



CONSULTING ENGINEER'S REPORT

for the

West Virginia Parkways Authority

**CONSULTING ENGINEER'S DETAILED
RECOMMENDATIONS BASED ON STUDY OF WV
TURNPIKE'S NEEDS FOR ESTIMATED
OPERATING EXPENSES, RENEWAL AND
REPLACEMENT REQUIREMENTS
AND CAPITAL COSTS**

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TABLE OF CONTENTS

EXECUTIVE SUMMARY..... 3

1.0 INTRODUCTION AND PURPOSE 4

2.0 THE WEST VIRGINIA TURNPIKE SYSTEM..... 4

2.1 OVERVIEW OF THE WEST VIRGINIA TURNPIKE SYSTEM 4

**2.2 TURNPIKE SYSTEM CONDITION REPORTS INCLUDING REQUIRED
 MAINTENANCE AND REPAIR NEEDS..... 5**

2.3 OPERATING EXPENSES..... 8

2.4 RENEWAL AND REPLACEMENT 10

2.5 CAPITAL NEEDS 12

3.0 CONCLUSION 13

4.0 ADDITIONAL IMPORTANT INFORMATION.....14

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EXECUTIVE SUMMARY

The purpose of this report is to provide information from the General Engineering Consultant of the West Virginia Parkways Authority (Authority) on:

- (1) the current condition of the West Virginia Turnpike (Turnpike),
- (2) the Turnpike's annual needs for operating expenses (see Table No.1),
- (3) the Turnpike's annual needs for renewal and replacement requirements (see Table No. 2),
- (4) the Turnpike's capital needs (see Table No. 3), and
- (5) the recommendations of HNTB as to how to address these needs,

based on its latest inspections, its long-term familiarity with the Turnpike and its professional engineering judgment.

Turnpike operations are funded entirely by Turnpike toll revenues. Toll revenues must pay for operating and routine maintenance expenses, debt service, renewal and replacement requirements and capital needs.

This report recommends a 30-year program to address Authority needs. This report explains the reasoning behind this recommendation.

Bridge repairs and culvert repair needs comprise most of the critical needs facing the Authority. There are 116 bridges located on the Turnpike. Many of these bridge decks are approaching 30 years or older. This 30-year program calls for replacement of 111 bridge decks. Many culverts are over 50 years old and exhibit structural concerns that will need to be addressed over the next 30 years.

In addition, the Authority will need to upgrade its computer based toll collection system three times over the next 30 years. Replacement or spare parts are difficult to obtain and expensive. Computer operating systems and software are at or near obsolescence. Because a failure of the system would present serious and major operational and financial issues for the Authority (or any toll road), system upgrades are essential and will provide for reliable and cost-effective toll collections.

The proposed 30-year program will also address the remaining other needs. This will include, without limitation bridge painting and repairs, guardrail replacement, culvert repairs, equipment replacement, signing and lighting repairs, paving, and pavement repairs and maintenance such as pothole patching.

This program will allow the Authority to ensure that the Turnpike is safe and properly maintained.

IN THE PROFESSIONAL ENGINEERING OPINION OF HNTB, THIS PROPOSED 30 YEAR PROGRAM IS WHAT IS SUFFICIENT TO MEET THE TURNPIKE

INDENTURE'S DEBT SERVICE COVERAGE REQUIREMENTS AND "GOOD REPAIR" REQUIREMENTS IN THE FUTURE.

1.0 INTRODUCTION AND PURPOSE

The purpose of this document is to provide a report from the General Engineering Consultant of the West Virginia Parkways Authority (Authority) on the current physical condition of the West Virginia Turnpike (Turnpike), the financial condition of the Authority, to outline projects currently in progress on the Turnpike, and to document the adequacy or inadequacy of the current programs and capital needs.

This report identifies and details these problems and needs and outlines how they must be addressed in our professional engineering judgment.

