

Washington Metropolitan Area Transit Authority Triennial On-Site Safety Review

Final Report

Tri-State Oversight Committee

Review Conducted: June 2007



Review Conducted and Report Assembled by



November 13, 2007

Table of Contents

Acronyms	2
Acknowledgements	3
Executive Summary	4
Introduction	11
System Safety Program Plan	13
SSPP Implementation – System Safety Functions and Other Selected SSPP Elements	15
Police/Security	22
Emergency Management	25
Rail Transportation (RTRA)	28
RTRA Rail Transportation Training	35
Employee Fitness for Duty	40
Facilities Inspections & Employee Safety	45
Subway Emergency Exits & Related Equipment	49
Systems Maintenance - ATC	54
Systems Maintenance – Power	61
Track Inspection & Maintenance	71
Stations, Tunnels and Structures	76
Elevators and Escalators	85
Vehicles	92
Vehicle Maintenance Training	96
Rail Car Materials	98
Communications	100
Appendix A: Observations	102
Appendix B: Corrective Actions Matrix for the Tri-State Oversight Committee’s Triennial Safety Review	107

Acronyms

APTA	American Public Transportation Association
ATC	Automatic Train Control
CAP	Corrective Action Plan
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CSO	Chief Safety Officer
CSR	WMATA Office of Corporate Safety and Risk Protection
DDOT	District of Columbia Department of Transportation
DRPT	Department of Rail and Public Transportation (VA)
ELES	Department of Elevators and Escalators
EMA	Emergency Management Agency
EMI	Engineering Modification Instruction
FFD	Fitness for Duty
FTA	Federal Transit Administration
IRP	Infrastructure Renewal Program
ISA	Internal Safety Audit
JGB	Jackson Graham Building
MDOT	Maryland Department of Transportation
MOC	Maintenance Operations Center
MSDS	Material Safety Data Sheet
MWAA	Metropolitan Washington Airports Authority
NBIS	National Bridge Inspection Standards
NFPA	National Fire Protection Association
NICET	National Institute for Certification in Engineering Technologies
OCC	Operations Control Center
O&M	Operations and Maintenance
OJT	On-The-Job Training
P/I	Policy/Instruction
PMI	Preventative Maintenance Inspection
PMOC	Project Management Oversight Contractor (FTA)
POWR	Power Department
RSO	Regional Safety Officers
PMP	Project (or Program) Management Plan
QA	Quality Assurance
QAM	Quality Assurance Policy and Procedures Manual
QUAL	WMATA Office of Quality Assurance
RTRA	Department of Rail Transportation
ROW	Right-Of-Way
SEPP	Security and Emergency Preparedness Plan
SFIP	Safety Facilities Improvement Plan
SSC	Safety and Security Certification
SSMP	Safety and Security Management Plan
SSO	State Safety Oversight
SSOA	State Safety Oversight Agency (TOC)
SSPP	System Safety Program Plan
SSRP	WMATA Office of System Safety and Risk Protection
TOC	Tri-State Oversight Committee
TPS	Traction Power Substations
TRA	Transportation Resource Associates
TSSM	Track, Structures, and System Maintenance
WMATA	Washington Metropolitan Area Transit Authority

Acknowledgements

The Tri-State Oversight Committee and review contractors (headed by Transportation Resource Associates) would like to thank the Washington Metropolitan Area Transit Authority (WMATA) personnel and management who participated in this review. Review activities, including meetings, interviews, inspections, etc., were overwhelmingly positive and productive. Throughout the review process, WMATA staff members took time out of their schedules to arrange meetings, accompany review team members on site visits, and gather the documentation necessary to complete the review. It was evident that WMATA employees are committed to the safety and security oversight process and taking the necessary steps to address the requirements of the program and respond to our requests. This would not have been possible without the endorsement of WMATA and its full participation in the review process.

Executive Summary

The District of Columbia Department of Transportation, the Maryland Department of Transportation, and the Virginia Department of Rail and Public Transportation have designated the Tri-State Oversight Committee (TOC) to provide safety and security oversight of the Washington Metropolitan Area Transit Authority (WMATA) to fulfill the Federal Transit Administration's (FTA) requirements for state safety oversight of rail fixed guideway systems (as contained in 49 CFR Part 659). Consistent with FTA requirements, the TOC has recently completed a triennial on-site safety review of WMATA. This document is the report for that review.

This review, and the findings and observations contained in this report, are intended to help WMATA maintain and improve the level of system safety and security of its Metrorail operations. This review is based on the WMATA System Safety Program Plan and Security and Emergency Preparedness Plan, and primarily judges the appropriateness and implementation of those documents. The results of the review were predominantly positive, however, this report highlights the areas where WMATA can improve its safety, operations, maintenance, and related activities. It is important to note that this report is, by design, focused on areas where WMATA can make its rail system safer and more secure. This focus is not intended to diminish the many positive attributes of the WMATA system, its safety and security programs, or its personnel's efforts to implement those programs.

This WMATA Triennial Review does not end in a simple passing or failing grade, or percentage of safety or security compliance. Rather, the reader is invited to review the **Findings** and **Observations** in the body of the report. The more important of the two are those items labeled as **Findings**. These describe areas where WMATA is not in compliance with its own safety or security programs or where those programs are not appropriate (based on the review team's experience in the rail transit industry). These are the areas where WMATA is required (in accordance with TOC Program Procedures) to develop Corrective Action Plans, detailing how the finding will be resolved. In the body of the report, **Observations** are commingled with findings and describe those areas where the review team wishes to convey additional information to WMATA, though it does not necessarily require a corrective action plan. However, Observations are summarized in Appendix A. WMATA may wish to address items identified as "observations" in the corrective action plan.

It is also important to note that the findings resulting from this report do not constitute safety or security emergencies. Rather, they are all areas where WMATA can improve the way it conducts its rail operations and enact processes that will prevent or mitigate safety and security emergencies in the future. If left unaddressed, these findings will likely grow more serious and could become major issues. It is important that corrective action plans be developed for each finding to demonstrate WMATA's continued commitment to the highest practical level of safety and security.

The following is a list of the findings contained in this report. For detailed review results, findings, and observations, please review the body of this document.

Findings

System Safety Program Plan

Finding 1: WMATA needs to update the current draft version of SSPP as soon as possible to include better formatting, additional response to TOC's previous comments, and to address recent organizational changes.

SSPP Implementation – System Safety Functions and Other Selected SSPP Elements

Finding 2: WMATA does not currently have an authority-wide Safety and Security Certification (SSC) Program for the Metrorail System.

Finding 3: WMATA is not implementing its Internal Safety Audit (ISA) Policy/Procedure, and has open CAPs from its 2005 ISA.

Finding 4: While WMATA has advanced some prototype Configuration Management efforts, there does not appear to be an overall authority-wide policy, procedure, or plan to address the requirement in the SSPP (Element 17) for Configuration Management.

Finding 5: Related to WMATA procurement of safety- or security-critical parts and equipment, procedures could not be identified for the associated quality assurance (QA) process.

Finding 6: WMATA should expand its Construction Safety and Environmental Manual to include construction security considerations.

Finding 7: It is not evident that all of the functions of the previous Office of Quality Assurance have been effectively reassigned, and the existing QA Policy and Procedures Manual (QAM) is now obsolete.

Finding 8: WMATA's process for managing Policies and Procedures does not result in the availability of the latest documents.

Police/Security

No findings.

Emergency Management

Finding 9: As required in the TOC Program Standard, WMATA does not have an emergency management plan. However, many of the components of such a plan are already in place and appropriately administered. A formal plan is required because it helps an agency to integrate and coordinate the disparate activities required for emergency management.

Rail Transportation (RTRA)

Finding 10: It appears that the track worker protection rules set forth in Special Order 07-02 are being consistently violated and are not properly enforced.

Finding 11: Although OCC Line Controllers are required to undergo annual recertification, no such recertification requirement exists for OCC Assistant Superintendents.

Finding 12: Rail Supervisors are not denoting Rail Operators who do not answer questions satisfactorily or do not have all of their required equipment during quality checks for any follow-up corrective actions.

Finding 13: There are no formal written criteria used to direct the methodology and process of the quality checks that Rail Supervisors perform on Rail Operators.

RTRA Rail Transportation Training

Finding 14: The Right-of-Way Training program should be more structured and cover topics more specifically.

Finding 15: WMATA does not appear to have a formal written agency-wide policy on which personnel are required to attend Right-of-Way Training, and how often they must be recertified.

Finding 16: The RTRA Utility Supervisor Training Program Description and Guidelines Document should be updated to reflect the recent organizational changes at WMATA, as well as to reflect the names of current instructors for each course.

Employee Fitness for Duty

Finding 17: There is no medical recertification requirement for rail operators, even though bus operators do have such a requirement.

Finding 18: Elevator and Escalator Mechanics, as well as Station Managers, are not subject to any form of random drug and alcohol testing.

Facilities Inspections & Employee Safety

Finding 19: Some safety-related items from the 10 Point Checklist were found to be deficient. Each facility undergoes regular inspections to ensure that safety equipment such as fire extinguishers and eyewash stations are in working order in case of an emergency. While reports showed that they were regularly inspected, some items from the checklists (comprising the reports) did not meet checklist requirements.

Finding 20: The SFIP Book was missing from Greenbelt, which is concerning because a full history of safety issues is no longer documented. Furthermore, it is a security concern because the manual contains information that may be deemed security-sensitive, such as facility plans and information about equipment in the facility.

Subway Emergency Exits & Related Equipment

Finding 21: Emergency exit shaft inspections should include a formal follow-up process or confirmation loop to ensure that deficiencies are corrected.

Finding 22: WMATA should consider developing a checklist to accompany the WMATA emergency exit shaft inspection report.

Finding 23: Emergency exit signage is unclear due to various reasons, including caked-on grime and age/“wear and tear.”

Finding 24: There is a lack of signage at track level indicating track numbers.

Systems Maintenance – ATC

Finding 25: The prints in our sample of interlocking locations were in the same tattered, ripped, and disorganized condition noted in TOC’s 2004 triennial review.

Finding 26: The two preventive maintenance inspection types sampled (track circuit and switch obstruction checks) had a number of late inspections, as well as some that seemed to be significantly early.

Finding 27: In some ATC Preventive Maintenance Instruction documents, the inspection frequency was not obvious.

Systems Maintenance – Power

Finding 28: POWR biweekly (14-day) Traction Power Facility Inspections do not appear to be completed consistently on schedule.

Finding 29: Battery inspection intervals varied from fewer than 30 days to as many as 180 days.

Finding 30: Biweekly Traction Power Facility Inspections do not appear to be effective against housekeeping and facility upkeep issues in many locations.

Finding 31: Station lighting inspection forms frequently do not include date of inspection and are completed inconsistently.

Finding 32: The prints in our sample of traction power substations were in the same tattered, ripped, and disorganized condition noted in TOC’s 2004 triennial review.

Finding 33: POWR’s policy of posting a single-line diagram (a simplified drawing of substation and third rail equipment for the area immediately surrounding the subject substation) in substations, showing DC feeders, third rail sections, and other critical, location-specific information, is not upheld at all locations.

Track Inspection & Maintenance

Finding 34: Track Inspection Defect Database sheets sampled do not correspond completely with track conditions as found in the field; some cases of broken or missing track clips and bolts, as well as frog wear, were not recorded in the database.

Finding 35: Some of the walking track inspections sampled were separated by seven (7) days, and therefore outside of the interval prescribed by WMATA Track Standards.

Stations, Tunnels and Structures

Finding 36: The availability of Record Drawings needs to be improved.

Finding 37: WMATA should update its Condition Rating Codes Guidelines to be in accordance with current NBIS standards for bridge inspection classification.

Finding 38: Substructure conditions need to be monitored, as minor structural movement at reviewed locations was noted and should be addressed.

Finding 39: Clearance sign location may not be well-placed at the Addison Road Pedestrian Bridge and minor damage is present (possibly the result of the poor markings). This may be an issue elsewhere throughout the system.

Finding 40: Detailed, hands-on inspections should be conducted of non-redundant, through-girder bridges and fatigue detail areas.

Finding 41: WMATA bridges over local roads should have pier bent protection added.

Finding 42: Certain WMATA structures do not currently meet the rocker bearing standard set by AASHTO.

Finding 43: Multiple instances of cracked or missing platform floor tiles and missing mortar/grout were noted.

Finding 44: Skid-resistant surfaces at escalator thresholds are worn out.

Elevators and Escalators

Finding 45: The preventive maintenance inspections (PMIs) reviewed for eight escalators and three elevators (two years' records each) showed significant variation in schedule attainment, including many late inspections.

Finding 46: Monthly (B), quarterly (C), and annual (E) ELES PMIs do not always occur in a predictable fashion.

Finding 47: The PMI forms for elevators and escalators could be improved by adding spaces for objective data entry, checkmarks, and additional comments.

Finding 48: The completed PMIs reviewed show a number of discrepancies that should be avoided in the future, including multiple handwritten copies of the same inspection, forms with no year in the date, etc.

Vehicles

Finding 49: Maintenance work does not always follow the written maintenance procedures.

Finding 50: Documentation of preventive maintenance inspections (PMIs) is not consistent throughout the Car Maintenance Department.

Finding 51: Pre-determined, acceptable ranges for many readings taken on PMIs are not always listed on the PMI record documents (checklists).

Finding 52: Many readings taken during PMIs are not recorded on the PMI documents or on the computerized records.

Finding 53: Procedures for calibration of tools, gauges, and equipment are not consistent throughout the Car Maintenance Department.

Finding 54: The Car Maintenance Department needs to continue to expand the capabilities of the MAXIMO computerized records system.

Finding 55: PMIs are not always performed on schedule or within three days of the due date. Sometimes a car is run even though it has exceeded its inspection interval by more than 10%.

Finding 56: Maintenance software is not always updated at the same time that car modifications are made.

Vehicle Maintenance Training

Finding 57: WMATA does not have an up-to-date matrix showing all required technical training for each class of railcar maintainer at each location.

Finding 58: WMATA does not have goals for how soon after hire or promotion training should be completed.

Finding 59: WMATA does not have training in backshop (component repair) procedures.

Finding 60: WMATA should evaluate the number of instructors assigned to railcar maintenance training (6000-series railcar training alone appears to require at least two or three person-years of instructor time).

Rail Car Materials

Finding 61: WMATA's software for procurement, PeopleSoft, does not reliably send (fax) orders to suppliers.

Finding 62: Some repairable items may not have enough spares as evidenced by a zero-stock condition at one or more storehouses.

Finding 63: Parts are sometimes lost in a stockroom (wrong bin, etc.)

Finding 64: There continue to be issues with parts for the 5000- and 6000-series railcars.

Communications

Finding 65: WMATA has not produced an overall system diagram of its fiber-optic system.

Introduction

The Virginia Department of Rail and Public Transportation (DRPT), the Maryland Department of Transportation (MDOT), and the District of Columbia Department of Transportation (DDOT) administer a rail transit safety oversight program that fulfills the Federal Transit Administration (FTA) requirements for state safety oversight under 49 CFR Part 659). The Tri-State Oversight Committee (TOC) oversees the safety and security of the Metrorail operations of the Washington Metropolitan Area Transit Authority (WMATA).

As part of its Program Procedures, TOC is required to conduct an onsite safety review of WMATA's rail fixed guideway system once every three years. This report documents the findings of the WMATA triennial review, conducted May 29 through June 26, 2007.

The on-site review began with a kick off meeting on May 29, attended by TOC members, WMATA personnel, and the TOC's review team (contract personnel from Transportation Resource Associates, Inc. (TRA), and its affiliate, LS Engineering Associates). The majority of the review was completed over the next three weeks, with the few remaining areas covered in the fourth week. During the on-site review, the team interviewed WMATA personnel, conducted field inspections, and reviewed various documents. An exit briefing was held on June 26th, where the review team presented its most significant findings to date and addressed questions and concerns of the TOC and WMATA personnel.

The following areas were covered during the reviews:

- System Safety (including employee safety, contractor safety, configuration management, procurement, employee safety, capital projects, et al.)
- System Security, Emergency Management, and Policing
- Rail Transportation Training
- Employee Fitness-for-Duty
- Operations, Supervision, and Operations Control
- Infrastructure Maintenance (including facilities, traction power, signals, track, structures, right-of-way, and elevators and escalators.)
- Vehicle Maintenance

This review is based on the WMATA System Safety Program Plan (SSPP) and the Security and Emergency Preparedness Plan (SEPP), and primarily judges the appropriateness and implementation of those documents. The review team has attempted to identify deficiencies in each of the review areas. Brief discussions of each topic area and review methodology are shown under each of these headings. Where

appropriate, findings and observations are listed. The numbered findings describe areas where WMATA is not in compliance with its own safety or security programs or where those programs are not appropriate (based on the review team's experience in the rail transit industry). These are the areas where WMATA is required (in accordance with TOC Program Procedures) to develop formal Corrective Action Plans, detailing how the finding will be resolved. Observations are commingled with findings, and describe those areas where the review team wishes to convey additional information to WMATA, where such additional information does not necessarily require a corrective action plan. However, in some instances, WMATA may wish to address items identified as "observations" in the corrective action plan (e.g. in the case of questions about staffing levels).

This review, and the findings and suggestions contained in this report, are intended to help WMATA maintain and improve the level of system safety and security of its Metrorail operations. The results of the review were predominantly positive, however, this report highlights the areas where WMATA can improve its safety, operations, maintenance, and related activities.

An Initial Draft Report of this report was submitted for TOC review, comments, and suggestions. After making modifications to satisfy TOC requests for clarification, the report was provided to WMATA for its review to verify the basic accuracy of the information presented and any challenges to the conclusions reached. TRA made minor modifications to the report to address two factual errors in the draft report. This Final Report incorporates TOC & WMATA's comments, and takes into consideration WMATA's initial brief description of its CAPs.

System Safety Program Plan

Description

TOC is the designated State Safety Oversight Agency (SSOA) as outlined in 49 CFR Part 659 and is responsible for safety and security oversight of the WMATA Metrorail System. WMATA is required to submit a System Safety Program Plan (SSPP) document for the Metrorail System to TOC that conforms to the requirements contained in TOC's Program Standard and Procedures, dated September 15, 2006. The SSPP should be reviewed and revised by WMATA at least annually, and TOC must review and approve each version of the SSPP.

Current Situation

In accordance with TOC requirements, WMATA submitted an updated version of the SSPP on 12/22/06 that followed the format required by TOC. TOC comments were provided to WMATA on 2/12/07, which included the need to improve some of the sections that were provided and to provide some sections that had not been previously addressed. While a formal response was not provided by WMATA to TOC, as part of the Triennial Review documentation, WMATA provided an in-progress version of the SSPP tentatively dated 6/15/07 on the cover (identified as "Draft Final") and April 16, 2007 in the footer (identified as "TOC Format"). Modifications in the document from the previous version were identified in track changes.

Evaluation Criteria

The following evaluation criteria were used to review the SSPP:

- TOC Program Standard and Procedures, September 15, 2006
- FTA State Safety Oversight Regulations, 49 CFR Part 659, April 29, 2005
- FTA SSO Guidance: Resource Toolkit for SSO Agencies Implementing 49 CFR Part 659, January 2006, especially Appendix E: Program Requirements for Development of a Rail Transit Agency SSPP
- FTA SSO Guidance: miscellaneous resource materials disseminated by FTA at SSO workshops and meetings in 2006 and 2007

Findings and Observations

Finding 1: WMATA needs to update the current draft version of SSPP as soon as possible to include better formatting, additional response to TOC's previous comments, and to address recent organizational changes.

The document provided by WMATA as part of the Triennial Review was a draft document that was not completed, reviewed, or formally submitted to TOC for review and approval. This was due to organizational changes in SSRP and the SSPP provided

was still in the development process. Many, but not all, of TOC's previous comments were addressed to some degree. Those that should be enhanced include the following:

- Chapter 7 – Safety Certification: This should be revised to reflect the WMATA Safety and Security Certification Plan that is currently under development.
- Chapter 10 – Accident/Incident Notification, Investigation and Reporting: Section 10.3 should discuss the use of the hazard resolution process in the development of corrective action plans (CAPs); Section 10.5 could reference the investigation criteria in Section 10.2 as also being the notification criteria; and Section 10.6 does not comply with the TOC process for including CAPs in the Draft Final Accident Reports.
- Chapter 17 – Configuration Management: In Section 17.1 it is not clear if WMATA has an existing configuration management process or a plan to develop it in the future.
- General – WMATA sometimes references FTA requirements, but it should be understood that the FTA requirements are only the baseline on which TOC establishes its own requirements, with which WMATA must comply. Most often, TOC and FTA requirements are the same, but not always. Therefore, WMATA should only reference the TOC requirements.

There is also a need to update the SSPP to reflect the ongoing organizational changes and responsibility reassignments being implemented. WMATA will need to provide a schedule for the submission of the next version of the SSPP that addresses TOC's comments and the organizational changes. The new Chief Safety Officer should play a major role in the development of the next version of the SSPP.

Observation 1: It is hoped that WMATA will use this opportunity to completely review its SSPP and take advantage of the many FTA guidance documents available (see the evaluation criteria).

Persons interviewed

- Fred Goodine – Previous Assistant General Manager, System Safety and Risk Protection
- Alexa Dupigny-Samuels – Acting Director, System Safety and Risk Protection
- Ronald Edwards – Manager of Rail Safety

Documents Reviewed

- WMATA System Safety Program Plan (in-progress Final Draft), dated 7/15/07

SSPP Implementation – System Safety Functions and Other Selected SSPP Elements

Description

The WMATA Department of Corporate Safety and Risk Protection (CSRP) is responsible for several functions related to the implementation and oversight of the System Safety Program Plan (SSPP) including:

- Hazardous Management Process (SSPP Element 6)
- Safety Data Acquisition (SSPP Element 9)
- Accidents/Incidents Notification, Investigation, Reporting (SSPP Element 10)
- Internal Safety Audits (SSPP Element 12)
- Employee and Contractor Safety Programs (SSPP Element 18)
- Hazardous Materials (SSPP Element 19)

Within the SSPP, the roles and responsibilities of other WMATA departments are identified. This section will focus on the implementation of the system safety functions of the SSPP for which the primary responsibility rests with CSRP. A few other areas are presented that are not otherwise addressed in this Triennial Review Report, namely:

- Safety Certification (SSPP Element 7)
- Managing Safety in System Modifications (Element 8)
- Configuration Management (SSPP Element 17)
- Procurement (SSPP Element 21)
- Capital Project Prioritization (to assure that proper attention is being devoted to the projects designed to overcome safety and security weaknesses)
- Construction Safety and Security

Current Situation

Under WMATA's new organization structure, CSRP is intended to be headed by a Chief Safety Officer (CSO). The CSO will report to the Assistant General Manager of Safety, Security and Emergency Management who reports directly to WMATA's General Manager. At the time of this review, the CSO position remained unfilled. CSRP encompasses the following functions:

- Corporate Safety
- Environmental Services
- Risk Management
- Rail, Bus and Facilities Safety

WMATA's CSRP Functional Organization Chart lists numerous responsibilities to be performed by each of the four groups.

Prompted by the FTA SSO Audit of TOC in September 2005 and the new FTA SSO Rule that became effective on April 29, 2006, TOC and WMATA have been working together to better adhere to FTA and TOC requirements, and to have a model System Safety Program. Unfortunately, a backlog of accidents, incidents, and open CAPs, coupled with several major accidents, have been challenges to overcome. It is hoped that WMATA's organizational and personnel changes will allow for greater progress to be made in the future.

Evaluation Criteria

- WMATA System Safety Program Plan, June 15, 2007
- WMATA Safety Rules and Procedures

Findings and Observations

Finding 2: WMATA does not currently have an authority-wide Safety and Security Certification (SSC) Program for the Metrorail System.

