

Research Program Report
The Stream Course of Great Meadow Run
In 1754

November, 1991

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INTRODUCTION

Ranger Smith, Fort Necessity National Battlefield RDE, Box 528, Farmington, PA 15437 inquired as to the possibility of using soil morphology as a means to identify the original stream course adjacent to the Fort. Studies of soils throughout Pennsylvania and those along stream channels do indicate that soil morphology can identify sources of parent material and estimated time of horizon formation. Because such relationships exist, I responded with a research proposal. Preparations for field investigation included study of aerial photographs of various ages, study of the soil survey for the eastern part of Fayette County, and surveillance of the landscapes in and around Fort Necessity. These preliminary studies indicated that certain streams in the area did have meanders before emptying into ponds.

The soil survey shows the soils adjacent to the stream channel are mapped as Philo silt loam, a deep, moderately well drained, loamy soil formed on floodplain sediments. Swampgrass, soft rush, ironweed, milkweed, plantain, and goldenrod typically grow on these soils. The usual soil profile has a dark brown silt loam surface horizon, a friable, dark yellowish brown loam subsoil, with gray and yellowish brown mottling below 18 inches. The soils are subject to flooding, have a seasonal water table that rises to as high as 18 inches from the surface. The Fort is located near the confluence of Great Meadow Run and Indian Run. The Philo soil is bounded on the upland sides by Brinkerton and Ansoch silt loams. These are deep, poorly drained loamy soils of the footslopes. A very dark grayish-brown silt loam plow layer overlies a light brownish gray, grayish brown, and gray mottled silty clay loam subsoil horizon. The lower part of the subsoil is a very firm gray clay loam mottled with yellowish red. A copy of the soils map is attached for the Fort Necessity site.

OBJECTIVE

The objective of this study was to determine if a 1754 stream channel could be identified through soil investigations.

PROCEDURES

The 1988 aerial photo of the site was used as a base map. (Copy attached). The report "New Light on Washington's Fort Necessity" by J. C. Harrington was studied for reference to soil properties and clues to the location of the 1754 stream course. An auger hole reconnaissance was conducted on October 7 and 8, 1991 to determine a sampling plan. On November 4, 5, and 6, 1991, 8 backhoe trenches were examined at selected locations to determine if the filled stream course could be detected. Because the cut channel carries stream flow through most of the year and its banks are some 3 feet high above the stream level, it was assumed that some course of the stream occurred in 1754. There are also references to "natural entrenchments" noted by Washington when he originally selected the site for a defense position. (Harrington, 1957). Harrington also reports of other investigators who make reference to a meandering stream and provide a map with the stream channel identified with respect to the Fort.

Trench wall descriptions were prepared with the assistance of Mr. John Pousson, Archeologist from the DSC-Eastern Team, Applied Archeology Center. Mr. Pousson determined the locations and elevations of the trenches with a surveyor's level provided by the Fort Necessity National Park Headquarters. He also prepared a report of his findings. (attached).

RESULTS AND DISCUSSION

The trench wall descriptions are provided in figures 3 through 10. These trenches were dug perpendicular to the direction of the expected flow of the original stream. Sites were selected across low micro-relief although auger hole inspection was inconclusive as to what horizons were associated with fill. Auger holes sampled a bluish-gray very fine sand that occurred consistently at 34 to 56 inches below the surface. This layer was interpreted as a quiet water deposit that could settle out in a lake. Field inspections and descriptions of this layer by several scientists indicate that this is a bluish-gray clay. The color is really dark gray (5Y4/1) and gray (5Y5/1) in the Munsell Color Notation system. When saturated, as this material usually is, the texture seems heavy. On the laboratory bench, the material is obviously extremely well sorted very fine sands.

Trenches 1, 2, and 3 exposed the 1932 fill over a previous surface horizon. This material and contact was clearly visible in all 3 trenches. The thickness of the fill varied from none at the westerly end of Trench 3 to 2.5 feet, also in Trench 3. The usual thickness of fill on the lawn area is nearly 2 feet that includes a 3 inch thickness of organic matter enriched surface horizon. The slopes of the trench surfaces do not vary much in trenches 1, 2, and 3. There is some depression through the center of the remaining trenches; however, soil horizons are not indicative of any unusual positioning. Mr. Fousson and I did obtain elevations of each end of every trench and he has these elevations in his records.

The horizon sequences in most pits are disappointing in so far as providing clues to a former stream bed. Of most interest are trenches 1, 2 and 3 as they provide a clear look at the fill on top of a former surface. There are also obvious indications of previous excavations ie: the tile drainage lines; but, no obvious discontinuities in the overlying horizons in most instances. These observations then do not give much support to the original purpose of using soil morphology to determine disruption of naturally formed horizons. No easily detectable channel fill was identified in any of the trenches. Surface fill to raise the exposition site above flooding and rock-fragment-containing fill over the tile line in trenches 4 and 5 are both recognizable. In several trenches, the sandy loam soil matrix was loose, very friable, and slightly banded usually above the bluish gray very fine sand. This sediment is typical of stream overflow deposits. There were no time indicators of the sandy deposits except in trench 2 where the barrel staves were found below the horizon. At this location, the 1932 surface fill was 2 feet thick so that the previous surface would have been about 18 inches above the wood parts. The horizons below 4 feet appear horizontally con-

lucous, whereas horizons above are discontinuous, and varied in proportions of sand and silt. Sediments of overflowing streams tend to be sandy, non-uniform, and lack continuity. Sediments from slow flowing streams, back water, or still water (lakes and ponds) are very fine sand, extremely well sorted, and commonly form continuous blankets. The smallest particles only settle to the bottom if there is no turbulence in the water for at least several days, i.e. an ice-covered lake. Another environment for fine sand and silt sedimentation is a vegetated marsh where flow velocities are low and vegetation such as swamp grass (soft rush, *Juncus effusus* L.) further reduces velocities and causes almost still water conditions. Organic matter also accumulates in marshes often aggregating the smallest mineral particles and causing precipitation on the mineral surface under water. The previous described scenarios are often difficult to date. Carbon dating of wood pieces may assist in some investigations. Archeological evidence such as the wooden staves may help. (Please see Pousson report.) Additional trenching may uncover clues as to the 1754 stream channel.

