

KEEPING PROJECTS **ON TRACK**

Presented by Bruce Stephan

NetPoint + GPM
CONFERENCE

May 8, 2020 | ONLINE

Agenda



7 Line Extension

Helping MTACC President
Take Informed Action



Second Avenue Subway

Helping NYC Transit Get
the Project Done on Time



BART Transbay Corridor Core Capacity

Helping FTA and Congress
Better Understand
Schedule Issues



LA Metro's $1.2B Crenshaw LAX

Helping LA Metro & FTA
Predict Revenue Service

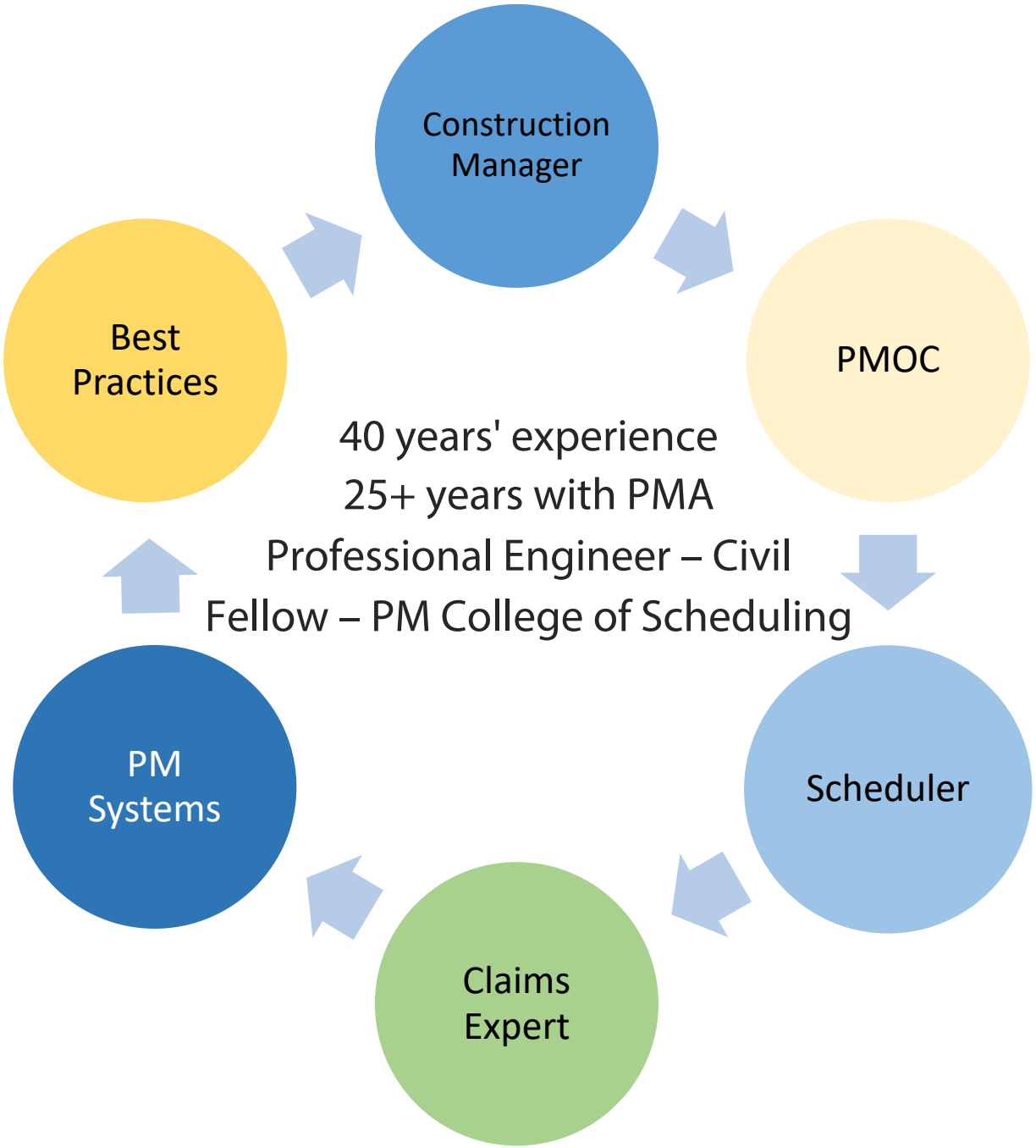


SFMTA Central Subway

Helping SF MTA Allocate
Delay Responsibility

Bruce Stephan, PE, PMP

EXECUTIVE DIRECTOR – WEST







7 Train Extension

New York City Transit Authority

Helping Executives Take Informed Action

7 Train Extension

Project Overview

$2 billion project to bring transit to Jacob Javits Convention Center from Grand Central and Times Square.

As a key part of the Hudson Yards Redevelopment Project, the project will bring business and entertainment into the area, as well as aid redevelopment of nearby Chelsea and Hell's Kitchen.

Scope of Work

- 7,000 ft of twin rock tunnels,
- New 34th Street and Javits Stations
- Finishes and Systems contract

Opened to the public on September 13, 2015.



7 Train Extension

PMA Role

Seconded to MTACC team during construction

PMA provided:

- Project Controls
- Scheduling
- Claims Avoidance
- Delay Analysis
- Claims Resolution

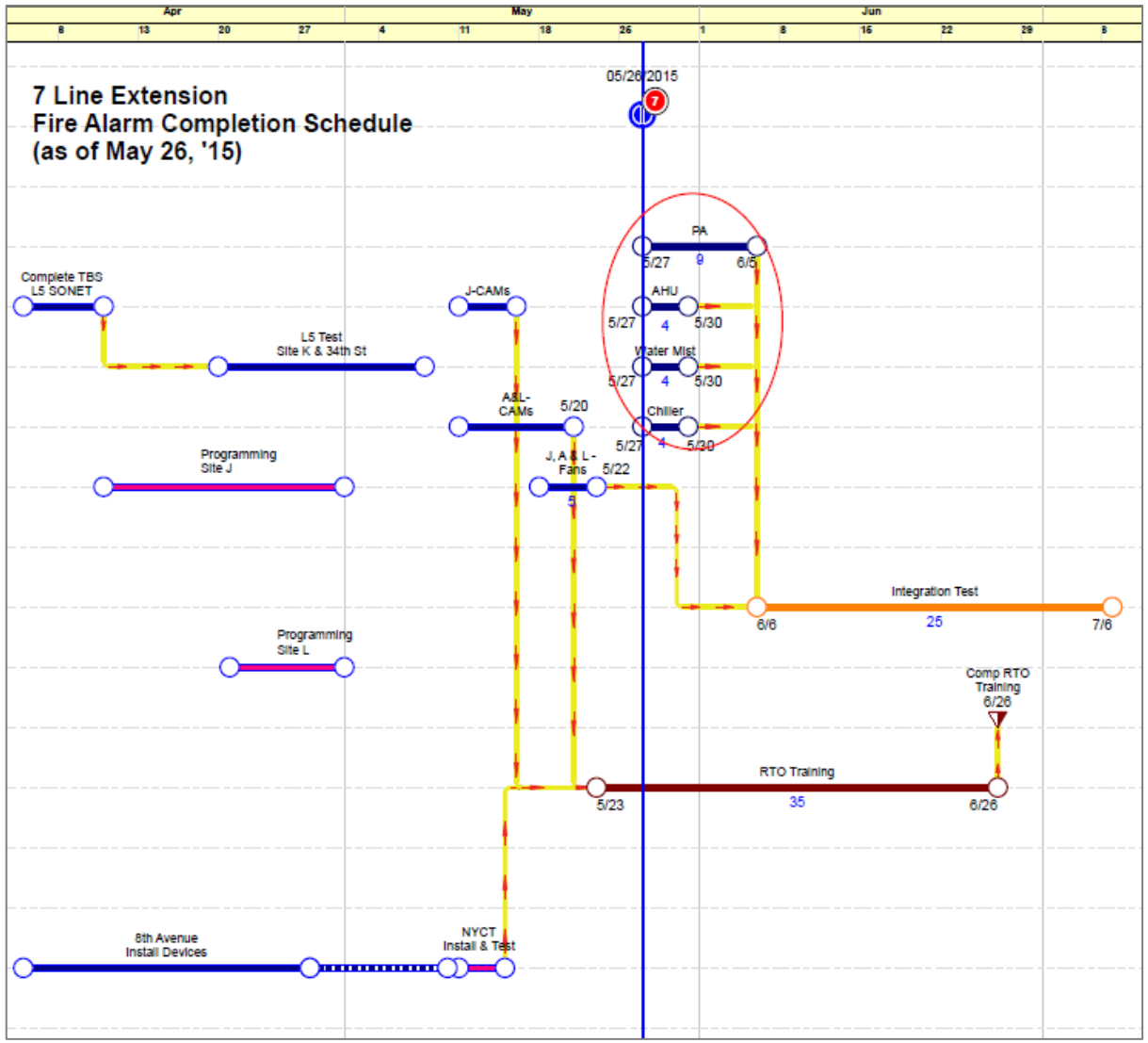
Advisor to Project Executive and MTACC President



Use of NetPoint **in 7 Train Extension**

Used by President of MTA

- Briefed Contractor's Senior Management and NYCT's Operations twice weekly.
- More than 50 executives were in the meeting.
- MTA's president walked through the subnets line by line with responsible parties to obtain status and discuss solutions to obstacles.





NetPoint Advantage

on 7 Train Extension

NetPoint subnets were used by executive management to coordinate with Contractors and Agency staff involved in startup and testing. This ultimately was a key factor in getting this significant, complex project opened to revenue service.

NetPoint was used to analyze and resolve contractor claims.

NetPoint was used in management and status reports to key stakeholders.



Second Avenue Subway Phase 1

New York City Transit Authority

Helping Get the Project Done on Time

Second Avenue Subway Phase 1

Project Overview

- 2 miles of twin-bored tunnels in densely packed urban area
- 3 New Stations: 96th, 86th, and 72nd Streets
- $4.5 billion overall cost
- Revenue Service date established by FTA as December 31, 2016
- State-of-the-Art Fire, Life, Safety & Communication Systems
- Tracks, signals, power, HVAC, vent buildings, axial fans, elevators, escalators, street restoration



PMA ROLE

The project had experienced delays and the decision was made to accelerate.

UPPER EAST SIDE & ROOSEVELT ISLAND **Transportation**

MTA Will Tap Into Back-Up Fund to Finish Second Ave. Subway On Time: Board



By Shaye Weaver | February 24, 2016 12:36pm
@shayeweaver

UPPER EAST SIDE —
The MTA decided on Wednesday to spend an additional $66 million in order to stay on schedule for the December opening of the Second Avenue Subway.



The Second Avenue Subway's 72nd Street cavern as of Jan. 21.

MTA Capital Construction/Rehema Trimiew

The agency's full board voted in favor of using money from its contingency fund that would allow contractors to work additional and longer shifts in order to complete work, like installing escalators and elevators, and finishing facility power and electrical distribution rooms at each station.

Contractors must finish by set milestones, which are still to be determined, or they

PMA was hired as Chief of Acceleration and assigned to CM teams.

"On February 24, 2016, the MTA allocated $66 million to speed up the construction of the first phase so that it could open in December"

- The first few months were spent drafting and negotiating an acceleration agreement that tied the acceleration money to key milestones.
- The milestones were defined by coding them to specific schedule activities.

