

Bridge Asset Management



International Bridge Forum
King's College Cambridge
14 September 2009

Bill Valentine
Chief Bridge Engineer
Transport Scotland



Asset Management



A strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of the road and bridge infrastructure to meet the needs of current and future customers



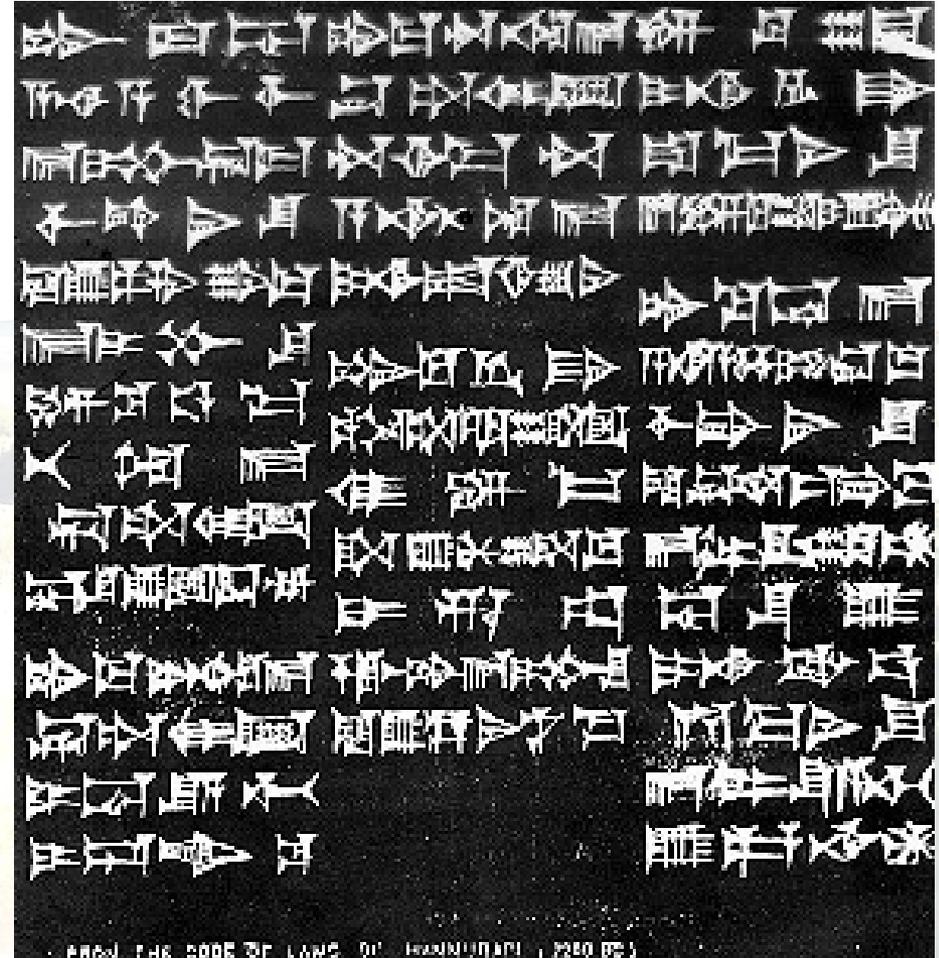
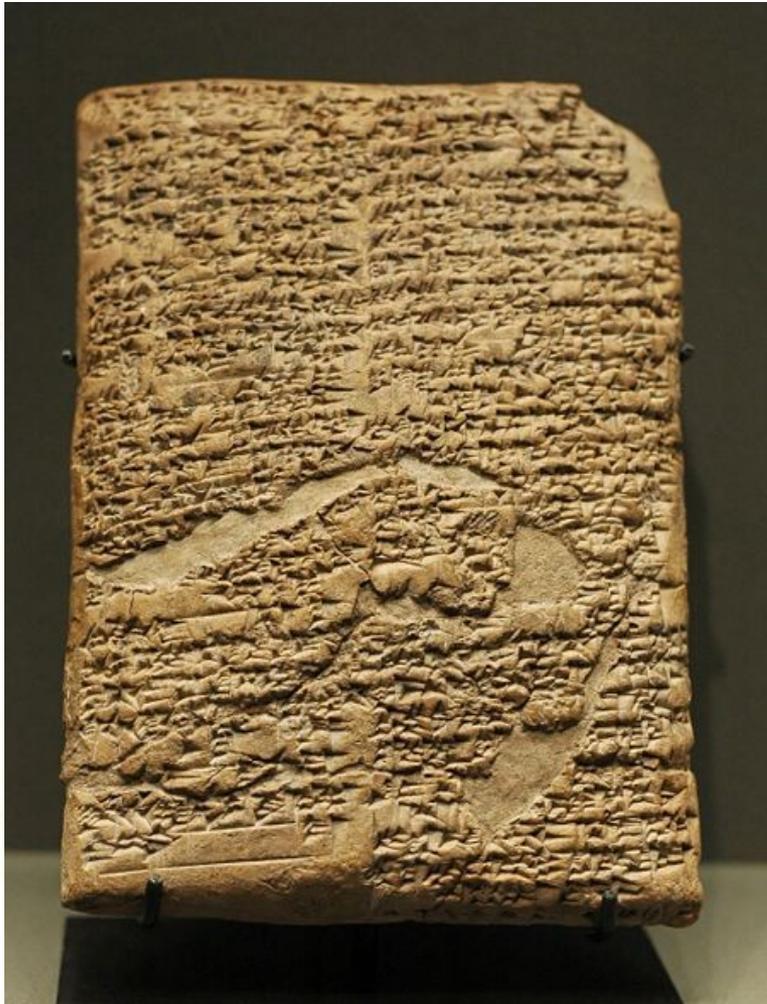
‘Ensure that the bridges stock is managed effectively’



