

Cork Strategic Water Study - Non-Domestic Demand

- **Commercial/Industrial**
 - Large (>10Ml/yr)
 - Medium (1Ml/yr < & < 10ml/yr)
- Average consumption based on meter readings
- Small (< 1 Ml/year) = No of Consumers x Base Demand of 580l/con/day

- **Agricultural** (unmetered allowance)
 - Livestock numbers x base water usage
- | | l/head/day | Assumption |
|--------------|------------|------------|
| Dairy Cows | 150 | Metered |
| Calves <1yr | 20 | |
| Other Cattle | 36.5 | Unmetered |
| Sheep | 4 | |

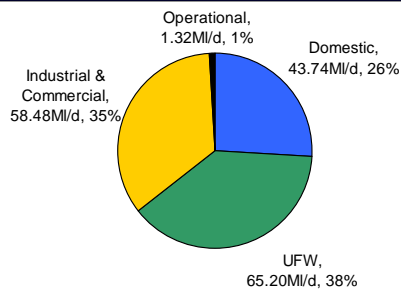
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Cork Strategic Water Study - Primary Scheme Demand

• Population	299,650
• Properties	126,800
• Domestic	43.74 Ml/d
• Non – Domestic	58.48 Ml/d
• Accounted for Water (AFW)	103.5 Ml/d
• Estimated Unaccounted for Water (UFW)	65.2 Ml/d
% UFW	38%
% UFW excluding large metered consumers	48%

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Cork Strategic Water Study - Demand Components



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Cork Strategic Water Study

Water Conservation & Demand Management

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Cork Strategic Water Study - Water Conservation Drivers

1. **Economic:**
Marginal Cost Savings (Short Run – SR ELL)
Deferred Capital Savings (Long Run – LR ELL)
2. **Sustainable Development:**
Rising Demand can be Serviced
3. **EU / National Policy:**
'Polluter Pays' Objective
4. **Asset Conditions:**
Increasing Age Impacts on Leakage
5. **Environmental:**
Permits Reduced Abstractions
6. **Climate Change:**
Ability to cope with Droughts

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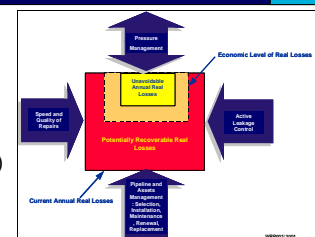
Cork Strategic Water Study - Demand Management

Water Conservation:

- Active Leakage Control (Detect & Repair)
- Pressure Management
- Reduce Losses
- Asset Management (Planned Rehabilitation)

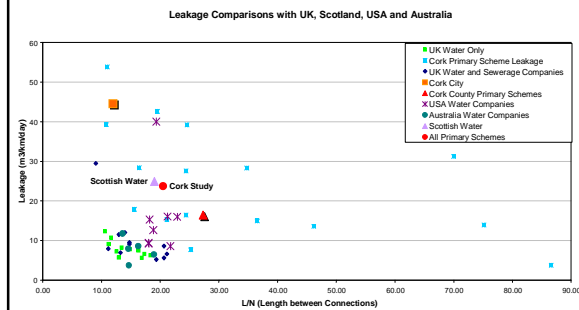
Demand Management:

- Tariff Control
- Awareness & Promotion of Water Saving
- Demand Reduction



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Cork Strategic Water Study - International Benchmarking



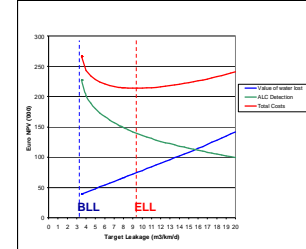
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Cork Strategic Water Study - Leakage Target Setting

Targets Based on Economic Principles

The Economic Level of Leakage is the level at which:

The PV cost of leakage control
+
The PV cost of the water lost
is a Minimum



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Cork Strategic Water Study - Economic Level of Leakage

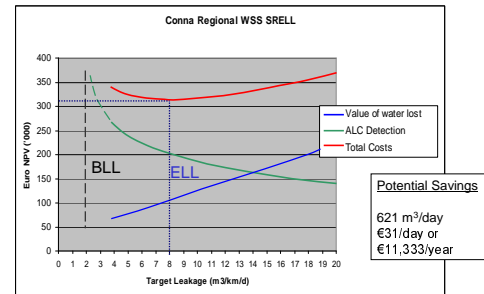
Balance between cost of leak detection and repair and variable cost of production

