Project Report

Krishnapatnam Port Company Limited

Condition Pavement Strength Testing

for Port Roads

Using IRSM SWECO PRI2100 Falling Weight Deflectometer

24-May-2018 To 25-May -2018

Prepared By

INDIAN ROAD SURVEY & MANAGEMENT PVT. LTD.

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ISO 9001 Quality Management

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ACKNOWLEDGEMENTS

The Project was outsourced by M/s Krishnapatnam Port Company Limited to M/s Indian Road Survey & Management Pvt. Ltd. (IRSM), Chennai. We the team members whole heartedly thank, M/s Krishnapatnam Port Company Limited, M/s Vishwa Samudra Engineering Pvt Ltd, M/s Avani Ecoprojects Pvt Ltd and all Staff & Engineers for the opportunity and all their co-operation provided at the survey site and encouragement provided to complete this project successfully. We Thank Dr. A. Veeraragavan Sir from IIT Madras, for the extensive support during this project.

G. Parasuraman

Managing Director

Indian Road Survey & Management Pvt. Ltd

Contents

1. Introduction

Indian Road Survey and Management Pvt Ltd., (IRSM) has been selected to undertake the Structural Condition Survey using SWECO PRI2100 Falling Weight Deflectometer (FWD). The IRSM survey team has started the data collection on 24-May-2018. The survey team has collected the survey data in Krishnapatnam Port Roads.

IRSM's Falling Weight Deflectometer equipment was supplied and operated by IRSM staff and this report presents the technical methodology and factual data collected as part of this survey.

IRSM's, FWD collects data statically and can complete up to 30-40 test points per hour depending on the test spacing and traffic environment.

1.1. IRSM Company Profile

INDIAN ROAD SURVEY AND MANAGMENT (IRSM) is a 50-50 joint venture with ARRB Group Ltd Australia. IRSM is self-equipped with ARRB Australia make "HAWKEYE 2000 Professional Network Survey Vehicle" (NSV) and SWECO make "PRI2100 Falling Weight Deflectometer" (FWD) which are being regularly serviced and tested to guarantee a quality product.

IRSM has an experienced and professional team of trained engineers and technicians with appropriate training and relevant experience. As such, IRSM is the local provider capable of providing high quality Data Collection Services.

IRSM is an ISO 9001 for Quality assurance & ISO 39001 for Road Traffic Safety certified company which is first of its kind in India. This ensures a quality safely & on time delivery of project for client.

During the past 25 years, ARRB has built a reputation as premier automated pavement condition service providers in Australia and throughout the Asia region.

Given ARRB's experience in Automated Road Data Collection projects, IRSM is able to offer services that will provide the end user with a complete pavement condition and asset survey of the valuable road network. Our proven track record in projects of this type allows

us to offer experienced staff and proven equipment, culminating in quality results at an extremely low risk to the M/s Krishnapatnam Port Company Limited. We hope to work with M/s Krishnapatnam Port Company Limited, for a long term so that the organisation can benefit from our vast experience in collecting data over many road networks with IRSM's advance data acquisition and processing technology with the use of state-of-the-art Hawkeye 2000 Professional NSV and SWECO PRI2100 Falling Weight Deflectometer equipment.

As mentioned above, IRSM is a joint venture established in 2009 and has the full support of the two International Companies.

1.1.1. **Taisei International**

*M/s **Taisei International***, is a one stop shop for all NDT equipment's who have worked extensively in India providing various NDT equipment from a range of suppliers including ARRB, Cooper, Delta, Transtech Systems, Carl Bro Intelligent Solutions, Fuji Telcom and many more. Taisei International has wide range of equipment with trained engineers for customer support.

1.1.2. **ARRB Group**

ARRB Group is the leading Australian provider of value added research and technical services addressing transport problems.

The organisation employs over 200 staff who form a multi-disciplinary pool of highly qualified research professionals, experienced engineers, and specialist technical and support staff. ARRB Group has certified laboratory and testing facilities and has implemented a program to gain Quality Assurance certification.

ARRB Group has its headquarters in Melbourne, and offices in Perth, Brisbane, Adelaide, Sydney and Jakarta. ARRB has completed over 500 network level road condition surveys for a range of clients, including State Road Authorities, International customers, Local Government and Private Industries.

Choosing IRSM & ARRB to supply road data collection will provide you with the following benefits:

- ARRB is the preferred pavement data provider for Australian State Road Authorities and numerous local government authorities and regional road groups.
- IRSM & ARRB equipment is maintained to the highest standard being regularly serviced and tested to guarantee a quality product.
- IRSM & ARRB surveys are conducted by trained engineers, and technicians with the appropriate training and relevant experience.
- ARRB has dedicated quality procedures which are accredited by NATA and ISO 9001:2008

1.1.3. **Project Scope**

M/s Krishnapatnam Port Company Limited has constructed a few road sections using Stabilroad German Soil Stabilization technology by its principle contractor Vishwa Samudra Engineering Pvt Ltd with their technical partners Avani Ecoprojects Pvt Ltd, Hyderabad. M/s Krishnapatnam Port Company Limited, have outsourced work to **IRSM Pvt Ltd** for the Structural condition testing survey using the IRSM Falling Weight Deflectometer (FWD) and subsequent analysis is to ascertain the relative performance of the pavement of 2.8 km approx., in 6 different road section of Krishnapatnam Port.

Figure 1-1 Map of Project Corridor

1.1.4. **Data collection:**

After signing the contract, The IRSM FWD & Survey Crew was mobilized to site Krishnapatnam Port on 24-May-18 and completed data collection using IRSM FWD on 24-May-18 for the 2.8 km approx. in 6 different sections.

Advantage of Falling Weight Deflectometer Over BBD:

- FWD is Non-destructive test equipment for pavements
- FWD Imparts a dynamic load to a pavement structure Simulates a moving wheel load whereas BBD is Static.
- FWD Provides fast, non-destructive evaluation of pavements whereas BBD takes much time.
- FWD is safe operating on project site as it is compatible and can be operated inside vehicle and one test takes few seconds, so it is without much disturbance to moving traffic whereas on BBD it is not the case.
- FWD Provides information on condition of underlying pavement layers
- Benkelman beam can only measure the maximum deflection, but FWD can measure the exact shape of the deflected bowl. Two pavements may have same maximum deflection, but different shapes will perform differently.
    - We can back calculate the moduli values of the different pavement layers (by matching the measured and computed bowl ordinates using software) and these moduli values can be used to compute the stresses in different pavement layers using any pavement analysis software. Such analysis is not possible in a BBD.
- We can estimate the structural inadequacy and also calculate the residual life of pavements with FWD.
- BBD can do the test for pavements with relatively thin bituminous surfacing (but for the current pavements with high pavement thickness as well as bituminous layer thickness, we should resort to FWD.

IRSM have collected data and here presenting the reports on the current condition of various test sections and subsequent analysis is to ascertain the relative performance of the pavement in 6 different road section of Krishnapatnam Port which will help M/s

Krishnapatnam Port Company Limited, in its future planning related to the Road Infrastructure Development.

2. Methodology

IRSM's survey crew mobilized to the test locations following instruction to proceed and receipt of testing program details.

The collected raw data were handed over to IRSM's processing center in the IRSM's head office in Chennai. A series of processing tasks were completed including:

- Rationalization of network data for manipulating and generating a variety of reports
- Generating tabular reports and developing correlations between current condition and composition.
- Generating graphical reports of current pavement performance.

The FWD data collection has been collected below

1) Prepare the FWD unit for deflection testing
2) Bring the FWD to a stopped position at the beginning of the test section, centered on the outside wheel path (or specific position), and take a measurement by applying load using following sequence:
   a) One settling drop to ensure proper contact.
   b) Three drops with an applied load of 40 KN ± 10% (or Specified Load).
3) Deflections are recorded from the sensors located at the center of the loading plate for each drop except the settling drop.
4) Along with these deflection data, the parameter like Chainage, Temperature, Date and Time and position of Sensors will also be recorded.
5) After each measurement, drive the FWD forward to next measurement point.

During the data collection process, the testing patterns we have used the lined pattern. In this position, the Data Collection will be made in the same direction. For example: if the Measurement at the beginning of the section is taken on outside wheel path, then the next measurement has to be taken after moving to the specified interval

on same direction. While starting the adjacent lane, an offset distance is considered while starting and continued as stated earlier. Refer Figure 2-1 Data collection Pattern – Lined

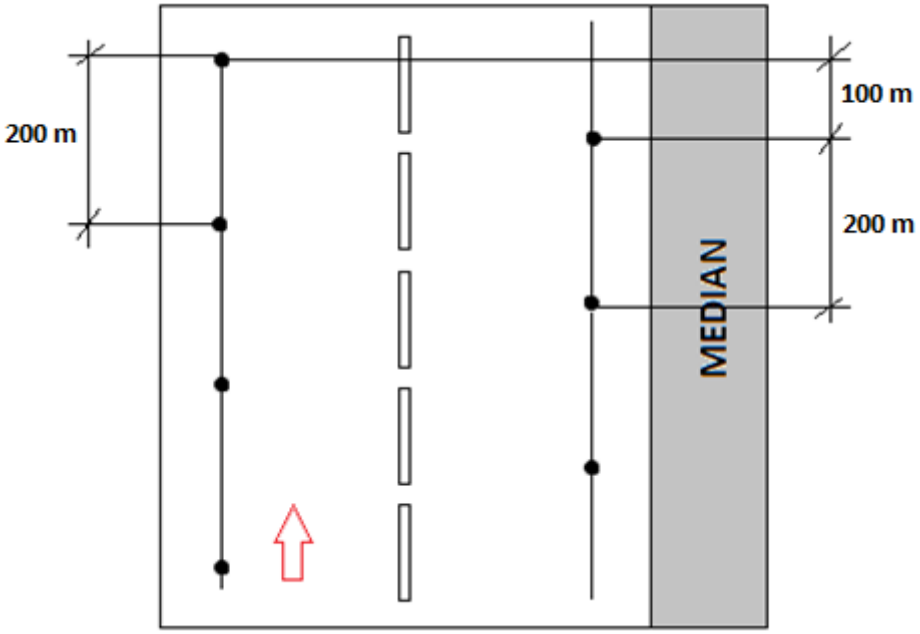

Figure 2-1 Data collection Pattern – Lined

2.1. FWD testing

IRSM has a SWECO PRI2100 FWD. This unit is fitted with a magnetic sensor-based odometer for linear reference. The odometer is capable of recording the chainage to an accuracy of 0.1 metre.

Specifically, the testing will be conducted with:

- Nine geophones to record the deflection bowl at 0, 200, 300, 450, 600, 900, 1200, 1500 and 1800mm from the center of the load.
- A testing cycle at each location which will comprise of a seating drop followed by at least one drop cycle for each target loading. The drop cycles are used to determine the repeatability of the deflection data at a test location.
- A load pulse applied through a 300mm diameter loading plate with 5mm of rubber.
- An operating system which is capable of being set to a predefined load for testing the pavement, in this case around 40 KN for flexible Pavement.

- Equipment which will electronically capture and store the location, load, deflection and temperature data for test cycle at each test location.
- An odometer capable of recording the chainage to an accuracy of 0.1 meter per kilometer or less.
- An infra-red thermometer which will be used to record the pavement temperature and a thermocouple based sensor that will measure air temperature.

Testing will be carried out at appropriate intervals.

The recording of location references will be undertaken in accordance with the client's requirements. This entails all chainages being recorded as the distance from the start of the link in the prescribed direction.

IRSM undertake field checks to ensure the quality of the data collected. The data collected at each test location should be checked prior to storing the results in the field. The minimum checks required are:

- The targeted loading of 60 KN/ 80KN is within the acceptable range of ± 10%.
- Valid deflections are recorded on each geophone.
- The deflections are decreasing – a check to ensure the deflections decrease with distance from the impact location.
- The deflection bowl readings are consistent for both test cycles of each target load – ensures only repeatable deflection data for a location is stored.

Here, in this site while trying with 40KN load, deflection is so lean and difficult to vary errors relating to formation the deflection bowl. Based on IRSM experience, FWD crew has adopted 60KN and 80KN load testing in alternate test locations and successfully executed survey.

The data collected will be checked during processing to ensure the field checks are met, the location referencing is correct and that all processing errors are eliminated. During the processing, checking will be undertaken to ensure the data delivered meets the defined requirements.

2.2. Description of Falling Weight Deflectometer

IRSM used a SWECO PRI 2100 Falling Weight Deflectometer. These units are a non-destructive pavement testing device which provides accurate data on the response of the pavement (specifically the surface deflection bowl) to dynamic loads by simulating actual wheel loads in both response and duration. This allows more accurate and rapid measurement of pavement deflection under load than traditional methods.

All testing is controlled by a personal computer which is located in the vehicle towing the FWD. As a result, only one operator is required to conduct a survey on most occasions making it less labour/ equipment intensive than traditional methods.

A dynamic load is generated by the dropping of a mass from a pre-set height onto a 300-mm diameter plate. The magnitude of the load and the pavement response are measured by a load cell and nine geophones. One geophone is located immediately under the load, whilst the others are located at variable offsets from the centre of the load.

The test load can be varied between 7 and 150 KN to meet the requirements of the particular task and the pavement response for up to four different magnitudes of load can be measured during any test sequence.

The offsets of the geophones can be set to any distance up to 1800 mm from the centre of the load and a typical sequence can be completed in approximately one minute. Highly accurate deflection bowl measurements are therefore possible and the FWD is very useful for carrying out large-scale pavement surveys.

This data can assist in applications such as pavement overlay design, pavement condition surveys and in the development and operation of Pavement Management Systems (PMS). It is also used as input in back-calculation of pavement Moduli packages such as ARRB's EFROMD2 or Dynatest's ELMOD6.

The FWD is integrally mounted on a trailer which is towed by a dedicated vehicle.

Figure 2-2 - IRSM's Falling Weight Deflectometer – PRI2100

The IRSM FWD and towing vehicle also contain all necessary equipment to perform the survey in a safe and efficient manner including clearly visible identification signs, double sided arrow boards and flashing lights for which a permit has been issued. The FWD can be equipped with GPS allowing for accurate location of test locations if required.

Confidence limits

Load cell accuracy	2% +/- 2 kPa (1kPa = 0.145 psi)
Load resolution	0.03 - 0.12 kN (7 - 26 lbf), magnitude dependent
Deflection range	2.0 mm (80 mil)
Deflector accuracy	2% +/- 2 microns (1 micron = 0.04 mil)
Deflector resolution	1 micron
Deflection random error	typically 1 - 2 microns (0.04 - 0.08 mil)
Deflection systematic error	+/- 2%
Distance Measuring Instrument	0.1%

Equipment Calibration Certificate

SWECO
Pavement Consultants

CERTIFICATE OF CALIBRATION

Owner:	IRSM	**Date of calibration:**	24-08-2017
Type no.:	PRI2100	**Next calibration, geophones:**	24-08-2018
Serial no.:	0711-210	**Next calibration, load cell:**	24-08-2018
		Calibrated by:	KVO

To Whom It May Concern:

We, Sweco, Pavement Consultants, Kokbjerg 5, DK-6000 Kolding, Denmark, hereby certify that FWD PRI 2100 with serial number 0711-210 property of IRSM has been calibrated and inspected on 24-08-2018 at the Sweco calibration station, Kokbjerg 5, DK-6000 Kolding, Denmark.

The calibration was performed in accordance with Crow and Sweco standard and. We confirm that a true and correct calibration has been achieved.

Calibration details appear from the calibration documents held by IRSM

Traceability:

The calibration is traceable through calibration Equipment:
(FHWA-LTPP Calibration Equipment)

Keithley KUSB DAQ board S/N: 1142332
Reference Load Cell S/N: HBM No. 283AE0/283ADP/283AE3
Silicon Designs ± 5g Accelerometer S/N: 9087

With ref to AMRL certificate, issued by AASHTO Materials Reference Laboratory, US. and certificate no: 9.1K-2000 issued by Force Technology, DK

Signature:

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Technician

3. Site Observations at the time of Testing:

Carriageway Width

The project road has two lanes with paved carriageway of 7.0m width and there are no paved shoulders on either side of the carriageway. The carriageway is built with flexible pavement of three coat surface dressing as wearing course. The area completely dedicated for parking lorries on both sides of the road. & it was split in to parallel roads we named it as Port Road 1, 2, 3, 4, 5 & Diversion Road. These are separated by drainage canals in between the parking lanes.

Terrain

- The project road is passing through the plain terrain and an average travel speed of 10 kmph is observed. No Speed restriction is applied in areas with habitation to slow down the vehicles

Road Geometries

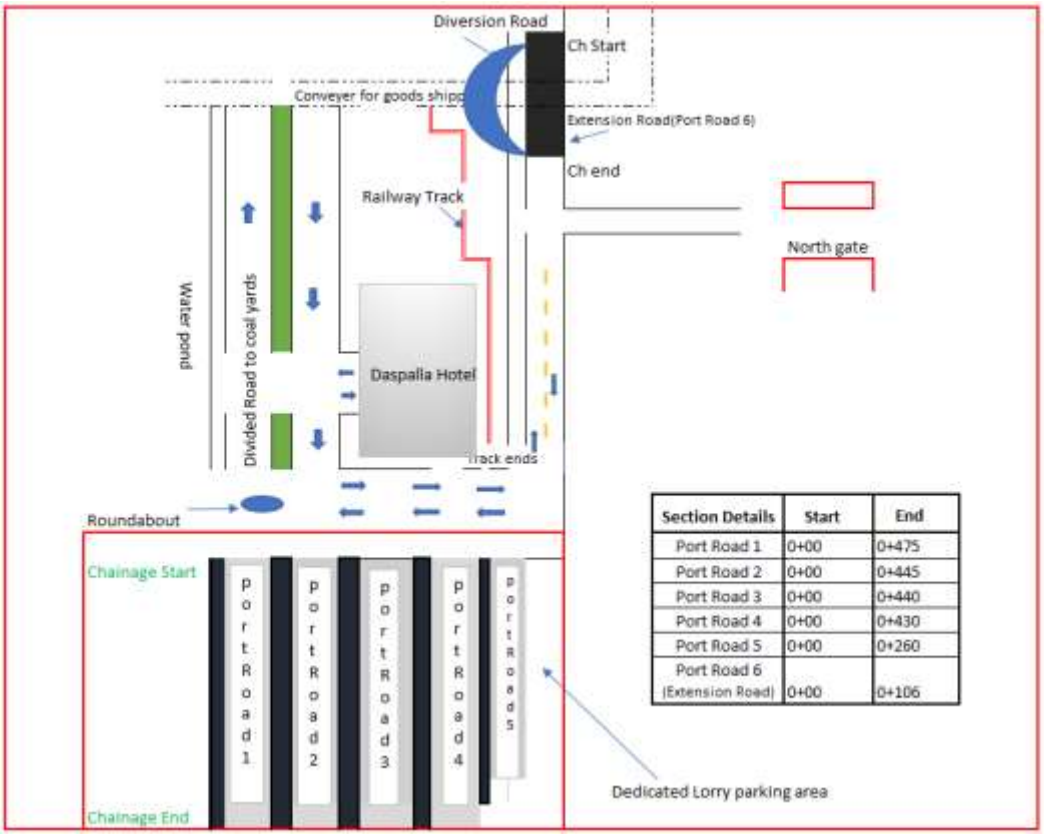
- There is no sharp curve found along the alignment. The vertical alignment is generally having smooth geometry.

Visual Condition Survey

Major observations found during visual condition survey are narrated below.

- Entire stretch of the project road is in good condition, but it was completely accumulated with sand/soil.
- Major distresses observed was Water stagnation on both sides of the Road.
- In few locations Flooding is observed at on the project road.

3.1. Site Sketch



Section Details	Start	End
Port Road 1	0+00	0+475
Port Road 2	0+00	0+445
Port Road 3	0+00	0+440
Port Road 4	0+00	0+430
Port Road 5	0+00	0+260
Port Road 6 (Extension Road)	0+00	0+106

Figure 3-1 Krishnapatnam Port - Site Section Sketch

3.2. Traffic Details

It is understood that the design traffic volumes were calculated based on traffic growth, vehicle damage factors etc. provided from traffic counts. From the client records, we have identified as 4500 CVPD. Based on this and considering traffic rate as 7.5%, VDF as 5.63, The Calculated Design Traffic [1]is found to be 241.53 MSA.

3.3. Pavement Layer Details

Details related to the Pavement Layers have been provided by the client.

During Analysis, the same pavement thickness has been considered as 40mm Bituminous layer and 400mm Cementitious layer.

[1] Design Traffic in Cumulative Standard Axles, $N = \frac{365*[(1+r)^n-1]}{r} * A * D * F$ Eq4.5, IRC37:2012

List of Photograph showing some site condition















4. Analysis Methodology

IRC 115: 2014 procedures were used as reference and provided Structural evaluation and strengthening of flexible Pavements. Accordingly, the sequence of testing and analysis steps has been conducted in accordance with the IRC 115:2014.

4.1. For Flexible Pavements:

The Remaining Life Analysis on the Flexible Pavement analysis is carried by Evaluating the Elastic Modulus of each Layers and Performance of Flexible Pavement - Fatigue and Rutting Behavioral checks.

The step by step analysis for flexible pavement has been explained in the flow chart attached below.

