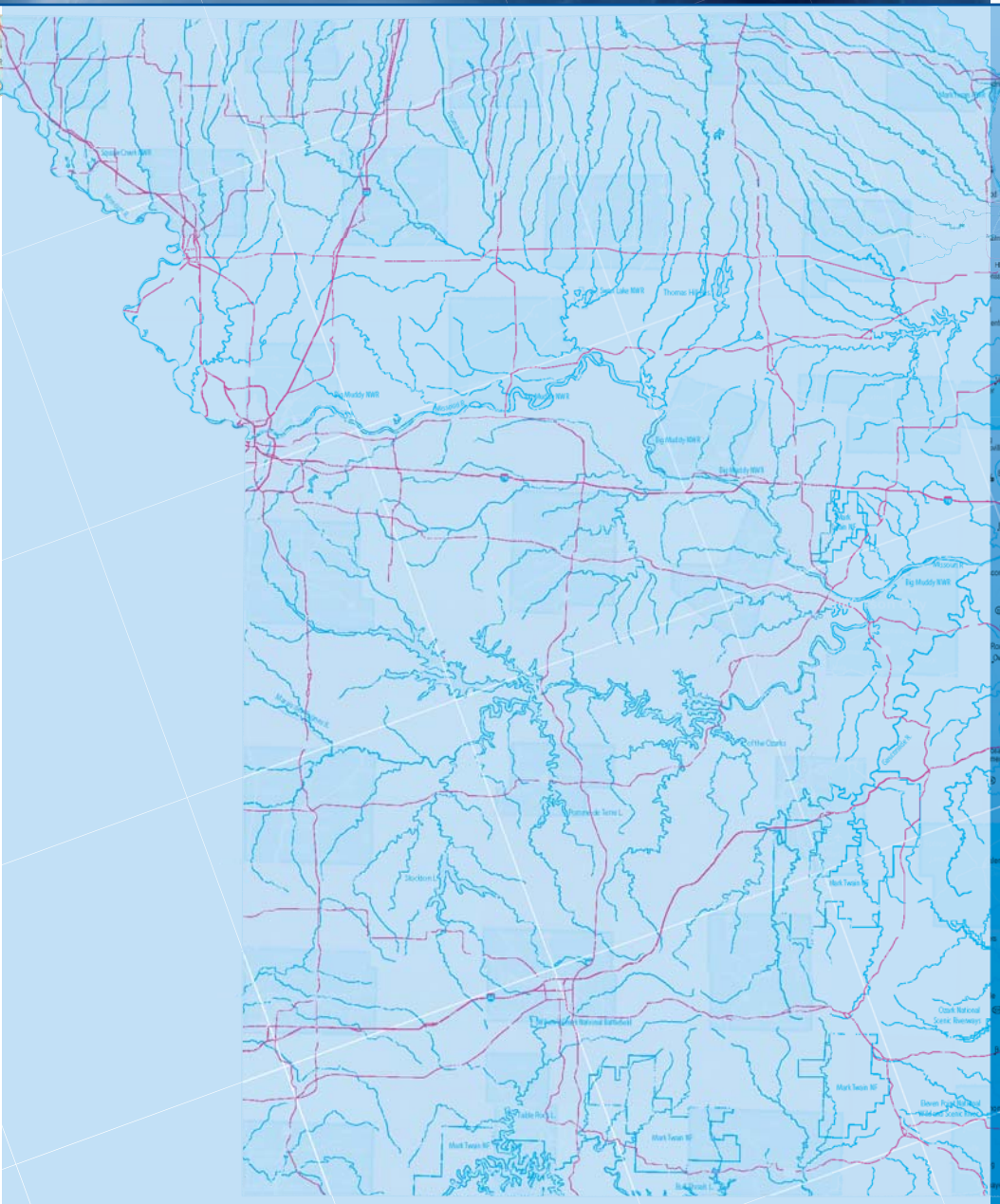
Missouri Water Plan

WORKPLAN OUTLINE

MISSOURI DEPARTMENT OF NATURAL RESOURCES

March 12, 2015



US Army Corps of Engineers
Kansas City District

CDM Smith

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Section 1 Task Options

The Missouri Department of Natural Resources (MDNR) is charged with preparing, maintaining and implementing the Missouri State Water Plan per state statute 640.415 RSMo. Missouri has been successfully implementing this plan through studies and projects focused primarily on meeting the water supply challenges of the state. Missouri's water resources are vital to the health and economy of the state. As such, it is important to maintain a current, comprehensive and contemporary plan for the management of the Missouri's water resources.

Looking at regions of the state, key elements for Missouri's next iteration of the State Water Plan involve analyzing water demands and defining water supply and availability. Apparent gaps between demand and supply will be determined and priorities for infrastructure funding will be defined. Effective public outreach and stakeholder involvement are integral to the State Water Plan process to garner public input and support as well as constituent buy-in for future infrastructure funding. Public participation is required per state statute 640.415 RSMo during development and revision of the State Water Plan.

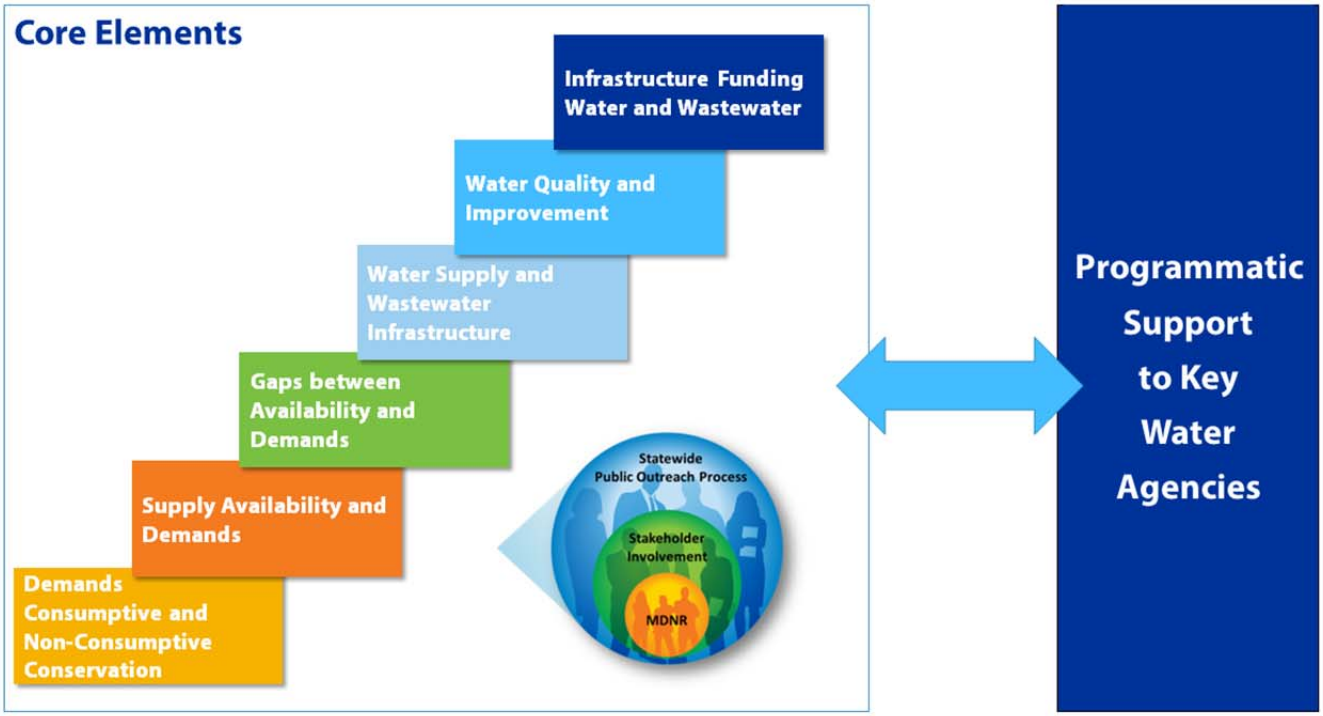


Figure 1. Core Elements of a State Water Plan

Likewise, several state agencies are appointed through the Inter-Agency Task Force (IATF) as established in state statute 640.430 RSMo, to advise the MDNR during the development and revision of the State Water Plan.

