US Army Corps
of Engineers ®
Rock Island District

City of Springfield Aquatic Recreation and Supplemental Water Supply Project

Draft Supplemental Environmental Impact Statement

August 2023

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ABBREVIATIONS AND ACRONYMS

Term	Definition
7Q10	seven-day ten-year low flow
°F	degrees Fahrenheit
ac	acre
ACHP	Advisory Council on Historic Preservation
ADA	Americans with Disabilities Act
AADT	Annual Average Daily Traffic
APE	Area of Potential Effect
bgs	below ground surface
BMP	Best Management Practice
CAA	Clean Air Act
CCR	Coal Combustion Residual
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFCs	chlorofluorocarbons
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGWD	Curran-Gardner Water District
CH_4	Methane
City	City of Springfield
CO	Carbon Monoxide
CO_2	carbon dioxide
CO_3	Carbonate
Corps	The United States Army Corps of Engineers, Rock Island District
CR	County Road
CWA	Clean Water Act
CWLP	City Water, Light & Power
DA	Department of the Army
dB	Decibel
dBA	A-weighted Decibels
DO	Dissolved Oxygen
EcoCAT	Ecological Compliance Assessment Tool
EIS	Environmental Impact Assessment
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESI	Environmental Solutions & Innovations, Inc.
ESO	Energy Service Office
FAC	Facultative
FACW	Facultative Wetland
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency

Term	Definition
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
ft	feet
GHGs	Green House Gases
gpm	gallons per minute
HEC-RAS	Hydrologic Engineering Center's River Analysis System
HUD	United States Department of Housing and Urban Development
Hz	Hertz
I-55	Interstate 55
IDNR	Illinois Department of Natural Resources
IDOT	Illinois Department of Transportation
IEPA	Illinois Environmental Protection Agency
IL	Illinois
ILCS	Illinois Compiled Statutes
INAI	Illinois Natural Areas Inventory
INHS	Illinois Natural Heritage Survey
INPC	Illinois Nature Preserves Commission
IPaC	Information Planning and Consultation
IPCC	Intergovernmental Panel on Climate Change
ISGS	Illinois State Geologic Survey
ISWS	Illinois State Water Survey
ITA	Incidental Take Authorization
IWA	International Water Association
lbs	pounds
Ldn	Day-Night Sound Level
LEDPA	Least Environmentally Damaging Practicable Alternative
lf	Linear feet
LOS	Level of Service
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
MGD	Million Gallons per Day
msl	mean sea level
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NCA4	Fourth National Climate Assessment
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGCC	Natural Gas-fueled Combined Cycle
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NO_x	Nitrogen Dioxide
NPS	National Park Service

Term	Definition
NPV	Net Present Value
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NRW	Non-Revenue Water
NWI	National Wetland Inventory
NYDEC	New York Department of Environmental Conservation
O_3	Ozone
OBL	Obligate
OSHA	Occupational Safety and Health Administration
OWR	Office of Water Resources
PA	Programmatic Agreement
Pb	Lead
PM	Particulate Matter
PMCL	Planning and Management Consultants, Ltd.
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SCWRD	Sangamon County Water Reclamation District
SDWA	Safe Drinking Water Act
SEIS	Supplemental Environmental Impact Assessment
sf	square feet
SHPO	State Historic Preservation Office
SO_2	Sulfur Dioxide
South Fork	South Fork of the Sangamon River
SSCRPC	Springfield-Sangamon County Regional Planning Commission
SSWC	South Sangamon Water Commission
SWAP	Source Water Assessment and Protection Program
SWPPP	Stormwater Pollution Prevention Plan
TSS	Total Suspended Solids
UAW	Unaccounted for Water
USACE	United States Army Corps of Engineers
USC	United States Code

EXECUTIVE SUMMARY

INTRODUCTION

The United States Army Corps of Engineers, Rock Island District (Corps) has prepared this Supplemental Environmental Impact Statement (SEIS) to address potential environmental, social, and economic impacts associated with the proposed City of Springfield (City) Aquatic Recreation and Supplemental Water Supply Project in Sangamon County, Illinois.

The City submitted a Clean Water Act (CWA) Section 404 permit application to the Corps in 1989 to place material in Horse Creek for the construction of a supplemental water supply reservoir, referred to as Hunter Lake. In review of the application, the Corps determined the project to be a major federal action which could significantly affect the quality of the human and natural environment, necessitating the development of an EIS for compliance with the National Environmental Policy Act (NEPA). The Corps, working in conjunction with the City, Office of Public Utilities, also known as City Water, Light & Power (CWLP), prepared an Environmental Impact Statement (EIS), which was finalized in 2000 (Final EIS), to address the City's need for a supplemental drinking water supply. The Final EIS identified the construction of Hunter Lake as the City's proposed alternative for supplemental water supply, but a decision document was not issued. Between 2001 and 2008 the City coordinated with the Corps and Illinois Environmental Protection Agency (IEPA) regarding CWA Section 401 water quality certification. In 2008 the City submitted an updated permit application to the Corps and IEPA. Due to the age of the data contained in the Final EIS, the Corps determined a SEIS was necessary. A detailed project history is presented in Appendix A.

