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Summer school on
Contaminated Soils

From characterization to

Remediation

Management of complex and / or large scale soil remediation projects:

Bart Callaert

Envisan – member of JDN group

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CONTENT

- **Introduction**
- **Different stages**
- **Execution – case studies**
- **Conclusion**

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Contaminated site

Spotlights

Press

Communication

Crisis Management

Perception of the risks

Risks

Surrounding area

Politics

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OVERVIEW

- Introduction
- Different stages
- Execution – case studies
- Conclusion

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Different Stages

I	Initiative
P	Planning (site assessment, initial design)
F	Financing of Redevelopment
SD	Site Development (Cleanup, Remediation, Rehabilitation)
RD	Real Estate Development (building ; infrastructure)
O	Operating & Maintenance

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OVERVIEW

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Case Study :
Complex Remediation project

- Description of project
- General content / constraints
- Monitoring and measurements
- Communication : Actions and information
- Problems
- Conclusion

Complex Remediation project Description

- Ireland
- Waterford
- City centre
- Gasworks
- Client Bord Gaiss
- Engineer Mouchel Parkman
- Contractor SIAC – JAN DE NUL – ENVISAN
- Budget 9 Mio Euro

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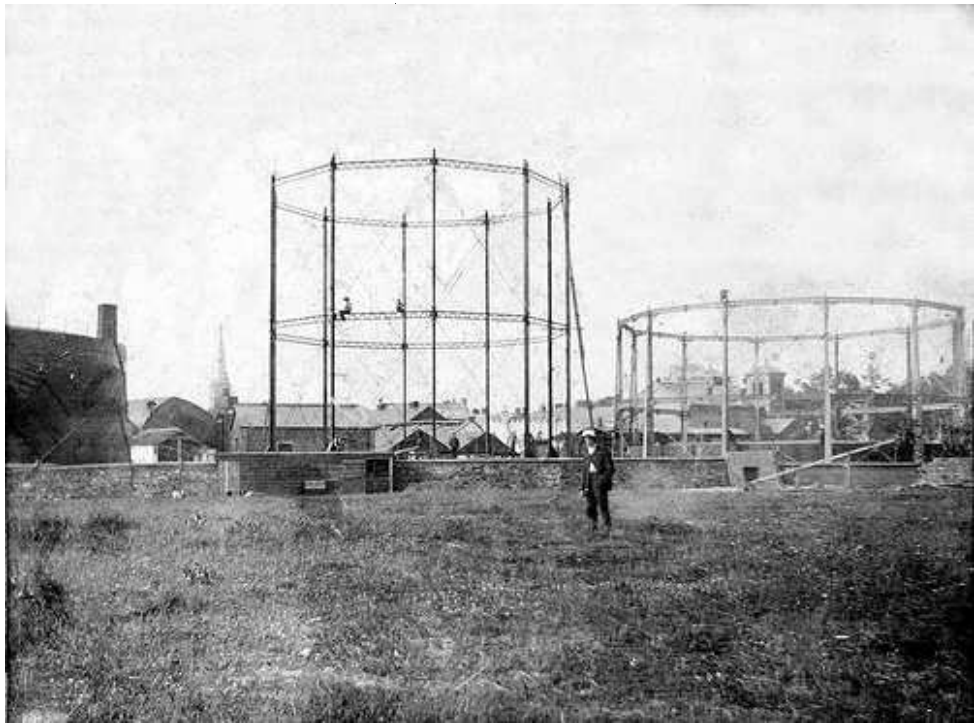

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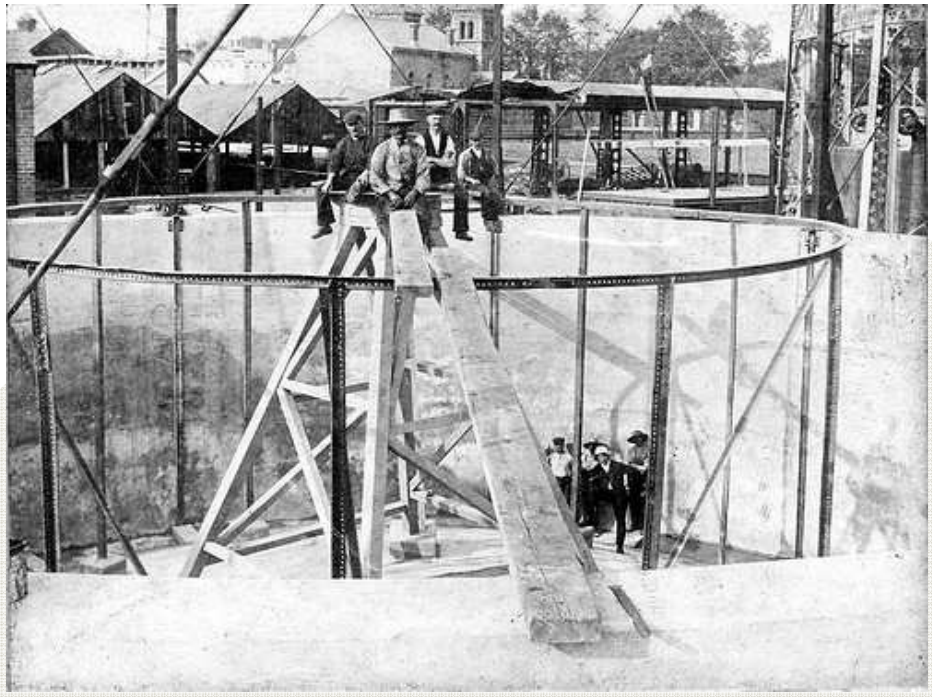


erial view from West

Complex Remediation project Complex

- Protection of underground services
- Removal of heavy contamination
- Treat heavy contaminated perched waters
- Deep excavation and treatment of heavy contamination
- Adjacent residential and industrial properties
- Heterogeneous ground conditions