The update to the State Water Plan will set the vision for the water resources management of the state that will benefit present and future generations. It has been more than a decade since the last edition of the plan. This outline includes three options for consideration that reflect varying levels of effort and engagement that will address the core elements while meeting state regulations or state requirements. Each option builds upon the previous, allowing flexibility in the process to meet the immediate as well as future needs. The options offered reflect an 18-, 24-, and 36-month schedule for completion. A final report will be provided at the end of 18 months including infrastructure, policy and future study recommendations.

Option 1 (18 months). A team of MDNR staff and CDM Smith will be working closely with stakeholders to complete the State Water Plan update within 18 months. The plan will leverage available data and studies including the northwest and southwest Missouri demand and supply availability data and findings as well as the surface water yield Reservoir Operation Study Computer Program (RESOP) studies. Public outreach and education will leverage the ongoing watershed planning efforts of *Our Missouri Waters (OMW)* by reaching out to basin stakeholders. Citizens of Missouri have expertise on issues related to their local water resources. Involving this expertise during the planning process is essential for sound water policy to meet the needs for future generations. The stakeholder engagement in this process occurs at the earliest phases to ensure that citizen-experts' concerns, ideas for solutions and priorities are incorporated throughout the planning process.

There is no additional groundwater or hydrologic and hydraulic modeling anticipated in this option. Nor will there be decision support models, tools and respective training provided in this 18-month period. CDM Smith will be in close coordination with MDNR staff in identifying data and studies in support of a rapid planning process to provide agreed upon water resource management recommendations.

Pro: Comprehensive planning including core elements, completed quickly with available data and studies, methods, approaches and recommendations vetted with MDNR staff and best professional judgment, and engagement with partner agencies for input and buy in.

Option 2 (24 months). A team of MDNR staff and CDM Smith will be working closely with stakeholders to complete the State Water Plan update within 24 months. The plan will build upon the available data, studies and projects from across the state. An evaluation of available data will be conducted in conjunction with *OMW t*o determine gaps that will lend to identifying data needs which may require data collection, surveys and possible modeling to support the plan. Stakeholder involvement in forming the technical work groups will be incorporated into the process to review methods, approaches and recommendations. In addition to the education and outreach achieved by *OMW* that is targeted at a basin scale, the plan will educate and engage residents and business statewide.

Pro: Inclusive of all components of Option 1. Additional elements include stream data, vetted with stakeholder-based technical work groups, and greater public education and input.

Option 3 (36 months). A team of MDNR staff and CDM Smith will be working closely with stakeholders to complete the State Water Plan update within 36 months. The plan will employ contemporary tools such as a decision support model in identifying priorities, phasing and funding. These decision support tools such as IWR-MAIN and STELLA will remain with MDNR and necessary training will be provided for future decision

making. The three-year process will kickoff with public outreach regarding the current plan and future plan needs by region. Stakeholder-based technical work groups will work on the core elements that support methods, approaches, findings and recommendations. Decision support models will assist in final recommendations and costs. Draft findings will be vetted through a series of statewide meetings.

Pro: Inclusive of all components of Options 1 and 2. Additional components include employment of tools applied for topics such as minimum/instream flows, fits the timeline of the *OMW* in its delivery, educates the public/constituents for support of future infrastructure needs.

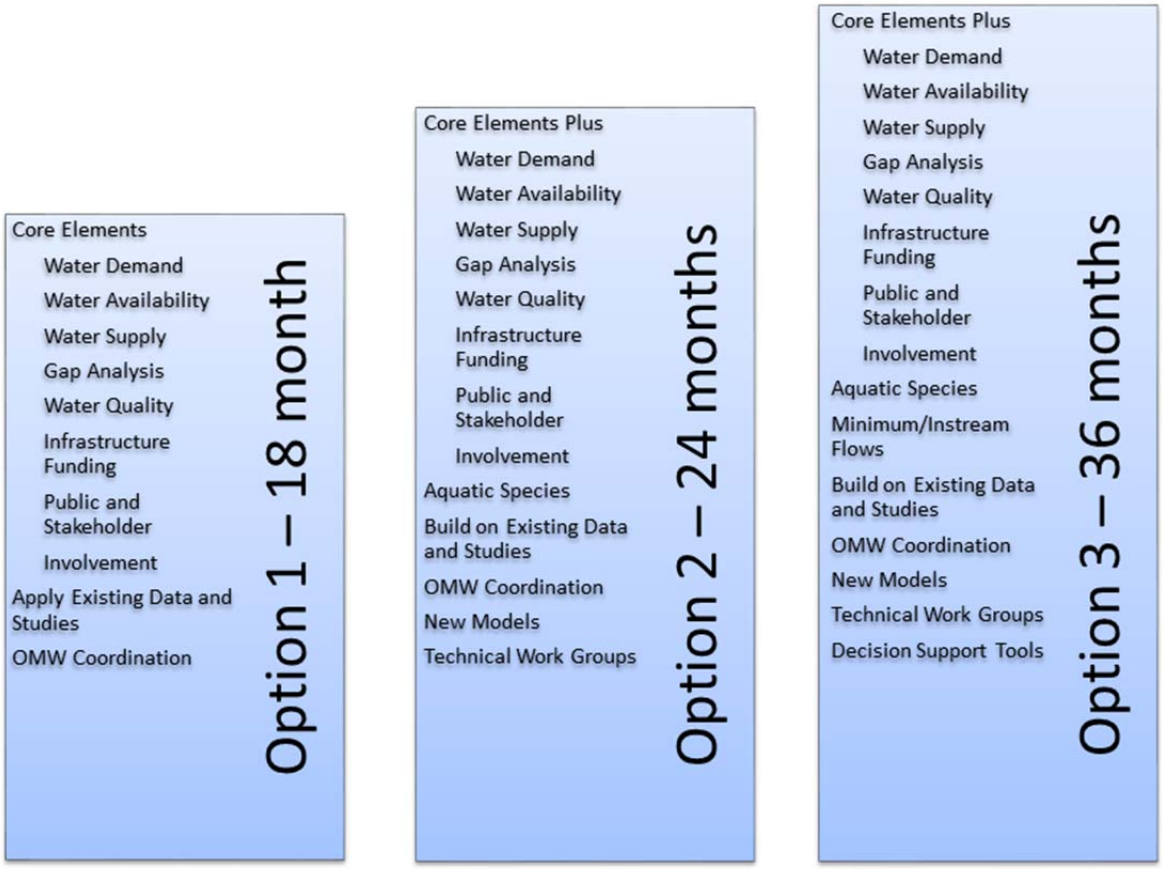
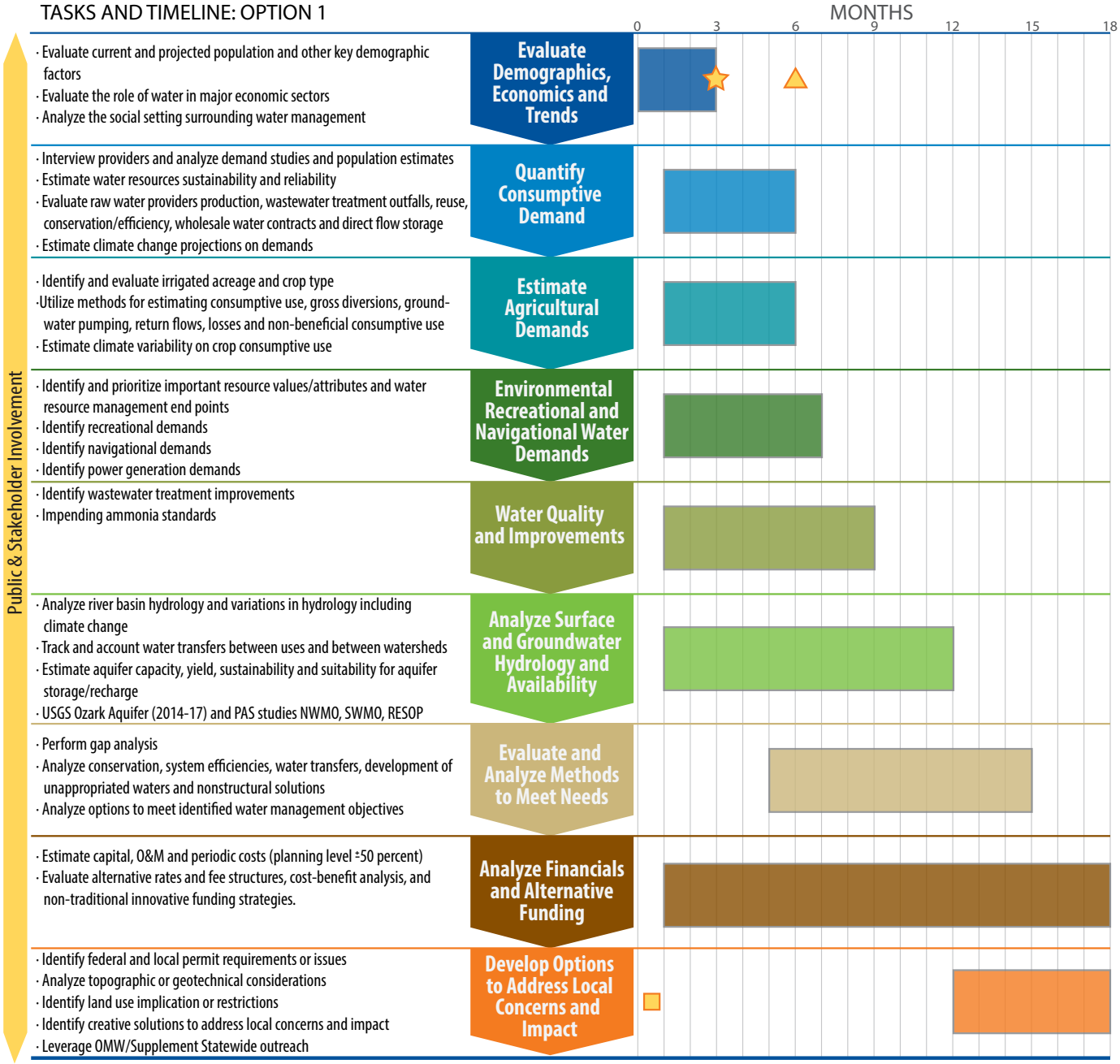


