



*OTEC Conference*  
*What is the Current  
Standard for the Analysis of  
Delays?*

*Speaker: Scott Lowe, P.E*

*Date: October 28, 2008*

# *The Contract*



**108.06.A. General.** The Department will only extend the Completion Date if an excusable delay...delays Work on the critical path shown on the accepted progress schedule.

# *The Contract*



**108.06.A. General.** The critical path is defined as the sequence of activities that must be completed on time to ensure that the Project finishes by the Completion Date.

# *The Contract*



**108.06.A. General.** The Department will not evaluate a request ... unless the Contractor notifies the Engineer as specified ... and provides the required analysis as specified in 108.02.B.4.

# *The Contract*



**108.02.B.4. Schedule Documentation for Time Extensions.** Furnish documentation, including schedule updates, to support all time extension requests.



Critical Path = Longest Path

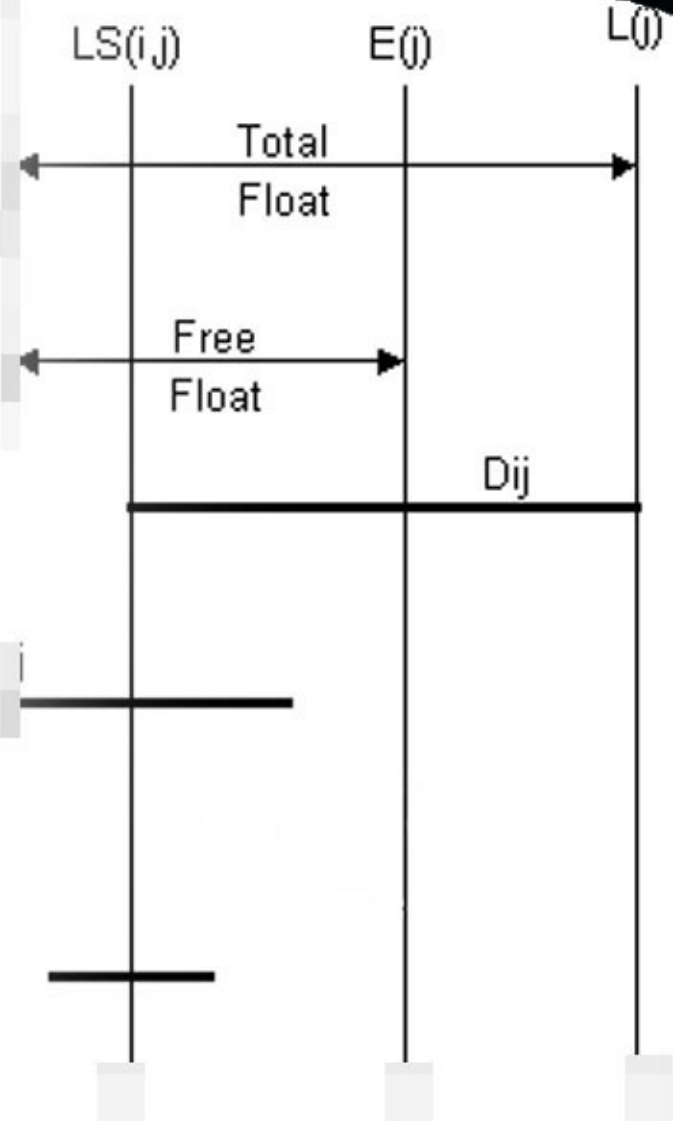


**Only delays to the critical path to the Completion Date could jeopardize finishing the Project by the Completion Date.**

## *Another Important Concept*

# FLOAT

The difference between when an activity can start and must start so as to complete the project by the scheduled date.



## *Other Contract Considerations*



**104.02.C. Suspension of Work.** The Department will not make an adjustment under this subsection in the event that performance is suspended or delayed by any other cause, or for which an adjustment is provided or excluded under any other term or condition of this Contract.

# *Use the Accepted Progress Schedule to Measure Delay*



1. Use “*contemporaneous*” schedules
2. *Contemporaneous* means “of the time”
3. Don’t make up schedules after the fact to measure delay

# *Use Contemporaneous Schedules*



“... in the absence of compelling evidence of actual errors in the CPMs we will let the parties ‘live or die’ by the CPM applicable to the relevant time frames.” [VABCA Nos. 1943, 1944, 1945, and 1946, 84-2 BCA. ¶ 17,341 at 86,411](#)

# *Potentially a New Standard*



- Association for the Advancement of Cost Engineering International (AACEI)
- Recommended Practice No. 29R-03
- Forensic Schedule Analysis
- Published in June 2007

# *Layer 1 – Timing*

- Prospective
- Retrospective



# *Layer 2 – Basic Methods*

- Observational
- Modeled



# *Layer 3 – Specific Methods*



## ■ Observational Methods

- Static
- Dynamic

## ■ Modeled Methods

- Additive
- Subtractive

# *Layer 4 – Basic Implementation*



- Gross or Period Mode
- As-Is or Split
- Modified or Created

# *Layer 5 – Specific Implementation*

- Fixed vs. Variable Periods
- Global vs. Stepped Insertion or Extraction

# *Impacted As-Planned: Weaknesses*



“We have found that [his] analysis systematically excluded all delays and disruptions except those allegedly caused by the Government ... We conclude that his analysis was inherently biased, and could lead to but one predictable outcome ... To be credible, a contractor’s CPM analysis ought to take into account, and give appropriate credit for all of the delays which were alleged to have occurred.”