- **Public Safety Paramount**
- **Network Availability - Minimise Intervention & Disruption**
- **Sustainability - Minimise Environmental Impact**
- **Maximise Limited Budgets - Achieve Cost Effective Solutions**
- **Obtain Resources to meet Future Needs**

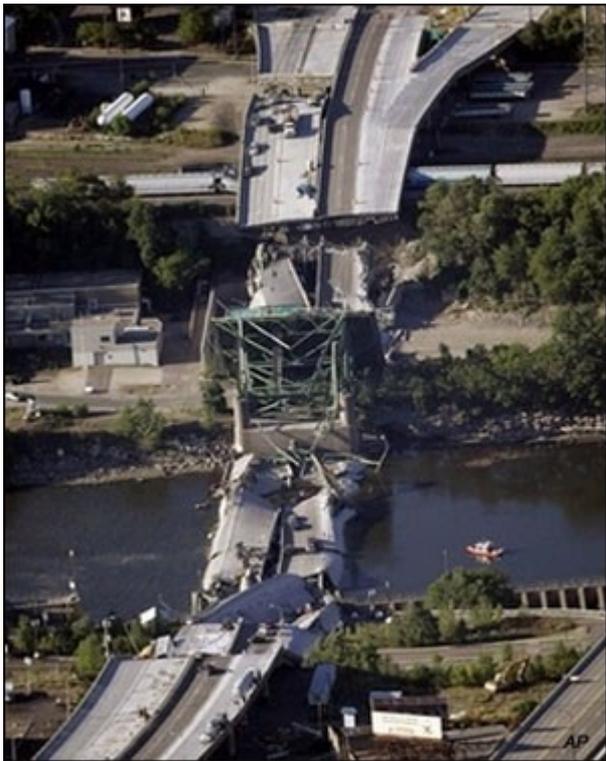


Safety always a high priority



Code of Hammurabi. C. 1750 B.C.

“If a builder builds a house for a man and does not make its construction firm and the house collapses and causes the death of the owner of the house, that builder shall be put to death...”



