Launch of Sustainable Remediation Forum UK

13th May 2008
CCTV Training Centre, Barbican, London

SuRF
SUSTAINABLE REMEDIATION FORUM UK

CL:AIRE
CONTAMINATED LAND: APPLICATIONS IN REAL ENVIRONMENTS

www.claire.co.uk/projectsandsites/surfuk

LAUNCH OF SUSTAINABLE REMEDIATION FORUM UK MEETING

MEETING NOTES

13th May 2008

CITB Training Centre, Barbican, LONDON

Attending:

Natalyn Ala	Atkins Global
John Allison	MWH
Stuart Arch	WorleyParsons Komex
Paul Bardos	R3
Chris Barrett	Arup
Richard Boyle	English Partnerships
Louise Cartwright	EESI
Terry Coleman	Environment Agency
Alan Crossfield	Delta Simons
Sam Dewsnap	Waste Management
Bridget Durning	Oxford Brookes University
Kevin Eaton	ENVIRON
David Ellis	DuPont (USA) – joined by phone
Frank Evans	National Grid
Andrew Fraser	Terravac
Marlon Frost	Grontmij
Jane Garrett	CL:AIRE
Gary Graveling	Buro Happold
Nicola Harries	CL:AIRE
Quentin Hulm	Cornelsen
Stephan Jefferis	Environmental Geotechnics
Bob Kalin	Strathclyde University
Doug Laidler	SAGTA
John Lamble	WSP
Judith Lowe	Independent Consultant
Nick Marks	London Borough of Newham
Paul Mathers	WRAP
Sean McCarthy	QinetiQ
John Moritz	Cobbetts
Phil Morgan	Sirius
Adrian Needham	Golders
David Reinke	Shell
Martin Richell	Raw Group
Walter Robertson	Entec UK Ltd
Philippa Scott	Shell
Katherine Smith	LACORS
Mark Stevenson	URS
Alan Thomas	ERM
Janys Thornton	HM Treasury
David Tully	AIG
Steve Wallace	National Grid

Welcome

Jane Garrett (JG) (Chief Executive of CL:AIRE) gave a warm welcome on behalf of CL:AIRE to everybody especially our overseas visitors joining by telephone and thanked them for giving up their time today. She explained that SuRF UK is an important initiative for CL:AIRE and thanked English Partnerships for providing the funding to allow us to do this. JG went on to say that sustainability is now written into government policy at the highest level and lots of sectors are now looking at how they can measure sustainability in their own business sectors. It is important for the contaminated land/brownfield sector seize this opportunity and develop its own measures and make its position clear and not be left behind.

Format for the Day, Rules of Engagement and Commitment

Judith Lowe (JL) (independent facilitator) described the objectives for the day and how the day would proceed in line with the agenda. There would be a series of presentations and then syndicate group exercises in the afternoon.

JL explained that there was a good cross section of people present from practitioners, academics, NGOs and government, and many of the individuals had been to the Inaugural meeting held in June 2007. CL:AIRE had specifically arranged the attendees into three groups (red, yellow and green) in order for syndicate groups to work on three aspects, Tools, Framework and Case Studies. JL explained that the meeting would be held under Chatham House Rules, that there should be a spirit of sharing but people should be respectful of commercial concerns. Everything discussed should be as transparent as possible and that people should be able to ask obvious and simple questions. It was also stated that any input and views given at the meeting was individuals input and not that of their companies. All information about this meeting and subsequent meetings will be put up onto the CL:AIRE website and any queries relating to SuRF UK should be co-ordinated through Nicola Harries at CL:AIRE. During the coffee break there will be a short exercise asking people for their reasons why they are at the meeting and at the end of the day there will be requests for commitment to take the initiative forward.

Presentations

A series of presentations were given which are included in Appendix A. They included:

Nicola Harries (NH) of CL:AIRE presented on “Progress from last meeting & Definition”.
Frank Evans (FE) of National Grid presented on “Drivers Now & Conceptual Framework”.
Paul Bardos (PB) of R^3 presented on “Appraisal of Tools, literature review”.
David Reinke (DR) of Shell Global Solutions presented on “Cost Benefit Analysis Case Study”
David Ellis of Dupont presented on “SURF USA – Progress so far”.

Coffee Exercise

Attendees were asked to complete a questionnaire asking why they have attended the meeting. People were asked to complete their top five reasons for attending. FE summarized the findings and fedback the main reasons to the meeting.

These were:

- Greatest interest and reason for attending was to influence the development of the framework with six people making it their main reason.

Other reasons included:

- Wish to offer sustainability related services to their clients
- Wish to understand more about Sustainable Remediation
- Wish to understand the view of the contaminated land community
- General interest in seeing sustainable remediation techniques used in contaminated land management

There was no strong feeling on cost implications and few people considered that they had a limited knowledge and were coming to gather a better understanding.

Syndicate Group Exercises

JL introduced the group exercises and explained that all attendees had been split into three different groups Framework, Tools and Case Studies. Each group had a Facilitator and scribe and a series of questions to assist the groups to get the maximum out of the session. Framework was led by Frank Evans and John Morritz, Tools was led by Philippa Scott and Paul Bardos and Case Studies were led by David Reinke and Stuart Arch.

At the end of the exercise, each session provided feedback to the rest of the attendees. The three groups' discussions are summarized below.

Framework – Feedback provided by John Morritz

- Issues considered in relation to framework were:
    - what will it look like?
    - aims
    - do parts of the framework already exist?
    - boundaries
    - guidance
    - info to put the framework together.
    - drafting the framework
    - timetable/milestones

  The general feeling was that the framework already existed in the form of document CLR11 and that that should be the main driver because it already exists.

- Sustainability comes in at various points in drafting the framework.
- There was some feeling that CLR11 only meets some of the objectives.
- Mention was made that the English Partnerships National Brownfield Strategy does not think about sustainability.
- "Sustainability" should be part of the risk assessment process.
- When should end uses for sustainability be addressed as part of the planning process?
- Sustainable regeneration framework should look at social, economic and environmental issues.
- We should look at how developers and planners tackle sustainability issues.
- Third party engagement was important.
- A question was raised as to whether SuRF should be the Sustainable Remediation Forum or the Sustainable Regeneration Forum.
- Mention was made of the spatial planning process which involves community engagement and ensures that economic output is captured.

- The framework should apply to the remediation process as well.
- Reference was made to the Part 2A regime. The cost benefit analysis would look at sustainability.
- Social, economic and environmental factors are going to be addressed.
- The group decided that you can't get away from market forces.
- Questions were raised about the extent to which the framework will drive decision making.
- Once we accept that the site is going to be developed for a specific land use, then you can apply the framework.
- CLR11 is auditable and transparent and should take that process forward.
- The key issue is that the land should be "suitable for use" within Planning Policy Statement 23.
- The framework is about a process and does allow a framework and record of the environmental impacts.
- Could planning conditions be drafted to refer to sustainability framework?

Summary

1 What should the aims and goals be?

1.1 Engagement at the remediation action stage.

1.2 There is a boundary which needs to be drawn with a whole load of other sectors, for example, developers, planners, etc.

2 Is it one framework with different decision processes?

3 We should sort out the remediation first.

4 What are the likely benefits of the framework?

4.1 Market differentiation.

4.2 Transparency.

4.3 Will help EA regulators because of the element of self-regulation.

5 Having developed the product for sustainable remediation, we could then seek to influence planning policy.

6 Should contaminated land projects include social aspects during the remediation process?

7 Are local authorities competent to review the sustainability frameworks?

8 The boundaries of the framework – do these relate to time and space?

9 The support for the framework should follow CLR11 but should look at other guidance, such as (a) BREEAM and (b) the Code for Sustainable Homes.

10 Social issues in the long term should be taken care of in the planning process but the social implications for remediation process should be part of the work on the framework.

<u>Tools – Feedback provided by Philippa Scott</u>

1. Attributes of tools (to aide sustainability assessment in Soil and groundwater management)

- Tool box needed – akin to remediation treatment train
- Build on learning from other disciplines
- Use what is available

- Simple, easy to use but flexible enough to manage complex cases
- Broad based
- Auditable
- Have regulatory and business buy in
- Consider the lifecycle of land not a single remedial event

2. **What kind of tools is needed for sustainability assessment?**
    - No tool detail discussed, recognised calculators needed for the various metrics e.g. gases
    - A framework to direct use of tools (what and when)
    - Tiered approach to use of tools building in complexity
    - Tools need to be verified, audited, ground truthed and set in context (normalised)

3. **What is the value of a tiered approach?**
    - Allows range of situations to be processed from simple to complex
    - No mandatory so can be site/project specific
    - Options for qualitative and quantitative approaches

4. **How will we determine appropriate boundaries?**

    - Not sure
    - Agreed to identify the elements with an obvious fit to sustainability assessment
    - Initial components of ROSA (Remediation options sustainability assessment)

5. **How will tools fit in to the framework?**
    - Conceptually in a similar way to risk assessment

6. **How do we assure verification and acceptance of the tools so sustainable management solutions are not rejected?**
    - Topic not yet covered

7. **What needs to be completed?**
    - Identify key metrics
    - Existing tools inside and outside industry
    - Review literature to see if this information has already been collated
    - Pick most useful tools
    - Decide how best to manage historic and current “contamination” sustainably
    - Decide how to manage the time element
    - the life cycle of land
    - Or life cycle of a remediation

8. **What can be delivered by the next meeting - November?**
    - An information exchange facility
    - An e-mail brainstorm to identify the key parameters needed to measure sustainability. Contributions will come from SURF members
    - Review of the brainstorm data to establish:
        - the critical metrics for ROSA
        - parameters that are not considered necessary in an initial ROSA

Case Studies – Feedback provided by Stuart Arch

Purpose:

- Discuss the need for case studies as part of framework development
- Identify what case studies need to address
- Are case studies avaiolable
- How will they be collated/reported
- Deadlines

Discussion

1. At what decision making 'level' should case studies be targeted?

    - Policy (e.g., whether a site should be remediated for housing or industrial land);
    - Objective setting (i.e., identifying remediation goals and approaches); and,
    - Technology selection.

    This requires the scope of the framework to be defined.

2. a) Case Studies needed to help develop the framework should
    - come from real sites in UK or abroad;
    - based on existing availbale data to avoid unnecessary reworking;
    - may be 'sustainability' assessments or just remediation options appraisals;
    - may be qualitative or quantitative; and,
    - be provided as soon as possible.

    b) Case Studies may be provided as a parallel document alongside the framework that is eventually produced. These case studies should:
    - reflect a range of examples;
    - be based on real or hybrid sites to avoid confidentiality probelms and enable examination of different scenarios; and,
    - will be needed in November.

3. Sites need to reflect various sizes and complexities of sites to enable examination of the application of the framework and important factors.

4. The SuRF US site examples should be examined in UK policy context to see if the conclusions are the same and whether the framework is applicable. **Action 1: Nicola Harries.**

5. Types of sites to be considered include:
    - operational sites with ongoing use;
    - brownfield sites for proposed redevelopment (for which policy level decisions could be examined); and,
    - sites that are unused but have long term legacy issues

    During plenary discussion, the question was raised as to whether examples of sites that are surrounding industrial facilities, and that may become contaminated should be examined.

