
**Research Report
KTC-93-30**

**VISUAL OBSERVATIONS OF PARKING AND DRIVING AREAS AND
DRAINAGE CONDITIONS ON COLVERFIELD LANE
FORT WRIGHT TRACE, FORT WRIGHT, KY.**

by

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November 1993

INTRODUCTION

~~On September 30, 1993, the Condominium Council of Co-Owners of Fort Wright Trace in Fort Wright, Kentucky requested of the Director of the Kentucky Transportation Center that a member of his staff meet with them to review and visually inspect the drainage and pavement conditions in their community. The Head of the Pavements Section met with representatives of the Council on October 13, 1993 as a part of the Transportation Center's Technology Exchange Program.~~

A visual inspection was conducted of Cloverfield Lane and its associated parking areas beginning at the intersection of Cloverfield Lane and Castle Hill Lane and continuing to the end of Cloverfield Lane.

It should be noted that all statements, conclusions, and recommendations that follow in this report are based strictly upon the visual inspection. No field measurements were made, nor were any laboratory tests conducted.

RESULTS OF VISUAL INSPECTION

Drainage Conditions

At the intersection of Cloverfield Lane, Council representatives indicated that some of the surface water traveling downgrade on Castle Hill Lane bypasses the curb inlet to the storm sewer located in the right gutter line at approximate Station 4+82 on Castle Hill Lane. This water then turns the corner and flows down Cloverfield Lane. It appears possible the steep grade of Castle Hill Lane (approximately 5%) could cause the downgrade velocity vector of surface water to become considerably greater than the cross slope velocity vector produced by the pavement crown on Castle Hill Lane. If this occurs, then it is very likely some of the surface water will bypass the above mentioned curb inlet.

Representatives of the owners' council complained that during wet weather surface drainage on Cloverfield Lane and its associated parking areas was very poor. Water ponded in several areas, and in the winter, these often froze creating a hazard. There are two double valley gutter inlets located left and right of centerline of Cloverfield Lane at Stations 5+00 and 10+83. It appears these are not collecting all of the surface water as they were intended. Both gutter inlets at Station 10+83 were designed to have the same surface elevation of approximately 824.0 feet (from Sheet 5 of development plans for Fort Wright Trace, Phase B, "Street and Storm Sewer Profiles"). It appears the surface elevation of the gutter inlet right of centerline of Cloverfield Lane is higher than the inlet left of centerline. It appeared very little water was draining into the gutter inlet right of centerline.

Sheet 6 of the above mentioned plans shows the design cross section for Cloverfield Lane and the adjacent parking areas from Station 2+15 to Station 11+85.

The visual inspection indicates that Cloverfield Lane and adjacent parking areas may not have been constructed in conformance with this cross section. The drainage problem is probably exacerbated by this possible improper cross slope (particularly from approximate Station 6+00 to Station 11+85).

Although gutter inlets were placed at the design low points of the street (Stations 5+00 and 10+83), it appears the surface water is traveling a rather long distance before encountering an inlet. Intermediate surface drains would facilitate removal of much of the surface water. These will be discussed later under recommendations.

A second major concern of the owners was the apparent subsurface drainage that was occurring throughout the parking areas. A considerable amount of subsurface water drains from the construction joint between the concrete curb and the asphalt surface. This appears to be common through the parking areas, and the owners' representatives indicated this occurs even in extended dry periods. Figures 1 through 11 show some of the typical problems associated with the subsurface drainage. Most of the parking areas are surrounded by grassy lawns with elevations that are higher than the asphalt surface. It is suspected that these areas are the source of much of the water that is seeping out at the construction joint.

Figures 12 through 16 show where water is seeping through the asphalt layers in locations that are not associated with the construction joint between the curb and the asphalt pavement. The light-colored stains associated with the seepage in Figures 12 through 14 appear to be fine-grained material flushing or pumping up through the asphalt layers from the subgrade. Figure 15 shows some darker brown staining. This may indicate that the water that is seeping through the asphalt is emulsifying (dissolving into the water) the asphalt binder or cement used in the asphalt mixture.

Figure 16 shows a patch located right of Station 2+25 on Cloverfield Lane. Water is also seeping under this patch, and the surface of the patch has sunk.

From the amount of subsurface seepage evident, it is indicated that much of the subgrade soil may be saturated or nearly saturated. It is assumed the subgrade soil is probably a fine-grained clay. Fine-grained clays usually lose much of their shear strength and/or bearing capacity when they become saturated. This will drastically reduce the service life of the pavement, probably causing premature failure of the pavement.