While SSC has been implemented on selected major projects, WMATA is in the process of refining its SSC Program for which a consultant (Parsons Brinckerhoff) report is being developed. That report is expected to establish procedures for performing SSC and define the types of projects for which varying degrees of SSC are applicable. Hopefully, this will also address smaller scale/modernization projects for which SSPP Element #8 (Managing Safety in System Modifications) applies. Going forward based on the consultant report, the SSC Program should be guided by an implementation plan that describes a schedule and resource requirements. The schedule should be detailed in identifying the applicable projects (existing and future), and the human resources required – WMATA project management and system safety personnel and/or consultants.

Finding 3: WMATA is not implementing its Internal Safety Audit (ISA) Policy/Procedure and has open CAPs from its 2005 ISA.

In response to deficiencies identified by both TOC and FTA, WMATA has made progress in establishing a compliant ISA Program. WMATA submitted a proposed two-year schedule and checklists for four upcoming ISAs to TOC on 5/14/07 and TOC comments were provided on 6/21/07. The schedule was accepted, but several suggested improvements were also provided. The proposed schedule will result in the accomplishment of the full complement of ISAs (all 21 elements of the SSPP over a three-year period) by performing nine audits in both 2007 and 2008. Due to the organizational and staffing changes, there have been delays in advancing the 2007 ISAs.

Even though FTA has accepted the use of APTA to perform Internal Safety Audits and WMATA has utilized their services in the past, it is generally considered industry best-practice for a transit agency to conduct its own internal audits. TOC believes that there are benefits to WMATA performing audits by its System Safety (or other WMATA staff when there may be a conflict) department. TOC is pleased that WMATA has recently

agreed to change their approach to ISAs to be compatible with their Internal Security Audits which are conducted solely with WMATA staff. There remains an open deficiency from the September 2005 FTA SSO Audit of TOC, which can be satisfied as soon as WMATA provides TOC with verification that five CAPs from the 2005 WMATA Internal Safety Audit have been completed.

Finding 4: While WMATA has advanced some prototype Configuration Management efforts, there does not appear to be an overall authority-wide policy, procedure, or plan to address the requirement in the SSPP (Element 17) for Configuration Management.

The issue of Configuration Management is the only Finding of the 2004 Triennial Review for which WMATA does not have an acceptable CAP. TOC has provided some assistance to WMATA in this regard by sharing FTA guidance and another transit agency's approach. Configuration Management involves a rigorous process for reviewing and approving configuration changes to the existing physical infrastructure, facilities, equipment, and systems consistent with the Engineering Modification Instruction (EMI) process. The impact of changes on operating and maintenance (O&M) requirements also needs to be determined and appropriate changes made to rules, procedures, training, inspections, and maintenance requirements.

The other aspect of Configuration Management is the proper documentation of the resulting changes (physical change and subsequent O&M requirement changes). This involves plans, specifications, as-built drawings, equipment schematics, railcar books, rulebooks, inspection checklists, O&M procedures, training curricula, etc. Once a change is agreed upon and a prototype is approved, there must be a process of tracking that the change is made on other similar equipment and facilities.

Finding 5: Related to WMATA procurement of safety- or security-critical parts and equipment, procedures could not be identified for the associated quality assurance (QA) process.

TOC SSPP requirements for Procurement (Element 21) states that WMATA must have a QA program in place to assure that new materials used for maintenance or construction activities have been assessed for safety concerns or safety hazards. WMATA has a QA Policy and Procedures Manual that appears to establish general requirements that apply to the procurement process. Interviews with a Procurement Department manager and staff, however, could not identify a procedure that they follow to meet the QA requirement. They acknowledged that often suppliers are required to provide independent verification of the equipment and materials that are provided to WMATA.

Finding 6: WMATA should expand its Construction Safety and Environmental Manual to include construction security considerations.

In its Safety and Security Management Plan (SSMP) requirements and guidance, FTA includes a section on Construction Security Management Plans, which could easily be integrated with existing construction safety guidance and expanded into the project's O&M phase. The security portion should identify how security will be incorporated into

the construction and operation of the facility. It should tie together all security documents, policies, and procedures related to the project. The plan must take into account that many construction sites have numerous entry points and many skilled craft workers may be on the site irregularly or for short periods of time, but must be properly identified during work periods. In FTA's SSMP Guidance 17, construction security elements are advocated as is the need to have a person (owner, contractor, subcontractor) assigned responsibility.

Finding 7: It is not evident that all of the functions of the previous Office of Quality Assurance have been effectively reassigned, and the existing QA Policy and Procedures Manual (QAM) is now obsolete.

With the recent disaggregation of the QA function from the Office of Quality Assurance (QUAL) in the System Safety Department to O&M, there is concern that all of the QA functions previously assigned to QUAL will be effectively implemented. As a minimum, it appears that the QAM should be revised to reflect the changes in responsibilities.

Finding 8: WMATA's process for managing Policies and Procedures does not result in the availability of the latest documents.

Based on trying to identify applicable Policy/Instructions (P/Is) and Procedures that guide certain WMATA activities (including System Safety), an effective process for the organization, management, and accessibility of P/Is and Procedures appears to be needed. This would enable the appropriate groups within WMATA to contribute to the development of, be aware of, and have access to, the latest P/Is and Procedures. On several instances, P/Is and Procedures were requested and either documents that should have been available were not available or known to be available, or an earlier version was provided when a later version existed. There needs to be a defined configuration management process to assure that WMATA employees have ready access to the latest information. This should be done primarily electronically, but if hard copies of P/Is and Procedures exist, a process should be instituted to maintain the correct versions.

Observation 2: WMATA needs to continue to work closely with TOC to close out the numerous accident/incident/hazardous condition reports.

While WMATA has been working to provide TOC with information to allow TOC to close many investigation reports, there remain several reports that have been open for a long period of time for which additional WMATA input is required, especially the proposal of CAPs. With the recent organization and staffing (actual and proposed) changes, WMATA has placed increased emphasis on this area, and TOC looks forward to continuing to work closely with WMATA in this regard to fully address the deficiencies identified by FTA in their September 2005 SSO Audit of TOC.

Observation 3: WMATA needs to develop acceptable CAPs and to continue to work closely with TOC to close out numerous open CAPs.

CAPs are required by WMATA to address deficiencies and recommendations related the following:

- TOC Triennial Review (2004)
- WMATA Accident/Incident Reports
- WMATA Hazardous Condition Reports
- WMATA Internal Safety Audits

TOC and WMATA have been working to establish acceptable CAPs, which require a clear statement of the proposed action, the responsible organization/person, and the implementation timeframe. TOC approval of the proposed CAPs is required, after which WMATA is responsible for their implementation. TOC also requires periodic updates of progress and current status. After completion of a CAP by WMATA, appropriate verification is required to allow TOC to approve its completion. With the recent organization and staffing (actual and proposed) changes, WMATA has placed increased emphasis on this area, yet numerous CAPs remain open. TOC looks forward to continuing to work closely with WMATA in this regard to address the deficiencies identified by FTA in their September 2005 SSO Audit of TOC. TOC recognizes that some CAPs may involve capital projects that require a longer timeframe to implement, but WMATA must still regularly report progress on all open CAPs. Please refer to the TOC Program Standard and Procedures for more detailed CAP requirements and responsibilities of WMATA.

Observation 4: While WMATA appears to have an effective Capital Improvement Program (CIP) development process that appropriately addresses safety and security needs, there may need to be a process for promptly including projects that result from CAPs.

WMATA has established a policy to focus its capital program management resources on projects to modernize its existing system through the multiyear Metro Matters Program that includes the Infrastructure Renewal Program (IRP), Railcars and Facilities, and Security Projects and Activities. Sponsorship of major “new start” projects to expand the Metrorail System, e.g., the Dulles Corridor Project, will be accomplished by the jurisdictions in which they are located. WMATA will provide appropriate technical support to assure compatibility with the existing system, and to provide O&M of the completed system. For the Dulles Corridor Project the sponsoring agency is the Metropolitan Washington Airports Authority (MWAA) in close cooperation with the Virginia Department of Rail and Public Transportation (DRPT).

In the CIP Prioritization Policy presented to the WMATA Board on 9/7/06, WMATA clearly states that unplanned safety needs are the first priority, but that the capital budget has no contingency. WMATA should consider creating such a contingency or a process to adjust the capital budget should there be a critical CAP that needs to be addressed as an emergency or on a high priority basis.

Observation 5: *Given the recent organization and staffing changes in the WMATA System Safety Function and the emphasis being placed on the DuPont Safety Program, WMATA should assure that sufficient staff resources are available to fulfill the requirements of TOC's SSO Program Standard and Procedures.*

There have been many recent changes in organization and staffing of the System Safety functions at WMATA, and some positions remain to be filled. WMATA has also made a commitment to use the DuPont Safety Program as a means to improve the culture of safety and to reduce accidents/incidents and the resulting claims cost. Admittedly, the DuPont Safety Program focuses on "occupational safety" and not "system safety," but there are some areas of overlap. DuPont representatives have been made aware of TOC and the SSO Program requirements, which are process oriented. Since safety resources are required to interface with, and implement, the DuPont Safety Program, there is concern for sufficient resources being available to meet requirements for System Safety functions imposed by TOC.

Persons Interviewed

- John Catoe – General Manager
- Gerald Francis – Deputy General Manager
- Polly Hanson – Assistant General Manager, Safety, Security & Emergency Mgmt
- Fred Goodine – Previous Asst. General Mgr, System Safety & Risk Protection
- Alexa Dupigny-Samuels – Acting Director, Safety and Risk Protection
- Ronald Edwards – Manager of Rail Safety
- Dave Couch – Director, Office of Infrastructure Renewal Programs
- Greg Scrader – Project Manager, DuPont Safety
- Rob Jacques – Quality Manager, DuPont Safety
- Bruce Heppen – Associate General Counsel
- Joan LeLacheur – Environmental Services Manager
- Morris Moses – Acting Director, Office of Procurement & Materials
- Timothy Jensen – Environmental Protection Oversight Administrator

Documents Reviewed

- WMATA System Safety Program Plan (in-progress Final Draft), dated 7/15/07
- WMATA Organizational Assessment, Gayland Moffat Consulting, 4/07
- WMATA Organization Chart, 5/29/07
- Corporate Safety & Risk Management Functional Organization Chart, 5/29/07
- WMATA Safety Rules and Procedures Manual (latest entry was 8/21/06)
- Metrorail Safety Rules and Procedures Handbook, 1/2004
- WMATA Safety Passport (pocket-sized brochure summarizing safety information)
- Office of Quality Assurance Policy and Procedures Manual, 6/2007
- WMATA Construction Safety and Environmental Manual, 8/5/02
- WMATA Safety and Security Certification Program Plan, 7/2003
- Project/Safety and Security Certification Steps Matrix

- Rail Operations Center System Upgrade, Safety Certification Manual, 1/18/07
- Safety Bulletins (several 2007)
- WMATA Hazard Identification/Resolution Matrix, 4/9/07
- Accident Notification Form and Investigation report samples
- WMATA 12/1/06 Internal Safety Audit Report, APTA
- Prioritized Corrective Action Plan Matrix
- Monthly Safety Committee Meeting Minutes (numerous)
- Railcar Rehabilitation Program Safety Certification Program Plan (several)
- WMATA FTA Quarterly Review Progress Report and Meeting Handouts, 5/30/07
- FTA PMOC Metro Matters Program Monitoring Report, 4/2007
- FTA PMOC Rail Car Procurement Program Monitoring Report, 4/2007
- FTA PMOC Dulles Corridor Metrorail Project Monitoring Report, 4/2007
- Capital Program Prioritization Process, P/I 4.12/1 12/16/02
- Capital Improvement Program Prioritization Policy, 9/7/06
- Metro Matters Funding and Local Funding Agreements, 10/21/04
- Interactive Electronic Technical Manual Project Background and Description
- Safety/Environmental Requirements for Contractors
- Material Discrepancy Report (example) 11/25/02
- Material Safety Data Sheet (MSDS) Processing Procedure
- Inventory Purchase Requisition Process Flow Chart
- DuPont Safety Program, WMATA Executive Overview, 5/30/07
- DuPont Safety Program 22 Elements, 5/11/06
- Joint Labor/Management Safety and Health Council Agreement
- WMATA Master Program Management Plan (PMP) Volume One (applies to both Infrastructure Renewal Program and Major Capital Projects)
- Project Management Plans (PMPs) for several Railcar Rehabilitation Projects

Police/Security

Description

The methodology employed was to review the Security and Emergency Preparedness Plan and evaluate the Metro Transit Police Department's role and responsibilities for security and emergency preparedness in conforming to the plan. Reviewing applicable documents including standard operating procedures and general orders along with conducting interviews with police and security officers and field interviews and observations accomplished this task.

Current Situation

Metro Transit Police Department has authorized strength 423 sworn officers, 106 security special police and 24 civilian personnel assigned to Metro Transit Police Department (MTPD). Officers provide a variety of law enforcement and public safety services on the Metrorail and Metrobus systems in the Washington Metropolitan Area. Metro Transit Police Officers have jurisdiction and arrest powers throughout the 1,500 square mile Transit Zone, which includes Maryland, Virginia, and the District of Columbia for crimes that occur on or against Transit Authority facilities.

The following areas of the Security and Emergency Preparedness Plan (SEPP) were reviewed:

1. SEPP Program Introduction, including purpose of the SEPP, goals and objectives, scope of program, security and law enforcement, management authority and legal aspects, government involvement, security acronyms and definitions.
2. System Description, including background and history of system, organizational structure (Org. chart) human resources, passengers, services and operations, operating environment, integration with other plans and programs, current security conditions, capabilities and agency practices
3. SEPP Management Activities including responsibility for mission statement and system security policy, current management of the SEPP Program and the division of police and security responsibilities
4. SEPP Program Description including, planning, organization, equipment, training and procedures, emergency exercises and evaluation and corrective action
5. Threat and Vulnerability (and or Risk Identification), Assessment, and Resolution
6. Implementation and Evaluation of SEPP including, implementation tasks for goals and objectives and implementation schedule for evaluation.
7. Modification of System Security Plan including initiation, review process and implementation of modification.

Evaluation Criteria

The following evaluation tools were utilized during this review:

- Tri-State Oversight Committee (TOC) security standards requirements.
- Federal Transit Administration (FTA) Security and Emergency Preparedness Plan Guidance
- Federal Transit Administration (FTA) Top 20 security program action items
- Federal Bureau of Investigation (FBI) Uniform crime statistics

Findings and Observations

Observation 6: *MTPD Research and Planning Division have been extremely responsive to address deficiencies in the Security and Emergency Preparedness Plan (SEPP).*

The plan was reviewed in February of 2007 and required minor modifications to bring the plan into 100% compliance. Changes included the addition of a current organization chart, development of a program roles and responsibilities matrix, a description of plan review and the responsible person for these reviews. The MTPD Research and Planning Division revised the SEPP including all modifications. The 2007 SEPP document as reviewed is complete and up to date.

Observation 7: *During the triennial period of review from 2004 to 2007, MTPD has experienced an increase in calls for service at a rate of 14.42%.*

Assuming calendar year 2007 continues at the pace recorded in the first quarter of 2007 and projected to an annual basis, MTPD will experience continued increase in calls for service of 5.96%. Based on this information, MTPD needs to closely monitor their overall work load to insure adequate staffing levels are available to continue to maintain public safety and respond to additional calls for service.

Persons Interviewed

- Chief of Police Polly Hanson
- Acting Deputy Chief of Police Jeff Delinski
- Captain Amy Phillips
- Lieutenant Douglas Durham-Research and Planning Division
- Leslie Campbell-Counterterrorism Coordinator
- Lieutenant George Burns- Office of the Chief of Police
- Police Officer Jason Mangan
- Police Officer Jeff Sesok- Field Training Officer

Facilities Visited

- Police Headquarters, Jackson Graham Bldg.

- Subway tunnel emergency exits and fire control room between Gallery Place/ Chinatown and Archives/Navy Memorial-Penn Quarter Station
- New Carrollton Station and Shop
- Greenbelt Yard Operations
- Pentagon City Station
- Foggy Bottom Station
- Metro Center Station
- Judiciary Square Station
- Gallery Place/ Chinatown Station and emergency exits
- L'Enfant Plaza Station
- Archives/Navy Memorial-Penn Quarter Station

Documents Reviewed

- System Security Emergency Program Plan
- Metro Emergency Services Training Manual
- Uniform crime reports for 2004, 2005, 2006 and YTD 2007
- Metrorail System Joint Training Program from WMATA and Fire Service supervisors
- Police Standard Operating Procedures
- Police General Orders
- Daily Operation reports
- Mandatory police training requirements and records for Virginia, Maryland, and the District of Columbia
- Records of specialized police training classes
- Records of scenario training and evaluation records
- Emergency Response Training Facility document
- Various maps, system descriptions and information brochures

Emergency Management

Description

The Emergency Management Department of Washington Metropolitan Area Transit Authority (WMATA) is organized within the Safety Department and is staffed with three (3) employees. The department is responsible for management and investigation function of fire, life, safety, and emergencies along with providing staffing for incident command for out of the ordinary situations and incidents that may occur at a transit agency. The events the department would manage could include fires, derailments, collisions, man made and natural disasters as well as other unplanned events that could be encountered by WMATA. In addition the Emergency Management Department is responsible for interface and coordination with the District of Columbia Council of Governments, The District of Columbia, Maryland and Virginia Emergency Management Agencies (EMA's) as well as six (6) primary fire jurisdictions within its service area. The department develops and staffs training drills and exercises for WMATA and numerous outside first responder agencies. The Emergency Management Department is also responsible for a variety of safety and first responder training programs including track safety for employees and contractors, as well as developing and providing familiarization training and distributing associated materials to a myriad of federal, state and local first responder agencies. To date in fiscal year 07 the department has provided familiarization training to over 5000 first responders.

The following general areas were reviewed for Emergency Management:

1. Notification procedures, both internal and external.
2. Emergency Management Procedures, including reviewing a checklist of possible types of emergencies WMATA might expect.
3. Control Center [procedures for supervisory control of emergency incidents.
4. Incident Command including plans for establishing a command post and coordination of resources at the scene of emergencies.
5. Traction power procedures for communications and the removal and restoration of third rail power.
6. Training, Drills and exercises including the development, scenario, participation, frequency, reporting and after action report review and corrective action process.
7. Plan review and updates.
8. Internal training including training on the emergency preparedness plan.

Evaluation Criteria

Description of the criteria used in this area

- Tri-State Oversight Committee (TOC) emergency management program standard requirements
- Standard Transit Industry practices

Findings and Observations

Finding 9: As required in the TOC Program Standard, WMATA does not have an emergency management plan. However, many of the components of such a plan are already in place and appropriately administered. A formal plan is required because it helps an agency to integrate and coordinate the disparate activities required for emergency management.

While many elements of an emergency management plan exist in dispatch procedures, standard operating procedures (SOP), general orders, and training procedures, there is no single overarching document. The absence of this document does not allow WMATA to comply with the standard requirement (section 7.1, 7.2 and 8.2), and because the information is contained in disparate sources, it is difficult to ensure that procedures are adequately updated and that employees are provided training at the same level. WMATA must ensure that this information is all assembled in a single emergency management plan, as required. This should also help formalize and integrate the related processes involved in emergency management.

Observation 8: The Emergency Management Department is required to conduct extensive activities with a limited level of staff. There exists a possibility that staffing levels may be strained and that all work activities may not be able to be accomplished, as required.

The Emergency Management Department personnel staffing should be evaluated, given their reviewed workload. While reviewing the training requirement schedules, scheduled coordinating meetings with various area emergency management agencies, station inspection programs and various other emergency situations responded to by the Emergency Management department, it is apparent that members in some cases may have to prioritize what duties receive attention due to staffing levels within the department.

List of persons interviewed

- Ronald Edwards, Manager of Safety and Training
- Ron Bodmer, Manager of Emergency Management
- Thomas E. Jones, Supervisor Fire Protection
- Victor Size, Fire, Life Safety Officer

List of facilities visited/records perused, etc.

- WMATA Standard Operating Procedures for Emergency Events
- Emergency Response Maps
- Emergency Equipment locations
- Fire Protection Inspections and Procedures
- Fire Equipment locations (Including inspection and testing protocols)
- Metro Rail Transit Fire/ Rescue Emergency Procedures Policy

- WMATA Communication protocols (Police and Operations Control Center)
 - WMATA General Orders
 - WMATA Special Orders
 - WMATA Numbered Memorandum
 - Passenger Notification Protocols
 - Metro Rail Safety Rules and Procedures
 - Incident Command Protocols and Procedures
 - WMATA Rollover Railcar Evacuation Simulator CD
 - Warning Strobe Alarm Device CD
 - WMATA Emergency Tunnel Evacuation Cart CD
 - Emergency Response Training Facility CD
 - Chemical Biological Incident Response Force CD
 - WMATA Passenger Rail Car Evacuation CD
-
- Carmen Turner Training Facility
 - Jackson Graham Communication Center
 - Greenbelt Yard
 - New Carrollton Station, Shop and Yard
 - Gallery Place/ Chinatown Station and tunnel
 - Archives/ Navy Memorial-Penn Quarter Station and tunnel
 - Judiciary Square Station
 - Metro Center Station
 - Union Station
 - 7th and Indiana Emergency Exit
 - Fan Shaft #FE-12 at Queens Chapel Road in Prince George County
 - Vent Shaft # FE-15 at Queens Chapel Road in Prince George County
 - Emergency Exit #EB-1 at 8915 16th Street, Montgomery County

Rail Transportation (RTRA)

Description

Rail Transportation (RTRA) at WMATA is the organizational unit that directly provides service to customers along the Metrorail system. Also known as the “service delivery” functions, RTRA includes a broad swath of job classifications that encompass the direct administration of rail service, the direct supervision of rail operations service delivery, the central control and dispatch of rail operations, and the management and oversight thereof. RTRA functions occur at the Jackson Graham Building (JGB) Operations Control Center (OCC), along the lines, and at terminals. Training of RTRA personnel is addressed in the RTRA Training section of this report.

Current Situation

There are approximately 1,676 budgeted positions to deliver and support the rail transportation functions. These positions are split among the OCC and the three line service groups: Line Service Red (LSR), Line Service Blue/Orange (LSBO) and Line Service Yellow/Green (LSYG). The Director of the OCC, as well as the directors of the three respective line service groups, all report directly to WMATA Chief Operating Officer (Rail).

OCC

The OCC Director oversees OCC operations and training, which are the primary focus of this review. OCC training is addressed in the RTRA Training section of this report. The Training Administrator, OCC Superintendent, and the Track Access Manager all report to the OCC Assistant Director, who in turn reports to the OCC Director. The Track Access Manager is new to the OCC organization, having come from the Planning group at WMATA.

The OCC Superintendent oversees five Assistant Superintendents, who in turn supervise 31 Line Controllers. At the time of this review there were four open Line Controller positions, and one open Assistant Superintendent position. Recruitment for these positions is ongoing, and has included seeking qualified individuals from outside of WMATA. From within WMATA, Line Supervisors and Interlocking Operators are the most common internally recruited personnel to become line controllers due to their skill sets and experience. Currently there is no program in place for the line service directors to identify those individuals most qualified to become Line Controllers. Line Controllers may obtain other positions elsewhere in Rail Transportation through seniority-based job picks. Turnover has been relatively stable among Line Controllers; the current vacancies exist due to retirements as well as Line Controllers who have picked into other positions in the field. In the judgment of the review team at the time of this review, there were enough Line Controllers present in the OCC to meet pertinent staffing requirements. However, in the professional judgment of the review team, the current number of budgeted positions may leave the OCC shorthanded considering the

challenge that recruitment from inside WMATA has posed, on top of retirements, as well as vacation and sick leave.