Complex Remediation project Works

- Characterization
- Excavation: variable depth – 8 m
- Quantities: 60.000 Tonnes contaminated soils
- Groundwater treatment
- Treatment of contaminated ground water
- Mobile Water Treatment Installation (WTI)
- Multi modal transport and TFS
- Treatment and valorisation (using thermal plant)
- Backfilling of excavated area
- Environmental monitoring and follow up

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General content and constraints

- Tender documents
- EPA – Waste licence
- Local legislation (building permit)
- National legislation
- International legislation
  - TFS

Monitoring and measurements

- Dust monitoring
- Odour monitoring
- Vibration monitoring
- Noise monitoring
- Medical follow up

Monitoring and measurements

- Dust monitoring
  - 4 station
  - Frisbee' gauges (code BS:1747)

Summary last 4 weeks (mg/m2/day)	
A1	154
A2	135
A3	165
A4	192

EPA Limit: 350mg/m^2/day

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Monitoring and measurements

- Odour measurements

The volatile compounds likely to be encountered on a gasworks are listed below:

Benzene (aromatic odour)*
Toluene (aromatic odour) *
Ethylbenzene *
Xylene (pungent odour) *
Styrene
Naphthalene (moth-balls odour)
Phenol (sweet smelling)
Ammonia (pungent odour)
Cresol (creosote odour)

* Denotes compounds that have been deteted to date.

The presence of the other compounds has not been detected.

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Monitoring and measurements

Measurement and follow up

- Active carbon tubes and Drager tubes
  - Around du site
  - Employees
  - Houses

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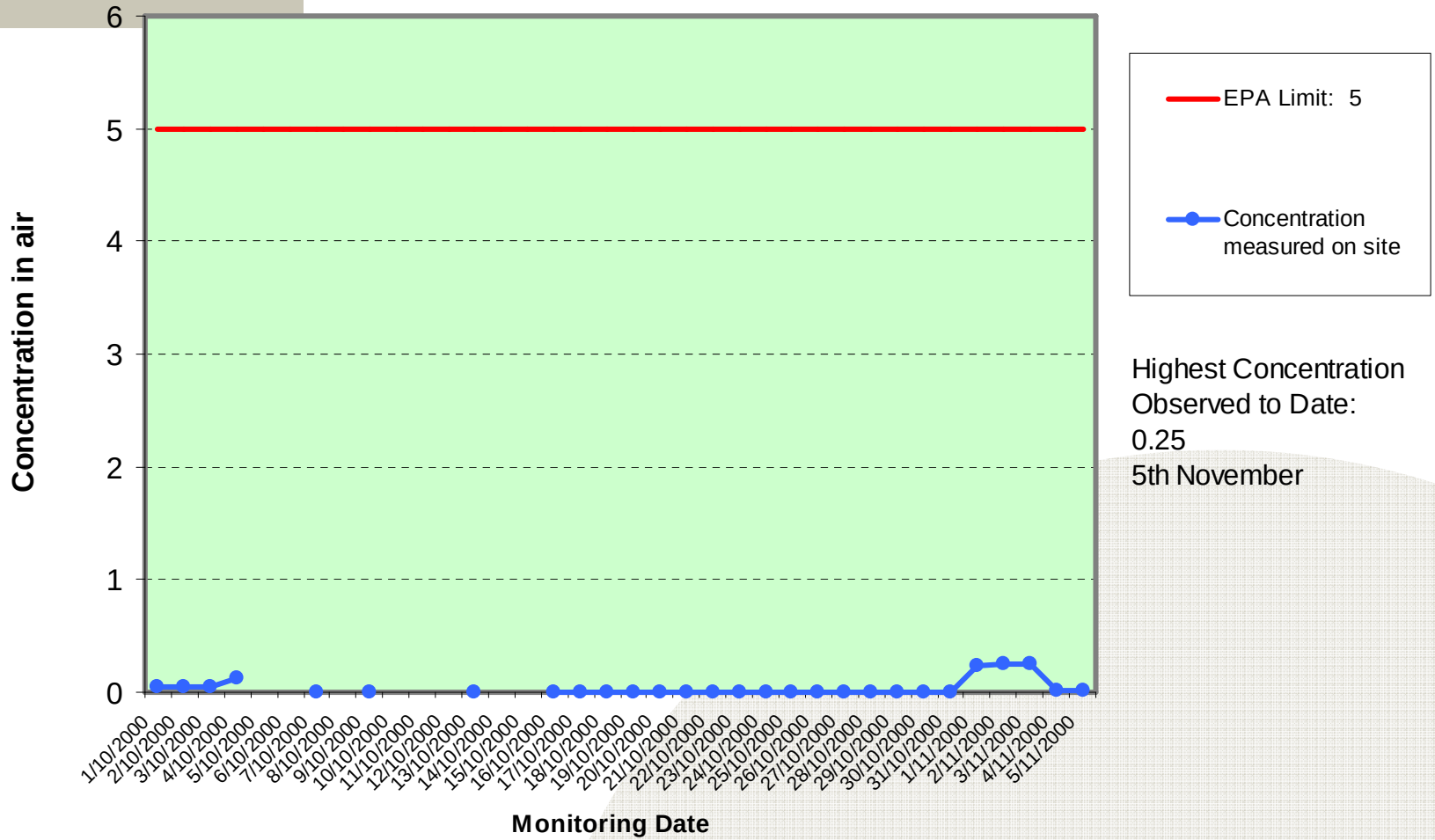
Monitoring and measurements



