DYNAMIC APPROACH FOR INVESTIGATIONS AT CONTAMINATED SITES

Charlotte Riis, NIRAS & Nancy Hamburger, Capital Region

Short Course, NORDROCS, Oslo, September 18, 2012

OUTLINE

10.00-10.10	Welcome & course outline
10.10-10.30	The dynamic investigation approach
10.30-11.15	The Tool Box
11.15-11.30	BREAK
11.30-11.45	Client's view on the dynamic approach
11.45-12.15	Case
12.15-12.30	Discussion

THE DYNAMIC INVESTIGATION APPROACH – WHY AND HOW?

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INTRODUCTION

Dynamic investigations – NOTHING NEW

US EPA: TRIAD Ressource Center

www.triadcentral.org

Denmark: Since 2010 in full extent at 15-20 sites

Sweden: One site in 2011

INVESTIGATIONS AT CONTAMINATED SITES

Typical work flow & decision process

Historical information	(Potentially contaminating activities at the site?)
⇩ Yes	
Field investigations	(Detection of contamination, spreading?)
⇩ Yes	
Risk assessment	(Risk of human health or the environment?)
⇩ Yes	
Remedy screening	(Which remedies can be implemented at the site?)
⇩	
Risk assessment	(Which remedies are recommended?)
⇩ Decision	
Remediation	Likely Expensive!

Data collection is basis for decision

REMEDIAL INVESTIGATIONS

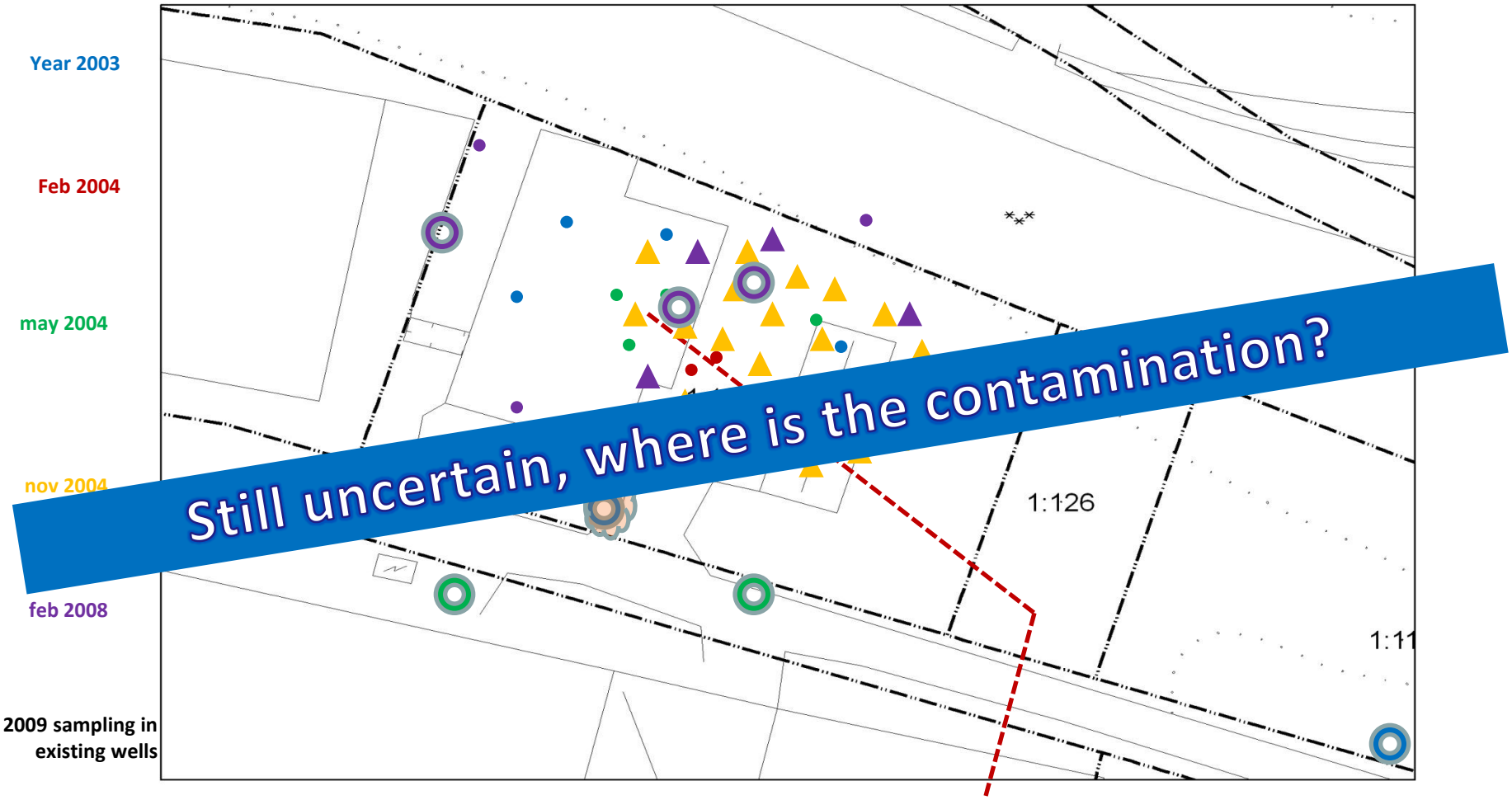
Typical work flow - traditional approach

