

MEMORANDUM

Date: December 30, 2020
From: Tyler Pelton, E.I.T. (Heritage), Logan Dixon, P.E. (Heritage)
To: Joey Ashby (MSD)
CC: Casey DeYoung, P.E. (Heritage)
Subject: Crossings at Mill Creek Apartments Capacity Analysis

Executive Summary

This memorandum has been prepared to assist MSD in processing a capacity request for the Crossings at Mill Creek Apartments to add an additional 58,800 GPD of dry weather flow (DWF) to manhole (MH#28139). The dry weather flow (DWF) capacity of the Hazelwood Pump Station (HPS) and the sewer lines between the pump station and MH#28139 were examined. No DWF modelling data is available for this area since it is located in the combined sewer catchment. In September of 2017, drawdown tests completed for HPS determined the firm capacity to be 198 GPM (285,120 GPD). Using pump runtime data collected from the MSD PI server, along with the available drawdown data, the HPS was determined to have an average daily DWF of 25,308 GPD. This observed average DWF is less than the calculated average DWF capacity of the pump station (73,438 GPD), indicating that the current pump station has adequate capacity for existing DWF and an additional 48,130 GPD of average DWF capacity. The analysis area can be seen in Figure 1.

An analysis of the sewer system upstream of the pump station shows that 40,980 GPD of additional average DWF flow can be added to the system before surcharging from the under-capacity pipe downstream of MH#55666 exceed the crown of the pipe of the upstream MH#63931. Some surcharging exists at MH#55666 but is not within 6' of the ground elevation. The pipe at MH#63931 is less than 6' deep. Figures 2 – 4 shows the sewer pipes with existing flow, the maximum allowed flow, and the requested flow.

As can be seen from the summarized results, the pump station nor the sanitary sewers have capacity for the requested flow. Up to 40,980 GPD can be approved based on the existing system capacity. Pump upgrades and 1,324 ft of pipe upgrades (8-inch upsized to 10-inch) would be required to approve the full amount of requested flow. Alternatively, a flow monitor can be installed to verify the existing flow in the system. If the actual flows are less than the flows calculated in this analysis, the development could potentially be approved without requiring additional improvements to the existing system.

Pump Station Analysis

The existing average daily flow at the HPS was calculated by multiplying the daily pump runtimes by the pumping rates recorded during the drawdown test completed in September 2017. The flows were calculated and averaged for three separate dry weather periods during 2020. The daily flows and corresponding dates can be found in Table 1 below.

| Table 1: Observed Dry Weather Date | |
|---|------------------------------|
| Date | Calculated Flow (GPD) |
| 7/24/2020 | 22,880 |
| 9/07/20 | 22,033 |
| 11/01/20 | 31,010 |
| <i>Average</i> | <i>25,308</i> |

The daily flow is produced from a combination of waste water flow, and infiltration and inflow during and after rain events. It has been previously determined that the observed average daily DWF should be observed on the third day after a significant rainfall event. The average DWF dates selected for this analysis have an average flow of 25,308 GPD. Dry weather modeling data was unavailable due to the project area residing in the combined catchment.

At the pump station, a peaking factor of 3.88 was back calculated based on the pump station firm capacity (285,120 GPD) and the equation provided in section 15.4.1.c of the MSD Design Manual. The average DWF capacity of the pump station is calculated by dividing the firm capacity by the peaking factor which results in a total average DWF capacity of 73,438 GPD. Based on these observations, the HPS has a remaining average DWF capacity of 48,130 GPD. The results of this analysis are summarized in Table 2.

| Table 2: Hazelwood PS Flow Information | | |
|---|--|-----------------------|
| <i>A</i> | Existing Firm Capacity | 285,120 GPD (198 gpm) |
| <i>B</i> | Peaking Factor | 3.88 |
| <i>C</i> | Existing ADWF Capacity (<i>A/B</i>) | 73,438 GPD |
| <i>D</i> | Existing ADWF | 25,308 GPD |
| <i>E</i> | Remaining ADWF Capacity (<i>C – D</i>) | 48,130 GPD |
| <i>F</i> | Requested ADWF | 58,800 GPD |

Sanitary Sewer Analysis

To determine sewer line capacity, design flows and as-built data was input into an InfoWorksICM model between MH#28139 and the HPS. The design flow was calculated per

parcel utilizing the method identified in section 8.8.4 of the MSD Design Manual. Additional flow was added upstream until either the full flow capacity of a line with an upstream manhole less than 6' deep was exceeded, or surcharging in the system came within 6' of the ground elevation.

This analysis resulted in a system capacity of 552,900 GPD at the sewer line downstream of MH#55666. Once this system capacity is exceeded, surcharging originating at this sewer segment exceeds the crown of the shallow pipe at the next upstream MH#63931. The results of this analysis are summarized in table 3.

| | | |
|----------|--|-------------|
| <i>A</i> | Existing System Capacity | 552,900 GPD |
| <i>B</i> | Existing ADWF Capacity (<i>A/5.0</i>) | 110,580 GPD |
| <i>C</i> | Existing ADWF | 69,600 GPD |
| <i>D</i> | Remaining ADWF Capacity (<i>B - C</i>) | 40,980 GPD |

Conclusion

Based on the data presented in this analysis, the HPS has the capacity for 73,438 GPD of average DWF. There is currently 25,308 GPD of existing average DWF in the system. This leaves an additional 48,130 GPD of remaining capacity that can be allocated towards future buildout at the HPS. The sewer lines between the requested location and the HPS has an available capacity of 40,980 GPD. Therefore, the requested additional average DWF of 58,800 GPD exceeds capacity limitations at the HPS and existing sewer lines. Upgrades to the pump station and sanitary sewers will be necessary to adequately support the requested flow.

END OF MEMORANDUM

Figure 1: Crossings at Mill Creek Apartments Capacity Request Draft

LEGEND

- Service Area
- Influent Sanitary Sewer Manhole
- Influent Sewer Line
- Pump Station
- Sewer Manhole

Force Main

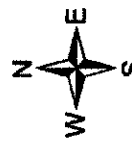
Pipe Diameter

- 0" - 4"
- 4" - 20"
- 20" - 95"

Sanitary Sewer

Pipe Diameter

- 0" - 8"
- 8" - 24"
- 24" - 220"



Map Created By: **HERITAGE ENGINEERING**

msd
SALAMANCA, OHIO

LOIC
SALAMANCA, OHIO

Copyright © 2020, LOUISVILLE AND Jefferson COUNTY
METRO GOVERNMENT. ALL RIGHTS RESERVED. THIS
DOCUMENT IS THE PROPERTY OF LOUISVILLE AND
Jefferson COUNTY METRO GOVERNMENT. NO
REPRODUCTION OR TRANSMISSION IN ANY FORM OR
BY ANY MEANS, ELECTRONIC OR MECHANICAL,
including photocopying and recording, or
in any information system, is permitted without the
written permission of Metro Gov.

