

National and international construction business administration science in a construction law context

Workshop 12: International
Approach to Delay & Disruption in
Construction Business

Practical example dredging project, disrupted flow of construction activities

- Dredging project in South America, based on FIDIC Blue 2006: deepening of berth pockets, inner port, turning basin and access channel, total 32.000.000m³
- Original programme based on use of 3 hopper dredgers
- Major constraint: environmental season between 1 October and 1 February for part of working area
- Delay & disruption due to restricted access to turning basin due to no environmental license

Trailing Suction Hopper Dredger



Area to be dredged



Port overview



What was the plan and what happened?

- Contractor required 100% access on a 24/7 basis on the entire work site, so that he would have maximum flexibility in planning his work, depending on weather and soil conditions
- Original plan was to start dredging the basin as from 1 February
- In reality contractor was restricted in access to the basin between 01 February and 3 April, resulting in less flexibility, less efficiency and less overall progress

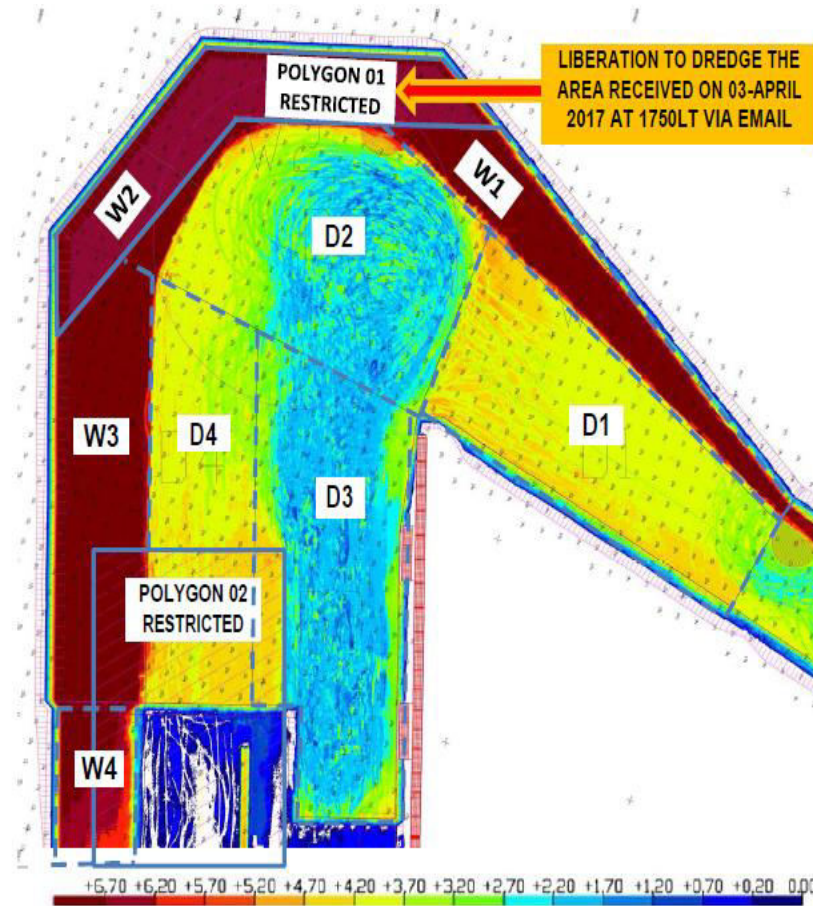
What was the impact?

- Instead of working in long straight lines the dredgers now had to work in shorter curved lines: more turning, less overall speed, less accuracy on the sea bottom, more turbidity and sedimentation, less overall progress
- Contractor could only work with 1 dredger instead of planned 2 dredgers: 2nd dredger had to work elsewhere, causing inefficiency in area where other dredger was already working

(how) was the delay recovered?

- The delay was partly recovered by mobilising a 4th dredger (acceleration measure) and replanning of activities in such a way that basin was given priority (in view of environmental season)
- Employer omitted part of the restricted area from the scope of work
- On balance and including previous delays, an extension of time of 31 days was agreed