CONCLUSIONS FROM SOIL INVESTIGATION

The exposure of soil horizons by trenching in selected transects were not conclusive in identifying a fill of any natural channel near the Fort. The fill applied in 1932 was obvious in Trenches 1, 2, and 3. The drain tiles were also obvious in several trenches. However, the discontinuity between a filled trench over the tile and the adjacent soil horizons was not always detectable. It is presumed that such a trench was dug, the clay tile positioned, and the trench refilled. Only one trench exposing the drain tile also exposed a somewhat contrasting "fill" above it. The soil horizons are convoluted and often discontinuous; therefore, are not good stratigraphic indicators.

Reconstruction of the hydrologic environment that existed in 1754 from the soil horizons that I investigated is probably better interpreted from conditions rather than the direct observations of soil horizons. That is, the 1754 and 1931 ground lines were only detectable in trench 2 adjacent to the Fort. There were few instances where fill could be differentiated from natural soil. Previous investigators also had difficulty recognizing layers that would date events. Because there was no evidence of a previous channel nor of any "fill" associated with a previous channel, perhaps there was none or at least not as perceptible as the present cut channel. The marsh had an outlet downslope of the Fort. The wet meadow had tussocks of soft rush nearly continuous across a flat, wet landscape with some alders growing in isolated areas according to Washington. The surface was organic-

enriched mud that rarely dried out even during dry seasons of the year. Because there was no channel, one was dug through the swamp to an outlet in an attempt to drain the marsh so that it could be farmed. The cut channel did not result in a "dry" field as the area was never cultivated and even after maintenance of the cut channel and the installation of many tile drainage lines the area was still managed most intensely as pasture for cows and horses. The outlet was a rock controlled grade level for the stream. The bluish gray very fine sand layer could have been the saturated surface of the marsh during pre-settlement times. During deforestation and cultivation of hillslopes adjacent to the "Meadow", erosion scoured the hillslopes and contributed sediment to the marsh from 1754 to 1932. A mixture of sands and silt moved with the muddy runoff waters from unprotected fields settled over the marsh because of the decreased water velocity and the dense vegetation. Two to three feet of sediment would not be excessive deposition when the entire watershed is considered as a source area.

The trench transects did not indicate channels. There are present depressions along linear pathways where trenches 4, 5, 6, 7, and 8 were dug. These depressions were associated with tile lines leading to the dug stream channel and the presence of an old water line. ~~that~~ the depressions, ~~then~~ represent ~~200~~ a result of human activity rather than ~~representing~~ a natural drainageway. From further observations of wetlands in the region, the stream channels are only evident at the entrance to the marshes and not near the exit. The exit forms a channel only after flow has progressed past the base level control. For the Great Meadow this point is east of the Fort near the bridge.

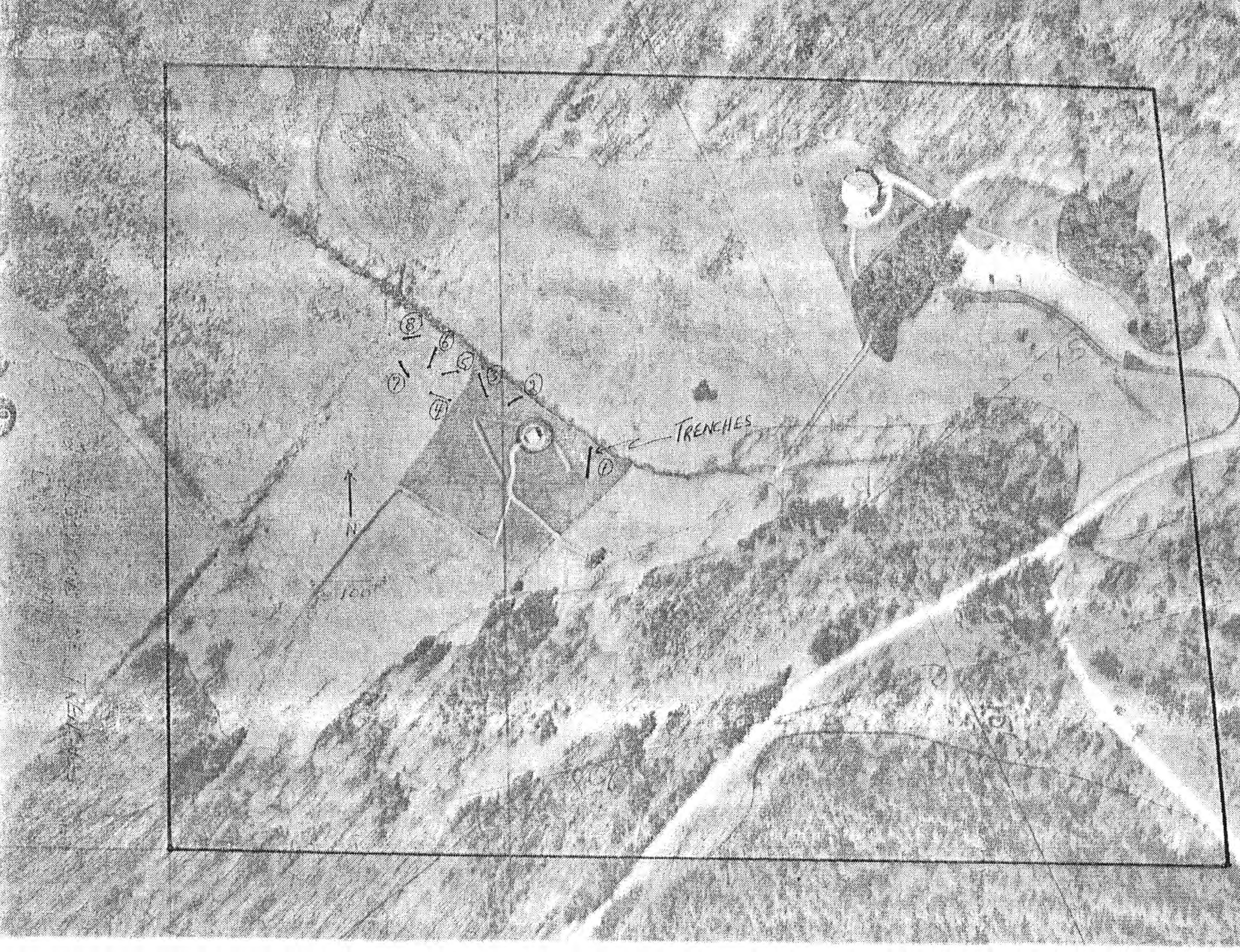
To recreate the hydrology to its 1754 state is nearly impossible because of the many changes in the landscape through the past 240 years. The original stream channel would be nearly as artificial as the dug channel. A step toward recreating the environmental conditions of 1754 would be to fill the dug channel. A wetlands would then be created with imperceptible surface flow, considerable subsurface storage of water, and a highly buffered low velocity outlet flow. Water for the Fort's use could be obtained by digging a shallow pit. The 1932 fill raised the Fort above the saturated level of the soft rush covered wetland. The 1900 cut channel maintains partial drainage of the filled valley and the direct discharge from upstream sources. The cut channel has also been stable because of revegetation of the drainage area with the conversion of the land use from cultivation to forests and to permanent cover during the mid to late 1900's.