Figure 2. Summary of Each Major Task for the 3 Options

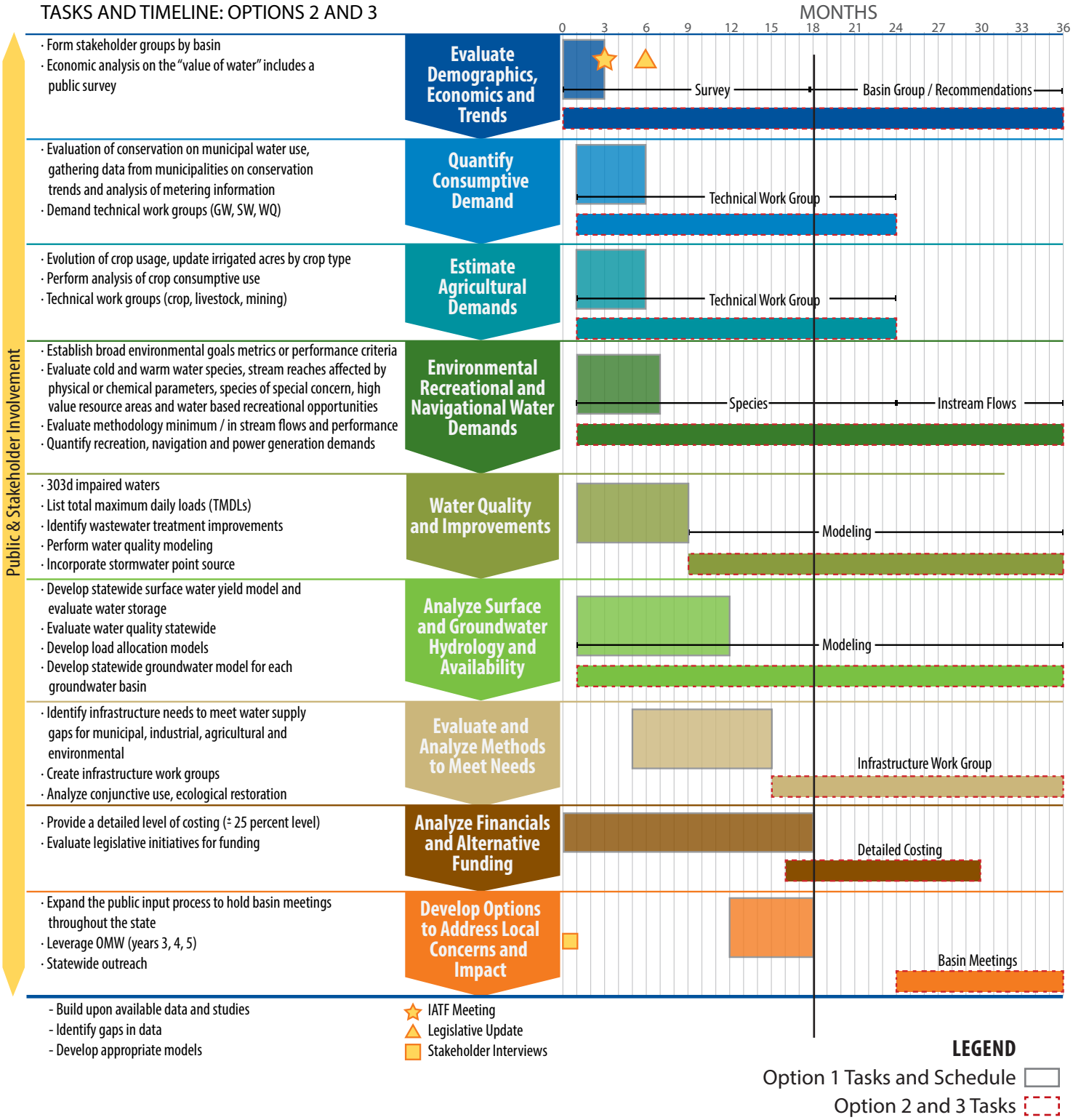
Missouri Water Plan

TASKS AND TIMELINE: OPTION 1

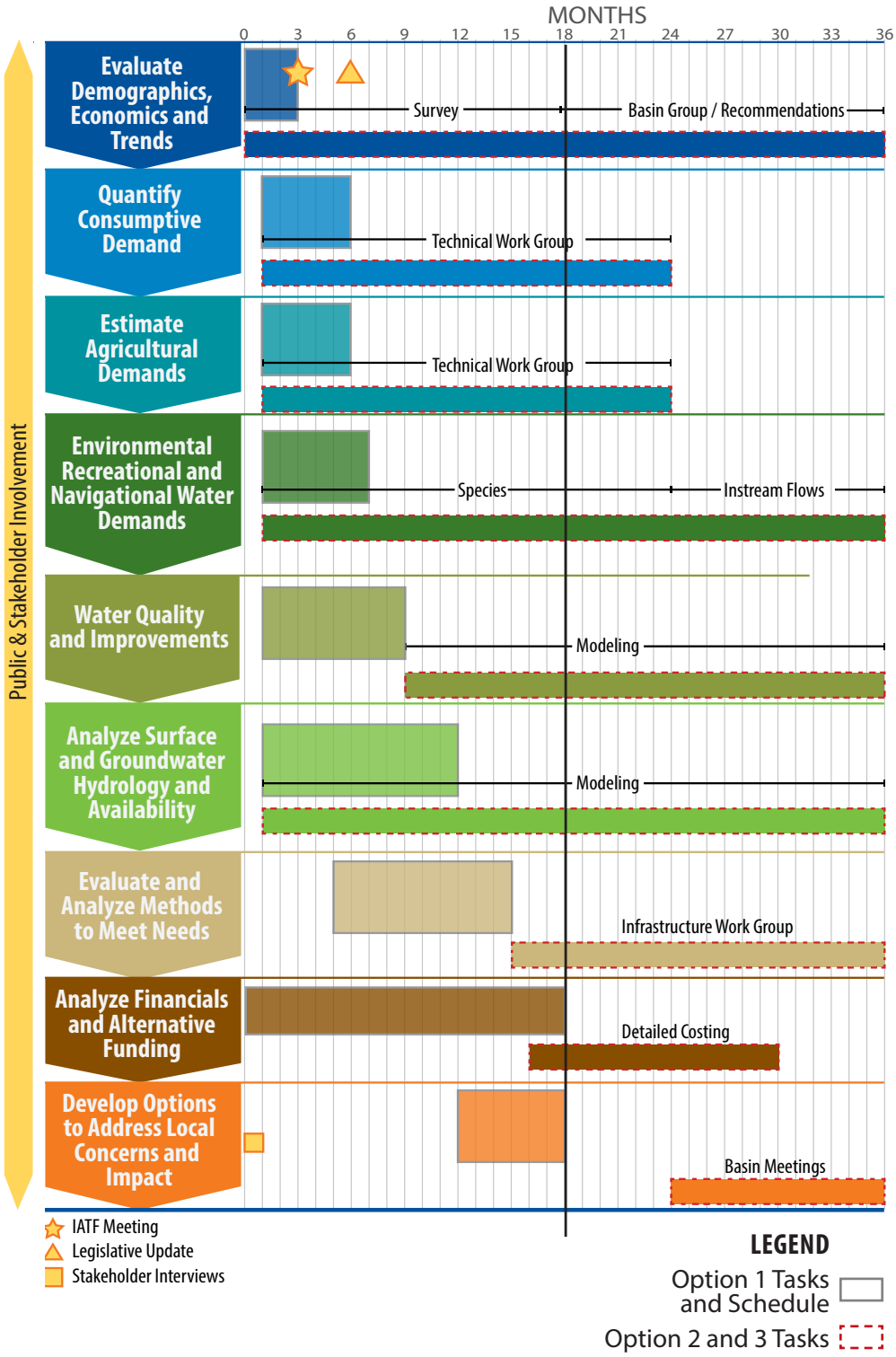


Missouri Water Plan

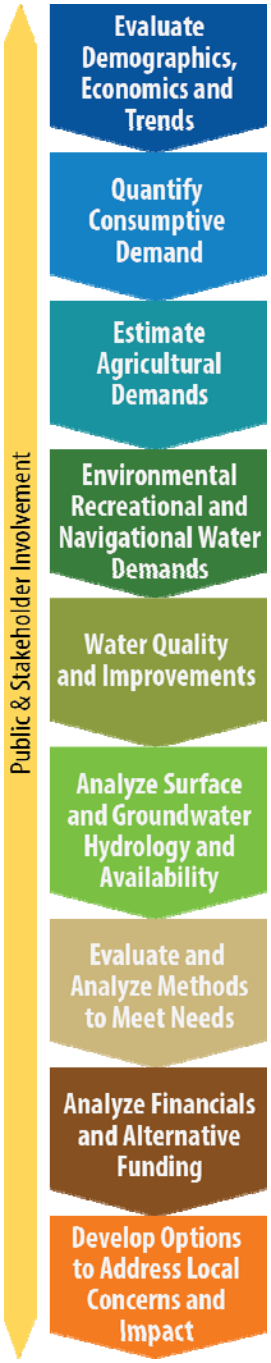
TASKS AND TIMELINE: OPTIONS 2 AND 3



TASKS AND TIMELINE: OPTIONS 1, 2 AND 3



Section 3 Task Descriptions and Assumptions



The overall objective for all tasks will be to develop a common technical platform for the state. A common technical platform will be useful for building consensus and comparing needs across the state. All tasks will be executed at the designated planning level for the state, i.e., five planning regions.

Assumptions:

Option 1:

- Planning horizon will be 2060 for the State Water Plan.
- Planning regions will mirror the five planning regions from the previous State Water Plan.
- Region descriptions and institutional setting (e.g., mission, mandates, laws and policies) will be migrated forward from the previous State Water Plan.

Options 2/3:

- The scope of the effort will be expanded particularly in the areas of demand projection, groundwater availability, infrastructure and stakeholder involvement.
- Planning regions may be defined differently (e.g., based on watersheds) or expanded beyond the five planning regions from the previous State Water Plan.
- Basin descriptions and institutional setting will be revised to include information that represent changed conditions with respect to water management in 2015.

Task 1 Evaluate Demographics, Economics and Trends

The evaluation of economic, demographic and social trends for a region begin with a clear understanding of what issues, questions and objectives the state is seeking to answer with these data. There will be a consideration of past, current and future growth projections; both economic and population. These are drivers of sector water demand projections.

Assumptions:

Option 1:

- The Missouri Census Data Center and the Office of Administration's state demographer will provide population projections to 2030. MDNR will extrapolate population projections to 2060 as were completed for southwest Missouri.