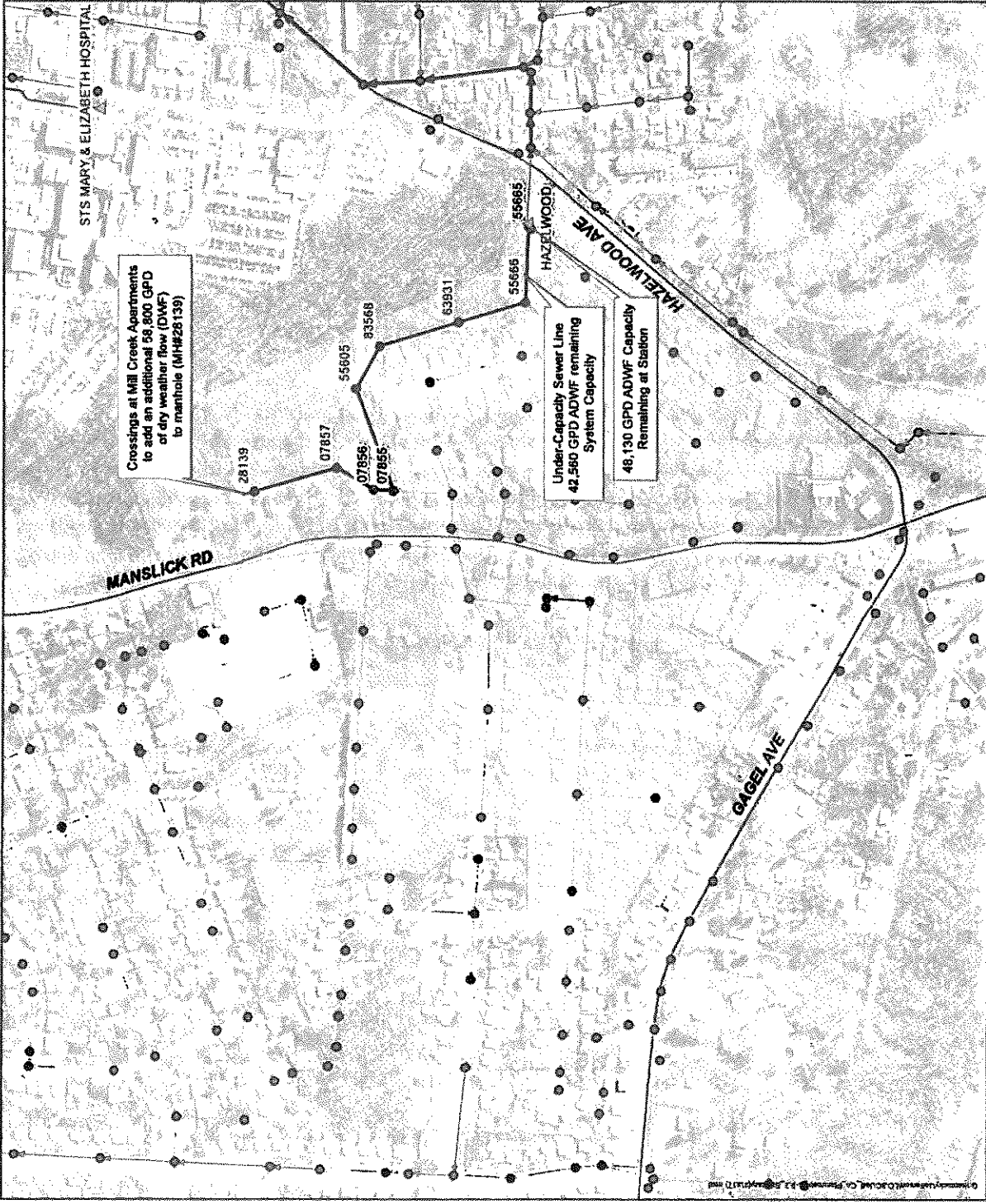


Figure 2 - Existing Flow

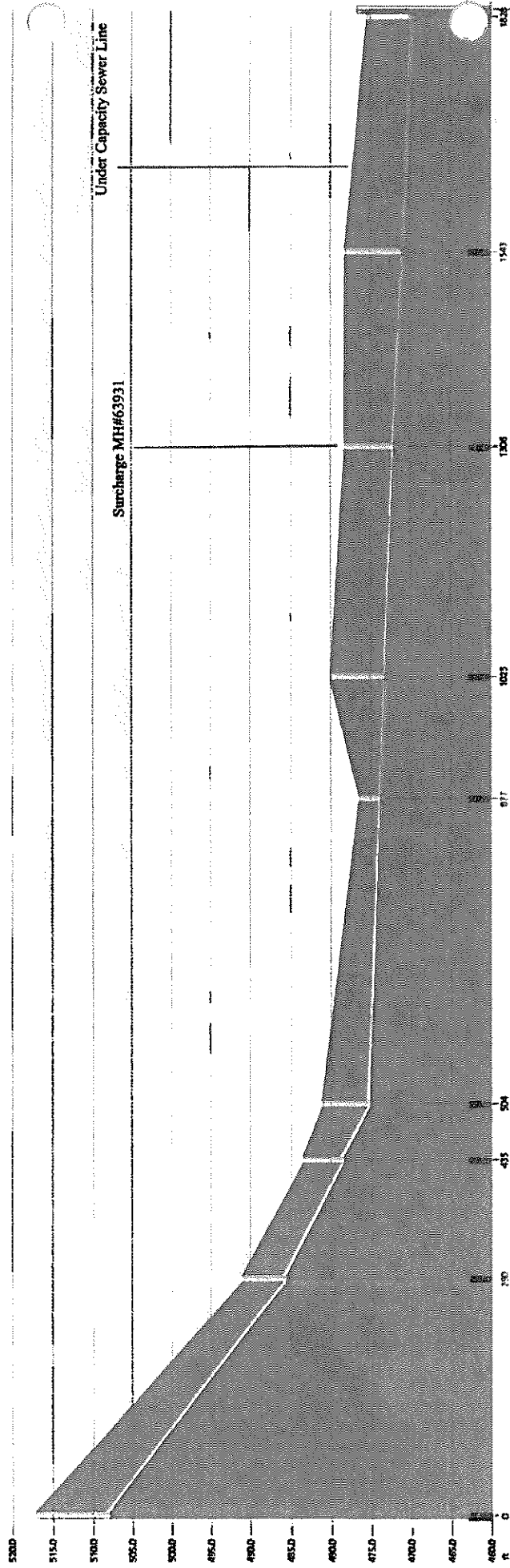


Figure 3 - Maximum Allowed Flow (42,560 GPD ADWF)