Turning Basin – restricted access

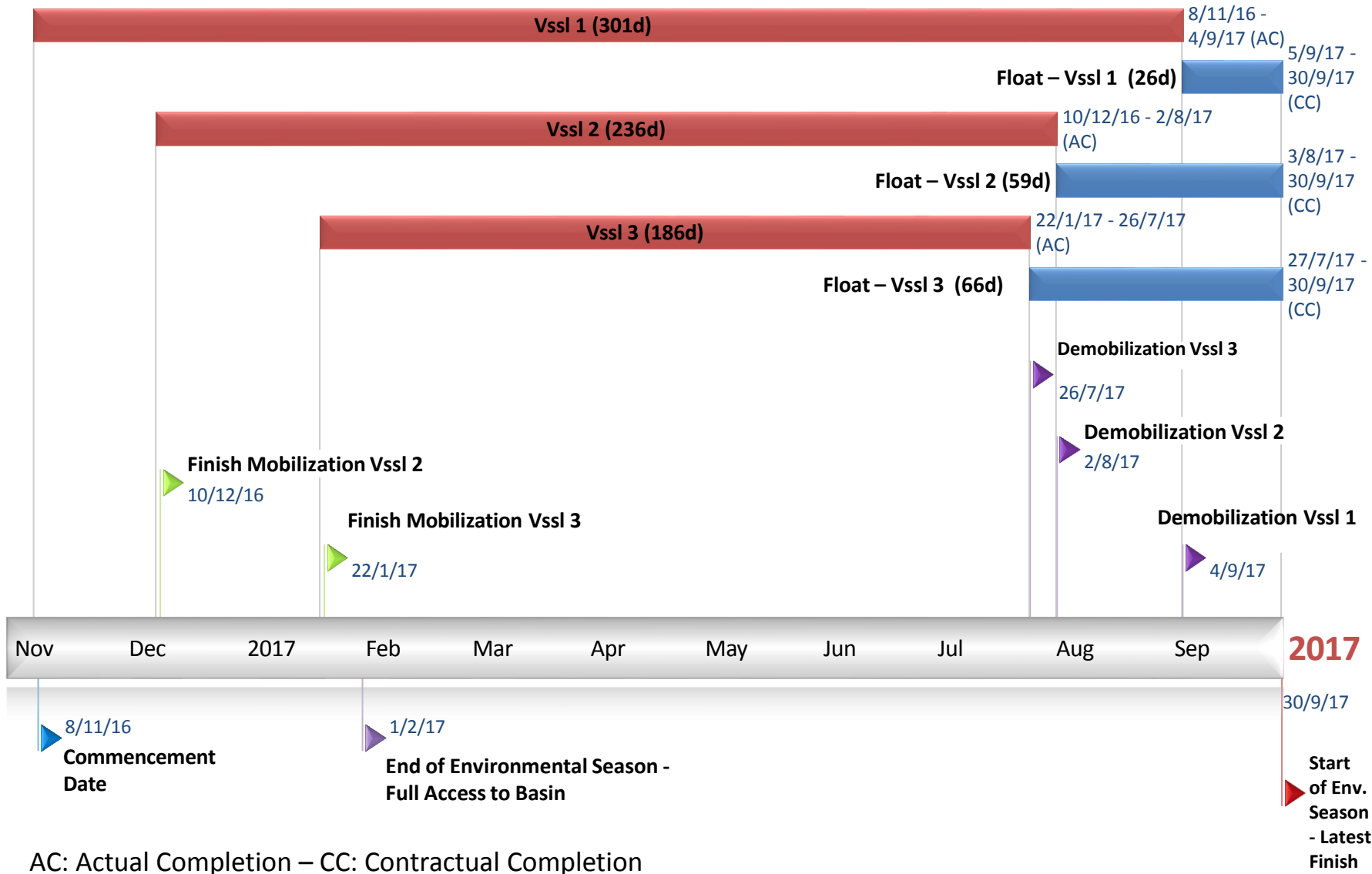


POLYGON 01	
Coordinates	
X	Y
294970.4	7587812
295062.8	7587466
294580.8	7587337
294488.3	7587683
294224	7588376
294278	7588175
294456	7588891
294562	7588762
295034	7589036
295206	7588924