Challenges:

- Few data
- High degree of interpretation
- Fased approach with waiting time (mobilization, analyses, reporting)
- Year long investigation projects
- Inefficiency – restart of project at each phase costs time and money for both client and consultant

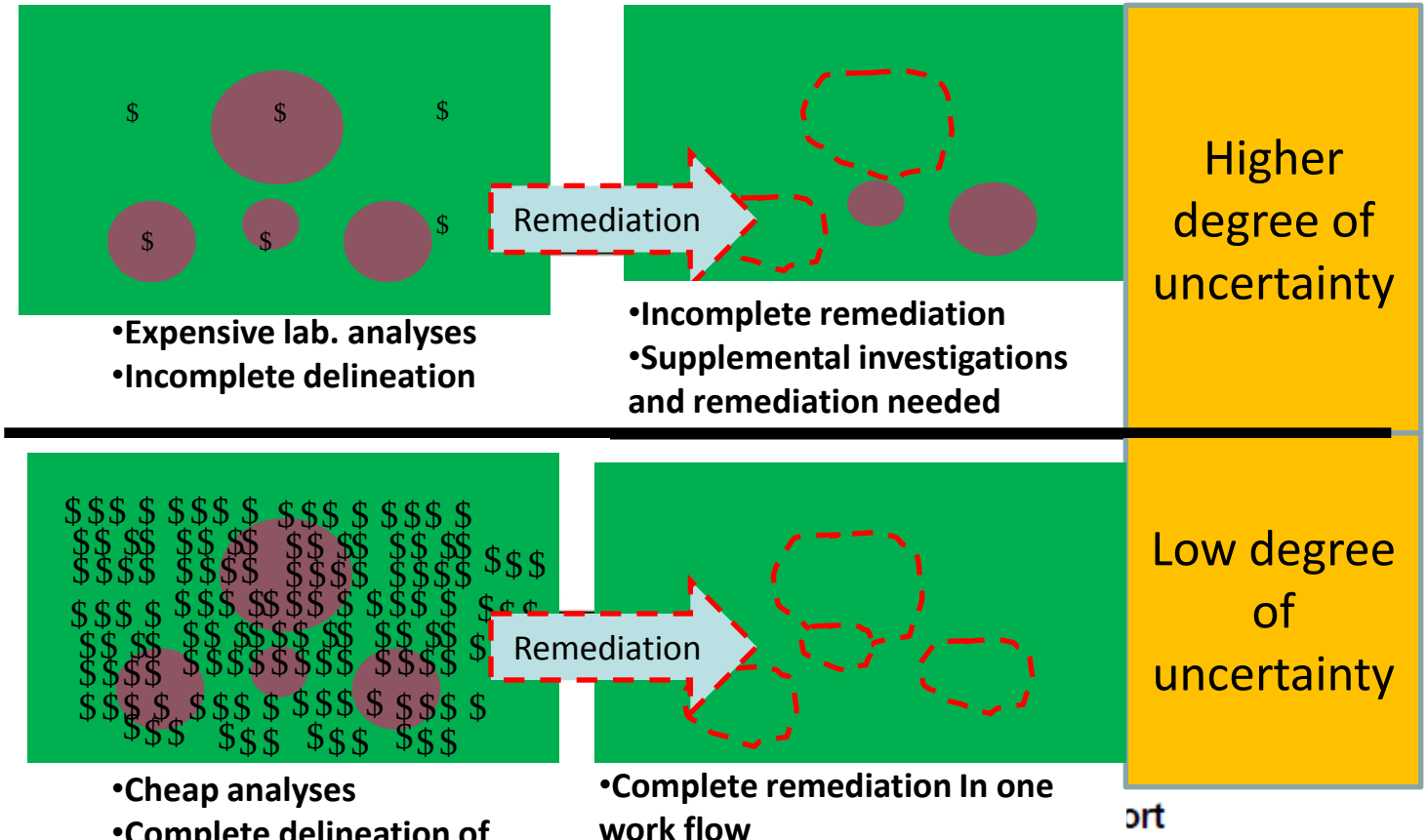