The proposed project presented and discussed within this SEIS is a modified version of the Hunter Lake reservoir considered in 2000 and includes the addition of Aquatic Recreation in the Purpose and Need. The content of this document is intended to supplement the 2000 Final EIS with project revisions and updated information to inform the Corps' decision regarding a requested CWA Section 404 permit application. Information presented in this document is also intended to inform the CWA Section 404(b)(1) review process.

The proposed project includes the construction of an earthen dam on Horse Creek, a tributary to the South Fork of the Sangamon River, located southeast of the existing Lake Springfield and north of Pawnee, Illinois in Section 31 of Rochester Township. The earthen dam would result in the formation of a reservoir, Hunter Lake, which would inundate portions of both Horse Creek and Brush Creek. The reservoir would cover approximately 2,649 acres (Figure ES-1), hold approximately 12.2 billion gallons of water, and maintain an average depth between 14.2 and 42.7 feet. Additional upland resources surrounding Hunter Lake, to be managed by the Illinois Department of Natural Resources (IDNR), would provide buffer zones around the reservoir. The project area includes the inundation area of the reservoir and surrounding uplands, totaling approximately 7,983 acres.

Public input regarding the proposed project has been obtained through two separate comment periods, one in 2016 and one in 2021. Input received from the public, agencies, and tribes has been considered in this SEIS and is presented in Appendices B and C.

