



Ground Penetrating Radar Report

City of Largeville

Parkade P5

Largeville, Alberta

February 27, 2019

			Conquest System
CONCRETE FLOOR AND WALL INSPECTIONS USING GPR RADAR IMAGING			

February 27, 2019

City of Largeville
AB
T5X 2F4

Attn: Chief Inspector

Re: Concrete Floor Inspection using GPR Technology
Parkade P5
Largeville, Alberta
February 27, 2019

Dear sir,

We have completed the examination of the concrete floor on the Parkade P5 Level. The purpose of the inspection was to map the location of conduits or piping in the floor. After the floor has been marked out, anchor holes will be cored into the concrete floor to an approximate depth of 3 inches to support the installation of a metal fence.

Scope: To map the location of mesh, re-bar or any conduit within the slab to find the ideal placement for anchors to be drilled into the floor to hold fencing.

Equipment: A Conquest Ground Penetrating Radar (GPR) unit was used to examine the concrete slab. The unit was set to examine a thickness of up to 18 inches.

Calibration: The equipment was calibrated with a concrete calibration factor of 100 to 110.

Technique: The GPR unit was used to scan mainly two sizes of grid patterns, in normal and high resolution mode. The first size is a 48 inch by 48 inch grid pattern. Within each of the 48-inch x 48-inch grids, 13 scan lines were taken in each direction. The second size is a 96-inch by 96-inch grid pattern. Within each of the 96-inch x 96-inch grids, 25 scan lines were taken in each direction.

In some cases, only a partial grid was scanned due to space or object limitations, so, the actual inspection size may only be 48" x 96".

The High Resolution mode (which adds additional half lines to the scan - doubling the scan lines) can be used in some cases. This increases the number of scan lines taken by double. Each grid location was given a unique identifying number, which corresponds, to the actual location. In some cases only a partial grid was scanned due to space or object limitations.

On this project both grid patterns were used in High Resolution mode. The locations to scan were shown to Russell NDE Systems Inc. by the chief inspector.

Each grid location was given a unique identifying number. These were recorded as follows: Image 1 to Image 5. The size of each grid pattern is shown below.

4 x 4 foot size: Scan lines (1 to 13) and (A to M).

8 x 8 foot size: Scan lines (1 to 25) and (A to Y).

The following areas were inspected: Refer to digital overview pictures for more information. The Image numbers and area have been listed below.

<u>Image #</u>	<u>Size</u>	<u>Location – Server Room</u>
Image 1	4x6	Near the entrance door
Image 2 to 4	4x4	Middle walkway
Image 5	4x8	Neat the Shaw cable connections on wall

Grid scan lines and image numbers were marked on the concrete slab with green tape. The Conquest System processed the data to provide both plan view and cross-sectional maps. Each plan view map was comprised of a minimum of (18) 1 inch thick slice elevations. These maps were analyzed to determine the depth and direction of linear features such as re-bar, cables, or conduit.

The re-bar was marked directly on the floor with blue tape. The conduits and unknown features were marked on the brown masking tape with large lines using a red paint marker. The original core hole locations were marked on the floor with a black circle by Atlantic fencing. The area to drill was marked with brown masking tape, as a square and labeled “safe to core area”.

The radar images can show linear features such as re-bar, conduit, post-tension cables and hot water pipes. It is often not possible to differentiate what the linear indication is; however, reinforcing mesh and re-bar are often on fixed spacing, therefore repetitive signals on spacing of 6”, 8”, 10”, and 12” are assumed to be reinforcing bars or wire. All other linear indications are assumed to be conduit, post-tension cables or pipes. Any signal crossing diagonally on the grid is usually a conduit. In addition, the depth of re-bars is usually predictable and constant (in layers). The side-view (B-Scan) image often helps in identifying what is re-bar and what is another linear indication using depth. After the

pattern has been established, any suspected signals using depth and sometimes size are shown as possible conduit.

Additionally, the GPR unit also has an electro-magnetic detector feature, which was used. This feature shows if there is power surging through a conduit line. For this feature to work there must be a sizable load on the line at the time of inspection.

The equipment is limited to starting or ending a scan 4 inches out from any wall or obstacle. There are some areas where the scanning line will stop due to obstacle interference. These areas can be seen in the GPR Images and an example has been labeled showing what it looks like.

The equipment cannot scan through metal decking (Q-deck). If there are conduits or piping tied below the decking it will not be shown in the GPR images. It must be looked at visually from below. The metal decking can in some instances make interpretation more difficult.

Results: The rebar mat varies in spacing and in some areas has an upper and lower level. Power conduits were also found in the images. Any conduit or unknown features were marked out with a red paint marker. The rebar signals were marked with blue tape. We do not advise that any anchors or core holes be placed over any of the features marked out. Drill in the areas that are marked “safe to core area”. The anchor depth is 3 inches, however the analysis and marking out of features was completed to a minimum depth of 5 inches as requested.

Image Reports:

Please find attached GPR images from the job. The following pictures contain only the relevant image at the slice depth (elevation) of the linear features. Multiple slices have been added to show the features coming into and out of view, depending on the depth. In the GPR Images; the red crosshairs have been placed where core areas are located.

The complete images are retained on file with all the depth scans. Digital pictures of the inspection areas showing the images have been added. The attached results show the GPR signals at the relevant depth in the slab. The first few images have been labeled with an explanation.

Notes:

In some areas, the reflections from the re-bar can mask the objects below. For instance, if a conduit has been tied to a re-bar, especially if it is tied below a re-bar, it may be impossible to separate the images to identify the conduit. Therefore, we also try to avoid placing a core location above a re-bar when possible.

Limited Liability Policy: Russell NDE Systems Inc. warrants that the information is provided in good faith, and to the best ability of the technical personnel and their equipment. We accept no responsibility for consequential damages. In the event that any information provided is incorrect the liability of Russell NDE Systems Inc. shall be limited to the actual invoiced amounts paid to Russell NDE Systems. in relation to the individual location examined.

We are pleased to have been of service to you. If you have any questions, please call our office at 468-6800.

Sincerely,

Russell NDE Systems Inc.

Allen Russell

GPR Technician

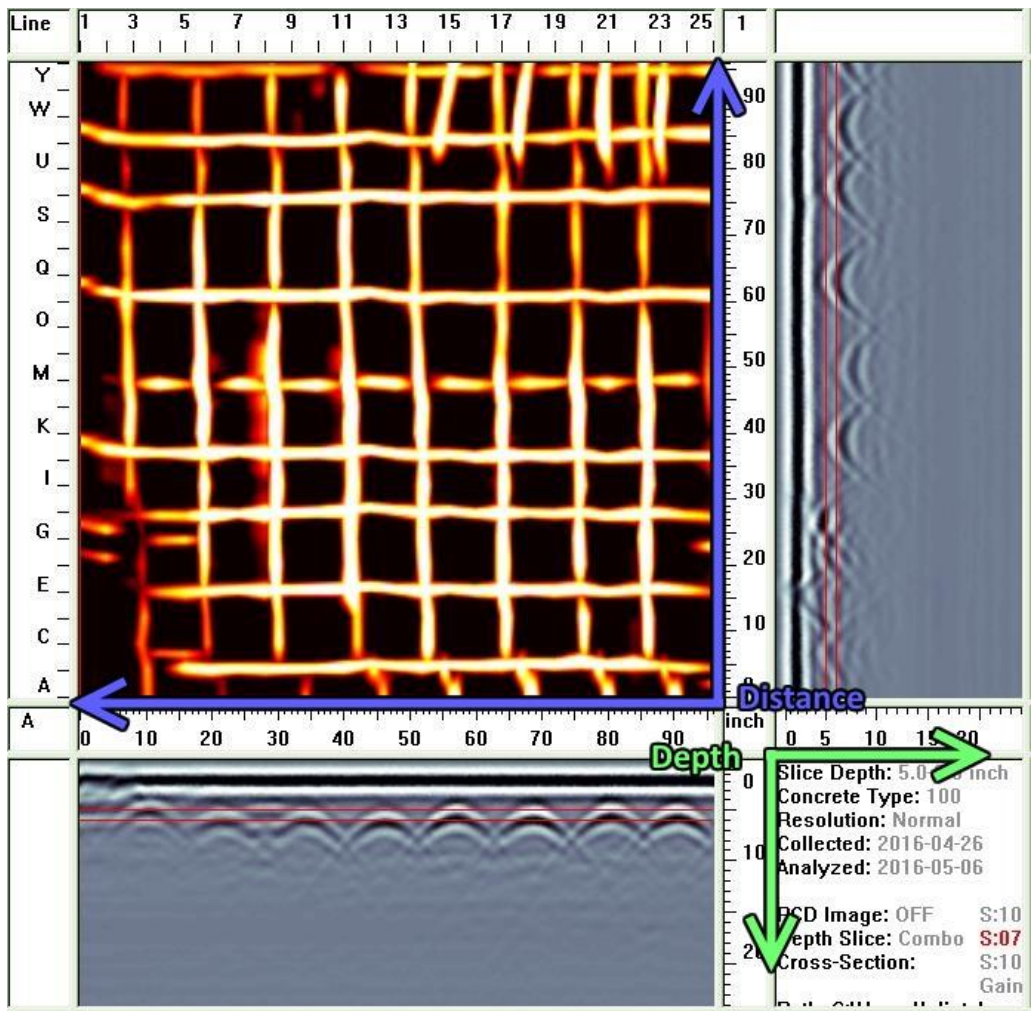
Ground Penetrating Radar (GPR) Image Report

The following pictures provide the GPR Data Images at the relevant slice depths (elevation). The first few images have been labeled with additional relevant information pertaining to the image.

