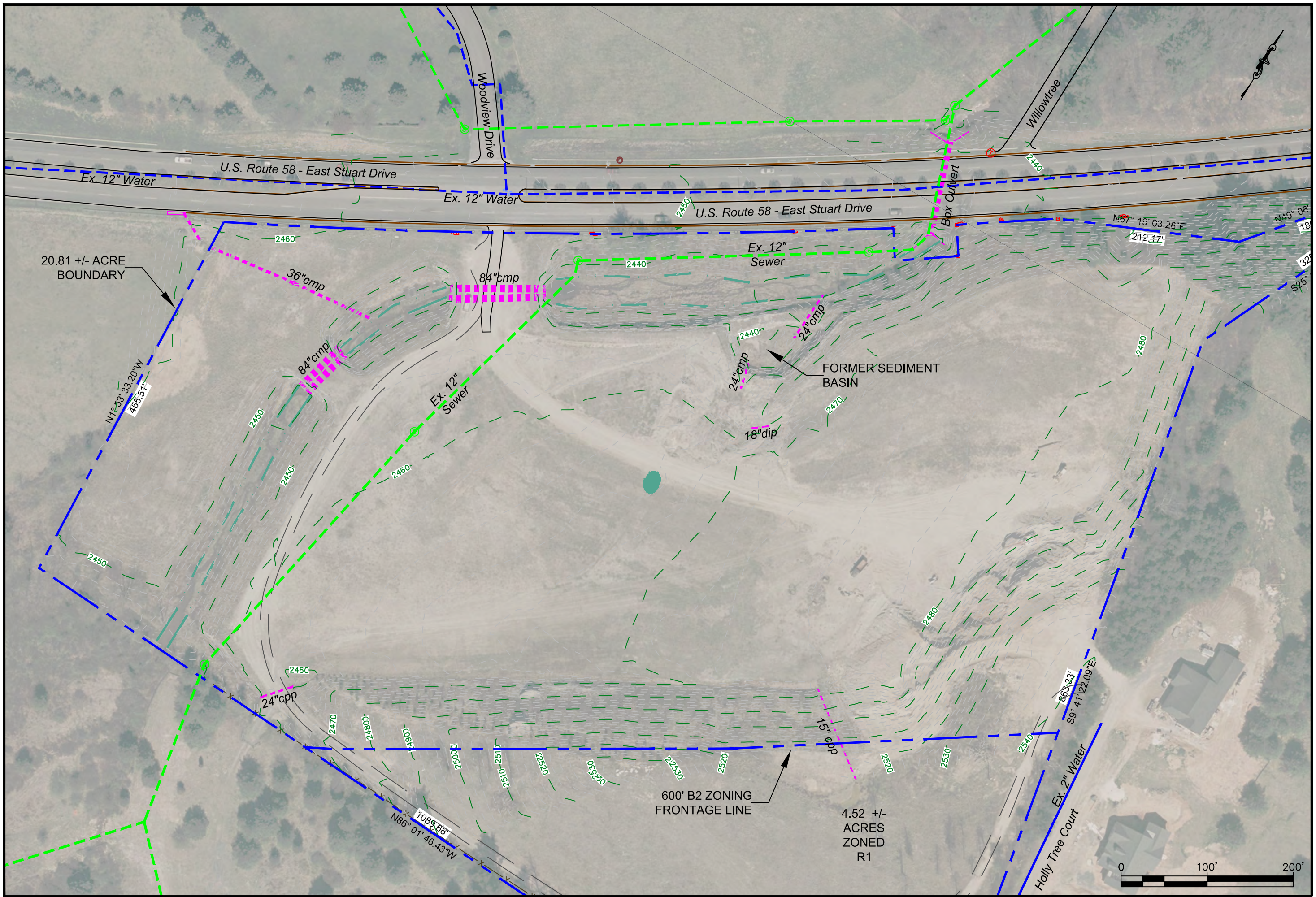
As part of this Study, a topographic survey was completed for the B2 frontage portion of the property. Ground elevations range from 2428’ msl at the low point along Route 58 up to 2540’ msl at the top of a cut slope. The property’s previous owner graded the site over a period of years, speculating to improve the site for sale as a commercial site. Generally speaking, higher ground on the southern part of the site was excavated and used as fill material for the low-lying area adjacent to Route 58. As a result, a sizable “flat” area was graded beside Route 58. Ground elevations for the pad areas range from 2454’ msl up to 2482’ msl.



Graded Route 58 Frontage



Graded Frontage – Cut Slope in Back



**GALAX EAST SITE
 DEVELOPMENT STUDY
 CITY OF GALAX, VA**

**EXISTING
 CONDITIONS**

DATE:	02/25/2019
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CHECKED BY:	RKH
PROJECT NO.:	1857
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Ground slopes generally range from 2%-5% in the graded frontage portion of the property and the cut slope varies from 1.5:1 to 2:1 grade. An un-named stream traverses through the property with the banks being wooded in most locations. As the property was originally graded, a stacked rock wall was constructed to buffer the fill area from the stream.

Utilities to the site are addressed as follows:

- Sanitary Sewer – City of Galax has a 12” gravity sewer line running through the property, located adjacent to the stream.

The 12” sewer line is not directly accessible to the westernmost portion of the Galax East site without a deep line crossing the creek or an aerial crossing. Similarly, the easternmost portions of the site would require either a deep or aerial creek crossing. Utility improvements to the property should include sewer line extensions so that the site can be served without additional creek crossings.

- Public Water – City of Galax has a 12” water main located in the median strip of Route 58 – not currently on the site, but directly adjacent to it.

Water service to the site will require connecting to the 12” main located in the Route 58 median and extending a new water line into the development. There are no existing fire hydrants in close proximity to the Galax East site, so a fire hydrant test was not conducted. The 12” main is served by the City’s 0.62 MG Taylorwood tank (Base 2705.76’, O’flow 2737.26’). With ground elevations of the pad areas ranging from 2454’ – 2482’, the anticipated normal water pressures available to the property are expected to range from 96-120 psi +/- depending upon system operating conditions.

- Electricity – Appalachian Power is the electrical service provider. Single phase electrical service is currently available along the Route 58 frontage. The nearest 3-phase power to the site is located just east of the easternmost property line – along Route 58 approximately 1,100 feet east of the existing site entrance.

Preliminary discussions with ApCo indicated that the site could be provided 3-phase service by extension(s) from existing 3-phase poles.

POTENTIAL DEVELOPMENT ALTERNATIVES

The City authorized this Study in order to evaluate potential types of development which could be targeted for that portion of the Galax East site which is currently zoned B2. That portion of the property joining Route 58 and set back for a distance of 600 feet is zoned B2 and includes approximately 16.29 +/- acres. This includes the portion of the site that has been graded previously.

In preliminary discussions with City staff, an approach being considered by the City would be to make the property available to a private developer under the terms of a performance agreement whereby the developer would be responsible for buildout of the property within a designated time period. The performance agreement would likely include stipulations such as acceptable development themes, property uses, timeframes, etc.

One potential development theme favored by the City would be a “hospitality” theme – targeting restaurants, motels, or other similar establishments. This theme would be within the guidelines of B2 zoning and these establishments typically provide a large tax revenue to the City (property tax, meals tax, lodging tax). Another theme favored by the City would be “medical care”. This could include establishments such as medical offices, nursing homes, assisted living facilities, and similar uses. These types of establishments typically have a substantial number of jobs and provide an essential service. A “medical care” theme is not covered under B2 zoning, so the property would have to be rezoned to B3 for these uses.

Other potential development themes would be possible and could be considered by the City. However, for the purpose of this Study, these two themes were selected for further evaluation and are discussed in greater depth herein.

ENTRANCE & UTILITY IMPROVEMENTS

The Galax East site has an existing entrance to Route 58, directly across from the intersection with Woodview Drive. The existing entrance is not suitable for a commercial entrance and will need to be upgraded.