**Haney v. United States 30 CCF ¶ 70, 1891], 676 F.2d 584 (Ct. Cl. 1982); Pathman Construction Co. , ASBCA No. 23392, 85-2 BCA ¶ 18,906 (CPM analysis with “built-in bias” rejected).**

# *Contemporaneous Analysis*



“Mr. Maurer, appellant’s expert, testified about the critical delays to the project ... The analysis about the critical delays was based on appellant’s original schedule, the schedule updates, the daily reports, project correspondence, and the contract documents ... Mr. Maurer described his analysis as a step by step process, beginning with the original schedule and proceeding chronologically through the project, updating the sequence at intervals to see what happens as the project progressed” ... [ASBCA No. 34,645, 90-3 BCA ¶ 12,173 \(1990\)](#).

# *Potential Analysis Techniques*



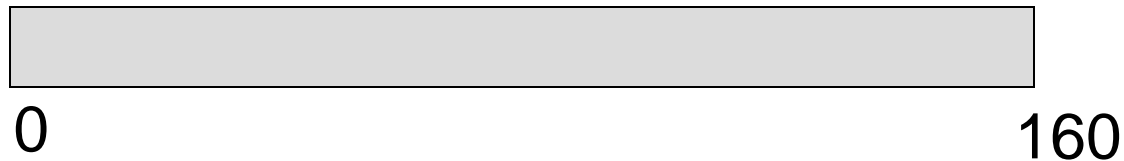
**There are two basic approaches:**

- 1. Time Impact Analysis or, to use the RP 29R-03 taxonomy, the Modeled, Additive, Multiple Base**
- 2. Contemporaneous Analysis or, to use the RP taxonomy, the Observational, Dynamic, Contemporaneous, Split**

