



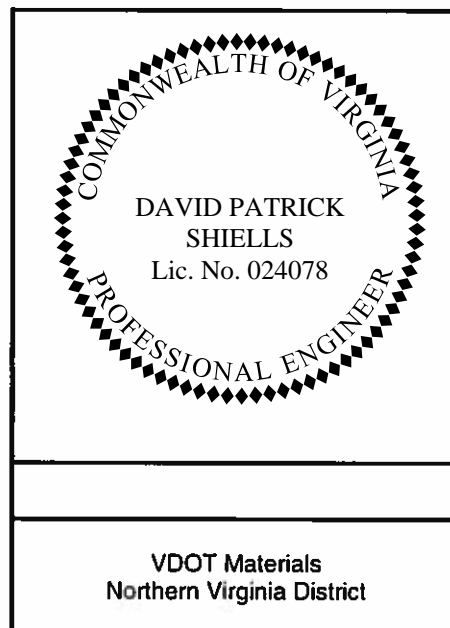
COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION

DIVISION: MATERIALS

REPORT COVER SHEET

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| Pavement Investigation and Evaluation for Town of Waterford |
| September 16, 2016 |
| David P. Shiells, P.E. |



Responsible for All Pages

| | |
|---------------------|-------------------|
| Project Description | Town of Waterford |
| From: | N/A |
| To: | N/A |
| Project UPC No.: | 100418 |



COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION

4975 Alliance Drive
Fairfax, VA 22030

CHARLES A. KILPATRICK, P.E.
COMMISSIONER

September 16, 2016

MEMORANDUM

TO: Mr. Michael Gleasman, P.E.

SUBJECT: Pavement Investigation in the Town of Waterford
Loudoun County, Virginia

As requested, we have completed a review of the condition of the existing pavements within the Town of Waterford. As described to us, the main concerns for the roadways within the town are to provide the most effective short-term pavement resurfacing and to provide for long-term pavement performance. Local residents are also interested in lowering the existing pavement surface at specific locations in order to mitigate surface water flow into their residences and businesses and to allow for more convenient street parking.

The Town of Waterford lies mainly on the side of a large hill, occupying the area between Catocin Creek and Clarkes Gap Road. Numerous historic structures including residences and businesses are scattered throughout the town among more recently constructed buildings and dwellings. Many of the structures are separated from the existing streets by narrow sidewalks, boardwalks, shallow ditches, or ditches which have been infilled over time. There are three main thoroughfare roadways and three connecting streets within the town limits. The three thoroughfares are identified as the north-south stretch of pavement of Route 665 variously named Clarkes Gap Road/High Street/ Butchers Row/Loyalty Road; the southeasterly-northwesterly stretch of pavement of Route 662 variously named Factory Street/Second Street/West Main Street/First Street and the easterly-westerly pavement of Route 698 named Water Street. The three connecting streets all are oriented east-west and named East Main Street, Patrick Street and Janney Street.

The provision of conveyances for surface drainage throughout the town is very poor to nonexistent. This is likely due to the lack of adequate ditches, buried or plugged driveway pipes, and inadequate storm water facilities. As a result, streets within the town have become the paths of least resistance for precipitation to reach Catoctin Creek. Numerous town residents and business owners have begun to construct sandbag barriers in order to mitigate the flow of water from the streets into their buildings. Gravel washouts onto the paved streets, from adjacent driveways, shoulders, and alleys, are also common.

Existing Pavement Conditions

The typical sections within the Town of Waterford consist of a variety of very old, non-standard curb and gutter and open shoulder configurations. The width of the pavement varies from approximately 14' on Patrick Street to approximately 21' on High Street near the intersection with Patrick Street. On-street parking on many of the town's thoroughfares, particularly on West Main Street, reduces the effective travel width to just one lane, forcing oncoming traffic to yield wherever pull off openings are available. The pavement is old and its condition ranges from fair to very poor, with occasional longitudinal cracking, moderate to severe alligator cracking, moderate rutting, open longitudinal joints, pavement edge failures, and potholes. Some of the pavement surfaces appear to be very old, particularly along the lesser-used streets (East Main Street and Patrick Street). The only apparent utility beneath the pavements appears to be a sanitary sewer system. However, visually, the existing pavement distress does not consistently follow the path of the sanitary sewer beneath the pavement. Figures 1 through 7 illustrate the variable existing pavement conditions.

Where it exists, most of the curb and gutter has been either buried beneath repeated asphalt pavement overlays and/or destroyed by traffic abuse or subgrade movement. Visually, it appears that repeated overlays and build-up of the pavement have created conditions in a few locations where the existing pavement surface is significantly higher than the adjacent sidewalk/curb and gutter. This is particularly true along the west side of Second Street near its intersection with West Main Street and along the south side of West Main Street. Figures 8 through 10 illustrate the existing curb and gutter and pavement build-up conditions.

Existing Drainage Conditions

There are very few deep or continuous stretches of ditch within Waterford. From the occasional appearance of driveway cross-pipes, many of which are partially or completely buried, it appears that ditching along both sides of the pavement previously existed. However, many of those ditches have been infilled and the space is now used for near-street parking. Anecdotally, townspeople told us that a group of concerned citizens has begun the process of marking the buried driveway pipes in hopes of having VDOT clear them. However, restoration of the ditches between the driveways is not an issue that the residents appear ready to discuss, likely due to the potential loss of parking space. Figures 11 through 16 illustrate the inadequate or nonexistent pavement drainage.

Where runoff encounters high spots along the pavement edge, due to the slight crown in the pavement, puddles form. The resultant standing water adjacent to the pavement edge allows

runoff to inundate the pavement and granular subbase, exposing the pavement section to extended periods of saturation. Potholes and edge failures are coincident with evidence of ponded water along the pavement edge throughout the town.

Field Investigation

A total of 28 locations were cored and drilled to a maximum depth of 6.7 feet below the existing pavement surface in order to determine the structure and condition of the existing pavement and to investigate the subgrade soils. The borings were performed at the following locations:

- Factory Street: CB-1, CB-2
- Second Street: C-3A, C-3B, CB-4, CB-5, CB-6A, CB-6B, C-7A, C-7B
- West Main Street and First Street: C-8A, CB-8B, C-9, C-10, CB-11, CB-12
- East Main Street: CB-13A, CB-13B, CB-14
- Patrick Street: CB-15, CB-16
- Water Street: CB-17, C-18
- Clarks Gap Road/High Street/Butchers Row/Loyalty Road: CB-19A, CB-19B, CB-20, C-21A, CB-21B

Cores were not obtained from Janney Street due to the very poor condition of the existing surface treatment (tar and chip) where most of the surface treatment has reverted back to unbound aggregate. Cores were also not obtained from Church Street since it appears to be only gravel surfaced and locally treated as a private alleyway.

Detailed descriptions and photographs of the asphalt layers encountered are included on the attached boring logs, and are shown on the attached boring location photos. Boring location plans are also attached.

Asphalt Pavement Structure, Subbase and Subgrade Soil Conditions

The existing pavement structure is quite variable, both in thickness and condition, ranging from 8" thick along the western end of Factory Street to less than 2" thick on East Main Street near the intersection with Second Street. The condition ranges from moderately stripped and oxidized to completely stripped and friable. Specific to each street, the asphalt pavement thicknesses measured in the cores were:

- Factory Street: 5.0" to 8.0" (average 6.5")
- Second Street: 3.6" to 7.5" (average 5.7")
- West Main Street and First Street: 4.1" to 7.5" (average 6.1")
- East Main Street: 1.9" to 6.0" (average 4.6")
- Patrick Street: 4.1" to 6.0" (average 5.1")
- Water Street: 3.1" to 5.0" (average 4.1")
- Clarks Gap Road/High Street/Butchers Row/Loyalty Road: 3.8" to 7.1" (average 5.2")

Most of the streets contain some amount of both open and patched potholes. The patched areas appear to have been repaired during multiple visits, over a long period of time, with materials

ranging from hot-mixed asphalt, to cold-patch asphalt, to sprayed temporary asphalt repair material.

The substantially raised pavement profile, adjacent to businesses and residences along Second Street and West Main Street, does not appear to be entirely due to repeated overlay build up. Cores obtained at C-7A and C-7B along Second Street indicate only an average asphalt thickness of 6.6". However, the existing surface of Second Street is in excess of 15" above the adjacent sidewalk. On West Main Street, at core locations C-9 and C-10 where the most substantial raised profile exists, an average asphalt thickness of 6.7" was measured. The adjacent sidewalk along the south side of West Main Street varies between 7" and 10" below the elevation of the pavement. As a result, it appears that the existing, raised pavement elevation is due to, or in addition to, factors other than repeated overlay/build-up of the pavement. Anecdotally, townspeople noted to us that they believed the profile was intentionally raised to accommodate more convenient geometric conditions on Second Street and West Main Street. Apparently, there was quite a history of difficult turns due to elevation differences in adjacent roadway pavement surfaces, particularly at the intersection Main, Second and Water Streets.

Granular subbase beneath the asphalt pavement consists mainly of a coarse soil fill comprised of SILTY F-C SAND with f-c gravel or CLAYEY F-C SAND AND F-C GRAVEL. Quarried, crushed aggregate subbase was only encountered in borings C-7A and C-8A and may be associated with episodes of either utility or pavement repair. The granular subbase ranged from 2.4" thick in CB-14 on East Main Street to greater than 13" of crushed aggregate in C-7A on Second Street immediately south of the West Main Street intersection.

The subgrade generally consists of LEAN CLAYs, SILTY and CLAYEY SANDs and SANDY SILTs, all with varying amounts of gravel. The soils occur as both man-made FILL and residuum of the parent gneiss found at depth at this location. In general, the soils range from medium dense/very stiff to loose/firm with average SPT (uncorrected) "N" values of between 5 and 25 blows per foot. Overall, the subgrade soils are moist, with in-situ moisture contents averaging between 15% and 20%. Optimum moisture contents of the four subgrade samples that were tested ranged from 11.8% to 21.2% (average of 14.5%).

No evidence of ground water was encountered during drilling in any of the borings. The borings were backfilled and patched immediately after completion. Detailed descriptions and photographs of the asphalt layers encountered are included on the boring logs.

Conclusions

The streets within the Town of Waterford are paved with old to very old asphalt which is in fair to very poor condition. Evidence of the distress in the pavement is obvious in many locations as indicated by the existence of longitudinal cracking, moderate to severe alligator cracking, moderate rutting, open longitudinal joints, pavement edge failures, and potholes. The almost complete lack of surface drainage adjacent to the pavement, likely a significantly contributing factor to the various pavement failures, has caused town residents to adopt a defensive position toward the roadways, as the streets have become the defacto surface drainage system throughout the town. In addition to the lack of drainage, many of the pavements are structurally inadequate for the current traffic volumes. The severe alligator cracking at various locations and the moderate rutting on East Main Street and Patrick Street immediately west of High Street are indicative of structural pavement failure over subgrades which are bearing traffic loads beyond their capacity. Also, many of the cores have moderate to nearly complete stripping of the bituminous binder, particularly in the layers beneath the most recent overlay, compromising the structural integrity of the pavement.

Recommendations

Surface and Pavement Drainage

As noted previously, there is a substantial lack of conveyances for water to drain off of, and away from, the roadways throughout Waterford. Any plan for restoration of the pavements in Waterford must include a strategy for provision of adequate facilities to allow the pavement to drain. These should include re-establishment of pavement edge ditches; exposure, unplugging, and/or replacement of driveway pipes; and connection of the ditches to existing (and perhaps newly constructed) facilities to allow water to reach Catoctin Creek. Failure to improve the drainage throughout the town will reduce the expected pavement life.

Pavement Restoration

The following options are presented in order of least risk/highest cost/longest potential lifespan to greatest risk/lowest cost/shortest potential lifespan and are broken down into the five streets described as Route 662, Route 665, Route 698, East Main Street (Route 785), and Patrick Street (Route 783).

Please note that if reconstruction is chosen on any of the streets, a careful examination of the subgrade conditions, including proof-rolling of the subgrade with a loaded dump truck, will be required. We anticipate that some undercut and replacement of unsuitable subgrade soils (primarily due to high moisture content) will be required. Also note that an advantage of demolition and reconstruction is control of the surface grade. Areas of existing pavement where the surface is substantially above the adjacent sidewalk could easily be lowered if the existing roadway were demolished and reconstructed.

Route 662 (Factory Street/Second Street/West Main Street/First Street)

Based on an analysis of the existing and projected traffic volumes along Route 662, assuming a 20-year secondary pavement design scenario, the existing pavement thickness deficit ranges from adequate (no build up required) to 4.1" (avg. 1.6") required to meet a 20-year design.

Please note that due to the deficit in available pavement section thickness, it will not be possible to *reduce* the existing pavement thickness in order to lower the surface. Reducing the existing pavement section, even if replaced with a shallower thickness of *new* pavement, will reduce the potential lifespan of the pavement and lead to premature failure. Only Option 1 will allow changes to the pavement surface elevation.

Option 1 – Complete Reconstruction

To meet a 20-year design life, we recommend complete demolition of the existing pavement and reconstruction with:

Surface: 1" Asphalt Concrete Type SM-4.75A, estimated at 118 lbs/sy
Base: 5" Asphalt Concrete, Type BM-25.0A
Subbase: 6" Aggregate Base Material, Type I, Size no. 21B extended to daylight in adjacent ditches or connected to UD-4 edgedrains beneath adjacent curb and gutter.

Option 2 – Mill and Overlay Buildup

In order to provide a longer-lasting pavement structure without complete reconstruction, it would be advantageous to add to the existing pavement thickness by removing the existing surface and building up the pavement. We recommend that the existing pavement be milled to a depth of 1.5" to remove the existing severely deteriorated and debonded surface. Any severe failures should be patched full depth (4") with BM-25.0A prior to building up the existing pavement with 2" of SM-12.5A and 1" of SM-4.75A. However, given the existing, highly variable pavement conditions and the geometric controls presented by the thin roadway, nearby dwellings/businesses, and adjacent driveways, it is unlikely that a buildup of the pavement will be possible between Patrick Street and Leggett Street. For these areas, we recommend that the existing pavement be milled to a depth of 2.5" to remove the existing severely deteriorated and debonded surface. Any severe failures should be patched full depth (4") with BM-25.0A prior to building up the existing pavement with 1.5" of SM-12.5A and 1" of SM-4.75A.

Option 3 – Mill and Overlay (no net buildup)

In order to improve the existing surface condition—with no improvement in the potential pavement life and no change in the current grade (i.e. an aesthetic and short-term functional improvement)—we recommend the following:

Mill the existing pavement to a depth of 2", patch the severe failures full depth (4") with BM-25.0A and replace with 2" Asphalt Concrete Type SM-9.5A, estimated at 230 lbs/sy

Route 665 (Clarkes Gap Road/High Street/ Butchers Row/Loyalty Road)

Based on an analysis of the existing and projected traffic volumes along Route 665, assuming a 20-year secondary pavement design scenario, the existing pavement thickness deficit ranges from approximately 1.8" to 5.9" (avg. 3.6") required to meet a 20-year design.

Option 1 – Complete Reconstruction

To meet a 20-year design life, we recommend complete demolition of the existing pavement and reconstruction with:

- Surface: 1" Asphalt Concrete Type SM-4.75A, estimated at 118 lbs/sy
- Base: 5.5" Asphalt Concrete, Type BM-25.0A
- Subbase: 6" Aggregate Base Material, Type I, Size no. 21B extended to daylight in adjacent ditches or connected to UD-4 edgedrains beneath adjacent curb and gutter.

Option 2 – Mill and Overlay Buildup

In order to afford a longer-lasting pavement structure without complete reconstruction, it would be advantageous to add to the existing pavement thickness by removing the existing surface and building up the pavement. Given that the roadway is primarily a thoroughfare with few private or commercial entrances, a buildup of the existing pavement may be more appropriate than on Route 662. We recommend that the existing pavement be milled to a depth of 2" to remove the existing severely deteriorated surface. Any severe failures should be patched full depth (6") with BM-25.0A prior to building up the existing pavement with 4.5" of BM-25.0A and 1" of SM-4.75A. This will produce a net buildup of 3.5" and meet the thickness requirement for a 20-year design life.

Option 3 – Mill and Overlay (no net buildup)

In order to improve the existing surface condition—with no improvement in the potential pavement life and no change in the current grade (i.e. an aesthetic and short-term functional improvement)—we recommend the following:

Mill the existing pavement to a depth of 2", patch the severe failures full depth (6") with BM-25.0A and replace with 2" Asphalt Concrete Type SM-9.5A, estimated at 230 lbs/sy

Route 698 (Water Street)

Based on an analysis of the existing and projected traffic volumes along Route 698, assuming a 20-year secondary pavement design scenario, the existing pavement thickness deficit ranges from adequate to 1.9" (avg. 0.4") required to meet a 20-year design.

Option 1 – Complete Reconstruction

To meet a 20-year design life, we recommend complete demolition of the existing pavement and reconstruction with:

- Surface: 1" Asphalt Concrete Type SM-4.75A, estimated at 118 lbs/sy

Base: 3.5" Asphalt Concrete, Type BM-25.0A
Subbase: 6" Aggregate Base Material, Type I, Size no. 21B extended to daylight in adjacent ditches or connected to UD-4 edgedrains beneath adjacent curb and gutter.

Option 2 – Mill and Overlay Buildup

In order to afford a longer-lasting pavement structure without complete reconstruction, it would be advantageous to add to the existing pavement thickness by removing the existing surface and building up the pavement. Given that the roadway is primarily a thoroughfare with few private or commercial entrances, a buildup of the existing pavement may be appropriate. We recommend that the existing pavement be milled to a depth of 2" to remove the existing severely deteriorated surface. Any severe failures should be patched full depth (4") with BM-25.0A prior to building up the existing pavement with 2" of IM-19.0A and 1" of SM-4.75A. This will produce a net buildup of 1" and meet the thickness requirement for a 20-year design life.

Option 3 – Mill and Overlay (no net buildup)

In order to improve the existing surface condition—with no improvement in the potential pavement life and no change in the current grade (i.e. an aesthetic and short-term functional improvement)—we recommend the following:

Mill 2" of the existing surface, patch the severe failures full depth (4") with BM-25.0A and replace with 2" Asphalt Concrete Type SM-9.5A, estimated at 230 lbs/sy

East Main Street (Route 785)

Based on an analysis of the existing and projected traffic volumes along East Main Street (between Second Street and High Street), assuming a 20-year secondary pavement design scenario, the existing pavement thickness deficit ranges from approximately 0.9" to 3.6" (avg. 2.3") required to meet a 20-year design. However, given the extensive amount of pavement failures along East Main Street, we strongly recommend that *Option 1 – Complete Reconstruction* be considered as the best option.

Option 1 – Complete Reconstruction

To meet a 20-year design life, we recommend complete demolition of the existing pavement and reconstruction with:

Surface: 1" Asphalt Concrete Type SM-4.75A, estimated at 118 lbs/sy
Base: 3.5" Asphalt Concrete, Type BM-25.0A
Subbase: 6" Aggregate Base Material, Type I, Size no. 21B taken to daylight in adjacent ditches or connected to UD-4 edgedrains beneath adjacent curb & gutter.

Anecdotally, we were told by residents of the town that a group of concerned citizens has petitioned Loudoun County and VDOT for replacement of an existing concrete/rubble ditch which separates East Main Street from a historical parcel—currently a small park—along the north side of East Main Street near the intersection with Water Street. Plans for the ditch reconstruction have apparently been drawn up and submitted for approval. If demolition and

reconstruction are chosen, we recommend that pavement reconstruction be coordinated with the ditch reconstruction project.

Option 2 – Mill and Overlay Buildup

In order to afford a longer-lasting pavement structure without complete reconstruction, it would be advantageous to add to the existing pavement thickness by removing the existing surface and building up the pavement. There are only a few private or commercial entrances along East Main Street, allowing for relatively easy buildup of the existing pavement.

Please note that any milling of the pavement may expose the existing coarse soil subbase, given that the pavement thickness varies considerably between 1.9” and 6” in thickness.

We recommend that the existing pavement be milled to a depth of 2” to remove the existing severely deteriorated surface. Any severe failures should be patched full depth (4”) with BM-25.0A prior to building up the existing pavement with 3.5” of BM-25.0A and 1” of SM-4.75A. This will produce a net buildup of 2.5” and meet the thickness requirement for a 20-year design life.

Option 3 – Mill and Overlay (no net buildup)

In order to improve the existing surface condition—with no improvement in the potential pavement life and no change in the current grade (i.e. an aesthetic and short-term functional improvement)—we recommend the following:

Mill 2” of the existing surface, patch the severe failures full depth (6”) with BM-25.0A and replace with 2” Asphalt Concrete Type SM-9.5A, estimated at 230 lbs/sy. Please note that any milling of the pavement may expose the existing coarse soil subbase, given that the pavement thickness varies considerably between 1.9” and 6” in thickness.

Patrick Street (Route 783)

Based on an analysis of the existing and projected traffic volumes along Route 698, assuming a 20-year secondary pavement design scenario, the existing pavement thickness deficit ranges from 0.5” to 1.6” (avg. 1.1”) required to meet a 20-year design.

Please note that the complete deterioration of the existing concrete curb and gutter along the north side of Patrick Street will necessitate replacement of the curb and gutter along with the pavement for all of the options below.

Option 1 – Complete Reconstruction

To meet a 20-year design life, we recommend complete demolition of the existing pavement and reconstruction with:

- Surface: 1” Asphalt Concrete Type SM-4.75A, estimated at 118 lbs/sy
- Base: 3.5” Asphalt Concrete, Type BM-25.0A
- Subbase: 6” Aggregate Base Material, Type I, Size no. 21B extended to daylight in adjacent ditches or connected to UD-4 edgedrains beneath adjacent curb and gutter.

Option 2 – Mill and Overlay Buildup

In order to afford a longer-lasting pavement structure without complete reconstruction, it would be advantageous to add to the existing pavement thickness by removing the existing surface and building up the pavement. Please note that any milling of the pavement may expose the existing stripped asphalt base.

We recommend that the existing pavement be milled to a depth of 2” to remove the existing severely deteriorated surface. Any severe failures should be patched full depth (4”) with BM-25.0A prior to building up the existing pavement with 3” of BM-25.0A and 1” of SM-4.75A. This will produce a net buildup of 2” and meet the thickness requirement for a 20-year design life.

Option 3 – Mill and Overlay (no net buildup)

In order to improve the existing surface condition—with no improvement in the potential pavement life and no change in the current grade (i.e. an aesthetic and short-term functional improvement)—we recommend the following:

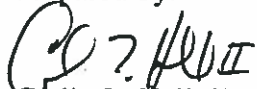
Mill 2” of the existing surface, patch the severe failures full depth (4”) with BM-25.0A and replace with 2” Asphalt Concrete Type SM-9.5A, estimated at 230 lbs/sy.

Janney Street

If Janney Street is included in the resurfacing plan, we recommend demolition of the existing deteriorated surface treatment and replacement with Option 1 as recommended for East Main Street.

If you have any questions, please contact Carlin Hall at (703) 259-2745.

Prepared by:



Carlin L. Hall, II
Asst. District Materials Engineer

For:



David P. Shiells, P.E.
District Materials Engineer

Cc: Mr. Sunil Taori, P.E.
Mr. Harihar Shiwakoti, P.E.

Attachments: Figures 1 through 16 (6)
Boring Location Plans (4)
Core Location Photographs (19)
Boring Logs (28)
Summary of Soils Laboratory Test Data (1)
Soils Laboratory Test Results (21)



Figure 1: West Main Street south of Clover Hill Road



Figure 2: East Main Street between Second Street and High Street



Figure 3: Second Street north of Janney Street



Figure 4: High Street between Patrick Street and Janney Street.



Figure 5: Water Street near its intersection with Butchers Row.



Figure 6: Patrick Street between High Street and Second Street.



Figure 7: Factory Street between High Street and Second Street.



Figure 8: West Main Street west of Second Street. Note the substantially raised pavement elevation adjacent to the sidewalk. The exposed curb consists of pieces of decorative slate/shale, stood on edge.



Figure 9: Second Street south of West Main Street. Note the substantially raised pavement elevation adjacent to the sidewalk. The exposed curb consists of deteriorated hydraulic cement concrete. The gutter pan is completely buried; only the top surface of the curb is exposed.



Figure 10: West Main Street west of Second Street. Note the substantially raised pavement elevation adjacent to the sidewalk. The exposed curb consists of hydraulic cement concrete. The gutter pan is buried by a few inches of asphalt.



Figure 11: Second Street between Janney Street and Patrick Street. The short stakes mark the ends of a completely buried driveway cross-pipe. Note the complete lack of ditches.



Figure 12: Sandbagging in front of 15539 Second Street (south of Patrick Street). Note the lack of a ditch and a vehicle parked in the backfilled ditch line.



Figure 13: Factory Street between High Street and Second Street. A loosely-constructed concrete cap has been poured over the end of the pipe which crosses beneath Factory Street. The end of the pipe was subsequently buried. An adjacent homeowner has dug below the cap to expose the end of the pipe, apparently in an attempt to allow water to drain. There is only a shallow ditch in the foreground and none at the far end of the pipe.



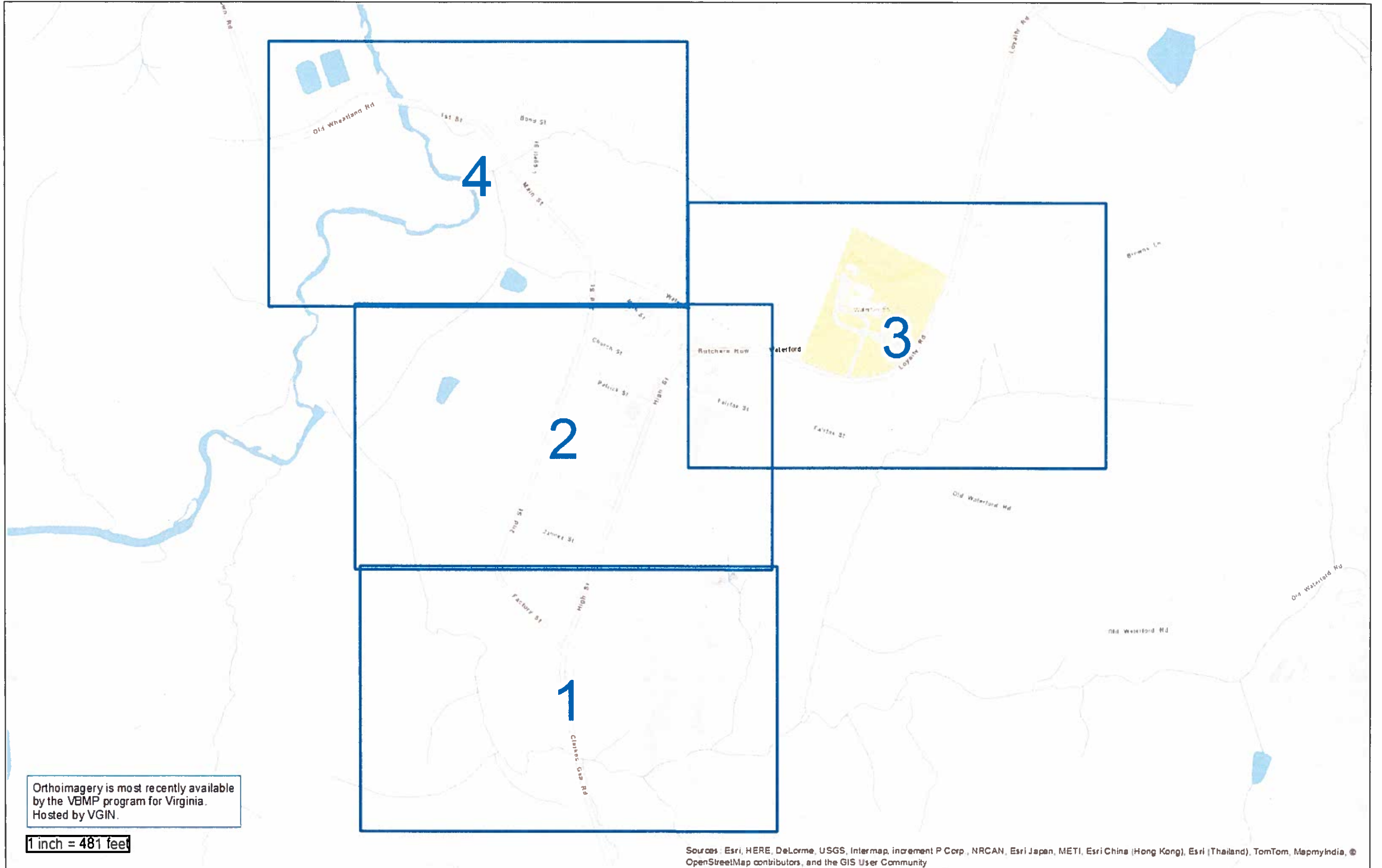
Figure 14: Partially buried pipes in front of 40152 West Main Street. Note the vehicle parked in the partially filled ditch line.



