U.S. DOT Federal Railroad Administration
Office of Passenger and Freight Programs

Monitoring Procedure 34 - Project Schedule Review

1.0 PURPOSE

Competent scheduling is required for sound project planning and control of costs and risks. This Monitoring Procedure (MP) describes how the Monitoring and Technical Assistance Contractor (MTAC) conducts a project schedule review to determine whether the sponsor's project schedule is reasonable given the project conditions.

2.0 KEY PRINCIPLES

The MTAC should evaluate the Grantee's Project Schedule for completeness and reliability; usefulness as a management tool; the degree to which it reflects the project scope, cost, management practices, and the method of project delivery.

3.0 REQUIRED DOCUMENTS

Before performing the review, the MTAC will meet with the Grantee and its staff and consultants to discuss the purpose of the review, and obtain required information, including but not limited to:

1. Schedule Assumptions (see a sample schedule in Appendix A of this MP)
1. Description of the schedule development, control process, and procedures
2. Latest schedules in electronic format

4.0 SCOPE OF WORK

4.1 Review of Schedule

The MTAC should review the Grantee's project schedule, related staff, and processes:

In planning, the Grantee develops a schematic schedule showing all project phases. In PE, the Grantee sets forth a more detailed schedule including activities within PE, FD, and related to the selected delivery method; schedule control procedures; and schedule control personnel.

In FD, the Grantee develops an Integrated Baseline Schedule showing critical project activities, logic flow and durations, including identification of agreements for third parties, utilities, and real estate/ROW. The schedule is recommended to be cost/resource-loaded.

Below are Schedule Essentials for any project phase:

	Schedule Essentials
Basis of Schedule	A logical document that defines the basis for the development of the project schedule -- - key elements, issues and special considerations, exclusions - includes Schedule Assumptions in Appendix A below - resource planning methodology - activity identification and duration estimating - source and methodology for determining logic and sequencing - labor productivity adjustments, including congestion assessment, extended work hours, winter work, curfews, etc. - production rates, identifies basis for startup and sequencing requirements, and defines any owner requirements such as regulatory, environmental, quality/ inspection - is consistent in use of the time sensitive variables in the capital cost estimate, including year of expenditure assumptions, and durations incorporated into the master schedule
Schedule Format	Consistent with relevant, identifiable industry engineering practices. Software is appropriate for size and complexity of project.
Schedule structure	Work Breakdown Structure has been applied in the development of the schedule. WBS consistent with the analyzed plan and program for all project participants' agreed upon roles, responsibilities, capabilities and capacities.
Schedule Level	Schedule is sufficiently developed in detail to determine the validity of the project critical path to revenue operations. It should break out, at a minimum, project milestones, environmental, public involvement, PE design, value engineering, final design, right-of-way, permits, third party agreements, utility relocations, safety and security, construction - trackwork, train control systems, vehicles, system integration, communications, fare collection, and startup and testing in sufficient detail to confirm the reasonableness of durations and sequencing and to estimate the probability of schedule risk.
Schedule elements	Schedule reflects the approved scope Schedule includes adequate time and appropriate sequencing for: • Design phases • Agreements - Right-of-way acquisition; household/business relocations; Utilities relocation; Railroad purchase and/or usage; Interagency Agreements; Funding milestones for Federal and non-Federal sources • Reviews - by FRA for environmental, risk assessment, PMP reviews, completion reviews for each phase; by state, other fed, third parties • Procurement - of design contracts; of materials, equipment, vehicles, especially long-lead items • Bid and award periods reflect the required sequencing and durations for the selected project delivery method and logically tied to the proper work activities • Construction processes and durations are adequate and complete, and allow schedule contingency for potential delays, including inter-agency work, utility relocation, civil, architectural, and systems work, Grantee operations and maintenance, mobilization, and integrated pre-revenue testing
Resource Scheduling	Quantities and costs as defined in cost estimate match resources/costs assigned to the activities in the schedule. The distribution of resources and costs per specification or industry standards are reasonably associated to the activity it is assigned.
Schedule Control	Define the approach to and use of scheduling tools, such as scheduling software, Grantee procedures for schedule change and update, use of a work breakdown structure, assignment of staff responsibility for schedule, cost loading, resource loading, etc.