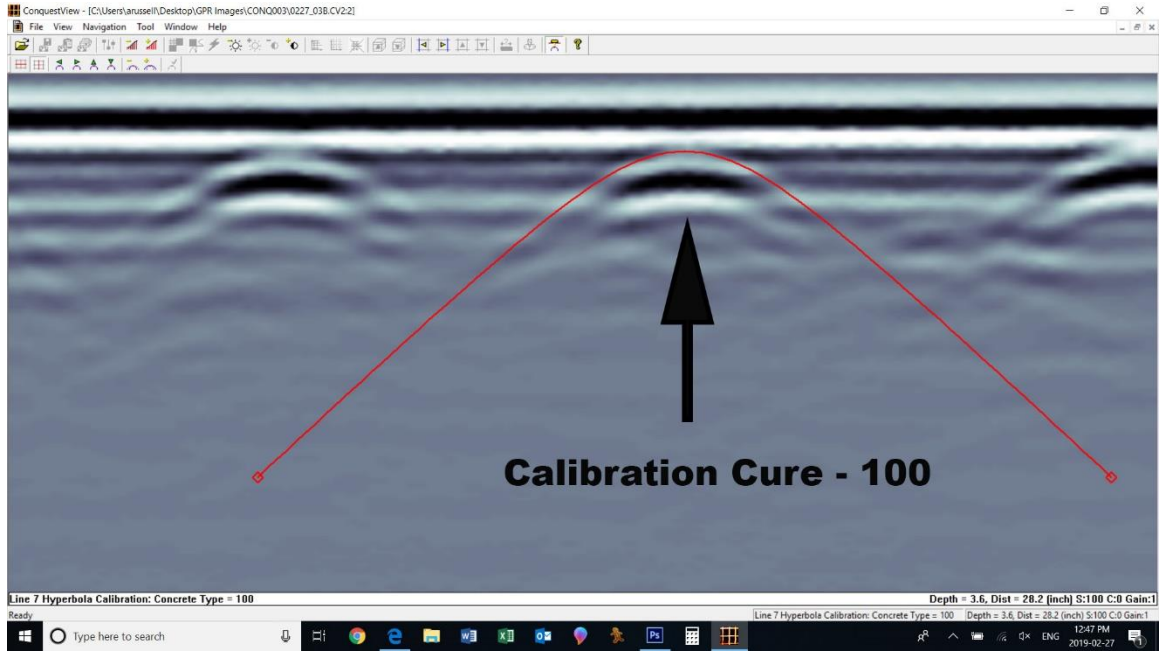
The top of the re-bar can be seen in the Side View Scan portion as the top of the white Hyperbola. The **depth** is measured in inches up and down the side of the Hyperbola (up to 18 inches). The **distance** is shown along the top of the hyperbolas (up to 96 inches). These positions correspond to the red crosshairs on the Plan View Map.

The re-bar pattern can be seen in the Plan View Map, as the depth increases in each image the lower signals can be seen coming more into view, with the upper level disappearing. The information shown in the Plan View Map is relevant only to the depth indicated and shown between the 2 red lines in the Side View Scan.

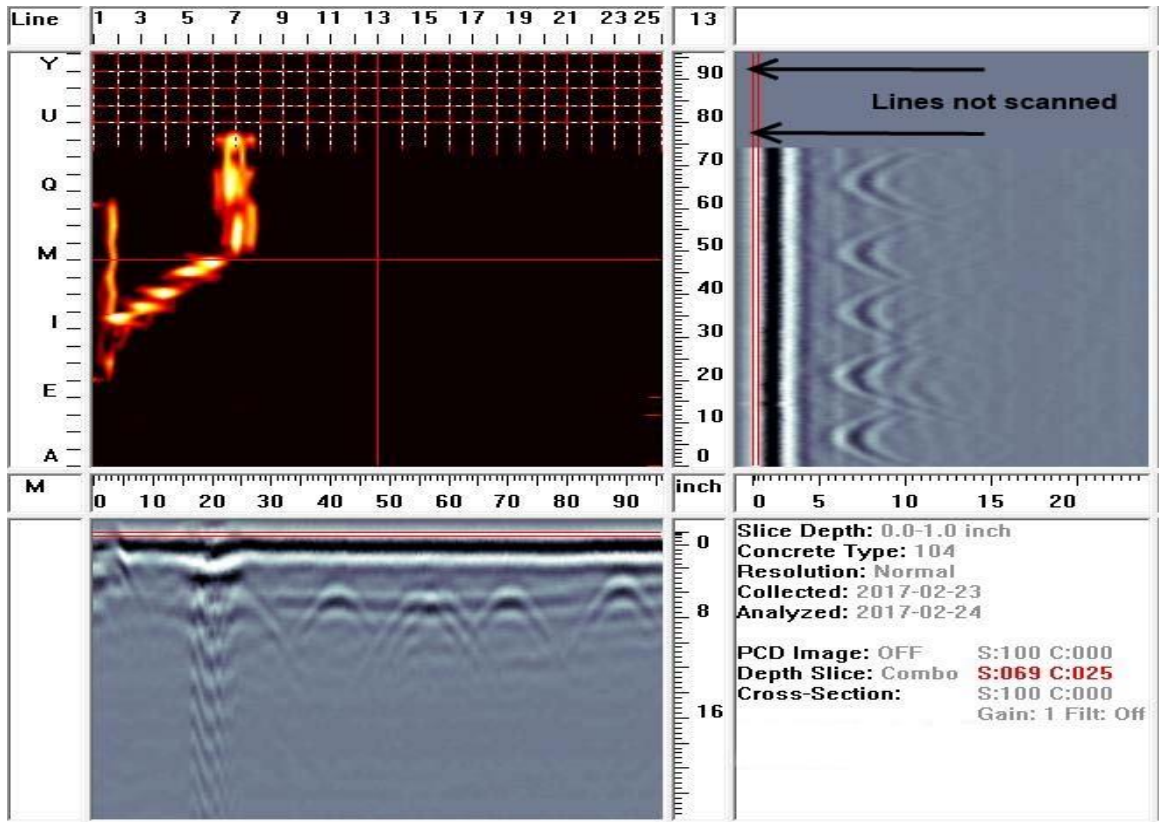
The GPR Image below is an image at a depth slice of 5 to 6 inches. (8' x 8' Grid size).



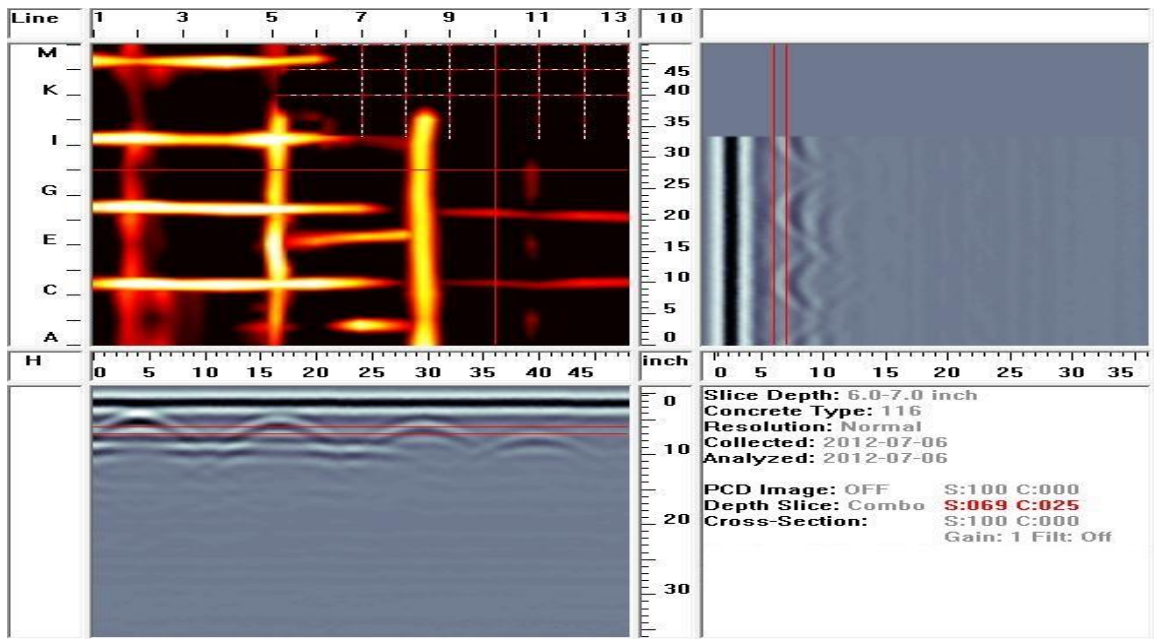
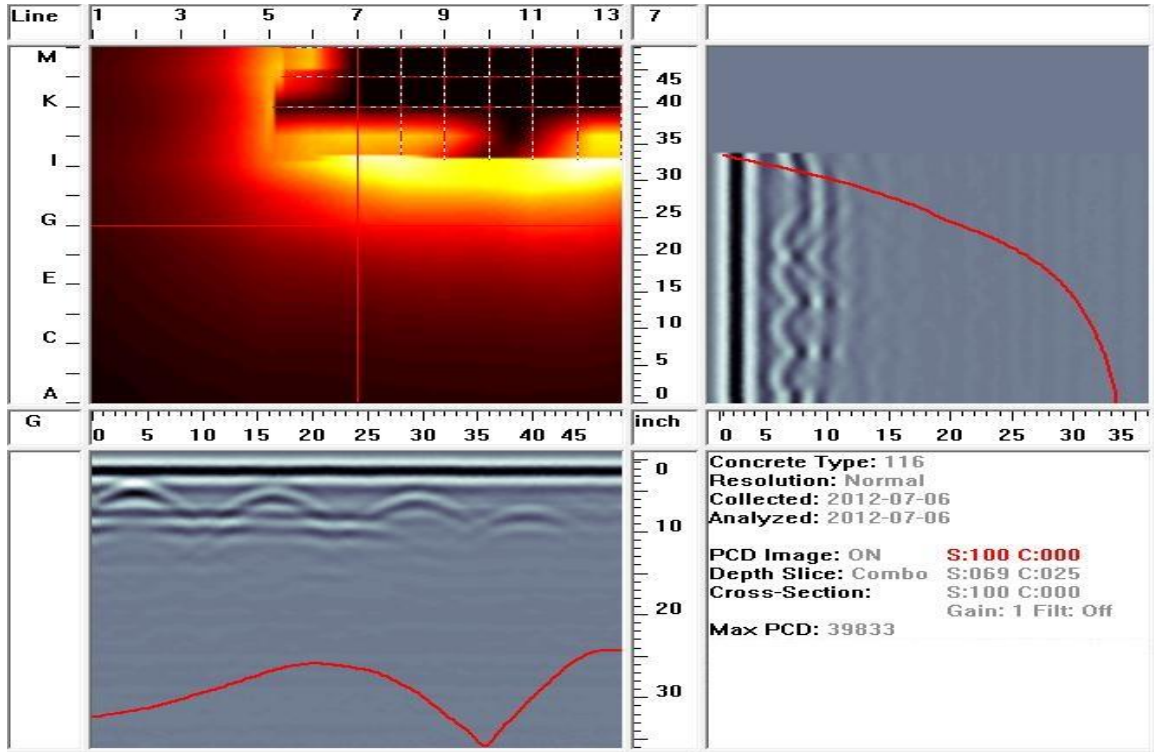
The image below shows the calibration of Image 3 with a calibration rating of 100.