Highest Concentration Observed to Date:
0.25
5th November

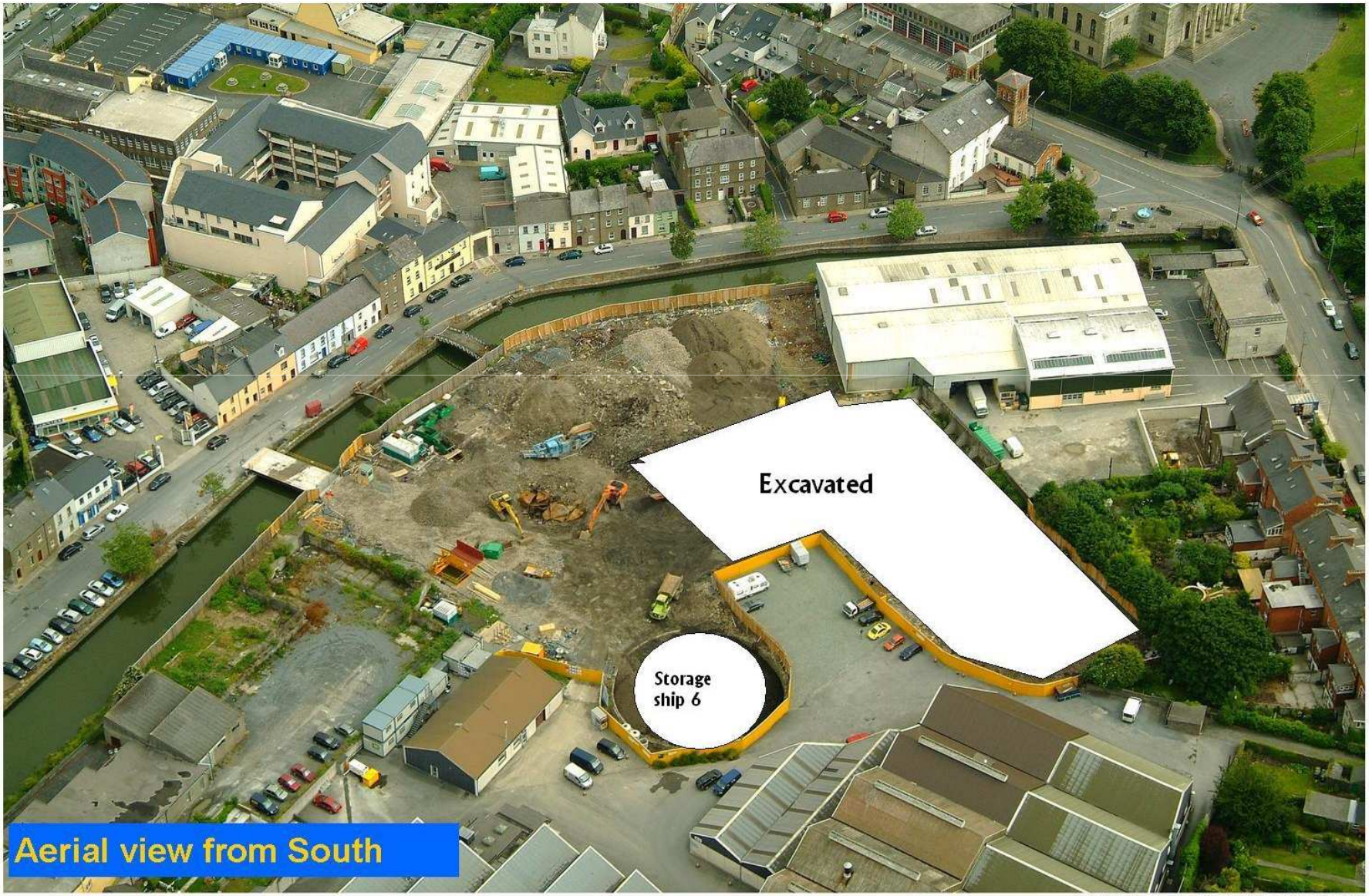
Results: Benzene

Monitoring and measurements

- Vibrations
- Noise monitoring

Special measurements

- Dust and Odour
  - Actions:
    - Covering excavated material
    - Use existing tanks for storage
    - Odour suppressing system
    - Covering trucks during transport


Excavated
Storage
ship 6
Aerial view from South
Photo: Peter Barrow 1st July 2006 Tel: 0872-559638

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Communication

During entire project

- Preparation
- Execution

- Different levels (direct / indirect)

Communication

Different levels of information

- Authorities
  - National
  - International
- Other public authorities (city, harbour, public services,..)
- Other stakeholders