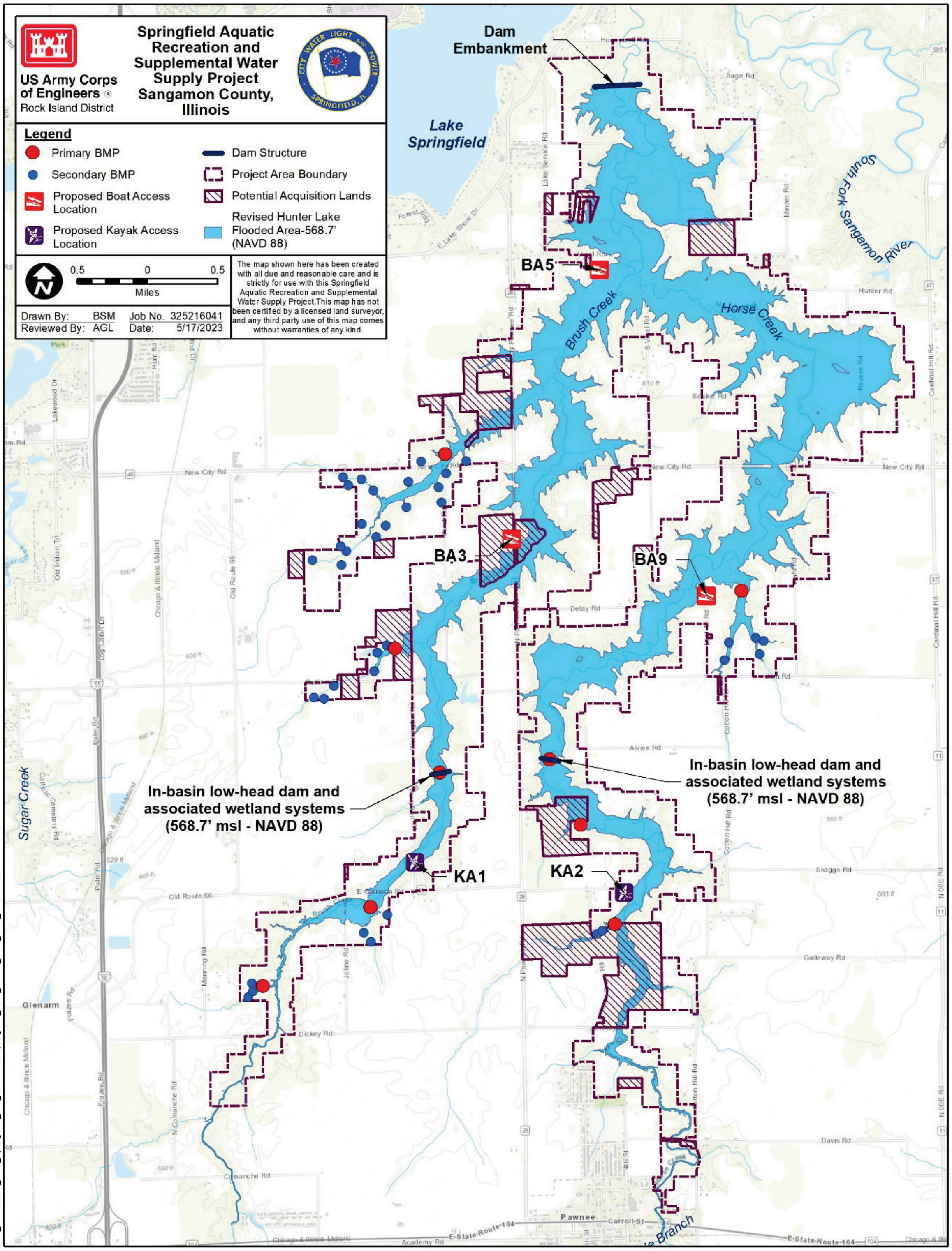


Figure ES-1. Hunter Lake Project Area

PURPOSE AND NEED

The original purpose of the Springfield Aquatic Recreation and Supplemental Water Supply Project was to supply the City of Springfield with a supplemental water supply source. In 2019, the City notified the Corps of their intentions to include aquatic recreation as a primary purpose and need in addition to supplemental water supply.

The City owns and operates water and electric utilities which are administered by CWLP and serves the residents of the City and other wholesale customers. In total, the service area encompasses approximately 100 square miles in portions of 12 townships and includes a population of about 150,000. CWLP also operates the largest municipally owned electric utility in Illinois serving multiple communities on a retail basis. The City's primary water supply source is Lake Springfield. Lake Springfield, with contributions from the South Fork pumping facility, constitutes the raw water source for the City and surrounding communities in addition to cooling water for the City's Dallman Power Station (Figure ES-2).

The adequacy of Lake Springfield as a primary source was questioned after the 1953-1955 drought which almost caused the shutdown of both the water treatment and electric generation plants. In the last 30 years, the City has experienced three more droughts which, despite supplementing from the Sangamon River, have caused mandatory water use restrictions and the subsequent need for additionally water supply.

Determination of the supplemental water need of the City takes into consideration many complex factors such as hydrological and statistical modeling of the characteristics and contributions of Lake Springfield and the existing pump station on the South Fork of the Sangamon River (yield), trends in population growth and potable water use, analysis of water use by the Dallman power station, benefits of conservation measures and mandatory water restrictions during drought periods, contractual obligations to provide potable water to other communities, wholesale water uses, and industrial water uses. The purpose of the proposed project aims to satisfy the need of supplemental water by the City. The quantity of supplemental water needed to fulfill the existing and future water demand of the City was conservatively calculated to be 12 MGD.

In 2020, a study was performed by the University of Illinois regarding the supply and demand of aquatic recreation within a 50-mile radius of the City of Springfield. The study analyzed aquatic recreation types such as fishing, fishing tournaments, waterfowl bird watching and hunting, motorboating, kayaking, canoeing, swimming, and jet skiing. There are approximately 57,503 acres of flat-water resources within the study area with over 45,000 acres of public lakes and over 11,000 acres of rivers. A survey was performed as part of the study to gather information on the demand for aquatic recreation within the study area. From the results of the survey, the unmet need for flat-water resources was estimated to be 12,447 acres. A goal of providing at least an additional 2,500 acres of flat-water recreation area was established by the City for the proposed purpose of aquatic recreation.

In accordance with the CWA Section 404(b)(1), the Corps has determined the basic project purpose to be water supply and recreation. Additionally, the Corps has determined that the proposed Hunter Lake is not water dependent, as the proposed activity does not require access or proximity to or siting within a special aquatic site to fulfill its basic purpose. The Corps has determined the overall project purpose is to meet the public's need for supplemental water supply and aquatic based recreation within Springfield and the surrounding 50-mile radius.

