APPENDICES

INVESTIGATING PREMATURE PAVEMENT FAILURE DUE TO MOISTURE

FINAL REPORT

SPR 632

Oregon Department of Transportation

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Final Report

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A-1.0 INTRODUCTION

The principal objectives of this research effort were to identify sources of moisture and other conditions that led to rutting problems in five hot-mix asphalt (HMA) pavement sections in the state of Oregon. It also aimed to evaluate design, construction, and materials requirements that would minimize the risk of such failures for future rehabilitation projects in Oregon. To meet these objectives, several research activities were planned as part of the study. One of the research activities was the review of previous research conducted in the following areas with emphasis on "moisture damage":

- Moisture damage in HMA pavements,
- Site investigation techniques,
- Pavement structural design techniques,
- Pavement construction techniques, and
- Material selection and testing.

An in-depth review of literature was conducted through keyword searches of article databases to locate research articles, reports, and other documents relevant to this study. The Transportation Research Information System (TRIS), a comprehensive bibliographic database was the primary source of the search. Other databases and primary sources that were searched regarding the research topic included:

- American Society of Civil Engineers (ASCE) publications,
- Asphalt Paving Technology (Journal of the Association of Asphalt Paving Technologists (AAPT)) database,
- Journal of Transportation Engineering database,
- National Technical Information Service (NTIS),
- Strategic Highway Research Program (SHRP),
- National Center for Asphalt Technology (NCAT) research reports, and
- Transportation Research Board (TRB) publications index.

A-2.0 MOISTURE DAMAGE IN HMA PAVEMENTS

Environmental factors such as temperature and moisture can have a significant effect on the durability of HMA pavements. The presence of critical environmental conditions together with moisture, poor materials and traffic, can lead to premature failure in HMA pavements, as a result of "stripping". Stripping in asphalt mixtures can produce serious pavement distress, reduce pavement performance, and increase pavement maintenance costs. Moisture-induced damage of asphalt pavements is probably one of the most important concerns to all the state highway agencies in the United States. In recent years, many states have experienced an increase in severity and extent of asphalt pavement damage due to moisture sensitivity.

Numerous research efforts have been directed at this problem in the past and more are expected in the future. The purpose of this section is to summarize the literature that has been added during the past several decades by answering the following questions:

- What is moisture-induced HMA pavement damage?
- What are the various forms of HMA pavement distress induced by moisture damage?
- What are the factors affecting moisture sensitivity of HMA mixtures?
- What are the different moisture susceptibility tests?

A-2.1 DEFINITION

Moisture damage can be defined as the loss of strength and durability in asphalt mixtures due to the effects of moisture (*Little and Jones 2003*). Moisture damage in HMA pavements may be associated with three mechanisms that will degrade the integrity of a hot-mix asphalt matrix (*Terrel and Al-Swailmi 1994*):

1. *Loss of cohesion (strength) of the asphalt film*: Water can interact with the asphalt cement to cause a reduction in cohesion (cohesion failure) with an associated reduction in stiffness and strength of the HMA mixture.
2. *Failure of the adhesion (bond) between the aggregate and asphalt*: Water can enter between the asphalt film and the aggregates, break the adhesive bond between the aggregate and asphalt, and "strip" the asphalt from the aggregate.
3. *Degradation*: Fracture of individual aggregate particles occurs when they are subjected to freezing.

A-2.2 MOISTURE-INDUCED DAMAGE IN HMA MIXTURES

Moisture damage in HMA pavements can occur when water infiltrates the pavement layers. Pore water in mixtures can cause premature failure of HMA pavements due to "stripping", which is the loss of the integrity of a HMA mix through the weakening of the bond between the aggregate and asphalt cement. That is, stripping of an asphalt concrete mixture takes place when adhesion is lost between the aggregate surface and the asphalt cement. The HMA mix loses its strength gradually over a period of time before showing signs of distress on the pavement surface. Surface indicators due to stripping may include rutting, shoving, corrugations, fatigue cracking, raveling, flushing, and potholes.

Five different mechanisms of stripping have been reported in the literature: detachment, displacement, spontaneous emulsification, pore pressure, and hydraulic scour (*Taylor and Khosla 1983; Kiggundu and Roberts 1988; Terrel and Al-Swailmi 1994*). These mechanisms may act individually or together to cause adhesion failure in the mix. Kiggundu and Roberts (*1988*) reported that pH instability and the effects of the environment or climate on asphalt-aggregate material systems can also contribute to moisture damage. The five mechanisms of stripping are summarized as follows.

- *Detachment:* Detachment is the separation of an asphalt film from an aggregate surface by a thin layer of water, with no obvious break in the asphalt film (*Majidzadeh and Brovold 1968; Cheng et al. 2002*).
- *Displacement:* Displacement involves the displacement of asphalt at the aggregate surface through a break in the asphalt film (*Fromm 1974; Tarrer and Wagh 1991*). This break can be caused by incomplete coating of the aggregate surface, asphalt film rupture at sharp aggregate corners/edges under traffic load, or pinholes originating in the asphalt film.
- *Spontaneous Emulsification:* Spontaneous emulsification is an inverted emulsion of water droplets in asphalt cement (*Asphalt Institute 1987*). Fromm (*1974*) demonstrated that once the emulsion formation penetrates the substrata, the adhesive bond is broken.
- *Pore Pressure:* Development of pore pressure in water that is entrapped in the pores in the HMA mixture can lead to distress. The effect of pore pressure takes place when the air voids in the HMA pavement are compressed due to loading, which pressurizes any water in the voids. If the pore pressure increases to a high level, the asphalt film on the aggregate can rupture under the pressure and create a break in the film where water can infiltrate to the surface of aggregate (*Birgisson et al. 2005*).
- *Hydraulic Scour:* Hydraulic scour is the mechanism of stripping that is applicable only to surface courses. Here, stripping results from the action of tires on a saturated surface. Water is sucked under the tire into the pavement by the tire action. Osmosis and pullback have been suggested as possible mechanisms of scour (*Fromm 1974; Birgisson et al. 2005*). Osmosis occurs in the presence of salts or salt solutions in aggregate pores and creates an osmotic pressure gradient that actually sucks water through the asphalt film.

A-2.3 CAUSES OF MOISTURE DAMAGE IN HMA

Extensive research has been performed in the past in order to identify the causes of moisture damage in HMA pavements. In order to understand the causes of moisture damage, it is necessary to identify the different sources of moisture in the pavement system and the types of failure. Water can enter the pavement system in three ways: (1) capillary action from the water table; (2) infiltration from the road surface; and (3) seepage from surrounding areas. Once the moisture enters the system it can cause damage to the pavement structure if it remains in the structure with improper drainage.

Moisture damage generally starts at the bottom of an asphalt base layer or at the interface of two asphalt layers (*Khosla et al. 1999*). Eventually, potholes are formed or the pavement ravels or ruts. With hardened binders, fatigue cracking (alligator cracking) may occur. Surface raveling or a loss of surface aggregate can also occur, especially with chip seals. Occasionally, binder from within the pavement will migrate to the pavement surface creating spots of bleeding asphalt (*Stuart 1990*). Previous studies have indicated several factors that are responsible for stripping of HMA mix. An extensive literature review has been carried out to identify the main factors leading to moisture-induced damage. Based on the literature (*Stuart 1990; Hicks 1991*), the various factors that affect the moisture susceptibility in HMA are summarized in Table A-2.1. An understanding of these factors is important to investigate and solve the problem of moisture-induced damage in HMA pavements. Detailed descriptions of some of the important factors are presented in the following sections.

A-2.3.1 Aggregate Properties

Aggregates can greatly influence whether or not a mixture will be moisture sensitive. The physio-chemical properties of the aggregate are important to the overall water susceptibility of an asphalt pavement. Chemical and electrochemical properties of the aggregate surface in the presence of water have a significant effect on stripping (*Khosla et al. 1999).* Aggregates that impart a low pH value (i.e., acidic) to water are more susceptible to stripping. These aggregates are classified as hydrophilic, or water loving. On the other hand, hydrophobic aggregates typically have lower silica contents and generally result in basic solutions (high pH) in the presence of water. Hydrophobic aggregates such as limestone provide better resistance to stripping (*Khosla et al. 1999*).

Table A-2.1: Factors Influencing Moisture Damage (*Stuart 1990, Hicks 1991*)

Major Factors	Description
Aggregate Properties	▪ Composition (degree of acidity or pH, surface chemistry, type of minerals, source of aggregate) ▪ Physical characteristics (angularity, surface roughness, surface area, gradation, porosity, and permeability) ▪ Dust and clay coatings ▪ Moisture content ▪ Resistance to degradation
Asphalt Binder Properties	▪ Grade or stiffness ▪ Chemical composition ▪ Crude source and refining process
HMA Mixture Characteristics	▪ Air void level and compaction ▪ Type of HMA (dense-graded, gap-graded, open-graded)
Environmental Factors	▪ Temperature ▪ Freeze-thaw cycles ▪ Moisture vapor ▪ Dampness ▪ Pavement age ▪ Micro organisms ▪ Presence of ions in the water
Traffic	▪ Percent of trucks ▪ Gross vehicle weight of trucks ▪ Truck tire pressure
Construction of HMA Pavements	▪ Compaction ▪ Drainage ▪ Weather ▪ Segregation ▪ Contractor experience
Design of HMA Pavements	▪ Air void content ▪ Subsurface drainage ▪ HMA mix selection ▪ Designer experience ▪ Designer site visit

Interlocking properties of the aggregate particles, which include individual crystal faces, porosity, angularity, absorption, and surface coating, are also believed to improve the bond strength in an asphalt mixture. Kiggundu and Roberts (*1988*) postulated that the absence of a sound interlocking network of these properties might induce stripping (*Birgisson et al. 2005*).

It is often observed that siliceous aggregates have slick, smooth areas, which may lead to stripping, while roughness may help to promote bonding. Besides, some limestone and lime-treated aggregates tend to form stronger, more robust, and durable bonds with asphalt. This is believed to be caused by the insensitivity of these bonds to the action of water (*Birgisson et al. 2005*).

Excessive dust coating on the aggregate can prevent thorough coating of asphalt cement on the aggregate. Fine clays may also emulsify the asphalt in the presence of water. Both conditions increase the probability of an asphalt mix to strip prematurely (*Stuart 1990; Khosla et al. 1999*).

High moisture contents in the mineral aggregates before mixing with the asphalt cement can also increase the potential for stripping. It is noted that asphalt cement will adhere better to a dry aggregate surface than to a moist or wet aggregate surface. One means of controlling the moisture content of the aggregates in HMA mixtures during the mixing process is to specify a maximum moisture content at the time of discharge from the mixing plant. For example, the Oregon DOT specifies a maximum moisture content of 0.80% for dense-graded mixtures at the time of discharge from the mixing plant. In addition, the Oregon DOT specifies a maximum mixing temperature (based on the job-mix formula) that can be increased (with approval from the Engineer) if the mixture moisture content (among other factors) requirement is not met (*Oregon Department of Transportation Standard Specifications, 2008*).

Degradation of aggregate in HMA mixes also contributes to stripping. Use of weak and friable aggregates in an HMA mix can cause degradation under heavy traffic. Broken aggregates from compacting, traffic loading, and cold milling expose new surfaces. These uncoated surfaces can absorb water and initiate premature stripping (*Stuart 1990; Kandhal 1994; Khosla et al. 1999*).

A-2.3.2 Asphalt Binder Properties

Asphalt characteristics have been related to the moisture susceptibility of asphalt concrete mixtures (*Terrel and Shute 1994*). The most important characteristic of asphalt that relates to stripping resistance is the viscosity of asphalt binder in service. Several studies have documented that high viscosity asphalt cement resists displacement by water better than asphalt cements that have low viscosity (*Hicks 1991*). However, a low viscosity is advantageous during mixing because of the increased coatability, providing a more uniform film of asphalt over the aggregate particles (*Hicks 199; Khosla et al. 1999*).

Observations made by Schmidt and Graf (*1972*) indicated that most of the asphalt binders appear to behave similarly with respect to moisture; provided they are of the same viscosity (i.e., the effect of asphalt composition is negligible). In contrast, Fromm (*1974*) observed that the rate of emulsion formation in asphalt submerged in water depends on the nature of the asphalt rather than its viscosity. Logically, emulsified asphalt may be prone to stripping by spontaneous emulsification if some concentration of emulsifier remains in the binder after mixing. The presence of paraffin in asphalt is believed to be detrimental to stripping resistance *(Khosla et al. 1999*). Other factors such as surface changes, chemical bonding, polarity, role of additives, source of asphalt crude, and others can contribute to the moisture damage and need assessment (*Terrel and Shute 1994*).

A-2.3.3 HMA Properties

The type of HMA placed on site also plays a major role on its susceptibility to water. The majority of pavement failures caused by stripping occur in open-graded mixes, base courses, and surface treatments, all of which are relatively permeable to water when compared with dense-graded mixes (*Hicks 1991; Kandhal 1994; Khosla et al. 1999; Birgisson et al. 2005*). Good resistance to stripping in open-graded cold-mix paving mixtures was observed in the state of Oregon (*Takallou et al. 1985*). This resistance may, however, be due to the anti-stripping agents that were contained in the emulsions used for these mixtures or to thicker asphalt coatings of aggregates.

Surface treatments have been noted to be particularly vulnerable to stripping. Stripping in dense-graded, hot mix paving mixtures is generally not considered a large problem unless the mixtures have excessive air voids, insufficient bitumen, inadequate compaction, or aggregate with adsorbed coatings (*Brown et al. 1959; Hicks 1991*).

A-2.3.4 Climate and Environmental Factors

The literature suggests that environment and climate have a strong influence on the occurrence of moisture damage (*Hicks 1991*). There are several environmental factors which can affect the degree of moisture damage besides the amount of rainfall and water in the pavement. Below are some of the climatic and environmental factors that affect water damage of HMA pavements.

- High rainfall affects the amount of water in the pavement (*Stuart 1990*).
- Heat after a rainstorm can create blisters on aggregates at the surface of the pavement, which may leave a pit, if broken (*Stuart 1990*).
- Pressure and water movements due to freezing and thawing can rupture asphalt films and promote stripping (*Stuart 1990*).
- Cracks caused by low temperatures or fatigue stresses may promote stripping because they allow the entrance of water (*Stuart 1990).*
- Temperature can also have an effect on moisture damage. Field experience has indicated that cool rainfalls and rapid drops in temperature while a pavement mixture is being placed or cured can have harmful effects on adhesion. Also, pavements placed in cool seasons may be more difficult to compact, and thus have higher air void levels and higher permeability than pavements placed in warmer weather. This may increase the susceptibility of moisture damage (*Stuart 1990; Hicks 1991; Terrel and Al-Swailmi 1994*).
- Aging increases the stiffness of asphalt and thus may decrease the susceptibility to moisture damage (*Terrel and Al-Swailmi 1994*).
- Research identifies that water with low pH (i.e., acidic) helps the retention of acidic asphalts on acidic aggregates, while a high pH (i.e., basic) helps the retention of acidic asphalts on basic aggregates (*Stuart 1990*).

- High water table often permits migration of moisture/moisture vapor into pavement which accelerates moisture damage (*Hicks 1991; Terrel and Al-Swailmi 1994*).
- The presence of microorganisms in the binder as well as in the surrounding soil may also contribute to stripping (*Ramamurti and Jayaprakash 1987and 1992; Brown and Pabst 1988*). These asphalt-loving bacteria feed on the asphaltic hydrocarbons, thus creating microscopic tunnels through the binder, which allow water access to the binder-aggregate interface. Water access, coupled with the pumping action of repeated wheel loads, can initiate stripping failures.

A-2.3.5 Traffic

Traffic, which applies stresses to the pavement while it is in a weakened condition from moisture, has been shown in several studies to determine whether or not moisture damage and stripping will occur by comparing cores from the wheelpath to those from outside the wheelpath (*Hicks 1991*). This showed that moisture related problems do not occur without the presence of traffic.

A-2.3.6 Construction Practices

A number of construction issues can affect the moisture sensitivity of the mix. The following provides a summary of the important issues:

Compaction: The amount of compaction achieved (relative density) has a major effect on the air void content, the permeability of the finished pavement, and the sensitivity of the mix to moisture damage. A high air void content in asphalt layers allows the movement of water through available pore spaces. Studies have shown that at less than about 4% to 5% air void content, the voids are generally not interconnected and therefore impervious to water (*Kandhal 1994*). While most asphalt mixes are designed to have 3% to 5% air voids, under the assumption that this level of air voids will be realized following the expected traffic loads for the performance life of the pavement, many agencies specify an air void content of 8% during construction assuming that the remaining decrease in air voids will occur following the expected (design) traffic loads. However, if the mixture is not compacted sufficiently during construction, the design air voids content (i.e., 3 to 5%) may never be reached. If the pavement remains pervious (i.e., at a relatively high air void content) for an extended period, stripping is likely to occur due to ingress of water and hydraulic pore pressures induced by traffic (*Kandhal 1994*).

Segregation: Segregation is one of the problems that occur during paving operations. There are two types of segregation witnessed during charging a paver: 1) physical and 2) thermal (*St. Martin et al. 2003*). Physical segregation results in some aggregates not being properly coated with asphalt binder. The segregated areas are more prone to moisture damage as a result of displacement, detachment, or hydraulic scour because this type of segregation leads to thinner asphalt binder films (*St. Martin et al. 2003*). Thermal segregation occurs during the transportation of mix to a project site. During transportation, the mix cools unevenly in the back of trucks, particularly when tarps are not used, leaving a crust of cooler mix on top. This crust travels through the paver and leads to cool spots interspersed within warmer spots. The cooler spots of mix are more difficult to compact under the roller and in some cases will cause the roller to bridge over the warmer mix (*St. Martin et al. 2003*). This situation leads to locations with lower density and, thus, greater permeability in the mix. A possible solution to this thermal segregation problem is to use a material transfer vehicle, or other suitable device, that remixes the HMA before going into the hopper of the paver. Another option would be to use insulated trucks that help prevent temperature loss (*St. Martin et al. 2003*). Thermal segregation can also be caused by:

- Long delays between supply loads whereby the last part of the load in the paver hopper cools substantially before the next load is placed in the hopper; and
- Allowing the mixture to cool in the wings of the hopper, and then folding the wings of the hopper to dump the cooled mixture on the conveyor system prior to the next load being placed in the hopper.

Improper Drainage: According to Birgisson et al. (*2005*), the most common water movement under pavement layers is through upward capillary action. Above the capillary fringe, water moves as a vapor. Many subbases or subgrades in the existing highway system lack the desired permeability; therefore, are saturated with the capillary moisture (*Birgisson et al. 2005*). Water infiltration into the base and subgrade is attributed to cracks, unsealed joints, or both in the pavement. This is considered a secondary problem next to subsurface seepage and infiltration along the edge of the pavement. The construction of multilane highways (or widening) to greater widths, gentler slope and milder curves in all kinds of terrain has compounded the subsurface drainage problem. Quite often, a four-lane highway is rehabilitated by paving the median and shoulders with HMA resulting in a fully paved width of 72-78 feet, which is equivalent to a six lane highway without any increase in the subsurface drainage capability (*Birgisson et al. 2005*). Stripping occurs when the pavement layers are in contact with water for a long period of time due to improper drainage conditions.

Paving and Mixing Temperature: With regard to paving conditions, factors such as ambient and base temperature should be monitored. If either is too low, obtaining the proper density may be difficult (*Hicks 1991)*. Higher mixture temperatures should generally result in lower voids that may decrease moisture damage (*Hicks 1991*).

Stable Base: Pavements should always be constructed on stable bases. A stable platform is needed so that the compaction energy provided by rollers is provided to the HMA layer being compacted (*St. Martin et al. 2003*). Pavements should maintain a sufficient cross slope to ensure that water does not pond on the surface. If water does not flow off the pavement, there is a greater potential for the water to infiltrate the pavement, increasing the potential for moisture damage (*St. Martin et al. 2003*).

Quality Control/Quality Assurance (QC/QA): Implementation of a quality control/quality assurance plan can assist in ensuring that the HMA mixture is produced and placed in accordance with specifications, which typically stipulate mixture characteristics (e.g., mixing temperature range, minimum compaction temperature, minimum density, no segregation, etc.) intended to prevent or minimize moisture damage and other distresses. Section A-2.5, below, provides a more detailed discussion of QC/QA practices.

A-2.3.7 Pavement Design Considerations

The most important pavement design variable that affects the moisture damage potential of an asphalt mixture is pavement drainage. Poor subsurface drainage results in the presence of water in HMA pavements. If available in excessive quantities, water can lead to the premature stripping of HMA. Kandhal et al. (*1989*) have reported case histories where stripping was not a general phenomenon on the entire project, but rather a localized phenomenon in areas that were over-saturated with water and/or water vapor due to inadequate subsurface drainage conditions. The inability to drain a permeable layer leads to increased fatigue cracking and rutting; increased stripping may also result from poor drainage (*NCHRP Digest 268, 2002*).

Current design practices usually place the air void content at 3 to 5 percent in mixes. Most agencies require 92% of the theoretical maximum specific gravity, or 8% air voids, at the time of construction (*Khosla et al. 1999*). Strategic Highway Research Program (SHRP) researchers presented a relationship between air voids and relative strength of HMA mixes after water conditioning. Mixtures with low (<4%) air voids were found to be nearly impermeable, whereas open-graded mixtures (>13% air voids) were found to be free draining. Both mixes minimize the water susceptibility of the resulting pavement. However, the midrange or "pessimum" voids region was shown to induce premature stripping. Terrel and Al-Swailmi (*1994*) described the concept of pessimum air voids, which is the range of air void contents within which most asphalt mixtures are typically compacted (between about 8% and 10%). With proper mix design and compaction control the "pessimum" region can be avoided (*Terrel and Al-Swailmi 1994; Khosla et al. 1999*).

Shatnawi and Van Krik (*1993*) reported that stripping was severe in pavements that have chip seals and pavement reinforcing fabrics. The use of chip seals and pavement reinforcing fabrics as interlayer can increase moisture damage because they trap water in the pavement.

Designers should be careful in selecting the appropriate HMA mixture type for the surface course and its underlying layer. The open-graded friction course (OGFC) is the most common open-graded mixture type used in the United States for surface courses (*NAPA 2001).* OGFC should be selected in conjunction with the underlying mixture types. The asphalt-treated permeable base (ATPB) is an open-graded mixture that can be used as a base course to assist with drainage of water from below the pavement surface. The OGFC is a permeable layer that allows water to quickly pass through the pavement surface for drainage. The ATPB also allows water to be quickly drained from the pavement structure. It may be advantageous to use an ATPB in base layers that allows water to escape from the pavement structure more quickly than does a conventional unbound dense aggregate base (*D'Angelo and Anderson 2003*).

Pavements may have fundamental design flaws that trap water or moisture within the structural layers. There must be good drainage design, both for the surface and subsurface layers, since water causes moisture-related distress. The application of surface seals to a moisture-sensitive mix can also be a factor in accelerating moisture damage as reported by Shatnawi and Van Krik (*1993*).

One design-related problem is that the site inspection or investigation needs to be done prior to design, and this does not always occur (*Victorine 1997*). Additionally, the designer needs sufficient information on existing conditions. There is often a lack of sufficient knowledge about what the existing pavement structure is and what condition it is in. This is especially true when overlays have to be designed (*Victorine 1997*).

A-2.4 MOISTURE SENSITIVITY TESTS

The performance of HMA in the presence of water is a complex issue and has been the subject of numerous research studies during the past six decades. Several test methods have been proposed and used in the past to predict the moisture susceptibility of HMA mixes. Some of the most common tests used by US state highway agencies are:

1. Boiling Water Test,
2. Static-Immersion Test (*AASHTO T-182*),
3. Lottman Test (*Lottman 1982*),
4. Tunnicliff and Root Conditioning Test (*Tunnicliff and Root 1984*),
5. Modified Lottman Test (*AASHTO T-283*),
6. Immersion-Compression Tests (*ASTM D1075; 37*),
7. Freeze-Thaw Pedestal Test, and
8. Marshall Stability with Conditioning.

The tests for identifying the moisture damage potential of an asphalt–aggregate mixture can be classified into two major categories: 1) tests on loose mixtures, and 2) tests on compacted mixtures.

- Tests conducted on coated aggregate whereby the loose, uncompacted mixture is immersed in water which is either held at room temperature or brought to a boil. Assessment of the separation of the bitumen from the aggregate is then made by visual inspection (*Scholz 1995*).
- Tests conducted on compacted mixtures which can be laboratory-prepared specimens or cores taken from existing pavements. Assessment of moisture damage is generally made by a ratio to unconditioned strength or stiffness (e.g., indirect tensile strength or indirect tensile stiffness), where "unconditioned" refers to the as-cored or as-manufactured properties of the compacted mixture and "conditioned" refers to the properties after the compacted mixture has been subjected to some sort of treatment intended to simulate in-service conditions of the pavement (*Scholz 1995*).

Although the tests listed above are being used by various state agencies, Birgisson et al. (*2005*) noted that no test proved to be superior and can correctly identify a moisture-susceptible mix in all cases. This means that many HMA mixes, which might otherwise perform satisfactorily in the field, are likely to be rendered unacceptable if these tests and criteria are used and vice versa. Some of concerns that are to be addressed in relation to test methods as reported by Birgisson et al. (*2005*) are:

1. Proliferation of test procedures and criteria.
2. Reproducibility of most test methods is not satisfactory.
3. Need to consider minimum wet strength (if desired value can be established) of the conditioned specimens rather than relying solely on the Tensile Strength Ratio (TSR) value.
4. Lack of satisfactory correlation between laboratory and field performance.

The literature notes that the modified Lottman test (AASHTO T-283) is the most commonly used test among the state highway agencies (*Aschenbrener 2002*). It is a combination of the Lottman Test (*Lottman 1982*) and the Tunnicliff and Root Test (*Tunnicliff and Root 1984*). Six specimens are produced with air voids between six percent and eight percent. The higher percentage of air voids helps to accelerate moisture damage on the cores. Two groups of three specimens are utilized. The first group is the control group. The second group is saturated to between 55 and 80 percent with water and is placed in the freezer (0°F or –18°C) for 16 hours to 18 hours. The frozen specimens are then moved to a water bath at 140°F (60°C) for 24 hours. After conditioning, the Resilient Modulus Test and/or Indirect Tensile Strength (ITS) test are performed. The ITS test is performed at 77°F and a minimum tensile strength ratio (i.e., conditioned ITS to unconditioned ITS) of 0.7 is usually specified to distinguish between moisture sensitive and moisture insensitive mixtures (*Roberts et al. 1996*). In spite of its wide usage there have been questions on the accuracy of this test.

A-2.5 SUMMARY

Moisture damage of HMA pavements has been one of the major concerns for the US state highway agencies. There have been several studies conducted on this problem in the past several decades. This section reported the findings of the literature review on the causes of moisture damage of HMA pavements. It was found that moisture can degrade the integrity of an HMA mix through two mechanisms: loss of cohesion and failure of adhesion bond between the asphalt binder and aggregates. One of the major forms of moisture damage in pavements was found to be stripping. There are different mechanisms of stripping such as detachment, displacement, spontaneous emulsification, pore pressure, and hydraulic scour. One of the major findings of this section was the various factors that lead to moisture damage in HMA pavements. Based on the detailed literature review, the main factors are: aggregate properties, asphalt binder properties, HMA mixture characteristics, environmental factors, traffic, and design and construction of HMA pavements. A detailed description of each of these factors was presented in this section.

A-3.0 FORENSIC INVESTIGATION OF PREMATURE PAVEMENT FAILURES

Forensic investigation of pavements can help pavement engineers to determine the cause of premature failures of pavements and to develop the rehabilitation strategies and improve the future design and construction (*Victorine 1997*). The present study involves the investigation of premature pavement failures in five locations in the state of Oregon. A comprehensive literature review was conducted to gather information on the current state of forensic investigation of pavement failures. The primary focus of this effort was placed on the variety of site investigation techniques that have been reported in the literature to identify pavement distress. This section presents an overview of these current forensic investigation practices by answering the following questions:

- What is forensic engineering/investigation and premature pavement failure?
- What is the importance of forensic investigation of pavement failure?
- What is the most efficient methodology to conduct forensic investigation of pavement failure?

A-3.1 DEFINITIONS

Several definitions for forensic engineering were found in the literature. Some of the definitions are presented here:

- "The application of the engineering sciences to the investigation of failures or other performance problems" (*ASCE 1986)*.
- "Forensic engineering involves investigation of failures, which are defined as instances when a structure does not conform to design expectations" (*Feld 1997*).
- A forensic investigation is the process by which the forensic engineering team gathers the necessary information to form the probable cause of the failure that has occurred (*Victorine 1997*).

The terms 'premature' and 'failure' have been explained by Victorine (*1997*). The word 'premature' implies that the actual number of years or traffic repetitions has fallen short of the anticipated design expectations. The term 'failure' may imply more than just not satisfying the criteria under which the pavement was designed. Failure suggests that some event has occurred that affects the ability to the pavement to perform its intended function of providing structural support for roadway traffic. Thus, pavement failure usually requires immediate remedial action.

A-3.2 IMPORTANCE OF FORENSIC INVESTIGATION

Rehabilitation of existing pavements is often preferred over replacement – a preference based on the high costs of new construction (*O' Kon 1992*). Most of the time, routine maintenance is performed on pavement sections without prior forensic investigation. The maintenance may consist of a chip seal, crack or joint sealing, asphalt overlays, or patching. If the distress is not propagating at a high rate, then a forensic investigation does not have to precede routine maintenance (*Crampton 2001*). However, if the pavement is deteriorating more rapidly than normal, if the distress has occurred shortly after construction, if the distress mechanism is unknown, or if there is disagreement about the distress mechanism, then engineers should perform the forensic investigation before rehabilitation or maintenance takes place to ensure that the cause of the distress is counteracted by the rehabilitation strategy (*Crampton 2001*).

One of the major incentives to conduct a forensic investigation before rehabilitation efforts is the vast cost benefit associated with it. Some of the advantages of conducting pavement forensic investigation as reported in the literature (*Crampton 2001; NHI and FHWA 2002; Caltrans 2003*) include:

- Identification of the cause of the distress,
- Development and selection of best rehabilitation alternatives,
- To determine the speed with which the distress is propagating,
- Prioritization of projects for rehabilitation action,
- Development of performance prediction models and curves,
- Improved design practices,
- Improved material selection and testing, and
- Improved future construction techniques for future pavements.

A-3.3 FORENSIC INVESTIGATION METHODOLOGY

The major goal of a forensic investigation is to determine the mechanism related to an observed pavement distress as well as the events that may have led to structural failure. Most of the times, the pavement distress mechanisms will be unknown or the distress may be due to combinations of mechanisms. A forensic investigation should find which mechanisms caused the distress and rule out any unrelated mechanisms (*Crampton 2001*). A forensic investigation is most beneficial when it is properly planned and conducted in an efficient manner. Based on available literatures, the important tasks involved in a forensic investigation are:

1. Records review,
2. Site observation and conditions survey,
3. Field testing of pavement sections,
4. Laboratory testing of field samples,
5. Data analysis, and

6. Report findings.

A-3.3.1 Records Review

Records review refers to the data that can be collected from office files and historical records that can be an invaluable aid in the investigation process. These previous data are important because the failure of a pavement is generally caused by: 1) faulty design, 2) improper construction, 3) inappropriate material selection, and 4) environment. Based on the literatures (*ASCE 1986; Victorine 1997; Scullion 2001; Crampton 2001; Kandhal 2001; Zhang 2002; and Caltrans 2003*), data that were considered essential for identification of probable failure of pavements due to moisture damage (stripping) are presented in Table A-3.1.

Table A-3.1: Essential Data Required for Pavement Failure Investigation

Roadway Element (s)	Data Required
Pavement History	▪ Date of construction of pavement overlays, repairs, and maintenance information ▪ Past distress data ▪ Non-destructive test results
Pavement Structure	▪ Layer thickness and material properties
Pavement Material Information	▪ HMA mix design ▪ Aggregates ▪ Asphalt binder ▪ Base layer material information
Traffic Information	▪ Average Daily Traffic (ADT) ▪ Equivalent Single Axle Loads (ESALs)
Description of Distress	▪ Type ▪ Severity ▪ Extent
Relevant Construction Records	▪ Drawings ▪ Specifications ▪ Schedule ▪ As-built drawings ▪ QC/QA records ▪ Lab material test results ▪ Drainage
Weather Records	▪ Rainfall data ▪ Weather during construction ▪ Temperature data
Soil and geologic information	▪ Classification ▪ Geologic origin ▪ Terrain

A-3.3.2 Initial Site Observation/Condition Survey

The second step in the investigation process is to interpret the visual pavement distress data. The goals of the initial site visit observation and condition surveys are to conduct a visual examination of the distresses on the pavement section. This will help the investigators/researchers to identify the distress types in the pavement section. Several reports and manuals provide valuable information on the identification of pavement distress (*LTPP 2003; Victorine 1997; Scullion 2001; Caltrans 2003*). Once the distress has been identified, the potential methods for field and lab investigation can be developed. Figure 2.1 presents a picture of the three stages of stripping which can be identified during a visual survey. The onsite investigation also gives the investigative team additional support in developing alternate rehabilitation strategies by considering the existing local conditions and restrictions that will influence the final decision (*Victorine 1997*).

Some of the important activities at this stage of the investigation are:

- *Preliminary meeting*: An initial meeting is usually arranged between the coordinator of the project and the investigation team. The purpose of the preliminary meeting is to review the facts of the case and become familiar with specifics of the local area and project location (*Victorine 1997*).
- *Interviews*: Interviews with people familiar with the project under investigation usually can provide valuable information, such as their own professional opinion or facts that might not have been significant enough to report. Interviews generally have been arranged with the district construction engineer, the project engineer, the laboratory supervisor, and the project inspector (*Victorine 1997*).
- *Documentation*: The development of graphic and narrative records of the investigation should be implemented in order to provide a complete survey of the condition of the pavement. Field data can be collected in the form of measured drawings, sketches, verbal description, video recordings, and photographs (*ASCE 1986*).
- *Failure hypothesis*: One of the major purposes of the initial site visit is to come up with the distress mechanism hypothesis based on the visual examination of the failed pavement section.

Figure A-3.1: Three Stages of Stripping: White Stains, Flushing, and Pothole (After *Kandhal 2001*)

A-3.3.3. Field Testing

The next major step in the pavement failure investigation is the field data acquisition. Field data are acquired by performing field investigation. Various testing methods that are going to be used in the field investigation are decided after the initial site visit and distress documentation. Some of the field evaluation methods that were suggested to investigate distress as a result of water damage (stripping) are summarized in Table A-3.2 (*Scullion 2001*).

The major objective of field testing is to determine the in-situ properties of pavement layers. The in situ properties may differ from the properties that were designed, in which case the field tests may find deficiencies that resulted in pavement distress. There are two types of testing: 1) non-destructive and 2) destructive testing. Some of the testing methods that relate to water damage are (*Scullion 2001*):

Table A-3.2: Field Investigation Methods to Evaluate Water Damage

Pavement Distress	Evaluation Method
Rutting (probable outcome of stripping)	▪ Condition survey, extent, and severity of problem ▪ Drainage ▪ Ground Penetrating Radar (GPR) survey (moisture in base, stripping in HMA, layer thickness) ▪ Falling Weight Deflectometer (FWD) survey (layer moduli) ▪ Dynamic Cone Penetration (DCP) survey (strength profile in base and subgrade) ▪ Samples (from rutted and non-rutted areas, cores and/or bag samples) ▪ Trenching (trench to identify problem layer)
Alligator cracking (probable outcome of stripping)	▪ Condition survey, extent and severity of problem ▪ Drainage ▪ GPR survey (moisture in base, stripping in HMA, layer thickness, layer bonding) ▪ FWD survey (layer moduli) ▪ DCP survey (strength profile in base and subgrade) ▪ Samples (from areas with and without cracking, cores and/or bag samples) ▪ Bonding between layers (observation from coring, slab removal, Seismic Pavement Analyzer Test (SPA) test)
Longitudinal cracking (probable outcome of stripping)	▪ Condition survey, extent and severity of problem ▪ Drainage ▪ Undisturbed samples of fill and subgrade foundation soils ▪ Geometric factors: lane, paved or unpaved shoulder, side slopes ▪ Other: presence of trees close to pavement edge
Raveling (probable outcome of stripping)	▪ Condition survey, extent and severity of problem ▪ HMA cores for laboratory evaluation

A-3.3.3.1 Non-Destructive Testing (NDT) Techniques

Nondestructive testing is defined as test methods that are used to examine an object, material or system without impairing its future usefulness (*ASNT 2006*). Non-destructive testing of pavement structures has gained increasing popularity among many state highway agencies. Several methods are described in the following paragraphs.

Visual Inspection / Field Distress survey

A field (or visual) distress survey refers to an evaluation of the pavement to determine the type, extent, and severity of existing distress. Field distress surveys serve as the cornerstone in the identification of overall pavement condition and the development of appropriate rehabilitation alternatives (*Caltrans 2003*).

Falling Weight Deflectometer (FWD)

The FWD is a non-destructive testing device that can be used to perform structural testing for pavement rehabilitation projects and pavement structure failure detection. It is capable of applying dynamic loads to the pavement surface, similar in magnitude and duration to that of a single heavy moving wheel load. The response of the pavement system is measured in terms of vertical deformation, or deflection, over a given area using seismometers. It is important to note that the FWD analysis indicates only the stiffness of a material in-place and does not give much information regarding the durability of a material, nor the quality of other materials, such as aggregates. Another limitation of FWD testing is that the moduli for pavement layers less than three inches thick cannot be back calculated accurately (*Victorine 1997*).

Automated Road Analyzer (ARAN)

The Automated Road Analyzer (ARAN) is a multi-functional data collection vehicle which gathers information while traveling at highway speeds. The combination of high resolution digital video, ultrasonic sensors, accelerometers, gyroscopes, Global Positioning Systems (GPS), and a distance measuring device are used to collect data at highway speeds. As it travels, it collects information on rutting and roughness, grade, and curve radius. It also collects right-of-way digital video. Digital photographs of the pavement view are taken by two rear-mounted, downward looking cameras. It can measure transverse pavement profile and determine the amount and severity of rutting. In addition, digital images of the pavement are collected and stored on removable hard drives. These images are processed by agency personnel at an off-line work station (*Groeger 2003*). Some of the information that ARAN can record include:

- The ride quality of the roadway (longitudinal profile / roughness in terms of International Roughness Index (IRI)),
- The depression on the roadway in wheel paths (rutting),
- The grade and cross-slope of the roadway,
- Real time video imagery of the roadway pavement and right-of-way imagery,
- Precise location information of specific features on or near the roadway, and
- Faulting of concrete pavements.

Ground Penetrating Radar (GPR)

GPR works by sending pulses of electromagnetic energy into the pavement and capturing the reflected energy from each layer interface. A plot is made of the time of arrival of the reflected incident wave versus the return voltage, since part of the incident wave may be transmitted at the layer interface instead of being reflected. Amplitudes and time delays between peaks are then used to estimate layer properties and thicknesses. The size of the reflected signal is a function of the dielectric properties of pavement layers, which is strongly related to the moisture content of the layer. GPR data analysis can be used to determine only the presence of moisture, not moisture content. By analyzing moisture content changes, the ground penetrating radar can also determine areas where drainage of the underlying layers is poor. In addition, GPR can locate voids beneath the surface layer of the pavement. GPR can also be used to locate stripping in asphalt layer (*Scullion 1997 and 2001*). Some of the benefits of GPR as reported by (*Scullion 2001*) are:

- Rapid evaluation of subsurface conditions in flexible pavements,
- Data collected at highway speed,
- Depth of penetration of 24 inches,
- Signals sensitive to changes in moisture content, density, and layer thickness, all of which are critical factors in pavement performance investigations, and
- With the integrated video system it is possible to pinpoint locations with suspected subsurface defects for validation coring (GPR will also minimize coring requirements).

Portable Seismic Pavement Analyzer (PSPA)

The Portable Seismic Pavement Analyzer (PSPA) is a non–destructive testing tool that can be used for determination of pavement modulus as well as layer thickness, defects, voids, cracks or zones of deterioration for HMA and PCC pavements. PSPA utilizes elastic wave propagation in an automated manner to identify a pavement's elastic properties, thickness, and possible flaws in a fraction of a minute. The device combines three complementary wave propagation methods, impact-echo, ultrasonic body waves, and the spectral analysis of surface waves. The applications of PSPA include: determination of the thickness and elastic modulus of a pavement surface layer, de-lamination and de-bonding detection, and quality control/quality assurance of the pavement top layer material.

A-3.3.3.2 Destructive Testing Methods

Destructive testing involves destruction of all or part of the pavement section to determine different properties. Common types of destructive testing include coring, boring, and trenching. These sampling techniques are performed to determine the thickness, nature, and condition of pavement layers and materials, their in-situ properties, the water and drainage conditions, and the effects of traffic (*Crampton 2001*). The probable tests to be used for identification of water susceptibility are discussed below.

Coring

The analysis of pavement cores typically includes determining the layer thicknesses. Some of the applications of coring are reported by Victorine (*1997*). Pavement cores verify the presence or actual thicknesses of layers in relation to those documented in the pavement design and rehabilitation records. Coring is beneficial to determine whether two layers were appropriately bonded to one another. Coring provides information as to whether each of the layers was in good condition, or whether it was somehow damaged, or crushed. The moisture levels of the soil when the core was obtained are important. However, since water is typically used to cool the core barrel during coring operations, it may be difficult (or even impossible) to obtain accurate information about the moisture content of the pavement or subgrade layers (*Victorine 1997*). Figures A-3.2 and A-3.3 show HMA mixtures extracted from pavements showing signs of stripping.

Figure A-3.2: Example of a Stripped HMA Mix (*After Kandhal 2001*)

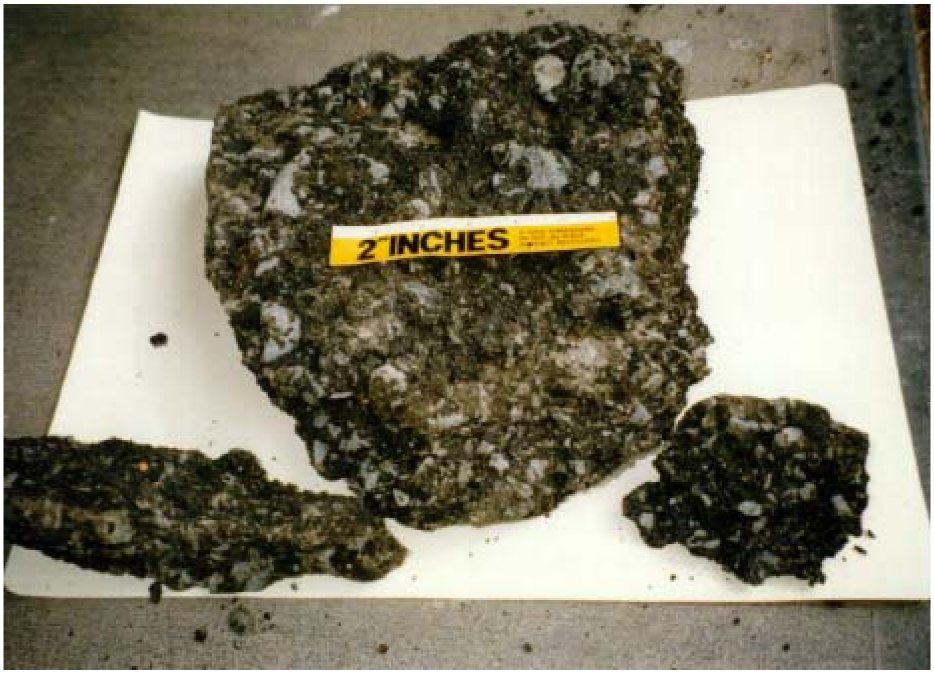

Figure A-3.3: Example of Badly Stripped AC 28 and AC 14 Courses.

Trenching

Trenching is carried out in order to take samples of any pavement layer. These samples are then taken back to the laboratory for testing. Trenching is sometimes performed to verify the thickness and condition of bound or unbound layers, or to determine rutting in different layer(s). Since the trench is difficult to repair and requires closure of traffic lane, trenching is used only in critical situations (*Victorine 1997*).

A-3.3.4. Lab Testing of Field Samples

The majority of the tests on the samples taken from field investigation are performed in laboratories, because much of the testing equipment is too large or expensive to be brought into the field. Shipping the material sample to the laboratory is much less expensive than hauling the bulky testing equipment to the field (*Crampton 2001*). The purpose of the laboratory testing is to determine the in-situ properties of the material that still exists in the field. Laboratory investigations involve testing that determines the physical, chemical, and material properties of each component of pavement sections. The laboratory test methods are selected based on the results of the condition survey results (distress types). Some of the lab evaluation methods that were suggested in the literature (*Scullion 2001*) to investigate distress due to water damage (stripping) are presented in Table A-3.3.

A-3.3.5. Data Analysis

This step involves reviewing all evidences relating to the project in order to come up with the most reasonable explanation for the failure. This process is ongoing throughout the project, i.e., as test results are compiled, the lines of thinking can become better defined. However, even after the completion of all testing, uncertainties often remain. In that case, through a combination of previous experience and engineering principles, the most likely cause of the problem must be determined (*Victorine 1997*). Some of the questions that should be asked in order to compare the data obtained from field to form evidence on the probable causes of failure are (*Crampton 2001*):

Table A-3.3: Lab Evaluation Methods to Investigate Pavement Distress

Rutting (probable outcome of stripping)	▪ HMA properties	▪ Hveem stability, water susceptibility, condition ▪ Asphalt content, asphalt penetration, air void content ▪ Aggregate properties (gradation, absorption, shape, surface texture) ▪ Wheel tracker performance (Asphalt Pavement Analyzer, Hamburg Wheel Tracker) ▪ Repeated load test
	▪ Base, Subbase, Subgrade	▪ Gradation, field moisture content ▪ Tri-axial classification and tube suction test (moisture susceptibility)
Alligator cracking (probable outcome of stripping)	▪ HMA properties	▪ Moisture susceptibility ▪ Asphalt content, asphalt penetration, air void content ▪ Aggregate properties (gradation, absorption, shape, surface texture)
	▪ Base, Subbase, Subgrade	▪ Gradation, field moisture content ▪ Tri-axial classification and tube suction test (moisture susceptibility)
Longitudinal cracking (probable outcome of stripping)	▪ HMA properties (segregation of HMA near crack)	
Raveling (probable outcome of stripping)	▪ HMA Properties ▪ Air voids	▪ Asphalt content ▪ Asphalt properties (penetration, viscosity) ▪ Aggregate properties (gradation, absorption, shape, surface, texture, mineralogy) ▪ Moisture susceptibility

- What did the industry standard call for?
- What did the design documents call for?
- What was actually constructed?
- What changed after construction?

The answers to these questions may reveal deficiencies in the design or errors in the construction procedures. It also helps to identify the pertinent information that was obtained during the literature and document searches (*Crampton 2001*).

A-3.3.6 Findings

Reports should include items such as the project history and background, a description of pavement structure, and a description of material types. A detailed description of the pavement condition, the types of distress involved, and the failure modes should also be included. Environmental conditions, soil conditions, traffic history data, and traffic projections must be included. A summary of the evaluation and testing strategies used for the investigation, as well as the findings of these tests, should also be presented. Finally, a prioritized summary of possible corrective strategies and their associated costs should be included (*Victorine 1997*).

A-3.4 CASE HISTORIES OF MOISTURE DAMAGE INVESTIGATION STUDIES

Case studies of forensic investigations of pavements were reviewed to determine methodologies used, information gathered and reported, and to determine the process through which conclusions were made by the investigators.

Case 1: Importance of Invasive Measures in Assessment of Existing Pavements (*Mooney et al. 2000*)

This paper presents the results of a forensic investigation of a distressed portion of the Oklahoma Turnpike interstate pavement. Extending over 22.5-km (14-mi) the highway investigated consisted of multiple asphalt concrete (AC) overlays accumulated over a 40-year period. The investigators compared the efficiency between destructive and non-destructive testing methods. A thorough nondestructive investigation was carried out using falling weight deflectometer testing and ground penetrating radar. This was followed by a detailed invasive investigation involving coring, drilling and sampling, laboratory testing, and trenching (*Mooney et al. 2000*).

The pavement profile deduced from nondestructive test results alone failed to reveal a significantly weakened subsurface HMA layer that was clearly revealed during invasive testing. Mechanistic analysis of the perceived pavement and actual pavement profiles revealed a significant difference in fatigue life. It was revealed that pavement failure investigations should not rely on nondestructive testing alone. Although GPR and FWD testing provided rapid and comprehensive coverage, invasive assessment remains important (*Mooney et al. 2000*).

Case 2: Field and Laboratory Investigation of Stripping in Asphalt Pavements: State of the Art Report (*Kandhal 1994*)

This report recommends a field investigative methodology that can be used by specifying agencies and industry to establish stripping as a problem on specific project or statewide.

An investigative methodology based on forensic experience with HMA pavements is needed to establish if stripping is a problem on a specific project or statewide. Mere visual observations of the road surface is often misleading because the HMA surface distresses such as raveling, flushing, and rutting can be caused by factors other than stripping. The following methodology is presented here as reported by Kandhal (*1994*).

Sampling (*Kandhal 1994*)

Inspect the whole project and select a 500 ft long section which represents the ‘distressed area’. Most projects will also have relatively better areas with minimal or no distress. Select another 500 ft long section from the same project which can be termed relatively “good area.” Document the observed distress (such as raveling, flushing, rutting, and potholing) in both areas. Obtain at least seven 4-inch diameter cores at random locations in each area. A minimum sample size of seven for each area is necessary for reasonable statistical analysis of the data and to represent the sampled population with an acceptable degree of confidence. If it is a 4-lane highway, obtain all cores in the inside wheel track of the slow traffic (outside) lane. If it is a 2-lane highway obtain all cores from the outside wheel track of the lane. According to author’s experience, stripping usually occurs first at these locations across the roadway pavement. Four-inch diameter cores have been suggested so that the indirect tensile test can be conducted. An additional eighth core can also be obtained if the aged asphalt cement binder is to be recovered and tested for penetration and/or viscosity.

It is necessary to drill these cores without using water as a coolant so that the in-situ moisture contents can be determined. Compressed air and CO_2 are introduced under pressure to cool the inside of the core drill. The advance rate of the gas-cooled core drill is usually slower than that of the water cooled core drill but the valuable information of moisture content cannot be obtained from wet coring. Cores should be sealed in air-tight containers to determine the in-situ moisture content in the laboratory later. Seasonal variations of the in- situ moisture content in HMA layers must be taken into account. If dry coring cannot be done then additional pavement layer samples should be obtained adjacent to the wet coring sites using a jack hammer. The HMA chunk samples loosened by the jack hammer from each layer should also be sealed in air-tight containers so that the in-situ moisture content can be determined in the laboratory later.

Testing (*Kandhal 1994*)

The in-situ moisture content should be determined by weighing the cores before and after drying. It is preferable to dry the cores at ambient temperatures with a fan. Measure the thickness of all layers in the core. Observe the condition of the core especially any evidence of stripping in the layer(s) or at the interface between the layers. It is not always possible to see the stripping on the outside of cores. Saw the cores to separate the HMA layers so that the individual layer(s) can be tested. Measure the average thickness of each layer specimen after sawing. Determine the bulk specific gravity of all specimens as per AASHTO T166. Determine the indirect tensile strength of the dry specimens at 77°F using AASHTO T283 (Sections 10 and 11) or ASTM D 4867 (Sections 8 and 9).

Examine the split exposed surfaces of the tested core specimens for stripping. Disregard the fractured and crushed aggregate particles. Heat the specimen just enough to push it apart by hand and observe the extent of stripping. A visual rating of the stripping on the exposed surface should be made and documented. A rating system developed by the Georgia Department of Transportation and used by the South Carolina Department of Highways and Public Transportation (SCDHPT) in their statewide stripping survey (*Busching 1986*) is recommended. This visual stripping rating is based on broad, easily assessed range estimates of stripping. The rating system considers the stripping of fine aggregate matrix and coarse aggregate fraction separately. Stripping of fine aggregate matrix is considered to be more critical than a comparable percentage of stripping in the coarse aggregate fraction. The procedure, however, does require some training for consistent interpretation of observations.

Conduct extraction test as per AASHTO T164 and gradation of extracted aggregate specified in AASHTO T30 on all seven cores to determine the mix composition (asphalt content and gradation).

Case 3: Premature Failure of Asphalt Overlays from Stripping: Case Histories (*Kandhal and Richards 2001*)

This paper dealt with four case studies, three in the US and one in Australia. The case histories documented the effect of pavement saturation. The authors suggested that under saturated conditions all asphalt mixes may fail as a consequence of cyclical hydraulic stress, physically scouring the asphalt binder from the aggregate. The authors classified this stripping as a mechanical failure of the asphalt pavement system. Based on the case studies and literature review, the authors reported the following conclusions and recommendations (*Kandhal and Richards 2001*):

- The most vital aspect of pavement performance is drainage. Stripping of asphalt courses will not occur in absence of moisture and moisture vapor.
- The case studies identified saturation of asphalt layers by various mechanisms. In each case the authors concluded that saturation is the cause of the problem; stripping is the outcome.
- The degree of saturation of the pavement and asphalt layers was found to be a critical element in the appraisal of stripping failures. Forensic examinations of failures should include a measure of the moisture conditions in failed and non-failed sections of each project to ascertain the degree of saturation in each pavement layer.
- If subsurface drainage of the pavement is inadequate, moisture and/or moisture vapor can move upwards due to capillary action and saturate the asphalt courses.
- Thermal pumping of moisture may occur if trafficking does not reduce the permeability of typical dense-graded HMA, and saturation may follow.
- If saturation exists, then stripping is highly likely and is caused by the mechanical scouring of the binder from the aggregate surface due to extreme cyclic pore water pressure generated by heavy traffic. The potential for premature stripping is enhanced further if the HMA mixture consists of stripping prone aggregates.
- An asphalt treated permeable material (ATPM) base course is recommended at the bottom of the asphalt pavement to intercept moisture and/or moisture vapor. The ATPM should be connected to edge drains on both sides to provide a positive drainage.
- Prior to the application of an OGFC as a wearing course the following are the recommended treatments to minimize saturation in the underlying asphalt course(s):

  (a) Delay the placement of OGFC for two summers if the underlying HMA course has excessive air voids (more than six percent) so that the surface of the underlying mix is effectively sealed by traffic to be practically impermeable to water residing in the OGFC.

(b) If the placement of OGFC cannot be delayed due to project logistics or safety considerations, apply a uniform emulsion fog seal (use a slow-setting emulsion diluted 50% with water) to completely fill the surface voids just prior to the placement of OGFC.

(c) Use a relatively fine-graded surface course mix with not more than 12.5 mm maximum nominal size underneath the OGFC. The evidence suggests coarse graded mixes are more permeable.

(d) Use an 'effective' anti-stripping agent in the underlying surface course mix.

- The pavement design engineer should evaluate the condition of all existing pavement courses in terms of stripping and drainage before deciding about the depth of milling and/or the selection of new asphalt overlays (both type and thickness). Each course should be separated by sawing, slightly warmed (not to exceed 40°C to avoid recoating), and crumbled so that the loose asphalt mix can be examined for stripping. For major projects, it may be prudent to obtain the moisture profile of the pavement (using a jack hammer or coring with dry ice) similar to what was done in the case histories.
- There is a need to develop a reliable and realistic laboratory test method to predict moisture susceptibility of HMA mixtures. It was observed in these case histories that the asphalt pavements were near 100% saturated with water (not 55-80% saturated as specified in ASTM D4867 or AASHTO T283) and the cyclic pore pressure generated by the traffic mechanically scoured the asphalt binder off the aggregate surface. A laboratory test procedure that simulates such conditions should be more realistic. A similar procedure was recommended by Jimenez (*1974*), which involved submerging the specimens in water and applying repeated pulses of water pressure. Tests similar to the SHRP developed ECS (Environmental Conditioning System), in which specimens can be tested under saturated conditions, and wheel tracking type test (such as the Hamburg device) also have potential. Validation of any new test procedure should be done in test pavements which are intentionally saturated with water by designing an inadequate drainage system.

Case 4: Rehabilitation Techniques for Stripped Asphalt Pavements (*Johnson et al. 2002*)

This section includes the abstract from the study on techniques to rehabilitate stripped pavements by Johnson et al. (*2002*). The major objective of this study was to determine the most cost-effective method for rehabilitating stripped asphalt pavements in the state of Montana. Asphalt stripping is a fairly common form of distress for pavements in Montana, particularly for pavements that were surfaced with an open-graded friction course. Currently, the technique for rehabilitating these pavements involves the costly removal of most or all of the stripped material, prior to the placement of an overlay. The goal of this research was to determine whether the stripped material can remain in place, serving as a structural layer within the rehabilitated pavement. This study involved the construction of five test sites, which were incorporated into larger overlay projects. Average daily ESALs at the five sites ranged from 677 to 1,634 during

2002. At each of these sites, stripped material was removed from a control section and stripped material was left in place for a test section, prior to the placement of the overlay. Leaving stripped asphalt concrete surface material in-place during rehabilitation, to be overlaid with the new asphalt concrete, did not tend to make the rehabilitated pavement more susceptible to either stripping damage or load-induced damage. Life-cycle cost analyses should consider rate of stripping deterioration (inches per year) to new asphalt concrete to be the same, whether or not stripped material is removed prior to placing an overlay. Overlay thickness and mix design methods for resisting stripping are the important factors for extending the life of a rehabilitated stripped asphalt pavement.

A-3.5 SUMMARY

This section presented an overview of the forensic investigation procedures of pavement failures based on detailed literature review. Forensic investigation of pavements is very useful to determine the cause of failure and identification of its prevention. It was found that there were slight variations in the procedures followed in different forensic investigations reported in the literature. However, the most common steps in the forensic investigation of pavements included: records review, contractor/maintenance personnel interviews, initial onsite investigation, detailed conditions survey, field testing to obtain samples of materials, laboratory testing of materials, data analysis, failure cause identification, recommendation of solution to prevent such failure in future, and detailed investigation report. Under each of these processes, the critical data elements and different testing procedures required were included. Summaries of studies related to moisture damage and forensic investigation procedures were also included in this section.

A-4.0 DESIGN BEST PRACTICES

A-4.1 INTRODUCTION

Pavement rehabilitation is defined as a structural or functional enhancement of a pavement which produces a substantial extension in service life, by significantly improving pavement condition and ride quality (*Hall et al. 2001*).

Individual rehabilitation treatments are often categorized as belonging to one of the '4- R's – restoration, resurfacing, recycling, or reconstruction. Hall et al. *(2001*) defines each of the four types of rehabilitation as follows:

- 'Restoration' is a set of one or more activities that repair existing distress and significantly increase the serviceability (and therefore, the remaining service life) of the pavement, without substantially increasing the structural capacity of the pavement.

- 'Resurfacing' may be either of the following:

    1. A structural overlay, which significantly extends the remaining service life by increasing the structural capacity and serviceability of the pavement, usually in combination with pre-overlay repair and/or recycling. A structural overlay also corrects any functional deficiencies present in the pavement structure.
    2. A functional overlay, which significantly extends the service life by correcting functional deficiencies, but does not significantly increase the structural capacity of the pavement.

- 'Recycling' is the process of removing pavement materials for reuse in resurfacing or reconstructing a pavement.
- 'Reconstruction' is the removal and replacement of all asphalt and concrete layers, and often the base and subbase layers, in combination with remediation of the subgrade and drainage, and possible geometric changes.

The purpose of rehabilitation technique selection is to identify a suitable rehabilitation technique best suited to the correction of existing distress and achievement of desired improvements in the structural capacity, functional adequacy, and drainage adequacy of the pavement (*Hall et al. 2001*). The selection and design of the appropriate rehabilitation techniques for a HMA pavement requires consideration of three major tasks. They are reported in (*NHI and FHWA 2001*) as follows:

- The pavement must first be thoroughly evaluated to 1) identify and quantify the various types of distress, 2) identify the mechanisms that are causing the distress, and 3) characterize the existing pavement structural capacity.
- Secondly, maintenance and rehabilitation treatments must be identified. This is accomplished considering: 1) the array of possible treatments, 2) the physical, economic, political, timing, and other constraints imposed upon the project, and 3) the variety of conditions (structure, distress, traffic, environment and so on) associated with the existing HMA pavement.
- Third, a life-cycle cost analysis should be conducted (along with an assessment of certain non-economic factors) to identify the best treatment for the given project.

Based on the outcome of these three tasks, one of the 4-R strategies that bests suits the situation is recommended for implementation. This study considers the best techniques to implement the 'HMA overlay' treatment process. Other rehabilitation treatments are not considered in this study. HMA overlay typically involves milling and resurfacing of the existing asphalt pavement to mitigate the effects of rutting, cracking, and other distresses. Resurfacing thickness may depend on the condition of the existing pavement, anticipated future truck traffic, and available funding. HMA overlays may be placed either on existing HMA or PCC pavements. The scope of this study is limited to HMA overlays on existing HMA pavements. The purpose of the following sections is to review and summarize the literature by answering the following questions:

- What is the purpose and applications of HMA overlay rehabilitation treatment?
- What are the pavement structural design (HMA overlay) best practices that have been effective in reducing the risk of failures related to moisture damage?
- What are the various construction best practices that have prevented moisture related damage of HMA pavements?
- What are the best material selection and testing guidelines to assist in reducing the risk of failure due to moisture damage?

A-4.2 BEST PRACTICES

The design and construction of HMA overlays are the most widely-used method for rehabilitation of HMA pavements in the United States (SHRP 1989). They provide a relatively fast, cost-effective means of correcting existing surface deficiencies, restoring user satisfaction and (depending on the thickness) adding structural load-carrying capacity (*Sebaaly et al. 1997; NHI and FHWA 2001*).

Although an HMA overlay is one of the most preferred rehabilitation treatments, it has several limitations. Failure of many overlays to provide the performance level and useful life expected are (*NHI and FHWA 2001*):

- The distress exhibited by the existing pavements: Pavements that exhibit more fatigue cracking, rutting, and/or active transverse cracking will adversely impact the performance of the overlay.
- The intended design life: Even under the best of conditions, HMA overlays will require some type of rehabilitation again with in approximately 15 years.
- Availability of quality materials: The lack of good sound aggregates and/or select asphalt binders that are suited to the prevailing temperature conditions can limit the performance of an overlay.

The available options under the overlay category include straight overlay, pulverize and overlay, mill and overlay, and stress relief course and overlay. This study considers only the mill and overlay method. Some of the most important steps to be considered while designing a HMA overlay include (*Sebaaly et al. 1997a*):

1. Identify the complete history of the pavements section,
2. Identify the traffic requirement,
3. Survey the conditions of the project,
4. Conduct nondestructive testing,
5. Conduct overlay design analysis, and
6. Evaluate alternatives and make final recommendations.

The pavement design engineer should first collect data on the history of the pavement from construction records. The historical data is collected in order to determine the layer thickness and other useful information required to create the structural section of the existing pavement. The design engineer should also obtain core sampling from the pavements at specified distance to observe the visual condition of the HMA layer. Any moisture damage such as stripping would be revealed during this process. The coring also serves as a cross check to verify the structural information from the construction records.

The next step is to obtain the traffic data for the design period. The design engineer typically uses the 18-kip equivalent single axle load (ESAL) concept for this purpose. The engineer calculates the first year design ESALs and then project the complete design period ESALs based on appropriate growth factors.

The condition survey and non-destructive testing of the pavement also plays a critical role in the HMA overlay design. Most state agencies would have these data available from the pavement management system (PMS), and also information directly obtained by the designer through field surveys. Sebaaly et al. (*1997*) recommended the designer to conduct the field survey and not to rely on the PMS data. This can be attributed to the fact that the PMS data might be obsolete in many cases. The non-destructive testing methods have been already discussed in Section A-3.3.3.1 of this appendix.

A-4.2.1 Cold Milling Depth

The first step in the actual decision process in the overlay design is the selection of the depth to which the existing pavement will be milled (if milling is to be performed). FHWA defines milling of pavement as a process that removes distressed materials from existing asphalt pavements to provide a relatively smooth platform to build the overlay. The literature was reviewed to identify best practices for suggesting the correct depth of milling.

Based on a research by Wu et al. (*2000*) for Kansas Transportation Authority and Kansas Department of Transportation, it was concluded that in order to achieve higher fatigue life, the depth of milling should not be more than about 55% of the thickness of the HMA layer to be milled. The literature search did not reveal other research on the selection of milling depth on HMA pavements.

A-4.2.2 Overlay Design

Two major factors in the design of HMA overlay include:

- Overlay thickness design, and
- Drainage design.

A-4.2.2.1 Overlay Thickness Design

There are several methods by which overlay thickness can be determined. Overlay thickness may be specified based on simple engineering judgment or policy decisions or designed based on structural deficiency, limiting deflection, or limiting fatigue damage approaches (*Crovetti 2005*). Crovetti (*2005*) reported the most recent data on the overlay design practice of five states as presented in Table A-4.1. Each method of overlay design is described briefly in this section.

Engineering Judgment

Engineering judgment involves a subjective decision by the engineer with respect to overlay thickness based on experience, taking into account environmental conditions, traffic loading, subgrade soil type, and the nature and extent of distress. Few state agencies rely on this method (*Forsyth 1993*). Some agencies have monitored the performance of previous overlays and have an approximate estimate of how selected standard overlays will perform.

Table A-4.1: Summary of Overlay Design Procedures Used in Some State Highway Agencies (*Crovetti 2005)*

State	Promoted Overlay Design Procedures	Key Data Used to Characterize Existing Pavement	Methods Used to Determine Overlay Thickness Requirements
Illinois	Asphalt Institute	Maximum surface deflection obtained with a falling weight deflectometer	Asphalt Institute nomograph of overlay thickness vs. representative rebound deflection.
Indiana	1993 AASHTO	Visual observations and surface deflections obtained with a falling weight deflectometer	1993 AASHTO structural deficiency approach
Iowa	1993 AASHTO	Surface deflections obtained with a Road Rater	Structural deficiency approach using internal IaDOT method for computing effective structural number of existing pavement
Michigan	Policy Decisions	Visual assessment of surface condition	Policy overlay thicknesses used for first structural overlay. Subsequent improvements utilize cold-in-place recycling or reconstruction.
Minnesota	Internal Methods	Surface deflections obtained with a falling weight deflectometer	Internally developed program used to compute overlay thickness required to increase single axle load carrying capacity to desired level.

Other agencies have set up standards such as 50 mm (2 in) HMA overlays for certain classes of roads, 75 mm (3 in) HMA overlays for other classes, and so on (*NHI and FHWA 2001*). There are obvious deficiencies to this approach, because very few engineers have adequate experience to determine the required overlay thickness for a given traffic and design life. In addition, the advent of vehicles with higher tire pressures, different axle configurations, and higher axle loads, along with new paving materials, questions the validity of the engineering judgment based on past experience. The rational development of an overlay design procedure that quantitatively considers the important design factors is strongly recommended. The engineering judgment is more acceptable when designing overlays to correct functional deficiencies (*NHI and FHWA 2001*).

Standard Thickness (Distress Identification)

The standard overlay thickness is prescribed for a given pavement type, thickness, and traffic loading. It offers, in one sense, less flexibility than the engineering judgment method, since overlay thickness determination becomes policy rather than a subjective decision. The overlay thickness is selected based on the nature and severity of distress (*Forsyth 1993*).

Deflection Approach

The basic concept of the deflection approach is that, in general, the larger the deflection is, the weaker the pavement and subgrade soil must be. This method is based on the premise that the fatigue life of a pavement is a function of deflection level as measured by an appropriate NDT device (*Forsyth 1993*). Overlays can be used to strengthen the pavement structure to an extent indicated by a certain desired reduction in deflection. Critical deflection levels are identified below which the pavement is expected to perform satisfactorily. The thicker the overlay, the greater the reduction of deflection, and thus increases the overlay life. The Asphalt Institute, California, Texas, and several other agencies have used the deflection approach in the overlay design of HMA pavements (*NHI and FHWA 2001*). ODOT uses deflections derived from FWD testing to quantify the structure capacity of existing pavements for the purpose of determining required overly thickness (*ODOT Pavement Design Guide, 2007*).

Structural Deficiency

This procedure involves a comparison of structural capacity of the existing pavement with that required to carry the traffic loading estimated for the design life of the overlay. The basic concept is that an overlay is required that is equal to the difference between the structural capacity of a newly designed pavement and the structural capacity provided by the existing pavement (*NHI and FHWA 2001; Forsyth 1993*).

Mechanistic Approach

In this approach, the overlay thickness limits fatigue damage in the existing pavement and/or overlay to an acceptable level over the design period. The existing pavement and overlay are modeled using elastic layer theory or finite element analysis to estimate the critical fatigue responses associated with the design axle load. For flexible pavements with HMA original surface layers or HMA overlays, the critical response is the maximum tensile strain at the bottom of the original HMA surface layer or HMA overlay (*NHI and FHWA 2001*).

Once the maximum tensile strains are known, they can be used along with a suitable HMA fatigue transfer function equation to estimate the fatigue life of the pavement. The simplest case involving the application of this approach is for a HMA overlay on an existing HMA pavement that has no remaining life or, by definition, zero structural capacity. Since, in this case, the original HMA surface layer has no load-carrying capacity, it is simulated as having an elastic (Young's) modulus value on the order of that of an aggregate base material, and the critical strain is determined at the bottom of the

HMA overlay. Then, either by trial and error, or through a graphical method, a design overlay thickness is determined that corresponds to the design future load applications (*NHI and FHWA 2001*).

For the case where the existing HMA surface layer has some remaining life (i.e., structural capacity greater than zero), the process becomes somewhat more complicated because consideration must be given to tensile strains in both the original HMA layer and the HMA overlay. It involves the use of the Miner's linear damage hypothesis and associated remaining life concept (*Seeds et al. 1982).*

As previously discussed, the performance of an overlay (of a given thickness) is influenced by the amount of distress exhibited by the existing pavement. Obviously, one way to maximize the performance of an overlay is to exercise a certain amount of repair prior to overlay placement. In HMA overlays, such repairs as full-depth patching of all the areas exhibiting medium to severe fatigue cracking and improving any poor drainage areas are sure to increase the life. This approach could also be viewed as a way of reducing the overlay thickness requirement, i.e., more pre-overlay repair means less thickness.

A second approach to overlay design is to place an overlay of sufficient thickness to protect the weakened areas in the existing pavement. If it is determined that a stabilized subbase/base layer has deteriorated, instead of removing and replacing the layer, the reduced strength of that layer can be considered in the design of the overlay. The thickness of the overlay is then increased to account for the decreased strength of the deteriorated layer and to protect it from excessive stresses or deflections. With an increase in overlay thickness, applied loads will be distributed over a larger area in the lower pavement layers, decreasing the stresses and deflections imposed on the deteriorated layer. It should be noted that the designed thickness must be developed from a deflection-based or mechanistic overlay design procedure, as discussed previously. However, the additional thickness required to adequately protect weak layers will normally be so thick that this approach is not an economically feasible alternative. A certain amount of pre-overlay treatment and repairs should be performed as part of an overlay design. Generally, the second approach to overlay design is not recommended.

A-4.2.2.2 Drainage Design

As detailed earlier, improper drainage of pavements was found to be one of the most important causes of moisture damage in HMA pavements. Hence, to prevent moisture damage, one of the most important steps in HMA overlay design is the design of drainage systems. To obtain adequate pavement drainage, the designer should consider providing three types of drainage systems: (1) surface drainage, (2) groundwater drainage, and (3) structural drainage (*AASHTO 1993*). Failure of any one of these will allow the moisture to stay in the pavement and lead to moisture-related distress such as stripping, rutting, potholes, etc. The pavement design engineer should conduct a detailed drainage survey to evaluate the existing drainage conditions. Drainage evaluation requires investigation of the problem site, preferably during a wet weather period. According to AASHTO 1993, the following is the partial list of questions to ask during the site investigation,

- Where and how does water move across the pavement surface?
- Where does water collect on and near the pavement?
- How high is the water level in the ditches?
- Do the joints and cracks contain any water?
- Does water pond on the shoulder?
- Does water-loving vegetarian flourish along the roadside?
- Are deposits of fines or other evidence of pumping (blowholes) visible at the pavement's edge?
- Do the drainage system inlets contain debris or sediment buildup?
- Are the joints and cracks sealed effectively?

The most obvious signs of inadequate subsurface drainage will likely be notable during the distress survey: pumping of water and/or fines at transverse and/or longitudinal joints, blowholes along the lane/shoulder joints, and localized settlement of an asphalt concrete shoulder near blowholes. One among the major moisture-related problem is stripping in asphalt and asphalt-overlaid concrete pavements, which may be investigated by visual examination of cores after splitting. The following additional indications of inadequate drainage should also be noted during the field survey:

- Standing water in the ditches,
- Cattails or other water-loving vegetation in the ditches,
- Inadequate height of subdrain outlets or daylighted base above the ditch line,
- Clogging or obstruction of subdrain outlets, and
- Clogging of daylighted base by soil and/or vegetation.

If visual observations suggest a significant drainage deficiency may exist, more intensive inspection may be conducted. If edge drains are present, their effectiveness should be evaluated by observing their outflow either after a rainfall or after water is released from a water truck over pavement discontinuities. The flow from each outlet should be examined and any outlets that are flowing at a much lower rate than the others should be noted on a strip map (*NHI and FHWA 2001*).

Another way of assessing the effectiveness of edge drains is through the use of video inspections (*Christopher 2000*). This inspection uses a high-resolution, high-sensitivity color video camera attached to a pushrod cable approximately 15 mm (0.6 in) in diameter and 150 m (500 ft) long (*Daleiden 1998*). The device is inserted into the drainage system at the outlets, and as the camera is pushed along, a VCR records the inspection in progress and simultaneously notes the distances that the camera has advanced (*Daleiden 1998*). In this way, any blockages, rodents' nests, or areas of crushed pipes can be located. Several states have now adopted video edge drain inspection as part of new drainage construction (*NHI and FHWA 2001*).

In addition, the following drainage-related items should be noted as part of the drainage survey (*NHI and FHWA 2001*):

- *Topography of the project*: The overall topography and the approximate cut/fill depth should be noted along the length of the project to determine if more distresses occur in certain cut or fill areas.
- *Transverse slopes of the shoulder and pavement*: These should be evaluated to ensure that they are no water stagnation that prevents the effective moisture runoff from the surface. Recent research on surface drainage has suggested a minimum two percent slope for mainline pavements and a three percent slope for shoulders to reduce hydroplaning (*Anderson et al. 1998*). Some cross slope corrections may be possible during rehabilitation, if inadequate cross slope exists.
- *Condition of the ditches*: The condition of the ditches (and the embankment material adjacent to the shoulder) should be noted along the length of the project to see if they are clear of standing water, debris, or vegetation that might otherwise impede the flow of water. The presence of cattails or willows growing in the ditch is a sign of excess moisture.
- *Geometrics of the ditches*: The depth, width, and slope of the ditches should be noted along the length of the project to ensure that they facilitate the storage and movement of water. It is recommended that ditches be 1.2 m (4 ft) below the surface of the pavement, be at least 1 m (3 ft) wide, and have a minimum slope of one percent.
- *Condition of drainage outlets (if present)*: These should be assessed over the entire length of the project to ensure that they are clear of debris and set at the proper elevation above the ditchline. The overall condition of the outlets and headwall (if present) should also be assessed, and the presence or absence of outlet markers noted.
- *Condition of drainage inlets (if present)*: Many urban projects incorporate drainage inlets to remove surface water, and these should also be inspected over the length of the project. They should be free of debris, with adequate cross slopes on the pavement surface.

All of the information collected from the drainage surveys should be marked and noted on strip maps, and then examined together to obtain a visual picture of what moisture is doing to the pavement, whether any moisture damage is occurring, and what factors are present that allow the moisture damage to occur. In particular, AASHTO (*1993*) suggests the following questions:

- Is the original drainage design adequate for the existing road?
- What changes are necessary to ensure drainage inadequacies, which may contribute to structural distress, are corrected?
- If the original drainage system design was adequate, have any environmental or structural changes taken place?
- Does the present or projected land use in areas adjacent to the road indicate any change in flow pattern of surface drainage or likely to change, thus rendering existing drainage facilities inadequate?

Based on a through drainage condition survey detailed above along with other data, the pavement designer should come up with a drainage design to prevent water from staying in the pavement for a long time.

Subsurface drainage systems should be installed at locations suitable for easy removal of water the pavement. If there is no groundwater to be removed, shallow trenches are adequate. If frost heave is a problem, the drainage system should be deep enough to keep groundwater at least 0.9 meters below the pavement structure (*Terrel 1990*). In HMA overlay projects where road widening is necessary, it is essential to provide uninterrupted drainage of the base layer under the pavement. If the widening is to extend to the edge of the shoulder, an open-graded asphalt treated permeable material may be used as drainage layer under the widened portion (*Terrel 1990*). Installation of drainage systems are discussed in Section A-5.5 of this chapter.

A-4.2.3 HMA Mix Design

A vital component in the flexible pavement overlay process is the design of HMA mixture. The mixture design consists of selecting and proportioning the aggregates and asphalt binder, to produce a mixture that will provide high durability, workability, and stability. The prime objective of the HMA mix design is to determine the optimum asphalt binder content (for a particular aggregate type, nominal maximum size, gradation, etc.) to be used in the mix. The majority of state highway agencies in the US utilize the Superpave mix design method in an attempt to accomplish this. However, some state highway agencies still allow the use of either the Marshall or Hveem mix design methods.

A-4.3 SUMMARY

Structural design of HMA overlays is one of the most critical stages in the overlay project development process. This section presented the different steps involved in the design of HMA overlays. Findings included the critical elements that should be considered by the pavement design engineer during the condition and drainage surveys. This section also reported the optimum depth of milling before HMA overlay. HMA mix design is also a key component of the overall design process for HMA overlays. A general discussion of the goals and steps of the mix design process was provided.

A-5.0 CONSTRUCTION BEST PRACTICES

The production of HMA mix and the subsequent construction of the pavement play a major role in the prevention of moisture sensitivity of HMA pavements. One might have the best HMA mix and HMA pavement design on paper, but if they are not produced or constructed according to the developed design, the entire pavement system may become a failure. Some of the material production and construction issues that increase the potential for moisture damage were addressed earlier in Section A-2.0. The purpose of this section is to review the available information in the literature related to the best practices that will prevent the moisture susceptibility of HMA during material production and construction. This process involves the following steps:

- Surface preparation of existing pavement,
- HMA production (cold feed system, aggregate drying and mixing, loading into trucks, and transportation to the site),
- Aggregate and stockpiling,
- Paving operations,
- Compaction, and
- Weather considerations during construction.

A-5.1 SURFACE PREPARATION

Before the HMA overlay can be placed on the existing pavement, the surface needs to be prepared properly to receive the overlay. This practice will ensure a proper bonding between the existing surface and the new overlay. This process is commonly referred as surface preparation or pre-overlay treatment. Surface preparation of existing pavements can include activities such as removing a top layer (fully or partially) through milling, applying a leveling course, applying a tack coat, repairing localized areas, surface leveling (rutting), control of reflection cracking, drainage improvements, etc. The amount of repair and treatment that is performed to a pavement prior to overlay is probably the single most important factor that affects the future performance of the overlay (*NHI and FHWA 2001*). The amount and type of pre-overlay restoration needed on an existing pavement must be carefully determined by considering the following factors:

- Type of overlay,
- Structural adequacy of the existing pavement,
- Distress type exhibited by the existing pavement,
- Future traffic loadings,
- Physical constraints such as traffic control, and
- Overall costs (pre-overlay repair and overlay).

Another factor that would play a major role in the selection of the surface preparation is the vertical clearance distance between the existing pavement and bridges passing over it. Some of the projects being analyzed as part of this research involved milling of existing roadways in order to maintain minimum vertical clearance. Hence, the cold milling process is discussed in detail in this section.

Cold milling has been used for several purposes in the pavement rehabilitation process. However, perhaps the most common reason is to remove material from an existing HMA pavement in preparation for an overlay. Cold milling operations use drum-mounted carbide steel cutting bits to chip off the pavement surface. It creates roughened surface for bonding and eliminates the need to raise drainage structures and other utilities to the level of the new pavement (*NHI and FHWA 2001*).

Cold milling is generally conducted longitudinally along the pavement profile. The following practices are suggested in the literature (*NHI and FHWA 200; Roberts et al.; WAPA 2002*):

- It is recommended that failed pavement areas be patched prior to cold milling, as cracking becomes difficult to locate on the milled surface.
- The forward speed of the machine, the rotational velocity of the rotating drum, the spacing of the carbide bits, and the grade control of the cutting head should be closely controlled to produce a uniform texture throughout the project.
- The longitudinal profile should be held to the same tolerance as new base course construction if the pavement is to be overlaid.
- After a pavement has been milled, the resulting surface is quite dirty and dusty. The surface should be cleaned off by sweeping or washing before any overlay is placed; otherwise, the dirt and dust will decrease the bond between the new overlay and the existing pavement. When sweeping, more than one pass is typically needed to remove all the dirt and dust. If the milled surface is washed, the pavement must be allowed to dry prior to paving.
- Transverse slope of the pavement is also an important factor and should be specified to obtain proper drainage. Generally, a transverse slope of 2 percent, or 64 mm (2.5 in) over 3.66 m (12 ft), is recommended.
- Grinding limits and transitions or stop lines at bridges and ramps should be clearly marked on the plans.

A-5.1.1 Drainage (During Surface Preparation)

Inadequate drainage is one of the major factors that could damage the existing pavement. Some of the problems that may have contributed to the failure of the existing pavement include (*NAPA 1990*):

- Clogged side ditches and culverts,
- Failed cross slope, catch basins, and under drains, and

- Saturated, dense-graded granular bases.

These problems should be identified early and corrected. Constructing a high quality overlay without addressing these root causes will likely lead to premature failure of pavements.

A-5.1.2 Quality of Milled Surface

A study was conducted by Gallivan and Gundersen (*2004*) in Indiana to identify the best test procedure to evaluate the quality of milled surface. The study reported that macrotexture testing on the milling operations was the best and most accurate method to measure the quality of the milled surface. They concluded that this will lead to improved construction quality and longer-lasting pavements. The test procedure is generally the same as ASTM E965. The detailed description of the test is provided in Gallivan and Gundersen (*2004*). Figures A-5.1 and A-5.2 present examples of poorly and properly milled surfaces, respectively.

Figure A-5.1: Poorly Milled Pavement Surface

Figure A-5.2: Properly Milled Pavement Surface

Cold milling equipment comes in a variety of sizes. This allows the user to customize the equipment based on the project requirement. Cold milling equipment uses carbide bits mounted on a revolving drum (FigureA-5.3) to break up and remove the surface material. The basic components of a milling machine are a cutting drum to mill the existing pavement, a vacuum to collect the milled particles and a conveyance system to transport the milled particles to a dump truck for hauling. Drum widths vary from as little as 0.3 m (1 ft) to as great as 3.6 m (12 ft) (*NHI and FHWA 2001*). The carbide bits must be continually maintained and frequently replaced to provide a uniform texture with no ridges or low spots. Equipment must be inspected frequently to ensure that all cutting bits are functioning properly and that worn bits are replaced. Worn cutting bits will produce a surface texture characterized by ridges and low spots (*NHI and FHWA 2001*). Figure A-5.3 shows an example of milling drum with multiple teeth.

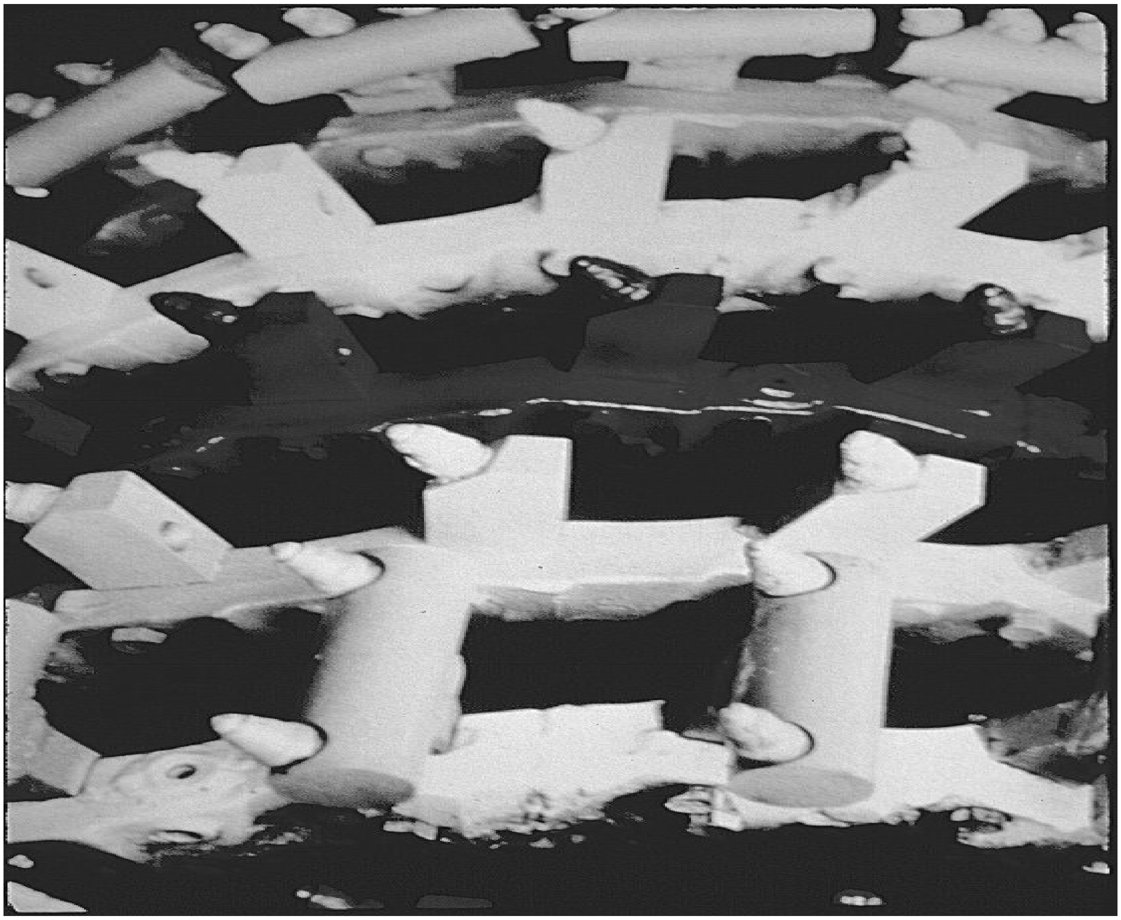

Figure A-5.3: Multiple Teeth Application on a Milling Drum (*NHI and FHWA 2001*)

A-5.2 AGGREGATE STOCKPILING

The process of producing a moisture resistant HMA mix should start with monitoring the quality of aggregate stockpiling. It is a common practice to stockpile aggregates near the HMA plant. Segregation of aggregates and moisture absorption during stockpiling can lead to a moisture sensitive HMA mix. Hence, it is necessary to take certain measures during aggregate stockpiling to achieve an HMA mix that meets the design criteria. Some of the best practices to prevent aggregate segregation and moisture absorption as reported by St. Martin et al. (*2003*) include:

- The foundation for aggregate stockpiles should be stable so that the construction equipment can efficiently build the stockpiles and remove material from the stockpiles.
- The foundation for aggregate stockpiles should be clean to ensure that foreign materials, such as roots, soil, or grass, are not picked up during aggregate hauling. Vegetation, soft particles, clay lumps, excess dust and vegetable matter may affect performance through loss of structural support and/or prevents binder-aggregate bonding (*WAPA 2002*).

- Foundations should be constructed such that water does not pond underneath the stockpile which would increase the moisture content of the aggregates near the bottom of the stockpile.
- It is also important that there is sufficient space between the stockpiles so that cross-contamination between stockpiles does not occur.
- Stockpiles should be built to ensure that the moisture content within the stockpile stays as low and consistent as possible. A method of preventing water from infiltrating into the stockpile is to cover the stockpile using some type of a roof structure. Tarps are generally not recommended for covering stockpiles because moisture tends to collect under the tarp.
- Proper handling/hauling techniques should be used to minimize segregation (Figure 2.8). Excessive handling of the aggregates can also cause degradation of the aggregates, which causes a change in the gradation of the stockpile.
- Some state highway agencies require the treatment of aggregate stockpiles with lime slurry marination (LSM) to reduce moisture sensitivity.

Figure A-5.4: Aggregate Segregation in Stockpile (*After WAPA 2002*)

A-5.3 HMA PRODUCTION

A-5.3.1 Cold Feed System

The cold feed system includes cold feed bins, a collecting conveyor, and a charging conveyor. To produce a uniform, high-quality HMA, it is imperative that the entire cold feed system needs to be properly calibrated. Two major issues at this stage are to maintain the targeted aggregate gradation and proper mixing of the anti-stripping agent (e.g., hydrated lime), if used, with the aggregate, if required. One of the common anti-stripping agents used to resist stripping is hydrated lime. Care should be taken so that the hydrated lime is evenly distributed within the aggregate. Usage of bulkheads with the cold feed bins will prevent the aggregates from overflowing from one bin to another (*St. Martin et al. 2003*).

A-5.3.2 Drying and Mixing Process

The goals of the drying and mixing process are (*St. Martin et al 2003*):

1. Completely dry the aggregates,
2. Add proper proportions of asphalt binder and aggregates, and
3. Produce properly-coated HMA to meet the job mix formula.

Aggregates that are not properly coated with asphalt binder have a higher potential for moisture damage, owing to displacement. A good quality control/quality assurance (QC/QA) program will ensure that the two latter goals are met. However, depending on the gradation and moisture content of the aggregates, the amount of drying within the drying process may change. Aggregate blends that contain a large percentage of coarse aggregates (e.g., coarse-graded Superpave and stone matrix asphalt) may require more drying time than blends with a higher fraction of fine aggregates. Regardless, the moisture content of the aggregates should be monitored during production. For mixtures containing recycled asphalt pavement (RAP), the moisture content of the RAP should also be monitored during production. At least two moisture content measurements on aggregates or RAP should be obtained per day, or more frequently if the moisture conditions change during the day (e.g., after rain) (*St. Martin et al. 2003*).

A-5.3.3 Loading of Mixture into Haul Units

Two important considerations while loading the HMA mix in the trucks are: (1) proper charging of HMA mix into trucks, and (2) truck bed cleanliness and lubrication. Improper charging of the truck bed can lead to segregation. Aggregate segregation can lead to increased permeability within the completed pavement (*Roberts et al. 1996*). Dropping HMA from the storage silo or batcher (for batch plants) in one large mass creates a single pile of HMA in the truck bed. Large-sized aggregate may roll off from this pile and collect around the base. Dropping HMA in several smaller masses (three drops are typical) at different points in the truck bed will minimize the segregation risk (*WAPA 2002*). Another important factor is lubrication used in the truck beds. Non-petroleum based products should be used for lubrication such as lime water, soapy water or other suitable commercial products (*Roberts et al. 1996*). Since use of petroleum-based products (e.g., diesel fuel) breaks down the asphalt binder, they should not be used. The truck bed should also be kept clean from foreign substances so that the chances of them getting mixed with the HMA mix are removed.

A-5.3.4 Transport of Mixture

Once the HMA mix is loaded into the truck, it has to be transported to the paving site. According to St. Martin et al. (*2003*), one of the main areas of concern during this stage is the draindown of asphalt binder from the coarse aggregate. This occurs in mixes having very thick binder films; namely, OGFC, and SMA. This draining of the asphalt binder from the coarse aggregate structure can be translated to segregation on the roadway. As a result of the draindown, the coarser aggregates are not coated with sufficient asphalt binder, and therefore moisture damage can occur owing to displacement, detachment, or hydraulic scour in the presence of water (*St. Martin et al. 2003*).

In addition to draindown of asphalt binder, truck transport also affects the HMA mix through cooling. If the HMA mix cools off below a certain temperature, it will be difficult to achieve proper density on the roadway. Insufficient density allows water to permeate into the pavement (*St Martin et al. 2003*). The mix is usually loaded into a truck at a fairly uniform temperature in the range of 250°F to 350°F. During transport, heat is transferred to the surrounding environment by convection and radiation and the mix surface temperature drops. This cooler HMA mix surface insulates the interior mass and thus the transported mixture tends to develop a cool or thin crust on the surface that surrounds a much hotter core. Environmental conditions (air temperature, rain, and wind) and length of haul can affect the characteristics and temperature of this crust (*WAPA 2002*). WAPA suggests several measures to minimize HMA cooling during transport that include:

- Minimize haul distance,
- Insulate truck beds, and
- Place a tarpaulin over the truck bed.

A-5.3.5 Loading of Mixture into Paving Units

The literature was reviewed to identify best practices that will prevent moisture damage during the loading of HMA mix from the trucks to the pavers. Some of the best practices identified include:

- The HMA mix should be unloaded quickly when it arrives at the paving site. This will minimize the mix cooling before it is placed. The supply of mix to the paving train should not be such that there are an excessive number of trucks waiting to empty. As the trucks wait, the mixture cools.
- Before HMA is loaded into the paver, the inspector and/or foreman should make sure that it is the correct mix. Occasionally, paving jobs require more than one mix design (i.e., one for the leveling course and one for the wearing course) and these mixes should not be interchanged.
- The hopper should never be allowed to empty during paving. This results in the leftover cold, large aggregate in the hopper sliding onto the conveyor in a concentrated mass and then being placed on the mat without mixing with any hot or fine aggregate. This can produce aggregate segregation or temperature differentials, which will cause isolated low densities in the mat. If there are no transport vehicles immediately available to refill the hopper, it is better to stop the paving machine than to continue operating and empty the hopper (*TRB 2000*). A recent study by Gilbert (*2005*) reported that dump trucks used without material transfer vehicles (MTV) are prone to temperature segregation. The author also suggested that windrow elevators appear to work on par with MTVs.

- Large temperature differences can occur in the placement of a significantly cooler portion of HMA mass into the mat. This cooler mass comes from the surface layer (or crust) typically developed during the mix transport from the mixing plant to the job site (*WAPA 2002*). These cooler areas will cool down to cessation temperature (the temperature at which no further compaction can take place due to increased HMA viscosity, commonly taken as 175°F) more quickly than the surrounding mat. Roller patterns developed based on general mat temperatures may not be adequate to compact these cooler areas before they cool to cessation temperature resulting in isolated spots of inadequate compaction. Thus, temperature differentials can cause isolated areas of inadequate compaction resulting in decreased strength, accelerated aging/decreased durability, rutting, raveling, and moisture damage (*Hughes 1984; Hughes 1989*). Generally, temperature differentials greater than about 25°F can potentially cause compaction problems (*WAPA 2002*).

A-5.4 COMPACTION OF HMA

Once placed on the roadway, the mix is rolled to achieve a desirable in-place density. This adequate compaction is the most important aspect to obtain a pavement that can resist moisture damage and other distresses. For dense-graded mixes, numerous studies have shown that initial in-place air void content should not be below approximately 3% or above approximately 8% (*St. Martin et al. 2003*).

The longitudinal joint is often highly susceptible to water infiltration into the pavement structure. In the field, longitudinal joints are usually constructed to a lower density than the interior portion of the mat. This lower density at the joints is a result of compacting unconfined edges, not properly pinching the joint with the roller, and so forth (*St. Martin et al. 2003*).

Excessive rolling during mix compaction and using a heavier roller than needed may also result in moisture damage. Either factor may cause fracturing of the aggregate. Again, in the presence of water, the fractured aggregate can absorb water and lead to displacement of the asphalt film (*St. Martin et al. 2003*).

Determination of pavement density is a primary activity performed by either the contractor or the agency before acceptance. Inadequate and improper compaction enhances the permeability and allows air to enter in to the pavement structure and prematurely age the mixture. The intrusion of water can also result in stripping in a moisture-sensitive mixture. AASHTO recommends QC testing frequencies for density at a rate of one test per 500 tons (AASHTO 1996). A primary purpose of density QC testing is to monitor and control the lay-down and compaction processes to ensure that desired target levels are met with minimal variation (*Russell et al. 2001*).

A-5.5 PAVEMENT DRAINAGE

Drainage of water from pavements has been an important consideration in pavement construction for many years. Numerous premature pavement failures have been due to the improper design and installation of drainage systems. Many drainage system failures are traced to poor construction and inspection. A plugged subsurface drainage system may be worse than having no drainage system at all because the pavement system becomes permanently saturated and will lead to severe pavement distress in addition to stripping. In addition to the efficient design of subsurface drainage of pavements, choices made in construction often control pavement subsurface drainage performance. As a result, construction decisions and actions can have a significant impact on the performance of a pavement section. NCHRP Report 96 and NCHRP Report 239 are the two detailed reports discussing the importance of subsurface drainage of pavements (*Christopher and McGuffey 1997; Ridgeway 1982*). Some of the common drainage problems identified during the construction process include (*Christopher and McGuffey 1997*):

- Poor control of grades, which leaves water pooled in the pipes,
- Drains going uphill,
- Inadequate compaction of backfill material,
- Backfill not meeting specifications,
- Guide and guardrail posts driven through drains and outlet pipes,
- Pipes and other parts of the facility crushed and collapsed by construction traffic,
- Drains not connected to outlets,
- Altered drainage outlet spacing,
- Outlets placed in sags,
- Headwalls that tilt backward,
- Bad or poor headwall connections,
- Improper use of connectors,
- High ditch lines that do not allow proper drainage from outlets, and
- Outlets that have been left out altogether.

The study indicated that most problems with subsurface drainage facilities originate in the construction phase. It also reported that giving proper training to the construction staff may avoid the problems identified above. The study reported some best practices on the installation of edge drains. Proper pipe grade control is essential for edge drains to be effective. Undulating drain lines are not acceptable because water will accumulate in depressed areas. Good practice dictates that the drains should be properly connected to the permeable base and outlets. Outlets are required to be graded according to drainage requirements (*Christopher and McGuffey 1997*).

Drain lines are to be carefully marked and proper care should be given throughout construction to avoid crushing the pipe with construction equipment. Sometimes, the drains are constructed after constructing the pavements to avoid this problem. In this case, temporary drainage is required for the permeable base to prevent a bathtub effect from water trapped in the porous base. The drain trench filter (aggregate or geo-textile) has to be placed carefully at the design location around all sides of the backfill, except for the section in contact with the permeable base (*Christopher and McGuffey 1997*).

The edge drain is required to be backfilled with material at least as permeable as the permeable base. Most states use graded gravel or crushed rock for backfill. For retrofit installation through existing dense-graded aggregate, some states use free-draining sand with prefabricated geo-composite edge drain (PGED) systems, some states use trench system, and some states use both. In any case, the drainage backfill should be placed below the invert of the pipe and compacted to better support the pipe. As with the trench line, the pipe should be placed at the proper grade on smooth surface (*Christopher and McGuffey 1997*).

The edge drain system should be inspected and tested for proper operation toward the end of construction, before final acceptance. Acceptance criteria based on performance parameters must be established, otherwise signs of poor construction practices most likely will not be identified until major structural damage occurs. Inspection techniques can consist of simply pouring water on the drainage layer or in an upstream section of the drain, measuring the outflow, and comparing the outflow with the anticipated rate. A simple go, no-go gauge on the end of a fiberglass rod can be pushed from the outlet into the edge drain to verify continuity. Video equipment also provides an effective tool for post-construction evaluation (*Christopher and McGuffey 1997*).

Permeable base pavement failures have occurred in cases in which water could not get out of the base fast enough (e.g., because of a lack of pipe outlets, plugged outlets, crushed outlets, clogged filters, or clogged drains). These failures can also be attributed to poor maintenance. As a result, FHWA has recommended that permeable base not to be installed unless there is a commitment to maintain the subsurface drainage system.

A-5.6 QUALITY CONTROL/QUALITY ASSURANCE (QC/QA)

The term “QC/QA,” is short for quality control and quality assurance. Quality Assurance is the planned and systematic actions to assure that project components are being designed and constructed in accordance with applicable standards and contract documents. Quality Control is the review of project services, construction work, management, and documentation for compliance with contractual and regulatory obligations and accepted industry practices. Quality control/quality assurance is one of the most important aspects of HMA production and construction process. A superior mix on paper might fail in the field due to the construction practices that did not incorporate any quality control procedure. The three major objectives of quality control system are to:

- Produce a quality product,
- Assure that the final product meets job specification, and
- Satisfy the customer’s needs, as economically as possible.

In order to meet these objectives a typical QC/QA program will have various sampling and testing procedures are presented in Table A-5.1

Table A-5.1: QC/QA Sampling and Testing Procedures

Testing and Sampling Stage	Testing required
Pre-production	Plant considerations Aggregate, asphalt cement, and additives for mix design Consider anticipated process adjustments Cause and effect Economics
Job Mix Formula approval and verification	Aggregate gradation Aggregate physical properties Asphalt content Volumetric analysis Stability or strength testing, where applicable Moisture susceptibility
QC during product5ion by contractor	Aggregate gradation Asphalt content Volumetric analysis In-place density
Production and in-place acceptance by owner	Random production and in-place acceptance testing by the owner is similar to contractor testing, plus measurements of Thickness, smoothness, overall profile and workmanship

Some of the tools used to ensure the quality of HMA in the field include (*Russell et al. 200*1): 1) QC plans 2) checklists 3) daily dairies and 4) feedback systems. A brief description on the importance of each of these tools is provided below.

A-5.6.1 Quality Control Plans

Quality control plans are essential documentation during the construction of a HMA pavement. The contractor should prepare the QC plan at the start of the project to serve as a guidance document that will deliver a high quality project. Once the plan is prepared, all project personnel should be made aware of its contents. The QC plan should state the quality policies, practices, organization, and activities that will be conducted to produce a quality product for the project. The plan should meet product specifications through process management and inspection (*Melan 1993*). A formal planning process using a QC plan allows the contractor to specify key areas during production that will require personnel awareness. With increased awareness, it is more likely that these areas will receive the required attention by project staff. Based on the survey conducted among 40 state highway agencies, 34 agencies required contractors to provide a QC plan.

As part of NCHRP 447, Russell et al. (*2001*) conducted a survey to collect information about current QC and QA practices among agencies and contractors. Three basic attributes from the agency surveys were reported in the study. They are: (1) contractor requirements, (2) project resources, and (3) acceptance testing (Table A-5.2). In addition, QA specifications were collected from 40 US state highway agencies. The information from these specifications was divided into two categories: (1) acceptance testing and (2) pay adjustments. Under the acceptance testing category, the study reports the mix property acceptance attributes, density acceptance attributes, and the smoothness acceptance attributes from the 40 states surveyed (*Russell et al. 2001*). These measures describe overall pavement quality by measuring, respectively, the HMA materials composition, the densification of the material to withstand repeated loading, and ride quality. A detailed description of the frequency, location, quantity, and method of sampling practiced by the US state highway agencies are presented in Russell et al. (*2001*).

Table A-5.2: Summary of Three Basic Attributes of QA/QC of State Highway Agencies (*After Russell et al. 2001*)

Attribute	Yes	No	Total Responding
1) Contractor Requirements			
Technician certification required	36	6	42
Contractor provides mix design	36	6	42
Contractor QC plan required	34	6	40
2) Project Resources			
Required time and cost determine testing levels	5	30	35
Staffing determines testing levels	11	31	42
Waive testing for small tonnage (<500 tons)	22	8	30
Adjust testing levels during production	10	31	41
3) Acceptance Testing			
Contractor tests used for acceptance	27	15	42
Split-samples used for verification	29	13	42
Independent samples used for verification	20	22	42
Pay adjustments	39	2	41
Dispute resolution system	33	9	42

A-5.6.2 Checklists

A checklist is defined as a tool to ensure that all important steps or actions in an operation have been taken (*Summers 1997*). A quality control checklist should be an integral part of the quality control plan. Each checklist should address key quality control checkpoints and quality problem areas specific to the process which include: stockpiling, production, and construction. For a checklist to be useful, it must be in the proper format. According to QC literature and HMA trade publications, some of the suggested checklist characteristics are as follows (*AASHTO 1991, NAPA 1997*):

- Standardized form,
- Clear and simple form to ease recording,
- Appropriate spacing for recording,
- Clear directions for correct use of the form, and
- Ample space for recording the project number and location, weather conditions, signature, date, and remarks.

A-5.6.3 Daily Diaries

In addition to QC checklist, daily job diaries are necessary for field-level implementation of a quality program. This helps to record the information on the day-to-day activities. They provide a way to record information regarding daily project conditions that enable project staff to later understand the project conditions. Daily diaries require a systematic approach to ensure that documented information can be used effectively at a later time such as forensic investigation of pavement failures, etc. (*Russell et al. 2001*). Diaries should also include items such as changes that occur during operation, different or unusual events on a project, visitors to the project, and reasons for paving delays (e.g., breakdown or weather). Diaries should be updated twice per day, usually at the middle and end of the work day. The recorded data should be detailed and include the date and location of paving, names and titles of people involved in any discussion, the topics discussed, and outcomes of the discussions (*AASHTO 1991*). The diaries should be employee-specific, and the level of detail noted should depend on an employee's duties and location.

Checklists and daily diaries provide a standardized way to document data regarding the HMA construction process. They are important for reference in cases of contractor and agency disputes, as well as follow-up research to understand pavement performance. The data recorded can then be used by project staff for the feedback that is necessary for process control and improvements during construction (*Russell et al. 2001*).

A-5.6.4 Feedback System

Feedback system is very critical to the success of the QC/QA program. Each and every project personnel, including the laborers, should be trained on the worthiness of providing feedback on any defect on the project. This will ensure that proper corrective actions are taken by decision makers before it is too late. The literature reports a feedback loop suggested by Gitlow et al. (*1997*) and presented in Figure A-5.5.

As discussed in earlier sections of this report, segregation is a huge problem that might lead to moisture damage in pavements. Russell et al. (*2001*) has illustrated this loop to HMA construction to identify the source of segregation during production. The illustration is reported from Russell et al. (*2001*) as follows. In the loop, input would be the HMA mix as it is delivered to the paver; however, the process would be laydown and the output would be the mix directly behind the paver. If segregation is detected, the feedback loop should be completed by the paving inspector who would inform the person who can adjust the input (delivered mix) and eliminate the segregation before it is delivered to the paver. It is also possible that the segregation is caused by paver stoppage, which would require informing the paver operator about the problem. Without feedbacks from personnel at laydown, mix plant, or trucking operations, there is no way of correcting the segregated mix. If feedback is used effectively, all parties involved in the quality system should have up-to-date information on defects and corrective actions. This will lead to improvements in the process, resulting in a better quality product. Improved feedback can lead to improved HMA construction, resulting in a higher quality pavement (*Russell et al. 2001*).

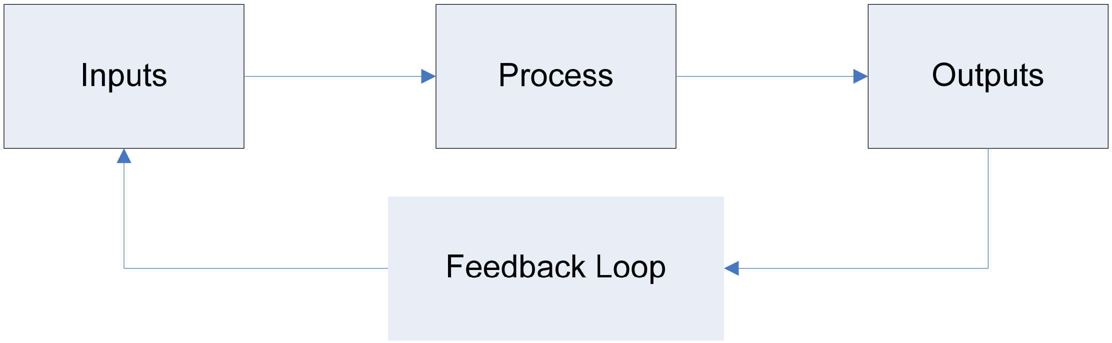

Figure A-5.5: Feedback Loop (*Gitlow et al. 1997*)

A-5.6.5 Quality Control Personnel

The authority and responsibility of each person in the quality control system is related to the skill and technical capabilities of the people involved. People in the quality control system must know their duties, responsibilities, and authority. Each individual should clearly and distinctly see how their job and responsibilities for quality control fit with the work of others at the facility. Quality control personnel should have the following qualities:

- Will be able to establish credibility with buyers once they have a good grasp of the quality control procedures and techniques,
- Must have the proper attitude towards testing, and
- The personnel need to be groomed over a long period of time through training and hands-on experience.

A-5.7 SUMMARY

An efficiently designed HMA overlay pavement will not serve its purpose if it is not constructed properly. This section discussed various materials and construction-related issues that will help prevent moisture-related pavement damage. Practices that will help HMA mixtures to resist moisture damage during the production stage were discussed in detail. This included the in-plant materials storage, production, material transportation, and unloading at the construction site. Best practices that should be followed during the paving and compaction operation were also discussed. Numerous premature pavement failures occurred due to the improper design and installation of drainage systems. Many drainage system failures have been traced to poor construction and inspection. It was found from the literatures that proper training of agency and contractor personnel on QC/QA, control of thermal segregation during material handling, proper milling of the existing surface and testing the texture of milled surface, provision of adequate drainage and preventing any damage of drainage systems during construction, were some of the best practices identified to reduce the moisture damage.

A-6.0 MATERIAL SELECTION AND TESTING BEST PRACTICES

Most HMA pavements are composed of two basic materials, aggregates and asphalt binder. In some cases anti-stripping agents might also be used to avoid stripping. Proper material selection and testing are critical to obtain a desirable HMA mix that will resist the moisture damage in pavements. Before production in the hot-mix plant, component materials are often tested to ensure that they have the same physical properties desired in the mix design (*Russell et al. 2001*). The literature was reviewed to document the best practices in material selection and testing that has been reported from previous studies.

A-6.1 AGGREGATE SELECTION AND TESTING

Aggregates compromise approximately 92 to 96% of the weight of HMA (depending to mix type). Hence, the aggregate properties are very important to the performance of flexible pavements. Often, pavement distress such as rutting, stripping, surface disintegration, and lack of adequate surface frictional resistance can be attributed directly to improper aggregate selection and use (*Kandhal et al. 1997*). Aggregate is a collective term for sand, gravel, and crushed stone, mineral materials in their natural or processed state. Rock fragments (crushed stone, sand, and gravel) which are used in their natural state are considered natural aggregates. Artificial aggregates are the manufactured aggregates or by-products of industrial processes. Examples of manufactured aggregates include blast furnace slag, steel slag, or wet bottom boiler slag. Recycled aggregates consist mainly of crushed concrete or crushed asphalt concrete reclaimed from the demolition of deteriorated concrete and asphalt roadways, respectively.

Some of the properties/characteristics of aggregates that have been reported in literature that contributed to moisture damage include (*Khosla et al. 1999; Birgisson et al. 2005; Stuart 1990; Parker 1989; Kandhal 1994*):

- Degradation of aggregate.
- High moisture contents in the mineral aggregates before mixing with the asphalt binder.
- Excessive dust coating on the aggregate can prevent thorough coating of asphalt binder on the aggregate.
- It is often observed that siliceous aggregates have slick, smooth areas, which may give rise to stripping, while roughness may help to promote bonding.
- Interlocking properties of the aggregate particles, which include individual crystal faces, porosity, angularity, absorption, and surface coating, are also believed to improve the bond strength in an asphalt mixture.
- Aggregates that impart a low pH value to water.

Aggregates have to pass a stringent series of mechanical, chemical, and physical tests in order to demonstrate that they will perform satisfactorily, and meet or exceed specifications in a HMA mixture. Several test procedures have been established by organizations such as the American Society for Testing and Materials (ASTM) standards, the American Association of State Highway and Transportation Officials (*AASHTO*), and Superpave guidelines. A study conducted by Kandhal in 1997 reported the variety of tests used by the various state highway agencies in the US. The author listed the aggregate tests for HMA as follows:

1. Particle Shape and Surface Texture (Coarse Aggregate),
2. Particle Shape and Surface Texture (Fine Aggregate),
3. Porosity or Absorption,
4. Cleanliness and Deleterious Material,
5. Toughness and Abrasion Resistance,
6. Durability and Soundness,
7. Expansive Characteristics, and
8. Polishing and Frictional Characteristics.

The various tests employed by the US state highway agencies in order to determine these properties are documented by Kandhal (*1997*). Based on the findings the author reported that the tests and specifications of the US state highway agencies indicate considerable variation. Most of the aggregates tests and/or related specifications have been developed over time and reflect local conditions and properties of available aggregate sources. Therefore, there are no standards which are acceptable on a national basis. There is a need to identify performance-related aggregate tests for HMA that can be adopted by all highway agencies.

Kandhal et al. (*1998*) conducted a study to determine the best test method for aggregates to study the presence of detrimental plastic fines in the fine aggregate, which may induce stripping in HMA mixtures. The study concluded that AASHTO TP57 (methylene blue test) is the best test for fine aggregate in determining the propensity for stripping in HMA. Therefore, the methylene blue test is recommended to indicate the presence of detrimental plastic fines which may induce stripping in HMA mixtures.

AASHTO recommended quality control testing procedure for aggregates. With regard to testing frequency, aggregate gradation tests should be conducted at a frequency at 1 test per 500 tons and fractured faces, sand equivalent, and Atterberg limits should be tested at a frequency of 1 test per 1,000 tons during plant set up (*Russell et al. 2001*). They also indicate that most state agencies in the US were testing only for the gradation and fractured faces of component aggregates. Other aggregate tests such as L.A. abrasion, deleterious materials, sand equivalent, and insoluble residue, are used by some agencies; however, these tests are not routinely used during construction.

Aggregates that are susceptible to moisture damage can be treated with anti-stripping agents to improve the moisture resistance of the HMA mixture. Some of the anti-stripping agents include portland cement, fly ash, and polymers (*Epps et al. 2003*). The most commonly-used treatment of aggregates is the addition of hydrated lime. This method has also proved to be more economical, with savings from 9% to 20% of a pavement cost (depending on functional classification) over the course of its life cycle (*Hicks and Scholz 2001*).

A-6.2 ASPHALT BINDER SELECTION AND TESTING

The most important character of asphalt that relates to stripping resistance is the viscosity of the asphalt binder in service. Several studies have documented that high viscosity asphalt cement resists displacement by water better than asphalt cements that have low viscosity *(Hicks 1991*). The AASHTO M226 specification, "Viscosity Graded Asphalt Cement," provides a standardized procedure to grade the viscosity of asphalt binders. Two fundamental tests are performed under M226, the thin film oven test and the rolling film oven test. AASHTO MP1, "Performance Graded Asphalt Binder," is a comprehensive Superpave specification that details the performance-based grading tests on the asphalt binder.

Similar to aggregates, asphalt binders can also be treated with anti-stripping agents to improve the moisture resistance of the HMA mixture. The two most common types of anti-stripping agents include liquid anti-stripping agents (or adhesion agents) and polymers. A detailed discussion on the method of addition is noted in the later part of this report.

A-6.3 ANTI-STRIPPING AGENTS

In order to reduce pavement damage related to stripping, additives are generally used by many agencies to decrease the moisture susceptibility. These additives are referred as anti-stripping agents. If a HMA mix is inherently prone to stripping based on the results of the methodological investigations and moisture susceptibility tests, then anti-stripping agents are warranted (*Kandhal 1992*). Tunnicliff and Root (*1984*) defined anti-stripping additives as substances that convert the aggregates surface to one that is more easily wetted with asphalt and water. Liquid anti-stripping agents and lime additives are among the most commonly used anti-stripping agents.

Anti-stripping agents have been widely accepted among the various state highway agencies in the US. A survey was conducted by Aschenbrener (*2002*) to identify the current practice of anti-stripping agent usage among highway agencies. The author reported that of the 55 agencies (50 state departments of transportation, 3 FHWA Federal Land offices, the District of Columbia, and 1 Canadian province) surveyed, 25 respondents use a liquid anti-stripping agent, 13 use hydrated lime, seven use either a liquid or hydrated lime, and 10 reported that they did not use any treatment for moisture damage problems in HMA pavements (Table A-6.1). This survey gives a clear idea on the prevalence of anti-stripping agents among the state highway agencies.

Table A-6.1: Use of Anti-stripping Agents among US State Highway Agencies (*After Aschenbrener 2002*)

State	Liquid	Lime	None
Alabama	X		
Alaska	X		
Arizona		X	
Arkansas	X		
California	X	X	
Colorado		X	
Connecticut			X
District of Columbia	X	X	
Delaware			X
Florida	X	X	
Georgia		X	
Hawaii			X
Idaho	X		
Illinois	X		
Indiana	X		
Iowa	X		
Kansas	X		
Kentucky	X		
Louisiana	X		
Maine			X
Maryland	X		
Massachusetts			X
Michigan	X		
Minnesota	X		
Mississippi		X	
Missouri	X		
Montana		X	
Nebraska	X		
Nevada		X	
New Hampshire			X
New Jersey			X
New Mexico		X	
New York	X		
North Carolina	X	X	
North Dakota			X
Ohio			X
Oklahoma	X		
Oregon	X	X	
Pennsylvania	X		
Rhode Island	X		
South Carolina		X	
South Dakota		X	
Tennessee	X		
Texas	X	X	
Utah		X	
Vermont	X		
Virginia	X		
Washington	X		
West Virginia			X
Wisconsin	X		
Wyoming		X	
Total	30	17	10

In spite of its great moisture resistance property, Tunnicliff and Root (*1984*) noted that if an anti-stripping agent is used when it is not needed or if it is used incorrectly, adverse affects may occur. Such adverse affects will lead to an increased economic cost as well as early maintenance and/or rehabilitation. The two types of anti-stripping agents are discussed below.

A-6.3.1 Liquid Anti-Stripping Agents

Liquid anti-stripping agents are chemical compounds that contain amines. When they are mixed with an asphalt binder, reduce the surface tension and, therefore, promote increased adhesion to aggregate (*Tunnicliff and Root 1984*). Anti-stripping agents give the asphalt binder an electrical charge that is opposite to that of the aggregate surface (*Hicks 1991*). The majority of the liquid anti-stripping agents are classified as being 'heat stable', which means, they should not lose their effectiveness when the modified asphalt binder is stored even at high temperature for prolonged periods (*Hicks 1991*).

Liquid anti-stripping agents can be added to HMA in two ways. The simplest and the most economical way is to mix the additive into the asphalt binder in a liquid state and then mix the modified asphalt binder with aggregate. One major limitation with this method is that only a portion of the anti-strip agent reaches the aggregate-asphalt binder interface (*Hicks 1991*). The other method is to apply the anti-stripping agent directly to the aggregate surface. This method has been proved to be the most efficient method, however, a uniform dispersion is not possible because very small amounts of anti-strip agents (for example, 0.5 percent by weight of asphalt binder) are normally used, and the HMA mix contains a substantial amount of fines (*Hicks 1991*).

A-6.3.2 Lime Additive

Lime has been used as an anti-stripping agent in HMA mixtures for decade. Three forms of lime was reported in the literature (*Roberts et al. 1996)*: 1) hydrated lime ($Ca\ (OH)_2$), 2) quick lime (CaO), and 3) dolomitic limes (both types S and N). Hydrated lime is the most common type of lime used as anti-stripping agent. Hydrated lime produces a sharp decrease in the interfacial tension between the asphalt binder and water which results in good adhesion between the binder and the aggregate (*Hicks 1991*). Further, hydrated lime interacts with carboxylic acids in the asphalt binder which forms an insoluble product that is readily adsorbed onto the aggregate surface (*Plancher et al. 1977*).

The anti-stripping mechanism of lime is not well understood. Various mechanisms have been postulated (*Stuart 1990*): 1) lime interacts with acids in the asphalt binder that are readily adsorbed onto the aggregate surface; 2) lime provides calcium ions which can replace hydrogen, sodium, potassium and other cations on the aggregate surface; and 3) lime reacts with most siliceous aggregates to form a calcium silicate crust which has a strong bond to the aggregate and has sufficient porosity to allow penetration of the asphalt binder to form a strong bond.

Research has indicated that the amount of hydrated lime needed to reduce the moisture sensitivity of hot-mix asphalt is in the order of 1% to 1.5% by dry weight of aggregates. Finer aggregates may require higher percentages of lime because of increased aggregate surface area (*Kandhal 1992*).

Aggregates have been treated with lime by the following four methods (*Hicks 1991*):

1. Dry hydrated lime: The addition of dry lime to aggregates is the simplest method. However, the main problem with using dry lime is maintaining its coating on the aggregate surface until it is coated with asphalt binder. It is more critical in drum mixers, which tend to pick up some of the lime in the exhaust gas flow. However, Georgia DOT has successfully instituted the use of dry, hydrated lime in drum mixers by injecting lime into the drum just ahead of the asphalt binder. The pick-up of lime by the gas stream is prevented by modifications of the flights and providing suitable baffles inside the drum (*Kennedy 1984*). Some asphalt-paving technologists believe that the use of dry lime is not consistently effective, although many agencies including Georgia DOT report satisfactory results with dry lime.
2. Hydrated lime slurry: The addition of hydrated lime slurry to the aggregate arguably provides the best aggregate coating of all the methods. This method requires additional water to be added to the aggregates. The water must be removed by drying the aggregates which results in increased fuel cost and reduced HMA production rates.
3. Dry, hydrated lime to wet aggregates: In this method dry, hydrated lime is added to wet aggregate, usually containing 3-5 percent water, and then mixed in a pugmill or tumble mixer to obtain a homogenous mix
4. Hot (quicklime) slurry: The use of quicklime (CaO) slurry has at least two advantages: 1) its cost is equal to that of hydrated lime, but when slaked, the yield is 25 percent greater; and 2) the heat from slaking results in an elevated temperature which helps in the evaporation of the added moisture. However, quicklime should be handled with caution because it can cause skin burns.

The lime slurry marination (LSM): This method utilizes a slurry mixture of lime and water that is applied at a metered rate to the aggregate, insuring superior coverage of the stone surfaces. The aggregate is then marinated in stockpile for some period of time, allowing the lime to react with the aggregate (*NLA 2006*). Typically, there is a minimum time limit for this procedure and a maximum time limit after which the stockpile is deemed to be unsatisfactory for use in the product. Nevada DOT requires stockpiles to marinate for at least 48 hours and the marinated aggregates should be used within 45 days.

According to Epps et al. (*2003*), marination of aggregates after treatment with lime is frequently used in a number of western states. Several research studies have shown that there are some degrees of benefit as a result of marination after lime addition (*Betenson 1998; Button and Epps 1983; Little 1994*). It can also depend on the type of aggregate being used (*Epps et al. 2003*).

The relative effectiveness of the preceding treatments based on comparative laboratory and field studies have been generally inconclusive. Further they increase the fuel and equipment costs and decrease the HMA production rate (*Kandhal 1992*).

Numerous research studies have been conducted in the past to evaluate the effectiveness of anti-stripping agents on HMA moisture susceptibility. Liquid anti-strip agents and hydrated lime are presently the most common types of anti-strip agents used in the United States. Some of the major studies on anti-stripping agents include Anderson et al. (*1982*), Edler et al. (*1985*), Ho (*1988*), Anagnos (*1990*), Hicks (*1991*), Maupin (*1995*), Sebaaly et al. (*1997*), and Lavin (*1999*).

The findings from various research studies referenced above have mixed opinions on which anti-stripping agent was better, either liquid or lime anti-stripping agents. For instance, Aschenbrener and McGennis (*1994*) reported that neither lime nor anti-stripping agents are a panacea for moisture damage. In contrast Maupin (*1997*) noted that hydrated lime and liquid anti-strip additives performed on an equal level. A common finding is that, both liquid anti-strip agents and hydrated lime can reduce the moisture sensitivity of HMA. The magnitude of improvement offered by these anti-strip chemicals as illustrated by laboratory tests depends on the laboratory test method used to evaluate moisture sensitivity as well as the asphalt binder source, aggregate type, anti-strip concentration, and other aspects (*Epps et al. 2003*).

A-6.3.3 Moisture Susceptibility Testing

Laboratory tests are commonly used to determine the effectiveness of different types of anti-strip treatments. Aschenbrener (*2002*) reported based on a survey, that majority (44 respondents) of the highway agencies conducted test(s) for moisture susceptibility. The most common test was the indirect tensile test (AASHTO T283, ASTM D4867, etc.), five agencies used a compressive test (AASHTO T165), two performed retained a stability test, and two used both a wheel tracking and indirect tensile test. The timing of the test was also reported. Thirty agencies conducted the tests only during the mix design process and eighteen performed the tests both during the mix design process and during field acceptance. The study findings are reported (*Aschenbrener 2002*) in Table A-6.2.

Table A-6.2: Moisture Susceptibility Testing Practices among US State Highway Agencies (*Aschenbrener 2002*)

State	Moisture Susceptibility Test	Type of Test	Stage of Testing
Alabama	Yes	Tensile (AASHTO T283)	Mix design /Acceptance
Alaska	Yes	Compressive	Mix design
Arizona	Yes	Compressive	Mix design
Arkansas	Yes	Stability	Mix design
California	No		
Colorado	Yes	Tensile (Modified AASHTO T283)	Mix design /Acceptance
Connecticut	Yes (Superpave mix only)	AASHTO T283	Mix design /Acceptance
District of Columbia	Yes	Tensile (ASTM D4867)	Mix design
Delaware	Yes	Tensile (AASHTO T283)	Mix design
Florida	Yes	Tensile (Modified AASHTO T283)	Mix design
Georgia	Yes	Tensile (Modified Lottman test, GDT-66)	Mix design /Acceptance
Hawaii	No		
Idaho	Yes	Compressive (AASHTO T165)	Mix design
Illinois	Yes	Tensile (Modified AASHTO T283)	Mix design
Indiana	Yes	Tensile (AASHTO T283)	Mix design
Iowa	Yes	Tensile (AASHTO T283)	Mix design /Acceptance
Kansas	Yes	Tensile (Modified AASHTO T283)	Mix design /Acceptance
Kentucky	Yes	Tensile (Modified version of ASTM D4867)	Mix design
Louisiana	Yes	Tensile (Modified AASHTO T283)	Mix design
Maine	No		
Maryland	Yes	Tensile (ASTM D4867)	Mix design / Acceptance
Massachusetts	No		
Michigan	Yes	Tensile (AASHTO T283 or ASTM D4867 – contractor choice)	Mix design / Acceptance
Minnesota	Yes	Tensile (version of ASTM D4867)	Mix design / Acceptance
Mississippi	Yes	Tensile (Modified AASHTO T283)	Mix design / Acceptance
Missouri	Yes	Tensile (AASHTO T283)	Mix design
Montana	Yes	Tensile (Modified AASHTO T283)	Mix design
Nebraska	Yes	Tensile (AASHTO T283)	Mix design / Acceptance
Nevada	Yes	Tensile (Modified AASHTO T283 with freeze-thaw cycle)	Mix design / Acceptance

New Hampshire	No		X
New Jersey	Yes	Tensile (AASHTO T283)	Mix design
New Mexico	Yes	Compressive (AASHTO T165)	Mix design
New York	Yes (not routine)	Tensile (AASHTO T283)	Mix design
North Carolina	Yes	Tensile (Modified AASHTO T283 with no freeze-thaw cycle)	Mix design / Acceptance
North Dakota	Yes	Tensile (Modified Lottman)	Mix design
Ohio	Yes	Tensile (AASHTO T283 with some modifications in air voids and saturation)	Mix design
Oklahoma	Yes	Tensile (OH L-36, similar to AASHTO T283)	Mix design / Acceptance
Oregon	Yes	Tensile (Modified AASHTO T283)	Mix design / Acceptance
Pennsylvania	Yes	Tensile (Modified AASHTO T283)	Mix Design
Rhode Island	No		
South Carolina	Yes	Tensile (Modified AASHTO T283)	Mix Design
South Dakota	Yes	Tensile (ASTM D486 for Marshall designs and AASHTO T283 for Superpave)	Mix Design
Tennessee	Yes	Tensile (version of AASHTO T283)	Mix design / Acceptance
Texas	Yes	Tensile/Hamburg (modified of AASHTO T283)	Mix design / Acceptance
Utah	Yes	Tensile/Hamburg (AASHTO T283)	Mix Design
Vermont	Yes (only on new aggregates and all Superpave design)	Tensile (AASHTO T283)	Mix Design
Virginia	Yes	Tensile (AASHTO T283)	Mix Design
Washington	Yes	Tensile (Modified Lottman)	Mix Design
West Virginia	No		
Wisconsin	Yes	Tensile (ASTM D4867)	Mix Design
Wyoming	Yes	Tensile (Modified AASHTO T283 with freeze-thaw cycle)	

A-6.4 MATERIAL SPECIFICATIONS

St. Martin et al. (*2003*) reported some of the material specifications that result in the resistance of moisture sensitivity. Some of the material specifications reported in this section include those from California Department of Transportation (Caltrans), Nevada Department of Transportation, Texas Department of Transportation, and Utah Department of Transportation.

