

Asset Management Approach for Wellfields

South Carolina Water Resource Conference

October 15, 2008



Asset Management Approach for Wellfields

Presentation Topics

1. Overview
2. Asset Management Approach
3. City of Berlin Wellfield

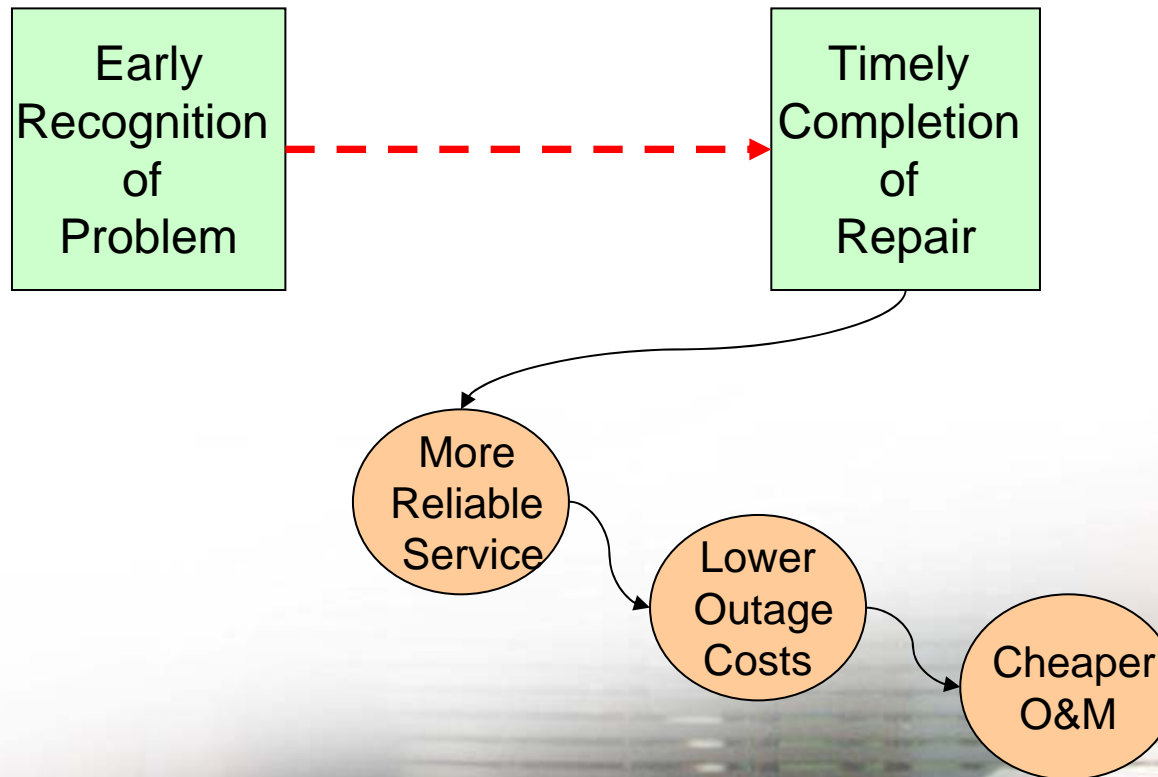
Asset Management Approach for Wellfields

Definition

**Inspection, monitoring and
maintenance based planning
process for maintaining
groundwater engineering assets**

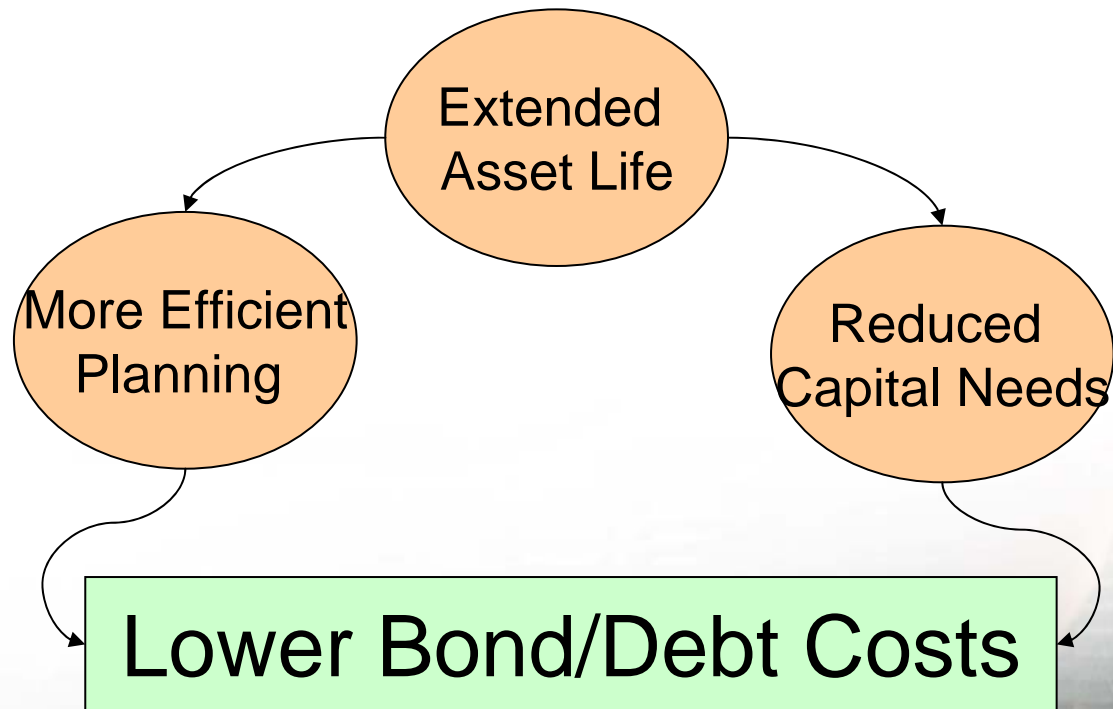
Asset Management Approach for Wellfields

Short Term Benefit



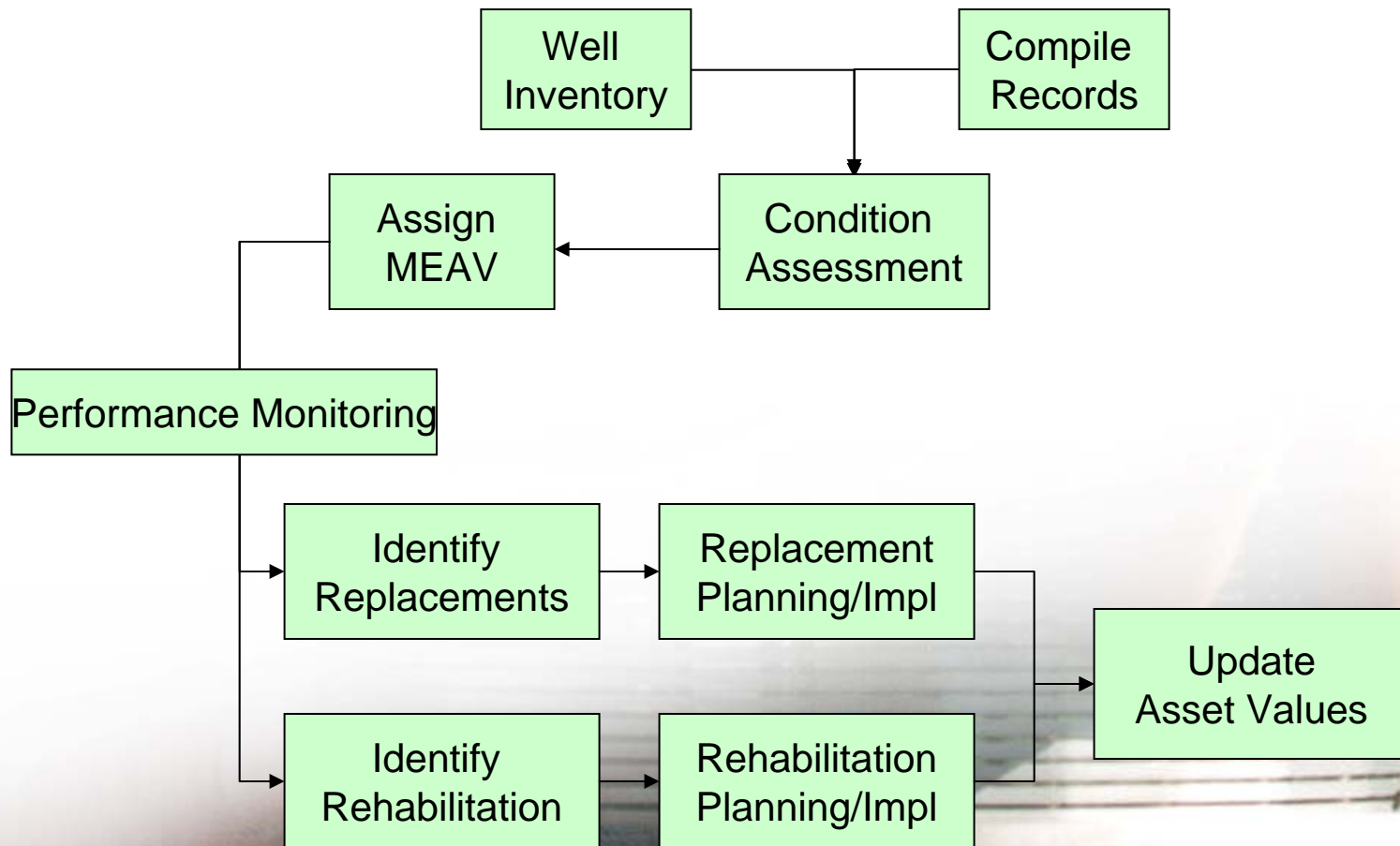
Asset Management Approach for Wellfields