In addition, the MTAC should review the project schedule and the Grantee's schedule staffing, capabilities and processes as follows:

1. Evaluation of the Grantee's schedule

a. *Format*. Is the schedule format consistent with relevant, identifiable industry or engineering practices? Does it use software appropriate for the size and complexity of the project?
b. *Quality.* What is the structure, quality, and detail of the schedule?
c. *Completeness.* Is the schedule mechanically correct and complete and free of material inaccuracies or incomplete information?
d. *Work Breakdown Structure.* How has the project work breakdown structure been applied to develop the schedule?

e. Phasing and Sequencing:

i. Does the schedule contain activities that adequately define the entire scope of the work being performed?
ii. Is the schedule sufficiently developed to determine the validity, stability, and reasonableness of the project critical path?
iii. Are near-critical paths easily identifiable and reasonable in terms of their logic and proximity to the project critical path?
iv. Are the schedule assumptions for project phase durations reasonable?
    - Check for consistency with Grantee's Schedule Assumptions (see Appendix A)
    - Review project calendars used in the schedule (see Appendix B of this MP)
    - Assess the validity and reasonableness of activity durations for major elements on the critical path and the critical path schedule contingency (float)
    - Have labor and material availability been factored into construction durations?
v. Are the project schedule structure and sequencing logical and reasonable?
    - Is sequencing, through the use of predecessors and successors, identified for all material tasks?
    - Is the work sequenced efficiently, i.e. can/should work be conducted in parallel that is shown in sequence?
    - Is the use of constraints identifiable, justified, and reasonable?
    - Are work areas identified in construction and properly sequenced from the appropriate predecessor activities (i.e., right-of-way acquisition, permitting, etc.)?
    - Are the durations and logic reasonable for temporary construction and physical construction constraints, such as transportation or site access restrictions?
    - Are project calendars appropriately defined and utilized and include allowances for seasonal weather variations?

f. *Hierarchy.* Is the hierarchy of schedule elements evident?

i. Is a top-level summary included to clarify phases or groups of activities?
ii. Is the schedule detail beneath the 'hammock' or summary level task based?

g. *Cost/Resource-loaded Schedules.*

i. A cost/resource-loaded schedule enables the Grantee to be a more "informed consumer" of a construction contractor's schedule. If the schedule is cost loaded for construction activities, examine the flow of cost through time and assess the following:
    - Do the quantities and costs assigned to activities in the schedule match those in the cost estimate?
    - If the schedule critical path and logic ties among activities are reasonable, does the cost curve presented seem reasonable? Is the money flowing too fast? Are the costs front-end loaded?
    - When the initial cost distribution is accepted, that curve becomes a baseline from which project progress is compared. If actual expenditures are "above the curve," investigate why project funds are being spent faster than anticipated. Verify the cost distribution was accepted by all parties including the construction contractor.
    - Consider the cost impacts if the project experiences delays or finishes early.

ii. A resource-loaded schedule is the hardest to develop, but yields valuable information: Consider the job loading for the project for a daily work force and a monthly work force; how many people should be on the project; how many people and related equipment can fit into the available work space.

h. *Contingencies.* Discuss with the Grantee the exposed and hidden (patent and latent) contingency in the schedule, including amounts and how it is expressed in the schedule.

i. Develop a bar chart to illustrate the placement of this contingency across the project design phase and the major contract packages during construction
ii. Describe the adequacy of proposed contingency at milestones
iii. Describe the MTAC's approach to identifying schedule hidden contingency, e.g. talking with the Grantee's scheduler, etc.
iv. Evaluate schedule elements that are functionally equivalent to schedule contingency but not identified as such, including extended durations, forced float, dummy activities, or positive lag values
v. Determine if the use of constraints is identifiable and reasonable
vi. Float available in the schedule, at any time shall not be considered for the exclusive use of either the Grantee or the contractor. During the course of contract execution, any float generated due to the efficiencies of either party is not for the sole use of the party generating the float; rather it is a shared commodity to be reasonably used by either party. Efficiencies gained as a result of favorable weather within a calendar month will also contribute to the reserve of float. An accepted schedule showing work completed in less time than the contract completion date will be considered to have Project Float.

