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STRUCTURAL | GEOTECHNICAL | SPECIAL INSPECTIONS
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April 18, 2022

RE: Existing Condition Report
Bennett Residence
4105 Red Hill Church Rd
Coats, NC 27521

## Abstract

***SFA Design Group*** conducted a visual observation of the Bennett Residence on April 6th, 2022. The subject property is located at 4105 Red Hill Church Rd, Coats, NC 27521 (Figure-A). Originally built in 1920, the existing structure is a single-story, wood-framed, single family home of approximately 2,123 sq-ft. (Figure-C). The foundation consists of traditional brick stemwall, resting on a continuous concrete footing at the perimeter, with brick pilaster and beam construction at the interior and a concrete slab on grade at the interior of the garage. The residence is located on a 1.08 acres lot. The results of the investigation and the corresponding repair recommendations are presented in the following pages.

## Introduction

Differential settlement is a potential hazard which can compromise the structural integrity of your home, leading to costly repairs if not addressed in a timely manner. The causes of differential settlement at this location are out of the scope of this report, but literature[1] indicates drought, improper drainage and poorly compacted fill to be the common contributing factors. The effects of differential settlement include foundation cracks, cracks in drywall and sloping floors. A Zip Level was used to locate the differences in the floor elevations throughout the home. The Zip Level readings and corresponding topographic map will be discussed later in this report.

## Scope

The purpose of this report is as follows:

- Gather data pertaining to differential settlement and foundation issues
- Evaluate the foundation of the subject property
- Evaluate the repair plan proposed by the contractor for its viability in supporting the areas of the structure indicated without adversely affecting the structures structural integrity
- Provide a comprehensive repair plan for consideration that addresses all areas observed to be outside of industry standards elevation deviation of ½" over a 10ft span.

All care was taken to provide the best available information to the client and the engineers, with the goal of recommending the best possible plan for support of the foundation.

Areas of the home that were not able to be observed due to obstructions or were otherwise made unavailable are not in the scope of this project and are not addressed.

[1] http://www.arpnjournals.com/jeas/research_papers/rp_2010/jeas_0710_363.pdf

## Data Collection

Data collection performed to evaluate the structural integrity of the subject property's foundation is collected in four stages:

1. A thorough inspection of the home is conducted. Items of interest during inspection include the following:

    - All visible cracks in the foundation, slabs, walls, etc.
    - Damaged or rotting wood members.
    - Identifying bowing, heaving or sloping floors and misaligned doors and windows.

2. Photographs are taken of the home's interior and exterior.

3. Measurements of the home are then taken in order to digitally produce foundation plans.

4. A Zip Level survey of the main level is performed to identify variances in the floor elevation.

The Zip Level survey data will be entered into a *3D Field*, mapping software, to create a topographical map of the floor, providing a contoured model of the areas experiencing the most settlement. From this information, the design engineer can properly analyze the issues concerning the foundation and make appropriate repair recommendations.

## Results

Based on maps provided by the North Carolina Flood Risk Information System[2] the property is not in an area that is at risk of flooding; nor are there any geotechnical or ground water conditions which would indicate a potential for permanent ground displacement (Figure-B).

A visual inspection of the property found most of the CMU, brick and concrete foundation to be in average condition, with certain areas showing signs of differential settlement (Figure-C).

A Zip Level Survey was performed on the interior of the subject property, using the front door as the bench mark or starting point; designated as "0.0" on the floor plan (Figure-D). Measurements of the floor elevation were made in tenths of an inch. The high point was +0.7" and the low point was -2.8". The maximum difference in the floor readings was 3.5". As can be seen on the topographic map, the most significant settlement is indicated by dark brown contours surrounding the area (Figure-D & E).

A Bosch rebar scanner was used to identify if rebar was present in the concrete and/or CMU elements readily accessible for scanning. Rebar was not detected under this scanning method.