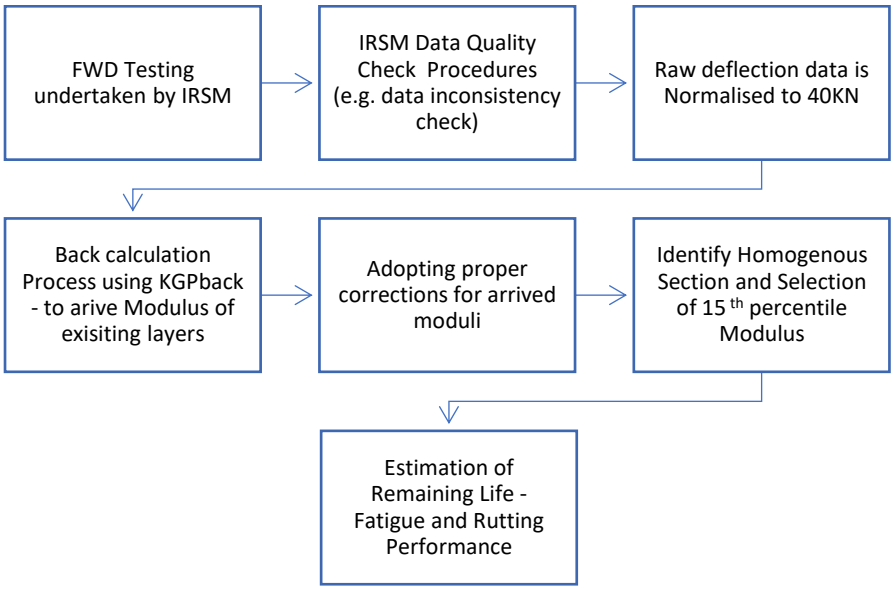


Figure 4-1 Process Flow to determine pavement modulus values

These has been Explained in the procedural steps below

1. The recorded data was normalized to a standard load – 40kN (IRC 115).

2. The normalized deflections were then back calculated using the KGP-back Application (refer 4.1.1) to obtain Elastic Modulus values of Bituminous, Granular layer and Sub-grade.

3. The corrections factors will be applied to all layers as suggested in IRC 115:2014.

In accordance with Section 6.4.2 of IRC 115, the calculated modulus values in the Bituminous Layers have been adjusted relative to the standard temperature of 35°C using equation 4 and 5 of IRC 115: 2014.

$$E_{T1} = \lambda E_{T2}$$ Eq 4, IRC115:2014

$$\lambda = \frac{1-0.238 \ln T1}{1-0.238 \ln T2}$$ Eq 5, IRC115:2014

Where

λ - Temperature Correction factor

E_{T1} - Backcalculated Modulus (MPa) at Temperature T1

E_{T2} - Backcalculated Modulus (MPa) at Temperature T2

In accordance with Section 6.5.2 of IRC 115, the calculated modulus values for Sub-grade and Granular Layer have been adjusted relative to the moisture conditions at the time of the testing. Since the granular layer present here is cementitious Layer - No correction needs to be applied to this cementitious layer.

$$E_{Subgrade\_Monsoon} = 3.351 * (E_{Subgrade\_Winter})^{0.7688} - 28.9$$ Eq 6, IRC115:2014

$$E_{Subgrade\_Monsoon} = 0.8554 * (E_{Subgrade_{Summer}}) - 8.461$$ Eq 7, IRC115:2014

4. Using these corrected Moduli Values - Homogenous sections are prepared and 15th percentile Moduli values are selected for Design. Here, we have considered Each section as one homogenous section.

5. Checking the in-serviceability of the Pavement layers through Performance criteria - analyzing the Remaining life (IRC 115) with reference to the Traffic MSA.

Initially, The Critical Strains Values - tensile strain (in the bituminous layer), ε_t and compressive strain (at the top of the sub-grade layer), ε_v are evaluated using the IRC approved program IITPAVE application (refer 4.1.2).

Using the Critical Strain values, the pavement performance in term of Fatigue and Rutting ca be evaluated as provided in Section 8.3 of IRC 115.

Fatigue Model

$$N_f = 0.711 * 10^{-4} * [\frac{1}{\varepsilon_t}]^{3.89} * \left[\frac{1}{M_{Bit}}\right]^{0.854}$$ Eq16, IRC115:2014

Rutting Model

$$N_R = 1.41 * 10^{-8} * \left[\frac{1}{\varepsilon_v}\right]^{4.5337}$$ Eq17, IRC115:2014

For special case of Cementitious Layer,

A. Fatigue life in terms of standard axles

$$N = RF\left[\frac{11300/E^{0.0804}+191}{\varepsilon_t}\right]^{12}$$ Eq6.6, IRC37:2012

B. Fatigue equations for cumulative Damage Analysis

$$\log N_{fi} = \frac{0.972-(\sigma_t/M_R up)}{0.0825}$$ Eq6.7, IRC37:2012

Using these equations, Actual Remaining Life of the pavement retained can be Evaluated in terms of Traffic MSA.

4.1.1. **KGPback Application**

KGPback is a genetic algorithm-based model for back calculation of layer moduli provided along with IRC 115 publication. It uses linear elastic theory for the analysis of pavement in its forward calculation algorithm.

The procedure provided in Appendix III has been adopted to back calculate the Elastic modulus values of each layer listed below

- The Normalize the raw deflection values to 40KN
- Derive the limits for Modulus of Bituminous layer, Granular layer and Sub grade as discussed in Appendix III.8 of IRC 115:2014 and IRC 37: 2012

  For this project, The Limits has been considered as below:

	Low Limit	Upper Limit
Bituminous layers	750MPa,	3000MPa.
Cementitious layer[2]	3500MPa	10000MPa
Subgrade[3]	1.2*$E_{sg\ calc}$ *0.8	1.2* $E_{sg\ calc}$ *1.2

[2] For Cementitious Layer, the limits are derived based on UCS value shared by the client from their Records.

$E_{cgsb} = 1000 * UCS$ Eq 7.2 from IRC 37-2012

[3] $E_{sgcalc} = \frac{\left(\frac{2}{1-\mu}\right)*P}{(3.14*r*w)}$ EqIII.2, IRC115:2014

- Feed the pavement structure detailing values appropriately in KGPback application
- Modulus values can be arrived; Review the results.

The screen shot of the KGPback application has been attached below.

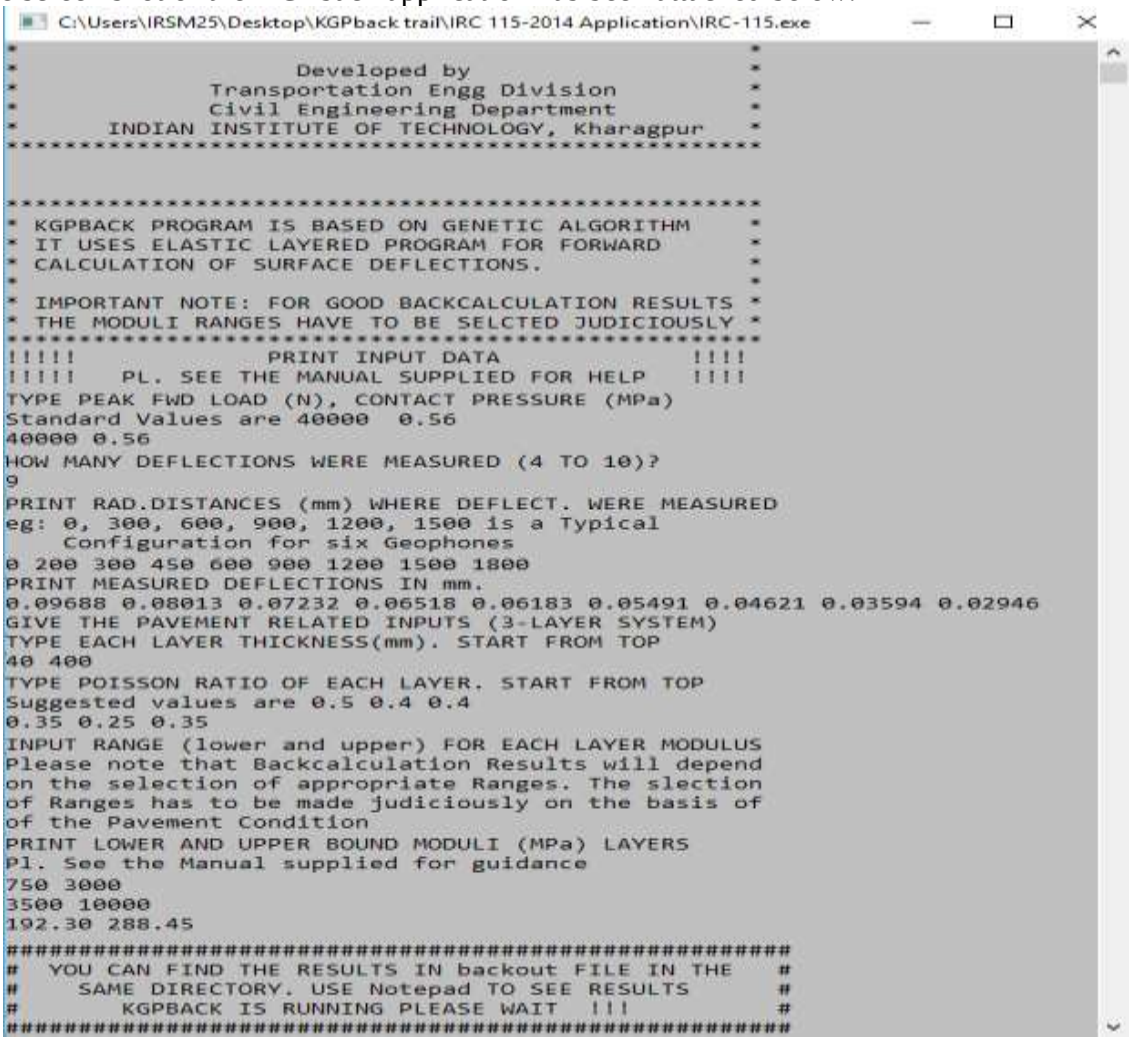


Figure 4-2 Feeding the data in KGPback Application

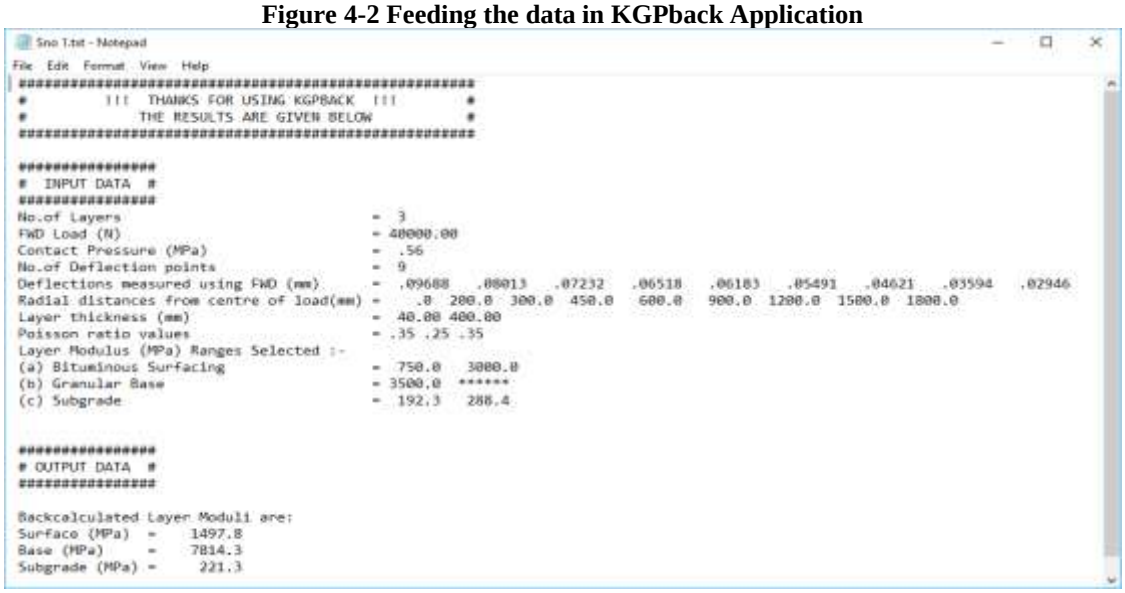


Figure 4-3 Results obtained from KGPback

4.1.2. IITPAVE Application

IITPAVE is a multilayer elastic layer linear analysis program provided along with IRC 37: 2012. This IITPAVE has been used for the computation of stresses and strains in flexible pavements. Tensile strain ε_t , at the bottom of the bituminous layer and the vertical strain ε_v , on the top of the subgrade are conventionally considered as critical parameters for pavement design to limit cracking and rutting in the bituminous layers and non-bituminous layers respectively. Under repeated wheel loads the pavement foundation materials in different layers do not behave linear elastically. The granular materials and subgrade soils are nonlinear with an elastic modulus varying with level of stresses.

An overview of the analysis process using this IITPAVE is presented below.

Figure 4-4 - Opening Page - IITPAVE

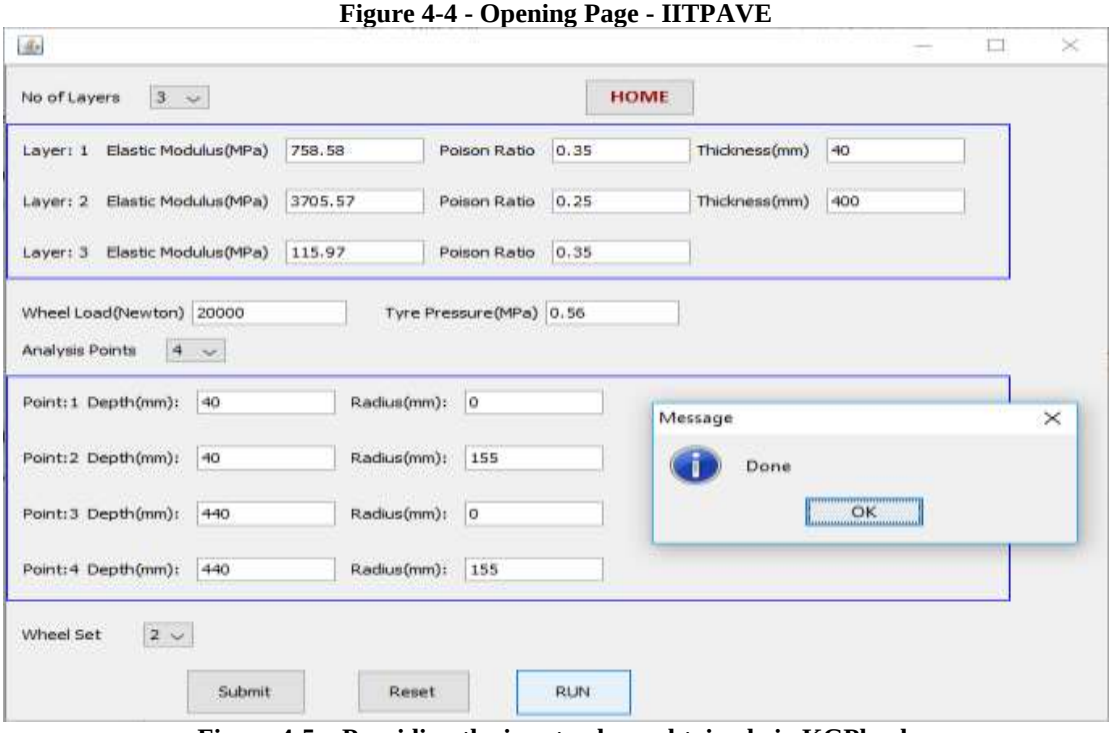


Figure 4-5 – Providing the input values, obtained via KGPback

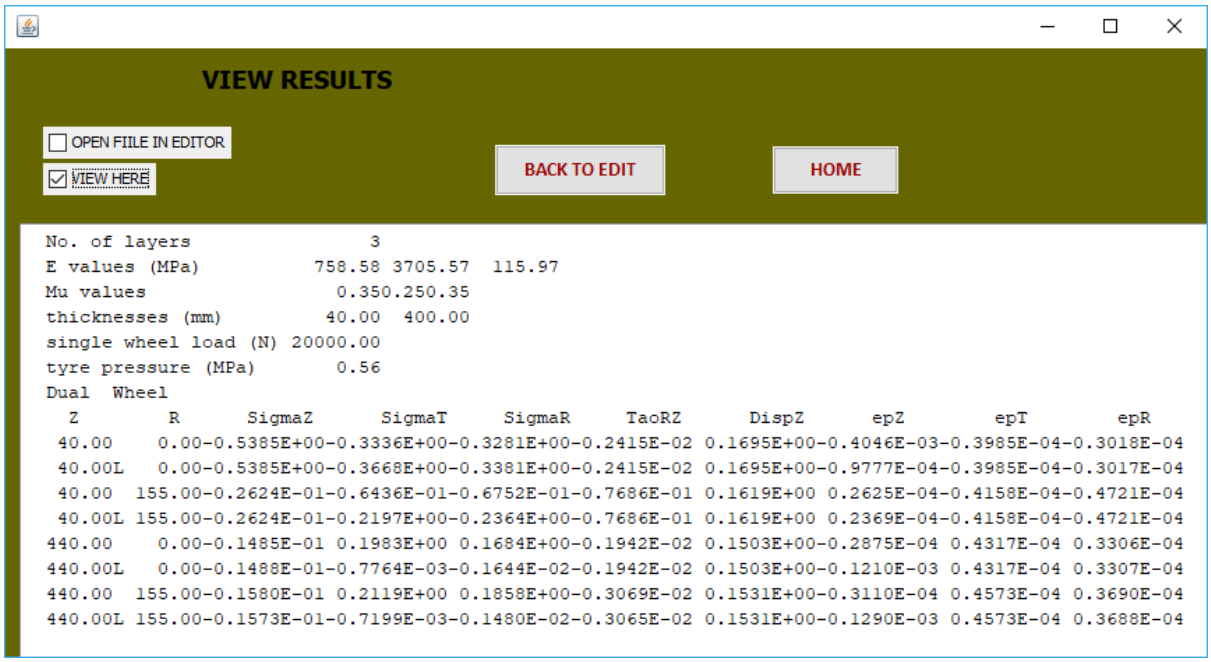


Figure 4-6 - Obtaining required strain values for checking Fatigue and Rutting performances.

5. Results

5.1. Falling Weight Deflectometer (FWD) Results

Listed below are the parameters included in the spreadsheet describing the data fields:

Location	File name indicating road name and direction
Chainage	Distance from start point in meters
Date	Date of Testing
Time	Time of FWD test
Drop	Number of drop number, only second drop presented
D0	Deflection under load at 0mm offset
D200	Deflection at 200mm offset from load
D300	Deflection at 300mm offset from load
D450	Deflection at 450mm offset from load
D600	Deflection at 600mm offset from load
D900	Deflection at 900mm offset from load
D1200	Deflection at 1200mm offset from load
D1500	Deflection at 1500mm offset from load
D1800	Deflection at 1800mm offset from load
kPa	Applied surface pressure from FWD load
kN	Applied surface load
Air (deg)	Air Temperature (Deg C)
Sur (deg)	Surface Temperature (Deg C) measured by non-contact sensor

5.2. Maximum Deflection

IRSM's Falling Weight Deflectometer (FWD) was used to collect pavement strength and stiffness information and these values are reported in mm. The results of the normalized maximum deflection testing are presented below.

5.3. Normalised Deflection Values

In accordance with international best practice and with Section 4.4 of IRC 115, the recorded deflection values have been normalized to the equivalent applied pressure of 40KN.

This Load is representative of a standard ESAL. The following figure presents the Peak Deflection.