Literature such as "The Fluvial System" by S. A. Schumm and Geological Research Papers by G. H. Dury report on detailed studies of drainage systems. A thorough review of this literature was not pertinent to this study. They do not consider the small size of the valley fill as occurs in the Great Meadow nor

the probability of dense tuff-like vegetation over the drainageway. There are indications that flow channels do exist even in peat bogs but the channels are most apparent near the inlet than near the outlet. Also their course continually change with time.

From this analysis of the soils and the site, a meaningful channel has not been located. Further, because of the drastic changes to the site during the exploitation of timber and attempts of agricultural production on the hillslopes within the drainage basin, sediment has been deposited throughout the meadow probably changing the course of any shallow, broad existing channels over time. The nearly 2 foot of 1932 fill upon which the Fort now rests also has drastically changed the site's hydrological character. The straight dug channel is probably no more artificial than is the mound upon which the Fort now sits. However, the stream is probably more evident. Should this cut channel be filled to the level of its adjacent banks, the stream would again form a broad, shallow, wetland adjacent to the Fort. There would also be considerably more water storage in the Meadow and subsurface flow through saturated sands. The wetter conditions may favor the persistence of the soft rush vegetation and other hydric plants that existed in 1754 before the drainage channel was cut. Although the trenches gave some indications of loose fine sands, considerable more study would be necessary to trace the pathways and date their existence. The gravelly lenses are indicators of channel bottoms. At 3 to 4 feet deep, they may represent a Pleistocene environment. The bluish gray very fine sand represents quiet water deposition and may also be associated with the Pleistocene era. However, it is not inconceivable that the bluish gray very fine sand was the surface on which the soft rush was growing when Washington first view the site. This layer contains the preserved wood pieces, the oxidized organic leaves and stems, and remains continuously saturated.

To improve the authenticity of the site, I recommend filling the cut channel from the bridge to the east of the Fort and as far upstream as resources and authority permit. This would return the stream to a filled valley environment were it would interact with the vegetative cover, microrelief, subsurface flow capabilities and become a "natural" water course.