A-6.4.1 Caltrans

Caltrans has specifications for:

- Modified liquid anti-strip additives,
- New dry lime on wet aggregate, and
- Modified lime slurry marination (LSM).

A-6.4.2 Nevada Department of Transportation (NDOT)

Nevada has an extensive specification for moisture sensitivity since the mid-1980s. The specifications cover mix design and construction activities. The following are the summary of major points in NDOTs moisture sensitivity specifications:

- *Mix design*: Moisture sensitivity testing is required as part of the Hveem mix design procedure. The modified Lottman procedure is used with one freeze-thaw cycle. The retained strength ratio is defined as the ratio of the unconditioned indirect tensile strength to the conditioned indirect tensile strength. Minimum values of the unconditioned indirect tensile strength of 65 psi and a minimum retained strength ratio of 70% are required.
- *Field mixtures*: Field mixtures are sampled from behind the paver every 10,000 tons or twice a week and evaluated through the modified Lottman procedure with one freeze-thaw cycle. Minimum values of the unconditioned indirect tensile strength of 65 psi and a minimum retained strength ratio of 70% are required.
- *Construction practice:* Currently, 48 hours of marinating is required for all aggregate sources throughout the state. Percent moisture for marination is 3% above the saturated surface dry condition. Marinated aggregates can be stockpiled for a maximum period of 60 days.

A-6.4.3 Texas Department of Transportation (TxDOT)

Material specifications adopted by TxDOT as reported in Martin et al. (*2003*) is presented here. Anti-stripping treatment was required for mixtures with TSR values less than 0.60 or uncoated aggregate surface after boiling greater than 20%. Marginal mixtures were defined as those with TSR values between 0.60 and 0.80 or 10% to 20% uncoated aggregate surface after boiling. Treatment of these mixtures was also recommended.

In-place density specifications are also an important part of TxDOTs efforts to preclude moisture sensitive HMA mixtures (*TxDOT 2002*). If moisture sensitivity is a concern, lime or liquid anti-stripping agents can be added and a wet-dry TSR testing with a minimum TSR of 0.80 and a minimum wet tensile strength of 70 psi is expected (Table A-6.3). The new TxDOT specifications now use Hamburg Wheel Tracking Device (HWTD) testing at 50°C during mix design and production. This test replaces previous moisture sensitivity and rutting testing. The requirements shown in Table A-6.4 vary by binder grade (*TxDOT 2003*).

Table A-6.3: Old TxDOT Guidelines for Moisture Sensitive HMA Mixtures Using Wet – Dry TSR and Boil Criteria (*O'Connor 1984*)

Stripping Potential of Mix	Boiling Test	Lottman Test
	Uncoated Aggregate Surface	Ratio of Condition to Dry Strength
Nonstripping	< 10%	> 0.80
Marginal Mix	10 to 20%	0.60 to 0.80
Stripping Susceptible	> 20%	< 0.60

Table A-6.4: New TxDOT Specifications for Moisture Sensitive HMA Mixtures Using HWTD Criteria (*TXDOT 2003*)

High Temperature PG Binder Grade	Minimum No. of HWTD Passes at 50°C to 0.5 inch Rut Depth
PG 64	10,000
PG 70	15,000
> PG 76	20,000

A-6.5 SUMMARY

Proper material selection and testing are critical in obtaining a desirable HMA mix that can satisfactorily resist moisture damage. This section reported the findings of the literature review to document the best practices of material selection and testing procedures reported from previous studies. Aggregate and asphalt binder properties that will help to resist moisture damage were discussed in detail and included the use of clean and sound aggregates and use of high viscosity asphalt binders. It was found that HMA mixes that are inherently prone to stripping can be improved by the addition of anti-stripping agents. The most commonly used anti-stripping agent was found to be liquid anti-stripping agents. The specifications to prevent moisture damage that were used by different state highway agencies were also explained in this section.

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APPENDIX B: MAINTENANCE PERSONNEL INTERVIEW QUESTIONNAIRE

MAINTENANCE PERSONNEL INTERVIEW QUESTIONNAIRE

Date: _____________

ODOT District: _________________ ODOT Region: ______________________
Project Name/ID: ____
Project Location (MP): From: _________________ To: ____________________

I. Existing Pavement Conditions

1. How old was the existing pavement surface?
2. How close was it to its design life?
3. How many overlays has the pavement had before?
4. Was a detailed pavement surface evaluation conducted prior to beginning work on the pavement? If yes, who was responsible for the survey (ODOT designer, contractor, etc)?
5. What were the findings of the survey?
6. Were there any considerable distresses on the pavement surface? If yes, what kind of distresses were they?
7. Did you notice any moisture-related damage on the surface? Was there any evidence of “rutting” or “stripping”? If yes, how severe was it?
8. Was effort made to identify the causes of distress? If yes, what was the methodology employed?
9. Did the design engineer perform any core sampling? Was there any stripping visible in the cores?
10. What were the findings of the testing?
11. Was any kind of repair method recommended to mitigate the distresses which may have affected the overlay constructed over it? If yes, what kinds of pavement repairs were performed?
12. Did you check the quality of repair work?
13. What was the overall condition of the shoulders? Please rate them and provide your comments?

    Good Fair Poor
14. If Fair/Poor, were any kind of measures taken to rectify it?
15. Was a detailed drainage condition survey conducted prior to starting to work (milling/overlay) on the pavement? If yes, what were the findings of the survey?
16. Did you find any visible evidence of drainage malfunction? 1. Surface, 2. Base and 3. Subsurface drainage conditions?
17. What were the condition of the drainage inlets and outlets (if present)?

    Good Fair Poor
18. Did the construction overlay require additional drainage capacity for the pavement? If yes, was it added to the pavement?
19. What was the normal weather like before, during, and after the overlay?
20. What was the traffic volume and loading on the existing pavement?

    Average Annual Daily Traffic _____________
    Level of truck traffic___________________
    % of trucks ___________________________
21. Any other comment on the condition of the existing surface before milling was started?

II. Milling of Existing Pavement

1. When was the milling performed?
   Date:
   Time range:
2. What were the weather conditions during the milling operations? (please describe)
3. How was the milling depth determined?
4. What was the process used to mill the pavement?
5. What type of equipment used to mill the pavement?
6. Was the surface cleaned properly after milling?
7. How was it cleaned? Was it washed? If so, was it given sufficient time to dry before overlay?
8. Was the milled surface opened to traffic before receiving the HMA overlay? If so, what was the volume of traffic?
9. Was the milled surface experience any exposure to rain? If so, how long was it exposed to rain?
10. Was there any kind of distress (e.g. stripping) noticed on the milled surface?
11. What kind of drainage system exists in the pavement structure?
12. Was there any kind of damage to the existing drainage during the milling process?
13. Was there any addition of drainage systems to the pavements?

III. Paving Operations

1. When was the paving operations performed?
   Dates:
   Time range:
2. Were there delays prior to placement of overlay? Was the mix temperature monitored?
3. Was the mixture tested before being placed on the milled surface? What tests were performed and who performed the testing? ODOT or GC or Both? (please describe)
4. Did the mixture contain recycled HMA used? Do know what mix design method was used for this purpose?
5. What mix type was used for the overlay?
6. Did the HMA mix meet specs? What was the sampling location (trucks/mat/windrow)?
7. How frequent was the sampling done?
8. Was a tack coat applied prior to placing the overlay? Type of emulsion? Application rate?
9. Was there any usage of geo textiles?
10. How was the weather during paving? Was there any rain during paving operations?
11. If rain, what action was taken? How long was the delay due to rain?

IV. Compaction

1. What time of the day the compaction was performed?
   Date:
   Time range:
2. What was the min and max temperature during construction?
3. What was the min and max temperature after construction?
4. What type of rollers was used for compaction?
5. Did you notice any signs of over rolling that caused aggregates to break?
6. Was the compacted mixture tested fort in-place density? Records?

7. What kind of sampling method used (cores, nuclear gauge)? What was the frequency and size (e.g. 1 per 2500 feet)? Please also mention if testing done based on quantity?
8. What was the sequence of construction? Was the road opened to traffic immediately after being overlaid?
9. Was there any precipitation/rainfall after or during construction?
10. What was the designed air void? Was it achieved?
11. Was there any sudden rise or drop in temperature during or after construction?

V. Quality Control/Assurance

1. Was there a quality control program in place for the project?
2. Did the contractor require any kind of certification?
3. Did the GC workers receive proper training on QC/QA?
4. Did the inspectors follow any checklist for QC/QA?
5. Was there any daily diary used?
6. Did the production plant require any kind of certification?
7. Was the smoothness tested on the finished pavement surface? What was the frequency?
8. What sampling method was used?

VI. Maintenance

1. What type of maintenance performed on the constructed roadway over the time period (time overlaid till now)?
2. What was the amount of work done on the pavement (please describe)?
3. When the distress was first noted? What kind of distress (please describe)?
4. What action was taken to rectify it?
5. What kind of testing was done to identify the causes of the distress?
6. What was the condition of the drainage system?
7. What do you think are the probable causes of distress?
8. How do you think moisture might have entered the pavement?
9. Was the rainfall higher compared to normal conditions?
10. Was there any increase in traffic compared to the design traffic?

APPENDIX C: PERSONNEL INTERVIEWS

C-1.0 MAINTENANCE PERSONNEL INTERVIEWS

C-1.1 PLEASANT VALLEY-DURKEE

ODOT maintenance personnel were interviewed at the ODOT Baker City maintenance office on May 4, 2006. The interviewee was Mr. Brad Payton, the maintenance manager for Baker City. Questions were targeted at identifying the factors that might have caused the distress observed in the project locations.

It was found that this part of the interstate was built in late 60s to early 90s. Responding to the question on the distress history, the respondent noted that there wasn't any cracking observed in this project. Starting 1992 to 1999, the outside lane started to exhibit rutting. These ruts were periodically repaired by the ODOT maintenance personnel. After 1999, pot holes became a major issue in the project.

The topography of the area was mostly hillside and there was no surface drainage provided. The recent maintenance work on the project was done in June 2005. At that time the distressed areas were patched. The patched portions failed immediately and the maintenance work was carried out again in August 2005. The distresses have increased ever since. According to the respondent, pot holes were a major concern in the project compared to rutting.

Addressing the drainage issue, it was found that the drains were properly maintained and cleaned every year. Answers to most questions were directed to the Salem office.

C-1.2 COTTAGE GROVE-MARTIN CREEK

The maintenance manager for the Cottage Grove project was Ms. Ramona Cline. The questionnaire was sent to her electronically, which was found to be more convenient compared to a personal interview. A completed questionnaire was received from the manager and the summary of responses is reported in this section.

It was found that the project was overlaid twice since its construction in 1962. The distresses found on the project prior to rehabilitation were rutting, potholes, and fatigue cracking. The respondent confirmed that the rutting was related to moisture damage. Based on the response, the condition of the shoulders and drainage prior to rehabilitation was found to be 'Fair' and additional drains were added as part of the overlay near bridges.

The respondent noted that the pavements were milled in September 1997 and April of 1998. The weather during the milling was similar to the paving conditions. The method of pavement milling was cold plane pavement removal with a self-propelled milling machine that had two full sized mills running in tandem. The respondent also noted that the milled surface was properly cleaned with power brooms. It was found that the milled surface was not open to traffic nor exposed to rain. In regards to distresses witnessed on the milled surface, the respondent answered that none were witnessed. No stripping was found on the milled surface.

The respondent noted that the paving of the project fell under two seasons. The first season was dry before the project and was wet immediately after the completion of the project; the second season was dry throughout. There was no delay during the paving operations, with proper monitoring of the mix temperature. A 2-inch F-mix was used for the overlay in this project. The mixture was tested both by ODOT and the contractor. According to the respondent the mix also contained recycled HMA. The respondent noted that the HMA mix sampled at the plant during production met the specifications. The frequency of sampling was not known. A tack coat was applied prior to overlay and no geo-textiles were used in the project. On one of the nights during the paving, there was rain and the paving was shut down. The shutdown continued until the next shift. Heavy rain was recorded in the month of October. Similar to Vets Bridge project, paving was done during the night time due to traffic lane closure restrictions. The temperature during and after paving operations was not known to the respondent. The respondent also pointed out that there was not breakage of aggregates during compaction.

The respondent noted that after construction there were numerous distresses noticed on the project. The ODOT maintenance crew performed hand patching, inlay repair, concrete patching, and also installed three perforated pipes. According to the respondent the primary cause of distress was ‘underground springs’.

C-1.3 ANLAUF-ELKHEAD ROAD

Several attempts were made to interview the maintenance personnel knowledgeable about this project. However, due to the heavy work load of the personnel contacted, responses were not received.

C-1.4 GARDEN VALLEY-ROBERTS CREEK

ODOT maintenance personnel interviews were conducted at the Region 3 office on February 23, 2006. The respondents included: Darren Nenvoll, Mel Dunlap, and Andrew Clark of ODOT. Questions were targeted at identifying the factors that might have caused the distress observed in the project. The questionnaire developed as a part of this study was used as a major guideline during the interview process.

Information on the existing pavement prior to overlay was requested. It was found that the original thickness of the existing pavement that was milled was roughly 8 to 9 inches. The existing HMA surface consisted of B-mix. Responding to whether there was any addition to the existing drainage systems, they noted that the drainage inlets were replaced prior to the rehabilitation of the project. Other information regarding the history the original pavement was referred to the pavement design team at the ODOT Salem office.

Milling of existing pavement surface is one of the important factors that can lead to moisture damage in overlaid pavements. The existing pavement was milled to a depth of 50 mm and replaced with 19 mm open-graded HMA mix. Information on how the milling depth was determined was not available during the interview. It was found that the existing HMA surface was milled with a 7.5 foot roto-mill similar to one used for the Vets Bridge project. Brooms were used to clean up the milled surface. The respondents noted that the milled B-mix surface was opened to traffic for approximately one year before receiving the HMA overlay. Based on this comment it is obvious that the milled surface would have been exposed to rain for a long time.

Most questions on the paving operations were referred to the construction division, similar to the Vets Bridge project. The researchers were advised to request construction daily reports to gather more information on the construction. The paving operations were carried out during the night.

The project used PBA-5 for the B-mix and PBA-6 for the F-mix, using McCall and Chevron asphalt cement respectively. The project did not use lime or other additives to prevent stripping of the mix. The mixes did not have recycled aggregates in the overlay, and only natural aggregates were used.

ODOT personnel had tested the mix used in the project with the help of Asphalt Pavement Analyzer and the results showed an average rut depth of just over 3 mm. Since the value is below the maximum limit criteria for rut depth, this mix was classified as rut resistant when placed at or close to the job mix formula.

Information regarding the Quality Control (QC) and Quality Assurance (QA) of the project during construction was requested through a series of questions. The project required the QC testing performed by the contractor and QA testing performed by the ODOT personnel at 100 % frequency. In terms of frequency of testing, it was 1 sample per sub-lot for QC and one per ten sub-lots for QA (sub-lot: 1000 tons). It was found that the project had the application of a tack coat prior to overlay placement. The emulsion type used for the tack coat application was CSS-1.

Specification requirements during the compaction process were sought from the respondents. The specification for this project was governed by the old 1996 yellow book standards. No density specification was followed for the F-mix, and only roller specification was allowed. In the case of compaction, a minimum of four roller passes on the F-mix, or until all roller marks are eliminated, was applied. No vibratory roller was allowed on the open-graded mix as per the specification.

The type of aggregate used in the project was South Umpqua gravel. The respondents ruled out any chances of breakage of aggregates, because they asserted that they were “good, hard rocks”. They also mentioned that these aggregates had problems of stripping under old mix design method.

Suspicion of drainage failure during construction that could have influenced moisture damage was ruled out by the ODOT personnel. The newly-replaced drainage inlets were checked following construction.

The ODOT maintenance personnel had conducted trenching operations at several locations after the formation of distress and the results were requested by the researchers for further analysis. The ODOT region 3 office performed trenching operations in August, 2003. The distress witnessed by the investigation team included localized areas of rutting and shoving in HMA layers. During that time they found only one failure location in northbound lanes compared with several in the southbound lanes of the project. Two trenches were cut around MP 123 for detailed investigation of the problem.

The first trench was cut in the outside wheelpath approximately 3 feet from the end of the bridge-end panel along the fog stripe (Figure C-1.1). ODOT personnel reported that an area of unstable HMA at about 3.5 to 4 inches below the surface was observed (Figure C-1.2). It was concluded that the mix was stripping, as evident from the pictures (Figure C-1.3 and C-1,4) that showed a dry mix consisting of mostly uncoated aggregates. The investigation team was unable to distinguish the layer to which the uncoated aggregates belonged. This was due to the fact that the trenching was performed using a backhoe. The sides of the trench clearly showed a layer of stripping in the wheelpath (Figure C-1.4).

Figure C-1.1: First Trench Cut in an Area of Observed Distress

Figure C-1.2: Unstable Mix from the Trench

Figure C-1.3: Aggregates Removed From the Trench Showed Signs of Stripping

Figure C-1.4: Sides of Trench Showing Evidence of Stripping

The second trench was cut in an area that did not experience any failure. The material was in much better condition, did not show much stripping, and the stripping had not progressed to the same extent as the previous area (Figures C-1.5 and C-1.6).

Figure C-1.5: HMA Layer Trenching With Back Hoe in Second Trench

Figure C-1.6: Picture of the Sides of the Second Trench

The ODOT personnel reported that as stripping progressed, the loose asphalt binder might have moved up through the pavement and appeared on the surface as flushing. This condition was usually followed by small pot holes. Further, they added that “none of the problematic areas in the section are showing classic signs of stripping as described above”. They suspected during the time of investigation that the loose asphalt binder was filling up the voids in the open-graded HMA and had yet to migrate to the surface. They concluded that with the excessive oil and hot temperatures in the summer months, the pavement experienced rutting and shoving in these localized areas.

C-1.5 VETS BRIDGE-MYRTLE CREEK

ODOT maintenance personnel interviews were conducted at the Region 3 office on February 23, 2006. The respondents included Darren Neavoll, Mel Dunlap, and Andrew Clark of ODOT. Questions were targeted at identifying the factors that might have caused the observed distresses in the Vets Bridge-Myrtle Creek project. The questionnaire was used as a guideline during the personnel interview process.

Information on the existing pavement prior to overlay was requested. It was found that the original thickness of the existing pavement that was milled in the Vets Bridge project was roughly 8 to 9 inches. The existing HMA surface consisted of B-mix. It was known from the interview that the drainage inlets were replaced prior to the rehabilitation of the project. Other information regarding the history of the original pavement was referred to the pavement design team in the Salem office.

Milling of the existing pavement surface could be one of the important factors for moisture damage in overlaid pavements. The existing pavement was milled to a depth of 75 mm and replaced with a 19 mm open-graded HMA mix. Information on how the milling depth was determined was not available during the interview. It was found that the existing HMA surface was milled using a 7.5 foot roto-mill. The respondents mentioned that brooms were predominately used to clean the milled surface. Sufficient time was allowed for any moisture to dry before placing the tack coat. The respondents noted that the milled surface was not opened to traffic before receiving the HMA overlay. On this response, it should be noted that the respondents were not fully confident about the authenticity of the above statement. Further, they added that the milled surface might be opened to traffic for some time, but did not know the duration the surface may have been opened to traffic. The respondents indicated that the milled surface had most likely not been exposed to rain. They indicated that the weather was good during the milling and construction operations as these occurred during the summer.

It should be noted that most of the questions posed during the interview were deferred to the Salem office. The researchers were advised to request construction daily reports to gather more information on the construction process. The paving operations were carried out at night. The project was one of the early ODOT projects that used night time operations to avoid disturbance to the heavy day time traffic. Efforts were made by the researchers to correlate any influence on the night time operations to the pavement damage. The respondents did not see night time operations influencing the pavement damage observed. Further they added that there was a 45 minute delay during paving due to the paver break down. This happened during the paving of the northbound section of the project. It was noted however that, during the paving process, one

HMA dump truck was dripping asphalt binder on the mat. As a result, the entire mat subjected to the dripping had to be removed and replaced.

The Vets Bridge-Myrtle Creek project used neat asphalt 70-28 in the F-mix and 70-22 in the B-mix, from McCall oil. The project did not use lime or other additives to prevent stripping of the mix.. Further, the mixes did not have recycled aggregates in the overlay and only natural aggregates were used.

Information from past records from the ODOT personnel revealed that the asphalt content in the open graded mix was 6.0%. The mix did not show any signs of asphalt drain down at all, no signs of slumping in the truck, or pooling at the ends of the gates. At the paver the mix still showed no signs of excess asphalt but looked very good with a nice thick asphalt film coating on the aggregate.

One of the ODOT personnel noted that the dump truck driver on this project was relatively inexperienced and the driver was dumping the truck loads in front of the paver and had trouble feeding a consistent flow of mix to the paver due to inexperience. Below is an excerpt from his statement: “While I was there I saw trucks backing into the paver without direction striking the pickup machine, I saw the wind row too big and over lapped overfilling the paver forcing the hopper to overflow and spill mix off the side of the hopper leaving significant rows of spillage in front of the screed extensions. These are things that cause operations to slow down on the road and segregation to occur leaving the potential for long term performance problems”.

Information regarding the Quality Control (QC)/Quality Assurance (QA) of the project during construction was requested through a series of questions. The project required the QC testing performed by the contractor and QA testing performed by the ODOT personnel at 100% frequency. In terms of frequency of testing, 1 sample per sub-lot for QC and one per ten sub-lots for QA (sub-lot: 1000 tons) was followed throughout the project. It was found that the project had the application of a tack coat prior to overlay placement. The emulsion type used for the tack coat was CSS-1.

Specification requirements during the compaction process were sought from the respondents. The specification for this project was governed by the old 1996 yellow book standards. No density specification was followed for the F-mix, and only roller specification was allowed. In the case of compaction efforts, a minimum of four roller passes on the F-mix, or until all roller marks are eliminated was followed at the project. No vibratory rollers were allowed on the open-graded mix as per the specification. In case of sampling method, nuclear gauges were not used on the open-graded mix.

The type of aggregate used in the project was South Umpqua river gravel. The respondents ruled out any chances of breakage of aggregates, because they asserted that they were “good, hard rocks.” They also mentioned that these aggregates had problems of stripping under the old mix design method. Suspicion of drainage failure during construction, influencing moisture damage, was ruled out by the ODOT personnel. The newly-replaced drainage inlets were checked following construction.

The ODOT maintenance personnel had conducted trenching operations at several locations after the formation of distress at several locations of the project. The researchers requested for the results of those tests. The ODOT personnel observed stripping in the new 19 mm open-graded HMA and also in the material underlying the new layer. Documentation of the tests conducted on this project was not readily available for further review.

APPENDIX D: INITIAL SITE VISITS

D-1.0 SITE VISITS

The results of visual examination of the pavement conditions, assessed during the initial site visits to the projects are summarized in this section. Qualitative descriptions of the different types of distress witnessed in the projects are presented for all projects. Observed distresses are documented with photographs from the project sites.

D-1.1 PLEASANT VALLEY-DURKEE

A windshield survey was performed on the Pleasant Valley-Durkee project between MP 317.5 and MP 327.3 on May 4, 2006.

Eastbound Direction: The eastbound lanes were in good condition for about three miles and only one pothole was observed. The pavement condition became poorer just east of MP 323 near the underpass approximately at MP 323.5. Water was seen coming out of the construction joints at isolated locations as shown in Figure D-1.1 and D-1.2 and the water had a greenish brown color as shown in Figure D-1.3. Rutting was also noticed in some locations. Several patches were noticed east of MP 323.5 throughout the remainder of the project. Several of the patches exhibited severe distress as shown in Figure D-1.4. Drains close to the patch were clogged and appeared to be non-functional.

Figure D-1.1: Water Coming Out Of the Construction Joints

Figure D-1.2: Example of Water along the Construction Joints Close To a Long Patch

Figure D-1.3: Colored Water Coming Out Of the Pavement Joints

Figure D-1.4: Patch with Severe Distress Visible On the Outside Lane of the Project

Westbound Direction: The westbound section (starts at the end) with a patch close to 100 feet in length. There were several patches observed along this section, predominately in the left wheel path on the outside lane. A bigger patch that was almost one mile in length was also observed in this section. Further to the west, patches were found in both lanes with several of them exhibiting rutting and raveling. Several locations that were patched earlier had been re-patched (‘patched the patch’) by the maintenance personnel. Through construction joints, water was seen coming out with the greenish tint color similar to the eastbound lanes. In certain locations pumping of fines were seen as shown in Figure D-1.5. Overall, the westbound lanes appeared to be in a worse shape compared to the eastbound lanes.

Figure D-1.5: Silt Deposits on the Pavement Surface Close To a Patch

D-1.2 COTTAGE GROVE – MARTIN CREEK

The investigators conducted the windshield survey to review the surface condition of Cottage Grove project between MP 169.3 and MP 174.7 on February 23, 2006.

Southbound Direction: Pavement condition in this project was found to be similar to Vets Bridge-Myrtle Creek and Garden Valley-Roberts Creek projects. The pavement showed large patches in numerous locations, indicative of the significant amount of maintenance works done by the ODOT personnel in the last 4 years. In contrast to the previous two projects, to get an accurate picture of the project, the patches were counted. There were roughly 23 patches in the southbound lanes, nearly five patches per mile in this project. Figures D-1.6 and D-1.7 represent a typical pictures of the patches found throughout this project.

The location presented in Figure D-1.7, was identified as a potential trenching location. In addition to numerous patches, there were infrequent fat spots in the southbound lanes. In certain locations bleeding was observed, especially in the wheel path of the inside and outside lanes of the pavement.

Figure D-1.6: Patch Visible On the Outside Lane inside Wheel Path

Figure D-1.7: Example of Two Patches in the Wheel Paths of the Outside Lane

A brief stop was made roughly at southbound MP 171.6 close to a bridge. This section of the pavement had considerable patches. In addition, the pavement appeared to have severe rutting problems. The investigators assessed the surrounding conditions by inspecting the drainage systems located near these distressed location. Four drains were examined during the inspection. Two of the drains contained a significant amount of debris; whereas the other two were appeared to be in good condition. One of the drains containing debris is shown in Figures D-1.8. The sides of the bridges had debris and vegetation growth as shown in Figure D-1.9.

Figure D-1.8: A Partially Clogged Drain That Was Found Close To the Patches in the Previous Pictures (Figures D-1.6 and D-1.7)

Figure D-1.9: Condition on the Sides of a Bridge Where Vegetation Has Grown

Northbound Direction: The northbound lanes were in much better condition as compared with the southbound lanes. Still, intermittent patching was found along the project. A small pot hole in combination with bleeding was found in one location (Figure D-1.10). An interesting observation along this stretch of the pavement was the amount of vegetation growth and water stagnation along the pavement sides as shown in Figure D-1.11.

Figure D-1.10: A Pot Hole with Some Bleeding

Figure D-1.11: Very Low Flow Rate of Water in This Ditch Has Allowed the Growth of Algae and Other Plants Commonly Found In Ponds

D-1.3 ANLAUF– ELKHEAD ROAD

The visual examination of the Anlauf-Elkhead road project was performed on February 23, 2006, between MP 154.5 and MP 162.1.

Southbound Direction: Several patches were found in the direction of this road. Near MP 157 three patches were found and this location was identified as a good location to perform trenching operations during the field investigation. Figure D-1.12 presents a typical patch found in this road section. Evidence of bleeding was found on the outer wheel path on the inside lane. In addition, the pavement exhibited 'shoving' on the inside lane, inside wheel path. On the outside lane, the wheel path had low severity raveling at certain locations. At one location the pavement surface looked pitted and raveled (Figure D-1.13). Stripping failure was noticed in certain locations of this project. In case of the drainage systems, fewer drains were found along this section. The section of the roadway was on a slope.

Figure D-1.12: Typical Patch Found Along This Project

Figure D-1.13: Part of the Pitted and Raveled Pavement Section

Northbound Direction: The condition of the pavement in the northbound lanes was in much worse shape as compared with the southbound lanes, with patching being the primary distress. At Elkhead road, several patches were noticed and this location was identified as a good location to perform trenching operations during the field investigation. At one location, a much bigger patch, nearly the full width of the inside lane, was observed. Half a dozen patches were found between MP 156 and MP 159. These patch locations were identified as recommended spots to perform trenching operations. Bleeding was observed in certain isolated locations of the pavement section. A pot hole was also found at MP 162.

D-1.4 GARDEN VALLEY-ROBERTS CREEK

The investigators conducted the windshield survey to review the surface condition of the Garden Valley-Roberts Creek project between MP 117.74 and MP 125.0 on February 23, 2006.

Southbound Direction: The pavement was in good shape for at least one mile (MP 125 to MP 124). Rutting was the primary distress in both lanes from MP 124 to MP 123. The section between MP 121 to MP 120 had several patches. Some of the patches are presented in Figures D-1.14 through D-1.15. Rock cuts were observed in certain sections of the project. It should be noted that water was seen coming out of the joints on the outside lanes roughly in the section between MP 117 to MP 117.74.

Figure D-1.14: Patch on the Outside Lane

Figure D-1.15: Representative Example of the Numerous Patches Found In This Project

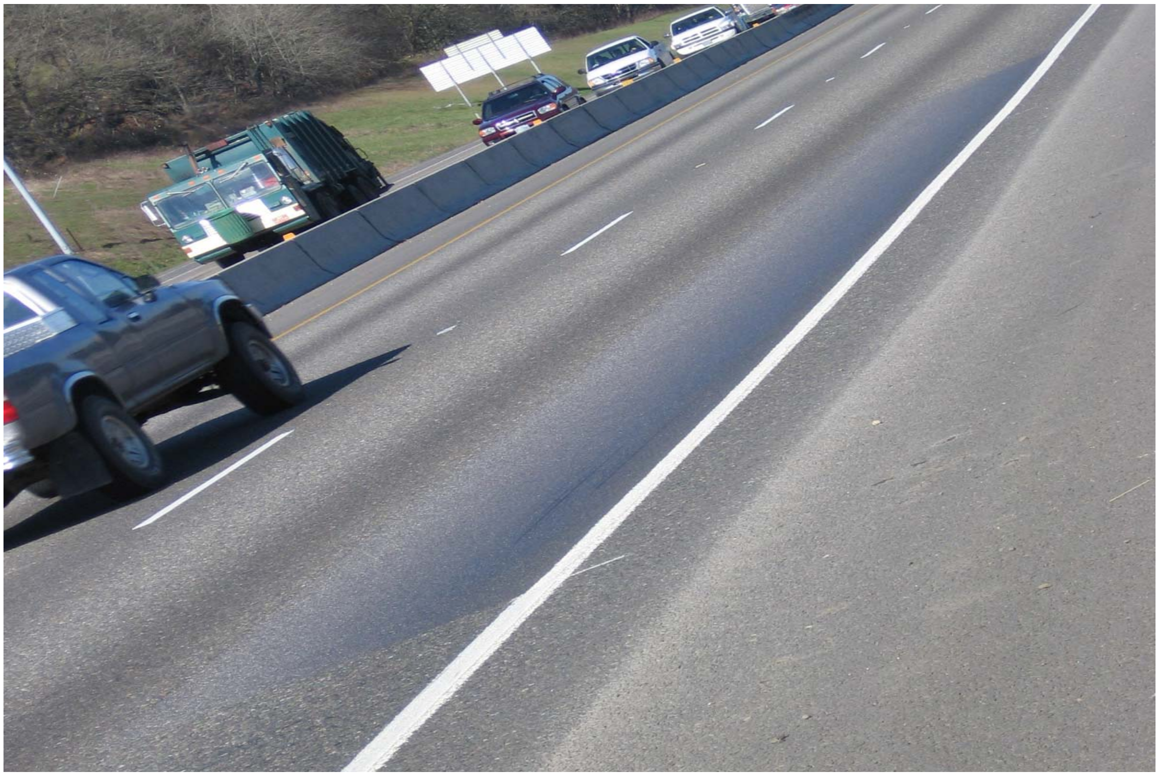


Figure D-1.16: Close-up of the patch on the outside lane wheel path

Northbound Direction: The northbound lanes appeared to be in a worse condition in comparison with those in the southbound direction. The pavement had many patches on the outside lanes. Rutting was noticed in few places with low severity, mainly on the inner section of the slower lanes. Fat spots were observed in a few isolated locations (Figure D-1.17). Bleeding was observed almost everywhere and it appeared to be a common problem in this area (Figure D-1.18). There was no cracking observed in both the southbound and northbound lanes.

Figure D-1.17: Few Fat Spots Found At This Location

Figure D-1.18: Bleeding Of Binder, a Common Sight in This Part of the State

D-1.5 VETS BRIDGE – MYRTLE CREEK

A windshield survey was performed on the Vets Bridge-Myrtle Creek project between mile post (MP) 109.0 and MP 112.5 on February 23, 2006. Observations made during the survey are provided below based on direction of travel during the survey.

Southbound Direction: Numerous locations on the southbound (SB) lanes exhibited blade and pothole patches in both wheel paths. The investigators assume these patches were placed to treat rutting distress. Figures D-1.19 and D-1.20 show patches observed in the southbound lanes of the project. Fat spots were observed frequently in the southbound lanes and no cracking was noted. The drains that were located close to these cracks were inspected. The drains appeared fully functional, without any clogging. An informal assessment of the topography was performed by taking several photographs. Rock cuts were observed at certain locations as shown in Figure D-1.21.

Figure D-1.19: Patch Visible In the Wheel Path of the Outside Lane

Figure D-1.20: Patch along the Outside Lane Wheel Path at MP 110

Figure D-1.21: Rock Cut Was Observed On Certain Locations of the Section

A brief stop was made at the rest area at southbound MP 111. The purpose was to gather more information on the pavement topography, pavement distress, and any other pertinent information that could be used to identify the cause of distress. Severe bleeding was observed on the pavement section near the rest area. It should be noted that bleeding was found to be a common problem throughout the project. A typical representation of the bleeding is presented in Figures D-1.22 and D-1.23. Inadequate slope was witnessed near the southbound MP 111 and the pavement section was almost at the same elevation as the sides. This condition is presented in Figure D-1.24. Based on the impromptu interview with a maintenance worker who was scraping the vegetation along the roadside, it was found that the vegetation was scraped once a year in addition to the application of herbicides (Figure D-1.25). Closer examination of the pavement section near south MP 111 indicated that some areas had stripping problems as shown in Figure D-1.26.

Figure D-1.22: Bleeding Observed on the Pavements near Rest Area at MP 111

Figure D-1.23: Bleeding Observed On the Pavement Section Adjacent To the Rest Area at MP 111

Figure D-1.24: Inadequate Slope and Vegetation Growth Seen Close To the Pavement at MP 111

Figure D-1.25: Vegetation Scraped Along the Pavement Section (Scraped Once A Year)

Figure D-1.26: Closer Look at the Pavement Section at MP 111

Northbound Direction: A similar survey was conducted along the northbound section of the project. This section had patches in numerous locations, similar to the southbound lanes. Most of the observed patches in the northbound section were in the inside lanes. Figure D-1.27 and D-1.28 show a typical example of patches witnessed during the survey. At one location, a section of the pavement had a combination of distresses such as bleeding, rutting, and patches (Figure 3D-1.29). Fewer fat spots were observed in this direction as compared with the southbound direction. Visual inspection of the drains along the pavement sections revealed proper maintenance and an absence of clogging (Figure D-1.30).

Figure D-1.27: Example of a Patch Found On the Inside Lane of the Pavement Section

Figure D-1.28: Another Example of a Patch Found On the Inside Lane

Figure D-1.29: Combinations of Rutting, Patches, and Bleeding

Figure D-1.30: Properly Maintained Drain with No Clogging

APPENDIX E: RECORDS REVIEW

E-1.0 RECORDS REVIEW

E-1.1 PURPOSE

Review of records is an important process in the investigation of pavement failure. It helps to identify any deficiencies in the design and/or construction of the pavement or any other factors that might have influenced the failure. A detailed records review was conducted with the help of the ODOT Construction Section to obtain the following information:

- Pavement design information.
- Existing pavement structure immediately before rehabilitation.
- Geotechnical and bridge design information related to soil, aggregate, and moisture conditions on the project.
- Topography and geographic features in the vicinity of the project.
- Environmental conditions immediately before, during, and immediately after rehabilitation.
- HMA aggregates source test results.
- HMA mix design information.
- HMA production test results.
- Type of milling equipment used to remove existing HMA, depth of cut per pass, and percent of total depth of existing HMA removed.
- Whether or not traffic was allowed on the milled surface and, if so, for how long?
- Pre- and post-construction pavement performance derived from ODOTs pavement management system database, as well as from observations made by the maintenance personnel.
- Maintenance activities performed prior to and following rehabilitation.
- Forensic evaluation information already obtained by ODOT personnel.

E-1.2 RESULTS

The investigators contacted the ODOT Construction Section to obtain relevant records related to the five projects in this study. The findings of the records review are summarized in Table E-1.1. The tabular format presented is conducive for easy review and analysis.

Table E-1.1: Summary of the Findings from Records Review

Project Demographic Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Year of Rehabilitation	2003	2002	2000	1997	1999
County	Douglas	Douglas	Lane	Douglas	Baker
Highway type/ Section	I-5 MP 109.0 – 112.5	I-5 MP 117.74 – 125.0	I-5 MP 169.3 – 174.7	I-5 MP 154.5 – 162.1	I-84 MP 317.5 – 327.3
Direction	SB and NB	SB and NB	SB and NB	SB and NB	EB and WB
Number of lanes	4	4	4	4	4
Year of Orig. Construction	1955	Variable (1953 earliest)	1959	1954	Late 60s
Number of contracts let on this project	3 (1955, 1964, 1976)	Variable (1976 last Rehab)	3 (1959, 1962, 1980)	3 (1954, 1965, 1975-76)	No data available
Percent cut / percent Fill	No data available	No data available	No data available	No data available	No data available
Creeks/river along project?	Yes (100% of project length)	Yes (100% of project length)	Yes (100% of project length)	Yes (100% of project length)	Yes (100% of project length)
Pavement Rehab Design Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Existing structure (before Rehab)	40 mm Open graded E-mix	1” E-mix WC; 1.5 – 5.5” C-mix BC	1” E-mix WC; 5” B-mix BC	25 mm E-mix WC, 75 mm B-mix BC	No data available
Subgrade soil type (classification)	No data available	Clayey gravel; Inorganic clay with low to medium plasticity	Silty clay with high plastic and soft material	Dry to damp, stiff, silty-clay subgrade materials	Silty clay with medium plastic slightly moist
Design Subgrade modulus (Avg/range)	37.9 MPa (5500 psi)	42.7 MPa	34 MPa (5000 psi)	55.16 MPa	No data available
Subgrade soil moisture content	No data available	5.48 to 22.64; top 1000 mm dry followed by highly moist soil	No data available	No data available	No data available

Pavement Rehab Design Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Deflection testing performed?	Yes	Yes	Yes	Yes	
Pavement Design Recommended	75 mm grind and overlay, with 75 mm of Level 4, 19 mm Open mix	WC: 50 mm of 19 mm Open graded HMAC BC: Inlay 50 mm of 19 mm dense HMAC	2” inlay F-mix AC wearing course; two areas of base failure, full dig out and replacement with B-mix	25 mm and 75 mm mill from inside and outside lane resp; 50 mm 19 mm lime treated leveling dense mix BC, followed by 50 mm of 19mm lime treated Open mix WC	50 mm of HMA milled and inlayed with 19 mm dense HMA mix, then overlaid with 40 mm of 12.5 mm SMA

Pre-Design Pavement Condition Survey Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Was a detailed condition survey performed?	Yes	Yes	Yes	Yes	Yes
Was visual examination of pavement surface conducted? If so, in what year?	Yes (2000)	Yes (1998)	Yes (1995)	Yes (1995)	Yes (1998)
What was the predominant distress noted in the project?	Rutting (both directions)	Rutting (both directions)	Rutting (both directions)	Rutting (both directions)	Rutting (both directions)
What are the other types of surface distress noted?	Fatigue cracking, few longitudinal cracks, and few ruts rich with asphalt	SB - Fatigue cracks and patches; NB – Patches, raveling, and longitudinal cracks	SB – blade and pothole patches; NB – fatigue cracking with low to high severity	Patches (inlay and blade), raveling, transverse and longitudinal cracking near ramps	Rutting and patches

Pre-Design Pavement Condition Survey Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Was coring performed?	Yes	Yes	Yes	Yes	Yes
Was stripping evident in core? If yes, at what depth/layer?	No	No	SB – Yes (MP 170.39, 170.43, 171.39); NB - None	Yes (few cores, initial stages)	Yes (few cores @ EB MPs 314.85 and 315.38 and at ramps WB MP 313)
Was exploration hole drilled?	No	Yes	Yes	Yes	Yes
Was rutting measurements taken? If so, what was the average/range of rutting?	Yes; Average: 0.5”, ranging from 0 to 1”	Yes; Average: 3/8”, ranging from 0 to 1 1/8”	Yes; Average: 0.75”, ranging from 0 to 1 5/8”	Yes; ranging from 0” to 1.4”	Yes; raging from 0.1 to 0.8” EB and 0 to 0.8” WB
What was the condition of shoulders? (Poor, Fair, Good)	Fair	Fair	Fair	No data available	No data available
Was a detailed drainage survey conducted? If so what was the condition of the drains? (Poor, Fair, Good)	Unknown; Unknown	Unknown; Unknown	Unknown; Unknown	No data available	No data available
Traffic Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Design ESALs	15 year; Truck lane: 29,200,000 Inside lane: 3,240,000	10 year – 18 million	10 year - 6,100,000	10 year; SB-20,600,000 NB-23,800,000	10 year – 20.6 million

Traffic Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
ADT	NB-11700, SB-10800	NB-14600, SB-13400	NB-11000, SB-10000	NB-9100, SB-8400	6700
Level of truck traffic (%)	NB-22.7%, SB-25.4%	NB-21%, SB-23%	NB-21.8%, SB-24.3%	NB-22.4, SB-21.8%	42%
Year of traffic counts	1997	1994	1993	1994	1996
Environmental Condition Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Inches of rainfall in previous 7 days (before Rehab)	No data available	No data available	Dry (Maintenance personnel)	No data available	No data available
Mean Daily Temperature in previous 7 days (before Rehab	No data available	No data available	No data available	No data available	No data available
Minimum and Maximum temperature in previous 7 days (before Rehab?	No data available	No data available	No data available	No data available	No data available
Was there rainfall during construction?	No	No	Yes	No data available	No data available
What was the average rainfall during the period?	No data available	No data available	No data available	No data available	No data available
What was the average temperature during paving?	No data available	No data available	No data available	No data available	No data available
Minimum/ Maximum temperature in 30 days following Rehab?	No data available	No data available	No data available	No data available	No data available

Environmental Condition Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Inches of rainfall in 30 days following Rehab	No data available	No data available	No data available	No data available	No data available
Mean Daily Temperature in 30 days following Rehab	No data available	No data available	No data available	No data available	No data available
HMA Mix Design Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Mix Design Existing AC surface (before Rehab)					
• Mix type	E-mix	E-mix	E-mix WC over B-mix BC	E-mix WC over B-mix BC	No data available
• Target AC	No data available	No data available	No data available	No data available	No data available
• Actual AC	No data available	No data available	No data available	No data available	No data available
• Target P200	No data available	No data available	No data available	No data available	No data available
• Actual P200	No data available	No data available	No data available	No data available	No data available
• Moisture content	No data available	No data available	No data available	No data available	No data available
Mix Design New AC base course					
• Mix type	Not Applicable for mainline, only inlay was involved	19 mm Dense HMA mix	Standard duty HMA B-mix	Heavy duty HMA B-mix	19 mm dense HMA mix
• Target AC		5.2	5.7	5.5	
• Actual AC		Avg-5.17	Avg-6.02, Stddev-0.154	Avg-5.55, Stddev-0.1531	
• Target P200		4.8	5.0	5.0	

HMA Mix Design Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
• Actual P200		Avg-5.57, Stddev-0.5649	Avg-3.93, Stddev-0.5465	Avg-5.93, Stddev-0.475	
• Moisture content		0.21	0.47	0.30	
Mix Design New AC wearing course					
• Mix type	Level 4, Open mix	19 mm Open mix	Heavy duty F-mix	Heavy duty F-mix	
• Target AC	5.7 (was initially 5.8, then raised to 6, then reduced to 5.7)	5.8	5.4	5.6	
• Actual AC	No data available	Avg-5.365	Avg-6.02, Stddev-0.21	Avg-5.67, Stddev-0.0516	
• Target P200	2.3	2.5	3.9	3.9	
• Actual P200	No data available	Avg-3.02, Stddev-0.4134	Avg-4.03, Stddev-0.5366	Avg-4.109, Stddev-0.5381	
• Moisture content	No data available	0.44	0.81	0.51	
Material Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Materials - Existing AC surface (before Rehab)	No data available	No data available	No data available	No information	
• Aggregate type	No data available	No data available	No data available	No information	
• Was lime used? If yes, what amount?	No data available	No data available	No data available	No information	
• Asphalt type	No data available	No data available	No data available	No information	
• Asphalt grade	No data available	No data available	No data available	No information	

Material Records	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
• Any additives used?	No data available	No data available	No data available	No information	
Materials - New AC base course					
• Aggregate type	Not Applicable for mainline, only inlay was involved	S. Umpqua gravels	Gravel	Gravel	
• Was lime used? If yes, what amount?		No	No	Yes, 1%	
• Asphalt type		Chevron	McCall	McCall	
• Asphalt grade		PBA – 5	PBA-5	PBA-5	
• Any additives used?		No	No	No	
Materials - New AC wearing course					
• Aggregate type	S. Umpqua gravels	S. Umpqua gravels	Gravel	Gravel	
• Was lime used? If yes, what amount?	No	No	Yes; 1%	Yes, 1%	
• Asphalt type	McCall	Chevron	McCall	McCall	
• Asphalt grade	PG 70 - 28	PBA - 6	PBA-6	PBA-6	
• Any additives used?	No	No	No	No	
Quality Control/Quality Assurance Tests	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
New base					
• Gradation within specs?	Yes	Yes	Yes	Yes	

Quality Control/Quality Assurance Tests	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
- Binder content within specs?	Yes	Yes	Yes (6 sublot over spec limit)	Yes	
- Moisture content within specs?	Yes	Yes	Yes	Yes	
New wearing course					
- Gradation within specs?	Yes	Yes	Yes	Yes	
- Binder content within specs?	Yes	Yes	Yes	Yes	
- Moisture content within specs?	Yes	Yes	Yes	Yes	
Pavement Surface Preparation Records (Milling)	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
What the depth of cut per pass?	No data available	No data available	No data available	No data available	
What percentage of total depth of existing surface milled?	No data available	No data available	No data available	No data available	
What was the milling equipment used?	7.5 foot roto-mill	7.5 foot roto-mill	Self propelled machine	No data available	
Was the surface cleaned after milling? (Y/N). If yes, what was used to clean the surface?	Yes; pick up broom	Yes; pick up broom	Yes; Power broom, backhoe	No data available	
Was milled surface exposed to traffic?	No (not sure)	Yes	No	No data available	

Pavement Surface Preparation Records (Milling)	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Was the milled surface exposed to rain?	Yes	Yes	No	No data available	
What was the weather during milling operations?	Dry	Dry	Dry	No data available	
Was any kind of distress noticed on the milled surface particularly stripping?	No	No	No	No data available	
Post Construction Records (pavement management system)	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
• Distress type					

Maintenance Records					
Post construction conditions – Maintenance personnel comments on prime cause of distress	Rutting primary distress. Maintenance personnel have been repairing the distress with patches.	Localized areas of rutting and shoving in the HMA layers. At that time they found only one area of failure in NB compared to several in the SB of the project Maintenance personnel have been repairing the distress with patches.	Rutting was found in many places. Hand patching, inlay repair and concrete patching. Also installed 3 perforated pipes. Maintenance personnel say “underground springs” were the major cause of distress	No information	Potholes were the major problem according to maintenance personnel; Water comes out of construction joints in many places. Rutting is found in lots of places. Close to 2500 tons of grind inlay every year close to 250K. Patches did in June failed in August last year.
Was trenching operations carried out? (Y/N)	Yes	Yes (Refer chapter 3.0) August of 2003; Two trenches were cut around MP 123	No information	No information	Yes (May 16, 2006)

Maintenance Records					
If yes, what were the findings?	The new 19 mm open-graded HMA and material underlying the new layer appeared to be stripping. No documentation was provided	Trench 1: ODOT personnel reported that an area of unstable HMAC at about 3.5 to 4 inches below the surface was observed. It was concluded that the mix was stripping. Trench 2: The second trench was cut in an area that was not experiencing any failure. The material was in much better condition, but did show that this area is also starting to strip.	No information	No information	Two trenches. Both trenches had materials exhibiting stripping in the surface layers. Sample collected with the investigators.
Post Construction Records (Initial Site visits)	Vets Bridge – Myrtle Creek	Garden Valley – Roberts Creek	Cottage Grove – Martin Creek	Anlauf – Elk head Road	Pleasant Valley - Durkee
Distress types	SB: Patches, fat spots and bleeding NB: Rutting, bleeding, and patches	SB: Rutting and patches NB: Fat spots and patches	SB: Patches, fat spots and bleeding NB: Patches	SB: Patches, shoving and pothole NB: Pothole, bleeding, and patches	EB: Patches, potholes, water coming out of pavementsWB: Lengthy patches, silt coming out of pavements

E-1.3 PLEASANT VALLEY-DURKEE

The segment of the project under investigation is located between Interstate 84 MP 317.5 and 327.3. The design information was not readily available from records search.

E-1.4 COTTAGE GROVE-MARTIN CREEK

The project in question is located on Interstate 5, between MP 169.51 and 174.73. The scope of the rehabilitation project was to restore the ride quality, eliminate surface distress in the existing pavement, and to update the existing structures.

The existing highway comprised of four travel lanes with 3 meter outside shoulders and a central median. From approximately MP 172.10 to the north end of the project, the median is paved and includes a concrete median barrier. The pavement construction history shows that this section was originally constructed as a two lane roadway in 1959 using 100 mm of HMA over an aggregate base that ranged from 420 mm to 575 mm thick. In 1962 the section was widened to four lanes with new work that consisted of 100 mm of HMA over 75 mm of PMBB over 475 mm of aggregate base. Further, the records indicated that the section received a 38 mm HMA overlay. In 1980, the section was again overlaid using a 25 mm Class ‘E’ HMA wearing course over 125 mm of Class ‘B’ HMA base.

The ODOT design personnel conducted detailed fieldwork in order to study the existing pavement conditions. The design team measured the pavement depth at several locations by coring. The pavement depth varied from 300 mm to 500 mm. The average depth in the NB was 375 mm and SB was 368 mm. The core summaries indicated that stripping failure was found in the SB outside lane, outside wheel path. Three cores obtained at MPs 170.39, 170.43, and 171.39 indicated stripping failures in the SB section. None of the NB cores showed stripping failure. In addition to stripping, the cores indicated pavement breakups in several locations.

The ODOT team performed deflection testing using a Dynatest Falling Weight Deflectometer. The average deflection measurements varied between 7.28 microns to 8.89 microns in both directions, in the outside and inside travel lanes respectively.

The design records have documented the findings of the visual examination conducted by the ODOT design personnel. It was found that the SB lanes had experienced rutting and had numerous blade patches and isolated pothole patches and no cracking was found in the lanes. Sporadic round-bottomed potholes appeared to extend to the bottom of the top lift of pavement. In the NB lanes, the primary distress types noted were rutting and fatigue cracking that ranged from low to high severity.

Existing pavement conditions were investigated with the help of rutting measurements along the entire project. The rutting was measured at 86 individual locations and ranged from 0 mm to 40mm with an average of about 19mm.

Traffic data were examined from the records obtained from ODOT Transportation Development Division. The data were based on a 24-hour manual count taken at MP 165.00 in 1993. The design team used a rounded value of 6,100,000 equivalent single axle loads (ESALs) projected from a 1996 datum, as the 10-year ESALs for all design calculations. The percent truck traffic was found to be 21.8% during 1993.

ODOT design personnel used three design procedures to estimate the required overlay thickness including ODOT overlay design procedure, AASHTO (NDT) method, and AASHTO (condition survey) method. It was found that both the AASHTO methods did not warrant any overlay to the existing pavement. The ODOT method warranted a 12.5mm overlay depth. Based on the fieldwork, the ODOT design team recommendations were:

- 50 mm full width cold plane pavement removal
- Full width overlay, with a 50 mm F-mix wearing course

The ODOT design team recommended that since the F-mix is a free-draining material designed to optimize surface drainage, it was critical that this material be placed full width from edge of pavement to edge of pavement, to provide an unobstructed drainage path. This included tying the F-mix into existing storm drain inlets in areas where the median is located. In addition, it was recommended that a provision should be made for surface drains at any locations where the open-graded F-mix abuts a dense-graded pavement on a grade with the dense pavement on the lower side.

Based on the above recommendations, the Cottage Grove-Martin Creek project was rehabilitated in 2000 as opposed to the targeted completion date of 1996. The project included milling 50 mm of the existing HMA surface and replacing it with 50 mm of 19 mm lime-treated, open-graded HMA mix.

E-1.5 ANLAUF–ELKHEAD ROAD

The project in question is located on Interstate 5, approximately 15 miles south of Cottage Grove. The project begins at MP 154.85 and ends at MP 162.25. The information reported in this section is based on the records obtained from the ODOT design files. The report was dated in November, 1995. The scope of the project was to construct a 3-R preservation project. The works included were: rehabilitation of existing pavement, one structure raised, two structures widened, and various safety features of the highway upgraded. All ramps within the project were also included as part of this project.

The existing highway comprised of four travel lanes, each 3.6 m wide, with 3.1 m outside shoulders and inside shoulders of varying width. Records reported that there were five interchanges within project limits. The pavement construction history showed that this section was originally constructed in 1954 with a variable number of lanes, using 90 mm of dense-graded HMAC over an aggregate base that ranged from 305 mm to 430 mm in thickness. In 1965 the section was widened to four lanes with the new work consisting of 100 mm dense-graded HMAC over 75 mm of PMBB over 430 mm of aggregate base. The records showed that the section also received a 100 mm HMAC overlay. In 1975-1976, the entire section was again overlaid using a 25 mm Class “E” AC wearing course over a 75 mm Class “B” AC base course.

The ODOT design personnel conducted detailed fieldwork to study the conditions of the existing pavement on September 1994. The design records documented the findings of the visual examination conducted in August, 1995. At that time, the pavement exhibited low to high severity rutting in the outside travel lanes throughout the project. Some areas showed severe rutting and the HMA surface had shoving with 150 mm high humps along the fog line. There were numerous locations with inlay or blade patches. The HMA surface over all bridges had patches. The inside lanes had low to moderate severity rutting throughout. Cracking was not common in either lane. The exit ramps exhibited raveling, traverse and longitudinal cracking in a few places.

Existing pavement conditions were further studied with the help of rutting measurements along the entire project. Rut measurements were taken at 0.25 mile intervals in both wheel paths of both travel lanes in each direction and the measurements varied from 0 to 35 mm. In the SB direction, the average rut measurement was the highest for the outside lane left wheel path, ranging from 18 mm to a low of 12 mm in inside lane in both wheel tracks. In the NB direction, the average rut measurement was the highest for the outside lane left wheel path, 13 mm to a lowest of 8 mm in the inside lane left wheel path. The design team performed air void content, asphalt content, and gradation analysis on cored samples to identify the cause of rutting. Overall, the designers concluded that rutting was constrained to the top 75 mm to 125 mm of HMAC, and was not a subgrade problem.

The design team measured the pavement depth at several locations (SB outside lane using 36 core samples, out of which 13 were in the SB outside lane outer wheel path). The pavement depths varied from 240 mm to 355 mm with an average of about 295 mm. Fourteen core samples were drilled in the NB outside lane outer wheel path indicating depths of asphalt bound material ranging from 265 mm to 405 mm with an average of 310 mm.

The ODOT team performed deflection testing using the Dynatest Falling Weight Deflectometer. The average deflection measurements varied between 70 microns to 432 microns in both directions in the outside and inside travel lanes. The 80th percentile deflection for the NB and SB were 210 and 174 microns, respectively.

Traffic data were examined from the records. The source of the data was from the ODOT Transportation Development Division and is based on a 24-hour manual count taken at Oakland ATR in 1994. The design team used rounded values of 20.6 million and 23.8 million for the SB and NB directions, respectively, projected from a 1996 datum, as the 10-year ESALs for all design calculations.

ODOT design personnel used two design procedures to estimate the required overlay thickness including the ODOT overlay design procedure, and the AASHTO (NDT) method. It was found that the AASHTO method did not warrant any overlay (0 mm) to the existing pavement. However, the ODOT method required a 15 mm overlay in NB right lane.

The final design recommendation was milling of the existing 25 mm HMAC from the inside (fast) lanes and 75 mm of HMAC from the outside (slow) lanes. 50 mm of a 19 mm lime-treated, dense-graded HMAC was placed on the outside lanes to match the grade of inside lanes. The entire surface was then overlaid with 50 mm of a 19 mm lime-treated, open-graded HMAC. The Anlauf-Elkhead project was rehabilitated in 1997.

E-1.6 GARDEN VALLEY-ROBERTS CREEK

The project in question is located on Interstate 5, between MP 125.00 and 117.74. The pavement construction history showed that the structural layers along the entire stretch of the project were not uniform and varied considerably. Some parts of the pavement (MP 123.0 to 125.0) were originally constructed in 1953; some (MP 117.5 to 119.0) were constructed in 1958. As per the records, the road section between MP 117.5 to MP 122.5 was last constructed in 1976 with varying thickness of structural layers. The top wearing course before rehabilitation was a 25mm E-mix over the entire project. The underlying layers in most part of the project were approximately 100mm of ‘C’ class base course over 100mm of asphalt treated aggregate base.

As part of the pavement design, the ODOT design personnel conducted a visual examination of the project in 1998. The ODOT personnel concluded that the major problem in the pavement sections was rutting. The ODOT maintenance personnel patched several of the rutted sections. During the summer of 1998, the NB outside lane from MP 117.74 to 120.0 was inlayed with a 50 HMA. Overall, the pavement was in good shape.

Records indicated that the deflection testing was carried out in several locations along the project corridor in both the inside and outside lanes. The deflection measurements varied considerably along the stretch. Overall, the pavement was found to be in sound structural condition.

In addition to the deflection testing, coring operations were performed to study the conditions of the structural layers. The ODOT design personnel cored a total of 52 samples from the mainline on this project. The coring depth varied from 155 mm to 500 mm. The core condition summaries indicated a good pavement condition without any stripping, except at MP 120.75, where some breakage/stripping were observed. Overall, analysis of the obtained cores did not indicate any problem with the pavement.

Three exploration holes were drilled by ODOT personnel to examine the pavement structural layers. Records indicated that the HMA depth was 225 mm with an average base depth of 350 mm. The base material was a gravelly sand mixture with traces of silt. The subgrade material varied considerably between the three exploration holes. One sample was clayey gravel, while others were inorganic clay with low to medium plasticity.

The subgrade soils were tested for optimum and moisture content determination. Samples were collected at depths ranged from 500 to 1,200 mm, mostly between the MP 119.0 and MP 119.47 NB. Records indicated that the top 1,000 mm were relatively dry, with higher moisture content at depths greater than 1,000 mm.

Rutting was measured along the entire project length. The collected records indicated that the majority of rutting fell in the low and moderate severity categories with a low percentage in high severity category. There was only one measurement which was more than 25 mm deep. Rutting was the only primary distress noticed during the field work.

Traffic data were examined from the records. The source of the data was from the Transportation Planning Analysis Unit (TPAU), which provided the traffic counts taken in 1994. The 10- and

20-year ESAL projections used for the design were 18 million and 38 million respectively, for the truck lanes.

Records indicated that the subgrade modulus for the project varied from 87.4 MPa to 155.1 MPa, which the ODOT personnel attributed to the presence of the AC/CTB section. For design purposes, a resilient modulus value of 42.7 MPa was used by the ODOT design personnel.

Based on the fieldwork and Index of Retained Modulus Ratio (IRMR) tests, the ODOT design personnel determined that the pavement was still in good condition. Further, the pavement did not show any evidence of stripping. The recommendations by the ODOT personnel were:

- 50 mm cold plane pavement removal (from inside fog line to 0.6 m outside of fog line)
- Inlay 50 mm of 19 mm dense-graded HMAC base course (from inside fog line to 0.6 m outside of fog line)
- Full width overlay, with a 50 mm of 19 mm maximum aggregate size open-graded HMAC wearing course

For the South Umpqua river bridge approach at NB MP 120.5, the following design recommendations were suggested:

- 125 mm cold plan pavement removal
- Inlay of 75 mm of 19 mm dense-graded HMAC base course
- 50 mm of 19 mm maximum aggregate size open-graded HMAC wearing course (as part of overlay)

Based on the above recommendation, the Garden Valley-Roberts Creek project was rehabilitated in 2002, which included milling of the top 50 mm HMA layer and replacing it with 50 mm of 19 mm dense-graded HMA mix. The entire surface was then overlaid with 50 mm of 19 mm open-graded HMA.

E-1.7 VETS BRIDGE-MYRTLE CREEK

This project is located on Interstate 5, roughly ten miles south of the city of Roseburg, between MP 109.0 and 112.5, both southbound (SB) and northbound (NB). This pavement was originally constructed in 1955 using 100 mm of HMA over 425 mm of aggregate base over 450 mm of selected subgrade material. Records indicate that some sections of the project were constructed as a four lane highway and some as a two lane highway. In 1964, the pavement received a 40 mm HMA overlay. Also, the road was widened to four lane sections throughout, with 90 mm HMA over 75 mm of bituminous base over 340 mm of aggregate base. The last overlay on the pavement was carried out in 1976, which included a 50 mm dense-graded base course topped with a 40 mm open graded (E class) wearing course. The existing surface during the time of rehabilitation design was an ‘E mix’ wearing surface.

In 2000, the ODOT design personnel initiated the design work for the rehabilitation of the pavement. The major scope of the project was to rehabilitate the existing mainline pavement, in addition to the pavement rehabilitation in the northbound Booth Ranch truck scale site, and the rehabilitation of the ramps at the Boomer Hill interchange.

Records indicate that deflection testing was carried out in several locations along the project. The average deflection on the outside travel lanes on the NB and SB were 111 and 110 microns, respectively. Measurements on the inside lane, inside wheel path for NB and SB were 115 and 67 microns, respectively.

In addition to the deflection testing, coring operations were performed to study the conditions of the structural layers. The ODOT design personnel obtained a total of 37 core samples. It was found that all cores were in good condition except a small number of broken cores. There was no evidence of stripping found in the cores.

Existing pavement conditions were studied with the help of rutting measurements along the entire project. Records indicated that the majority of the rutting fell into the low and moderate severity categories with a low percentage falling into the high severity category. Records on the pavement condition identified rutting as the primary distress noticed during the field work. Evidence of fatigue cracking and longitudinal cracking were also found during the pre-design investigation.

Traffic data were examined from the records. It was found that the 15-year ESAL projections used for the design were 29,200,000 and 3,240,000 for the truck lanes and the inside lanes, respectively.

The records indicated that the subgrade modulus for the SB outside lane and NB outside lane were 88.0 MPa and 78.9 MPa, respectively. ODOT design personnel used a conservative value of 37.9 MPa for design purposes.

Based on the field work, ODOT design personnel concluded that the mainline pavement did not require any structural overlay. The recommendation was a 75mm full width grind and overlay, with 75 mm of Level 4, 19 mm open-graded HMA wearing course. Based on the above recommendation, the Vets Bridge-Myrtle Creek project was rehabilitated in 2003, which included milling of the 75 mm of the existing HMA surface and replacing it with 75 mm of 19 mm open-graded HMA mix.

APPENDIX F: PAVEMENT CORE LOGS FOR PLEASANT VALLEY – DURKEE

PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: **I84: PLEASANT VALLEY-DURKEE**

PD # 22

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 321.206

Logged By: Craigh Weldon [✓ Michael]

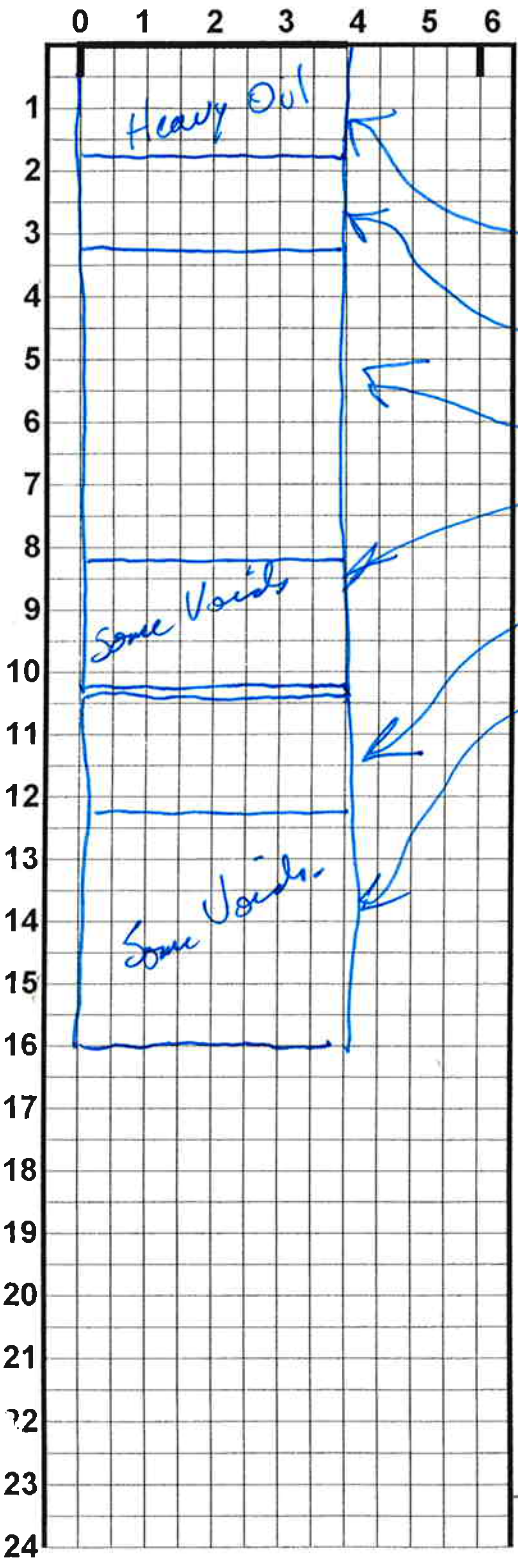
LOCATION: WB OWT 50' W of BR 08941 W

TERENCE

CORE LENGTH: 16 inches

Designer: **JASON**

EA # **PE001135/010/J13**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

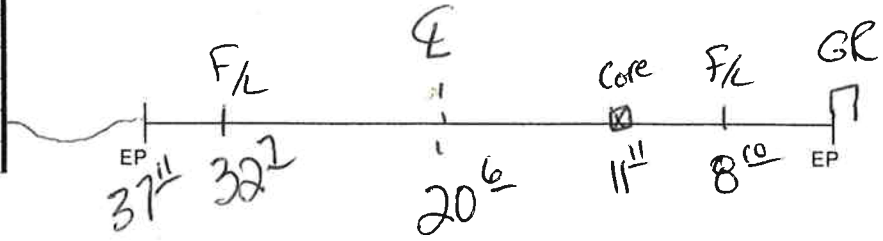
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 21

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 321.213

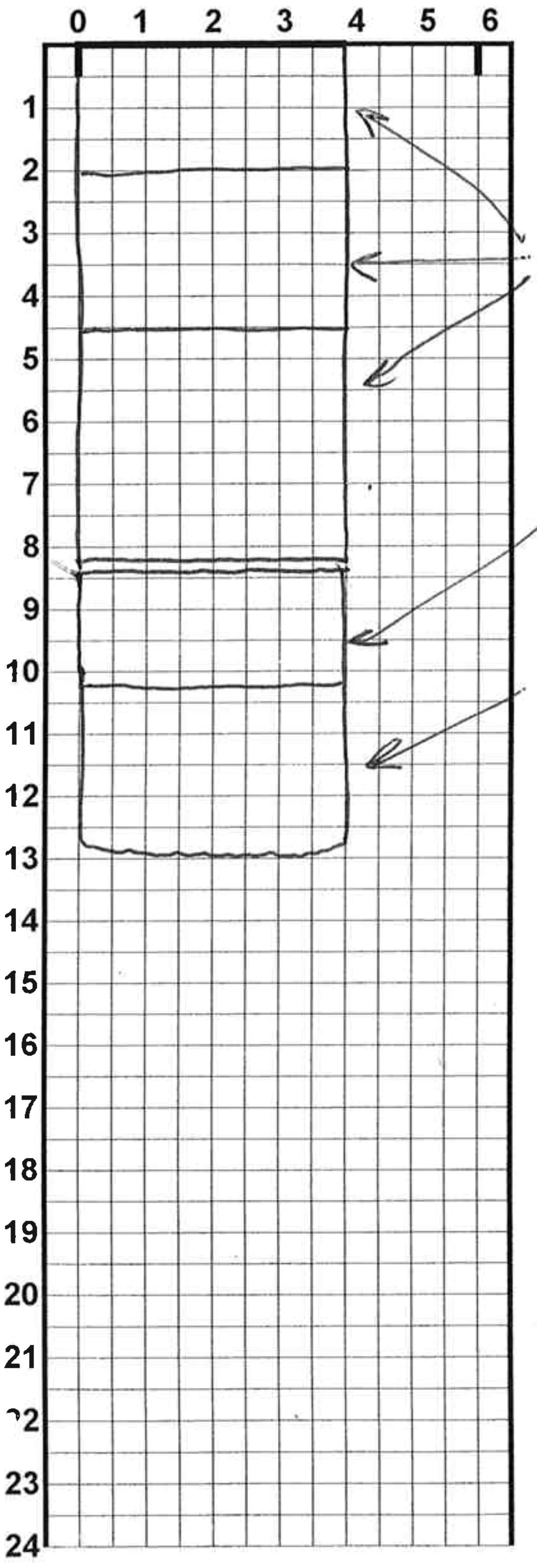
Logged By: Craigh Weldon [✓ Michael] TERENCE

LOCATION: WB OWT 10' W of BR 08941W

CORE LENGTH: 13.0 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

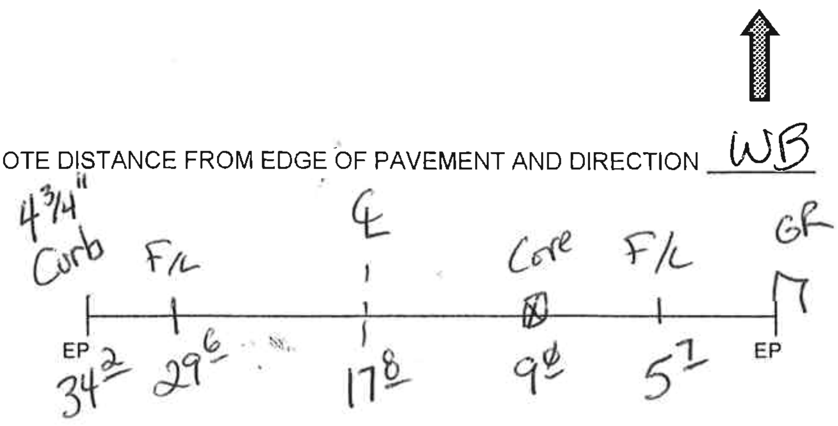
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair [✓ Poor]

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor w/voids

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

HIGHWAY: OLD OR TRAIL HWY NO .006

MILEPOINT: 321.293

LOCATION: WB OWT 10' E of BR 08941W

CORE LENGTH: 11.50 inches

PD # 20

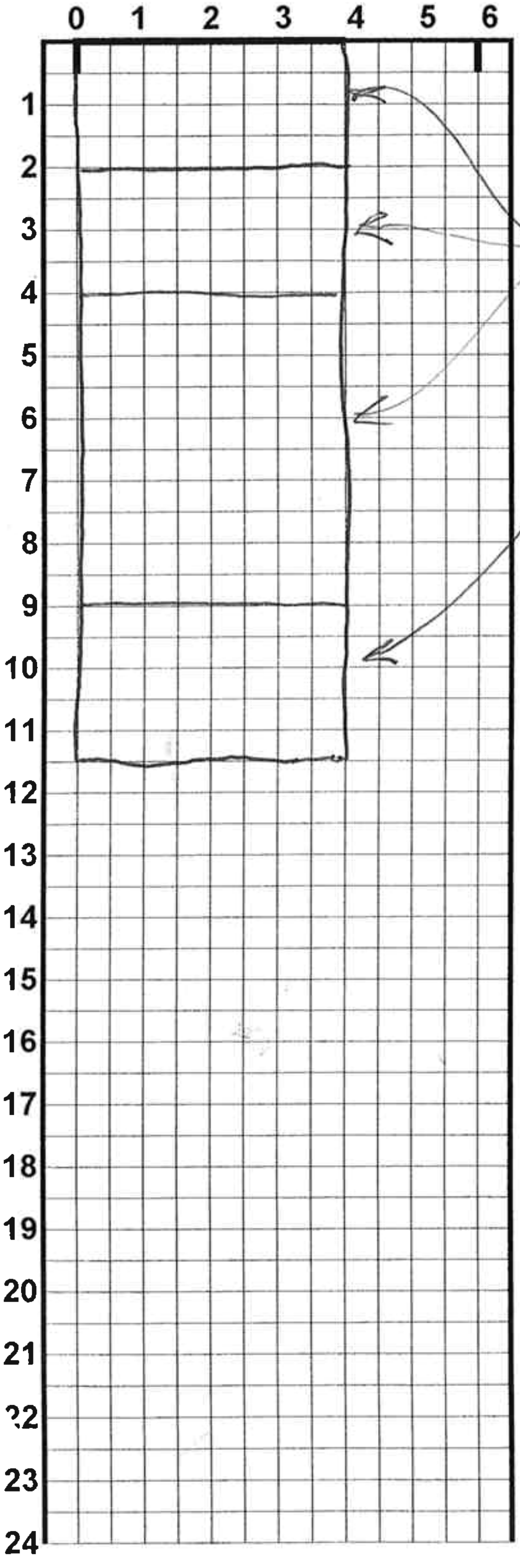
Date: 10/19/05

Logged By: Craigh Weldon [✓ Michael]

TERENCE

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

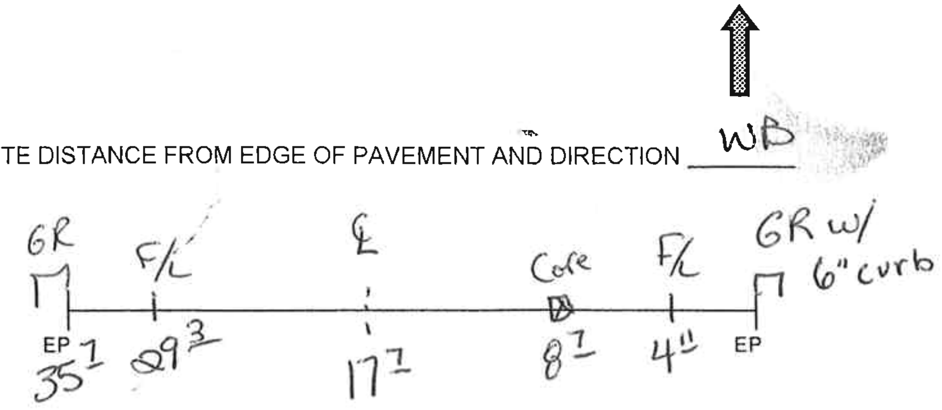
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor w/voids

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

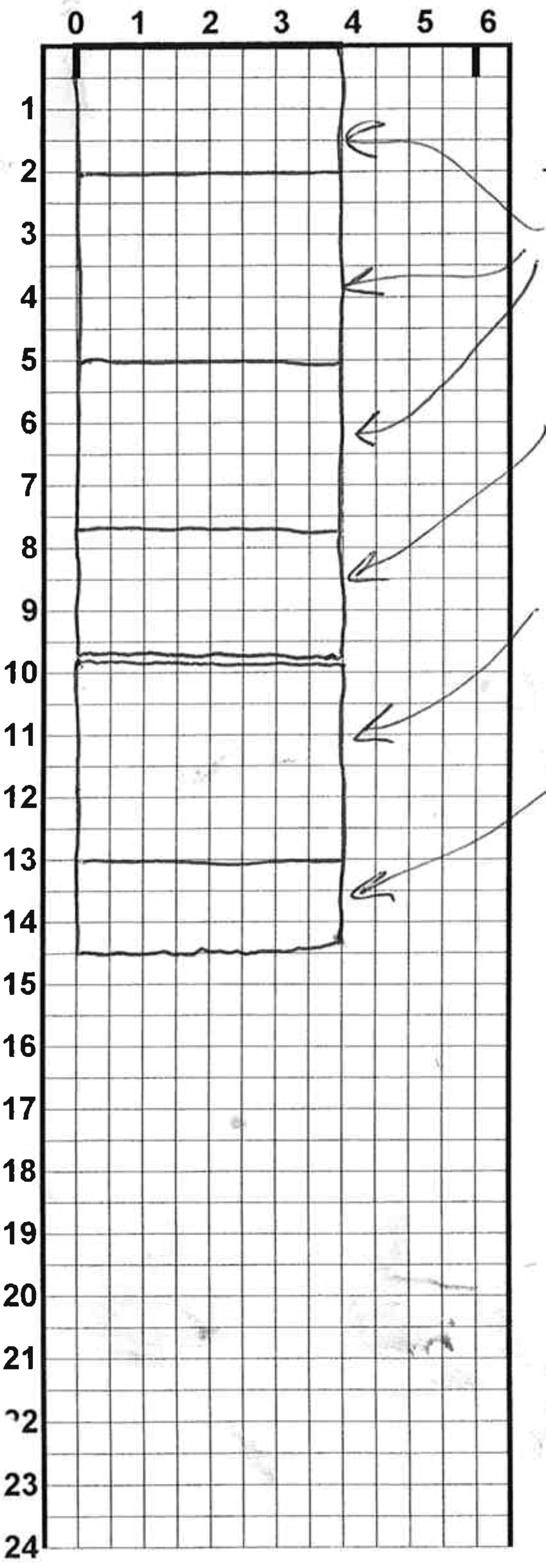
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE
PD # 19
HIGHWAY: OLD OR TRAIL HWY NO .006
Date: 10/19/05
MILEPOINT: 321.30
Logged By: Craigh Weldon [✓ Michael]
TERENCE
LOCATION: WB OWT 50' E of BR 08941 W
CORE LENGTH: 14.50 inches
Designer: JASON
EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

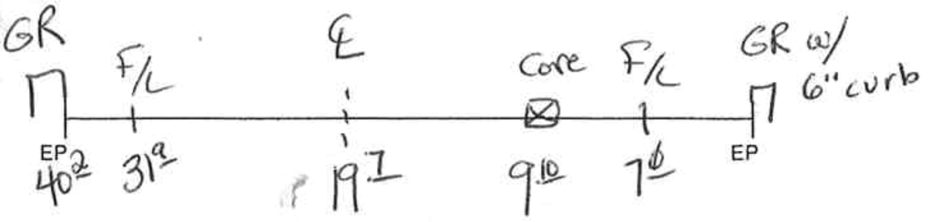
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor w/voids

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

OJECT: I84: PLEASANT VALLEY-DURKEE

PD # 11

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/18/05

MILEPOINT: 325.242

Logged By: Craigh Weldon [✓ Michael]

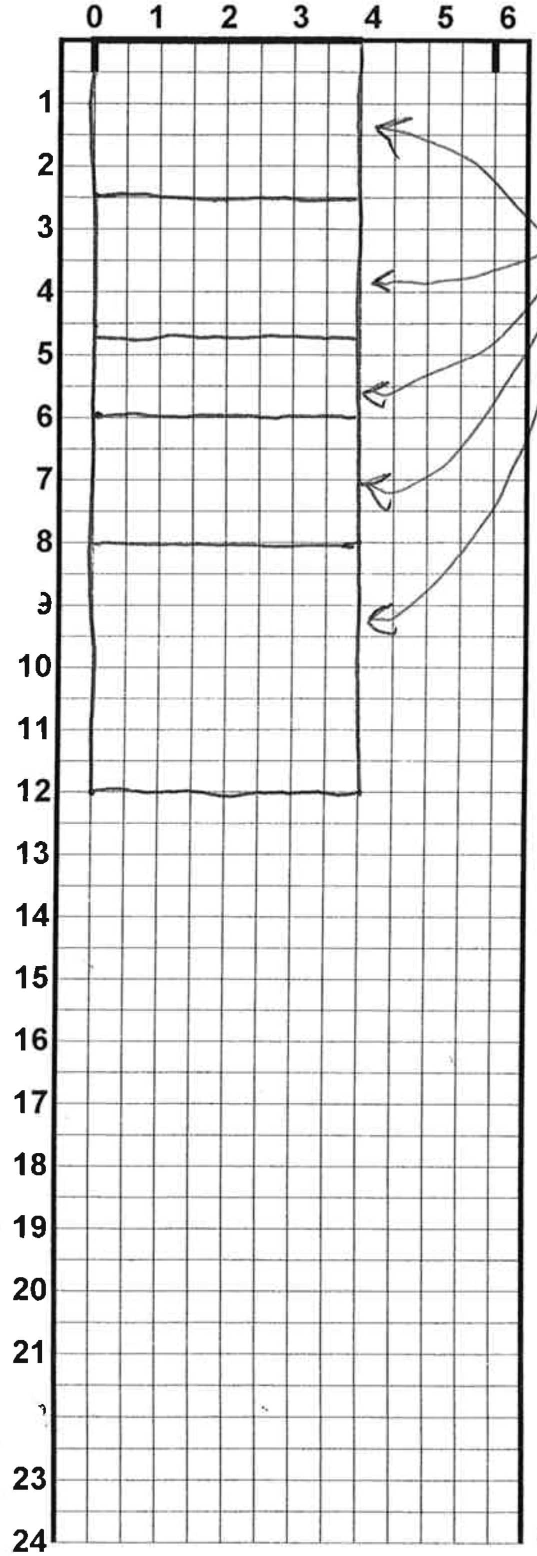
TERENCE

LOCATION: OWT WB 50' W of BR 07987

CORE LENGTH: 12.0 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

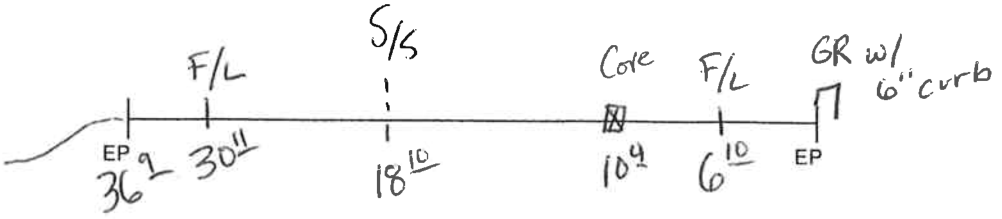
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 10

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/18/05

MILEPOINT: 325.248

Logged By: Craigh Weldon [✓ Michael]

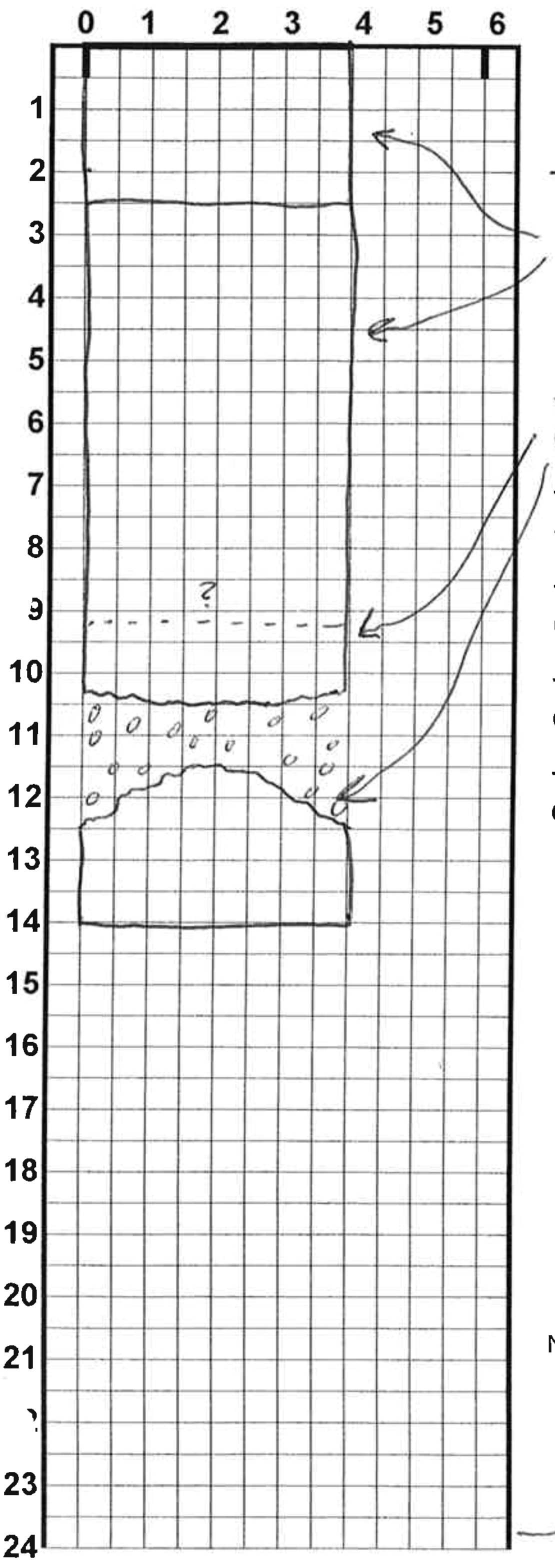
TERENCE

LOCATION: OWT WB 10'W of BR 07987

CORE LENGTH: 14.0 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

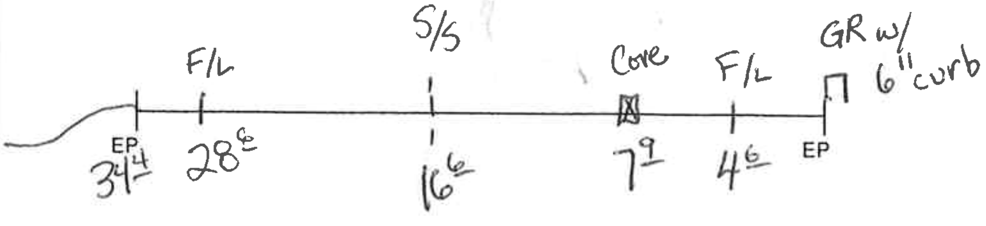
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

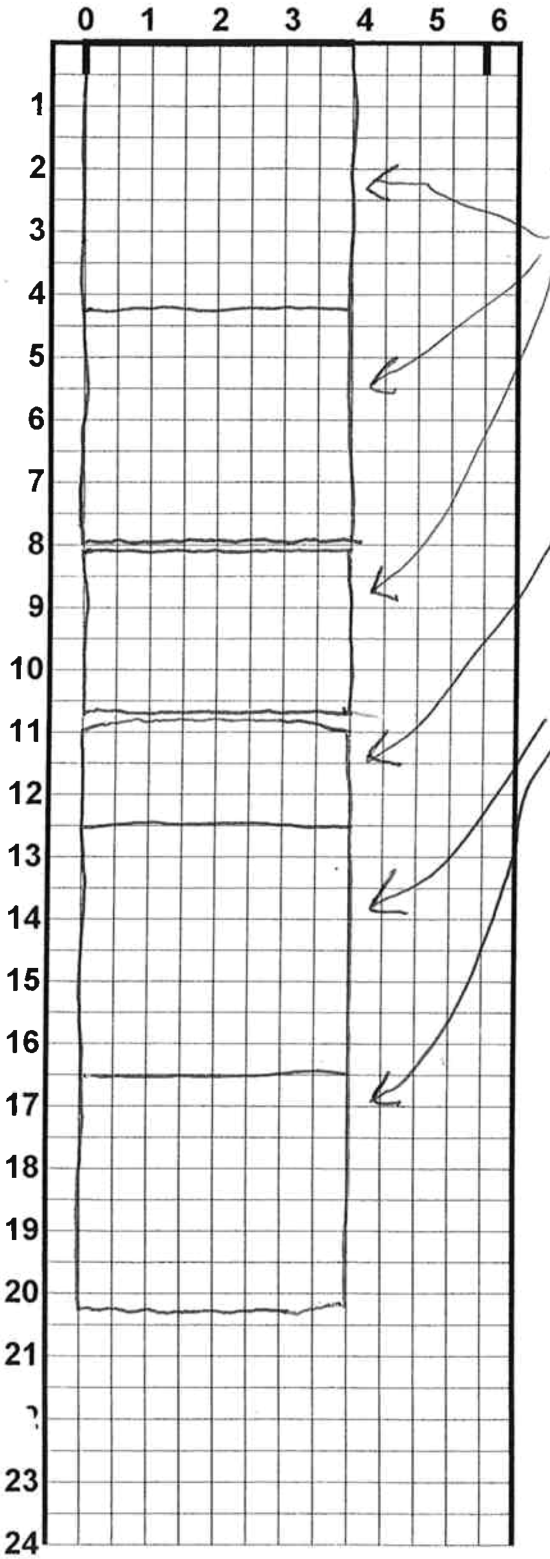
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

ROJECT: I84: PLEASANT VALLEY-DURKEE
HIGHWAY: OLD OR TRAIL HWY NO .006
MILEPOINT: 325.334
LOCATION: OWT WB 10' E of BR 07987
CORE LENGTH: 20.25 inches

Saved: [✓ Yes] No
PD # 9
Date: 10/18/05
Logged By: Craigh Weldon [✓ Michael]
TERENCE
Designer: JASON
EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

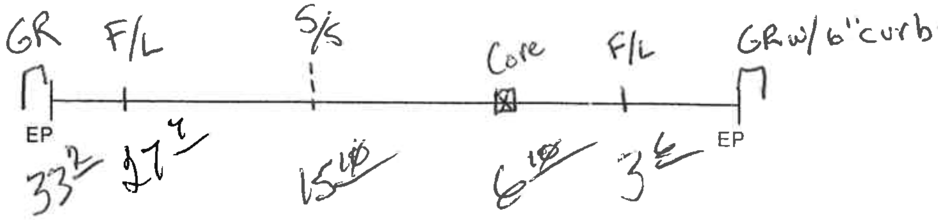
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PD #: 8

OJECT: I84: PLEASANT VALLEY-DURKEE

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/18/05

MILEPOINT: 325.341

Logged By: Craigh Weldon [✓ Michael]

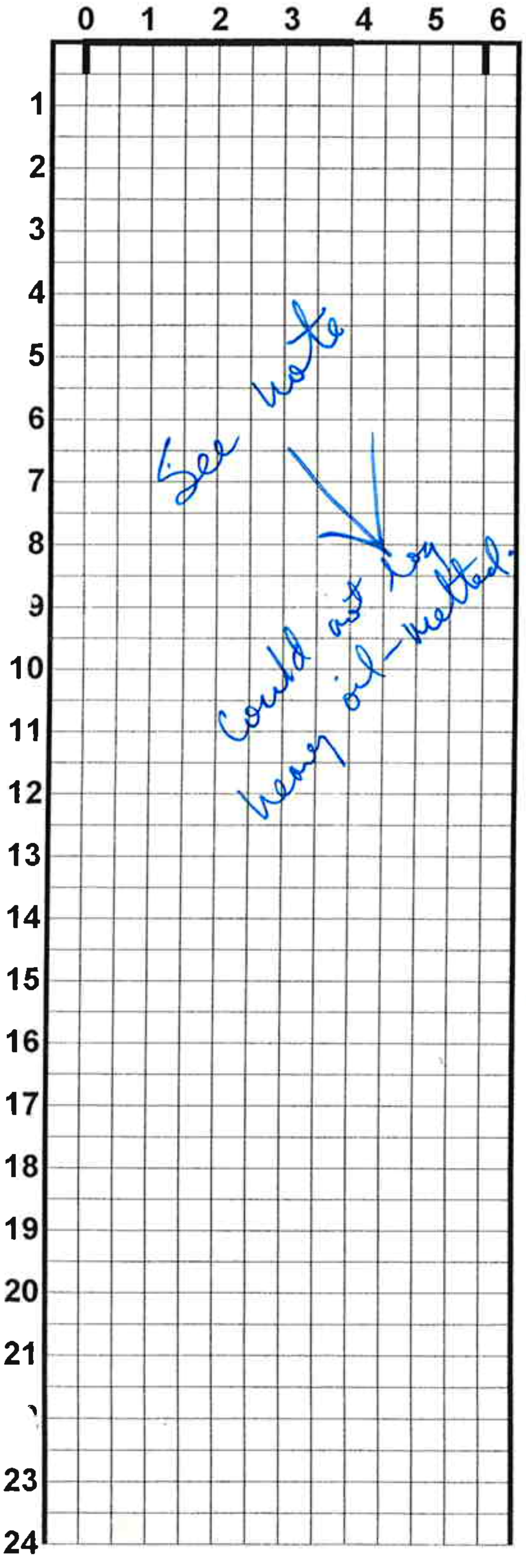
LOCATION: OWT WB 50' E of BR 07987

TERENCE

CORE LENGTH: 10 inches

Designer: JASON

EA #: PE001135/010/J13



See note

Could not log heavy oil-melted.

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

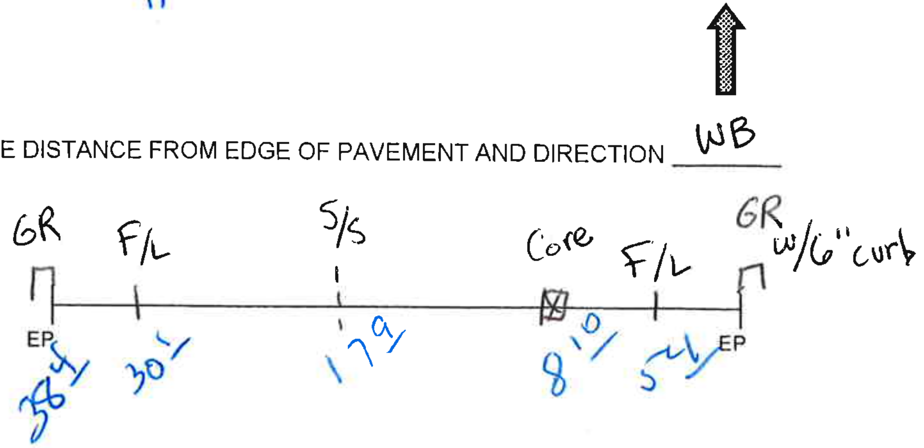
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Ten inches total heavy oil. Could not get all of core. Melted in barrel approx. 4.5 inches left.

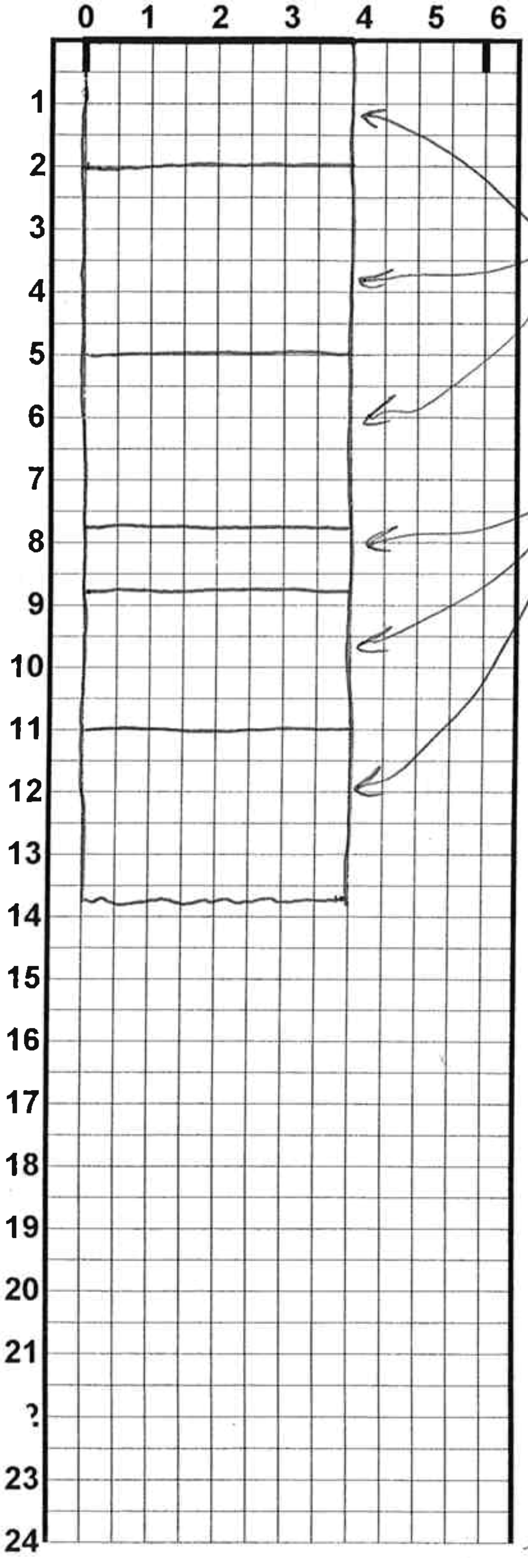
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

ROJECT: I84: PLEASANT VALLEY-DURKEE
HIGHWAY: OLD OR TRAIL HWY NO .006
MILEPOINT: 326.201
LOCATION: OWT WB 50' W of BR 09475A
CORE LENGTH: 13.75 inches

Saved: [✓ Yes] No
PD # 6
Date: 10/18/05
Logged By: Craigh Weldon [✓ Michael]
TERENCE
Designer: JASON
EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

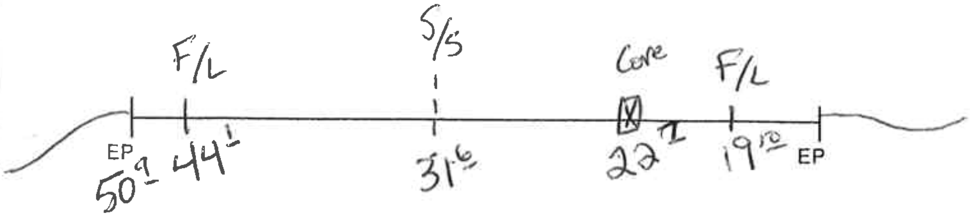
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

↑

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 5

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/18/05

MILEPOINT: 326.208

Logged By: Craigh Weldon [✓ Michael]

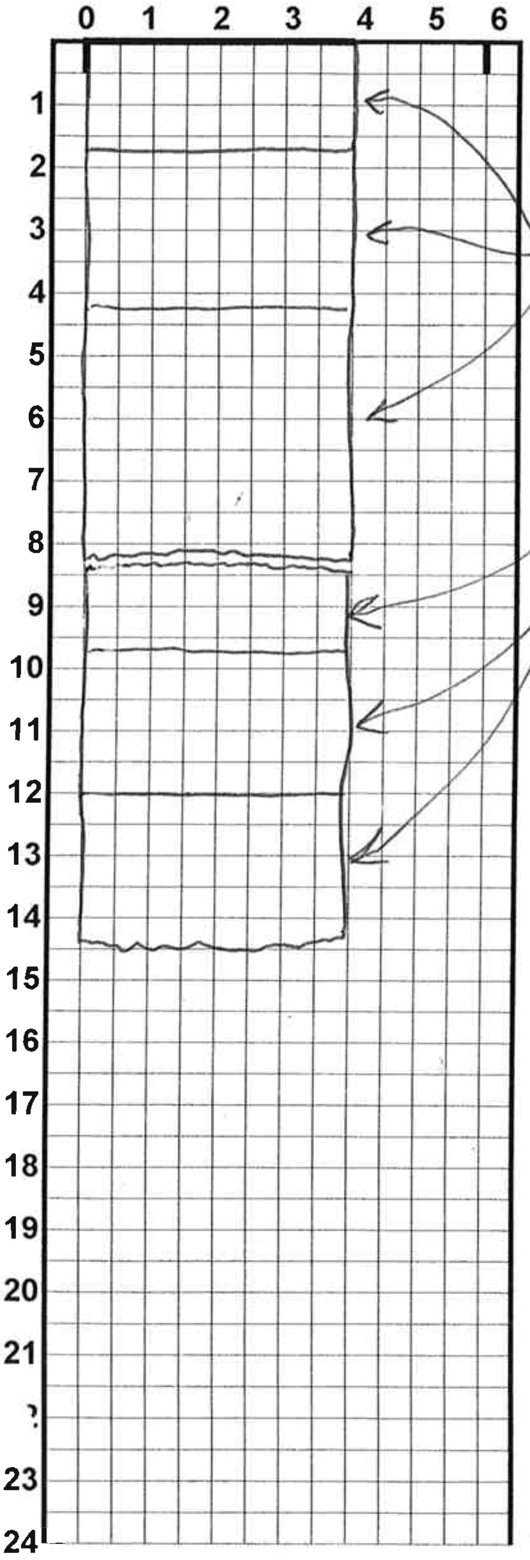
TERENCE

LOCATION: OWT WB 10' W of BR 09475A

CORE LENGTH: 14.50 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

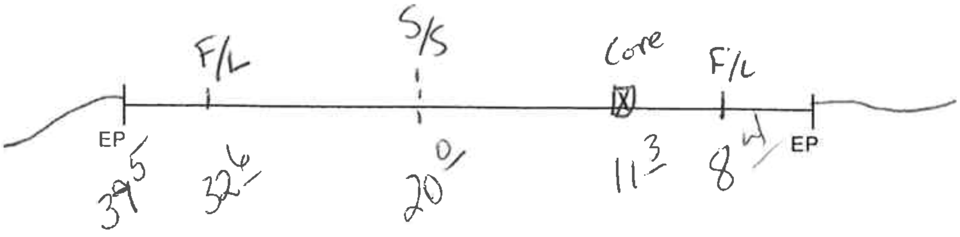
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 3

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/18/05

MILEPOINT: 326.249

Logged By: Craigh Weldon [✓ Michael]

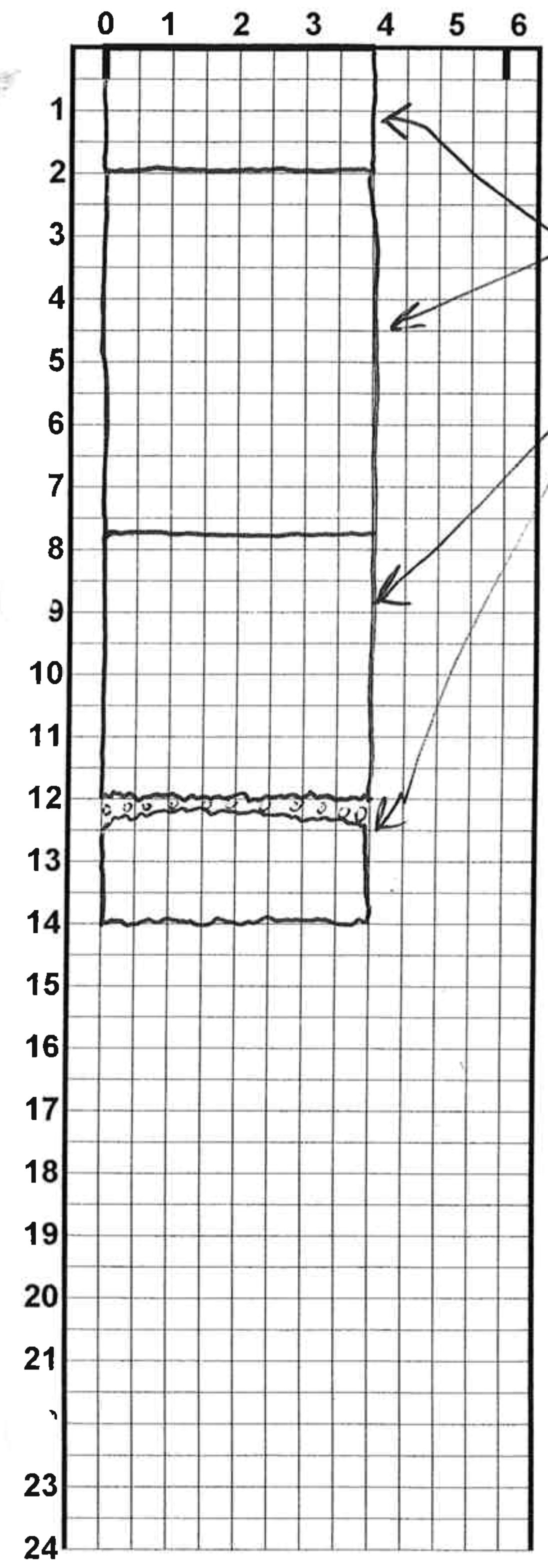
TERENCE

LOCATION: OWT WB 10' E of B 09475A

CORE LENGTH: 14.0 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

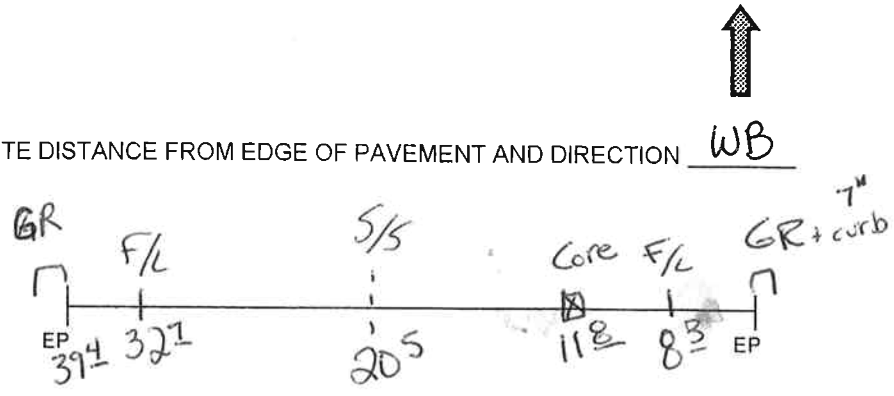
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 3

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/18/05

MILEPOINT: 326.256

Logged By: Craigh Weldon [✓ Michael]

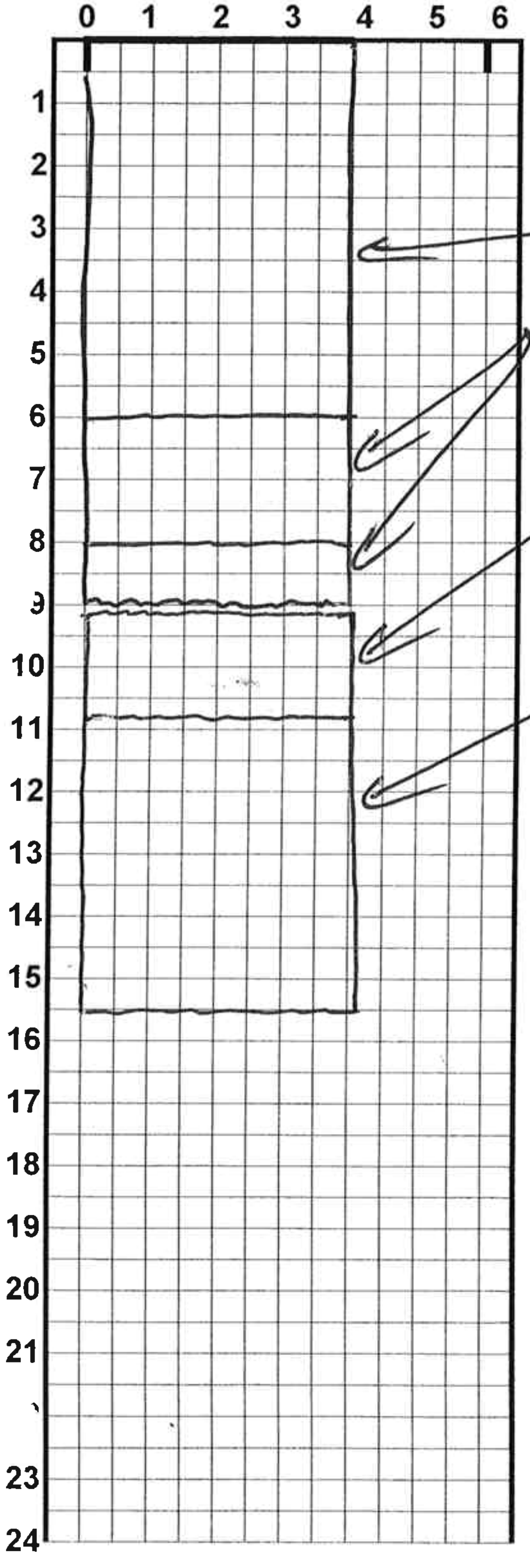
LOCATION: OWT WB 50' E of BR 09475A

[✓ TERENCE]

CORE LENGTH: 15.50 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair [✓ Poor]

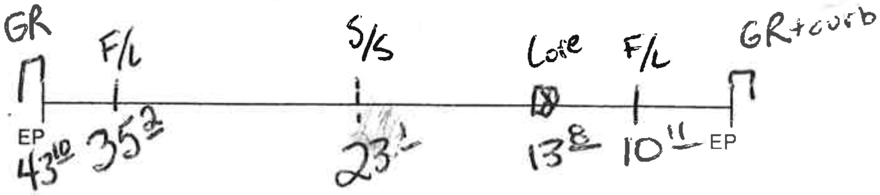
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

WE BROKE

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PD # 34

PROJECT: **I84: PLEASANT VALLEY-DURKEE**

HIGHWAY: OLD OR TRAIL HWY NO .006

MILEPOINT: 325.287

LOCATION: OWT EB RL 10 ft app. Core

CORE LENGTH: 17 1/2 inches

Date: 3/28/06

Logged By: Craigh Weldon Michael

TERENCE

Designer: **JASON**

EA # **PE001135/010/J13**

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

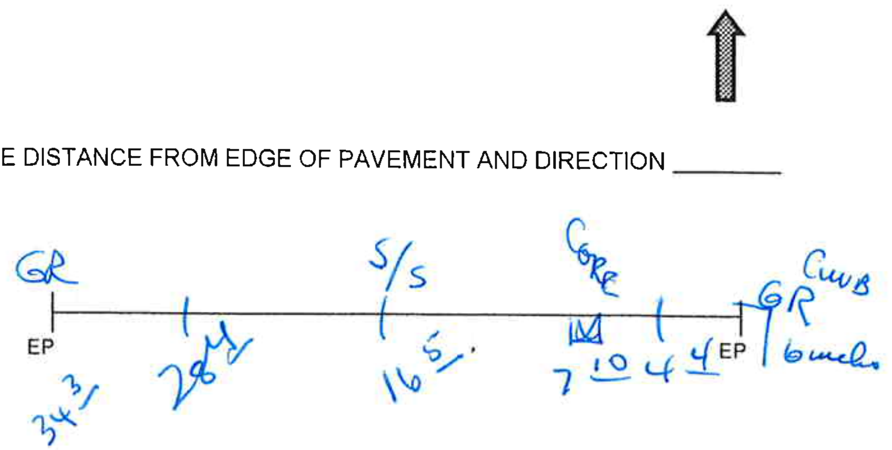
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION ________



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I84: PLEASANT VALLEY-DURKEE

PD #: 33

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-28-06

MILEPOINT: 325.279

Logged By: Craigh Weldon Michael

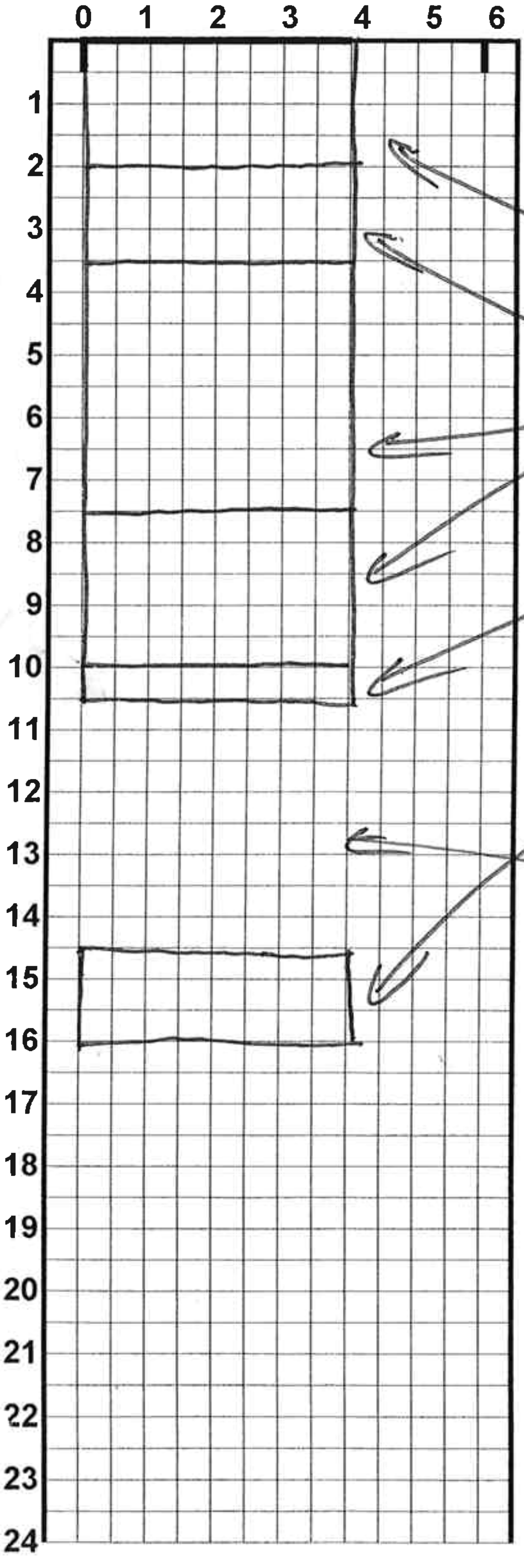
[✓ TERENCE]

LOCATION: EB OWTRL 50' W BR. 07987A

CORE LENGTH: 16 inches

Designer: JASON

EA #: PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

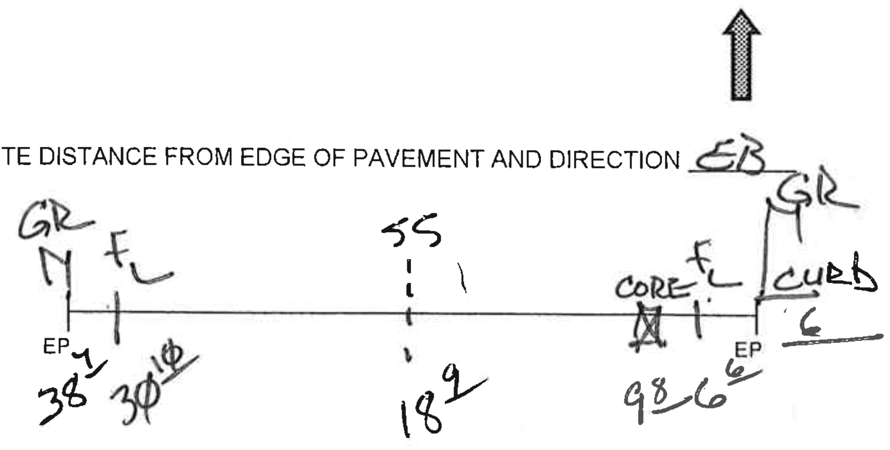
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair [✓ Poor]

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

Melted & stuck in Core Bit

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PD #: 35

Date: 3-28-06

Logged By: Craigh Weldon Michael [✓ TERENCE]

Designer: JASON

EA #: PE001135/010/J13

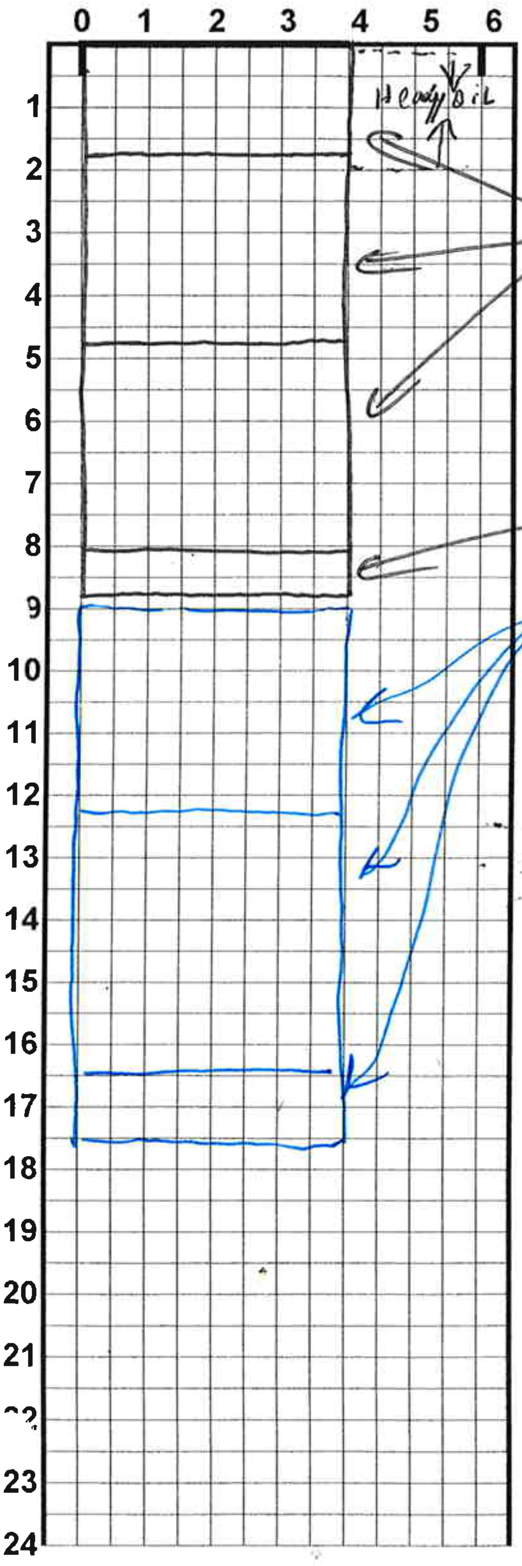
PROJECT: I84: PLEASANT VALLEY-DURKEE

HIGHWAY: OLD OR TRAIL HWY NO .006

MILEPOINT: 325.393

LOCATION: EB OUT RL 10' E. BR 07987A

CORE LENGTH: 17½ inches



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

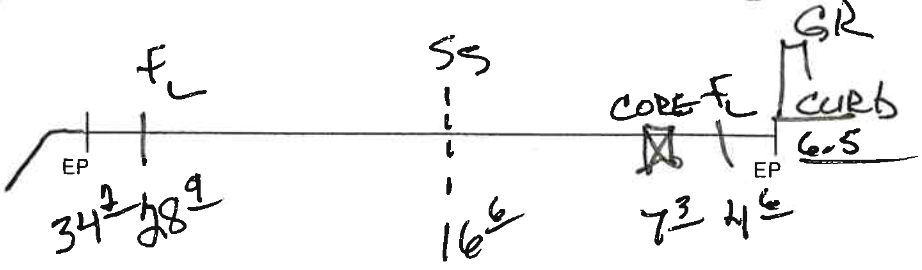
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I84: PLEASANT VALLEY-DURKEE

HIGHWAY: OLD OR TRAIL HWY NO .006

MILEPOINT: 325. 401

LOCATION: OWT EB RL 50 FT LEAVE CORE

CORE LENGTH: 19 1/4 inches

PD #: 36

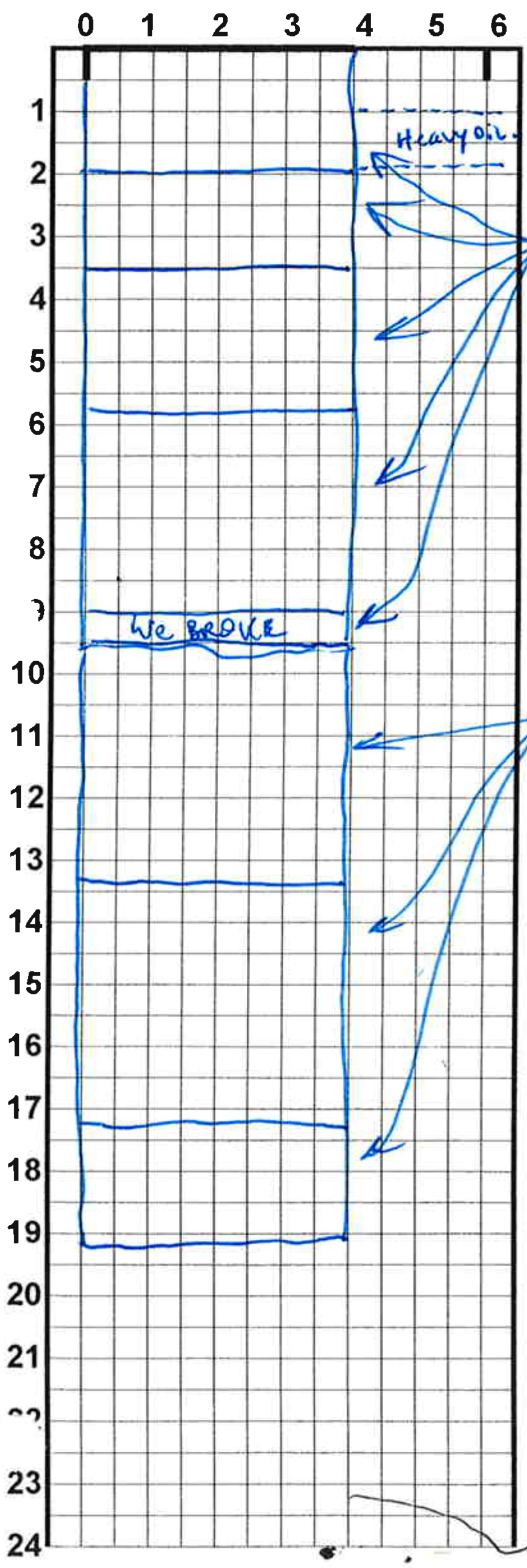
Date: 3/28/06

Logged By: Craigh Weldon Michael

TERENCE

Designer: JASON

EA #: PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

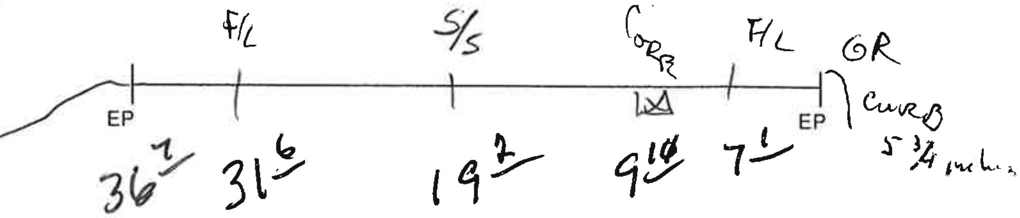
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD #: 38

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-29-06

MILEPOINT: 326.216

Logged By: Craigh Weldon Michael

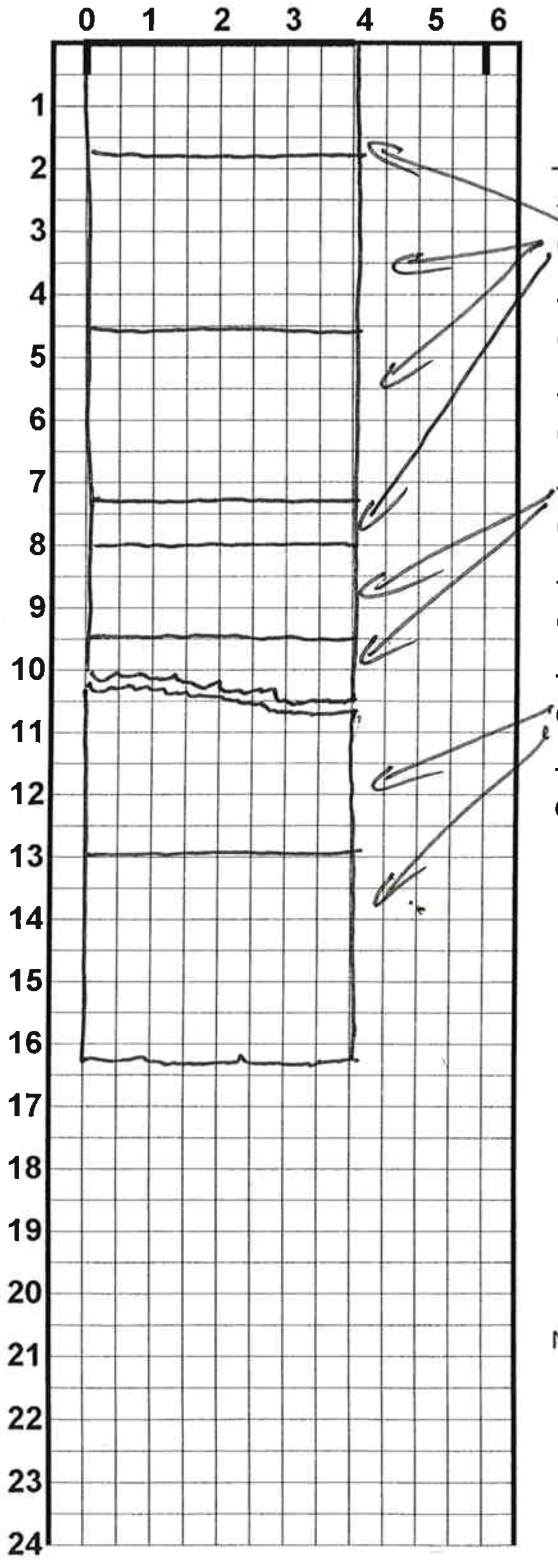
LOCATION: EB OWT RL 50' W BR ~~09475~~ 09475

[✓ TERENCE]

CORE LENGTH: 16.25 inches

Designer: JASON

EA #: PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

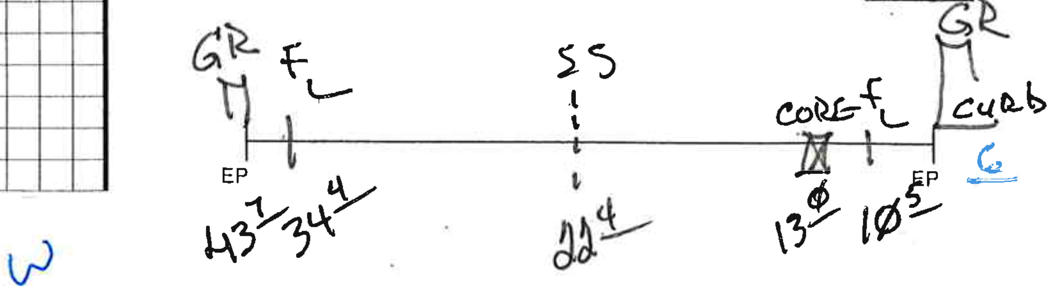
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 39

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-29-06

MILEPOINT: 326.224

Logged By: Craigh Weldon Michael

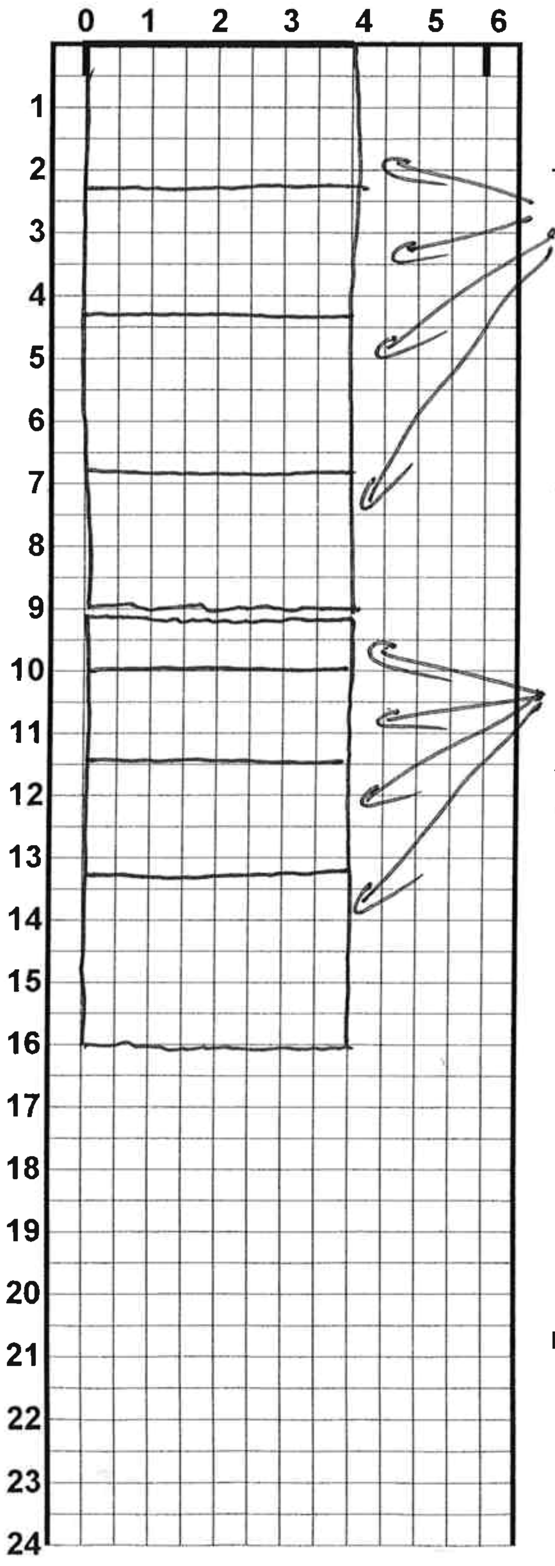
LOCATION: EB OWT RL 10' W BR 09475

[✓ TERENCE]

CORE LENGTH: 16.0 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

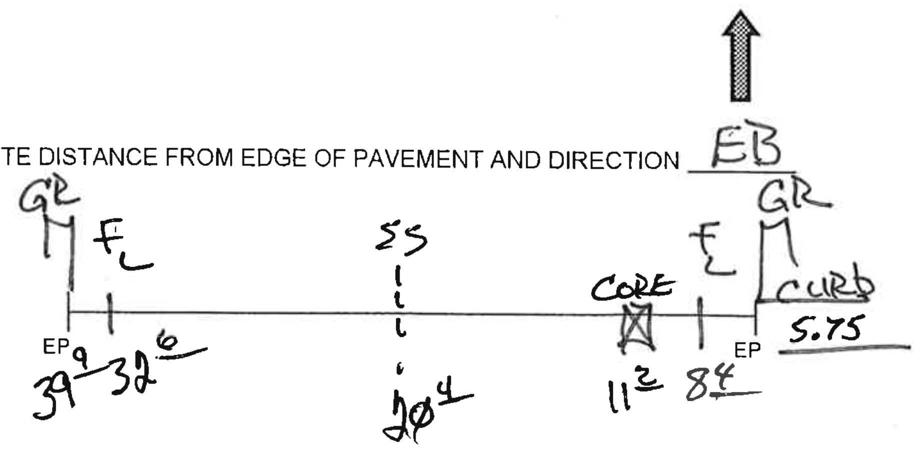
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 40

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-29-06

MILEPOINT: 326.264

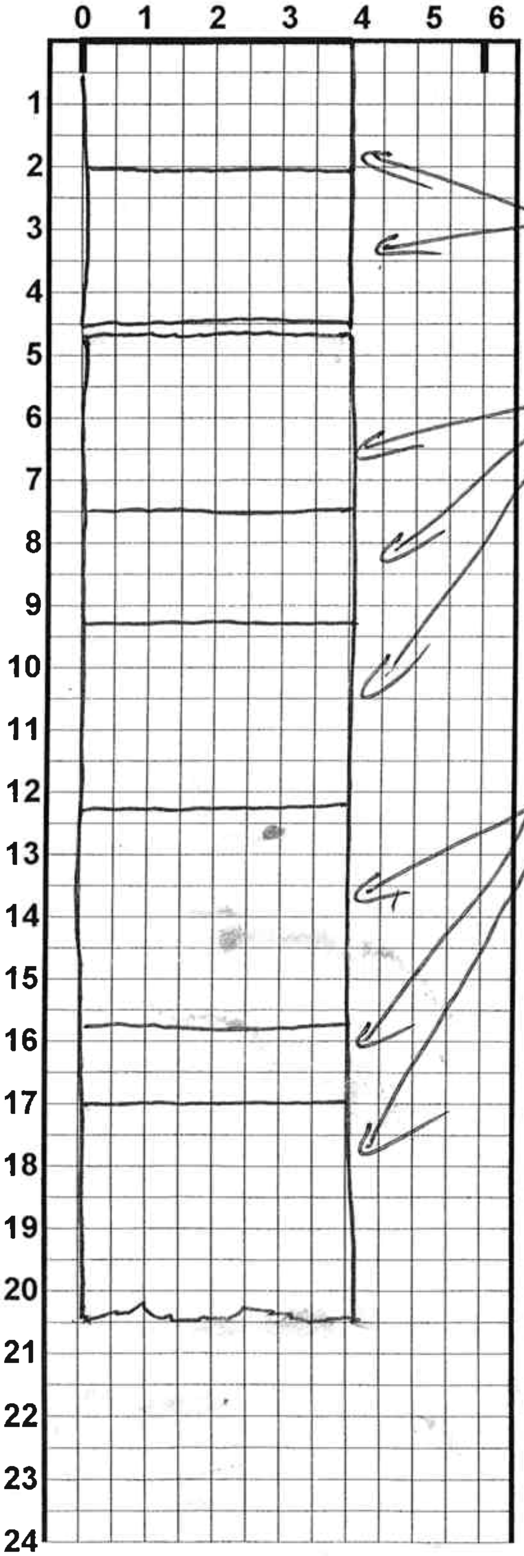
Logged By: Craigh Weldon Michael [✓ TERENCE]

LOCATION: EB OUT RL 10'E BR 09475

CORE LENGTH: 20.5 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

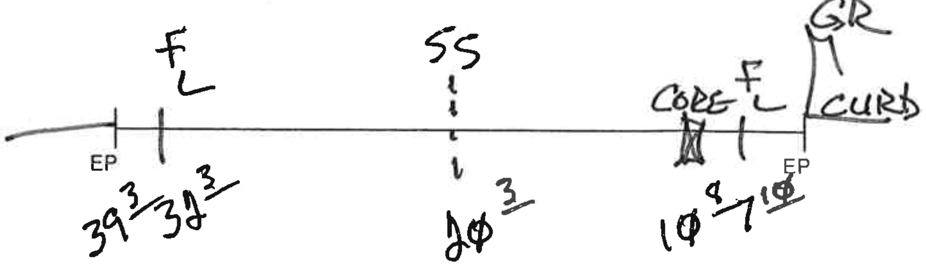
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 41

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3/29/06

MILEPOINT: 326.272

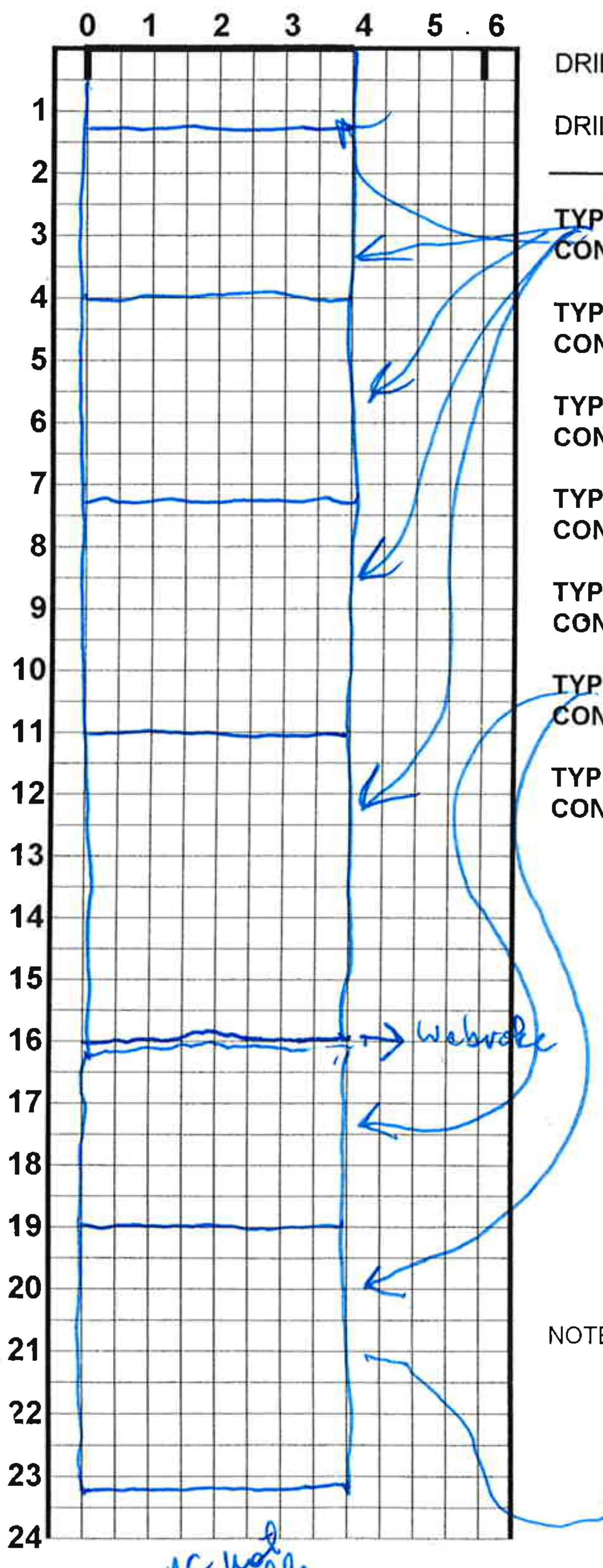
Logged By: [✓ Craigh] Weldon Michael TERENCE

LOCATION: RL OUT EB 50 Ft leave Core

CORE LENGTH: 23 1/4 inches

Designer: JASON

EA # PE001135/010/J13



Move AC not recoverable.

