Submerging high resistant geomembranes

Containment barrier closure dams Baku - Azerbaijan

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Presentation index

- Introduction
- Remediation Boyukshor Phase 1 - design closure dams
- Geomembrane characteristics
- Construction works, phasing and working method
- Conclusions

Goal of this presentation

Sharing the experiences of submerging a high resistant geomembrane as containment barrier, within the constraints of all challenging circumstances.

Site location

Remediation Boyukshor

Project

- Engineering and design, supervision and project management of the remediation and rehabilitation project of lake Boyukshor Phase 1

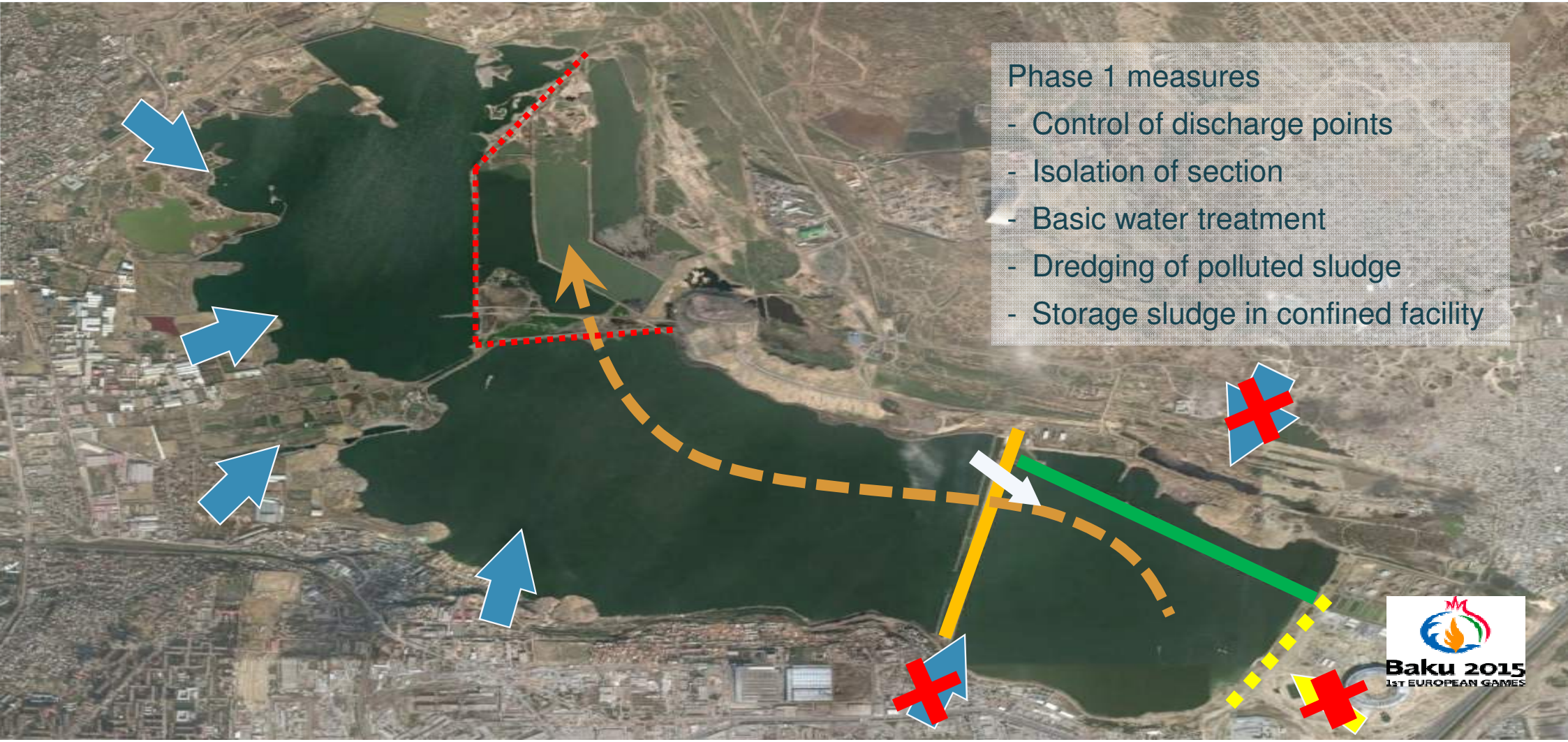
Client

- Ministry of Economy and Industry and Tamiz Shahar JSC

Remediation Boyukshor – project phases

Remediation Boyukshor – plan layout

Remediation Boyukshor Phase 1



Remediation Boyukshor Phase 1

Measures

- Sludge dredging 2,800,000 m3 (in situ) and deposited in containment cells (140 ha)
- Interception system 715 m (sheetpiles and drainage) combined with boulevard