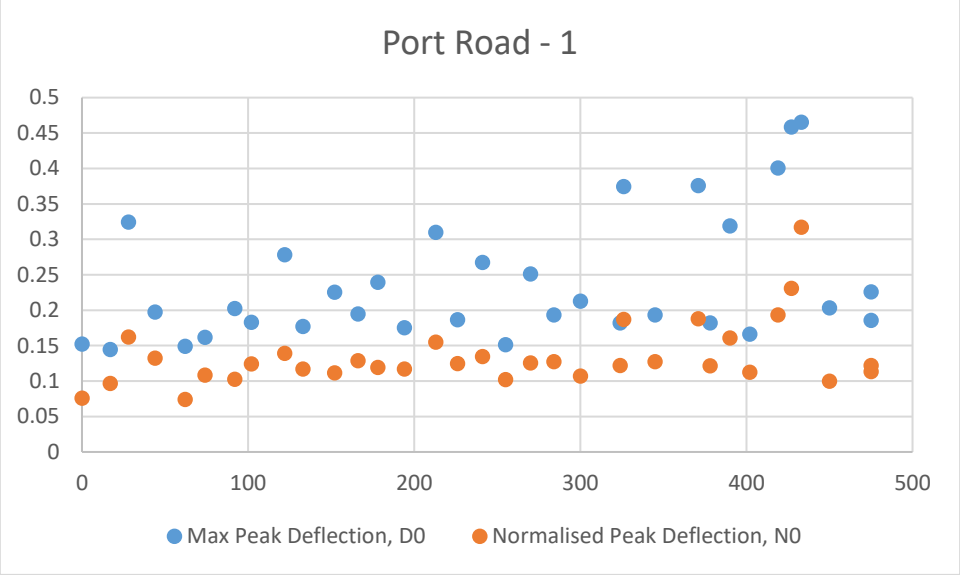


Figure 5-1 Peak Deflection @ Port Road 1

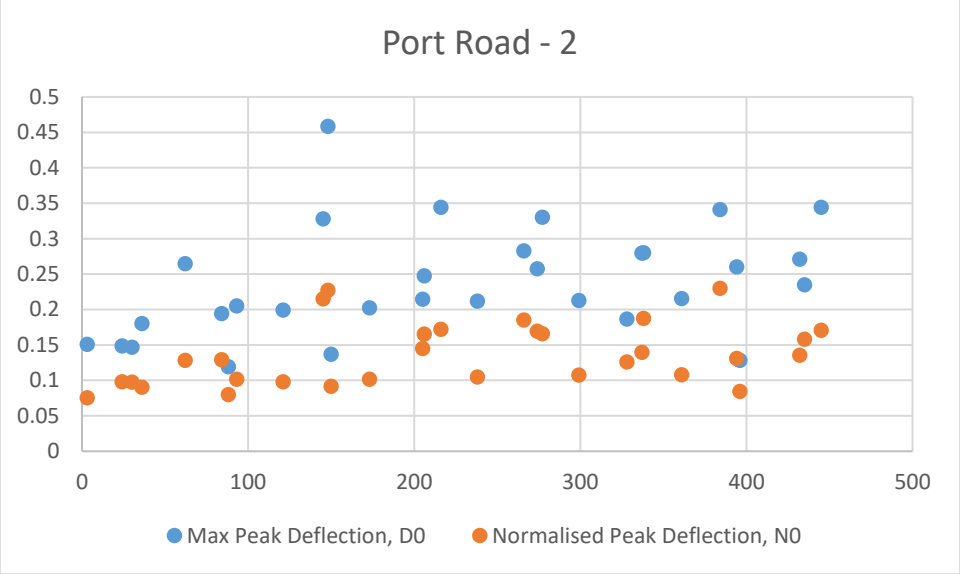


Figure 5-2 Peak Deflection @ Port Road 2

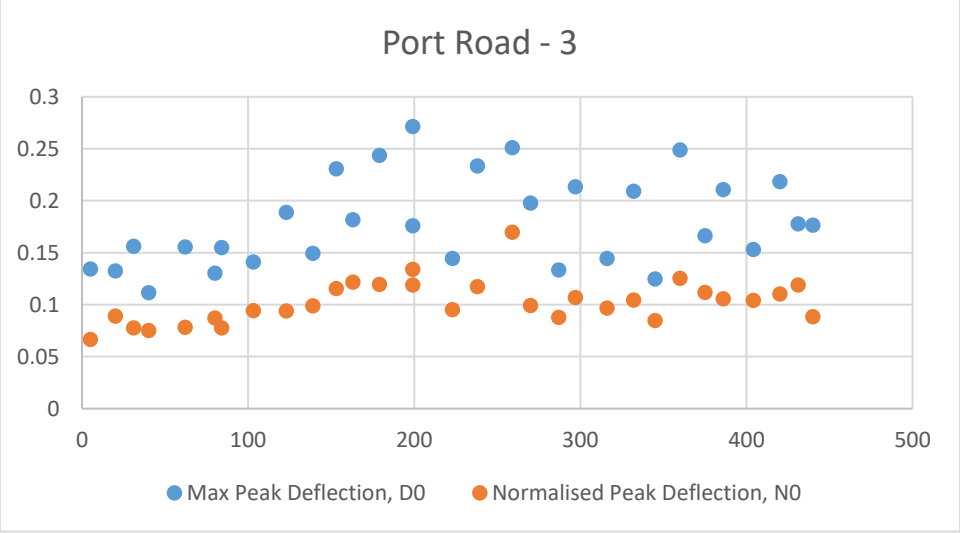


Figure 5-3 Peak Deflection @ Port Road 3

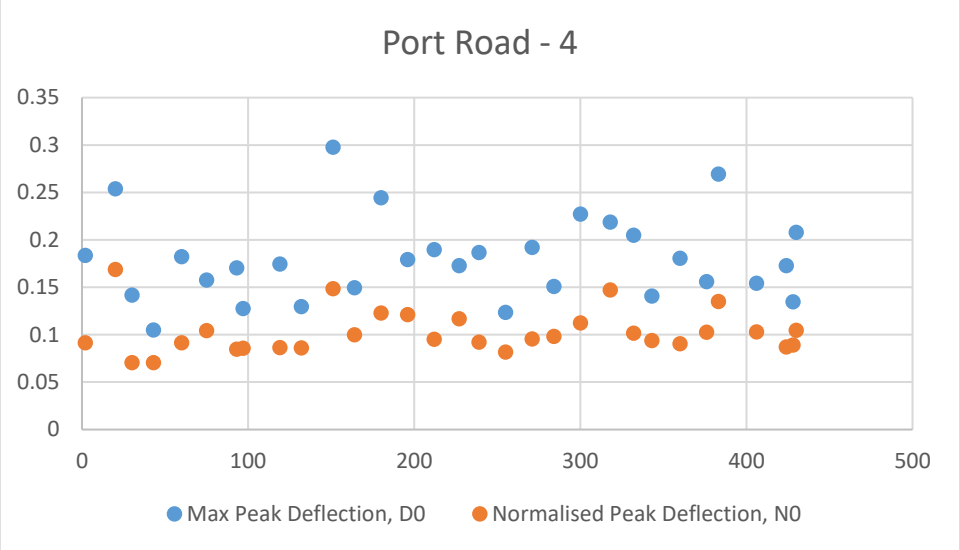


Figure 5-4 Peak Deflection @ Port Road 4

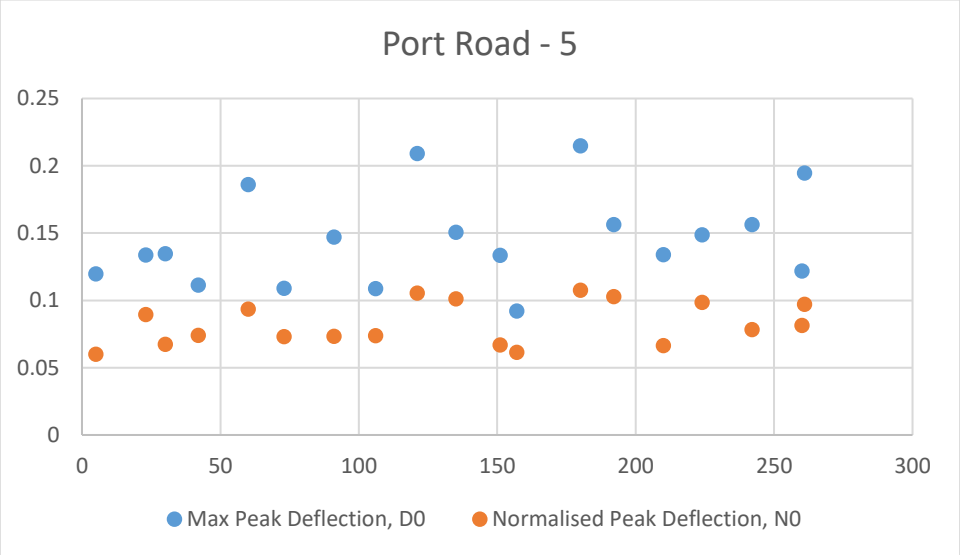


Figure 5-5 Peak Deflection @ Port Road 5

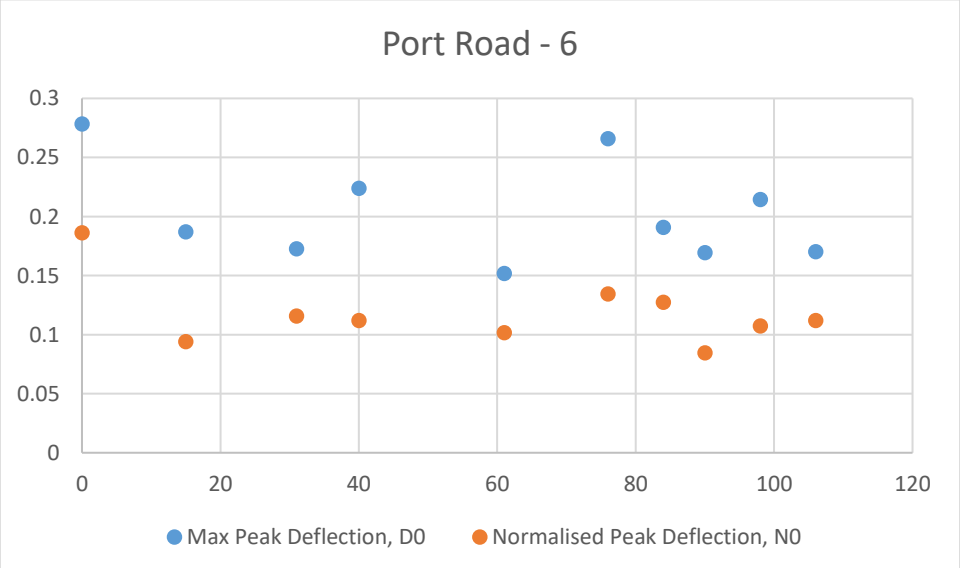


Figure 5-6 Peak Deflection @ Port Road 6

5.4. Modulus Values

In accordance with IRC 115 and IRC 37:2012, the recorded deflection values have been analyzed to determine back-calculated modulus value. The processed results are attached in Appendix.

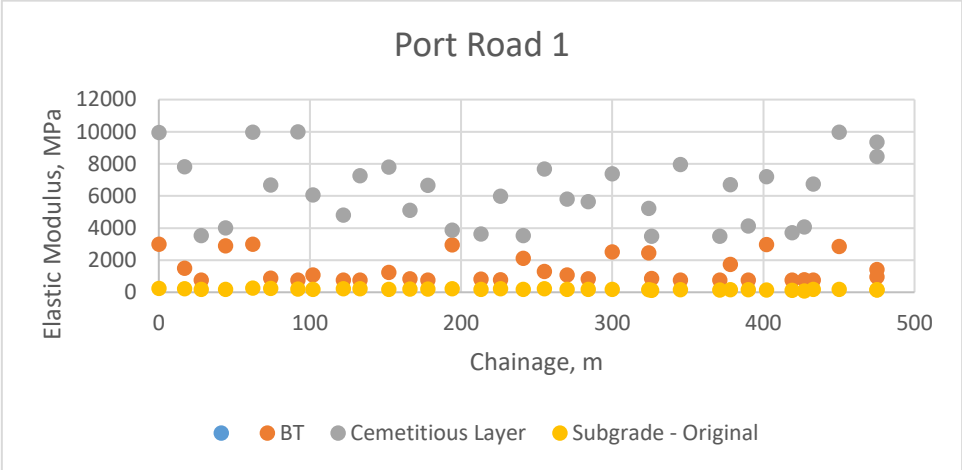


Figure 5-7 Back-calculated E-moduli Value for port Road 1

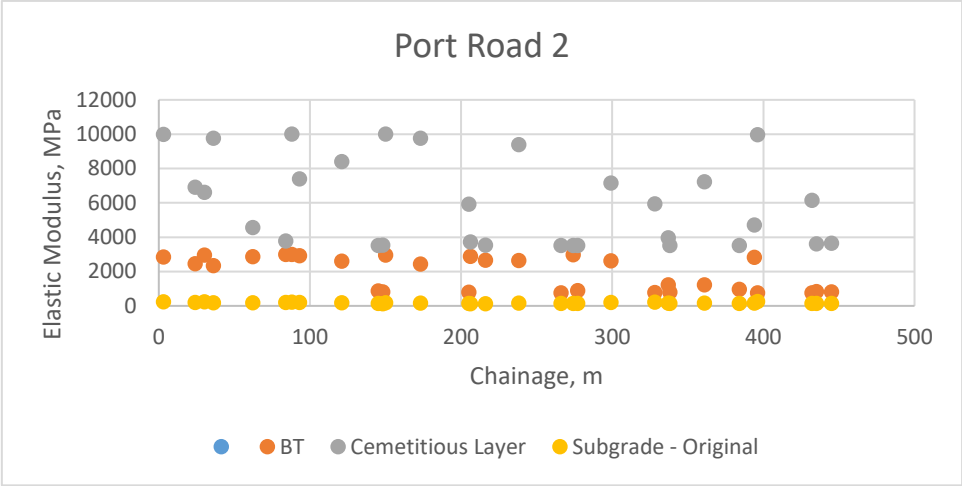


Figure 5-8 Back-calculated E-moduli Value for port Road 2

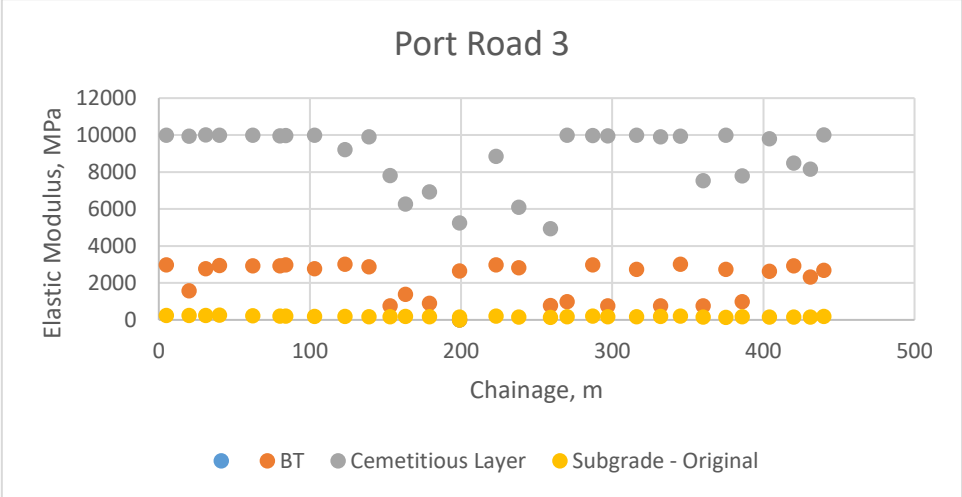


Figure 5-9 Back-calculated E-moduli Value for port Road 3

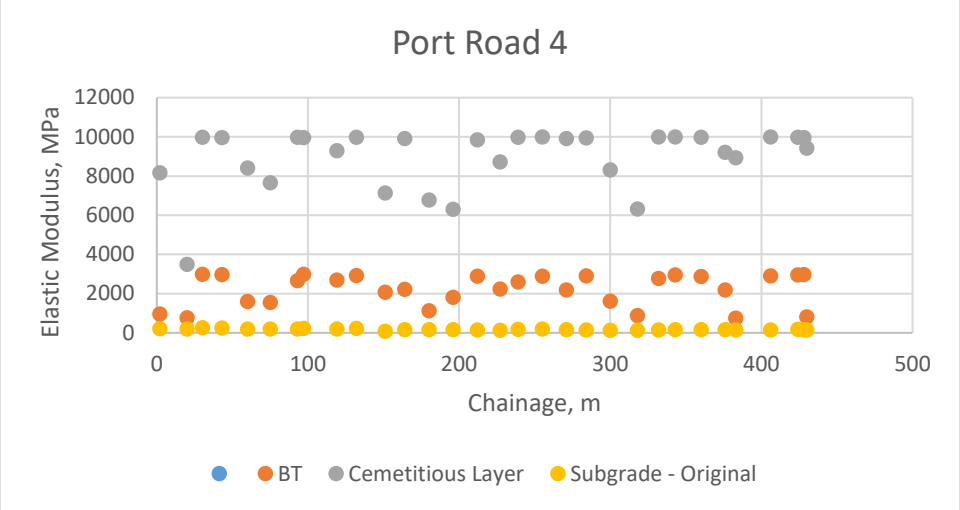


Figure 5-10 Back-calculated E-moduli Value for port Road 4

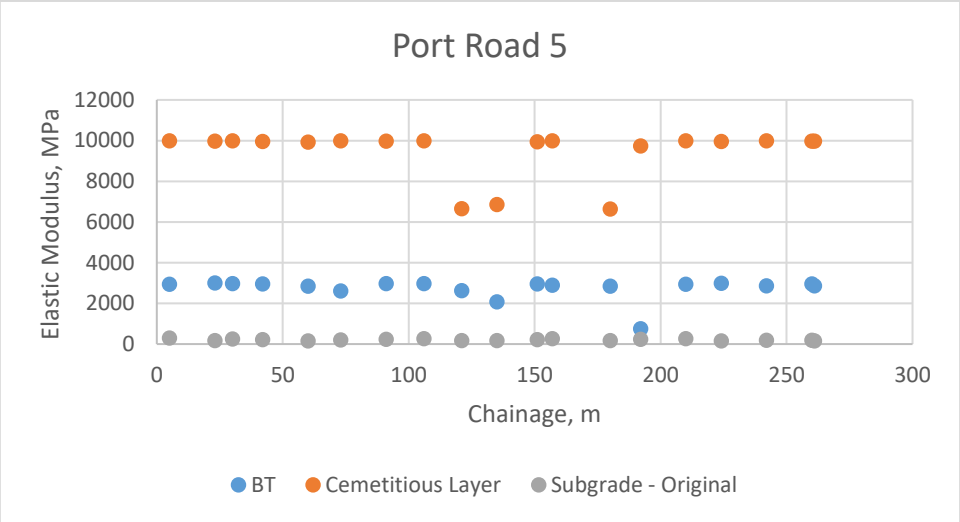


Figure 5-11 Back-calculated E-moduli Value for port Road 5

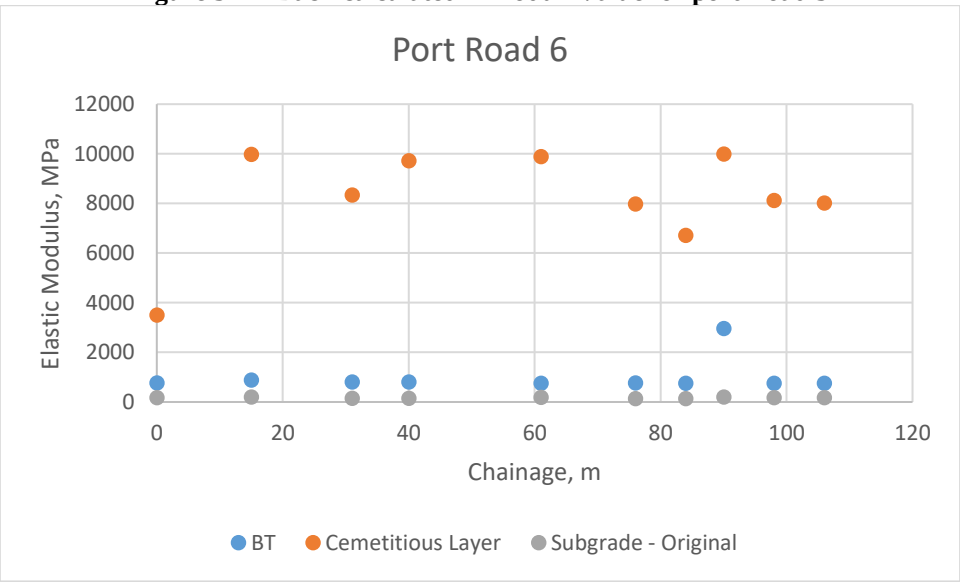


Figure 5-12 Back-calculated E-moduli Value for port Road 6

5.4.1. **Temperature Corrected Values**

In accordance with Section 6.4.2 of IRC 115, the calculated modulus values in the Layer 1 Bituminous Layers have been adjusted relative to the standard temperature of 35°C. Temperature corrections were made based on the infrared pavement temperature readings collected at the time of deflection testing.

