A Standards in Trade (SIT) Workshop:
China Brownfields Remediation

Importance of Conceptual Site Model (CSM) in Site Remediation

（场地概念模型在环境污染修复中的重要性）

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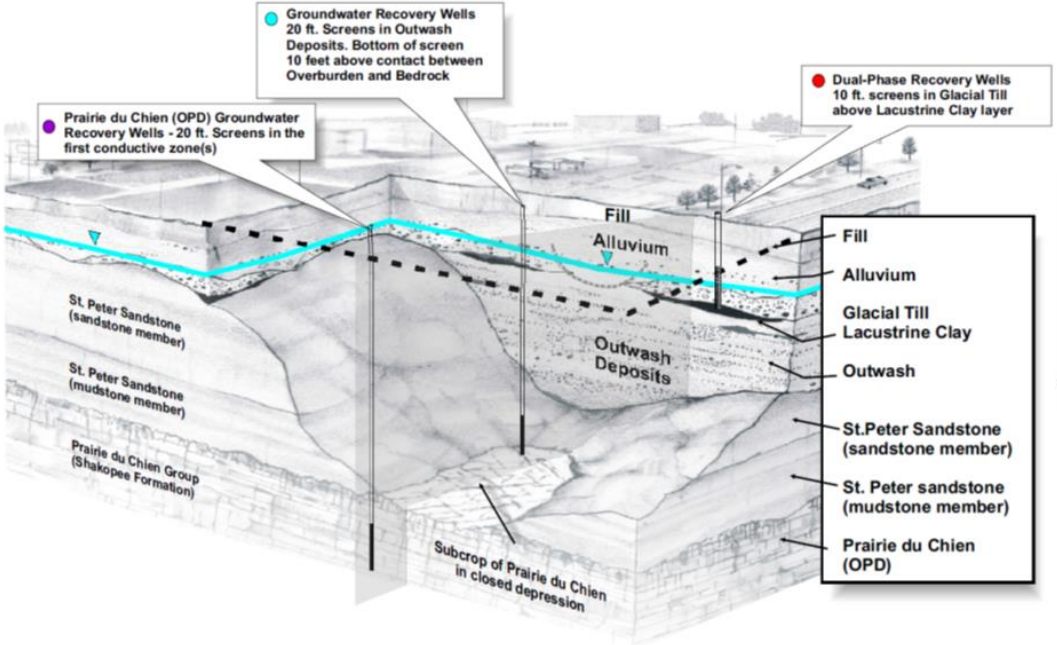
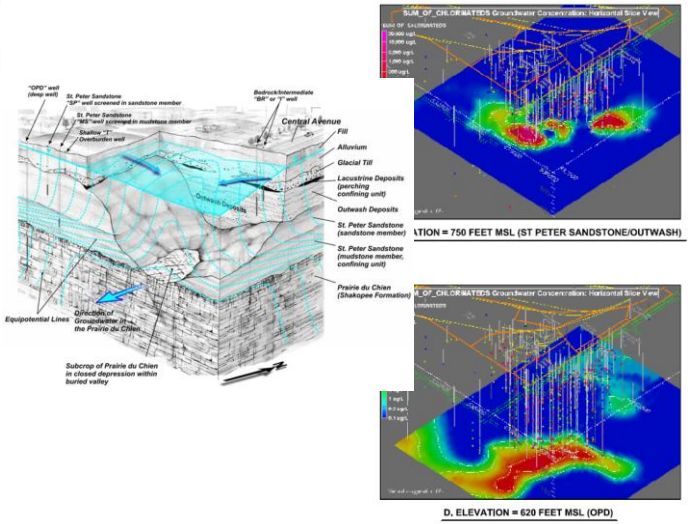
Presentation Outline

1. Conceptual Site Model Introduction
2. Technical Importance
3. Regulatory Requirement
4. Market Efficiency
5. A Case Example
6. Conclusions

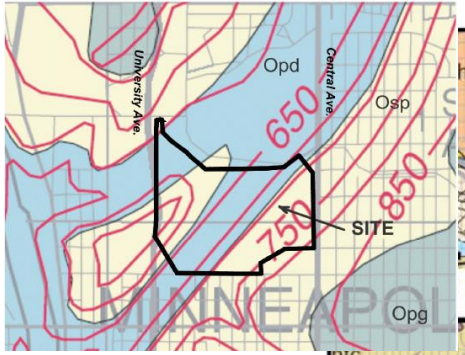
What is CSM?

