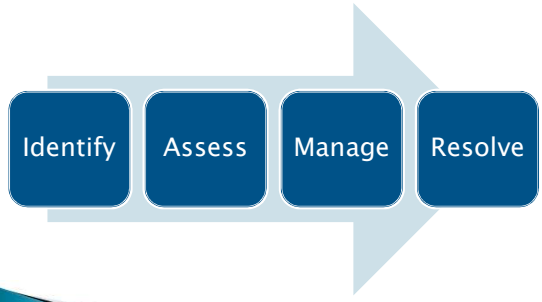
How to Review Construction Schedules Like an Expert

Presented by: John Jackson

encoregroup

1

Steps for Risk Management



2

Critical Path Method Scheduling

- Critical Path Method (CPM) is a project management technique that requires mapping out every key task that is necessary to complete a project. It includes identifying the amount of time necessary to finish each activity and the dependencies of each activity on any others. CPM is used to set a realistic deadline for a project and to track its progress along the way.

3

AACEI – Recommended Protocols for Forensic Scheduling

2. SOURCE VALIDATION

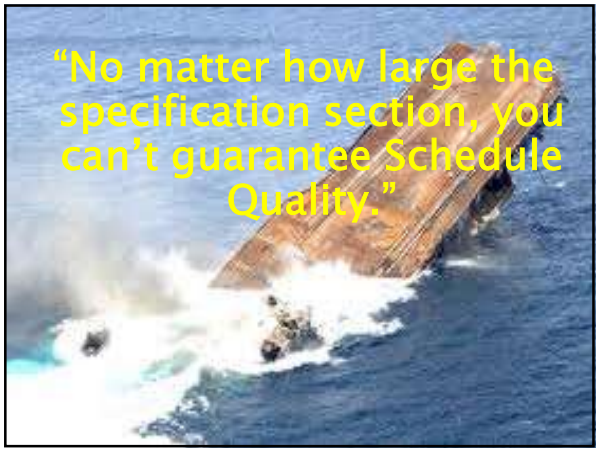
The intent of the source validation protocols (SVP) is to provide guidance in the ***process*** of assuring the validity of the source input data that forms the foundation of the various forensic schedule analysis methodologies discussed in Section 3. Any analysis method, no matter how reliable and meticulously implemented, can fail if the input data is flawed. The primary purpose of the SVP is to minimize the failure of an analysis method based upon the flawed use of source data.

The approach of the SVP is to maximize the ***reliable use*** of the source data as opposed to assuring the underlying reliability or accuracy of the substantive content of the source data. The best accuracy that an analyst can hope to achieve is in the faithful reflection of the facts as represented in contemporaneous project documents, data, and witness statements. Whether that reflection is an accurate model of reality is almost always a matter of debatable opinion.

4

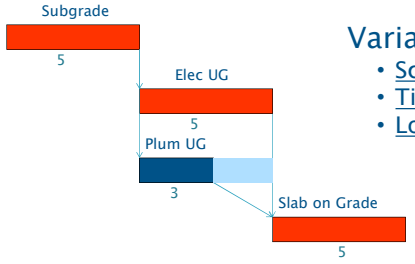
Validating a construction schedule as a source document includes analyzing the *validity of a critical path*, as well as ensuring that a source schedule *can be used as a basis for time impact analyses*.

5



6

Understand the Critical Path

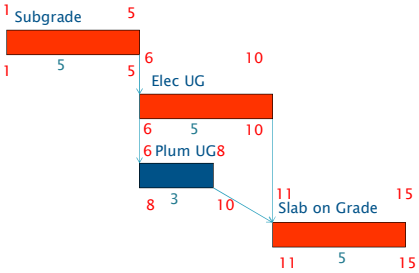


Variables:

- Scope
- Time
- Logic

7

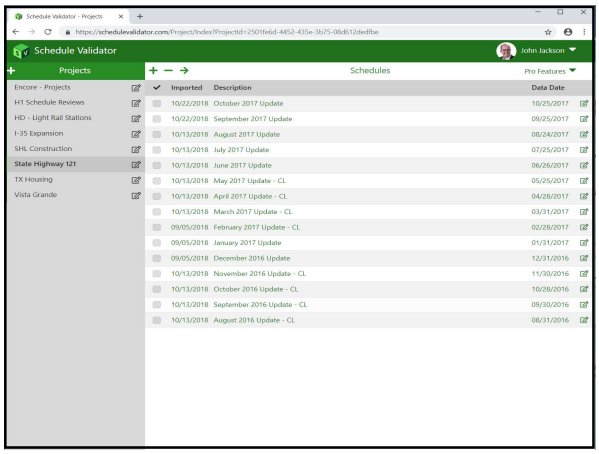
Time Management and the Critical Path



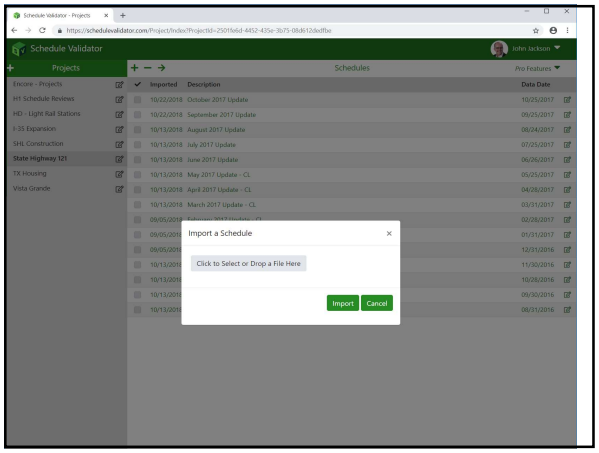
8

Step 1 – Validate the plan and get it in place as soon as possible.