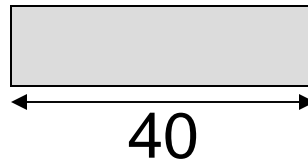
# *Delay Analysis of Potential Changes*



Schedule In Place When Change Is Made



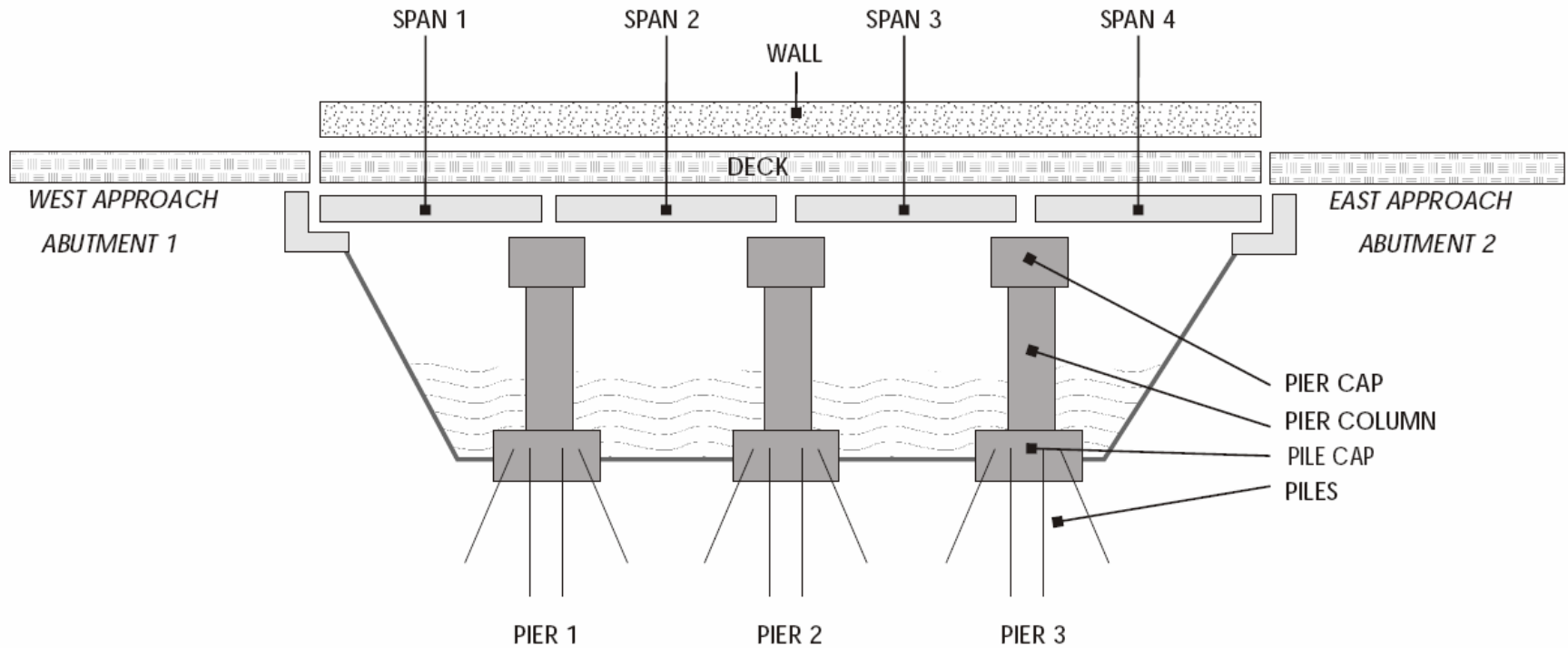
Potential Change Activity



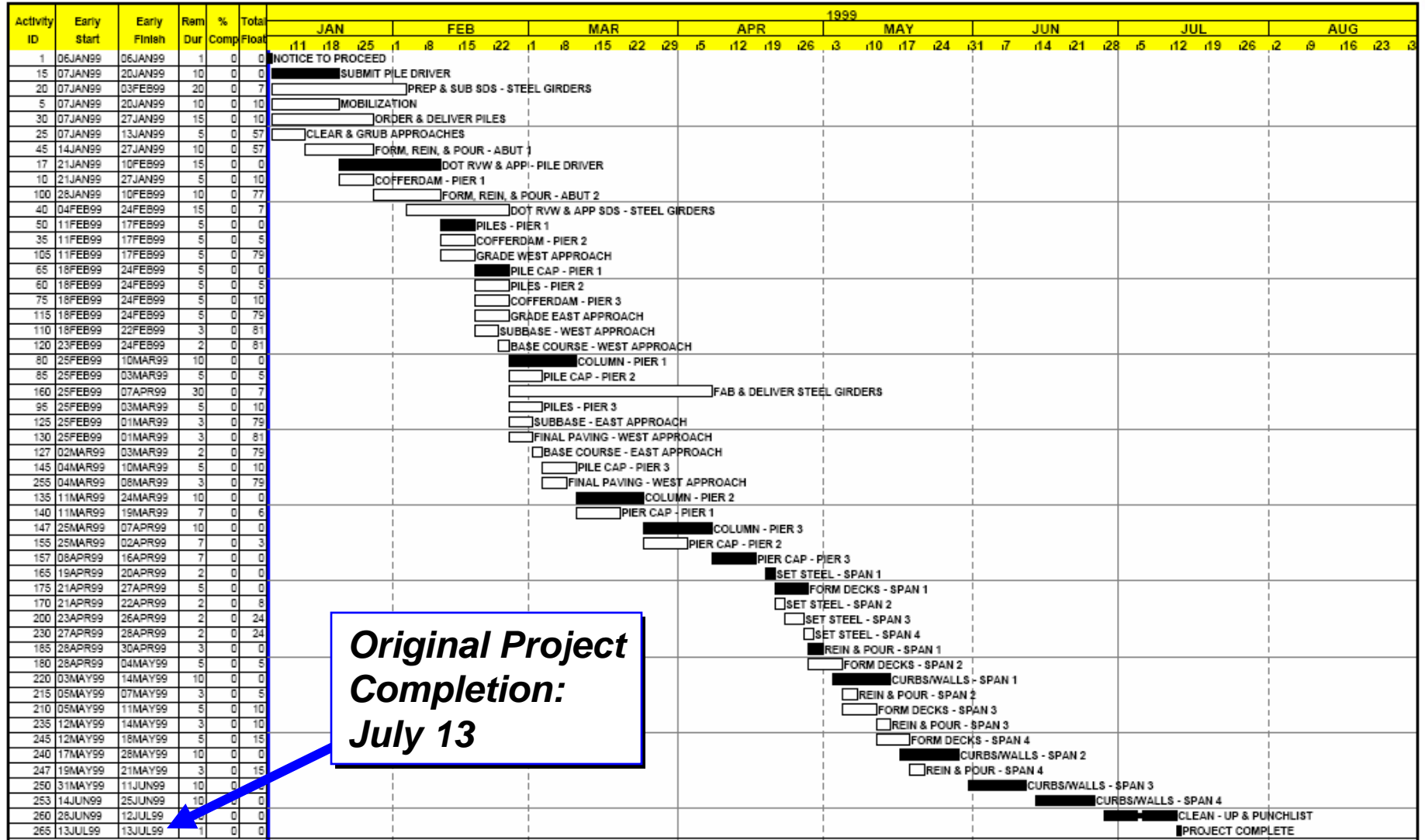
Revised Schedule with Potential Change



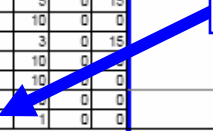
