

**AUDIT OF THE INDEPENDENCE OF
CENTRAL ARTERY/TUNNEL PROJECT
INSPECTION CONTRACTORS**

Federal Highway Administration

Report Number: MH-2007-039

March 27, 2007



**U.S. Department of
Transportation**

The Inspector General

**Office of Inspector General
Washington, DC 20590**

**Office of the Secretary
of Transportation**

March 27, 2007

The Honorable Michael E. Capuano
Member, U.S. House of Representatives
Washington, D.C.

Dear Representative Capuano:

This report responds to your request that the Office of Inspector General (OIG) review any independence concerns posed by contractors who were performing recent remediation (repairs or retrofits) inspection work on the Boston Central Artery/Tunnel (CA/T) Project.

In light of the tragic accident that occurred in one of the tunnels on July 10, 2006, the Federal Highway Administration (FHWA) and OIG agreed that it was imperative that safety reviews and remediation work be conducted independently of contractors who performed the original work or oversight. This is necessary to provide assurance to the driving public that the CA/T system is safe. In late October 2006, media reports revealed that employees of the CA/T Project's long-time oversight contractor—a joint venture of Bechtel Corporation and Parsons Brinckerhoff Quade & Douglas, Inc. (B/PB)—were conducting inspections of remediation work.

On October 24, 2006, the *Boston Herald* reported that a few employees of B/PB had been conducting daily field inspections of remediation work inside the I-90 connector tunnel. The tunnel was closed to traffic after the ceiling collapse, pending safety reviews and remediation work to address any problems that may have been identified during these reviews. The involvement of B/PB employees in such work could undermine the public's confidence that the Commonwealth's efforts to ensure the safety of the tunnels were truly independent. The then-Massachusetts Secretary of Transportation ordered B/PB employees to be removed from inspections or remediation work. Similar questions about

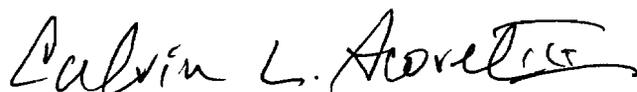
independence arose regarding two other firms that were involved in remediation inspection work—Keville Enterprises and HNTB Corporation (HNTB).

Based on the results of our reviews, which we have enclosed, we have concluded that contractors with potential independence issues have been removed from CA/T remediation work and that the Commonwealth has sufficiently mitigated any risks. According to Commonwealth documentation, seven B/PB employees had been conducting inspections before the Commonwealth directed them to stop on October 24, 2006, and these employees were removed from remediation work. We confirmed that the Commonwealth performed 193 re-inspections on the work of the seven B/PB employees. We reviewed a sample of 30 re-inspections that the Commonwealth conducted, and found that the Commonwealth followed its re-inspection procedures for all 30 cases. After reviewing this sample, we concluded that the Commonwealth sufficiently mitigated the risks posed by B/PB's involvement in earlier remediation work. We informed FHWA and Commonwealth officials of the results of our review. FHWA informed us that, in conducting its own assessment, it was also satisfied with the Commonwealth's efforts to deal with any independence concerns.

Accordingly, based on the interviews we conducted and the documentation we reviewed, we concluded that the Commonwealth took sufficient steps to mitigate any risks posed by B/PB's prior inspection work. In addition, we concluded that the Commonwealth has taken sufficient steps to evaluate whether or not other contractors, such as Keville Enterprises and HNTB, may lack sufficient independence due to previous involvement in the design or construction of the CA/T Project.

If I can answer any questions or be of further assistance on this matter, please feel free to call me at (202) 366-1959, or my Deputy, Todd Zinser, at (202) 366-6767.