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[2] https://fris.nc.gov/fris/?ST=NC

## Recommendations

Based upon field observations, and evaluation of collected data, we find the property to be experiencing settlement, cracks, and general foundation stress in various areas. Based upon our findings, portions of the structure outside of the contractors recommended repair plan are experiencing differential settlements outside of the ½ in : 10 ft criteria. Figure F depicts a repair plan that includes all areas observed outside of this criteria for consideration only. We recommend the following:

- Install a push pier / helical pier system to stabilize and potentially lift the structure (Figure-F).
- Install a SmartJack system to stabilize and potentially lift the interior floor framing (Figure-F)
- SmartJack layout and quantities are based on bringing the structure up to a level condition per industry standards where industry standards are understood to be 0.5" of settlement over a 10' span.
- It is recommended to perform an elevation survey of the floor after installation of SmartJacks and/or piers to determine the necessity of installing add'l SmartJacks to support the floor framing.
- Inject PolyLevel to fill all voids potentially re-level any concrete slabs and walkways.
- Ensure that all drainage properly discharge away from structure.

It is our understanding that the intent of this repair is to stabilize, and potentially lift the worst case portions of the structure. It should be noted that this project is voluntary and recommendations for repairs are not mandatory. The homeowner should, however, understand that the new foundation system will support the structure ONLY in the areas addressed. Structural concerns and additional settlement may continue in areas not supported and the home should be closely monitored for additional damage in these areas.

## Limitations and Closure

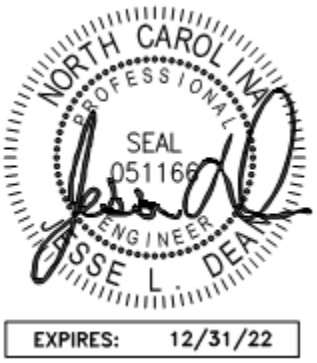
This report does not contain all variables that may be causing the foundation issues. Comprehensive reports can be produced using geotechnical and structural engineering investigations by licensed professionals. These additional reports would require a soils analysis of the site, as well as a complete vertical and lateral analysis of the structure. This report only provides information procured via visual inspection, from online sources and data collected from the Zip Level measurements. All observed areas are indicated and problematic regions documented.

Thank you for the opportunity of providing our services to you on this project.

Sincerely,

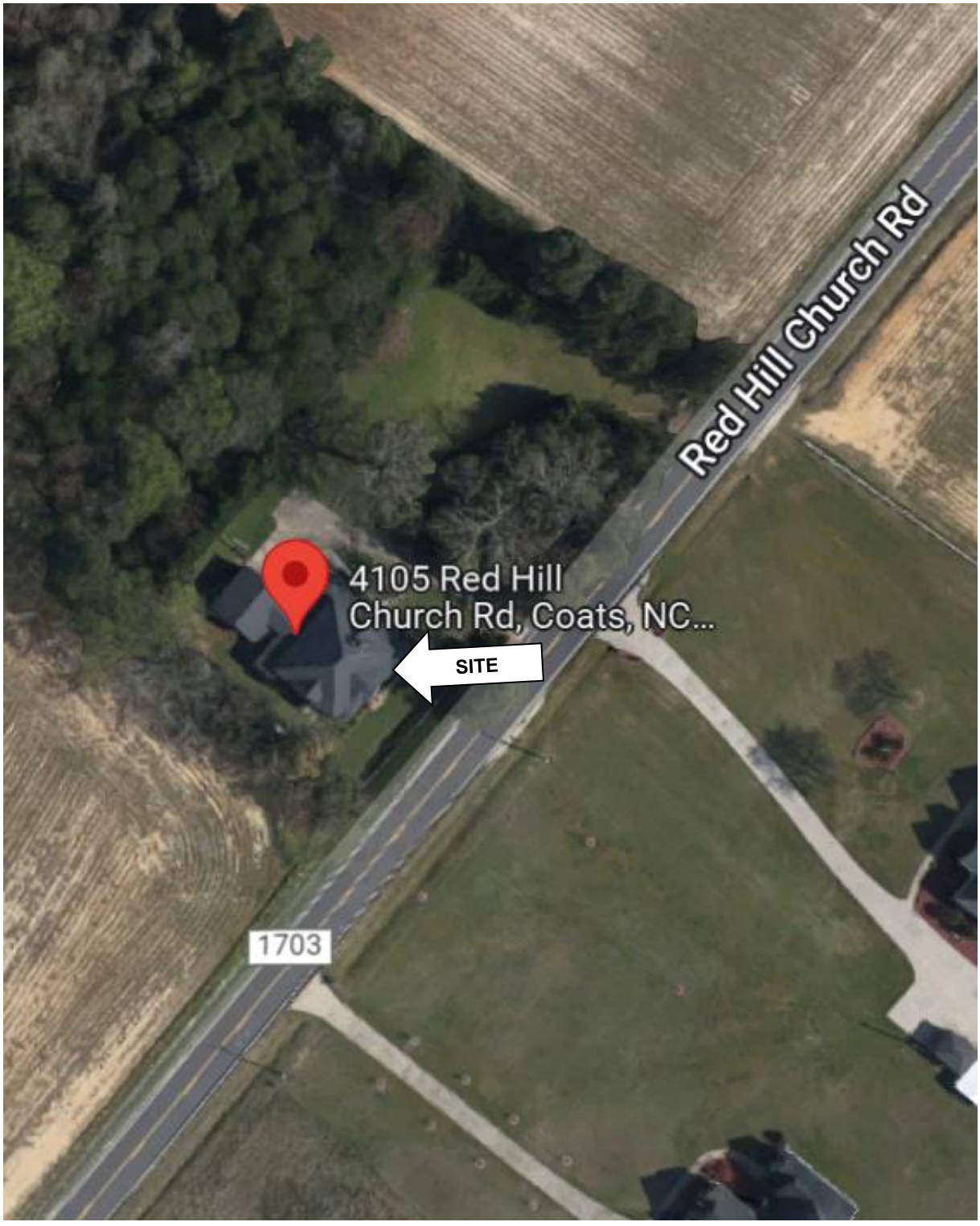
Jesse Dean, PE
SFA Design Group, Inc.