Long Term Benefit



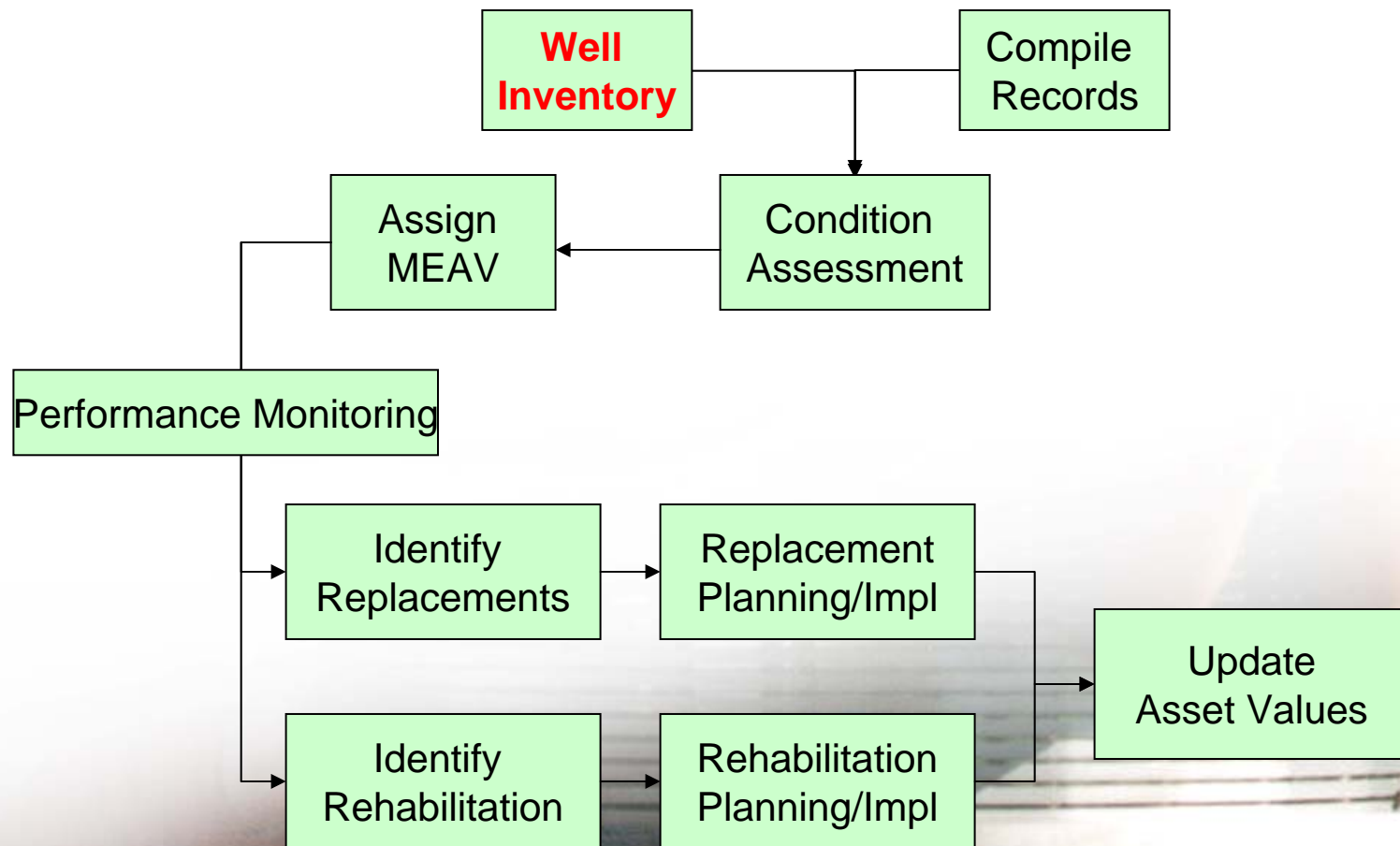
Asset Management Approach for Wellfields

Approach



Asset Management Approach for Wellfields

Approach



Asset Management Approach for Wellfields

Well Inventory

- **Operational Wells**
- **Standby Wells**
- **Wells Awaiting Rehabilitation**
- **Non-commissioned Wells**

Asset Management Approach for Wellfields

Regulatory Issues

- **Water Availability**
- **GW/SW Interactions**
- **Existing Wells**
- **Potential Transfers**
- **New Wells Needed**

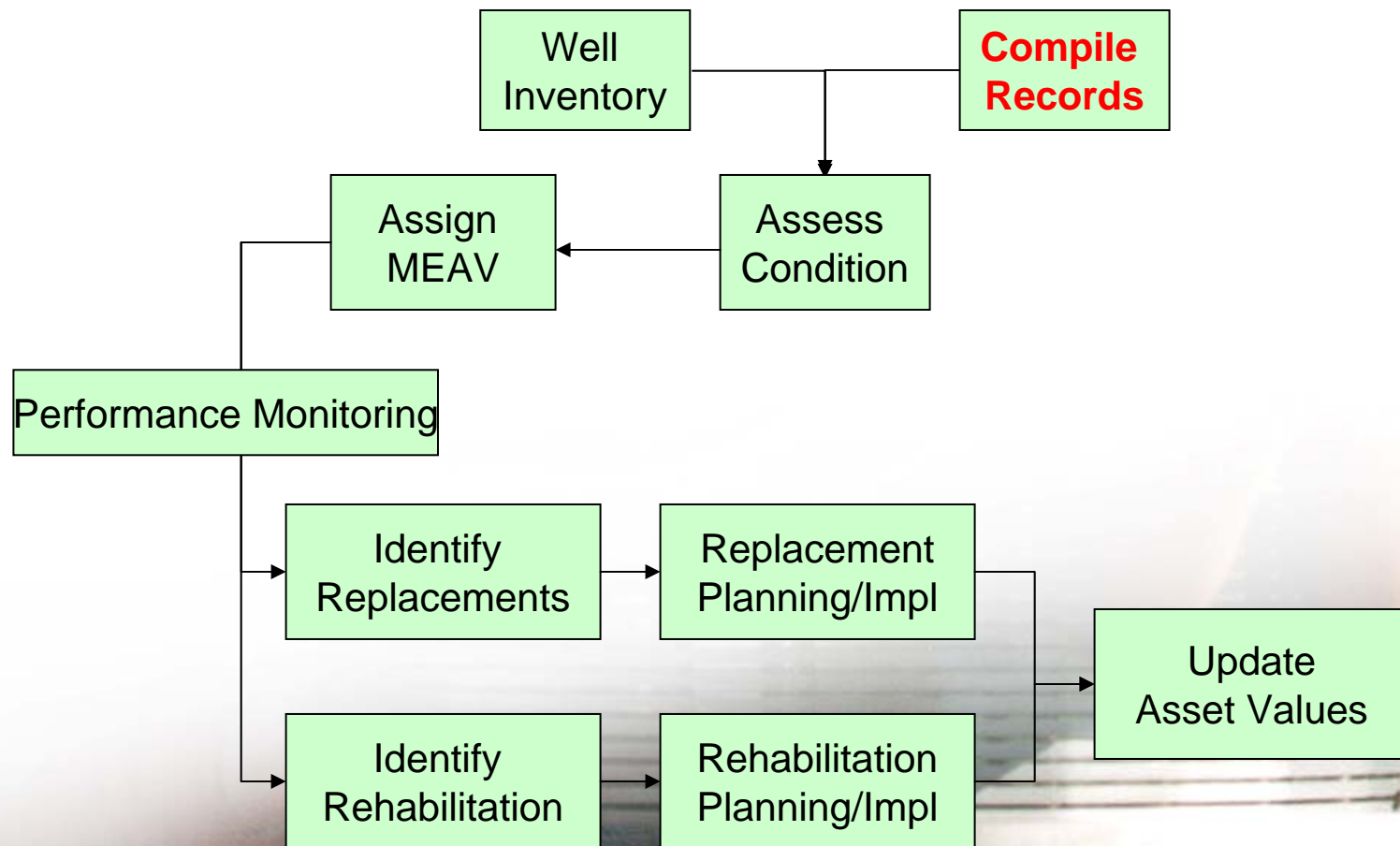
Asset Management Approach for Wellfields

Infrastructure Inventory

- **Pumps**
- **Pipes**
- **Monitoring Controls**

Asset Management Approach for Wellfields

Approach



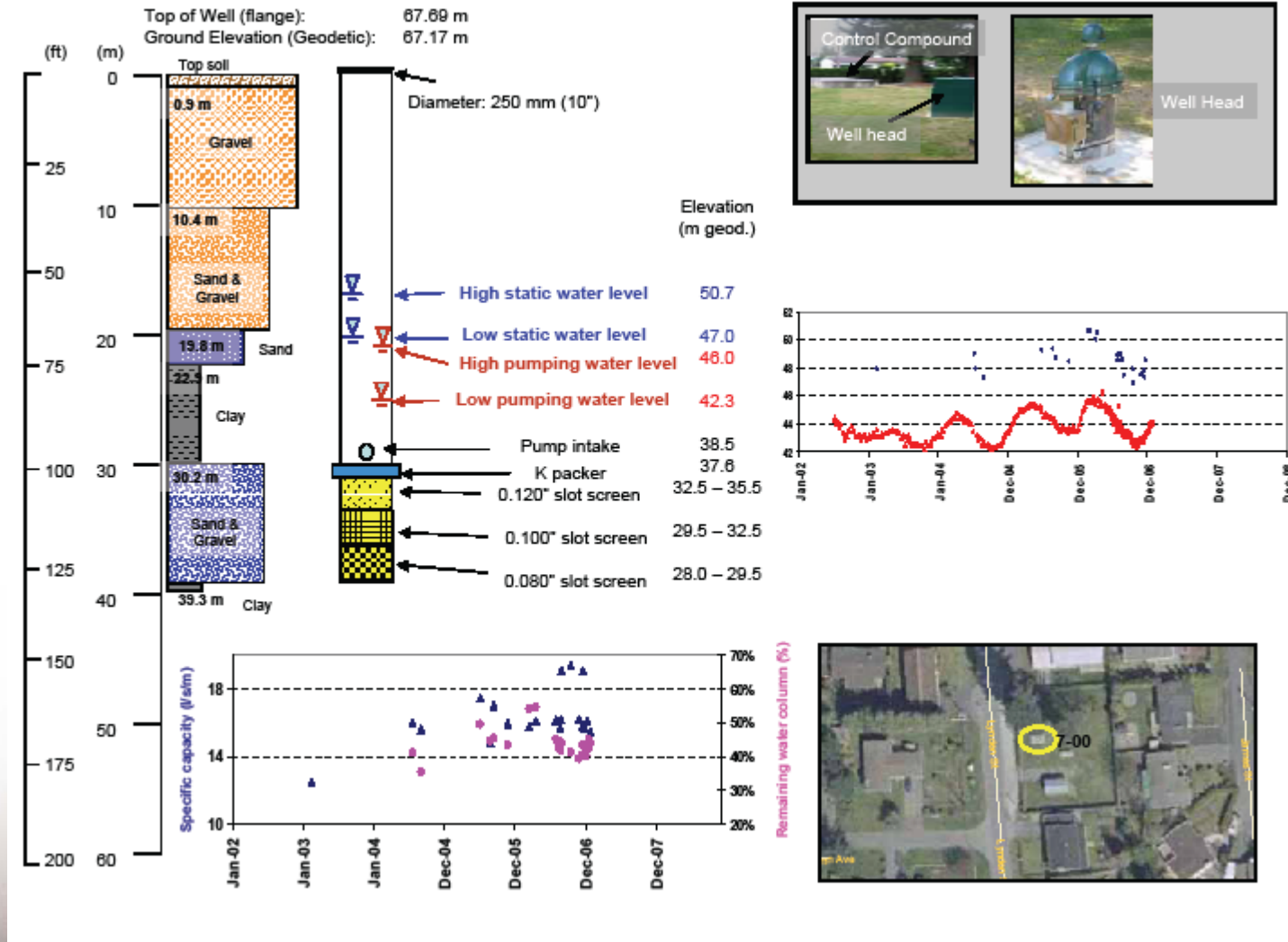
Asset Management Approach for Wellfields

