

BRIDGE INSPECTION REPORT

2022 INSPECTION YEAR



Transportation and Infrastructure

Foreword

In 2007, the Department of Transportation and Public Works (currently the Department of Transportation and Infrastructure) commenced a Province wide initiative to inspect all of our major highway and Confederation Trail structures and report on the condition of these structures on a biennial basis. The first set of bridge inspections was conducted in 2008.

The department, in collaboration with Stantec, has developed a Comprehensive Bridge Inspection Training (CBIT) course, which was the first ever course developed in Canada, by Canadian engineers, for Canadian bridge inspectors. It is a full, two-week course, which outlines the importance of bridge inspection work by breaking it down to the element level and material defect level. Inspection teams are to take this course once every five years, with the next course slated in May 2026.

The department solicited expressions of interest from the local consulting community with great interest from all parties. Currently there are seven (7) local consulting firms contracted out to assist the department in retrieving valuable inspection data.

In conjunction with this, the department purchased a Bridge Management Software (BMS) system, developed by Stantec and based on the Ontario Structures Inspection Manual (OSIM), the standard to which the province inspects their structures.

As of the end of 2022, the department has completed our eighth full cycle of major highway (258) and pedestrian and Confederation Trail structure (35) inspections. Department staff have also completed the initial inspections of the smaller structure inventory; however, the results for these structure inspections are currently excluded from this report.

The success of this program could not be possible without the support of the Minister and Deputy Minister of Transportation and Infrastructure, nor without the work and efforts by our local consulting engineering community.

Inspection Program

The department has been conducting its inspection program since early 2008, using internal staff as well as external consultants.

In 2011, the department had undergone an internal audit by the Auditor General's office, specifically related to capital projects and bridge management. In the report, the Auditor mentioned

that the department is conducting extensive bridge inspection and management practices without it being legislated.

With respect to the actual program, the department has divided the structures into geographical zones for which one of the external consultants is responsible for inspections. These zones are further divided into even year and odd year inspections.

The inspections were carried out over the Summer/Fall months of 2022 and the inspection data was input into the Bridge Management System (BMS) software. Once the data was entered, checked and verified by each of the consultants, it was given to the department for their checks and verification. Once the department was satisfied with the inspection data, the inspections for each structure were closed to any further changes. The final inspections were completed and closed in early April 2023.

Inspection Results

The inspection data, which was entered into the BMS and verified by both the consultant and the department, is manipulated by the BMS to set forth a series of results based on the inspection data.

The results of the 2022 inspection program are listed below and outline graphically in the appendices. There are currently only 293 (20%) structures which have been inspected biennially over the last 16 years and reported on here; however, 768 small structures have been inspected in the last six years. This represents a total of 70% of the entire structure network; therefore, the results may not be indicative of the true condition of the entire Provincial network of highway structures. While the department has reached its target of 100 % of the network being inspected, the results of the full network will not be reported until after the 2023 inspections have been completed. The 293 structure (20% of the network) represents about 45% of the net replacement value; therefore, they represent a significant investment both fiscally and with respect to risk management.

Bridge Condition Index (BCI) Results.

This report focuses on the 293 structures that represent the most risk. The department will report on the smaller structure inventory in the 2023 report.

The results of the inspections yield an overall Bridge Condition Index (BCI) for each structure. This index ranges from a condition index of Poor (BCI less than 60), Fair ($60 < \text{BCI} < 70$), and Good ($70 < \text{BCI} < 99$).

As of the completion of the 2022 inspections, the overall condition of the inspected highway and Confederation Trail network (293 structures) is as follows:

Condition State	Percentage of Inspected Structures
Good (BCI > 70)	54 %
Fair (60 < BCI < 70)	23 %
Poor (BCI < 60)	23 %
Average BCI	74.2

Table 1 – BCI Breakdown of All Inspected Structures

The overall condition of the inspected highway network (IE less the Confederation Trail network and pedestrian bridges, 258 structures) is as follows:

Condition State	Percentage of Inspected Highway Structures
Good (BCI > 70)	59 %
Fair (60 < BCI < 70)	22 %
Poor (BCI < 60)	19 %
Average BCI	76.0

Table 2 – BCI Breakdown of Inspected Highway Structures

Graphical representations of the BCI breakdown for all inspected highway and Confederation Trail structures and all inspected highway structures are given in Appendices ‘A’ and ‘B’ respectively.

The BCI distribution graphs are also shown graphically in Appendices ‘C’ and ‘D’ for all inspected structures and all inspected highway structures respectively. These graphs indicate that there still exists a significant number of structures in the fair condition state that will be transitioning into the poor condition state without any intervention. The effects of this distribution can be seen on the BCI and risk parameters, which will be discussed later.

Of note, our target Key Performance Indicator of an average BCI > 70 for all inspected structures has been met, as indicated in Appendices ‘A’ and ‘B’; however, with the noted ‘wave’ of fair-to-poor indicated above, this will undoubtedly change.

Bridge Criticality and Urgency (BCU) Results

In 2010, the department initiated a training module to include the assignment of risk parameters to the elements of each structure based on a Bridge Criticality and Urgency (BCU) rating. This is a 1 to 10 rating system, where 1 indicates no risk and 10 indicates very high risk of the element in question. An overview of the Bridge Criticality Rating system can be found in Appendix ‘E’.

The department has been inspecting structures with a BCU rating since 2011 and has been tracking the risk profile of the inspected network since then. In general, the higher the BCU rating, then the higher the risk rating for the structure in question.

Currently, the matrix indicates low, medium, medium-high and high risk categories. The matrix is shown in Appendix 'F' for all inspected structures and Appendix 'G' for all inspected highway structures and are summarized in the tables below.

Network Risk Distribution – All Inspected Structures 293 sites		
Risk Level	# of Structures	%
High	54	18.49
Medium-High	60	20.55
Medium	91	31.16
Low	88	29.79
Total	293	100

Table 3 – Network Risk Distribution All Inspected Structures

Network Risk Distribution – All Inspected Highway Structures 258 sites		
Risk Level	# of Structures	%
High	39	15.12
Medium-High	54	20.93
Medium	83	32.17
Low	82	31.78
Total	258	100

Table 4 – Network Risk Profile – All Inspected Highway Structures

As can be seen, the tables and graphs indicate that there is a significant amount of bridge infrastructure which is currently at high risk. In light of this, department staff have been reviewing our five-year capital bridge construction plan to include these structures in the program. The department is also considering conducting more periodic reviews of our higher risk structures in order to maintain an acceptable level of safety across the network.

Analogous to the BCI breakdowns, these graphs represent only those structures that are currently being inspected at this time (20% of the network) and do not reflect the overall cross section of highway structures that currently exist across the province.

Condition and Risk Trends

The department has been tracking the BCI trend and risk-profile trend of the network of structures since 2011. The following table outlines the BCI Trend from 2011 through to 2020.

Network BCI Distribution (%)				
	Condition State			
Year	Good (70 < BCI)	Fair (60 < BCI < 70)	Poor (BCI < 60)	Average BCI
2011	35%	29%	37%	62.8
2012	32%	28%	40%	61.9
2013	37%	26%	37%	66.6
2014	40%	31%	29%	69
2015	43%	29%	28%	69.3
2016	47%	27%	26%	70.3
2017	53%	27%	20%	72.9
2018	50%	28%	22%	72.9
2019	54%	25%	21%	74
2020	50%	27%	23%	73.1
2021	52%	28%	20%	73.9
2022	54%	23%	23%	74.2

Table 5 – BCI Breakdown over Time

The above table shows the department is making strides in overall bridge condition index. This is due to the maintenance and capital programs over the years; however, it is also due to significant training and calibration efforts within the inspection teams. This trend is graphically represented in Appendix ‘H’.

The following table indicates the risk profile trend over time; however, it has been truncated to exclude 2011, 2012 and 2013 due to size limitations. A graph is provided in Appendix ‘I’.

		Risk Level				
		High	Medium-High	Medium	Low	TOTAL
2011	No	28	28	53	141	250
	%	11.2	11.2	20.2	56.4	99
2012	No	79	66	65	58	268
	%	29.5	24.6	24.3	21.3	100
2013	No	74	68	61	53	256
	%	28.9	26.6	23.8	20.7	100
2014	No	68	74	62	62	266
	%	25.6	27.8	23.3	23.3	100
2015	No	63	72	64	67	266
	%	23.7	27.1	24.0	25.2	100
2016	No	45	72	64	71	252
	%	17.9	28.6	25.4	28.2	100
2017	No	54	71	79	84	288
	%	18.8	24.7	27.4	29.2	100
2018	No	58	79	76	76	289
	%	18.8	24.7	27.4	29.2	100
2019	No	56	79	77	83	295
	%	19.0	26.8	26.1	28.1	100
2020	No	54	73	79	87	293
	%	18.4	24.9	27.0	30.0	100
2021	No	50	67	87	89	293
	%	17.1	22.9	29.7	30.3	100
2022	No	54	60	91	88	293
	%	18.5	20.6	31.1	29.8	100

Table 6 – Risk Profile over Time

The risk profile trend graph in Appendix ‘I’ indicates a significant jump of structures in the high-risk category from 2011 and 2012. This is due to calibration training efforts within the inspection teams in order to have better correlation of results between inspection groups.

