CIWM

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Landfill Aftercare Workshop

CIWM, Northampton

Wednesday 19th November 2014

Keith Knox & Richard Beaven

Engineering and the Environment

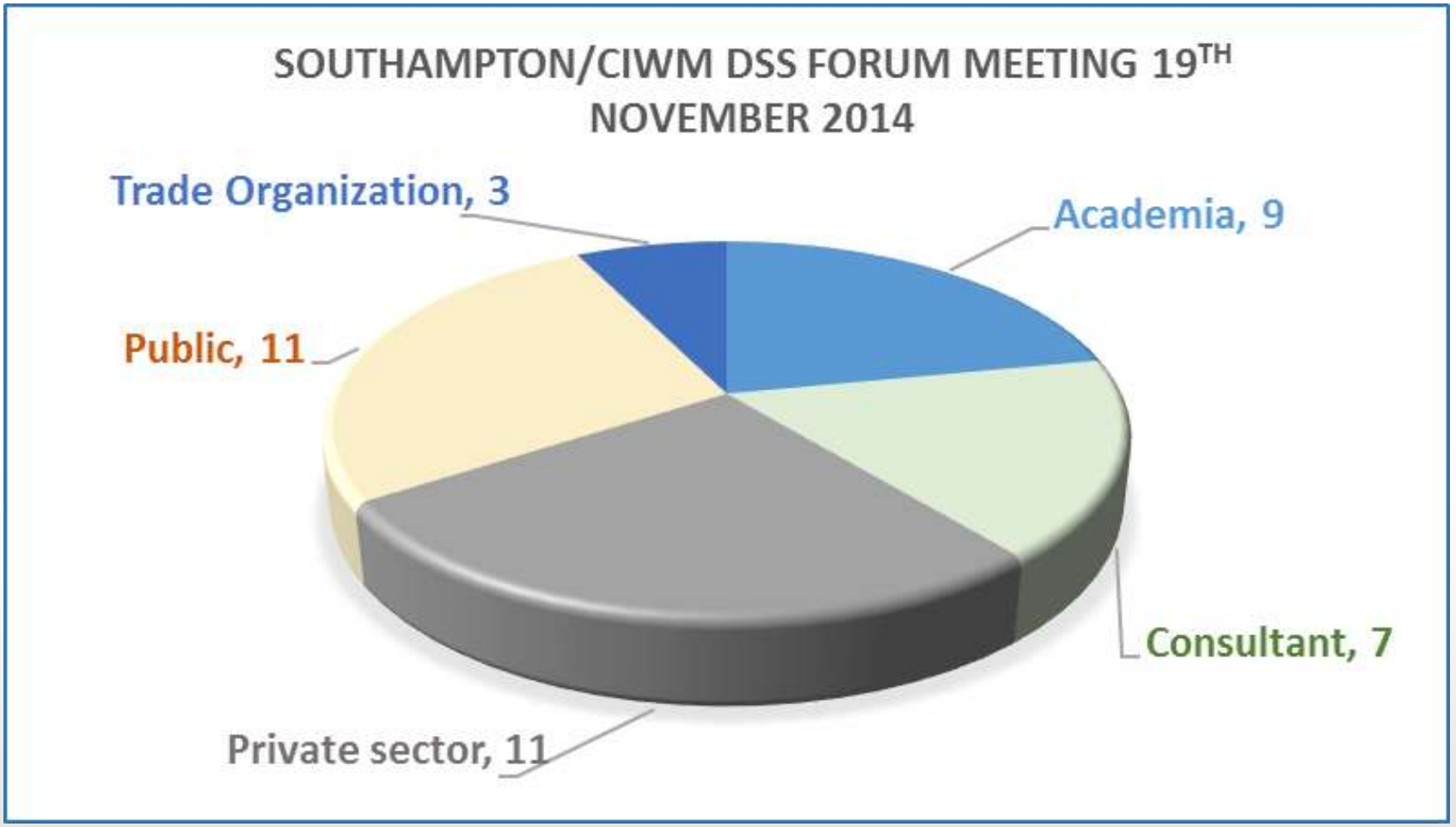
Background to this event

- UoS awarded EPSRC Platform Grant **Processes, resource recovery and remediation of residual wastes**
  - *Development of a decision support systems (DSS) for sustainable landfill aftercare*
  - *Development/promotion of a Sustainable Waste Management Forum - stakeholder engagement*
- Draft DSS created (details to follow)
  - *Provide opportunity for stakeholder feedback and input at an early stage*

Role of Forum?

