

**GEORGIA DOT RESEARCH PROJECT 12-39**

**FINAL REPORT**

**CRITICAL ASSESSMENT OF I-85 CRCP CRACK  
SPACING PATTERNS AND THEIR IMPLICATIONS FOR  
LONG-TERM PERFORMANCE**



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GDOT Research Project No. 12-39

Final Report

**CRITICAL ASSESSMENT OF I-85 CRCP CRACK SPACING PATTERNS  
AND THEIR IMPLICATIONS FOR LONG-TERM PERFORMANCE**

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# **Executive Summary**

## **Background and Research Needs**

Continuous Reinforced Concrete Pavement (CRCP) has been used in Georgia since 1969 (FHWA, 2012) for its good long-term performance and minimal amount of maintenance. Although CRCP has many advantages compared to the traditional Jointed Plain Concrete Pavement (JPCP), the construction of CRCP can be more expensive and involves large amounts of capital investment. The CRCP projects in Georgia are typically limited to the heavily trafficked interstate highways.

Twenty-eight centerline miles of Interstate Highway 85 (I-85) from Mileposts 33 - 61 were reconstructed with CRCP and opened to traffic in 2011. The occurrence of transverse cracks right after the highway's being opened to traffic, especially the spacing between transverse cracks, has raised the concerns of the Georgia Department of Transportation (GDOT) and the Federal Highway Administration (FHWA) about the pavements' long-term performance and the acceptance of CRCP construction. GDOT has actively taken the initiative to have Georgia Tech's research team comprehensively and quantitatively study the transverse crack spacing.

## **Objective of Proposed Research Program**

The objective of this research project is to study the I-85 CRCP transverse crack spacing patterns and compare them with the ones recommended in the CRCP design guides, the CRCP on I-20 in Georgia, and the CRCP in Long-term Pavement Performance (LTPP) program. The Mean Crack Spacing (MCS) is used in our study because it has been commonly used in CRCP design guides as one of the performance control factors. In addition, we used the 5-crack-average method to explore the detailed and local level of crack patterns. Though there are 4 lanes in each direction of I-85, the study focused only on the most outside lane where the heaviest truck traffic occurred. The following sections summarize the major findings and recommendations in our study:

## **Major Findings**

- 1) Based on the literature review, the MCS is recommended to be in the range of 3.5 ft - 8 ft as recommended by the 1993 AASHTO CRCP design guide and in the range of 3 ft - 6 ft as

recommended by the Mechanistic-Empirical Pavement Design Guide (MEPDG). In addition, based on the study of LTPP General Pavement Studies 5 (GPS-5) CRCP sections, approximately 90% of all punchouts occurred over time between cracks with narrow spacing (1 ft - 2 ft). However, other conditions should also be considered when a punchout occurs, such as the short longitudinal cracks that connect two narrowly-spaced transverse cracks, loss of foundation support, and loss of crack Load Transfer Efficiency (LTE).

- 2) The following are the results from the comparison of MCSs on I-85 and the ones recommended by 1993 AASHTO design guide and the MEPDG:

The MCS on I-85 (an average of 3.76 ft with a range of 2.5 ft - 5.3 ft) is, in general, bounded by the MEPDG recommended range (3 ft - 6 ft), but it is near the lower end of the AASHTO recommended range (3.5 ft - 8 ft). On I-85 North, there are five 1,000-ft segments (4%) that have MCSs less than the MEPDG recommended lower bound (3 ft), and 39 segments (29%) have the ones less than the AASHTO recommended lower bound (3.5 ft). On I-85 South, 4 segments (3%) are less than 3 ft, but 47 segments (35%) are less than 3.5 ft.

- 3) The following are the results from the comparison of CRCP MCSs on I-85 and on I-20:

The original two lanes of I-20 CRCP near Douglassville, GA, constructed in 1972, are still in service. They serve as the truck lanes after lane addition in the early 1990's. It shows signs of wear, but has little distress. To study the MCSs on I-20 and compare them to the ones on I-85, 6 outside lane-miles (3 lane-miles East and 3 West) were chosen.

Based on our study, the MCS on I-20 (an average of 5.28 ft with a range of 4.0 ft - 7.6 ft) is well bounded by the AASHTO recommended values, but it is at the upper limit of the MEPDG recommended range. There are 4 segments (24%) that have an MCS greater than the MEPDG recommended upper bound (6 ft) on I-20 East and 1 1,000-ft segment (6%) on I-20 West. The average MCS on I-85 (3.76 ft) is less than the one on I-20 (5.28 ft) based on the analysis on all 1,000-ft segments. This might be caused by the different designs. For example, the slab thickness and steel content on I-85 sections is greater than the sections on

I-20. Accordingly, based on field investigation, the average crack width on I-20 is larger than on I-85.

- 4) Compared with 23 CRCP sections in the LTPP GPS-5 program:

The average MCSs on I-85 are roughly in the middle to low range of the ones of the LTPP sections. The minimum and maximum MCSs (2.5 ft and 5.3 ft, respectively) of all I-85 1,000-ft sections are well bounded by the ones of all LTPP CRCP sections (2.1 ft and 8.4 ft, respectively).

- 5) The following are the results from the comparison of MCS on three construction projects:

Because the 28 center-line-mile I-85 CRCP was constructed in three projects (first project: Mileposts 33 - 47.5; second project: Mileposts 47.5 - 57; third project: Mileposts 57 - 61), a comparison study was conducted to evaluate their MCSs. The results show no significant difference, though the MCSs of the second project are slightly lower than the ones for other two projects. The biggest difference is about 0.7 ft. Section 2 also has the largest variation. Since project 2 and 3 have similar design and comparable traffic, the differences might be caused by the differences in the construction temperatures, which could be further investigated if data is available.

- 6) The following are the results from the comparison of MCSs on I-85 in May 2012 and May 2013:

From May 2012 to May 2013, the average MCS on I-85 North varied from 4.0 ft to 3.7 ft; the one on I-85 South varied from 3.9 ft - 3.8 ft. Since data was collected only twice, it is too early to determine if the transverse cracks have fully developed on a newly constructed CRCP. To investigate the actual change of the MCS over time, additional data needs to be collected.

- 7) The following are the results from the comparison of crack patterns on I-85 and I-20 using the 5-crack-average method for studying the localized crack spacing distribution:

The localized crack spacing distribution, derived using the 5-crack-average method, reveals the detailed and local level of crack patterns. The variation of localized crack spacing on I-20 (with the standard deviation of crack spacing of 1.7 ft) is larger than the one on I-85 (with the standard deviation of crack spacing of 1.1 ft) based on the selected 1-mile crack data on both I-85 and I-20. In terms of the localized cracking spacing less than 2 ft, about 0.7% (or a total of 9) of the localized crack spacing is less than 2 ft on the 1-mile I-85 section and 0.6% (or a total of 6) on the I-20 section. These spots can be further investigated and monitored because they can, potentially, lead to pavement distresses, such as punchouts, when other conditions (e.g. longitudinal cracks that connect two narrowly-spaced transverse cracks, loss of foundation support, and loss of LTE) are present.

8) Patches/punchouts observed from Mileposts 55 - 56 on I-85 South:

Ten patches/punchouts were observed on I-85 South from Mileposts 55 - 56 based on the data collected in May 2013. In comparison with the data collected in May 2012, three more patches and one new punchout were observed in this section. After discussing the problem with GDOT engineers, it appears that the problem may be caused by poor construction in this isolated section; further study is needed.

### **Recommendations**

The following are recommendations for future studies:

- 1) It is recommended that the continuous monitoring of the propagation of cracks, including both transverse and longitudinal cracks, using video log images, be conducted on the entire I-85 CRCP section for at least two more years (2014 and 2015) to better understand the early stages of crack propagation behavior in CRCP on I-85.
- 2) GDOT has been one of the leading state DOTs having CRCP. The CRCP in Georgia involves a large amount of capital investment and majority of them have performed well since 1970s. It is recommended to collect data, including pavement data and video log images, using sensing technologies so the punchouts, spalling, and crack characteristics, including transverse cracks, longitudinal cracks, and crack width, can be more accurately quantified

and better analyzed to reveal the characteristics of these CRCP with good long-term performance. This will help us to better understand the CRCP behavior and performance in Georgia.

- 3) Besides collecting and analyzing transverse cracks, it is recommended that other crack characteristics on I-85, including transverse and longitudinal cracks and crack width be analyzed. Various factors contribute to the occurrence of a punchout, such as narrow transverse crack spacing, short longitudinal cracks connect two narrowly-spaced cracks, loss of foundation support, and loss of LTE.
- 4) Closely monitoring the spots where potential punchouts and spalling could occur is recommended. These spots can be selected based on the transverse crack spacing (less than 2 ft or greater than 8 ft), occurrence of longitudinal cracks, and crack width, and located in field using GIS/GPS technologies. The outcomes will help engineers better understand the behavior of CRCP distresses and better manage the CRCP on I-85.
- 5) A study on the section of I-85 South from Mileposts 55 - 56 is recommended. By using video log images, 3D laser data, Falling Weight Deflectometer, Magnetic Imaging Technology, etc., a continuously monitoring on the pavement conditions, including crack patterns and base condition can be performed so proactive maintenance and rehabilitation actions can be made in a timely manner. In addition, a forensic study of the causes of problem on I-85 is also recommended so they can be prevented.

# **1 Introduction**

## **1.1 Research Background and Need**

### ***1.1.1 CRCP in Georgia***

Continuous Reinforced Concrete Pavement (CRCP) has been used in Georgia since 1969 (FHWA, 2012) because of its good performance in the long term and the need of the minimal amount of maintenance. In the early 2000s, the Georgia Department of Transportation (GDOT) began to achieve much pavement performance success by applying CRCP in a wave of intensive highway reconstruction (FHWA, 2012). CRCP is considered a highly valuable asset and is an important component in the pavement selection process in GDOT.

Although CRCP has many advantages compared to the traditional Jointed Plain Concrete Pavement (JPCP), the construction of CRCP can be more expensive and involve large amounts of capital investment. The CRCP projects in Georgia are typically limited to heavily trafficked interstate highways.

### ***1.1.2 Newly Constructed I-85 CRCP Sections***

Twenty-eight centerline miles of Interstate Highway 85 (I-85) from Mileposts 33 - 61 were reconstructed with CRCP and open to traffic in 2011. Transverse cracks on these newly constructed CRCP sections on I-85 occurred in less than 2 years. The occurrence of transverse cracks, especially the spacing between transverse cracks, raised the concerns of GDOT and Federal Highway Administration (FHWA) about the pavement's long-term performance and the acceptance of CRCP construction. Although a visual field survey showed no significant difference in crack spacing from other field data (Jubran, 2012), the statistical analysis based on the comprehensive, field-collected data has not yet been done.

### ***1.1.3 I-20 CRCP Sections***

The CRCP section on I-20 from Mileposts 24 - 31 was constructed in 1972, and, after being in service for about 40 years, is still in good condition. In addition, as the site of this I-20 CRCP

section is only 18.4 miles away from the newly constructed I-85 CRCP sections, the differences in environmental conditions of the two sites are insignificant. Therefore, the I-20 CRCP section serves as a good candidate for comparison with the I-85 CRCP sections.

#### ***1.1.4 Research Need***

Due to the high construction cost of CRCP, the performance monitoring process has been an essential component of the CRCP life cycle because it provides critical information for the maintenance and rehabilitation process directly affecting the pavement longevity. For the newly constructed I-85 CRCP sections, many transverse cracks have already been observed. Though transverse cracks are natural for a CRCP, an abnormal pattern might indicate the potential of developing undesirable distresses, such as punchouts and spalling. Thus, comprehensive research is needed to objectively evaluate the performance of the newly constructed I-85 CRCP sections by studying and comparing the I-85 crack patterns to the I-20 crack patterns in the sections that are known to have good performance. Doing so will help determine whether or not the I-85 CRCP crack pattern is normal or of significant concern; the study will, also, provide information for further maintenance of the section. In this study, I-20 CRCP sections were selected for this comparison study because they were constructed in 1972 but are still in good condition. In addition, the CRCP sections in Long-term Pavement Performance (LTPP) General Pavement Studies 5 (GPS-5) program were also used for comparison.

#### **1.2 Research Objective**

The objective of this research project is to study the I-85 CRCP transverse crack spacing patterns and compare them with the ones recommended in the CRCP design guides, the CRCP on I-20 in Georgia, and the CRCP in LTPP. The Mean Crack Spacing (MCS) was chosen as the main parameter in our study because it has commonly been used in CRCP design guides as one of the performance control factors. In addition, we also used the 5-crack-average method to explore the detailed and local level of crack patterns. Though there are 4 lanes in each direction of I-85, the study was focused only on the most outside lane with the heaviest truck traffic.

Detailed pavement data, including GPS and video log pavement images, were collected for analysis using the Georgia Tech Sensing Vehicle (GTSV). The following are the major aspects for the comparison study:

- 1) Compare the MCSs on I-85 and I-20 with the MCS range suggested by the 1993 AASHTO Design Guide and the Mechanistic-Empirical Pavement Design Guide (MEPDG);
- 2) Compare the MCS on I-85 with the ones in the CRCP sections in LTPP GPS-5 program;
- 3) Study the MCS change over time on I-85 based on the data collected in May 2012 and May 2013;
- 4) Compare the localized crack spacing distribution on I-85 and I-20 using the 5-crack-average method;
- 5) Initial investigation of the patches/punchouts observed on Mileposts 55 - 56 on I-85 South;

The research outcomes will enable GDOT and FHWA to gain detailed insight into the crack patterns about the newly constructed CRCP on I-85. This will also enable GDOT and FHWA to better understand the crack patterns that began in the early stages of pavement life. This research could, potentially, help GDOT develop acceptance specifications for CRCP construction. In addition, this study will contribute to the understanding of CRCP cracking behavior in their early stages.

### **1.3 Report Organization**

This report is organized as follows. Chapter 1 introduces the research background, needs, and objectives; Chapter 2 conducts a comprehensive literature review of the major characteristics of CRCP, the principal design considerations, the most concerned distresses, the performance evaluation criteria, and the crack spacing characteristics of CRCP; Chapter 3 describes the data collection locations, data collection devices, collected data format, and data processing procedures; Chapter 4 presents the statistical comparison study of I-85 CRCP crack spatial patterns; and Chapter 5 presents the major findings and recommends future research.

## **2 Literature Review of Transverse Cracking Patterns on CRCP**

CRCP is a type of rigid pavement that consists of Portland Cement Concrete (PCC) slabs resting on a base course (e.g. Hot Mix Asphalt (HMA) interlayer) or directly on the subgrade. It can provide a long-term and “zero-maintenance” service life under heavy traffic loads if it is properly designed and constructed with high quality materials and construction methods (FHWA, 2012). In the U.S., CRCP was first constructed in the 1960s/1970s by highway agencies in Illinois, Oklahoma, Virginia, North and South Dakota, Texas, and Oregon. Highway agencies in California, Georgia, and Louisiana have significant experience using CRCP.

### **2.1 Characteristics of CRCP and its Applications**

Table 2.1 lists the major characteristics of PCC. PCC has a very high compressive strength but a much lower tensile strength (around 1/10 of compressive strength), which makes a PCC slab prone to cracking under tensile stresses. In addition, PCC has a very high modulus of elasticity compared to the underlying materials, which is about 1/40 to 1/300 of PCC modulus (Papagiannakis, 2007). This makes it a “rigid” body, and much of its load-carrying capacity is derived through plate action.

Due to drying shrinkage of PCC and frictional constraints from the underlying layer, a PCC slab tends to crack soon after construction, which lowers its load-carrying capacity. To control the crack occurrence, transverse joints or tensile reinforcements are commonly used. They are referred to as JPCP and CRCP, respectively. In this review, we focus only on CRCP.

CRCP has no transverse contraction joints, and transverse cracks are allowed to form. The cracked segments are held together by the continuous longitudinal reinforcement, so the integrity of slab is maintained. The reinforcement in CRCP is not designed to resist any load-related stresses. At each crack, the aggregate interlock carries the traffic loading. Thus, crack width is an important factor that affects the performance of CRCP. In general, the crack width in CRCP is smaller than 0.04 in, and most of the time smaller than 0.02 in (Kohler, 2005). Cracks in CRCP typically form at average intervals of 1 ft to 6 ft as seen in the statistical analysis of 72 test sections in the LTPP program (Kohler, 2004).

**Table 2.1: Characteristics of PCC**

| <b>Item</b>                      | <b>Value</b>   |
|----------------------------------|--|
| Density                          | 2240 - 2400 kg/m <sup>3</sup> (140 - 150 lb/ft <sup>3</sup> )                |
| Compressive strength             | 20 - 40 MPa (3000 - 6000 psi)  |
| Flexural strength                | 3 - 5 MPa (400 - 700 psi)  |
| Tensile strength                 | 2 - 5 MPa (300 - 700 psi)  |
| Modulus of elasticity            | 14,000 – 41,000 MPa (2 - 6 x 10 <sup>6</sup> psi)                            |
| Permeability                     | 1 x 10 <sup>-10</sup> cm/sec   |
| Coefficient of thermal expansion | 10 <sup>-5</sup> °C <sup>-1</sup> (5.5 x 10 <sup>-6</sup> °F <sup>-1</sup> ) |
| Drying shrinkage                 | 4 - 8 x 10 <sup>-4</sup>   |
| Poisson's ratio                  | 0.20 - 0.21  |
| Specific heat capacity           | 0.75 kJ/kg K (0.18 Btu/lbm °F (kcal/kg °C))                                  |

From: [http://www.engineeringtoolbox.com/concrete-properties-d\\_1223.html](http://www.engineeringtoolbox.com/concrete-properties-d_1223.html)

In the GPS-5 of LTPP, there were originally 85 CRCP experimental sections in 29 states and 4 climate regions. When a CRCP section was overlaid with asphalt concrete due to the deteriorated pavement conditions, it was moved to GPS-7 (a study of asphalt concrete overlay over Portland cement concrete). The LTPP GPS-5 data for CRCP test sections were the major source for studying CRCP characteristics and performance. Studies in 1999 and 2000 (Tayabji, 1999, 2001) reveal the following major findings: “a) CRCP test section ages ranging from 5 - 34 years (as of 1999) were observed; b) very limited amounts of localized failures were observed (at only 16 sections as of 1995), with only little high-severity cracking observed at these 16 sections; c) nine sections were overlaid as of 1995, most due to resurfacing of adjacent sections; d) most CRCP sections were performing well with  $\geq 15$  years (some  $\geq 20$  years) of service life; e) very little distress was reported; and f) little degradation in ride quality over time was observed, indicating that a CRCP built smooth remains smooth for many years.”

As of March 2012, there were still 34 of the original 85 sections in GPS-5 that were in service. Their average age was 31 years; the oldest was constructed in 1969 in Virginia and the newest was constructed in 1990 in Oklahoma. The average age of the 51 sections removed from GPS-5 was 26 years when removed; at least 30 of those sections were added to GPS-7 after receiving asphalt overlays. Other than the Virginia section mentioned above, the oldest section was a section in Texas that lasted from 1965-2006 and a section in the South Dakota that lasted from 1963 - 2008.

## 2.2 CRCP Design

Typical CRCP design involves the following activities:

- Determining the slab thickness, concrete mixture constituents and properties, steel content, and location;
- Providing for sufficient slab edge support;
- Strengthening or treating the existing soils;
- Providing non-erodible bases (e.g. HMA) that also provide friction that leads to desirable transverse cracking patterns;

While most of these features are common to all good pavement designs, reinforcement and edge support are particularly critical to a CRCP. The AASHTO 1986/1993 design method was still widely used in state DOTs in the United States, while some highway agencies have implemented the new NCHRP MEPDG with the associated software (DARWin-ME). In GDOT, though the MEPDG is under evaluation, the currently used design method for CRCP is based on the 1981 revision of the AASHTO Interim Guide for Design of Pavement Structures (1972).

In the 1986/1993 AASHTO design method, slab thickness is solved based on an empirical equation that relates the number of cumulative Equivalent Single-axle Load (ESAL) passes to the corresponding change in pavement serviceability (AASHTO, 1986, 1993). The computation of steel content is based on three criteria: 1) transverse crack spacing ranging 3.5 ft - 8 ft; 2) transverse crack opening not exceeding 0.04 in; and 3) stresses in the steel being limited to 75%

of the ultimate yield stress. Two empirical equations are used to estimate the steel content, which relate the crack spacing and crack width to the percent reinforcement, respectively.

The NCHRP Study 1-37A adopted a mechanistic-empirical method for CRCP design (ARA, 2004), which involves analytical computations of pavement structural response to load and environmental input and incorporation of these parameters into mechanistic-empirical damage functions to predict the accumulation of pavement distresses over time. The design process is an iterative process accomplished by validating the trial designs using the performance criteria. Punchout and roughness are two types of distresses that are used to define the performance criteria.

In Georgia, CRCP is typically used for high traffic volumes and high duty applications. Figure 2.1 shows the typical CRCP section used in GDOT. The slab thickness of CRCP is designed to be the same as JPCP, which is 11 in or 12 in. A 3 in layer of 19mm HMA is used as an interlayer (referred to as a base course by some other agencies) between the concrete slab and the base, which provides separation from the Graded Aggregate Base (GAB) and mitigates fines and moisture infiltration. The minimal thickness of GAB is 8 in and is, typically, 12 in for interstate highways. Steel reinforcement is placed in one layer above the slab thickness mid-plane with a minimum 3.5 in cover. Number 6 rebar is used for longitudinal reinforcement, and #4 rebar is used in the transverse direction to support the longitudinal reinforcing bars (see Figure 2.2 and Figure 2.3).

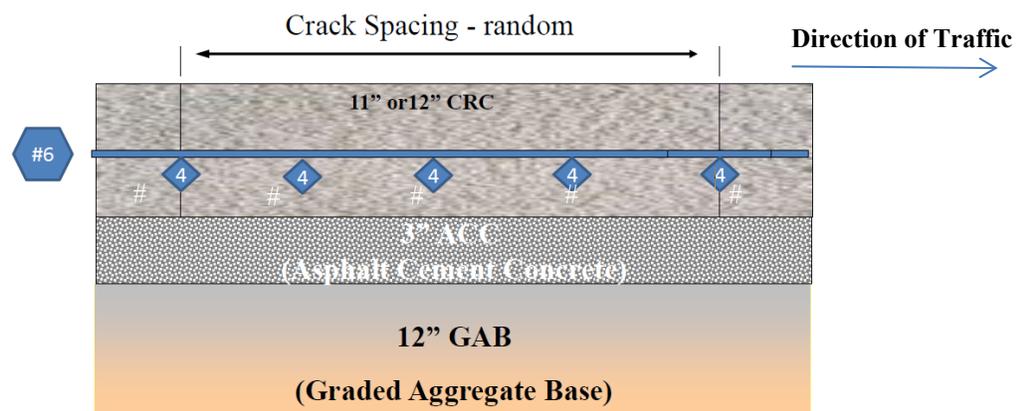


Figure 2.1: Typical CRCP Section in GDOT (Jubran, 2012)

To keep the crack spacing between 3.5 ft (controlling punchout) and 8 ft (controlling spalling), the minimum recommended steel content is 0.6% (FHWA, 1990). The recommended spacing of the longitudinal steel is not less than 4 in or 2 1/2 times the maximum sized aggregate, whichever is greater, but not greater than 9 in. A minimum ratio of 0.03 square inches of steel bond area per cubic inch of concrete is recommended. The bar sizes should meet the minimum bond ratio and the minimum bar spacing criteria. Typically, longitudinal bars are tied or clipped to the transverse bars every 1 ft- 3 ft (California DOT, 2007).



**Figure 2.2: Layout of CRCP Reinforcing Bars (FHWA, 2012)**



**Figure 2.3: Support of Longitudinal Steel Bars (FHWA, 2012)**

## 2.3 CRCP Performance

### 2.3.1 Performance Measure

The LTPP defines 15 types of distresses for CRCP, as shown in Table 2.2, which are grouped into three categories: cracking, surface distresses, and miscellaneous distresses. Among all distresses, fine transverse cracking ( $\leq 0.04$  in) is expected for a properly functioning CRCP.

GDOT has conducted annual surveys on JPCP based on GDOT's survey protocol, but the distress types and survey method are not defined for CRCP (though punchouts are still surveyed).

**Table 2.2: Distress Types Defined in LTPP (FHWA, 2003)**

|                                  | DISTRESS TYPE                               | UNIT OF MEASURE       | DEFINED SEVERITY LEVELS? |
|----------------------------------|---|-----------------------|--------------------------|
| <b>A. Cracking</b>               |   |                       |                          |
| 1.                               | Durability Cracking ("D" Cracking)          | Number, Square Meters | Yes                      |
| 2.                               | Longitudinal Cracking                       | Meters                | Yes                      |
| 3.                               | Transverse Cracking                         | Number, Meters        | Yes                      |
| <b>B. Surface Defects</b>        |   |                       |                          |
| 4a.                              | Map Cracking                                | Number, Square Meters | No                       |
| 4b.                              | Scaling                                     | Number, Square Meters | No                       |
| 5.                               | Polished Aggregate                          | Square Meters         | No                       |
| 6.                               | Popouts                                     | Not Measured          | N/A                      |
| <b>C. Miscellaneous Distress</b> |   |                       |                          |
| 7.                               | Blowups                                     | Number                | No                       |
| 8.                               | Transverse Construction Joint Deterioration | Number                | Yes                      |
| 9.                               | Lane-to-Shoulder Dropoff                    | Millimeters           | No                       |
| 10.                              | Lane-to-Shoulder Separation                 | Millimeters           | No                       |
| 11.                              | Patch/Patch Deterioration                   | Number, Square Meters | Yes                      |
| 12.                              | Punchouts                                   | Number                | Yes                      |
| 13.                              | Spalling of Longitudinal Joints             | Meters                | Yes                      |
| 14.                              | Water Bleeding and Pumping                  | Number, Meters        | No                       |
| 15.                              | Longitudinal Joint Seal Damage              | Number, Meters        | No                       |

### 2.3.2 Punchouts

Though CRCP performs well based on the past experience, punchouts, as shown in Figure 2.4, become a major concern due to their frequent occurrence and negative impact on ride quality and safety. In the MEPDG, punchouts are major controlling distresses for pavement design (ARA, 2004). In previous AASHTO design guides (AASHTO 1986, 1993), though, punchouts were not directly considered in design equations; crack spacing and crack width were considered two important causal factors for punchouts.

Normally, punchouts occur at the edge of pavement between two closely spaced transverse cracks and a short longitudinal crack that intersects these two transverse cracks. Based on the observation on LTPP sections, punchouts are often bounded by a pair of transverse cracks spaced at 2 ft or less (ARA, 2003). Thus, cracks with narrow spaces are considered undesirable. In AASHTO design guides (AASHTO 1986, 1993), a 3.5 ft - 8 ft interval is considered ideal. Another structural causal factor for punchouts is the loss of support of a concrete slab due to base erosion. Poor support speeds up the deterioration of crack Load Transfer Efficiency (LTE) (ARA, 2004). Figure 2.5 illustrates the mechanism of punchout development. High tensile stress occurs at the top of the slab some distance from the pavement edge when a truck passes near the edge of the slab between two closely spaced transverse cracks. This will result in micro-cracks that begin at the transverse crack and propagate to another crack. With the loss of support due to the erosion of the subbase, the portion of pavement bounded by two transverse cracks, the short longitudinal crack, and the slab edge will be separated from the concrete slab and form a punchout.



**Figure 2.4: Example Image of a CRCP Punchout (Roesler, 2005)**

In summary, the following are the causal factors of punchouts (ARA, 2003): “1) Presence of narrow transverse crack spacing (2 ft or less) in the crack spacing distribution; 2) LTE across the transverse cracks due to aggregate interlock deterioration from excessive crack opening and heavy repeated loads; 3) Loss of support along the pavement edge due to base erosion; 4) Negative temperature gradients through the slab thickness and top of slab drying shrinkage further magnify bending stresses; and 5) Passages of heavy axles causing repetitive cycles of

excessive tensile bending stresses leading to longitudinal fatigue cracking that defines the punchout.”

To reduce or control the development of punchouts, the following means can be performed (ARA, 2004):

- Increase longitudinal steel content in order to reduce crack width and increase LTE;
- Place steel bars above slab thickness mid-plane (the minimum cover should be satisfied);
- Reduce PCC coefficient of thermal expansion (CTE) to lower the thermal-induced tensile stresses;
- Increase slab thickness;
- Use tied PCC shoulder to restrict the movement of CRC slab;
- Use a stabilized base;
- Reduce the built-in curling after placement;
- Increase PCC strength;

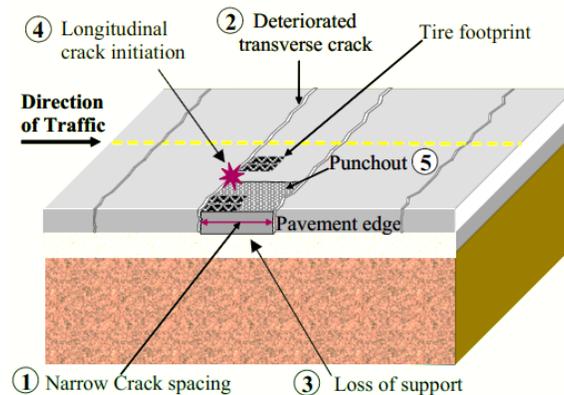


Figure 2.5: Mechanism of Punchout Development (ARA, 2003)

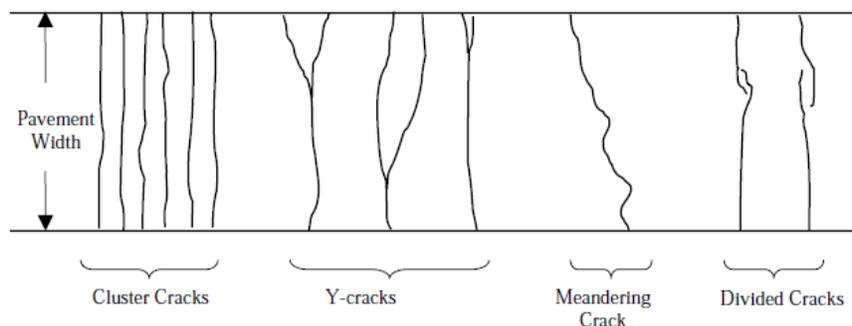
### 2.3.3 Crack Pattern and Spatial Distribution

It is well recognized that there is a correlation between crack pattern (shape and spacing) and punchout development. Kohler (2004) summarized four types of crack patterns that are susceptible to punchout development. As shown in Figure 2.6, cluster cracks are the transverse cracks that are closely spaced with the mean spacing of five consecutive cracks being less than 2

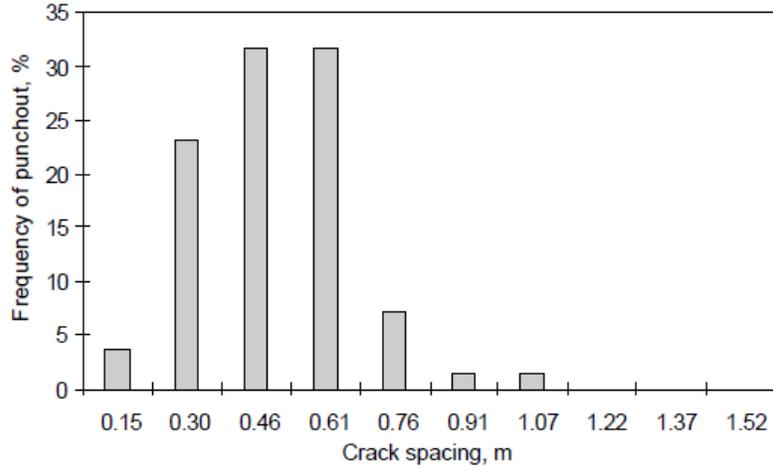
ft. Selezneva, Darter, Zollinger, and Shoukry (2003) analyzed the crack maps of the test sections from LTPP GPS-5 and found that the majority of the punchouts occurred in the CRCP sections that had transverse cracks spaced from about 0.3m - 0.6m (1 ft - 2 ft; see Figure 2.7). Y-cracking is a branched single crack that may result in spalling and punchouts (Ley, 2011). A meandering crack is a transverse crack that is not perpendicular to the edge of the pavement, which increases the possibility of forming a Y-crack. A divided crack is a broken crack, and each part of it doesn't cross the slab. It may result in spalling and punchouts.

Selezneva et al. (2003) has done a comprehensive statistical analysis on 72 LTPP test sections. It was found that 1) transverse crack spacing characteristics correlates to CRCP performance; 2) around 90% of punchouts occurred between cracks with narrow spacing (1 ft - 2 ft); 3) a punchout is associated with a short longitudinal crack that is about 4 ft from the edge of CRCP slab; 4) the distribution of crack spacing on a CRCP section is not normal but possibly modeled by a Weibull distribution (see Figure 2.8).

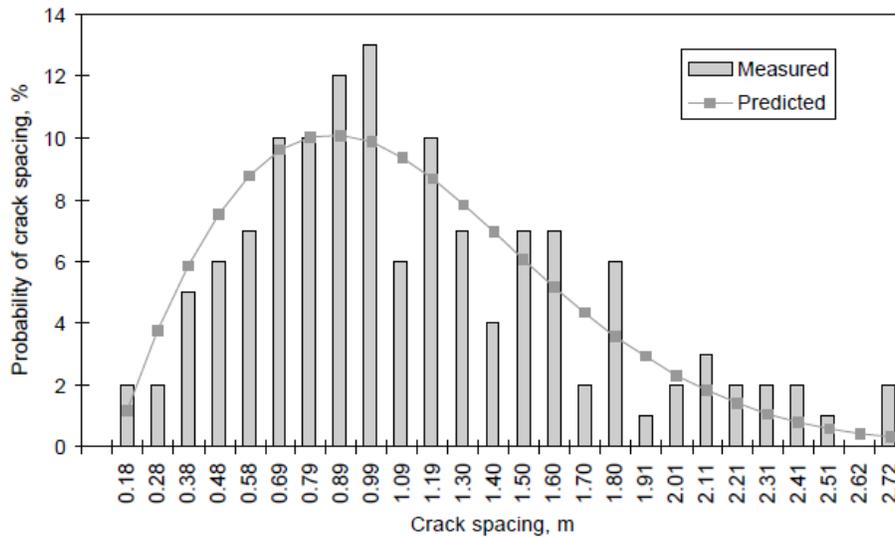
Of all types of cracks, cluster cracks are considered the ones that have the most potential for punchout development, especially for sections with poor support conditions (Kohler, 2004). The major causes of cluster cracking are the deterioration of sub-base support conditions, lack of concrete consolidation, inadequate pavement thickness, and poor drainage (Fwa, 2005). Research of LTPP data (USDOT, 1998) shows the cluster crack ratio doesn't have a strong correlation with the curing temperature, yet it has strong correlation with the crack spacing standard deviation, and it is also sensitive to the sub-base aggregate type.



**Figure 2.6: Crack Patterns Associated Undesirable Passive Cracks (Kohler, 2004)**



**Figure 2.7: Frequency of Punchouts vs. Crack Spacing (Selezneva, 2003)**



**Figure 2.8: Weibull Distribution of Crack Spacing (Selezneva, 2003)**

One of the usually used clustering measurement methods is plotting the average crack spacing of five or three closest cracks (ASCFC) along with distance. Along the distance, the average distance of several close cracks provides a stable pattern and indication of the problematic locations. Figure 2.9 shows an example of the plotting of ASCFC. Using the average spacing of both the closest 3 cracks or 5 cracks has been tested in LTPP studies, and the patterns revealed have been shown to be very similar. If the acceptable range of ASCFC is 3 ft - 6 ft, the location of problem pavements can be easily identified.

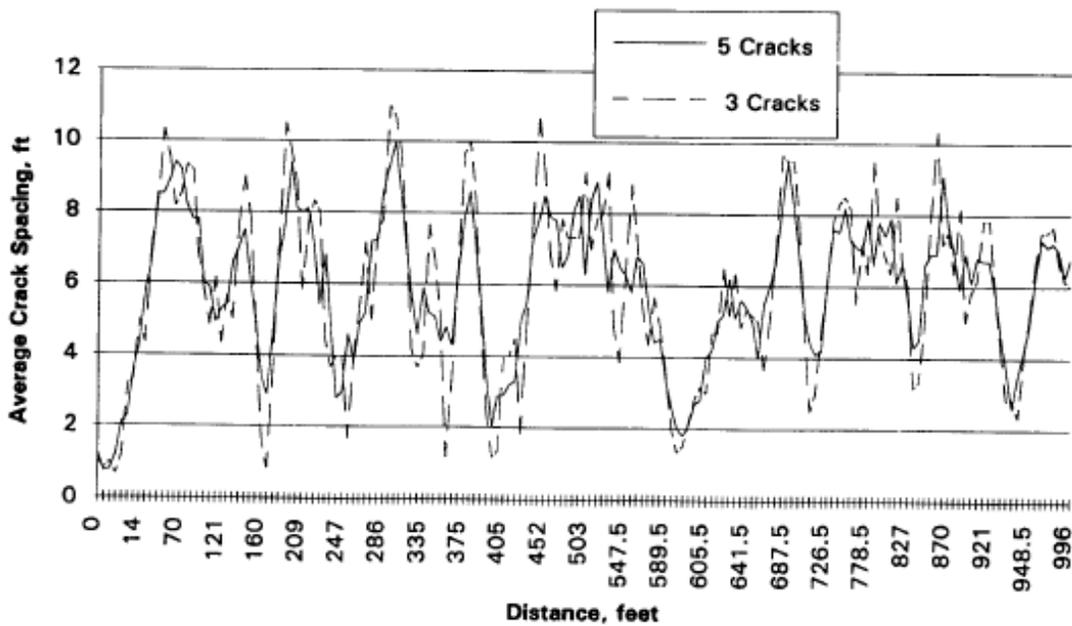


Figure 2.9: Crack Spacing Pattern for IA-1 section – Average Crack Spacing of Closest 3 or 5 Cracks (USDOT, 1998)

Zollinger (1999) developed another cluster crack measurement indicator that is called the cluster ratio. The cluster ratio is defined as the number of adjacent crack groups spaced within a designated distance divided by the total number of cracks in a distribution, and it actually indicates the probability that the distance between certain numbers of consecutive cracks is less than the designated distance. The use of an adjustable minimum number of cluster cracks could reduce the impact from definition differences and provide more comprehensive analysis of cluster cracks in practice.

### 2.3.4 Temporal Development of Crack Spacing

The development of CRCP cracks is an on-going process, and over the development cycle, the spacing gradually narrows. Zollinger's study (Zollinger, 1999) found that primary cracks form within the first week after concrete placement, and the final crack spacing distribution, including secondary cracks, is completed between 6 months and 3 years. Therefore, the crack patterns revealed before stabilization normally only provide temporary information of the pavement; for longer term prediction, data after the completion of most crack development are still needed.

Kohler (2004) found that the temporal development pattern of cracks depends on the crack control approach used, normally classified as either an active control method or a passive control method. In a passive control method, the crack pattern is governed by the longitudinal steel content and the friction between the concrete slab and foundation, which will result in unevenly distributed crack spacing. However, the active control method applies artificial transverse joints to reduce the randomness of transverse cracks. The development patterns in Illinois test sections using two different approaches are shown in Figure 2.10. It can be seen that more cracks developed with the active crack control method, yet the increase is much smoother over time.

The location of newly developed cracks is another important factor affecting crack spacing distribution. A study (Suh Y-C, 1992) of the early life of newly constructed CRCP sections shows that the location of new cracks seems to depend on the length of the slab segment. For segments 3 ft or shorter, new cracks appear near the middle of the segment; for segments 3 ft - 8 ft long, new cracks appear around the middle area but with higher scattering; for segments longer than 8 ft, the location of new cracks is randomly distributed. The mechanistic explanation is that when the length of the segment is short, the middle area has the largest tensile stress; if the segment is long enough, the middle area becomes much larger, and every location has the same amount of high stress. Consequently, the occurrence of new cracks becomes randomly distributed.

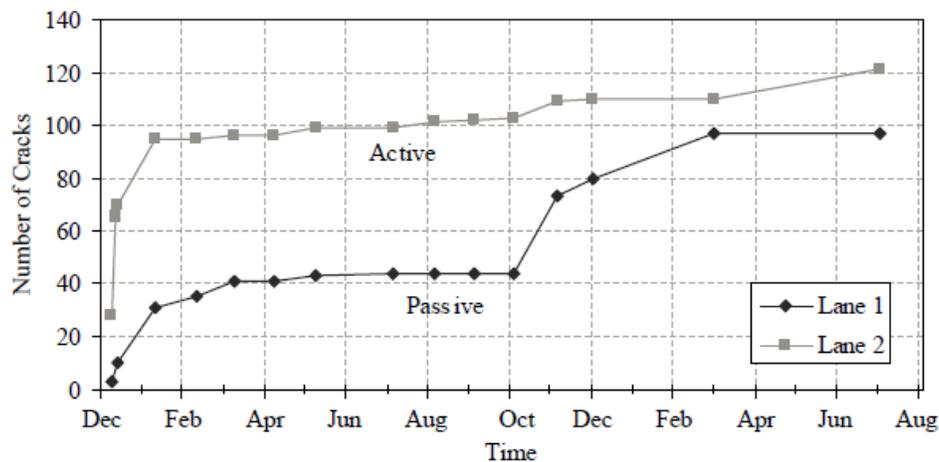


Figure 2.10: Temporal Change of Crack Numbers for Different Crack Control Method (Kohler, 2004)

### **3 Data Collection and Data Processing Procedure**

#### **3.1 Data Collection Location**

The newly constructed CRCP section on I-85 stretches 28 centerline miles from Mileposts 33 - 61 southwest of Atlanta. The I-85 CRCP has been constructed and was opened to traffic in 2011. To study the temporal development of CRCP cracking, the video log image data were collected on I-85 outside lanes in May 2012 and May 2013. Instructed by GDOT engineers, the data was actually collected starting from Milepost 35, where there is an interchange and it is convenient for sensing vehicle operation. Thus, there are total 52-lane-mile data collected each time.

For comparison, 6 lane-mile CRCP sections were also chosen on I-20 west of Atlanta because the pavement was constructed in 1972 and is still in good condition. The data was collected from Mileposts 24 - 27 on I-20 East and from Mileposts 31- 28 on I-20 West. The data on I-20 were collected in May 2013.

The locations of the two sites are shown in Figure 3.1. These two sites are 18.4 miles apart and have very similar climate conditions; however, the design parameters of these two sites are different, as shown in Table 3.1. The CRCP slab thickness on I-85 is 11 in or 12in, which is 2 in or 3 in thicker than that on I-20. The longitudinal and transverse steel types are similar. The steel content used on I-85 is 0.7%, but it is 0.6% on I-20. This is expected to create cracks with narrower spacing.

#### **3.2 Data Collection Devices**

For pavement data collection, the Georgia Tech Sensing Vehicle (GTSV), which is equipped with multi-angle high-resolution cameras and a high-accuracy GPS device, is used. Continuous perspective and downward pavement images, along with GPS data, are collected. As shown in Figure 3.2, the GTSV is equipped with a 2D imaging system, a 3D line-laser-imaging system, a 3D Light Detection and Ranging (LiDAR) system, an Inertial Measurement Unit (IMU), and a Differential GPS. It was developed under a research project sponsored by the USDOT RITA (Research and Innovative Technology Administration) program and can be operated at 60 mph.

The crack widths on I-85 are very small (less than 0.04 in), which are very hard to capture using a 3D laser. Thus, the perspective and downward 2D images were used in this study to extract and register the pavement transverse cracks. Sample images collected by both perspective and downward cameras are shown in Figure 3.3.