- North dam 1,850 m
- Road dam 1,570 m (8-lane high way)
- Geomembrane surface : ca. 53.000 m^2 XR-5
- Protective geotextile bottom and top (sandwich): ca. 106.000 m^2 non-woven 1000 gram/m^2

Challenging circumstances

Severe environmental circumstances, heavy polluted area

High risks to dewatering locations

Weather circumstances

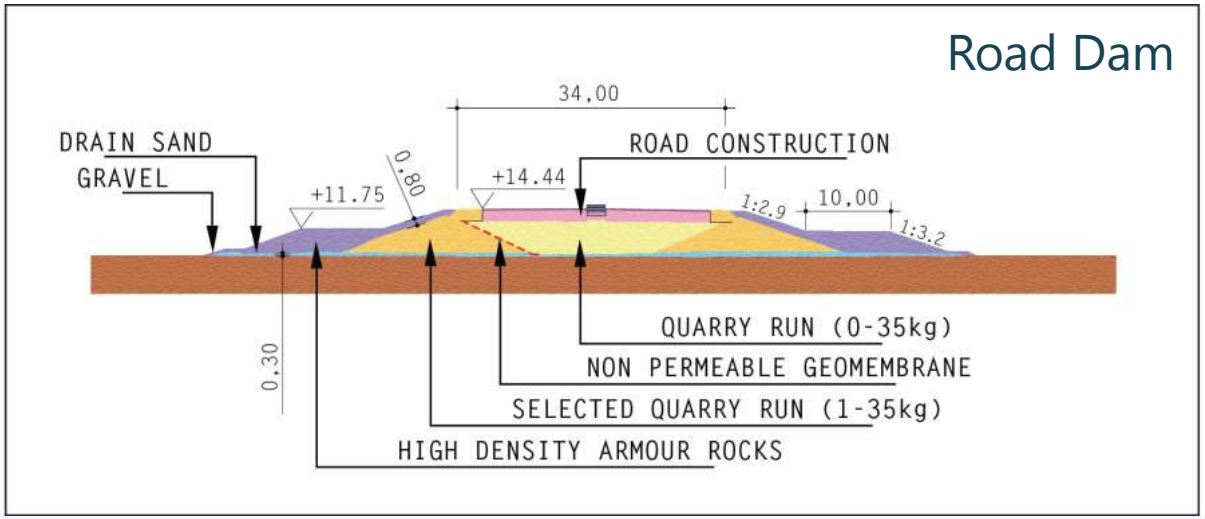
Transport of materials and equipment,

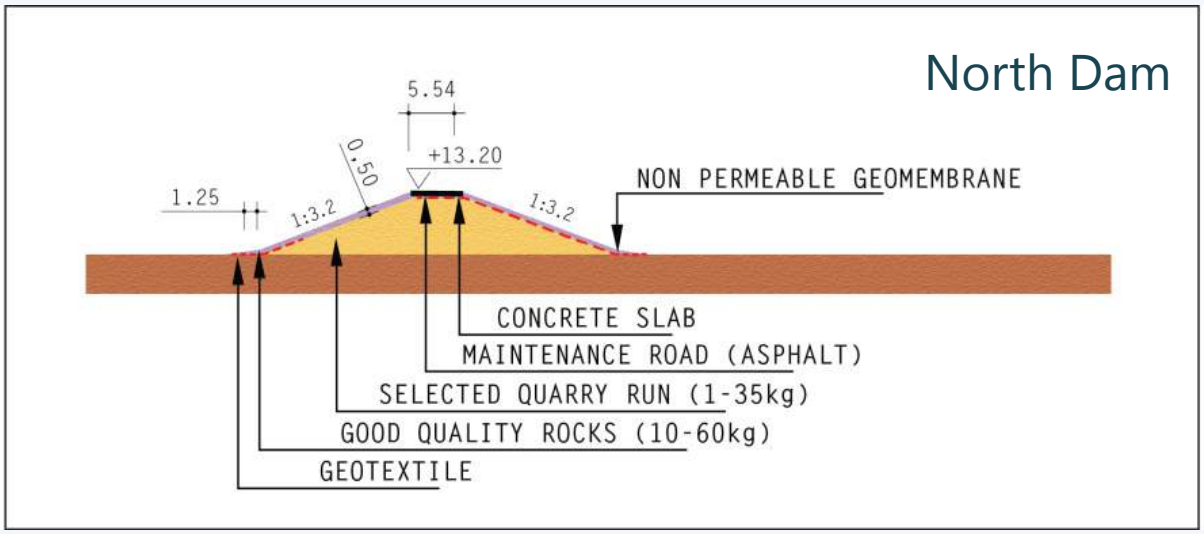
Building materials, suitability of the subsoil/sub grade