6. Workload in preparation of case studies should be minimised.

7. Contact should be made with government funding bodies, Regional Development Agencies, English Partnerships, ODA to ask for case studies or an understanding of the policy that they have in place for selecting remediation strategies or measuring sustainability of remedation. **Action 2: CL:AIRE to send out letters or otherwise request information.**

8. Examples from other industries could be examined

9. SUB:RIM expereince should be investigated. **Action 3: Doug Laidler**

10. Existing sources of potential case studies (associated with remediation selection and sustainability aspects), for which data could be provided immediately, include:
    - National Grid Property – **Action 4: Frank Evans**
    - Shell Global Solutions – **Action 5: David Reinke**
    - SAGTA – **Action 6: Doug Laidler**
    - Welsh assembly government. **Action 7: Quentin Hulm**
    - Housebuilders Federation and NHBC. **Action 8: Marlon Frost**
    - EA – **Action 9: Terry Coleman**
    - MOD/DLO – **Action 10: Stuart Arch**
    - DuPont – **Action 11: Nicola Harries**

11. Should case studies be full detailed reports or brief summary statements that illustrate particularly points within the framework. To be considered further when the framework is known. For now, brief informal data summaries will be collated.

12. A brief note on the data requirements for case studies should be prepared to aid people who may not know whether the information they have is useful. Aspects to be considered include:
    - Type of site;
    - Size;
    - Existing drivers for considering sustainability/choosing remediation options;
    - Tool/method of assessment;
    - Data related to sustainability indicators;
    - How assessment helped process or informed the decisions made; and,
    - Lesssons learned.

    This could be circulated via CL:AIRE to all attendees to pass on.**Action 12: Stuart Arch.**

    It was not read during plenary that EURO DEMO website developed a data gathering tool that could be used through the CL:AIRE website and may also be a way to gather wider European input.

13. **If attendees have data available, don't delay in sending it to Nicola Harries.**

SUMMARY & NEXT STEP

JL concluded the afternoon by asking all attendees to think how they as individuals or their organisations that they represent would be able to contribute to help deliver on SuRF UK s tasks. Attendees were asked to fill out individual contribution sheets. JL then explained that CL:AIRE will be organising another "Open Forum" meeting in November 08 and February 09 which everybody will be invited to attend. She thanked everybody for their time and confirmed notes of the meeting will be distributed and that CL:AIRE will be in touch shortly.

CLOSE

APPENDIX A - PRESENTATIONS

LAUNCH of SUSTAINABLE REMEDIATION FORUM UK (SuRF UK)

PROGRESS FROM LAST MEETING

Nicola Harries

CL:AIRE

SuRF
SUSTAINABLE REMEDIATION FORUM UK

RECAP

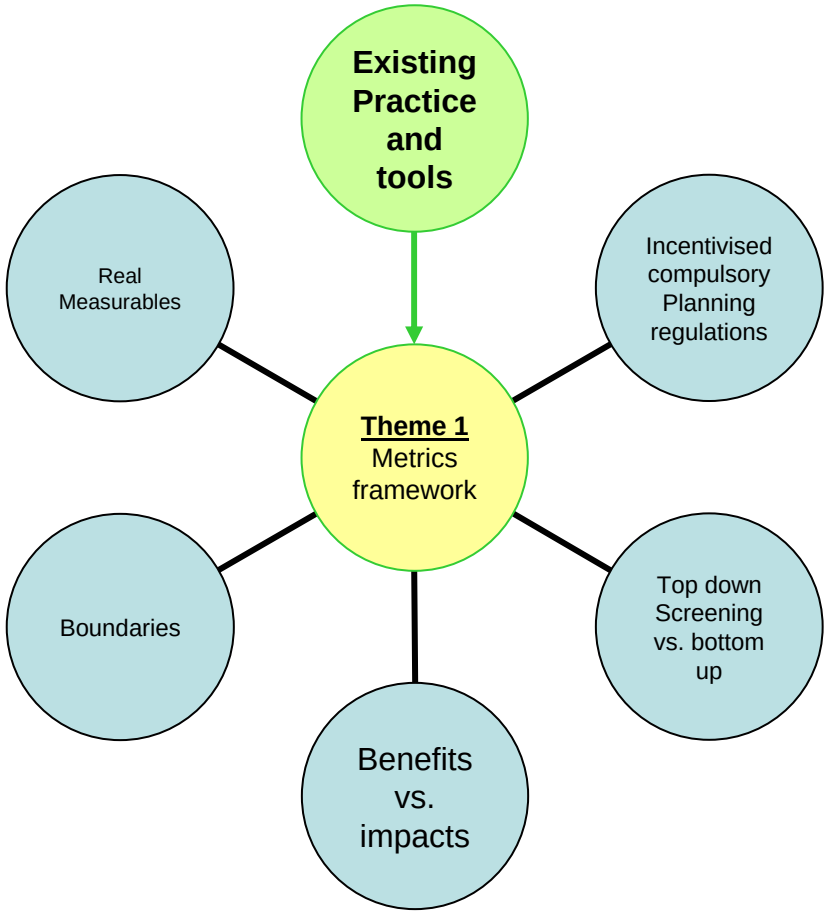
- Meeting held June 2007 – appetite to develop framework
- Action Plan developed
- Funding needed
- Steering Group to be set up to drive initiative forward

SuRF
SUSTAINABLE REMEDIATION FORUM UK

BRAINSTORMED OUTPUTS FROM JUNE 2007 MEETING

Theme 1. Metrics/Framework
Theme 2. Carbon Trading
Theme 3. Affect on Design and Delivery

Moving forward on Theme 1 & 3.



SuRF
SUSTAINABLE REMEDIATION FORUM UK

BRAINSTORMED ACTIONS

Metrics & Framework

- Review Tools inside & outside of industry
- Define Boundaries
- Define Parameters
- Develop Framework

Design & Delivery

- Demonstration Projects (based on framework development)
- Identify policy drivers to push sustainability profile

SuRF
SUSTAINABLE REMEDIATION FORUM UK

PROGRESS

- CL:AIRE secured funding January 2008 through English Partnerships. Funding available until March 2009 to facilitate initiative and develop the concepts of a “sustainable remediation decision making” framework with industry
- Steering Group now set up
- Launch “Open Forum” to allow industry to provide valuable input and feedback at key stages

SuRF
SUSTAINABLE REMEDIATION FORUM UK

STEERING GROUP

- CL:AIRE
- Industry : Shell Global Solutions & National Grid Property through SAGTA
- Environment Agency
- R^3 Environmental Technology Ltd
- US SURF

SuRF
SUSTAINABLE REMEDIATION FORUM UK

PROGRESS

Mission Statement :

To "Develop a framework in order to embed balanced decision making in the selection of the remediation strategy to address land contamination as an integral part of sustainable development".

Explanatory words:

1) Working mission statement
2) Framework has specific meaning as a word
3) Balanced decision making in terms of Sustainable means Social - Economic - Environmental
4) Land Contamination has no statutory meaning and include decision making on groundwater issues associated with land contamination.
5) Development used in global sense not with narrow meaning of 'Building houses' and includes sustainable land-use (e.g operational refinery)

SuRF
SUSTAINABLE REMEDIATION FORUM UK

OPEN FORUM

- First Open Forum meeting, next in November and February 09
- Open to all
- Steering Group to share progress
- CL:AIRE to have SuRF area on website
- Chance to influence direction
- Solicit ideas to defining the work plan
- Not a talking shop, must deliver tangible outputs in March 09
- Transparent process consultation all the way

SuRF
SUSTAINABLE REMEDIATION FORUM UK

PROFILE

- **Special Sustainability Sessions** at:
  - Battelle 08 **www.battelle.org/environment/er/conferences/**
  - CONSOIL 08 **www.consoil.de** Milan, Italy 3 - 6 June 08
    - **Invited speakers from UK & US SURF & Industry Groups**
    - **Panel Discussion**

SuRF
SUSTAINABLE REMEDIATION FORUM UK

THANK YOU FOR YOUR TIME

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Sustainable Remediation: Policy Drivers and Framework

Frank Evans

National Grid

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Outline of Presentation

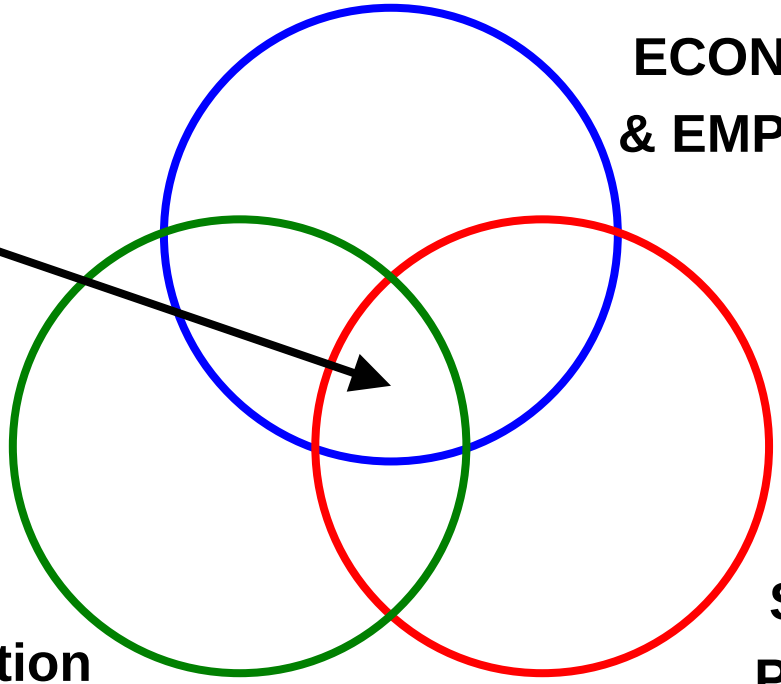
- Sustainable Development: UK Policy
- Sector initiatives
  - Planning
  - Construction
  - Where does remediation fit in?
- Brownfield land lifecycle
- How a framework might be developed

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

What is Sustainable Remediation?

Is this the point that represents sustainability remediation?



ECONOMIC GROWTH & EMPLOYMENT

SOCIAL PROGRESS

ENVIRONMENT
- **Effective Protection**
- **Prudent use of Natural Resources**

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Delivering Sustainable Development

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Overarching Definition

'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (1987, Brundtland)

…to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life without compromising the quality of life of future generation (2005, HM Government, Securing the Future)

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

UK Overarching Policy

- Securing the Future - UK Government sustainable development strategy (2005)
  - Defines Strategy
  - 5 principles
  - 4 priorities
  - New set of indicators

- Replaces 1999 strategy document

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Securing the Future

5 Principles

- Live within environmental limits
- Achieve a just society,
- By means of sustainable economy
- Good governance
- Sound science

- **4 Priorities**
- Sustainable consumption and production
- Natural Resource protection and environmental enhancement
- Building Sustainable communities
- Climate change and energy

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Role of Brownfield

- Priority indicator in terms of UK Sustainable Development
- Creating Sustainable Communities
- 'Brownfield first' objective

In UK policy terms, developing Brownfield and therefore implicitly, the associated remediation is considered 'sustainable'

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Planning Policy

- *Planning for a Sustainable Future*
- Role of Brownfield reinforced
  - Fiscal measures to incentivise
- Planning Policy Statement: Planning & Climate change. Consultation 2006
  - Zero-carbon development
  - Lifetime impacts

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Code for Sustainable Homes

- National Standard: Sustainable design and construction
- Developer can be assessed against code: a way of market differentiation
- 1 – 6 star rating system
- Launched as part of package towards zero carbon development

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Carbon Challenge

- Delivered by English Partnerships on behalf of DCLG
- Accelerate house-building industry's response to climate change
- Fast-track creation of new communities
- Testing ground for the Code for Sustainable Homes and the New PPS on climate change

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

UK Waste Strategy

- Includes ex-situ remediation
- Hazardous Waste (Annex C3)
  - Need to reduce volume
  - Encourage sustainable treatment technologies such as bioremediation, soil washing and thermal desorption
- Considering target to halve CD&E wastes going to landfill by 2012
- Recognise landfill may have place

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Sustainable Construction: Context

- Draft strategy out for consultation in July 2007. Plan to launch 2008
- UK Construction industry
  - Value. GDP. Employment
  - Buildings
    - 50% of UK carbon emissions
    - 50% of water consumption
    - 33% of landfill waste
    - 13% of raw material consumption
- Sustainable Development means changing the way we construct

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Sustainable Construction: Milestone Targets

- Procurement – Design – Innovation – Skills
- Health & Safety: Reduce rates
- Zero carbon homes. Energy Performance Certificates
- Reduced water consumption
- Waste: by 2020 – zero waste to landfill

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Sustainable Construction: Land Remediation

- Not address directly
  - Brownfield land regeneration is part of Construction activities (in a political reporting sense)
  - ‘Landfill may be important for some hazardous waste streams’
  - That’s it……..!