Inputs to ELL Model - Conna Regional WSS

Parameter	Value	Remark
Average Zone Night Pressure	34.6 m.	Given
Length of mains	28,000 m.	Given
Number of connections	660 nr.	Given
L/N	42.42	Calculated
% mains poor	62	assumed
% mains average	38	assumed
% mains good	0	assumed
Average Cost of detection	€258.60 - €349.90	Varies (increases as UFW reduces)
Average cost of repair	€650 / leak	Power & Chemicals
Marginal operational Cost	€0.05 / m³	

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Cork Strategic Water Study - ELL Conna RWSS



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Cork Strategic Water Study - Scheme Leakage Targets

Water Operational Area	Mains Length, L, km	L/N (N, no. properties)	2003 UFW			Study Target			Prelim. SRELL
			Ml/d	l/prop/d	m³/km/d	Ml/d	l/prop/d	m³/km/d	
Mallo WSS	62	16.0	1.63	421	26.5	1.08	280	17.5	136
Conna Regional	28	42.3	0.60	947	21.3	0.26	416	9.4	356
Bandon WSS	58	19.0	1.50	491	25.9	0.86	280	14.8	190
Youghal WSS	38	12.3	1.36	443	36.1	0.86	280	22.8	184
Midleton WSS	24	10.1	1.64	691	103.8	0.67	280	42.1	202
Cloyne-Aghada WSS	65	40.5	1.20	1,131	18.7	0.37	349	5.8	289
Ferry WSS	57	23.4	2.42	994	42.5	0.77	317	13.6	297
Whitegate Regional WSS	95	34.8	2.82	1,030	29.6	1.07	390	11.2	330
Cork Harbour & City WSS	640	15.0	13.74	318	23.2	12.10	280	20.5	149
Imishannon WSS	146	21.1	2.42	349	16.6	1.94	280	13.3	173
Glinmire Regional WSS	11	12.6	0.59	688	54.5	0.24	280	22.2	142
Macroom WSS	41	25.3	0.35	218	8.6	0.35	218	8.6	126
Glasahoy & Cobb Regional WSS	161	17.4	8.26	894	51.3	2.59	280	16.1	209
Cloakilly WSS	571	90.8	2.51	399	4.4	2.51	399	4.4	399
Dunmanway WSS	20	22.3	0.50	572	25.6	0.31	351	15.7	291
Cork City WSS	425	11.0	23.50	610	55.3	10.79	280	25.4	220

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Cork Strategic Water Study - Admin Area Targets

Admin Area	Mains Length, L, km	L/N (N, no. properties)	2003 UFW			Study Target	
			Ml/d	l/prop/d	m³/km/d	Ml/d	Ml/day
County	1923	27.3	33.90	482	17.6	18.97	14.93
City	673	11.9	31.30	555	46	17.79	13.51
Primary Scheme Total	2598	20.5	65.2	514	25.1	36.76	28.44

Potential Savings Demand Management

- Cistern Displacement – Hippo's 1-2Ml/day
- Regulation of Toilets 2-3Ml/day long term

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Cork Strategic Water Study - Delivering Leakage Targets

Management / Structure:

- Independent Senior Engineer led Organisation
- Divisional Team for Detection / Repair / Records

Infrastructure & Mgt. Systems:

- 350 DMA's with Telemetry Reporting (Regional)
- 16 Teams Equipped & Trained
- CIS Completion
- Asset Performance Databases
 - Bursts
 - Complaints
 - Water Quality
 - Failures and Shut Downs
- Modelling & Pressure Management Set-up
- Mgt. System and Costs Tracking – Link to JD Edwards



Detection & Repair Teams & Support Staffing

Promote Leak Reporting – Free phone Leak Line

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Cork Strategic Water Study - Indicative Resources & Budget

Region	Leaks to be Detected/ Required				Repair Budget Required €m	Detection Budget Required €m	Support Staff Requirements			Support Team Cost €m	Total Costs €m
		Primary Schemes	Rest of Area	Total			Eng.	GIS	Tech.		
	Nr./annum	Nr.	Nr.	Nr.	€/annum	€/annum	Nr.	Nr.	Nr.	€/annum	€/annum
County Western	574	1.28	0.24	2	374,000	178,500	1	0.5	1	100,000	652,500
County Northern	315	0.72	4.76	5	193,000	73,000	1	0.5	1	100,000	366,000
County Southern	2197	4.97	0.21	5	1,374,000	550,500	1	0.5	1	100,000	2,024,500
Total County	3086	7	5.21	12	1,941,000	802,000	3	1.5	3	300,000	3,043,000
Cork City	1800	4	-	4	1,000,000	330,000	***	***	-	-	1,330,000
Totals	4886	11	5	16	2,941,000	1,132,000	3	1.5	3	-	€4.373M