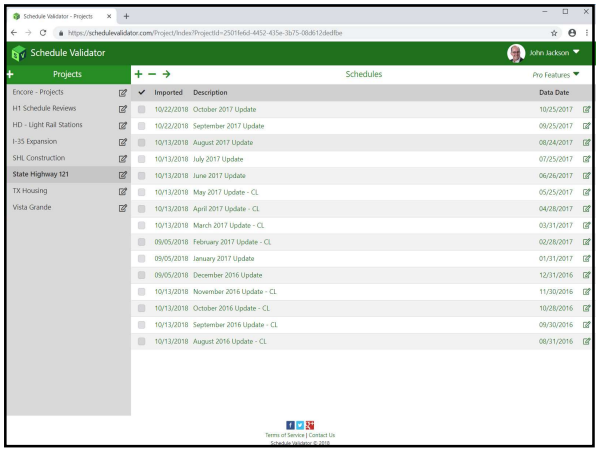
9


Schedule Validator
John Jackson
Projects
Schedules
Pro Features
Encore - Projects
H1 Schedule Reviews
HD - Light Rail Stations
I-35 Expansion
SHL Construction
State Highway 121
TX Housing
Vista Grande
Imported
Description
Data Date
10/22/2018 October 2017 Update 10/25/2017
10/22/2018 September 2017 Update 09/25/2017
10/13/2018 August 2017 Update 08/24/2017
10/13/2018 July 2017 Update 07/25/2017
10/13/2018 June 2017 Update 06/26/2017
10/13/2018 May 2017 Update - CL 05/25/2017
10/13/2018 April 2017 Update - CL 04/28/2017
10/13/2018 March 2017 Update - CL 03/31/2017
09/05/2018 February 2017 Update - CL 02/28/2017
09/05/2018 January 2017 Update 01/31/2017
09/05/2018 December 2016 Update 12/31/2016
10/13/2018 November 2016 Update - CL 11/30/2016
10/13/2018 October 2016 Update - CL 10/28/2016
10/13/2018 September 2016 Update - CL 09/30/2016
10/13/2018 August 2016 Update - CL 08/31/2016

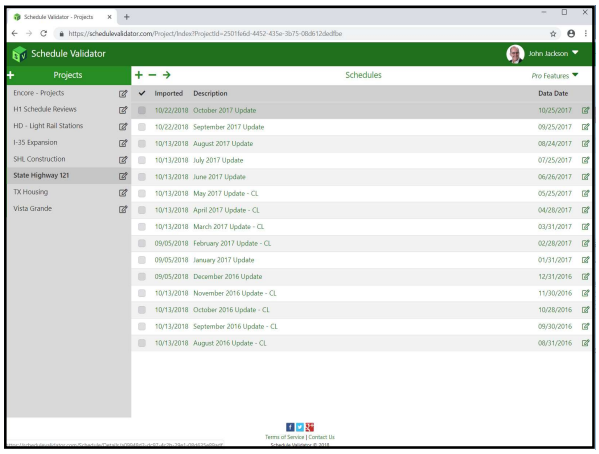
10


Schedule Validator
Projects
Schedules
Import a Schedule
Click to Select or Drop a File Here
Import
Cancel

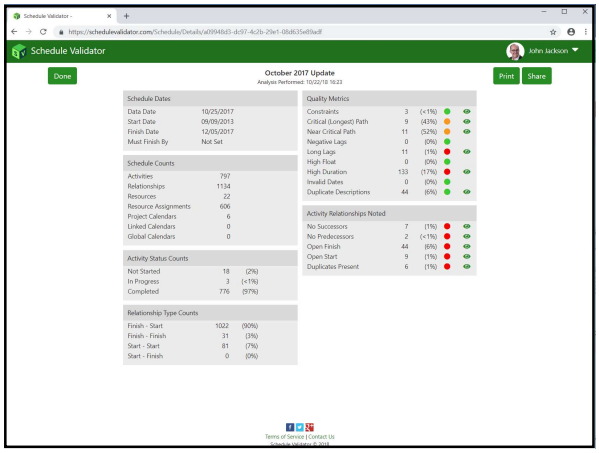
11


Schedule Validator
John Jackson
Projects
Schedules
Pro Features
Encore - Projects
H1 Schedule Reviews
HD - Light Rail Stations
I-35 Expansion
SHL Construction
State Highway 121
TX Housing
Vista Grande
Imported
Description
Data Date
10/22/2018 October 2017 Update 10/25/2017
10/22/2018 September 2017 Update 09/25/2017
10/13/2018 August 2017 Update 08/24/2017
10/13/2018 July 2017 Update 07/25/2017
10/13/2018 June 2017 Update 06/26/2017
10/13/2018 May 2017 Update - CL 05/25/2017
10/13/2018 April 2017 Update - CL 04/28/2017
10/13/2018 March 2017 Update - CL 03/31/2017
09/05/2018 February 2017 Update - CL 02/28/2017
09/05/2018 January 2017 Update 01/31/2017
09/05/2018 December 2016 Update 12/31/2016
10/13/2018 November 2016 Update - CL 11/30/2016
10/13/2018 October 2016 Update - CL 10/28/2016
10/13/2018 September 2016 Update - CL 09/30/2016
10/13/2018 August 2016 Update - CL 08/31/2016