Improvements to the entrance would need to be completed in accordance with the requirements of VDOT's Road Design Manual, specifically Appendix F – Access Management Design Standards for Entrances and Intersections. Entrance requirements are determined based upon a number of criteria; including the functional classification of the main road, traffic volumes, design speed, nature of the commercial development, geography, and other related parameters. Route 58-East Stuart Drive has a VDOT-published AADT of 19,000 vehicles/day. The K-Factor is 0.083, so the peak-hour volume would be 1,577 vehicles/day. The posted speed limit is 35 mph.

The nature and volume of traffic for the Galax East site development is ultimately dependent upon the nature and success of the establishments – but is unknown at this time. However, based upon the nature of the targeted development types and existing data for Route 58, it is believed that the proposed commercial entrance would warrant a turning lane from both the east-bound and west-bound traffic directions. Until such time as actual traffic data is available for the new development, a traffic signal would not be warranted.

Figure 3 is attached, showing the layout and configuration for the entrance improvements. A right-turn lane would be added for eastbound traffic with a 200-foot stacking lane and 100-foot taper. Adding the right-turn lane would necessitate that existing guardrail and curb and gutter sections be removed and replaced for the wider road. A similar left-turn lane would be added for westbound traffic with a 200-foot stacking lane and 100-foot taper. Adding the left-turn lane would require a portion of the existing curbed median to be removed. The development entrance itself would include three lanes; one lane entering, one left-turn exit, and one right-turn exit.

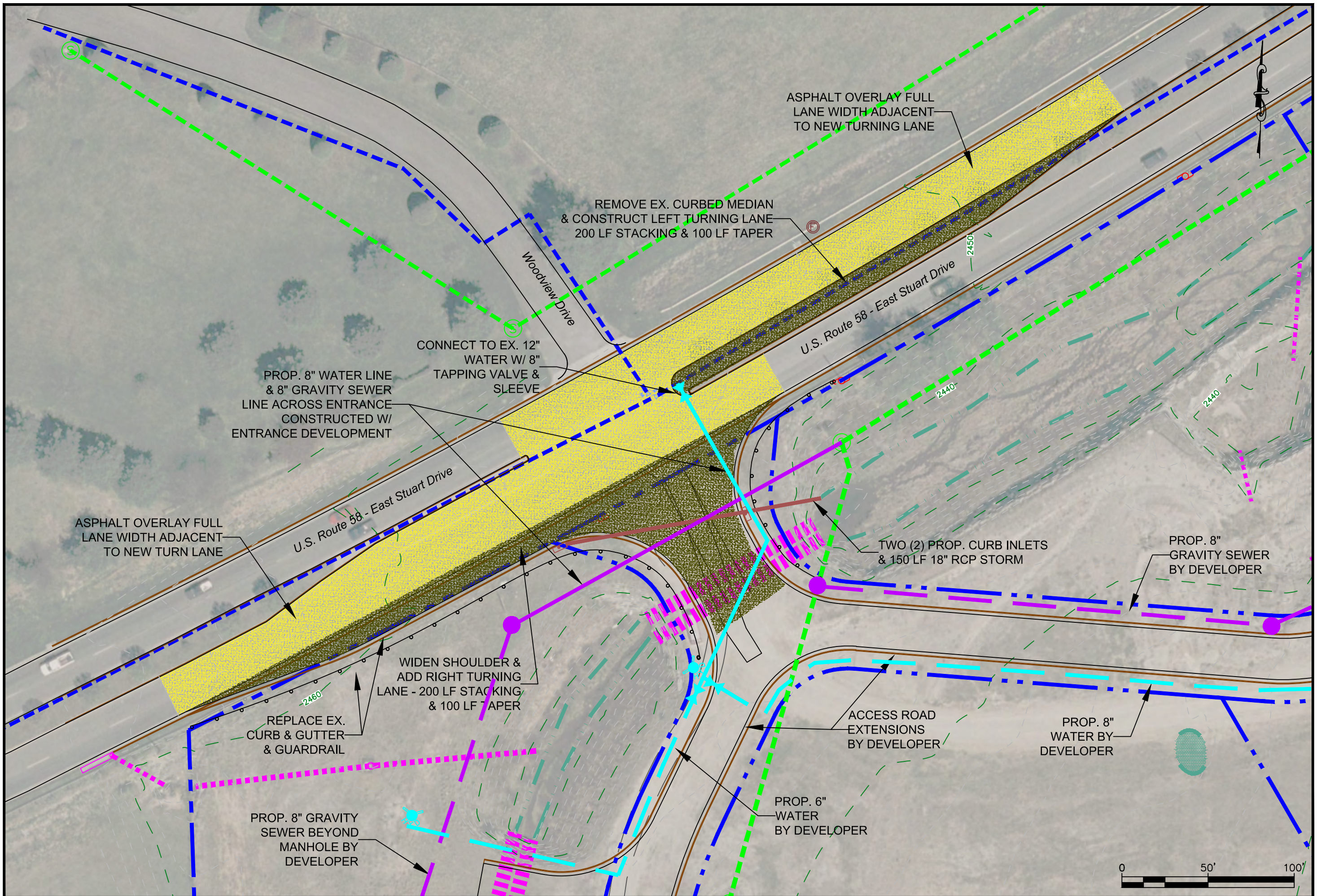
Other utility improvements should also be completed as part of the proposed entrance construction upgrades. The potable water connection to the City's existing 12" water line located in the Route 58 median should be made. An 8" wet tap is proposed to be installed with an 8" water line extended into the Galax East site. For sanitary sewer, an 8" sewer line should be constructed across the entrance (to serve the westernmost lot) before the entrance is paved. Replacement of curb and gutter along the eastbound lane would require two curb inlets and a short length of storm pipe.

For planning purposes, it is presumed that the entrance improvements would be completed by the City either prior to the property development or concurrent with the property development construction.

**BARTLETT SITE DEVELOPMENT STUDY
CITY OF GALAX, VIRGINIA
COMMERCIAL ENTRANCE COST ESTIMATE**

April 29, 2019
Filename: BartlettSite-CostEstimate.xls
Sheet Name: PrelimEntrance

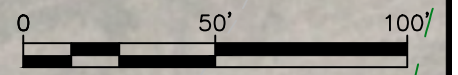
<u>ITEM/DESCRIPTION</u>	<u>QNTY</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
<u>General Construction Items</u>				
Mobilization / Bonds / Insurance	1	%	5	\$ 14,500
Clearing, Grubbing & Demolition	1	%	5	14,500
Erosion & Sediment Control	1	%	5	14,500
Unclassified Excavation / General Construction	1	%	15	43,400
			Subtotal	\$ 86,900
<u>Roadway Entrance Construction</u>				
Aggregate Base Course - Street (8") VDOT 21-B	1,400	S.Y.	\$ 16	\$ 22,400
Asphalt Binder Course (4") VDOT BM 25.0	1,400	S.Y.	30	42,000
Asphalt Surface Course (2") VDOT SM-9.5D	4,000	S.Y.	16	64,000
Asphalt Surface Milling, 2" Depth	2,600	S.Y.	6	15,600
Line Paintings, Markings, and Signage	1	L.S.	5,000	5,000
Traffic Control	1	L.S.	10,000	10,000
Remove Existing Curbing and/or Curb & Gutter	720	L.F.	10	7,200
Remove Existing Guardrail	400	L.F.	10	4,000
Curb & Gutter - VDOT CG-6	580	L.F.	35	20,300
Concrete Curb, VDOT CG-2	320	L.F.	30	9,600
Guardrail, VDOT GR-2	520	L.F.	30	15,600
Guardrail Terminal End Sections, VDOT GR-9	2	L.S.	3,500	7,000
			Subtotal	\$ 222,700
<u>Utilities</u>				
8" Water Line, Ductile Iron	200	L.F.	\$ 40	\$ 8,000
8" Tapping Valve & Sleeve	1	EA.	3,800	3,800
8" Gate Valve	1	EA.	1,200	1,200
6" Gate Valve	1	EA.	1,200	1,200
Fire Hydrant Assembly	1	EA.	4,000	4,000
8" Gravity Sewer, Ductile Iron	220	L.F.	70	15,400
4' Std. Sanitary Sewer Manhole	1	EA.	2,500	2,500
Connect to Existing Manhole	1	EA.	1,500	1,500
18" RCP Storm Sewer - Class III RCP	160	L.F.	90	14,400
Curb Inlet - VDOT DI-3B, L=8'	2	EA.	6,000	12,000
18" Pipe Outlet Structure, VDOT ES-1	1	EA.	2,500	2,500
			Subtotal	\$ 66,500
SUBTOTAL CONSTRUCTION				\$ 376,100
RELATED COSTS & CONTINGENCIES, 25%				\$ 94,000
TOTAL ESTIMATED CONSTRUCTION				\$ 470,100



