The Washington Metrorail Safety Commission

Special Study

of WMATA Metrorail's Radio Band and Infrastructure Replacement Project:

Program Completion Could Address Radio Communication Deficiencies and Improve Safety at WMATA Metrorail

The WMSC's Special Study of Safety Impacts of WMATA's Radio Replacement Project

Final Report:
August 4, 2025

Table of Contents

Prepared under the authority of the Washington Metrorail Safety Commission

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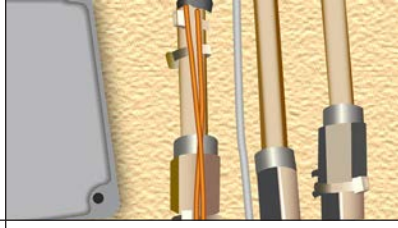


Highlights

Why the WMSC Did This Special Study

- The WMSC and its predecessor safety oversight organizations have been aware of continued issues with inconsistent and unintelligible radio coverage at WMATA Metrorail for at least the last decade that have played a role in safety events and near misses. This notably includes the January 12, 2015 L'Enfant Plaza Metro Station smoke accident that resulted in the evacuation of more than 200 passengers from a 6-car Metro train, the transport of 84 passengers to hospitals, and the death of one passenger.
- Multiple findings and other official actions regarding radio communications at Metrorail have been issued by the WMSC and its predecessor safety oversight organizations, including one finding from the FTA's June 17, 2015 Safety Management Inspection Report that stated "Many WMATA employees throughout the agency ranked poor radio performance as their top safety issue."
- As recently as the WMSC's 2024 Audit of Emergency Management and Life Safety Programs, continued radio issues were identified including in a finding that "Metrorail does not have a reliable communication system for operations or emergencies."
- WMATA has had unfinished efforts in place to address its radio communications deficiencies for years. The primary contract work for this effort began in 2017, has cost $569.4 million to date, and has experienced repeated delays. The WMSC reviewed this project because the delay of improved radio communications directly affects safety at WMATA due to the danger of continuing communication deficiencies throughout the Metrorail system.

This notably includes the January 12, 2015 L'Enfant Plaza Metro Station smoke accident that resulted in the evacuation of more than 200 passengers from a 6-car Metro train, the transport of 84 passengers to hospitals, and the death of one passenger.

Because of the serious identified safety concerns associated with nonfunctioning radio coverage on WMATA Metrorail, the WMSC recommends WMATA leadership continue its new focus on and prioritize expeditious completion of the radio modernization project to improve radio communications at WMATA Metrorail.

What the WMSC Found

- Safety-related radio deficiencies persist at WMATA Metrorail. A review of WMSC investigations reports between April 2019 and July 2024 reveal 64 reports cite radio or communications issues. Fifteen systemwide radio outages were reported from February 1 to April 24, 2025, and radio communication challenges complicated emergency response to a person fatally struck by a train in January 2025.
- WMATA's work to upgrade its radio system began in 2015. The 700 MHz Radio System Project (contract FQ15000) began in August 2017 and is currently projected to continue in parallel with its supporting Fiber Optic Cable and Metro Box Enclosure Installation Project (contract FIRPG211190) into 2027.
- WMSC review found four key reasons for delays in this project to date: (1) cellular infrastructure work took priority early in the project over the radio portion, delaying radio work, (2) an initial lack of fiber redundancy led to fiber design issues and delay, (3) initially fiber work was scoped to include other stakeholder projects separate from the radio initiative, which slowed progress, and (4) work restrictions during the COVID-19 pandemic.
- Over the last year, WMATA has reprioritized to focus on completing radio fiber work prior to other fiber initiatives. This has decreased previously projected delays to complete the radio project.

What the WMSC Recommends

- Because of the serious identified safety concerns associated with nonfunctioning radio coverage on WMATA Metrorail, the WMSC recommends WMATA leadership continue its new focus on and prioritize expeditious completion of the radio modernization project to improve radio communications at WMATA Metrorail.
- The WMSC recommends relevant oversight authorities such as WMATA's Office of Inspector General take note of issues pursuant to the radio system at WMATA and the radio project's progress to date and provide any additional oversight necessary.

Background

Background

Metrorail's radio coverage issues, which have resulted in multiple safety events and near misses, have been documented by its various safety oversight agencies for years.

The Radio Communications System at WMATA Metrorail

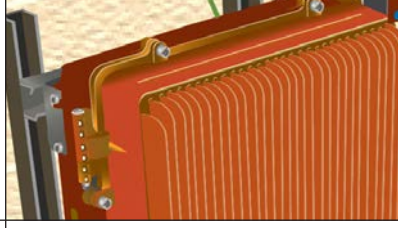
WMATA's radio communications framework involves multiple systems with components both above and below ground. Distributed Antenna Systems (DASs) are used at WMATA Metrorail to make above ground signals accessible below ground for both cellular and radio coverage. WMATA's terminology for discrete DAS used in the communication system include: (1) the "Comprehensive Radio Communications System" (CRCS) that supports WMATA's daily operational communication needs, (2) a "Public Safety Radio System" (PSRS) dedicated for emergency, safety, and security functions including use by jurisdictional partners, and (3) a "Neutral Host System," which refers to WMATA's system for extending cellular coverage for multiple carriers for all cellphone users.

The CRCS is a single cell simulcast radio system used by Metrorail, Metrobus, and WMATA's Metropolitan Transit Police Department (MTPD). It currently operates at a frequency of 490 MHz in the National Capital Region (and will operate under the future 700 MHz band upon completion of the radio modernization project). When WMATA or area jurisdictions emit a radio signal on the CRCS, the signal is distributed over a fiber-optic cable to head-end radio amplifiers that are typically located in WMATA stations. That signal is then propagated over a shared radiating cable in the tunnels and amplified with intermediate bi-directional amplifiers (BDAs), which are positioned every 2,200 feet in tunnels.

The WMATA PSRS operates in the 800 MHz frequency band and is the radio system for local public safety agencies. The PSRS is similar in technical configuration to the CRCS and the two systems share the same radiating cable in Metrorail tunnels but use separate BDAs. The greater signal loss over the radiating cable at 800 MHz (compared to the 490 MHz CRCS signal) requires positioning a larger number of 800 MHz BDAs located every 1,100 feet in tunnels. The 800 MHz frequency band has been in use by jurisdictional emergency responders, but the WMATA system lacked radio infrastructure to access this system, which the modernization project will allow upon completion.

Historical Radio Deficiencies at WMATA Metrorail

Metrorail's radio coverage issues, which have resulted in multiple safety events and near misses, have been documented by its various safety oversight agencies for years. Notably, the January 12, 2015 L'Enfant Plaza Station smoke accident resulted in the evacuation of more than 200 passengers from a 6-car Metro train, the transport of 84 passengers to hospitals and the death of one passenger. Radio communication limitations during emergency response to this accident played a role in the delayed evacuation. The District of Columbia Fire and Emergency Medical Services (FEMS) Report states that during the emergency response "FEMS personnel encountered difficulty communicating with each other in the Metro station using traditional radio communication channels. The findings indicate that communications were not effective



