VSP ENGINEERING

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Forensic Engineering

Structural Engineering

Civil Engineering

Municipal Engineering

Mechanical/ Electrical Engineering

Land Surveying

Construction Layout

Construction Inspection

Estimated Mitigation Costs

1995 Sweetland Rd.
Muscatine, IA

I hereby certify that this document was prepared by me and the related engineering work was performed by me or under my direct personal supervision and that I am a duly Licensed Engineer under the laws of the State of Iowa.

Randy L. Van Winkle, P.E. Reg. #9675 — Date: 09/11/19
My license renewal date is December 31, 2020

LICENSED PROFESSIONAL ENGINEER
Licensed
9675
Randy L.
Van Winkle
IOWA

HISTORY

The Tom and Debbie Antram residence at 1995 Sweetland Rd in Muscatine, Iowa, was built in 1979. The house is situated near the edge of a steep ravine and there have been settlement issues and foundation damages in recent years.

Repairs have been required following four separate events:

The first event occurred in 1993 and consisted of mudjacking under the lower level floor of the residence. The total cost of the repairs in 1993 was $13,000.00.

Event #2 occurred in 2009, a firm named Tomlinson Cannon installed micropiles around the entire rear of the structure and several earth anchors. The cost of the 2009 improvements totaled $34,700.00.

Remediation Event #3 occurred in 2011. Tomlinson Cannon returned and several piles and installed additional micropiles. This work totaled $2,100.00.

In the late winter/spring 2019, significant new movements began to occur. The homeowners began to note additional signs of cracking and settlement both in drywall in the interior and in the concrete foundation wall along the east side of the residence. An engineering firm, VSP Engineering was retained to determine the cause of the additional movement that seemed to be accelerating and to recommend a course of action to prevent future

settlement or displacement of the foundations. Based upon our observations, VSP Engineering recommended the following procedure be initiated to stabilize the basement floor and rear foundation wall of the residence.

1) Remove all interior furnishings and floor coverings over the east half of the lower level.
2) Sawcut and remove the basement floor over the entire east half of the lower level and over most of the laundry room.
3) Install concrete Deadman anchors under the floor near the center of the basement. The Deadman anchors should have rods extending through the eastside foundation wall and into an 18-foot-deep wall of a steel sheet piling. Placed approximately 1 foot away from the east foundation wall. The sheet piling should be driven so the top of the piling is just below grade.
4) As noted above, the rods from the Deadman anchors should be extended through the sheet piling and connected to it to prevent the top of the sheet piling from tipping outwards. As recommended to place granular fill to bring the subgrade up to five inches below the original basement floor elevation.
5) It was recommended to pour five-inch-thick concrete basement floor up to the original basement floor elevation, reinforced with #4 rebar spaced at 12 inches on center each way.
6) It was recommended all interior finished in the basement be repaired and drywall cracks patched as required. In addition, adjust all windows and floors that operate with difficulty. It was estimated at the time of these recommendations the cost would be approximately $38,000.00.

However, throughout the summer of 2019, it became apparent that the shifting of the soil was increasing and that the recommended project would no longer be adequate to restrain the movement of the foundation and prevent the sliding of the house. On July 12th, I returned to the Antram residence to review/evaluate a report by the owner that the cracking and displacement of various elements of the home had dramatically increased. My inspection confirmed that the movement and structural distress in the home had accelerated. It was agreed that the structural integrity of the home had been compromised and that human occupancy should not continue. It was our determination at that time the movement of the house had proceeded to the point where repairs are no longer an effective option. It is clear that the ground has lost its stability and further slumping and movement of the soils supporting the house will continue. The repairs recommended by VSP Engineering are no longer appropriate. Continued displacements of the soil under and adjacent to the house have caused numerous wide cracks to develop in the lower level concrete floor and in the wood framed walls on both levels. Doors no longer close properly due to racking. The basement floor slopes visibly to the east. It was therefore recommended that the house be abandoned and razed in order to prevent the ongoing expenses of repairs which appear to be accelerating as time goes on.

Ongoing maintenance cost will include monitoring of the slope by County personnel (est. $300 a year). Maintenance costs will also include periodic repairs (est. every 5 years) due to sloughing and/or erosion. (Est. cost

$6,600, 3 men, 3 days and equipment).

FUTURE DAMAGES

In my opinion, the slope stability failure of this hillside is accelerating and it will continue to damage the residence. Repair of this structure is no longer a viable option. It is recommended that the home be demolished and the owners relocate.

If this residence is not razed, abandoned and demolished there will be continued expense to attempt to prevent further sliding of the house, which will probably not be effective in preventing further damages. In addition to the loss of the house, it should be noted that approximately 50 feet from the front of the house is a paved county road, which will also be jeopardized by the continued sluffing of the steep embankment that is currently supporting the front of the residence.

Based upon these consideration the following cost estimates have been prepared showing the cost that have been incurred from the past and the potential projected cost that could incur in the future. It should be noted that these costs are estimates only and that the actual continued movement of the ground supporting the residence may move more rapidly or less rapidly than we have predicted. Please see the chart of the following page which outlines out projected future expenses regarding this residence.

1995 Sweetland Road

Muscatine, IA

Incurred and Estimated Mitigation Costs

YEAR	Mitigation Cost	Brief Description of Work
1993	$13,000	Mudjacking and Earth Anchors
2009	$34,700	Install Micropiles and Mudjacking
2011	$2,100	Repair/Lengthen Piles
2019	$38,000	Sheet Piling and Earth Anchors
2019	$179,000	Demolish Residence - Relocate
2020	$40,000	Reg-grade Site
2025	$8,000	Monitor Erosion/Sloughing
2030	$8,000	Maintain/Repair as Needed
2035	$8,000	Estimate Annual Cost $1,600