The risk profile indicates a slight downward trend in the high-risk category from 2012 to 2015, with a slight increase of the high-risk structures from 2015 to 2016 due to the increase in sample size. From 2016 and 2018, the general trend is an increase of structure in the high-risk category,

which is most likely due to the number of structures that are in the “Fair” condition state moving their way into the “Poor” condition state. From 2019 onward, a slight decreasing trend in the high-risk category with an increasing trend in the low-risk category can be observed. This would most likely be attributed to the increase in capital funds provided to the highway structures Capital program through various federal funding arrangements. The department will continue to collect additional inspection information, which will determine whether or not this trend continues. BCI and Risk Trend Graphs are shown in Appendices ‘H’ & ‘I’.

Sufficiency Index (SI)

Currently, the Federal Highways Administration (FHWA) in the US uses a Sufficiency Rating system to better capture the overall sufficiency from an operational and functional perspectives as well as condition. The PEI Bridge Management System calculates a similar overall index referred to as the Sufficiency Index or SI.

The Sufficiency Index (SI) is a compilation of the condition index (BCI), risk analysis (BCU) and includes other important operational factors; such as, load rating; scour potential; flood potential; fatigue critical elements; approach road geometry; structure lane width; barrier index; etc..

As of 2013, the department has been including a rating for SI in our latest structure records. After years of data collection and some study on the outcomes, the department has chosen a lower threshold limit of less than 65 (IE. $SI < 65$). This lower bound threshold seems to correlate well with the proposed five-year plan; however, at this time, only the overall index results are being reported on.

The results are represented in the table below and graphically represented in Appendix ‘J’ for the entire inspected highway network. Table 7 below indicates that, from 2017 and 2022, the number of structures below the threshold of 65 is trending downwards. This again suggests that the funding allocation over the last few years has been moderately sufficient enough to decrease the overall risk to the department. Of note, this index is still in its infancy stages compared to the other indices; therefore, only the actual numbers are reported for information purposes only. Work continues on the calibration of this index and how this may be utilized in determining our capital programs.

Sufficiency Index trend graphs are shown in Appendix ‘K’.

SI Value	2022 No. of Structures	2022 % of Structures	2021 No. of Structures	2021 % of Structures	2020 No. of Structures	2020 % of Structures	2019 No. of Structures	2019 % of Structures	2018 No. of Structures	2018 % of Structures	2017 No. of Structures	2017 % of Structures
$80 \leq SI$	136	52.71%	134	51.94%	129	50.19%	123	47.67%	112	44.60%	105	41.80%
$65 \leq SI < 80$	90	34.88%	91	35.27%	91	35.41%	96	37.21%	100	39.80%	107	42.60%
$SI < 65$	32	12.41%	33	12.79%	37	14.40%	39	15.12%	39	15.50%	39	15.50%
TOTAL	258	100%	258	100%	257	100%	258	100%	251	100%	251	100%

Table 7 – Sufficiency Index Results

Performance Deficiencies, Maintenance Needs and Recommended Works

Performance Deficiencies

The consultants are required to report on any suspected performance deficiencies for each element of a structure. Performance deficiencies are identified to supplement the information recorded in the condition states and are generally used when an element is suspected to not be performing as intended. These are outlined in Table 8 below with the number of occurrences for each as of the conclusion of the 2022 inspection period.

Performance Deficiency	No. of Occurrences In 2022	No. of Occurrences In 2021	No. of Occurrences In 2020	No. of Occurrences In 2019	No. of Occurrences In 2018	No. of Occurrences In 2017	No. of Occurrences In 2016
1-Load Carrying Capacity	945	927	1002	1053	1065	990	1033
2-Excessive Deformations	55	45	74	82	94	101	86
3-Continuing Settlement	21	31	33	36	39	38	45
4-Continuing Movements	70	69	84	99	115	120	124
5-Seized Bearings	8	7	8	8	10	10	8
6-Brng. not Unif.Load/Unstbl.	18	13	10	9	14	20	20
7-Jammed Expansion Joint	12	13	12	13	11	9	9
8-Pedestrian/Vehicular Hazard	396	376	299	320	349	322	280
9-Rough Riding Surface	105	117	122	126	145	117	101
10-Surface Ponding	12	12	17	20	17	20	21
11-Deck Drainage	26	24	24	25	20	21	20
12-Slippery Surfaces	3	2	2	2	0	0	0
13-Flooding/channel Blockage	13	14	14	16	19	12	15
14-Undermining of Foundation	19	13	18	39	47	34	40
15-Unstable Embankments	61	63	72	78	98	96	77
16-Other	211	253	243	210	212	198	233
TOTAL	1975	1979	2034	2136	2255	2108	2112

Table 8 – Performance Deficiencies

There continues to be a large quantity of PD-01 – Load Carrying Capacity. This is primarily due to our aging infrastructure which is not currently constructed to the design standards of today.

Of note, there is a decrease in some areas, with an increase in other areas. These could be further alleviated with a more robust maintenance program. See the next section on Maintenance Needs and Recommended Works.

Maintenance Needs and Recommended Works.

Once a performance deficiency has been selected, the inspection teams are then required to select a Maintenance Need or Recommended Work in order to mitigate the performance deficiency.

A maintenance need is generally selected when the element in question has less than 25 % of its quantity in the poor condition state, or if the required maintenance work can be carried out by our internal maintenance personnel or standing offer crews. A recommended work is generally any works that does not fit in the above definition and is usually classified as a Capital project.

Inspection teams are to assign timing for the maintenance needs or recommended works and recommended works are to include an estimated cost. Maintenance needs and recommended works are not to overlap; that is, if a recommended work is selected for a specific element, there would not be a maintenance need associated with the same element. It will be one or the other.

Table 9 identifies the various maintenance needs with associated timings.

	Now	1 Year	2 Years	No. of Occurrences 2022	No. of Occurrences 2021	No. of Occurrences 2020	No. of Occurrences 2019	No. of Occurrences 2018	No. of Occurrences 2017	No. of Occurrences 2016
1-Lift/Swing Bridge Maintenance	0	0	0	0	0	0	0	0	0	0
2-Bridge Cleaning	9	33	59	101	94	94	104	117	105	82
3-Railing System Repair	145	136	372	653	676	633	560	499	370	356
4-Painting Steel Bridge Structures	2	2	60	64	77	76	67	55	51	62
5-Bridge Deck Joint Repair	3	5	18	26	23	21	21	19	22	26
6-Bridge Bearing Maintenance	1	0	13	14	8	9	16	18	12	8
7-Structural Steel Repair	1	4	21	26	27	21	14	22	24	18
8-Concrete Repair	8	53	429	490	463	458	470	475	418	301
9-Timber Repair	15	73	399	487	501	521	586	648	556	493
10-Works for Modular Bridges	0	0	0	0	0	0	0	0	0	0
11-Animal/Pest Control	1	1	5	7	5	5	4	4	6	5
12-Bridge Surface Repair	9	28	72	109	121	114	114	111	105	98
13-Erosion Control at Bridges	15	19	80	114	103	112	137	126	115	122
14-Concrete Sealing	0	0	0	0	0	0	0	5	5	2
15-Rout and Seal – Concrete and Asphalt Pavement on Bridge Decks	0	18	58	76	79	96	90	89	81	81
16-Works for Drainage system	4	6	13	23	24	19	20	17	19	23
17-Scaling (Loose Concrete or ACR Steel)	0	0	1	1	0	0	--	--	--	--
18-Other Maintenance	101	75	218	394	389	390	384	362	347	373
Totals	314	453	1818	2585	2590	2569	2587	2567	2236	2050

Table 9 – Maintenance Needs

As indicated above, there is a significant amount of maintenance required for timber repair, concrete repair and railing system maintenance. There is also a slight decrease in the total amount of Maintenance Needs required; however, these could be significantly alleviated with the addition of dedicated crews assigned to bridge maintenance, which would be specifically mandated to review and address the maintenance concerns on our structures as outlined by the inspection reports.

Table 10 summarizes the recommended works and includes associated costs with the works. There are too many categories of recommended works to summarize in this report; however, they range from barrier repairs/replacement to girder repairs, abutment repairs, sub-structure repairs, etc., etc..

Timing	2022 No. of Occ.	Cost	2021 No. of Occ.	Cost	2020 No. of Occ.	Cost	2019 No. of Occ.	Cost	2018 No. of Occ.	Cost	2017 No. of Occ.	Cost	2016 No. of Occ.	Cost
Urgent	0	\$0	10	\$119,320	10	\$68,320	10	\$50,400	15	\$181,315	21	\$409,315	28	\$904,440
< 1 year	76	\$2,877,959	60	\$1,687,990	98	\$2,496,712	96	\$2,503,403	114	\$2,841,498	115	\$2,373,895	116	\$2,639,857
1 - 5 year	418	\$13,899,744	430	\$13,651,000	465	\$11,996,629	497	\$10,643,022	522	\$10,453,584	475	\$10,974,704	463	\$9,521,860
6 - 10 year	58	\$914,670	61	\$955,405	78	\$1,330,485	74	\$1,124,470	88	\$1,144,029	117	\$2,130,124	98	\$1,810,235
None	6	\$48,700	8	\$84,700	6	\$53,700	5	\$19,860	4	\$19,860	4	\$20,200	4	\$20,200
Total	558	\$17,741,073	569	\$16,498,415	657	\$15,945,846	682	\$14,341,155	743	\$14,640,286	732	\$15,908,238	709	\$14,896,592

Table 10 – Recommended Works

The above tables indicate that there is a significant amount of work required within the next 5 years, with a decrease in the value of work required urgently and an increase in the overall value of work required. This trend is likely to continue without any preventative maintenance as suggested above.