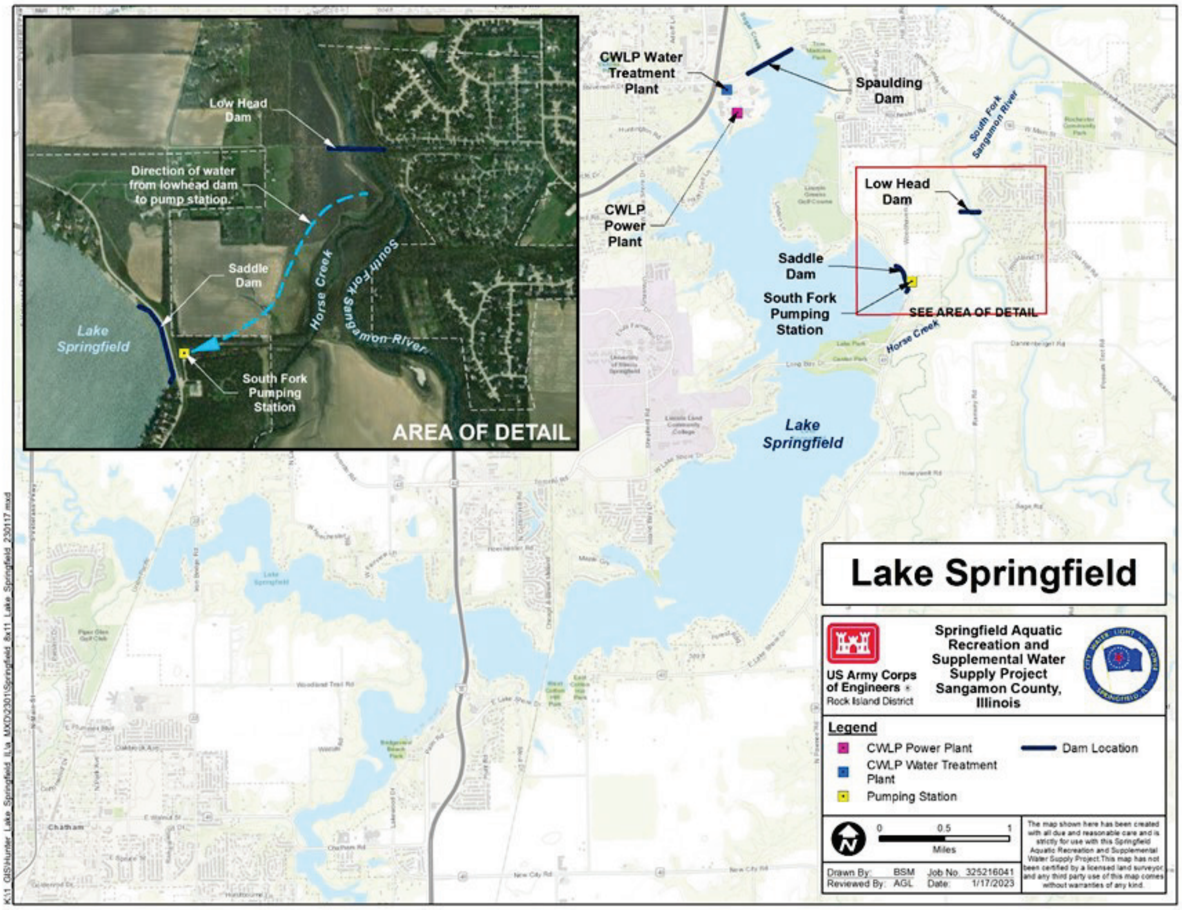


Figure ES-2. Springfield Water Supply System

COOPERATING AGENCIES

Because the Hunter Lake project involves the discharge of fill material into Waters of the United States (WOTUS), a Section 404 permit must be obtained by the City to comply with Section 404 of the CWA. Section 404 permits are obtained from the Corps; thus, the Corps will act as the lead federal agency due to its power of approval over the permit. As the lead agency, the Corps will ensure compliance with NEPA through the supervision of SEIS preparation, development and approval of a SEIS schedule and milestones, approval of the draft SEIS, and final approval of the SEIS. IEPA will work as a Cooperating Agency for the SEIS due to their authority over the issuance of a 401 Water Quality Certification, which is required for a Section 404 permit to be valid.

ALTERNATIVES EVALUATED IN THE SEIS

A multi-phased analysis of alternatives to meet the projected supplemental water supply needs was conducted prior to 2019 (Appendix D). Alternatives underwent additional screening and consideration in 2020 to account for the aquatic recreation aspect of the project purpose and need. Multiple alternatives considered as no action alternatives with respect to 404(b)(1) guidelines were determined to be impracticable due to their inability to meet the dual purpose and need of supplemental water supply and aquatic recreation.

The following alternatives are considered in detail in this EIS:

- Alternative A – No Action Alternative
- Alternative B – Hunter Lake, Revised Configuration

Under the No Action Alternative evaluated in this SEIS, the City would not construct Hunter Lake and no activities related to Hunter Lake would take place. The No Action Alternative would be the continuation of the current condition in which no supplemental water supply is provided despite the normal rate of development that would continue to occur in the area. In addition, the City's municipal, commercial, and industrial customers would continue to be at risk for loss of dependable water supply in times of drought.

Alternative B consists of the construction of Hunter Lake with an earthen dam built on Horse Creek. A drought yield of 12 MGD was used to establish the lake control elevation based on the water need of the City. The resulting reservoir would inundate portions of both Horse Creek and Brush Creek. The 2,649-acre reservoir would hold approximately 12.2 billion gallons of water with a normal pool elevation of 568.7 feet. Maximum and average depths would be 42.7 feet and 14.2 feet, respectively.

The original configuration of Hunter Lake, created in 2000, was revised to provide access for aquatic recreation and integrated design features to enhance water quality. Design features supporting improved water quality include:

- In-lake sediment and nutrient control basins
- Underwater berms across the floodplain within the sediment basin footprint
- Stormwater Detention Basins
- Dry Basins
- Wet Basins
- Wetland and Ponds
- Water and Sediment Control Basins
- Grade Control
- Terraces
- Grassed Waterways
- Permanent Cover
- Shoreline Stabilizations

In 2022 the City worked with the IDNR to identify public access points along the shoreline of the proposed Hunter Lake. A total of nine locations were considered as access sites based on existing roadway infrastructure, topography, and known environmental and cultural constraints. The nine locations were screened using various criteria and three final sites were identified through coordination between IDNR, CWLP, and the Corps. The three access points included one to accommodate between 50 and 60 trailered vehicles and two to accommodate approximately 10 to 15 trailered vehicles. Additionally, two primitive kayak access sites would be located upstream of each of the proposed low-head dams, one on Horse Creek and one on

Brush Creek. The kayak access points were chosen to avoid impacts to sensitive resources and allow for easy accessibility from existing roadways.

