New Jersey Department of Transportation
QUALITY IMPROVEMENT ADVISORY
QUALITY MANAGEMENT SERVICES

Manager: Brian Strizki **Telephone: (609) 530-6363**

QIA No. QIA001

Approved: Brian Strizki
Date: August 27, 1996

Process Affected:
☒Scope ☒Design ☐Right of Way ☐Utilities ☐Environmental ☐Historic ☒Construction

Bureaus Affected: All CPM Units

Procedure(s) Affected: Project Delivery Schedule

Route & Section: Route 287, Section 5S & 4N

Project Summary:

Route 287, Section 5S & 4N is a 100% State funded project with limits extending from milepost 14.44 to milepost 22.17 in Bedminster and Bridgewater Townships, Somerset County. The original scope of this project includes reconstructing and rehabilitating this section of Route 287 as well as performing some widening. Recently a Baseline Scope Change was requested to provide a substantial improvement to the proposed final pavement product. This change was initiated due to the resident engineer's anticipation of a 300% increase in quantity for the removal and replacement of defective concrete pavement. Using the bid prices received on the project, this translated into a $2.2 million cost overrun for the affected item. Because of the magnitude of the disparity between the plan quantity and that estimated on site, non-destructive testing was performed in order to more accurately determine the extent of the necessary repairs. The concrete repair problem is further detailed in the next section. In addition to this repair, other improvements were proposed. . It was determined that their inclusion in the contract would also be necessary in order to achieve a pavement with a significantly greater effective life than originally designed. These improvements are as follows:

- Changed bituminous pavement mix designs to meet current material standards
- Additional milling and paving quantities beyond the current project scope
- Additional subsurface drainage beyond the current project scope

The cost of all of the improvements (including the concrete repairs) will result in a construction change order totaling $4,285,325.41, a significant increase to the original contract amount.

Nature of Problem(s):

There are several reasons which necessitated this Baseline Scope Change. They are detailed as follows:

Concrete Repairs: During the time lapse between the original pavement survey and the start of construction, the condition of the pavement has deteriorated substantially. One reason for the delay in advancing the project to final design was due to an environmental lawsuit which was brought against the Department. During this time period the existing concrete pavement suffered deterioration due to continued exposure to the elements as well as vehicular impacts. In many cases when the Maintenance Bureau becomes aware of an upcoming project which will reconstruct a pavement section such as in this case, their efforts and resources are often dedicated to other areas despite the current condition of the pavement. In this case, the project delay along with the lack of maintenance contributed to the pavement condition becoming further aggravated. This resulted in the need for the significant increase in concrete repair items. The final quantity of additional work was based upon the results of testing performed and recommendations from the Bureau of Geotechnical Engineering in conjunction with a private testing firm, and is estimated at $2,988,591.91.

Pavement Design: The pavement design recommendation for the referenced project was approved in 1988. However, construction did not begin until this year. During this time period the Bureau of Geotechnical Engineering has made many improvements in the strategy for rehabilitation of concrete pavements and asphalt mix design. The anticipated service life of the proposed resurfacing was approximately 8 years, based upon previous projects with

similar conditions. The improved technology that exists is bituminous concrete surface course, mix I-4, polymer modified. By applying this item at an additional cost of $600,000, it is anticipated that the effective life of this rehabilitation could be increased by approximately 50%.

Milling And Paving: Field observations identified that the mainline sections, and some shoulder sections of existing bituminous pavement had extensive wheel path rutting. This resulted in an increased cost of $203,515.50 due to additional milling and inclusion of bituminous stabilized base course prior to finished paving. While rutting of this type is not uncommon for roads of this type that carry a high percentage of heavy truck traffic, the condition evidently worsened from the time that the original pavement survey was performed.

Edge Drains: There were additional areas in need of subsurface drainage along the concrete pavement section of the inner barrel of both northbound and southbound Route 287. This was due to the presence of excessive moisture in the pavement observed during excavation. Drainage was provided for along the outer barrel of both the northbound and southbound roadway, however, none was provided on the plans for the inner roadway. Since proper internal drainage is essential to long term pavement performance, an increase in underdrain, type F and geocomposite edge drain were added to the contract. The cost of these additional items totaled $493,158. It is likely that the continued pavement deterioration contributed to the need for these items.

Recommendation(s):

The following is a list of recommendations extracted from the occurrences on the referenced project which may prove to be beneficial when applied to other projects with similar conditions:

1. The design development stage of projects needs to be accomplished in a timely fashion, especially when the deterioration of existing physical conditions can potentially result in significant future impacts.

2. Conditions need to be updated and verified periodically during the life of the design development stage to ensure that contracts reflect relevant and necessary construction items and quantities, and to ensure that field conditions accurately reflect those which existed during the initial development of the plans.

3. The Maintenance Bureau should utilize a proactive approach in keeping abreast of project schedules in order to adequately ensure that attention is properly provided to the appropriate areas.

4. A greater emphasis also should be placed on the scope development stage by CPM personnel and project associated outside consulting firms to ensure that necessary work items are clearly defined in the design contracts.

5. Pavement condition surveys should accurately reflect existing material conditions. Also, pavement repair quantities should account for probable future degradation that may occur prior to construction of that item. (e.g. due to heavy truck loading, presence of salt water).

6. All involved parties need to ensure that all necessary environmental clearances are obtained and environmental issues are resolved early in the design process so that environmental issues and concerns won't delay the project delivery schedule.

7. New technologies and improvements, especially those which can lead to a substantial initial or life cycle cost savings or benefit should be incorporated into projects as early in the design process as practicable. This can result in significant savings to the Department.

Implementation: Can be immediate

Impact Assessment:	**Cost Impact:**
☒Schedule ☒Quality ☒Cost ☒Scope	$4,285,325.41