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TRENCHES

N

100m

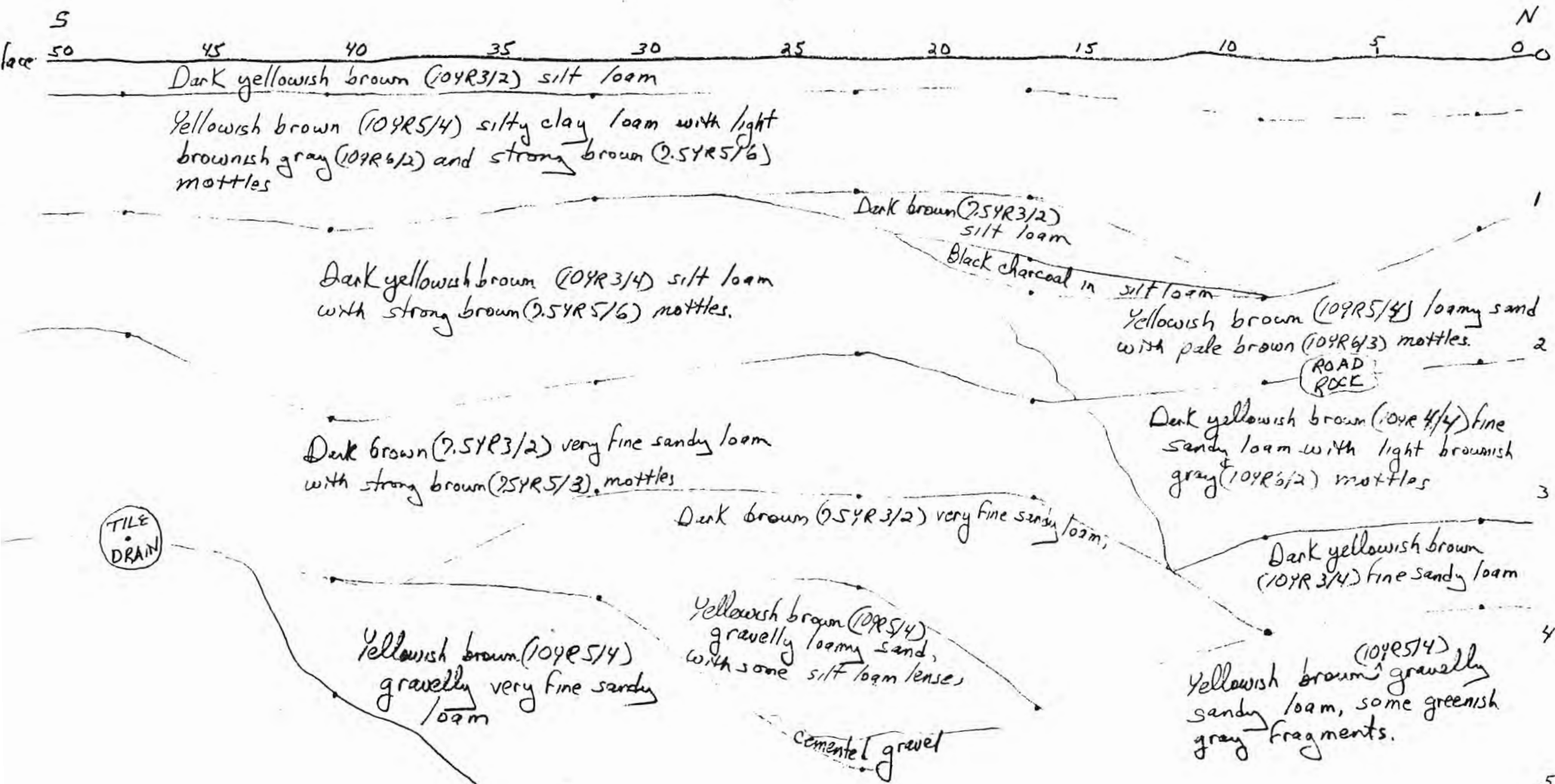
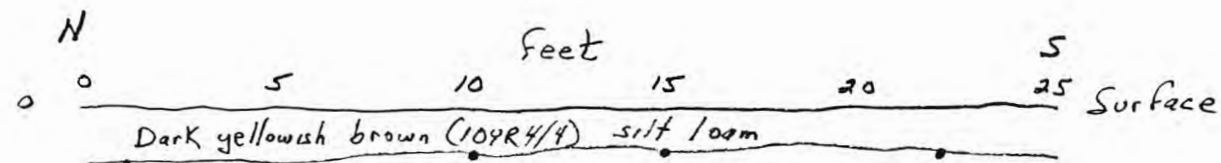


Figure 3 -- TRENCH #1
WEST WALL



1932 fill; silty clay loam
Yellowish brown 10YR 5/4 matrix
with pale brown 10YR 6/3 mottles