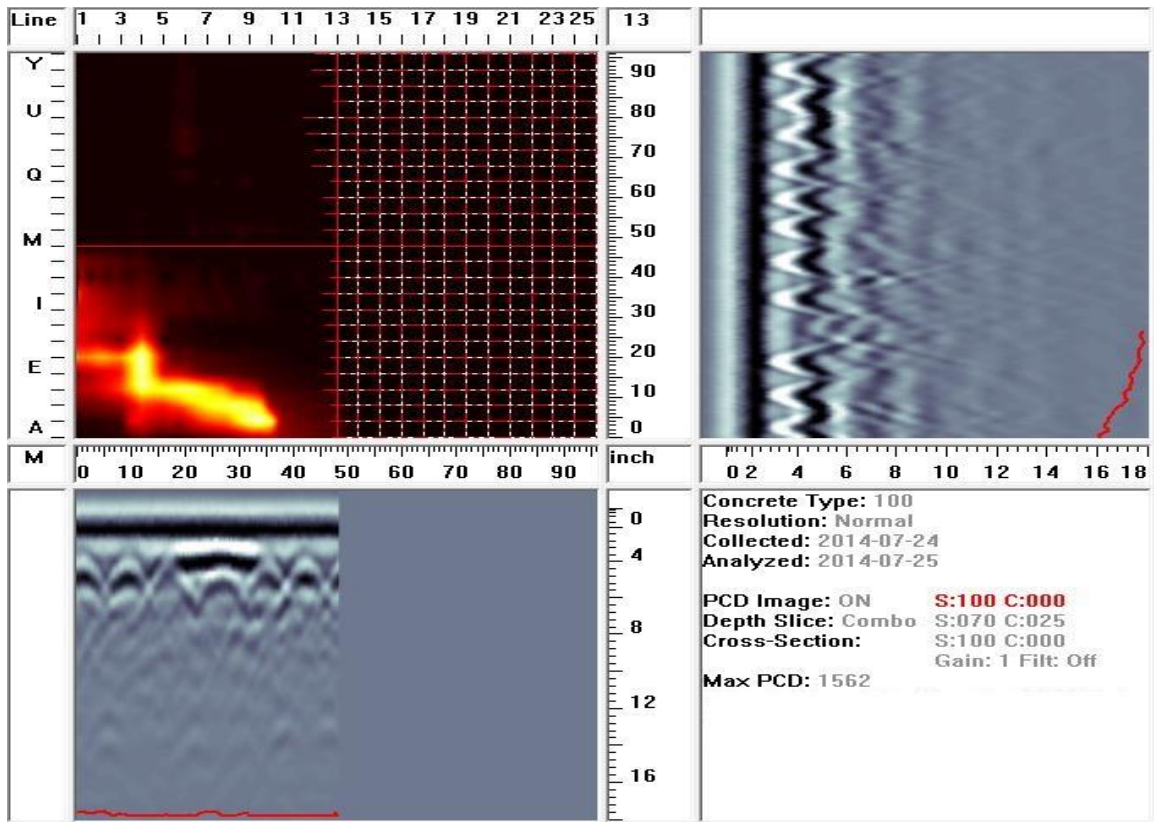
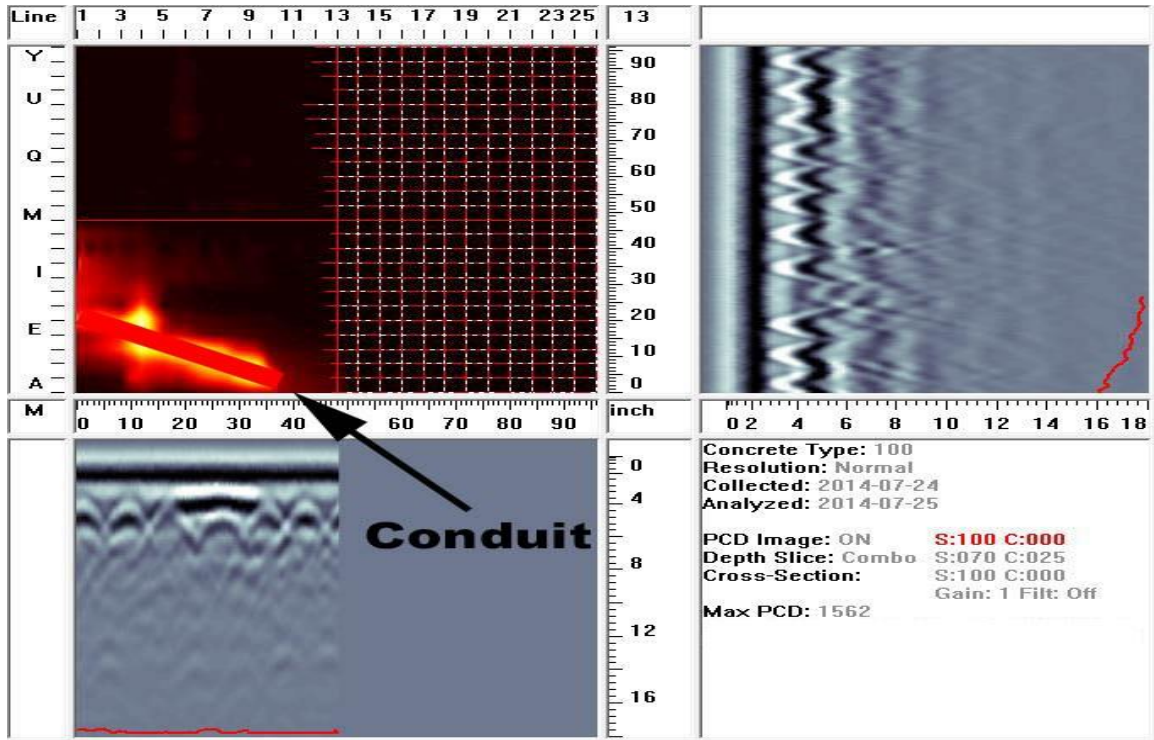
The picture below shows an example of what the scan lines look like if they were not scanned. This may be caused by a track or wall obstruction, or the inspection area did not require a full scan.



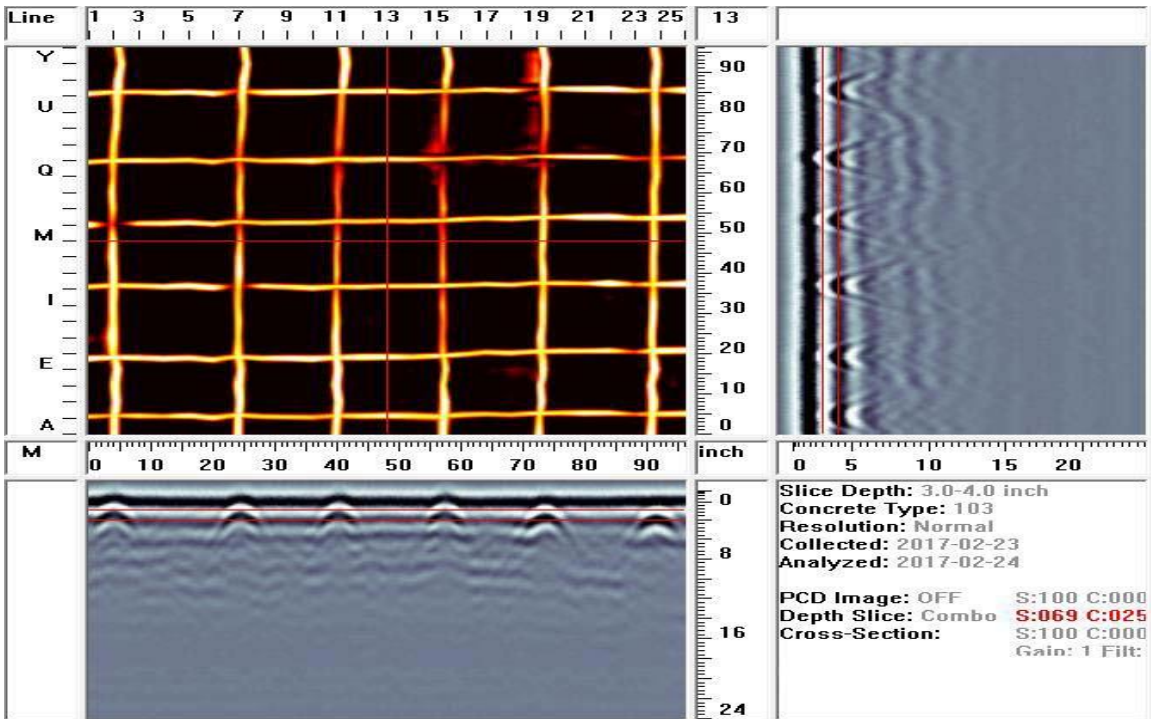
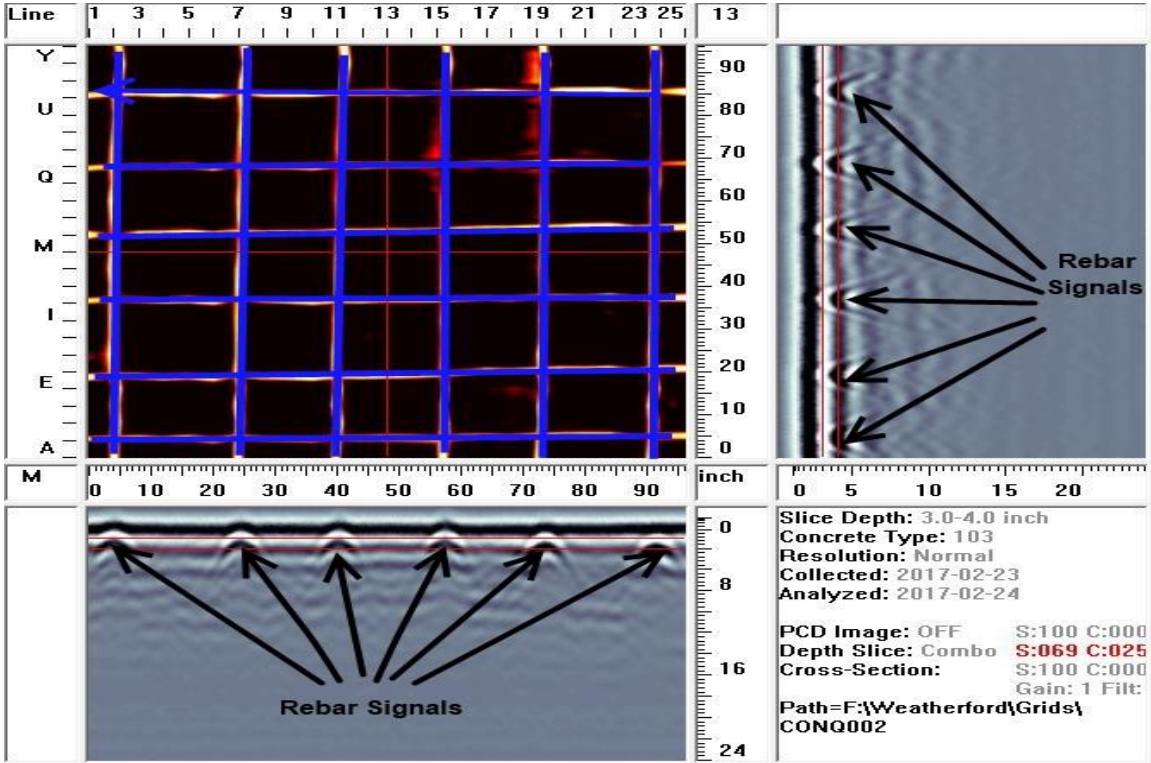
As noted, the GPR unit also has an electro-magnetic detector feature, which was used. This feature shows if there is power surging through a conduit line. The GPR Image below is an example picture of power around a large electrical box. The top picture shows the electro-magnetic detector feature turned on and the bottom picture shows the image in normal scanned mode. The top picture is showing power coming from the electrical box (upper right quadrant in the grid). The bottom picture shows the regular GPR image.