Five Year Capital Program

Based on the bridge inspections, Bridge Condition Indices and Risk Profile, the department has developed a five (5) year Capital Construction Program, which can be found in Appendix 'L'.

The program has been created in conjunction with the program set forth from the Bridge Management System (BMS) as well as the BCI (condition) and BCU (risk) profiles. It also takes into consideration the volume of traffic and the importance of the highway network IE. Arterials, Collectors, etc..

The five-year plan includes for the following:

- Some key preservation items for our larger, more important infrastructure sites. Most notably, the Hillsborough and New Dominion (West River) Bridges need to be re-painted in order to increase their service lives. These could cost in the order of \$15.0 M each. Hillsborough bridge painting is included in the five-year plan.

The five-year plan does not allow for the following:

- There are no funds for the smaller, buried type structures which will undoubtedly also require capital expenditures.
- There are no funds dedicated for any major rehabilitation or replacement works for any of the Confederation Trail network of structures.
- Painting of the New Dominion (West River) bridge.

The program is what the department has planned to have done over the next five years; however, it was based on an annual budget that may not be available for all of these projects listed in the plan. It is important to note that it will most likely be adjusted to reflect any future budget constraints, or any unforeseen weather events or other structural issues throughout the network that was not anticipated for.

Conclusions and Recommendations

This report outlines the need for additional funding in order to maintain a serviceability of the highway structure network. There are areas of significant risk that the department is assuming on a number of structures that are currently being inspected. There is no real indicator on how this

translates into the remaining portion of the highway network that is not currently being inspected; however, it would be safe to state that a one-to-one ratio would be a conservative estimate of the risk that exists on the remaining uninspected network.

Forecast scenarios are included in Appendices ‘M’, ‘N’, ‘O’, ‘P’, ‘Q’ and ‘R’. These indicate the trend of Bridge Condition Index (BCI) over time. The three scenarios that are modeled are: 1) Do Nothing; 2) Unconstrained (or unlimited) Budget; and 3) Constrained Budget. It can be clearly seen the effects of doing nothing versus our currently constrained budgets.

Of particular note that, in recent years, the amount of budget available has increased to point of being reasonably sustainable; however, the predictive models require adjustment to account of increasing costs, especially considering the substantial increases in material costs, as well as for the impacts of climate change,. These will be part of future works between the department and the software provider.

Department staff are continuing to inspect all remaining structures within the entire network and inputting the inspection data into the Bridge Management System (BMS) software, based on the Ontario Structures Inspection Manual (OSIM). The first full cycle was complete in 2022; however, given the volume of the structures, we do not anticipate any results until after the 2023 inspection cycle.

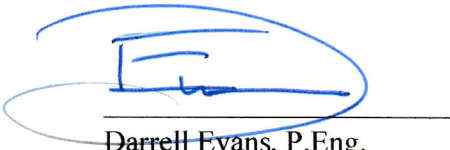
The following are some recommendations to be considered:

- To increase funding to a sustainable level for several years to come in order to reduce the department’s liability and to maintain an acceptable level of serviceability to the traveling public.
- To increase our inspection budgets to include the remaining portion of structures currently not being inspected.
- To increase to compliment of internal bridge maintenance crews to 3 to address the list of maintenance needs that are currently being reported on.
- To expand the funding for the standing offer contractors to include those knowledgeable in concrete repair methods and procedures to address the larger structures.
- To set aside some preservation funds for our most important structures in order to extend their service lives.

- Reducing the number of structures on our network by closing or severing non-essential or seasonal roads as required or any roads that have redundancy built into the network. Currently, there are four structures that are weight restricted and 8 that are either closed or have been removed.

In closing, the department continues to conduct routine inspections on our network of structures and will include all our smaller structures as time and budgets permit. It is understood that budgets may be further constrained and the department will continue to work within these confines as required; however, the report indicates that there will be consequences as a result.

Respectfully Submitted.



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A/Asst. Director
Capital Projects Div.
Transportation and Infrastructure

Date Submitted: 29 May 2023

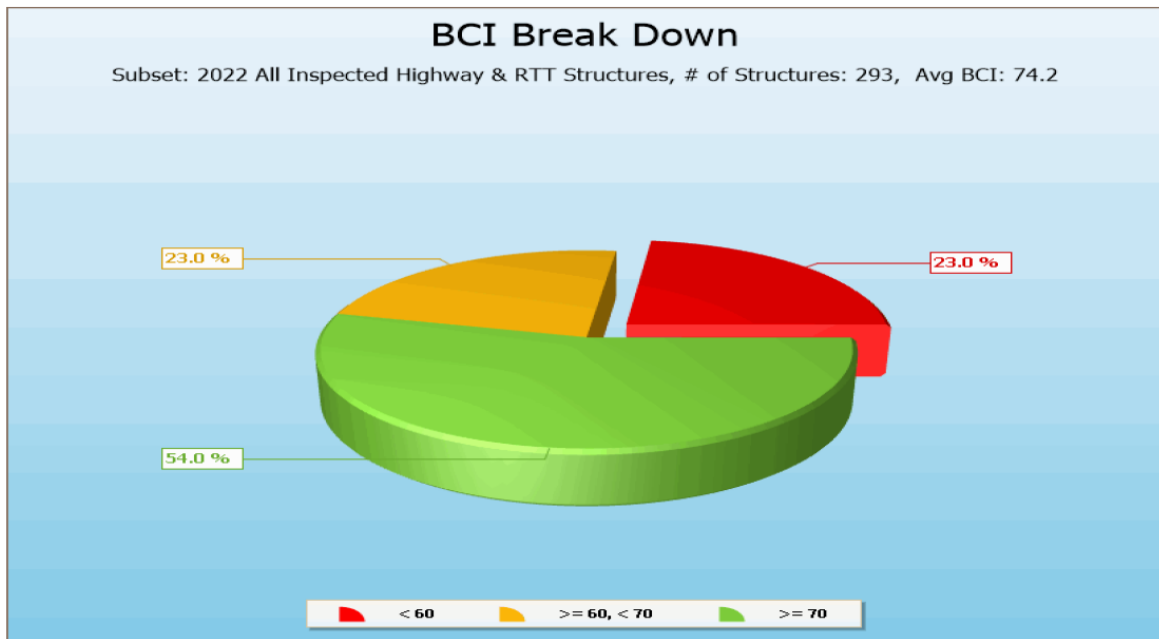
Appendix 'A'

BCI Breakdown, All Inspected Highway and Confederation Trail Structures

Department of Transportation, Infrastructure & Energy
Bridge Section

Department of Transportation, Infrastructure & Energy

Key Performance Indicator Report



Subset: 2022 All Inspected Highway & RTT Structures, # of Structures: 293

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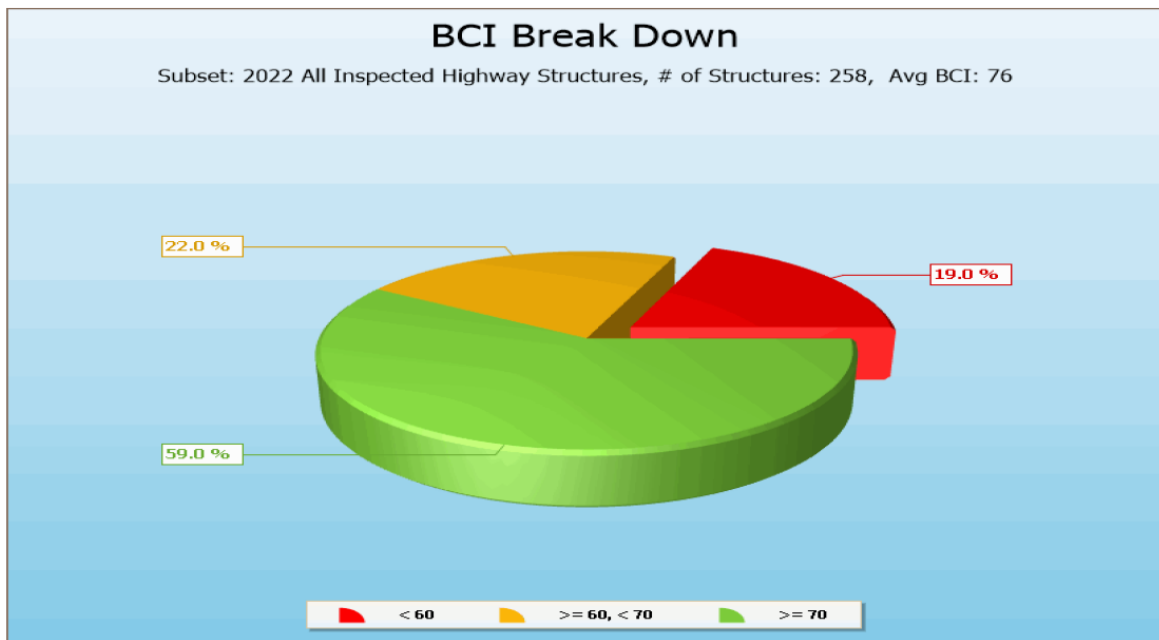
Appendix 'B'