Figure 15: Partially buried/crushed pipe at intersection of Second Street and Factory Street. The pipe is located in the depression to the right at the foot of the crushed warning sign. Water puddles at the low point of the curve (pipe inlet), saturating the pavement. Note the adjacent pavement failures and repairs.



Figure 16: Butchers Row between East Main Street and Water Street/Loyalty Road. Note the lack of ditches on either side of the pavement.



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1

Orthoimagery is most recently available by the VBMP program for Virginia. Hosted by VGIN.

1 inch = 481 feet

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, OpenStreetMap contributors, and the GIS User Community



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1 inch = 150 feet

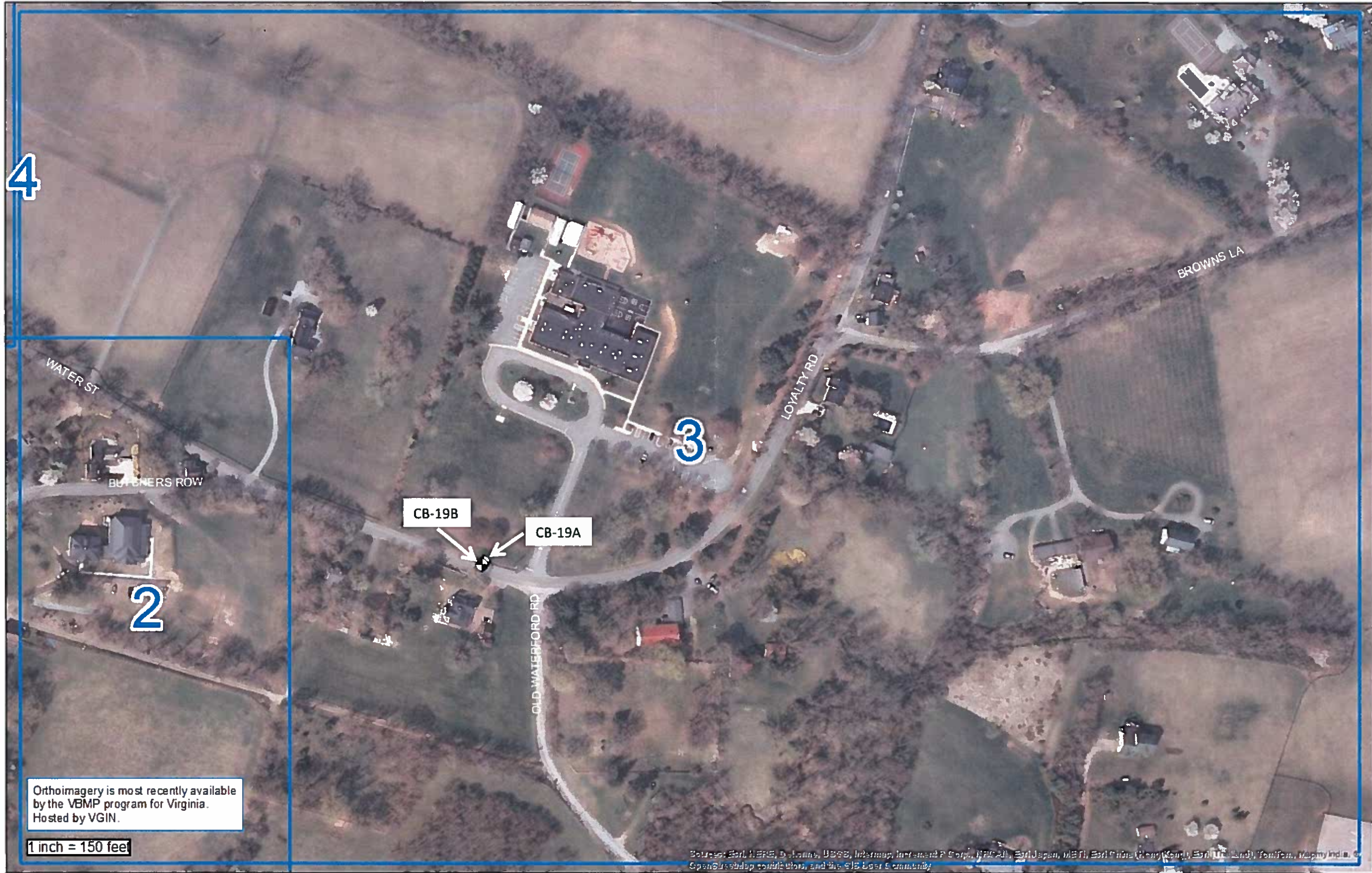
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Orthomagery is most recently available by the VBMP program for Virginia. Hosted by VGIN.

1 inch = 150 feet

Source: Esri, HERE, DeLorme, USGS, Intermap, iGeographics, GeoEye, IGN, Aerotech, GEBCO, Swire, Bing, The Mapbox, Aero, IGN, Mapbox, TerraStar, © OpenStreetMap contributors, and the GIS User Community



4

3

2

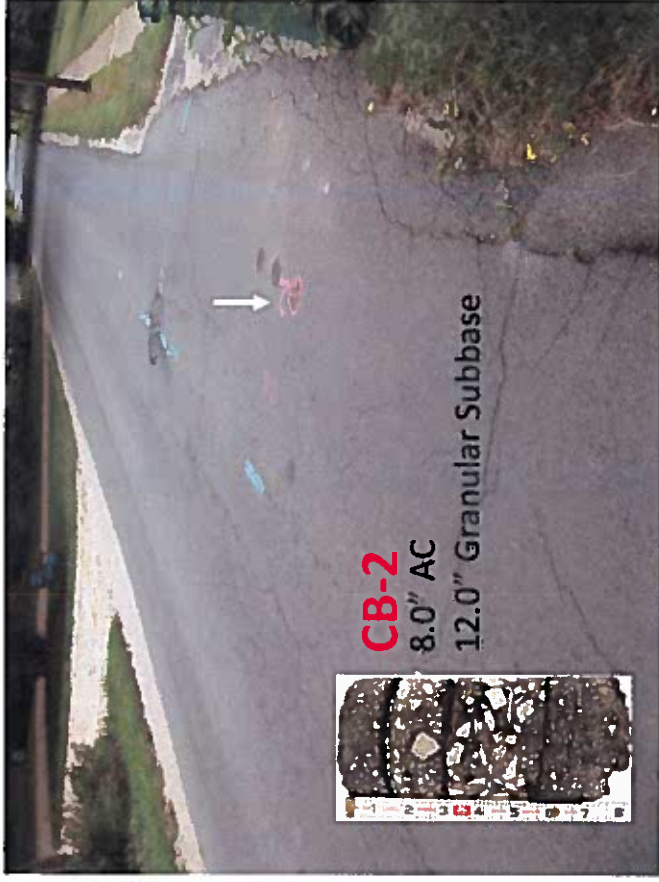
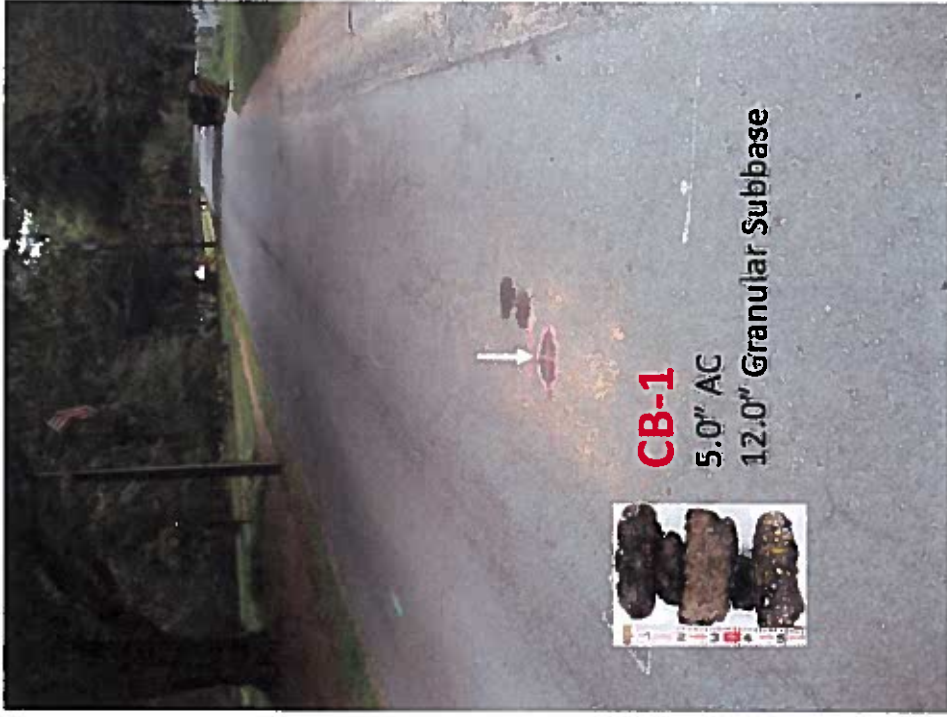
CB-19B

CB-19A

Orthomagery is most recently available by the VBMP program for Virginia. Hosted by VGIN.

1 inch = 150 feet

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., GEBCO, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, Mapbox India, © OpenStreetMap contributors, and the GIS User Community



CB-3A

5.0" AC

4.8" Granular Subbase

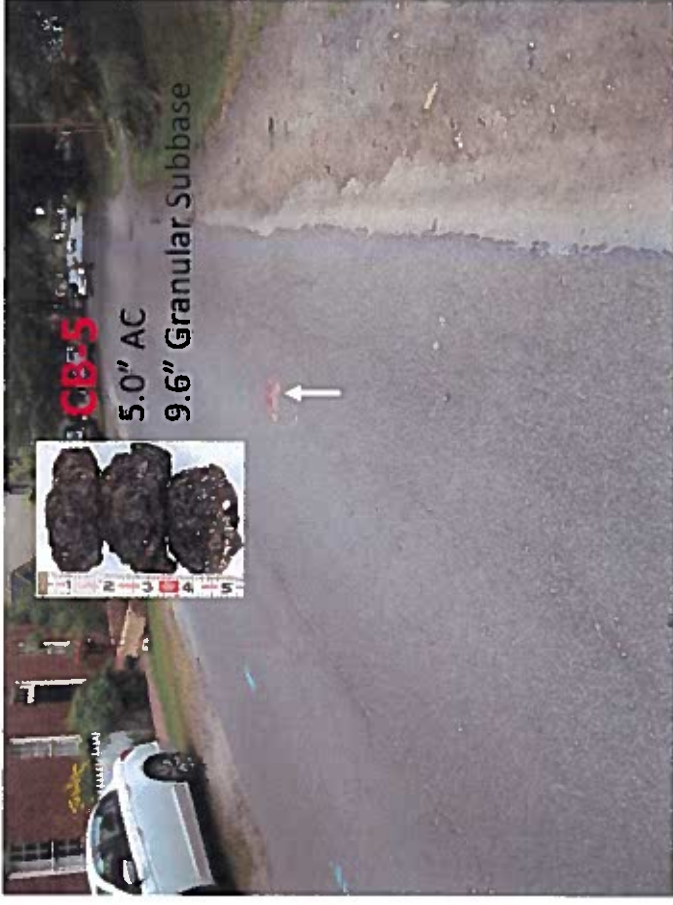
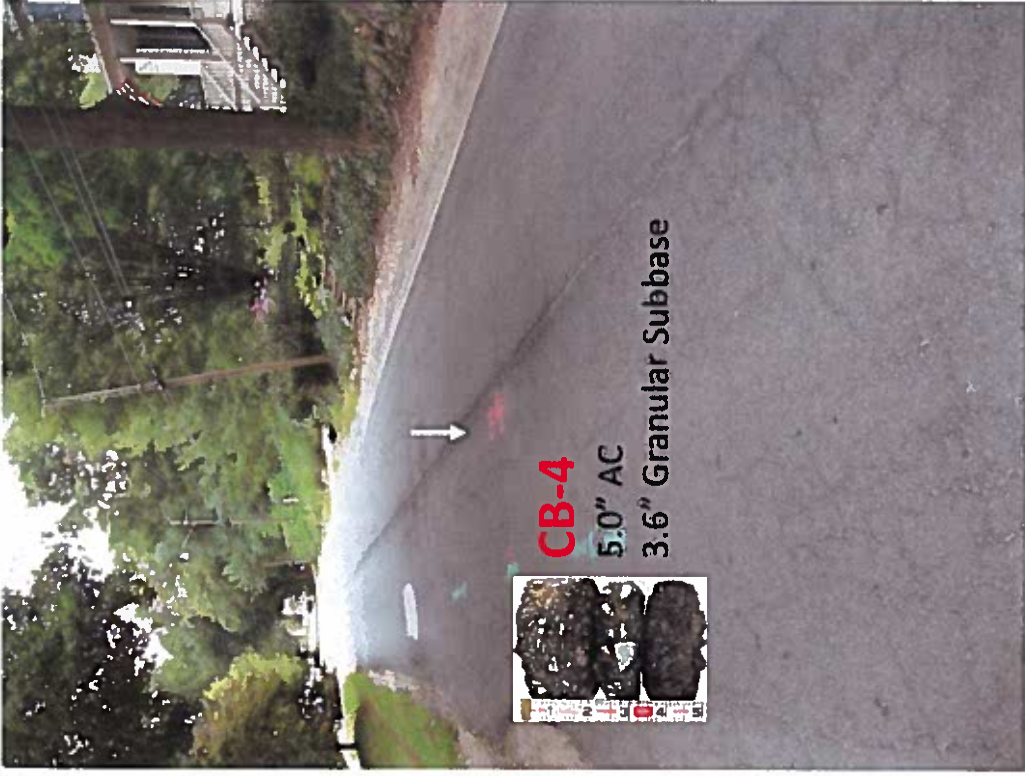