Options 2/3:

- The state demographer will provide population projections to 2030. CDM Smith will extrapolate population projections to 2060 at the county level. These projections will be available by county.

Task 2 Quantify Consumptive Demands

Water use data must be gathered from available sources including MDNR's Major Water User database, U.S. Geological Survey (USGS) reports, and the Public Water Supply Census. Several methodologies will be looked at to determine municipal and industrial demands. Gallons per capita or projections by sector applying employment will depend upon the available data and purpose. Stakeholders may contribute in support of methods applied and accepting the findings.

Assumptions:

Option 1:

- County-wide gallons per capita per day (gpcd) will be established based upon the Public Water Supply (PWS) Census production values and population served. Self-supplied residential will be based upon population by county minus PWS population served multiplied by per capita water use. Self-supplied nonresidential water use will be obtained from MDNR's Major Water User database and USGS reports.

Options 2/3:

- County-wide gallons per capita per day (gpcd) will be established as data are available from water providers. An extensive analysis of conservation savings will be performed.
- Demand projections for each of the water use sectors defined in the MDNR's 1994 Water Use in Missouri report will be completed on a county basis.

Task 3 Estimate Agricultural Demands

Agricultural demands consist primarily of crop irrigation, livestock watering and aquaculture. Acres by crop type and number of livestock are readily available in the USDA's Census of Agricultural data. Future projections of the mix of crop type, head of livestock, and water use by type are the key drivers in determining agricultural demands. Understanding the latest practices and technologies are key when making these determinations.