GALAX EAST SITE
 DEVELOPMENT STUDY
 CITY OF GALAX, VA

PROPOSED ENTRANCE
 IMPROVEMENTS

DATE:	02/25/2019
SHEET:	3
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CHECKED BY:	RKH
PROJECT NO.:	1857
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Alternative 1 – Medical Care Theme

Figure 4 is attached, showing a potential development layout that's been prepared for a possible layout with a medical care theme. The layout figure has been prepared using footprints of actual similar facilities located nearby.

The layout shown reflects developing the commercial frontage property into three (3) lots, ranging from 3.0-6.5 acres.

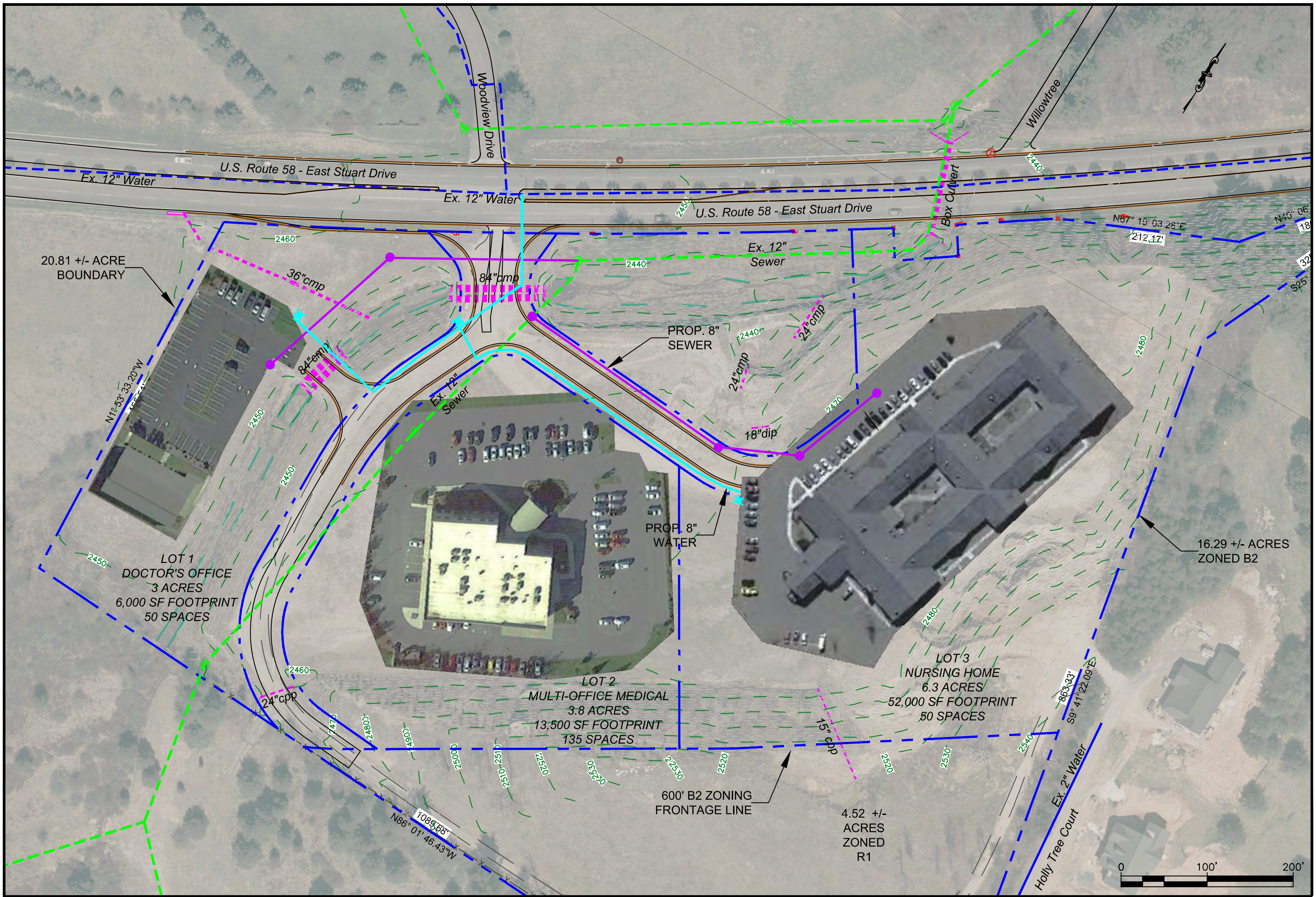
Lot 1 is located on the western property boundary. The pad area for this lot is relatively narrow, approximately 125 feet wide. The lot layout shown is patterned after a 6,000 SF building footprint and 50-space parking lot.

Lot 2 includes about 3.8 acres. The building footprint shown is for about 13,500 SF with approximately 135 parking spaces. This lot layout reflects a multiple office medical building with a number of practices within the same building.

Lot 3 includes about 6.5 acres on the east side of the property. The building footprint shown reflects a 52,000 SF nursing home facility with 50 parking spaces and room for additional spaces on the north side of the building.

With the layout as shown, each lot is largely occupied with a building, parking, or other impermeable surfaces. Development would disturb over 1 acre, so DEQ would require stormwater quality management. This could be accomplished using either on-site stormwater BMP's, the purchase of nutrient removal credits or a combination thereof.

The Alternate 1 layout reflects a medical care theme which would require B3 zoning. The frontage property is currently zoned B2.



**GALAX EAST SITE
 DEVELOPMENT STUDY
 CITY OF GALAX, VA**

**OPTION 1 -
 MEDICAL CARE THEME
 PROPOSED LAYOUT**

DATE:	02/25/2019
SHEET:	4
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CHECKED BY:	RKH
PROJECT NO.:	1857
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Alternative 2 – Hospitality Theme

Figure 5 is attached, showing a potential development layout that's been prepared for a possible layout with a hospitality theme. The layout figure has been prepared using footprints of actual similar facilities located nearby.

The layout shown reflects developing the commercial frontage property into four (4) lots, ranging from 3.0-3.6 acres.