Attachments:
Figure A – Site Map
Figure B – Flood Hazard Map
Figure C – Foundation Layout
Figure D – Zip Level Measurements And 2D Topographic Map
Figure E – 3D Topographic Map
Figure F – SFA Comprehensive Recommended Repair Plan
Appendix 1 – Photographs




**Date: 04/18/2022**

MEK




https://www.google.com/maps

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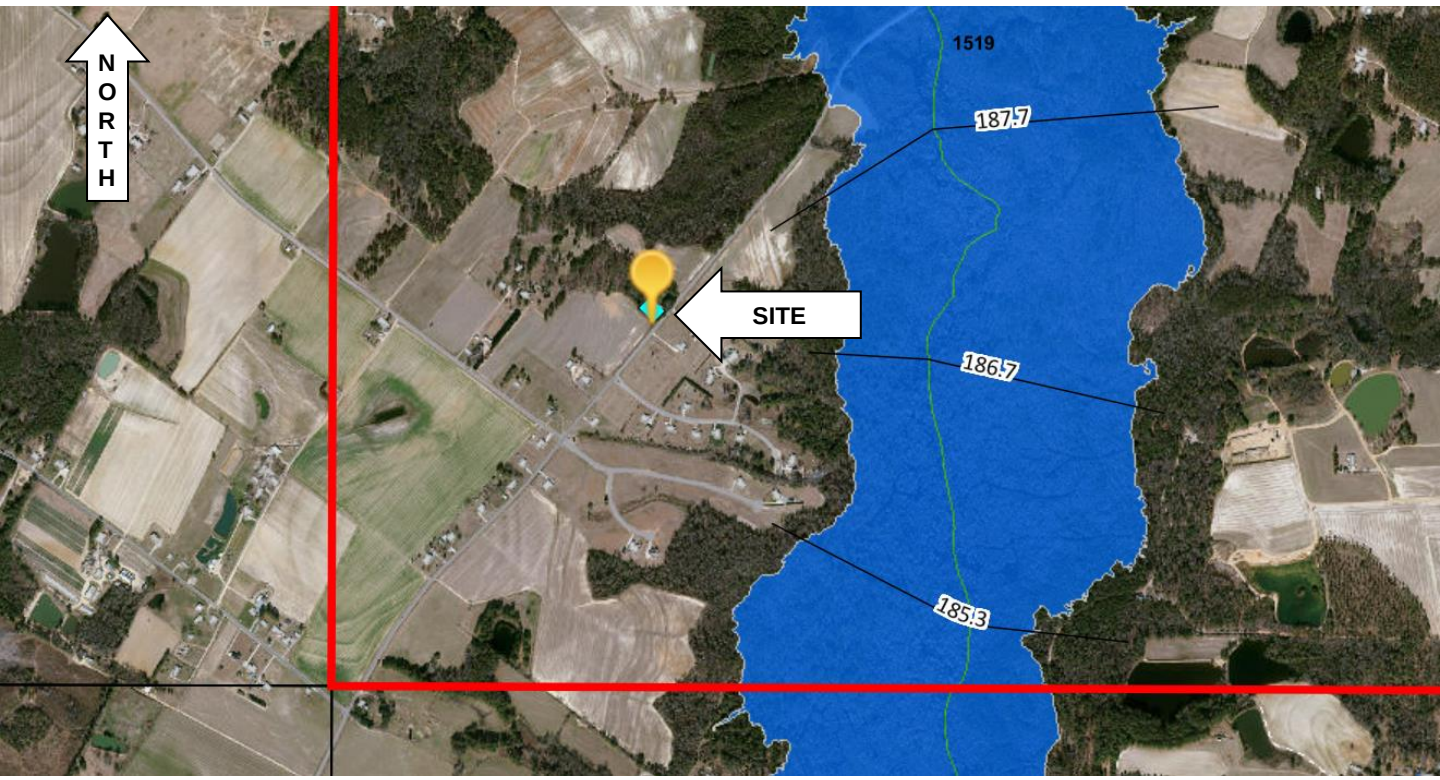
|---|---|---|
| sfa | **SITE MAP**<br>**4105 Red Hill Church Rd**<br>**Coats, NC 27521** | Project Number: RBC22-046<br>FIGURE-A |




https://fris.nc.gov/fris/?ST=NC

Flood Hazard Areas

- Zone VE
- Zones A, A99, V
- Zones AE, AH, AO, AE: 1% Annual Chance Flood Hazard Contained In Structure, 1% Annual Chance Flood Hazard Conditions
- Zone AE: Floodway, 1% Annual Chance Flood Hazard Conditions: Floodway, 1% Future Conditions Contained In Channel: Floodway
- Zone AE: Community Encroachment Area, 1% Annual Chance Flood Hazard Conditions: Community Encroachment Area
- 0.2% Annual Chance Flood Hazard Contained In Channel, 0.2% Annual Chance Flood Hazard
- Zone X: 1% Future Conditions, 1% Future Conditions Contained In Channel, X: 1% Future Conditions Contained in Structure
- 1% Future Conditions Contained In Channel: Community Encroachment Area
- Zone X: Protected By Levee
- Zone D
- Open Water
- Zone X