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Communication

- Different ways:
  - Telephone line (24 H / 7 Days)
  - Leaflets / brochures
  - Informal and formal meetings
  - Meeting with stakeholders representatives

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Communication

- Problems:
  - Technicians talk (ppm/ ppb etc…)
  - Emotional versus financial
  - Understanding the risk and the measurements
  - Political content : elections
  - Best practice

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Communication : Solutions

- White tyvek --- blue
- Open door events
- Open books (info / analyses)
- Involvement : street art

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Communication

Case study :
Large scale remediation

Description of project
General content / constraints
Duration and financing
Execution


Sfax, Tunisia
Image © 2008 DigitalGlobe
2193 m
Google

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Description of project

- **Fertilizer production (NPK): 1963-1991**
- **Stockpiling production residue**
  - **50 ha.**
  - **7 m. high**
- **80 ha pollution on the beach**
- **450 ha rehabilitation zone**

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General content

- **Initiative**
  - **Ministry of infrastructure and housing (SEASNVS)**
- **Planning**
  - **1990 – 2006**
  - **Site investigation**
  - **Feasibility study**
  - **Engineering**
  - **Detail Engineering**
- **Financing**

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DURATION AND FINANCING

Ministry of infrastructure and housing (SEACNVS)

2005	**Tender**
2006 – 2009	**Execution of the works**

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DURATION AND FINANCING

Budget **75 Mio €**

Financing

European Investment Bank
Others :
26 Mio € Belgian (mixed)
8 Mio € French (mixed)

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Execution

Total duration : 2,5 years

• **Dredging and dewatering of sediment**	**500 000 m3**
• **Soil remediation**	**1.800.000 m3**
• **Deposit remodelling**	**700 000 m3**
• **Dredging and refill**	**4 350 000 m3**

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Contaminated soils and sediments

What to do with such a volume?
Finding a smart solution…

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Execution

- **Phase 0** **Site Characterisation**
- **Phase 1** **Remediation Works**
- **Phase 2** **Rehabilitation and Civil works**

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Characterization

- **Initial survey and bathymetry**
- **Sampling**
  - **106 vibro-cores**
  - **66 Van Veen - samples**
- **Sampling Kerkennah Canal (offshore)**
- **Boreholes**
- **Analyses**

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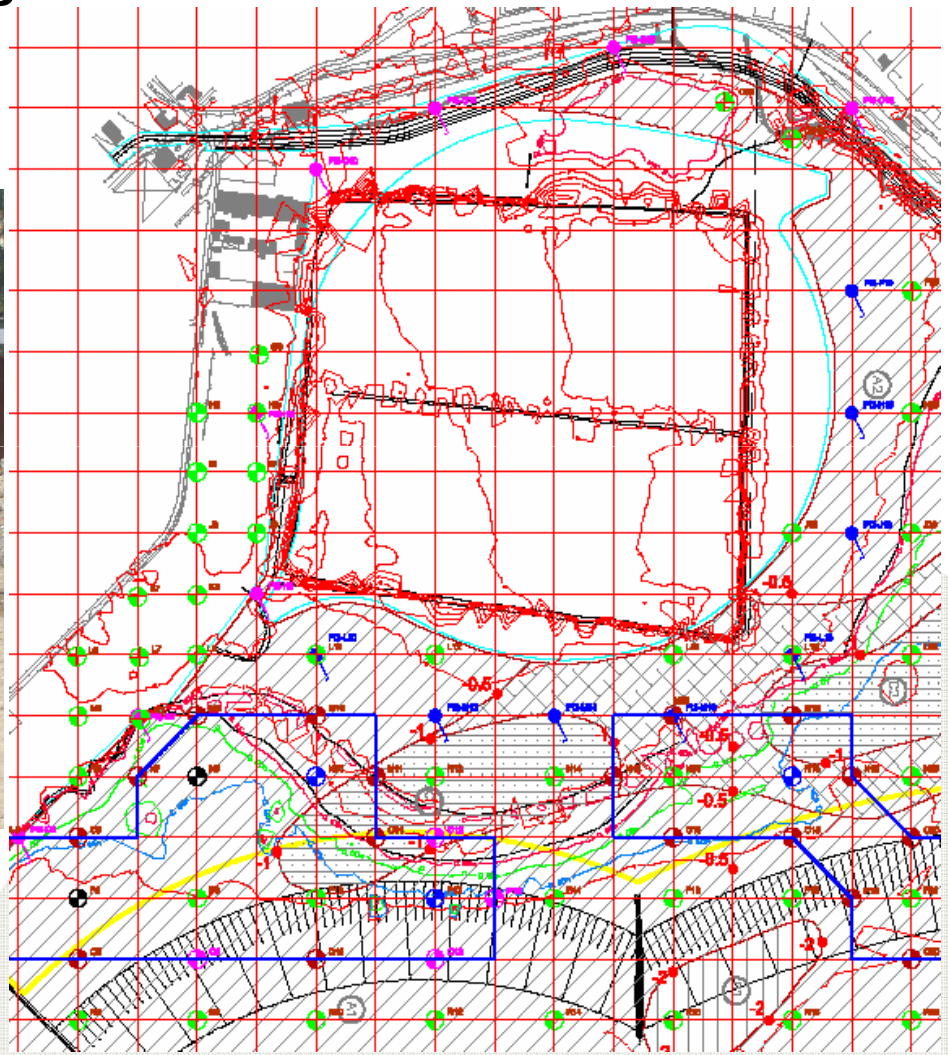
Characterization
Sampling initial condition