Well Records

- Well Construction
- Pump Data
- Initial Development
- Water Quality
- Static Water Level
- Pumping Drawdown
- Inspection Reports

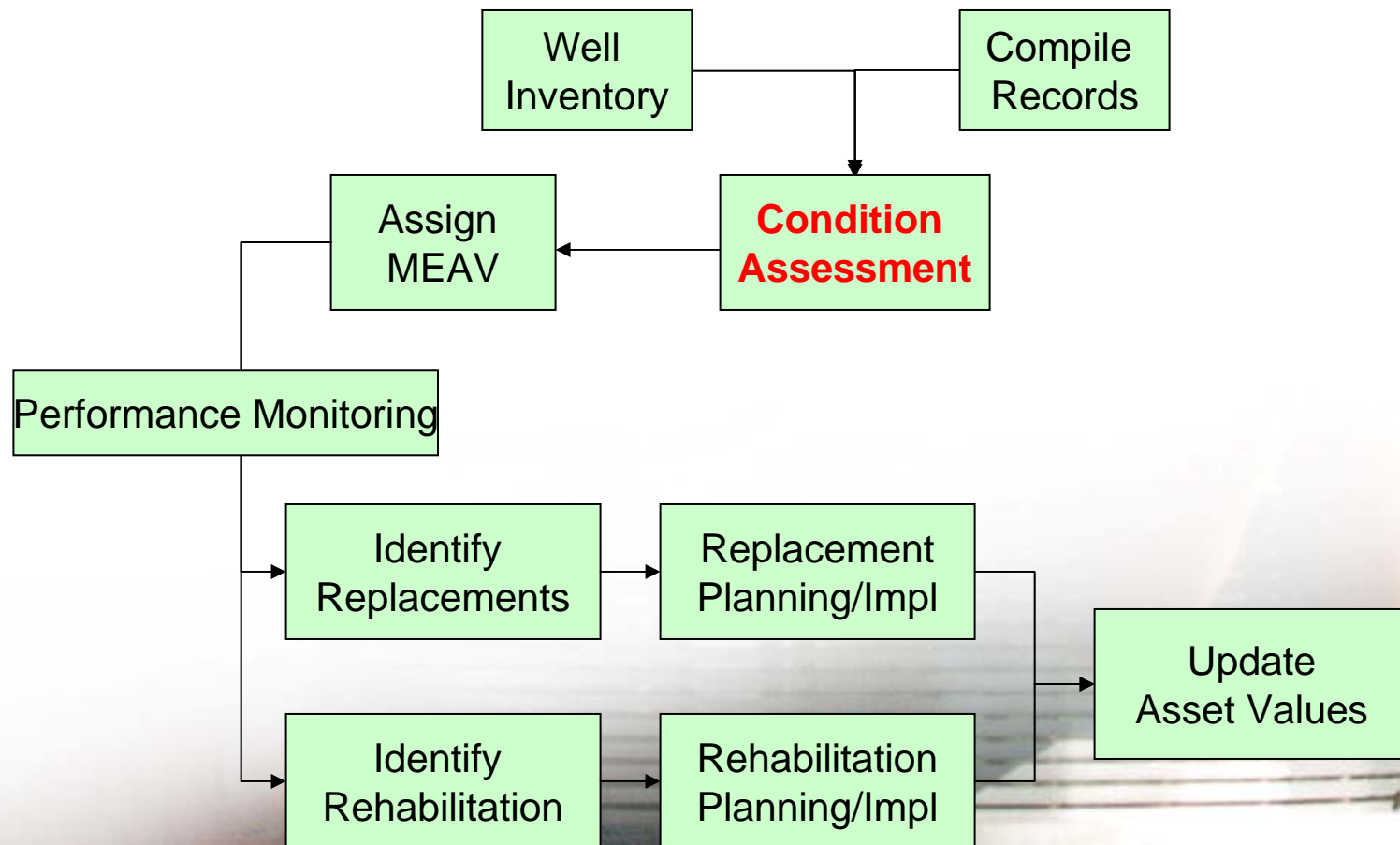
Asset Management Approach for Wellfields

Well Records



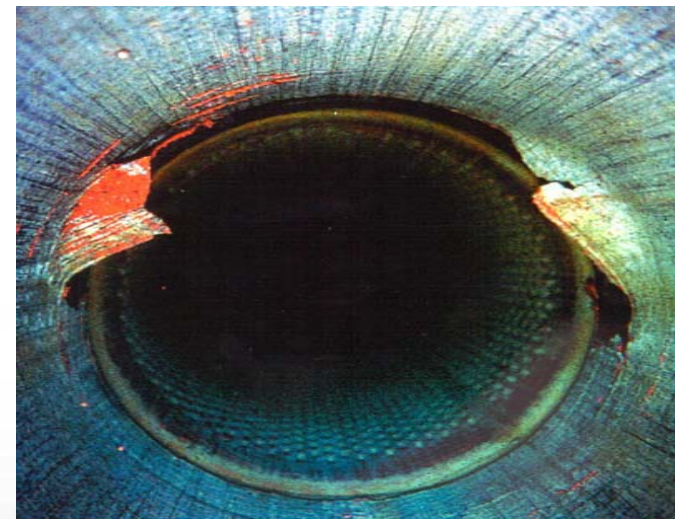
Asset Management Approach for Wellfields

Approach



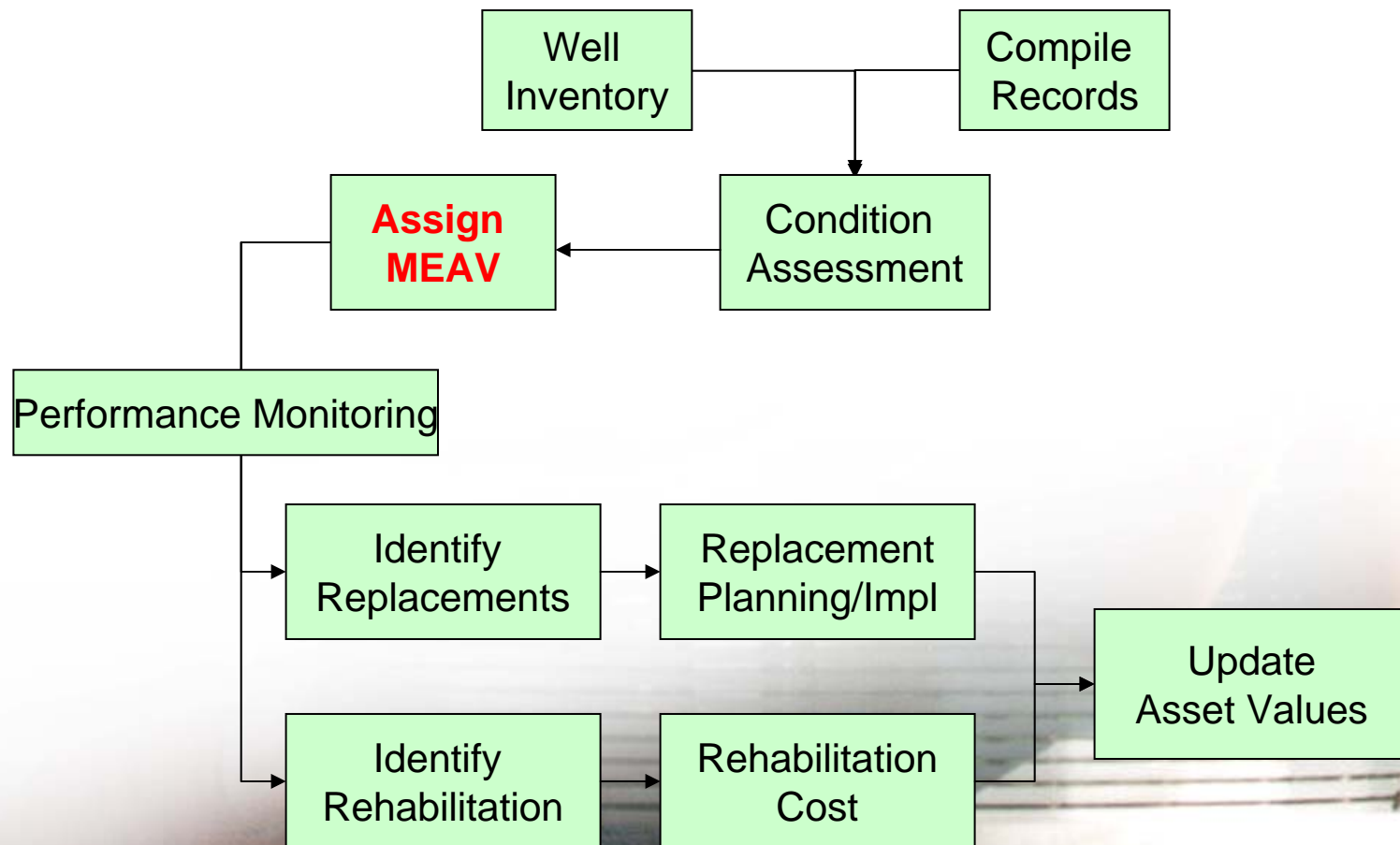
Asset Management Approach for Wellfields

