Facilities

Earth Shielding Surveys

June 2019

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Introduction

In May and June of 2019 physical surveys were performed to verify that the earth shielding installed on various Lab structures continues to provide the level of shielding intended by the original designs. This was accomplished by observing spot elevations at intervals over each shielding configuration to verify that the thickness of soil over the shielded structure closely matches the original design thickness.

Methodology

Ground elevation observations were obtained using “optical” surveying techniques. Optical surveys use an instrument placed at a known location (on JLab’s local “Ground Control Network”) to measure horizontal angles, vertical angles and distances to each observation point. Horizontal and vertical angles are measured by visually sighting a target placed at each observation location. Distances to each observation point are simultaneously obtained by laser ranging to the target. In the field these distances and angles are observed and recorded using a single instrument known as a “Total Station”. The data collected by the Total Station is then used to calculate the location of the observed point in 3 dimensions. Observations reported in this document can be assumed to be accurate to within +/-0.10 foot or better in all 3 dimensions.

Reporting

Observation results are presented graphically for each shielded structure by overlaying them on…

1. Elevation contours derived from a March 2014 aerial survey of the Lab site and;
2. Original design elevation contours (when available).

Both overlays are shown at the same 1 inch = 30 foot scale. Aerial contours are plotted on ½ foot intervals while original design contours are plotted on 1 foot intervals.
In addition to the drawings a brief verbal description of other aspects of the shielding condition observed during performance of the survey is also included.

Results

End Station A: The entire dome is covered in heavy vegetation and there is no evidence in the observed elevations of any notable soil movement. All 3 soil retention rings appeared to be in good condition. However, there were a few areas where there is evidence of some downhill side material moving away from the rings but these areas

were limited, are heavily vegetated and did not show evidence of any recent soil movement. The timber and steel retaining wall, installed along the west side of the dome berm to protect the Building 92 cooling tower from soil movement, was inspected and found to be in sound condition.

Beam Dump A: The Beam Dump berm is heavily vegetated and there is no evidence in the observed elevations of any recent soil movement.

End Station B: The entire dome is covered in heavy vegetation and there is no evidence in the observed elevations of any notable soil movement. Both soil retention rings appeared to be in good condition with little observed soil movement adjacent to either ring.

Beam Dump B: The Hall B Beam Dump berm, with the exception of the gravel access road, is heavily vegetated with little sign of soil movement evident in the observations. However, some erosion was observed along portions of the north side of the access road.
There are 2 timber retaining structures installed on the north side of the berm and another installed on the berm between Hall A and the B dump berm. While all 3 of these structures appear to be in sound condition it should be noted that considerable (>1.5 foot) changes in elevation from the uphill to downhill sides of each structure were observed. This condition imparts considerable structural loads on these structures so they should be inspected on an annual basis (vs. the 5 year inspection cycle for the shielding berms in general).

End Station C: The dome, except for those areas that were stabilized with gravel in 1997, is covered in heavy vegetation and there is no evidence in the observed elevations of any notable soil movement. The single soil retention ring appeared to be good condition. However, there were a limited number of areas where there is evidence of some downhill side material moving away from the ring but these areas were limited, all were heavily vegetated and did not show evidence of any recent soil movement.

Beam Dump C: The hall C Beam Dump berm is covered in heavy vegetation and no soil movement was noted in the survey.

LERF Berms: All 3 berms are vegetated and no evidence was found in the observed elevations indicating any recent soil movement. The concrete walkway at the top of the north and west berms was found several years ago to have settled as a result of poor soil compaction. However, there was no evidence of any settlement beyond that previously observed. There is also evidence of settlement around the exterior stair at the west end of the building that should continue to be monitored from a structural perspective but has no impact from a shielding configuration perspective. Note that no drawing showing LERF design contours was available for use in this report.

Hall D Tagger Berm: The entire tagger berm is heavily vegetated and there was no evidence in the observed elevations of any soil movement. Retaining walls on the south side of buildings 200 and 201 were inspected and found to be in sound condition.

Hall D Berm: The berm is heavily vegetated and there was no evidence in the observed elevations of any soil movement.

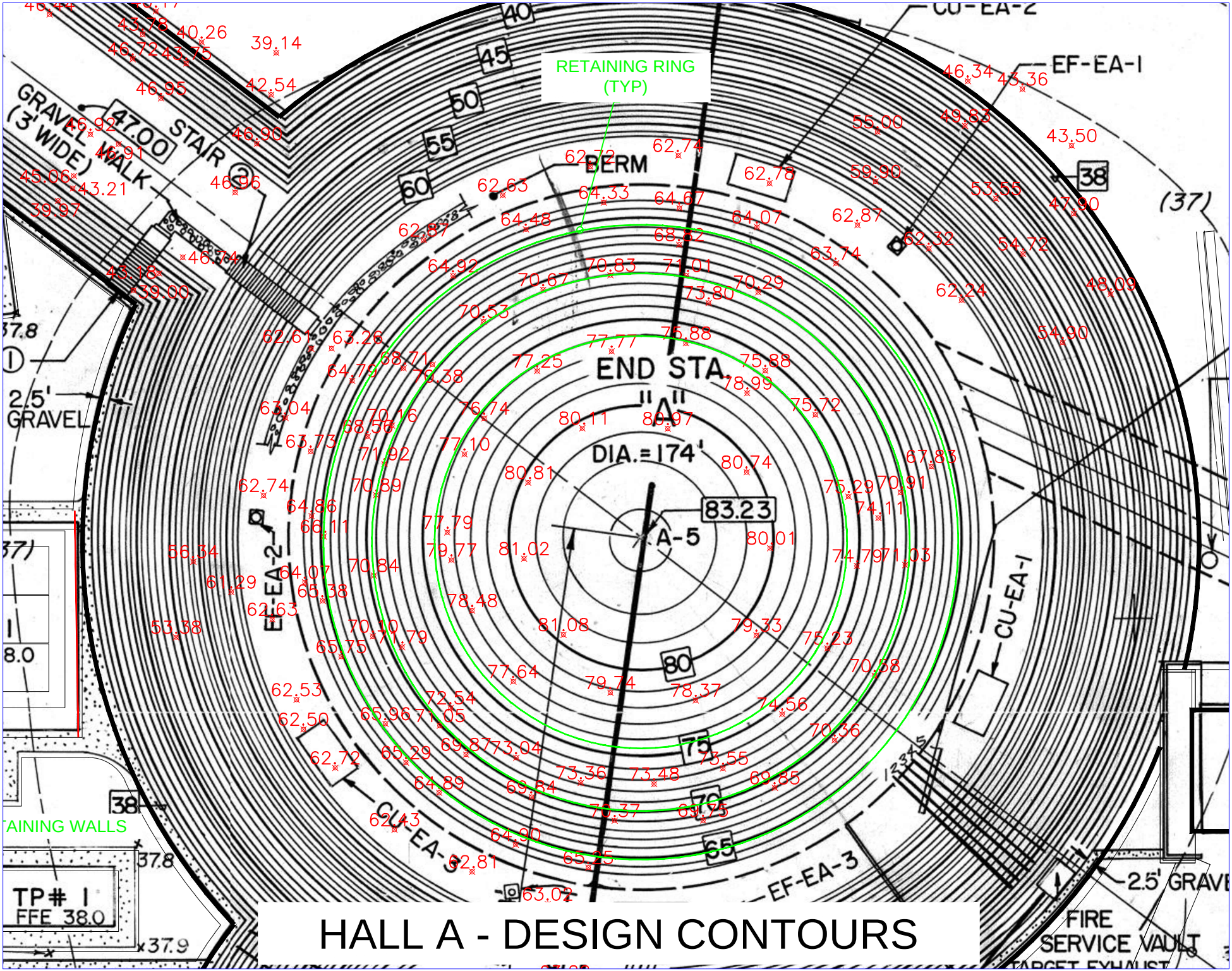
Conclusion

None of the areas surveyed showed any evidence of recent soil movement and all observed elevations appeared to be in close agreement to the original design of each facility. Stabilizing vegetation on all of the study areas appears to be healthy and no other factors impacting soil stability were observed.