At all times there are six Line Controllers and one Assistant Superintendent on duty in the OCC. If an Assistant Superintendent is not available, a "Utility" Line Controller fills that role. Utilities are selected from existing Line Controllers based on performance and are provided with additional training, with the intent of eventual promotion to Assistant Superintendent. All Line Controllers and Assistant Superintendents may work a maximum of 12 consecutive hours, unless they receive approval from the OCC Superintendent to work more. In addition, Line Controllers and Assistant Superintendents must take a minimum of 8 hours off duty in between shifts.

In addition to Assistant Superintendents and Line Controllers, the OCC Superintendent also oversees the Maintenance Operations Center (MOC) and the Customer Operations Assistant Superintendent. At the time of this review, MOC had been under the purview of the OCC for approximately 1.5 years, having previously fallen under the umbrella of Track, Structures, and System Maintenance (TSSM). As of this review, the five MOC Assistant Superintendents (who oversee five Plant Service Dispatchers and 14 MOC Supervisors for ATC, Communications, and Power) are not cross-trained with OCC Assistant Superintendents. The Customer Operations Assistant Superintendent oversees twelve Customer Communications Specialists.

The reviewers observed Line Controllers performing their duties in the OCC during a segment of the afternoon peak period. In general, the Line Controllers observed appeared to understand their responsibilities and performed their duties in accordance with all applicable requirements.

The Training of OCC Line Controllers and Assistant Superintendents is discussed in the RTRA Training section of this report.

Line Service

As mentioned above, the line service component at WMATA, responsible for day to day rail operations, is divided into three groups: LSR, LSBO, and LSYG. LSR includes the Red Line; LSBO includes the Blue and Orange lines, and LSYG includes the Green and Yellow lines. Each group is headed by a director who reports directly to the WMATA Chief Operating Officer (Rail). The line service directors supervise, in addition to their administrative staff, Superintendents for each rail division. LSR has divisions at Brentwood, Glenmont, and Shady Grove; LSBO divisions include New Carrollton, West Falls Church, Alexandria, and Largo; and LSYG includes divisions at Greenbelt and Branch Avenue. Each division Superintendent oversees a Chief Operations Supervisor, who in turn is responsible for the oversight of Senior Rail Supervisors. The Chief Operations Supervisor is responsible for oversight of both stations and train movements. Senior Rail Supervisors and Rail Supervisors perform direct supervisory activities over Rail Operators, Station Managers, Interlocking Operators, Division Clerks, Depot Clerks, and Station Supply Runners. Senior Rail Supervisors are a notch above regular Rail Supervisors in pay grade and seniority. At the time of this review,

the railcar maintenance functions at each division are not organizationally split among the line service groups.

At WMATA, Rail Operators are hired exclusively from the ranks of Bus Operators and Station Managers (who also must have previous experience as Bus Operators). A very small proportion of Rail Operators are part timers, most of whom are retirees. Station Managers are not considered to be safety-sensitive employees, and are thus not subject to FTA drug and alcohol testing requirements. Almost all Rail Supervisors are former Rail Operators. Training of Rail Operators and Rail Supervisors is addressed in the RTRA Training section of this report.

The primary document used to control and safely operate the Metrorail system is the Metrorail Safety Rules and Procedures Handbook, issued in January 2004. In addition, there are a large number of comprehensive Standard Operating Procedures (SOPs), and Emergency Operations Procedures (EOPs) that identify critical operational and technical procedures for RTRA employees. Other operational procedures are disseminated to RTRA employees through the use of Special Orders and Bulletins.

Rail Supervisors are assigned zones/ territories to cover during their shifts; however, these boundaries are not rigid and Rail Supervisors may be called upon by the OCC to provide assistance or support in other locations. Rail Supervisors are required to perform quality checks and spot checks of Rail Operators and Station Managers. According to interviews with line service directors and division superintendents, Rail Supervisors were issued handheld TREO 700P SmartPhones at the beginning of 2007. These handhelds contain Rail Quality Check and Station Spot Check mobile applications, to be performed on Rail Operators and Station Managers, respectively. Based on observations of quality checks performed by Rail Supervisors on Rail Operators during runs, these evaluations appeared to be performed consistently. The electronic forms contain criteria used to determine whether a particular Rail Operator or Station Manager would need follow-up, as well as the opportunity to provide more detailed written comment.

Overall, the evaluations of rail operators appeared to be performed at an appropriate frequency by rail supervisors; however, numerous issues regarding the reviews exist. A review of a sample of the results of these evaluations revealed that none of the Rail Operators, including those with significant unmet criteria in their evaluations, were flagged for any follow-up corrective action. Additionally, a large number of the evaluation forms were incomplete, especially with respect to the omission of the identification of the Rail Operator undergoing the evaluation. These are addressed in the Findings below. At the time of this review, there was no set criteria used to determine how many evaluations Supervisors must perform in a given time period, or how many evaluations Rail Operators or Station Managers must be subjected to in a given time period. Rail Supervisors upload the data from their handhelds to various "synch" locations at each division, which is then transmitted in real time to a central web application server and a database server. Select Management has access to web-based reports on evaluations via a secured intranet application. At the time of this review, there did not appear to be a written criteria prescribing how often Rail

Supervisors must upload their handhelds to the intranet – some appeared to perform this after every shift, and others would go as long as several weeks between uploads.

The reviewers conducted ride-along observations along the lines, and observed generally good operations and compliance with applicable rules and procedures, with the exception of Special Order 07-02, which relates to track worker protection. Special Order 07-02 is addressed in a Finding below.

Evaluation Criteria

The evaluation criteria used to assess the operational safety of the RTRA functions are primarily based on WMATA's own rules, plans, policies, and procedures. The TOC on-site review team used these criteria to determine whether WMATA is in compliance with its own rules and with operational practices deemed essential to operation. Due to the limited scope of this review, the review team was precluded from assessing compliance with all rules and procedures; rather, the review is intended to be a 'snapshot in time' of compliance. This was accomplished through observations of line and OCC operations, interviews with managers and supervisory personnel, reviews of samples of records, logs, and reports, and assessments of historical operational incidents. In addition to compliance with its own rules, the reviewers also utilized their professional judgment based on experience with industry best practice and with multiple peer transit agencies.

Findings and Observations

Overall, the results of this review have indicated that WMATA RTRA generally operates in compliance with its established rules, plans, policies, and procedures. General compliance refers to the majority of operational practices being in accordance with WMATA's own rules (i.e. the Metrorail Safety Rules and Procedures Handbook) and SOPs, as was observed by the reviewers through interviews with relevant personnel, observations of day to day operations, and reviews of record samples. Note that this indication of overall compliance should not be construed as an official certification of compliance with all rules, plans, policies, and procedures; rather, the limited nature of this review is intended to provide a 'snapshot in time.'

Finding 10: It appears that the track worker protection rules set forth in Special Order 07-02 are being consistently violated and are not properly enforced.

Special Order 07-02 is intended to provide rules, policies, and procedures for the protection of maintenance/ wayside workers while trains are running. The special order itself is a long, highly complex document that prescribes separate sets of rules in different sections for Maintenance/ Wayside workers, the OCC, and Rail Operators. All pertinent WMATA personnel are provided a copy of the Special Order and must sign off on having received it.

Several TOC reviewers on separate occasions reported non-compliance with the provisions of 07-02, on the part of all responsible parties – the OCC not making the proper announcements at the proper intervals, Rail Operators not observing speed restrictions or horn-sounding policies in the vicinity of Maintenance/ Wayside workers,

Rail Supervisors failing to enforce non-compliance while performing quality checks, and Maintenance/ Wayside workers not displaying proper hand signals, or not contacting the OCC at proper intervals or not reporting rules violations by Rail Operators. It is essential to note that all of the reviewers who observed non-compliance with 07-02 were conducting observations of other operational routines, including, but not limited to, quality checks of Rail Operators by Rail Supervisors, and track inspection. Thus, all of the instances of observed non-compliance with 07-02 were secondary observations, and the reviewers are therefore unable to provide exact details regarding each instance of observed non-compliance. We believe that general non-compliance with Special Order 07-02 is a systemic problem, and not a disciplinary problem for a subset of operators or other employees. Therefore, we believe that specific train information, while important, is not essential to tackling the larger issue.

WMATA management was made aware of this issue immediately after the review team observed an unusually high level of non-compliance, and WMATA management expressed serious concern and began taking immediate steps to address the issue (including performing its own rule compliance checks and evaluating the procedure).

Moving forward, if WMATA decides to leave Special Order 07-02 unchanged, there should be a program or procedure to better ensure that all relevant personnel (OCC, Line Service, and Maintenance/ Wayside) understand all of the provisions of a track worker protection scheme, such as an intensive required training course or more formal familiarization protocol. Otherwise, WMATA should consider developing separate, less complex Special Orders for each separate group of personnel (OCC, Line Service, Maintenance/ Wayside) that are easier to digest.

Finding 11: Although OCC Line Controllers are required to undergo annual recertification, no such recertification requirement exists for OCC Assistant Superintendents.

Assistant Superintendents have a position of oversight of Line Controllers, and may be called upon to perform the same duties of Line Controllers during routine and exigent circumstances. Given that Assistant Superintendents are called upon to perform the same functions as Line Controllers, they should also be required to undergo the equivalent regular recertification process.

Finding 12: Rail Supervisors are not denoting Rail Operators who do not answer questions satisfactorily or do not have all of their required equipment during quality checks for any follow-up corrective actions.

A review of a one week period of rail quality checks performed by Rail Supervisors on Rail Operators and Station managers included personnel from different divisions and line service groups. Of the 132 quality checks that were reviewed, none were flagged for follow-up despite more than a quarter of the checks indicating a large number of unmet criteria (i.e., incorrect answers to questions about rules, policies, and procedures, as well as missing required equipment, and non-compliance with WMATA safety rules

and procedures.). WMATA should evaluate its policies and procedures for quality checks and spot checks and determine if they are being met.

Finding 13: There are no formal written criteria used to direct the methodology and process of the quality checks that Rail Supervisors perform on Rail Operators.

No formal written criteria are used to determine how many quality checks and spot checks Rail Supervisors should perform during their shifts, or how many such checks Rail Operators and Station Managers should be subjected to within a given period of time. Additionally, no formal written criteria are used to determine when and how often Rail Supervisors should upload the quality check and spot check information collected on their TREO 700P SmartPhones. Refer to *APTA Rail Transit Standard Operating Practices 011-04, §11, Standard for Rule Compliance (7/26/04)*, for guidance in developing formal written procedures for efficiency checks.

Observation 9: Currently there is no program in place by which line service management personnel are encouraged to identify those RTRA employees who may be most qualified to become OCC Line Controllers. Such a program could aid OCC recruitment efforts.

Observation 10: WMATA should evaluate whether the current number of budgeted positions for Line Controllers may leave the OCC short-handed considering the challenge that recruitment from within WMATA has posed, on top of retirement, as well as vacation and sick leave.

Observation 11: At the time of this review, MOC Assistant Superintendents were not being cross-trained with OCC Assistant Superintendents.

Persons Interviewed

- Steve Feil, COO Rail
- Dan Epps, Director, OCC
- Hercules Ballard, Assistant Director, OCC
- Charles Dziduch, Director, LSBO
- John DeFilippo, Superintendent, Shady Grove Division, LSR
- Robert Relyea, Superintendent, Greenbelt Division, LSYG
- 2 Assistant Superintendents, OCC
- 3 Operations Supervisors
- 3 Terminal Supervisors
- 3 Rail Operators
- 2 Station Managers

Facilities Visited

- OCC

- New Carrollton Terminal
- Orange/ Blue Line trains and stations
- Shady Grove Terminal
- Red Line trains and stations
- Greenbelt Terminal
- Green/ Yellow Line trains and stations

Documents Reviewed

- TOC Program Procedures
- TOC Program Standards
- Various WMATA Organizational Charts
- WMATA System Safety Program Plan
- WMATA Metrorail Safety Rules and Procedures Handbook
- WMATA Accident/Incident/Unacceptable Hazard forms
- Final Report, January 2004 TOC Triennial Review of WMATA
- Sample of Quality Check results
- Sample of Employee Disciplinary Records
- OCC SOPs

RTRA Rail Transportation Training

Description

Training provided to rail transportation employees is a critical aspect of rail operations and safety. Because of the highly technical nature of rail transit operations, the type of training that new employees receive (in the case of WMATA, employees transferring from the position of Bus Operator, Station Manager, and on occasion, other positions), along with on-going refresher/follow-up training, is a key factor in overall operational safety. As such, the TOC Review Team assessed both the new Rail Operator training and ongoing training activities provided by WMATA's Operations Training group to RTRA employees. In addition to Rail Operators, the primary classifications included within the transportation training review are Rail Supervisors, OCC Line Controllers, and Assistant Superintendents.

Current Situation

The Training function for WMATA Rail Operators is conducted by the Operations Training unit, which is in the Office of Operations Planning and Administrative Support, which is organizationally located within the Department of Operations. This training group is distinct from RTRA, but both units report to the Department of Operations and work closely together. Ms. Cynthia Gannaway is the Manager of the Operations Training group. Training for the OCC Line Controllers is conducted by a distinct training group within the OCC, while Rail Transportation is directly responsible for the training of Rail Supervisors.

All WMATA Rail Operators are hired internally from the ranks of Bus Operators and Station Managers. Rail Operator job qualifications include being in possession of a good work record, safety record, and customer service record. Training of new Rail Operators is currently provided by eleven full-time Instructors, who are assisted by eight "utility" Instructors (who serve in a back-up capacity). The new Rail Operator training course is approximately 14 weeks in duration and includes classroom time, yard familiarization, line operations, and on the job training (OJT) portions. For the OJT portion of training, new Rail Operators are assigned to work with Line Platform Instructors, who are Rail Operators who have agreed to accept students to train.

At the time of this review, WMATA personnel interviewed indicated that there is a shortage of Line Platform Instructors. This may be due to a lack of incentive for Rail Operators to take on the additional workload. In addition, there are four tests and four quizzes given to students throughout the training program. Quizzes are designed to check material retention and tests are designed to gauge progress of the student. Operators who fail two or more tests may not continue with rail operator training. All students must receive a passing score of at least 75% on three out of four tests. Rail Operators who are promoted to the Rail Supervisor position must undergo the RTRA Utility Training Program. Minimum qualifications are outlined in the RTRA Utility Supervisor Training Program Description and Guidelines document, dated October 2004.

Refresher training and re-certification of all Rail Operators, along with all other employees qualified to operate trains (including Rail Supervisors), is required on a biennial basis. The Training Enforcement & Certification unit (organizationally within the Department of Operations) is responsible for administering this program. The recertification program consists of classroom activities and two tests which Rail Operators and Supervisors must pass. A review of a sample of employee training transcripts indicated that Rail Operators appear to have generally completed all of their required training courses in a timely manner.

Line Controllers from the Operations Control Center are trained under a separate program administered directly by the OCC Training Administrator and exists separately from the Operations Training Group. Line Controllers may be hired internally from the ranks of Rail Supervisors and Interlocking Operators. Due to potential personnel shortages and the difficulty of recruiting internally, the OCC has begun to recruit Line Controllers from outside the organization. All Line Controllers, both internal and external, must be first certified as train operators.

Line Controllers hired internally undergo a 16-week training program (external hires undergo 20 weeks). Formal evaluations are conducted every 3 to 4 days. The training administrator may remove a trainee for poor performance in the first 3 to 4 weeks. The OJT portion of the training program is done with Line Controllers specially selected by the Training Administrator and the OCC Director to assist with OJT, for which they themselves must receive training. The final examination at the end of the training program includes a written component and an evaluation of hands-on practical skills.

The OCC Training Administrator is also responsible for the MOC dispatchers and supervisors. Development of this training regimen is currently an ongoing process at WMATA due to the reorganization and subsequent moving of MOC from Track and Structures Systems Maintenance to its current position under the OCC umbrella.

Evaluation Criteria

The evaluation criteria utilized to assess the training of RTRA employees is primarily based upon the training program and procedures identified and promulgated by WMATA. It was the expectation of the TOC on-site review team that WMATA should be in complete compliance with its own operational training programs and practices it identifies as being critical to its operation. The training manuals, course syllabi, and other documents used in this training comprise these criteria.

While it was not possible, given the relatively limited nature of this triennial review, to identify all training procedures or compliance with procedures, this review is intended to present a “snapshot” of compliance. This was accomplished through review team staff interviews with training personnel and reviews of records.

In addition to compliance with its own rules, team members, where necessary or where WMATA procedures are silent, incorporated “best practices” as used by other similarly situated rail transit systems. Best practices were primarily utilized wherein review team

members, using their professional judgment, determined that WMATA could benefit by using a training practice or policy to meet a particular training issue.

Findings and Observations

In summary, the results of the on-site review indicate that the initial Rail Operator training and refresher training provided to RTRA employees is adequate and in general compliance with its established procedures. General compliance can be defined as the majority of operational practices and records comporting with WMATA defined policies and rules, as indicated in interviews of training personnel and reviews of records. This obviously is not intended to be interpreted as a certification of conformance with all procedures, as this relatively limited review is not a statistically accurate assessment of rail transportation training. It is, however, the opinion of the on-site review team that there is general compliance with established procedures.

The following issues identified within this section are those which indicate noncompliance with training procedures and/or areas in which training practices/procedures could be enhanced. The assessments are based upon discussions with RTRA staff, reviews of records, and interviews with training personnel.

Finding 14: The Right-of-Way Training program should be more structured and cover topics more specifically.

WMATA's Right-of-Way Training is not under the purview of Operations Training, but is overseen by the WMATA Safety Department. Members of the TOC review team attended the right-of-way training course as a requirement for gaining access to the right of way. Review team members observed that while the course covered important safety issues, it did not have a consistent and formal setup. Team members identified a number of areas in which the course should be enhanced to provide a more structured education on right of way safety. While we appreciated the review of past accidents and "lessons learned," they could be strengthened by being tied directly to rules that workers must follow. A course syllabus should be developed which clearly describes what topics must be covered in the course and the areas in which a student must be proficient by the end of the course (e.g. signaling trains or setting up work zones). The syllabus should be directly linked to the specific rules and procedures (e.g. hand signals, horn signals, equipment and procedures required to enter the ROW, etc.). Our exposure to the rules involved being handed a rulebook and an out-of-date Special Order (07-01). There was no class-specific handout or reference material. These types of handouts typically highlight the most important rules, procedures, and other information (such as phone numbers, how signage indicates location, trip stop/call station descriptions, etc.) WMATA should provide a handout based on the syllabus so that students can follow along and understand the curriculum. Along with this, rules should be directly referenced by number so that students know where to find them in the rulebook. We also noted that personal protective equipment/safety equipment was discussed at the end of the class, as were hand signals and the process for radioing the OCC. In our experience, these topics are typically covered earlier in the course and in

more detail so that participants understand how they relates to overall ROW safety procedures. This information should also be described in handouts.

It was not clear what graduates of the class were certified to do, beyond entering the trackway. Work zone setup is mentioned in the class; however, it was not explicitly stated if participants were allowed to set up work zones, required to signal trains when in a group, and so on. Clear direction on these issues is needed, particularly in print, so that participants can understand their roles and responsibilities. WMATA may consider looking to other transit systems to see how various formal approaches are applied.

Finding 15: WMATA does not appear to have a formal written agency-wide policy on which personnel are required to attend Right-of-Way Training, and how often they must be recertified.

While attending Right-of-Way Training, the reviewers encountered WMATA personnel who were unaware as to their requirements for initial and refresher Right-of-Way Training. Though some job classifications may currently prescribe Right-of-Way Training, there does not appear to be an agency-wide policy for all WMATA personnel regarding who must attend Right-of-Way Training, and how often they must be recertified. WMATA should develop a plan, policy, or procedure that clearly states who must attend Right-of-Way Training, and how often.

Finding 16: The RTRA Utility Supervisor Training Program Description and Guidelines Document should be updated to reflect the recent organizational changes at WMATA, as well as to reflect the names of current instructors for each course.

The review team recognizes that management changes at WMATA have recently taken place at WMATA and that not all documents could have reasonably been expected to be updated by this point in time. However, it is important to ensure that all documents are up to date, and training plans should be revised to reflect the current situation.

Observation 12: At the time of this review, there was a shortage of qualified Line Platform Instructors. WMATA should evaluate whether Rail Operators are offered the appropriate incentives to take on the increased work load of training new employees.

Persons Interviewed

- Clarissa A. Cannon, Supervisor of Transportation Training, Office of Operations Planning & Administrative Support
- Vincent P. Fields, Rail Transportation Training Instructor, Office of Operations Planning & Administrative Support
- Cynthia C. Gannaway, Manager of Operations Training, Office of Operations Planning & Administrative Support
- Fritz Raymond, Training Administrator, Operations Control Center

Facilities Visited

- Carmen Turner Training Facility, Landover, MD
- OCC Training Facility, JGB, Washington, DC

Documents Reviewed

- WMATA System Safety for Train Operators
- WMATA Train Operator Revised Curriculum, Class 07-05
- RTRA Utility Supervisor Training Program Description and Guidelines
- Customer Communications Specialist Course Syllabus
- OCCO Daily Training / Evaluation Checklist for: Central Control Supervisor (Line Controller)
- Utility Owl Shift OCC Assistant Superintendent Training/ Evaluation Checklist
- Line Controller Course Outlines
- Line Controller Course Schedules

Employee Fitness for Duty

Description

Employee Fitness for Duty (FFD) comprises the programs, policies, and procedures in place at WMATA designed to ensure that all safety-sensitive employees are able to perform the critical mental and physical aspects of their duties. WMATA employs the DOT/FTA definition of 'safety-sensitive' function, as laid out in the WMATA Drug and Alcohol Policy and Testing Program (which lists all safety-sensitive job classifications). The scope of this FFD review includes the following elements:

- Compliance with 49 CFR Parts 40 and 655, which govern substance abuse testing program requirements for safety-sensitive employees of fixed-guideway transit systems.
- The ability of WMATA to determine the fitness of their safety-sensitive employees to perform their duties through programs, policies, and procedures.
- The existence of an hours-of-service policy for safety-sensitive employees dictating maximum consecutive hours on duty, and minimum off-duty periods between shifts.

A major component of this review of FFD is related to WMATA's substance abuse testing program. Evaluation of this program is based upon the criteria set forth in 49 CFR Parts 40 and 655. Such a program is required to include six forms of substance abuse testing: pre-employment testing; random testing; post-accident testing; reasonable suspicion testing; return to duty testing; and follow-up testing.

Current Situation

WMATA's Drug and Alcohol Policy and Testing Program is dated April 2002, remaining unchanged from the previous triennial review in 2004. The 2002 version remains up to date, reflecting still-current FTA rules. Overall, the policy meets the requirements set forth in 49 Parts 40 and 655. All safety-sensitive employees at WMATA are required to sign off on having received a copy of this policy.

Although the scope of this review is focused on the Metrorail system, all Rail Operators at WMATA are hired internally from the ranks of Bus Operators (as well as Station Managers, who were also all previously hired as Bus Operators.) Applicants for the Bus Operator position undergo a single day of rigorous testing (e.g., reading and writing skills) that includes a mandatory pre-employment physical examination and drug and alcohol screening. All applicants who test positive are disqualified from reapplying for a year and must provide evidence of treatment from an approved facility. Typically, three to five business days pass before the results of the pre-employment screening are known.