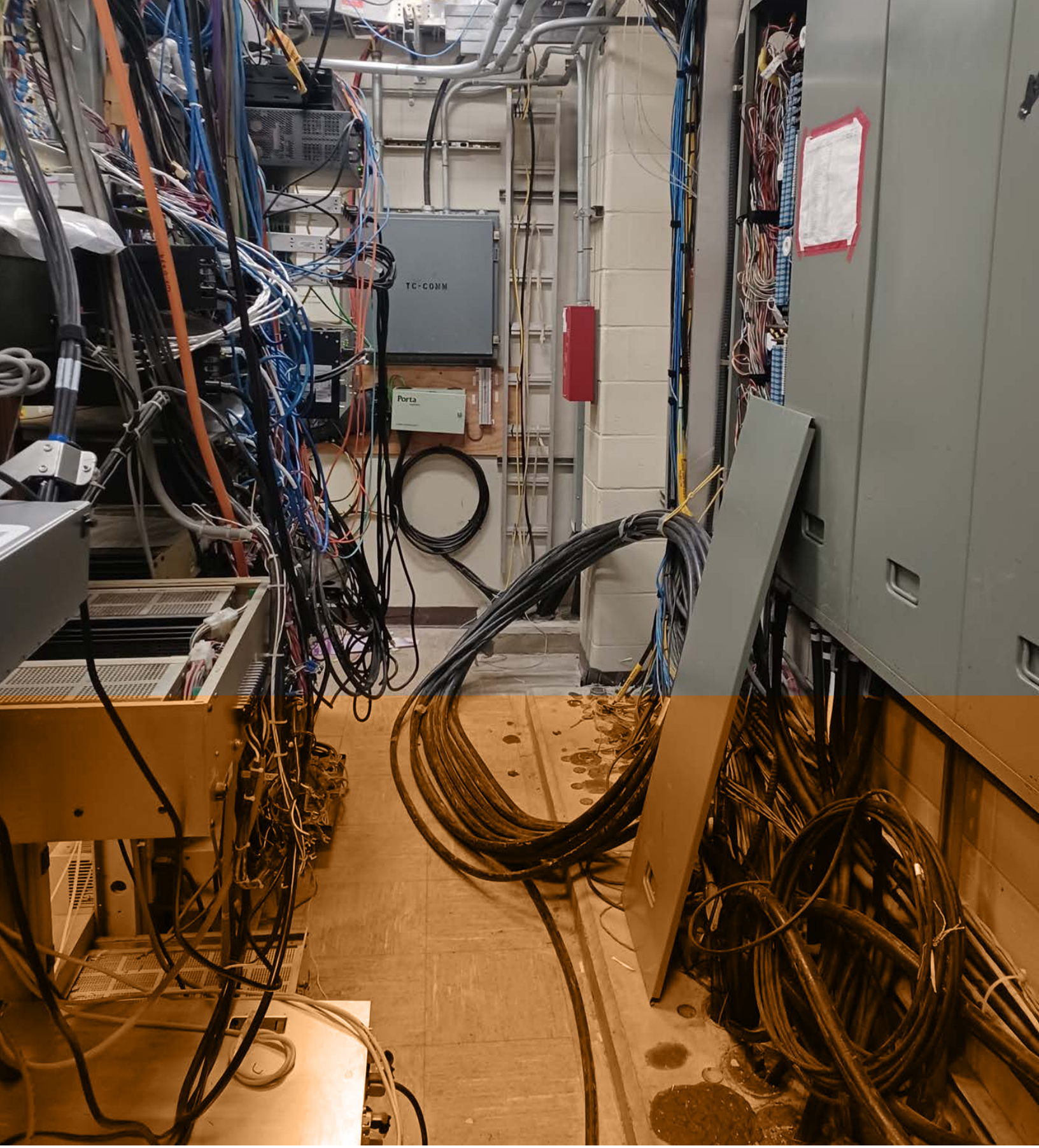
or sporadic during the response." Following a routine test of service coverage, D.C. FEMS had informed WMATA [one week prior to the incident] on January 8, 2015 that "there was no 800 MHz radio coverage anywhere in the L'Enfant Plaza Metro Station." The Tri-State Oversight Committee's (WMATA Metrorail's safety oversight entity prior to the formation and certification of the WMSC) Three-Year July 8, 2015 Audit of Radio and Communications Systems stated that WMATA communications "… personnel reported that, per the CRCS system design, there are several known areas of poor to no radio coverage within the system." The report continues:

> "One finding in this report stated 'WMATA's railcar and portable radio communications systems are in need of a comprehensive safety analysis due to reported failures and findings identified throughout this report.' Although the TOC's review found numerous areas where improvements to maintenance, training, and implementation of new programs would eradicate or mitigate some radio problems, WMATA's radio communications systems may have other unknown deficiencies that are causing users to report widespread dead spots."

Pointing to serious rail accidents over the preceding decade, including the 2015 L'Enfant fatal smoke/fire accident, which raised concerns regarding Metrorail's safety performance, in 2015 the FTA conducted an organization wide Safety Management Inspection (SMI) of WMATA including Metrorail. One finding from the FTA's June 17, 2015 Safety Management Inspection report stated, "there is still major distortion and feed-back in the field, and from the ROCC [Rail Operations Control Center], and a significant number of radio dead spots still exist. Many WMATA employees throughout the agency ranked poor radio performance as their top safety issue." Poor radio performance hampers or fully eliminates necessary communication throughout the system, including communication between the control center and train operators to coordinate safe train movement as well as communication between WMATA and responding jurisdictional emergency response personnel. This limitation or elimination of necessary communication creates the opportunity for safety events.

Many WMATA employees throughout the agency ranked poor radio performance as their top safety issue.

WMATA's safety oversight agencies noted these continued radio communication issues in official findings and corrective actions. Existing WMSC CAPs regarding radio coverage deficiencies include CAP C-0100, which resulted from a 2021 WMSC finding that states, "Metrorail is not maintaining a fully functioning radio communications system in all rail yards and shops;" as well as C-0221, which resulted from a 2022 WMSC Communications Systems Audit finding that stated, "Metrorail lacks the safety assurance and safety promotion activities required to ensure that only current and calibrated radios are in use as required by Metrorail instruction and procedure, creating a risk that this safety equipment will not properly function when needed." Closed CAPs issued by previous safety oversight agencies regarding the radio communications system at WMATA include FTA-RED-16-005A, which stated "WMATA must provide FTA with a quarterly report documenting its assessments and findings regarding radio quality and planned corrective actions."



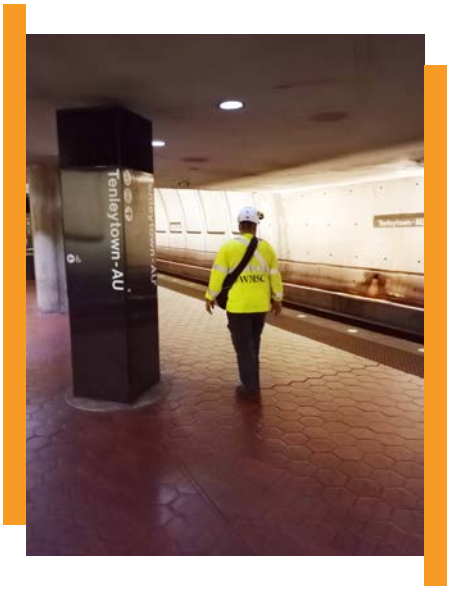
WMATA's Radio
Modernization Project

WMATA's Radio **Modernization Project**

The Middle-Class Tax Relief and Job Creation Act of 2012 was enacted by Congress on February 22, 2012 and required all public agencies to vacate their T-band frequencies (488-500 MHz) within 10 years (by February 22, 2022). The Act did not provide new frequencies for these agencies. After several years of working with the Federal Communications Commission, new frequencies were assigned to WMATA, which then began preparing a new project to replace the existing radio system.

WMATA initially chose to use its own workforce to install communications technology updates. During that time, WMATA identified parallel work being done for its radio update project and for its previous cellular infrastructure update initiative. WMATA combined these two projects seeking efficiencies in 2016, titling the combined project the Radio & Cellular Infrastructure Replacement Project.

The intent of this Radio & Cellular Infrastructure Replacement Project was to provide a new radio system for operational use at WMATA, a new Public Safety Radio System in the underground tunnel system, access to WMATA's entire radio system to jurisdictional partners, and new cellular infrastructure in the underground tunnel system for wireless providers.



The above ground portion of the 700 MHz radio system requires leasing and constructing multiple antenna tower locations as well as in-building enhancements throughout the National Capital Region. In addition, two new prime sites (the main locations for data management) and new consoles at the control centers would be needed.

The below ground portion of the 700 MHz radio system consists of installing new DAS connecting to existing infrastructure in stations and installing components in shafts and stations. WMATA worked closely with cellular carriers to complete the cellular portion of the DAS installation. PowerWave Technologies, the original cellular installation company, entered bankruptcy, which led to some delays.

Work was completed in segments. As WMATA finished a segment, it was turned over to the carriers to begin installation of their cellular repeaters to then bring the cellular segments on-air. Although the cellular system, now complete, was activated in segments, the WMATA radio portion was initially believed to need to be completed in its entirety before being brought on-air (it is now understood the system can be activated in segments which will begin with yards due to the discrete nature of their boundaries, an aspect which will be further explained later in this paper). When the radio system is complete, it will provide the 700 MHz band system for WMATA use, as well as the new 800 MHz band system for emergency response and jurisdictional partners.

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Radio Band and Infrastructure **Replacement Project Contract History**

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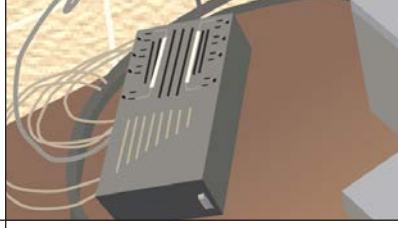

The Tri-State Oversight Committee's Three-Year Audit of Radio and Communications Systems at WMATA, dated July 8, 2015, stated, "The agency had already concluded that the legacy underground DAS were too problematic to maintain and that a new solution to provide reliable underground communications was needed." The report goes on to explain "Additionally, a Federal law passed in 2012 reclaims the "T-Band" spectrum (490 MHz to 512 MHz) for a new Nationwide Public Safety Broadband Network (NPSBN), necessitating the move of WMATA's CRCS to a new frequency band. The available spectrum for the new CRCS is not supported by the legacy [system]." Of the new contract effort, this report states "WMATA's current plans are to deploy a 700 MHz Project…commencing in January 2016."

In 2015, WMATA issued Request for Proposal (RFP) number FQ15000 for contract support to provide all infrastructure changes required to transition from its 490 MHz system to a new 700 MHz system, including above ground and below ground installations, fiber laying, and system integration. The RFP described a scope of work that included: "Design and Construct a 700 MHz, P-25 Phase II radio system with Network Management System for use in the above ground and below ground sections of the WMATA operating area."