CB-3B

6.0" AC

6.0" Granular Subbase







C-6A
3.6" AC
7.2" Granular Subbase



C-6B
7.5" AC
8.2" Granular Subbase



C-7B
7.1" AC
4.8" Granular Subbase



C-7A
6.1" AC
+13.0" CA

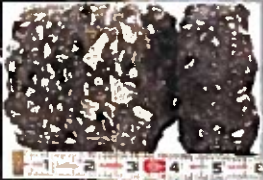




CB-8B

5.8" AC

4.8" Granular Subbase

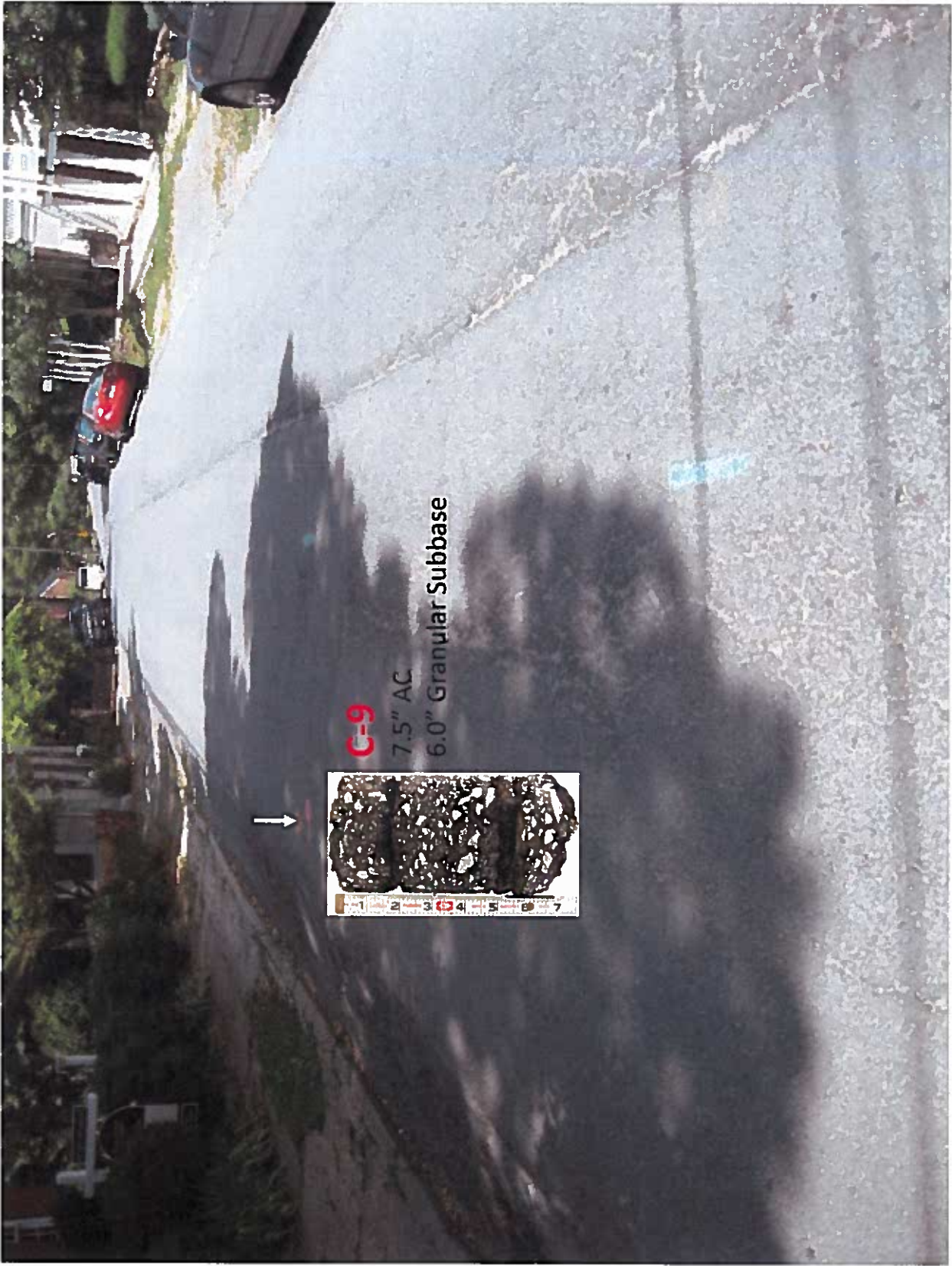


C-8A

4.1" AC

7.2" CA





C-9

7.5" AC

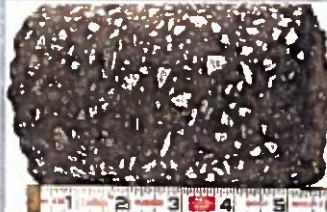
6.0" Granular Subbase

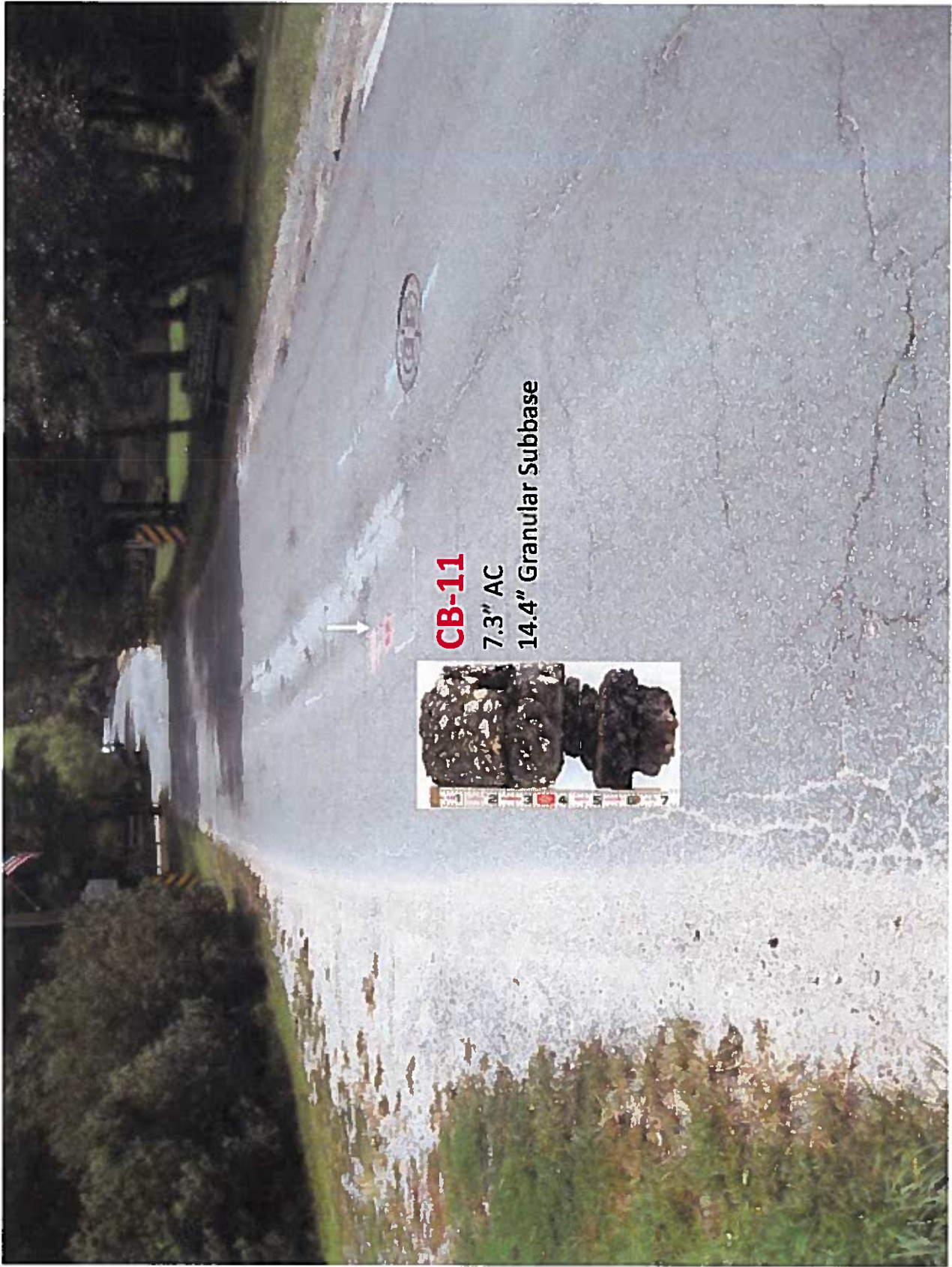


C-10

5.9" AC

13.2" Granular Subbase



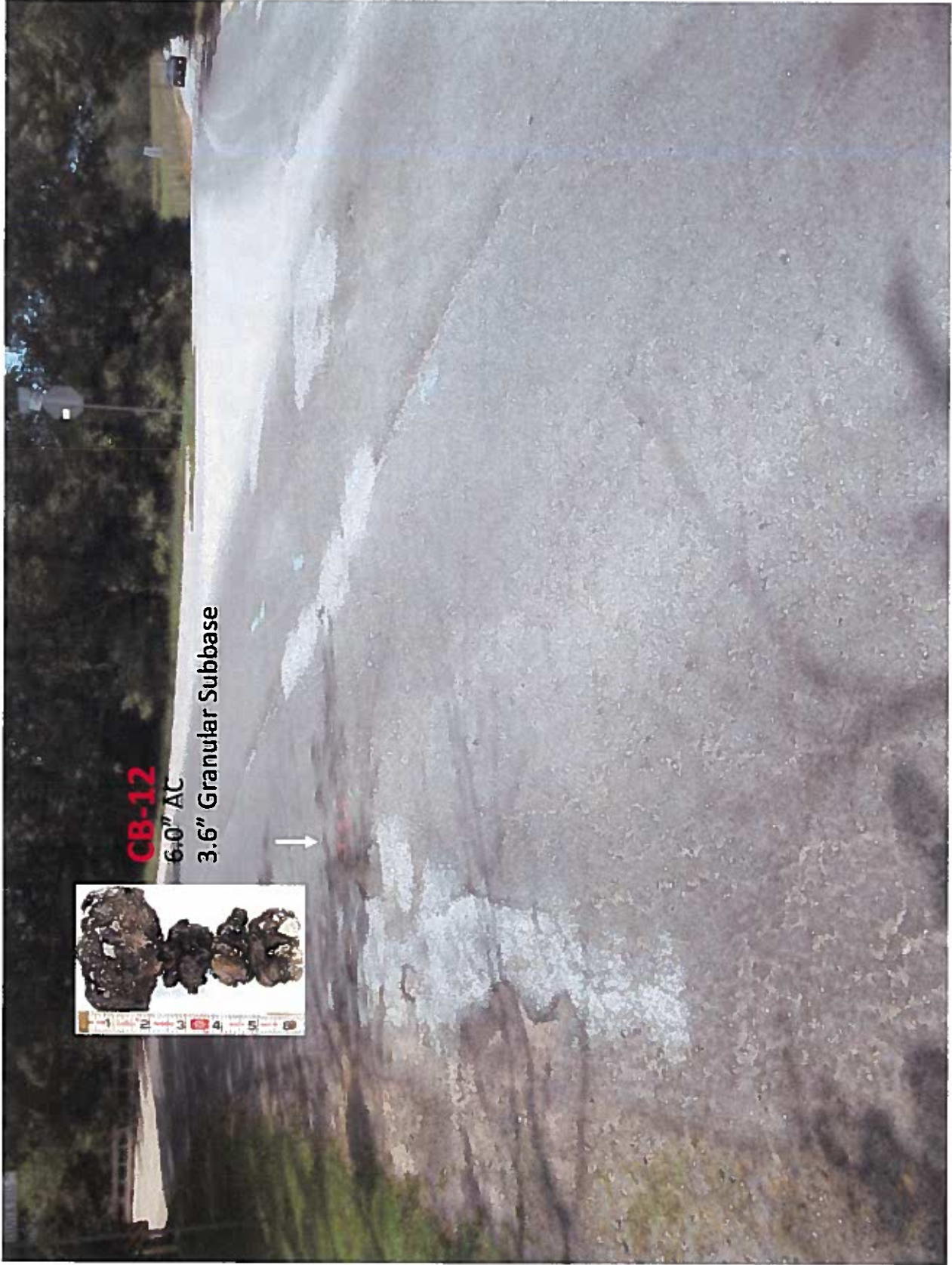


CB-11

7.3" AC

14.4" Granular Subbase





CB-12

6.0" AC

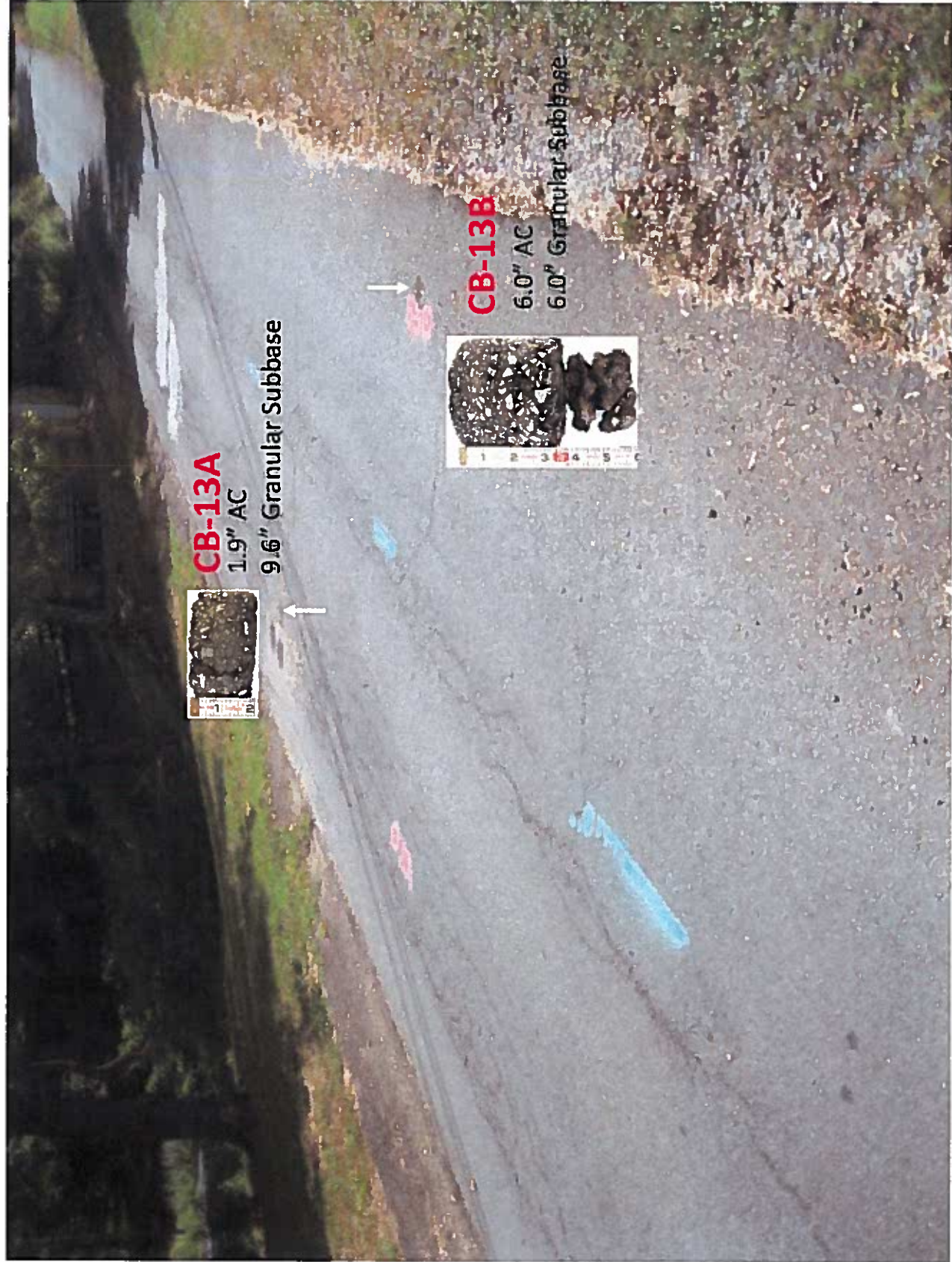
3.6" Granular Subbase

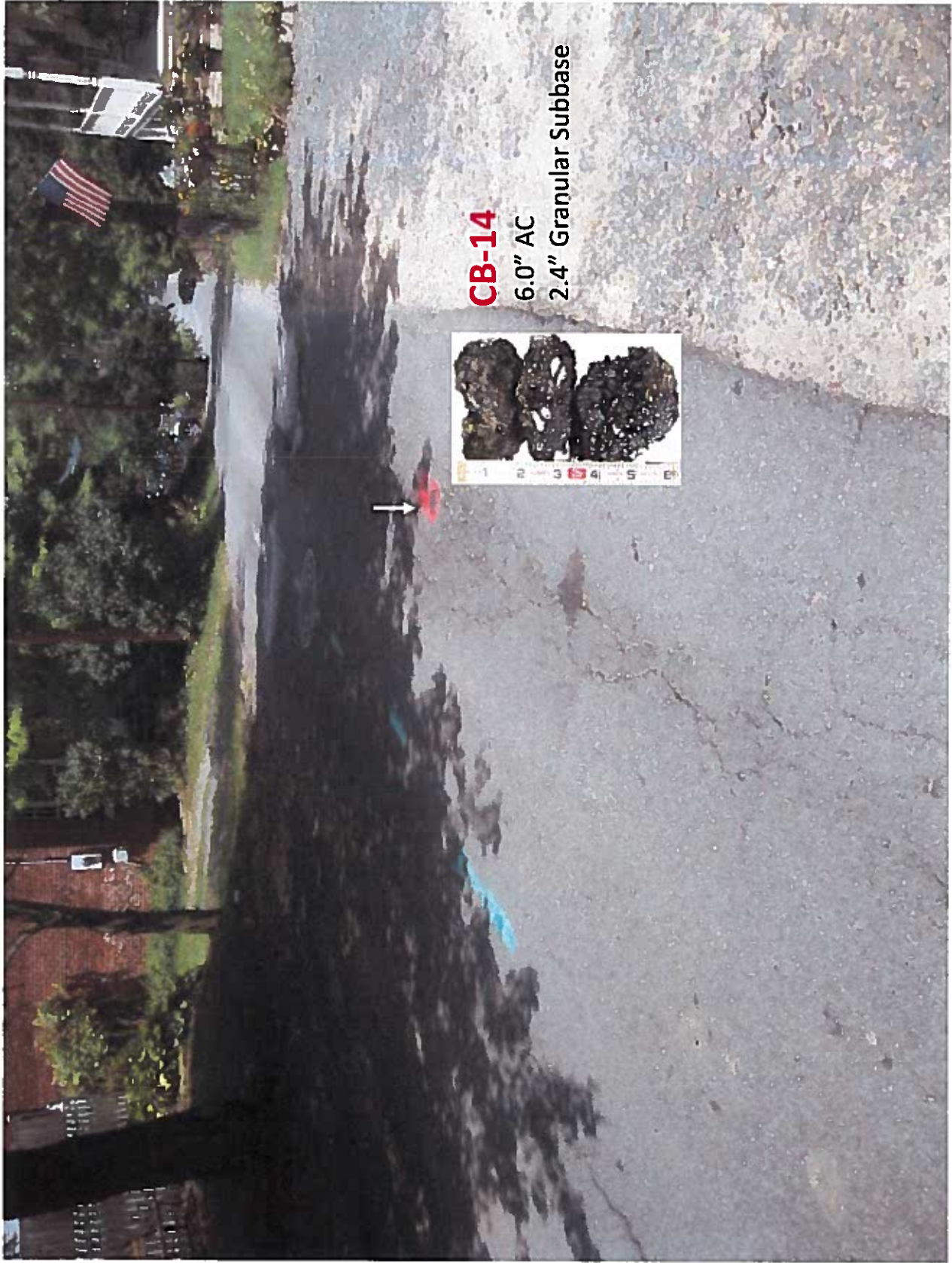


CB-13A
1.9" AC
9.6" Granular Subbase



CB-13B
6.0" AC
6.0" Granular Subbase

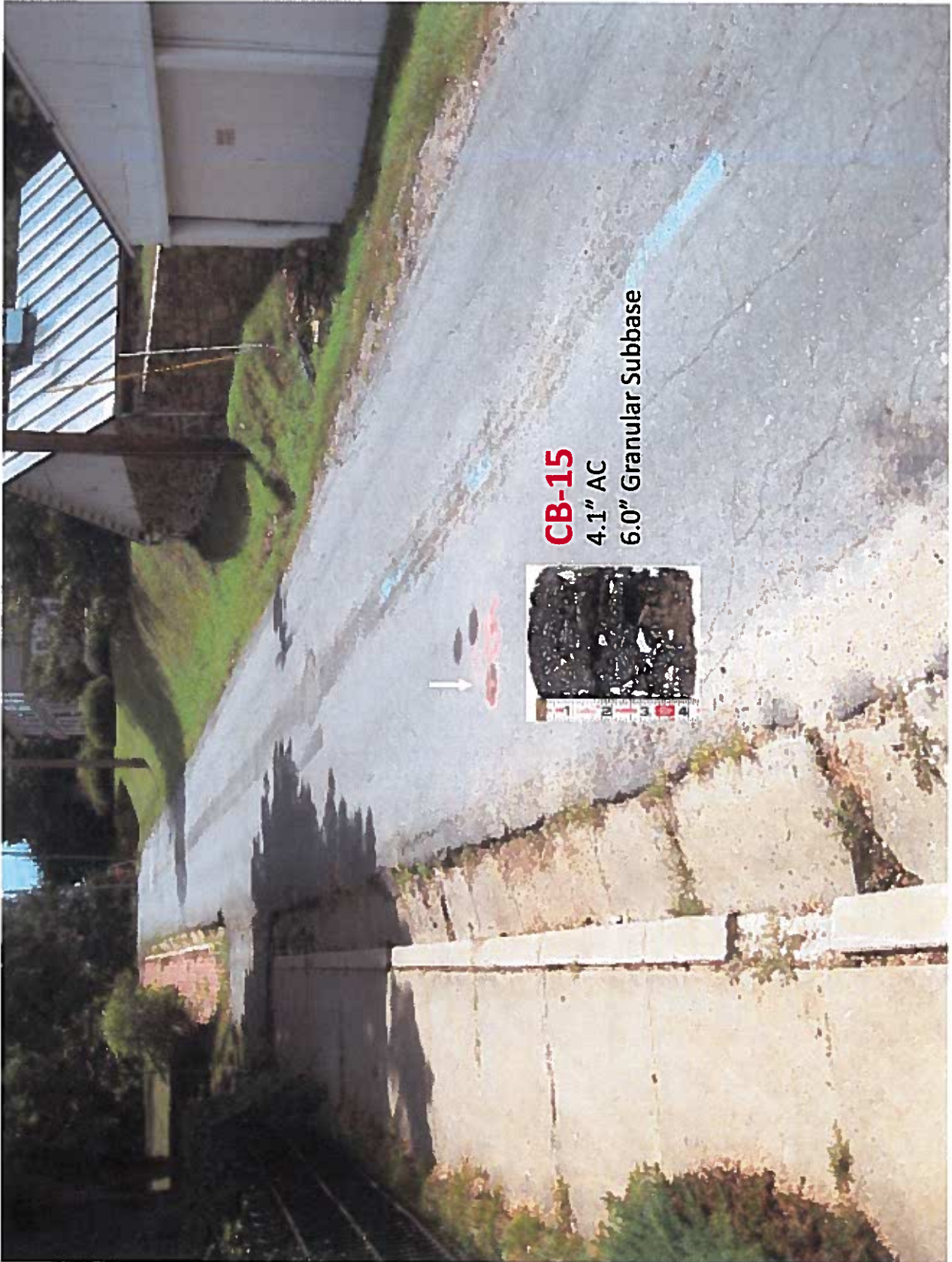




CB-14

6.0" AC

2.4" Granular Subbase



CB-15

4.1" AC

6.0" Granular Subbase



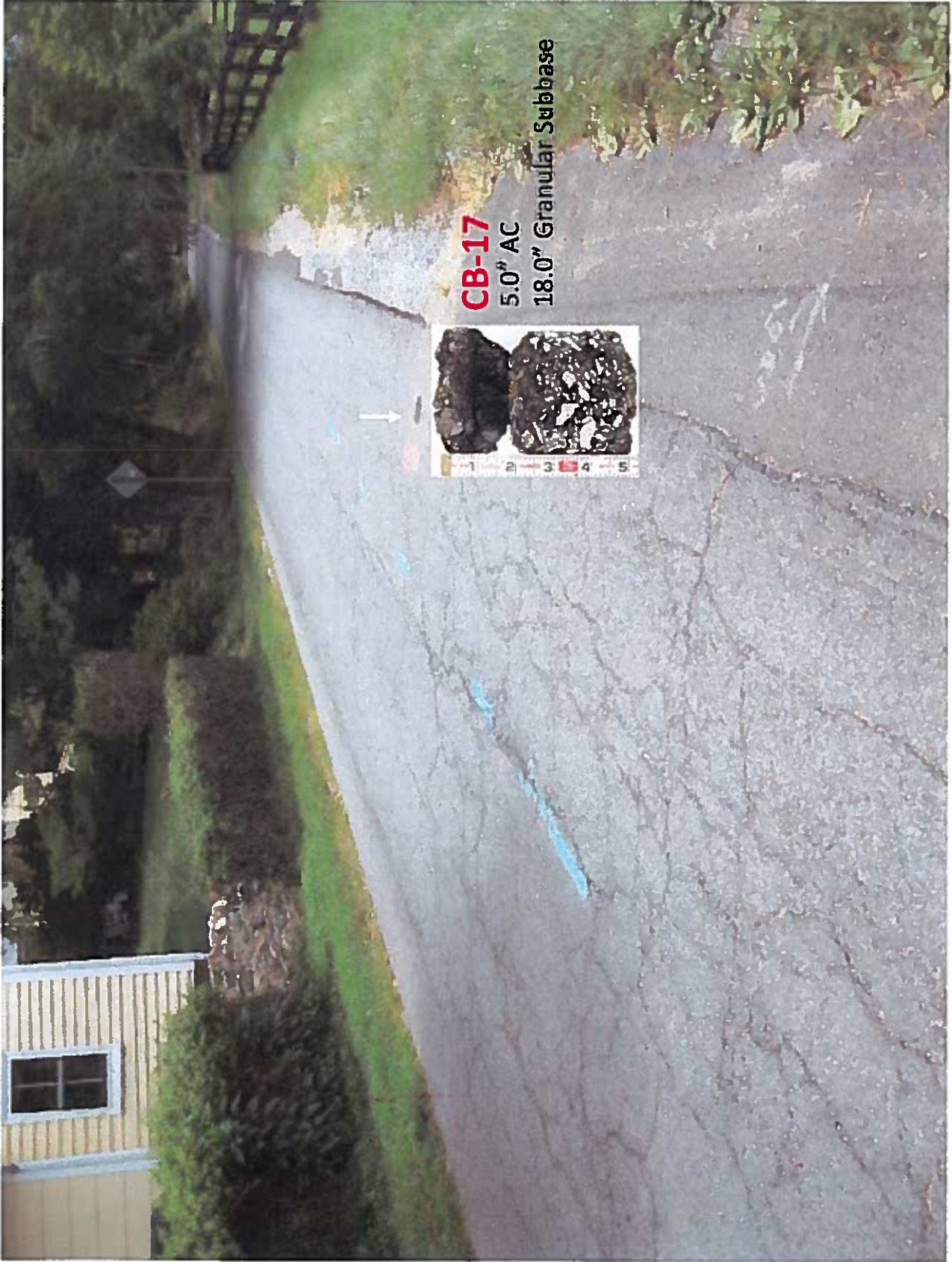


CB-16

6.0" AC

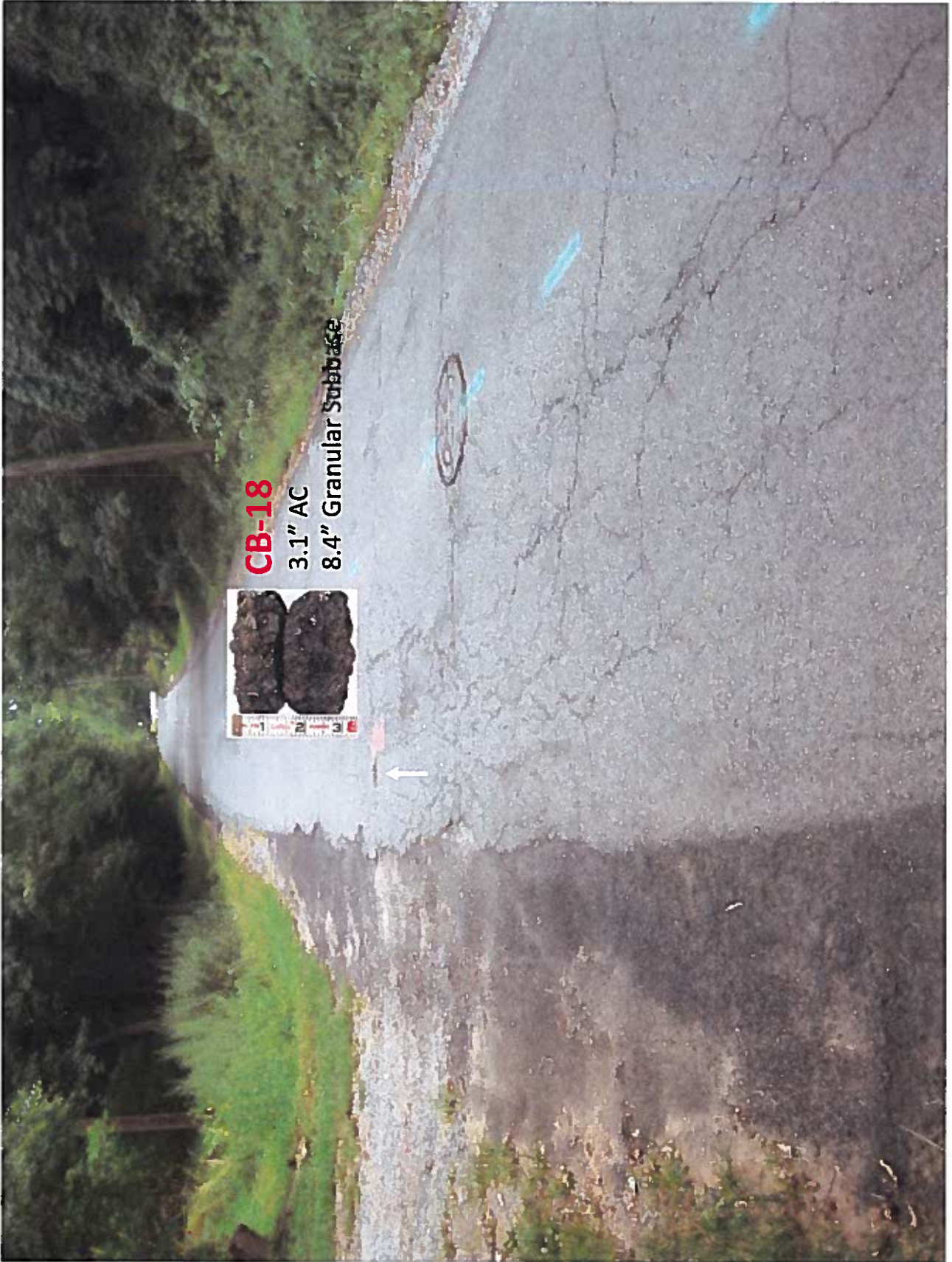
6.0" Granular Subbase





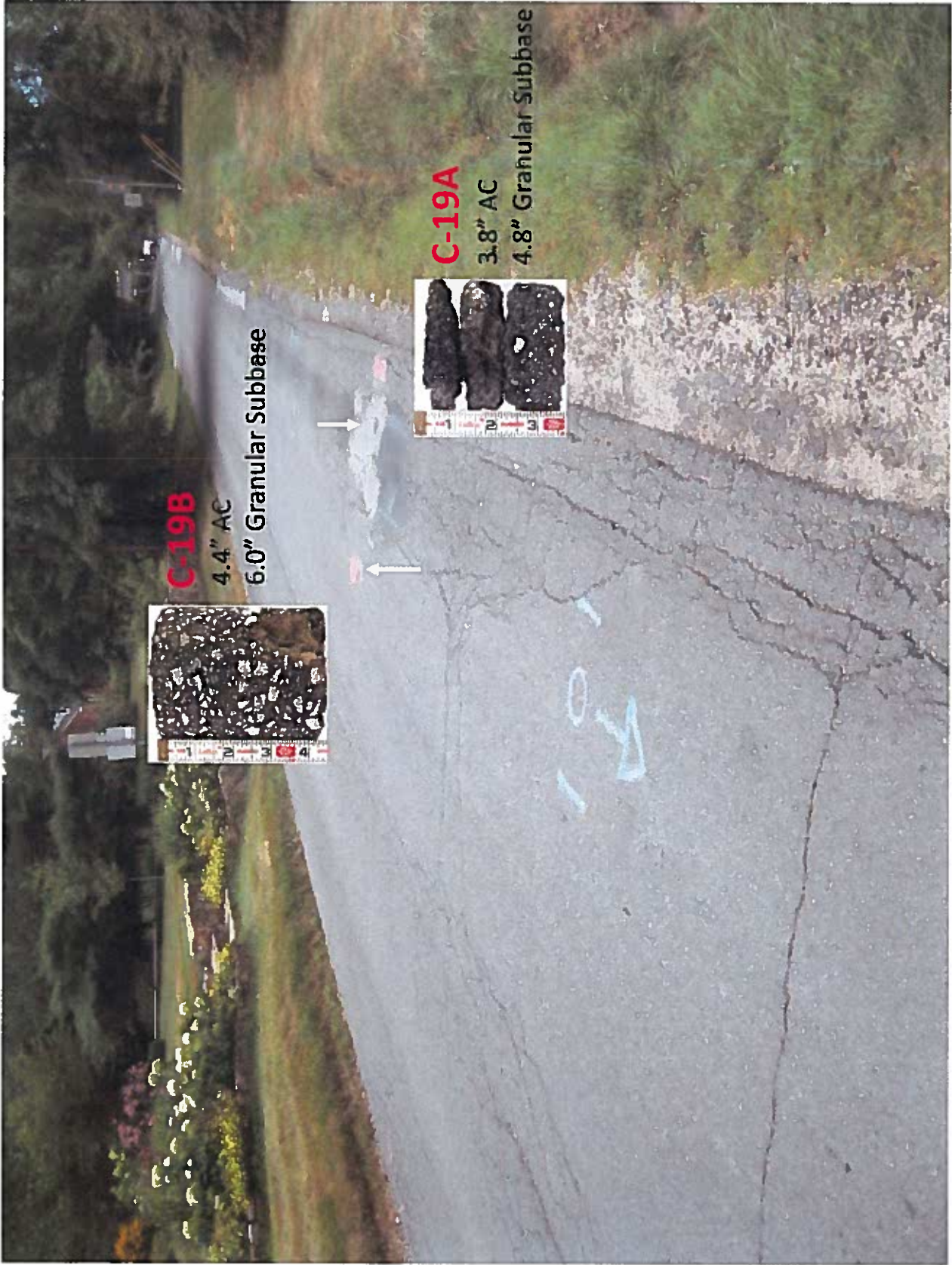
CB-17
5.0" AC
18.0" Granular Subbase





CB-18
3.1" AC
8.4" Granular Subbase





C-198

4.4" AC

6.0" Granular Subbase



C-19A

3.8" AC

4.8" Granular Subbase

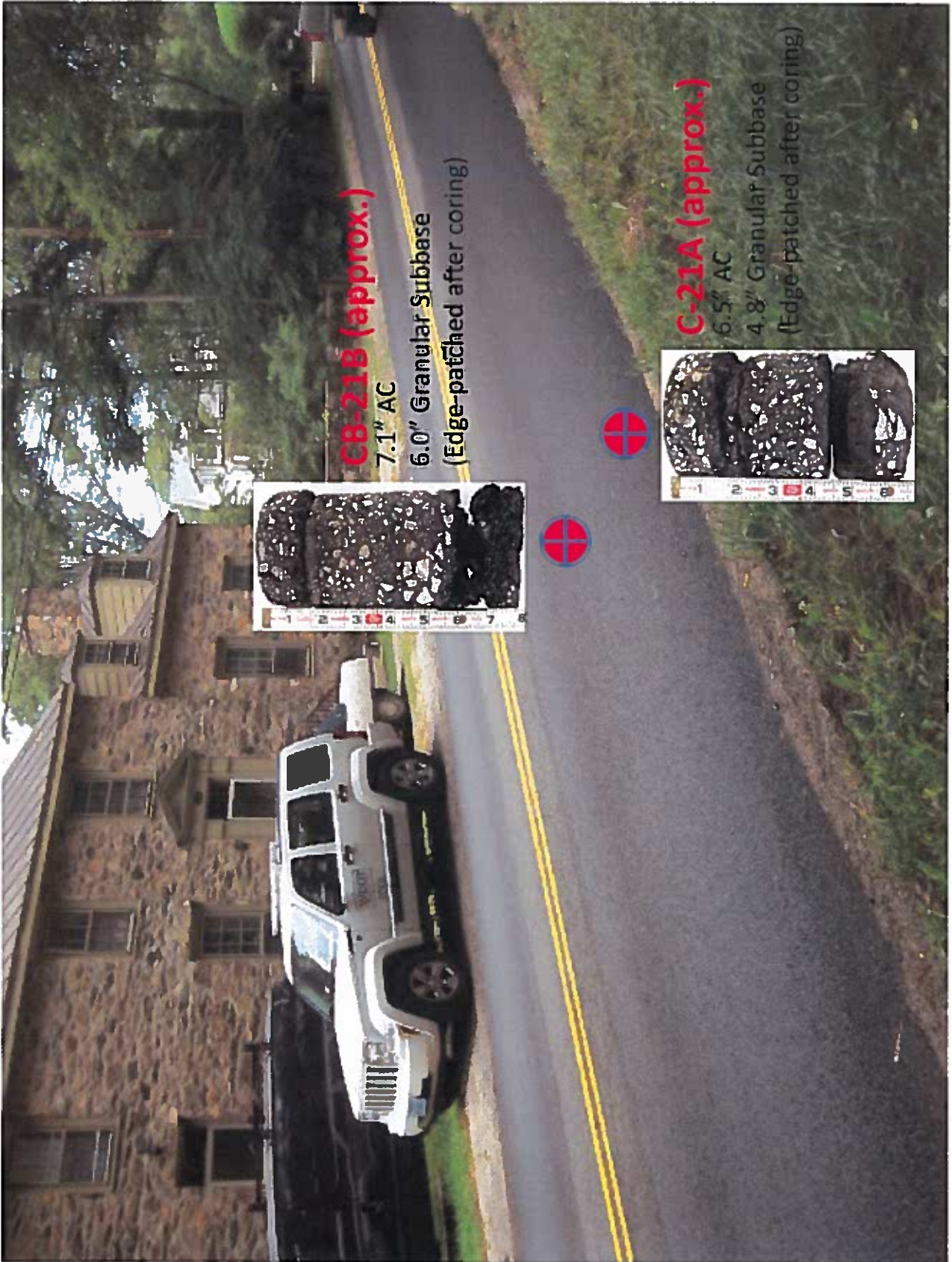




CB-20

4.3" AC

3.6" Granular Subbase



CB-21B (approx.)

7.1" AC

6.0" Granular Subbase

(Edge-patched after coring)



C-21A (approx.)