# The Project



# Baseline Schedule



**Original Project Completion: July 13**



## *The Change*

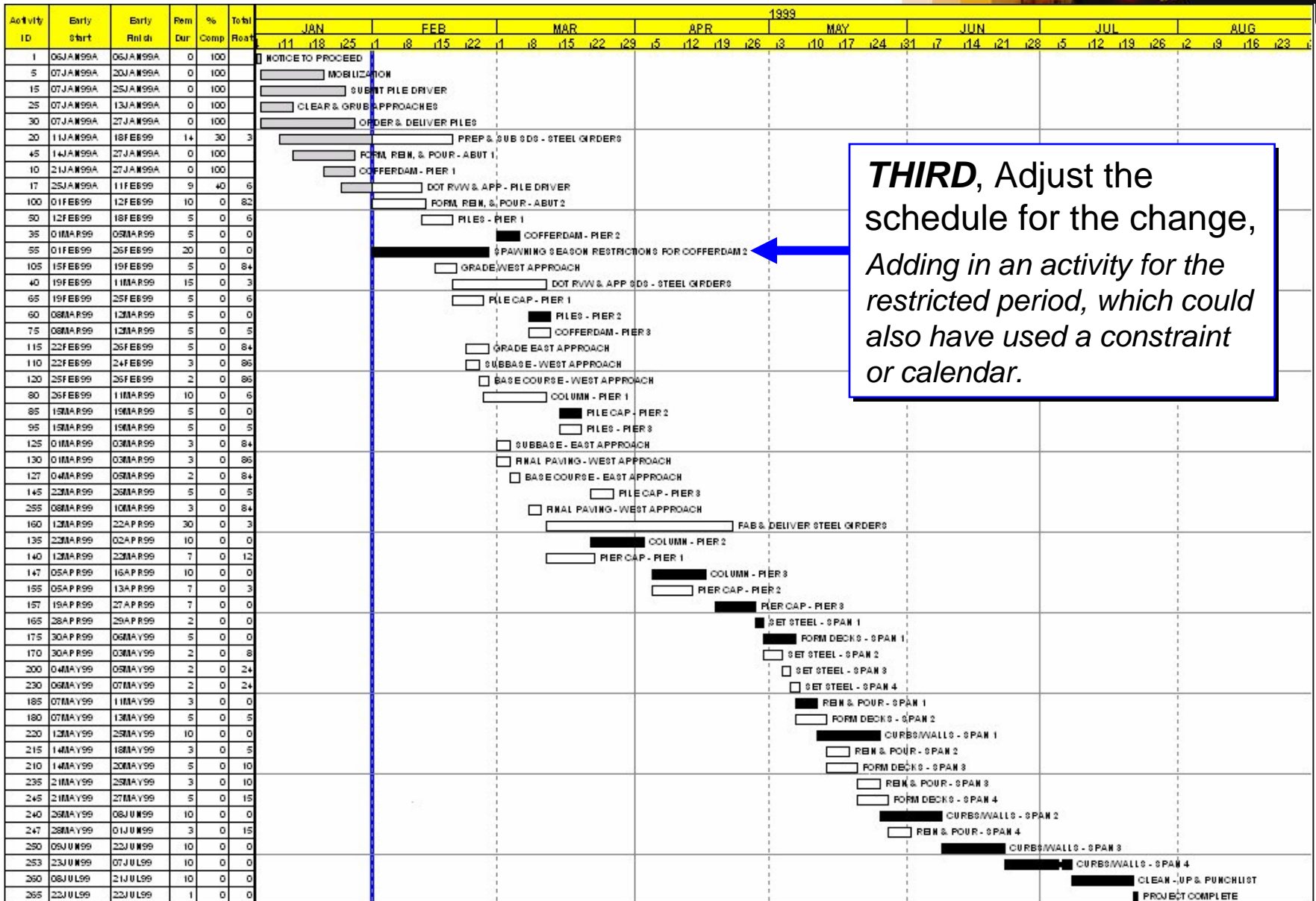


On February 1, the owner informed the contractor that to accommodate the spawning season this year, the project's environmental permit had been modified. The second cofferdam, located in a flowing portion of the river, could not be installed until March.



