Water Conservation & Efficiency in EPA Region 4 CWA Section 404 Review of Water Supply Projects

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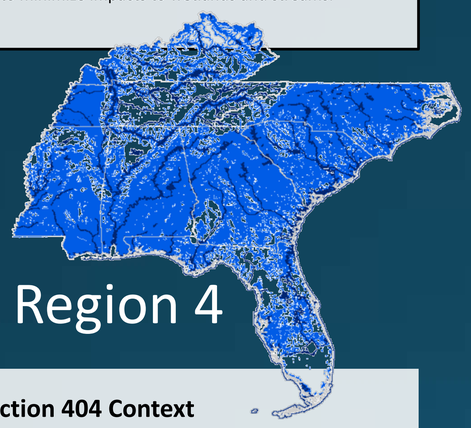
Introduction

Public water supply, aquatic habitat, water quality protection, energy generation, agriculture, commercial and industrial uses, and recreational opportunities all depend on water, yet competition among these uses, instream and off-stream, is stretching our limited water supply in ways that require new solutions for responsible use. Freshwater ecosystems have been impacted more than any other habitat globally, in large part by hydrologic modification for withdrawal and storage, and it is estimated that more than 40% of the world's freshwater is held behind dams.

Construction of water supply projects, particularly storage reservoirs, generally involves the discharge of fill material in waters of the U.S. These impacts to streams and/or wetlands require a Clean Water Act (CWA) Section 404 permit. Environmental review by EPA for Section 404 permitting involves review of project purpose and review of the alternatives analysis for selection of the least environmentally damaging practicable alternative. Even if the project purpose and selected alternative are found to be consistent with the regulations (called the 404(b)(1) Guidelines) that guide Section 404 reviews, EPA also reviews proposed activities to ensure that the project is sized accordingly to minimize impacts to wetlands and streams.



CWA Section 404 Context

EPA Region 4 reviews proposed water supply projects seeking CWA Section 404 permits in terms of project purpose, alternatives analysis, and impacts to aquatic resources. These review principles can assist local governments and water utilities in eliminating or minimizing the need for additional capacity **before** consideration of a water supply project that would impact aquatic resources.

A water utility seeking water supply through a new reservoir or other project involving impacts to wetlands or streams should explore opportunities to optimize water conservation as a first source of supply. In other words, the utility should demonstrate that its existing supply is not sufficient to address projected demand. Region 4 Section 404 reviews will consider:

- system management
- inputs and outputs
- sources of potential loss
- leakage management
- metering
- rate structure
- end user efficiency measures
- conservation planning

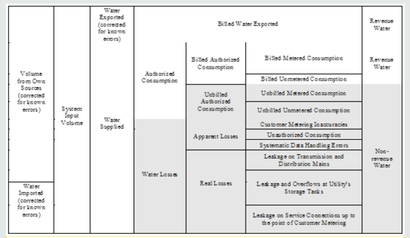
Review Principles

System Accounting

Recommend auditing using AWWA Free Water Audit Software©
- Five years' worth of data if seeking to develop new supply

Water balance: Account for all inputs & outputs
- Apparent losses & real losses

Metrics:
- Data Validity Score
- Non-revenue water



Water balance components. All data in volume for the period of reference, typically one year.
Source: AWWA (2016) *Water Audits and Loss Control Programs (Manual of Water Supply Practices M36), 4th edition.*

Loss Minimization: Leak Management

Leaks are usually the primary form of real loss
- Should be proactively managed to economically low level
- Pressure management often key; also physical condition/stress

Infrastructure Leakage Index (ILI): (CARL:UARL) or Op24
- Expect low ILI
- Decreasing trend in Op24
- DMAs can be helpful in identifying problem areas, recoverable leakage

Economic Level of Leakage (ELL) analysis
- Identify the point where the value of water lost to leakage equals the value of the intervention activities to control it

Informed leakage management program/water loss control plan
- Four pillars described by AWWA: active leakage control, optimized leak repair activities, pressure management, and system rehabilitation and renewal

General Guidelines for Setting a Target ILI (without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be fearibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target – is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

Infrastructure Leakage Index (ILI) as a target-setting tool.
Source: AWWA (2009) *Water Audits and Loss Control Programs (Manual of Water Supply Practices M36), 3rd edition.*

Metering

Meter all users, including multi-family residential sub-meters
- Better understanding of system
- Revenue recovery
- Incentivize efficient use
- No flat charges; a meaningful portion of bill must correspond to use

Bulk metering calibration & replacement program recommended

Base meaningful portion of bill on volumetric use

Source water metering

Conservation Rate Structure

Full cost pricing
- Rates should reflect full long-range (forward-looking) costs
- Reflect value and scarcity of the resource
- Encourage, reward conservation and efficient use

Rate planning, revenue stability planning
- Base / volumetric charges reflective of fixed costs, demand patterns, scarcity and value of resource, etc.
- Conservation rate structure (e.g., Inclining block) to incentivize efficient use, reflect costs of providing next volume of water

Utility bill should convey information about customer's water use, rate structure, comparison to average/conserving use

End User Profile & Practices

Water use profile: Customer classes & demand
- SFR, multi-family, industrial, commercial, institutional
- Variability with time (recommend monthly at least) by customer class
- Seasonal demand patterns

Residential indoor demand gpcd – five years of data

Assessment of water savings potential
- Based on end user efficiency measures tied to savings opportunities identified

Water Conservation & Efficiency Plan

Written plan for optimizing system performance
- Living document that evolves with system

Definitive & measurable goals

Recognize effects of measures already implemented

Forecast effects of planned measures

Implementation/Expected Uses

CWA Section 404 review for water supply projects
- Reservoirs
- Infrastructure construction

Section 404 pre-application phase

NEPA scoping & review

Key Questions of Section 404 Review

Are proposed project & impacts commensurate with projected supply-demand gap?
- Are projections based on reasonable demand?
- Can the supply-demand gap be closed completely without new construction or withdrawal?

With need refined through conservation/efficiency review, do other alternatives become available?
- Purchase from other system
- Smaller reservoir
- Site in location w/less adverse impact

Benefits of Finding Supply w/Efficiency

Avoidance or delay of capital investments

Responsible management for tax- and rate-payers

Protection of flowing waters

Preserve habitat, migration routes, endemic species

Protection of water quality

Preserve sediment dynamics, avoid downstream erosion and sediment starvation

Maintenance of natural hydrograph (depending upon other influences on system)

Disclaimer

The views and opinions presented here are those of the author and do not necessarily represent the official positions of the US Environmental Protection Agency.

Contact

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