TRADITIONAL INVESTIGATION APPROACH

Example site in SE



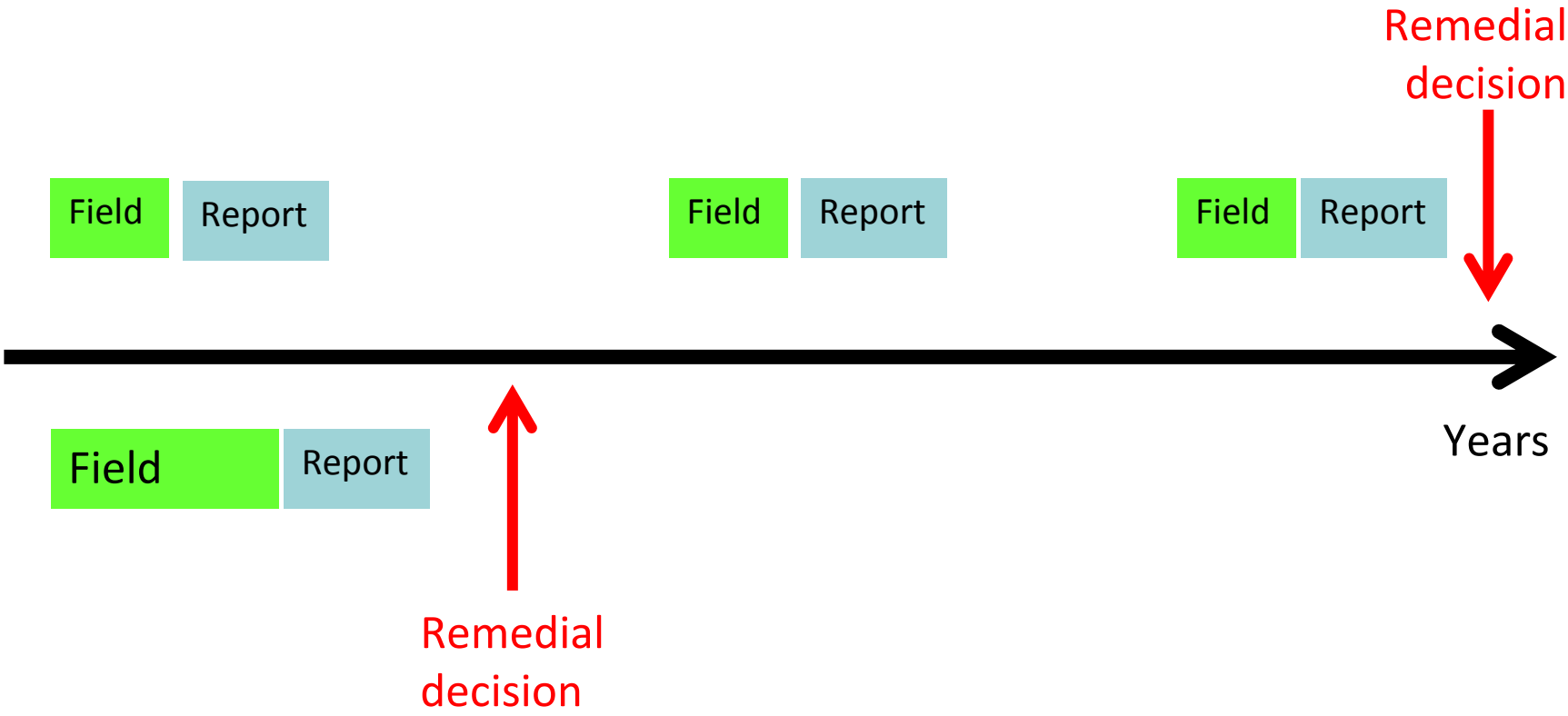
DYNAMIC VS. TRADITIONAL APPROACH

Data density and uncertainty

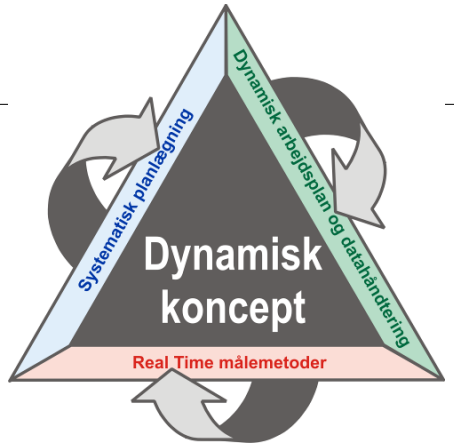


DYNAMIC INVESTIGATION APPROACH

Field work compressed into one phase



DYNAMIC INVESTIGATION APPROACH



THREE PARTS:

1) Systematic planning

Define remediation goals

Collect all information

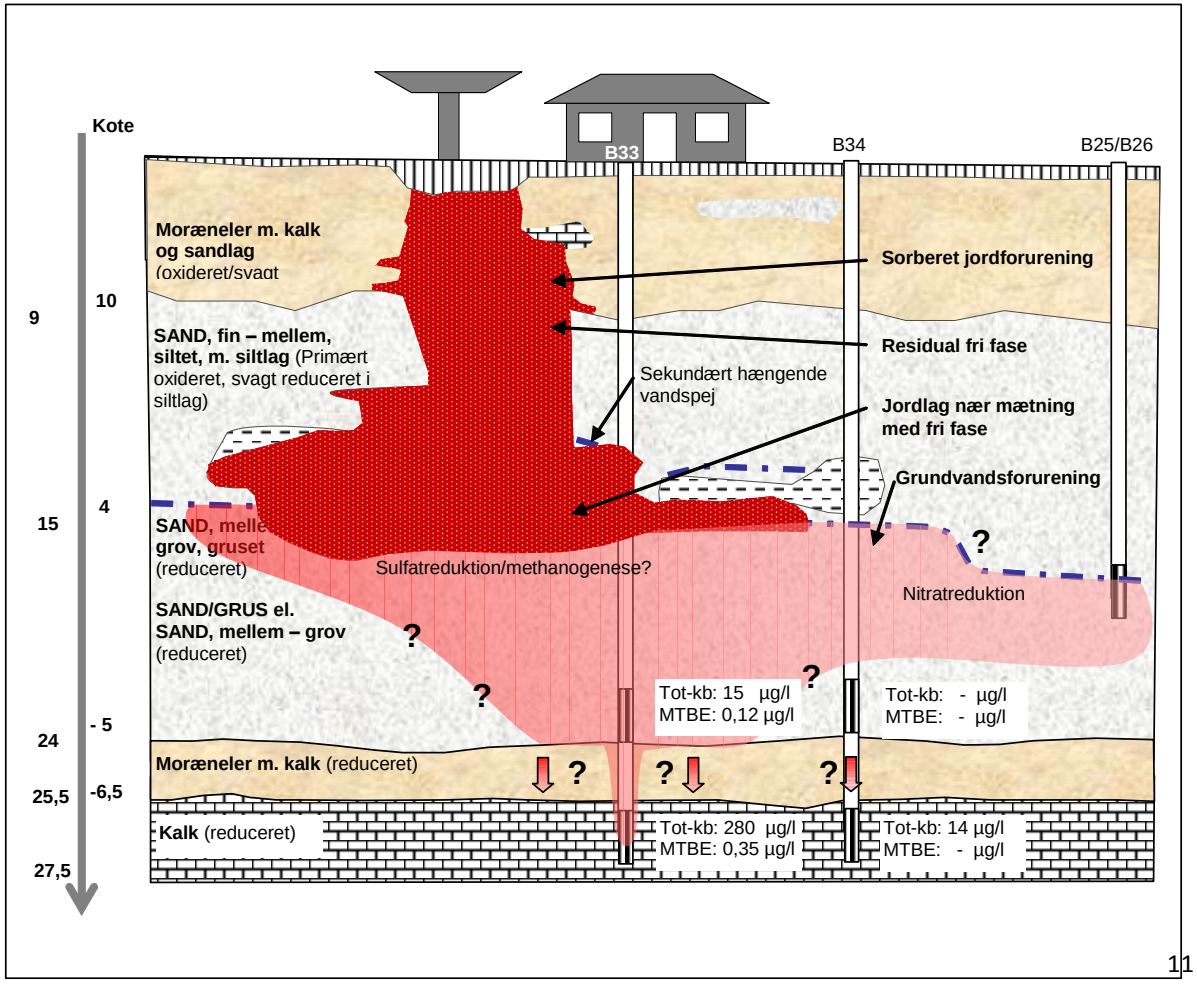
Plan for multiple scenarios

Tool box must be ready

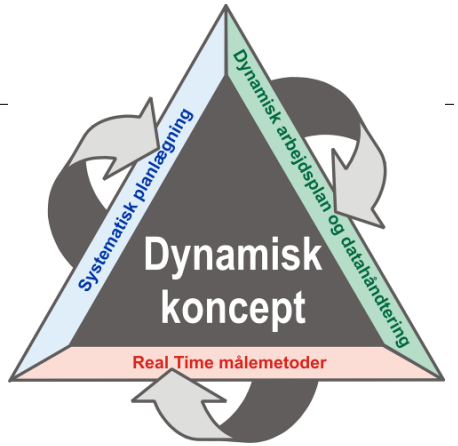
SYSTEMATIC PLANNING

Collect information – conceptual site model

- Historical info
- Geology
- Hydrogeology
- Contaminants
- Migration pathways
- Uncertainties