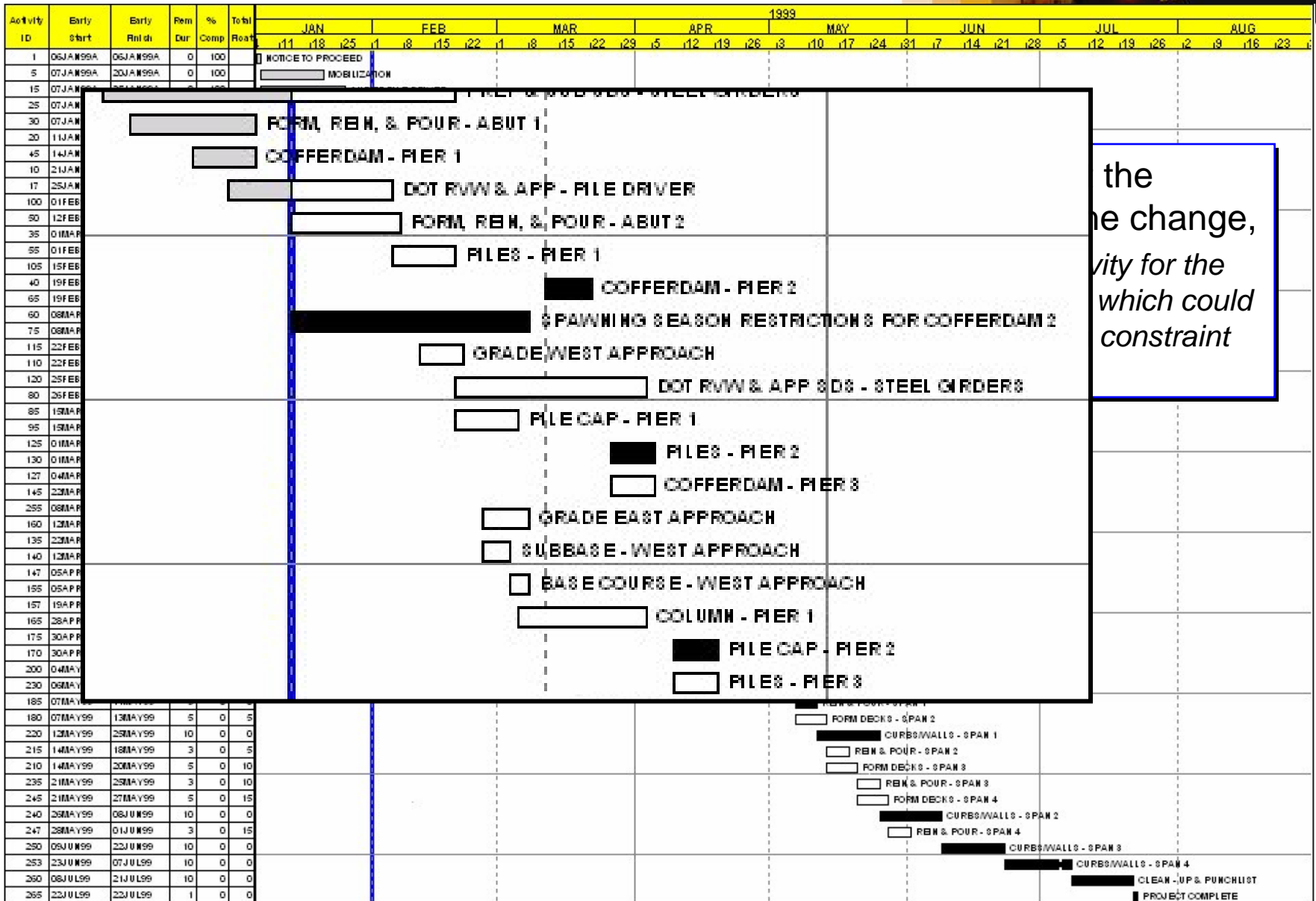


# Adjust for Change



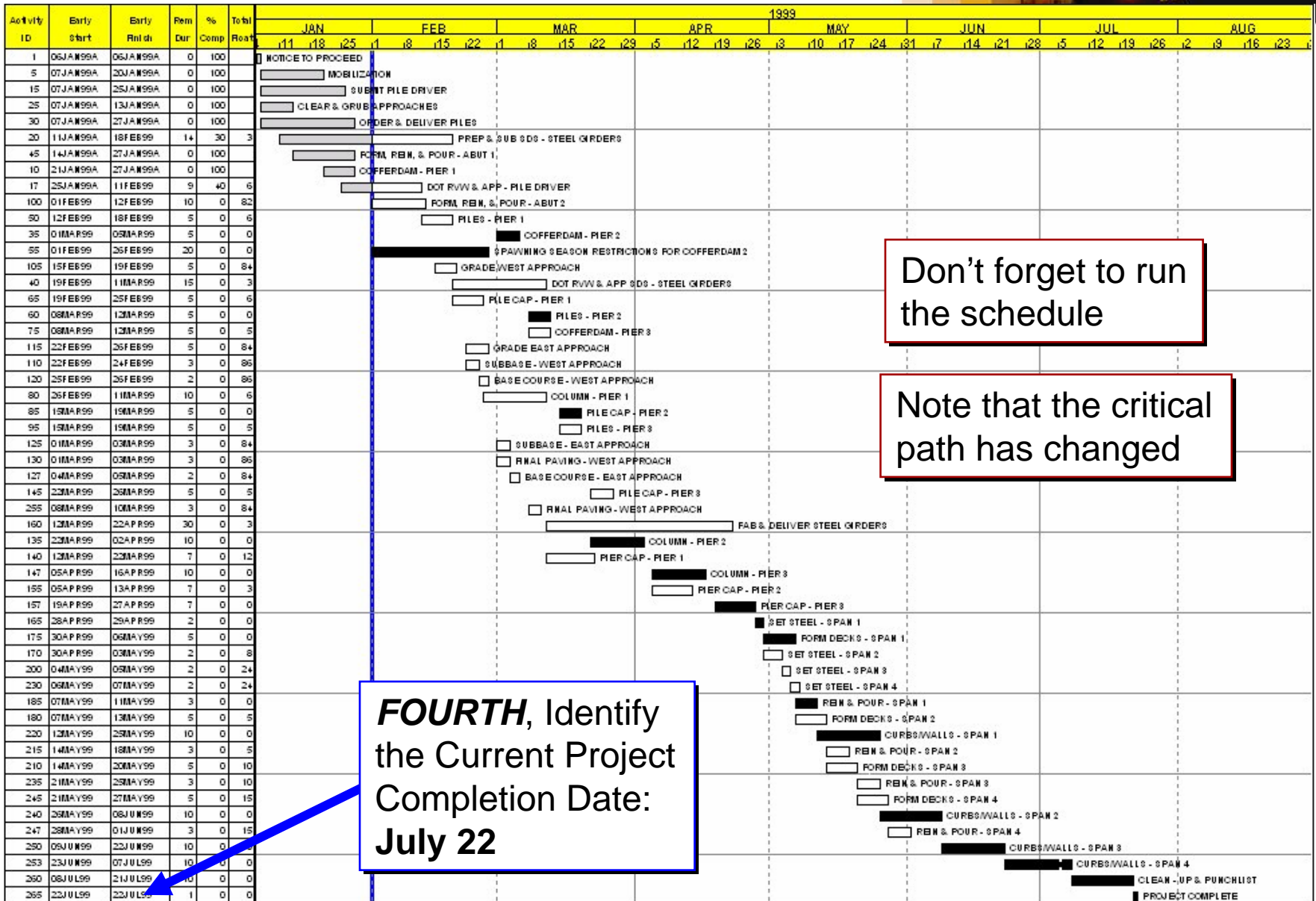
**THIRD**, Adjust the schedule for the change, Adding in an activity for the restricted period, which could also have used a constraint or calendar.