2.0 THE WEST VIRGINIA TURNPIKE SYSTEM

2.1 OVERVIEW OF THE WEST VIRGINIA TURNPIKE SYSTEM

The West Virginia Turnpike, shown in Figure 1, is an 88-mile long toll road extending from Charleston to Princeton, West Virginia. Originally constructed during the 1950s as a two-lane toll road through rugged mountains with passing lanes on steep grades, there were originally six interchanges. Eleven additional interchanges, including the I-64 Interchange south of Beckley, were added during a 15 year long upgrading period from 1972 to 1987. This resulted in a scenic, modern four-lane divided interstate highway with construction costs of nearly \$741 million. Financing was accomplished through the use of federal highway funds on a 90% to 10% matching basis. The West Virginia Division of Highways (WVDOH) supplied the 10% matching funds. The Authority repaid the 10% matching funds to the WVDOH with the last payment made in June 1994. An eighteenth interchange was constructed at Beckley utilizing Turnpike funds. It was opened to traffic May 22, 1996. It eliminated a dangerous south bound merge condition and provided access for northbound and southbound traffic to the Beckley Travel Plaza, Caperton Center, and Raleigh County Route 11 (Dry Hill Road).

The Turnpike was originally financed in the 1950s with Turnpike toll revenue bonds. Those bonds went into default shortly after completion of the original Turnpike because of insufficient traffic and toll revenues. After the upgrade of the Turnpike to interstate standards, and as other interstate highways connecting to the Turnpike were completed (I-64, I-77 and I-79), the Turnpike was able to cure that default. In 1989 the Authority was formed as the successor to the original West Virginia Turnpike Commission. That same year, the Authority issued new Turnpike revenue and refunding bonds to refinance the original 1950's bonds, to repay the WVDOH its matching funds for the upgrade of the Turnpike to interstate standards and pay issuance costs. The 1989 bonds were refunded in 1993 to take advantage of lower interest rates, and have been refunded in 2002, 2003 and 2008. Under the Indenture, the Authority has various specific covenants concerning operation and maintenance of the Turnpike (including the "good repair" covenant and the bond debt service coverage requirements mentioned above).

Tolls are collected at three (3) mainline barrier Toll Plazas and at the US 19 Interchange Plaza. Data regarding transactions and revenue are included in the West Virginia Turnpike 2018 Revenue Bond Study Report for the Authority by CDM Smith (2018 Revenue Bond Study).

Turnpike operations are funded entirely by Turnpike toll revenues. Toll revenues must pay for operating and routine maintenance expenses, debt service, renewal and replacement requirements and deferred maintenance and capital needs.

2.2 TURNPIKE SYSTEM CONDITION REPORTS INCLUDING REQUIRED MAINTENANCE AND REPAIR NEEDS

As part of the West Virginia Parkways Authority's overall financial planning, HNTB has reviewed the estimated total project costs for current and proposed West Virginia Turnpike projects, and has prepared estimates of Operating Expenses and Renewal and Replacement account requirements for the next 30 years. Specifically, HNTB has evaluated costs and other aspects of the following:

- Physical Condition
- Operating Expenses (Table No. 1)
- Renewal and Replacement Account (Table No. 2)
- 2019-2050 Capital Needs (Table No. 3)

The following sections report on the current physical condition of the Turnpike and descriptions and estimated costs of the backlog of essential deferred maintenance and capital needs.

General Physical Condition

Applying Federal Highway Agency (FHWA) developed standards of comparison, 80% of Turnpike roadways are in good to very good condition while only 20% are currently rated in fair to poor condition.

Specific descriptions and characterizations of roadway and related area conditions and maintenance problems are set out below.

Pavement and Shoulders

The Turnpike is currently nearing completion of a 10-year program of paving projects that has raised the good to very good condition from 45% to 80%.