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

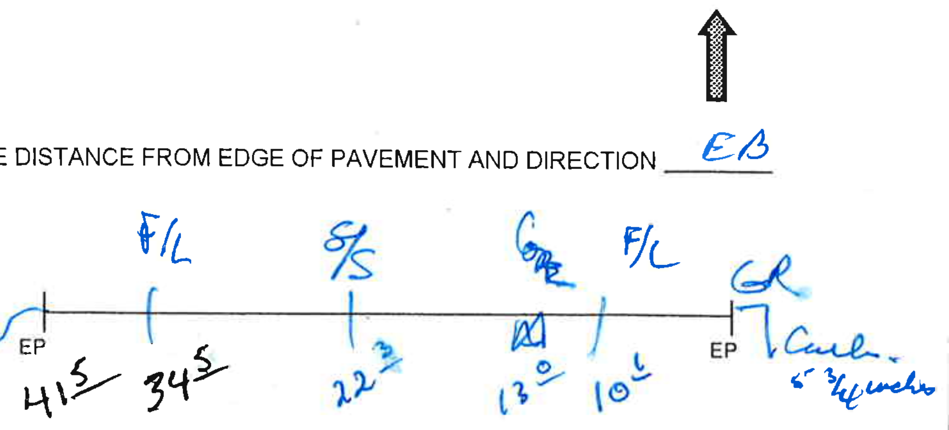
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 46

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3/30/06

MILEPOINT: 321

Logged By: [✓ Craigh] Weldon Michael

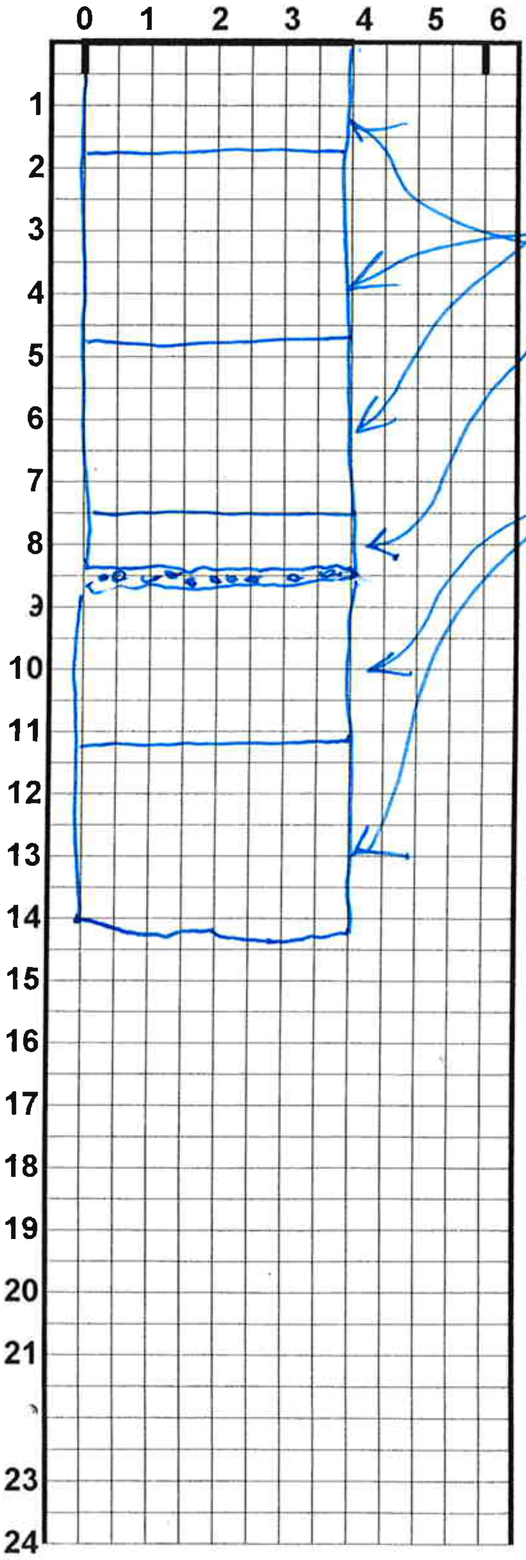
TERENCE

LOCATION: RL OWT EB Probe # 5

CORE LENGTH: 14 1/4 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

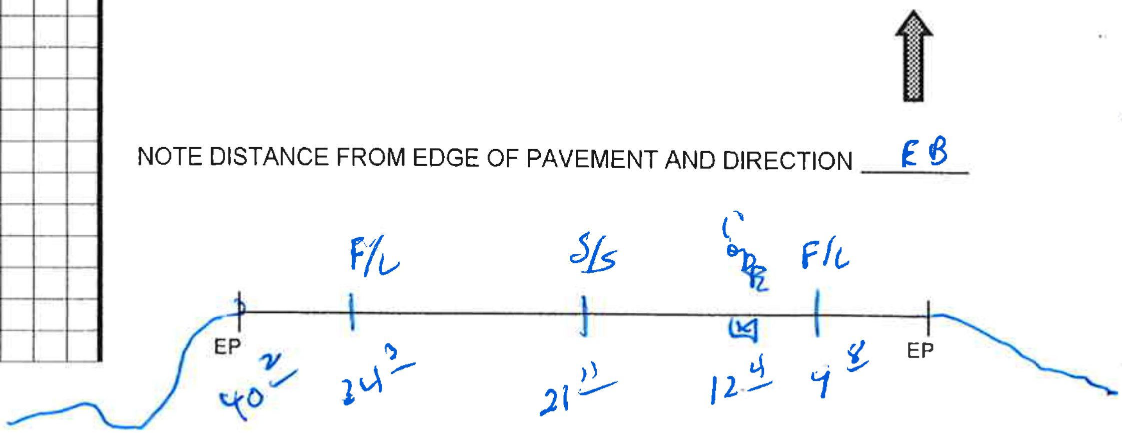
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: Yes No

PROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 29

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-28-06

MILEPOINT: 323.50

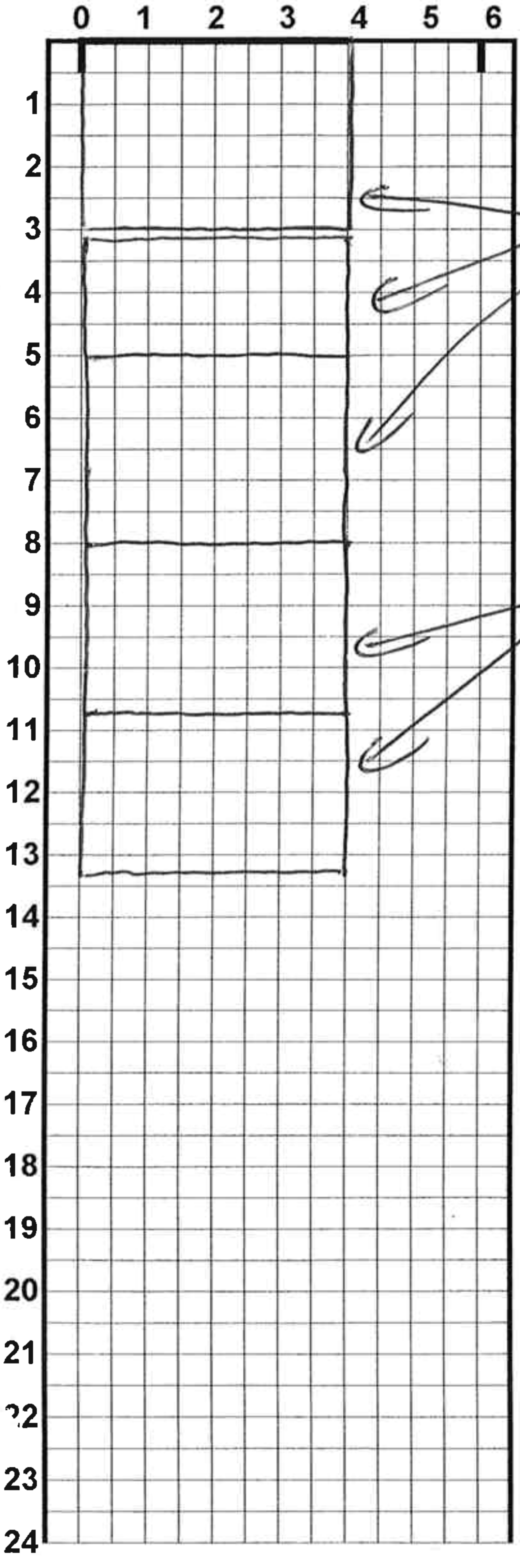
Logged By: Craigh Weldon Michael [✓ TERENCE]

LOCATION: EB IWT RL

CORE LENGTH: inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: NO [✓ YES]

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

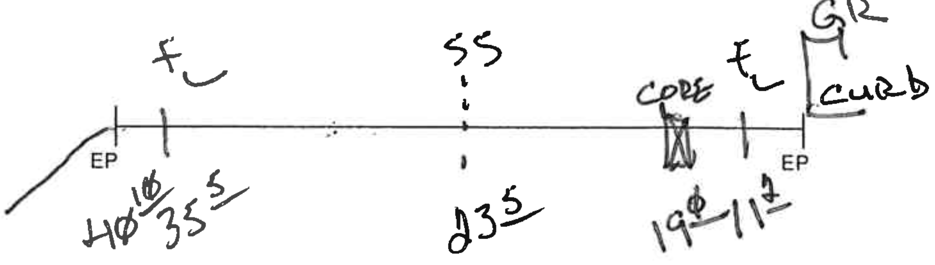
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 30

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-28-06

MILEPOINT: 324.00

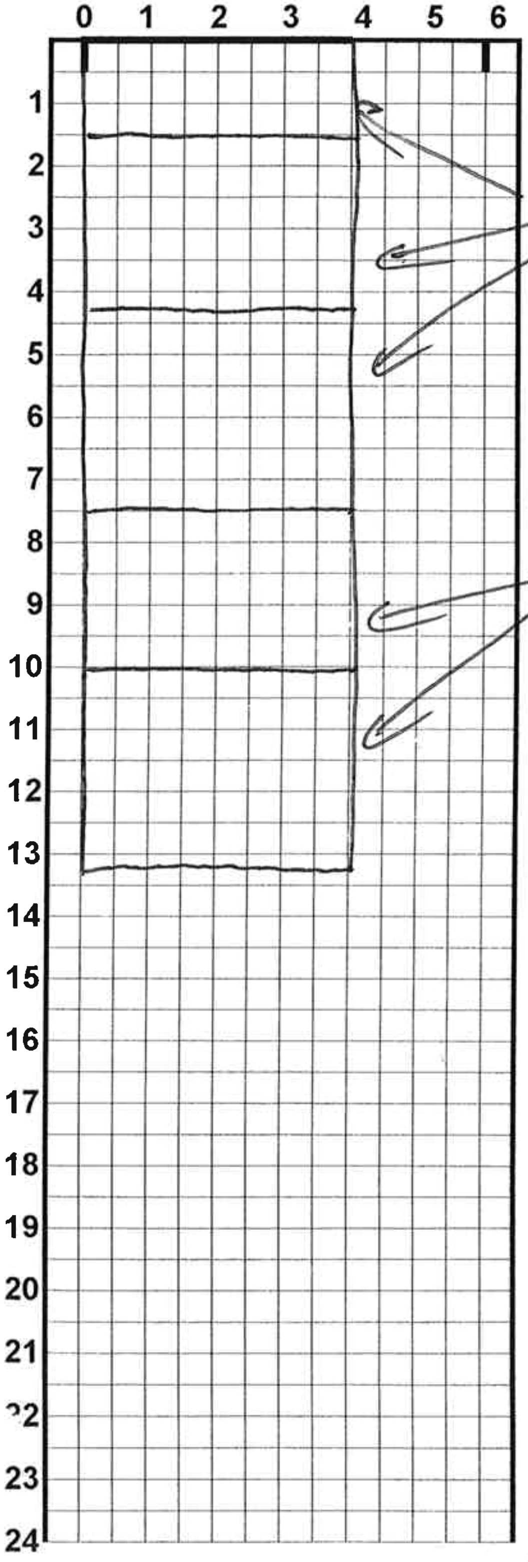
Logged By: Craigh Weldon Michael [✓ TERENCE]

LOCATION: EB OWT RL

CORE LENGTH: 13.25 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

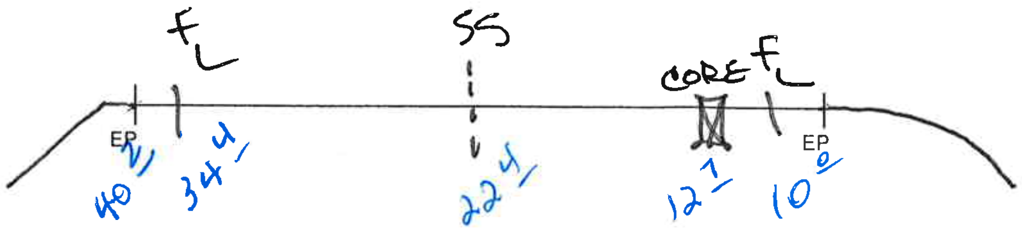
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 3.1

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3/28/06

MILEPOINT: 324.5

Logged By: [✓ Craigh] Weldon Michael

LOCATION: OWT EBRL Probe locate.

TERENCE

CORE LENGTH: 12 3/4 inches

Designer: JASON

EA # PE001135/010/J13

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

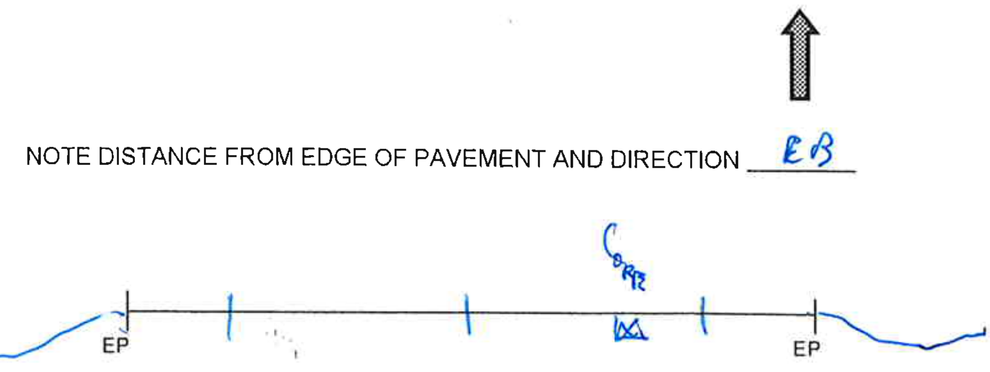
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 32

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-28-06

MILEPOINT: 325.00

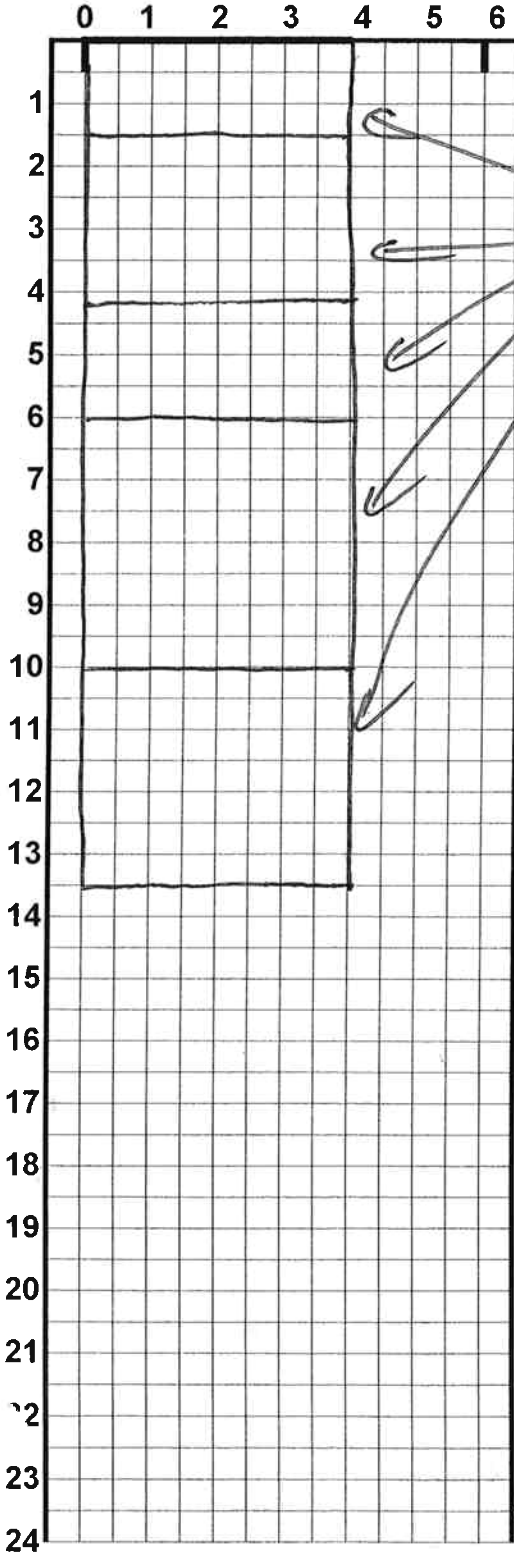
Logged By: Craigh Weldon Michael [✓ TERENCE]

LOCATION: EB OUT RL

CORE LENGTH: 13.5 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

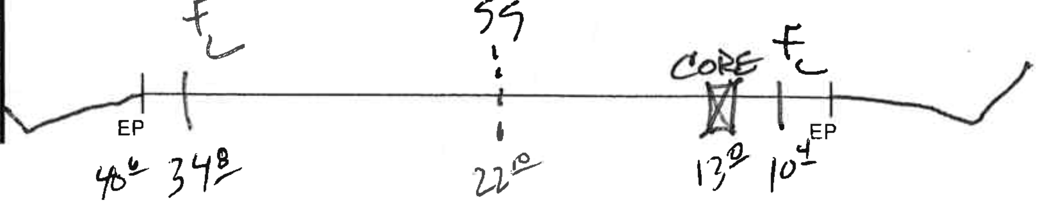
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 37

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3/29/06

MILEPOINT: 326.0 Probe #4

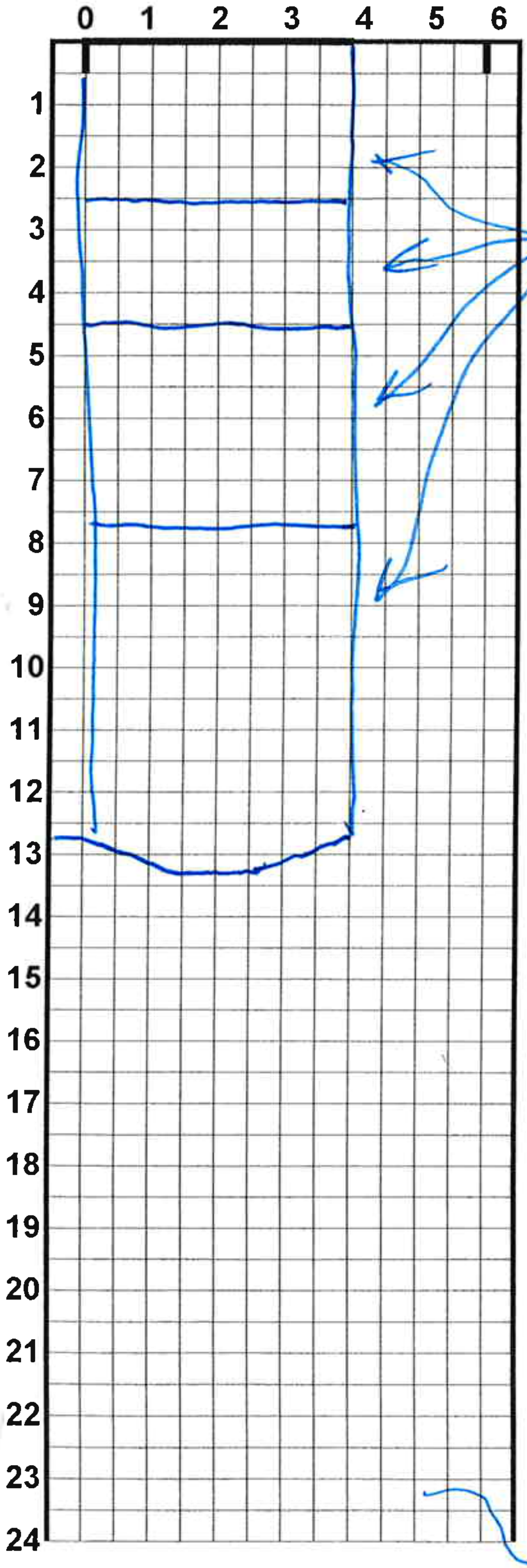
Logged By: [✓ Craigh] Weldon Michael TERENCE

LOCATION: OWT EB RL

Designer: JASON

CORE LENGTH: 13 1/4 inches

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

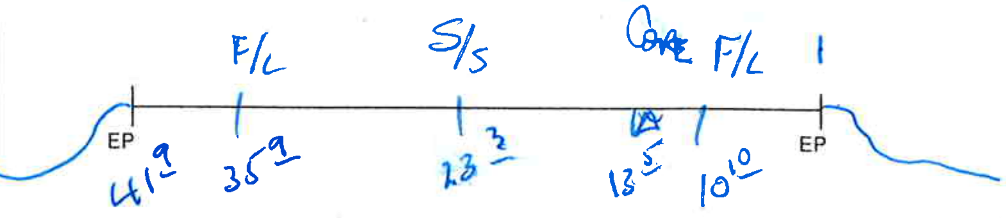
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 42

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-29-06

MILEPOINT: 326.75

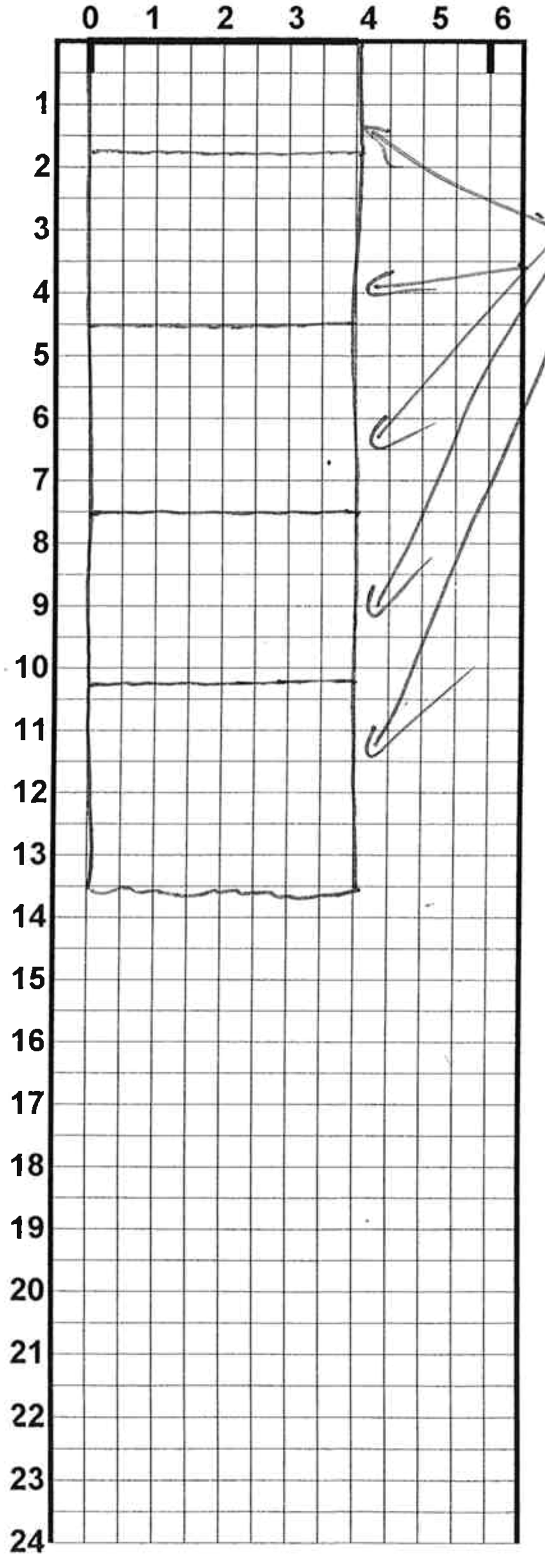
Logged By: Craigh Weldon Michael [✓ TERENCE]

LOCATION: EB OWT RL

CORE LENGTH: 13.5 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

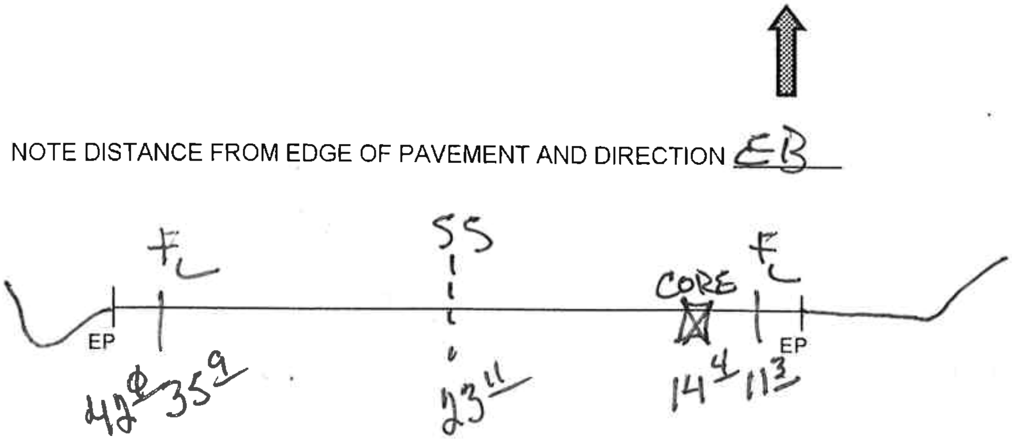
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 43

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3/29/06

MILEPOINT: 327.25

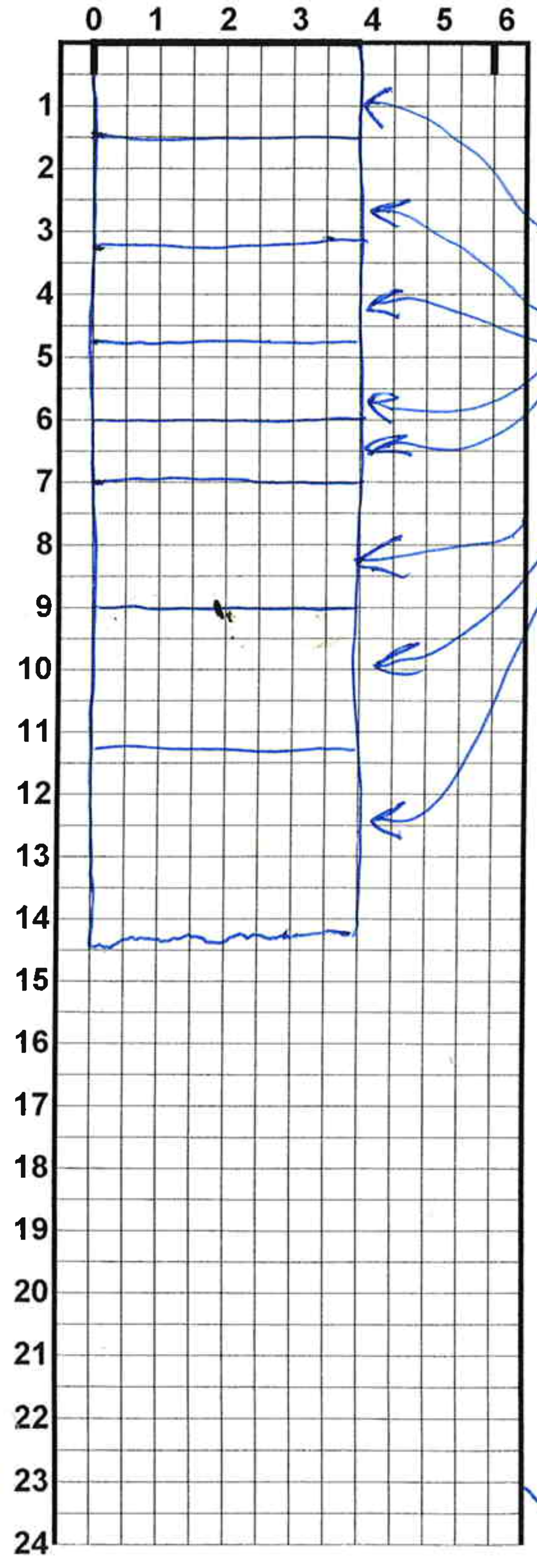
Logged By: Craigh Weldon [✓ Michael] TERENCE

LOCATION: EB OWT RL

CORE LENGTH: 14.25 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

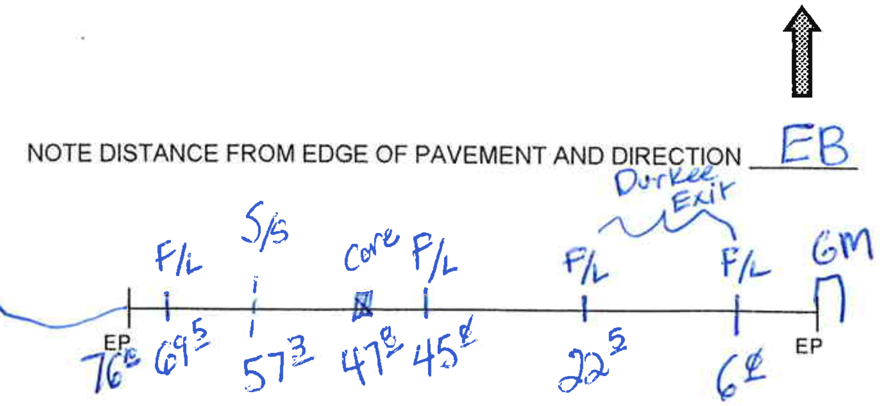
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: **I84: PLEASANT VALLEY-DURKEE**

PD #: 28

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3/23/06

MILEPOINT: 319.25

Logged By: Craigh Weldon [✓ Michael]

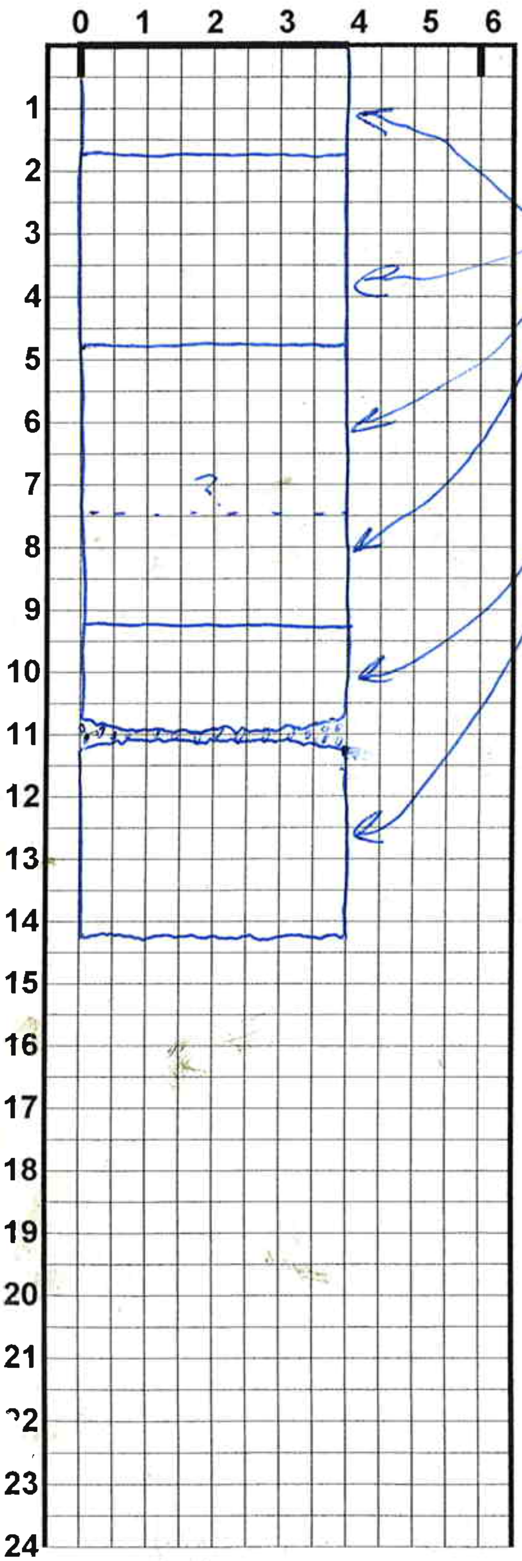
LOCATION: WB OW T RL

TERENCE

CORE LENGTH: 14.25 inches

Designer: **JASON**

EA #: **PE001135/010/J13**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

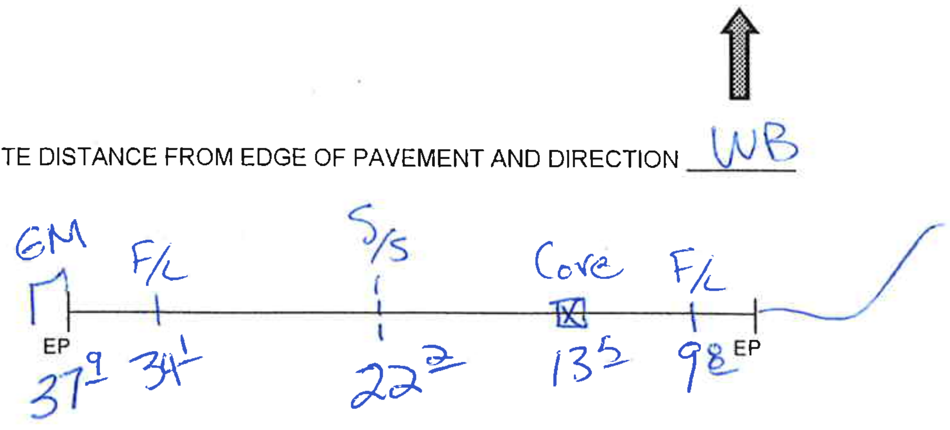
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 27

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-23-06

MILEPOINT: 319.75

Logged By: Craigh Weldon [✓ Michael]

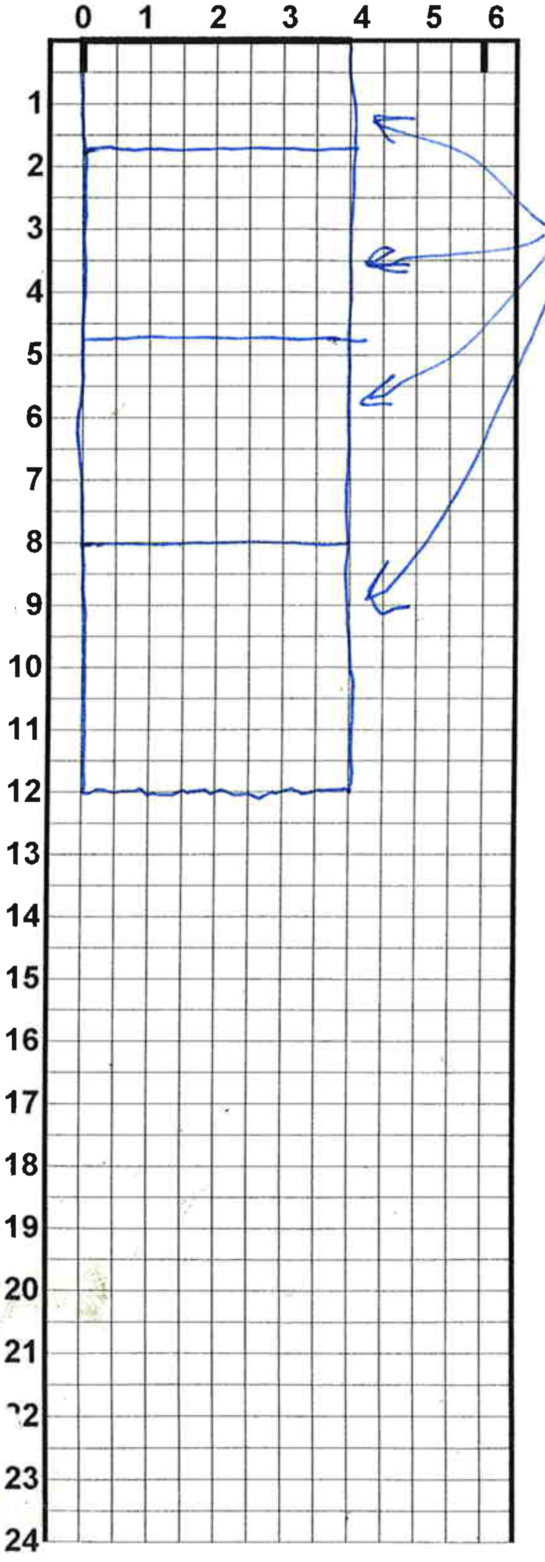
LOCATION: WB OWT RL

TERENCE

CORE LENGTH: 12.0 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

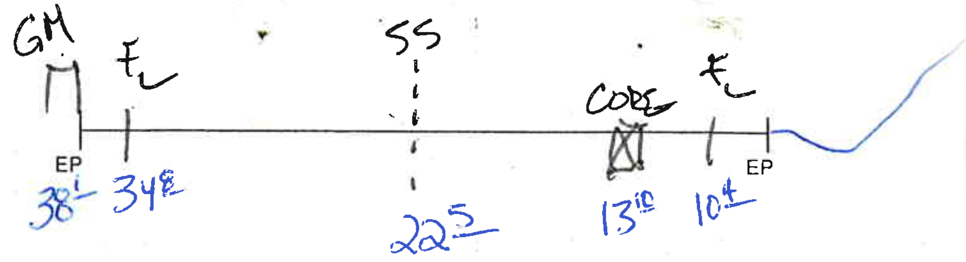
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: **I84: PLEASANT VALLEY-DURKEE**

PD # 26

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/20/05

MILEPOINT: 320.25

Logged By: Craigh Weldon [✓ Michael]

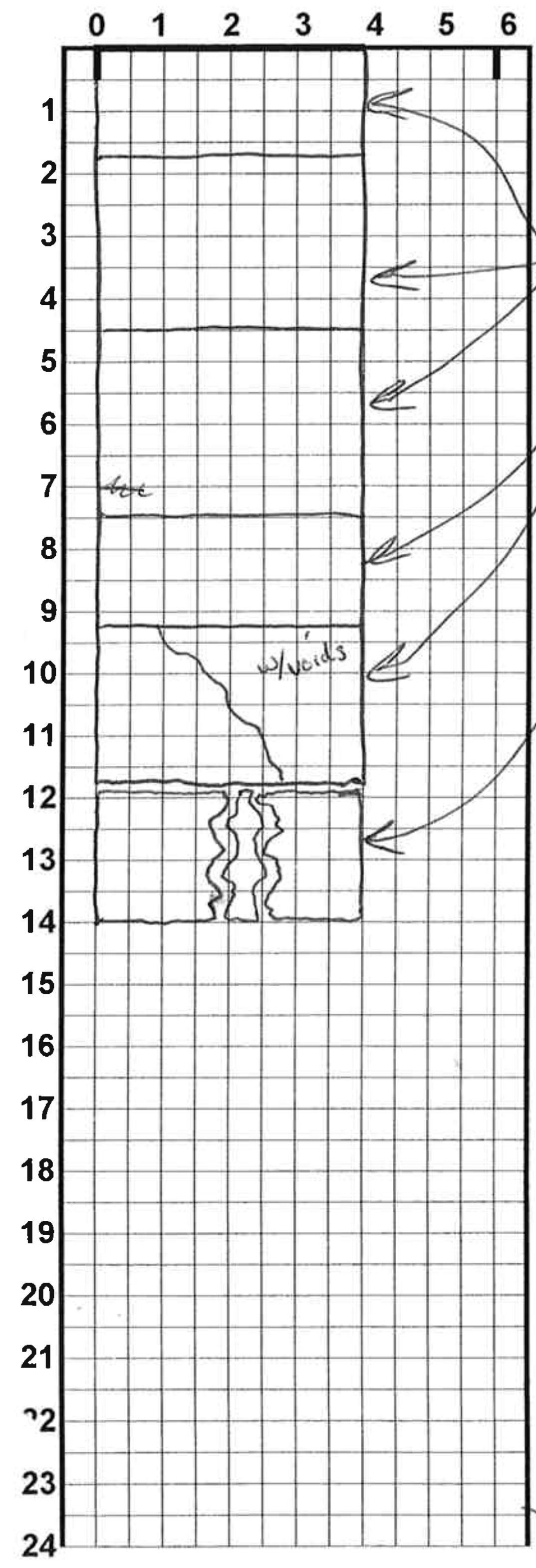
TERENCE

LOCATION: WB OWT

CORE LENGTH: 14.0 inches

Designer: **JASON**

EA # **PE001135/010/J13**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

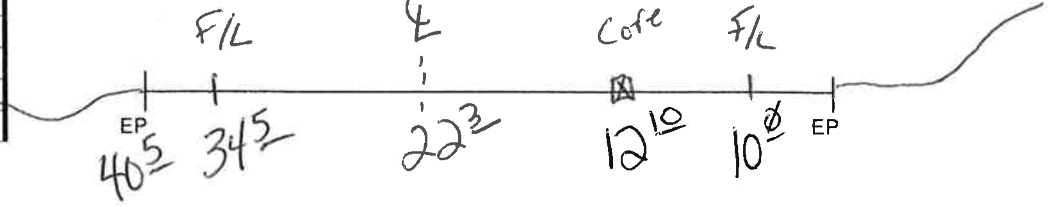
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 25

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/20/05

MILEPOINT: 320.75

Logged By: Craigh Weldon [✓ Michael]

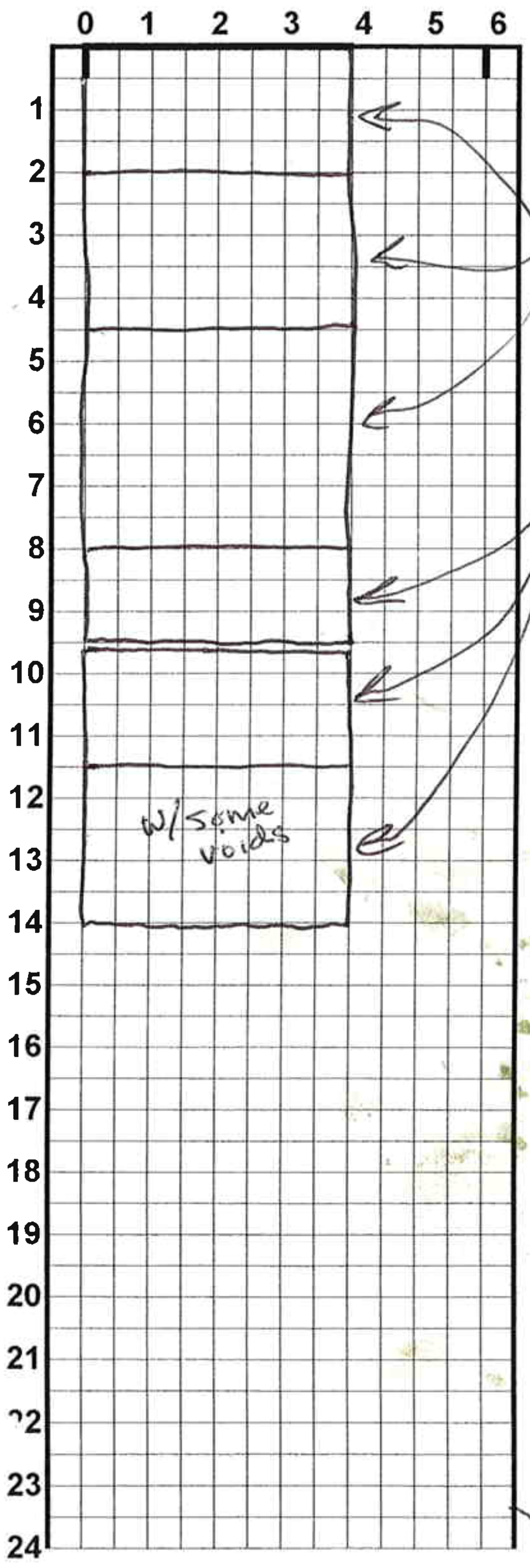
TERENCE

LOCATION: WB OWT

CORE LENGTH: 14.0 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

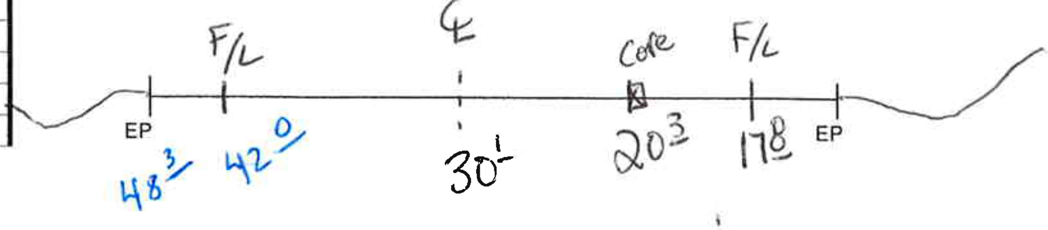
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: **I84: PLEASANT VALLEY-DURKEE**

PD # 18

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 321.75

Logged By: Craigh Weldon [✓ Michael]

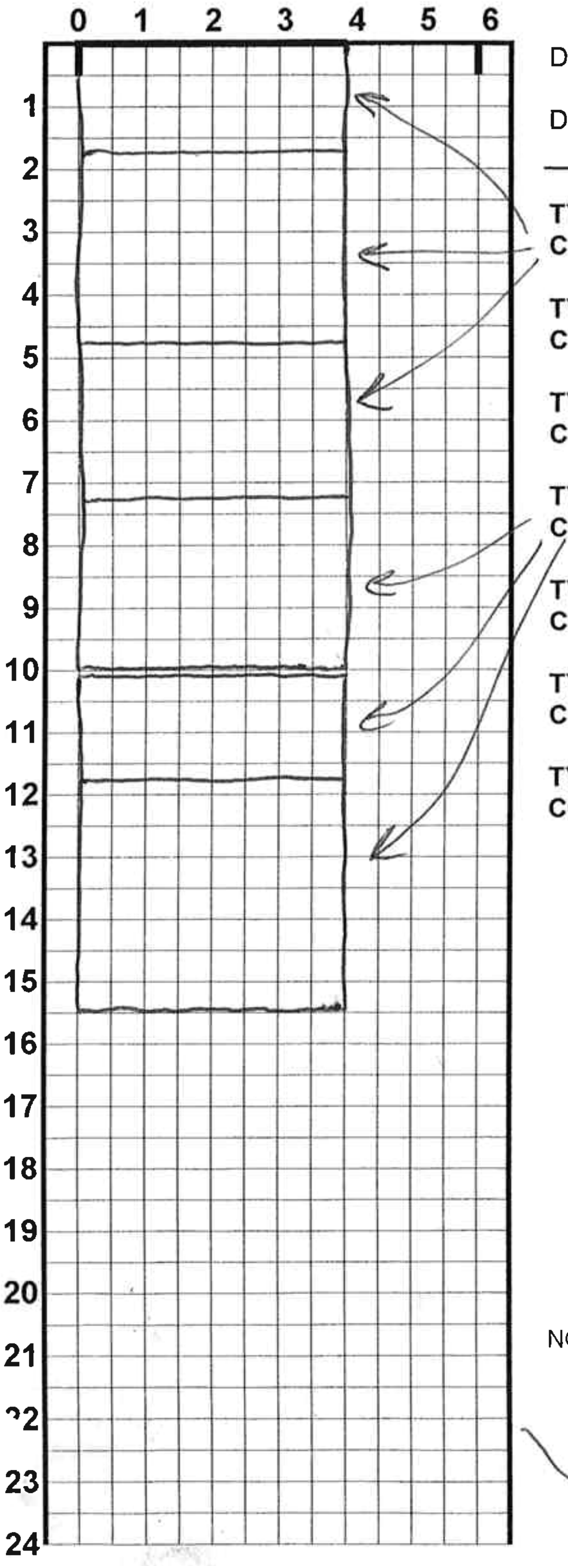
LOCATION: WB OWT

TERENCE

CORE LENGTH: 15.50 inches

Designer: **JASON**

EA # **PE001135/010/J13**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

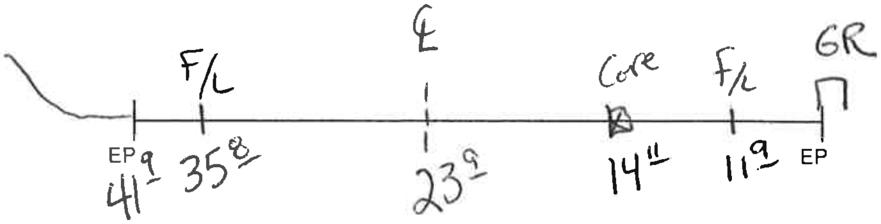
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: **I84: PLEASANT VALLEY-DURKEE**

PD # 17

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 322.25

Logged By: Craigh Weldon [✓ Michael]

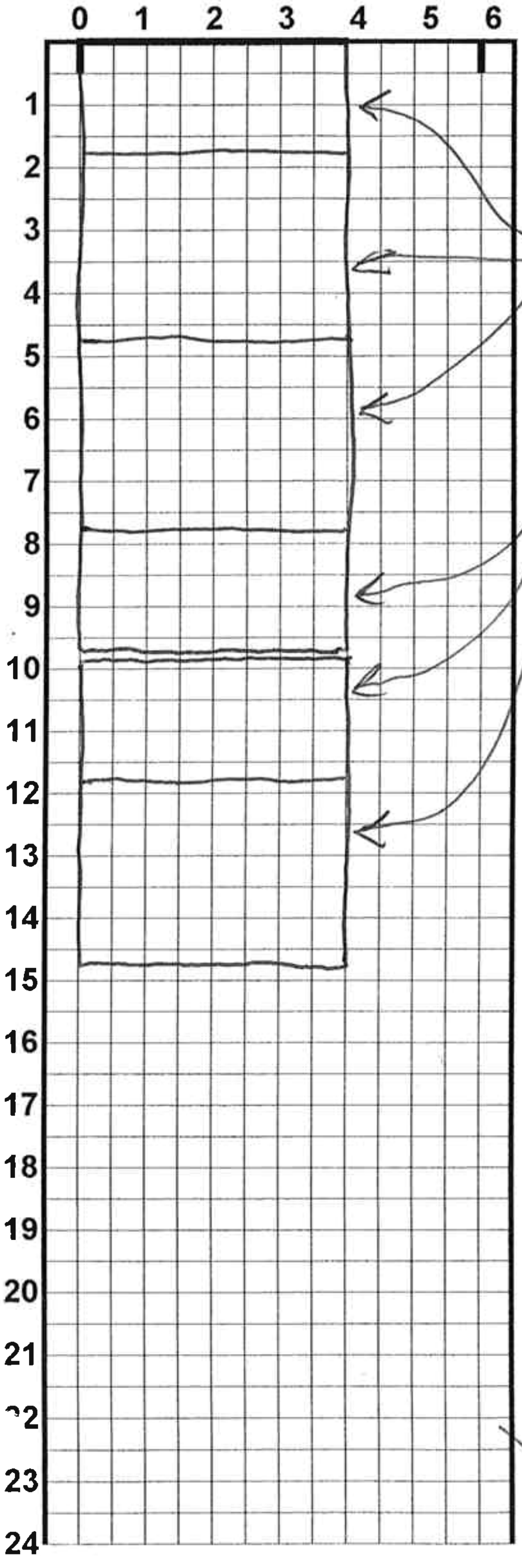
TERENCE

LOCATION: WB OWT

CORE LENGTH: 14.75 inches

Designer: **JASON**

EA # **PE001135/010/J13**



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

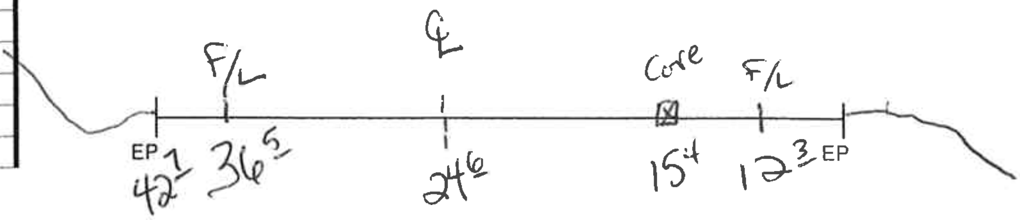
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: **I84: PLEASANT VALLEY-DURKEE**

PD #: 16

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 322.75

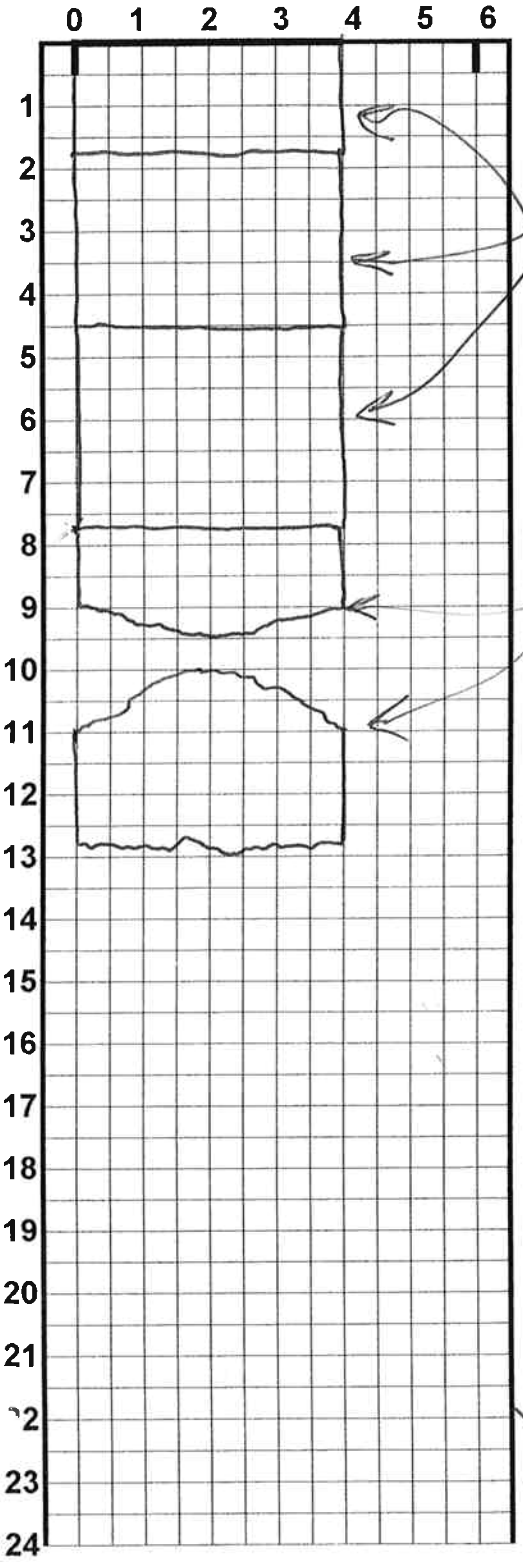
Logged By: Craigh Weldon [✓ Michael]
TERENCE

LOCATION: WB OWT

CORE LENGTH: 13.0 inches

Designer: **JASON**

EA #: **PE001135/010/J13**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

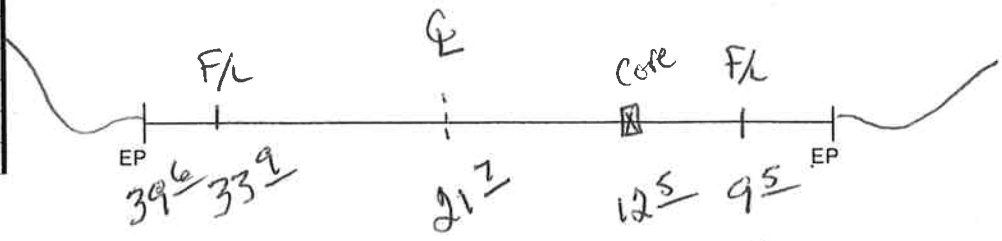
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 15

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 323.25

Logged By: Craigh Weldon [✓ Michael]

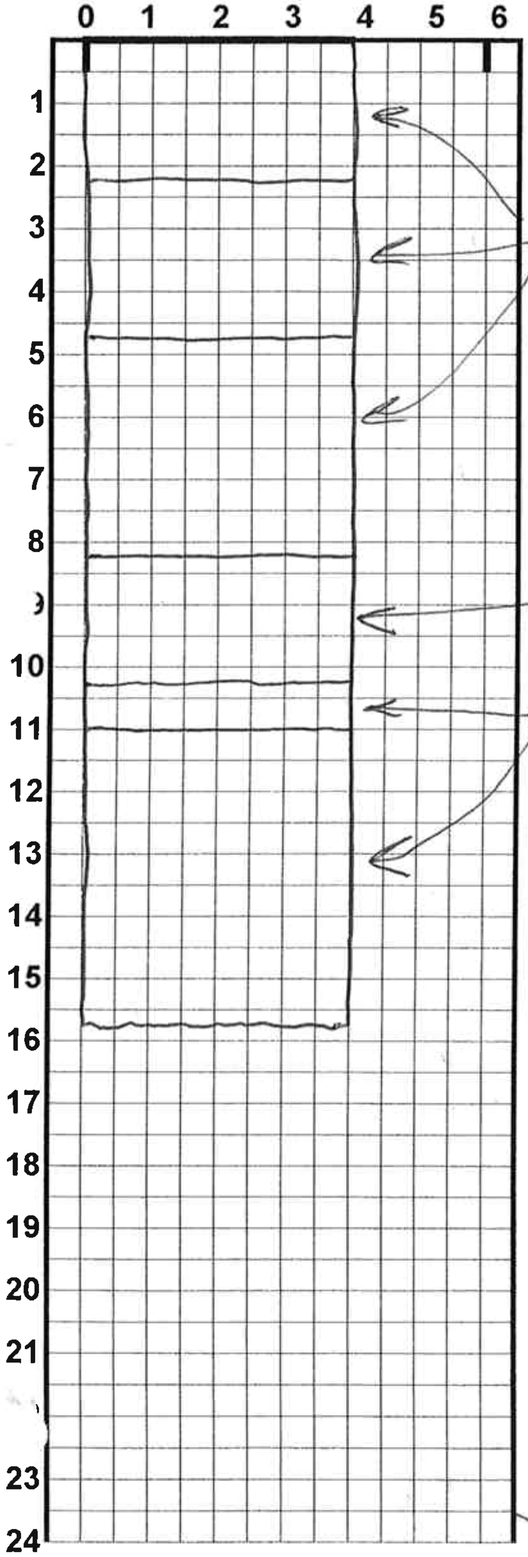
LOCATION: WB OWT

TERENCE

CORE LENGTH: 15.75 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

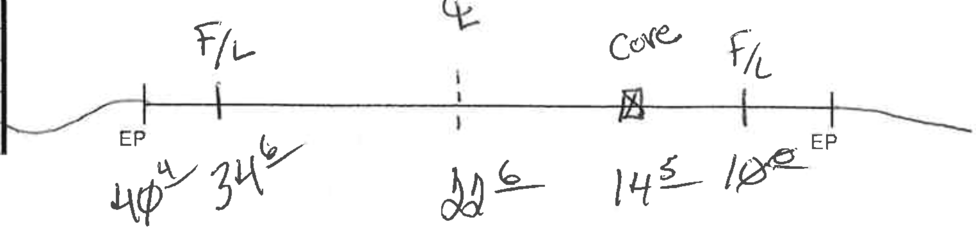
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor Crumbly nearing poor condition

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD #: 14

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 323.75

Logged By: Craigh Weldon Michael

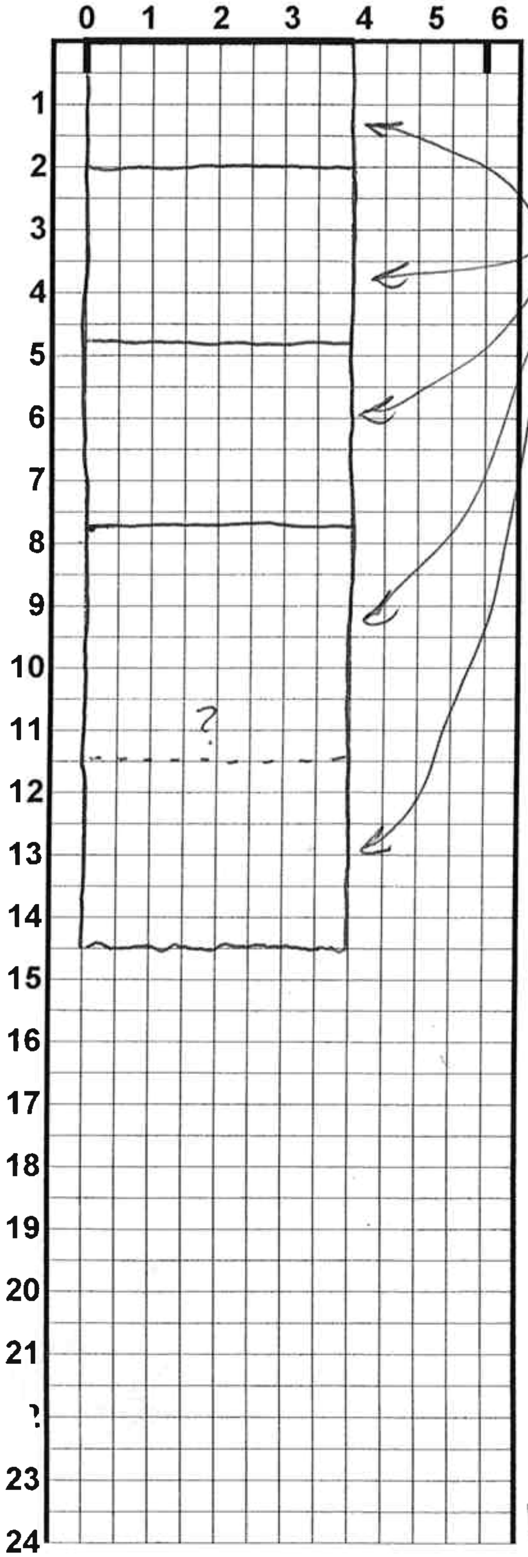
LOCATION: WB OWT

TERENCE

CORE LENGTH: 14.50 inches

Designer: JASON

EA #: PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

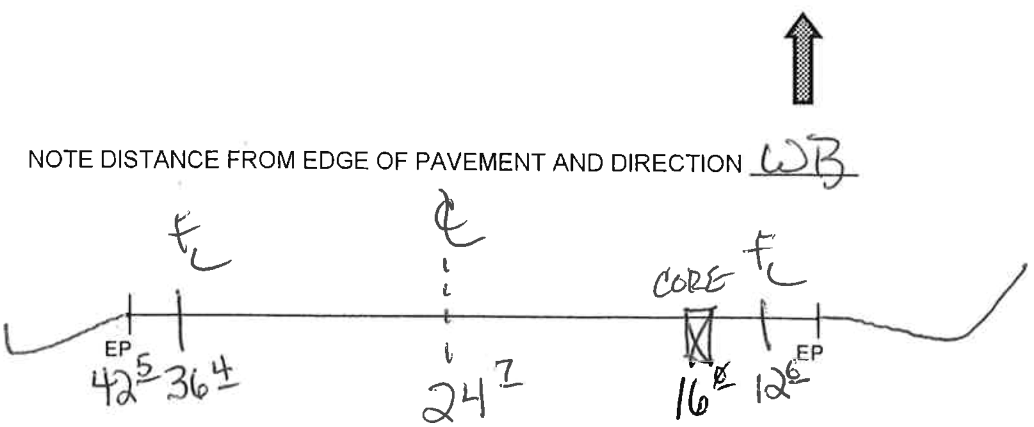
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 45

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3/29/06

MILEPOINT: 324.0

Logged By: [✓ Craigh] Weldon Michael

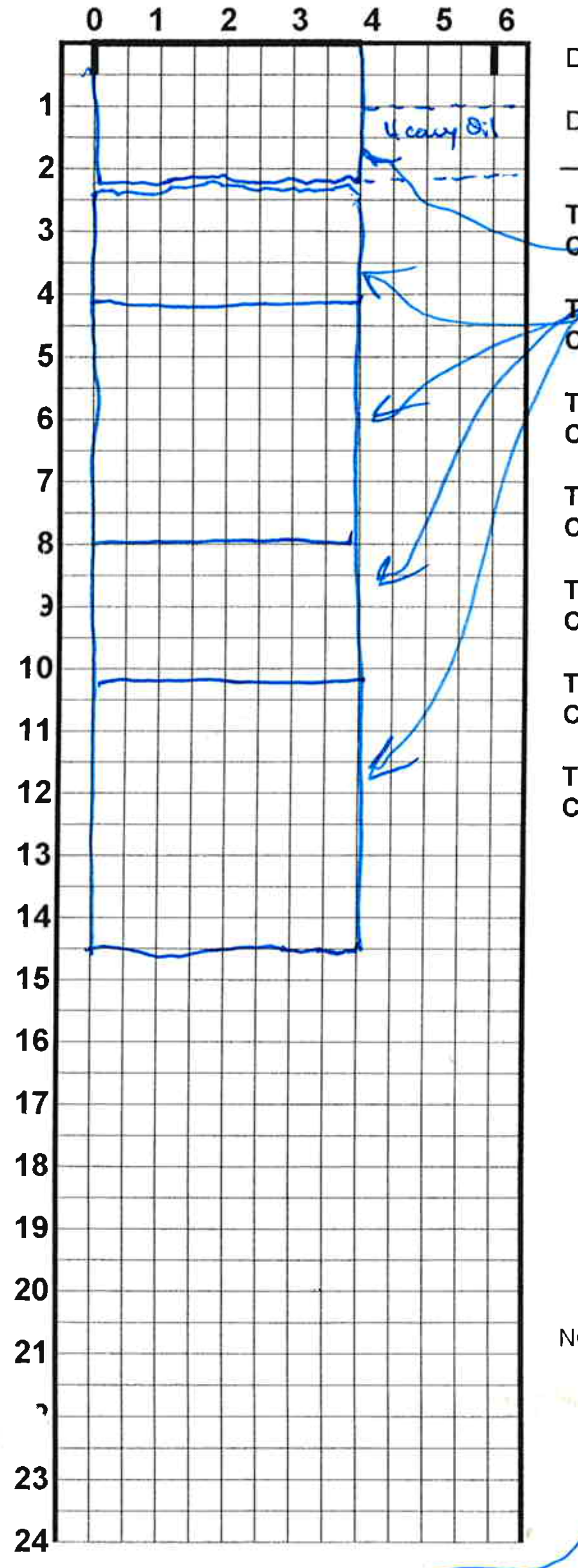
TERENCE

LOCATION: @ 1WT LL WB

CORE LENGTH: 14½ inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

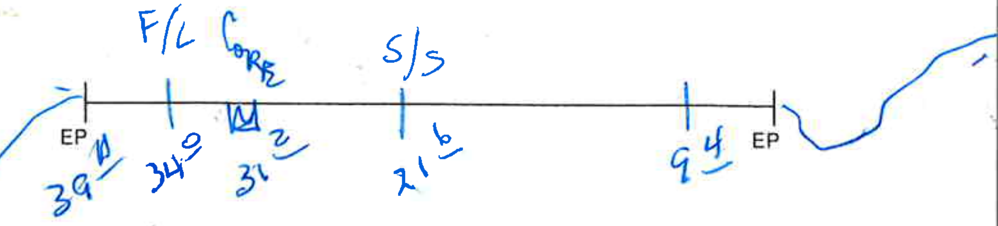
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 13

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 324.25

Logged By: Craigh Weldon Michael

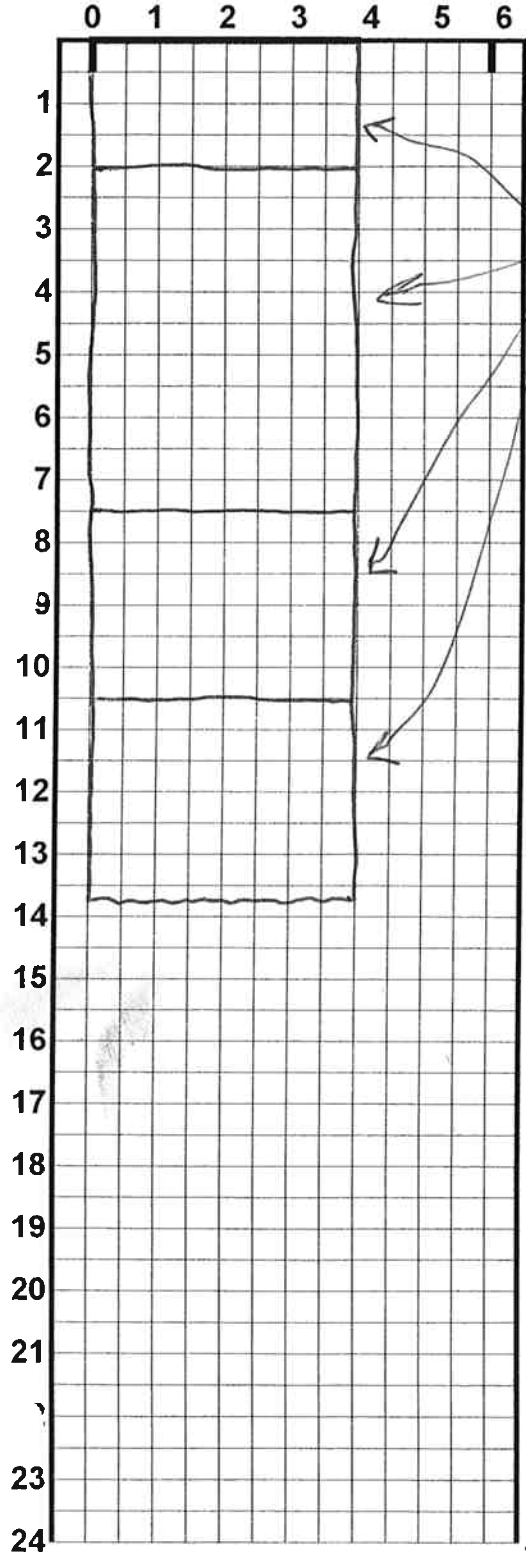
TERENCE

LOCATION: WB OWT

CORE LENGTH: 13.75 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

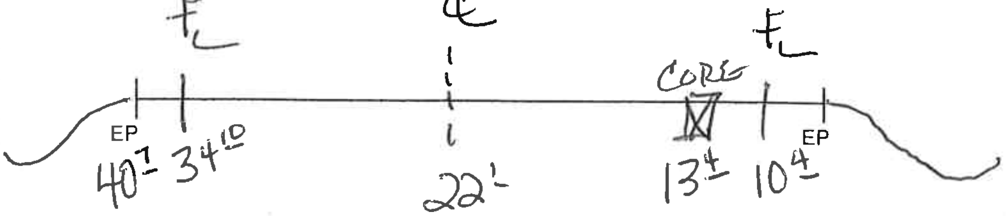
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 24

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/20/05

MILEPOINT: 324.5

Logged By: [✓ Craigh] Weldon Michael

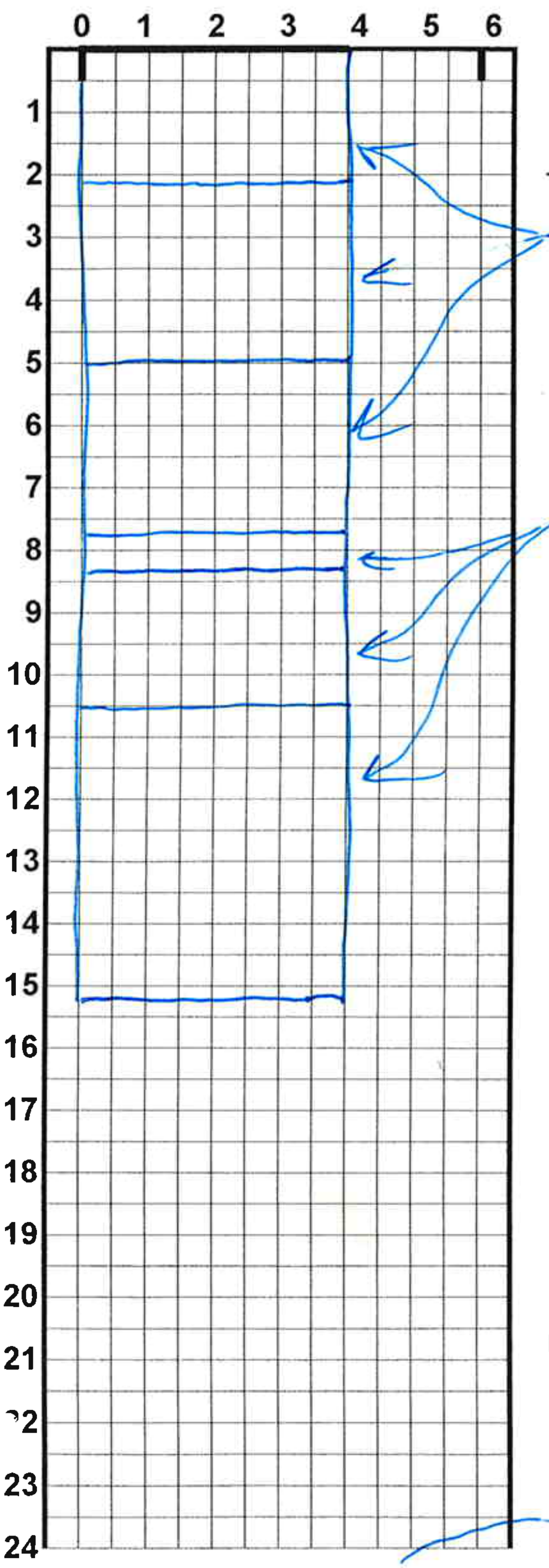
LOCATION: RL OWT WB Probe locate

TERENCE

CORE LENGTH: 15 1/4 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

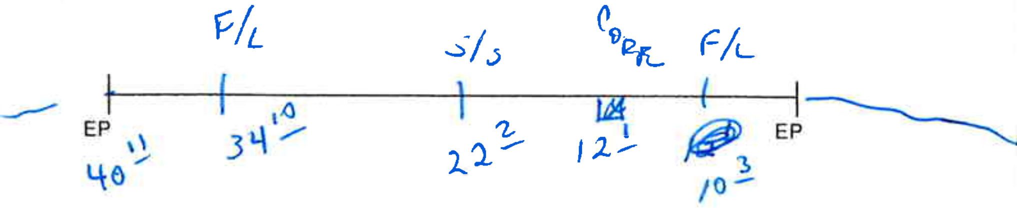
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 23

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/20/05

MILEPOINT: 324.5

Logged By: Craigh Weldon Michael

LOCATION: LL IWT WB Probe Locate

TERENCE

CORE LENGTH: inches

Designer: JASON

EA # PE001135/010/J13

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

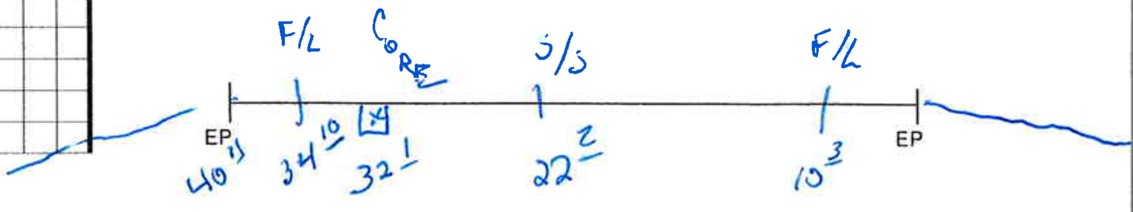
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD #: 12

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/19/05

MILEPOINT: 384.75

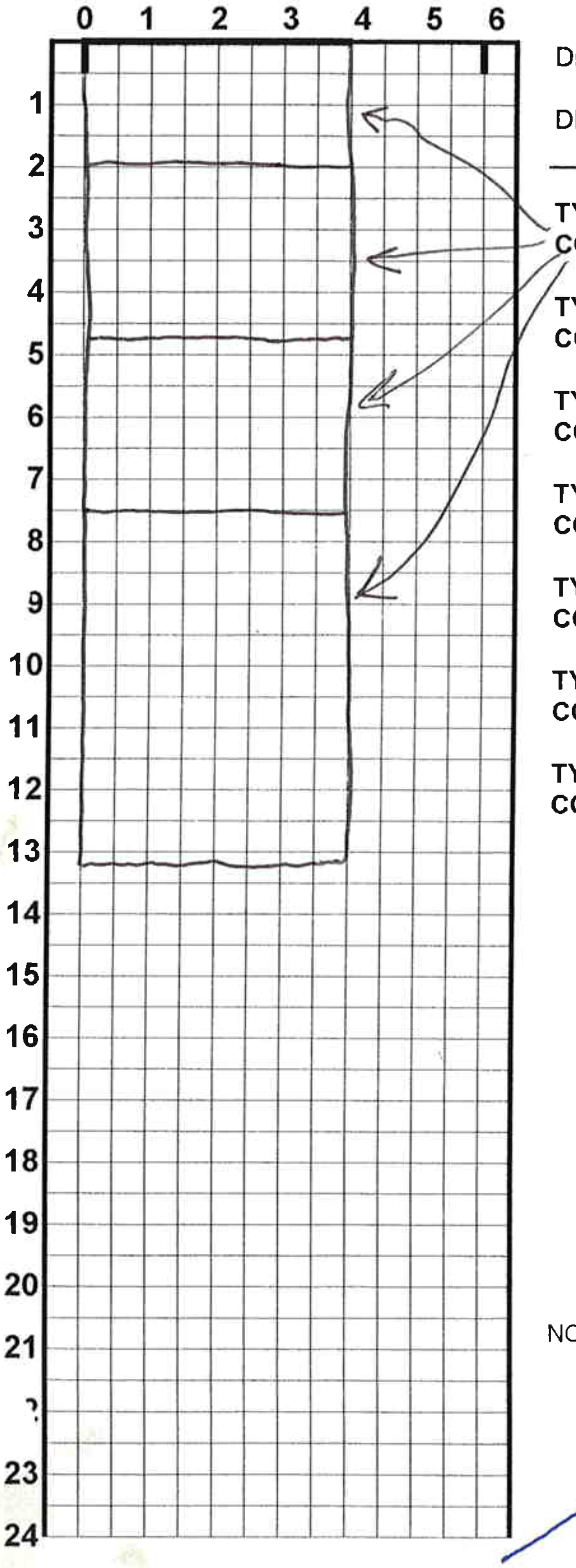
Logged By: Craigh Weldon Michael [✓ TERENCE]

LOCATION: WB OWT

CORE LENGTH: 13.25 inches

Designer: JASON

EA #: PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

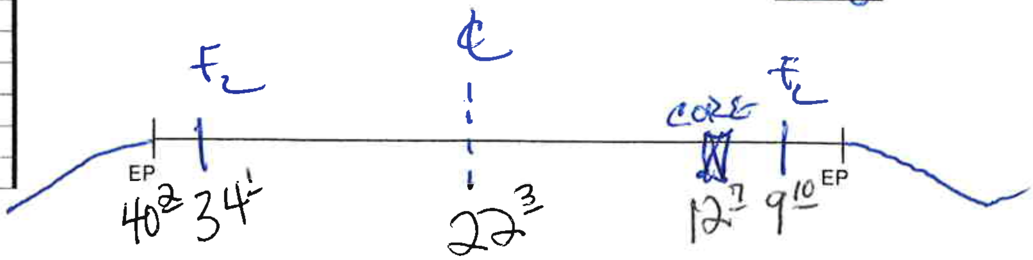
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: **I84: PLEASANT VALLEY-DURKEE**

PD #: 44

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-29-06

MILEPOINT: 325.00

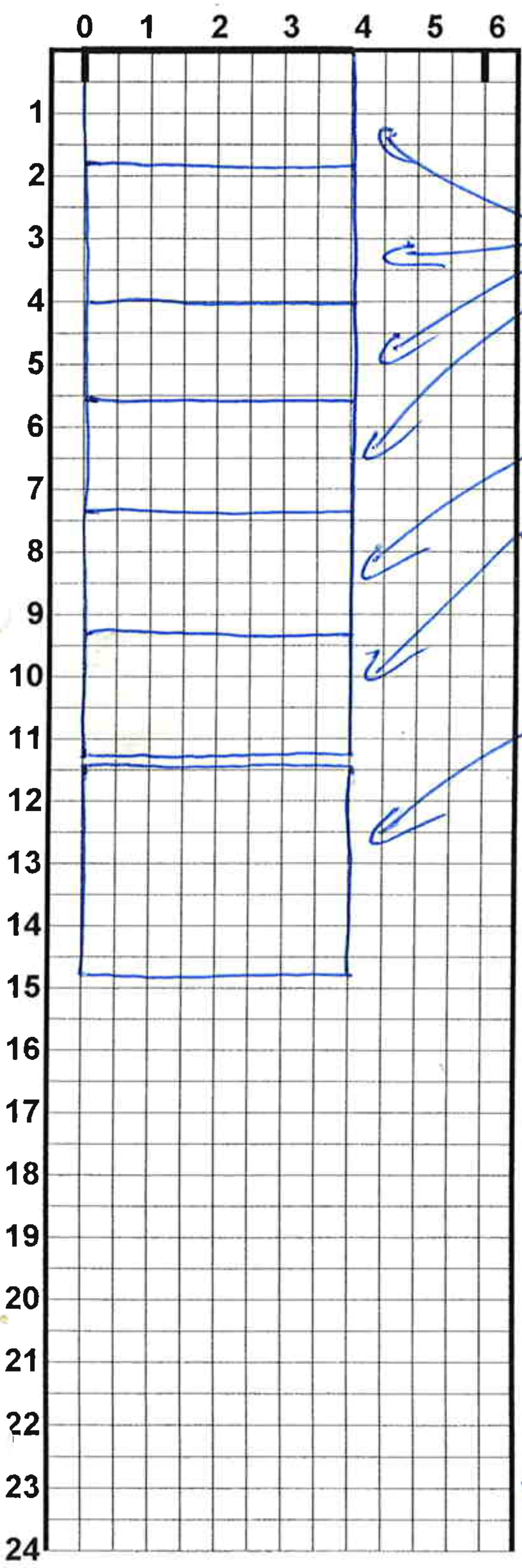
Logged By: Craigh Weldon Michael [✓ TERENCE]

LOCATION: WB IWT LL

CORE LENGTH: 14.75 inches

Designer: **JASON**

EA #: **PE001135/010/J13**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

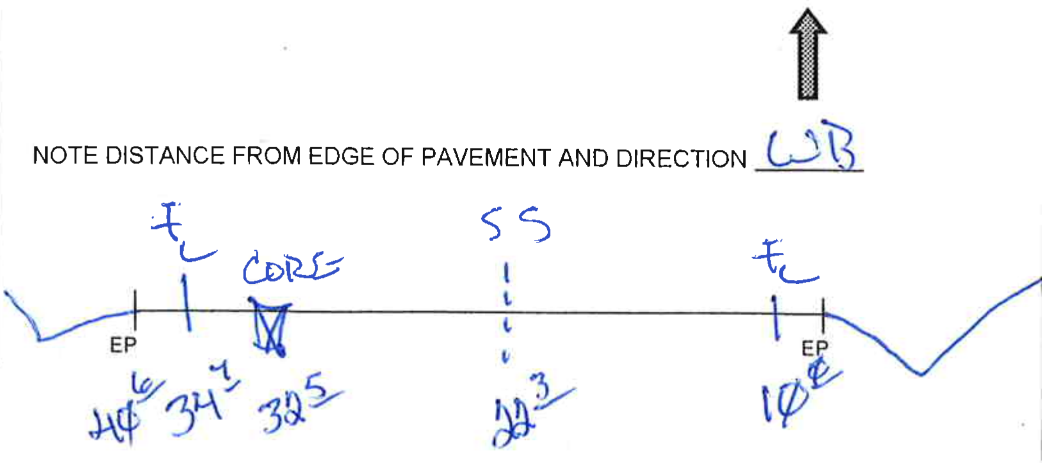
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor w/voids

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD #: 47

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3-30-06

MILEPOINT: 325.50

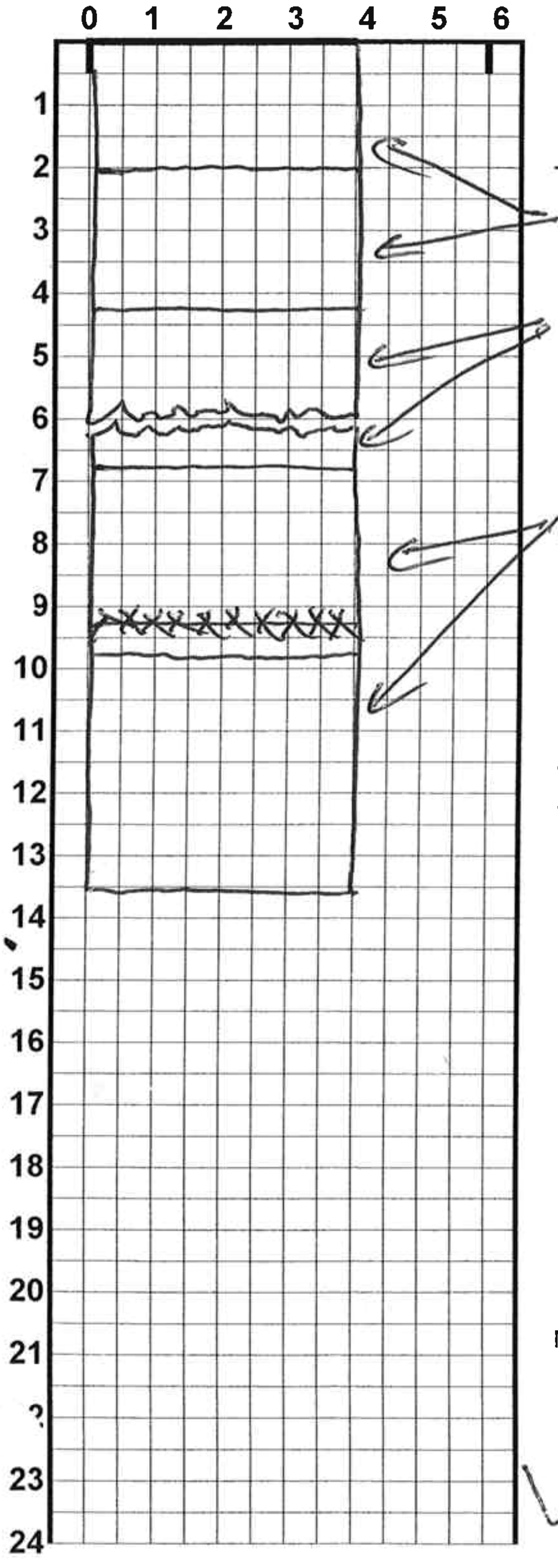
Logged By: Craigh Weldon Michael [✓ TERENCE]

LOCATION: EB IWT LL

CORE LENGTH: 13.5 inches

Designer: JASON

EA #: PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

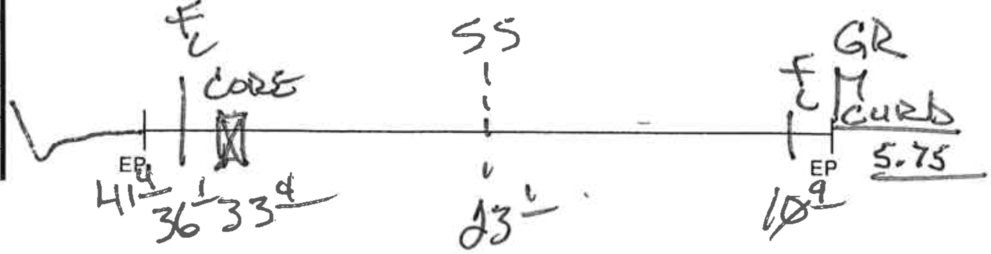
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: **I84: PLEASANT VALLEY-DURKEE**

PD # 7

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 10/18/05

MILEPOINT: 325.75

Logged By: Craigh Weldon [✓ Michael]

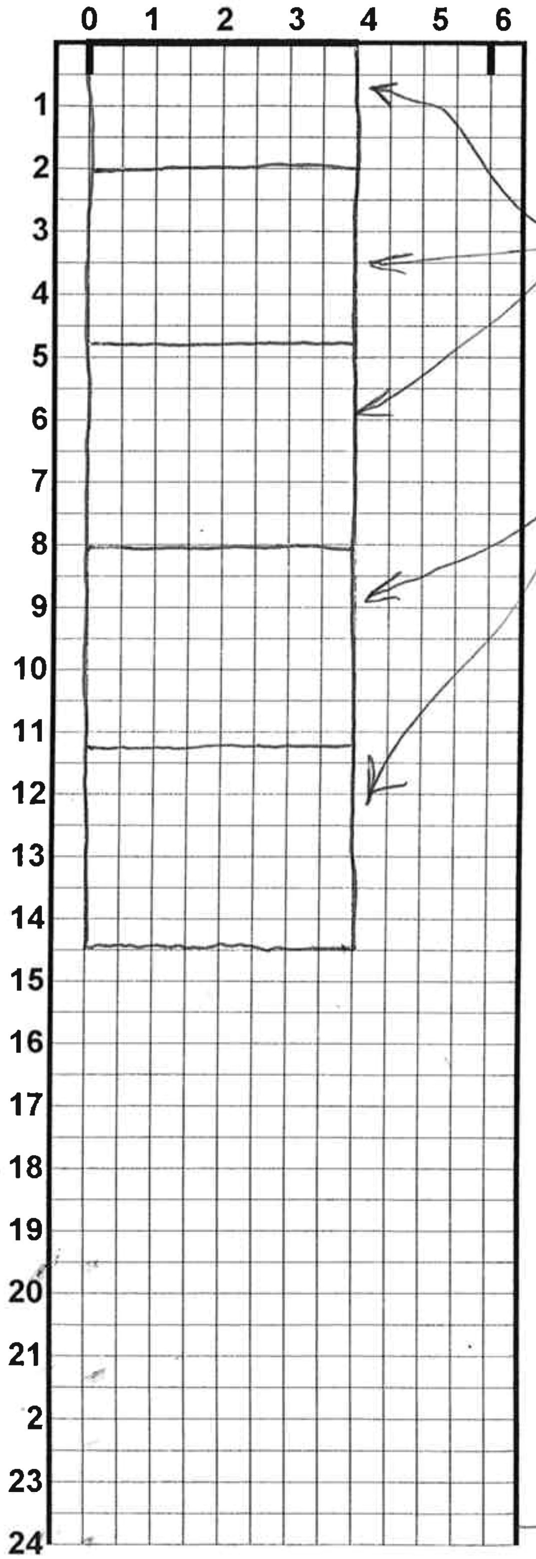
TERENCE

LOCATION: OWT WB

CORE LENGTH: 14.50 inches

Designer: **JASON**

EA # **PE001135/010/J13**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

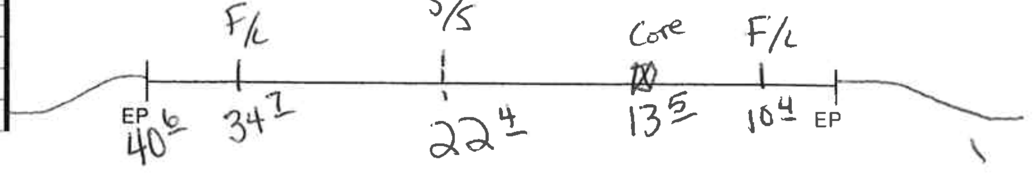
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION WB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

ROJECT: I84: PLEASANT VALLEY-DURKEE

PD # 48

HIGHWAY: OLD OR TRAIL HWY NO .006

Date: 3/30/06

MILEPOINT: 326.5

Logged By: [✓ Craig] Weldon Michael

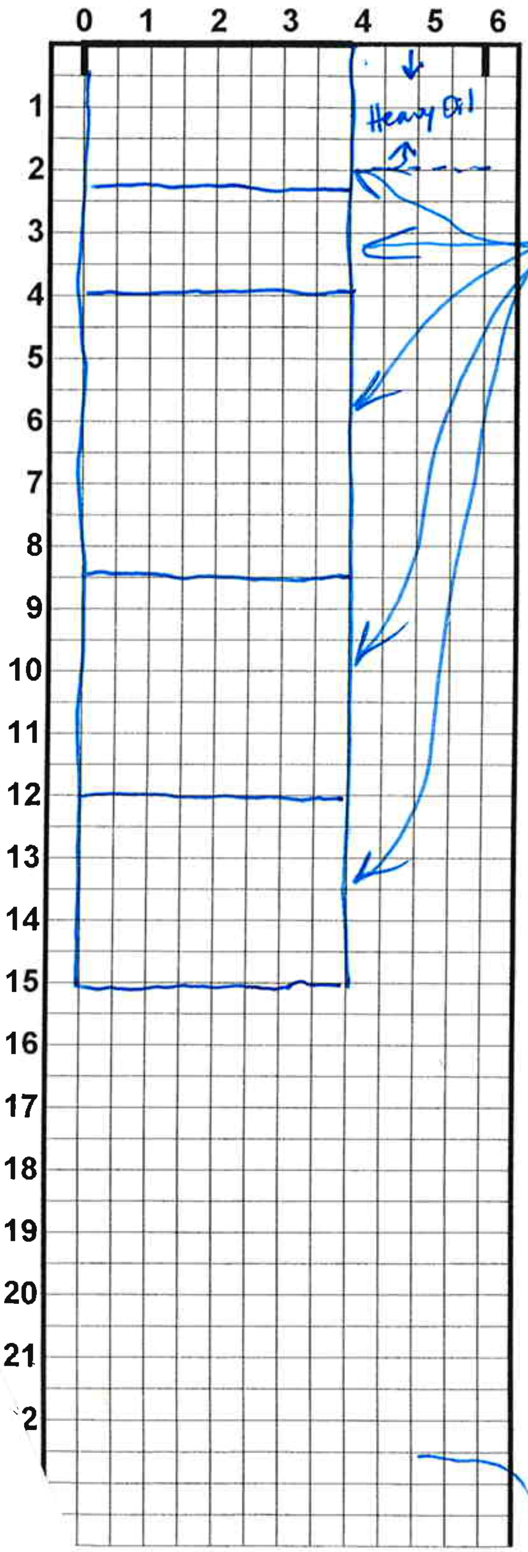
TERENCE

LOCATION: LL 1WT EB

CORE LENGTH: 15 inches

Designer: JASON

EA # PE001135/010/J13



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

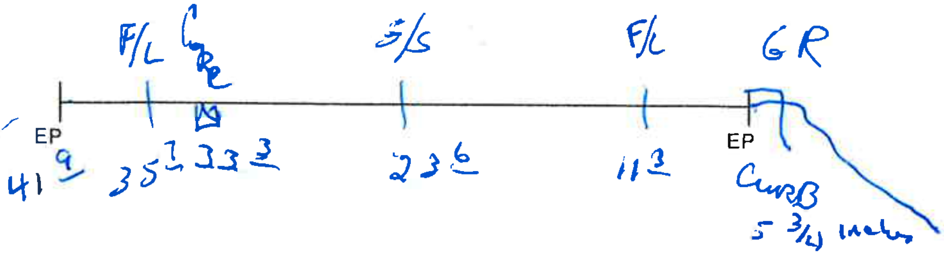
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION EB



APPENDIX G: PAVEMENT CORE LOGS FOR COTTAGE GROVE – MARTIN CREEK

Form 734-3049 (Rev. 2-79)
OREGON DEPARTMENT
OF TRANSPORTATION

TABULATION SHEE

SHEET .... OF .... SHEETS

COTTAGE GR. - MARTIN CR.

CORE SUMMARY - SOUTH BOUND

	HOLE #.	M.P.	DIRECTION	LOCATION	DEPTH			
1	1	174.40	S.B.	OWTOL	13.75"			
2	28	174.00	"	"	12.0"			
3	2	173.99	"	"	16.25"			
4	3	173.50	"	"	14.0"			
5	4	172.99	"	"	15.0"			
6	5	172.30	"	"	13.75"			
7	6	171.99	"	"	17.0"			
8	7	171.39	"	"	18.0"			
9	8	170.98	"	"	13.0"			
10	9	170.43	"	"	12.5"			
11	10	170.39	"	"	12.75"			
12	11	170.00	"	"	13.0"			
13	12	169.5	"	"	17.0"			
				AVERAGE =	14.46"			

Form 734-3049 (Rev. 2-79)
OREGON DEPARTMENT
OF TRANSPORTATION

TABULATION SHEE

SHEET .... OF .... SHEET

COTTAGE GR. - MARTIN CR.

CORE SUMMARY - NORTH BOUND

	HOLE#	M.P.	DIRECTION	LOCATION	DEPTH			
1	13	169.51	N.B.	OWT OL	14.5"			
2	14	170.00	"	"	14.0"			
3	15	170.5	"	"	14.25"			
4	16	171.0	"	"	13.0"			
5	29	171.22	"	"	12.5"			
6	17	171.70	"	"	20.0"			
7	18	172.00	"	"	13.75"	6" CORE		
8	19	"	"	"	6.5"	6" CORE,	NOT FULL	DEPTH
9	20	"	"	"	6.25"	6" CORE,	NOT FULL	DEPTH
10	21	172.56	"	"	13.5"			
11	22	173.00	"	"	13"			
12	23	173.50	"	"	20"			
13	24	174.00	"	"	14.5"			
14	25	174.56	"	"	15.25"	6" CORE		
15	26	"	"	"	5.5"	6" CORE,	NOT FULL	DEPTH
16	27	"	"	"	5.5"	6" CORE,	NOT FULL	DEPTH
				AVERAGE	14.85"	(DOES NOT	INCL. #'s	19,20,26&2

Oregon Department of Transportation

SURFACING DESIGN CORE LOG

Saved: [✓ Yes] No
PD# 2

PROJECT: Cottage Grove - Martin Ck

HIGHWAY: Pacific Hwy No 1

DATE 5-22-95

MILE POINT/STATION: 173.99 SB RT LN OWT / STATION:

Designer: RM

CORE LENGTH: 16.25"

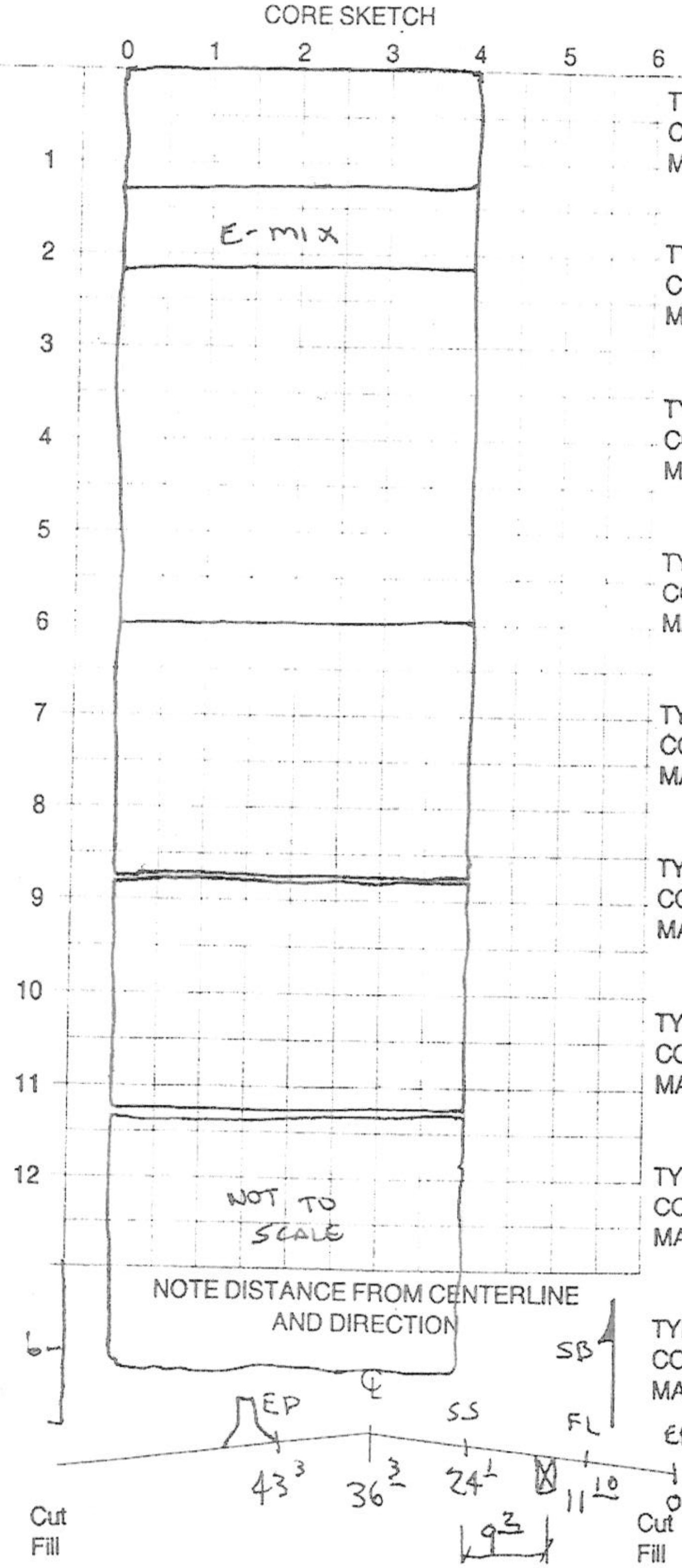
Drilled on Crack: YES [✓ NO]

Region: 1 [✓ 2] 3 4 5

TYPE:

CORE SKETCH

DESCRIPTION



TYPE: DenseAC OpenAC [✓ Patch] Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: DenseAC [✓ OpenAC] Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" [✓ 5/8"] 1/2" 3/8" 1/4"

TYPE: DenseAC OpenAC Patch Stripping PCC CTB
CONDITION: Good Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: DENSE AC
CONDITION: GOOD
MAX AGG: 5/8"

TYPE:
CONDITION:
MAX AGG:

TYPE:
CONDITION:
MAX AGG:

WH/RS
SAMPLER'S NAME

Oregon Department of Transportation

SURFACING DESIGN CORE LOG

PROJECT: COTTAGE GROVE - MARTIN CK

Saved: Yes [✓ No]
PD# 6

HIGHWAY: PACIFIC HWY NO 1

DATE 5-22-95

MILE POINT/STATION: 171.99 SB RT LN OWT / STATION:

CORE LENGTH: 17"

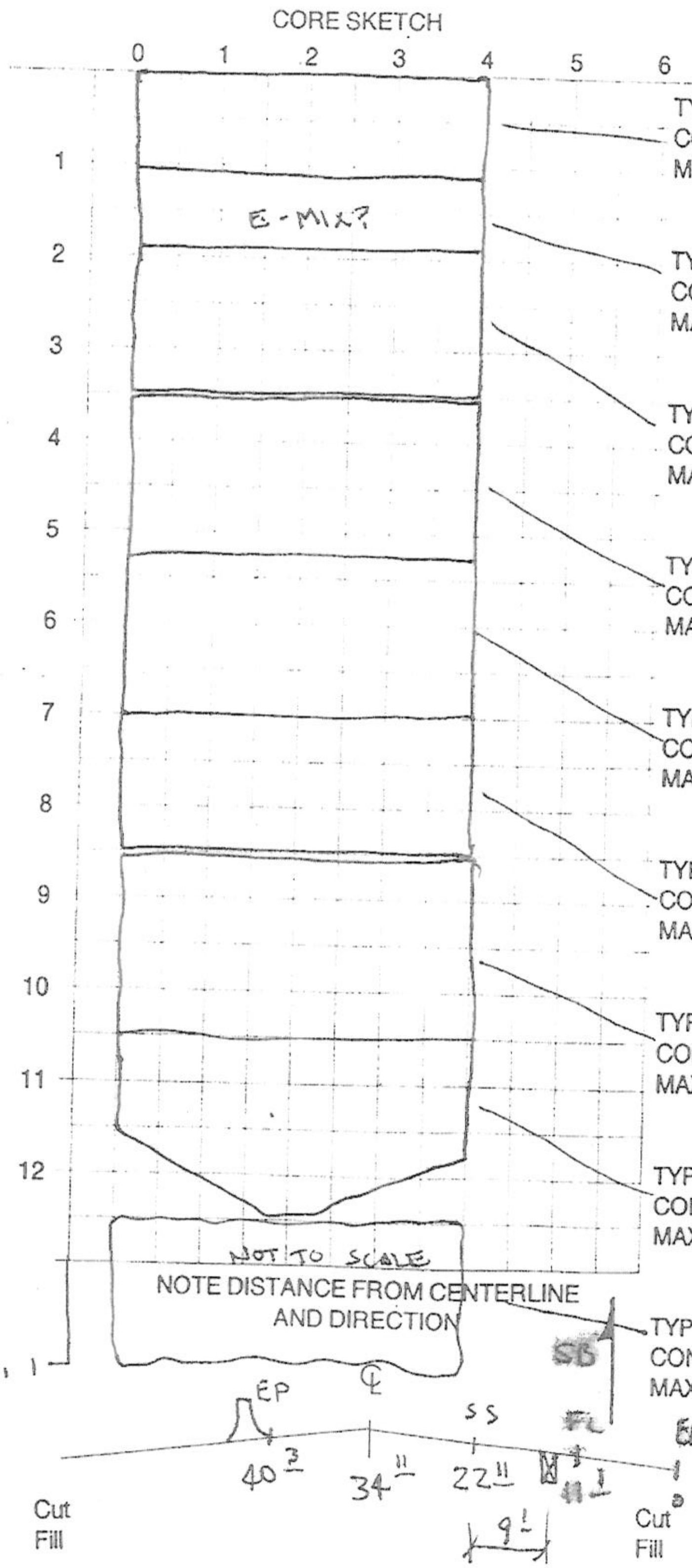
Drilled on Crack: YES [✓ NO]

Designer: RM
Region: 1 [✓ 2] 3 4 5

TYPE:

CORE SKETCH

DESCRIPTION



TYPE: DenseAC OpenAC [✓ Patch] Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: DenseAC [✓ OpenAC] Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" [✓ 5/8"] 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" [✓ 3/4"] 5/8" 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: DENSE AC
CONDITION: GOOD
MAX AGG: 1/2"

TYPE: DENSE AC
CONDITION: GOOD
MAX AGG: 3/8"

TYPE: DENSE AC
CONDITION: GOOD
MAX AGG: 5/8"

WH/RS
SAMPLER'S NAME

SURFACING DESIGN CORE LOG

Saved: Yes [✓ No]
PD# 8

PROJECT: COTTAGE GROVE - MARTIN CK

HIGHWAY: PACIFIC HWY NO 1

DATE 5-22-95

MILE POINT/STATION: 170.98 SB RT LN OWT / STATION:

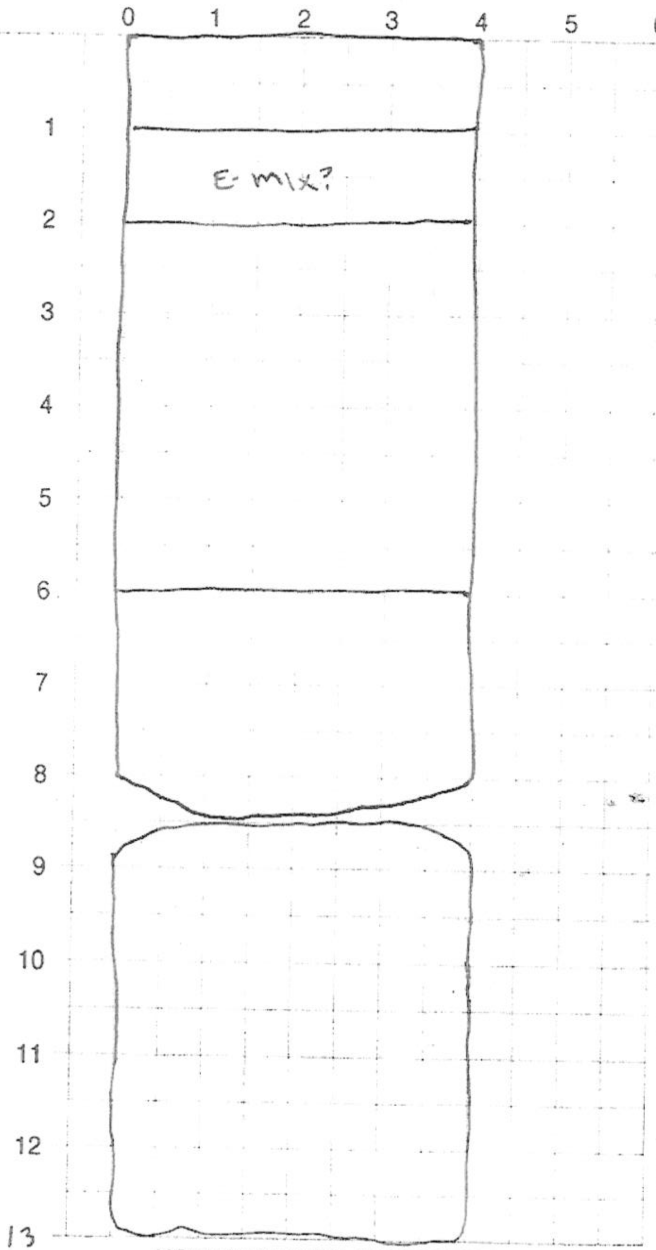
Designer: RM
Region: 1 [✓ 2] 3 4 5

CORE LENGTH: 13"

Drilled on Crack: YES [✓ NO]

TYPE:

CORE SKETCH



DESCRIPTION

TYPE: DenseAC OpenAC [✓ Patch] Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: DenseAC [✓ OpenAC] Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" [✓ 5/8"] 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ [✓ 1"] 3/4" 5/8" 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

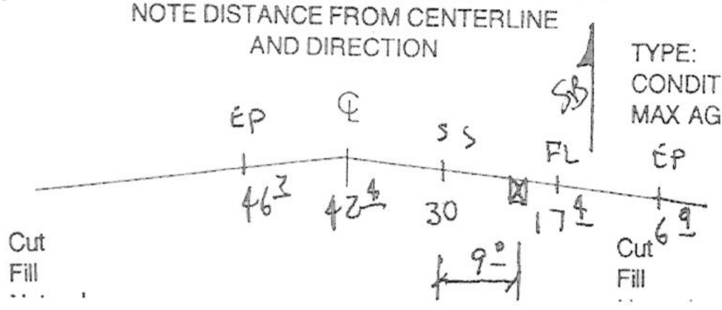
TYPE: DenseAC OpenAC Patch Stripping PCC CTB
CONDITION: Good Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" ~~3/8"~~ 1/4"

TYPE:
CONDITION:
MAX AGG:

TYPE:
CONDITION:
MAX AGG:

TYPE:
CONDITION:
MAX AGG:

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



WH/BE/RS
SAMPLER'S NAME

NEW BIT

Oregon Department of Transportation

SURFACING DESIGN CORE LOG

NEW BIT

Saved: Yes [✓ No]

PD# 11

PROJECT: COTTAGE GROVE - MARTIN CREEK

HIGHWAY: PACIFIC HWY No1

[redacted] TUESDAY ^

DATE MAY 23, 1995

MILE POINT/STATION: 170.00 SB RTLN OUT / ~~STATION:~~

Designer:

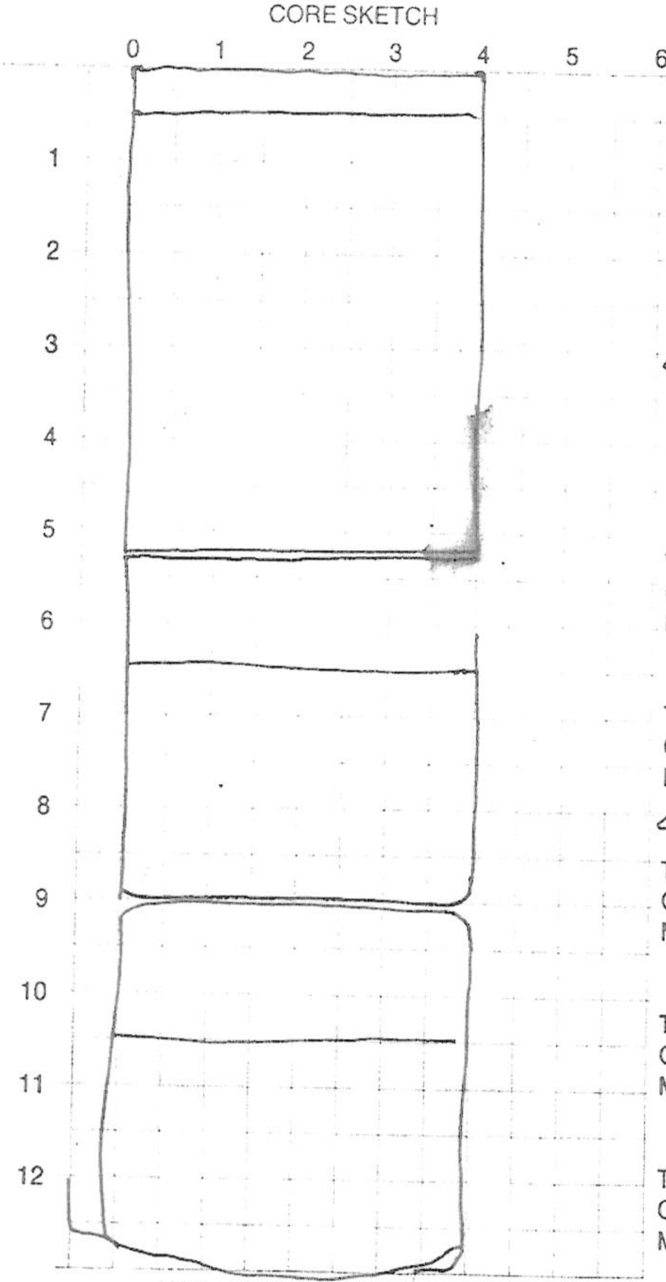
CORE LENGTH: 13"

Drilled on Crack: YES [✓ NO]

Region: 1 2 3 4 5

TYPE:

CORE SKETCH



NEW DESCRIPTION BIT

TYPE: [✓ DenseAC] OpenAC [✓ Patch] Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" 3/8" [✓ 1/4"]

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" [✓ 3/4"] 5/8" 1/2" 3/8" 1/4"

< SEPARATED BY DRILL (SBD)

TYPE: DenseAC OpenAC Patch Stripping PCC CTB
CONDITION: Good Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

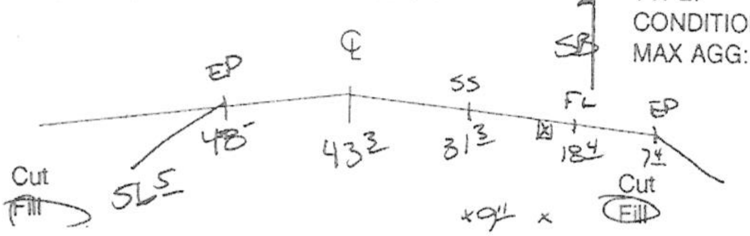
< SBD

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] [✓ Fair] Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: DAC
CONDITION: GOOD
MAX AGG: 5/8

TYPE:
CONDITION:
MAX AGG:

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



TYPE:
CONDITION:
MAX AGG:

B1B2 DR
SAMPLER'S NAME

NEW BIT

Oregon Department of Transportation

SURFACING DESIGN CORE LOG

Saved: [✓ Yes] No
PD# 12

PROJECT: COTTAGE GROVE - MARTIN CREEK

HIGHWAY: PACIFIC HWY #1

DATE MAY 23, 1995

MILE POINT/STATION: 169.5 SBRTLNOUT / STATION:

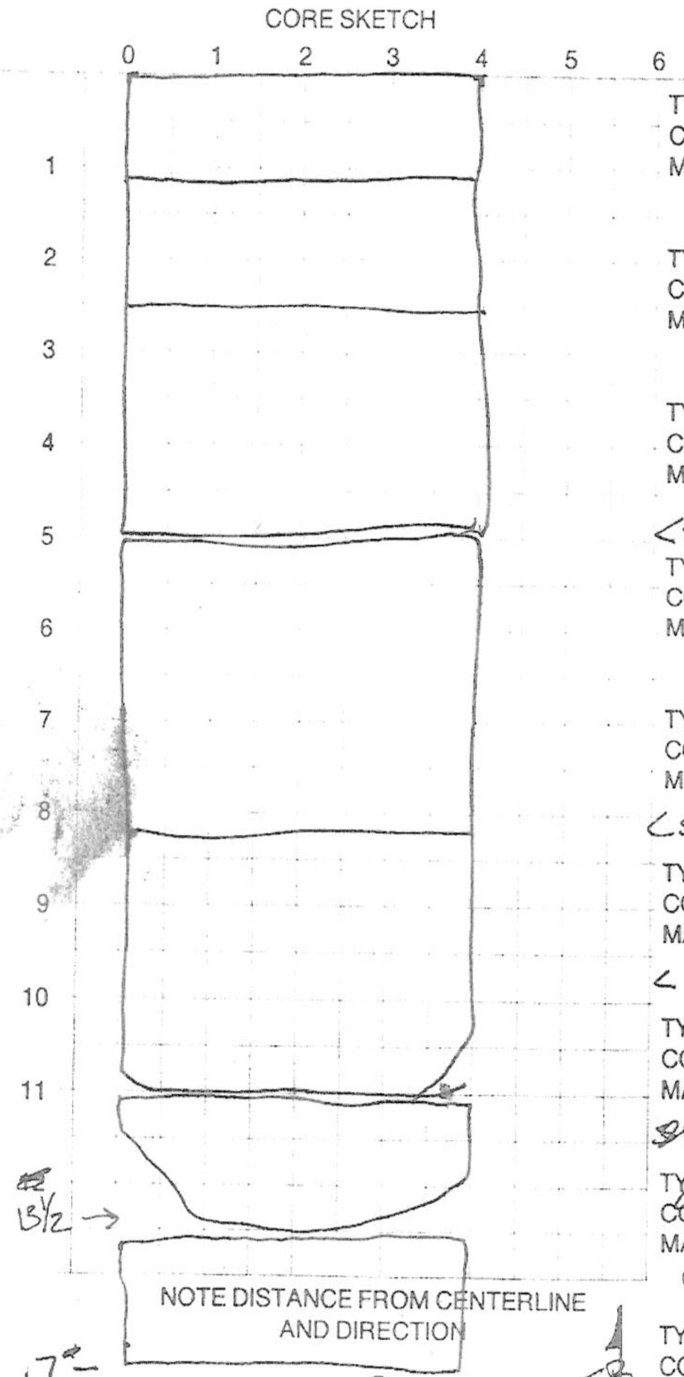
Designer: RM
Region: 1 [✓ 2] 3 4 5

CORE LENGTH: 17"

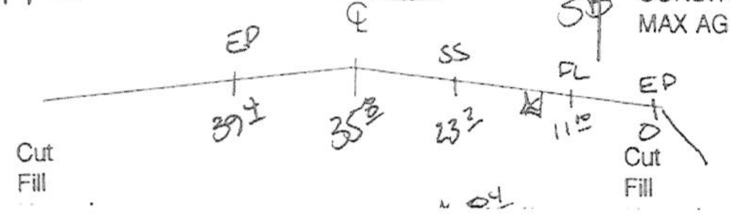
Drilled on Crack: YES [✓ NO]

TYPE:

CORE SKETCH



NOTE DISTANCE FROM CENTERLINE AND DIRECTION



DESCRIPTION

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

< SEPARATED BY DRILL (SBD)

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

< SEPARATED BY DRILL

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: Good [✓ Fair] Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

< SBD

TYPE: DAC
CONDITION: GOOD
MAX AGG: 1/2

~~SBD~~

TYPE:
CONDITION:
MAX AGG:

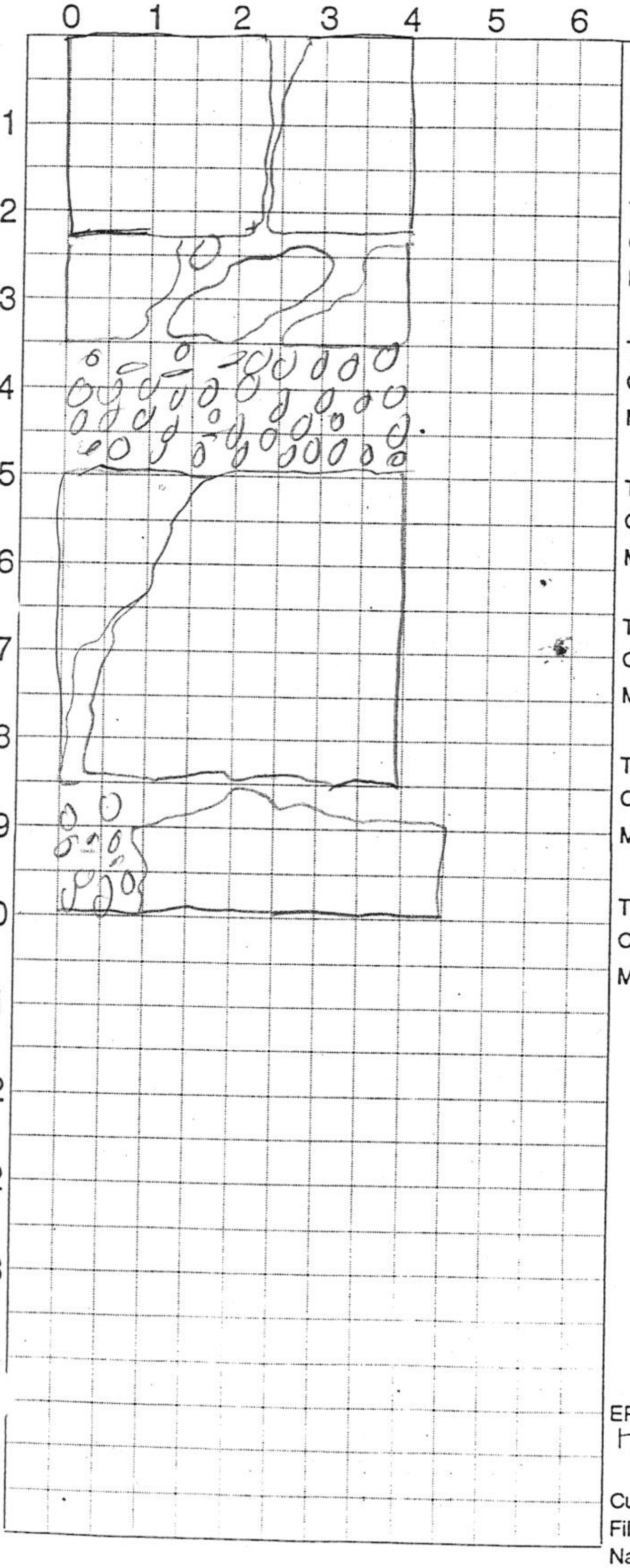
TYPE:
CONDITION:
MAX AGG:

B. B₂ De
SAMPLER'S NAME

AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No
PROJECT: COTTAGE GROVE - MARTIN CR
PD # 1
HIGHWAY: PACIFIC Hwy #1
DATE 12-18-95
MILEPOINT: 164.45 SB RtLnOWP
STATION:
Sampler: WBIR
CORE LENGTH: 10.00
Drilled on Crack: [✓ YES] NO
Designer: RM
TYPE: ALLIGATOR
Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch [✓ Stripping] PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair Poor]
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

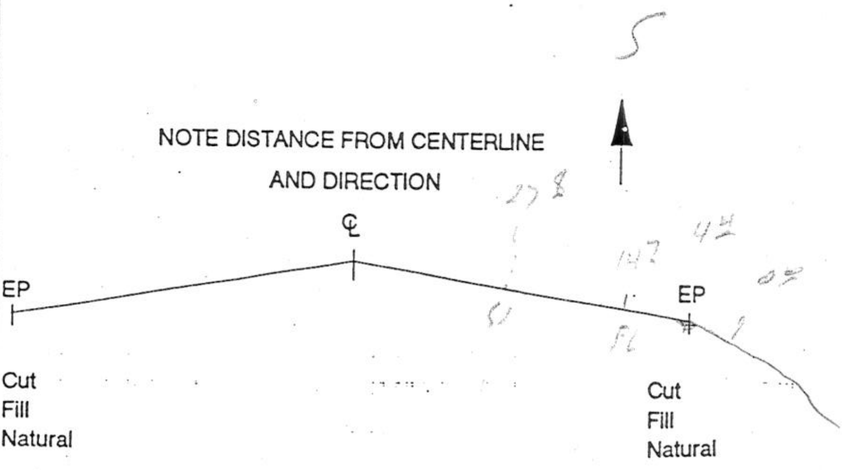
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair Poor]
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION

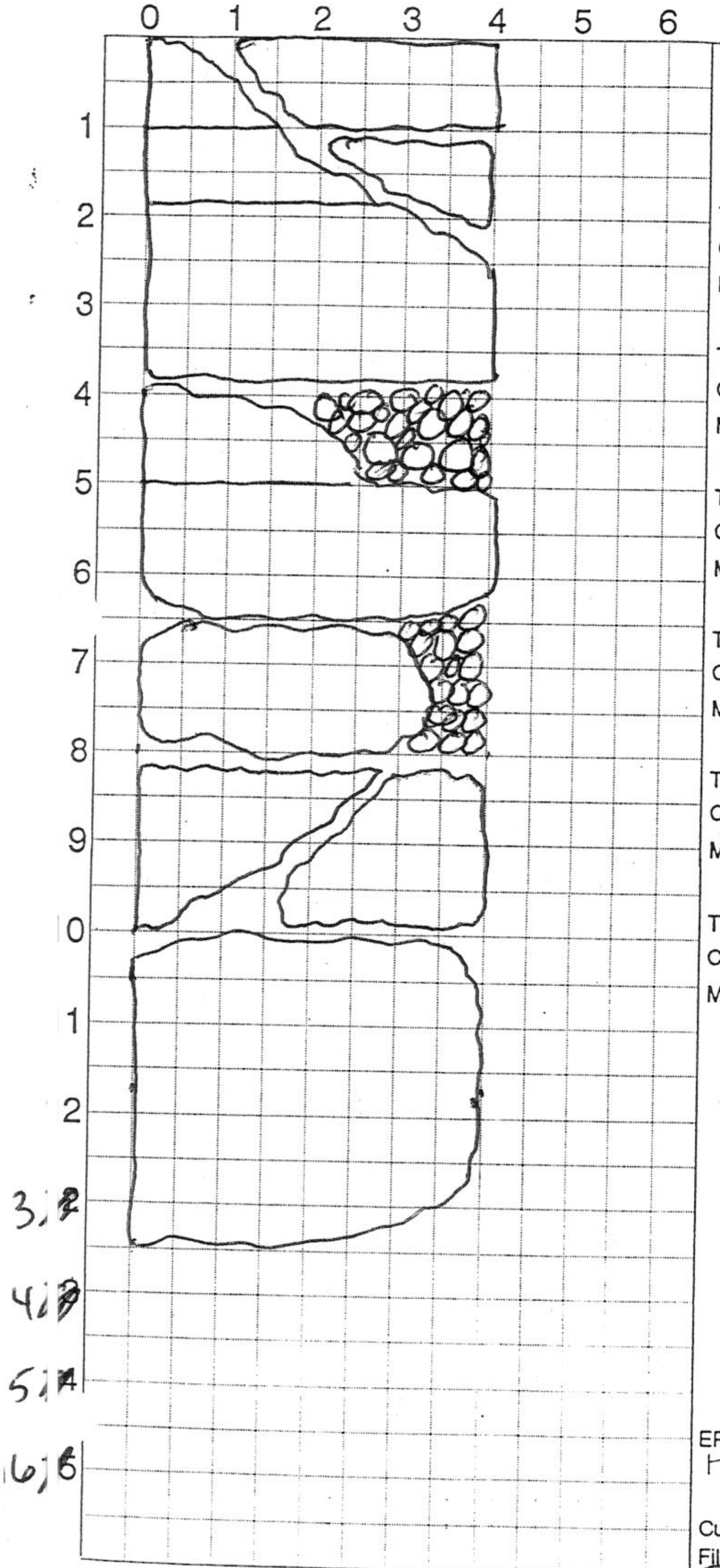


AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No
PD # 2
DATE 12-18-95

PROJECT: Cottage Grove - Martin Cr.
HIGHWAY: Pacific Hwy. NO. 1
MILEPOINT: 169.44 SB RT LN. STATION:
CORE LENGTH: 13.50
Drilled on Crack: [✓ YES] NO
TYPE: Alligator
Sampler: Phil
Designer: Roger
Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] – [✓ Poor]
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] – [✓ Poor]
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

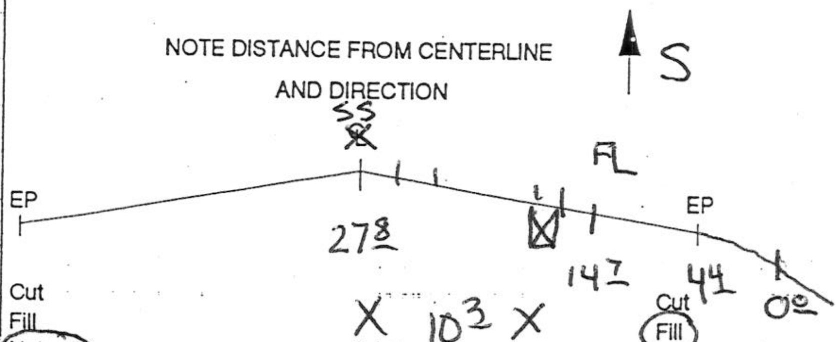
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

Dense AC
Fair
5/8

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION



Cut
Fill
[✓ Natural]

Cut
[✓ Fill]
Natural

VEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: Cottage Grove - Martin Cr.