    But, when sector report on its use of landfill: remediation activities will be included

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Remediation: Where does it fit in with policy?

- Precedes the Code for Sustainable Homes and Carbon Challenge: Building Homes on development platforms
- Implicitly part of Sustainable Construction Strategy but not referenced as such
- Development stage not directly reference in planning docs
- Ask where does SR fit in?
  - Brownfield Redevelopment = Sustainable
  - Lower waste = Sustainable
  - Zero carbon development = Sustainable
    (focus on construction and occupation of house)

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Remediation: Where does it fit in?

- In regulatory terms, falls between soils, groundwater and waste management
- Remediation tends to address a waste legacy: a past unsustainable practise
- Brownfield redevelopment is considered the greater good
- Minimising waste and minimising carbon emissions not always achievable.

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Political Dimensions

- Sustainable remediation decision influenced by political and regulatory boundaries
  - Risk acceptance
  - Financial measures
  - European legislation

- What may be most sustainable course of action unacceptable in regulatory terms

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

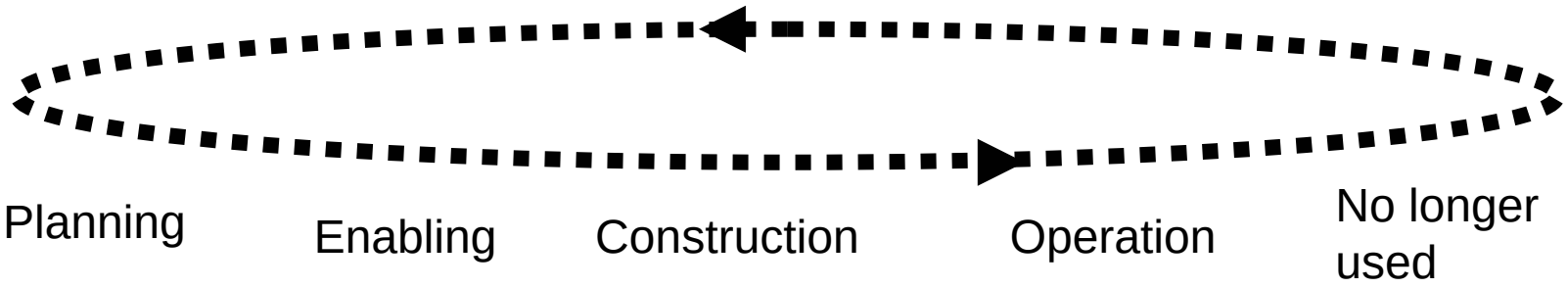
Sustainable land-use

- Any site is a parcel of land that is somewhere in a life-cycle
- Brownfield land is in at least a 2nd phase of lifecycle

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Sustainable land-use



Avenue Coking Works

Dounreay

Wind farms

Olympics Site

LNG Terminal

Millennium Dome

Reclaimed salt marsh

Operational Industrial Facility

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Sustainable land-use

Planning | Enabling | Construction | Operation | No longer used

Planning Policy Statement

Code for Sustainable Homes
EP Carbon Challenge

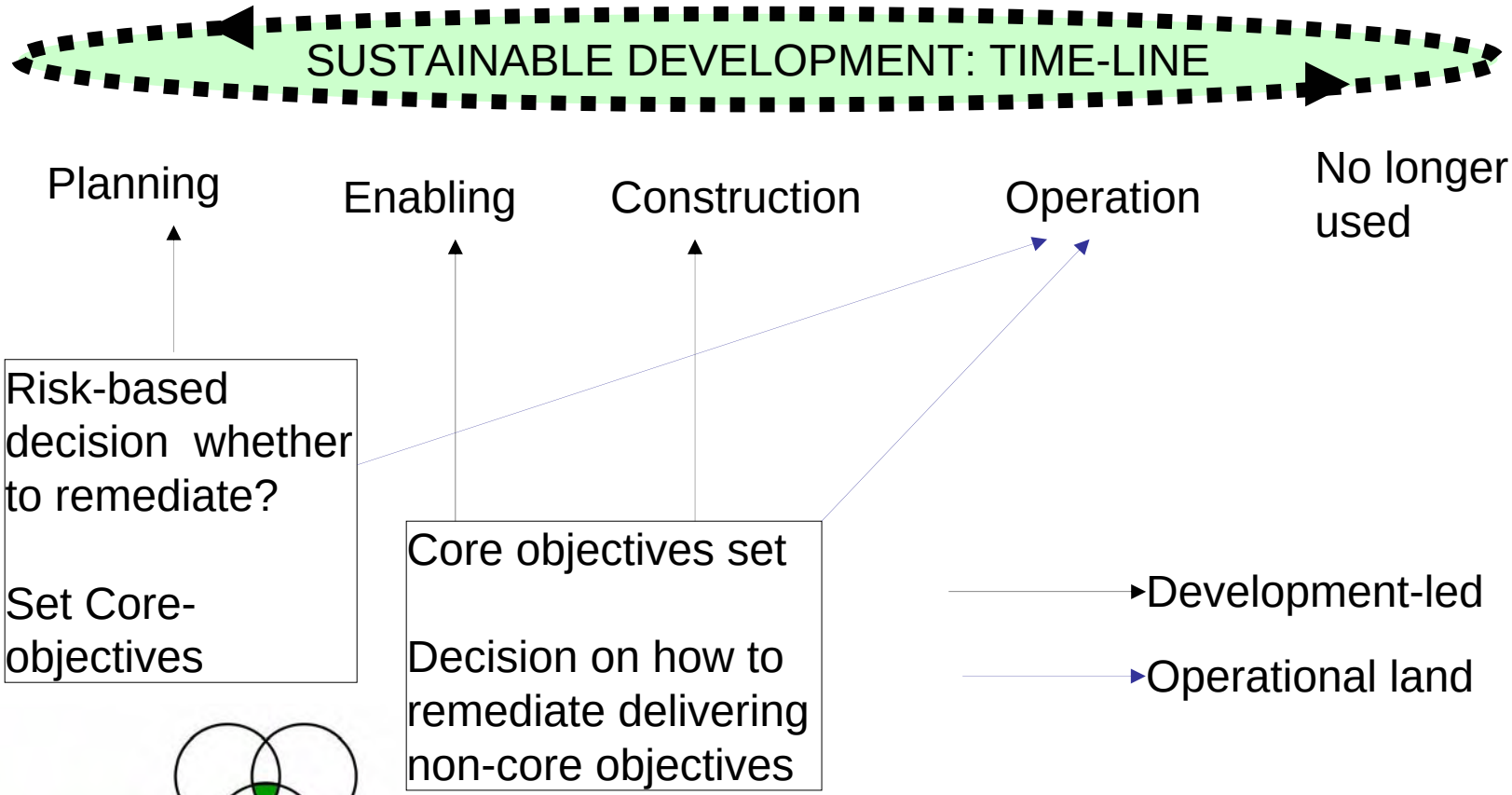
Sustainable Construction

Securing our Future: UK Governments Sustainable Development Strategy

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Sustainable Remediation



SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Core vs Non-core Objectives

- Remediation decision-making has several points at which the sustainability of scheme can be considered
- Whether to remediate? Land-use decision
  - CORE objectives
  - e.g. residential, on-going refinery, retain as woodland
- How to remediate?:
  - NON-CORE objectives
  - E.g. bioremediation, in-situ thermal etc..
- Operational land: Within an operation window under permit

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

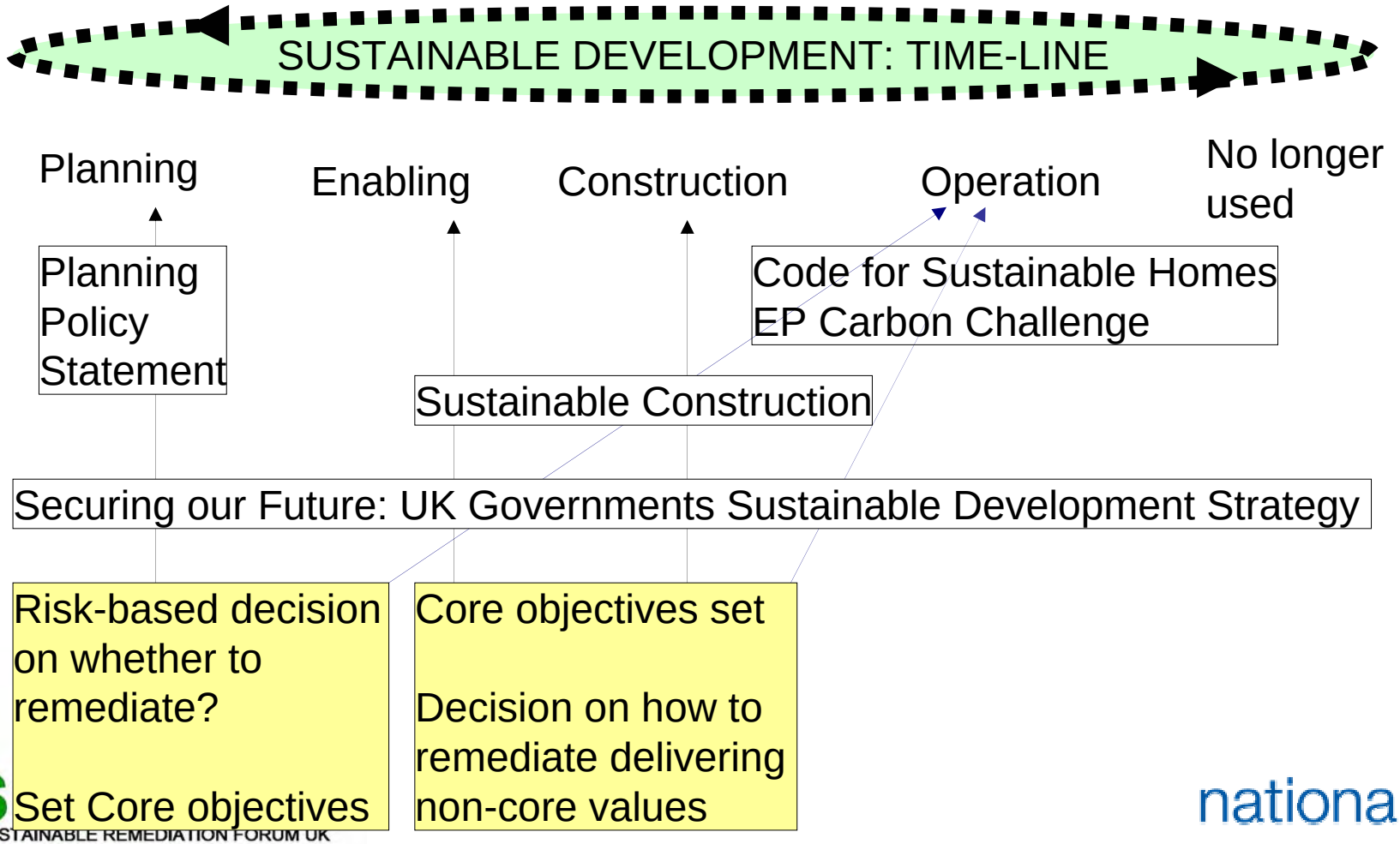
What is Framework?