6.5" AC

4.8" Granular Subbase

(Edge-patched after coring)





PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-1
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA |
| 18 | 998 | 16 | 35 | 0.42 | | | | |
| 2 | 996 | 9 | 5 | 2.42 | | | | |
| 3 | 996 | 4 | 5 | 90 | | | | |
| 4 | 994 | 4 | 6 | 4.42 | | | | |
| 4 | 994 | 4 | 7 | 90 | | | | |
| 6 | | 12 | | 6.42 | | | | |

Date(s) Drilled: 6/20/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| LL | PI | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 5.0" Asphalt Concrete
 0.4 / 998.6
 Fill, Brown and black CLAYEY F-C SAND AND FINE GRAVEL FILL, dense, moist to wet (SC/GC)
 1.4 / 997.6
 Residual, Red brown LEAN CLAY with f-c sand, stiff, moist (CL)

 -- decrease in plasticity below 3.8'

| | | |
|--|--|------|
| | | 16.3 |
| | | 25.7 |
| | | 20.3 |

Boring Terminated at 6.4'



Pavement Profile:
 3.5" coarse surface/intermediate graded AC (4 layers)
 -- top layer (0.8" thick) is substantially stripped
 -- remaining three layers are completely stripped and friable. The 2nd (0.8" thick) and 4th (1.0" thick) layers disintegrated before or during coring.
 1.5" surface graded AC (1 layer)
 -- completely stripped with abundant binder
 NOTE: A vertical crack extends from the bottom of the AC thickness through all layers except the top coarse surface/intermediate layer.

REMARKS: Rig Type: CME 45C Skid Rig. Sample no. 2 was obtained from 2.0' to 6.4'.

PAGE 1 OF 1
 CB-1

SPT_LOG_WATERFORD_PVMT_INVESTIGATION.GPJ 8:30:004 021011 8/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-2
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/20/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

LIQUID LIMIT
 PLASTICITY INDEX
 MOISTURE CONTENT (%)

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

LL PI

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | STRATA LEGEND | |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|---------------|-------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | | DIP ° |
| | | | | | | | | | | |
| | | | | | | | | | | |
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0.0 / 999.0
 8.0" Asphalt Concrete

0.7 / 998.3
 Fill, Brown and black CLAYEY F-C SAND AND FINE GRAVEL FILL, medium dense, moist to wet (SC/GC)

1.7 / 997.3
 Residual, Brown SILTY F-C SAND, trace fine gravel, medium dense, moist (SM)

-- increase in gravel (quartz fragments) below 4.6'

17.0

12.1

21.8

Boring Terminated at 6.7'

Pavement Profile:
 1.3" coarse surface graded AC (1 layer)
 -- substantially stripped
 4.3" base graded AC (2 layers)
 -- upper layer (1.6" thick) is mildly stripped
 -- lower layer (2.7" thick) is mildly to moderately stripped with minor to moderate voids
 2.4" surface graded AC (1 or 2 layers)
 -- completely stripped. The lower 0.5" of the layer may represent asphalt coated sand/gravel from the layer below.

REMARKS: Rig Type: CME 45C Skid Rig. Sample no. 3 was obtained from 1.7' to 4.7'. Sample no. 4 was obtained from 4.7' to 6.7'.

PAGE 1 OF 1
 CB-2

SPT LOG WATERFORD PVMT INVESTIGATION.GPJ.8.30.004.D2.1011.8/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-3A
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | |
| | | | | | 0.42 | | | | |
| | | | | | 0.94 | | | | |

Date(s) Drilled: 6/20/16
 Drilling Method(s): 4" ID Pvmt Core/Hand Auger
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | 11.5 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 5.0" Asphalt Concrete
 0.4 / 998.6
 Fill, Dark brown to black F-C SAND FILL with fine gravel and clay, dense, moist to wet (SP/SC)
 0.8 / 998.2
 Residual, Dark brown SILTY F-C SAND, trace fine gravel, medium dense, wet (SM)
 Hand Auger Terminated at 0.9'



Pavement Profile:
 1.9" coarse surface graded AC (1 layer)
 – mildly stripped with moderate voids
 3.1" intermediate graded AC (1 layer)
 – mildly stripped with minor to moderate voids

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-3A

SPT LOG WATERFORD PAVT INVESTIGATION GP.1.8 30.004.021011.8/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-3B
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | |
| | 998 | 21 | | | 0.5 | | | | |
| | | 10 | | | | | | | |
| 2 | 997 | 5 | 60 | | | | | | |
| | | | | | 2.5 | | | | |



Date(s) Drilled: 6/21/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| | | |
|--------------|------------------|----------------------|
| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
| | | 17.5 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 6.0" Asphalt Concrete
 0.5 / 998.5
 Fill, Brown CLAYEY F-C SAND FILL with fine gravel, medium dense to dense, wet (SC)
 1.0 / 998.0
 Residual, Brown SILTY F-C SAND, trace fine gravel, medium dense, moist (SM)
 Boring Terminated at 2.5'

Pavement Profile:
 2.6" coarse surface graded AC (1 layer)
 - moderately stripped
 2.5" coarse surface/intermediate graded AC (1 layer)
 - moderately to substantially stripped
 0.9" surface graded AC (1 layer)
 - completely stripped. A vertical crack extends through the layer.

SPT LOG WATERFORD PVMT INVESTIGATION.GPJ.8.30.004.021011.8/15/16

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-3B

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-------------------|--------------------------|-------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | DIP ° | |
| | 998 | 27 | | 0.46 | | | | |
| | 2 | 39 | | | | | | |
| | | 15 | | | | | | |
| | 3 | 8 | | 2.46 | | | | |
| | 996 | 4 | | | | | | |
| | 4 | 6 | | | | | | |
| | | 6 | | | | | | |
| | 994 | 2 | | 4.46 | | | | |
| | | 3 | | | | | | |
| | 6 | 4 | | 100 | | | | |
| | | 4 | | | | | | |
| | | | | 6.46 | | | | |



Date(s) Drilled: 6/21/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 5.0" Asphalt Concrete

0.5 / 998.5
 Fill, Brown and black CLAYEY F-C SAND AND FINE GRAVEL FILL, very dense, moist to wet (SC/GC)

0.8 / 998.2
 Fill, Brown SILTY F-C SAND FILL, trace fine gravel, very dense to medium dense, moist (SM)

2.5 / 996.5
 Residual, Red brown LEAN CLAY with f-m sand, stiff, moist (CL)

-- firm below 4.5'

Boring Terminated at 6.5'

Pavement Profile:
 2.0" coarse surface graded AC (1 layer)
 -- mildly to moderately stripped
 1.5" intermediate graded AC (1 layer)
 -- completely stripped and friable with abundant binder
 1.5" surface graded AC (1 layer)
 -- completely stripped and friable with abundant binder

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| LL | PI | |
| | | 14.2 |
| | | 29.1 |
| | | 36.1 |

REMARKS: Rig Type: CME 45C Skid Rig.

SPT LOG WATERFORD PAVMT INVESTIGATION.GPJ.8.30.004.021011.8/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-5
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-------------------|--------------------------|-------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | DIP ° | |
| | 18 | | | 0.42 | | | | |
| | 10 | 75 | | | | | | |
| | 7 | | | | | | | |
| | 5 | | | 2.42 | | | | |
| | 3 | | | | | | | |
| | 2 | 80 | | | | | | |
| | 4 | | | 4.42 | | | | |
| | 6 | | | | | | | |
| | 994 | 11 | | 100 | | | | |
| | 16 | | | | | | | |
| | 6 | 22 | | 6.42 | | | | |

Date(s) Drilled: 6/21/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| LL | PI | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 5.0" Asphalt Concrete
 0.4 / 998.6
 Fill, Brown CLAYEY F-C SAND FILL with fine gravel, medium dense, moist (SC)
 1.2 / 997.8
 Fill, Brown SILTY F-C SAND FILL, trace fine gravel, medium dense, moist (SM)
 2.4 / 996.6
 Residual, Red brown LEAN CLAY, trace fine sand, firm, moist (CL)
 -- very stiff below 4.4'
 5.6 / 993.4
 Residual, Brown SILTY F-C SAND, trace fine gravel/rock fragments, medium dense, moist (SM)
 Boring Terminated at 6.4'

| | | |
|--|--|------|
| | | |
| | | 14.1 |
| | | 28.6 |
| | | 18.8 |



Pavement Profile:
 1.4" coarse surface graded AC (1 layer)
 -- completely stripped. A vertical crack extends through the layer. The layer partially disintegrated before or during coring.
 1.9" intermediate graded AC (1 layer)
 -- completely stripped. The layer partially disintegrated before or during coring.
 1.7" surface graded AC (1 layer)
 -- completely stripped and friable with abundant binder. At least one diagonal crack extends through the layer. The layer partially disintegrated before or during coring.

SPT LOG WATERFORD PAVT INVESTIGATION GP4.9 30.004 02:10:11 8/15/16

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 CB-5

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | |
| | | 12 | | | 0.3 | | | | |
| | 998 | 6 | 85 | | | | | | |
| 2 | 997 | 6 | | | 2.3 | | | | |

Date(s) Drilled: 6/21/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | 17.3 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 3.6" Asphalt Concrete
 0.3 / 998.7
 Fill, Dark brown CLAYEY F-C SAND FILL with fine gravel, medium dense, moist (SC)
 0.9 / 998.1
 Residual, Brown SILTY F-C SAND, medium dense, moist to wet (SM)
 Boring Terminated at 2.3'



Pavement Profile:
 0.8" coarse surface graded AC (1 layer)
 -- substantially stripped. A vertical crack extends through the layer. The layer disintegrated before or during coring.
 2.8" coarse surface/intermediate graded AC (2 layers)
 -- both layers are completely stripped with abundant binder. Both layers partially disintegrated before or during coring.

SPT LOG-WATERFORD PAVT INVESTIGATION GPJ.8 30.004 021011 8/15/16

REMARKS: Rig Type: CME 45C Skid Rig.



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-6B
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|-----------------|-------------------|--------------------------|--------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | |
| 998 | 16 | 9 | 80 | 0.62 | | | | |
| 997 | 8 | 9 | | 2.62 | | | | |



Date(s) Drilled: 6/21/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| | | |
|--------------|------------------|----------------------|
| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
| | | 16.6 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 7.5" Asphalt Concrete
 0.62 / 998.38
 Fill, Brown SILTY/CLAYEY F-C SAND FILL with fine gravel, medium dense, wet (SM/SC)
 1.3 / 997.7
 Fill, Brown SILTY F-C SAND FILL, trace fine gravel, medium dense, moist (SM)
 1.9 / 997.1
 Black ASPHALT PAVEMENT DEBRIS
 -- probable disintegrated pavement
 Boring Terminated at 2.6'

Pavement Profile:
 2.1" coarse surface graded AC (1 layer)
 -- mildly stripped with minor voids
 2.2" surface/coarse surface graded AC (1 layer)
 -- completely stripped. The upper 0.5" of the layer partially disintegrated before or during coring.
 3.2" intermediate/base graded AC (1 layer)
 -- moderately stripped with moderate voids

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-6B

SPT LOG WATERFORD PVMT INVESTIGATION.GPJ 8 30.004.021011 8/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-7A
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | |
|------------|----------------|--|-------------------|---------------|-------------------|--------------------------|--------|--------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | JOINTS | STRATA LEGEND |
| 8 | 998 | | | 0.55 | | | | | |
| 9 | | | | | | | | | |
| 2 | 997 | 6 | 55 | | | | | | |
| | | 6 | | 2.55 | | | | | |

Date(s) Drilled: 6/22/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | 6.1 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 6.1" Asphalt Concrete
 0.5 / 998.5
 +13.0" Crushed Aggregate

Boring Terminated at 2.6'; however, no sample recovery below 1.7'



Pavement Profile:
 1.0" coarse surface graded AC (1 layer)
 -- mildly stripped with minor voids. A vertical crack extends through the layer.
 5.1" coarse surface/intermediate graded AC (1 or 2 layers)
 -- mildly stripped
 -- lower 1.8" contains moderate voids

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-7A



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-7B
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/22/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | |
| 2 | 998 | 16 | | | 0.62 | | | | |
| | | 19 | | | | | | | |
| | 997 | 12 | 70 | | | | | | |
| | | 11 | | | 2.62 | | | | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 7.1" Asphalt Concrete
 0.6 / 998.4
 Fill, Dark brown and black SILTY F-C SAND FILL with fine gravel and asphalt pavement debris, dense, wet (SM)
 1.0 / 998.0
 Fill, Brown SILTY F-C SAND FILL with fine gravel, dense, moist to wet (SM)
 Boring Terminated at 2.6'

LIQUID LIMIT
 PLASTICITY INDEX
 MOISTURE CONTENT (%)

LL PI 8.3



Pavement Profile:
 2.6" coarse surface/intermediate graded AC (1 layer)
 -- mildly to moderately stripped
 2.9" intermediate graded AC (1 layer)
 -- moderately stripped
 0.8" surface graded AC (1 layer)
 -- substantially to completely stripped
 0.8" coarse surface graded AC (1 layer)
 -- substantially to completely stripped

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-7B



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-8A
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/24/16
 Drilling Method(s): 4" ID Pvmt Core/Hand Auger
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

LIQUID LIMIT
 PLASTICITY INDEX
 MOISTURE CONTENT (%)

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

LL PI
 20.4

0.0 / 999.0
 4.1" Asphalt Concrete
 0.3 / 998.7
 7.2" Crushed Aggregate
 - lower 4.1" is very fine (fine gravel and sand)
 0.9 / 998.1
 Residual, Grey brown F-C SANDY SILT, trace fine gravel, stiff, moist to wet (ML)
 Boring Terminated at 0.9'

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | |
| | | | | | 0.34 | | | |
| | | | | | 0.94 | | | |



Pavement Profile:
 4.1" coarse surface graded AC (2 layers)
 - upper layer (2.5" thick) contains minor to moderate voids
 - lower layer (1.6" thick) is substantially to completely stripped.
 At least one vertical crack extends through the layer. The layer partially disintegrated before or during coring.

SPT_LOG WATERFORD PVMT INVESTIGATION.GPJ.8 30 004:0210:11 8/15/16

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-8A



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-8B

PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/22/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

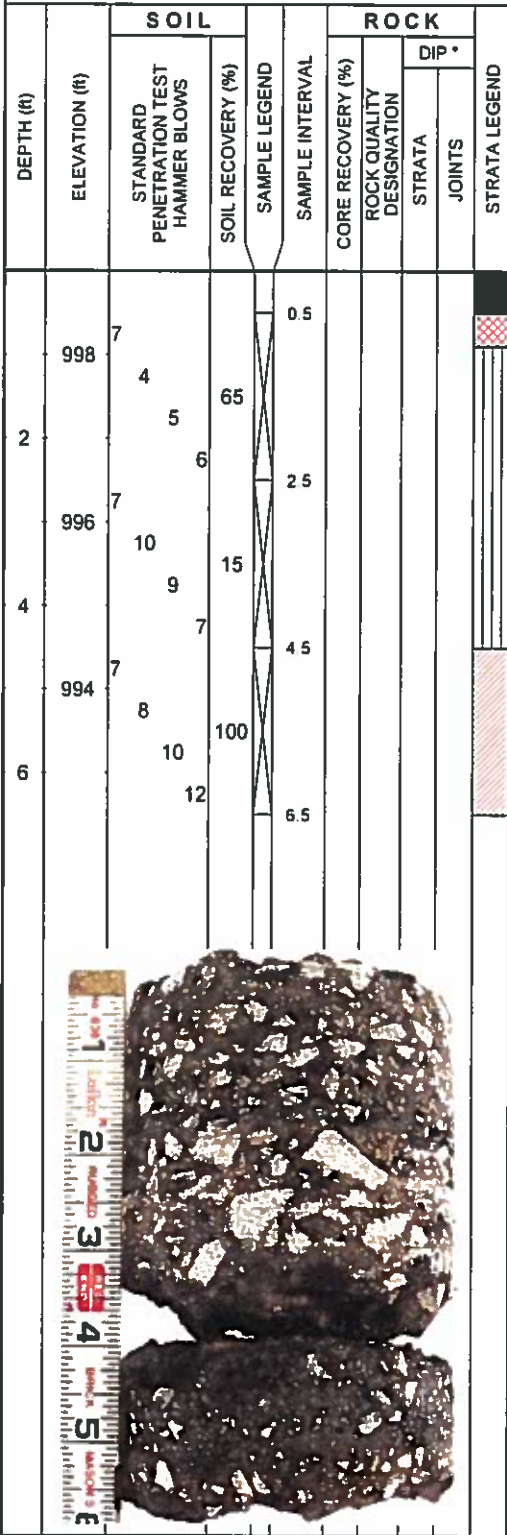
LAB DATA

LIQUID LIMIT
 PLASTICITY INDEX
 MOISTURE CONTENT (%)

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

LL PI



0.0 / 999.0
 5.8" Asphalt Concrete
 0.5 / 998.5
 Fill, Brown SILTY F-C SAND AND FINE GRAVEL FILL, medium dense, moist (SM)
 0.9 / 998.1
 Residual, Grey brown F-C SANDY SILT, trace fine gravel, stiff, moist (ML)
 -- very stiff below 2.5'

4.5 / 994.5
 Residual, Brown F-M SANDY LEAN CLAY, very stiff, moist (CL)

Boring Terminated at 6.5'

20.1
 19.1
 16.3



Pavement Profile:
 1.8" coarse surface graded AC (1 layer)
 -- mildly stripped with minor voids. A diagonal crack extends through the layer.
 2.5" intermediate graded AC (1 layer)
 -- moderately to substantially stripped
 -- the lower 0.8" of the layer is completely stripped and it partially disintegrated before or during coring. The lower 0.8" may represent a layer of coarse-graded surface treatment (tar and chip)
 1.5" surface graded AC (1 layer)
 -- completely stripped

REMARKS: Rig Type: CME 45C Skid Rig. Sample no. 6 was obtained from 0.9' to 4.5'.

PAGE 1 OF 1

CB-8B

SPT_LOG WATERFORD PVMT INVESTIGATION.GPJ.8 30.004 021011 8/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-9
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA |
| 2 | 998.11 | 11 | 75 | | 0.62 | | | |
| | 997.4 | 4 | 4 | | 2.62 | | | |

Date(s) Drilled: 6/22/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| LL | PI | 18.0 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

- 0.0 / 999.0
7.5" Asphalt Concrete
- 0.6 / 998.4
Fill, Grey brown SILTY F-C SAND FILL with fine gravel, medium dense, moist (SM)
- 1.1 / 997.9
Fill, Brown CLAYEY F-C SAND FILL, trace fine gravel, medium dense, moist (SC)
- 1.7 / 997.3
Residual, Brown SILTY F-C SAND, trace fine gravel, medium dense, moist (SM)

Boring Terminated at 2.6'



Pavement Profile:
 3.2" coarse surface graded AC (2 layers)
 -- upper layer (1.8" thick) is substantially stripped
 -- lower layer (1.4" thick) is moderately stripped. The bottom of the layer is angled such that it varies from 1.0" thick to 2.0" thick across the core.
 1.5" intermediate graded AC (1 layer)
 -- mildly stripped with numerous voids
 1.2" surface graded AC (2 layers)
 -- completely stripped
 1.6" intermediate/base graded AC (1 layer)
 -- completely stripped. The layer disintegrated before or during coring.

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-9



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-10
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|--------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | JOINTS |
| | | | | | | | | | |
| | 998 | 13 | | | 0.5 | | | | |
| | | 13 | | | | | | | |
| 2 | 997 | 8 | 75 | | | | | | |
| | | 5 | | | 2.5 | | | | |

Date(s) Drilled: 6/22/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | 12.3 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 5.9" Asphalt Concrete
 0.5 / 998.5
 Fill, Dark brown to black SILTY F-C SAND FILL with fine gravel and asphalt pavement debris, medium dense, moist (SM)
 -- no AC pavement debris below 0.9'
 1.6 / 997.4
 Residual, Brown CLAYEY/SILTY F-C SAND, trace fine gravel/quartz fragments, medium dense, moist (SC/SM)
 Boring Terminated at 2.5'



Pavement Profile:
 5.9" coarse surface graded AC (2 layers)
 -- upper layer (1.6" thick) is mildly to moderately stripped
 -- lower layer (4.3" thick) is mildly to moderately stripped

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-10



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-11

PAGE 1 OF 1

STATION: _____
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET: _____
 LONGITUDE: _____
 COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|--------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | JOINTS |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |



Date(s) Drilled: 6/22/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s): _____
 Driller: C. Haines
 Logger: J. Quinlan

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| LL | PI | |

FIELD DESCRIPTION OF STRATA

| | | |
|---|--|------|
| 0.0 / 999.0 7.3" Asphalt Concrete | | |
| 0.6 / 998.4 Fill, Brown SILTY/CLAYEY F-C SAND FILL with fine gravel, dense, moist to wet (SM/SC) | | 6.8 |
| 1.8 / 997.2 Fill, Dark brown SILTY F-C SAND FILL, trace fine gravel, medium dense, dry (SM) | | |
| 2.6 / 996.4 Residual, Brown LEAN CLAY with f-m sand, slightly micaceous, firm, moist (CL) | | 23.1 |
| 5.0 / 994.0 Residual, Brown SILTY/CLAYEY F-C SAND, trace fine gravel, loose, moist (SM-SC) | | 19.0 |
| Boring Terminated at 6.6' | | |

Pavement Profile:

- 2.3" coarse surface graded AC (1 layer)
 -- moderately stripped
- 1.5" intermediate graded AC (1 layer)
 -- moderately stripped with minor voids
- 2.2" surface/coarse surface graded AC (3 layers)
 -- upper layer (0.5" thick) is completely stripped and friable
 -- middle layer (0.9" thick) is completely stripped and friable with abundant binder
 -- lower layer (0.8" thick) is completely stripped and friable with abundant binder. The layer resembles cold-patch AC pavement.
- NOTE: All three layers partially disintegrated before or during coring.
- 1.3" intermediate/base graded AC (1 layer)
 -- completely stripped and friable
- NOTE: At least one vertical crack extends through the entire AC pavement thickness. All layers partially or completely disintegrated before or during coring.

REMARKS: Rig Type: CME 45C Skid Rig. Sample no. 1 was obtained from 2.6' to 5.0'.

PAGE 1 OF 1

CB-11

SPT LOG WATERFORD PAVEMENT INVESTIGATION.GPJ 8 30 004 021011 8/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-12

PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/24/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

LIQUID LIMIT
 PLASTICITY INDEX
 MOISTURE CONTENT (%)

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | |
| 0.0 | 999.0 | | | | 0.5 | | | |
| 0.5 | 998.5 | | | | | | | |
| 0.8 | 998.2 | | | | | | | |
| 2.5 | 996.5 | | | | 2.5 | | | |
| 4.5 | 994.5 | | | | 4.5 | | | |
| 6.5 | | | | | 6.5 | | | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 6.0" Asphalt Concrete

0.5 / 998.5
 Fill, Brown and grey SILTY F-C SAND FILL mixed with f-c crushed aggregate, medium dense, moist to wet (SM)

0.8 / 998.2
 Fill, Brown LEAN CLAY FILL with f-m sand, stiff, moist (CL)

2.5 / 996.5
 Fill, Brown to grey brown SILTY F-C SAND FILL, trace fine rock fragments, slightly micaceous, medium dense, moist (SM)

4.5 / 994.5
 Fill, Dark grey green LEAN CLAY FILL with f-m sand, trace organics (rootlets), moderate organic odor, firm, moist (CL)

Boring Terminated at 6.5'

LL PI

21.9

17.2

25.7



Pavement Profile:
 NOTE: The AC pavement disintegrated before or during coring. Pieces retrieved range from surface to base graded. All are completely stripped and friable.

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1

CB-12



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-13A

PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/30/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | |
| 0 | 999.0 | | | | 0.5 | | | |
| 1.9 | 998.8 | 14 | 65 | | | | | |
| 2.0 | 998.8 | 9 | 6 | | 2.5 | | | |
| 4.0 | 996.0 | 5 | 8 | | 4.5 | | | |
| 4.0 | 996.0 | 8 | 90 | | | | | |
| 6.0 | 994.0 | 15 | 11 | | 4.5 | | | |
| 6.0 | 994.0 | 15 | 65 | | | | | |
| 6.5 | 993.5 | 15 | 6.5 | | | | | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 1.9" Asphalt Concrete
 0.2 / 998.8
 Fill, Brown and grey CLAYEY F-C SAND AND F-C GRAVEL FILL, medium dense, moist to wet (SC/GC)
 1.0 / 998.0
 Residual, Grey brown SILTY F-C SAND, trace fine gravel/rock fragments, medium dense, moist (SM)
 -- dense below 4.5'

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| LL | PI | |

14.6

10.7

9.4

Boring Terminated at 6.5'



Pavement Profile:
 0.9" coarse surface graded AC (1 layer)
 - mildly stripped with moderate voids
 1.0" surface graded AC (1 layer)
 - substantially stripped
 NOTE: A vertical crack extends through the entire AC pavement thickness.

REMARKS: Rig Type: CME 45C Skid Rig. Sample no. 5 was obtained from 1.0' to 6.5'.

PAGE 1 OF 1

CB-13A

SPT_LOG WATERFORD PAVT INVESTIGATION GPJ 8 30 004 021011 0/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-13B

PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | |
| | 998 | 6 | | | 0.5 | | | | |
| | 997 | 7 | 75 | | 2.5 | | | | |

Date(s) Drilled: 6/30/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| | | |
|--------------|------------------|----------------------|
| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
| | | 13.6 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 6.0" Asphalt Concrete

0.5 / 998.5
 Fill, Brown and grey CLAYEY F-C SAND AND F-C GRAVEL FILL, medium dense, moist to wet (SC/GC)

1.0 / 998.0
 Residual, Brown SILTY F-C SAND with f-c rock fragments, medium dense, moist (SM)

Boring Terminated at 2.5'



Pavement Profile:
 1.6" coarse surface graded AC (1 layer)
 -- mildly to moderately stripped
 1.6" coarse surface/intermediate graded AC (1 layer)
 -- mildly stripped with numerous voids
 2.8" base graded AC (1 layer?)
 NOTE: The layer completely disintegrated before or during coring. Pieces retrieved are completely stripped and friable.

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 C-13B

SPT_LOG WATERFORD PVMT INVESTIGATION GPJ 8 30.004 021011 8/15/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-14
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

LAB DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | |
| 0.0 | 999.0 | | | | 0.5 | | | |
| 2.0 | 998.0 | 21 | 70 | | 2.5 | | | |
| 4.0 | 996.0 | 21 | 90 | | 4.5 | | | |
| 6.0 | 994.0 | 32 | 100 | | 5.5 | | | |

Date(s) Drilled: 6/30/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 6.0" Asphalt Concrete

0.5 / 998.5
 Fill, Grey and tan SILTY F-C SAND AND FINE GRAVEL FILL, loose to medium dense, moist (SM/GM)

0.7 / 998.3
 Fill, Brown F-C SANDY SILT FILL with fine gravel, very stiff, moist (ML)

1.2 / 997.8
 Residual, Light brown SILTY F-C SAND, trace fine rock fragments, very dense, dry (SM)

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| LL | PI | |
| | | 5.6 |
| | | 3.2 |
| | | 5.1 |

Boring Terminated at 5.5'



Pavement Profile:
 1.5" coarse surface graded AC (1 layer)
 – moderately to substantially stripped. Two vertical cracks extend through the layer. The layer partially disintegrated before or during coring.
 1.6" base graded AC (1 layer)
 – completely stripped. The layer partially disintegrated before or during coring.
 2.9" coarse surface graded AC (1 or 2 layers)
 – completely stripped and friable with abundant binder. The layer partially disintegrated before or during coring.

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 CB-14

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|-------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | DIP ° |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | | | | | |

Date(s) Drilled: 6/24/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

| Liquid Limit | Plasticity Index | Moisture Content (%) |
|--------------|------------------|----------------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 4.1" Asphalt Concrete

0.4 / 998.6
 Fill, Brown SILTY F-C SAND FILL with fine gravel, loose, moist (SM)

0.9 / 998.1
 Residual, Brown SILTY F-C SAND, trace fine gravel, loose, moist (SM)

-- decrease in sand content/size below 4.4'

Boring Terminated at 6.4'

Pavement Profile:
 0.5" surface graded AC (1 layer)
 -- mildly to moderately stripped
 3.6" intermediate graded AC (3 layers?)
 -- all layers are completely stripped
 -- lower 2.5" (lower 2 layers?) contain numerous voids and a few pieces of uncoated, coarse crushed aggregate.