COMMUNICATION	63rd	16	The Contractor shall complete all work and preliminary testing and pre-testing required to perform Field Installation Acceptance Tests (Level 3/4) on the 63rd Street Station communication systems.	5/31/2016
		16A	The Contractor shall complete all work and testing through Systems Integrated Testing of all the 63rd Street Station Communications Systems, except UHF SIT and Fire Alarm Combined SIT .	6/30/2016
	72nd	17	The Contractor shall complete all work and preliminary testing and pre-testing required to perform Field Installation Acceptance Tests (Level 3/4)on the 72nd Street Station communication systems, except for the UHF Radio system and work associated with room 7024.	6/13/2016
		17A	The Contractor shall complete all work and testing through Systems Integrated Testing of all the 72nd Street Station Communications Systems, except escalators, elevators and except UHF SIT and Fire Alarm Combined SIT.	8/29/2016
	86th	18	The Contractor shall complete all work and preliminary testing and pre-testing required to perform Field Installation Acceptance Tests (Level 3/4) on the 86th Street Station communication systems, except for the UHF Radio system.	6/27/2016
		18A	The Contractor shall complete all work and testing through Systems Integrated Testing of all the 86th Street Station Communications Systems, except escalators, elevators and except UHF SIT and Fire Alarm Combined SIT.	8/1/2016

(R-4/14/16) With All Accelerations -CM,TP, SIG, TRK - C

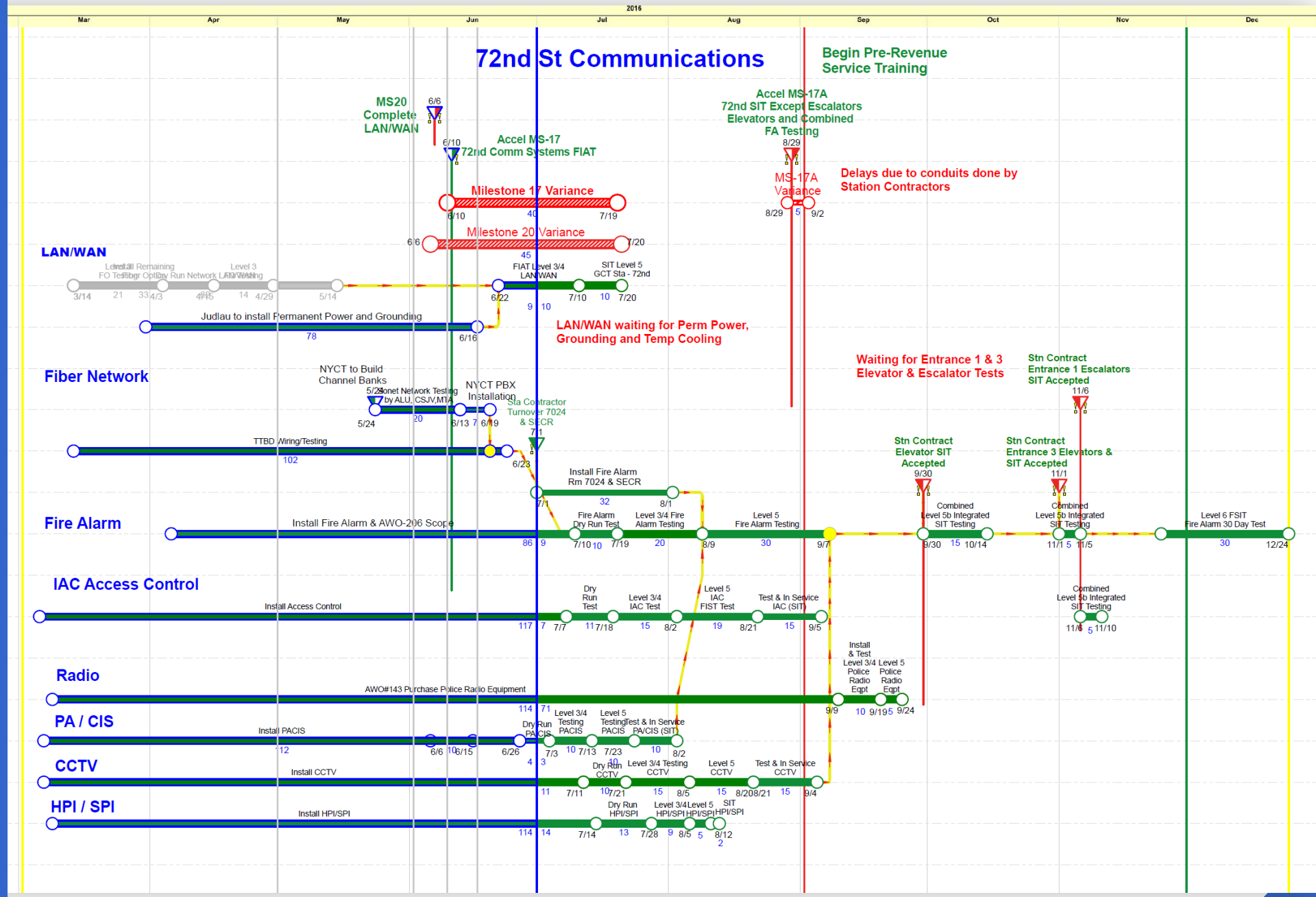
ACC MILESTONE #06 - TRACTION POWER FIAT - 72ND ST BY 5/2/16				
CONTRACT MILESTONES AND ACCESS CONSTRAINTS				
CONTRACT MILESTONES				
ACCELERATION AGREEMENT MILESTONES				
GENERAL				
72nd St. Complete TPSS/CBH FIAT--Ready for Facility Power and CON ED High Tension Power by 5/2/16				
CONSTRUCTION	07/13/15 A	04/19/16	79	4512
TRACTION POWER SUBSTATION	12/17/15 A	04/19/16	79	4262
TRACTION POWER	12/17/15 A	04/19/16	79	4262
72ND ST STATION	12/17/15 A	04/19/16	79	4262
POWER UP AUX SWITCH GEAR BY OTHERS - 72 ST SS	02/01/16	02/01/16	1	2112
TERMINATE CONTROL WIRE - 72 ST SS	12/17/15 A	04/06/16	1	132
TERMINATE SCADA - 72 ST SS	01/11/16 A	04/06/16	1	98
INSTALL & TERMINATE - HT CABLE - 72 ST SS	04/06/16	04/14/16	8	1920
INSTALL CONED CT & HI-POT & CONED TRIP TEST - 72 ST SS	04/14/16	04/19/16	5	0
TRACTION POWER CBH	07/13/15 A	02/03/16	2	250
TRACTION POWER	07/13/15 A	02/03/16	2	250
72ND ST STATION	07/13/15 A	02/03/16	2	250
TERMINATE CONTROL AND SCADA WIRES - 72 ST CBH	07/13/15 A	02/03/16	2	250
TESTING & COMMISSIONING	02/02/16	05/02/16	91	256
FIELD INSTALLATION ACCEPTANCE TEST (FIAT)	02/02/16	05/02/16	91	256
TRACTION POWER	02/02/16	05/02/16	91	256
72ND ST STATION	02/02/16	05/02/16	91	256
TEST CONTROL CABLE - 72 ST	02/02/16	02/06/16	5	0
FIELD TEST TRACTION POWER SCADA - 72 ST (FIAT)	04/28/16	05/02/16	5	256
FACILITIES INTEGRATED SYSTEMS TESTS (FIST)	03/17/16	05/02/16	47	0
TRACTION POWER	03/17/16	05/02/16	47	0
72ND ST STATION	04/09/16	05/02/16	24	0
FACILITY INTEGRATED SYSTEMS TEST - 72 ST SUBSTATION (FIAT & FIST)	04/19/16	05/02/16	13	0
FACILITY INTEGRATED SYSTEMS TEST - 72 ST CBH (FIAT & FIST)	04/09/16	05/02/16	24	0
POWER CONTROL CENTER (PCC)	03/17/16	03/27/16	10	0
FACILITY POWER PLC TEST - 72 ST (FIST)	03/17/16	03/27/16	10	0

- Agreement signed 4/20/16, 8 months left.

72nd St. Station (July)

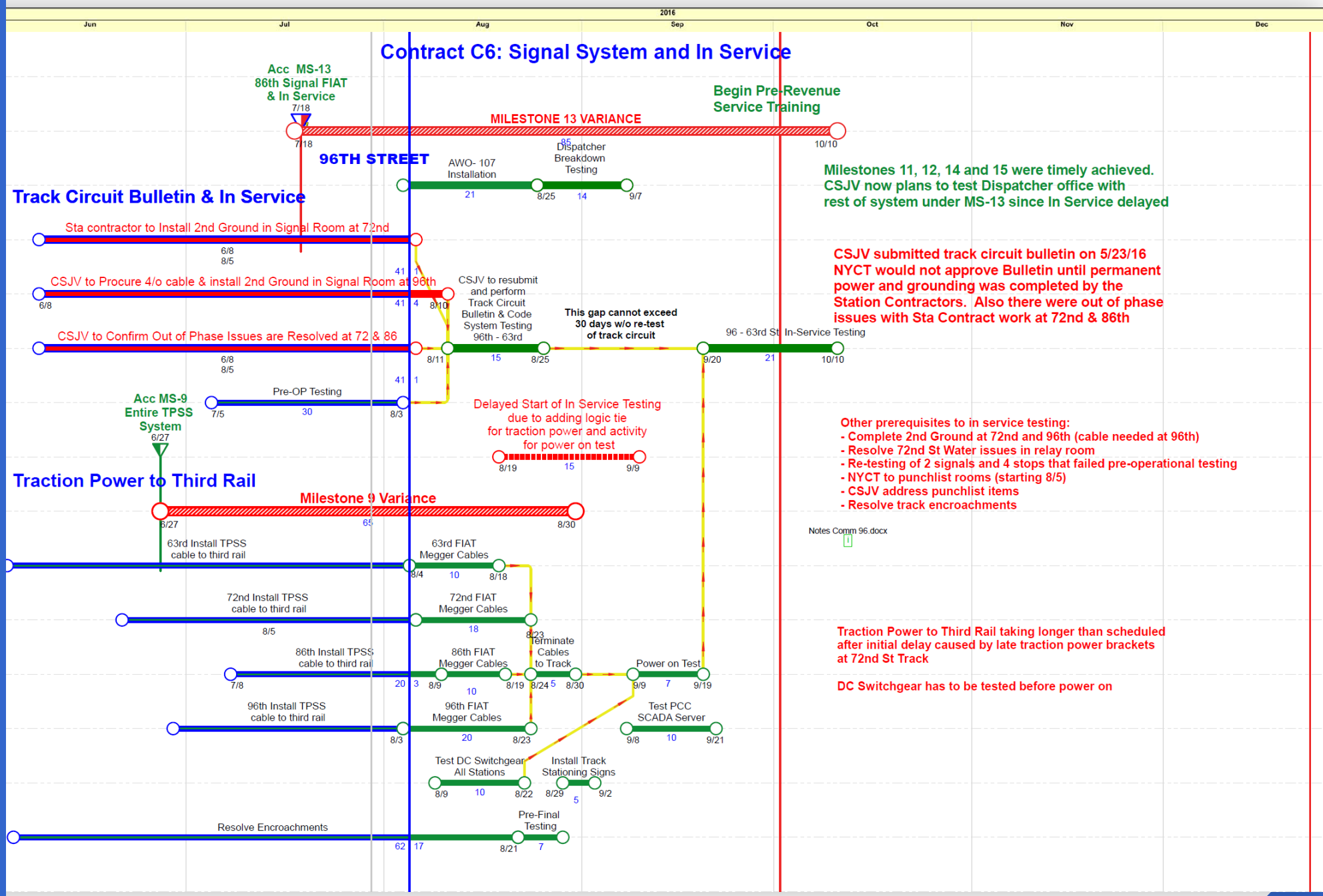
NetPoint was used to:

1. Show the interrelationships between various communication systems testing;
2. Show delays to the acceleration milestones;
3. Identify the causes of the delays so they could be addressed.



With only 4 months to the grant date, almost everything was critical.

NetPoint began to be used on a daily basis to identify and resolve delays.