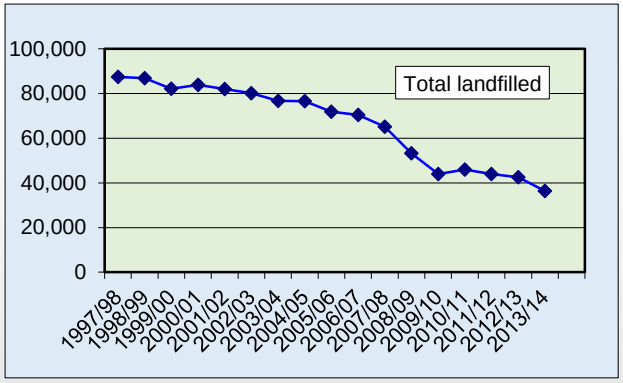
- Exchange ideas between a wide range of stakeholders on technical and scientific aspects of Landfill aftercare
  - e.g. this meeting and its technical presentations
  - Central issue of aftercare periods of centuries
- Provide input into DSS development – commentary and content
- Highlight areas where there is insufficient technical information, that could be addressed by research
- Be open to any interested party
- Terms of reference?

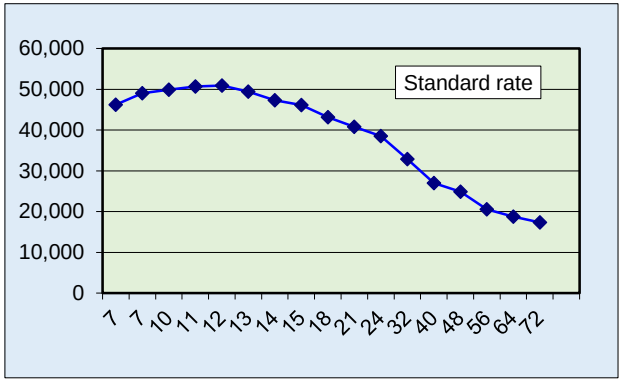
Attendees at today's Forum meeting

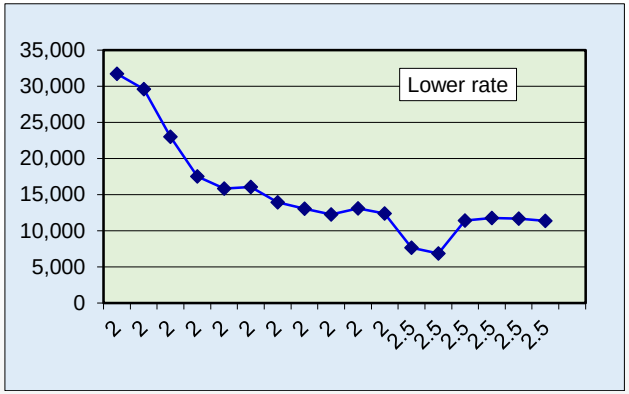


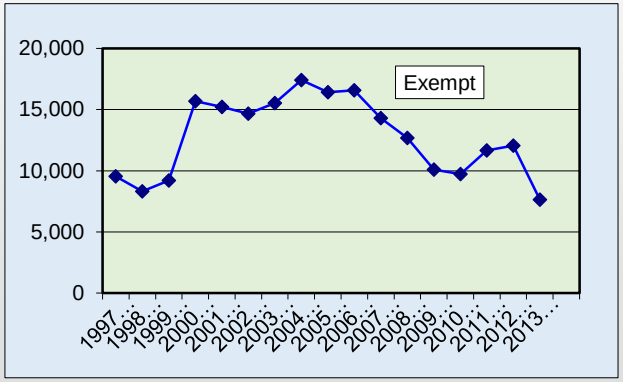
Continuing need for technical interest in landfill