SPT LOG WATERFORD PVMT INVESTIGATION GPJ 8 30.004 021011.8/15/16

REMARKS: Rig Type: CME 45C Skid Rig. Sample no. 7 was obtained from 1.0' to 6.4'.



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-16
 PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | |
| | | | | | | | | | |
| | 998 | 4 | | | 0.5 | | | | |
| | | 3 | | | | | | | |
| 2 | | 8 | 90 | | | | | | |
| | | 7 | | | | | | | |
| | 996 | 3 | | | 2.5 | | | | |
| | | 3 | | | | | | | |
| 4 | | 4 | 100 | | | | | | |
| | | 5 | | | | | | | |
| | 994 | 4 | | | 4.5 | | | | |
| | | 7 | | | | | | | |
| | | 7 | 90 | | | | | | |
| 6 | | 8 | | | 6.5 | | | | |



Date(s) Drilled: 6/24/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | |
| LL | PI | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 6.0" ASphalt Concrete
 0.5 / 998.5
 Fill, Brown and black SILTY F-C SAND AND F-C GRAVEL FILL with fine asphalt pavement debris, loose, moist to wet (SM/GM)
 1.0 / 998.0
 Residual, Brown SILTY F-C SAND, trace fine gravel, medium dense, moist (SM)
 2.5 / 996.5
 Residual, Brown SILTY F-C SAND, trace fine gravel, loose, moist (SM)
 - decrease in sand content/size, medium dense below 4.5'

Boring Terminated at 6.5'

Pavement Profile:
 0.8" intermediate graded AC (1 layer)
 - substantially to completely stripped
 NOTE: The remaining AC pavement thickness disintegrated before or during coring. Pieces retrieved are base graded, completely stripped, and friable.

| | | |
|--|--|------|
| | | 10.0 |
| | | 22.5 |
| | | 14.5 |

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1
 CB-16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-17
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | |
| 0 | 999.0 | 13 | 0.5 | | | | | |
| 2 | 998.6 | 13 | 50 | | | | | |
| | | 11 | | | | | | |
| | | 12 | | | | | | |
| 4 | 996.6 | 6 | 2.5 | | | | | |
| | | 13 | | | | | | |
| | | 13 | 40 | | | | | |
| | | 16 | | | | | | |
| 6 | 994.4 | 12 | 4.5 | | | | | |
| | | 36 | | | | | | |
| | | 46 | 85 | | | | | |
| | | 31 | | | | | | |
| | | | 6.5 | | | | | |

Date(s) Drilled: 7/19/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| LL | PI | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 5.0" Asphalt Concrete

0.4 / 998.6
 Fill, Brown SILTY F-C SAND FILL with fine gravel, medium dense, moist to dry (SM) 5.4

1.9 / 997.1
 Residual, Brown SILTY F-C SAND with f-c rock fragments, medium dense, moist to dry (SM) 6.2

-- light brown to tan, very dense below 4.5'

3.3

Boring Terminated at 6.5'



Pavement Profile:
 1.5" coarse surface graded AC (1 layer)
 – substantially to completely stripped. A vertical crack extends through the layer. The layer partially disintegrated before or during coring.
 2.2" intermediate graded AC (1 layer)
 – substantially stripped with moderate voids. The upper 0.5" partially disintegrated before or during coring.
 1.3" coarse surface graded AC (1 layer)
 – substantially stripped with minor voids. A vertical crack extends through the layer.

REMARKS: Rig Type: CME 45B Truck Rig.

PAGE 1 OF 1
 CB-17

SPT_LOG_WATERFORD_PVMT_INVESTIGATION_GPJ_8_30_004_021011_0715/16



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-18

PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 6/30/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

LIQUID LIMIT
 PLASTICITY INDEX
 MOISTURE CONTENT (%)

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 3.1" Asphalt Concrete
 0.3 / 998.7
 Fill, Grey and brown CLAYEY F-C GRAVEL FILL with sand,
 dense, moist to wet (GC)
 -- decrease in fines below 0.7'
 1.0 / 998.0
 Residual, Brown SILTY F-C SAND, trace fine gravel, dense,
 moist to dry (SM)
 -- with f-c quartz fragments, medium dense below 2.4'
 4.4 / 994.6
 Residual, Brown CLAYEY F-C SAND, trace fine gravel, medium
 dense, moist (SC)

Boring Terminated at 6.4'

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | |
| 14 | 998 | 55 | 0.42 | | | | | |
| 18 | 996 | 16 | 2.42 | | | | | |
| 2 | 994 | 7 | 6.42 | | | | | |
| 4 | | 5 | | | | | | |
| 5 | | 6 | | | | | | |
| 6 | | 7 | | | | | | |

SPT LOG WATERFORD PAVT INVESTIGATION GPJ.B 30.004 021011 8/15/16



Pavement Profile:
 1.3" coarse surface graded AC (1 layer)
 -- moderately to substantially stripped
 1.8" surface/coarse surface graded AC (1 layer)
 -- substantially to completely stripped
 NOTE: At least one vertical crack extends through the entire AC pavement thickness. Both layers partially disintegrated before or during coring.

REMARKS: Rig Type: CME 45C Skid Rig.

PAGE 1 OF 1

CB-18



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-19A

PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 7/20/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

LIQUID LIMIT
 PLASTICITY INDEX
 MOISTURE CONTENT (%)

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

LL PI

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|--------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | JOINTS |
| 9 | 998 | 7 | 40 | | 0.4 | | | | |
| 2 | 997 | 9 | 7 | | 2.4 | | | | |

0.0 / 999.0
 3.8" Asphalt Concrete
 0.3 / 998.7
 Fill, Brown CLAYEY F-C SAND AND F-C GRAVEL FILL, medium dense, wet (SC/GC)
 0.7 / 998.3
 Possible fill, Brown F-C SANDY SILT FILL, trace fine gravel, very stiff, moist (ML)
 Boring Terminated at 2.4'

19.1



Pavement Profile:
 0.8" surface graded AC (1 layer)
 -- moderately to completely stripped. The layer appears to be a combination of old surface AC and more recent cold-patch AC. The cold-patch portion contains abundant binder. At least two vertical cracks extend through the layer.
 1.0" intermediate/base graded AC (1 layer)
 -- completely stripped. At least one vertical crack extends through the layer. The layer partially disintegrated before or during coring.
 2.0" surface/coarse surface graded AC (1 layer)
 -- completely stripped. At least one vertical crack extends through the layer. The layer partially disintegrated before or during coring.

SPT_LOG WATERFORD PAVT INVESTIGATION GPFJ.8.30.004.021011.8/15/16

REMARKS: Rig Type: CME 45B Truck Rig.

PAGE 1 OF 1

C-19A



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-19B

PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft

OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | | |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|--------|--------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | JOINTS |
| | 998.9 | 9 | | | 0.38 | | | | |
| | 997.2 | 12 | 65 | | 2.38 | | | | |

Date(s) Drilled: 7/20/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | 6.8 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 4.4" Asphalt Concrete
 0.4 / 998.6
 Fill, Dark brown to black CLAYEY F-C SAND AND F-C GRAVEL FILL mixed with asphalt pavement debris, medium dense, moist to wet (SC/GC)
 0.9 / 998.1
 Residual, Light brown SILTY F-C SAND, trace fine rock fragments, medium dense, moist (SM)
 Boring Terminated at 2.4'



Pavement Profile:
 2.1" coarse surface graded AC (2 layers)
 - upper layer (1.4" thick) contains minor voids
 - lower layer (0.7" thick) is moderately to substantially stripped
 2.3" intermediate graded AC (1 layer)
 - mildly stripped with minor to moderate voids. One side of the core contains a large piece of soil that is incorporated into the layer.

REMARKS: Rig Type: CME 45B Truck Rig.

PAGE 1 OF 1

C-19B



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-20
PAGE 1 OF 1

STATION:
 LATITUDE: 36.999990° N
 SURFACE ELEVATION: 999.0 ft
 OFFSET:
 LONGITUDE:
 COORD. DATUM: NAD 83

FIELD DATA

Date(s) Drilled: 7/19/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

| DEPTH (ft) | ELEVATION (ft) | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | STRATA | JOINTS | STRATA LEGEND | DESCRIPTION | LL | PI | MOISTURE CONTENT (%) |
|------------|----------------|--|-------------------|-----------------|-------------------|--------------------------|--------|--------|---------------|---|----|----|----------------------|
| | | | | | | | | | | 0.0 / 999.0 4.3" Asphalt Concrete | | | |
| | | | | | | | | | | 0.4 / 998.6 Fill, Brown grey SILTY F-C SAND AND FINE GRAVEL FILL, medium dense, wet (SM/GM) | | | 20.7 |
| 2 | 998 | 11 | 70 | 2.35 | | | | | | 0.7 / 998.3 Residual, Brown and orange brown FINE SANDY SILT, slightly micaceous, very stiff, moist (ML) -- increase in sand content/size, stiff below 2.4' | | | 14.0 |
| 4 | 996 | 5 | 75 | 4.35 | | | | | | -- with fine, friable rock fragments and thin, black oxide stringers, with moderate schistosity, very stiff below 4.4' | | | 9.1 |
| 6 | 994 | 8 | 70 | 6.35 | | | | | | Boring Terminated at 6.4' | | | |



Pavement Profile:
 1.5" coarse surface graded AC (1 layer)
 -- mildly stripped
 2.0" surface graded AC (2 layers)
 -- upper layer (0.6" thick) is completely stripped, friable, and with abundant binder. The layer disintegrated before or during coring.
 -- lower layer (1.4" thick) is completely stripped.
 0.8" base graded AC (1 layer)
 -- completely stripped

REMARKS: Rig Type: CME 45B Truck Rig.

PAGE 1 OF 1
CB-20



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

C-21A
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | |
| | | | | | | | | |
| | 998 | 5 | | | 0.56 | | | |
| | | 5 | | | | | | |
| 2 | 997 | 4 | 85 | | | | | |
| | | 5 | | | 2.55 | | | |



Date(s) Drilled: 7/19/16
 Drilling Method(s): 4" ID Pvmt Core/Split-Spoon
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | 22.2 |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 6.5" Asphalt Concrete
 0.6 / 998.4
 Fill, Dark brown and black SILTY F-C SAND AND FINE GRAVEL
 FILL with f-c asphalt pavement debris, loose, wet (SM/GM)
 1.0 / 998.0
 Residual, Dark brown LEAN CLAY with f-c sand, stiff, moist (CL)

Boring Terminated at 2.6'

Pavement Profile:
 1.5" coarse surface graded AC (1 layer)
 -- mildly stripped with minor to moderate voids
 0.5" surface graded AC (1 layer)
 -- mildly to moderately stripped
 2.2" coarse surface graded AC (1 layer)
 -- mildly to moderately stripped
 0.5" surface graded AC (1 layer)
 -- completely stripped with abundant binder. The layer partially disintegrated before or during coring.
 1.8" intermediate graded AC (1 layer)
 -- completely stripped. The layer partially disintegrated before or during coring.

REMARKS: Rig Type: CME 45B Truck Rig.

PAGE 1 OF 1
 C-21A



PROJECT #: Waterford Pavement Investigation
 LOCATION: LOUDOUN COUNTY
 STRUCTURE: PAVEMENT

CB-21B
 PAGE 1 OF 1

STATION: OFFSET:
 LATITUDE: 36.999990° N LONGITUDE:
 SURFACE ELEVATION: 999.0 ft COORD. DATUM: NAD 83

FIELD DATA

| DEPTH (ft) | ELEVATION (ft) | SOIL | | | ROCK | | | STRATA LEGEND |
|------------|----------------|--|-------------------|---------------|-----------------|-------------------|--------------------------|---------------|
| | | STANDARD PENETRATION TEST HAMMER BLOWS | SOIL RECOVERY (%) | SAMPLE LEGEND | SAMPLE INTERVAL | CORE RECOVERY (%) | ROCK QUALITY DESIGNATION | |
| 0.0 | 999.0 | | | | 0.58 | | | |
| 0.6 | 998.4 | | | | | | | |
| 0.8 | 998.2 | 18 | 75 | | | | | |
| 1.1 | 997.9 | 9 | | | 2.58 | | | |
| 1.5 | 997.5 | 8 | | | | | | |
| 2.0 | 997.0 | 5 | | | | | | |
| 2.6 | 996.4 | 3 | | | | | | |
| 3.4 | 995.6 | 3 | | | | | | |
| 4.0 | 995.0 | 4 | | | | | | |
| 4.6 | 994.4 | 4 | | | | | | |
| 4.58 | 994.4 | 3 | | | | | | |
| 5.0 | 994.0 | 5 | | | | | | |
| 5.6 | 993.4 | 6 | | | | | | |
| 6.0 | 993.0 | 6 | | | 6.58 | | | |



Date(s) Drilled: 7/19/16
 Drilling Method(s): 2.25" HSA
 SPT Method: Automatic Hammer
 Other Test(s):
 Driller: C. Haines
 Logger: J. Quinlan

LAB DATA

| LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT (%) |
|--------------|------------------|----------------------|
| | | |

GROUND WATER
 NOT ENCOUNTERED DURING DRILLING
 NO LONG TERM MEASUREMENTS TAKEN

FIELD DESCRIPTION OF STRATA

0.0 / 999.0
 7.1" Asphalt Concrete

0.6 / 998.4
 Fill, Brown to light brown SILTY/CLAYEY F-C SAND FILL with fine gravel, medium dense, wet (SM/SC)

1.1 / 997.9
 Residual, Brown to orange brown CLAYEY F-C SAND, trace fine gravel, medium dense, moist (SC)
 -- loose below 2.6'

3.4 / 995.6
 Residual, Red brown LEAN CLAY with f-m sand, firm, moist (CL)
 -- stiff below 4.6'

-- brown to tan, decrease in plasticity, with fine, friable rock fragments and mild foliation below 5.6'

| LL | PI | MOISTURE CONTENT (%) |
|----|----|----------------------|
| | | |
| | | 15.1 |
| | | 25.2 |
| | | 22.7 |

Boring Terminated at 6.6'

Pavement Profile:
 1.5" coarse surface graded AC (1 layer)
 0.3" surface graded AC (1 layer)
 -- substantially stripped
 2.1" coarse surface graded AC (1 layer)
 -- substantially stripped
 1.8" base graded AC (1 layer)
 -- substantially to completely stripped with abundant binder
 1.4" surface graded AC (1 layer)
 -- completely stripped and friable with abundant binder. The material resembles cold patch AC. The layer partially disintegrated before or during coring.

SPT_LOG WATERFORD PVMT INVESTIGATION.GPJ.8.30.004.021011.8/15/16

REMARKS: Rig Type: CME 45B Truck Rig.

PAGE 1 OF 1
 CB-21B

Summary of Soil Laboratory Test Data

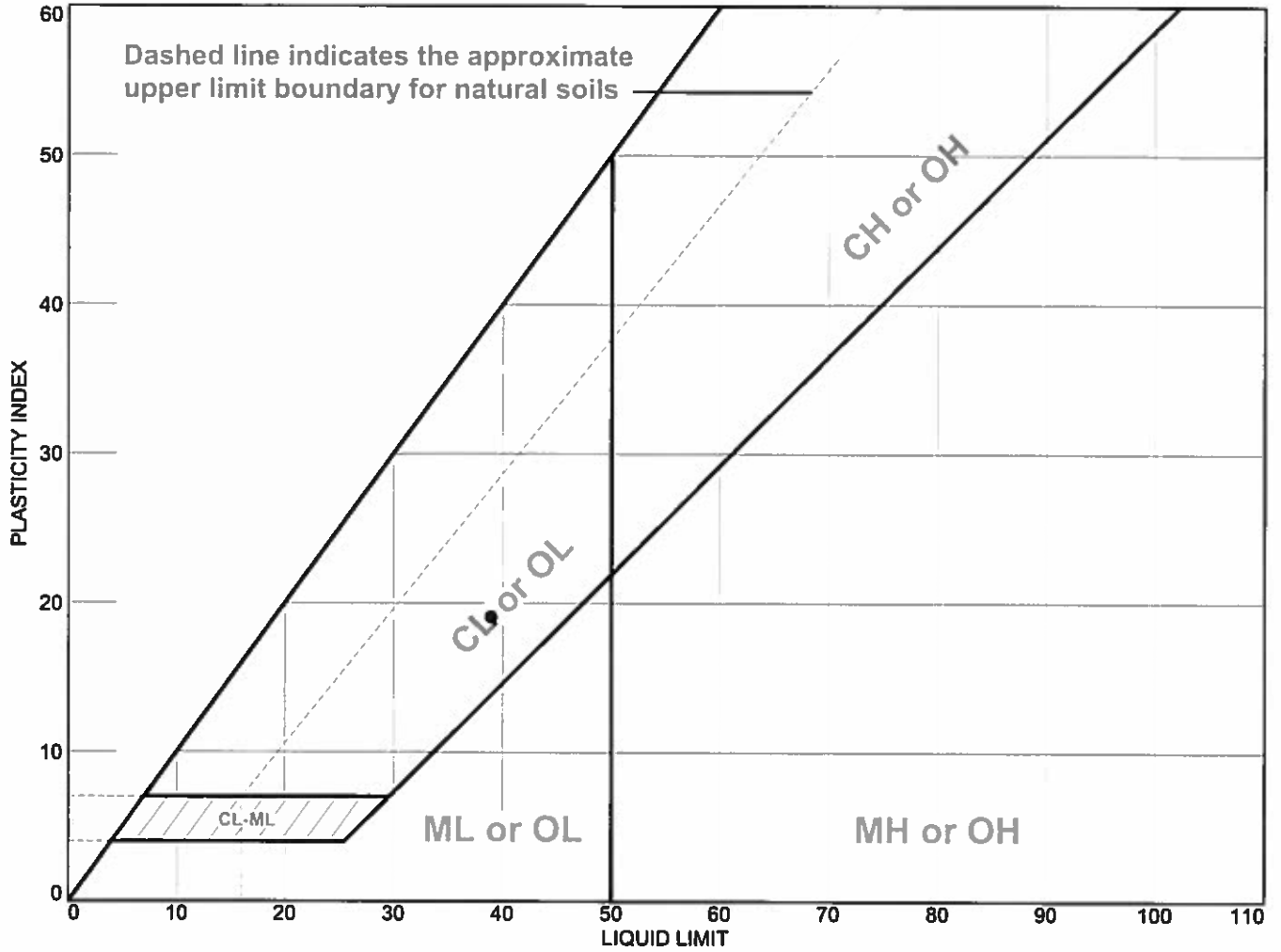
Waterford Pavement Investigation
 Project No. 100418
 UPC No. 100418

| Sample No. | Boring | Depth | Laboratory Soil Description | USCS Class. | % Retained on No. 4 Sieve | % Finer than No. 200 Sieve | MDD (pcf) | OMC (%) | Corr. MDD (pcf) | Corr. OMC (%) | Atterberg Limits | | | CBR (VTM-8) | Swell (%) |
|------------|--------|--------------|---|-------------|---------------------------|----------------------------|-----------|---------|-----------------|---------------|------------------|----|----|-------------|-----------|
| | | | | | | | | | | | LL | PL | PI | | |
| 1 | CB-11 | 2.6' to 5.0' | Brown LEAN CLAY with f-m sand, slightly micaceous | CL | 0.0 | 76.7 | 104.9 | 21.2 | NCR | NCR | 39 | 20 | 19 | 6.0 | 0.7 |
| 2 | CB-11 | 2.0' to 6.4' | Red brown LEAN CLAY with f-c sand | CL | 2.0 | 82.6 | | | | | 39 | 24 | 15 | | |
| 3 | CB-2 | 1.7' to 4.7' | Brown SILTY F-C SAND, trace fine gravel | SM | 9.0 | 44.9 | 121.3 | 12.0 | NCR | NCR | NP | NP | NP | 12.0 | 0.5 |
| 4 | CB-2 | 4.7' to 6.7' | Brown CLAYEY F-C SAND, trace fine gravel | SC | 15.5 | 46.8 | | | | | 31 | 20 | 11 | | |
| 5 | CB-13A | 1.0' to 6.5' | Grey brown SILTY F-C SAND, trace fine gravel | SM | 7.5 | 44.2 | 121.1 | 11.8 | NCR | NCR | NP | NP | NP | 11.4 | 0.5 |
| 6 | CB-9A | 0.9' to 4.5' | Grey brown F-C SANDY SILT, trace fine gravel | ML | 6.0 | 54.1 | | | | | 31 | 24 | 7 | | |
| 7 | CB-15 | 1.0' to 6.4' | Brown SILTY F-C SAND, trace fine gravel | SM | 9.9 | 40.0 | 118.7 | 12.8 | NCR | NCR | NP | NP | NP | 10.0 | 0.6 |

- Notes: 1. Soil classification and testing in accordance with USCS, ASTM D2487, D421, D422, D4318, US COE EM1110, VTM-1 and VTM-8
 2. MDD = Maximum Dry Density (VTM-1), not corrected for material retained on #4 sieve
 OMC = Optimum Moisture Content (VTM-1), not corrected for material retained on #4 sieve
 Corr. MDD and Corr. OMC are Maximum Dry density and Optimum Moisture Content corrected for 10% or more material retained on #4 sieve in accordance with VTM-1
 NCR = No Correction Required to the MDD or OMC
 CBR = California Bearing Ratio (VTM-8)
 3. Atterberg Limits:
 LL = Liquid Limit PL = Plastic Limit
 PI = Plasticity Index NP = Non-plastic

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

LIQUID AND PLASTIC LIMITS TEST REPORT



| MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|--|----|----|----|-------|--------|------|
| Lean Clay with Sand Trace Mica Yellow (CL) | 39 | 20 | 19 | 89.0 | 76.7 | CL |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Project No. 24078-V **Client:** VDOT **Remarks:**
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418 ●Data Entered: 7/25/16
Source of Sample: CB-11 **Depth:** 2.60-5.00 **Sample Number:** 1

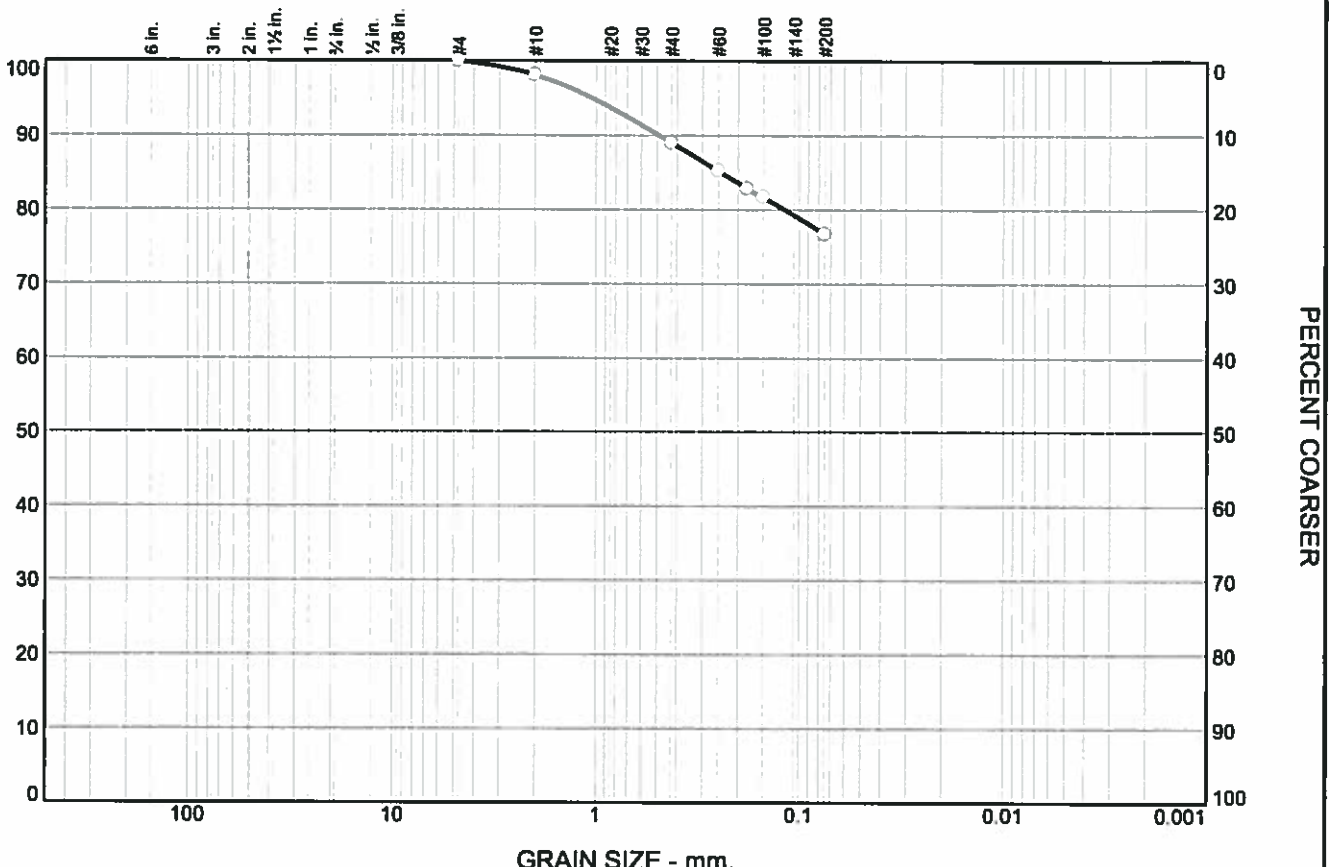
ECS MID-ATLANTIC, LLC
 14026 Thunderbolt Place, Suite 100 Phone (703) 471-8400
 Chantilly, VA 20151-3232 Fax (703) 834-5527

Figure

Tested By: HTN1 **Checked By:** DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 1.9 | 9.1 | 12.3 | 76.7 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| #4 | 100.0 | | |
| #10 | 98.1 | | |
| #40 | 89.0 | | |
| #60 | 85.1 | | |
| #80 | 82.8 | | |
| #100 | 81.6 | | |
| #200 | 76.7 | | |

Soil Description
Lean Clay with Sand Trace Mica Yellow (CL)

Atterberg Limits
 PL= 20 LL= 39 PI= 19

Coefficients
 D₉₀= 0.4908 D₈₅= 0.2455 D₆₀=
 D₅₀= D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= CL AASHTO= A-6(14)

Remarks
 Data Entered: 7/25/16

* (no specification provided)