Sincerely,



Calvin L. Scovel III
Inspector General

Enclosure (Report Number MH-2007-039)

cc: James Ray, Chief Counsel, FHWA

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Independence of Central Artery/Tunnel Project Inspection Contractors (Report No. MH-2007-039)

Introduction

Since the July 10, 2006 collapse of overhead panels in one of the Boston Central Artery/Tunnel (CA/T) Project tunnels, which killed a motorist, the Commonwealth of Massachusetts (the Commonwealth) has been conducting a series of safety reviews and remediation work to correct any deficiencies identified during the reviews.¹ As a result of the tunnel ceiling collapse and the resulting fatality, portions of the CA/T Project were closed to traffic and the Commonwealth and the Federal Highway Administration (FHWA) agreed to an 8-stage reopening process. FHWA is the Federal agency responsible for overseeing the CA/T Project and the Office of Inspector General (OIG) has been providing independent oversight of the reopenings at the request of the Massachusetts U.S. congressional delegation and the U.S. Secretary of Transportation. We have also been providing oversight to the Commonwealth's more comprehensive "Stem to Stern" review. Also, in December 2006, the National Transportation Safety Board Reauthorization Act of 2006 (Public Law No. 109-443) directed OIG to provide oversight related to the CA/T Project.

It is imperative that, going forward, CA/T Project safety reviews and remediation activities are conducted in a rigorous and independent manner to restore public confidence and ensure the safety of drivers who use the reopened tunnels. Accordingly, contractors including the main joint venture Bechtel Corp. and Parsons Brinckerhoff Quade & Douglas, Inc. (B/PB) who were previously involved in the design and oversight of the I-90 tunnels, which require remediation, should not play a role in the remediation work or inspections related to the reopening process.

On October 24, 2006, the *Boston Herald* reported that a few employees of B/PB had been conducting daily field inspections of remediation work inside the I-90 connector tunnel. Based on our review, we determined that the B/PB employees had apparently been used to supplement Commonwealth inspectors. At that time, the Massachusetts Governor's office stated that it had previously directed the Commonwealth's Executive Office of Transportation (EOT) to ensure that B/PB would have no involvement in either the I-90 connector remediation work or the more comprehensive "Stem to Stern" safety review. On October 24, 2006, the

¹ The Commonwealth of Massachusetts tunnel safety reviews and remediation work is being directed by the Executive Office of Transportation (EOT) with the support of employees and contractors managed by the Massachusetts Highway Department (MHD), which is part of EOT.

Massachusetts Secretary of Transportation publicly announced that B/PB's involvement in the remediation was an inadvertent oversight and that he ended B/PB's involvement.

After October 24, 2006, Commonwealth officials informed us that they reviewed B/PB's involvement in tunnel remediation and conducted new inspections of any remediation work that B/PB initially inspected (the remediation work itself was performed by other firms). Further questions arose regarding the independence of two additional firms that the Commonwealth was using in the CA/T Project remediation—Keville Enterprises and HNTB Corporation (HNTB). According to Commonwealth officials, they vetted and cleared other contractors working on remediation to ensure that these firms did not lack independence due to any previous involvement with any I-90 work.

In conducting the audit, we reviewed documentation provided by Commonwealth officials. We also conducted interviews with officials from EOT, the Massachusetts Highway Department, the Massachusetts Turnpike Authority, B/PB, Keville Enterprises, and the National Transportation Safety Board. Exhibit A details our analysis of the involvement of B/PB, Keville Enterprises, and HNTB in the I-90 remediation work. Exhibit B provides an overview of other contractors that are involved in inspection work. We conducted our performance audit work from October through December 2006 in accordance with Generally Accepted Government Auditing Standards prescribed by the Comptroller General of the United States. Exhibit C details our objectives, scope, and methodology.

RESULTS

Bechtel Corporation and Parsons Brinckerhoff Quade & Douglas, Inc. Employees Have Been Removed from the CA/T Project Remediation Work

According to Commonwealth documentation, seven B/PB employees were conducting inspection activities before B/PB was directed to stop on October 24, 2006. The records also show that the Commonwealth removed these employees from remediation work by that same date. The Commonwealth identified 193 inspections that required an independent re-inspection.² The initial inspections in question were conducted between September 21, 2006 and October 24, 2006, the date of B/PB's removal from remediation work. Between September 21st and October 24th, the seven B/PB employees were used to supplement the Commonwealth's other inspection staff. The Commonwealth was relying on inspections performed by seven B/PB employees during this period of time. They

² Exhibit A provides additional details about the Commonwealth's inspection process and procedures.

were tasked to conduct inspections on their own and not as part of inspection teams using Commonwealth employees. The Commonwealth reported to us that, after October 24th, it conducted independent re-inspections on all of B/PB's 193 inspections.