HNTB has been carefully inspecting and preparing accurate reports on the condition of the West Virginia Turnpike for over 50 years. Yearly inspections of bridges, pavements, culverts, signs, lighting, pavement markings and other structures along or under the Turnpike are performed. The Annual Report, prepared by HNTB, contains information on the conditions of the various assets of the Turnpike and contains HNTB's funding recommendation for Renewal and Replacement Requirements for the next fiscal year.

HNTB is also required by the Turnpike bond indenture covenants to inspect and certify that the Turnpike is being operated and maintained in a sound and economical manner consistent with sound management practices and principles, and is being kept in good repair, working order and condition. In this report, these covenants collectively are sometimes referred to as "good repair" covenants. HNTB also prepares the yearly report which details the necessary repairs needed to maintain the Turnpike.

The Turnpike mainline roadways were originally constructed in the early 1950s of Portland Cement Concrete (PCC), and substantially redone in the 1970s and 1980s when the Turnpike was upgraded to interstate standards. Currently 80% of the pavements are rated to be in good to very good condition.

The 30-year program recommended in this report will address future paving needs. Those paving needs consist of rehabilitation of the pavements and overlays to preserve existing asphalt pavements.

This proposed 30-year program will address the need to rehabilitate pavements and develop a preservation plan to preserve all the asphalt pavements. At the end of this 30 years, all Turnpike pavements will remain in very good or good condition.

Bridge Approaches

Bridge approaches located on embankments settle relative to the bridge decks which are supported by substructure units firmly founded on bedrock or supported by piling driven to bedrock. Settled bridge approaches cause vehicles to bounce and cause the bridges to vibrate excessively. Periodic mill and overlay of the approaches is required.

Embankments and Cuts

Authority personnel continually remove slide debris and maintain roadway ditches, benches and backslopes.

Drainage Facilities

Culverts are subject to corrosion due to acid water runoff. There also are broken or collapsed pipes, rusted and leaking pipe inverts, and erosion at the outlet ends of pipes. Ditches require continued maintenance and clean-out. Approximately 40% of roadway pipes will need to be replaced or rehabilitated within the next 30 years.

Guardrail and Fencing

A recent 3-year program replaced older guardrail sections that have been deteriorated with rusted beams and posts. Guardrail needs will be reduced to yearly replacement on repair of damaged guardrail.

Bridges

There are 116 bridges located on the Turnpike (106 painted steel bridges and 10 concrete bridges) and they remain in relatively good condition for their age; however, they require continual sweeping of deicing salts and abrasives from the decks, washing down steelwork exposed to deicing salts, sealing deck cracks, repairing defects and damages and repainting of structures at scheduled intervals. Since the upgrade of the Turnpike to interstate standards, all of the 106 painted steel bridges including the two major bridges over the Bluestone River and the two major bridges crossing the Kanawha River near Charleston have required repainting.

All the bridges have transverse cracks that allow de-icing salt solutions onto the steelwork causing corrosion, which, in turn, causes the concrete deck to chip along the edges of the beams.

Delaminations and spalls are forming on the bottoms of those bridge decks where the bottom layer of deck reinforcing steel was not epoxy coated. (Delaminations and spalls essentially are holes in the bottom of the bridge decks.) The 30-year program calls for the replacement of 111 bridge decks. Many of these decks are 30 years old at this time.

The Federal Highway Administration (FHWA) mandates that these bridges be inspected every two (2) years. Approximately one half of the bridges are scheduled for inspection each year. In-Depth Bridge Inspections are required every six (6) years with Periodic Bridge Inspections at two-year intervals between. Underwater Bridge Inspections are required every five (5) years.

In addition to the bridge inspection reports, "Structure Inventory and Appraisal" forms (SIA Forms) are required by FHWA. These SIA Forms are ten (10) page reports that provide a variety of information in coded form that is required by the FHWA.

In accordance with an FHWA mandate, all of the West Virginia Turnpike bridges have been rated to determine maximum safe loads for the bridges. With regard to bridges, the Authority has incurred costs in analyzing overweight vehicles that may use the Turnpike's bridges. All bridges have been inventoried and rated, and are being inspected, in accordance with FHWA Standards. Additional inspections were made on the Bluestone River Northbound and Southbound Bridges in accordance with state and federal instructions following the Minnesota Bridge collapse in 2007.