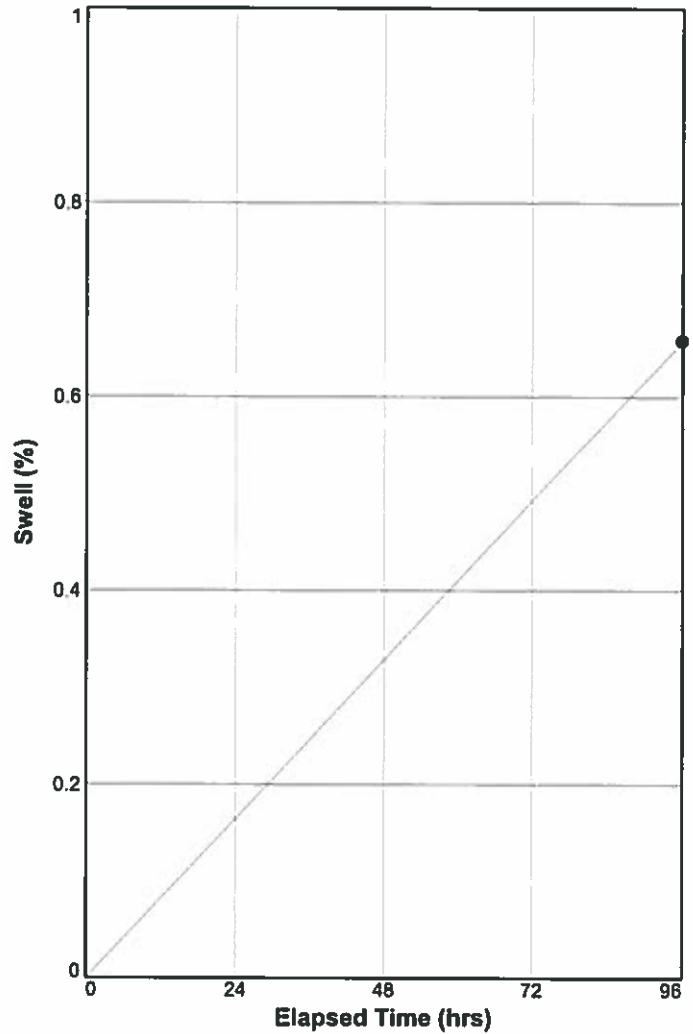
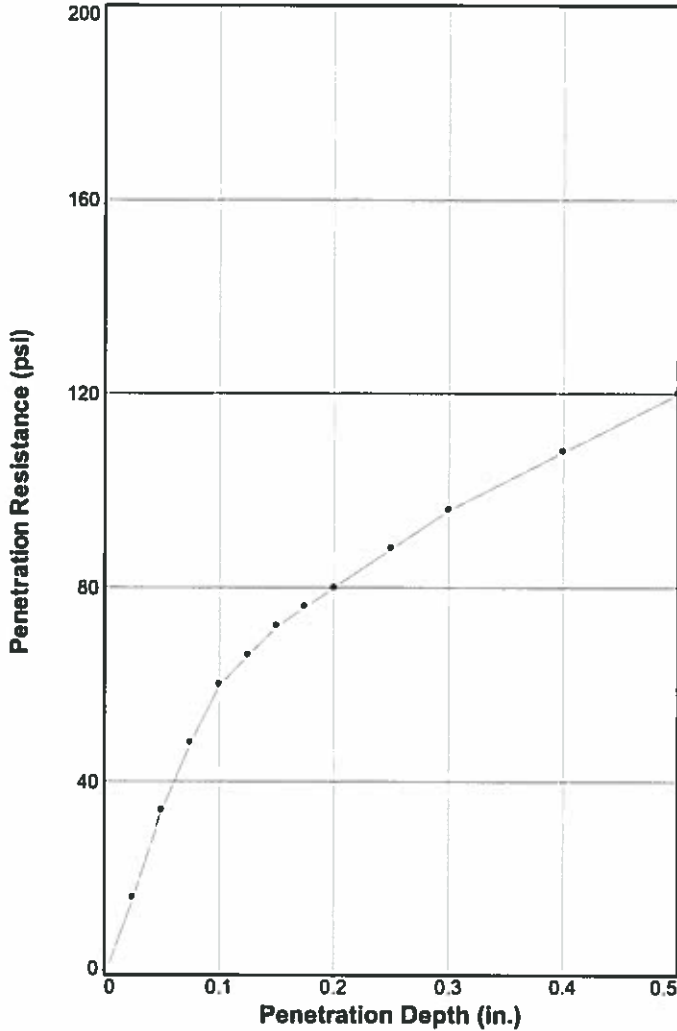
Source of Sample: CB-11 Depth: 2.60-5.00 Date: 7/21/16
 Sample Number: 1

| | |
|--|--|
| ECS MID-ATLANTIC, LLC 14026 Thunderbolt Place, Suite 100 Chantilly, VA 20151-3232 Phone: (703) 471-8400 Fax: (703) 834-5527 | Client: VDOT Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418 Project No: 24078-V Figure |
|--|--|

Tested By: KV Checked By: DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

BEARING RATIO TEST REPORT VTM-8 (2013)



| | Molded | | | Soaked | | | CBR (%) | | Linearity Correction (in.) | Surcharge (lbs.) | Max. Swell (%) |
|-----|---------------|-----------------------|--------------|---------------|-----------------------|--------------|----------|----------|----------------------------|------------------|----------------|
| | Density (pcf) | Percent of Max. Dens. | Moisture (%) | Density (pcf) | Percent of Max. Dens. | Moisture (%) | 0.10 in. | 0.20 in. | | | |
| 1 ● | 105.4 | 100.5 | 21.6 | 104.7 | 99.8 | 26.5 | 6.0 | 5.3 | 0.000 | 10 | 0.7 |
| 2 ▲ | | | | | | | | | | | |
| 3 ▬ | | | | | | | | | | | |

| Material Description | USCS | Max. Dens. (pcf) | Optimum Moisture (%) | LL | PI |
|----------------------|--|------------------|----------------------|------|----|
| | Lean Clay with Sand Strong Brown (2.0% +4) | CL | 104.9 | 21.2 | 39 |

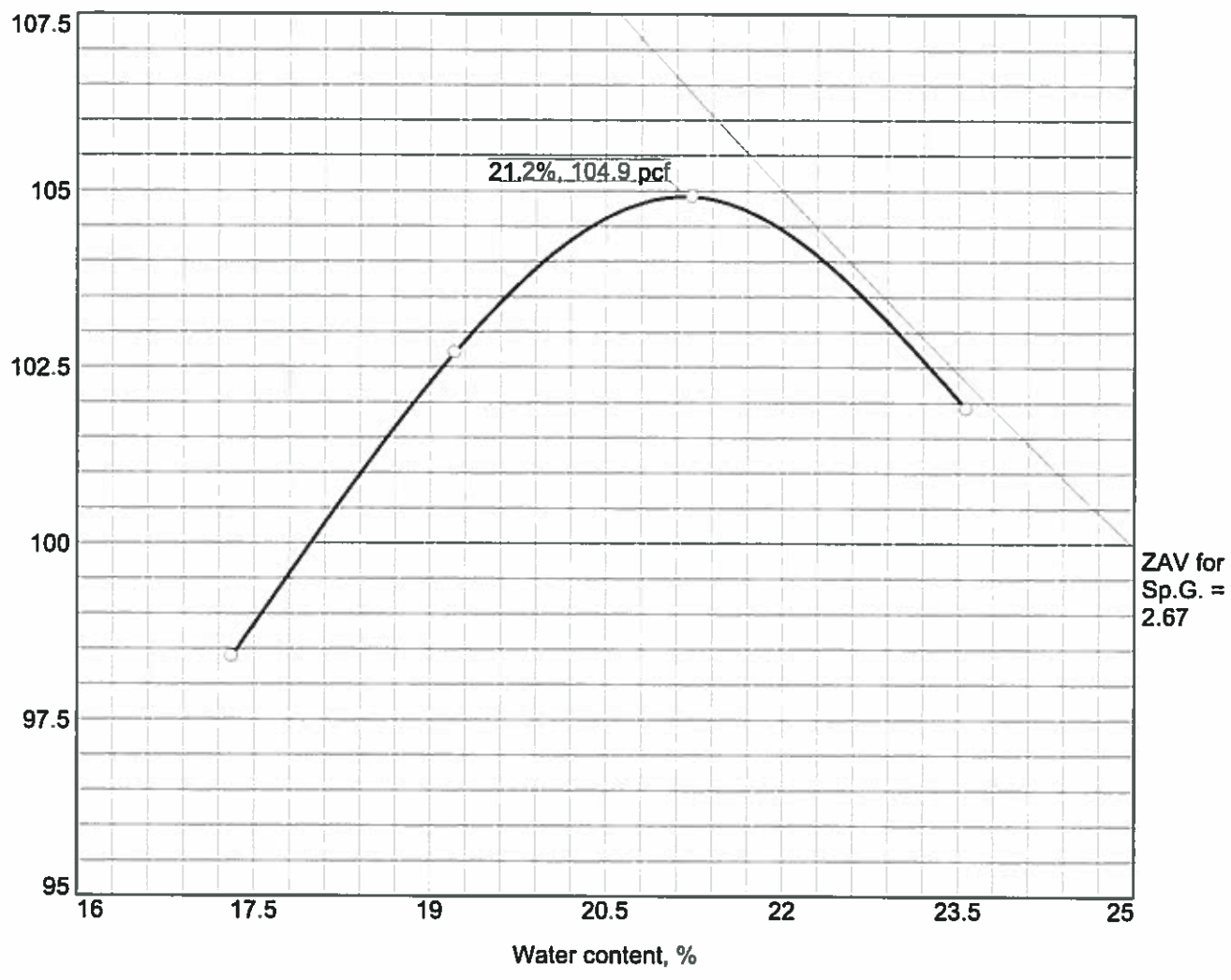
Project No: 24078-V
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
Source of Sample: CB-1 **Depth:** 2.00-6.40
Sample Number: 2
Date: 7/21/16

Test Description/Remarks:

 Data Entered: 8/3/16

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

COMPACTION TEST REPORT For Curve No. CB-1



Test specification: Virginia Test Method - 1

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > #4 | % < No.200 |
|----------------|----------------|---------|----------------|-------|----|----|-----------|---------------|
| | USCS | AASHTO | | | | | | |
| 2.00-6.40 | CL | A-6(13) | | 2.67 | 39 | 15 | 2.0 | 82.6 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|--|--|
| Maximum dry density = 104.9 pcf Optimum moisture = 21.2 % | Lean Clay with Sand Strong Brown (2.0% +4) |

| | |
|--|-----------------------------------|
| Project No. 24078-V Client: VDOT Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418 Date: 7/22/16 Source of Sample: CB-1 Sample Number: 2 | Remarks: Data Entered: 7/25/16 |
|--|-----------------------------------|

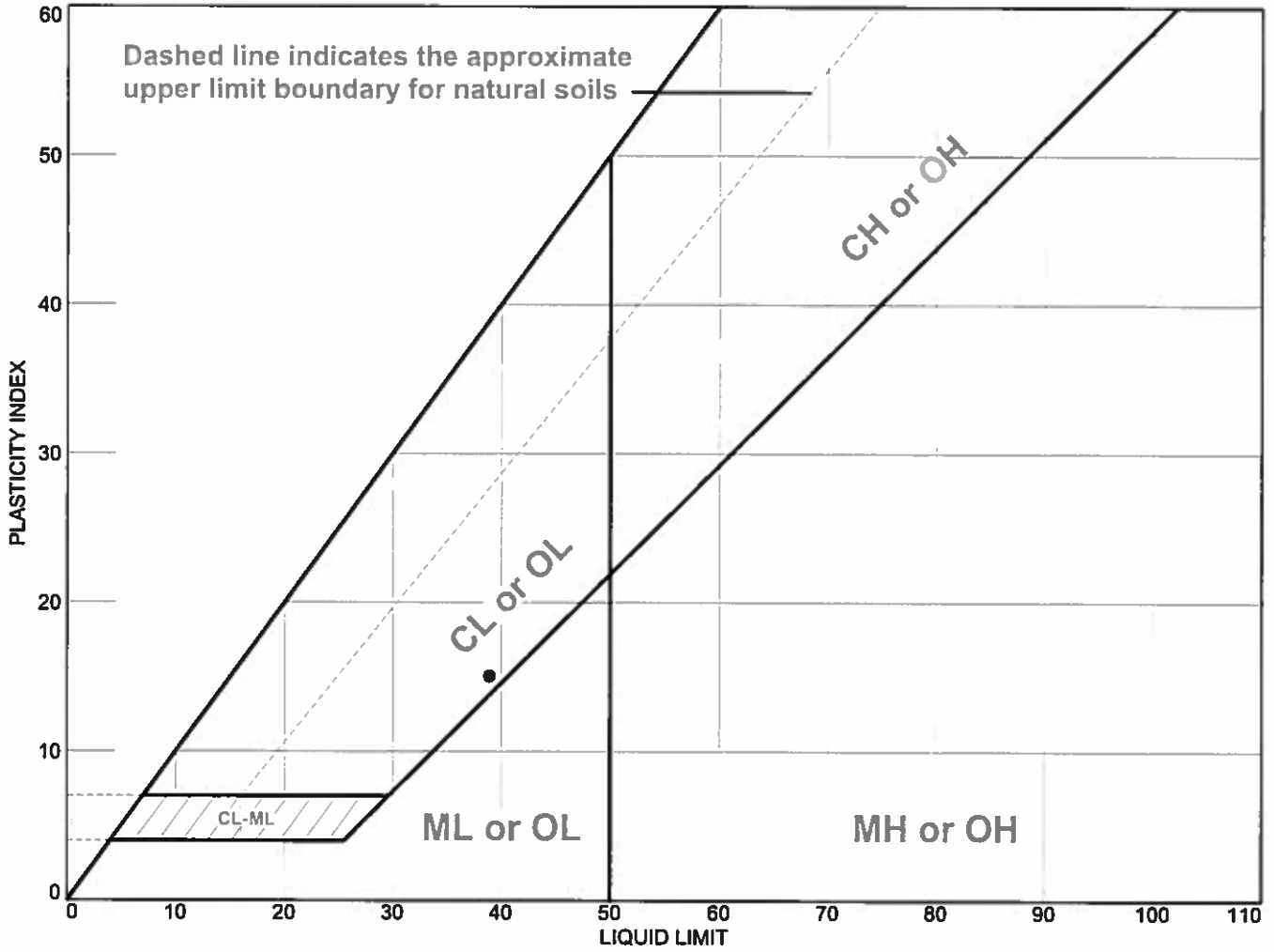
ECS MID-ATLANTIC, LLC
 14026 Thunderbolt Place, Suite 100 Phone: (703) 471-8400
 Chantilly, VA 20151-3232 Fax: (703) 834-5527

Figure

Tested By: KV Checked By: DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

LIQUID AND PLASTIC LIMITS TEST REPORT



| MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|--|----|----|----|-------|--------|------|
| Lean Clay with Sand Strong Brown (2.0% +4) | 39 | 24 | 15 | 91.8 | 82.6 | CL |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Project No. 24078-V **Client:** VDOT **Remarks:**
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418 ●Data Entered: 7/25/16
Source of Sample: CB-1 **Depth:** 2.00-6.40 **Sample Number:** 2

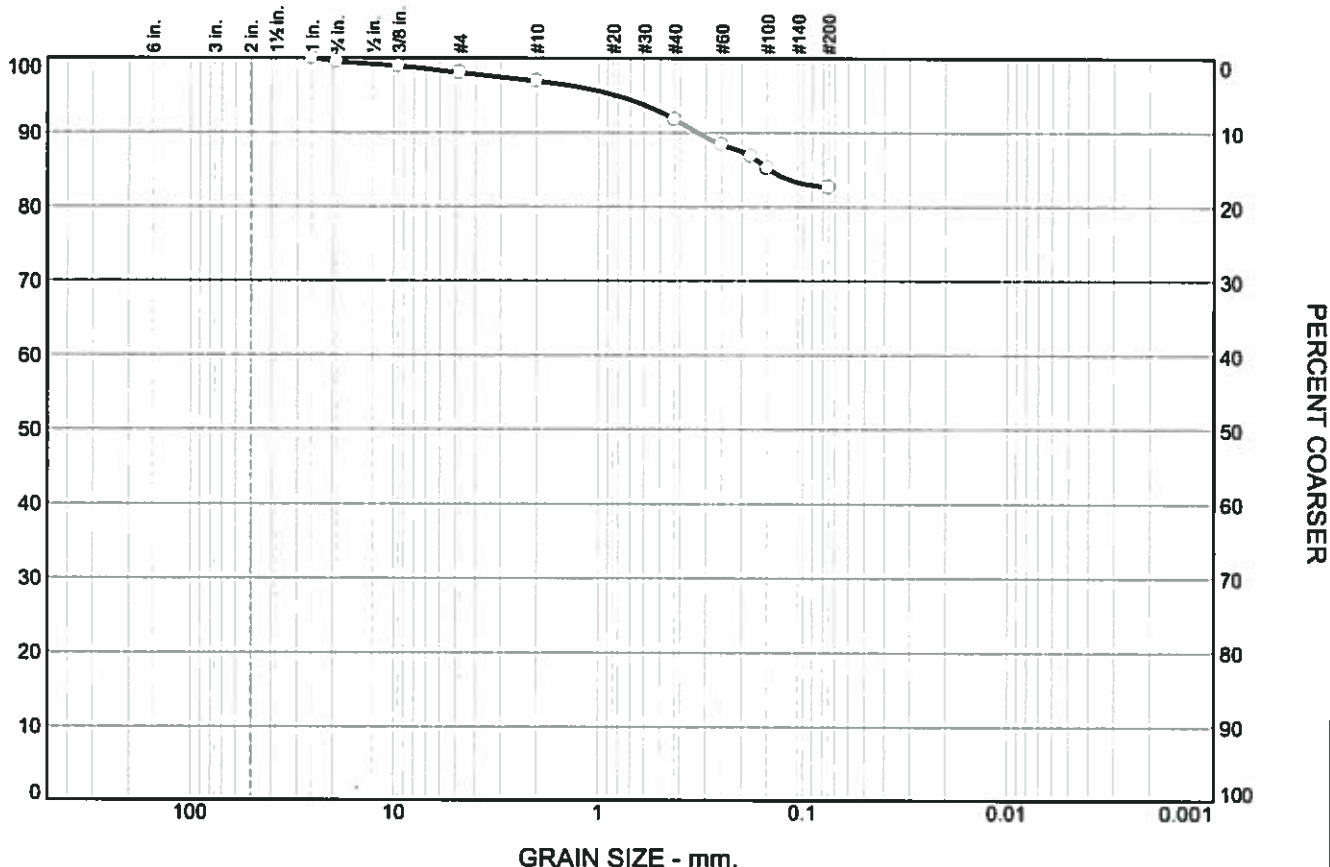
ECS MID-ATLANTIC, LLC
 14026 Thunderbolt Place, Suite 100 Phone (703) 471-8400
 Chantilly, VA 20151-3232 Fax (703) 834-5527

Figure

Tested By: HTN1 **Checked By:** DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.4 | 1.6 | 1.1 | 5.1 | 9.2 | 82.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 1.0 | 100.0 | | |
| 0.75 | 99.6 | | |
| 0.375 | 98.9 | | |
| #4 | 98.0 | | |
| #10 | 96.9 | | |
| #40 | 91.8 | | |
| #60 | 88.4 | | |
| #80 | 86.8 | | |
| #100 | 85.2 | | |
| #200 | 82.6 | | |

Soil Description

Lean Clay with Sand Strong Brown (2.0% +4)

Atterberg Limits

PL= 24 LL= 39 PI= 15

Coefficients

D₉₀= 0.3300 D₈₅= 0.1466 D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Data Entered: 7/25/16

* (no specification provided)

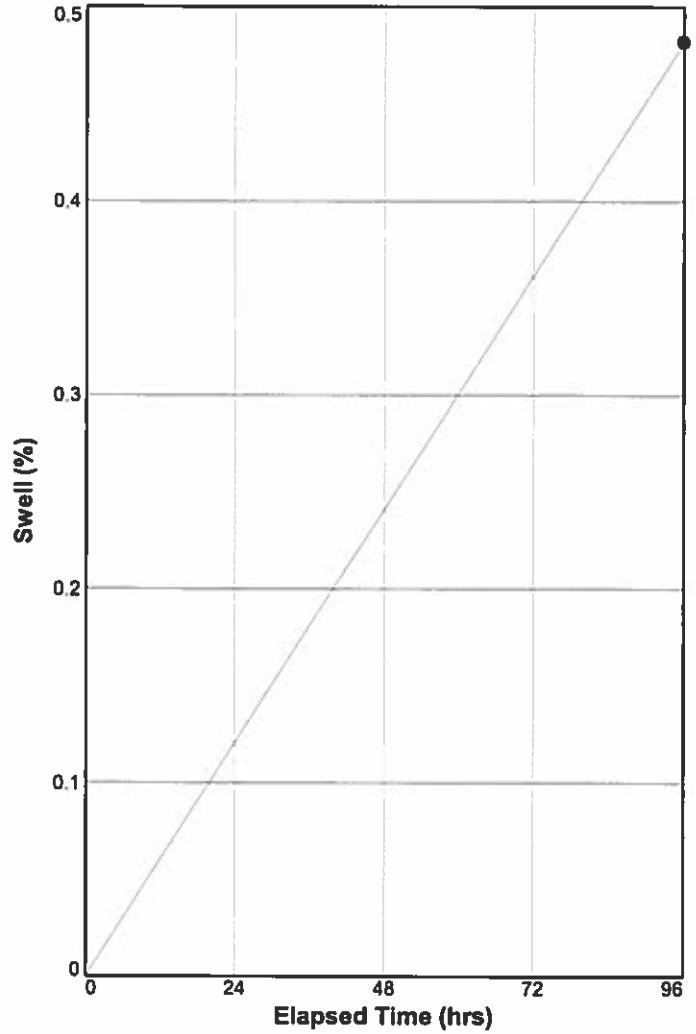
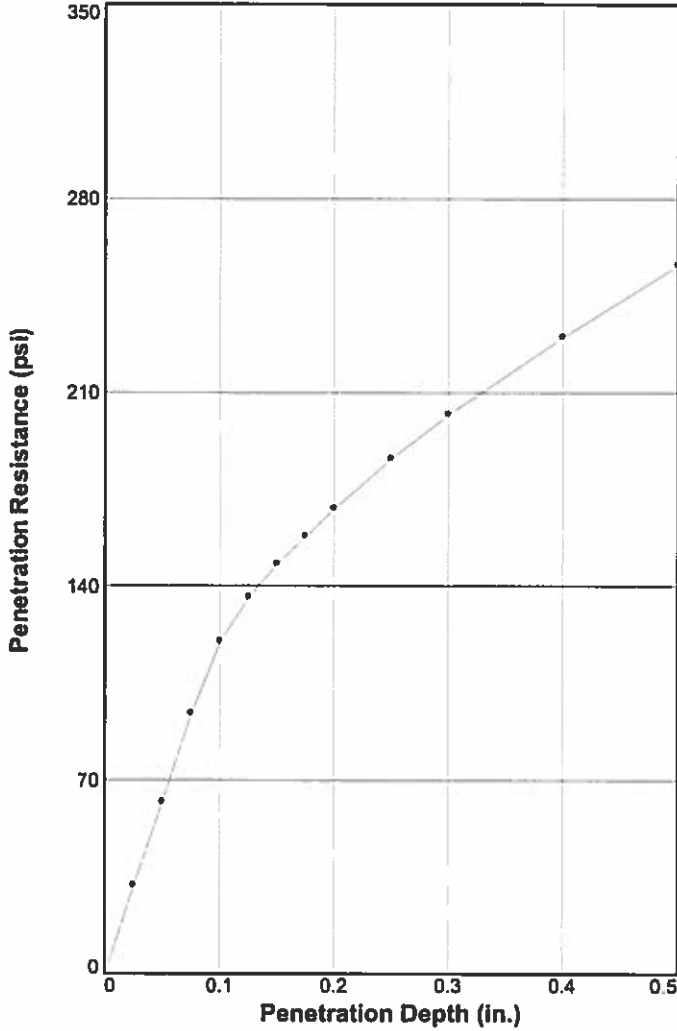
Source of Sample: CB-1 Depth: 2.00-6.40 Date: 7/21/16
Sample Number: 2

| | |
|--|--|
| ECS MID-ATLANTIC, LLC 14026 Thunderbolt Place, Suite 100 Chantilly, VA 20151-3232 Phone: (703) 471-8400 Fax: (703) 834-5527 | Client: VDOT Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418 Project No: 24078-V Figure |
|--|--|

Tested By: KV Checked By: DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

BEARING RATIO TEST REPORT VTM-8 (2013)



| | Molded | | | Soaked | | | CBR (%) | | Linearity Correction (in.) | Surcharge (lbs.) | Max. Swell (%) |
|-----|---------------|-----------------------|--------------|---------------|-----------------------|--------------|----------|----------|----------------------------|------------------|----------------|
| | Density (pcf) | Percent of Max. Dens. | Moisture (%) | Density (pcf) | Percent of Max. Dens. | Moisture (%) | 0.10 in. | 0.20 in. | | | |
| 1 ○ | 121.7 | 100.3 | 12.2 | 121.1 | 99.8 | 15.4 | 12.0 | 11.2 | 0.000 | 10 | 0.5 |
| 2 ▲ | | | | | | | | | | | |
| 3 □ | | | | | | | | | | | |

| Material Description | USCS | Max. Dens. (pcf) | Optimum Moisture (%) | LL | PI |
|----------------------|---------------------------------|------------------|----------------------|------|----|
| | Silty Sand Dark Brown (9.0% +4) | SM | 121.3 | 12.0 | NP |

Project No: 24078-V
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
Source of Sample: CB-2 **Depth:** 1.70-4.70
Sample Number: 3
Date: 7/21/16

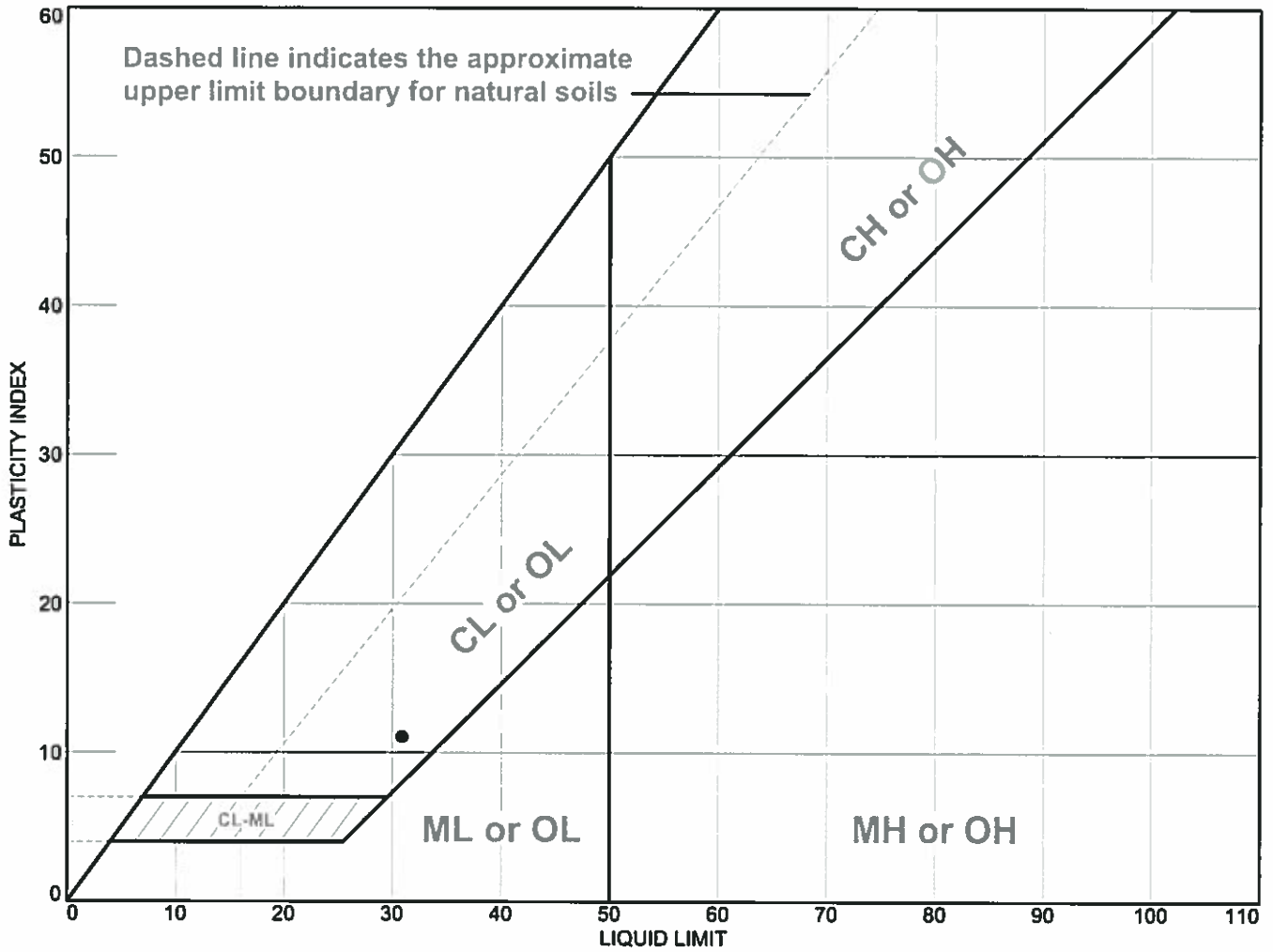
Test Description/Remarks:

 Data Entered: 8/3/16



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LIQUID AND PLASTIC LIMITS TEST REPORT



| MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|--|----|----|----|-------|--------|------|
| ● Clayey Sand with Gravel Yellowish Light Brown (15.5% +4) | 31 | 20 | 11 | 61.7 | 46.8 | SC |
| ■ Silty Sand Dark Brown (9.0% +4) | NP | NP | NP | 68.7 | 44.9 | SM |
| | | | | | | |
| | | | | | | |

Project No. 24078-V **Client:** VDOT
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
 ● **Source of Sample:** CB-2 **Depth:** 4.70-6.70 **Sample Number:** 4
 ■ **Source of Sample:** CB-2 **Depth:** 1.70-4.70 **Sample Number:** 3

Remarks:
 ● Data Entered: 7/25/16
 ■ Data Entered: 7/25/16

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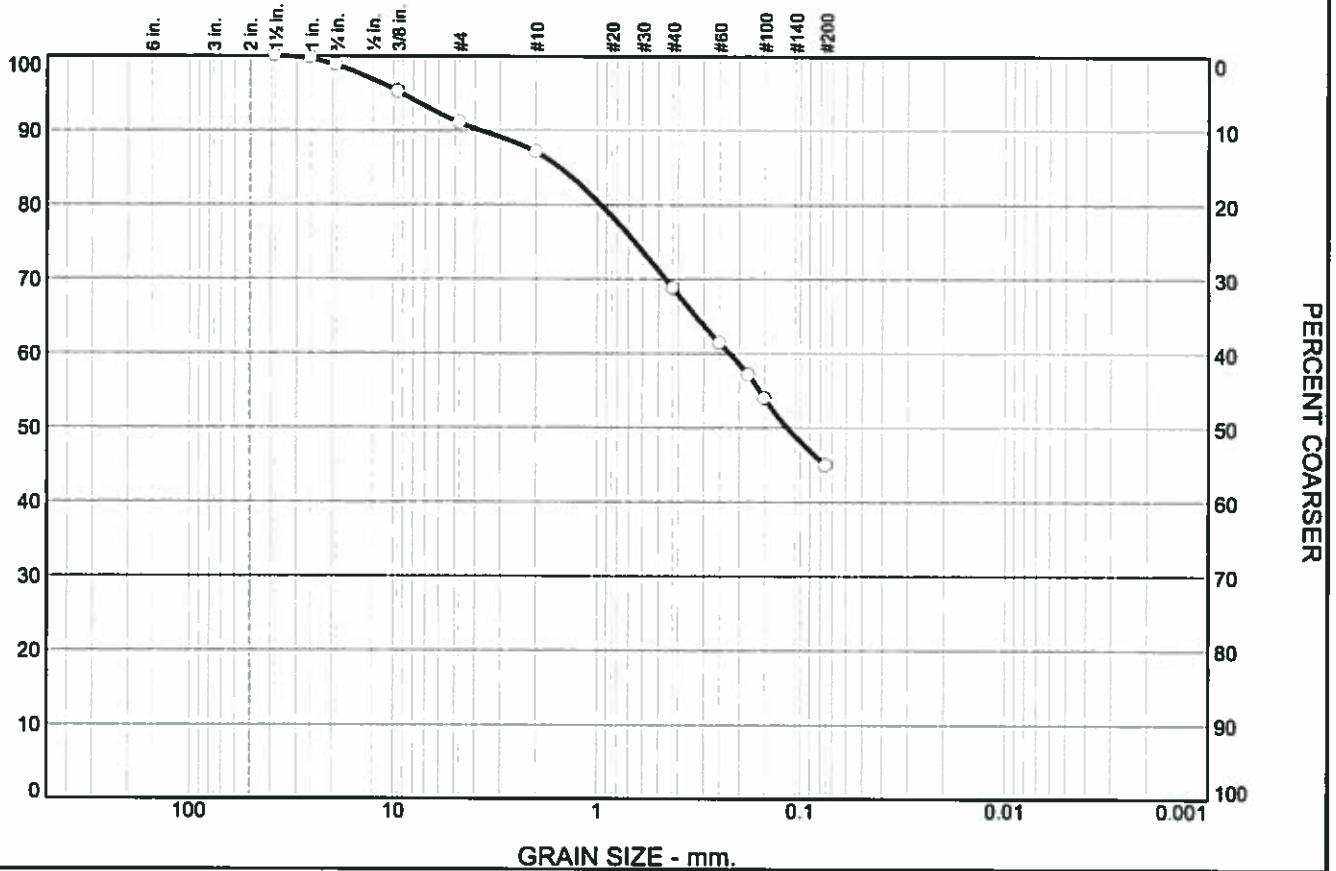
Figure

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Tested By: HTN1 **Checked By:** DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 1.2 | 7.8 | 3.9 | 18.4 | 23.8 | 44.9 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 1.5 | 100.0 | | |
| 1.0 | 99.7 | | |
| 0.75 | 98.8 | | |
| 0.375 | 95.2 | | |
| #4 | 91.0 | | |
| #10 | 87.1 | | |
| #40 | 68.7 | | |
| #60 | 61.4 | | |
| #80 | 57.1 | | |
| #100 | 53.9 | | |
| #200 | 44.9 | | |

* (no specification provided)

Soil Description

Silty Sand Dark Brown (9.0% +4)

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 3.7760 D₈₅= 1.5281 D₆₀= 0.2232
D₅₀= 0.1159 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

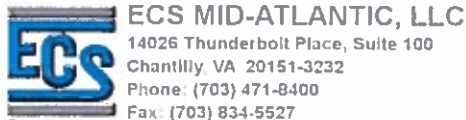
USCS= SM AASHTO= A-4(0)

Remarks

Data Entered: 7/25/16

Source of Sample: CB-2 **Depth:** 1.70-4.70
Sample Number: 3

Date: 7/21/16



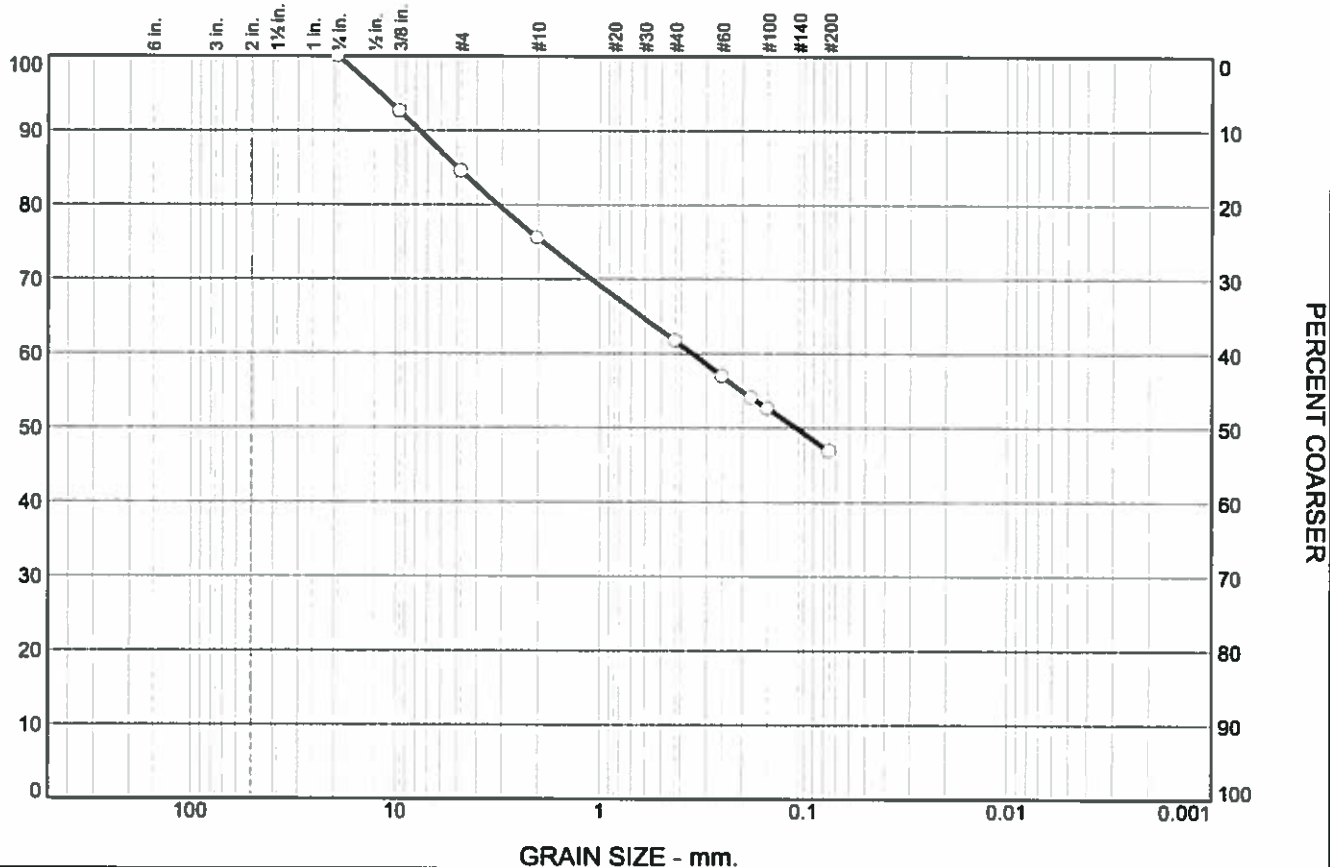
Client: VDOT
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
Project No: 24078-V **Figure**

Tested By: KV

Checked By: DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 15.5 | 9.0 | 13.8 | 14.9 | 46.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 0.75 | 100.0 | | |
| 0.375 | 92.6 | | |
| #4 | 84.5 | | |
| #10 | 75.5 | | |
| #40 | 61.7 | | |
| #60 | 56.9 | | |
| #80 | 54.0 | | |
| #100 | 52.6 | | |
| #200 | 46.8 | | |

Soil Description
Clayey Sand with Gravel Yellowish Light Brown (15.5% +4)

Atterberg Limits
 PL= 20 LL= 31 PI= 11

Coefficients
 D₉₀= 7.6295 D₈₅= 4.9671 D₆₀= 0.3515
 D₅₀= 0.1093 D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= SC AASHTO= A-6(2)

Remarks
 Data Entered: 7/25/16

* (no specification provided)

Source of Sample: CB-2 Depth: 4.70-6.70 Date: 7/21/16
 Sample Number: 4

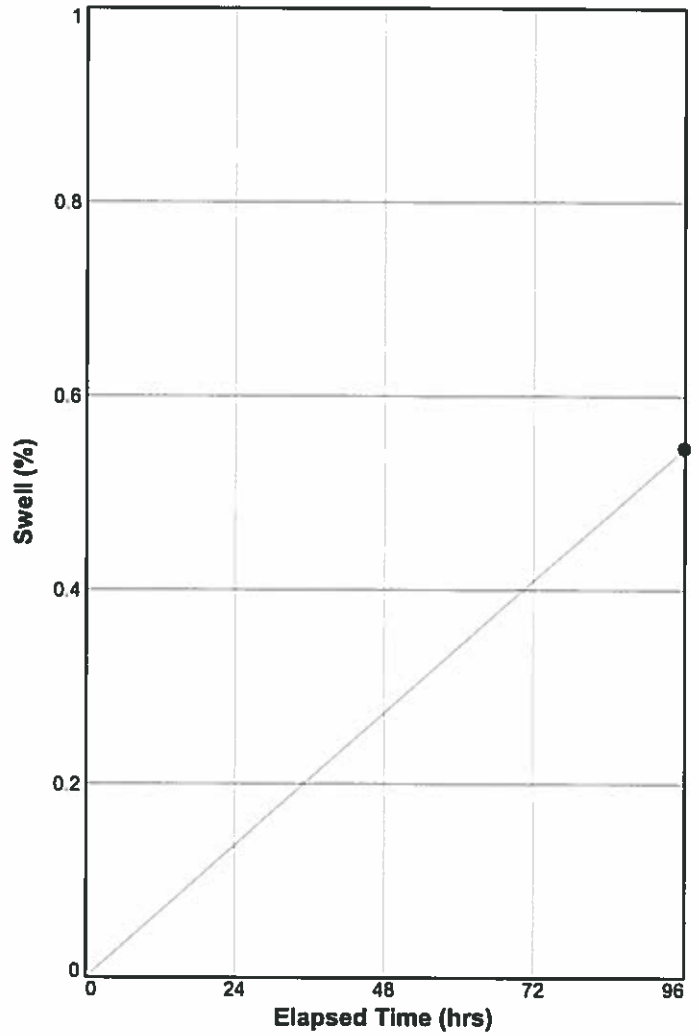
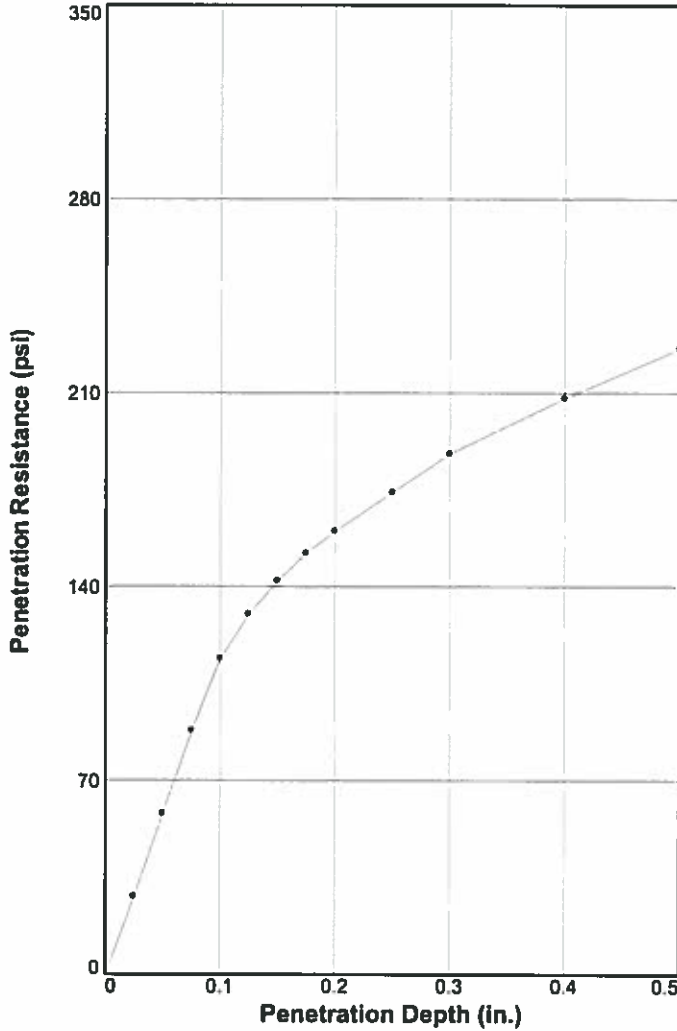
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 Chantilly, VA 20151-3232
 Phone: (703) 471-8400
 Fax: (703) 834-5527

Client: VDOT
 Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
 Project No: 24078-V Figure

Tested By: KV Checked By: DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

BEARING RATIO TEST REPORT VTM-8 (2013)



| | Molded | | | Soaked | | | CBR (%) | | Linearity Correction (in.) | Surcharge (lbs.) | Max. Swell (%) |
|-----|---------------|-----------------------|--------------|---------------|-----------------------|--------------|----------|----------|----------------------------|------------------|----------------|
| | Density (pcf) | Percent of Max. Dens. | Moisture (%) | Density (pcf) | Percent of Max. Dens. | Moisture (%) | 0.10 in. | 0.20 in. | | | |
| 1 ○ | 122.4 | 101.1 | 12.1 | 121.8 | 100.5 | 15.5 | 11.4 | 10.7 | 0.000 | 10 | 0.5 |
| 2 ▲ | | | | | | | | | | | |
| 3 ▬ | | | | | | | | | | | |

| Material Description | USCS | Max. Dens. (pcf) | Optimum Moisture (%) | LL | PI |
|----------------------------|------|------------------|----------------------|----|----|
| Silty Sand Brown (7.5% +4) | SM | 121.1 | 11.8 | NP | NP |

Project No: 24078-V
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
Source of Sample: CB-13A **Depth:** 1.00-6.50
Sample Number: 5
Date: 7/21/16

Test Description/Remarks:

Data Entered: 8/3/16



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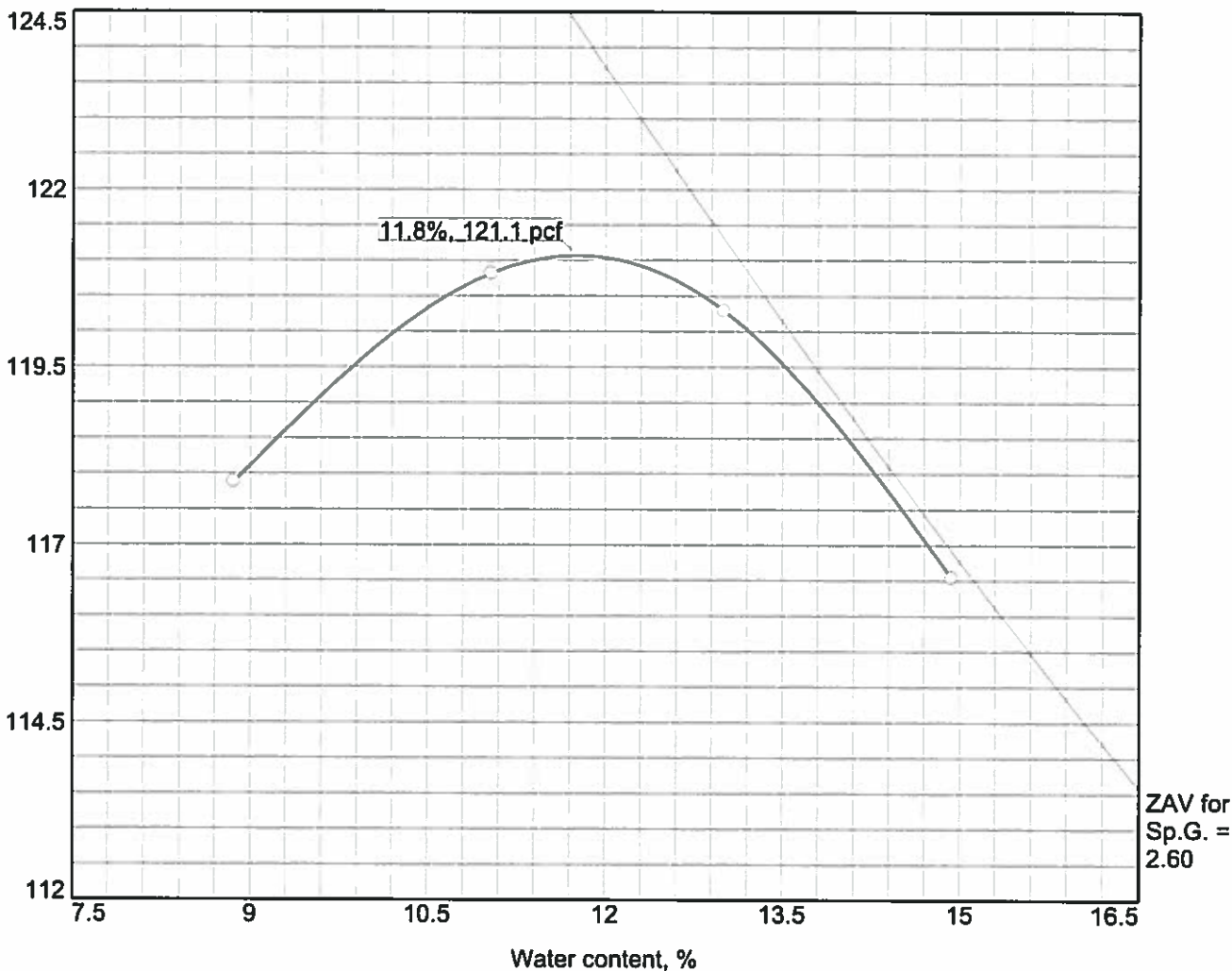
14026 Thunderbolt Place, Suite 100
Chantilly, VA 20151-3232

Phone: (703) 471-8400
Fax: (703) 834-5527

Figure _____

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

COMPACTION TEST REPORT For Curve No. CB-13A



Test specification: Virginia Test Method - 1

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > #4 | % < No.200 |
|----------------|----------------|--------|----------------|-------|----|----|-----------|---------------|
| | USCS | AASHTO | | | | | | |
| 1.00-6.50 | SM | A-4(0) | | 2.6 | NP | NP | 7.5 | 44.2 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---------------------------------|----------------------------|
| Maximum dry density = 121.1 pcf | Silty Sand Brown (7.5% +4) |
| Optimum moisture = 11.8 % | |

| | |
|--|--|
| Project No. 24078-V Client: VDOT Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418 Date: 7/23/16 Source of Sample: CB-13A Sample Number: 5 | Remarks: Data Entered: 7/25/16 |
|--|--|

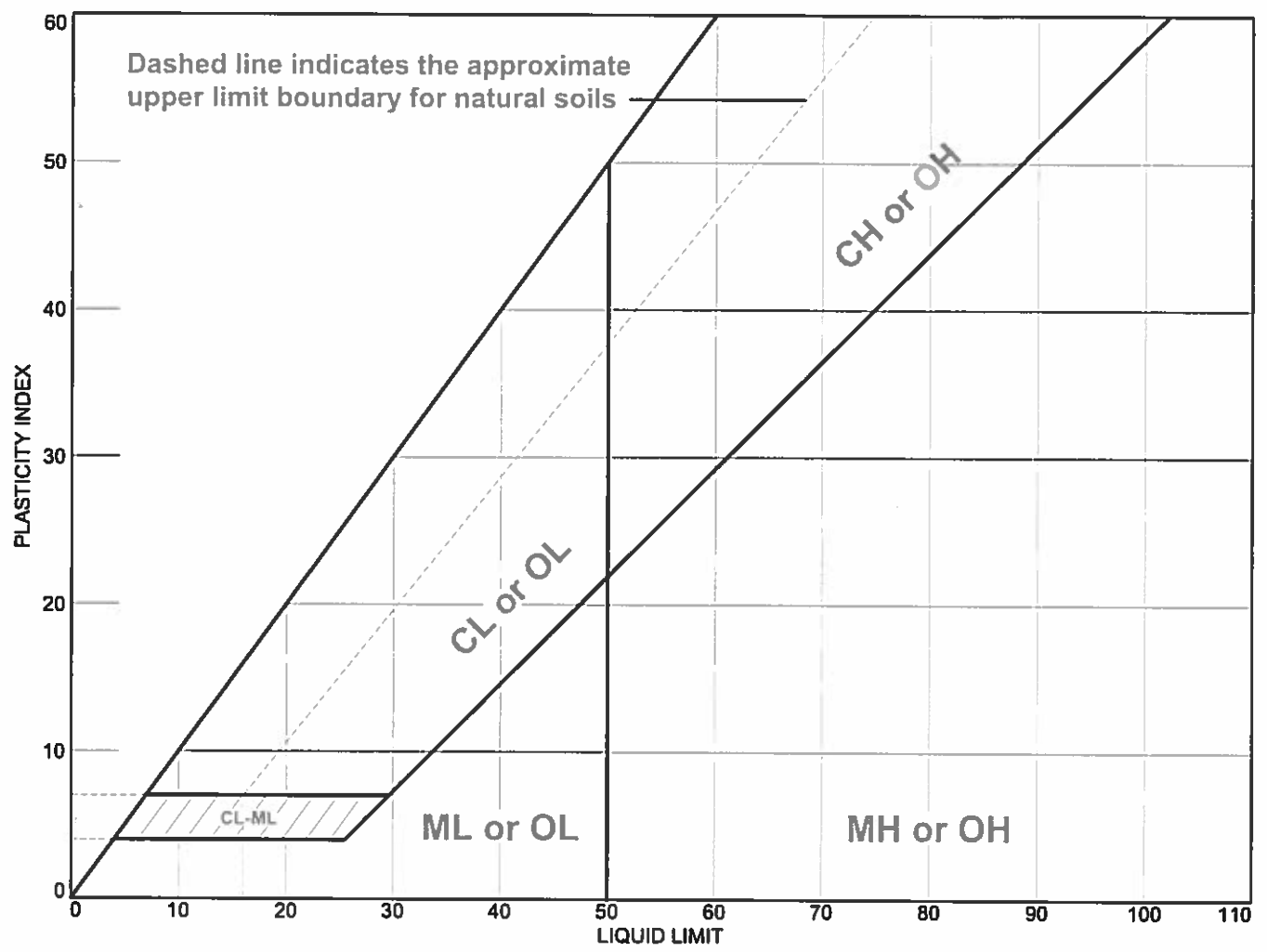
ECS MID-ATLANTIC, LLC
 14025 Thunderbolt Place, Suite 100 Phone: (703) 471-8400
 Chantilly, VA 20151-3232 Fax: (703) 834-5527

Figure

Tested By: KV **Checked By:** DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

LIQUID AND PLASTIC LIMITS TEST REPORT



| MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|----------------------------|----|----|----|-------|--------|------|
| Silty Sand Brown (7.5% +4) | NP | NP | NP | 58.5 | 44.2 | SM |
| | | | | | | |
| | | | | | | |

Project No. 24078-V **Client:** VDOT
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
Source of Sample: CB-13A **Depth:** 1.00-6.50 **Sample Number:** 5