Notes:

***2 man full time leak detection teams with full time leakage foreman for every two crews

*** Primary Schemes Only

*** Effective structure in place

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Cork Strategic Water Study - WC & Demand Management Strategy

Short-Long Term

Water Conservation:

- Active Leakage Control - Targets
- Implement Data & Job Management Systems
- Pursue Consumer Side Leakage
 - Bye-Laws
- Implement Pressure Management
- Implement Rehabilitation Schemes
- Implement Integrated Building Control Policy

Medium – Long Term

Demand Management:

- Awareness & Promotion of Water Saving
 - Internal – Public Buildings, Depots
 - Domestic Consumer – Home & garden
 - Non Domestic Consumers
- Leaflets, Schools Programme, Website and Press
- Demand Reduction
 - Water Saving Devices - Hippo
 - Large Users – Efficiency
 - Regulation – Cistern Size, Appliances
 - Water Butts
 - Grey Water

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Cork Strategic Water Study

Future Demand Projections

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Cork Strategic Water Study -Planning Guidelines

Documents consulted:-

- Cork Area Strategic Plan (CASP) – October, 2001
- North and West Cork Strategic Plan 2002-2020
- National Spatial Strategy (NSS)
- South West Regional Planning Guidelines - May, 2004
- Cork County Development Plans – 2003 and 1996
- Cork City Development Plan 2004
- LAPs & SLAPs, 2005

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Cork Strategic Water Study - Population Projections



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Cork Strategic Water Study - Growth Scenarios

'Planning Scenario'

- upper bound estimate of future demand
- consistent with the high population forecast of the NSS
- allowance for development of all residential and commercial zoned lands
- equivalent proportional growth in the industrial / commercial components

'Forecast Scenario'

- lower bound estimate of future demand
- consistent with the CASP high population forecast
- equivalent proportional growth in the industrial / commercial components

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Planning Scenario – NSS (inc. all Zonings)

Forecast Scenario – CASP High


+13.5 %

Year	Planning Scenario (NSS)	Forecast Scenario (CASP High)
2005	854,774	854,774
2010	875,843	~870,000
2015	904,887	~895,000
2020	927,006	~915,000
2025	929,168	~925,000
2035	949,412	~940,000

Cork Strategic Water Study - Domestic PCC

Per Capita Consumption

- Typical daily breakdown (UK)
 - Toilet Use - 48 litres
 - Personal washing - 38 litres
 - Clothes washing - 30 litres
 - Kitchen & Cleaning - 25 litres
 - External (car washing etc) - 4 litres
 - Total - 145 litres
- Expected Change (138 l/c/d rising to 162 l/c/d by 2028)
 - Reduction (eco-friendly washers, public awareness, use of grey water)
 - Increase (Power showers, waste disposal units, washing recyclables)



Cork Strategic Water Study - Commercial / Ind Demand

Small & Medium Commercial Demand

Assumed growth is directly proportional to domestic growth.

Distribution of Increase:-

- 50% in areas of predicted domestic demand growth
- 50% in areas of predicted employment growth (CASP)

Large Commercial Demand

Provision made for zoned areas (e.g. Ringaskiddy & Carrigtwohill)

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Cork Strategic Water Study - Agricultural Demand

- Future consumption to remain static at present levels
- For future scheme expansion areas, agriculture demand based on:
 - 75% of 'take-up' of dairy contribution
 - 25% of 'take-up' of dry-stock contribution
 - 100% uptake assumed for West Cork due to limited resources

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Cork Strategic Water Study - Peak Factors

WTW Area	2001 Peak Factor	2002 Peak Factor	2003 Peak Factor	2004 Peak Factor	Restricted Demand?	Significant Tourist Influence?	Future Peak Factor
Carrigrohilly			120.0%	128.8%	Yes	Yes	25%
Youghal		112.0%	120.0%			Yes	25%
Malone		114.0%	131.1%				25%
Midleton							25%
Cloyne/Aglish			133.0%				25%
Midway/ish Regional							25%
Eniscarna			131.0%				25%
Knockraha			122.0%				25%
Cahinchey/Tinkertown							25%
Baccharon		114.0%	120.4%	118.7%			20%
Barishon			117.0%				15%
Fennay		109.0%	180.0%				15%
Enishan		111.0%	112.0%	113.4%			15%
Donaghadee				108.8%	Yes		15%
Lee Road	113.4%	106.4%	184.1%	106.8%			15%