PD # 3

HIGHWAY: Pacific Hwy. NO. 1

DATE 12/8/95

MILEPOINT: 169.34 SB Rt.LN. STATION:

Sampler: Phil

CORE LENGTH: 12.50

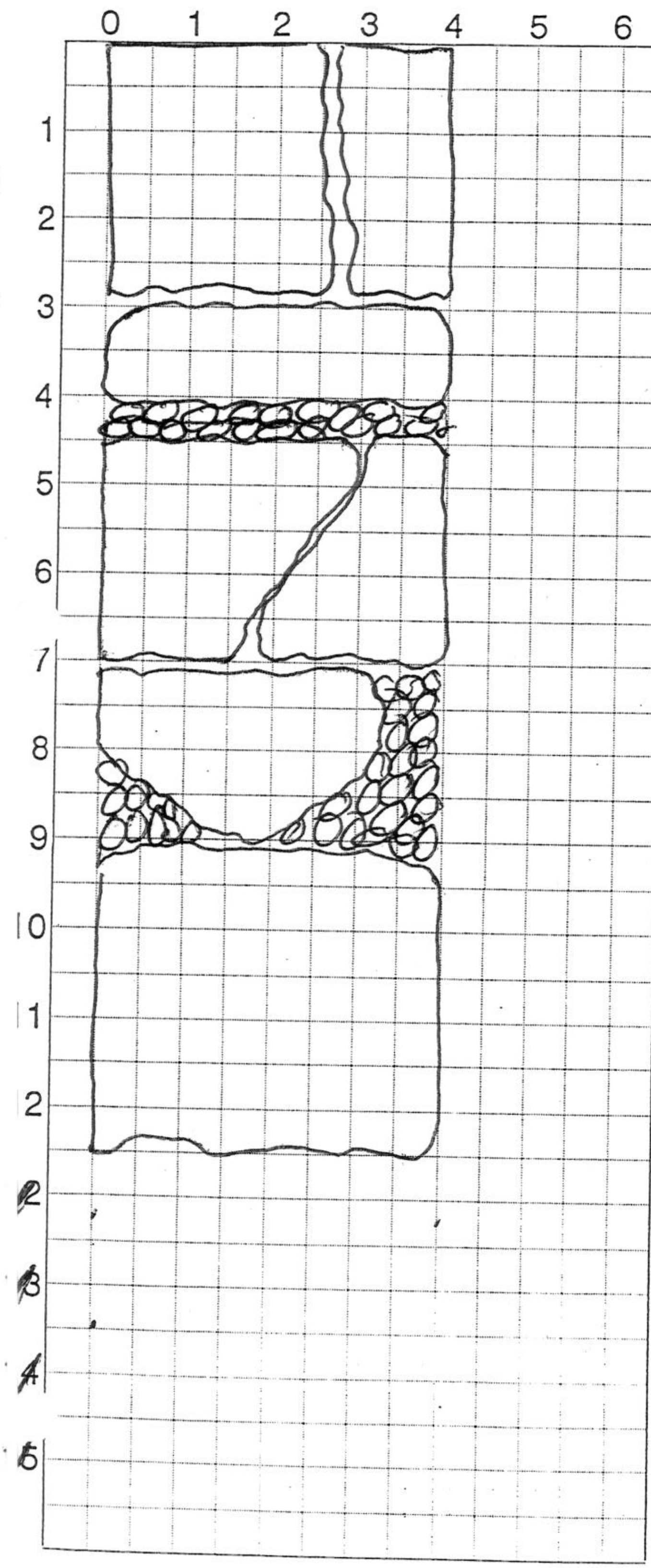
Drilled on Crack: [✓ YES] NO

TYPE: Alligator

Designer: Roger

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair]-[✓ Poor]
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair]-[✓ Poor]
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

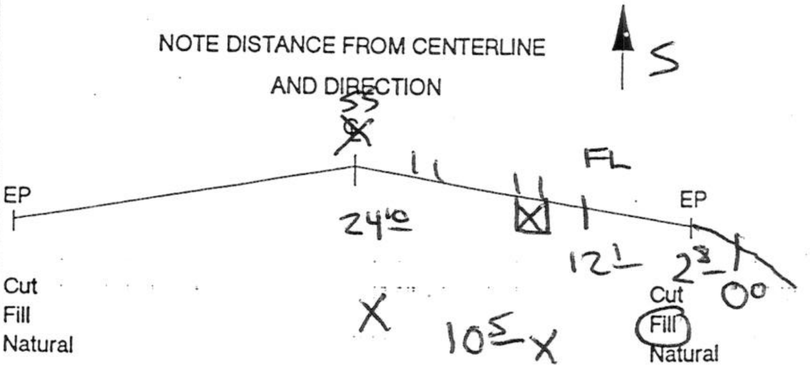
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good]-[✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION



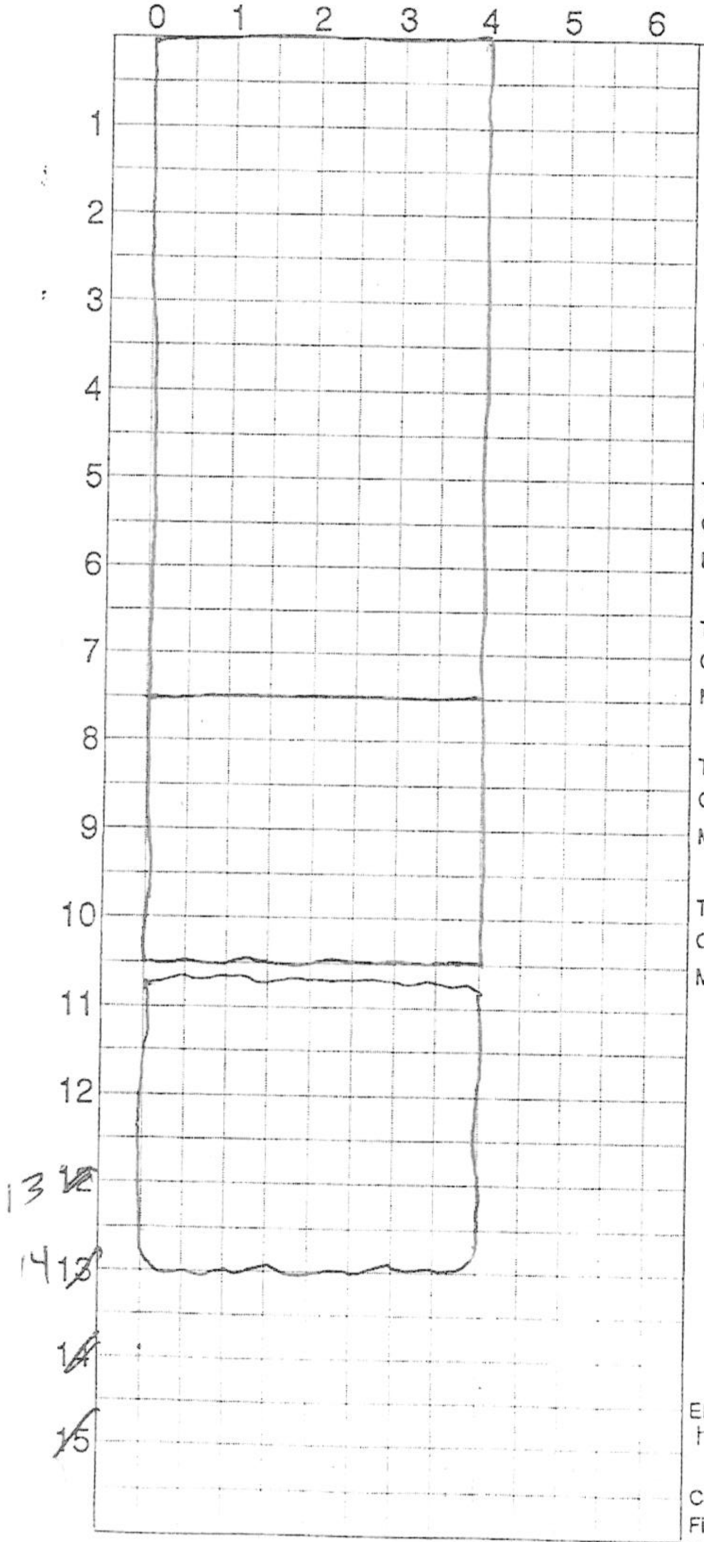
VEMENT DESIGN CORE LOG

Saved: [✓ Yes] No
PD # 4
DATE 12/18/95

PROJECT: Cottage Grove - Martin Cr.
HIGHWAY: Pacific Hwy NO. 1
MILEPOINT: 169.19 SB RT. LN STATION:
CORE LENGTH:
Drilled on Crack: YES [✓ NO]
TYPE:

Sampler: Phil
Designer: Roger
Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+
Unable to Dercern Lifts

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

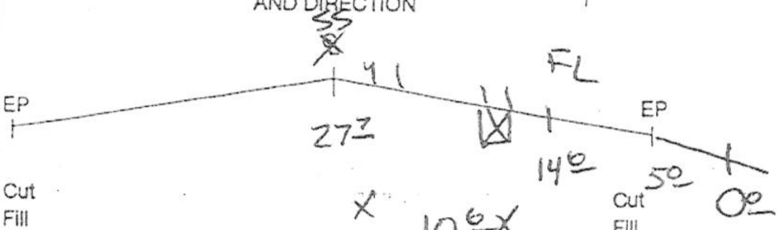
TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION



Cut
Fill
Natural

Cut
Fill
[✓ Natural]

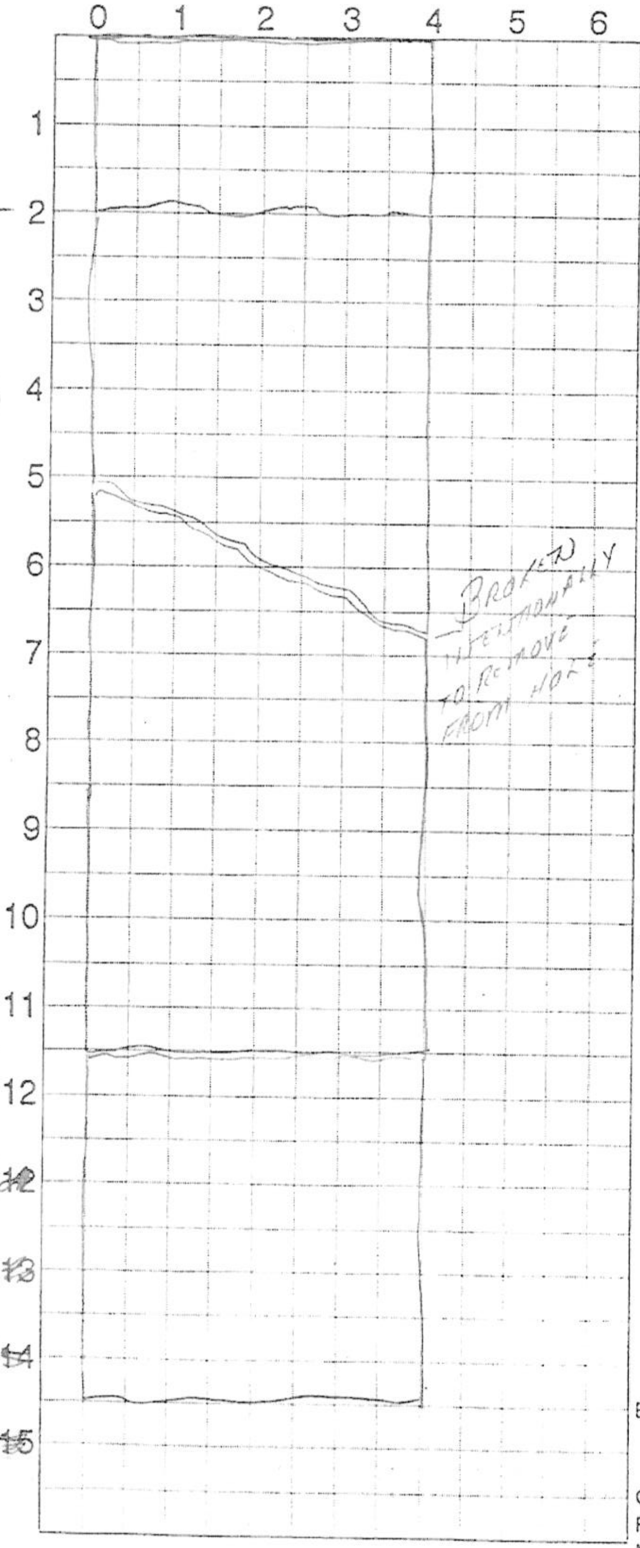
TOP LIFT ONLY

VEMENT DESIGN CORE LOG

PROJECT: COTTAGE GROVE - MARTIN CR
HIGHWAY: PACIFIC #1
MILEPOINT: 169.21 NB OL OWT STATION:
CORE LENGTH: 15.5"
Drilled on Crack: [✓ YES] NO
TYPE: FAT

Saved: [✓ Yes] No
PD # 5
DATE 12/18/95
Sampler: Eric H.
Designer: Pocock
Region: 1 [✓ 2] 3 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 [✓ 1+]

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

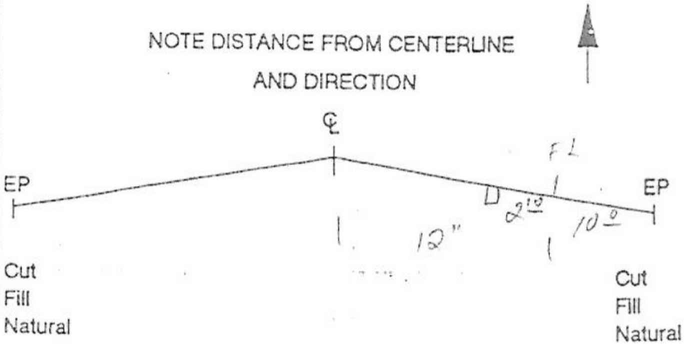
TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION

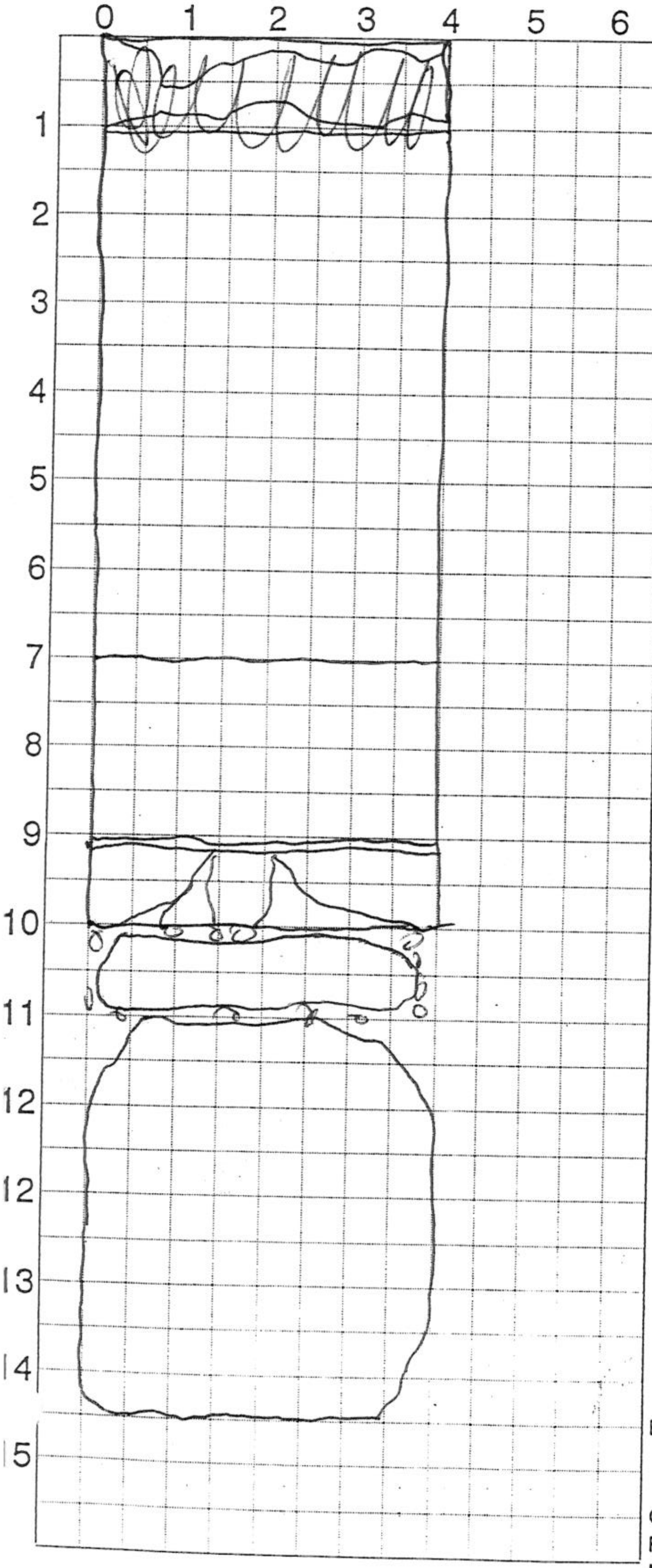


AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No
PD # 6
DATE 12-18-95
Sampler: Bob D.
Designer: Roger
Region: 1 2 [✓ 3] 4 5

PROJECT: Cottage Grove - Martin Crk
HIGHWAY: Pacific Hwy #1
MILEPOINT: 169.487 NB RT LN STATION:
CORE LENGTH:
Drilled on Crack: YES [✓ NO]
TYPE:

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

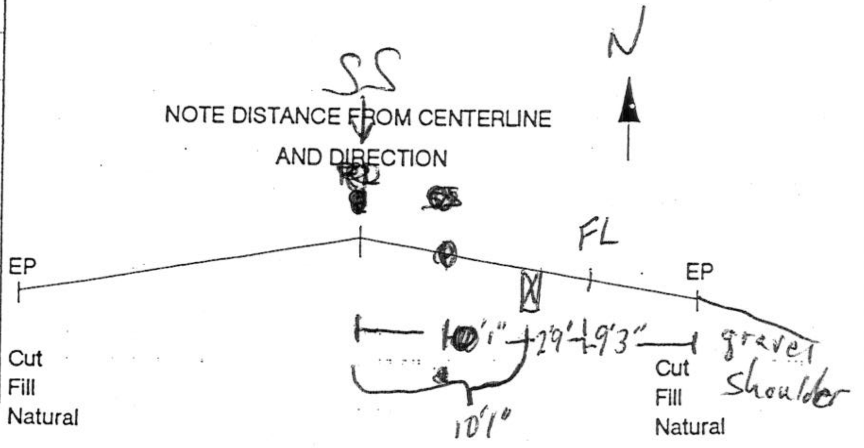
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+



SURFACING DESIGN CORE LOG

Saved: Yes [✓ No]
PD# 15

PROJECT: COTTAGE GROVE- MARTIN CREEK

HIGHWAY: PACIFIC HWY No 1

DATE May 23, 1995

MILE POINT/STATION: 170.5 NBRTLNOWT/ STATION:

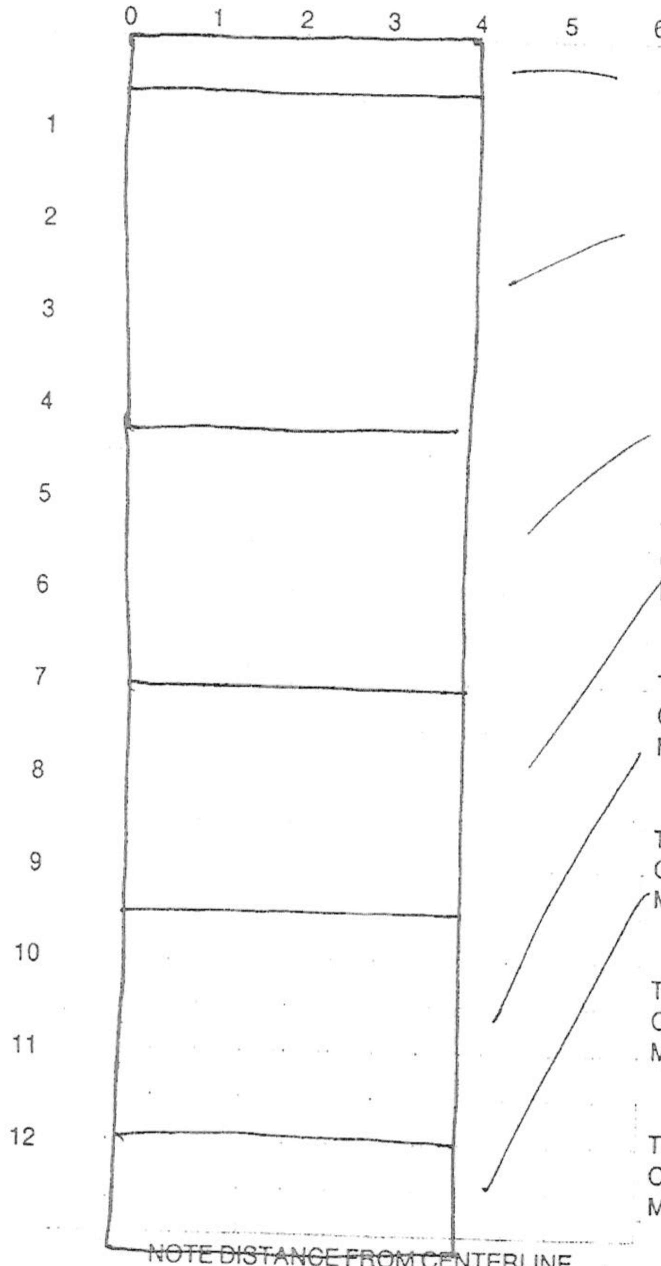
Designer: RM
Region: 1 [✓ 2] 3 4 5

CORE LENGTH: 14.25"

Drilled on Crack: YES [✓ NO]

TYPE:

CORE SKETCH



DESCRIPTION

TYPE: [✓ DenseAC] OpenAC [✓ Patch] Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" [✓ 3/4"] 5/8" 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

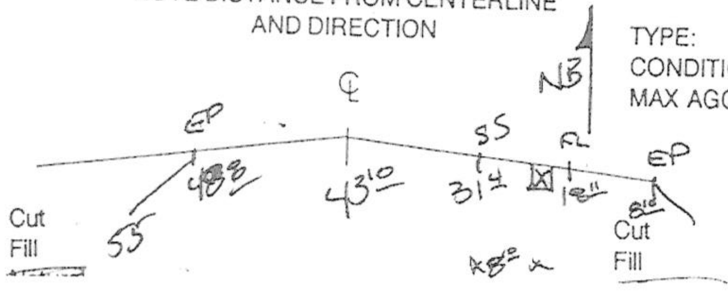
TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE:
CONDITION:
MAX AGG:

TYPE:
CONDITION:
MAX AGG:

NOTE DISTANCE FROM CENTERLINE AND DIRECTION

TYPE:
CONDITION:
MAX AGG:



B, B2 Dr
SAMPLER'S NAME

Oregon Department of Transportation

SURFACING DESIGN CORE LOG

Saved: [✓ Yes] No
PD# 16

PROJECT: Cottage Grove - Martin Crk

HIGHWAY: Pacific no. 1

DATE 5/23/95

MILE POINT/STATION: 171.0 NB, Rt Ln, Owt / STATION:

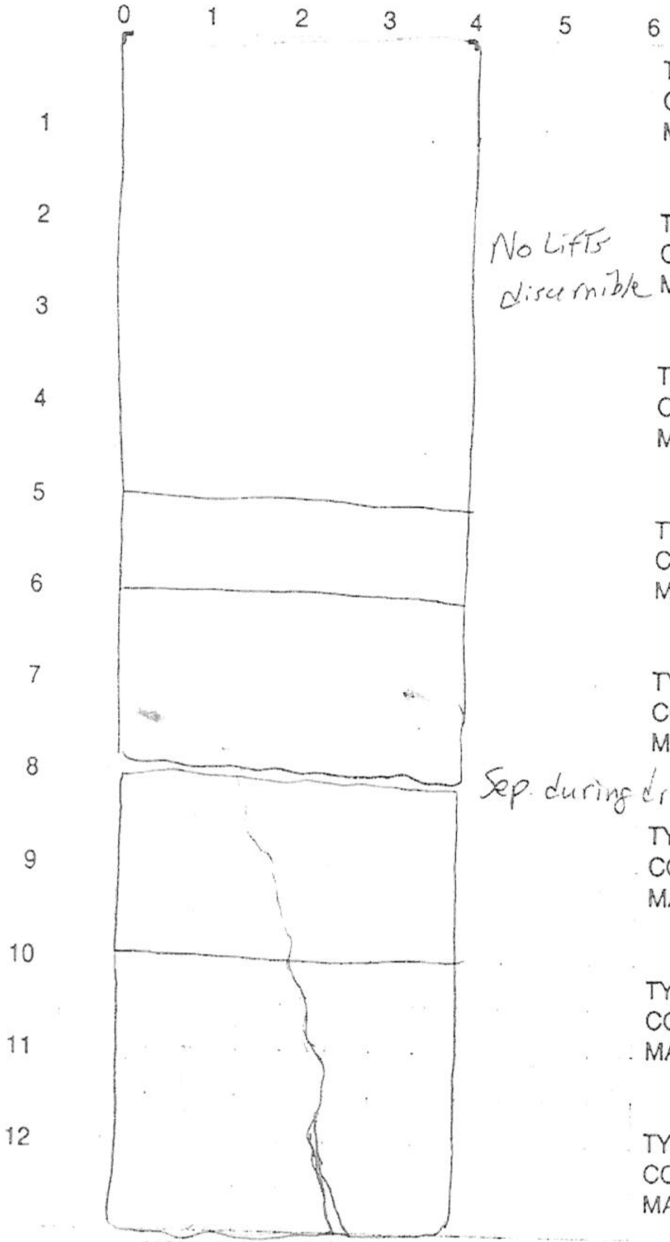
Designer: Roger
Region: 1 2 [✓ 3] 4 5

CORE LENGTH: 13

Drilled on Crack: YES [✓ NO]

TYPE:

CORE SKETCH



No Lifts discernible

Sep. during drilling

DESCRIPTION

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" 3/8" [✓ 1/4"]

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

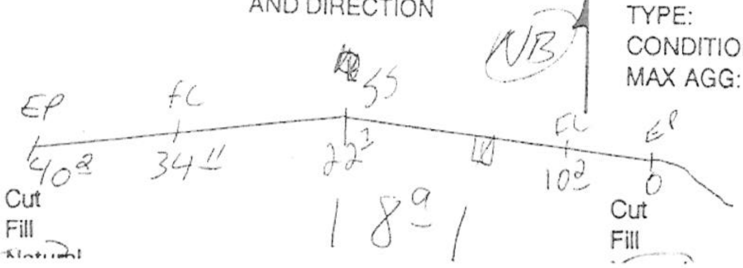
TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: Good [✓ Fair] Poor
MAX AGG: 1"+ 1" 3/4" [✓ 5/8"] 1/2" 3/8" 1/4"

TYPE: DenseAC OpenAC Patch Stripping PCC CTB
CONDITION: Good Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" 3/8" 1/4"

TYPE:
CONDITION:
MAX AGG:

TYPE:
CONDITION:
MAX AGG:

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

Cut
Fill

TYPE:
CONDITION:
MAX AGG:

Flaherty/Halstead
SAMPLER'S NAME

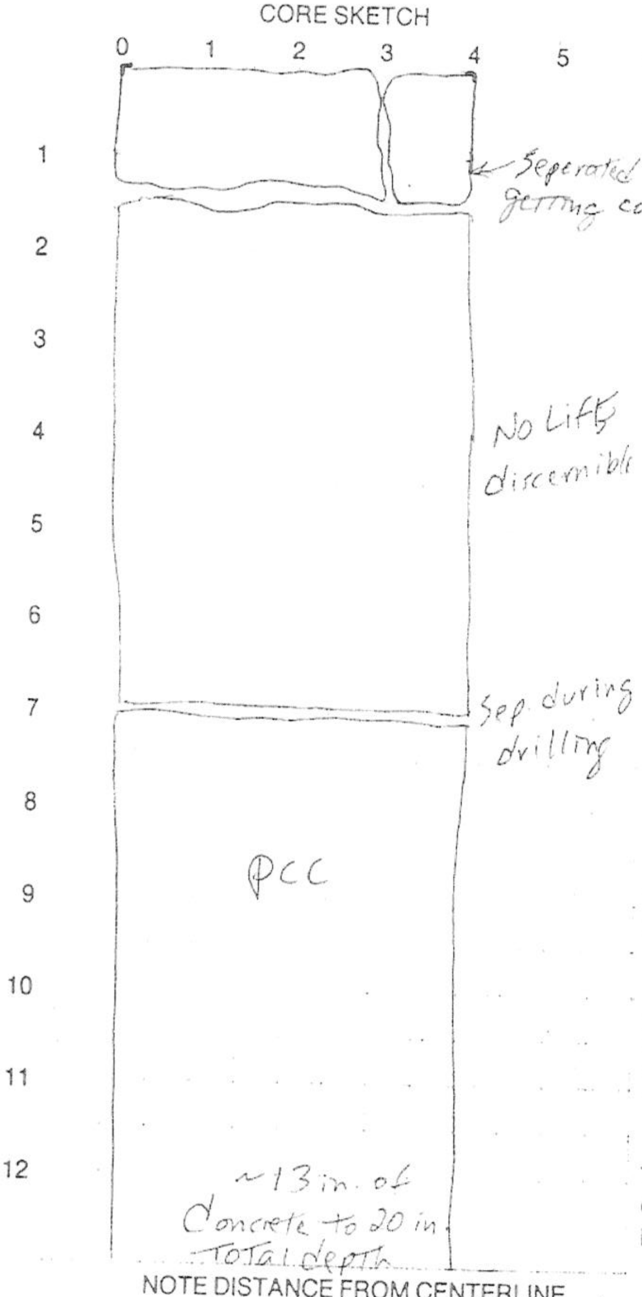
SURFACING DESIGN CORE LOG

Saved: [✓ Yes] No
PD# 17

PROJECT: Cottage Grove - Martin Crk.
HIGHWAY: Pacific no. 1
DATE 5/23/95
MILE POINT/STATION: 171.70 NB / STATION:
CORE LENGTH: ~20 in. rt Ln, OWT
Drilled on Crack: [✓ YES] NO
Designer:
Region: 1 2 3 4 5

TYPE:

DESCRIPTION



← Seperated getting core out of hole

No Lifts discernible

Sep during drilling

PCC

~13 in. of Concrete to 20 in. TOTAL depth

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] [✓ Fair] Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: DenseAC OpenAC Patch Stripping [✓ PCC] CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: DenseAC OpenAC Patch Stripping PCC CTB
CONDITION: Good Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" 3/8" 1/4"

TYPE: DenseAC OpenAC Patch Stripping PCC CTB
CONDITION: Good Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" 3/8" 1/4"

TYPE: DenseAC OpenAC Patch Stripping PCC CTB
CONDITION: Good Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" 3/8" 1/4"

TYPE:
CONDITION:
MAX AGG:

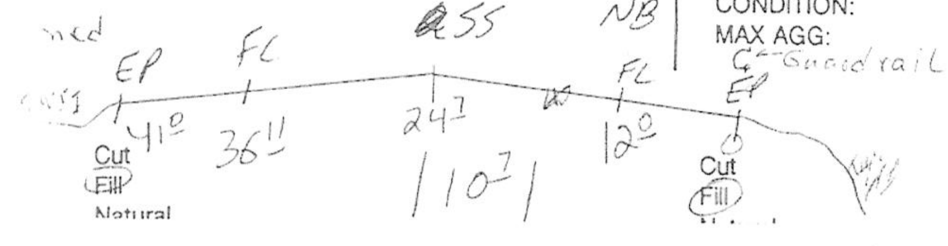
287' North of Structure

263' N. of [illegible]

TYPE:
CONDITION:
MAX AGG:

NOTE DISTANCE FROM CENTERLINE AND DIRECTION

TYPE:
CONDITION:
MAX AGG:



Flaherty/Halstead
SAMPLER'S NAME

SURFACING DESIGN CORE LOG

Saved: Yes [✓ No]
PD# 21

PROJECT: Cottage Grove - Martin Ck

HIGHWAY: Pacific Hwy No 1

DATE 5-24-95

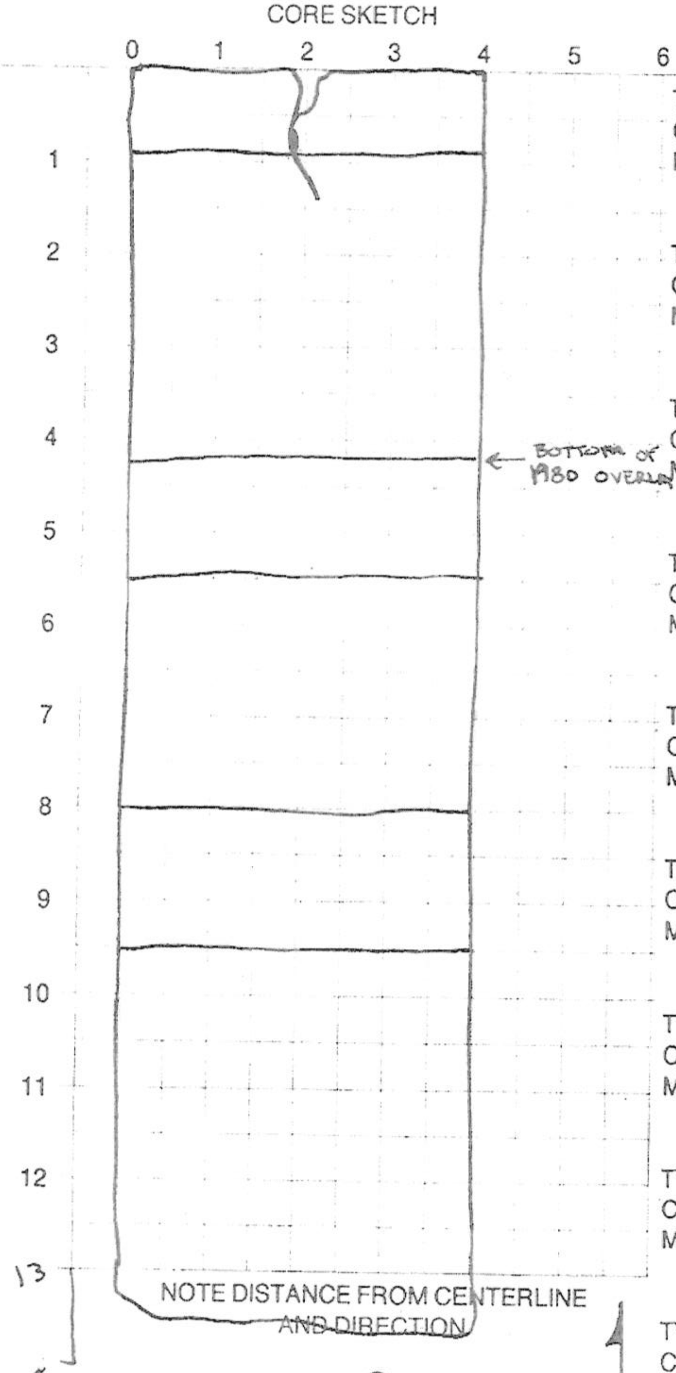
MILE POINT/STATION: 172.56 NB RT LN OWT / STATION:

Designer: RM
Region: 1 [✓ 2] 3. 4 5

CORE LENGTH: 13.5"

Drilled on Crack: [✓ YES] NO

TYPE:



DESCRIPTION

TYPE: DenseAC [✓ OpenAC] Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" [✓ 3/4"] 5/8" 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" ~~1/2"~~ 3/8" [✓ 1/4"]

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" [✓ 5/8"] 1/2" 3/8" 1/4"

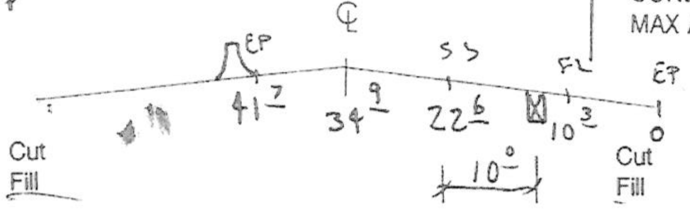
TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" [✓ 5/8"] 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" [✓ 3/4"] 5/8" 1/2" 3/8" 1/4"

TYPE:
CONDITION:
MAX AGG:

TYPE:
CONDITION:
MAX AGG:

TYPE:
CONDITION:
MAX AGG:



WH/RS
SAMPLER'S NAME

SURFACING DESIGN CORE LOG

PROJECT: COTTAGE GROVE - MARTIN CK

Saved: Yes [✓ No]
PD# 24

HIGHWAY: PACIFIC HWY NO 1

DATE 5-24-95

MILE POINT/STATION: 174.00 NB RT LN OWT / STATION:

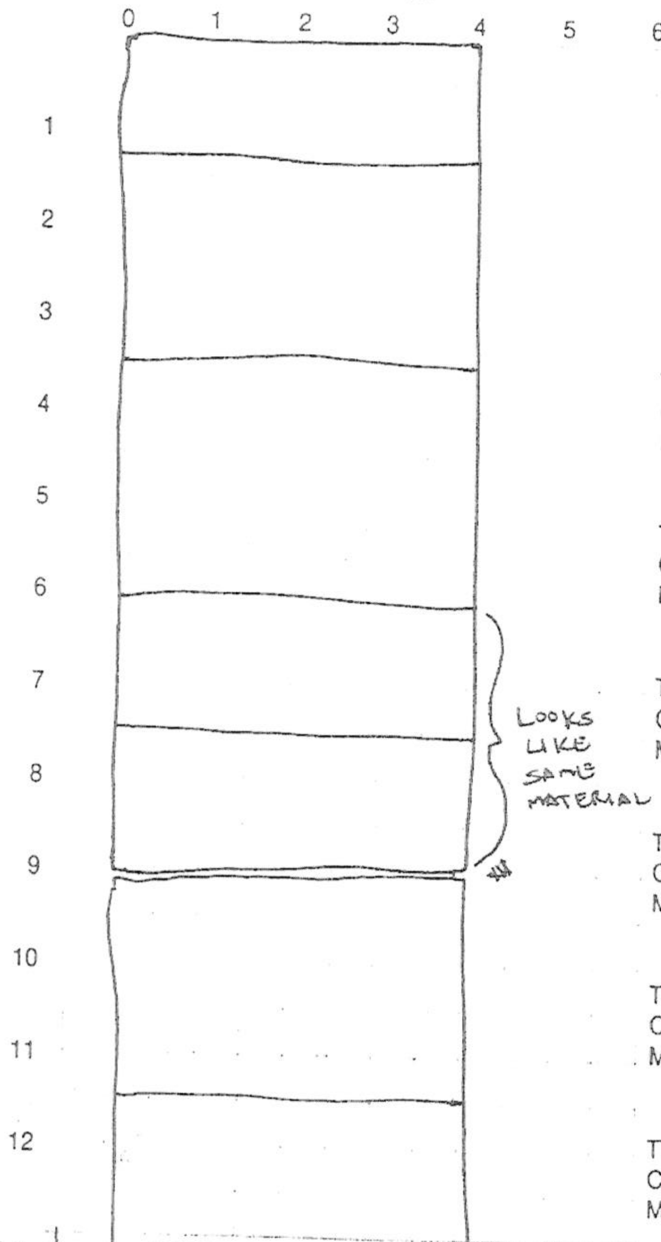
Designer: RM
Region: 1 [✓ 2] 3 4 5

CORE LENGTH: 14.5"

Drilled on Crack: YES [✓ NO]

TYPE:

CORE SKETCH



DESCRIPTION

TYPE: DenseAC [✓ OpenAC] Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" 1/2" [✓ 3/8"] 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" [✓ 3/4"] 5/8" 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" [✓ 3/4"] 5/8" 1/2" 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

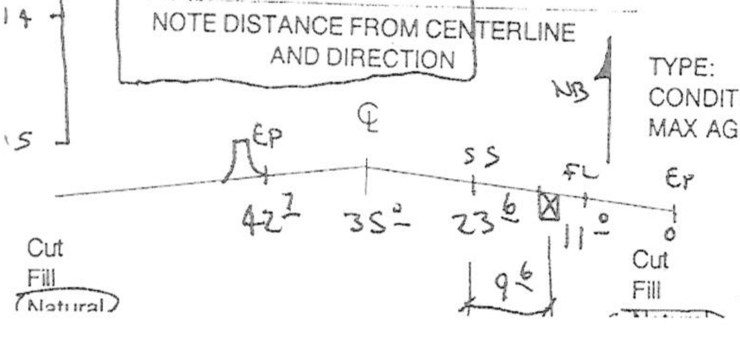
TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" 5/8" [✓ 1/2"] 3/8" 1/4"

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1"+ 1" 3/4" [✓ 5/8"] 1/2" 3/8" 1/4"

TYPE: DENSE AC
CONDITION: GOOD
MAX AGG: 5/8"

TYPE:
CONDITION:
MAX AGG:

TYPE:
CONDITION:
MAX AGG:



NOTE DISTANCE FROM CENTERLINE AND DIRECTION

Cut
Fill
[✓ Natural]

Cut
Fill
Natural

WH/RS
SAMPLER'S NAME

APPENDIX H: PAVEMENT CORE LOGS FOR ANLAUF – ELKHEAD ROAD

S .FACING DESIGN CORE LOG

Saved: Yes No

PROJECT: Anlauf - Elkhead Rd

PD# 1

HIGHWAY: Pacific Hwy No. 1

DATE 9-18-95

MILE POINT: 161.94 SB Rt Ln

STATION:

Sampler:

CORE LENGTH: 13"

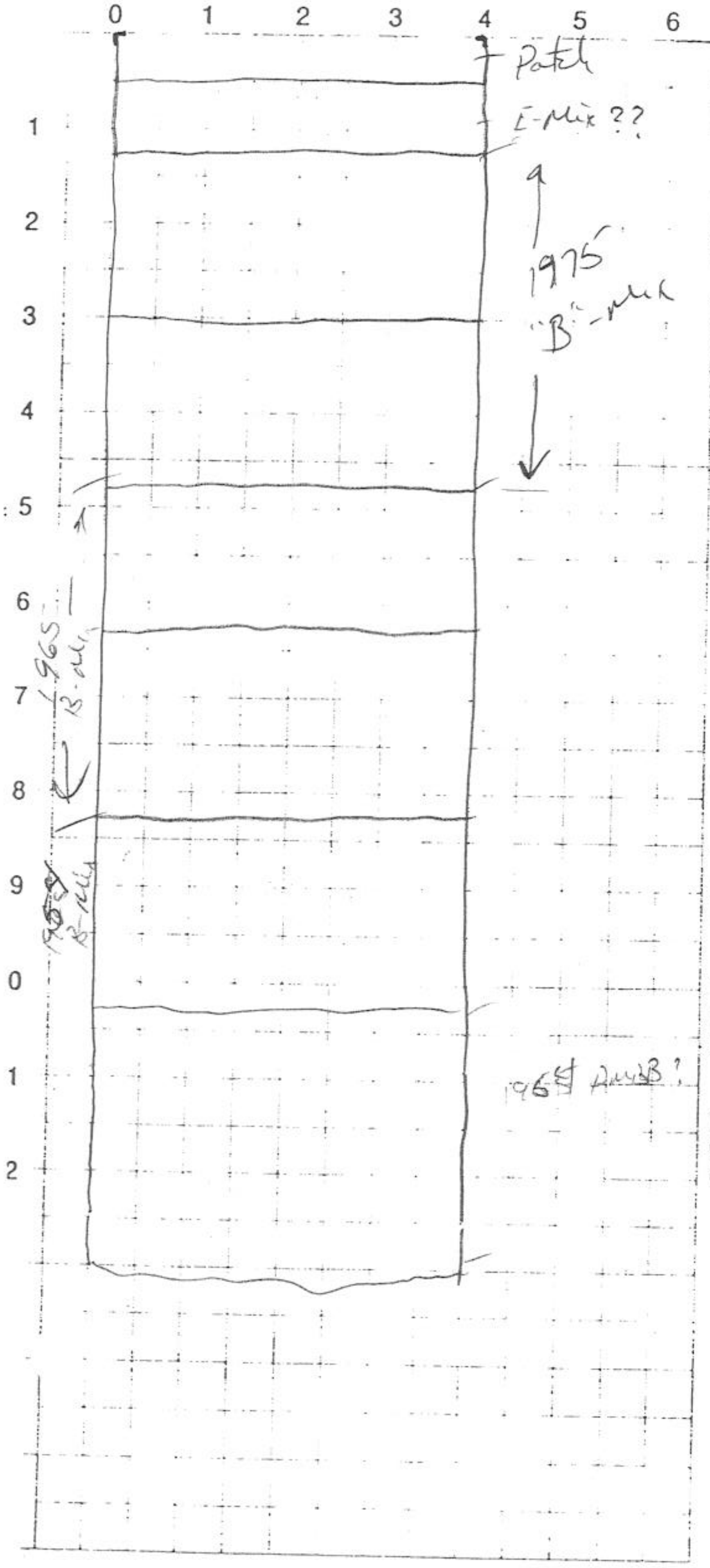
Drilled on Crack: YES [✓ NO]

Designer: RM [✓ MR] NN RS

TYPE: —

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: DenseAC OpenAC [✓ Patch] Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

used to be E-Mix

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

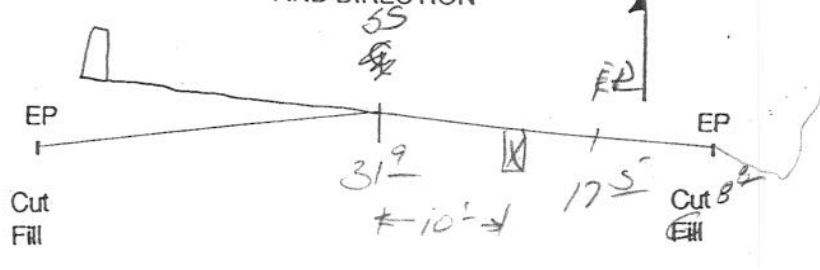
TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



S. .FACING DESIGN CORE LOG

Saved: Yes No

PROJECT: ANLAUF - ELKHEAD RD

PD# 2

HIGHWAY: PACIFIC NO. 1

DATE 9-18-95

MILE POINT: 161.39 SB RtLn STATION:

Sampler: MRemily

CORE LENGTH: 11.5"

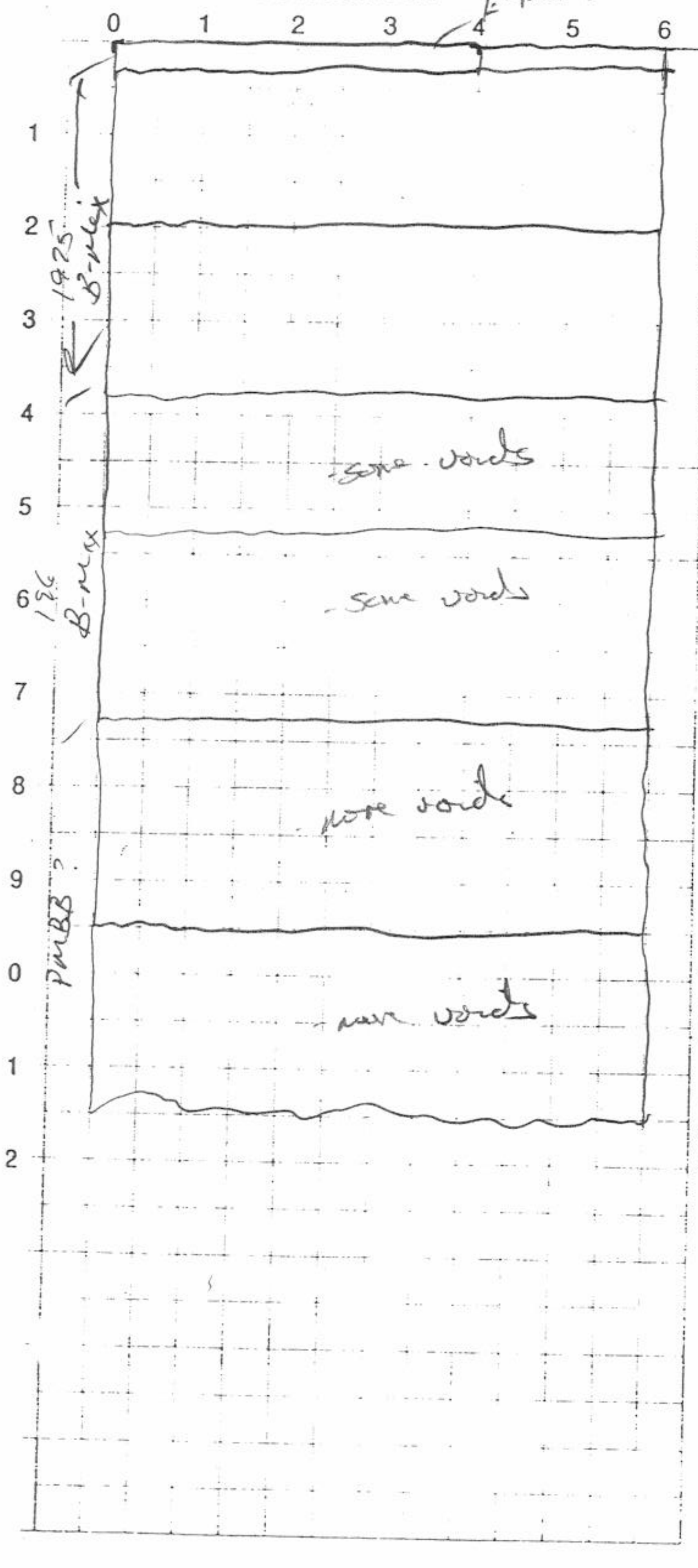
Drilled on Crack: YES [✓ NO]

Designer: RM [✓ MR] NN RS

TYPE: In OWT RUT - Extraction Sample

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: [✓ 1/4] 3/8 1/2 ~~5/8~~ 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX AGG: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION

S .FACING DESIGN CORE LOG

Saved: Yes No

PROJECT: Anlauf - Elkhead Rd

PD# 23

HIGHWAY: Pacific No. 1

DATE 9-18-95

MILE POINT: 161.39 SB Rt Ln STATION:

Sampler:

CORE LENGTH: 11.5"

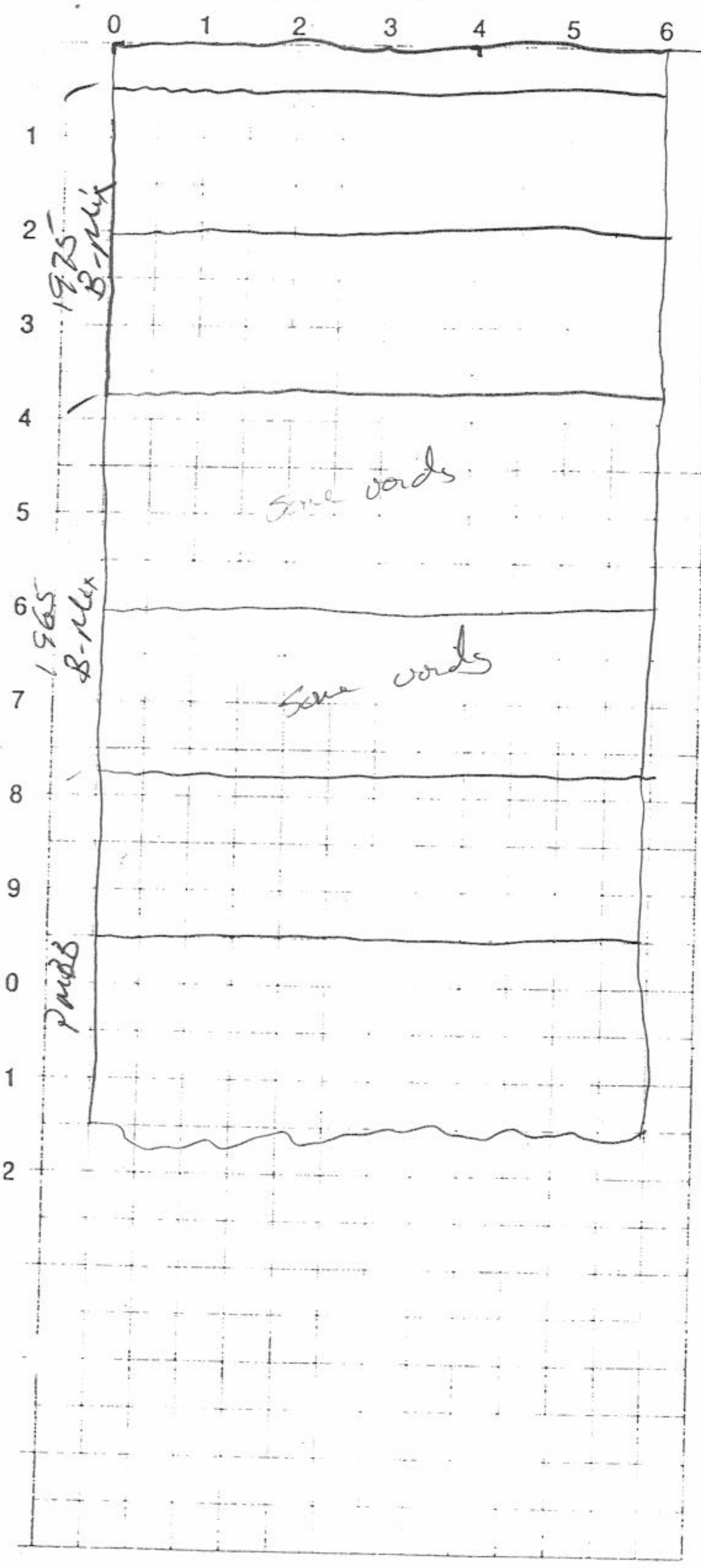
Drilled on Crack: YES [✓ NO]

Designer: RM [✓ MR] NN RS

Region: 1 2 [✓ 3] 4 5

TYPE:

CORE SKETCH



TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

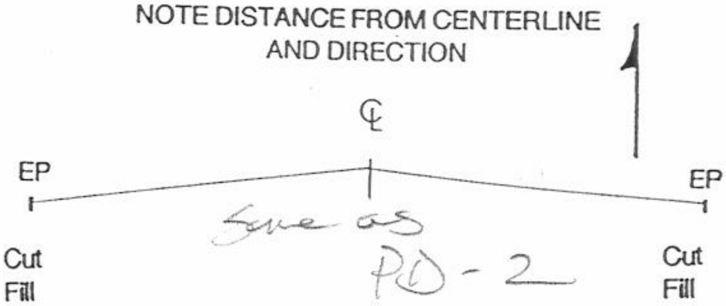
TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: ~~Good~~ [✓ Fair] Poor
MAX AGG: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 [✓ 1+]

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Same as PD-2

SURFACING DESIGN CORE LOG

Saved: Yes No

PROJECT: Anlauf - Elkhead Rd.

PD# 4

HIGHWAY: Pacific No.1

DATE 5-18-95

MILE POINT: MP 161.00 SB Rt Ln STATION:

Sampler: MRemily

CORE LENGTH: 10.5''

Drilled on Crack: YES [✓ NO]

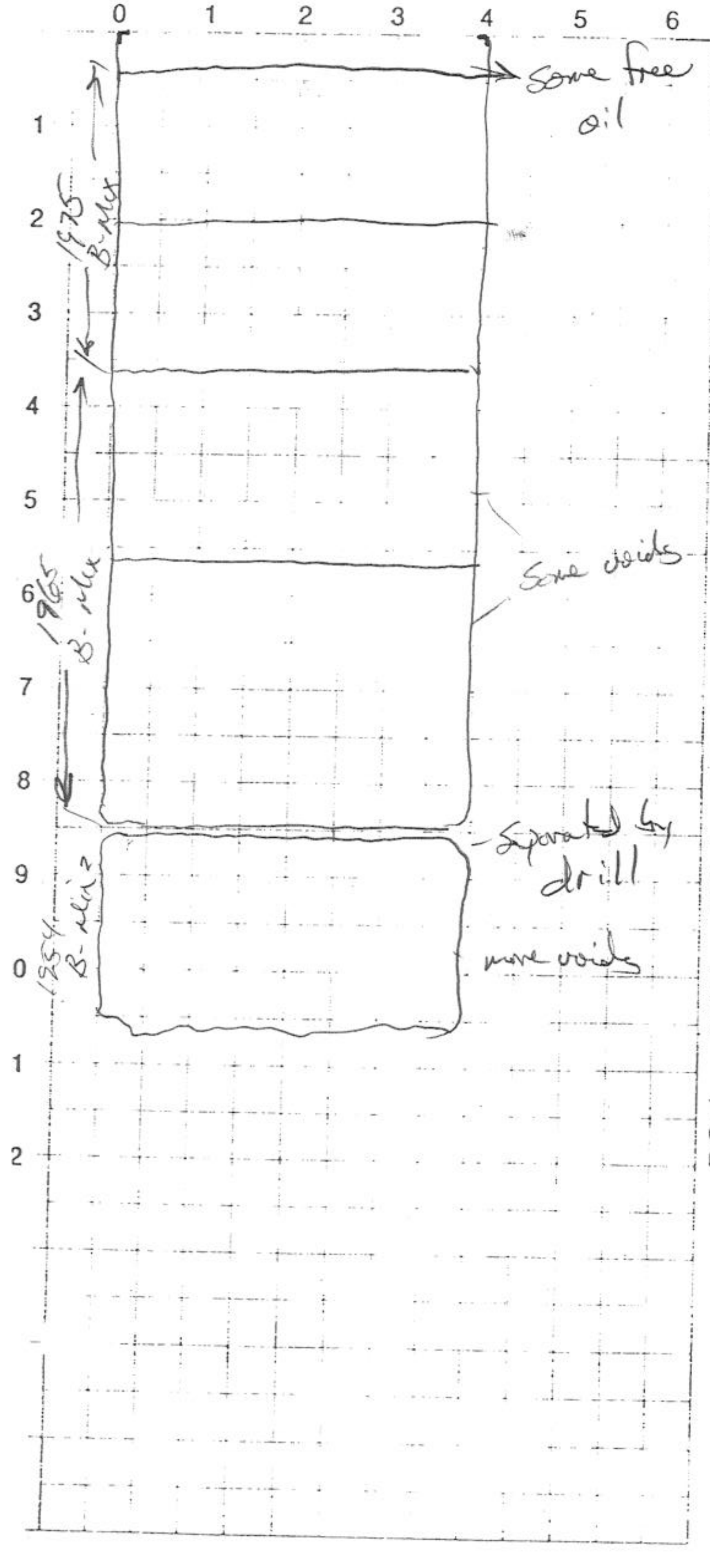
Designer: RM [✓ MR] NN RS

Region: 1 2 [✓ 3] 4 5

TYPE: OWT Rut

E-Mix ?

CORE SKETCH



TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

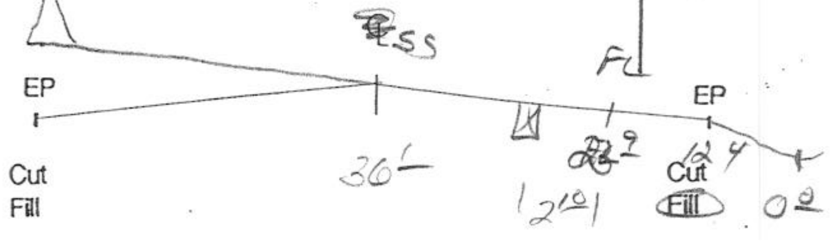
TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX AGG: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



S FACING DESIGN CORE LOG

Saved: Yes No

PROJECT: Anlauf - Elkhead Rd

PD# 5

HIGHWAY: Pacific No. 1

DATE 9-18-95

MILE POINT: MP 161.00 SB Rt Ln STATION:

Sampler: MRemily

CORE LENGTH: 11.5"

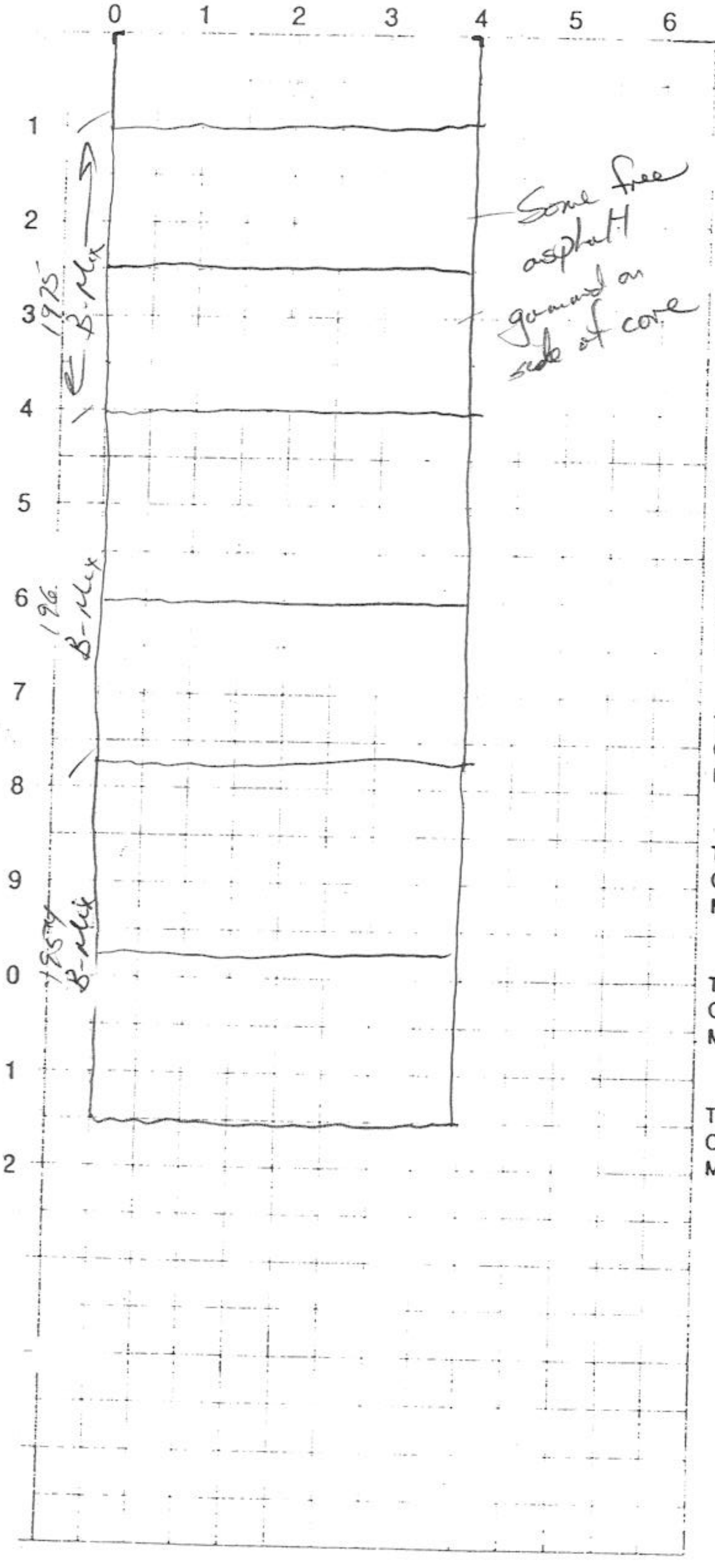
Drilled on Crack: YES [✓ NO]

Designer: RM [✓ MR] NN RS

TYPE: BWT

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



E-Mix

TYPE: [✓ DenseAC OpenAC] Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

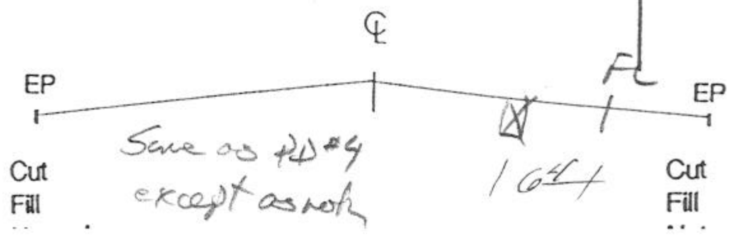
TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 [✓ 1+]

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION



Same as PD #4 except as noted

S FACING DESIGN CORE LOG

Saved: Yes No

PROJECT: Anlauf - Elk Head Rd. Intch

PD# 6

HIGHWAY: Pacific Hwy #1

DATE 9-18-95

MILE POINT: 160.50 SB out

STATION:

Sampler: Lyn H

CORE LENGTH: 10.50"

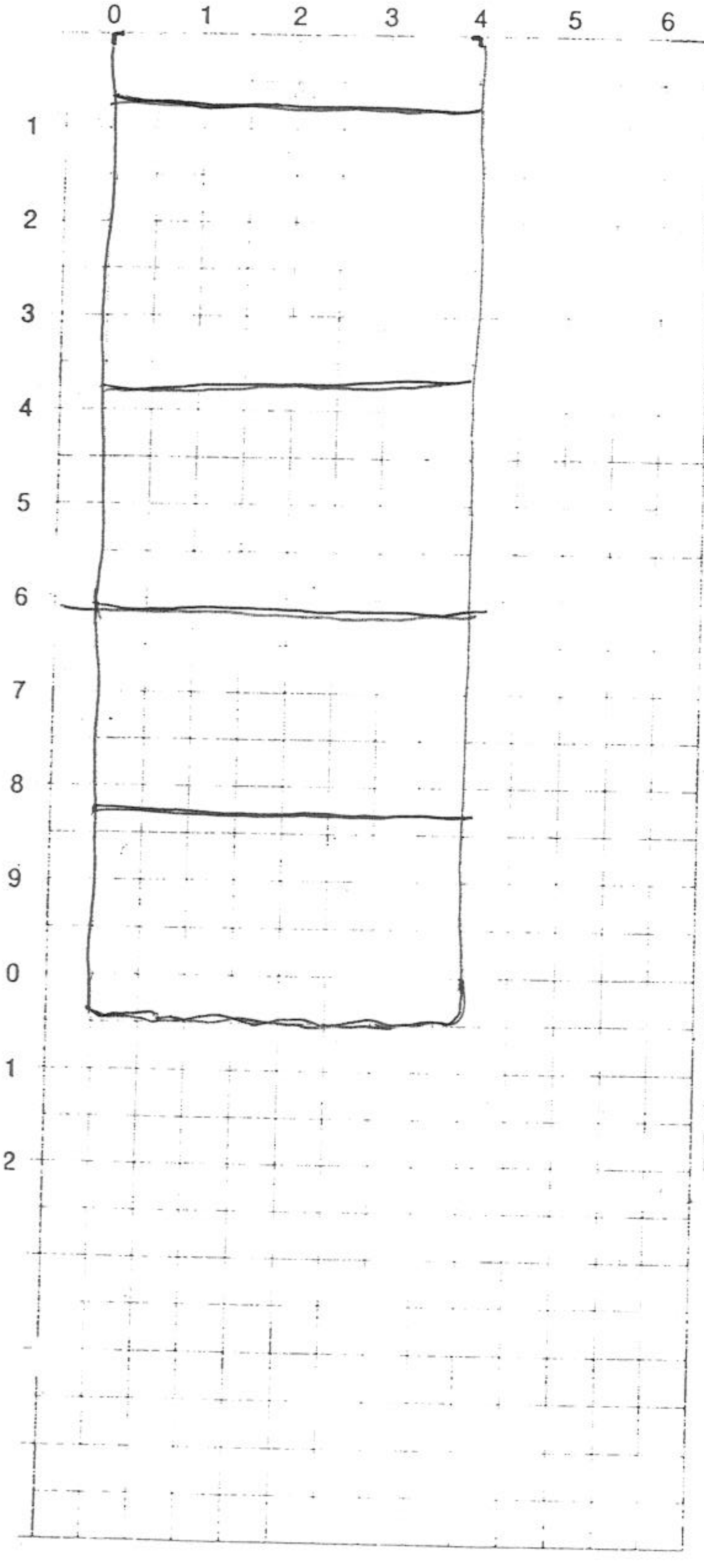
Drilled on Crack: YES [✓ NO]

Designer: RM [✓ MR] NN RS

TYPE:

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ DenseAC] OpenAC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX AGG: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

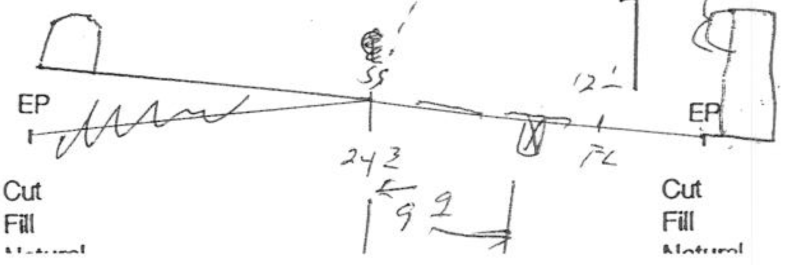
TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: DenseAC OpenAC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX AGG: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



PAVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd. Intch.

HIGHWAY: Pacific Hwy #1

MILEPOINT: 160.21 SB Rtlncut STATION: ______

CORE LENGTH: 10"

Saved: [✓ Yes] No

PD # 7

DATE 9-19-95

Sampler: WBK

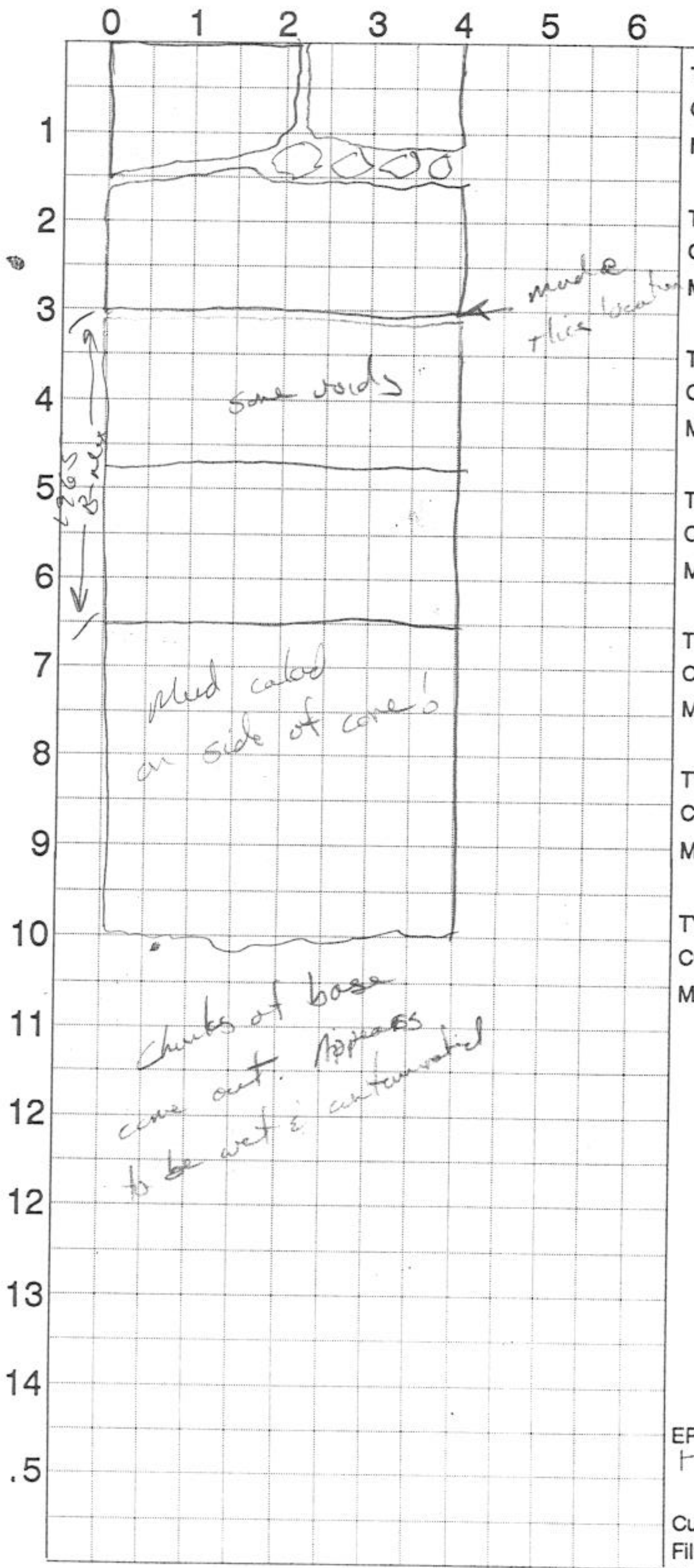
Designer: me

Region: 1 2 [✓ 3] 4 5

Drilled on Crack: [✓ YES] [✓ NO]

TYPE: Fatigue in Base Failure

CORE SKETCH



TYPE: Dense AC Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

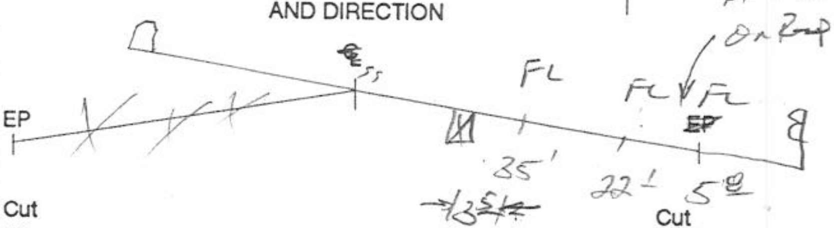
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

Cut
[✓ Fill]
Natural

Shoulder humped about 4" @ FL

?AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: ANLAUF - ELKHEAD Rd INTCH

PD # 8

HIGHWAY: Pacific Hwy #1

DATE 9-19-95

MILEPOINT: 159.33 SB Rt Ln STATION:

Sampler:

CORE LENGTH: 12.5"

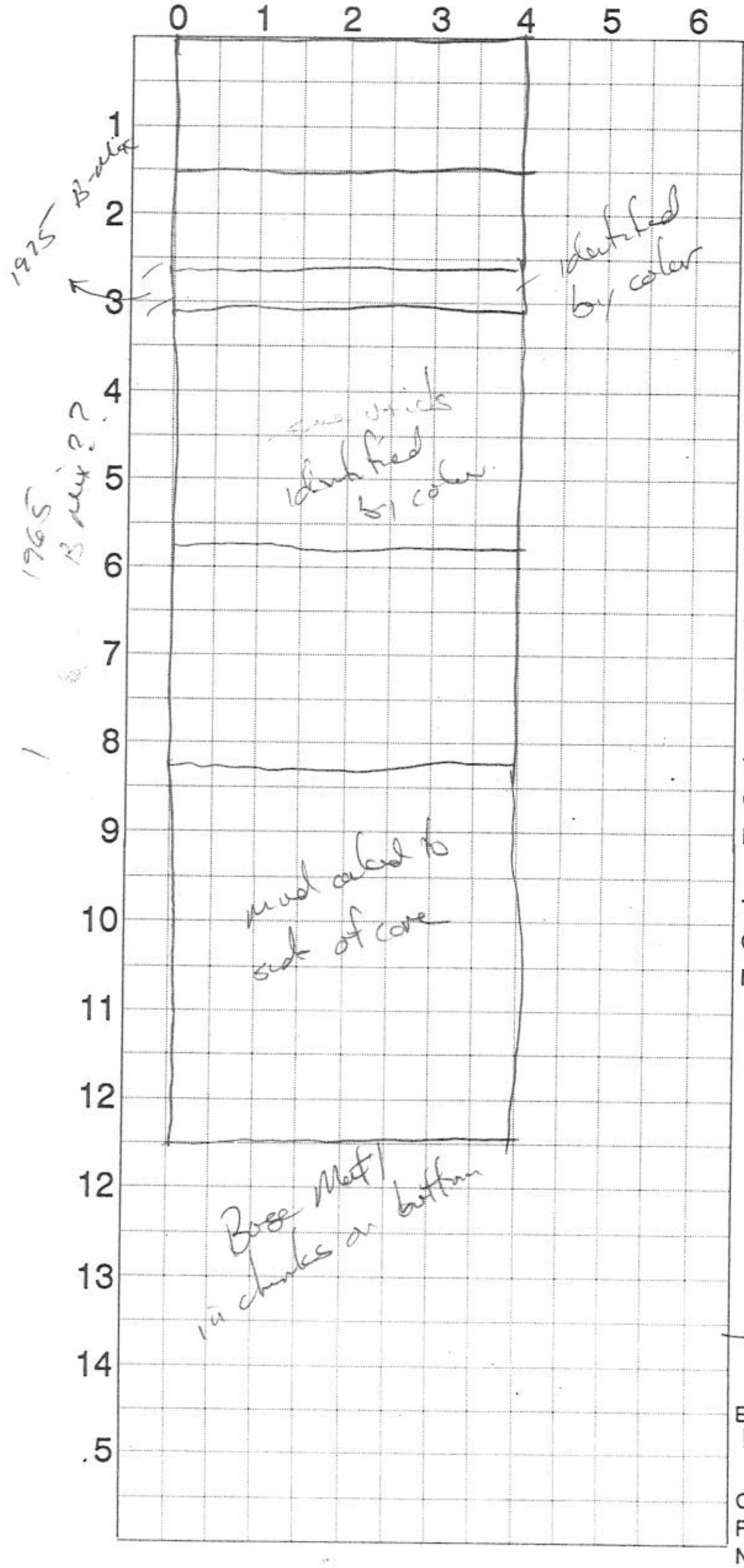
Drilled on Crack: YES [✓ NO]

Designer: MR

TYPE: 50' S. Exit 159 Structure - On Patch

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

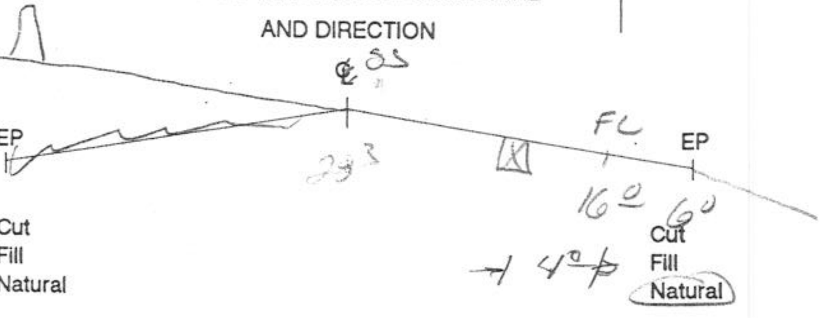
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

Cut
Fill
[✓ Natural]

’AVEMENT DESIGN CORE LOG

Saved: Yes No

PROJECT: ANLAUF - ELKHEAD Rd INTCH

PD # 10.

HIGHWAY: PACIFIC HWY I

DATE 9-19-95

MILEPOINT: 157.48 SB RtLn

STATION:

Sampler: [illegible]

CORE LENGTH: 11.5"

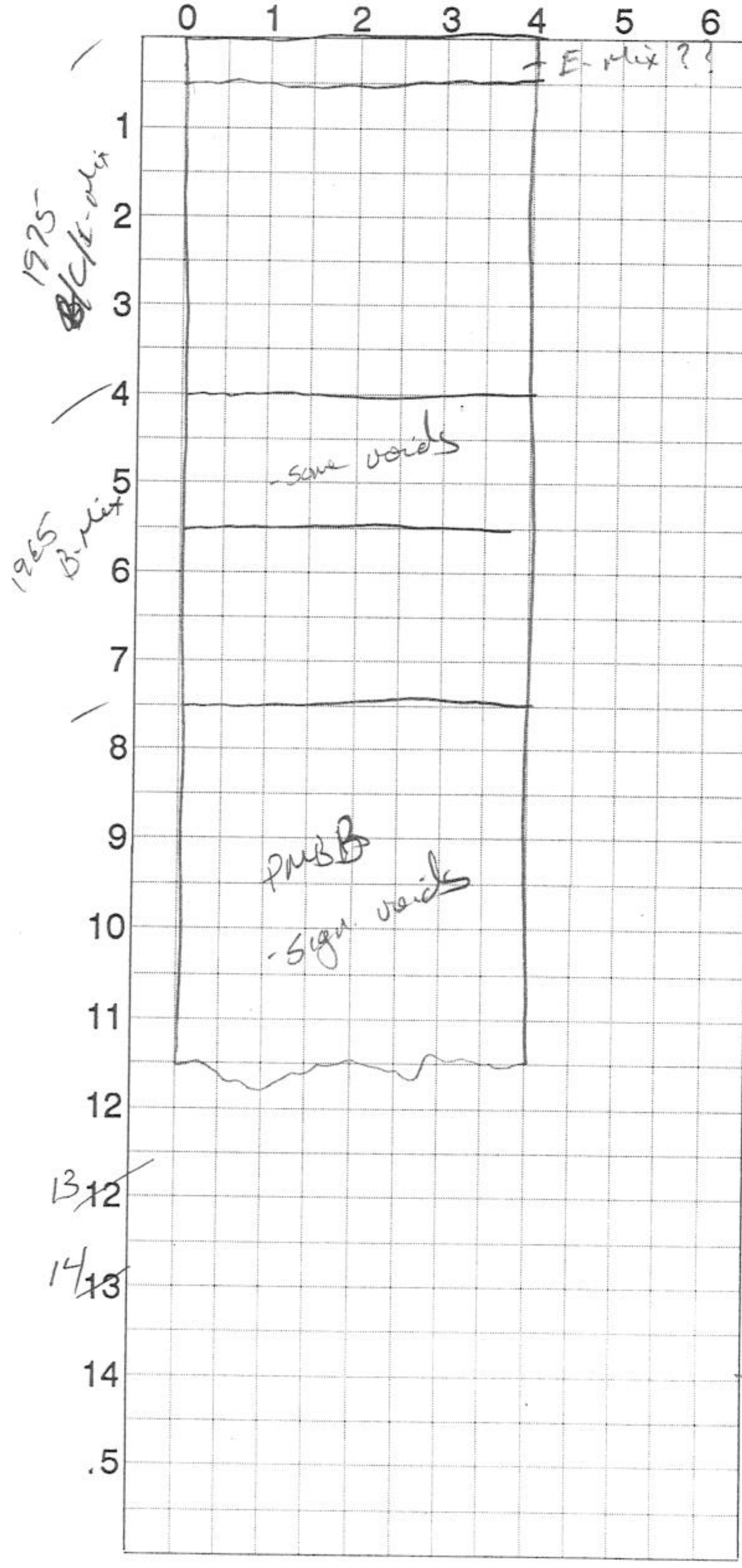
Drilled on Crack: YES [✓ NO]

Designer: MR MR

TYPE: Dual Wheel Rut
This hole in OWT

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

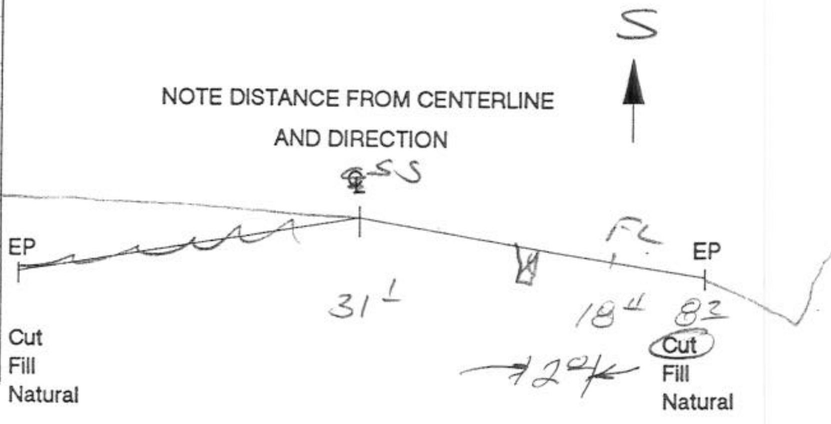
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION



Cut
Fill
Natural

[✓ Cut]
Fill
Natural

'AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: ____

PD # 11

HIGHWAY: ____

DATE 9-15-95

MILEPOINT: 157.48 SB Rt Ln STATION: ____

Sampler: Ram

CORE LENGTH: ____

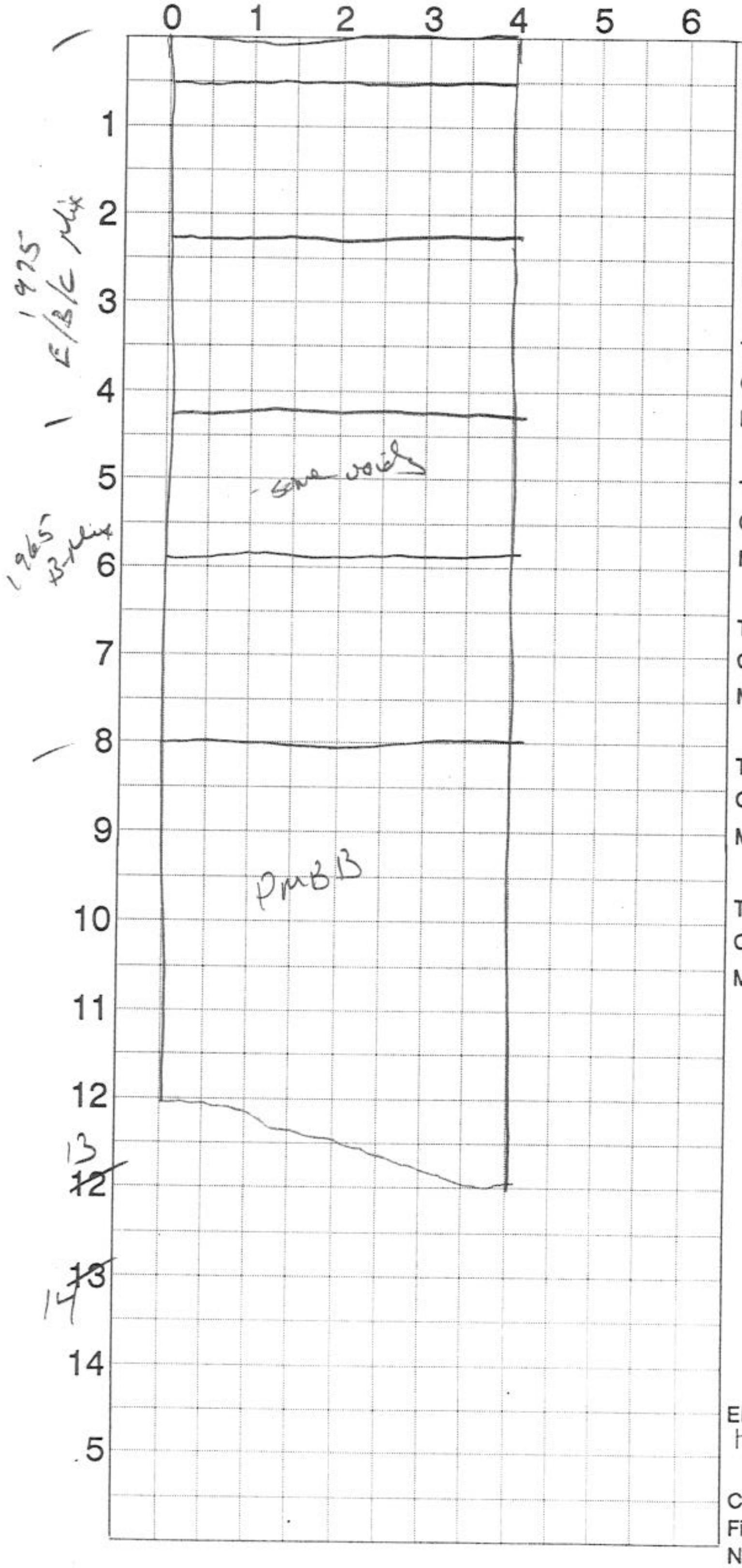
Drilled on Crack: YES [✓ NO]

Designer: MR

TYPE: Between set of dual wheel ruts CBWT

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: ~~Dense AC~~ [✓ Open AC] Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

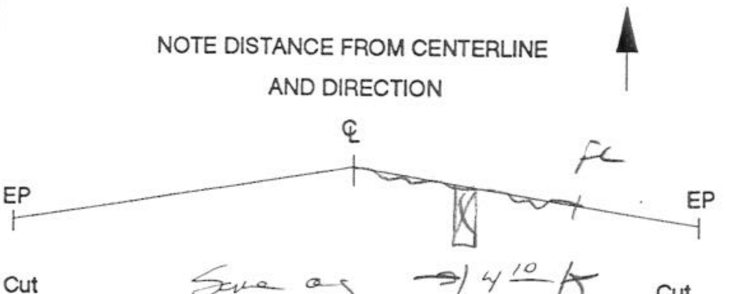
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

Same as → 14 10 ft
hole #10
except as noted

Cut
Fill
Natural

'AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: Anlauf - Elkhead Rd

PD # 12

HIGHWAY: Pacific No: 1

DATE 9-19-95

MILEPOINT: MP 156.70 SB Rt Ln STATION:

Sampler: Randy

CORE LENGTH: 9.5"

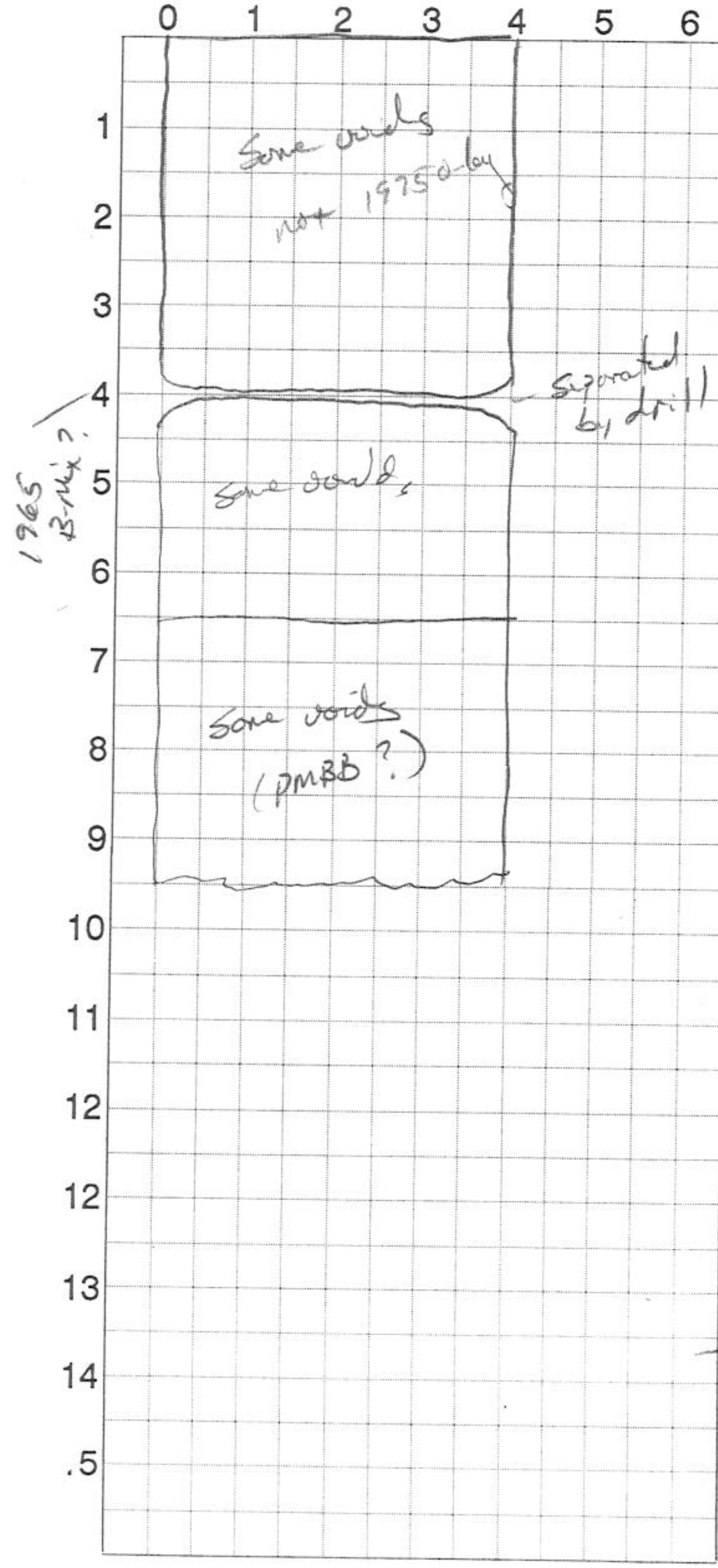
Drilled on Crack: YES [✓ NO]

Designer: MR

TYPE: in patch under Cox Rd structure

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

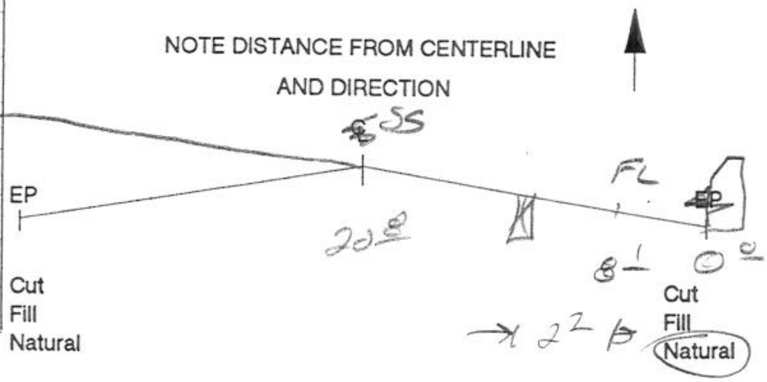
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION

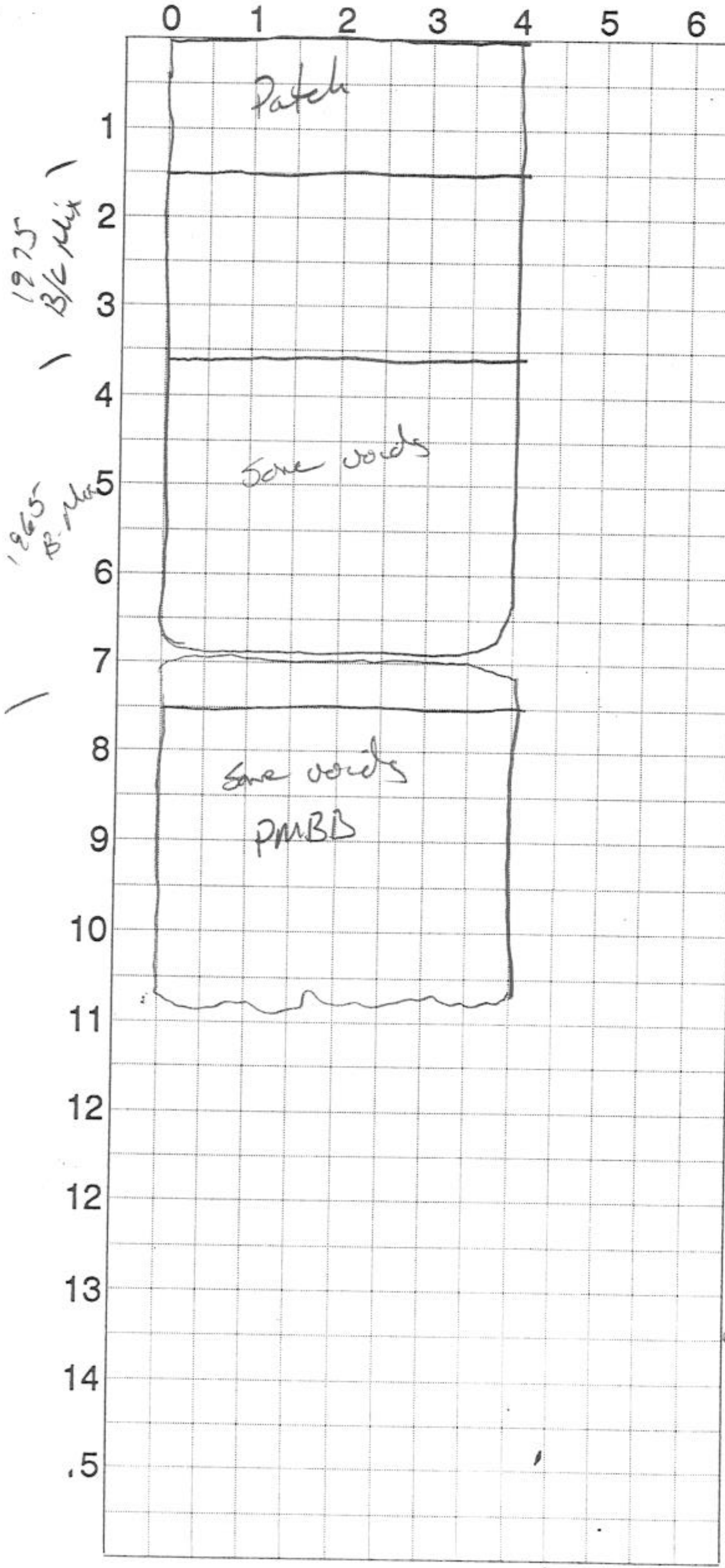


ᐧAVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd Patch
HIGHWAY: Pacific No. 1
MILEPOINT: 156.45 SB Rt Ln STATION: 100 ft S of Curtis Cr. Bridge
CORE LENGTH: 10.75"
Drilled on Crack: YES [✓ NO]
TYPE:

Saved: [✓ Yes] No
PD # 13
DATE 9-19-95
Sampler: Romily
Designer: WR
Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

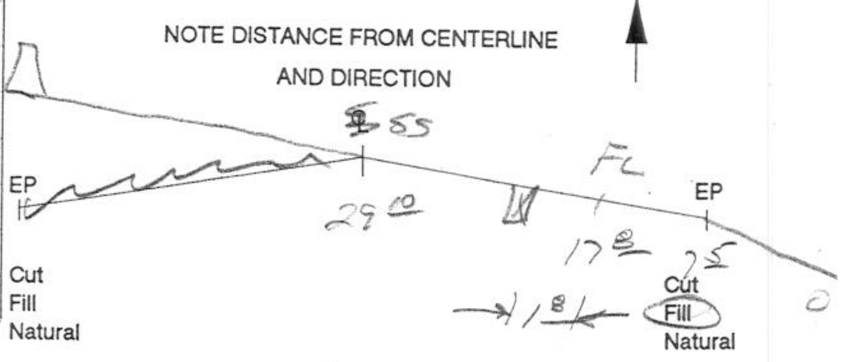
TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 [✓ 1+]

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+


NOTE DISTANCE FROM CENTERLINE AND DIRECTION

Cut
Fill
Natural

Cut
[✓ Fill]
Natural

'AVEMENT DESIGN CORE LOG

Saved: Yes No

PROJECT: Anlauf - Elkhead Rd.

PD # 14

HIGHWAY: Pacific No. 1

DATE 9-19-95

MILEPOINT: 155.99 SB Rt Ln

STATION: 55' S Cox Creek bridge

Sampler:

CORE LENGTH: 13.25"

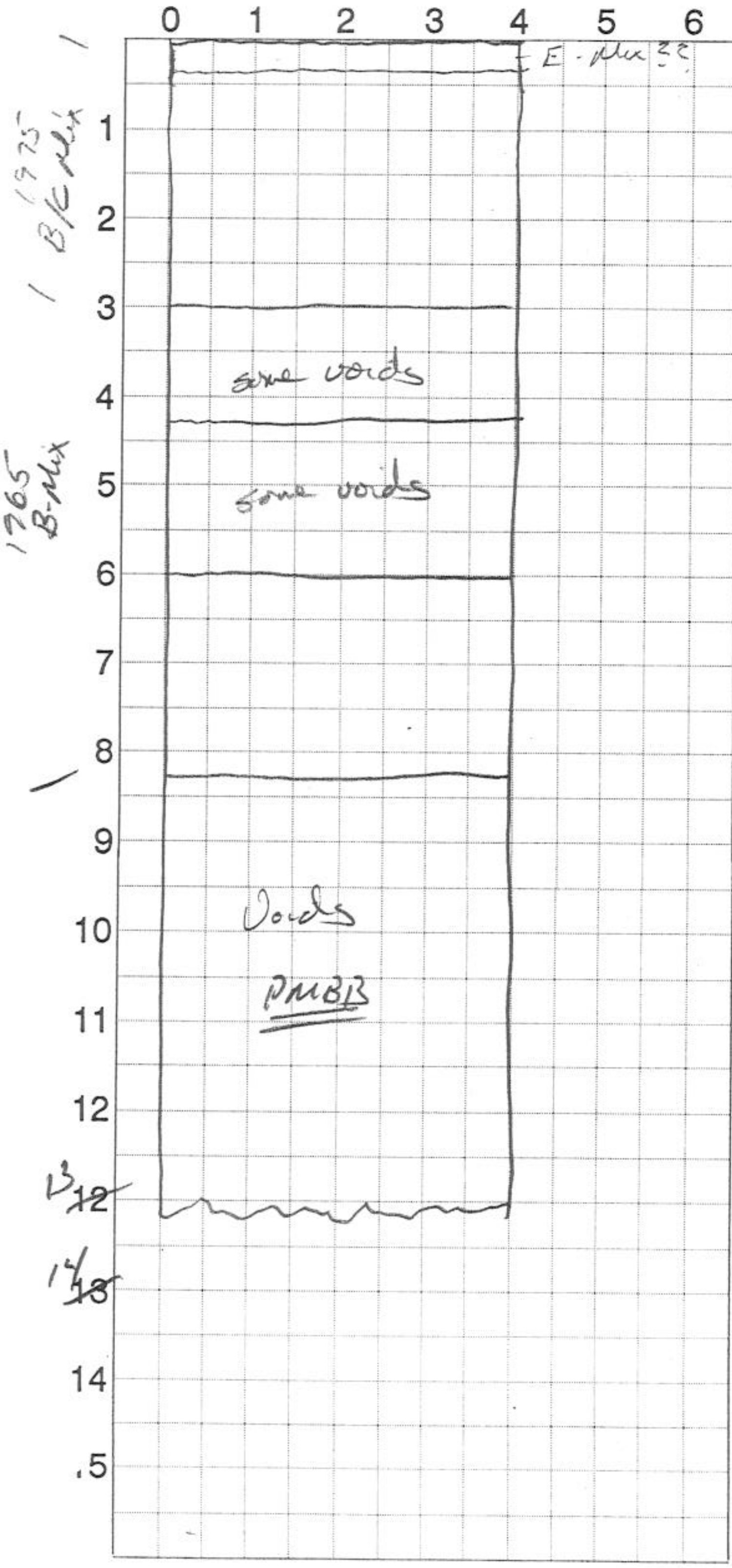
Drilled on Crack: YES [✓ NO]

Designer: MR

TYPE:

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

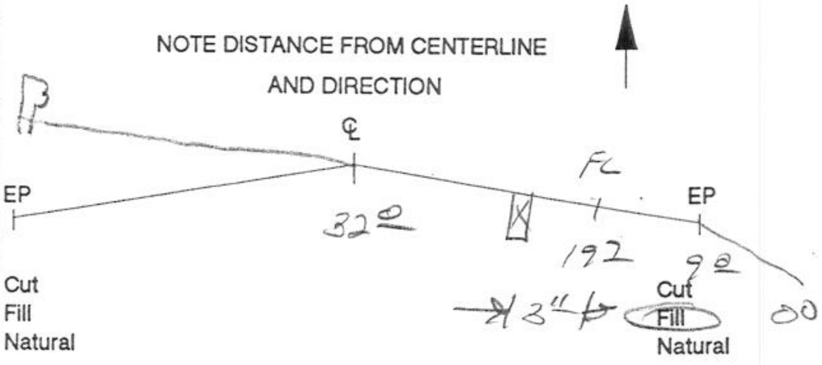
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION

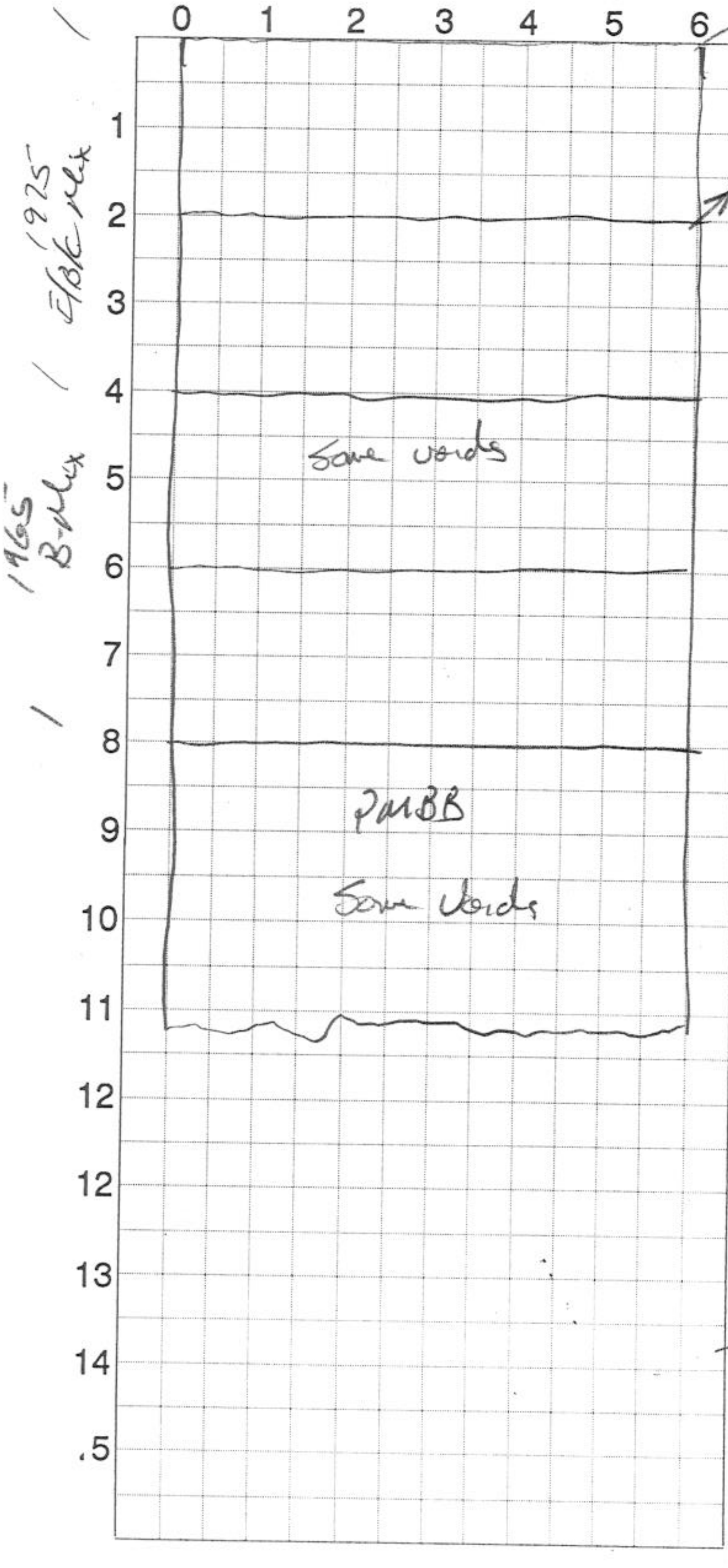


PAVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd.
HIGHWAY: Pacific No. 1
MILEPOINT: 155.36 SB Rt Ln STATION:
CORE LENGTH: 11.25"
Drilled on Crack: YES [✓ NO]
TYPE: Couldn't differentiate E-Mix

Saved: Yes No
PD # 15
DATE 9-19-95
Sampler: Remly
Designer: MR
Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

Some free AC on side of core

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

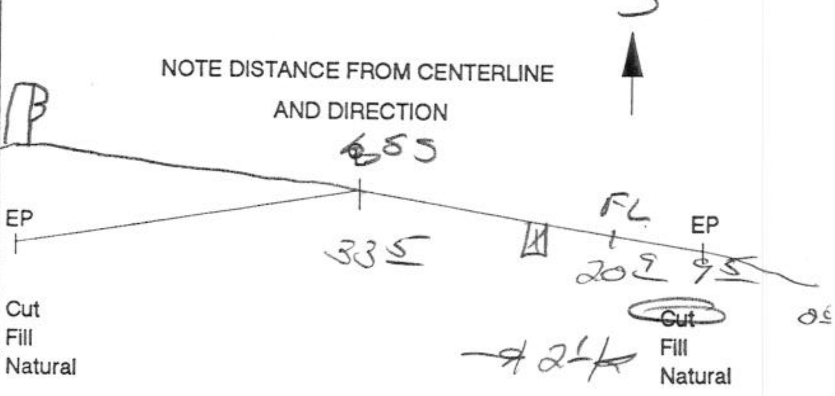
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

[✓ Cut]
Fill
Natural

'AVEMENT DESIGN CORE LOG

Saved: Yes No

PROJECT: Anlauf - Elkhead Rd

PD # 16

HIGHWAY: Pacific No. 1

DATE 9-19-95

MILEPOINT: 155.36 SB Rt Ln STATION:

Sampler: Remily

CORE LENGTH: 11.25"

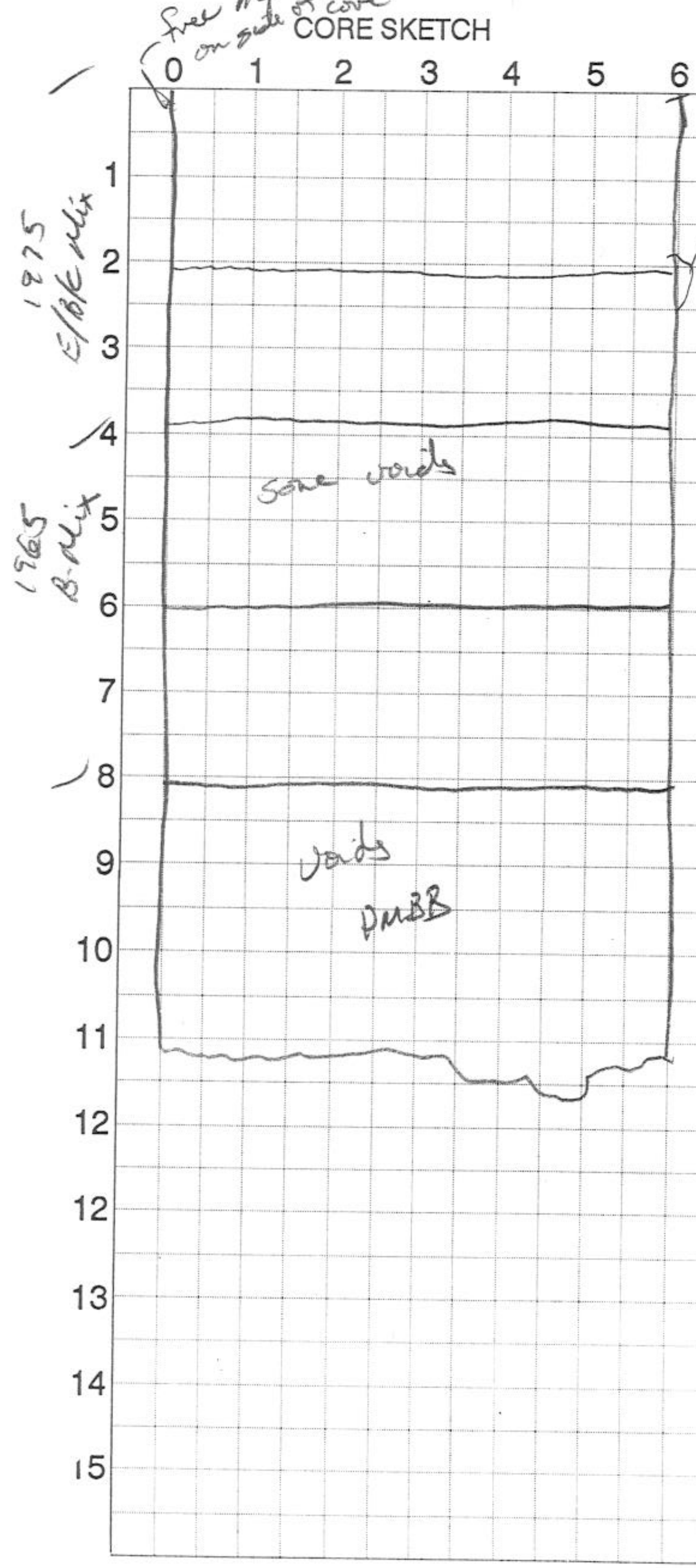
Drilled on Crack: YES [✓ NO]

Designer: MR

TYPE: 2nd 6" Core sample

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



Unable to distinguish E-Mix

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

free AC on side of core

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

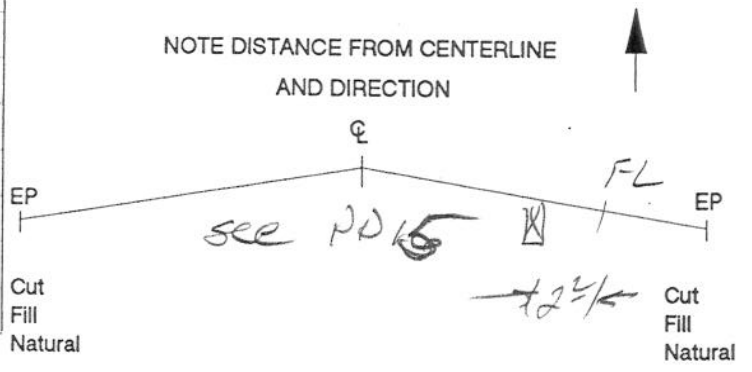
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



ᐧAVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: Anlauf - Elkhead Rd

PD # 17

HIGHWAY: Pacific No. 1

DATE 9-19-85

MILEPOINT: 155.04 SB Rt Ln

STATION:

Sampler: Pamil,

CORE LENGTH: 14"

Drilled on Crack: YES [✓ NO]

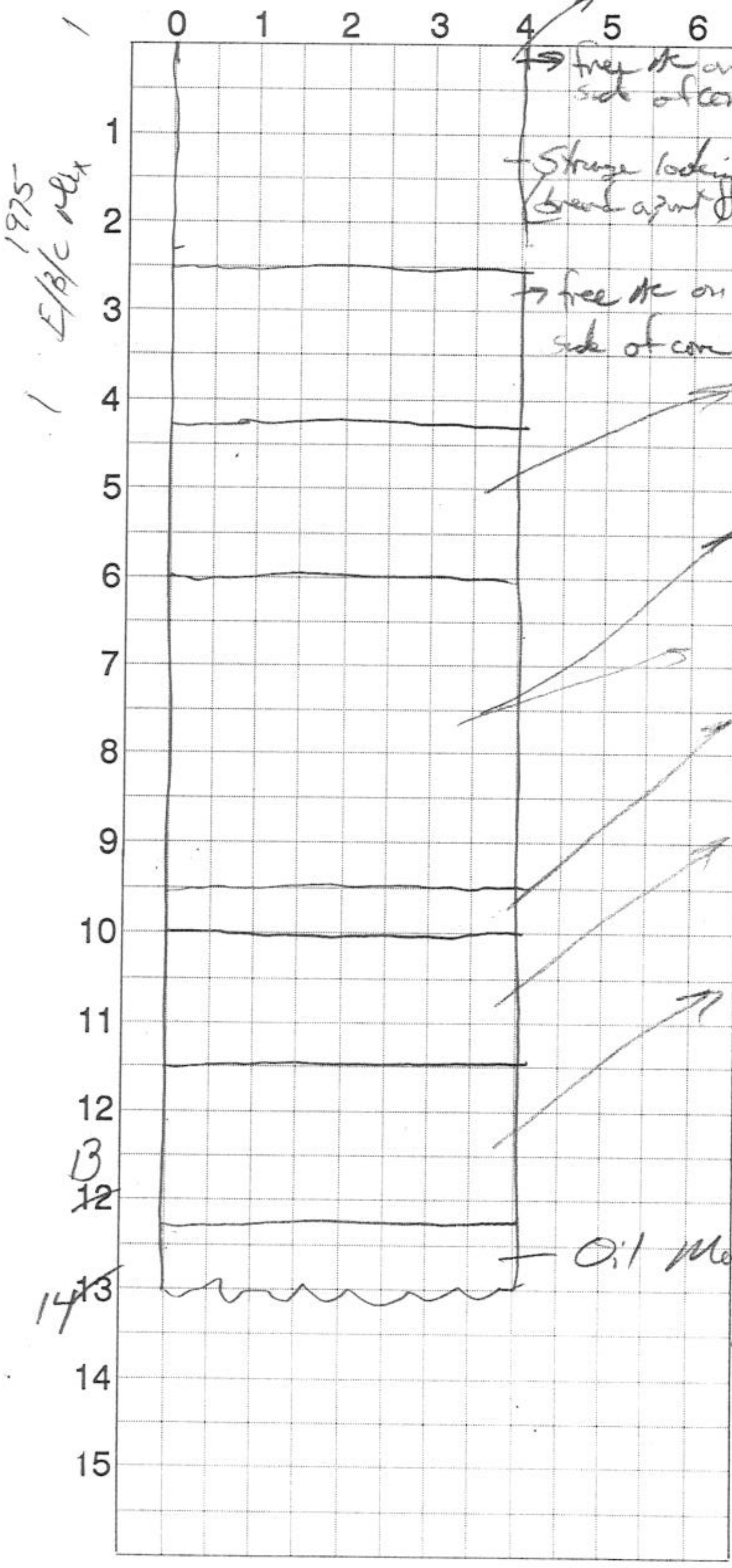
Designer: UR

TYPE: Inside of curve

Region: 1 2 [✓ 3] 4 5

Could not distinguish E-Mix

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

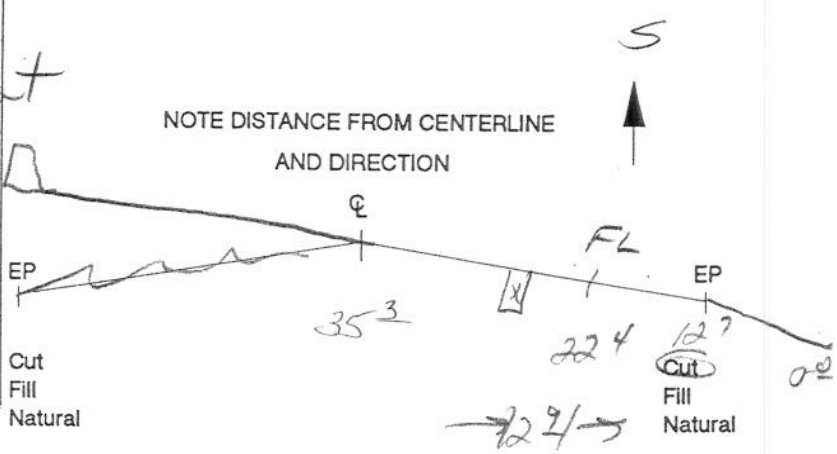
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: Dense AC Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC [✓ Open AC] Patch Stripping PCC CTB [✓ Other] Macadam
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

[✓ Cut]
Fill
Natural

'AVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd.