# Adjust for Change



the  
change,  
activity for the  
which could  
constraint

# Adjust for Change

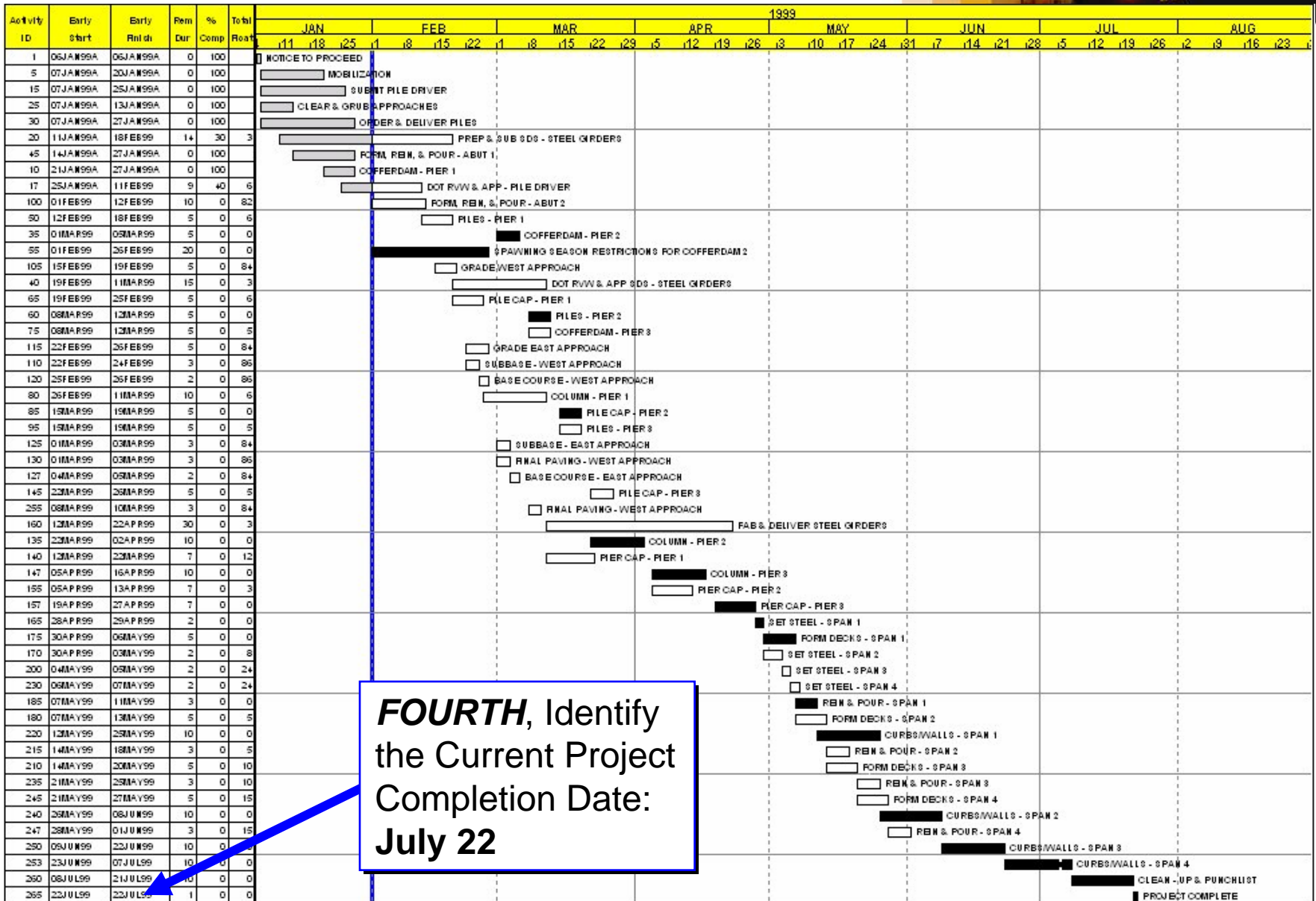


Don't forget to run the schedule

Note that the critical path has changed

**FOURTH**, Identify the Current Project Completion Date: **July 22**

# Adjust for Change



**FOURTH**, Identify the Current Project Completion Date: **July 22**

# *Analyzing Delays: Beforehand*



What was the completion date?

- Before the change: July 19
- After the change: July 22

The change order issued for the permit revision should include a 3-day time extension.

Alternately, the work could be accelerated to mitigate the delay and achieve timely completion.

REPORT DATE 25JUN04 RUN NO. 29  
14:09

AS-PLANNED

START DATE 5JAN98 FIN DATE 10JUL98

Schedule Report - Sorted by Total Float

DATA DATE 5JAN98 PAGE NO. 1

ACTIVITY ID	ORIG DUR	REM DUR	%	CODE	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	LATE START	LATE FINISH	TOTAL FLOAT
1	1	1	0		NOTICE TO PROCEED	5JAN98	5JAN98	5JAN98	5JAN98	0
15	10	10	0		SUBMIT PILE DRIVER	6JAN98	19JAN98	6JAN98	19JAN98	0
17	15	15	0		SHA REVIEW & APPROVE PILE DRIVER	20JAN98	9FEB98	20JAN98	9FEB98	0
50	5	5	0		DRIVE PILE - PIER 1	10FEB98	16FEB98	10FEB98	16FEB98	0
65	5	5	0		CONSTRUCT PILE CAP - PIER 1	17FEB98	23FEB98	17FEB98	23FEB98	0
80	10	10	0		F/R/P COLUMN - PIER 1	24FEB98	9MAR98	24FEB98	9MAR98	0
135	10	10	0		F/R/P COLUMN 2 - PIER 2	10MAR98	23MAR98	10MAR98	23MAR98	0
147	10	10	0		F/R/P COLUMN PIER 3	24MAR98	6APR98	24MAR98	6APR98	0
157	7	7	0		F/R/P PIER CAP - PIER 3	7APR98	15APR98	7APR98	15APR98	0
165	2	2	0		SET STEEL - SPAN 1	16APR98	17APR98	16APR98	17APR98	0
175	5	5	0		FORM DECKS - SPAN 1	20APR98	24APR98	20APR98	24APR98	0
185	3	3	0		REBAR, POUR SPAN 1	27APR98	29APR98	27APR98	29APR98	0
220	10	10	0		CURBS/WALL - SPAN 1	30APR98	13MAY98	30APR98	13MAY98	0
240	10	10	0		CURBS/WALL SPAN 2	14MAY98	27MAY98	14MAY98	27MAY98	0
250	10	10	0		CURBS/WALL SPAN 3	28MAY98	10JUN98	28MAY98	10JUN98	0
253	10	10	0		CURBS/WALL SPAN 4	11JUN98	24JUN98	11JUN98	24JUN98	0
260	10	10	0		CLEAN-UP & PUNCHLIST	25JUN98	9JUL98	25JUN98	9JUL98	0
265	1	1	0		PROJECT COMPLETE	10JUL98	10JUL98	10JUL98	10JUL98	0
155	7	7	0		F/R/P PIER CAP - PIER 2	24MAR98	1APR98	27MAR98	6APR98	3
25	5	5	0		CLEAR & GRUB APPROACHES	6JAN98	12JAN98	13JAN98	19JAN98	5
35	5	5	0		CONSTRUCT COFFERDAM - PIER 2	10FEB98	16FEB98	17FEB98	23FEB98	5
45	10	10	0		FORM, REINFORCE, POUR (F/R/P)- ABUTMENT 1	13JAN98	26JAN98	20JAN98	2FEB98	5
60	5	5	0		DRIVE PILES - PIER 2	17FEB98	23FEB98	24FEB98	2MAR98	5
85	5	5	0		CONSTRUCT PILE CAP - PIER 2	24FEB98	2MAR98	3MAR98	9MAR98	5
100	10	10	0		F/R/P ABUTMENT 2	27JAN98	9FEB98	3FEB98	16FEB98	5
180	5	5	0		FORM DECKS - SPAN 2	27APR98	1MAY98	4MAY98	8MAY98	5
215	3	3	0		REBAR, POUR SPAN 2	4MAY98	6MAY98	11MAY98	13MAY98	5
140	7	7	0		F/R/P PIER CAP - PIER 1	10MAR98	18MAR98	18MAR98	26MAR98	6
20	20	20	0		PREP & SUBMIT SHOP DWGS - STEEL GIRDERS	6JAN98	2FEB98	15JAN98	11FEB98	7
40	15	15	0		AGENCY REVIEW & APPROVE STEEL GIRDERS	3FEB98	23FEB98	12FEB98	4MAR98	7
160	30	30	0		FAB & DELIVER STEEL GIRDERS	24FEB98	6APR98	5MAR98	15APR98	7
170	2	2	0		SET STEEL - SPAN 2	20APR98	21APR98	30APR98	1MAY98	8