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Cork Strategic Water Study - Headroom Factors

Typical international figure for headroom:10%, outage: 5-7.5%

Headroom/Outage reduced to 5% for Primary Schemes study because:-

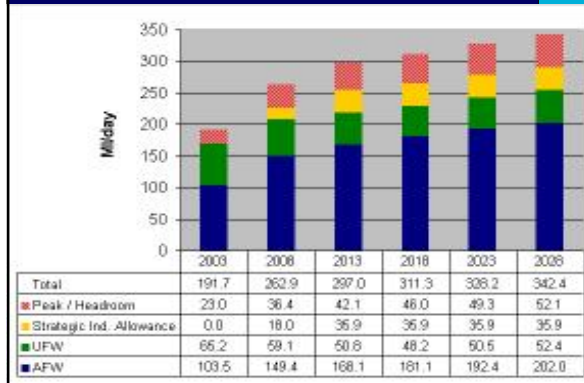
- inclusion of all available zoned residential lands results in 13.5% increase over projections planning publication projections;
- high growth NSS' EGS 2 Option 1 scenario would suggest that an underestimation of growth in the planning period would be most unlikely.

Headroom allowance of 10 % applied to all Secondary Schemes & Un-serviced areas due to greater uncertainty in these areas

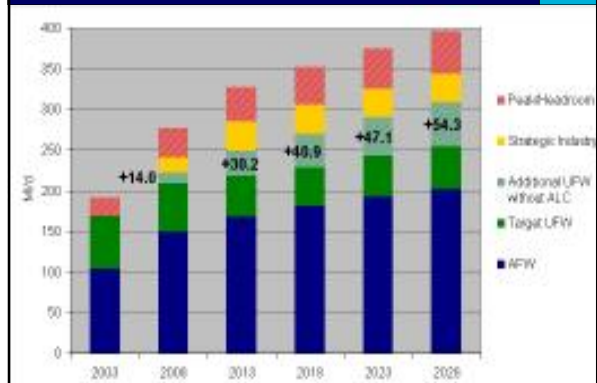
Headroom applied to 'Accounted For Water' Demand only
i.e. not UFW or Strategic Industrial Allowances

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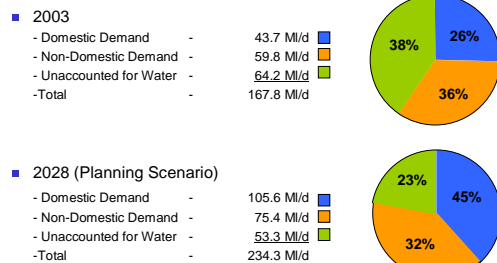
Cork Strategic Water Study - Demand Summary



Cork Strategic Water Study - Effect of Passive Leakage



Cork Strategic Water Study - Demand Breakdown



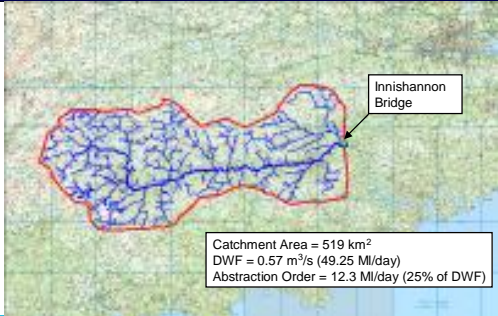
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Cork Strategic Water Study

Resource Assessment

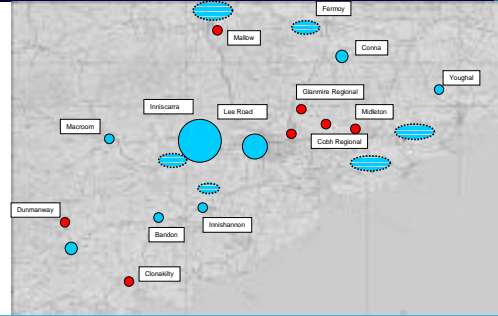
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Cork Strategic Water Study - Resource Assessment



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Cork Strategic Water Study - Resource Assessment