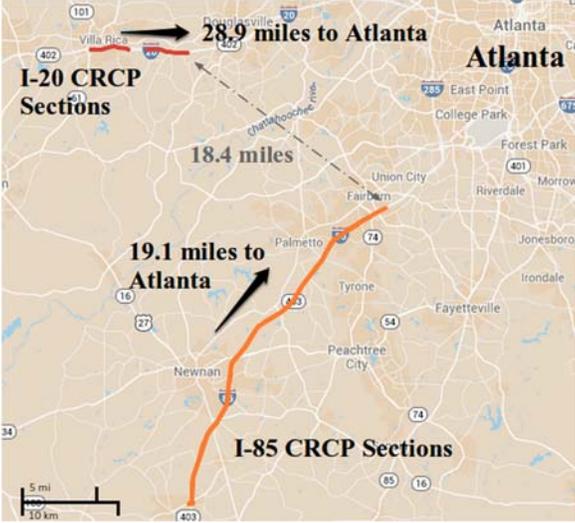


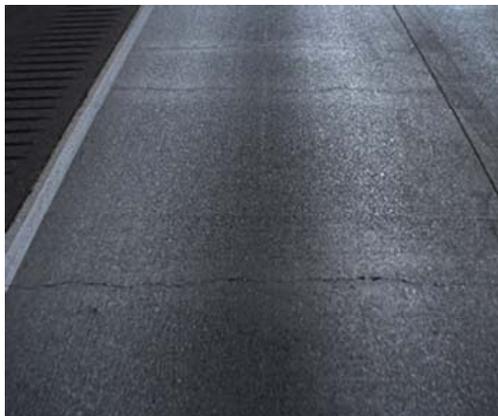
Figure 3.1: Location of CRCP Sections on I-85 and I-20

Table 3.1: CRCP Typical Sections on I-85 and I-20

|                                | I-85                                    | I-20  |
|--------------------------------|---|---|
| <b>CRC Slab Thickness</b>      | 11 or 12 in.                            | 9 in.   |
| <b>Interlayer</b>              | 3 in 19mm Asphalt Concrete              | 1 in 4.75mm Asphalt Concrete                                      |
| <b>Base Type</b>               | 12 in GAB                               | 5 in cement stabilized GAB plus 6 in stabilized aggregate type II |
| <b>Longitudinal Steel Type</b> | #6                                      | #6  |
| <b>Transverse Steel Type</b>   | #4                                      | #4  |
| <b>Steel Burial Depth</b>      | Minimum 3.5 in (1/3 depth from the top) | Minimum 3.5 in (at mid-depth)                                     |
| <b>Steel Content</b>           | 0.7%                                    | 0.6%  |
| <b>Year Constructed</b>        | 2011                                    | 1972  |



**Figure 3.2: Georgia Tech Sensing Vehicle**



**(a) Downward image.**



**(b) Perspective image.**

**Figure 3.3: Sample Image of Collected Perspective and Downward Pavement Images**

### 3.3 Data Processing Procedure

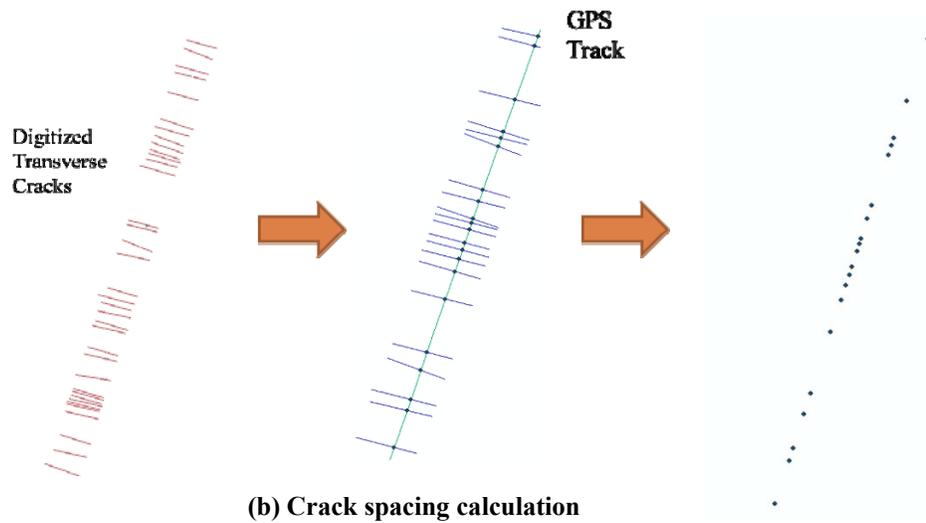
A semi-automatic method was used to extract and register the crack maps for the 52-lane-mile (26 miles on North and South, respectively) roadway on I-85 and the 6-lane-mile (3 miles East

and West, respectively) roadway on I-20. First, by visually investigating both perspective and downward pavement images, each transverse crack is identified. Because each image is photographically registered with its GPS coordinates, crack locations can be automatically calculated and stored in a database. This procedure generates the detailed crack maps. For I-85, there are 35,220 2D images that were reviewed, including data captured in May 2012 and May 2013; there are 2,010 images that were reviewed for I-20. Figure 3.4(a) shows an example of the extracted crack map. The cracks are accurately aligned with the right lane of I-85 using the high-accuracy GPS data. The extracted crack maps were then intersected with the center-line track of the travel lane that was generated from the GPS track of the vehicle. Figure 3.4(b) shows the intersected crack points that were used to compute the transverse crack spacing for every two adjacent cracks.

Because construction terminal areas, such as bridges, normally have a special structure that is different from other normal CRCP sections; the spacing data in these areas are not included in our analysis so that the mean spacing data could reflect the majority of the cases. In addition, as severe shadows on the collected pavement images could result in unrecognizable cracking, these areas are also removed from the analysis to avoid unnecessary bias.



**(a) Aligned crack data on GIS map**



**Figure 3.4: Crack Map and Crack Spacing Calculation**

## **4 Statistics Analysis and Comparison Study of I-85 Transverse Crack Spacing**

To analyze the transverse crack patterns on I-85 CRCP section, the following steps are performed. First, the roadways are segmented into small, consecutive segments for analysis and comparison. The length of each segment is 1,000 ft, which is also the unit length used in the LTPP (FHWA, 2012). Second, for each segment, the MCS is calculated to compare with the design guides, and the ones on I-20 CRCP sections and LTPP GPS-5 CRCP sections. Finally, 1 mile of the representative CRCP section is chosen from both I-85 and I-20, respectively, to calculate the average spacing of 5 consecutive cracks and compare their localized crack distribution and spatial patterns. Appendix I and II list the MCSs of all 1,000-ft segments on I-85 and I-20 CRCP sections. The detailed spacing for every two cracks and the histograms for the first six 1,000-ft segments are also included.

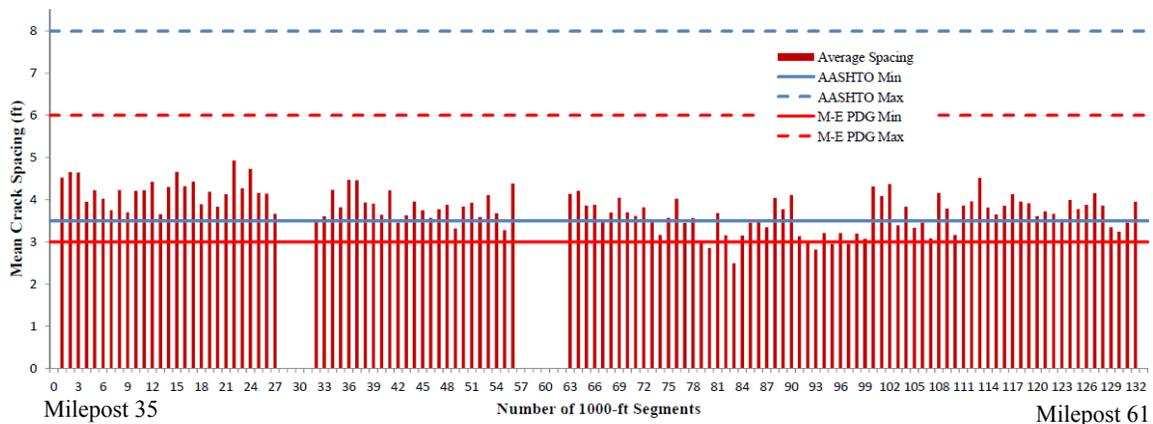
### **4.1 Mean Crack Spacing Analysis**

Studies showed that small crack spacing, e.g. less than 2 ft, makes concrete slabs susceptible to punchouts (Selezneva et al., 2003; Kohler, 2004). From a pavement design point of view, the MCS is an important control factor because the localized non-uniformity cannot be considered at this stage. In the 1993 AASHTO design guide, the recommended MCS is 3.5 ft - 8 ft. Spacing that is too wide, e.g. greater than 8 ft, could result in wilder joint opening and make concrete slabs susceptible to spalling. In the MEPDG (ARA, 2004), the MCS is used to determine the crack opening and predict the critical tensile stresses for fatigue accumulation. Large crack spacing will result in wider crack width, which will cause the loss of LTE across transverse cracks and result in faulting and punchouts, and, therefore, the roadway will have smoothness issues. In the MEPDG, the recommended range for the MCS is 3 ft - 6 ft (Roesler, 2013).

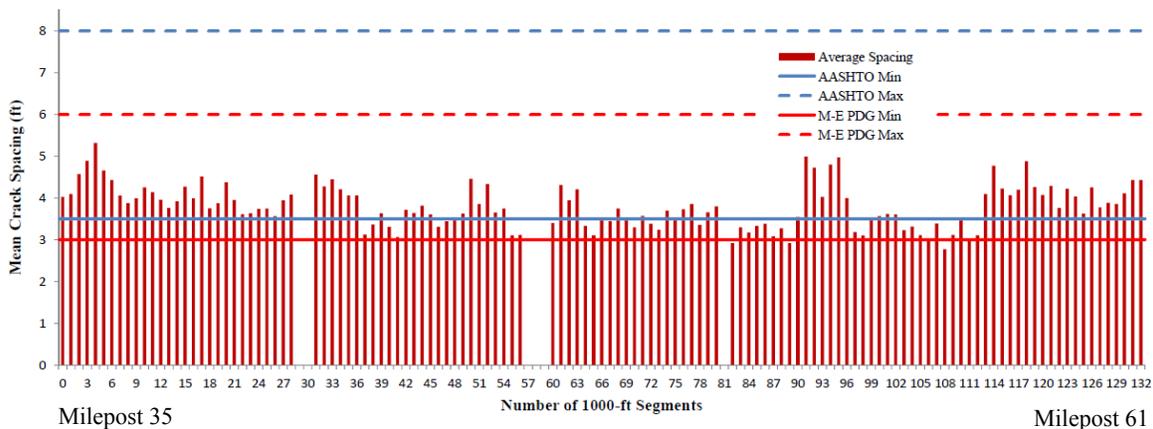
#### **4.1.1 Mean Crack Spacing on I-85**

The average MCS values of the entire I-85 North and South CRCP sections (outside lane) are 3.7 ft and 3.8 ft, respectively. When all the segments on both North and South are considered, the average MCS is 3.76 ft. Figure 4.1(a) and (b) show the MCS distributions of all 1,000-ft segments on I-85 North and South, respectively. Each direction has 133 1,000-ft segments. The

skipped segments (without spacing values) are either bridges or interchanges where the CRCP has not been applied. The blue solid and dashed horizontal lines represent the 1993 AASHTO recommended MCS range (3.5 ft - 8 ft), and the red solid and dashed horizontal lines represent the MEPDG recommended range (3 ft - 6 ft). From Figure 4.1(a) and (b), it can be seen that the MCSs on I-85 North and South are, in general, bounded by the MEPDG recommended range, but near the lower end of the AASHTO recommended range. On I-85 North, there are 5 segments (4%) that have an MCS less than the MEPDG recommended lower bound (3 ft), but 39 segments (29%) are less than the AASHTO recommended 3.5 ft; on I-85 South, there are 4 segments (3%) less than 3 ft, but 47 (35%) less than 3.5 ft. Though some segments on I-85 have an MCS less than 3 ft, none is less than 2 ft, which is considered the length of a critical segment that could lead to a punchout (ARA, 2004). Figure 4.2 shows the histograms of all the crack spacing on I-85 North and South, which are close to Weibull distribution.

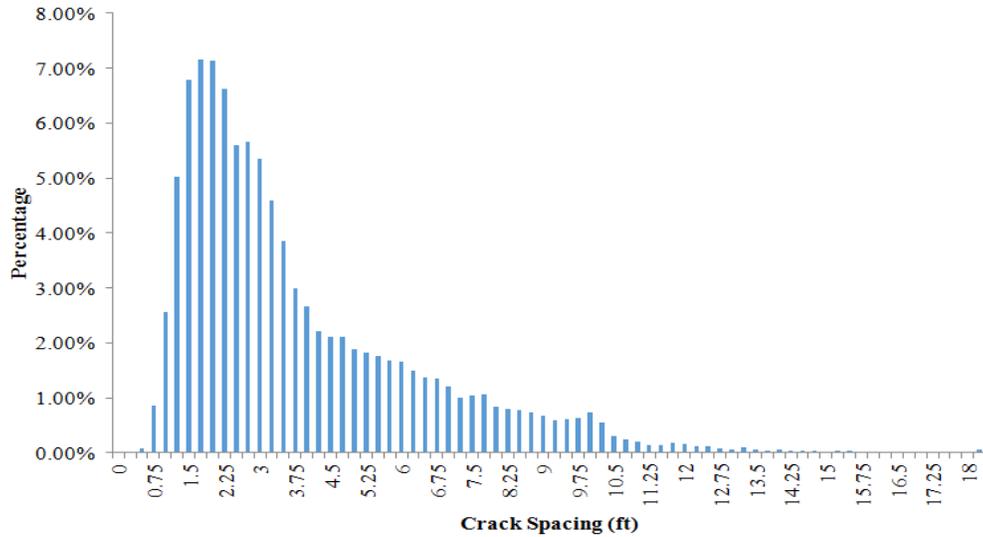


(a) I-85 North

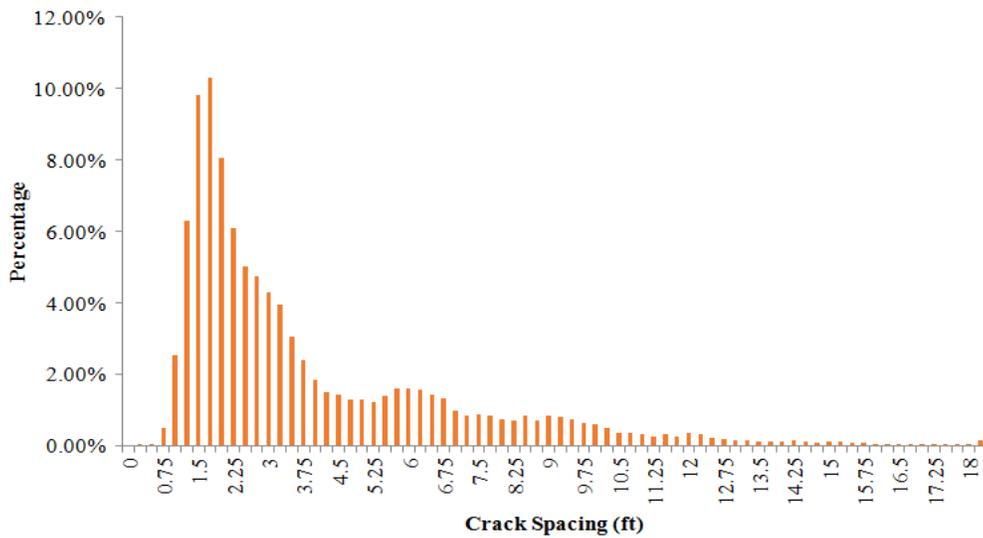


(b) I-85 South

Figure 4.1: Mean Crack Spacing of 1,000-ft Segment on I-85



(a) I-85 North



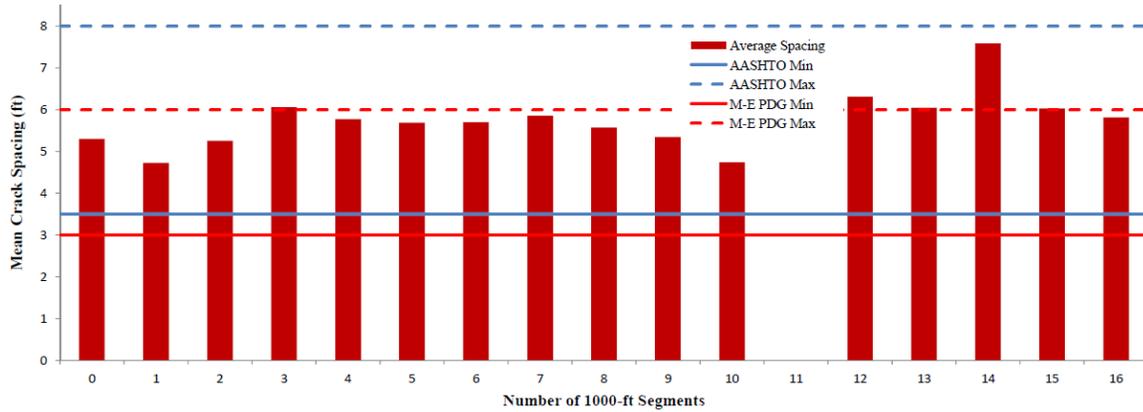
(b) I-85 South

Figure 4.2: Histogram of Crack Spacing on I-85

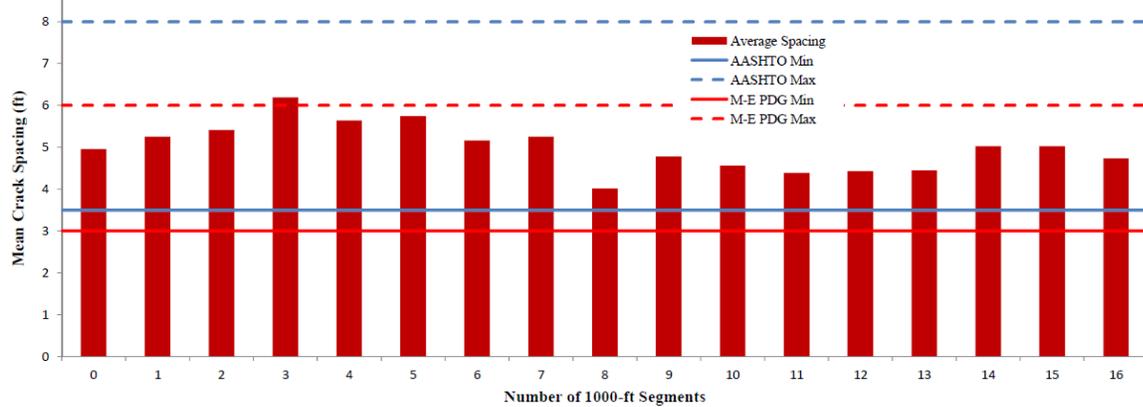
#### 4.1.2 Comparison with Mean Crack Spacing on I-20

The average MCS values of the I-20 East and West CRCP sections are 5.7 ft and 5.0 ft, which are larger than those on I-85. When all the segments on both East and West are considered, the average MCS is 5.28 ft. Figure 4.3(a) and (b) show the MCS distributions of all 1,000-ft segments on I-20 East and West, respectively. In each direction (East and West), there are 17 segments each of which is 1,000 ft long. The blue solid and dashed horizontal lines represent the

1993 AASHTO recommended MCS range (3.5 ft - 8 ft); the red solid and dashed horizontal lines represent the MEPDG recommended range (3 ft - 6 ft). From Figure 4.3(a) and (b), it can be seen that the MCS on I-20 East and West is well bounded by the AASHTO recommended range, but it is at the upper end of the MEPDG recommended range. On I-20 East, there are 4 segments (24%) that have an MCS greater than the MEPDG recommended upper bound (6 ft); there is 1 segment (6%) on I-20 West. Figure 4.4 shows the histograms of all the crack spacing on I-20 East and West.

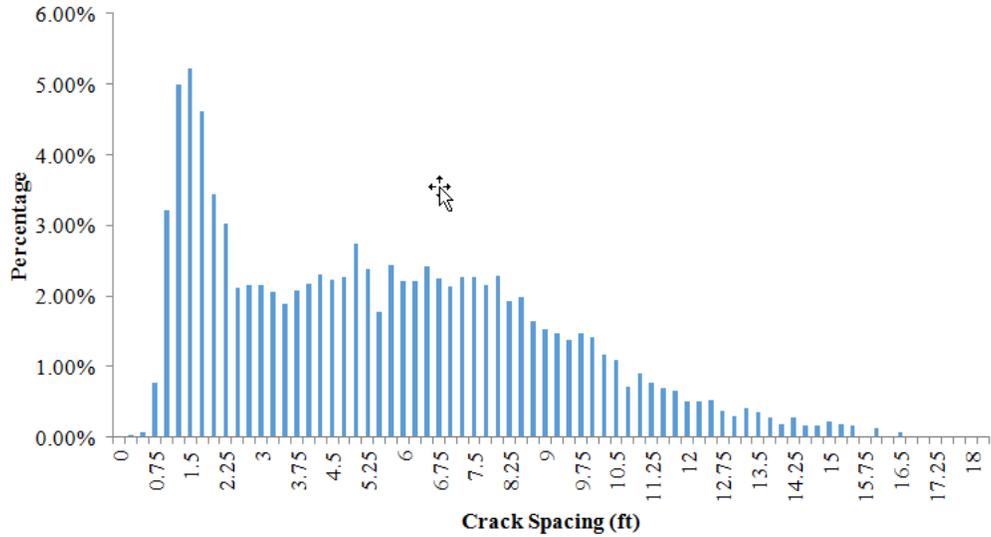


(a) I-20 East

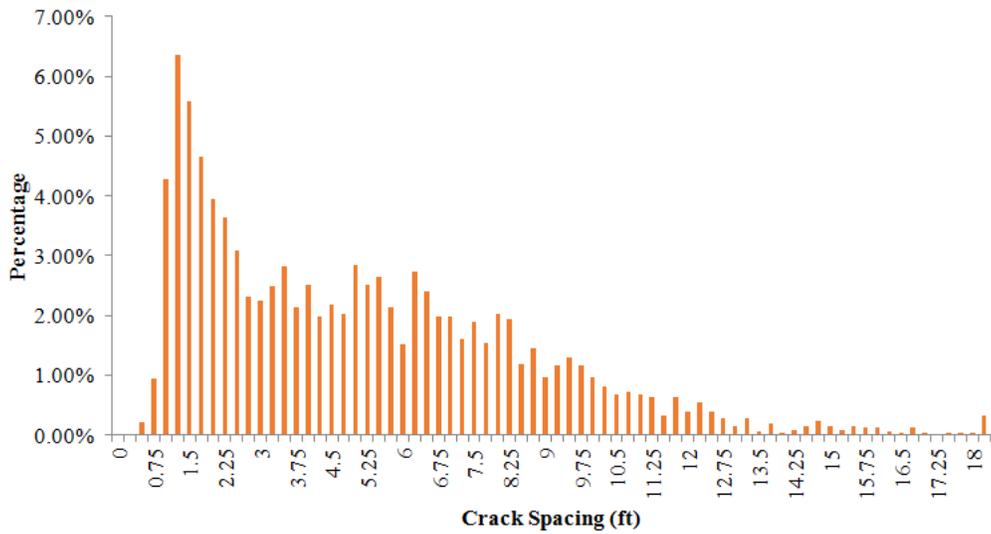


(b) I-20 West

Figure 4.3: Mean crack spacing of 1,000-ft. segment on I-20



(a) I-20 East



(b) I-20 West

Figure 4.4: Histogram of Mean crack spacing of 1,000-ft. segment on I-20

Table 4.1 summarizes the statistical analyses of the MCSs on both I-85 and I-20. It can be seen that the MCS on I-85 is generally smaller than on I-20. Though some segments on I-85 are not within the AASHTO recommended MCS range, it is generally bounded by the MEPDG recommended range and vice versa on I-20. In most cases, larger crack spacing results in wider crack width. Field inspection showed that the transverse cracks on I-85 are normally tight, and the crack widths are less than 0.04 in. However, the crack widths on I-20 are visually wider than those on I-85. From Table 4.1, it can be seen that the crack spacing distribution is quite non-

uniform in each 1,000-ft segment because the standard deviation of all segments ranges from 0.6 ft - 5.0 ft.

**Table 4.1: Mean Crack Spacing on I-85 and I-20**

|  | I-85             |                  | I-20             |                  |
|--|------------------|------------------|------------------|------------------|
|  | North            | South            | East             | West             |
| <b>Number of 1,000-ft. Segments</b>                  | 133              | 133              | 17               | 17               |
| <b>Mean of All Segments</b>                          | 3.7 ft           | 3.8 ft           | 5.7 ft           | 5.0 ft           |
| <b>Standard Deviation</b>                            | 1.6 ft to 3.9 ft | 0.6 ft to 5.0 ft | 3.3 ft to 5.2 ft | 2.8 ft to 4.4 ft |
| <b>Minimum</b>                                       | 2.5 ft           | 2.8 ft           | 4.7 ft           | 4.0 ft           |
| <b>Maximum</b>                                       | 4.9 ft           | 5.3 ft           | 7.6 ft           | 6.2 ft           |
| <b>% of Segments Out of MEPDG Recommended Range</b>  | 4%               | 3%               | 24%              | 6%               |
| <b>% of Segments Out of AASHTO Recommended Range</b> | 29%              | 35%              | 0                | 0                |

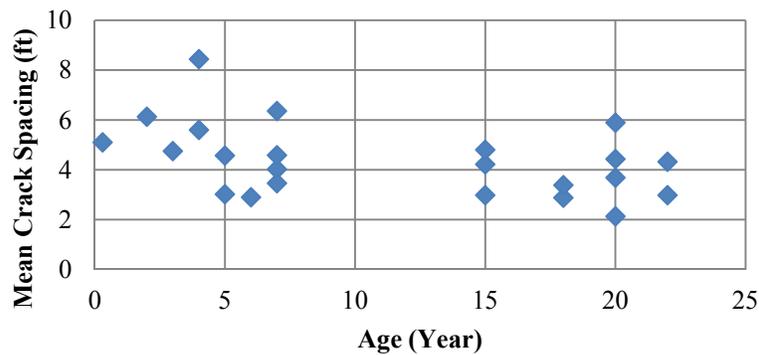
It should be noted that, as presented in Table 3.1, the design parameters of the I-85 CRCP section are different from the ones for the I-20 CRCP section. For example, the PCC slab thickness of I-85 (11 in or 12in) is greater than the one of I-20 (9 in). A thicker slab leads to better capacity for resisting critical bending stress, which normally results in smaller crack spacing and tighter crack widths for the CRCP. Also, the MCS ranges recommended by the design guide are empirical. Though the actual MCS is not within the ranges, the actual pavement condition might not be bad because many other factors, such as the LTE across transverse crack, concrete setting temperature, supporting conditions, and traffic loading, may contribute to the behavior and performance of the CRCP. Thus, long-term condition monitoring is essential to better understand the relationship between the transverse crack patterns and the actual pavement performance.

#### ***4.1.3 Comparison with Mean Crack Spacing of LTPP CRCP Sections***

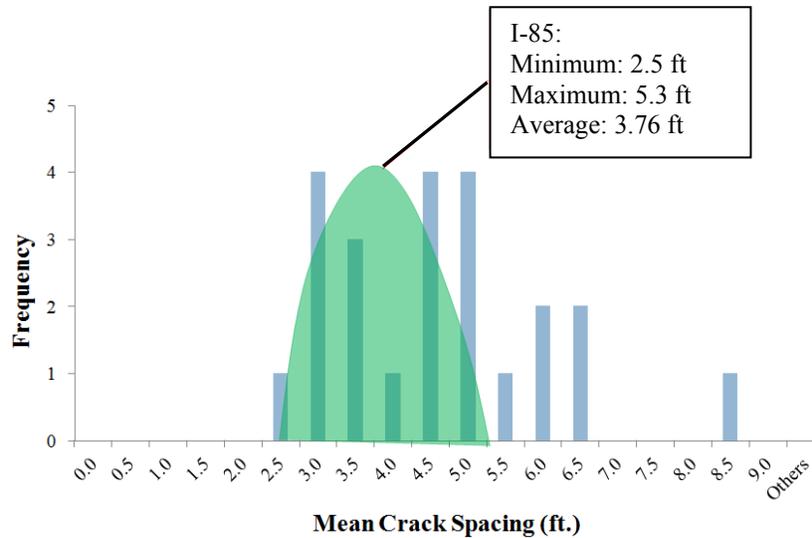
Appendix III summarizes the crack spacing from 23 CRCP sections in the LTPP GPS-5 program (USDOT, 1998). The ages of the CRCP sections when the study was performed range from 0.3 to 22 years. The MCS of the GPS-5 sections ranged from 2.13 ft - 8.44 ft. Figure 4.5 shows the

relationship between the MCS and the CRCP age. It can be seen that all the MCSs are greater than 2 ft. However, there is no clear relationship between the MCSs and the ages. The data is very scattered. For example, there are four sections that are 7 years old, but the MCSs are 3.46 ft, 4.02 ft, 4.58 ft, and 6.36 ft. The four sections at 20 years have MCSs of 2.13 ft, 3.68 ft, 4.43 ft, and 5.89 ft. The scatter data might be caused by the variation of the LTPP sections in terms of spatial locations, steel contents, slab thickness and base types.

Figure 4.6 shows the histogram in blue color of the MCS distribution of the selected 23 LTPP CRCP sections. The transparent green area illustrates the distribution of MCSs on I-85. In comparison with the average MCSs on I-85 (3.76 ft for all the 1,000-ft segments on both North and South), it can be seen that the average MCSs on I-85 are roughly in the middle to low range of the ones of the LTPP sections. The minimum and maximum MCSs (2.5 ft and 5.3 ft, respectively) of all I-85 1,000-ft sections are also bounded by the ones of all the LTPP CRCP sections (2.1 ft and 8.4 ft, respectively).



**Figure 4.5: MCS on LTPP CRCP Section vs. Age**



**Figure 4.6: Distribution of MCS on LTPP CRCP Sections**

Though the MCSs on I-85 CRCP section are comparable with the ones on LTPP CRCP sections, further study is needed to evaluate the performance of each LTPP CRCP section. Thus, the relationship between the MCS and CRCP performance can be further studied.

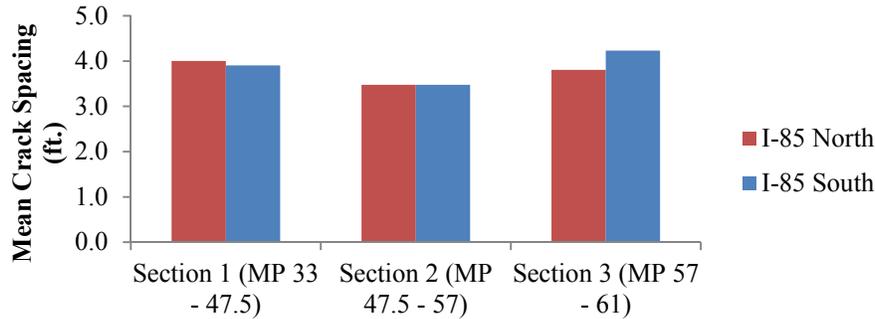
#### ***4.1.4 Comparison of Three Construction Sections***

The I-85 CRCP section consists of 3 different sections that were constructed in three different projects. The project numbers (PI No.) are 0003161, M002434, and M003480. Table 4.2 lists the location, traffic count, and design of each project. The project with PI No. of M002434 has the heaviest traffic (132,200 AADT in 2008). Since the three sections may have been placed at different times and may have different ambient temperatures and curing conditions, a comparison study was performed as follows.

Figure 4.7 shows the MCSs of the 3 construction sections. The first section (Mileposts 33 - 47.5) has MCSs of 4.0 in and 3.9 in in the North and South (the MCSs were calculated based on the data collected from Mileposts 35 to 47.5 since data was actually collected starting from Milepost 35), respectively. The section (Mileposts 47.5 - 57) has MCSs of 3.5 in in the both directions. They are 3.8 in and 4.2 in in the North and South direction for the third section (Mileposts 57 - 61). Though the MCSs of the second section are slightly lower than that of the other two sections, they are not statistically different.

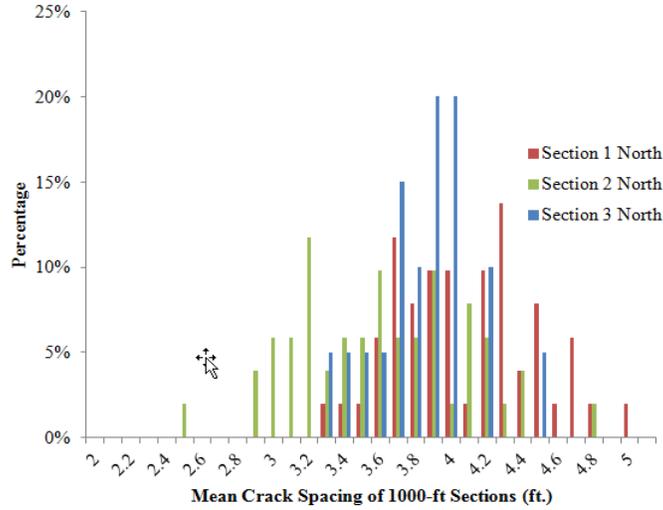
**Table 4.2: Design Parameters of Three Construction Sections**

| <i>Project Number</i> | <i>Range</i>     | <i>Traffic ADT and Year</i> | <i>Truck Percentage</i> | <i>CRCP Slab Thickness</i> | <i>Interlayer</i>                  | <i>Base</i>  |
|-----------------------|------------------|-----------------------------|-------------------------|----------------------------|------------------------------------|--------------|
| <b>0003161</b>        | MP33-<br>MP47.5  | 59,300 (2009)               | 16%                     | 11 in                      | 3 in recycled asphalt<br>superpave | 12 in<br>GAB |
| <b>M002434</b>        | MP47.5 –<br>MP57 | 132,200<br>(2008)           | 15%                     | 12 in                      | 3 in recycled asphalt<br>superpave | 12 in<br>GAB |
| <b>M003480</b>        | MP57 –<br>MP61   | 95,400 (2008)               | 15%                     | 12 in                      | 3 in recycled asphalt<br>superpave | 12 in<br>GAB |

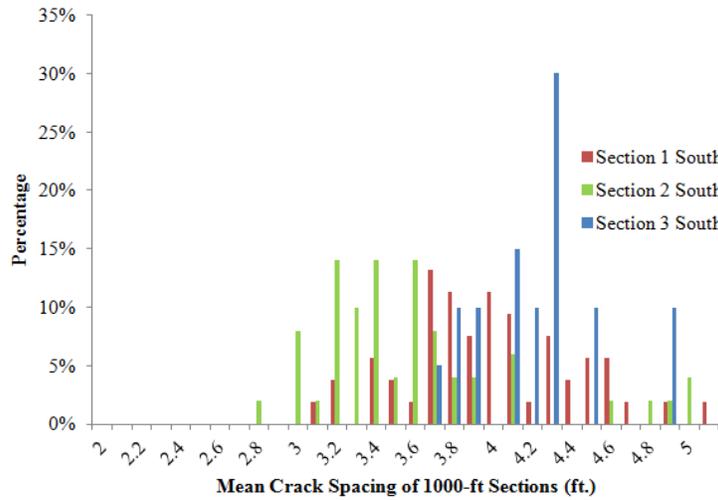


**Figure 4.7: Average Mean Crack Spacing of Three Construction Sections**

Figure 4.8(a) and (b) shows the histograms of the MCS distributions of the 3 CRCP sections in the North and South directions. The mean values can be seen in Figure 4.7. The standard deviations for Sections 1, 2, and 3 on North are 0.39 ft, 0.47 ft, and 0.28 ft, respectively. They are 0.46 ft, 0.52 ft, and 0.32 ft on the South direction. Though all 3 distributions are in the average range, Section 2 has the largest variation with the lowest mean value. Since Sections 2 and 3 have similar designs and comparable traffic loads, the differences might be caused by the differences in the construction temperatures, which could be further investigated in further if data is available.



(a) I-85 North



(b) I-85 South

Figure 4.8: Distribution of Mean Crack Spacing of Three Construction Sections

#### 4.1.5 MCS Change over Time

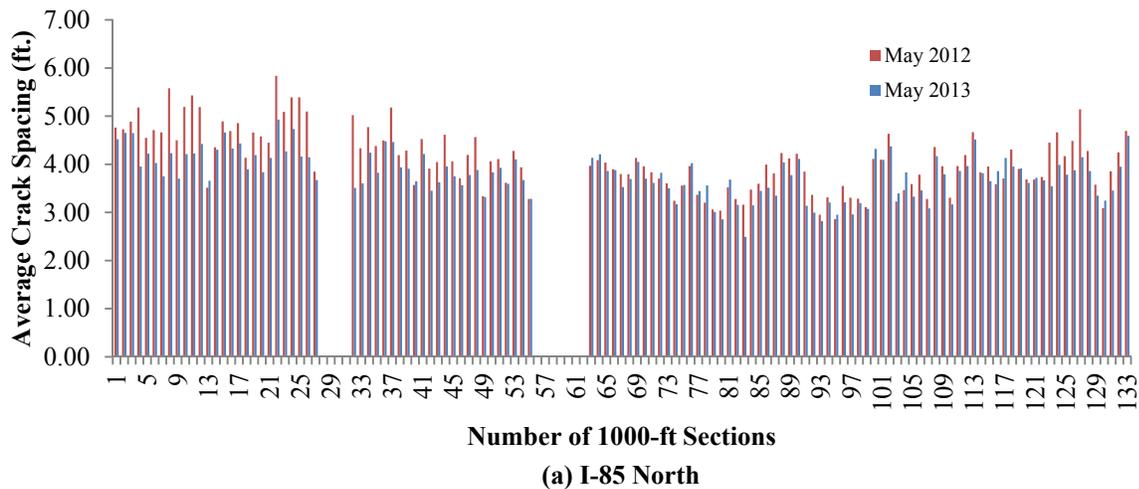
The Georgia Tech research team collected video log images of the I-85 CRCP sections in May 2012 and May 2013. The data collected can be used to analyze the MCS changes over time.

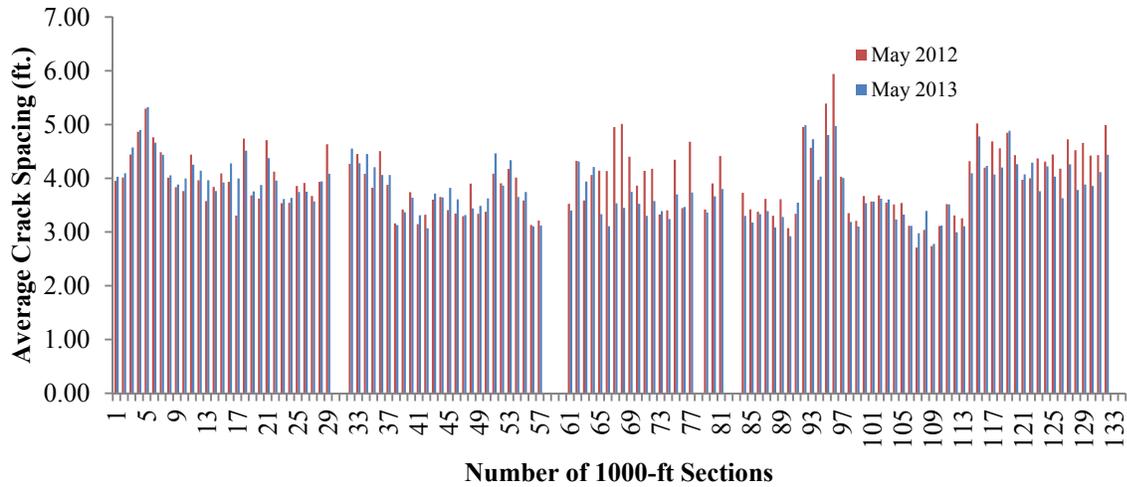
Figure 4.9(a) and (b) show the MCS distributions on I-85 North and South in May 2012 and May 2013. The average MCS on I-85 North in May 2012 is 4.0 ft, which decreased to 3.7 ft in May 2013; the average MCS on I-85 South in May 2012 is also 3.9 ft and decreased to 3.8 ft in May 2013 (shown in Table 4.3). Figure 4.10 shows corresponding histogram of MCSs on I-85 North

and South in two years. From Figure 4.9(a) and (b), it can be seen that the MCSs on I-85 North and South decreased over time due to the occurrences of new transverse cracks. However, at some locations, the MCSs show increasing trends though the value is small (normally less than 0.5 ft). This is not because the cracks were cured; however, the cracks are very fine and hard to be recognized. Missing cracks will increase MCS. Using section 17 on I-85 South as an example, from the data captured in May 2012, there are 302 transverse cracks identified; there are 251 identified in May 2013. Accordingly, the MCS changed from 3.31 ft to 3.99 ft, which was caused by some missing cracks. Figure 4.11 shows an example case in which two transverse cracks were missed in the image captured in May 2013, which might be because the cracks are very tight and the contrast in the image captured in May 2013 is not good enough. This could be improved by enhancing the data collection procedures by, for example, spreading water before capturing video log images to improve the contrast of cracks on the digital images.

**Table 4.3: MCS Changes Over Time (May 2012 vs. May 2013)**

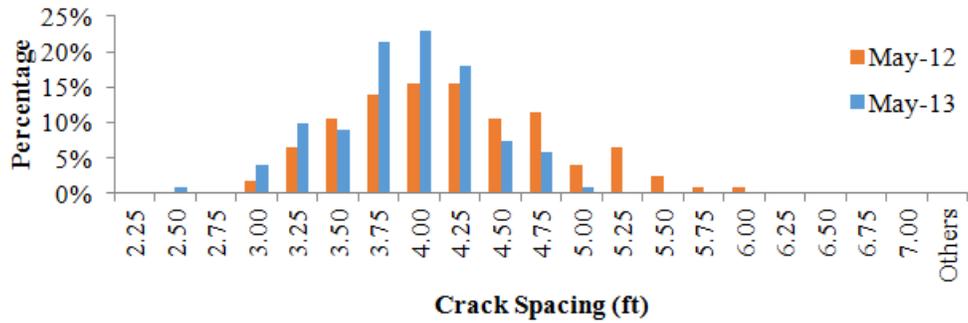
|                                     | North         |               | South         |               |
|-------------------------------------|---------------|---------------|---------------|---------------|
|                                     | 2012 May      | 2013 May      | 2012 May      | 2013 May      |
| <b>Number of 1,000-ft. Segments</b> | 133           | 133           | 132           | 133           |
| <b>Mean of All Segments</b>         | 4.0 ft        | 3.7 ft        | 3.9 ft        | 3.8 ft        |
| <b>Standard Deviation</b>           | 1.6 to 4.4 ft | 1.6 to 3.9 ft | 1.6 to 5.1 ft | 0.6 to 5.0 ft |
| <b>Minimum</b>                      | 2.9 ft        | 2.5 ft        | 2.8 ft        | 2.8 ft        |
| <b>Maximum</b>                      | 5.8 ft        | 4.9 ft        | 5.9 ft        | 5.3 ft        |



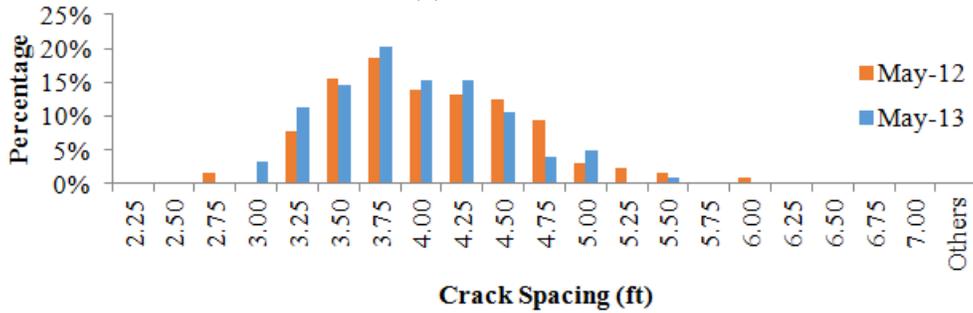


(b) I-85 South

Figure 4.9: Change of Mean Crack Spacing over Time

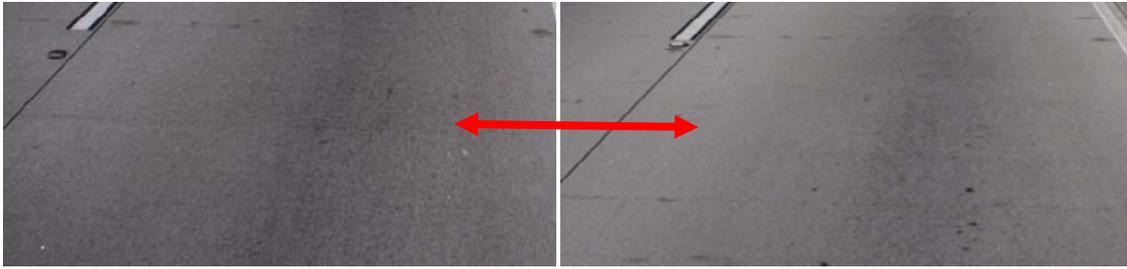


(a) I-85 North



(b) I-85 South

Figure 4.10: Histogram of Change of Mean Crack Spacing over Time

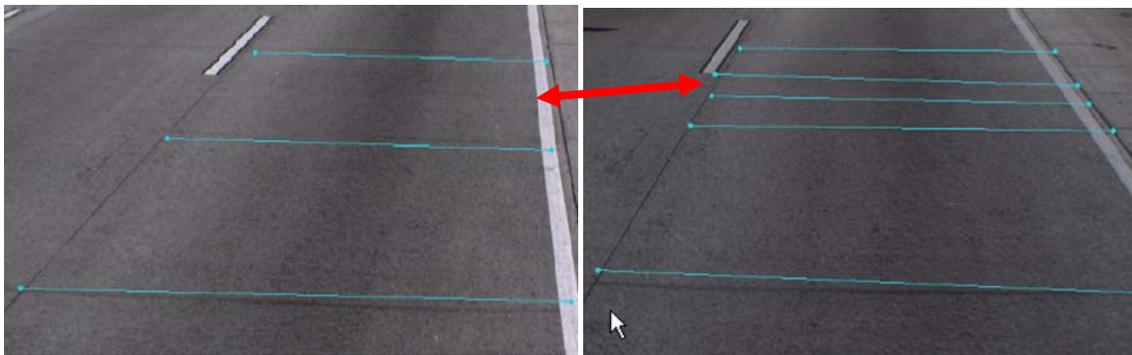


(a) May 2012

(b) May 2013

**Figure 4.11: Missing Transverse Cracks**

The comparison shows that for the majority of sections, the change of the MCS between May 2012 and May 2013 is not significant ( $< 0.3$  ft). However, in some areas, such as in the North direction near Section 25 and in the South direction near Section 67, the variation appears to be relatively large. These areas could be the focus of future observation. Using Section 25 on I-85 North as an example, from the data captured in May 2012, there are 186 transverse cracks identified on the video log images. However, in May 2013, there are 240 transverse cracks identified. Accordingly, the MCS changed from 5.39 ft to 4.16 ft. Figure 4.12 shows an example case where two new transverse cracks were found in the image captured in May 2013 compared with the one that had been captured in May 2012. However, since data was collected only twice, it is hard to tell if the developments of transverse cracks have completed or not. To investigate the complete change of the MCS over time, more data collections are needed.