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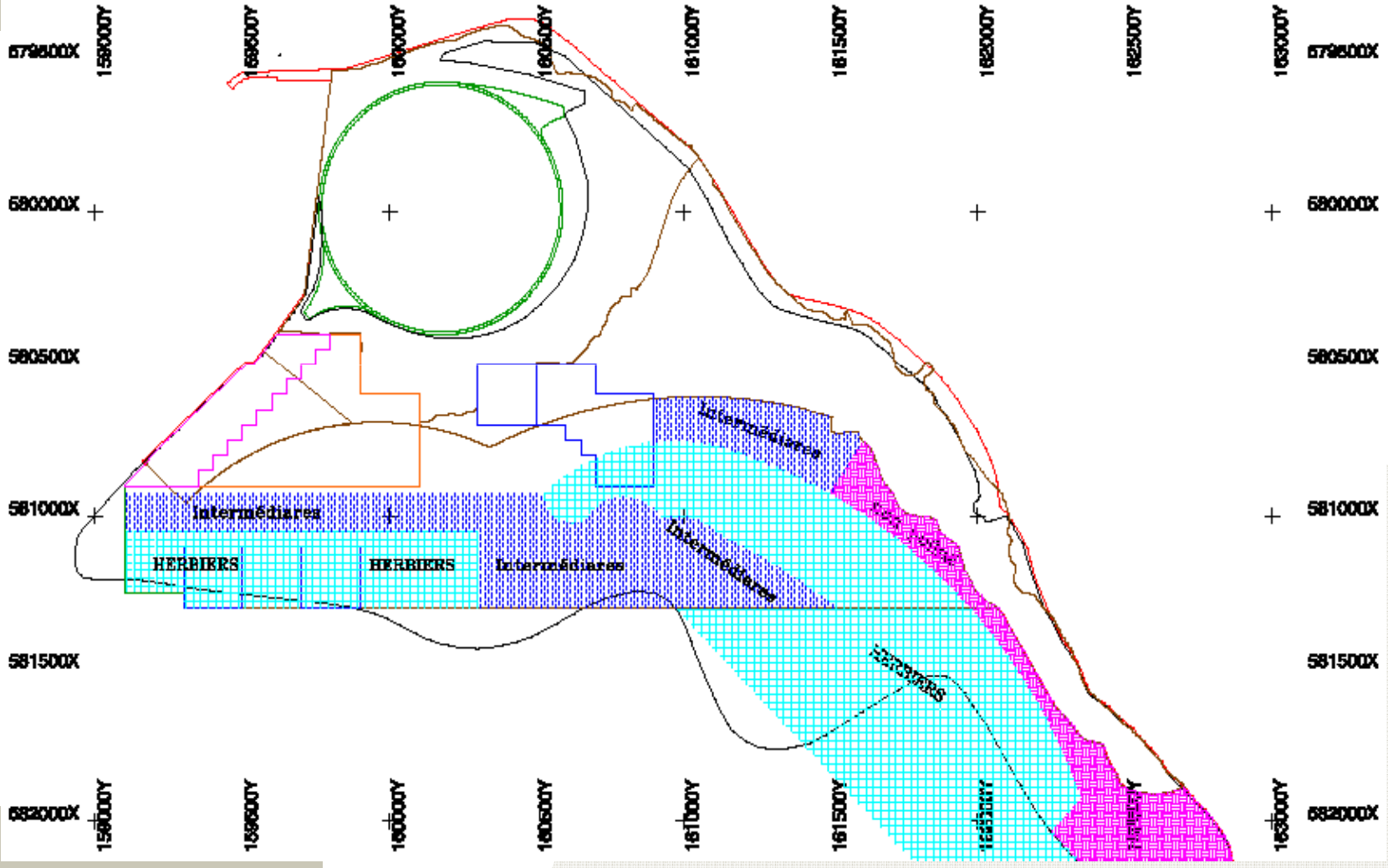
Characterization



remediation scheme

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Characterization

Conclusion contamination

- **Soil 2 800 000 m3**
- **Sediments 500 000 m3**

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Phase 0 Site characterization

Phase 1 Remediation Works

- **Mobilization**
- **Dredging of sediments and dewatering**
- **Contaminated soil removal**
- **Capping of deposit area**