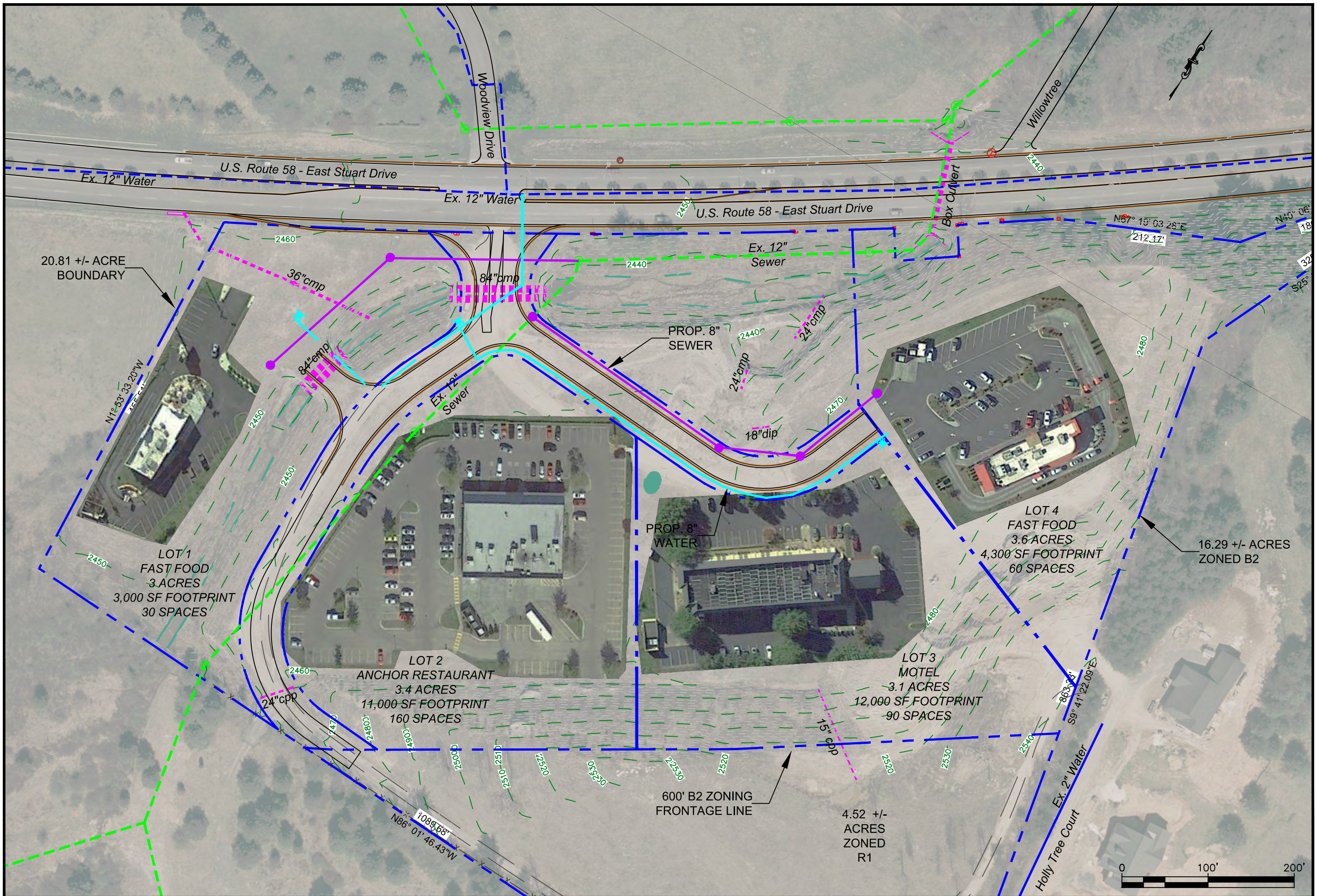
Lot 1 located on the western side of the property reflects a fast food establishment with a 3,000 SF footprint building with a drive-through window and 30 +/- parking spaces.

Lot 2 includes a larger 11,000 SF footprint restaurant building with 160 +/- parking spaces, including some spaces for bus parking.

Lot 3 includes a 12,000 SF footprint motel building with 90 +/- parking spaces. The actual facility patterned for this footprint is multiple stories.

Lot 4 includes a high-volume 4,300 SF footprint fast food establishment with a drive-through window and 60 +/- parking spaces.

The proposed development pattern and facilities shown for Alternative 2 are consistent with the current B-2 zoning.



20.81 +/- ACRE
BOUNDARY

LOT 1
FAST FOOD
3 ACRES
3,000 SF FOOTPRINT
30 SPACES

LOT 2
ANCHOR RESTAURANT
3.4 ACRES
11,000-SF FOOTPRINT
160 SPACES

LOT 3
MOTEL
3.1 ACRES
12,000 SF FOOTPRINT
90 SPACES

LOT 4
FAST FOOD
3.6 ACRES
4,300 SF FOOTPRINT
60 SPACES

16.29 +/- ACRES
ZONED B2

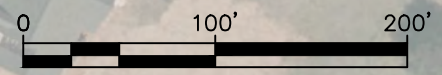
600' B2 ZONING
FRONTAGE LINE

4.52 +/-
ACRES
ZONED
R1

GALAX EAST SITE
DEVELOPMENT STUDY
CITY OF GALAX, VA

OPTION 2 -
HOSPITALITY THEME
PROPOSED LAYOUT

DATE:	02/25/2019
SHEET:	5
DRAWN BY:	SCT
CHECKED BY:	RKH
PROJECT NO.:	1857
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OTHER DEVELOPMENT CONSIDERATIONS

Two potential development layout themes were previously prepared and provided to demonstrate that facilities could be reasonably accommodated on the Galax East site. The layouts have been prepared based upon the assumption that entrance improvements would be needed for the road connection to Route 58.

The layouts presented include building and parking lot footprints from other existing facilities located in southwest Virginia and western North Carolina. The layouts demonstrate that the targeted medical care and hospitality themes could be accommodated on the site. The layouts presented do not provide detailed grading plans as this would normally be completed in final site design. However, the indicated building/parking lot footprints have been situated within the existing graded pad areas that were shaped by the previous landowners.

In order to develop a better understanding of the site's subgrade conditions, a geotechnical investigation was completed for the site. Multiple soil borings were completed, soil characteristics were examined, and a summary report is provided in the Appendix.

Other development themes could be pursued by the City.

In order to complete the development, a number of regulatory approvals would need to be secured:

- i) Erosion and Sediment Control Permit – grading would disturb over 10,000 square feet, so an Erosion and Sediment Control Permit would be required. The City of Galax reviews and issues E&S permits.
- ii) Stormwater Quality Permit – grading would disturb over 1 acre, so the project would have to comply with nutrient (phosphorous) reduction requirements and the construction would have to be registered for coverage under DEQ's Construction Stormwater VPDES General Permit. Plan review and permit issuance for this program is completed by the City of Galax.
- iii) Water Line Construction Permit – the water line extension serving the development would be required to be approved and permitted by the Virginia Department of Health – Office of Drinking Water.
- iv) Sewer Line Construction Permit – the sewer line extension serving the development would be required to be permitted by the Virginia Department of Environmental Quality
- v) Commercial Entrance Permit – the commercial entrance to Route 58 would have to comply with applicable VDOT requirements. The City of Galax administers the highway program within the City limits.

APPENDIX

Geotechnical Site Investigation

PRELIMINARY GEOTECHNICAL STUDY

**Galax East Site
Galax, Virginia**

Prepared for:

**City of Galax
Galax, Virginia 24333**

Prepared by:



**310 West Valley Street
Abingdon, Virginia 24210
276.206.8571**

February 2019

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APPENDIX

BORING LOGS

INTRODUCTION

As authorized by the City of Galax, we have completed a preliminary study of an approximately 21-acre tract of land along Route 58/East Stuart Drive that is referred to as the Galax East Site. We understand the City desires to market the property for sale as potential commercial and/or industrial development. The purpose of our study was to obtain general subsurface information about soil and foundation conditions on the property. Included in the study were soil borings, a site reconnaissance, and analysis of the collected data. The results of the study, presented in outline and tabular form, comprise this report.

SITE DESCRIPTION

Location: The 21-acre tract is located on the south side of Route 58 between its intersection with Country Club Lane (to the west) and the Twin County Plaza to the east. The previous owners graded portions of the property, primarily along the frontage portion (approximately 600 feet set back from Route 58). The area being considered for development is about 16 acres.