Assumptions:

Option 1:

- Irrigated acres by crop type, livestock and aquaculture counts are available from USDA's Census of Agriculture. USGS Water Use reports along with University of Missouri Extension data can be used to estimate water use per head and irrigated acre by crop type, respectively. Projections for agriculture use would be based on historic trends.

Options 2/3:

- Agriculture acres by crop type are available, an analysis of crop consumptive use is performed including climate variability impacts on crop consumptive use.
- Stakeholders from each agricultural demand sector may contribute in support of methods applied and accepting the findings.

Task 4 Environmental, Recreational and Navigational Water Demands

Non-consumptive water demands are considered recreational, navigational, environmental and power utilities. These demand sectors are important economic drivers in Missouri. The State Water Plan would set priorities and balance the impacts of future consumptive demands with the non-consumptive demands. The State Water Plan would set future study of flows required for recreation, navigation and the environment. Power generation, both hydropower and thermal, are also large users of water for turbine generation and cooling water. User groups are essential to understanding and balancing these demands.

Assumptions:

Option 1:

- Demands for non-consumptive use will be projected at the same use as today. For example, thermal power projections based upon the Department of Energy's Energy Information Agency's projections by fuel type for reference, high, low may be applied for demand estimates.
- Environmental and recreational demands will be identified.

Options 2/3:

- Environmental attributes will be identified by stakeholders in each planning area. These attributes can be used to determine environmental priorities for flows and project priorities. A methodology and tools for developing in-stream flows will be established.

Task 5 Water Quality and Improvements

Water quality is critical to the health and economy of Missouri for current and future generations. Water quality is important for potable water, end of the pipe wastewater, and stormwater discharges. Water quality plays a vital part of the biological integrity and diversity of the state's water systems and as such contributes greatly to recreational opportunities. There are existing regulatory programs and processes for waterways that are included on the 303d list or those that have an approved total maximum daily loads (TMDLs) that work outside the State Water Plan. The plan process will assist in identifying water quality needs associated with ammonia.

Assumptions:

Option 1:

- Water and wastewater treatment facility information is available from the MDNR's violations database and the Missouri Clean Water Information System (MoCWIS).
- Water quality improvements with respect to ammonia will be identified.

Option 2/3:

- Include 303d lists and TMDL information to inform the decision making process.
- Nonpoint Source, watershed restoration projects and monitoring data is available; in coordination with *OMW*.
- Water quality needs will be expanded beyond ammonia to include nutrients.
- Water quality modeling will be performed to evaluate assimilative capacity and wastewater upgrades.

- Groundwater quality data will be available from MDNR's groundwater monitoring network and USGS.

Task 6 Analyze Surface and Groundwater Hydrology and Availability

Evaluation of surface and groundwater sources may include collection of data from a variety of sources including the state, USGS and the U.S. Army Corps of Engineers (USACE). The state has completed stream and reservoir firm yield studies for at risk water supplies in Missouri. The studies examine the drought of record firm yields and are published in the Missouri Water Supply Study (RESOP), June 2011.

The state may find that additional water availability analyses are required to support decision-making related to the water supplies to serve projected water needs. As the state continues to focus on potential gaps in water supply for future demands and potential means to serve those gaps, the state may find that additional water availability estimates should be prepared.

Assumptions:

Option 1:

- Water treatment facility information is available from MDNR's Safe Drinking Water Intended Use Plan (IUP).
- Surface water supply availability will be determined using USGS's gage data. Availability will be determined using the three return intervals to be determined by MDNR for average, wet and dry conditions. One climate scenario will be included.
- Reservoir water availability will be determined using the RESOP study to evaluate yield. USACE reservoirs will also be evaluated for storage and to evaluate reallocation.
- Groundwater availability will be assessed with existing groundwater data including the MDNR's well data monitoring network.

Options 2/3:

- Three climate variability scenarios (hot/dry, central tendency and warm/wet) and a scenario based on historic conditions for temperature and precipitation will be evaluated for the 2060 planning horizon.
- Reservoir water availability will be determined using the RESOP study to evaluate renewal storage. USACE reservoirs will also be evaluated for storage and to evaluate reallocation. Reservoir optimization modeling may be used to determine reallocation volumes.
- Groundwater availability will be determined from two existing groundwater models and additional modeling in areas where groundwater supplies appear to be limited as indicated by historical use (declining water levels) or quality.
- Well data will be provided by MDNR for areas where groundwater is declining.

Task 7 Evaluate and Analyze Methods to Meet Needs

One of the key tenants of state water planning is the principle of identifying a broad range of supply and demand management strategies, as well as inclusion of a complete set of water use sectors. At the same time, in some cases, existing planning efforts have identified the most effective and implementable

strategies. The plan will start with the principal of maximizing existing planning efforts to help ensure that local planning initiatives are respected, to promote efficiency and buy-in to the state planning effort, and reduce duplication of efforts. In some cases, existing, permitted and planned projects/capacity can meet all or a portion of long-term needs. The remaining unmet need or gap between supply and demand then becomes the principle focus of the decision-making process.

Projected demands will be compared to existing projects identified for each basin. This will allow for identification of infrastructure gaps. This gap analysis is essential, as it identifies the current and future needs for new water supply projects and management options.

The overall purpose of this task is the development and selection of a series of projects and strategies for addressing specific current or future water supply shortfalls and water and wastewater quality demands. Examples of strategies to be analyzed may include storage and conveyance infrastructure, treatment supply augmentation, existing supply management (e.g., reuse, USACE reservoir reallocation) and demand management (e.g., conservation and drought restrictions). Implementation of projects to meet environmental, recreational, navigational and power will also be identified in this task.

Assumptions:

Option 1:

- Information on planned infrastructure projects will come from a variety of sources. This would include a survey of water and wastewater providers (response rate for this could be in the 30 to 50 percent range), requesting data from:
  - The Missouri Water and Wastewater Review Committee
  - Missouri State Revolving Fund
  - U.S. Department of Agriculture Rural Development
  - Community Block Development Grant Program
  - Contacting large wholesale potable water and wastewater utilities in the state
- Gap analysis for municipal and industrial will be conducted to determine an infrastructure gap. This will be done by analyzing demands and subtracting projects identified by water providers.
- Gap analysis for other demand sectors will include agriculture, navigation, recreation and environment.
- In addition to projects, broad strategies for water supply will be evaluated. These strategies include:
  - Conservation
  - Reuse
  - New surface water supply development
  - Additional pumping
  - Reservoir storage, firm yield and reallocation

Options 2/3:

- Municipal and industrial infrastructure project lists will be based on planned projects from water and wastewater service providers. These lists will be compiled from a survey of water and wastewater providers.

The appropriate strategies will be evaluated for each of the planning areas. Appropriate strategies for each planning area will be informed by stakeholders and determined by the MDNR.

Task 8 Analyze Financials and Alternative Funding

As a result of the analysis of demands, constraints and opportunities, both a current and future set of implementation strategies and associated infrastructure costs can be projected for the future. MDNR's State Revolving Fund (SRF) program would be reviewed and identify shortfalls in future funding. These are reconnaissance-level estimates (plus or minus 50 percent). Nonfinancial considerations for prioritization should be taken into account, for instance recreational benefits.