Additionally, if the bottom of the asphalt layers is saturated for extended periods of time (as suspected in this case) or if there are extended periods of seepage through the asphalt layers, this may dissolve or strip the asphalt cement from the aggregate, and cause rapid deterioration in the asphalt layers.

One of the owners' representatives complained that water often stood on the small flat area between Building No. 12 and the toe of the cut slope on the south side of the development. Some concern was expressed that the water may be seeping from the slope, and that the slope may be unstable. Although the slope was heavily vegetated, there did not appear to be seepage coming from the cut slope. However, it would be advisable for the slope to be monitored in the future for any signs of possible instability. It appeared likely the improper drainage in this area may have been due to improper surface grading.

Condition of the Asphalt Pavement

It is the author's understanding that first portion of Cloverfield Lane was paved from approximate Station 2+00 to approximate Station 6+50. This was done approximately two years ago. The remainder of Cloverfield Lane was paved in July of 1993 (from about Station 6+50 to Station 11+85).

Inspection of the portion of the pavement that was approximately two years old revealed depressions near the curb where vehicles had parked. These depressions were scattered throughout the parking areas, and in some cases, were rather severe. Numerous hairline cracks were present in the asphalt surface. These also were scattered throughout the parking areas, and were generally located near the curbs. Some of these cracks appeared to be associated with the depressions caused by vehicles, and would appear to be tension cracks. However, some of the cracks that were present were not associated with the depressions and may have been due to environmental distress (shrinkage cracks caused by evaporation of light-weight volatiles from the asphalt cement).

In the author's opinion, the depressions and cracking appeared to be relatively advanced for a two-year-old asphalt pavement. The depressions are probably exacerbated by the saturated or near saturated subgrade soils, as discussed earlier.

The typical pavement section for Cloverfield Lane indicated there should be a final two-inch surface course for the driving lanes and parking areas. It is presumed by the author that this implies the top two inches of asphaltic material would consist of an asphaltic mixture that would meet the gradation and asphalt cement content specifications of a typical asphaltic surface mixture (the Kentucky Department of Highways publication entitled "Standard Specifications for Road and Bridge Construction" contains a typical specification). However, the surface mixture on the portion of Cloverfield Lane and adjacent parking areas from approximate Station 6+50 to Station 11+85 appears to be a very "atypical" mixture. From the visual inspection, the author would question the possibility of this mixture being a surface mixture. The visual appearance would indicate the mixture to be somewhat open or gap-graded with the top size aggregate appearing to be somewhat larger than what might be expected of a surface mixture. Additionally, the appearance of the material

in front of the garage entrances located to the right of centerline would indicate the possibility that the material may not have been properly compacted. The owners' representatives indicated that the surface was very porous, and that water which came from the downspouts on the garages quickly disappeared into the asphalt surface. This also would indicate poor compaction. Figures 19 through 21 are typical examples of the appearance of the surface mixture.

The typical section for Cloverfield Lane indicated the concrete box curb was to be constructed on top of the final asphalt base course. The owners' representatives said the curb had been constructed on the soil. Although the author did not attempt to definitely confirm this, in one location, soil did appear to be in contact with the base of the curb. From Station 2+25 to approximate Station 5+00, joints had not been sawn into the concrete curb. The results of this failure to do so are shown in Figure 22.

RECOMMENDATIONS

Based on the previously discussed observations, the following recommendations are made:

1. The entire length of Cloverfield Lane should be surveyed to determine the conformance of the cross sections of the street and parking areas to the typical street section shown on the plans. It is recommended that cross sections be taken on 25-foot intervals.
2. Panel edge drains should be installed immediately behind the concrete curb for the entire length of Cloverfield Lane. The recommended locations are shown as solid red lines on the attached sketch. These edge drains would help eliminate the seepage of water at the joint between the curb and the pavement. I have attached an informational brochure describing panel edge drains (this is not an endorsement of a particular brand).
3. To help alleviate the surface water problems, it is recommended that three French drains be installed at the locations marked by dashed red lines on the attached sketch. The effluent from these drains should be directed as shown on the sketch.
4. All storm drain sizes should be checked to determine if proper sizes were installed.
5. Core samples should be obtained of the asphalt layers in areas of alligator cracking, in areas where there are water seeps in dry weather, and in areas where depressions the asphalt have occurred. The following items should be checked:
 - A. Thickness of the asphalt layers,
 - B. Density of the asphalt cores (this will help to determine degree of

compaction of the asphalt layers),

- C. ~~Visually check all cores for signs of asphalt stripping or emulsion due to water seepage or saturation,~~
- D. Determine grain-size distribution on at least two cores from the portion of the pavement that was paved in July 1993 and determine if the gradation meets a surface gradation as specified by the Kentucky Department of Highways or Kenton County,
- E. Repeat Item D for the portion of pavement that was paved approximately two years ago,
- F. Sample the subgrade soils at the bottom of each core hole,
- G. Determine in-situ moisture content of each soil sample and determine grain-size distribution of one or two of the soil samples, and
- H. Monitor the core holes for one to three hours after the sample was obtained to determine if the hole fills with water (this will help to determine if the water under the pavement is under a pressure head),