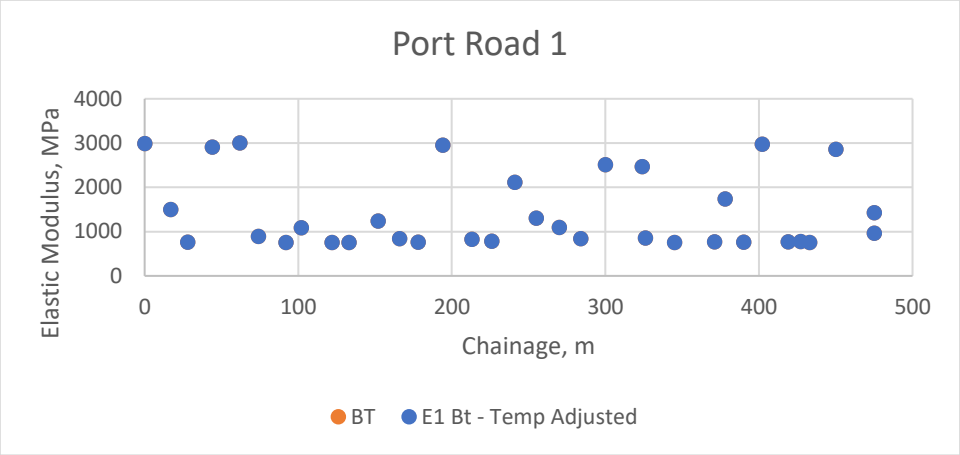


Figure 5-13 Elastic Modulus Layer 1 Temperature Adjusted @ Port Road 1

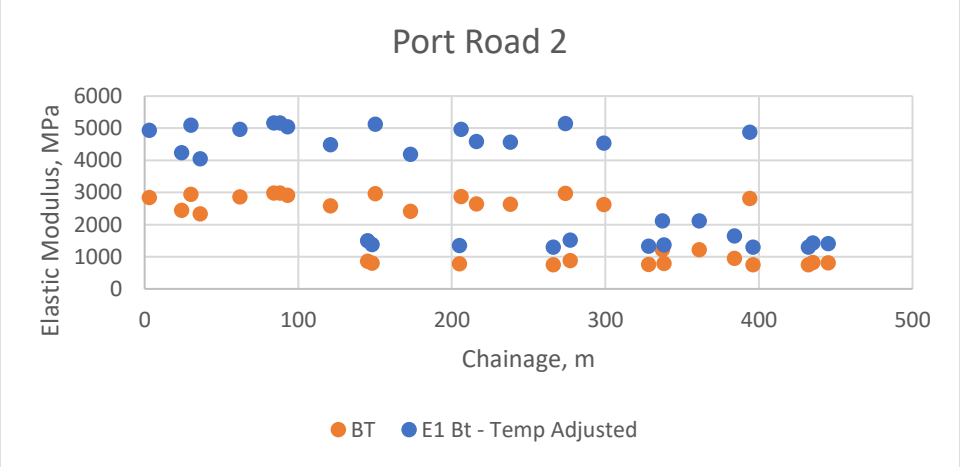


Figure 5-14 Elastic Modulus Layer 1 Temperature Adjusted @ Port Road 2

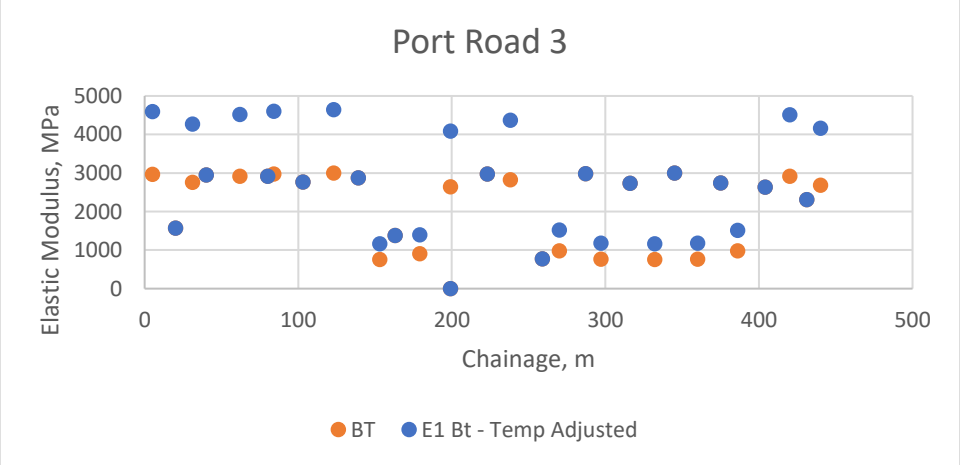


Figure 5-15 Elastic Modulus Layer 1 Temperature Adjusted @ Port Road 3

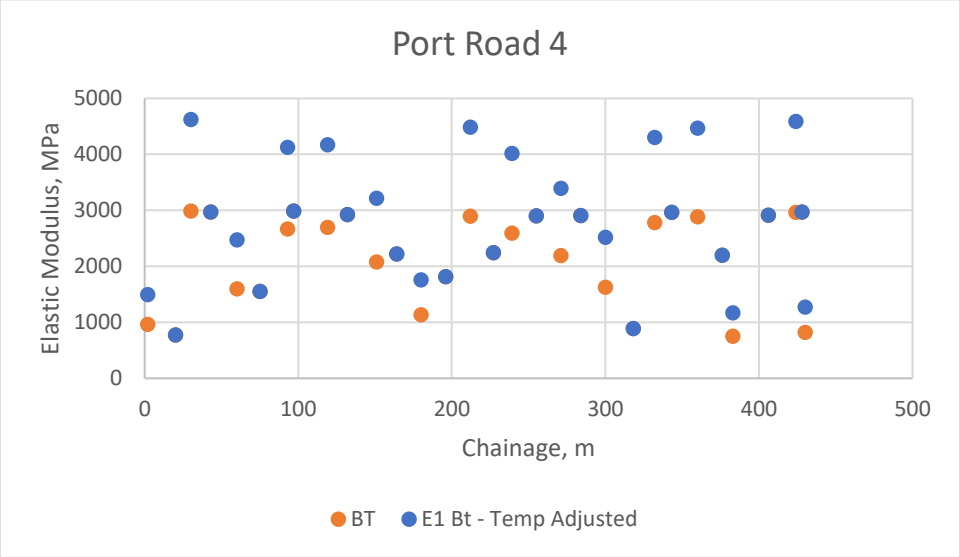


Figure 5-16 Elastic Modulus Layer 1 Temperature Adjusted @ Port Road 4

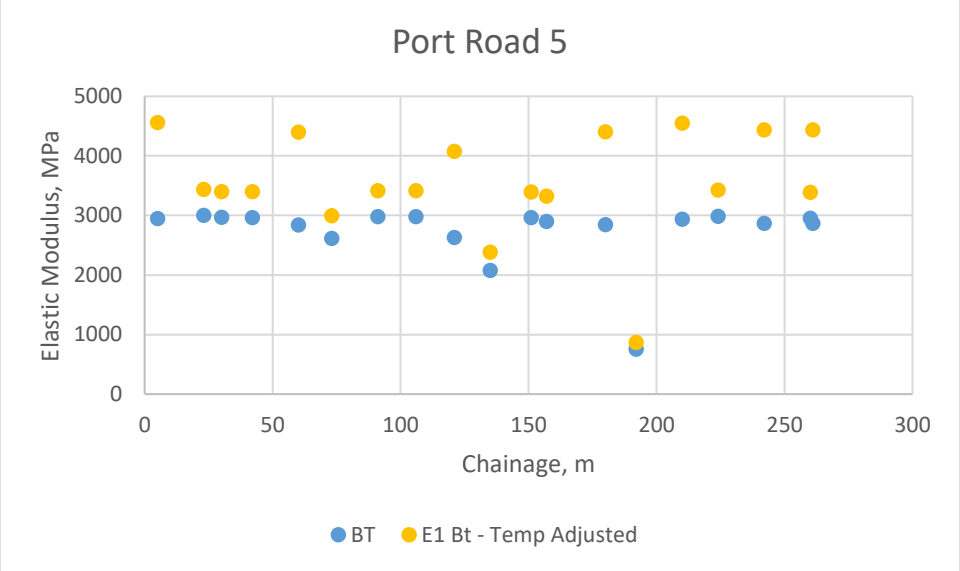


Figure 5-17 Elastic Modulus Layer 1 Temperature Adjusted @ Port Road 5

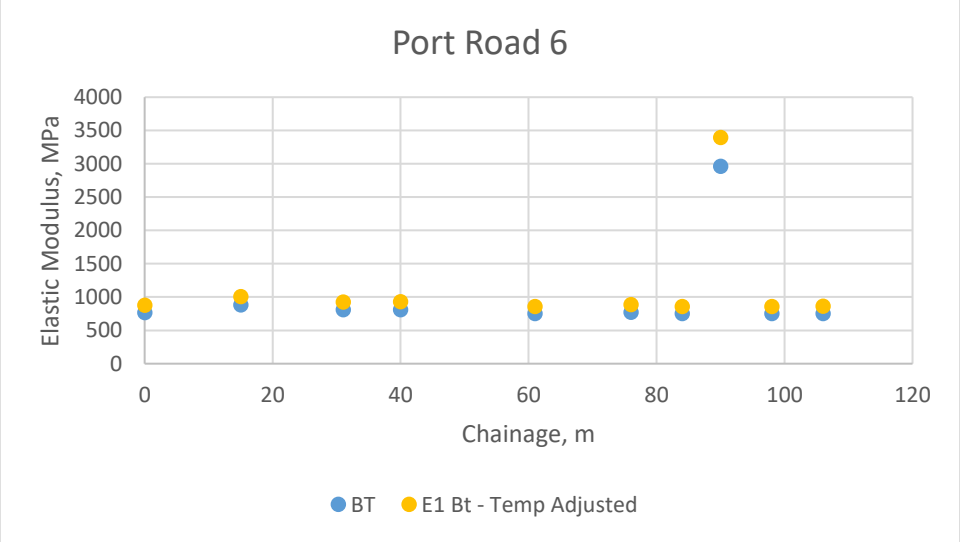


Figure 5-18 Elastic Modulus Layer 1 Temperature Adjusted @ Port Road 6

5.4.2. **Seasonal Corrected Values**

In accordance with Section 6.5.2 of IRC 115, the calculated modulus values for Sub-grade have been adjusted relative to the moisture conditions at the time of the testing. No correction applied to cementitious Layer, As cementitious layer has no effect on the season variations.

The originally calculated modulus values of Sub-grade were taken during the Summer season. Equation 7 for the Subgrade layer has been chosen for the correction.

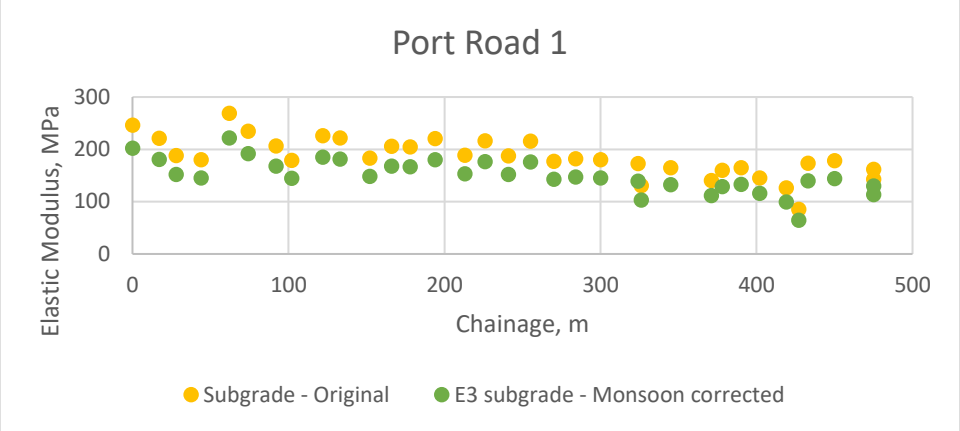


Figure 5-19 Elastic Modulus Layer 3 Subgrade Layer Seasonal corrected at port road 1

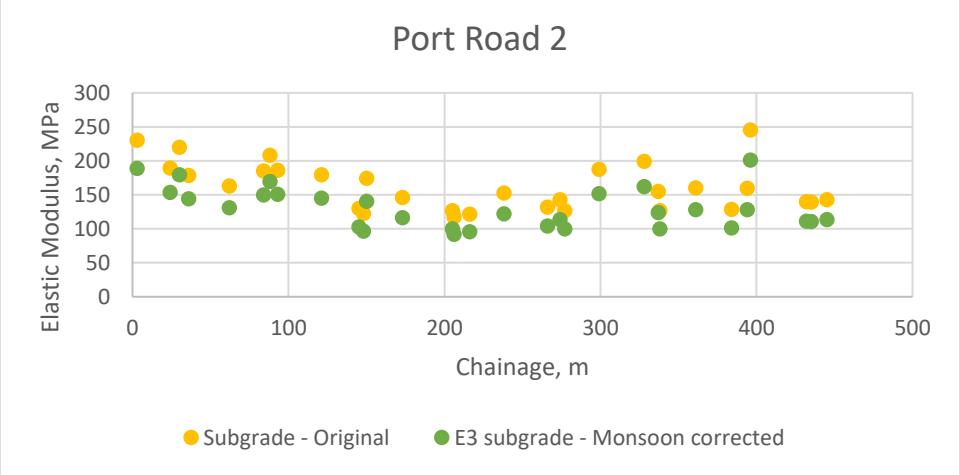


Figure 5-20 Elastic Modulus Layer 3 Subgrade Layer Seasonal corrected at port road 2

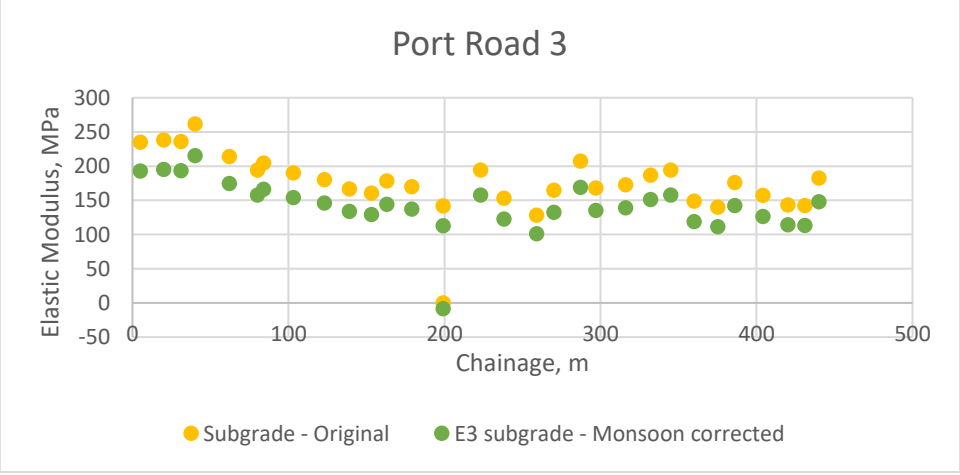


Figure 5-21 Elastic Modulus Layer 3 Subgrade Layer Seasonal corrected at port road 3

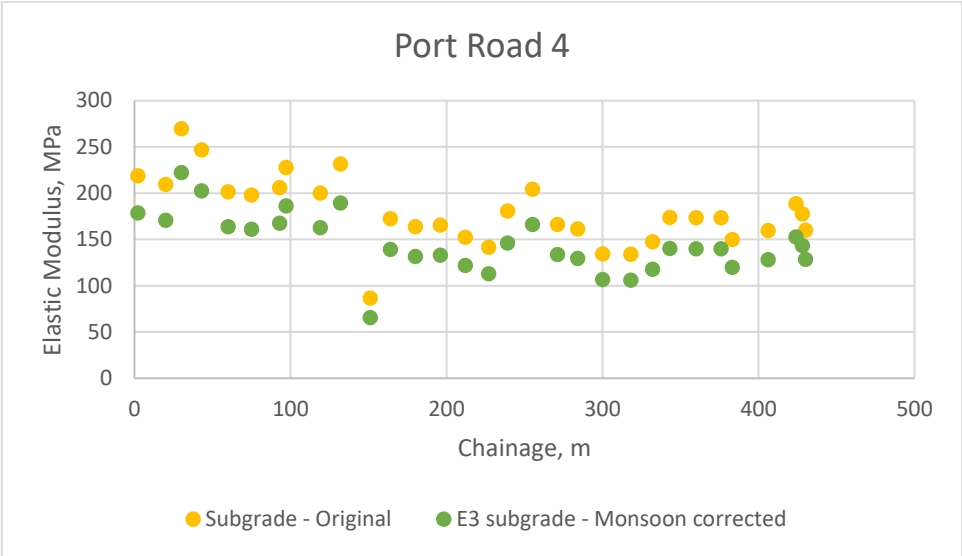


Figure 5-22 Elastic Modulus Layer 3 Subgrade Layer Seasonal corrected at port road 4

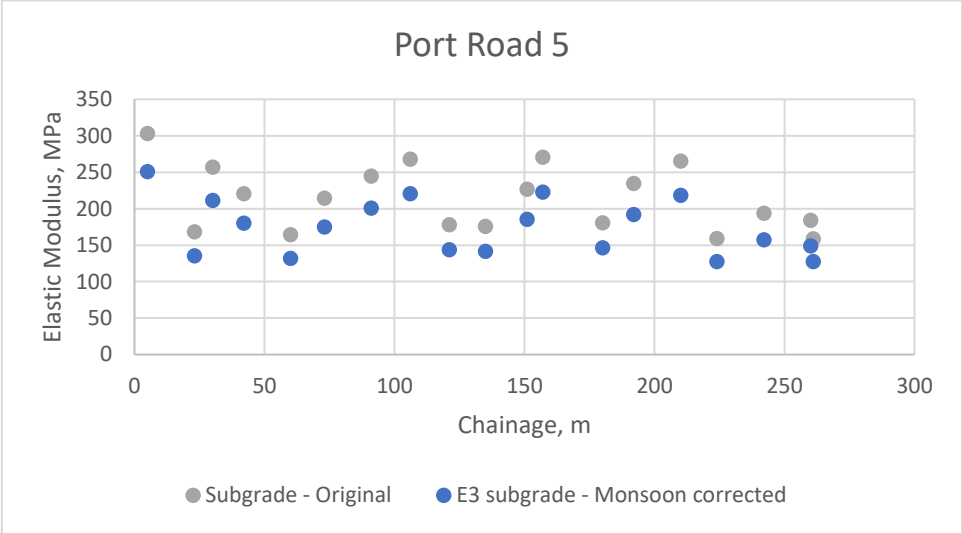


Figure 5-23 Elastic Modulus Layer 3 Subgrade Layer Seasonal corrected at port road 5

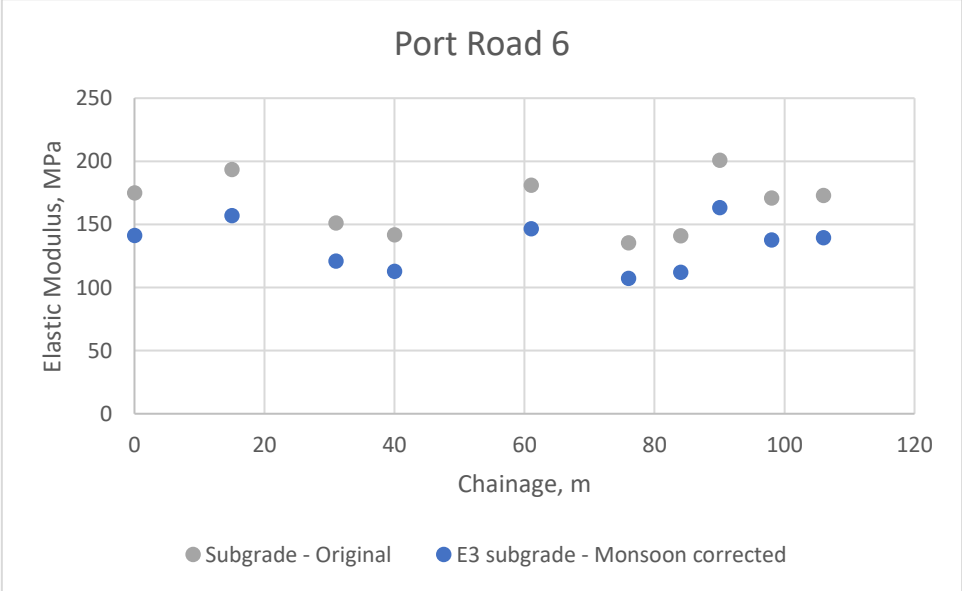


Figure 5-24 Elastic Modulus Layer 3 Subgrade Layer Seasonal corrected at port road 6

5.5. Performance Criteria

The Pavement performance is evaluated to find the actual Remaining Life retained at present in terms of Fatigue and Rutting performances for Flexible Pavements. The calculated Design traffic projected for 15 years is 241.53 MSA.

As Discussed in Section 4 the analysis has been carried out. Based on the Deflection data - Elastic Modulus values has been processed. After applying appropriate correction to Derived Elastic modulus values, the Sections has been grouped to Road-wise and 15% percentile values has been arrived.

The evaluated Fatigue performance of Bituminous layer, Rutting performance based on Subgrade layer, fatigue performance in cementitious layer are listed below

Section	15 % percentile			Fatigue in Bituminous Layer, Nf (MSA)	Fatigue in Cementitious Layer(B), Nfi (MSA)	Rutting in Sub-grade, N (MSA)	Design Traffic Ni(MSA)	Safe / Not Safe
	E – Bituminous Temp Adj	E2 Cementitious (Original)	E3 Subgrade Monson Adj					
Port Road 1	758.58	3705.57	115.97	16609	18459	6062	>241.53	Safe
Port Road 2	1360.45	3509.55	100.13	6250	18277	4615	>241.53	Safe
Port Road 3	1181.54	6591.15	113.69	71801	10119	32387	>241.53	Safe
Port Road 4	1527.67	7401.3	118.83	83257	9599	50303	>241.53	Safe
Port Road 5	3226.41	8873.42	134.42	75359	9954	117701	>241.53	Safe
Port Road 6	859.34	7155.4	112.3	133347	8884	39064	>241.53	Safe

6. Discussion and Conclusion

The project consists of 6 road sections inside Krishnapatnam Port, Nellore in Andhra Pradesh. The total length of the existing project corridor is 2.8 km approx.

IRSM's SWECO PRI2100 Falling Weight Deflectometer was engaged for data collection and the survey was done on 24-May-2018. The testing was undertaken in all sections, that reflected the road conditions and pavement composition. Subsequently the analysis was undertaken with appropriate pavement compositions as per IRC guidelines - IRC 115: 2014 and IRC 37: 2012.

The results from the entire stretch are presented in Section 5.
The results indicate:

- All road section in Krishnapatnam Port has a uniform Pavement composition.
- During initial Testing, it is observed the deflection readings recorded in these sub sections indicates a very stiff underlying layers ensuring the privileges of the high performance heavy volume pavements.
- for Back calculation process, the limits for Subgrade and Bituminous layer has been considered based on the IRC 115: 2014 and for cementitious layer the limits have been considered based on IRC 37: 2012. The same has been discussed 4.1.1
- Through the performance check, the existing pavement is found to be satisfactorily safe in terms of Fatigue performance of Bituminous Layer & cementitious layer and Rutting performance based on Subgrade Layer.
- Variability in the calculated results may be a reflection on variability of the pavement composition along the alignment. For each section, the available information only supports the consideration of provided pavement composition in that section.

Appendix I – Section-wise Representative Peak Deflection Data

The Peak Normalized deflection values are presented here as 1 km representation

- The values represent the normalized Peak Deflection (N1 - Normalized to load 40KN)
- Normalized deflection values are in mm
- The testing interval adopted in this location was 200m as specified in IRC 115:2015
- The testing was done in both inner lane and outer lane of the pavement.