The GPR Image below is an example picture of power for an electrical line. The top picture shows the electro-magnetic detector feature turned on and labelled.



The GPR Image below is an Image at a depth slice of 3 inches. This is showing an example of what the rebar signals will look like. The rebar signals can be seen in the plan view map and have been labelled with blue lines. The side view scans have also been labeled showing some of the related GPR signals



GPR and Digital pictures – Server Room

The pictures below show an overview of the location for Image 1.

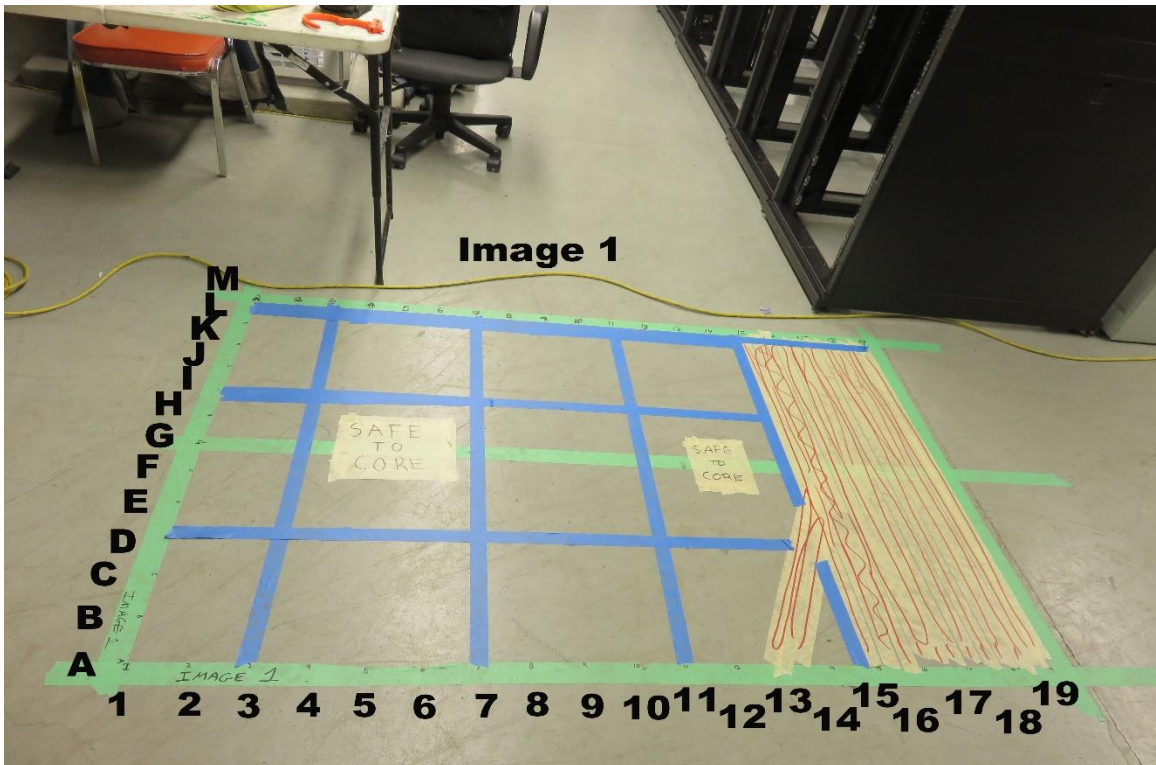
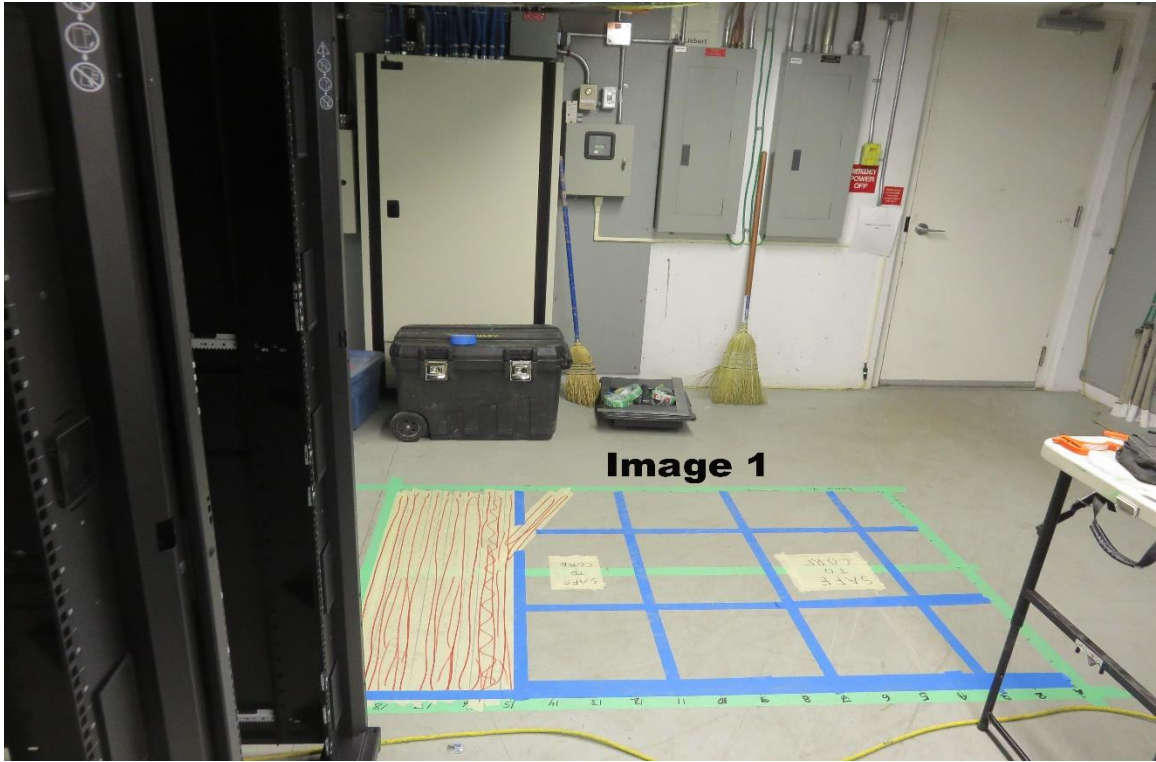
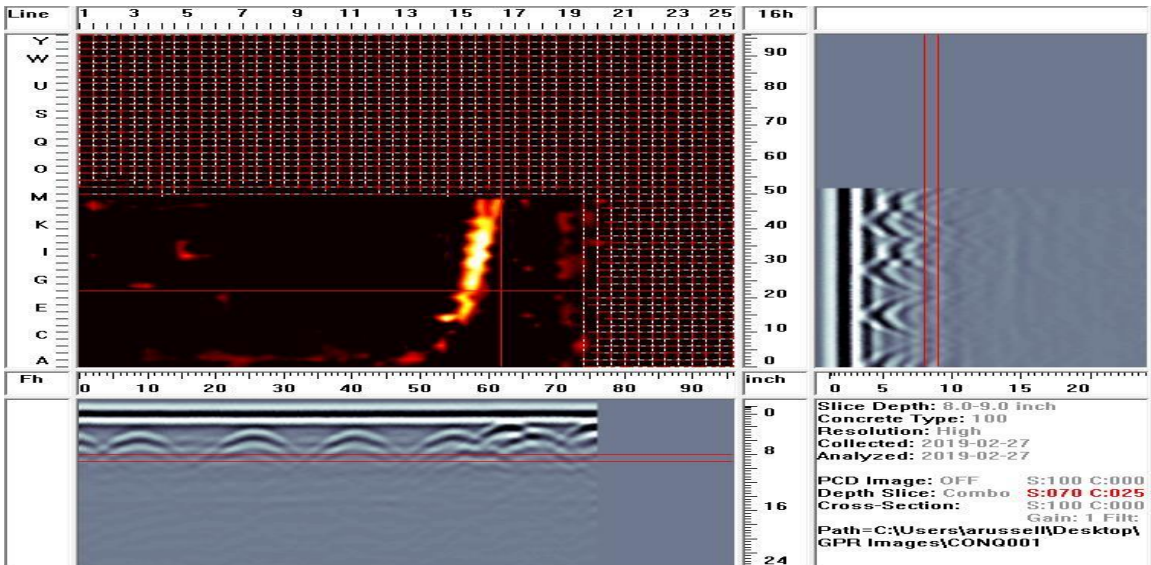
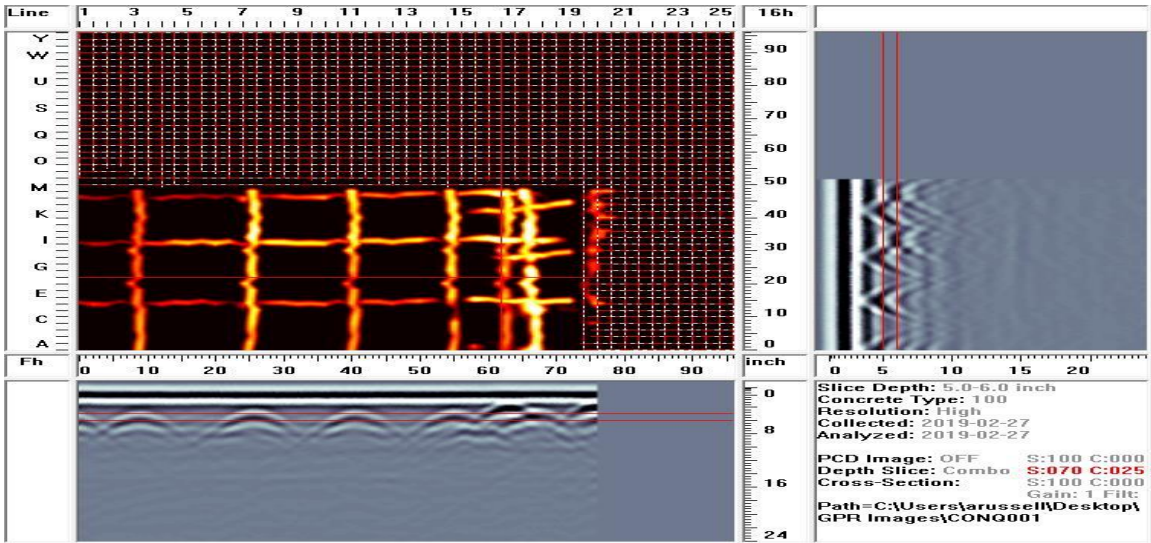
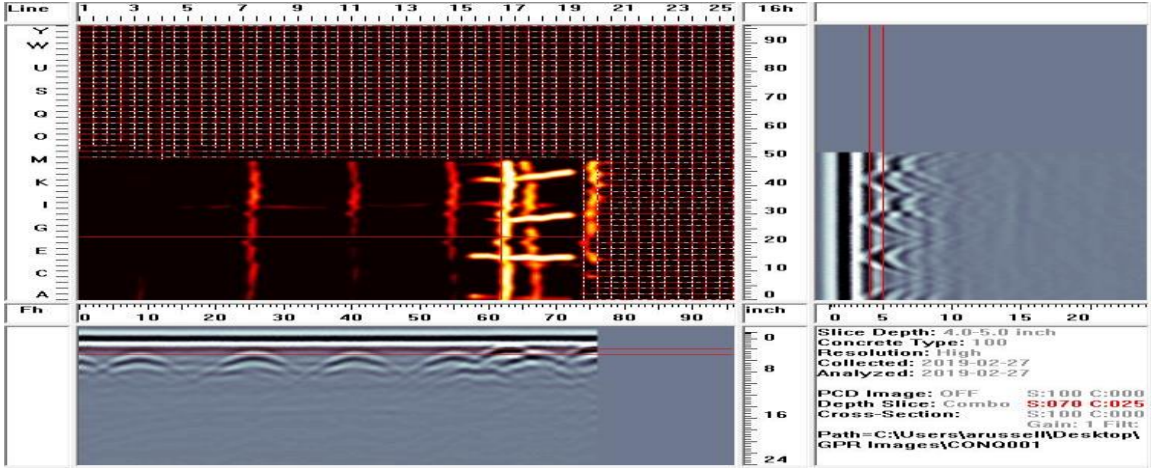