Remarks:
 ● Data Entered: 7/25/16

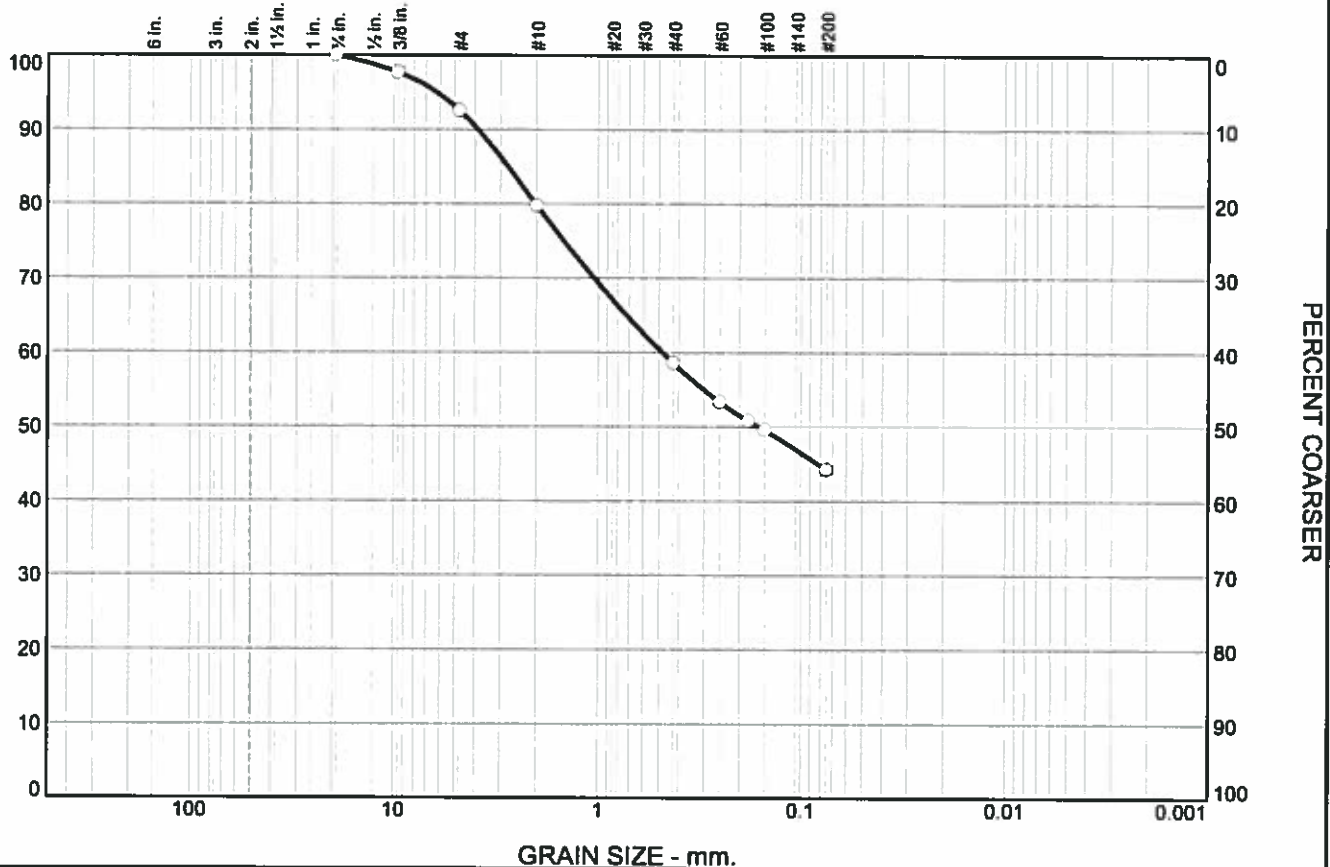
ECS MID-ATLANTIC, LLC
 14026 Thunderbolt Place, Suite 100 Phone (703) 471-8400
 Chantilly VA 20151-3232 Fax: (703) 834-5527

Figure

Tested By: HTN1 **Checked By:** DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 7.5 | 12.8 | 21.2 | 14.3 | | 44.2 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 0.75 | 100.0 | | |
| 0.375 | 97.6 | | |
| #4 | 92.5 | | |
| #10 | 79.7 | | |
| #40 | 58.5 | | |
| #60 | 53.3 | | |
| #80 | 50.7 | | |
| #100 | 49.5 | | |
| #200 | 44.2 | | |

* (no specification provided)

Soil Description

Silty Sand Brown (7.5% +4)

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 3.8949 D₈₅= 2.7813 D₆₀= 0.4845
D₅₀= 0.1612 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Data Entered: 7/25/16

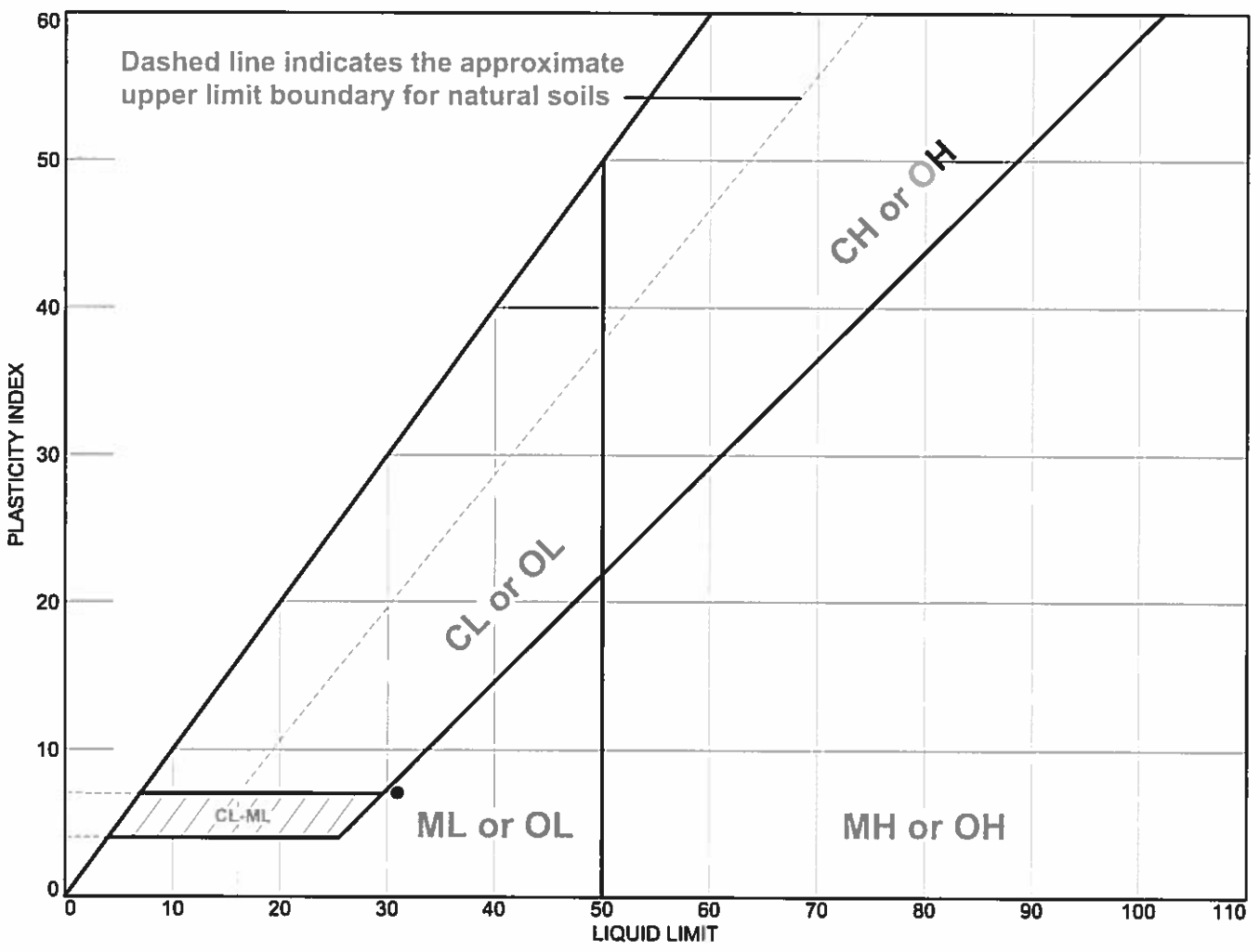
Source of Sample: CB-13A Depth: 1.00-6.50 Date: 7/21/16
Sample Number: 5

| | |
|--|--|
| ECS MID-ATLANTIC, LLC 14026 Thunderbolt Place, Suite 100 Chantilly, VA 20151-3232 Phone: (703) 471-8400 Fax: (703) 834-5527 | Client: VDOT Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418 Project No: 24078-V Figure |
|--|--|

Tested By: KV Checked By: DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

LIQUID AND PLASTIC LIMITS TEST REPORT



| MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---------------------------------------|----|----|----|-------|--------|------|
| Sandy Silt Trace Mica Olive (6.0% +4) | 31 | 24 | 7 | 73.1 | 54.1 | ML |
| | | | | | | |
| | | | | | | |

Project No. 24078-V **Client:** VDOT

Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418

● **Source of Sample:** CB-8B **Depth:** 0.90-4.50 **Sample Number:** 6

Remarks:

● Data Entered: 7/25/16

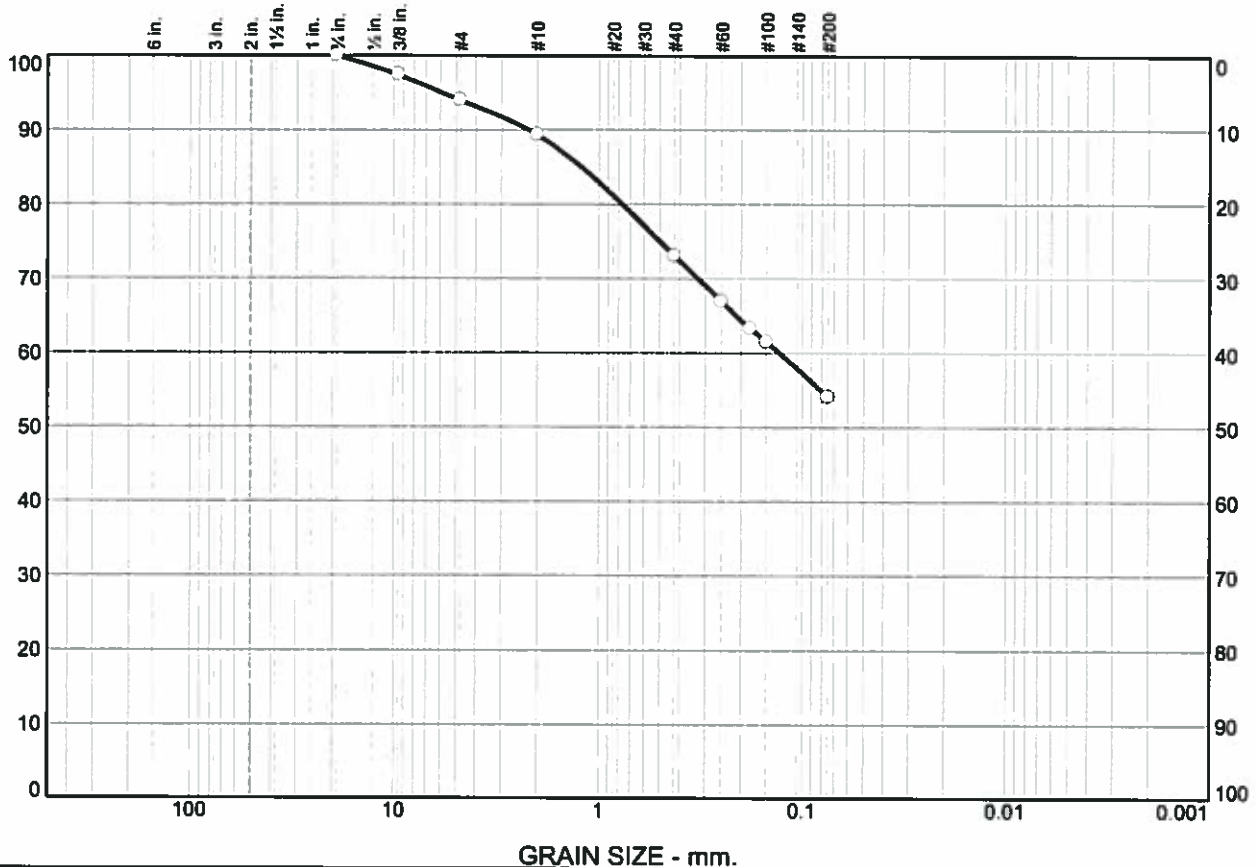
ECS MID-ATLANTIC, LLC
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 Chantilly, VA 20151-3232 Fax: (703) 834-5527

Figure

Tested By: HNT1 **Checked By:** DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 6.0 | 4.7 | 16.2 | 19.0 | 54.1 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 0.75 | 100.0 | | |
| 0.375 | 97.4 | | |
| #4 | 94.0 | | |
| #10 | 89.3 | | |
| #40 | 73.1 | | |
| #60 | 67.0 | | |
| #80 | 63.3 | | |
| #100 | 61.5 | | |
| #200 | 54.1 | | |

Soil Description

Sandy Silt Trace Mica Olive (6.0% +4)

Atterberg Limits

PL= 24 LL= 31 PI= 7

Coefficients

D₉₀= 2.2011 D₈₅= 1.2150 D₆₀= 0.1293
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(2)

Remarks

Data Entered: 7/25/16

(no specification provided)

Source of Sample: CB-8B **Depth:** 0.90-4.50
Sample Number: 6

Date: 7/21/16



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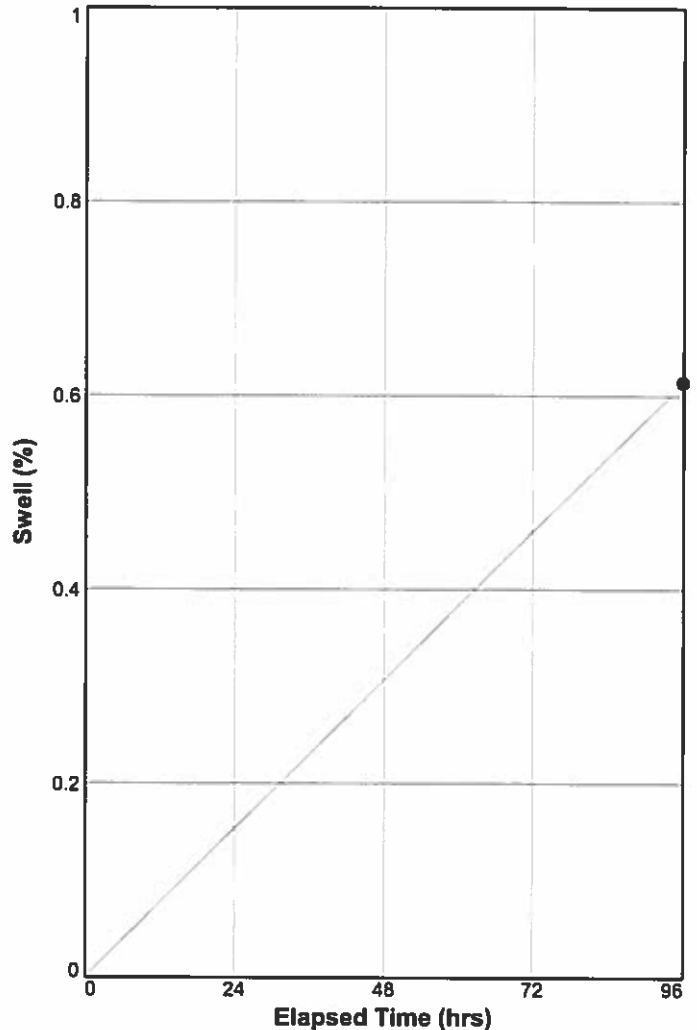
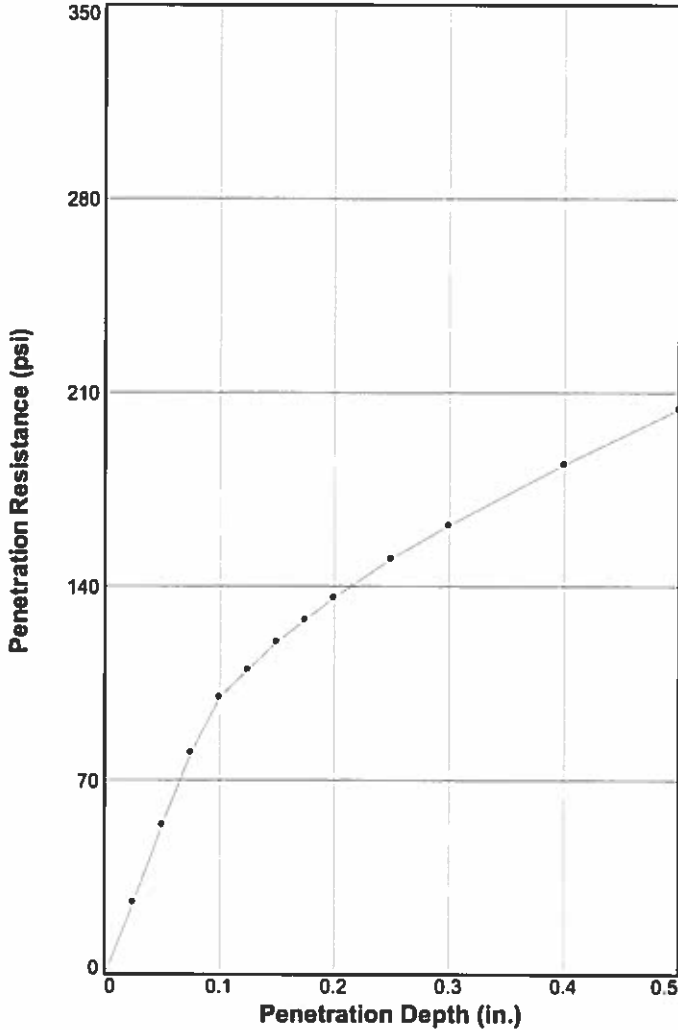
Client: VDOT
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
Project No: 24078-V **Figure**

Tested By: KV

Checked By: DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples

BEARING RATIO TEST REPORT VTM-8 (2013)



| | Molded | | | Soaked | | | CBR (%) | | Linearity Correction (in.) | Surcharge (lbs.) | Max. Swell (%) |
|----------------------------|---------------|-----------------------|--------------|---------------|-----------------------|--------------|----------|------------------|----------------------------|------------------|----------------|
| | Density (pcf) | Percent of Max. Dens. | Moisture (%) | Density (pcf) | Percent of Max. Dens. | Moisture (%) | 0.10 in. | 0.20 in. | | | |
| 1 ○ | 119.2 | 100.4 | 13.1 | 118.5 | 99.8 | 16.4 | 10.0 | 9.1 | 0.000 | 10 | 0.6 |
| 2 △ | | | | | | | | | | | |
| 3 □ | | | | | | | | | | | |
| Material Description | | | | | | | USCS | Max. Dens. (pcf) | Optimum Moisture (%) | LL | PI |
| Silty Sand Brown (9.9% +4) | | | | | | | SM | 118.7 | 12.8 | NP | NP |

Project No: 24078-V
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
Source of Sample: CB-15 **Depth:** 1.00-6.40
Sample Number: 7
Date: 7/21/16

Test Description/Remarks:

Data Entered: 8/3/16



ECS MID-ATLANTIC, LLC

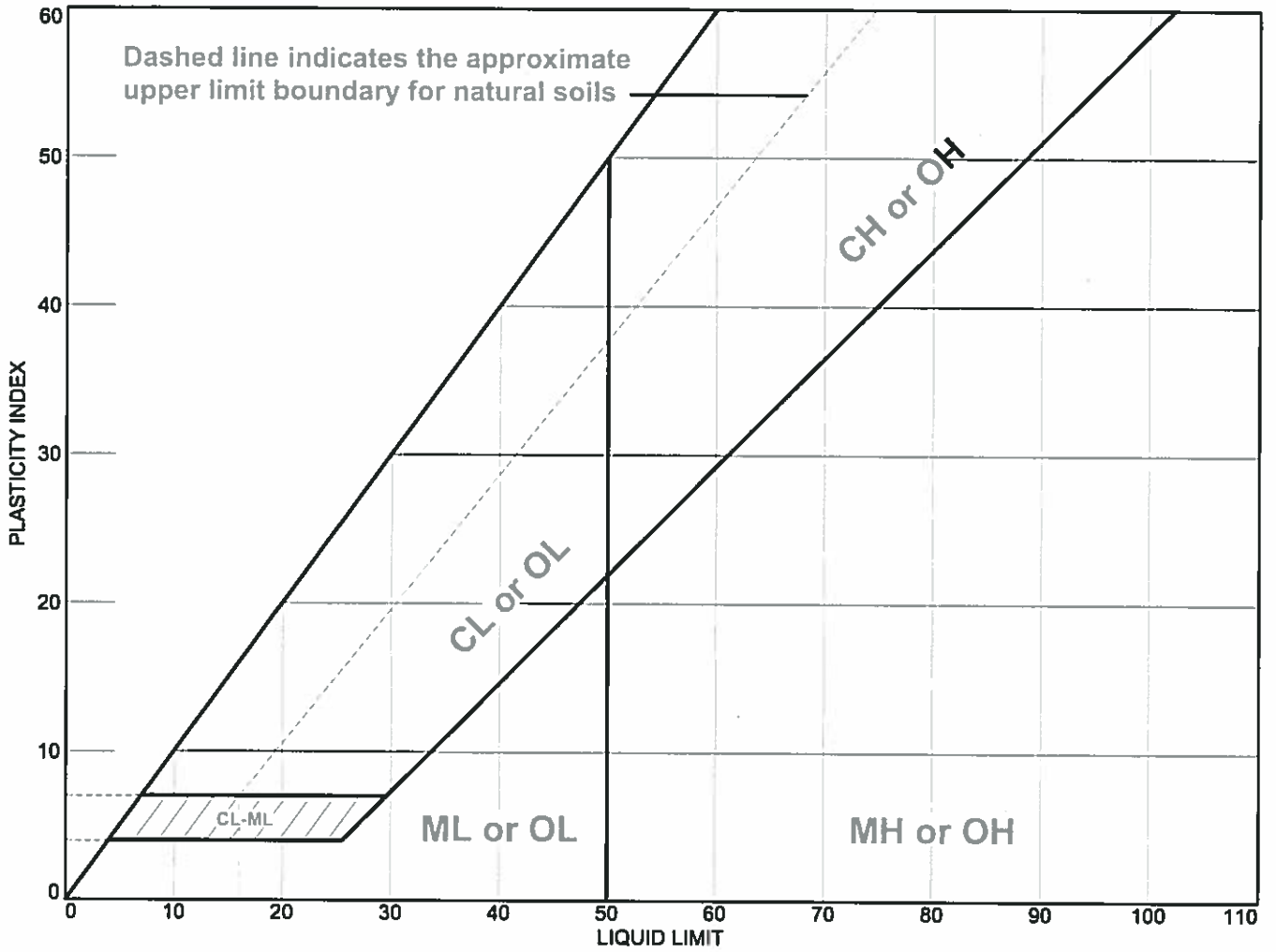
14026 Thunderbolt Place, Suite 100
 Chantilly, VA 20151-3232

Phone: (703) 471-8400
 Fax: (703) 834-5527

Figure _____

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical.

LIQUID AND PLASTIC LIMITS TEST REPORT



| MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|----------------------------|----|----|----|-------|--------|------|
| Silty Sand Brown (9.9% +4) | NP | NP | NP | 62.9 | 40.0 | SM |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Project No. 24078-V **Client:** VDOT

Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418

Source of Sample: CB-15 **Depth:** 1.00-6.40 **Sample Number:** 7

Remarks:

- Data Entered: 7/25/16

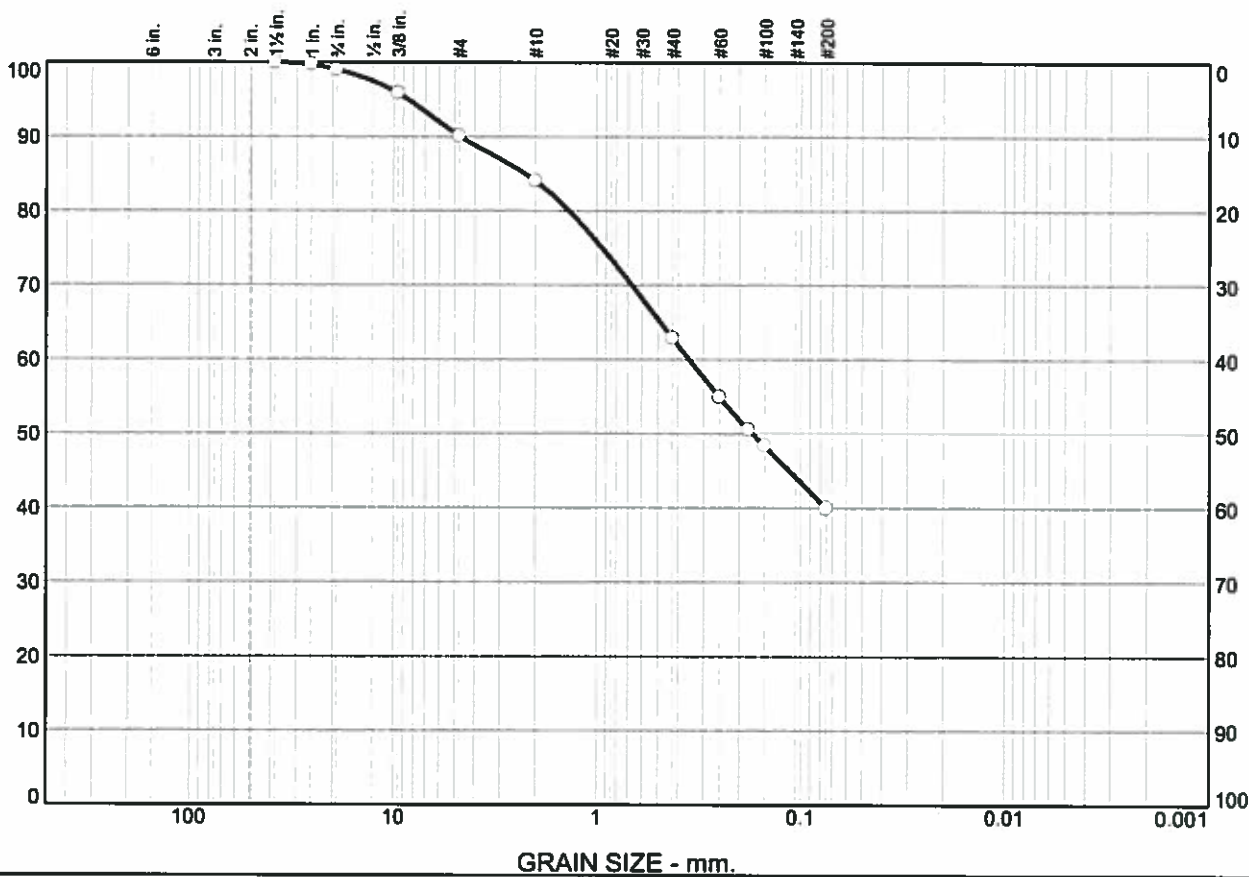
ECS MID-ATLANTIC, LLC
 14026 Thunderbolt Place, Suite 100 Phone: (703) 471-8400
 Chantilly, VA 20151-3232 Fax: (703) 834-5527

Figure

Tested By: HTN1 **Checked By:** DVT

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Particle Size Distribution Report



| % +3" | % Gravel | | % Sand | | | % Fines | |
|-------|----------|------|--------|--------|------|---------|------|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 1.0 | 8.9 | 6.1 | 21.1 | 22.9 | 40.0 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 1.5 | 100.0 | | |
| 1.0 | 99.7 | | |
| 0.75 | 99.0 | | |
| 0.375 | 95.8 | | |
| #4 | 90.1 | | |
| #10 | 84.0 | | |
| #40 | 62.9 | | |
| #60 | 54.9 | | |
| #80 | 50.5 | | |
| #100 | 48.3 | | |
| #200 | 40.0 | | |

* (no specification provided)

Soil Description

Silty Sand Brown (9.9% +4)

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 4.6960 D₈₅= 2.2489 D₆₀= 0.3529
D₅₀= 0.1726 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Data Entered: 7/25/16

Source of Sample: CB-15 Depth: 1.00-6.40
Sample Number: 7

Date: 7/21/16

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Client: VDOT
Project: Waterford Pavement Investigation PE-09-96A-113 No. 100418
Project No: 24078-V Figure

Tested By: KV Checked By: DVT