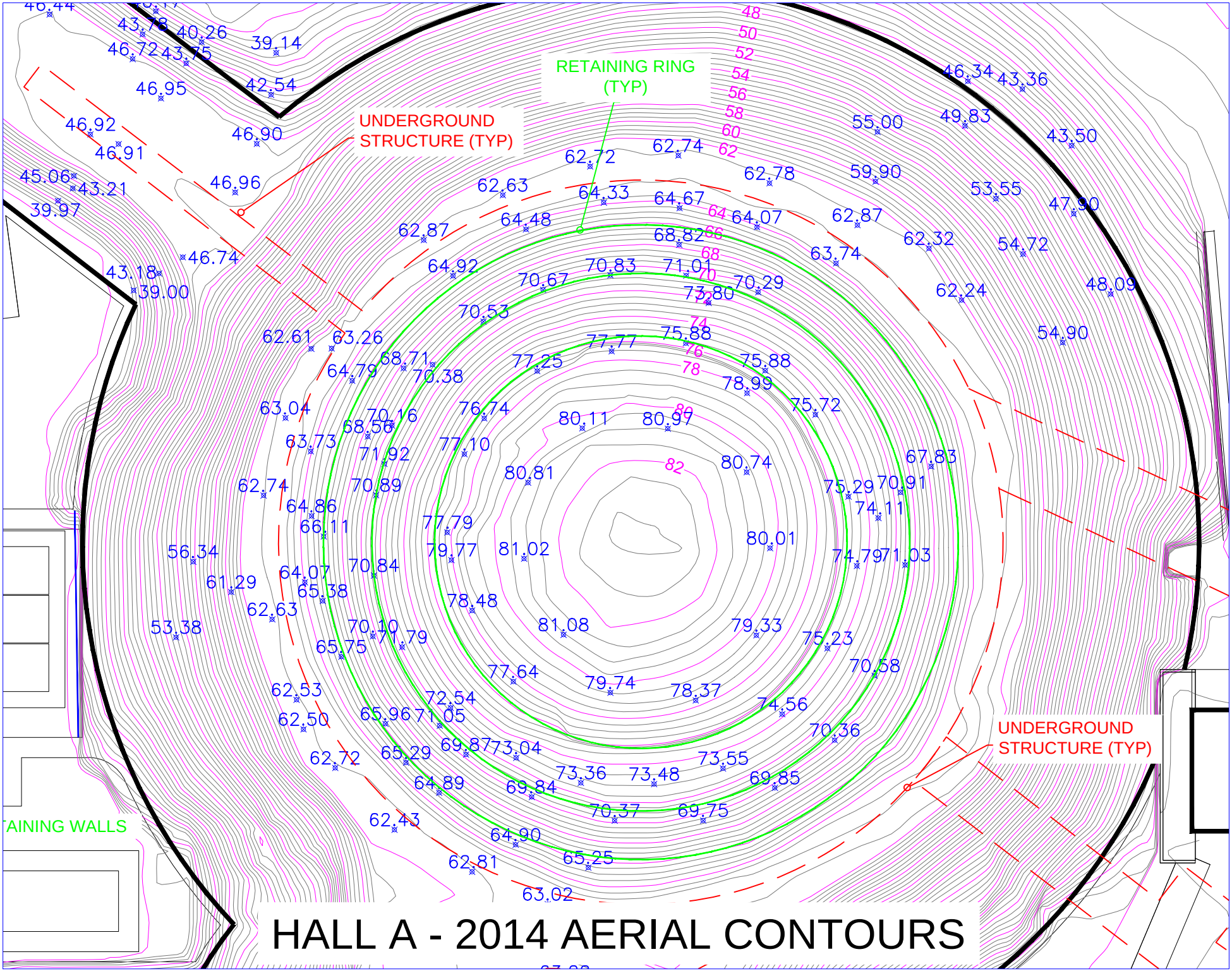
Going Forward

Based on these observations and in combination with past survey results it is becoming evident that as long as the vegetation remains healthy and the installed retaining structures are in good condition that the value of repeating a physical survey like the one reported here, or the aerial survey performed in 2014, every 5 years should be reexamined. It is recommended that consideration be given to only doing a visual inspection of the dome surfaces and retaining rings every 5 years vs. doing another full physical or aerial survey.

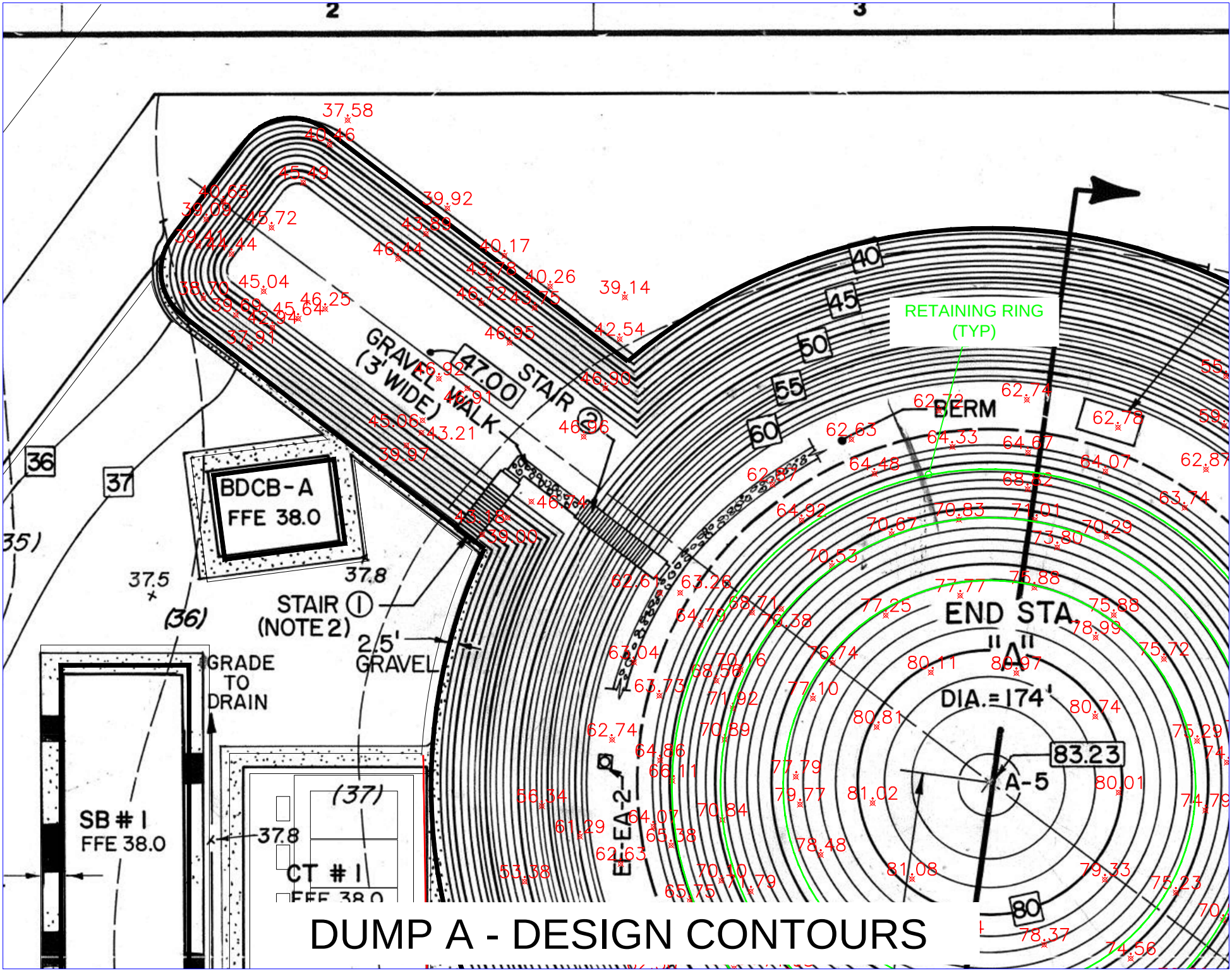
However, as noted above the elevation differences observed in this survey around the retaining walls on the north side of the B Dump berm and on the berm between B dump and Hall A require that these structures be inspected for structural condition on an annual basis due to the stresses imparted by the differences in soil depths.