- Legend:
- - - - Dredging Regions
 - — — Restricted Areas

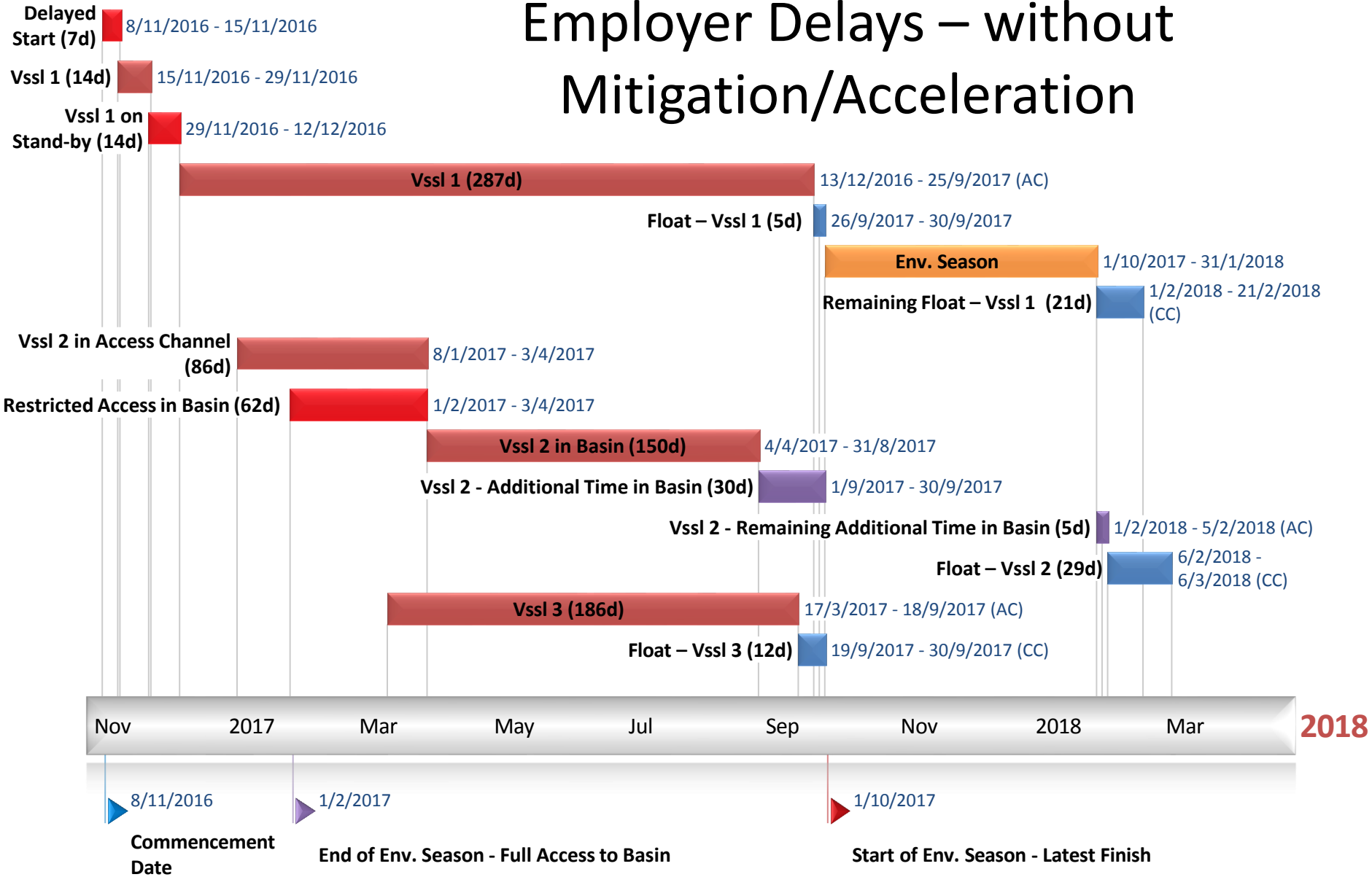
D&D analysis – example

Contract Schedule



Delay analysis – example

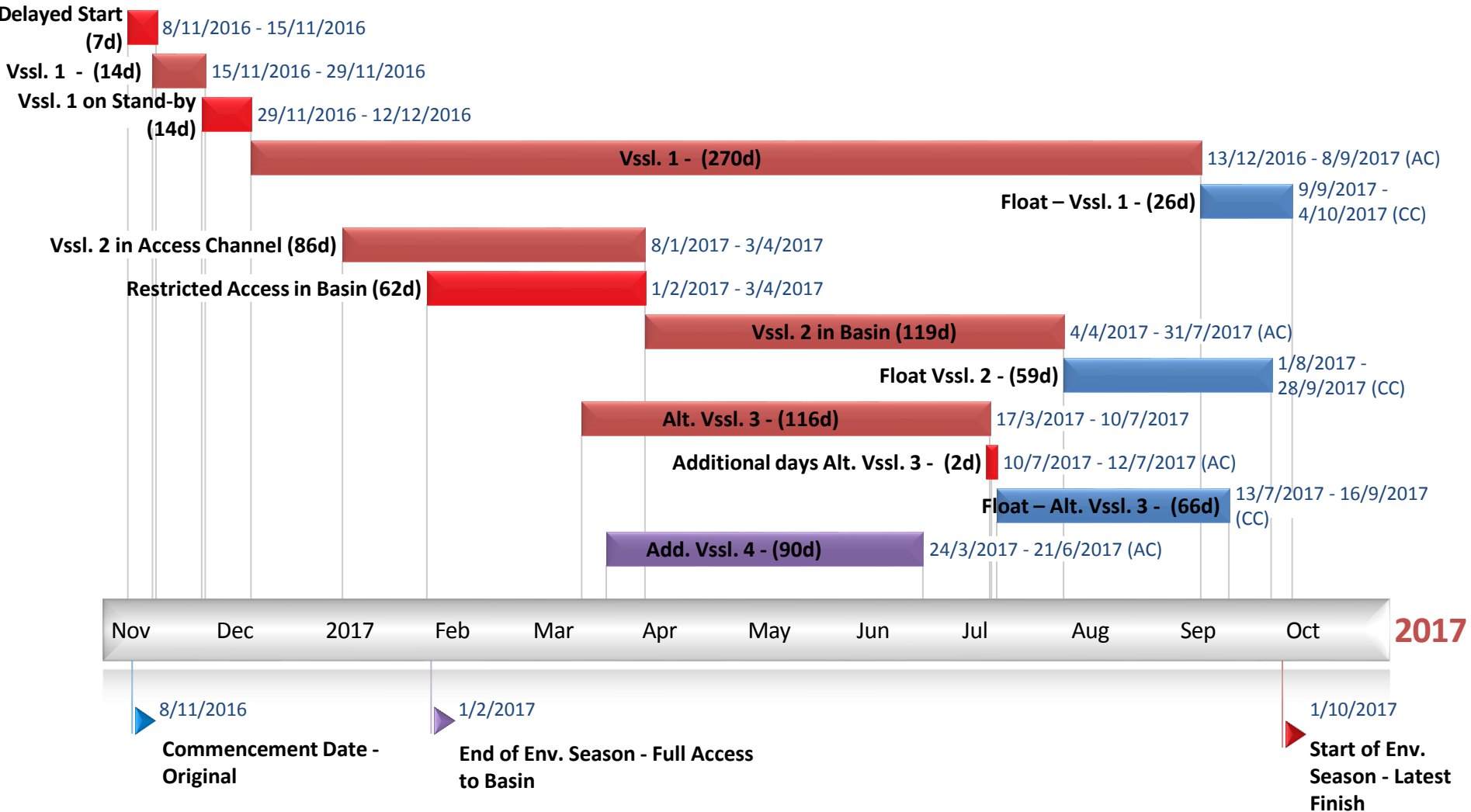
Employer Delays – without Mitigation/Acceleration



AC: Actual Completion – CC: Contractual Completion

Delay analysis – example

Mitigated Schedule



AC: Actual Completion – CC: Contractual Completion

D&D Protocol

preferred choices

method of disruption analysis

Productivity-based methods	Cost-based methods
1. Project-specific studies	1. Estimated vs. incurred labour
<u>(a) Measured mile analysis</u>	2. Estimated vs. used cost
(b) Earned value analysis	
(c) Programme analysis	
(d) Work or trade sampling	
(e) System dynamics modelling	
2. Project-comparison studies	
3. Industry studies	

Measured Mile analysis definition

- D&D Protocol: 'This compares the level of productivity achieved in areas or periods of the works impacted by identified disruption events with productivity achieved on identical or like activities in areas or periods of the works not impacted by those identified disruption events.'
- => compare actual efficiency/production between areas of basin where work was performed with and without restrictions