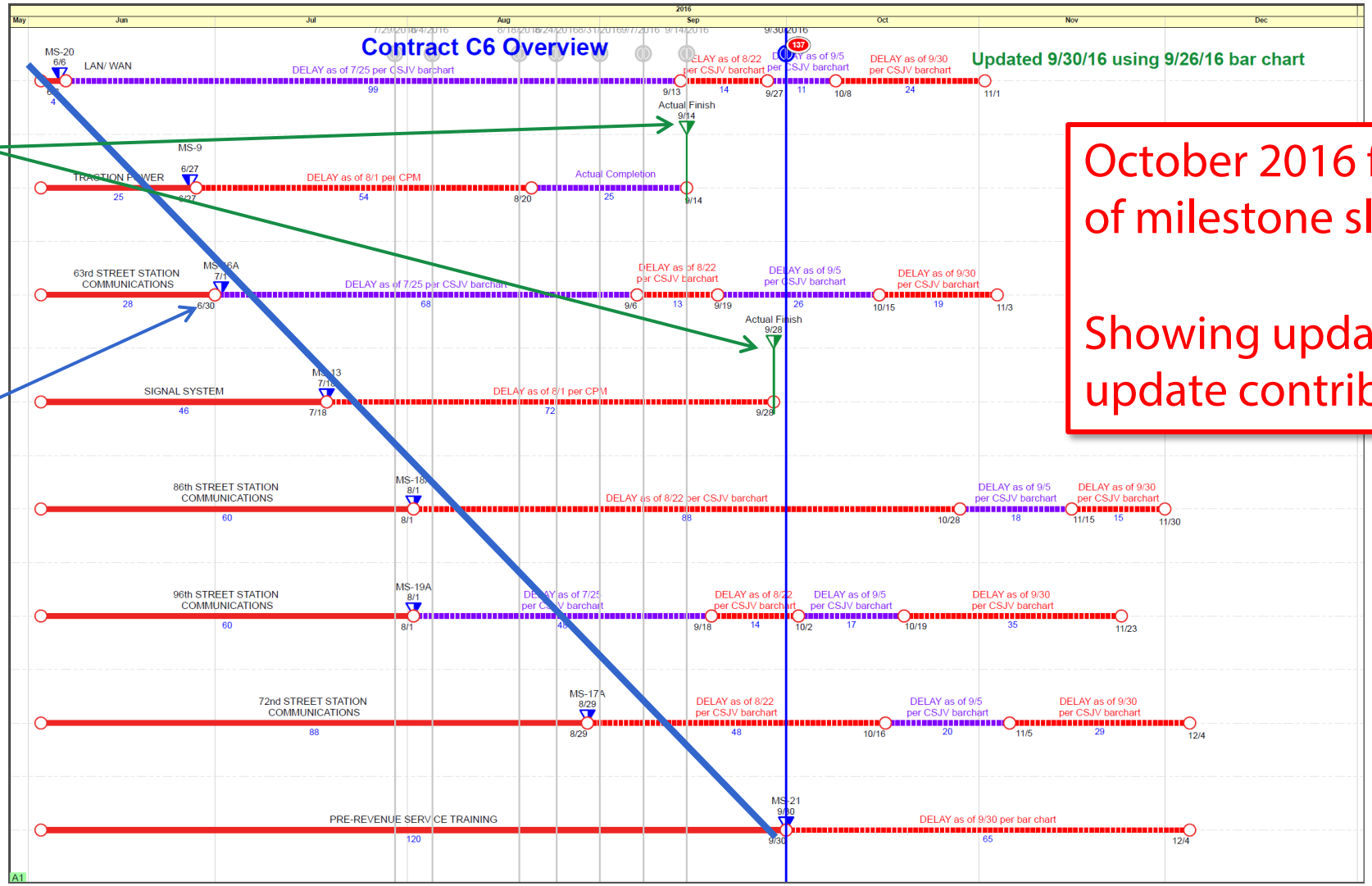


NetPoint Made the Ongoing Delays Obvious

Milestones kept slipping through the summer

Actual milestone dates (some good news)

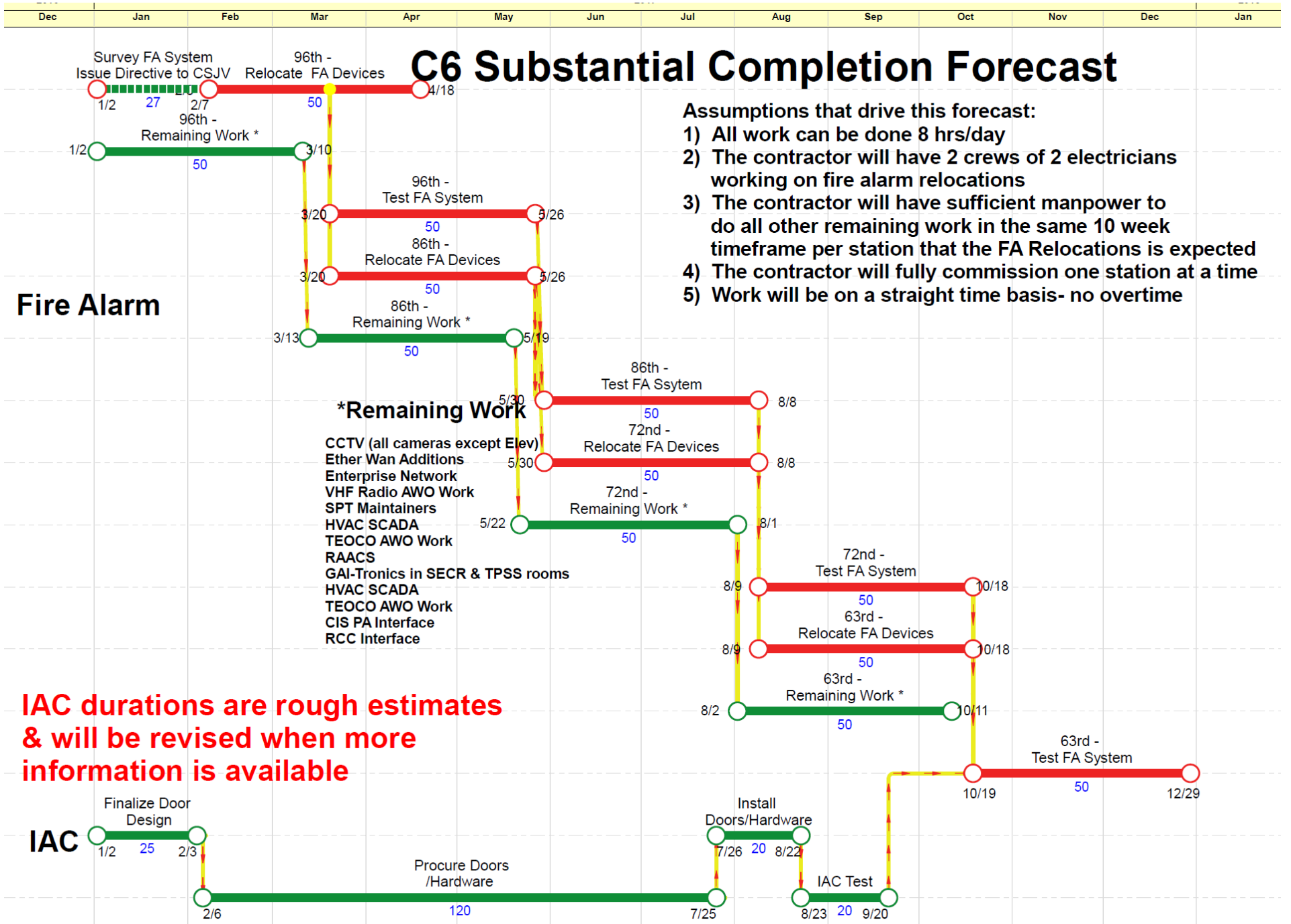
Required milestone dates



October 2016 forecast of milestone slippage

Showing update by update contribution

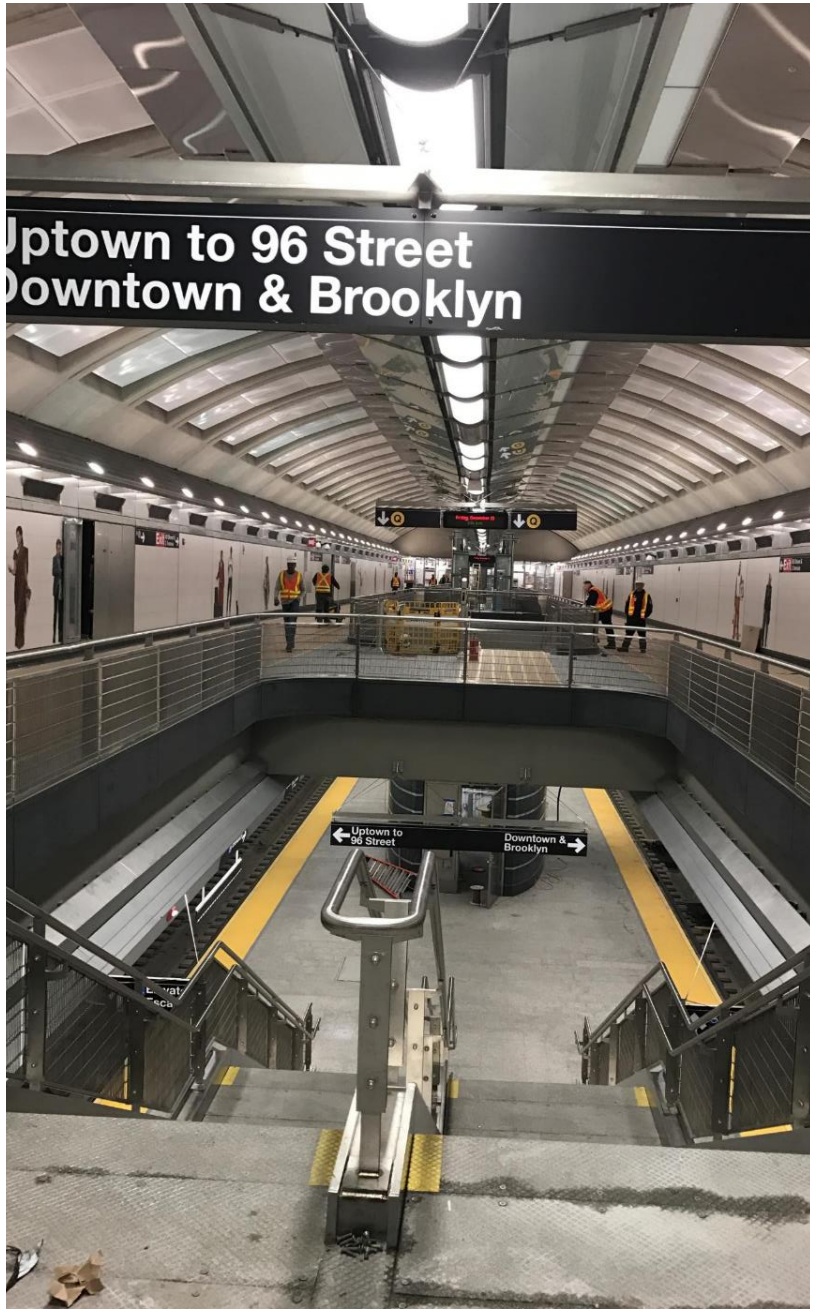
C6 Substantial Completion Forecast

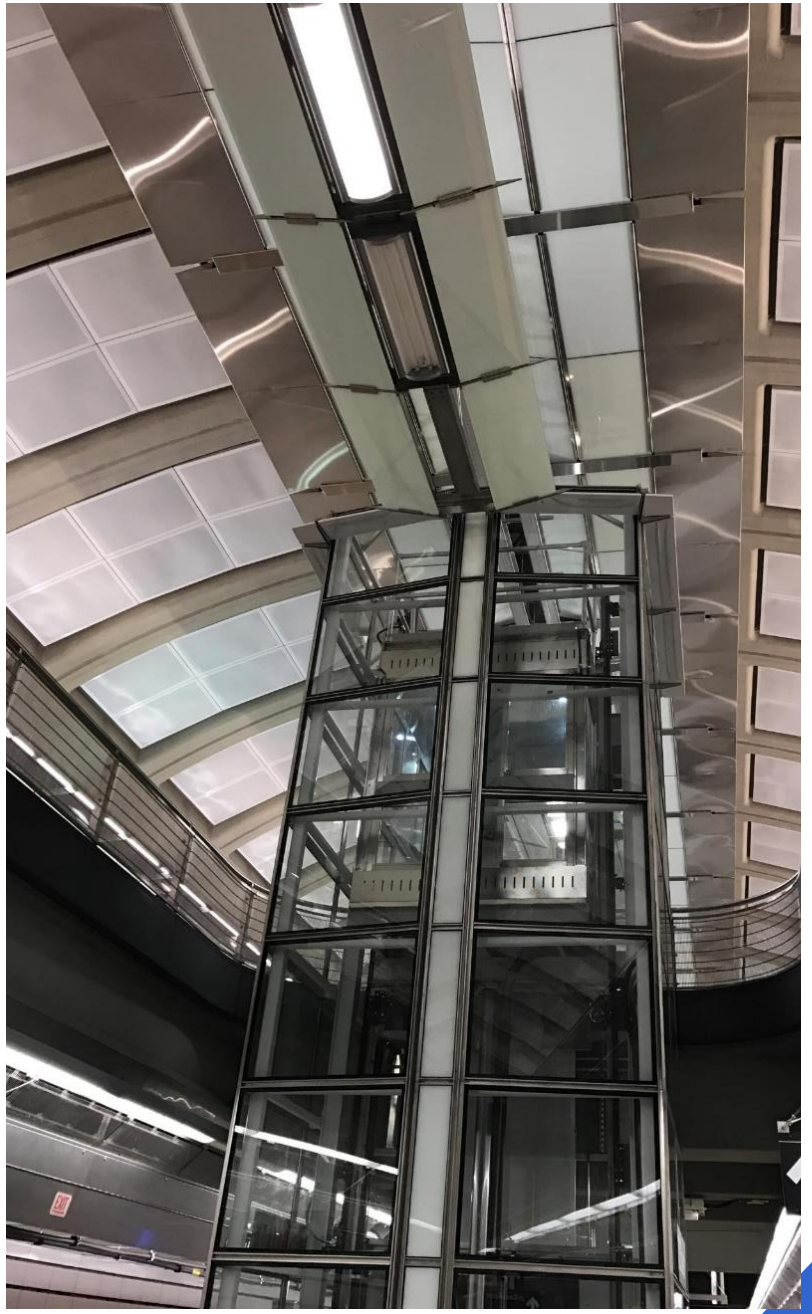


Assumptions that drive this forecast:

1) All work can be done 8 hrs/day
2) The contractor will have 2 crews of 2 electricians working on fire alarm relocations
3) The contractor will have sufficient manpower to do all other remaining work in the same 10 week timeframe per station that the FA Relocations is expected
4) The contractor will fully commission one station at a time
5) Work will be on a straight time basis- no overtime


Phase 2
Phase 1
(under construction)
Phase 3
Phase 4
MANHATTAN
125 St
116 St
106 St
96 St
86 St
72 St
57 St
55 St
42 St
Times Sq
42 St
34 St
Herald Sq
23 St
14 St
Canal St
Grand St
Chatham Square
Houston St
Lexington Av/63 St
Transfers under evaluation


Uptown to 96 Street
Downtown & Brooklyn
Uptown to 96 Street
Downtown & Brooklyn



SUCCESS!