Topography: We understand that grading of the site was completed intermittently over approximately 10 years. A ridge on the south side of the property was excavated (up to 64 feet of cut) and the excavated materials were used to fill lower lying areas of the site. We understand that a bulldozer and track hoe were primarily used to complete the excavation and fill.

A stream runs through the western portion of the property and separates a little over an acre from the rest of the property. The site is sparsely covered with grass with the stream being tree lined. Relief on the developable portions of the property is about 25 feet with the grade gradually rising as you move to the east. Grades generally range from nearly flat to about 3.5 percent. Surface drainage is considered poor to fair.

Sources of Information: Preliminary site plan prepared by The Lane Group, undated. Field investigations were completed October 15, 16, and 17, 2018. Twenty-one soil borings, ranging in depth from two to 30 feet, were completed using a four-wheeled, all-terrain drill rig.

SUMMARY OF SUBSURFACE EXPLORATION

Test Borings			
No. of Borings: 19 plus 2 offsets (B5A and 6A)		Range in Depth, ft: 2.0 to 30.0	
Drilling Contractor: Total Depth Drilling		Crew: Tim, Donnie	
Drill Rig		Support Vehicles	
Track-mounted Geoprobe		Water Truck	
Truck-mounted CME 55		Front-end Loader	
Other – Four-wheeler ATV		x	Other - 1-ton truck x
Drill Tools			
Hollow-Stem Auger		x	
NQ2” Rock bit & barrel			NW Casing
Type of Borings & Drilling Quantities in ft		Type of Sampling & Sampling Details	
Auger Probe			Standard Penetration Test: 5-ft intervals or less Extra Samples: Shelby Tube: None Bulk: Bulk sample obtained from auger cuttings of B14.
Soil – Intermittent Sampling		408.4	
Soil - Continuous Sampling			
Boulders			
NQ2” Rock			
NW Casing			
<p>A representative of our firm directed the drill crew regarding boring locations and sampling requirements. He also examined the samples as they were recovered, prepared a field log of the borings, and adjusted the drilling program to fit the conditions encountered. Soil samples were placed in plastic sample bags for temporary storage. Boring logs and a sketch of the boring locations are in the Appendix.</p> <p>Standard Penetration Test - performed by driving a split-barrel sampler (2" O.D., 1.375" I.D.) 1 ft using 140-lb hammer, 30" fall; yields N-value or blow-count in blows per foot that provides relative indication of consistency and density.</p>			



SUBSURFACE DESCRIPTION

Strata descriptions are summarized in the tables below. For details of individual strata, please refer to the boring location map and the soil boring logs provided in the Appendix. Where possible, the strata descriptions are arranged in descending order. With discontinuous layers, a given layer may directly overlie more than one stratum; or the opposite, more than one layer may rest on a single stratum of broad lateral extent. Topsoil depths measured at boring locations generally varied from 0 to 2 inches.

Descriptive Tables

Stratum: Tan and gray micaceous silt with few rock fragments, (Man-made FILL)		
Thickness ft: 3 to 10	N-values: 2 to 32	Moisture: Moist to wet
Occurrence: All borings except Borings 4, 6, 8, 9 and 12		
Properties: Fill consistency was variable within the borings, ranging from soft to very stiff consistency; shear strength is judged low; compressibility is judged low to moderate under light loads.		

Stratum: Gray silt and sand with some organic zones, and rock fragments, (Alluvium)		
Thickness ft: 2 to 25 ⁺	N-values: 3 to 50 ⁺	Moisture: Moist to wet
Occurrence: Borings 1, 3, 15, 16, 17, and 19		
Properties: Silt and sand generally judged as firm, organic zones generally limited to about 1 foot thick, shear strength is judged low to moderate; compressibility is judged low to moderate under light loads.		

Stratum: Tan and gray micaceous Silt, some sand, (Residuum)		
Thickness ft: 3 to 8 ⁺	N-values: 4 to 36	Moisture: Moist to wet
Occurrence: All borings		
Properties: Silt generally judged as firm to very stiff consistency; shear strength is judged moderate; compressibility is judged low under light loads.		

Bedrock was encountered in 12 of the 19 borings. Bedrock depths, presumed on auger refusal or N-values of 50 or more blows per 6 inches, ranged from 2 feet (B6) to 30 feet (B7). Bedrock outcrop was observed between Borings 5 and 6. Additionally, outcrop can be seen in several areas of the cut slope located south of the flat graded area.

Groundwater

Groundwater was encountered in 7 of the 19 borings. Water levels were recorded over a period of about 24 hours after completion of the boring. Recorded water levels ranged from 2 feet below the existing surface in Borings 5 and 8 to over 10 feet deep in several borings. Based on our observations, it is our opinion that groundwater is generally moving in the

alluvial layer, where encountered, and/or near the residual soil/bedrock interface. The measured rise of water levels in the open boreholes over the time period recorded indicates the presence of a slight to moderate hydraulic head. To note, our borings were completed after a very wet period, several inches of rain (from Hurricane Michael) occurred the week or so prior to our field work. Groundwater data are shown on the individual boring logs.

The borings were backfilled on completion of the hole or at the end of our field work.

GEOTECHNICAL OPINIONS AND RECOMMENDATIONS

Subsurface Conditions

The Lynchburg Gneiss underlies the site. Gneiss and schist are predominant rock types in the formation, but intrusions of quartz and diabase are present. Folds of the layered rocks trend to the northeast yielding major fractures roughly parallel to the folds.

Foundation Conditions

The site consists of two areas with different foundation bearing properties. A cut area on the east side of the property exposes residual soils that grade into bedrock. Residual soils develop in place as the underlying parent bedrock disintegrates and decomposes by chemical and physical weathering. On the west side, a fill generated by the cut covers a natural drainage swale containing alluvium. This area is also underlain by residual soils and bedrock. An approximate location of the cut/fill transition is shown on the Soil Boring Location map (FIG 1). The areas will be discussed separately below.

East Area (cut area)

In our opinion, bearing conditions in the eastern area are more favorable than in the western area. Residual soil, predominantly tan, gray, and red micaceous silt was encountered in Borings 6, 8, 9, and 12. N-values (or blow counts) in these borings averaged about 20 blows per foot, indicating a very stiff consistency. Residual soils tend to have an inherent strength greater than that indicated by N-values or laboratory tests. As such, it is our opinion that the residual silt is significantly stronger than the fill. For shallow footings at typical footing depth in the eastern area, we expect bearing capacities in the range of 3000 to 4000 psf. If deep foundations are warranted, our preliminary results indicate that sound bedrock will provide a bearing capacity of 20 tsf or more. As always, specific structural requirements must be available before conducting studies for design criteria.

West Area (fill area)

We understand the fill was placed intermittently over approximately a 10 year period with no particular effort to achieve uniformity in distribution, consistency, or compaction. Placement of such a heterogeneous mass creates several questions for those interested in developing the site for structures. Unfortunately, these questions cannot be answered before building design criteria are established and a detailed study for specific structures is performed. Some of what we consider to be likely questions are discussed below. Since this is a preliminary study, the discussions are, by necessity, in broad and general terms and cannot be used for design purposes.

1. Is the existing fill suitable for structures supported by shallow footings?

Generally, the existing fill encountered in the western portion of the site exhibited less favorable foundation conditions, in our opinion, than the residual soils in the cut area, as earlier in the report. This opinion is based primarily upon the variable consistency of the fill encountered in our borings. Overall, the consistency of the fill ranged from very soft to very stiff as indicated by N-values (or blow counts) ranging from 2 blows per foot (in Borings 1, 11, and 13) to 16⁺ blows per foot (in Borings 5, 7, and 17). Moisture content was also variable, generally ranging from moist to wet.

We also compared the average N-value (within the existing fill layer) for each individual boring. In our opinion, the results tend to confirm the non-uniform nature of the existing fill.