DYNAMIC INVESTIGATION APPROACH



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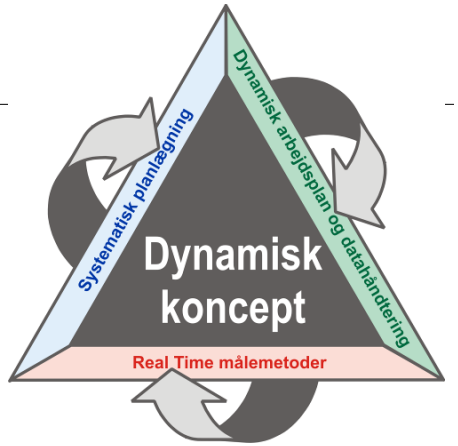
2) Real-time data

Appropriate investigation tools and field analyses

REAL TIME DATA

DYNAMIC INVESTIGATION APPROACH



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3) **Dynamic work plan and data management**

Flexible planning

On-going data visualization

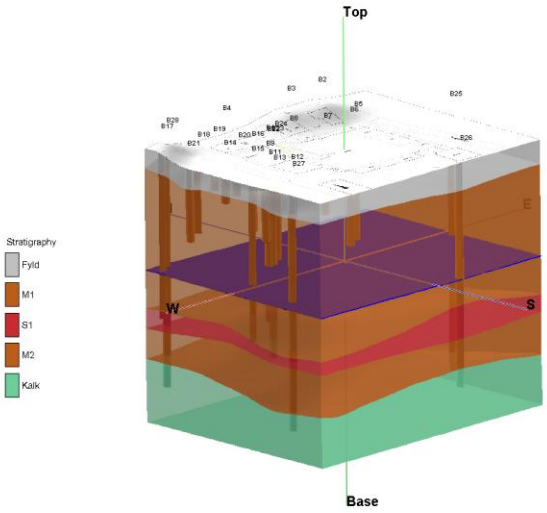
DYNAMIC WORK PLAN

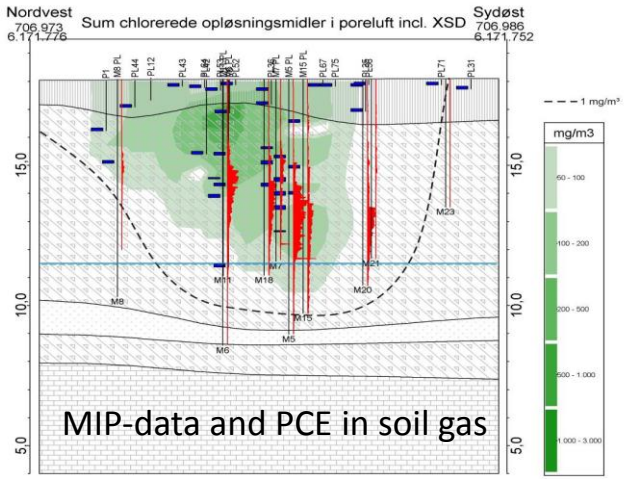
Flexibility

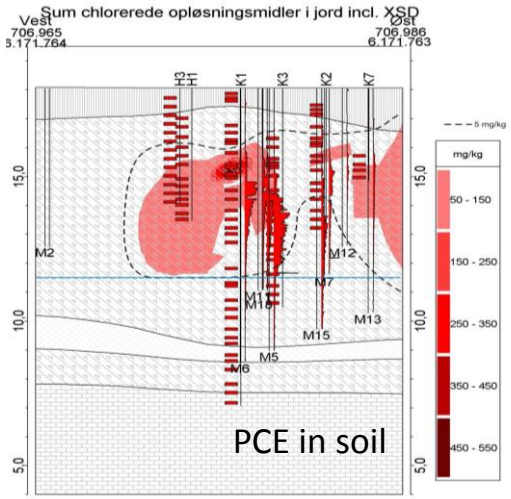
- Investigation plan is continuously ajusted according to the latest data from measurements, probings and analyses
- Mandated personel on site to make flexible decisions
- On-going communication with client – updated conceptual site model