Image 1 – GPR Image (depth slice 4, 5 and 8) 4x6 foot Grid



The pictures below show an overview of the location for Image 2.

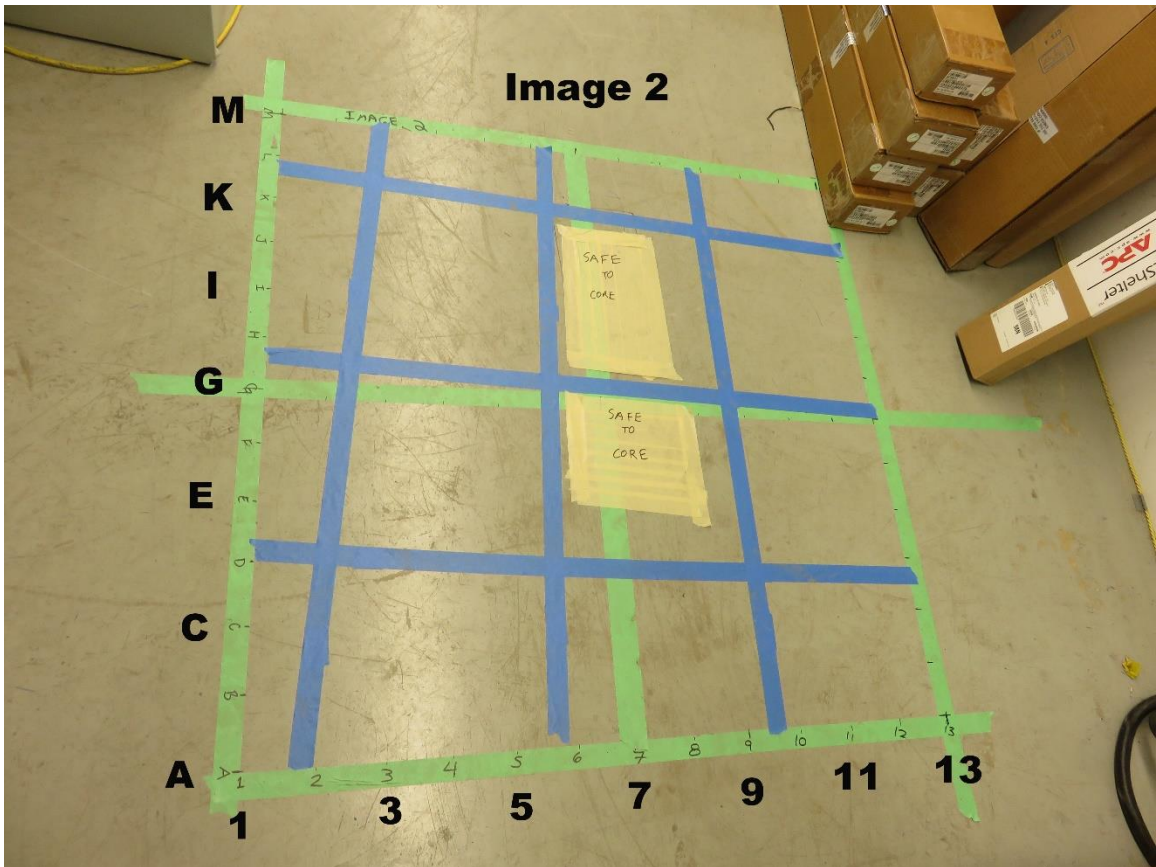
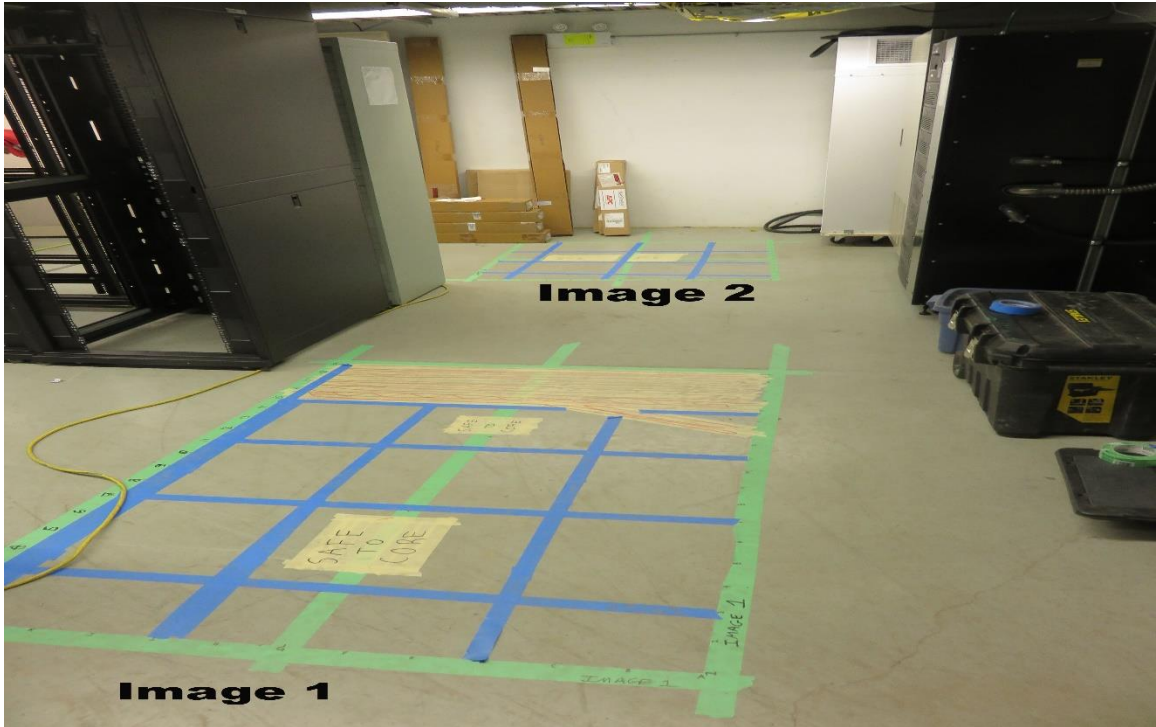
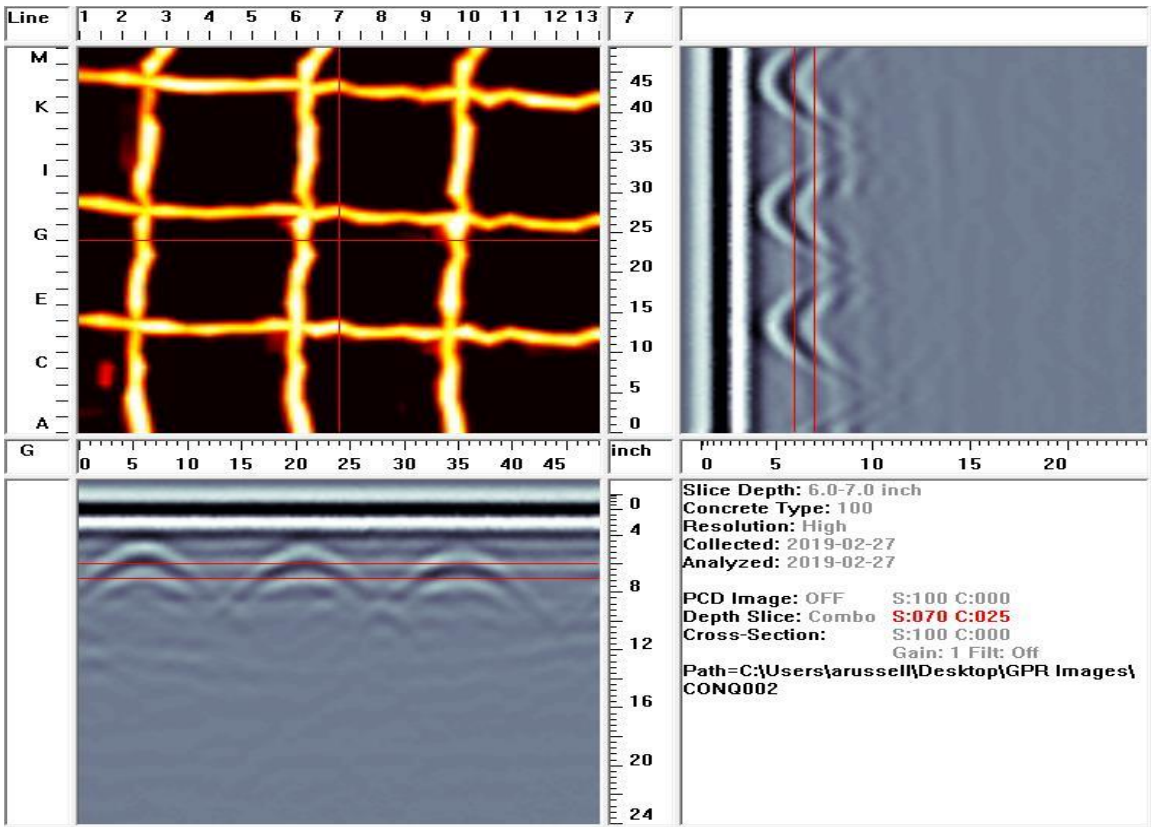
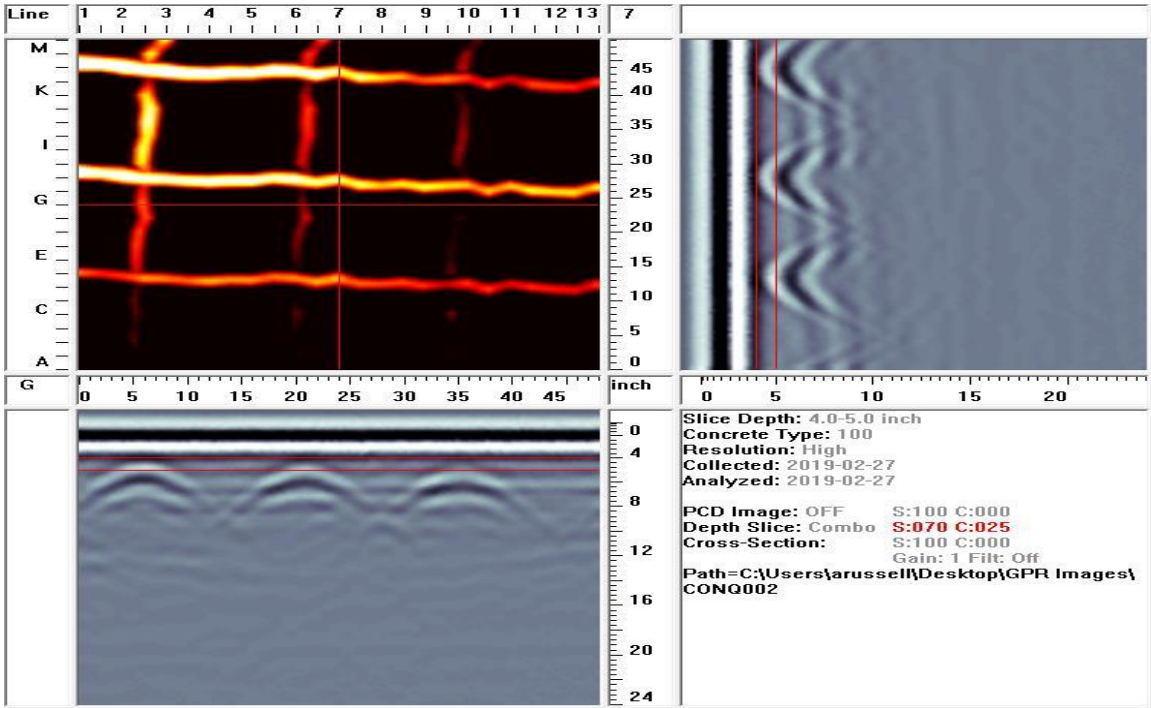