The FTA Milestone of 12/31/16 *Substantially* Achieved. Final "Delay" was a New Years Party in the Station ☺



Second Avenue Subway Ringing in New Year With Party - The New ...
https://www.nytimes.com/2016/12/29/.../**second-avenue**-subway-**party-new-years-eve**.ht...
Dec 29, 2016 - An invitation-only group of about 500 people, including track engineers and elected officials, is expected for the **celebration**, which will include ...

Second Avenue subway first ride before New Year's Eve ball drop ...
www.nydaily**news**.com/**new**.../**avenue**-subway-ride-**new-year-eve**-ball-drop-article-1.29...
Jan 1, 2017 - **Second Avenue** subway takes first ride just before **New Year's Eve** ball drop in ... Cuomo rings in **New Year** with the first ride of **Second Ave**.

MTA Announces Official Hours For Inaugural Second Avenue Subway ...
gothamist.com/2016/12/31/**second_avenue**_subway_inaugural_trips.php
Dec 31, 2016 - Hours after the New York Times published a tantalizing preview of Governor Cuomo's **New Years Eve Second Avenue** Subway Celebration ...

Governor Cuomo Will Ride The Second Avenue Subway On New ...
gothamist.com/2016/12/26/post_189.php
Dec 26, 2016 - But Governor Andrew Cuomo is not one to miss an infrastructure-related photo opportunity, hence the inaugural **New Year's Eve** ride planned ...

Second Avenue Subway gets its historic inaugural ride on New Year's ...
ny.curbed.com/2017/1/1/.../**second-avenue**-subway-first-ride-governor-cuomo
Jan 1, 2017 - Inside the 72nd Street station on the new **Second Avenue** subway Amy Plitt ... what was (briefly) the city's most exclusive **New Year's Eve party**.

Second Ave Subway's ceremonial first ride will be a New Year's party ...
ny.curbed.com/2016/12/27/14094206/**second-avenue**-subway-ceremonial-ride
Dec 27, 2016 - While the rest of us will be spending our **New Year's Eve** elsewhere, Governor Andrew Cuomo is planning on spending his on the inaugural ...

Second Avenue Subway poised to open by New Year's Eve - Curbed NY



NetPoint Advantage
in Second Avenue Subway

Entire program schedule was summarized in NetPoint.

Key fragnets were used at team meetings to identify and resolve issues.

MTA President used NetPoint fragnets to chair weekly coordination meeting with 5 prime contractors. This was where the miracles happened.

NetPoint used to analyze Contractor delay claims and allocate responsibility for the cost of delays.

NetPoint used to present claims settlements involving time extensions.



Crenshaw / LAX Transit Project

LA Metro

Helping LA Metro & FTA Predict Revenue Service

LA Metro's Crenshaw/LAX Transit Project Predicting Revenue Service w/NetPoint

Project Overview

- $1.2 billion Design-Build Light Rail Contract
- Overall $2 billion program
- 8.5 mile guideway at grade, aerial, and underground sections, and eight stations
- Connection between Green Line near LAX and the Exposition Line
- Serves the cities of Los Angeles, Inglewood and El Segundo, as well as unincorporated LA County.



PMA's Initial Role in LA Metro's Crenshaw/ LAX Transit Project

2015 Schedule Analysis

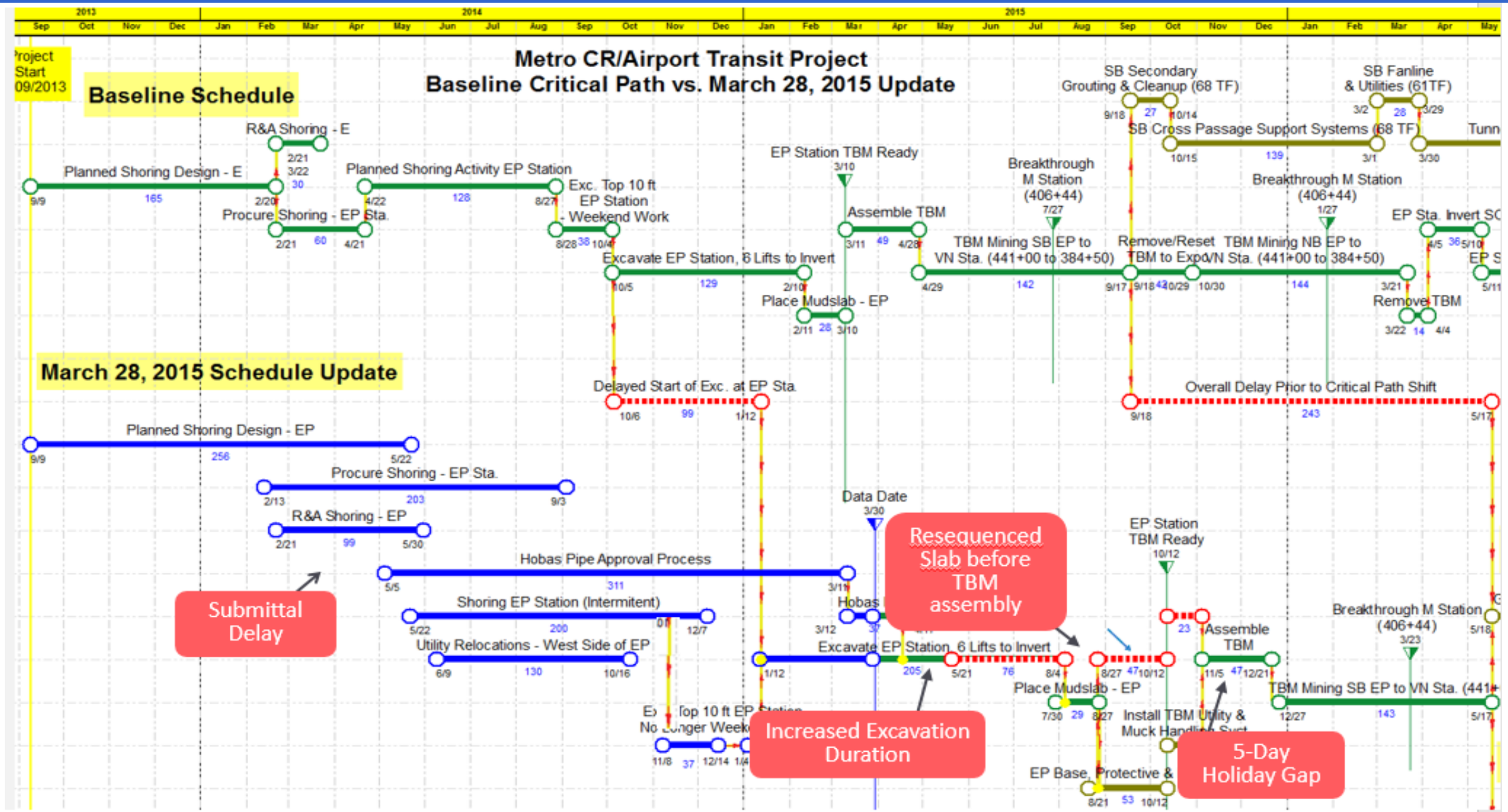


2015 Schedule Analysis

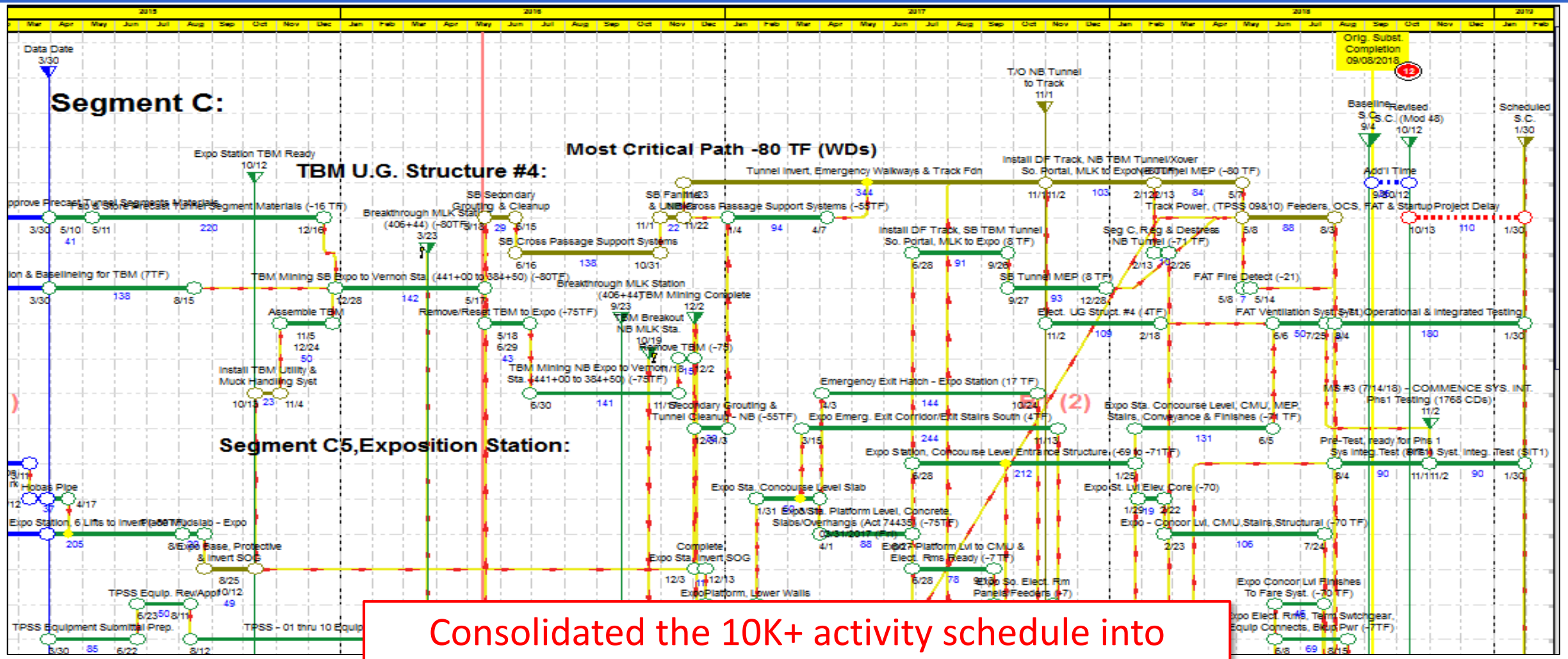
Design 75%/Construction 22% Complete
TBM about to mobilize – aggressive production rate. Other bidders had 2 TBMs
4-8 months behind schedule with 4 years to Revenue Service.