REPORT DATE 25JUN04 RUN NO. 29  
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17	15	15	0		SHA REVIEW & APPROVE PILE DRIVER	20JAN98	5FEB98	20JAN98	5FEB98	0
50	5	5	0		DRIVE PILE - PIER 1	10FEB98	16FEB98	10FEB98	16FEB98	0
65	5	5	0		CONSTRUCT PILE CAP - PIER 1	17FEB98	23FEB98	17FEB98	23FEB98	0
80	10	10	0		F/R/P COLUMN - PIER 1	24FEB98	9MAR98	24FEB98	9MAR98	0
135	10	10	0		F/R/P COLUMN 2 - PIER 2	10MAR98	23MAR98	10MAR98	23MAR98	0
147	10	10	0		F/R/P COLUMN PIER 3	24MAR98	6APR98	24MAR98	6APR98	0
157	7	7	0		F/R/P PIER CAP - PIER 3	7APR98	15APR98	7APR98	15APR98	0
165	2	2	0		SET STEEL - SPAN 1	16APR98	17APR98	16APR98	17APR98	0
175	5	5	0		FORM DECKS - SPAN 1	20APR98	24APR98	20APR98	24APR98	0
185	3	3	0		REBAR, POUR SPAN 1	27APR98	29APR98	27APR98	29APR98	0
220	10	10	0		CURBS/WALL - SPAN 1	30APR98	13MAY98	30APR98	13MAY98	0
240	10	10	0		CURBS/WALL SPAN 2	14MAY98	27MAY98	14MAY98	27MAY98	0
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260	10	10	0		CLEAN-UP & PUNCHLIST	25JUN98	9JUL98	25JUN98	9JUL98	0
265	1	1	0		PROJECT COMPLETE	10JUL98	10JUL98	10JUL98	10JUL98	0
155	7	7	0		F/R/P PIER CAP - PIER 2	24MAR98	1APR98	27MAR98	6APR98	3
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100	10	10	0		F/R/P ABUTMENT 2	27JAN98	9FEB98	3FEB98	16FEB98	5
180	5	5	0		FORM DECKS - SPAN 2	27APR98	1MAY98	4MAY98	8MAY98	5
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40	15	15	0		AGENCY REVIEW & APPROVE STEEL GIRDERS	3FEB98	23FEB98	12FEB98	4MAR98	7
160	30	30	0		FAB & DELIVER STEEL GIRDERS	24FEB98	6APR98	5MAR98	15APR98	7
170	2	2	0		SET STEEL - SPAN 2	20APR98	21APR98	30APR98	1MAY98	8



15	10	10	0	SUBMIT PILE DRIVER	6JAN98	19JAN98	6JAN98	19JAN98	0
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1/6	<b>As-Planned</b>			1/19		
<b>January</b>						
	7	14	21	28		



REPORT DATE 25JUN04 RUN NO. 25  
14:31

UPDATE NO. 1

START DATE 5JAN98 FIN DATE 23JUL98

Schedule Report - Sorted by Total Float

DATA DATE 2FEB98 PAGE NO. 1

ACTIVITY ID	ORIG DUR	REM DUR	%	CODE	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	LATE START	LATE FINISH	TOTAL FLOAT
1	1	0	100		NOTICE TO PROCEED	5JAN98A	5JAN98A			
5	10	0	100		MOBILIZATION	6JAN98A	19JAN98A			
<del>10</del>	<del>5</del>	<del>0</del>	<del>100</del>		<del>CONSTRUCT COPPERBANK PIER 1</del>	<del>20JAN98A</del>	<del>20JAN98A</del>			
15	10	0	100		SUBMIT PILE DRIVER	6JAN98A	22JAN98A			