Assumptions:

Option 1:

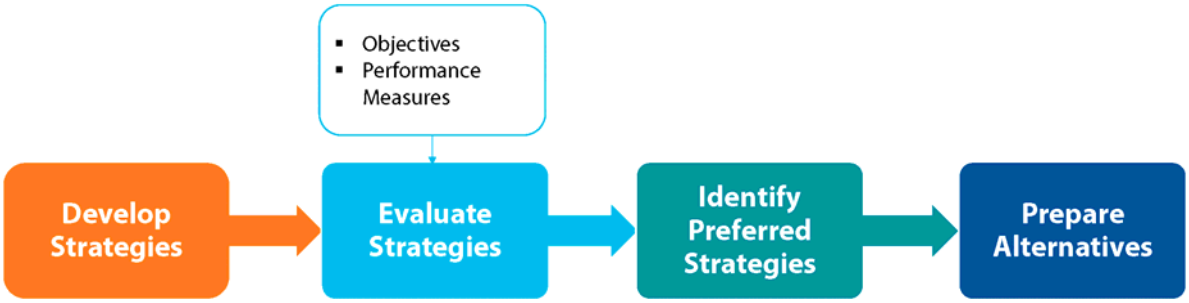
- Costs will be evaluated for each of the five planning regions including the general location, infrastructure needed to implement, and planning-level costs at plus or minus 50 percent level contingency.

Options 2/3:

- Objectives and performance measure will be determined from a broad stakeholder process.

Task 9 Develop Options to Address Local Concerns and Impact

Options to address local concerns will be developed and should include the following considerations: develop and evaluate water and wastewater supply projects and options consisting of structural and nonstructural measures that appear to be feasible as well as politically and socially acceptable; formulate water supply and wastewater options for the implementation of the most promising alternatives in each region; and build consensus among all parties to the study process as to which alternatives should be pursued for implementation.



The above steps can be accomplished through a facilitated, collaborative, consensus-based stakeholder process or through a more systematic analysis process. Both processes require developing a more clear understanding of the interrelationships among individual water supply options, both existing and new, requiring the entire water system be examined in a comprehensive fashion. If a more systematic analysis approach is preferred, a first step in evaluating water solutions is to develop comprehensive alternatives that represent combinations of supply strategies.

Assumptions:

Option 1:

- Objectives and performance measures will be determined from the interview process.

Task 10 Final Report

An Executive Summary and final report will be prepared. Each step will be included in separate sections. All database and documentation used will be provided.

Task 11 Public and Stakeholder Interaction

Citizens of Missouri are experts about their local water resources. They know the resources best. This innovative approach to stakeholder engagement outlined below builds upon recent academic research in effective public participation to listen to these experts first. From the beginning of the planning process, it engages, documents and incorporates citizens' water expertise to ensure current and anticipated concerns, ideas for solutions, and priorities inform and shape the entire planning effort.

Social and political acceptance within regions and local jurisdictions is an outcome of successful public engagement. Successful engagement acknowledges, listens to, and incorporates the water expertise of Missourians into water planning. Public and stakeholder engagement within this process will leverage the ongoing watershed planning efforts of *OMW* to ensure sound and coordinated outreach. Statewide public outreach and education is a fundamental part of the State Water Plan process to gain insight and input and garner constituent support for future funding.

Given the shared nature of the resource and naturally competing interests in the State Water Plan, collaboration will be paramount in successfully completing the plan.

Assumptions:

Option 1:

- Interview up to 60 to 80 representatives and leaders within Missouri's water community to define water values, current priorities, anticipated concerns and planning recommendations.
- Stakeholder involvement will focus on outreach to leverage the capacities of existing stakeholder groups and partnerships such as *OMW* and existing commissions and committees.
- Contribute content to the MDNR to include on the Web, newsletter, press release, public service announcement and speaker's bureaus.
- Public outreach support will include 15 meetings during 18 months.

Option 2/3:

- Two statewide stakeholder work groups will be formed to provide information and develop consensus on the approach, data sources and results for the demand and water availability. Both the demand and water availability work groups are anticipated to meet two times each to review the proposed approach and data and to review the findings for a total of four statewide meetings.
- Subgroups of the statewide demand and water availability work groups are expected to form and will meet on an ad-hoc basis.

Section 4 Costs

The following is a budget guideline by task for Option 1, if the MDNR chooses to move forward with the scope of services described in Section 3. Depending on budget and availability, CDM Smith can revisit the assumptions with the MDNR to meet its needs.

Task	Description	Total	
Task 1	**Evaluate Demographics, Economics and Trends**	$	75,000
Task 2	**Quantify Consumptive Demands**	$	150,000
Task 3	**Estimate Agricultural Demands**	$	52,000
Task 4	**Environmental, Recreational and Navigational Water Demands**	$	52,000
Task 5	**Water Quality and Improvements**	$	349,000
Task 6	**Analyze Surface and Groundwater Hydrology and Availability**	$	224,000
Task 7	**Evaluate and Analyze Methods to Meet Needs**	$	376,000
Task 8	**Analyze Financials and Alternative Funding**	$	203,000
Task 9	**Develop Options to Address Local Concerns and Impacts**	$	216,000
Task 10	**Final Report**	$	103,000
Task 11	**Stakeholder Involvement**	$	200,000
Total		**$**	**2,000,000**

Note: These preliminary costs estimates do not include the USACE overhead or other contributive costs to the project, if funded through the Planning Assistance to States Program.

As demonstrated in CDM Smith's statewide planning qualifications (Section 5), the range of issues and approaches can vary greatly in support of a collaborative, comprehensive and contemporary water plan process. CDM Smith estimates that in order to complete the items listed as assumptions for Options 2/3 above, the total project cost could range from $2 to $4 million allowing 2 to 3 years to complete.

About CDM Smith

CDM Smith is a consulting, engineering, construction and operations firm delivering exceptional service to public and private clients worldwide. An employee-owned corporation with over $1 billion in annual revenues and a multidisciplinary staff of nearly 6,000 employees working from 120+ offices worldwide, we take pride in the freedom to put our clients first and apply our minds and passions to imagine and create sustainable solutions.

CDM Smith maintains the size, stability and resources to successfully undertake a diverse range of projects with a local staff of 45 employees.

Planning for Water

Water is among our most precious and strained resources—making statewide water resource planning of critical importance. Almost by definition, statewide planning often strains the traditional boundaries and takes a more comprehensive look at water use sectors not inherent in traditional water resource planning. Statewide plans at their core typically seek to establish a vision for sustaining and enhancing the social and economic conditions of the state and its various regions.

At CDM Smith, we have applied innovation to integrated resources planning, the developed system models and decision support tools, and have recent experience with incorporating climate change into decision-making efforts. In Oklahoma, Colorado, Georgia, California, Texas, West Virginia, Arkansas, South Carolina and IRPs in 15 states, the CDM Smith has facilitated and successfully completed water resource plans that focus on a collaborative and consensus-driven process. In addition, we have completed an assessment of state planning for the USACE. The CDM Smith Team's experience in statewide planning is unmatched.

CDM Smith has been supporting supply studies in concert with the MDNR and the USACE in both Northwest and Southwest Missouri over the past 5 years. These studies have evaluated source water supplies, USACE reservoir reallocation considerations and infrastructure needs, costs, and funding. Collectively, these studies continue to support the implementation of Missouri's State Water Plan.

UNPARALLELED STATEWIDE PLANNING EXPERTISE

OKLAHOMA
($3 million)

In Oklahoma, our successful statewide planning effort focused on quantifying demands, supply and legal and physical supply gaps, improving planning capacity of the state and local utilities via modeling and analytical tool development and robust public outreach. With 82 major watersheds and a critical dependence on the Ogallala aquifer the CDM Smith Team worked closely with the USACE and Oklahoma Water Resources Board (OWRB) under a unique funding and political partnership. Our leadership and technical support provided the detailed quantification of available resources and also identified critical infrastructure needs though detailed outreach to local utilities. This provided the USACE and OWRB an understanding of resource, policy and legal constraints/limitations.