Image 2 – GPR Image (depth slice 4 and 6) 4x4 foot Grid



The pictures below show an overview of the locations of Image 2 to Image 4 with a closer view of Image 3.

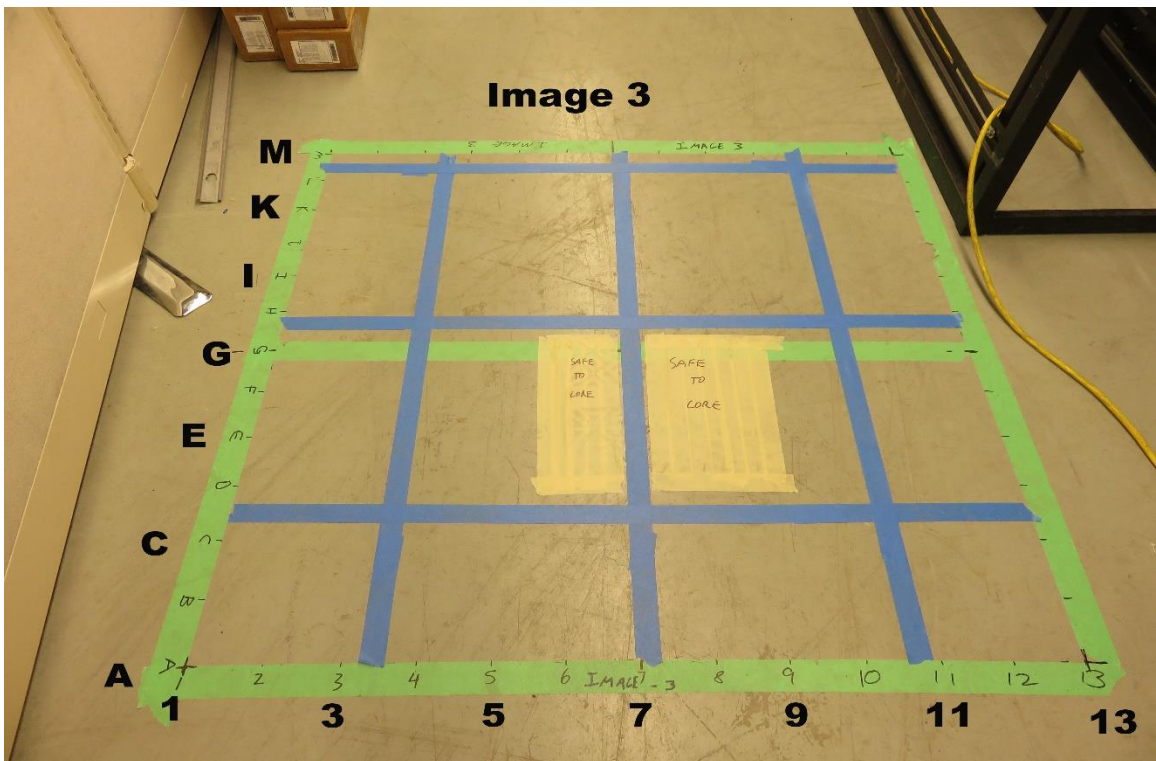
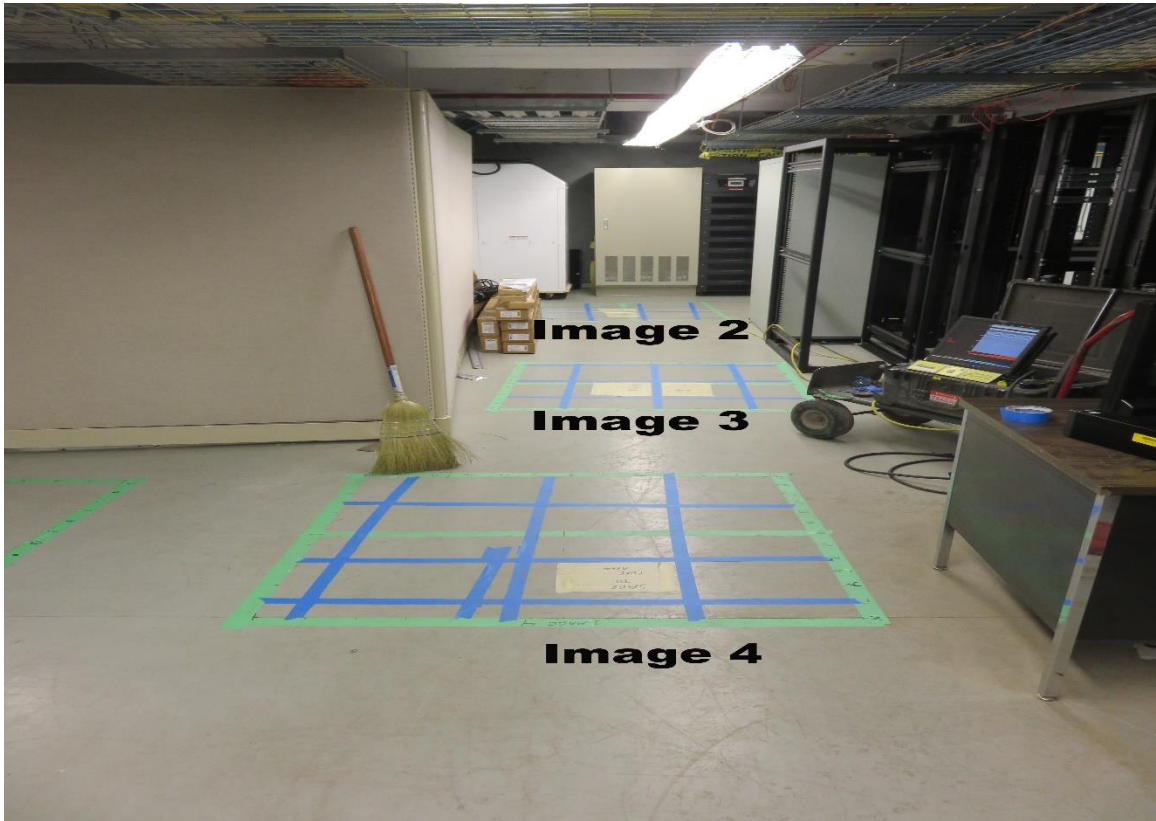
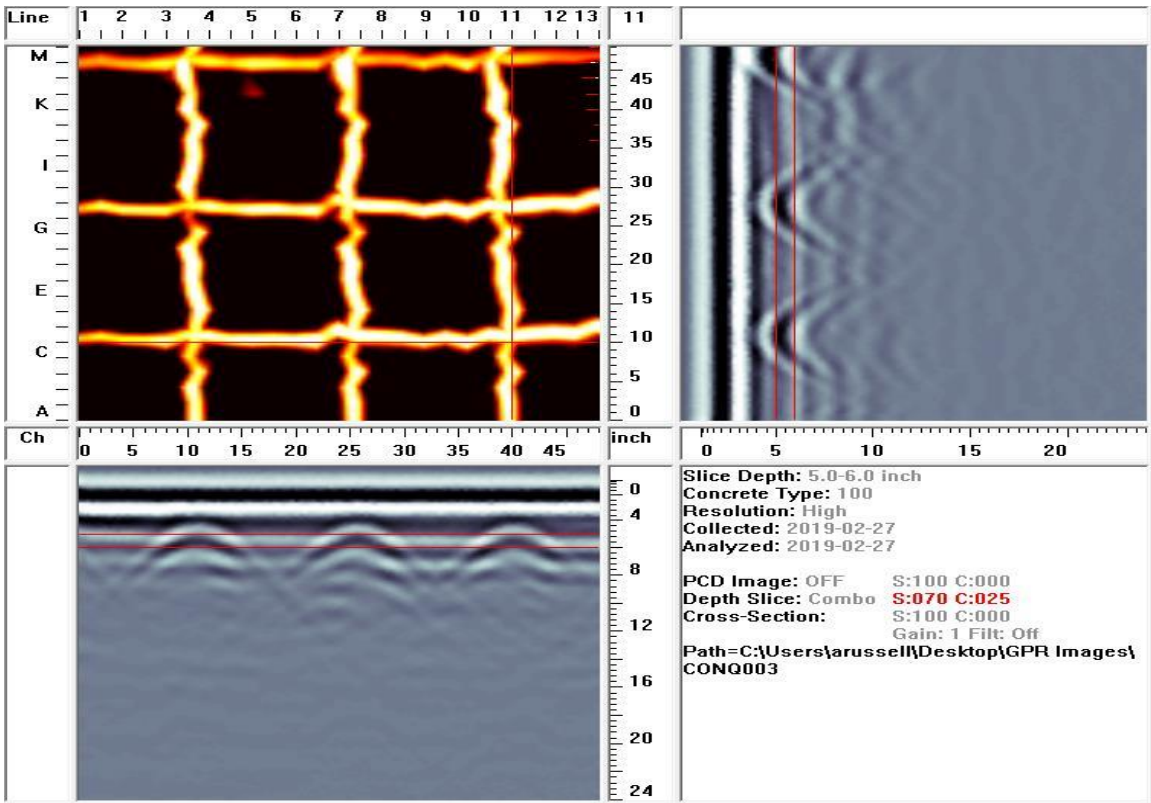