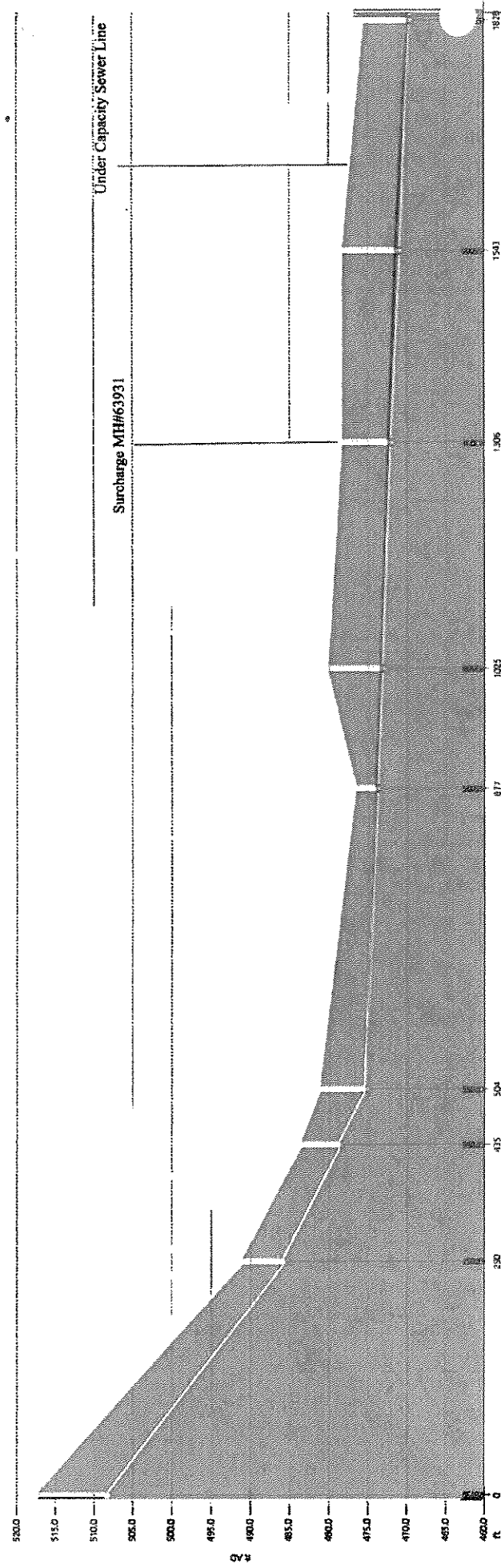
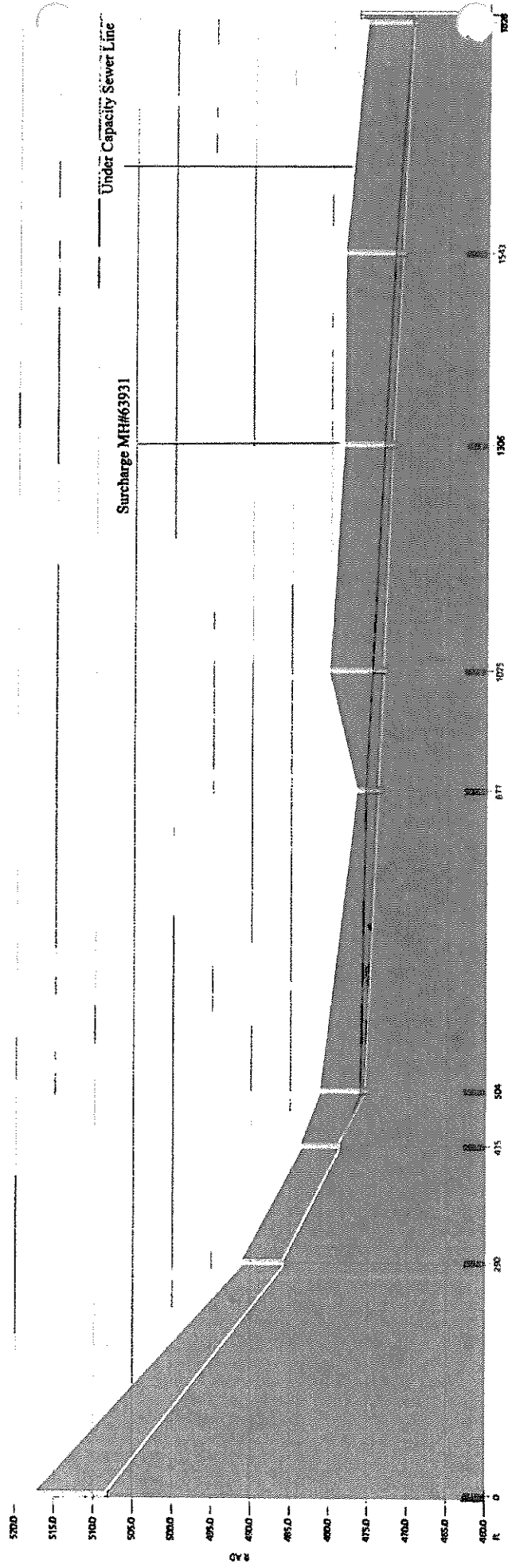


Figure 4 - Requested Flow (58,800 GPD ADWF)



Asher Engineering, Inc.
Environmental & Engineering Consulting

December 2, 2020

Mr. Jonathan Brannon, AIA
WBCS Architecture+Design
jonathan@wbcsearch.com

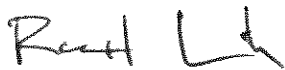
Re: Geotechnical Engineering Study
Crossings at Mill Creek
1936 Bluegrass Avenue
Louisville, Kentucky

Dear Mr. Brannon,

Asher Engineering has completed a Geotechnical Engineering Study for the referenced project. This report contains the findings of our subsurface exploration, geotechnical recommendations to aid design of foundations, and pavements, and construction recommendations with regard to site work; fill placement, and foundation installation and inspection.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance, or if you have any questions regarding this report, please contact our office.

Sincerely,



Richard A. Linker, P. E.

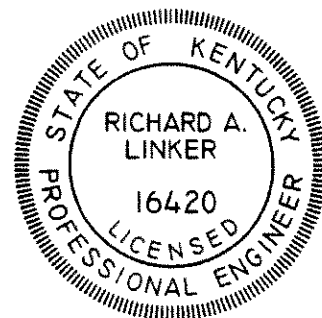


TABLE OF CONTENTS

| | |
|---|---|
| LETTER OF TRANSMITTAL | i |
| 1.0 PROJECT INFORMATION | 1 |
| 2.0 SUBSURFACE EXPLORATION | 1 |
| 3.0 DESIGN RECOMMENDATIONS | 2 |
| 3.1 Site Development..... | 2 |
| 3.2 Shallow Foundations | 3 |
| 3.3 Floor Slabs | 3 |
| 3.4 Below Grade Walls..... | 3 |
| 3.5 Pavements | 4 |
| 4.0 CONSTRUCTION RECOMMENDATIONS | 5 |
| 4.1 Subgrade Preparation..... | 5 |
| 4.2 Engineered Fill..... | 5 |
| 4.3 Foundation Excavations..... | 5 |
| 5.0 QUALIFICATIONS | 6 |
| APPENDICES | |
| Site Location Photograph | |
| Location of Test Borings | |
| Thickness of Old Fill | |
| Test Boring Logs | |

1.0 PROJECT INFORMATION

The 10.2 acre site is located at the southeast corner of Bluegrass Ave. and Manslick Rd., in Louisville, Kentucky. The site topography changes dramatically from the west and center portion which is flat to the east side of the site which drops in elevation significantly forming a ridge that extends downward steeply to the east. The east portion of the site is heavily wooded with small and large trees and thick brush from the north to the south border. The center and west half of the site has some woods, but also some open areas at the northeast corner of the site, and the east side of the site. The southwest corner of the site also has some open spaces, and is the only portion of the site that is developed with a small Dr. Office building with driveway and parking lot.

Proposed for construction is an apartment complex with four 3-Story and three 3-Story slab on grade apartment buildings, with a Club House building and asphalt paved parking lots and access drives down the center of the site north to south.