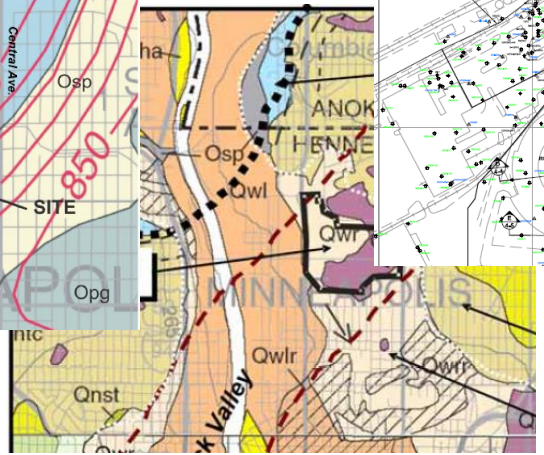


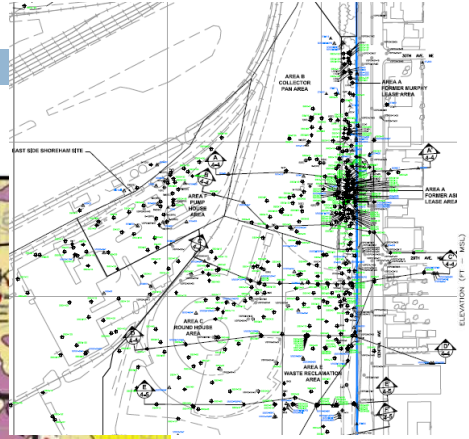


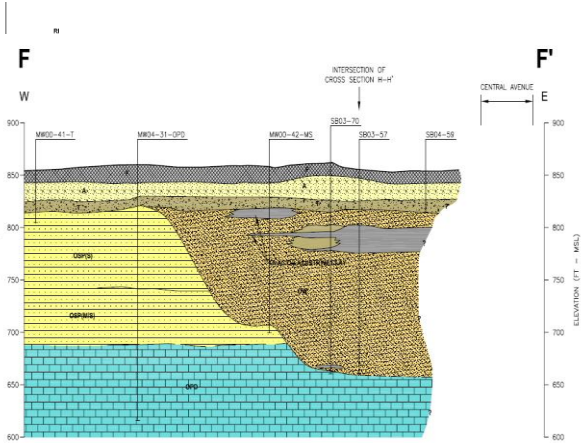
- What information is in this CSM?

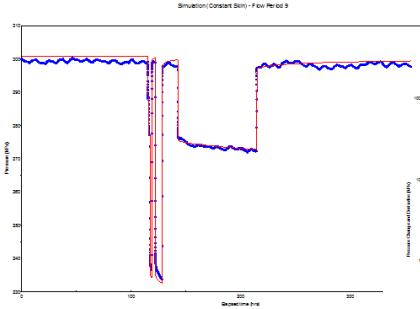
How to Develop a CSM?

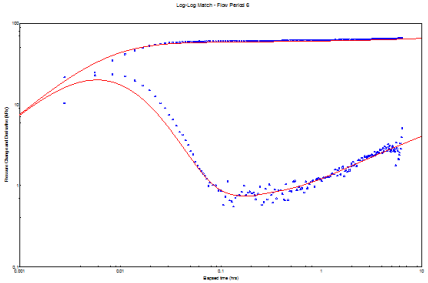








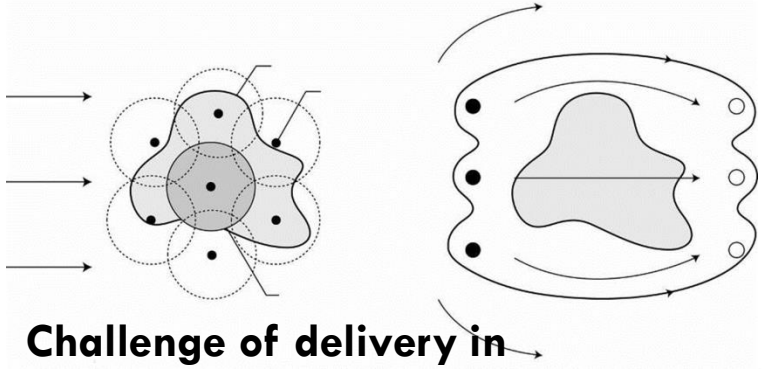




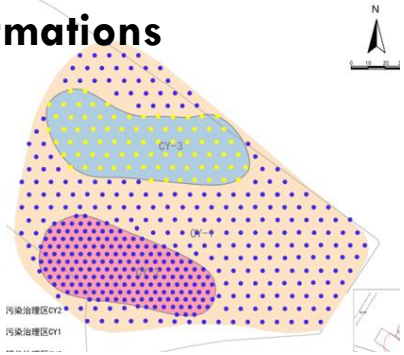
- Process to develop the SCM

Technical Basis of Remediation - ISCO

- “Site specific information including the applicability of ISCO to the specific contaminants, the concentration range, and hydrogeologic conditions, must be gathered and reviewed when evaluating the appropriateness of using ISCO for a remediation strategy.” – ITRC
- Man-made Conduits, Low permeability, Metals, SOD, soil and groundwater data
- And everything else...

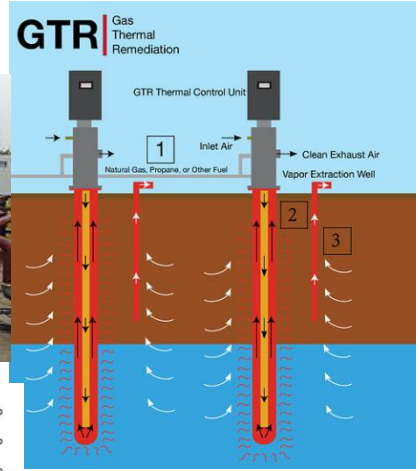


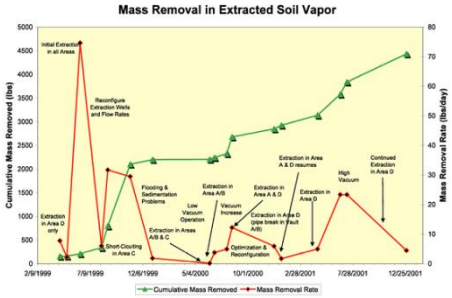
Challenge of delivery in heterogeneous formations