Notice to Proceed	Contract Time (cal days)	Contract Substantial Completion	Metro Testing & Pre-Rev Ops (Cal Days)	Contingency (cal days)	Revenue Service Date Commitment
September 10, 2013	1824	September 8, 2018	152	266	October 31, 2019
	5 years		5 months	14.6%	
Time Extension #1	1859	October 13, 2018	152	231	
	35 cal days extension			12.7%	
Current Forecast	1988	February 19, 2019	152	102	
	129 cal days LATE			5.6%	

Contractor Schedule Analysis



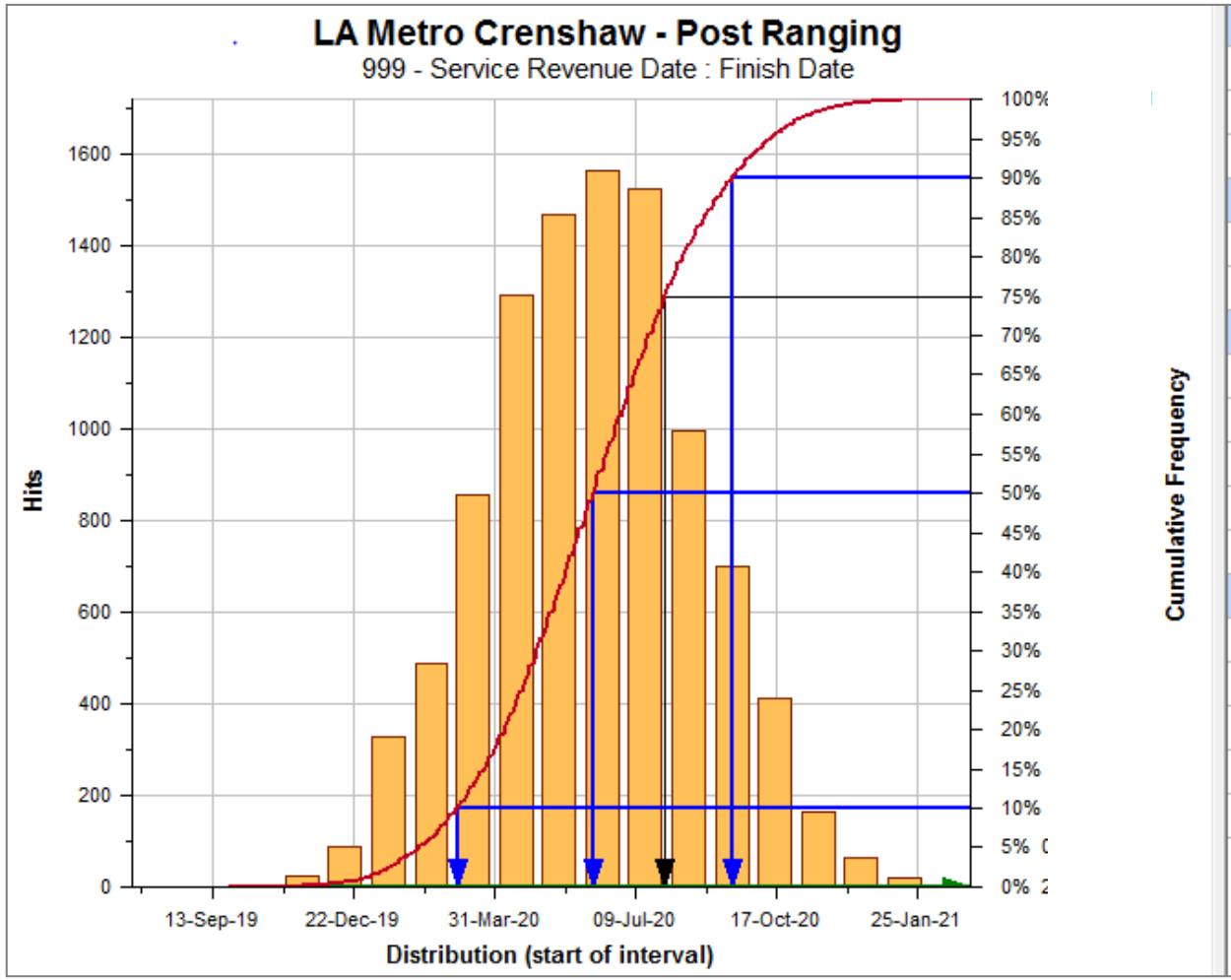
Risk Workshop Risk Model



Consolidated the 10K+ activity schedule into a ~200 activity model using NetPoint

Risk Results P65

(months late)



Data	
Finish Date of:	
999 - Service Revenue Date	
Analysis	
Iterations:	10000
Statistics	
Minimum:	
Maximum:	
Mean:	
Bar Width:	
Highlighters	
Deterministic (18-Jul-19)	<1%
10%	
50%	
90%	
75%	

Risk Mitigation Workshop

- Getting the entire project schedule on the wall enabled stakeholders to visualize the overall picture of the project and how activities related to each other on the timescale.
- This was invaluable to develop resequenced mitigation workarounds.
- As a result, the SC date was brought back to Nov 6, 2018. The critical path goes through the ATC design.

Schedule Activities	Mitigation Measure	Order	Change to May Update	WCSS S.C Date Before	WSCC S.C. After
Expo Excavation			No opportunity		
Expo Invert Slab	WSS to check with concrete Sub to see if possible to reduce 1 month duration.	1	1. Act. 988-CT-72365 Membrane base slab reduced from 3 weeks to 2 weeks. 2. Act. 72375 to 72185: Changed FS relationships to SS for forming Slabs 5 & 6 concurrently as well as Slabs 6 & 7	2/13/2019	2/4/19
TBM Assembly	TBM Utility and Muck Handling system to be concurrent with TBM Assembly	2	Act 988-CT-2180 (Muck) allowed to be SS relationship with 2160, TBM Assembly	2/4/19	1/9/19
Tunnel Invert Slab	Can potentially place more than 60 ft per day. 120 to even 200-300 if they get approval from Metro. Also WSS can be working on both South and North tunnel Inverts concurrently.	3	As scheduled, forming the invert of the NB was tied as a successor to completing the SB conduits and emergency walkways. This logic was removed and replaced with the NB invert formwork proceeding subsequent to the SB invert formwork. Specifically, cut tie 988-CT-7950 as pred to 8550, and replaced it with 6830 FS pred to 8550. (gave 7950 a new successor of 9290 for the SB – NB tie.) This saved nearly 1 month in the tunnel invert activities, but only resulted in a 2 weeks savings as the CP shifted to the Expo Station Structural work.	1/9/19	12/31/18 – New critical Path emerged through Expo Station Structure
Expo Station, Lower Level Walls	Revise Logic to save some time	4	The HRC Membrane (Act 93638) at the lower level walls was 10 days with a SS 5 successor to rebar walls (Act 72735), this was changed to an 8d duration and a SS 3 with rebar. Also, the rebar (72735 was a FS predecessor to forming walls (72725) this was changed to a SS 5 day, as these are plural walls, not a singular wall pour. This change saved 12 WDs in the Expo lower level walls, but only a 5wd savings to the schedule, as the CP shifted back to the Tunnel Install of Support System/cross passages, tunnel inverts, walkways and track foundations.	12/31/18	12/26/18

PMA's Ongoing Role in LA Metro's Crenshaw/ LAX Transit Project

2015

Performed Schedule Analysis to:

(1) Determine if WSCC schedule accurately predicts the Revenue Service Date;

(2) Determine Probabilistic RSD via a risk workshop/Monte Carlo;

(3) Develop mitigation strategies via a workshop with Contractor.

2016

Conducted a best practices study and survey of peer agencies to help Metro improve delivery of its $50 billion capital program.

2017

Wrote Metro's Risk and Contingency Management Plan and completely revised its Risk Register to comply with FTA grant requirements.

2018-Today

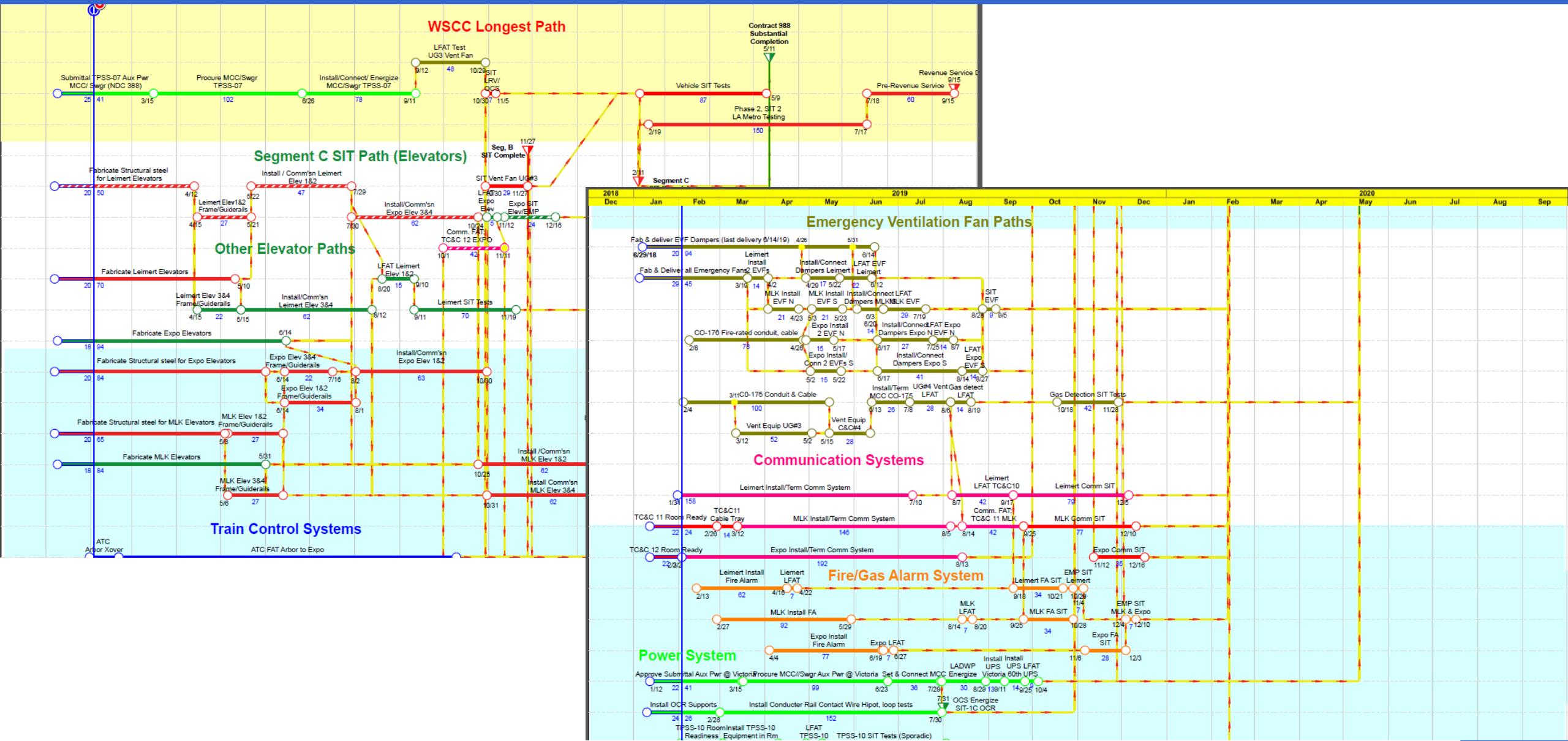
PMA serves as independent neutral conducting a quarterly assessment of the probable Crenshaw Revenue Service Date (RSD). Scope includes developing schedule risk model, facilitating risk workshops, performing NetRisk probabilistic analysis, and presenting findings and recommendations to Metro's CEO, Deputy CEO, and the Contractor.

2018 – Today: Quarterly Risk Analysis

- The TBM successfully completed on time despite the earlier delays.
- However, despite best efforts, other delays have continued.