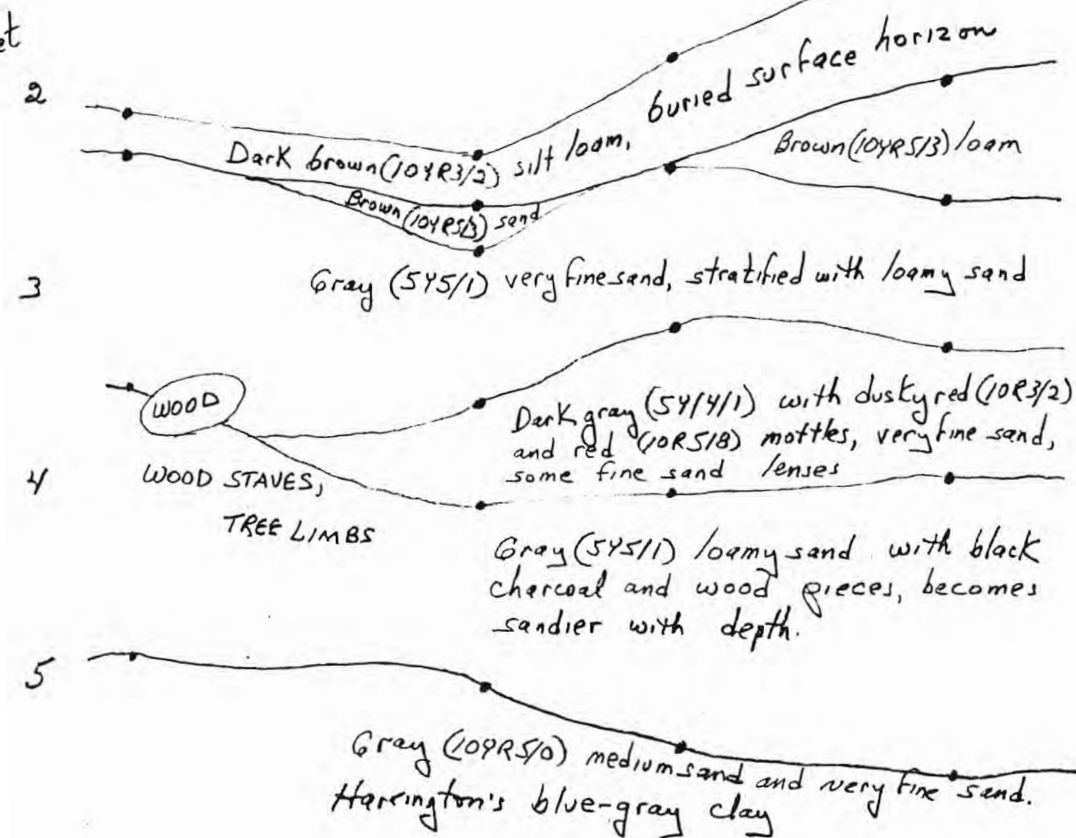
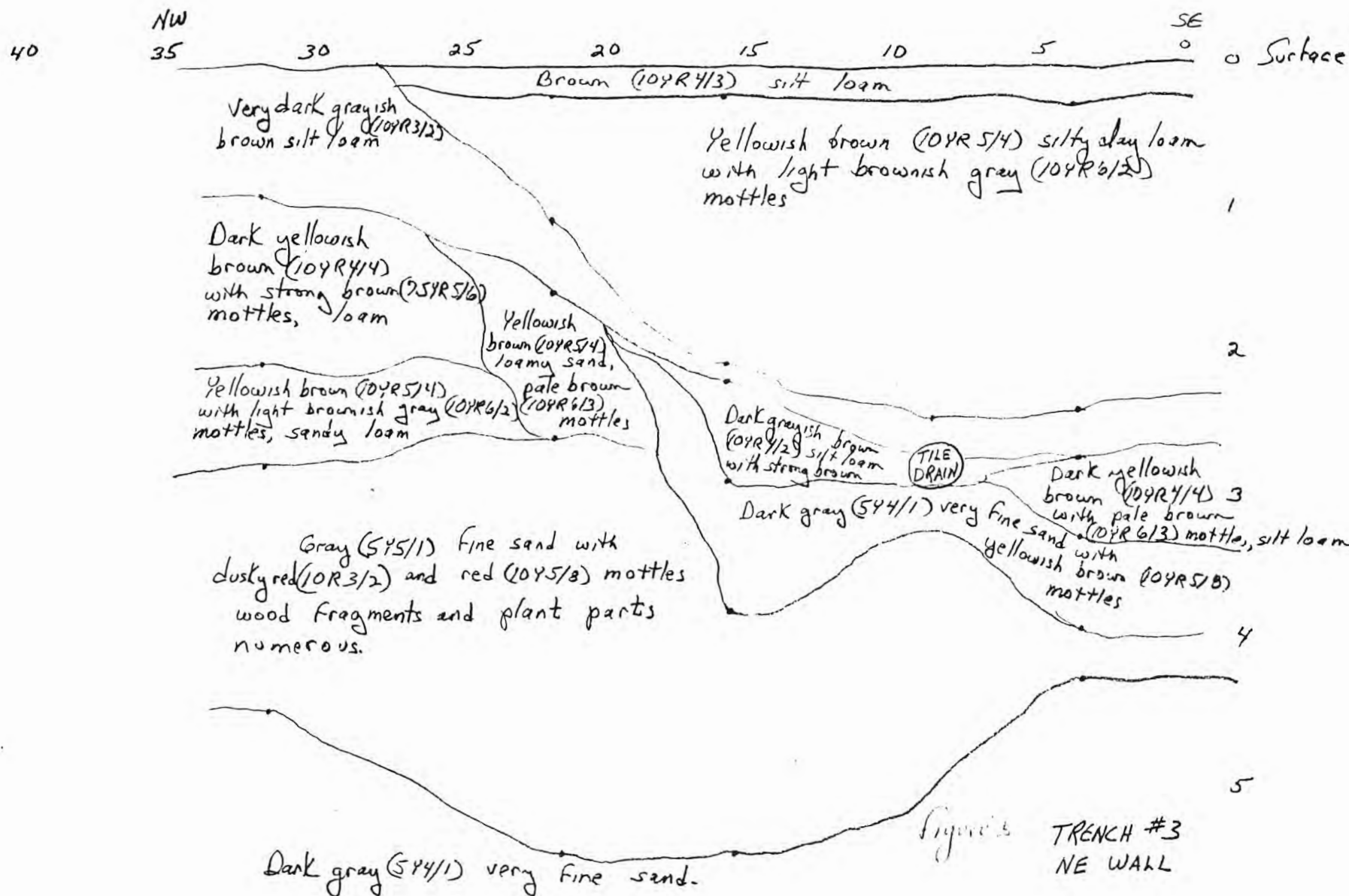