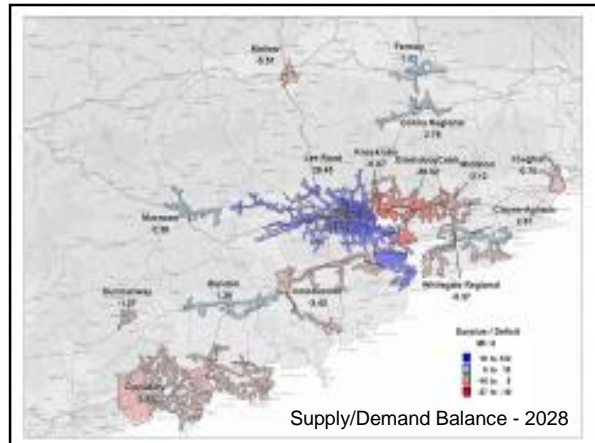


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WTN	Source	Existing Capacity MB	Potential Capacity MB	Additional Capacity MB
Innishannon	Lee Ingroundwater	08.08	227.25	+199.27
Lee Road	River Lee	36.48	80.89	+44.41
Bandon	Bandon River	4.50	7.75	+3.25
Bandon	Bandon River	11.28	12.30	+1.02
Malin	Overmaccara River	2.73	7.26	+4.53
Youghal	Overmaccara River, Glynnine Borehole, Tooty River	3.40	4.47	+1.07
Knockraha	Ennisbeg, Kilquane, Ryebole Rivers	1.17	1.17	+0.00
Malin	Problems Impediment, Clyde River	4.36	5.80	+1.44
Malin	Collins River	3.58	3.80	+0.22
Glinsk/Ballycaddy	Glinsk/Ballycaddy River, Ovenside Bn, Tolestown Impediment	22.17	30.50	+8.33
100-daygate Regional	Dover Borehole	4.99	4.99	+0.00
Cloyne/Aghada	Carmichael Borehole	4.58	6.55	+1.97
Fermoy	Blackwater Infiltration Gallery, Augmentation well	8.75	7.50	-1.25
Corrality	Augmahan River	9.09	10.00	+0.91
Dunamarey	Corrality Lake	1.18	1.18	+0.00
Corra Regional	River Dole	3.48	4.80	+1.32
Total		108.63	390.40	+281.77

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Strategic Mains Models

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Cork Strategic Water Study - Cork Harbour & City WSS



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Cork Strategic Water Study - Strategic Models

Test Cluster	Scheme	Pressure No.	Flow No.	Level No.	TOTAL No.
1	City and Harbour	57	35	10	185
	Curraleigh WSS	15	11	4	
	Innishannon (A. Kinsale) WSS	30	16	7	
	Total Cluster No. 1	102	62	21	
2	Geafelary WSS	16	8	4	140
	Cobh WSS	31	25	11	
	Clayton/Aghada WSS	11	3	5	
	Whitegate WSS	16	8	2	
	Total No. 2	74	44	22	
3	Bandon WSS	8	5	2	107
	Ferryway WSS	10	6	3	
	Knockraha WSS	7	6	3	
	Malwa WSS	7	4	2	
	Macroom WSS	3	2	1	
	Middleton WSS	3	3	1	
	Youghal WSS	15	11	5	
	Total Cluster No. 3	53	37	17	
TOTAL		229	143	60	432

- 14 Schemes – (9 Models)
- 1669 Nodes
- 316km of main
- 1,500 pipe lengths
- 55 reservoirs or tanks
- 39 pump stations
- 500 Site surveys
- Calibration of 113 meters,
- Installation of 7 new meters
- 104 Pressure tappings

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Cork Strategic Water Study

General Service Criteria, Levels of Service & Performance Indicators

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Cork Strategic Water Study - Levels of Service

“The achievement of the highest level of consumer satisfaction and service quality in line with the prevailing regulatory framework, whilst making best use of available resources”
(Faria and Alegre,1996)

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Cork Strategic Water Study - 5 Key Water Operator Objectives

- to provide an appropriate level of service to consumers, while complying with national and regional policies and meeting statutory and other obligations;
- to plan, construct, maintain and operate the water operator's physical assets as efficiently and effectively as possible.
- to make the most efficient use of water resources;
- to achieve the most efficient use of financial resources;
- to obtain the highest possible productivity from human resources and offer the best employment and career opportunities according to the individuals' skills and aptitudes;

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Cork Strategic Water Study - Monitoring & Achieving Objectives

Consumer Satisfaction

Set Levels of Service (LOS) Objectives
Assess Performance Against LOS
Identify Needs and Plan Investment

Improving Performance

Classify Schemes
Identify Performance Indicators
Benchmark against other Schemes or Authorities
Identify Improvement Areas

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Cork Strategic Water Study - Performance Indicators

For Cork Authorities

- Facilitate Better Management;
- Allows Monitoring of the effects of Management Decisions;
- Provides decision support information;
- Aids pro-active management – reduce fire fighting
- Highlights strengths and weaknesses of schemes and assets;
- Assists with implementation of a Total Quality Management regime;
- Facilitates the implementation of benchmarking;

For the DoEHLG:

- Supports the formulation of policies for the water sector
- Aids Assessing investment priorities, project selection and follow up.