2018 Model Focused on UG Station Systems

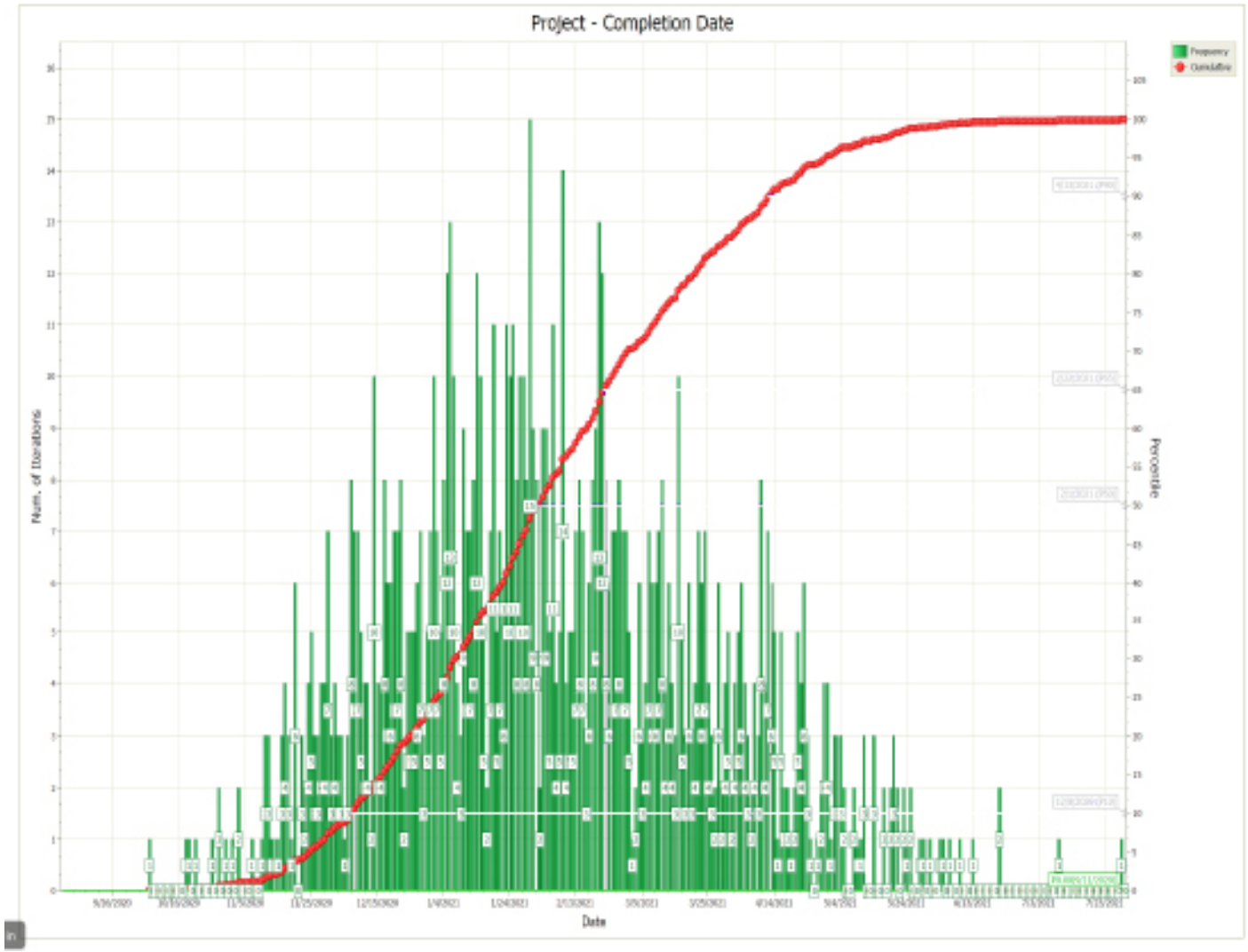


Systems Work – Train Control, Traction Power, Communications





NetRisk Used to Forecast Revenue Service Date Results



TIFIA RSD: Oct 30, 2019

Optimistic P50

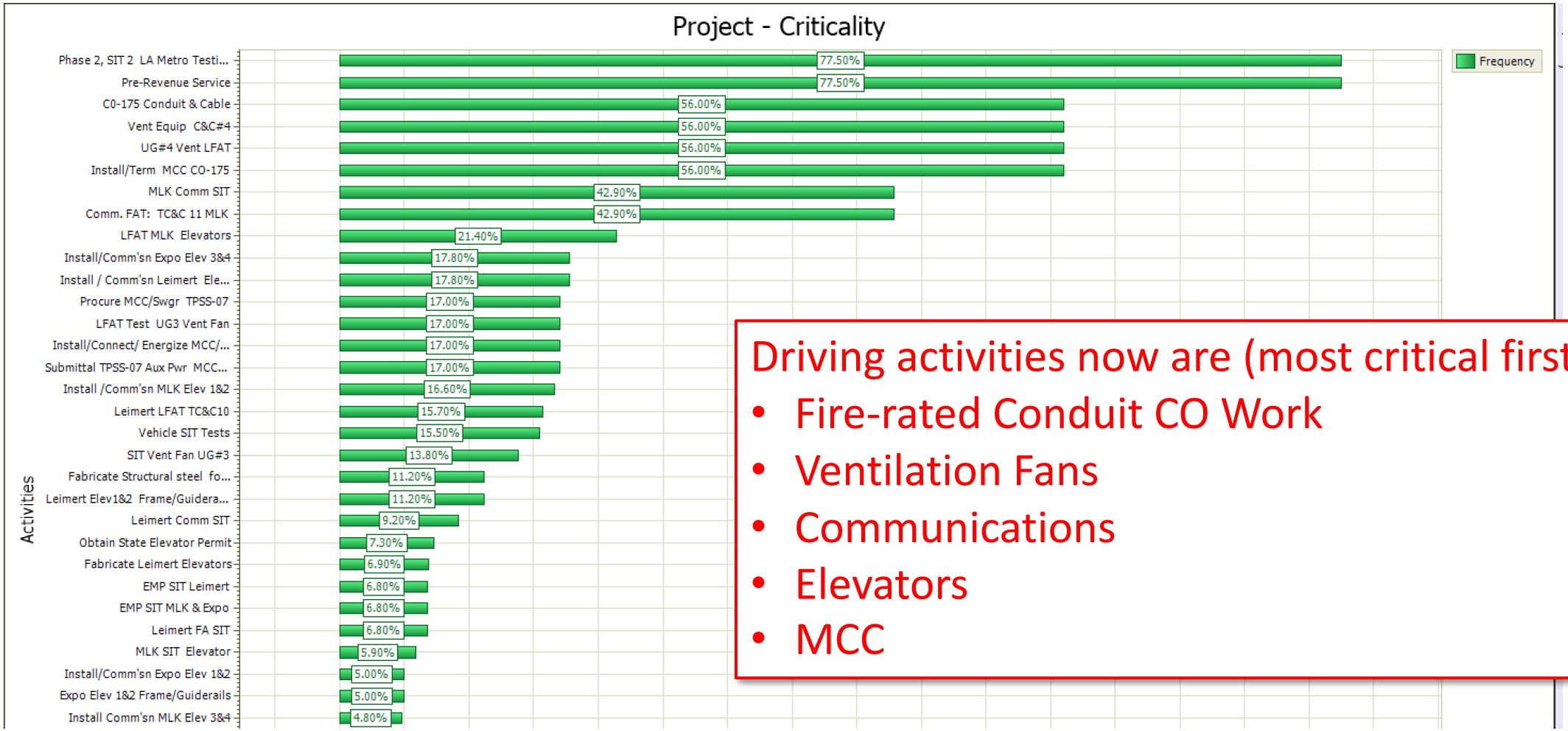
Probable P65

Pessimistic P90

This represents almost a delay to the date in the grant.

CONFIDENTIAL

What-if Criticality Index

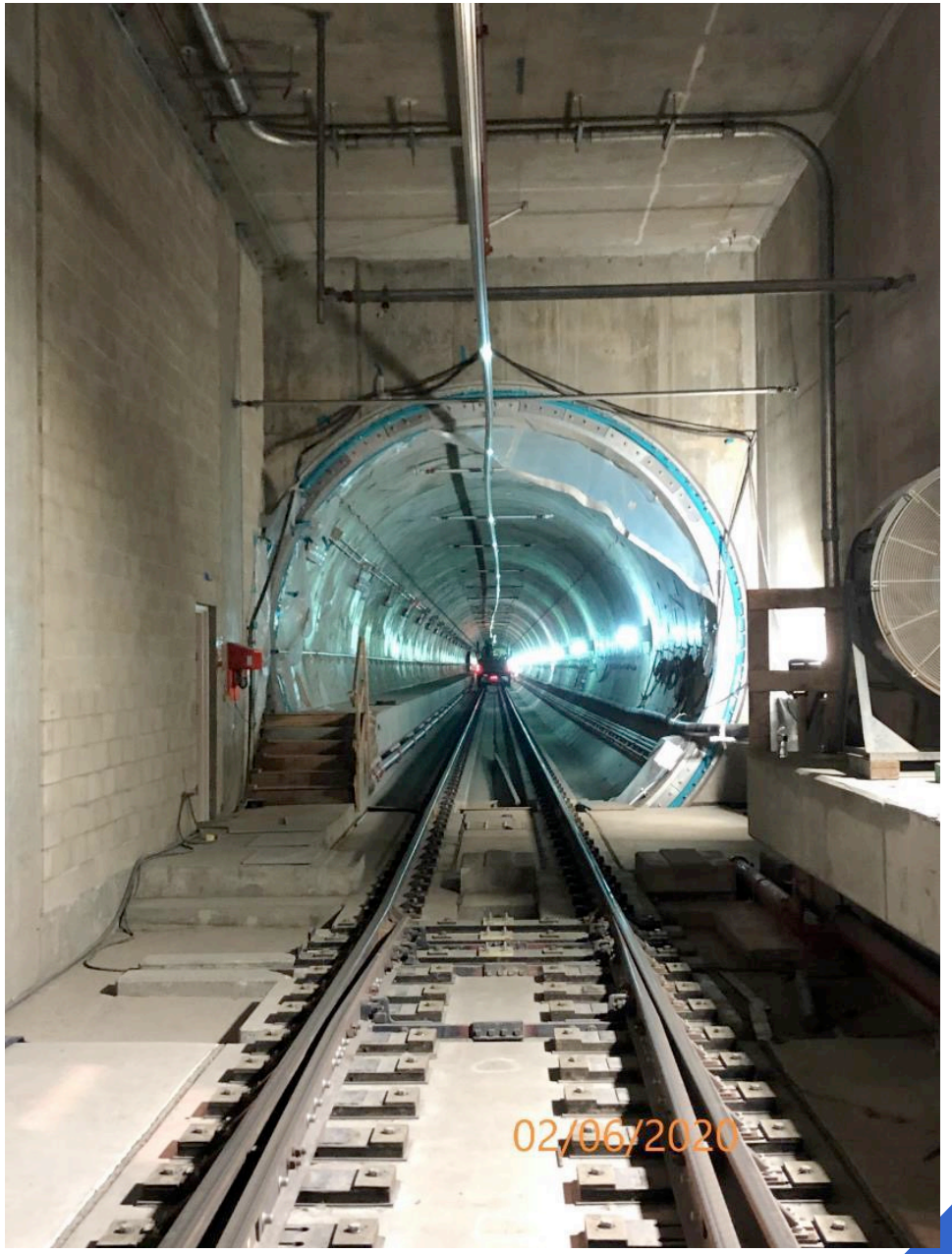


Driving activities now are (most critical first):

- Fire-rated Conduit CO Work
- Ventilation Fans
- Communications
- Elevators
- MCC

TODAY
Public date for Revenue Service is now mid-2021







NetPoint Advantage
in Crenshaw LAX Project

Allowed us to summarize a 10K+ schedule on a single large plot to help team better understand the entire schedule.

Summary NPT plan used in the mitigation workshop.

Using NetPoint model in the mitigation workshop unearthed alternative sequencing to mitigate project risk.

The unique clarity of the plans enabled stakeholders to visualize the overall picture of the project and how activities related to each other on the timescale.

During the workshop, NetPoint facilitated discussion among stakeholders to bring the critical and near-critical paths, and the use of preferential crew logic to the center stage.