HIGHWAY: Pacific No. 1

MILEPOINT: 155.64 NB ~~Rt~~ 4n STATION:

CORE LENGTH: 11"

Drilled on Crack: YES [✓ NO]

TYPE:

Saved: [✓ Yes] No

PD # 19

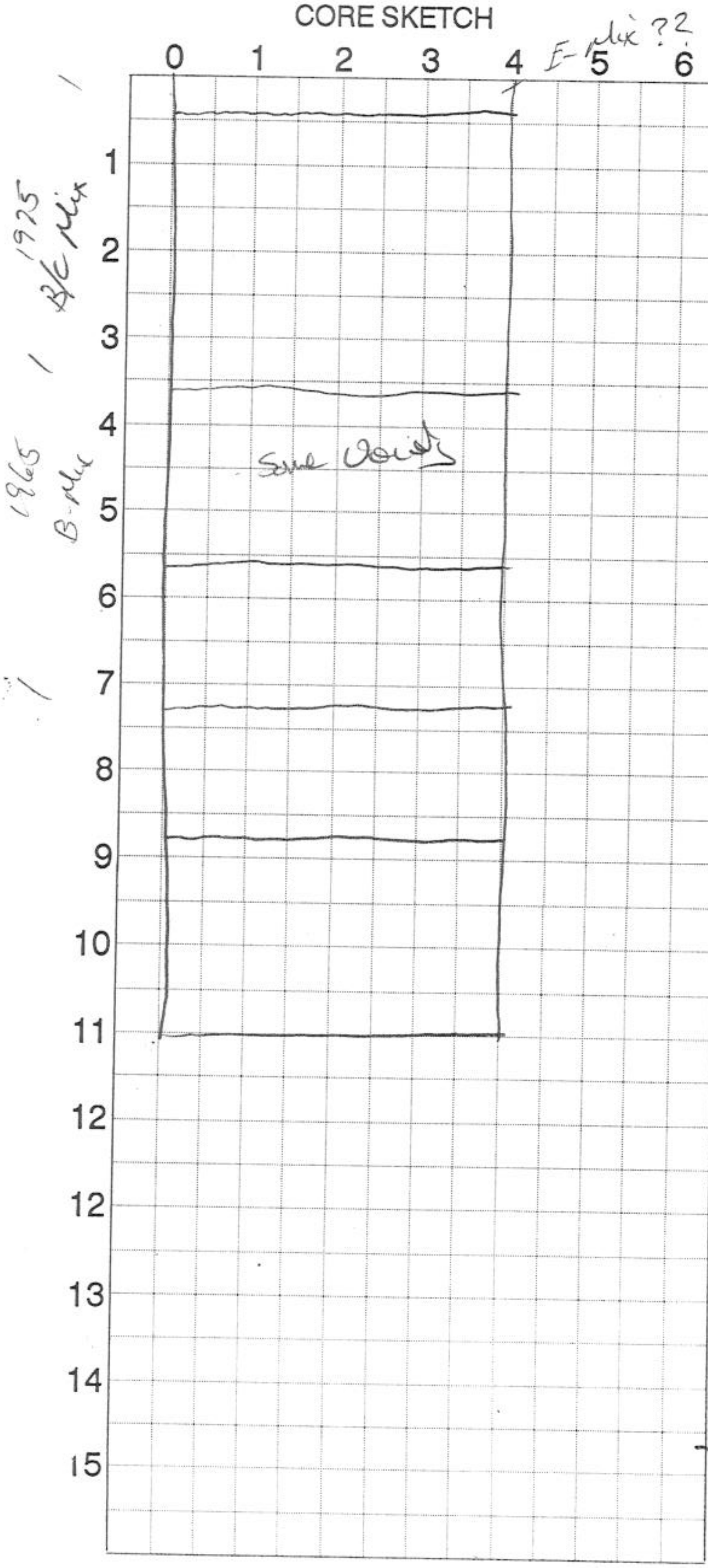
DATE 9-19-95

Sampler: Remy

Designer: NR

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC Open AC] Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

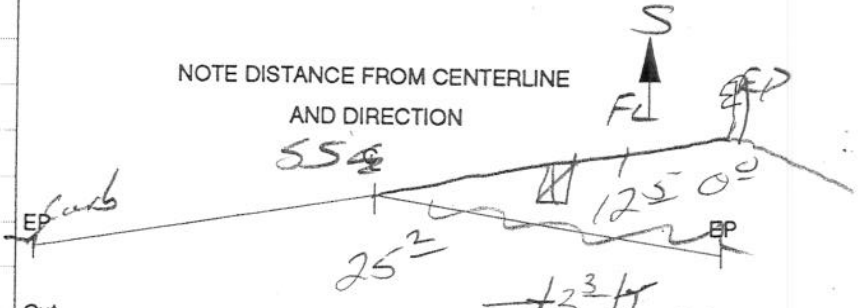
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

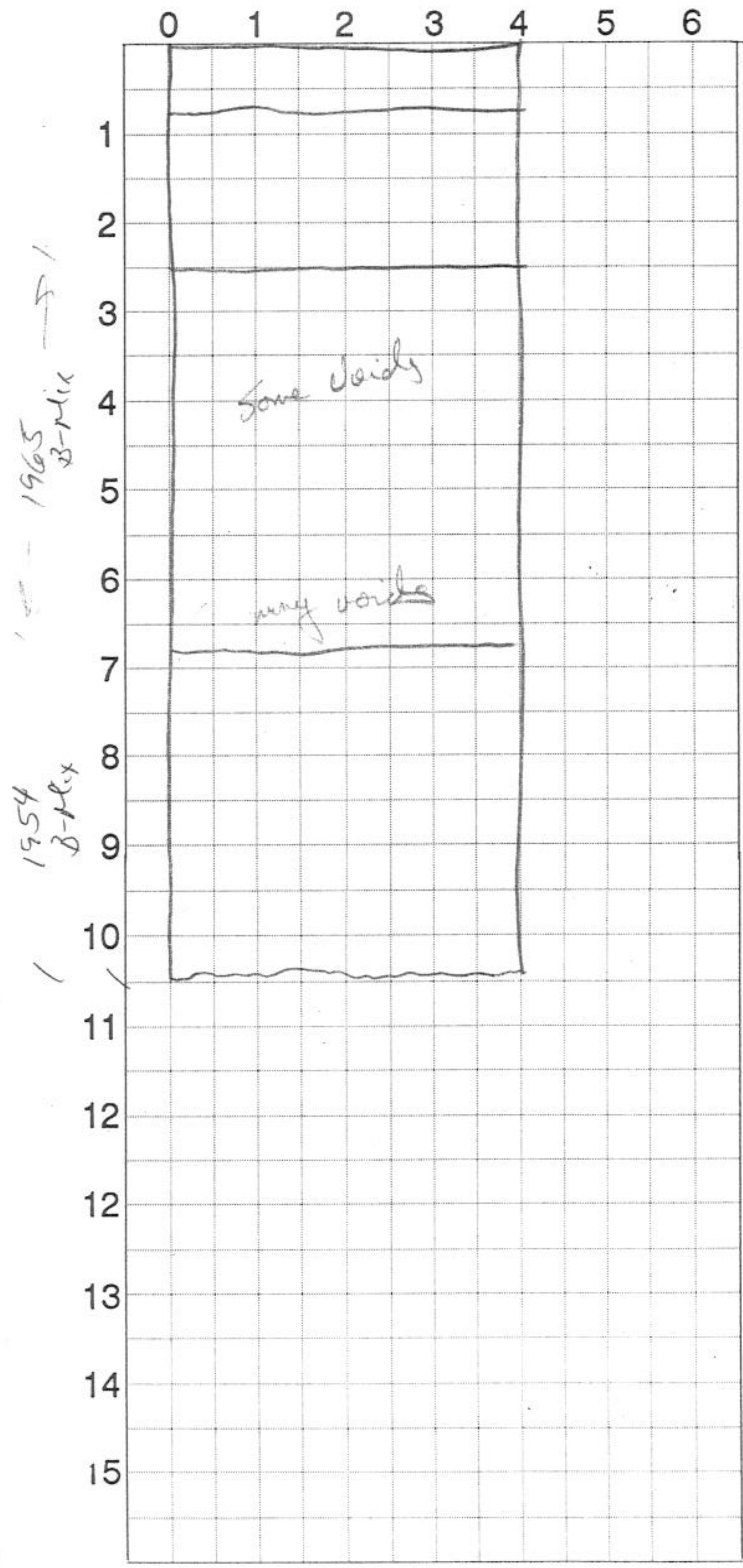
Cut
[✓ Fill]
Natural

’AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No
PD # 20
DATE 9-20-95

PROJECT: Anlauf - Elkhead Rd.
HIGHWAY: Pacific Hw. 1
MILEPOINT: 156.50 NB Rt Ln STATION: 25 ft N. of Curtis Creek Bridge
CORE LENGTH: 10.5"
Drilled on Crack: YES [✓ NO]
TYPE:
Sampler: Randy
Designer: MR
Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] [✓ Open AC] Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

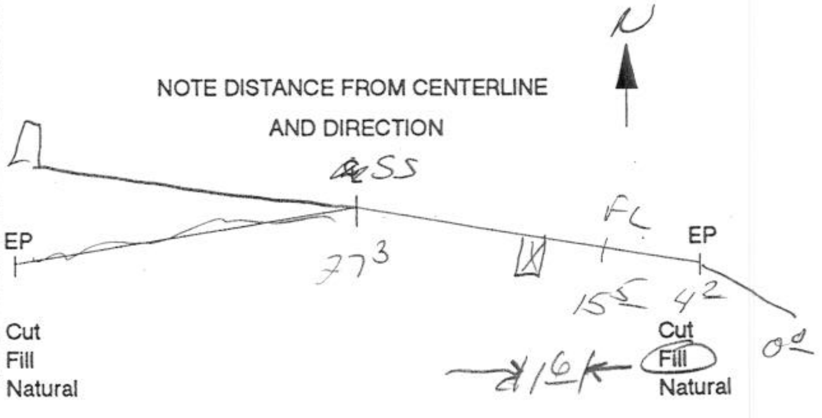
TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION



Cut
Fill
Natural

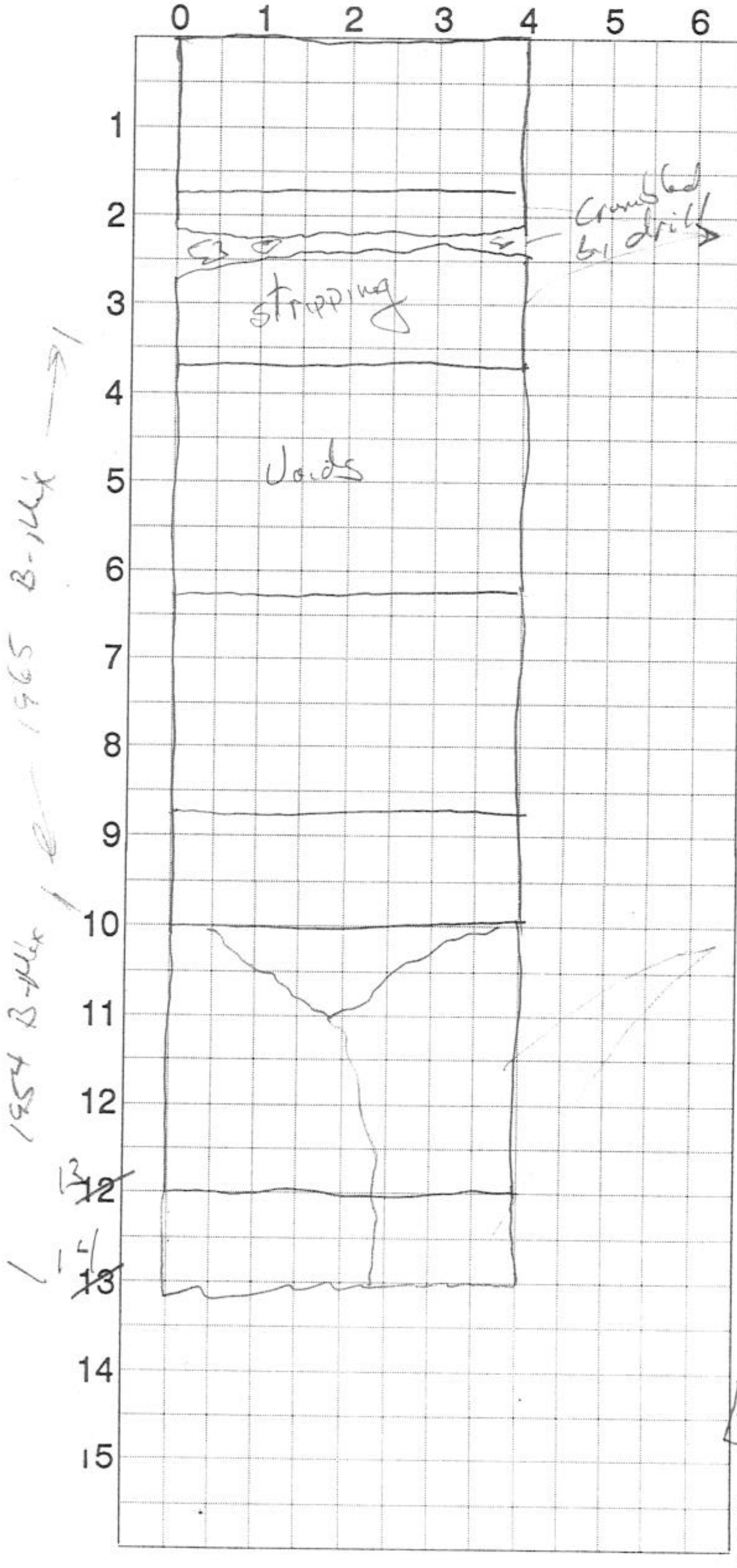
Cut
[✓ Fill]
Natural

'AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No
PD # 21
DATE 9-20-95
Sampler: Reauly
Designer: MR
Region: 1 2 [✓ 3] 4 5

PROJECT: Anlauf-Elkhead Rd.
HIGHWAY: Pacific No. 1
MILEPOINT: 156.65 ~~NR~~ RT LN
STATION: Under Cox Rd Bridge
CORE LENGTH: 14"
Drilled on Crack: YES [✓ NO]
TYPE:

CORE SKETCH



TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

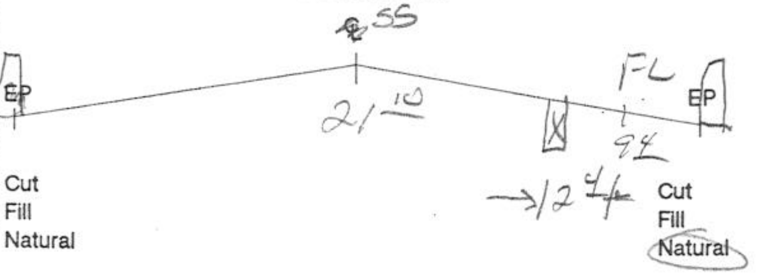
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

Cut
Fill
[✓ Natural]

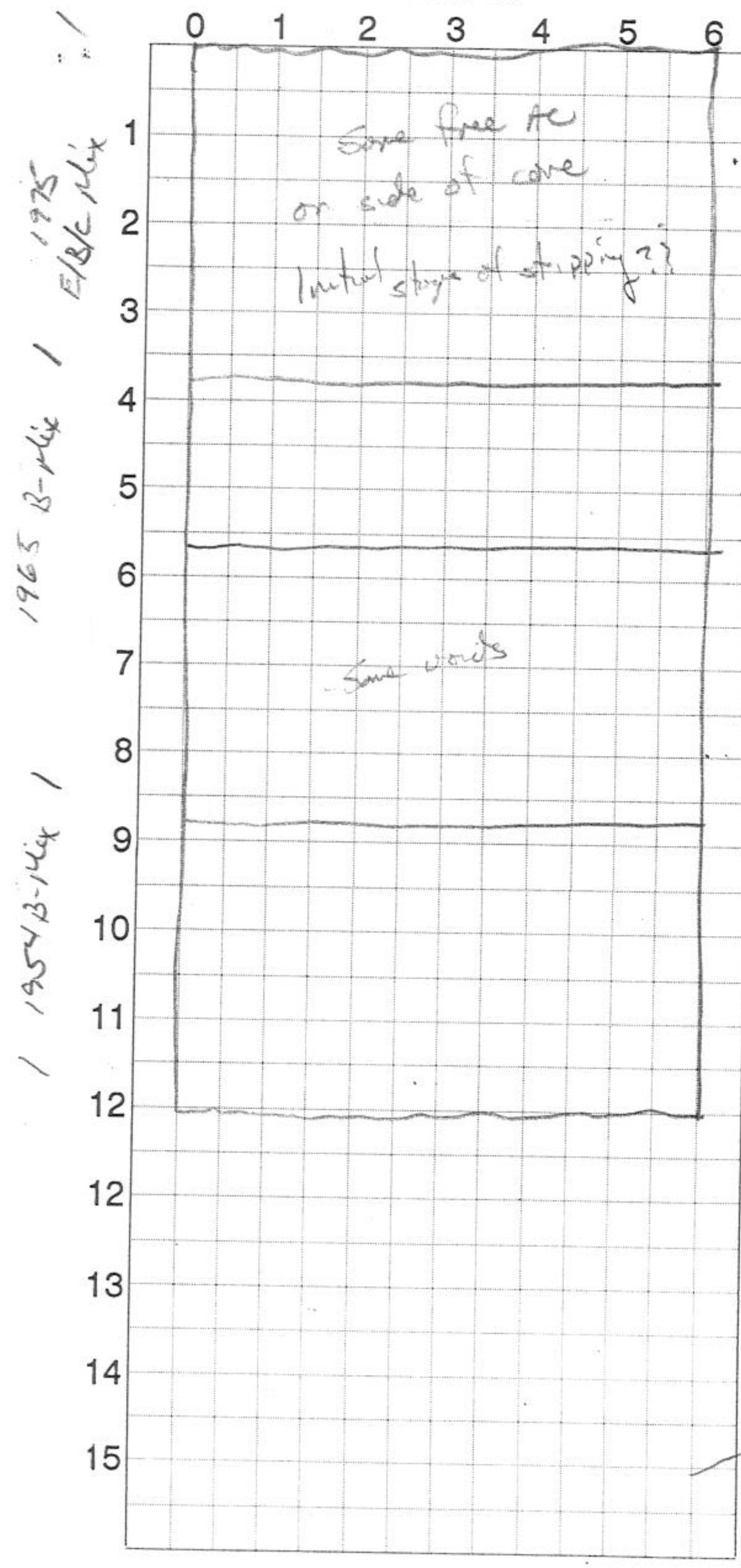
’AVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd
HIGHWAY: Pacific No. 1
MILEPOINT: 157.00 NB Rt Ln STATION:
CORE LENGTH: 12"

Saved: [✓ Yes] No
PD # 22
DATE 9-20-95
Sampler: Reavily
Designer: MR
Region: 1 2 [✓ 3] 4 5

Drilled on Crack: YES [✓ NO]
TYPE: Drilled in dual wheel rut

CORE SKETCH



TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB Other
Initial
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

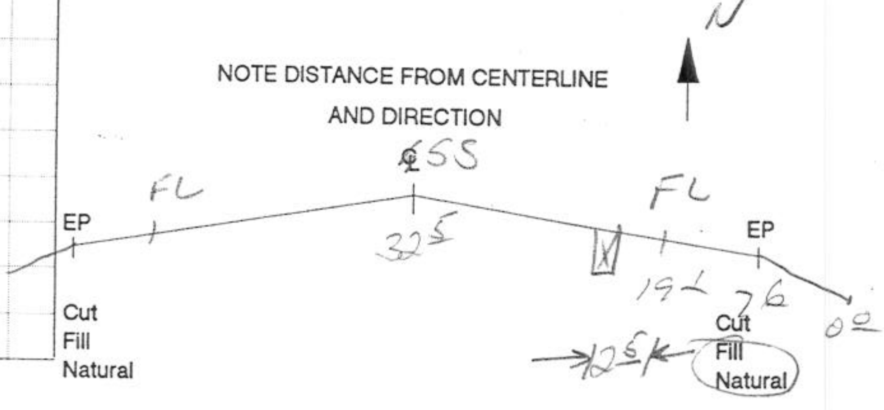
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

Cut
Fill
[✓ Natural]

'AVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd.

HIGHWAY: Pacific No. 1

MILEPOINT: 157.00 NB RT Ln STATION:

CORE LENGTH: 13"

Saved: [✓ Yes] No

PD # 23

DATE 9-20-95

Sampler: Remily

Designer: NR

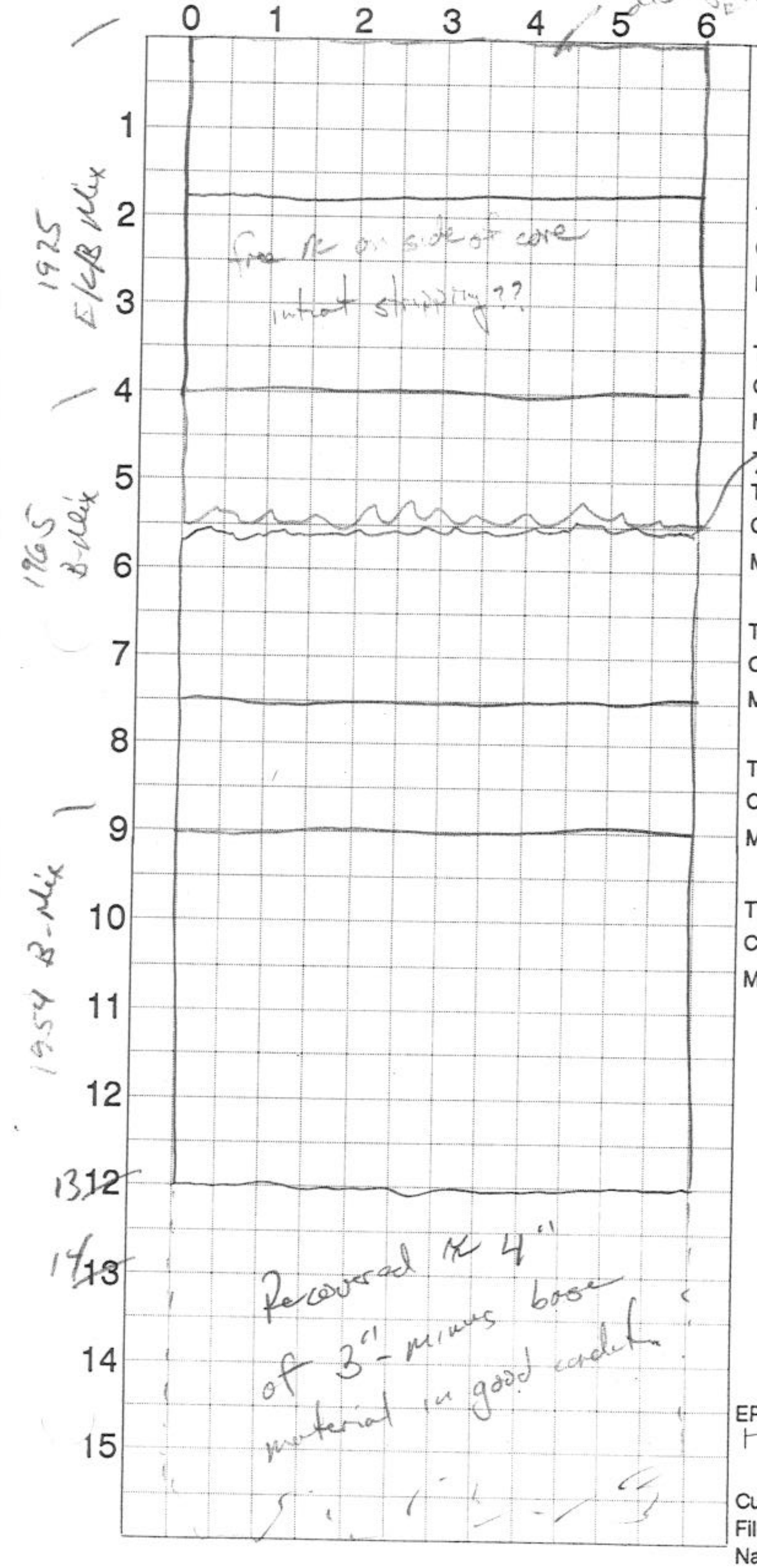
Region: 1 2 [✓ 3] 4 5

Drilled on Crack: YES [✓ NO]

TYPE: Drilled in dual wheel rut

CORE SKETCH

couldn't distinguish E-Mix



fine ~ on side of core intact stripping??

Recovered ~ 4" of 3"-minus base material in good condition

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

broke off by driller due to excess asphalt

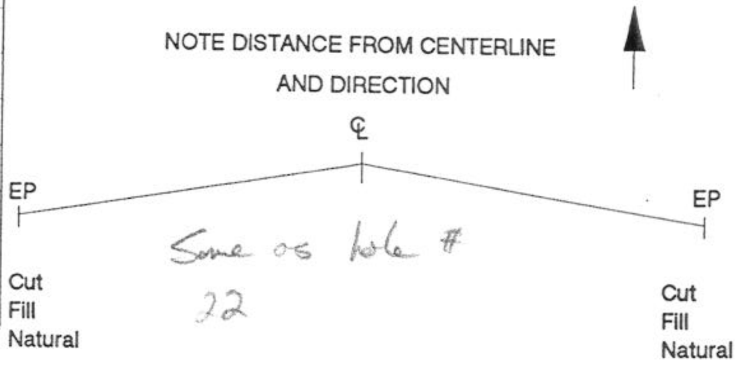
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Same as hole # 22

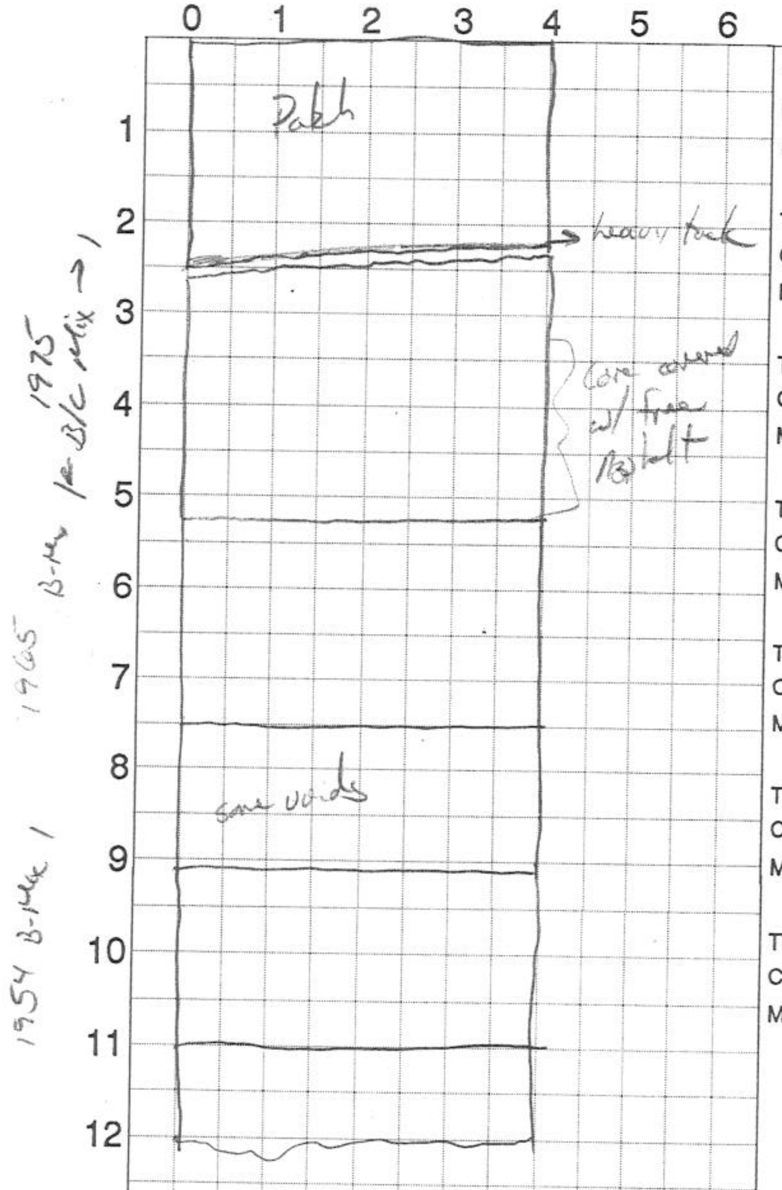
'AVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd
HIGHWAY: Pacific No. 1
MILEPOINT: 157.31 NB Rt Ln STATION:
CORE LENGTH: 12"

Saved: [✓ Yes] No
PD # 24
DATE 9-20-95
Sampler: Remily
Designer: MR
Region: 1 2 [✓ 3] 4 5

Drilled on Crack: YES [✓ NO]
TYPE: Patch w/ 2" Ruts
AC is "humped" up near FL

CORE SKETCH



TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB Other ↳ Initial stages
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

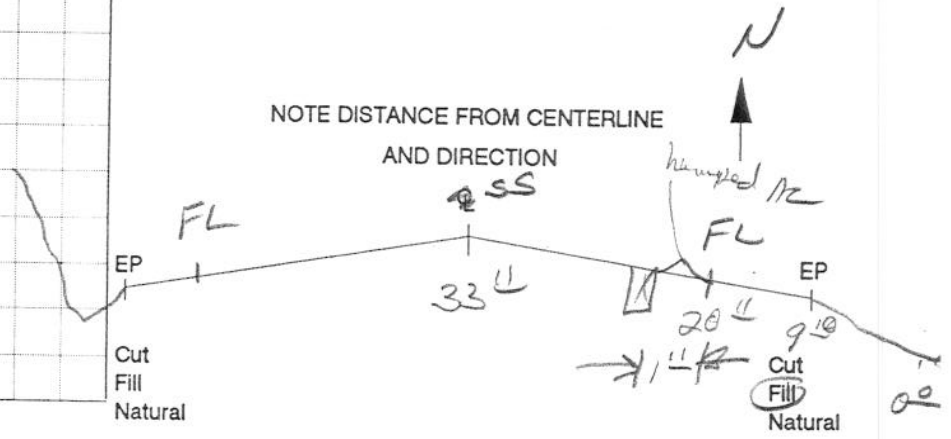
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: ~~Dense AC~~ Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



PAVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: Anlauf - Elkhead Rd

PD # 25

HIGHWAY: Pacific Hwy. 1

DATE 9-20-95

MILEPOINT: 158.19 NB Rt Ln STATION:

Sampler: Reanily

CORE LENGTH: 11.25"

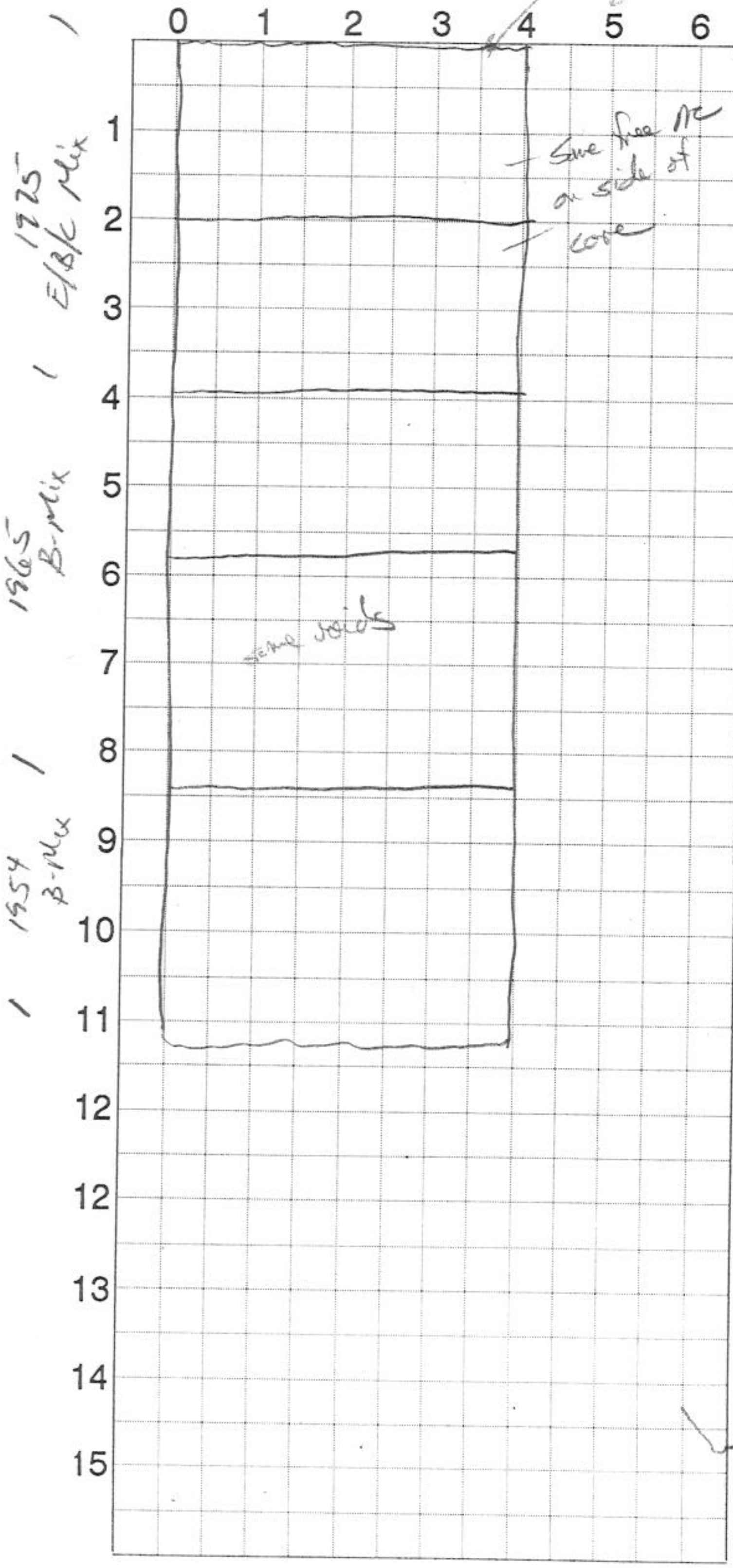
Drilled on Crack: YES [✓ NO]

Designer: MR

TYPE: Drilled in Dual wheel Rut (5/8" deep)

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

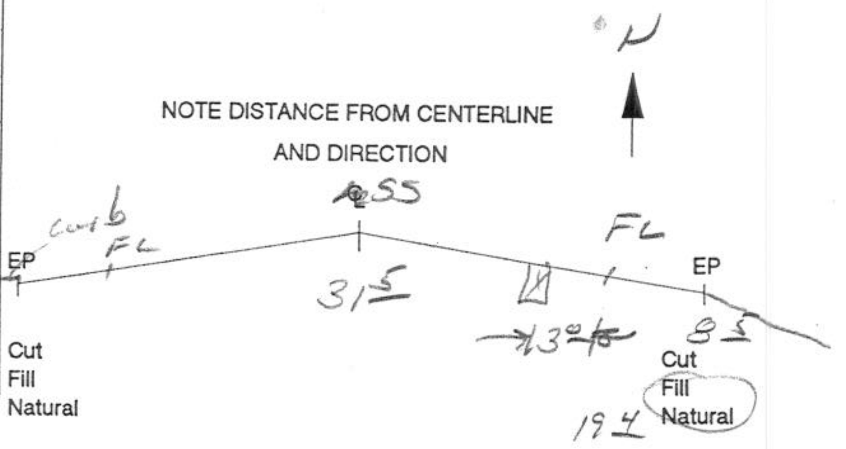
TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



ꟼAVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd.

HIGHWAY: Pacific No. 1

MILEPOINT: MP 158.19 NB RT Ln STATION:

CORE LENGTH: 11.0"

Drilled on Crack: YES NO

TYPE: Drilled between wheeltracks

Saved: Yes No

PD # 26

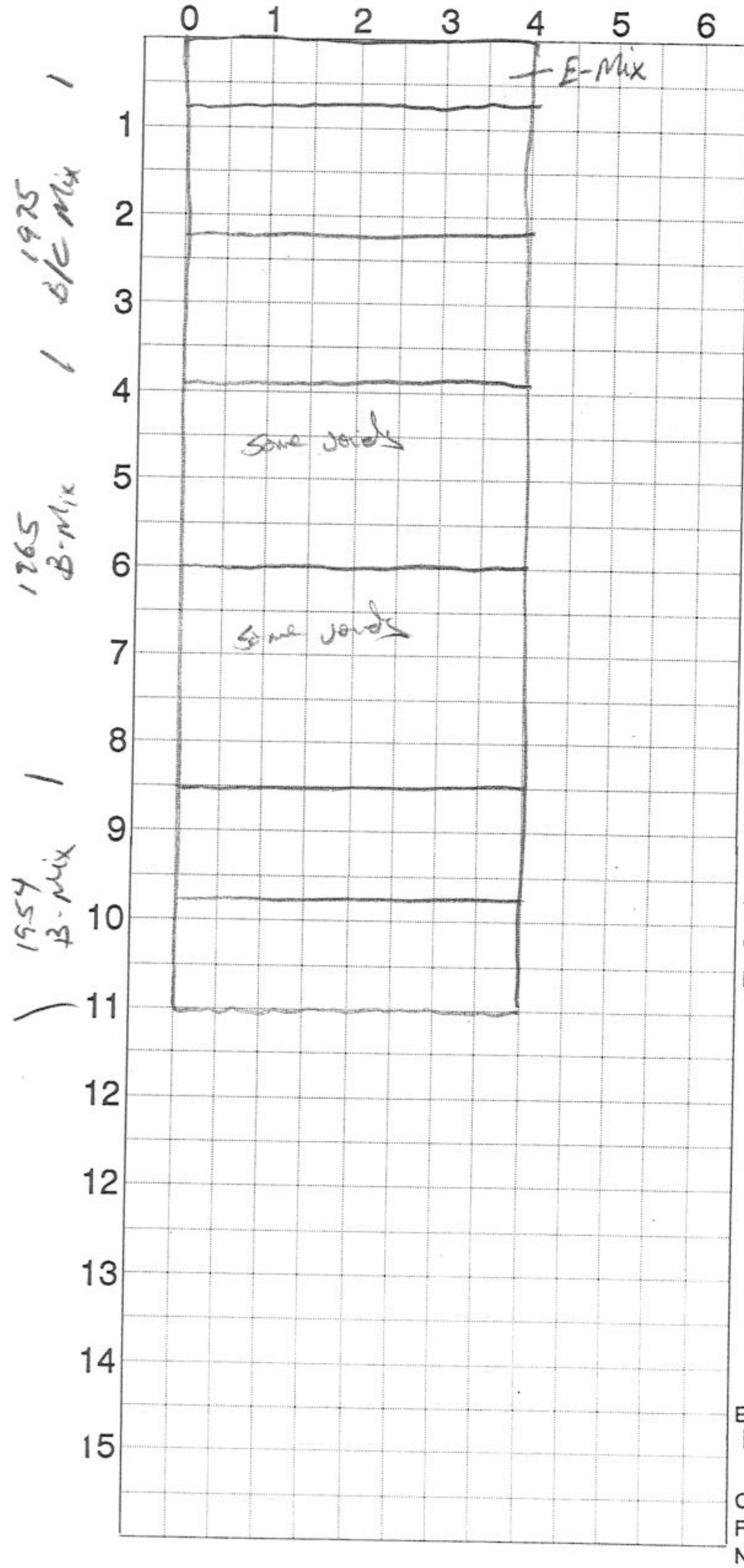
DATE 9-20-95

Sampler: Remily

Designer: WR

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: Dense AC [✓ Open AC] Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

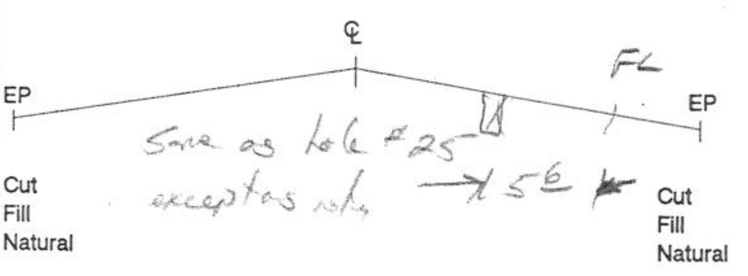
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



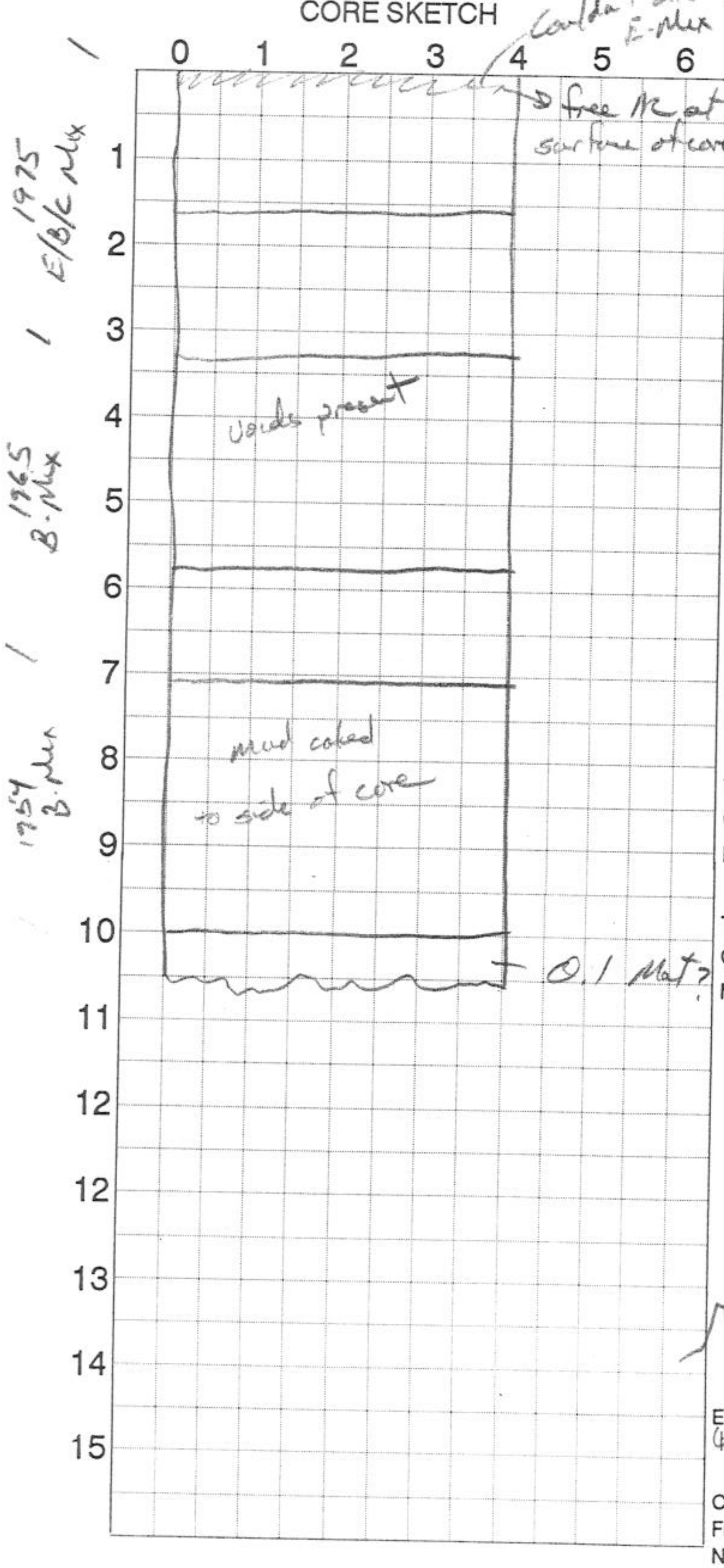
Same as hole #25 except as noted

?AVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd.
HIGHWAY: Pacific No. 1
MILEPOINT: 158.92 NB RtLn STATION:
CORE LENGTH: 10.5"
Drilled on Crack: YES [✓ NO]
TYPE:

Saved: [✓ Yes] No
PD # 27
DATE 9-20-95
Sampler: Remily
Designer: MR
Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

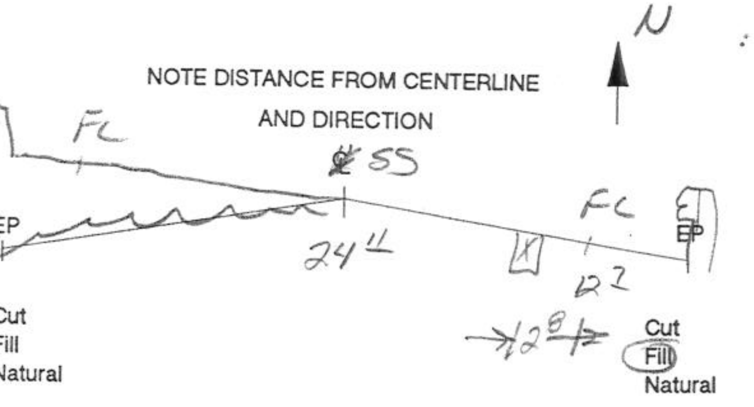
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
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Natural

Cut
[✓ Fill]
Natural

Slide
64 ft crack on S[illegible]
192 Ft S of
this MP

’AVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd

HIGHWAY: Pacific No. 1

MILEPOINT: 158.92 NB Rt Ln STATION:

CORE LENGTH: 11"

Drilled on Crack: YES [✓ NO]

TYPE: Drilled between wheelpaths

Saved: [✓ Yes] No

PD # 28

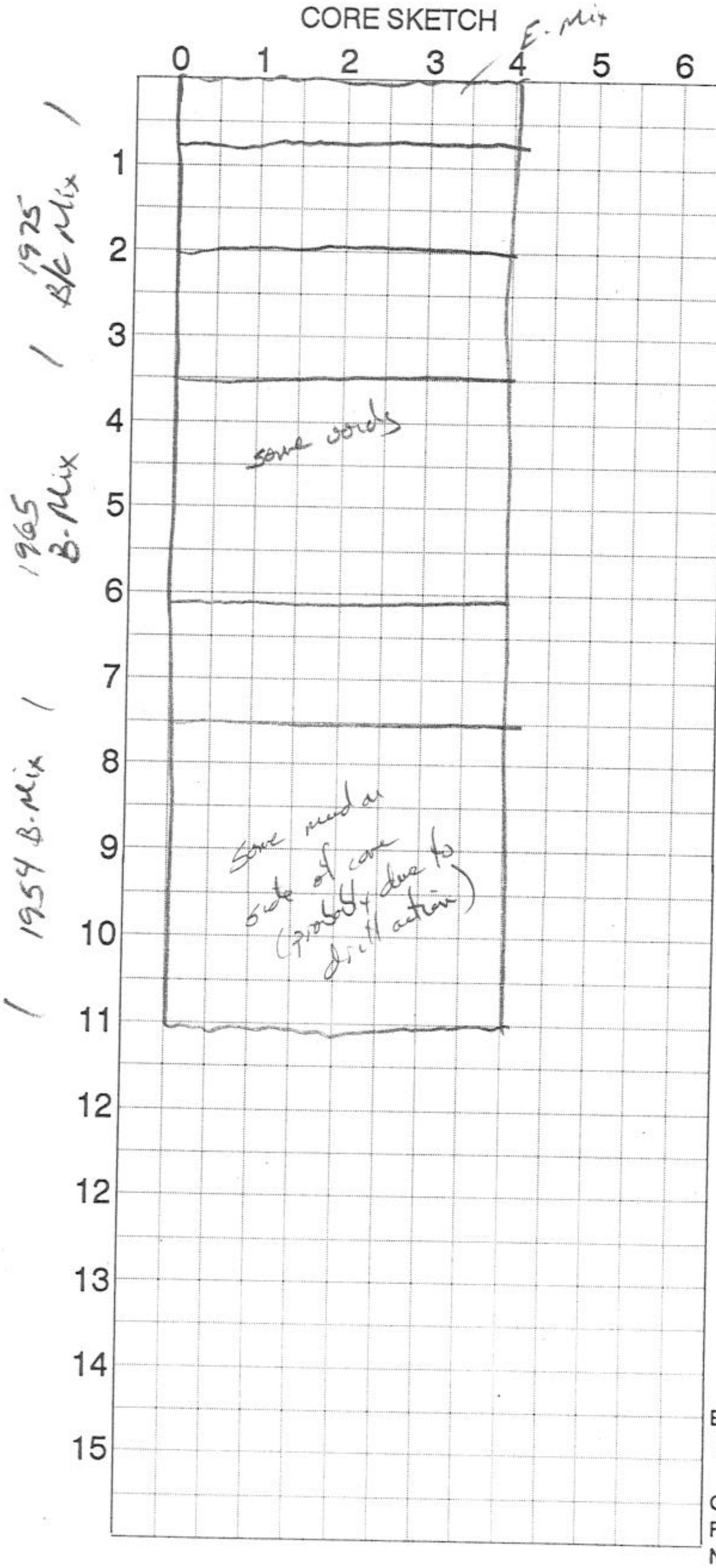
DATE 9-20-95

Sampler: Romily

Designer: MK

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: Dense AC [✓ Open AC] Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor E-Mix
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

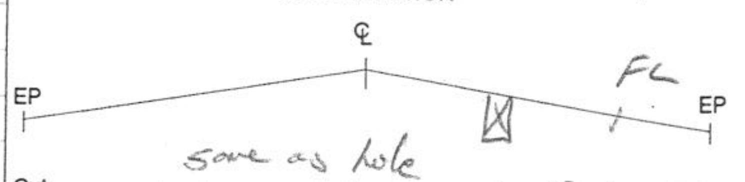
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION



Cut
Fill
Natural

same as hole #27 except as noted

Cut
Fill
Natural

’AVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: Arlout - Elkhead Rd.

PD # 29

HIGHWAY: Pacific No. 1

DATE 9-20-85

MILEPOINT: 159.43

STATION:

Sampler: Randy

CORE LENGTH: 12.5"

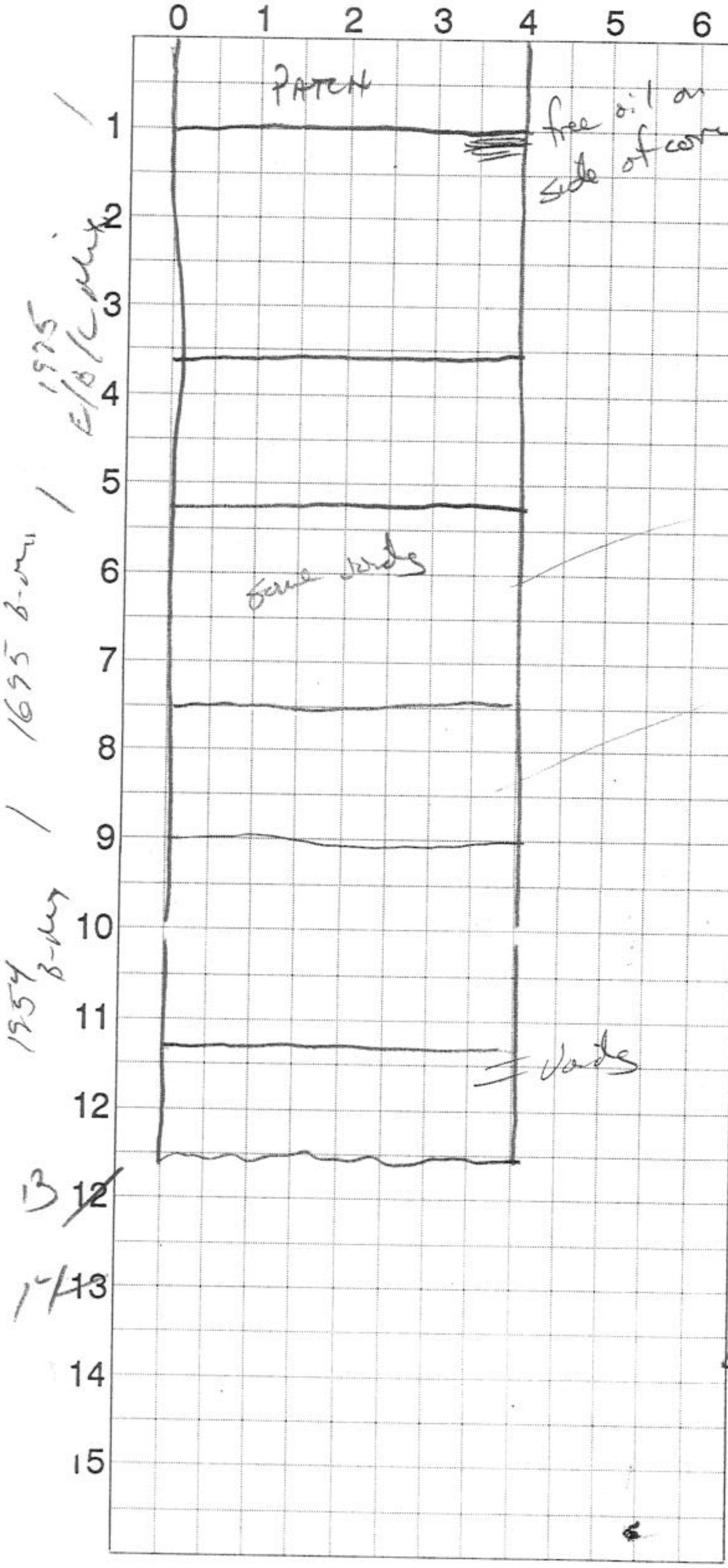
Drilled on Crack: YES [✓ NO]

Designer: MR

TYPE:

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

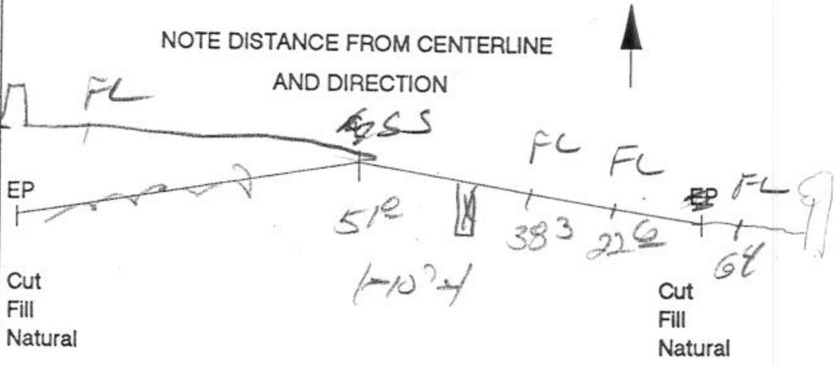
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION

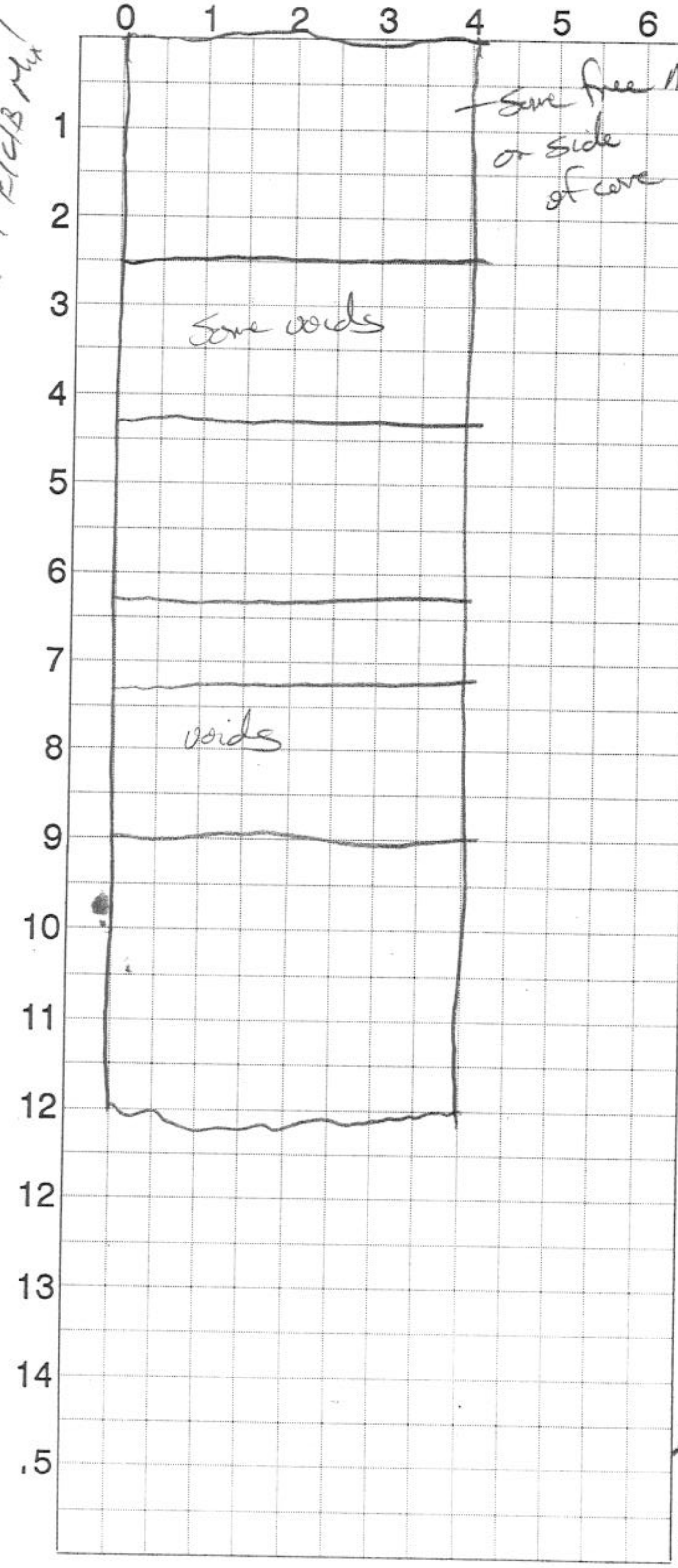


PAVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd
HIGHWAY: Pacific No. 1
MILEPOINT: 160.05 NB Rt Ln STATION:
CORE LENGTH: 12"
Drilled on Crack: YES [✓ NO]
TYPE:

Saved: [✓ Yes] No
PD # 31
DATE 9-20-53
Sampler: Remily
Designer: WR
Region: 1 2 [✓ 3] 4 5

CORE SKETCH



1925 / E/C/B Mix /
1965 B-Mix /
/
1954-

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

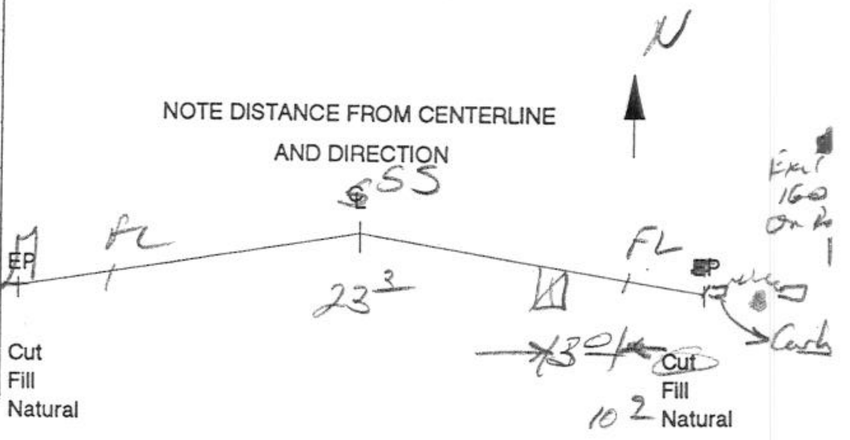
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC [✓ Open AC] Patch Stripping PCC CTB [✓ Other] Macadam
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

[✓ Cut]
Fill
Natural
10 2

PAVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd.

HIGHWAY: Pacific No 1

MILEPOINT: ~~MB~~ 161.04 NB RtLt STATION: ________

CORE LENGTH: 12.25"

Drilled on Crack: YES [✓ NO]

TYPE: Drilled Through older patch

Saved: [✓ Yes] No

PD # 32

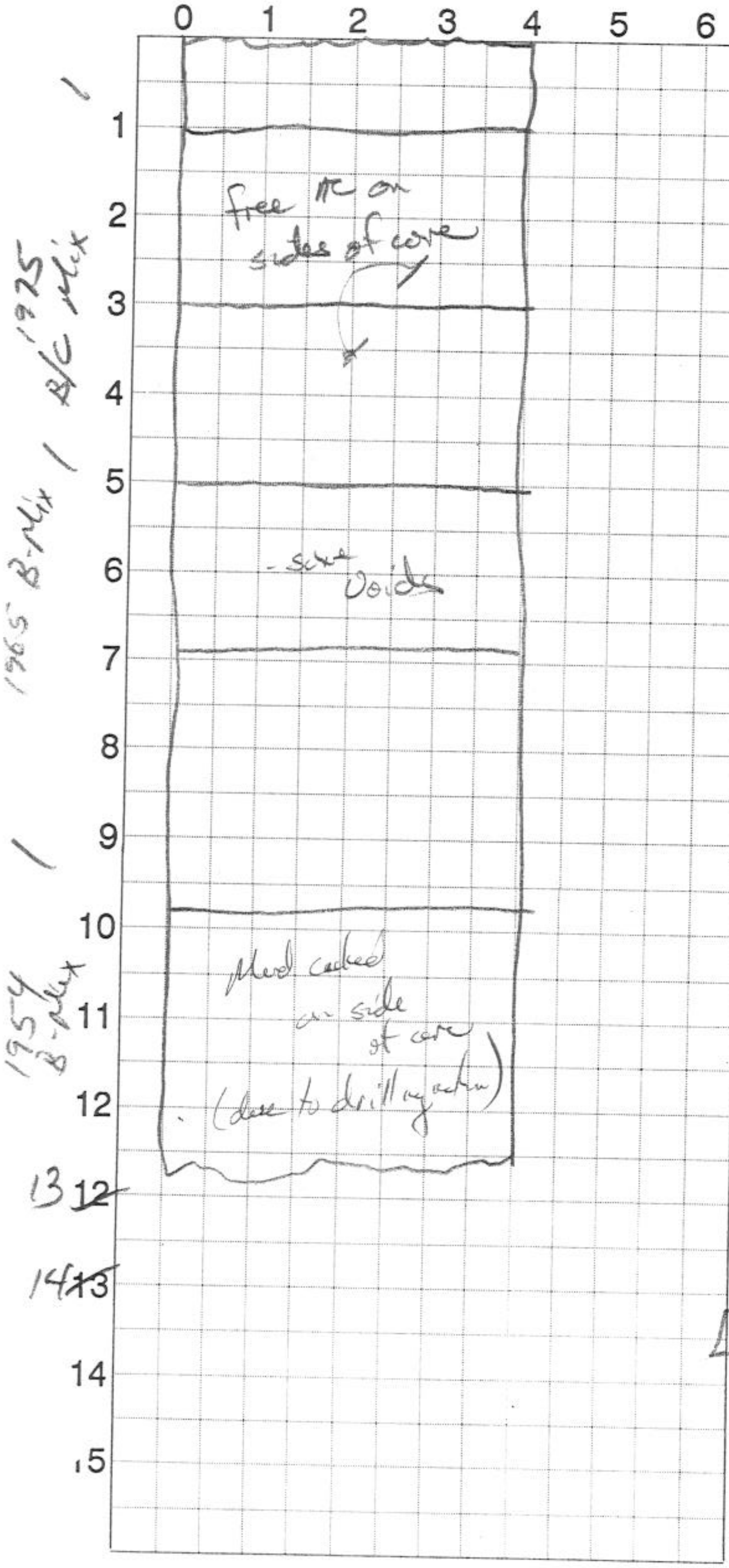
DATE 5-20-95

Sampler: Reuily

Designer: RR

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: Dense AC [✓ Open AC] [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

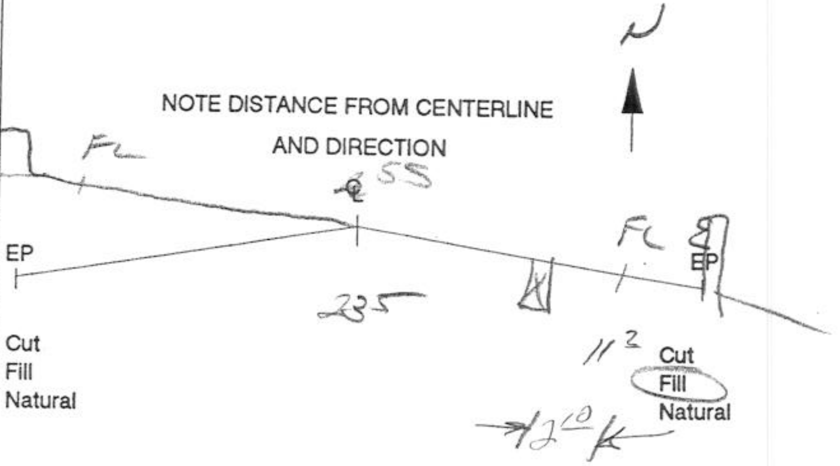
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
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Natural

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[✓ Fill]
Natural

PAVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: Anlauf - Elkhead Rd.

PD # 33

HIGHWAY: Pacific No. 1

DATE 9-20-95

MILEPOINT: 161.20 NB Rt Ln STATION:

Sampler: Rowly

CORE LENGTH: 13"

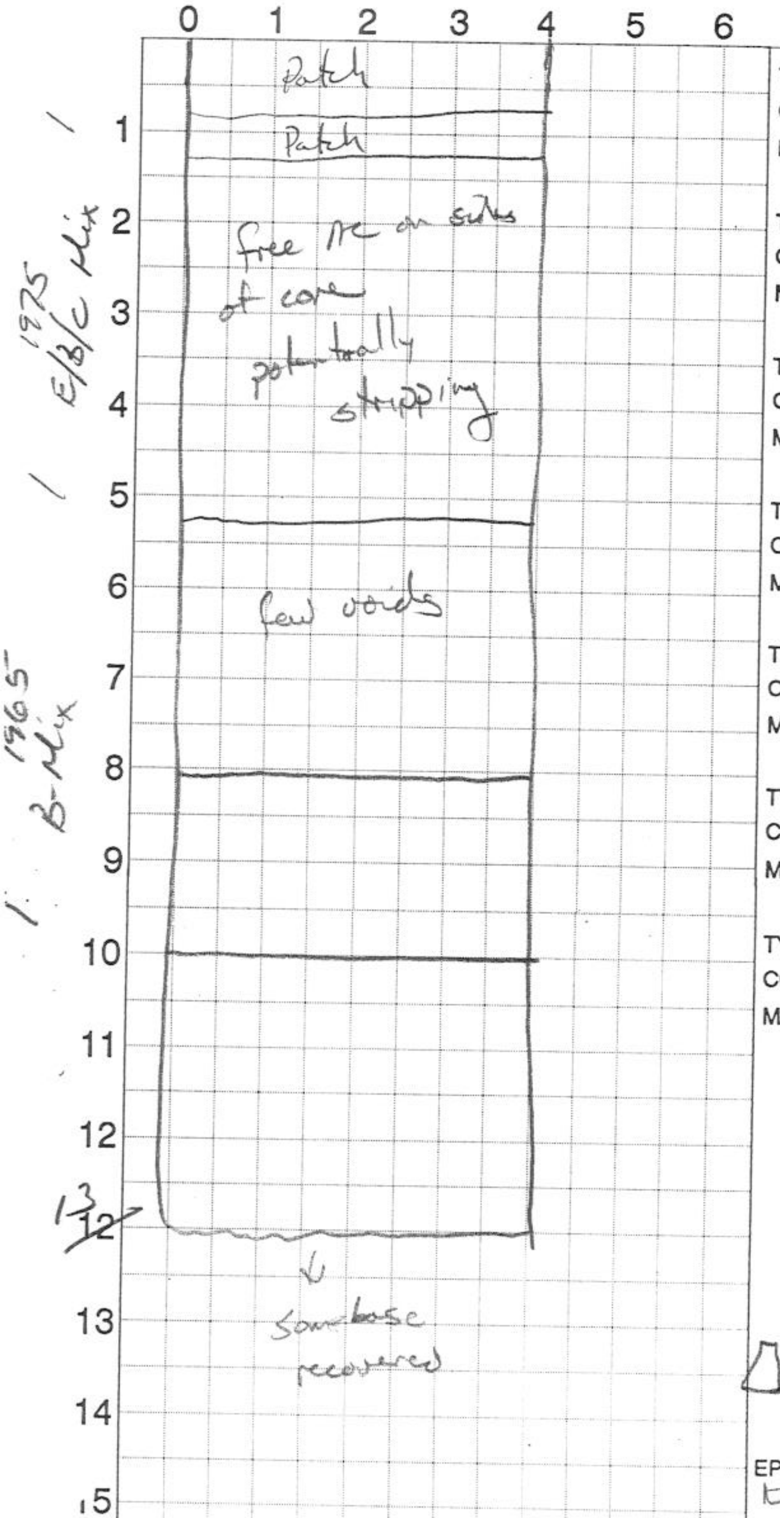
Drilled on Crack: YES [✓ NO]

Designer: MR

TYPE: Patch Older

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

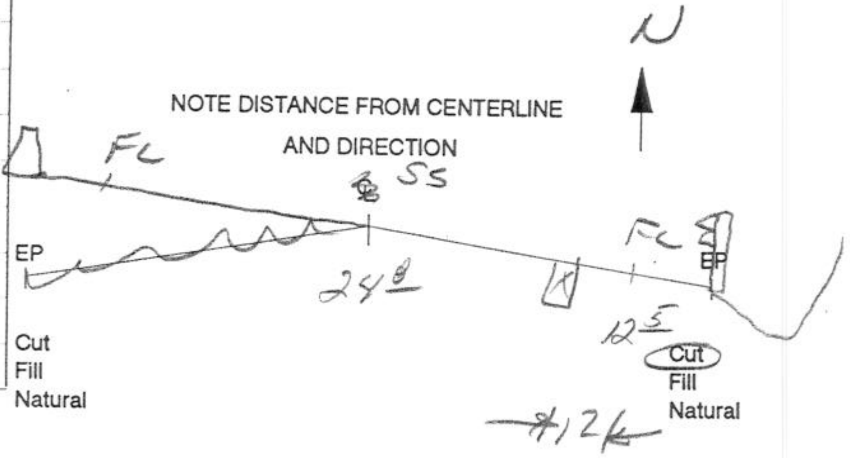
TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

[✓ Cut]
Fill
Natural

PAVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd

HIGHWAY: Pacific No 1.

MILEPOINT: 161.61 NB Rt Ln STATION:

CORE LENGTH: 14.25"

Drilled on Crack: YES [✓ NO]

TYPE: Patch - Newer

Saved: [✓ Yes] No

PD # 34

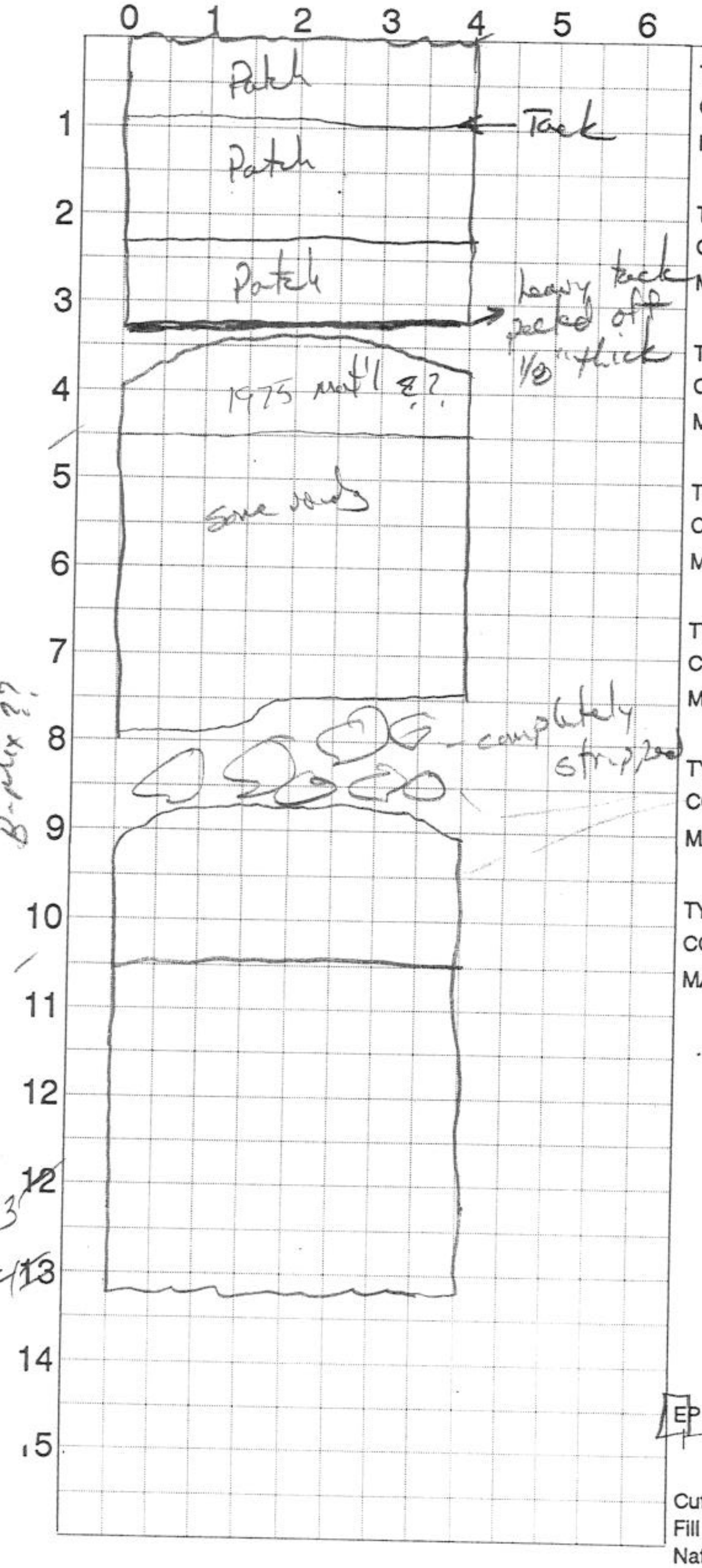
DATE 9-20-55

Sampler: Remily

Designer: MR

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor New
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

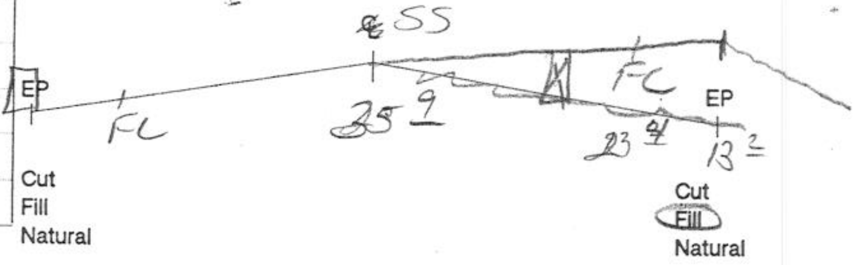
TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

Cut
[✓ Fill]
Natural

PAVEMENT DESIGN CORE LOG

PROJECT: Anlauf-Elkhead Rd

HIGHWAY: Pacific Hwy #1

MILEPOINT: 162.04± NB Rt Ln STATION:

CORE LENGTH: 11.25"

Drilled on Crack: YES [✓ NO]

TYPE: Patch @ end of bridge

Saved: [✓ Yes] No

PD # 35

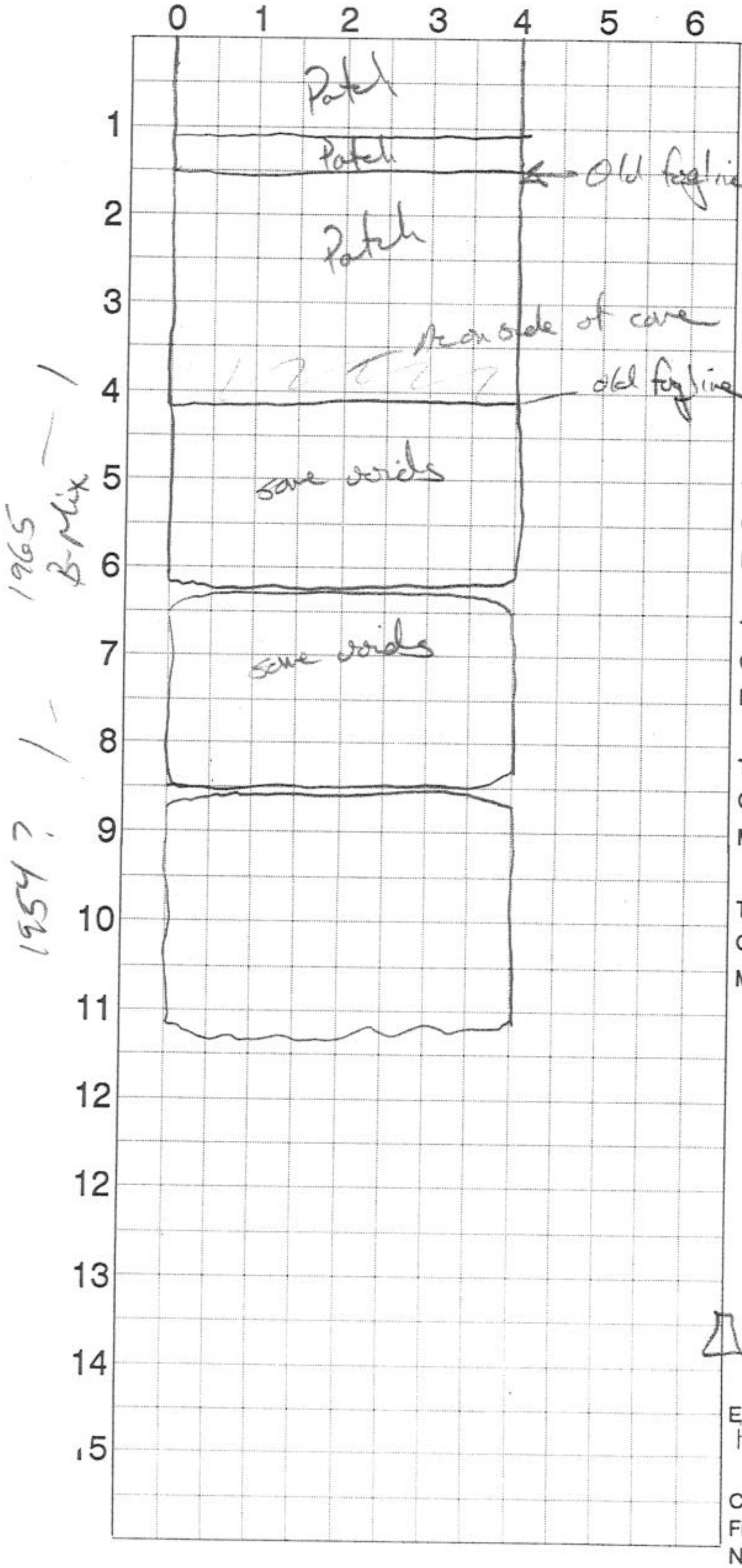
DATE 9-20-95

Sampler: Ronnie

Designer: MR

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: [✓ 1/4] 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC [✓ Patch] Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

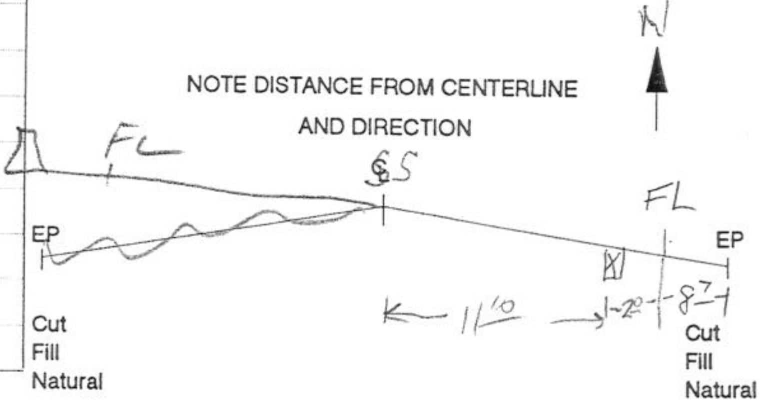
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



PAVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: Anlauf-Elkhead Rd.

PD # 36

HIGHWAY: Pacific Hwy #1

DATE 9-20-95

MILEPOINT: 162.23 23

STATION:

Sampler: WTH

CORE LENGTH: 16"

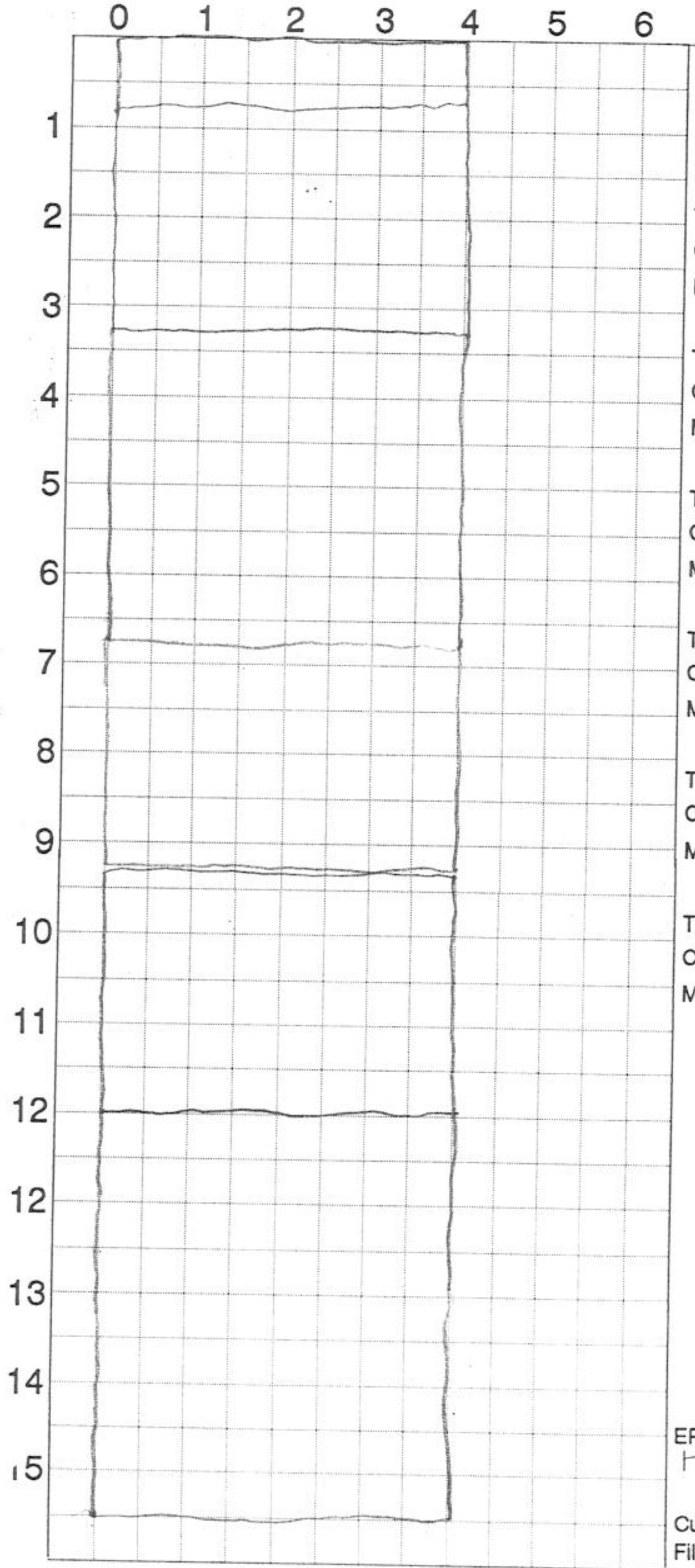
Drilled on Crack: YES NO

Designer: MRMR

TYPE: Near end of project.

Region: 1 2 3 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

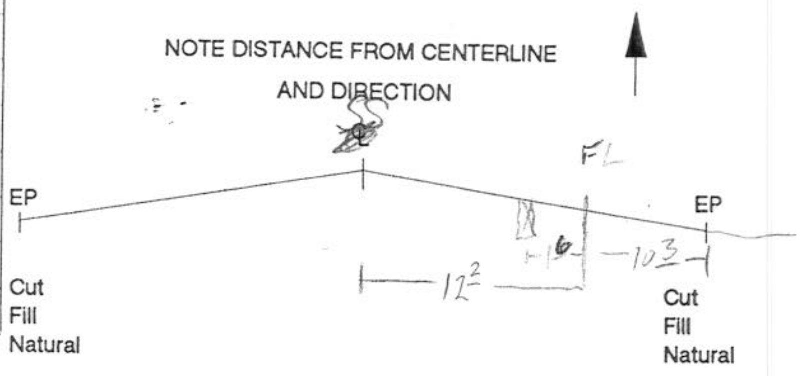
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 [✓ 1+]

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 [✓ 1+]

TYPE: Dense AC [✓ Open AC] Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 [✓ 1+]

TYPE: Dense AC [✓ Open AC] Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 [✓ 1+]

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+



NOTE DISTANCE FROM CENTERLINE AND DIRECTION

’AVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Road

HIGHWAY: Pacific No 1

MILEPOINT: EXIT 159 NB on Ramp

STATION: ~~EXIT~~ 66 ft N cntr of PCC Island

CORE LENGTH:

Drilled on Crack: YES [✓ NO]

TYPE:

Saved: Yes [✓ No]

PD # 30

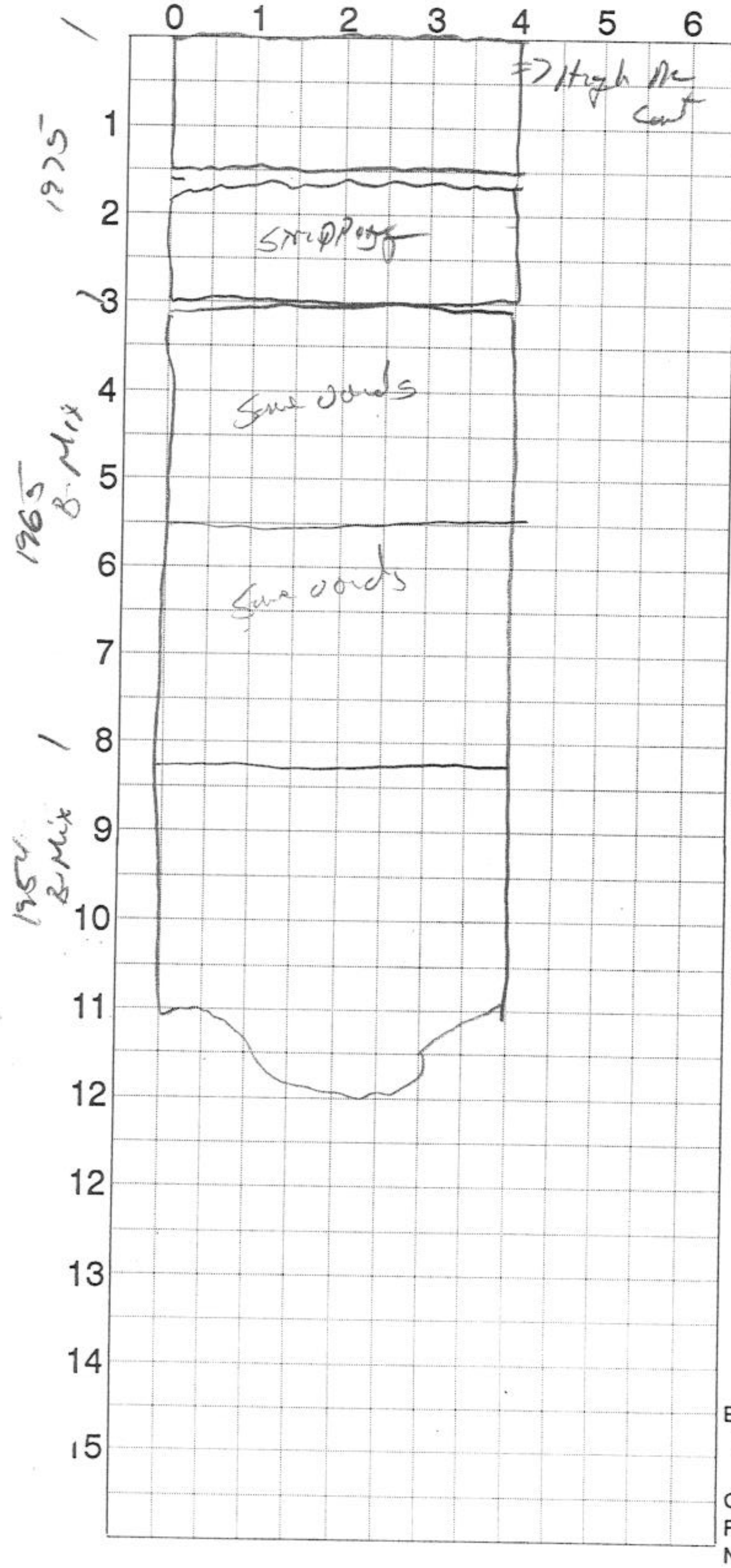
DATE 9-20-95

Sampler: Remily

Designer: MR

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: Dense AC [✓ Open AC] Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 [✓ 3/8] 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair [✓ Poor]
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

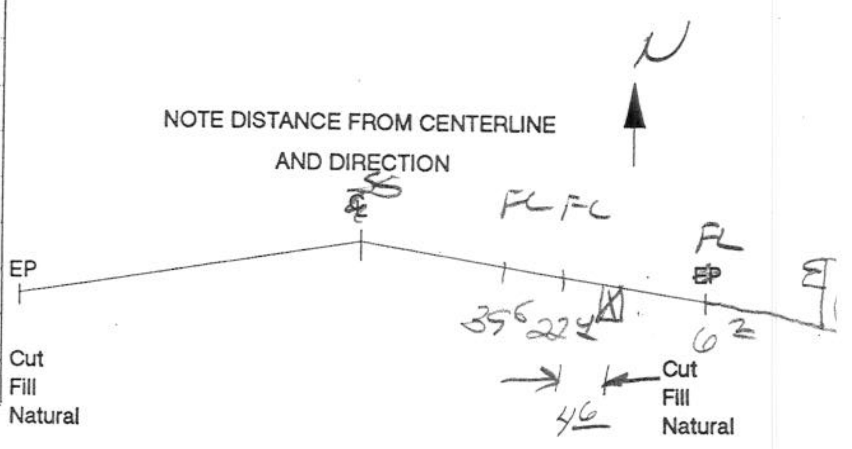
TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



'AVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd

HIGHWAY: Pacific #1

MILEPOINT: Exit 159 · NB Off Ramp

STATION: 145' N of tip of Cone Island

CORE LENGTH: 7.5"

Drilled on Crack: [✓ YES] NO

TYPE: longitudinal

Saved: Yes [✓ No]

PD # 31

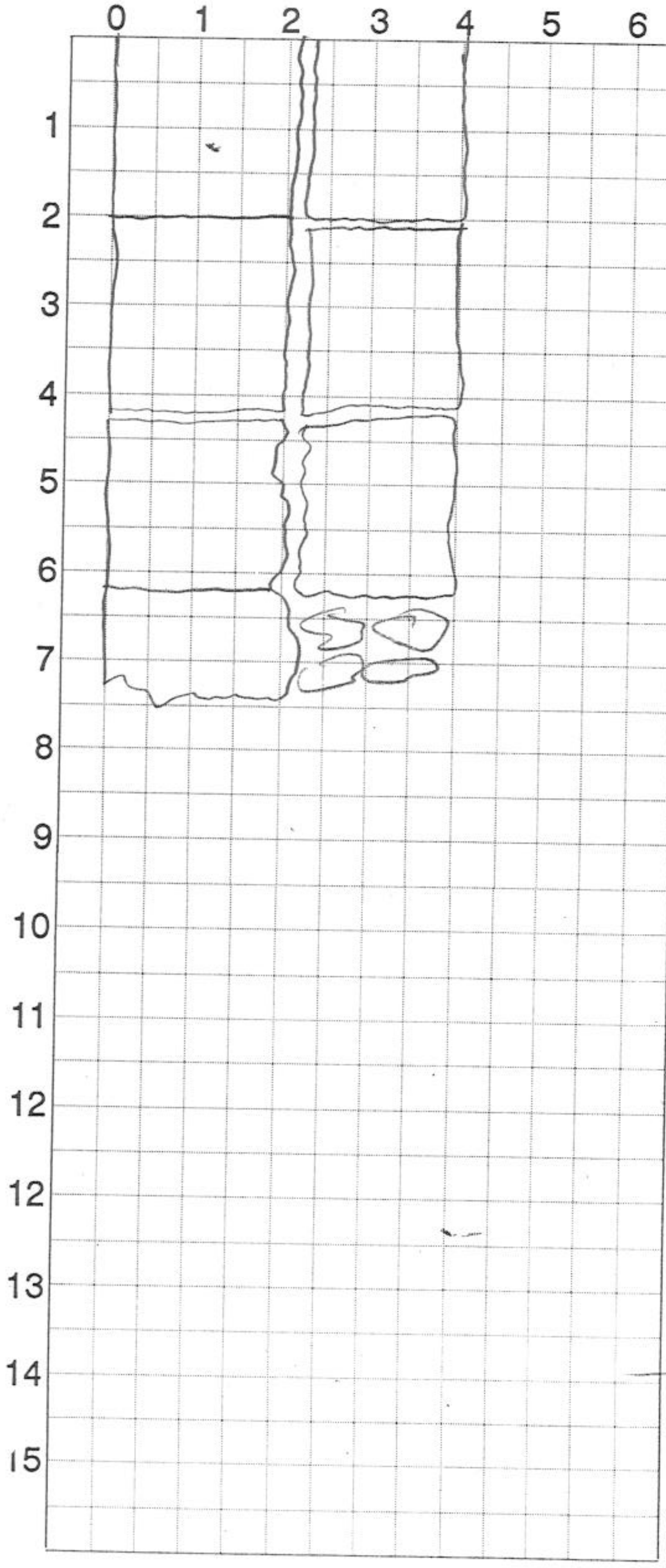
DATE 9.20.95

Sampler: Remly

Designer: MR

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

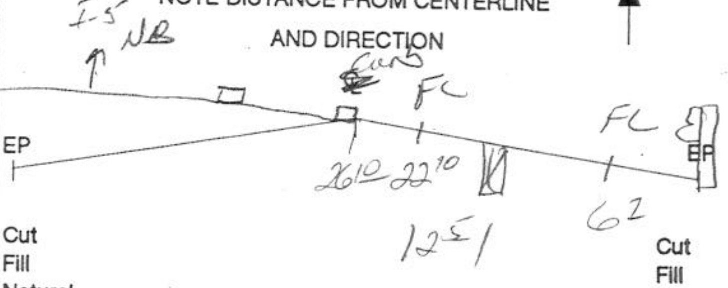
TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

Cut
Fill
Natural

PAVEMENT CORE LOG

Saved: Yes No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD #

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 157.2

Logged By: CRAIGH MICHAEL

ERIC TRAVIS

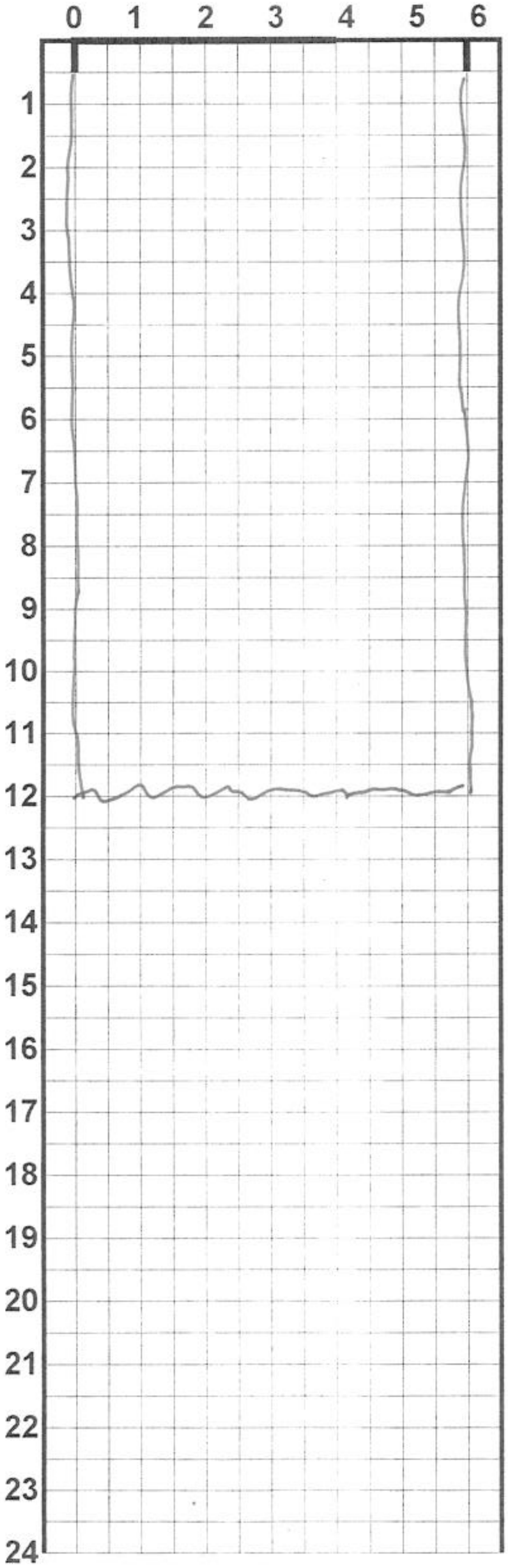
LOCATION: #9

CORE LENGTH: 12 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 15 & 16

↑

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

EP EP

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # ·

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 157.2

Logged By: CRAIGH MICHAEL
ERIC TRAVIS

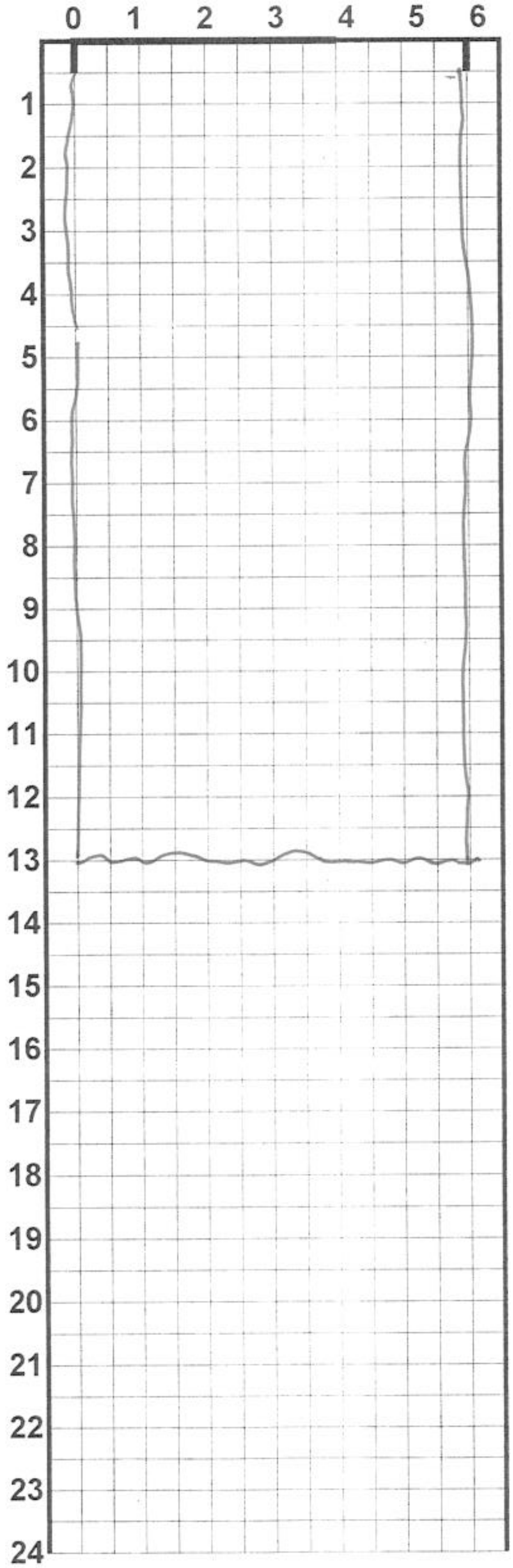
LOCATION: #10

CORE LENGTH: 13 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 19&20

⬆

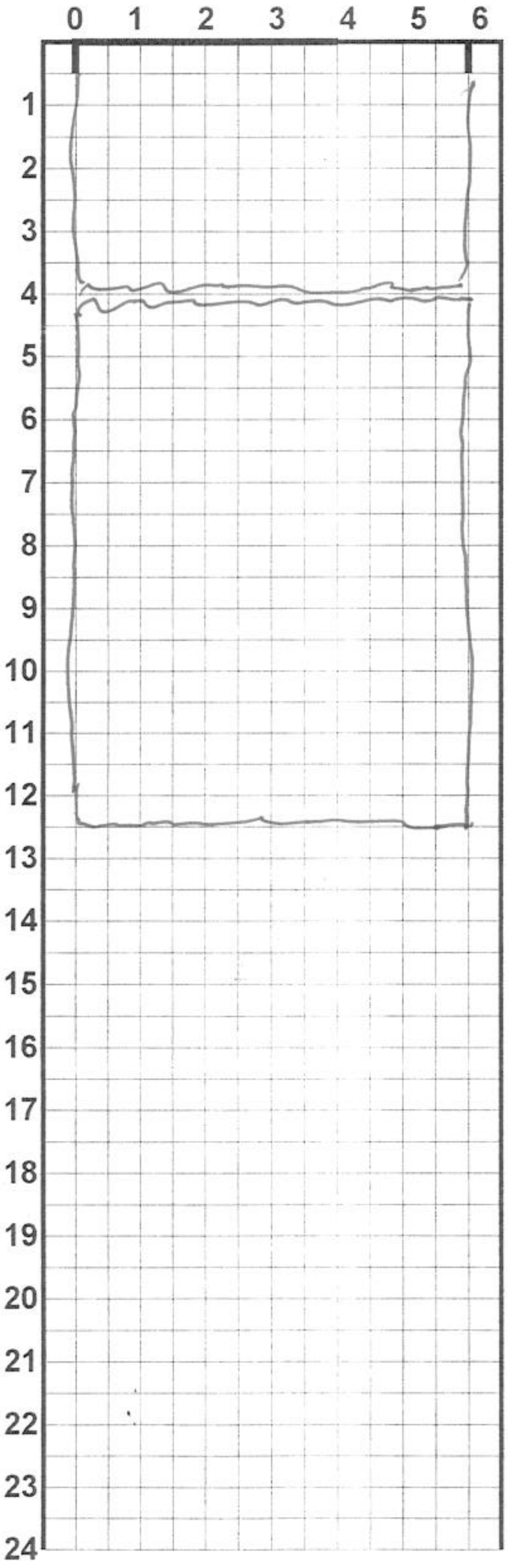
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

EP EP

PAVEMENT CORE LOG

Saved: Yes No

PROJECT: I-5 ANLAUF/RESEARCH CORES
PD #
HIGHWAY: PACIFIC HWY NO 1
Date: 10/16/06
MILEPOINT: 157.2
Logged By: CRAIGH MICHAEL
ERIC TRAVIS
LOCATION: #11
CORE LENGTH: inches
Designer: TODD SCHOLZ
EA # 07RF0632/000/J13
KEY #



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

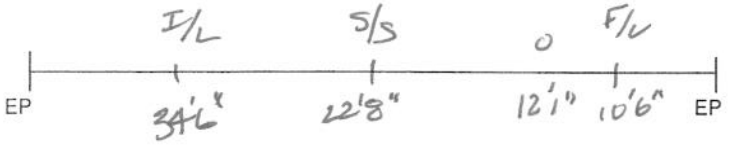
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 7&8

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD #

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 157.2

Logged By: CRAIGH MICHAEL
ERIC TRAVIS

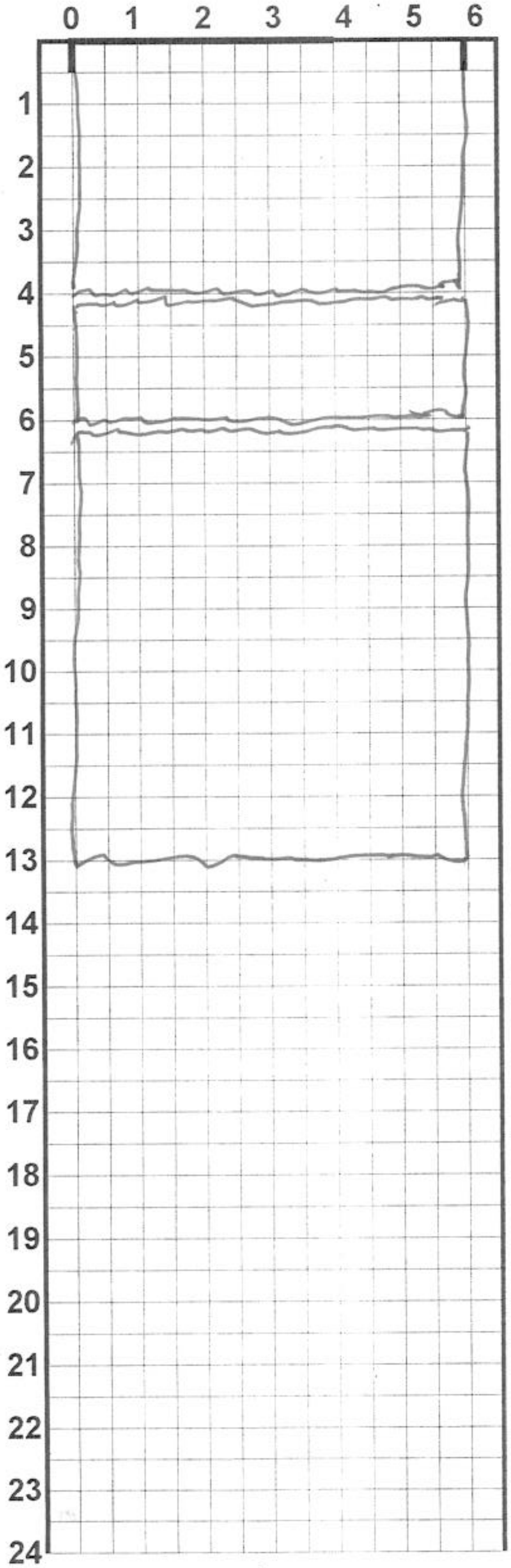
LOCATION: #12

CORE LENGTH: 13 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] ~~YES~~

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 11 & 12

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

EP EP

PAVEMENT CORE LOG

Saved: Yes No

PROJECT: I-5 ANLAUF/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 157.2

LOCATION: #2 SB RL OWT

CORE LENGTH: 11.5 inches

PD # 14

Date: 10/16/06

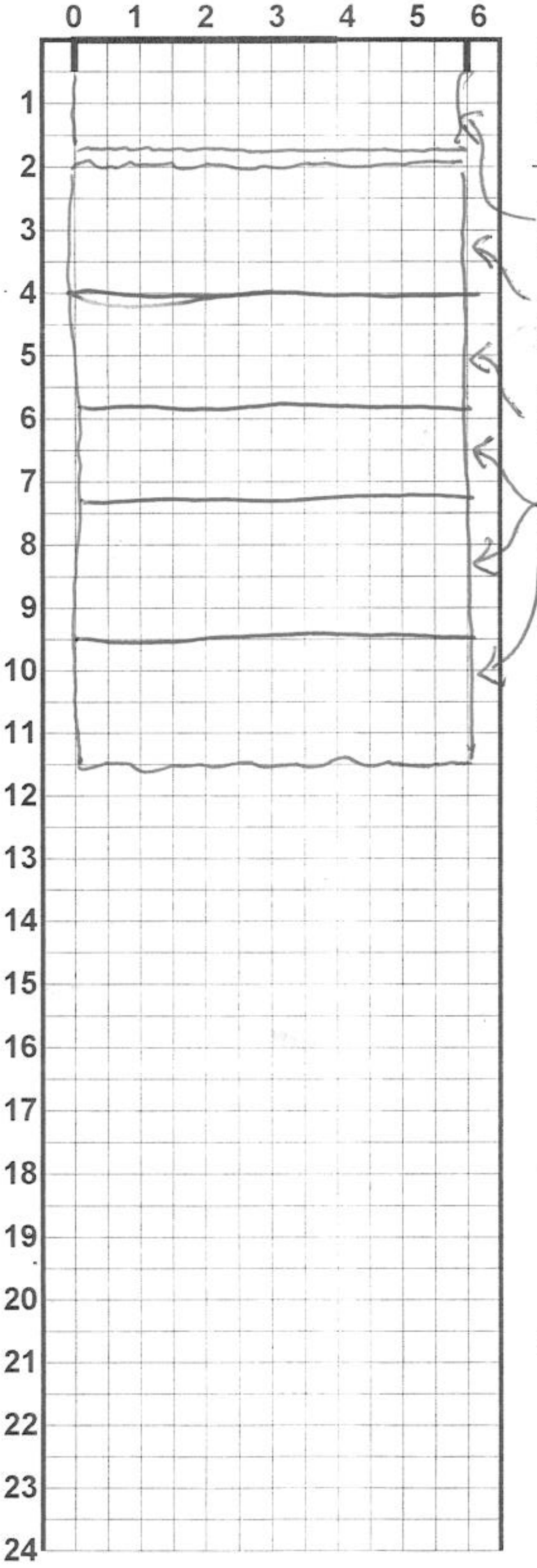
Logged By: CRAIGH MICHAEL

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] [✓ ~~Open AC~~] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

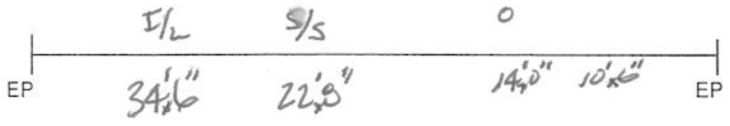
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 3&4

ODOT Photo # 14

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PD # 15

Date: 10/16/06

Logged By: CRAIGH MICHAEL

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #

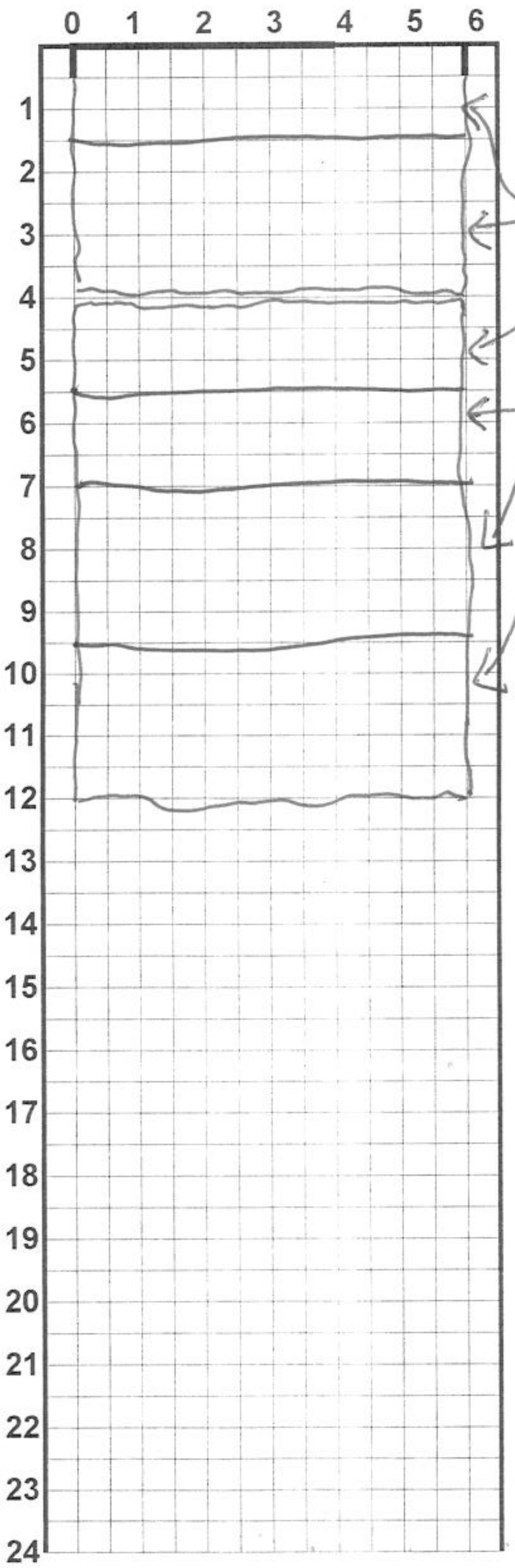
PROJECT: I-5 ANLAUF/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 157.2

LOCATION: #3 SB RL OWT

CORE LENGTH: 12 inches



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

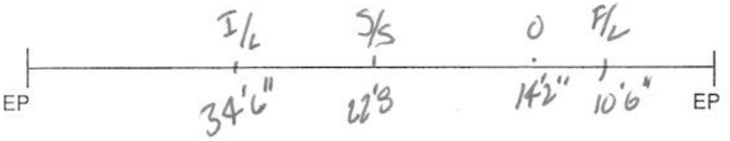
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 5&6

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 16

HIGHWAY: PACIFIC HWY NO 1

Date:

MILEPOINT: 157.2

Logged By: CRAIGH MICHAEL

LOCATION: #4 SB RL OWT

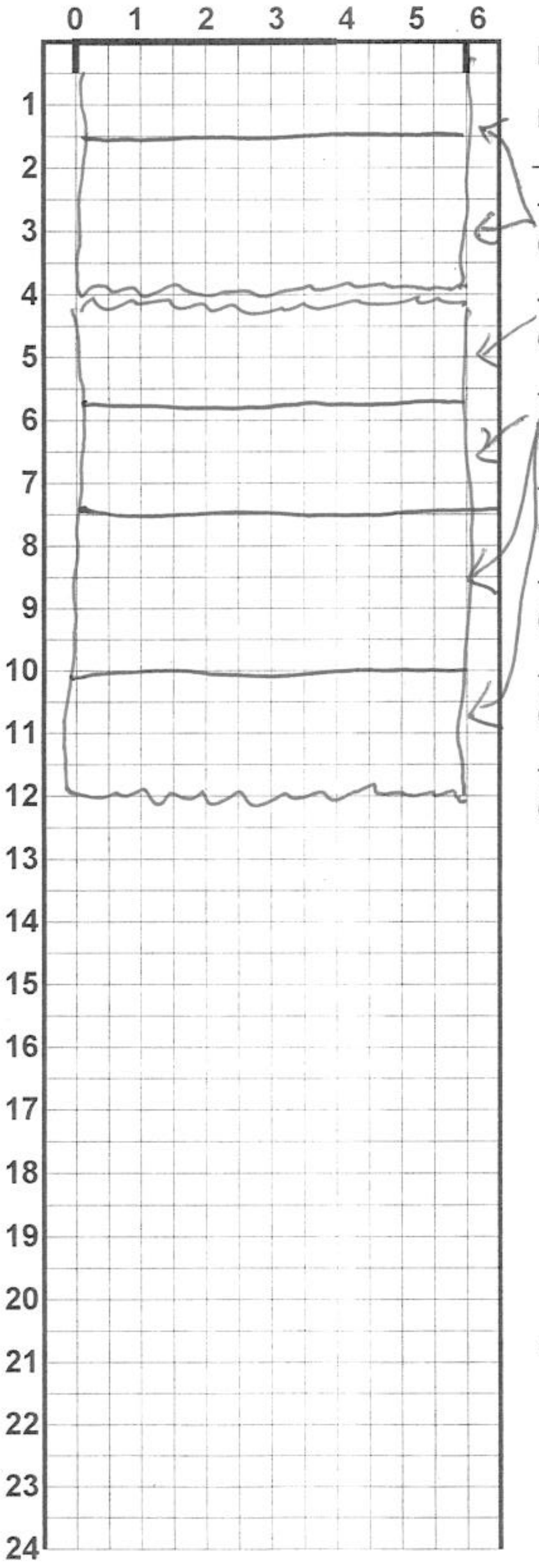
ERIC TRAVIS

CORE LENGTH: 12 inches

Designer: **TODD SCHOLZ**

EA # **07RF0632/000/J13**

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

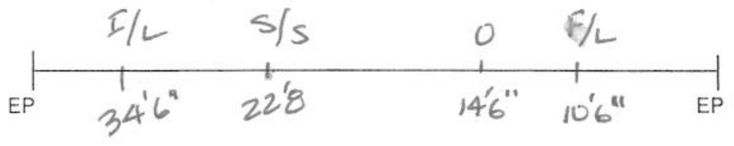
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 9 & 10

Was intact until tech drilled into top of core to remove it from the pavement... this caused the delamination.