SUMMARY OF IMPACTS

Twenty-two environmental resource categories were analyzed with respect to each alternative. The resource categories were decided upon based on internal scoping and comments received during the scoping period; they encompass the environmental resources that may be impacted by the proposed project.

Table ES-1 presents a summary of the impacts of each of the alternatives carried forward for detailed analysis. The construction of the dam and subsequent inundation of the project area would predominantly impact the resources that pertain to the land surface and cover such as surface water, wetlands, vegetation, wildlife, aquatic ecology, parks and recreation, community facilities and services, transportation, visual resources, and cultural and historic resources. Impacts on factors related to the human environment (land use, socioeconomics, air, noise, solid/hazardous waste, public and worker safety, etc.) are generally considered to be minor and temporary.

Table ES-1. Summary and Comparison of Alternatives by Resource Area

Resource	Alternative A: No Action	Hunter Lake Reservoir Revised
Air Quality	No Impact	Minor impact from fugitive dust and emissions from construction equipment and vehicles, minimized through use of Best Management Practices (BMPs) (such as covered loads and wet suppression). Minor impact associated with increased vehicular traffic associated with recreational use. No exceedances of regional National Ambient Air Quality Standards (NAAQS) expected.
Climate Change and Greenhouse Gases (GHG)	No Impact	Construction activities would contribute to localized GHG emissions that would be negligible and would not affect climate change.
Geology and Soils	No Impact	Minor impact from increases in soil erosion during construction, minimized through the use of BMPS. Indirect impact associated with erosion along the reservoir shoreline. Minimized through shoreline stabilization measures.
Prime Farmland	No Impact	Minor impacts associated with inundation and conversion related to loss of prime farmland soils relative to the amount of land designated as prime farmland in the vicinity.
Groundwater	No Impact	Minor localized impact on the potentiometric surface of the shallow aquifer.
Surface Water	No project-related change from the existing condition of surface waters or water quality would occur. As water demand increases, changes in water supply withdrawal over time may change discharge from Lake Springfield and withdrawal from South Fork Sangamon River	Minor, temporary, impacts to water quality from dam construction. Long term beneficial impacts to downstream water quality associated with integrated features designed to enhance water quality. Long term beneficial impacts to lacustrine water resources with permanent adverse impacts to riverine water resources
Floodplains	No Impact	Small increase in South Fork peak discharge and, therefore, a small increase in 100-year flood elevation. However, there would be a reduction in South Fork peak flood discharges and elevations for small floods with a return period of less than 10 years. The method of diversion and management of Horse Creek during dam construction will consider flood risks and avoid potential increases to flood risk.

Resource	Alternative A: No Action	Hunter Lake Reservoir Revised
Wetlands	No Impact	Moderate adverse effect due to loss of generally small, low functional quality wetlands and open water within the project footprint. Positive effect in the long term from anticipated development of wetland and open water acreages within the project area associated with project features. Regardless, adverse impacts to existing wetlands will be mitigated for by establishment of onsite mitigation areas and onsite mitigation banking.
Vegetation	No Impact	Moderate adverse impact associated with loss of vegetation in the inundation zone. Offset by preservation and restoration of upland habitats within the project area resulting in a long-term beneficial impact.
Wildlife	No Impact	Moderate impact associated with the loss of habitat within the inundation area. Offset by long-term benefit to wildlife habitat due to preservation and restoration of prairie, forest, and wetland habitat within the unflooded portions of the project area.
Aquatic Ecology	No Impact	Permanent adverse impact due to loss of low-quality stream habitat. Stream impacts compensated by extensive stream mitigation plan. Permanent adverse impacts to riverine resources and lotic habitats with long-term beneficial impacts to lentic aquatic habitat and ecosystem support due to expansion and increased productivity of aquatic habitat within Hunter Lake.
Threatened and Endangered Species	No Impact	Minor impact associated with loss of habitat for protected species. Avoidance and minimization efforts to reduce impacts to would be implemented and impacts would be mitigated in accordance with necessary permit requirements.
Natural Areas and Conservation	No Impact	No Impact
Parks and Recreation	No impacts to existing parks or recreational areas. However, this alternative would not address forecasted demand for aquatic recreation or water supply needs,	Large beneficial impact to local and area wide recreation opportunities. Minor impacts form the closure of KOA campground.
Socioeconomics and Environmental Justice	No Impact	Minor, indirect impact to the regional economy associated with the loss of revenue from farming leases and property taxes, offset by substantially greater indirect benefits from recreation in the long term. No disproportionate impacts to environmental justice communities.