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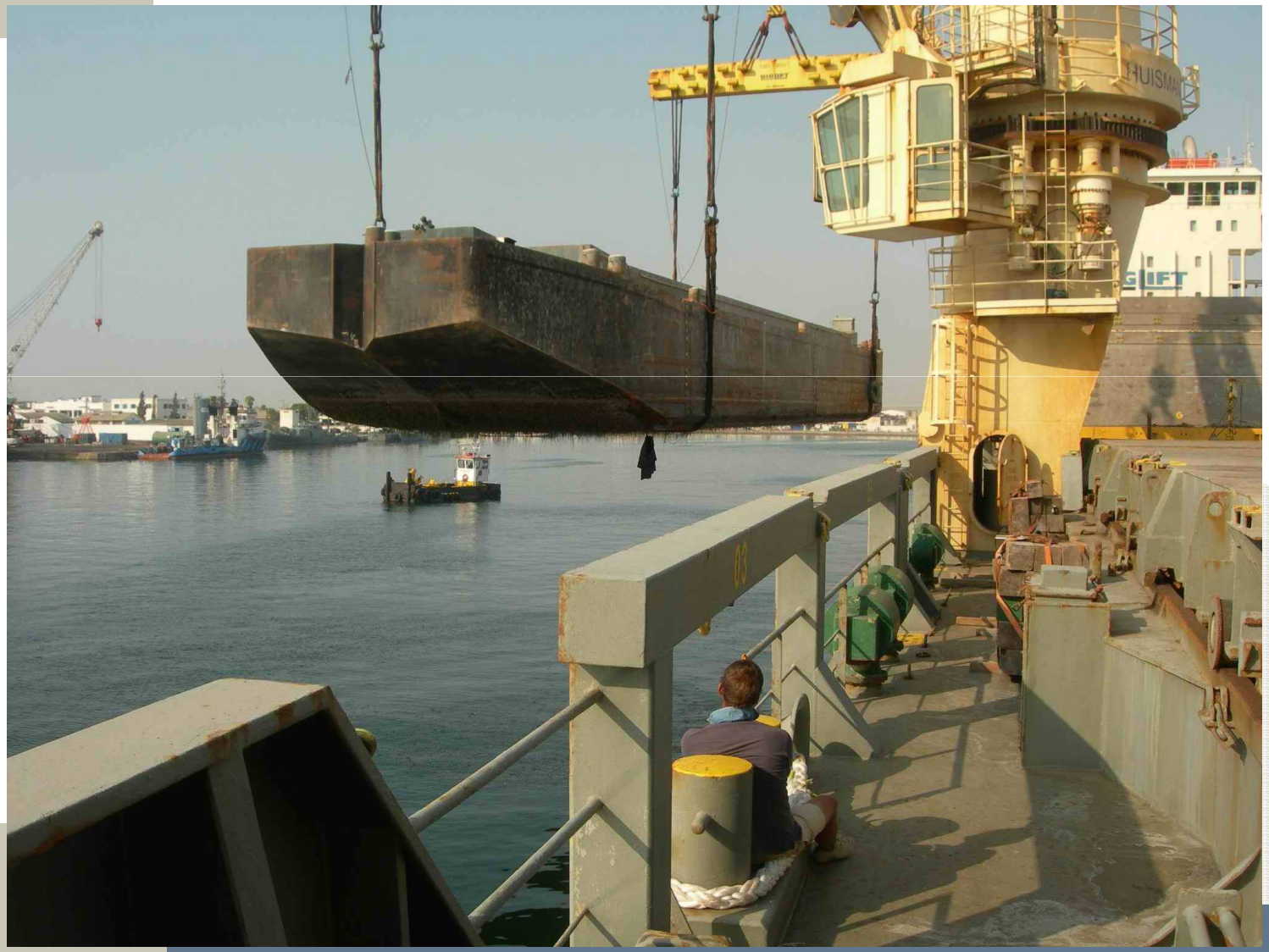
Mobilization



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Sediments

Dredging (water depth – 1,5 m)

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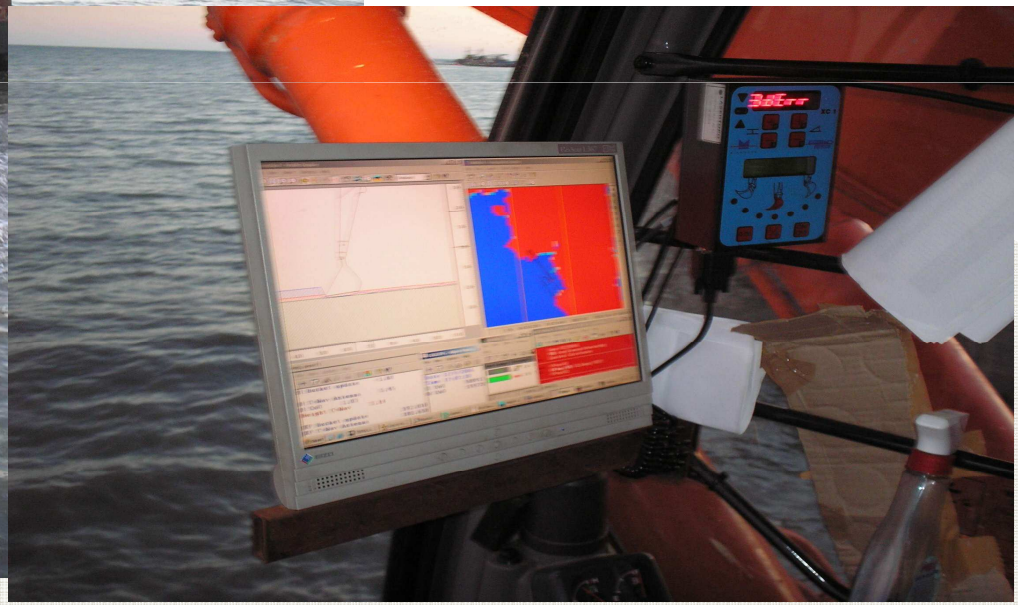
Sediments