COLORADO
($2.7 million for the first phase;10 years, $1-2 million per year)

In Colorado, CDM Smith has completed the most comprehensive analysis of water supply and resource needs in the state's history. Over the last eight years, CDM Smith completed the Statewide Water Supply Initiative (SWSI) 1, SWSI 2, SWSI 2010, Basin Needs Assessments. In addition, we are currently completing the Basin Roundtable Basin Reports, five Annual Reports for the IBCC, assisted the CWCB in numerous planning efforts to integrate this technical work into each of the CWCB sections as well as supporting the agencies Water Supply Planning section.

GEORGIA
($6 million)

CDM Smith worked with Georgia to completed its first statewide water development and conservation plan. This regionally-focused planning process required accommodation of Georgia Reasonable Riparian Use Laws and the need to look more closely at the sustainability of surface and groundwater use and development.

ARKANSAS
($3 million over 2 years)

CDM Smith worked closely with the Arkansas Natural Resource Commission and various stakeholders to update the state water plan. CDM Smith was responsible for generating a defensible and balanced forecast of agriculture irrigation water use for the entire state of Arkansas, including the intense water using area of the Delta. The forecast included detailed statistical modeling of irrigated acres based on historical trends and crop and county specific water application rates. CDM Smith communicated the working methodology to a diverse group of stakeholders and incorporated their qualitative knowledge into the final statistical model.

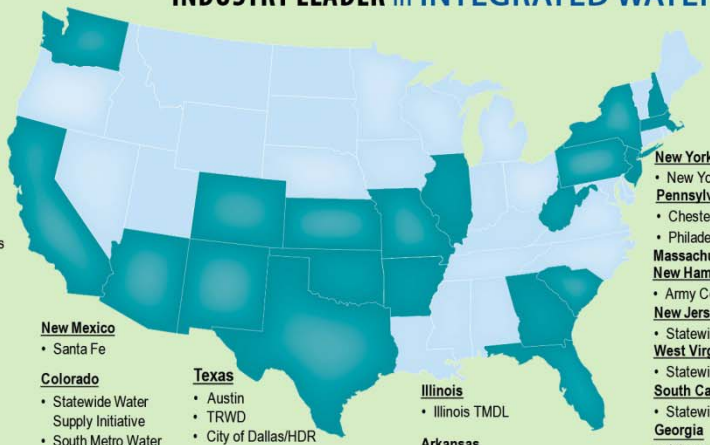
WEST VIRGINIA
($2 million)

CDM Smith was recently selected to provide a statewide water plan for the State of West Virginia. The plan will include water supply demand, water quality, water modeling, shortage analysis and gap alternatives.

SOUTH CAROLINA
($1 million)

CDM Smith was recently selected to provide a statewide modeling platform for South Carolina using the SWAM model.

INDUSTRY LEADER in INTEGRATED WATER RESOURCES MANAGEMENT



Washington
- Central Puget Sound Water Forum

California
- Bay Area Water Agencies
- Benicia
- Butte County
- CALFED
- Gilroy
- City of Los Angeles
- MWD of So. California
- Municipal WD of Orange
- Otay Water District
- Rancho California WD
- City of San Diego
- San Joaquin County
- Santa Clara Valley WD
- Santa Fe Irrigation District
- SAWPA
- Solano County

Arizona
- Nogales

Mexico
- Tijuana, Baja California

New Mexico
- Santa Fe

Colorado
- Statewide Water Supply Initiative
- South Metro Water Supply Authority
- Castle Pines North Metro District
- Town of Castle Rock
- City of Northglenn

Kansas
- Kansas Water Office Reservoir Study

Missouri
- Water Supply Study

Texas
- Austin
- TRWD
- City of Dallas/HDR
- Wichita Falls
- Brazoria County
- Marathon Oil Company
- Laguna Madre
- Brazos River Authority
- El Paso
- San Antonio
- BECC Bi -National Water Plan
- TRWD/Dallas Lake Palestine Water Supply System Integration
- Aqua Water Supply Corp.

Illinois
- Illinois TMDL

Arkansas
- Statewide Water Plan Central Arkansas Water

Oklahoma
- Oklahoma Comprehensive
- Water Plan
- Edmond
- Norman
- Oklahoma City Water
- Utilities Trust Stillwater

New York
- New York City

Pennsylvania
- Chester County
- Philadelphia WD

Massachusetts and New Hampshire
- Army Corps of Engineers

New Jersey
- Statewide Planning Support

West Virginia
- Statewide Water Plan

South Carolina
- Statewide Water Plan

Georgia
- Atlanta Regional Commission
- ACT/ACF Study
- Georgia Coastal Study
- Georgia Water Development and Conservation Plan

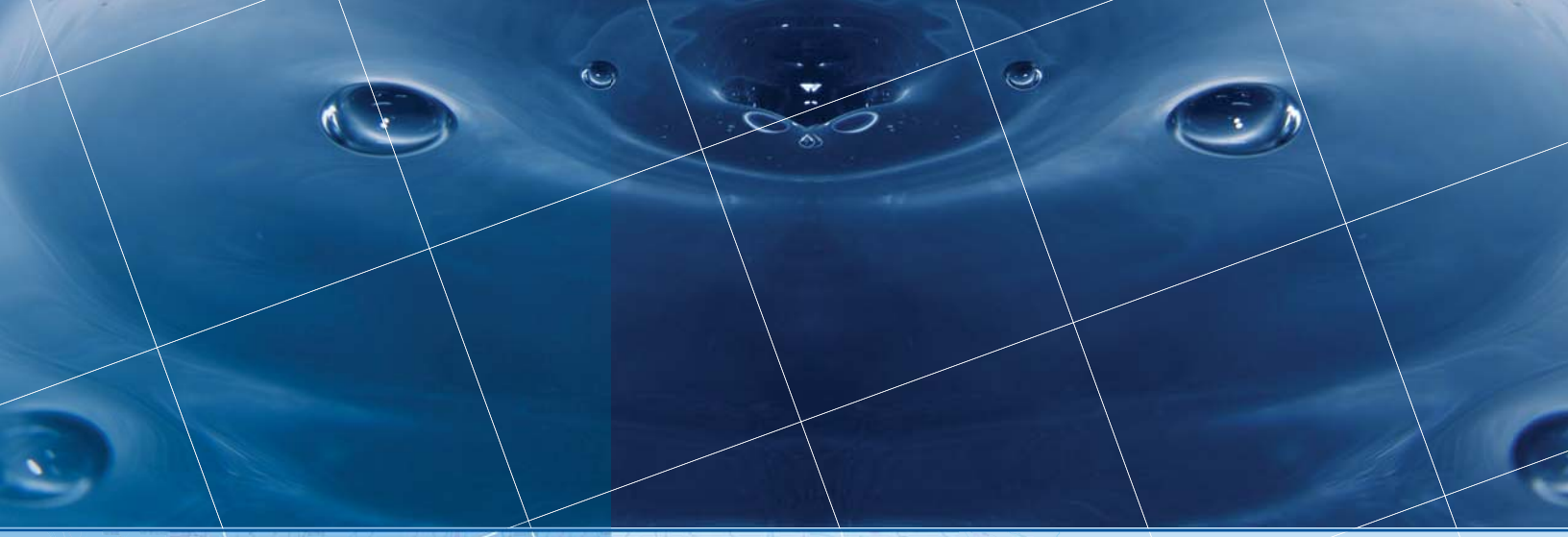
Florida
- Lake Okeechobee Project
- Daytona Beach
- Water Authority of Volusia
- West Palm Beach