6. The concrete curb should be scored to control cracking.

7. The cut slope on the south side of the development should be monitored at regular intervals for any possible instability and seepage. Additionally, the rear wall of the garages should be checked periodically for plumb and cracking, which could be an indicator of any future instability of the cut slope.

8. A reputable engineering firm should be retained to perform the work recommended in this report.

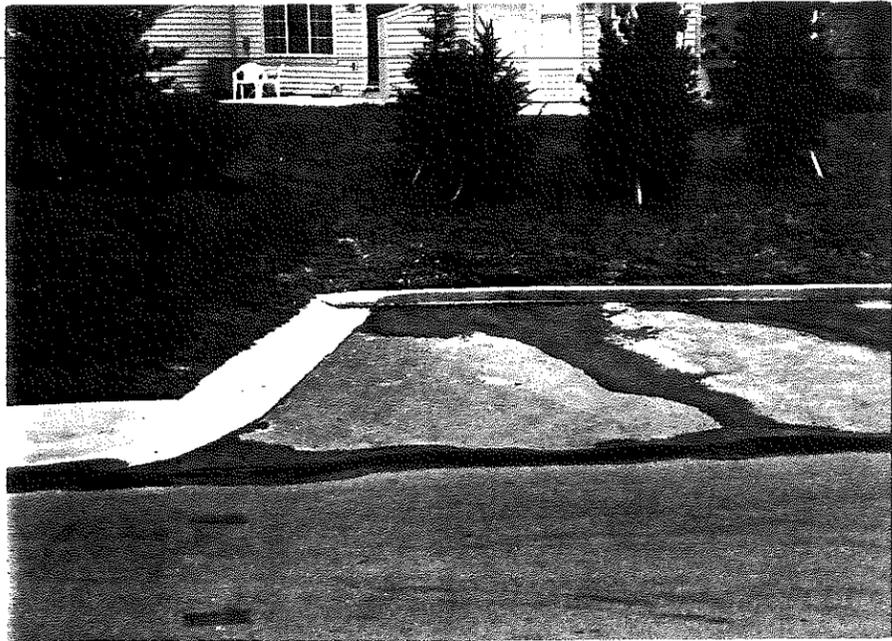


Figure 1



Figure 2



Figure 3