Motorola Solutions Inc. (MSI or Motorola) outlined the requirements of the project in its 2016 Technical Proposal which stated that the intended 700 MHz radio solution was to have 28 above ground sites integrated with a fiber-fed digital Distributed Antenna System. Motorola further explained that this system was to provide 95% reliable portable coverage and that the DAS below ground network would provide 700 MHz and 800 MHz coverage below ground. Motorola outlined additional requirement items: vacate T-Band (400 MHz frequencies such as what was used by WMATA's current 490Mhz Radio System) frequencies as a result of the Middle-Class Tax Relief Act of 2012, improve radio coverage throughout the WMATA tunnel system, enhance radio coverage in WMATA facilities, support an expanded service area at Dulles, and maintain the then 15-year-old CRCS system.

On December 23, 2016, WMATA awarded this contract to MSI at the initial value of $161,056,749 with a start date of December 28, 2016 and a completion date of December 21, 2022. Metrorail's October 16, 2016 Capital Project Status Update: Radio and Cellular Infrastructure Replacement report forecasted the project would be complete in 2022, with WMATA required to vacate T-band frequencies by February 22, 2022. On January 13, 2021, the requirement to vacate the T-Band frequences per the Middle-Class Tax Relief and Job Creation Act of 2012 was repealed. Nonetheless, the radio update project continued due to WMATA's recognized need for radio system improvements.

The FTA oversees major transit capital projects that it funds, such as WMATA's radio modernization project. The FTA awarded grants to WMATA for this Radio Band and Infrastructure Replacement Project and assigned a Project Management Oversight Contractor (PMOC) to support the FTA's project oversight role, as was the case with this project. The FTA's oversight generally begins when the project enters its development phase, or when the FTA administrator determines oversight is necessary. According to the FTA's Project and Construction Management Guidelines updated in January 2025, its oversight "includes a review of the Project Management Plan (PMP), project scope, cost estimates, and schedules." The FTA authorized grants to WMATA for this Radio Band and Infrastructure Replacement Project. WMATA provided Quarterly Milestone Progress Reports on this project to the FTA through its PMOC.

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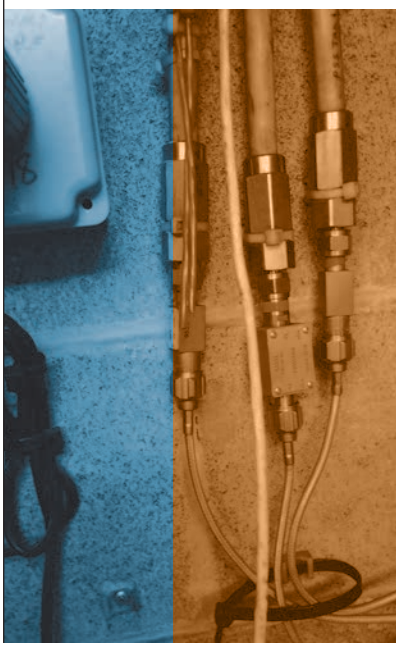

Contract and Schedule

Delay Analysis

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Delay Analysis

The WMSC reviewed WMATA's 700 MHz Radio System Project (contract FQ15000) documents including the Conformed Contract, the Scope of Work and Technical Specifications, the System Integration Plan, schedules, schedule analyses and narratives, project change orders (PCOs), the project risk registry, the Non-Conformance Report (NCR) list, the Contract Deliverable Requirements List, and the Requirements Traceability Matrix. Additionally, the WMSC sampled recent monthly status meeting minutes, weekly trackers, radio site daily reports, and related test reports.

Given the dependencies between the 700 MHz Radio System Project (contract FQ15000) and the Fiber Optic Cable and Metro Box Enclosure Installation Project (contract FIRPG211190, the related project involving required fiber laying needed for the radio update), the WMSC conducted similar review for the Fiber Optic project.

Additionally, the WMSC interviewed WMATA personnel and reviewed additional documents requested from WMATA (detailed in appendices at the end of this document) to inform the WMSC's understanding of project history.

Project Cost

The WMATA 700 MHz Radio System Project (contract FQ15000) had an original notice to proceed value of $161.1 million with an original project closeout of the fourth quarter of 2022. The related Fiber Optic Cable and Metro Box Enclosure Installation project (FIRPG211190) had a notice to proceed value of $182.5 million. This contract included both fiber for the radio project as well as fiber for other intended projects such as an initiative to establish remote power energization capabilities and Supervisory Control and Data Acquisition (SCADA) systems, some of which were later descoped (like the remote power control initiative) to prioritize completion of radio related fiber needs, meaning this total cost is only partially allocated to radio project related work. However, the total value of the radio modernization project reviewed to date including project change orders accrued is $569.4 million (including both the radio and related fiber project inputs per WMATA project records), and the project work is ongoing.

Although delays and overruns can occur in any complex project, the WMSC believes that the cost and time allotted in the original contract should have been sufficient to complete this project and finds the degree of delay in this project notable and beyond expectation. For comparison, the Burlington Northern Santa Fe (BNSF) Railway undertook a project of greater engineering complexity when it deployed Positive Train Control (PTC) technology from 2010 to about 2017. During this period, BNSF constructed and activated an extensive radio communications infrastructure including more than 6,000 radio towers across its rail network of more than 11,000 track miles and equipped over 5,000 locomotives with onboard communications hardware. The

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WMATA contract files show Contract Modification 86.2, dated September 25, 2023, was valued at $33.7 million, representing one fifth of the original contract cost (there are multiple other smaller scale modifications over the years on this project resulting in extended time and/or cost on smaller scales; the WMSC chooses to explore this modification due to its significant added cost and duration).

total cost of the project was approximately $2 billion. Consequently, the WMSC believes that the original contract term for WMATA's 700 MHz radio project should have been sufficient to complete the work.

Below Ground

In January 2022, a joint venture between C3M Power Systems and Aldridge was awarded the contract to complete the fiber optics installation in coordination with WMATA personnel (WMATA personnel had been solely responsible for this installation) under the contract Fiber Optic Cable and Metro Box Enclosure Installation (contract FIRPG211190).

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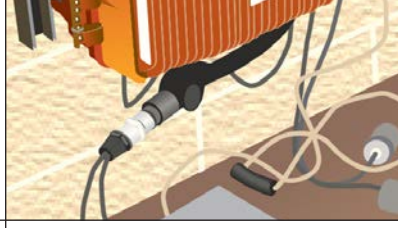
> "WMATA was responsible for the fiber cable installation for the below ground portion of Motorola's work. WMATA determined that it is responsible for the delay due to late deliver[y] and installation of the cable."

The time extension granted to Motorola under this modification extended the Contract Period of Performance from October 1, 2023 to September 30, 2026, an extension of three years. The modification further states that "there were also elements of work that were fully under Motorola's control which were not completed within the planned period of performance."

These statements were reflected in one of WMATA's 2023 Quarterly Reports to the Federal Transit Administration, which describes schedule impacts of a "3-year project delay due to installation of fiber infrastructure and 2-year delay due to poor contractor performance." Review of WMATA project documentation does not clearly explain which work elements under Motorola's control contributed to the 2-year delay, nor is it clear if these delays were in parallel with other project delays or uniquely responsible for the extension of overall project completion.



Explanation of Major Project Delays

Through document review and interviews with WMATA project personnel, the WMSC determined reasons for some of the major delays experienced in this project:

1. Cable infrastructure (including fiber, radiating cable, and snake trays) began installation in January 2016 including infrastructure for both the radio and cellular aspects of the project. In 2018, WMATA decided to **focus on completing the cellular infrastructure** portion of this project. Although some radio design work was completed, most radio project work was put on hold until the cellular system was done. This caused a **two-year delay**.

2. WMATA consulted with the Metropolitan Washington Council of Governments in 2019, in their role as facilitators of area public safety discussions, to review the Factory Acceptance Test (FAT) of underground bidirectional amplifier equipment for the tunnel Distributed Antena Systems and determined the fiber design had key deficiencies with redundancy. The original design included 850,000 linear feet of cable, and was then **revised to provide geographically redundant fiber**, increasing the total fiber need to 2,500,000 linear feet. This increased the time needed to complete this work by two years.

3. In addition to the radio project, WMATA initially included other initiatives (such as SCADA reporting for other technical subsystems like traction power) in its fiber optic cable installations. WMATA reassessed priorities within the last 18 months and **refocused on completing the fiber work required for the radio project** before any other fiber needs, **reducing** the additional time needed per item number 2 above to **just six months**.

4. Project work was suspended due to the **pandemic** in 2020. Work was restarted after splitting the work groups into Teams A and B to reduce potential contagion exposure. This complication resulted in an overall delay of **six months**.

A combination of the above factors has delayed fiber completion, which WMATA now anticipates in June 2026. At that time, Motorola will begin testing and commissioning final radio systems. Commissioning is currently anticipated in December 2026.

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Other Major Project Subsystems (Vehicle Installations, Tower Sites, and Control Center Updates)

The WMSC reviewed work activities related to other subsystems of the overall radio infrastructure project, which included control center additions and modifications, above ground radio sites, and carborne equipment installations. None of the activities for these subsystems indicated delays that contributed uniquely to the overall delay in project completion.