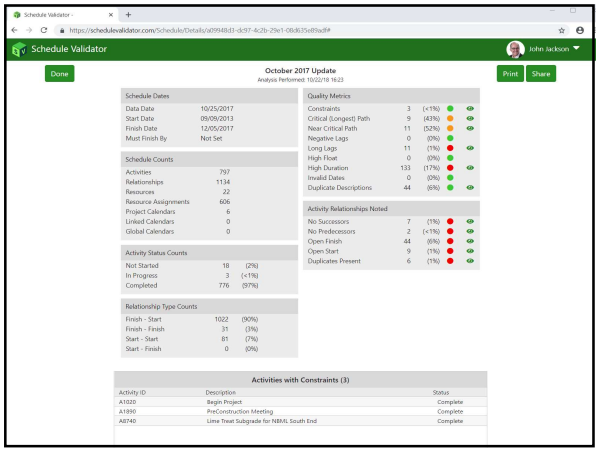
12


Schedule Validator
Projects
Schedules
Encore - Projects
H1 Schedule Reviews
HD - Light Rail Stations
I-35 Expansion
SHL Construction
State Highway 121
TX Housing
Vista Grande
Imported
Description
Data Date
10/22/2018 October 2017 Update 10/25/2017
10/22/2018 September 2017 Update 09/25/2017
10/13/2018 August 2017 Update 08/24/2017
10/13/2018 July 2017 Update 07/25/2017
10/13/2018 June 2017 Update 06/26/2017
10/13/2018 May 2017 Update - CL 05/25/2017
10/13/2018 April 2017 Update - CL 04/28/2017
10/13/2018 March 2017 Update - CL 03/31/2017
09/05/2018 February 2017 Update - CL 02/28/2017
09/05/2018 January 2017 Update 01/31/2017
09/05/2018 December 2016 Update 12/31/2016
10/13/2018 November 2016 Update - CL 11/30/2016
10/13/2018 October 2016 Update - CL 10/28/2016
10/13/2018 September 2016 Update - CL 09/30/2016
10/13/2018 August 2016 Update - CL 08/31/2016

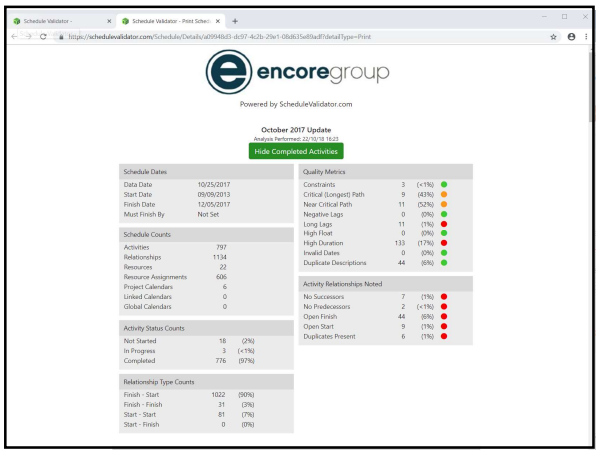
13


Schedule Validator
Done
October 2017 Update
Print
Share
Schedule Dates
Schedule Counts
Activity Status Counts
Relationship Type Counts
Quality Metrics
Activity Relationships Noted

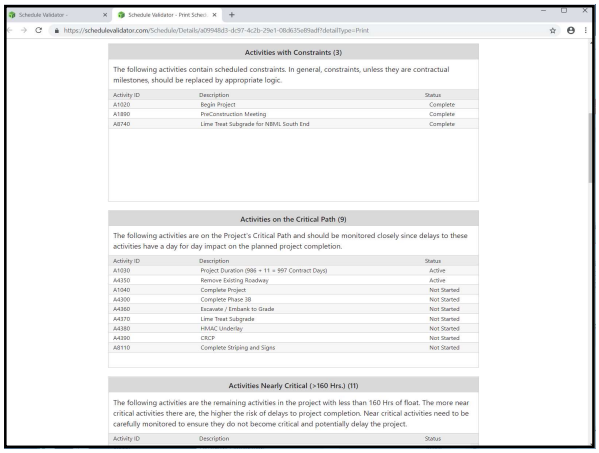
14


Schedule Validator
Done
October 2017 Update
Print
Share
Schedule Dates
Schedule Counts
Activity Status Counts
Relationship Type Counts
Quality Metrics
Activity Relationships Noted
Activities with Constraints (3)

15



16



17

A Validated CPM Schedule is essential to ensure a schedule can be relied upon for reliability and analysis

18

A Validated CPM Schedule is useless if it is not monitored properly.

19

Step 2 – Implement good update validation procedures.

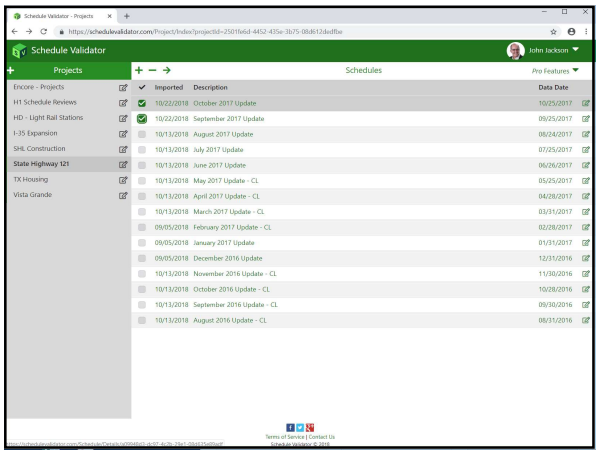
20

What's allowable in an update?

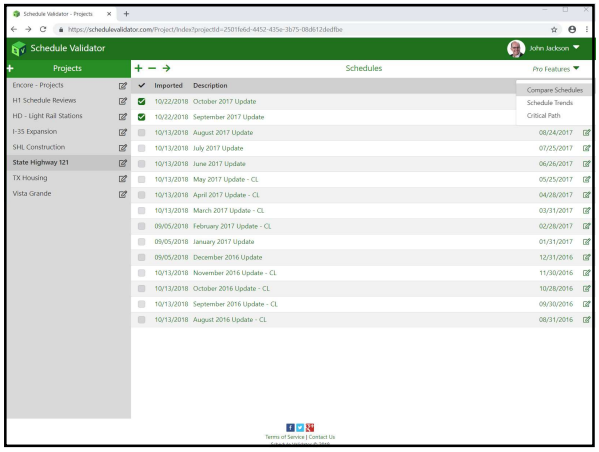
(2) The Contractor shall schedule and meet with (monthly) to discuss the current Project Schedule, progress of the Work, and any potential changes to the current Project Schedule. The Contractor shall submit all changes to for acceptance before such changes are incorporated into the current Project Schedule. Contractor

(4) Submittal of the BPS and subsequent updated Project schedules shall be understood to be the Contractor's certification that the submitted schedule meets all of the requirements of the Contract, represents the Contractor's plan on how the Work shall be accomplished, and accurately reflects the Work that has been accomplished and how it was sequenced (as-built logic).