2.0 SUBSURFACE EXPLORATION

The subsurface conditions were explored by conducting 12 test borings at the locations shown on the sketch in the Appendix. The boring logs (also included in the Appendix) describe the materials and conditions encountered at each location.

The flat to gently sloping portion of the site from the center to the west has been filled. This man-placed fill is what forms the ridge that runs north-south along the east portion of the site. The old fill material consists of clay soil, crushed stone, concrete, shale, cinders, asphalt, rock, brick, trace organics. The subsurface conditions east of the 'ridge' is stiff natural silty clay soil.

| <u>Building (Borings)</u> | <u>Old Fill Thickness, ft.</u> |
|---------------------------|--------------------------------|
| 1 (B-7 and B-10) | 2 to 6 |
| 2 (B-4 and B-7) | 6 to 12 |
| 3 (B-4 and B-1) | 14 |
| 4 (B-1 and B-2) | 10 to 14 |
| 5 (B-6) | 0 |
| 6 (B-9) | 0 |
| 7 (B-12) | 10 |
| CH (B-5 and B-8) | 6 to 12 |

2.0 SUBSURFACE EXPLORATION (CONT.)

The borings were extended to 20 ft. and did not technically 'refuse' on bedrock. However, the sampling and drilling observations revealed that the borings encountered Shale bedrock about 18 to 20 ft. below existing grade.

3.0 DESIGN RECOMMENDATIONS

The following design recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions.

3.1 Site Development

The flat to gently sloping portion of the site from the center to the west has been filled forming a steep ridge that runs north-south along the east portion of the site.

The subsurface conditions east of the ridge consist of stiff natural silty clay soil.

The old fill material was not placed under engineering control, and is not suitable for support of the new buildings. The old fill was relatively 'clean' with no trash or debris, and minimal topsoil and organics. We recommend undercutting Bldgs 1, 2, 3, 4, 7, and the ClubHouse down to firm natural soil. (Buildings 5 and 6 are in an area with little or no old fill, and can be completed by typical building pad and footing construction.)

The undercut area should be extended 5 ft. outside the bldg footprint. The old fill material that was removed would then be placed back into the undercut excavation, compacted in about 1 ft. loose lifts. Any pieces of old fill larger than 1 ft. should not be used back in the new engineered fill. Floor slabs should be poured on a stone subbase of at least 12 in. of Ky DGA crushed limestone.

The old fill can remain in place under new pavement areas provided they are inspected by proofroll with a loaded dump truck. Any soft areas identified by the proofroll would be undercut and stabilized with crushed stone

With this construction, there will be no slope issues regarding the new structures.

All structures will bear either on firm natural soil (Bldgs 5 and 6), or engineered fill that is placed and compacted on firm natural soil.

3.2 Shallow Foundations

Footings can be proportioned using a net allowable bearing capacity of 3000 psf for continuous wall and isolated footings. Site Classification C should be used for seismic design. Wall footings must be at least 16 in. wide and column footings must be at least 24 in. wide to provide an adequate factor of safety for bearing capacity. All exterior footings and footings in unheated areas must bear at least 30 in. below final exterior grade for frost protection. Interior footings in heated areas can bear at nominal depths below the floor (at least 12 inches).

3.3 Floor Slabs

The geotechnical engineer should inspect the subgrade with a proofroll prior to the placement of fill or the crushed stone base. Some undercutting and stabilization with crushed stone may be necessary to stabilize the slab area, especially during wet periods of the year. Upon approval of the subgrade, we recommend that the slab be supported on a 4-in. layer of KY DGA crushed stone compacted to 100 percent of the standard Proctor.

3.4 Below Grade Walls

Below grade walls and retaining walls should be designed to provide sufficient drainage to relieve hydrostatic pressure. A clean, free draining granular fill such as KY No. 57 stone should be used to backfill against below grade walls. The backfill zone should be drained using a perforated pipe placed at the base of the wall. An Equivalent Hydrostatic Pressure of 50 pcf can be used to design below grade walls. A unit weight of 130 pcf should be used for the granular backfill. The granular fill should be capped at the ground surface with about 2 ft. of clayey soil to inhibit infiltration of surface water behind the below grade walls. Care should be taken and equipment size limited when compacting next to the walls.

3.5 Pavements

The subgrade in all new pavement areas should be proofrolled to identify any soft areas that may require undercutting and stabilization. Assuming proper subgrade preparation and drainage, a California Bearing Ratio (CBR) value of 5 is recommended.

The following pavement sections are recommended.

Automobile and Light Truck Areas

1.5 in. asphalt concrete surface
2.0 in. asphalt concrete base
4.0 in. KY DGA
4.0 in. 4 to 6 in. Minus crushed stone

Heavy Truck Areas

1.5 in. asphalt concrete surface
3.0 in. asphalt concrete base
4.0 in. KY DGA
4.0 in. 4 to 6 in. Minus crushed stone

4.0 CONSTRUCTION RECOMMENDATIONS

Variations in subsurface conditions must be expected during construction. It is therefore recommended that the geotechnical engineer be retained to review the soils-related phases of the project and to correlate the subsurface data with the soil conditions that are encountered during construction.

4.1 Subgrade Preparation

Prior to construction or the placement of new engineered fill, the exposed subgrade should be evaluated by the project geotechnical engineer. The evaluation should include proofrolling of the exposed subgrade with a loaded dump truck. If unsuitable material were disclosed, the geotechnical engineer would recommend an appropriate remedial measure at that time. The silty clay soils encountered just beneath the pavement surface will be sensitive to moisture and heavy construction equipment, and may require aeration and re-compaction or undercutting to reach firm subgrade. The severity of this potential problem depends on the weather conditions prevailing during construction.

The contractor should exercise discretion when selecting equipment sizes and also control surface water while the subgrade soils are exposed. It may be necessary to undercut and stabilize the proposed pavement areas with crushed stone, or use a geotextile fabric to improve the subgrade, especially if the sitework is done during wet weather conditions.

4.2 Engineered Fill

Engineered fill should be placed on a prepared subgrade that has been evaluated by the geotechnical engineer. Engineered fill placed in the building pad should be compacted to at least 98 percent of the standard Proctor maximum dry density (ASTM D-698). Fill placed in paved areas may be compacted to 95 percent. The geotechnical engineer or his representative should monitor engineered fill placement and compaction operations. Field density tests should be performed on each lift as necessary to insure that the specified compaction is being achieved.

4.3 Foundation Excavations

All foundation excavations should be evaluated by the geotechnical engineer or his representative to insure adequate foundation support. All concrete for foundations should be poured the same day the excavation is made.

5.0 QUALIFICATIONS

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either express or implied. Asher, Inc. is not responsible for the independent conclusion, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

The nature and extent of variation and change in the subsurface conditions at the site may not become evident until the course of construction. Construction monitoring by the geotechnical engineer or his representative is therefore considered necessary to verify the subsurface conditions and to check that the soil connected construction phases are properly carried out. If significant variations or changes are in evidence, it may then be necessary to reevaluate the recommendations of this report.

Furthermore, if the project characteristics are altered significantly from those discussed in this report, if the project information contained in this report is incorrect, or if additional information becomes available, a review must be made to determine if any modification in the recommendations will be required.