- **Not dead, just lost a bit of weight**
- **Leachate and gas from 'new' mix of wastes?**
- **Hydraulic characteristics of 'new' mix of wastes?**
- **Legacy of closed sites: ~2000 sites in UK?**









Programme

10:00 Welcome and Introduction to the meeting
Steve Lee, CIWM; Professor William Powrie, University of Southampton
Programme for the day; housekeeping etc.

10:15 Introduction to decision support systems, LANDSS and the Forum
Richard Beaven and Keith Knox, University of Southampton
Why a DSS?
Terms of reference for the Soton landfill DSS [environmental control, sustainability, aftercare]
Role of Forum: usefulness and usability
Draft structure of LANDSS *[RPB]*

10:45 Draft exemplar of LANDSS for one topic: leachate recirculation
Keith Knox, University of Southampton

11:15 TEA, COFFEE, take into:

11:20 Break out group exercise
All: arrangements to be announced on the day
Is the DSS format useful and usable?
List topics that stakeholders would like to see in the DSS

12:00 Feedback and discussion
Keith Knox, University of Southampton

12:30 Presentation: 'A new approach to funding accelerated Landfill Aftercare'
Jan Gronow, Independent Consultant

13:00 LUNCH

14:00 Presentation: 'Beyond the flux box - a simple method for measuring whole site LFG emissions'
Charlotte Scheutz, Technical University of Denmark

14:45 Presentation: 'Clogging of leachate collection systems'
Richard Beaven, University of Southampton

15:30 Wrap up, what next?

CLOSE OF MEETING

Break out groups, overall criteria for LANDSS

Group	Chair	Recorder
1	Jan Gronow	Nick Woodman
2	William Powrie	Keith Knox
3	Chris Murphy	Richard Beaven
4	David Hall	Dave Richards

Topics for discussion in break out groups
Usefulness and usability of the site
How useful is this type of information-based DSS to different groups of stakeholders?
Priorities and relative importance of subject areas to be covered in DSS (retaining focus on aftercare)
Detailed topics within subject areas, what type information would people find most useful?
What level of detail may you want to access?
Structure of DSS – does it work?
Submission of stakeholders' comments and own material: vetting process, discussion board, dialogue, etc.
Links to other DSSs and web sites e.g. LandSim, GasSim, Acumen, etc.