Condition Assessment



Asset Management Approach for Wellfields

Approach



Asset Management Approach for Wellfields

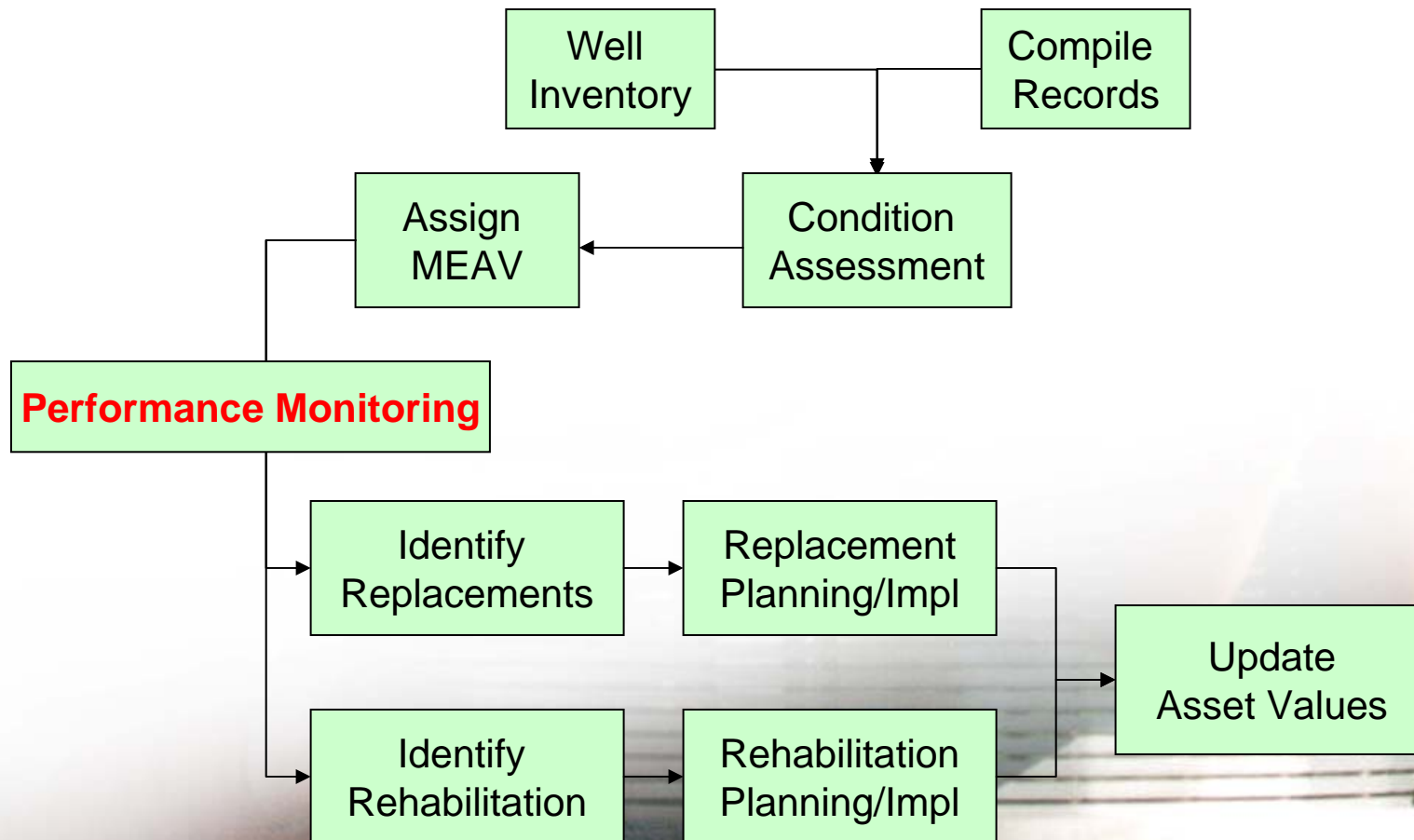
Determine MEAV

Modern Equivalent Asset Value (MEAV)

Quantifies an asset's value by assessing its differences with a reference asset in terms of differences in maintenance and other operating costs even though the two assets may differ in scale/technology and service potential.

Asset Management Approach for Wellfields

Approach



Asset Management Approach for Wellfields

Performance Monitoring

- **Pump Operation/Efficiency**
- **Yield/Specific Capacity**
- **Water Quality**
- **Biofouling/Encrustation**
- **Mechanical Plugging**
- **Inspection Opportunities**

Asset Management Approach for Wellfields

Well Performance

Reasons for Decline:

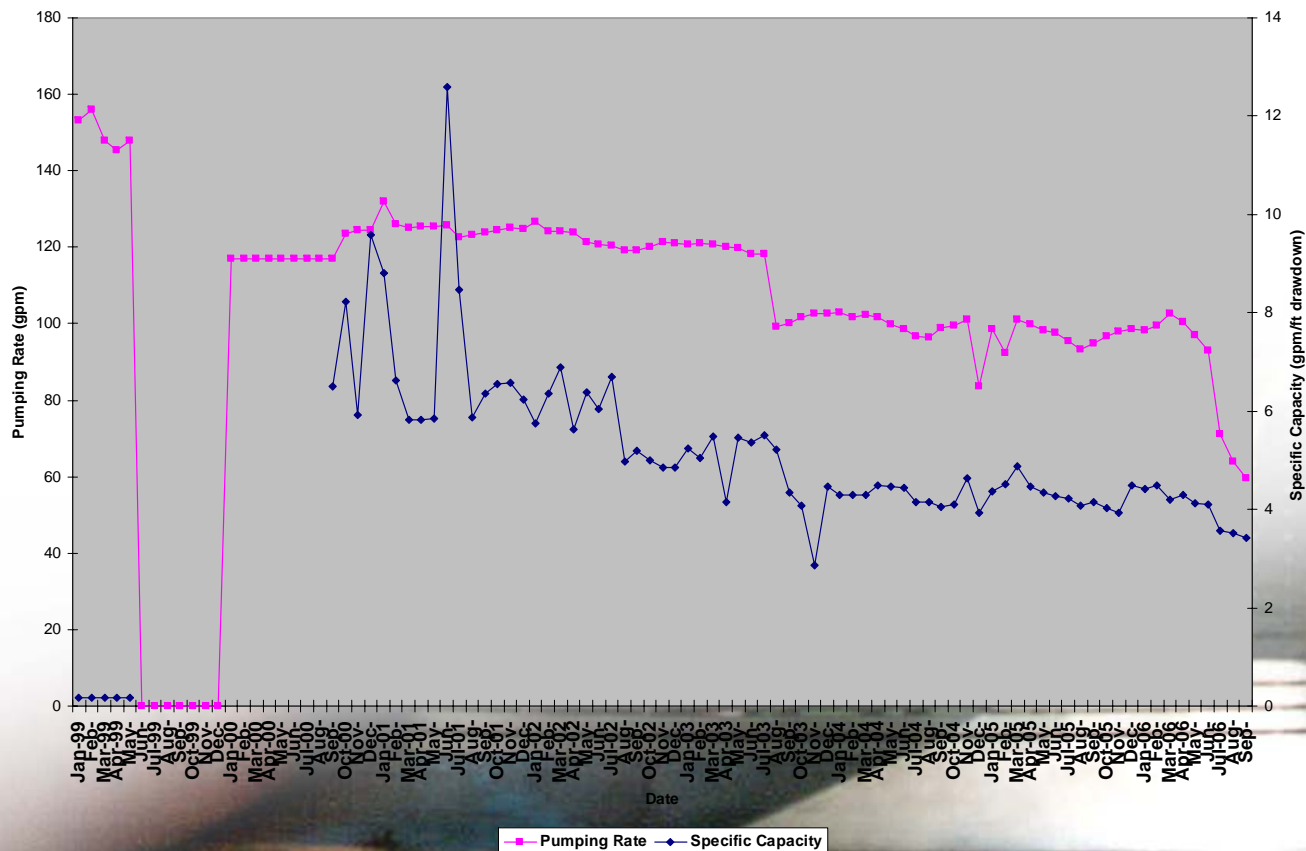
- Mechanical plugging in aquifer/gravel pack
- Bacterial deposits in screen, gravel pack or aquifer
- Well construction
- Well development
- Operations