(a) May 2012

(b) May 2013

**Figure 4.12: New Transverse Formed Over Time**

## 4.2 Spatial Analysis of Localized Cracks

The MCS is important for pavement design purpose. However, different crack patterns occur on the CRCP because of different construction times of different pavement sections, nonuniformity of concrete materials, subbase, and subgrade materials, the changing bonding conditions between concrete and reinforcements, etc. For a 1,000-ft segment, the MCS cannot reveal the localized characteristics of the transverse cracks, which indicate the local performance of the concrete slab and underlying subbase and subgrade.

To show the localized patterns of CRCP transverse cracks, the clustering measurement method used by Tayabji (1998) is the plot of the average crack spacing of 3 or 5 consecutive cracks vs. distance. The results of using the average spacing of 3 cracks and 5 cracks have been tested in the LTPP study, and the patterns are very similar. Thus, we use the 5-crack method to study the localized patterns of transverse cracks. Let  $x_i$  be the linear measurement of crack  $i$  on a CRCP roadway. Without the loss of generality,  $x_i$  can be assumed to monolithically increase, i.e.  $x_{i+1} > x_i$ . Then, the following calculates the average crack spacing of five consecutive cracks:

$$y_i = 0.25 \sum_{j=i}^{i+4} (x_{i+4} - x_i), \quad i = 1, 2, \dots, n-4, \quad n \text{ is the total number of cracks} \quad (1)$$

### 4.2.1 Comparison of Crack Spatial Distributions on I-85 and I-20 Using 5-Crack-Average Method

To compare the patterns of localized transverse crack spacing distribution, the first 1-mile segment of the collected CRCP sections on I-85 North and I-20 East was chosen. Because the first mile covers at least 5 consecutive 1,000-ft segments with a typical MCS, the bias caused by localized crack patterns can be considered insignificant, as shown in Figure 4.1(a) and Figure 4.3(a). By using the aforementioned 5-crack-average method, the localized crack spacing distributions shown in Figure 4.13 were plotted. These two distributions are plotted together for comparing their patterns, which have no spatial correlation.

The major statistical factors were calculated and shown in Table 4.4. It can be seen that the MCS on I-85 is less than on I-20 (4.4 ft vs. 5.5 ft). The variation of localized crack spacing on I-

20 (with the standard deviation of crack spacing of 1.7 ft) is larger than the one on I-85 (with the standard deviation of crack spacing of 1.1 ft) based on the selected 1-mile crack data on both I-85 and I-20. In terms of the localized cracking spacing less than 2 ft, about 0.7% (or a total of 9) of the localized crack spacing is less than 2 ft on the 1-mile I-85 section and 0.6% (or a total of 6) on the I-20 section. A field visit was conducted to explore the difference in the variation of localized crack spacing. Figure 4.14 shows that I-85 has a uniformly small crack pattern, while I-20 has the pattern of a short crack spacing group divided by a large spacing between two groups. Thus, it is likely that I-20 has a slightly higher variation of localized crack spacing than I-85.

The localized crack spacing distribution provides critical information for further investigation. Long-term performance monitoring on spots that have abnormally large and small crack spacing is suggested. In addition, more tests, such as Falling Weight Deflectometer (FWD) measurements and smoothness measurements can be performed. Then, a better understanding can be achieved of different transverse crack spatial patterns.

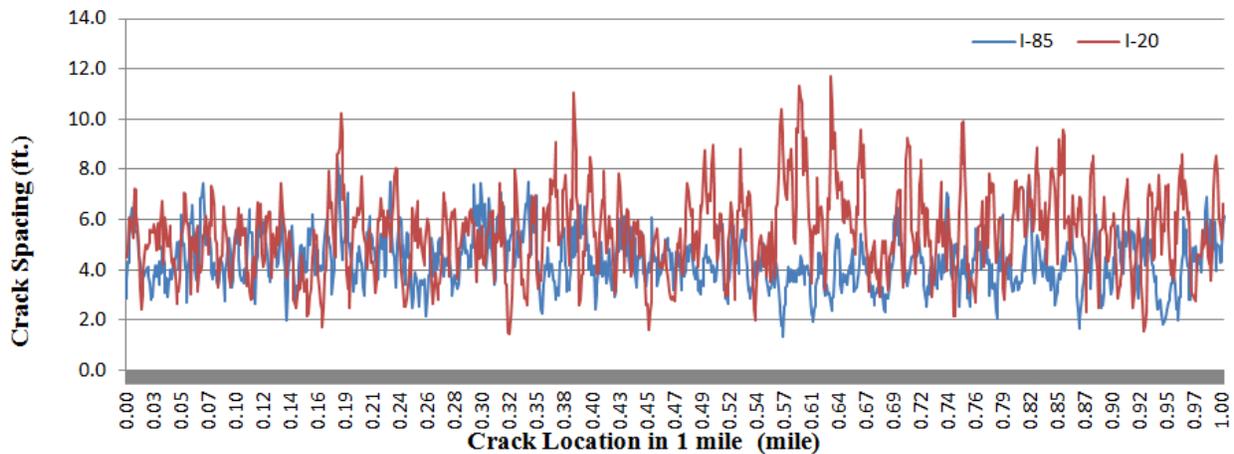


Figure 4.13: Localized 5-Crack-Average Crack Spacing Distribution



**Figure 4.14: Transverse Cracks on I-85 and I-20**

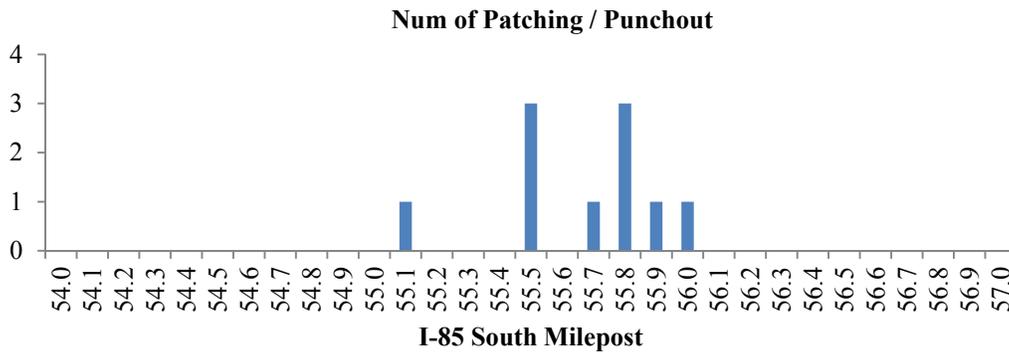
**Table 4.4: Summary of 5-Crack-Average Crack Spacing Distribution for 1 Mile on I-85 and I-20**

|   | <b>I-85</b> | <b>I-20</b> |
|---|-------------|-------------|
| <b>Total Number of Cracks</b>                                   | 1,205       | 963         |
| <b>Minimum Crack Spacing</b>                                    | 1.4 ft      | 1.5 ft      |
| <b>Maximum Crack Spacing</b>                                    | 8.5 ft      | 11.7 ft     |
| <b>Mean Crack Spacing</b>                                       | 4.4 ft      | 5.5 ft      |
| <b>Number (%) of Cracks with Average Spacing Less Than 2 ft</b> | 9 (0.7%)    | 6 (0.6%)    |
| <b>Standard Deviation of Crack Spacing</b>                      | 1.1 ft      | 1.7 ft      |

**4.2.2 Patches/Punchouts on Milepost 55 to 56 of I-85**

Through the field data collection and in-office investigation on video log images, it was found that the I-85 CRCP sections are generally in good condition except for a very short segment from Milepost 55 - 56 on I-85 South. In this short segment, several punchouts developed and were repaired (Appendix IV show the images of all spots in both May 2012 and May 2013). Figure 4.15 shows the number of punchouts at different locations. Three punchouts/patches were found at Mileposts 55.5 and 55.8, respectively. One punchout was found at Mileposts 55, 55.7, 55.9, and 56. Through the comparison with the data collected in May 2012 (see Appendix IV), 3 new patches and 1 new punchout were found at Mileposts 55.5, 55.8 (two spots), and 56. Figure 4.16 shows an example punchout that was found in the data captured in May 2013 but not in May 2012.

To check if there is any exception in the MCS at these spots, Figure 4.17 shows the spatial distribution of the MCSs from Mileposts 54.0 - 57.0. It can be seen that the range of the MCS varies from 2.4 ft to 4.4 ft, which should be in the normal range of the MCS. The MCS at Milepost 55.8 has the lowest value (2.4 ft), where 3 punchouts occurred, but there is no apparent correlation between the occurrence of punchouts and the MCS for other spots. Thus, other factors may contribute to the punchout occurrences. A comprehensive forensic study of the causal factors of the punchouts that occurred at this location is needed.



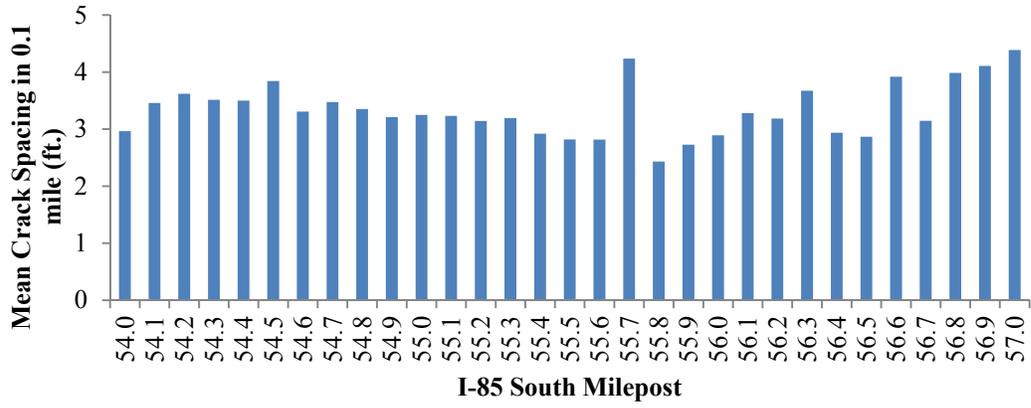
**Figure 4.15: Punchouts/Patches Occurrences on I-85 South**



**(a) May 2012**

**(b) May 2013**

**Figure 4.16: A Punchout Occurred in 2013**



**Figure 4.17: MCS (every 0.1 mile) Distribution between Milepost 54.0 to 57.0**

## 5 Conclusions and Recommendations

The objective of this research project is to study the I-85 CRCP (from Mileposts 35 - 61 on I-85 North and South) crack spacing patterns by collecting detailed pavement data using GPS, 2D imaging, and 3D sensing technologies. In addition, this study compared the measured transverse crack spacing patterns on I-85 with the ones on I-20 in Georgia (the one performed well for more than 40 years) and the LTPP CRCP sections. The research outcomes will enable GDOT and FHWA to gain insight about the detailed crack patterns from the newly constructed CRCP on I-85. This will also enable GDOT and FHWA to better understand the crack patterns in the early stages of pavement life. In addition, this study will significantly benefit the understanding of early CRCP cracking behavior in Georgia.

To acquire the detailed crack maps, the Georgia Tech research team has collected the video log images, along with GPS data, on 52 lane-mile CRCP sections on I-85 (26 miles North and South, respectively), and on a 6 lane-mile CRCP sections on I-20 (3 miles East and West). To investigate the change of crack spacing patterns over time, the I-85 data was collected in May 2012 and May 2013. A semi-automatic method was applied to extract and spatially register the crack maps. First, each transverse crack is identified by visually investigating both perspective and downward pavement images. Because each image is photographically registered with GPS coordinates, the crack location can be automatically calculated. This procedure generates the detailed, spatially registered crack maps. For the I-85 CRCP sections, there are 35,220 video log images (captured in May 2012 and May 2013) that were reviewed; a total of 2,010 images were reviewed for I-20.

The following summarize the major findings:

- 1) Based on the literature review, the MCS is recommended to be in the range of 3.5 ft - 8 ft as recommended by the 1993 AASHTO CRCP design guide and in the range of 3 ft - 6 ft as recommended by the Mechanistic-Empirical Pavement Design Guide (MEPDG). In addition, based on the study of LTPP General Pavement Studies 5 (GPS-5) CRCP sections, approximately 90% of all punchouts occurred over time between cracks with narrow spacing

(1 ft - 2 ft). However, other conditions should also be considered when a punchout occurs, such as the short longitudinal cracks that connect two narrowly-spaced transverse cracks, loss of foundation support, and loss of crack Load Transfer Efficiency (LTE).

- 2) The following are the results from the comparison of MCSs on I-85 and the ones recommended by 1993 AASHTO design guide and the MEPDG:

The MCS on I-85 (an average of 3.76 ft with a range of 2.5 ft - 5.3 ft) is, in general, bounded by the MEPDG recommended range (3 ft - 6 ft), but it is near the lower end of the AASHTO recommended range (3.5 ft - 8 ft). On I-85 North, there are five 1,000-ft segments (4%) that have MCSs less than the MEPDG recommended lower bound (3 ft), and 39 segments (29%) have the ones less than the AASHTO recommended lower bound (3.5 ft). On I-85 South, 4 segments (3%) are less than 3 ft, but 47 segments (35%) are less than 3.5 ft.

- 3) The following are the results from the comparison of CRCP MCSs on I-85 and on I-20:

The original two lanes of I-20 CRCP near Douglassville, GA, constructed in 1972, are still in service. They serve as the truck lanes after lane addition in the early 1990's. It shows signs of wear, but has little distress. To study the MCSs on I-20 and compare them to the ones on I-85, 6 outside lane-miles (3 lane-miles East and 3 West) were chosen.

Based on our study, the MCS on I-20 (an average of 5.28 ft with a range of 4.0 ft - 7.6 ft) is well bounded by the AASHTO recommended values, but it is at the upper limit of the MEPDG recommended range. There are 4 segments (24%) that have an MCS greater than the MEPDG recommended upper bound (6 ft) on I-20 East and 1 1,000-ft segment (6%) on I-20 West. The average MCS on I-85 (3.76 ft) is less than the one on I-20 (5.28 ft) based on the analysis on all 1,000-ft segments. This might be caused by the different designs. For example, the slab thickness and steel content on I-85 sections is greater than the sections on I-20. Accordingly, based on field investigation, the average crack width on I-20 is larger than on I-85.

- 4) Compared with 23 CRCP sections in the LTPP GPS-5 program:

The average MCSs on I-85 are roughly in the middle to low range of the ones of the LTPP sections. The minimum and maximum MCSs (2.5 ft and 5.3 ft, respectively) of all I-85 1,000-ft sections are well bounded by the ones of all LTPP CRCP sections (2.1 ft and 8.4 ft, respectively).

- 5) The following are the results from the comparison of MCS on three construction projects:

Because the 28 center-line-mile I-85 CRCP was constructed in three projects (first project: Mileposts 33 - 47.5; second project: Mileposts 47.5 - 57; third project: Mileposts 57 - 61), a comparison study was conducted to evaluate their MCSs. The results show no significant difference, though the MCSs of the second project are slightly lower than the ones for other two projects. The biggest difference is about 0.7 ft. Section 2 also has the largest variation. Since project 2 and 3 have similar design and comparable traffic, the differences might be caused by the differences in the construction temperatures, which could be further investigated if data is available.

- 6) The following are the results from the comparison of MCSs on I-85 in May 2012 and May 2013:

From May 2012 to May 2013, the average MCS on I-85 North varied from 4.0 ft to 3.7 ft; the one on I-85 South varied from 3.9 ft - 3.8 ft. Since data was collected only twice, it is too early to determine if the transverse cracks have fully developed on a newly constructed CRCP. To investigate the actual change of the MCS over time, additional data needs to be collected.

- 7) The following are the results from the comparison of crack patterns on I-85 and I-20 using the 5-crack-average method for studying the localized crack spacing distribution:

The localized crack spacing distribution, derived using the 5-crack-average method, reveals the detailed and local level of crack patterns. The variation of localized crack spacing on I-20 (with the standard deviation of crack spacing of 1.7 ft) is larger than the one on I-85 (with the standard deviation of crack spacing of 1.1 ft) based on the selected 1-mile crack data on

both I-85 and I-20. In terms of the localized cracking spacing less than 2 ft, about 0.7% (or a total of 9) of the localized crack spacing is less than 2 ft on the 1-mile I-85 section and 0.6% (or a total of 6) on the I-20 section. These spots can be further investigated and monitored because they can, potentially, lead to pavement distresses, such as punchouts, when other conditions (e.g. longitudinal cracks that connect two narrowly-spaced transverse cracks, loss of foundation support, and loss of LTE) are present.

8) Patches/punchouts observed from Mileposts 55 - 56 on I-85 South:

Ten patches/punchouts were observed on I-85 South from Mileposts 55 - 56 based on the data collected in May 2013. In comparison with the data collected in May 2012, three more patches and one new punchout were observed in this section. After discussing the problem with GDOT engineers, it appears that the problem may be caused by poor construction in this isolated section; further study is needed.

### **Recommendations**

The following are recommendations for future studies:

- 1) It is recommended that the continuous monitoring of the propagation of cracks, including both transverse and longitudinal cracks, using video log images, be conducted on the entire I-85 CRCP section for at least two more years (2014 and 2015) to better understand the early stages of crack propagation behavior in CRCP on I-85.
- 2) GDOT has been one of the leading state DOTs having CRCP. The CRCP in Georgia involves a large amount of capital investment and majority of them have performed well since 1970s. It is recommended to collect data, including pavement data and video log images, using sensing technologies so the punchouts, spalling, and crack characteristics, including transverse cracks, longitudinal cracks, and crack width, can be more accurately quantified and better analyzed to reveal the characteristics of these CRCP with good long-term performance. This will help us to better understand the CRCP behavior and performance in Georgia.

- 3) Besides collecting and analyzing transverse cracks, it is recommended that other crack characteristics on I-85, including transverse and longitudinal cracks and crack width be analyzed. Various factors contribute to the occurrence of a punchout, such as narrow transverse crack spacing, short longitudinal cracks connect two narrowly-spaced cracks, loss of foundation support, and loss of LTE.
- 4) Closely monitoring the spots where potential punchouts and spalling could occur is recommended. These spots can be selected based on the transverse crack spacing (less than 2 ft or greater than 8 ft), occurrence of longitudinal cracks, and crack width, and located in field using GIS/GPS technologies. The outcomes will help engineers better understand the behavior of CRCP distresses and better manage the CRCP on I-85.
- 5) A study on the section of I-85 South from Mileposts 55 - 56 is recommended. By using video log images, 3D laser data, Falling Weight Deflectometer, Magnetic Imaging Technology, etc., a continuously monitoring on the pavement conditions, including crack patterns and base condition can be performed so proactive maintenance and rehabilitation actions can be made in a timely manner. In addition, a forensic study of the causes of problem on I-85 is also recommended so they can be prevented.

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## Appendix I: Information of the 1,000-ft Sections on I-85

I-85 North CRCP Sections (different gray level indicates different project):

| Section Number | MP From (mile) | MP To (mile) | Mean Spacing (m) | Mean Spacing (ft.) |
|----------------|----------------|--------------|------------------|--------------------|
| 1              | 35.77          | 35.93        | 1.38             | 4.52               |
| 2              | 35.93          | 36.12        | 1.42             | 4.65               |
| 3              | 36.12          | 36.31        | 1.42             | 4.65               |
| 4              | 36.31          | 36.49        | 1.21             | 3.95               |
| 5              | 36.49          | 36.68        | 1.29             | 4.22               |
| 6              | 36.68          | 36.87        | 1.23             | 4.03               |
| 7              | 36.87          | 37.06        | 1.14             | 3.75               |
| 8              | 37.06          | 37.25        | 1.29             | 4.23               |
| 9              | 37.25          | 37.44        | 1.13             | 3.70               |
| 10             | 37.44          | 37.63        | 1.28             | 4.21               |
| 11             | 37.63          | 37.82        | 1.29             | 4.22               |
| 12             | 37.82          | 38.01        | 1.35             | 4.42               |
| 13             | 38.01          | 38.20        | 1.12             | 3.66               |
| 14             | 38.20          | 38.39        | 1.31             | 4.30               |
| 15             | 38.39          | 38.58        | 1.42             | 4.66               |
| 16             | 38.58          | 38.77        | 1.32             | 4.33               |
| 17             | 38.77          | 38.96        | 1.35             | 4.43               |
| 18             | 38.96          | 39.15        | 1.19             | 3.90               |
| 19             | 39.15          | 39.34        | 1.28             | 4.19               |
| 20             | 39.34          | 39.53        | 1.17             | 3.83               |
| 21             | 39.53          | 39.71        | 1.26             | 4.13               |
| 22             | 39.71          | 39.90        | 1.50             | 4.93               |
| 23             | 39.90          | 40.09        | 1.30             | 4.27               |
| 24             | 40.09          | 40.28        | 1.44             | 4.73               |
| 25             | 40.28          | 40.47        | 1.27             | 4.16               |
| 26             | 40.47          | 40.66        | 1.26             | 4.14               |
| 27             | 40.66          | 40.82        | 1.12             | 3.67               |
| 28             |                |              |                  |                    |
| 29             |                |              |                  |                    |
| 30             |                |              |                  |                    |
| 31             |                |              |                  |                    |
| 32             | 41.70          | 41.80        | 1.07             | 3.51               |
| 33             | 41.80          | 41.99        | 1.10             | 3.60               |

|    |       |       |      |      |
|----|-------|-------|------|------|
| 34 | 41.99 | 42.18 | 1.29 | 4.24 |
| 35 | 42.18 | 42.37 | 1.17 | 3.83 |
| 36 | 42.37 | 42.56 | 1.36 | 4.47 |
| 37 | 42.56 | 42.74 | 1.36 | 4.46 |
| 38 | 42.74 | 42.93 | 1.20 | 3.94 |
| 39 | 42.93 | 43.12 | 1.19 | 3.91 |
| 40 | 43.12 | 43.31 | 1.11 | 3.64 |
| 41 | 43.31 | 43.50 | 1.29 | 4.22 |
| 42 | 43.50 | 43.69 | 1.05 | 3.45 |
| 43 | 43.69 | 43.88 | 1.11 | 3.63 |
| 44 | 43.88 | 44.07 | 1.21 | 3.95 |
| 45 | 44.07 | 44.26 | 1.14 | 3.75 |
| 46 | 44.26 | 44.45 | 1.09 | 3.57 |
| 47 | 44.45 | 44.64 | 1.15 | 3.78 |
| 48 | 44.64 | 44.83 | 1.18 | 3.88 |
| 49 | 44.83 | 45.02 | 1.01 | 3.32 |
| 50 | 45.02 | 45.21 | 1.17 | 3.83 |
| 51 | 45.21 | 45.40 | 1.20 | 3.93 |
| 52 | 45.40 | 45.59 | 1.10 | 3.59 |
| 53 | 45.59 | 45.78 | 1.25 | 4.10 |
| 54 | 45.78 | 45.96 | 1.12 | 3.67 |
| 55 | 45.96 | 46.15 | 1.00 | 3.28 |
| 56 | 46.15 | 46.16 | 1.34 | 4.39 |
| 57 |       |       |      |      |
| 58 |       |       |      |      |
| 59 |       |       |      |      |
| 60 |       |       |      |      |
| 61 |       |       |      |      |
| 62 |       |       |      |      |
| 63 | 47.57 | 47.67 | 1.26 | 4.14 |
| 64 | 47.67 | 47.86 | 1.28 | 4.21 |
| 65 | 47.86 | 48.05 | 1.18 | 3.86 |
| 66 | 48.05 | 48.24 | 1.18 | 3.88 |
| 67 | 48.24 | 48.43 | 1.07 | 3.53 |
| 68 | 48.43 | 48.62 | 1.13 | 3.70 |
| 69 | 48.62 | 48.81 | 1.23 | 4.05 |
| 70 | 48.81 | 48.99 | 1.13 | 3.70 |
| 71 | 48.99 | 49.18 | 1.10 | 3.61 |
| 72 | 49.18 | 49.37 | 1.17 | 3.82 |

|     |       |       |      |      |
|-----|-------|-------|------|------|
| 73  | 49.37 | 49.56 | 1.07 | 3.50 |
| 74  | 49.56 | 49.75 | 0.97 | 3.17 |
| 75  | 49.75 | 50.02 | 1.09 | 3.57 |
| 76  | 50.02 | 50.13 | 1.23 | 4.02 |
| 77  | 50.13 | 50.32 | 1.05 | 3.44 |
| 78  | 50.32 | 50.51 | 1.09 | 3.56 |
| 79  | 50.51 | 50.70 | 0.92 | 3.01 |
| 80  | 50.70 | 50.89 | 0.87 | 2.86 |
| 81  | 50.89 | 51.08 | 1.12 | 3.68 |
| 82  | 51.08 | 51.27 | 0.96 | 3.16 |
| 83  | 51.27 | 51.46 | 0.76 | 2.49 |
| 84  | 51.46 | 51.65 | 0.96 | 3.15 |
| 85  | 51.65 | 51.84 | 1.05 | 3.45 |
| 86  | 51.84 | 52.02 | 1.07 | 3.51 |
| 87  | 52.02 | 52.21 | 1.02 | 3.35 |
| 88  | 52.21 | 52.40 | 1.23 | 4.04 |
| 89  | 52.40 | 52.59 | 1.15 | 3.77 |
| 90  | 52.59 | 52.78 | 1.25 | 4.11 |
| 91  | 52.78 | 52.97 | 0.96 | 3.14 |
| 92  | 52.97 | 53.16 | 0.91 | 2.99 |
| 93  | 53.16 | 53.35 | 0.86 | 2.82 |
| 94  | 53.35 | 53.54 | 0.98 | 3.21 |
| 95  | 53.54 | 53.73 | 0.90 | 2.95 |
| 96  | 53.73 | 53.92 | 0.98 | 3.21 |
| 97  | 53.92 | 54.11 | 0.90 | 2.96 |
| 98  | 54.11 | 54.30 | 0.97 | 3.19 |
| 99  | 54.30 | 54.49 | 0.94 | 3.08 |
| 100 | 54.49 | 54.68 | 1.32 | 4.32 |
| 101 | 54.68 | 54.87 | 1.25 | 4.09 |
| 102 | 54.87 | 55.06 | 1.33 | 4.37 |
| 103 | 55.06 | 55.25 | 1.04 | 3.40 |
| 104 | 55.25 | 55.43 | 1.17 | 3.83 |
| 105 | 55.43 | 55.62 | 1.02 | 3.33 |
| 106 | 55.62 | 55.81 | 1.05 | 3.46 |
| 107 | 55.81 | 56.00 | 0.94 | 3.08 |
| 108 | 56.00 | 56.19 | 1.27 | 4.17 |
| 109 | 56.19 | 56.38 | 1.16 | 3.79 |
| 110 | 56.38 | 56.57 | 0.97 | 3.17 |
| 111 | 56.57 | 56.76 | 1.18 | 3.86 |

|     |       |       |      |      |
|-----|-------|-------|------|------|
| 112 | 56.76 | 56.95 | 1.21 | 3.96 |
| 113 | 56.95 | 57.14 | 1.38 | 4.51 |
| 114 | 57.14 | 57.33 | 1.16 | 3.82 |
| 115 | 57.33 | 57.52 | 1.11 | 3.65 |
| 116 | 57.52 | 57.71 | 1.18 | 3.86 |
| 117 | 57.71 | 57.90 | 1.26 | 4.13 |
| 118 | 57.90 | 58.09 | 1.21 | 3.95 |
| 119 | 58.09 | 58.28 | 1.19 | 3.91 |
| 120 | 58.28 | 58.46 | 1.10 | 3.61 |
| 121 | 58.46 | 58.65 | 1.13 | 3.72 |
| 122 | 58.65 | 58.84 | 1.12 | 3.67 |
| 123 | 58.84 | 59.03 | 1.08 | 3.54 |
| 124 | 59.03 | 59.22 | 1.22 | 3.99 |
| 125 | 59.22 | 59.41 | 1.15 | 3.78 |
| 126 | 59.41 | 59.60 | 1.18 | 3.88 |
| 127 | 59.60 | 59.79 | 1.27 | 4.15 |
| 128 | 59.79 | 59.98 | 1.18 | 3.86 |
| 129 | 59.98 | 60.17 | 1.02 | 3.35 |
| 130 | 60.17 | 60.36 | 0.99 | 3.25 |
| 131 | 60.36 | 60.55 | 1.05 | 3.45 |
| 132 | 60.55 | 60.74 | 1.20 | 3.95 |
| 133 | 60.74 | 60.85 | 1.40 | 4.59 |

Note: Data was collected in May, 2013

I-85 North CRCP Sections – Detailed Crack Spacing for First Six 1,000-ft Sections and Corresponding Histograms:

| Mile Post | Spacing (ft) | Section # | Mile Post | Spacing (ft) | Section # | Mile Post | Spacing (ft) | Section # |
|-----------|--------------|-----------|-----------|--------------|-----------|-----------|--------------|-----------|
| 35.77     |              | 1         | 36.17     | 7.47         | 3         | 36.52     | 7.28         | 5         |
| 35.77     | 3.46         | 1         | 36.17     | 1.22         | 3         | 36.52     | 9.24         | 5         |
| 35.77     | 2.74         | 1         | 36.17     | 8.78         | 3         | 36.53     | 8.51         | 5         |
| 35.77     | 2.21         | 1         | 36.17     | 3.24         | 3         | 36.53     | 2.13         | 5         |
| 35.77     | 3.04         | 1         | 36.17     | 2.68         | 3         | 36.53     | 3.43         | 5         |
| 35.77     | 6.61         | 1         | 36.17     | 2.61         | 3         | 36.53     | 1.19         | 5         |
| 35.77     | 8.02         | 1         | 36.17     | 1.27         | 3         | 36.53     | 1.37         | 5         |
| 35.77     | 3.07         | 1         | 36.18     | 0.97         | 3         | 36.53     | 6.60         | 5         |
| 35.78     | 9.65         | 1         | 36.18     | 3.93         | 3         | 36.53     | 6.95         | 5         |
| 35.78     | 6.24         | 1         | 36.18     | 2.15         | 3         | 36.53     | 5.31         | 5         |
| 35.78     | 5.34         | 1         | 36.18     | 2.70         | 3         | 36.53     | 8.41         | 5         |
| 35.78     | 3.10         | 1         | 36.18     | 9.41         | 3         | 36.53     | 0.78         | 5         |
| 35.78     | 9.30         | 1         | 36.18     | 4.66         | 3         | 36.53     | 2.34         | 5         |
| 35.78     | 7.73         | 1         | 36.18     | 2.21         | 3         | 36.53     | 4.07         | 5         |
| 35.78     | 2.59         | 1         | 36.18     | 2.84         | 3         | 36.53     | 5.62         | 5         |
| 35.78     | 4.79         | 1         | 36.18     | 6.28         | 3         | 36.53     | 0.91         | 5         |
| 35.79     | 5.66         | 1         | 36.18     | 3.82         | 3         | 36.54     | 1.41         | 5         |
| 35.79     | 2.96         | 1         | 36.18     | 2.77         | 3         | 36.54     | 8.74         | 5         |
| 35.79     | 3.66         | 1         | 36.18     | 7.41         | 3         | 36.54     | 2.46         | 5         |
| 35.79     | 5.69         | 1         | 36.18     | 1.66         | 3         | 36.54     | 7.26         | 5         |
| 35.79     | 2.81         | 1         | 36.19     | 3.58         | 3         | 36.54     | 2.29         | 5         |
| 35.79     | 2.42         | 1         | 36.19     | 3.02         | 3         | 36.54     | 5.86         | 5         |
| 35.79     | 2.25         | 1         | 36.19     | 3.35         | 3         | 36.54     | 3.08         | 5         |
| 35.79     | 5.31         | 1         | 36.19     | 2.15         | 3         | 36.54     | 1.38         | 5         |
| 35.79     | 4.34         | 1         | 36.19     | 3.18         | 3         | 36.54     | 1.33         | 5         |
| 35.79     | 6.68         | 1         | 36.19     | 2.66         | 3         | 36.54     | 3.14         | 5         |
| 35.79     | 2.73         | 1         | 36.19     | 5.32         | 3         | 36.54     | 2.66         | 5         |
| 35.79     | 2.96         | 1         | 36.19     | 2.98         | 3         | 36.54     | 3.58         | 5         |
| 35.79     | 2.61         | 1         | 36.19     | 1.57         | 3         | 36.54     | 5.15         | 5         |
| 35.79     | 2.98         | 1         | 36.19     | 10.24        | 3         | 36.55     | 7.79         | 5         |
| 35.79     | 2.94         | 1         | 36.19     | 3.39         | 3         | 36.55     | 1.27         | 5         |
| 35.80     | 2.75         | 1         | 36.19     | 7.82         | 3         | 36.55     | 6.39         | 5         |
| 35.80     | 3.34         | 1         | 36.20     | 8.27         | 3         | 36.55     | 2.29         | 5         |
| 35.80     | 2.77         | 1         | 36.20     | 2.50         | 3         | 36.55     | 6.68         | 5         |
| 35.80     | 7.83         | 1         | 36.20     | 1.31         | 3         | 36.55     | 9.34         | 5         |
| 35.80     | 2.24         | 1         | 36.20     | 1.64         | 3         | 36.55     | 2.44         | 5         |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.80 | 6.17  | 1 | 36.20 | 2.36  | 3 | 36.55 | 3.28  | 5 |
| 35.80 | 2.42  | 1 | 36.20 | 2.90  | 3 | 36.55 | 4.69  | 5 |
| 35.80 | 1.15  | 1 | 36.20 | 10.23 | 3 | 36.55 | 4.02  | 5 |
| 35.80 | 5.14  | 1 | 36.20 | 0.84  | 3 | 36.55 | 6.78  | 5 |
| 35.80 | 3.38  | 1 | 36.20 | 3.07  | 3 | 36.55 | 2.83  | 5 |
| 35.80 | 7.95  | 1 | 36.20 | 5.36  | 3 | 36.56 | 6.22  | 5 |
| 35.80 | 3.16  | 1 | 36.20 | 10.06 | 3 | 36.56 | 3.23  | 5 |
| 35.80 | 2.63  | 1 | 36.20 | 4.69  | 3 | 36.56 | 11.34 | 5 |
| 35.81 | 7.46  | 1 | 36.20 | 3.04  | 3 | 36.56 | 1.06  | 5 |
| 35.81 | 2.21  | 1 | 36.20 | 1.45  | 3 | 36.56 | 0.90  | 5 |
| 35.81 | 2.00  | 1 | 36.21 | 11.07 | 3 | 36.56 | 6.69  | 5 |
| 35.81 | 1.18  | 1 | 36.21 | 5.15  | 3 | 36.56 | 2.05  | 5 |
| 35.81 | 6.62  | 1 | 36.21 | 2.84  | 3 | 36.56 | 4.30  | 5 |
| 35.81 | 2.39  | 1 | 36.21 | 8.17  | 3 | 36.56 | 2.86  | 5 |
| 35.81 | 3.24  | 1 | 36.21 | 3.26  | 3 | 36.56 | 6.26  | 5 |
| 35.81 | 6.01  | 1 | 36.21 | 9.01  | 3 | 36.56 | 3.07  | 5 |
| 35.81 | 2.50  | 1 | 36.21 | 3.21  | 3 | 36.56 | 1.32  | 5 |
| 35.81 | 3.24  | 1 | 36.21 | 8.13  | 3 | 36.56 | 1.66  | 5 |
| 35.81 | 4.37  | 1 | 36.21 | 0.85  | 3 | 36.57 | 5.53  | 5 |
| 35.81 | 4.31  | 1 | 36.22 | 8.87  | 3 | 36.57 | 1.25  | 5 |
| 35.81 | 6.03  | 1 | 36.22 | 9.19  | 3 | 36.57 | 1.44  | 5 |
| 35.82 | 5.70  | 1 | 36.22 | 2.93  | 3 | 36.57 | 1.22  | 5 |
| 35.82 | 3.52  | 1 | 36.22 | 5.94  | 3 | 36.57 | 8.50  | 5 |
| 35.82 | 2.96  | 1 | 36.22 | 0.99  | 3 | 36.57 | 9.67  | 5 |
| 35.82 | 8.27  | 1 | 36.22 | 2.19  | 3 | 36.57 | 1.64  | 5 |
| 35.82 | 1.43  | 1 | 36.22 | 2.95  | 3 | 36.57 | 5.82  | 5 |
| 35.82 | 2.16  | 1 | 36.22 | 12.35 | 3 | 36.57 | 3.22  | 5 |
| 35.82 | 12.51 | 1 | 36.22 | 2.68  | 3 | 36.57 | 8.24  | 5 |
| 35.82 | 2.49  | 1 | 36.22 | 1.50  | 3 | 36.57 | 1.66  | 5 |
| 35.82 | 10.22 | 1 | 36.22 | 1.06  | 3 | 36.57 | 1.73  | 5 |
| 35.82 | 1.17  | 1 | 36.22 | 3.76  | 3 | 36.57 | 3.87  | 5 |
| 35.82 | 1.14  | 1 | 36.23 | 3.84  | 3 | 36.58 | 4.23  | 5 |
| 35.82 | 2.78  | 1 | 36.23 | 1.68  | 3 | 36.58 | 7.33  | 5 |
| 35.83 | 6.44  | 1 | 36.23 | 6.54  | 3 | 36.58 | 3.09  | 5 |
| 35.83 | 2.34  | 1 | 36.23 | 3.67  | 3 | 36.58 | 6.16  | 5 |
| 35.83 | 2.19  | 1 | 36.23 | 4.53  | 3 | 36.58 | 1.72  | 5 |
| 35.83 | 10.44 | 1 | 36.23 | 3.01  | 3 | 36.58 | 1.34  | 5 |
| 35.83 | 2.98  | 1 | 36.23 | 3.71  | 3 | 36.58 | 1.49  | 5 |
| 35.83 | 10.93 | 1 | 36.23 | 9.09  | 3 | 36.58 | 5.01  | 5 |
| 35.83 | 6.23  | 1 | 36.23 | 0.99  | 3 | 36.58 | 3.33  | 5 |
| 35.83 | 5.88  | 1 | 36.23 | 1.18  | 3 | 36.58 | 7.69  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.83 | 3.08  | 1 | 36.23 | 5.21  | 3 | 36.58 | 2.84  | 5 |
| 35.83 | 2.84  | 1 | 36.23 | 4.73  | 3 | 36.58 | 2.18  | 5 |
| 35.83 | 3.29  | 1 | 36.23 | 4.77  | 3 | 36.58 | 0.99  | 5 |
| 35.84 | 2.88  | 1 | 36.24 | 4.01  | 3 | 36.58 | 1.97  | 5 |
| 35.84 | 3.70  | 1 | 36.24 | 2.90  | 3 | 36.58 | 4.09  | 5 |
| 35.84 | 5.47  | 1 | 36.24 | 3.02  | 3 | 36.59 | 9.00  | 5 |
| 35.84 | 1.84  | 1 | 36.24 | 9.44  | 3 | 36.59 | 2.51  | 5 |
| 35.84 | 7.65  | 1 | 36.24 | 1.08  | 3 | 36.59 | 2.85  | 5 |
| 35.84 | 12.26 | 1 | 36.24 | 1.45  | 3 | 36.59 | 2.76  | 5 |
| 35.84 | 10.03 | 1 | 36.24 | 1.41  | 3 | 36.59 | 5.89  | 5 |
| 35.84 | 4.19  | 1 | 36.24 | 6.74  | 3 | 36.59 | 6.61  | 5 |
| 35.85 | 8.89  | 1 | 36.24 | 3.39  | 3 | 36.59 | 3.06  | 5 |
| 35.85 | 1.81  | 1 | 36.24 | 3.31  | 3 | 36.59 | 8.99  | 5 |
| 35.85 | 1.14  | 1 | 36.24 | 3.01  | 3 | 36.60 | 13.00 | 5 |
| 35.85 | 6.10  | 1 | 36.24 | 10.25 | 3 | 36.60 | 5.33  | 5 |
| 35.85 | 7.68  | 1 | 36.25 | 4.78  | 3 | 36.60 | 9.07  | 5 |
| 35.85 | 7.60  | 1 | 36.25 | 3.71  | 3 | 36.60 | 2.97  | 5 |
| 35.85 | 4.56  | 1 | 36.25 | 11.18 | 3 | 36.60 | 1.36  | 5 |
| 35.85 | 4.35  | 1 | 36.25 | 3.03  | 3 | 36.60 | 1.26  | 5 |
| 35.85 | 1.45  | 1 | 36.25 | 3.06  | 3 | 36.60 | 4.87  | 5 |
| 35.85 | 1.92  | 1 | 36.25 | 3.13  | 3 | 36.60 | 4.22  | 5 |
| 35.85 | 3.58  | 1 | 36.25 | 11.22 | 3 | 36.60 | 6.27  | 5 |
| 35.85 | 5.95  | 1 | 36.25 | 5.06  | 3 | 36.60 | 6.29  | 5 |
| 35.86 | 8.52  | 1 | 36.25 | 1.94  | 3 | 36.60 | 4.35  | 5 |
| 35.86 | 1.48  | 1 | 36.25 | 2.83  | 3 | 36.61 | 6.33  | 5 |
| 35.86 | 2.14  | 1 | 36.26 | 9.73  | 3 | 36.61 | 2.74  | 5 |
| 35.86 | 1.82  | 1 | 36.26 | 4.85  | 3 | 36.61 | 4.91  | 5 |
| 35.86 | 1.09  | 1 | 36.26 | 2.94  | 3 | 36.61 | 2.60  | 5 |
| 35.86 | 4.98  | 1 | 36.26 | 2.04  | 3 | 36.61 | 3.20  | 5 |
| 35.86 | 10.28 | 1 | 36.26 | 9.74  | 3 | 36.61 | 6.20  | 5 |
| 35.86 | 6.34  | 1 | 36.26 | 4.92  | 3 | 36.61 | 2.81  | 5 |
| 35.86 | 1.77  | 1 | 36.26 | 4.78  | 3 | 36.61 | 4.82  | 5 |
| 35.86 | 0.86  | 1 | 36.26 | 2.48  | 3 | 36.61 | 4.94  | 5 |
| 35.86 | 1.24  | 1 | 36.26 | 8.21  | 3 | 36.61 | 6.96  | 5 |
| 35.86 | 1.25  | 1 | 36.26 | 1.12  | 3 | 36.61 | 1.44  | 5 |
| 35.86 | 5.07  | 1 | 36.26 | 1.42  | 3 | 36.61 | 1.28  | 5 |
| 35.87 | 13.18 | 1 | 36.26 | 1.78  | 3 | 36.61 | 2.12  | 5 |
| 35.87 | 3.67  | 1 | 36.27 | 11.75 | 3 | 36.62 | 7.92  | 5 |
| 35.87 | 4.77  | 1 | 36.27 | 2.98  | 3 | 36.62 | 3.66  | 5 |
| 35.87 | 3.28  | 1 | 36.27 | 7.58  | 3 | 36.62 | 2.57  | 5 |
| 35.87 | 1.56  | 1 | 36.27 | 2.14  | 3 | 36.62 | 3.90  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.87 | 1.41  | 1 | 36.27 | 3.49  | 3 | 36.62 | 4.53  | 5 |
| 35.87 | 5.10  | 1 | 36.27 | 5.11  | 3 | 36.62 | 1.44  | 5 |
| 35.87 | 3.61  | 1 | 36.27 | 1.90  | 3 | 36.62 | 1.90  | 5 |
| 35.87 | 6.96  | 1 | 36.27 | 6.61  | 3 | 36.62 | 1.32  | 5 |
| 35.87 | 9.09  | 1 | 36.27 | 2.19  | 3 | 36.62 | 4.28  | 5 |
| 35.87 | 5.00  | 1 | 36.27 | 1.85  | 3 | 36.62 | 5.43  | 5 |
| 35.88 | 3.97  | 1 | 36.27 | 2.52  | 3 | 36.62 | 6.18  | 5 |
| 35.88 | 1.74  | 1 | 36.27 | 9.17  | 3 | 36.62 | 4.03  | 5 |
| 35.88 | 6.88  | 1 | 36.28 | 3.25  | 3 | 36.62 | 0.86  | 5 |
| 35.88 | 3.24  | 1 | 36.28 | 4.57  | 3 | 36.62 | 1.14  | 5 |
| 35.88 | 5.91  | 1 | 36.28 | 3.84  | 3 | 36.62 | 7.99  | 5 |
| 35.88 | 0.94  | 1 | 36.28 | 6.43  | 3 | 36.63 | 7.13  | 5 |
| 35.88 | 2.65  | 1 | 36.28 | 9.38  | 3 | 36.63 | 3.00  | 5 |
| 35.88 | 2.57  | 1 | 36.28 | 1.67  | 3 | 36.63 | 3.57  | 5 |
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| 35.88 | 2.83  | 1 | 36.28 | 3.09  | 3 | 36.63 | 2.99  | 5 |
| 35.88 | 9.20  | 1 | 36.28 | 4.31  | 3 | 36.63 | 11.58 | 5 |
| 35.88 | 1.24  | 1 | 36.28 | 7.09  | 3 | 36.63 | 6.24  | 5 |
| 35.88 | 1.68  | 1 | 36.28 | 2.42  | 3 | 36.63 | 2.15  | 5 |
| 35.88 | 5.58  | 1 | 36.28 | 3.27  | 3 | 36.63 | 4.58  | 5 |
| 35.89 | 11.80 | 1 | 36.29 | 3.87  | 3 | 36.63 | 5.81  | 5 |
| 35.89 | 8.99  | 1 | 36.29 | 1.76  | 3 | 36.63 | 5.49  | 5 |
| 35.89 | 3.50  | 1 | 36.29 | 5.07  | 3 | 36.64 | 4.68  | 5 |
| 35.89 | 1.20  | 1 | 36.29 | 8.92  | 3 | 36.64 | 4.99  | 5 |
| 35.89 | 1.79  | 1 | 36.29 | 4.87  | 3 | 36.64 | 2.58  | 5 |
| 35.89 | 1.55  | 1 | 36.29 | 2.81  | 3 | 36.64 | 3.25  | 5 |
| 35.89 | 1.04  | 1 | 36.29 | 5.90  | 3 | 36.64 | 0.99  | 5 |
| 35.89 | 9.10  | 1 | 36.29 | 3.65  | 3 | 36.64 | 1.28  | 5 |
| 35.89 | 1.34  | 1 | 36.29 | 2.77  | 3 | 36.64 | 1.17  | 5 |
| 35.89 | 11.03 | 1 | 36.29 | 11.60 | 3 | 36.64 | 0.68  | 5 |
| 35.89 | 3.35  | 1 | 36.29 | 1.98  | 3 | 36.64 | 4.53  | 5 |
| 35.90 | 5.23  | 1 | 36.30 | 3.12  | 3 | 36.64 | 6.50  | 5 |
| 35.90 | 5.44  | 1 | 36.30 | 2.22  | 3 | 36.64 | 3.75  | 5 |
| 35.90 | 5.52  | 1 | 36.30 | 2.40  | 3 | 36.64 | 2.49  | 5 |
| 35.90 | 1.55  | 1 | 36.30 | 6.66  | 3 | 36.64 | 3.21  | 5 |
| 35.90 | 11.51 | 1 | 36.30 | 2.86  | 3 | 36.64 | 4.09  | 5 |
| 35.90 | 6.31  | 1 | 36.30 | 5.70  | 3 | 36.65 | 10.30 | 5 |
| 35.90 | 2.56  | 1 | 36.30 | 1.67  | 3 | 36.65 | 1.72  | 5 |
| 35.90 | 5.83  | 1 | 36.30 | 8.70  | 3 | 36.65 | 1.68  | 5 |
| 35.90 | 1.29  | 1 | 36.30 | 2.88  | 3 | 36.65 | 2.89  | 5 |
| 35.90 | 2.82  | 1 | 36.30 | 6.58  | 3 | 36.65 | 5.94  | 5 |