APPENDIX

**Site Location Photograph
Location of Test Borings
Thickness of Old Fill
Test Boring Logs**

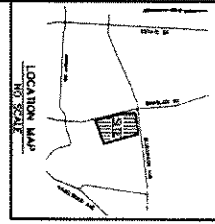


Marian Development

**Site Location
Bluegrass Avenue At Manslick Road
Louisville, KY**

**Asher Engineering, Inc.
Project No.: 20-114
Photo Date September 2019**

20-ZONE-0096



EROSION PREVENTION AND SEDIMENT CONTROL NOTES

THE APPROVED EROSION PREVENTION AND SEDIMENT CONTROL PLAN SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND SHALL BE REVISITED AS NECESSARY TO ACCOMMODATE ANY CHANGES TO THE CONSTRUCTION PROGRAM. THE CONSTRUCTION PROGRAM SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO THE START OF CONSTRUCTION. THE CONSTRUCTION PROGRAM SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND SHALL BE REVISITED AS NECESSARY TO ACCOMMODATE ANY CHANGES TO THE CONSTRUCTION PROGRAM.

THE CONSTRUCTION PROGRAM SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND SHALL BE REVISITED AS NECESSARY TO ACCOMMODATE ANY CHANGES TO THE CONSTRUCTION PROGRAM.

PROPOSED IMPROVED CALCULATIONS (FOOTPRINT)

NET AREA: 377,426 (FOOTPRINT)

GROSS AREA: 400,000 (FOOTPRINT)

NET AREA: 377,426 (FOOTPRINT)

PROPOSED IMPROVED CALCULATIONS

Area = 1.17

Area = 1.17 Acres

Permitted Area = 0.006 (3.11' x 20.0' x 9.1')

Permitted Area = 0.106 (4.24')

PROPOSED IMPROVED SURFACE

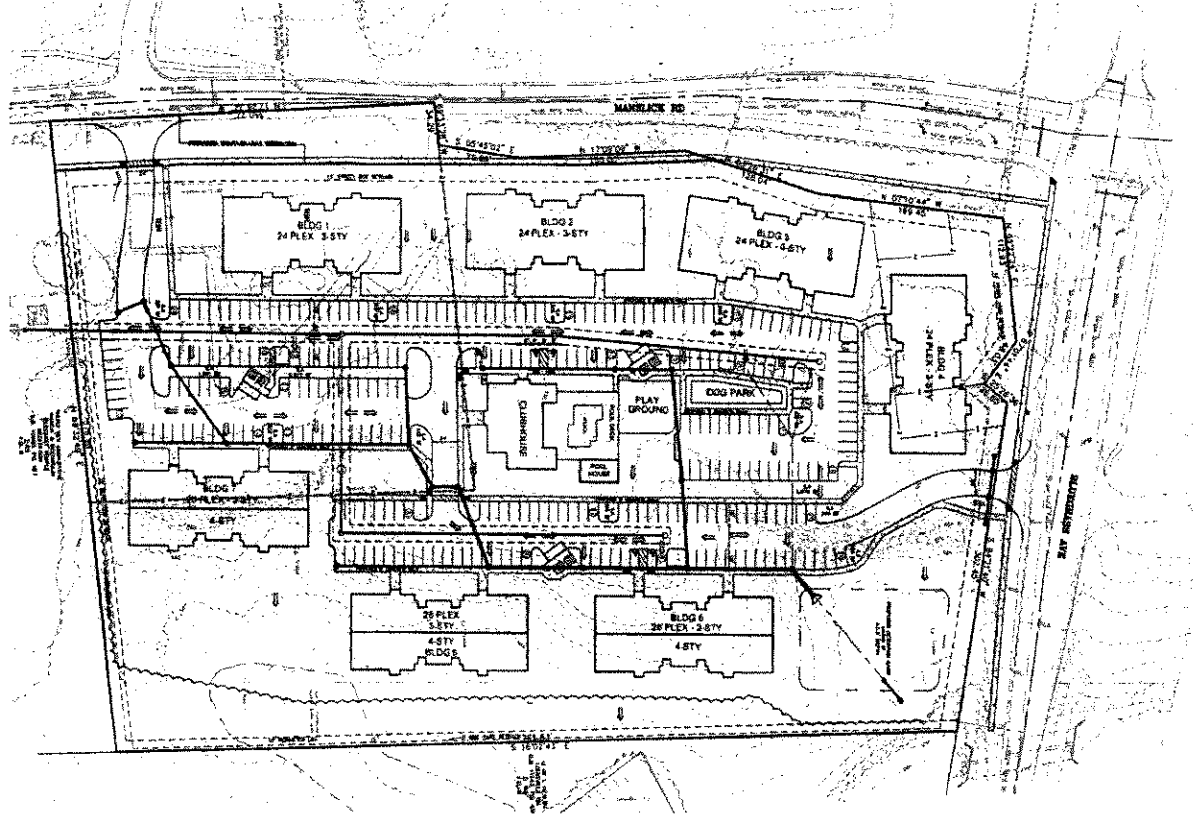
NON-DEVELOPED IMPROVED SURFACE = 212,296 SF

NON-DEVELOPED IMPROVED SURFACE = 204,744 SF

NET IMPROVED IMPROVED SURFACE = 17,552 SF

GENERAL NOTES:

1. SEE SITE SPECIFICATIONS OF STATE AND LOCAL GOVERNMENT AGENCIES.
2. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
3. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
4. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
5. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
6. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
7. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
8. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
9. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
10. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
11. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
12. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
13. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
14. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.
15. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF LOUISVILLE ZONING ORDINANCES AND ALL OTHER LOCAL, STATE AND FEDERAL REGULATIONS.