- CLR11 is a framework
- Model procedures for managing land contamination
- Technical framework for structured decision-making
  - Defines stages, record decisions
  - Processes and procedures
  - Flow diagrams

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Basis for a Framework?



SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Basis for a Framework?

- Technical framework for structured decision-making: defines stages, record decisions, processes and procedures
- Links to decision-making during lifecycle of a property (a time and space boundary)
- To reflect different decision points for considering sustainability
- Recognise that some ‘sustainability’ decisions are implicitly made (e.g. planning permission)
- Political and regulatory constraints
- Role of risk assessment and Cost Benefit Analysis
- **Must be verified – case studies, testing**

SuRF
SUSTAINABLE REMEDIATION FORUM UK

nationalgrid

Sustainable Remediation in the US: Progress so Far

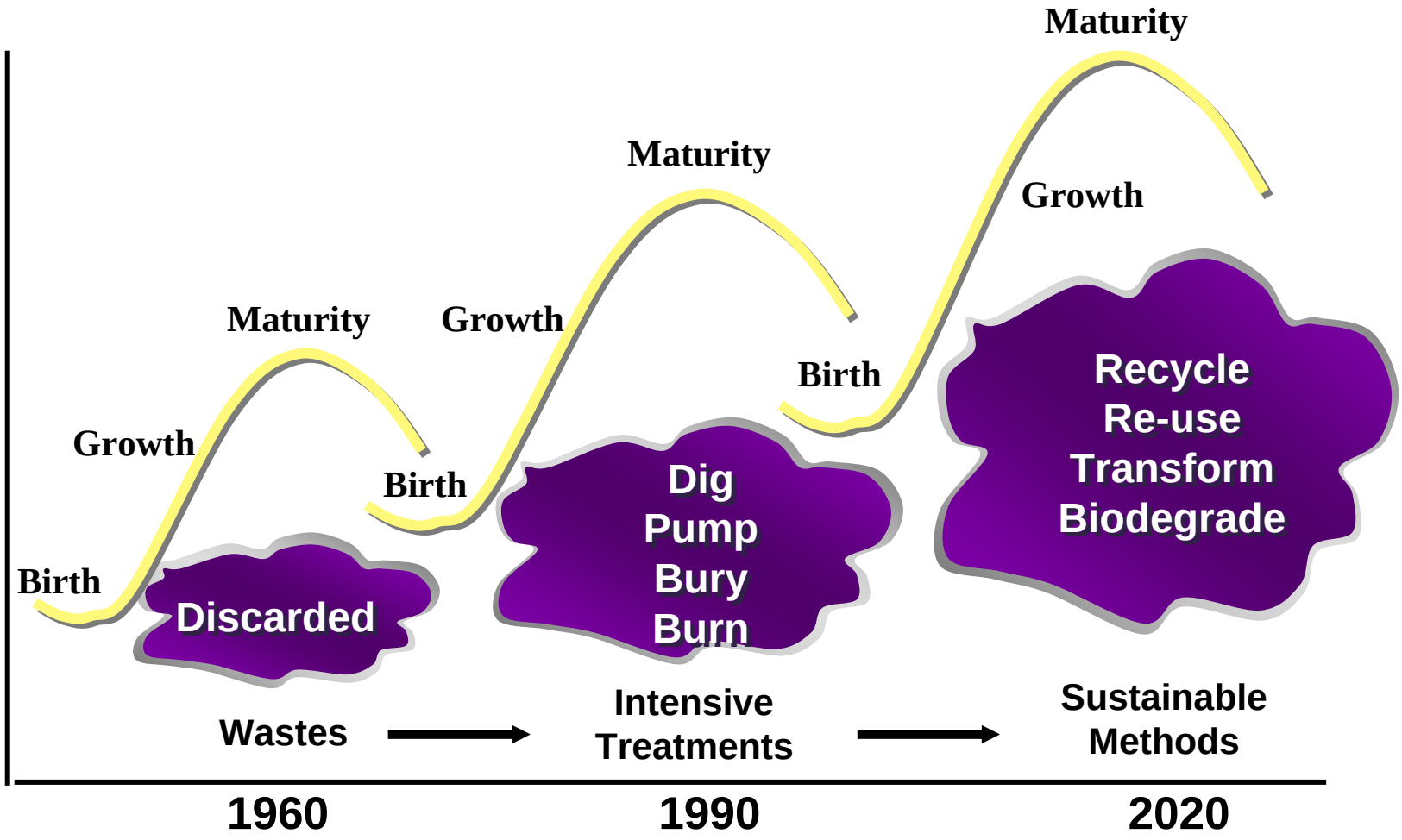
David E. Ellis, Ph.D.
DuPont Engineering

SURF UK Meeting
May 13, 2008

The significant problems we face cannot be solved at the same level of thinking we were at when we created them.

Albert Einstein

Transforming Our Thought Processes



DuPont's Sustainable Remediation Principles

In fulfilling our obligation to remediate sites to be protective of human health and the environment we will embrace sustainable approaches to remediation that provide a net benefit to the environment.

To the extent possible, these approaches will:

- **Minimize or eliminate energy consumption or the consumption of other natural resources**
- **Reduce or eliminate releases to the environment, especially to the air**
- **Harness or mimic a natural process**
- **Result in the reuse or recycling of land or otherwise undesirable materials**
- **Encourage the use of remedial technologies that permanently destroy contaminants**

The Sustainable Remediation Forum (SURF)

Mission Statement:

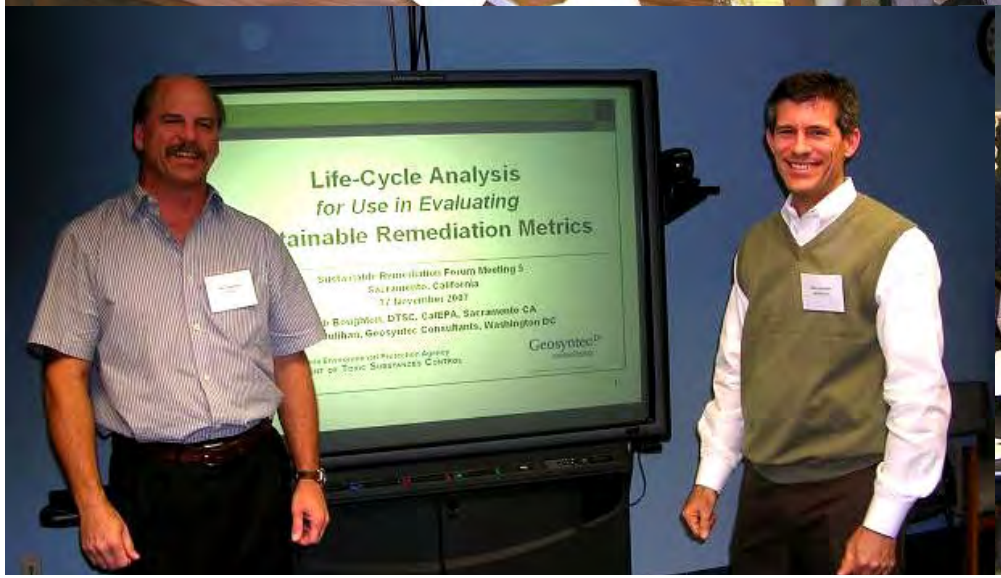
To establish a framework that incorporates sustainable concepts throughout the remedial action process, that provides long-term protection of human health and the environment, and that achieves public and regulatory acceptance

Open meetings. Inviting State and Federal regulators, academia, industry, consultants, and advocacy groups

Six meetings so far, another scheduled for June

Developing a common language, evaluating estimation tools, reviewing real world projects

Public Engagement – Sustainable Remediation Forum



How SURF Operates

- Membership in SURF is based upon contribution of effort
- SURF meets quarterly at locations hosted by volunteer organizations
- Meeting facilitation and recording are provided gratis by DuPont
- Meeting lengths vary, but one and a half days seems optimum
- A sustainability theme is selected for each meeting.
- Ground rules for our SURF meetings include:
  - Everyone is expected to show respect for others and their opinions
  - Participants are expected to be familiar with the notes of earlier meetings
  - Dress is informal – no neckties
  - SURF is a marketing-free zone