Figure 4



Figure 5

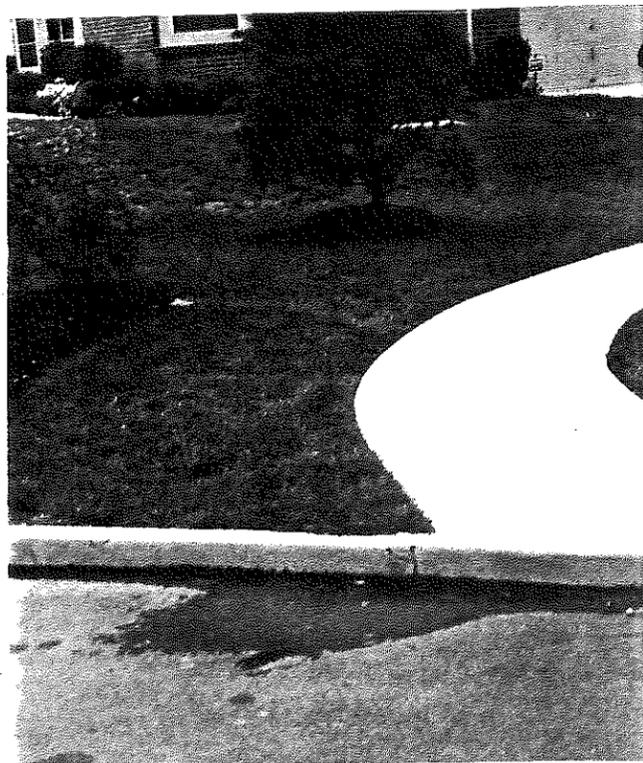


Figure 6

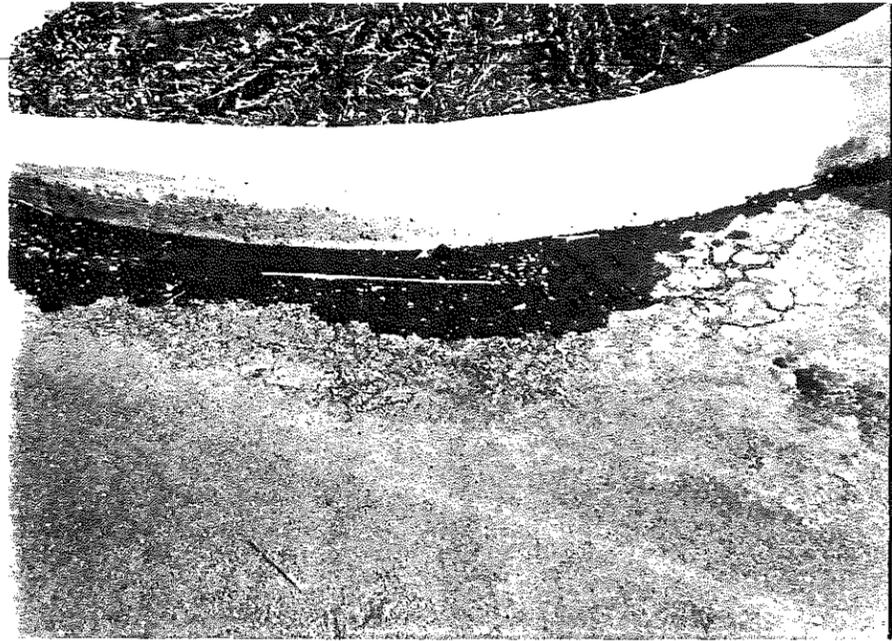


Figure 7



Figure 8

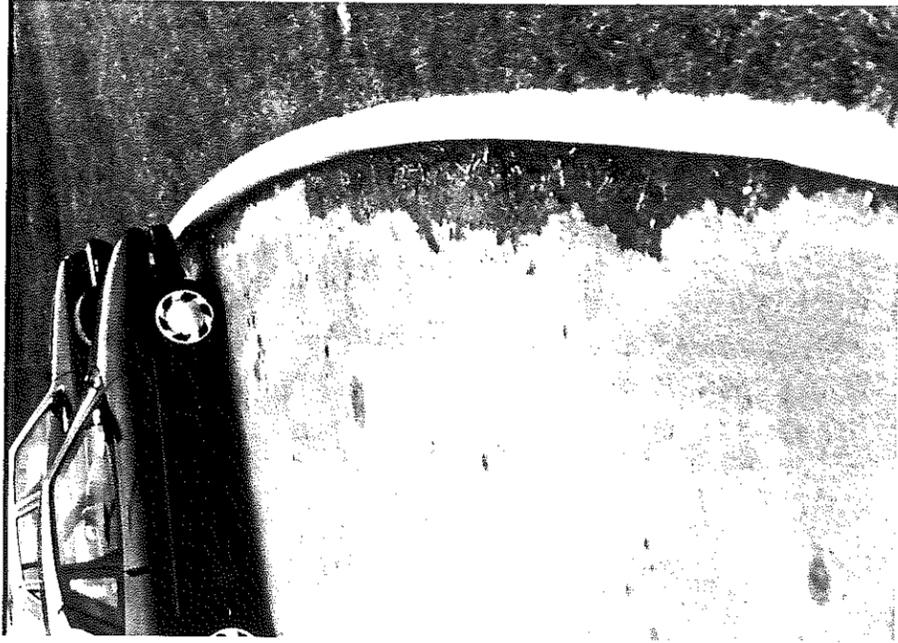


Figure 9

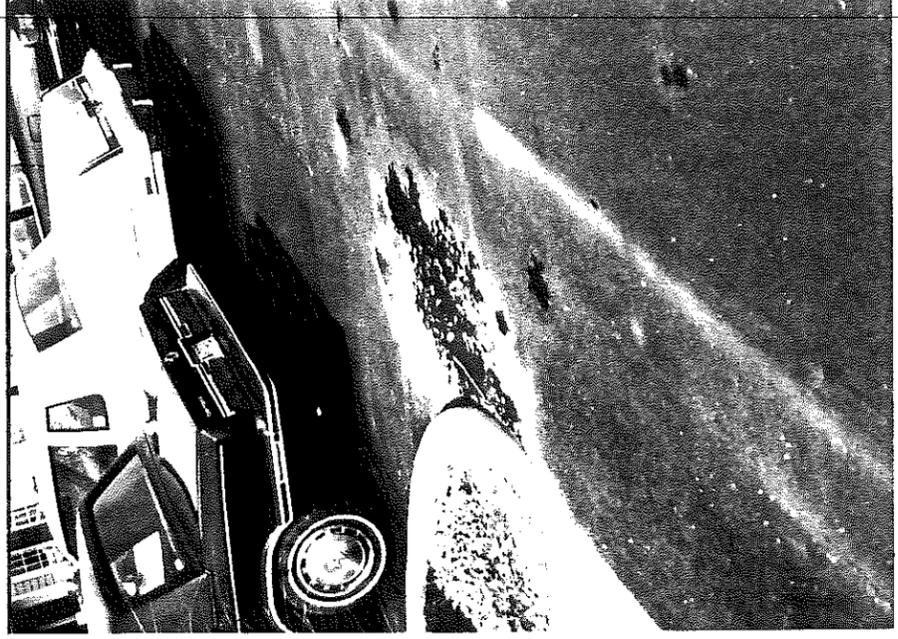


Figure 10



Figure 11