Stream Centerlines

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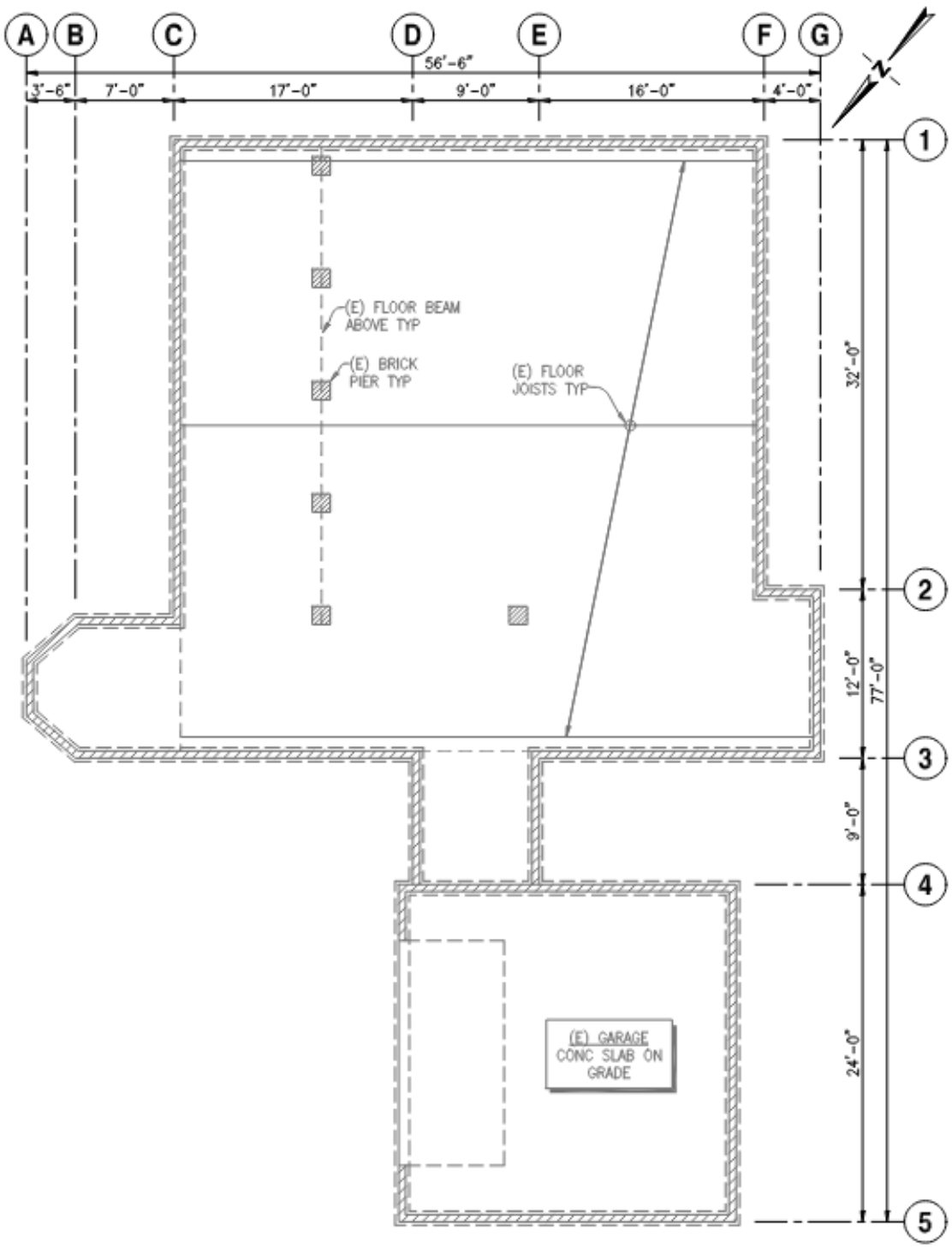
| sfa | **FLOOD HAZARD MAP**<br>**4105 Red Hill Church Rd**<br>**Coats, NC 27521** | Project Number: RBC22-046<br>FIGURE-B |