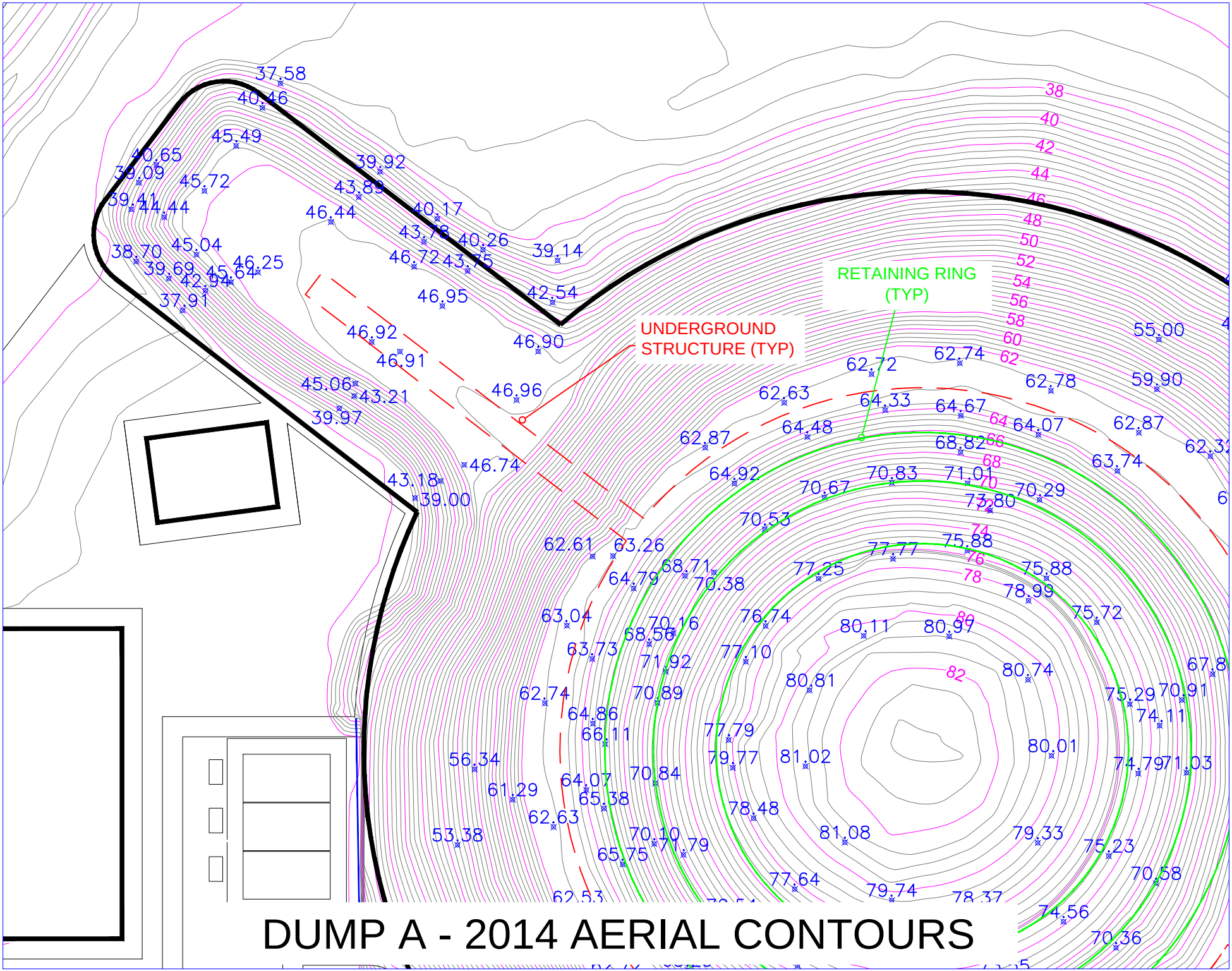
HALL A - DESIGN CONTOURS



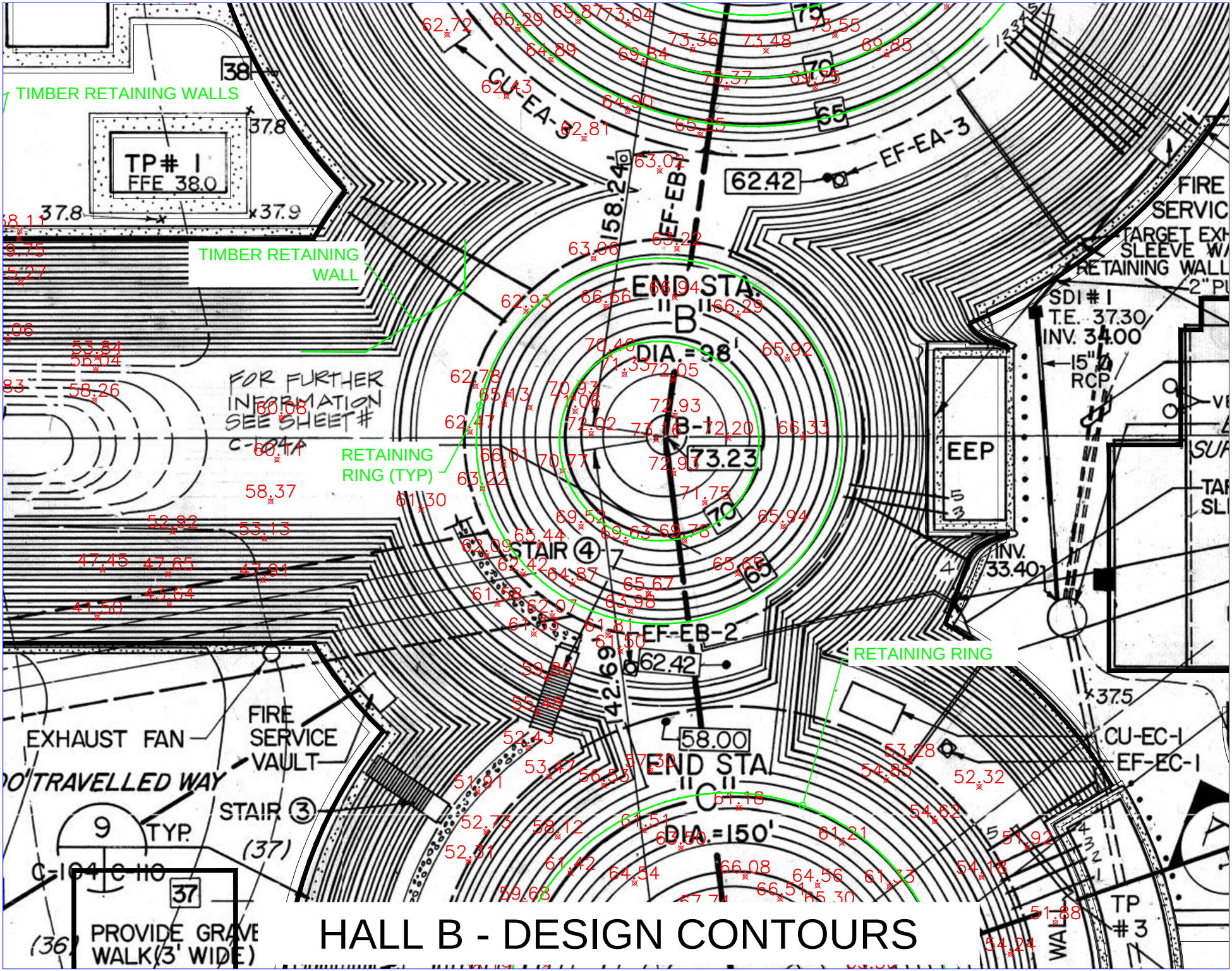
HALL A - 2014 AERIAL CONTOURS



DUMP A - DESIGN CONTOURS



DUMP A - 2014 AERIAL CONTOURS



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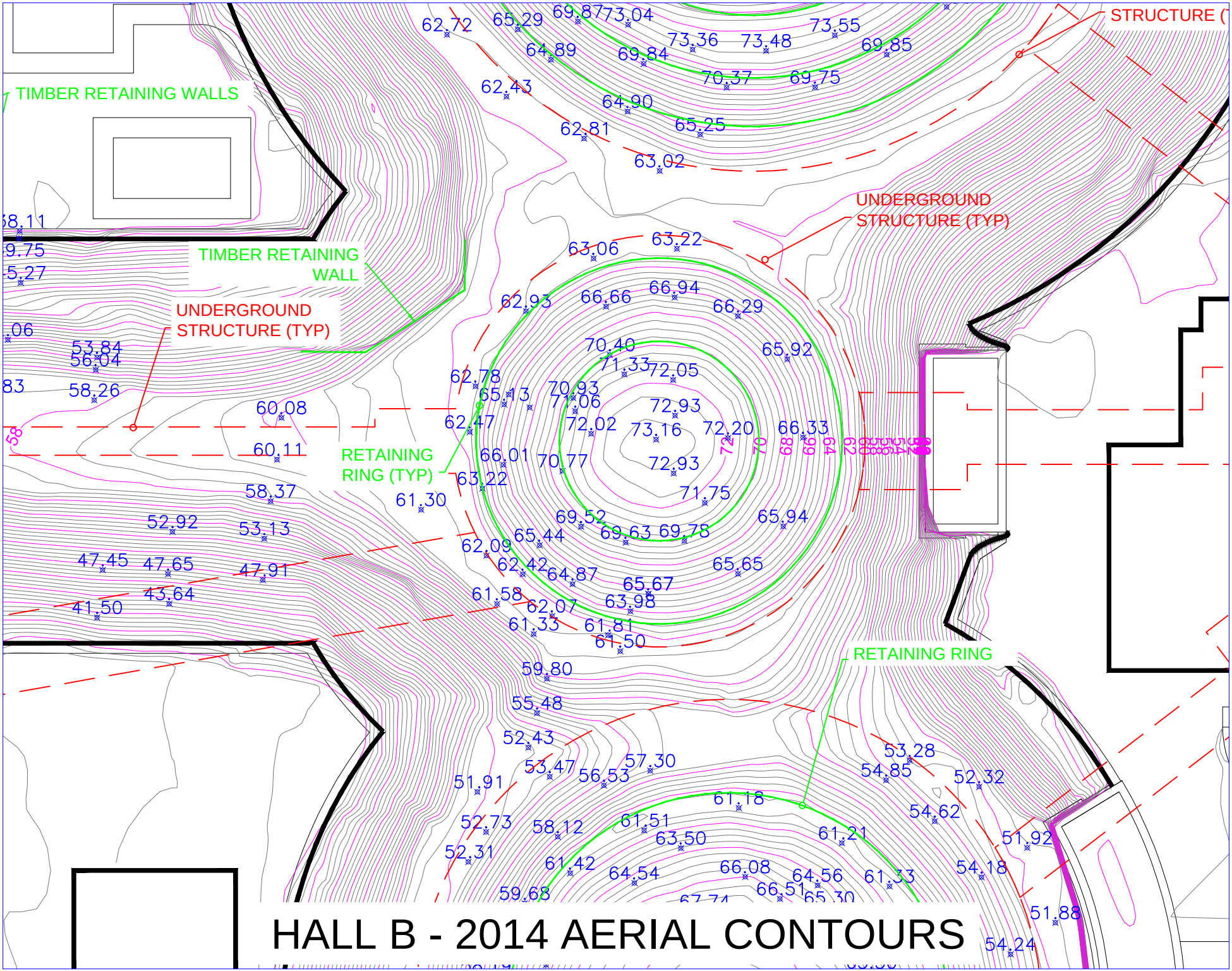