Potential delays due to control center additions and modifications, including data connections to legacy systems, were ruled out through evolving schedule analysis. Although delays were noted, they were less than the fiber optics installation delays.

Carborne equipment installation does not appear to pose a schedule risk to this project. The status of carborne communications equipment installation is as follows:

- 2000/3000 Series (Breda): 100% complete (280 active railcars)
- 6000 Series (Alstom): 12.6% complete (23 of 182 railcars)
  Expected completion November 2025
- 7000 Series (Kawasaki): 100% complete (748 active railcars)
- Nonrevenue vehicles: 100% complete

Current Project **Status**

Current Project Status

90% of fiber has been installed and crews are working to complete the outstanding installations including the remaining effort to terminate and connect fiber.

Overall Project Status

WMATA has completed several significant aspects of this project. These include the neutral host cellular system install (completed in January 2021), the interim upgrade of legacy 800 MHz PSRS head ends (completed in April 2021), the secondary communication software allowing users to access radio communications via cellular device (the WAVE application, completed June 2024), and a pilot to explore the feasibility of deploying radios with capabilities to connect via cellular networks when radio signals are not available (completed January 2025).

Major parts of this project still pending completion include completing the overall effort of upgrading the 490 MHz system (CRCS) with the new 700 MHz radio system, enabling interoperability with regional partners, providing replacement BDAs for 490 and 800 MHz systems and underground radio infrastructure, and replacing the underground 800 MHz system with new system upgrades.

700 MHz Project and Status

700 MHz Above Ground Status

Major pieces of the 700 MHz above-ground work include completion of the radio cores/servers and operations (awaiting 700 MHz activation), completion of radio prime sites (awaiting 700 MHz activation), and installation of the new consoles at the control center that operate both 490 and 700 MHz bands.

Major pending items include the remaining completion of 7 of 27 total antenna tower sites for above ground communications (five of these are in final stages of design and two are under construction). Additionally, there is partial supplemental coverage in 13 of the 87 facilities that have been tested. Two of the facilities tested require a new in-building system and designs are currently underway. The remaining buildings cannot be tested until associated radio sites are complete and transmitting. Additionally, the 57 control station sites are pending with designs underway for 13 of the 57, with yards having top priority.

700 MHz Below Ground Status

Major pieces completed of the 700 MHz below-groundwork include 3 antenna sites that are awaiting 700 MHz activation. The BDAs are installed in all stations and vent shafts and all 3 below ground antenna sites are completed (at Rosslyn, Rhode Island, and Mount Vernon Stations). 90% of fiber has been installed and crews are working to complete the outstanding installations including the remaining effort to terminate and connect fiber.

700 MHz Activation Schedule

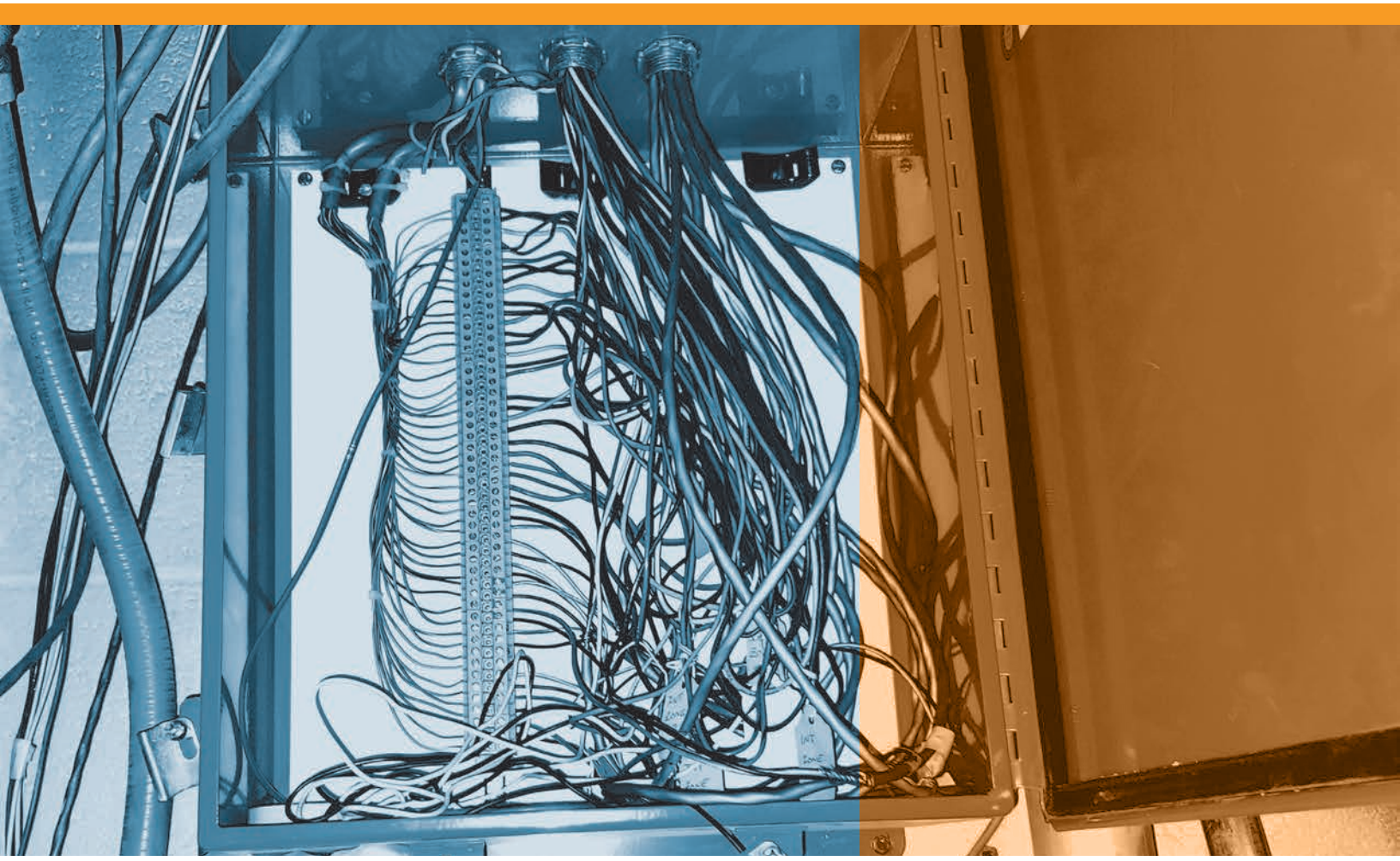
The WMATA CSRS 700 MHz system activation status as of March 2025 shows New Carrollton Yard scheduled for earliest activation in summer 2025 (the first of eight yards). WMSC interviews clarified that yard locations are being activated first due to the discrete nature of yard territory boundaries. The last of the yard activations is scheduled for Summer 2026 for West Falls Church Yard. The four Rail Ops channels are scheduled for activation beginning with Rail Ops 4 in winter 2025 and ending with Rail Ops 3 in winter 2026.

800 MHz Activation Schedule

As of March 2025, the first jurisdiction scheduled for 800 MHz activation is Arlington County with planned activation in summer 2025. Other jurisdictions included in this schedule are City of Alexandria, Fairfax County, Montgomery County, District of Columbia, and Prince George's County. The last location scheduled for activation is Prince George's County, which is planned for winter 2026.

Above Ground Antenna Tower Sites

There are 27 above ground antenna sites in this project. Construction is complete for 20 of these which are being readied for service. Five sites remain in the design phase: Missouri Ave., L'Enfant, Dulles, St. Elizabeth, and McCoart. Two sites are currently under construction: Shady Grove and Greenbelt. Three sites are currently experiencing construction difficulties: Dulles Yard (foundation and an adjacent retaining wall deficiencies that are pending approval from Metropolitan Washington Airports Authority); Missouri Ave. (retaining wall deficiency); and L'Enfant (Heating, Ventilation, and Air Conditioning design deficiencies).