Asset Management Approach for Wellfields

Example Application

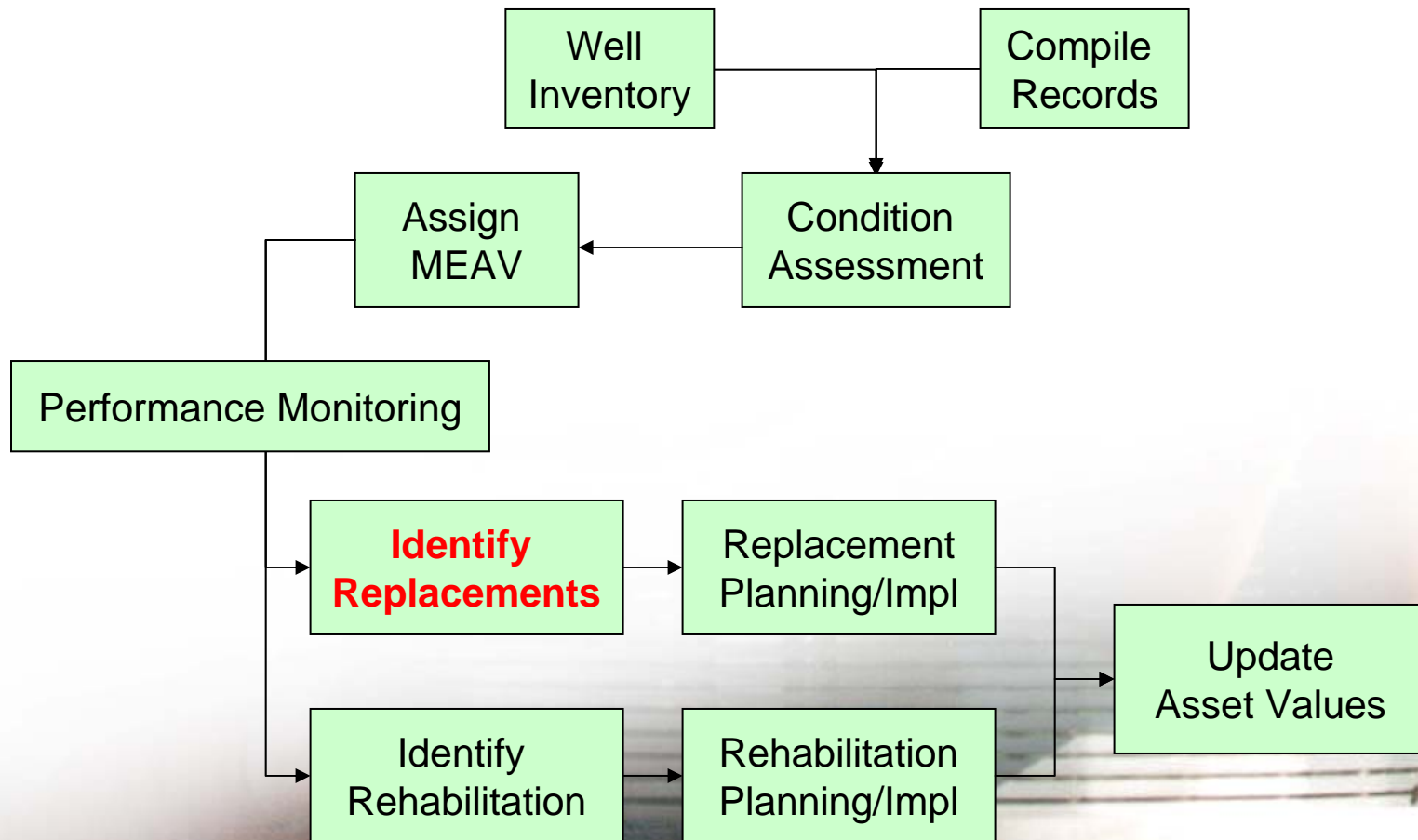
Regional District of Nanaimo

Historical Operations- Fairwinds Well 2



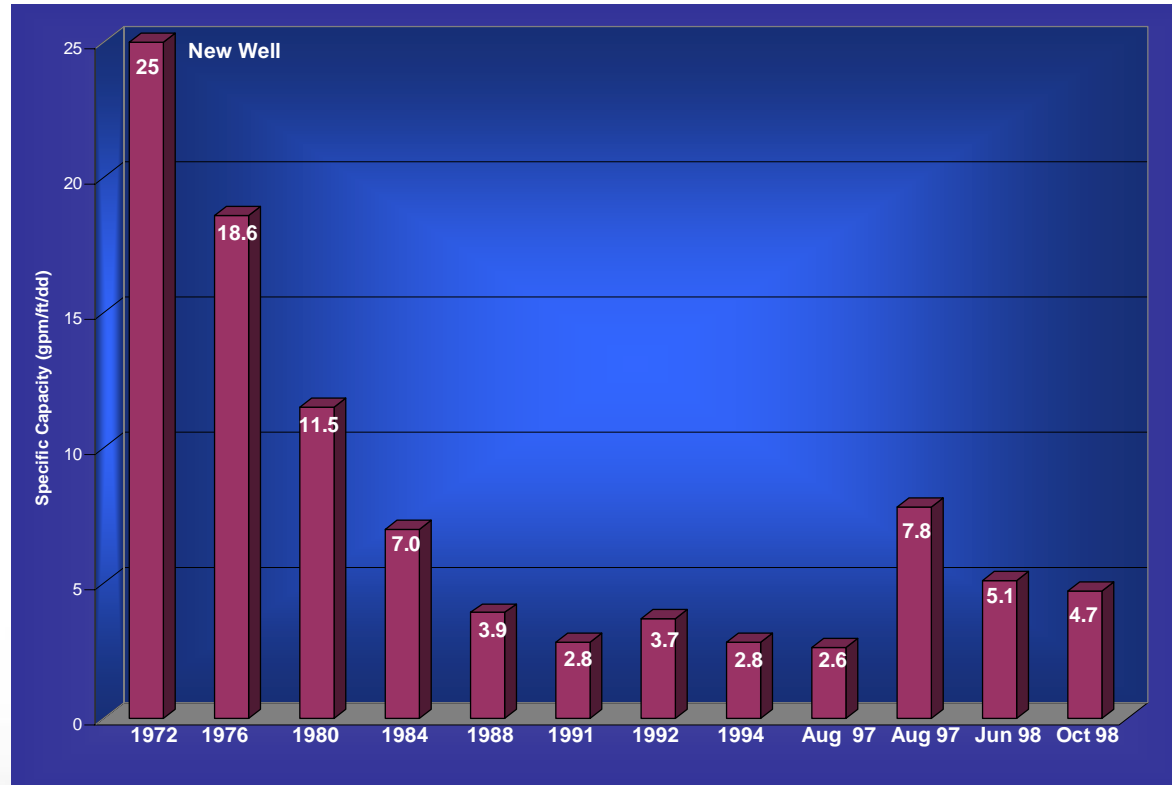
Asset Management Approach for Wellfields

Approach



Asset Management Approach for Wellfields

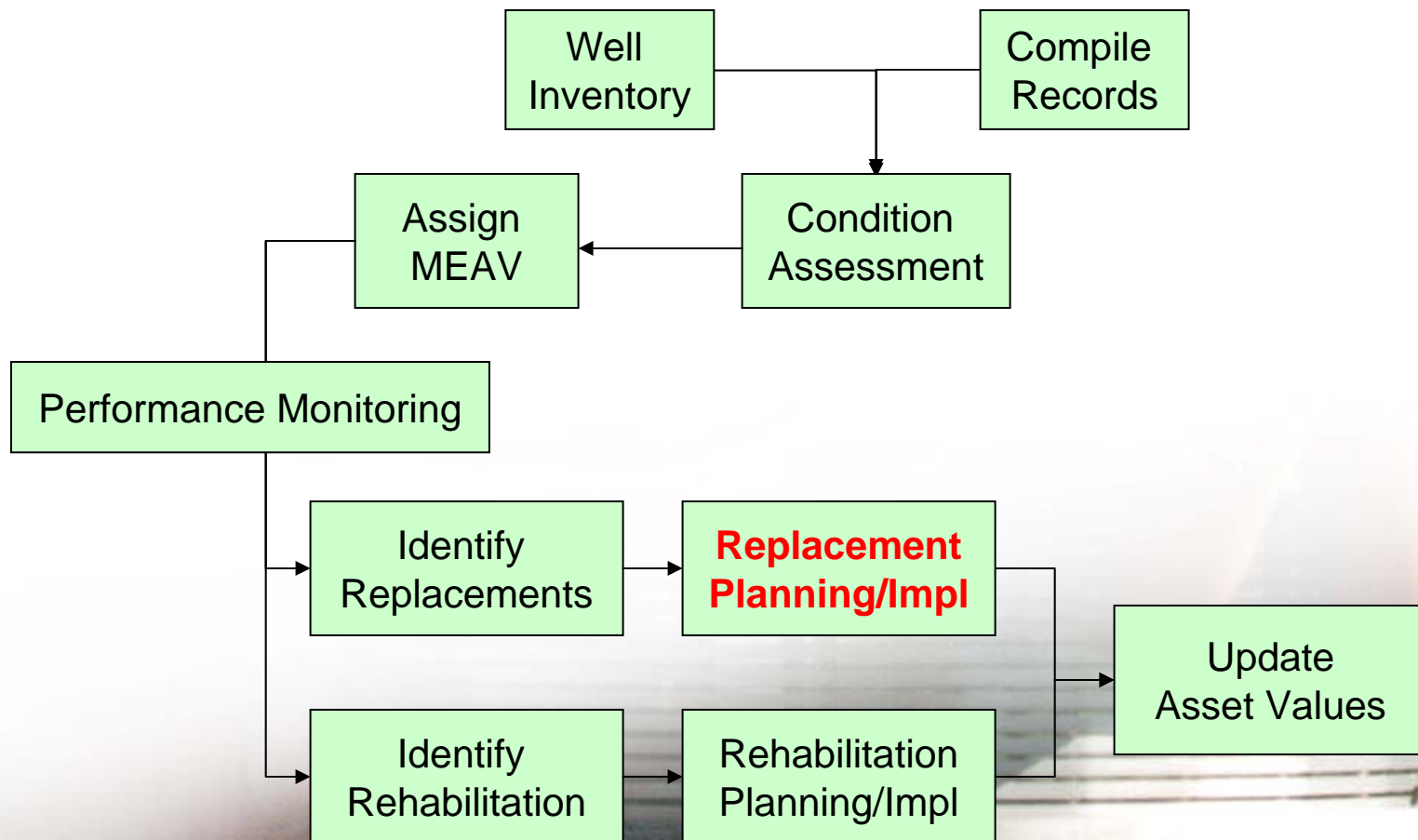
Identify Replacements



Well Aging

Asset Management Approach for Wellfields

Approach



Asset Management Approach for Wellfields

Replacement Planning/Implementation

Well Replacement Costs

Regulatory Issues - \$10,000+

Land Acquisition - \$60,000+

Site Preparation - \$5,000+

Engineering - \$100,000+

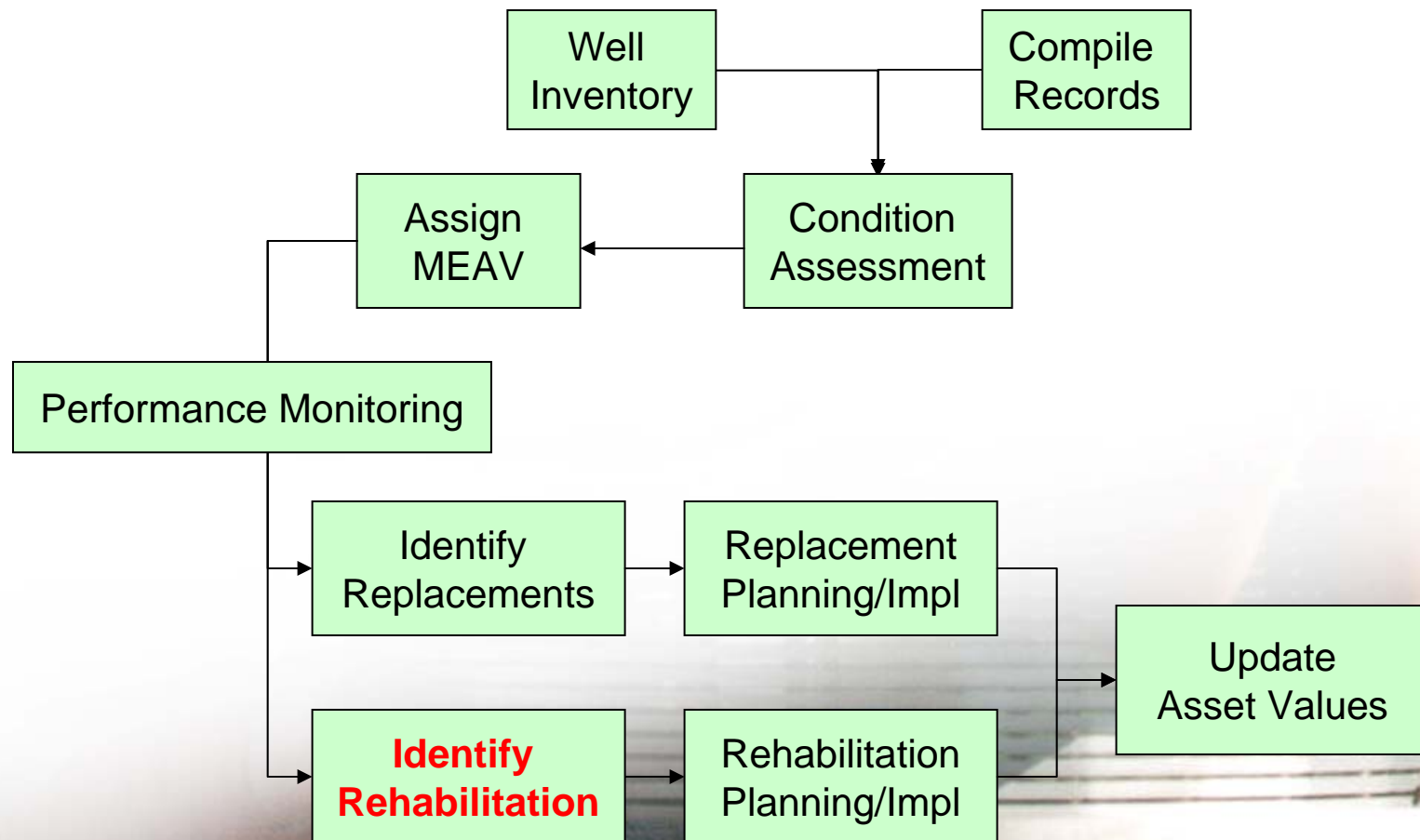
Well Construction/Development - \$200,000+