Dredging with high precision excavator

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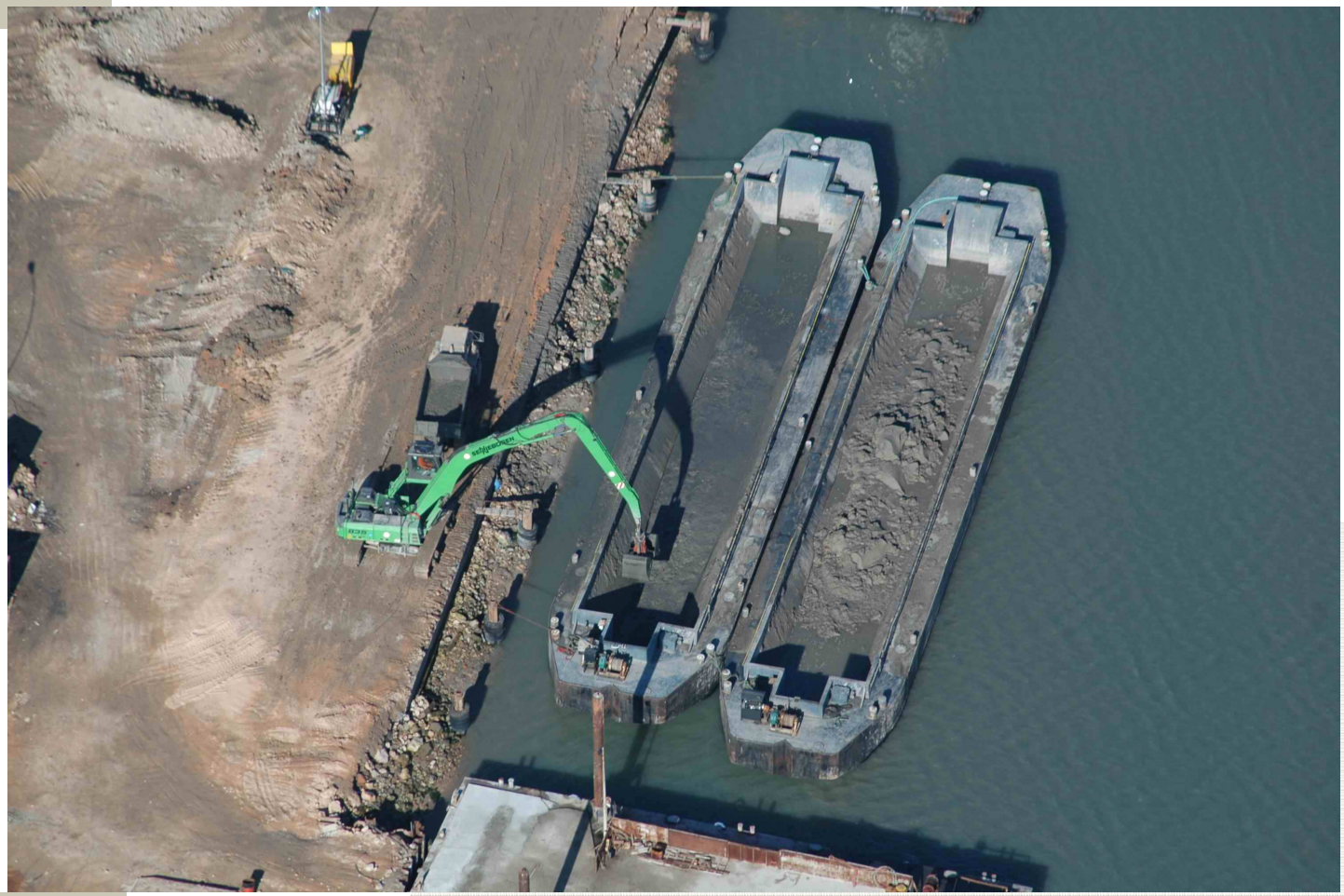
Sediments



Transfer area to dewatering facility

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Sediments

Dewatering

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Removal of contaminated soils

Remediation

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Remediatioin of disposal area

- **Drainage and capping**
- **Vertical screen**
  - **HDPE - in slurry wall**
  - **Depth: 7 – 10 m**
  - **Length: 3 km**
- **Pumping system**

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Remediation of disposal area

Guiding walls

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Remediation of disposal area
Vertical screen

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Works

Phase 0 **Site Characterization**

Phase 1 **Remediation Works**

Phase 2 **Rehabilitation Works and Civil Works**

Reclaiming of excavated areas

Civil works

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Rehabilitation

James Cook Humbold

Alexander Von

Sandsource - Kerkennah Canal

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Rehabilitation

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Rehabilitation

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Rehabilitation

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Civil works

Embankment and drainage canal

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Health - Safety
Quality - Environment