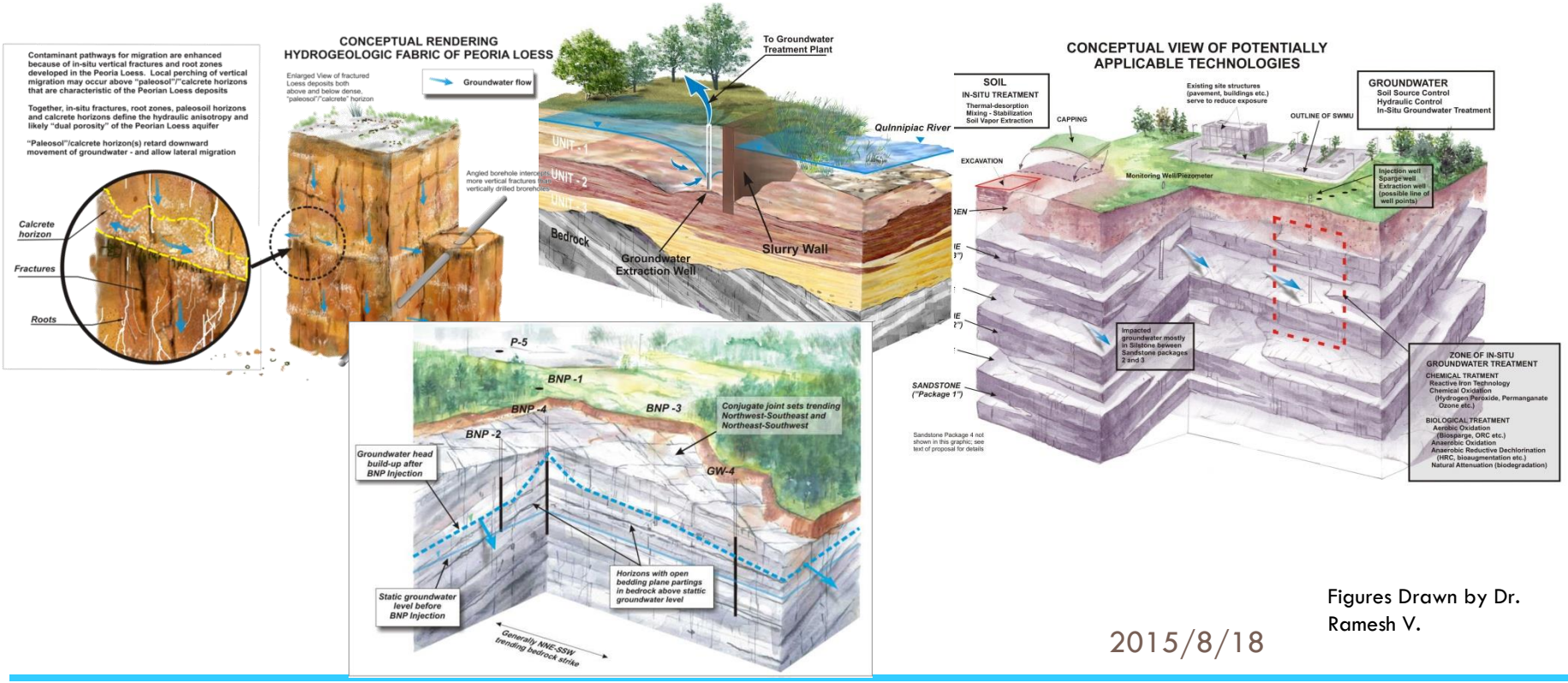
Technical Basis of Remediation - ISTD

- Key Site conditions include:
  - Site Sitting
  - Stratigraphy and hydrogeology
  - NAPL volume estimates
  - Contamination mobility
- Organic Matter, TOC And everything else...





Technical Basis of Remediation – other remedies



Figures Drawn by Dr. Ramesh V.

Regulatory Requirement – Super Fund Clean up Process

PA/SI
- Preliminary Assessment\Site Inspection

NPL Listing
- National Priority List Site Listing Process

RI/FS
- Scoping
- Site Characterization
- Development and Screening of Alternatives
- Treatability Investigations
- Detailed Analysis

ROD
- Record of Decision

RD\RA
- Remedial Design and Remedial Action

Construction Completion and Rest
- Construction Completion, Post Construction Completion, NPL Delete, Reuse

3 Site Characterization 3-1
3.1 Introduction 3-3
3.2 Field Investigation Methods 3-3
3.2.1 Implement Field Activities 3-3
3.2.2 Investigate Site Physical Characteristics 3-5
3.2.2.1 Surface Features 3-5
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3.2.4 Determine the Nature and Extent of Contamination 3-13
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3.2.4.4 Sediments 3-17
3.2.4.5 Air 3-18
3.2.5 Additional Site Characterization 3-18