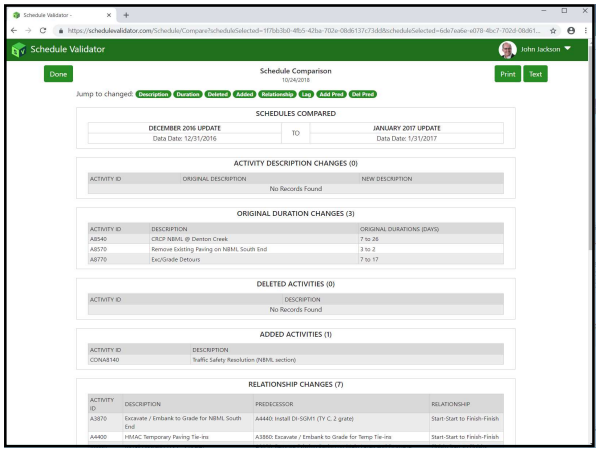
21


Schedule Validator
Projects
Schedules
Encore - Projects
H1 Schedule Reviews
HD - Light Rail Stations
I-35 Expansion
SHL Construction
State Highway 121
TX Housing
Vista Grande
Imported
Description
Data Date
10/22/2018 October 2017 Update 10/25/2017
10/22/2018 September 2017 Update 09/25/2017
10/13/2018 August 2017 Update 08/24/2017
10/13/2018 July 2017 Update 07/25/2017
10/13/2018 June 2017 Update 06/26/2017
10/13/2018 May 2017 Update - CL 05/25/2017
10/13/2018 April 2017 Update - CL 04/28/2017
10/13/2018 March 2017 Update - CL 03/31/2017
09/05/2018 February 2017 Update - CL 02/28/2017
09/05/2018 January 2017 Update 01/31/2017
09/05/2018 December 2016 Update 12/31/2016
10/13/2018 November 2016 Update - CL 11/30/2016
10/13/2018 October 2016 Update - CL 10/28/2016
10/13/2018 September 2016 Update - CL 09/30/2016
10/13/2018 August 2016 Update - CL 08/31/2016

22


Schedule Validator
Projects
Schedules
Compare Schedules
Schedule Trends
Critical Path
Encore - Projects
H1 Schedule Reviews
HD - Light Rail Stations
I-35 Expansion
SHL Construction
State Highway 121
TX Housing
Vista Grande

23

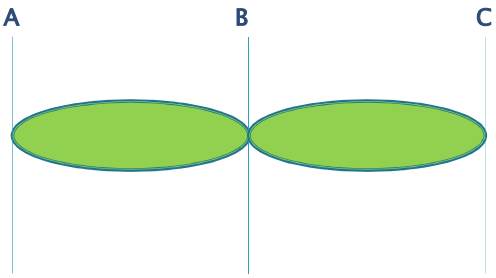

Schedule Validator
Done
Schedule Comparison
Print
Text
SCHEDULES COMPARED
DECEMBER 2016 UPDATE
JANUARY 2017 UPDATE
ACTIVITY DESCRIPTION CHANGES (0)
ORIGINAL DURATION CHANGES (3)
DELETED ACTIVITIES (0)
ADDED ACTIVITIES (1)
RELATIONSHIP CHANGES (7)

24

Step 3 – Manage Milestones

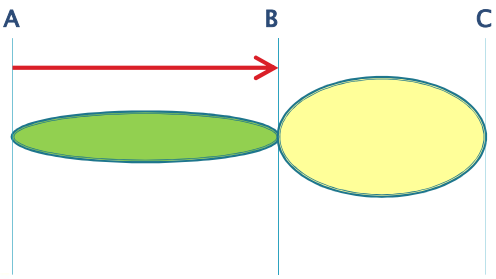
25

PROJECT CREEP



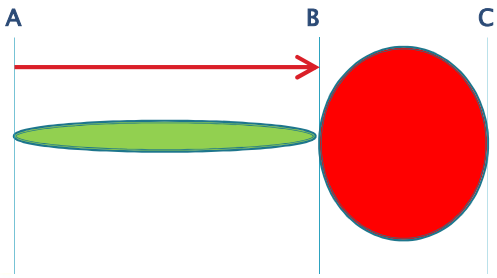
26

PROJECT CREEP



27

PROJECT CREEP



28

What does "on schedule" really mean?

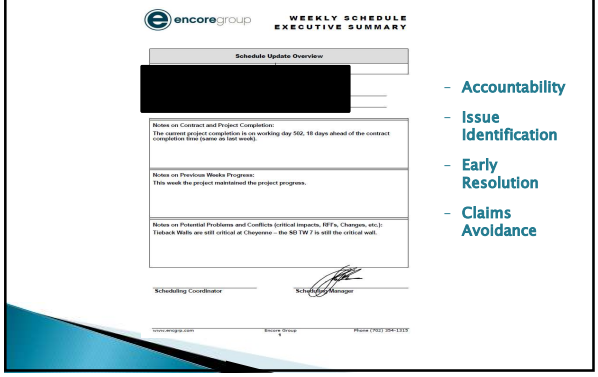
29

Monitoring Progress

- 3 Key Items to Review
- The Completion Date
- Progress on the Critical Path
- Potential Problems

30

Schedule Progress Reporting


encoregroup

WEEKLY SCHEDULE EXECUTIVE SUMMARY

Schedule Update Overview

[redacted]

Notes on Contract and Project Completion:
The current project completion is on working day 502, 18 days ahead of the contract completion time (same as last week).

Notes on Previous Weeks Progress:
This week the project maintained the project progress.