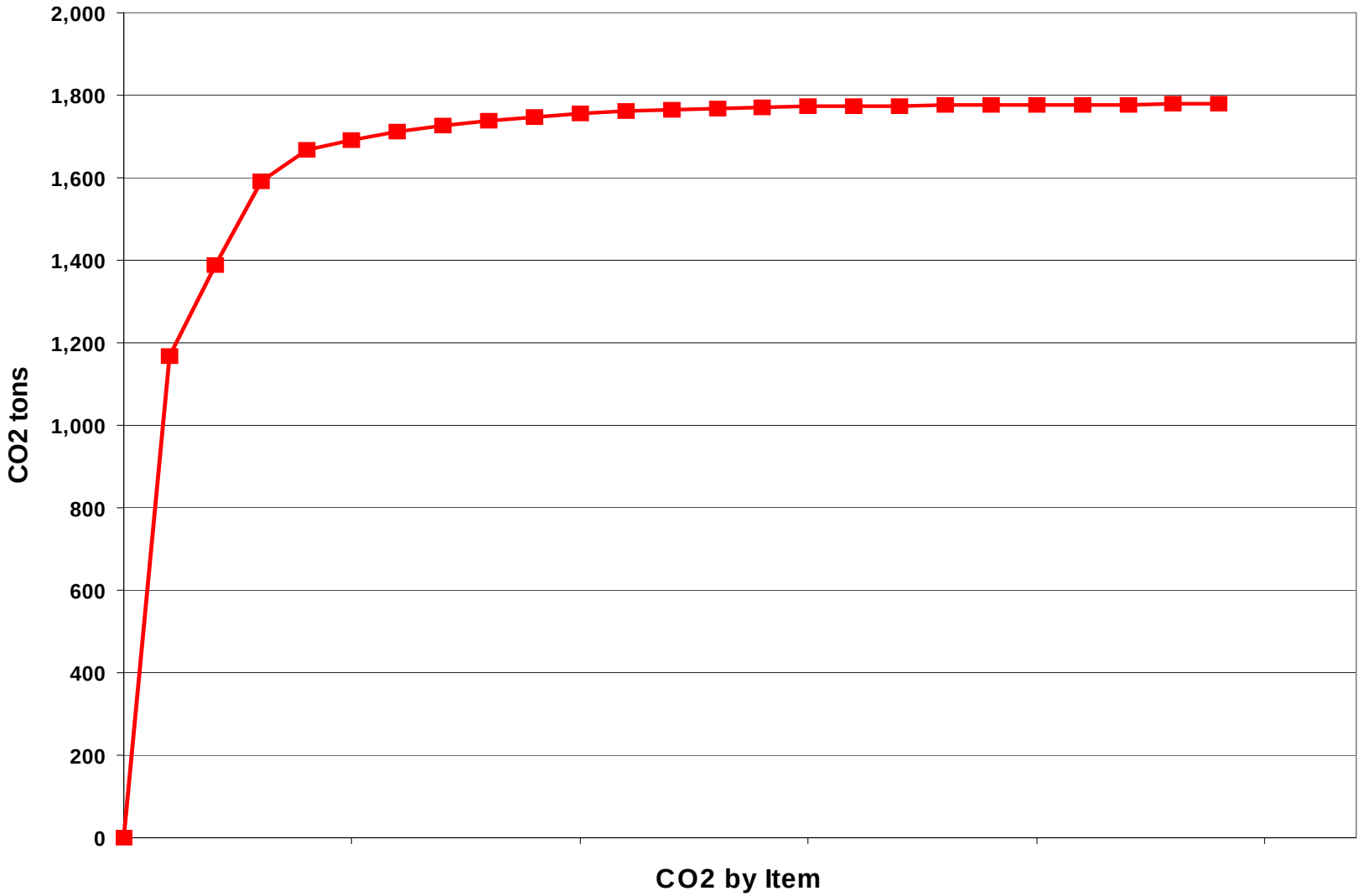
How SURF Operates

- Membership in SURF is based upon contribution of effort
- SURF members are asked to be active contributors to projects. This includes a significant amount of time working on our projects *in addition to time spent attending meetings*
- SURF finds that it is very helpful if there is continuity from member organizations - i.e. the same person represents them at all meetings
- Agendas are created by ad hoc committees who volunteer at the end of each meeting
- Presentations are selected based on short abstracts
- Team building is done by everyone sharing something addressing a secondary theme

How SURF Operates

- SURF is evolving from an information sharing group to a working group.
- Less and less of our time together is used for presentations
- Increasing amounts of our time together is spent in work groups charged with specific tasks
- Projects include:
  - A sustainability comparison of four remedies on a hypothetical site
  - A white paper to define the state of practice in sustainable remediation
- Examples follow

SURF Site Exercise - Cumulative CO_2 Chart



SURF Site Exercise - CO_2 Calculations

CO2 item	Pounds CO2)	Cumulative tons)
Carbon Change out (1 per year - 6 tons)	2,338,200	1,169
Building heat, cooling, lighting, 4 months 5 HP = 5 kwh	438,300	1,388
Commuting Distance - 20 miles each way	406,848	1,592
Monitoring GW 240 miles / event	150,221	1,667
Pumping	45,845	1,690
Construction Debris Disposal	45,680	1,713
debris disposal (roll-off)	26,856	1,726
Pre-manufactured steel / insulated bldg (20' by 40')	22,000	1,737
Bldg Foundation	20,302	1,747
Contaminant degradation	20,000	1,757
Bldg floor slab (6")	8,565	1,761
main header and discharge header , 4" PVC	8,190	1,766
Carbon Tank foundations	5,139	1,768
Drill Rig	5,036	1,771
leased vehicle	3,443	1,772
laterals, 2" PVC	3,406	1,774
Chain link fence	1,468	1,775
Silt fence	1,290	1,775
Leased Vehicle	1,148	1,776
Leased Vehicle	1,148	1,777
Leased Vehicle	1,148	1,777
Leased Vehicle	1,148	1,778
Leased Vehicle	1,148	1,778
Riser, 1.25" PVC	452	1,778

"Integrating Sustainability Principles, Practices and Metrics into Remediation Projects"

The purpose of the SURF white paper is to collect, clarify, and communicate the thoughts and experiences of SURF members on sustainability in remediation

Introduction and Scope - Dave Ellis & Paul Hadley

Current Status of Sustainability in Remediation – Dick Raymond

Sustainability concepts and Practices in Remediation – Stephanie Fiorenza

A Vision for Sustainability – Paul Favara

Impediments and Barriers – David Major

Success Stories – Brandt Butler

Summary, Conclusions, and Recommendations – Dave Ellis & Paul Hadley

DuPont / EPA Sustainability Pilot

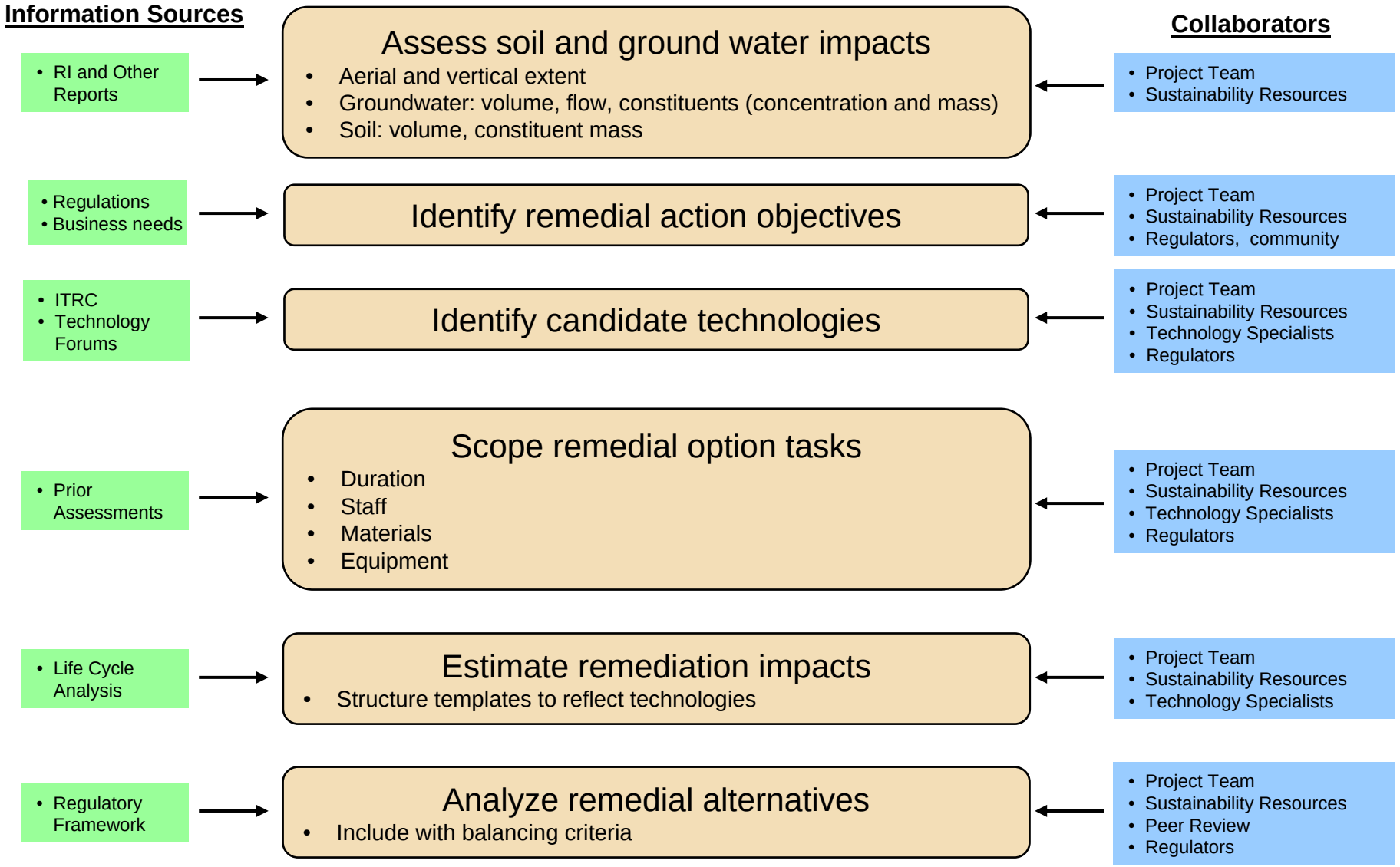
DuPont is working with regulators to evaluate sustainability at a real site. Our goal is to allow the agencies to understand the process

DuPont volunteered our site in Martinsville, VA

We are working with EPA Region 3 and VA DEQ to evaluate three waste units that are ready for remedial action

We studied a previously remediated SWMU to illustrate the process and tools

DuPont's Framework for Sustainable Remediation Assessment



Proposed Sustainability Credits and Debits

Media or Impact	Credit (+)	Debit[1] (-)
Greenhouse Gas (CO_2 equivalents)	❑ Carbon sequestration ❑ Destroy compounds with high GHG equivalents	❑ Generated by fuel consumed during activity ❑ Generated by manufacture of consumables
Resource Use		
Soil	❑ Reused-recycled soil or soil-substitute (e.g. crushed concrete)	❑ All soil required ❑ Off-site disposal
Land	❑ Beneficially reused (brownfields, wind field, solar field) ❑ Ecological resource preservation or improvements (e.g. wetlands)	❑ Permanently deed restricted
Water	❑ Reused-recycled	❑ All water used or captured for treatment ❑ Water for dust control
Energy	❑ Renewable energy generated on-site	❑ Required by remediation activity ❑ Required for manufacture of consumables
Occupational Risk	❑ Controls or measures to reduce hazardous exposure	❑ Exposure hours on-site ❑ Exposure hours for travel and delivery ❑ Road miles traveled for personnel and consumables

Unit H1 - Former Finish Oil Disposal Pond

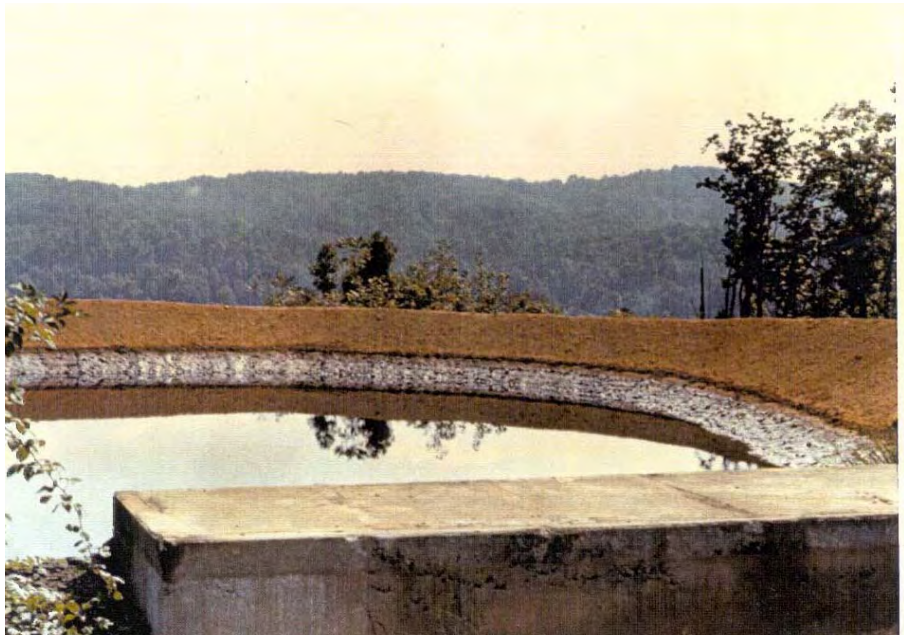
Chlorinated VOCs in soil, soil vapor and groundwater; PCBs, coal ash (arsenic) in soil only.