BCI Breakdown, All Inspected Highway Structures

Department of Transportation, Infrastructure & Energy
Bridge Section

Department of Transportation, Infrastructure & Energy

Key Performance Indicator Report



Subset: 2022 All Inspected Highway Structures, # of Structures: 258

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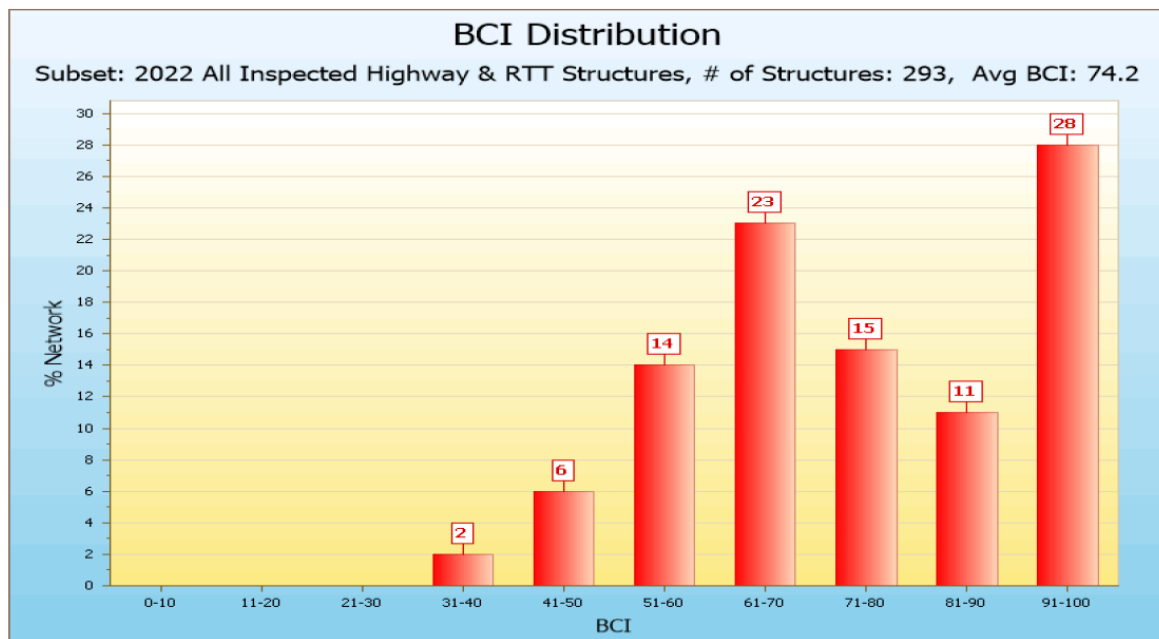
Appendix 'C'

BCI Distribution, All Inspected Highway and Confederation Trail Structures

Department of Transportation, Infrastructure & Energy
Bridge Section

Department of Transportation, Infrastructure & Energy

Key Performance Indicator Report



Subset: 2022 All Inspected Highway & RTT Structures, # of Structures: 293

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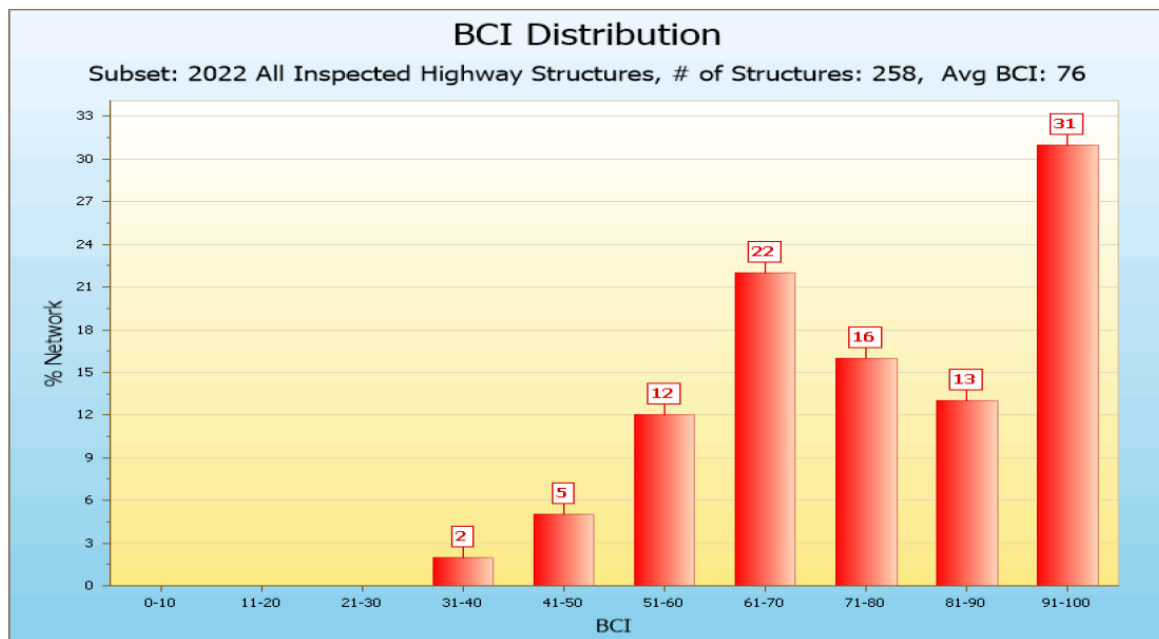
Appendix 'D'

BCI Distribution, All Inspected Highway Structures

Department of Transportation, Infrastructure & Energy
Bridge Section

Department of Transportation, Infrastructure & Energy

Key Performance Indicator Report



Subset: 2022 All Inspected Highway Structures, # of Structures: 258

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Appendix 'E'

Bridge Criticality Rating

Bridge Criticality Rating

1 - No Repairs, No Safety Concerns.

- Strength: Element retains its original design load carrying capacity and requires no repairs at this time. Minor non-structural maintenance.
- Safety: There are no safety concerns on the structure.

2 - No Repairs in foreseeable future, No Safety Concerns.

3 - No Structural Repairs necessary at this time. No Safety concerns.

- Strength: Element retains its original design load carrying capacity but may require minor non-structural repairs in near future.
- Safety: There are no safety concerns on the structure.

4 - Non Structural Repairs, No Safety Concerns.

- Strength: Element retains its original design load carrying capacity but requires non-structural repairs.
- Safety: There are no safety concerns on the structure.

5 - Minor Structural Repairs, No Safety Concerns.

- Strength: The element's design load carrying capacity may be reduced to a minor extent; the element requires some minor structural repairs.
- Safety: There are no safety concerns on the structure.

6 - Minor Structural Repairs, Minor Safety Concern.

- Strength: The element's design load carrying capacity may be reduced to a minor extent; the element requires some minor structural repairs.
- Safety: There may be a minor safety concern on the structure.

7 - Minor Structural Repairs, Moderate Safety Concern.

- Strength: The element's design load carrying capacity may be reduced to a minor extent; the element requires some minor structural repairs.
- Safety: There is a moderate safety concern.

8 - Moderate Priority Structural Repairs, Moderate Safety Concern.

- Strength: The element's design load carrying capacity is reduced to a moderate extent but load evaluation is not being recommended; the element requires moderate priority structural repairs to remain in long term service.
- Safety: There is a moderate safety concern.

9 - Moderate Priority Structural Repairs, Significant Safety Concern.

- Strength: The element's design load carrying capacity is reduced to a moderate extent, load evaluation is recommended, but lane closure is not recommended; the element requires moderate priority structural repairs to remain in long term service.
- Safety: There is a significant safety concern

10 - High Priority Structural Repairs, Significant Safety Concern.

- Strength: The element's design load carrying capacity is reduced significantly; a bridge or lane closure, load posting, or load evaluation is recommended; the element requires high priority structural repairs to remain in service.
- Safety: There is a significant safety concern

Stantec Consulting Ltd.
January 2010

Appendix 'F'

Network Risk Profile, All Inspected Highway and Confederation Trail Structures

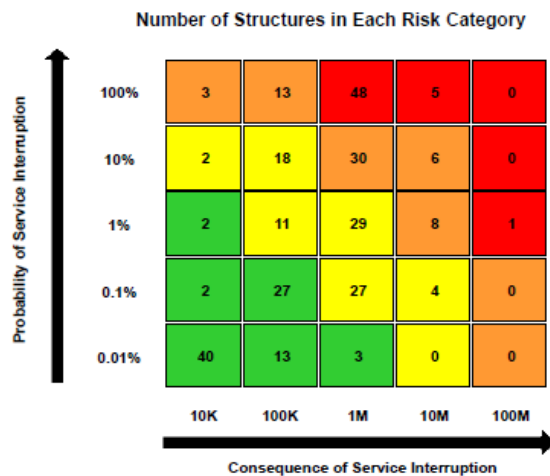


Department of Transportation, Infrastructure & Energy
Bridge Section

Department of Transportation, Infrastructure & Energy

Network Risk Profile

Databases	BMS_PEI_Master_20210408.aocdb	Total Number of Structures	293
Subset	2022 All Inspected Highway & RTT Structures		
User	peitir1		



Network Risk Distribution

Risk Level	# of Structures	%
High	54	18.49%
Medium-High	60	20.55%
Medium	91	31.16%
Low	87	29.79%
Total	292	100.00%

Appendix 'G'