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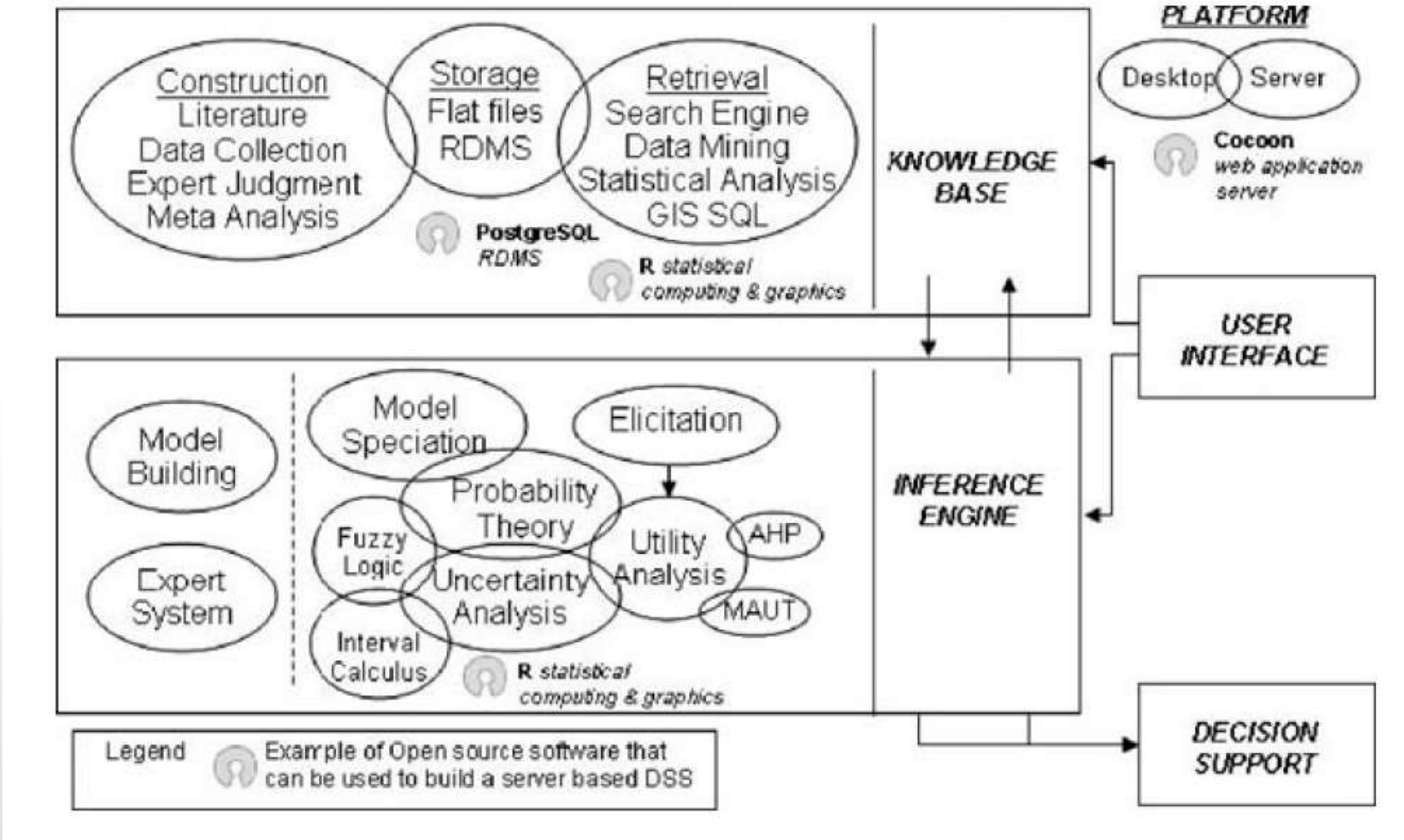
Decision support systems

A DSS is a system for helping to choose among alternative actions

What are Decision Support Systems?

General technical architecture for DSS



Five broad categories of DSS

- communications-driven,
- data-driven,
- document driven (could be a filing cabinet!),
- knowledge-driven (information based)
- model-driven decision support systems.

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Information-Based DSS

- An information-based DSS includes information upon which decisions are supported
- Decision making supported indirectly by providing access to information that is relevant to the decision at hand.
  - Simplest form provides access to textual information, possibly including static tables, pictures, and graphics
  - next level of information-based DSS includes numerical data in addition to information
  - numerical analysis tools might be involved, BUT only as a qualitative component

Model-Based DSSs

- provide numerical solutions that support decision-making
- solutions quantitatively support decision making
- development of a model-based DSS requires consideration of both the problem to be solved and the computational tools that are appropriate or needed.
- examples of existing model based DSS in landfills….

Some existing landfill DSS

GASSIM 2.5

First Forum meeting April 2014

- Small “international” group
- The different DSS systems were discussed
  - Agreed that a prototype of a Knowledge-driven DSS should be produced for next forum meeting
  - concentrate on one small area (recirculation)
- www.southampton.ac.uk/landss
- LANDSS very much a draft for comment!

www.southampton.ac.uk/landss

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Landfill Aftercare Forum meeting 19th November 2 days 14 min ago
What a great site. How did 1 month 2 weeks ago
New member added 1 month 3 weeks ago

LANDSS: Landfill (Aftercare) Decision Support System

LANDSS is being developed as a Decision Support System (DSS) covering aspects of landfill engineering. The site has a particular emphasis on environmental control, sustainability and long term aftercare.