1. INDICATES (E) BRICK STEMWALL ON (E) CONC FOOTING (NOTIFY ENGINEER OF RECORD IF FIELD CONDITIONS DIFFER)

2. INDICATES SPAN OF (E) FLOOR/ROOF FRAMING.

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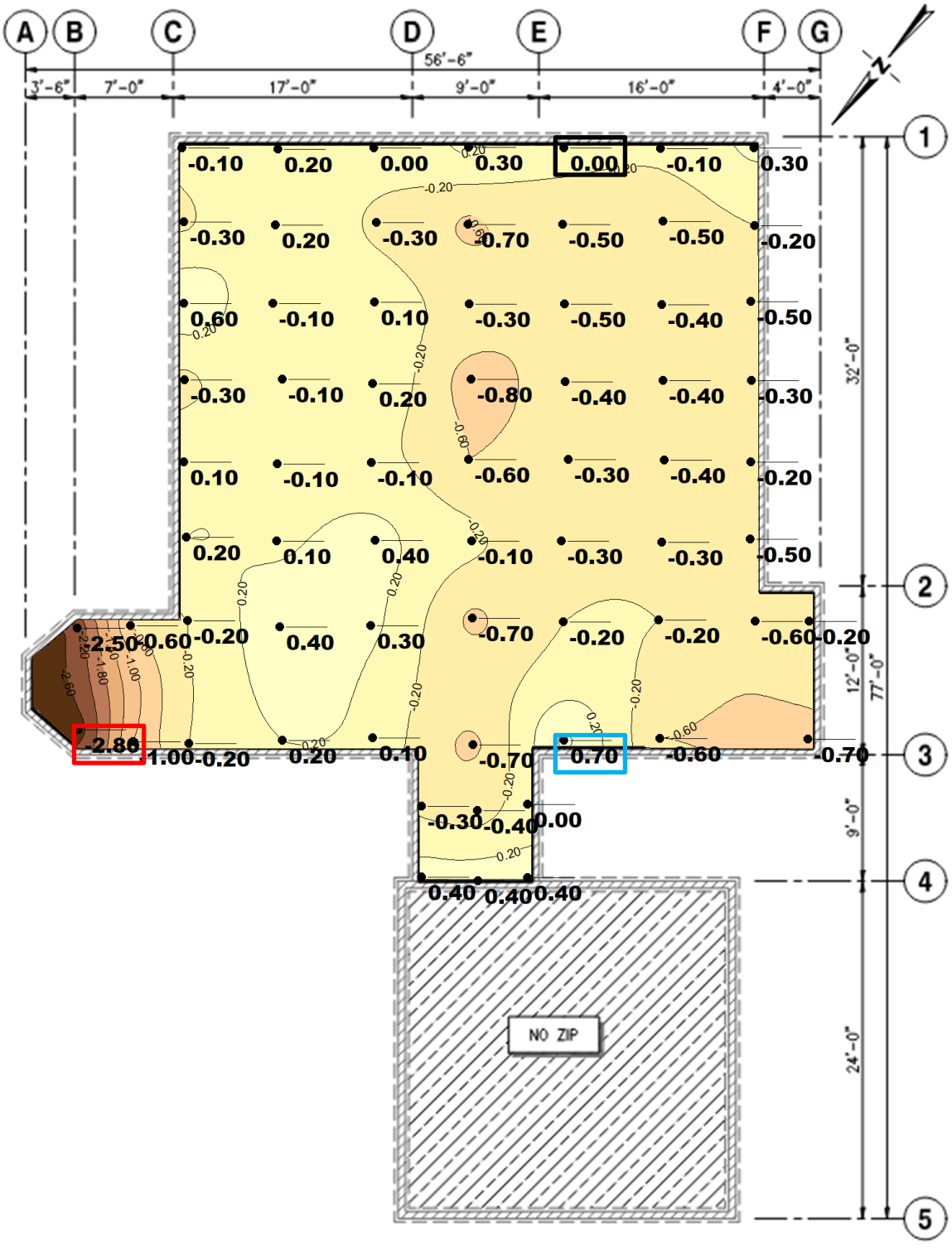
| sfa | **FOUNDATION LAYOUT** | Project Number: RBC22-046 |
| | | FIGURE-C |




Starting Point: 0.0 | Highest Point: +0.7" | Lowest Point: -2.8"