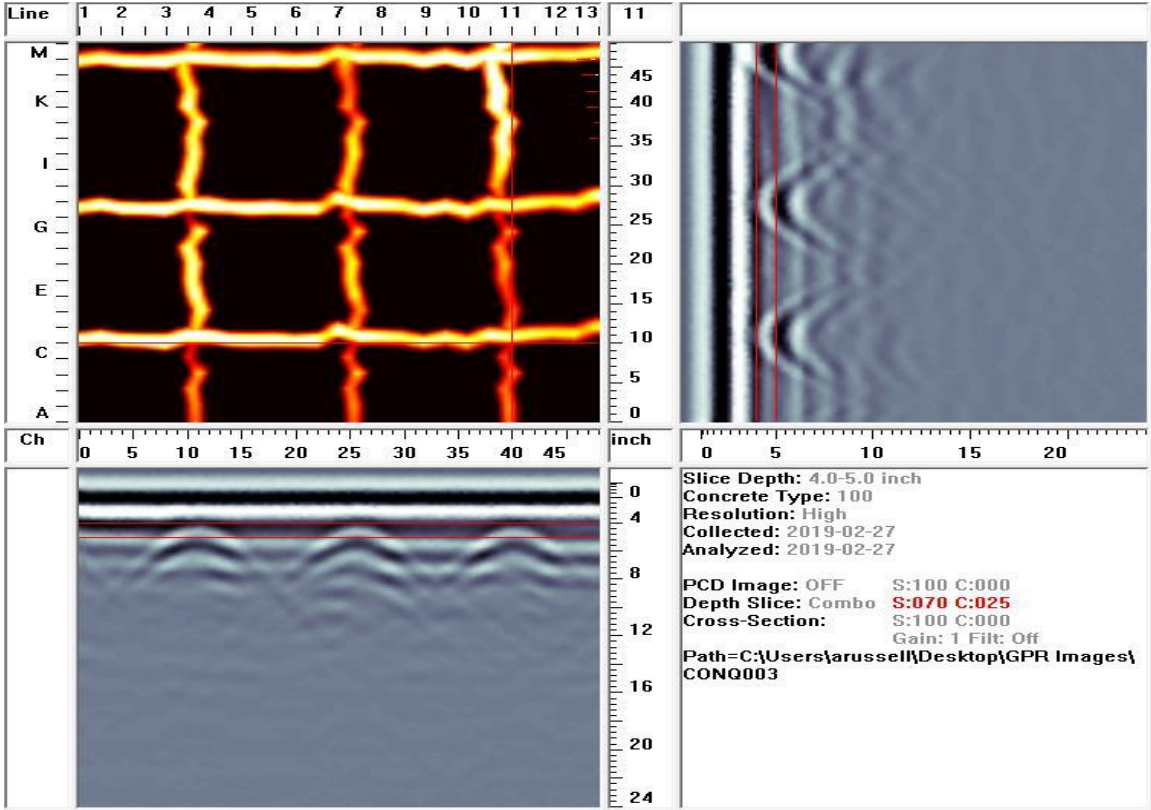
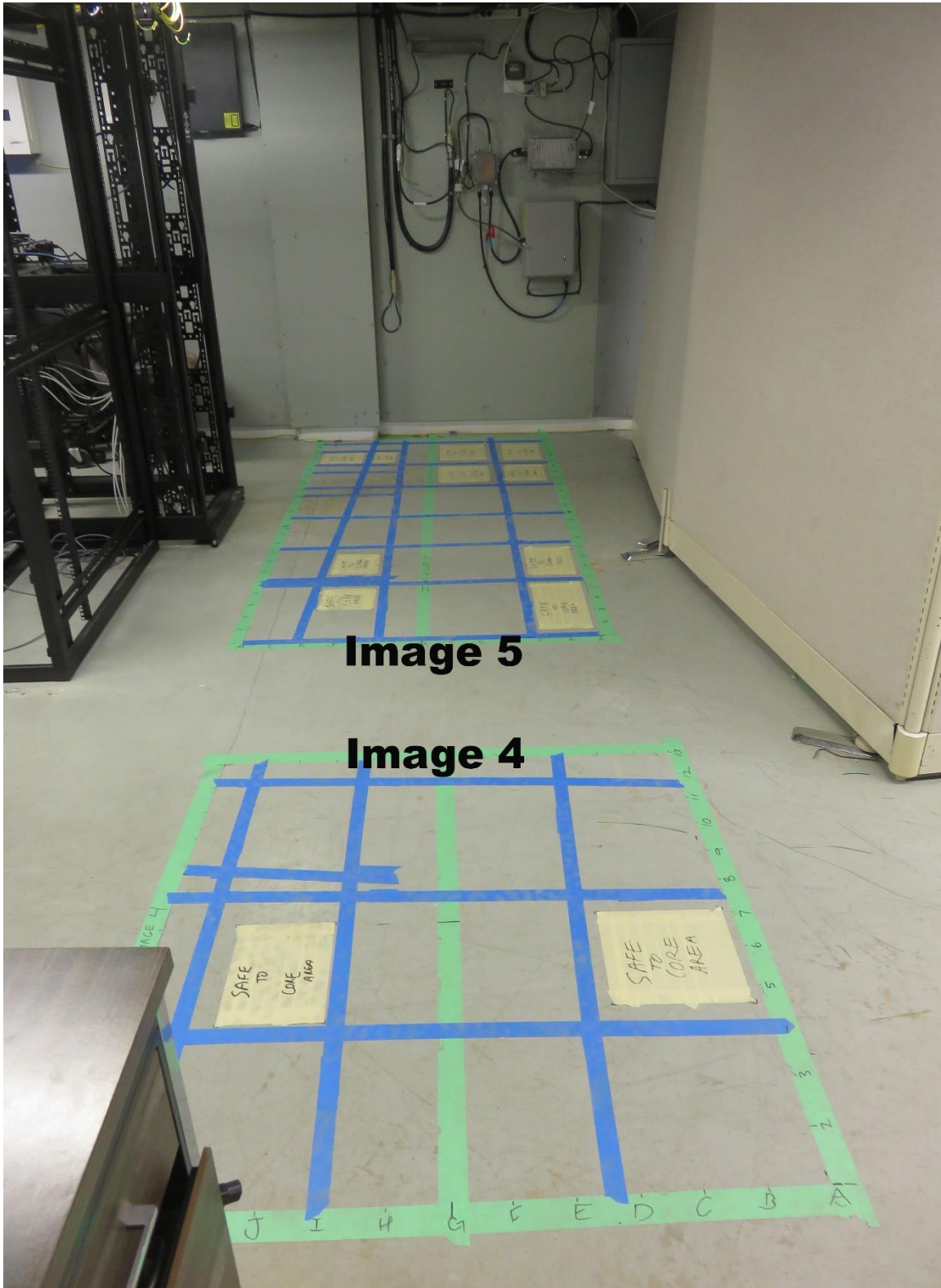


Image 3 – GPR Image (depth slice 4 and 5) 4x4 foot Grid



The picture below shows an overview of the location for Image 4 and Image 5.



The pictures below show a closer view of Image 4 and Image 5.