In accordance with a recent FTA rule change, WMATA has decreased the percentages of employees randomly screened for drugs and for alcohol to 25% and 10%, respectively. To generate a list of employees to be randomly tested from the pool of all

safety-sensitive employees, WMATA makes its PeopleSoft database, which is updated daily, available to an external company, Computer Information Service, which provides a random list of names once per month to WMATA Human Resources. WMATA then feeds the random list into "The Assistant" software package, which automatically and randomly distributes the names of employees to be tested on a daily basis. The Assistant also determines which employees are tested for drugs, alcohol, or both. WMATA Human Resources provides a list of employees to be tested to all of the Line Service Divisions on a daily basis. At the time of this review, The Assistant did not have the capability to plot the distribution of the random tests over a given time period in order to evaluate the temporal spread of tests ordered for employees. However, a review of a sample of records from April 2007 indicated that distribution of the time of day of employee notification was satisfactory. It is important to evaluate the variance of the times at which employees are notified of random drug or alcohol screenings. Other transit systems have encountered situations where an employee has come to expect that he/she will always be pulled for screening at the beginning of a shift and therefore has risked breaking the rules during his/her shift, believing that the drug/alcohol test will not take place. The purpose of random screening is to be random in terms of day and time.

The pool of safety sensitive employees includes 6,196 individuals; as such approximately 1500 drug tests and 600 alcohol tests are performed on a yearly basis, based on respective 25% and 10% drug and alcohol testing rates. The number of names drawn monthly is larger than the respective drug and alcohol quotas to account for sick leave, vacation, and other issues rendering an employee absent for his or her test. Approximately 14 to 15 employees are called for random testing on a typical weekday. Employees are required to report directly to the testing site within one hour of notification, according to the Drug and Alcohol Policy. All testing is conducted at 616 H Street, NW in Downtown Washington, the location of WMATA's Medical Services and Compliance Branch. Sample collection procedures are outlined in the Drug and Alcohol Policy and Testing Program, and are in accordance with Part 40 requirements. Samples are sent to an external company, Quest Diagnostics, for evaluation. After three to five business days, the results of the test become available. Positive test results will result in the oversight monitor notifying the affected employee's division to hold him or her off duty. The Medical Review Officer (MRO) makes an official determination, and will institute a mandatory referral to the WMATA Employee Assistance Program (EAP) and the Substance Abuse Professional (SAP) who makes recommendations concerning drug and alcohol education, treatment, return to duty testing, follow-up testing, and aftercare. Based on WMATA's Drug and Alcohol Policy and a sample of employee records viewed, the EAP process, along with attendant return-to-duty and follow-up testing, appeared to be conducted in accordance with pertinent requirements.

According to the Drug and Alcohol Policy, reasonable suspicion testing is based on "specific, contemporaneous articulable [sic] observations concerning the appearance, behavior, speech, or body odors of the covered employee." WMATA employs a referral form and checklist that supervisors must complete to institute a reasonable suspicion test. According to interviews with WMATA personnel, there are few reasonable

suspicion tests performed, and the rate of positive results on these is high, suggesting that Supervisors do a good job making such observations of their employees. A review of the forms, as well as MIS reports from 2005 and 2006 showed that the vast majority of reasonable suspicion tests given resulted in positive results, a sign that supervisory personnel are well-trained to spot the signs of substance abuse.

For post-accident testing, Supervisors employ another checklist, separate from the reasonable suspicion checklist mentioned above. If the accident or incident fails to meet the threshold for a required FTA test, or if a non-safety-sensitive employee was involved in the incident, then WMATA may subject the employee in question to an internal WMATA, non-FTA drug and alcohol testing program. Such post-accident testing is WMATA's only internal non-FTA drug and alcohol testing regimen. A sample of employee records from 2005 and 2006 showed that post-accident testing was being conducted in accordance with applicable requirements.

In terms of medical qualifications, all safety-sensitive WMATA employees must pass a pre-employment medical history and examination. Employees whose positions require them to hold a Commercial Driver's License (CDL) are required to undergo biennial medical recertification. However, other safety-sensitive employees at WMATA are not required to undergo any medical recertification.

At the time of this review, WMATA's Hours of Service policy was such that employees are allowed, but not required, to take eight hours off between shifts. The reviewers discussed the ongoing effort by APTA to develop Hours of Service standards that prescribe minimum hours off duty between shifts, as well as maximum consecutive hours an employee can work.

Evaluation Criteria

The following criteria were used to evaluate WMATA's FFD programs, policies, and procedures:

- FTA Drug and Alcohol Testing Regulations (49 CFR Parts 40 and 655)
- WMATA Drug and Alcohol Policy and Testing Program (dated 4-30-2002)

Findings and Observations

Finding 17: There is no medical recertification requirement for rail operators, even though bus operators do have such a requirement.

WMATA's policy for medical recertification only applies to those employees whose positions require a CDL. This means that Bus Operators, but not Rail Operators or other safety-sensitive employees, are subject to medical recertification every two years. WMATA should extend its medical recertification requirements to all safety-sensitive employees. It is an industry best practice to ensure the physical qualifications for satisfactorily performing functions that affect the safety of WMATA operations. The

persons interviewed during this review appeared to agree with the concept of broadening the reach of medical recertification.

It is best practice to conduct medical recertification of all employees in safety-sensitive positions. We believe that there should be consistency in testing at WMATA, since one type of vehicle operator is already subject to such testing, and our experience has been that many transit systems have chosen to adopt this approach.

Finding 18: Elevator and Escalator Mechanics, as well as Station Managers, are not subject to any form of random drug and alcohol testing.

Elevator and Escalator Mechanics, as well as Station Managers, are not considered safety-sensitive positions at WMATA, and are thus not subject to FTA drug and alcohol testing requirements set forth in 49 CFR Parts 40 and 655. However, the reviewers believe that these positions do involve work that directly affects the safety of operations, and that barring their inclusion among safety-sensitive positions, they should thus be subjected to a non-FTA drug and alcohol testing regimen administered internally by WMATA. At the time of this review, WMATA had in place an internal drug and alcohol testing program for post-accident testing for instances when the accident or incident did not meet the threshold required to perform an FTA post accident test, or if a non-safety-sensitive employee was involved in the accident or incident. WMATA should consider expanding the scope of its internal drug and alcohol testing program to include random testing of Elevator and Escalator Mechanics as well as Station Managers. WMATA may look to peer transit agencies with established internal non-FTA drug and alcohol testing programs for resources in developing its own such program.

Every day, virtually every WMATA passenger uses an elevator or escalator to travel to or from the train. We consider both to be modes of transportation, the safety of which ELES mechanics are responsible. A maintainer who is incapacitated due to drugs or alcohol could make a mistake that jeopardizes the lives of scores of passengers on a crowded escalator or in a crowded elevator. Similarly, station managers are charged with overseeing the safety of thousands of passengers who pass through their stations on a daily basis. They may be required to make decisions in exigent circumstances which require clear judgment. We believe that whether leading passengers away from a dangerous situation or simply ensuring that unsafe situations are immediately addressed requires an alert employee.

Persons Interviewed

- Jeanne J. Fahnbulleh, MSW, LCSW-C, Manager, Medical Services & Compliance Branch, Office of Human Resources Management Services, Department of Workforce Development & Administration
- James T. Wynne, Jr., Manager, EEO & Dispute Resolution, Office of Civil Rights, Department of Workforce Development & Administration

Facilities Visited

- WMATA Medical Services & Compliance Branch, 616 H Street NW, Washington, DC 20001

Documents Reviewed

- Sample of employee drug and alcohol testing records (including chain of custody forms), from 2005 and 2006
- WMATA Drug and Alcohol Policy and Testing Program
- Sample of MIS forms – monthly from 2005 and 2005
- Sample Record of Pre-Employment Medical History and Physical Examination
- Sample Medical Examination Report, For Commercial Drivers Fitness Determination
- Tabulation of random collection times, April-June, 2007
- Sample FTA Reasonable Suspicion Referral Form
- Sample WMATA Post-Accident Drug and Alcohol Testing Decision Maker Form
- Sample WMATA Post-Incident, ARPS, Follow-Up Referral Form
- Sample DOT/FTA Drug and/or Alcohol Referral Form: Random and/or Follow-Up Testing
- Non-Represented Employee Substance Abuse Policy and Employee Assistance Program Policy

Facilities Inspections & Employee Safety

Description

The topic area of Facilities Inspections and Employee Safety is defined in a broad sense. The principle focus is toward the general condition of WMATA shops and maintenance facilities in terms of worker health and safety practices, fire and life safety aspects, general conditions within various facilities, and hazardous materials practices and storage. This topic area addresses the various safety-related activities that are associated with the WMATA rail system.

WMATA's Office of Industrial, Construction, and Environmental Safety's Division of Audit & Safety Oversight administers a comprehensive facility inspection program to ensure that employee safety issues are regularly monitored and addressed. This facilitates compliance with the requirements of the System Safety Program Plan. Regional Safety Officers conduct periodic inspections of the facilities, which may include completion of a formal "Safety Inspection Report" in which photographs and descriptive text describe any safety deficiencies identified. The primary responsibility for conducting regular inspections belongs to Shop Supervisors who complete the WMATA 10 Point Safety and Health Inspection Checklist, which is a primary component of the Safety Facilities Improvement Plan (SFIP). The SFIP consists of the related inspections and safety programs, job safety analysis reports, safety meeting notes, safety bulletins, facility evacuation plans, fire drill paperwork, incident reports, and other external reports, which are kept in a single binder at each of the maintenance facility locations.

WMATA's Office of Industrial, Construction, and Environmental Safety's Division of Audit & Safety Oversight also conducts inspections of at least half of the Metrorail stations each fiscal year, looking for wiring, housekeeping, chemical storage, Materials Safety Data Sheet (MSDS), signage, blue light, lighting, emergency phone, tripping hazard, and other safety related issues.

The Department conducts trend analyses on safety issues and uses this information to implement safety enhancements.

The Department also administers or oversees employee safety training in a wide range of areas, including personal protective equipment, hazardous communications, respiratory protection, and bloodborne pathogens. Other topics include: confined space entry, fire extinguisher training, and lockout/tagout. Certificates are issued to employees undergoing this training and familiarization. All records are kept on the training department's server, which generates compliance lists and notifies line managers when employees are due for new safety training.

Evaluation Criteria

The evaluation criteria used to assess the general safety activities related to worker health and safety, facility safety, and hazardous materials are primarily based upon the practices and procedures identified and promulgated by WMATA. It was the expectation of the on-site review team that WMATA should be in compliance with its own safety rules and operational practices.

It is not possible, given the relative limited nature of this on-site safety review, to identify all applicable internal procedures or compliance with procedures. Thus, this review represents a “snapshot” of compliance with internal operating practices. This was accomplished through discussions with WMATA System Safety staff, walk-through inspections of the facilities, and reviews of selected records and reports. Observations and comments derived from the walk-through inspections are provided as a part of this report.

In addition to compliance with its own rules, team members, where necessary or where WMATA procedures are silent, incorporated “best practices” as used by other similarly situated rail transit systems.

Findings and Observations

Finding 19: Some safety-related items from the 10 Point Checklist were found to be deficient. Each facility undergoes regular inspections to ensure that safety equipment such as fire extinguishers and eyewash stations are in working order in case of an emergency. While reports showed that they were regularly inspected, some items from the checklists (comprising the reports) did not meet checklist requirements.

Some fire extinguishers did not appear to have recent inspections noted on their tags, and some eye wash stations were empty or half-filled. The review team noticed that in a few instances, a small number of fire extinguishers did not have the most up-to-date inspection and that some eyewash stations did not have full water containers. While inspection checklists were completed and real issues identified during each review, WMATA should redouble its efforts to ensure that all appropriate areas are addressed in the monthly 10-Point inspection or related supervisory audits. It was the reviewer’s judgment that these deficiencies were old and should have been caught in previous inspections. While conducting a full-scale review of all employee and facility safety areas is beyond the requirement of this assessment, the review team believes that WMATA should look into this general issue.

Finding 20: The SFIP Book was missing from Greenbelt, which is concerning because a full history of safety issues is no longer documented. Furthermore, it is a security concern because the manual contains information that may be deemed security-sensitive, such as facility plans and information about equipment in the facility.

The review team asked to review the SFIP book at Greenbelt and learned from WMATA staff that it had been “taken home” by a manager several months earlier. The book has not been returned, and in that time, information normally kept in the book, such as the completed 10-Point Inspection forms, was kept in the facility manager’s office. WMATA should ensure that these books are always kept on site and may wish to consider creating a redundant copy of it as well. Employees should not be allowed to take sensitive WMATA documentation of the premises, and policies should be in place for actions related to any employee who does so.

Observation 13: Safety training courses appear to be comprehensive.

The various employee safety courses administered and overseen by WMATA appear to be very detailed and include clear procedures on issues such as use of fire extinguishers, respiratory protection, and other topics listed earlier in this section.

Observation 14: Rail maintenance facilities appeared to be generally well-kept and in safe condition.

With only a few exceptions for minor safety issues, the rail maintenance facilities appeared to be well kept. Regional safety officers audit the condition of facilities for employee safety related violations and hazards. The regional safety officer who offered the site visit identified issues of which he was aware, such as improper use of an extension cord, and explained steps the department has taken to mitigate these issues at all facilities. TRA identified no tripping hazards during its walk-throughs, no spills, and generally well-stored equipment. Electrical panels were clean and well-marked, hazardous materials appeared to be stored properly, machines had proper guards, other items on the facility safety checklist were found to be in order.

Observation 15: “WMATA 10 Point Safety and Health Inspection Checklists” were completed on time and kept at the facilities.

The review team assessed the completeness of these checklists and reviewed related findings on the handwritten portion of the forms. It appears that the forms are completed as required and that real issues are identified and corrected as a part of this program.

Observation 16: The SFIP program appears to be a comprehensive means of providing for overall effective facility safety.

Coupled with the other efforts of the Office of Industrial Construction, and Environmental Safety, the result has been strong compliance with the no-lost-work incentive program. The SFIP formalizes a number of critical functions and centralizes their recordkeeping in one location.

Observation 17: It was reported that in some cases, it can be difficult to accomplish all of the regional safety officer responsibilities with the limited staffing levels.

There are only three safety officers who can conduct the station and facility audits, and while the SFIP provides for local reviews, the oversight may be strained at times, particularly given that on-site audits are just one of many responsibilities for the regional safety officers. WMATA should determine if current staffing levels are appropriate for the number of responsibilities and requirements and to ensure that the department can move toward a preventive model and not just a reactive one.

Persons interviewed

- Ronald Edwards, Manager of Safety and Training
- Dorsey M. Adams, Safety Officer, Office of Industrial, Construction, & Environmental Safety Division of Audit & Safety Oversight
- AJ Araujo, Assistant Superintendent – Greenbelt Service & Inspection

Facilities Visited

- Greenbelt Yard
- New Carrollton Yard

Documents Reviewed

- Safety Facilities Improvement Plan – New Carrollton
- SFIP Records at New Carrollton
- WMATA 10 Point Safety & Health Inspection Checklist (blank)
- Completed WMATA 10 Point Safety & Health Inspection Checklists (2006 & 2007 for Greenbelt, Glenmont, New Carrollton, Alexandria, and Brentwood)
- Safety Inspection Reports – B ranch Avenue
- Monthly Environmental Compliance Checklist

Subway Emergency Exits & Related Equipment

Description

The topic area of subway exits inspections focuses on facilities provided for safe emergency egress from WMATA subway stations and tunnels. The subway portion of Metrorail is designed with emergency evacuations in mind. Persons in the subway may exit via “walk-out” emergency exit facilities located in the stations (including the normal entry points) and facilities located alongside the subway tunnels. Exits located along the subway tunnel fall into three categories – those that pass through a vent shaft, those that pass through a fan shaft, and those that are a dedicated exit. Our review focused on examples of each type of emergency exit. These emergency exits typically have access to the trackway either via a door that leads directly onto a catwalk or a door that leads to a small hallway with open doorways to the catwalk and track areas. All facilities considered to be emergency exits contain staircases. Some vent and fan shafts have ladders instead, but these would not typically be used in an evacuation due to the height of the ladders and the skills it may require to climb, which passengers may lack. “Walk-out” emergency exits, which contain stairs, are typically marked with exit signage and are designed to provide adequate lighting for a safe evacuation. At ground level, a release-bar must be pressed in order to open doors embedded into the ground or sidewalk. Some exits lead to doorways in buildings. Exit signage is located in the tunnels. These doors are locked and alarmed from the exterior points to prevent individuals from gaining access to the tunnel. The principle inspection focus is toward the general condition of the emergency exits and related equipment in the exits that will guide a safe and orderly evacuation. The review focused on a sample of exits and a review of inspection and maintenance records for the entire system.

Evaluation Criteria

The evaluation criteria used to assess the general condition of the subway emergency exits and related equipment are primarily based upon the practices and procedures identified and promulgated by WMATA. It is the expectation that WMATA should be in compliance with its own safety rules and operational and inspection practices. Furthermore, the TRA team evaluated the inspection protocol to determine if proper steps are taken to address all areas in the inspection.

Requirements for subway emergency exits, blue light facilities, and associated equipment are also promulgated in NFPA 130 Standard for Fixed Guideway Transit and Passenger Rail Systems. It should be noted that NFPA 130 was developed after initial exits were designed and built for WMATA, but that WMATA follows NFPA 130 requirements whenever applicable. New designs (e.g. for exit hatches) meet NFPA 130 requirements.

Given the limited nature of the on-site safety review, it is not possible to identify all best practices or deficiencies in the maintenance of subway emergency exits. Thus, TRA

used random sampling methods to review records and actual facilities for condition and levels of maintenance. TRA reviewed this “snapshot” of the condition with representatives from WMATA to confirm that any findings are applicable.

Documents used as a review criteria include:

- Tri-State Oversight Committee (TOC) Program Procedures
- TOC Checklists
- WMATA Procedures/Policies
- Standard Transit Industry practices

Findings and Observations

WMATA conducts a comprehensive formal inspection program of its 119 emergency exits. On a quarterly basis, all exits are inspected by staff from the Office of Passenger Vehicle Fire Life Safety & Emergency Management. In addition, staff members inspect other emergency equipment, including the ETEC, sprinklers, fire extinguishers, standpipes, Halon FM-200 systems, and deluge systems. Most are inspected on a quarterly basis. Inspections are scheduled in advance to ensure that all shafts are inspected in a given quarter. Inspections are recorded on the “WMATA Emergency Exit Shaft Inspection Report.” This inspection sheet is pre-populated with the shaft (exit) number, station, and location. Inspectors fill out the remaining fields, which are listed as: hatch door pull weight, date, inspected by, and defects/remarks. There is no predetermined list of elements to be checked in the review, but WMATA reports that inspectors are very familiar with the process and know which areas to address. The defects/remarks field on the forms is “open text” style, so that any defect can be written in. Inspection information on the paper forms is scanned, and electronic backup copies of the information are kept in addition to the paper records which are stored in a file cabinet at the Carmen Turner facility. TRA found complete inspection records for each quarter in the past two years. Defects/remarks were complete and detailed, providing enough information to indicate the proper repair needed.

Defects are entered into the MAXIMO system, and repairs are supposed to be made by PLNT staff, which includes handypersons, masons, sign shop personnel, locksmiths, and all other non-electrical trades. Electricians are also linked into the MAXIMO system. A work order is generated and a repair is supposed to be made. However, in a review of the inspections, TRA found that deficiencies carried over from quarter to quarter and that repairs did not appear to be addressed in a timely manner in all instances. TRA also noted that minor deficiencies noted in the on-site review of exit shafts had been previously noted on the last quarterly inspection. While it appears that there is a generally good inspection program in place, there needs to be a final component to it that ensure that inspections are addressed and deficiencies corrected.

TRA reviewed the Metrorail Emergency Response maps developed by WMATA that are used to facilitate orderly emergency response to incidents on the Metrorail system. These maps are organized by the jurisdiction of the emergency response organizations

and contain detailed information about the emergency facilities and equipment on the entire Metrorail system. TRA found that these CDs serve as excellent resources and clearly document the significant steps WMATA has taken to prepare for safety incidents. Metrorail should continue to ensure that the maps are up-to-date and accurate.

TRA reviewed the three types of “walk-out” emergency exits – the dedicated exit, the fan shaft exit, and the vent shaft exit. In each, TRA reviewed the ease with which the exit could be accessed from the trackway, the security of the door at ground-level, the condition of the exit pathway (including stairs, floors, walls, and doors), the lighting, the signage, the cleanliness, and any other factors that could impede a safe evacuation.

In each instance, TRA found that the emergency exit shafts were generally well-marked, free of debris, and adequately illuminated. While some lights were out in the emergency exit pathways (e.g. in the stairways), this did not compromise the overall availability of light to the area. Findings from these visits are presented below:

Finding 21: Emergency exit shaft inspections should include a formal follow-up process or confirmation loop to ensure that deficiencies are corrected.

It is commendable that Emergency Management Staff conduct quarterly reviews and identify deficiencies and items needing repair in the emergency exits. This is negated, however, by the fact that repairs are not conducted in a timely manner. It seems that with the formal deficiency reporting protocol and use of the MAXIMO system, follow-up should be relatively easy, since work orders can be generated for items needing repair. However, repeated deficiencies at given locations indicate that repairs are not conducted on a timely basis. This finding was corroborated by WMATA staff. Emergency Management staff indicated that it is also difficult to follow-up on opened work items to ensure that repairs are made due to the multiple individuals required for conducting repairs. This may also be due to the fact that different groups conduct inspections from those that do the repairs. WMATA should investigate why this is happening and resolve the issue so that repairs are made in a timely manner.

Finding 22: WMATA should consider developing a checklist to accompany the WMATA emergency exit shaft inspection report.

While our review of the Inspection Reports indicated that inspectors were finding a wide range of issues and clearly describing them on the forms, it may be beneficial to provide a full checklist that would include items such as: hatch padlock hasp, lighting, doors at track level, etc. This would also ensure that all necessary elements are verified in each inspection. For follow-up purposes this would provide verification that an element was found to be functional in previous inspections.

Finding 23: Emergency exit signage is unclear due to various reasons, including caked-on grime and age/“wear and tear.”

In 2004 we identified a similar issue in which dirty signs were difficult, if not impossible, to read. TRA recognizes that dirt is inevitable in a subway environment and that keeping all signs clean at all times may not be feasible. However, WMATA should

consider a program to regularly clean illuminated exit signs located next to mid-tunnel exit shafts. Other emergency exit signage, such as the photoluminescent signs in the shaft areas adjacent to the track areas and in the stairwells, has degraded over time. TRA could not determine what some signs once indicated, while others could barely be made out due to outlines of the original lettering. WMATA should ensure that a consistent approach to signage is employed (e.g. old signs should be removed and replaced or a determination should be made that signage is not necessary). These signs typically indicated the location, but were not the signs in the tunnels themselves that directed individuals to the stations.

Finding 24: There is a lack of signage at track level indicating track numbers.

It would be helpful to both track workers and emergency responders to have the tracks clearly labeled at the track level entrances from the emergency exit stairways. It can be disorienting to go down several switchbacks of stairs or down additional hallways, and a clear label on each door to the trackway or adjacent to the open entrance may help emergency responders and WMATA employees enter the correct track area and minimize the odds of people entering an incorrect trackway, particularly in a case where a person may think a track has had its power cut or service restricted.

List of persons interviewed

- George W. Burns III, Lieutenant Counterterrorism Coordinator/WMD
- Officers Jason P. Mangan, Metro Transit PD
- Officer Jeffrey Sesok, Metro Transit PD
- Ronald Edwards, Manager of Safety and Training
- Ron Bodmer, Manager of Emergency Management
- Thomas E. Jones, Supervisor Fire Protection
- Victor Size, Fire, Life Safety Officer

List of facilities visited/records perused, etc.