|       |       |   |       |      |   |       |       |   |
|-------|-------|---|-------|------|---|-------|-------|---|
| 35.91 | 8.63  | 1 | 36.30 | 2.24 | 3 | 36.65 | 3.57  | 5 |
| 35.91 | 1.41  | 1 | 36.30 | 2.77 | 3 | 36.65 | 3.72  | 5 |
| 35.91 | 5.19  | 1 | 36.30 | 1.65 | 3 | 36.65 | 9.41  | 5 |
| 35.91 | 1.66  | 1 | 36.30 | 2.98 | 3 | 36.65 | 4.83  | 5 |
| 35.91 | 10.49 | 1 | 36.31 | 5.93 | 4 | 36.65 | 2.85  | 5 |
| 35.91 | 4.86  | 1 | 36.31 | 7.52 | 4 | 36.65 | 9.31  | 5 |
| 35.91 | 5.41  | 1 | 36.31 | 1.75 | 4 | 36.66 | 7.16  | 5 |
| 35.91 | 0.94  | 1 | 36.31 | 2.87 | 4 | 36.66 | 2.79  | 5 |
| 35.91 | 5.62  | 1 | 36.31 | 2.70 | 4 | 36.66 | 3.89  | 5 |
| 35.91 | 3.16  | 1 | 36.31 | 8.88 | 4 | 36.66 | 2.76  | 5 |
| 35.91 | 5.90  | 1 | 36.31 | 4.03 | 4 | 36.66 | 1.05  | 5 |
| 35.91 | 3.68  | 1 | 36.31 | 5.81 | 4 | 36.66 | 1.93  | 5 |
| 35.92 | 6.54  | 1 | 36.31 | 4.97 | 4 | 36.66 | 2.33  | 5 |
| 35.92 | 5.73  | 1 | 36.31 | 3.66 | 4 | 36.66 | 5.75  | 5 |
| 35.92 | 5.60  | 1 | 36.31 | 2.51 | 4 | 36.66 | 1.69  | 5 |
| 35.92 | 10.33 | 1 | 36.32 | 6.65 | 4 | 36.66 | 5.65  | 5 |
| 35.92 | 2.73  | 1 | 36.32 | 2.76 | 4 | 36.66 | 3.81  | 5 |
| 35.92 | 0.81  | 1 | 36.32 | 2.49 | 4 | 36.66 | 7.76  | 5 |
| 35.92 | 1.89  | 1 | 36.32 | 3.90 | 4 | 36.66 | 1.83  | 5 |
| 35.92 | 2.36  | 1 | 36.32 | 3.38 | 4 | 36.66 | 1.41  | 5 |
| 35.92 | 2.66  | 1 | 36.32 | 5.71 | 4 | 36.66 | 2.07  | 5 |
| 35.92 | 1.64  | 1 | 36.32 | 2.97 | 4 | 36.66 | 6.57  | 5 |
| 35.92 | 9.74  | 1 | 36.32 | 0.69 | 4 | 36.67 | 2.83  | 5 |
| 35.93 | 4.00  | 1 | 36.32 | 2.03 | 4 | 36.67 | 3.52  | 5 |
| 35.93 | 5.88  | 2 | 36.32 | 3.41 | 4 | 36.67 | 3.28  | 5 |
| 35.93 | 6.33  | 2 | 36.32 | 6.74 | 4 | 36.67 | 2.05  | 5 |
| 35.93 | 3.39  | 2 | 36.32 | 4.59 | 4 | 36.67 | 8.65  | 5 |
| 35.93 | 5.10  | 2 | 36.32 | 2.78 | 4 | 36.67 | 2.75  | 5 |
| 35.93 | 2.53  | 2 | 36.32 | 7.19 | 4 | 36.67 | 10.88 | 5 |
| 35.93 | 0.87  | 2 | 36.33 | 2.33 | 4 | 36.67 | 5.15  | 5 |
| 35.93 | 1.31  | 2 | 36.33 | 6.17 | 4 | 36.67 | 4.05  | 5 |
| 35.93 | 1.85  | 2 | 36.33 | 4.96 | 4 | 36.67 | 3.23  | 5 |
| 35.93 | 8.46  | 2 | 36.33 | 2.29 | 4 | 36.67 | 3.39  | 5 |
| 35.93 | 5.29  | 2 | 36.33 | 4.08 | 4 | 36.68 | 3.81  | 5 |
| 35.93 | 1.50  | 2 | 36.33 | 6.28 | 4 | 36.68 | 6.54  | 5 |
| 35.93 | 6.35  | 2 | 36.33 | 2.54 | 4 | 36.68 | 3.48  | 5 |
| 35.94 | 6.05  | 2 | 36.33 | 3.33 | 4 | 36.68 | 3.87  | 5 |
| 35.94 | 2.30  | 2 | 36.33 | 6.14 | 4 | 36.68 | 2.10  | 5 |
| 35.94 | 3.09  | 2 | 36.33 | 2.54 | 4 | 36.68 | 13.58 | 5 |
| 35.94 | 2.21  | 2 | 36.33 | 2.82 | 4 | 36.68 | 1.55  | 5 |
| 35.94 | 9.44  | 2 | 36.33 | 3.72 | 4 | 36.68 | 5.06  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.94 | 3.31  | 2 | 36.33 | 2.78  | 4 | 36.68 | 6.87  | 5 |
| 35.94 | 3.18  | 2 | 36.34 | 6.90  | 4 | 36.68 | 2.13  | 5 |
| 35.94 | 2.56  | 2 | 36.34 | 7.49  | 4 | 36.68 | 7.05  | 6 |
| 35.94 | 3.37  | 2 | 36.34 | 10.75 | 4 | 36.69 | 4.29  | 6 |
| 35.94 | 11.87 | 2 | 36.34 | 1.65  | 4 | 36.69 | 6.93  | 6 |
| 35.94 | 5.85  | 2 | 36.34 | 6.36  | 4 | 36.69 | 6.11  | 6 |
| 35.95 | 3.03  | 2 | 36.34 | 2.12  | 4 | 36.69 | 6.37  | 6 |
| 35.95 | 7.13  | 2 | 36.34 | 6.38  | 4 | 36.69 | 1.58  | 6 |
| 35.95 | 2.97  | 2 | 36.34 | 0.94  | 4 | 36.69 | 3.75  | 6 |
| 35.95 | 6.49  | 2 | 36.34 | 1.69  | 4 | 36.69 | 3.90  | 6 |
| 35.95 | 1.74  | 2 | 36.34 | 1.47  | 4 | 36.69 | 2.05  | 6 |
| 35.95 | 1.54  | 2 | 36.34 | 4.59  | 4 | 36.69 | 1.96  | 6 |
| 35.95 | 10.19 | 2 | 36.34 | 2.28  | 4 | 36.69 | 4.06  | 6 |
| 35.95 | 6.21  | 2 | 36.35 | 4.77  | 4 | 36.69 | 9.39  | 6 |
| 35.95 | 2.51  | 2 | 36.35 | 5.88  | 4 | 36.69 | 2.67  | 6 |
| 35.95 | 1.62  | 2 | 36.35 | 3.17  | 4 | 36.70 | 5.87  | 6 |
| 35.95 | 2.26  | 2 | 36.35 | 6.41  | 4 | 36.70 | 4.49  | 6 |
| 35.95 | 2.40  | 2 | 36.35 | 6.48  | 4 | 36.70 | 4.81  | 6 |
| 35.96 | 8.71  | 2 | 36.35 | 8.32  | 4 | 36.70 | 4.47  | 6 |
| 35.96 | 6.55  | 2 | 36.35 | 3.90  | 4 | 36.70 | 2.91  | 6 |
| 35.96 | 2.93  | 2 | 36.35 | 2.34  | 4 | 36.70 | 8.65  | 6 |
| 35.96 | 5.50  | 2 | 36.35 | 3.93  | 4 | 36.70 | 10.46 | 6 |
| 35.96 | 6.19  | 2 | 36.35 | 4.30  | 4 | 36.70 | 1.82  | 6 |
| 35.96 | 5.50  | 2 | 36.35 | 4.16  | 4 | 36.70 | 1.87  | 6 |
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| 35.96 | 3.09  | 2 | 36.36 | 0.86  | 4 | 36.71 | 4.38  | 6 |
| 35.96 | 2.07  | 2 | 36.36 | 8.19  | 4 | 36.71 | 5.72  | 6 |
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| 35.96 | 4.62  | 2 | 36.36 | 6.20  | 4 | 36.71 | 1.39  | 6 |
| 35.97 | 2.17  | 2 | 36.36 | 4.48  | 4 | 36.71 | 0.85  | 6 |
| 35.97 | 1.50  | 2 | 36.36 | 5.68  | 4 | 36.71 | 1.39  | 6 |
| 35.97 | 6.56  | 2 | 36.36 | 3.26  | 4 | 36.71 | 5.67  | 6 |
| 35.97 | 4.98  | 2 | 36.36 | 5.19  | 4 | 36.71 | 1.80  | 6 |
| 35.97 | 9.37  | 2 | 36.36 | 2.84  | 4 | 36.71 | 3.62  | 6 |
| 35.97 | 9.65  | 2 | 36.36 | 2.82  | 4 | 36.71 | 1.55  | 6 |
| 35.97 | 11.22 | 2 | 36.36 | 2.92  | 4 | 36.71 | 1.88  | 6 |
| 35.98 | 9.33  | 2 | 36.37 | 2.20  | 4 | 36.71 | 2.44  | 6 |
| 35.98 | 2.57  | 2 | 36.37 | 2.16  | 4 | 36.71 | 1.93  | 6 |
| 35.98 | 4.18  | 2 | 36.37 | 4.22  | 4 | 36.71 | 1.81  | 6 |
| 35.98 | 2.48  | 2 | 36.37 | 5.41  | 4 | 36.71 | 1.33  | 6 |
| 35.98 | 1.14  | 2 | 36.37 | 2.40  | 4 | 36.71 | 2.68  | 6 |

|       |       |   |       |      |   |       |       |   |
|-------|-------|---|-------|------|---|-------|-------|---|
| 35.98 | 6.52  | 2 | 36.37 | 4.53 | 4 | 36.71 | 1.58  | 6 |
| 35.98 | 13.35 | 2 | 36.37 | 3.78 | 4 | 36.71 | 3.27  | 6 |
| 35.98 | 3.07  | 2 | 36.37 | 5.80 | 4 | 36.71 | 3.75  | 6 |
| 35.98 | 5.86  | 2 | 36.37 | 3.91 | 4 | 36.72 | 1.91  | 6 |
| 35.98 | 0.88  | 2 | 36.37 | 2.04 | 4 | 36.72 | 3.15  | 6 |
| 35.98 | 8.48  | 2 | 36.37 | 4.56 | 4 | 36.72 | 3.36  | 6 |
| 35.99 | 10.67 | 2 | 36.37 | 4.61 | 4 | 36.72 | 2.86  | 6 |
| 35.99 | 1.57  | 2 | 36.37 | 5.16 | 4 | 36.72 | 5.67  | 6 |
| 35.99 | 2.08  | 2 | 36.38 | 3.46 | 4 | 36.72 | 3.96  | 6 |
| 35.99 | 3.34  | 2 | 36.38 | 6.72 | 4 | 36.72 | 5.42  | 6 |
| 35.99 | 4.13  | 2 | 36.38 | 5.00 | 4 | 36.72 | 1.09  | 6 |
| 35.99 | 1.02  | 2 | 36.38 | 4.36 | 4 | 36.72 | 1.48  | 6 |
| 35.99 | 6.77  | 2 | 36.38 | 5.62 | 4 | 36.72 | 2.15  | 6 |
| 35.99 | 1.68  | 2 | 36.38 | 2.26 | 4 | 36.72 | 0.48  | 6 |
| 35.99 | 6.10  | 2 | 36.38 | 2.16 | 4 | 36.72 | 5.16  | 6 |
| 35.99 | 4.07  | 2 | 36.38 | 2.23 | 4 | 36.72 | 1.59  | 6 |
| 35.99 | 1.03  | 2 | 36.38 | 3.20 | 4 | 36.72 | 6.73  | 6 |
| 35.99 | 8.49  | 2 | 36.38 | 2.49 | 4 | 36.72 | 1.37  | 6 |
| 35.99 | 4.59  | 2 | 36.38 | 7.55 | 4 | 36.72 | 7.13  | 6 |
| 36.00 | 5.48  | 2 | 36.38 | 1.70 | 4 | 36.73 | 4.46  | 6 |
| 36.00 | 3.49  | 2 | 36.38 | 3.49 | 4 | 36.73 | 6.62  | 6 |
| 36.00 | 1.83  | 2 | 36.38 | 3.82 | 4 | 36.73 | 10.26 | 6 |
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| 36.00 | 2.60  | 2 | 36.39 | 4.91 | 4 | 36.73 | 2.36  | 6 |
| 36.00 | 2.89  | 2 | 36.39 | 1.27 | 4 | 36.73 | 1.50  | 6 |
| 36.00 | 7.29  | 2 | 36.39 | 7.45 | 4 | 36.73 | 1.80  | 6 |
| 36.00 | 10.53 | 2 | 36.39 | 1.76 | 4 | 36.73 | 5.74  | 6 |
| 36.00 | 4.56  | 2 | 36.39 | 3.36 | 4 | 36.73 | 2.89  | 6 |
| 36.00 | 4.93  | 2 | 36.39 | 0.74 | 4 | 36.73 | 2.70  | 6 |
| 36.00 | 2.99  | 2 | 36.39 | 0.47 | 4 | 36.73 | 9.63  | 6 |
| 36.01 | 6.53  | 2 | 36.39 | 0.62 | 4 | 36.73 | 2.57  | 6 |
| 36.01 | 1.78  | 2 | 36.39 | 3.71 | 4 | 36.74 | 5.71  | 6 |
| 36.01 | 11.87 | 2 | 36.39 | 1.57 | 4 | 36.74 | 2.43  | 6 |
| 36.01 | 3.09  | 2 | 36.39 | 0.99 | 4 | 36.74 | 4.20  | 6 |
| 36.01 | 2.79  | 2 | 36.39 | 7.72 | 4 | 36.74 | 5.17  | 6 |
| 36.01 | 3.19  | 2 | 36.39 | 1.26 | 4 | 36.74 | 3.68  | 6 |
| 36.01 | 3.30  | 2 | 36.39 | 4.69 | 4 | 36.74 | 6.62  | 6 |
| 36.01 | 4.19  | 2 | 36.39 | 3.81 | 4 | 36.74 | 3.74  | 6 |
| 36.01 | 4.63  | 2 | 36.40 | 5.58 | 4 | 36.74 | 2.03  | 6 |
| 36.01 | 4.89  | 2 | 36.40 | 1.71 | 4 | 36.74 | 5.71  | 6 |
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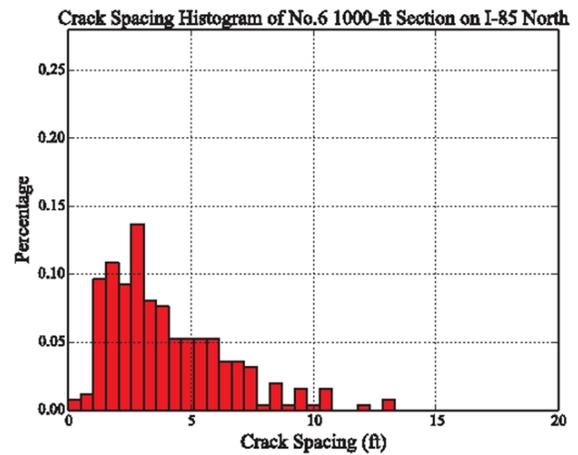
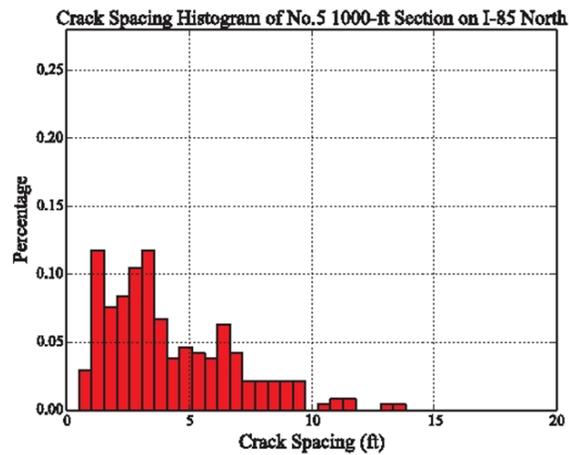
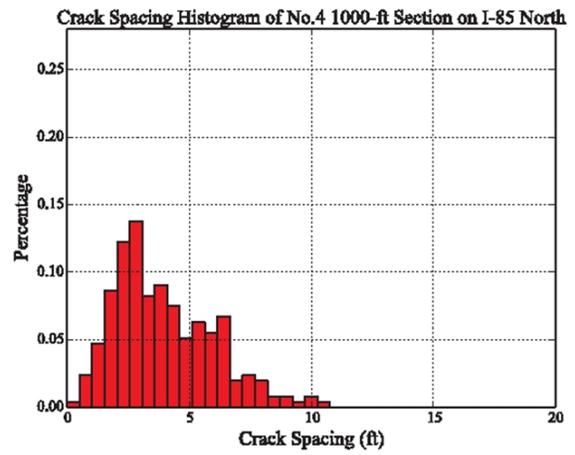
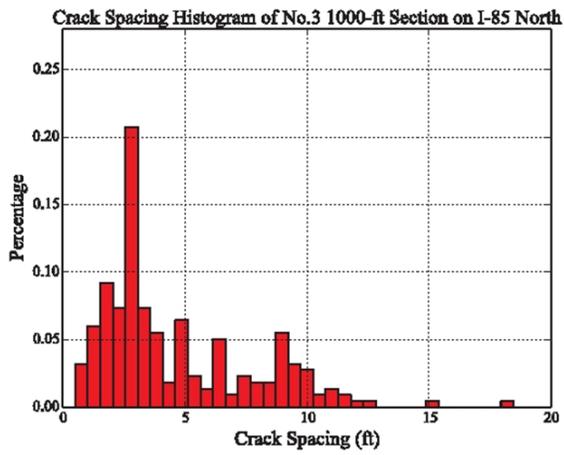
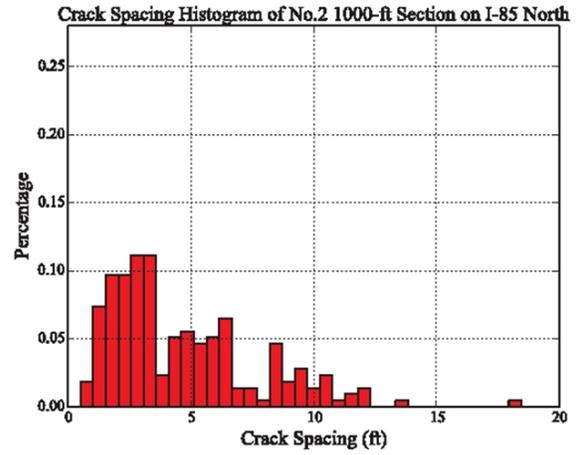
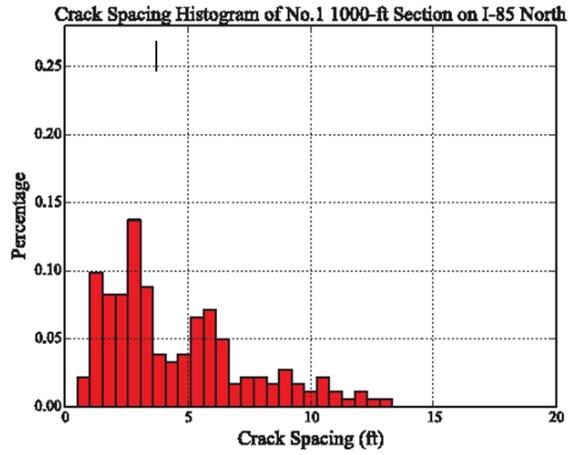
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| 36.02 | 11.42 | 2 | 36.40 | 4.38 | 4 | 36.74 | 12.13 | 6 |
| 36.02 | 5.96  | 2 | 36.40 | 2.75 | 4 | 36.75 | 4.02  | 6 |
| 36.02 | 2.58  | 2 | 36.40 | 2.94 | 4 | 36.75 | 6.45  | 6 |
| 36.02 | 2.70  | 2 | 36.40 | 5.43 | 4 | 36.75 | 3.54  | 6 |
| 36.02 | 6.08  | 2 | 36.40 | 4.36 | 4 | 36.75 | 10.33 | 6 |
| 36.02 | 3.39  | 2 | 36.40 | 1.51 | 4 | 36.75 | 4.91  | 6 |
| 36.02 | 1.80  | 2 | 36.40 | 4.17 | 4 | 36.75 | 2.29  | 6 |
| 36.02 | 8.50  | 2 | 36.40 | 5.08 | 4 | 36.75 | 2.38  | 6 |
| 36.02 | 8.48  | 2 | 36.40 | 3.50 | 4 | 36.75 | 2.92  | 6 |
| 36.02 | 9.00  | 2 | 36.40 | 5.63 | 4 | 36.75 | 13.14 | 6 |
| 36.03 | 5.23  | 2 | 36.40 | 3.03 | 4 | 36.75 | 2.90  | 6 |
| 36.03 | 3.18  | 2 | 36.41 | 5.93 | 4 | 36.76 | 4.75  | 6 |
| 36.03 | 10.53 | 2 | 36.41 | 2.83 | 4 | 36.76 | 3.23  | 6 |
| 36.03 | 1.79  | 2 | 36.41 | 2.24 | 4 | 36.76 | 3.05  | 6 |
| 36.03 | 2.68  | 2 | 36.41 | 5.37 | 4 | 36.76 | 8.53  | 6 |
| 36.03 | 4.64  | 2 | 36.41 | 1.13 | 4 | 36.76 | 1.39  | 6 |
| 36.03 | 4.29  | 2 | 36.41 | 6.70 | 4 | 36.76 | 9.40  | 6 |
| 36.03 | 2.50  | 2 | 36.41 | 6.59 | 4 | 36.76 | 4.54  | 6 |
| 36.03 | 3.77  | 2 | 36.41 | 3.00 | 4 | 36.76 | 2.77  | 6 |
| 36.03 | 11.71 | 2 | 36.41 | 2.35 | 4 | 36.76 | 2.91  | 6 |
| 36.03 | 3.51  | 2 | 36.41 | 3.02 | 4 | 36.76 | 4.69  | 6 |
| 36.04 | 8.52  | 2 | 36.41 | 1.58 | 4 | 36.76 | 1.76  | 6 |
| 36.04 | 6.07  | 2 | 36.41 | 1.50 | 4 | 36.77 | 13.03 | 6 |
| 36.04 | 2.83  | 2 | 36.41 | 2.29 | 4 | 36.77 | 9.70  | 6 |
| 36.04 | 2.99  | 2 | 36.41 | 1.75 | 4 | 36.77 | 4.90  | 6 |
| 36.04 | 3.11  | 2 | 36.41 | 1.60 | 4 | 36.77 | 3.43  | 6 |
| 36.04 | 6.41  | 2 | 36.41 | 5.76 | 4 | 36.77 | 1.99  | 6 |
| 36.04 | 1.94  | 2 | 36.41 | 2.58 | 4 | 36.77 | 9.75  | 6 |
| 36.04 | 3.07  | 2 | 36.42 | 6.23 | 4 | 36.77 | 2.49  | 6 |
| 36.04 | 9.27  | 2 | 36.42 | 3.75 | 4 | 36.77 | 6.62  | 6 |
| 36.04 | 9.19  | 2 | 36.42 | 2.09 | 4 | 36.77 | 2.20  | 6 |
| 36.05 | 2.24  | 2 | 36.42 | 7.72 | 4 | 36.77 | 2.88  | 6 |
| 36.05 | 1.30  | 2 | 36.42 | 5.51 | 4 | 36.78 | 5.28  | 6 |
| 36.05 | 1.57  | 2 | 36.42 | 1.73 | 4 | 36.78 | 4.68  | 6 |
| 36.05 | 3.19  | 2 | 36.42 | 2.15 | 4 | 36.78 | 2.22  | 6 |
| 36.05 | 2.38  | 2 | 36.42 | 4.41 | 4 | 36.78 | 2.53  | 6 |
| 36.05 | 4.10  | 2 | 36.42 | 2.87 | 4 | 36.78 | 1.34  | 6 |
| 36.05 | 5.36  | 2 | 36.42 | 3.27 | 4 | 36.78 | 3.45  | 6 |
| 36.05 | 3.57  | 2 | 36.42 | 3.58 | 4 | 36.78 | 5.67  | 6 |
| 36.05 | 4.79  | 2 | 36.42 | 3.86 | 4 | 36.78 | 4.62  | 6 |
| 36.05 | 1.14  | 2 | 36.42 | 2.34 | 4 | 36.78 | 5.40  | 6 |

|       |       |   |       |      |   |       |       |   |
|-------|-------|---|-------|------|---|-------|-------|---|
| 36.05 | 3.08  | 2 | 36.42 | 2.30 | 4 | 36.78 | 1.17  | 6 |
| 36.05 | 1.22  | 2 | 36.43 | 3.09 | 4 | 36.78 | 6.73  | 6 |
| 36.05 | 1.39  | 2 | 36.43 | 3.10 | 4 | 36.78 | 2.13  | 6 |
| 36.05 | 4.26  | 2 | 36.43 | 1.59 | 4 | 36.78 | 6.75  | 6 |
| 36.05 | 10.26 | 2 | 36.43 | 1.96 | 4 | 36.79 | 3.19  | 6 |
| 36.05 | 1.22  | 2 | 36.43 | 5.22 | 4 | 36.79 | 2.20  | 6 |
| 36.05 | 2.03  | 2 | 36.43 | 2.62 | 4 | 36.79 | 1.25  | 6 |
| 36.06 | 1.38  | 2 | 36.43 | 9.72 | 4 | 36.79 | 2.29  | 6 |
| 36.06 | 2.69  | 2 | 36.43 | 6.26 | 4 | 36.79 | 7.51  | 6 |
| 36.06 | 2.42  | 2 | 36.43 | 5.76 | 4 | 36.79 | 1.34  | 6 |
| 36.06 | 3.29  | 2 | 36.43 | 2.87 | 4 | 36.79 | 2.75  | 6 |
| 36.06 | 5.42  | 2 | 36.43 | 2.06 | 4 | 36.79 | 2.13  | 6 |
| 36.06 | 1.86  | 2 | 36.43 | 4.70 | 4 | 36.79 | 10.28 | 6 |
| 36.06 | 6.95  | 2 | 36.43 | 2.51 | 4 | 36.79 | 4.52  | 6 |
| 36.06 | 2.73  | 2 | 36.44 | 2.75 | 4 | 36.79 | 2.62  | 6 |
| 36.06 | 9.82  | 2 | 36.44 | 3.56 | 4 | 36.79 | 2.17  | 6 |
| 36.06 | 4.96  | 2 | 36.44 | 6.45 | 4 | 36.79 | 7.42  | 6 |
| 36.06 | 2.44  | 2 | 36.44 | 3.16 | 4 | 36.79 | 2.71  | 6 |
| 36.06 | 1.49  | 2 | 36.44 | 2.82 | 4 | 36.80 | 3.13  | 6 |
| 36.06 | 0.84  | 2 | 36.44 | 3.94 | 4 | 36.80 | 3.08  | 6 |
| 36.07 | 8.46  | 2 | 36.44 | 2.90 | 4 | 36.80 | 4.43  | 6 |
| 36.07 | 7.63  | 2 | 36.44 | 1.17 | 4 | 36.80 | 1.93  | 6 |
| 36.07 | 3.23  | 2 | 36.44 | 9.92 | 4 | 36.80 | 7.54  | 6 |
| 36.07 | 4.33  | 2 | 36.44 | 2.48 | 4 | 36.80 | 2.82  | 6 |
| 36.07 | 6.23  | 2 | 36.44 | 4.74 | 4 | 36.80 | 4.60  | 6 |
| 36.07 | 1.67  | 2 | 36.44 | 1.89 | 4 | 36.80 | 2.49  | 6 |
| 36.07 | 8.05  | 2 | 36.44 | 5.46 | 4 | 36.80 | 2.71  | 6 |
| 36.07 | 4.26  | 2 | 36.45 | 4.54 | 4 | 36.80 | 3.35  | 6 |
| 36.07 | 3.11  | 2 | 36.45 | 1.13 | 4 | 36.80 | 3.58  | 6 |
| 36.07 | 2.50  | 2 | 36.45 | 1.03 | 4 | 36.80 | 1.84  | 6 |
| 36.07 | 2.86  | 2 | 36.45 | 5.56 | 4 | 36.80 | 3.10  | 6 |
| 36.07 | 5.78  | 2 | 36.45 | 2.05 | 4 | 36.80 | 5.40  | 6 |
| 36.08 | 6.57  | 2 | 36.45 | 8.12 | 4 | 36.80 | 1.51  | 6 |
| 36.08 | 4.89  | 2 | 36.45 | 4.06 | 4 | 36.81 | 7.55  | 6 |
| 36.08 | 4.37  | 2 | 36.45 | 4.44 | 4 | 36.81 | 0.41  | 6 |
| 36.08 | 2.57  | 2 | 36.45 | 8.33 | 4 | 36.81 | 5.49  | 6 |
| 36.08 | 2.54  | 2 | 36.45 | 2.94 | 4 | 36.81 | 4.86  | 6 |
| 36.08 | 3.00  | 2 | 36.45 | 2.65 | 4 | 36.81 | 1.47  | 6 |
| 36.08 | 2.97  | 2 | 36.45 | 2.85 | 4 | 36.81 | 8.23  | 6 |
| 36.08 | 2.28  | 2 | 36.45 | 6.05 | 4 | 36.81 | 1.33  | 6 |
| 36.08 | 7.33  | 2 | 36.46 | 3.91 | 4 | 36.81 | 5.51  | 6 |

|       |       |   |       |      |   |       |      |   |
|-------|-------|---|-------|------|---|-------|------|---|
| 36.08 | 4.74  | 2 | 36.46 | 5.82 | 4 | 36.81 | 3.00 | 6 |
| 36.08 | 1.21  | 2 | 36.46 | 2.16 | 4 | 36.81 | 3.20 | 6 |
| 36.08 | 2.35  | 2 | 36.46 | 1.90 | 4 | 36.81 | 2.76 | 6 |
| 36.08 | 1.73  | 2 | 36.46 | 6.19 | 4 | 36.81 | 4.14 | 6 |
| 36.08 | 2.28  | 2 | 36.46 | 1.51 | 4 | 36.81 | 2.68 | 6 |
| 36.09 | 8.41  | 2 | 36.46 | 2.98 | 4 | 36.81 | 2.35 | 6 |
| 36.09 | 10.61 | 2 | 36.46 | 2.69 | 4 | 36.82 | 4.80 | 6 |
| 36.09 | 3.07  | 2 | 36.46 | 3.09 | 4 | 36.82 | 1.62 | 6 |
| 36.09 | 1.43  | 2 | 36.46 | 3.78 | 4 | 36.82 | 2.92 | 6 |
| 36.09 | 3.83  | 2 | 36.46 | 1.42 | 4 | 36.82 | 5.08 | 6 |
| 36.09 | 5.34  | 2 | 36.46 | 3.66 | 4 | 36.82 | 1.59 | 6 |
| 36.09 | 8.92  | 2 | 36.46 | 3.80 | 4 | 36.82 | 7.90 | 6 |
| 36.09 | 5.30  | 2 | 36.46 | 2.74 | 4 | 36.82 | 1.35 | 6 |
| 36.09 | 3.36  | 2 | 36.46 | 4.12 | 4 | 36.82 | 7.67 | 6 |
| 36.09 | 1.92  | 2 | 36.46 | 4.47 | 4 | 36.82 | 1.14 | 6 |
| 36.09 | 1.75  | 2 | 36.47 | 2.01 | 4 | 36.82 | 6.15 | 6 |
| 36.09 | 3.07  | 2 | 36.47 | 3.44 | 4 | 36.82 | 3.19 | 6 |
| 36.10 | 11.85 | 2 | 36.47 | 2.67 | 4 | 36.82 | 6.84 | 6 |
| 36.10 | 2.72  | 2 | 36.47 | 2.96 | 4 | 36.82 | 1.78 | 6 |
| 36.10 | 8.63  | 2 | 36.47 | 1.90 | 4 | 36.83 | 6.54 | 6 |
| 36.10 | 1.42  | 2 | 36.47 | 1.58 | 4 | 36.83 | 0.98 | 6 |
| 36.10 | 10.21 | 2 | 36.47 | 1.31 | 4 | 36.83 | 4.63 | 6 |
| 36.10 | 9.62  | 2 | 36.47 | 7.71 | 4 | 36.83 | 2.55 | 6 |
| 36.10 | 3.58  | 2 | 36.47 | 1.75 | 4 | 36.83 | 1.33 | 6 |
| 36.10 | 5.67  | 2 | 36.47 | 2.97 | 4 | 36.83 | 6.45 | 6 |
| 36.11 | 3.92  | 2 | 36.47 | 2.10 | 4 | 36.83 | 4.75 | 6 |
| 36.11 | 6.48  | 2 | 36.47 | 4.54 | 4 | 36.83 | 4.28 | 6 |
| 36.11 | 6.53  | 2 | 36.47 | 6.39 | 4 | 36.83 | 4.69 | 6 |
| 36.11 | 3.53  | 2 | 36.47 | 6.25 | 4 | 36.83 | 5.37 | 6 |
| 36.11 | 18.44 | 2 | 36.47 | 2.60 | 4 | 36.83 | 1.40 | 6 |
| 36.11 | 1.57  | 2 | 36.48 | 5.42 | 4 | 36.83 | 2.96 | 6 |
| 36.11 | 1.16  | 2 | 36.48 | 9.84 | 4 | 36.83 | 2.93 | 6 |
| 36.11 | 4.21  | 2 | 36.48 | 6.23 | 4 | 36.83 | 2.93 | 6 |
| 36.11 | 5.39  | 2 | 36.48 | 3.40 | 4 | 36.83 | 1.19 | 6 |
| 36.12 | 9.15  | 3 | 36.48 | 4.71 | 4 | 36.83 | 2.51 | 6 |
| 36.12 | 2.82  | 3 | 36.48 | 9.06 | 4 | 36.84 | 5.92 | 6 |
| 36.12 | 6.41  | 3 | 36.48 | 3.70 | 4 | 36.84 | 2.52 | 6 |
| 36.12 | 2.11  | 3 | 36.48 | 2.98 | 4 | 36.84 | 6.74 | 6 |
| 36.12 | 15.19 | 3 | 36.48 | 6.04 | 4 | 36.84 | 0.92 | 6 |
| 36.12 | 1.02  | 3 | 36.48 | 3.10 | 4 | 36.84 | 5.57 | 6 |
| 36.12 | 1.69  | 3 | 36.49 | 5.47 | 4 | 36.84 | 4.00 | 6 |

|       |       |   |       |      |   |       |      |   |
|-------|-------|---|-------|------|---|-------|------|---|
| 36.12 | 2.69  | 3 | 36.49 | 4.68 | 4 | 36.84 | 1.22 | 6 |
| 36.12 | 3.03  | 3 | 36.49 | 2.16 | 4 | 36.84 | 8.29 | 6 |
| 36.12 | 6.53  | 3 | 36.49 | 3.31 | 4 | 36.84 | 3.47 | 6 |
| 36.13 | 5.43  | 3 | 36.49 | 2.36 | 4 | 36.84 | 1.05 | 6 |
| 36.13 | 2.88  | 3 | 36.49 | 5.56 | 4 | 36.84 | 5.54 | 6 |
| 36.13 | 9.53  | 3 | 36.49 | 2.18 | 4 | 36.84 | 2.45 | 6 |
| 36.13 | 9.12  | 3 | 36.49 | 6.91 | 4 | 36.84 | 3.82 | 6 |
| 36.13 | 3.04  | 3 | 36.49 | 3.07 | 4 | 36.85 | 3.92 | 6 |
| 36.13 | 7.32  | 3 | 36.49 | 4.10 | 4 | 36.85 | 2.46 | 6 |
| 36.13 | 5.00  | 3 | 36.49 | 5.08 | 4 | 36.85 | 3.35 | 6 |
| 36.13 | 8.44  | 3 | 36.49 | 5.57 | 4 | 36.85 | 1.63 | 6 |
| 36.13 | 3.55  | 3 | 36.49 | 2.51 | 5 | 36.85 | 3.93 | 6 |
| 36.13 | 2.92  | 3 | 36.50 | 6.96 | 5 | 36.85 | 8.42 | 6 |
| 36.14 | 11.94 | 3 | 36.50 | 6.07 | 5 | 36.85 | 2.72 | 6 |
| 36.14 | 3.02  | 3 | 36.50 | 3.07 | 5 | 36.85 | 2.91 | 6 |
| 36.14 | 0.92  | 3 | 36.50 | 3.14 | 5 | 36.85 | 2.82 | 6 |
| 36.14 | 1.86  | 3 | 36.50 | 7.64 | 5 | 36.85 | 3.69 | 6 |
| 36.14 | 3.07  | 3 | 36.50 | 5.47 | 5 | 36.85 | 7.56 | 6 |
| 36.14 | 10.09 | 3 | 36.50 | 3.88 | 5 | 36.85 | 1.06 | 6 |
| 36.14 | 9.57  | 3 | 36.50 | 3.21 | 5 | 36.85 | 8.97 | 6 |
| 36.14 | 5.02  | 3 | 36.50 | 2.49 | 5 | 36.85 | 2.26 | 6 |
| 36.14 | 2.73  | 3 | 36.50 | 4.34 | 5 | 36.86 | 1.58 | 6 |
| 36.14 | 2.27  | 3 | 36.50 | 5.07 | 5 | 36.86 | 6.08 | 6 |
| 36.15 | 6.45  | 3 | 36.50 | 1.37 | 5 | 36.86 | 1.35 | 6 |
| 36.15 | 8.95  | 3 | 36.50 | 1.36 | 5 | 36.86 | 7.39 | 6 |
| 36.15 | 1.79  | 3 | 36.51 | 1.67 | 5 | 36.86 | 1.89 | 6 |
| 36.15 | 2.69  | 3 | 36.51 | 1.56 | 5 | 36.86 | 2.98 | 6 |
| 36.15 | 6.24  | 3 | 36.51 | 9.05 | 5 | 36.86 | 5.55 | 6 |
| 36.15 | 2.80  | 3 | 36.51 | 3.23 | 5 | 36.86 | 4.09 | 6 |
| 36.15 | 10.71 | 3 | 36.51 | 5.79 | 5 | 36.86 | 6.25 | 6 |
| 36.15 | 2.77  | 3 | 36.51 | 3.23 | 5 | 36.86 | 2.59 | 6 |
| 36.15 | 2.84  | 3 | 36.51 | 2.54 | 5 | 36.86 | 2.99 | 6 |
| 36.15 | 3.94  | 3 | 36.51 | 3.20 | 5 | 36.86 | 2.89 | 6 |
| 36.16 | 10.26 | 3 | 36.51 | 3.15 | 5 | 36.86 | 3.98 | 6 |
| 36.16 | 1.93  | 3 | 36.51 | 5.34 | 5 | 36.87 | 5.86 | 6 |
| 36.16 | 8.81  | 3 | 36.51 | 3.16 | 5 | 36.87 | 1.90 | 6 |
| 36.16 | 8.16  | 3 | 36.51 | 3.35 | 5 | 36.87 | 3.31 | 6 |
| 36.16 | 6.40  | 3 | 36.51 | 1.14 | 5 | 36.87 | 2.57 | 6 |
| 36.16 | 4.40  | 3 | 36.52 | 7.72 | 5 | 36.87 | 4.04 | 6 |
| 36.16 | 9.88  | 3 | 36.52 | 6.96 | 5 | 36.87 | 5.33 | 6 |
| 36.16 | 7.43  | 3 | 36.52 | 2.92 | 5 | 36.87 | 4.45 | 6 |

|       |       |   |       |       |   |       |      |   |
|-------|-------|---|-------|-------|---|-------|------|---|
| 36.17 | 2.87  | 3 | 36.52 | 1.58  | 5 | 36.87 | 3.68 | 6 |
| 36.17 | 1.72  | 3 | 36.52 | 1.52  | 5 | 36.87 | 6.20 | 6 |
| 36.17 | 1.41  | 3 | 36.52 | 3.41  | 5 | 36.87 | 3.53 | 6 |
| 36.17 | 18.38 | 3 | 36.52 | 11.22 | 5 | 36.87 | 3.48 | 6 |
| 36.17 | 2.62  | 3 | 36.52 | 2.71  | 5 |       |      |   |