It is being developed in consultation with stakeholders, through a landfill aftercare forum. The next meeting of the forum is being hosted by the CIWM at their offices in Northampton on 19th November 2014.

LANDSS draws on work carried out at the University of Southampton, together with literature and other sources of expert knowledge. It aims to present current knowledge and links to other sites and resources, at several levels of detail, so that it is helpful to a range of users including landfill operators, technical advisors, regulators and researchers.

We will welcome your input in helping us build a useful and useable site.

Proposed structure of LANDSS

- Topics
- Knowledge base
- Site Maps
- General Functionality

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Engineering and environmental control topics
Waste related topics
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Landfill Aftercare Forum meeting 19th November 3 days 22 hours ago
What a great site. How did 1

Topics

Below is a summary of topics that will be covered by LANDSS

How long is the aftercare period of landfill
This depends very much on how the site is operated - but could be centuries

Landfill hydrology
Flow into and through waste, leachate flushing and recirculation

Leachate Recirculation

Landfill settlement

Pollution potential of waste

LTP optimisation

Leachate drainage/collection systems
Design and long-term performance issues

Cap performance

Landfill aeration
acceleration of degradation and landfill stabilisation

Landfill Gas
Control and emission monitoring

Flow and transport through mineral barriers
A short sentence that highlights the page content

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Case studies
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Knowledge base

Design

- Read more

Waste properties

Information on fundamental properties of landfilled waste

- Read mor

Measurement Techniques

Content feature image:

- Read more

Hydraulic conductivity database

Table of K values EXAMPLE for FORUM meeting - TO BE REMOVED AND UPDATED.xlsx

Leachate recirculation site map

Leachate recirculation introduction

Design/ concepts	Properties	Measurement	References
Conceptual process description as precursor to design	Waste permeability	Monitoring leachate recirculation	Full reference list
Conceptual process design examples	water content of waste		Case studies
Leachate recirculation infrastructure			
Infiltration rates for different infrastructure types	preferential flow		
Moisture content for enhanced gas generation			
Transient storage to manage winter flow peaks			

Back to Leachate Recirculation Introduction

General functionality

- Whatever you want!
- Search
- Comments
- Forms – running (simple) models in background
- Layout
- ….

Acknowledgements

Research supported by EPSRC Platform Grant **Processes, resource recovery and remediation of residual wastes**

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Leachate Recirculation Exemplar