Continuing Radio Deficiencies at WMATA Metrorail

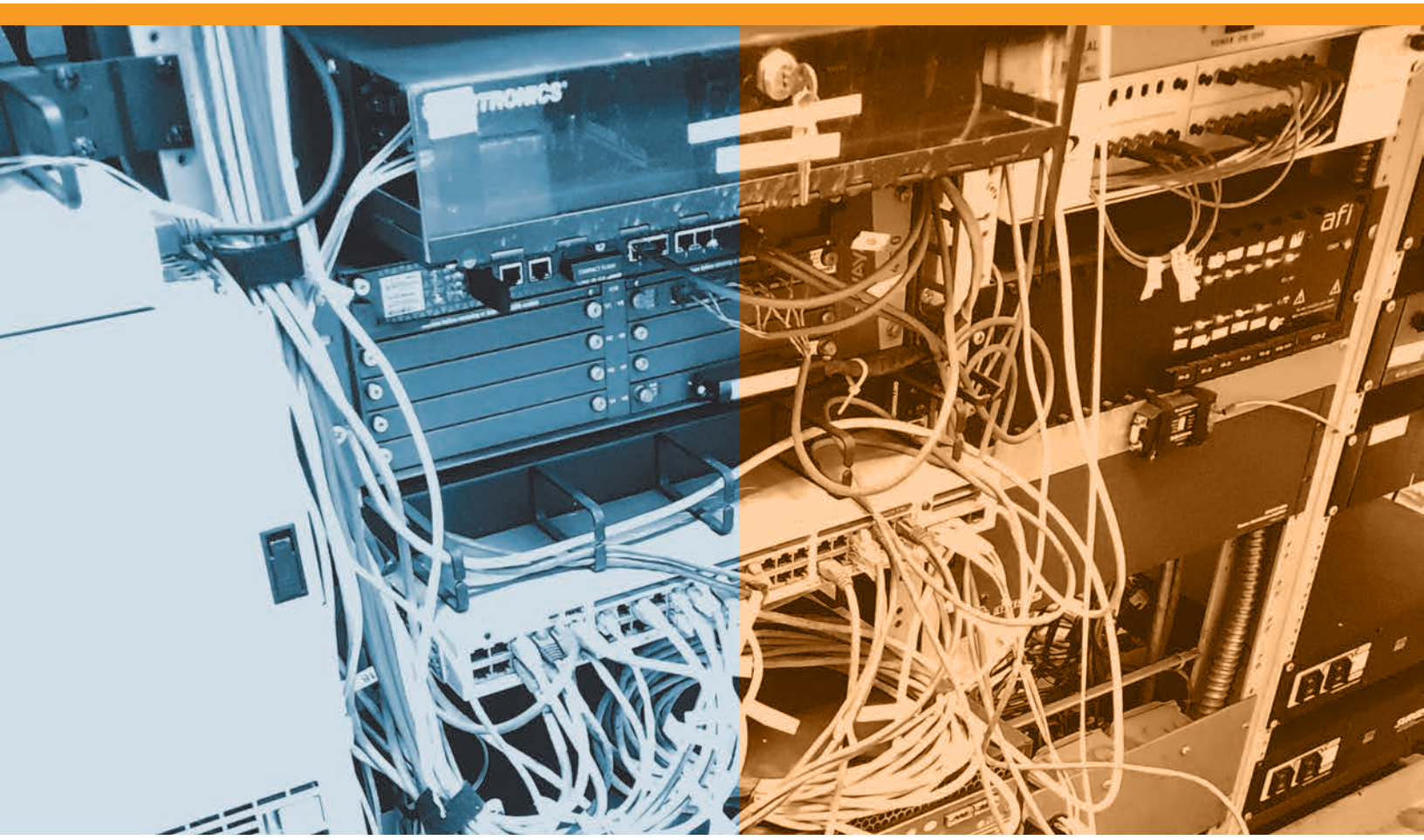
Continuing Radio Deficiencies at WMATA Metrorail

The radio communication issues present at WMATA Metrorail which existed prior to the beginning of the radio modernization project continue today. Examples of safety events involving radio deficiencies, as well as more recent total radio system failures, are provided below.

WMSC Audit of WMATA Emergency Management and Life Safety Programs

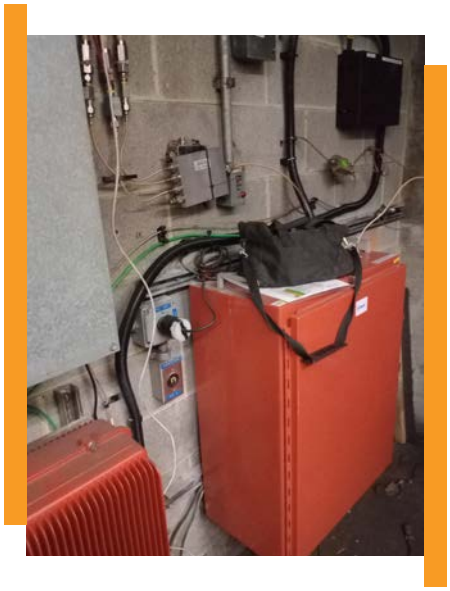
The WMSC's audit of WMATA Emergency Management and Life Safety Programs identified continuing Metrorail radio deficiencies. The audit report, published January 29, 2025, discussed radio related safety deficiencies such as intermittent radio communication deficiencies and known dead spots of radio coverage. These safety concerns led to Finding 1: "Metrorail does not have a reliable communication system for operations or emergencies." The inability for field personnel to communicate with the control center and for first responders to communicate with one another during emergency response is a safety risk to all who interact with the Metrorail system.

The WMSC's audit of WMATA Emergency Management and Life Safety Programs identified continuing Metrorail radio deficiencies...These safety concerns led to Finding 1: "Metrorail does not have a reliable communication system for operations or emergencies."



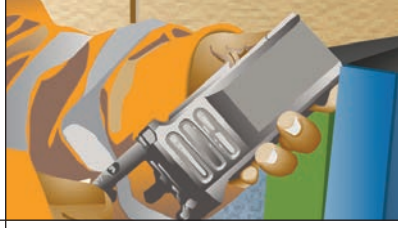
A review of WMSC investigations reports between April 2019 and July 2024 (from approximately two years after the beginning of radio project contract work to two years after the radio project was originally scheduled to conclude) reveal 64 reports that cite radio or communications deficiencies.

WMSC Investigations Reports Citing Radio Communications Deficiencies



WMATA's radio modernization effort, which was originally intended for completion in 2022, began in 2016 and is still underway. Likewise, safety-related radio communication deficiencies, have persisted throughout the project and are continuing. WMSC investigations of WMATA safety events regularly cite radio communications deficiencies as factors in either the occurrence of these events or in the response to the events. A review of WMSC investigations reports between April 2019 and July 2024 (from approximately two years after the beginning of radio project contract work to two years after the radio project was originally scheduled to conclude) reveal 64 reports that cite radio or communications deficiencies. Examples of these include:

- An evacuation for life safety reasons at Rhode Island Avenue-Brentwood Station on September 19, 2022 followed a bomb threat. Train operators were instructed to bypass and the station was evacuated. Control center personnel reported difficulty communicating evacuation instructions by radio, including three failed attempts to contact the Rhode Island Avenue-Brentwood Station Manager. According to the investigation report for this event, "both MTPD and ROCC personnel reported experiencing radio communications system issues during the event."
- On May 21, 2023, a Silver Line train at Metro Center Station struck a person who had fallen onto the roadway. Due to poor radio reception, a Metro Center station manager had to contact the control center using the Emergency Trip Station (ETS) to report that they could see a person on the roadway. There was no associated work order created to track the communications difficulty experienced during this event. The injured person was transported to a local hospital.
- A November 20, 2023 occurrence of improper rail vehicle movement at Huntington Station resulted in a near collision with two passenger trains. The trains came within 200 feet of one another. Due to radio communication difficulties, multiple attempts were needed to provide a single instruction, and the interruption of radio communication prevented other personnel and the train operator from effectively communicating with rail traffic control. Radio checks conducted as part of the resulting WMSC investigation demonstrated that most communication at Huntington Station was difficult or impossible to comprehend.
- On January 29, 2025, a person was fatally struck by a train on the red line near Grosvenor Station on WMATA tracks. The ongoing WMSC investigation suggests the initial reports and response to the person on the tracks, and later the report that the person had been struck, were delayed by inadequate radio coverage.

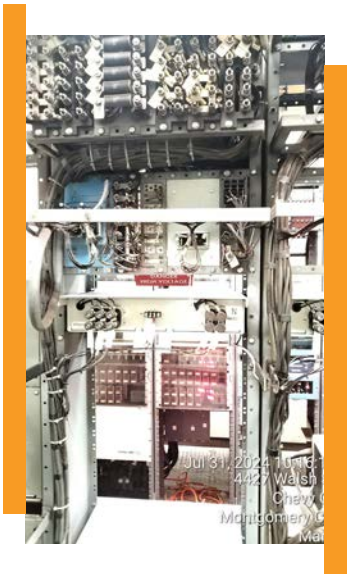


Systemwide Radio Outages

On February 10, 2025 at 9:55 a.m. ATC mechanics reported that the inspection WMSC personnel were onsite to observe would be delayed because there was an ongoing systemwide radio failure. This was the second total radio system outage in six days; the prior such outage occurred on February 4, 2025. A systemwide radio outage is a major safety issue because there is no ability to communicate via radio throughout the entire system.

WMSC inspectors travelled to the Carmen Turner Facility (CTF) which houses the two redundant prime site controllers which serve as the central processing unit for the radio system. If one of the prime site controllers fails, processing can be handled by the other unit. The WMSC inspectors arrived at CTF at 10:25 a.m. Separately, at 10:47 am, as required by the WMSC Program, Standard, WMATA notified the WMSC of the radio system outage. That notification stated that the radio system outage started at 9:53 a.m., and that radio communication was restored at 10:29 a.m.