- WMATA Standard Operating Procedures for Emergency Events
- Emergency Response Maps
- Emergency Equipment locations
- Fire Protection Inspections and Procedures
- Fire Equipment locations (Including inspection and testing protocols)
- Metro Rail Transit Fire/ Rescue Emergency Procedures Policy
- WMATA Communication protocols (Police and Operations Control Center)
- Metro Rail Safety Rules and Procedures
- Incident Command Protocols and Procedures
- WMATA Emergency Tunnel Evacuation Cart CD
- Emergency Response Training Facility CD
- WMATA Emergency Exit Shaft Inspection Reports for 2005 & 2006, all routes.
- Carmen Turner Training Facility
- Gallery Place/ Chinatown Station and tunnel

- Archives/ Navy Memorial-Penn Quarter Station and tunnel
- Judiciary Square Station
- Metro Center Station
- Union Station
- 7th and Indiana Emergency Exit
- Fan Shaft #FE-12 at Queens Chapel Road in Prince George's County
- Vent Shaft # FE-15 at Queens Chapel Road in Prince George's County
- Emergency Exit #EB-1 at 8915 16th Street, Montgomery County

Systems Maintenance - ATC

Description

WMATA's Metrorail system utilizes an automatic train control system to ensure safe train separation, to enforce civil and temporary speed restrictions, allow automatic train operation, effect proper train berthing in passenger stations, and facilitate proper train door opening in stations.

The automatic train control system includes a large array of critical elements, including switch machines, track circuits, wayside signals, interlockings, and a number of other systems, subsystems, and components.

Current Situation

The Automatic Train Control, or ATC, department is responsible for inspection, maintenance, and repair of the Metrorail train control systems. The department is made up of ATC Technicians, who are responsible for the bulk of field work, as well as Shift Supervisors and Area Managers.

The ATC department's system upkeep revolves in large part around testing and preventive maintenance inspections. These tests include a number of locking tests (e.g., traffic, route, approach, etc.) in interlockings, switch obstruction testing, track circuit tests, etc.

Switches receive an additional visual inspection monthly. There is also a joint quarterly switch inspection performed by Track and ATC (TSSM Automatic Train Control) personnel. This joint inspection is a commendable practice.

Evaluation Criteria

1. WMATA's ATC Department activities were evaluated primarily using its own internal procedures and standards, especially existing preventive maintenance instructions;
2. As appropriate, external standards such as the maintenance and inspection guidelines promulgated by the American Public Transportation Association (APTA) and the Federal Railroad Administration; and
3. When WMATA or external criteria do not exist, or are inappropriate, the reviewer's professional judgment is used.

Findings and Observations

Finding 25: The prints in our sample of interlocking locations were in the same tattered, ripped, and disorganized condition noted in TOC's 2004 triennial review.

The interlocking rooms visited during this review all exhibited poor station prints and documentation. One exception was the relatively new New York Ave., which had

construction prints but no as-built prints. Usable, complete, and uniform prints for high voltage equipment are important for troubleshooting (both for speed and personnel safety), equipment reliability, and configuration management. All interlockings, and other key ATC locations as identified by WMATA, should have up-to-date prints that correspond with prints in management and engineering offices.

Finding 26: The two preventive maintenance inspection types sampled (track circuit and switch obstruction checks) had a number of late inspections, as well as some that seemed to be significantly early.

This review concentrated on two types of PMI, looking at procedure completeness and schedule adherence. Switch obstruction testing is a monthly verification that a switch fails with a certain gap (achieved by manually obstructing the switch points). In our sample, this PMI is done on an average of 30 days, however there is a wide variety of elapsed times between PMIs. They vary from nine or ten days between checks in some cases to more than 40 or 50. [We recognize that there may be some filing errors or other outliers, however there is a significant number of PMIs in the 40-day range.] The other PMI reviewed in detail was track circuit checks. This is a quarterly test of track circuit transmitters, receivers, voltage, resistance, etc. Our sample showed an average of 101 days between such PMIs (quarterly should translate to 90 days). As with switch obstruction testing, some are well below the schedule target, while others are well above. [Data for all PMIs checked, including elapsed time between inspections, are shown below.]

Finding 27: In some ATC Preventive Maintenance Instruction documents, the inspection frequency was not obvious.

Looking at PMIs such as 11000, 28400, 12000, 12400 and others, the inspection frequency was not apparent to the reviewer. Other PMIs, e.g., 21300, have the frequency listed in section 1.

Observation 18: WMATA is considering moving its locking tests from an annual to a biennial frequency.

WMATA might consult APTA and/or FRA standards on these tests. Both utilize a biennial frequency. WMATA should also consider its current workload and, perhaps most of all, the typical failure rate and history in such locking tests.

Observation 19: The ATC Technician training program, which includes classroom training, on-the-job training, written tests, and performance evaluations, seems effective and inclusive.

Observation 20: The blue "Special Order" tag, used to mark components, wires, and ATC devices out of service, is an excellent system.

It helps to ensure uniformity and configuration management, and makes it easier for ATC Technicians and other personnel to determine the type of and reason for changes were made at a particular location.

Persons Interviewed

- Mr. Jerry Pitts, Area Manager
- Mr. Mike Savina, Area Manager
- Mr. Karl Spencer, Superintendent
- ATC Technicians as part of field inspections

Facilities Visited

ATC management, field, and area offices including Alexandria, Brentwood, and West Falls Church. Field locations including interlockings and intermediate relay locations at A01, C01, C02, and B02.

Documents/Information Reviewed

Preventive Maintenance Inspection instructions/sample data sheets for the following PMI types: T22A, Open Door Command Spillover Tests, 02/01/07; ZZ072, Train Control Room Inspection, 09/05/84; ZZ071, Interlocking Inspection, 05/02/84; 28110, Approach Locking, 03/10/82; 28120, Time Locking, 01/28/82; 28130, Route Locking, 12/28/81; 28140, Traffic Locking, 02/17/82; 28150, Switch Locking, 03/18/82; 28300, Vital Relays, signed 06/09/81; 28200, Switch Obstruction Test & Inspection – GRS 55E, 08/14/82; 28220, Speed Frater Switch Obstruction Test and Inspection, 11/29/83; 28320 AC Vital Relay, 08/13/82; 58200 Switch Machine Obstruction Test & Inspection, 06/08/92, 28400, YM-2 Switch Machine Obstruction Test, 02/12/86; 11000, High Frequency Track Circuits, 02/24/82; 12000 Power Frequency Track Circuit (AC Track Circuit), 08/13/82; 12400, Union Switch & Signal AC Track Circuit, 11/29/93; 16100, Remote Terminal Unit, 03/04/82; 16400, Ferranti Outpost Model 409 Remote Terminal Unit, 03/26/93; 21300, Switches, 01/20/88; 26000, Intrusion Detection and Warning System, 12/2/93; 27500 Ground Fault Detector Test, 12/17/98; and 41000 Audi Frequency Train Detection Circuits (AF-800), 02/11/92.

Automatic Train Control System Journeyman Course Outline (various revision dates, 2006 and 2007, according to section)

Completed Preventive Maintenance Inspection data reviewed for the following locations and dates:

Track Circuit PMI							
C01 Trk1	Days elapsed	C01 Trk2	Days elapsed	C02 Trk1	Days elapsed	C02 Trk2	Days elapsed
	4/12/05		1/7/05		4/4/07		1/12/05

7/7/05	85	4/12/05	95			2/19/05	37
10/5/05	88	7/13/05	91			7/11/05	142
1/2/06	87	10/14/05	91			10/19/05	98
1/18/06	16	1/16/06	92			1/10/06	81
7/6/06	168	4/5/06	79			4/5/06	85
12/15/06	159	7/17/06	102			7/14/06	99
4/6/07	111	11/7/06	110			10/26/06	102
		4/13/07	156			4/12/07	166
C03 Trk1	Days elapsed	C03 Trk2	Days elapsed	C04 Trk1	Days elapsed	C04 Trk2	Days elapsed
1/14/05		6/9/05		3/10/05		3/22/05	
3/23/05	69	9/28/05	109	6/7/05	87	6/15/05	83
4/19/05	26	12/20/05	82	9/13/05	96	9/21/05	96
7/12/05	83	3/22/06	92	12/7/05	84	12/20/05	89
10/13/05	91	11/8/06	226	3/28/06	111	3/17/06	87
1/19/06	96	3/20/07	132	9/14/06	166	6/8/06	81
4/20/06	91			12/13/06	89	6/28/06	20
7/7/06	77			3/19/07	96	3/21/07	263
10/11/06	94						
1/10/07	89						
4/3/07	83						
D01 Trk1		D01 Trk2		D02 Trk1		D02 Trk2	
2/15/07		2/13/07		2/15/07		5/9/07	

D03 Trk1	D03 Trk2		
2/20/07	5/8/07		
D05 Trk1	D05 Trk2		
3/21/07	3/13/07		
Average	101		

Switch Obstruction PMI					
K02	Days elapsed	K04	Days elapsed	K05	Days elapsed
1/4/06		1/3/06		1/5/06	
2/1/06	27	2/1/06	28	1/30/06	25
3/10/06	39	3/15/06	44	2/7/06	7
4/14/06	34	4/3/06	18	3/2/06	25
6/19/06	65	5/11/06	38	4/19/06	47
7/13/06	24	6/5/06	24	8/17/06	118
8/2/06	19	7/5/06	30	9/18/06	31
9/6/06	34	7/11/06	6	10/9/06	21
10/3/06	27	9/5/06	54	11/7/06	28
11/1/06	28	10/17/06	42	12/12/06	35
12/12/06	41	11/7/06	20	2/12/07	60
1/4/07	22	12/19/06	42	2/22/07	10
2/16/07	42	1/23/07	34	3/1/07	9
3/6/07	20	3/1/07	38	3/29/07	28
4/12/07	36	3/12/07	11	4/11/07	12

5/3/07	21	4/12/07	30	5/1/07	20
6/4/07	31			5/23/07	22
				6/6/07	13
C02	Days elapsed	C04			
1/11/05		1/3/06			
2/22/05	41	1/30/06	27		
3/2/05	10	3/14/06	44		
4/26/05	54	4/12/06	28		
5/4/05	8	6/22/06	70		
6/2/05	28	7/5/06	13		
7/6/05	34	8/1/06	26		
8/3/05	27	9/5/06	34		
9/6/05	33	10/6/06	31		
10/11/05	35	11/2/06	26		
11/10/05	29	12/4/06	32		
12/14/05	34	12/22/06	18		
2/9/06	55	1/3/07	11		
3/7/06	28				
4/19/06	42				
5/29/06	40				
6/8/06	9				
7/12/06	34				
8/3/06	21				
9/5/06	32				
10/16/06	41				
11/13/06	27				

12/14/06	31
1/9/07	25
Average	30

Systems Maintenance – Power

Description

WMATA's Metrorail system runs on electric traction power, and also includes a host of important electrically-powered elements including the automatic train control system, passenger station and parking lot power, communications and computer systems, etc. The POWR section of Track, Structures, and Systems Maintenance (TSSM) is responsible for inspection, testing, maintenance, and repair of electrical power systems.

Current Situation

POWR is responsible for a large variety of electrical equipment. This includes traction power substations, A/C power rooms in passenger stations, D/C tie breaker stations, third rail feeder and return cables and hardware, lighting, low-voltage electrical outlets and supply, etc. POWR accomplishes a variety of inspection, preventive maintenance, and repair activities on this equipment using personnel from five field offices.

This review concentrated on a sample of POWR's equipment responsibilities. The sample included preventive maintenance/inspections on traction power substations, inspections of passenger station/parking lot lighting, physical condition of traction power substations, and conditions at passenger station A/C rooms.

Of all POWR equipment, traction power substations (TPS) are perhaps the type most sensitive to proper preventive maintenance instruction (PMI) completion. TPSs are also particularly critical to the continued and safe operation of the Metrorail system.

Evaluation Criteria

1. WMATA's POWR Department activities were evaluated primarily using its own internal procedures and standards, especially existing preventive maintenance instructions;
2. As appropriate, external standards such as the maintenance and inspection guidelines promulgated by the American Public Transportation Association (APTA); and
3. When WMATA or external criteria do not exist, or are inappropriate, the reviewer's professional judgment is used.

Findings and Observations

Finding 28: POWR biweekly (14-day) Traction Power Facility Inspections do not appear to be completed consistently on schedule.

Of the 228 inspection records checked for this PMI type, 42 (over 18%) had 20 or more days between inspections (20 was used as a somewhat trivial threshold for lateness, and represents almost 50% over the target interval). A few completed biweeklies with no date or incomplete date were counted in the total, which works in WMATA's favor for the overall percentage. These six non-dated PMIs may have been part of the 42 that

were over 20 days, however this is impossible to determine from the data available. [Data for sample set shown below.]

Finding 29: Battery inspection intervals varied from fewer than 30 days to as many as 180 days.

Battery inspection data were collected for the same facilities as biweekly inspection data. There was a wide variation in completion dates (we believe the inspection is quarterly). Some locations had no battery inspection data at all, though this may have resulted from differing filing practices. Inspections should be conducted quarterly. [Data for sample set shown below.]

Finding 30: Biweekly Traction Power Facility Inspections do not appear to be effective against housekeeping and facility upkeep issues in many locations.

Based on limited field inspection, this review concludes that WMATA's biweekly Traction Power Facility inspection may not be particularly effective in identifying, rectifying, and preventing housekeeping / facility upkeep problems. We noted several instances of poor housekeeping, including varying amounts of trash on floors and floors that needed to be swept (in order to prevent high voltage / dust interaction, and to maximize equipment reliability). Some substations had tools lying in the middle of the floor, as opposed to hanging on the racks provided. Additional issues included serious weed growth problems in one outdoor transformer yards (serious enough to prevent one exterior door from closing properly), however these were reported to be in the work order process.

Finding 31: Station lighting inspection forms frequently do not include date of inspection and are completed inconsistently.

The station lighting forms in use seem like a good idea, however there is no place on the form for the inspector to fill in the inspection date (a date for supervisor signature appears at bottom, and was used for this audit where possible). Additionally, WMATA's lighting inspection form includes widely varying levels of data depending on which inspector fills it out. Some include checks for each station area, others very few checks. Some are manually coded as exterior or interior inspections. Some use a special exterior inspection form. It is admirable that WMATA has a regular inspection for station and parking lot lighting, however the paperwork associated with that inspection may benefit from some streamlining. [TOC does not necessarily recommend that WMATA create more paperwork, but rather that it examine the current use of the lighting inspection form versus what information is actually needed. WMATA should make changes based on this internal review.]

Finding 32: The prints in a sample of traction power substations were in the same tattered, ripped, and disorganized condition noted in TOC's 2004 triennial review.

The substations visited during this review all exhibited poor station prints and documentation. Some had no prints at all. Usable, complete, and uniform prints for high voltage equipment are important for troubleshooting (both for speed and personnel safety), equipment reliability, and configuration management. All substations, and other key high voltage locations as identified by WMATA, should have up-to-date prints that correspond with prints in management and engineering offices.

Finding 33: POWR's policy of posting a single-line diagram (a simplified drawing of substation and third rail equipment for the area immediately surrounding the subject substation) in substations, showing DC feeders, third rail sections, and other critical, location-specific information, is not upheld at all locations.

Most of the substations visited did not have a single-line diagram posted, as POWR reported was normal practice. Such a practice would be beneficial (and would result in a finding from this assessment if omitted). However, the practice is not carried out uniformly. This lack of a single-line, coupled with the lack of good substation prints, seems to pose a significant problem. POWR also reports that its personnel are issued a complete set of Metrorail prints, showing third rail feeder locations, tie breaker and sectionalizing switches, etc. Additionally, MOC typically issues *switching orders* to personnel before switching is performed in substations. POWR should determine whether personnel are to depend on single-lines, or should rely on their own personal copy of prints. If it has not already, WMATA and POWR should consider the configuration management issues that attend the latter choice.

Observation 21: Substation and AC room locations reviewed as part of this assessment were generally in good condition.

Conditions found in breaker cubicles, rectifiers, and other critical areas indicate a good, well-executed POWR department preventive maintenance program.

Observation 22: WMATA's POWR section utilizes a number of very good preventive maintenance inspection (PMI) processes and forms.

The forms and procedures in use seem to be appropriate and complete. Of particular note is that the forms and procedures emphasize measurements, voltages, and other objective data. Nearly all of the PMI forms reviewed (hundreds) for this assessment were completed properly.

Observation 23: Because most preventive maintenance instructions were not received in a timely manner, this review was unable to assess the content and form of most preventive maintenance instructions.

Workable copies of the PMI forms were not submitted by WMATA for timely review. Likewise, this review was unable to assess power-related training, as requested course syllabi, outlines, and related materials were not submitted for review.

Persons Interviewed

- Mr. Leroy Archer, Area Manager
- Mr. Donald Harris, Superintendent
- Mr. Arthur Ibarrientos, Area Manager
- Mr. Luís Rodriguez, Shift Supervisor
- Mr. Michael Taylor, Area Manager

Facilities Visited

- Alexandria, Carmen Turner, Twinbrook, West Falls Church POWR offices and records
- Substations (TPS) and passenger station A/C rooms (AC) including the following: J01 TPS, J02 TPS, K08 TPS, K05 TPS, K05 AC, D11 TPS, G05 TPS.

Documents/Information Reviewed

- DC Traction Power and Tie Breaker Facility Inspection – Supervisor’s Inspection (used by Technicians – 50.417, 05/06)
- Battery Data Sheet (2 parts – 50.548 and .549, 09/04)
- AC Passenger Facility Lighting Inspection (03/06 revision and a number of older permutations)
- Output of training database: Student Activity Report, 5/31/2007
- Completed PMI forms and checklists for the following PMI types, locations, and dates:

Biweekly (14day)

C06 TPS	Days elapsed	Batteries	Days elapsed	C12 TPS	Days elapsed	Batteries	Days elapsed
5/16/06		5/20/06		5/15/06		4/26/06	
6/3/06	17	6/16/06	26	5/30/06	15	8/22/06	116
6/16/06	13	9/15/06	89	6/13/06	13	11/20/06	88
6/27/06	11	12/1/06	76	7/3/06	20	2/15/07	85
7/19/06	22			7/31/06	28		
7/26/06	7			8/17/06	17		
8/8/06	12			9/11/06	24		
8/24/06	16			9/19/06	8		
9/14/06	20			10/5/06	16		

9/19/06	5			11/1/06	26		
10/4/06	15			11/12/06	11		
11/1/06	27			11/14/06	2		
11/13/06	12			11/29/06	15		
11/27/06	14			12/25/06	26		
12/13/06	16			1/9/07	14		
12/28/06	15			1/23/07	14		
1/9/07	11			2/6/07	13		
2/9/07	30			2/20/07	14		
2/24/07	15			3/8/07	18		
3/7/07	13			3/21/07	13		
3/20/07	13			4/3/07	12		
4/3/07	13			4/17/07	14		
4/17/07	14			4/30/07	13		
5/1/07	14			5/15/07	15		
5/15/07	14			10/?			
				no date			
				no date			
K02 TPS	Days elapsed	Batteries	Days elapsed	J01 TPS	Days elapsed	Batteries	Days elapsed
5/10/06		7/2/06		5/8/06		2/28/06	
5/24/06	14	9/27/06	85	5/22/06	14	8/30/06	180
6/6/06	12	11/14/06	47	6/4/06	12	2/7/07	157
6/20/06	14	3/14/07	120	7/6/06	32	5/9/07	92
7/2/06	12			8/1/06	25		
7/24/06	22			8/13/06	12		
8/1/06	7			8/30/06	17		

8/15/06	14			9/10/06	10		
9/14/06	29			9/28/06	18		
9/27/06	13			10/12/06	14		
10/12/06	15			11/22/06	40		
10/30/06	18			12/7/06	15		
11/8/06	8			12/21/06	14		
11/16/06	8			12/31/06	10		
12/5/06	19			1/14/07	14		
12/14/06	9			1/25/07	11		
12/28/06	14			2/7/07	12		
1/11/07	13			3/1/07	24		
1/27/07	16			3/11/07	10		
2/7/07	10			3/29/07	18		
2/22/07	15			4/8/07	9		
3/6/07	14			4/18/07	10		
3/28/07	22			5/9/07	21		
4/11/07	13			5/20/07	11		
4/27/07	16						
5/8/07	11						
5/16/07	8						
K01 TPS	Days elapsed	Batteries	Days elapsed	K07 TPS 1	Days elapsed	Batteries	Days elapsed
5/9/06		6/7/06		5/16/06		5/18/06	
5/24/06	15	8/30/06	83	5/30/06	14	5/19/06	1
6/24/06	30	11/24/06	84	6/14/06	14	11/1/06	162
7/14/06	20	2/14/07	80	7/5/06	21	1/26/07	85
7/20/06	6			7/11/06	6	4/21/07	85

8/3/06	13			7/26/06	15		
8/18/06	15			8/8/06	12		
9/12/06	24			8/25/06	17		
9/22/06	10			9/6/06	11		
10/11/06	19			9/29/06	23		
10/25/06	14			10/4/06	5		
11/10/06	15			10/19/06	15		
11/24/06	14			11/3/06	14		
12/6/06	12			11/14/06	11		
12/14/06	8			11/29/06	15		
12/26/06	12			12/12/06	13		
1/16/07	20			12/27/06	15		
1/30/07	14			1/10/07	13		
2/15/07	15			2/13/07	33		
2/20/07	5			3/1/07	18		
3/8/07	18			3/6/07	5		
3/24/07	16			3/27/07	21		
4/3/07	9			4/21/07	24		
4/19/07	16			4/21/07	0		
5/2/07	13			5/9/07	18		
5/25/07	23			5/18/07	9		
B10 AC	Days elapsed	Batteries	Days elapsed	B10 TB	Days elapsed	Batteries	Days elapsed
1/17/07		2/19/07		1/12/07		2/19/07	
1/23/07	6	5/15/07	86	1/23/07	11		
2/14/07	21			2/4/07	11		
2/19/07	5			2/19/07	15		

3/7/07	18	3/11/07	22
3/22/07	15	3/25/07	14
4/3/07	11	4/10/07	15
4/4/07	1	5/1/07	21
4/16/07	12	5/10/07	9
5/3/07	17	5/21/07	11
5/15/07	12		

B10 TP1	Days elapsed	Batteries	Days elapsed	B10 TP2	Days elapsed	Batteries	Days elapsed
1/17/07		No dates in file		1/8/07		3/7/07	
1/23/07	6			1/23/07	15	3/12/07	5
2/6/07	13			2/6/07	13	5/21/07	69
2/19/07	13			2/14/07	8		
3/7/07	18			3/7/07	23		
3/19/07	12			3/20/07	13		
4/3/07	14			4/3/07	13		
4/15/07	12			4/15/07	12		
5/2/07	17			5/2/07	17		
5/15/07	13			5/21/07	19		
5/28/07	13			5/31/07	10		

B11 AC1	Days elapsed	Batteries	Days elapsed	B11 AC2	Days elapsed	Batteries	Days elapsed
12/12/06		3/13/07		1/10/07		3/13/07	
1/10/07	28			1/23/07	13		
1/23/07	13			2/20/07	27		
2/20/07	27			3/3/07	13		

3/3/07	13			3/13/07	10		
3/13/07	10			4/4/07	21		
4/4/07	21			4/24/07	20		
4/24/07	20			5/9/07	15		
5/9/07	15			5/19/07	10		
5/19/07	10			(No date)			
B11 TB1	Days elapsed	Batteries	Days elapsed	B11 TB2	Days elapsed	Batteries	Days elapsed
1/10/07		No dates in file**		1/10/07		No dates in file	
1/23/07	13			1/23/07	13		
2/20/07	27			2/20/07	27		
3/3/07	13			3/3/07	13		
3/13/07	10			3/13/07	10		
4/24/07	41			4/24/07	41		
5/9/07	15			5/9/07	15		
5/19/07	10			5/19/07	10		
(No date)				(No date)			

Lighting inspections

A04	A05	A06	A07	A08
1/17/07	1/31/07	1/25/07	2/2/07	1/22/07
2/7/07	2/6/07	1/28/07	2/6/07	1/24/07
2/7/07	2/13/07	2/7/07	2/27/07	1/28/07
2/14/07	2/26/07	2/23/07	2/27/07	2/7/07
3/19/07	3/27/07	3/14/07	3/29/07	2/8/07
	3/27/07	5/19/07	4/17/07	2/28/07
	4/17/07	5/23/07	5/7/07	3/19/07

5/7/07	11/22/07	5/14/07	5/8/07
5/17/07	(No date)	5/14/07	5/19/07
	(No date)		(No date)
			(No date)
			(No date)
			(No date)

*(No date) indicates that there was a completed form with no date written down.