For consumers and pro-active stakeholders:

- Easy to understand measure of the quality of service provided.

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- Water Quality – EU & National Standards
- Security of Supply
 - Resources
 - Headroom 5-15% Risk Dependent
 - Demand Forecasting
 - Annual Review
 - 5 yearly major review
 - Water Use Restrictions – As required
 - Network
 - Storage – 24 hours peak daily demand – risk assessed
 - WTW Capacity Capable Peak Week requirements + 10%
- Leakage Targets
 - Distribution – ELL
 - Consumer Side – Reduce to 40l/p/d – Monitor
 - Repair Times
 - Reported Bursts – 90% 12 hours
 - Detected Bursts 72 hours
- Emergency Plan – In Place

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Consumer Service

- Min15m – Max 50m Pressure
- Supply Interruptions
 - 12 hours maximum for 99% properties for 10 year planning horizon.
 - Adequate monitoring/recording for 5 year planning horizon.
 - 24 hours notice of a planned interruption of water supply lasting more than 4 hours
- Bursts Target 200/1000km of main/annum
- Complaints & Queries – Respond within 10 days
- Appointments Policy

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Regional Water Supply Recommendations

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Cork Strategic Water Study - Division of Study Area



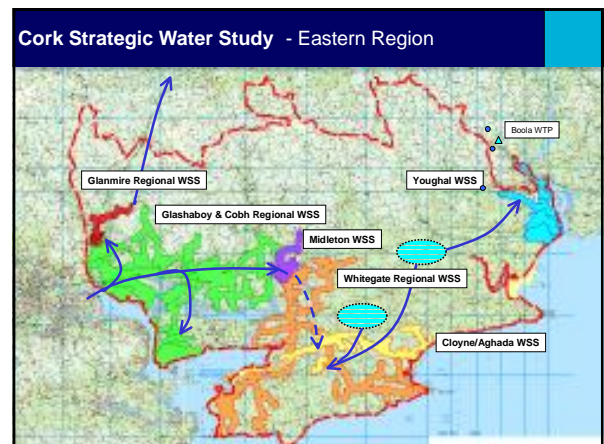
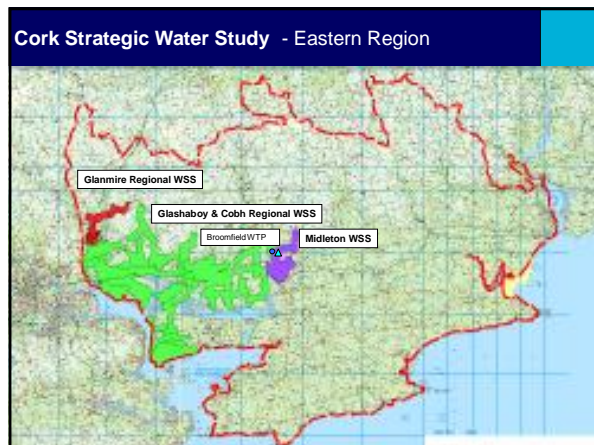
Cork Strategic Water Study - Methodology