Measured Mile analysis

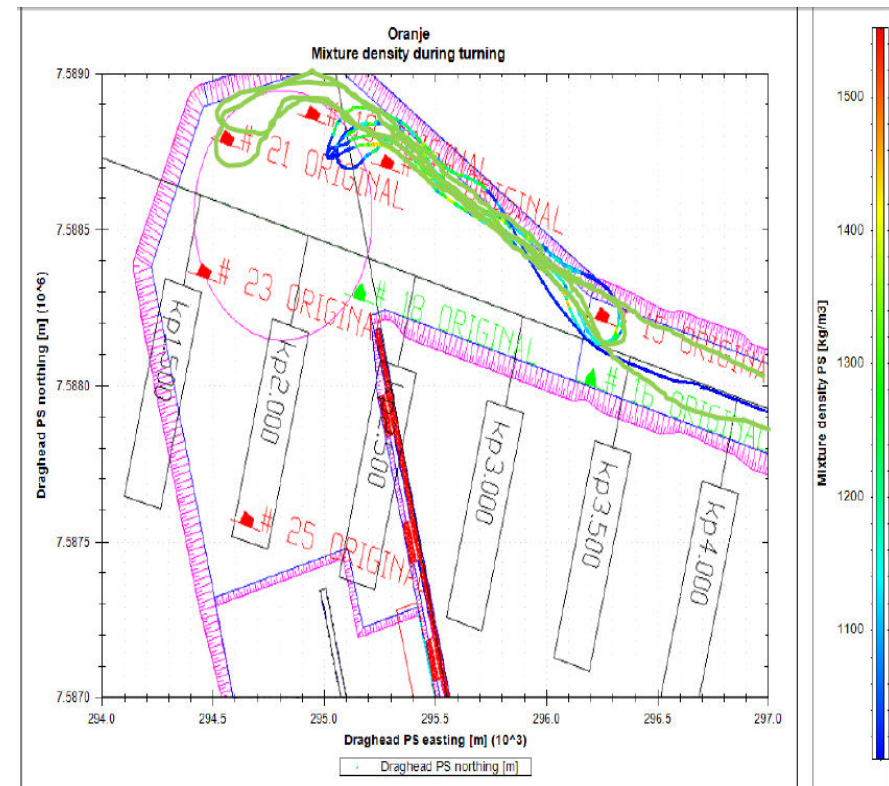
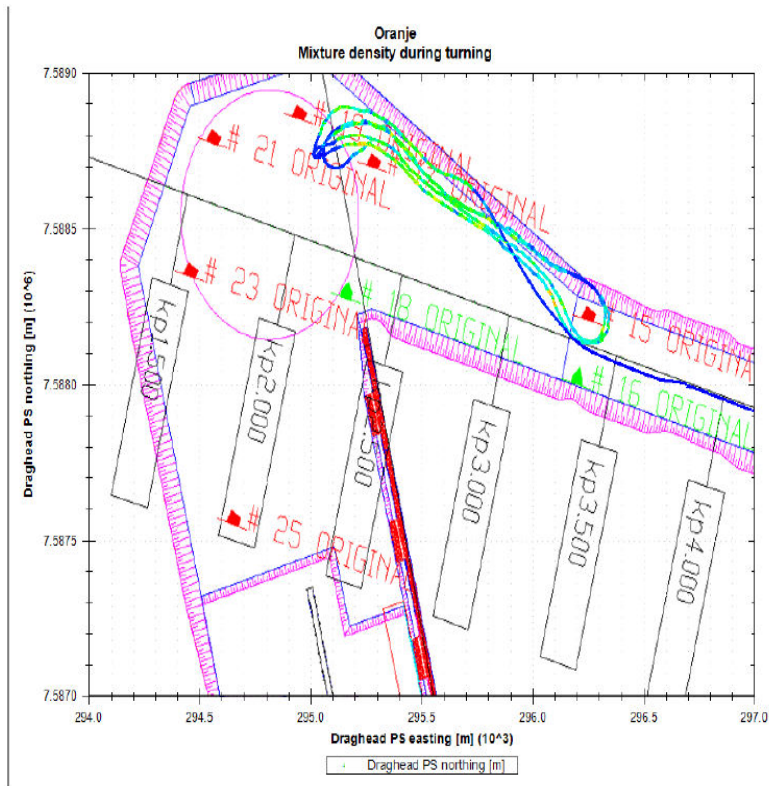
direct effects

Summary Effects - Additional weeks Vessel 1/ Vessel 2						Till 03-04-2017				
Effect 1	Inner Channel productions Vessel 2 vs bigger Vessel 3					0,48		Vssl 2 unable to work in Basin and forced to work in Channel an consume scope of more efficient Vssl 3.		
Effect 2	Additional turning time working in small areas (exclusion zones)					1,08		Vssl 1 unable to complete originally planned cycles, resulting in more turning and longer sailing		
	Additional sailing time working in small areas (exclusion zones)					0,45				
Effect 3	Vessel 1 dredging volume from D2 in turning basin					0,68		Vssl 1 dredging D2 i.s.o. bigger Vssl 2		
Effect 4	Siltation due to additional dredging time					0,75		siltation due to effect 1, 2 and 3 and delay to dredging exclusion zones		
						3,45				