**Indicates no date for battery inspections.

Track Inspection & Maintenance

Description

WMATA's Metrorail system depends on a system of track including two running rails, third rail for electric traction power, turnouts and crossovers, and associated hardware. Track, Structures, and Systems Maintenance (TSSM), and specifically the Track department within that division, is responsible for inspection and maintenance of the Metrorail track structure.

Current Situation

The Track department (Track) is responsible for both inspection and maintenance/repair of Metrorail track structure. The group is divided by line. Managers and personnel are divided into the following groups: Yellow/Green lines, Orange/Blue lines, and Red Line. TSSM is headquartered at Alexandria Yard, but Track personnel report to and work out of a variety of locations across the Metrorail system.

Much of Track's daily activities are centered around twice-weekly walking track inspections. [See WMATA Track Standards Manual §400.] Track Walkers perform such inspections, primarily during first shift. Track Walkers produce a report of their walking inspections each day, and submit this report for management review. The reporting process also includes inputting defects, maintenance items, and updates on existing (known) issues into a database.

There is also a significant amount of repair, maintenance, and corrective activity that takes place across all shifts, but largely during overnight hours. These maintenance activities are based in large part on the inspections performed by Track Walkers. Repairs are documented in Work Order Tracking and Daily Work Report documents. Documentation on work completed subsequently is given to Track Walkers, who are required to inspect and verify the repair.

Additional inspections include checks of track geometry and internal rail defects. Both are accomplished with specialized (rail vehicle-mounted or high-rail vehicle-mounted) equipment.

Switches receive an additional visual inspection monthly. There is also a joint quarterly switch inspection performed by Track and ATC (TSSM Automatic Train Control) personnel. This joint inspection is a commendable practice.

On a higher level, Supervisors, Maintenance Managers, and Superintendents are required to make regular visual inspections of their track territory.

Evaluation Criteria

1. WMATA's Track department was evaluated based primarily on its Track Standards Manual;

2. External guidelines, including American Public Transportation Association (APTA) Standard for Rail Transit Inspection & Maintenance (APTA RT-S-FS-002-02) and Federal Railroad Administration Track Safety Standards (as found in 49 CFR §213) [N.B., This review appreciates that neither of these standards is legally binding on WMATA.]; and
3. Reviewer's professional judgment as needed.

Findings and Observations

Finding 34: Track Inspection Defect Database sheets sampled do not correspond completely with track conditions as found in the field; some cases of broken or missing track clips and bolts, as well as frog wear, were not recorded in the database.

This review inspected Yellow/Green line track segments including King Street to Braddock Road, Navy Yard to Waterfront-SEU, Georgia Ave.-Petworth to Fort Totten, and College Park-U of Maryland to Greenbelt. In those areas, we took note of track conditions including maintenance items and defects. These were subsequently compared to WMATA-supplied Track Inspection Defect Database sheets (current as of one week before). Most of the items noted in our inspection were also found in WMATA Track Walker database output, indicating that Track Walkers are finding and recording conditions appropriately. There were a few instances, however, where what we found in the field was not reflected in the database. These included broken/missing track clips in multiple locations, broken/missing plate hold-down bolts in multiple locations, and substantial wear on a track frog.

Finding 35: Some of the walking track inspections sampled were separated by seven (7) days, and therefore outside of the interval prescribed by WMATA Track Standards.

A sample of inspections was taken from four track segments (two areas in two directions / two tracks each) for dates in Fall 2006. Of 82 inspections checked, seven were a week apart from the previous inspection. WMATA Track Standards Manual §400.3 requires twice-weekly inspection with one calendar day interval between inspections. Additionally there were four inspections in the sample that had only one day between inspections (inspections conducted on consecutive days). This may have been due to supplemental inspections (e.g., visual follow-up on geometry inspections). The data associated with this finding follow:

Track segment C09-C15				Track segment K06-K08			
Trk 1	Days elapsed	Trk 2	Days elapsed	Trk 1	Days elapsed	Trk 2	Days elapsed
10/1/06		10/2/06		10/3/06		10/4/06	
10/4/06	3	10/5/06	3	10/6/06	3	10/11/06	7
10/8/06	4	10/9/06	4	10/13/06	7	10/12/06	1
10/11/06	3	10/12/06	3	10/19/06	6	10/14/06	2
10/14/06	3	10/16/06	4	10/20/06	1	10/18/06	4
10/15/06	1	10/19/06	3	10/27/06	7	10/21/06	3
10/18/06	3	10/23/06	4	10/31/06	4	10/25/06	4
10/22/06	4	10/25/06	2	11/3/06	3	10/28/06	3
10/26/06	4	10/30/06	5	11/10/06	7	11/1/06	3
10/29/06	3	11/2/06	2	11/14/06	4	11/4/06	3
11/1/06	2	11/6/06	4	11/21/06	7	11/8/06	4
11/5/06	4	11/9/06	3	11/24/06	3	11/15/06	7
11/8/06	3	11/13/06	4	11/28/06	4	11/18/06	3
11/12/06	4	11/16/06	3			11/22/06	4
11/15/06	3	11/20/06	4			11/25/06	3
11/19/06	4	11/23/06	3			11/29/06	4
11/22/06	3	11/27/06	4				
11/26/06	4	12/4/06	7				
11/29/06	3	12/6/06	2				
12/3/06	4	12/11/06	5				
12/5/06	2	12/16/06	5				
12/10/06	5	12/20/06	4				
12/15/06	5	12/23/06	3				
12/19/06	4	12/27/06	4				
12/22/06	3	12/30/06	3				
12/26/06	4						
12/28/06	2						
12/29/06	1						
Average overall:		4					

Observation 24: *WMATA’s Track Walker training program, as shown in the training class syllabi and tests received during this review, seems appropriate and inclusive.*

Observation 25: *The WMATA Track Standards Manual is a very good document, and does a good job of covering necessary information including inspection intervals and procedures, track tolerances, and many departmental responsibilities.*

A complete review of the document is beyond the scope of this assessment, but it certainly seems to be well thought-out, and is clearly kept up to date.

Observation 26: *The current system of track inspection and maintenance documentation, though not perfect, seems very good.*

One finding related to inspection documentation is shown below. Overall, though, the system seems to work very well. Track Walkers and supervisory staff alike do a very good job of being descriptive and thorough in their use of the forms. The Track

Inspection Defect Database, Maximo work orders, Maintenance Daily Work Reports, and other documentation seem to work very well together.

Persons Interviewed

- Mr. Anthony Adams, Superintendent Yellow/Green Line Track, TSSM
- WMATA Track Walkers as part of field inspection process

Facilities Visited

Track segments including:

King Street (C13) to Braddock Road (C12)

Waterfront (F04) to Navy Yard (F05)

Georgia Ave. (E05) to Fort Totten (E06)

College Park (E09) to Greenbelt (E10)

Documents/Information Reviewed

- Washington Metropolitan Area Transit Authority Track Standards Manual, *Maintenance and Inspection Manual for Track and Structures Personnel*, effective July 1, 2006
- Track Inspection Defect Database printouts, including blank forms and completed forms for the following segments and dates:

C09 to C15 Trk1	05/20/07 - 05/26/07
C15 to C09	05/13/07 - 05/19/07
E02 to E07 Trk2	05/20/07 - 05/26/07
E02 to F07 Trk1	05/20/07 - 05/26/07
E07 to E02 Trk1	05/20/07 - 05/26/07
E07 to E10	05/20/07 - 05/26/07
E10 to E07	05/20/07 - 05/26/07
F07 to E02	05/20/07 - 05/26/07
F07 to F11 Trk1	05/20/07 - 05/26/07
F07 to F11 Trk2	05/20/07 - 05/26/07

Track-related work orders including:

251887

254983

957188

1215717

1436615

1786486

2102618

2112854

2112922

2112975

2113108

Maintenance Daily Work Report samples from Yellow-Green lines for:

3/11/07

3/12/07

3/13/07

3/14/07

Stations, Tunnels and Structures

Description

The implementation of WMATA's SSPP was reviewed as it relates to stations, tunnels, bridges, retaining walls and other structures. This includes vent shafts, fan shafts, aerial structures, and ancillary structures, including parking garages and retaining walls. Structures that extend into or cross the WMATA right-of-way (e.g. bridges, pedestrian walkways) are also addressed.

Current Situation

According to the SSPP, the Office of Track and Structures (TRST) of the Department of Rail services and maintains all tunnels and structures. Overall, WMATA has a good structural inspection and maintenance program in place. The current inspection program is adequate and should be maintained on the established schedule.

- | | |
|---------------------------------------|-------------|
| • Tunnels, Vent Shafts and Fan Shafts | Bi-Annually |
| • Pumping Stations | Weekly |
| • Elevated Structures | Annually |
| • Stations and Ancillary Structures | Annually |
| • Shops and other Service Buildings | Annually |

Track Structures & System Maintenance (TSSM/STRC) is responsible for performing detailed structural inspection on a variety of WMATA dynamically loaded structures including: 86 stations (47 below ground and 39 above ground); 15 aerial structures; 55 WMATA bridges; 13 pedestrian bridges; 6 yard access bridges, 577 escalator support structures, 192 elevator shafts and support structures; 510,988 linear feet (LF) of tunnels, 603,398 LF of ROW security fencing and gates; 52,280 LF of yard security fencing and gates, 15 pedestrian tunnels; 11 bus garages; 175,551 LF of retaining walls; 22 parking garages and 295 shaft structures.

The structural inspection group maintains and processes over 3000 reports per year. It is from these reports that Maintenance Managers develop both maintenance and capital programs, and Infrastructure Renewal Project Managers develop long range Capital Improvement programs.

The Structural Field Inspectors consist of five inspectors for Red Line, four for Blue/Orange Line, and five for Green/Yellow Line. The field inspectors report directly to the Maintenance Manager of each line. Their inspection reports are submitted to the Technical Support Supervisor for review, and routed to the Superintendent, Structural Engineer and finally to the desk of the General Superintendent.

In addition, inspections are made in response to observations/reports from Train Operators and maintenance personnel that indicate changed or unusual conditions in

the system. Where problems emerge, resolutions are in planning or underway, depending on the urgency and magnitude of the problem. Except for emergency actions, funding is limited and has to be prioritized.

All the Inspection records are properly filed and stored in the Office of Rail Track/System Maintenance Building located at 3101 Eisenhower Avenue, Alexandria, VA 22314. All files are properly color coded and maintained for a minimum of five years.

WMATA Bridge Inspectors are certified in "Bridge Safety Inspections". NICET (National Institute for Certification in Engineering Technologies) is a Nationally Recognized certification organization based in Alexandria Va. Most States require a NICET certification for their bridge inspectors.

WMATA conducts Structural Inspections annually. ALL of WMATA bridges are inspected by NICET-Certified inspectors and the reports are reviewed by a Professional Engineer. All pier footing and foundations that are in rivers or streams are inspected every 3 years for erosion and scour.

WMATA bridge inspection program is modeled after the National Bridge Inspection Standards and the Standard for Rail Transit Structure Inspection and Maintenance Authorized September 22, 2002 by the APTA Rail Transit Standards Policy Committee.

WMATA is currently in the process of procuring a Bridge Inspection Management software package from InspectTech Inc. to streamline the structural inspection and management process and improve data documentation.

WMATA's entire line structure system is generally in good condition. Newer stations like Morgan Boulevard have more up-to-date design features and better lighting systems. There was one shattered glass window at Morgan Boulevard station at the time of inspection.

WMATA superstructures are mainly using the A588 steel box sections, and concrete or pre-stressed box sections. Some older superstructures are painted steel girder systems or plate girders with floorbeams systems. Substructures are mainly concrete reinforced.

Evaluation Criteria

The following evaluation criteria were used in the review:

1. FTA SSO Regulations
2. Pertinent Technical Manuals (ACI, AISC, Steel Construction Manual)
3. WMATA Procedures
4. WMATA Forms, Cut Sheets and Reports]
5. WMATA Safety Rules and Procedure Handbook
6. WMATA SSPP

Findings and Observations

Finding 36: The availability of Record Drawings needs to be improved.

Record Drawings for the Metrorail System are available, but their access is sometimes cumbersome and time consuming. Most construction records are at different depositories and many records are not readily available for use. WMATA is changing this condition. As time and funding permit, the record drawings, as well as the inspection and maintenance records, are entered into WMATA's intranet for improved availability. WMATA needs to ensure that this program progresses in a timely manner and that all Record Drawings are made available and kept up to date. This should be accomplished as part of a formal configuration management program.

Finding 37: WMATA should update its Condition Rating Codes Guidelines to be in accordance with current NBIS standards for bridge inspection classification.

The current condition rating codes guidelines rated the structure condition from 1 to 4 (Very Good to Poor), EEA (Engineering Evaluation Action), and SH (Safety Hazard, non structural condition). This system is adequate for Metrorail, However, it does not line up with the current NBIS (National Bridge Inspection Standards – which are offered by the Federal Highway Administration) coding system. Also, it is recommended that WMATA should add an “Emergency” condition, which will warrant the inspector and the department to take immediate action for any condition found in the field warranting immediate attention that could present an acute safety hazard. NBIS standard coding guidelines are the most common industry practice among most state and federal agencies.

Finding 38: Substructure conditions need to be monitored, as minor structural movement at reviewed locations was noted and should be addressed.

At Sandy Grove Bridge, one of the wingwalls moved outward by 1” at the top juncture with the abutment. This differential movement needs to be monitored periodically. There are mapcrackings noted at the both abutments of First Street Bridge. One full height diagonal crack, with efflorescence, was noted at the north abutment of the Addison Road Aerial structure. WMATA should address these issues and determine if they are issues at other locations.

Finding 39: Clearance sign location may not be well-placed at the Addison Road Pedestrian Bridge and minor damage is present (possibly the result of the poor markings). This may be an issue elsewhere throughout the system.

There is evidence of impact damage at two locations of the fascia beam at the Addison Road Pedestrian Bridge. This bridge is posted for 11'-6” which is below the standard vertical clearance. It is situated right above the entrance to the parking lot for Addison Road station, so it is unlikely that most drivers would see the posted sign before they drive underneath the bridge. WMATA should take additional steps to mark or sign the bridge height with enough notice to reduce driver error and bridge strikes.

Additionally, the vertical clearances at the M Street Bridge and K Street Bridge should be field verified and evaluated. Two areas of impact damage are noted at the bottom flange of fascia beam.

Finding 40: Detailed, hands-on inspections should be conducted of non-redundant, through-girder bridges and fatigue detail areas.

There are several WMATA bridges that are considered non-redundant structures. In this type of structure, failure of one member can cause the collapse of the entire bridge. In addition to existing inspections, hands-on, detailed inspection of the superstructure should be performed. Examples are Eastern Avenue Bridge and 580 Bridge. Other areas of concern for FCM (Fracture Critical Member) inspection include horizontal web stiffeners at fascia beams of the Westmoreland Street Bridge and Williamsburg Boulevard Bridge, and end bottom cover plate E' fatigue detail at the stringers for the Route 7 Bridge.

Finding 41: WMATA bridges over local roads should have pier bent protection added.

West Falls Church Yard Access Bridge has no protection on its center pier, which is located in the middle of a local roadway. Protection guide rail or concrete crash wall and impact attenuator should be considered to protect the pier from being hit by the local traffic. Other examples include the L Street Bridge, Florida Avenue Bridge and M Street Bridge.

Finding 42: Certain WMATA structures do not currently meet the rocker bearing standard set by AASHTO.

Several WMATA bridges have rocker bearings that need to be further evaluated for seismic resistance purposes. It is recommended by AASHTO that these type of bridges' bearings need to be replaced with elastomeric bearings to meet the standard AASHTO seismic design requirements. Examples are Aspen Road Bridge, Van Buren Bridge, Riggs Road Bridge, Kansas Avenue Bridge, Piney Branch Bridge and especially George Ave Bridge, which has a severe skew angle. WMATA should consider a program to evaluate, prioritize, and retrofit these structures as appropriate.

Finding 43: Multiple instances of cracked or missing platform floor tiles and missing mortar/grout were noted.

There are several above ground stations with cracked or missing floor tiles, missing mortar/grout and cracked tactile edge tiles. This situation is especially obvious at the above ground station at areas beyond the overhead gull wing roof where the platform is exposed to the sun, rain and snow. Examples are New Carrollton Station, Shady Grove Station, Twinbrook Station, Minnesota Avenue Station, Silver Spring Station, Takoma Station and Rockville Station. Floor tiles repair work was noted at East Falls Church Station.

Finding 44: Skid-resistant surfaces at escalator thresholds are worn out.

Most of the skid-resistant surfaces at both ends of the escalators are deteriorated and do not seem to provide significant protection against slippage on the metal escalator threshold plates. This is noted at most stations viewed. WMATA should consider the value of this skid-resistant surface, and whether or not it needs to be renewed.

Observation 27: As identified in 2004, water intrusion is present throughout the system.

WMATA clearly recognizes the importance of this issue and has made significant progress in mitigating the potential problems through several Infrastructure Renewal Programs. It should remain diligent in identifying water intrusion through routine inspections and implementing plans to stop leaks or divert drainage.

Water intrusion is common, not only in WMATA's tunnels and other underground facilities, but in structures that extend below the groundwater level. WMATA's stations and tunnels, accordingly, show some leakage problems.

Although most of WMATA's tunnels have concrete liners, there are a few sections of tunnels with steel liners that are subject to water intrusion and prone to rust damage. Under a task in an existing Infrastructure Renewal Program (IRP) contract, most of the steel tunnel liners have been cleaned and painted. A comprehensive inventory of leaks in all of WMATA's tunnels has recently been completed by the WMATA Office of Rail Track and Structures. Over the last 10 years, the number of documented leaks has been dramatically reduced through a localized grouting program.

Industry-wide research for building a "dry" tunnel has been, and is, on-going. Some success has been achieved with tunnels built with double-walled (concrete) liners [e.g. the "New Austrian Tunneling Method" (NATM)] where a waterproofing membrane between the initial and final tunnel liners diverts the intruding water into the tunnel drainage system. The water diversion concept is also used as a corrective measure in older concrete liners.

At the time of inspection, water leakage was noted at the equipment floor at Twinbrook Station. Rust stains were also noted along the joints of side walls at Benning Road Station.

Water leakage was noted from the gull roof through the joint with the center glass roof at the time of the site review on a rainy day at Addison Road station and Landover Station. Loose or missing joint fillers were noted between the gull roof panels at Deanwood Station and Minnesota Avenue Station. Water ponding is noted at both sides of the top edge of the gull roof at Cheverly Station.

WMATA clearly recognizes the importance of this issue and should continue to monitor and address water intrusion problems as part of its regular maintenance programs.

Observation 28: As found in 2004, Alkaline Aggregate Reaction (AAR) is present in many exposed concrete surfaces. WMATA has taken steps to mitigate

this problem such as making modifications to the concrete specifications for aggregate and cement composition. In addition, IRPs are conducted to seal the cracks to prevent further damage. This program has been effective so far and needs to be maintained in the future.

Alkaline Aggregate Reaction (AAR) has manifested itself as microcracking or “random mapcracking.” If left unchecked, this can result in deterioration of the concrete surfaces. AAR may not become evident until a number of years after the completion of construction. The most vulnerable surfaces are open platforms and sidewalk areas, where moisture and de-icing compounds are used.

AAR is a problem affecting many concrete structures, and research for its control is ongoing. It is recommended that WMATA continue to repair deteriorated areas and seal out moisture from exposed surfaces.

WMATA has control measures in place, and its structural inspectors are aware of the AAR symptoms in concrete structures. Specifications for concrete have been revised to include improved controls for coarse aggregate and use of low alkali cements.

Observation 29: Fine to Medium cracks with efflorescence were observed on concrete walls and ceilings.

Site visits to the stations revealed several areas exhibiting various fine to medium cracks with efflorescence especially at the joints between side walls, and the concrete walls and ceilings at the escalators area. Stations having such defects included Huntington Station, Wheaton Station and Medical Center Station. It is also common to see fine to medium cracks with light efflorescence at the end walls of underground stations. Examples are Bethesda Station, Deanwood Station, Forest Glen Station and Capital Heights.

Observation 30: Accessibility to inspect the condition of the concrete box interior surfaces is lacking.

Some of the concrete box superstructures have no access hatches for inspectors to assess the condition of the box interior surfaces. Examples are the King Street Bridge and C99 Flyover Bridge. WMATA should consider providing new openings at the end bearing locations like the one provided at the National Airport aerial structure.

Observation 31: This assessment noted a gap between the platform and the train door opening floor, which may pose a tripping hazard.

During our site visit we noted that at some stations there is a differential in height between stopped train level and the platform. This approximately 1” differential could be a tripping hazard to the public. Two examples are at the Metro Center upper level for the Blue/Orange line, and Pentagon at the C-line (Yellow Line). This may indicate a platform design error or vehicle suspension problems.

Observation 32: *The improved lighting at underground stations such as Foggy Bottom should be considered for wider implementation.*

While most underground stations have adequate illumination, lighting throughout the system could be enhanced. The newly improved lighting system at the Foggy Bottom station is an improvement over the older design. Many of the above ground stations lighting systems have burnt-out bulbs. Examples are Capital Heights Station, Brookland Station, Rhode Island Station and New York Station.

Observation 33: *Pedestrian Bridges are in good condition, but need minor floor slab crack sealing.*

Generally all pedestrian bridges are in good condition. The Frederick Avenue pedestrian bridges have a few minor fine cracks along the vertical column lines. The Rockville Pedestrian Bridge also has full width fine to medium cracks at the floor slab at vertical member lines.

Observation 34: *The Design Criteria and Standards are regularly updated.*

It is important that the *Design Criteria and Standards* are kept up to date to meet safety standards and operational needs. WMATA has a program in place to ensure that they are continually updated to conform to new governmental regulations, Industry Standards, and feedback from operations experience. The Transit Operations, Maintenance, and Safety Departments should review and provide input into the updates. Designs for new construction and the IRP projects conform to current *Design Criteria and Standards*, where feasible. This practice is effective in keeping the *Design Criteria and Standards* up to date and should be maintained in the future.

Observation 35: *Monitoring and control of adjacent construction is essential for the safety of patrons and Metrorail structures.*

Many buildings and other structures have been constructed adjacent to WMATA facilities. During construction (excavation support, construction equipment loadings), and after the adjacent facility is in use (debris falling off buildings, spalling of materials from overhead bridges, intrusions into right-of-way [ROW] fences), WMATA's structures and safety could be adversely affected.

WMATA recognizes the importance of this issue, and the Adjacent Development office, under the Office of the Chief Engineer, defines standards for construction in close proximity of WMATA ROW (e.g. piles may not be driven within influence zones of tunnels, movement monitoring programs are subject to WMATA approval, cranes may not swing over operating tracks, and potential intrusion conditions on structures crossing WMATA facilities have to be acknowledged by WMATA). Most adjacent jurisdictions are cooperating in this effort to assure safety. This program has been successful so far at ensuring the safety of WMATA passengers and staff, and clearly needs to be kept up in the future.