Figure 4 - TRENCH #2
EAST WALL



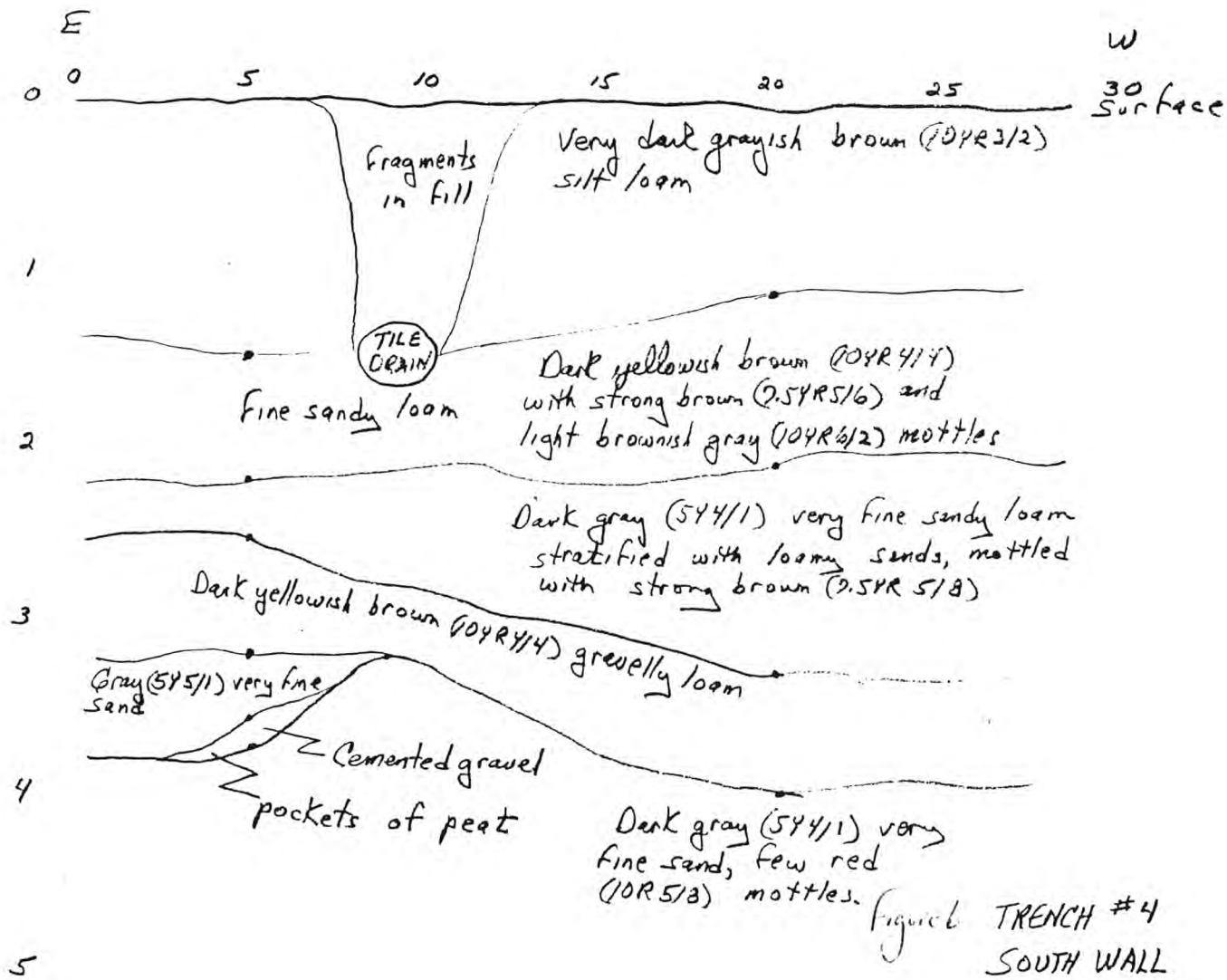