The Commonwealth removed the B/PB employees in question to ensure that no B/PB employees continued to conduct inspection work. In addition to reviewing the Commonwealth's re-inspection records, we interviewed four of the seven B/PB employees to verify the Commonwealth's claims that these employees were no longer conducting inspections.

Commonwealth officials identified a total of 193 B/PB inspections that required a re-inspection. We obtained the Commonwealth's list of the 193 inspections and reviewed in detail a sample of 30 B/PB inspections to verify that re-inspection forms were completed properly. Our review determined that the Commonwealth's re-inspection procedures were followed in these 30 cases. Accordingly, based on the documentation we reviewed and our interviews, we concluded that the Commonwealth took sufficient steps to evaluate B/PB's work, thereby mitigating potential risks posed by B/PB's involvement in remediation.

The Commonwealth also decided to remove an additional 63 B/PB employees who were performing mostly administrative duties. For example, some of these employees were classified under categories such as traffic support and secretarial. The Commonwealth identified these 63 employees by reviewing joint venture billing records to determine who had charged the CA/T Project for remediation-related work. According to the Commonwealth, removing all B/PB employees from any remediation-related work was justified to further avoid the appearance that the remediation work lacked independence from the contractors responsible for the design and construction of the I-90 tunnels. During the period of July 16, through October 22, 2006, the Commonwealth reported that approximately \$1.2 million was invoiced by B/PB for staff that worked on remediation-related activities, which includes the 63 administrative employees and seven inspectors.

We interviewed 17 of the 63 B/PB employees and determined that their responsibilities matched the documentation provided by the Commonwealth and that they had been removed from any remediation-related duties. We also assessed whether any B/PB administrative staff had performed any duties that would have precipitated the need for re-inspections. Based on the documentation we reviewed and our interviews, we concluded that the Commonwealth took sufficient steps to ensure that B/PB employees were removed from any remediation-related activities and no additional re-inspections were required.

Other Contractors with Independence Concerns Have Been Sufficiently Vetted or Removed from Remediation Inspection Work

Questions were also raised regarding the independence of two other contractors that had been involved in the CA/T Project remediation inspection work—Keville Enterprises and HNTB Corporation. First, 27 Keville Enterprise employees conducted remediation-related inspections and other technical support for the Commonwealth. This presented a potential independence concern because Keville previously had a subcontractor relationship with B/PB on the CA/T Project.

In reviewing Keville's independence, Commonwealth officials told us that they took the following facts into consideration: 1) Keville was not a partner in the B/PB joint venture; 2) at the time the Commonwealth was using these inspectors, Keville was not in a subcontractor relationship with B/PB; and 3) Keville was sufficiently independent in this case, because none of the Keville inspectors had previously been involved with oversight of the I-90 tunnel panels.

The Commonwealth provided us a list of the Keville employees assigned to inspection work, which we verified with Keville officials. Further, we interviewed several members of the Keville staff to verify their role and employment history on the CA/T Project. Based on our review and interviews, we determined that these employees were sufficiently independent. Nonetheless, on October 26, 2006, Commonwealth officials removed Keville inspectors from remediation work to avoid any appearance of a lack of independence due to the firm's previous involvement in the CA/T Project.

Second, although HNTB performed remediation-related inspections and other technical support on I-90, the Commonwealth concluded that the work of the seven HNTB employees in question was sufficiently independent because HNTB did not previously perform work on the I-90 tunnel ceiling system. Specifically, Gannett Fleming used a ceiling panel design in the I-90 tunnel that HNTB developed for the I-93 tunnel, but HNTB was not involved in the I-90 work. To verify the Commonwealth's claims, we also consulted with the National Transportation Safety Board (NTSB), which is conducting an independent investigation of the July 10, 2006 tunnel incident in which a passenger was killed. We confirmed that B/PB and Gannett Fleming were the firms involved in the I-90 tunnel work—not HNTB. Further, B/PB and its subcontractor, Gannett Fleming, revised parts of HNTB's panel design and Gannett Fleming independently designed all of the hanger systems for the I-90 connector tunnels. Accordingly, we concluded that HNTB did not have any independence issues in working on I-90 remediation.