I-85 South CRCP Sections (different gray level indicates different project):

| <b>Section Number</b> | <b>MP From (mile)</b> | <b>MP To (mile)</b> | <b>Mean Spacing (m)</b> | <b>Mean Spacing (ft.)</b> |
|-----------------------|-----------------------|---------------------|-------------------------|---------------------------|
| 1                     | 35.37                 | 35.56               | 1.23                    | 4.03                      |
| 2                     | 35.56                 | 35.75               | 1.25                    | 4.09                      |
| 3                     | 35.75                 | 35.94               | 1.39                    | 4.57                      |
| 4                     | 35.94                 | 36.12               | 1.49                    | 4.90                      |
| 5                     | 36.12                 | 36.31               | 1.62                    | 5.32                      |
| 6                     | 36.31                 | 36.51               | 1.42                    | 4.66                      |
| 7                     | 36.51                 | 36.69               | 1.35                    | 4.44                      |
| 8                     | 36.69                 | 36.88               | 1.24                    | 4.06                      |
| 9                     | 36.88                 | 37.07               | 1.18                    | 3.88                      |
| 10                    | 37.07                 | 37.26               | 1.22                    | 3.99                      |
| 11                    | 37.26                 | 37.45               | 1.30                    | 4.25                      |
| 12                    | 37.45                 | 37.64               | 1.26                    | 4.14                      |
| 13                    | 37.64                 | 37.83               | 1.21                    | 3.96                      |
| 14                    | 37.83                 | 38.02               | 1.15                    | 3.76                      |
| 15                    | 38.02                 | 38.21               | 1.20                    | 3.92                      |
| 16                    | 38.21                 | 38.40               | 1.30                    | 4.28                      |
| 17                    | 38.40                 | 38.59               | 1.22                    | 4.00                      |
| 18                    | 38.59                 | 38.78               | 1.38                    | 4.51                      |
| 19                    | 38.78                 | 38.97               | 1.14                    | 3.75                      |
| 20                    | 38.97                 | 39.16               | 1.18                    | 3.87                      |
| 21                    | 39.16                 | 39.34               | 1.33                    | 4.38                      |
| 22                    | 39.34                 | 39.53               | 1.21                    | 3.96                      |
| 23                    | 39.53                 | 39.72               | 1.10                    | 3.61                      |
| 24                    | 39.72                 | 39.91               | 1.11                    | 3.63                      |
| 25                    | 39.91                 | 40.10               | 1.14                    | 3.74                      |
| 26                    | 40.10                 | 40.29               | 1.14                    | 3.75                      |
| 27                    | 40.29                 | 40.48               | 1.09                    | 3.57                      |
| 28                    | 40.48                 | 40.67               | 1.20                    | 3.94                      |
| 29                    | 40.67                 | 40.71               | 1.24                    | 4.08                      |
| 30                    | 40.71                 | 41.23               |                         |                           |
| 31                    | 41.23                 | 41.24               |                         |                           |
| 32                    | 41.24                 | 41.43               | 1.39                    | 4.55                      |
| 33                    | 41.43                 | 41.62               | 1.30                    | 4.28                      |
| 34                    | 41.62                 | 41.81               | 1.36                    | 4.45                      |
| 35                    | 41.81                 | 42.00               | 1.28                    | 4.21                      |
| 36                    | 42.00                 | 42.19               | 1.24                    | 4.06                      |

|    |       |       |      |      |
|----|-------|-------|------|------|
| 37 | 42.19 | 42.38 | 1.24 | 4.06 |
| 38 | 42.38 | 42.56 | 0.95 | 3.13 |
| 39 | 42.56 | 42.75 | 1.03 | 3.37 |
| 40 | 42.75 | 42.94 | 1.11 | 3.64 |
| 41 | 42.94 | 43.13 | 1.01 | 3.31 |
| 42 | 43.13 | 43.32 | 0.94 | 3.07 |
| 43 | 43.32 | 43.56 | 1.13 | 3.72 |
| 44 | 43.56 | 43.70 | 1.11 | 3.64 |
| 45 | 43.70 | 43.89 | 1.16 | 3.82 |
| 46 | 43.89 | 44.08 | 1.10 | 3.61 |
| 47 | 44.08 | 44.27 | 1.01 | 3.31 |
| 48 | 44.27 | 44.46 | 1.05 | 3.44 |
| 49 | 44.46 | 44.65 | 1.06 | 3.49 |
| 50 | 44.65 | 44.84 | 1.11 | 3.63 |
| 51 | 44.84 | 45.03 | 1.36 | 4.46 |
| 52 | 45.03 | 45.22 | 1.18 | 3.86 |
| 53 | 45.22 | 45.40 | 1.32 | 4.34 |
| 54 | 45.40 | 45.59 | 1.11 | 3.65 |
| 55 | 45.59 | 45.78 | 1.14 | 3.75 |
| 56 | 45.78 | 45.97 | 0.95 | 3.11 |
| 57 | 45.97 | 46.01 | 0.95 | 3.12 |
| 58 |       |       |      |      |
| 59 |       |       |      |      |
| 60 |       |       |      |      |
| 61 | 46.74 | 46.94 | 1.04 | 3.40 |
| 62 | 46.94 | 47.11 | 1.31 | 4.31 |
| 63 | 47.11 | 47.30 | 1.20 | 3.94 |
| 64 | 47.30 | 47.49 | 1.28 | 4.21 |
| 65 | 47.49 | 47.68 | 1.02 | 3.33 |
| 66 | 47.68 | 47.87 | 0.95 | 3.11 |
| 67 | 47.87 | 48.06 | 1.08 | 3.53 |
| 68 | 48.06 | 48.25 | 1.05 | 3.45 |
| 69 | 48.25 | 48.44 | 1.14 | 3.75 |
| 70 | 48.44 | 48.62 | 1.07 | 3.53 |
| 71 | 48.62 | 48.81 | 1.01 | 3.30 |
| 72 | 48.81 | 49.00 | 1.09 | 3.58 |
| 73 | 49.00 | 49.19 | 1.03 | 3.39 |
| 74 | 49.19 | 49.38 | 0.99 | 3.24 |
| 75 | 49.38 | 49.57 | 1.13 | 3.70 |

|     |       |       |      |      |
|-----|-------|-------|------|------|
| 76  | 49.57 | 49.76 | 1.06 | 3.47 |
| 77  | 49.76 | 50.02 | 1.14 | 3.73 |
| 78  | 50.02 | 50.14 | 1.18 | 3.86 |
| 79  | 50.14 | 50.33 | 1.02 | 3.36 |
| 80  | 50.33 | 50.52 | 1.12 | 3.66 |
| 81  | 50.52 | 50.66 | 1.16 | 3.80 |
| 82  | 50.66 | 51.01 |      |      |
| 83  | 51.01 | 51.09 | 0.89 | 2.92 |
| 84  | 51.09 | 51.28 | 1.01 | 3.30 |
| 85  | 51.28 | 51.47 | 0.97 | 3.18 |
| 86  | 51.47 | 51.66 | 1.02 | 3.33 |
| 87  | 51.66 | 51.84 | 1.03 | 3.39 |
| 88  | 51.84 | 52.03 | 0.94 | 3.09 |
| 89  | 52.03 | 52.22 | 1.00 | 3.28 |
| 90  | 52.22 | 52.41 | 0.89 | 2.92 |
| 91  | 52.41 | 52.60 | 1.08 | 3.55 |
| 92  | 52.60 | 52.79 | 1.52 | 4.99 |
| 93  | 52.79 | 52.98 | 1.44 | 4.73 |
| 94  | 52.98 | 53.17 | 1.23 | 4.03 |
| 95  | 53.17 | 53.36 | 1.46 | 4.81 |
| 96  | 53.36 | 53.55 | 1.52 | 4.97 |
| 97  | 53.55 | 53.74 | 1.22 | 4.00 |
| 98  | 53.74 | 53.93 | 0.97 | 3.19 |
| 99  | 53.93 | 54.12 | 0.95 | 3.10 |
| 100 | 54.12 | 54.31 | 1.08 | 3.54 |
| 101 | 54.31 | 54.50 | 1.09 | 3.57 |
| 102 | 54.50 | 54.69 | 1.10 | 3.62 |
| 103 | 54.69 | 54.88 | 1.10 | 3.61 |
| 104 | 54.88 | 55.06 | 0.99 | 3.23 |
| 105 | 55.06 | 55.25 | 1.01 | 3.32 |
| 106 | 55.25 | 55.44 | 0.95 | 3.12 |
| 107 | 55.44 | 55.63 | 0.91 | 2.98 |
| 108 | 55.63 | 55.90 | 1.03 | 3.39 |
| 109 | 55.90 | 56.01 | 0.85 | 2.78 |
| 110 | 56.01 | 56.20 | 0.95 | 3.12 |
| 111 | 56.20 | 56.39 | 1.07 | 3.51 |
| 112 | 56.39 | 56.58 | 0.91 | 2.99 |
| 113 | 56.58 | 56.77 | 0.95 | 3.11 |
| 114 | 56.77 | 56.96 | 1.25 | 4.09 |

|     |       |       |      |      |
|-----|-------|-------|------|------|
| 115 | 56.96 | 57.15 | 1.46 | 4.78 |
| 116 | 57.15 | 57.34 | 1.29 | 4.23 |
| 117 | 57.34 | 57.53 | 1.24 | 4.07 |
| 118 | 57.53 | 57.72 | 1.28 | 4.20 |
| 119 | 57.72 | 57.90 | 1.49 | 4.88 |
| 120 | 57.90 | 58.10 | 1.30 | 4.26 |
| 121 | 58.10 | 58.28 | 1.24 | 4.07 |
| 122 | 58.28 | 58.47 | 1.31 | 4.29 |
| 123 | 58.47 | 58.66 | 1.15 | 3.76 |
| 124 | 58.66 | 58.85 | 1.29 | 4.22 |
| 125 | 58.85 | 59.04 | 1.23 | 4.03 |
| 126 | 59.04 | 59.23 | 1.11 | 3.63 |
| 127 | 59.23 | 59.42 | 1.30 | 4.26 |
| 128 | 59.42 | 59.61 | 1.15 | 3.78 |
| 129 | 59.61 | 59.80 | 1.18 | 3.88 |
| 130 | 59.80 | 59.99 | 1.18 | 3.86 |
| 131 | 59.99 | 60.18 | 1.25 | 4.12 |
| 132 | 60.18 | 60.37 | 1.35 | 4.44 |
| 133 | 60.37 | 60.56 | 1.35 | 4.44 |

I-85 South CRCP Sections – Detailed Crack Spacing for First Six 1,000-ft Sections and Corresponding Histograms:

| Mile Post | Spacing (ft) | Section # | Mile Post | Spacing (ft) | Section # | Mile Post | Spacing (ft) | Section # |
|-----------|--------------|-----------|-----------|--------------|-----------|-----------|--------------|-----------|
| 35.37     |              | 1         | 35.71     | 3.21         | 2         | 36.09     | 5.42         | 4         |
| 35.37     | 1.26         | 1         | 35.71     | 5.38         | 2         | 36.09     | 1.70         | 4         |
| 35.37     | 4.86         | 1         | 35.71     | 5.89         | 2         | 36.10     | 10.03        | 4         |
| 35.37     | 3.83         | 1         | 35.71     | 3.60         | 2         | 36.10     | 3.03         | 4         |
| 35.37     | 8.72         | 1         | 35.71     | 3.20         | 2         | 36.10     | 2.89         | 4         |
| 35.37     | 5.48         | 1         | 35.71     | 2.82         | 2         | 36.10     | 8.56         | 4         |
| 35.37     | 8.83         | 1         | 35.71     | 3.18         | 2         | 36.10     | 3.50         | 4         |
| 35.37     | 1.93         | 1         | 35.71     | 7.89         | 2         | 36.10     | 1.27         | 4         |
| 35.37     | 1.70         | 1         | 35.71     | 10.33        | 2         | 36.10     | 10.23        | 4         |
| 35.37     | 1.94         | 1         | 35.71     | 2.53         | 2         | 36.10     | 8.38         | 4         |
| 35.38     | 6.42         | 1         | 35.71     | 5.20         | 2         | 36.10     | 1.47         | 4         |
| 35.38     | 9.15         | 1         | 35.72     | 3.59         | 2         | 36.10     | 5.98         | 4         |
| 35.38     | 3.10         | 1         | 35.72     | 1.86         | 2         | 36.10     | 1.14         | 4         |
| 35.38     | 6.73         | 1         | 35.72     | 7.32         | 2         | 36.11     | 8.54         | 4         |
| 35.38     | 2.34         | 1         | 35.72     | 5.50         | 2         | 36.11     | 4.01         | 4         |
| 35.38     | 1.50         | 1         | 35.72     | 2.31         | 2         | 36.11     | 9.33         | 4         |
| 35.38     | 1.42         | 1         | 35.72     | 0.92         | 2         | 36.11     | 1.47         | 4         |
| 35.38     | 5.83         | 1         | 35.72     | 2.55         | 2         | 36.11     | 1.33         | 4         |
| 35.38     | 2.98         | 1         | 35.72     | 2.65         | 2         | 36.11     | 1.63         | 4         |
| 35.38     | 2.10         | 1         | 35.72     | 10.29        | 2         | 36.11     | 5.97         | 4         |
| 35.38     | 3.76         | 1         | 35.72     | 8.82         | 2         | 36.11     | 2.77         | 4         |
| 35.38     | 2.40         | 1         | 35.72     | 2.84         | 2         | 36.11     | 9.19         | 4         |
| 35.38     | 3.08         | 1         | 35.72     | 2.75         | 2         | 36.11     | 4.40         | 4         |
| 35.38     | 6.21         | 1         | 35.72     | 3.08         | 2         | 36.12     | 6.76         | 4         |
| 35.39     | 5.52         | 1         | 35.73     | 1.42         | 2         | 36.12     | 1.46         | 4         |
| 35.39     | 2.64         | 1         | 35.73     | 7.73         | 2         | 36.12     | 1.47         | 4         |
| 35.39     | 3.42         | 1         | 35.73     | 2.30         | 2         | 36.12     | 7.22         | 4         |
| 35.39     | 1.31         | 1         | 35.73     | 8.31         | 2         | 36.12     | 6.40         | 4         |
| 35.39     | 1.71         | 1         | 35.73     | 1.52         | 2         | 36.12     | 1.61         | 4         |
| 35.39     | 1.26         | 1         | 35.73     | 1.52         | 2         | 36.12     | 8.26         | 4         |
| 35.39     | 1.85         | 1         | 35.73     | 1.46         | 2         | 36.12     | 3.67         | 4         |
| 35.39     | 10.70        | 1         | 35.73     | 8.37         | 2         | 36.12     | 2.18         | 4         |
| 35.39     | 2.04         | 1         | 35.73     | 2.99         | 2         | 36.12     | 3.96         | 4         |
| 35.39     | 2.52         | 1         | 35.73     | 3.13         | 2         | 36.12     | 8.64         | 4         |
| 35.39     | 5.13         | 1         | 35.73     | 8.39         | 2         | 36.12     | 1.64         | 4         |
| 35.39     | 1.06         | 1         | 35.74     | 6.64         | 2         | 36.12     | 1.36         | 4         |

|       |       |   |       |      |   |       |       |   |
|-------|-------|---|-------|------|---|-------|-------|---|
| 35.39 | 2.61  | 1 | 35.74 | 3.02 | 2 | 36.12 | 1.51  | 5 |
| 35.39 | 6.03  | 1 | 35.74 | 1.89 | 2 | 36.13 | 6.93  | 5 |
| 35.39 | 1.25  | 1 | 35.74 | 0.70 | 2 | 36.13 | 1.78  | 5 |
| 35.39 | 1.94  | 1 | 35.74 | 1.28 | 2 | 36.13 | 8.32  | 5 |
| 35.40 | 7.07  | 1 | 35.74 | 1.41 | 2 | 36.13 | 3.62  | 5 |
| 35.40 | 1.44  | 1 | 35.74 | 6.82 | 2 | 36.13 | 4.18  | 5 |
| 35.40 | 3.05  | 1 | 35.74 | 2.79 | 2 | 36.13 | 2.39  | 5 |
| 35.40 | 10.69 | 1 | 35.74 | 2.87 | 2 | 36.13 | 7.82  | 5 |
| 35.40 | 1.78  | 1 | 35.74 | 4.75 | 2 | 36.13 | 5.90  | 5 |
| 35.40 | 1.33  | 1 | 35.74 | 6.56 | 2 | 36.13 | 3.09  | 5 |
| 35.40 | 1.41  | 1 | 35.74 | 3.72 | 2 | 36.13 | 1.61  | 5 |
| 35.40 | 1.32  | 1 | 35.74 | 2.03 | 2 | 36.13 | 4.63  | 5 |
| 35.40 | 10.71 | 1 | 35.74 | 3.83 | 2 | 36.14 | 9.07  | 5 |
| 35.40 | 6.38  | 1 | 35.74 | 1.74 | 2 | 36.14 | 6.78  | 5 |
| 35.40 | 8.70  | 1 | 35.74 | 1.26 | 2 | 36.14 | 1.57  | 5 |
| 35.41 | 2.51  | 1 | 35.74 | 5.43 | 2 | 36.14 | 1.25  | 5 |
| 35.41 | 3.07  | 1 | 35.75 | 3.25 | 2 | 36.14 | 7.34  | 5 |
| 35.41 | 2.92  | 1 | 35.75 | 9.23 | 3 | 36.14 | 3.91  | 5 |
| 35.41 | 4.01  | 1 | 35.75 | 2.97 | 3 | 36.14 | 1.91  | 5 |
| 35.41 | 6.88  | 1 | 35.75 | 2.74 | 3 | 36.14 | 6.41  | 5 |
| 35.41 | 2.20  | 1 | 35.75 | 6.32 | 3 | 36.14 | 6.64  | 5 |
| 35.41 | 9.22  | 1 | 35.75 | 5.56 | 3 | 36.14 | 3.24  | 5 |
| 35.41 | 6.37  | 1 | 35.75 | 1.63 | 3 | 36.14 | 2.26  | 5 |
| 35.41 | 3.15  | 1 | 35.75 | 1.52 | 3 | 36.14 | 2.87  | 5 |
| 35.41 | 1.81  | 1 | 35.75 | 1.62 | 3 | 36.15 | 14.77 | 5 |
| 35.41 | 0.98  | 1 | 35.75 | 1.23 | 3 | 36.15 | 3.30  | 5 |
| 35.41 | 2.21  | 1 | 35.75 | 6.10 | 3 | 36.15 | 1.56  | 5 |
| 35.41 | 5.24  | 1 | 35.75 | 2.85 | 3 | 36.15 | 13.62 | 5 |
| 35.42 | 9.23  | 1 | 35.75 | 2.99 | 3 | 36.15 | 2.95  | 5 |
| 35.42 | 10.61 | 1 | 35.75 | 2.71 | 3 | 36.15 | 3.03  | 5 |
| 35.42 | 1.65  | 1 | 35.76 | 6.17 | 3 | 36.15 | 3.10  | 5 |
| 35.42 | 2.51  | 1 | 35.76 | 9.74 | 3 | 36.15 | 2.61  | 5 |
| 35.42 | 6.24  | 1 | 35.76 | 1.58 | 3 | 36.15 | 5.77  | 5 |
| 35.42 | 7.26  | 1 | 35.76 | 1.26 | 3 | 36.16 | 6.79  | 5 |
| 35.42 | 4.81  | 1 | 35.76 | 7.74 | 3 | 36.16 | 3.33  | 5 |
| 35.42 | 2.98  | 1 | 35.76 | 3.55 | 3 | 36.16 | 9.19  | 5 |
| 35.42 | 5.77  | 1 | 35.76 | 3.33 | 3 | 36.16 | 1.86  | 5 |
| 35.42 | 1.08  | 1 | 35.76 | 5.65 | 3 | 36.16 | 4.48  | 5 |
| 35.42 | 1.39  | 1 | 35.76 | 6.01 | 3 | 36.16 | 5.05  | 5 |
| 35.42 | 1.88  | 1 | 35.76 | 5.49 | 3 | 36.16 | 6.68  | 5 |
| 35.43 | 6.91  | 1 | 35.77 | 6.82 | 3 | 36.16 | 1.60  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.43 | 2.66  | 1 | 35.77 | 1.25  | 3 | 36.16 | 1.50  | 5 |
| 35.43 | 3.12  | 1 | 35.77 | 2.19  | 3 | 36.16 | 10.19 | 5 |
| 35.43 | 1.74  | 1 | 35.77 | 1.48  | 3 | 36.16 | 1.98  | 5 |
| 35.43 | 0.92  | 1 | 35.77 | 1.37  | 3 | 36.17 | 8.98  | 5 |
| 35.43 | 1.83  | 1 | 35.77 | 5.37  | 3 | 36.17 | 11.43 | 5 |
| 35.43 | 14.50 | 1 | 35.77 | 4.04  | 3 | 36.17 | 7.76  | 5 |
| 35.43 | 1.88  | 1 | 35.77 | 4.81  | 3 | 36.17 | 3.54  | 5 |
| 35.43 | 1.61  | 1 | 35.77 | 8.05  | 3 | 36.17 | 6.28  | 5 |
| 35.43 | 7.00  | 1 | 35.77 | 3.37  | 3 | 36.17 | 8.15  | 5 |
| 35.43 | 3.26  | 1 | 35.77 | 3.84  | 3 | 36.17 | 4.49  | 5 |
| 35.43 | 2.38  | 1 | 35.77 | 3.03  | 3 | 36.18 | 10.11 | 5 |
| 35.44 | 6.17  | 1 | 35.77 | 3.26  | 3 | 36.18 | 3.34  | 5 |
| 35.44 | 9.42  | 1 | 35.77 | 2.56  | 3 | 36.18 | 5.56  | 5 |
| 35.44 | 1.60  | 1 | 35.77 | 1.33  | 3 | 36.18 | 3.20  | 5 |
| 35.44 | 10.79 | 1 | 35.78 | 10.03 | 3 | 36.18 | 2.99  | 5 |
| 35.44 | 1.29  | 1 | 35.78 | 7.71  | 3 | 36.18 | 9.37  | 5 |
| 35.44 | 1.40  | 1 | 35.78 | 1.81  | 3 | 36.18 | 2.28  | 5 |
| 35.44 | 1.41  | 1 | 35.78 | 1.11  | 3 | 36.18 | 0.85  | 5 |
| 35.44 | 7.51  | 1 | 35.78 | 1.44  | 3 | 36.18 | 9.53  | 5 |
| 35.44 | 1.46  | 1 | 35.78 | 7.54  | 3 | 36.18 | 5.86  | 5 |
| 35.44 | 6.26  | 1 | 35.78 | 3.29  | 3 | 36.18 | 6.16  | 5 |
| 35.44 | 9.04  | 1 | 35.78 | 2.90  | 3 | 36.18 | 1.62  | 5 |
| 35.44 | 0.93  | 1 | 35.78 | 7.96  | 3 | 36.19 | 1.36  | 5 |
| 35.45 | 1.40  | 1 | 35.78 | 1.39  | 3 | 36.19 | 8.54  | 5 |
| 35.45 | 1.93  | 1 | 35.78 | 2.33  | 3 | 36.19 | 3.35  | 5 |
| 35.45 | 2.03  | 1 | 35.78 | 2.66  | 3 | 36.19 | 3.03  | 5 |
| 35.45 | 2.11  | 1 | 35.78 | 6.56  | 3 | 36.19 | 5.62  | 5 |
| 35.45 | 8.45  | 1 | 35.79 | 2.74  | 3 | 36.19 | 5.29  | 5 |
| 35.45 | 2.69  | 1 | 35.79 | 2.45  | 3 | 36.19 | 6.25  | 5 |
| 35.45 | 1.01  | 1 | 35.79 | 7.01  | 3 | 36.19 | 9.36  | 5 |
| 35.45 | 9.53  | 1 | 35.79 | 5.18  | 3 | 36.19 | 3.50  | 5 |
| 35.45 | 5.91  | 1 | 35.79 | 3.13  | 3 | 36.20 | 8.95  | 5 |
| 35.45 | 11.84 | 1 | 35.79 | 2.48  | 3 | 36.20 | 2.95  | 5 |
| 35.45 | 1.15  | 1 | 35.79 | 3.06  | 3 | 36.20 | 5.51  | 5 |
| 35.45 | 2.16  | 1 | 35.79 | 9.42  | 3 | 36.20 | 9.28  | 5 |
| 35.45 | 3.10  | 1 | 35.79 | 6.13  | 3 | 36.20 | 8.73  | 5 |
| 35.46 | 2.66  | 1 | 35.79 | 6.08  | 3 | 36.20 | 3.13  | 5 |
| 35.46 | 3.17  | 1 | 35.79 | 1.53  | 3 | 36.20 | 6.43  | 5 |
| 35.46 | 6.31  | 1 | 35.79 | 1.29  | 3 | 36.20 | 3.07  | 5 |
| 35.46 | 2.91  | 1 | 35.80 | 8.19  | 3 | 36.20 | 5.44  | 5 |
| 35.46 | 2.56  | 1 | 35.80 | 3.04  | 3 | 36.21 | 9.06  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.46 | 7.75  | 1 | 35.80 | 2.83  | 3 | 36.21 | 5.85  | 5 |
| 35.46 | 1.33  | 1 | 35.80 | 3.55  | 3 | 36.21 | 2.88  | 5 |
| 35.46 | 4.81  | 1 | 35.80 | 1.34  | 3 | 36.21 | 1.64  | 5 |
| 35.46 | 0.90  | 1 | 35.80 | 1.26  | 3 | 36.21 | 14.42 | 5 |
| 35.46 | 1.66  | 1 | 35.80 | 10.16 | 3 | 36.21 | 6.12  | 5 |
| 35.46 | 0.73  | 1 | 35.80 | 3.24  | 3 | 36.21 | 1.86  | 5 |
| 35.46 | 1.46  | 1 | 35.80 | 7.19  | 3 | 36.21 | 11.85 | 5 |
| 35.46 | 1.23  | 1 | 35.80 | 1.68  | 3 | 36.21 | 4.71  | 5 |
| 35.46 | 2.15  | 1 | 35.80 | 6.27  | 3 | 36.22 | 2.06  | 5 |
| 35.46 | 3.42  | 1 | 35.81 | 8.74  | 3 | 36.22 | 6.25  | 5 |
| 35.46 | 4.97  | 1 | 35.81 | 1.23  | 3 | 36.22 | 5.59  | 5 |
| 35.47 | 12.35 | 1 | 35.81 | 2.52  | 3 | 36.22 | 2.53  | 5 |
| 35.47 | 5.34  | 1 | 35.81 | 7.37  | 3 | 36.22 | 10.04 | 5 |
| 35.47 | 1.16  | 1 | 35.81 | 3.91  | 3 | 36.22 | 4.97  | 5 |
| 35.47 | 6.34  | 1 | 35.81 | 6.62  | 3 | 36.22 | 7.08  | 5 |
| 35.47 | 3.02  | 1 | 35.81 | 5.57  | 3 | 36.22 | 5.35  | 5 |
| 35.47 | 0.98  | 1 | 35.81 | 3.04  | 3 | 36.22 | 6.60  | 5 |
| 35.47 | 5.15  | 1 | 35.81 | 2.13  | 3 | 36.22 | 3.18  | 5 |
| 35.47 | 10.95 | 1 | 35.81 | 3.20  | 3 | 36.23 | 5.87  | 5 |
| 35.47 | 2.92  | 1 | 35.81 | 2.45  | 3 | 36.23 | 8.88  | 5 |
| 35.47 | 7.43  | 1 | 35.81 | 3.55  | 3 | 36.23 | 3.06  | 5 |
| 35.48 | 2.60  | 1 | 35.81 | 4.62  | 3 | 36.23 | 8.56  | 5 |
| 35.48 | 5.96  | 1 | 35.81 | 1.46  | 3 | 36.23 | 5.66  | 5 |
| 35.48 | 2.78  | 1 | 35.82 | 12.01 | 3 | 36.23 | 2.56  | 5 |
| 35.48 | 2.51  | 1 | 35.82 | 3.73  | 3 | 36.23 | 4.62  | 5 |
| 35.48 | 3.51  | 1 | 35.82 | 1.67  | 3 | 36.23 | 11.31 | 5 |
| 35.48 | 5.62  | 1 | 35.82 | 6.99  | 3 | 36.23 | 1.40  | 5 |
| 35.48 | 4.11  | 1 | 35.82 | 5.64  | 3 | 36.24 | 1.34  | 5 |
| 35.48 | 2.66  | 1 | 35.82 | 5.93  | 3 | 36.24 | 9.38  | 5 |
| 35.48 | 3.67  | 1 | 35.82 | 5.94  | 3 | 36.24 | 7.07  | 5 |
| 35.48 | 7.77  | 1 | 35.82 | 1.76  | 3 | 36.24 | 5.23  | 5 |
| 35.48 | 5.97  | 1 | 35.82 | 1.18  | 3 | 36.24 | 4.32  | 5 |
| 35.48 | 3.37  | 1 | 35.82 | 1.49  | 3 | 36.24 | 1.46  | 5 |
| 35.48 | 4.35  | 1 | 35.82 | 1.56  | 3 | 36.24 | 1.57  | 5 |
| 35.49 | 1.16  | 1 | 35.82 | 6.37  | 3 | 36.24 | 4.40  | 5 |
| 35.49 | 2.17  | 1 | 35.83 | 5.76  | 3 | 36.24 | 14.28 | 5 |
| 35.49 | 1.20  | 1 | 35.83 | 6.93  | 3 | 36.25 | 6.39  | 5 |
| 35.49 | 4.75  | 1 | 35.83 | 2.47  | 3 | 36.25 | 3.13  | 5 |
| 35.49 | 9.79  | 1 | 35.83 | 2.55  | 3 | 36.25 | 5.53  | 5 |
| 35.49 | 3.84  | 1 | 35.83 | 5.50  | 3 | 36.25 | 13.75 | 5 |
| 35.49 | 1.38  | 1 | 35.83 | 6.52  | 3 | 36.25 | 7.78  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.49 | 6.81  | 1 | 35.83 | 8.46  | 3 | 36.25 | 2.97  | 5 |
| 35.49 | 2.82  | 1 | 35.83 | 6.43  | 3 | 36.25 | 2.95  | 5 |
| 35.49 | 1.26  | 1 | 35.83 | 2.18  | 3 | 36.25 | 6.71  | 5 |
| 35.49 | 1.22  | 1 | 35.83 | 3.12  | 3 | 36.25 | 1.56  | 5 |
| 35.49 | 1.88  | 1 | 35.83 | 2.60  | 3 | 36.25 | 6.59  | 5 |
| 35.49 | 1.56  | 1 | 35.84 | 5.23  | 3 | 36.26 | 10.19 | 5 |
| 35.49 | 6.38  | 1 | 35.84 | 2.05  | 3 | 36.26 | 1.52  | 5 |
| 35.50 | 10.20 | 1 | 35.84 | 8.49  | 3 | 36.26 | 9.07  | 5 |
| 35.50 | 1.01  | 1 | 35.84 | 1.53  | 3 | 36.26 | 8.68  | 5 |
| 35.50 | 1.76  | 1 | 35.84 | 10.26 | 3 | 36.26 | 1.64  | 5 |
| 35.50 | 1.61  | 1 | 35.84 | 2.72  | 3 | 36.26 | 2.03  | 5 |
| 35.50 | 10.15 | 1 | 35.84 | 2.69  | 3 | 36.26 | 11.98 | 5 |
| 35.50 | 1.45  | 1 | 35.84 | 2.48  | 3 | 36.26 | 2.62  | 5 |
| 35.50 | 5.72  | 1 | 35.84 | 9.29  | 3 | 36.26 | 3.50  | 5 |
| 35.50 | 6.09  | 1 | 35.84 | 5.54  | 3 | 36.27 | 6.31  | 5 |
| 35.50 | 6.28  | 1 | 35.84 | 2.40  | 3 | 36.27 | 2.61  | 5 |
| 35.50 | 2.99  | 1 | 35.84 | 3.08  | 3 | 36.27 | 3.31  | 5 |
| 35.50 | 3.23  | 1 | 35.85 | 1.09  | 3 | 36.27 | 5.50  | 5 |
| 35.50 | 1.11  | 1 | 35.85 | 7.16  | 3 | 36.27 | 3.15  | 5 |
| 35.50 | 1.04  | 1 | 35.85 | 2.88  | 3 | 36.27 | 6.48  | 5 |
| 35.50 | 1.08  | 1 | 35.85 | 6.47  | 3 | 36.27 | 10.96 | 5 |
| 35.50 | 1.26  | 1 | 35.85 | 2.94  | 3 | 36.27 | 12.41 | 5 |
| 35.50 | 0.73  | 1 | 35.85 | 3.31  | 3 | 36.27 | 1.43  | 5 |
| 35.50 | 1.60  | 1 | 35.85 | 3.50  | 3 | 36.27 | 1.32  | 5 |
| 35.51 | 8.52  | 1 | 35.85 | 1.41  | 3 | 36.28 | 1.95  | 5 |
| 35.51 | 3.16  | 1 | 35.85 | 1.22  | 3 | 36.28 | 6.70  | 5 |
| 35.51 | 5.83  | 1 | 35.85 | 11.26 | 3 | 36.28 | 6.23  | 5 |
| 35.51 | 5.99  | 1 | 35.85 | 2.06  | 3 | 36.28 | 6.60  | 5 |
| 35.51 | 7.11  | 1 | 35.85 | 1.30  | 3 | 36.28 | 3.61  | 5 |
| 35.51 | 3.02  | 1 | 35.85 | 4.23  | 3 | 36.28 | 11.69 | 5 |
| 35.51 | 2.89  | 1 | 35.86 | 7.22  | 3 | 36.28 | 2.68  | 5 |
| 35.51 | 1.01  | 1 | 35.86 | 9.80  | 3 | 36.28 | 1.28  | 5 |
| 35.51 | 1.89  | 1 | 35.86 | 8.31  | 3 | 36.28 | 3.77  | 5 |
| 35.51 | 1.54  | 1 | 35.86 | 1.58  | 3 | 36.28 | 3.14  | 5 |
| 35.51 | 2.10  | 1 | 35.86 | 2.30  | 3 | 36.28 | 2.69  | 5 |
| 35.51 | 4.09  | 1 | 35.86 | 5.36  | 3 | 36.29 | 12.77 | 5 |
| 35.51 | 6.64  | 1 | 35.86 | 2.30  | 3 | 36.29 | 6.11  | 5 |
| 35.52 | 5.70  | 1 | 35.86 | 7.46  | 3 | 36.29 | 3.60  | 5 |
| 35.52 | 3.22  | 1 | 35.86 | 1.75  | 3 | 36.29 | 7.93  | 5 |
| 35.52 | 2.36  | 1 | 35.86 | 10.63 | 3 | 36.29 | 2.98  | 5 |
| 35.52 | 8.68  | 1 | 35.87 | 7.97  | 3 | 36.29 | 1.56  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.52 | 0.79  | 1 | 35.87 | 1.58  | 3 | 36.29 | 1.68  | 5 |
| 35.52 | 2.58  | 1 | 35.87 | 1.21  | 3 | 36.29 | 11.35 | 5 |
| 35.52 | 1.72  | 1 | 35.87 | 5.65  | 3 | 36.29 | 3.71  | 5 |
| 35.52 | 5.30  | 1 | 35.87 | 11.91 | 3 | 36.30 | 4.90  | 5 |
| 35.52 | 4.85  | 1 | 35.87 | 5.81  | 3 | 36.30 | 6.91  | 5 |
| 35.52 | 1.57  | 1 | 35.87 | 5.80  | 3 | 36.30 | 1.68  | 5 |
| 35.52 | 1.43  | 1 | 35.87 | 1.78  | 3 | 36.30 | 2.30  | 5 |
| 35.52 | 7.16  | 1 | 35.87 | 1.77  | 3 | 36.30 | 1.22  | 5 |
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| 35.53 | 10.79 | 1 | 35.87 | 2.96  | 3 | 36.30 | 9.05  | 5 |
| 35.53 | 2.30  | 1 | 35.88 | 10.92 | 3 | 36.30 | 2.62  | 5 |
| 35.53 | 1.36  | 1 | 35.88 | 3.23  | 3 | 36.30 | 3.32  | 5 |
| 35.53 | 1.58  | 1 | 35.88 | 5.54  | 3 | 36.30 | 6.58  | 5 |
| 35.53 | 1.93  | 1 | 35.88 | 2.67  | 3 | 36.30 | 5.35  | 5 |
| 35.53 | 1.29  | 1 | 35.88 | 9.95  | 3 | 36.31 | 8.68  | 5 |
| 35.53 | 8.17  | 1 | 35.88 | 8.05  | 3 | 36.31 | 2.98  | 5 |
| 35.53 | 10.49 | 1 | 35.88 | 3.01  | 3 | 36.31 | 1.53  | 5 |
| 35.53 | 3.04  | 1 | 35.88 | 2.48  | 3 | 36.31 | 1.80  | 5 |
| 35.53 | 2.52  | 1 | 35.88 | 2.81  | 3 | 36.31 | 12.58 | 5 |
| 35.53 | 11.67 | 1 | 35.88 | 6.58  | 3 | 36.31 | 2.35  | 5 |
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| 35.54 | 1.41  | 1 | 35.89 | 7.95  | 3 | 36.31 | 1.70  | 5 |
| 35.54 | 1.44  | 1 | 35.89 | 7.29  | 3 | 36.31 | 1.63  | 5 |
| 35.54 | 13.05 | 1 | 35.89 | 5.98  | 3 | 36.31 | 8.83  | 5 |
| 35.54 | 2.15  | 1 | 35.89 | 3.27  | 3 | 36.31 | 2.81  | 6 |
| 35.54 | 5.75  | 1 | 35.89 | 4.87  | 3 | 36.32 | 5.90  | 6 |
| 35.54 | 2.79  | 1 | 35.89 | 7.02  | 3 | 36.32 | 2.76  | 6 |
| 35.54 | 1.83  | 1 | 35.89 | 2.69  | 3 | 36.32 | 6.14  | 6 |
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| 35.54 | 5.78  | 1 | 35.90 | 5.71  | 3 | 36.32 | 3.78  | 6 |
| 35.54 | 1.62  | 1 | 35.90 | 3.50  | 3 | 36.32 | 7.97  | 6 |
| 35.55 | 2.04  | 1 | 35.90 | 1.42  | 3 | 36.32 | 1.75  | 6 |
| 35.55 | 1.79  | 1 | 35.90 | 2.20  | 3 | 36.32 | 2.64  | 6 |
| 35.55 | 6.32  | 1 | 35.90 | 10.38 | 3 | 36.32 | 1.55  | 6 |
| 35.55 | 2.69  | 1 | 35.90 | 2.19  | 3 | 36.32 | 7.65  | 6 |
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| 35.55 | 4.24  | 1 | 35.90 | 1.77  | 3 | 36.33 | 1.18  | 6 |
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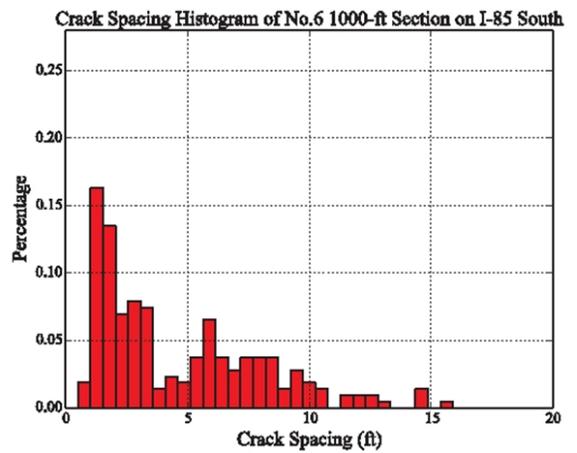
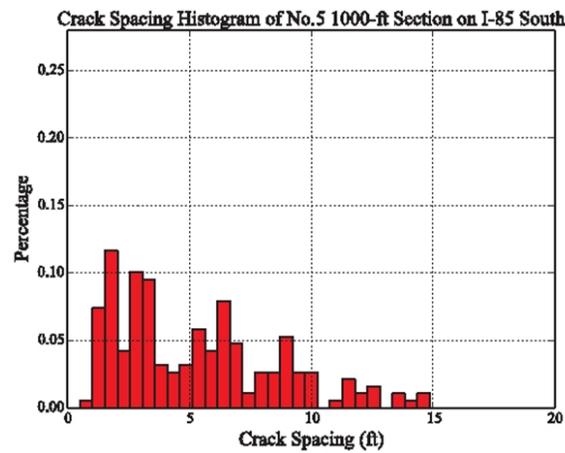
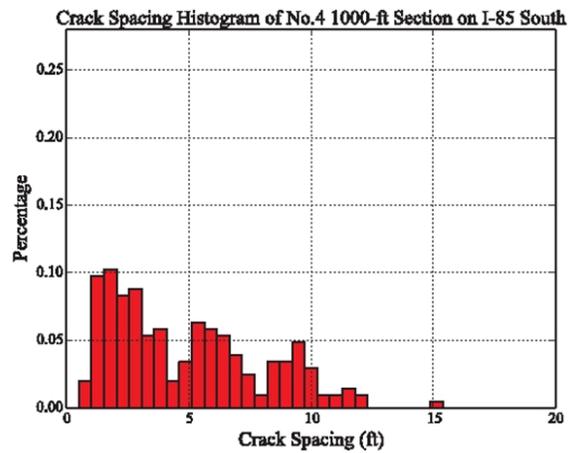
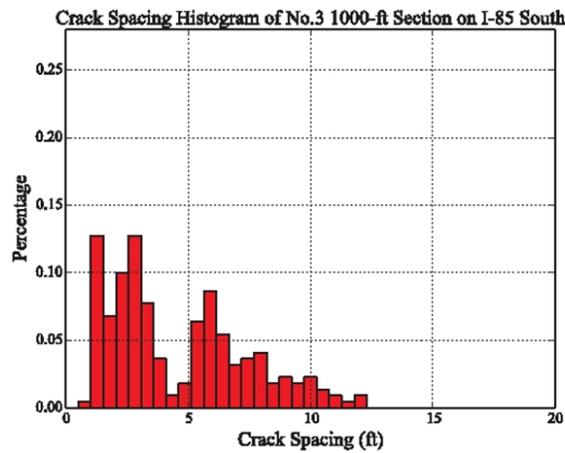
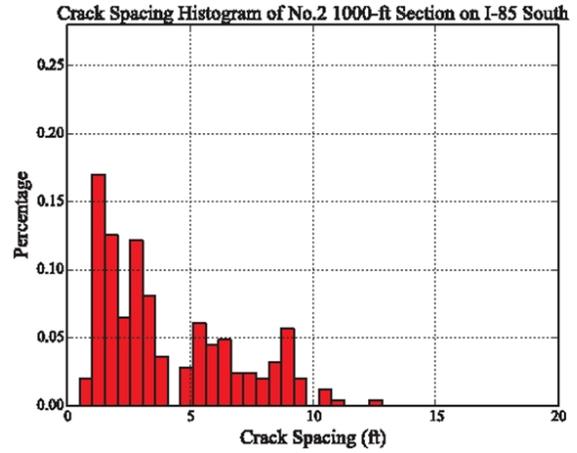
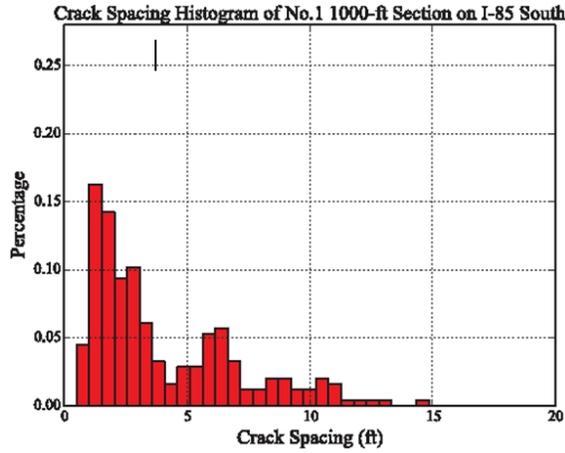
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| 35.55 | 3.83  | 1 | 35.91 | 5.96  | 3 | 36.33 | 1.62  | 6 |
| 35.55 | 2.14  | 1 | 35.91 | 1.87  | 3 | 36.33 | 15.52 | 6 |
| 35.55 | 6.33  | 1 | 35.91 | 6.25  | 3 | 36.33 | 1.89  | 6 |
| 35.55 | 2.50  | 1 | 35.91 | 9.24  | 3 | 36.33 | 1.52  | 6 |
| 35.55 | 4.21  | 1 | 35.91 | 3.00  | 3 | 36.33 | 7.63  | 6 |
| 35.55 | 1.74  | 1 | 35.91 | 5.80  | 3 | 36.33 | 3.59  | 6 |
| 35.56 | 8.84  | 2 | 35.91 | 5.62  | 3 | 36.34 | 8.95  | 6 |
| 35.56 | 3.02  | 2 | 35.91 | 6.18  | 3 | 36.34 | 3.01  | 6 |
| 35.56 | 6.15  | 2 | 35.91 | 1.34  | 3 | 36.34 | 1.83  | 6 |
| 35.56 | 6.47  | 2 | 35.91 | 0.90  | 3 | 36.34 | 1.39  | 6 |
| 35.56 | 2.96  | 2 | 35.92 | 9.98  | 3 | 36.34 | 1.29  | 6 |
| 35.56 | 3.35  | 2 | 35.92 | 6.75  | 3 | 36.34 | 1.47  | 6 |
| 35.56 | 8.20  | 2 | 35.92 | 5.73  | 3 | 36.34 | 8.54  | 6 |
| 35.56 | 1.75  | 2 | 35.92 | 2.86  | 3 | 36.34 | 9.80  | 6 |
| 35.56 | 1.52  | 2 | 35.92 | 6.07  | 3 | 36.34 | 5.07  | 6 |
| 35.56 | 1.71  | 2 | 35.92 | 2.08  | 3 | 36.34 | 5.92  | 6 |
| 35.56 | 9.18  | 2 | 35.92 | 1.53  | 3 | 36.34 | 6.56  | 6 |
| 35.56 | 1.13  | 2 | 35.92 | 11.69 | 3 | 36.35 | 2.23  | 6 |
| 35.57 | 2.99  | 2 | 35.92 | 3.70  | 3 | 36.35 | 9.89  | 6 |
| 35.57 | 2.38  | 2 | 35.92 | 8.62  | 3 | 36.35 | 3.16  | 6 |
| 35.57 | 3.15  | 2 | 35.93 | 5.33  | 3 | 36.35 | 3.13  | 6 |
| 35.57 | 6.33  | 2 | 35.93 | 9.16  | 3 | 36.35 | 3.57  | 6 |
| 35.57 | 9.72  | 2 | 35.93 | 5.06  | 3 | 36.35 | 2.08  | 6 |
| 35.57 | 1.90  | 2 | 35.93 | 2.93  | 3 | 36.35 | 6.29  | 6 |
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| 35.57 | 1.33  | 2 | 35.93 | 1.28  | 3 | 36.35 | 9.44  | 6 |
| 35.57 | 2.92  | 2 | 35.93 | 7.27  | 3 | 36.35 | 2.70  | 6 |
| 35.57 | 2.81  | 2 | 35.93 | 5.07  | 3 | 36.35 | 5.98  | 6 |
| 35.57 | 6.85  | 2 | 35.93 | 2.83  | 3 | 36.36 | 5.63  | 6 |
| 35.57 | 1.97  | 2 | 35.93 | 5.53  | 3 | 36.36 | 4.88  | 6 |
| 35.57 | 5.82  | 2 | 35.93 | 3.04  | 3 | 36.36 | 9.54  | 6 |
| 35.57 | 1.74  | 2 | 35.94 | 6.00  | 4 | 36.36 | 4.12  | 6 |
| 35.57 | 1.94  | 2 | 35.94 | 6.13  | 4 | 36.36 | 6.15  | 6 |
| 35.58 | 5.62  | 2 | 35.94 | 11.81 | 4 | 36.36 | 5.81  | 6 |
| 35.58 | 2.08  | 2 | 35.94 | 5.00  | 4 | 36.36 | 9.96  | 6 |
| 35.58 | 5.11  | 2 | 35.94 | 6.57  | 4 | 36.36 | 1.76  | 6 |
| 35.58 | 0.90  | 2 | 35.94 | 11.04 | 4 | 36.36 | 1.34  | 6 |
| 35.58 | 1.44  | 2 | 35.94 | 5.35  | 4 | 36.36 | 1.18  | 6 |
| 35.58 | 10.80 | 2 | 35.95 | 2.89  | 4 | 36.37 | 7.87  | 6 |
| 35.58 | 5.52  | 2 | 35.95 | 5.19  | 4 | 36.37 | 2.29  | 6 |
| 35.58 | 1.44  | 2 | 35.95 | 6.51  | 4 | 36.37 | 3.23  | 6 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.58 | 6.11  | 2 | 35.95 | 5.18  | 4 | 36.37 | 6.49  | 6 |
| 35.58 | 3.01  | 2 | 35.95 | 2.13  | 4 | 36.37 | 1.84  | 6 |
| 35.58 | 5.38  | 2 | 35.95 | 1.20  | 4 | 36.37 | 1.72  | 6 |
| 35.58 | 4.90  | 2 | 35.95 | 0.89  | 4 | 36.37 | 2.12  | 6 |
| 35.59 | 1.99  | 2 | 35.95 | 1.61  | 4 | 36.37 | 2.62  | 6 |
| 35.59 | 3.30  | 2 | 35.95 | 1.36  | 4 | 36.37 | 7.40  | 6 |
| 35.59 | 6.07  | 2 | 35.95 | 4.51  | 4 | 36.37 | 13.08 | 6 |
| 35.59 | 6.59  | 2 | 35.95 | 1.92  | 4 | 36.37 | 1.82  | 6 |
| 35.59 | 2.23  | 2 | 35.95 | 12.17 | 4 | 36.37 | 1.36  | 6 |
| 35.59 | 1.45  | 2 | 35.95 | 6.23  | 4 | 36.38 | 7.09  | 6 |
| 35.59 | 1.21  | 2 | 35.96 | 9.69  | 4 | 36.38 | 1.71  | 6 |
| 35.59 | 6.74  | 2 | 35.96 | 1.70  | 4 | 36.38 | 6.93  | 6 |
| 35.59 | 1.72  | 2 | 35.96 | 5.77  | 4 | 36.38 | 2.22  | 6 |
| 35.59 | 12.31 | 2 | 35.96 | 5.26  | 4 | 36.38 | 2.74  | 6 |
| 35.59 | 1.35  | 2 | 35.96 | 3.44  | 4 | 36.38 | 6.40  | 6 |
| 35.59 | 1.34  | 2 | 35.96 | 2.17  | 4 | 36.38 | 9.56  | 6 |
| 35.59 | 3.34  | 2 | 35.96 | 3.56  | 4 | 36.38 | 7.84  | 6 |
| 35.59 | 2.89  | 2 | 35.96 | 2.28  | 4 | 36.38 | 1.93  | 6 |
| 35.60 | 2.73  | 2 | 35.96 | 6.90  | 4 | 36.38 | 1.37  | 6 |
| 35.60 | 1.36  | 2 | 35.96 | 7.79  | 4 | 36.38 | 1.53  | 6 |
| 35.60 | 8.28  | 2 | 35.97 | 9.36  | 4 | 36.38 | 1.94  | 6 |
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| 35.60 | 8.34  | 2 | 35.97 | 3.90  | 4 | 36.38 | 1.94  | 6 |
| 35.60 | 1.79  | 2 | 35.97 | 5.31  | 4 | 36.39 | 3.20  | 6 |
| 35.60 | 1.76  | 2 | 35.97 | 6.26  | 4 | 36.39 | 4.35  | 6 |
| 35.60 | 1.53  | 2 | 35.97 | 3.39  | 4 | 36.39 | 5.79  | 6 |
| 35.60 | 1.28  | 2 | 35.97 | 9.19  | 4 | 36.39 | 5.26  | 6 |
| 35.60 | 6.13  | 2 | 35.97 | 1.58  | 4 | 36.39 | 12.71 | 6 |
| 35.60 | 3.23  | 2 | 35.97 | 10.22 | 4 | 36.39 | 2.00  | 6 |
| 35.60 | 2.44  | 2 | 35.98 | 9.21  | 4 | 36.39 | 1.14  | 6 |
| 35.60 | 6.29  | 2 | 35.98 | 2.59  | 4 | 36.39 | 1.61  | 6 |
| 35.61 | 6.81  | 2 | 35.98 | 7.35  | 4 | 36.39 | 0.86  | 6 |
| 35.61 | 6.23  | 2 | 35.98 | 4.82  | 4 | 36.39 | 10.26 | 6 |
| 35.61 | 5.04  | 2 | 35.98 | 1.55  | 4 | 36.40 | 7.36  | 6 |
| 35.61 | 2.94  | 2 | 35.98 | 0.98  | 4 | 36.40 | 3.30  | 6 |
| 35.61 | 7.20  | 2 | 35.98 | 1.66  | 4 | 36.40 | 3.23  | 6 |
| 35.61 | 1.75  | 2 | 35.98 | 1.72  | 4 | 36.40 | 6.22  | 6 |
| 35.61 | 1.88  | 2 | 35.98 | 9.03  | 4 | 36.40 | 2.90  | 6 |
| 35.61 | 9.72  | 2 | 35.98 | 3.80  | 4 | 36.40 | 12.43 | 6 |
| 35.61 | 9.13  | 2 | 35.98 | 1.76  | 4 | 36.40 | 0.91  | 6 |
| 35.61 | 1.28  | 2 | 35.98 | 1.13  | 4 | 36.40 | 1.15  | 6 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 35.61 | 1.66  | 2 | 35.98 | 1.87  | 4 | 36.40 | 2.61  | 6 |
| 35.62 | 9.25  | 2 | 35.98 | 6.10  | 4 | 36.40 | 7.55  | 6 |
| 35.62 | 1.50  | 2 | 35.98 | 5.13  | 4 | 36.40 | 2.06  | 6 |
| 35.62 | 1.14  | 2 | 35.99 | 9.93  | 4 | 36.41 | 9.51  | 6 |
| 35.62 | 3.39  | 2 | 35.99 | 2.85  | 4 | 36.41 | 9.72  | 6 |
| 35.62 | 8.79  | 2 | 35.99 | 5.59  | 4 | 36.41 | 0.96  | 6 |
| 35.62 | 4.89  | 2 | 35.99 | 6.69  | 4 | 36.41 | 1.37  | 6 |
| 35.62 | 3.51  | 2 | 35.99 | 5.07  | 4 | 36.41 | 1.40  | 6 |
| 35.62 | 2.11  | 2 | 35.99 | 9.70  | 4 | 36.41 | 1.52  | 6 |
| 35.62 | 1.42  | 2 | 35.99 | 5.29  | 4 | 36.41 | 8.39  | 6 |
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| 35.62 | 1.24  | 2 | 36.00 | 11.50 | 4 | 36.41 | 1.29  | 6 |
| 35.62 | 0.92  | 2 | 36.00 | 7.01  | 4 | 36.41 | 8.06  | 6 |
| 35.63 | 10.47 | 2 | 36.00 | 3.68  | 4 | 36.41 | 2.26  | 6 |
| 35.63 | 2.97  | 2 | 36.00 | 2.44  | 4 | 36.42 | 8.66  | 6 |
| 35.63 | 1.89  | 2 | 36.00 | 1.52  | 4 | 36.42 | 3.49  | 6 |
| 35.63 | 3.69  | 2 | 36.00 | 1.14  | 4 | 36.42 | 3.49  | 6 |
| 35.63 | 8.10  | 2 | 36.00 | 2.85  | 4 | 36.42 | 1.58  | 6 |
| 35.63 | 9.00  | 2 | 36.00 | 5.52  | 4 | 36.42 | 1.95  | 6 |
| 35.63 | 5.34  | 2 | 36.00 | 9.40  | 4 | 36.42 | 2.70  | 6 |
| 35.63 | 2.66  | 2 | 36.00 | 3.15  | 4 | 36.42 | 6.79  | 6 |
| 35.63 | 7.49  | 2 | 36.01 | 11.16 | 4 | 36.42 | 4.42  | 6 |
| 35.64 | 8.86  | 2 | 36.01 | 3.52  | 4 | 36.42 | 1.48  | 6 |
| 35.64 | 8.30  | 2 | 36.01 | 2.85  | 4 | 36.42 | 2.16  | 6 |
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| 35.64 | 3.62  | 2 | 36.01 | 7.99  | 4 | 36.42 | 8.68  | 6 |
| 35.64 | 2.74  | 2 | 36.01 | 5.88  | 4 | 36.42 | 5.74  | 6 |
| 35.64 | 6.62  | 2 | 36.01 | 2.93  | 4 | 36.43 | 11.88 | 6 |
| 35.64 | 5.75  | 2 | 36.01 | 2.52  | 4 | 36.43 | 1.99  | 6 |
| 35.64 | 2.75  | 2 | 36.01 | 6.62  | 4 | 36.43 | 1.29  | 6 |
| 35.64 | 3.22  | 2 | 36.01 | 5.42  | 4 | 36.43 | 9.71  | 6 |
| 35.64 | 5.82  | 2 | 36.01 | 1.83  | 4 | 36.43 | 11.56 | 6 |
| 35.64 | 3.83  | 2 | 36.01 | 1.40  | 4 | 36.43 | 4.92  | 6 |
| 35.65 | 9.18  | 2 | 36.02 | 8.93  | 4 | 36.43 | 1.32  | 6 |
| 35.65 | 1.39  | 2 | 36.02 | 15.29 | 4 | 36.43 | 1.33  | 6 |
| 35.65 | 1.97  | 2 | 36.02 | 5.06  | 4 | 36.43 | 1.16  | 6 |
| 35.65 | 1.62  | 2 | 36.02 | 2.95  | 4 | 36.43 | 1.40  | 6 |
| 35.65 | 1.84  | 2 | 36.02 | 2.39  | 4 | 36.44 | 14.86 | 6 |
| 35.65 | 5.15  | 2 | 36.02 | 8.69  | 4 | 36.44 | 5.66  | 6 |
| 35.65 | 3.10  | 2 | 36.02 | 6.27  | 4 | 36.44 | 8.02  | 6 |