Transbay Corridor Core Capacity Program

Bay Area Rapid Transit District

Helping FTA and Congress Better Understand Schedule Issues

Transbay Corridor Core Capacity Overview

Project Overview

$3.5B program, $2.7B federally funded

Goals:

Reduce the level of crowding

Allow for continued ridership growth

How:

Communication-Based Train Control

5 new Traction Power Substations

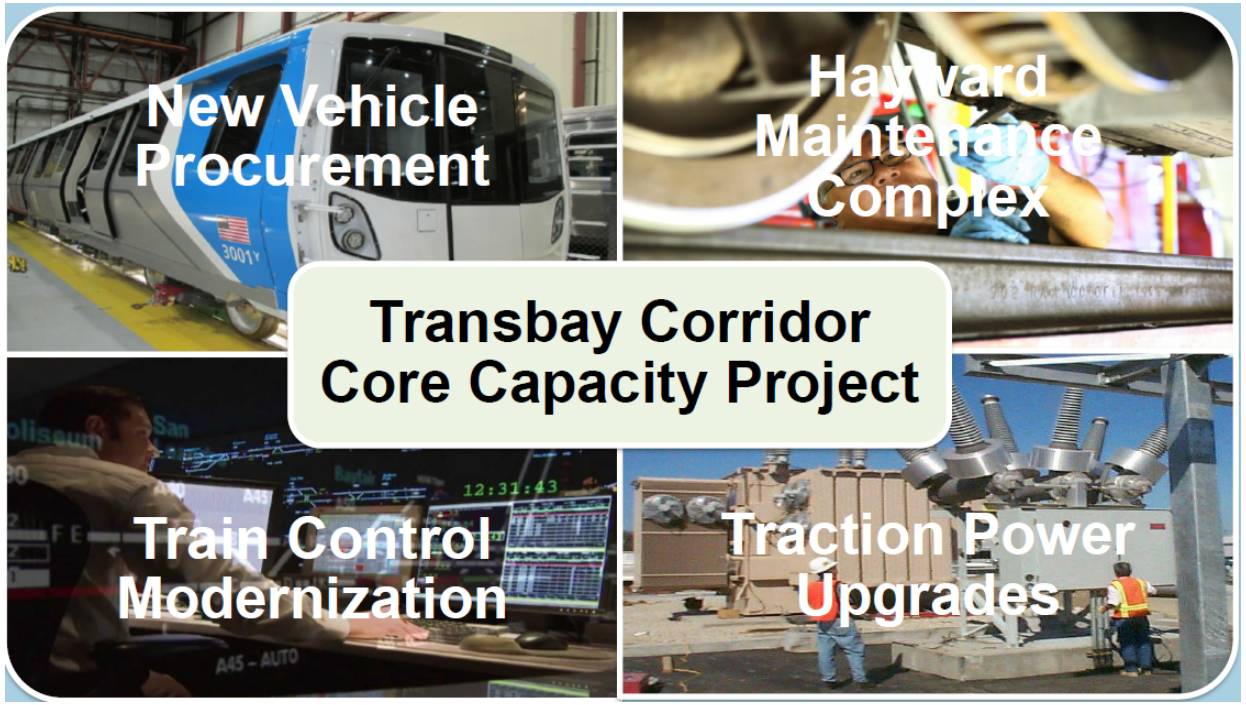
Purchase 252 new rail cars

Storage yard for 250 rail cars

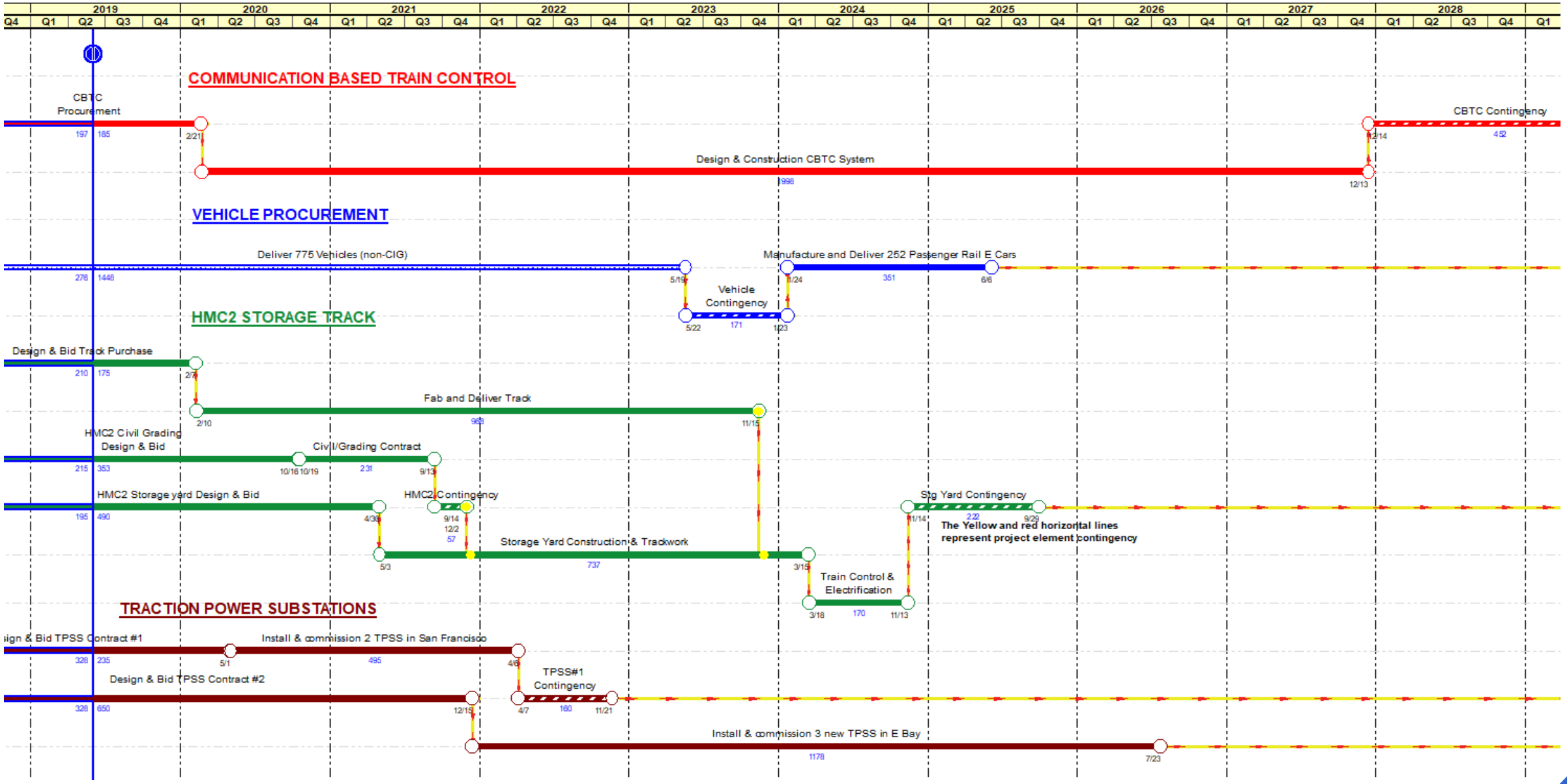


PMA Role

- PMA performs Project Management Oversight.
- Client is Federal Transit Administration.
- Watches over agencies receiving federal funds.
- Analyze readiness, capacity, and capability.
- Involves a deep dive into cost and schedule.
- Risk facilitation and analysis to set contingency.



Summary Schedule for Congress



Schedule MD

Schedule MD allowed PMA to identify schedule quality issues that guided the Sponsor Agency to improve its schedule (and the model's) accuracy.

Schedule MD™ - DCMA Report - WWBRT - 4-07-2020 unconstrained.xml

v1.2.1.2

Summary

Comprehensive

Item	Rating	Result	Tripwire	Definition
High Duration		16%	≤ 5% (!)	Incomplete activities with duration > 44 days divided by the total number of incomplete activities. For .xer files, this includes only task dependents and resource dependents. For .np4/.npz files, only activities and delays. *Not calculated when the denominator equals 0.
Resources		100%	0% (!)	Incomplete activities without resources divided by the total number of incomplete activities. For .xer files, this includes only task dependents and resource dependents. For .np4/.npz files, only activities and delays. *Not calculated when the denominator equals 0.

Credible

Item	Rating	Result	Tripwire	Definition
Critical Path Length Index		1.26	≥ 0.95	Critical Path Length + total float divided by the critical path length. *Not calculated when the denominator equals 0.
High Float		100%	≤ 5% (!)	Incomplete activities with total float > 44 days divided by the total number of incomplete activities. For .xer files, this includes only task dependents and resource dependents. For .np4/.npz files, only activities and delays. *Not calculated when the denominator equals 0.
Critical Path Test		PASS		Whether or not the last activity on the critical path shifts in direct proportion (within 90%) to a delay to another activity on the critical path.

Well Built

Item	Rating	Result	Tripwire	Definition
Logic		7%	≤ 5% (!)	Incomplete activities with no predecessor and/or no successor divided by the total number of incomplete activities. For .xer files, this includes only task dependents and resource dependents. For .np4/.npz files, only activities and delays. *Not calculated when the denominator equals 0.
Leads		0%	0%	The number of incomplete links with negative lags divided by the total number of incomplete links. For .xer files, this includes only links between task dependents and resource dependents. For .np4/.npz files, only links between activities and delays. *Not calculated when the denominator equals 0.



NetPoint Advantage
for FTA Projects

Schedule simplified to explain complex schedule issues to lay persons in US Congress.

Conversion from MS Project to NetPoint using layout manager simplified model creation.

The ability to show how activities related to each other on the timescale during the risk workshop allowed for an accurate ranking based on criticality.

Schedule MD allowed PMA to identify schedule quality issue that guided the Sponsor Agency to improve its schedule (and the model's) accuracy.

NetRisk's integrated risk register and NetPoint schedule allowed easy assignment of risks to activities and provided immediate results with easy-to-customize reports.



Third Street Light Rail Central Subway

San Francisco Municipal Transportation Agency

Helping SF MTA Allocate Delay Responsibility

SFMTA Central Subway

PROJECT OVERVIEW

The SFMTA Central Subway project involves constructing a new subterranean light rail line from a surface station adjacent to the Caltrain commuter rail depot at 4th and King Streets to Chinatown, with stops in South of Market and Union Square.

Phase 2 consists of the construction of four new stations using the SME construction method built along the 1.7-mile Central Subway project alignment through one the most densely populated neighborhoods in the United States.

This $1.5 billion project, funded by the FTA and by other municipal and federal agencies, will improve public transportation in San Francisco's Downtown Business District.



PMA Role in **SFMTA Central Subway**

PMA appointed Schedule Manager in 2016

Scope includes:

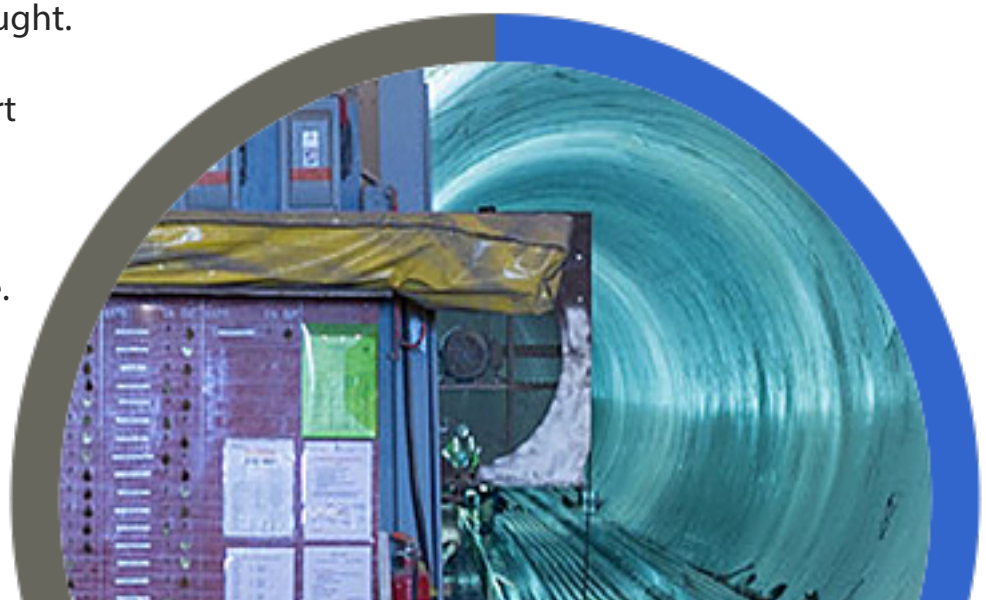
Review contractor's schedule to identify manipulations to the monthly updates, prepare written comments, and work with contractor to provide a compliant and accurate schedule.

Develop independent Time Impact Analysis and other change order documentation for every change order request where time is sought.

Prepare and present the monthly report that goes to the FTA oversight team.

Conduct a risk-based analysis to determine a likely revenue service date.

Lead schedule discussions in weekly meeting.



PMA appointed Claims Manager in 2017

Scope includes:

Develop a log to address backlog of claims.