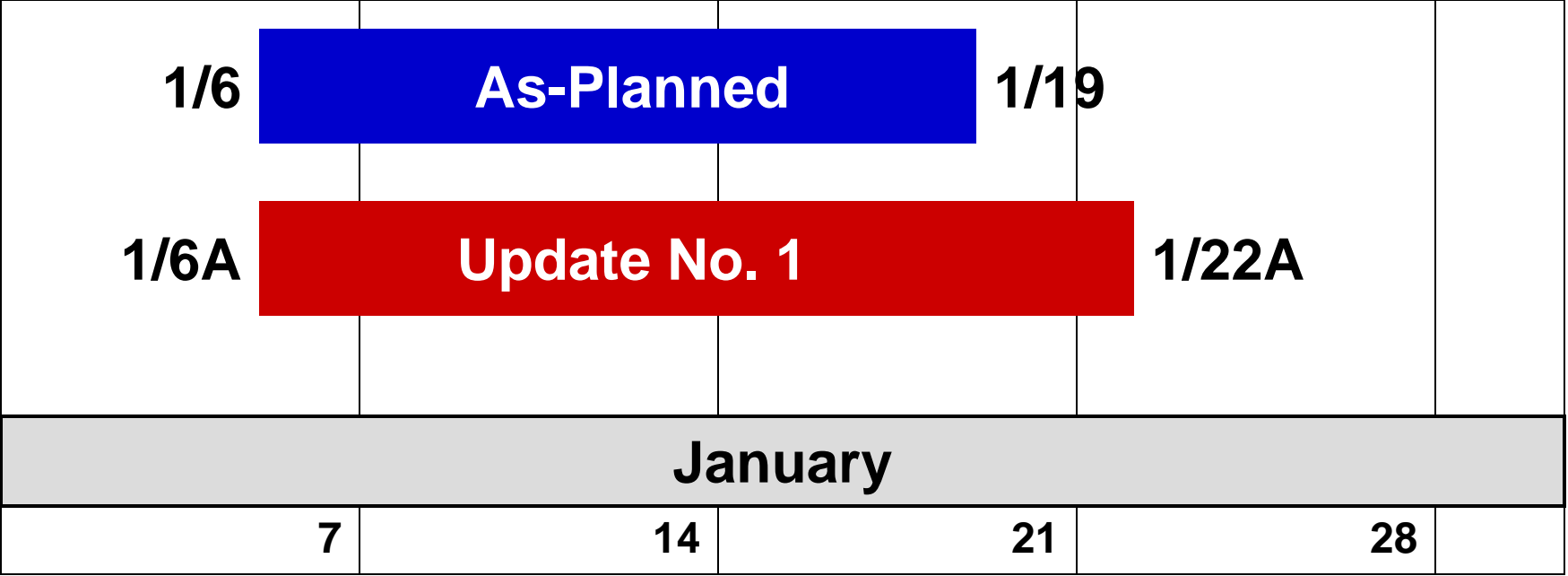


**As-Planned Schedule**

15	10	10	0	SUBMIT PILE DRIVER	6JAN98	19JAN98	6JAN98	19JAN98	0
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**Schedule Update, 2FEB98**

15	10	0	100	SUBMIT PILE DRIVER	6JAN98A	22JAN98A
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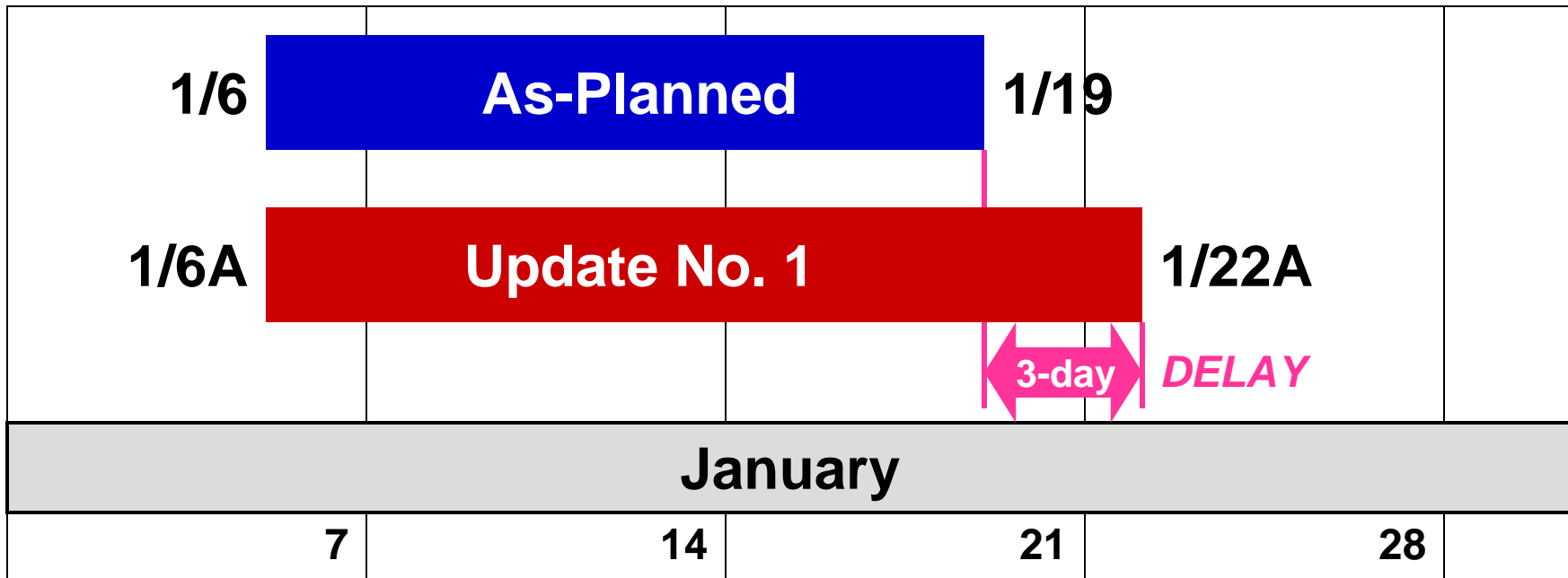


## As-Planned Schedule

15	10	10	0	SUBMIT PILE DRIVER	6JAN98	19JAN98	6JAN98	19JAN98	0
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## Schedule Update, 2FEB98

15	10	0	100	SUBMIT PILE DRIVER	6JAN98A	22JAN98A			
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# QUESTIONS AND ANSWERS

*Feel Free to Contact  
Me for More Info*

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Principal

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