Obtain Resources – Convince Politicians The Scottish Cabinet





**Minister for Transport,
Infrastructure & Climate Change**

Stewart Stevenson



Delivering better transport sits at the heart of the Scottish Government's intention to build a:

wealthier and fairer Scotland, healthier Scotland, safer and stronger Scotland, smarter Scotland, greener Scotland

- **Transport Scotland created to deliver £3 billion capital investment programme to 2010 and beyond.**
- **Responsible for overseeing operation and maintenance of national rail and trunk road networks.**
- **Trunk road asset value £17bn – bridges £4.5bn**
- **Annual maintenance budget circa £24m ~ 0.53%**
- **Work Bank or backlog > £250m and rising**

In simple terms

Bridge asset management covers all the actions that need to be carried out to ensure bridges remain safe, fit for purpose and without excessive maintenance and cost.



The reality



- All public bodies are being placed under increasing pressure to justify investment and to demonstrate that best use is being made of resources.
- Current best practice for the management of large infrastructure networks is set out in recent publications by the Department for Transport and the British Standards Institution. These publications recommend that infrastructure organisations adopt a formal asset management approach.

HENCE





ROAD ASSET **MANAGEMENT PLAN**
for SCOTTISH TRUNK ROADS: APRIL 2007 – MARCH 2009

Road (and bridge!) Asset Management Plan



AMP Buiding Blocks

- Know your assets
- Current & future demand
- Performance management framework
- Risk management
- Lifecycle plans –establish deterioration rates?
- Decision Support
- Work plan
- Financial plan



Know your Assets

Table 2: Structure Types and Quantities

STRUCTURE TYPE	NUMBER	QUANTITY ¹
Bridge	1821	1,093,917m ²
Culvert	1933	58,220m
Retaining Wall	909	69,364m
Sign/Signal Gantry	238	3,746m
High Mast Light	620	16,255m
Footbridge	146	1,9994m ²



First Generation Bridge Management System



```

teemtalk TT320IW (TRBDB) 10.1.130.131
File Edit Settings Help
trbdb01
TRANSPORT SCOTLAND
TRNMD - BRIDGES : TRUNK ROAD BRIDGES DATABASE (TRBDB)

Paul Manson

Overall Database Options
Management Systems

INPUT A NEW STRUCTURE TO THE DATABASE
UPDATE AN EXISTING STRUCTURE ALREADY IN THE DATABASE

QUERY AND REPORT - ALL STRUCTURES (CENTRAL DATABANK)
-----
TECHNICAL APPROVAL OF STRUCTURES
TECHNICAL APPROVAL OF STRUCTURES
FULL TEXT INVENTORY / BLANKS REPORT : ANY STRUCTURE RECORDS
6 YEAR CYCLIC PROGRAMME OF PRINCIPAL INSPECTIONS
GENERAL INSPECTIONS MONITORING SYSTEM
PRINCIPAL INSPECTIONS FOR MAINTENANCE WORKS PRIORITISATION
EXPENDITURE AND WORKS RECORDS
WEATHER RESISTANT STEEL MONITORING
ABNORMAL VEHICLE MOVEMENTS

select(F3) sendmail(F6) quit(F8) EXIT(F12)
    
```

Old TRBDB

```

teemtalk TT320IW (TRBDB) 10.1.130.131
File Edit Settings Help
TRANSPORT SCOTLAND
TRNMD - BRIDGES : TRUNK ROAD BRIDGES DATABASE (TRBDB)

STRUCTURE UPDATE - QUERY SCREEN

Unit      : 
Route     : A1
Area      : 
Str Type  : 

Str Name   : 
Str Ref No : 
In PI Prog : 
In Assmt Prog : 
Status    : %[ST]

          96
Structures
    
```

Str Ref No	Str Name	Easting	Northing
A1 5	MARYFIELD O/B	397258	657528
A1 5 C50	CATCH-A-PENNY	395900	660300
A1 10	HENDERSONS RAIL O/B	394400	661200
A1 10 C50	HILL BURN	393900	661300
A1 20	EYE WATER	393500	661500
A1 25	AYTON CASTLE O/B	393000	661700
A1 25 C40	EAST RESTON MILL	390000	662100
A1 25 C50	SWINWOOD MILL	389300	662300

```

query(F2) select(F3) report(F4) clear(F6) goto(F9) >
    
```