Network Risk Profile, All Inspected Highway Structures

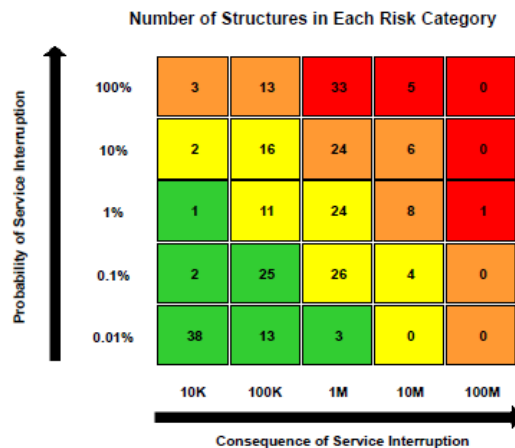


Department of Transportation, Infrastructure & Energy
Bridge Section

Department of Transportation, Infrastructure & Energy

Network Risk Profile

Databases	BMS_PEI_Master_20210408.aocdb	Total Number of Structures	258
Subset	2022 All Inspected Highway Structures		
User	peitir1		

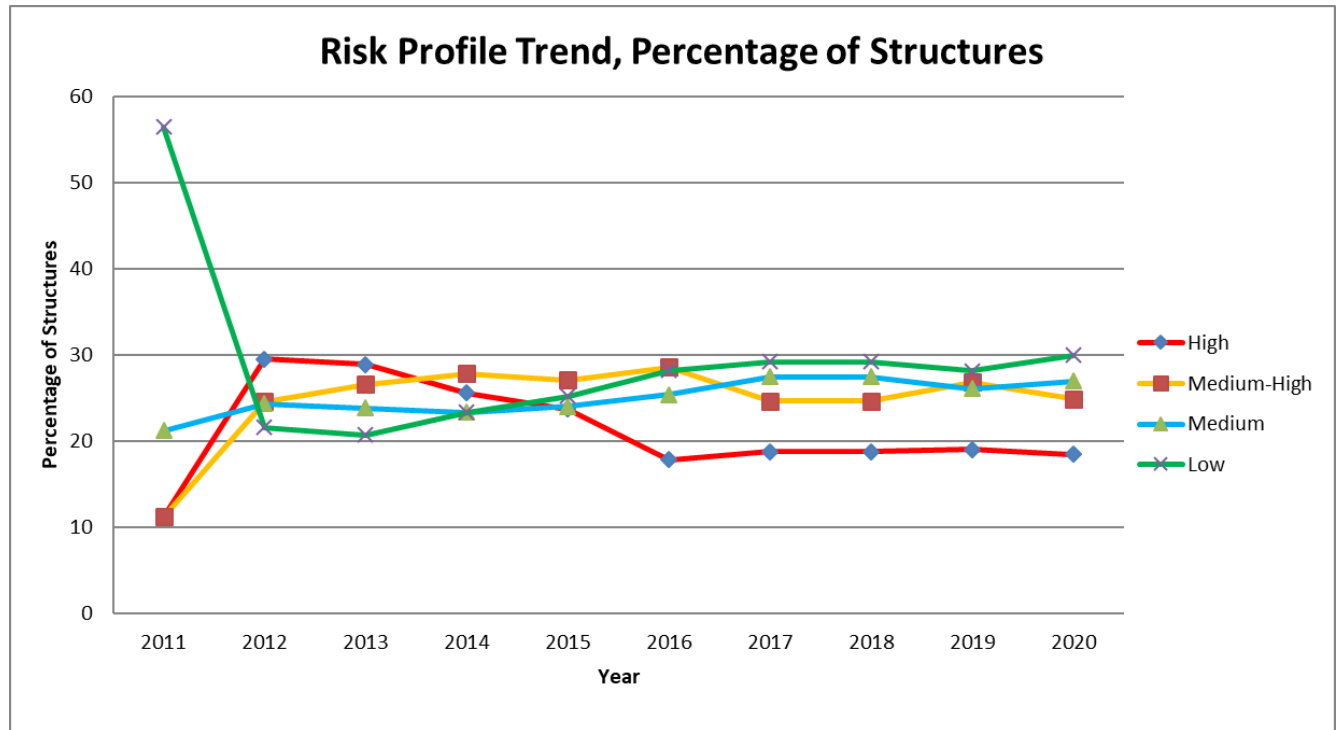


Network Risk Distribution

Risk Level	# of Structures	%
High	39	15.12%
Medium-High	54	20.93%
Medium	83	32.17%
Low	82	31.78%
Total	258	100.00%

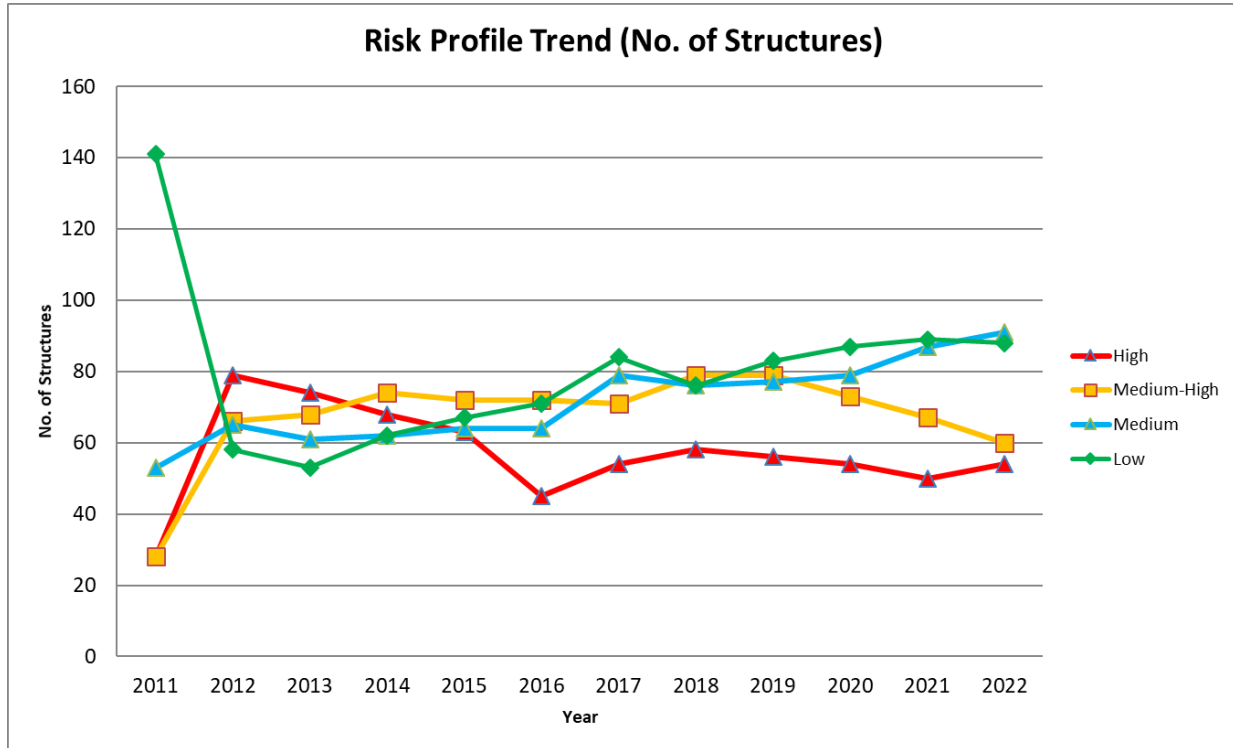
Appendix 'H'