DYNAMIC WORK PLAN

Data management



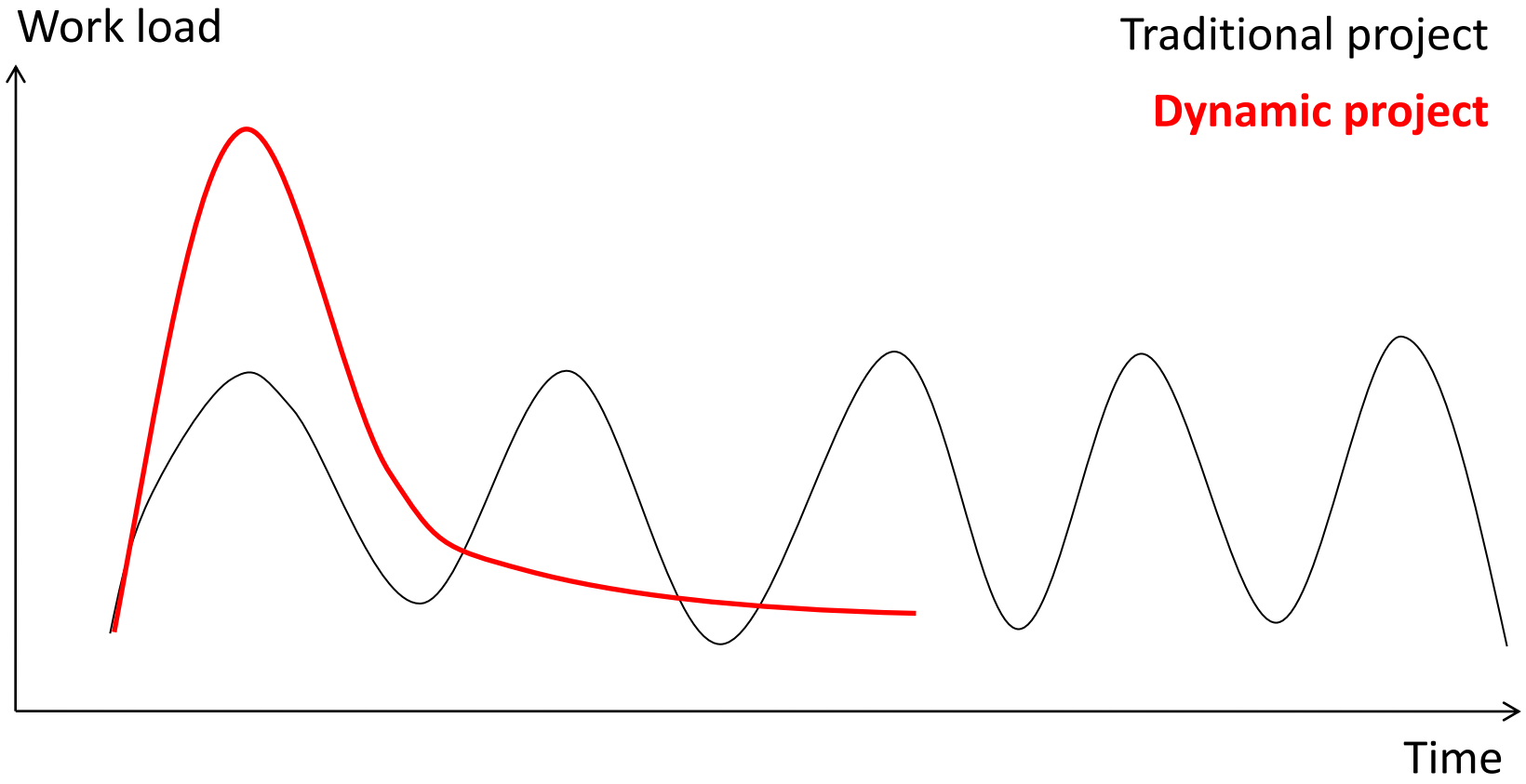




Geological profiles and contaminant distribution – e.g. RockWorks

DYNAMIC VS. TRADITIONAL APPROACH

Work load over time



PRACTICAL EXPERIENCES WITH DYNAMIC INVESTIGATIONS

Advantages

- Efficient and compressed investigation
- Continuing ajustment and targeting of strategy
- Detailed delineation in short timeframe
- Larger data set and certainty for decision making
- Less disturbance of land owners
- Cost reduction relative to collected data density

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Challenges

- Compressed course and long working days
- Difficult to predict extent of activities if only few informations are available
- Little time for ”reaction” → decision-making power available for client and regulator

COMPARISON OF 2 REM. INVESTIGATIONS: Dynamic vs. Traditional Approach: DATA SET

ALBA-GRUNDEN				
Aktivitet	Antal punkter	Antal meter	Antal analyser Felt	Antal analyser Akkr.
FASE 1, 2010				
Filtersatte boringer	4	50,5		
Jordpr.fra boringer	4			8
Vandpr. boringer	11			
Geoprobe vandpr.	10	119,5		19
FASE 2, 2010: TRIAD				
Terrænnær poreluft	74		74	9
Vand – terrænnært	7		7	
MIP sonderinger	23	162,5	45	
Geoprobe vandpr.	2	19		1
Kerneprøver	8	35	119	9
Håndboringer	4	14,5	46	2
Sudan IV jordprøver	18			
FLUTe linere	6		111	