Second Generation Bridge Management System



Data Explorer 1.14.9 - LT33034 - Scotland_SMS

File Edit View Window

View

Map View

OS 1:50000 Raster (5x5Km)

Item	Unique System Number Ddi Only	Item Type	Structure Code	Structure Name	Structure Co
2	1000030	CULVERT	A1 10 C50	HILL BURN CUL	No safety ba
51	1000020	BRIDGE	A1 20	EYE WATER	The rail joint
66	1359	BRIDGE	A1 25	AYTON CASTLE	The rail joint
103	1000000	CULVERT	A1 5 C50	CATCH-A-PENN	?

Find Next

Query Bridge Asset Value (1) Concrete Coating History (1) Concrete Impregnation History (1)
 Span Widening History (0) Support Bearing History (20) Support Joint History (4) Supports (4)
 Span Surfacing History (1) Span Waterproofing History (1)
 Parapet Upgrading And Prioritisation (2) Protective System History (4) Span Details (3) Span Obstacles (3)
 Condition Score (0) Span (0) Document (0) Inspection (0) Inspection History (18) Job List (0)

Rectangle Polygon

Auto Hide

< Back Next >

start SMS Document1 - Microsof... Data Explorer 1.14.9 ... 10:51

New SMS

Risk based approach

- Parapets and entry/exit RRS
- Bridge supports
- Scour
- Vulnerable structures e.g. post-tensioned, half-joints
- Flooding
- Bridge strikes
- Assessments
- BD 79
- Abnormal loads
- Inspections

