Student Center Building
Storm Water System Study

November 3, 2016

Prepared by: A. Ryan
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1.0 Existing Conditions

The Chamberlain Student Center at Rowan University is currently experiencing issues with the existing underground storm water system in between column line 19 & 20 on drawing P-2 dated 3/18/1971. The branch in this location serves six (6) 4" diameter roof drains and discharges out of the back of the building, combining with another branch line before it discharges into the stream. During episodes of heavy rains, multiple cleanouts inside the building pop off due to the pressure in the storm water pipe causing water to overflow into the building. The cleanout in the hallway adjacent to the mail room is the first cleanout to pop off in the student spaces. To mitigate the water issue, large, heavy objects are placed on top of the cleanout, which then forces water downstream, popping the next cleanout in the hallway that connects to the door at the back of the building. The floor plan in Appendix A shows the locations of the two cleanouts (CO #1 & CO #2) that cause issues along with the approximate location of the storm water line.

2.0 Findings

Burns contracted Master Locators to assist in inspecting the existing underground storm water pipe to locate any blockages or obstructions. Through the use of a video camera on the end of a snake, multiple locations were found to be slightly, partially or mostly blocked. A total of 4 blockages were found.

Starting from CO #1, which is shown on the floor plan in Appendix A, the first blockage was encountered approximately 3’ from the cleanout. Figure 1 below shows a photo of the blockage.

![Figure 1: 1st Blockage Approximately 3’ from CO #1](image)

The arrows above show beginning of the first blockage. Standing water upstream of the blockage shows that approximately ¼ of the inner diameter of the pipe is obstructed.
Continuing downstream, the first blockage is still evident approximately 9' from CO #1, where the buildup appears to have grown larger than Figure 1. Figure 2 below shows a photo of the blockage.

![Figure 2: 1st Blockage Approximately 9’ from CO #1](image)

This location appears to be a larger buildup of sludge/grease and rocks/stones. This blockage appears to take up between ¼ - ½ of the pipe inside diameter as it continues downstream.

The first blockage continues to approximately 21’ from CO #1. Figure 3 below shows two photos towards the end of the blockage.

![Figure 3: 1st Blockage Approximately 18’ from CO #1 (Left), End of 1st Blockage Approximately 21’ from CO #1 (Right)](image)
Figure 3 (left) shows a break in the sludge build up on the bottom of the pipe, which appears to have air space below. The buildup is not solid, which should allow for an easier cleaning/jetting removal. Figure 3 (right) shows the end of the obstruction.

The second blockage was encountered approximately 43’ from CO #1. Figure 4 below shows two pictures of the blockage.

![Figure 4: 2nd Blockage Approximately 44’ from CO #1 (Left), Water Buildup Behind 2nd Blockage Approximately 28’ from CO #1 (Right)](image)

The second blockage appears to be due to rock/stone build up at the bottom of the pipe. In the left photo above, the build appears to take up almost half of the inner diameter of the pipe. The right photo shows a backup of water behind the stones. Directly upstream, the camera submerges completely underwater due to the height of the water build up. The cause of this is unknown, as there are no rocks or stones on the roof that could get into the system. No holes or punctures were evident during the inspection either. A blockage of this size could cause the water backup issues present in multiple locations in the Student Center.

The third blockage was encountered approximately 103’ from CO #1. Figure 5 below shows a photo of the blockage.
This blockage is unique in its shape and color. The color of the material looks similar to the color of the roof, which is a built up system with silver top coat. Roofing material could have entered the roof drains and traveled to this location to settle. Standing water upstream of this location shows that less than \( \frac{1}{4} \) of the pipe inner diameter is obstructed.

Finally, the last accessible obstruction was encountered approximately 123’ from CO #1. Figure 6 below shows a photo of the blockage.
The final blockage accessible from CO #1 is shown above, the camera was not able to get past to investigate the remaining 75’-100’ of the storm water line before it discharges to the stream behind the Student Center due to its size and shape. The large obstruction is unique as it does not cover the bottom of the pipe and has somehow attached to the sides of the pipe.

Moving next to CO #2 shown in Appendix A, the camera was inserted but was not able to make the multiple bends required to turn into the main. Once the branch line made the 90° turn into the top of the main, the camera hit the bottom of the pipe perpendicularly and got stuck due to the size of the camera and rigidity of the snake. The final cleanout is CO #3, which can be seen below in Figure 7.

![Figure 7: Inaccessible Cleanout #3](image)

Due to the location of the cleanout and the ductwork built over it, there was no plausible way to access the storm water pipe. The site plan shown on drawing MPE-1 dated 3/18/1971 shows a cleanout in the grass behind the Student Center that was not able to be located. Due to the saturated soil conditions, the ground penetrating radar (GPR) was not able to locate any portion of the pipe below grade outside of the building. Access from the headwall at the creek was also not possible due to the multiple bends the storm water line makes before entering the building. The crawler (small robotic car with camera) is not designed to make turns. Also, the snake would have encountered two locations while traveling upstream where it would have not been able to make turns as well, shown below in Figure 8.
The level of the stream at the time of survey was observed to be low, but should be investigated at times of heavy rains to make sure the level does not rise to the point of blocking the drainage from the 15” main. Most likely, if the discharge did get blocked, issues would occur in both lines shown above in Figure 8, so the stream does not appear to be an issue. The multiple blockages located in the pipe appear to be the reason for the storm water backup.

In addition to inspecting the underground storm water main, the existing roof drains and leaders were investigated to determine if the sizing is adequate per the most recent code. No issues with the existing sizing was found.