Observation 36: The inspection staff is well qualified.

Structural inspections are undertaken by well-trained staff. Nominally, inspection staff are NICET Level I to IV certified, with a minimum of 120 hours NHI training hours. The inspectors are trained in the condition coding system developed by the Office of Rail Track and Structures.

Observation 37: Vent and Fan Shafts, and Pumping Stations are generally in good condition.

Vent and fan shafts are a vital part of passenger safety system of WMATA. They are part of a network of approximately 90 emergency exits. Also, since most of the underground portion of the Metrorail System is below the groundwater level, the operability of pumping stations is critical.

Ventilation fans and drainage pumping stations are maintained by the Office of Plant Maintenance. A well-defined program of preventive maintenance for fans and pumps is in place. Routine inspections confirm that there are no obstructions in the vent and fan shafts that could adversely impact ingress and egress.

Persons Interviewed

- David Knights, General Superintendent – Track & Structure/System Maintenance (TSSM), Office of Rail Track Structure System Maintenance.
- Clay Bunting, Superintendent STRC – Track & Structure/System Maintenance (TSSM), Office of Rail Track Structure System Maintenance.
- Raymond Boissonneault II, Technical Support Supervisor – Track & Structure/System Maintenance (TSSM), Office of Rail Track Structure System Maintenance.

Facilities Visited

- Jackson Graham Building, WMATA Headquarters
- Carmen Turner Building, Maintenance and Training Headquarters
 - Office of Rail Track and Structures
 - Office of Plant Maintenance
 - A-line (Red-Line)
 - B-line (Red Line)
 - C-Line (Orange and Blue Line)
 - D-Line (Orange and Blue Line)
 - E-Line (Green Line) – Not visited
 - F-line (Green Line) – Not visited
 - G-Line (Blue Line)
 - J-Line (Blue Line)
 - K-Line (Orange Line)
 - L-Line (Blue line)
- Tunnels
 - Medical Center to Bethesda (Concrete lined tunnel sections)

- Fan and Vent Shafts
 - Medical Center to Bethesda

Documents Reviewed

- WMATA Tunnel Structural Inspection Checklist
- WMATA Station Structural Maintenance Inspection Checklist
- Inspection Branch Deficiencies Report Flow Chart (Graphic defining coordination between Inspection & Maintenance Dept's.)
- Office of Track and Structures (TRST) Organization Chart
- MPLN Monthly Preventive Maintenance Summary, July 2003
- WMATA Structural Maintenance Inspection Report
- WMATA Maintenance Plan for Metrorail Structures, March 1979
- 2007 WMATA TSSM/Rail Structure Inspection Schedule
- Eisenhower Avenue, Station Structural Maintenance Inspection Report (5-3-07)
- Condition Rating Codes Guidleline, dated 9-11-03
- 2006 Structure Inspection Compliance Schedule
- WMATA Track & Structures/TSSM Structure Maintenance and Inspection Manual
- WMATA Station Structure Maintenance Report
- WMATA TSSM/rail Structure Inspection Schedule

Elevators and Escalators

Description

WMATA's Metrorail system utilizes over 800 elevators and escalators to facilitate passenger movement into, out of, and within passenger stations. These include both older, new, and rebuilt units. There are escalators, hydraulic elevators, and traction elevators. There are also a number of non-passenger units in shops and WMATA facilities, which were not a major part of this review.

Current Situation

WMATA's Elevator Escalator Department, or ELES, is responsible for maintenance, inspection, and repair of more than 500 of the 854 WMATA elevator and escalators. Contractors maintain the balance of the units. ELES continues on a plan to take over as much of the contract maintenance as possible.

ELES includes a number of Journeymen/Mechanics, assisted by Technical Skills Program personnel. These two types of personnel are responsible for maintenance, inspection, and repair tasks on elevators and escalators. The ELES group works out of Carmen Turner Facility as its main office, and has forward parts and field offices across the Metro system.

WMATA's ELES inspections revolve around monthly (B), quarterly (C), and annual (E) PMIs.

Evaluation Criteria

1. WMATA's ELES Department activities were evaluated primarily using its own internal procedures and standards, especially existing preventive maintenance instructions and forms;
2. As appropriate, external standards such as the maintenance and inspection guidelines promulgated by ANSI in its A17 elevator and escalator standard; and
3. When WMATA or external criteria do not exist, or are inappropriate, the reviewer's professional judgment is used.

Findings and Observations

Finding 45: The preventive maintenance inspections (PMIs) reviewed for eight escalators and three elevators (two years' records each) showed significant variation in schedule attainment, including many late inspections.

While the overall average for the monthly inspections is 34 days, there is a wide variation in inspection intervals. Many inspections intervals number 40, 50, or more days. [Inspection data are shown below.]

Finding 46: Monthly (B), quarterly (C), and annual (E) ELES PMIs do not always occur in a predictable fashion.

It seems that the yearly inspection cycle should be {B, B, C, B, B, C, B, B, C, B, B, E}, or something similar. (Indicating that quarterly inspections(C inspections) are performed every third month, or quarterly. Thus, two monthly (B) inspections are followed in the third month by the quarterly (C) inspection.) The pattern should always be the same if the proper inspections are conducted on time. The sample set (see data below) shows that there is no real pattern to PMIs performed. Some units have five, six, or more B inspections performed in a row. Some show one E inspection over a two-year period; some show none at all. This indicates that quarterly inspections are not performed on a quarterly basis (if at all) and that at least one annual inspection was missed.

Finding 47: The PMI forms for elevators and escalators could be improved by adding spaces for objective data entry, checkmarks, and additional comments.

The elevator forms and the escalator form (documents 50.300, 50.332, and 50.331, all revised 05/30/02) are very good outlines of the tasks to be performed in each PMI, and do include a space for Mechanic comments. In review of completed forms, however, this review found very few comments, and very little objective data such as measurements, tolerances, etc. While the amount of work and thought put into these forms is evident, ELES should consider adding space for objective data and measurements. Such data are important for maintenance history and management review. For example, managers may want to know if a particular escalator is nearing, but not at, the limits for step-to-skirt clearance. Additionally, perhaps more importantly, adding objective data and useful information requires more Mechanic involvement and investment in the PMI inspection process.

Finding 48: The completed PMIs reviewed show a number of discrepancies that should be avoided in the future, including multiple handwritten copies of the same inspection, forms with no year in the date, etc.

There are a number of paperwork issues that might pique negative interest from outside reviewers. These include multiple inspections on the same day or within days of each other (see data below). Two copies of one inspection (WO 295794, on 06/27/06) was found on two records – two handwritten color forms. Many completed PMIs have no supervisor review signature. Many lack a year in the field for date completed. Very few have substantive comments. This review appreciates that some of these issues arise from filing or paperwork mistakes, or other oversights. Still, it is important that ELES maintain consistency in its inspection paperwork.

Observation 38: The Technical Skills Program training and apprenticeship program, as described during this review, seems to be a very good method for acquiring skilled, educated ELES Mechanics.

Observation 39: ELES has a formula for how many elevator and escalator units it can manage per Mechanic.

This formula is used to determine staffing and how many units can be taken back from outside contractors. While this review is not qualified to comment on the appropriateness of the particular ratio, having such a system and standard is commendable.

Observation 40: *This review assessed the content of contractor maintenance versus WMATA's own practices and forms, and found them to be substantially similar.*

WMATA has also asked its contractors to use WMATA's own forms for their work. This helps to ensure uniformity and consistency.

Observation 41: *The PMI inspection process described on the elevator forms and escalator form is a very good outline of required maintenance tasks.*

The list seems inclusive and appropriate to WMATA's ELES equipment.

Observation 42: *This review noted a few minor issues at ELES units inspected in the field, but did not encounter any major or immediate safety issues.*

Minor issues were transmitted to ELES personnel on site immediately. The units reviewed demonstrated a good ongoing maintenance program.

Observation 43: *Station Managers supplement ELES inspections with multiple daily inspections and functional tests.*

These are excellent practices, and are one of the primary ways ELES identifies new maintenance issues.

Persons Interviewed

- Mr. Jeffrey Griffin, Project Manager, Contract Maintenance
- Mr. David Lacosse, Director
- Mr. Cedric Watson, Superintendent
- Mechanics as part of field inspections.

Facilities Visited

- Carmen Turner Maintenance Facility ELES office
- Carmen Turner Maintenance Facility passenger elevator
- Largo Town Center elevators 1, 2, and 3, escalators 2 and 4, associated control rooms for all units
- Prince George's Plaza escalators 1, 2, and 3
- Minnesota Ave. elevators (two)

Documents/Information Reviewed

- ELES Organizational Chart, received 06/20/07
- WMATA Elevator/Escalator System Map, 05/21/07
- ELES Responsibility Matrix, 05/21/07
- Elevator PM Procedures – Traction Units (50.331, 05/30/02)
- Elevator PM Procedures – Hydraulic Units (50.332, 05/30/02)
- Escalator PM Procedures (50.300, 05/30/02)
- Elevator/Escalator Repair Log (50.125, 12/05)
- SSOP #9 – Escalator Operations (Station Manager inspections: draft 11/01/05)
- Prints at various elevator installations

Completed Preventive Maintenance Inspection data reviewed for the following locations and dates:

Arlington Cem C06X01				Brookland B05X01			
Type	Date	Days elapsed	Comments	Type	Date	Days elapsed	Comments
B	6/20/05			B	6/10/05		Year not recorded
C	7/19/05	29		B	7/6/05	26	Year not recorded
B	8/16/05	27		C	9/2/05	56	Year not recorded
B	9/15/05	29		B	11/4/05	62	Year not recorded
E	10/5/05	20		B	12/28/05	54	Year not recorded
B	11/17/05	42		B	2/21/06	53	
B	12/20/05	33		B	5/30/06	99	
C	1/19/06	29		B	7/27/06	57	
B	2/7/06	18		B	8/9/06	12	
Semi-Annual	3/30/06	53		B	9/8/06	29	
B	4/24/06	24		B	9/14/06	6	
B	6/16/06	52		B	5/23/07	249	
B	6/23/06	7					
B	8/11/06	48					
B	9/27/06	46					
B	10/25/06	28					
C	11/15/06	20					
B	12/21/06	36					
C	1/11/07	20					

Columbia Hts E04X01				DuPont A03501			
Type	Date	Days elapsed	Comments	Type	Date	Days elapsed	Comments

C	6/1/05			B	6/20/05			All for this unit: Older form used No place for Supv. signature
C	7/12/05	41		B	7/7/05	17		
B	8/3/05	21		B	8/24/05	47		
B	9/19/05	46	WO 1030846	B	9/16/05	22		
B	10/27/05	38	WO 1030842		10/6/05	20		
B	11/13/05	16		B	12/12/05	66		
C	12/19/05	36		B	1/26/06	44		
B	1/26/06	37		B	2/22/06	26		
B	2/22/06	26		C	3/3/06	11		
C	3/22/06	30		B	4/4/06	31		WO 888279 WO 723996
B	4/17/06	25		B	5/1/06	27		
C	5/10/06	23		C	6/23/06	52		
B	6/7/06	27		B	7/27/06	34		
B	7/5/06	28		B	7/27/06	0		
E	8/10/06	35		B	8/23/06	26		
B	9/4/06	24		C	9/28/06	35		
B	10/3/06	29		E	10/30/06	32		
B	10/3/06	0		B	11/14/06	14		
B	11/28/06	55		B	12/18/06	34		Type unclear Year not recorded
B	12/13/06	15		C	2/1/07	43		
B	2/20/07	67		B	2/26/07	25		
				B	4/4/07	38		
				E	5/2/07	28		

Farragut W C03E01

Type	Date	Days elapsed	Comments
B	6/19/05		Year recorded not
C	7/16/05	27	
B	8/11/05	25	No Supv. Signature (all forms this unit)
B	9/10/05	29	
E	10/22/05	42	

Foggy Btm C04X01

Type	Date	Days elapsed	Comments
B	1/18/05		
	6/23/05	155	
B	7/29/05	36	
B	8/28/05	29	
B	9/29/05	31	

Type	Date	Days elapsed	Comments	Type	Date	Days elapsed	Comments
B	11/12/05	20	Also very few comments on this unit	B	10/28/05	29	Type unclear
B	12/10/05	28		B	12/14/05	46	
C	1/7/06	27		B	2/1/06	47	
B	2/18/06	41		B	2/28/06	27	
B	3/25/06	37		E	3/15/06	15	
C	4/29/06	34		C	4/18/06	33	
B	5/25/06	26		E	5/31/06	43	
B	6/24/06	29		B	6/16/06	16	
B	7/24/06	30		C	7/27/06	41	
C	8/11/06	17		B	8/26/06	29	
B	9/19/06	38		B	9/29/06	33	
E	10/17/06	28		B	10/31/06	32	
B	11/20/06	33		C	11/27/06	27	
B	1/30/07	70		B	12/19/06	22	
B	2/27/07	27		C	1/17/07	28	
B	3/29/07	32		B	2/28/07	41	
B	4/20/07	21		B	3/23/07	23	
Glenmont B11X01				Metro Ctr A01W01			
Type	Date	Days elapsed	Comments	Type	Date	Days elapsed	Comments
B	6/9/05		Very few comments on this unit	B	6/29/05		No Supv. signature Very few comments
B	10/28/05	139		C	7/5/05	6	
C	11/11/05	13		B	8/26/05	51	
B	12/22/05	41		B	9/28/05	32	
B	3/8/06	76		B	10/18/05	20	
E	4/28/06	50		C	11/17/05	29	
B	5/7/06	9		B	12/23/05	36	
B	9/8/06	121		B	1/24/06	31	
B	9/27/06	19		B	2/28/06	34	
B	10/11/06	14		C	4/1/06	31	
B	11/7/06	26		C	4/20/06	19	
C	1/10/07	63		B	5/31/06	41	
B	2/19/07	39		B	6/23/06	23	
C	2/21/07	2		B	7/18/06	25	
E	2/26/07	5		C	8/17/06	29	
B	3/2/07	6		B	9/7/06	20	
B	3/6/07	4		WO 2023829	E	10/25/06	
B	3/7/07	1	WO 2023885	B	11/20/06	25	
B	3/8/07	1	WO 2024056	B	12/28/06	38	
C	3/12/07	4		C	1/23/07	25	
E	3/15/07	3					
B	4/13/07	28					
C	5/10/07	27					

Minnesota D09X02

Type	Date	Days elapsed	Comments
C	6/14/05		
B	7/27/05	43	
B	8/10/05	13	
			Occasional comments
C	9/22/05	42	
B	10/8/05	16	
C	12/3/05	55	
			E.g., WOs Open
B	1/24/06	51	
B	2/16/06	22	
C	3/9/06	23	
B	4/11/06	32	
C	5/6/06	25	
B	6/10/06	34	
B	7/19/06	39	
C	8/18/06	29	
B	9/27/06	39	
B	10/9/06	12	
B	11/1/06	22	
C	12/6/06	35	
B	1/17/07	41	
B	2/24/07	37	

Navy Yd F05X02

Type	Date	Days elapsed	Comments
B	12/17/04		
B	1/25/05	38	
C	2/7/05	12	
B	3/23/05	46	
B	4/21/05	28	
B	5/17/05	26	
B	6/22/05	35	
B	7/10/05	18	
B	8/18/05	38	
B	9/19/05	31	
B	10/24/05	35	
C	11/28/05	34	
B	1/19/06	51	
B	2/20/06	31	
B	3/21/06	31	
B	4/27/06	36	
B	5/16/06	19	
B	6/27/06	41	WO 295797
B	6/27/06	0	WO 295797
C	7/23/06	26	
B	8/27/06	34	
B	9/21/06	24	
C	10/19/06	28	
B	12/19/06	60	

Tenleytown A07X01

Type	Date	Days elapsed	Comments
MLY	6/30/05		
QLY	7/23/05	23	
MLY	8/23/05	30	
MLY	9/20/05	27	
MLY	10/24/05	34	
MLY	11/26/05	32	
MLY	12/10/05	14	
MLY	1/22/06	42	
MLY	2/25/06	33	
ANN	3/30/06	35	
MLY	4/8/06	8	forms
MLY	5/5/06	27	Contractor
QLY	6/16/06	41	WMATA form
B	7/28/06	42	WMATA form
B	2/28/07	210	WMATA form
Average		34.18	

Vehicles

Description

On its five heavy rail lines, WMATA operates a fleet of approximately 1020 railcars. The fleet consists of six series of cars: 1000-series (originally 300 cars), 2000-series cars (originally 76), 3000-series (originally 292), 4000-series (originally 100), 5000-series (originally 192), and 6000-series (order not completed—70 cars in the operating fleet as of the date of the review). A number of cars have been removed from the fleet over the years as a result of accidents. While car age differs by about thirty years, all series of cars look the same except for minor differences from series to series, and the WMATA cars have a distinctive look.

Metrorail cars are seventy-five feet long, ten feet wide, and ten feet, ten inches high. Car weight is approximately 77,000 pounds. All cars operate in semi-permanently-coupled married pairs with an operating cab at each end of the pair. Each car is equipped with three double passenger doors per side as well as a crew door at each end. Passenger seating consists mainly of cross seats; the number varies by car series.

Each car is equipped with four 175-horsepower traction motors. The 1000- and 2000-series cars were originally equipped with d.c. traction motors and cam controls. The 1000-series cars were converted to a.c. traction motors and IGBT controls in the 1990s, and the 2000-series cars were converted recently. The 3000- and 4000-series cars were originally equipped with d.c. traction motors and chopper controls. The 3000-series cars are in the process of being converted along with the 2000-series cars. On the 5000- and 6000-series cars, a.c. traction motors and IGBT controls are original equipment.

Maximum acceleration rate is 3.0 mphps (miles per hour per second) in both automatic and manual operation. The full service braking rate is 2.2 mphps. In addition, the maximum service braking rate of 3.0 mphps is available in manual operation. Finally, emergency braking is at a rate of 3.2 mphps. Emergency braking is available to the train operator through the “deadman” feature (release of the operating handle), the emergency position of the operating handle, and the large emergency pushbutton (“mushroom”) switch on the console. Only the pushbutton is available to the operator when the train is in automatic mode.

Braking consists of a combination of friction/disc brakes and dynamic (regenerative if the line is receptive) braking using the traction motors. Emergency braking is friction only. Parking brakes are manually applied via a hydraulic pump (1000-series) or a ratchet mechanism with chains and cables (all other series).

Current Situation

Railcars are maintained at Brentwood, New Carrollton, Shady Grove, Alexandria, West Falls Church, Greenbelt, and Branch Avenue. Each car pair is assigned to a

maintenance location where it receives all A, B, and C preventive maintenance inspections. (A (performed every 45 to 90 days depending on car series), B (every 4½ to 6 months), and C (yearly) preventive maintenance inspections) Cars may, however, run anywhere on the system (with the exception of the 6000-series cars which are kept on the Green Line for warranty purposes), and repairs and intermediate inspections (performed at half or one-third the interval of lettered inspections or about one month) may be performed at any of the above locations.

Evaluation Criteria

1. WMATA System Safety Program Plan
2. WMATA Preventive Maintenance Inspection Procedures
3. General industry standards.

Findings and Observations

Finding 49: Maintenance work does not always follow the written maintenance procedures.

The reviewer observed the teardown of a railcar truck, comparing the work with the written procedures available in the truck shop. There were certain differences between the two. All written procedures should be kept up to date, changed, as necessary, and followed by the maintenance workers. When a worker or crew suggests a change, that change should be processed by the appropriate procedures and incorporated, with or without change, if appropriate.

Finding 50: Documentation of preventive maintenance inspections (PMIs) is not consistent throughout the Car Maintenance Department.

It is suggested that a standard format be developed for checklist forms for all tasks performed on preventive maintenance. Comprehensive checklists will maximize the likelihood that all tasks are performed properly. The format for all car series and all locations could be the same; only the tasks need be different. This will reduce the chance of error by maintenance persons moving from one location to another and for others reviewing maintenance records. This standard format should be extended to the data which are entered into MAXIMO.

Finding 51: Pre-determined, acceptable ranges for many readings taken on PMIs are not always listed on the PMI record documents (checklists).

For various tests, such as the wheel gauge test, there is an acceptable range of measurements within which the reading is valid. Listing the acceptable ranges of all readings taken on the PMI means that the maintainer does not have to rely on memory or look up the information. This is a quality assurance step.

Finding 52: Many readings taken during PMIs are not recorded on the PMI documents or on the computerized records.

The reviewer found that PMIs simply noted compliance or non-compliance, but without an actual recorded value, it is impossible to verify this. Ensuring that the maintenance worker records the actual reading is another step to ensuring that the reading is acceptable.

Finding 53: Procedures for calibration of tools, gauges, and equipment are not consistent throughout the Car Maintenance Department.

At one location torque wrenches were calibrated yearly. At another location torque wrenches were tested, before each use, on a gauge in the tool crib and sent out for calibration when then failed the test. WMATA should decide the best procedure and use it at all shops. This was also a finding in the 2004 review.

Finding 54: The Car Maintenance Department needs to continue to expand the capabilities of the MAXIMO computerized records system.

The MAXIMO system is a general system of maintenance records that is (or will be) used for all WMATA maintenance. It does not have all of the detailed capabilities for any given type of maintenance, i.e., railcar maintenance. However, it can be customized to meet most needs of any user. The Car Maintenance Department has added many capabilities useful to car maintenance. However, the department realizes that more can be done. The reviewer urges that this effort continue in order to maximize the value of the system and the data stored in the system.

Finding 55: PMIs are not always performed on schedule or within three days of the due date. Sometimes a car is run even though it has exceeded its inspection interval by more than 10%.

The PMI interval is approximately 30 days for all series of cars, and the industry standard is not to exceed the scheduled interval by more than 10% (3 days). If the PMI cannot be performed within three days of schedule, the railcar should be held out of service after three days beyond the scheduled date.

Finding 56: Maintenance software is not always updated at the same time that car modifications are made.

Maintenance software should be updated as soon as car modifications require it. In addition, during modifications of a car fleet, such as happens to a new car fleet, two (or possibly more) versions of maintenance software will be required while some cars have the modification and some do not.

Observation 44: Despite some procedural problems, the WMATA fleet of railcars appears to be well maintained.

Persons Interviewed

- Doug Smith, Superintendent, Service and Inspection (S&I)
- Rod Spencer, Superintendent, Support Maintenance
- Sam Draither, Electric Shop Supervisor
- Ron Pichini, Electronic Shop Supervisor
- Mike Batson, Pneudraulic Shop Supervisor
- Bob Ernst, Assistant Superintendent, Support Maintenance
- A.J. Arajuo, Assistant Superintendent, Service and Inspection, Greenbelt
- Brand Loney, Service and Inspection Supervisor, Greenbelt
- Joe Gray, Supervisor, Car Inspection
- John Coon, Assistant Superintendent
- Henry Bertagnolli, Superintendent, Shady Grove Service and Inspection
- Harold Engle, Supervisor, Car Inspection
- Cris Miller, Supervisor
- Don Johnson, Electrician C
- Juan Sandobal, Electrician AA
- Kimbal Etyweiller, Electrician A
- Dan George, Assistant General Superintendent, Service and Inspection

Facilities Visited

- Greenbelt Support Maintenance Shop and Service and Inspection Shop
- Branch Avenue Service and Inspection Shop
- Shady Grove Service and Inspection Shop

Documents/Information Reviewed

- WMATA System Safety Program Plan, December 15, 2006
- Rohr 1000-Series Railcar Periodic "C" Inspection Procedures, Rev. 07
- Breda DC Fleet Periodic "C" Inspection Procedures, Rev. 07
- Breda AC Fleet Periodic "C" Inspection Procedures, Rev. 00
- CAF 5000-Series Periodic Inspection Procedures, no Rev. #, no date
- Alstom 6000 AC Series Periodic "C" Inspection Draft Procedures, Rev. 0
- CAF Truck Overhaul Procedures
- PMI records (hardcopy) for various vehicles

Vehicle Maintenance Training

Description

Vehicle maintenance training is administered by three instructors in the Operations Training group. Their responsibilities include training for new car maintenance employees, refresher training, and new car training. They do receive a certain amount of assistance. For example, a car maintenance employee teaches a course on HVAC.