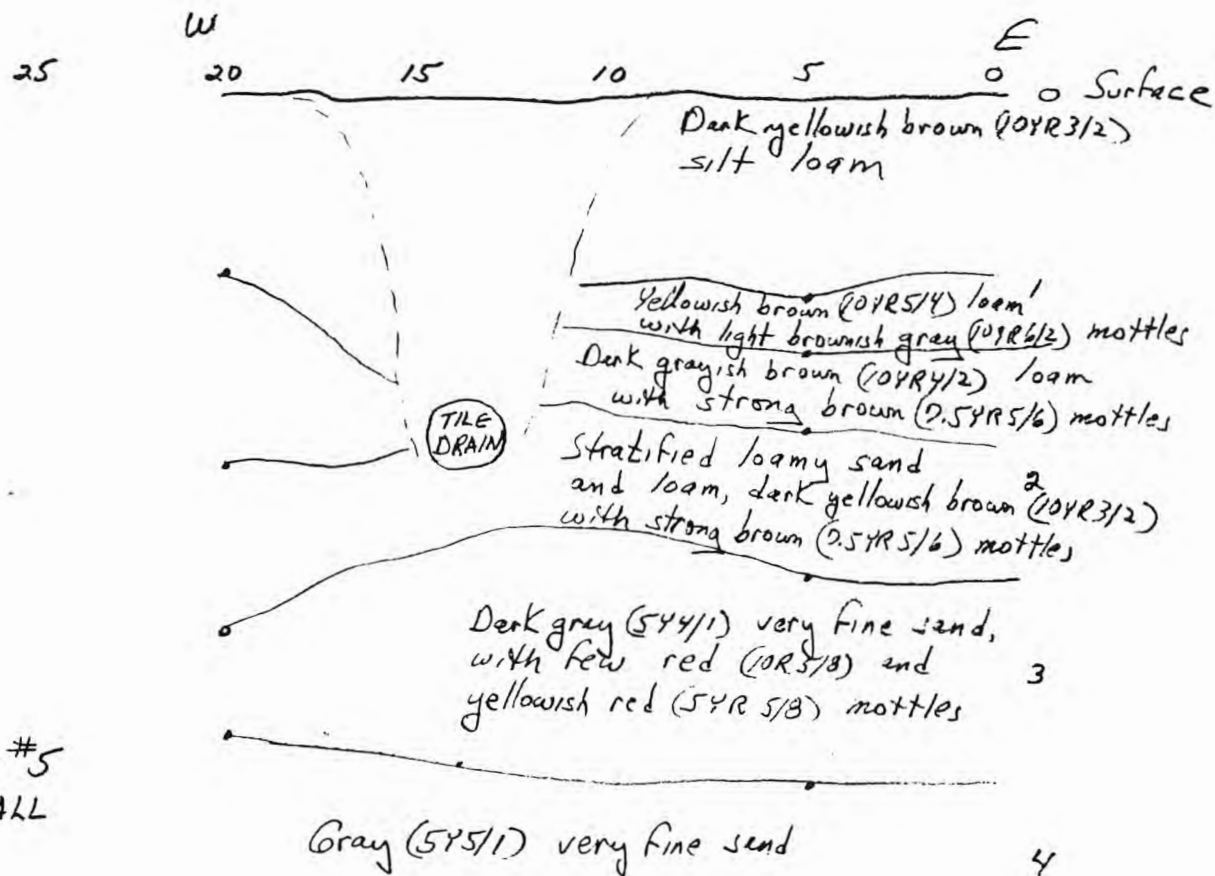
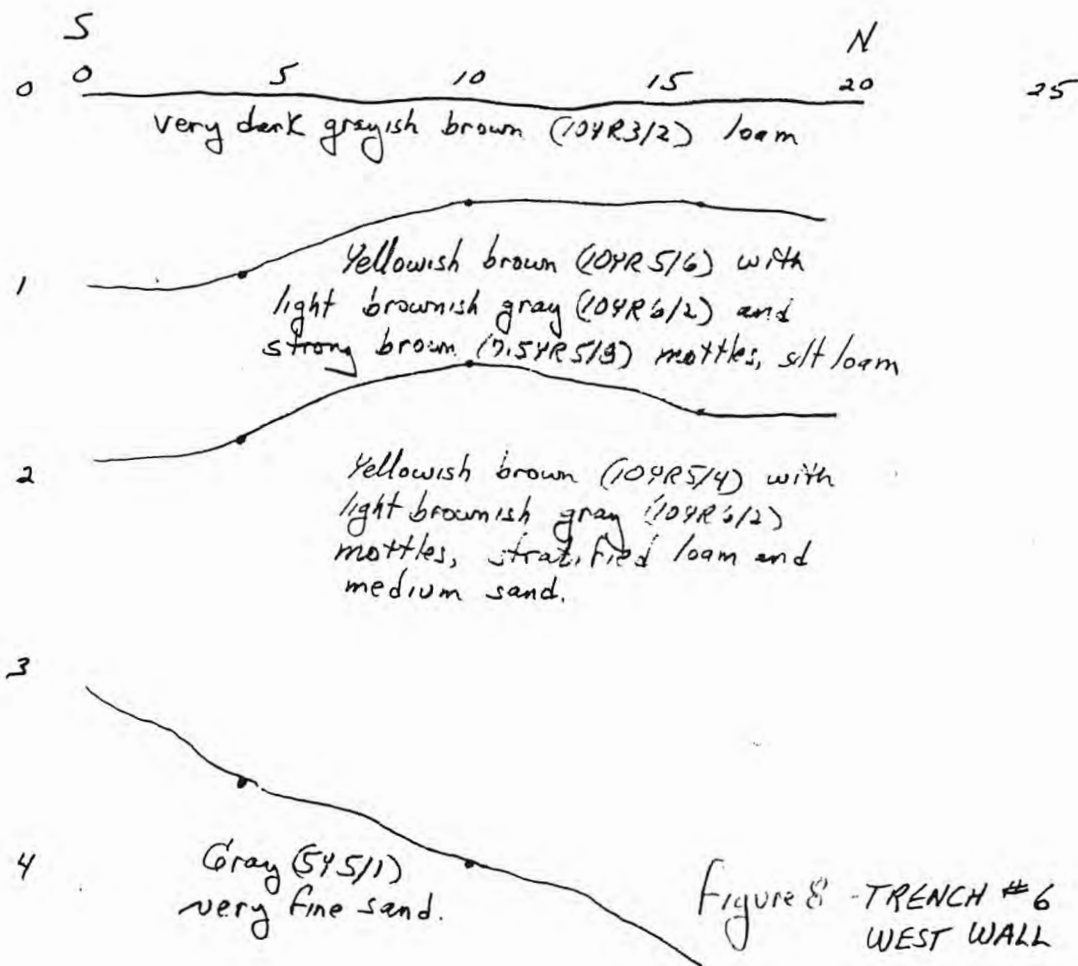