WMATA personnel explained that the Prime Site Controller "B" failed to assign incoming radio traffic as intended, which caused a communication failure. WMATA personnel believed this to be the same failure mode that led to the systemwide radio outage February 4, 2025. However, the February 4, 2025 failure occurred on the Prime Site Controller "A" and required manual intervention by the system managers to assign the radio communications to the other unit, which restored radio communications.



During the February 10, 2025 event, the prime site controller "B" experienced a similar failure to process radio traffic and required the same manual intervention to reassign the radio communication to the other unit. When asked about automating the fail-over process, WMATA personnel explained that the current hardware has been unpredictable due to the age of the system, which, at more than 20 years old, exceeds the manufacturer's recommended life expectancy. Currently, there are no spare units available to replace either of the two prime site controller units should that become necessary. Inspectors were told that these units are not expected to be replaced until the completion of the radio modernization project.

Subsequent interviews with WMATA personnel confirmed that spare parts and reliability of the older equipment that comprise the current 490 MHz radio system is a problem as sourcing replacement parts is nearly impossible due to the age of the current equipment and bankruptcy of relevant manufacturers.

From follow up discussions with WMATA subject matter experts, the WMSC learned that a potential cause of the ongoing system-wide radio outages may be a malfunctioning Global Positioning System time source which is critical for maintaining synchronization across all radio communications. This issue may be contributing to a failure in the Prime Site Controller during which the controller is unable to process or transmit radio traffic.

Between February 1, 2025 and April 24, 2025, 15 systemwide radio outages were reported. The longest of these outages to date lasted close to one hour.

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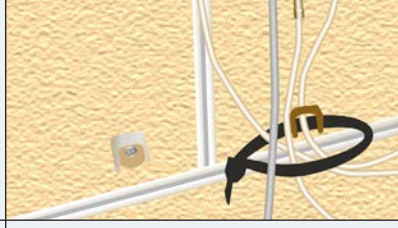
Conclusion and **Recommendations**

Conclusions and Recommendations



WMATA's radio modernization effort, which was originally intended for completion in 2022, began in 2016 and is still underway. Likewise, safety-related radio communication deficiencies, such as those discussed in this report, have persisted throughout the duration of this project and are continuing.

WMSC analysis of the delay of this project revealed four key factors: (1) cellular infrastructure update work taking priority over radio work, which caused a 2-year delay; (2) the need to revisit project design to add fiber redundancy, which caused a 2-year delay; (3) rescoping fiber work to prioritize completion of radio fiber, which reduced the 2-year delay caused by fiber design issues to an overall delay of 6-months; and, (4) the coordination of isolated work teams during the pandemic, which caused a 6-month delay. Review of updated project schedules and interviews with current WMATA project personnel revealed a focus on this project by current WMATA leadership, which has helped shorten the expected remaining schedule for project completion. Cutover to the new radio system is currently expected to begin with selected yards in 2025, and overall system cutover and commissioning is currently expected in December 2026.

The WMSC emphasizes the need for current WMATA leadership to maintain this focus by continuing to prioritize completion of the radio modernization project. Despite the eight years of work and hundreds of millions of dollars spent, the radio communications problems present at WMATA Metrorail prior to the beginning of the radio replacement project continue to pose a hazard to safety on the system today. A functioning radio communications system is critical to allow communication for all aspects of rail transit, including the safe coordination of movement of rail vehicles and facilitating emergency response. Effective radio communication during emergencies can affect the outcome because delayed communication can result in delayed emergency response, which has occurred as illustrated in several safety events detailed in this report.

Accordingly, because of the impact of a continuously inconsistent and under-functioning radio communications system, the WMSC will continue its oversight of radio communications at WMATA Metrorail. Additionally, the WMSC recommends that WMATA's Office of the Inspector General take note of issues surrounding completion of this project and conduct any appropriate oversight work.

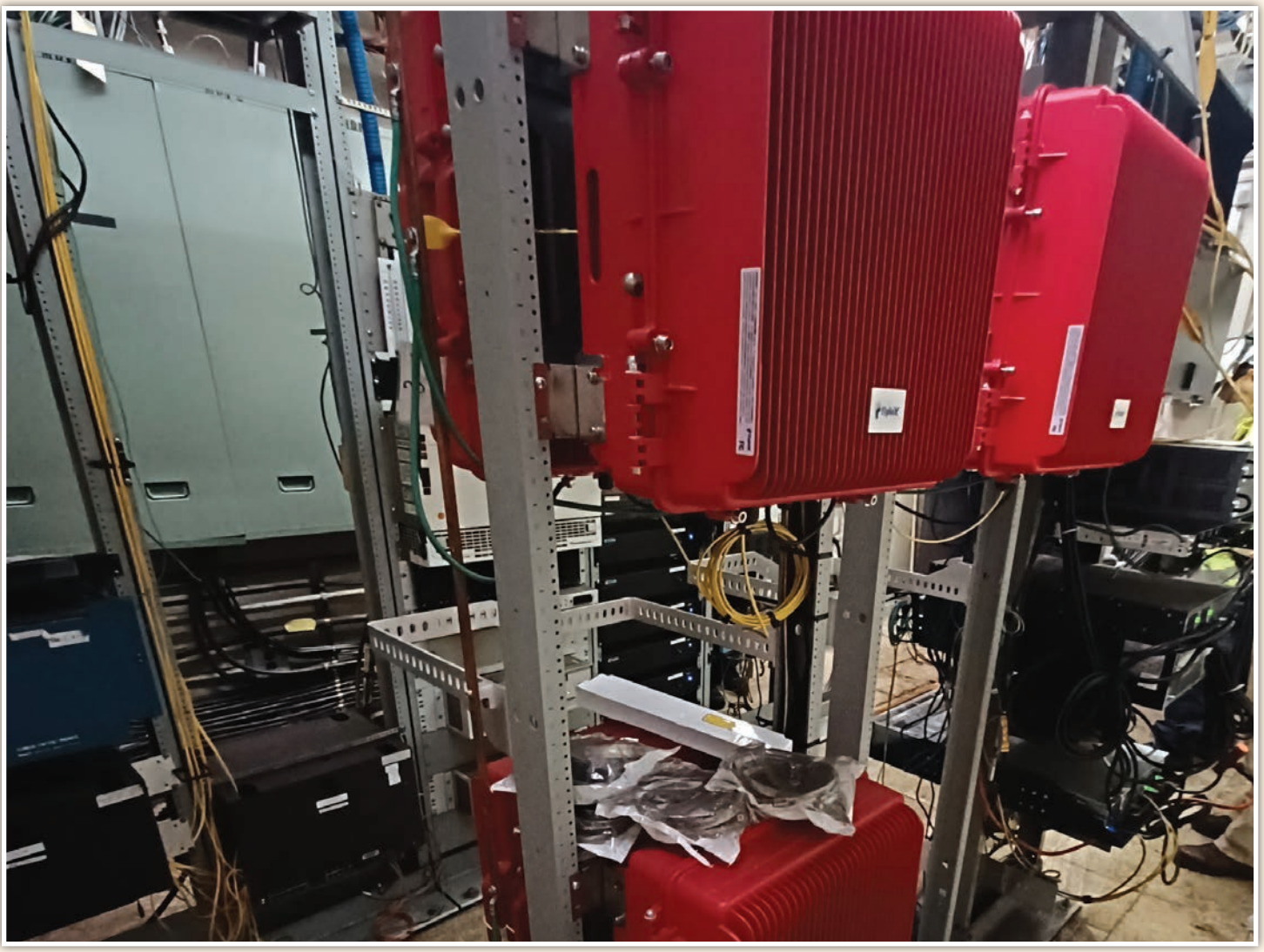
Despite the eight years of work and hundreds of millions of dollars spent, the radio communications problems present at WMATA Metrorail prior to the beginning of the radio replacement project continue to pose a hazard to safety on the system today.