3.0 Recommendations
To properly remove the debris and grease build up in the pipe, it is recommended to water jet the existing storm water line. The indoor cleanouts are not ideal as it would require a long run hose run into the building in addition to the length of the pipe. Instead, locating the cleanout outside would be useful in cleaning the section between the stream and the entrance to the building. To properly clean the portion below the building, it is recommended to excavate the area behind the mechanical room to locate the pipe and install a new cleanout in the north-south run to give direct access to the main. Ideally, the jet is run upstream of the pipe to hit the face of the buildup while allowing the debris and grease to flow downhill as the jet is moved through. Once the jetting is complete, another video inspection of the pipe is recommended to ensure all of the blockages are removed. A cost estimate for these services can be found in Appendix B. Master Locator’s reports can be found in Appendix C, and the multiple videos of the pipe inspection are included with this report.
NOTE: All information contained herein is for reference only. Master Locators, Inc. is not responsible for the accuracy of its content.
# Video Pipe Inspection Report

**Project Information:**

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<th>Date of Inspection:</th>
<th>Customer:</th>
<th>Burns Engineering</th>
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<tr>
<td>Site Name:</td>
<td>Technicians:</td>
<td>George Fields</td>
</tr>
<tr>
<td>Street Address:</td>
<td>Job #:</td>
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</tr>
<tr>
<td>City, State:</td>
<td>Available Drawing(s):</td>
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**Purpose of Inspection:**

Inspect storm pipes.

### Inspection Data: RUN 1

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<th>Line Condition:</th>
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<td>Storm</td>
<td>Fair</td>
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<td>Entry Point:</td>
<td>Line Material:</td>
<td>Line Diameter:</td>
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<tr>
<td>CO 1 (Near Cafeteria)</td>
<td>DIP</td>
<td>Approx. 8&quot;</td>
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**Note #:** ____

**Notes:**

Lateral left at 1'. Dried mud covering a quarter of the pipe is crumbling at 18'. Lateral top at 3'. Water in line from 20' to 40'. Debris in line from 40' to 45'. Lateral top at 114'. Debris blockage at 123'.

### Inspection Data: RUN 2

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<td>Entry Point:</td>
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<tr>
<td>CO 2 (Small Hallway)</td>
<td>DIP</td>
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**Note #:** ____

**Notes:**

No debris in line. 45 degree right turn down at 7'. 45 degree right turn at 9'. Tees into main at 11'.

### Inspection Data: RUN 3

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**Notes:**

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**Note #:** ____

**Notes:**

### Inspection Data: RUN 5

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**Note #:** ____

**Notes:**

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*Diagram/field sketch with letter designations identified above to be attached with report.*
FIELD SERVICE REPORT

Company: Burns Engineering  Project: Rowan University

Customer Contact: Joseph Zagorski  ML Office Rep/PM: TAT

Lead Technician: George Fields  Assts: ____________________________

Address: Glassboro NJ 08028-1700

Services Performed: GPR Survey  EM Scan  Air / Hydro Excavation  Concrete Scan  Site Training
(Circle all that apply)  Leak Locate  Fault Locate  Survey & Mapping  Other:_________________

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<th>#</th>
<th>Description of Services</th>
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<th>OT Hours</th>
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<th>Onsite</th>
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<td>4 / 8</td>
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<td>7:00</td>
<td>8:45 PM</td>
<td>2:00 PM</td>
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Full Scope of Work:

Utilities/Features Designated: (circle all that apply)
GAS    WATER    ELECTRIC    FIBER OPTIC    COMM    XORM    SEWER    REBAR    UST    UNKNOWN    NONE

Other:__________________________________________________________________________________________

Additional Resources: (traffic control, rentals, supplies, etc...)

Results and Notes:

Started at c/o#1 from cafeteria side in front of storage closet. Hit sediment build up at 18 feet and was able to push through. Hit another blockage at 41 feet which appeared to be rocks build up in the line almost causing a dam like effect in line. We were then able to push through this as well where on other side of blockage line started to open up and be clear again. At 104 feet I hit another small build up but could push through as well. At 123’ feet we encountered a blockage that took up majority of the line. This blockage was in the Maintenance room where it was under heavy units with duct work. Found what looks like a clean out under the units but had no access to this because of the location under the units. C/O 2 in hall which we were able to determine was a literal to the main by video pipe inspection did 2 45 degree turns to enter into main. Could not make turn into main to inspect rest of line. Tried to GPR outside to find main but could not locate due to saturated ground. Suggest to exploratory dig right outside of building and find main storm line. Once line is found I would suggest to cut an access hole in pipe so line could be jetted and cleaned up stream from this point to hopefully get blockages out and drained down out fall in creek area. This way you could install a clean out at this point where we had no access from under the unit inside of Maintenance Room.

Soil Conditions: Saturated  Dry  Clay  Sand  Other:

Weather Conditions: Clear  Overcast  Rain  Snow  Other:

Client Communication:

Deliverables Requested: PMU  ENGINEERING REPORT  CAD UPDATE  SKETCH  OTHER:

Deliverables Provided Onsite: YES / NO

Survey Methodologies

Known Utilities:  X  Passive Scans:  Split Box Scans:

Unknown Utilities: (Grid Spacing)

Utilities within Scope of Work:  GPR Scans:  3 by 3

Utilities outside Scope of Work:

Building Feeds:

Contacts on Site:

Name: Adam Ryan (Site Contact)  Company: Burns Engineering  Phone: (267) 640-5349  Signature:____________________

Name: ____________________________  Company:____________________  Phone:____________________  Signature:____________________

Project Complete: YES / NO

Form 018  14 Sep 07  Rev G  16 March 2016