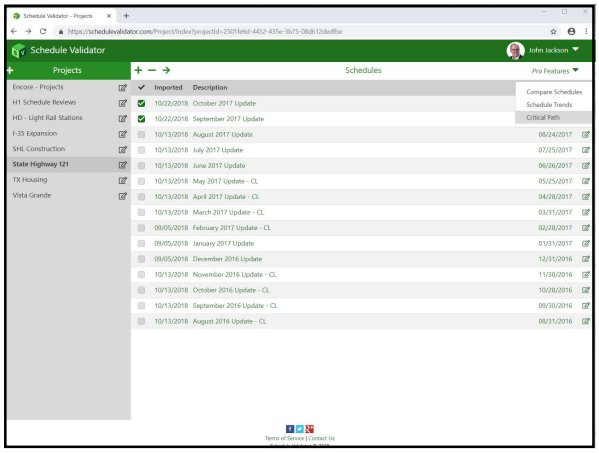
Notes on Potential Problems and Conflicts (critical impacts, RFI's, Changes, etc.):
Toeback Walls are still critical at Cheyenne – the SO-TW-7 is still the critical wall.

Scheduling Coordinator

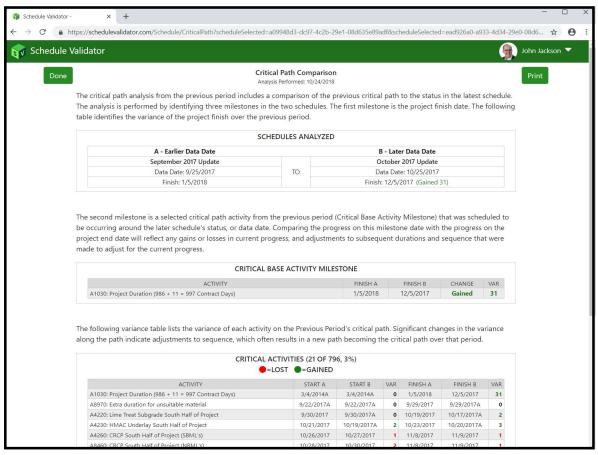
Schedule Manager

- Accountability
- Issue Identification
- Early Resolution
- Claims Avoidance

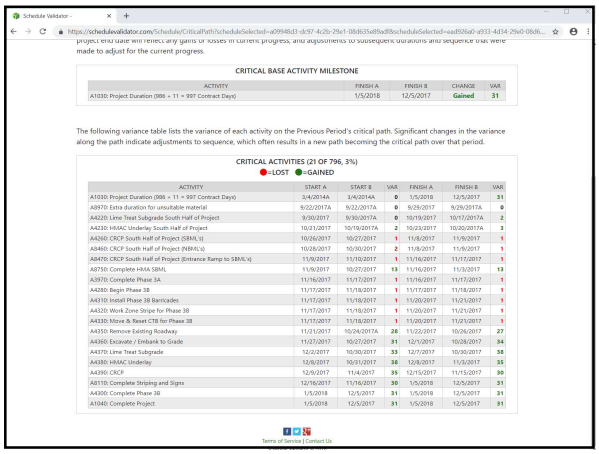
31



32



33



made to adjust for the current progress.

CRITICAL BASE ACTIVITY MILESTONE

ACTIVITY	FINISH A	FINISH B	CHANGE	VAR
A1030: Project Duration (986 + 11 = 997 Contract Days)	1/5/2018	12/5/2017	Gained	31

The following variance table lists the variance of each activity on the Previous Period's critical path. Significant changes in the variance along the path indicate adjustments to sequence, which often results in a new path becoming the critical path over that period.

CRITICAL ACTIVITIES (21 OF 796, 3%)

●=LOST ●=GAINED

ACTIVITY	START A	START B	VAR	FINISH A	FINISH B	VAR
A1030: Project Duration (986 + 11 = 997 Contract Days)	3/4/2014A	3/4/2014A	0	1/5/2018	12/5/2017	31
A3970: Extra duration for unsuitable material	9/22/2017A	9/22/2017A	0	9/29/2017	9/29/2017A	0
A4220: Lime Treat Subgrade South Half of Project	9/30/2017	9/30/2017A	0	10/19/2017	10/17/2017A	2
A4230: HMAC Underlay South Half of Project	10/21/2017	10/19/2017A	2	10/23/2017	10/20/2017A	3
A4260: CRCP South Half of Project (SBM/L's)	10/26/2017	10/27/2017	1	11/8/2017	11/9/2017	1
A8460: CRCP South Half of Project (NBM/L's)	10/28/2017	10/30/2017	2	11/8/2017	11/9/2017	1
A8470: CRCP South Half of Project (Entrance Ramp to SBM/L's)	11/9/2017	11/10/2017	1	11/16/2017	11/17/2017	1
A8750: Complete HMA SBM/L	11/9/2017	10/27/2017	13	11/16/2017	11/3/2017	13
A3970: Complete Phase 3A	11/16/2017	11/17/2017	1	11/16/2017	11/17/2017	1
A4280: Begin Phase 3B	11/17/2017	11/18/2017	1	11/17/2017	11/18/2017	1
A4310: Install Phase 3B Barricades	11/17/2017	11/18/2017	1	11/20/2017	11/21/2017	1
A4320: Work Zone Stripe for Phase 3B	11/17/2017	11/18/2017	1	11/20/2017	11/21/2017	1
A4330: Move & Reset CTB for Phase 3B	11/17/2017	11/18/2017	1	11/20/2017	11/21/2017	1
A4350: Remove Existing Roadway	11/21/2017	10/24/2017A	28	11/22/2017	10/26/2017	27
A4360: Excavate / Embank to Grade	11/27/2017	10/27/2017	31	12/1/2017	10/28/2017	34
A4370: Lime Treat Subgrade	12/2/2017	10/30/2017	33	12/7/2017	10/30/2017	38
A4380: HMAC Underlay	12/8/2017	10/31/2017	38	12/8/2017	11/3/2017	35
A4390: CRCP	12/9/2017	11/4/2017	35	12/15/2017	11/15/2017	30
A8510: Complete Striping and Signs	12/16/2017	11/16/2017	30	1/5/2018	12/5/2017	31
A4300: Complete Phase 3B	1/5/2018	12/5/2017	31	1/5/2018	12/5/2017	31
A1040: Complete Project	1/5/2018	12/5/2017	31	1/5/2018	12/5/2017	31

Terms of Service | Contact Us

34

Account for Every Day

- What did you say last week/month?
  - What did you do last week/month?
    - What happened to make up the difference?