Appendices

Appendices A and B

Appendix A: Personnel Interviewed

- Senior Vice President, Communications and Signaling
- Vice President, Communication and Signaling Engineering
- Director, Capital Improvement Projects
- Senior Program Manager, Communications and Signaling
- Project Manager, Fiber
- Assistant General Superintendent, Force Account Capital Projects



Appendix C

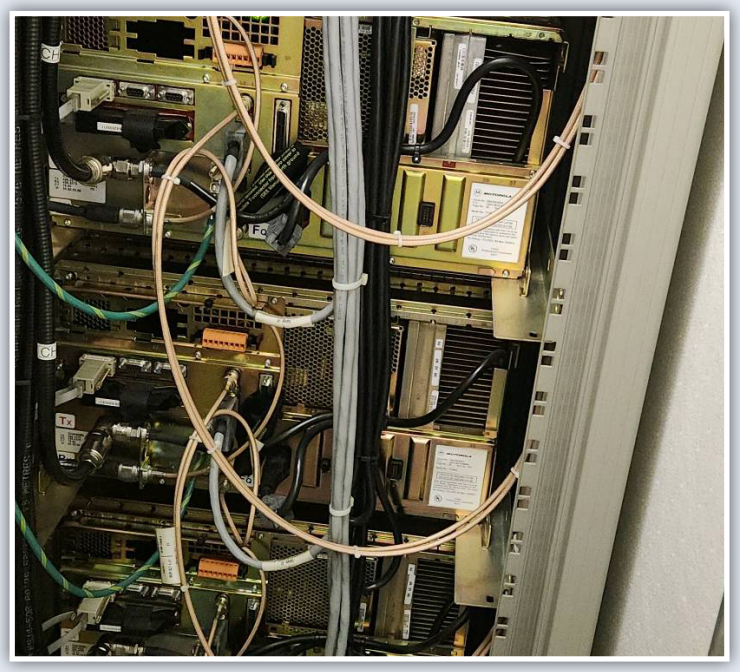
Appendix C: Documents Reviewed

- Federal Transit Administration Final Report: Washington Metropolitan Area Transit Authority Safety Management Inspection, March 16 to April 3, 2015 (6/17/2015)
- Washington Metropolitan Area Transit Authority's Federal Transit Administration Quarterly Presentation, Fiscal Year 2025, Quarter 1 (12/11/2024)
- WMATA's CRCS Overview Slide Presentation (no date)
- Capital Program, Planning, and Real Estate Committee Item III – B, Capital Project Status Update: Radio and Cellular Infrastructure Replacement (10/13/16)
- Initial Report by the Fire and Emergency Medical Services Department on the L'Enfant Plaza Metro Station Incident of January 12, 2015 (1/17/15)
- The Metropolitan Washington Council of Governments' Summary Report on Washington Metropolitan Area Transit Authority's Underground Communications Systems (10/2015)
- The Tri State Oversight Committee's Three-Year Safety and Security Review of the Washington Metropolitan Area Transit Authority's Radio and Communications Systems (7/8/2015)
- WMATA 700 MHz Radio System RFP No. FQ15000/ WJQ Volume 2-Technical Proposal Best and Final Offer (11/21/2016)
- Federal Communications Commission DA 21-52 Order (1/13/2021)
- Project and Construction Management Guidelines, The Federal Transit Administration (1/2025)
- Various WMATA's FQ15000 WMATA 700MHz Radio System and Fiber project documents including Conformed Contract, the Scope of Work and Technical Specifications, the System Integration Plan, schedules, schedule analyses and narratives, project change orders (PCOs), the project risk registry, the Non-Conformance Report (NCR) list, and Deliverable Requirements List and the Requirements Traceability Matrix

- WMSC Investigations Reports from August 2020 to July 2024
- WMSC's 2024 Audit of WMATA's Emergency Management and Fire Life Safety (1/29/2025)
- WMSC's 2024 Audit of Control Center and Rail Operations Draft Report and Documentation
- WMSC Risk Based Inspection Report Regarding WMATA's February 10, 2025 Systemwide Radio Outage (1/13/2025)
- WMSC Preliminary Investigation into WMATA January 10, 2025 Event Regarding a Person Fatally Struck by Train
- 2023 WMATA Quarterly Report to the Federal Transit Administration
- Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, H.R. 3630, 112th Congress (2012) (enacted)
- WMATA Radio Program Organizational Chart (2/18/2025)
- Communications & Signaling (COSI) Roles and Responsibilities for Radio Modernization Program (2/18/2025)

- Contract FQ18033, Task Order No: 21-FQ18033-IRPG-0010 – Parsons, Radio Program Project Management and On-Call Services Scope of Work (2/18/2025)
- Contract FQ18033, Task Order No: 21-FQ18033-IRPG-0011 – Delon Hampton / RK&K Joint Venture, Radio Program Project Management Supplemental Staff Augmentation Scope of Work (2/18/2025)
- Communications & Signaling (COSI) Employees and Budgeted Positions (2/18/2025)
- CIP0136 Radio & Cellular Infrastructure Replacement Project Summary, July 2022 to February 2025 (Alan Wonder)
- CIP0136 Radio & Cellular Infrastructure Replacement Project Contractors (Alan Wonder, 2/13/2025)
- Radio Project Summary of Schedule Delays (Alan Wonder, 2/14/2025)
- WMATA 700MHz Radio System Full Schedule (January 2025)
- Subscriber Portable Radio Tracker BI Dashboard (2/18/2025)
- FACP MBE Readiness Progress Tracker (2/18/2025)
- Control Stations Tracker Dashboard (2/18/2025)
- WMATA Tunnel DAS CIL Safety and Security Certification Program Certifiable Item List (1/7/2025)
- Radio Circuit Plan and Design – Package Testing (2/18/2025)
- WAS RF Test and Install Tracker (2/18/2025)
- FQ15000 WMATA AG Site Tracker, April 2022 to February 2025
- Engineering Design Tracker (2/18/2025)
- WMATA Tunnel DAS – Arlington County SubCIL Safety and Security Certification Program Certifiable Item List (2/18/2025)
- Fiber Tracker (2/18/2025)
- Building Coverage Testing Tracker (2/18/2025)
- Radio Band and Infrastructure Replacement Project – Elements of the Radio System (2/18/2025)
- Below Ground Installation Status Tracker October 2022 to February 2025
- WMATA Fiber Optic Infrastructure & Metro Box Enclosure Install Remaining Key Milestones Tracker (3/6/2025)
- CPM Schedule #92 and Latest Above Ground Fragnets: RF Site Status (Alan Wonder, Sheena Johnson 3/26/2025)
- WMATA Radio Systems Project Schedule (3/26/2025)
- WMATA 700MHz Radio System Project Schedule, July 2017 to December 2022
- WMATA Radio Systems Project Quarter 1 Schedule (4/14/2022)
- APX8000 Portable Radio Distribution Logs, March 2022 to January 2024

- CIP0136 Radio & Cellular Infrastructure Replacement Project Stakeholders Matrix (7/22/2022)
- Radio & Cellular Infrastructure and Master Fiber Program Management Organization Chart – Radio
- WMATA Radio Buy America Tracker, January 2021 to February 2022
- Change Order Tracker (6/30/2022)
- Above Ground Permits Logs, April 2022 to December 2023
- Motorola Solutions Quality Assurance Monthly Summary Reports, April 2022 to June 2024
- Motorola Solutions Nonconformity and Corrective Action Report Logs, March 2022 to October 2022
- CIP0136 Risk Register, March 2022 to August 2024
- Fourth Amendment Exhibit 3 – List of Tunnel Segments, Scan Amounts and Segment Lengths (1/5/2022)
- FQ15000 WMATA 700 MHz Radio System Quarterly Milestone Progress Reports January 2022 to March 2024 (Allen Wonder)
- WMATA Safety & Security Certification Program Plan (3/2012)
- WMATA 700 MHz Radio System Non-Conformance Logs October 2022 to June 2024
- WMATA Appendix V: Major Capital Project Financials, Fiscal Year 2023 and 2024
- WMATA Quarterly PMOC Progress Report September 2020 to June 2024 (Kenneth Spain, Allen Wonder)
- BG Installation Status Tracker – 700 and 800 BDA (1/26/2022)
- Rail Non-Revenue Vehicle Prototype Installation Tracking Schedule
- WMATA Tunnel DAS RFI Status Tracker, April 2022 to January 2024
- WMATA Tunnel DAS Submittal Tracker, April 2022 to January 2024