- Borings 1, 2, 3, 11, 13, 15, and 16 yielded average N-values of 4 to 6 blows per foot (soft to firm consistency).
- Borings 7, 10, 14, 17, 18, and 19 yielded higher average N-values of 8 to 18 blows per foot (firm to very stiff consistency).

The variable consistency of the fill creates differential bearing conditions and we consider the fill, in its current condition, as a marginal bearing stratum for structures using shallow foundations. There may be areas where lightweight structures (wall loads of 2000 to 4000 psf) could be constructed if the owner is willing to risk minor cosmetic damage associated with settlement. But overall, it is our opinion that much of the area underlain by fill will require improvement to make using shallow foundations feasible.

As with the cut area, at the opposite extreme is a building in which column loads are enough to justify a deep foundation. Overall, bedrock was encountered in 11 of the 19 borings at depths ranging from 2 to 25 feet.

Bedrock depths exceed 30 feet in areas. The bedrock is suitable for support of structures on a deep foundation such as piles or drilled piers. We estimate that the bedrock has a bearing capacity of at least 20 tsf.

2. What can be done to improve soil conditions for shallow foundations?

Site improvement techniques range from very basic removal of unsuitable material and replacement with select fill to proprietary methods such as dynamic compaction or construction using Geopiers. Listed below are brief descriptions of a few site improvement techniques that are commonly used today and potentially could be used in the western portions of the site to improve bearing conditions.

- Removal of unsuitable material and replacement with select fill – this method entails undercut of proposed spread and/or continuous footings and replacement with compacted granular fill. Undercut depths on past projects for lightly loaded structures (wall loads 2000 to 4000 psf) have ranged from 3 to 5 feet. The objective of this type of site improvement is to provide a firm supporting stratum resistant to shear failure and at the same time, reduce the potential for consolidation settlement.

Alternatively, the on-site silt may be considered for use as replacement. Generally, the depth of undercut and subsequent replacement will be greater if lower strength materials are used as replacement.

- Compensated foundation – If material equal to or greater than the weight of the planned structure is removed in the building area, then the structure can be placed without increasing the load on the bearing materials. This method is the basis for the “floating foundation.” The excavated space is normally used as a basement.
- Preload (surcharge) – Preload means placing and leaving a load on a proposed building area for a period of time prior to construction. The bearing materials are allowed to consolidate and densify under the load (surcharge). When the consolidation is essentially complete, the load is removed and the building is constructed. Monitoring and instrumentation are normally required to confirm completion of the consolidation. The surcharge is generally an earth embankment, but any material can be used.
- Dynamic compaction – Dynamic compaction can be considered a gigantic compaction method. A heavy (5 to 40 ton) weight is dropped by a crane from heights of 20 feet or more. The weight is dropped in predetermined patterns which depend to some extent on site conditions. Craters created

by the falling weight are filled and subsequent passes may be required. This method is best suited to areas prior to building because of the vibrations induced by the falling weight.

- Geopiers – rammed aggregate piers are constructed by drilling into the existing fill and replacing with thin lifts of crushed stone subjected to direct vertical ramming energy (compaction) to form stiff engineered elements. The piers are generally installed on a grid pattern to specified depths based on structural specifics to improve bearing capacity and to control settlement.
- Site grading – Probably one of the simplest and most economical methods of improvement is to unload a building area during site grading. By permanently removing, say 6 to 8 feet of material from an area, a building that does not exceed the weight of the material removed could be constructed there. Although a variation of preloading, the advantage is that the “load” may have been on the site for years and work can begin immediately.

General Discussion

As mentioned earlier, comprehensive studies will be required for individual building sites to determine site specific conditions. Based on these results and the structural requirements of the building, foundation selection and design criteria can be developed.

Although not ideal, the existing fill material is acceptable for use in controlled fill provided proper moisture content is achieved. Silt is the dominant soil type expected for grade work and is considered poor quality material for fills and pavement subgrade. Silt is subject to loss of strength and stability if disturbed in the presence of water or while at high moisture content. Attempts to construct fills of these materials or conduct grading operations during wet weather or in the winter invariably meet problems which typically result in poor workmanship. We recommend that earthwork operations be limited to the warm, dry weather of summer or early fall. Topsoil or other deleterious materials, as well as boulders or cobbles, should not be used in controlled fill.

The boulder retaining walls along the stream suggest the possibility of boulders in the fill. If there are areas of nested boulders in the fill, there is a potential for overlying soils moving into voids between the boulders. This in turn, results in surface depressions. Indications of surface depressions were observed in two locations behind the boulder walls along portions of the stream. The depressed areas are shown FIG 1.

Geotextiles provide a possible solution to the potential problem of soil migration in nested boulders. Where voids are discovered in the nested boulders, they can be filled with granular material to create support over the void area. By then covering the boulders with a geotextile and placing compacted fill on it, soil migration into the voids can be eliminated.

Geotextiles can be used for enhanced strength. The geotextiles can be used on soft soils to provide a base on which to begin compaction; they can also be used within fill layers to provide reinforcement of the total mass.

Groundwater may be encountered during foundation excavation as well as site grading. Dewatering should be expected. Improving the ditch (cleaning and lowering the ditch line) along the base of the cut slope (south side of the property) and/or installing additional ditches may lessen groundwater issues.

Controlled Fill

We recommend all fill placed on the project be constructed as controlled fill, as described below. Generally, the on-site materials are acceptable for controlled fill if placed at the proper moisture content. All fill materials should be approved by a Geotechnical Engineer prior to placement.

• Recommendations

1. Place controlled fill as outlined below:
 - a. Remove any topsoil in fill area. Controlled fill should begin on a firm base.
 - b. Construct controlled fill under continuous observation and testing of engineering technician.
 - c. Place soil fill in 6- to 8-inch lifts and compact each lift to at least 95% of maximum density as determined by ASTM Method D 698 (Standard Proctor).
 - d. Maintain proper moisture content of fill during placement as determined by technician or engineer.
 - e. Construct fill during summer or late fall, if possible, to take advantage of favorable weather conditions for soil moisture control.

Follow Up

Follow-up is an important part of all geotechnical aspects of a project. We recommend that a competent Geotechnical Engineer periodically observe site grading and foundation work once

construction is underway. This will allow confirmation that design and construction are consistent with our interpretations, assumptions, and recommendations.

LIMITATIONS

The analysis and recommendations submitted in this report are based on data obtained from field investigations. This report does not reflect any variations that may occur between locations of subsurface exploration. Such variations may not become apparent until construction is underway. If variations become evident, we should be notified so that immediate recommendations can be rendered.

This report has been prepared for the City of Galax, Virginia to be used in development of the Galax East Site. Anyone using this report for any purpose other than the project described herein must draw his own conclusions regarding construction procedures and soil conditions. We disclaim all responsibility and liability for any part that is removed, quoted, or reproduced separately from the entire report.



APPENDIX

NOTES TO BORING LOGS

These notes refer to and are a part of the accompanying boring logs.

1. The borings were made by a boring contractor under the observation of a representative of our firm. These boring logs were compiled from field logs and the results of visual examination of the soil samples.
2. The logs of the borings apply only at the specific boring locations and on the dates indicated. They are not warranted to be representative of subsurface conditions at other locations and times.
3. The depth of the indicated boundaries between soil strata is approximate. The transition between the strata may be gradual.
4. The groundwater levels shown on the boring log represent average or typical values observed during the period of the boring operation or shortly after completion of a boring. These observations do not reflect seasonal changes in the water table or the effects of intense rainfall or runoff. In any excavation, trickling flow or seepage may be encountered from perched water which is at levels above the water table observed in the borings.
5. “Decomposed rock” is residual material having a standard penetration resistance of 50 blows or more per six inches. Decomposed rock can be an extremely hard and compact mixture of soil and weathered fragments of rock which may require rock excavation methods for removal.
6. “Sound” and/or “relatively sound rock” are non-decomposed rock and rock in which weathering is largely confined to joints. Such rock may be fractured to varying degrees.
7. Soil samples recovered from the borings have been stored at The Lane Group in Abingdon, Virginia and are available for inspection by appointment. The soil samples will be discarded two months after submission of our report unless a request is received to retain them for a longer period.
8. The locations of the borings were determined by survey. The elevations were determined from interpolation between contours from the Soil Boring Location map. The locations and elevations of the borings should be considered accurate only to the degree implied by the method used.