Particulars	Peak Deflections*	
	in µm	in mm
Port Road 1 60 KN	196.48	0.19648
Port Road 1 80 KN	276.33	0.27633
Port Road 2 60KN	216.36	0.21636
Port Road 2 80KN	258.10	0.25810
Port Road 3 60 KN	154.42	0.15442
Port Road 3 80 KN	202.65	0.20265
Port Road 4 60 KN	157.07	0.15707
Port Road 4 80 KN	201.79	0.20179
Port Road 5 60 KN	125.78	0.12578
Port Road 5 80 KN	162.93	0.16293
Port Road 6 60 KN	192.67	0.19267
Port Road 6 80 KN	212.00	0.21200

*The data is Actual peak deflection recorded by applying 60KN / 80KN Load

Particulars	Normalised Deflections **	
	in µm	in mm
Port Road 1	134.95	0.13495
Port Road 2	136.03	0.13603
Port Road 3	102.32	0.10232
Port Road 4	102.74	0.10274
Port Road 5	82.64	0.08264
Port Road 6	117.44	0.11744

** The data is Normalised from 80KN / 60KN to 40KN

Appendix II – FWD Raw Deflection Data

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 1 60 KN.fwd	17	L1F	1	144	119	107	97	92	81	68	53	44	59.68	35	
	Port Road 1 60 KN.fwd	17	L1F	2	144	119	108	97	92	82	69	54	44	59.21	35	
1	Port Road 1 60 KN.fwd	17	L1F	3	146	121	109	98	93	83	70	54	44	60.31	35	Good
	Port Road 1 60 KN.fwd	74	L1F	1	162	124	109	94	89	76	64	51	44	59.86	35	
	Port Road 1 60 KN.fwd	74	L1F	2	162	124	109	94	88	76	64	51	44	59.63	35	
2	Port Road 1 60 KN.fwd	74	L1F	3	162	125	110	95	89	76	64	52	43	59.53	35	Good
	Port Road 1 60 KN.fwd	133	L1F	1	178	123	109	97	95	81	69	54	46	60.79	35	
	Port Road 1 60 KN.fwd	133	L1F	2	177	123	108	96	94	80	69	55	46	60.34	35	
3	Port Road 1 60 KN.fwd	133	L1F	3	177	123	109	96	95	81	69	55	46	60.36	35	Good
	Port Road 1 60 KN.fwd	194	L1F	1	176	147	131	112	102	88	69	53	44	60.05	35	
	Port Road 1 60 KN.fwd	194	L1F	2	176	147	132	113	102	88	70	53	45	60.14	35	
4	Port Road 1 60 KN.fwd	194	L1F	3	174	146	131	112	102	88	69	53	45	59.42	35	Good
	Port Road 1 60 KN.fwd	255	L1F	1	151	123	110	97	92	80	68	52	47	59.1	35	
	Port Road 1 60 KN.fwd	255	L1F	2	152	124	111	99	93	82	69	56	48	59.47	35	
5	Port Road 1 60 KN.fwd	255	L1F	3	152	124	111	98	92	81	68	55	47	59.58	35	Good
	Port Road 1 60 KN.fwd	324	L1F	1	185	155	142	129	123	110	88	68	56	60.72	35	
	Port Road 1 60 KN.fwd	324	L1F	2	181	153	141	128	122	109	87	68	55	59.34	35	
6	Port Road 1 60 KN.fwd	324	L1F	3	181	153	141	128	122	109	87	69	55	58.89	35	Good
	Port Road 1 60 KN.fwd	378	L1F	1	182	154	142	128	121	109	91	75	63	59.97	35	
	Port Road 1 60 KN.fwd	378	L1F	2	183	155	143	128	122	109	91	74	63	60.15	35	
7	Port Road 1 60 KN.fwd	378	L1F	3	182	154	142	128	121	108	91	74	63	59.85	35	Good
8	Port Road 1 60 KN.fwd	433	L1F	1	447	128	120	112	108	99	84	69	59	58.14	35	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 1 60 KN.fwd	433	L1F	2	474	131	123	116	111	102	87	72	61	59.24	35	
	Port Road 1 60 KN.fwd	433	L1F	3	475	131	123	115	111	102	87	71	61	58.7	35	
	Port Road 1 60 KN.fwd	475	L1R	1	188	152	142	134	129	120	106	84	70	61.28	35	
	Port Road 1 60 KN.fwd	475	L1R	2	185	150	141	133	128	119	105	84	69	60.88	35	
9	Port Road 1 60 KN.fwd	475	L1R	3	185	150	140	132	128	119	104	84	69	60.82	35	Good
	Port Road 1 60 KN.fwd	402	L1R	1	166	149	148	144	135	114	98	79	64	58.83	35	
	Port Road 1 60 KN.fwd	402	L1R	2	167	149	149	145	137	115	98	79	65	59.09	35	
10	Port Road 1 60 KN.fwd	402	L1R	3	167	149	149	145	137	115	97	79	65	59.19	35	Good
	Port Road 1 60 KN.fwd	345	L1R	1	195	144	135	124	118	106	93	73	61	61.35	35	
	Port Road 1 60 KN.fwd	345	L1R	2	193	143	134	123	118	105	93	73	61	60.66	35	
11	Port Road 1 60 KN.fwd	345	L1R	3	193	143	134	123	118	105	93	73	61	60.23	35	Good
	Port Road 1 60 KN.fwd	284	L1R	1	196	151	136	125	119	108	97	81	47	61.68	35	
	Port Road 1 60 KN.fwd	284	L1R	2	194	150	135	124	118	107	96	80	47	60.66	35	
12	Port Road 1 60 KN.fwd	284	L1R	3	191	147	133	122	116	105	93	79	46	59.72	35	Good
	Port Road 1 60 KN.fwd	226	L1R	1	186	149	123	99	88	78	68	56	49	59.84	35	
	Port Road 1 60 KN.fwd	226	L1R	2	189	151	126	101	91	80	70	59	52	60.17	35	
13	Port Road 1 60 KN.fwd	226	L1R	3	186	149	124	100	88	79	69	57	50	59.81	35	Good
	Port Road 1 60 KN.fwd	166	L1R	1	196	144	130	113	107	91	72	59	51	60.9	35	
	Port Road 1 60 KN.fwd	166	L1R	2	195	143	129	113	106	90	73	60	51	60.46	35	
14	Port Road 1 60 KN.fwd	166	L1R	3	194	143	128	112	106	90	72	58	50	60.16	35	Good
	Port Road 1 60 KN.fwd	102	L1R	1	181	145	132	118	111	98	81	65	54	58.22	35	
	Port Road 1 60 KN.fwd	102	L1R	2	183	147	134	120	112	99	82	65	54	58.93	35	
15	Port Road 1 60 KN.fwd	102	L1R	3	185	148	134	120	113	100	82	66	55	59.34	35	Good
16	Port Road 1 60 KN.fwd	44	L1R	1	196	166	150	123	117	101	84	66	55	59.22	35	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 1 60 KN.fwd	44	L1R	2	199	168	152	125	119	103	85	68	56	60.04	35	
	Port Road 1 60 KN.fwd	44	L1R	3	198	167	151	125	118	103	85	67	55	59.93	35	
	Port Road 1 80 KN.fwd	0	L1F	1	152	133	123	111	106	95	81	66	56	79.97	35	
	Port Road 1 80 KN.fwd	0	L1F	2	152	133	122	111	106	95	81	67	56	80.01	35	
17	Port Road 1 80 KN.fwd	0	L1F	3	154	133	123	111	106	95	81	67	57	80	35	Good
	Port Road 1 80 KN.fwd	62	L1F	1	151	124	115	103	98	88	77	63	55	81.27	35	
	Port Road 1 80 KN.fwd	62	L1F	2	148	122	112	101	96	86	75	61	54	79.71	35	
18	Port Road 1 80 KN.fwd	62	L1F	3	149	124	114	103	97	88	77	63	55	79.42	35	Good
	Port Road 1 80 KN.fwd	122	L1F	1	279	188	161	134	123	109	90	75	63	79.92	35	
	Port Road 1 80 KN.fwd	122	L1F	2	278	188	160	133	122	108	90	74	62	79.94	35	
19	Port Road 1 80 KN.fwd	122	L1F	3	279	188	161	134	123	108	90	75	63	79.88	35	Good
	Port Road 1 80 KN.fwd	178	L1F	1	240	179	163	143	135	119	96	77	67	80.18	35	
	Port Road 1 80 KN.fwd	178	L1F	2	240	179	163	143	135	120	96	79	68	80.14	35	
20	Port Road 1 80 KN.fwd	178	L1F	3	239	179	162	143	135	119	96	78	67	79.97	35	Good
	Port Road 1 80 KN.fwd	241	L1F	1	270	223	204	178	164	139	110	83	67	79.4	35	
	Port Road 1 80 KN.fwd	241	L1F	2	266	221	203	176	162	138	110	82	67	78.66	35	
21	Port Road 1 80 KN.fwd	241	L1F	3	267	222	204	177	163	138	109	82	66	79.85	35	Good
	Port Road 1 80 KN.fwd	300	L1F	1	212	179	165	151	144	129	111	90	70	79.38	35	
	Port Road 1 80 KN.fwd	300	L1F	2	213	180	166	151	144	130	111	90	70	79.37	35	
22	Port Road 1 80 KN.fwd	300	L1F	3	214	181	167	152	145	131	112	90	70	79.57	35	Good
	Port Road 1 80 KN.fwd	371	L1F	1	387	310	275	236	215	185	147	107	86	80.5	35	
	Port Road 1 80 KN.fwd	371	L1F	2	371	299	266	228	208	179	144	107	86	79.46	35	
23	Port Road 1 80 KN.fwd	371	L1F	3	370	299	265	228	208	180	144	107	87	79.7	35	Good
24	Port Road 1 80 KN.fwd	419	L1F	1	406	304	282	248	230	204	171	135	112	83.34	35	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 1 80 KN.fwd	419	L1F	2	401	300	278	245	227	201	169	133	110	82.94	35	
	Port Road 1 80 KN.fwd	419	L1F	3	396	296	274	242	223	198	167	132	108	82.21	35	
	Port Road 1 80 KN.fwd	427	L1F	1	455	363	342	308	286	255	218	182	165	78.19	35	
	Port Road 1 80 KN.fwd	427	L1F	2	459	367	347	309	290	258	221	184	167	79.08	35	
25	Port Road 1 80 KN.fwd	427	L1F	3	462	370	350	311	292	259	223	186	168	80.99	35	Good
	Port Road 1 80 KN.fwd	475	L1F	1	227	194	176	160	153	136	119	98	84	79.44	35	
	Port Road 1 80 KN.fwd	475	L1F	2	225	193	175	159	153	136	118	97	83	79.43	35	
26	Port Road 1 80 KN.fwd	475	L1F	3	226	195	176	160	154	137	119	97	84	80.15	35	Good
	Port Road 1 80 KN.fwd	450	L1R	1	204	154	148	139	136	127	114	97	84	81.18	35	
	Port Road 1 80 KN.fwd	450	L1R	2	203	153	148	139	137	126	113	97	85	81.43	35	
27	Port Road 1 80 KN.fwd	450	L1R	3	203	152	146	138	135	126	113	97	84	81.31	35	Good
	Port Road 1 80 KN.fwd	390	L1R	1	318	262	194	179	171	150	127	98	81	79.29	35	
	Port Road 1 80 KN.fwd	390	L1R	2	319	263	196	179	172	151	128	99	82	79.17	35	
28	Port Road 1 80 KN.fwd	390	L1R	3	320	264	197	180	173	151	129	98	82	79.56	35	Good
	Port Road 1 80 KN.fwd	326	L1R	1	376	305	290	262	214	182	153	121	95	80.29	35	
	Port Road 1 80 KN.fwd	326	L1R	2	374	303	289	261	214	182	153	121	95	79.83	35	
29	Port Road 1 80 KN.fwd	326	L1R	3	374	303	289	261	214	182	152	121	95	79.97	35	Good
	Port Road 1 80 KN.fwd	270	L1R	1	253	201	183	165	159	145	123	92	71	80.42	35	
	Port Road 1 80 KN.fwd	270	L1R	2	250	199	181	163	157	143	121	91	71	79.52	35	
30	Port Road 1 80 KN.fwd	270	L1R	3	251	199	181	163	157	143	121	90	71	79.54	35	Good
	Port Road 1 80 KN.fwd	213	L1R	1	313	221	197	174	161	138	100	83	71	80.34	35	
	Port Road 1 80 KN.fwd	213	L1R	2	308	218	195	172	159	137	101	84	71	79.47	35	
31	Port Road 1 80 KN.fwd	213	L1R	3	309	219	194	172	160	138	101	84	72	79.8	35	Good
32	Port Road 1 80 KN.fwd	152	L1R	1	227	189	170	153	139	127	114	94	72	81.27	35	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 1 80 KN.fwd	152	L1R	2	226	187	168	152	138	125	113	93	71	80.84	35	
	Port Road 1 80 KN.fwd	152	L1R	3	224	186	168	151	137	124	112	92	70	80.39	35	
	Port Road 1 80 KN.fwd	92	L1R	1	203	149	139	126	119	108	93	78	66	79.21	35	
	Port Road 1 80 KN.fwd	92	L1R	2	202	148	138	125	119	107	93	78	66	78.78	35	
33	Port Road 1 80 KN.fwd	92	L1R	3	203	149	139	126	120	108	94	79	66	79.09	35	Good
	Port Road 1 80 KN.fwd	28	L1R	1	323	235	208	181	160	125	103	82	70	79.56	35	
	Port Road 1 80 KN.fwd	28	L1R	2	325	237	210	183	163	128	107	84	72	80.01	35	
34	Port Road 1 80 KN.fwd	28	L1R	3	326	237	210	183	163	128	108	84	72	80.03	35	Good
	Port Road 2 60KN.fwd	30	L1F	1	144	117	110	96	87	71	61	54	47	60.42	46	
	Port Road 2 60KN.fwd	30	L1F	2	147	121	114	100	91	75	66	59	52	60.21	46	
35	Port Road 2 60KN.fwd	30	L1F	3	149	123	116	102	92	76	66	59	52	60.16	46	Good
	Port Road 2 60KN.fwd	88	L1F	1	122	109	104	95	92	84	73	62	55	59.45	46	
	Port Road 2 60KN.fwd	88	L1F	2	118	105	99	90	87	79	68	57	49	59.6	46	
36	Port Road 2 60KN.fwd	88	L1F	3	117	104	97	89	86	78	65	55	47	60.02	46	Good
	Port Road 2 60KN.fwd	150	L1F	1	138	121	113	107	103	95	83	69	61	59.94	46	
	Port Road 2 60KN.fwd	150	L1F	2	136	120	112	105	102	93	83	68	60	59.82	46	
37	Port Road 2 60KN.fwd	150	L1F	3	137	120	113	106	102	94	82	69	61	59.74	46	Good
	Port Road 2 60KN.fwd	206	L1F	1	246	217	195	178	168	149	127	100	84	59.85	46	
	Port Road 2 60KN.fwd	206	L1F	2	248	219	197	180	170	151	129	103	87	59.8	46	
38	Port Road 2 60KN.fwd	206	L1F	3	248	219	196	180	169	151	128	101	85	60.05	46	Good
	Port Road 2 60KN.fwd	274	L1F	1	261	207	175	149	139	128	113	89	76	61.87	46	
	Port Road 2 60KN.fwd	274	L1F	2	256	203	171	146	136	125	109	87	73	60.53	46	
39	Port Road 2 60KN.fwd	274	L1F	3	255	202	170	145	136	124	109	86	74	60.15	46	Good
40	Port Road 2 60KN.fwd	328	L1F	1	185	125	113	106	101	90	73	61	51	58.95	46	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 2 60KN.fwd	328	L1F	2	187	126	113	107	101	91	73	62	51	59.32	46	
	Port Road 2 60KN.fwd	328	L1F	3	188	127	114	108	102	91	75	63	51	59.47	46	
	Port Road 2 60KN.fwd	396	L1F	1	128	97	90	82	79	73	63	49	46	60.62	46	
	Port Road 2 60KN.fwd	396	L1F	2	128	96	89	81	79	72	62	49	45	60.58	46	
41	Port Road 2 60KN.fwd	396	L1F	3	128	97	89	82	79	72	63	49	46	60.62	46	Good
	Port Road 2 60KN.fwd	435	L1R	1	235	201	189	165	156	137	111	86	68	60.33	46	
	Port Road 2 60KN.fwd	435	L1R	2	234	199	187	163	155	135	110	85	68	59.18	46	
42	Port Road 2 60KN.fwd	435	L1R	3	236	201	188	164	156	136	110	85	68	59.14	46	Good
	Port Road 2 60KN.fwd	384	L1R	1	337	249	217	186	172	144	111	80	65	58.8	46	
	Port Road 2 60KN.fwd	384	L1R	2	341	252	220	188	174	145	112	81	65	59.36	46	
43	Port Road 2 60KN.fwd	384	L1R	3	345	255	222	190	176	147	113	81	65	59.77	46	Good
	Port Road 2 60KN.fwd	338	L1R	1	278	227	208	182	167	139	117	89	74	60.07	46	
	Port Road 2 60KN.fwd	338	L1R	2	280	228	209	182	169	139	118	89	74	59.67	46	
44	Port Road 2 60KN.fwd	338	L1R	3	282	229	210	183	169	140	119	89	74	59.71	46	Good
	Port Road 2 60KN.fwd	266	L1R	1	285	238	206	180	166	142	115	91	76	61.37	46	
	Port Road 2 60KN.fwd	266	L1R	2	282	235	203	177	163	139	112	89	73	61	46	
45	Port Road 2 60KN.fwd	266	L1R	3	281	235	203	177	164	140	114	88	74	60.79	46	Good
	Port Road 2 60KN.fwd	205	L1R	1	212	178	166	153	145	131	112	93	77	58.56	46	
	Port Road 2 60KN.fwd	205	L1R	2	215	180	168	154	147	133	114	94	79	59.1	46	
46	Port Road 2 60KN.fwd	205	L1R	3	216	182	170	156	148	135	115	95	80	59.61	46	Good
	Port Road 2 60KN.fwd	145	L1R	1	331	248	215	185	174	146	114	86	74	61.61	46	
	Port Road 2 60KN.fwd	145	L1R	2	328	246	213	184	172	144	113	85	73	61.12	46	
47	Port Road 2 60KN.fwd	145	L1R	3	325	243	210	181	169	141	111	83	71	60.37	46	Good
48	Port Road 2 60KN.fwd	84	L1R	1	195	158	144	124	118	102	83	65	56	60.64	46	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 2 60KN.fwd	84	L1R	2	193	157	142	123	116	100	82	64	55	59.76	46	
	Port Road 2 60KN.fwd	84	L1R	3	194	157	142	123	117	100	81	64	55	59.9	46	
	Port Road 2 60KN.fwd	24	L1R	1	148	134	123	112	106	94	78	61	52	61.05	46	
	Port Road 2 60KN.fwd	24	L1R	2	148	135	123	113	107	95	80	63	55	60.44	46	
49	Port Road 2 60KN.fwd	24	L1R	3	149	135	123	113	106	94	80	64	54	60.54	46	Good
	Port Road 2.fwd	3	L1F	1	151	129	122	112	108	99	87	75	65	79.48	46	
	Port Road 2.fwd	3	L1F	2	151	129	121	111	106	98	86	74	64	79.92	46	
50	Port Road 2.fwd	3	L1F	3	151	129	121	111	108	96	85	71	62	80.49	46	Good
	Port Road 2.fwd	62	L1F	1	267	229	204	184	172	153	126	104	86	82.53	46	
	Port Road 2.fwd	62	L1F	2	266	227	203	183	171	152	127	104	86	82.64	46	
51	Port Road 2.fwd	62	L1F	3	261	223	198	178	167	148	123	102	82	82.36	46	Good
	Port Road 2.fwd	121	L1F	1	200	175	162	148	142	127	109	90	75	81.63	46	
	Port Road 2.fwd	121	L1F	2	200	175	162	148	142	128	110	91	76	81.23	46	
52	Port Road 2.fwd	121	L1F	3	198	173	162	147	141	127	109	90	76	81.4	46	Good
	Port Road 2.fwd	173	L1F	1	199	186	177	163	156	143	123	103	88	79.67	46	
	Port Road 2.fwd	173	L1F	2	204	190	181	168	161	147	128	108	93	79.72	46	
53	Port Road 2.fwd	173	L1F	3	204	189	180	166	159	145	127	106	91	79.93	46	Good
	Port Road 2.fwd	238	L1F	1	212	188	174	161	155	142	124	104	90	80.61	46	
	Port Road 2.fwd	238	L1F	2	212	188	174	161	155	142	124	103	91	80.84	46	
54	Port Road 2.fwd	238	L1F	3	211	187	173	160	154	141	123	102	90	80.94	46	Good
	Port Road 2.fwd	299	L1F	1	212	170	158	142	131	118	100	87	73	78.2	46	
	Port Road 2.fwd	299	L1F	2	213	172	159	143	132	119	101	89	74	79.63	46	
55	Port Road 2.fwd	299	L1F	3	213	173	160	143	133	119	101	89	74	79.85	46	Good
56	Port Road 2.fwd	361	L1F	1	215	194	188	174	163	147	127	98	82	79.98	46	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 2.fwd	361	L1F	2	215	193	187	172	162	145	125	98	81	79.92	46	
	Port Road 2.fwd	361	L1F	3	216	193	188	172	163	146	124	98	81	80.09	46	
	Port Road 2.fwd	432	L1F	1	271	224	209	189	181	163	139	115	97	80.29	46	
	Port Road 2.fwd	432	L1F	2	271	224	210	190	181	163	139	116	97	80.18	46	
57	Port Road 2.fwd	432	L1F	3	271	224	210	190	181	163	139	115	98	79.89	46	Good
	Port Road 2.fwd	445	L1R	1	345	256	232	209	201	177	148	120	93	80.4	46	
	Port Road 2.fwd	445	L1R	2	345	256	233	208	201	177	147	119	93	80.87	46	
58	Port Road 2.fwd	445	L1R	3	343	254	231	207	198	176	146	118	92	80.53	46	Good
	Port Road 2.fwd	394	L1R	1	259	215	198	175	166	147	122	100	84	79.37	46	
	Port Road 2.fwd	394	L1R	2	261	216	200	176	168	148	123	101	85	79.75	46	
59	Port Road 2.fwd	394	L1R	3	261	217	200	177	168	148	123	101	85	79.85	46	Good
	Port Road 2.fwd	337	L1R	1	279	240	223	196	181	157	132	102	84	79.64	46	
	Port Road 2.fwd	337	L1R	2	279	241	224	197	183	158	133	103	86	80.26	46	
60	Port Road 2.fwd	337	L1R	3	280	241	224	196	182	158	133	103	85	80.23	46	Good
	Port Road 2.fwd	277	L1R	1	331	289	271	246	236	214	185	112	95	80.08	46	
	Port Road 2.fwd	277	L1R	2	329	288	271	246	236	213	185	113	97	79.71	46	
61	Port Road 2.fwd	277	L1R	3	330	289	271	246	236	214	185	113	96	79.41	46	Good
	Port Road 2.fwd	216	L1R	1	345	280	261	234	219	194	162	130	110	79.72	46	
	Port Road 2.fwd	216	L1R	2	344	280	261	233	219	194	162	130	111	80.1	46	
62	Port Road 2.fwd	216	L1R	3	344	280	261	234	220	195	163	131	112	80.14	46	Good
	Port Road 2.fwd	148	L1R	1	463	352	315	272	237	203	160	122	100	81.46	46	
	Port Road 2.fwd	148	L1R	2	457	345	309	265	231	197	155	117	96	80.67	46	
63	Port Road 2.fwd	148	L1R	3	455	344	307	264	229	196	153	116	94	80.1	46	Good
64	Port Road 2.fwd	93	L1R	1	205	176	162	146	138	123	106	89	76	80.75	46	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 2.fwd	93	L1R	2	207	176	162	146	138	123	106	89	75	81.19	46	
	Port Road 2.fwd	93	L1R	3	203	172	158	142	134	119	102	85	72	80.15	46	
	Port Road 2.fwd	36	L1R	1	179	162	154	142	137	123	105	87	74	79.54	46	
	Port Road 2.fwd	36	L1R	2	179	161	154	141	136	123	104	87	73	80.03	46	
65	Port Road 2.fwd	36	L1R	3	182	164	156	144	139	125	107	90	77	80.06	46	Good
	Port Road 3 60 KN.fwd	20	L1F	1	130	98	88	83	77	71	60	51	44	58.96	35	
	Port Road 3 60 KN.fwd	20	L1F	2	133	100	91	84	80	72	62	53	46	59.75	35	
66	Port Road 3 60 KN.fwd	20	L1F	3	134	101	92	85	81	74	65	54	47	59.88	35	Good
	Port Road 3 60 KN.fwd	80	L1F	1	130	111	104	96	92	85	75	64	56	59.53	35	
	Port Road 3 60 KN.fwd	80	L1F	2	130	112	105	97	93	86	76	65	58	59.81	35	
67	Port Road 3 60 KN.fwd	80	L1F	3	131	113	105	98	93	86	76	65	57	60.03	35	Good
	Port Road 3 60 KN.fwd	139	L1F	1	150	131	124	115	112	101	86	73	60	60.69	35	
	Port Road 3 60 KN.fwd	139	L1F	2	149	130	123	115	110	100	86	71	61	60.61	35	
68	Port Road 3 60 KN.fwd	139	L1F	3	149	131	124	116	111	101	87	73	62	60.33	35	Good
	Port Road 3 60 KN.fwd	199	L1F	1	174	152	139	127	121	107	92	75	63	58.81	35	
	Port Road 3 60 KN.fwd	199	L1F	2	177	154	142	130	124	110	94	77	65	59.35	35	
69	Port Road 3 60 KN.fwd	199	L1F	3	176	153	141	128	121	108	92	72	62	59.32	35	Good
	Port Road 3 60 KN.fwd	259	L1F	1	251	195	184	164	153	134	113	92	77	59.51	35	
	Port Road 3 60 KN.fwd	259	L1F	2	250	194	183	163	153	133	115	93	78	59.04	35	
70	Port Road 3 60 KN.fwd	259	L1F	3	252	196	185	165	154	135	118	92	78	59.09	35	Good
	Port Road 3 60 KN.fwd	316	L1F	1	144	126	120	109	105	96	82	68	58	59.97	35	
	Port Road 3 60 KN.fwd	316	L1F	2	145	127	119	110	105	96	83	69	59	59.57	35	
71	Port Road 3 60 KN.fwd	316	L1F	3	144	127	118	109	105	95	82	68	58	59.51	35	Good
72	Port Road 3 60 KN.fwd	375	L1F	1	166	145	137	128	122	113	99	82	70	59.31	35	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 3 60 KN.fwd	375	L1F	2	165	144	136	127	121	112	98	81	70	58.96	35	
	Port Road 3 60 KN.fwd	375	L1F	3	168	147	139	130	124	114	100	84	72	60.2	35	
	Port Road 3 60 KN.fwd	431	L1F	1	178	155	146	136	127	116	101	84	69	60.13	35	
	Port Road 3 60 KN.fwd	431	L1F	2	177	155	146	135	126	115	101	84	69	59.67	35	
73	Port Road 3 60 KN.fwd	431	L1F	3	178	155	146	136	127	115	101	84	69	59.84	35	Good
	Port Road 3 60 KN.fwd	404	L1R	1	152	132	124	116	111	102	88	72	62	58.65	35	
	Port Road 3 60 KN.fwd	404	L1R	2	153	132	125	116	112	102	88	73	62	58.78	35	
74	Port Road 3 60 KN.fwd	404	L1R	3	154	134	126	118	112	103	90	74	62	59.19	35	Good
	Port Road 3 60 KN.fwd	345	L1R	1	124	109	102	96	93	84	75	63	55	58.58	35	