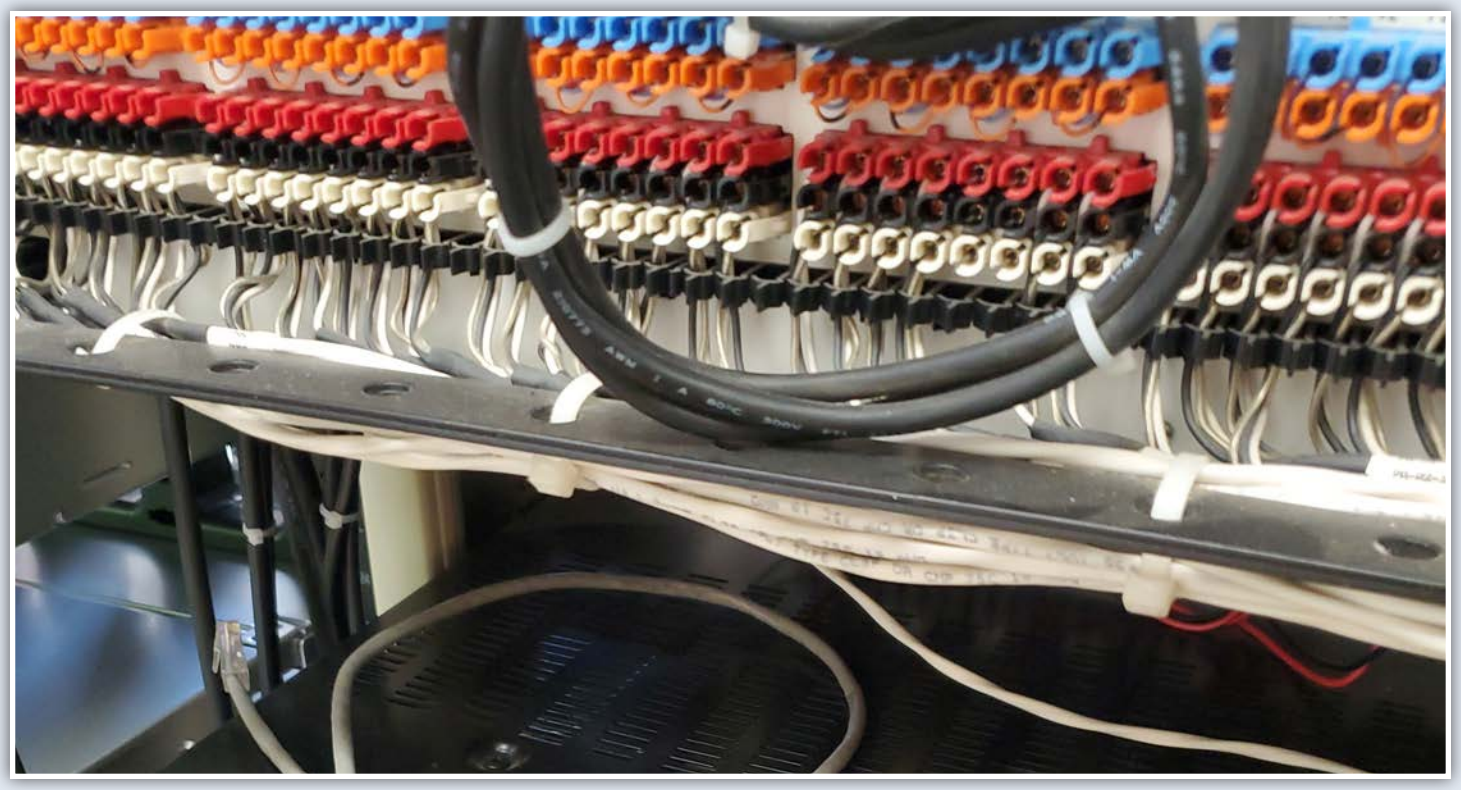


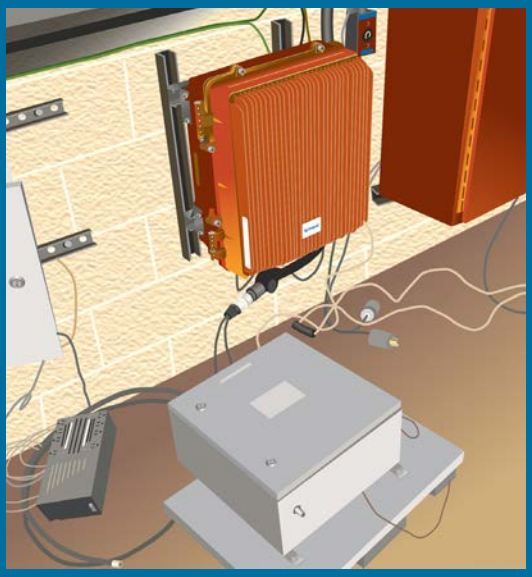
- FACP Combined Tracker
- CIP0136 Radio Infrastructure Financing Plan, Fiscal Year 2024 – Quarter 1 and Quarter 2
- CIP0136 PO Summary Tracker (1/19/2024)
- FQ15000 Radio Infrastructure Program Project Change Orders MOD Tracker, January 2023 to July 2024
- RBIR Radio Procurements Tracker, December 2023 to May 2024
- WMATA System Map (7/26/2023)
- Radio & Cellular Infrastructure and Master Fiber Program Management Organization Chart – Fiber
- WMATA 700 MHz Subscriber Mobile Tracker, April 2022 to February 2023
- CIP0136 Radio & Cellular Infrastructure Replacement Contract Summary, January 2023 to July 2024
- RBIR Systems Procurements Designs Tracker
- WMATA Quality Management Plan, CIP0136 Radio and Cellular Infrastructure Replacement Project (Karen Fisher, 2/8/2019)
- PMOC Tracker, Fiscal Year 2022 – Quarter 4

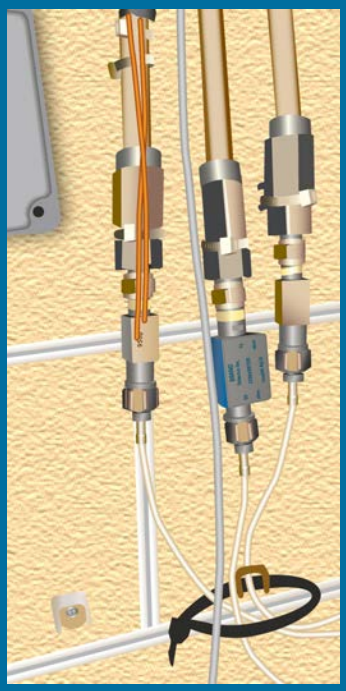
- Motorola Solutions FQ15000 WMATA 700 MHz Radio System Internal Testing Audit (Lamont Edwards, 12/17/2022)
- WMATA Metrorail Infrastructure Map Ancillary Locations (4/22/2024)
- FQ15000 WMATA 700 MHz Radio System Field Data Collection Report – Subscribers (2/1/2024)
- WMATA Metrorail Infrastructure Map Fiber Optic Cable/RF System (1/2024)
- FQ15000 WMATA 700 MHz Radio System Field Data Collection Report – Tantallon (6/30/2023)
- WMATA FQ15000 Radio Project Compliance Audit (Lee Ragin, 5/23/2023)
- Motorola Solutions Internal Audit Schedule, 2022 and 2023
- PMO Partnership WMATA Interim Implementation Plan #02 – Radio & Cellular Program Action Items List, October 2021 to September 2024
- FQ15000 Submittal Tracker (10/5/2023)
- Motorola Solutions Field Data Collection Report Summary – All Sites (6/13/2024)
- Buy America Receipt at Post-Delivery Audit Checklist (6/30/2023)
- FQ17044-20-006: Above Ground Fiber Optic Cable Installation – A Lines (4/11/2022)
- FQ17044-20-012: Above Ground Fiber Optic Cable RFI's – C Line (4/11/2022)
- FQ17044-20-006: Above Ground Fiber Optic Cable Submittals – A Lines (4/11/2022)
- Permit Status Tracker
- CIP0136 Total Project Cost Evolution
- WMATA Disadvantaged Business Enterprise Prompt Payment Report (9/29/2021)
- WMATA 700 MHz Radio System Project BU46 Review (4/2021)

- Motorola Solutions Safety and Security Certification Plan – FQ15000 WMATA 700 MHz Radio System (9/8/2017)
- PMOC Quarterly Comprehensive Monitoring Report – WMATA Radio and Cellular Projects, March 2021 to July 2024
- Additional WMATA Radio & Cellular Communications Project for PMOC Review
- WMATA Radio and Cellular Project QRM Agenda, October 2021 to June 2022
- PMOC Quarterly Report Change Mod #063 – CRCS Coverage Support Services
- WMATA FQ15000 RFI Status (4/11/2022)
- FACP MOC PWR Drop Status (2/1/2021)
- MB Box Installation Tracker
- MB Location Matrix (3/24/2022)
- PMO Partnership Safety and Security Management Plan Checklist (Dain Pankratz, 7/1/2024)

- PMOC Comprehensive Monthly Report: Systemwide Infrastructure Rehabilitation Program, Major Capital Projects Program, Railcar Procurement Program (8/11/2016)
- PMOC Quarterly Monitoring Report: Radio and Cellular Infrastructure Replacement Project (9/9/2020)
- PMOC Comprehensive Monthly Report: Radio and Cellular Infrastructure Replacement Project, Station Platform Rehabilitation Program, Rail Heavy Repair and Overhaul Facility Project (5/9/2019)
- PMOC Comprehensive Monthly Report: Systemwide Infrastructure Rehabilitation Program, Test Track and Commissioning Facility Project, Radio & Cellular Infrastructure Renewal Project, 7000 Series Railcar Procurement Project – March 2016 to July 2016
- PMOC Comprehensive Monthly Report: Systemwide Infrastructure Rehabilitation Program, Test Track and Commissioning Facility Project, 700 MHz Radio Replacement and Neutral Host Project, 7000 Series Railcar Procurement Project, February 2016 to March 2016
- WMATA Radio and Cellular Infrastructure Replacement Program Project Dashboard
- WMATA 700 MHz Radio System Project Dashboard
- Contract Modification #063 WMATA 700 MHz Radio System Project
- WMATA Radio and Cellular Project Schedule: PMOC Request for Clarification and Agenda (10/2021)
- WMATA Radio and Cellular Project PMOC/WMATA Follow-Up Meeting Notes (2/11/2022)
- WMATA Radio and Cellular Project Safety Documents and Safety Certification Meeting Takeaway and Action Items (6/24/2022)
- WMATA Radio & Cellular Certifiable Items List (5/20/2021)
- 700 MHz Radio/Cellular Monthly Report (10/21/2022)
- WMATA Radio and Cellular Project PMOC Coordination Meeting Agenda (11/2/2020)
- WMATA Radio/Cellular Safety Open Issues







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