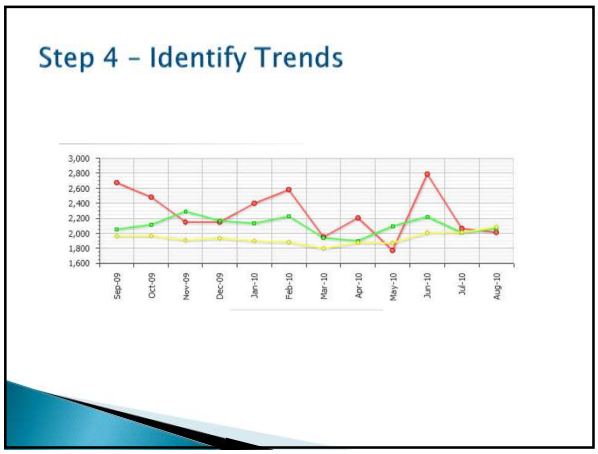
Data Date	Contractor			Owner			Project	Notes
	Gain	Loss	T	Gain	Loss	T		
3/31/2011								
4/30/2011								
5/31/2011								
6/30/2011								
7/31/2011								
Totals								

35

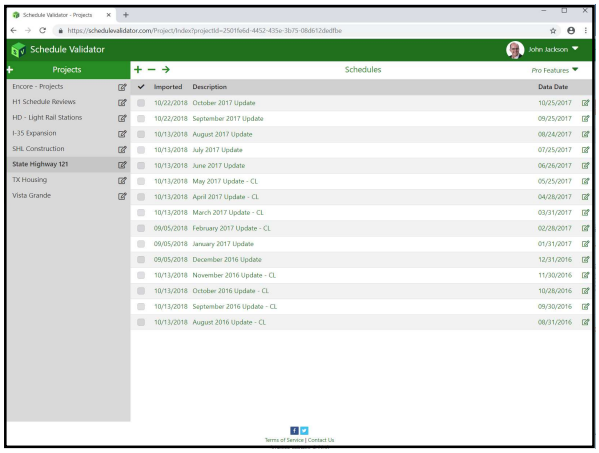
Establish a Resolution Strategy

Data Date	Contractor			Owner			Project	Notes
	Gain	Loss	T	Gain	Loss	T		
3/31/2011	5	-10	-5	0	0	0	-5	
4/30/2011	0	0	0	0	-15	-15	-20	
5/31/2011	5	0	5	15	0	15	0	
6/30/2011	0	-15	-15	5	0	5	-10	
7/31/2011								
Totals	**10**	**-25**	**-15**	**20**	**-15**	**5**		

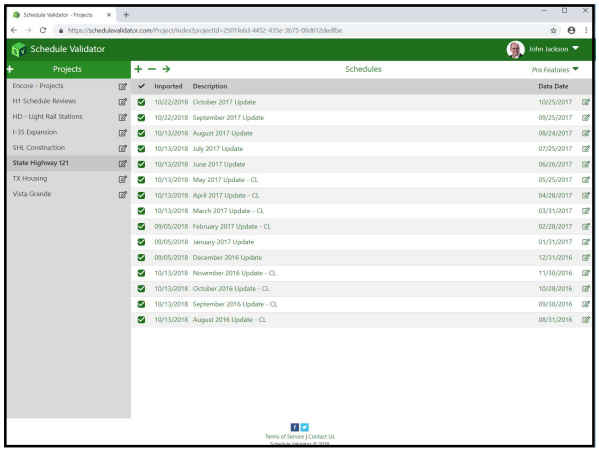
36


Step 4 – Identify Trends
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10

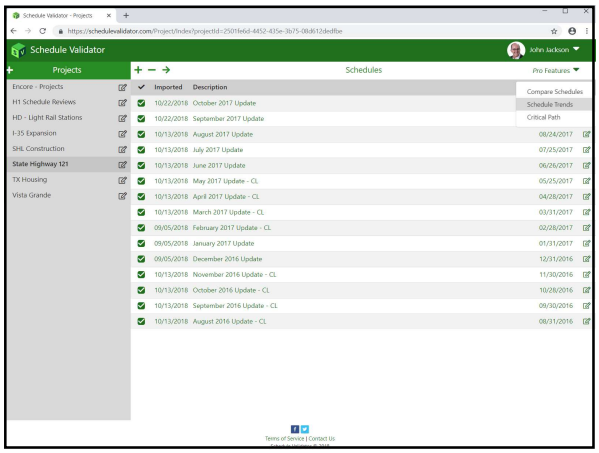
37


Schedule Validator
Projects
Schedules
Pro Features
John Jackson
Encore - Projects
H1 Schedule Reviews
HD - Light Rail Stations
I-35 Expansion
SHL Construction
State Highway 121
TX Housing
Vista Grande
Imported
Description
Data Date
10/22/2018 October 2017 Update 10/25/2017
10/22/2018 September 2017 Update 09/25/2017
10/13/2018 August 2017 Update 08/24/2017
10/13/2018 July 2017 Update 07/25/2017
10/13/2018 June 2017 Update 06/26/2017
10/13/2018 May 2017 Update - CL 05/25/2017
10/13/2018 April 2017 Update - CL 04/28/2017
10/13/2018 March 2017 Update - CL 03/31/2017
09/05/2018 February 2017 Update - CL 02/28/2017
09/05/2018 January 2017 Update 01/31/2017
09/05/2018 December 2016 Update 12/31/2016
10/13/2018 November 2016 Update - CL 11/30/2016
10/13/2018 October 2016 Update - CL 10/28/2016
10/13/2018 September 2016 Update - CL 09/30/2016
10/13/2018 August 2016 Update - CL 08/31/2016