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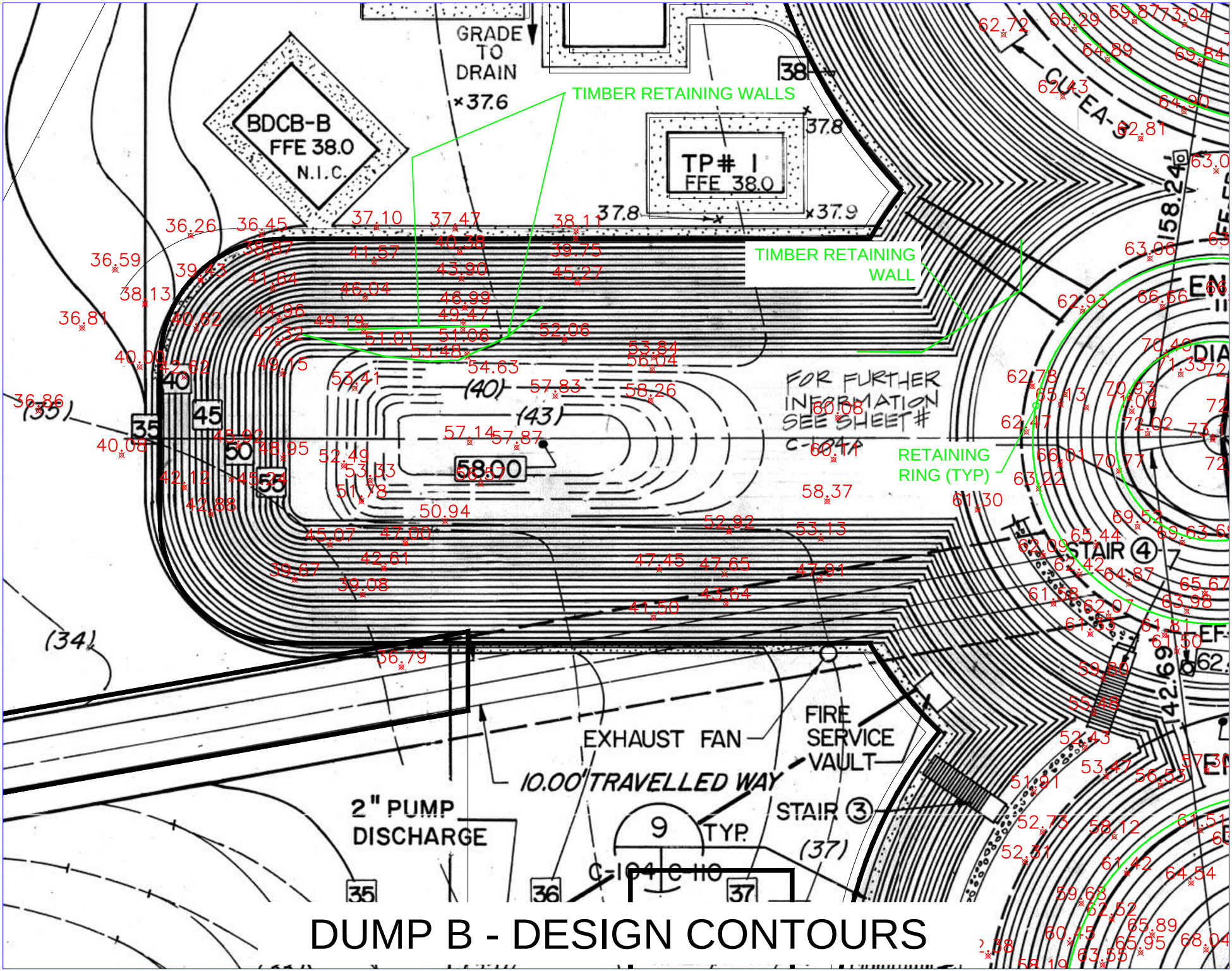

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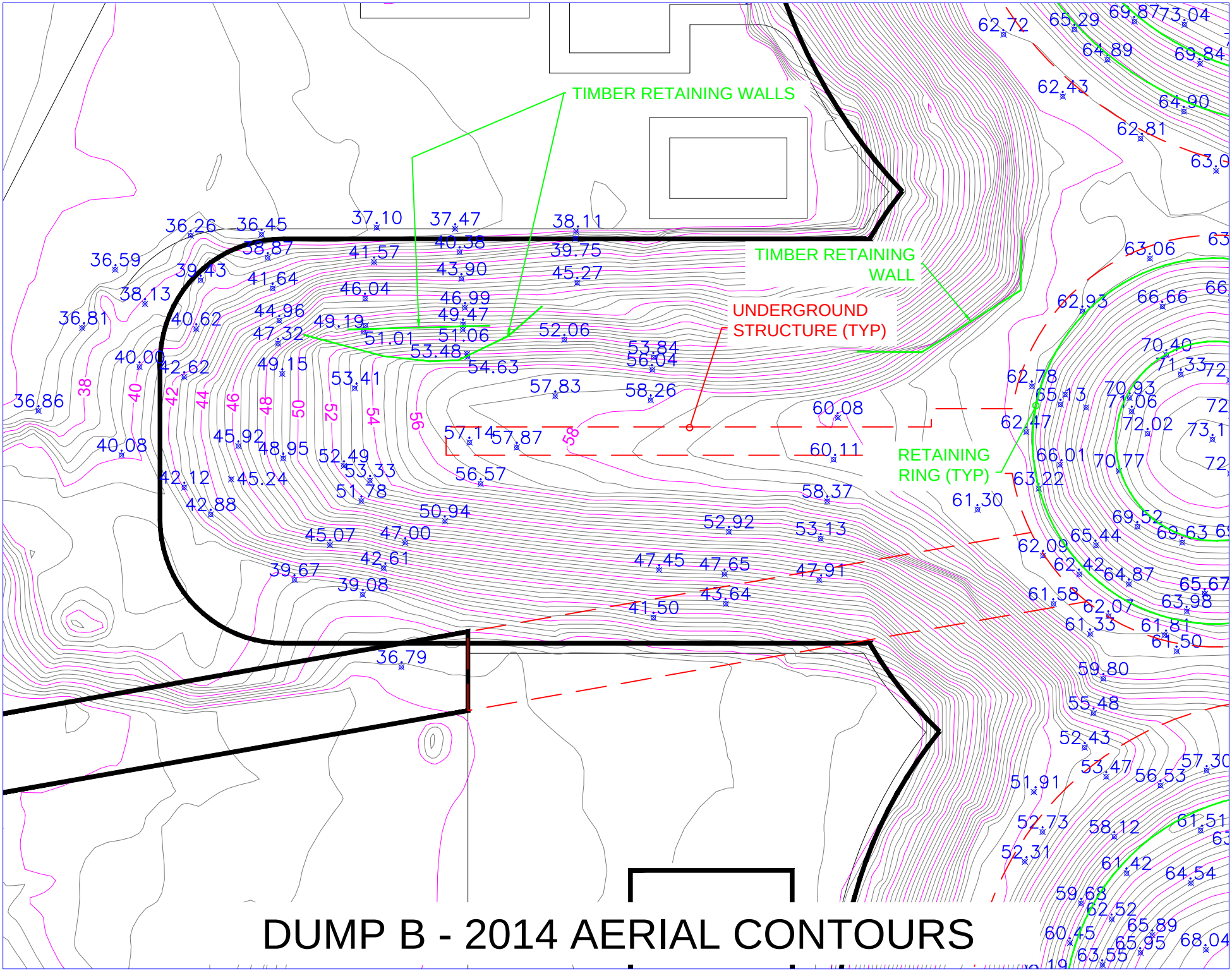