Remaining Contractors Conducting Inspections Have Been Vetted and Cleared to Ensure Their Independence

Several firms, aside from B/PB, Keville and HNTB, have been involved in remediation work. The Commonwealth is using the following design and inspection consultants—TranSystems; Transportation Engineering and Construction, Inc.; Charles H. Sells, Inc.; Diversified Technology Consultants; and Purcell Associates. According to the Commonwealth, these contractors have been vetted to ensure they had no significant prior involvement in the I-90 tunnel. To ensure their independence, the Commonwealth requested that each firm provide, in writing, (1) involvement with the design or construction of the CA/T Project before July 10, 2006; (2) contractual agreements with B/PB; and (3) names of employees involved in the remediation who were previously employed by B/PB, any B/PB subconsultants on the CA/T Project, or any section design consultants on the CA/T Project. The Commonwealth obtained and reviewed the requested information along with each firm's written assurance that it had no conflicts of interest in conducting remediation work.

Although no questions had been raised as to the independence of these five firms, we interviewed Commonwealth officials to assess their vetting and clearance process, and reviewed the engineering firms' written assertions and responses to MHD's follow-up questions. Based on the results of our interviews and document reviews, we determined that the Commonwealth performed due diligence in assessing these firms' independence. Exhibit B provides additional information on the current involvement of these firms in I-90 remediation work and the vetting process.

CONCLUSION

We informed FHWA of the results of our review and provided them with a draft of our report. FHWA informed us that, based on its own review, it was satisfied with the corrective actions taken by the Commonwealth. We make no recommendations to FHWA and accordingly no reply is required.

**EXHIBIT A: SUMMARY MATRIX OF ACTIONS REPORTED BY MASSACHUSETTS AND OIG
ACTIVITIES TO ADDRESS THEM**

Firm No. of Employees with Potential Independence Concerns	Activity Performed	Mitigation Actions Taken by the Commonwealth of Massachusetts
Bechtel/ Parsons Brinckerhoff Quade & Douglas, Inc. (B/PB) 7 Inspectors 5 full time 2 part time	Inspected the two hanger systems: the new Hilti bolt system and the existing Unistrut hanger system on I-90 Westbound and Ramp D tunnels 1. Hilti Bolt System <ul style="list-style-type: none"> • Completed an inspection form while observing: • Drilling of holes for bolts • Installation of Hilti bolts • Load tests (also reported by an independent pull-test firm) • Bracket installation • Torque setting of first nut • Tightening of second nut 	<ul style="list-style-type: none"> • The Commonwealth removed B/PB inspectors from remediation work on October 24, 2006. • The Massachusetts Highway Department (MHD) identified 193 inspections performed by B/PB employees from September 21st through October 24th that required an independent reinspection. (Any B/PB inspections performed before September 21 were redundant and not relied upon because MHD performed independent inspections using its own employees.) See the note at the end of this table for more information on the 193 inspections. • MHD created a spreadsheet detailing the 193 inspections, which we obtained. • MHD conducted re-inspections of the Unistrut and Hilti system brackets and identified prior independent load tests for Hilti bolts. • We interviewed the MHD Chief Engineer, the MHD Director of Construction, the Massachusetts Turnpike Authority Chief of Staff, and the CA/T Project Director regarding the State’s contract with B/PB and the process they used to identify potentially compromised inspections. • We examined the MHD’s spreadsheet of the initial 193 inspections. We also obtained and reviewed a summary of B/PB billings for remedial work as additional verification. • We interviewed 4 of the 7 B/PB inspectors to independently verify the number of inspections listed by MHD and to confirm that B/PB is no longer involved in tunnel remediation work. • Based on our review, we concluded that the Commonwealth’s process provided sufficient assurance that B/PB inspectors were taken off the job and inspections performed solely by B/PB employees were selected for re-inspection. • MHD examined all inspection forms and identified the specific inspections conducted after September 21 by the seven B/PB inspectors. MHD identified a total of 193 inspections performed by B/PB inspectors. • MHD reported that it had completed a re-inspection process for each of the 193 B/PB inspections.