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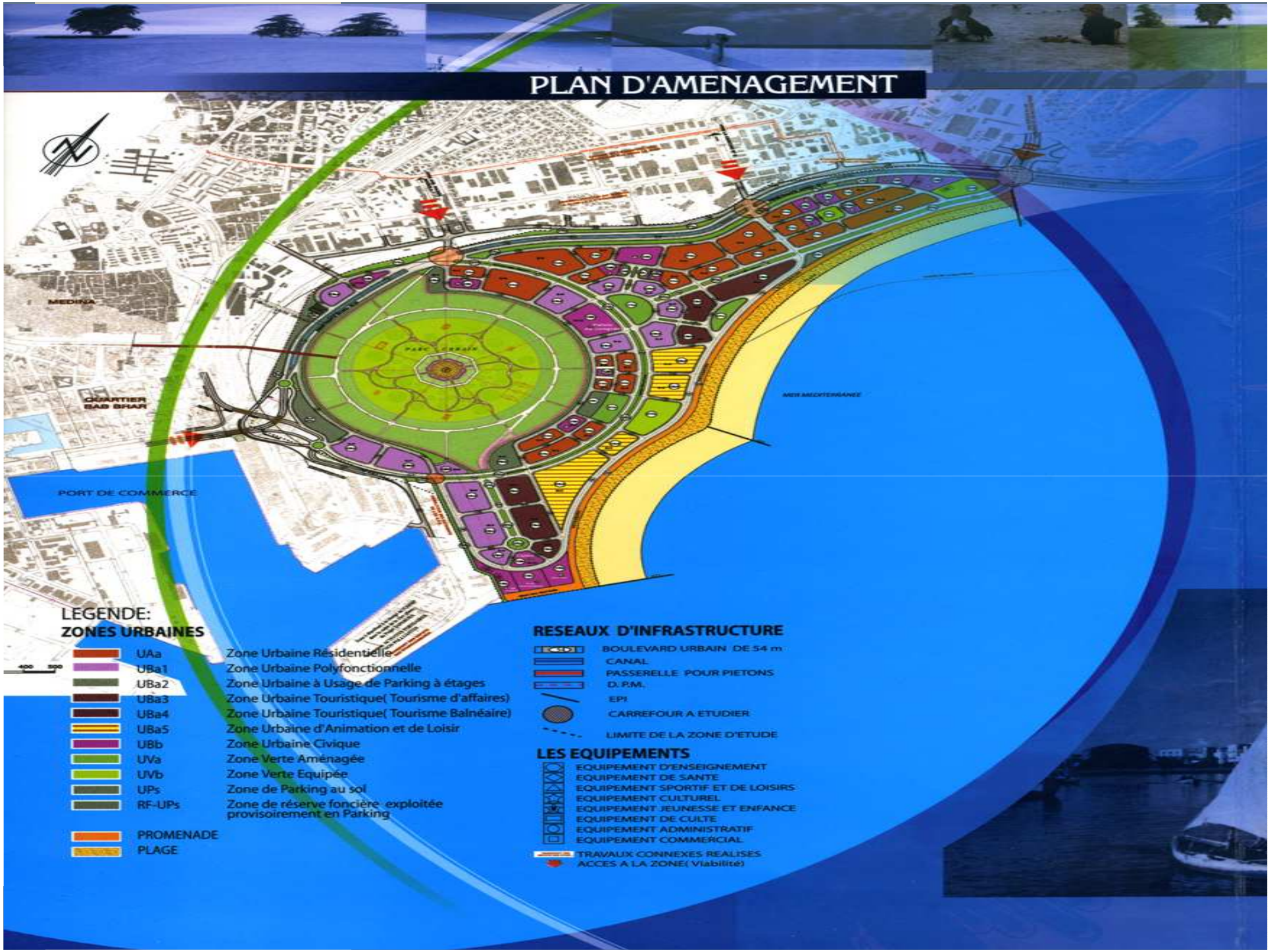
Conclusion

- **Solution for industrial stockpiling area**
- **Economical solution for contaminated sediments & soils**
- **Project:**
  - **15 years before construction**
  - **2,5 year remediation & rehabilitation**
  - **Sustainable long term solution**

PLAN D'AMENAGEMENT



LEGENDE:

ZONES URBAINES

UAa	Zone Urbaine Résidentielle
UBa1	Zone Urbaine Polyfonctionnelle
UBa2	Zone Urbaine à Usage de Parking à étages
UBa3	Zone Urbaine Touristique(Tourisme d'affaires)
UBa4	Zone Urbaine Touristique(Tourisme Balnéaire)
UBa5	Zone Urbaine d'Animation et de Loisir
UBb	Zone Urbaine Civique
UVa	Zone Verte Aménagée
UVb	Zone Verte Equipée
UPs	Zone de Parking au sol
RF-UPs	Zone de réserve foncière exploitée provisoirement en Parking
PROMENADE	
PLAGE	

RESEAUX D'INFRASTRUCTURE

- BOULEVARD URBAIN DE 54 m
- CANAL
- PASSERELLE POUR PIETONS
- D. P.M.
- EPI
- CARREFOUR A ETUDIER
- LIMITE DE LA ZONE D'ETUDE

LES EQUIPEMENTS

- EQUIPEMENT D'ENSEIGNEMENT
- EQUIPEMENT DE SANTE
- EQUIPEMENT SPORTIF ET DE LOISIRS
- EQUIPEMENT CULTUREL
- EQUIPEMENT JEUNESSE ET ENFANCE
- EQUIPEMENT DE CULTE
- EQUIPEMENT ADMINISTRATIF
- EQUIPEMENT COMMERCIAL

- TRAVAUX CONNEXES REALISES
- ACCES A LA ZONE(Viabilité)

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Sfax beach today

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CONCLUSTION

Succes story : for complex and large scale projects

- Local experience
- Experience with remediation
- Proper financial compensation (attention on H&S)
- Proper communication plan and budget
- + …

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Project team

Conclusion

Communication …..
to avoid problems

Explain the risk …. Risk perception

Manage and explain from the beginning the unknown elements (quantities , duration , weather ..)

Our advice:

proactive involvement
Organisation
Communication

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Merci et bon appétit

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