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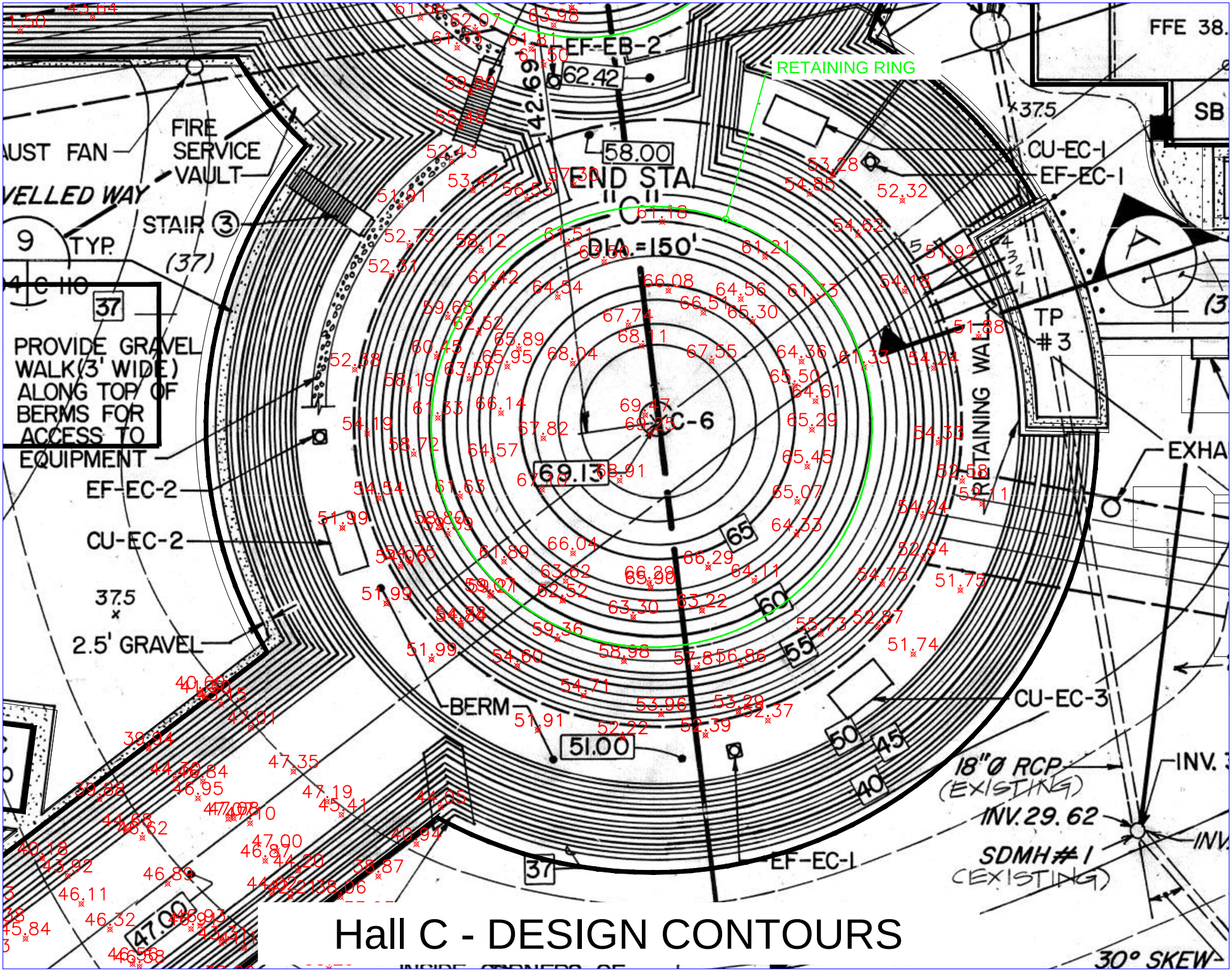
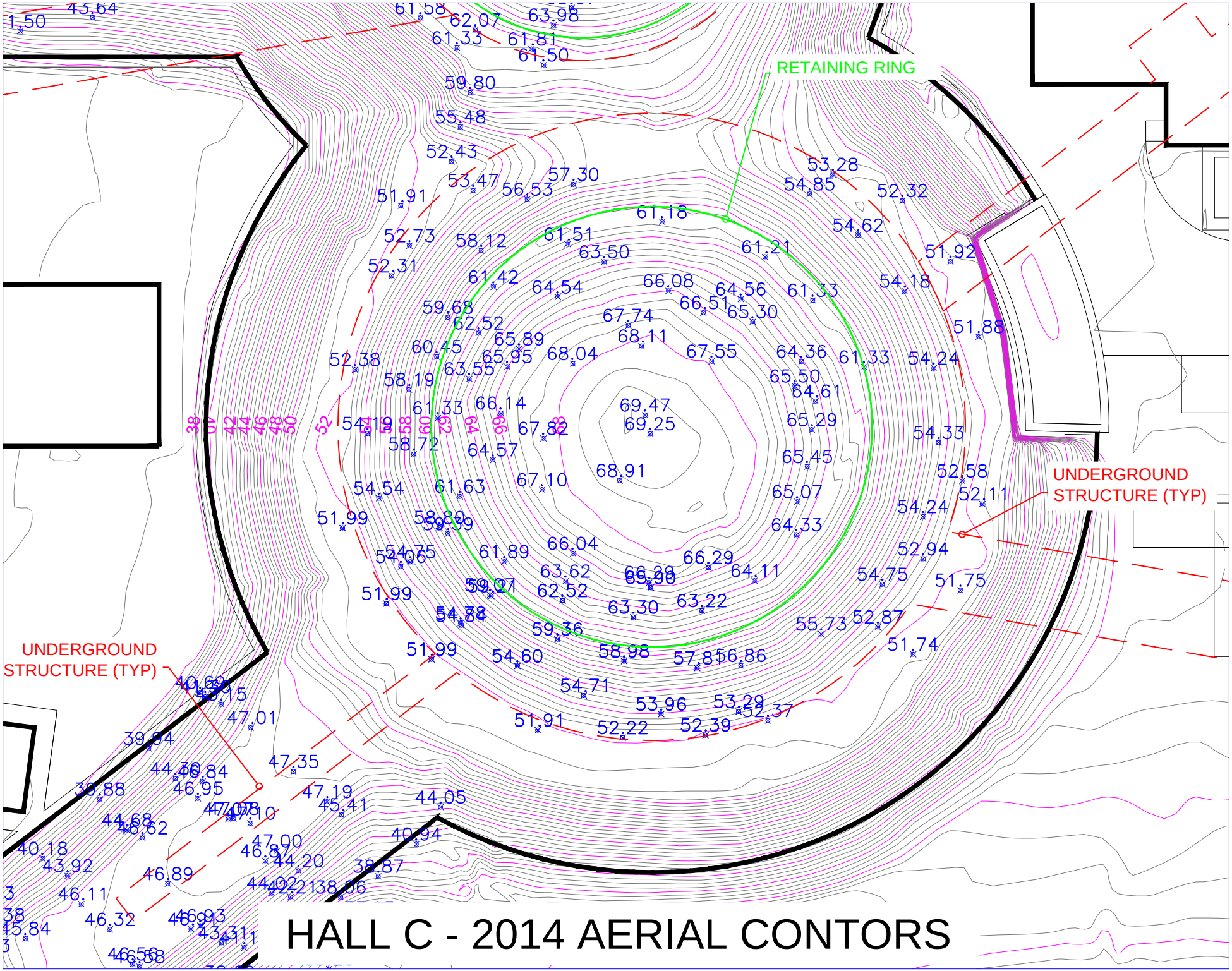
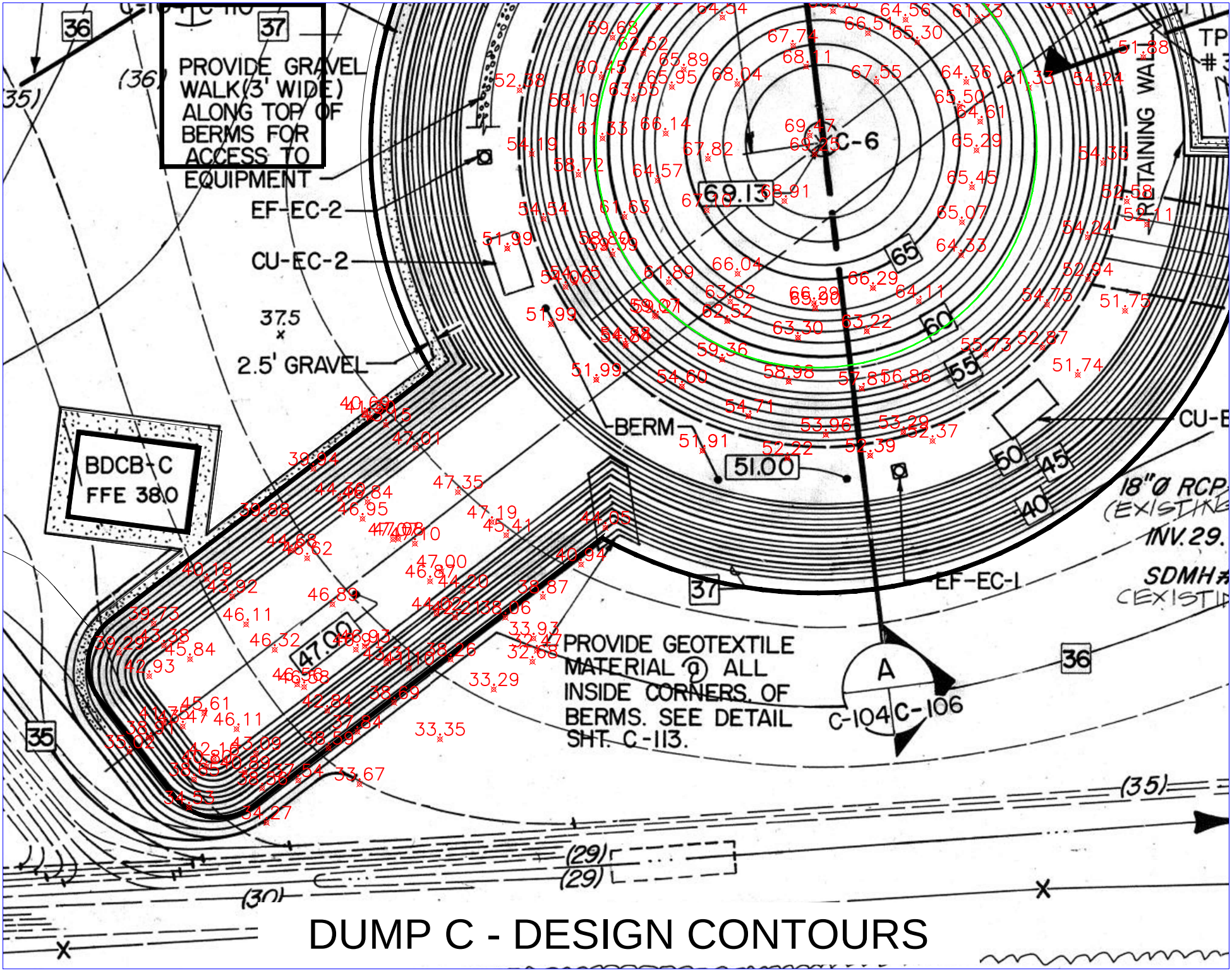

RETAINING RING
FFE 38.
SB
CU-EC-1
EF-EC-1
TP #3
RETAINING WALL
EXHA
EF-EB-2
62.42
58.00
END STA
"C"
DIA.=150'
69.13
EC-6
65
60
55
50
45
40
37
FIRE SERVICE VAULT
STAIR (3)
TYP.
(37)
PROVIDE GRAVEL WALK(3' WIDE) ALONG TOP OF BERMS FOR ACCESS TO EQUIPMENT
EF-EC-2
CU-EC-2
37.5
2.5' GRAVEL
BERM
51.00
CU-EC-3
18"Ø RCP (EXISTING)
INV. 29.62
SDMH #1 (EXISTING)
INV.
30° SKEW
Hall C - DESIGN CONTOURS