Former pond filled with coal ash and site soils

Nearly round, approximately 100’ diameter

Residuals impacts 3.5 to 4.5 feet bgs

Then - 1970’s



Now - 2004

Unit H1 Potential Remedial Measures

- **Source remediation – mitigate groundwater impacts**
- **Soil**
  - ****Excavation (source material removal) and landfill**
  - ****Cap (geomembrane)**
  - ***SVE**
  - In-situ Stabilize
  - ****Chem-reduction - ZVI/Clay optimized treatment**
  - Enhanced bio
  - In-situ thermal & vapor capture
  - **(--)Excavate & Ex-situ thermal treatment**
  - **(--)Excavate & Chem-ox (not effective chlorinated orgs & high oil demand)**
  - Excavate and soil wash
- **Groundwater – Meet MCL's (GPS) in plume and surface water standards in discharge to river**
- **Groundwater (source area or river)**
  - ***MNA**
  - **(--)PRB – Iron (river)**
  - ***Enhanced bioremediation**
  - ***Pump and treat (strip and carbon adsorption) – source and river**
  - Air sparge w/vapor capture (akin to Unit G) – option w/windmills - source
  - In-situ chem-ox (source)
  - In-well stripping

Example Table 1 – Technology Screening

Source Area Remedies	Protect HH &E	Control Sources	Meet Cleanup Objectives	Selection
Bio-barrier	Unlikely	Unlikely, source concentrations high (bio not very effective at high concentrations)	Unlikely	**Poor**
Bioventing	Unlikely	Uncertain, oxygen demand will be very high due to waste oil in source	Uncertain. Reduces some constituents, but source concentrations likely inhibit degradation.	**Poor**
Capping	Yes, when combined with MNA	Yes, by eliminating migration	Yes (constituents remain)	**Good**
Chemical Oxidation (In Situ)	Unlikely	Uncertain, oxygen demand will be very high due to waste oil in source. CFC-11 expected to be highly resistant to oxidation	Uncertain. Other constituents, including waste oils may interfere with reaction	**Poor**
Chemical Reduction	Unlikely	Source is already highly reduced. CFC-11 appears resistant to reduction.	Uncertain. Other constituents, including waste oils may interfere with reaction.	**Poor**
Excavation & Off-Site Disposal	Yes, when combined with MNA	Yes, by removal	Yes (complete removal)	**Good**
Ex-Situ Thermal Desorption	Yes, when combined with MNA	Yes, by treatment	Yes (some constituents remain, metals)	**Good**
In Situ Bioremediation	Unlikely	Unlikely, No evidence of degradation to CFC-11	Unlikely	**Poor**
Options graded "**Good**" are considered adequate treatment options and are passed onto the selection screening, which factors in balancing criteria.				
Options graded "**Fair**" are not recommended and would only be considered in the absence of more effective options.				
Options graded "**Poor**" are either not applicable to the treatment of the constituents present or there is such great uncertainty regarding the effectiveness of the option at this location				

Example Table 2 - Remedy Selection Matrix

	Protect HH &E	Control Sources	Meet Cleanup Objectives	Long-term reliability	Reduction of T, M, V	Short-term effectiveness	Ease of implementation	Cost	Community acceptance	State acceptance	Sustainability
Source Area Remedies											
ZVI-Clay In-Situ Treatment	Yes, when combined with MNA	Yes, by treatment	Yes	High	High due to treatment	Moderate 3,800 hours 9,900 miles	Moderate	$$	Highly acceptable	Highly acceptable	CO_2 182 ton Adj. CO_2 41 ton Efficiency: 0.003
Excavation & Off-Site Disposal	Yes, when combined with MNA	Yes, by treatment	Yes	High	None	Moderate 4,400 hours 109,000 miles	Simple	$$	Acceptable	Acceptable	CO_2 251 ton Adj. CO_2 251 ton Efficiency: 0.000
Ex-Situ Thermal Desorption	Yes, when combined with MNA	Yes, by treatment	Yes	High	High due to treatment	Low 7,100 hours 11,800 miles	Complex	$$	Acceptable	Acceptable	CO_2 592 ton Adj. CO_2 451 ton Efficiency: 0.0008
Soil Vapor Extraction	Yes, when combined with MNA	Yes, by treatment	Yes	High	Moderate	Low 6,700 hours 17,000 miles	Moderate	$$	Highly Acceptable	Highly acceptable	CO_2 677 ton Adj. CO_2 536 ton Efficiency: 0.0007
Capping	Yes, when combined with MNA	Yes, by treatment	Yes	Moderate	Moderate, eliminate mobility	High 820 hours 1,600 miles	Simple	$	Acceptable	Acceptable	CO_2 24 ton Adj. CO_2 24 ton Efficiency: 0.000
Groundwater - MNA in addition to those listed above (assessment not included with above)											
MNA	Yes, mitigate migration	N/A	Yes	Yes	High	1,000 hours 8,600 miles	Simple	$	Acceptable	Acceptable	CO_2 5 ton Adj. CO_2 0 ton Efficiency: 0.09

Sustainable Remediation Process Observations

- Only remedies that are fully protective of human health and the environment should be considered
- Considering sustainability changes our thought process
- Our engineers worked together more closely, quality improved
- Some unexpected and very creative remedies have been proposed. Some are less costly, others more costly
- Processing potential remedies and sustainability together with agencies allows more efficient decision making

Remediation Sustainability Challenges

- Build sustainability into a variety of regulatory regimes
- Balance efforts between source and plume cleanups
- Develop sustainability methods useful for big and small sites
- Mitigate the negative impact of non-degradation policies on ground water remediation
- Be careful about the trade you are making - between ground water pollution vs. global warming

Discussion

If you don’t know where you are going, you might end up someplace else.

Yogi Berra

Soil and Groundwater Risk Management, Sustainability and Net Environmental Value

David Reinke – Shell Global Solutions (UK)

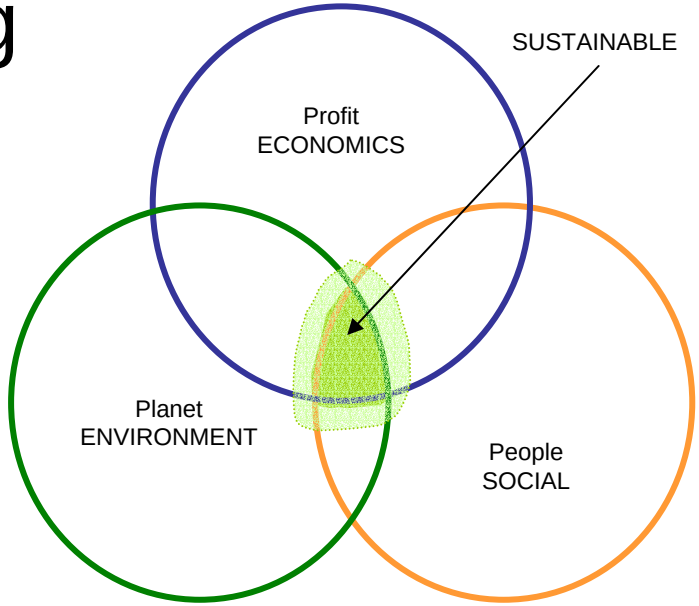
Philippa Scott – Shell Global Solutions (UK)

Stuart Arch – WorleyParsons Komex

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Contents of Presentation

- Balanced Decision Making Concept
- Cost Benefit Analysis (CBA) Approach
  - Example Project
  - Potential for Application
- Request for Input



SuRF
SUSTAINABLE REMEDIATION FORUM UK

Balanced Decision Making

- Risk based management is the key first step to sustainability in addressing land contamination
- Identified risks need to be managed
- How do you balance the economic, social, and environmental considerations of proposed corrective actions?
  - Qualitative (yes/no, good/bad)
  - Quantitative
    - Multi Criteria Analysis 0.5 x  + 2 x  = 3 x 
    - Cost Effectiveness Analysis
    - Cost Benefit Analysis (CBA) $$$ 
    - Net Environmental Value (NEV)

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Cost Benefit Analysis (CBA)

- UK Environment Agency existing guidance on assessing the costs and benefits of soil and groundwater remediation
- Working with WorleyParsons Komex
  - Co-authored UK CBA guidance on groundwater remediation
  - Prof. Paul Hardisty co-authored book “The Economics of Groundwater Remediation and Protection”
- CBA (including externalities) used on refinery, gas works, and fuel storage sites in UK
- Assess potential for application of this approach for incorporating sustainability into remedial decision making (i.e. is this a suitable tool/framework?)

SuRF
SUSTAINABLE REMEDIATION FORUM UK

CBA – Using the Language of Money

$$NPV = \sum_{0}^{t} \left[\frac{(B_p + B_x) - (C_p + C_x)}{(1+i)^t} \right]$$

NPV = Net Present Value ($)

t = Time (years)

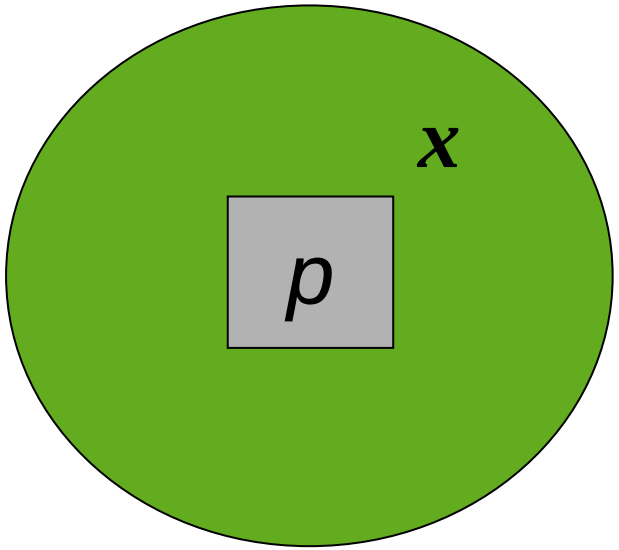
B = Benefit ($)

C = Cost ($)

i = Discount rate (%)

P = project (internal)

x = society and environment (External)



Slide courtesy of:

WorleyParsons Komex

resources & energy

SuRF
SUSTAINABLE REMEDIATION FORUM UK

CBA – Approach

- High level economic evaluation
- Compares a range of remedial approaches
- Monetize risk / damage averted
- Different approaches accrue different benefits / risks
- Which approach gives greatest net benefit to society?