FRYDENSBERGVEJ				
Aktivitet	Antal punkter	Antal meter	Antal analyser felt	Antal analyser Akkr.
UNDERSØGELSER, 2005				
Filtersatte boringer	11	???		
Jordpr. fra boringer	9			9
Sudan IV	7			
Vandpr. Boringer	11			28
Poreluft	33		10	1
ATD-rør	5			5
Volumenpumpning	1			
TV-inspektion kloak	1	30		
UNDERSØGELSER, 2007				
Filtersatte boringer	8			
Jordpr. fra boringer	8			20
Sudan IV	8			
Vandpr. boringer	20			20
Poreluft	24			12
Geotekn.	5			

128 SOIL GAS 23

176 SOIL SAMPLES 29

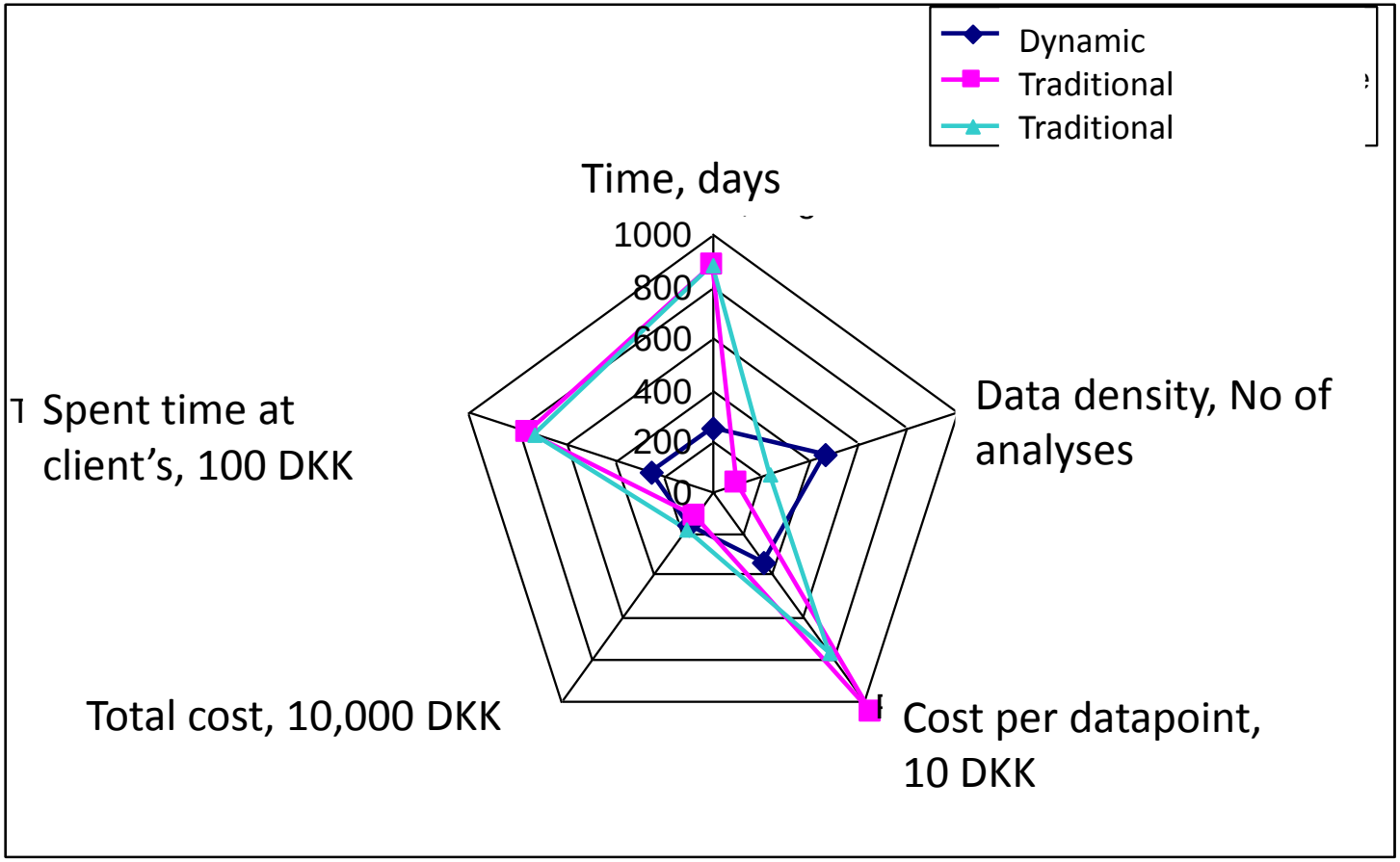
DATA POINTS

- **DYNAMIC INVESTIGATION**
  TOTAL NUMBER OF ANALYSES **~ 400**