Current Situation

Operations Training is preparing for 6000-series car training. Alstom will present three six-week sessions of training based on the running maintenance manual (as required by the contract). Operations Training will attend these sessions and prepare to present the same material to the remaining car maintenance people.

Evaluation Criteria

WMATA System Safety Program Plan

Findings and Observations

Finding 57: WMATA does not have an up-to-date matrix showing all required technical training for each class of railcar maintainer at each location.

Proper training is necessary for an efficient work force and for quality work. Car Maintenance must determine what training is needed by each of its workers. The requirements will vary by job classification and possibly by other factors such as location and whether the employee is at a Service and Inspection Shop or a backshop. The training requirements are needed by Operations Training in order to staff for and plan training.

Finding 58: WMATA does not have goals for how soon after hire or promotion training should be completed.

Setting goals (by Operations Training and Car Maintenance) will help Operations Training plan training and allow Car Maintenance to have trained workers when it needs them.

Finding 59: WMATA does not have training in backshop (component repair) procedures.

Without formal training, Car Maintenance must make do with whatever training supervisors and experienced workers can give other workers.

Finding 60: WMATA should evaluate the number of instructors assigned to railcar maintenance training (6000-series railcar training alone appears to require at least two or three person-years of instructor time).

In order to train all car maintenance workers on 6000-series cars (they will eventually run on all lines), provide backshop training, and train new car maintenance workers, Operations Training may need more instructors.

Observation 45: Operations Training possesses few car simulation training aids.

Car simulation training aids might enhance car maintenance training.

Persons Interviewed

- Cynthia Gannaway, Manager of Operations Training
- Chuck Waple
- Bob Mietlicki, Instructor
- Kevin Watson, Instructor
- Jim Loos, Instructor

Facilities Visited

Training Center (Carmen Turner)

Documents/Information Reviewed

- Alstom 6000 Maintenance Training Schedule, March 6, 2007
- Alstom 6000 Maintenance Training Attendance Status June 8, 2007
- WMATA Railcar Maintenance Course Summary Report 6/1/2006 to 5/31/2007
- Course Outline—Initial Prop-Brake, 5/11/2007
- Course Outline—5000-Series Electrical, 5/11/2007
- Course Outline—2k 3k Rehab Electrical, 5/11/2007
- Course Outline—Friction Brake Review, 5/11/2007
- Course Outline—Breda 4000-Series, 5/11/2007
- Course Outline—AC Propulsion, 5/11/2007
- Course Outline—Chopper Review, 5/11/2007
- Course Outline—VMS Maintenance Course, 5/1/2007
- Course Description—Primary Power for Transit Cars (CMNT) (no date)

Rail Car Materials

Description

The Office of Procurement and Materials is responsible for purchasing and managing the parts and materials required for the maintenance of WMATA's railcars. The responsibility includes managing the inventory at the Metro Supply Facility, transferring items, as needed, to the location storerooms, and managing the inventory at each of those location storerooms. Procurement and Materials are separate functions, but Procurement purchases stock items for the Materials inventory as well as the non-stock items as needed.

Current Situation

Materials manages an inventory of tens of thousands of items at the Car Maintenance operating locations as well as the Metro Supply Facility. Each operating location storehouse has one or more Materials employees assigned; when none is on duty, Car Maintenance has access to the storeroom with the obligation of recording removal of any material.

Evaluation Criteria

WMATA System Safety Program Plan

Findings and Observations

Finding 61: WMATA's software for procurement, PeopleSoft, does not reliably send (fax) orders to suppliers.

At one time the system failed to fax as many as fifty percent of the orders. WMATA has decreased that percentage and continues to work on the problem. In addition, steps are in place to determine which orders are not placed and to place them. WMATA should continue to work on this problem until it is resolved completely.

Finding 62: Some repairable items may not have enough spares as evidenced by a zero-stock condition at one or more storehouses.

WMATA should inventory repairable railcar components and determine if there are enough spares of each item to constitute an appropriate float for each item, taking into account the repair cycle time of each item. It should then budget purchase of any needed items.

Finding 63: Parts are sometimes lost in a stockroom (wrong bin, etc.)

Although in an estimated 95% of the cases a search yields the lost items, WMATA should institute procedures to minimize the probability of storing items in the wrong bins.

Finding 64: There continue to be issues with parts for the 5000- and 6000-series railcars.

For the 5000-series cars (now out of warranty), issues consist mainly of the difficulties of making arrangements to obtain parts from overseas suppliers. For the 6000-series cars (still under warranty), the difficulty consists of the carbuilder's slowness in providing the necessary stock of parts.

Observation 46: The Materials Department has established goals for such measures as the stockout rate and speed of processing orders. These are useful management tools.

Persons Interviewed

- Morris Moses, Acting Director, Office of Procurement and Materials

Facilities Visited

- Metro Supply Facility

Documents/Information Reviewed

- WMATA Inventory Users' Guide
- WMATA Performance Measures Third Quarter FY 2007 Office of Procurement and Materials
- WMATA Maintenance and Materiel Management System Storeroom Stockout Report for Store 251 [Greenbelt]
- Scope of Work for Materials Management Training (no date) [Contract Training]
- Evaluation form for Materials Management Training (no date)
- Various selections of Materials Management System computer screens and instructions

Communications

Description

WMATA communications are carried by radio, (increasingly) by fiber-optics, and (less and less) by copper wire. Functions handled by SMNT/COMM include CCTV, radio (including radiax cable in the tunnels), remote and local public address in stations, telephones, emergency telephones, PROTECT systems, ATC, and bus transfer machines.

Current Situation

SMNT/COMM responsibilities include inspections of a wide variety of communications equipment including daily inspections of station communications rooms.

Evaluation Criteria

1. WMATA System Safety Program Plan
2. Inspection Schedules

Findings and Observations

Finding 65: WMATA has not produced an overall system diagram of its fiber-optic system.

WMATA's fiber-optic system has been installed in pieces with some pieces owned by contractors such as Verizon which grant WMATA use of a certain number of fibers. The pieces, while forming a system, have never been consolidated on a single drawing which shows the complete system. Apparently the system is not understood by many at WMATA. Producing a system drawing could increase understanding of the system and its interconnections.

Persons Interviewed

- Herbert Bullock, Assistant Superintendent, Communications
- Lester De Lago, Assistant General Superintendent, Systems Maintenance
- Alan Nabb, Superintendent, Communications

Facilities Visited

- Huntington Station Communications Room
- Alexandria TSSM Headquarters

Documents/Information Reviewed

- MPLN Preventive Maintenance Summary May 10, 2007 SMNT/COMM

- MPLN Preventive Maintenance Summary May 10, 2007 SMNT/COMM-Radio
- MAXIMO COMM COMPLIANCE WORKSHEET FOR MAY 2007
- [Partial] List of COMM Inspection Work Orders May 2007

Appendix A: Observations

The following is a list of the observations contained in this report. For detailed review results, findings, and observations, please review the body of this document.

Within the body of the report, observations are commingled with findings, and describe those areas where the review team wishes to convey additional information to WMATA, where such additional information does not necessarily require a corrective action plan. However, in some instances, WMATA may wish to address items identified as “observations” in the corrective action plan (e.g. in the case of questions about staffing levels).

Observations

System Safety Program Plan

Observation 1: It is hoped that WMATA will use this opportunity to completely review its SSPP and take advantage of the many FTA guidance documents available (see the evaluation criteria).

SSPP Implementation – System Safety Functions and Other Selected SSPP Elements

Observation 2: WMATA needs to continue to work closely with TOC to close out the numerous accident/incident/hazardous condition reports.

Observation 3: WMATA needs to develop acceptable CAPs and to continue to work closely with TOC to close out numerous open CAPs.

Observation 4: While WMATA appears to have an effective Capital Improvement Program (CIP) development process that appropriately addresses safety and security needs, there may need to be a process for promptly including projects that result from CAPs.

Observation 5: Given the recent organization and staffing changes in the WMATA System Safety Function and the emphasis being placed on the DuPont Safety Program, WMATA should assure that sufficient staff resources are available to fulfill the requirements of TOC’s SSO Program Standard and Procedures.

Police/Security

Observation 6: MTPD Research and Planning Division have been extremely responsive to address deficiencies in the Security and Emergency Preparedness Plan (SEPP).

Observation 7: During the triennial period of review from 2004 to 2007, MTPD has experienced an increase in calls for service at a rate of 14.42%.

Emergency Management

Observation 8: The Emergency Management Department is required to conduct extensive activities with a limited level of staff. There exists a possibility that staffing levels may be strained and that all work activities may not be able to be accomplished, as required.

Rail Transportation (RTRA)

Observation 9: Currently there is no program in place by which line service management personnel are encouraged to identify those RTRA employees who may be most qualified to become OCC Line Controllers. Such a program could aid OCC recruitment efforts.

Observation 10: The current number of budgeted positions for Line Controllers may leave the OCC short-handed considering the challenge that recruitment from within WMATA has posed, on top of retirement, as well as vacation and sick leave.

Observation 11: At the time of this review MOC Assistant Superintendents were not being cross-trained with OCC Assistant Superintendents.

RTRA Rail Transportation Training

Observation 12: At the time of this review, there was a shortage of qualified Line Platform Instructors. WMATA should evaluate whether Rail Operators are offered the appropriate incentives to take on the increased work load of training new employees.

Employee Fitness for Duty

No observations.

Facilities Inspections & Employee Safety

Observation 13: Safety training courses appear to be comprehensive.

Observation 14: Rail maintenance facilities appeared to be generally well-kept and in safe condition.

Observation 15: "WMATA 10 Point Safety and Health Inspection Checklists" were completed on time and kept at the facilities.

Observation 16: The SFIP program appears to be a comprehensive means of providing for overall effective facility safety.

Observation 17: It was reported that in some cases, it can be difficult to accomplish all of the regional safety officer responsibilities with the limited staffing levels.

Subway Emergency Exits & Related Equipment

No observations.

Systems Maintenance – ATC

Observation 18: WMATA is considering moving its locking tests from an annual to a biennial frequency.

Observation 19: The ATC Technician training program, which includes classroom training, on-the-job training, written tests, and performance evaluations, seems effective and inclusive.

Observation 20: The blue “Special Order” tag, used to mark components, wires, and ATC devices out of service, is an excellent system.

Systems Maintenance – Power

Observation 21: Substation and AC room locations reviewed as part of this assessment were generally in good condition.

Observation 22: WMATA’s POWR section utilizes a number of very good preventive maintenance inspection (PMI) processes and forms.

*Observation 23: Because most preventive maintenance instructions were not received in a timely manner, this review was unable to assess the content and form of most preventive maintenance instructions.***Track Inspection & Maintenance**

Observation 24: WMATA’s Track Walker training program, as shown in the training class syllabi and tests received during this review, seems appropriate and inclusive.

Observation 25: The WMATA Track Standards Manual is a very good document, and does a good job of covering necessary information including inspection intervals and procedures, track tolerances, and many departmental responsibilities.

Observation 26: The current system of track inspection and maintenance documentation, though not perfect, seems very good.

Stations, Tunnel and Structures

Observation 27: As identified in 2004, water intrusion is present throughout the system.

Observation 28: As found in 2004, Alkaline Aggregate Reaction (AAR) is present in many exposed concrete surfaces. WMATA has taken steps to mitigate this problem such as making modifications to the concrete specifications for aggregate and cement composition. In addition, IRPs are conducted to seal the cracks to prevent further

damage. *This program has been effective so far and needs to be maintained in the future.*

Observation 29: Fine to Medium cracks with efflorescence were observed on concrete walls and ceilings.

Observation 30: Accessibility to inspect the condition of the concrete box interior surfaces is lacking.

Observation 31: This assessment noted a gap between the platform and the train door opening floor, which may pose a tripping hazard.

Observation 32: The improved lighting at underground stations such as Foggy Bottom should be considered for wider implementation.

Observation 33: Pedestrian Bridges are in good condition, but need minor floor slab crack sealing.

Observation 34: The Design Criteria and Standards are regularly updated.

Observation 35: Monitoring and control of adjacent construction is essential for the safety of patrons and Metrorail structures.

Observation 36: The inspection staff is well qualified.

Observation 37: Vent and Fan Shafts, and Pumping Stations are generally in good condition.

Elevators and Escalators

Observation 38: The Technical Skills Program training and apprenticeship program, as described during this review, seems to be a very good method for acquiring skilled, educated ELES Mechanics.

Observation 39: ELES has a formula for how many elevator and escalator units it can manage per Mechanic.

Observation 40: This review assessed the content of contractor maintenance versus WMATA's own practices and forms, and found them to be substantially similar.

Observation 41: The PMI inspection process described on the elevator forms and escalator form is a very good outline of required maintenance tasks.

Observation 42: This review noted a few minor issues at ELES units inspected in the field, but did not encounter any major or immediate safety issues.

Observation 43: Station Managers supplement ELES inspections with multiple daily inspections and functional tests.

Vehicles

Observation 44: Despite some procedural problems, the WMATA fleet of railcars appears to be well maintained.

Vehicle Maintenance Training

Observation 45: Operations Training possesses few car simulation training aids.

Rail Car Materials

Observation 46: The Materials Department has established goals for such measures as the stockout rate and speed of processing orders. These are useful management tools.

Communications

No observations.

Appendix B: Corrective Actions Matrix for the Tri-State Oversight Committee's Triennial Safety Review

Washington Metropolitan Area Transit Authority Metrorail System Conducted May & June 2007

WMATA is required to develop corrective action plans for each of the findings presented in this report. The following is an example of a Corrective Action Plan Matrix that contains the type of information that is useful to tracking WMATA's response to the Triennial Review Report. All findings are listed in the following matrix. These only represent a brief summary of the findings; for a more complete explanation, please see the Final Report of the TOC's Triennial Safety Review of the WMATA Metrorail System.

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
System Safety Program Plan								
Finding 1: WMATA needs to update the current draft version of SSPP as soon as possible to include better formatting, additional response to TOC's previous comments, and to address recent organizational changes.								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
SSPP Implementation – System Safety Functions and Other Selected SSPP Elements								
Finding 2: WMATA does not currently have an authority-wide Safety and Security Certification (SSC) Program for the Metrorail System.								
Finding 3: WMATA is not implementing its Internal Safety Audit (ISA) Policy/Procedure and has open CAPs from its 2005 ISA.								
Finding 4: While WMATA has advanced some prototype Configuration Management efforts, there does not appear to be an overall authority-wide policy, procedure, or plan to address the requirement in the SSPP (Element 17) for Configuration Management.								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 5: Related to WMATA procurement of safety- or security-critical parts and equipment, procedures could not be identified for the associated quality assurance (QA) process.</p>								
<p>Finding 6: WMATA should expand its Construction Safety and Environmental Manual to include construction security considerations.</p>								
<p>Finding 7: It is not evident that all of the functions of the previous Office of Quality Assurance have been effectively reassigned, and the existing Quality Assurance Policy and Procedures Manual (QAM) is now obsolete.</p>								
<p>Finding 8: WMATA's process for managing Policies and Procedures does not result in the availability of the latest documents.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
Emergency Management								
<p>Finding 9: As required in the TOC Program Standard, WMATA does not have an emergency management plan. However, many of the components of such a plan are already in place and appropriately administered. A formal plan is required because it helps an agency to integrate and coordinate the disparate activities required for emergency management.</p>								
Rail Transportation (RTRA)								
<p>Finding 10: It appears that the track worker protection rules set forth in Special Order 07-02 are being consistently violated and are not properly enforced.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 11: Although OCC Line Controllers are required to undergo annual recertification, no such recertification requirement exists for Assistant Superintendents.</p>								
<p>Finding 12: Rail Supervisors are not flagging Rail Operators who do not answer questions satisfactorily or do not have all of their required equipment during quality checks for any follow-up.</p>								
<p>Finding 13: There are no formal written criteria used to direct the methodology and process of the quality checks that Rail Supervisors perform on Rail Operators.</p>								
<p>RTRA Rail Transportation Training</p>								
<p>Finding 14: The Right-of-Way Training program should be more structured and cover topics more specifically..</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 15: WMATA does not appear to have a formal written agency-wide policy on which personnel are required to attend Right-of-Way Training, and how often they must be recertified.</p>								
<p>Finding 16: The RTRA Utility Supervisor Training Program Description and Guidelines Document should be updated to reflect the recent organizational changes at WMATA, as well as to reflect the names of current instructors for each course.</p>								
<p>Employee Fitness for Duty</p>								
<p>Finding 17: There is no medical recertification requirement for rail operators, even though bus operators do have such a requirement.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 18: Elevator and Escalator Mechanics, as well as Station Managers, are not subject to any form of random or reasonable suspicion drug and alcohol testing.</p>								
<p>Facilities Inspection & Employee Safety</p>								
<p>Finding 19: Some safety-related items from the 10 Point Checklist were found to be deficient. Each facility undergoes regular inspections to ensure that safety equipment such as fire extinguishers and eyewash stations are in working order in case of an emergency. While reports showed that they were regularly inspected, some items from the checklists (comprising the reports) did not meet checklist requirements.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 20: The SFIP Book was missing from Greenbelt, which is concerning because a full history of safety issues is no longer documented. Furthermore, it is a security concern because the manual contains information that may be deemed security-sensitive, such as facility plans and information about equipment in the facility.</p>								
<p>Subway Emergency Exits & Related Equipment</p>								
<p>Finding 21: Emergency exit shaft inspections should include a formal follow-up process or confirmation loop to ensure that deficiencies are corrected.</p>								
<p>Finding 22: WMATA should consider developing a checklist to accompany the WMATA emergency exit shaft inspection report.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 23: Emergency exit signage is unclear due to various reasons, including caked-on grime and age/“wear and tear.”</p>								
<p>Finding 24: There is a lack of signage at track level indicating track numbers.</p>								
Systems Maintenance - ATC								
<p>Finding 25: The prints in our sample of interlocking locations were in the same tattered, ripped, and disorganized condition noted in TOC’s 2004 triennial review.</p>								
<p>Finding 26: The two preventive maintenance inspection types sampled (track circuit and switch obstruction checks) had a number of late inspections, as well as some that seemed to be significantly early.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 27: In some ATC Preventive Maintenance Instruction documents, the inspection frequency was not obvious.</p>								
<p>Systems Maintenance - ATC</p>								
<p>Finding 28: POWR biweekly (14-day) Traction Power Facility Inspections do not appear to be completed consistently on schedule.</p>								
<p>Finding 29: Battery inspection intervals varied from fewer than 30 days to as many as 180 days.</p>								
<p>Finding 30: Biweekly Traction Power Facility Inspections do not appear to be effective against housekeeping and facility upkeep issues in many locations.</p>								
<p>Finding 31: Station lighting inspection forms frequently do not include date of inspection and are completed inconsistently.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 32: The prints in our sample of traction power substations were in the same tattered, ripped, and disorganized condition noted in TOC's 2004 triennial review.</p>								
<p>Finding 33: POWR's policy of posting a single-line diagram (a simplified drawing of substation and third rail equipment for the area immediately surrounding the subject substation) in substations, showing DC feeders, third rail sections, and other critical, location-specific information, is not upheld at all locations.</p>								
<p>Track & Inspection Maintenance</p>								
<p>Finding 34: Track Inspection Defect Database sheets sampled do not correspond completely with track conditions as found in the field; some cases of broken or missing track clips and bolts, as well as frog wear, were not recorded in the database.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
Finding 35: Some of the walking track inspections sampled were separated by seven (7) days, and therefore outside of the interval prescribed by WMATA Track Standards.								
Station, Tunnels and Structures								
Finding 36: The availability of Record Drawings needs to be improved.								
Finding 37: WMATA should update its Condition Rating Codes Guidelines to be in accordance with current NBIS standards for bridge inspection and classification..								
Finding 38: Substructure conditions need to be monitored.								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 39: Clearance sign location may not be well-placed at the Addison Road Pedestrian Bridge and minor damage is present (possibly the result of the poor markings). This may be an issue elsewhere throughout the system.</p>								
<p>Finding 40: Detailed, hands-on inspections should be conducted of non-redundant, through-girder bridges and fatigue detail areas.</p>								
<p>Finding 41: WMATA bridges over local roads should have pier bent protection added.</p>								
<p>Finding 42: Certain WMATA structures do not currently meet the rocker bearing standard set by AASHTO.</p>								
<p>Finding 43: Multiple instances of cracked or missing platform floor tiles and missing mortar/grout were noted.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
Finding 44: Skid-resistant surfaces at escalator thresholds are worn out.								
Elevators and Escalators								
Finding 45: The preventive maintenance inspections (PMIs) reviewed for eight escalators and three elevators (two years' records each) showed significant variation in schedule attainment, including many late inspections.								
Finding 46: Monthly (B), quarterly (C), and annual (E) ELES PMIs do not always occur in a predictable fashion.								
Finding 47: The PMI forms for elevators and escalators could be improved by adding spaces for objective data entry, checkmarks, and additional comments.								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 48: The completed PMIs reviewed show a number of discrepancies that should be avoided in the future, including multiple handwritten copies of the same inspection, forms with no year in the date, etc.</p>								
Vehicles								
<p>Finding 49: Maintenance work does not always follow the written maintenance procedures.</p>								
<p>Finding 50: Documentation of preventive maintenance inspections (PMIs) is not consistent throughout the Car Maintenance Department.</p>								
<p>Finding 51: Pre-determined, acceptable ranges for many readings taken on PMIs are not always listed on the PMI record documents (checklists).</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
<p>Finding 52: Many readings taken during PMIs are not recorded on the PMI documents or on the computerized records.</p>								
<p>Finding 53: Procedures for calibration of tools, gauges, and equipment are not consistent throughout the Car Maintenance Department.</p>								
<p>Finding 54: The Car Maintenance Department needs to continue to expand the capabilities of the MAXIMO computerized records system.</p>								
<p>Finding 55: PMIs are not always performed on schedule or within three days of the due date. Sometimes a car is run though it has exceeded its inspection interval by more than 10%.</p>								
<p>Finding 56: Maintenance software is not always updated at the same time that car modifications are made.</p>								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
Vehicle Maintenance Training								
Finding 57: WMATA does not have an up-to-date matrix showing all required technical training for each class of railcar maintainer at each location.								
Finding 58: WMATA does not have goals for how soon after hire or promotion training should be completed.								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
Finding 59: WMATA does not have training in backshop (component repair) procedures.								
Finding 60: WMATA should evaluate the number of instructors assigned to railcar maintenance training (6000-series railcar training alone appears to require at least two or three person-years of instructor time).								
Materials								
Finding 61: WMATA's software for procurement, PeopleSoft, does not reliably send (fax) orders to suppliers.								
Finding 62: Some repairable items may not have enough float.								
Finding 63: Parts are sometimes lost in a stockroom (wrong bin, etc.)								

Finding	WMATA Corrective Action Plan	Responsible Person/ Department	Expected Completion Date	Date CAP Approved by TOC	Interim CAP Progress	Actual Completion Date	Recommendation for TOC Action / Date Closed by TOC	Issues Preventing Completion
Finding 64: There continue to be issues with parts for the 5000- and 6000-series railcars.								
Communications								
Finding 65: <i>WMATA has not produced an overall system diagram of its fiber-optic system.</i>								