ODOT Photo # 16

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 18

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 157.2

Logged By: CRAIGH MICHAEL

ERIC TRAVIS

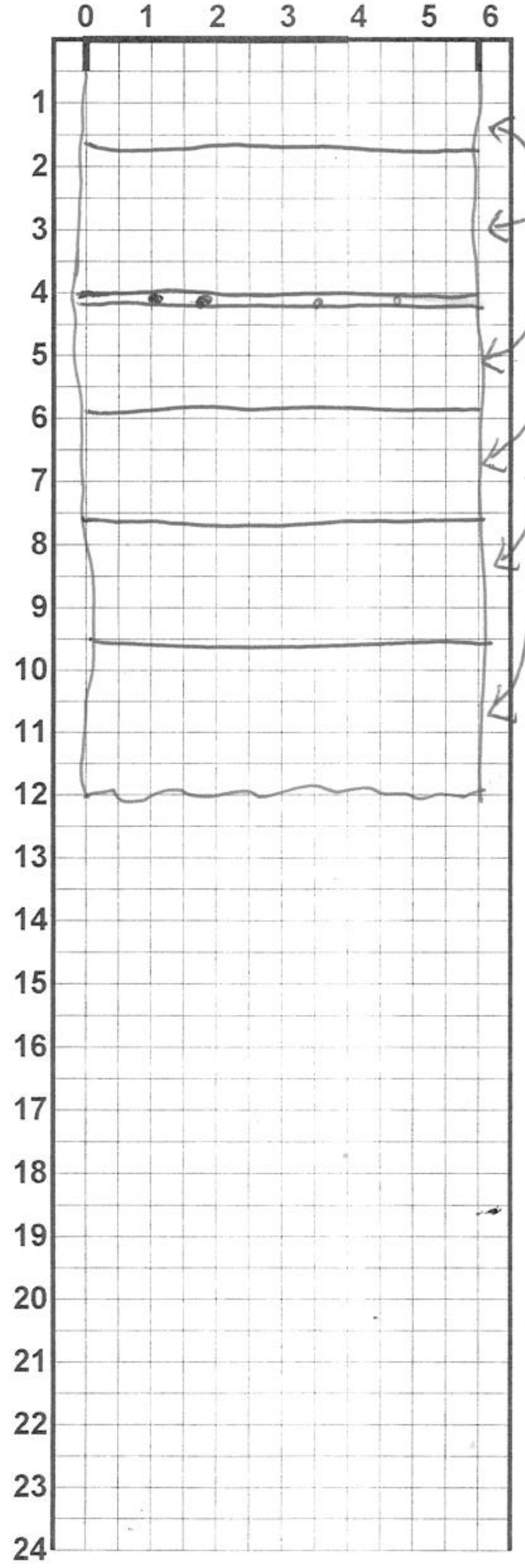
LOCATION: #6 SB RL OWT

CORE LENGTH: 12 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

§ Photos 17 & 18

ODOT Photo #18

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

EP EP

no info

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 19

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 157.2

Logged By: CRAIGH MICHAEL

LOCATION: #7 SB RL OWT

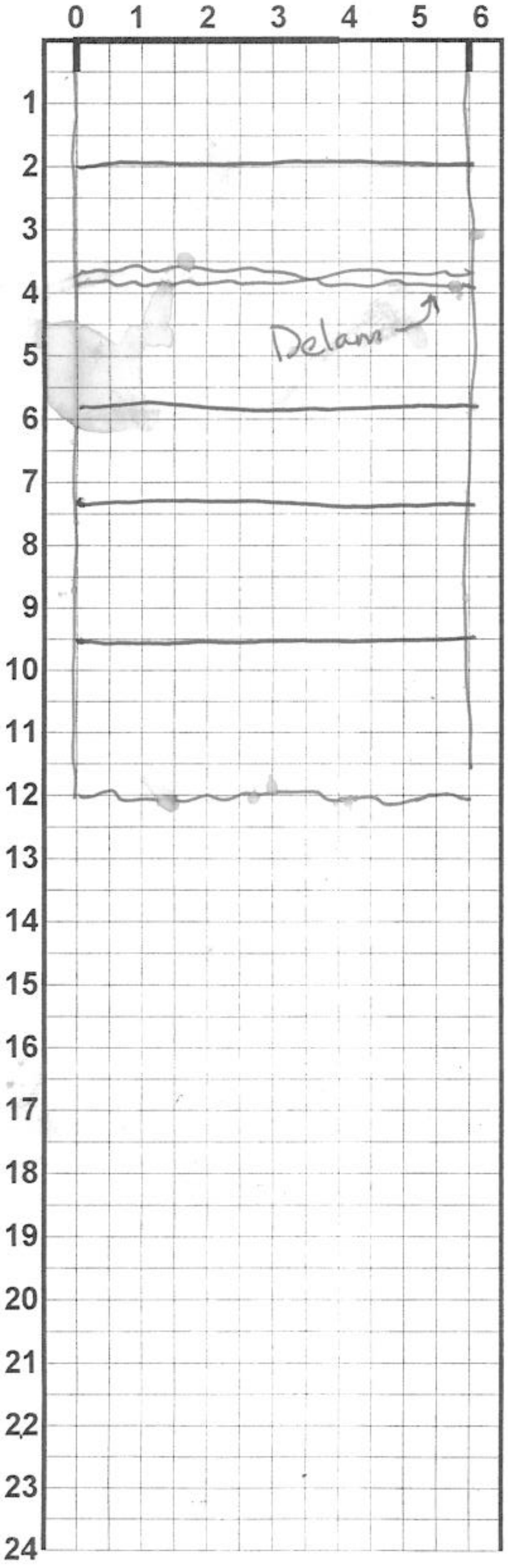
ERIC TRAVIS

CORE LENGTH: 12 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 23 & 24

ODOT Photo #19

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

EP EP

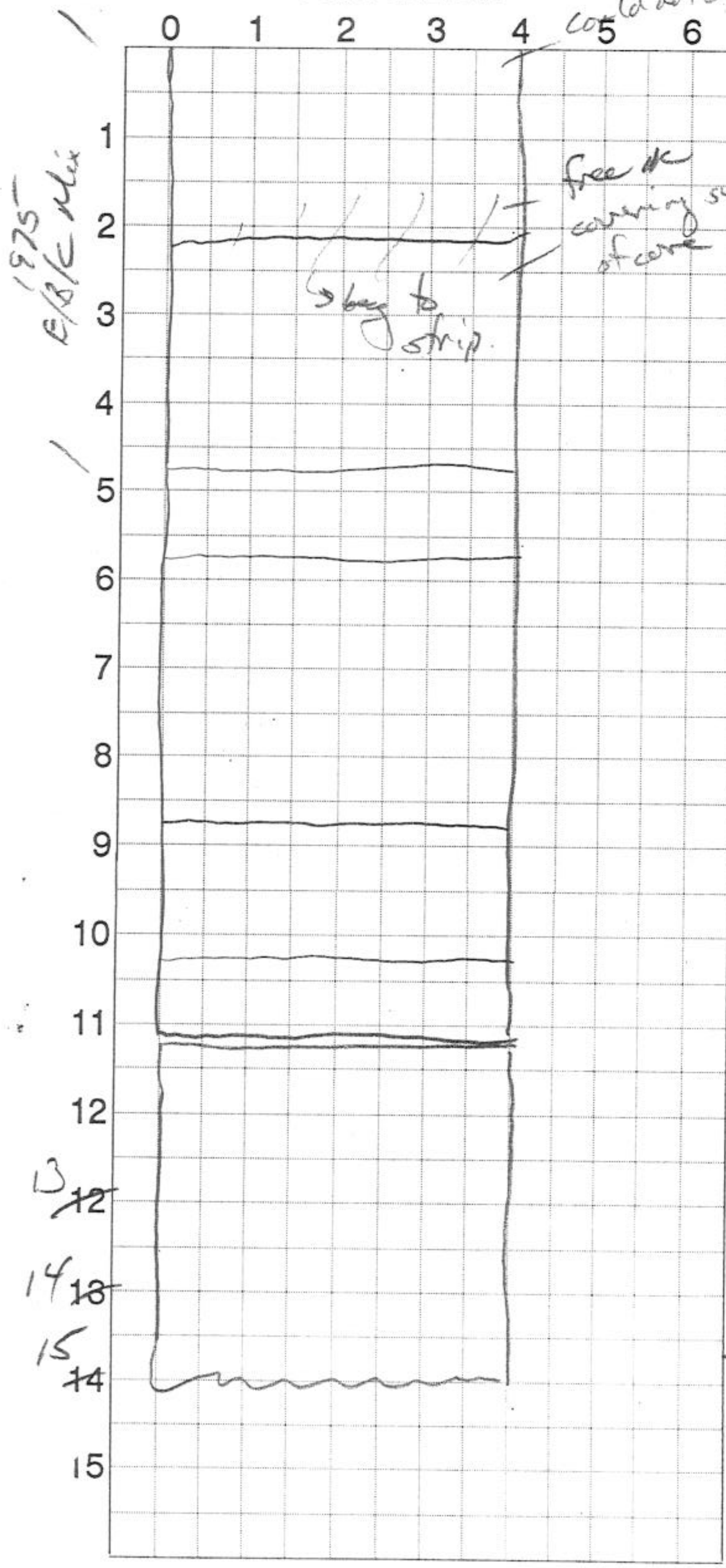
PAVEMENT DESIGN CORE LOG

PROJECT: Anlauf - Elkhead Rd
HIGHWAY: Pacific No. 1
MILEPOINT: 155.04 SB Rt Ln STATION:
CORE LENGTH: 15"
Drilled on Crack: YES [✓ NO]
TYPE: BWT

Saved: [✓ Yes] No
PD # 18
DATE 9-19-95
Sampler: Bowly
Designer: MR
Region: 1 2 [✓ 3] 4 5

CORE SKETCH

could not distinguish E-Mix



1975 E/B/C Mix

free AC coming side of core

beg to strip

TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+
initial stages

TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+
initial stages

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

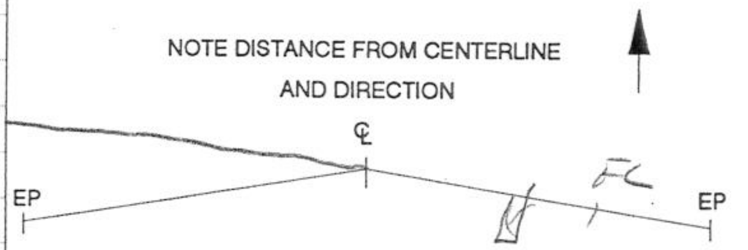
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: [✓ Good] Fair Poor
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

NOTE DISTANCE FROM CENTERLINE
AND DIRECTION



Cut
Fill
Natural

Same as PD 17 154 ←
except as noted

Cut
Fill
Natural

·PAVEMENT DESIGN CORE LOG

Saved: [✓ Yes] No

PROJECT: Anlauf - Elkhead Rd. Intch

PD # 9

HIGHWAY: Pacif. Hwy # 1

DATE 9-19-95

MILEPOINT: 158.83 SB Rt Ln STATION:

Sampler: wsH

CORE LENGTH: 14"

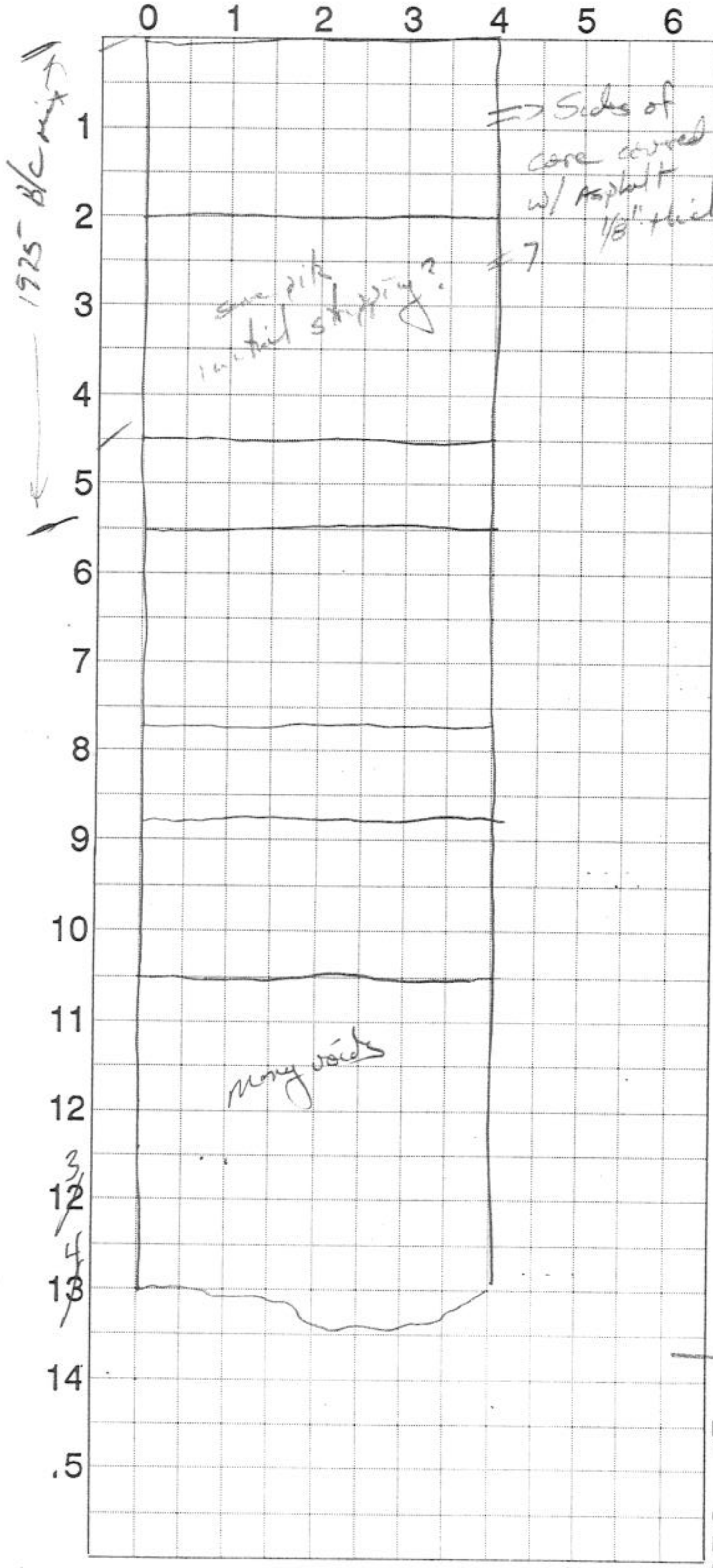
Drilled on Crack: YES [✓ NO]

Designer: MR MR.

TYPE: Drilled on patch where Maint ditch work completed

Region: 1 2 [✓ 3] 4 5

CORE SKETCH



TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB [✓ Other] Fat
CONDITION: Good [✓ Fair] Poor ↳ Initial stages
MAX. AGG.: 1/4 3/8 [✓ 1/2] 5/8 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch [✓ Stripping] PCC CTB Other
CONDITION: Good [✓ Fair] Poor ↳ Initial stages
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

TYPE: Dense AC Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 1 1+

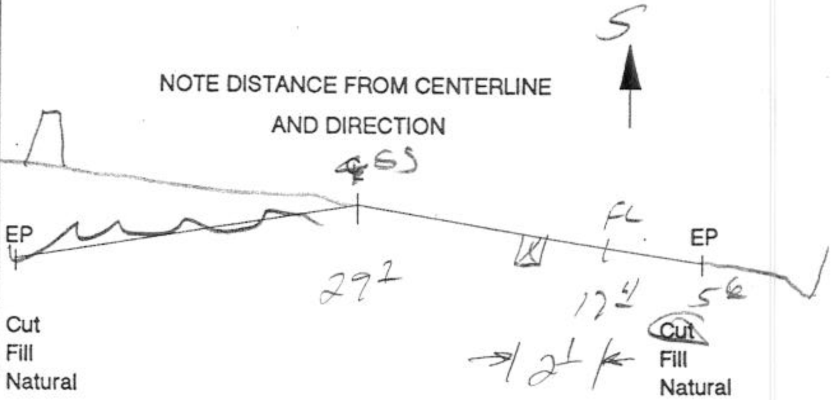
TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good Fair Poor
MAX. AGG.: 1/4 3/8 1/2 [✓ 5/8] 3/4 1 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 3/4 [✓ 1] 1+

TYPE: [✓ Dense AC] Open AC Patch Stripping PCC CTB Other
CONDITION: Good [✓ Fair] Poor
MAX. AGG.: 1/4 3/8 1/2 5/8 [✓ 3/4] 1 1+

NOTE DISTANCE FROM CENTERLINE AND DIRECTION



Cut
Fill
Natural

[✓ Cut]
Fill
Natural

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 17

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 157.2

Logged By: CRAIGH MICHAEL

LOCATION: #5 SB RL OWT

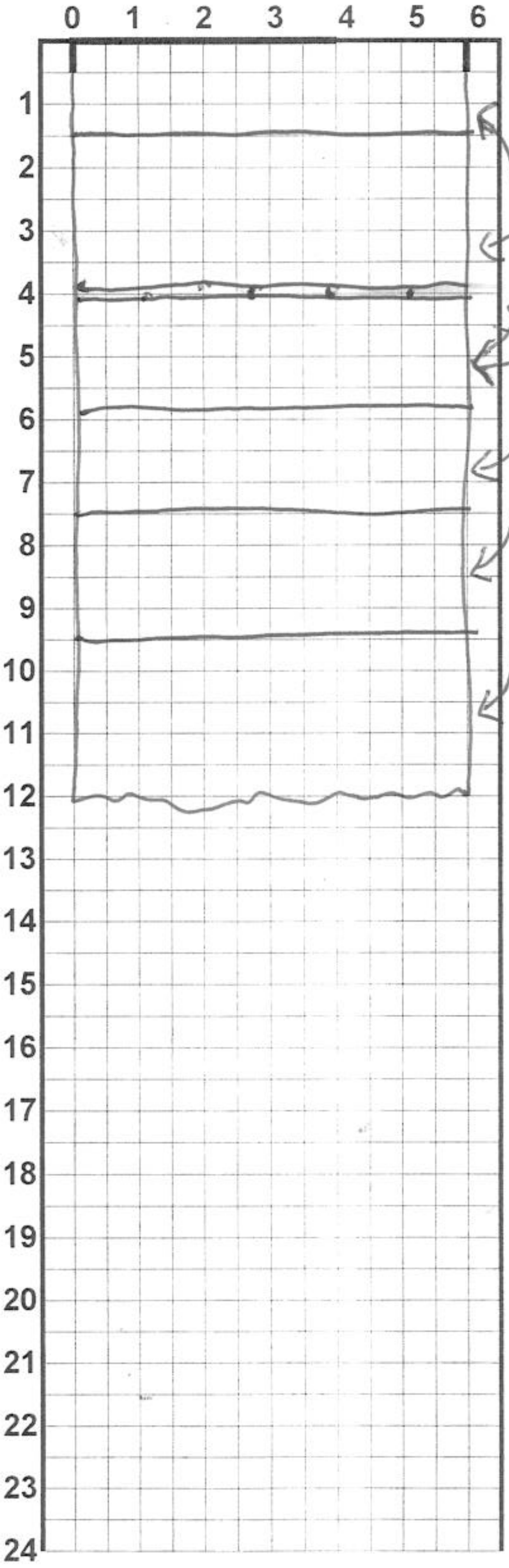
ERIC TRAVIS

CORE LENGTH: 12 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 13 & 14

ODOT Photo #17

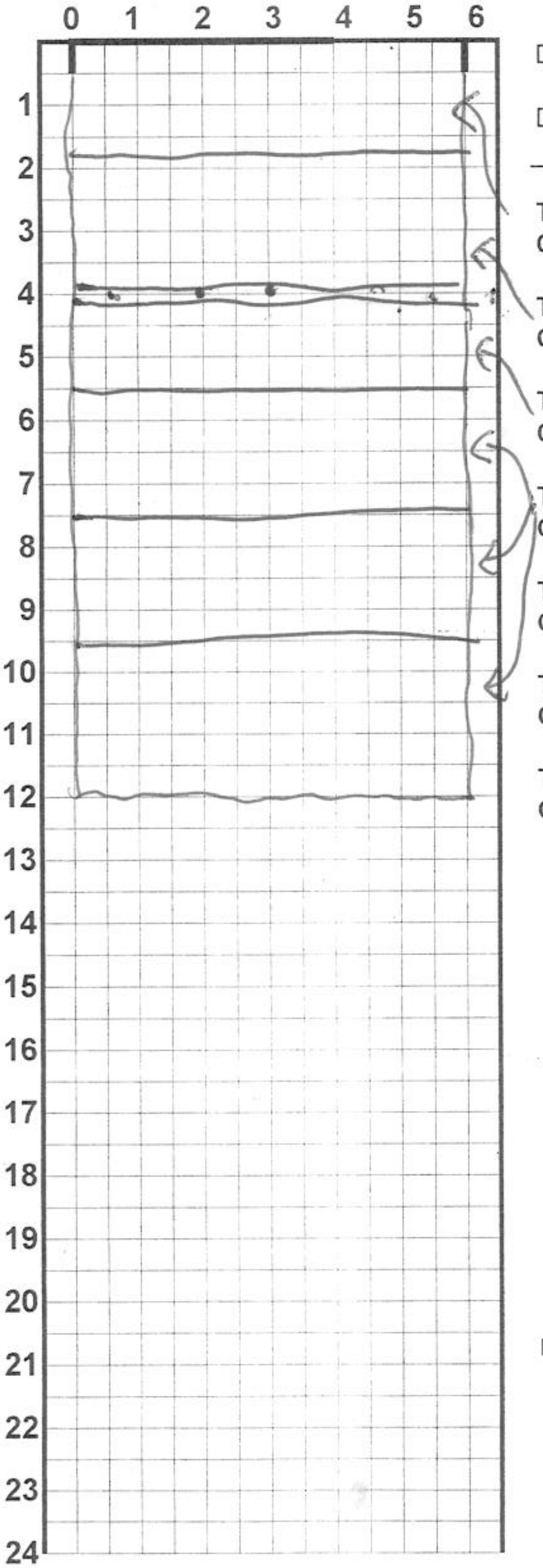
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

EP EP

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES
PD #: 13
HIGHWAY: PACIFIC HWY NO 1
Date: 10/16/06
MILEPOINT: 157.2
Logged By: CRAIGH MICHAEL
LOCATION: #1 SB RL OWT
ERIC TRAVIS
CORE LENGTH: 12 inches
Designer: **TODD SCHOLZ**
EA #: 07RF0632/000/J13
KEY #:



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] ~~[✓ Open AC]~~ PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

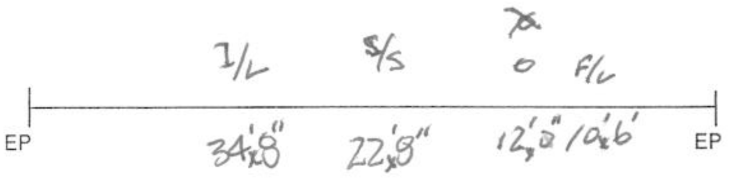
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 1 & 2

ODOT Photo #13

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PD # 8

Date: 10/16/06

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #

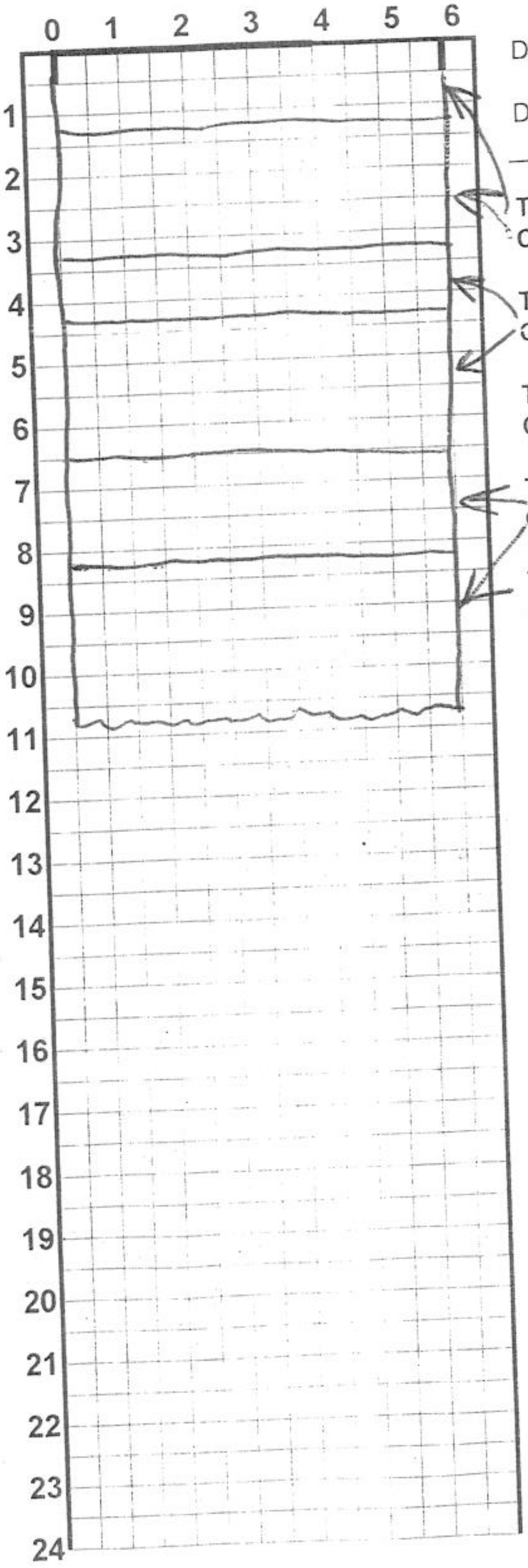
PROJECT: I-5 ANLAUF/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 156.90

LOCATION: SBCNTRL

CORE LENGTH: 10.75 inches



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil-Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

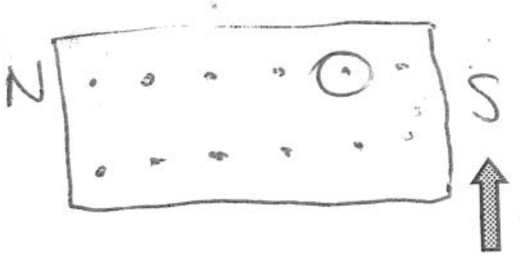
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

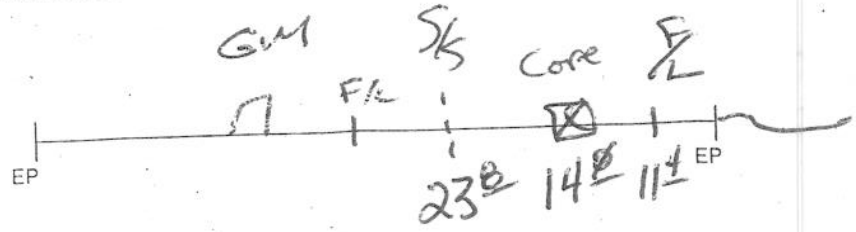
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



MENT CORE LOG

ARCH CORES

Y NO 1

Saved: [✓ Yes] No

PD # 9

Date: 10/16/06

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

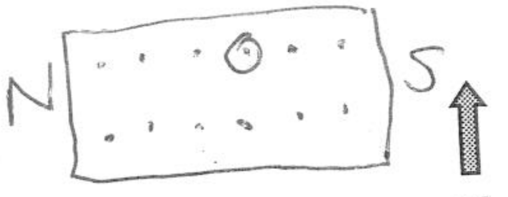
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

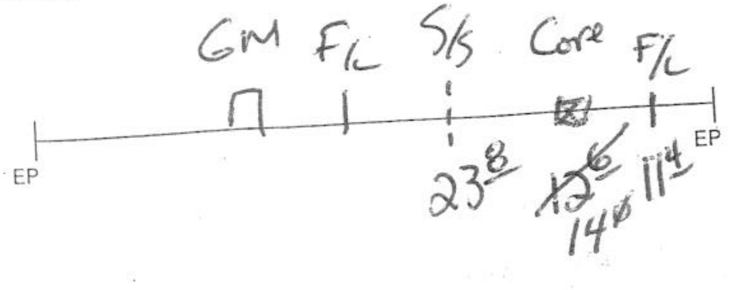
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



No

10

10/16/06

CRAIGH [✓ MICHAEL]

ERIC TRAVIS

TODD SCHOLZ

07RF0632/000/J13

ES

. Long. Fat. Other):

TB Oil Mat Other

TB Oil Mat Other

TB Oil Mat Other

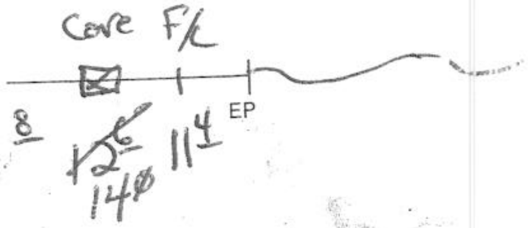
B Oil Mat Other

B Oil Mat Other

B Oil Mat Other

B Oil Mat Other

ND DIRECTION SB



157/2 ✓
156.53

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 20

HIGHWAY: PACIFIC HWY NO 1

Date:

MILEPOINT: 157.2

Logged By: CRAIGH MICHAEL
ERIC TRAVIS

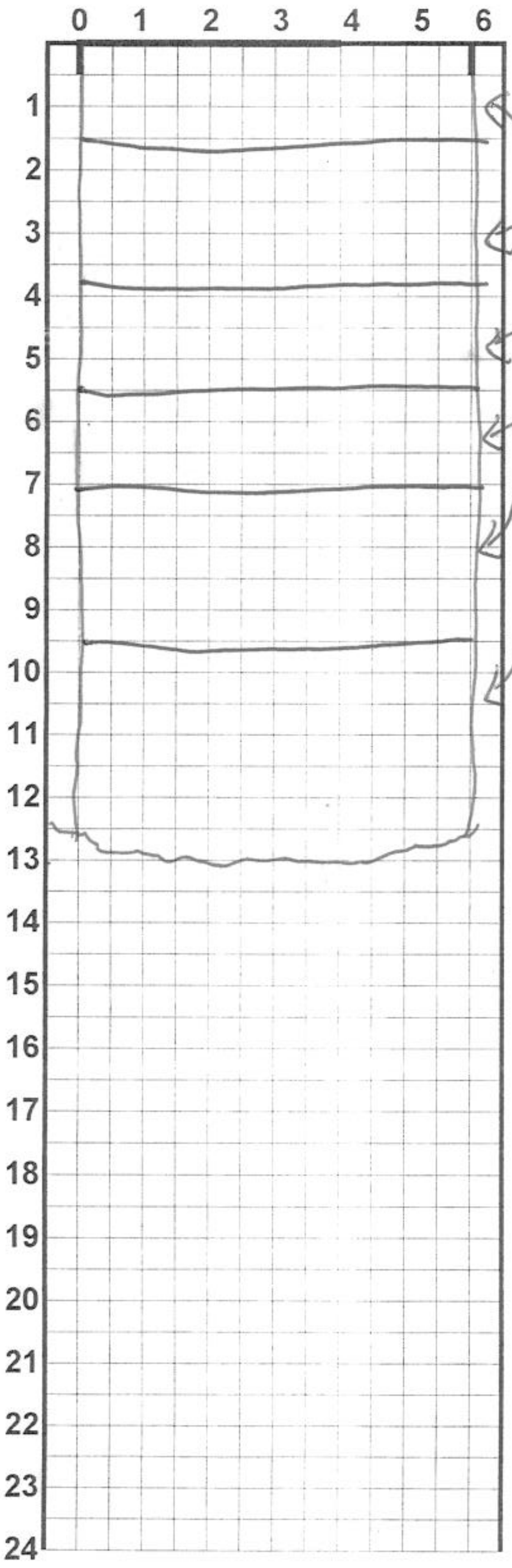
LOCATION: #8 SB RL OWT

CORE LENGTH: 13 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Photos 21&22

ODOT Photo # 20

↑

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

EP EP

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 156.90

LOCATION: SBOWTRL

CORE LENGTH: 10.75 inches

PD # 8

Date: 10/16/06

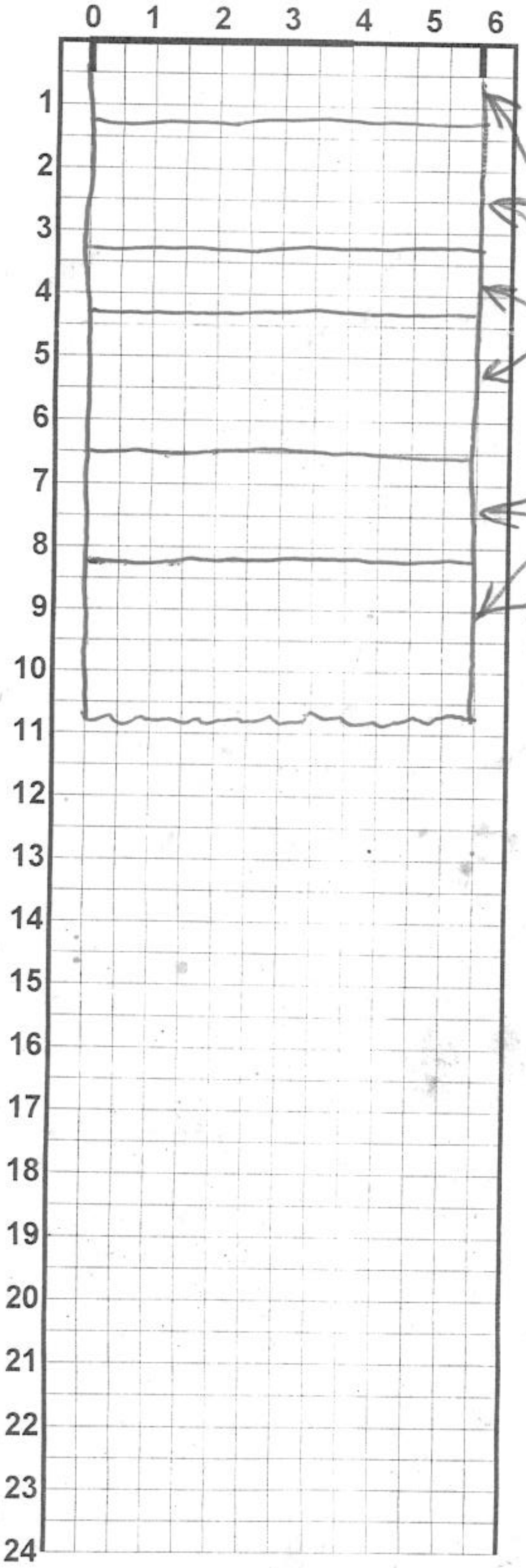
Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

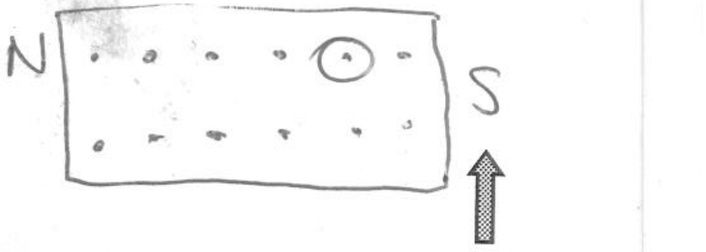
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

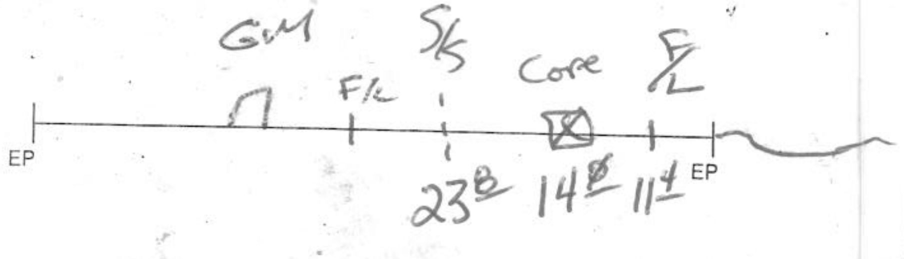
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 10

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 156,90

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

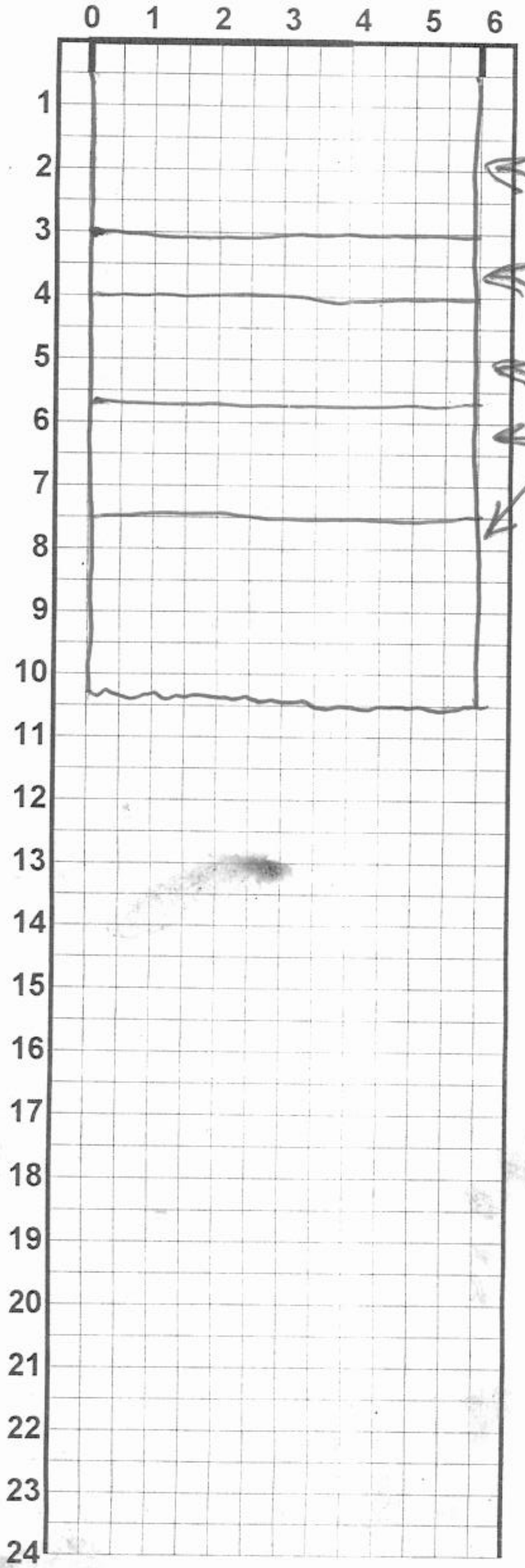
LOCATION: SB OWTRL

CORE LENGTH: 10.50(?) inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

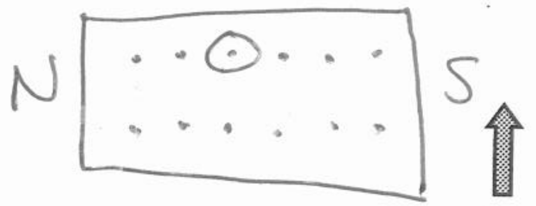
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

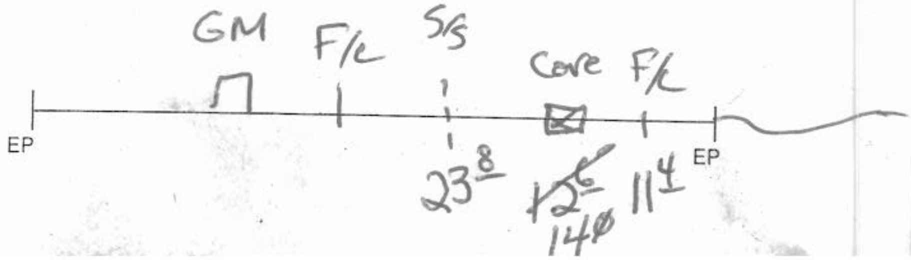
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



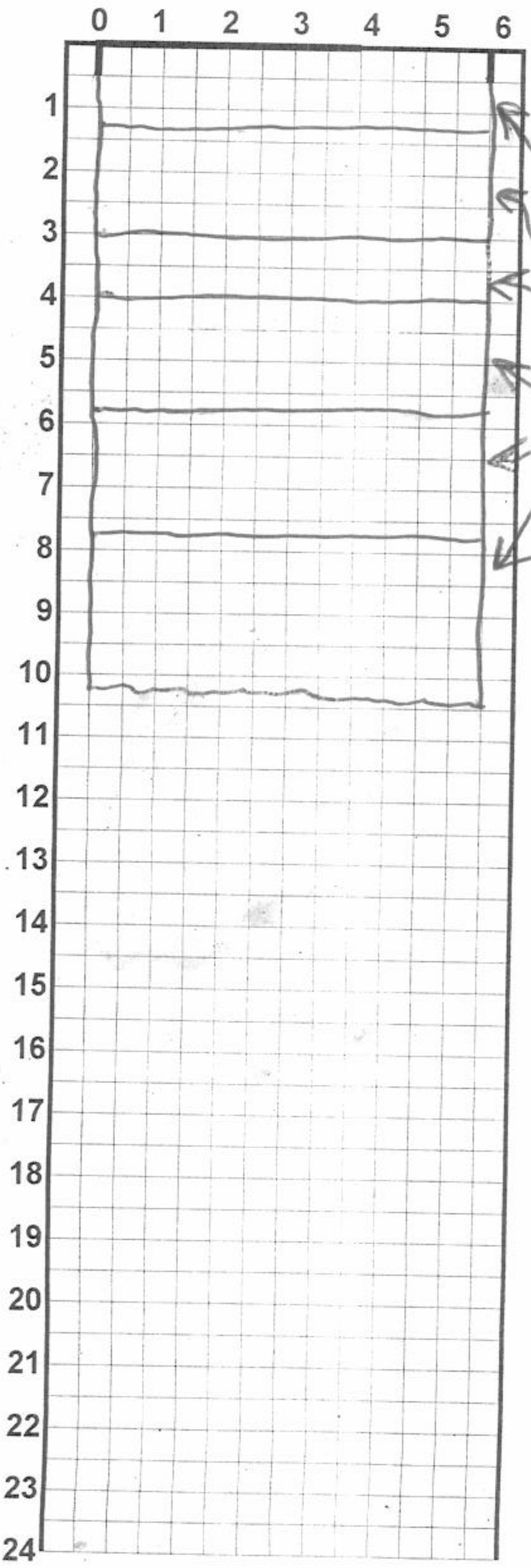
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

PROJECT: I-5 ANLAUF/RESEARCH CORES
HIGHWAY: PACIFIC HWY NO 1
MILEPOINT: 156.90
LOCATION: SBOWT RL
CORE LENGTH: 10.50 inches

Saved: [✓ Yes] No
PD # 9
Date: 10/16/06
Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS
Designer: TODD SCHOLZ
EA # 07RF0632/000/J13
KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

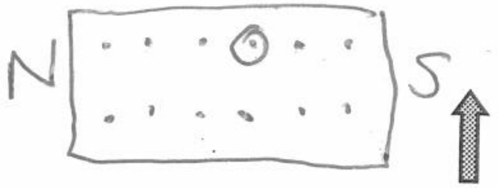
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

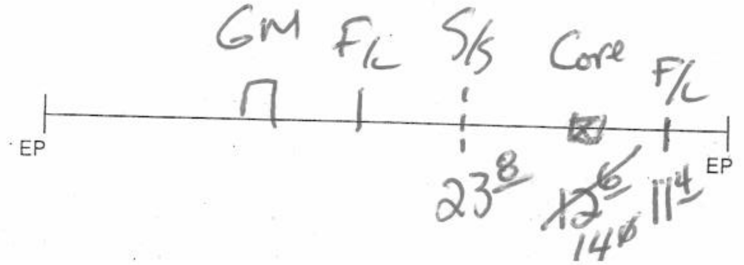
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 156.9d

LOCATION: SBOWT RL

CORE LENGTH: 11.5 inches

PD # 1

Date: 10/16/06

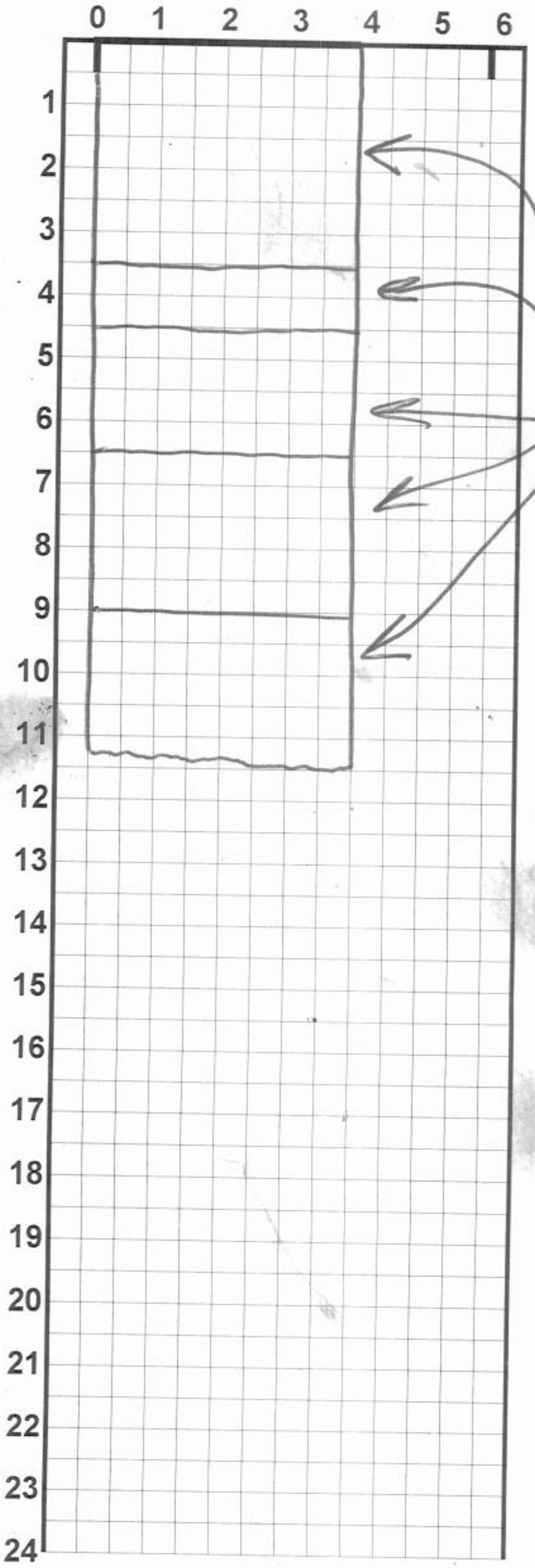
Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

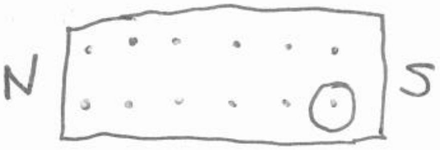
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

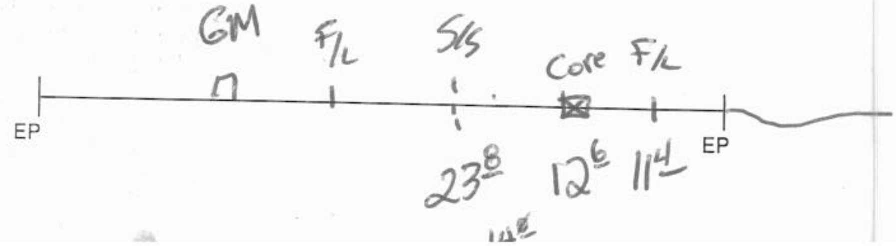
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

94 95 99



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 156.90

LOCATION: SB OWT RL

CORE LENGTH: 11.50 inches

PD # 2

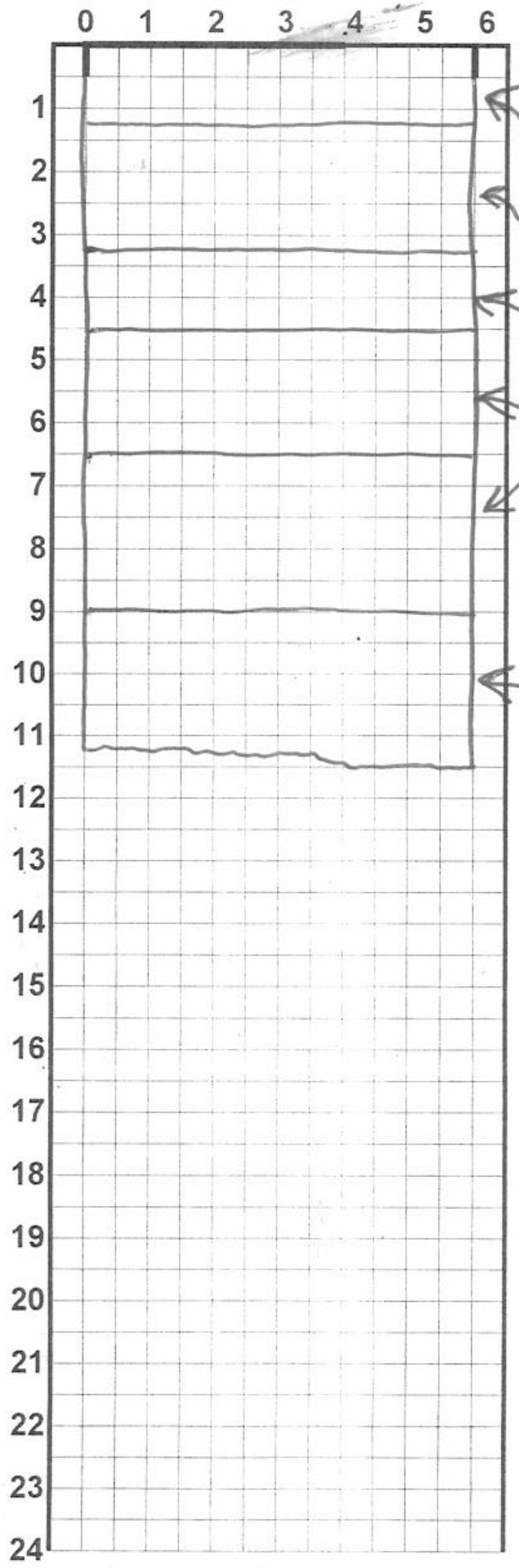
Date: 10/16/06

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

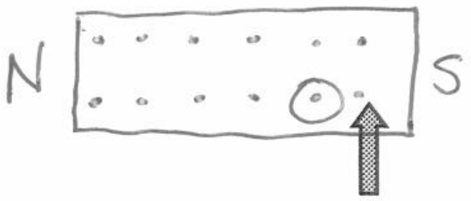
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

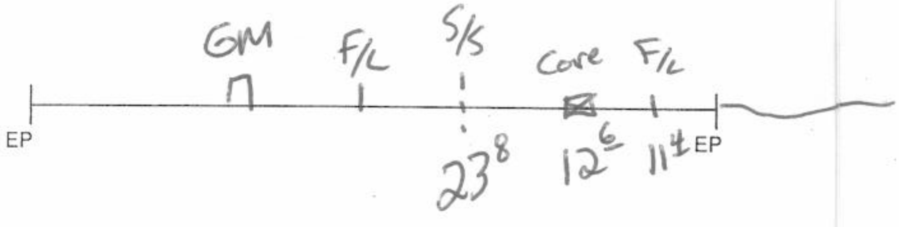
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 3

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 156.90

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

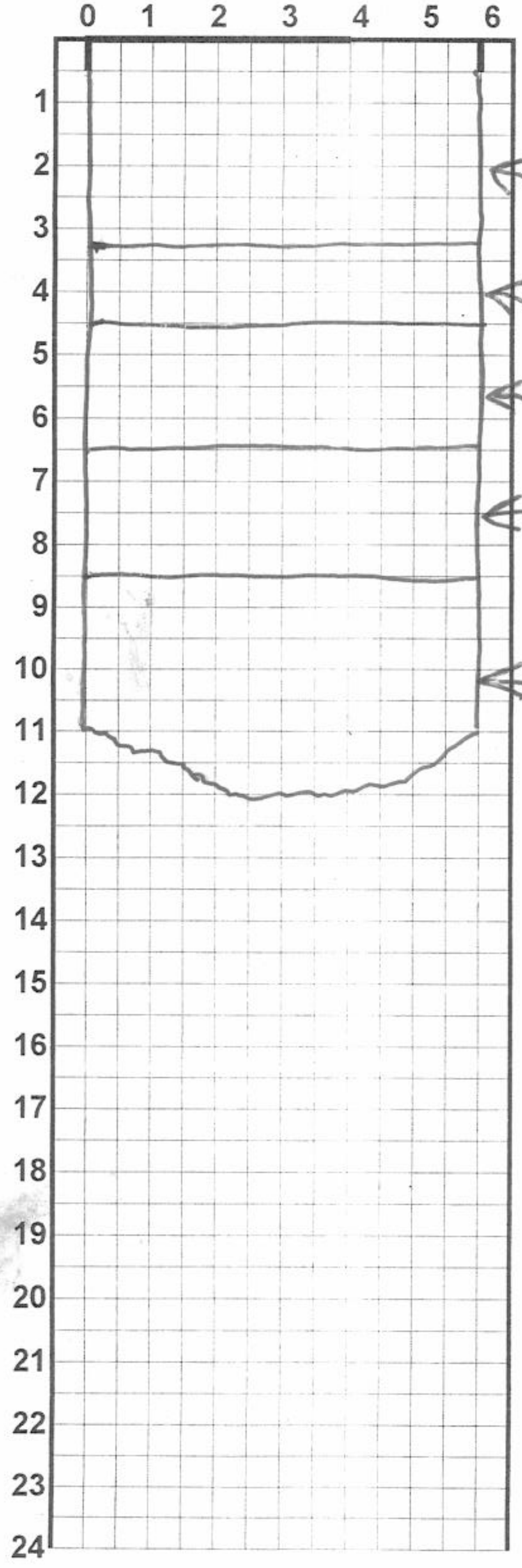
LOCATION: SB OWT RL

CORE LENGTH: 12.0(?) inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

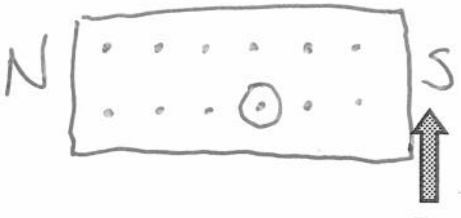
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

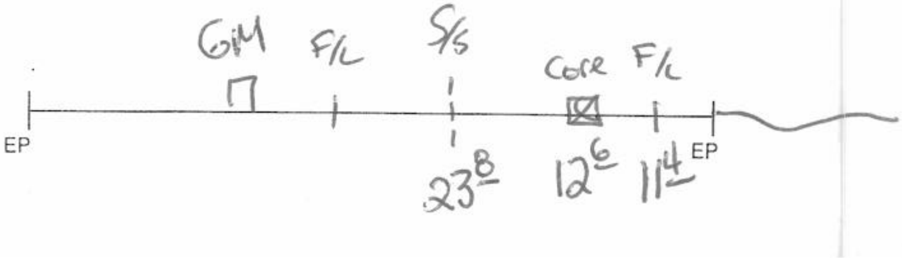
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 4

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 156.90

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

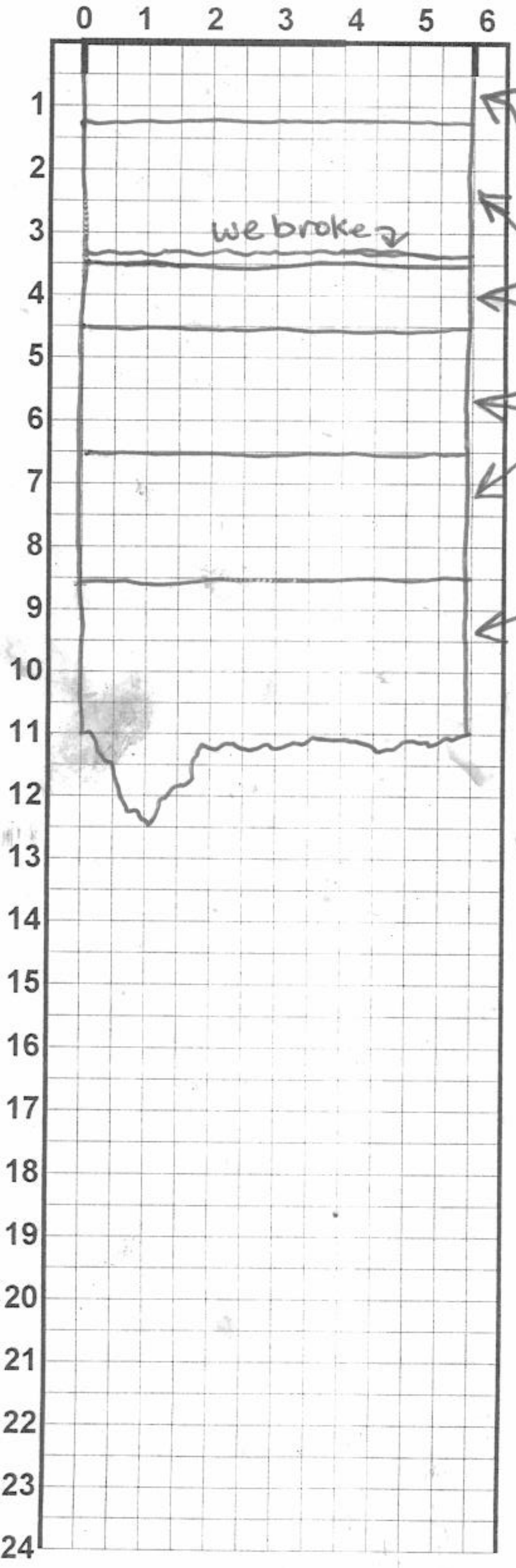
LOCATION: SB OW T RL

CORE LENGTH: 12.50 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] [✓ Poor]

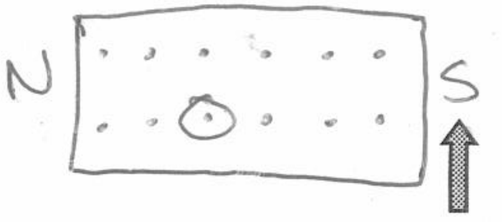
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

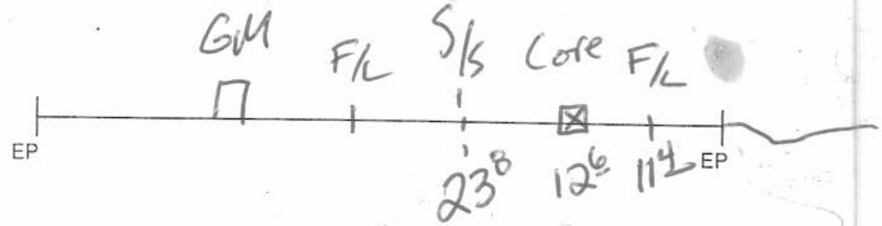
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 5

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 156.90

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

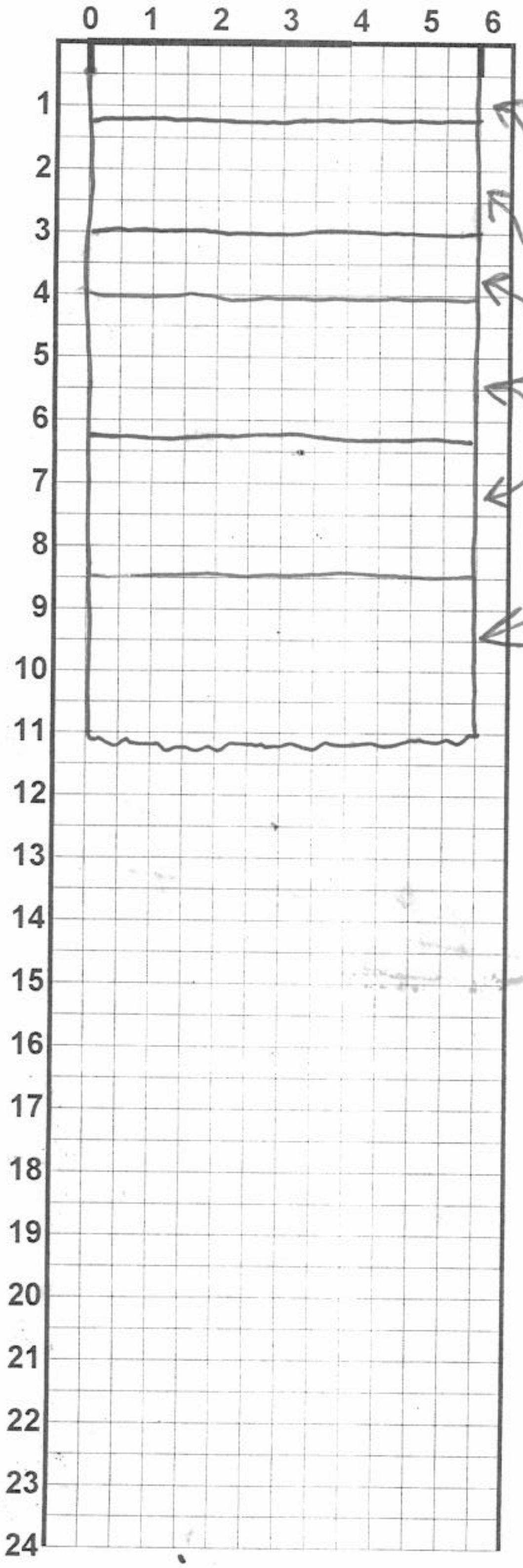
LOCATION: SB OWT RL

CORE LENGTH: inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

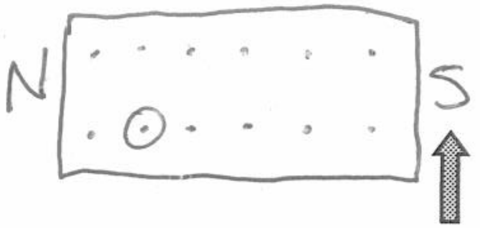
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

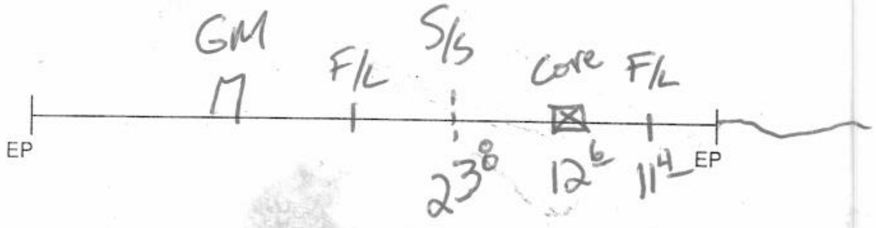
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 156.90

LOCATION: SBOWTRL

CORE LENGTH: 11.50 inches

PD # 12

Date: 10/16/06

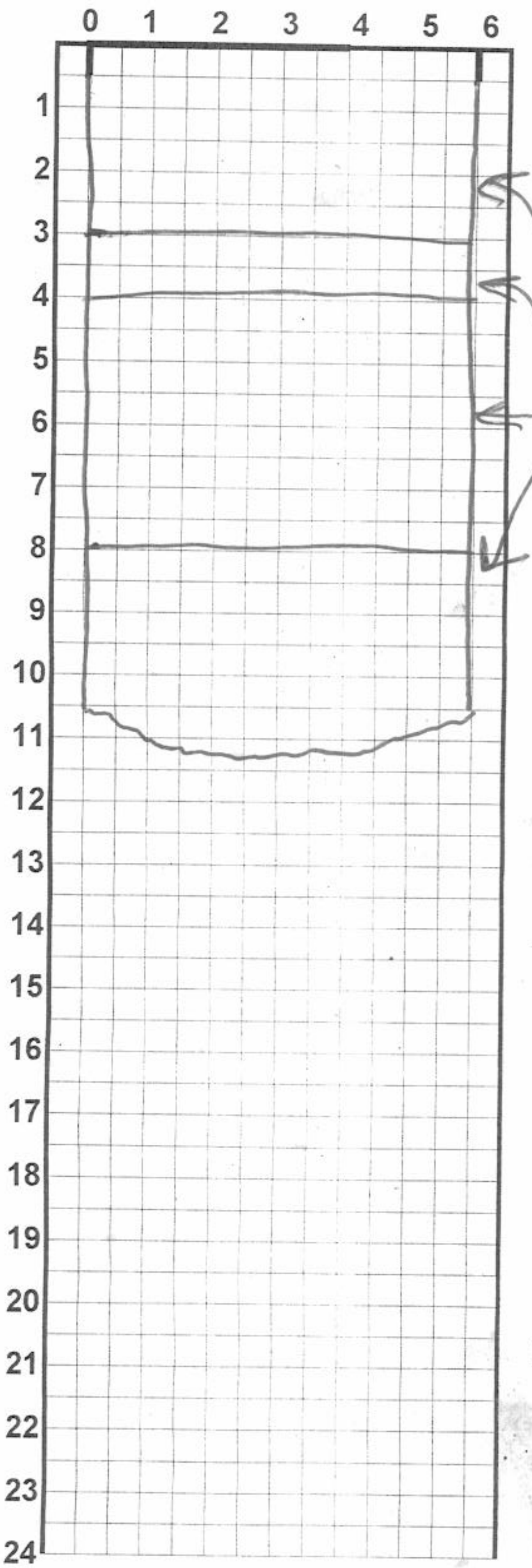
Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

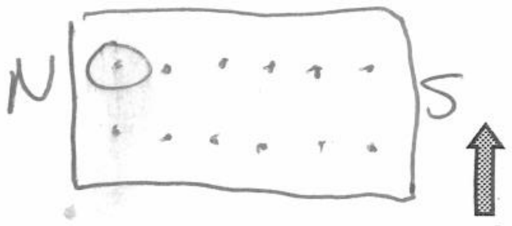
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

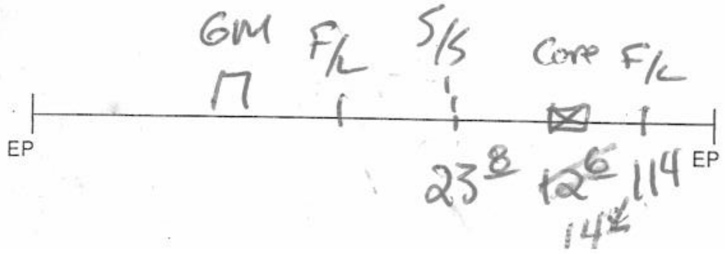
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 156.90

LOCATION: SBOWTRL

CORE LENGTH: 11.0 inches

PD # 6

Date: 10/16/06

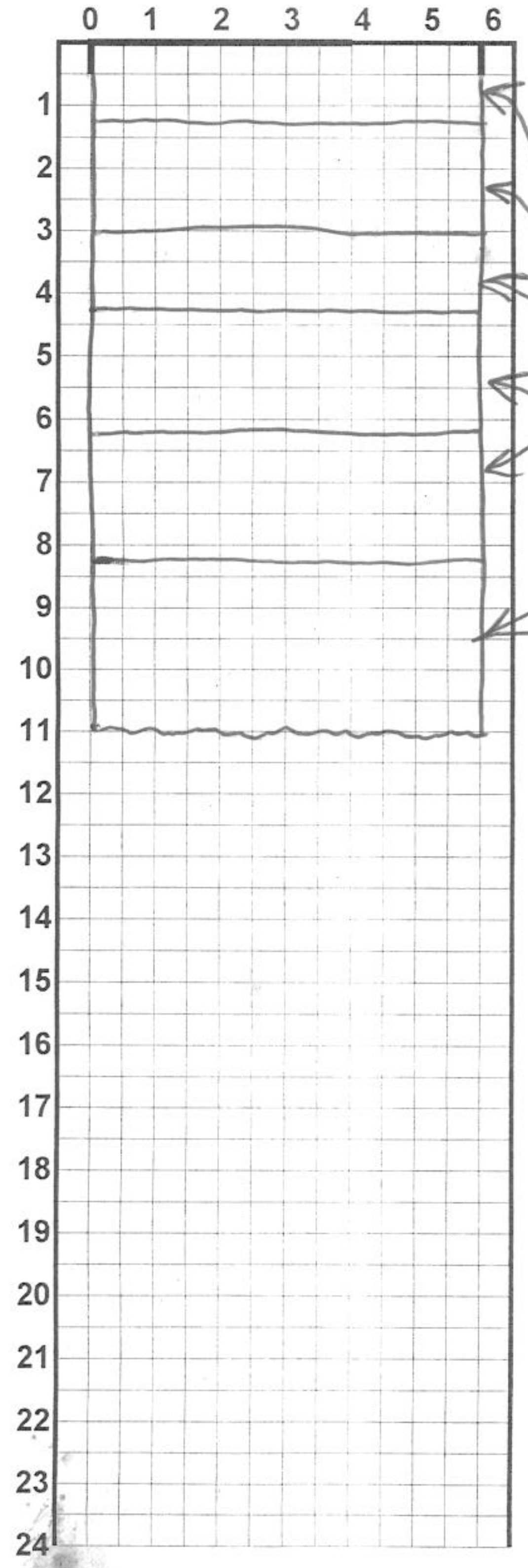
Logged By: CRAIG [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

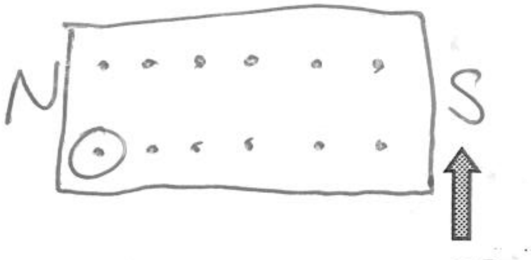
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

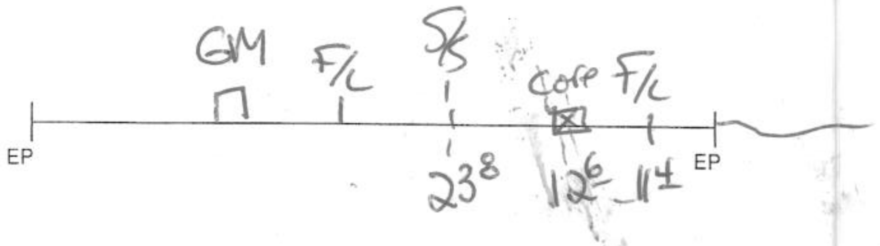
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 11

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 156.90

Logged By: CRAIGH MICHAEL
ERIC TRAVIS

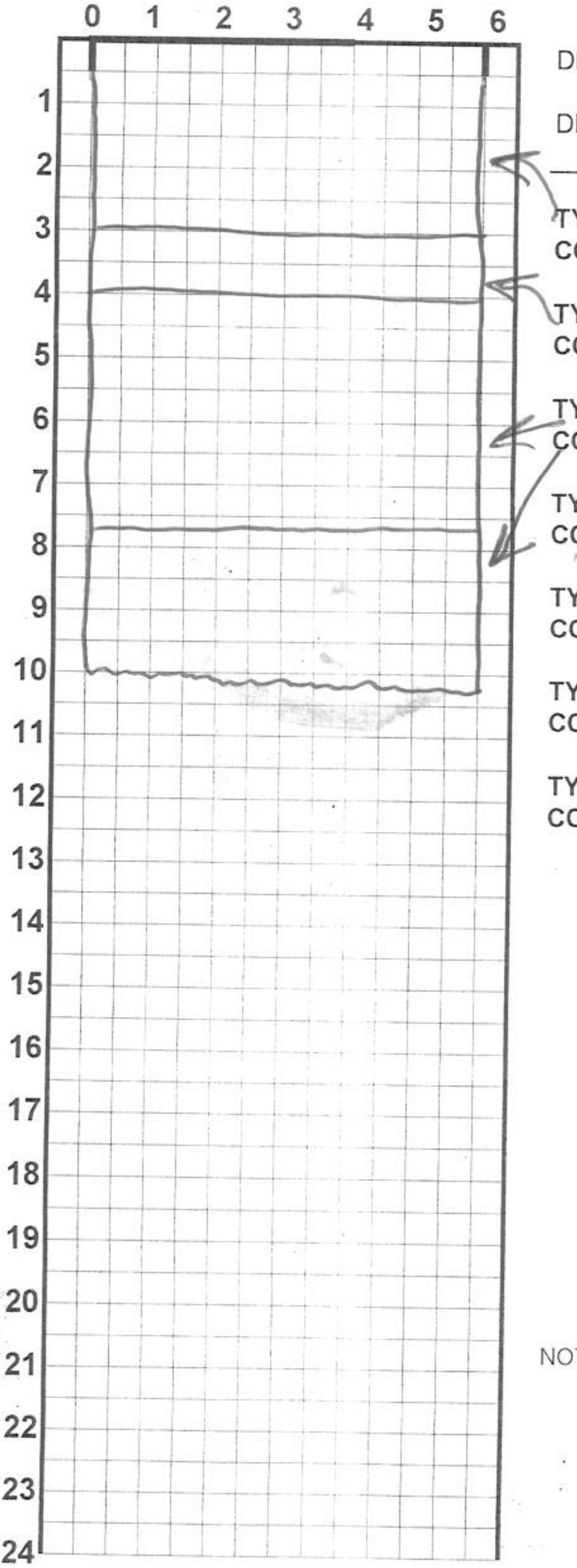
LOCATION: SB OWT RL

CORE LENGTH: 10.25 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

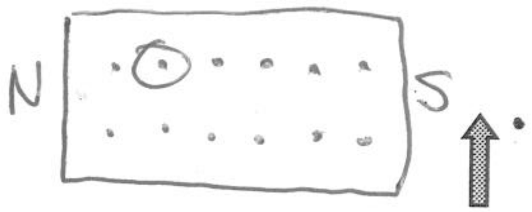
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

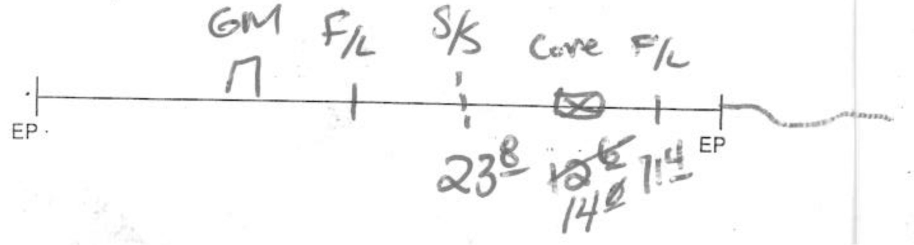
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 7

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 156.90

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

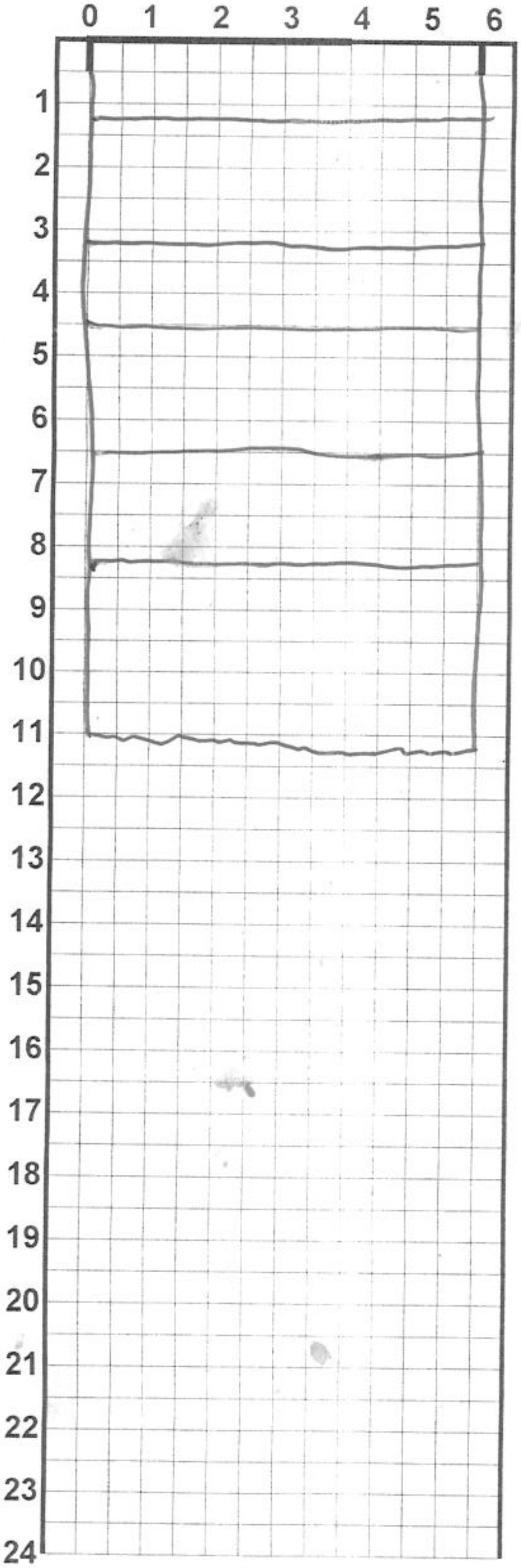
LOCATION: SB OWT RL

CORE LENGTH: 11.25 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

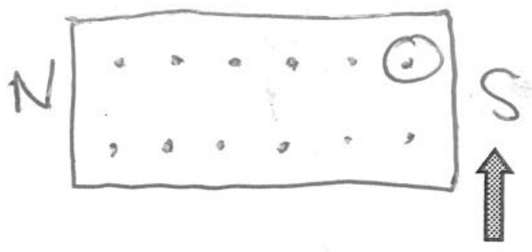
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

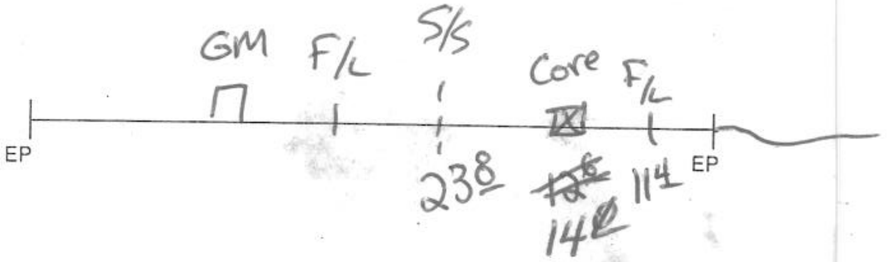
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



APPENDIX I: PAVEMENT CORE LOGS FOR GARDEN VALLEY – ROBERTS CREEK

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD #: 10

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118.

Logged By: CRAIGH [✓ MICHAEL]

LOCATION: SB OW TRL

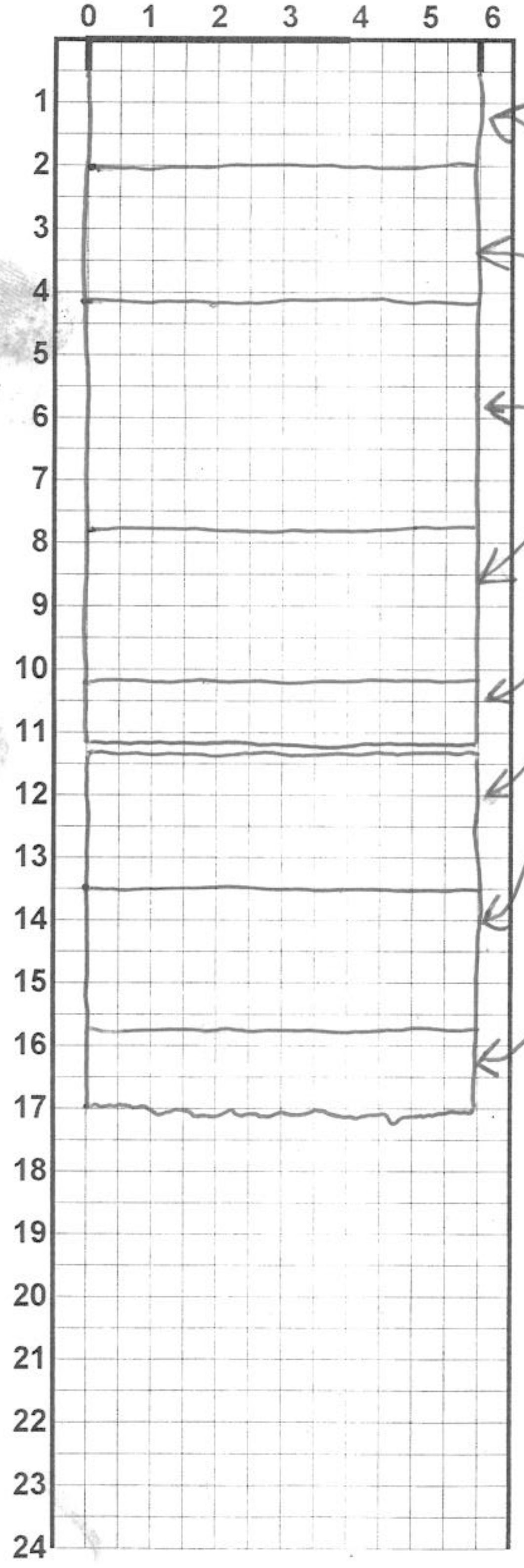
ERIC TRAVIS

CORE LENGTH: 17.0 inches

Designer: TODD SCHOLZ

EA #: 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

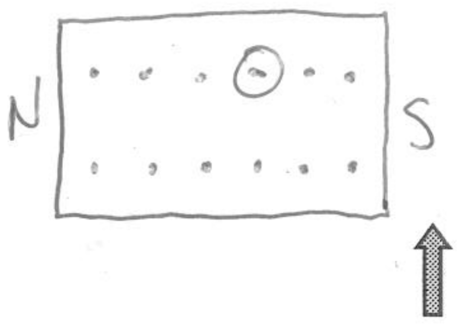
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] [✓ Poor]

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

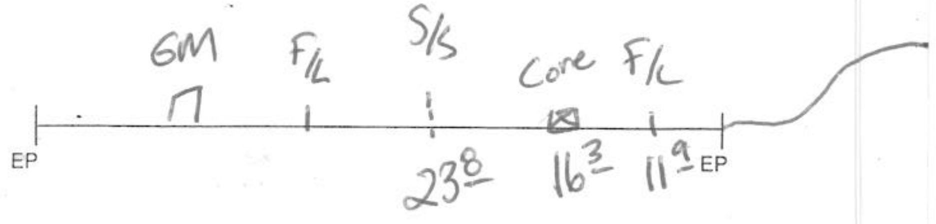
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat [✓ Other]
CONDITION: Good [✓ Fair] Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD # 11

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118.-

Logged By: CRAIGH [✓ MICHAEL]

LOCATION: SB OWT RL

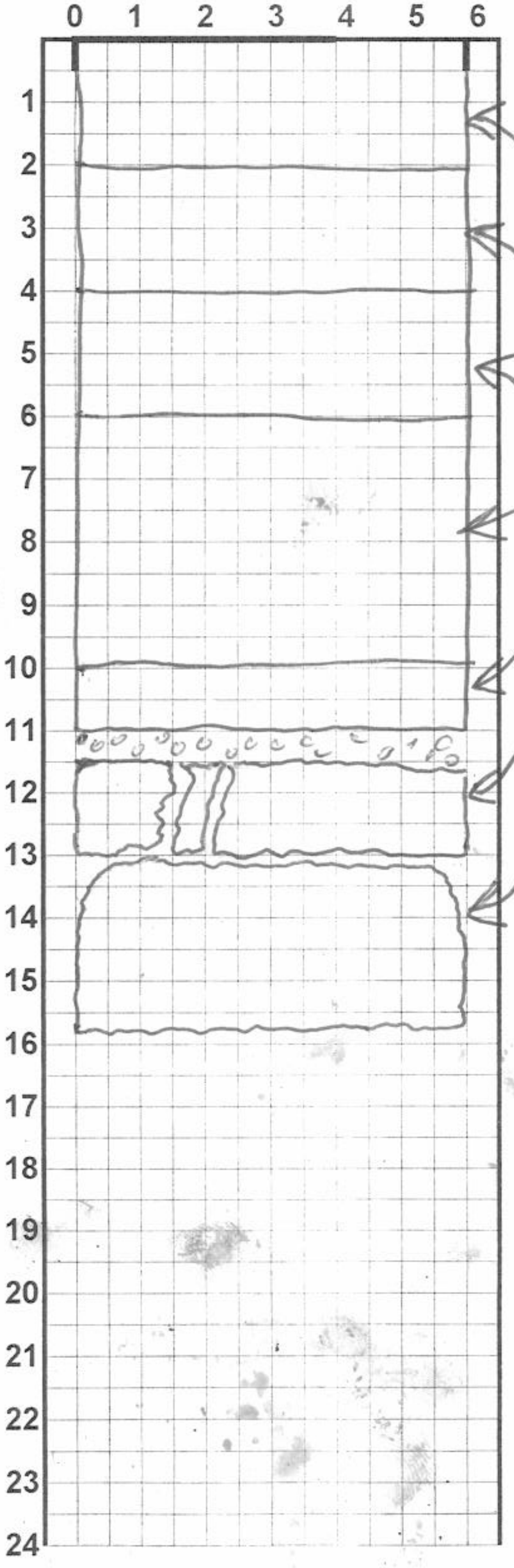
ERIC TRAVIS

CORE LENGTH: 15.75 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

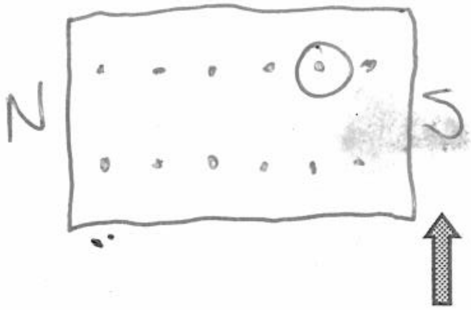
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

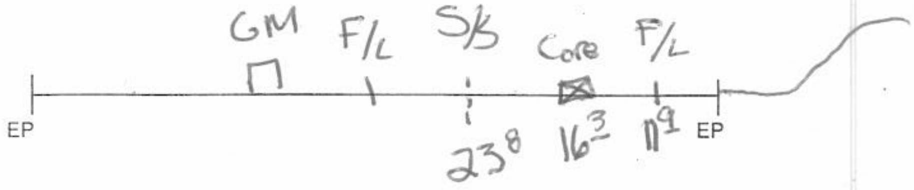
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair [✓ Poor]

ODOT #31



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD # 2

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

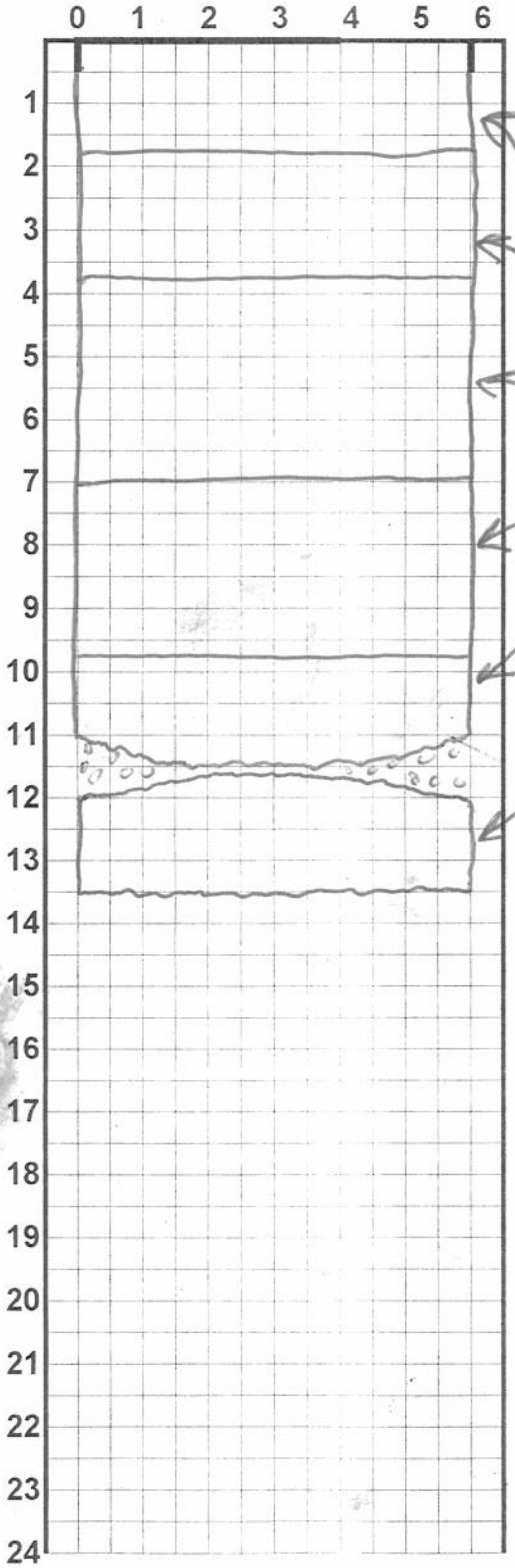
LOCATION: SBOWTRL

CORE LENGTH: 13.50 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

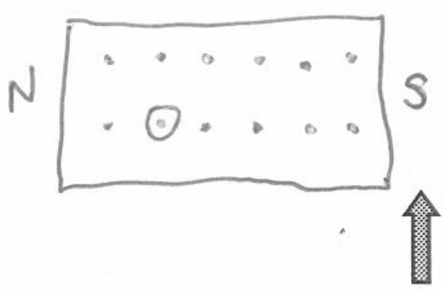
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor Stripping@ bottom

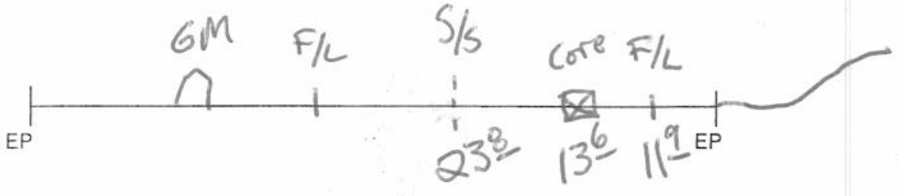
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

OPOT#22



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD # 1

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

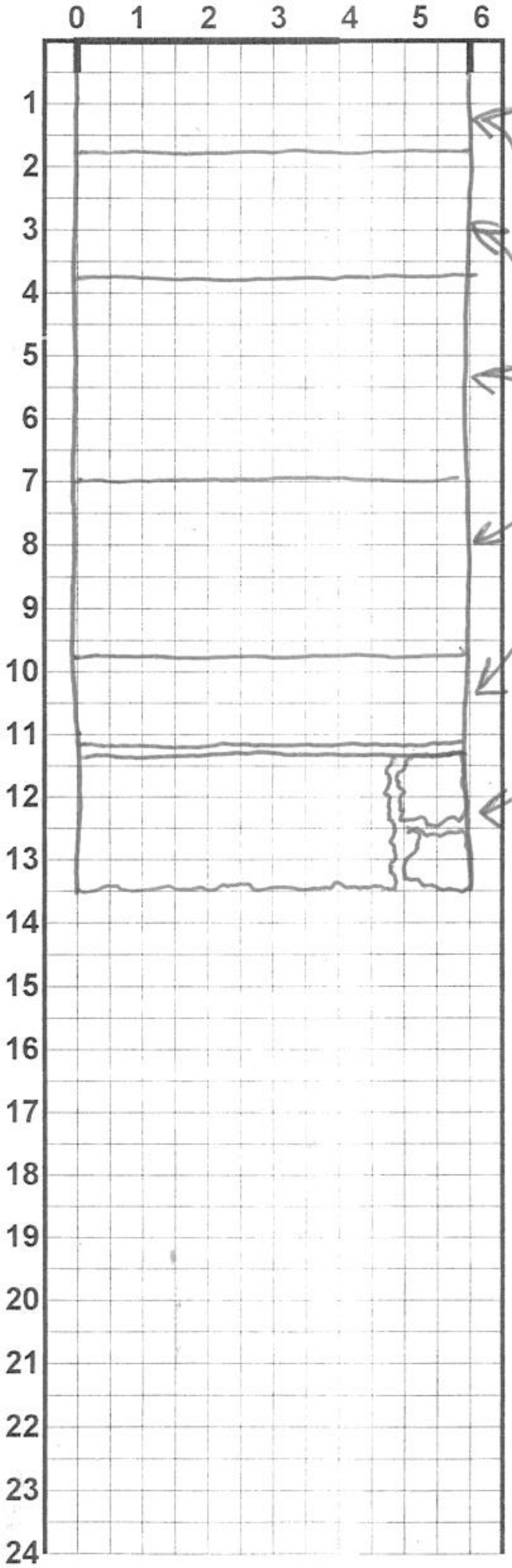
LOCATION: SB OWT RL

CORE LENGTH: 13.50 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

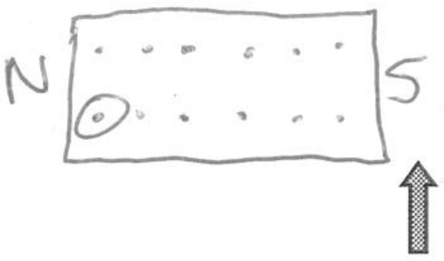
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

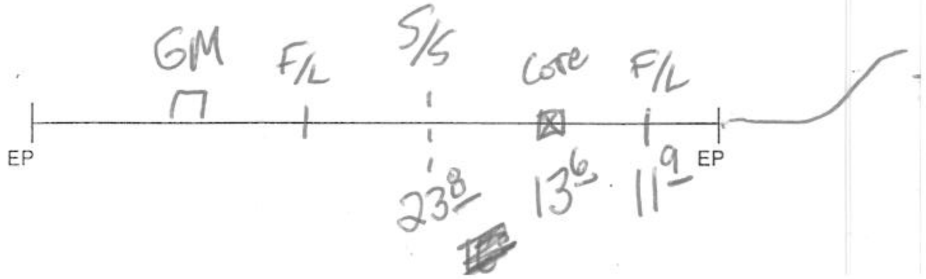
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

ODOT Pic #21



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 118.8

LOCATION: SB OWT RL

CORE LENGTH: 16.0 inches

PD #: 8

Date: 10/17/06

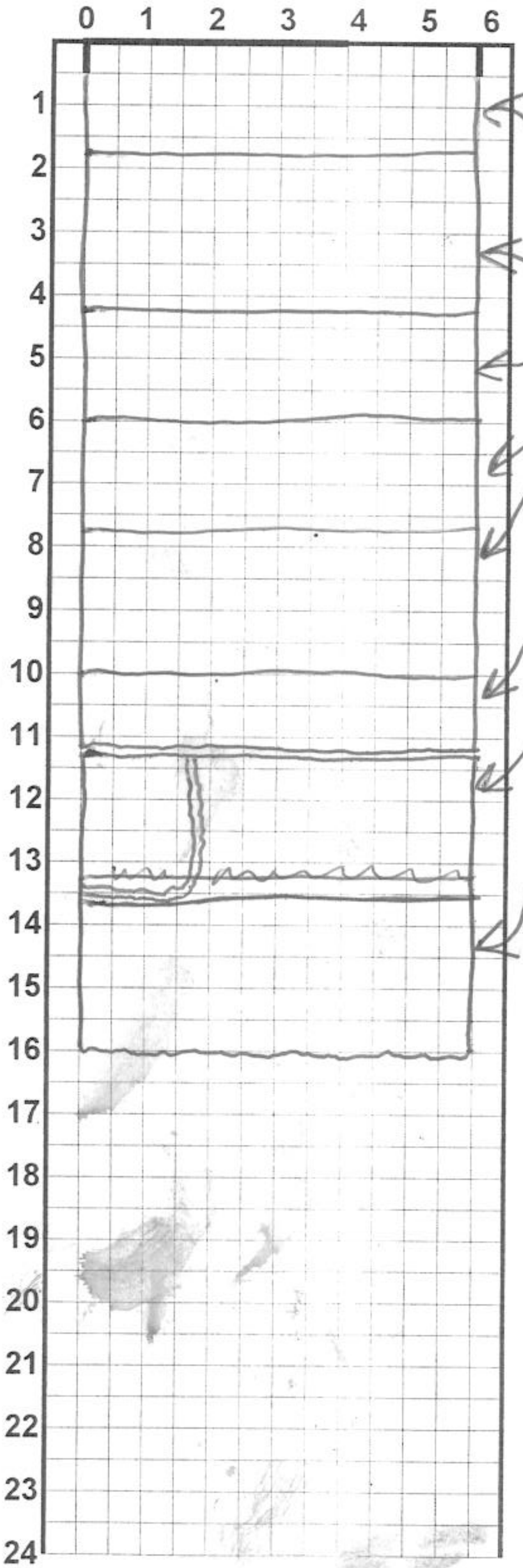
Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA #: 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

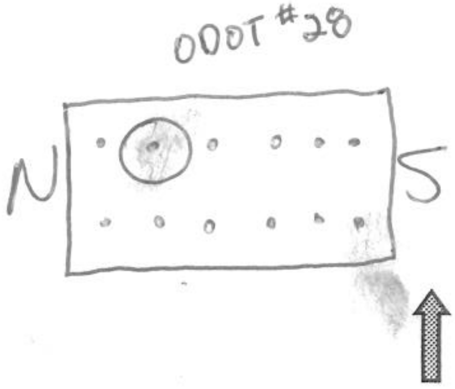
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

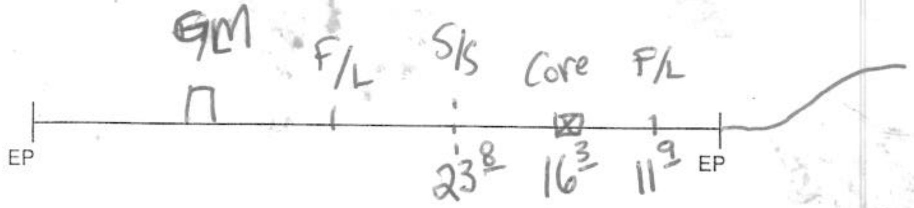
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 118.

LOCATION: SB OWT RL

CORE LENGTH: 16¼ inches

PD # 7

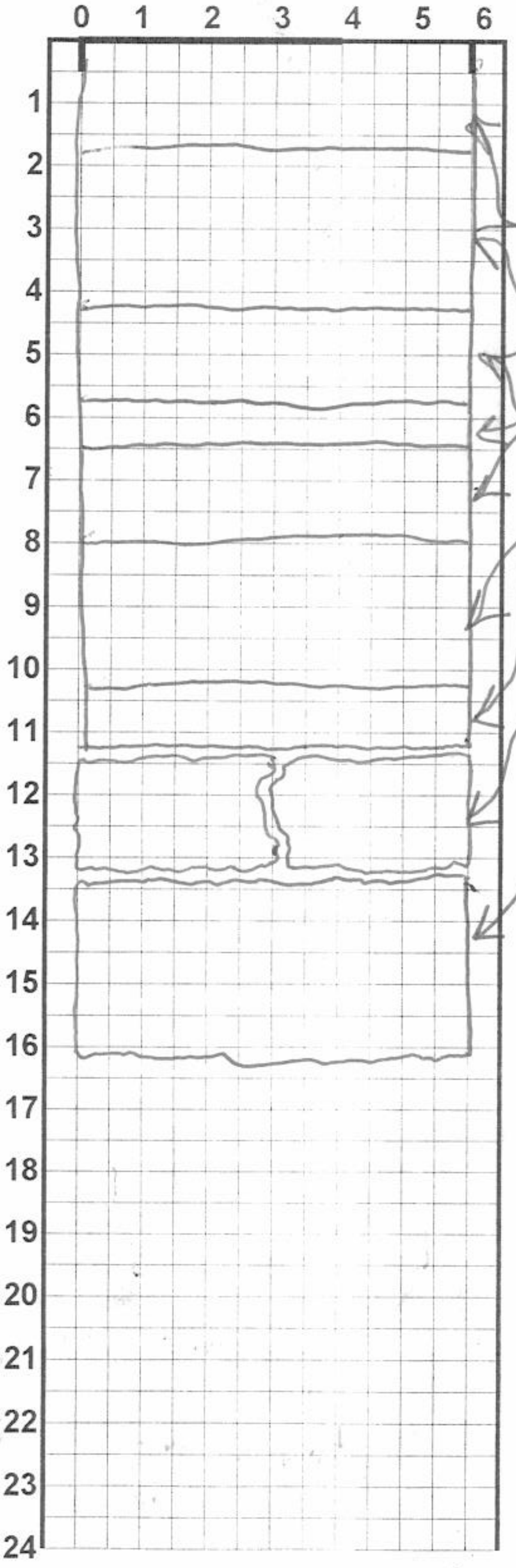
Date: 10/17/06

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: ~~Dense AC~~ [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

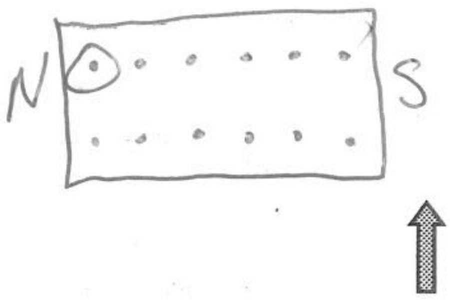
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

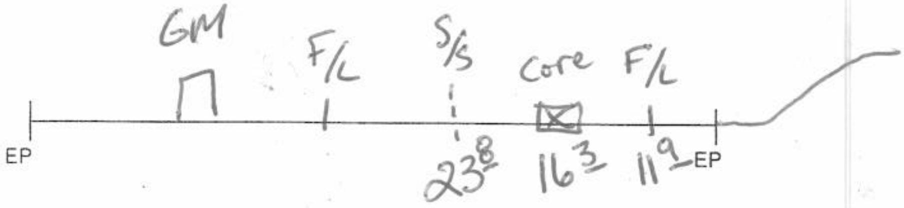
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

ODOT #27 (no number in picture)



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD # 12

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118.

Logged By: CRAIGH [✓ MICHAEL] ERIC TRAVIS

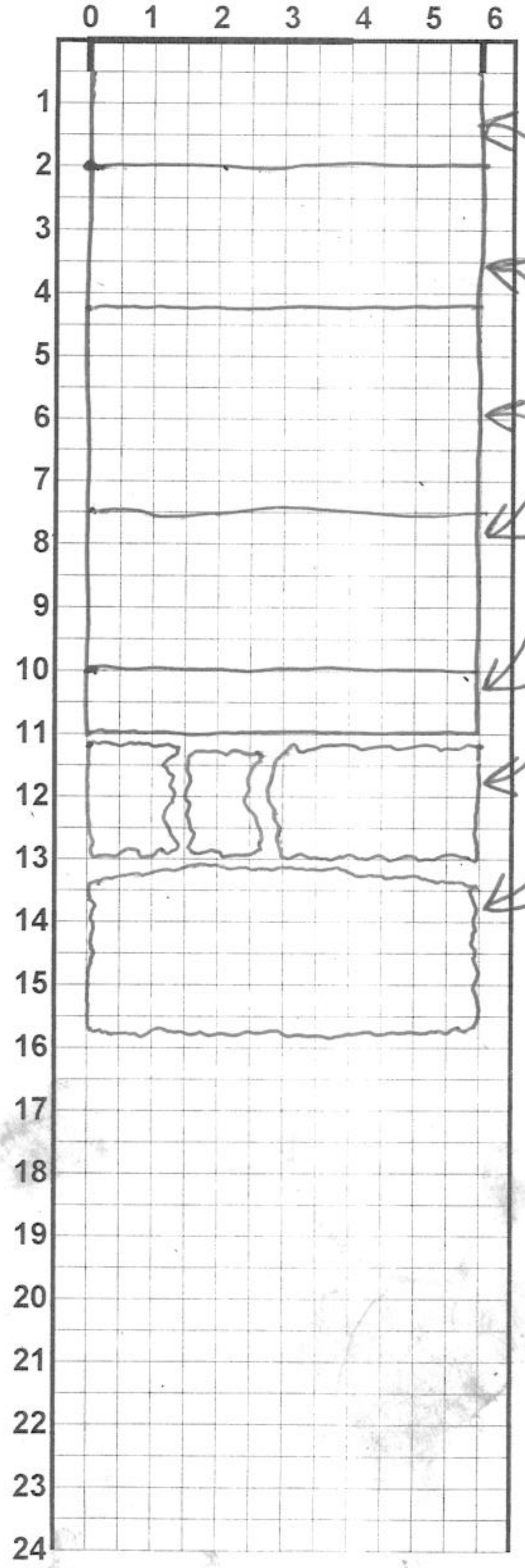
LOCATION: SB OWT RL

CORE LENGTH: 15.75 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

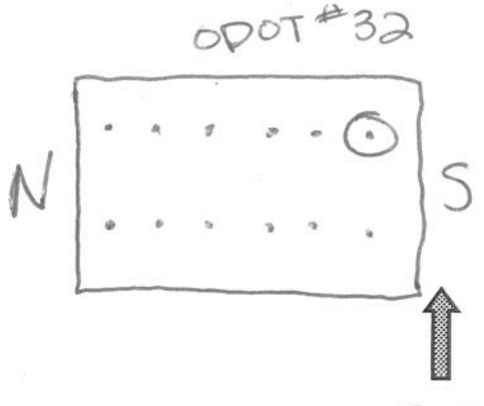
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

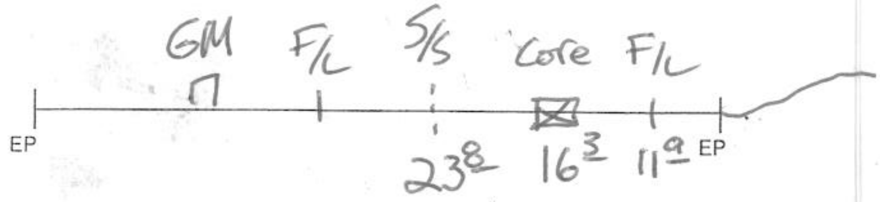
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD # 3

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118

Logged By: CRAIGH [✓ MICHAEL]

LOCATION: SB OWT RL

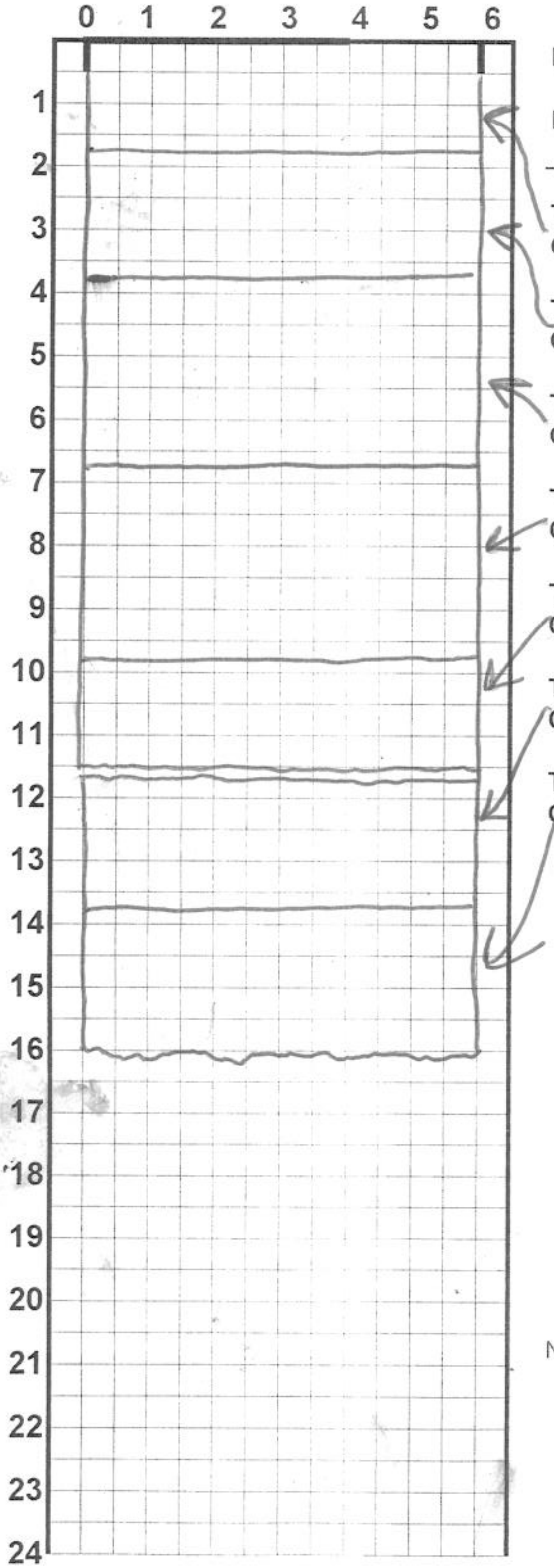
ERIC TRAVIS

CORE LENGTH: 16.0 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

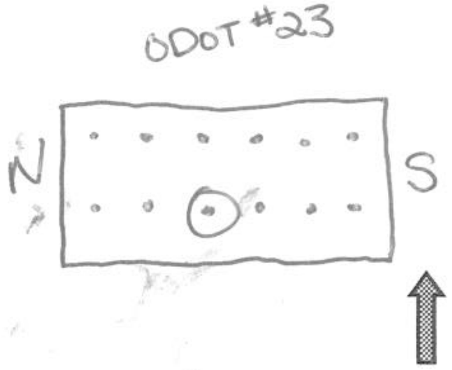
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

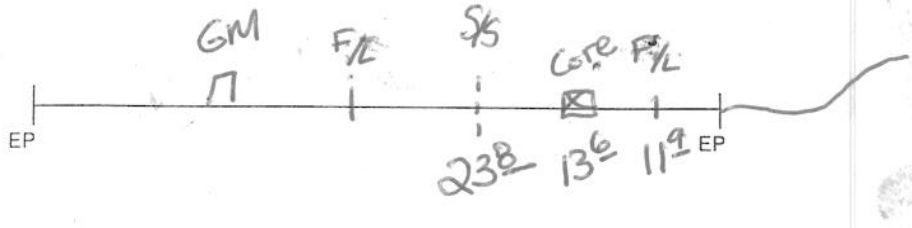
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor stripping

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD # 5

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118.

Logged By: CRAIG [✓ MICHAEL]

ERIC TRAVIS

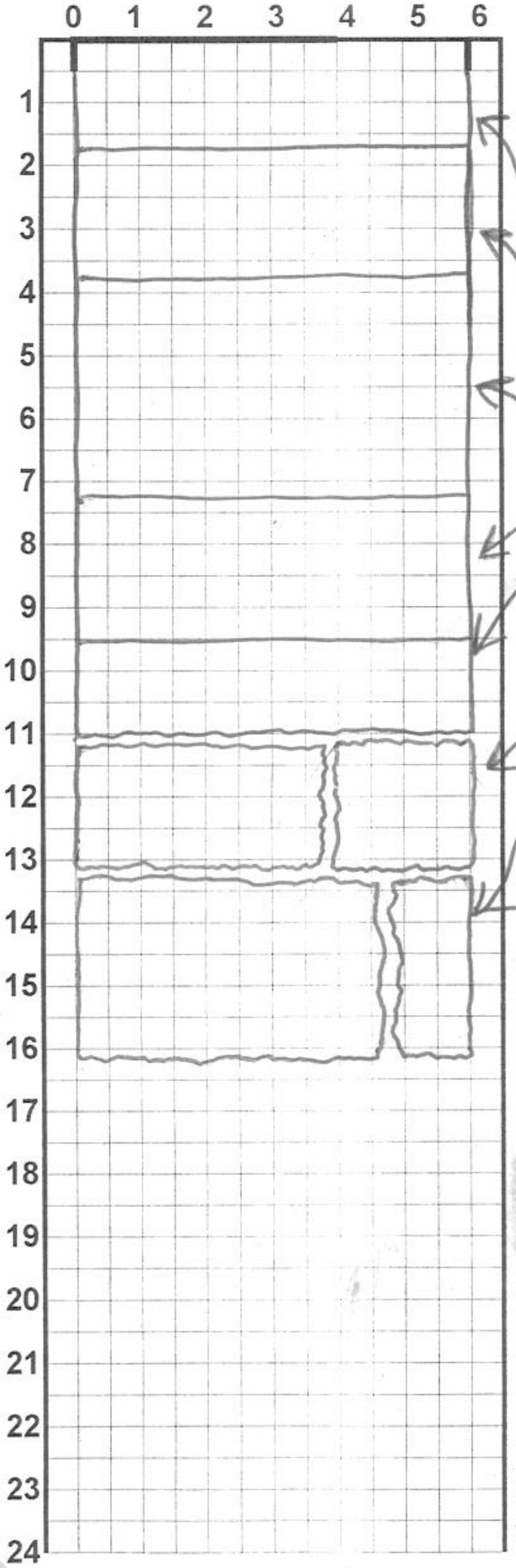
LOCATION: SB OWT RL

CORE LENGTH: 16.25 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

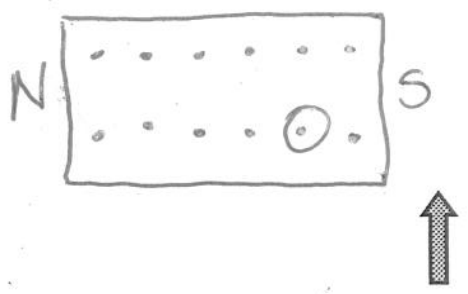
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

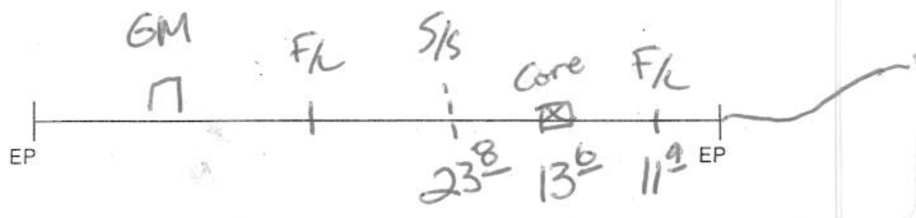
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair [✓ Poor]

ODOT #25



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD # 4

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118.

Logged By: CRAIG [✓ MICHAEL]

LOCATION: SB OWTRL

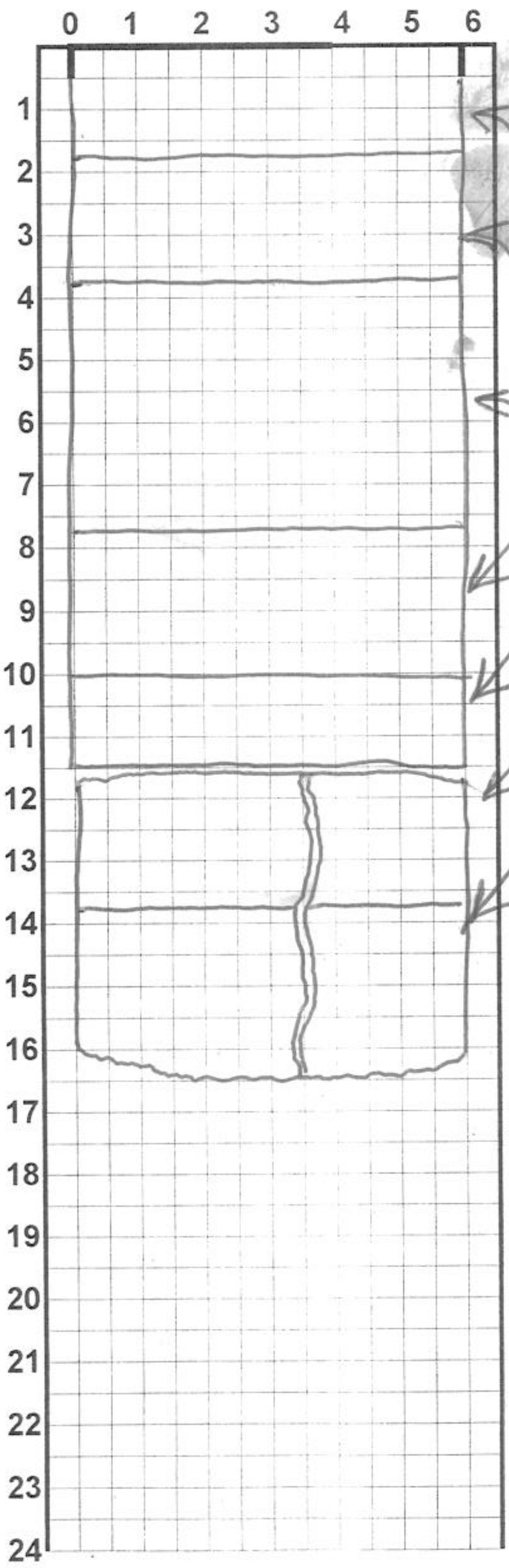
ERIC TRAVIS

CORE LENGTH: 16.50 inches

Designer: **TODD SCHOLZ**

EA # **07RF0632/000/J13**

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

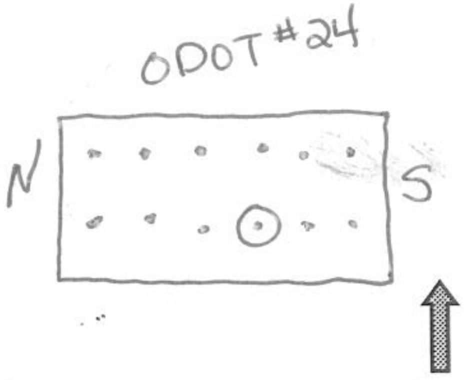
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

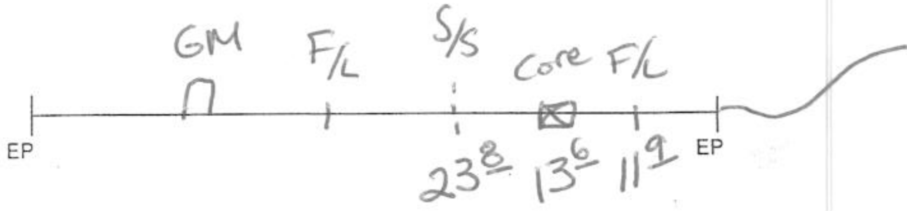
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor Stripping

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor



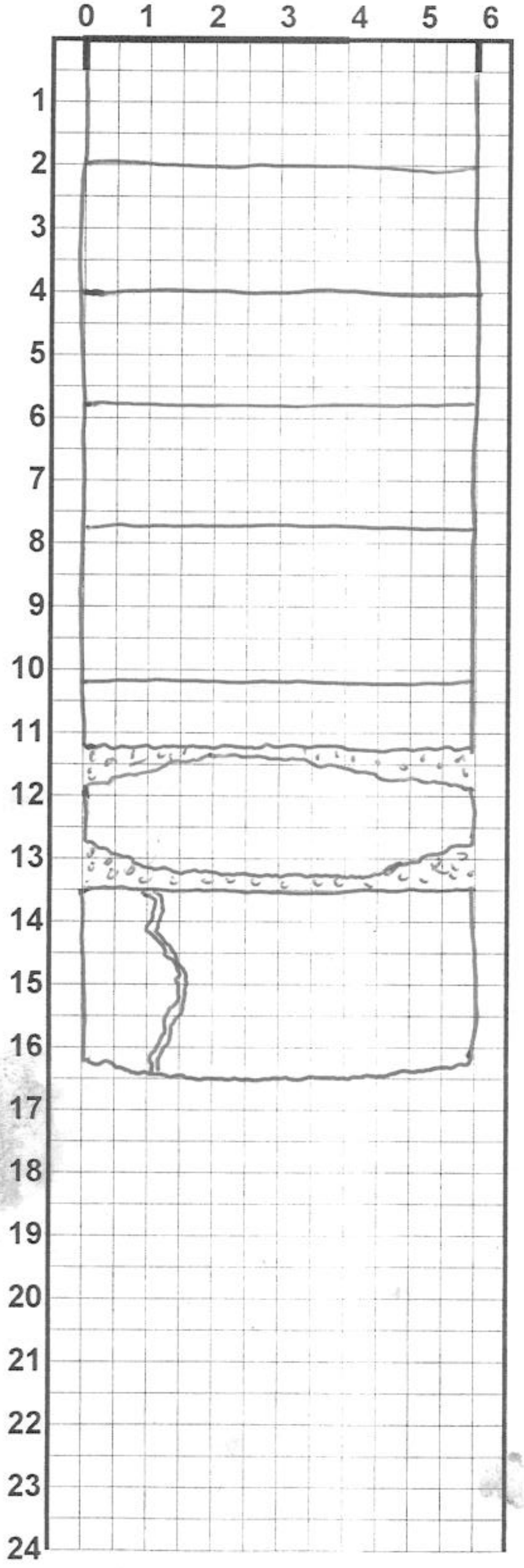
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES
PD # 9
HIGHWAY: PACIFIC HWY NO 1
Date: 10/17/06
MILEPOINT: 118.
Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS
LOCATION: SB OWTRL
CORE LENGTH: 16.50 inches
Designer: TODD SCHOLZ
EA # 07RF0632/000/J13
KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

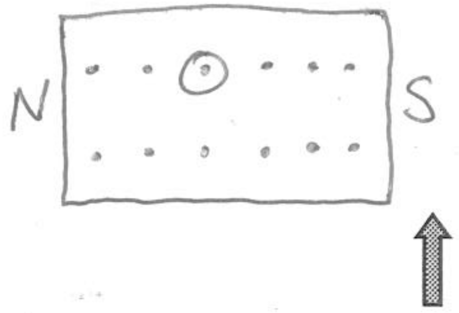
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

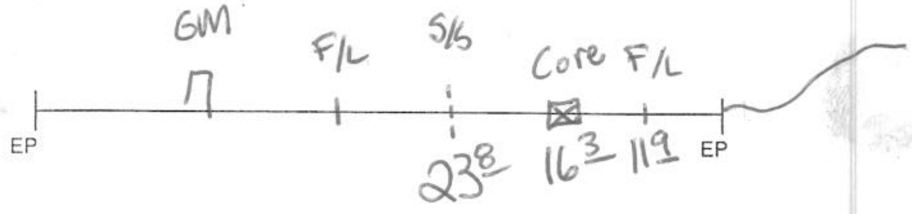
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

ODOT #29



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



G.V - Roberts Creek

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD # 6

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118.

Logged By: [✓ CRAIGH MICHAEL]
ERIC TRAVIS

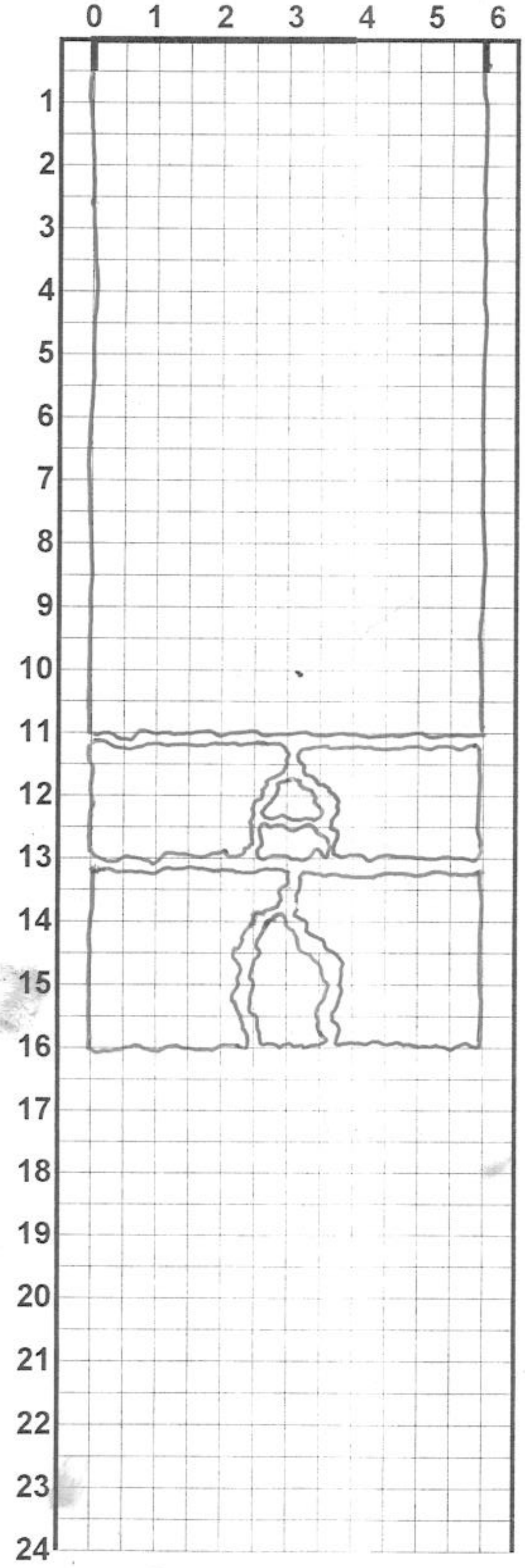
LOCATION: SB OWT RL

CORE LENGTH: 16.0 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

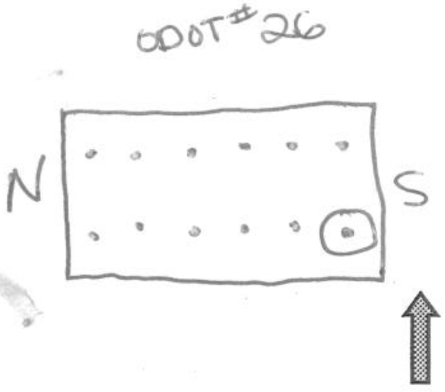
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

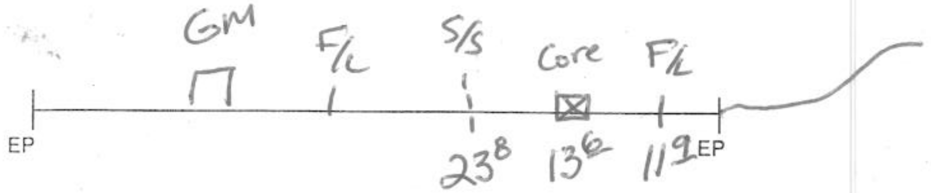
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

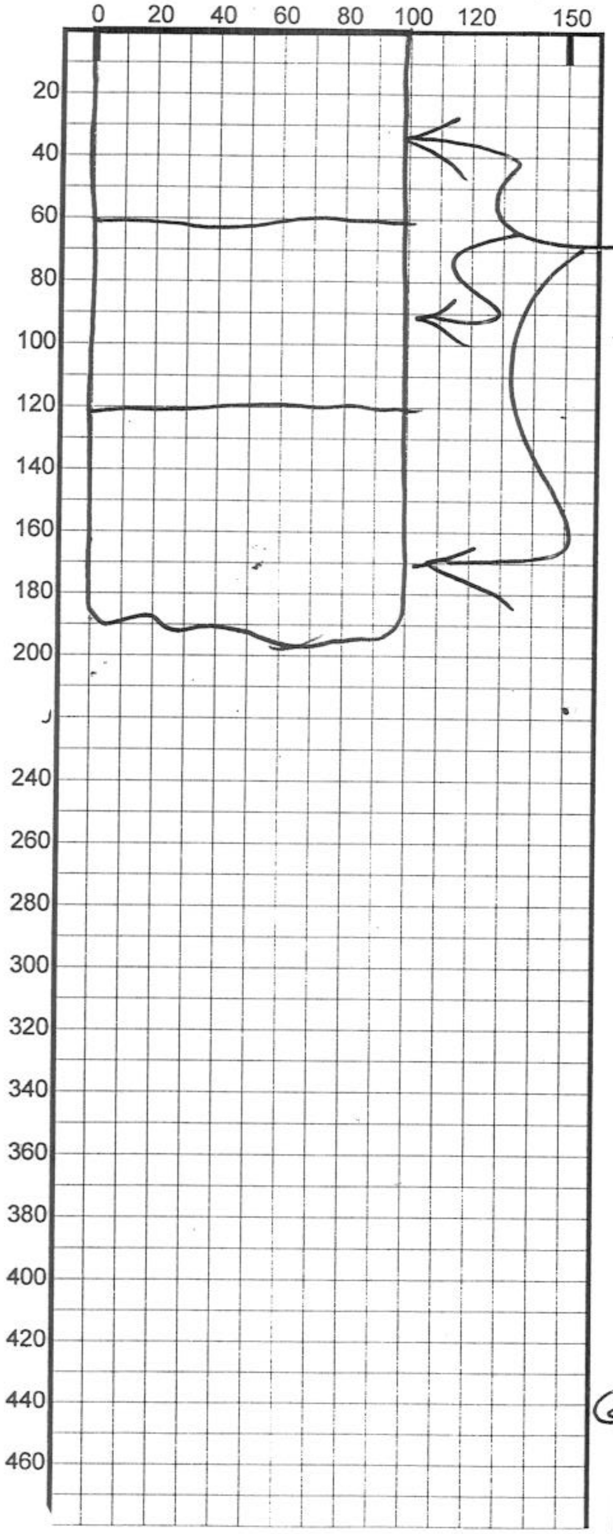


APPENDIX J: PAVEMENT CORE LOGS FOR VETS BRIDGE – MYRTLE CREEK

PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**
GHWAY: **PACIFIC HWY. NO. 1**
LOCATION: MP-109.90 SB RL OUT
CORE LENGTH: 190 mm

Saved: [✓ Yes] No
PD # 7
Date: 11-21-2000
Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER
Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

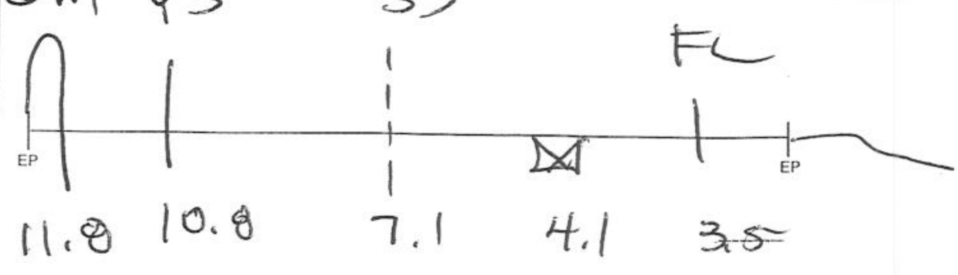
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION

SB



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

Saved: [✓ Yes] No

IGHWAY: **PACIFIC HWY. NO. 1**

PD # 6

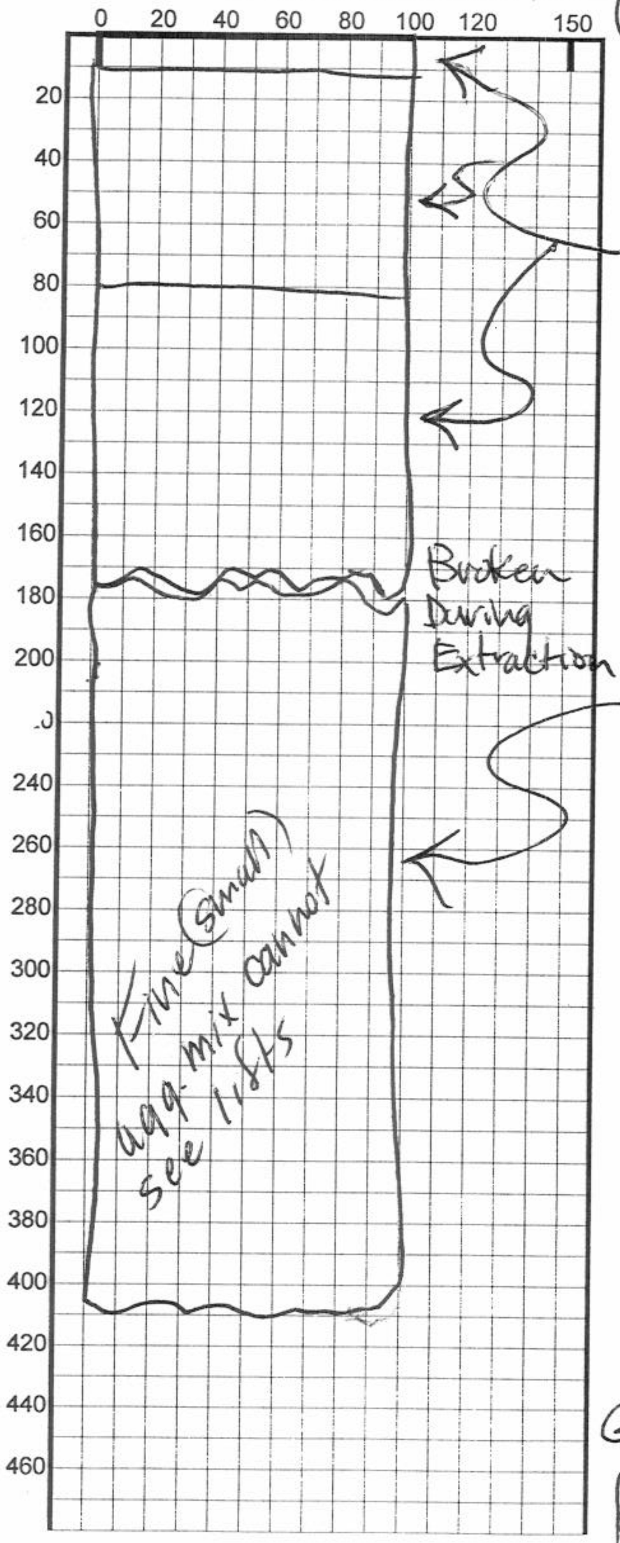
LOCATION: SB RL OUT MP 110.327

Date: 11-27-2000

CORE LENGTH: mm (30 meter South of Structure Boomer Hill Rd. Br.)