**EXHIBIT A: SUMMARY MATRIX OF ACTIONS REPORTED BY MASSACHUSETTS AND OIG
ACTIVITIES TO ADDRESS THEM (Cont.)**

Firm No. of Employees with Potential Independence Concerns	Activity Performed	Mitigation Actions Taken by the Commonwealth of Massachusetts
	<p>2. Unistrut System</p> <ul style="list-style-type: none"> • Completed an inspection form while observing: • Disassembly of old bracket • Checking the Unistrut for damage • Checking bracket for damage • Replacement of existing or new bracket and new spring nuts • Replacement of new bolts • Use of metal shims, if needed • Torque setting of bolts 	<ul style="list-style-type: none"> • We obtained a list of the 193 initial inspections from which we selected a sample of 30 inspections and corresponding re-inspection records for review. We then analyzed the re-inspection forms to ensure that the associated records were complete and accurate. We found no significant problems. We also interviewed the MHD Chief Engineer to obtain further clarification of the re-inspection process. • Based on our review and interviews, we concluded that MHD’s documentation of the re-inspections is complete and it took sufficient steps to re-inspect B/PB’s work, thereby mitigating any potential risk related to B/PB’s prior involvement in tunnel remediation work.
<p>B/PB</p> <p>63 employees with multiple job titles related to technical and administrative</p>	<p>After the July 2006 tunnel ceiling collapse, B/PB assisted the Commonwealth with technical support, electric support (electrical shutdown and identification of embedded conduits), procurement support, safety monitoring, mechanical engineering, and ceiling</p>	<ul style="list-style-type: none"> • Based on OIG discussions with Commonwealth transportation officials, we learned that, in addition to removing the 7 inspectors, the Commonwealth also removed all 63 B/PB employees from any remediation related work on October 24, 2006. • The Commonwealth reported to us that it conducted its own inspections before September 21; therefore, any B/PB inspections before that date were not used by the Commonwealth for any of the phased openings. MHD re-inspected all 193 B/PB inspections conducted after September 21. • B/PB employees had performed administrative and technical support to assist MHD’s tunnel evaluation. The Commonwealth supplied OIG with a list of all B/PB workers based on hours billed by B/PB from pay periods ended July 16 through October 22, 2006, which we reviewed.

EXHIBIT A: SUMMARY MATRIX OF ACTIONS REPORTED BY MASSACHUSETTS AND OIG ACTIVITIES TO ADDRESS THEM (Cont.)

Firm No. of Employees with Potential Independence Concerns	Activity Performed	Mitigation Actions Taken by the Commonwealth of Massachusetts
support.	condition inspections after the accident.	<ul style="list-style-type: none"> • We interviewed 17 of the 63 B/PB employees to independently verify their roles. • Based on our review, we concluded that the Commonwealth removed all B/PB staff from the tunnel remediation program as officials had stated, thereby mitigating questions about their independence in working on remediation activities.
Keville Enterprises, Inc. 7 Inspectors 20 other employees	Keville employees provided some tunnel remediation inspections and technical support to MHD.	<ul style="list-style-type: none"> • Based on OIG discussions with Commonwealth transportation officials, we learned that Keville Enterprises was a sub-consultant to B/PB prior to the July 10, 2006 accident. • The Commonwealth took the position that the Keville staff had no independence concerns because the assigned inspectors did not have a prior role in the I-90 tunnel connector system. • We requested EOT to provide a listing of Keville staff assigned to tunnel remediation work. • We contacted Keville officials directly to verify the names of listed staff. We also requested information to confirm that Keville employees assigned to tunnel inspections did not previously work on I-90 tunnel ceiling inspections. • We also interviewed 5 of the 27 Keville staff to verify that they did not have a prior role in the inspection of I-90 tunnel panel installations. • On October 26, 2006, the Commonwealth removed Keville inspectors from the tunnel remediation program to avoid any potential questions about the firm's independence.
HNTB Corporation (HNTB) 7 employees	HNTB employees conducted tunnel remediation inspections and provided technical support to MHD.	<ul style="list-style-type: none"> • Based on OIG discussions with Commonwealth officials, we learned that EOT has taken the position that the HNTB staff was independent because the assigned inspectors did not have a prior role in the I-90 tunnel connector system. • We verified that Gannett Fleming used the panel design developed by HNTB for I-93; however, B/PB and Gannett Fleming revised parts of the panel design and independently designed all hanger systems for I-90. Thus, HNTB was not involved in the original I-90 work. • Based on our review, we concluded that HNTB does not have independence concerns because HNTB