RETAINING RING
UNDERGROUND STRUCTURE (TYP)
UNDERGROUND STRUCTURE (TYP)
HALL C - 2014 AERIAL CONTORS



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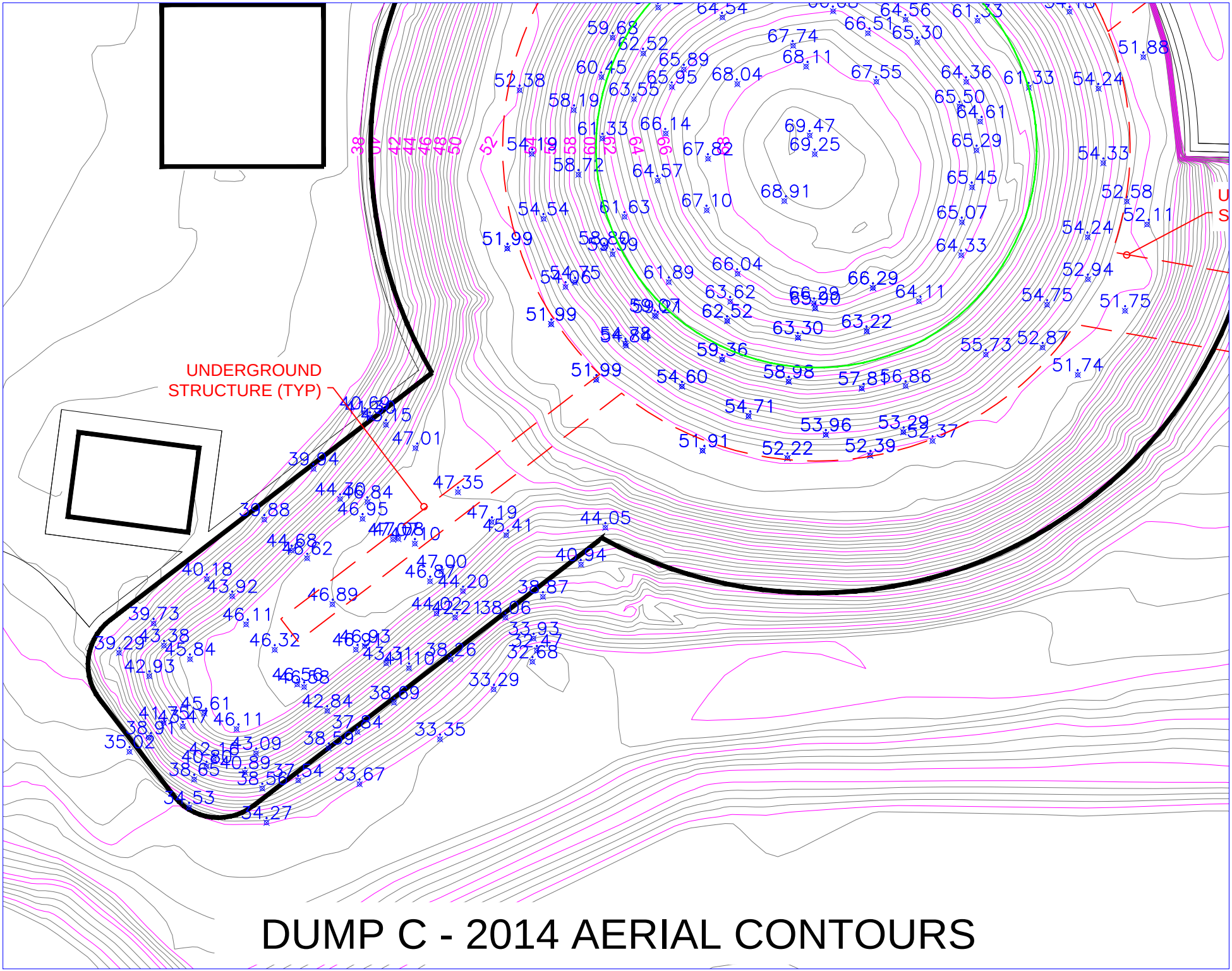

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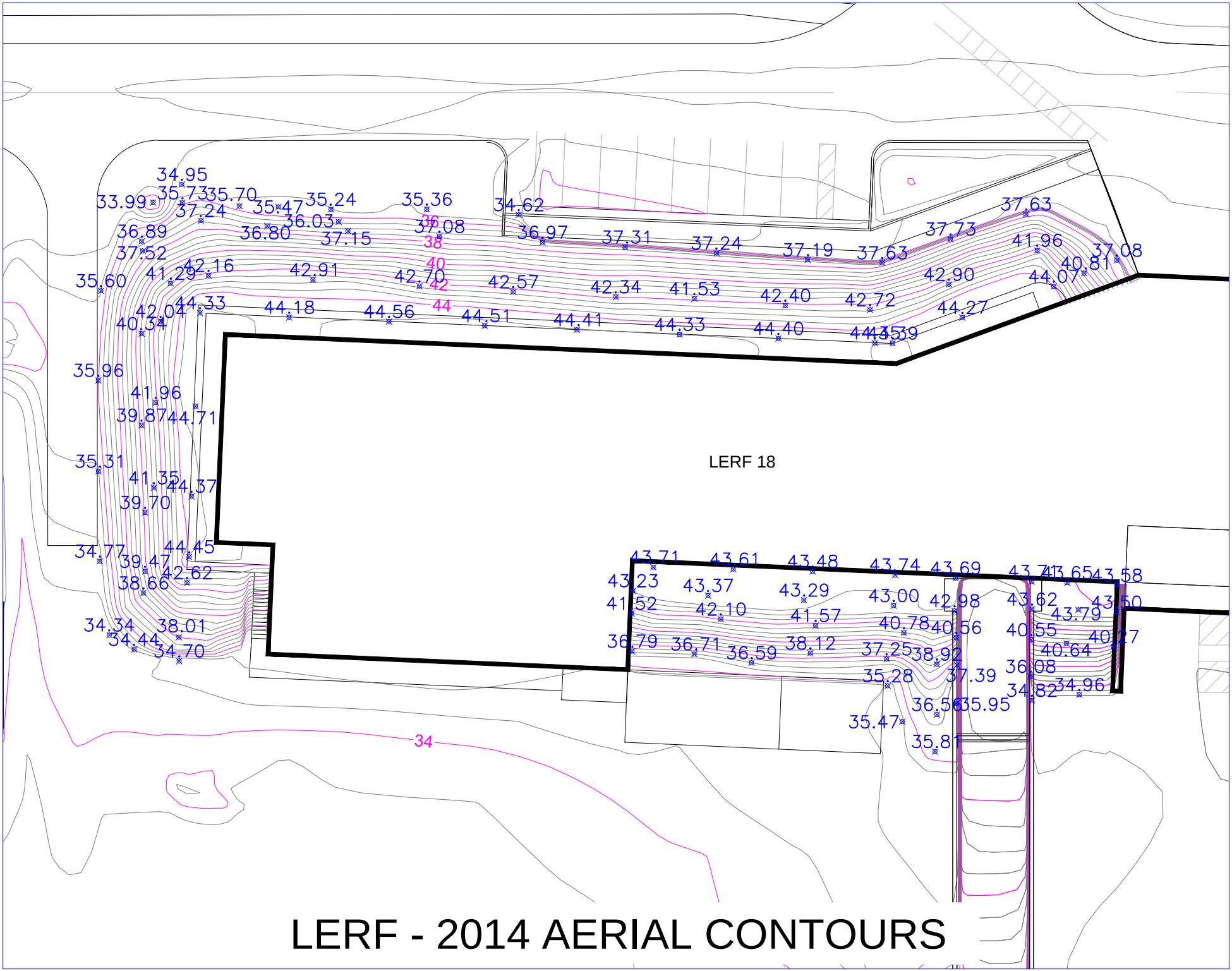
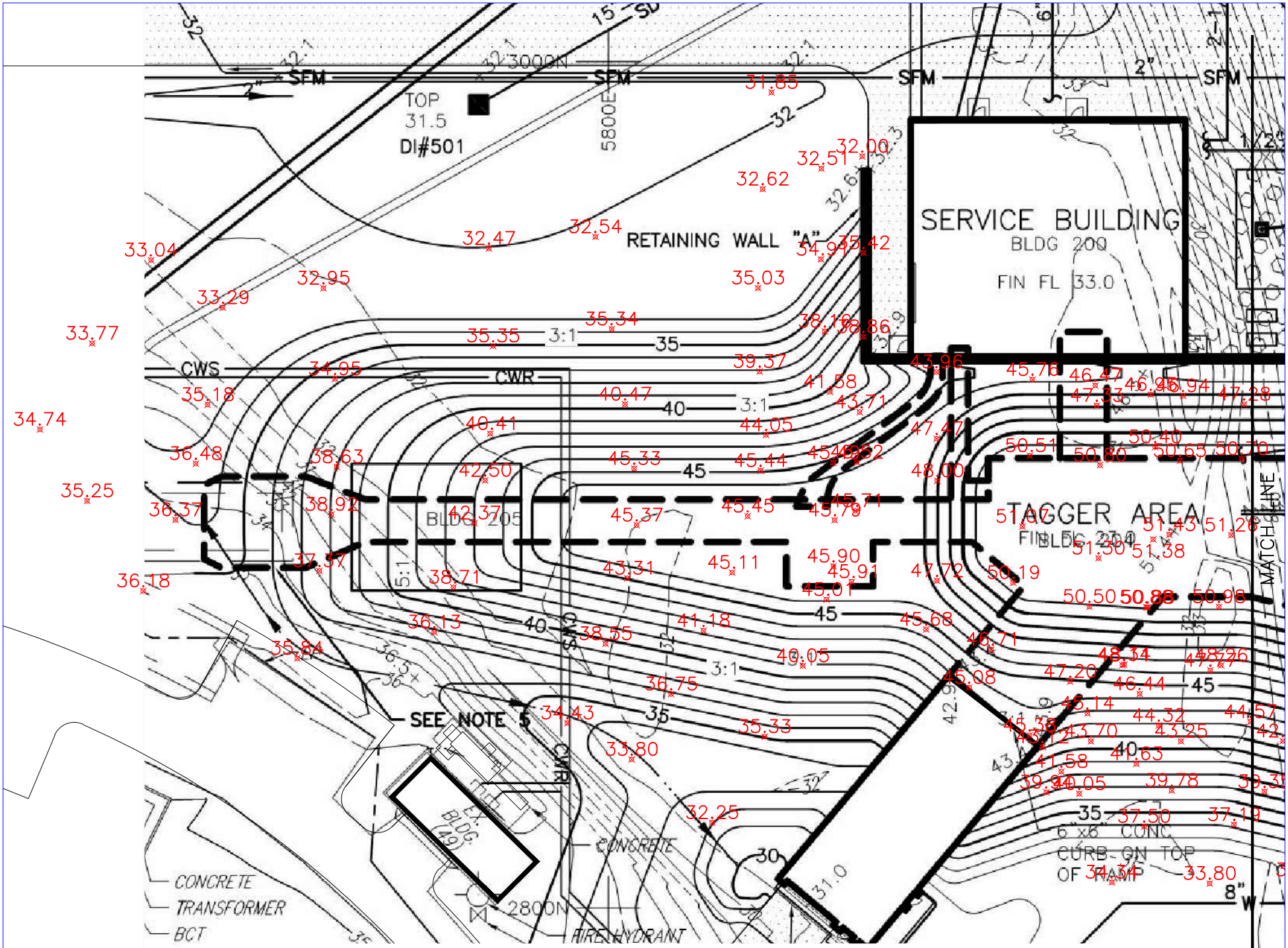
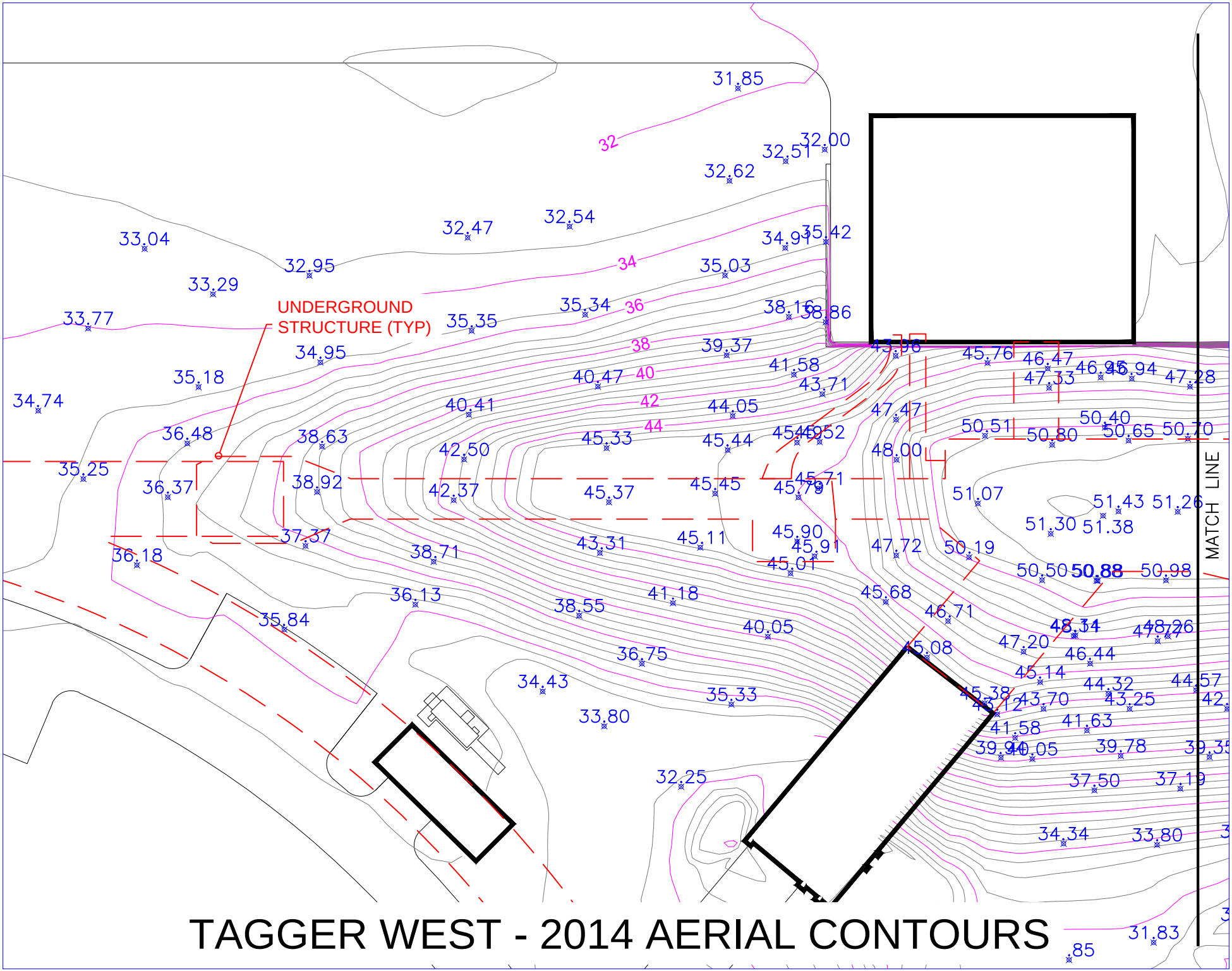