EPA Best Practice (BMP) Guidance

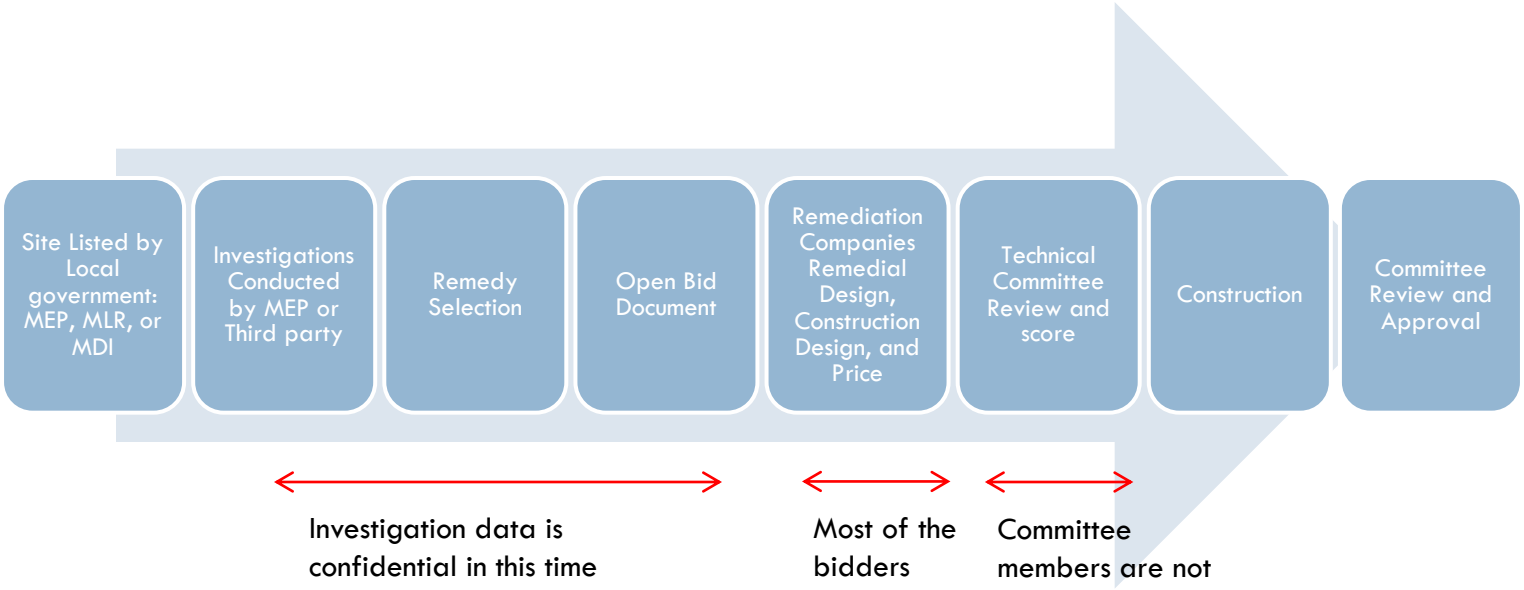
General Environmental Cleanup Steps	CSM Life Cycle	Best Management Practices: SPP	Best Management Practices: DWS/RTMT	CERCLA - Superfund	RCRA	Brownfields	UST	VCUP Varies by State	IRP/ERP	MMRP
Site Assessment	Preliminary CSM Baseline CSM Conceptual			Preliminary Assessment (PA) Site Inspection (SI) National Priorities List (NPL) No Further Remedial Action Planned (NFRAP)	Facility Assessment (RFA)	Phase I Environmental Site Assessment (ESA)	Initial Site Characterization Initial Response	PA SI	PA SI	PA SI MR Site Prioritization Protocol (MRSPP)
Site Investigation and Alternatives Evaluation	Characterization CSM Stage			Remedial Investigation/ Feasibility Study (RI/FS) Removal Actions - Emergency/ Time Critical/Non-Time-Critical	Facility Investigation (RFI) Corrective Measures Study (CMS)	Phase II ESA	SI Corrective Action Plan (CAP)	RI/FS	RI/FS NFRAP	RI/FS
Remedy Selection	Design CSM Stage			Proposed Plan Record of Decision (ROD)	Statement of Basis (SB) Final Decision and Response to Comments	Remedial Action Plan (RAP)	Cleanup Selection	ROD	Proposed Plan ROD	Remedy Selection
Remedy Implementation	Remediation/ Mitigation CSM Stage			Remedial Design (RD) Remedial Action (RA) – Interim and Final	Corrective Measure Implementation (CMI)	Cleanup and Development	Corrective Action - Low-impact site cleanup - Risk-based remediation - Generic remedies - Soil matrix cleanup	RD RA	RD RA – Interim and Final Remedy in Place (RIP)	RD Time Critical Removal Action (TCRA) RA RIP
Post-Construction Activities	Post-Remedy CSM Stage			Operational & Functional Period Operation & Maintenance (O&M) Long term monitoring (LTM) Optimization Long Term Response Action (Fund-lead groundwater/surface water restoration)	O&M On-site inspections and oversight	Property Management Long-term O&M Redevelopment Activities (Private- and Public-led)	LTM	O&M LTM	Shakedown period Operating Properly and Successfully O&M LTM	Shakedown period Long Term Management
Site Completion	Quantitative			Construction Complete (CC) Preliminary or Final Close Out Report (PCOR/FCOR) Site Completion - FCOR Site Deletion O&M as appropriate	Certification of Completion Corrective Action Complete with Controls or without Controls	CC Property Management	No Further Action (NFA)	CC	Response Complete (RC) NFA	RC NFA

Market Efficiency

- China ER market start in 2005, estimated at least same scale as USA
- Regulatory control to minimize Market In-efficiency is the basis to Develop a healthy Remediation Market