Resource	Alternative A: No Action	Hunter Lake Reservoir Revised
Community Facilities and Services	No Impact	Minor temporary impact during construction. Long term beneficial impact associated with the availability of a supplemental water supply.
Land Use	No change in land use, however, maintaining the current land use in the project area is not consistent with the City of Springfield 2020 Land Use Plan.	No impact. Conversion of agricultural land to the reservoir and active and passive recreational land is consistent with the City's Land Use Plan.
Public Health and Safety	No Impact	Large beneficial impacts to public health and safety during times of drought.
Transportation	No Impact	Moderate impact to residents associated with changes in one-way travel patterns due to road closures.
Noise	No Impact	Minor intermittent impact associated with construction activities.
Visual Resources	No Impact	Minor adverse visual impacts during construction. Positive long-term impact in in aesthetics and visual attractiveness of the project area
Cultural and Historic Resources	No Impact	Impacts would be minimized through compliance with a Programmatic Agreement between the Corps and Advisory Council on Historic Preservation (ACHP) and adherence to BMPs.
Solid and Hazardous Waste	No Impact	Minor impact. Wastes would be managed in accordance with applicable local, state and federal requirements.
Cumulative Effects	No Impact	Minor cumulative impacts to resources such as surface waters, water quality, vegetation, wildlife, and cultural resources due to mitigative measures, integrated design features, and conversion to other comparatively more beneficial resources. Beneficial cumulative impacts to public health and safety and wetlands due to increased water supply during drought as well as mitigation performed for wetlands lost.

THE APPLICANT'S PREFERRED ALTERNATIVE

The revised Hunter Lake alternative is the City's preferred alternative to meet the project purpose and need while providing the best use of the City's resources. This alternative represents the alternative that meets the purpose and need defined by the City and is the most effective at meeting the purpose with regards to logistics and implementation while also enhancing environmental quality. The proposed Hunter Lake alternative meets the purpose and need of the project by supplying the city with a supplemental water source capable of providing 12 MGD of additional water supply in addition to at least 2,500 acres of flat-water resources for aquatic recreation.

Hunter Lake would increase the acreage of surface waters within the project area and improve the surface water quality with the implementation of integrated design elements, ultimately providing beneficial long-term impacts to surface waters. Hunter Lake would create beneficial and long-term impacts to recreation in the form of additional aquatic recreational opportunities. Community facilities and services would be beneficially impacted over the long-term due to the supplemental water supply Hunter Lake would provide to the City of Springfield and the entities it serves. Visual resources would be beneficially impacted over the long-term as Hunter Lake would cause an increase in visual attractiveness of the area. Public Health and Safety would be beneficially impacted over the long term with the supplemental water supply of Hunter Lake because this water would prevent the negative effects of drought within the community.

The construction of Hunter Lake is expected to cause moderate adverse impacts to the wetlands within the project area. These impacts will ultimately be compensated through purchase of 71.1 acre-credits of mitigation bank credits in the bank service area of the project location, or the creation of up to approximately 135 permittee-responsible acre-credits within the project area or offsite within the HUC 8 area of the project location, per the USACE Rock Island District Mitigation and Monitoring Guidelines Document (Corps 2019) (Appendix E). Integrated design features and anticipated fringe wetlands around the reservoir are expected to result in an additional approximate 105 acres of wetlands within the project area.

Hunter lake is also expected to cause moderate adverse impacts to the streams and surface water resources present within the project area. These impacts equate to approximately 237,479 linear feet (45 miles) of streams which will be compensated by extensive stream mitigation (2,436,019 credits), outlined within the stream mitigation plan (Appendix E).

Permanent adverse impacts to aquatic ecology are also expected as a result of Hunter Lake and its impacts on surface water resources, however, these impacts will affect the existing low-quality stream habitats within the Hunter Lake project area which will be compensated with stream mitigation. Despite the loss of lotic habitats within the project area, substantial long-term gains in lentic habitat and ecosystems within Hunter Lake will be provided.

Moderate adverse impacts to vegetation and wildlife within the project area are expected, primarily within the inundation zone, due to a loss of vegetation and habitat. Preservation and restoration of prairie, forest, and wetland habitats and vegetation within the unflooded portions of the project area will be performed to offset proposed adverse impacts and to allow for long-term beneficial impacts to vegetation and wildlife habitat from the construction of Hunter Lake. Coordination with U.S. Fish and Wildlife Service is ongoing regarding potential impacts to protected bat species due to the loss of forested habitat.

Hunter Lake is expected to cause moderate impacts to residents with respect to transportation infrastructure, as the inundation will cause permanent road closures that would lead to travel pattern changes for residents. Any potential impacts to cultural and historic resources would be minimized through compliance with a Programmatic Agreement between the Corps and Advisory Council on Historic Preservation (ACHP) which would provide BMPs to reduce potential impacts.