Very tight schedule: 2 years completion to finish for the European games


Remediation Boyukshor Phase 1
Dredging

Plan design and typical cross sections





High resistant geomembrane XR-5

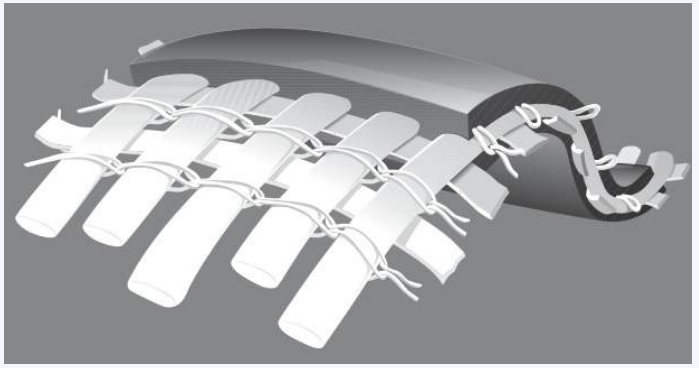
Description	Test method	Unit	Specification
Material Type	ASTM D 751	-	Reinforced EIA (Ethylene Interpolymer Allloy)
Base fabric type	ASTM D 751		Polyester
Weight	ASTM D 751	gram/m^2	1288 ± 2
Thickness (nominal, minimum)	ASTM D 751	mm	1.0
Roll width (mother rolls)	ASTM D 751	meter	2,54
Breaking yield strength	ASTM D 751 Grab Tensile	Newton meter	> 2,448 / 2,448
Tear strength	ASTM D 751 Trap Tear	Newton	> 175 / 245
Puncture resistance	ASTM D 4833	Newton	> 1,200

Material characteristics

Product	XR-5®	HDPE	PVC	Hypalon	Polypropylene
Kerosene	A	B	C	C	C
Diesel Fuel	A	A	C	C	C
Acids (General)	A	A	A	B	A
Naphtha	A	A	C	B	C
Jet Fuels	A	A	C	B	C
Saltwater 160° F	A	A	C	B	A
Crude Oil	A	B	C	B	C
Gasoline	B	B	C	C	C

A = Excellent
B = Moderate
C = Poor
NF = Not Found in Published Chart

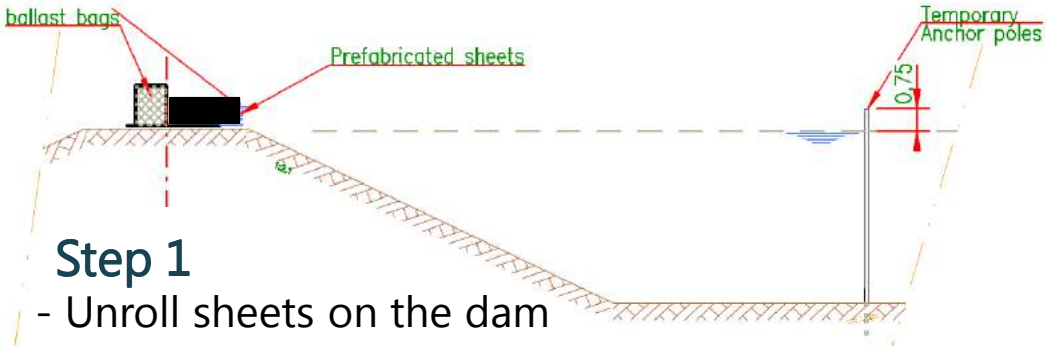
Comparative chemical resistance geomembrane type