LERF - 2014 AERIAL CONTOURS



TAGGER WEST - DESIGN CONTOURS



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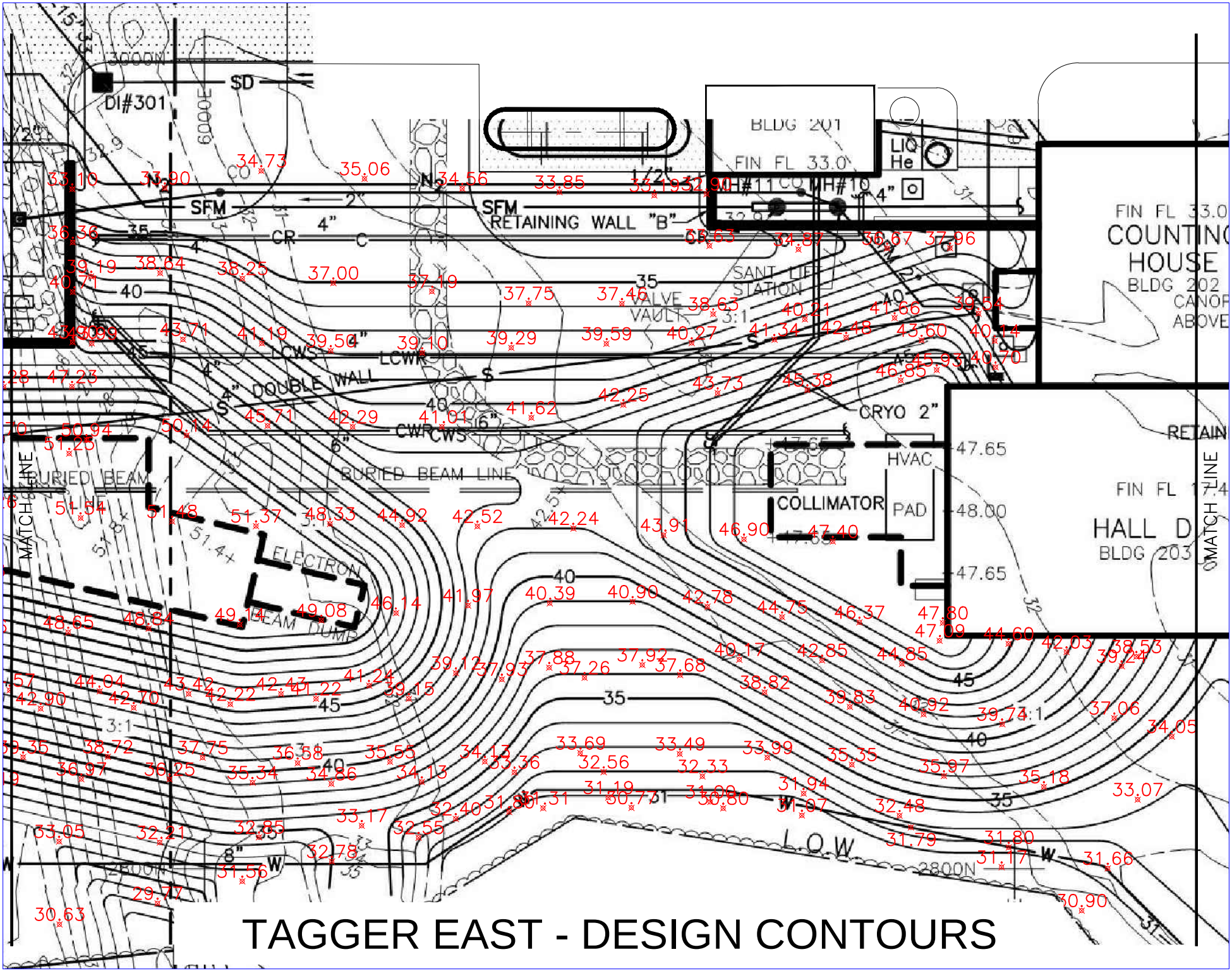