Infrastructure Work - \$300,000+

\$675,000+

Asset Management Approach for Wellfields

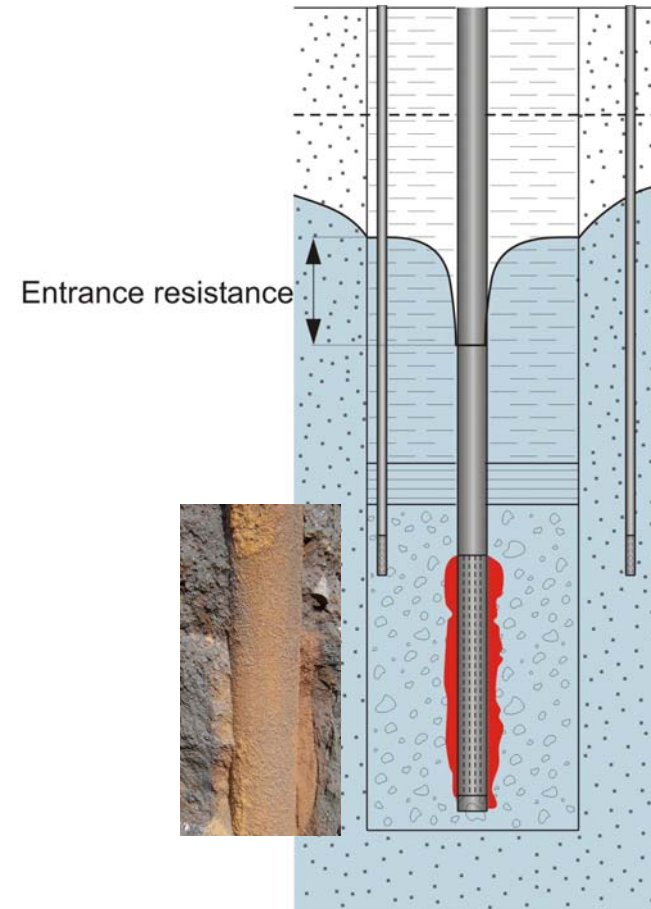
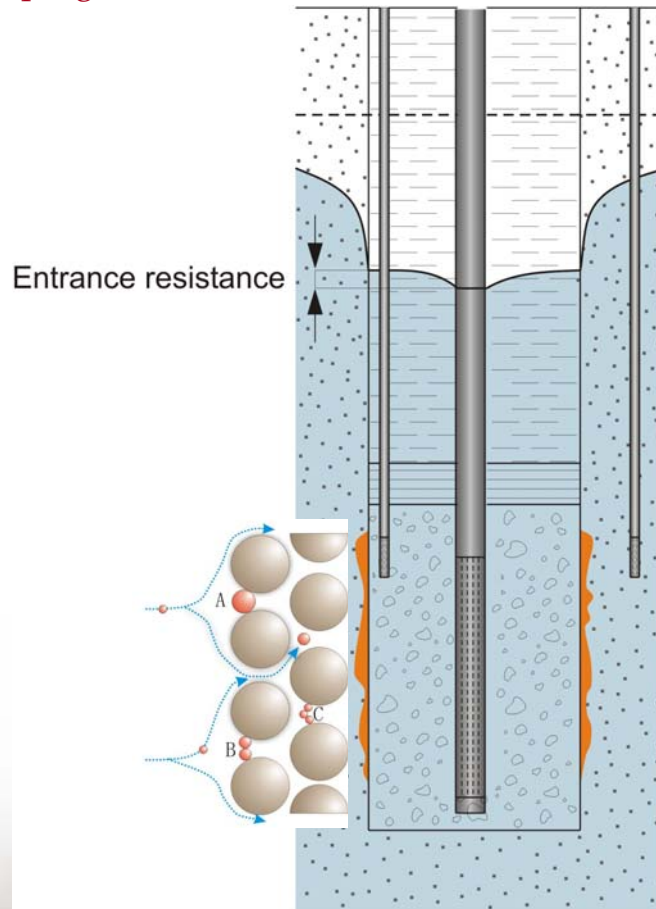
Approach



Asset Management Approach for Wellfields

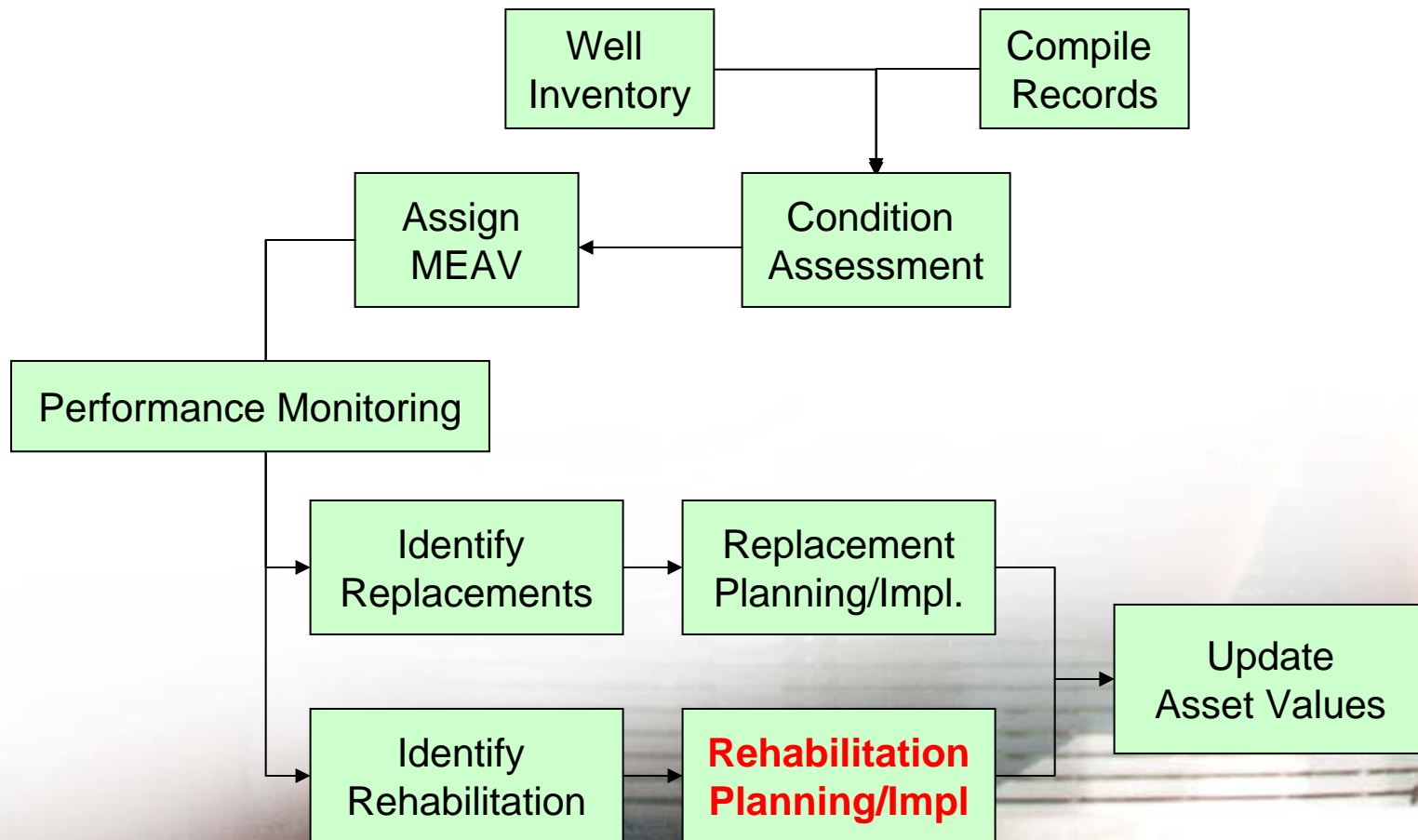
Clogging Process

kiwa 
Partner for progress



Asset Management Approach for Wellfields

Approach



Asset Management Approach for Wellfields

Well Rehabilitation



Test



Mech.



Video



Technology



Extraction



Monitor



Removal



Chemical
(If used)