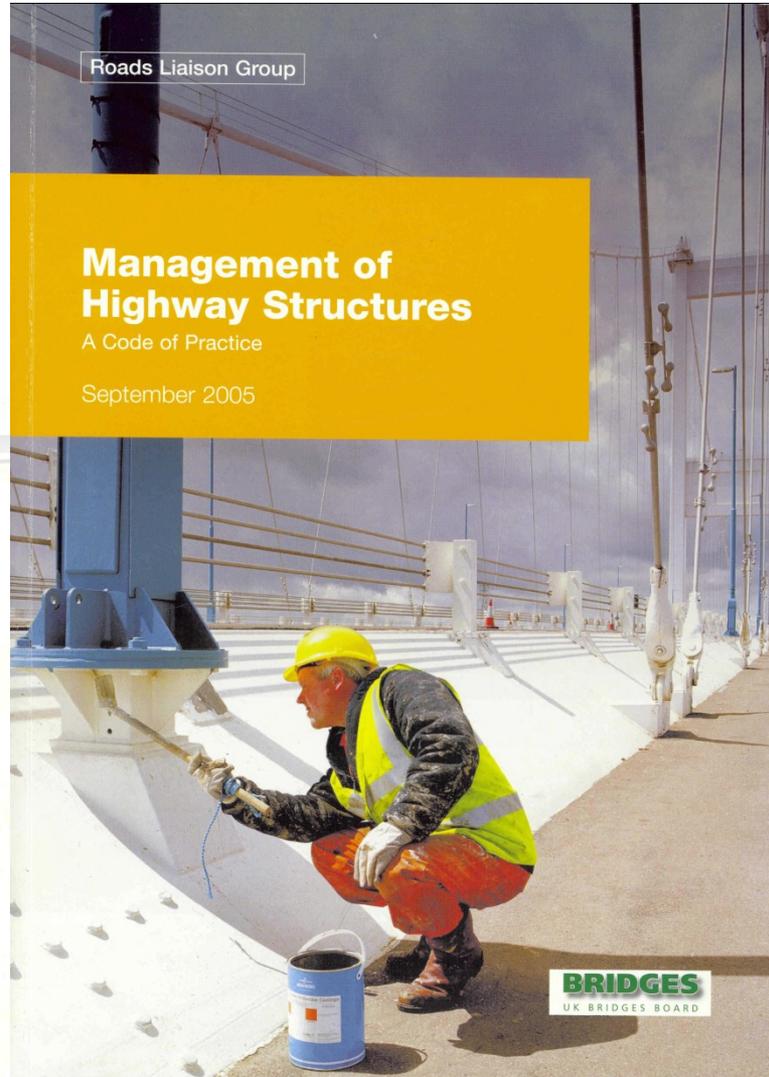


Lifecycle Plans

- **Based on rate of deterioration**
- **Roads have scrim, deflectograph etc**
- **Bridges still rely on human evaluation –hence need for good inspector training**



Management of Highway Structures CoP



Management of Highway Structures CoP

- Harmonise current practice amongst Authorities while allowing flexibility to reflect local conditions
- Recommend a minimum level of asset stewardship
- Support Government's 10-year Transport Plan objectives
- Support implementation of 'Best Value' and 'Resource Accounting & Budgeting'
- Support the adoption of 'whole life costing', 'risk management' and 'sustainability' principles
- Support the implementation of a comprehensive 'Asset Management Regime'
- Promote coordination with the management of pavement and lighting assets