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION AND PROPOSED PROJECT REQUIRING ENVIRONMENTAL ANALYSIS

The United States Army Corps of Engineers, Rock Island District (Corps), working in conjunction with the City of Springfield (City), Office of Public Utilities, also known as the City Water, Light & Power (CWLP), previously prepared an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA)) of 1969 (42 United States Code [USC] 4321 et. seq.) that evaluated a range of alternatives to provide supplemental water supply to meet existing and projected deficits in water availability (Appendix A). The region currently relies upon a water supply system consisting of Lake Springfield augmented by periodic pumping from the South Fork of the Sangamon River (Figure 1-1). The Final EIS for the proposed Hunter Lake (Corps 2000) (Appendix A) identified Hunter Lake as the City's proposed alternative for supplemental water supply but a decision document was not issued. Section 1.3 includes a description of the history of the proposed Hunter Lake, describing how the project was initiated and how it changed over time.

The Corps has prepared this Supplemental Environmental Impact Statement (SEIS) in consideration of the City's currently proposed Springfield Aquatic Recreation and Supplemental Water Supply Project in Sangamon County, Illinois. The proposed project is a modified version of the Hunter Lake reservoir considered in 2000. The content of this document is intended to supplement the 2000 Final EIS with project revisions and updated information to inform the Corps' decision regarding a requested Clean Water Act (CWA) Section 404 permit application.

The proposed project includes the construction of an earthen dam on Horse Creek, a tributary to the South Fork of the Sangamon River, that would result in the formation of a reservoir which would inundate portions of both Horse Creek and Brush Creek. The resulting reservoir would cover approximately 2,649 acres, would hold approximately 12.2 billion gallons of water, and have an average depth of 14.2 feet (42.7 feet maximum depth). In addition to the formation of the reservoir, additional upland natural resources surrounding the reservoir would be managed by the Illinois Department of Natural Resources (IDNR) to provide buffer zones.

1.2 PROJECT LOCATION

The proposed project is located southeast of the existing Lake Springfield and north of Pawnee, Illinois in Section 31 of Rochester Township (see Figure 1-1). The proposed earthen dam is located on Horse Creek, approximately 2.3 miles southwest of the confluence of Horse Creek and the South Fork of the Sangamon River. The project area, including the inundation area and surrounding uplands, is expected to be approximately 7,983 acres and lies between Old Route 66 to the west, Cardinal Hill Road to the east, and Carroll Street in Pawnee, Illinois to the South.