|       |      |   |       |       |   |       |       |   |
|-------|------|---|-------|-------|---|-------|-------|---|
| 35.65 | 7.26 | 2 | 36.03 | 10.12 | 4 | 36.44 | 9.14  | 6 |
| 35.65 | 2.15 | 2 | 36.03 | 3.84  | 4 | 36.44 | 7.08  | 6 |
| 35.65 | 1.13 | 2 | 36.03 | 6.05  | 4 | 36.44 | 1.72  | 6 |
| 35.65 | 0.88 | 2 | 36.03 | 4.33  | 4 | 36.44 | 1.64  | 6 |
| 35.65 | 1.07 | 2 | 36.03 | 9.66  | 4 | 36.44 | 1.33  | 6 |
| 35.65 | 1.46 | 2 | 36.03 | 2.47  | 4 | 36.44 | 1.38  | 6 |
| 35.65 | 1.61 | 2 | 36.03 | 3.78  | 4 | 36.44 | 1.09  | 6 |
| 35.65 | 8.41 | 2 | 36.03 | 7.05  | 4 | 36.44 | 1.56  | 6 |
| 35.65 | 2.79 | 2 | 36.03 | 9.55  | 4 | 36.44 | 5.22  | 6 |
| 35.65 | 5.15 | 2 | 36.04 | 7.61  | 4 | 36.45 | 11.87 | 6 |
| 35.66 | 6.43 | 2 | 36.04 | 2.80  | 4 | 36.45 | 3.60  | 6 |
| 35.66 | 5.13 | 2 | 36.04 | 2.16  | 4 | 36.45 | 10.30 | 6 |
| 35.66 | 1.36 | 2 | 36.04 | 1.82  | 4 | 36.45 | 5.37  | 6 |
| 35.66 | 1.61 | 2 | 36.04 | 2.44  | 4 | 36.45 | 4.88  | 6 |
| 35.66 | 6.52 | 2 | 36.04 | 8.50  | 4 | 36.45 | 7.28  | 6 |
| 35.66 | 1.80 | 2 | 36.04 | 2.14  | 4 | 36.45 | 1.49  | 6 |
| 35.66 | 9.08 | 2 | 36.04 | 1.35  | 4 | 36.45 | 1.31  | 6 |
| 35.66 | 1.10 | 2 | 36.04 | 6.35  | 4 | 36.45 | 3.55  | 6 |
| 35.66 | 2.83 | 2 | 36.04 | 9.51  | 4 | 36.46 | 8.27  | 6 |
| 35.66 | 2.40 | 2 | 36.04 | 2.52  | 4 | 36.46 | 5.57  | 6 |
| 35.66 | 1.28 | 2 | 36.04 | 2.20  | 4 | 36.46 | 11.62 | 6 |
| 35.66 | 1.18 | 2 | 36.04 | 6.65  | 4 | 36.46 | 1.88  | 6 |
| 35.66 | 4.96 | 2 | 36.05 | 3.63  | 4 | 36.46 | 2.00  | 6 |
| 35.66 | 3.02 | 2 | 36.05 | 10.66 | 4 | 36.46 | 2.28  | 6 |
| 35.66 | 1.14 | 2 | 36.05 | 6.93  | 4 | 36.46 | 8.66  | 6 |
| 35.66 | 1.72 | 2 | 36.05 | 5.30  | 4 | 36.46 | 6.80  | 6 |
| 35.67 | 1.93 | 2 | 36.05 | 2.77  | 4 | 36.46 | 1.92  | 6 |
| 35.67 | 1.50 | 2 | 36.05 | 11.44 | 4 | 36.46 | 2.10  | 6 |
| 35.67 | 7.07 | 2 | 36.05 | 1.25  | 4 | 36.47 | 7.53  | 6 |
| 35.67 | 1.69 | 2 | 36.05 | 1.49  | 4 | 36.47 | 5.30  | 6 |
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| 35.67 | 5.49 | 2 | 36.05 | 5.33  | 4 | 36.47 | 1.54  | 6 |
| 35.67 | 3.03 | 2 | 36.06 | 5.17  | 4 | 36.47 | 4.58  | 6 |
| 35.67 | 9.17 | 2 | 36.06 | 6.86  | 4 | 36.47 | 7.96  | 6 |
| 35.67 | 1.45 | 2 | 36.06 | 3.32  | 4 | 36.47 | 2.91  | 6 |
| 35.67 | 1.62 | 2 | 36.06 | 1.86  | 4 | 36.47 | 4.26  | 6 |
| 35.67 | 2.99 | 2 | 36.06 | 4.85  | 4 | 36.47 | 3.38  | 6 |
| 35.68 | 9.18 | 2 | 36.06 | 6.53  | 4 | 36.47 | 5.74  | 6 |
| 35.68 | 2.28 | 2 | 36.06 | 5.75  | 4 | 36.47 | 5.45  | 6 |
| 35.68 | 5.87 | 2 | 36.06 | 2.06  | 4 | 36.47 | 3.01  | 6 |
| 35.68 | 8.74 | 2 | 36.06 | 4.14  | 4 | 36.47 | 1.67  | 6 |

|       |      |   |       |       |   |       |       |   |
|-------|------|---|-------|-------|---|-------|-------|---|
| 35.68 | 2.78 | 2 | 36.06 | 6.38  | 4 | 36.47 | 2.45  | 6 |
| 35.68 | 4.10 | 2 | 36.06 | 2.71  | 4 | 36.48 | 9.19  | 6 |
| 35.68 | 2.10 | 2 | 36.06 | 2.69  | 4 | 36.48 | 1.21  | 6 |
| 35.68 | 7.17 | 2 | 36.07 | 11.57 | 4 | 36.48 | 1.24  | 6 |
| 35.68 | 2.15 | 2 | 36.07 | 2.96  | 4 | 36.48 | 14.81 | 6 |
| 35.68 | 5.88 | 2 | 36.07 | 8.72  | 4 | 36.48 | 6.41  | 6 |
| 35.68 | 4.85 | 2 | 36.07 | 9.28  | 4 | 36.48 | 10.70 | 6 |
| 35.68 | 1.45 | 2 | 36.07 | 2.57  | 4 | 36.48 | 1.42  | 6 |
| 35.68 | 1.56 | 2 | 36.07 | 3.45  | 4 | 36.48 | 1.86  | 6 |
| 35.68 | 1.15 | 2 | 36.07 | 5.75  | 4 | 36.48 | 3.42  | 6 |
| 35.69 | 6.37 | 2 | 36.07 | 9.35  | 4 | 36.48 | 2.59  | 6 |
| 35.69 | 8.76 | 2 | 36.07 | 1.94  | 4 | 36.49 | 2.44  | 6 |
| 35.69 | 6.39 | 2 | 36.08 | 2.59  | 4 | 36.49 | 8.17  | 6 |
| 35.69 | 2.20 | 2 | 36.08 | 6.77  | 4 | 36.49 | 3.35  | 6 |
| 35.69 | 1.35 | 2 | 36.08 | 3.11  | 4 | 36.49 | 3.04  | 6 |
| 35.69 | 1.82 | 2 | 36.08 | 3.13  | 4 | 36.49 | 6.27  | 6 |
| 35.69 | 9.33 | 2 | 36.08 | 3.60  | 4 | 36.49 | 6.00  | 6 |
| 35.69 | 8.37 | 2 | 36.08 | 8.85  | 4 | 36.49 | 7.31  | 6 |
| 35.69 | 5.78 | 2 | 36.08 | 3.77  | 4 | 36.49 | 1.51  | 6 |
| 35.69 | 1.45 | 2 | 36.08 | 2.27  | 4 | 36.49 | 8.49  | 6 |
| 35.69 | 1.21 | 2 | 36.08 | 3.75  | 4 | 36.49 | 2.88  | 6 |
| 35.69 | 1.78 | 2 | 36.08 | 10.13 | 4 | 36.49 | 3.63  | 6 |
| 35.70 | 5.42 | 2 | 36.08 | 1.56  | 4 | 36.49 | 0.99  | 6 |
| 35.70 | 2.88 | 2 | 36.08 | 1.66  | 4 | 36.50 | 1.75  | 6 |
| 35.70 | 5.54 | 2 | 36.09 | 10.35 | 4 | 36.50 | 1.26  | 6 |
| 35.70 | 2.93 | 2 | 36.09 | 3.03  | 4 | 36.50 | 1.09  | 6 |
| 35.70 | 5.50 | 2 | 36.09 | 7.68  | 4 | 36.50 | 8.07  | 6 |
| 35.70 | 3.47 | 2 | 36.09 | 0.94  | 4 | 36.50 | 2.09  | 6 |
| 35.70 | 3.75 | 2 | 36.09 | 1.69  | 4 | 36.50 | 1.95  | 6 |
| 35.70 | 3.11 | 2 | 36.09 | 1.12  | 4 | 36.50 | 9.95  | 6 |
| 35.70 | 2.88 | 2 | 36.09 | 0.97  | 4 | 36.50 | 5.61  | 6 |
| 35.70 | 3.08 | 2 | 36.09 | 1.94  | 4 | 36.50 | 5.67  | 6 |
| 35.70 | 3.10 | 2 | 36.09 | 6.06  | 4 | 36.50 | 3.42  | 6 |
| 35.70 | 7.68 | 2 | 36.09 | 7.22  | 4 |       |       |   |
| 35.70 | 1.53 | 2 | 36.09 | 2.17  | 4 |       |       |   |



## Appendix II Information of the 1,000-ft. Sections on I-20

I-20 East CRCP Sections:

| Section Number | MP From (mile) | MP To (mile) | Mean Spacing (m) | Mean Spacing (ft.) |
|----------------|----------------|--------------|------------------|--------------------|
| 1              | 24.57          | 24.76        | 1.57             | 5.14               |
| 2              | 24.76          | 24.94        | 1.44             | 4.73               |
| 3              | 24.94          | 25.14        | 1.58             | 5.19               |
| 4              | 25.14          | 25.32        | 1.68             | 5.51               |
| 5              | 25.32          | 25.51        | 1.51             | 4.94               |
| 6              | 25.51          | 25.70        | 1.67             | 5.49               |
| 7              | 25.70          | 25.89        | 1.72             | 5.63               |
| 8              | 25.89          | 26.08        | 1.79             | 5.86               |
| 9              | 26.08          | 26.27        | 1.59             | 5.22               |
| 10             | 26.27          | 26.46        | 1.63             | 5.35               |
| 11             | 26.46          | 26.56        | 1.41             | 4.63               |
| 12             | 26.56          | 26.84        | /                | /                  |
| 13             | 26.84          | 27.03        | 1.88             | 6.17               |
| 14             | 27.03          | 27.22        | 1.82             | 5.98               |
| 15             | 27.22          | 27.41        | 2.25             | 7.37               |
| 16             | 27.41          | 27.60        | 1.84             | 6.03               |
| 17             | 27.60          | 27.79        | 1.84             | 6.03               |
| 18             | 27.79          | 27.98        | 1.81             | 5.94               |
| 19             | 27.98          | 28.16        | 1.70             | 5.57               |
| 20             | 28.16          | 28.35        | 1.67             | 5.47               |
| 21             | 28.35          | 28.54        | 1.75             | 5.74               |
| 22             | 28.54          | 28.73        | 1.67             | 5.47               |
| 23             | 28.73          | 28.92        | 1.60             | 5.24               |
| 24             | 28.92          | 29.11        | 1.60             | 5.23               |
| 25             | 29.11          | 29.30        | 1.62             | 5.32               |
| 26             | 29.30          | 29.49        | 1.58             | 5.17               |
| 27             | 29.49          | 29.68        | 1.33             | 4.35               |
| 28             | 29.68          | 29.87        | 1.57             | 5.16               |
| 29             | 29.87          | 30.06        | 1.62             | 5.31               |
| 30             | 30.06          | 30.25        | 1.81             | 5.95               |
| 31             | 30.25          | 30.44        | 1.82             | 5.96               |
| 32             | 30.44          | 30.63        | 1.59             | 5.20               |
| 33             | 30.63          | 30.82        | 1.51             | 4.96               |

|    |       |       |      |      |
|----|-------|-------|------|------|
| 34 | 30.82 | 31.01 | 1.64 | 5.37 |
| 35 | 31.01 | 31.19 | 1.71 | 5.60 |
| 36 | 31.19 | 31.38 | 1.60 | 5.26 |
| 37 | 31.38 | 31.57 | 1.65 | 5.41 |
| 38 | 31.57 | 31.76 | 1.57 | 5.16 |
| 39 | 31.76 | 31.78 | 1.52 | 4.98 |

I-20 East CRCP Sections – Detailed Crack Spacing for First Six 1,000-ft Sections and Corresponding Histograms:

| Mile Post | Spacing (ft) | Section # | Mile Post | Spacing (ft) | Section # | Mile Post | Spacing (ft) | Section # |
|-----------|--------------|-----------|-----------|--------------|-----------|-----------|--------------|-----------|
| 24.57     |              | 1         | 24.92     | 9.30         | 2         | 25.30     | 2.57         | 4         |
| 24.57     | 1.42         | 1         | 24.92     | 2.74         | 2         | 25.30     | 0.00         | 4         |
| 24.57     | 11.08        | 1         | 24.92     | 1.59         | 2         | 25.30     | 1.47         | 4         |
| 24.57     | 1.21         | 1         | 24.92     | 4.88         | 2         | 25.30     | 5.52         | 4         |
| 24.57     | 6.78         | 1         | 24.92     | 8.31         | 2         | 25.30     | 2.12         | 4         |
| 24.57     | 3.62         | 1         | 24.92     | 3.25         | 2         | 25.31     | 0.00         | 4         |
| 24.57     | 3.86         | 1         | 24.92     | 2.27         | 2         | 25.31     | 1.89         | 4         |
| 24.57     | 2.91         | 1         | 24.92     | 0.68         | 2         | 25.31     | 9.72         | 4         |
| 24.57     | 7.62         | 1         | 24.92     | 8.17         | 2         | 25.31     | 0.81         | 4         |
| 24.57     | 1.13         | 1         | 24.92     | 1.04         | 2         | 25.31     | 0.74         | 4         |
| 24.57     | 1.67         | 1         | 24.92     | 12.37        | 2         | 25.31     | 1.38         | 4         |
| 24.57     | 1.74         | 1         | 24.92     | 0.95         | 2         | 25.31     | 13.81        | 4         |
| 24.57     | 7.22         | 1         | 24.92     | 4.16         | 2         | 25.31     | 1.73         | 4         |
| 24.58     | 0.94         | 1         | 24.93     | 10.09        | 2         | 25.32     | 9.21         | 4         |
| 24.58     | 13.80        | 1         | 24.93     | 2.26         | 2         | 25.32     | 8.02         | 4         |
| 24.58     | 8.79         | 1         | 24.93     | 2.80         | 2         | 25.32     | 4.63         | 4         |
| 24.58     | 3.87         | 1         | 24.93     | 9.53         | 2         | 25.32     | 2.05         | 4         |
| 24.58     | 1.94         | 1         | 24.93     | 4.28         | 2         | 25.32     | 13.85        | 4         |
| 24.58     | 9.79         | 1         | 24.93     | 3.61         | 2         | 25.32     | 4.62         | 4         |
| 24.58     | 7.04         | 1         | 24.93     | 5.54         | 2         | 25.32     | 12.40        | 5         |
| 24.58     | 2.41         | 1         | 24.93     | 1.24         | 2         | 25.32     | 1.21         | 5         |
| 24.59     | 9.25         | 1         | 24.93     | 4.31         | 2         | 25.32     | 2.33         | 5         |
| 24.59     | 9.59         | 1         | 24.93     | 1.20         | 2         | 25.33     | 8.97         | 5         |
| 24.59     | 2.72         | 1         | 24.93     | 1.73         | 2         | 25.33     | 1.17         | 5         |
| 24.59     | 1.55         | 1         | 24.93     | 1.85         | 2         | 25.33     | 1.29         | 5         |
| 24.59     | 11.08        | 1         | 24.93     | 3.52         | 2         | 25.33     | 2.73         | 5         |
| 24.59     | 2.69         | 1         | 24.94     | 7.08         | 2         | 25.33     | 1.70         | 5         |
| 24.59     | 11.64        | 1         | 24.94     | 6.56         | 2         | 25.33     | 10.58        | 5         |
| 24.60     |              | 1         | 24.94     | 6.67         | 2         | 25.33     | 4.27         | 5         |
| 24.60     | 2.25         | 1         | 24.94     | 10.16        | 2         | 25.33     | 7.32         | 5         |
| 24.60     | 3.68         | 1         | 24.94     | 7.82         | 2         | 25.33     | 5.93         | 5         |
| 24.60     | 3.46         | 1         | 24.94     | 7.31         | 2         | 25.33     | 7.78         | 5         |
| 24.60     | 2.77         | 1         | 24.94     | 6.08         | 3         | 25.34     | 8.85         | 5         |
| 24.60     | 1.80         | 1         | 24.95     | 9.21         | 3         | 25.34     | 1.95         | 5         |
| 24.60     | 3.05         | 1         | 24.95     | 4.51         | 3         | 25.34     | 0.00         | 5         |
| 24.60     | 1.29         | 1         | 24.95     | 7.07         | 3         | 25.34     | 12.76        | 5         |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 24.60 | 0.68  | 1 | 24.95 | 1.63  | 3 | 25.34 | 4.78  | 5 |
| 24.60 | 1.20  | 1 | 24.95 | 10.22 | 3 | 25.34 | 5.23  | 5 |
| 24.60 | 14.56 | 1 | 24.95 | 1.52  | 3 | 25.35 | 13.49 | 5 |
| 24.61 | 11.49 | 1 | 24.95 | 1.14  | 3 | 25.35 | 9.44  | 5 |
| 24.61 | 3.70  | 1 | 24.95 | 0.94  | 3 | 25.35 | 4.02  | 5 |
| 24.61 | 10.93 | 1 | 24.95 | 13.38 | 3 | 25.35 | 0.85  | 5 |
| 24.61 | 8.13  | 1 | 24.95 | 4.22  | 3 | 25.35 | 0.86  | 5 |
| 24.61 | 2.58  | 1 | 24.96 | 4.75  | 3 | 25.35 | 0.83  | 5 |
| 24.61 | 12.41 | 1 | 24.96 | 3.80  | 3 | 25.35 | 6.42  | 5 |
| 24.61 | 7.35  | 1 | 24.96 | 1.84  | 3 | 25.35 | 15.07 | 5 |
| 24.61 | 1.41  | 1 | 24.96 | 2.69  | 3 | 25.35 | 2.74  | 5 |
| 24.62 | 12.21 | 1 | 24.96 | 3.84  | 3 | 25.35 | 1.39  | 5 |
| 24.62 | 3.90  | 1 | 24.96 | 8.20  | 3 | 25.35 | 1.10  | 5 |
| 24.62 | 5.92  | 1 | 24.96 | 2.24  | 3 | 25.35 | 0.98  | 5 |
| 24.62 | 1.73  | 1 | 24.96 | 0.69  | 3 | 25.35 | 1.05  | 5 |
| 24.62 | 1.54  | 1 | 24.96 | 7.15  | 3 | 25.36 | 2.98  | 5 |
| 24.62 | 15.14 | 1 | 24.96 | 1.01  | 3 | 25.36 | 11.15 | 5 |
| 24.62 | 10.79 | 1 | 24.96 | 0.80  | 3 | 25.36 | 1.57  | 5 |
| 24.63 | 10.23 | 1 | 24.96 | 7.53  | 3 | 25.36 | 6.80  | 5 |
| 24.63 | 2.75  | 1 | 24.96 | 6.83  | 3 | 25.36 | 9.55  | 5 |
| 24.63 | 4.06  | 1 | 24.96 | 0.74  | 3 | 25.36 | 5.89  | 5 |
| 24.63 | 5.75  | 1 | 24.97 | 2.74  | 3 | 25.37 | 15.85 | 5 |
| 24.63 | 3.80  | 1 | 24.97 | 6.82  | 3 | 25.37 | 1.54  | 5 |
| 24.63 | 5.98  | 1 | 24.97 | 5.89  | 3 | 25.37 | 9.42  | 5 |
| 24.63 | 9.52  | 1 | 24.97 | 2.38  | 3 | 25.37 | 2.67  | 5 |
| 24.63 | 1.09  | 1 | 24.97 | 6.52  | 3 | 25.37 | 3.14  | 5 |
| 24.63 | 12.96 | 1 | 24.97 | 1.56  | 3 | 25.37 | 3.81  | 5 |
| 24.64 | 6.71  | 1 | 24.97 | 0.96  | 3 | 25.37 | 0.76  | 5 |
| 24.64 | 8.74  | 1 | 24.97 | 1.89  | 3 | 25.37 | 1.14  | 5 |
| 24.64 | 0.85  | 1 | 24.97 | 1.13  | 3 | 25.37 | 0.86  | 5 |
| 24.64 | 1.66  | 1 | 24.97 | 4.14  | 3 | 25.37 | 2.28  | 5 |
| 24.64 | 9.14  | 1 | 24.97 | 3.74  | 3 | 25.37 | 1.55  | 5 |
| 24.64 | 9.18  | 1 | 24.97 | 14.55 | 3 | 25.37 | 0.98  | 5 |
| 24.64 | 5.48  | 1 | 24.98 | 7.79  | 3 | 25.37 | 5.07  | 5 |
| 24.64 | 1.99  | 1 | 24.98 | 3.72  | 3 | 25.37 | 4.28  | 5 |
| 24.64 | 1.51  | 1 | 24.98 | 6.07  | 3 | 25.37 | 2.14  | 5 |
| 24.64 | 6.78  | 1 | 24.98 | 5.13  | 3 | 25.38 | 13.67 | 5 |
| 24.65 | 11.01 | 1 | 24.98 | 15.13 | 3 | 25.38 | 0.00  | 5 |
| 24.65 | 6.68  | 1 | 24.98 | 5.83  | 3 | 25.38 | 4.23  | 5 |
| 24.65 | 6.26  | 1 | 24.98 | 2.17  | 3 | 25.38 | 1.94  | 5 |
| 24.65 | 3.80  | 1 | 24.98 | 0.91  | 3 | 25.38 | 3.07  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 24.65 | 1.07  | 1 | 24.98 | 1.12  | 3 | 25.38 | 1.56  | 5 |
| 24.65 | 1.97  | 1 | 24.98 | 0.86  | 3 | 25.38 | 0.00  | 5 |
| 24.65 | 7.13  | 1 | 24.99 | 15.83 | 3 | 25.39 | 8.77  | 5 |
| 24.65 | 7.57  | 1 | 24.99 | 2.98  | 3 | 25.39 | 4.53  | 5 |
| 24.65 | 0.57  | 1 | 24.99 | 5.83  | 3 | 25.39 | 9.85  | 5 |
| 24.65 | 4.59  | 1 | 24.99 | 3.84  | 3 | 25.39 | 3.28  | 5 |
| 24.66 | 7.37  | 1 | 24.99 | 10.79 | 3 | 25.39 | 7.79  | 5 |
| 24.66 | 1.34  | 1 | 24.99 | 8.57  | 3 | 25.39 | 4.98  | 5 |
| 24.66 | 14.88 | 1 | 24.99 | 0.89  | 3 | 25.39 | 2.79  | 5 |
| 24.66 | 9.25  | 1 | 24.99 | 0.68  | 3 | 25.39 | 3.95  | 5 |
| 24.66 | 11.34 | 1 | 24.99 | 1.06  | 3 | 25.39 | 2.94  | 5 |
| 24.66 | 4.73  | 1 | 24.99 | 8.85  | 3 | 25.40 | 10.39 | 5 |
| 24.66 | 5.07  | 1 | 25.00 | 1.17  | 3 | 25.40 | 3.66  | 5 |
| 24.66 | 2.04  | 1 | 25.00 | 4.15  | 3 | 25.40 | 12.73 | 5 |
| 24.66 | 0.90  | 1 | 25.00 | 1.83  | 3 | 25.40 | 0.00  | 5 |
| 24.67 | 9.01  | 1 | 25.00 | 6.98  | 3 | 25.40 | 1.31  | 5 |
| 24.67 | 10.25 | 1 | 25.00 | 10.05 | 3 | 25.40 | 1.74  | 5 |
| 24.67 | 4.61  | 1 | 25.00 | 1.43  | 3 | 25.40 | 1.93  | 5 |
| 24.67 | 1.39  | 1 | 25.00 | 3.00  | 3 | 25.41 | 15.15 | 5 |
| 24.67 | 10.43 | 1 | 25.00 | 11.34 | 3 | 25.41 | 1.93  | 5 |
| 24.67 | 2.16  | 1 | 25.00 | 3.21  | 3 | 25.41 | 1.35  | 5 |
| 24.67 | 3.90  | 1 | 25.00 | 7.59  | 3 | 25.41 | 3.03  | 5 |
| 24.67 | 5.17  | 1 | 25.01 | 10.19 | 3 | 25.41 | 7.38  | 5 |
| 24.68 | 13.14 | 1 | 25.01 | 4.57  | 3 | 25.41 | 3.73  | 5 |
| 24.68 | 9.03  | 1 | 25.01 | 9.48  | 3 | 25.41 | 2.70  | 5 |
| 24.68 | 5.54  | 1 | 25.01 | 0.91  | 3 | 25.41 | 4.66  | 5 |
| 24.68 | 2.15  | 1 | 25.01 | 1.10  | 3 | 25.41 | 5.79  | 5 |
| 24.68 | 12.97 | 1 | 25.01 | 8.32  | 3 | 25.41 | 2.39  | 5 |
| 24.68 | 1.49  | 1 | 25.01 | 1.32  | 3 | 25.41 | 2.50  | 5 |
| 24.68 | 5.20  | 1 | 25.01 | 1.28  | 3 | 25.41 | 1.79  | 5 |
| 24.68 | 1.39  | 1 | 25.01 | 1.31  | 3 | 25.42 | 15.35 | 5 |
| 24.68 | 1.67  | 1 | 25.01 | 9.65  | 3 | 25.42 | 9.89  | 5 |
| 24.68 | 4.08  | 1 | 25.02 | 11.05 | 3 | 25.42 | 1.06  | 5 |
| 24.69 | 2.87  | 1 | 25.02 | 5.50  | 3 | 25.42 | 1.31  | 5 |
| 24.69 | 1.25  | 1 | 25.02 | 4.96  | 3 | 25.42 | 5.99  | 5 |
| 24.69 | 0.85  | 1 | 25.02 | 4.53  | 3 | 25.42 | 3.40  | 5 |
| 24.69 |       | 1 | 25.02 | 2.23  | 3 | 25.42 | 0.96  | 5 |
| 24.69 | 12.97 | 1 | 25.02 | 0.00  | 3 | 25.42 | 11.82 | 5 |
| 24.69 | 6.88  | 1 | 25.02 | 5.89  | 3 | 25.42 | 3.58  | 5 |
| 24.70 | 8.88  | 1 | 25.02 | 0.87  | 3 | 25.43 | 7.81  | 5 |
| 24.70 | 9.29  | 1 | 25.02 | 7.40  | 3 | 25.43 | 11.48 | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 24.70 | 2.56  | 1 | 25.03 | 4.21  | 3 | 25.43 | 1.97  | 5 |
| 24.70 | 5.92  | 1 | 25.03 | 4.31  | 3 | 25.43 | 13.56 | 5 |
| 24.70 | 1.40  | 1 | 25.03 | 2.80  | 3 | 25.43 | 7.83  | 5 |
| 24.70 | 2.16  | 1 | 25.03 | 1.83  | 3 | 25.43 | 3.05  | 5 |
| 24.70 | 3.76  | 1 | 25.03 | 3.59  | 3 | 25.43 | 4.24  | 5 |
| 24.70 | 3.64  | 1 | 25.03 | 6.94  | 3 | 25.43 | 3.87  | 5 |
| 24.70 | 0.88  | 1 | 25.03 | 4.21  | 3 | 25.44 | 3.05  | 5 |
| 24.70 | 6.55  | 1 | 25.03 | 6.29  | 3 | 25.44 | 1.13  | 5 |
| 24.70 | 2.48  | 1 | 25.03 | 3.20  | 3 | 25.44 | 0.81  | 5 |
| 24.70 | 6.31  | 1 | 25.03 | 1.55  | 3 | 25.44 | 7.55  | 5 |
| 24.70 | 2.62  | 1 | 25.03 | 1.46  | 3 | 25.44 | 12.37 | 5 |
| 24.70 | 4.82  | 1 | 25.03 | 5.01  | 3 | 25.44 | 7.54  | 5 |
| 24.71 | 1.51  | 1 | 25.04 | 14.26 | 3 | 25.44 | 2.77  | 5 |
| 24.71 | 11.10 | 1 | 25.04 | 7.66  | 3 | 25.44 | 4.79  | 5 |
| 24.71 | 2.22  | 1 | 25.04 | 3.12  | 3 | 25.44 | 5.73  | 5 |
| 24.71 | 3.80  | 1 | 25.04 | 2.56  | 3 | 25.44 | 1.36  | 5 |
| 24.71 | 3.53  | 1 | 25.04 | 1.19  | 3 | 25.44 | 1.39  | 5 |
| 24.71 | 6.99  | 1 | 25.04 | 10.52 | 3 | 25.45 | 8.91  | 5 |
| 24.71 | 3.72  | 1 | 25.04 | 14.35 | 3 | 25.45 | 0.00  | 5 |
| 24.71 | 1.89  | 1 | 25.04 | 2.92  | 3 | 25.45 | 7.82  | 5 |
| 24.71 | 6.45  | 1 | 25.05 | 9.52  | 3 | 25.45 | 10.11 | 5 |
| 24.71 | 5.78  | 1 | 25.05 | 10.41 | 3 | 25.45 | 1.23  | 5 |
| 24.71 | 3.26  | 1 | 25.05 | 1.54  | 3 | 25.45 | 1.24  | 5 |
| 24.72 | 10.27 | 1 | 25.05 | 4.76  | 3 | 25.46 | 12.37 | 5 |
| 24.72 | 1.93  | 1 | 25.05 | 14.96 | 3 | 25.46 | 1.39  | 5 |
| 24.72 | 0.20  | 1 | 25.05 | 1.69  | 3 | 25.46 | 7.01  | 5 |
| 24.72 | 5.71  | 1 | 25.05 | 13.32 | 3 | 25.46 | 3.39  | 5 |
| 24.72 | 5.82  | 1 | 25.06 | 1.68  | 3 | 25.46 | 2.77  | 5 |
| 24.72 | 10.20 | 1 | 25.06 | 12.01 | 3 | 25.46 | 1.33  | 5 |
| 24.72 | 3.32  | 1 | 25.06 | 5.95  | 3 | 25.46 | 2.97  | 5 |
| 24.72 | 5.09  | 1 | 25.06 | 1.19  | 3 | 25.46 | 1.76  | 5 |
| 24.72 | 4.10  | 1 | 25.06 | 6.22  | 3 | 25.46 | 0.92  | 5 |
| 24.72 | 4.93  | 1 | 25.06 | 0.96  | 3 | 25.46 | 12.17 | 5 |
| 24.72 | 1.23  | 1 | 25.06 | 8.54  | 3 | 25.46 | 3.10  | 5 |
| 24.73 | 7.93  | 1 | 25.06 | 1.79  | 3 | 25.46 | 1.33  | 5 |
| 24.73 | 7.71  | 1 | 25.06 | 9.43  | 3 | 25.46 | 0.69  | 5 |
| 24.73 | 0.84  | 1 | 25.07 | 11.68 | 3 | 25.46 | 1.22  | 5 |
| 24.73 | 3.36  | 1 | 25.07 | 8.00  | 3 | 25.46 | 3.22  | 5 |
| 24.73 | 6.72  | 1 | 25.07 | 12.77 | 3 | 25.46 | 6.20  | 5 |
| 24.73 | 4.41  | 1 | 25.07 | 1.76  | 3 | 25.46 | 1.39  | 5 |
| 24.73 | 2.87  | 1 | 25.07 | 1.27  | 3 | 25.47 | 14.11 | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 24.73 | 0.84  | 1 | 25.07 | 1.05  | 3 | 25.47 | 8.05  | 5 |
| 24.73 | 1.32  | 1 | 25.07 | 1.33  | 3 | 25.47 | 0.96  | 5 |
| 24.73 | 1.01  | 1 | 25.07 | 0.94  | 3 | 25.47 | 0.00  | 5 |
| 24.73 | 3.15  | 1 | 25.07 | 1.25  | 3 | 25.47 | 2.36  | 5 |
| 24.73 | 3.26  | 1 | 25.07 | 7.09  | 3 | 25.47 | 8.38  | 5 |
| 24.73 | 7.23  | 1 | 25.08 | 13.81 | 3 | 25.48 | 0.00  | 5 |
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| 24.74 | 2.86  | 1 | 25.08 | 5.55  | 3 | 25.48 | 0.60  | 5 |
| 24.74 | 3.85  | 1 | 25.08 | 6.00  | 3 | 25.48 | 1.63  | 5 |
| 24.74 | 5.20  | 1 | 25.08 | 6.94  | 3 | 25.48 | 8.63  | 5 |
| 24.74 | 7.04  | 1 | 25.08 | 7.25  | 3 | 25.48 | 10.89 | 5 |
| 24.74 | 1.40  | 1 | 25.08 | 7.01  | 3 | 25.48 | 1.30  | 5 |
| 24.74 | 9.75  | 1 | 25.08 | 3.75  | 3 | 25.49 | 6.56  | 5 |
| 24.74 | 1.57  | 1 | 25.08 | 1.49  | 3 | 25.49 | 2.65  | 5 |
| 24.74 | 7.19  | 1 | 25.09 | 7.63  | 3 | 25.49 | 1.59  | 5 |
| 24.74 | 9.13  | 1 | 25.09 | 2.40  | 3 | 25.49 | 8.94  | 5 |
| 24.74 | 3.51  | 1 | 25.09 | 1.74  | 3 | 25.49 | 3.56  | 5 |
| 24.75 | 4.38  | 1 | 25.09 | 5.95  | 3 | 25.49 | 3.49  | 5 |
| 24.75 | 4.54  | 1 | 25.09 | 4.55  | 3 | 25.49 | 1.94  | 5 |
| 24.75 | 7.55  | 1 | 25.09 | 2.71  | 3 | 25.49 | 0.00  | 5 |
| 24.75 | 1.63  | 1 | 25.09 | 7.06  | 3 | 25.50 | 1.12  | 5 |
| 24.75 | 0.85  | 1 | 25.09 | 1.36  | 3 | 25.50 | 0.65  | 5 |
| 24.75 | 7.77  | 1 | 25.09 | 1.88  | 3 | 25.50 | 0.80  | 5 |
| 24.75 | 8.75  | 1 | 25.09 | 2.61  | 3 | 25.50 | 0.99  | 5 |
| 24.75 | 2.97  | 1 | 25.09 | 9.75  | 3 | 25.50 | 0.00  | 5 |
| 24.75 | 0.92  | 1 | 25.09 | 2.08  | 3 | 25.50 | 4.55  | 5 |
| 24.75 | 0.69  | 1 | 25.10 | 11.22 | 3 | 25.50 | 12.93 | 5 |
| 24.75 | 1.17  | 1 | 25.10 | 7.40  | 3 | 25.50 | 1.13  | 5 |
| 24.75 | 7.48  | 1 | 25.10 | 10.96 | 3 | 25.50 | 8.68  | 5 |
| 24.76 | 7.18  | 2 | 25.10 | 1.45  | 3 | 25.51 | 0.00  | 5 |
| 24.76 | 1.45  | 2 | 25.10 | 4.72  | 3 | 25.51 | 10.13 | 5 |
| 24.76 | 1.26  | 2 | 25.10 | 8.51  | 3 | 25.51 | 15.44 | 6 |
| 24.76 | 0.90  | 2 | 25.10 | 1.80  | 3 | 25.51 | 4.04  | 6 |
| 24.76 | 14.67 | 2 | 25.10 | 1.54  | 3 | 25.51 | 3.05  | 6 |
| 24.76 | 7.16  | 2 | 25.10 | 2.42  | 3 | 25.52 | 14.75 | 6 |
| 24.76 | 7.48  | 2 | 25.10 | 1.32  | 3 | 25.52 | 8.85  | 6 |
| 24.76 | 1.24  | 2 | 25.10 | 6.64  | 3 | 25.52 | 13.09 | 6 |
| 24.76 | 8.15  | 2 | 25.11 | 1.61  | 3 | 25.52 | 1.45  | 6 |
| 24.76 | 4.14  | 2 | 25.11 | 4.27  | 3 | 25.52 | 1.15  | 6 |
| 24.76 | 1.45  | 2 | 25.11 | 6.86  | 3 | 25.52 | 1.48  | 6 |