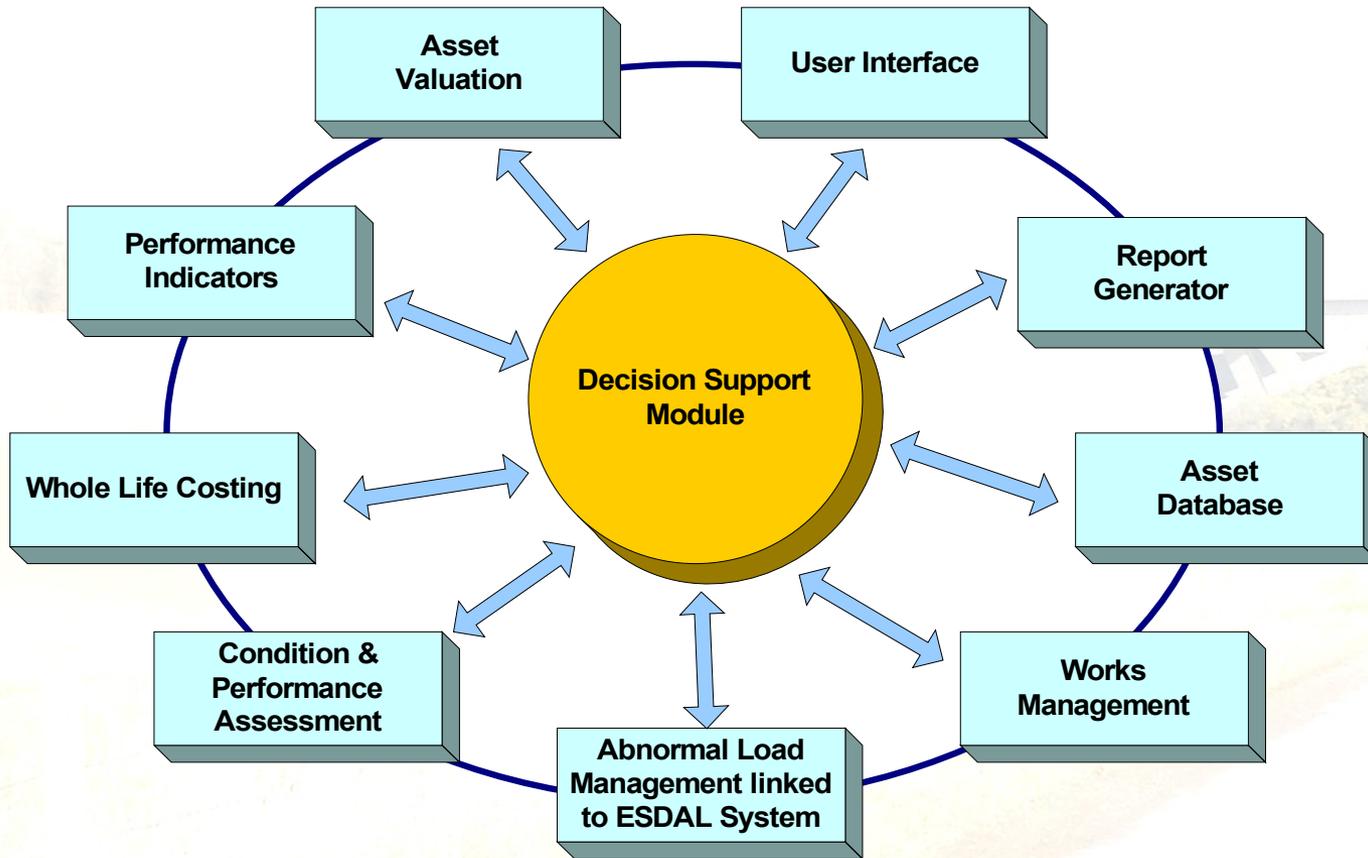


Framework for a Bridge Management System

- **Storage of minimum data set – format & content**
 - Structure definitions; Inventory data
 - Condition data; Maintenance data; Major modifications
 - Cost data; Assessment results
- **Support a range of data capture devices**
- **Schedule inspections and hold inspection data**
- **Schedule assessments and hold results**
- **Prioritise identified maintenance/renewal work**
- **Calculate BCI, KPIs, Asset Valuation**
- **Support in developing Asset Management Plans**
- **Management of abnormal loads linked to ESDAL**



Framework for a Bridge Management System



Prioritisation Tool (Decision Support Tool)

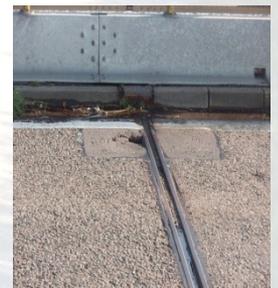
- **Make the right decision at the right time**
- **Do nothing**
- **Maintenance**
- **Refurbishment**
- **Widen**
- **Strengthen**
- **Replace**



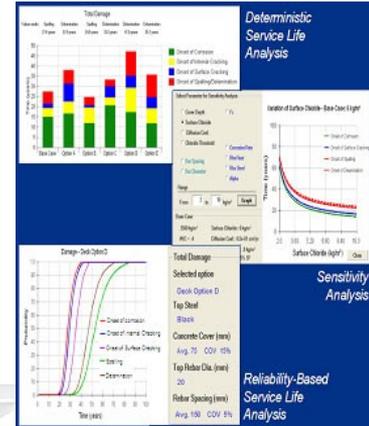
VALUE MANAGEMENT OF THE STRUCTURES RENEWAL PROGRAMME

Prioritisation Framework

- Risk – “any event or hazard that could hinder the achievement of business goals or the delivery of stakeholder expectations”
- Risk = Likelihood x Consequences
- Stage 1 :Define the Need
- Stage 2: - Define the Risk Event that could occur if nothing done
- Stage 3: Assess the level of likelihood of the Risk Event
- Stage 4: Assess the level of consequence of the Risk Event
- Stage 5: Assess the level of overall risk associated with the Risk Event
- Stage 6: Identify the appropriate Priority for the Need



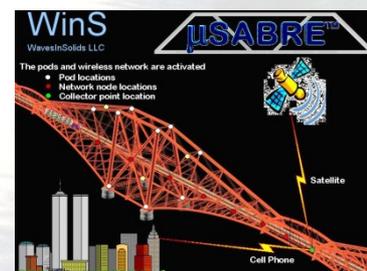
The Challenges



- A robust tool or methodology that will assist making the right decision at the right time

- Convince politicians of the need to invest at the right time

- Clever, cost effective asset management technology that puts bridge engineers in the lead



Learn from Mistakes The Old & New Approach



1979
A9 Cromarty Bridge
multi-span O/A length 1400m

2008
A 876 Clackmananshire
Bridge multi-span O/A
length 1200m





TRANSPORT
SCOTLAND

NEXT