Source: Generated using 3D field

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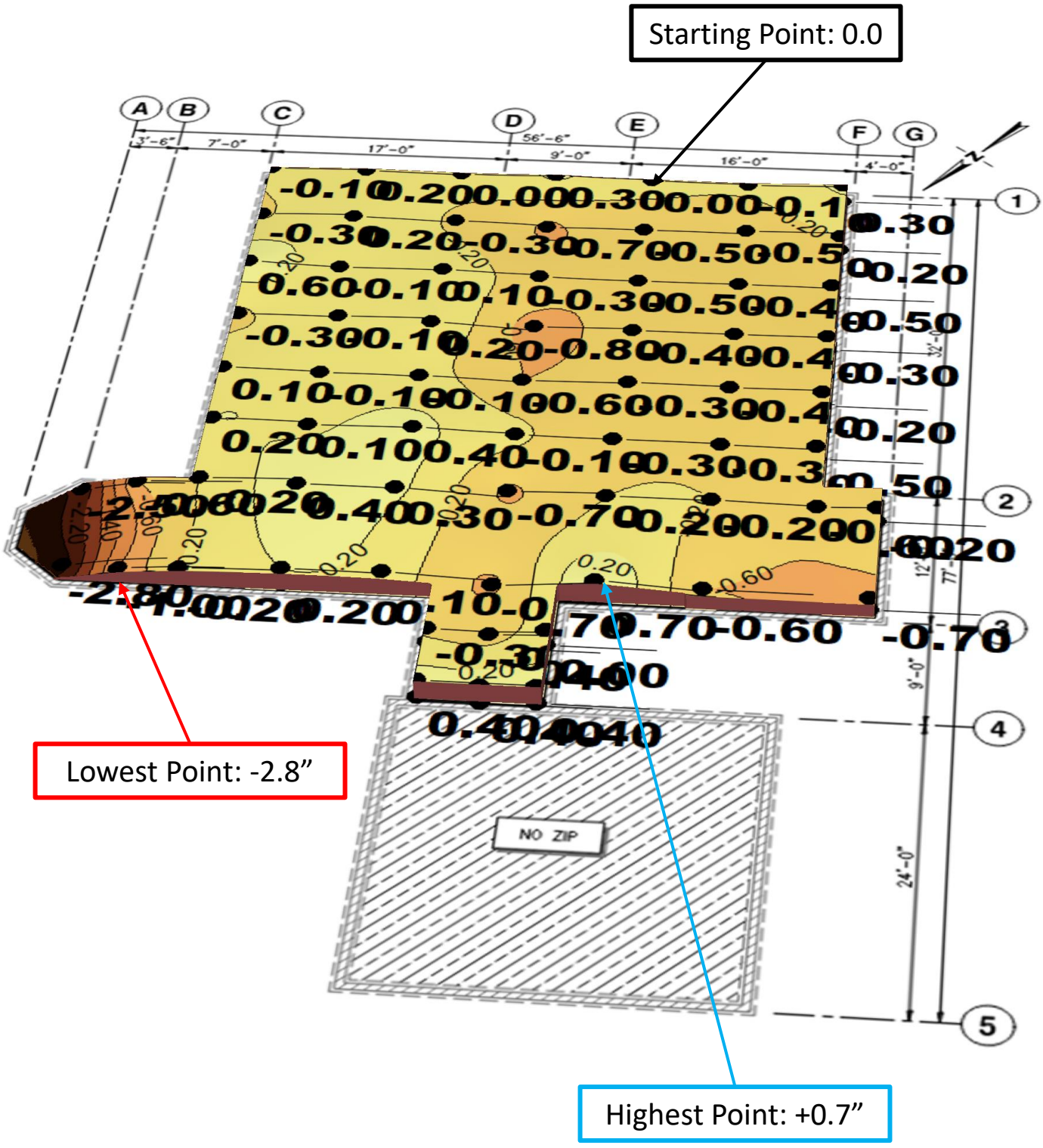
| sfa | **ZIP LEVEL MEASUREMENTS AND 2D TOPOGRAPHIC MAP** | Project Number: RBC22-046 |
| | | FIGURE-D |