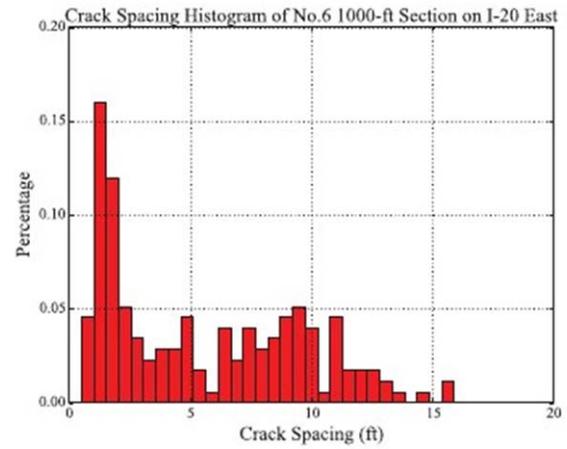
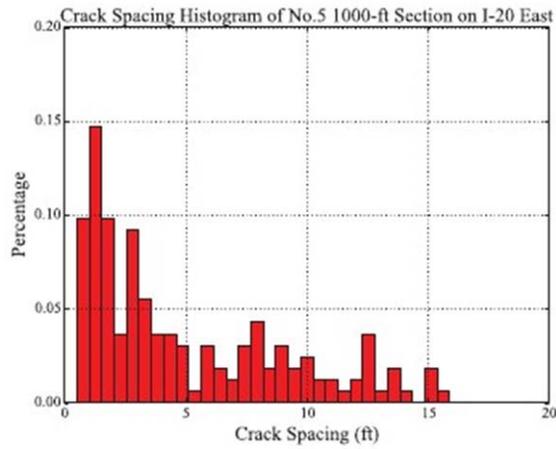
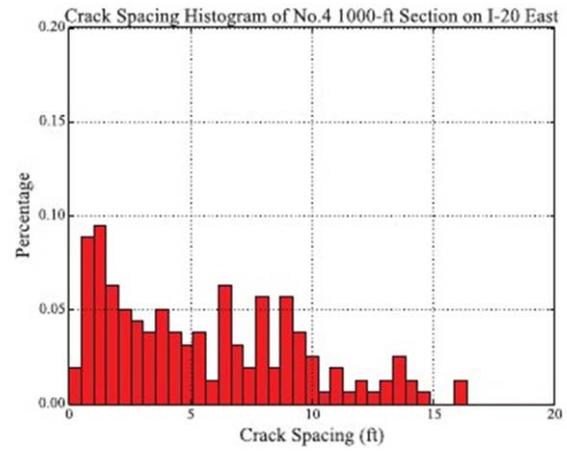
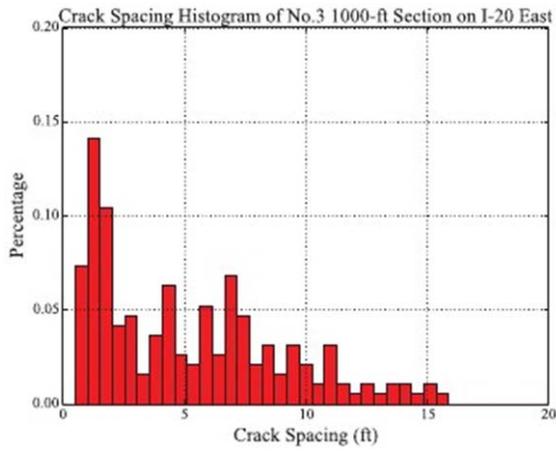
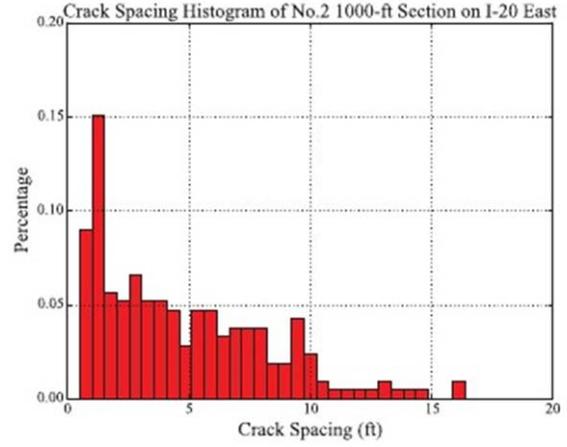
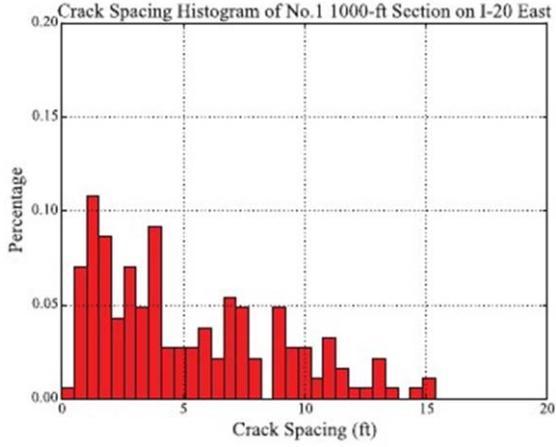
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| 24.77 | 1.22  | 2 | 25.11 | 9.35  | 3 | 25.53 | 4.26  | 6 |
| 24.77 | 0.93  | 2 | 25.11 | 1.24  | 3 | 25.53 | 1.58  | 6 |
| 24.77 | 1.07  | 2 | 25.11 | 1.39  | 3 | 25.53 | 1.55  | 6 |
| 24.77 | 6.45  | 2 | 25.11 | 11.12 | 3 | 25.53 | 9.02  | 6 |
| 24.77 | 3.31  | 2 | 25.11 | 1.66  | 3 | 25.53 | 1.48  | 6 |
| 24.77 | 9.83  | 2 | 25.11 | 1.56  | 3 | 25.53 | 1.55  | 6 |
| 24.77 | 4.60  | 2 | 25.11 | 1.72  | 3 | 25.53 | 4.50  | 6 |
| 24.77 | 4.87  | 2 | 25.12 | 9.34  | 3 | 25.53 | 1.64  | 6 |
| 24.77 | 2.10  | 2 | 25.12 | 6.16  | 3 | 25.53 | 2.78  | 6 |
| 24.77 | 0.79  | 2 | 25.12 | 7.89  | 3 | 25.53 | 2.21  | 6 |
| 24.77 | 0.77  | 2 | 25.12 | 12.72 | 3 | 25.53 | 1.31  | 6 |
| 24.77 | 9.51  | 2 | 25.12 | 4.48  | 3 | 25.53 | 10.16 | 6 |
| 24.77 | 1.46  | 2 | 25.12 | 8.28  | 3 | 25.53 | 10.39 | 6 |
| 24.78 | 7.07  | 2 | 25.12 | 7.31  | 3 | 25.54 | 4.08  | 6 |
| 24.78 | 6.17  | 2 | 25.13 | 6.76  | 3 | 25.54 | 7.28  | 6 |
| 24.78 | 9.46  | 2 | 25.13 | 2.01  | 3 | 25.54 | 3.22  | 6 |
| 24.78 | 3.91  | 2 | 25.13 | 11.02 | 3 | 25.54 | 0.93  | 6 |
| 24.78 | 1.49  | 2 | 25.13 | 2.99  | 3 | 25.54 | 1.61  | 6 |
| 24.78 | 5.31  | 2 | 25.13 | 8.46  | 3 | 25.54 | 10.24 | 6 |
| 24.78 | 9.68  | 2 | 25.13 | 6.72  | 3 | 25.54 | 1.50  | 6 |
| 24.78 | 10.24 | 2 | 25.13 | 8.81  | 3 | 25.54 | 12.67 | 6 |
| 24.78 | 3.70  | 2 | 25.13 | 1.12  | 3 | 25.54 | 2.28  | 6 |
| 24.79 | 3.06  | 2 | 25.14 | 13.37 | 4 | 25.54 | 3.20  | 6 |
| 24.79 | 5.57  | 2 | 25.14 | 9.74  | 4 | 25.55 | 6.64  | 6 |
| 24.79 | 5.91  | 2 | 25.14 | 7.75  | 4 | 25.55 | 9.74  | 6 |
| 24.79 | 0.85  | 2 | 25.14 | 2.18  | 4 | 25.55 | 4.61  | 6 |
| 24.79 | 1.12  | 2 | 25.14 | 8.72  | 4 | 25.55 | 1.17  | 6 |
| 24.79 | 11.56 | 2 | 25.14 | 3.49  | 4 | 25.55 | 1.04  | 6 |
| 24.79 | 0.70  | 2 | 25.14 | 9.22  | 4 | 25.55 | 0.96  | 6 |
| 24.79 | 5.51  | 2 | 25.14 | 1.75  | 4 | 25.55 | 0.00  | 6 |
| 24.79 | 5.47  | 2 | 25.14 | 1.41  | 4 | 25.55 | 1.14  | 6 |
| 24.79 | 9.24  | 2 | 25.14 | 1.08  | 4 | 25.55 | 11.06 | 6 |
| 24.79 | 1.20  | 2 | 25.14 | 0.78  | 4 | 25.55 | 1.58  | 6 |
| 24.79 | 1.03  | 2 | 25.15 | 3.84  | 4 | 25.56 | 8.60  | 6 |
| 24.79 | 3.49  | 2 | 25.15 | 4.23  | 4 | 25.56 | 1.47  | 6 |
| 24.80 | 2.19  | 2 | 25.15 | 6.57  | 4 | 25.56 | 1.65  | 6 |
| 24.80 | 6.00  | 2 | 25.15 | 1.97  | 4 | 25.56 | 6.04  | 6 |
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|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 24.80 | 2.27  | 2 | 25.15 | 4.30  | 4 | 25.56 | 8.70  | 6 |
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| 24.80 | 7.18  | 2 | 25.15 | 9.52  | 4 | 25.57 | 7.68  | 6 |
| 24.80 | 7.47  | 2 | 25.15 | 0.76  | 4 | 25.57 | 9.42  | 6 |
| 24.80 | 6.52  | 2 | 25.16 | 7.18  | 4 | 25.57 | 7.58  | 6 |
| 24.80 | 2.43  | 2 | 25.16 | 6.43  | 4 | 25.57 | 1.23  | 6 |
| 24.81 | 1.84  | 2 | 25.16 | 8.20  | 4 | 25.57 | 0.70  | 6 |
| 24.81 | 5.10  | 2 | 25.16 | 5.28  | 4 | 25.57 | 13.58 | 6 |
| 24.81 | 1.35  | 2 | 25.16 | 3.27  | 4 | 25.57 | 5.59  | 6 |
| 24.81 | 0.53  | 2 | 25.16 | 9.54  | 4 | 25.57 | 1.62  | 6 |
| 24.81 | 0.83  | 2 | 25.16 | 3.91  | 4 | 25.57 | 1.48  | 6 |
| 24.81 | 2.89  | 2 | 25.16 | 4.30  | 4 | 25.58 | 6.38  | 6 |
| 24.81 | 4.63  | 2 | 25.16 | 8.06  | 4 | 25.58 | 1.88  | 6 |
| 24.81 | 3.77  | 2 | 25.17 | 2.91  | 4 | 25.58 | 8.30  | 6 |
| 24.81 | 1.56  | 2 | 25.17 | 5.60  | 4 | 25.58 | 1.26  | 6 |
| 24.81 | 7.21  | 2 | 25.17 | 6.96  | 4 | 25.58 | 12.45 | 6 |
| 24.81 | 5.96  | 2 | 25.17 | 1.09  | 4 | 25.58 | 1.28  | 6 |
| 24.81 | 8.39  | 2 | 25.17 | 0.64  | 4 | 25.58 | 10.89 | 6 |
| 24.81 | 2.74  | 2 | 25.17 | 7.98  | 4 | 25.58 | 4.05  | 6 |
| 24.82 | 10.44 | 2 | 25.17 | 9.81  | 4 | 25.58 | 1.63  | 6 |
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| 24.82 | 9.53  | 2 | 25.18 | 6.20  | 4 | 25.59 | 9.90  | 6 |
| 24.82 | 2.75  | 2 | 25.18 | 2.81  | 4 | 25.59 | 7.28  | 6 |
| 24.82 | 4.33  | 2 | 25.18 | 2.94  | 4 | 25.59 | 7.64  | 6 |
| 24.82 | 8.10  | 2 | 25.18 | 15.94 | 4 | 25.59 | 2.19  | 6 |
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| 24.82 | 7.97  | 2 | 25.18 | 0.44  | 4 | 25.59 | 6.42  | 6 |
| 24.82 | 1.95  | 2 | 25.18 | 7.65  | 4 | 25.59 | 4.85  | 6 |
| 24.82 | 2.02  | 2 | 25.19 | 14.66 | 4 | 25.59 | 4.86  | 6 |
| 24.82 | 0.84  | 2 | 25.19 | 0.00  | 4 | 25.60 | 9.22  | 6 |
| 24.83 | 1.49  | 2 | 25.19 | 1.51  | 4 | 25.60 | 1.31  | 6 |
| 24.83 | 8.46  | 2 | 25.19 | 9.67  | 4 | 25.60 | 1.53  | 6 |
| 24.83 | 3.07  | 2 | 25.19 | 0.25  | 4 | 25.60 | 9.53  | 6 |
| 24.83 | 6.59  | 2 | 25.19 | 4.99  | 4 | 25.60 | 1.12  | 6 |
| 24.83 | 2.57  | 2 | 25.19 | 4.16  | 4 | 25.60 | 1.86  | 6 |
| 24.83 | 6.31  | 2 | 25.19 | 5.13  | 4 | 25.60 | 12.27 | 6 |
| 24.83 | 5.71  | 2 | 25.20 | 3.61  | 4 | 25.60 | 10.85 | 6 |
| 24.83 | 9.09  | 2 | 25.20 | 7.71  | 4 | 25.61 | 11.32 | 6 |
| 24.84 | 13.23 | 2 | 25.20 | 11.02 | 4 | 25.61 | 9.81  | 6 |
| 24.84 | 1.09  | 2 | 25.20 | 14.13 | 4 | 25.61 | 4.03  | 6 |

|       |       |   |       |      |   |       |       |   |
|-------|-------|---|-------|------|---|-------|-------|---|
| 24.84 | 9.59  | 2 | 25.20 | 6.44 | 4 | 25.61 | 2.37  | 6 |
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| 24.84 | 4.23  | 2 | 25.20 | 1.50 | 4 | 25.61 | 7.82  | 6 |
| 24.84 | 4.51  | 2 | 25.20 | 3.41 | 4 | 25.61 | 6.73  | 6 |
| 24.84 | 0.59  | 2 | 25.21 | 5.75 | 4 | 25.62 | 12.21 | 6 |
| 24.84 | 4.25  | 2 | 25.21 | 6.32 | 4 | 25.62 | 1.49  | 6 |
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| 24.84 | 8.06  | 2 | 25.21 | 1.51 | 4 | 25.62 | 8.78  | 6 |
| 24.84 | 2.24  | 2 | 25.21 | 9.84 | 4 | 25.62 | 1.31  | 6 |
| 24.84 | 1.35  | 2 | 25.21 | 0.59 | 4 | 25.62 | 7.88  | 6 |
| 24.84 | 1.15  | 2 | 25.21 | 3.84 | 4 | 25.62 | 8.03  | 6 |
| 24.85 | 7.80  | 2 | 25.21 | 4.89 | 4 | 25.62 | 3.66  | 6 |
| 24.85 | 4.73  | 2 | 25.21 | 1.63 | 4 | 25.62 | 12.43 | 6 |
| 24.85 | 5.56  | 2 | 25.21 | 4.50 | 4 | 25.62 | 1.20  | 6 |
| 24.85 | 1.60  | 2 | 25.21 | 2.25 | 4 | 25.62 | 1.03  | 6 |
| 24.85 | 9.65  | 2 | 25.22 | 7.54 | 4 | 25.62 | 0.89  | 6 |
| 24.85 | 12.20 | 2 | 25.22 | 6.53 | 4 | 25.63 | 11.72 | 6 |
| 24.85 | 2.49  | 2 | 25.22 | 7.60 | 4 | 25.63 | 1.24  | 6 |
| 24.85 | 1.26  | 2 | 25.22 | 6.73 | 4 | 25.63 | 3.22  | 6 |
| 24.86 | 13.45 | 2 | 25.22 | 2.03 | 4 | 25.63 | 10.83 | 6 |
| 24.86 | 6.84  | 2 | 25.22 | 2.61 | 4 | 25.63 | 9.62  | 6 |
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| 24.86 | 10.63 | 2 | 25.22 | 3.99 | 4 | 25.63 | 9.24  | 6 |
| 24.86 | 1.02  | 2 | 25.22 | 2.21 | 4 | 25.64 | 8.14  | 6 |
| 24.86 | 1.41  | 2 | 25.22 | 9.33 | 4 | 25.64 | 2.15  | 6 |
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| 24.86 | 1.06  | 2 | 25.23 | 5.49 | 4 | 25.64 | 4.55  | 6 |
| 24.86 | 3.53  | 2 | 25.23 | 6.09 | 4 | 25.64 | 11.53 | 6 |
| 24.86 | 3.60  | 2 | 25.23 | 3.68 | 4 | 25.64 | 2.97  | 6 |
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| 24.87 | 5.54  | 2 | 25.24 | 6.39 | 4 | 25.64 | 9.00  | 6 |
| 24.87 | 9.05  | 2 | 25.24 | 9.15 | 4 | 25.65 | 4.47  | 6 |
| 24.87 | 1.23  | 2 | 25.24 | 3.90 | 4 | 25.65 | 5.01  | 6 |
| 24.87 | 1.15  | 2 | 25.24 | 8.15 | 4 | 25.65 | 1.26  | 6 |
| 24.87 | 3.28  | 2 | 25.24 | 0.85 | 4 | 25.65 | 1.16  | 6 |
| 24.87 | 5.89  | 2 | 25.24 | 0.23 | 4 | 25.65 | 1.26  | 6 |
| 24.88 | 15.96 | 2 | 25.24 | 0.82 | 4 | 25.65 | 9.72  | 6 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
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| 24.88 | 1.72  | 2 | 25.24 | 2.16  | 4 | 25.65 | 0.00  | 6 |
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| 24.88 | 1.21  | 2 | 25.25 | 3.24  | 4 | 25.65 | 8.10  | 6 |
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| 24.88 | 2.47  | 2 | 25.25 | 2.03  | 4 | 25.66 | 11.91 | 6 |
| 24.88 | 2.58  | 2 | 25.25 | 0.00  | 4 | 25.66 | 1.57  | 6 |
| 24.88 | 3.97  | 2 | 25.25 | 16.31 | 4 | 25.66 | 2.19  | 6 |
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| 24.88 | 3.49  | 2 | 25.25 | 2.60  | 4 | 25.66 | 5.29  | 6 |
| 24.89 | 16.27 | 2 | 25.26 | 13.64 | 4 | 25.66 | 1.25  | 6 |
| 24.89 | 7.02  | 2 | 25.26 | 1.61  | 4 | 25.67 | 13.05 | 6 |
| 24.89 | 6.88  | 2 | 25.26 | 0.00  | 4 | 25.67 | 0.99  | 6 |
| 24.89 | 3.59  | 2 | 25.26 | 13.01 | 4 | 25.67 | 0.74  | 6 |
| 24.89 | 4.52  | 2 | 25.26 | 2.38  | 4 | 25.67 | 0.93  | 6 |
| 24.89 | 2.61  | 2 | 25.26 | 1.48  | 4 | 25.67 | 9.28  | 6 |
| 24.89 | 1.34  | 2 | 25.27 | 10.23 | 4 | 25.67 | 1.71  | 6 |
| 24.89 | 0.59  | 2 | 25.27 | 1.01  | 4 | 25.67 | 7.30  | 6 |
| 24.89 | 0.95  | 2 | 25.27 | 1.18  | 4 | 25.67 | 4.76  | 6 |
| 24.89 | 1.02  | 2 | 25.27 | 12.31 | 4 | 25.67 | 8.66  | 6 |
| 24.89 | 0.88  | 2 | 25.27 | 12.23 | 4 | 25.67 | 1.92  | 6 |
| 24.89 | 1.23  | 2 | 25.27 | 0.79  | 4 | 25.67 | 2.93  | 6 |
| 24.89 | 5.77  | 2 | 25.27 | 1.05  | 4 | 25.67 | 4.96  | 6 |
| 24.89 | 7.64  | 2 | 25.27 | 10.20 | 4 | 25.68 | 10.18 | 6 |
| 24.90 | 7.64  | 2 | 25.27 | 11.00 | 4 | 25.68 | 8.56  | 6 |
| 24.90 | 3.09  | 2 | 25.28 | 11.48 | 4 | 25.68 | 2.03  | 6 |
| 24.90 | 3.23  | 2 | 25.28 | 3.98  | 4 | 25.68 | 11.02 | 6 |
| 24.90 | 2.89  | 2 | 25.28 | 2.29  | 4 | 25.68 | 2.23  | 6 |
| 24.90 | 3.99  | 2 | 25.28 | 7.08  | 4 | 25.68 | 8.26  | 6 |
| 24.90 | 3.01  | 2 | 25.28 | 12.02 | 4 | 25.68 | 2.01  | 6 |
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| 24.90 | 3.84  | 2 | 25.28 | 9.09  | 4 | 25.69 | 10.83 | 6 |
| 24.90 | 2.99  | 2 | 25.29 | 0.00  | 4 | 25.69 | 1.92  | 6 |
| 24.90 | 5.35  | 2 | 25.29 | 6.44  | 4 | 25.69 | 10.87 | 6 |
| 24.91 | 13.02 | 2 | 25.29 | 0.97  | 4 | 25.69 | 8.91  | 6 |
| 24.91 | 3.48  | 2 | 25.29 | 10.33 | 4 | 25.69 | 6.79  | 6 |
| 24.91 | 9.22  | 2 | 25.29 | 1.41  | 4 | 25.69 | 5.04  | 6 |
| 24.91 | 14.20 | 2 | 25.29 | 8.41  | 4 | 25.69 | 1.79  | 6 |
| 24.91 | 1.06  | 2 | 25.29 | 0.91  | 4 | 25.70 | 9.34  | 6 |
| 24.91 | 1.96  | 2 | 25.29 | 0.99  | 4 | 25.70 | 9.14  | 6 |

|       |      |   |       |       |   |       |      |   |
|-------|------|---|-------|-------|---|-------|------|---|
| 24.91 | 3.88 | 2 | 25.29 | 3.36  | 4 | 25.70 | 3.44 | 6 |
| 24.91 | 5.97 | 2 | 25.29 | 8.39  | 4 | 25.70 | 1.75 | 6 |
| 24.91 | 1.68 | 2 | 25.30 | 6.26  | 4 | 25.70 | 6.37 | 6 |
| 24.91 | 1.74 | 2 | 25.30 | 13.22 | 4 | 25.70 | 6.97 | 6 |



I-20 West CRCP Sections

| <b>Section Number</b> | <b>MP From (mile)</b> | <b>MP To (mile)</b> | <b>Mean Spacing (m)</b> | <b>Mean Spacing (ft.)</b> |
|-----------------------|-----------------------|---------------------|-------------------------|---------------------------|
| 1.00                  | 28.25                 | 28.43               | 1.51                    | 4.95                      |
| 2.00                  | 28.43                 | 28.62               | 1.60                    | 5.25                      |
| 3.00                  | 28.62                 | 28.82               | 1.65                    | 5.41                      |
| 4.00                  | 28.82                 | 29.00               | 1.89                    | 6.19                      |
| 5.00                  | 29.00                 | 29.19               | 1.72                    | 5.64                      |
| 6.00                  | 29.19                 | 29.38               | 1.75                    | 5.74                      |
| 7.00                  | 29.38                 | 29.57               | 1.57                    | 5.17                      |
| 8.00                  | 29.57                 | 29.76               | 1.60                    | 5.25                      |
| 9.00                  | 29.76                 | 29.95               | 1.22                    | 4.01                      |
| 10.00                 | 29.95                 | 30.14               | 1.46                    | 4.79                      |
| 11.00                 | 30.14                 | 30.33               | 1.39                    | 4.56                      |
| 12.00                 | 30.33                 | 30.52               | 1.34                    | 4.39                      |
| 13.00                 | 30.52                 | 30.71               | 1.35                    | 4.43                      |
| 14.00                 | 30.71                 | 30.90               | 1.35                    | 4.44                      |
| 15.00                 | 30.90                 | 31.09               | 1.53                    | 5.02                      |
| 16.00                 | 31.09                 | 31.28               | 1.53                    | 5.02                      |
| 17.00                 | 31.28                 | 31.33               | 1.44                    | 4.74                      |

I-20 West CRCP Sections – Detailed Crack Spacing for First Six 1,000-ft Sections and Corresponding Histograms:

| Mile Post | Spacing (ft) | Section # | Mile Post | Spacing (ft) | Section # | Mile Post | Spacing (ft) | Section # |
|-----------|--------------|-----------|-----------|--------------|-----------|-----------|--------------|-----------|
| 28.25     |              | 1         | 28.59     | 1.20         | 2         | 28.99     | 0.96         | 4         |
| 28.25     | 1.48         | 1         | 28.59     | 1.04         | 2         | 28.99     | 1.60         | 4         |
| 28.25     | 3.83         | 1         | 28.59     | 8.67         | 2         | 28.99     | 4.76         | 4         |
| 28.25     | 6.45         | 1         | 28.59     | 4.16         | 2         | 28.99     | 3.62         | 4         |
| 28.25     | 6.23         | 1         | 28.60     | 7.69         | 2         | 28.99     | 9.64         | 4         |
| 28.25     | 6.50         | 1         | 28.60     | 1.70         | 2         | 28.99     | 1.42         | 4         |
| 28.25     | 1.69         | 1         | 28.60     | 10.25        | 2         | 29.00     | 12.02        | 4         |
| 28.25     | 9.47         | 1         | 28.60     | 4.21         | 2         | 29.00     | 10.04        | 4         |
| 28.25     | 6.00         | 1         | 28.60     | 6.76         | 2         | 29.00     | 16.17        | 4         |
| 28.25     | 4.04         | 1         | 28.60     | 9.49         | 2         | 29.00     | 1.47         | 4         |
| 28.25     | 5.03         | 1         | 28.60     | 2.36         | 2         | 29.00     | 9.75         | 5         |
| 28.26     | 11.72        | 1         | 28.60     | 3.10         | 2         | 29.00     | 3.04         | 5         |
| 28.26     | 9.18         | 1         | 28.61     | 16.23        | 2         | 29.00     | 2.07         | 5         |
| 28.26     | 1.14         | 1         | 28.61     | 3.87         | 2         | 29.00     | 3.36         | 5         |
| 28.26     | 1.35         | 1         | 28.61     | 12.26        | 2         | 29.01     | 2.92         | 5         |
| 28.26     | 1.22         | 1         | 28.61     | 1.27         | 2         | 29.01     | 4.04         | 5         |
| 28.26     | 3.45         | 1         | 28.61     | 11.91        | 2         | 29.01     | 5.55         | 5         |
| 28.26     | 4.93         | 1         | 28.61     | 5.28         | 2         | 29.01     | 2.31         | 5         |
| 28.26     | 4.18         | 1         | 28.61     | 5.26         | 2         | 29.01     | 2.10         | 5         |
| 28.26     | 5.71         | 1         | 28.61     | 1.17         | 2         | 29.01     | 1.70         | 5         |
| 28.26     | 4.64         | 1         | 28.61     | 2.66         | 2         | 29.01     | 1.83         | 5         |
| 28.26     | 5.46         | 1         | 28.62     | 12.23        | 2         | 29.01     | 7.00         | 5         |
| 28.27     | 4.27         | 1         | 28.62     | 6.78         | 2         | 29.01     | 9.26         | 5         |
| 28.27     | 4.87         | 1         | 28.62     | 13.08        | 2         | 29.01     | 8.82         | 5         |
| 28.27     | 6.35         | 1         | 28.62     | 1.45         | 2         | 29.01     | 1.95         | 5         |
| 28.27     | 7.12         | 1         | 28.62     | 5.27         | 2         | 29.01     | 1.70         | 5         |
| 28.27     | 4.75         | 1         | 28.62     | 5.64         | 2         | 29.02     | 11.96        | 5         |
| 28.27     | 4.40         | 1         | 28.62     | 0.73         | 2         | 29.02     | 1.70         | 5         |
| 28.27     | 6.40         | 1         | 28.62     | 7.79         | 3         | 29.02     | 3.19         | 5         |
| 28.27     | 4.49         | 1         | 28.63     | 7.68         | 3         | 29.02     | 7.79         | 5         |
| 28.27     | 3.79         | 1         | 28.63     | 12.09        | 3         | 29.02     | 9.78         | 5         |
| 28.28     | 7.17         | 1         | 28.63     | 3.83         | 3         | 29.02     | 1.91         | 5         |
| 28.28     | 7.57         | 1         | 28.63     | 23.73        | 3         | 29.02     | 12.07        | 5         |
| 28.28     | 1.02         | 1         | 28.63     | 1.52         | 3         | 29.02     | 7.70         | 5         |
| 28.28     | 10.25        | 1         | 28.63     | 1.99         | 3         | 29.03     | 3.91         | 5         |
| 28.28     | 7.58         | 1         | 28.63     | 3.40         | 3         | 29.03     | 11.52        | 5         |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 28.28 | 1.35  | 1 | 28.63 | 1.95  | 3 | 29.03 | 1.81  | 5 |
| 28.28 | 0.88  | 1 | 28.64 | 4.11  | 3 | 29.03 | 2.90  | 5 |
| 28.28 | 10.32 | 1 | 28.64 | 2.55  | 3 | 29.03 | 1.19  | 5 |
| 28.28 | 7.88  | 1 | 28.64 | 6.91  | 3 | 29.03 | 5.77  | 5 |
| 28.28 | 4.36  | 1 | 28.64 | 3.73  | 3 | 29.03 | 10.73 | 5 |
| 28.29 | 1.33  | 1 | 28.64 | 6.37  | 3 | 29.03 | 9.28  | 5 |
| 28.29 | 4.80  | 1 | 28.64 | 3.33  | 3 | 29.03 | 3.54  | 5 |
| 28.29 | 7.49  | 1 | 28.64 | 9.15  | 3 | 29.03 | 0.91  | 5 |
| 28.29 | 3.71  | 1 | 28.64 | 10.61 | 3 | 29.03 | 1.17  | 5 |
| 28.29 | 3.59  | 1 | 28.65 | 9.45  | 3 | 29.03 | 1.35  | 5 |
| 28.29 | 2.76  | 1 | 28.65 | 3.09  | 3 | 29.04 | 7.06  | 5 |
| 28.29 | 0.94  | 1 | 28.65 | 10.17 | 3 | 29.04 | 9.99  | 5 |
| 28.29 | 2.22  | 1 | 28.65 | 6.98  | 3 | 29.04 | 2.31  | 5 |
| 28.29 | 6.09  | 1 | 28.65 | 2.48  | 3 | 29.04 | 1.45  | 5 |
| 28.29 | 3.69  | 1 | 28.65 | 3.80  | 3 | 29.04 | 1.63  | 5 |
| 28.29 | 5.44  | 1 | 28.65 | 4.00  | 3 | 29.04 | 7.69  | 5 |
| 28.29 | 9.48  | 1 | 28.65 | 3.33  | 3 | 29.04 | 7.81  | 5 |
| 28.30 | 2.87  | 1 | 28.65 | 5.51  | 3 | 29.04 | 11.25 | 5 |
| 28.30 | 8.49  | 1 | 28.65 | 2.83  | 3 | 29.04 | 3.69  | 5 |
| 28.30 | 9.06  | 1 | 28.66 | 11.69 | 3 | 29.05 | 7.04  | 5 |
| 28.30 | 5.30  | 1 | 28.66 | 7.72  | 3 | 29.05 | 8.11  | 5 |
| 28.30 | 3.99  | 1 | 28.66 | 6.33  | 3 | 29.05 | 2.22  | 5 |
| 28.30 | 1.98  | 1 | 28.66 | 5.49  | 3 | 29.05 | 8.73  | 5 |
| 28.30 | 4.82  | 1 | 28.66 | 8.49  | 3 | 29.05 | 10.17 | 5 |
| 28.30 | 2.21  | 1 | 28.66 | 1.45  | 3 | 29.05 | 7.24  | 5 |
| 28.30 | 2.08  | 1 | 28.66 | 1.51  | 3 | 29.05 | 8.04  | 5 |
| 28.31 | 15.44 | 1 | 28.66 | 8.47  | 3 | 29.05 | 1.45  | 5 |
| 28.31 | 1.26  | 1 | 28.67 | 10.81 | 3 | 29.06 | 7.10  | 5 |
| 28.31 | 2.68  | 1 | 28.67 | 4.71  | 3 | 29.06 | 2.78  | 5 |
| 28.31 | 6.03  | 1 | 28.67 | 0.92  | 3 | 29.06 | 7.79  | 5 |
| 28.31 | 3.30  | 1 | 28.67 | 3.25  | 3 | 29.06 | 11.44 | 5 |
| 28.31 | 2.32  | 1 | 28.67 | 2.05  | 3 | 29.06 | 9.90  | 5 |
| 28.31 | 6.52  | 1 | 28.67 | 4.11  | 3 | 29.06 | 0.89  | 5 |
| 28.31 | 1.44  | 1 | 28.67 | 6.94  | 3 | 29.06 | 2.65  | 5 |
| 28.31 | 6.93  | 1 | 28.67 | 7.29  | 3 | 29.06 | 9.09  | 5 |
| 28.31 | 9.79  | 1 | 28.67 | 9.87  | 3 | 29.07 | 5.16  | 5 |
| 28.31 | 2.56  | 1 | 28.67 | 10.95 | 3 | 29.07 | 12.47 | 5 |
| 28.31 | 7.91  | 1 | 28.68 | 1.27  | 3 | 29.07 | 10.92 | 5 |
| 28.32 | 3.43  | 1 | 28.68 | 1.26  | 3 | 29.07 | 6.80  | 5 |
| 28.32 | 4.18  | 1 | 28.68 | 1.79  | 3 | 29.07 | 4.78  | 5 |
| 28.32 | 4.93  | 1 | 28.68 | 7.86  | 3 | 29.07 | 3.64  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 28.32 | 9.27  | 1 | 28.68 | 7.36  | 3 | 29.07 | 1.74  | 5 |
| 28.32 | 6.99  | 1 | 28.68 | 9.46  | 3 | 29.08 | 14.79 | 5 |
| 28.32 | 11.31 | 1 | 28.68 | 5.69  | 3 | 29.08 | 1.07  | 5 |
| 28.32 | 3.18  | 1 | 28.68 | 1.22  | 3 | 29.08 | 7.90  | 5 |
| 28.32 | 2.31  | 1 | 28.68 | 1.58  | 3 | 29.08 | 1.63  | 5 |
| 28.32 | 2.18  | 1 | 28.68 | 7.97  | 3 | 29.08 | 8.05  | 5 |
| 28.33 | 6.25  | 1 | 28.68 | 2.24  | 3 | 29.08 | 2.42  | 5 |
| 28.33 | 2.53  | 1 | 28.69 | 6.84  | 3 | 29.08 | 9.33  | 5 |
| 28.33 | 7.10  | 1 | 28.69 | 11.04 | 3 | 29.08 | 11.05 | 5 |
| 28.33 | 1.55  | 1 | 28.69 | 1.27  | 3 | 29.09 | 8.31  | 5 |
| 28.33 | 4.98  | 1 | 28.69 | 5.91  | 3 | 29.09 | 8.51  | 5 |
| 28.33 | 6.59  | 1 | 28.69 | 3.60  | 3 | 29.09 | 3.13  | 5 |
| 28.33 | 12.37 | 1 | 28.69 | 8.01  | 3 | 29.09 | 7.42  | 5 |
| 28.33 | 2.96  | 1 | 28.69 | 3.73  | 3 | 29.09 | 8.54  | 5 |
| 28.33 | 2.26  | 1 | 28.69 | 6.54  | 3 | 29.09 | 1.09  | 5 |
| 28.33 | 2.92  | 1 | 28.69 | 1.13  | 3 | 29.09 | 1.08  | 5 |
| 28.33 | 3.83  | 1 | 28.69 | 7.38  | 3 | 29.09 | 12.21 | 5 |
| 28.34 | 6.66  | 1 | 28.69 | 2.01  | 3 | 29.10 | 22.97 | 5 |
| 28.34 | 1.04  | 1 | 28.70 | 1.87  | 3 | 29.10 | 1.54  | 5 |
| 28.34 | 4.38  | 1 | 28.70 | 0.60  | 3 | 29.10 | 1.51  | 5 |
| 28.34 | 3.74  | 1 | 28.70 | 1.35  | 3 | 29.10 | 9.76  | 5 |
| 28.34 | 5.55  | 1 | 28.70 | 2.30  | 3 | 29.10 | 10.63 | 5 |
| 28.34 | 10.14 | 1 | 28.70 | 5.51  | 3 | 29.10 | 4.81  | 5 |
| 28.34 | 3.28  | 1 | 28.70 | 3.96  | 3 | 29.10 | 3.10  | 5 |
| 28.34 | 5.52  | 1 | 28.70 | 7.13  | 3 | 29.10 | 1.00  | 5 |
| 28.34 | 7.84  | 1 | 28.70 | 4.87  | 3 | 29.11 | 11.10 | 5 |
| 28.34 | 3.24  | 1 | 28.70 | 4.67  | 3 | 29.11 | 1.56  | 5 |
| 28.34 | 5.04  | 1 | 28.70 | 6.20  | 3 | 29.11 | 10.71 | 5 |
| 28.35 | 9.46  | 1 | 28.70 | 5.33  | 3 | 29.11 | 1.14  | 5 |
| 28.35 | 1.43  | 1 | 28.70 | 2.84  | 3 | 29.11 | 10.42 | 5 |
| 28.35 | 9.12  | 1 | 28.70 | 3.84  | 3 | 29.11 | 5.31  | 5 |
| 28.35 | 3.33  | 1 | 28.70 | 2.17  | 3 | 29.11 | 1.42  | 5 |
| 28.35 | 1.94  | 1 | 28.71 | 7.21  | 3 | 29.11 | 8.19  | 5 |
| 28.35 | 0.89  | 1 | 28.71 | 4.30  | 3 | 29.11 | 7.07  | 5 |
| 28.35 | 4.32  | 1 | 28.71 | 4.53  | 3 | 29.12 | 8.02  | 5 |
| 28.35 | 5.15  | 1 | 28.71 | 7.52  | 3 | 29.12 | 9.72  | 5 |
| 28.35 | 1.72  | 1 | 28.71 | 1.69  | 3 | 29.12 | 0.85  | 5 |
| 28.35 | 2.35  | 1 | 28.71 | 2.11  | 3 | 29.12 | 1.20  | 5 |
| 28.35 | 7.55  | 1 | 28.71 | 2.52  | 3 | 29.12 | 6.33  | 5 |
| 28.35 | 5.79  | 1 | 28.71 | 1.88  | 3 | 29.12 | 2.09  | 5 |
| 28.35 | 0.94  | 1 | 28.71 | 6.24  | 3 | 29.12 | 1.23  | 5 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 28.36 | 11.59 | 1 | 28.71 | 1.40  | 3 | 29.12 | 8.59  | 5 |
| 28.36 | 7.48  | 1 | 28.71 | 2.59  | 3 | 29.12 | 1.64  | 5 |
| 28.36 | 2.98  | 1 | 28.71 | 2.56  | 3 | 29.12 | 14.56 | 5 |
| 28.36 | 6.16  | 1 | 28.71 | 0.97  | 3 | 29.13 | 12.62 | 5 |
| 28.36 | 4.87  | 1 | 28.72 | 12.08 | 3 | 29.13 | 3.70  | 5 |
| 28.36 | 1.50  | 1 | 28.72 | 7.08  | 3 | 29.13 | 9.34  | 5 |
| 28.36 | 5.02  | 1 | 28.72 | 1.64  | 3 | 29.13 | 2.54  | 5 |
| 28.36 | 4.55  | 1 | 28.72 | 3.54  | 3 | 29.13 | 1.27  | 5 |
| 28.37 | 14.70 | 1 | 28.72 | 4.00  | 3 | 29.13 | 5.94  | 5 |
| 28.37 | 1.76  | 1 | 28.72 | 3.50  | 3 | 29.13 | 1.29  | 5 |
| 28.37 | 3.93  | 1 | 28.72 | 6.35  | 3 | 29.13 | 1.29  | 5 |
| 28.37 | 6.67  | 1 | 28.72 | 5.87  | 3 | 29.13 | 11.41 | 5 |
| 28.37 | 4.37  | 1 | 28.72 | 8.35  | 3 | 29.14 | 7.90  | 5 |
| 28.37 | 1.79  | 1 | 28.72 | 7.81  | 3 | 29.14 | 6.04  | 5 |
| 28.37 | 8.06  | 1 | 28.73 | 8.87  | 3 | 29.14 | 1.97  | 5 |
| 28.37 | 6.13  | 1 | 28.73 | 4.83  | 3 | 29.14 | 7.16  | 5 |
| 28.37 | 5.50  | 1 | 28.73 | 2.65  | 3 | 29.14 | 4.79  | 5 |
| 28.37 | 1.04  | 1 | 28.73 | 6.49  | 3 | 29.14 | 6.77  | 5 |
| 28.37 | 7.85  | 1 | 28.73 | 9.13  | 3 | 29.14 | 1.04  | 5 |
| 28.38 | 4.55  | 1 | 28.73 | 1.16  | 3 | 29.14 | 1.86  | 5 |
| 28.38 | 7.70  | 1 | 28.73 | 2.42  | 3 | 29.14 | 9.53  | 5 |
| 28.38 | 8.82  | 1 | 28.73 | 7.91  | 3 | 29.14 | 9.38  | 5 |
| 28.38 | 8.31  | 1 | 28.73 | 7.19  | 3 | 29.15 | 6.95  | 5 |
| 28.38 | 3.07  | 1 | 28.73 | 2.04  | 3 | 29.15 | 2.46  | 5 |
| 28.38 | 1.31  | 1 | 28.74 | 6.17  | 3 | 29.15 | 3.01  | 5 |
| 28.38 | 6.29  | 1 | 28.74 | 9.63  | 3 | 29.15 | 5.39  | 5 |
| 28.38 | 2.88  | 1 | 28.74 | 6.57  | 3 | 29.15 | 1.32  | 5 |
| 28.38 | 5.00  | 1 | 28.74 | 8.94  | 3 | 29.15 | 2.03  | 5 |
| 28.39 | 8.95  | 1 | 28.74 | 8.20  | 3 | 29.15 | 4.62  | 5 |
| 28.39 | 4.71  | 1 | 28.74 | 10.59 | 3 | 29.15 | 3.83  | 5 |
| 28.39 | 3.04  | 1 | 28.74 | 1.43  | 3 | 29.15 | 6.09  | 5 |
| 28.39 | 1.13  | 1 | 28.74 | 2.12  | 3 | 29.15 | 3.62  | 5 |
| 28.39 | 3.38  | 1 | 28.75 | 11.16 | 3 | 29.15 | 12.49 | 5 |
| 28.39 | 1.72  | 1 | 28.75 | 9.86  | 3 | 29.16 | 7.49  | 5 |
| 28.39 | 4.27  | 1 | 28.75 | 9.17  | 3 | 29.16 | 5.99  | 5 |
| 28.39 | 1.91  | 1 | 28.75 | 8.74  | 3 | 29.16 | 7.88  | 5 |
| 28.39 | 3.82  | 1 | 28.75 | 6.09  | 3 | 29.16 | 4.31  | 5 |
| 28.39 | 5.57  | 1 | 28.75 | 0.89  | 3 | 29.16 | 2.70  | 5 |
| 28.39 | 2.46  | 1 | 28.75 | 1.38  | 3 | 29.16 | 2.28  | 5 |
| 28.39 | 2.50  | 1 | 28.76 | 11.93 | 3 | 29.16 | 1.44  | 5 |
| 28.39 | 8.71  | 1 | 28.76 | 1.40  | 3 | 29.16 | 1.75  | 5 |

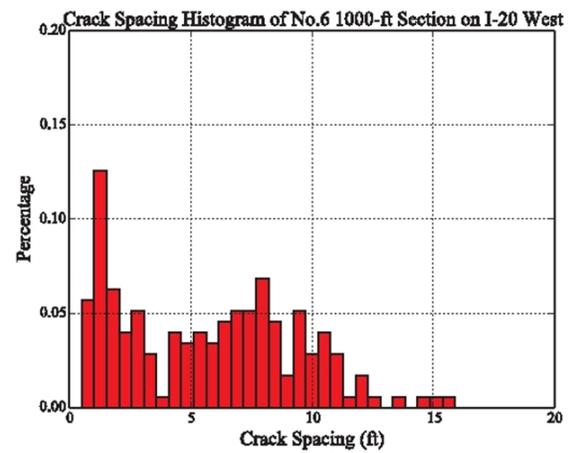
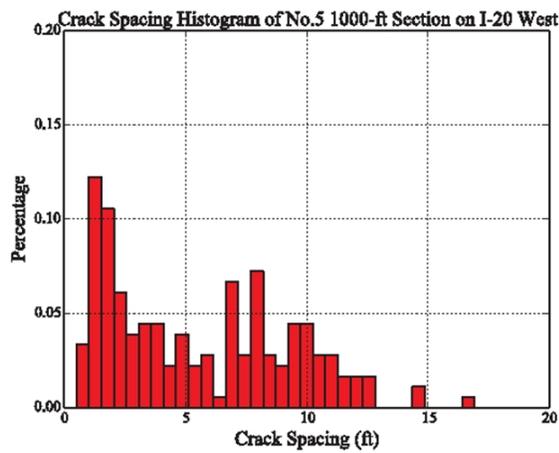
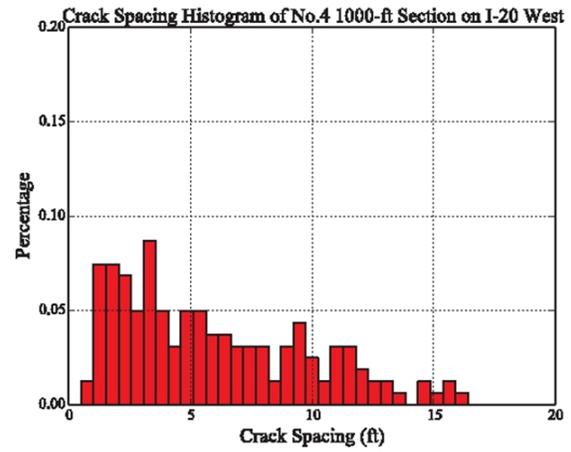
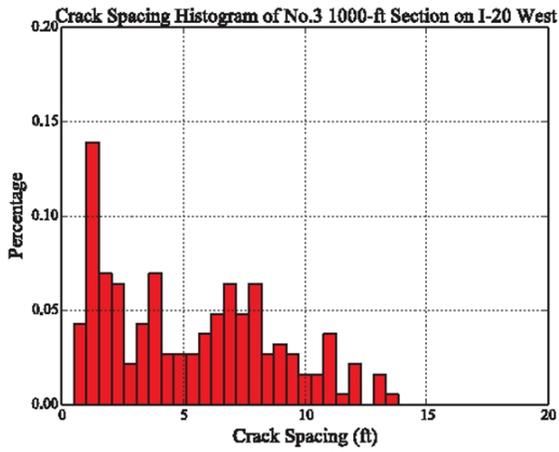
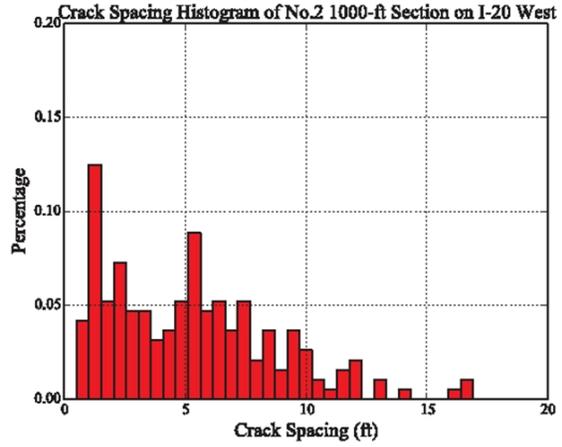
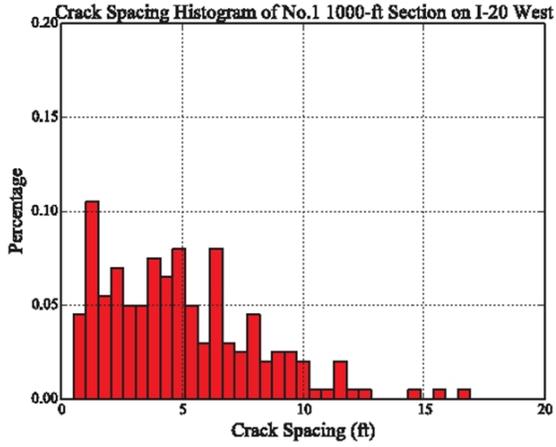
|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 28.39 | 0.85  | 1 | 28.76 | 8.62  | 3 | 29.16 | 6.92  | 5 |
| 28.39 | 1.31  | 1 | 28.76 | 7.81  | 3 | 29.16 | 8.04  | 5 |
| 28.39 | 3.42  | 1 | 28.76 | 1.16  | 3 | 29.16 | 3.18  | 5 |
| 28.40 | 3.86  | 1 | 28.76 | 9.38  | 3 | 29.17 | 4.95  | 5 |
| 28.40 | 1.42  | 1 | 28.76 | 1.16  | 3 | 29.17 | 7.07  | 5 |
| 28.40 | 1.25  | 1 | 28.76 | 2.18  | 3 | 29.17 | 3.50  | 5 |
| 28.40 | 4.85  | 1 | 28.76 | 1.12  | 3 | 29.17 | 1.05  | 5 |
| 28.40 | 4.75  | 1 | 28.76 | 3.33  | 3 | 29.17 | 0.87  | 5 |
| 28.40 | 10.23 | 1 | 28.76 | 7.07  | 3 | 29.17 | 0.74  | 5 |
| 28.40 | 4.33  | 1 | 28.77 | 11.97 | 3 | 29.17 | 1.51  | 5 |
| 28.40 | 3.79  | 1 | 28.77 | 4.22  | 3 | 29.17 | 4.71  | 5 |
| 28.40 | 3.08  | 1 | 28.77 | 6.80  | 3 | 29.17 | 3.89  | 5 |
| 28.40 | 5.55  | 1 | 28.77 | 1.04  | 3 | 29.17 | 16.64 | 5 |
| 28.40 | 2.22  | 1 | 28.77 | 1.00  | 3 | 29.17 | 7.47  | 5 |
| 28.40 | 1.49  | 1 | 28.77 | 0.93  | 3 | 29.18 | 4.37  | 5 |
| 28.40 | 0.89  | 1 | 28.77 | 12.83 | 3 | 29.18 | 2.31  | 5 |
| 28.40 | 1.75  | 1 | 28.77 | 5.74  | 3 | 29.18 | 4.60  | 5 |
| 28.40 | 2.13  | 1 | 28.77 | 11.27 | 3 | 29.18 | 3.18  | 5 |
| 28.41 | 6.17  | 1 | 28.78 | 1.13  | 3 | 29.18 | 8.47  | 5 |
| 28.41 | 8.41  | 1 | 28.78 | 12.96 | 3 | 29.18 | 9.51  | 5 |
| 28.41 | 2.05  | 1 | 28.78 | 2.24  | 3 | 29.18 | 6.69  | 5 |
| 28.41 | 11.55 | 1 | 28.78 | 9.52  | 3 | 29.18 | 4.26  | 5 |
| 28.41 | 11.07 | 1 | 28.78 | 4.99  | 3 | 29.18 | 10.06 | 5 |
| 28.41 | 6.61  | 1 | 28.78 | 2.00  | 3 | 29.18 | 1.97  | 5 |
| 28.41 | 1.12  | 1 | 28.78 | 7.11  | 3 | 29.19 | 1.82  | 5 |
| 28.41 | 3.02  | 1 | 28.78 | 10.84 | 3 | 29.19 | 4.82  | 5 |
| 28.42 | 6.19  | 1 | 28.79 | 8.02  | 3 | 29.19 | 10.32 | 5 |
| 28.42 | 6.64  | 1 | 28.79 | 7.75  | 3 | 29.19 | 8.77  | 5 |
| 28.42 | 5.55  | 1 | 28.79 | 1.00  | 3 | 29.19 | 11.06 | 5 |
| 28.42 | 7.87  | 1 | 28.79 | 1.08  | 3 | 29.19 | 1.31  | 5 |
| 28.42 | 16.84 | 1 | 28.79 | 1.16  | 3 | 29.19 | 5.56  | 6 |
| 28.42 | 6.43  | 1 | 28.79 | 1.17  | 3 | 29.19 | 1.65  | 6 |
| 28.43 | 7.74  | 1 | 28.79 | 5.69  | 3 | 29.19 | 2.87  | 6 |
| 28.43 | 12.25 | 1 | 28.79 | 3.62  | 3 | 29.20 | 7.57  | 6 |
| 28.43 | 3.79  | 1 | 28.79 | 6.85  | 3 | 29.20 | 4.30  | 6 |
| 28.43 | 3.79  | 1 | 28.79 | 5.42  | 3 | 29.20 | 1.44  | 6 |
| 28.43 | 9.42  | 1 | 28.79 | 4.10  | 3 | 29.20 | 6.18  | 6 |
| 28.43 | 1.51  | 1 | 28.79 | 6.99  | 3 | 29.20 | 12.13 | 6 |
| 28.43 | 0.74  | 1 | 28.79 | 1.47  | 3 | 29.20 | 1.19  | 6 |
| 28.43 | 0.76  | 1 | 28.80 | 4.05  | 3 | 29.20 | 12.06 | 6 |
| 28.43 | 8.05  | 1 | 28.80 | 3.98  | 3 | 29.20 | 6.64  | 6 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 28.43 | 1.24  | 1 | 28.80 | 8.30  | 3 | 29.21 | 8.84  | 6 |
| 28.43 | 10.00 | 2 | 28.80 | 0.81  | 3 | 29.21 | 6.21  | 6 |
| 28.44 | 4.25  | 2 | 28.80 | 7.61  | 3 | 29.21 | 9.33  | 6 |
| 28.44 | 6.78  | 2 | 28.80 | 6.67  | 3 | 29.21 | 1.14  | 6 |
| 28.44 | 6.24  | 2 | 28.80 | 1.13  | 3 | 29.21 | 12.15 | 6 |
| 28.44 | 3.26  | 2 | 28.80 | 1.29  | 3 | 29.21 | 6.57  | 6 |
| 28.44 | 8.97  | 2 | 28.80 | 13.02 | 3 | 29.21 | 1.95  | 6 |
| 28.44 | 7.12  | 2 | 28.80 | 1.54  | 3 | 29.21 | 7.84  | 6 |
| 28.44 | 5.45  | 2 | 28.80 | 1.36  | 3 | 29.21 | 2.95  | 6 |
| 28.44 | 7.44  | 2 | 28.81 | 5.91  | 3 | 29.21 | 1.25  | 6 |
| 28.45 | 9.53  | 2 | 28.81 | 10.59 | 3 | 29.22 | 1.52  | 6 |
| 28.45 | 1.31  | 2 | 28.81 | 13.68 | 3 | 29.22 | 1.40  | 6 |
| 28.45 | 4.31  | 2 | 28.81 | 7.47  | 3 | 29.22 | 7.26  | 6 |
| 28.45 | 3.42  | 2 | 28.81 | 11.12 | 3 | 29.22 | 2.23  | 6 |
| 28.45 | 6.52  | 2 | 28.82 | 9.08  | 4 | 29.22 | 2.31  | 6 |
| 28.45 | 4.69  | 2 | 28.82 | 5.34  | 4 | 29.22 | 9.98  | 6 |
| 28.45 | 7.10  | 2 | 28.82 | 11.50 | 4 | 29.22 | 0.87  | 6 |
| 28.45 | 6.43  | 2 | 28.82 | 1.15  | 4 | 29.22 | 7.64  | 6 |
| 28.45 | 2.21  | 2 | 28.82 | 8.10  | 4 | 29.22 | 1.74  | 6 |
| 28.45 | 1.03  | 2 | 28.82 | 8.01  | 4 | 29.22 | 7.72  | 6 |
| 28.45 | 4.94  | 2 | 28.82 | 13.23 | 4 | 29.22 | 6.19  | 6 |
| 28.45 | 5.13  | 2 | 28.83 | 9.57  | 4 | 29.22 | 1.78  | 6 |
| 28.46 | 2.08  | 2 | 28.83 | 1.62  | 4 | 29.23 | 8.20  | 6 |
| 28.46 | 4.64  | 2 | 28.83 | 11.65 | 4 | 29.23 | 5.70  | 6 |
| 28.46 | 6.21  | 2 | 28.83 | 1.99  | 4 | 29.23 | 0.78  | 6 |
| 28.46 | 12.23 | 2 | 28.83 | 1.44  | 4 | 29.23 | 4.82  | 6 |
| 28.46 | 4.73  | 2 | 28.83 | 8.49  | 4 | 29.23 | 5.32  | 6 |
| 28.46 | 6.32  | 2 | 28.83 | 9.89  | 4 | 29.23 | 1.18  | 6 |
| 28.46 | 1.09  | 2 | 28.84 | 26.40 | 4 | 29.23 | 10.96 | 6 |
| 28.46 | 7.42  | 2 | 28.84 | 1.11  | 4 | 29.23 | 13.61 | 6 |
| 28.46 | 6.94  | 2 | 28.84 | 10.76 | 4 | 29.24 | 9.62  | 6 |
| 28.47 | 8.57  | 2 | 28.84 | 6.18  | 4 | 29.24 | 7.29  | 6 |
| 28.47 | 2.67  | 2 | 28.84 | 8.84  | 4 | 29.24 | 0.69  | 6 |
| 28.47 | 6.08  | 2 | 28.84 | 12.10 | 4 | 29.24 | 7.90  | 6 |
| 28.47 | 4.79  | 2 | 28.85 | 9.63  | 4 | 29.24 | 4.78  | 6 |
| 28.47 | 4.79  | 2 | 28.85 | 2.85  | 4 | 29.24 | 8.14  | 6 |
| 28.47 | 5.41  | 2 | 28.85 | 12.94 | 4 | 29.24 | 4.54  | 6 |
| 28.47 | 8.52  | 2 | 28.85 | 1.29  | 4 | 29.24 | 6.84  | 6 |
| 28.47 | 9.32  | 2 | 28.85 | 3.47  | 4 | 29.25 | 8.90  | 6 |
| 28.48 | 10.61 | 2 | 28.85 | 6.86  | 4 | 29.25 | 8.45  | 6 |
| 28.48 | 6.25  | 2 | 28.85 | 3.51  | 4 | 29.25 | 9.43  | 6 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 28.48 | 5.24  | 2 | 28.85 | 2.18  | 4 | 29.25 | 15.41 | 6 |
| 28.48 | 5.19  | 2 | 28.86 | 11.67 | 4 | 29.25 | 9.40  | 6 |
| 28.48 | 1.65  | 2 | 28.86 | 4.58  | 4 | 29.25 | 5.99  | 6 |
| 28.48 | 5.83  | 2 | 28.86 | 5.23  | 4 | 29.26 | 8.57  | 6 |
| 28.48 | 1.60  | 2 | 28.86 | 5.81  | 4 | 29.26 | 2.28  | 6 |
| 28.48 | 2.55  | 2 | 28.86 | 11.00 | 4 | 29.26 | 5.83  | 6 |
| 28.48 | 1.49  | 2 | 28.86 | 0.85  | 4 | 29.26 | 1.18  | 6 |
| 28.48 | 1.16  | 2 | 28.86 | 9.23  | 4 | 29.26 | 1.17  | 6 |
| 28.48 | 6.01  | 2 | 28.86 | 5.85  | 4 | 29.26 | 7.11  | 6 |
| 28.48 | 3.11  | 2 | 28.86 | 3.14  | 4 | 29.26 | 1.55  | 6 |
| 28.48 | 5.38  | 2 | 28.86 | 3.73  | 4 | 29.26 | 4.91  | 6 |
| 28.49 | 5.55  | 2 | 28.86 | 1.64  | 4 | 29.26 | 1.09  | 6 |
| 28.49 | 3.39  | 2 | 28.87 | 1.58  | 4 | 29.26 | 6.10  | 6 |
| 28.49 | 1.23  | 2 | 28.87 | 11.59 | 4 | 29.26 | 7.13  | 6 |
| 28.49 | 16.70 | 2 | 28.87 | 15.70 | 4 | 29.27 | 12.69 | 6 |
| 28.49 | 2.41  | 2 | 28.87 | 1.56  | 4 | 29.27 | 1.46  | 6 |
| 28.49 | 2.05  | 2 | 28.87 | 14.87 | 4 | 29.27 | 7.54  | 6 |
| 28.49 | 8.37  | 2 | 28.88 | 14.70 | 4 | 29.27 | 9.89  | 6 |
| 28.49 | 4.09  | 2 | 28.88 | 6.40  | 4 | 29.27 | 7.93  | 6 |
| 28.49 | 7.53  | 2 | 28.88 | 6.48  | 4 | 29.27 | 9.62  | 6 |
| 28.50 | 3.43  | 2 | 28.88 | 4.93  | 4 | 29.27 | 8.72  | 6 |
| 28.50 | 4.70  | 2 | 28.88 | 5.27  | 4 | 29.28 | 8.01  | 6 |
| 28.50 | 4.40  | 2 | 28.88 | 11.13 | 4 | 29.28 | 11.09 | 6 |
| 28.50 | 2.47  | 2 | 28.88 | 11.52 | 4 | 29.28 | 1.01  | 6 |
| 28.50 | 5.93  | 2 | 28.89 | 3.06  | 4 | 29.28 | 1.07  | 6 |
| 28.50 | 7.27  | 2 | 28.89 | 5.30  | 4 | 29.28 | 14.45 | 6 |
| 28.50 | 7.44  | 2 | 28.89 | 6.47  | 4 | 29.28 | 4.20  | 6 |
| 28.50 | 6.98  | 2 | 28.89 | 3.63  | 4 | 29.28 | 4.95  | 6 |
| 28.50 | 1.14  | 2 | 28.89 | 10.82 | 4 | 29.28 | 1.29  | 6 |
| 28.50 | 1.12  | 2 | 28.89 | 7.86  | 4 | 29.28 | 0.97  | 6 |
| 28.50 | 4.87  | 2 | 28.89 | 4.74  | 4 | 29.28 | 1.59  | 6 |
| 28.50 | 3.90  | 2 | 28.89 | 3.51  | 4 | 29.28 | 4.63  | 6 |
| 28.51 | 2.29  | 2 | 28.89 | 6.67  | 4 | 29.28 | 2.84  | 6 |
| 28.51 | 4.74  | 2 | 28.90 | 8.88  | 4 | 29.29 | 2.65  | 6 |
| 28.51 | 3.65  | 2 | 28.90 | 3.91  | 4 | 29.29 | 7.17  | 6 |
| 28.51 | 2.02  | 2 | 28.90 | 4.56  | 4 | 29.29 | 7.90  | 6 |
| 28.51 | 1.33  | 2 | 28.90 | 3.84  | 4 | 29.29 | 5.44  | 6 |
| 28.51 | 5.27  | 2 | 28.90 | 5.44  | 4 | 29.29 | 3.14  | 6 |
| 28.51 | 5.19  | 2 | 28.90 | 5.30  | 4 | 29.29 | 3.50  | 6 |
| 28.51 | 5.90  | 2 | 28.90 | 13.42 | 4 | 29.29 | 1.05  | 6 |
| 28.51 | 9.25  | 2 | 28.90 | 3.06  | 4 | 29.29 | 0.96  | 6 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 28.51 | 9.80  | 2 | 28.91 | 12.65 | 4 | 29.29 | 11.14 | 6 |
| 28.51 | 0.62  | 2 | 28.91 | 7.94  | 4 | 29.29 | 1.38  | 6 |
| 28.52 | 7.80  | 2 | 28.91 | 10.93 | 4 | 29.30 | 11.51 | 6 |
| 28.52 | 2.34  | 2 | 28.91 | 3.78  | 4 | 29.30 | 1.49  | 6 |
| 28.52 | 6.04  | 2 | 28.91 | 9.63  | 4 | 29.30 | 10.32 | 6 |
| 28.52 | 1.89  | 2 | 28.91 | 1.89  | 4 | 29.30 | 8.13  | 6 |
| 28.52 | 11.56 | 2 | 28.91 | 3.53  | 4 | 29.30 | 5.14  | 6 |
| 28.52 | 9.64  | 2 | 28.91 | 5.94  | 4 | 29.30 | 6.14  | 6 |
| 28.52 | 0.98  | 2 | 28.91 | 1.23  | 4 | 29.30 | 7.26  | 6 |
| 28.52 | 7.44  | 2 | 28.92 | 3.14  | 4 | 29.30 | 2.64  | 6 |
| 28.52 | 2.35  | 2 | 28.92 | 8.80  | 4 | 29.30 | 1.99  | 6 |
| 28.52 | 6.18  | 2 | 28.92 | 4.62  | 4 | 29.30 | 6.82  | 6 |
| 28.53 | 1.23  | 2 | 28.92 | 1.76  | 4 | 29.31 | 6.80  | 6 |
| 28.53 | 5.83  | 2 | 28.92 | 6.06  | 4 | 29.31 | 9.28  | 6 |
| 28.53 | 8.47  | 2 | 28.92 | 4.68  | 4 | 29.31 | 7.68  | 6 |
| 28.53 | 2.66  | 2 | 28.92 | 2.29  | 4 | 29.31 | 2.06  | 6 |
| 28.53 | 8.24  | 2 | 28.92 | 3.36  | 4 | 29.31 | 1.90  | 6 |
| 28.53 | 4.09  | 2 | 28.92 | 3.58  | 4 | 29.31 | 3.23  | 6 |
| 28.53 | 3.83  | 2 | 28.92 | 3.05  | 4 | 29.31 | 2.87  | 6 |
| 28.53 | 8.99  | 2 | 28.92 | 2.39  | 4 | 29.31 | 10.65 | 6 |
| 28.53 | 5.26  | 2 | 28.92 | 9.28  | 4 | 29.31 | 1.46  | 6 |
| 28.54 | 6.61  | 2 | 28.93 | 7.44  | 4 | 29.32 | 10.59 | 6 |
| 28.54 | 2.24  | 2 | 28.93 | 1.09  | 4 | 29.32 | 1.10  | 6 |
| 28.54 | 8.36  | 2 | 28.93 | 3.52  | 4 | 29.32 | 9.66  | 6 |
| 28.54 | 9.55  | 2 | 28.93 | 4.58  | 4 | 29.32 | 1.54  | 6 |
| 28.54 | 2.56  | 2 | 28.93 | 3.15  | 4 | 29.32 | 10.21 | 6 |
| 28.54 | 6.64  | 2 | 28.93 | 3.77  | 4 | 29.32 | 3.82  | 6 |
| 28.54 | 2.40  | 2 | 28.93 | 7.47  | 4 | 29.32 | 10.58 | 6 |
| 28.54 | 3.09  | 2 | 28.93 | 4.49  | 4 | 29.32 | 9.24  | 6 |
| 28.54 | 2.81  | 2 | 28.93 | 6.74  | 4 | 29.33 | 5.70  | 6 |
| 28.54 | 13.08 | 2 | 28.93 | 2.38  | 4 | 29.33 | 3.14  | 6 |
| 28.55 | 2.26  | 2 | 28.93 | 2.31  | 4 | 29.33 | 2.39  | 6 |
| 28.55 | 1.11  | 2 | 28.94 | 11.03 | 4 | 29.33 | 9.68  | 6 |
| 28.55 | 3.32  | 2 | 28.94 | 9.85  | 4 | 29.33 | 0.75  | 6 |
| 28.55 | 9.06  | 2 | 28.94 | 10.18 | 4 | 29.33 | 0.90  | 6 |
| 28.55 | 5.45  | 2 | 28.94 | 2.65  | 4 | 29.33 | 8.61  | 6 |
| 28.55 | 2.08  | 2 | 28.94 | 2.17  | 4 | 29.33 | 8.67  | 6 |
| 28.55 | 3.36  | 2 | 28.94 | 5.58  | 4 | 29.33 | 0.96  | 6 |
| 28.55 | 6.54  | 2 | 28.94 | 1.94  | 4 | 29.33 | 4.56  | 6 |
| 28.55 | 9.41  | 2 | 28.94 | 4.10  | 4 | 29.33 | 2.89  | 6 |
| 28.55 | 7.46  | 2 | 28.94 | 6.08  | 4 | 29.33 | 7.62  | 6 |

|       |       |   |       |       |   |       |       |   |
|-------|-------|---|-------|-------|---|-------|-------|---|
| 28.56 | 4.64  | 2 | 28.95 | 24.26 | 4 | 29.34 | 10.36 | 6 |
| 28.56 | 2.93  | 2 | 28.95 | 8.47  | 4 | 29.34 | 8.48  | 6 |
| 28.56 | 7.32  | 2 | 28.95 | 3.43  | 4 | 29.34 | 4.67  | 6 |
| 28.56 | 1.32  | 2 | 28.95 | 2.39  | 4 | 29.34 | 4.18  | 6 |
| 28.56 | 1.46  | 2 | 28.95 | 6.03  | 4 | 29.34 | 8.04  | 6 |
| 28.56 | 14.13 | 2 | 28.95 | 7.65  | 4 | 29.34 | 1.81  | 6 |
| 28.56 | 1.23  | 2 | 28.96 | 7.01  | 4 | 29.34 | 1.45  | 6 |
| 28.56 | 8.12  | 2 | 28.96 | 1.60  | 4 | 29.35 | 15.01 | 6 |
| 28.56 | 11.73 | 2 | 28.96 | 1.93  | 4 | 29.35 | 7.07  | 6 |
| 28.56 | 2.03  | 2 | 28.96 | 1.16  | 4 | 29.35 | 10.93 | 6 |
| 28.57 | 1.60  | 2 | 28.96 | 15.84 | 4 | 29.35 | 6.83  | 6 |
| 28.57 | 9.85  | 2 | 28.96 | 3.30  | 4 | 29.35 | 0.87  | 6 |
| 28.57 | 2.84  | 2 | 28.96 | 14.66 | 4 | 29.35 | 1.68  | 6 |
| 28.57 | 1.07  | 2 | 28.96 | 4.53  | 4 | 29.35 | 4.36  | 6 |
| 28.57 | 1.78  | 2 | 28.96 | 3.49  | 4 | 29.35 | 2.69  | 6 |
| 28.57 | 0.96  | 2 | 28.97 | 5.31  | 4 | 29.35 | 10.34 | 6 |
| 28.57 | 0.88  | 2 | 28.97 | 5.10  | 4 | 29.35 | 2.66  | 6 |
| 28.57 | 2.57  | 2 | 28.97 | 6.26  | 4 | 29.36 | 7.44  | 6 |
| 28.57 | 4.15  | 2 | 28.97 | 12.29 | 4 | 29.36 | 1.21  | 6 |
| 28.57 | 6.09  | 2 | 28.97 | 2.92  | 4 | 29.36 | 3.42  | 6 |
| 28.57 | 10.61 | 2 | 28.97 | 2.08  | 4 | 29.36 | 6.28  | 6 |
| 28.57 | 7.81  | 2 | 28.97 | 1.24  | 4 | 29.36 | 1.97  | 6 |
| 28.58 | 11.26 | 2 | 28.97 | 7.17  | 4 | 29.36 | 6.75  | 6 |
| 28.58 | 0.85  | 2 | 28.97 | 1.23  | 4 | 29.36 | 1.53  | 6 |
| 28.58 | 0.84  | 2 | 28.97 | 7.05  | 4 | 29.36 | 8.18  | 6 |
| 28.58 | 5.55  | 2 | 28.97 | 1.57  | 4 | 29.36 | 2.07  | 6 |
| 28.58 | 7.59  | 2 | 28.97 | 3.43  | 4 | 29.36 | 2.36  | 6 |
| 28.58 | 2.31  | 2 | 28.98 | 10.64 | 4 | 29.36 | 10.98 | 6 |
| 28.58 | 1.53  | 2 | 28.98 | 7.28  | 4 | 29.37 | 8.22  | 6 |
| 28.58 | 1.04  | 2 | 28.98 | 2.72  | 4 | 29.37 | 9.17  | 6 |
| 28.58 | 1.78  | 2 | 28.98 | 7.63  | 4 | 29.37 | 8.56  | 6 |
| 28.58 | 7.82  | 2 | 28.98 | 9.37  | 4 | 29.37 | 7.74  | 6 |
| 28.58 | 0.77  | 2 | 28.98 | 2.19  | 4 | 29.37 | 5.28  | 6 |
| 28.58 | 11.30 | 2 | 28.98 | 2.74  | 4 | 29.37 | 6.52  | 6 |
| 28.58 | 1.31  | 2 | 28.98 | 7.76  | 4 | 29.37 | 4.23  | 6 |
| 28.58 | 1.30  | 2 | 28.98 | 2.26  | 4 | 29.37 | 5.20  | 6 |
| 28.59 | 16.53 | 2 | 28.99 | 4.79  | 4 | 29.38 | 6.25  | 6 |
| 28.59 | 4.18  | 2 | 28.99 | 12.48 | 4 | 29.38 | 10.07 | 6 |
| 28.59 | 5.90  | 2 | 28.99 | 4.82  | 4 | 29.38 | 10.16 | 6 |
| 28.59 | 5.46  | 2 | 28.99 | 2.33  | 4 | 29.38 | 10.35 | 6 |
| 28.59 | 2.73  | 2 | 28.99 | 1.05  | 4 |       |       |   |



### Appendix III LTPP GPS-5 CRCP Sections Crack Spacing Data

| Test Section ID | Age / year | Longitudinal percent steel | Base Type    | Average Crack Spacing / feet | Average Crack Spacing / m | Std. Dev. Crack Spacing /feet | Std. Dev. Crack Spacing /m | No. of Transverse Cracks |
|-----------------|------------|----------------------------|--------------|------------------------------|---------------------------|-------------------------------|----------------------------|--------------------------|
| IL-1            | 0.3        | 0.7                        | Perm. CTB    | 5.1                          | 1.55                      | 3.51                          | 1.07                       | 178                      |
| IL-2            | 15         | 0.59                       | CTB          | 4.22                         | 1.29                      | 2.66                          | 0.81                       | 240                      |
| IL-3            | 20         | 0.6                        | ATB          | 3.68                         | 1.12                      | 2.1                           | 0.64                       | 280                      |
| IL-4            | 20         | 0.6                        | ATB          | 2.13                         | 0.65                      | 1.17                          | 0.36                       | 472                      |
| IL-5            | 5          | 0.7                        | LCB          | 3.02                         | 0.92                      | 2.11                          | 0.64                       | 356                      |
| IA-1            | 20         | 0.65                       | CTB          | 5.89                         | 1.80                      | 3.87                          | 1.18                       | 168                      |
| IA-2            | 22         | 0.65                       | ATB          | 2.98                         | 0.91                      | 2.24                          | 0.68                       | 455                      |
| IA-3            | 15         | 0.65                       | ATB          | 2.98                         | 0.91                      | 1.76                          | 0.54                       | 439                      |
| OK-1            | 4          | 0.5                        | ATB          | 8.44                         | 2.57                      | 5.78                          | 1.76                       | 124                      |
| OK-2            | 5          | 0.5                        | ATB          | 4.57                         | 1.39                      | 3.37                          | 1.03                       | 230                      |
| OK-3            | 3          | 0.5                        | ATB          | 4.75                         | 1.45                      | 2.99                          | 0.91                       | 224                      |
| OK-4            | 7          | 0.5                        | Soil-asphalt | 6.36                         | 1.94                      | 3.21                          | 0.98                       | 146                      |
| OK-5            | 2          | 0.61                       | Perm. CTB    | 6.13                         | 1.87                      | 3.36                          | 1.02                       | 156                      |
| OR-1            | 7          | 0.6                        | Granular     | 4.02                         | 1.23                      | 2.1                           | 0.64                       | 305                      |
| OR-2            | 4          | 0.6                        | CTB          | 5.6                          | 1.71                      | 3.09                          | 0.94                       | 295                      |
| OR-3            | 20         | 0.54                       | CTB          | 4.43                         | 1.35                      | 2.72                          | 0.83                       | 225                      |
| PA-1            | 15         | 0.45                       | Granular     | 4.8                          | 1.46                      | 2.67                          | 0.81                       | 406                      |
| PA-2            | 22         | 0.55                       | Granular     | 4.32                         | 1.32                      | 2.47                          | 0.75                       | 256                      |
| WI-1            | 18         | 0.65                       | Granular     | 2.88                         | 0.88                      | 2.27                          | 0.69                       | 259                      |
| WI-2            | 6          | 0.67                       | Granular     | 2.9                          | 0.88                      | 1.42                          | 0.43                       | 344                      |
| WI-3            | 7          | 0.67                       | Granular     | 3.46                         | 1.05                      | 1.59                          | 0.48                       | 293                      |
| WI-4            | 7          | 0.67                       | Granular     | 4.58                         | 1.40                      | 2.22                          | 0.68                       | 225                      |
| WI-5            | 18         | 0.61                       | Granular     | 3.38                         | 1.03                      | 1.86                          | 0.57                       | 305                      |

## Appendix IV Images of Patching/Punchout on I-85 South

1. MP 55.1:



Captured in May 2013



Captured in May 2012

2. MP 55.5:



Captured in May 2013



Captured in May 2012

3. MP 55.5:



Captured in May 2013



Captured in May 2012

4. MP 55.5:



Captured in May 2013



Captured in May 2012

5. MP 55.7:



Captured in May 2013



Captured in May 2012

6. MP 55.8:



Captured in May 2013



Captured in May 2012

7. MP 55.8:



Captured in May 2013



Captured in May 2012

8. MP 55.8:



Captured in May 2013



Captured in May 2012

9. MP 55.9



Captured in May 2013



Captured in May 2012

10. MP 56.0



Captured in May 2013



Captured in May 2012