Site Listed by Local government: MEP, MLR, or MDI → Investigations Conducted by MEP or Third party → Remedy Selection → Open Bid Document → Remediation Companies Remedial Design, Construction Design, and Price → Technical Committee Review and score → Construction → Committee Review and Approval

Gaps in the Current Practice in China ER Market

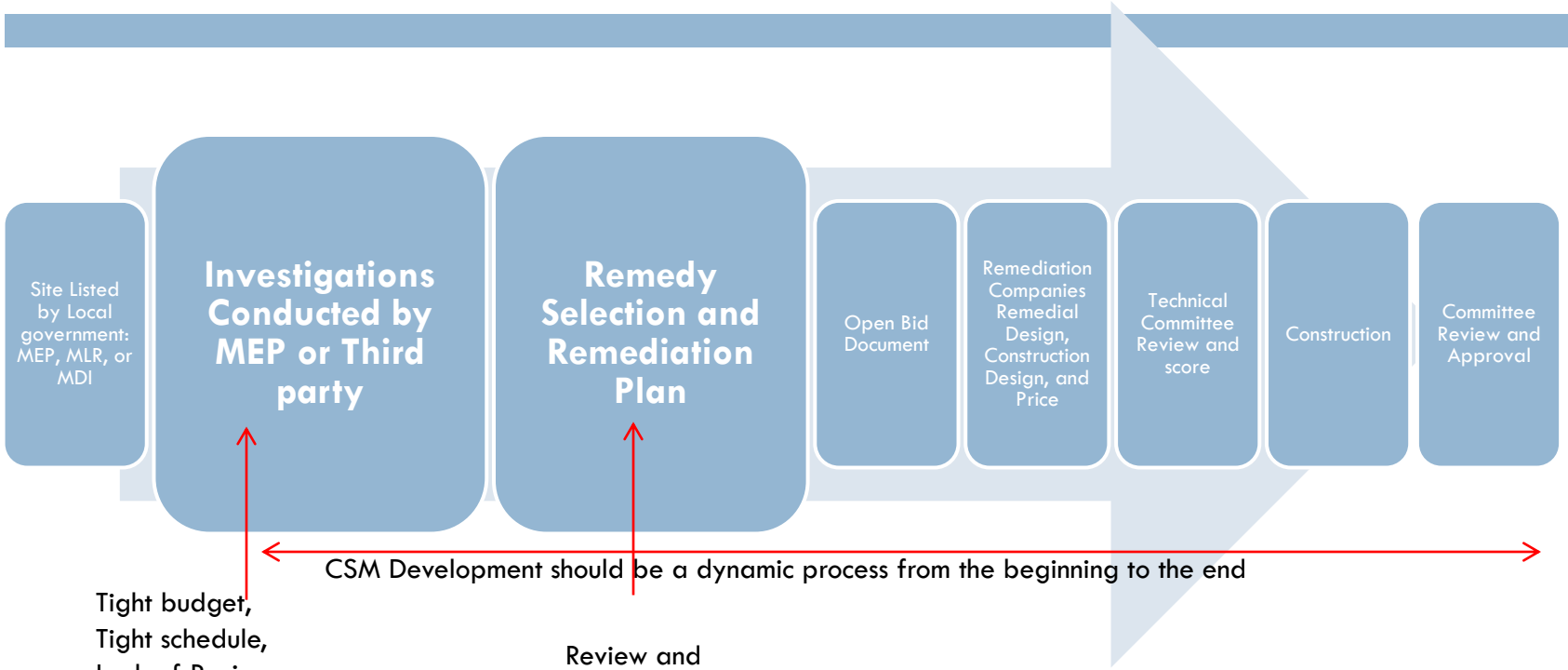


Investigation data is confidential in this time period

Most of the bidders don't have the chance to do pilot test

Committee members are not familiar with the site

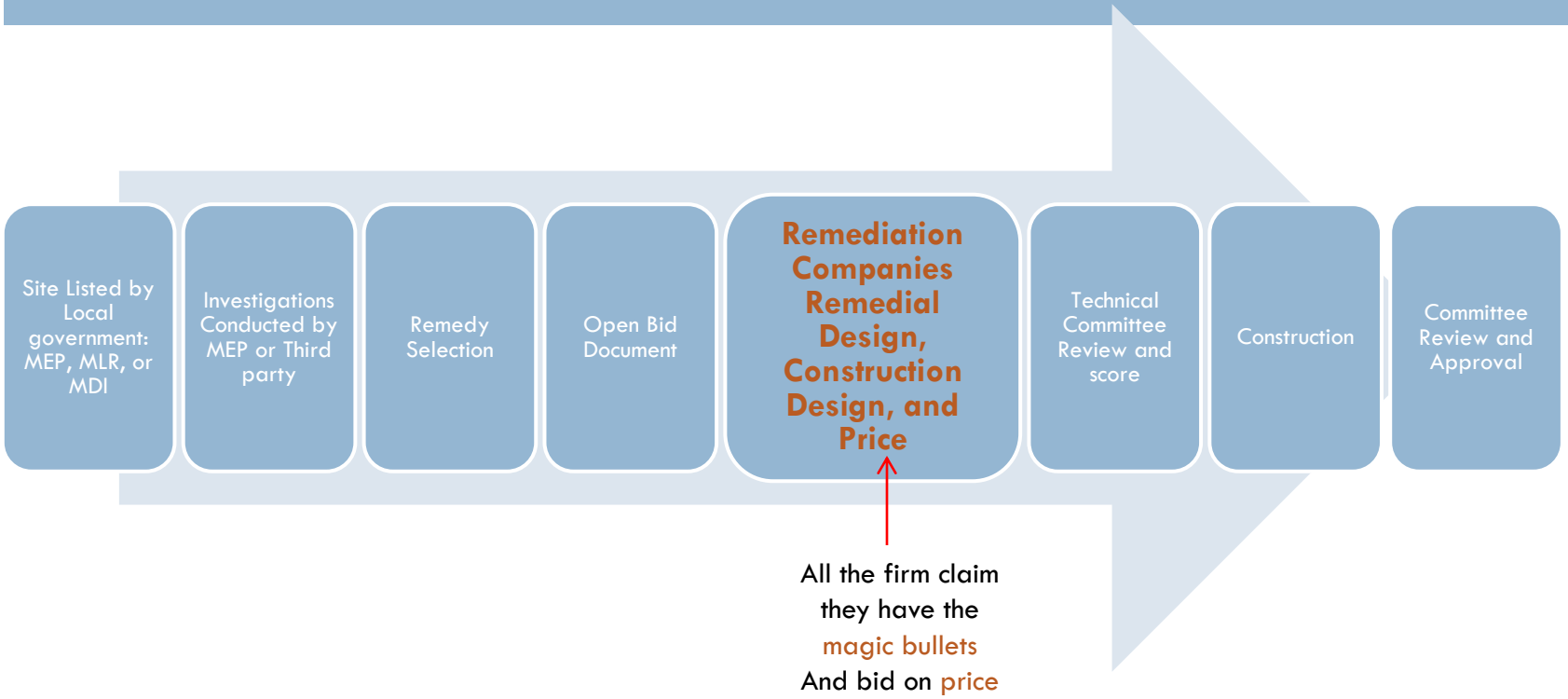
Gaps in the Current Practice in China ER Market



Tight budget,
Tight schedule,
Lack of Review