PROJECT SUMMARY

| EXISTING ZONE DISTRICT | EXISTING ZONE | PROPOSED ZONE | PROPOSED ZONE |
|------------------------|---------------|---------------|---------------|
| 20-ZONE-0096 | 20-ZONE-0096 | 20-ZONE-0096 | 20-ZONE-0096 |
| 3.0 | 3.0 | 3.0 | 3.0 |
| 10 | 10 | 10 | 10 |
| 20 | 20 | 20 | 20 |
| 30 | 30 | 30 | 30 |
| 40 | 40 | 40 | 40 |
| 50 | 50 | 50 | 50 |
| 60 | 60 | 60 | 60 |
| 70 | 70 | 70 | 70 |
| 80 | 80 | 80 | 80 |
| 90 | 90 | 90 | 90 |
| 100 | 100 | 100 | 100 |
| 110 | 110 | 110 | 110 |
| 120 | 120 | 120 | 120 |
| 130 | 130 | 130 | 130 |
| 140 | 140 | 140 | 140 |
| 150 | 150 | 150 | 150 |
| 160 | 160 | 160 | 160 |
| 170 | 170 | 170 | 170 |
| 180 | 180 | 180 | 180 |
| 190 | 190 | 190 | 190 |
| 200 | 200 | 200 | 200 |
| 210 | 210 | 210 | 210 |
| 220 | 220 | 220 | 220 |
| 230 | 230 | 230 | 230 |
| 240 | 240 | 240 | 240 |
| 250 | 250 | 250 | 250 |
| 260 | 260 | 260 | 260 |
| 270 | 270 | 270 | 270 |
| 280 | 280 | 280 | 280 |
| 290 | 290 | 290 | 290 |
| 300 | 300 | 300 | 300 |
| 310 | 310 | 310 | 310 |
| 320 | 320 | 320 | 320 |
| 330 | 330 | 330 | 330 |
| 340 | 340 | 340 | 340 |
| 350 | 350 | 350 | 350 |
| 360 | 360 | 360 | 360 |
| 370 | 370 | 370 | 370 |
| 380 | 380 | 380 | 380 |
| 390 | 390 | 390 | 390 |
| 400 | 400 | 400 | 400 |
| 410 | 410 | 410 | 410 |
| 420 | 420 | 420 | 420 |
| 430 | 430 | 430 | 430 |
| 440 | 440 | 440 | 440 |
| 450 | 450 | 450 | 450 |
| 460 | 460 | 460 | 460 |
| 470 | 470 | 470 | 470 |
| 480 | 480 | 480 | 480 |
| 490 | 490 | 490 | 490 |
| 500 | 500 | 500 | 500 |
| 510 | 510 | 510 | 510 |
| 520 | 520 | 520 | 520 |
| 530 | 530 | 530 | 530 |
| 540 | 540 | 540 | 540 |
| 550 | 550 | 550 | 550 |
| 560 | 560 | 560 | 560 |
| 570 | 570 | 570 | 570 |
| 580 | 580 | 580 | 580 |
| 590 | 590 | 590 | 590 |
| 600 | 600 | 600 | 600 |
| 610 | 610 | 610 | 610 |
| 620 | 620 | 620 | 620 |
| 630 | 630 | 630 | 630 |
| 640 | 640 | 640 | 640 |
| 650 | 650 | 650 | 650 |
| 660 | 660 | 660 | 660 |
| 670 | 670 | 670 | 670 |
| 680 | 680 | 680 | 680 |
| 690 | 690 | 690 | 690 |
| 700 | 700 | 700 | 700 |
| 710 | 710 | 710 | 710 |
| 720 | 720 | 720 | 720 |
| 730 | 730 | 730 | 730 |
| 740 | 740 | 740 | 740 |
| 750 | 750 | 750 | 750 |
| 760 | 760 | 760 | 760 |
| 770 | 770 | 770 | 770 |
| 780 | 780 | 780 | 780 |
| 790 | 790 | 790 | 790 |
| 800 | 800 | 800 | 800 |
| 810 | 810 | 810 | 810 |
| 820 | 820 | 820 | 820 |
| 830 | 830 | 830 | 830 |
| 840 | 840 | 840 | 840 |
| 850 | 850 | 850 | 850 |
| 860 | 860 | 860 | 860 |
| 870 | 870 | 870 | 870 |
| 880 | 880 | 880 | 880 |
| 890 | 890 | 890 | 890 |
| 900 | 900 | 900 | 900 |
| 910 | 910 | 910 | 910 |
| 920 | 920 | 920 | 920 |
| 930 | 930 | 930 | 930 |
| 940 | 940 | 940 | 940 |
| 950 | 950 | 950 | 950 |
| 960 | 960 | 960 | 960 |
| 970 | 970 | 970 | 970 |
| 980 | 980 | 980 | 980 |
| 990 | 990 | 990 | 990 |
| 1000 | 1000 | 1000 | 1000 |

CROSSINGS AT MILL CREEK APARTMENTS

Milestone design group

108 Doventry Lane, Suite 300 Louisville, KY 40222
502.327.7073 www.milestone-design.org

DATE: 3/26/2014
DRAWN BY: S.E.E.
CHECKED BY: M.M.M.
SCALE: 1/8" = 1'-0" (AS SHOWN)

JOB NUMBER: 20014
DEVELOPMENT PLAN

TO MINIMIZE THE TRACKING OF INSTRUCTION AREAS ONTO PUBLIC ROAD ONTO THE ROADWAY SHALL BE

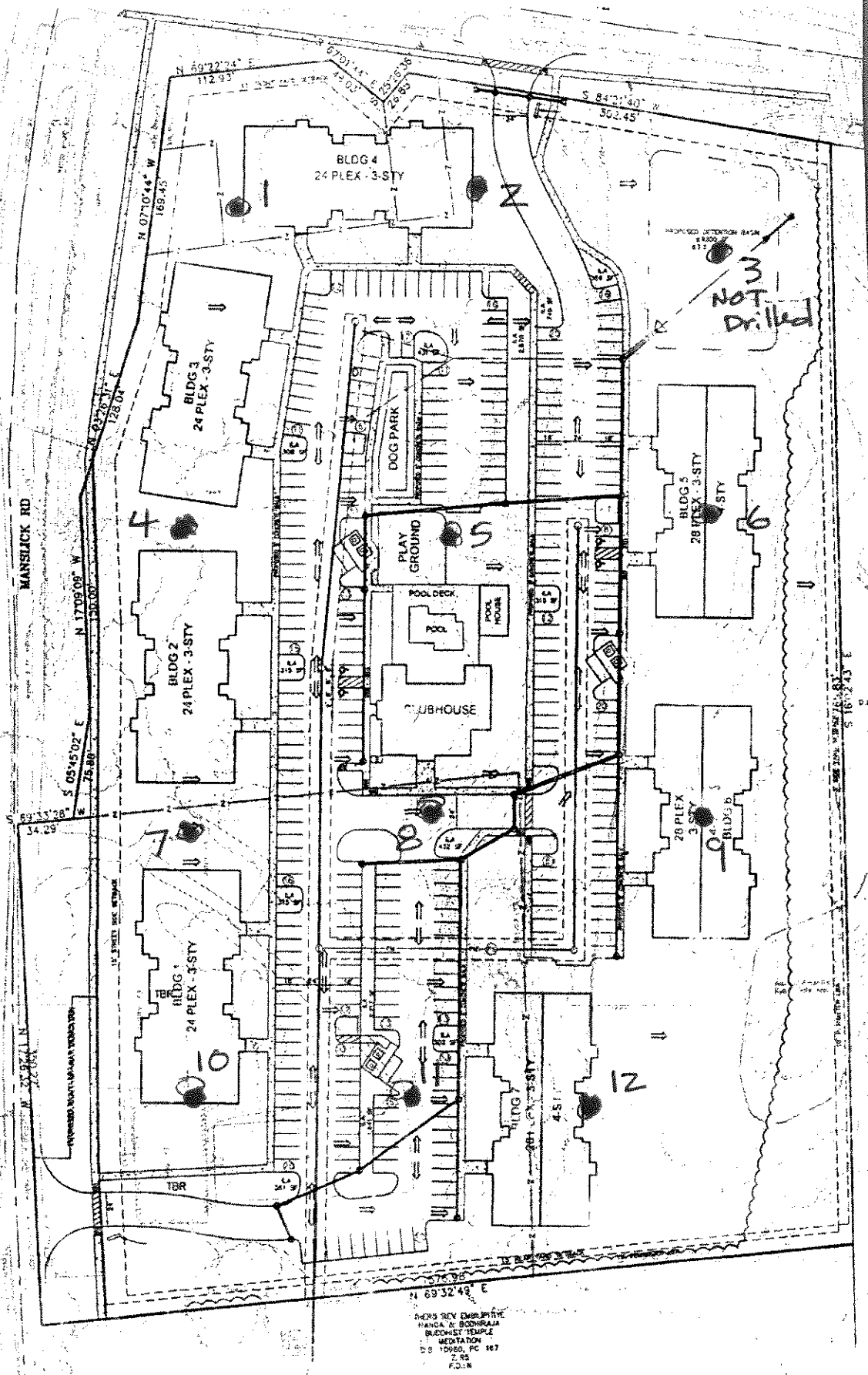
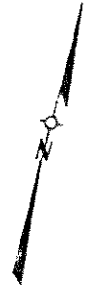
BE LOCATED AWAY FROM STREAMS, TRENCH BASINS. STOCKPILES SHALL BE PROPERLY STORED AND ADEQUATELY CONTAINED BY FENCE.