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: NO [✓ YES]

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

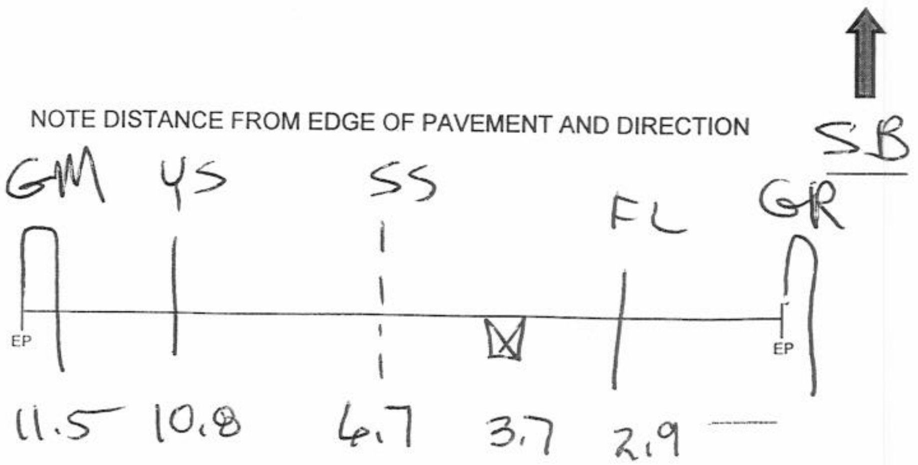
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: M.P. 110.356 SB RL OUT (Center of Boomer Hill Structure)

CORE LENGTH: 135 MM

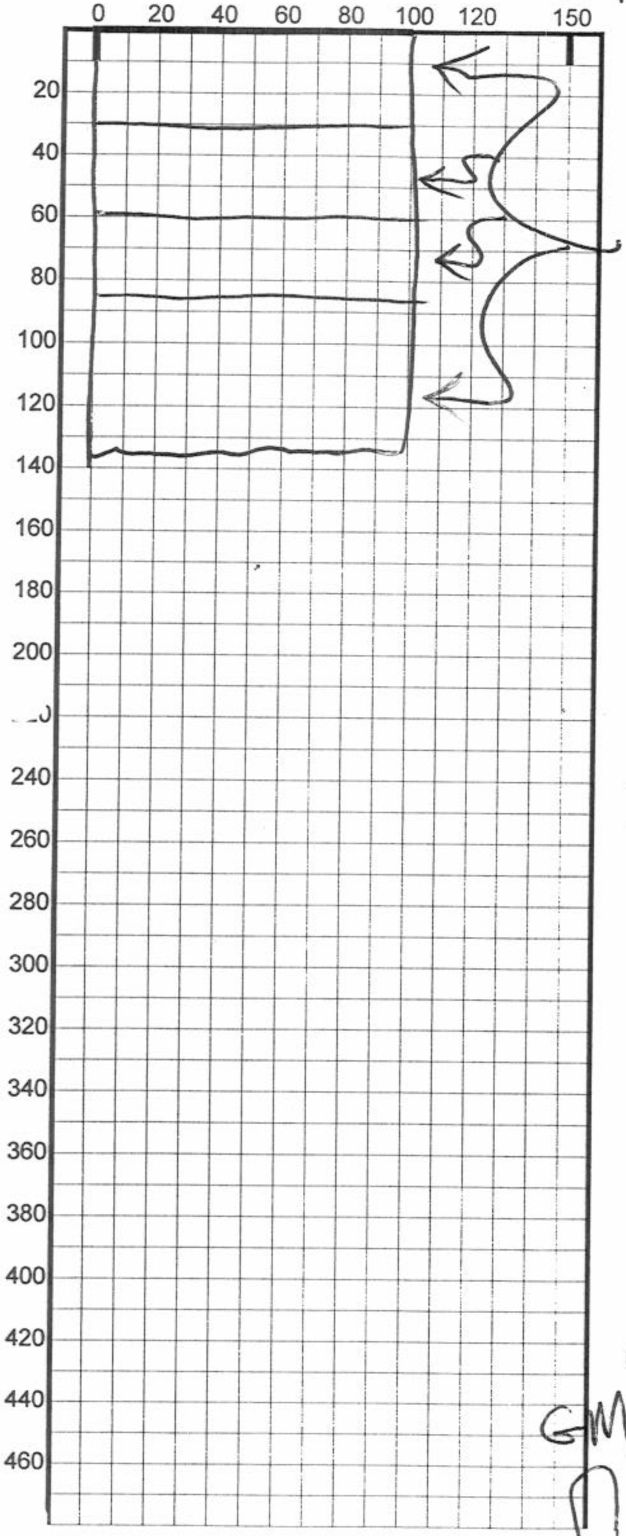
Saved: [✓ Yes] No

PD # 5

Date: 11-27-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

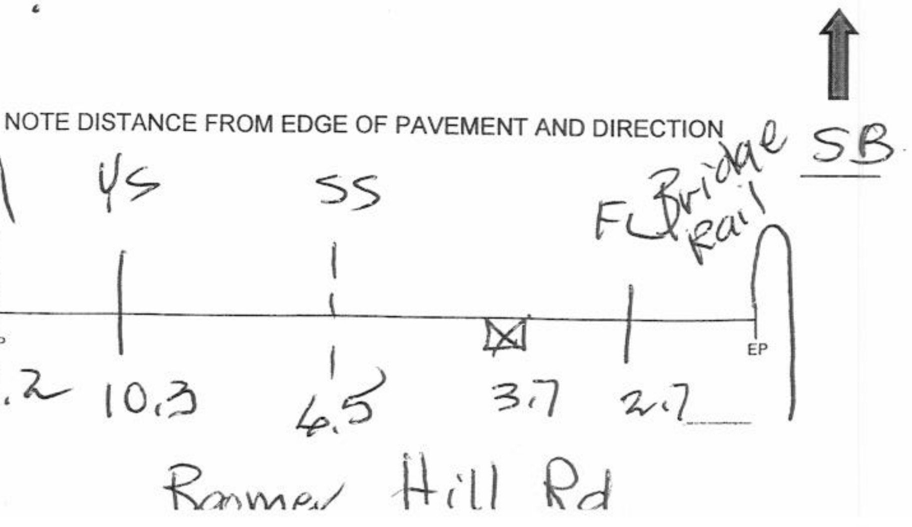
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

Saved: [✓ Yes] No

'GHWAY: **PACIFIC HWY. NO. 1**

PD # 4

LOCATION: 110,388 SB RL OWT

Date: 11-27-2000

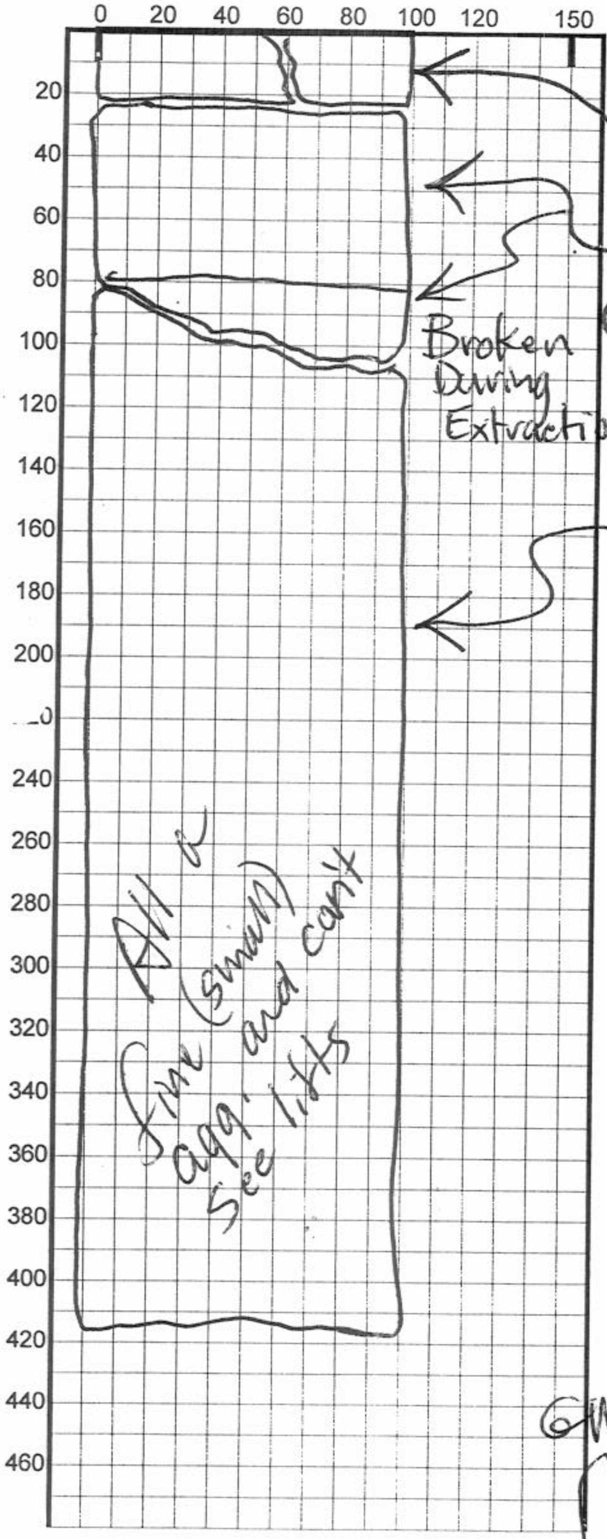
CORE LENGTH: 415 MM (27 meters North of Structure Boomer Hill Rd. Br.)

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**

DRILLED THROUGH PATCH: NO [✓ YES]

DRILLED ON CRACK: NO YES ([✓ Trans.] Long. Fat. Other):



TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

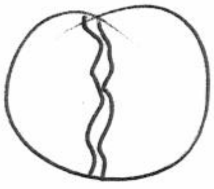
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

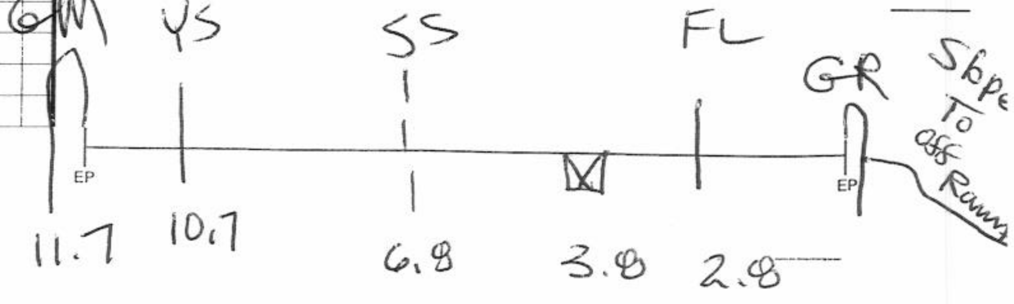
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



Top View of Core

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION

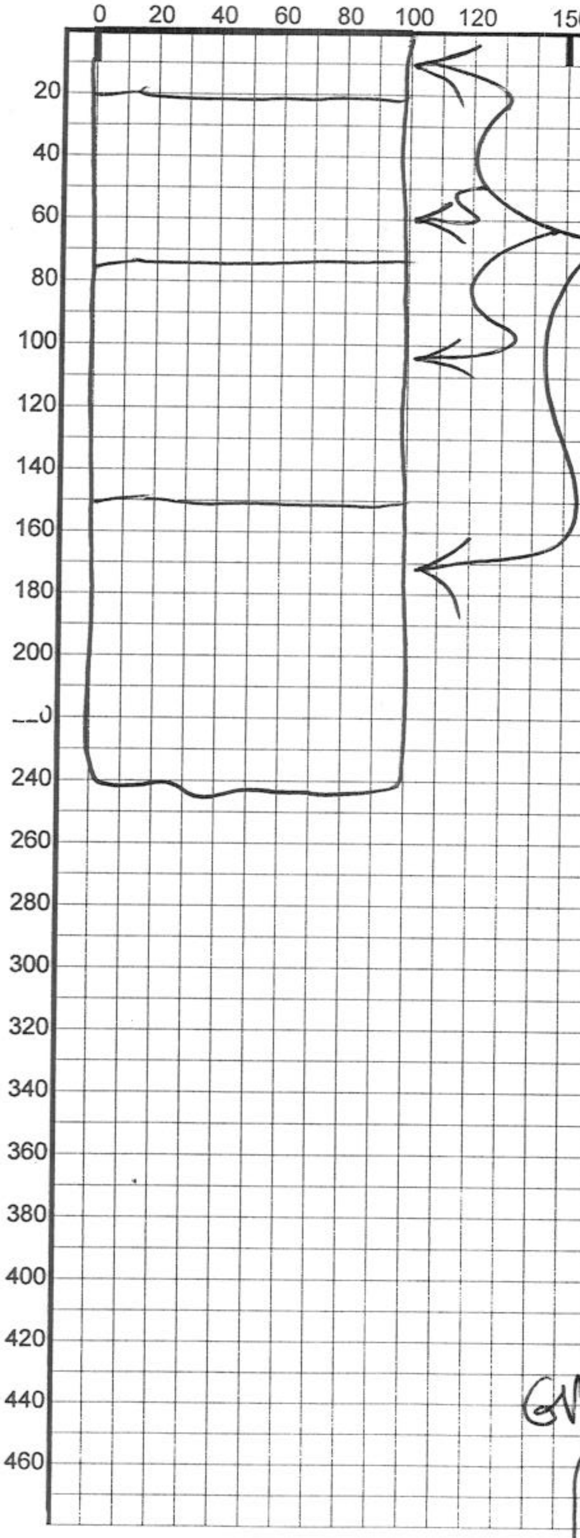
SB



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**
GHWAY: **PACIFIC HWY. NO. 1**
LOCATION: M.P. 111.00 SB RL OUT
CORE LENGTH: 240 mm

Saved: [✓ Yes] No
PD # 3
Date: 11-21-200
Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER
Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

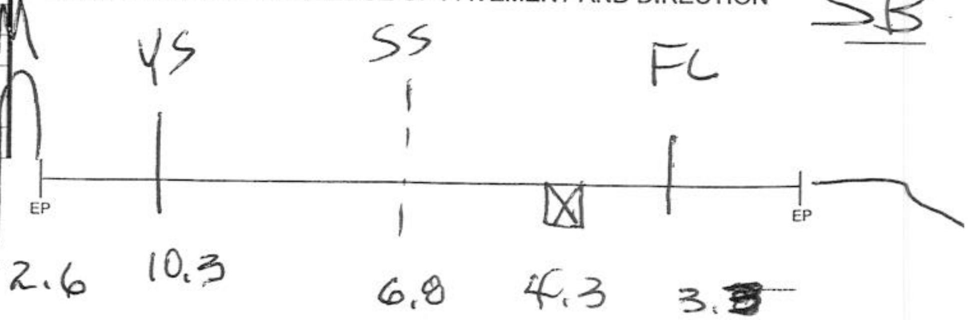
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: M.P. 111.50 SBRL OUT

CORE LENGTH: 240 mm

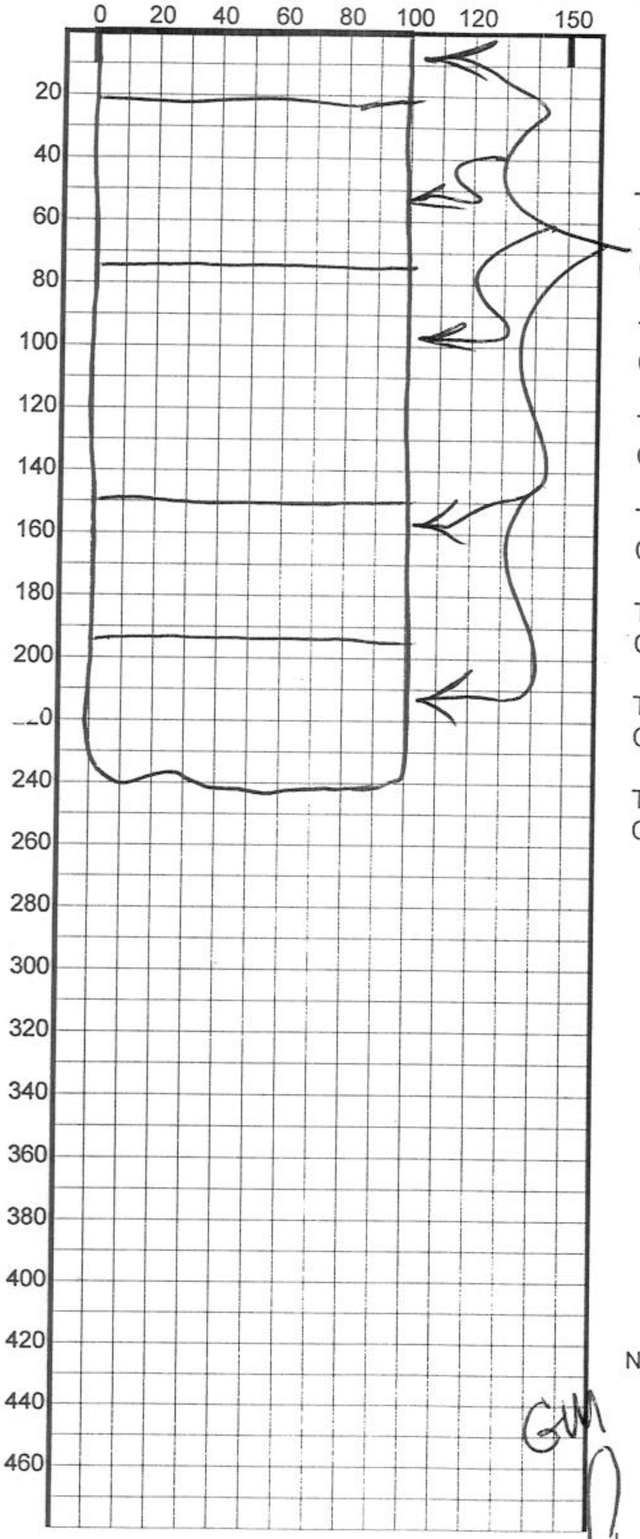
Saved: [✓ Yes] No

PD # 2

Date: 11-27-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

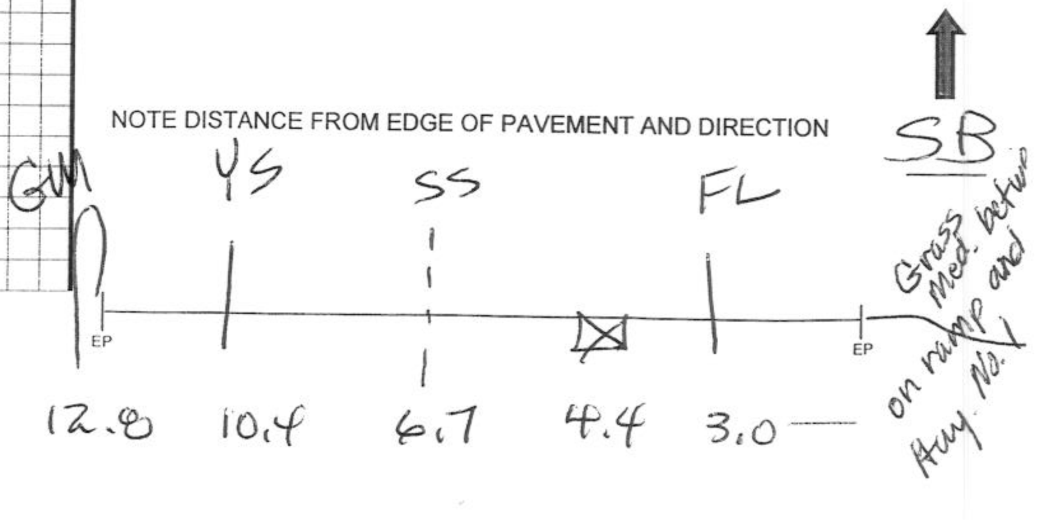
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: M.P. 111.90 SB OUT RL

CORE LENGTH: 225 MM

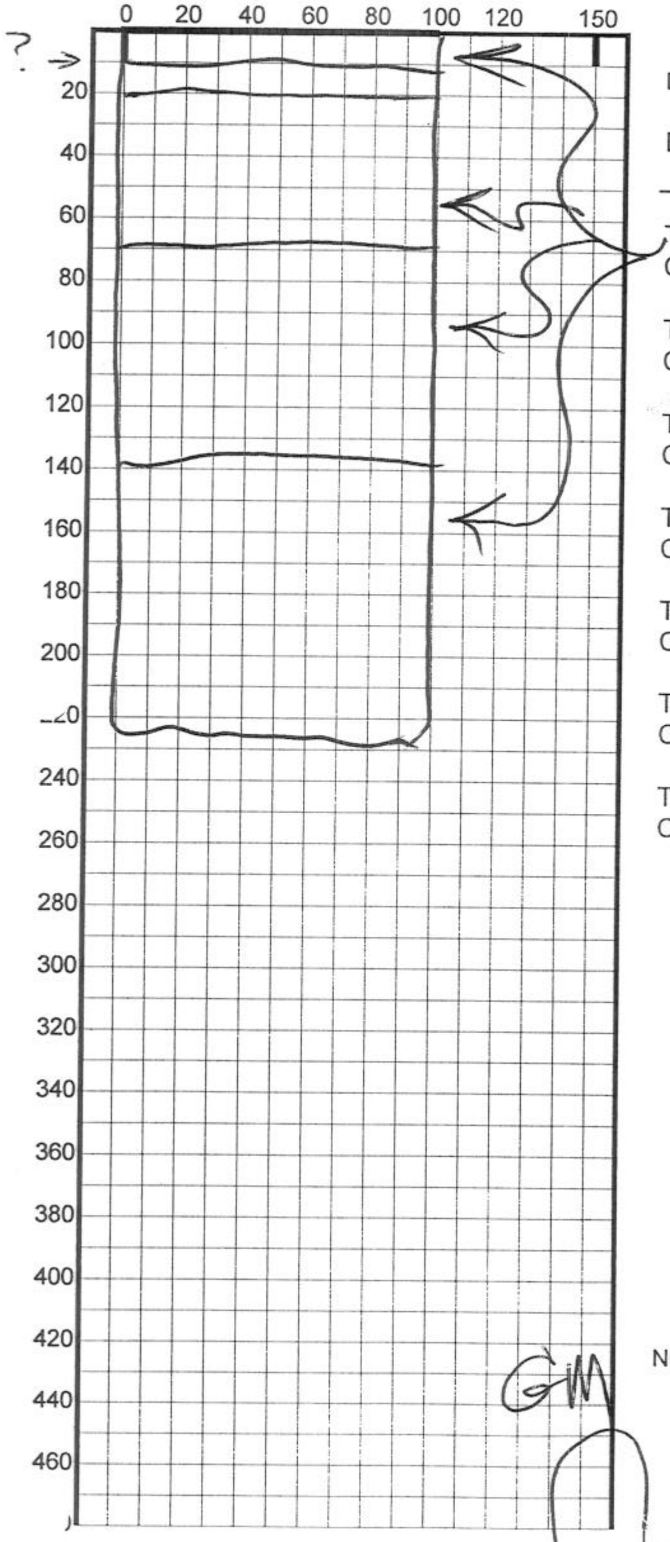
Saved: [✓ Yes] No

PD # /

Date: 11-27-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

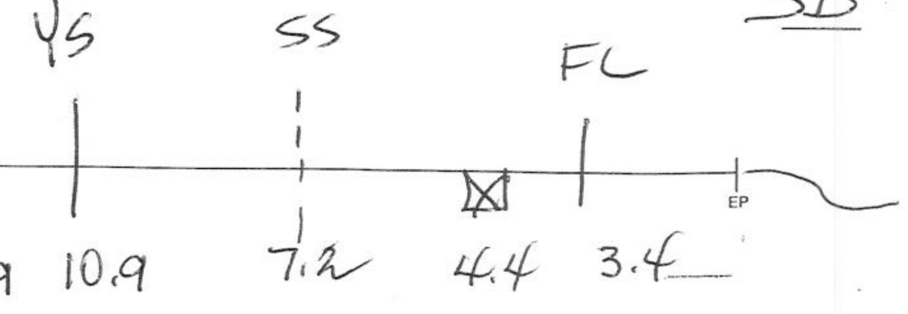
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

First possible core S.B. because of on ramp @ M.P. 112.23

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: MP 108.994 NB RL OUT

CORE LENGTH: 270 mm

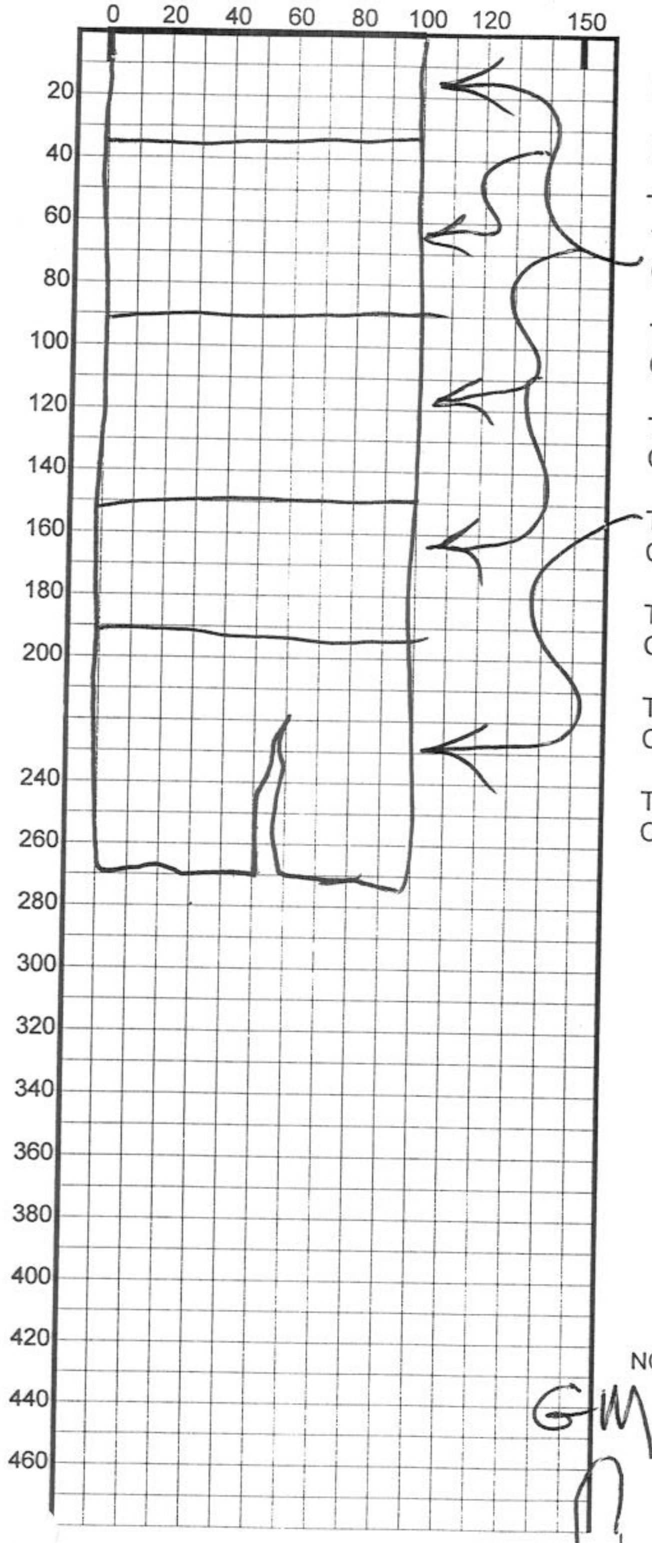
Saved: [✓ Yes] No

PD # 11

Date: 11-28-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

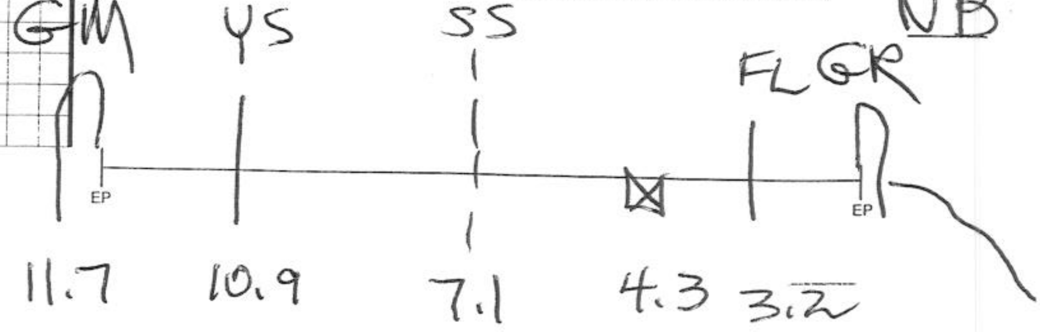
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION

NB



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: MP 109.50 NB RL OUT

CORE LENGTH: 240 MM

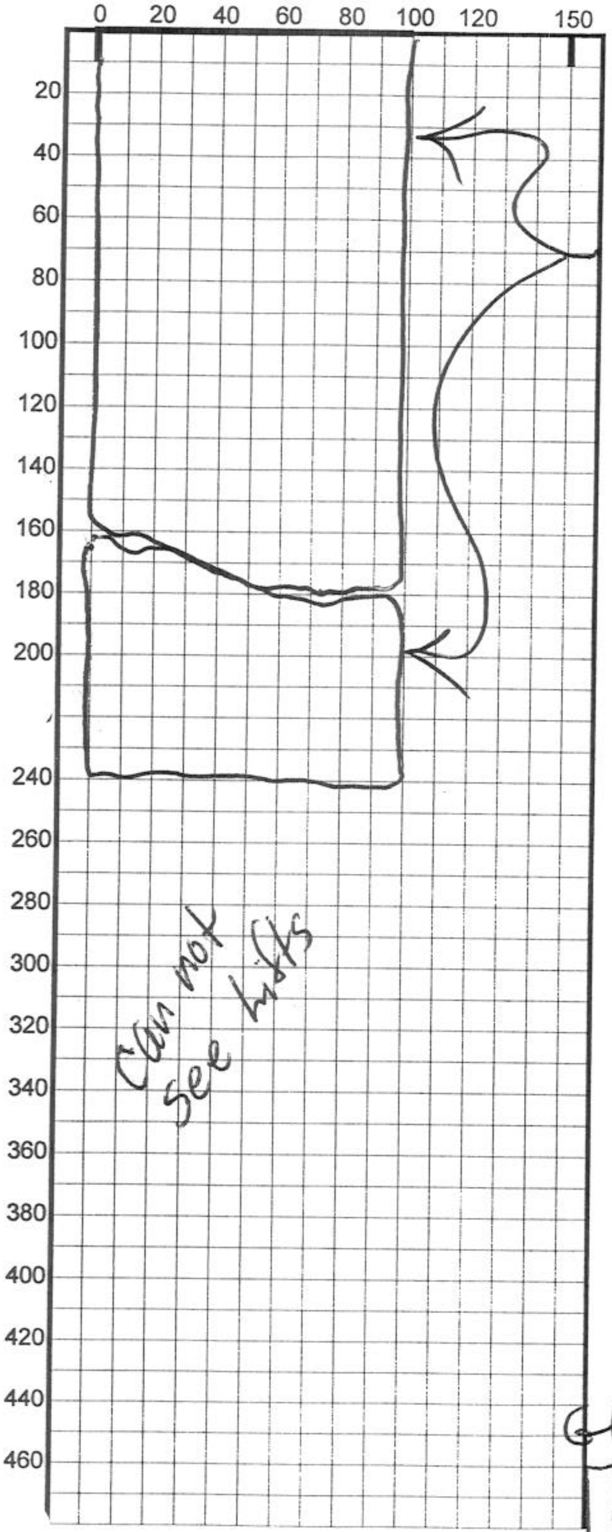
Saved: [✓ Yes] No

PD # 12

Date: 11-28-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

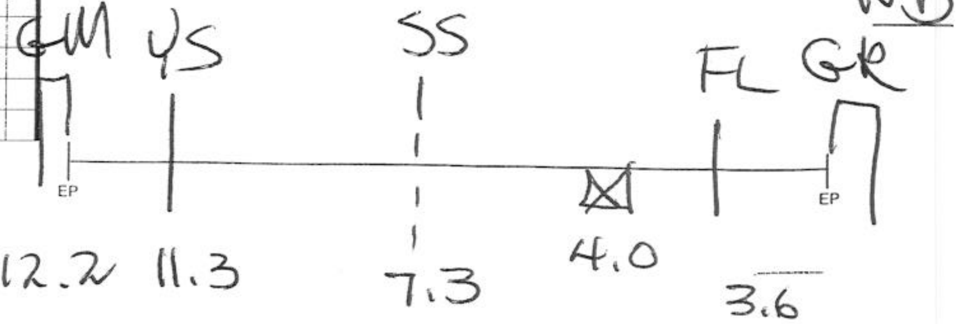
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC. Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION NB



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: MP 110.00 NB RL OWT

CORE LENGTH: 250 mm

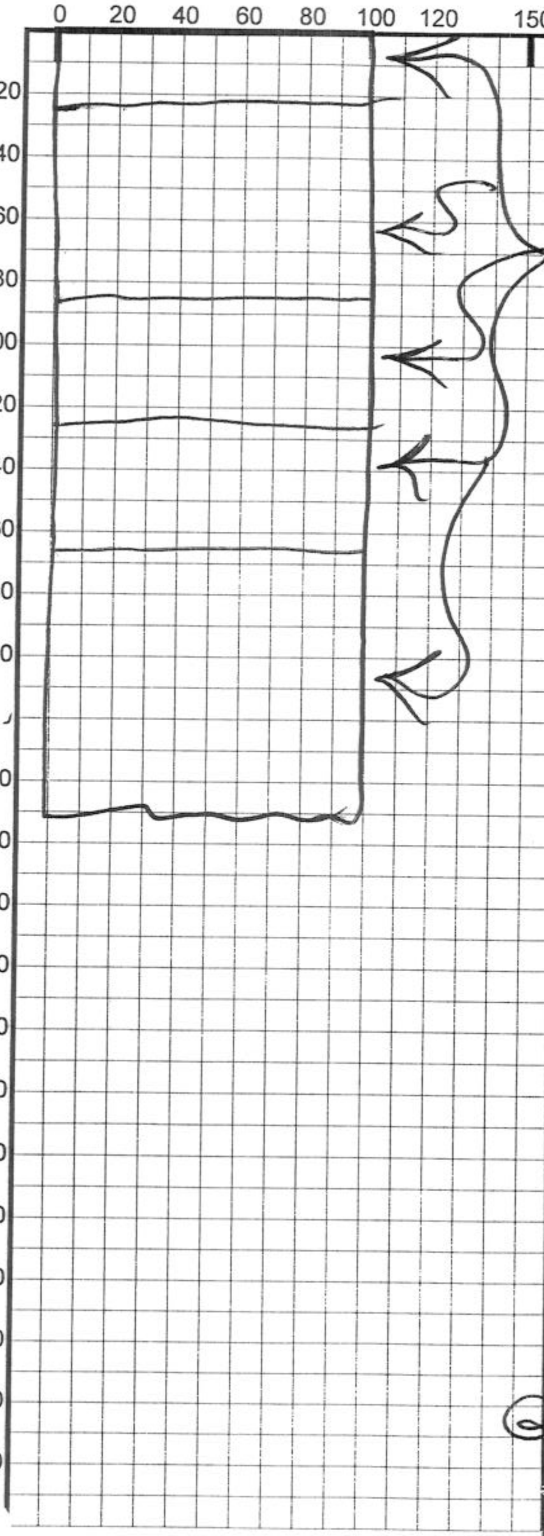
Saved: [✓ Yes] No

PD # 13

Date: 11-28-2006

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

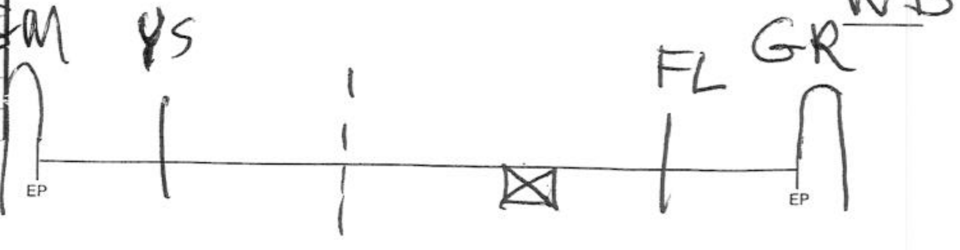
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION

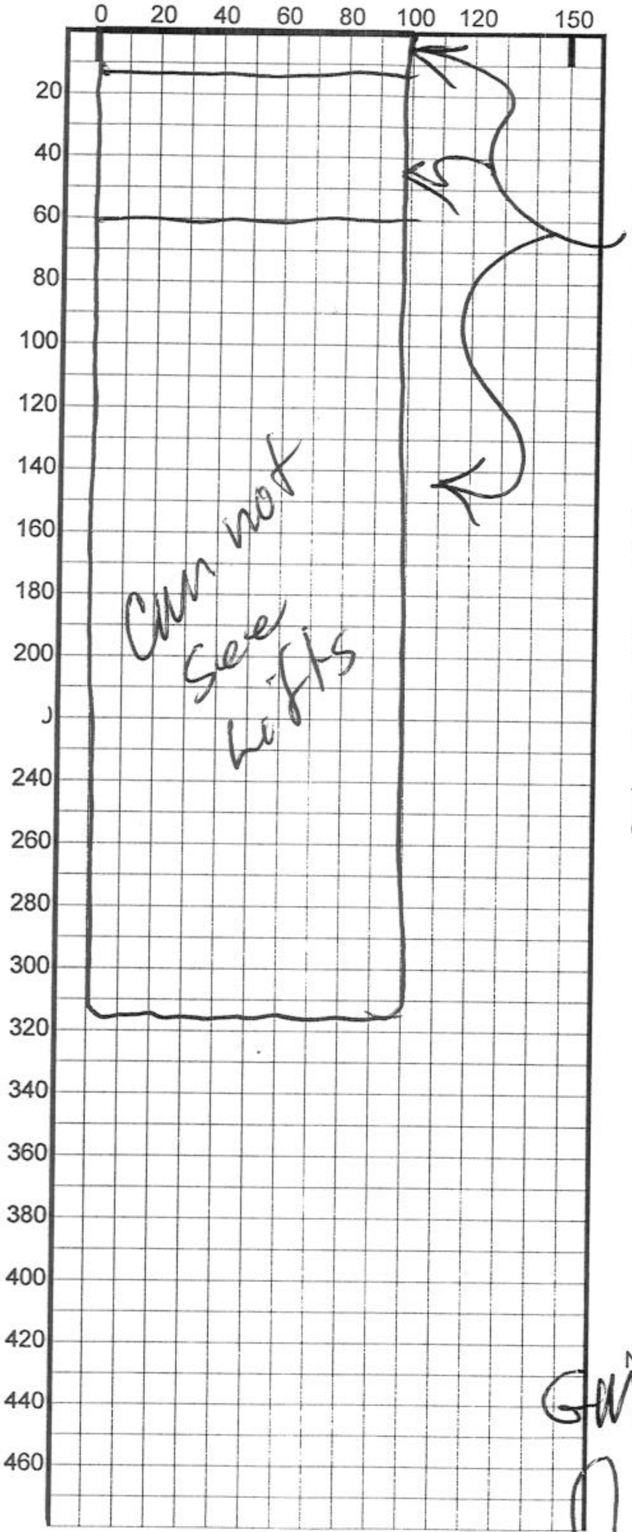


39.5' 34.7' 22.10' 12.8' 11.4'
12.0 10.6 6.7 3.9

PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**
'GHWAY: **PACIFIC HWY. NO. 1**
LOCATION: M.P. 110.32 NB OWTRL
CORE LENGTH: 315mm 30 meters S. of S. end of Br.

Saved [✓ Yes] No
PD # 14
Date: 11-28-2000
Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER
Designer: **ROGER**



DRILLED THROUGH PATCH: NO YES

DRILLED ON CRACK: NO YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

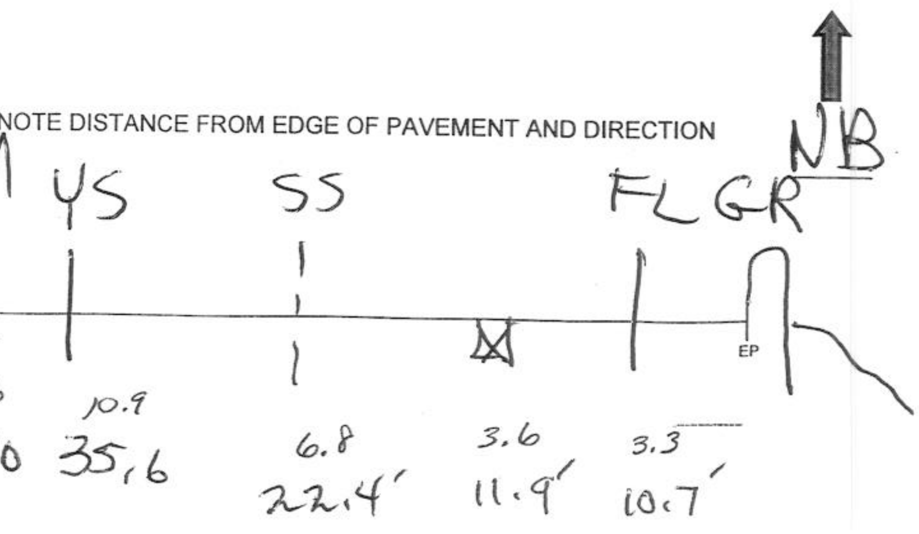
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: MP 110.36 NB RL OUT center of Br

CORE LENGTH: 130 mm

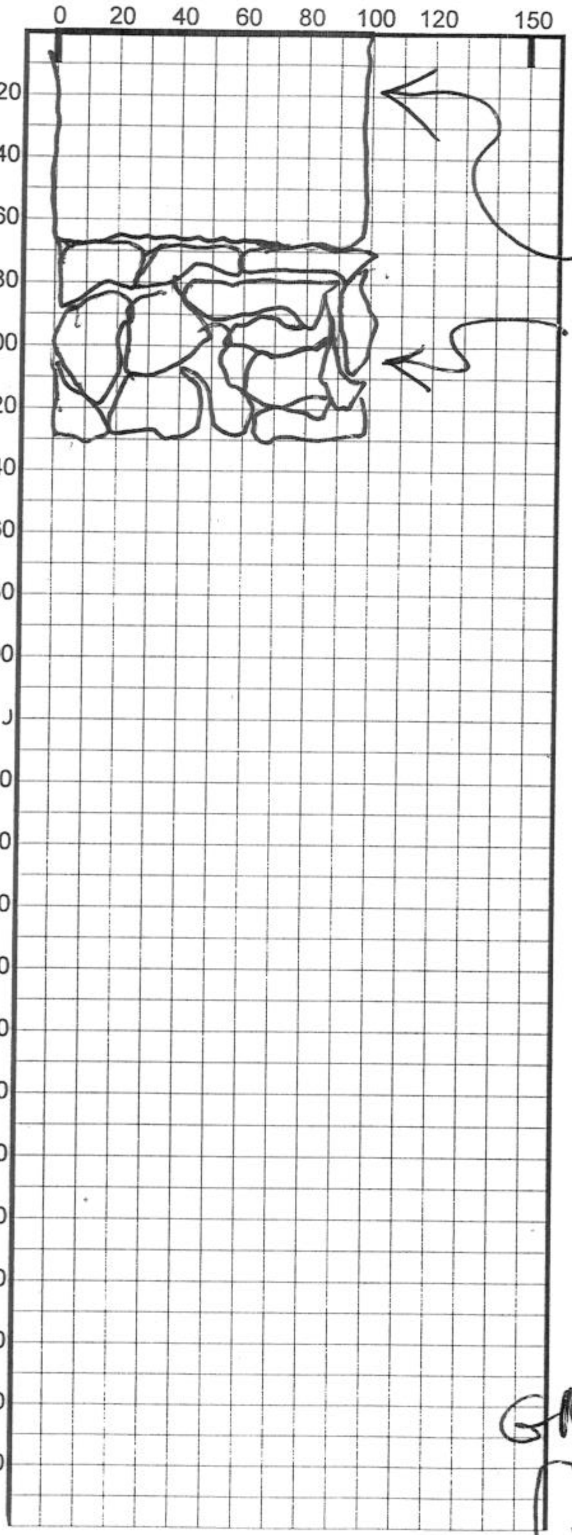
Saved: [✓ Yes] No

PD # 15

Date: 11-28-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor Broken to extract off the concrete deck

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

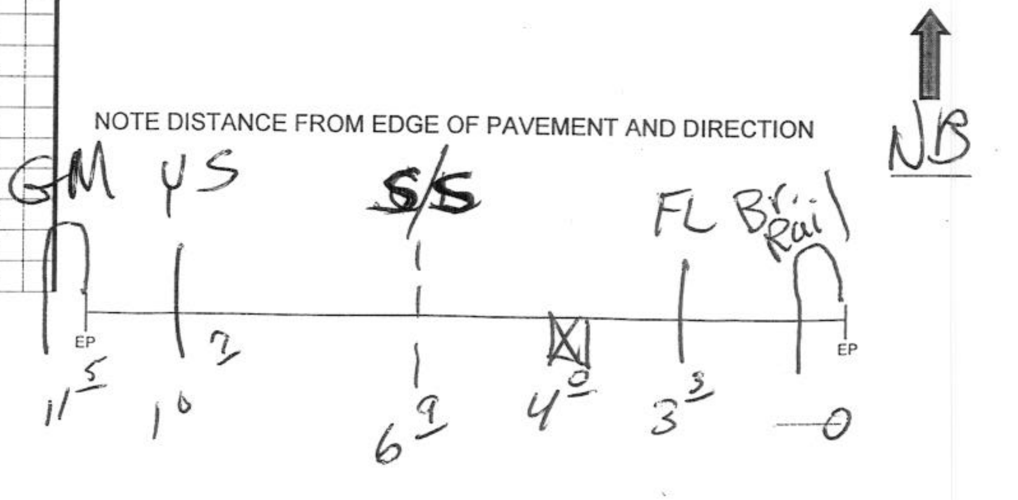
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: MP 110.50 NB RL OWT

CORE LENGTH: 315 mm

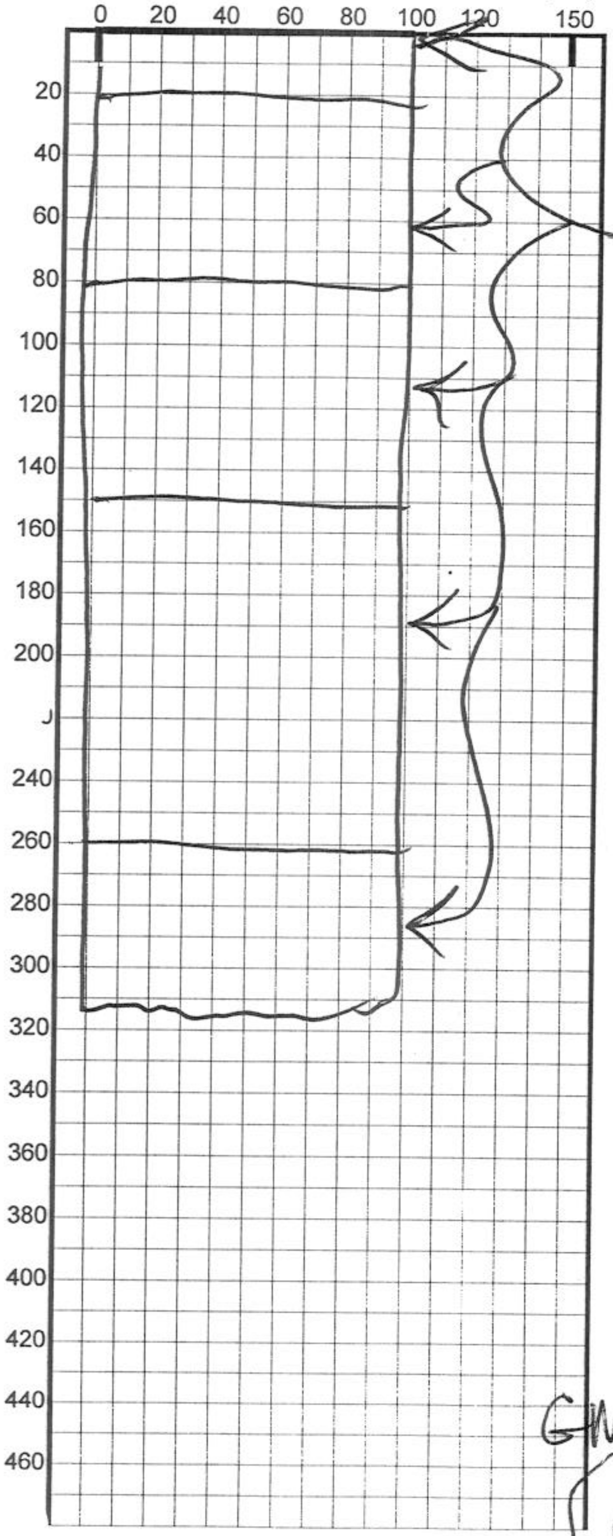
Saved: [✓ Yes] No

PD # 16

Date: 11-29-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

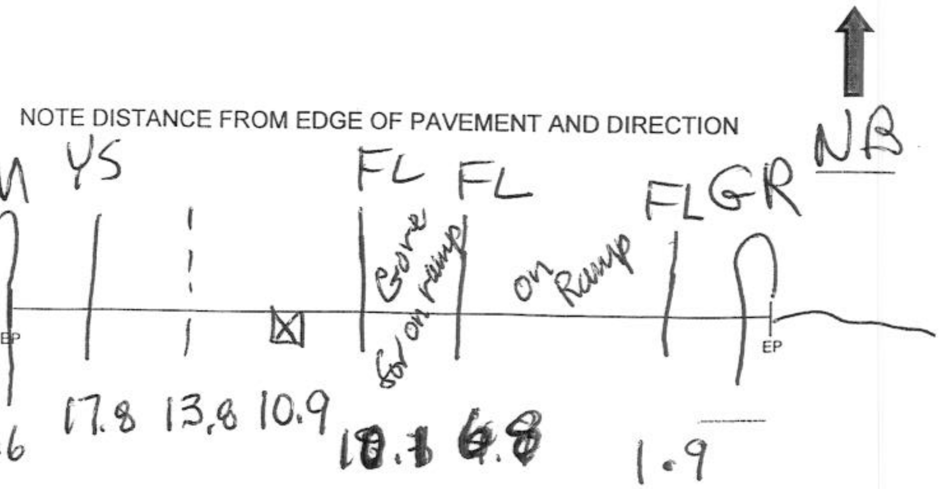
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

GHWAY: **PACIFIC HWY. NO. 1**

LOCATION: M.P. 110.95 NB RL OUT

CORE LENGTH: 220 mm

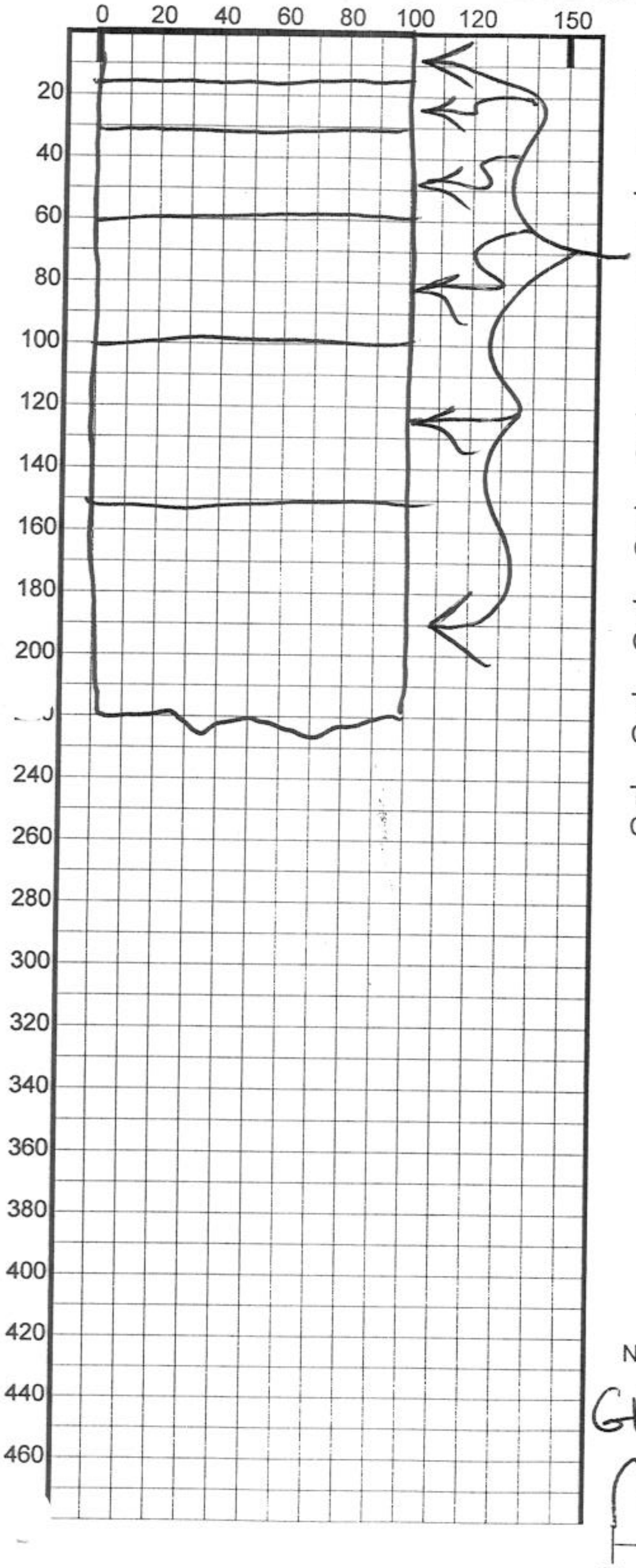
Saved: [✓ Yes] No

PD # 17

Date: 11-29-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

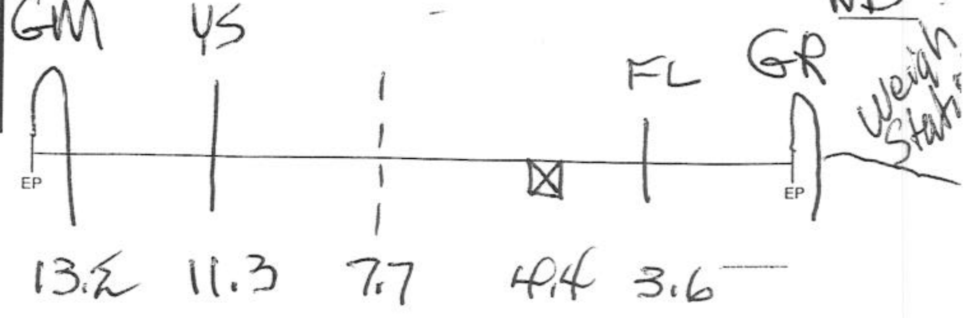
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION

NB



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

3HWAY: **PACIFIC HWY. NO. 1**

LOCATION: 111,50 NB RL OUT

CORE LENGTH: 240 mm

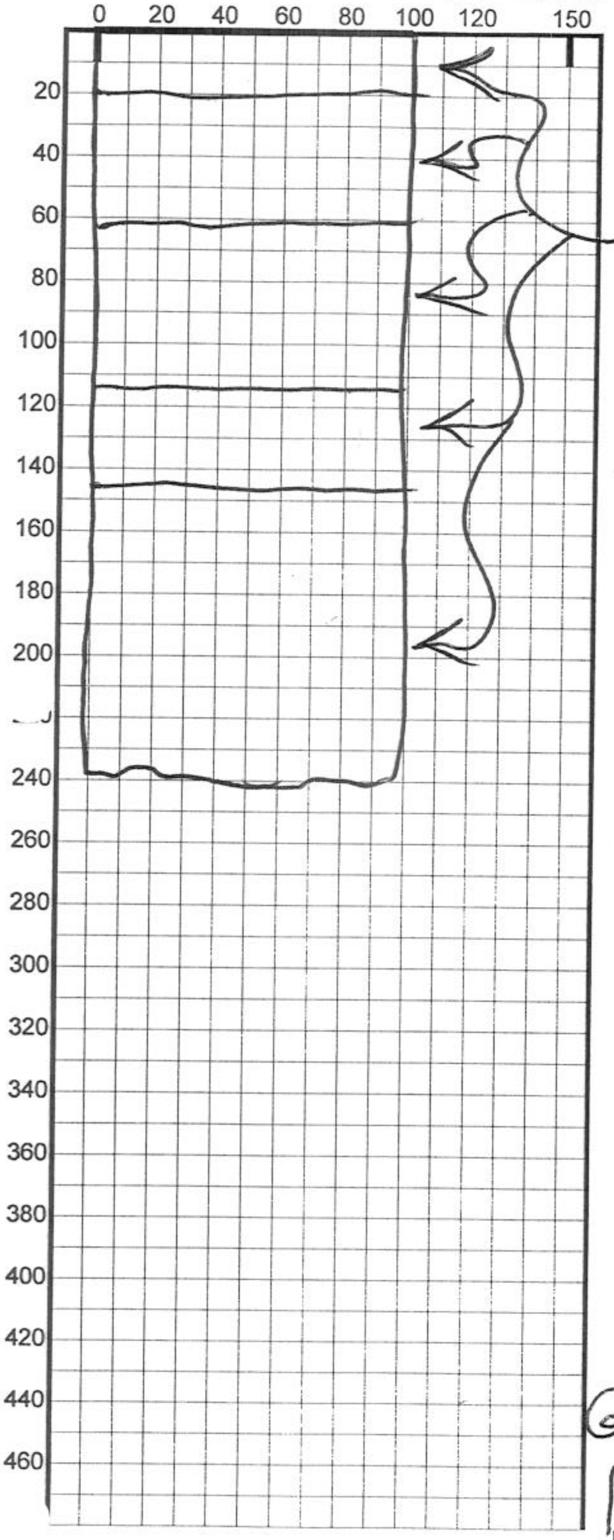
Saved: [✓ Yes] No

PD # 18

Date: 12-29-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

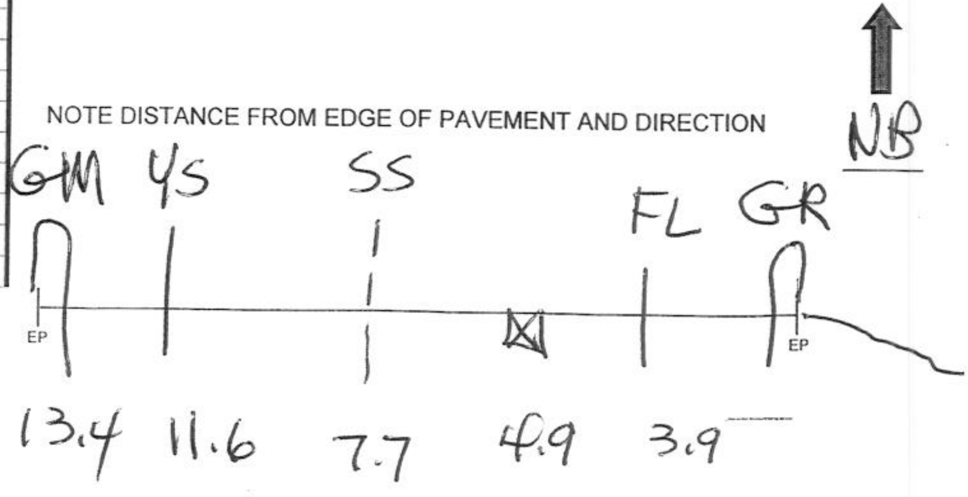
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

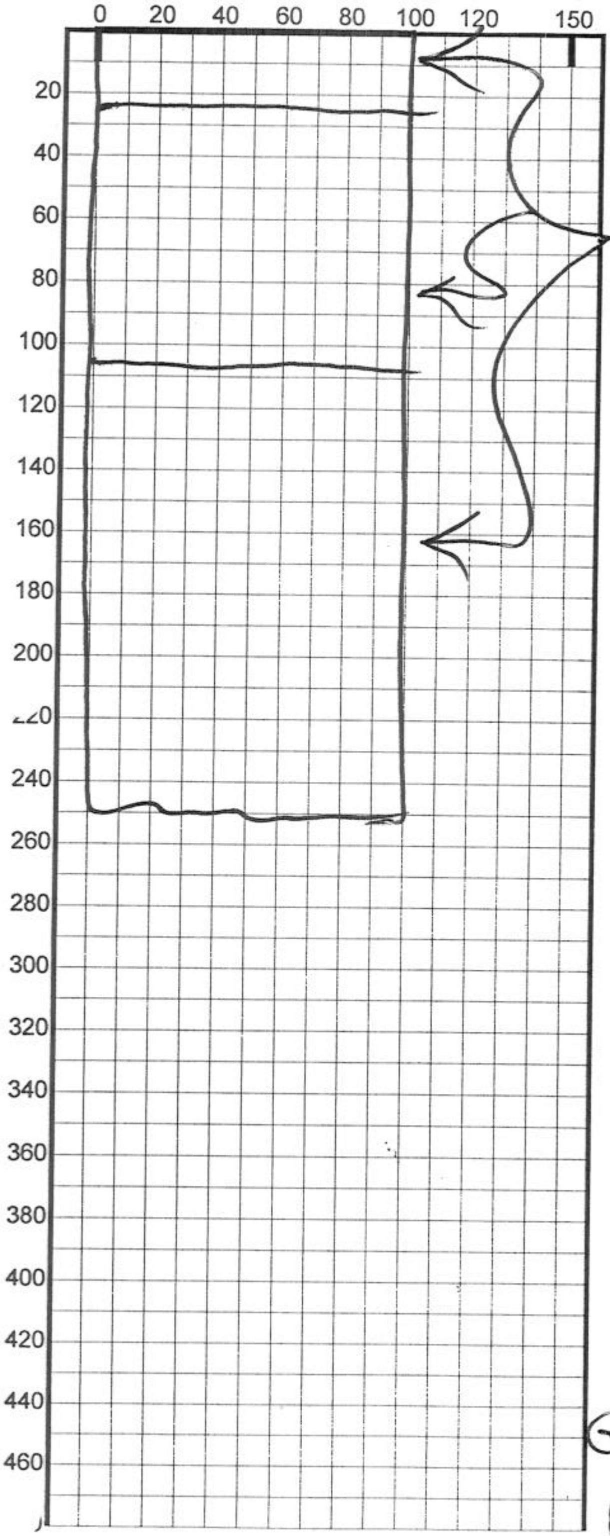
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**
GHWAY: **PACIFIC HWY. NO. 1**
LOCATION: 111.95 NB RL OUT
CORE LENGTH: 250 mm

Saved: [✓ Yes] No
PD # 19
Date: 11-29-2000
Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER
Designer: **ROGER**



DRILLED THROUGH PATCH: NO [✓ YES]

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

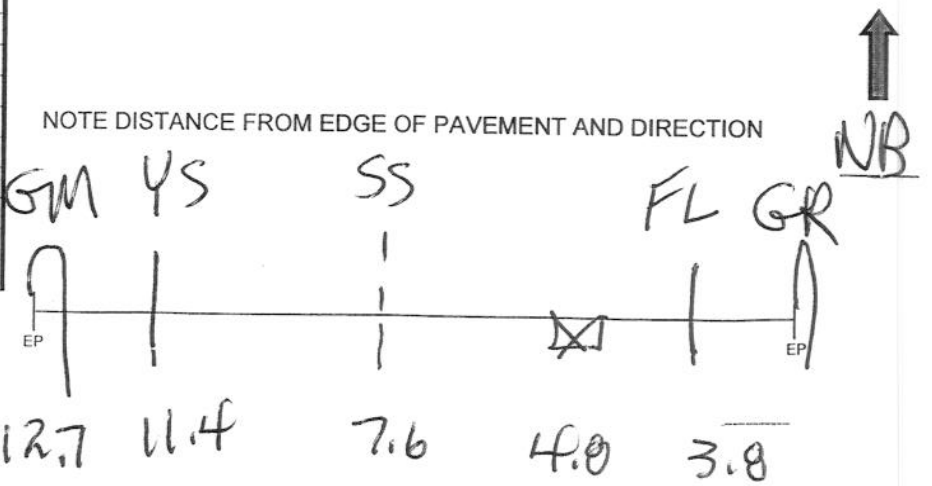
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

This is one of the inlayed patch locations called out in the Field Work Request.

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

HIGHWAY: **PACIFIC HWY. NO. 1**

LOCATION: MP 111.05 NB LL IWT

CORE LENGTH: 250 MM

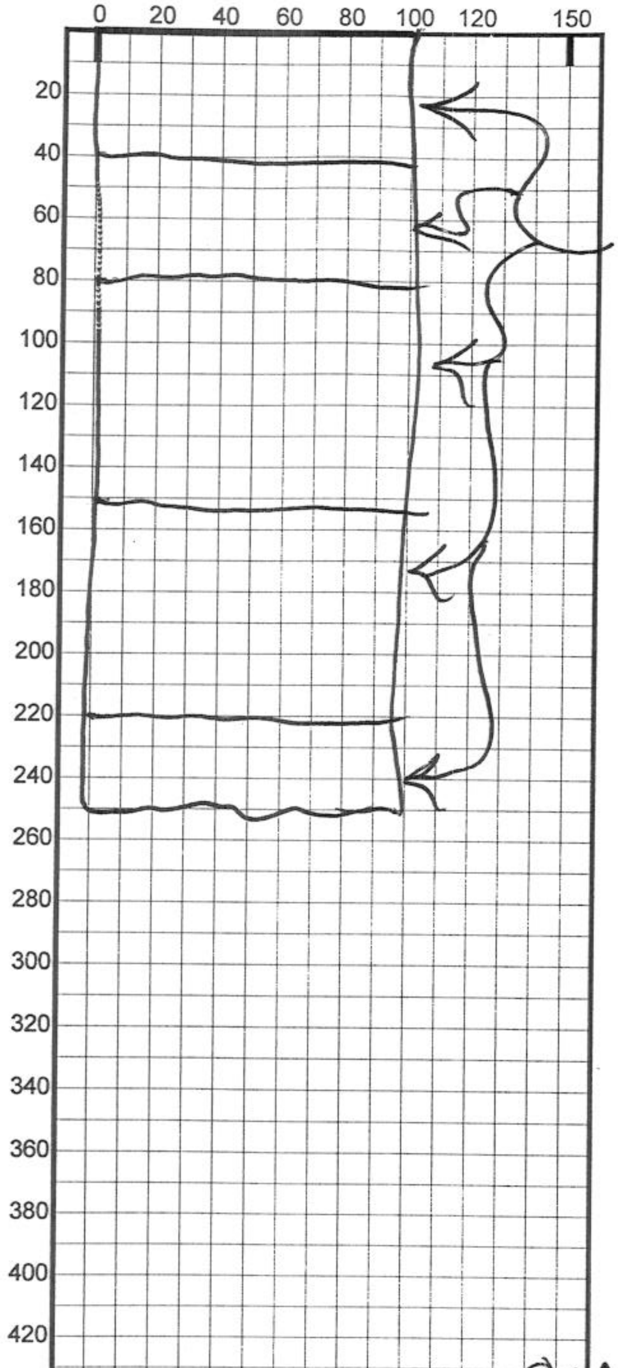
Saved: [✓ Yes] No

PD # 20

Date: 11-29-2

Logged By: [✓ BRUCE] JIM CRAIG JOHN

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Oth

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

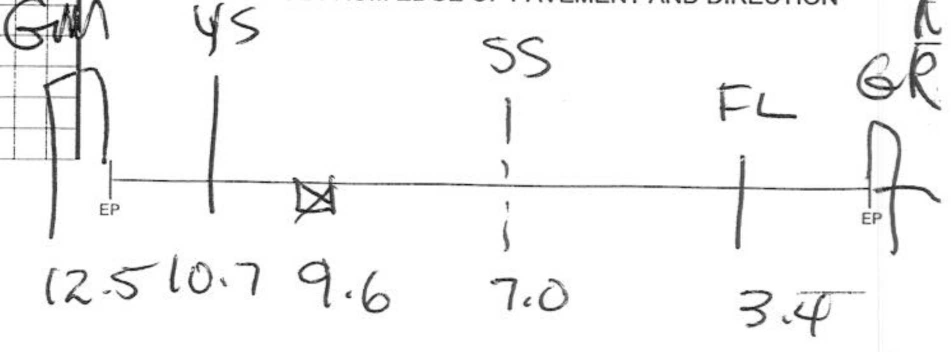
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

HIGHWAY: **PACIFIC HWY. NO. 1**

LOCATION: M.P. 111.85 NB LL IWT

CORE LENGTH: 320 mm

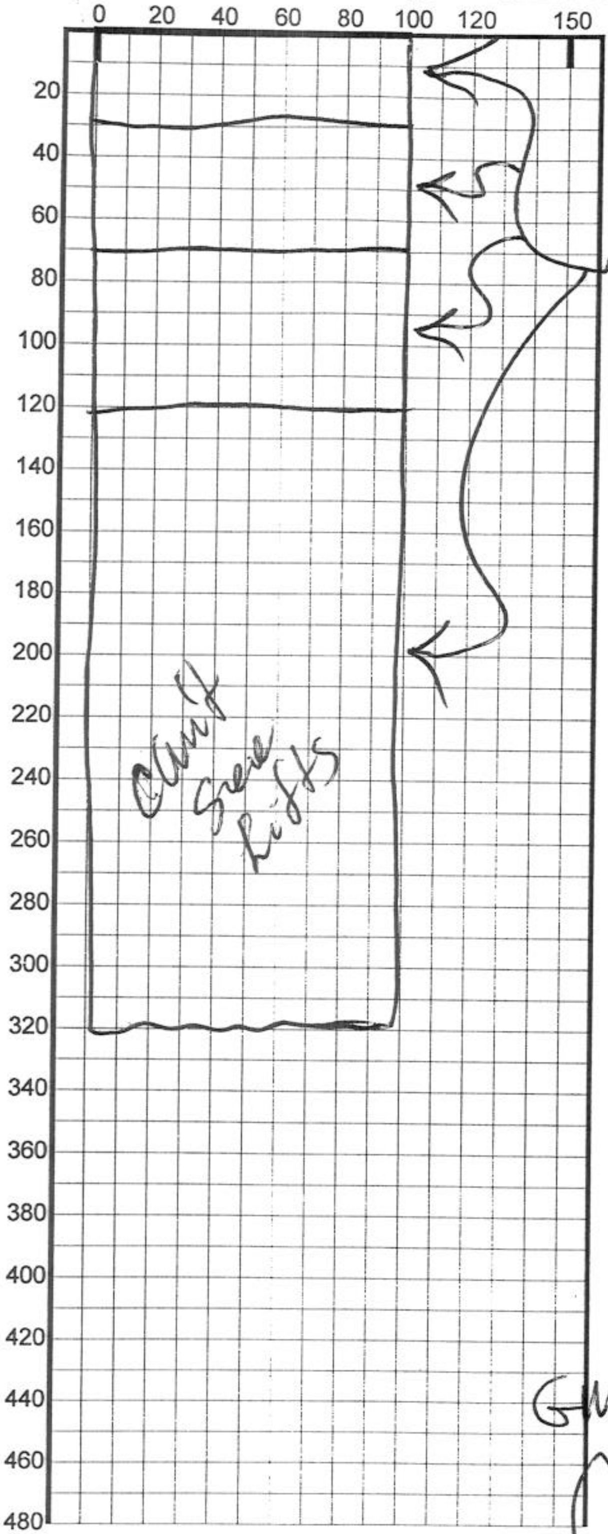
Saved: [✓ Yes] No

PD # 21

Date: 11-29-2

Logged By: [✓ BRUCE] JIM CRAIG JOHN RO

Designer: **ROGER**



DRILLED THROUGH PATCH: NO [✓ YES]

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other)

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

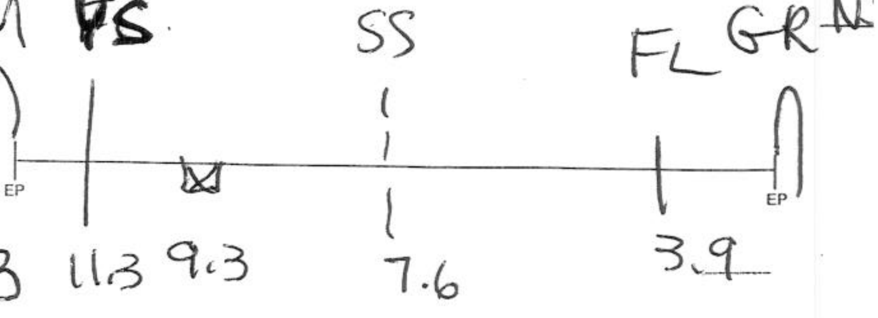
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

Inlay Patch requested for coring on the Field Work Request.

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

HIGHWAY: **PACIFIC HWY. NO. 1**

LOCATION: 110.05 SB LL IWT

CORE LENGTH: 280 mm

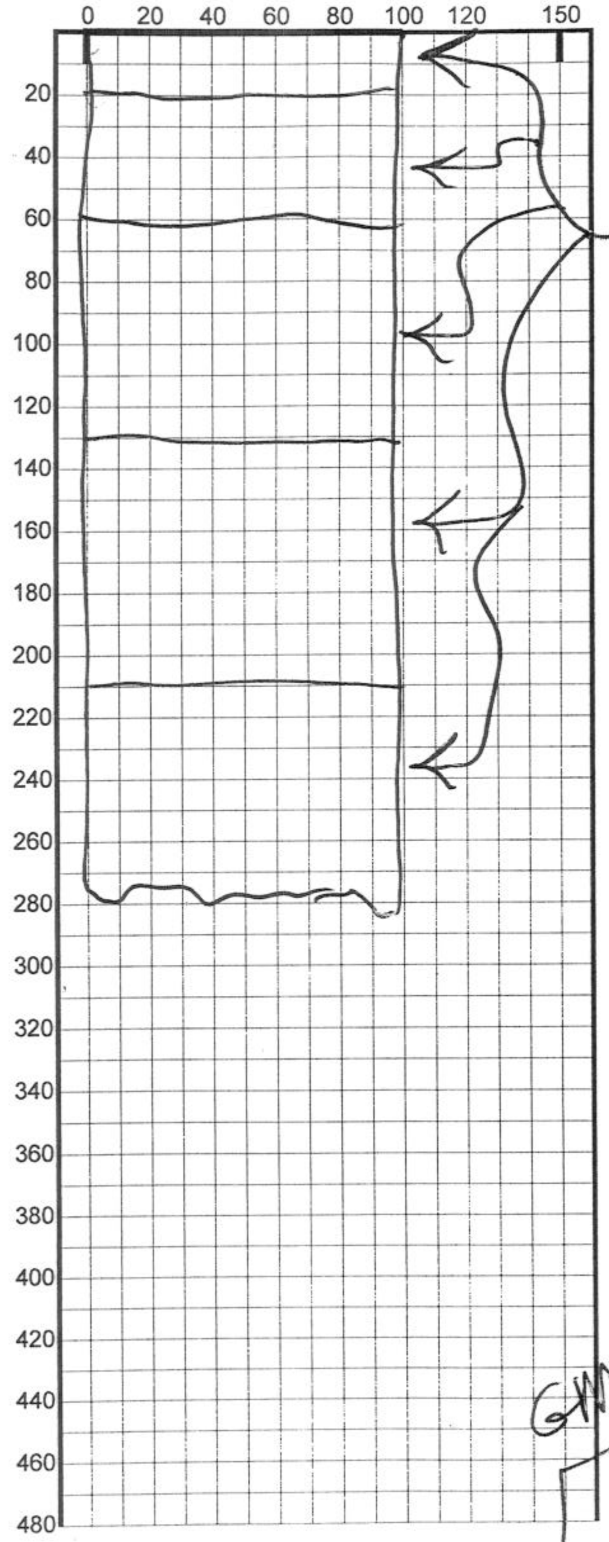
Saved: [✓ Yes] No

PD # 9

Date: 11-28-20

Logged By: [✓ BRUCE] JIM CRAIG JOHN RO

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

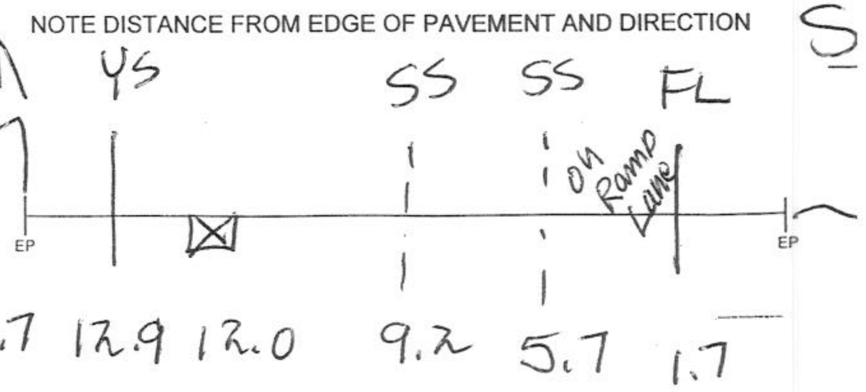
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

HIGHWAY: **PACIFIC HWY. NO. 1**

LOCATION: M.P. 109.2 SB LL IWT

CORE LENGTH: 260 mm

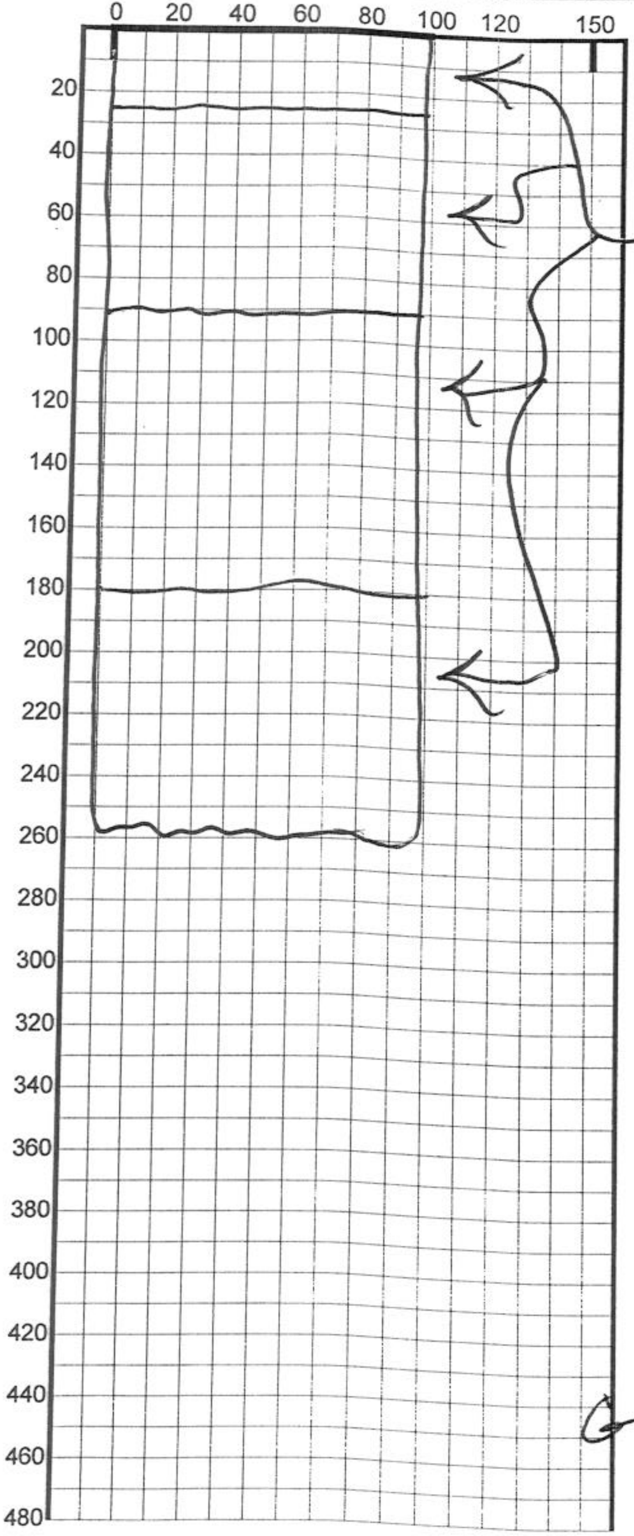
Saved: [✓ Yes] No

PD # 10

Date: 11-28-200

Logged By: [✓ BRUCE] JIM CRAIG JOHN RO

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

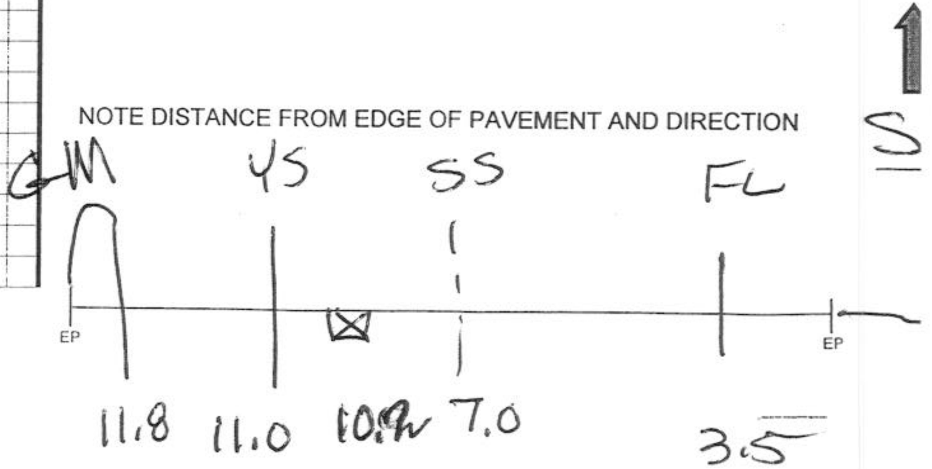
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



PAVEMENT CORE LOG

PROJECT: **DILLARD JCT. - MYRTLE CREEK**

IGHWAY: **PACIFIC HWY. NO. 1**

LOCATION: MP. 109.50 SB RL OUT

CORE LENGTH: 160 mm

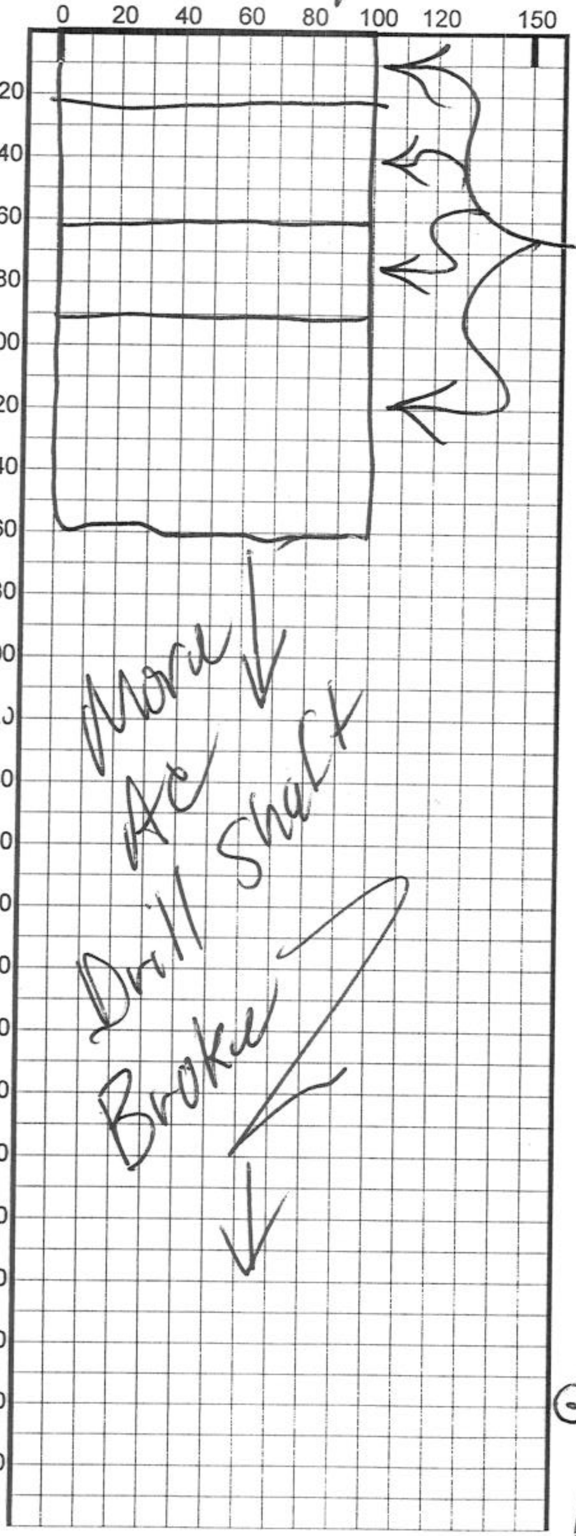
Saved: [✓ Yes] No

PD # 8

Date: 11-27-2000

Logged By: [✓ BRUCE] JIM CRAIG JOHN ROGER

Designer: **ROGER**



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

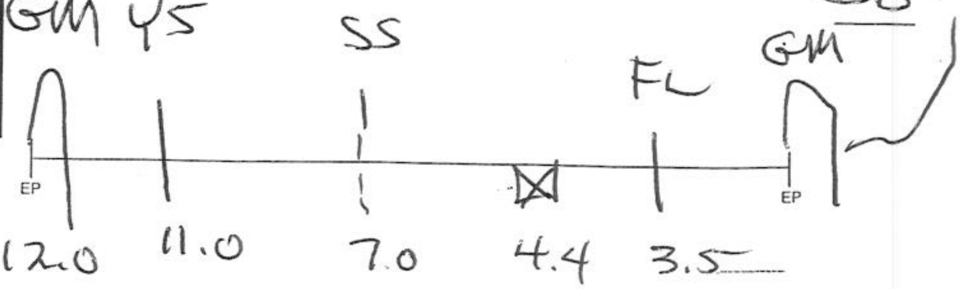
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



M1-9

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 109.90

LOCATION: SB BWT RL

CORE LENGTH: inches

PD # 8

Date: 10/26/06

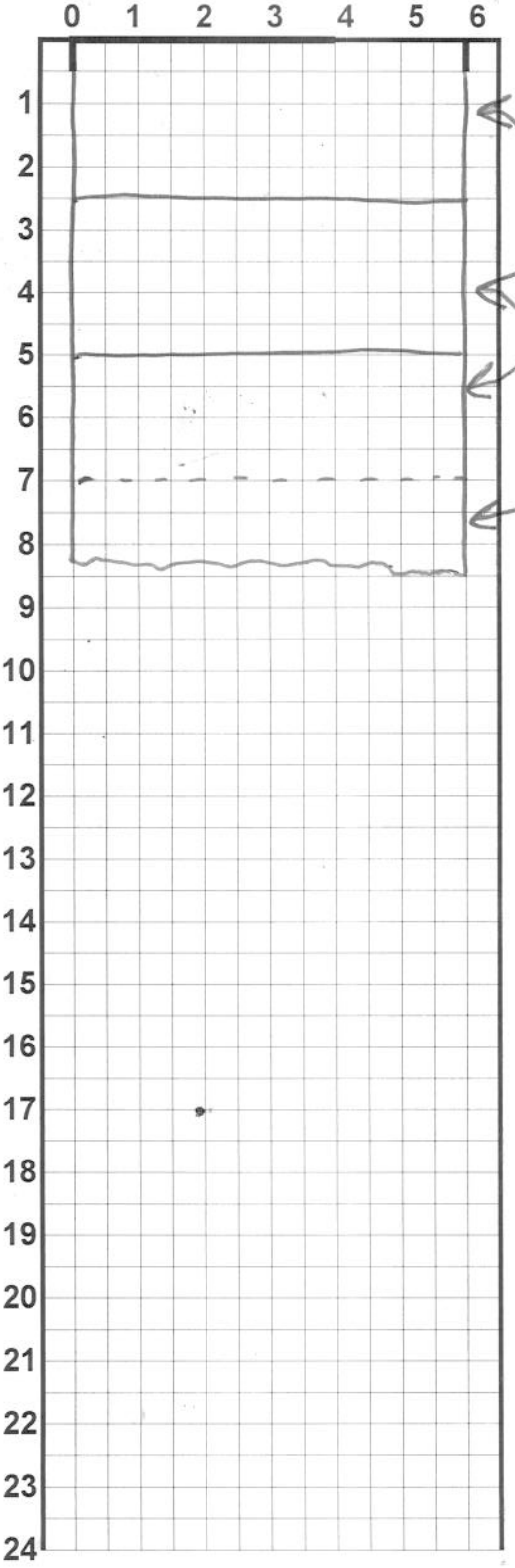
Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

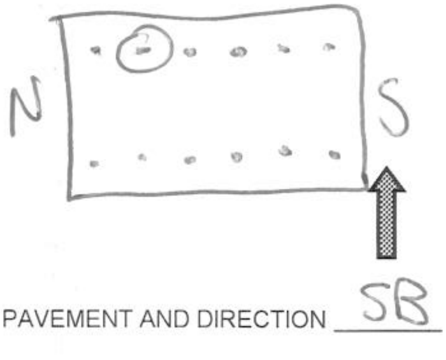
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

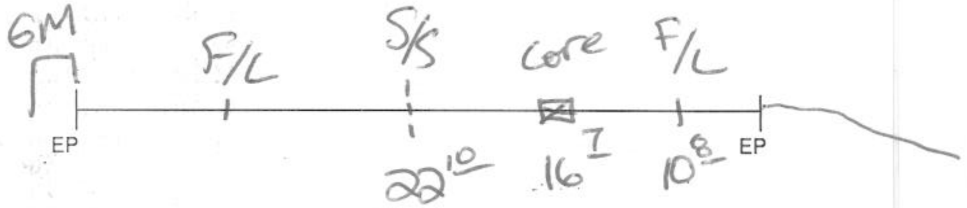
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



M-3

PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

PD # 3

HIGHWAY: PACIFIC HWY NO 1

Date: 10/26/06

MILEPOINT: 109.9

Logged By: [✓ CRAIG MICHAEL]
ERIC TRAVIS

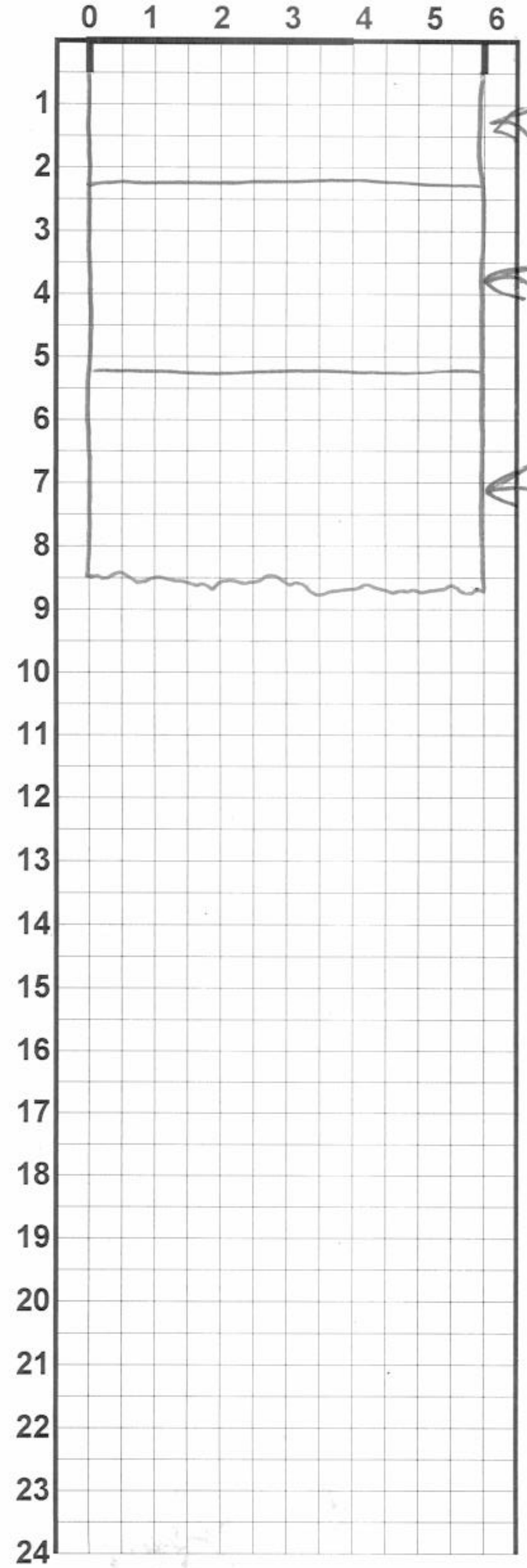
LOCATION: SB OWTRL

CORE LENGTH: 8.75 inches

Designer: **TODD SCHOLZ**

EA # **07RF0632/000/J13**

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

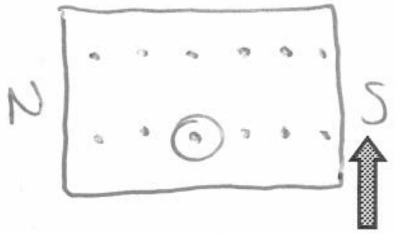
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

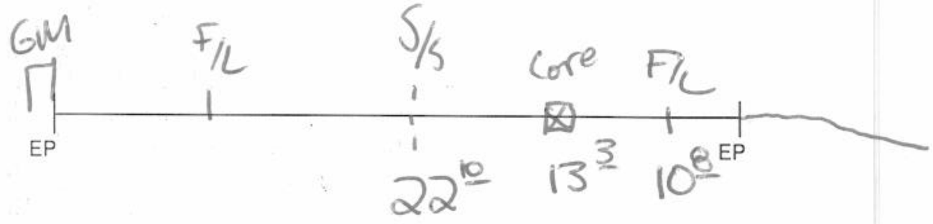
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

M-10

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 109.9

LOCATION: SB BWTRL

CORE LENGTH: 10.0 inches

PD # 12

Date: 10/26/06

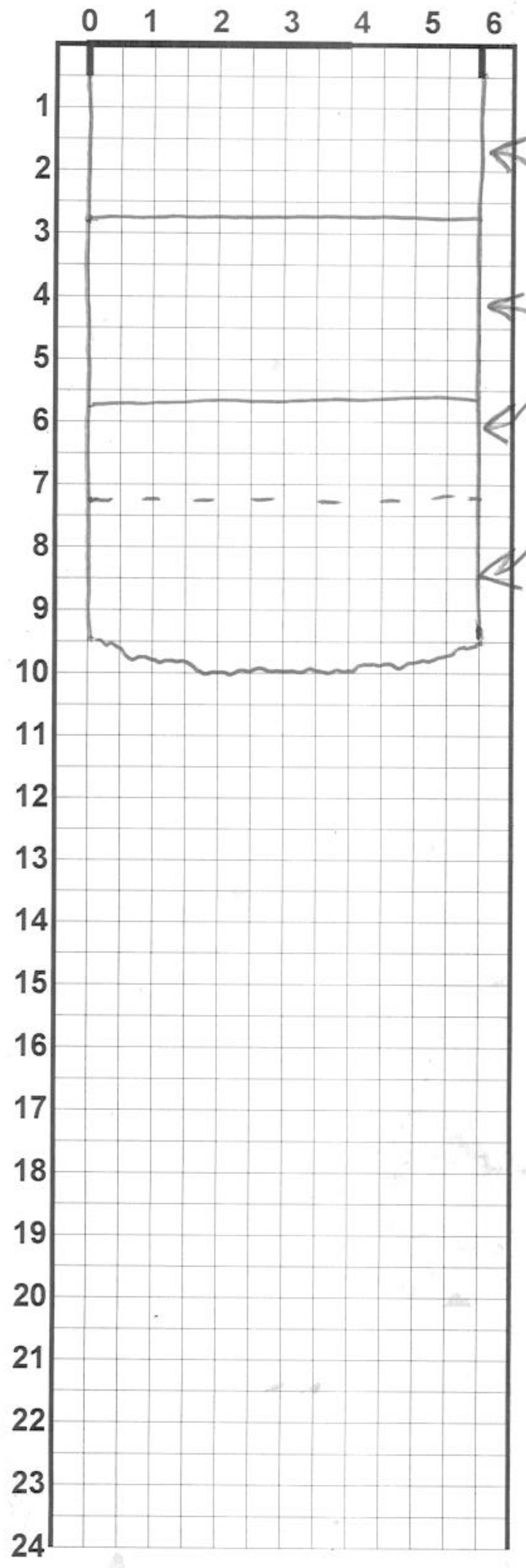
Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

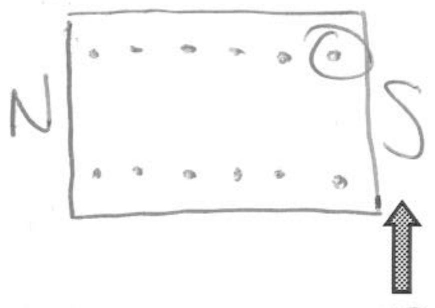
TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

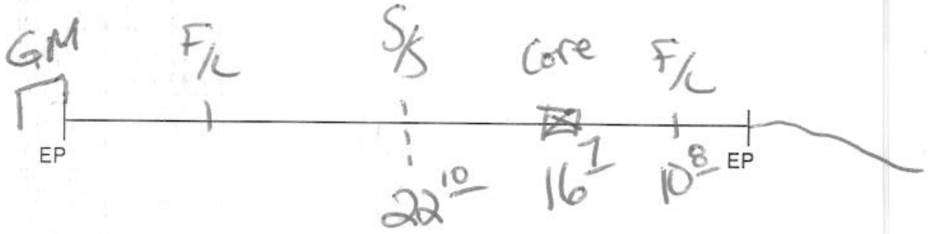
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

M-10



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

PD # 1

HIGHWAY: PACIFIC HWY NO 1

Date: 10/26/06

MILEPOINT: 109.90

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

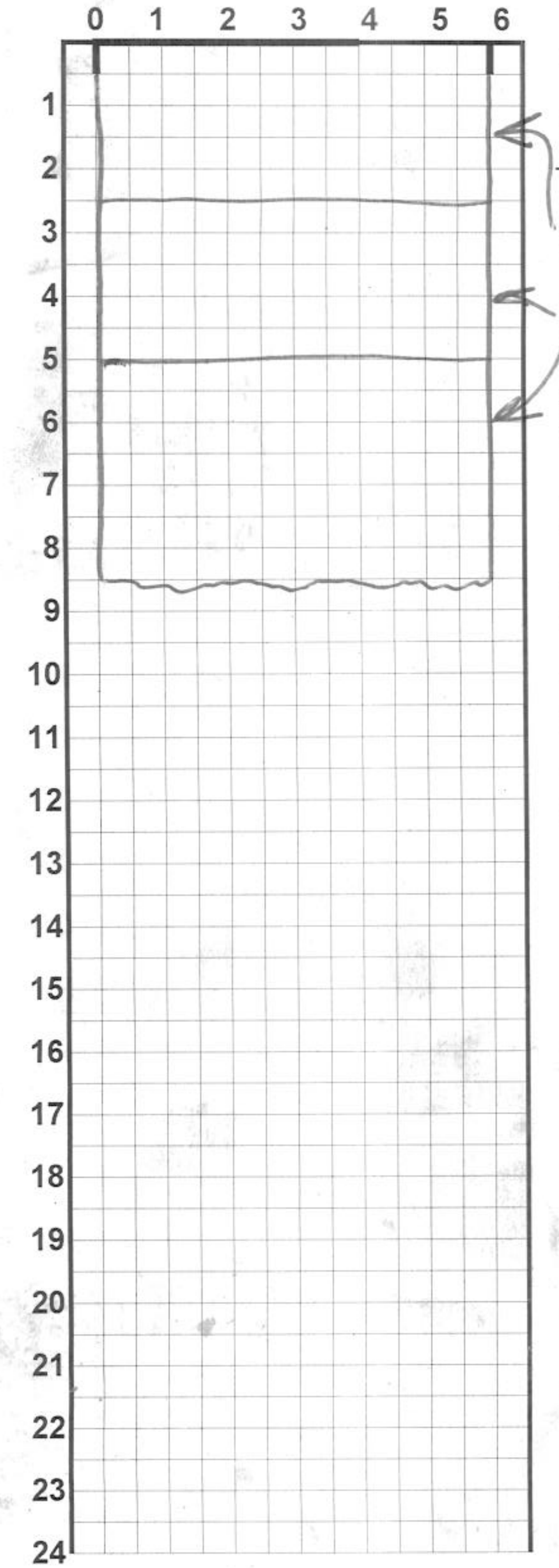
LOCATION: SB OWT RL

CORE LENGTH: 8.50 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

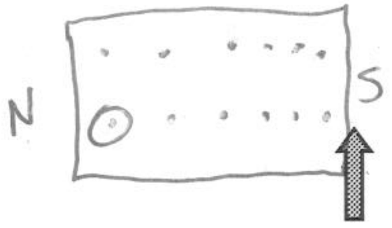
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

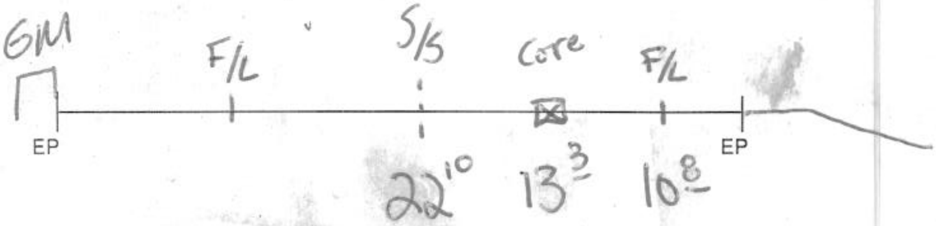
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

PD # 4

HIGHWAY: PACIFIC HWY NO 1

Date: 10/26/06

MILEPOINT: 109.90

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

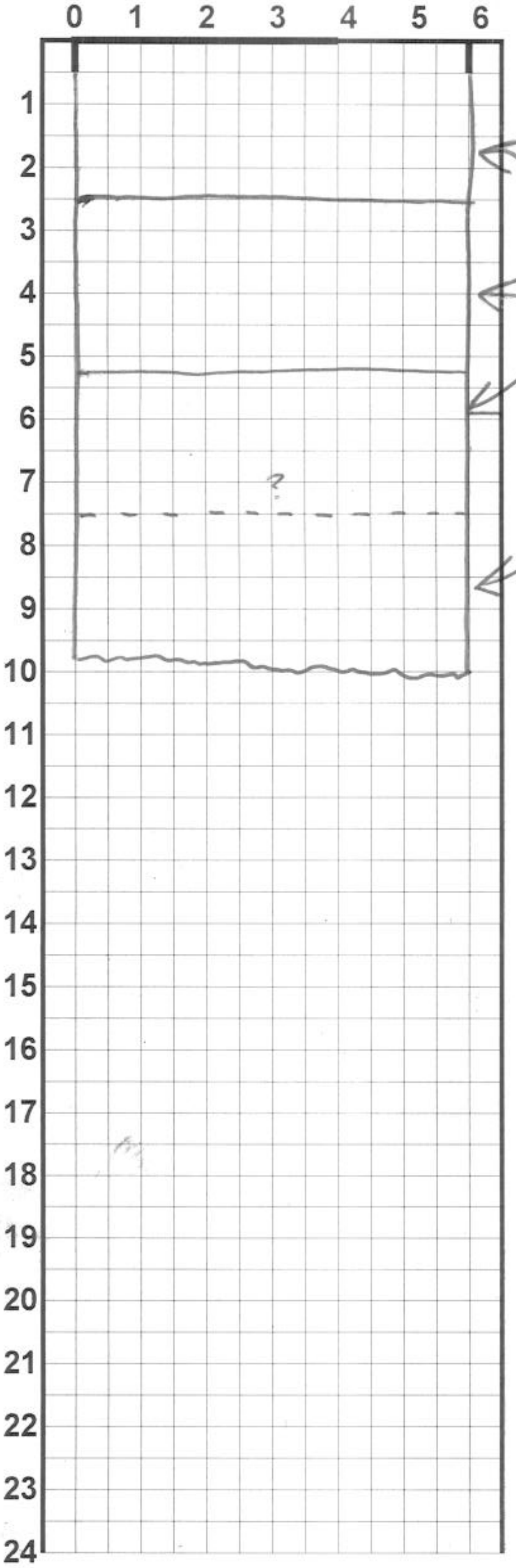
LOCATION: SB OWT RL

CORE LENGTH: 10.0 inches

Designer: **TODD SCHOLZ**

EA # **07RF0632/000/J13**

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

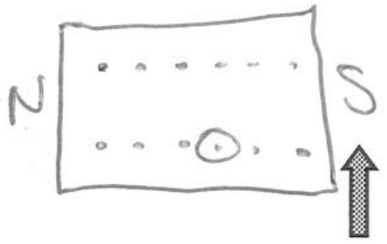
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

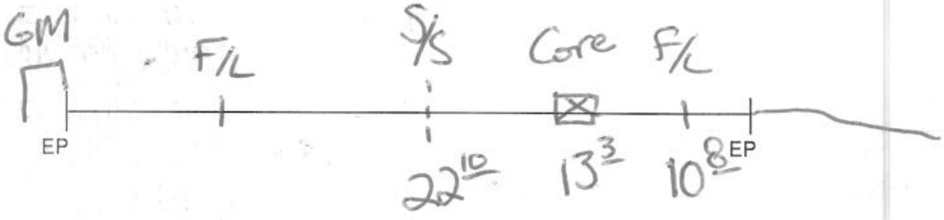
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

PD # 6

HIGHWAY: PACIFIC HWY NO 1

Date: 10/26/06

MILEPOINT: 109.9

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

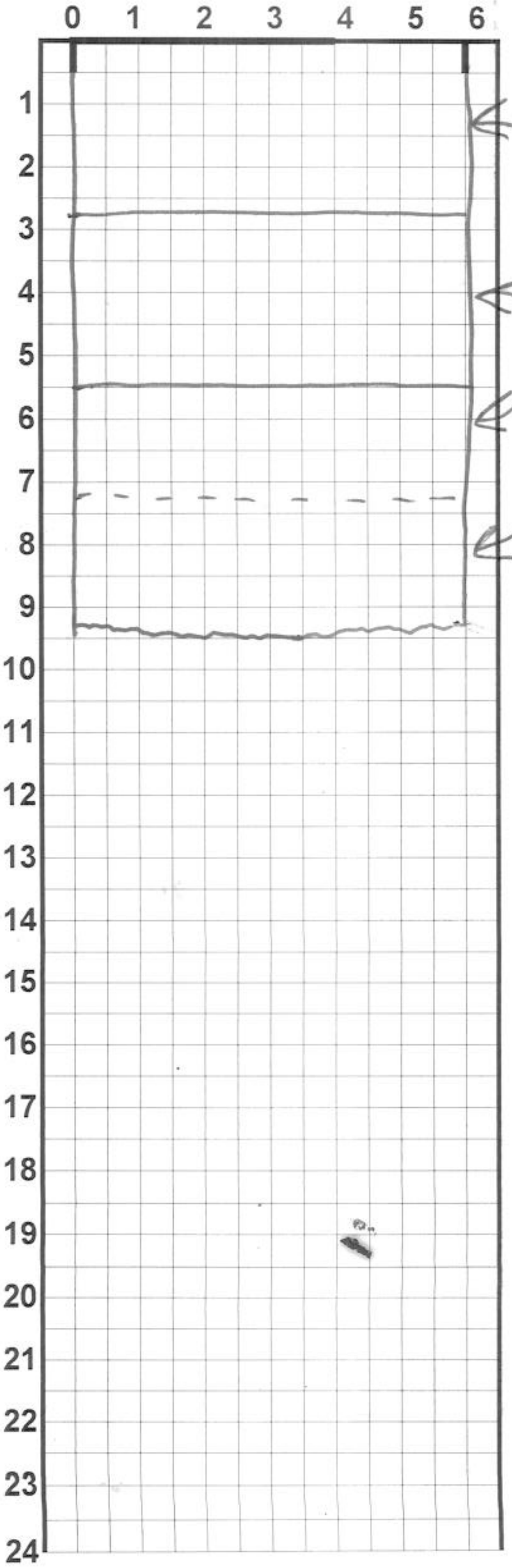
LOCATION: SB OWT RL

CORE LENGTH: 9.50 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

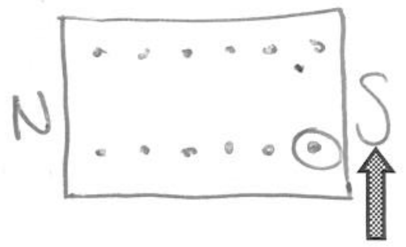
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

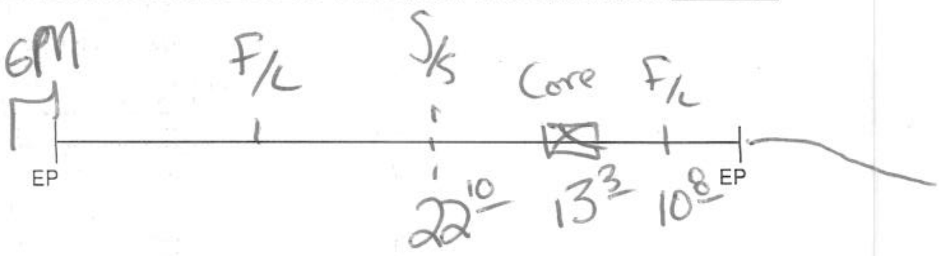
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 109.9

LOCATION: SB BWT RL

CORE LENGTH: 8.50 inches

PD # 7

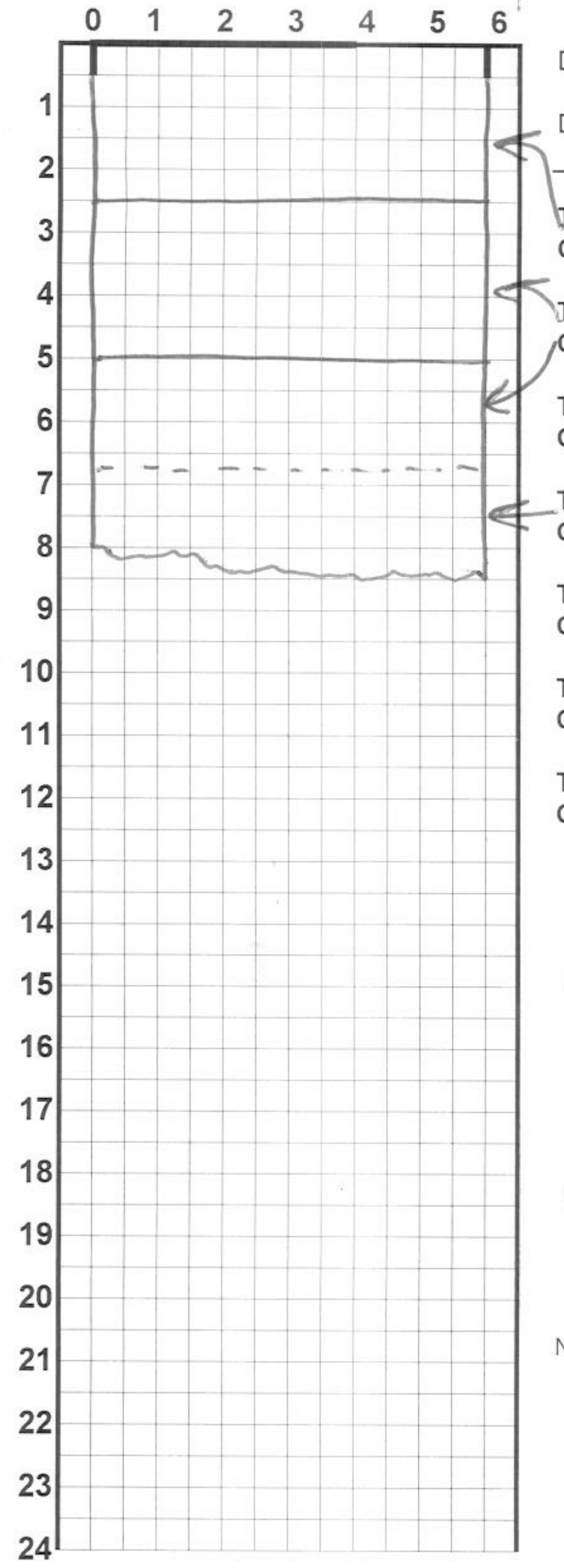
Date: 10/26/06

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

Designer: **TODD SCHOLZ**

EA # **07RF0632/000/J13**

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

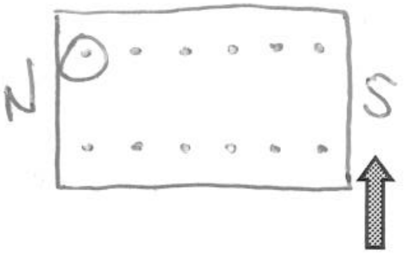
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

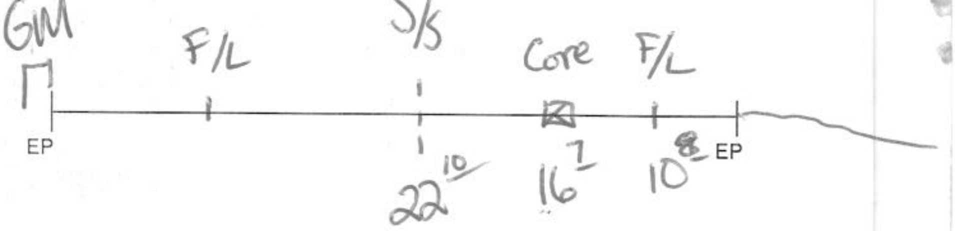
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: Yes No

PROJECT: MYRTLE CREEK MP 109.9

PD # 9

HIGHWAY: PACIFIC HWY NO 1

Date: 10/26/06

MILEPOINT: 109.9

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

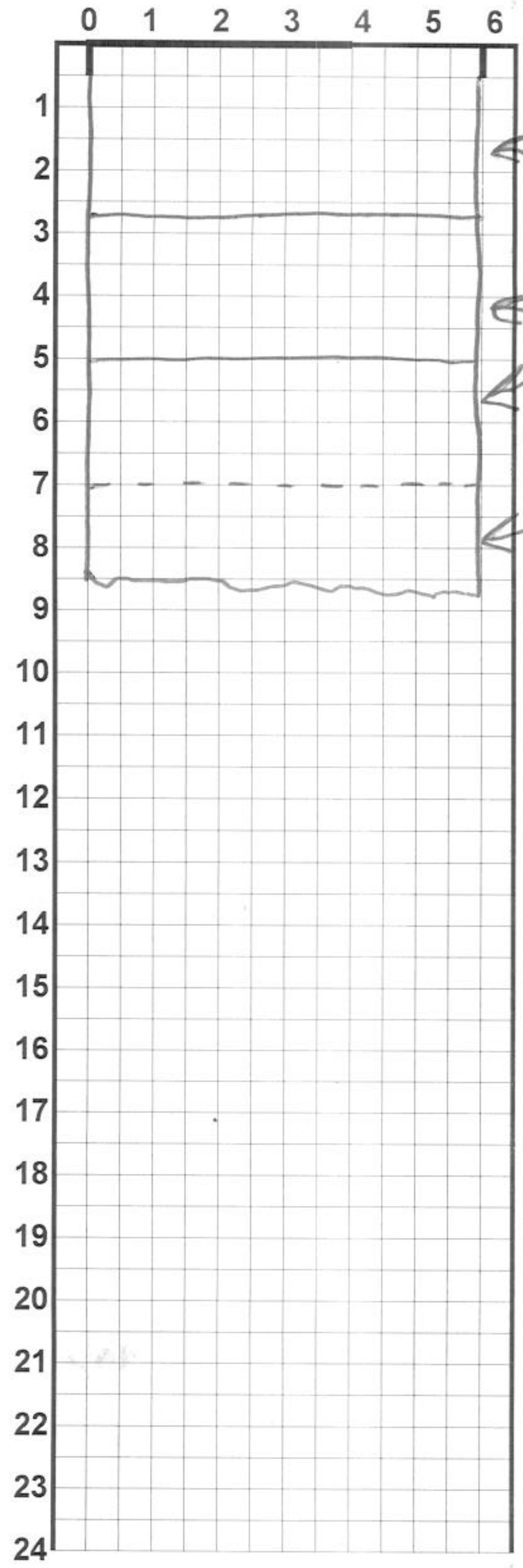
LOCATION: SB BWT

CORE LENGTH: 8.75 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

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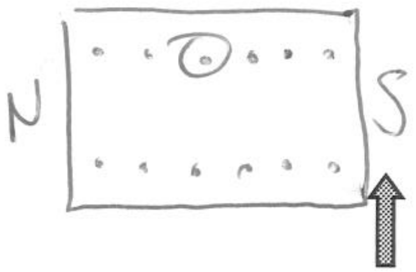
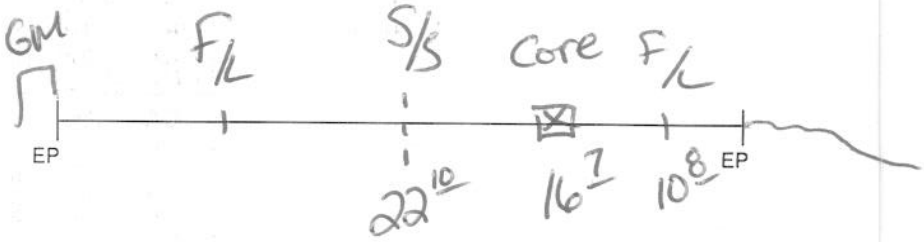
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 109.9

LOCATION: SB BWTRL

CORE LENGTH: 9.0 inches

PD # 10

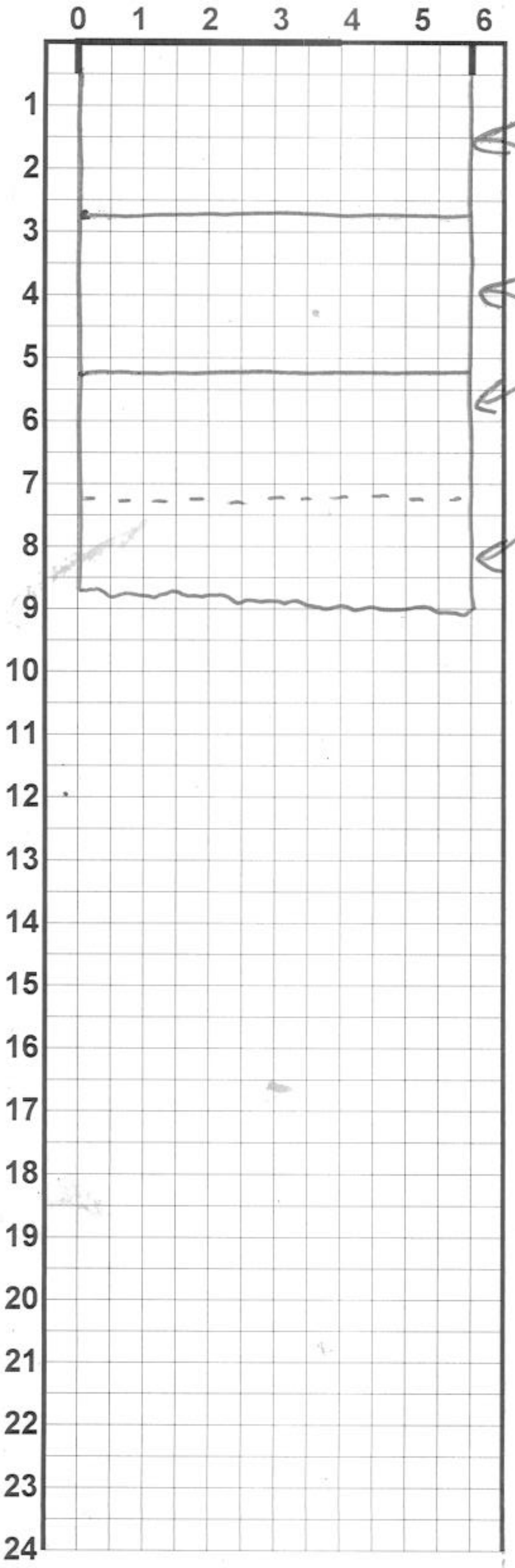
Date: 10/26/06

Logged By: CRAIG [✓ MICHAEL]
ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

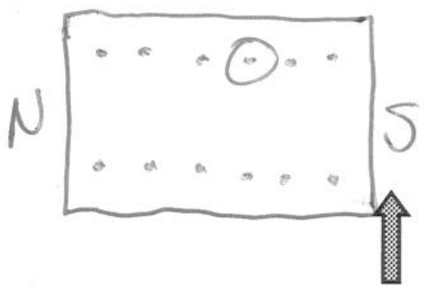
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

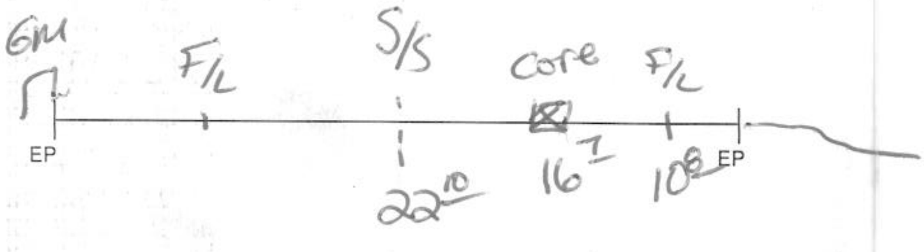
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



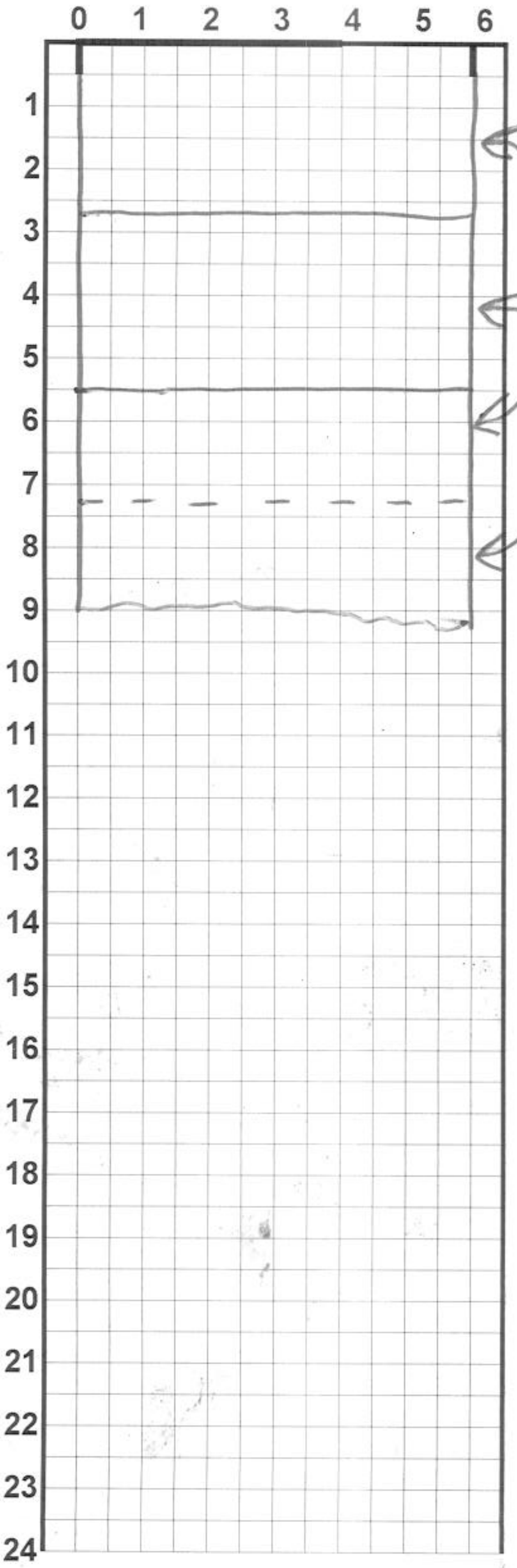
NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No
PD #: 11
Date: 10/26/06
Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS
Designer: **TODD SCHOLZ**
EA #: **07RF0632/000/J13**
KEY #: 13724

PROJECT: MYRTLE CREEK MP 109.9
HIGHWAY: PACIFIC HWY NO 1
MILEPOINT: 109.9
LOCATION: SB BWT RL
CORE LENGTH: ______ inches



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

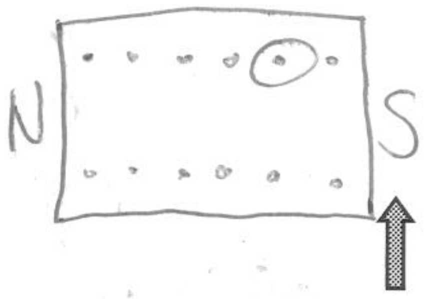
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

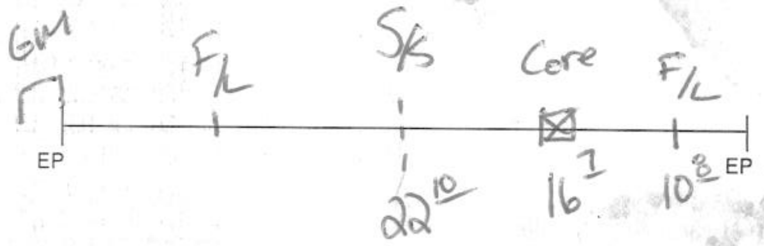
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

PD # 2

HIGHWAY: PACIFIC HWY NO 1

Date: 10/26/06

MILEPOINT: 109.90

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

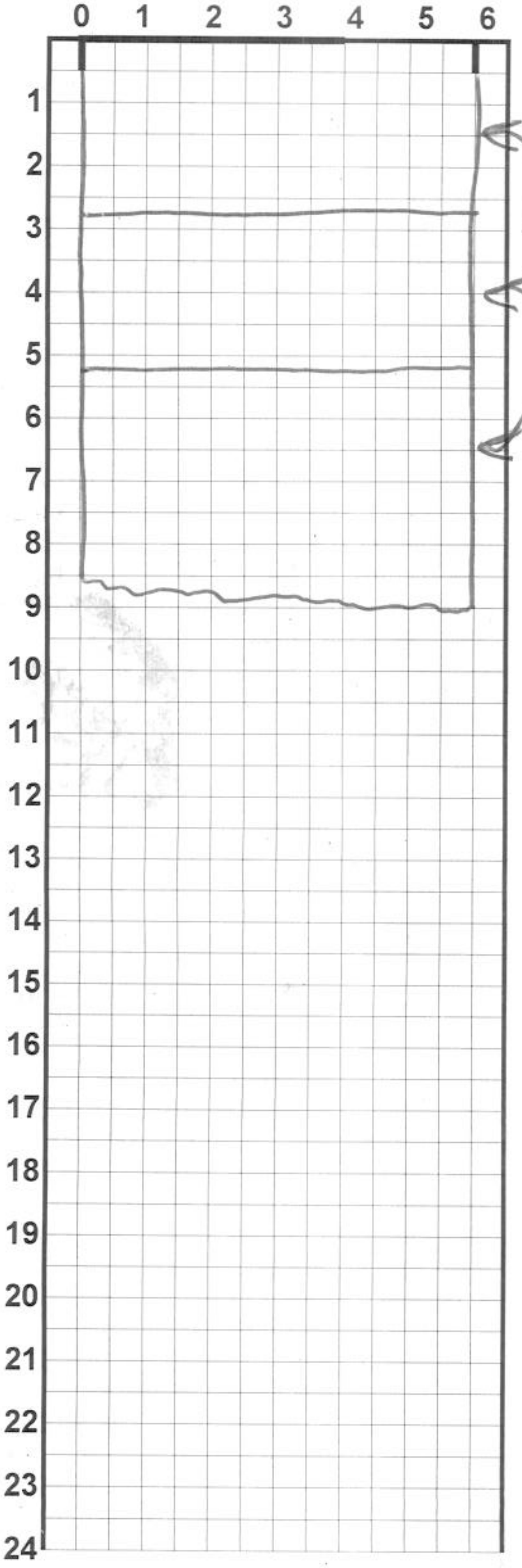
LOCATION: SB OWTRL

CORE LENGTH: 9.0 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

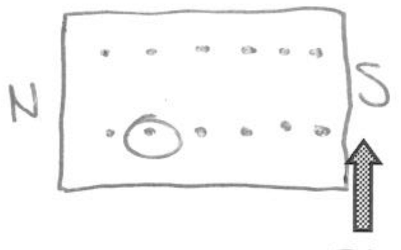
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

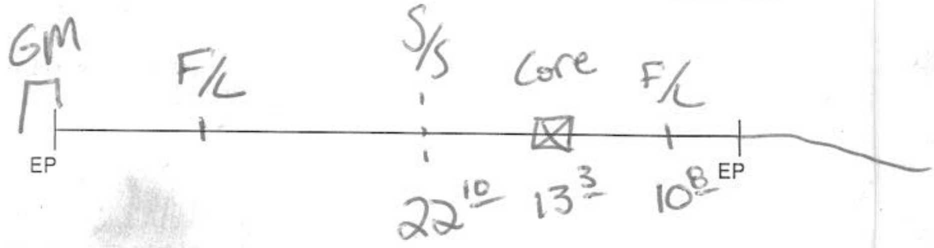
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



PAVEMENT CORE LOG

M-8

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

PD # 5

HIGHWAY: PACIFIC HWY NO 1

Date: 10/26/06

MILEPOINT: 109.9

Logged By: CRAIGH [✓ MICHAEL]
ERIC TRAVIS

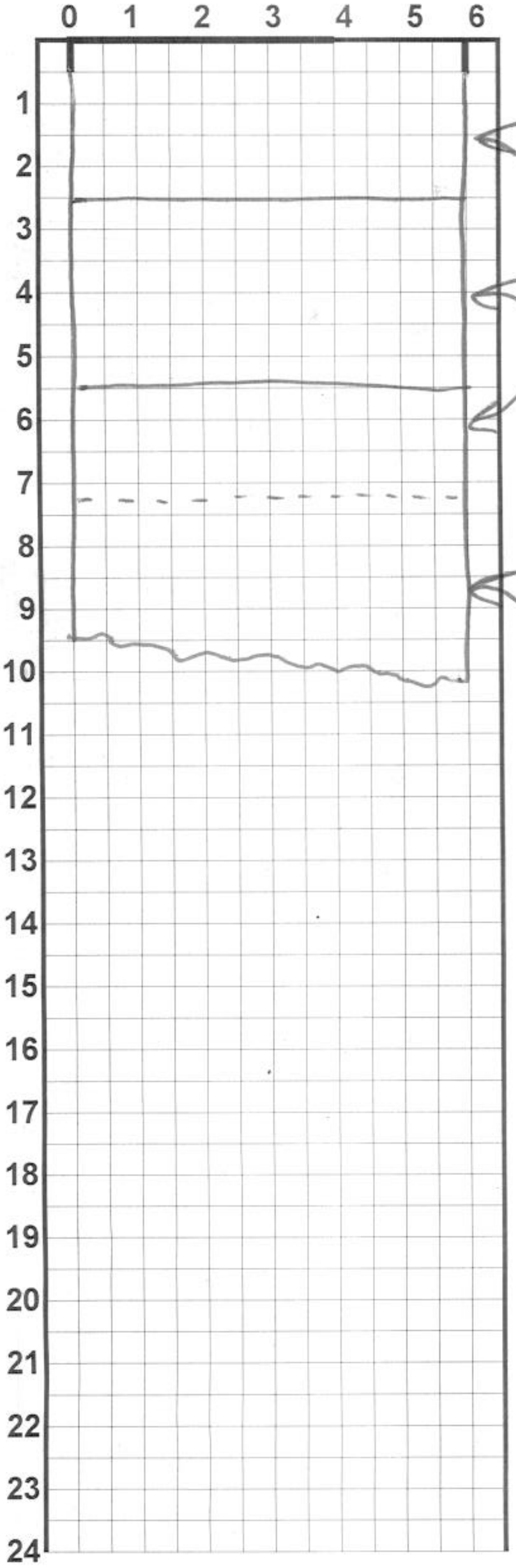
LOCATION: SB OWT RL

CORE LENGTH: 10.25 inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724



DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

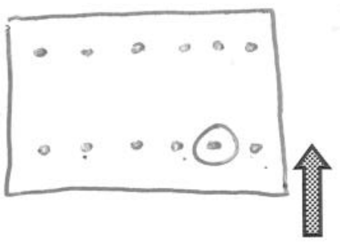
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

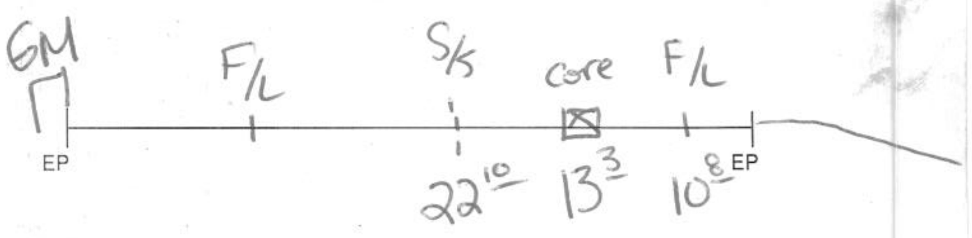
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

M-8



NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB



APPENDIX K: SUBCONTRACTOR REPORT ON GROUND PENETRATING RADAR SURVEYS

Identification of Moisture Damage in Asphalt Pavement using Ground Penetrating Radar (GPR)

Project Report

submitted to
Oregon State University
School of Civil and Construction Engineering
Corvallis, Oregon

by
INFRASENSE, Inc.
14 Kensington Road
Arlington, MA 02476

September 28, 2007

Table of Contents

1. Introduction

The overall objective of this project was to investigate and evaluate a methodology for identification of moisture damage in asphalt concrete pavement. Moisture damage, or “stripping” in hot mix asphalt (HMA) refers to the loss of adhesion between the asphalt cement and the aggregate surface, and it is caused primarily by the action of moisture and moisture vapor. Moisture damage occurs below the surface of the pavement, and manifests itself as accelerated rutting and surface distress. This evaluation has been carried out using Ground Penetrating Radar (GPR). The methods for GPR data collection and analysis are discussed in the following sections.