Toll Collection and Recording System

The toll system was replaced with an automated electronic toll collection system in 1999-2000.

The 30-year program contains periodic upgrades of the toll collection system. Upgrades to this system are essential (as a failure of the electronic toll collection system would present serious and major operational and financial issues of for the Authority – or any toll road) and will provide for reliable and cost-effective toll collections.

Other Miscellaneous Operations and Maintenance Required

In addition to the detailed areas of maintenance, repairs and operations required to be performed by the Authority as outlined above, the Authority is responsible for State police protection on the Turnpike and for two Public Service Commission (PSC) Commercial Motor Vehicle Officers and Vehicles assigned to the Turnpike and for routine maintenance, repairs, replacements, reconstruction and renovation of the facilities referenced below. These also must be paid for from Turnpike toll revenue. Such other miscellaneous maintenance and repairs include the following:

1. Signing, lighting, delineation and pavement marking;
2. Rest areas, travel plazas and tourist information and welcome centers;
3. Toll plazas and toll equipment;
4. Maintenance areas and related equipment;
5. Communication systems;
6. Administrative headquarters; and

7. Various vehicles, equipment and heavy equipment used in the operation and maintenance of the turnpike roadway.

2.3 OPERATING EXPENSES

Operating Expenses include all of the Authority's expenses in operating, maintaining and servicing the Turnpike system and otherwise carrying out and administering its related programs. Operating expenses include, for example, salaries, supplies, utilities, ordinary maintenance and repairs, insurance premiums, legal, accounting, management, traffic engineers and consulting engineers. Operating expenses do not include costs determined by the Consulting Engineers to be Renewal and Replacement requirements (see Section 2.4). Operating expenses also do not include depreciation or other non-cash accounting accruals or capital needs including major pavement rehabilitation and preservation as described further below.

The Authority has been proactive in implementing cost-saving measures. These cost-saving measures have included utilizing modern technology, utilizing the purchasing power created through statewide procurement contracts obtained and provided by the State of West Virginia's Purchasing Division, and implementing organizational efficiencies over the past 20 years. The implementation of these and other cost-cutting measures has limited the growth rate of operating expenses over the past 20 years.

A number of assumptions were used to project the Operating Expenses for the next 30 years:

1. Direct Salaries with projected growth of 2.0%.
2. Benefits with projected growth of 2.0%
3. All other operating Accounts with projected growth of 2.0%.
4. Non-departmental costs with projected growth of 2.0%.

Based upon all these factors, as well as specific knowledge of the operation of the Turnpike, projections for Operating Expenses for the fiscal years 2019 through 2050 are as follows:

Table No. 1

Year	Estimated Operating Expenses (In thousands)
2019	\$43,093
2020	43,955
2021	44,834
2022	45,731
2023	46,645
2024	47,578
2025	48,530
2026	49,500
2027	50,490
2028	51,500
2029	52,530
2030	53,581
2031	54,652
2032	55,746
2033	56,860
2034	57,998
2035	59,158
2036	60,341
2037	61,548
2038	62,779
2039	64,034
2040	65,315
2041	66,621
2042	67,954
2043	69,313
2044	70,699
2045	72,113
2046	73,555
2047	75,026
2048	75,794
2049	76,570
2050	77,353

2.4 RENEWAL AND REPLACEMENT

Under the Indenture, annual Renewal and Replacement requirements must be determined and certified by the Consulting Engineers. Under the Indenture, Renewal and Replacement requirements exclude annual Operating Expenses and include those expenditures required in that year for keeping the Turnpike open to public travel and use.