DESIGN MUST UTILIZE LOW-WATER PERMS PER MSD STANDARD DRAWING

LAND DISTURBANCE ACTIVITY WILL BE LIMITED TO ANY PORTION OF A SITE. RESTORATION MEASURES SHALL BE INSTALLED IMMEDIATELY, BUT NO LATER THAN 14 DAYS AFTER ACTIVITY HAS CEASED.

GROUNDWATER ENCOUNTERED DURING OTHER EXCAVATION ACTIVITIES SHALL BE CAPTURED BY SEDIMENT TRAPPING DEVICES PRIOR TO A STREAM, POND, SWALE OR

- 1. SON
- 2. TRENCH
- 3. DIRECT OPEN
- 4. NEARBY
- 5. ON
- 6. EXCAVATION
- 7. WITH
- 8. NO. OF
- 9. INFORMED
- 10. PERMIT
- 11. 4
- 12. DRIVING
- 13. REQUIRED
- 14. 4 TO
- 15. BORING
- 16. INS
- 17. PER



LOCATION OF TEST BORINGS

20-ZONE-0096

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 1

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|----|------------------|--|
| | — | 1 | 2-3-7 | 10 | | FILL - 3" of Topsoil; moist to v. moist; firm; brown silty clay soil with rock, crushed stone, concrete and trace of shale, cinders and asphalt |
| | — | 2 | 6-17-8 | 25 | | |
| | — | 3 | 2-2-2 | 4 | | Same - v. moist; med. firm to firm; brown with blue and dark gray silty clay with rock, crushed stone, and concrete |
| 5 | — | 4 | 3-4-4 | 8 | | |
| | — | 5 | 2-2-2 | 4 | | Same - v. moist (wet); med. firm (softer); dark gray, blue gray, and olive brown very silty clay with trace shale fragments and crushed stone |
| 10 | — | 6 | 4-6-7 | 13 | | |
| | — | 7 | 8-9-13 | 22 | | SILTY CLAY (CL) - moist; stiff; olive gray; silty; with trace organic debris (original ground line) |
| | — | | | | | <i>Ground water near 18 ft.</i> |
| 20 | — | | | | | Same - moist; v. stiff; red brown; with trace rock and shale fragments |
| | — | | | | | Terminated at 20 ft. |
| 25 | — | | | | | |

Notes: 3" of topsoil, approximately 12 ft. to 13 ft. of old fill; groundwater noted near 18 ft.

TEST PIT LOG

Asher Engineering

1021 South Floyd St.
Louisville, KY 40203
(502) 589-0073

Test Pit No.: 2

ELEV.: _____

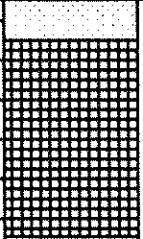
Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 13, 2020

| Elev (feet) | Depth (feet) | Soil Profile | Percent Moisture | Description of Material |
|-----------------------------|--------------|---|------------------|--|
| | |  | | <p>Fill - 3" topsoil; moist to very moist; medium firm; brown and gray silty clay soil with organics, rock, concrete (slabs); asphalt</p> <p>Same - moist to v. moist; med. firm; olive gray silty clay with asphalt and trace organics</p> <p>Same - moist; med. firm; brown and olive gray silty clay with trace asphalt</p> |
| | 5 | | | |
| | 10 | | | |
| | 15 | | | |
| | 20 | | | |
| | 25 | | | |
| Terminated at 10 ft. | | | | |

Notes: Test pit performed at Boring #2 location

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 3

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|---|------------------|--|
| | 5 | | | | | Not Drilled. Not Accessible. |
| | 10 | | | | | |
| | 15 | | | | | Same - v. moist; stiff; olive brown and gray; very silty |
| | 20 | 7 | 3-4-5 | 9 | | |
| | 25 | | | | | Terminated at 20 ft. |

Notes: 4" of topsoil, approximately 10 ft. to 13 ft. of old fill; perched water near 8.5 ft.

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 4

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|----|------------------|--|
| | | 1 | 1-1-2 | 3 | | FILL - 4" of Topsoil; moist to v. moist; soft to med. firm; gray and brown with trace red silty clay soil with rock and concrete Same - moist ; med. firm to firm; olive gray and dark gray very silty clay with cinders and asphalt Same - v. moist (wet); med. firm (softer); olive gray and brown very silty clay with asphalt SILTY CLAY (CL) - moist; stiff; olive gray and brown with gray; with trace organic debris (original ground line) <i>Ground water near 17 ft.</i> Same - v. moist; stiff; red brown with tan; with trace rock fragments Terminated at 20 ft. |
| | | 2 | 2-2-2 | 4 | | |
| | 5 | 3 | 2-18-6 | 24 | | |
| | | 4 | 4-4-2 | 6 | | |
| | 10 | 5 | 4-2-2 | 4 | | |
| | 15 | 6 | 3-4-7 | 11 | | |
| | 20 | 7 | 3-4-5 | 9 | | |
| | 25 | | | | | |

Notes: 4" of topsoil, approximately 10 ft. to 12 ft. of old fill; groundwater noted near 17 ft.

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 5

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|----|------------------|---|
| | — | 1 | 3-4-7 | 11 | | FILL - 4" of Topsoil; v. moist (wet); med. firm; brown with trace gray silty clay soil with rock, stone, and concrete Same - moist ; firm; brown silty clay soil with trace rock, concrete, and organics <i>Perched water near 8.5 ft.</i> Same - v. moist; firm; dark gray and olive brown; with trace rock and organics SILTY CLAY (CL) - moist; stiff; brown with gray; silty; with trace organics (original ground line) Same - v. moist; stiff; olive brown and gray; very silty Terminated at 20 ft. |
| | — | 2 | 2-2-3 | 5 | | |
| | — | 3 | 2-3-20 | 23 | | |
| | 5 — | | | | | |
| | — | 4 | 3-3-4 | 7 | | |
| | — | 5 | 3-5-5 | 10 | | |
| | 10 — | | | | | |
| | — | 6 | 3-5-6 | 11 | | |
| | 15 — | | | | | |
| | — | 7 | 3-4-5 | 9 | | |
| | 20 — | | | | | |
| | — | | | | | |
| | 25 — | | | | | |

Notes: 4" of topsoil, approximately 10 ft. to 13 ft. of old fill; perched water near 8.5 ft.