**EXHIBIT A: SUMMARY MATRIX OF ACTIONS REPORTED BY MASSACHUSETTS AND OIG
ACTIVITIES TO ADDRESS THEM (Cont.)**

Firm No. of Employees with Potential Independence Concerns	Activity Performed	Mitigation Actions Taken by the Commonwealth of Massachusetts
		did not contract for any part of the original I-90 tunnel connector work.

EXHIBIT B: OTHER INSPECTION CONTRACTORS' INVOLVEMENT IN REMEDIATION WORK 11

Firms	Responsibilities	Assessment ¹	Accepted by the Commonwealth as Being Independent
TranSystems	Designing all remedial ceiling hanger connections, excluding I-90 Tunnel Connector Eastbound temporary shoring towers.	Assertions on all three criteria support the firm's independence.	Yes
Transportation Engineering and Construction, Inc. (TEC)	Designing temporary shoring in the I-90 Tunnel Connector Eastbound and temporary jet fan supports for Ramps A and F.	<p>Four TEC staff members were previously involved with the Central Artery/Ted Williams Tunnel (CA/T) Project design for the Leverett Circle-Storrow Drive Connector. However, its staff was not involved with the design of the I-90 Connector Tunnels.</p> <p>Assertions on all three criteria and above review of prior participation on the CA/T project support the firm's independence.</p>	Yes
Chas. H. Sells, Inc. (Sells)	Performing Level 1 inspections throughout the I-90 Connector Tunnels and the Ted Williams Tunnel. ²	<p>Sells performed some aerial mapping for work on the Boston Survey Company in the early 1990s that included the CA/T Project. Also, one Sells employee had limited experience on the project related to loop ramps north of the Charles River, Fort Point Channel (exclusive of design of tunnel finishes), and in administrative duties. However, Sells staff was not involved with the design of the I-90 Connector Tunnels.</p> <p>Assertions on all three criteria and above review of prior participation on the CA/T project support the firm's independence.</p>	Yes
Diversified Technology Consultants	Performing Level 1 inspections throughout the I-90 Connector Tunnels. ²	One DTC engineer performed minimal design support work on the CA/T project. He was involved with temporary excavation support design criteria, inspection and repair design for wall leakage, and collection as-constructed details for atypical tunnel finish and platform areas. However, the DTC engineer was not involved with the design of the I-90 Connector	Yes

EXHIBIT B: OTHER INSPECTION CONTRACTORS' INVOLVEMENT IN REMEDIATION WORK 12
(Cont.)

Firms	Responsibilities	Assessment ¹	Accepted by the Commonwealth as Being Independent
		Tunnels. Assertions on all three criteria and above review of prior participation on the CA/T project support the firm's independence.	
Purcell Associates	Performing Level 1 inspections throughout the I-90 Connector Tunnels and the Ted Williams Tunnel. ²	Two engineers worked for section design consultants on other areas of the CA/T Project. The engineers worked on the bridges at Massachusetts Ave. interchange, pavement quantity calculations, and traffic management schemes. However, the Purcell engineers were not involved with the design of the I-90 Connector Tunnels. Assertions on all three criteria and above review of prior participation on the CA/T Project support the firm's independence.	Yes

Note 1:

To ensure independence, the Commonwealth asked each of the above design and inspection firms to disclose in writing the following and to clearly define each item of disclosure (assertion criteria):

1. Prior involvement (before July 10, 2006) with the design or construction of the Central Artery/Ted Williams Tunnel (CA/T) Project;
2. Contractual agreements with Bechtel Corporation and Parsons, Brinckerhoff, Quade & Douglas, Inc.; and
3. Individual employees involved in the remediation who were previously employed by Bechtel Corporation; Parsons, Brinckerhoff, Quade & Douglas, Inc.; a Bechtel/Parsons Brinckerhoff subconsultant on the CA/T Project; or a Section Design Consultant on the CA/T Project.