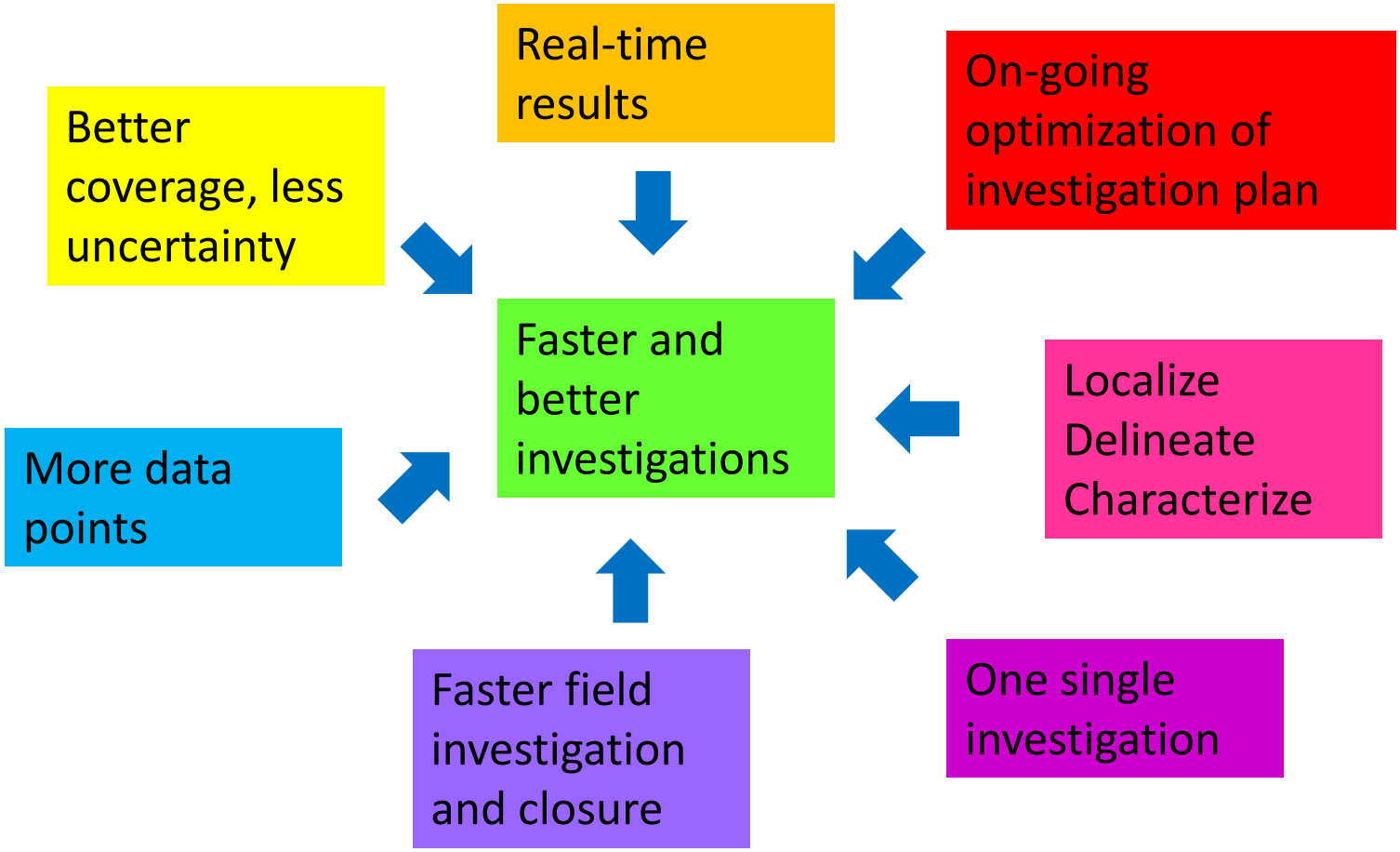
- **TRADITIONAL INVESTIGATION**
  TOTAL NUMBER OF ANALYSES **~ 100**

- **But approx. same costs!**

COMPARISON W/ 2 OTHER SITES



WHY DYNAMIC INVESTIGATION APPROACH?



WHEN IS A DYNAMIC APPROACH RELEVANT?

- Remedial investigations
  - Significant contamination
  - Challenging physical conditions (operating facility)
  - Remedial actions necessary
- Preliminary investigations
  - At several sites at one time – located at close proximity
- Industrial sites
  - Site screening
  - Need for fast investigation
- Investigations at remote areas