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5. “Decomposed rock” is residual material having a standard penetration resistance of 50 blows or more per six inches. Decomposed rock can be an extremely hard and compact mixture of soil and weathered fragments of rock which may require rock excavation methods for removal.
6. “Sound” and/or “relatively sound rock” are non-decomposed rock and rock in which weathering is largely confined to joints. Such rock may be fractured to varying degrees.
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LOG OF BORING 1

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2456	Date Started: 10/15/18		Date Completed: 10/15/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0		0.1 topsoil
FILL - tan and gray silty sand		1-1-1	FILL - tan and gray silty sand, soft, moist and wet
	5	3-5-4	FILL - gray micaceous silt and sand, moist to wet
		2-4-4	FILL - ditto with few organic seams
Tan and gray sand with rock fragments (Alluvium)	10	2-2-2	Gray sandy silt, slightly organic to organic, wet (Alluvium)
	15	7-6-3	Tan and gray sand with rock fragments, saturated
Tan micaceous SILT	20	2-3-3	Tan micaceous SILT, wet (bottom firm)
	25	2-2-3	Ditto
Boring Terminated at 25.0'			
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
8.0	0			
5.0	24			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

CWT-1.ex1

LOG OF BORING 2

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2456	Date Started: 10/15/18		Date Completed: 10/15/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0		0.1 topsoil
FILL - tan and gray micaceous silt		2-2-3	FILL - tan and gray micaceous silt, soft, moist
	5	3-2-3	FILL - ditto, wet
		4-4-3	FILL - gray silt and sand, slightly organic to organic
Tan and gray sand with rock fragments (Alluvium)			
	10	2-2-2	Brown sandy silt, firm, moist
	15	1-1-2	Tan micaceous silty sand, soft, wet
Tan and gray micaceous SILT			
	20	3-2-2	Tan and gray micaceous SILT, firm, wet
	25	2-2-2	Gray micaceous SILT, firm, wet
	30	2-2-4	Ditto, firm
Boring Terminated at 30.0'			
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
22.0	0			
14.0	24			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

LOG OF BORING 3

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2458	Date Started: 10/15/18		Date Completed: 10/15/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0		0.2 topsoil
FILL - tan and gray micaceous silt		2-2-2	FILL - tan and gray micaceous silt, soft, moist to wet
	5	2-3-2	FILL - ditto, topsoil 4.2' to 5', wet
		3-4-5	FILL - brown sandy silt and rock fragments, moist
Tan and gray sand with rock fragments (Alluvium)	10	3-3-4	Light gray sand with few gravel, moist to wet
	15	2-1-3	Tan micaceous SILT, medium, wet
Tan micaceous SILT		2-2-3	Ditto, wet
	20	2-2-2	Ditto, medium to firm, wet
	25		
Boring Terminated at 25.0'			
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

LOG OF BORING 4

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2458	Date Started: 10/15/18		Date Completed: 10/15/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

Tan micaceous SILT	0		
		2-2-2	Tan micaceous SILT, firm, moist
	5	2-2-2	Ditto, some sand
		3-1-2	Tan micaceous SILT, medium, moist
	10	2-1-2	Ditto
	15	2-1-3	Tan micaceous SILT, wet
Boring Terminated at 15.0'			
	20		
	25		
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
10.0	24			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

BP B4.xls

LOG OF BORING 5

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2468	Date Started: 10/15/18		Date Completed: 10/15/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0				
FILL - tan and gray micaceous silt		2-26-8	FILL - tan and gray micaceous silt with some sand and rock fragments, medium, moist		
		2-25/0	FILL - ditto, medium		
	5		Auger refusal @ 5.0'; presumed bedrock		
Boring Terminated at 5.0'					
	10				
	15				
	20				
	25				
	30				
	35				

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
2.0	24			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

BP B5.xls

LOG OF BORING 6

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2472	Date Started: 10/15/18		Date Completed: 10/15/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

Tan micaceous SILT	0				
		10-25/0	Tan micaceous SILT		
Boring Terminated at 2.0'			Auger refusal @ 2.0'; presumed bedrock		
	5				
	10				
	15				
	20				
	25				
	30				
	35				

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
				Hole backfilled on completion
				* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.

BP B6.xls

LOG OF BORING 6A

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2240	Date Started: 10/15/18		Date Completed: 10/15/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

Tan micaceous SILT	0		
Boring Terminated at 2.0'			Tan micaceous SILT Auger refusal @ 2.0'; presumed bedrock
	5		
	10		
	15		
	20		
	25		
	30		
	35		

Groundwater Data				NOTES: Surface is soft and wet Boring 6A was offset 10' North of Boring 6 * No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.
Depth, ft	Time, hr	Depth, ft	Time, hr	

LOG OF BORING 7

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2467	Date Started: 10/15/18		Date Completed: 10/15/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0				
FILL - tan and gray micaceous silt with rock fragments		4-5-6	FILL - tan and brown micaceous silt, medium to firm, moist		
	5	4-10-14	FILL - ditto, and gray rock fragments, medium, moist		
		5-9-23	FILL - ditto		
	10	5-5-9	FILL - tan and brown micaceous silt, medium, moist		
	15	5-12-12	FILL - ditto and gray organic silty clay with some wood pieces and rootlets		
	20	2-2-2	FILL - ditto, wet		
	25	2-3-5	Tan micaceous SILT, some sand, firm, wet		
Tan and gray micaceous SILT					
	30	35-50-25/0.4'	Gray micaceous SILT and weathered Gneiss fragments, moist, presumed bedrock		
Boring Terminated at 30.0'					
	35				

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
Dry	24			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

LOG OF BORING 8

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2477	Date Started: 10/16/18		Date Completed: 10/16/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0		0.1' topsoil
Tan and gray micaceous SILT		3-3-4	Tan and gray micaceous SILT, firm, moist
	5	3-5-5	Ditto
		7-13-11	Gray micaceous SILT, firm moist
	10	4-17-30	Ditto, firm and severely weathered rock fragments, moist
	15	39-25/0	Ditto, dry
Gray decomposed GNEISS			water on spoon
		50.0.4'	Decomposed GNEISS, dry
Boring Terminated at 19.0'	20		
	25		Ditto, medium to firm, wet
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
6.0	1			
2.0	8.0			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

LOG OF BORING 9

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2482	Date Started: 10/16/18		Date Completed: 10/16/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0		
Gray micaceous SILT		5-19-19	Gray micaceous SILT, firm, moist
	5	29-50/0.4'	Ditto
	10	10-13-11	Gray micaceous SILT, firm, moist
	15	4-9-10	Gray micaceous SILT, some sand, moist
			Auger refusal @17.0'
Boring Terminated at 17.0'			
	20		
	25		
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
8.0	0			
5.0	7			
				* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.

BP B9.xls

LOG OF BORING 10

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2479	Date Started: 10/16/18		Date Completed: 10/16/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0		
FILL - tan and red micaceous silt		2-4-6	FILL - tan and red micaceous silt, moist
	5	4-4-4	FILL - ditto and some sand, firm, moist
		5-6-5	Tan and gray micaceous SILT, firm, moist
	10	5-7-8	Tan micaceous SILT, firm, moist
	15	6-6-5	Ditto
	20	7-9-10	Ditto
Weathered to decomposed GNEISS			
	25	26-25/0	Severely weathered and decomposed GNEISS
Boring Terminated at 24.5'			
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
Dry	6			
* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.				