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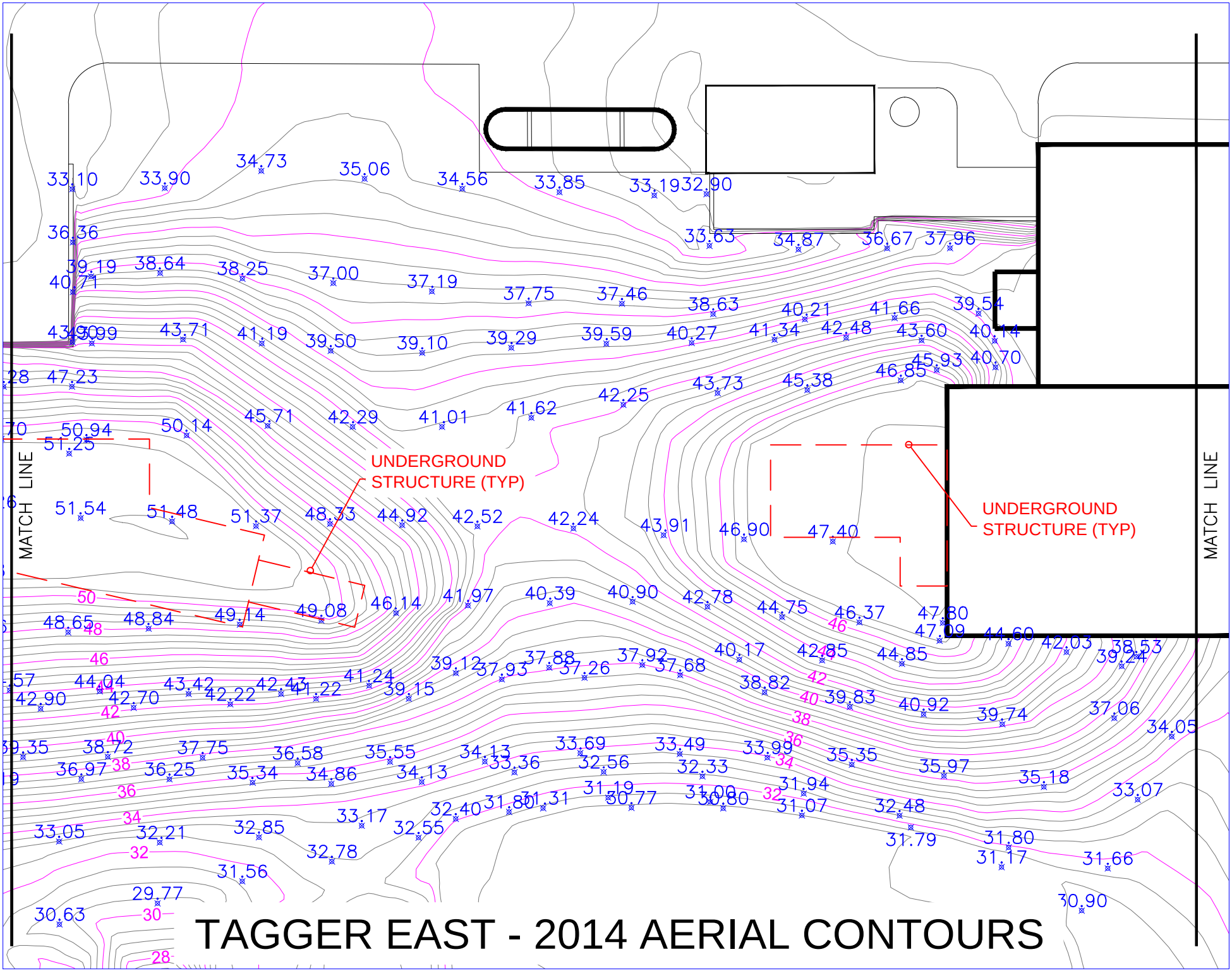

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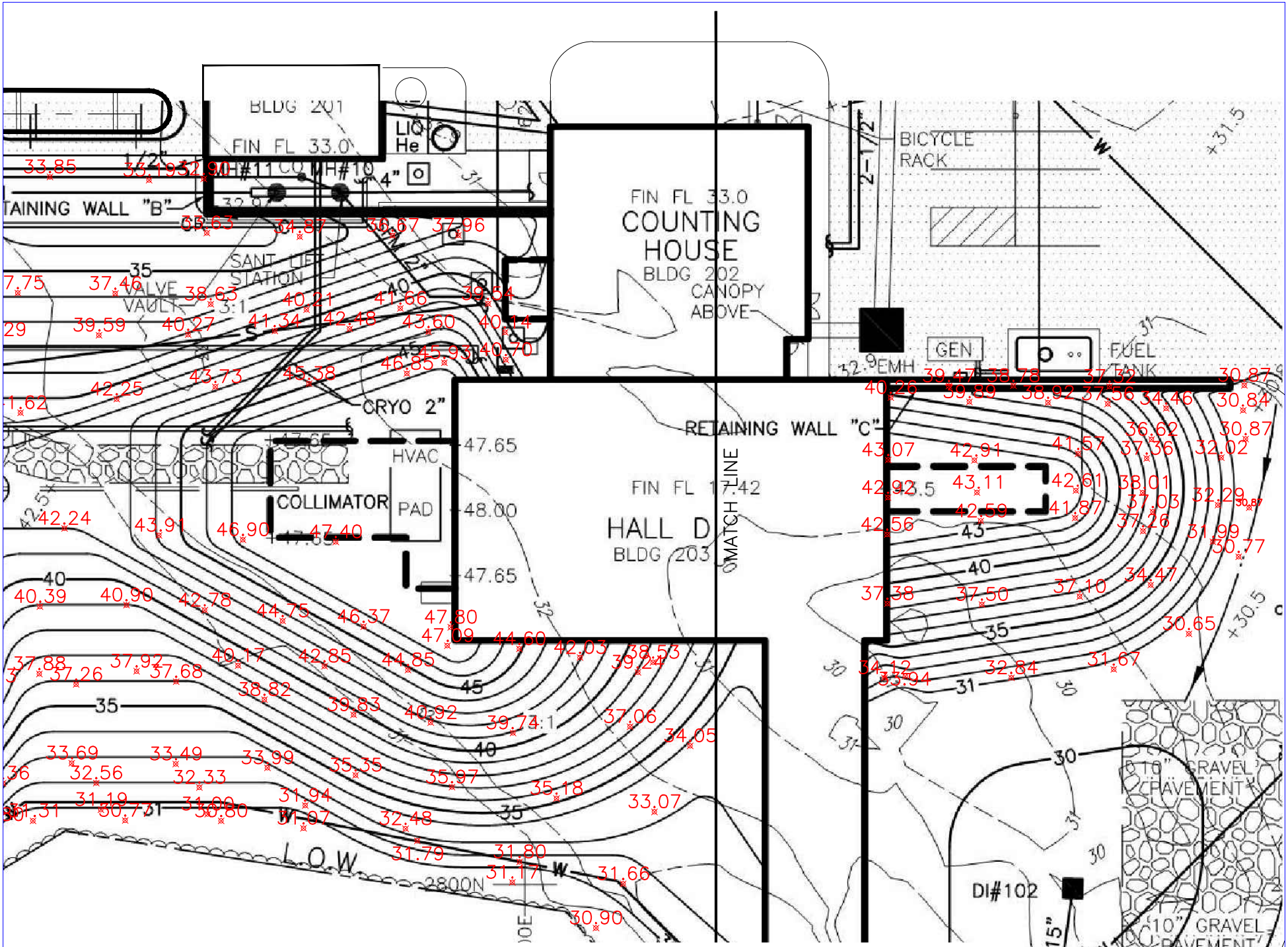

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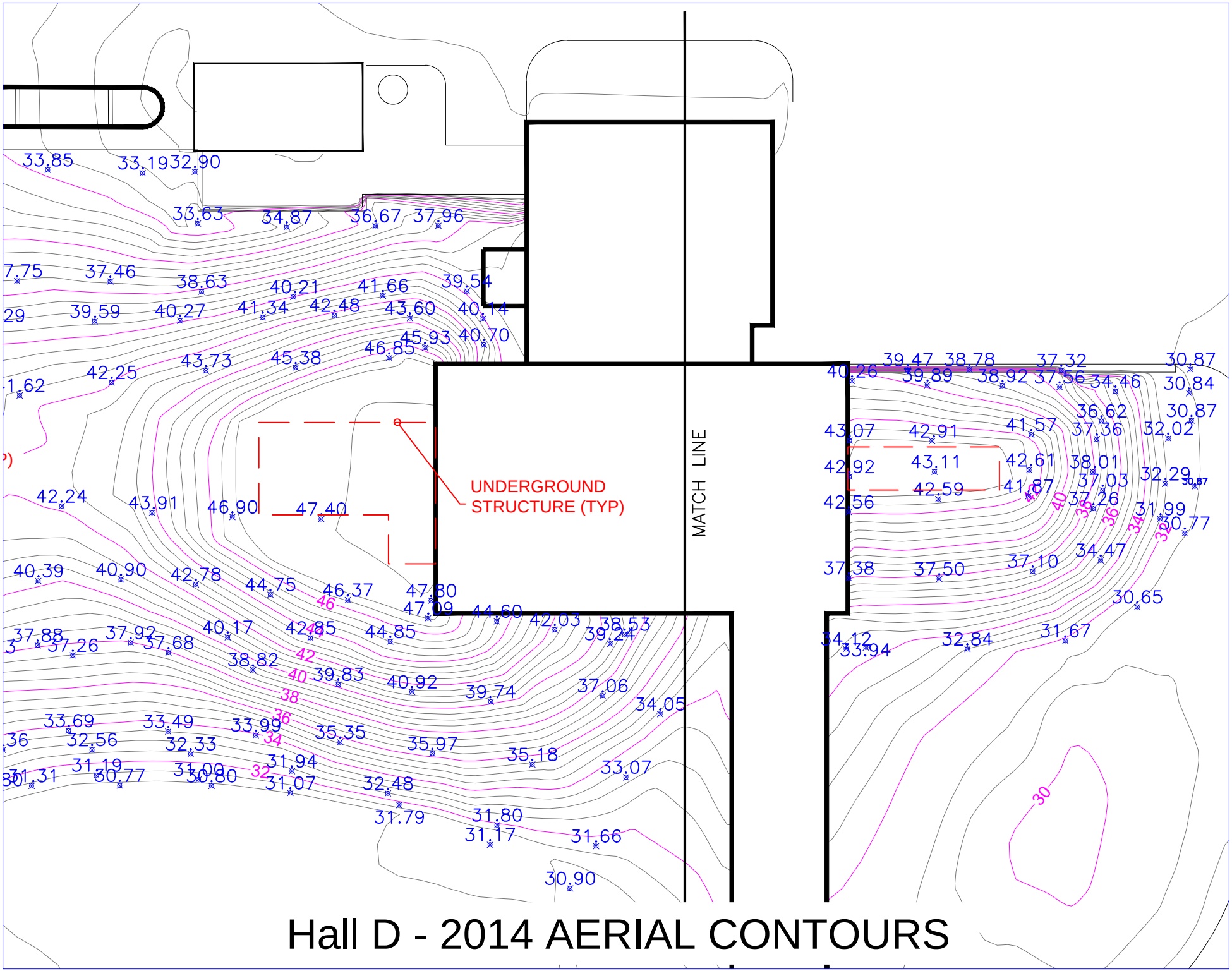

Hall D - 2014 AERIAL CONTOURS