Measured Mile analysis

loss of efficiency

Dredging Cycles (restrictions vs. no restrictions as original work method)

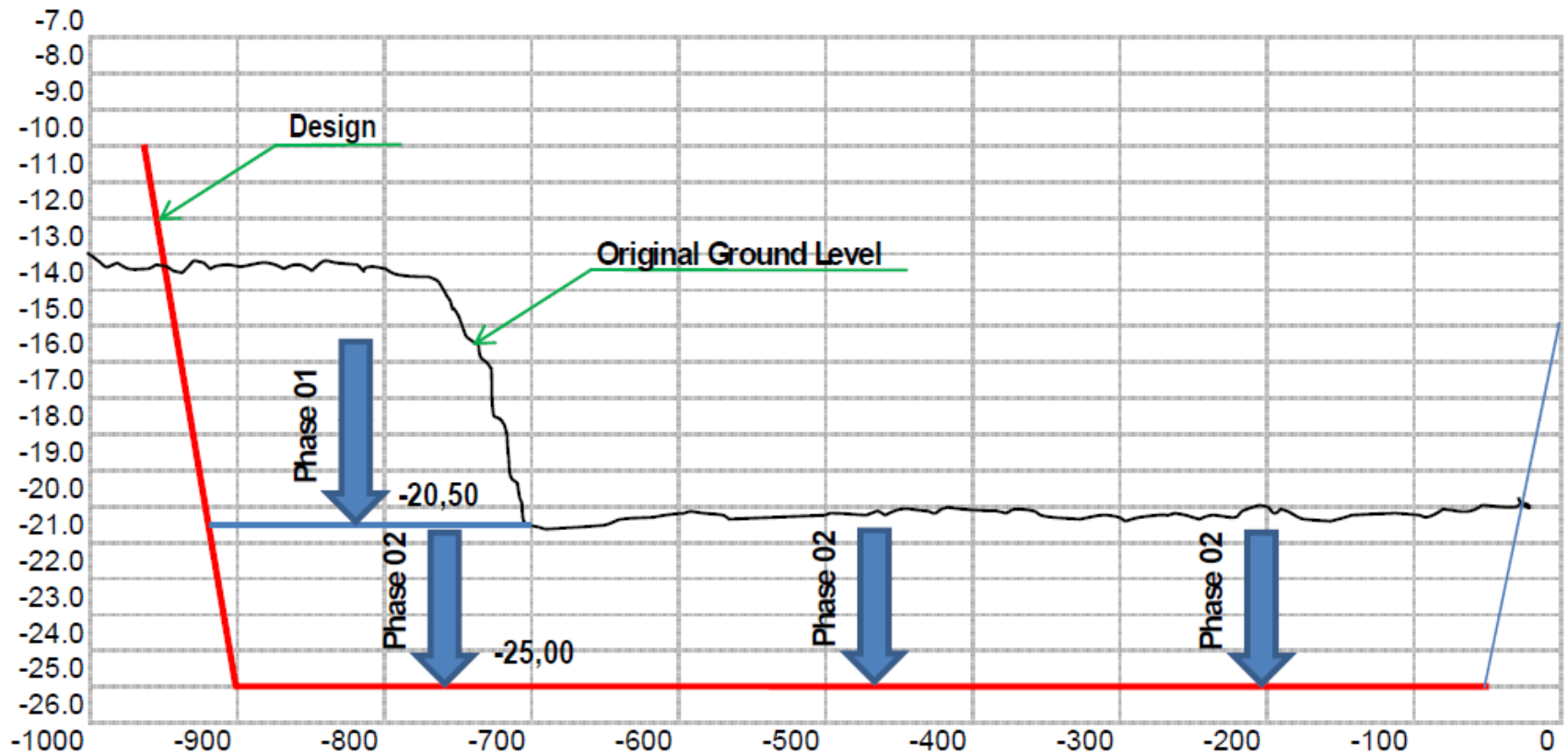


15-03-2017 trip 588

In green the preferred line where you dredge while turning

Measured Mile analysis additional sedimentation

Cross Section - Design (Original Work Method)



Typical cost items related to example

- Additional time spent by vessel
 - Depreciation & interest
 - Maintenance & repair
 - Insurance
 - Crew
 - Consumables (fuel, lubricants, provisions, engine room)
- Temporary importation
- Site/head office overheads
- Additional risks: environmental constraints, weather window, third party traffic, sedimentation