Note 2:

A Level 1 inspection is a safety review of the entire tunnel covering all elements, including ceiling and hangers, suspended lights, signs, pipes, Integrated Project Control System (IPCS) equipment, as well as elements around the roadway.

We performed this performance audit from October 2006 through December 2006. It was conducted in accordance with Generally Accepted Government Auditing Standards as prescribed by the Comptroller General of the United States. The objective of this audit was to determine what actions the Commonwealth of Massachusetts took to identify and remove any contractors that lacked independence in performing CA/T Project inspection duties. We conducted audit procedures that were considered necessary to achieve this audit objective. In addition, we evaluated the Commonwealth's efforts to mitigate any risks posed by prior remediation work performed by firms that may lack sufficient independence. Due to the specificity of the audit objective and the ongoing CA/T Project criminal and civil investigations by Federal and state agencies, we did not perform audit procedures designed to evaluate potential internal control deficiencies, fraudulent and illegal acts, and violations of contract provisions.

In carrying out this audit we obtained relevant documentation from the Commonwealth, such as inspection reports. We also interviewed officials from EOT, MHD, and the CA/T Project. We evaluated the process EOT used to ensure the independence of contractors that have continued to work on the I-90 tunnel remediation design and inspection work since October 2006.

In order to further evaluate the independence of the inspection firms we conducted interviews with B/PB and Keville Enterprise employees to determine their current and prior relationship with the CA/T Project. We also analyzed the written representations provided by other firms with regard to their independence.

Additionally, we assessed the remedial actions the Commonwealth took to correct any non-compliant services provided by B/PB related to the planned phased openings in the I-90 tunnels. We identified the rework steps that the Commonwealth used on the tunnel brackets, and identified and assessed the corrective steps taken.

The Commonwealth's remediation work involved inspections of the installation of ceiling hanger brackets that were fastened (1) to the Unistrut or (2) with new Hilti anchors. In the case of the Unistrut system, one or more inspections with several installation steps (installing multiple spring nuts, attaching the base plate, and torquing the bolts) were recorded on a single inspection report form. In the case of installing the new Hilti anchor system, a separate inspection was performed for each step, which included each hole drilling, each bolt installation, each load test, and the attachment of a new base plate bracket. As a result, the Hilti system would involve 13 inspection reports for each installation. All of the Unistrut system installations inspected by B/PB were subjected to a re-inspection. However, per MHD's re-inspection procedures of B/PB work, only the Hilti load test results and the base plate installation were subjected to a re-inspection. MHD

determined that if the existing Hilti system installations were disassembled, it would have required new Hilti anchors, nuts, and washers; and each anchor would have to be load tested once again. Further, the initial installation of these Hilti systems were put through load tests conducted by an independent testing firm. Successful load tests provide assurance that the mechanical anchors, which are embedded into the ceiling and are unique to the Hilti system, were fastened properly. Therefore, MHD determined that it would limit its re-inspection efforts to the external, non-imbedded components and/or verifying that the initial load test had been successfully performed by the independent testing firm. Based on its re-inspection procedures, MHD identified 193 total instances that required a re-inspection (138 Unistrut and 55 Hilti)

We selected and analyzed a sample of 30 B/PB inspections from the 193 inspections that MHD identified as requiring remedial work and determined whether each had received corrective actions.

EXHIBIT D: MAJOR CONTRIBUTORS TO THIS REPORT

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THE FOLLOWING INDIVIDUALS CONTRIBUTED TO THIS REPORT.

<u>Name</u>	<u>Title</u>
Thomas Yatsco	Program Director
Peter F. Babachicos	Project Manager
John M. Hannon	Senior Analyst
William R. Lovett	Senior Auditor
Paul D. McBride	Analyst