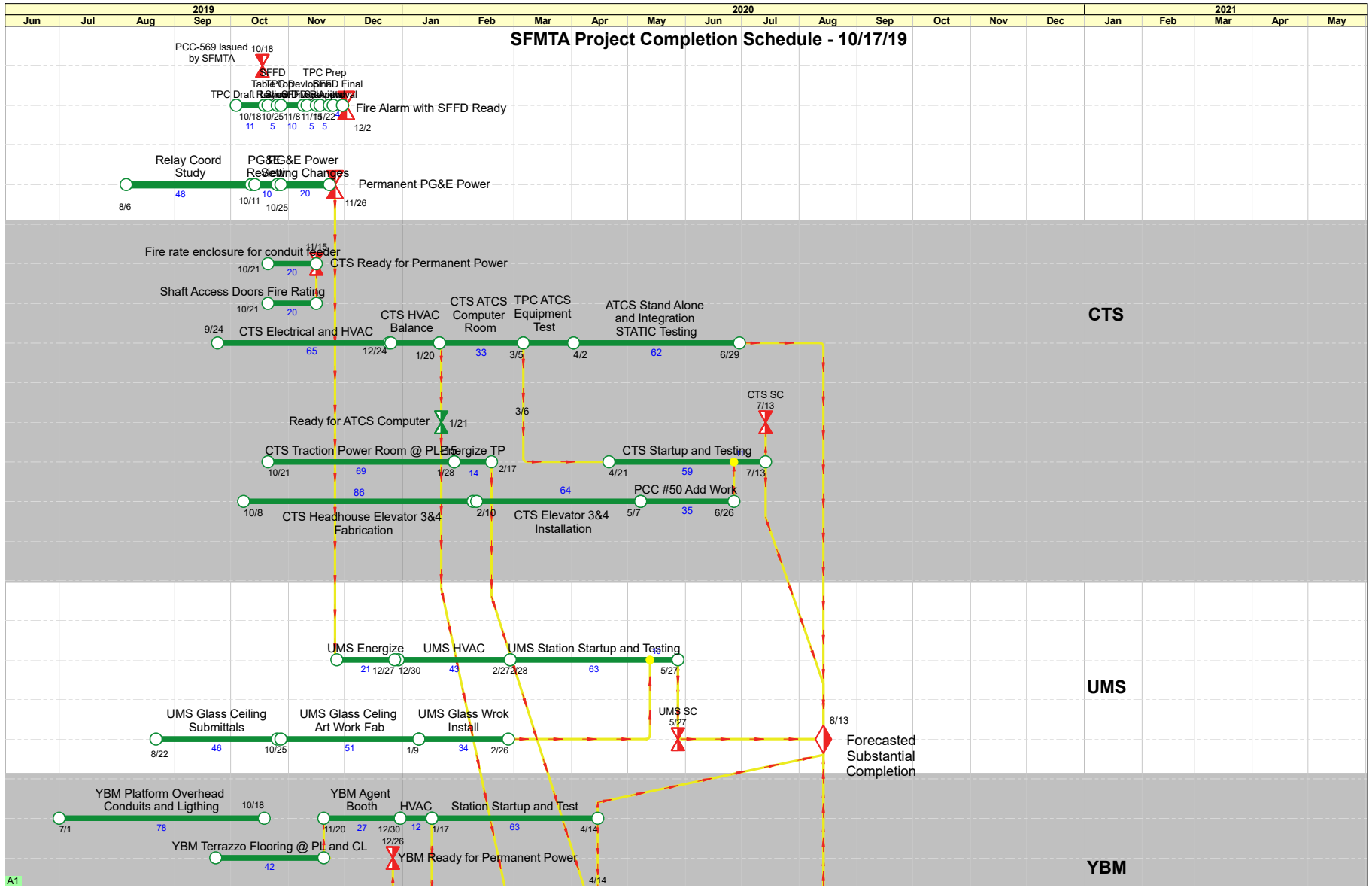
Analyze delays and obtain CCB approval to negotiate.

Perform expedited analysis of five years of delay.

Inform SFMTA of global settlement opportunities.

Schedule Summary Using NetPoint

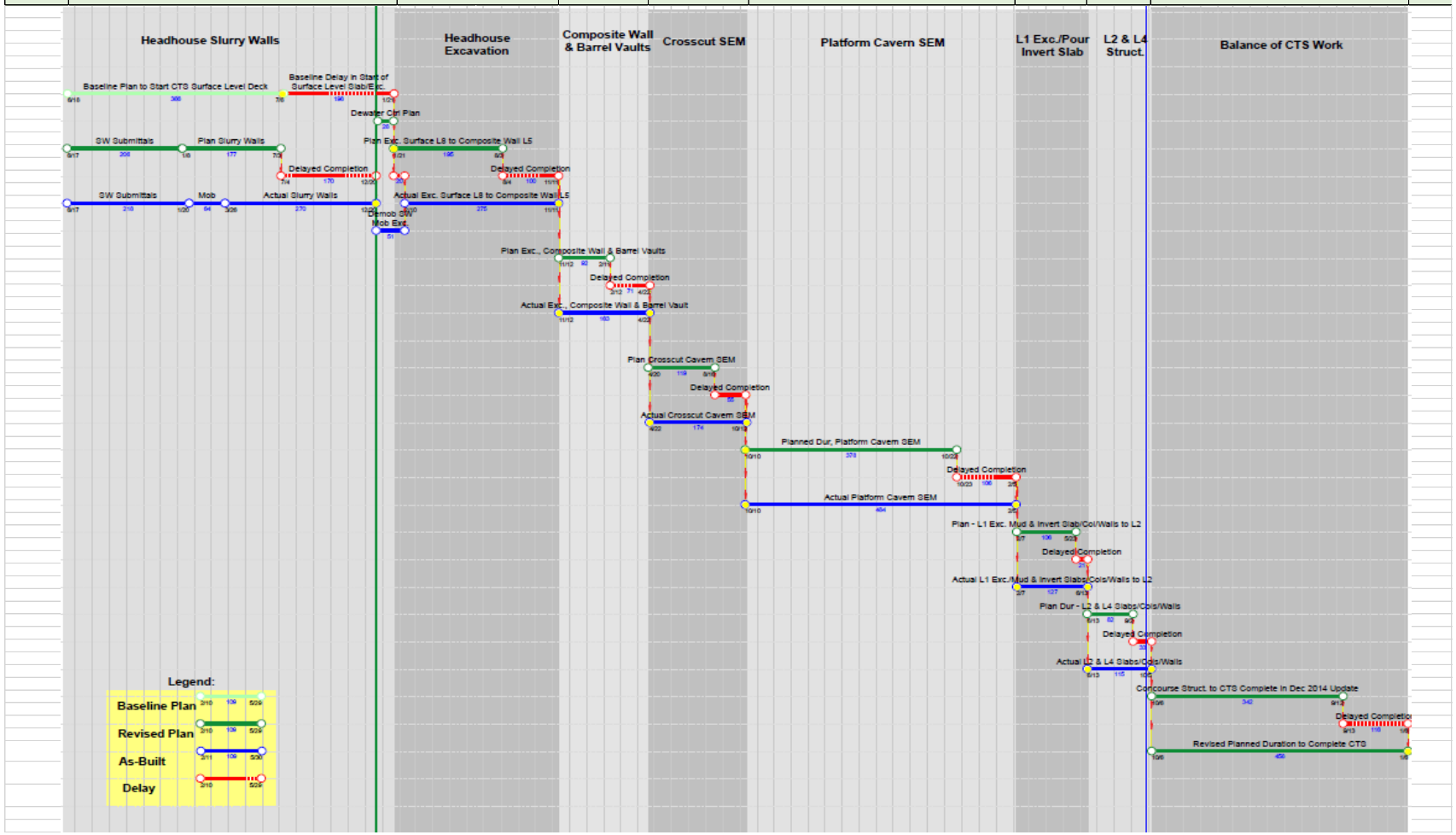
Key tool in identifying and resolving impediments to timely completion



Delay Allocation Using NetPoint

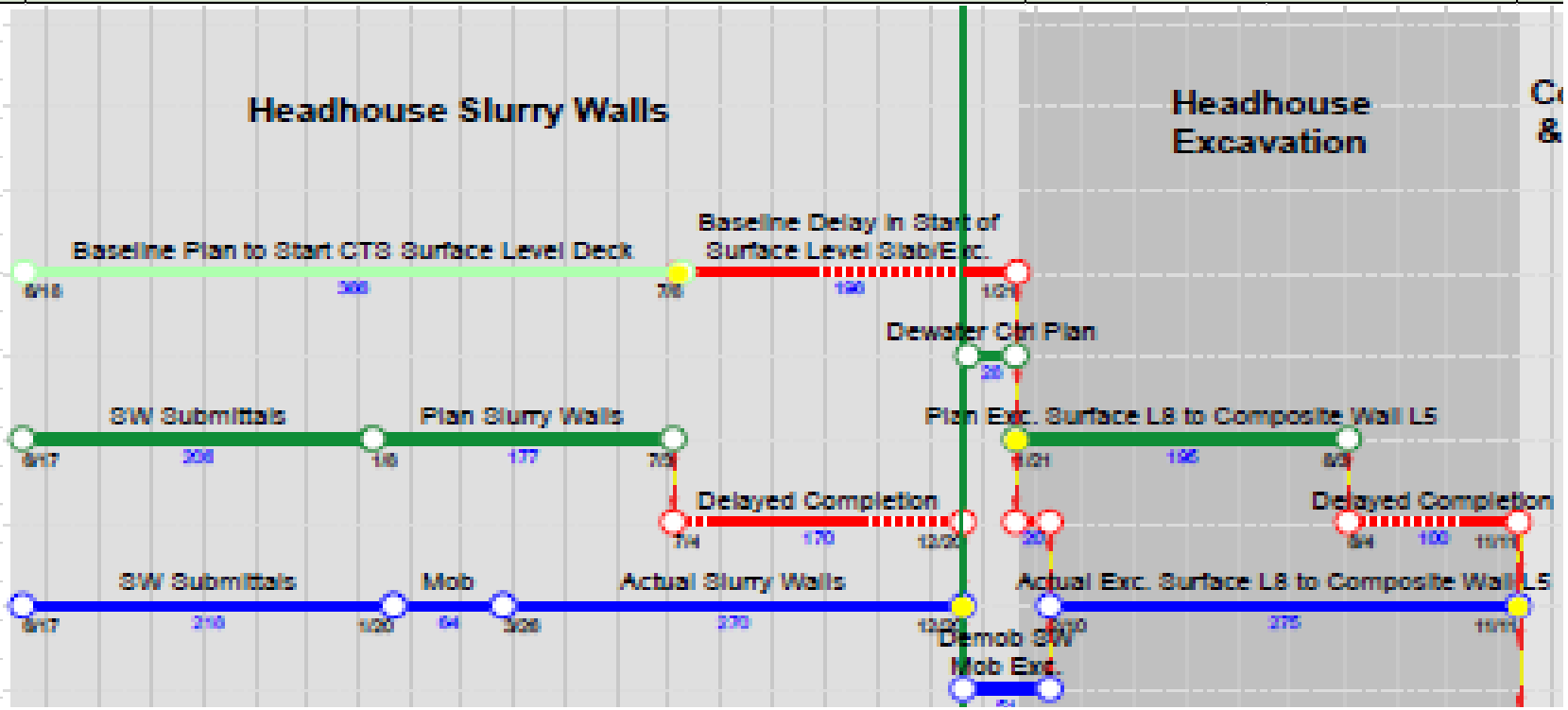
- 5 years of delay on a single page
- Observational Windows Analysis by critical path phases

NTP	1	2	3	4	5	6	7	8	9	
6/17/2013	Delay Summary Table dates	12/20/2014	6/6/2015	1/4/2016	4/21/2016	10/12/2016	2/7/2018	6/13/2018	9/26/2018	1/6/2020
TOTAL DELAY	194	56	62	53	55	106	21	33	116	696
TPC Request	0	45		148			70	0	0	263
Poss Entitle	118	9					22	0	0	149
Inexcusable	76	109		53	55	106	-1	33	116	547



Allocation of delay supplemented by visual image

NTP	1	2	3	
6/17/2013	Delay Summary Table dates	12/20/2014	6/6/2015	1/4
TOTAL DELAY	194	56	62	
TPC Request	0	45		
Poss Entitle	118	9		
Inexcusable	76	109		





NetPoint Advantage
on SFMTA Central Subway

NetPoint used to summarize contractor's schedule to explain schedule logic and focus team on critical paths.

NetPoint/Schedule MD used to analyze, approve or reject contractor's schedule.

NetPoint used to run weekly status meetings.

NetPoint/NetRisk used to facilitate risk sessions, run probabilistic simulations, and determine probable completion date.

NetPoint used in monthly reports to FTA PMOC and SFMTA Executive Director.



THANK YOU