The work under this project was carried out on test sections of Interstate 5 in Oregon. The sections were selected based on previous documentation of moisture damage. A list of the test sections is shown in Table 1. The total length evaluated was 114 lane miles. Within these sections, sub-sections were identified for detailed data analysis as indicated below in Section 4.

Table 1 – Pavement Sections Surveyed

SECTION NAME	SECTION LIMITS (MP)	DIRECTION OF SURVEY
Vets Bridge-Myrtle Creek	109.00 – 112.50	NB and SB
Garden Valley-Roberts Creek	117.70 – 125.00	NB and SB
Anlauf-Elkhead	154.50 – 162.10	NB and SB
Cottage Grove-Martin Creek	169.30 – 174.70	NB and SB

2. Data Collection

The GPR survey was conducted on July 9, 2007, in the outside traveling lane. The GPR equipment was a dual 1 GHz horn antenna system manufactured by GSSI, Inc. of North Salem, NH and is shown in Figure 1. Two passes of the survey vehicle were carried out in each lane—one with the antennas in the left and right wheelpaths, and one with the antennas in the centerline and on the fog line. The vehicle was equipped with an electronic distance-measuring instrument (DMI) mounted to the rear wheel, providing continuous distance data as the GPR data was collected. The data collection and recording was controlled by the SIR-20 GPR system operated from within the survey vehicle. The data was collected at a rate of two scans per foot of travel.

The GPR survey was carried out at normal interstate highway driving speed. A mark was manually placed in the data at each observed mile marker.

Figure 1 – Field Setup of GPR Equipment

3. GPR Data Analysis

The GPR data was analyzed for both layer thickness and moisture damage. The layer thickness analysis was carried out according to the GPR analysis principles described in Attachment A. The marked milepost locations recorded during the GPR data collection were correlated with the available milepost information, and the GPR distance scale was checked against the mileposts distances. A sample of GPR data is shown in Figure 2.

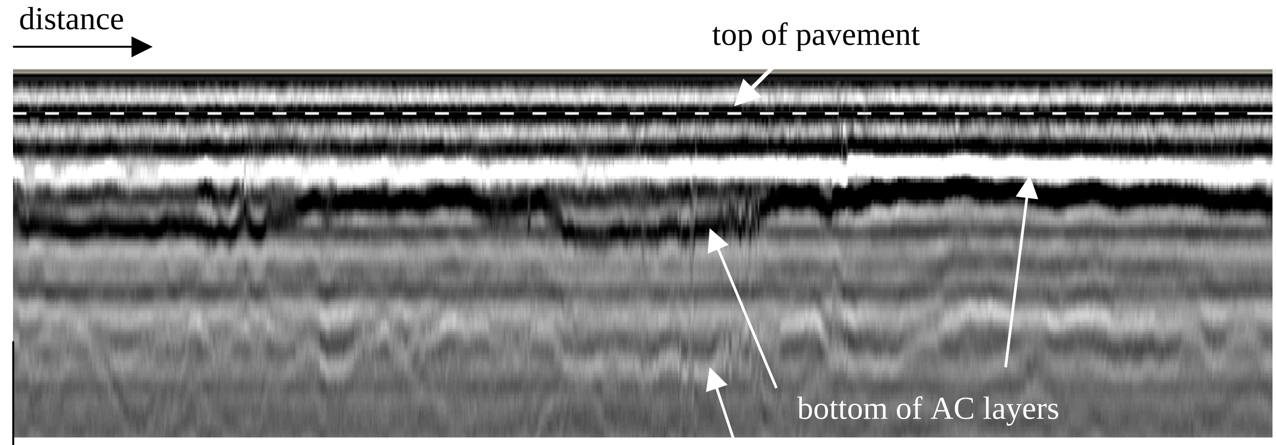


Figure 2 – Sample of GPR Data

Since mileposts are not necessarily located at the correct “mile point”, bridge deck location data was also used to establish the correlation between GPR scan location and mile point. Bridge deck mile points were taken from ODOT Highway Inventory Detail sheets. Since bridge decks show up distinctly in the GPR data, these mile points provided a more accurate reference point in the GPR data.

The individual layers in the GPR data are “picked” by the data analyst, and the software carries out the dielectric and thickness calculations from this picked data. Figure 3 shows the picked version of the data in Figure 2.

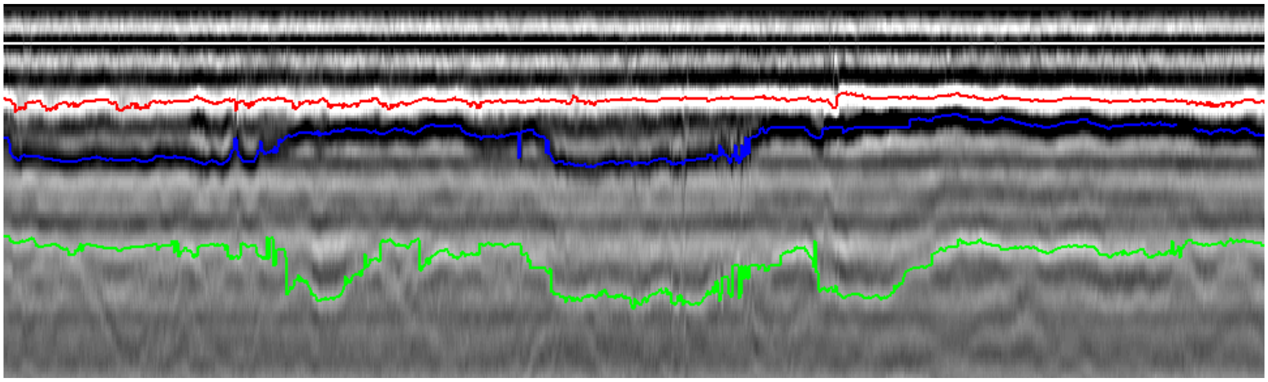


Figure 3 – Three Layers Picked in Figure 2 Data

The analysis for moisture damage was carried out using two different indicators—the reflection activity index (AI) and the differential compaction index. The activity index measures the reflection activity within a given depth range, or within specified pavement layers, and compares it to the background level in the local area. These indices are described in further detail below.

Activity Index

Moisture damage is a deterioration process characterized by local changes in the asphalt physical properties associated with increased porosity and higher moisture content. These changes in the physical properties of the HMA are accompanied by corresponding changes in the electromagnetic properties. Increased reflections from affected layers produce localized reflection anomalies within otherwise homogeneous layers. Because these deterioration processes tend to occur non-uniformly in the pavement, a measure of the uniformity of the electromagnetic properties may be an indicator of potential moisture damage. As a GPR indicator, the GPR Activity Index (AI) is defined as the normalized average absolute amplitude of the GPR scan as follows:

$$AI(x) = \frac{A(x)}{\overline{A}\left(x \pm \frac{L}{2}\right)}$$

Where A is the mean reflection amplitude for a given scan at station x, $\bar{A}$ is the average value of A over the specified interval, and L is the normalization length. When compared to the values from neighboring locations, the index shows changes in reflection activity, which, if sufficient, may be related to moisture damage or stripping. The data are normalized to a value relative to 1.0, permitting lane-to-lane and site-to-site comparison without concern for the absolute values. For this project, a value of L=500 feet was used for the normalization length.

Another key parameter in the AI computation is the depth range over which the scan amplitude is calculated. The depth range should be selected to highlight the depth in which stripping is believed to be occurring. For this project, the depth range was taken to be from the bottom of upper AC layer to the bottom of the lowest AC layer detected. Based on core data, this appeared to be the most significant range of interest.

Differential Compaction Index

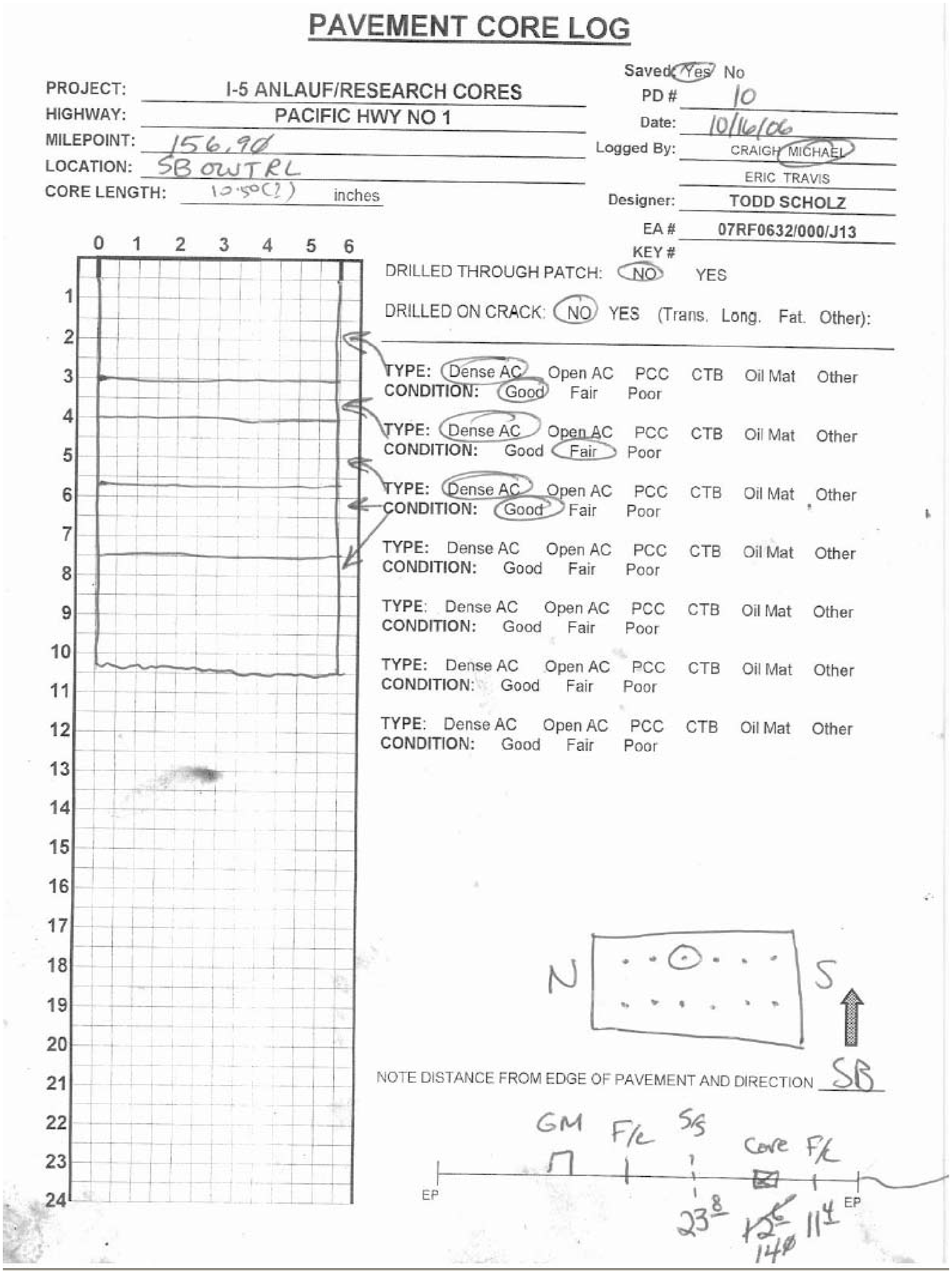
In this project, data were obtained from the wheelpaths and from the centerline of each lane surveyed. Since rutting can be a manifestation of moisture damage, one can look at the thickness difference between a pavement layer in the centerline and that same layer in the wheelpaths. If there is rutting, and it is occurring in the layer under consideration, then the layer in the wheelpaths should be thinner, or more compacted, than the same layer in the centerline. This differential compaction, if it exceeds a threshold, could be an indicator of moisture damage in the layer. The differential compaction calculation is made for each significant layer identified in the GPR data. For this project, the calculation of the differential compaction involved calculation of the layer thickness for each layer in the centerline and wheelpaths, and subtracting the centerline layer thickness from each of the wheelpath layer thicknesses. Negative values would indicate that the layer was more compacted in the wheelpath than in the centerline, and larger negative values would be indicative of potential moisture damage.

Note that there has been a considerable amount of patching on these pavement sections, apparently to fill the ruts and level the surface. In these areas, additional thickness may be added to a compacted or damaged layer, and the differential compaction index may not be valid in these areas.

4. Correlation with Cores

OSU and ODOT provided core log data at 122 locations in the 4 areas tested. The logs were based on cores taken in 1995, 2000, and 2006. Figure 4 shows a typical core log sheet. All of the core data has been incorporated into the pavement thickness analysis. For moisture damage correlation, only the cores taken in 2006 have been considered, since these are the most clearly documented. Note that many of the core locations are presented to the nearest tenth of a mile, when in fact the core was not located precisely at the reported mile point. For the recent cores, observing the core pattern on the pavement via ODOT videologs provided more precise locations. For example, the example core log shows a location of 156.90, whereas the videolog mile point is 156.93. This difference (150 feet) has an impact when correlating GPR data with core data.

The 48 cores taken in 2006 were typically in a 12-hole pattern (see the bottom of the core log) at each of 4 locations tested. The log shown in Figure 4 suggests that moisture damage is occurring in the thin 1-inch layer directly below the 3-inch surface layer, and a total AC depth of 10.5 inches. detailed analysis of thickness, activity, and differential compaction was carried for each analysis subsection specified by OSU. A list of these sections, along with comments on the observed conditions in each subsection, is provided in Table 2.



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ANLAUF/RESEARCH CORES

PD # 10

HIGHWAY: PACIFIC HWY NO 1

Date: 10/16/06

MILEPOINT: 156.90

Logged By: CRAIGH [✓ MICHAEL]

LOCATION: SB OWTRL

ERIC TRAVIS

CORE LENGTH: 10.50(?) inches

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY #

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

Figure 4 – Typical Core Log: MP 156.9 SB

Table 2 – List of Analysis Sub-Sections

Project	Direction	Start MP	End MP	Length (mi.)	Comments
Anlauf-Elkhead (MP 154.50-MP 162.10)	NB	156.30	157.50	1.20	Main form of distresses are stripping, patching, and rutting
	NB	161.00	161.50	0.50	
	SB	161.50	161.00	0.50	
	SB	158.50	157.00	1.50	
Garden Valley-Roberts Creek (MP 117.70-MP 125.00)	NB	117.70	119.00	1.30	Main form of distresses are stripping (voids), patching, cracking and fat spots
	NB	120.25	121.00	0.75	
	NB	123.70	124.70	1.00	
	SB	119.00	117.70	1.30	
	SB	121.00	120.25	0.75	
	SB	122.00	121.50	0.50	
	SB	123.80	122.70	1.10	
Vets Bridge-Myrtle Creek (MP 109.00-112.50)	NB	109.00	112.50	3.50	Section has many patches and the cores do not show sufficient evidence for stripping.
	SB	112.50	109.00	3.50	Full length suggested (only 11 cores available)
Cottage Grove-Martin Creek (MP 169.3-174.7)	NB	169.30	174.70	5.40	Suggested to Analyze the full section length, being the "TEST" section
	SB	174.70	169.30	5.40	

The plan for this project was to evaluate the moisture damage indicators using the first three sections in the list, and to apply the results of that evaluation to the Cottage Grove-Martin Creek section.

The sections with recent core data were evaluated to observe the correlation between the damage indices and the observed core and cross trench conditions. Attachment B shows samples of this type of analysis for core stations 156.9, 157.2, 109.9, and 118.0 in the southbound direction. The Attachment B data shows the differential compaction for each of 3 analyzed layers, along with the reflection activity for each surveyed position and the layer thickness profile for the centerline position. Gaps in the data occur where bridge decks are located. Core data is also shown. Since each core location has 12 cores, the layer depth data from all of these cores is presented at one station.

Anlauf-Elkhead Stations 156.9 and 157.2

For this section, the GPR pavement structure data in Attachment B reveals three AC layers at depths of 4, 6, and 12 inches. The cores reveal additional layers, but the overall structure depth appears to be consistent with the cores. Referring to the core log shown in Figure 4, it appears that the GPR signal detects the layer boundaries at 4 inches, 6 inches, and at the bottom of the AC. The cores at station 156.9 show damage in the lower inch of the top 4-inch layer. The cores at 157.2 show damage in the second layer (4-6 inches).

The differential compaction for the upper layer at core stations 156.9 and 157.2 appears to range from 0.5 to 1.0 inch. This is a substantial amount of compaction for a 4-inch layer, and it suggests the potential for moisture damage in the upper layer at these two locations. The activity index in the vicinity of core 156.9 is particularly high. Since this index focuses on the material below the first layer, it suggests that there could be moisture damage in the material below the top layer.

Vetsbridge-Myrtle Creek Station 109.9 SB

The cores at this nominal station appear from the videolog to be at mile point 109.855. The GPR data at the core location shows three AC layers, with depths of 3.5, 7, and 12 inches. A typical core log at this location (Figure 5) shows layer depths at 2.75, 5.5, 7.25, and 9 inches, and a cross trench at this location shows moisture boundaries at 3, 6, and 9 inches (see Figure 6a). The core data indicates that moisture damage is occurring in the lowest layer (below 7") while the cross trench shows moisture infiltration in the layer between 3 and 6 inches.

The GPR data in Attachment B in the vicinity of this location shows significant differential compaction in Layer 3 (> 1 inch), and high activity index values (>1.2). These results are consistent with the core and trench observations. The differential compaction data for layers 1 and 2 show inconsistent data between the wheelpaths. It is possible that in this area, different layers are being detected in the different wheelpaths, and that the values presented are not truly differential compaction of the same layer.

Garden Valley-Roberts Creek Station 118.6 SB

The cores at this nominal station appear from the videolog to be at mile points 118.550 and 118.645. Since the core data reports a nominal location of 118.6, the core data has been plotted at both locations in Attachment B. The GPR data shows 3 layers at depths of 4, 9, and 16 inches. A typical core log is shown in Figure 7. The trench and core data (Figures 6b and 7, respectively) show layers at 4, 8, 11, and 16 inches, and is reasonably consistent with the GPR data. The trench data shows moisture infiltration through the lower AC layers up to the 8 inch depth level. The core data shows moisture damage at various depths, but most consistently in the depth range from 11 to 16 inches.

The GPR data at these locations shows significant differential compaction in the third layer, consistent with the core damage observations. The reflection activity in this region is not particularly high, although there are some local peaks in the vicinity of the cores. It is possible that the apparent saturation of the lower half of this pavement causes attenuates the GPR signal and diminishes the observed reflection activity.

5. Moisture Damage Mapping

The correlations described in Section 4 show that there is a reasonable agreement between the layer structure determined by GPR and the structure shown in the cores, and that the reflection activity and differential compaction provide a reasonable indices for detecting moisture damage. In order to apply these indices to the detection of moisture damage, a threshold must be establish to distinguish damage from non-damage conditions. The thresholds are based on past experience and the limited correlations described in Section 4. Future evaluations and correlations will hopefully serve to fine-tune these criteria.

Activity Index Threshold

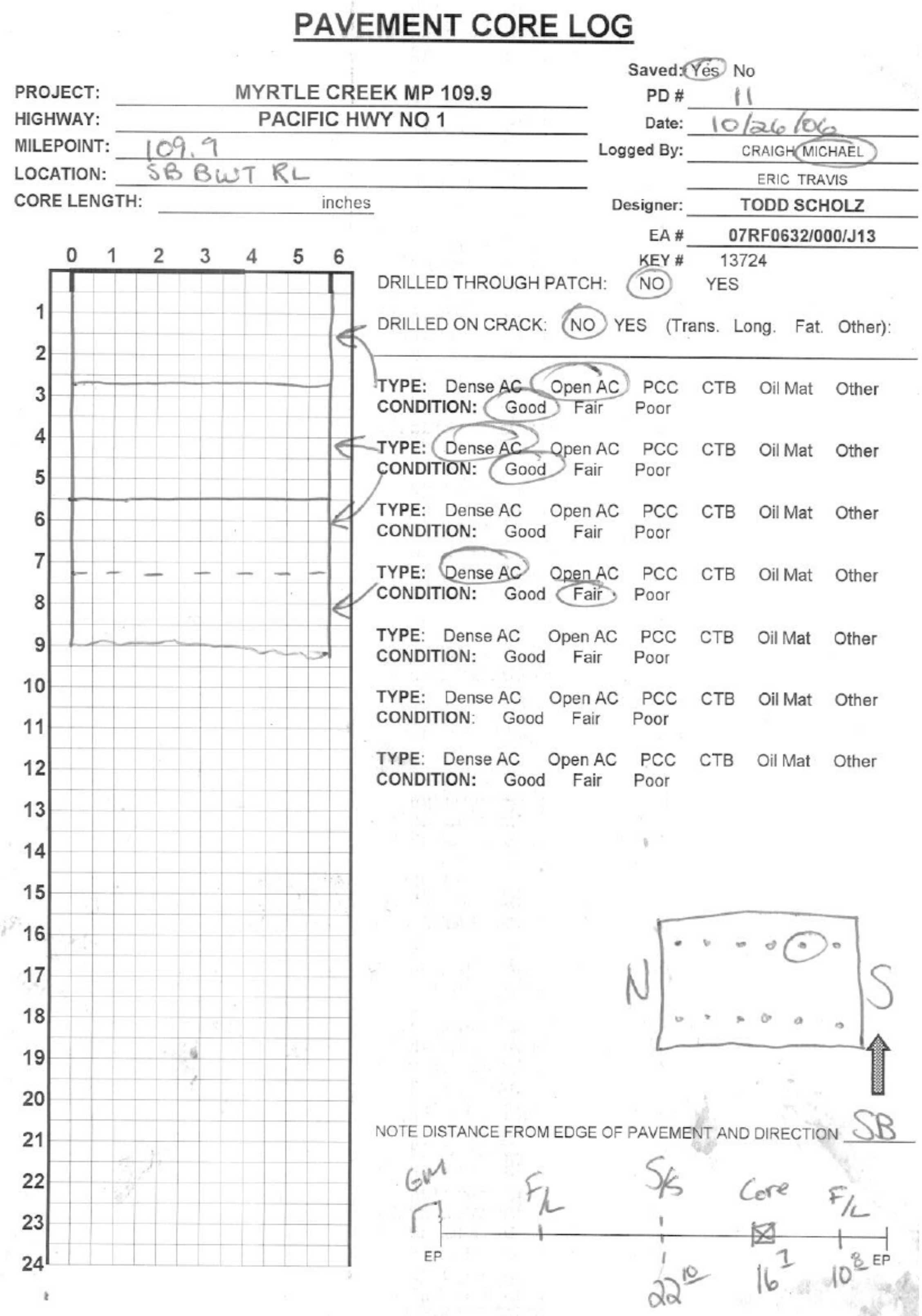
The activity index was calculated for each of the three lines of data—right wheelpath, centerline, and left wheelpath. At each analysis station, the average of the two highest values was calculated. If this average exceeded 1.2, then the location was considered to have the potential for moisture damage. The 1.2 factor has been successfully used in previous studies (see Hammons et. al., 2005) It highlights locations where reflection activity at a particular location is 20% higher than the background level, and suggests that there is a local reflective condition potentially related to moisture damage.

Differential Compaction Threshold

This threshold was established as a percentage of the layer thickness. One would expect that thicker layers would compact more than thin layers, and that the criterion for damage should be thickness dependent. Initially a fixed value of 25% percentage was used. This criterion produced problems where there was a thin layer, since the normal as-built variation in layer thickness was frequently reported as moisture damage. An alternate thickness dependent percentage was adapted and used for the evaluation presented in this report. Using this alternate, potential damage exists in a given layer if the differential compaction in that layer > PT, where P is a percentage, T is the layer thickness, and $P = 1.1T^{-0.9}$. The use of the exponential increases the threshold as the layer gets thin, and eliminates the problem discussed above.

Damage Plots

Maps graphically depicting potential moisture damage vs. mile point have been prepared using the above criteria, and are presented in Attachment C. A sample map is shown in Figure 8 and a description of the map is discussed below.



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: MYRTLE CREEK MP 109.9

HIGHWAY: PACIFIC HWY NO 1

MILEPOINT: 109.9

LOCATION: SB BWT RL

CORE LENGTH: inches

PD # 11

Date: 10/26/06

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

Designer: TODD SCHOLZ

EA # 07RF0632/000/J13

KEY # 13724

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

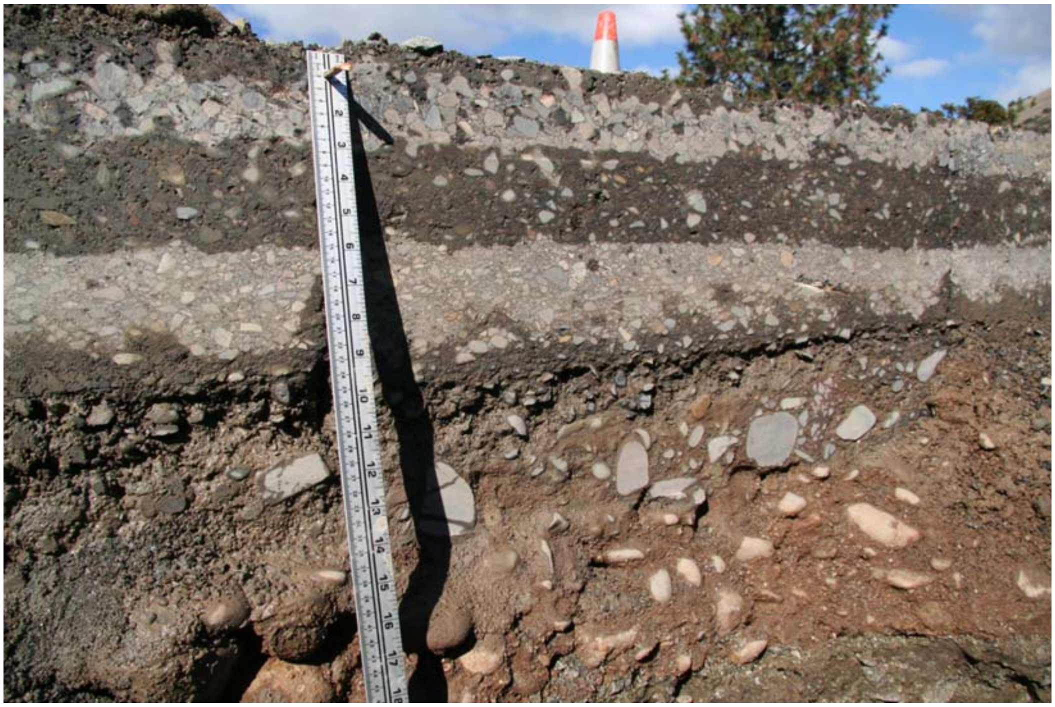
TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat Other
CONDITION: Good Fair Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION SB

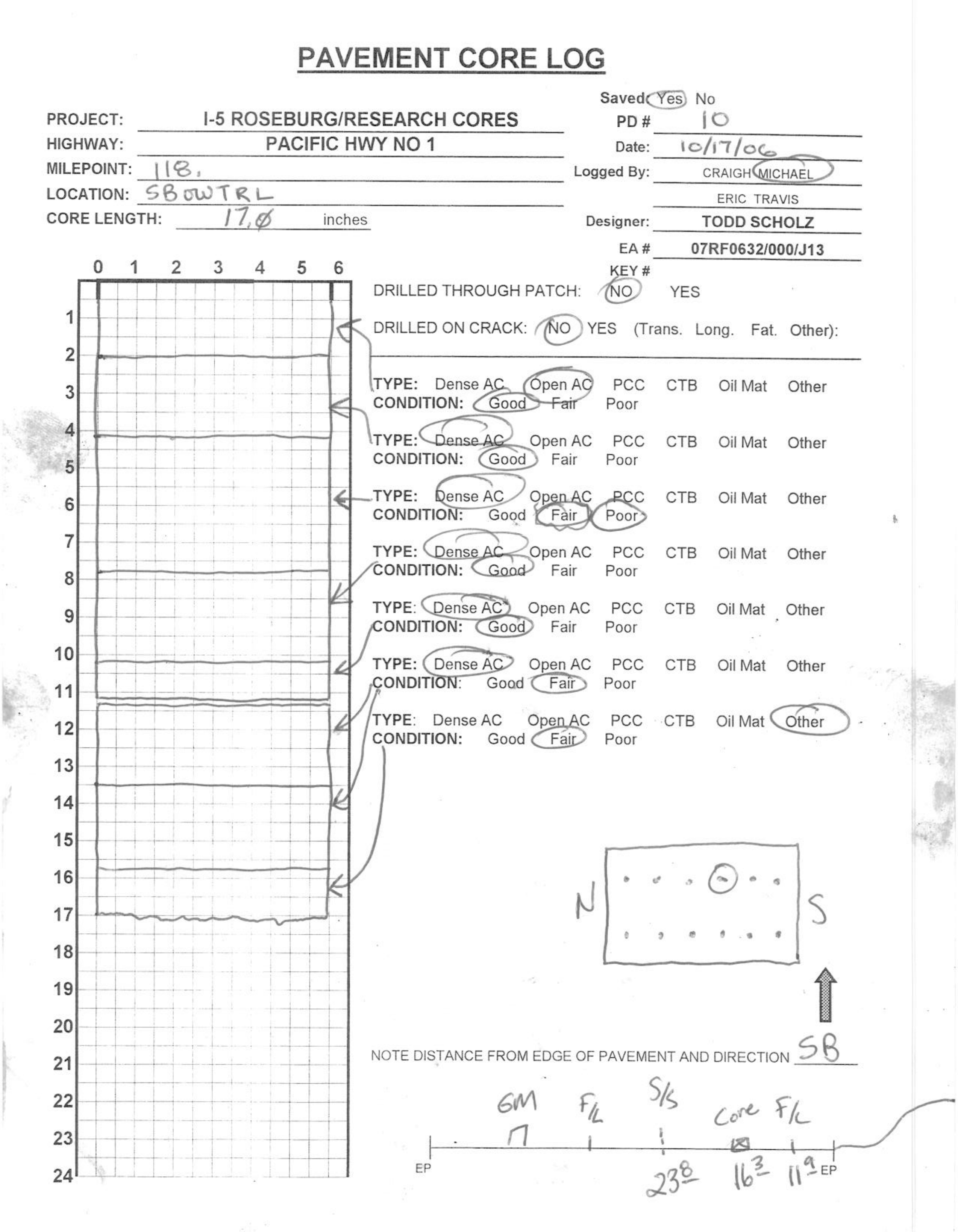
Figure 5 – Typical Core Log: MP 109.9 SB



a) Vets Bridge-Myrtle Creek, MP 109.855

b) Garden Valley-Roberts Creek, MP 118.645, SB

Figure 6 – Cross Trench Photos (provided by OSU)



PAVEMENT CORE LOG

Saved: [✓ Yes] No

PROJECT: I-5 ROSEBURG/RESEARCH CORES

PD #: 10

HIGHWAY: PACIFIC HWY NO 1

Date: 10/17/06

MILEPOINT: 118.

Logged By: CRAIGH [✓ MICHAEL]

ERIC TRAVIS

LOCATION: SBOWTRL

CORE LENGTH: 17.0 inches

Designer: TODD SCHOLZ

EA #: 07RF0632/000/J13

KEY #

DRILLED THROUGH PATCH: [✓ NO] YES

DRILLED ON CRACK: [✓ NO] YES (Trans. Long. Fat. Other):

TYPE: Dense AC [✓ Open AC] PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] [✓ Poor]

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: [✓ Good] Fair Poor

TYPE: [✓ Dense AC] Open AC PCC CTB Oil Mat Other
CONDITION: Good [✓ Fair] Poor

TYPE: Dense AC Open AC PCC CTB Oil Mat [✓ Other]
CONDITION: Good [✓ Fair] Poor

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION: SB

Figure 7 – Typical Core Log: MP 118 SB

The plot in Figure 8 has two sections—an upper section showing moisture damage, and a lower section showing layer thickness. The moisture damage plot has an upper part, showing differential compaction, and a lower part showing reflection activity. Locations exceeding the threshold appear on the map. For the activity criterion (lower part), the black bar appears at locations where the activity index exceeds 1.2. For the differential compaction, a colored bar appears for a particular layer that has exceeded the differential compaction criterion. The color code is green for layer 1, red for layer 2, and blue for layer 3. If more than one layer exceeds the threshold, the bars are stacked. In some areas it appears that there is blue stacked on blue. This appearance is due to the reduced scale of the map in Figure 8. At a larger scale, the color of the lower layer appears as well.

The layer thickness data is shown as depth plots with colors green, red, and blue representing layers 1, 2, and 3 as detected in the GPR data. The core values are presented as red dots. Each dot is a layer boundary reported in the core logs.

The activity index in Figure 8 shows limited areas of damage, but the differential compaction Layer 3 exceeds the limit in a large percentage of the section. Layer 3 is a fairly thick layer, and its differential compaction could be due to effects other than moisture damage. Some further investigation might help to clarify this difference. The moisture damage plots for all the sections listed in Table 1 are included in Attachment C.

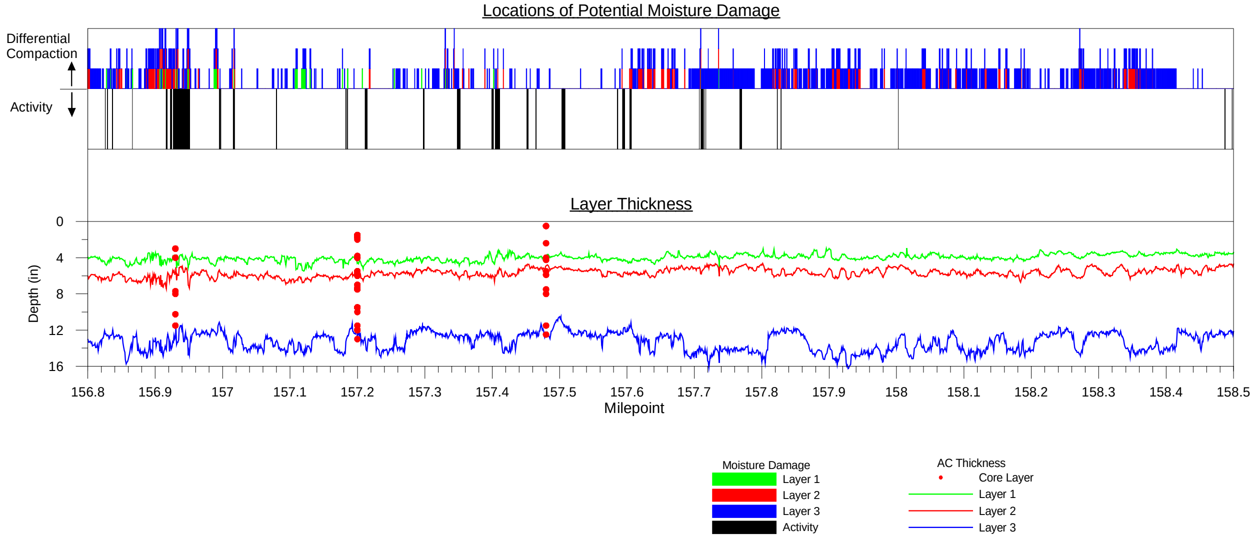


Figure 8 – Sample Moisture Damage Plot: Anlauf-Elkhead SB

6. Discussion of Results

Table 3 shows summary results for each of the sections analyzed. The results are presented for each indicator, and show the percentage of the analysis area where damage is indicated. For example, for the Anlauf-Elkhead NB section from MP 161-161.5, the activity index shows 15.5% of the section with potential moisture damage. The differential compaction index in this area shows less potential damage, with values of 0, 1.7, and 8.5 percent for layers 1, 2, and 3 respectively. Reference to the plot in Attachment C provides the depth of these 3 layers as they vary across the section. Note that the Activity Index and the differential compaction indices are computed separately, and the locations that are identified may or may not overlap.

A review of the figures in the table shows that in general, the differential compaction indicator increases with increasing depth. This suggests that there is more differential compaction (and possibly associated moisture damage) as you go deeper into the pavement. The values of the Activity Index range from 1 to 23 percent, with the highest values occurring in the Cottage Grove-Martin Creek section. The available core data from this section is from 1995, and while this data does not appear to show any moisture damage, a considerable amount of damage could have developed over the past 12 years.

The information provided in the damage plots for the Cottage Grove-Martin Creek section can be used to identify specific locations for coring and validation. Areas that show high reflection activity, high differential compaction, or both can be selected. In the northbound direction, it appears that the Activity Index is the primary indicator, since the differential compaction values are relatively low. In the southbound direction, there appears to be both a high degree of differential compaction in the lowest layer and high reflection activity, so both of these indicators should be used for verification site selection.

Table 3 – Summary Results of the Moisture Damage Analysis

				Predicted Moisture Damage (% of sub-section length)			
				Activity	**Differential Compaction**		
Project	**Direction**	**Start MP**	**End MP**	**Index**	**Layer 1**	**Layer 2**	**Layer 3**
Anlauf-Elkhead (MP 154.50-MP 162.10)	NB	156.30	157.50	19.8%	1.3%	5.1%	26.4%
	NB	161.00	161.50	15.5%	0.0%	1.7%	8.5%
	SB	161.50	161.00	0.9%	0.0%	0.6%	11.7%
	SB	158.50	157.00	2.1%	1.6%	10.3%	46.7%
	SB	155.50	154.50	Missing Data			
Garden Valley-Roberts Creek (MP 117.70-125.00)	NB	117.70	119.00	6.3%	14.6%	18.4%	8.8%
	NB	120.25	121.00	18.0%	0.8%	5.8%	9.5%
	NB	123.70	124.70	15.9%	2.4%	10.4%	18.4%
	SB	119.00	117.70	4.7%	3.9%	12.3%	20.0%
	SB	121.00	120.25	14.7%	1.0%	3.6%	13.7%
	SB	122.00	121.50	14.4%	3.6%	4.0%	11.0%
	SB	123.80	122.70	12.7%	3.7%	4.7%	16.1%
Vets Bridge-Myrtle Creek (MP 109.00-112.50)	NB	109.00	112.50	15.8%	4.3%	5.4%	10.2%
	SB	112.50	109.00	19.0%	14.4%	14.2%	25.0%
Cottage Grove-Martin Creek (MP169.3-174.7)	NB	169.30	174.70	19.0%	6.6%	3.4%	4.3%
	SB	174.70	169.30	23.1%	3.8%	9.5%	15.6%

ATTACHMENT A

Principles of GPR for Pavement Evaluation

Principles of GPR for Pavement Evaluation

Ground penetrating radar operates by transmitting short pulses of electromagnetic energy into the pavement using an antenna attached to a survey vehicle. These pulses are reflected back to the antenna with an arrival time and amplitude that is related to the location and nature of dielectric discontinuities in the material (air/asphalt or asphalt/concrete, reinforcing steel, etc). The reflected energy is captured and may be displayed on an oscilloscope to form a series of pulses that are referred to as the radar waveform. The waveform contains a record of the properties and thicknesses of the layers within the pavement (Figure A.1).

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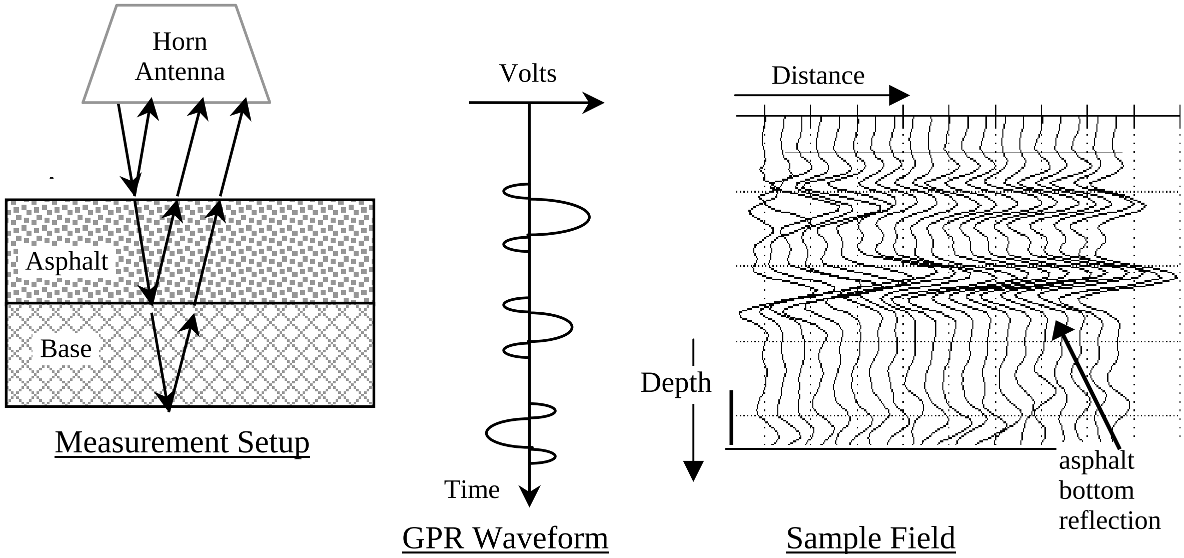


Measurement Setup

GPR Waveform

Sample Field

Figure A.1 – Structure of the GPR Signal for Pavements

The sequence of scans shown on the right of Figure A.1 is frequently coded in color or gray scale to produce the “B” scan representation, examples of which have been shown in Section 3 of the report. The B scan provides the equivalent of a cross sectional view of the pavement, with the individual pavement layers showing up as colored horizontal bands.

Layer thickness is calculated from the arrival time of the reflection from the top and bottom of each layer as follows:

$$\text{Thickness (in.)} = (5.9\ t)/\sqrt{\varepsilon_a} \qquad (1)$$

where time (t) is measured in nanoseconds and ε_a is the relative dielectric permittivity or "dielectric constant" of the pavement layer (Roddis, et. al., 1992).

Computation of the dielectric constant of the surface layer can be made by measuring the ratio of the radar reflection from the pavement surface to the radar amplitude incident on the pavement. The incident amplitude on the pavement is determined by measuring the reflection from a metal plate on the pavement surface, since the metal plate reflects 100% of the incident energy. Using this data, one obtains the asphalt dielectric constant, ε_a as follows:

$$\varepsilon_a = [(A_{pl} + A)/(A_{pl} - A)]^2 \qquad (2)$$

where A = amplitude of reflection from asphalt, and A_{pl} = amplitude of reflection from metal plate (= negative of incident amplitude) (Roddis, et. al., 1992). Table A.1 shows typical dielectric constants and associated GPR velocities for pavement materials. Note that the range of dielectric constant for asphalt is large, due to the variations in density and aggregate composition.

Table A.1 – GPR Velocities and Dielectric Constants for Pavement Materials

Velocity			**Dielectric constant**	**Notes**
Metric		**English**		
m/ns	**cm/ns**	**in/ns**		
0.100	10.0	3.94	9.00	typical for pcc
0.105	10.5	4.13	8.16	
0.110	11.0	4.33	7.44	
0.115	11.5	4.53	6.81	
0.120	12.0	4.72	6.25	
0.125	12.5	4.92	5.76	
0.130	13.0	5.12	5.33	
0.135	13.5	5.31	4.94	typical for ac
0.140	14.0	5.51	4.59	
0.145	14.5	5.71	4.28	
0.150	15.0	5.90	4.00	
0.155	15.5	6.10	3.75	

A similar calculation can be made for the dielectric constant of the base material. Changes in base moisture content have a strong effect on the base dielectric constant, and thus the base dielectric constant can be used as an indicator of high moisture content.

The calculations described above are automated in Infrasense's PAVLAYER© data analysis software program for computing pavement layer thickness and changes in pavement layer properties. The analytical techniques described above serve as the basis for the thickness data analysis carried out during this project, as described in Section 3 of the report.

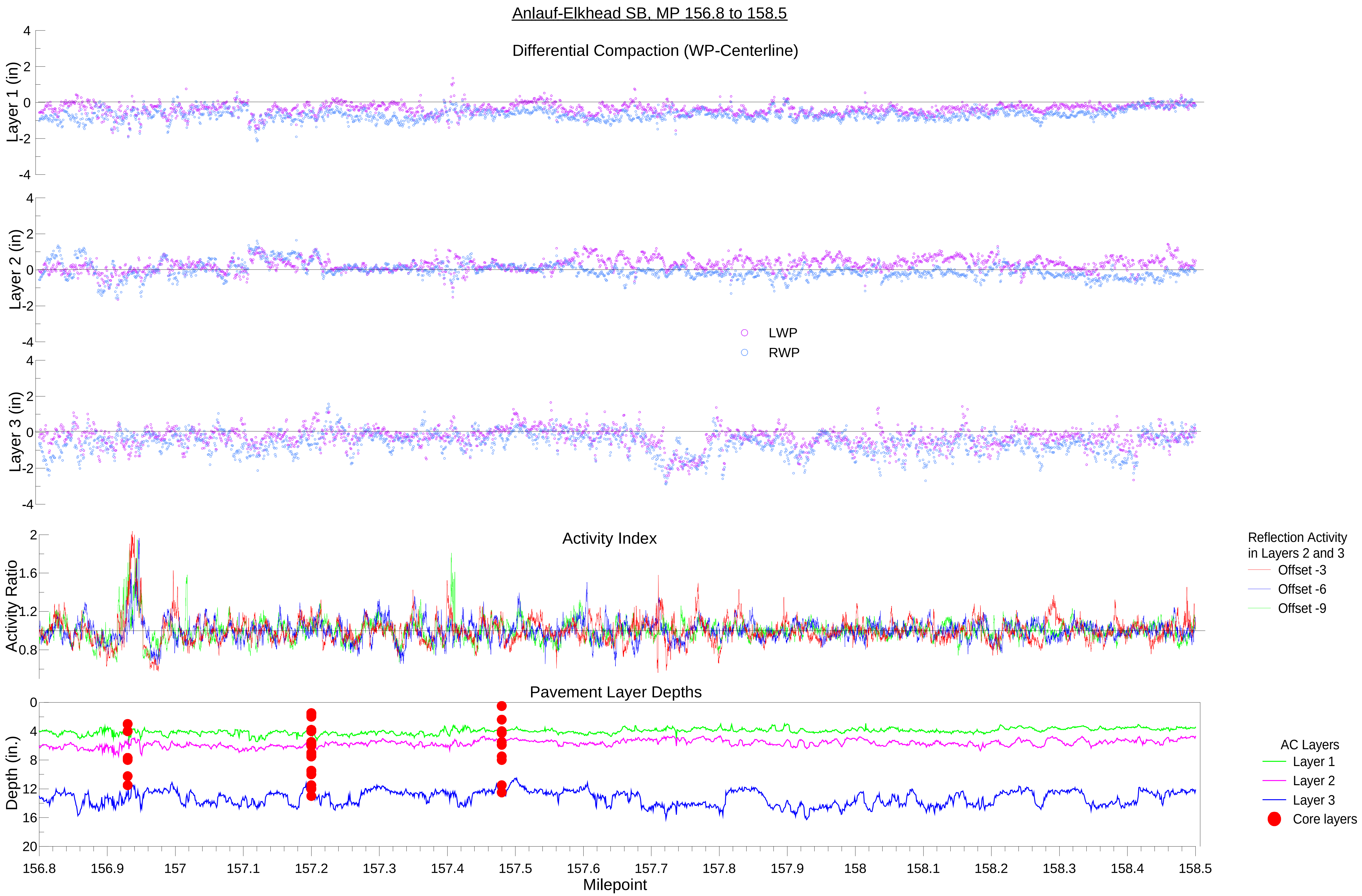
References

Roddis, W.M., Kim, Maser, K.R., and Gisi, A.J., "Radar Pavement Thickness Evaluations For Varying Base Conditions," *Transportation Research Record No. 1355,* TRB National Research Council, pp. 90-98, 1992.

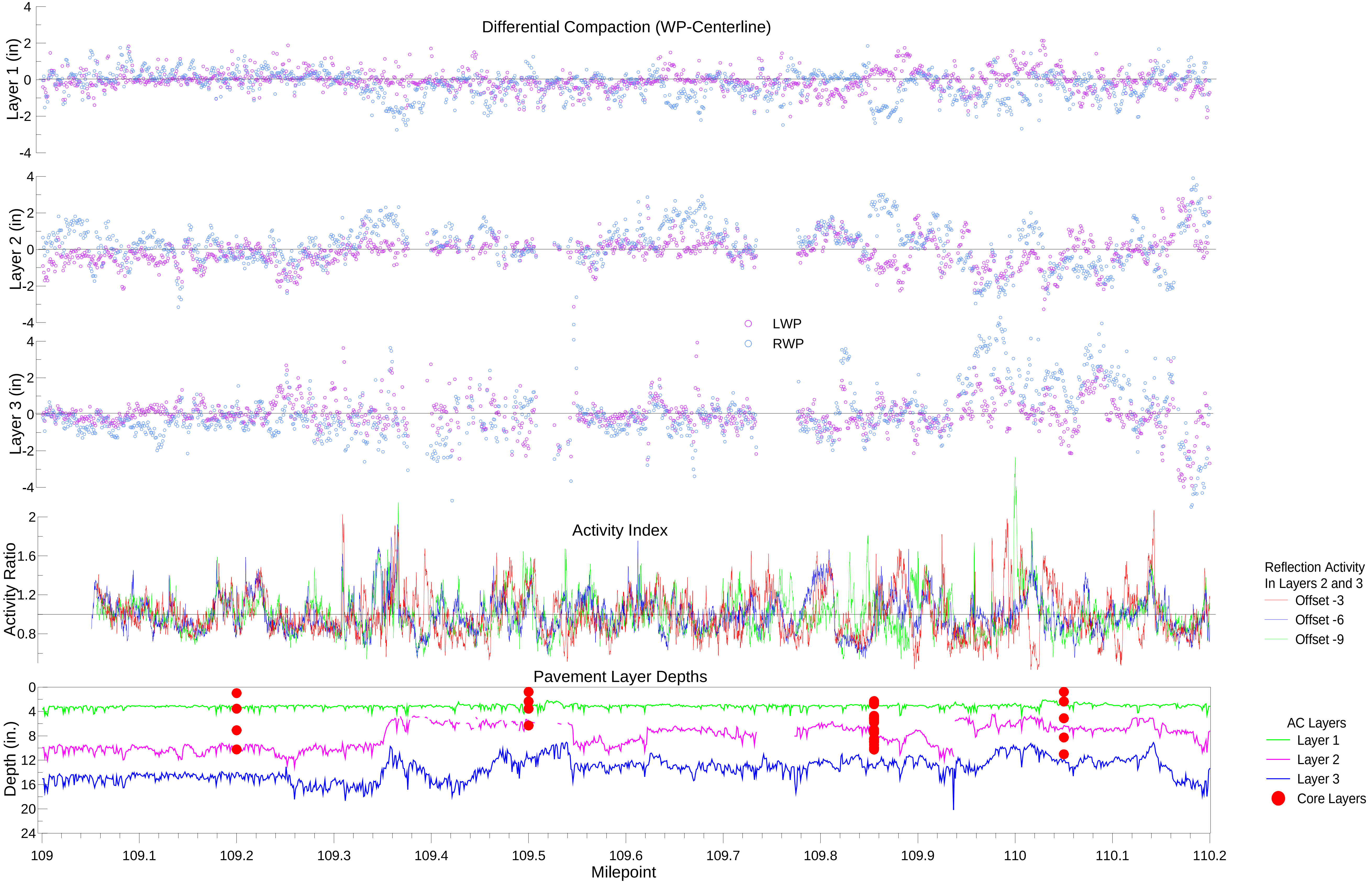
Hammons, M., Maser, K.R., and Nazarian, S. "Detection of Stripping in Hot-Mix Asphalt," Final Report prepared for the Office of Materials and Research, Georgia Department of Transportation, March 2005.

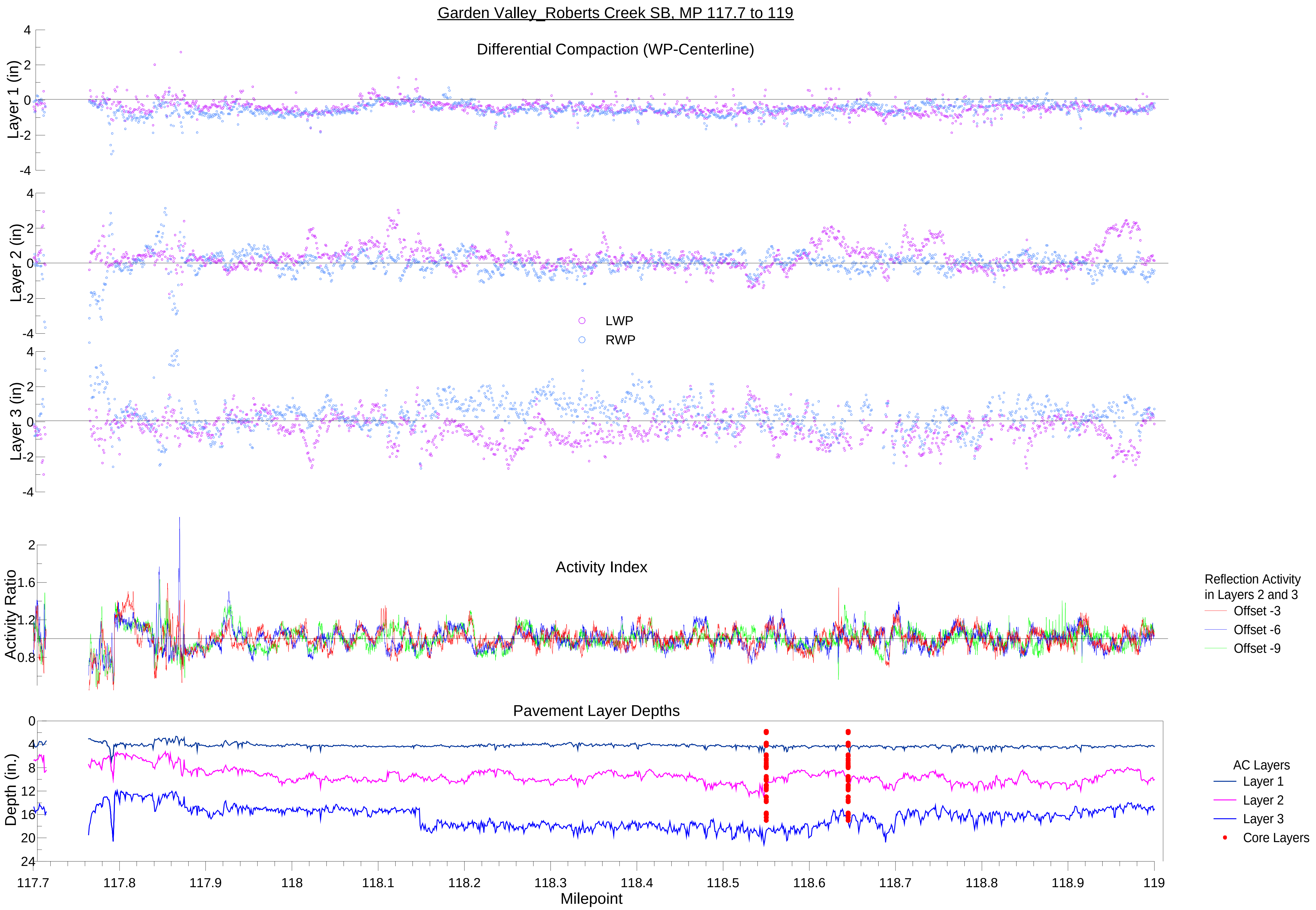
ATTACHMENT B

Analysis of Reflection Activity and Differential Compaction


Anlauf-Elkhead SB, MP 156.8 to 158.5
Differential Compaction (WP-Centerline)
Layer 1 (in)
Layer 2 (in)
Layer 3 (in)
4
2
0
-2
-4
LWP
RWP
Activity Index
Activity Ratio
2
1.6
1.2
0.8
Reflection Activity
in Layers 2 and 3
Offset -3
Offset -6
Offset -9
Pavement Layer Depths
Depth (in.)
0
4
8
12
16
20
AC Layers
Layer 1
Layer 2
Layer 3
Core layers
156.8
156.9
157
157.1
157.2
157.3
157.4
157.5
157.6
157.7
157.8
157.9
158
158.1
158.2
158.3
158.4
158.5
Milepoint

Vetsbridge_MyrtleCreek SB, MP 109 to 110.2





Garden Valley_Roberts Creek SB, MP 117.7 to 119

Differential Compaction (WP-Centerline)

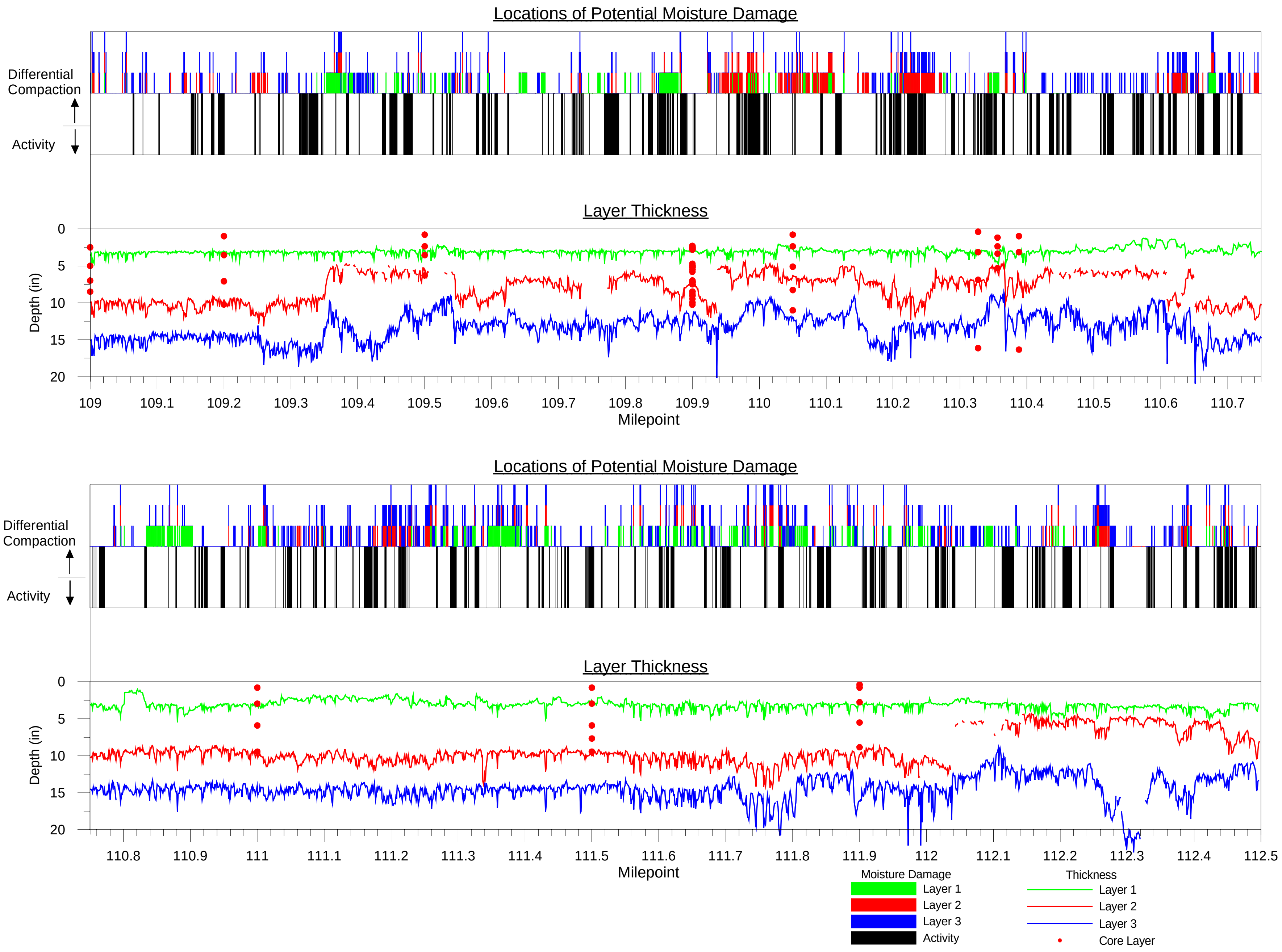
Activity Index

Pavement Layer Depths

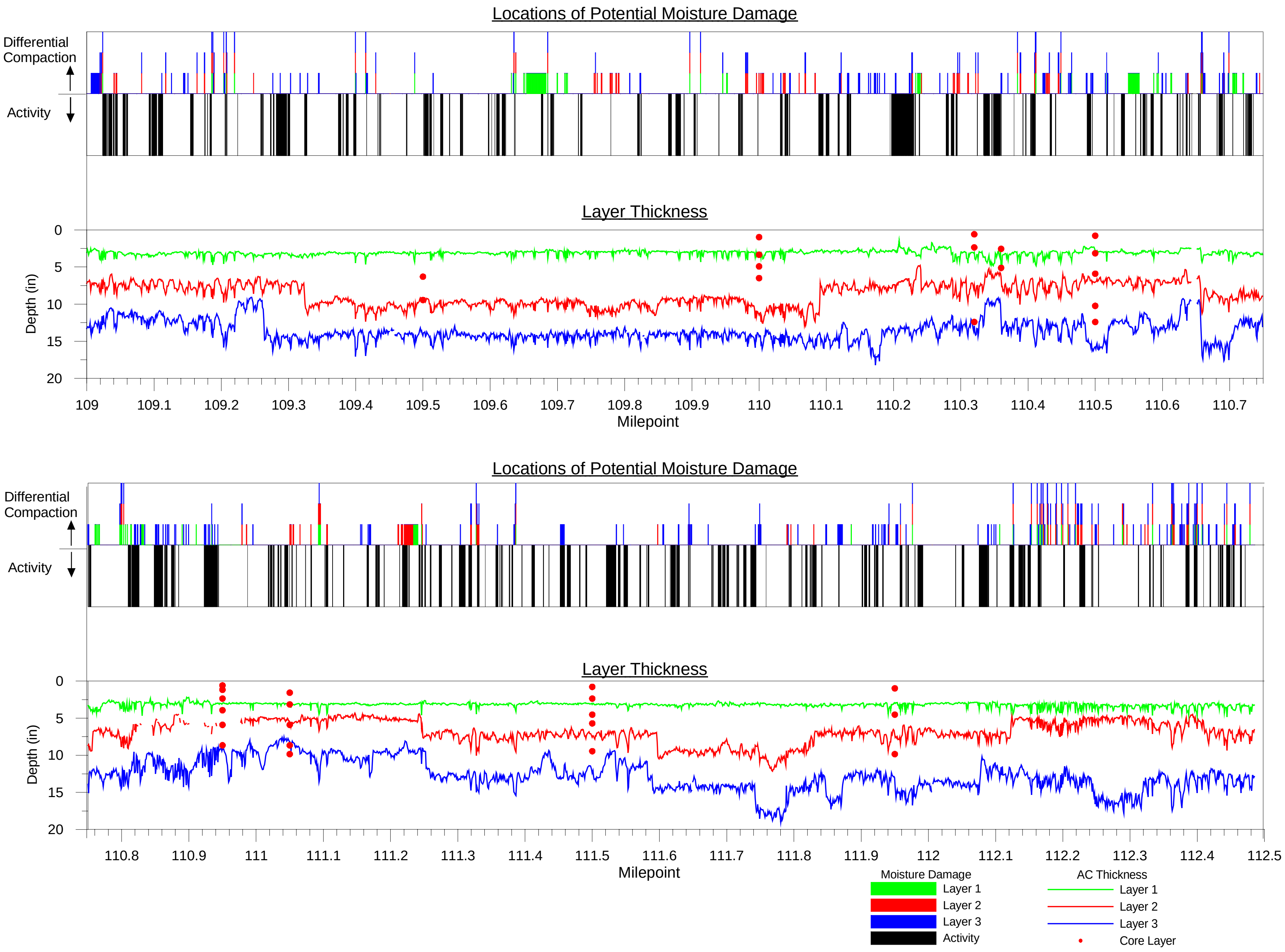
ATTACHMENT C

Moisture Damage Plots

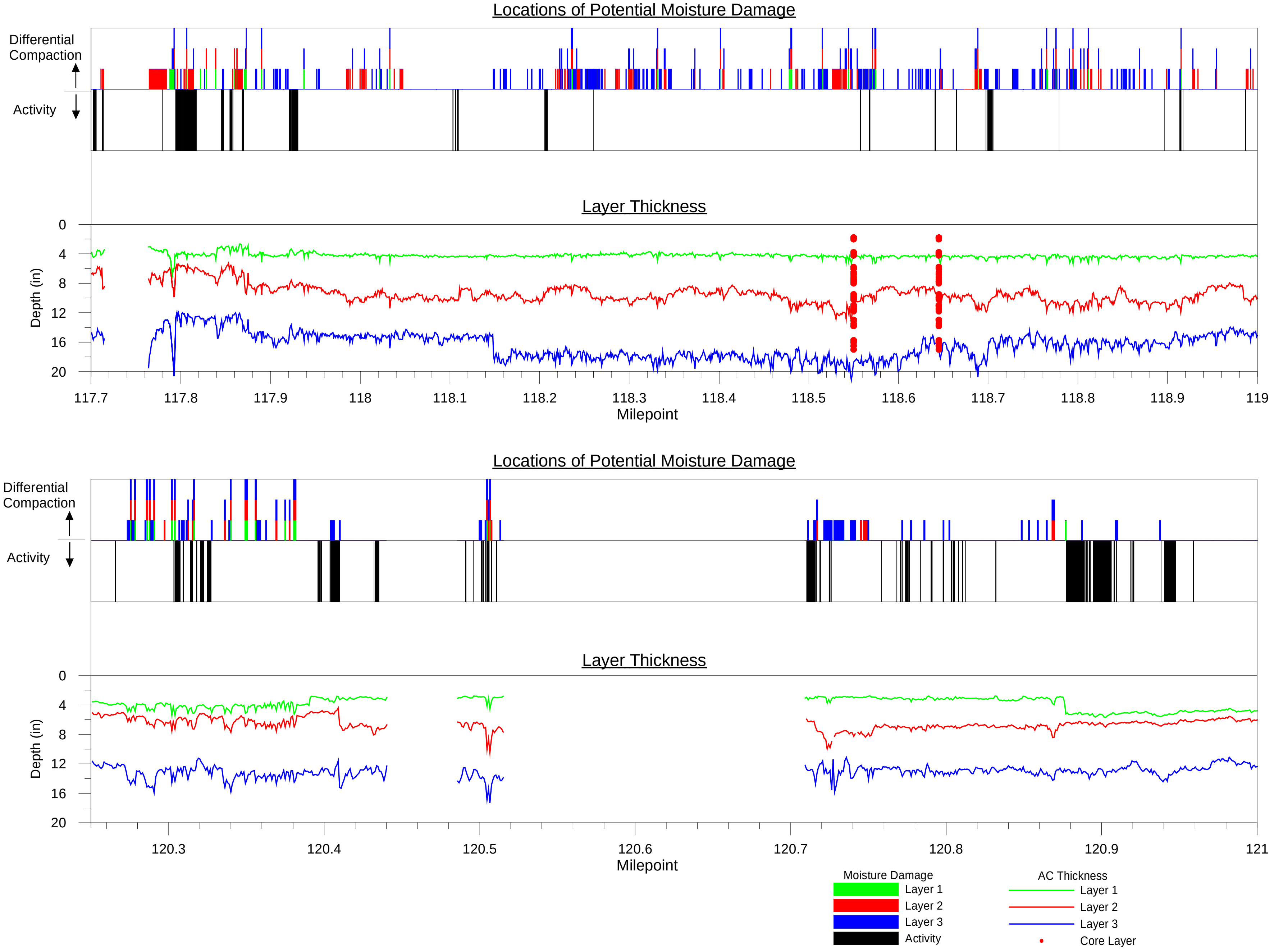
Vets Bridge-Myrtle Creek SB



Vets Bridge-Myrtle Creek NB



Garden Valley-Roberts Creek SB



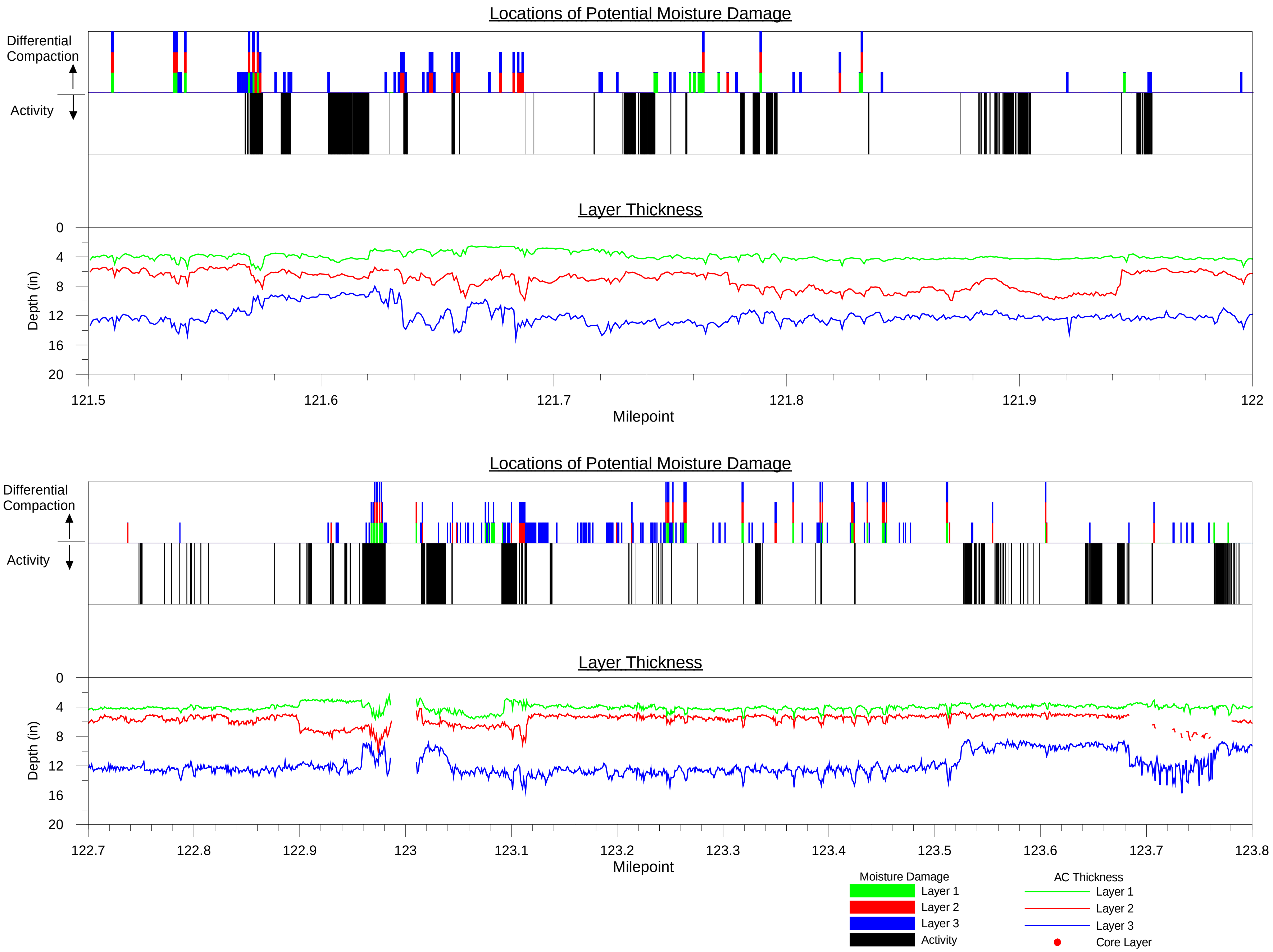
Locations of Potential Moisture Damage

Layer Thickness

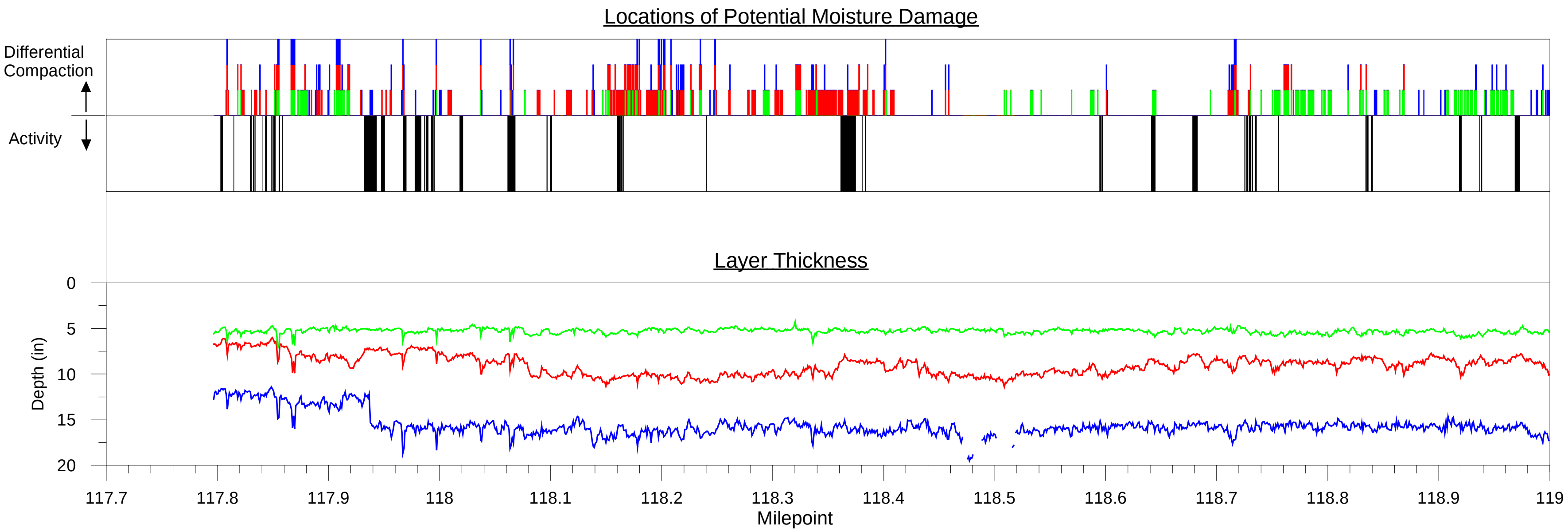
Locations of Potential Moisture Damage

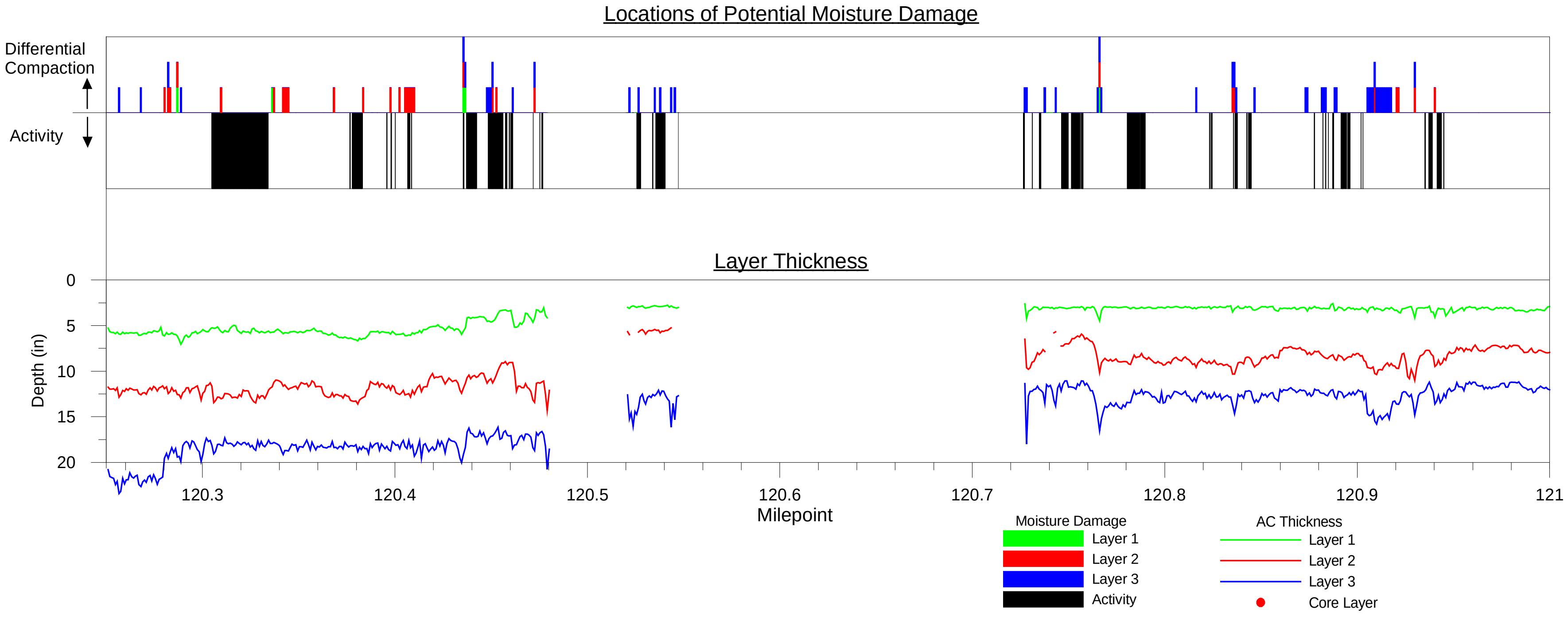
Layer Thickness

Garden Valley-Roberts Creek SB

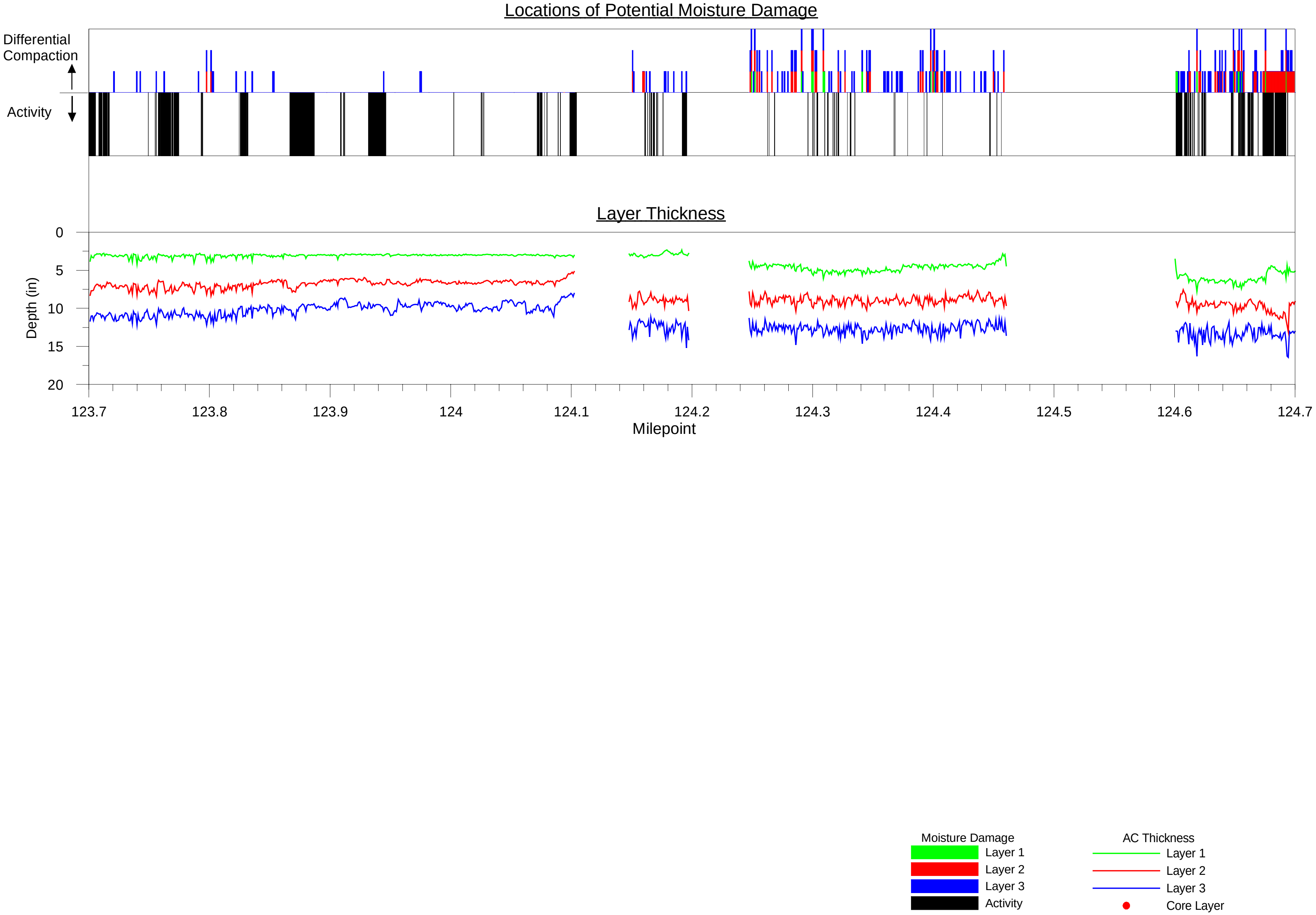


Garden Valley-Roberts Creek NB

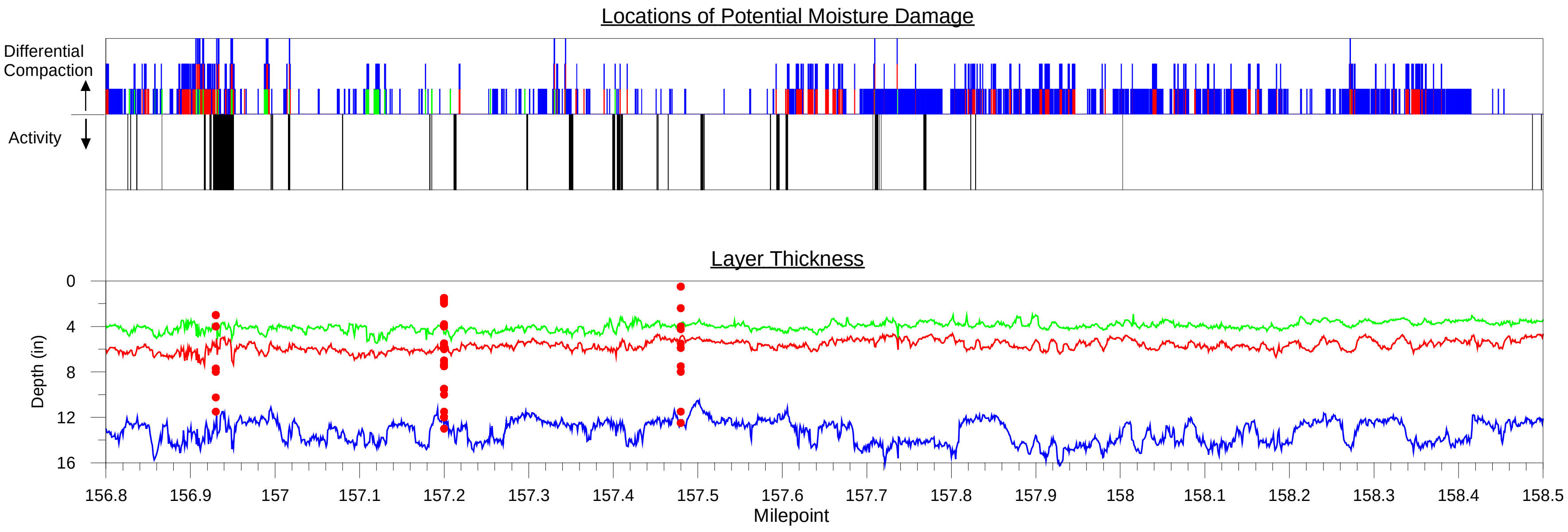


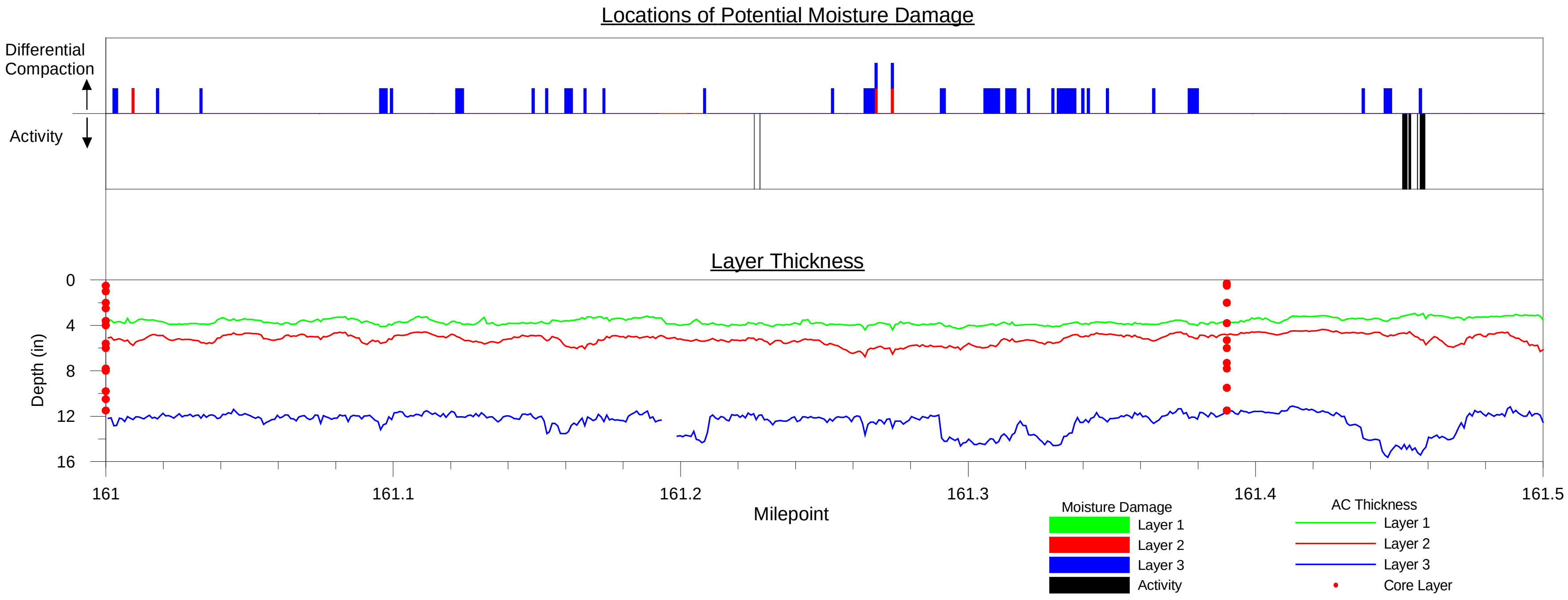


Garden Valley-Roberts Creek NB

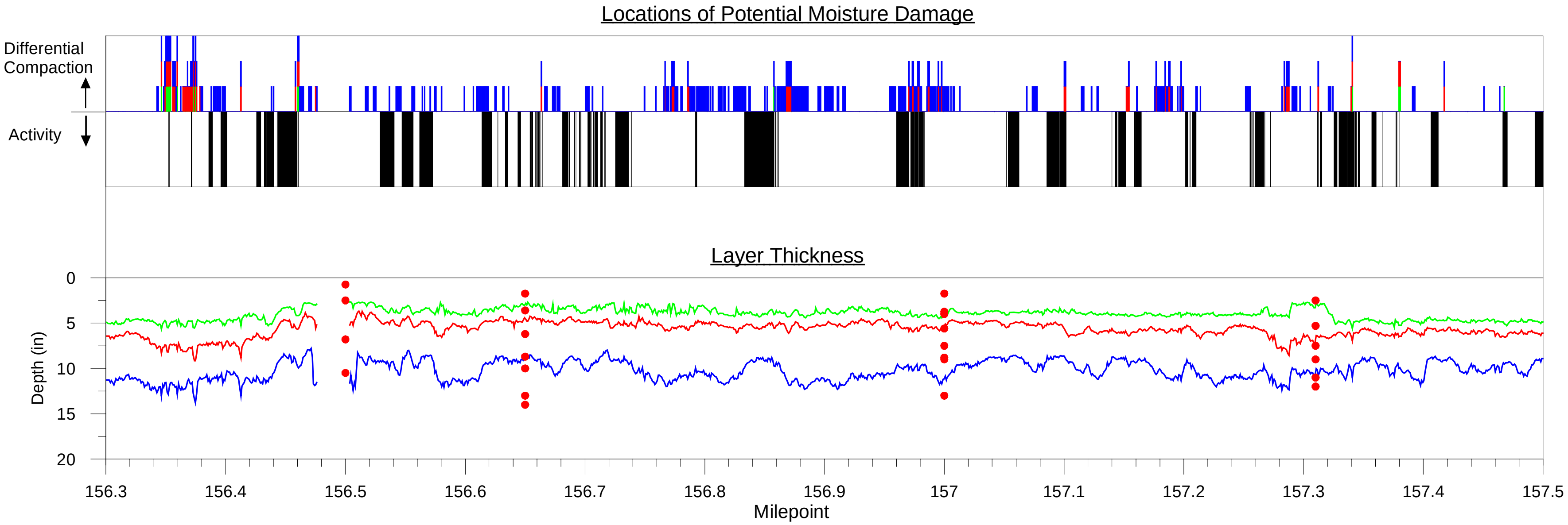


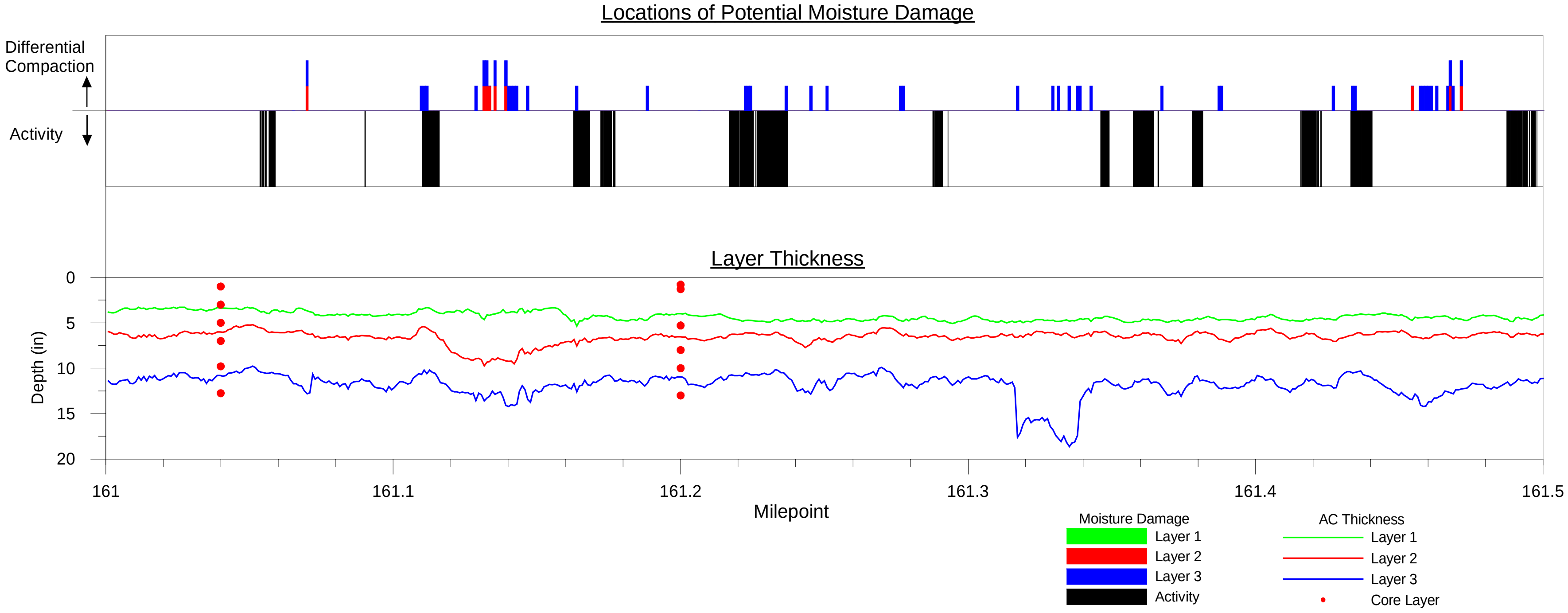
Anlauf-Elkhead SB



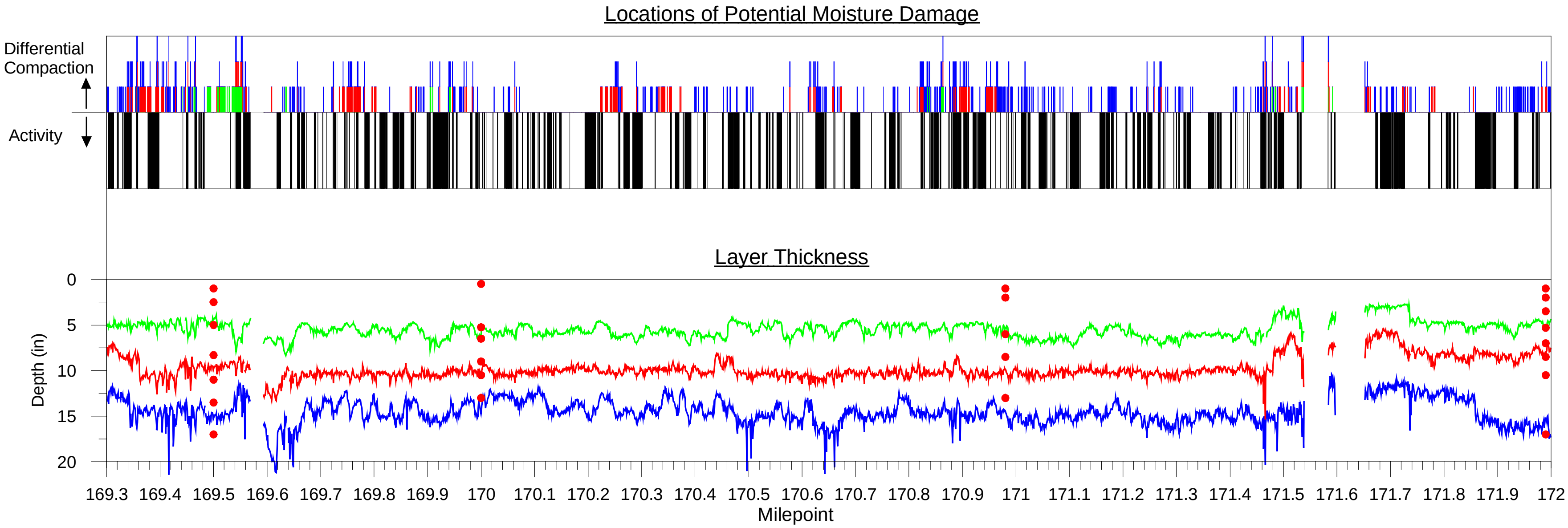


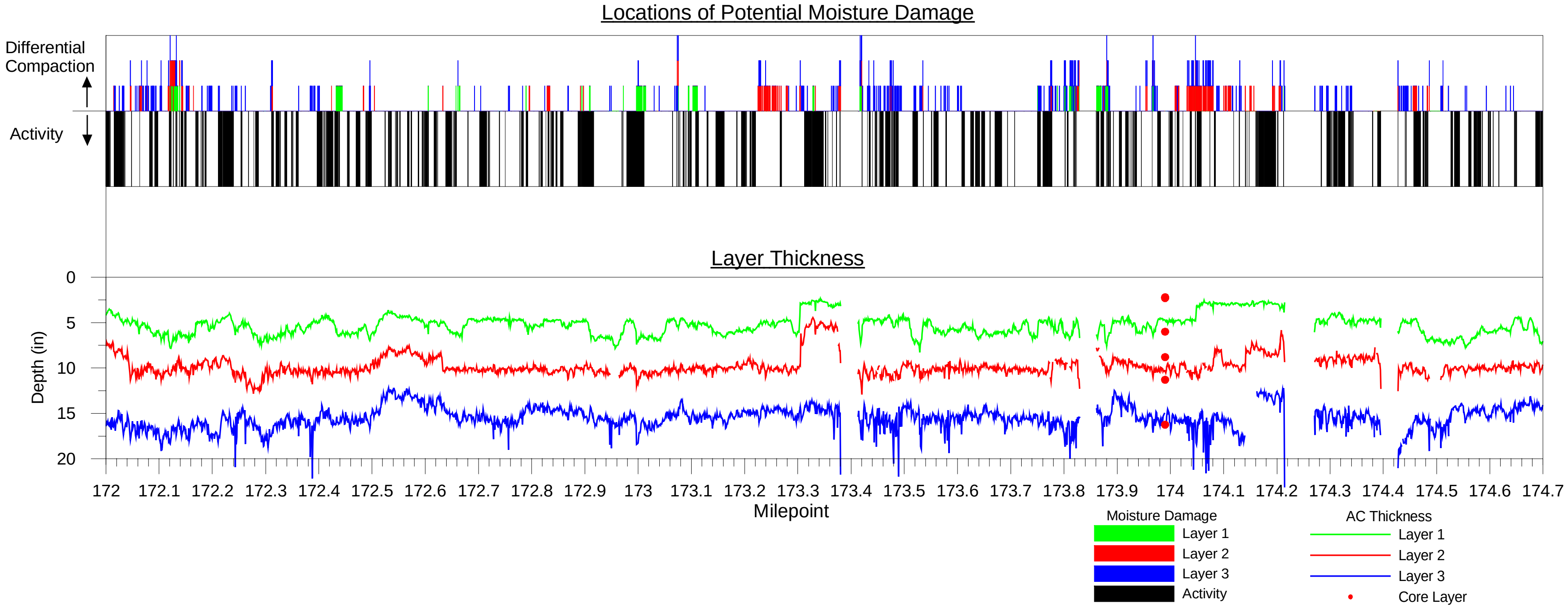
Anlauf-Elkhead NB



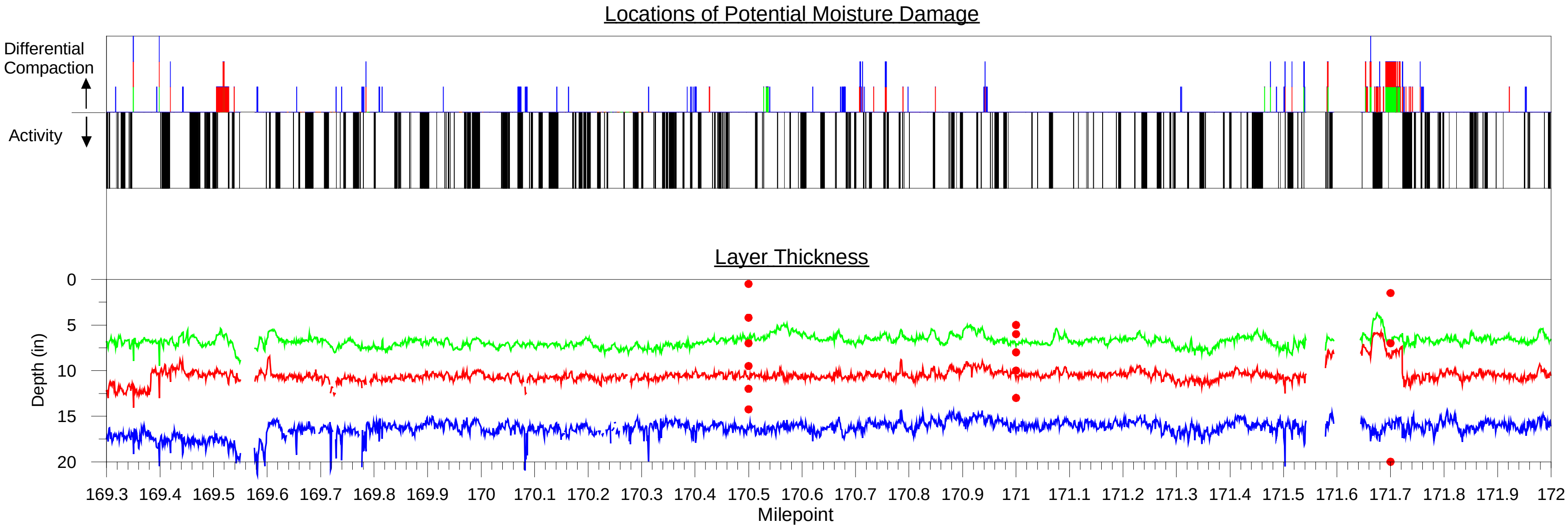


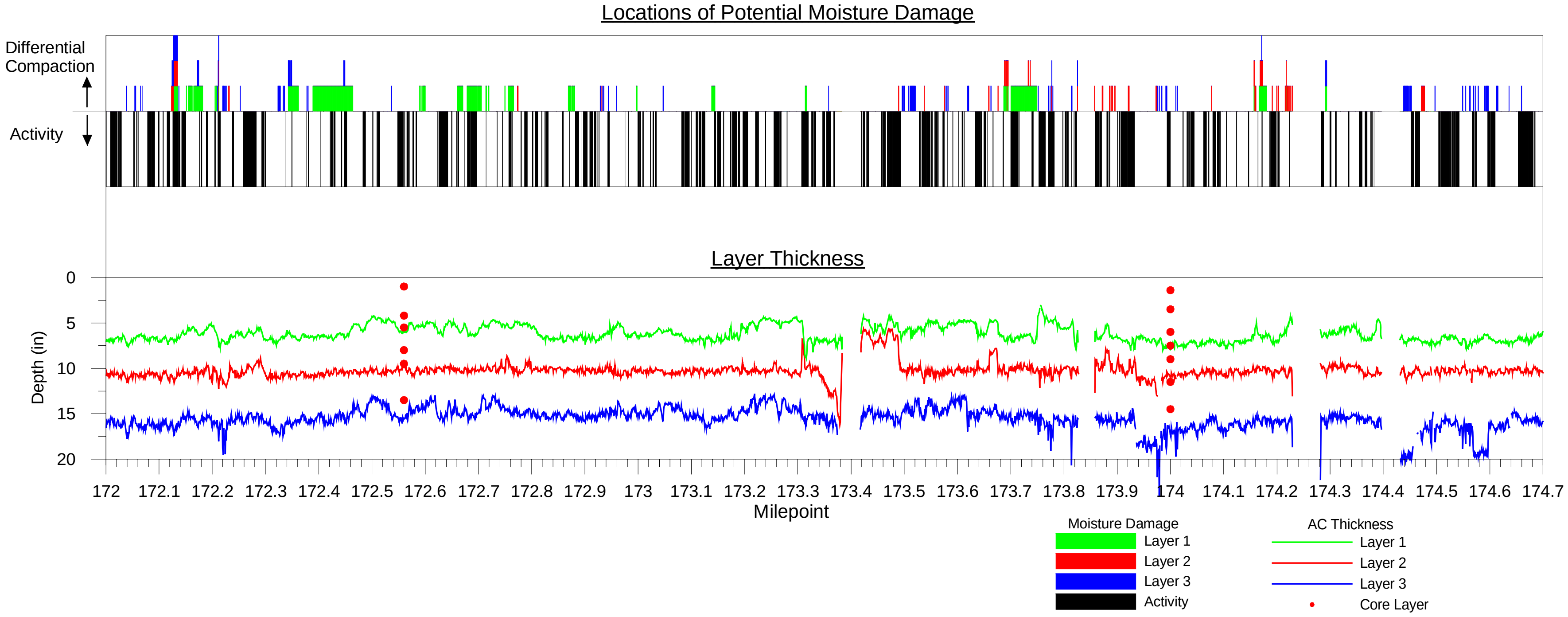
Cottage Grove-Martin Creek SB





Cottage Grove-Martin Creek NB





APPENDIX L: CHECKLIST FOR PRE-CONSTRUCTION SITE INVESTIGATIONS TO IDENTIFY THE POTENTIAL FOR MOISTURE-RELATED PROBLEMS IN REHABILITATED HOT MIX ASPHALT PAVEMENTS

CHECKLIST FOR PRE-CONSTRUCTION SITE INVESTIGATIONS TO IDENTIFY THE POTENTIAL FOR MOISTURE-RELATED PROBLEMS IN REHABILITATED HOT MIX ASPHALT PAVEMENTS

The basic steps for conducting pre-construction site investigations include: 1) records review, 2) site observations and conditions surveys, 3) field investigations, 4) laboratory investigations, 5) data analysis, and 6) report of findings. The following provides a checklist of activities for conducting each of these tasks, while Section 6.1 of this report provides details for these activities.

Records Review

☐ For the project under consideration, all available historical records have been collected for the following:

  ☐ Pavement construction information.

  ☐ Information regarding the existing pavement structure.

  ☐ Pavement materials information.

  ☐ Soils and geological information.

  ☐ Traffic data.

  ☐ Historical pavement performance.

  ☐ Weather data.

Site Observations and Condition Surveys

☐ A preliminary meeting with appropriate personnel has been held to become familiar with the project and surrounding area.

☐ Interviews with personnel familiar with the project (e.g., construction and maintenance personnel) have been held to obtain their opinions and observations regarding construction activities, pavement performance issues, and applied maintenance treatments.

☐ A condition survey of the pavement along the project has been conducted to gather information regarding the type, severity, extent, and location of distresses.

☐ Findings from the preliminary meeting, interviews, and condition survey have been documented

Field Investigations

☐ Guided by the findings from the records review and the recommendations from the site visit and condition survey documentation as well as recommendations identified in the ODOT Pavement Design Guide, a plan to conduct field investigations.

☐ Dates and times for conducting the field investigations have been coordinated with district maintenance personnel, motor carrier personnel, pavement services field crew personnel, and any required subcontractors.

☐ Field investigations have been conducted and documented.

Laboratory Investigations

☐ Core samples have been grouped according to division of segments along the project.

☐ A sufficient number of core samples from each grouping (minimum of three is recommended) has been selected for laboratory testing.

☐ Observations of the core samples to detect moisture damage have been made.

☐ If moisture damage is not obvious through observations of the core samples, the core samples have been cut into individual layers and tested to determine air void content, moisture susceptibility via AASHTO T 283 (optional), permeability via Florida DOT Test Method TM 5-565 (optional), and split along their diameter for visual assessment of moisture damage.

Data Analysis

☐ Analyses of the data derived from all of the above activities have been conducted to assess the pavement structural, functional, and drainage adequacy, materials durability, and variability within the project.

Report

☐ A report has been prepared that documents the efforts and findings from all of the above activities.

APPENDIX M: CHECKLIST FOR PAVEMENT STRUCTURAL DESIGN TECHNIQUES FOR THE REHABILITATION OF HOT MIX ASPHALT CONCRETE PAVEMENTS WHEN THE POTENTIAL FOR MOISTURE-RELATED PROBLEMS EXIST

CHECKLIST FOR PAVEMENT STRUCTURAL DESIGN TECHNIQUES FOR THE REHABILITATION OF HOT MIX ASPHALT CONCRETE PAVEMENTS WHEN THE POTENTIAL FOR MOISTURE-RELATED PROBLEMS EXIST

The structural design process for rehabilitation of HMA pavements is a multi-step process involving evaluation of the existing pavement, rehabilitation strategy selection (including materials incorporated), structural design, and life cycle cost analysis and, optionally, consideration of non-monetary factors. Section 6.1 of this report provides guidelines for evaluation of the existing pavement, whereas Section 6.2 provides guidelines for 1) rehabilitation strategy selection and 2) structural design. Recommendations concerning life cycle cost analyses are covered in the ODOT Pavement Design Guide, whereas non-monetary considerations are covered in the MEDPG documentation (*ARA 2004*). The following provides a checklist of activities, to be used in conjunction with Section 6.2 of this report, for 1) rehabilitation strategy selection and 2) structural design.

Rehabilitation Strategy Selection

- ☐ Based on the documented findings from the pre-construction site investigation activities (see Section 6.1), the project has been determined to be a viable candidate for an inlay and/or inlay/overlay rehabilitation treatment. The criteria listed under Item 1 of Section 6.2.1 have been checked to determine if the project is not a viable candidate.
- ☐ A list of practical rehabilitation strategy alternatives has been formulated.

Structural Design

- ☐ For the rehabilitation strategies identified above, appropriate materials have been identified for use in the inlay/overlay (see Section 6.4).
- ☐ Consideration has been given to provision for drainage of moisture that enters the pavement through:
    - ☐ Minimization of moisture infiltration via:
        - ☐ Adequate cross-slope and longitudinal gradients,
        - ☐ Possibly including edge drainage, and/or
        - ☐ Possible including wearing course surface drains at frequent intervals throughout the project;
    - ☐ Use of moisture-insensitive materials; and
    - ☐ Rapid removal of water from the pavement structure via:

  - ☐ Possibly including edge drain systems,
  - ☐ Where appropriate, ensuring adequate side ditch longitudinal grade and sufficient freeboard,
  - ☐ Where appropriate, ensuring adequate storm drain system capacity, and
  - ☐ Where appropriate, ensuring adequate design for daylighted bases/subbases (in combination with side ditches).
- ☐ With the aid of the ODOT Pavement Design Guide, pavement structures have been developed for each of the viable rehabilitation strategies identified above so as to satisfy the criteria for load-carrying capabilities.

APPENDIX N: CHECKLIST FOR CONSTRUCTION TECHNIQUES FOR THE REHABILITATION OF HOT MIX ASPHALT CONCRETE PAVEMENTS WHEN THE POTENTIAL FOR MOISTURE-RELATED PROBLEMS EXIST

CHECKLIST FOR CONSTRUCTION TECHNIQUES FOR THE REHABILITATION OF HOT MIX ASPHALT CONCRETE PAVEMENTS WHEN THE POTENTIAL FOR MOISTURE-RELATED PROBLEMS EXIST

Employing and properly executing good construction practices can greatly reduce the risk of moisture damage to rehabilitated asphalt concrete pavements. Section 6.3 of this report provides guidelines for 1) surface preparation of the existing pavement, 2) pavement drainage, 3) production of hot-mix asphalt, 4) paving operations, and 5) quality control/quality assurance. Provided below is a checklist, to be used in conjunction with Section 6.3, of the key construction techniques that should be employed to minimize the risk of moisture-induced damage to the rehabilitated pavement. The checklist assumes that project specifications and/or special provisions contain direction to the contractor for each of the techniques listed.

Surface Preparation

- ☐ Locations of failed pavement have been repaired.
- ☐ The contractor has provided adequate cross-slope of the existing pavement surface (i.e., 2%) through application of a leveling course or through cold milling operations.
- ☐ If a cold milling operation was employed in preparing the existing pavement surface:
    - ☐ The milled surface has a uniform texture.
    - ☐ The longitudinal profile of the milled surface has been finished to the same tolerance as for new base course construction.
    - ☐ The contractor has milled the existing surface to the limits specified on the plans.
- ☐ The finished surface of the existing pavement surface is very nearly planar.
- ☐ The milled surface has been thoroughly cleaned by sweeping or washing immediately prior to placement of the overlay or inlay. If washed, the surface has been allowed to dry prior to application of the tack coat.
- ☐ The tack coat has been applied at the specified dilution and at an appropriate rate so as to completely and uniformly coat the existing pavement surface.

Pavement Drainage

- ☐ Adequate cross-slope of the existing pavement surface has been checked and complies with specifications.

- ☐ If retrofitting or rehabilitating edge drain systems:
    - ☐ Edge drain grades have been cut to the specified slopes.
    - ☐ Edge drain outlets have been placed in sag curves.
    - ☐ Edge drain outlets are below the edge drain pipes.
    - ☐ Edge drain backfill material meets specifications.
    - ☐ Edge drain backfill material has been compacted to specification without crushing the edge drain pipes.
    - ☐ Precautions have been employed to prevent crushing of edge drain pipes and outlets by heavy equipment.
    - ☐ Guardrail and delineator posts have not been driven through edge drain pipes and outlets.

HMA Production

- ☐ Proper stockpiling of aggregates has been employed to ensure adequate cleanliness, minimize segregation, and allow drainage of free water:
    - ☐ Aggregate cleanliness, as determined by the Sand Equivalent test, has been checked at the specified frequency. Corrective action has been undertaken when the cleanliness of the aggregates fall out of specification.
    - ☐ Aggregate segregation, as determined by sieve analyses, has been checked at the specified frequency. Corrective action has been undertaken when the gradation of the aggregates fall out of specification.
    - ☐ Moisture content of the stockpiled aggregate has been determined at the specified frequency.
- ☐ The feed rates of the cold bins have been checked to ensure proper proportioning of the aggregates.
- ☐ The time required to adequately dry the aggregates (according to specifications) prior to mixing with asphalt cement has been properly adjusted to account for fluctuations in moisture content of the aggregates.
- ☐ The mixture discharged from the plant has been visually assessed to detect uncoated or partially coated aggregates or a particularly dry-looking mixture and, if observed, adjustments have been made to the mixing operation to correct any problems.

☐ Prior to loading the mixture into haul units, the haul units have been cleaned and lubricated with a non-petroleum-based lubricant.

☐ The mixture has been discharged from the silo or batcher unit into the haul units in two or more piles, rather than one large pile, to minimize aggregate segregation during load out.

☐ For open-graded or gap-graded (i.e., SMA) mixtures, observations of the haul units prior to discharge of the mixture onto the existing pavement surface or into the material transfer vehicle or paver have been made to detect draindown problems (e.g., asphalt cement dripping from the haul unit).

☐ Means or methods have been employed to minimize thermal segregation (i.e., non-uniform cooling) of the mixture during transport of the mixture from the plant to the project site.

Paving Operations and Compaction

☐ At the project site, the hauls units have been checked to ensure the correct mixture has been delivered, particularly when more than one mix design is utilized for the project.

☐ Deliveries of the hot mix asphalt to the project site have been balanced to prevent the paver hopper from being completely emptied between loads and to avoid unnecessary queuing of haul units.

☐ For haul units that load the mixture directly into the paver hopper, excessive bumping of the paver by the haul has been avoided.

☐ If warranted (e.g., for long haul distances) or whenever possible and practical, a material transfer vehicle has been employed as part of the equipment spread at the project site.

☐ The paver has been properly operated so as to prevent mixture (aggregate) segregation.

☐ Compaction of the mixture has been accomplished and verified according to specifications.

☐ The newly-placed pavement mat has been observed to detect fat spots indicative of draindown problems.

Quality Control and Quality Assurance

☐ A quality control plan for the project has been developed.

☐ A quality assurance plan for the project has been developed.

☐ Checklists of all important tasks or actions that need to be undertaken have been developed and implemented.

☐ The contractor has performed all required sampling and testing in accordance with the quality control plan, specifications, and special provisions.

☐ The contractor has provided documentation to ODOT of all quality control test results in accordance with the quality control plan, specifications, and special provisions.

☐ ODOT has performed all quality assurance testing in accordance with the quality assurance plan.

☐ If applicable, edge drain systems have been inspected and tested to ensure proper functioning.

☐ Daily diaries (in addition to the checklists) have been kept to record project conditions, activities, changes that occur during operations, unusual events, names and titles of persons involved in discussions regarding the project, and reasons for operational delays.

☐ Feedback has been sought from all appropriate personnel regarding any operational problem or defect associated with the project. Feedback has been recorded in the checklists and/or daily diaries.

APPENDIX O: CHECKLIST FOR MATERIALS SELECTION AND TESTING FOR THE REHABILITATION OF HOT MIX ASPHALT CONCRETE PAVEMENTS WHEN THE POTENTIAL FOR MOISTURE-RELATED PROBLEMS EXIST

CHECKLIST FOR MATERIALS SELECTION AND TESTING FOR THE REHABILITATION OF HOT MIX ASPHALT CONCRETE PAVEMENTS WHEN THE POTENTIAL FOR MOISTURE-RELATED PROBLEMS EXIST

The resistance of hot mix asphalt concrete to moisture-induced damage largely depends on the strength of the adhesive bond established between the asphalt cement and mineral aggregate which, in turn, largely depends on chemical compatibility between the asphalt cement and mineral aggregate. Aggregate cleanliness also plays a key role in developing a strong bond. Section 6.4 provides guidelines for materials selection and testing for 1) aggregates, 2) asphalt cements, 3) HMA mixtures, and 4) additives so as to reduce the risk of moisture-related problems in hot-mix asphalt concrete mixtures. The following provides a checklist for selection and testing of these materials.

Aggregates

☐ All requirements for aggregates to be used in the HMA mixture as specified in the Standard Specifications and/or Special Provisions have been met.

☐ An anti-stripping additive (e.g., lime, liquid anti-strip, etc.) will be used because one or both of the following is/are true:

  ☐ One or more of the aggregate fractions has a high concentration of siliceous compounds. Aggregate types that tend to have a high concentration of siliceous compounds include silica, sandstones, granites, porphyries, diorites, and ophites.

  ☐ One or more of the aggregate fractions has a poor or only fair resistance to stripping. Shale tends to have a poor resistance to stripping whereas granite, syenite, diorite, chert, gneiss, schist, slate, quartzite, and serpentine are examples of aggregates with a fair resistance to stripping.

Asphalt Cements

☐ All requirements for the asphalt cement as specified in the Standard Specifications, Special Provisions, and supporting documents (e.g., Standard Specifications for Asphalt Materials) have been met.

☐ The relative proportion of acids and bases has been determined for the asphalt cement.

☐ An anti-stripping additive (e.g., lime, liquid anti-strip, etc.) will be used in the HMA mixture with an asphalt cement that contains a higher proportion of acids than bases and will be combined with aggregates that have a high concentration of siliceous compounds (e.g., silica, sandstones, granites, porphyries, diorites, and ophites).

HMA Mixtures

☐ All requirements for the HMA mixtures as specified in the Standard Specifications, Special Provisions, and supporting documents (e.g., Standard Specifications for Asphalt Materials and ODOT Contractor Mix Design Guidelines for Asphalt Concrete) have been met.

☐ An anti-stripping additive (e.g., lime, liquid anti-strip, etc.) will be used in the HMA mixture if it does not meet the criterion for the Tensile Strength Ratio without use of an anti-stripping additive.

☐ If the HMA mixture does not satisfy the Tensile Strength Ratio criterion when an anti-stripping additive is used in the mixture, a different source for aggregates and/or asphalt cement, or a different anti-stripping additive, will be utilized so that the Tensile Strength Ratio criterion is met.

Additives

☐ Additives containing silicone have not been used.

☐ All requirements for the additive as specified in the Standard Specifications and/or Special Provisions have been met.

☐ If the additive utilized is not lime and is not on the Qualified Products list, it has been approved for use on the basis of laboratory tests.