BCI Trend Graph over Time



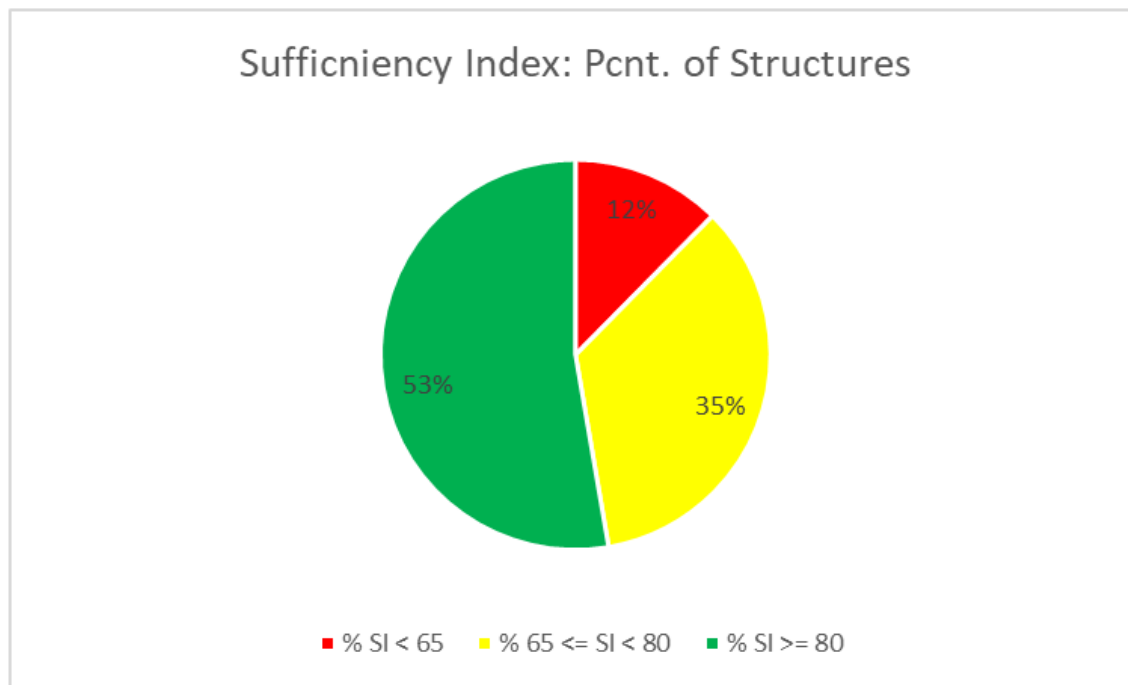
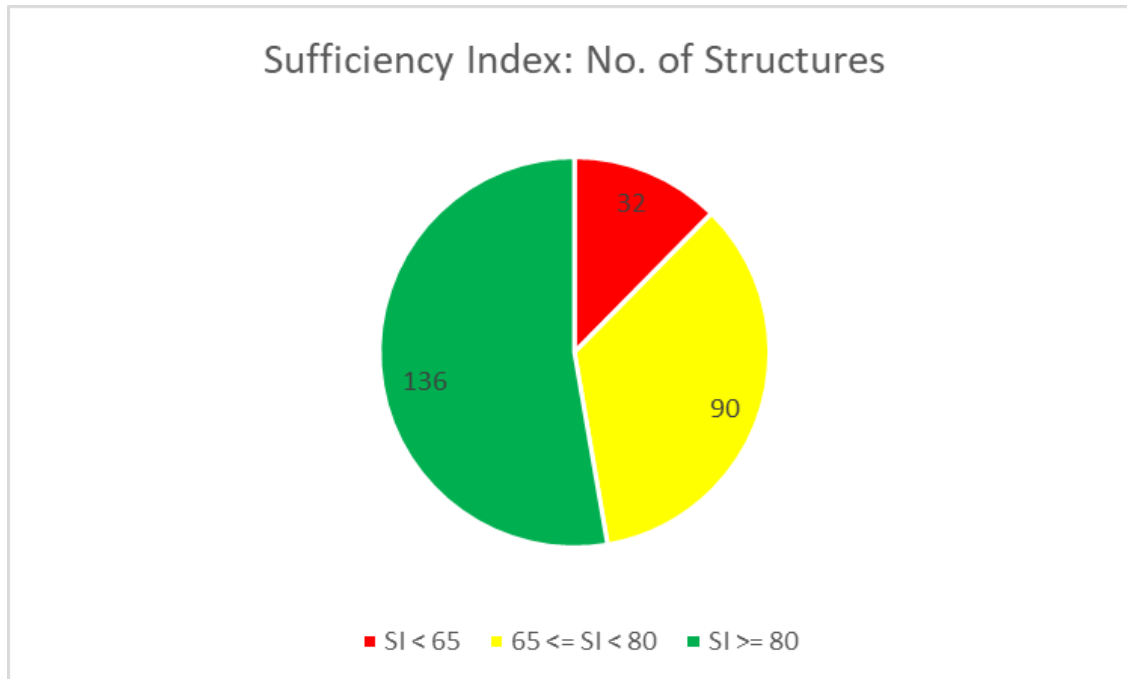
Appendix 'I'

Risk Profile Trend Table Over Time

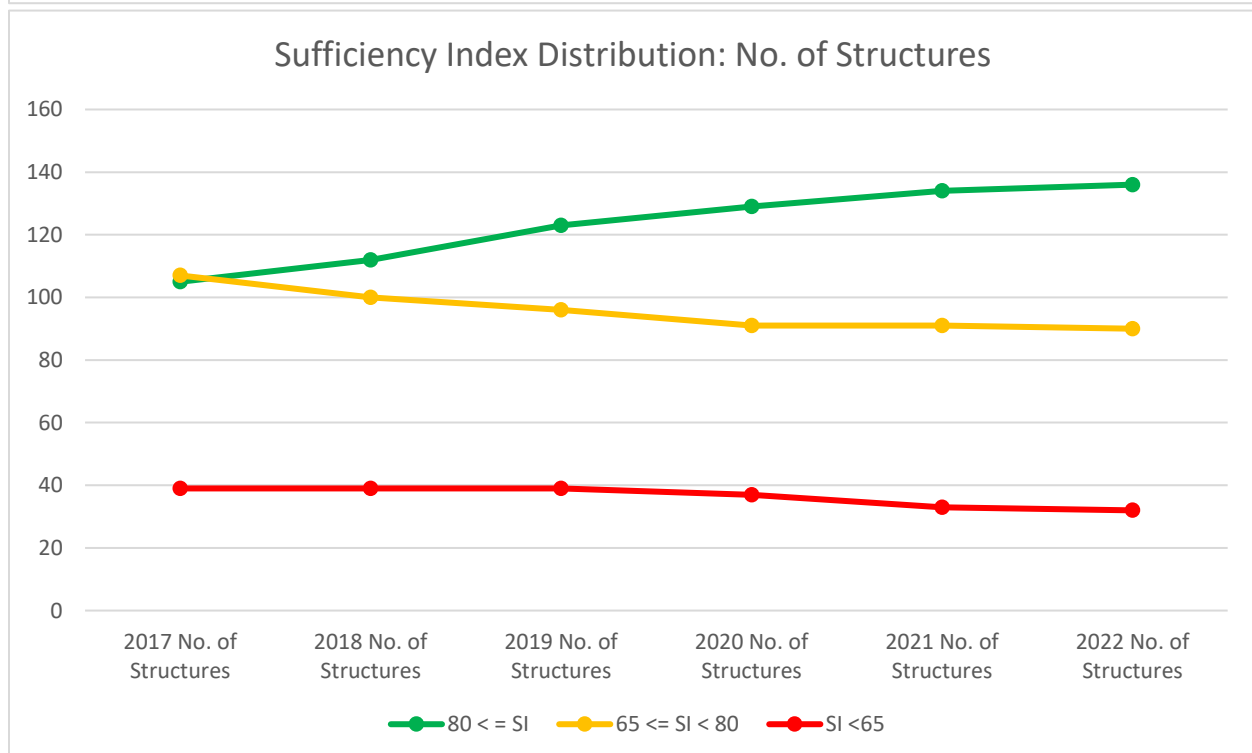
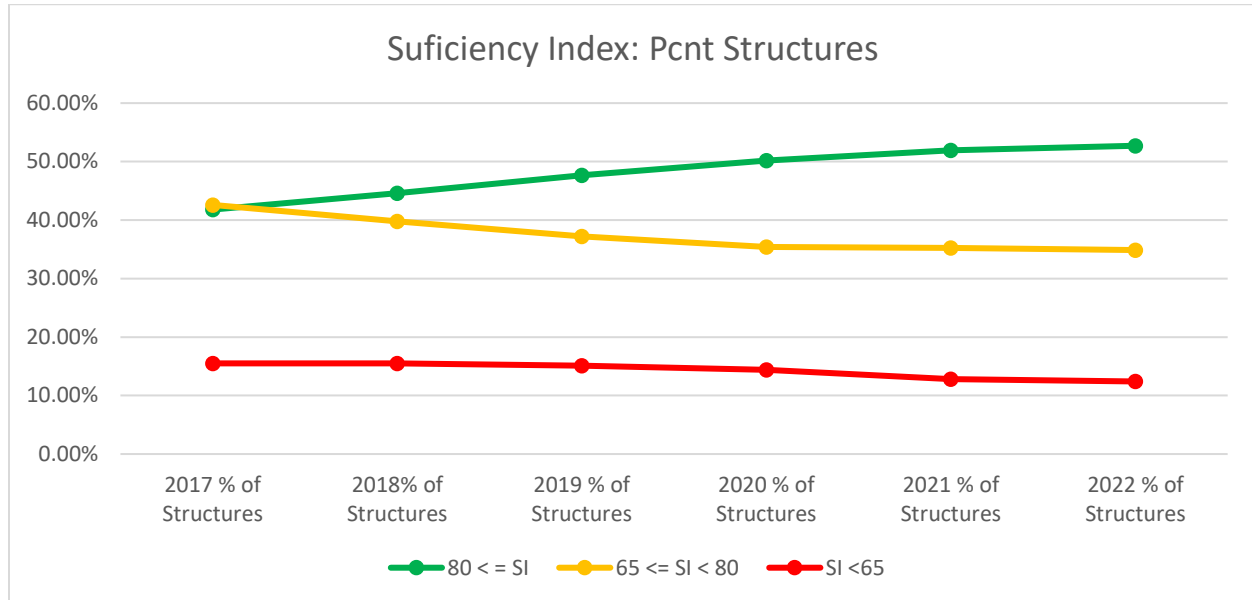


Appendix 'J'

Structure Sufficiency Index (SI) Breakdown



Appendix 'K'