Slide courtesy of:

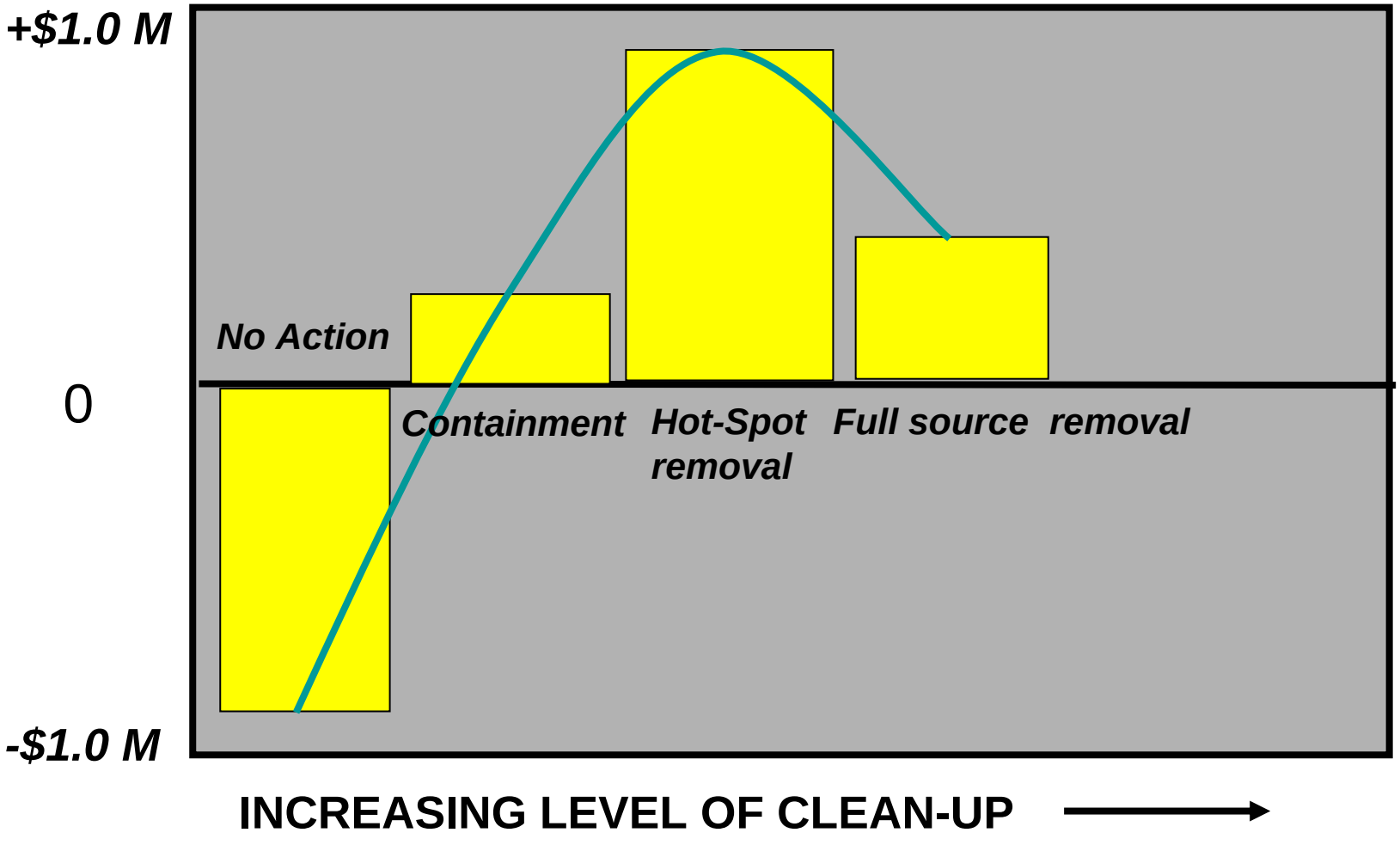
WorleyParsons Komex

resources & energy

SuRF

SUSTAINABLE REMEDIATION FORUM UK

CBA – Finding the Economic Optimum



SuRF
SUSTAINABLE REMEDIATION FORUM UK

CBA – Types of Costs/Benefits

	Costs	Benefits
Private	Borne by problem holder: • Labour • Plant • Materials • Energy • Reputation damage	Accrued by problem holder: • Property value increase • Fines/claims avoidance • Reputation enhancement
External	Borne by third parties: • Air emissions from remediation (CO_2, SO_x, NO_x, PM, VOCs) • Landfill space used by soil disposal	Accrued by third parties: • Improved water quality • Ecosystem protection • Human health protection • Property value increase

SuRF
SUSTAINABLE REMEDIATION FORUM UK

CBA – Categories of Costs/Benefits

	Costs	Benefits
Economic	Labour Plant Materials Energy Reputation damage Property value Permits Fines/claims Waste disposal Lost production	Property value Fines/claims avoidance Reputation enhancement
Environ-mental	Air (CO_2, SO_x, NO_x, PM, VOCs) Land (landfill space, quarry, soil quality) Water (groundwater quality & quantity, surface water quality) Ecology	Land (improved soil quality) Water (improved groundwater and surface water quality) Ecology
Social	Health and safety Odour Visual amenity Traffic congestion Noise Vibration	Human health protection Employment Community building (redevelopment of derelict land)

SuRF
SUSTAINABLE REMEDIATION FORUM UK

CBA – Example Project

- Retail site operated since 1970's
- Product loss in 2002 (~7,000L petrol)
- Remediation
  - Pump & treat + dual phase extraction
  - Met "interim" target agreed with regulator
    - no measurable free product
    - 50mg/L TPH in groundwater
- Perform CBA to assess sustainability of further actions

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Background – Site Layout

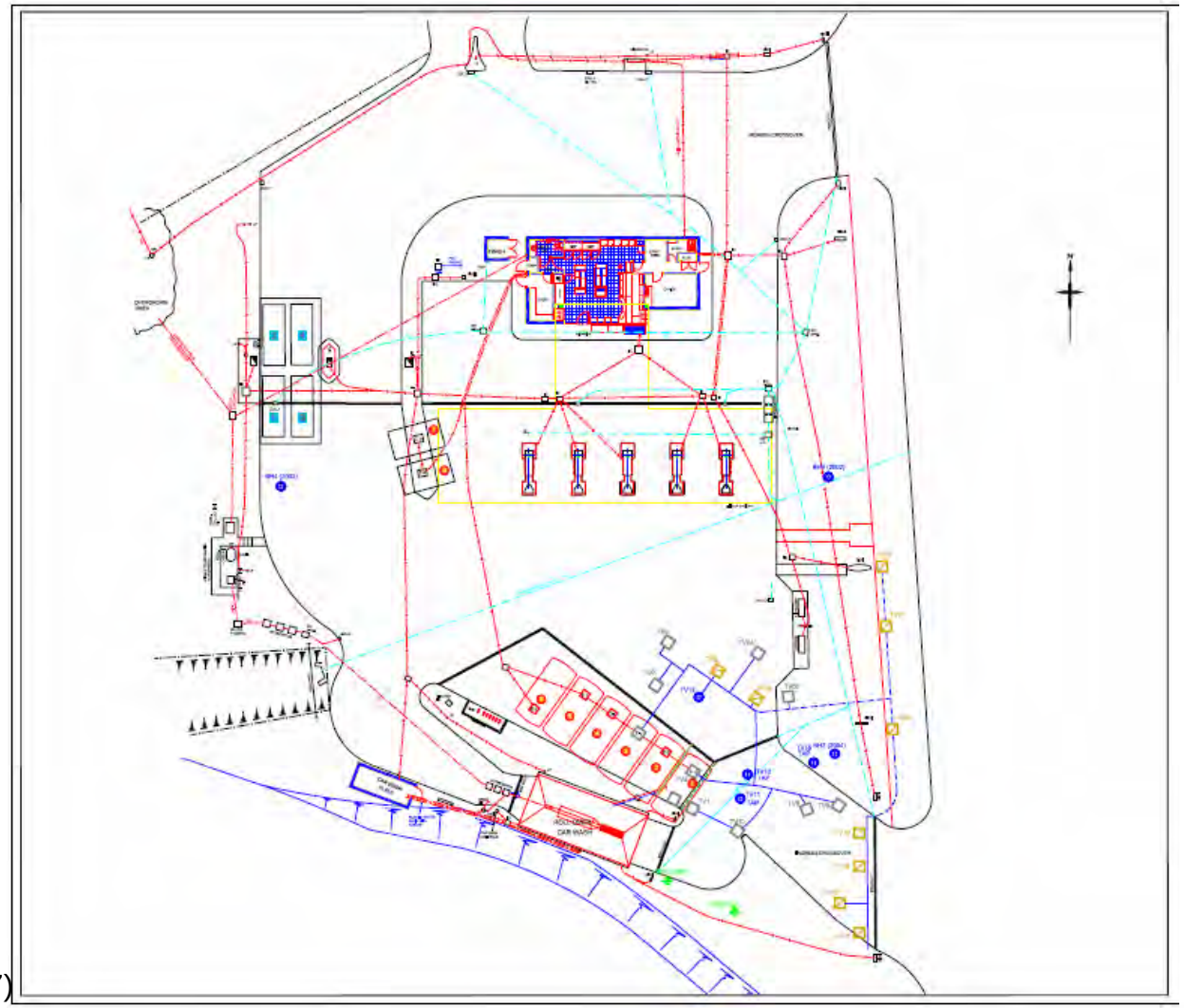


Figure from RSK (2007)

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Background – Site Setting

Figure from RSK (2007)