LOG OF BORING 11

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2470	Date Started: 10/16/18		Date Completed: 10/16/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0				
FILL - tan micaceous silt		3-3-3	FILL - tan micaceous silt, some sand, firm, moist		
	5	2-1-1	FILL - tan micaceous silt, soft, wet		
		2-2-2	FILL - Ditto		
Gray micaceous SILT	10	3-5-7	Gray micaceous SILT, moist		
Gray weathered to decomposed GNEISS	15	31-22-20	Gray severely weathered GNEISS fragments, moist		
		50	Decomposed GNEISS		
Boring Terminated at 19.0'	20				
	25				
	30				
	35				

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
Dry	5			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

LOG OF BORING 12

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2478	Date Started: 10/16/18		Date Completed: 10/16/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

Tan and gray micaceous SILT	0		
		6-13-16	Tan and gray micaceous SILT, firm, dry to moist
	5	8-8-6	Light gray micaceous SILT, firm, moist
		5-7-7	Ditto
	10	3-6-7	Ditto
	15	5-6-7	Tan micaceous SILT, firm, moist
	20	6-7-11	Ditto
	25	31-50/0.4'	Tan micaceous SILT and weathered GNEISS fragments, moist
Boring Terminated at 24.4'			
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
Dry	24			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

BP B12.xls

LOG OF BORING 13

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2473	Date Started: 10/16/18		Date Completed: 10/16/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0		
FILL - tan, gray and brown micaceous silt with some organic silt		3-3-3	FILL - tan and gray micaceous silt, medium to firm, moist
	5	3-3-2	FILL - ditto
	10	1-1-1	FILL - brown silt and gray organic silt, soft, wet
	15	4-12-14	FILL - ditto and gray micaceous SILT and weathered Gneiss fragments, firm, moist
Gray micaceous SILT and weathered GNEISS			
	20	11-20-22	Gray micaceous SILT and weathered GNEISS fragments, moist, firm
Boring Terminated at 20.0'			
	25		
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
Dry	24			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

LOG OF BORING 14

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2466	Date Started: 10/16/18		Date Completed: 10/16/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0				
FILL - tan and brown micaceous silt		3-3-3	FILL - tan and brown micaceous silt, wood pieces, medium, moist		
	5	5-3-3	FILL - tan and brown micaceous silt, few gravel, moist		
		3-6-6	FILL - ditto, firm		
	10	6-6-9	FILL - ditto and gray micaceous silty sand, firm, moist		
Tan micaceous SILT	15	37-25/0.3'	Tan micaceous SILT, quartzite fragments, firm, dry		
Decomposed GNEISS		50/0.1'	Ditto and decomposed GNEISS		
Boring Terminated at 18.6'	20				
	25				
	30				
	35				

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
Dry	24			

* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall
 ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation
 See NOTES TO BORING LOG which are a part of this log.

BP B14.xls

LOG OF BORING 15

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2460	Date Started: 10/16/18		Date Completed: 10/16/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0		
FILL - tan and brown micaceous silt		2-2-2	FILL - tan and brown micaceous silt, moist to wet
	5	2-2-1	FILL - ditto
		1-2-3	FILL - ditto
	10	4-5-7	FILL - Gray silty sand, firm, moist to wet
Gray silty sand and gravel, some organics (Alluvium)	15	12-12-12	Gray silty sand, organic, with gravels, wet
Gray decomposed GNEISS		50- 25/0.2'	Gray micaceous SILT and weathered GNEISS, moist
	20		
		50/0.2'	Gray decomposed GNEISS
Boring Terminated at 23.7'	25		
	30		
	35		

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
19.5	0			
* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.				

BP B15.xls

LOG OF BORING 16

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2458	Date Started: 10/17/18		Date Completed: 10/17/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0				
FILL - tan and brown micaceous silt		2-3-3	FILL - tan and gray micaceous silt, medium, moist		
	5	2-3-4	FILL - ditto, moist to wet		
		2-3-5	FILL - ditto, firm, moist to wet		
	10	3-3-2	FILL - ditto, firm, moist to wet		
Gray silty sand and organic silt (Alluvium)	15	5-5-3	Gray silty SAND, medium, wet		
	20	3-1-1	Gray organic silt, medium, wte		
Gray micaceous SILT					
	25	6-5-7	Tan and gray micaceous SILT, firm, moist to wet		
Boring Terminated at 25.0'					
	30				
	35				

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.				

BP B16.xls

LOG OF BORING 17

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2458	Date Started: 10/17/18		Date Completed: 10/17/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0				
FILL - tan and brown micaceous silt		4-7-7	FILL - tan micaceous silt, firm, moist		
	5	3-5-6	FILL - ditto, few rock fragments, firm, moist		
		3-3-4	FILL - ditto, firm,		
	10	4-5-5	FILL - ditto, firm		
Gray silty sand and organic silt (Alluvium)	15	12-10-7	FILL - gray sand and rock fragments		
	20	3-2-2	Gray silty sand and organic silt, medium, moist to wet		
Gray micaceous SILT					
	25	17-16-12	Tan and gray micaceous SILT, firm, moist to wet		
Boring Terminated at 25.0'					
	30				
	35				

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
				* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.

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LOG OF BORING 18

Project: Bartlett Property				Location: Galax, VA			
Type of Boring: Soil Boring - Intermittent Sampling				Drilling Contractor: Total Depth Drilling			
Elevation, ft: 2456		Date Started: 10/17/18		Date Completed: 10/17/18		Weather: Clear	
Stratum Description			Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0				
FILL - tan and brown micaceous silt			3-3-3		FILL - tan micaceous silt, firm, moist
		5		3-6-9	FILL - ditto, few rock fragments, firm, moist
				4-3-4	FILL - tan micaceous silt, some sand, firm,
		10		4-4-6	FILL - tan micaceous silt, firm, moist
		15		3-4-3	FILL - ditto, medium
		20		3-4-5	FILL - ditto and gray micaceous SILT, firm, moist
Tan and gray micaceous SILT					
		25		5-2-13	Tan and gray micaceous SILT, firm, moist to wet
Boring Terminated at 25.0'					
		30			
		35			

Groundwater Data				NOTES:			
Depth, ft	Time, hr	Depth, ft	Time, hr				
Dry	0						
				* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.			

LOG OF BORING 19

Project: Bartlett Property			Location: Galax, VA		
Type of Boring: Soil Boring - Intermittent Sampling			Drilling Contractor: Total Depth Drilling		
Elevation, ft: 2454	Date Started: 10/17/18		Date Completed: 10/17/18		Weather: Clear
Stratum Description	Depth, ft	BLOWS* REC./RQD**	Sample Description		

	0				
FILL - tan and brown micaceous silty sand		5-5-6	FILL - tan and gray micaceous silt, firm, moist		
	5	3-2-3	FILL - ditto, medium		
		4-3-4	FILL - tan and gray micaceous silt, medium, moist		
	10	4-4-5	FILL - ditto		
----- Gray organic silty sand (Alluvium) -----	15	9-3-3	FILL - ditto and gray organic silty sand		
Tan and gray micaceous SILT		6-7-6	Tan and gray micaceous SILT, firm, moist		
	20				
		3-2-3	Gray micaceous SILT, firm, moist to wet		
Boring Terminated at 25.0'	25				
	30				
	35				

Groundwater Data				NOTES:
Depth, ft	Time, hr	Depth, ft	Time, hr	
Dry	0			
				* No. of Blows Required to Drive 2" O.D., 1.375" I.D., Sampler 6" Using 140-lb Hammer, 30" Fall ** Core Recovery as Percent of Length of Drill Run. RQD is Rock Quality Designation See NOTES TO BORING LOG which are a part of this log.

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