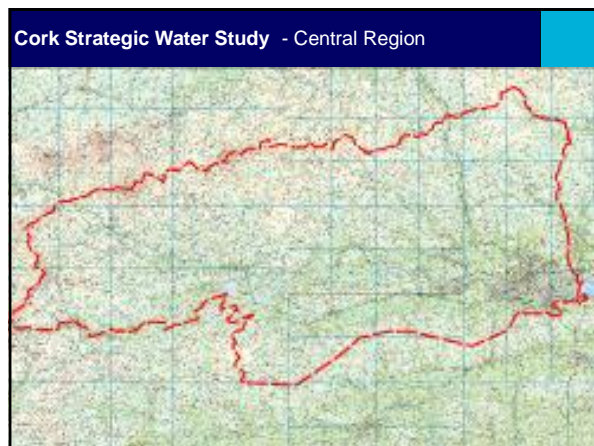
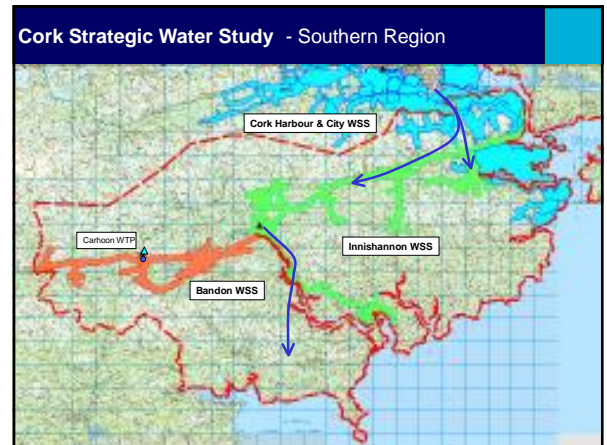
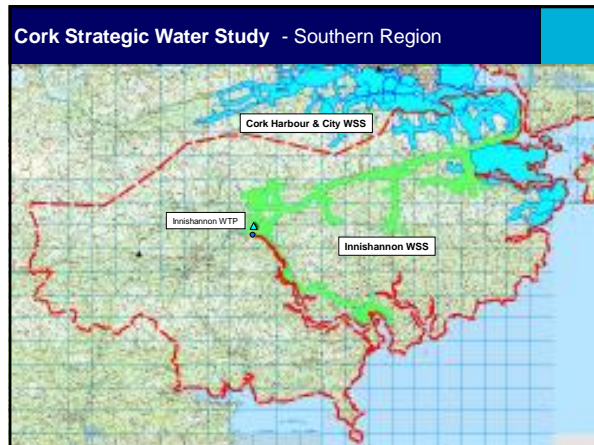
- Complete demand balance
- Identify the available supply options to meet the demand deficits.
- Assess supply options over the short-medium term (2003-2013) & medium-long term(2013-2028).
- Identify service storage augmentation.
- Identify preferred solutions and programme of recommended works.

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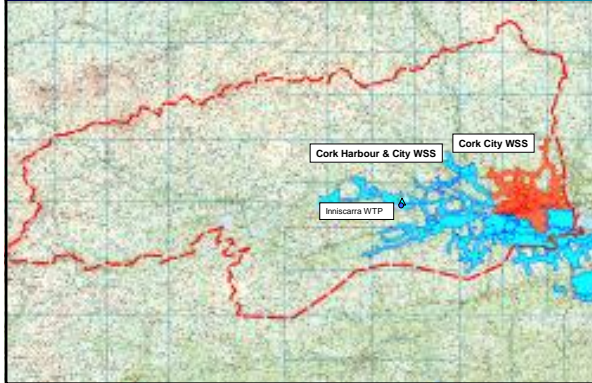
Cork Strategic Water Study - Eastern Region







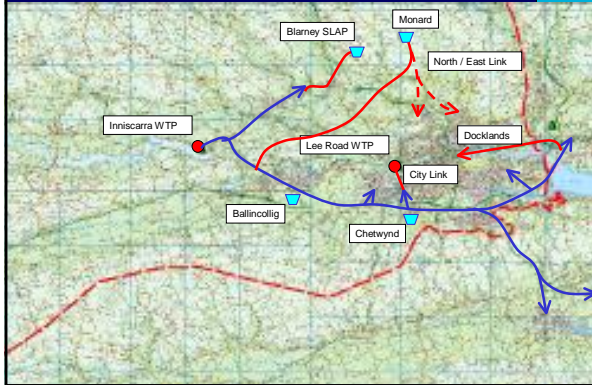
Cork Strategic Water Study - Central Region



Cork Strategic Water Study - Central Region



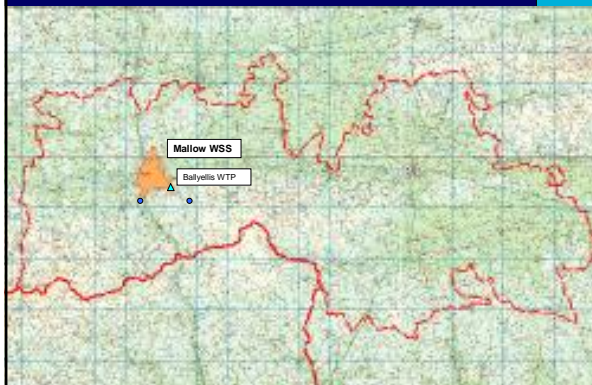
Cork Strategic Water Study - Central Region