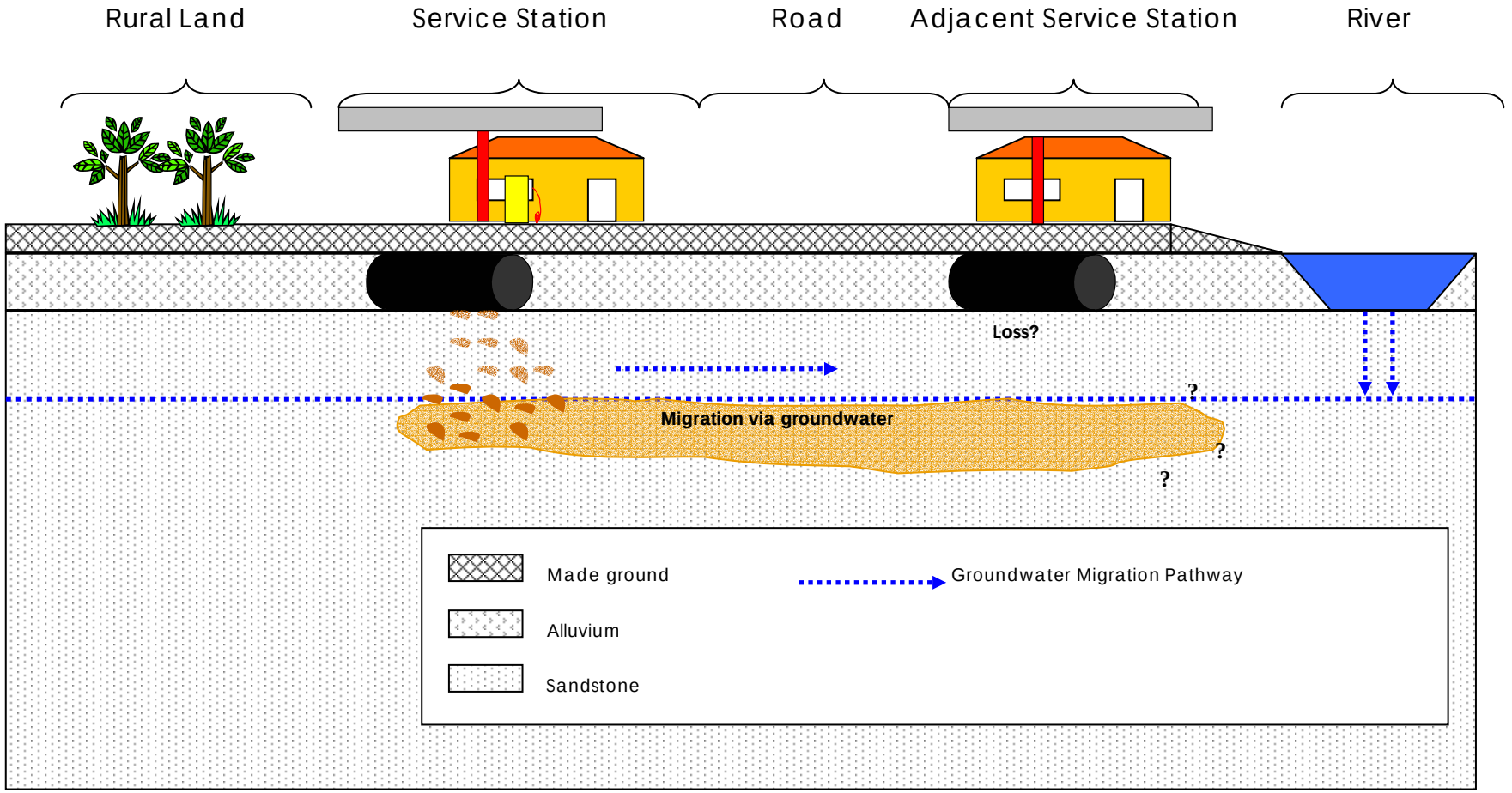
SuRF
SUSTAINABLE REMEDIATION FORUM UK

Background – Geology/Hydrogeology

- Geology
  - Fill material (<1.8m thick), overlying
  - Alluvium comprising clay and gravel recorded to depths of up to 2.7m bgl, overlying
  - Sandstone bedrock
- Hydrogeology
  - Groundwater ~ 9m below ground
  - Groundwater flows south-east
  - Closest abstraction bore ~ 1.9km
- Surface Water
  - River ~ 180m east of site

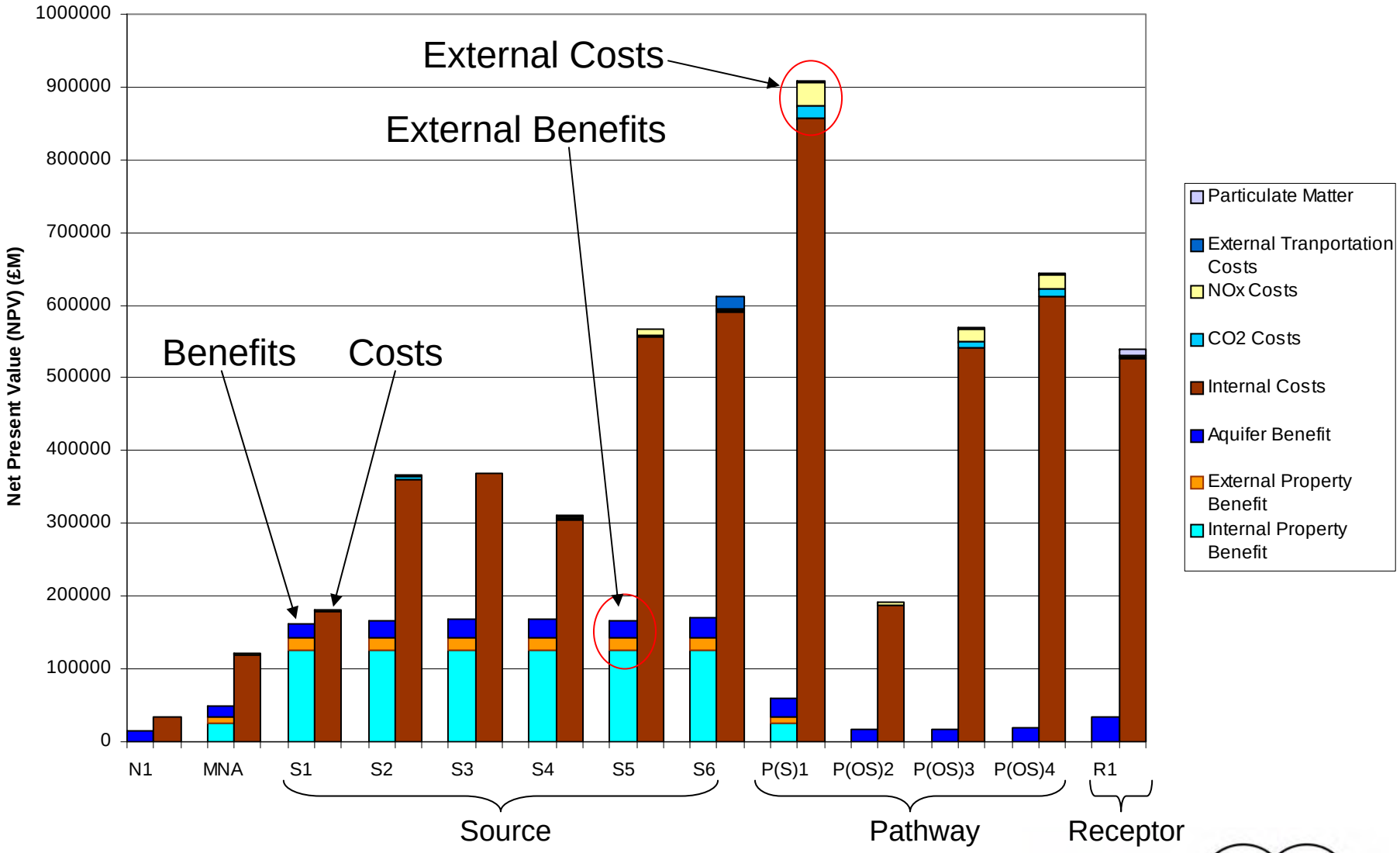
SuRF
SUSTAINABLE REMEDIATION FORUM UK

Conceptual Site Model (CSM)



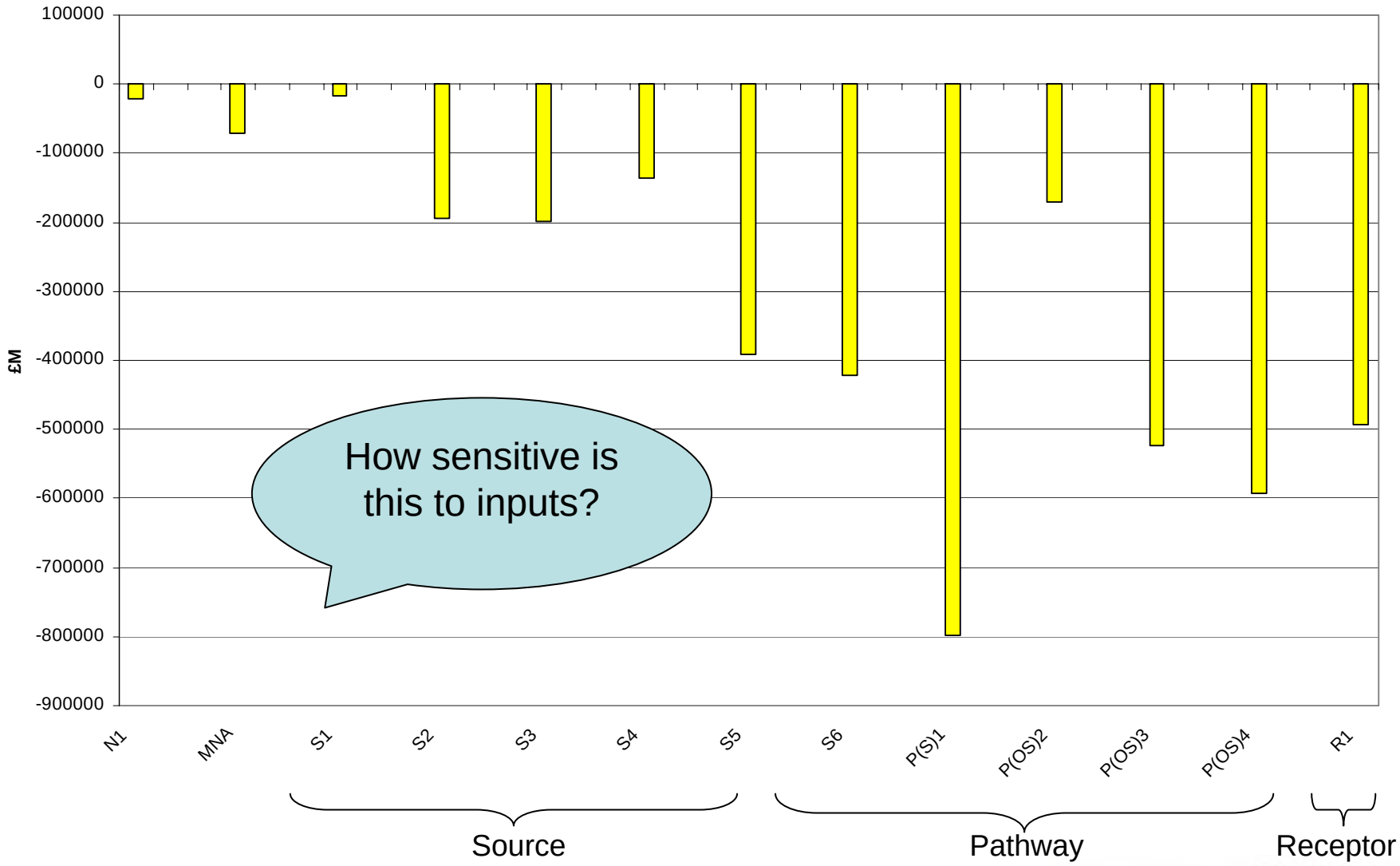
SuRF
SUSTAINABLE REMEDIATION FORUM UK

Project Results – Costs and Benefits



SuRF
SUSTAINABLE REMEDIATION FORUM UK

Project Results – Net Benefit



SuRF
SUSTAINABLE REMEDIATION FORUM UK

Other Project Examples

- Refinery
  - Initial advocated approach of remediation of a local area within a larger facility
  - More sustainable if the whole facility is considered at time of decommissioning
  - CBA helped stakeholders reach agreement
- Distribution Site
  - Remediation proposed at site closure for redevelopment – future site use to be determined
  - CBA undertaken to support internal business decision

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Potential for Application

- Need to consider sensitivity – helpful for stakeholder engagement (facility, regulator, community)
  - Discount rate
  - Time frame
  - Boundaries
  - Groundwater volume/price
  - Property values
- Monetisation can be difficult / controversial
  - Valuation of groundwater resources
  - Use sensitivity analysis to understand impact of these parameters on overall outcome

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Potential for Application (cont')

- Logical and quantitative approach for balancing economic, environmental and social aspects
- Helps identify what goal is most sustainable, not just how to achieve a particular goal in the most sustainable way
- Common unit of measure – easily understood
- Tiered approach
  - Level of detail proportional to size and complexity of problem

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Summary

- SURF UK collaborating on sustainable remediation decision making
- Trialled CBA
  - Existing guidance
  - Quantitative approach with a common denominator
  - Is a way of incorporating sustainability
  - Shows promise
  - Monetisation can be difficult, but not impossible
- Work will continue – what are your views?

SuRF
SUSTAINABLE REMEDIATION FORUM UK

Thank you

Questions:

Please contact

David.Reinke@shell.com

SuRF
SUSTAINABLE REMEDIATION FORUM UK