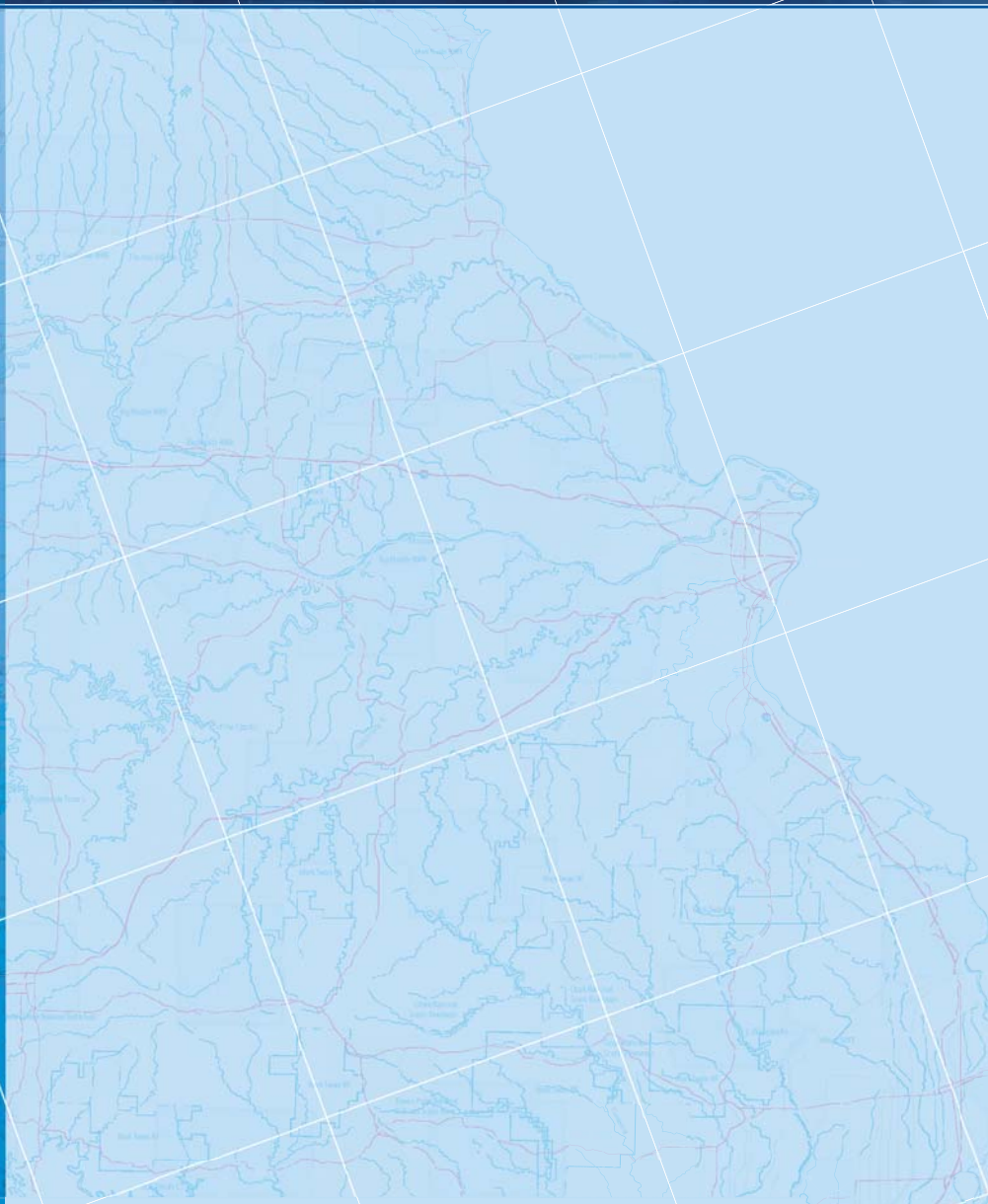
Nationally, CDM Smith has prepared more than 40 integrated resources plans and state and regional water plans involving stakeholder collaboration and decision making. These plans enjoyed broad stakeholder support, provided a framework for comprehensive water resources management and led to project implementation and funding. Tools utilized to develop decisions included IWR-MAIN, STELLA, and SWAM.

Team Member/Role	Biographical Summary
Mike Beezhold, Project Manager	Mr. Beezhold is a senior planner with over 20 years of water resources planning experience. Mike has been the Project Manager for the Southwest Missouri Water Resources Studies Phases I, II and III and the ongoing Stockton Lake Reallocation Study (2011 – Present). Mike also served as task manager for the Arkansas Statewide Water Plan.
Sue Morea, Senior Technical Specialist	Ms. Morea offers the MDNR 28 years of water supply planning and water quality experience. Sue Morea is CDM Smith's statewide planning expert and has served as program manager and project director for the following statewide water plans Colorado, Georgia, Arkansas, Oklahoma, and South Carolina.
Pat O'Neill, P.E., Infrastructure Planning	Mr. O'Neill brings nearly 25 years of infrastructure planning and design experience including water treatment and distribution, wastewater treatment and collection, and water resources management. Pat's primary focus has been working with various municipalities and utilities located across Missouri, Kansas, Iowa, and Nebraska to develop infrastructure solutions, address regulatory requirements, and identify funding alternatives.
Sarah Stewart, P.E., Water and Wastewater	Ms. Stewart is an environmental engineer with 13 years of experience with planning and design for both water and wastewater utilities, site-civil design; wastewater collection systems and treatment; water and wastewater pump stations; and, potable water treatment, distribution and storage design. Sarah has recently served as the Project Manager for the Northwest Missouri Water Supply and Alternatives studies.
Tim Feather, PhD., USACE Liaison	Dr. Feather's focus has been on the development of interdisciplinary solutions to water supply challenges. Tim compiled a summary of the state water planning for all 50 states that was published by the American Society of Civil Engineers (ASCE) Environmental and Water Resources Institute. He then led a similar initiative for the U.S. Army Corps of Engineers, where each state was interviewed as part of the summary process. These state water summaries are found at http://building-collaboration-for-water.org/.
Mark McCluskey, Supply Availability	Mr. McCluskey has over 15 years of experience in groundwater and hydrologic modeling, water supply, and water rights. Mark was the Project Engineer for the water supply aspects of the following statewide water plans; Colorado, Arkansas, and Oklahoma.
Bill Davis, Demands	Mr. Davis specializes in conducting water demand analyses, developing water use forecasts, evaluating water conservation programs and incorporating these analytical components into State Planning. Bill served as the Task Manager for the Oklahoma, Colorado, and Georgia Statewide demand forecasts.
Becky Dunavant, Water Quality	Ms. Dunavant has over 15 years of experience as an environmental scientist, specializing in water quality and water supply planning projects. Becky served as the Project Manager for TMDL Development for the Illinois Environmental Protection Agency. Becky served as task leader for the environmental water demands for Colorado, Oklahoma, and Arkansas.

Bill Mullican, Funding	In Mr. Mullican's over 30 years, Bill has had extensive interaction with the technical community, governmental entities at the local, state, and federal levels, stakeholders, and general public and provided invited testimony to the United States Congress on four occasions and on over 25 occasions to the Texas Legislature. Bill served as Deputy Executive Administrative for Water and Science Conservation, Texas Water Development Board 1997-2008.
Damon M. Hall, PhD., Stakeholder Involvement	Damon M. Hall, Ph.D. is an Assistant Professor in the Center for Sustainability, a graduate-degree granting research institute, at Saint Louis University in St. Louis, Missouri. Recently, Dr. Hall designed, conducted, and analyzed citizen engagement for the Scoping Phase for the Yellowstone River Basin's 2015 Montana State Water Plan sponsored by the Montana Department of Natural Resources and Conservation. More than 200 basin-wide water users participated in this phase within the Yellowstone Basin.

Full resumes available upon request.





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