	Port Road 3 60 KN.fwd	345	L1R	2	124	109	104	96	93	84	76	63	55	58.62	35	
75	Port Road 3 60 KN.fwd	345	L1R	3	126	111	105	98	94	86	76	65	56	59.55	35	Good
	Port Road 3 60 KN.fwd	287	L1R	1	134	114	106	97	93	84	73	60	51	61.54	35	
	Port Road 3 60 KN.fwd	287	L1R	2	133	113	104	96	92	83	72	59	51	60.7	35	
76	Port Road 3 60 KN.fwd	287	L1R	3	133	113	104	96	92	83	72	59	51	60.46	35	Good
	Port Road 3 60 KN.fwd	223	L1R	1	145	124	115	105	100	90	76	61	51	61.24	35	
	Port Road 3 60 KN.fwd	223	L1R	2	145	124	115	106	101	90	77	62	53	60.66	35	
77	Port Road 3 60 KN.fwd	223	L1R	3	143	123	115	104	100	89	76	61	51	60.31	35	Good
	Port Road 3 60 KN.fwd	163	L1R	1	181	148	135	119	113	99	84	66	56	59.66	35	
	Port Road 3 60 KN.fwd	163	L1R	2	182	149	136	120	114	100	85	68	57	59.82	35	
78	Port Road 3 60 KN.fwd	163	L1R	3	182	148	135	119	113	99	84	67	56	59.98	35	Good
	Port Road 3 60 KN.fwd	103	L1R	1	140	118	111	100	97	87	75	62	55	59.76	35	
	Port Road 3 60 KN.fwd	103	L1R	2	141	118	110	100	97	87	75	62	54	59.83	35	
79	Port Road 3 60 KN.fwd	103	L1R	3	142	119	111	101	96	87	75	64	55	60.26	35	Good
80	Port Road 3 60 KN.fwd	40	L1R	1	111	91	83	77	73	66	56	48	42	59.32	35	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 3 60 KN.fwd	40	L1R	2	111	91	82	76	73	66	56	48	41	59.25	35	
	Port Road 3 60 KN.fwd	40	L1R	3	112	92	84	77	74	67	57	49	43	59.14	35	
	Port Road 3 80 KN.fwd	5	L1F	1	134	129	122	114	110	100	86	70	59	80.92	44	
	Port Road 3 80 KN.fwd	5	L1F	2	135	129	122	115	111	101	87	71	62	80.81	44	
81	Port Road 3 80 KN.fwd	5	L1F	3	134	129	122	114	110	100	87	71	61	80.68	44	Good
	Port Road 3 80 KN.fwd	62	L1F	1	155	138	130	120	115	104	89	77	67	79.06	44	
	Port Road 3 80 KN.fwd	62	L1F	2	155	138	130	119	114	104	88	77	66	79.59	44	
82	Port Road 3 80 KN.fwd	62	L1F	3	156	139	131	120	116	105	90	77	67	79.76	44	Good
	Port Road 3 80 KN.fwd	123	L1F	1	187	166	155	140	133	120	106	87	74	80.04	44	
	Port Road 3 80 KN.fwd	123	L1F	2	190	169	158	143	136	123	108	90	76	80.64	44	
83	Port Road 3 80 KN.fwd	123	L1F	3	189	168	157	142	135	122	106	88	75	80.43	44	Good
	Port Road 3 80 KN.fwd	179	L1F	1	246	195	175	168	155	139	116	98	83	82.03	44	
	Port Road 3 80 KN.fwd	179	L1F	2	243	193	174	167	153	139	116	99	83	81.51	44	
84	Port Road 3 80 KN.fwd	179	L1F	3	242	192	173	166	152	138	115	98	82	81.14	44	Good
	Port Road 3 80 KN.fwd	238	L1F	1	233	207	193	176	167	149	126	103	86	79.59	44	
	Port Road 3 80 KN.fwd	238	L1F	2	232	206	192	176	166	149	126	102	86	79.27	44	
85	Port Road 3 80 KN.fwd	238	L1F	3	235	209	195	179	169	151	128	105	88	79.83	44	Good
	Port Road 3 80 KN.fwd	297	L1F	1	213	167	158	147	143	131	114	94	81	79.54	44	
	Port Road 3 80 KN.fwd	297	L1F	2	214	168	158	148	143	132	115	97	83	80.16	44	
86	Port Road 3 80 KN.fwd	297	L1F	3	213	165	156	146	141	130	113	94	80	80.17	44	Good
	Port Road 3 80 KN.fwd	360	L1F	1	249	198	185	172	164	150	130	108	91	78.45	44	
	Port Road 3 80 KN.fwd	360	L1F	2	248	198	185	172	164	150	131	108	91	79.8	44	
87	Port Road 3 80 KN.fwd	360	L1F	3	249	198	185	171	164	150	130	107	90	79.96	44	Good
88	Port Road 3 80 KN.fwd	420	L1F	1	217	194	183	170	163	149	129	107	90	79.48	44	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 3 80 KN.fwd	420	L1F	2	218	195	184	171	164	150	129	108	92	79.3	44	
	Port Road 3 80 KN.fwd	420	L1F	3	220	197	186	173	166	152	132	110	94	79.22	44	
	Port Road 3 80 KN.fwd	440	L1R	1	177	154	146	137	132	120	106	89	76	79.36	44	
	Port Road 3 80 KN.fwd	440	L1R	2	176	153	145	136	131	119	105	89	75	79.97	44	
89	Port Road 3 80 KN.fwd	440	L1R	3	176	154	145	136	131	119	105	89	75	79.89	44	Good
	Port Road 3 80 KN.fwd	386	L1R	1	212	179	168	152	147	130	113	90	77	79.44	44	
	Port Road 3 80 KN.fwd	386	L1R	2	211	178	166	151	144	129	112	90	77	80.17	44	
90	Port Road 3 80 KN.fwd	386	L1R	3	209	177	166	150	144	129	111	90	76	79.76	44	Good
	Port Road 3 80 KN.fwd	332	L1R	1	210	155	144	134	128	118	104	90	79	80.71	44	
	Port Road 3 80 KN.fwd	332	L1R	2	208	153	142	132	126	116	103	89	78	79.83	44	
91	Port Road 3 80 KN.fwd	332	L1R	3	209	153	143	133	127	116	103	89	78	79.66	44	Good
	Port Road 3 80 KN.fwd	270	L1R	1	199	175	164	152	145	132	118	94	81	79.49	44	
	Port Road 3 80 KN.fwd	270	L1R	2	197	173	163	150	143	130	118	95	81	79.94	44	
92	Port Road 3 80 KN.fwd	270	L1R	3	197	174	163	151	143	131	118	94	81	79.86	44	Good
	Port Road 3 80 KN.fwd	199	L1R	1	273	229	216	195	184	165	140	113	95	80.8	44	
	Port Road 3 80 KN.fwd	199	L1R	2	271	229	215	195	184	164	141	113	96	80.98	44	
93	Port Road 3 80 KN.fwd	199	L1R	3	270	229	215	195	185	165	142	113	97	81.16	44	Good
	Port Road 3 80 KN.fwd	153	L1R	1	228	187	175	160	153	138	119	99	84	79.07	44	
	Port Road 3 80 KN.fwd	153	L1R	2	231	190	178	163	155	140	120	100	85	79.96	44	
94	Port Road 3 80 KN.fwd	153	L1R	3	233	191	178	164	156	141	120	101	86	80.55	44	Good
	Port Road 3 80 KN.fwd	84	L1R	1	155	147	139	128	123	110	95	78	68	80.19	44	
	Port Road 3 80 KN.fwd	84	L1R	2	154	146	138	127	121	109	94	78	68	79.83	44	
95	Port Road 3 80 KN.fwd	84	L1R	3	156	148	140	128	123	111	95	80	70	80.17	44	Good
96	Port Road 3 80 KN.fwd	31	L1R	1	155	131	122	111	107	95	81	66	58	79.36	44	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 3 80 KN.fwd	31	L1R	2	156	134	125	114	111	98	84	69	61	79.83	44	
	Port Road 3 80 KN.fwd	31	L1R	3	157	135	126	115	110	99	84	67	60	81.77	44	
	Port Road 4 60 KN.fwd	20	L1F	1	255	159	135	119	111	95	77	57	48	60.3	35	
	Port Road 4 60 KN.fwd	20	L1F	2	254	158	134	119	110	94	76	57	47	60.26	35	
97	Port Road 4 60 KN.fwd	20	L1F	3	253	157	133	118	109	93	76	56	46	59.98	35	Good
	Port Road 4 60 KN.fwd	75	L1F	1	159	128	120	108	102	90	74	61	52	60.85	35	
	Port Road 4 60 KN.fwd	75	L1F	2	157	127	118	106	100	89	73	58	49	60.26	35	
98	Port Road 4 60 KN.fwd	75	L1F	3	157	129	120	108	102	90	75	60	51	59.87	35	Good
	Port Road 4 60 KN.fwd	132	L1F	1	131	100	92	86	81	75	65	56	50	60.88	35	
	Port Road 4 60 KN.fwd	132	L1F	2	129	99	90	84	80	75	63	55	46	59.66	35	
99	Port Road 4 60 KN.fwd	132	L1F	3	129	99	90	85	81	74	63	53	48	59.61	35	Good
	Port Road 4 60 KN.fwd	196	L1F	1	180	152	137	126	119	107	88	70	60	59.06	35	
	Port Road 4 60 KN.fwd	196	L1F	2	178	151	136	125	119	106	88	70	59	58.76	35	
100	Port Road 4 60 KN.fwd	196	L1F	3	180	153	138	127	120	107	89	70	61	59.28	35	Good
	Port Road 4 60 KN.fwd	255	L1F	1	124	109	102	96	92	85	74	62	53	60.42	35	
	Port Road 4 60 KN.fwd	255	L1F	2	123	108	101	95	91	84	72	61	52	60.38	35	
101	Port Road 4 60 KN.fwd	255	L1F	3	124	108	102	96	92	85	74	62	53	60.42	35	Good
	Port Road 4 60 KN.fwd	318	L1F	1	217	176	163	148	139	125	106	86	74	58.94	35	
	Port Road 4 60 KN.fwd	318	L1F	2	221	179	166	150	142	127	108	88	75	59.95	35	
102	Port Road 4 60 KN.fwd	318	L1F	3	219	178	165	150	141	126	108	87	74	59.55	35	Good
	Port Road 4 60 KN.fwd	376	L1F	1	157	134	124	114	109	98	85	68	58	60.84	35	
	Port Road 4 60 KN.fwd	376	L1F	2	156	134	124	115	109	97	86	68	59	61.03	35	
103	Port Road 4 60 KN.fwd	376	L1F	3	155	133	123	114	108	97	85	68	59	60.44	35	Good
104	Port Road 4 60 KN.fwd	428	L1F	1	137	122	114	108	104	95	85	69	61	60.64	35	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 4 60 KN.fwd	428	L1F	2	134	120	112	106	102	93	82	68	59	60.18	35	
	Port Road 4 60 KN.fwd	428	L1F	3	134	121	113	107	103	94	84	69	61	60.42	35	
	Port Road 4 60 KN.fwd	406	L1R	1	155	131	122	115	111	102	91	75	64	59.64	35	
	Port Road 4 60 KN.fwd	406	L1R	2	154	130	121	114	111	102	90	75	65	59.7	35	
105	Port Road 4 60 KN.fwd	406	L1R	3	154	130	122	114	110	101	90	74	64	60	35	Good
	Port Road 4 60 KN.fwd	343	L1R	1	142	121	114	106	104	96	85	70	60	59.87	35	
	Port Road 4 60 KN.fwd	343	L1R	2	141	121	114	106	103	94	84	70	60	60.26	35	
106	Port Road 4 60 KN.fwd	343	L1R	3	140	120	114	106	103	94	84	70	60	60	35	Good
	Port Road 4 60 KN.fwd	284	L1R	1	153	139	131	122	117	106	92	76	64	62.01	35	
	Port Road 4 60 KN.fwd	284	L1R	2	151	137	130	120	115	104	90	73	63	61.34	35	
107	Port Road 4 60 KN.fwd	284	L1R	3	149	134	127	118	114	103	89	74	61	60.64	35	Good
	Port Road 4 60 KN.fwd	227	L1R	1	172	152	141	130	124	113	97	82	69	59.15	35	
	Port Road 4 60 KN.fwd	227	L1R	2	173	152	141	131	125	114	96	81	71	59.05	35	
108	Port Road 4 60 KN.fwd	227	L1R	3	174	153	142	131	125	114	99	83	69	59.54	35	Good
	Port Road 4 60 KN.fwd	164	L1R	1	150	129	120	110	106	94	81	66	58	59.86	35	
	Port Road 4 60 KN.fwd	164	L1R	2	149	128	119	110	105	94	80	69	58	59.93	35	
109	Port Road 4 60 KN.fwd	164	L1R	3	150	130	121	111	107	95	82	68	60	59.91	35	Good
	Port Road 4 60 KN.fwd	97	L1R	1	128	100	93	86	82	74	65	55	48	59.96	35	
	Port Road 4 60 KN.fwd	97	L1R	2	128	100	92	86	82	74	65	55	48	59.22	35	
110	Port Road 4 60 KN.fwd	97	L1R	3	127	100	92	85	81	74	65	55	48	59.22	35	Good
	Port Road 4 60 KN.fwd	43	L1R	1	107	90	84	80	79	73	64	56	51	59.32	35	
	Port Road 4 60 KN.fwd	43	L1R	2	104	89	83	79	77	71	63	54	49	59.52	35	
111	Port Road 4 60 KN.fwd	43	L1R	3	104	88	83	78	76	70	62	53	48	59.61	35	Good
112	Port Road 4 80 KN.fwd	2	L1F	1	184	149	139	127	122	111	97	69	59	80.24	44	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 4 80 KN.fwd	2	L1F	2	184	149	140	128	123	112	99	72	62	80.37	44	
	Port Road 4 80 KN.fwd	2	L1F	3	183	148	138	127	122	111	97	70	63	79.99	44	
	Port Road 4 80 KN.fwd	60	L1F	1	182	157	147	133	127	113	94	78	65	79.56	44	
	Port Road 4 80 KN.fwd	60	L1F	2	182	157	147	134	127	114	98	79	67	79.21	44	
113	Port Road 4 80 KN.fwd	60	L1F	3	183	158	149	136	128	115	99	80	68	79.84	44	Good
	Port Road 4 80 KN.fwd	119	L1F	1	176	157	146	133	128	114	98	80	67	81.05	44	
	Port Road 4 80 KN.fwd	119	L1F	2	174	155	144	132	126	113	99	79	67	80.41	44	
114	Port Road 4 80 KN.fwd	119	L1F	3	174	155	144	132	126	113	99	80	67	80.24	44	Good
	Port Road 4 80 KN.fwd	180	L1F	1	245	190	179	165	156	141	119	97	81	79.12	44	
	Port Road 4 80 KN.fwd	180	L1F	2	244	190	178	166	156	141	120	98	82	79.89	44	
115	Port Road 4 80 KN.fwd	180	L1F	3	245	191	179	166	157	142	120	98	83	79.93	44	Good
	Port Road 4 80 KN.fwd	239	L1F	1	188	159	151	141	136	122	107	89	77	81.34	44	
	Port Road 4 80 KN.fwd	239	L1F	2	186	158	149	140	134	122	106	88	77	80.65	44	
116	Port Road 4 80 KN.fwd	239	L1F	3	186	158	149	139	134	121	106	88	76	80.3	44	Good
	Port Road 4 80 KN.fwd	300	L1F	1	228	212	202	191	181	166	142	117	98	80.47	44	
	Port Road 4 80 KN.fwd	300	L1F	2	227	212	202	190	181	166	142	117	99	80.96	44	
117	Port Road 4 80 KN.fwd	300	L1F	3	227	212	202	190	180	166	142	117	98	81.24	44	Good
	Port Road 4 80 KN.fwd	360	L1F	1	180	158	149	141	135	124	110	92	80	79.41	44	
	Port Road 4 80 KN.fwd	360	L1F	2	181	158	150	141	135	124	110	92	81	79.56	44	
118	Port Road 4 80 KN.fwd	360	L1F	3	181	159	150	141	136	125	111	92	81	79.94	44	Good
	Port Road 4 80 KN.fwd	424	L1F	1	172	146	139	130	126	116	102	86	74	78.71	44	
	Port Road 4 80 KN.fwd	424	L1F	2	173	148	141	132	127	117	103	87	76	79.38	44	
119	Port Road 4 80 KN.fwd	424	L1F	3	174	148	141	132	128	117	103	87	76	79.91	44	Good
120	Port Road 4 80 KN.fwd	430	L1R	1	209	176	165	155	149	136	118	98	83	78.73	44	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 4 80 KN.fwd	430	L1R	2	207	176	165	155	149	136	119	98	83	79.44	44	
	Port Road 4 80 KN.fwd	430	L1R	3	208	177	166	156	150	136	119	98	84	79.66	44	
	Port Road 4 80 KN.fwd	383	L1R	1	273	180	173	161	156	145	128	109	93	79.97	44	
	Port Road 4 80 KN.fwd	383	L1R	2	268	179	171	160	155	144	127	108	93	79.63	44	
121	Port Road 4 80 KN.fwd	383	L1R	3	268	179	172	161	155	144	127	108	92	79.82	44	Good
	Port Road 4 80 KN.fwd	332	L1R	1	208	183	175	163	157	145	130	109	95	81.11	44	
	Port Road 4 80 KN.fwd	332	L1R	2	204	180	172	161	154	143	128	107	95	80.37	44	
122	Port Road 4 80 KN.fwd	332	L1R	3	203	180	172	160	154	143	128	108	94	80.31	44	Good
	Port Road 4 80 KN.fwd	271	L1R	1	192	169	161	150	144	133	115	95	81	80.52	44	
	Port Road 4 80 KN.fwd	271	L1R	2	192	169	161	150	146	133	116	95	80	80.44	44	
123	Port Road 4 80 KN.fwd	271	L1R	3	193	170	162	151	146	134	117	96	81	80.24	44	Good
	Port Road 4 80 KN.fwd	212	L1R	1	189	176	169	159	153	140	122	102	88	79.05	44	
	Port Road 4 80 KN.fwd	212	L1R	2	189	176	169	159	152	139	121	102	87	79.4	44	
124	Port Road 4 80 KN.fwd	212	L1R	3	192	179	171	161	155	142	124	104	89	80.26	44	Good
	Port Road 4 80 KN.fwd	151	L1R	1	298	294	288	272	260	244	214	176	146	80.07	44	
	Port Road 4 80 KN.fwd	151	L1R	2	298	295	289	272	261	245	214	176	146	80.04	44	
125	Port Road 4 80 KN.fwd	151	L1R	3	298	295	289	273	261	245	214	176	146	80.2	44	Good
	Port Road 4 80 KN.fwd	93	L1R	1	171	148	137	126	121	108	94	76	66	80.44	44	
	Port Road 4 80 KN.fwd	93	L1R	2	171	149	138	127	121	109	95	79	68	80.23	44	
126	Port Road 4 80 KN.fwd	93	L1R	3	170	147	137	126	120	107	93	78	66	80.33	44	Good
	Port Road 4 80 KN.fwd	30	L1R	1	142	111	105	97	95	86	77	66	57	80.37	44	
	Port Road 4 80 KN.fwd	30	L1R	2	142	112	105	98	95	87	77	66	58	80.08	44	
127	Port Road 4 80 KN.fwd	30	L1R	3	142	112	105	98	96	88	79	67	59	80.03	44	Good
128	Port Road 5 60 KN.fwd	23	L1F	1	133	120	115	107	102	94	82	69	61	59.7	38	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 5 60 KN.fwd	23	L1F	2	133	121	116	109	103	96	87	71	63	59.84	38	
	Port Road 5 60 KN.fwd	23	L1F	3	135	123	119	111	106	98	89	74	65	59.84	38	
	Port Road 5 60 KN.fwd	73	L1F	1	108	99	93	88	85	79	69	60	52	59.44	38	
	Port Road 5 60 KN.fwd	73	L1F	2	111	102	96	92	89	82	72	63	55	60.14	38	
129	Port Road 5 60 KN.fwd	73	L1F	3	108	99	93	88	85	79	69	60	52	59.76	38	Good
	Port Road 5 60 KN.fwd	135	L1F	1	150	137	129	119	113	103	86	68	55	59.51	38	
	Port Road 5 60 KN.fwd	135	L1F	2	152	139	131	121	115	104	88	68	55	59.83	38	
130	Port Road 5 60 KN.fwd	135	L1F	3	150	137	128	119	112	102	85	66	52	59.47	38	Good
	Port Road 5 60 KN.fwd	224	L1F	1	150	130	121	116	109	103	91	76	65	61.2	38	
	Port Road 5 60 KN.fwd	224	L1F	2	148	128	120	114	107	101	89	75	64	60.36	38	
131	Port Road 5 60 KN.fwd	224	L1F	3	148	129	121	115	108	102	91	76	66	59.44	38	Good
	Port Road 5 60 KN.fwd	260	L1R	1	122	113	107	101	97	91	81	69	62	61.14	38	
	Port Road 5 60 KN.fwd	260	L1R	2	121	111	105	100	95	89	80	67	60	59.37	38	
132	Port Road 5 60 KN.fwd	260	L1R	3	122	112	107	102	97	91	82	69	63	59.13	38	Good
	Port Road 5 60 KN.fwd	192	L1R	1	159	99	92	86	83	74	64	52	46	62.33	38	
	Port Road 5 60 KN.fwd	192	L1R	2	155	97	91	85	81	73	63	53	47	60.53	38	
133	Port Road 5 60 KN.fwd	192	L1R	3	155	97	91	85	82	73	64	53	47	59.91	38	Good
	Port Road 5 60 KN.fwd	157	L1R	1	93	83	79	74	72	67	60	51	44	60.05	38	
	Port Road 5 60 KN.fwd	157	L1R	2	92	82	77	73	71	66	58	49	42	59.93	38	
134	Port Road 5 60 KN.fwd	157	L1R	3	91	83	78	74	71	67	59	50	44	60.13	38	Good
	Port Road 5 60 KN.fwd	106	L1R	1	110	87	78	73	70	66	61	51	46	58.77	38	
	Port Road 5 60 KN.fwd	106	L1R	2	108	85	76	70	67	63	57	46	42	59.08	38	
135	Port Road 5 60 KN.fwd	106	L1R	3	108	86	77	71	67	63	58	46	42	59.21	38	Good
136	Port Road 5 60 KN.fwd	42	L1R	1	112	98	94	89	86	80	72	59	51	60.23	38	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 5 60 KN.fwd	42	L1R	2	110	96	92	86	83	76	68	55	47	60.09	38	
	Port Road 5 60 KN.fwd	42	L1R	3	112	99	94	89	86	79	71	58	51	60.09	38	
	Port Road 5 80 KN.fwd	5	L1F	1	119	108	99	90	85	77	66	56	48	79.58	44	
	Port Road 5 80 KN.fwd	5	L1F	2	120	108	98	91	86	77	66	56	49	80.01	44	
137	Port Road 5 80 KN.fwd	5	L1F	3	120	109	99	91	86	78	67	56	49	79.99	44	Good
	Port Road 5 80 KN.fwd	60	L1F	1	185	168	160	147	140	129	113	97	83	79.22	44	
	Port Road 5 80 KN.fwd	60	L1F	2	186	169	161	148	141	130	113	97	83	79.56	44	
138	Port Road 5 80 KN.fwd	60	L1F	3	187	171	162	149	142	131	113	98	84	80.05	44	Good
	Port Road 5 80 KN.fwd	121	L1F	1	208	182	169	154	146	130	108	88	75	79.11	44	
	Port Road 5 80 KN.fwd	121	L1F	2	208	181	169	154	145	130	108	89	75	79.08	44	
139	Port Road 5 80 KN.fwd	121	L1F	3	211	184	171	156	147	131	108	89	76	79.85	44	Good
	Port Road 5 80 KN.fwd	180	L1F	1	218	185	172	153	144	130	110	88	77	79.62	44	
	Port Road 5 80 KN.fwd	180	L1F	2	213	184	170	151	142	127	107	85	73	80.2	44	
140	Port Road 5 80 KN.fwd	180	L1F	3	213	185	171	151	142	127	106	84	72	80.04	44	Good
	Port Road 5 80 KN.fwd	242	L1F	1	156	142	136	128	124	117	106	91	80	79.89	44	
	Port Road 5 80 KN.fwd	242	L1F	2	156	142	136	129	125	117	106	91	81	79.78	44	
141	Port Road 5 80 KN.fwd	242	L1F	3	157	143	137	130	126	118	106	92	82	80.36	44	Good
	Port Road 5 80 KN.fwd	261	L1R	1	195	172	163	152	147	135	120	101	87	80.35	44	
	Port Road 5 80 KN.fwd	261	L1R	2	195	172	163	153	147	135	120	102	88	80.3	44	
142	Port Road 5 80 KN.fwd	261	L1R	3	194	171	162	152	146	135	120	101	86	79.93	44	Good
	Port Road 5 80 KN.fwd	210	L1R	1	133	113	107	99	96	88	78	65	57	80.75	44	
	Port Road 5 80 KN.fwd	210	L1R	2	135	115	108	102	97	89	80	67	60	80.69	44	
143	Port Road 5 80 KN.fwd	210	L1R	3	134	115	108	101	97	89	80	66	60	80.42	44	Good
144	Port Road 5 80 KN.fwd	151	L1R	1	134	128	122	115	113	103	92	77	67	79.53	38	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 5 80 KN.fwd	151	L1R	2	133	127	121	114	111	101	90	75	66	79.85	38	
	Port Road 5 80 KN.fwd	151	L1R	3	133	128	121	114	110	102	90	77	67	79.84	38	
	Port Road 5 80 KN.fwd	91	L1R	1	148	130	122	112	106	95	82	68	59	80.31	38	
	Port Road 5 80 KN.fwd	91	L1R	2	146	128	119	109	103	93	79	65	56	80.51	38	
145	Port Road 5 80 KN.fwd	91	L1R	3	147	129	121	110	105	95	81	68	60	80.21	38	Good
	Port Road 5 80 KN.fwd	30	L1R	1	135	117	110	102	99	90	81	69	62	79.84	38	
	Port Road 5 80 KN.fwd	30	L1R	2	135	117	110	102	99	90	81	69	62	80.21	38	
146	Port Road 5 80 KN.fwd	30	L1R	3	134	116	110	101	98	89	80	67	61	79.99	38	Good
	Port Road 6 60 KN.fwd	0	L1F	1	277	173	154	133	122	106	84	67	54	59.85	38	
	Port Road 6 60 KN.fwd	0	L1F	2	279	176	156	135	124	108	87	69	57	59.81	38	
147	Port Road 6 60 KN.fwd	0	L1F	3	279	176	157	136	126	108	88	69	57	59.9	38	Good
	Port Road 6 60 KN.fwd	61	L1F	1	152	116	110	103	100	90	81	65	58	60	38	
	Port Road 6 60 KN.fwd	61	L1F	2	151	116	110	103	101	90	81	64	58	59.55	38	
148	Port Road 6 60 KN.fwd	61	L1F	3	152	116	111	104	101	90	82	64	58	59.52	38	Good
	Port Road 6 60 KN.fwd	106	L1F	1	172	135	127	118	113	102	88	71	60	61.72	38	
	Port Road 6 60 KN.fwd	106	L1F	2	170	134	126	117	112	101	88	71	60	60.59	38	
149	Port Road 6 60 KN.fwd	106	L1F	3	168	132	124	115	110	99	85	69	58	60.27	38	Good
	Port Road 6 60 KN.fwd	84	L1R	1	191	161	152	141	137	123	108	86	69	59.73	38	
	Port Road 6 60 KN.fwd	84	L1R	2	192	161	153	142	137	124	109	87	69	60.12	38	
150	Port Road 6 60 KN.fwd	84	L1R	3	189	159	150	139	134	121	106	84	66	59.73	38	Good
	Port Road 6 60 KN.fwd	31	L1R	1	172	143	135	124	120	108	95	78	67	59.71	38	
	Port Road 6 60 KN.fwd	31	L1R	2	173	143	135	125	121	108	96	78	68	59.66	38	
151	Port Road 6 60 KN.fwd	31	L1R	3	173	144	136	125	121	109	96	79	68	59.71	38	Good
152	Port Road 6 80 KN.fwd	15	L1F	1	187	151	142	132	127	115	101	84	72	79.62	38	Good