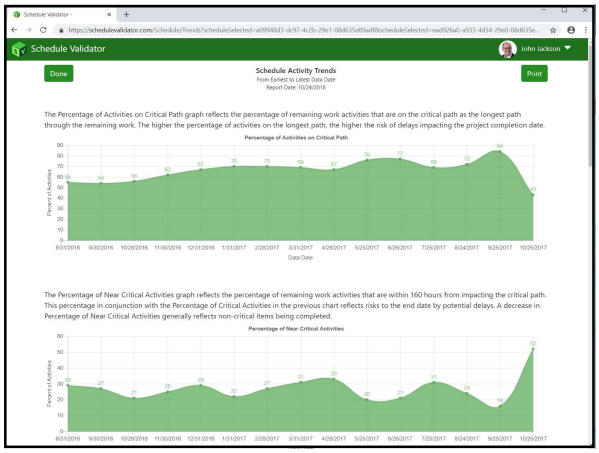
38


Schedule Validator
Projects
Schedules
Pro Features
John Jackson
Encore - Projects
H1 Schedule Reviews
HD - Light Rail Stations
I-35 Expansion
SHL Construction
State Highway 121
TX Housing
Vista Grande
Imported
Description
Data Date
10/22/2018 October 2017 Update 10/25/2017
10/22/2018 September 2017 Update 09/25/2017
10/13/2018 August 2017 Update 08/24/2017
10/13/2018 July 2017 Update 07/25/2017
10/13/2018 June 2017 Update 06/26/2017
10/13/2018 May 2017 Update - CL 05/25/2017
10/13/2018 April 2017 Update - CL 04/28/2017
10/13/2018 March 2017 Update - CL 03/31/2017
09/05/2018 February 2017 Update - CL 02/28/2017
09/05/2018 January 2017 Update 01/31/2017
09/05/2018 December 2016 Update 12/31/2016
10/13/2018 November 2016 Update - CL 11/30/2016
10/13/2018 October 2016 Update - CL 10/28/2016
10/13/2018 September 2016 Update - CL 09/30/2016
10/13/2018 August 2016 Update - CL 08/31/2016

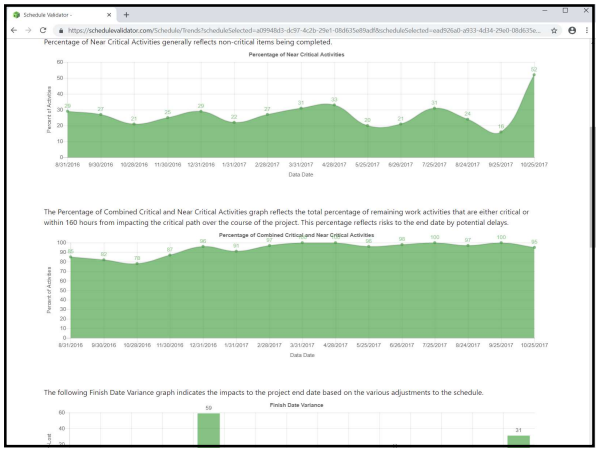
39


Schedule Validator - Projects
https://schedulevalidator.com/Project/Index?projectId=2501fe6d-4452-435e-3b75-08d612dedfbe
Schedule Validator
John Jackson
Projects
Schedules
Pro Features
Encore - Projects
H1 Schedule Reviews
HD - Light Rail Stations
I-35 Expansion
SHL Construction
State Highway 121
TX Housing
Vista Grande
Imported
Description
10/22/2018 October 2017 Update
10/22/2018 September 2017 Update
10/13/2018 August 2017 Update
10/13/2018 July 2017 Update
10/13/2018 June 2017 Update
10/13/2018 May 2017 Update - CL
10/13/2018 April 2017 Update - CL
10/13/2018 March 2017 Update - CL
09/05/2018 February 2017 Update - CL
09/05/2018 January 2017 Update
09/05/2018 December 2016 Update
10/13/2018 November 2016 Update - CL
10/13/2018 October 2016 Update - CL
10/13/2018 September 2016 Update - CL
10/13/2018 August 2016 Update - CL
08/24/2017
07/25/2017
06/26/2017
05/25/2017
04/28/2017
03/31/2017
02/28/2017
01/31/2017
12/31/2016
11/30/2016
10/28/2016
09/30/2016
08/31/2016
Compare Schedules
Schedule Trends
Critical Path
Terms of Service | Contact Us

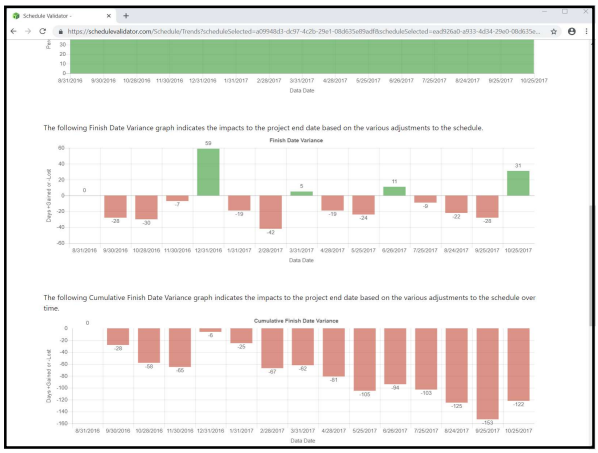
40


Schedule Validator
John Jackson
Done
Schedule Activity Trends
From Earliest to Latest Data Date
Report Date: 10/24/2018
Print
The Percentage of Activities on Critical Path graph reflects the percentage of remaining work activities that are on the critical path as the longest path through the remaining work. The higher the percentage of activities on the longest path, the higher the risk of delays impacting the project completion date.
Percentage of Activities on Critical Path
Percent of Activities
Data Date
The Percentage of Near Critical Activities graph reflects the percentage of remaining work activities that are within 160 hours from impacting the critical path. This percentage in conjunction with the Percentage of Critical Activities in the previous chart reflects risks to the end date by potential delays. A decrease in Percentage of Near Critical Activities generally reflects non-critical items being completed.
Percentage of Near Critical Activities
Percent of Activities
8/31/2016 9/30/2016 10/28/2016 11/30/2016 12/31/2016 1/31/2017 2/28/2017 3/31/2017 4/28/2017 5/25/2017 6/26/2017 7/25/2017 8/24/2017 9/25/2017 10/25/2017