3. Evaluation of the Grantee's schedule control methods and staff

a. The approach to and use of scheduling tools, such as scheduling software
b. Grantee internal procedures for schedule maintenance; plan and timing of schedule reviews; procedures for schedule change and update
c. Use of a work breakdown structure
d. Assignment of staff responsibility for schedule, cost loading, resource loading, etc., and the adequacy of the scheduling staff and software for the size and complexity of the project.

4. Evaluation conclusions, recommendations

a. Validate the usefulness of the schedule as a project management tool. Does it provide pertinent information on the overall pulse of the project? Does the schedule indicate to the reader what project work should be happening? If the schedule and project reality don't match, is the project ahead or has it slipped?
b. Evaluate the level of definition of the schedule and elements within for relevance to the project phase
c. Describe areas of concern; uncertainties, constraints to sequencing or duration; identify risks and provide a list of risks associated with the schedule. If requested, the MTAC will provide a written comparison of the proposed schedule with similar project(s) and analyze the differences. The MTAC will draw conclusions and provide recommendations based on this comparison.
d. Make suggestions to improve the schedule and proactively help the Grantee solve schedule problems.

APPENDIX A
Sample Format – Schedule Assumptions

Items (basis for duration assumptions) should be tailored to the project; items shown are for example.

SCHEDULE ASSUMPTIONS	DURATION (Months)
Planning & Concept Design	
PMP and Sub-plans	X
Alternatives Analysis	X
Service Planning / Infrastructure Design	X
NEPA, Tier I	X
Service Development Plan	X
Cost Estimate, Schedule, Finance Plan	X
Reviews by FRA along the way and at end	X
Total	XX
Preliminary Engineering	
PMP and Sub-plans	etc
Design	
Refinement of Service Planning	
NEPA, Tier II or Project	
Cost Estimate, Schedule, Finance Plan	
Value Engineering	
Risk Assessment	
Reviews	
Total	
Final Design	
PMP and Sub-plans	
Design	
Cost Estimate, Schedule, Finance Plan	
Constructability Review	
Risk Assessment Refresh	
Reviews	
Total	
Bid and Award of Construction Packages	
Bid package A, B, C, etc.	
Prepare and bid documents	
Award	
Construction	
Track, ROW, guideway, Segment A, B, C	
Systems	
Stations	
Inspections, Safety Certifications, Reviews	
Testing	
Training of Operator and Staff / Simulated Rev. Operations	
Revenue Operations	

APPENDIX A
Sample Format – Schedule Assumptions

APPENDIX B
Sample Calendar Description and List

For capital projects, two calendars predominate. The majority of the physical construction activities are based on a five-day work week with non-work days for holidays and weather delays. Design and other activities are based on a five-day work week with non-work days for holidays. Additional calendars can be used for other activities.

The MTAC should ensure Grantees provide calendar information for their Project Schedules, and the number of schedule activities associated with each calendar -- useful for calculating acceleration and delays. Below are examples.

Calendar Name	Number of Activities Assigned	Number of Activities on Critical Path/Total Duration	Number of Non-Critical Activities With Less Than 30 Days Contingency/ Avg. Contingency
Construction 5 Day w/Union Holiday & 30 Weather Days	2649 activities	700/36 months	2000/10 days
Engineering/Procurement/Permit Calendar	1555 activities		
DTP/DTE Business Days	446 activities		
Standard 5 Day Work Week	100 activities		
Winter Outage Calendar w/30 Weather Days	21 activities		
5-Day Week, 2-Shift	10 activities		
7-day Workweek Test/Commission Yard Modification Pre-Revenue Operation Start Revenue Operations	9 activities	9/6 months	
54-Hour Outage calendar	5 activities		
Weekend Outage Calendar w/30 Weather Days	4 activities		
NATM Tunneling w/Union Holiday & 2 Weather Days	2 activities		
TOTAL	**4801 activities**		