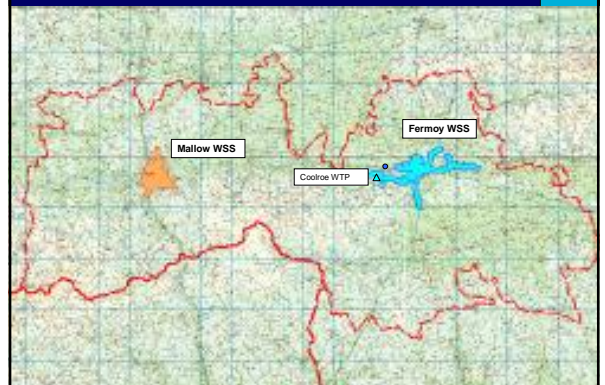
Cork Strategic Water Study - Northern Region



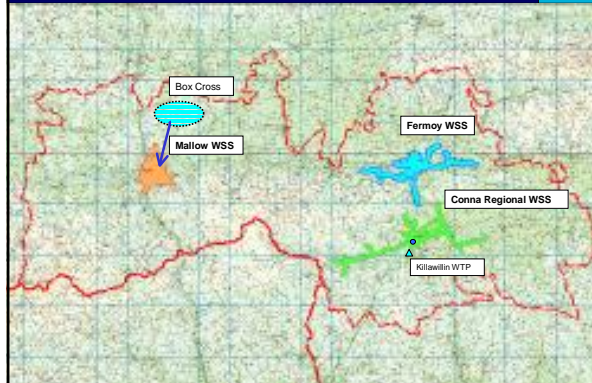
Cork Strategic Water Study - Northern Region



Cork Strategic Water Study - Northern Region



Cork Strategic Water Study - Northern Region



Cork Strategic Water Study - Western Region



Cork Strategic Water Study - Western Region



Cork Strategic Water Study - Western Region



Cork Strategic Water Study - Overall Capital Programme

Description	Cost (€M)	
	Med Term	Long Term
Production Upgrading	42.8	25.8
Reservoir Storage	28.3	11.3
Distribution	68.6	61.1
Asset Renewal (Mains Rehab – Annual)	15.4	
Leakage Control (Annual)	4.4	
Telemetry & Information Management	0.5	

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Cork Strategic Water Study - Overall Conclusion

- **Immediate Deficits met from Leakage Reduction**
- **Sustainable Growth to 2028 can be served by:**
 - Active Leakage Control and Realistic Demand Management Programme
 - Develop CH & C Reserve plus Local Schemes
 - Monitor and Maintain Asset Standards
 - Storage & Capacity Standards – matched to supply needs
- **Operation and Maintenance Systems to integrate:**
 - Production & Distribution
 - Leakage & Demand Management
 - Asset Monitoring & Management of Risk
 - Customer Services
 - Costs & Revenues Model

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Cork Strategic Water Study - Steering Group


Cork County Council:-	Cork City Council:-	DEHLG:-
Ned Flynn	Jack O'Leary	Tadhg O'Connor
Michael Lavelle	John O'Sullivan	
Kevin Sugrue	Pat O'Sullivan	RPS CE:-
Pat O'Mahoney	Brendan Goggin (Technical)	Jerry Grant
Frank Cronin		Grellan McGrath
Gerald Murphy (Technical)		Donal Lucey
Pat Murphy (Technical)		Alan Curran
Rob Andrews (Technical)		Kevin Power

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Cork Strategic Water Study - RPS Project Team

Project Management		
Jerry Grant	Project Director	
Grellan McGrath	Project Manager	
Alan Curran	Assistant Project Manager	
Demand Assessment	Treatment	Sources
Francis Finnerty	David McBratney	Kevin Power
Andy Werhle	Brendan O'Halloran	Ciona Doyle
	Joanna Crummie	Louise Leahy
Hydraulic Models	Strategy Development	Asset Registers
Tim Holmes	Donal Lucey	Peter Noonan
James Hollinshead	Paul O'Riordan	Carol O'Riordan
Adrian Duggan	GIS	
Paul Rockley	Tadhg Hurley	

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Cork Strategic Water Study



Presentation to Engineers Ireland (Cork Region)

17th January 2006

Grellan McGrath

RPS Group Ltd