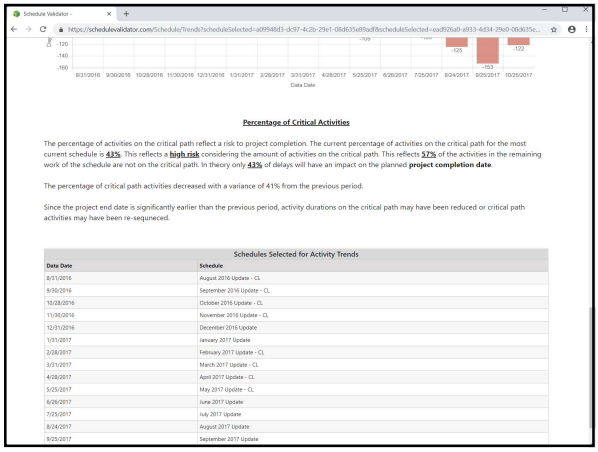
41


Percentage of Near Critical Activities generally reflects non-critical items being completed.
Percentage of Near Critical Activities
Percent of Activities
Data Date
The Percentage of Combined Critical and Near Critical Activities graph reflects the total percentage of remaining work activities that are either critical or within 160 hours from impacting the critical path over the course of the project. This percentage reflects risks to the end date by potential delays.
Percentage of Combined Critical and Near Critical Activities
Percent of Activities
The following Finish Date Variance graph indicates the impacts to the project end date based on the various adjustments to the schedule.
Finish Date Variance

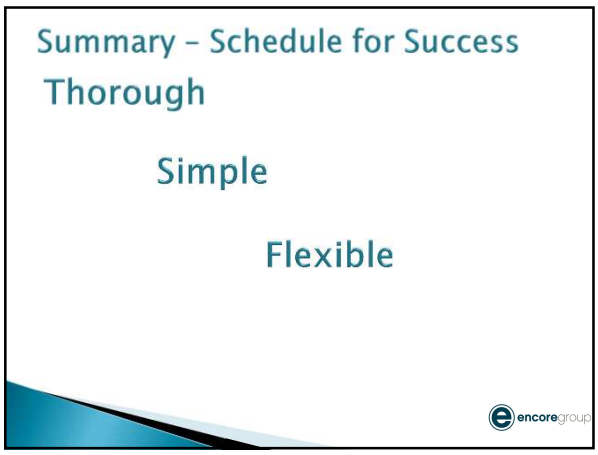
42


Schedule Validator -
https://schedulevalidator.com/Schedule/Trends?scheduleSelected=a09948d3-dc97-4c2b-29e1-08d635e89adf&scheduleSelected=ead926a0-a933-4d34-29e0-08d635e...
Days
Data Date
The following Finish Date Variance graph indicates the impacts to the project end date based on the various adjustments to the schedule.
Finish Date Variance
Days +Slained or -Lost
Data Date
The following Cumulative Finish Date Variance graph indicates the impacts to the project end date based on the various adjustments to the schedule over time.
Cumulative Finish Date Variance
Days +Slained or -Lost
Data Date

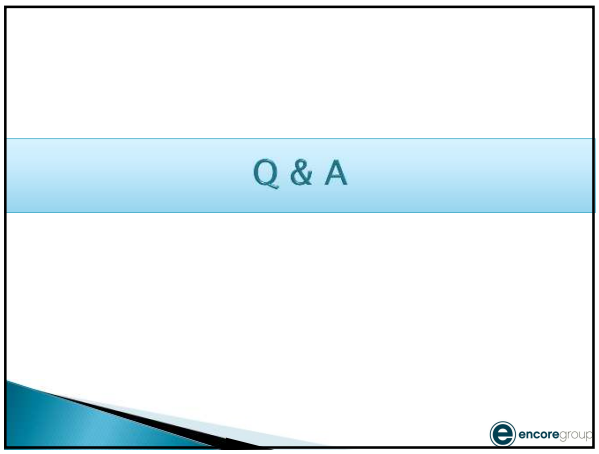
43


Schedule Validator -
https://schedulevalidator.com/Schedule/Trends?scheduleSelected=a09948d3-dc97-4c2b-29e1-08d635e89adf&scheduleSelected=ead926a0-a933-4d34-29e0-08d635e...
Days
Data Date
Percentage of Critical Activities
The percentage of activities on the critical path reflect a risk to project completion. The current percentage of activities on the critical path for the most current schedule is 43%. This reflects a high risk considering the amount of activities on the critical path. This reflects 57% of the activities in the remaining work of the schedule are not on the critical path. In theory only 43% of delays will have an impact on the planned project completion date.
The percentage of critical path activities decreased with a variance of 41% from the previous period.
Since the project end date is significantly earlier than the previous period, activity durations on the critical path may have been reduced or critical path activities may have been re-sequenced.
Schedules Selected for Activity Trends
Data Date
Schedule
8/31/2016 August 2016 Update - CL
9/30/2016 September 2016 Update - CL
10/28/2016 October 2016 Update - CL
11/30/2016 November 2016 Update – CL
12/31/2016 December 2016 Update
1/31/2017 January 2017 Update
2/28/2017 February 2017 Update - CL
3/31/2017 March 2017 Update - CL
4/28/2017 April 2017 Update - CL
5/25/2017 May 2017 Update - CL
6/26/2017 June 2017 Update
7/25/2017 July 2017 Update
8/24/2017 August 2017 Update
9/25/2017 September 2017 Update

44


Summary – Schedule for Success
Thorough
Simple
Flexible
encoregroup

45


Q & A
encoregroup

46

John Jackson
jjackson@encgrp.com
702-354-1315
encoregroup

47