Most of the time
No CSM
provided

Review and
approved by
the government

Gaps in the Current Practice in China ER Market



Market Failure

- Remediation company in China is not a construction company
- Gaps from investigation to remediation encourage firm to focus on magic bullets, not site specific conditions (“You can make anything work in the lab!”)
- Without thorough understanding of the site, firms bid on price and take huge risks
- Clean up goals are difficult to meet
- Firms that take right approaches will not sustain under current situation
- Developers\government also take risks

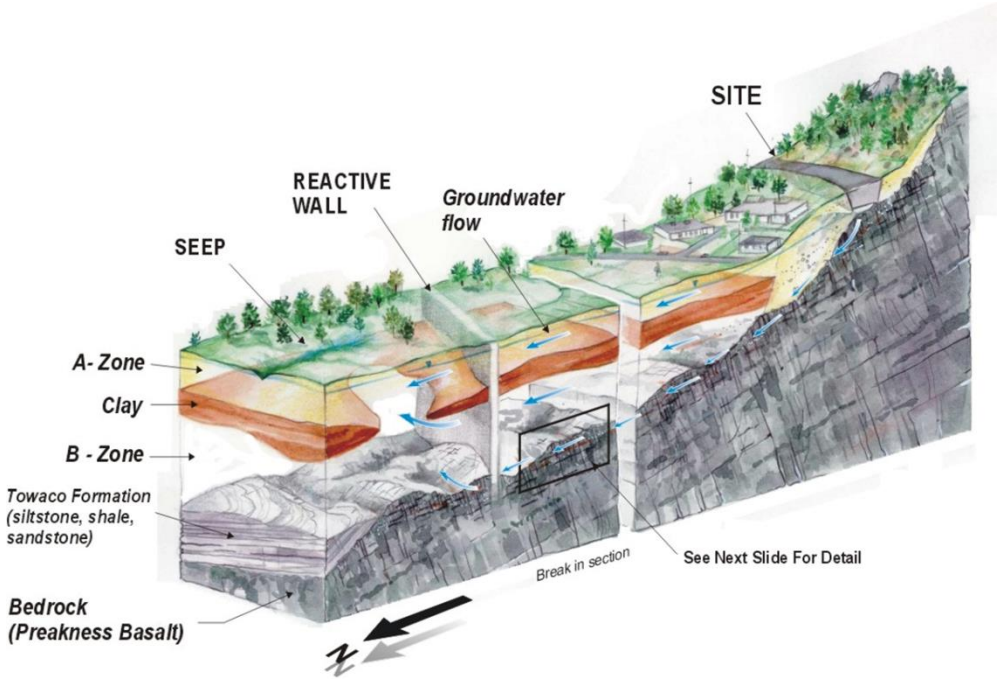
Policy Makers should design regulations to ensure market efficiency

