Water Contingency Planning Task Force

Appendix IV

Option evaluation process and Technical Assumptions

December 2009

Explanation of option analysis process

Staff and technical advisors defined set of relevant options

- Referred to TF input, existing options from GA / Metro area and case studies of other areas
- Individual sub-teams iteratively revised / augmented option set throughout process
- Teams created key assumptions (locations, distances, etc) to enable cost estimation

Sub-teams generated initial cost / benefit estimates

- Estimated *incremental* yield for each option (ie, yield not yet incorporated in Metro Plan)
- Estimated approximate costs bottom-up (eg, pump horsepower required, transport distance, etc)
- Capital and operating costs estimated over project lives, discounted back to 2010

Teams applied standard cost metrics across teams where possible, eg

- Cost per mile for pipe infrastructure, Cost per horsepower required for pumping stations, Cost per capacity for water treatment plants....(full list on following pages)

Full technical advisor team conducted "peer review" of all estimates

- Sub-teams presented findings to full advisory panel, as well as to water professionals
- Assumptions underlying costs, yields challenged and refined
- Developed consensus that estimates are directionally correct + reasonably accurate given constraints

Result is yield, cost estimates that are comparable- though not precise, as actual design and implementation analysis were not conducted

Summary of economic criteria used in analyses

Criterion	Definition, units	What this tells us
Yield: MGD (AAD)	**MGD saved or supplied, in Avg Annual Day terms**	**Options' contribution to supply gap**
Cost-efficiency: $/MG	**2010 $ cost per million gallons "saved"** • Includes capital expense, operating expense over project lifetime, discounted to 2010 at 3% real rate • Total 2010 $ costs divided by total MG yielded over project	**Relative cost efficiency of different types of solutions** • Normalized for timing of costs, enabling comparison of capital intensive options with low capital cost options
Capital required: $M	**$M of capital expense** (in 2010$)	**Degree of near-term budget demands**

Standard cost assumptions used by all teams

Capital expenses (I)

Category	Standard used	Assumptions
Intakes	$375,000 x (Q ^ 0.7), where Q = flow rate (MGD)	• Built-in contingency factor of 1.5 • Includes structure cost only • Pumps estimated separately • Cost has been calibrated for mid-2010 dollars
Pump stations	$33,314 x (HP ^ 0.68), where HP = pump horsepower	• May include single or multiple pumping stations • Cost calibrated for mid-2010 dollars • Includes all associated costs (pumps, housing, motors, design oversight, etc) • Based on South Central TX Regional Water Plan construction cost data
Pipeline	See table below	• All costs in mid-2010 Dollars • ENR Construction Cost Index (CCI) in October 2009: 8,596.31 • Assumed CCI for mid 2010: 8,770 • Cost per lineal foot = (CCI/653) * D ^ 1.085 • Built-in contingency factor of 1.5 • Accounts for distance calculated "as the crow flies" • Includes "right of way" cost contingency

Diameter (in)	Cost/lineal foot	Cost/mile
10	245	1,290,000
12	299	1,580,000
18	464	2,450,000
24	633	3,340,000
30	807	4,260,000
36	983	5,190,000
42	1,163	6,140,000
48	1,344	7,100,000
60	1,712	9,040,000
72	2,086	11,020,000
84	2,466	13,020,000
96	2,851	15,050,000

Standard cost assumptions used by all teams

Capital expenses (II)

Category	Standard used	Assumptions
Capacity	Peaking factor = 1.5x average annual day	• For treatment structures • For transmission or raw water withdrawal facilities use appropriate factors • Treatment facilities designed for peak day capacity
Distance	Calculate distances "as the crow flies". For remote areas, use factor of 1.2 or as required	• Pipeline contingency factor of 1.5 includes allotment for distance
Pump & WTP refurb	30% of original capital expense in Year 25	• Major refurbishment of pumping stations and Water Treatment Plants required every 25 years at ~1/4 to 1/3 of original cost
Treatment plant	($M)	• For standardization, use WTP w/ UV cost estimates • 2003 planning costs, updated with mid-2010 CCI

Q (MGD)[1]	w/UV
10	26.2
20	47.6
40	87.9
60	126.3
80	163.6
100	200.0
150	288.5
200	374.2
250	458.1
300	540.4

1. Peak Daily Demand (MGD) of Capacity

Standard cost assumptions used by all teams

Operating and maintenance expenses

Category	Standard used	Assumptions
Pumping costs	• $0.07 per kWh general • $0.12 per kWh peak power demand • 130 C factor • 0.75 Pump & motor efficiency • 10% of dynamic head for minor friction loss	• Based on 2010 rates (not independently estimating inflation) • Higher rate used only when ALL pumping assessed to occur during peak power demand periods (very limited cases)
Pump and pipeline O&M	• 0.50% of initial capital expense per year (pumps) • $1,000 per mile per year (pipeline)	• Includes all O&M expenses other than electricity • 2 personnel inspect 2x per year + periodic line cleaning
Treatment plant O&M	• $0.75 per 1,000 gallons	• Total cost for running plant (including electricity)

Technical Advisors heavily leveraged data from the current Metro Water plan for option evaluation

Key data used in analysis (not exhaustive)	Primary Purpose
Current and projected water demand and supply – Figure ES-2, Page ES-7	**Estimate potential water shortfall in 2012**
Water usage profile by customer category and end use – Figure 3-3, Page 3-3 **Per capita indoor and outdoor water consumption, by county** – Table 3-2, Page 3-7	**Estimate yield for conservation measures such as toilet retrofits, showerheads and faucets, pricing etc.**
District wide results (cost, yield) of conservation measure evaluation – Table 4-2, Page 4-5	**Determine yield that is <u>incremental</u> to what is already in the plan, for conservation measures**

Besides quantitative data, plan was referenced extensively for option implementation/policy considerations

Source: MNGWPD Water Supply and Water Conservation Management Plan (May 2009)