Video



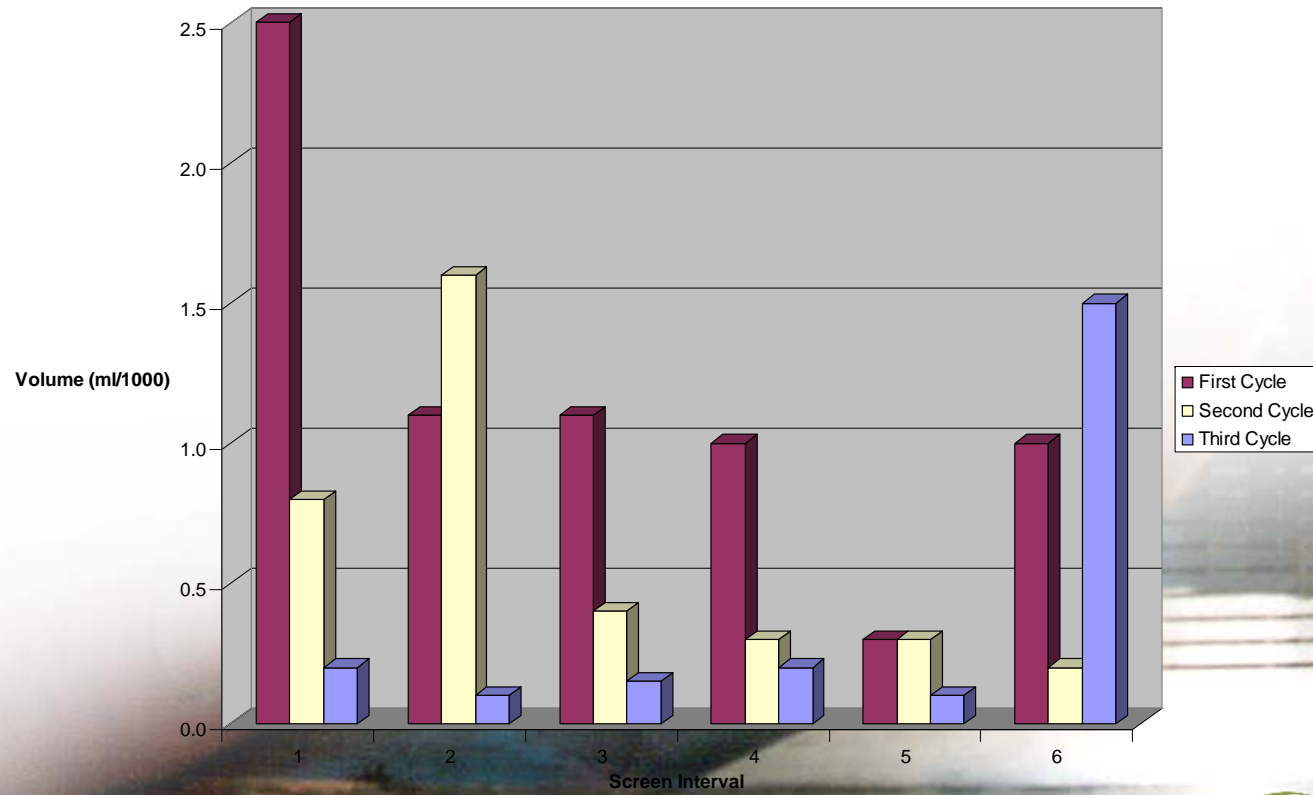
Test

Asset Management Approach for Wellfields

Well Rehabilitation

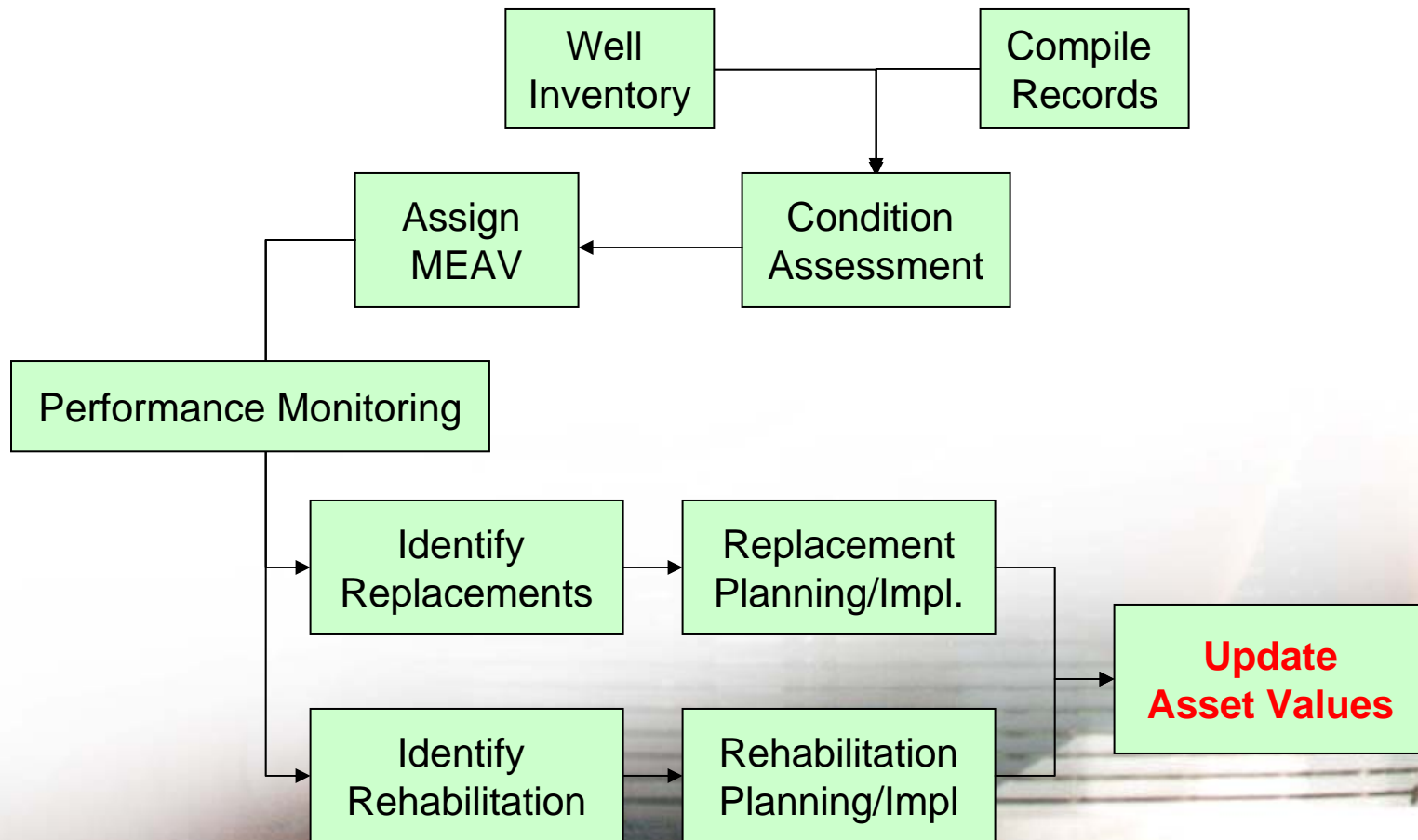
Monitor Progress

Sediment Removal Volumes



Asset Management Approach for Wellfields

Approach



Asset Management Approach for Wellfields

Update MEAV

New Well Cost – \$1,000,000

Debt costs - \$100,000 (10% of cost)

Additional Annual Operating Costs for Existing Well -
\$15,000

Debt Cost of Existing Well - \$100,000 - \$15,000 = \$85,000
per annum or 15%

Updated MEAV of Existing Well - \$850,000

Asset Management Approach for Wellfields

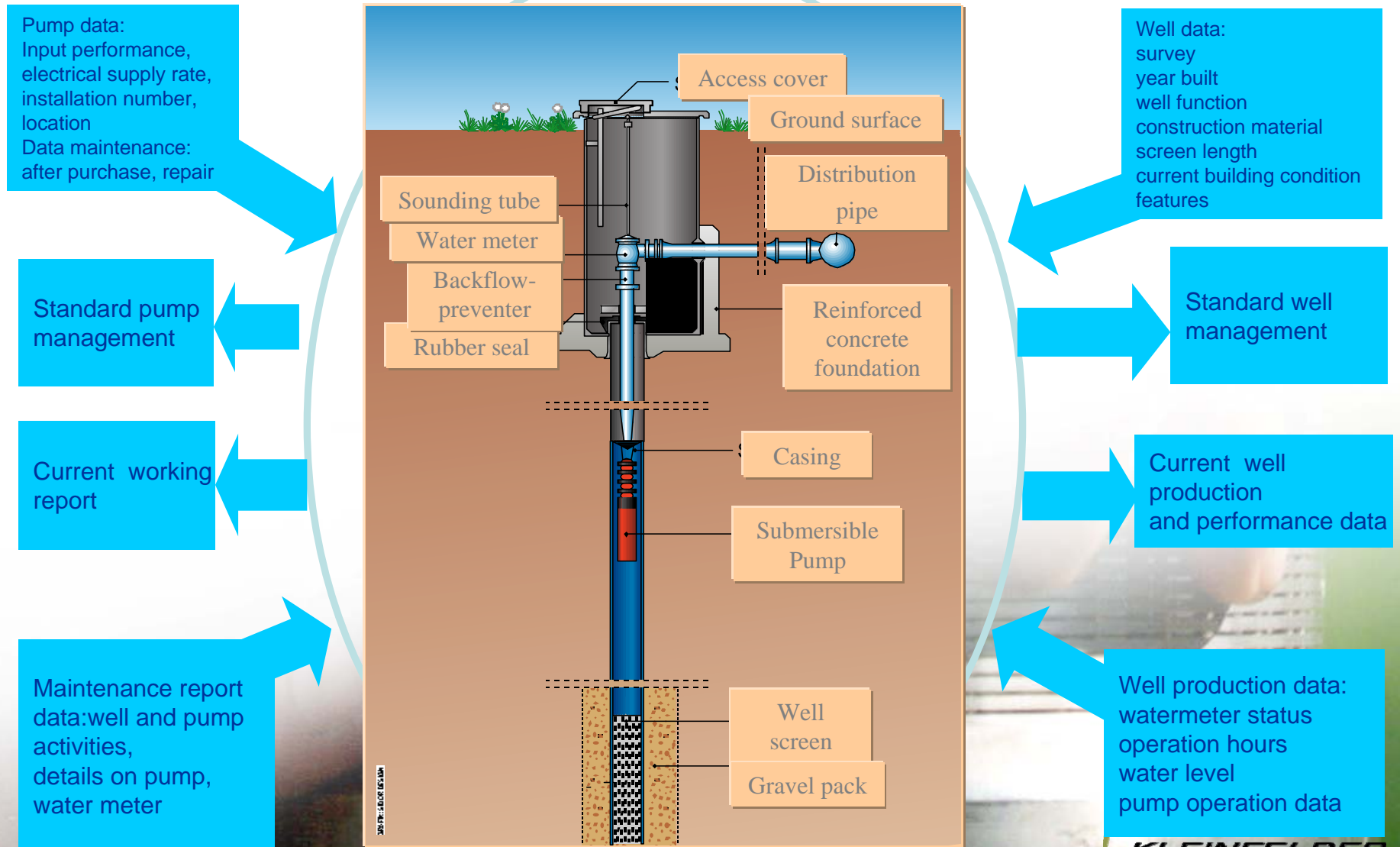
City of Berlin, Germany



- 3.5 Million People
- 14 wellfields
- 850 wells
- 160 MGD
- Vertical Wells
- Horizontal Wells