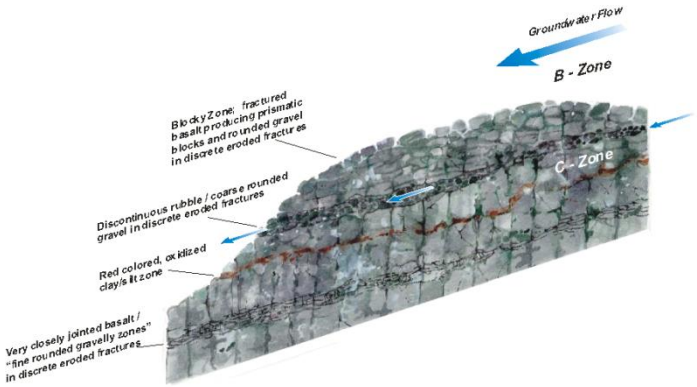
CSM Helps to Select Innovative Remedy and Reduce Cost

FIGURE 1-6

INNOVATIVE IN-SITU TECHNOLOGIES FOR CALDWELL TRUCKING COMPANY SITE

CSM Helps to Select Innovative Remedy and Reduce Cost





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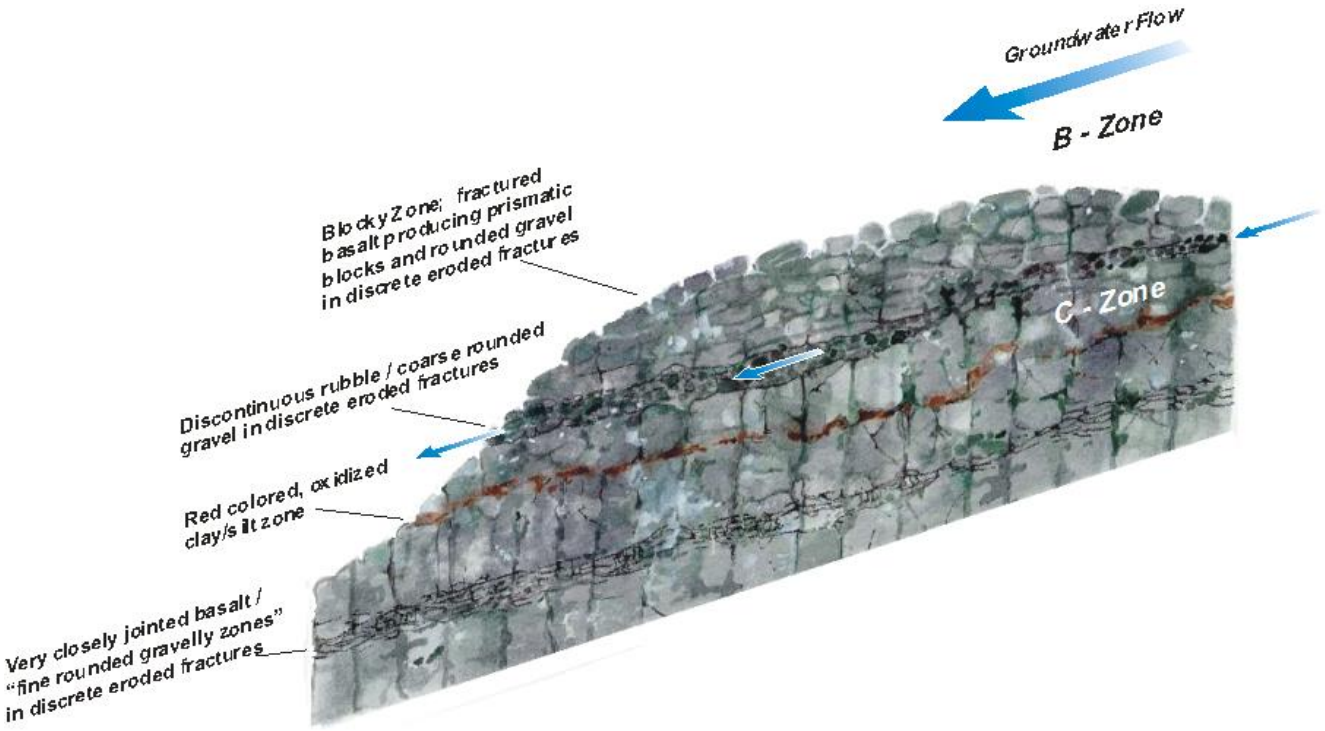
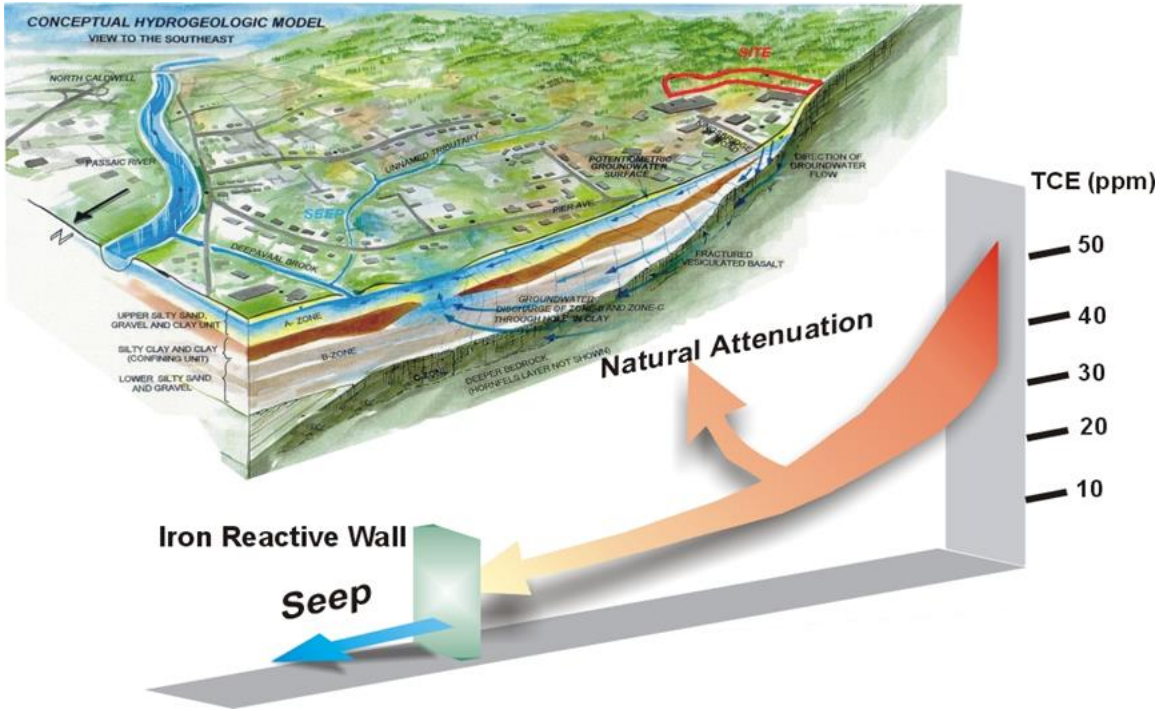
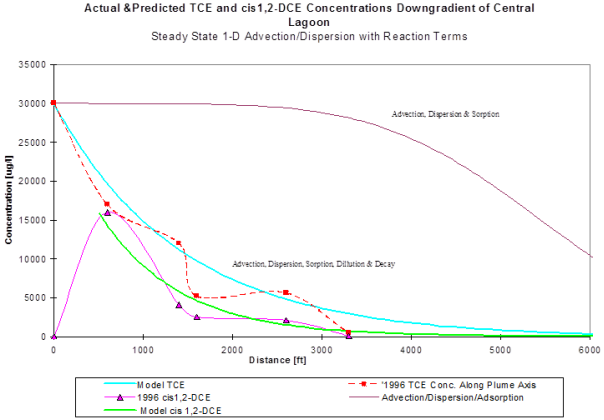