Source: Generated using 3D field

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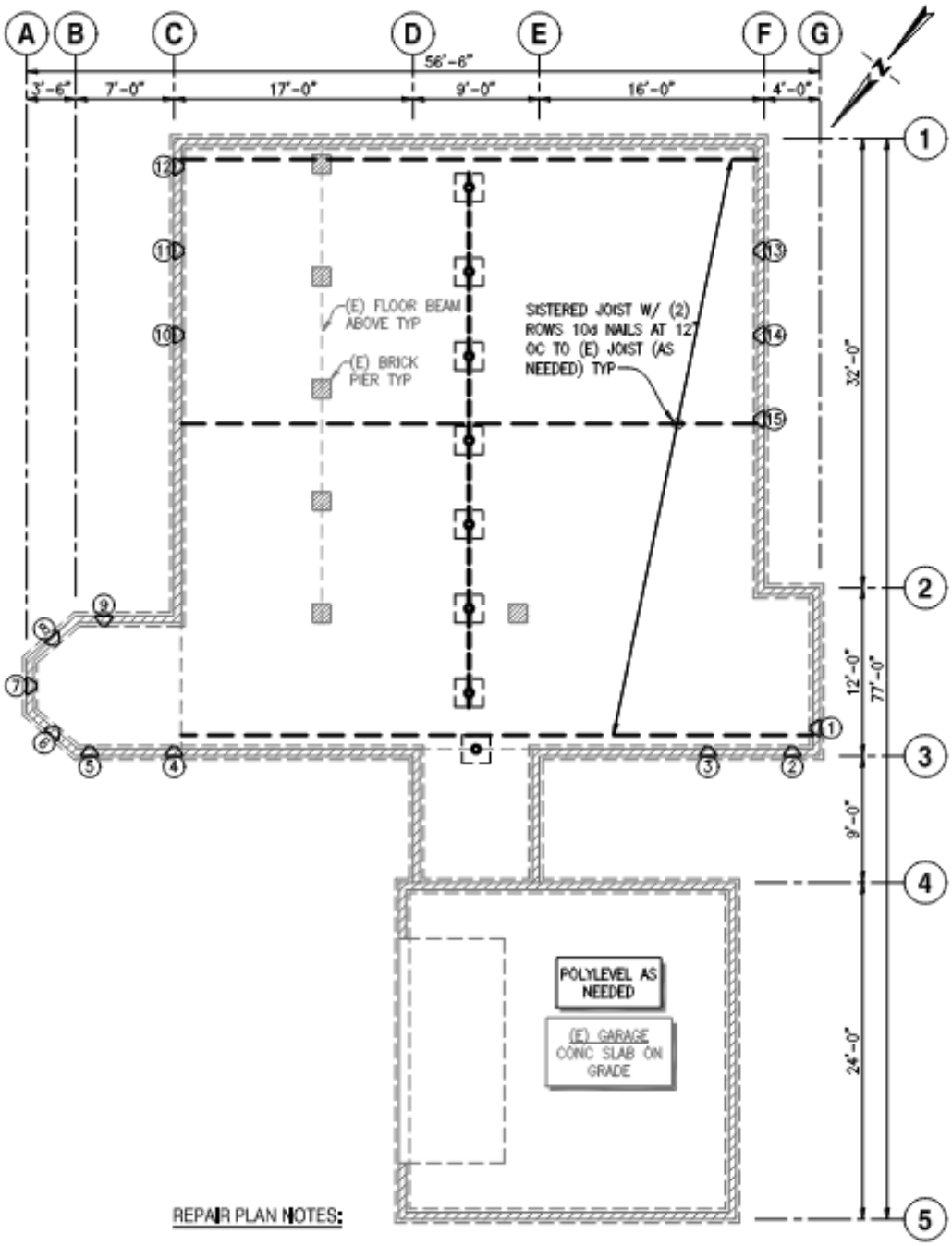
| sfa | **3D TOPOGRAPHIC MAP** | Project Number: RBC22-046 |
| | | FIGURE-E |




REPAIR PLAN NOTES:

1. INDICATES LOCATION OF FSI 288 PUSH PIER W/ FSI FS288BL FOUNDATION BRACKET ((15) TOTAL)
2. INDICATES LOCATION OF SUPPLEMENTAL STEEL BEAM ((38FT) TOTAL)
3. INDICATES LOCATION OF SJ350 SMARTJACK W/ CRUSHED STONE FTG ((8) TOTAL)
4. REPLACE "IN-KIND" ALL (E) WOOD MEMBERS (JOISTS, PURLINS, SUBPURLINS, SHEATHING, STUDS, WALL PLATES) WHICH SHOW SIGNS OF DRY ROT OR STRUCTURAL DAMAGE
5. ENSURE THAT ALL STORMWATER DRAINAGE PROPERLY DISCHARGE AWAY FROM STRUCTURE

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| sfa | **SFA COMPREHENSIVE RECOMMENDED REPAIR PLAN** | Project Number: RBC22-046 |
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| sfa | **PHOTOS** | Project Number: RBC22-046 |
| | | APPENDIX-1 |

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| sfa | **PHOTOS** | Project Number: RBC22-046 |
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