Prefabrication geomembrane panels

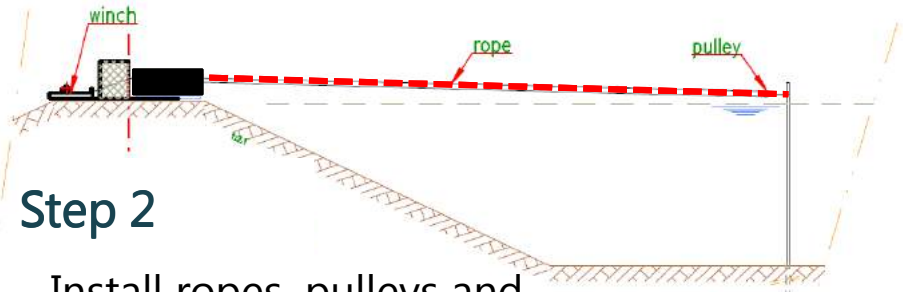
- Prefabricated panels: length 70 meter x width 15 to 20 meter
- Amount of prefabricated and submerged panels: 48 units
- Execution time for prefab and installation 4 month

Working sequence submerging panels



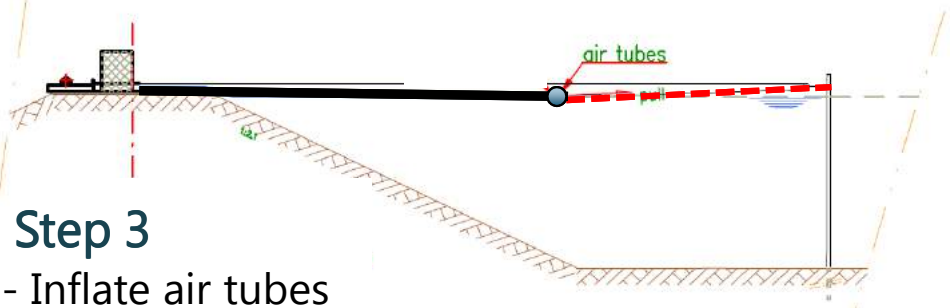
Step 1

- Unroll sheets on the dam
- Fixation with ballast bags



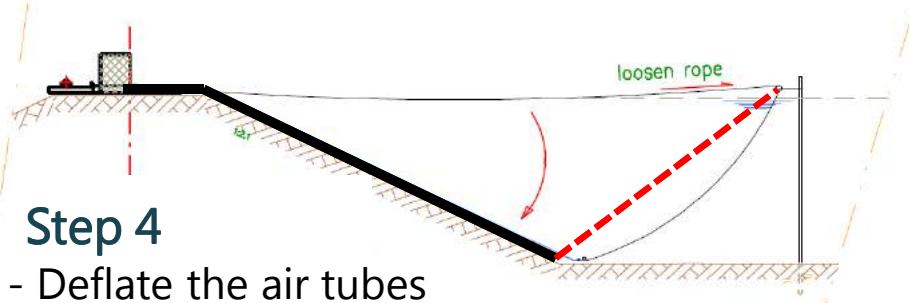
Step 2

- Install ropes, pulleys and winches



Step 3

- Inflate air tubes
- Positioning sheets on water surfaces by winches



Step 4

- Deflate the air tubes
- Submerge sheets gradual by loosen robes

Positioning geomembrane panels

Geomembranes, winches and cables for positioning before submerging under water

Remediation Boyukshor Phase 1

Road dam

Conclusions

- Severe environmental circumstances give need for a high resistant geomembrane as containment barrier.
- Challenging project circumstances give need for an innovating working method by prefabrication the panels and submerging-technique.
- The behaviour of the EIA-geomembrane for submerging with the applied working method was not exactly known in advance but execution/installation went well.
- To ensure the durability of the geomembrane it's strongly recommended to use non-woven geotextiles top and bottom as a sandwich construction

Thank you for your attention – Questions?

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For further information see our paper in the congress proceedings,
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