Asset Management Approach for Wellfields

City of Berlin, Well Field



Asset Management Approach for Wellfields

City of Berlin, Well Field

Well Monitoring System

Berliner Wasser Betriebe				Bericht												
von Werk Tegel				über Leistung, Betriebsstunden und Absenkung der eigenbewirtschafteten Brunnen												
an TW-W				der Galerie Tegelort Süd für den Zeitraum 09.09.98 bis 21.04.1999												
Br.	Datum	Zählerstand alt	Zählerstand neu	Zählerdifferenz zur Vormessung	Betriebsstunden	WSP ab OK Schachtrand		Δ h	Q mittel	Q mom. Nennl.		Manometerstand	Schieberstellung	Stromaufnahme	Kennziffer	Bemerkungen zu fehlenden Daten
Nr.				m³	h	m	m	cm	m³/h	m³/h	m³/h	bar		A	KWh/m³	
Sp.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	4/21/1999	399,646	439,924	40,278	325	19.90	14.73	517	124	134	100	1.5	offen	33.0	0.166	Deckungsmangel
2	4/21/1999	1,615,750	1,679,766	64,016	469	13.75	12.38	137	136	162	120		offen	50.0	0.228	ZW - Manometer fehlt !
3	4/21/1999	1,277,775	1,347,659	69,884	478	13.65	13.64	1	146	160	120	1.8	offen	40.0	0.171	ZW !
4	4/21/1999	1,624,421	1,685,538	61,117	457	13.27	ZU	#VALUE!	134	146	120	1.6	offen	45.0	0.210	ZW - A.-pegel nicht meßbar
5	4/21/1999	1,554,020	1,622,282	68,262	454	12.50	12.40	10	150	180	150	1.9	offen	58.0	0.241	ZW !
6	4/21/1999	1,847,558	1,924,464	76,906	464	ZU	11.86	#VALUE!	166	183	150	1.5	offen	56.0	0.211	ZW - Sonde fest !
7	4/21/1999	1,119,568	1,168,826	49,258	454	15.95	15.88	7	108	108	100	2.1	offen	36.0	0.207	ZW !
8	4/21/1999	1,005,381	1,044,515	39,134	436	21.70	21.43	27	90	100	80	1.7	offen	35.0	0.243	ZW !
9	4/21/1999	1,296,657	1,367,875	71,218	487	13.13	13.02	11	146	128	100	1.7	offen	38.0	0.162	ZW !
10	4/21/1999	1,222,170	1,222,170	0	1	7.00	6.97	3	0		120				#DIV/0!	ZW ! Pumpe defekt
11	4/21/1999	1,184,831	1,239,903	55,072	444	11.54	11.35	19	124	136	100	2.1	offen	38.0	0.191	ZW !
12	4/21/1999	1,516,465	1,664,559	148,094	706	12.85	12.25	60	210	166	150	2.3	offen	60.0	0.178	ZW !
13	4/21/1999	1,451,021	1,576,639	125,618	725	14.75	13.50	125	173	142	120	2.1	offen	47.0	0.169	ZW !
14	4/21/1999	1,084,443	1,404,342	319,899	2608	14.93	14.88	5	123	98	100	1.9	offen	33.0	0.168	ZW !
15	4/21/1999	1,925,714	2,347,865	422,151	2258	16.36	13.30	306	187	152	150	2.0	offen	56.0	0.187	ZW !
Bemerkungen:				(gesamt) 1,610,907	(gesamt) 10,766	(Mittelw.) 14.38			(Mittelw.) 135	(Mittelw.) 143	(Mittelw.) 119	(Mittelw.) 1.9		(Mittelw.) 44.6	(Mittelw.) 0.207	

Asset Management Approach for Wellfields

City of Berlin, Well Field

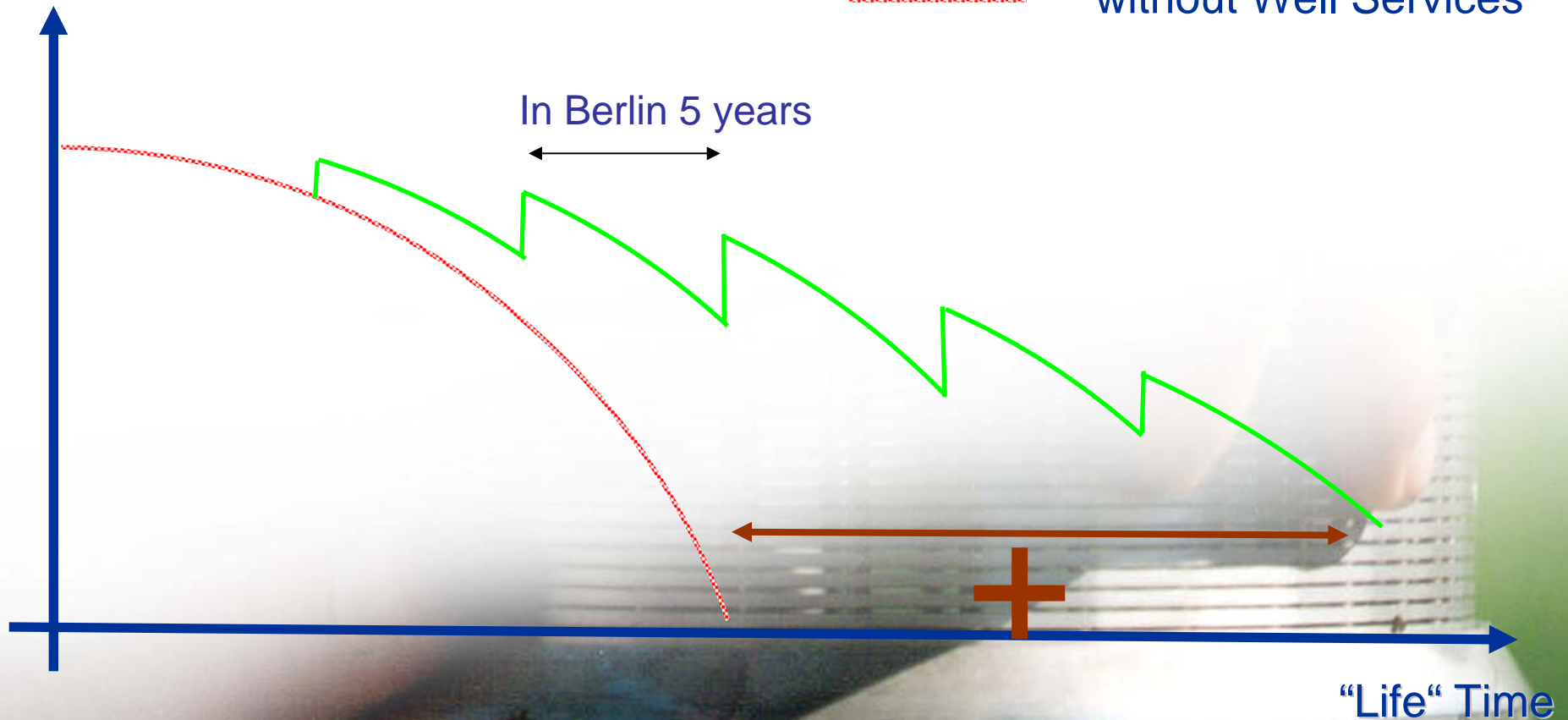
Spec. Capacity in $m^3/h/m$



with Well Services

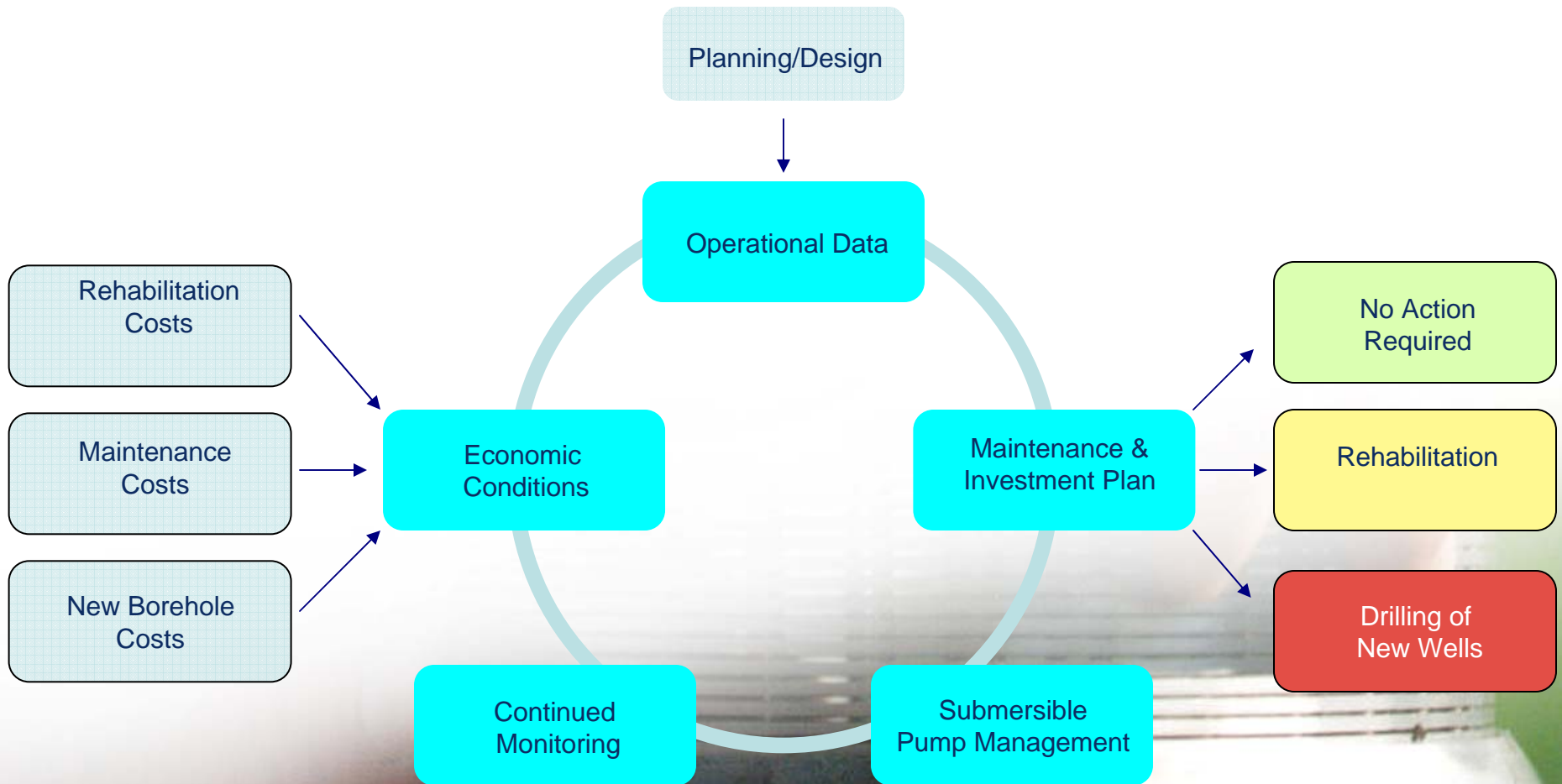


without Well Services



Asset Management Approach for Wellfields

City of Berlin, Well Field



Asset Management Approach for Wellfields

City of Berlin, Well Field

		Well Condition Ranking				
		1	2	3	4	5
Risk Ranking	1	Green	Green	Green	Green	Green
	2	Green	Yellow	Yellow	Yellow	Yellow
	3	Green	Yellow	Yellow	Orange	Orange
	4	Green	Yellow	Orange	Red	Red
	5	Green	Yellow	Orange	Red	Red

Routine Monitoring

Priority Inspection

Rehabilitate

Replace

Asset Management Approach for Wellfields

Summary

- Proactive Management of Groundwater Assets Saves Money
- Inspection/Monitoring Based Approach to Assess Well Condition
- Successful Management Requires Planned Maintenance & Assessment of Risk

Asset Management Approach for Wellfields

Questions