Accordingly, Renewal and Replacement requirements constitute the absolute minimum of essential capital outlays for a given fiscal year. Renewal and Replacement requirements do not include longer-term capital needs of the Turnpike (that is, those capital needs which are not necessary to keep the Turnpike open for public travel and use in the fiscal year in question but which must be addressed in a reasonable time frame in subsequent fiscal years in order to meet the Authority's Indenture covenant to operate, keep and maintain the Turnpike in "good repair, working order and condition" and in a "sound and economical manner" consistent with "sound management practices and principles.") This "good repair" covenant is a separate requirement of the Indenture, in addition to the debt service coverage tests under the Indenture.

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Based on the proposed 30-year program, our recommendations for Renewal and Replacement requirements for the fiscal years 2020 through 2050 are:

Table No. 2

Year	Estimated Renewal & Replacement Requirements (In thousands)
2019	\$16,988
2020	18,350
2021	18,202
2022	18,167
2023	18,396
2024	18,898
2025	19,683
2026	20,215
2027	20,632
2028	21,192
2029	23,303
2030	24,304
2031	27,582
2032	25,466
2033	26,436
2034	28,029
2035	27,238
2036	27,976
2037	27,715
2038	28,468
2039	29,243
2040	30,460
2041	31,282
2042	32,129
2043	33,002
2044	33,900
2045	34,826
2046	35,522
2047	36,233
2048	36,595
2049	36,961
2050	37,331

2.5 FUNDING NECESSARY TO MEET CAPITAL NEEDS

The Authority, in our professional judgment, needs to fund capital needs over a 30-year period as shown on Table No. 3 below.

Table No. 3

Year	Capital Needs
2019	\$52,200
2020	34,882
2021	33,748
2022	46,640
2023	48,520
2024	50,868
2025	34,543
2026	52,579
2027	36,646
2028	37,746
2029	38,878
2030	40,044
2031	41,246
2032	42,483
2033	50,758
2034	45,070
2035	46,422
2036	47,815
2037	49,249
2038	50,727
2039	52,249
2040	61,816
2041	55,431
2042	57,094
2043	58,806
2044	60,571
2045	62,388
2046	64,259
2047	75,187
2048	64,242
2049	65,329
2050	66,281

3.0 CONCLUSION

IN THE PROFESSIONAL ENGINEERING OPINION OF HNTB, FUNDING THE OPERATING COSTS, RENEWAL AND REPLACEMENT COSTS AND CAPITAL NEEDS IDENTIFIED ABOVE OVER 30 YEARS IS WHAT IS SUFFICIENT TO MEET BOTH THE TURNPIKE INDENTURE'S DEBT SERVICE COVERAGE REQUIREMENTS AND "GOOD REPAIR" REQUIREMENTS IN THE FUTURE.

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ADDITIONAL IMPORTANT INFORMATION

The estimates for Capital Needs, Operating Expenses, and the Renewal and Replacement requirements contained herein have been evaluated in this analysis.

Estimates of probable costs and expenditures for the Capital Needs Program, Operating and Maintenance Expenses, and Renewal and Replacement requirements in future years are based upon such data as are available and on current construction and living cost trends. These estimates are intended to show a reasonable expense trend over a period of years, rather than exact expenses for any particular year. There could, of course, be years when these expenses could be higher or lower than indicated, depending upon economic conditions and other management and local factors that might affect costs and procedures at that time.

Neither the Authority nor HNTB has control over the cost of labor, materials or construction bidding methods. Accordingly, the Engineer cannot and does not warrant that costs will not vary from the Engineer's estimates of probable cost.

* * *

It has been a pleasure to serve as General Engineering Consultants from the conception of the West Virginia Turnpike through the retirement of the original Turnpike bonds and beyond. During our 67-year tenure, we have enjoyed an excellent relationship with the past Commission, the current Authority and the staff of the Turnpike. Each of these parties, in the respective areas of responsibility, has contributed materially to protect the bondholder's interests and to provide an excellent transportation facility for the State of West Virginia. We look forward to the continuation of this relationship.