Point	Filename	Chainage	Lane	Drop	Deflection in microns									Load	Temparature	Remarks
					D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	kN	oC	
					0	200	300	450	600	900	1200	1500	1800			
	Port Road 6 80 KN.fwd	15	L1F	2	187	151	143	132	127	115	101	84	72	79.61	38	
	Port Road 6 80 KN.fwd	15	L1F	3	187	151	143	132	127	115	101	84	71	79.82	38	
	Port Road 6 80 KN.fwd	76	L1F	1	265	204	195	181	174	160	137	114	98	79.05	38	
	Port Road 6 80 KN.fwd	76	L1F	2	265	204	195	182	174	160	137	116	99	79.02	38	
153	Port Road 6 80 KN.fwd	76	L1F	3	267	206	197	183	177	162	140	117	100	79.33	38	Good
	Port Road 6 80 KN.fwd	98	L1F	1	214	179	168	153	147	132	114	93	79	79.6	38	
	Port Road 6 80 KN.fwd	98	L1F	2	215	180	169	155	149	133	115	94	80	80.02	38	
154	Port Road 6 80 KN.fwd	98	L1F	3	214	179	169	154	148	132	114	93	80	80	38	Good
	Port Road 6 80 KN.fwd	90	L1R	1	169	141	135	125	121	110	98	84	74	80.39	38	
	Port Road 6 80 KN.fwd	90	L1R	2	170	141	135	125	121	111	98	84	74	80.11	38	
155	Port Road 6 80 KN.fwd	90	L1R	3	169	141	135	125	121	111	98	84	75	80.08	38	Good
	Port Road 6 80 KN.fwd	40	L1R	1	223	190	182	167	162	148	131	111	95	80.03	38	
	Port Road 6 80 KN.fwd	40	L1R	2	225	192	185	170	165	151	135	114	98	79.95	38	
156	Port Road 6 80 KN.fwd	40	L1R	3	223	190	183	168	162	149	133	112	96	79.8	38	Good

Appendix III – Results

Section	Chainage	Corrected Deflection in mm									KGP back results			Correction for Temp and Summer Season			15%		
		D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	BT	Granular	subgrade	E1 Temp Adjusted	**E2 Original**	E3 Monsoon	E1 Temp Adj	E2 (Original)	E3 Mon
Port Road 1	17	0.097	0.080	0.072	0.065	0.062	0.055	0.046	0.036	0.029	1497.8	7814.3	221.3	1497.8	7814.3	180.84			
	74	0.109	0.083	0.073	0.063	0.059	0.051	0.043	0.034	0.029	890.8	6683.3	234.5	890.8	6683.3	192.13			
	133	0.117	0.081	0.072	0.064	0.063	0.053	0.046	0.036	0.030	752.2	7255.1	221.8	752.2	7255.1	181.27			
	194	0.117	0.098	0.088	0.075	0.068	0.059	0.046	0.035	0.030	2949.4	3874.9	220.4	2949.4	3874.9	180.07			
	255	0.102	0.083	0.075	0.066	0.062	0.055	0.046	0.037	0.032	1299.9	7680.8	215.9	1299.9	7680.8	176.22			
	324	0.122	0.103	0.095	0.086	0.082	0.073	0.059	0.046	0.037	2465.5	5221.9	172.9	2465.5	5221.9	139.44			
	378	0.122	0.103	0.095	0.085	0.081	0.072	0.061	0.050	0.042	1735.3	6696	160.3	1735.3	6696	128.66			
	433	0.317	0.089	0.083	0.078	0.075	0.069	0.059	0.048	0.041	752.2	6746.8	173.6	752.2	6746.8	140.04			
	475	0.122	0.099	0.092	0.087	0.084	0.078	0.069	0.055	0.045	958.9	9345.6	142.9	958.9	9345.6	113.78			
	402	0.113	0.101	0.101	0.098	0.092	0.078	0.066	0.054	0.044	2971.4	7197.9	145.6	2971.4	7197.9	116.09			
	345	0.128	0.094	0.088	0.081	0.078	0.069	0.061	0.048	0.040	754.4	7954.1	164.8	754.4	7954.1	132.51			
	284	0.128	0.098	0.089	0.082	0.078	0.070	0.063	0.053	0.031	838	5641.3	182.1	838	5641.3	147.31			
	226	0.125	0.100	0.083	0.067	0.059	0.053	0.046	0.038	0.034	778.6	5978	216.4	778.6	5978	176.65			
	166	0.129	0.095	0.085	0.074	0.070	0.060	0.048	0.039	0.033	838	5101.2	206	838	5101.2	167.75			
	102	0.124	0.100	0.091	0.081	0.076	0.067	0.056	0.044	0.037	1086.5	6067	179	1086.5	6067	144.66			
	44	0.132	0.112	0.101	0.083	0.079	0.069	0.057	0.045	0.037	2903.2	4014.7	180	2903.2	4014.7	145.51			
	0	0.076	0.067	0.061	0.056	0.053	0.048	0.041	0.033	0.028	2984.6	9955.5	246.6	2984.6	9955.5	202.48			
	62	0.075	0.062	0.057	0.051	0.048	0.044	0.038	0.031	0.027	3000	9974.6	268.9	3000	9974.6	221.56			
	122	0.139	0.094	0.080	0.067	0.061	0.054	0.045	0.037	0.031	752.2	4808.9	226.2	752.2	4808.9	185.03			

Section	Chainage	Corrected Deflection in mm									KGP back results			Correction for Temp and Summer Season			15%		
		D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	BT	Granular	subgrade	E1 Temp Adjusted	**E2 Original**	E3 Monsoon	E1 Temp Adj	E2 (Original)	E3 Mon
	178	0.120	0.089	0.081	0.071	0.067	0.060	0.048	0.039	0.034	758.8	6664.2	204.7	758.8	6664.2	166.64			
	241	0.135	0.112	0.103	0.089	0.082	0.070	0.055	0.042	0.034	2109.2	3538.1	187.3	2109.2	3538.1	151.76			
	300	0.107	0.091	0.084	0.076	0.073	0.065	0.056	0.045	0.035	2507.3	7388.6	180	2507.3	7388.6	145.51			
	371	0.188	0.152	0.135	0.116	0.105	0.091	0.073	0.054	0.043	763.2	3500	140.4	763.2	3500	111.64			
	419	0.194	0.145	0.134	0.118	0.109	0.097	0.082	0.064	0.053	765.4	3709.7	126.4	765.4	3709.7	99.66			
	427	0.231	0.185	0.174	0.156	0.146	0.130	0.111	0.093	0.084	774.2	4065.5	85.1	774.2	4065.5	64.33			
	475	0.113	0.097	0.088	0.080	0.077	0.068	0.060	0.049	0.042	1423	8456	161.8	1423	8456	129.94			
	450	0.100	0.075	0.072	0.068	0.067	0.062	0.056	0.048	0.041	2859.2	9974.6	178.4	2859.2	9974.6	144.14			
	390	0.161	0.133	0.099	0.090	0.087	0.076	0.065	0.050	0.041	761	4122.7	165.2	761	4122.7	132.85			
	326	0.187	0.152	0.145	0.131	0.107	0.091	0.076	0.060	0.047	855.6	3500	130.7	855.6	3500	103.34			
	270	0.126	0.100	0.091	0.082	0.079	0.072	0.061	0.046	0.036	1088.7	5806.5	177	1088.7	5806.5	142.94			
	213	0.155	0.110	0.098	0.086	0.080	0.069	0.050	0.042	0.036	822.6	3627.1	188.9	822.6	3627.1	153.12			
	152	0.112	0.093	0.083	0.075	0.068	0.062	0.056	0.046	0.035	1236.1	7788.9	183.2	1236.1	7788.9	148.25			
	92	0.103	0.075	0.070	0.064	0.060	0.055	0.047	0.040	0.033	752.2	9993.6	206.6	752.2	9993.6	168.26			
	28	0.163	0.118	0.105	0.091	0.081	0.064	0.053	0.042	0.036	761	3538.1	187.9	761	3538.1	152.27	758.58	3705.57	115.97
Port Road 2	30	0.097	0.080	0.075	0.066	0.060	0.049	0.043	0.038	0.033	2940.6	6600.7	220.1	5094.92	6600.7	179.81			
	88	0.080	0.071	0.067	0.061	0.059	0.054	0.046	0.039	0.034	2980.2	9993.6	208.6	5163.53	9993.6	169.98			
	150	0.092	0.080	0.075	0.071	0.068	0.063	0.055	0.046	0.041	2958.2	9993.6	174.3	5125.42	9993.6	140.64			
	206	0.165	0.146	0.131	0.120	0.113	0.100	0.085	0.068	0.057	2868	3722.4	117.4	4969.13	3722.4	91.96			
	274	0.169	0.134	0.113	0.096	0.090	0.083	0.073	0.057	0.049	2971.4	3512.7	142.9	5148.29	3512.7	113.78			