TEST PIT LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Test Pit No.: 6

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 13, 2020

| Elev (feet) | Depth (feet) | Soil Profile | Percent Moisture | Description of Material |
|-------------|--------------|--------------|------------------|--|
| | | | | Topsoil - 4" thick |
| | 5 | | | SILTY CLAY (CL) - moist to v. moist; med. firm; brown and olive gray; very silty |
| | 10 | | | Terminated at 10 ft. |
| | 15 | | | |
| | 20 | | | |
| | 25 | | | |

Notes: Test pit performed at Boring #6 location

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 7

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|-----|------------------|---|
| | | 1 | 2-4-4 | 8 | | FILL - 4" of Topsoil; moist; firm to med. firm; brown and dark brown silty clay soil; with trace brick; very silty |
| | | 2 | 2-2-3 | 5 | | |
| | | 3 | 2-2-3 | 5 | | |
| | 5 | | | | | SILTY CLAY (CL) - v. moist; med. stiff; brown; silty; (possible fill to 6 ft.) |
| | | 4 | 4-5-5 | 10 | | Same - moist; stiff to v. stiff; brown and red with olive gray and trace tan; becoming weather shale soil |
| | 10 | 5 | 4-6-8 | 14 | | |
| | | 6 | 17-22-50/5" | n/a | | Weathered Shale - dry; hard; olive gray and tan; silty; layered |
| | 15 | | | | | Same |
| | 20 | | | | | Terminated at 20 ft. |
| | 25 | | | | | |

Notes: 4" of topsoil, approximately 4 ft. to 6 ft. of old fill
 Sounded down to 20 ft.; slow drilling; no refusal encountered

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 8

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|----|------------------|--|
| | | 1 | 4-12-5 | 17 | | FILL - 5" of Topsoil; v. moist; med. firm; brown silty clay soil; with crushed stone, concrete, and trace brick fragments |
| | | 2 | 2-4-8 | 12 | | |
| | 5 | 3 | 4-4-4 | 8 | | Same - moist; firm; brown very silty clay soil |
| | | 4 | 3-2-3 | 5 | | ORGANIC CLAY (OL) - v. moist; med. firm to soft; gray; with trace old soil fill; low recovery |
| | 10 | 5 | 3-3-6 | 9 | | SILTY CLAY (CL) - v. moist; med. stiff to stiff; olive gray; very silty; trace organic odor |
| | 15 | 6 | 5-7-9 | 16 | | Same - moist; stiff to v. stiff; red with tan; with very silty layers and trace rock fragments |
| | 20 | | | | | Terminated at 20 ft. |
| | 25 | | | | | |

Notes: 5" of topsoil, approximately 4 ft. to 6 ft. of old fill over very silty dark gray organic soil to near 8 ft.
 Sounded down to 20 ft.; no refusal encountered

TEST PIT LOG

Asher Engineering
1021 South Floyd St.
Louisville, KY 40203
(502) 589-0073

Test Pit No.: 9

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 13, 2020

| Elev (feet) | Depth (feet) | Soil Profile | Percent Moisture | Description of Material |
|-------------|--------------|--------------|------------------|---|
| | | | | Topsoil - 12" thick |
| | | | | SILTY CLAY (CL) - moist to v. moist; med. firm; brown and olive gray; very silty |
| | 5 | | | Same |
| | | | | Terminated at 4 ft. |
| | 10 | | | |
| | 15 | | | |
| | 20 | | | |
| | 25 | | | |

Notes: Test pit performed at Boring #9 location

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 10

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|-----|------------------|--|
| | — | 1 | 1-2-3 | 5 | | FILL - 5" of Topsoil; v. moist; med. firm; red brown silty clay soil; with trace organics |
| | — | 2 | 3-5-6 | 11 | | |
| | — | 3 | 5-6-11 | 17 | | SILTY CLAY (CL) - moist; stiff to v. stiff; red brown and tan |
| | 5 — | | | | | |
| | — | 4 | 9-11-15 | 26 | | Same - moist to dry; v. stiff; tan with trace dark brown shale fragments; silty |
| | — | 5 | 7-8-12 | 20 | | Same - moist; v. stiff; tan with gray and trace red |
| | 10 — | | | | | |
| | — | 6 | 22-50/5" | n/a | | Weathered Shale - dry; hard; olive gray with some dark brown; silty; layered |
| | 15 — | | | | | |
| | — | | | | | |
| | 20 — | | | | | Terminated at 20 ft. |
| | — | | | | | |
| | 25 — | | | | | |

Notes: 5" of topsoil, approximately 2 ft. of old fill
 Sounded down to 20 ft.; slow drilling; no refusal encountered

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 11

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|----|------------------|--|
| | — | 1 | 1-2-3 | 5 | | FILL - 4" of Topsoil; moist; med. firm; brown silty clay soil; very silty |
| | — | 2 | 2-2-3 | 5 | | |
| | — | 3 | 2-3-3 | 6 | | SILTY CLAY (CL) - v. moist to moist; med. stiff; brown; very silty; (possible fill) |
| 5 | — | 4 | 2-3-4 | 7 | | |
| | — | 5 | 6-7-11 | 18 | | Same - moist; stiff; brown with red |
| 10 | — | 6 | 9-11-9 | 20 | | |
| | — | | | | | Same - moist; v. stiff; brown with tan, gray, and red |
| 15 | — | | | | | |
| | — | | | | | Same - moist; v. moist; brown and tan; with oxidation; becoming tan and gray shale |
| 20 | — | | | | | |
| | — | | | | | Refusal at 19 ft. |
| 25 | — | | | | | |

Notes: 4" of topsoil, approximately 2 ft. to 5 ft. of old fill
 Sounded down to 19 ft.; refusal

BORING LOG

Asher Engineering
 1021 South Floyd St.
 Louisville, KY 40203
 (502) 589-0073

Boring No.: 12

ELEV.: _____

Project: Crossings at Mill Creek

Project No.: 20-114

Location: Bluegrass Ave., Louisville, KY

Client: Marian Development

Date: November 12, 2020

| Elev (feet) | Depth (feet) | Sample Number | SPT Blows / 6" | N | Percent Moisture | Description of Material |
|-------------|--------------|---------------|----------------|----|------------------|--|
| | | 1 | 2-2-3 | 5 | | FILL - 7" of Topsoil; v. moist to moist; med. firm; brown and dark brown with olive gray and red silty clay soil; with trace rock, concrete, and organics Same - moist; med. firm; brown and olive gray very silty clay soil ORGANIC CLAY (OL) - v. moist; med. firm to soft; dark brown and gray with some black; with trace organics SILTY CLAY (CL) - v. moist to moist; stiff; red brown with tan <i>Groundwater at 19 ft.</i> Same - moist with wet zones; stiff to v. stiff; red and tan; with trace rock and shale Terminated at 20.5 ft. |
| | | 2 | 2-7-7 | 14 | | |
| | | 3 | 2-3-3 | 6 | | |
| | 5 | 4 | 2-3-3 | 6 | | |
| | | 5 | 2-2-2 | 4 | | |
| | 10 | 6 | 3-4-4 | 8 | | |
| | 15 | 7 | 6-7-18 | 25 | | |
| | 20 | | | | | |
| | 25 | | | | | |

Notes: 7" of topsoil, approximately 8 ft. to 10 ft. of old fill over a layer of organic soil to near 11 ft. Sounded down to 20 ft.; no refusal encountered