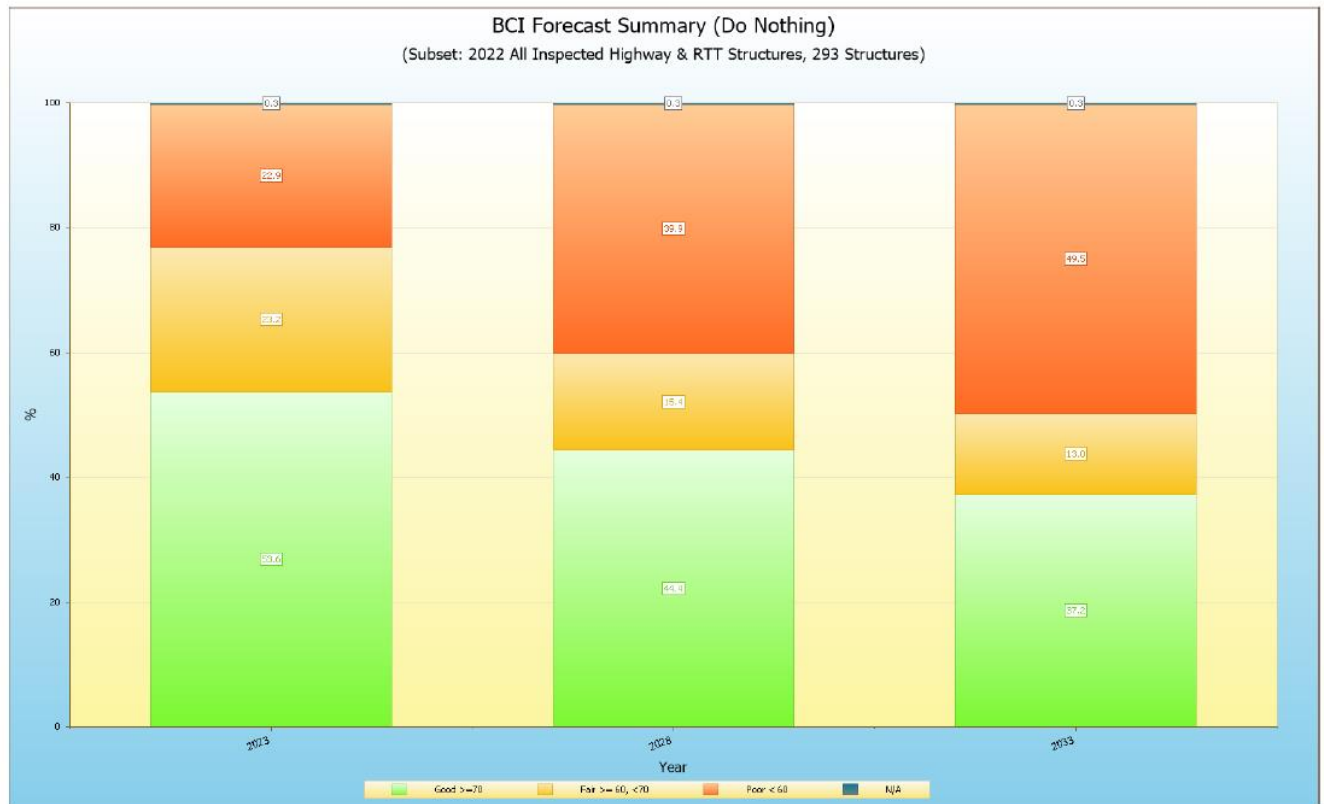


Appendix 'L'

2023/24 Bridge Projects					
Region	Bridge ID	Project Name	District No.	Route/Section	Description of Work
West	P1-093	Coughlin Road Bridge	25	14302	Replacement
West	P4-009	Old Princetown Road Structure	18	Maint ID 50261	Replacement
East	K3-008	Bridgetown	2	00402	Replacement
West	Q2-024	Rustico Bridge	18	00607	Replacement
2024/25 Bridge Projects					
Region	Bridge ID	Project Name	District No.	Route/Section	Description of Work
West	P1-036	Doyles	26	01215	Replacement
West	P1-144	Haywood Road	27	Maint. ID 40184	Replacement
West	Q1-074	Riverdale Bridge	17	Maint. ID 50027	Replacement
East	K2-038	Five Houses	2	Maint ID 60187	Replacement
East	K1-037	Basin Head Bridge	1	Maint. ID 60011	Replacement
East	AQ-095	Green Road	17	Maint. ID 50120	Replacement
West	P3-012	St. Nicholas Bridge	24	01107	Replacement
West	P1-003	Cain's Bridge	26	00220	Replacement
East	Q5-009	Hillsborough Bridge	6	00111	Bridge Painting
2025/26 Bridge Projects					
Region	Bridge ID	Project Name	District No.	Route/Section	Description of Work
West	P2-093	Gains Creek	25	17401	Replacement
East	K3-060	Upton Bridge	2	33902	Replacement
West	P2-039	Enmore Bridge	25	Maint ID 40127	Replacement
West	P2-062	Tory Road	25	Maint. ID 40548	Replacement
West	P3-013	St. Nicholas Bridge	24	01107	Replacement
East	Q4-012	Little Sands	4	00409	Replacement
West	P2-060	Coleman Corner Bridge	25	00217	Replacement
West	P4-112	Albany 'Y' Overpass	19	00102	Replacement
2026/27 Bridge Projects					
Region	Bridge ID	Project Name	District No.	Route/Section	Description of Work
West	P4-076	Emerald Bridge	19	Maint. ID 40517	Replacement
East	K2-017	Bangor Bridge	7	60114	Replacement
West	P3-009	Cabot Park	20	10501	Replacement
West	P1-108	Tignish Harbour	27	Maint. ID 50208	Replacement
East	Q4-060	Munn's Road Bridge	4	Maint. ID 50236	Replacement
West	P2-029	Alaska	24	13801	Replacement
West	P2-034	Sheep River	25	13501	Replacement
West	P2-016	Bideford Bridge	23	01207	Replacement
West	P2-046	Portage Bridge	25	00219	Replacement
2027/28 Bridge Projects					
Region	Bridge ID	Project Name	District No.	Route/Section	Description of Work
East	K2-037	Five Houses	2	32701	Replacement
West	P4-038	Norboro	19	Maint. ID 40514	Replacement
East	K5-030	Ross' Road	3	60252	Replacement
West	P2-035	Ox River	25	01102	Replacement
West	P4-001	Tryon Bridge	19	01001	Replacement
West	P4-098	Kinkora Bridge	19	Maint. ID 41288	Replacement

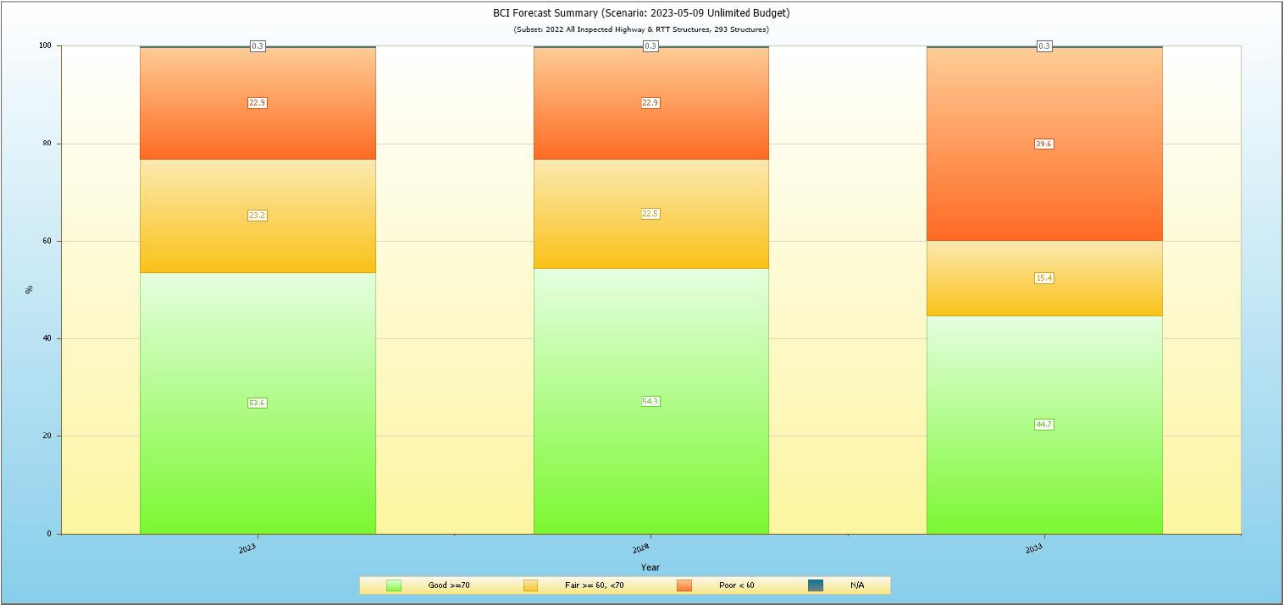
Appendix ‘M’