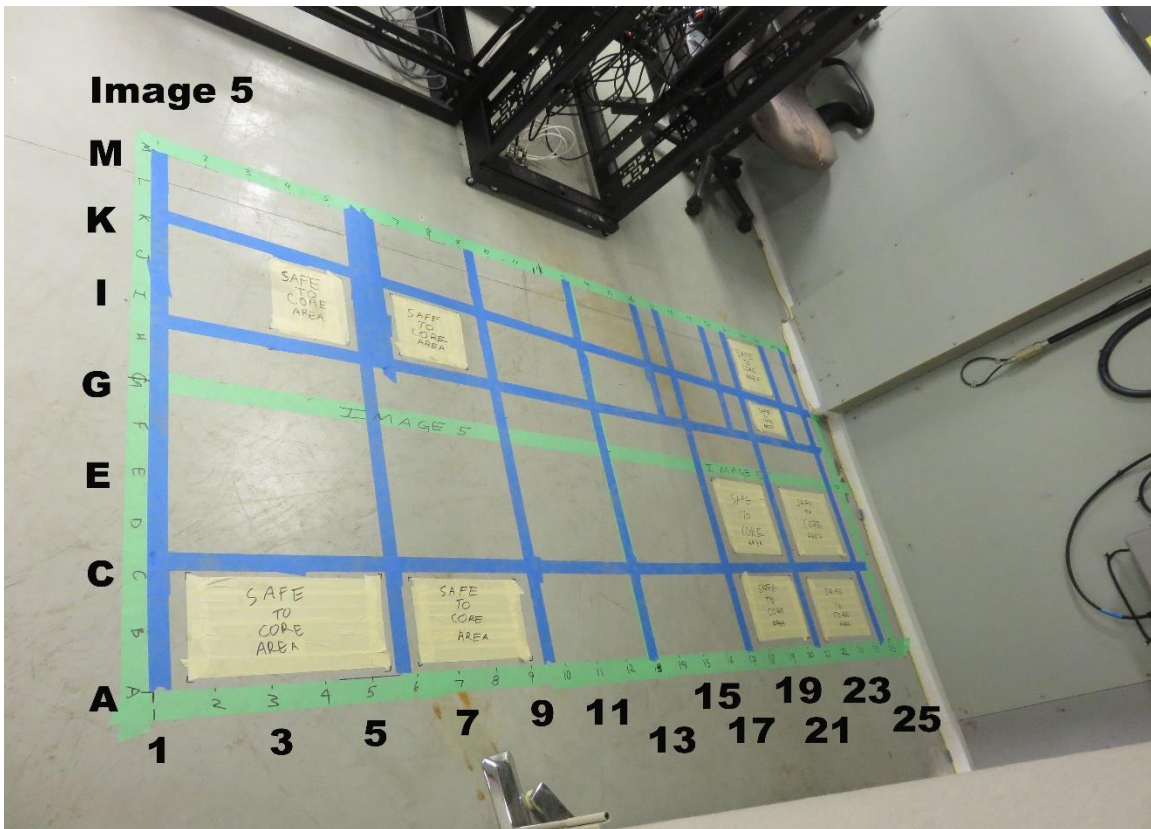
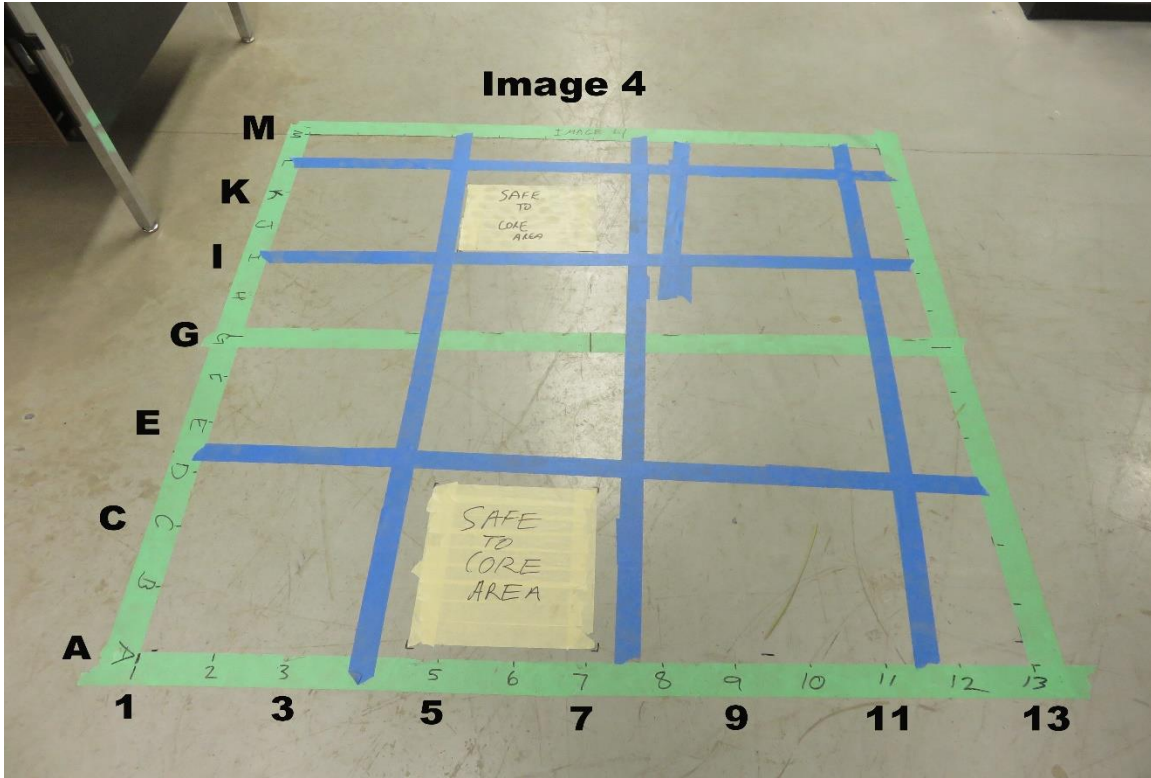


Image 4 – GPR Image (depth slice 4, 5 and 6) 4x4 foot Grid

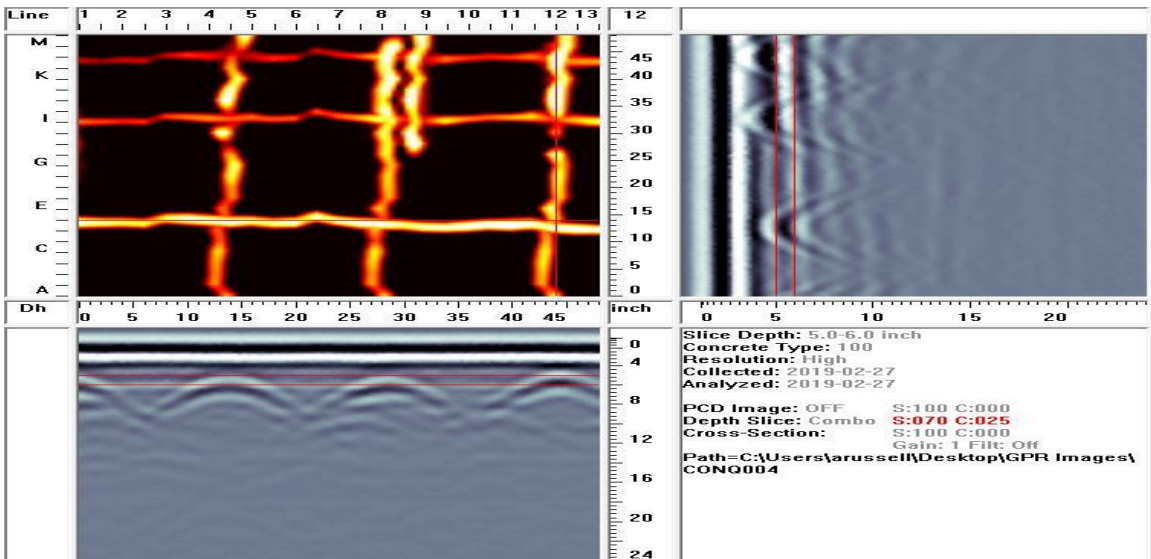
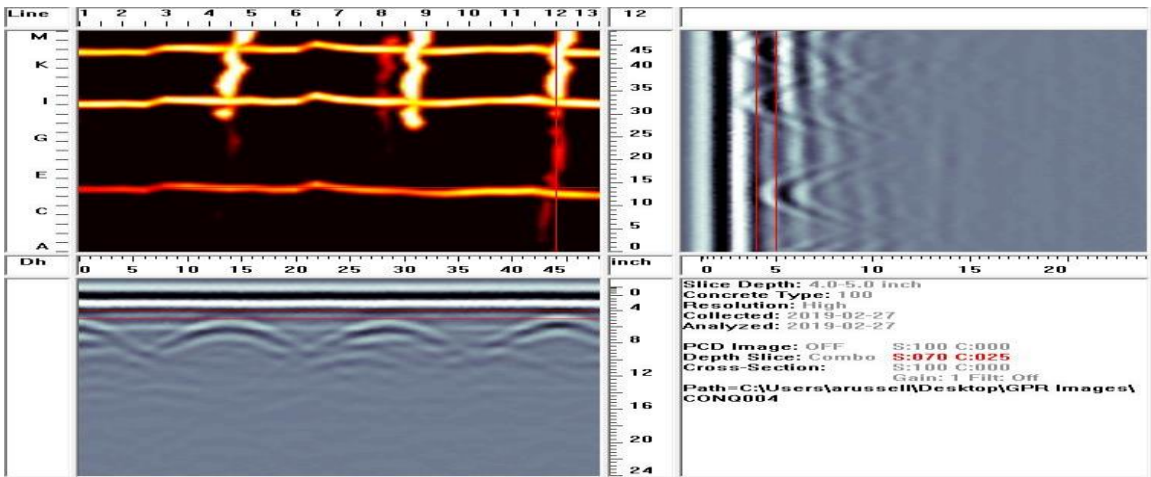
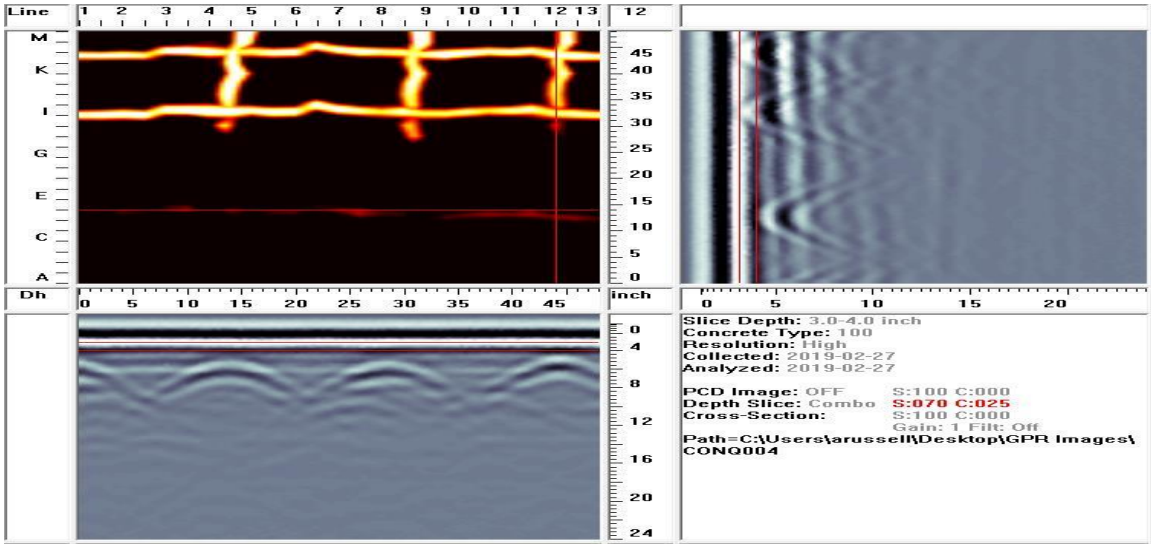


Image 5 – GPR Image (depth slice 4 and 6) 8x8 foot Grid