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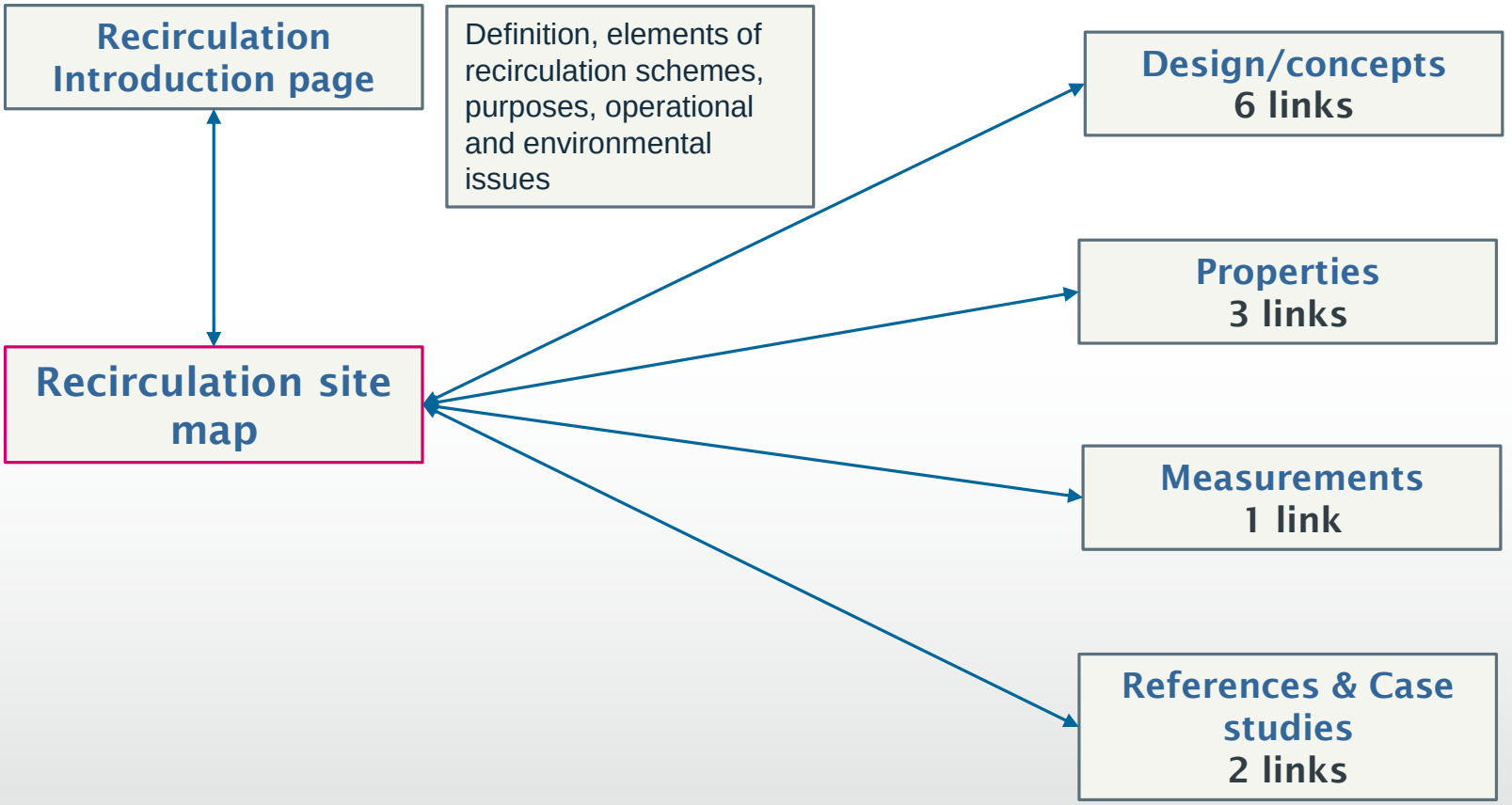
Leachate recirculation pages of DSS

- The site content is a combination of (i) things we have information or data on; and (ii) areas where stakeholders are likely to want information e.g:
- What can I achieve with recirculation?
- How much do I need to recirculate?
- What kind infrastructure can I use to do recirculation?
- How well do different infrastructure types perform?
- How long will it take leachate to get from the top of the landfill to the bottom?
- How close do I need to place re-injection facilities?
- What is the hydraulic conductivity of the waste in my landfill?
- What do I need to measure when recirculating?
- How do I find more detailed information?

Leachate recirculation pages of DSS

- **'Topics' ➔ 'Leachate Recirculation' ➔ Recirculation Introduction page**
- **Everything revolves around the 'Recirculation site map' – this is the hub**



Leachate recirculation – demonstration checklist

- **The need for a conceptual design**
  - Generally not done – has led to systems that could never meet their objectives
- **Examples of conceptual design**
  - lead to definition of system performance requirement, ➔ link to what different infrastructure types can achieve, plus size, topography & landfill characteristics
- **Recirculation infrastructure – this is the kit available**
- **Infiltration rates – this is what the kit can achieve (discuss units)**
- **Transient storage – benefited from modelling ➔ simple rules of thumb**
- **Moisture content for enhanced gas generation**
- **Measurement/monitoring**
  - Effectiveness at achieving objectives; environmental protection
  - Our lists are possibilities that should be considered case by case, not a required minimum
- **References and case studies**
  - Hot link example to EA report