Section	Chainage	Corrected Deflection in mm									KGP back results			Correction for Temp and Summer Season			15%		
		D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	BT	Granular	subgrade	E1 Temp Adjusted	**E2 Original**	E3 Monsoon	E1 Temp Adj	E2 (Original)	E3 Mon
	328	0.126	0.085	0.077	0.072	0.068	0.061	0.050	0.042	0.034	765.4	5939.9	199.6	1326.14	5939.9	162.28			
	396	0.084	0.064	0.059	0.054	0.052	0.048	0.041	0.032	0.030	750	9968.2	245.5	1299.46	9968.2	201.54			
	435	0.158	0.135	0.126	0.110	0.105	0.091	0.074	0.057	0.046	822.6	3601.7	139.5	1425.25	3601.7	110.87			
	384	0.230	0.170	0.148	0.127	0.117	0.098	0.076	0.054	0.044	950.1	3500	128.8	1646.16	3500	101.71			
	338	0.187	0.152	0.140	0.122	0.113	0.093	0.079	0.060	0.049	791.8	3500	126.8	1371.88	3500	100			
	266	0.185	0.155	0.134	0.117	0.108	0.092	0.074	0.059	0.049	752.2	3506.4	132.1	1303.27	3506.4	104.54			
	205	0.145	0.122	0.114	0.104	0.099	0.090	0.077	0.064	0.053	778.6	5908.1	126.8	1349.01	5908.1	100			
	145	0.215	0.161	0.139	0.120	0.113	0.094	0.074	0.055	0.048	862.2	3500	130	1493.86	3500	102.74			
	84	0.129	0.105	0.095	0.082	0.078	0.067	0.055	0.043	0.037	2980.2	3760.5	185.3	5163.53	3760.5	150.04			
	24	0.098	0.089	0.081	0.074	0.070	0.062	0.052	0.041	0.035	2443.5	6905.7	189.8	4233.64	6905.7	153.89			
	3	0.076	0.065	0.061	0.056	0.054	0.049	0.043	0.037	0.032	2846	9987.3	230.7	4931.02	9987.3	188.88			
	62	0.128	0.110	0.098	0.088	0.082	0.073	0.061	0.050	0.041	2863.6	4554.7	163.3	4961.51	4554.7	131.23			
	121	0.098	0.086	0.080	0.073	0.070	0.063	0.054	0.044	0.037	2588.7	8392.5	179.5	4485.21	8392.5	145.08			
	173	0.101	0.094	0.090	0.083	0.080	0.073	0.063	0.053	0.045	2419.4	9752.2	146.4	4191.88	9752.2	116.77			
	238	0.105	0.093	0.086	0.080	0.077	0.070	0.061	0.051	0.045	2637.1	9390	152.9	4569.07	9390	122.33			
	299	0.107	0.087	0.080	0.072	0.067	0.060	0.051	0.045	0.037	2619.5	7147.1	187.6	4538.58	7147.1	152.01			
	361	0.108	0.097	0.094	0.086	0.081	0.073	0.063	0.049	0.041	1218.5	7210.7	160.2	2111.19	7210.7	128.57			
	432	0.135	0.112	0.105	0.095	0.090	0.081	0.069	0.058	0.049	752.2	6130.5	140.2	1303.27	6130.5	111.47			
	445	0.171	0.127	0.115	0.103	0.099	0.088	0.073	0.059	0.046	813.8	3633.4	143.1	1410	3633.4	113.95			
	394	0.131	0.108	0.100	0.088	0.084	0.074	0.062	0.051	0.043	2815.2	4694.5	159.9	4877.65	4694.5	128.32			

Section	Chainage	Corrected Deflection in mm									KGP back results			Correction for Temp and Summer Season			15%		
		D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	BT	Granular	subgrade	E1 Temp Adjusted	**E2 Original**	E3 Monsoon	E1 Temp Adj	E2 (Original)	E3 Mon
	337	0.140	0.120	0.112	0.098	0.091	0.079	0.066	0.051	0.042	1222.9	3963.8	155	2118.81	3963.8	124.13			
	277	0.166	0.145	0.136	0.123	0.118	0.107	0.093	0.057	0.048	877.6	3506.4	127.1	1520.54	3506.4	100.26			
	216	0.172	0.140	0.131	0.117	0.110	0.097	0.081	0.065	0.056	2645.9	3519.1	121.9	4584.32	3519.1	95.81			
	148	0.227	0.172	0.154	0.132	0.115	0.098	0.077	0.059	0.048	798.4	3525.4	122.8	1383.32	3525.4	96.58			
	93	0.102	0.087	0.080	0.072	0.068	0.060	0.052	0.043	0.037	2914.2	7388.6	186.3	5049.18	7388.6	150.9			
	36	0.090	0.081	0.077	0.071	0.069	0.062	0.053	0.044	0.037	2338	9745.8	178.9	4050.85	9745.8	144.57	1360.45	3509.55	100.13
Port Road 3	20	0.089	0.067	0.061	0.056	0.053	0.049	0.042	0.035	0.031	1572.6	9936.5	238.2	1572.6	9936.5	195.3			
	80	0.087	0.075	0.070	0.065	0.062	0.057	0.051	0.043	0.038	2916.4	9961.9	194.4	2916.4	9961.9	157.83			
	139	0.099	0.086	0.082	0.076	0.073	0.067	0.057	0.048	0.040	2872.4	9911	166.5	2872.4	9911	133.96			
	199	0.119	0.103	0.095	0.087	0.082	0.073	0.063	0.050	0.043	0	0	0	0	0	-8.46			
	259	0.170	0.132	0.124	0.111	0.104	0.091	0.078	0.062	0.052	772	4929.6	128	772	4929.6	101.03			
	316	0.097	0.085	0.080	0.073	0.070	0.064	0.055	0.046	0.039	2733.9	9980.9	172.5	2733.9	9980.9	139.1			
	375	0.112	0.098	0.092	0.086	0.082	0.076	0.067	0.055	0.048	2738.3	9980.9	139.9	2738.3	9980.9	111.21			
	431	0.119	0.104	0.098	0.091	0.085	0.077	0.067	0.056	0.046	2311.6	8144.7	142.4	2311.6	8144.7	113.35			
	404	0.104	0.090	0.085	0.079	0.076	0.070	0.060	0.050	0.042	2630.5	9790.3	157.4	2630.5	9790.3	126.18			
	345	0.085	0.074	0.070	0.066	0.063	0.057	0.051	0.043	0.038	3000	9936.5	194.3	3000	9936.5	157.74			
	287	0.088	0.074	0.069	0.063	0.061	0.055	0.048	0.039	0.034	2980.2	9968.2	207.4	2980.2	9968.2	168.95			
	223	0.095	0.081	0.076	0.069	0.066	0.059	0.050	0.040	0.034	2971.4	8850	194.3	2971.4	8850	157.74			
	163	0.121	0.099	0.090	0.080	0.076	0.066	0.056	0.045	0.038	1379	6263.9	178.1	1379	6263.9	143.89			
	103	0.094	0.079	0.074	0.067	0.065	0.058	0.050	0.042	0.036	2762.5	9993.6	190.1	2762.5	9993.6	154.15			

Section	Chainage	Corrected Deflection in mm									KGP back results			Correction for Temp and Summer Season			15%		
		D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	BT	Granular	subgrade	E1 Temp Adjusted	**E2 Original**	E3 Monsoon	E1 Temp Adj	E2 (Original)	E3 Mon
	40	0.075	0.062	0.056	0.052	0.050	0.045	0.038	0.033	0.028	2945	9980.9	261.5	2945	9980.9	215.23			
	5	0.067	0.064	0.060	0.057	0.055	0.050	0.043	0.035	0.030	2967	9987.3	235.1	4593.32	9987.3	192.64			
	62	0.078	0.070	0.066	0.060	0.058	0.053	0.045	0.039	0.034	2916.4	9993.6	213.7	4514.98	9993.6	174.34			
	123	0.094	0.083	0.078	0.071	0.067	0.061	0.053	0.044	0.037	3000	9212.1	180.3	4644.41	9212.1	145.77			
	179	0.120	0.095	0.085	0.082	0.075	0.068	0.057	0.048	0.041	901.8	6918.4	170	1396.11	6918.4	136.96			
	238	0.117	0.104	0.097	0.089	0.084	0.075	0.064	0.052	0.044	2824	6098.7	153.1	4371.93	6098.7	122.5			
	297	0.107	0.083	0.079	0.074	0.071	0.066	0.057	0.048	0.041	763.2	9949.2	167.8	1181.54	9949.2	135.08			
	360	0.125	0.100	0.093	0.086	0.083	0.076	0.066	0.054	0.046	763.2	7522	148.6	1181.54	7522	118.65			
	420	0.110	0.098	0.093	0.086	0.083	0.076	0.066	0.055	0.046	2914.2	8475.1	143.2	4511.58	8475.1	114.03			
	440	0.088	0.077	0.073	0.068	0.066	0.060	0.053	0.045	0.038	2685.5	10000	182.7	4157.52	10000	147.82			
	386	0.106	0.089	0.084	0.076	0.073	0.065	0.056	0.045	0.038	976.5	7795.2	175.9	1511.75	7795.2	142			
	332	0.104	0.077	0.071	0.066	0.063	0.058	0.052	0.045	0.039	752.2	9898.3	186.5	1164.51	9898.3	151.07			
	270	0.099	0.087	0.082	0.076	0.072	0.066	0.059	0.047	0.041	980.9	9993.6	164.7	1518.57	9993.6	132.42			
	199	0.134	0.113	0.106	0.096	0.091	0.081	0.070	0.056	0.047	2639.3	5234.6	141.9	4085.99	5234.6	112.92			
	153	0.116	0.095	0.089	0.081	0.077	0.070	0.060	0.050	0.043	752.2	7801.6	160.6	1164.51	7801.6	128.92			
	84	0.077	0.073	0.069	0.064	0.061	0.055	0.047	0.039	0.034	2973.6	9968.2	204.3	4603.54	9968.2	166.3			
	31	0.078	0.066	0.062	0.056	0.054	0.048	0.041	0.034	0.030	2758.1	10000	235.6	4269.91	10000	193.07	1181.54	6591.15	113.69
Port	20	0.169	0.105	0.089	0.079	0.073	0.062	0.051	0.038	0.031	776.4	3500	209.6	776.4	3500	170.83			
	75	0.105	0.085	0.079	0.071	0.067	0.059	0.049	0.040	0.034	1557.2	7661.8	198.1	1557.2	7661.8	160.99			
	132	0.086	0.066	0.060	0.057	0.054	0.050	0.042	0.036	0.032	2925.2	9987.3	231.6	2925.2	9987.3	189.65			

Section	Chainage	Corrected Deflection in mm									KGP back results			Correction for Temp and Summer Season			15%		
		D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	BT	Granular	subgrade	E1 Temp Adjusted	**E2 Original**	E3 Monsoon	E1 Temp Adj	E2 (Original)	E3 Mon
	196	0.122	0.103	0.093	0.085	0.081	0.072	0.060	0.047	0.041	1818.9	6302.1	165.6	1818.9	6302.1	133.19			
	255	0.082	0.072	0.067	0.063	0.061	0.056	0.049	0.041	0.035	2903.2	10000	204.5	2903.2	10000	166.47			
	318	0.147	0.119	0.111	0.100	0.095	0.085	0.072	0.059	0.050	890.8	6327.5	134.1	890.8	6327.5	106.25			
	376	0.103	0.088	0.081	0.075	0.072	0.064	0.056	0.045	0.039	2201.6	9212.1	173.6	2201.6	9212.1	140.04			
	428	0.089	0.080	0.075	0.071	0.068	0.062	0.055	0.045	0.040	2975.8	9974.6	177.8	2975.8	9974.6	143.63			
	406	0.103	0.087	0.081	0.077	0.074	0.068	0.060	0.050	0.043	2914.2	10000	159.9	2914.2	10000	128.32			
	343	0.094	0.080	0.076	0.071	0.069	0.063	0.056	0.047	0.040	2969.2	10000	174	2969.2	10000	140.38			
	284	0.098	0.089	0.084	0.078	0.075	0.068	0.059	0.048	0.041	2907.6	9949.2	161.5	2907.6	9949.2	129.69			
	227	0.117	0.103	0.095	0.088	0.084	0.077	0.066	0.055	0.047	2247.8	8722.9	141.9	2247.8	8722.9	112.92			
	164	0.100	0.086	0.080	0.074	0.071	0.063	0.054	0.045	0.039	2225.8	9911	172.7	2225.8	9911	139.27			
	97	0.086	0.067	0.062	0.058	0.055	0.050	0.044	0.037	0.032	2989	9974.6	227.9	2989	9974.6	186.48			
	43	0.071	0.060	0.056	0.053	0.052	0.048	0.042	0.037	0.033	2975.8	9968.2	246.9	2975.8	9968.2	202.74			
	2	0.092	0.074	0.069	0.064	0.061	0.056	0.049	0.035	0.031	967.7	8176.4	218.8	1498.13	8176.4	178.7			
	60	0.092	0.079	0.074	0.068	0.064	0.057	0.049	0.040	0.034	1599	8417.9	201.5	2475.47	8417.9	163.9			
	119	0.087	0.077	0.072	0.066	0.063	0.056	0.049	0.040	0.033	2696.5	9294.7	200.2	4174.55	9294.7	162.79			
	180	0.123	0.096	0.090	0.083	0.079	0.071	0.060	0.049	0.041	1137.1	6791.3	164	1760.38	6791.3	131.82			
	239	0.092	0.078	0.074	0.069	0.067	0.060	0.053	0.044	0.038	2595.3	9987.3	180.8	4017.88	9987.3	146.2			
	300	0.112	0.105	0.100	0.094	0.089	0.082	0.070	0.058	0.049	1629.8	8322.6	134.6	2523.15	8322.6	106.68			
	360	0.091	0.080	0.075	0.071	0.068	0.062	0.055	0.046	0.041	2887.8	9980.9	173.6	4470.71	9980.9	140.04			
	424	0.087	0.074	0.071	0.066	0.064	0.059	0.052	0.044	0.038	2964.8	9980.9	188.7	4589.91	9980.9	152.95			

Section	Chainage	Corrected Deflection in mm									KGP back results			Correction for Temp and Summer Season			15%		
		D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	BT	Granular	subgrade	E1 Temp Adjusted	**E2 Original**	E3 Monsoon	E1 Temp Adj	E2 (Original)	E3 Mon
	430	0.105	0.089	0.083	0.078	0.075	0.069	0.060	0.049	0.042	822.6	9428.2	160.1	1273.5	9428.2	128.49			
	383	0.135	0.090	0.086	0.081	0.078	0.072	0.064	0.054	0.046	756.6	8938.9	150	1171.32	8938.9	119.85			
	332	0.102	0.090	0.086	0.080	0.077	0.071	0.064	0.054	0.047	2782.3	9993.6	147.6	4307.38	9993.6	117.8			
	271	0.096	0.084	0.080	0.075	0.072	0.066	0.058	0.047	0.040	2195	9911	166.4	3398.16	9911	133.88			
	212	0.096	0.089	0.085	0.080	0.077	0.071	0.062	0.052	0.044	2898.8	9860.2	152.5	4487.73	9860.2	121.99			
	151	0.149	0.147	0.144	0.136	0.130	0.122	0.107	0.088	0.073	2080.6	7140.8	86.7	3221.05	7140.8	65.7			
	93	0.085	0.074	0.068	0.063	0.060	0.054	0.047	0.039	0.033	2667.9	9980.9	206	4130.27	9980.9	167.75			
	30	0.071	0.056	0.052	0.049	0.048	0.043	0.039	0.033	0.029	2989	9987.3	269.7	4627.38	9987.3	222.24	1527.67	7401.3	118.83
Port Road 5	23	0.089	0.081	0.078	0.073	0.069	0.064	0.058	0.048	0.042	3000	9974.6	168.3	3437.36	9974.6	135.5			
	73	0.073	0.067	0.063	0.060	0.058	0.054	0.047	0.041	0.035	2617.3	9993.6	214.4	2998.87	9993.6	174.94			
	135	0.101	0.092	0.087	0.080	0.076	0.069	0.058	0.045	0.036	2080.6	6867.5	175.5	2383.93	6867.5	141.66			
	224	0.099	0.086	0.080	0.076	0.072	0.068	0.060	0.050	0.043	2989	9968.2	158.8	3424.76	9968.2	127.38			
	260	0.081	0.075	0.071	0.067	0.064	0.060	0.054	0.046	0.041	2956	9980.9	184	3386.95	9980.9	148.93			
	192	0.103	0.064	0.060	0.056	0.054	0.048	0.042	0.035	0.031	756.6	9733.1	234.4	866.9	9733.1	192.04			
	157	0.061	0.055	0.052	0.049	0.048	0.044	0.039	0.033	0.029	2901	10000	270.3	3323.93	10000	222.75			
	106	0.074	0.058	0.052	0.048	0.046	0.043	0.040	0.032	0.029	2982.4	10000	267.7	3417.2	10000	220.53			
	42	0.074	0.065	0.062	0.059	0.057	0.052	0.047	0.038	0.033	2967	9961.9	220.5	3399.55	9961.9	180.15			
	5	0.060	0.054	0.049	0.045	0.043	0.039	0.033	0.028	0.024	2947.2	9987.3	302.8	4562.66	9987.3	250.55			
	60	0.093	0.085	0.081	0.074	0.071	0.065	0.057	0.049	0.042	2843.8	9936.5	164.1	4402.59	9936.5	131.91			
	121	0.105	0.092	0.086	0.078	0.074	0.066	0.054	0.045	0.038	2632.7	6664.2	177.8	4075.78	6664.2	143.63			

Section	Chainage	Corrected Deflection in mm									KGP back results			Correction for Temp and Summer Season			15%		
		D(1)	D(2)	D(3)	D(4)	D(5)	D(6)	D(7)	D(8)	D(9)	BT	Granular	subgrade	E1 Temp Adjusted	**E2 Original**	E3 Monsoon	E1 Temp Adj	E2 (Original)	E3 Mon
	180	0.107	0.092	0.086	0.076	0.071	0.064	0.054	0.043	0.037	2846	6645.2	180.7	4405.99	6645.2	146.11			
	242	0.078	0.071	0.068	0.064	0.062	0.059	0.053	0.046	0.040	2865.8	10000	193.6	4436.65	10000	157.14			
	261	0.097	0.086	0.081	0.076	0.073	0.067	0.060	0.051	0.043	2868	9980.9	158.6	4440.05	9980.9	127.21			
	210	0.066	0.057	0.053	0.050	0.048	0.044	0.039	0.033	0.029	2940.6	9987.3	265.1	4552.45	9987.3	218.31			
	151	0.067	0.064	0.061	0.057	0.056	0.051	0.045	0.038	0.033	2962.6	9949.2	226.8	3394.51	9949.2	185.54			
	91	0.073	0.064	0.060	0.055	0.052	0.047	0.040	0.033	0.029	2980.2	9980.9	244.7	3414.68	9980.9	200.86			
	30	0.067	0.058	0.055	0.051	0.049	0.045	0.040	0.034	0.031	2969.2	9993.6	256.7	3402.07	9993.6	211.12	3226.41	8873.42	134.42
Port Road 6	0	0.186	0.117	0.104	0.090	0.083	0.072	0.058	0.046	0.037	767.6	3506.4	174.9	879.51	3506.4	141.15			
	61	0.102	0.078	0.074	0.069	0.067	0.060	0.055	0.043	0.039	750	9885.6	181	859.34	9885.6	146.37			
	106	0.112	0.088	0.083	0.077	0.073	0.066	0.057	0.046	0.039	754.4	8017.6	172.7	864.38	8017.6	139.27			
	84	0.127	0.107	0.101	0.094	0.091	0.082	0.072	0.057	0.045	750	6715.1	140.9	859.34	6715.1	112.06			
	31	0.116	0.096	0.091	0.084	0.081	0.073	0.064	0.052	0.045	809.4	8335.3	151	927.4	8335.3	120.7			
	15	0.094	0.076	0.072	0.066	0.064	0.058	0.051	0.042	0.036	879.8	9980.9	193.3	1008.06	9980.9	156.89			
	76	0.134	0.103	0.099	0.092	0.088	0.081	0.070	0.058	0.050	772	7973.1	135.2	884.55	7973.1	107.19			
	98	0.107	0.090	0.084	0.077	0.074	0.066	0.057	0.047	0.040	750	8125.6	170.7	859.34	8125.6	137.56			
	90	0.084	0.070	0.067	0.062	0.060	0.055	0.049	0.042	0.037	2964.8	9993.6	200.6	3397.03	9993.6	163.13			
	40	0.112	0.095	0.092	0.084	0.082	0.075	0.067	0.056	0.048	811.6	9720.4	141.7	929.92	9720.4	112.75	859.34	7155.4	112.3