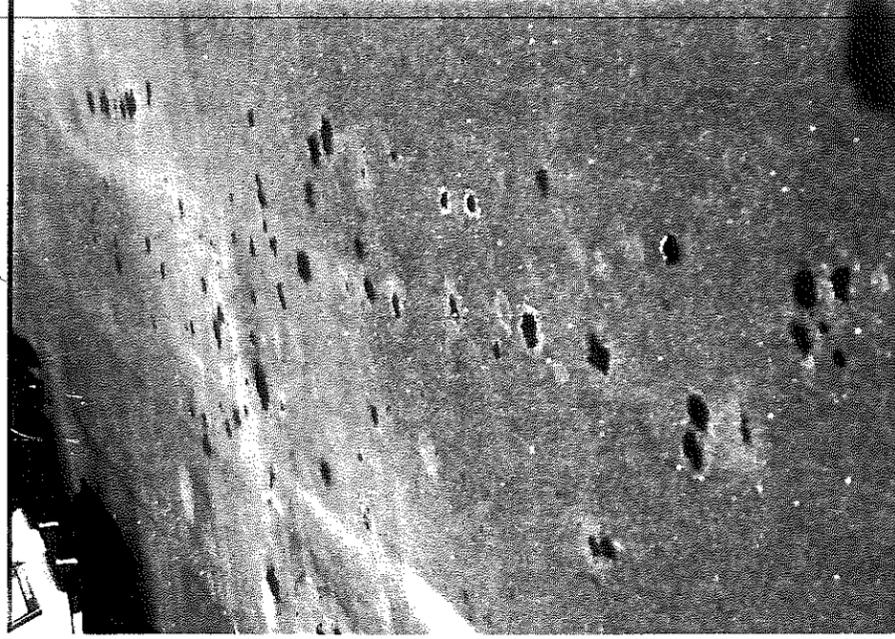


Figure 12

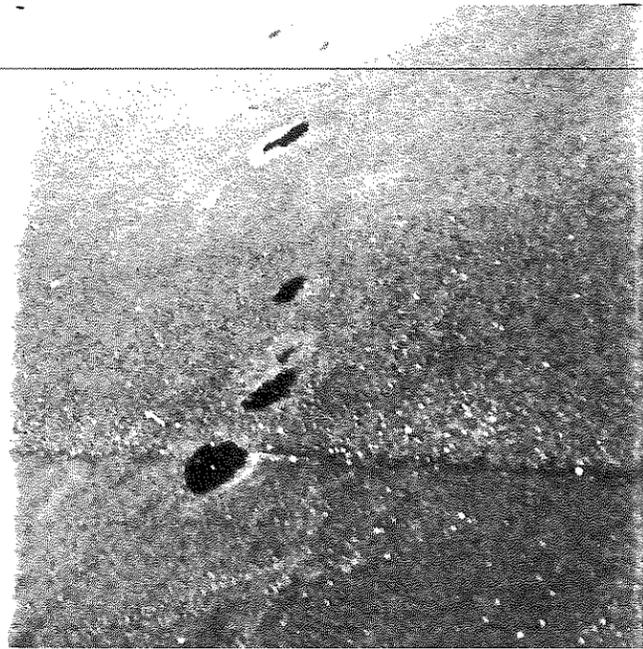


Figure 13

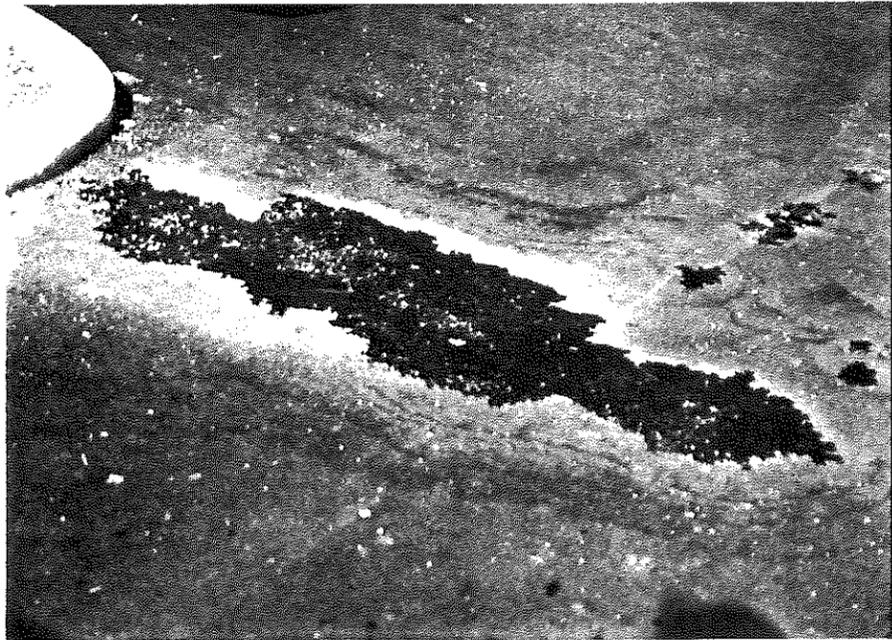


Figure 14



Figure 15

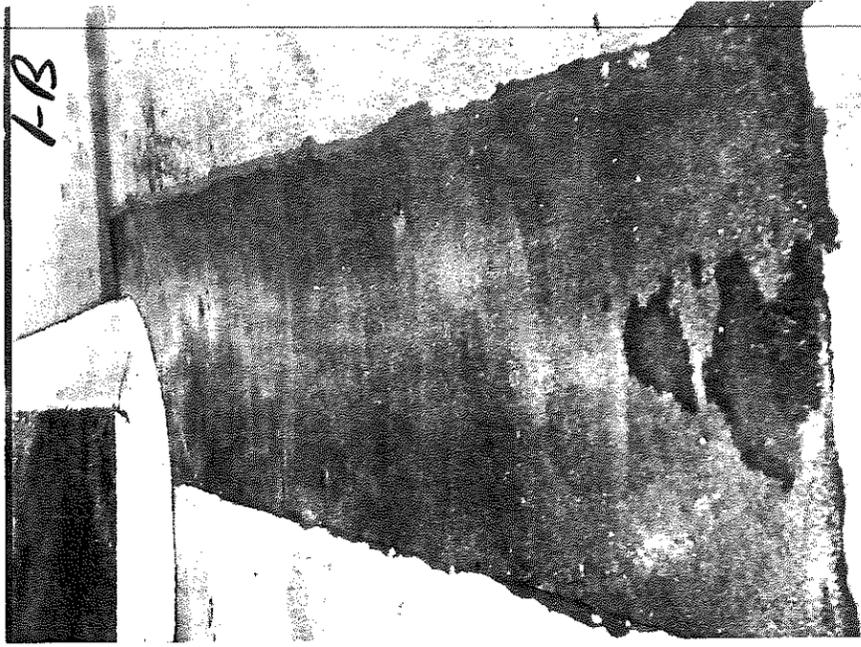


Figure 16

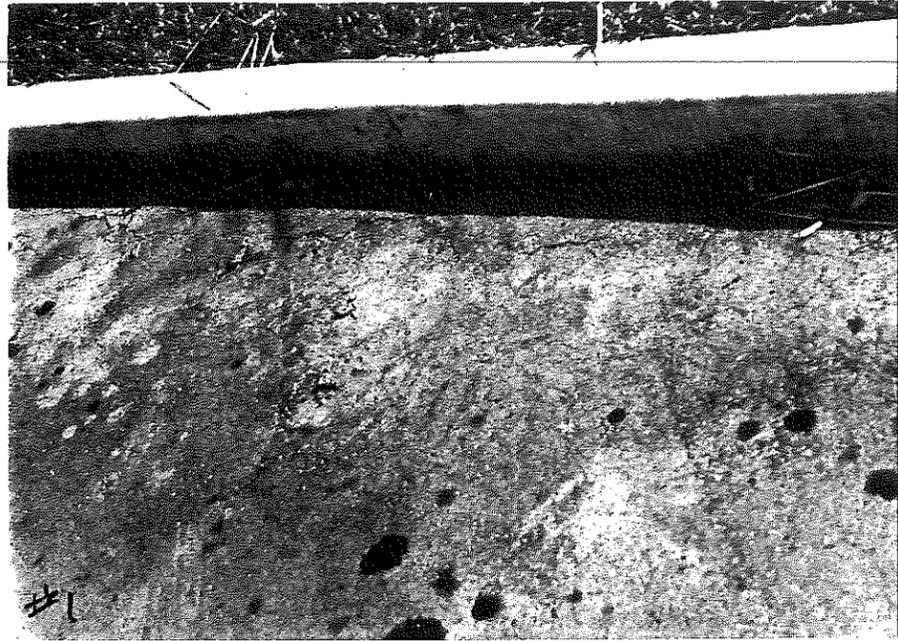


Figure 17



Figure 18