BCI Forecast Summary All Inspected Structures Do Nothing



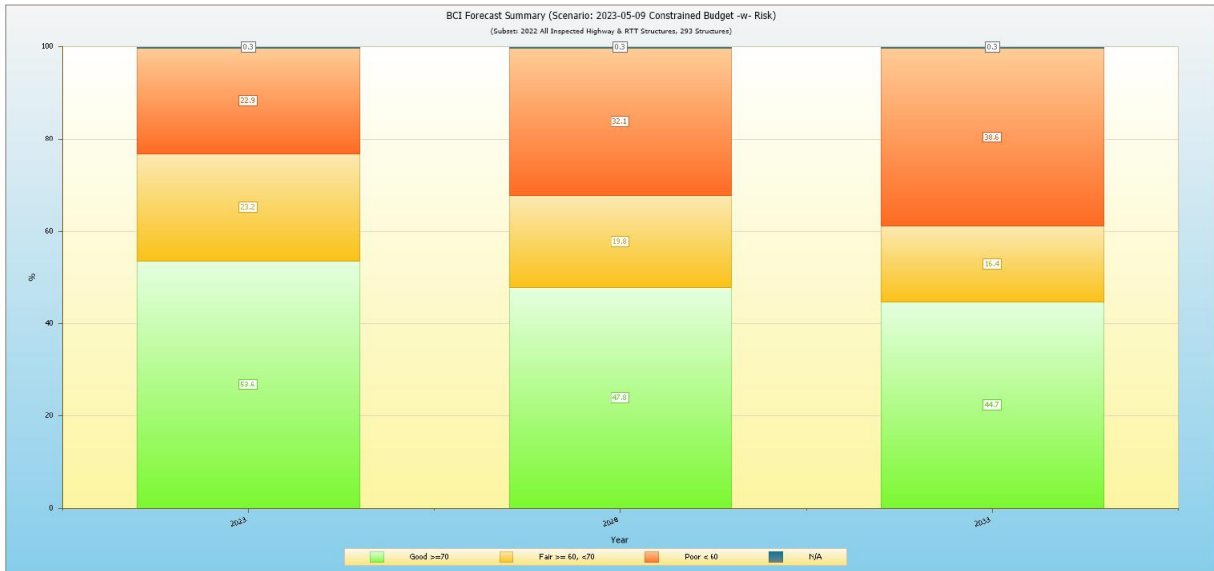
Appendix ‘N’

BCI Forecast Summary All Inspected Structures Unconstrained Budget



Appendix ‘O’

BCI Forecast Summary All Inspected Structures Constrained Budget



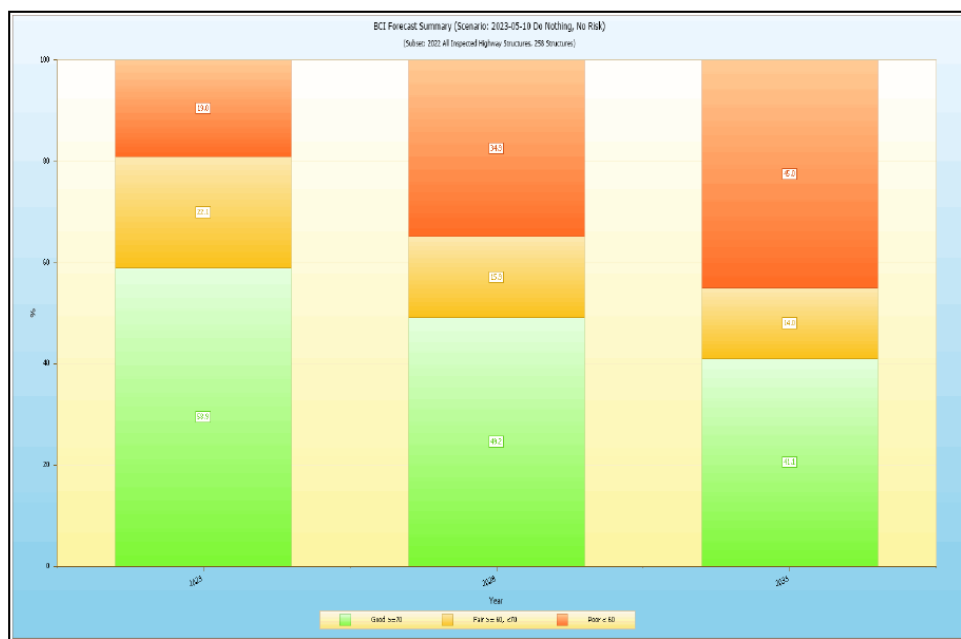
Appendix 'P'

BCI Forecast Summary All Inspected Highway Structures Do Nothing

Department of Transportation, Infrastructure & Energy
Bridge Section

Department of Transportation, Infrastructure & Energy

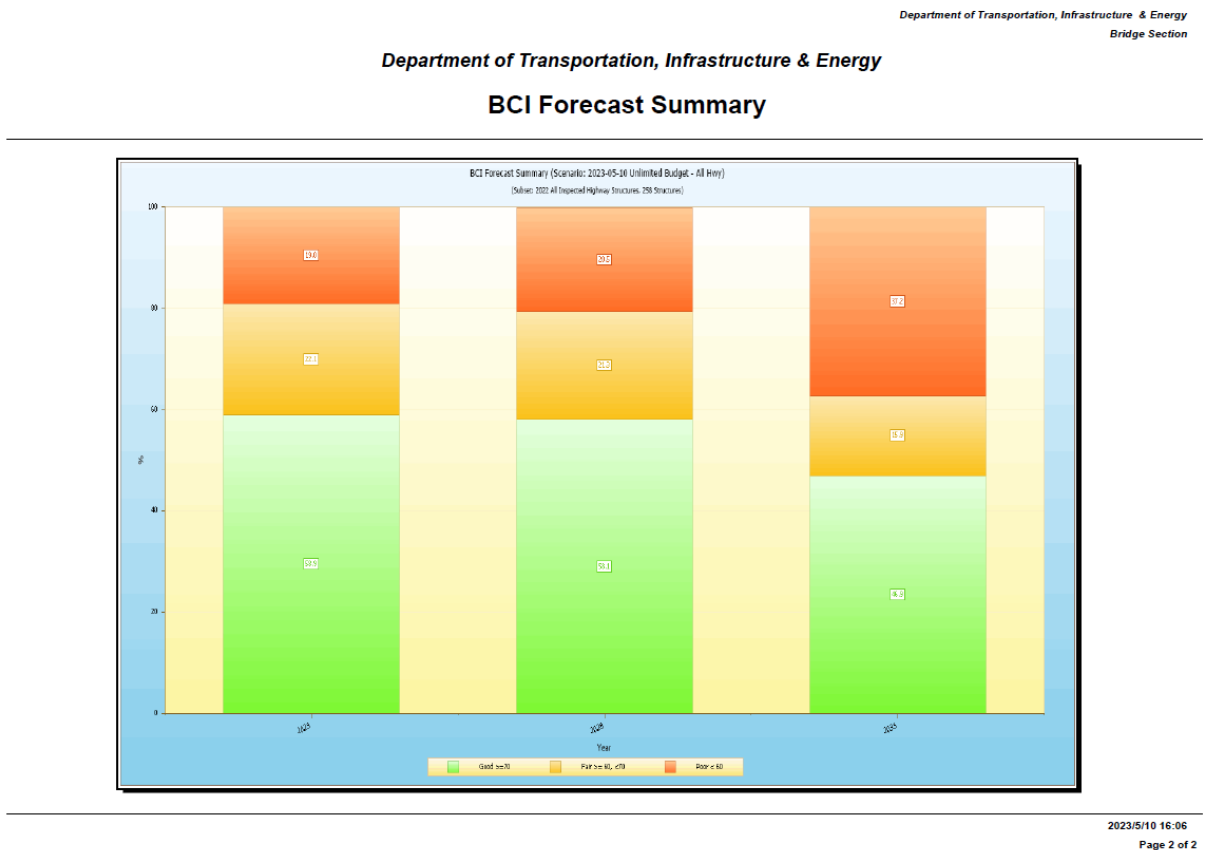
BCI Forecast Summary



2023/5/10 16:08
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Appendix ‘Q’

BCI Forecast Summary All Inspected Highway Structures Unconstrained Budget

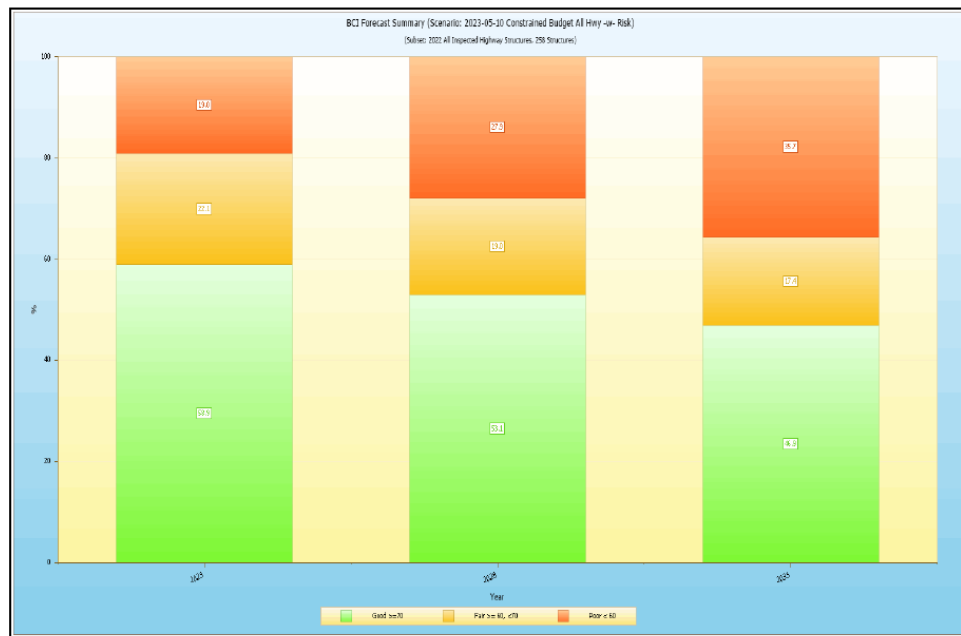


Appendix 'R'

BCI Forecast Summary All Inspected Highway Structures Constrained Budget

Department of Transportation, Infrastructure & Energy
Bridge Section

Department of Transportation, Infrastructure & Energy BCI Forecast Summary



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