CSM Helps to Select Innovative Remedy and Reduce Cost





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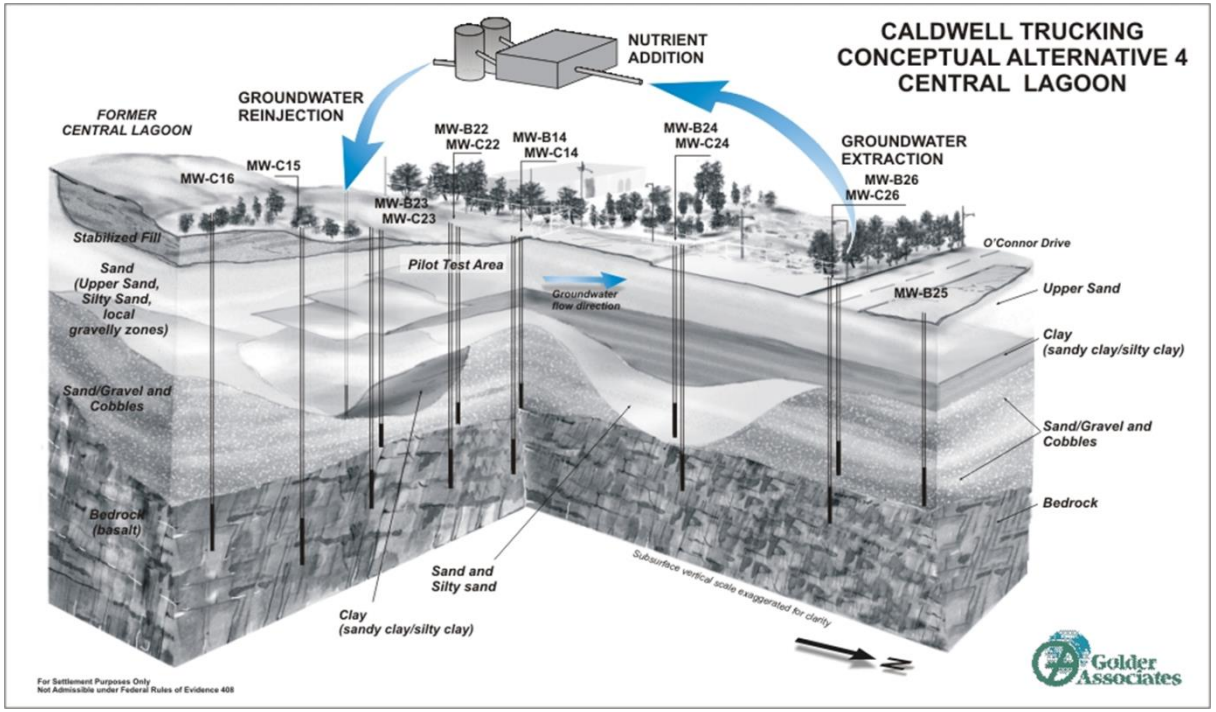

Conclusions

- Conceptual Site Model is the fundamental component of Site Remediation
- Technologies are not magic bullets
- Technology application tend to be site specific
- Realistic goals should be set and achieved by application of sound science and engineering to protect environment and human health

Thank You!