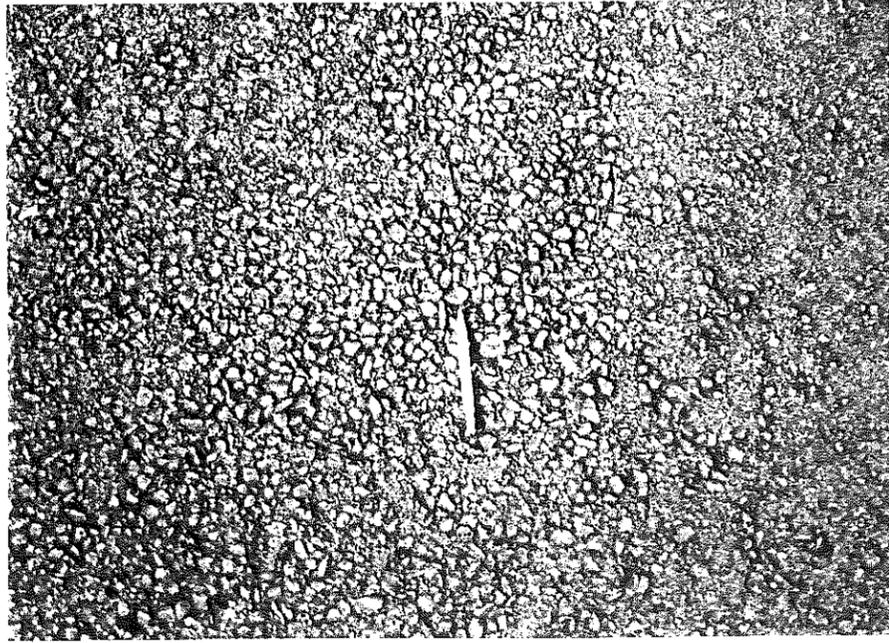


Figure 19



Figure 20



Figure 21

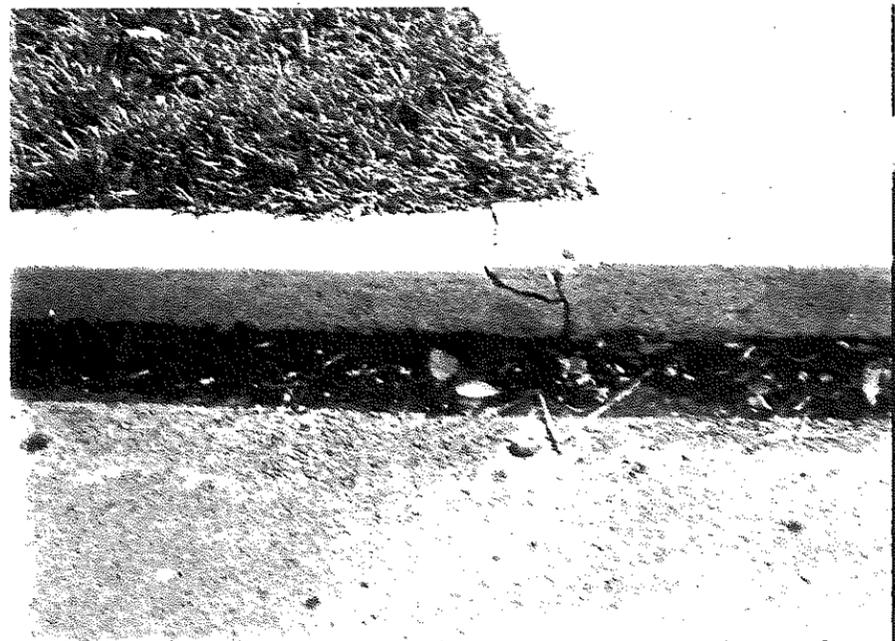
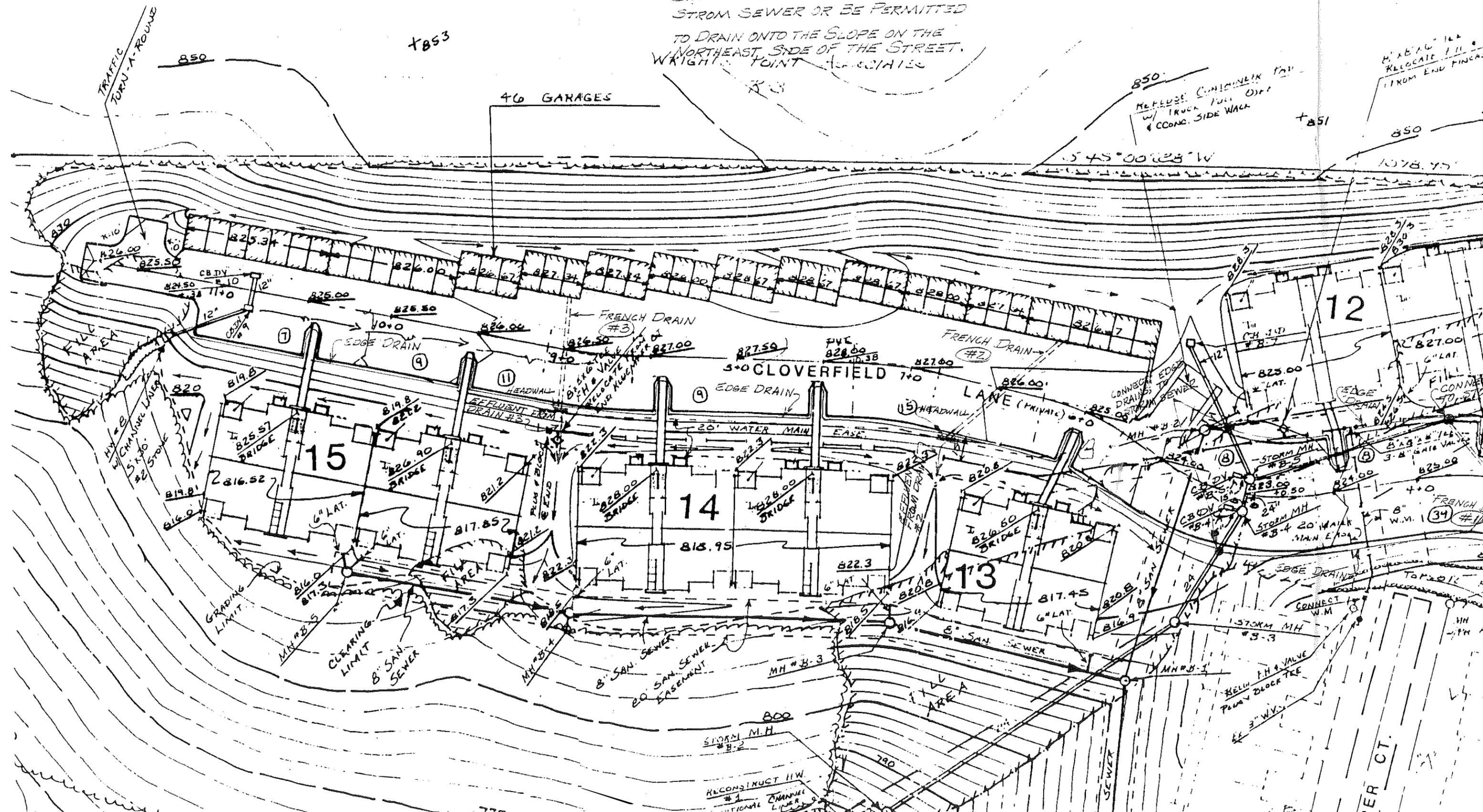


Figure 22

NOTE: ALL PROPOSED EDGE DRAINS SHOULD DRAIN TO THE NEAREST STORM SEWER OR BE PERMITTED TO DRAIN ONTO THE SLOPE ON THE NORTHEAST SIDE OF THE STREET. WRIGHT POINT ASSOCIATES



+853

46 GARAGES

REFUSE CONTAINER PAD W/ TRUCK FULL DUMP & CONC. SIDE WALL

+851

545°00'28" W

RELOCATE 11" FROM END FINISH

850

12

15

14

13

STORM M.H. # B-2

RECONSTRUCT 11" CHANNEL LINER

ER CT.