Figure 7 - TRENCH #5
NORTH WALL





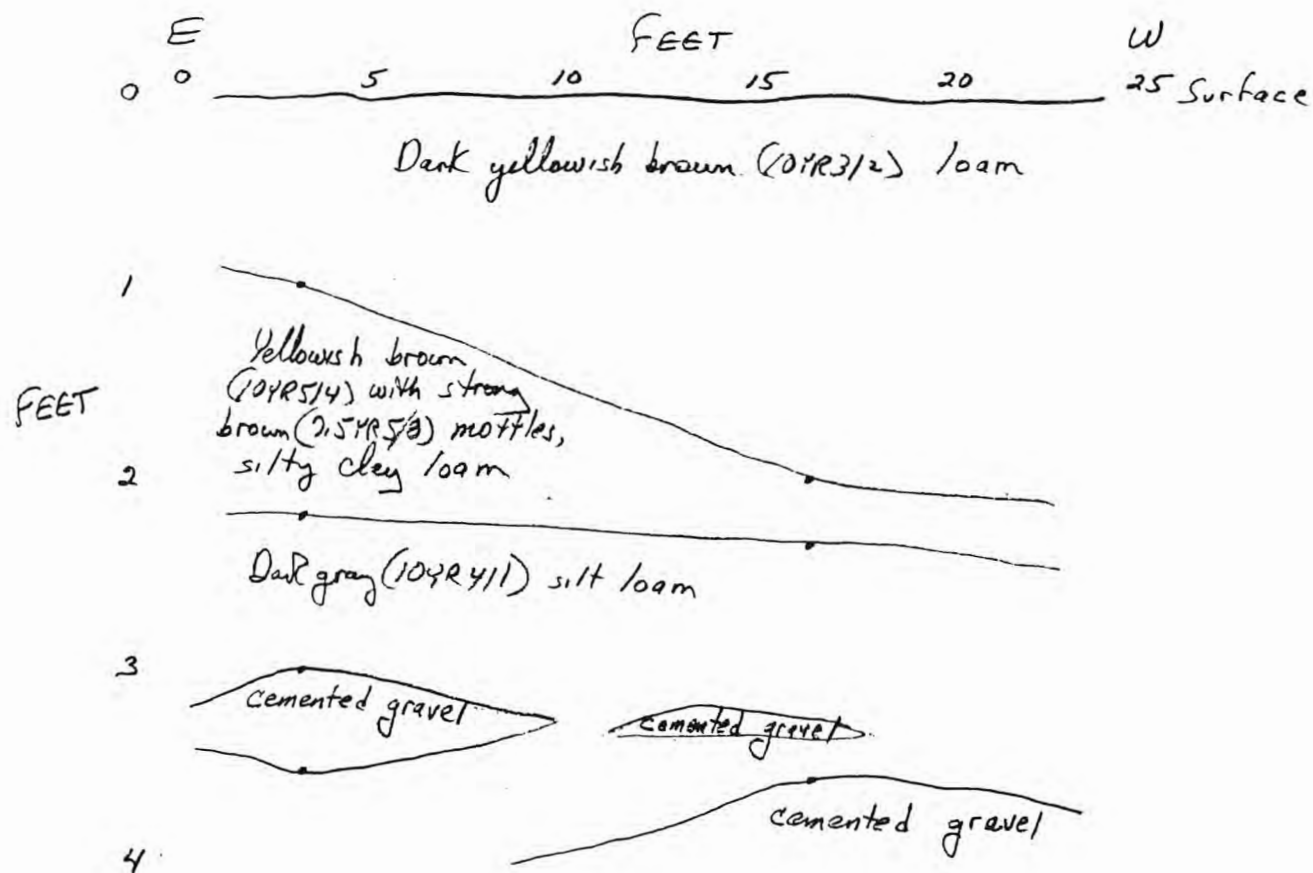


Figure 9 - TRENCH #7
SOUTH WALL

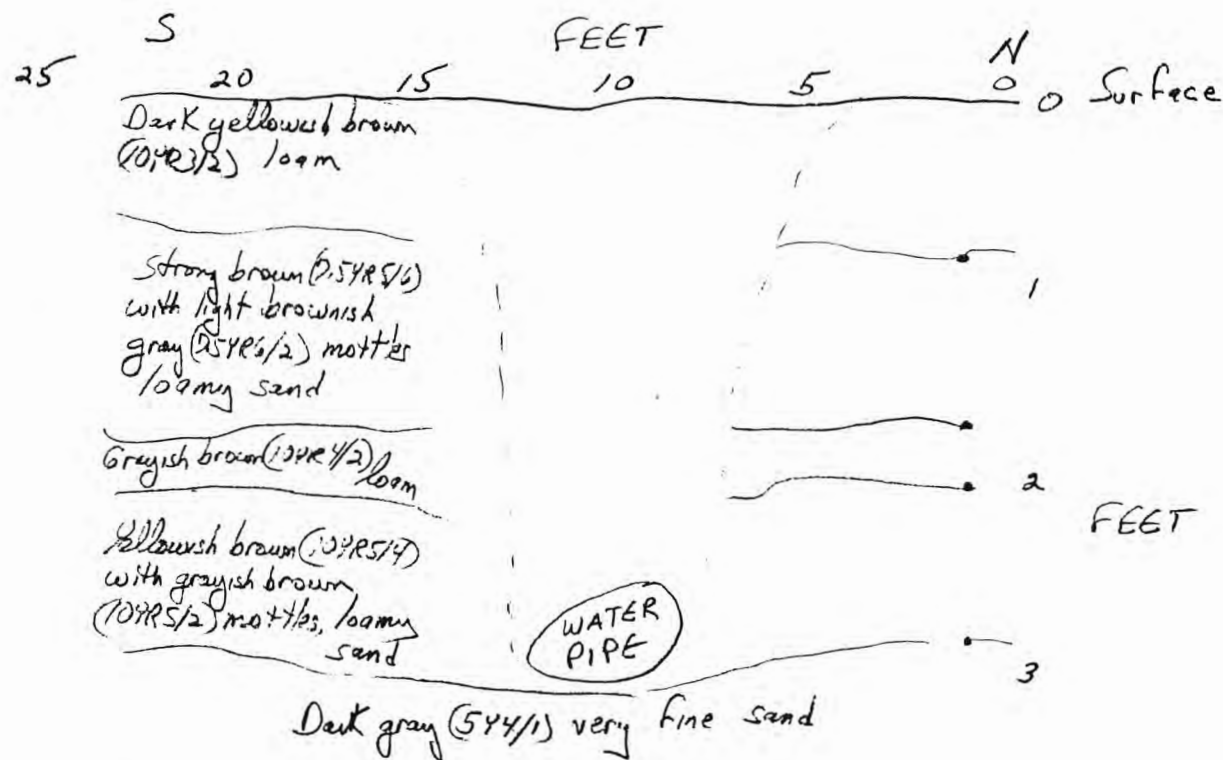


Figure 10 - TRENCH #8
WEST WALL