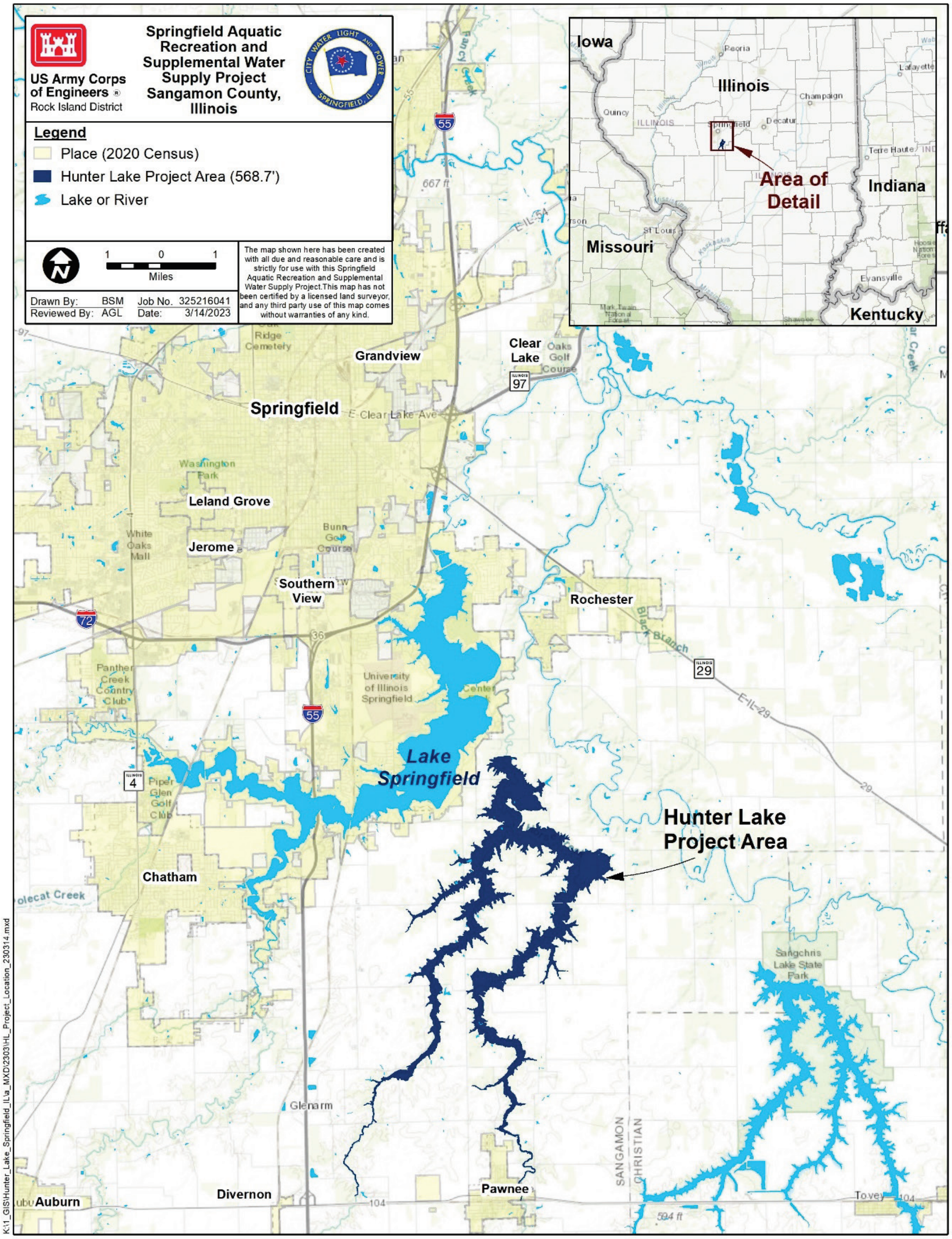


Figure 1-1. Hunter Lake Project Location

1.3 BACKGROUND AND HISTORY

The City's primary water supply source is Lake Springfield (see Figure 1-2), which also serves to meet local demand for aquatic recreation. The adequacy of Lake Springfield as a source of water was not questioned until the 1953-1955 drought which nearly caused the shutdown of both the water treatment and electric generation plants. As a result of this drought event, the City constructed a moveable low head dam across the South Fork of the Sangamon River (South Fork). During low lake levels when sufficient water is available in the South Fork, water is diverted to supplement Lake Springfield. However, within the last 30 years, the City has experienced three more droughts (1988, 2000, and 2012) which have led to mandatory water use restrictions. The following provides a brief history of the proposed Hunter Lake project to aid in understanding of previous consideration of the project, why changes were made to the project, and why this SEIS has been prepared. For a detailed history of the project, see Appendix A.

In July 1989, the City submitted a Section 404 permit application to the Corps to place material in Horse Creek for the construction of Hunter Lake. Information included in the permit application consisted of a description of the purpose and need (supplemental water supply), proposed discharge activity; the project location; the source, composition, and quantity of fill and/or discharge material; a description of impacts to waters of the United States (WOTUS); and the method of construction. The Corps determined that the Section 404 permit application for Hunter Lake constituted a major federal action which could significantly affect the quality of the human and natural environment, thus necessitating the development of an EIS. As a result, the 2000 EIS was prepared as part of the permitting process.

Lake Springfield During 1953-1955 Drought

A Final EIS was published in November 2000 in which the Hunter Lake Reservoir was identified as the preferred alternative. The Final EIS was published in the Federal Register on November 24, 2000; however, because of technical factors that challenged the issuance of a Water Quality Certification by the Illinois Environmental Protection Agency (IEPA) no Record of Decision was issued. Subsequently the City conducted additional coordination and consultation with the IEPA, performed studies related to the management of wastewater discharges within tributary streams, and re-initiated joint permitting with the IEPA/Illinois Department of Natural Resources-Office of Water Resources and the Corps. On December 17, 2010, the Corps issued a letter to the City formally determining the need for a SEIS due to the age of the data contained in the original EIS and the need to fully evaluate the alternatives for a supplemental water supply. The Hunter Lake Section 404 permit application was subsequently placed on inactive status.

After initiating further studies, the City, in January 2016 resubmitted a Hunter Lake Section 404 permit application and began to work with the Corps on this SEIS. The Corps identified analyses in the SEIS that needed to be updated to reflect current conditions. These included the water demand analysis, threatened and endangered species consideration to include bat presence/absence surveys, wetland delineations, the existing programmatic agreement related to cultural resources, water quality anti-degradation analysis, and mitigation plans. As a SEIS, this document does not repeat information presented in the Final EIS, rather the SEIS includes an evaluation of new and updated supporting information related to potential social, economic, and environmental impacts of reasonable water supply alternatives, and identifies a preferred alternative that meets the purpose and need for the project. Preparation of the SEIS also provides additional opportunities for public input concerning the project.

A revised Section 404 permit application for the construction of Hunter Lake was submitted to the Corps on November 30, 2022. Information within this revised application was updated to include information in blocks 10-13 and accurately reflect changes made to the proposed project including changes to project features and the addition of aquatic recreation to the existing supplemental water supply purpose and need. Addendum 1 to the permit application containing additional requested information from the Corps was submitted May 10, 2023 (Appendix A).

1.3.1 Water Supply

Springfield Water Supply History

Milestone Event	***Years***
Springfield Lake Constructed	1933-1935
Droughts	1953-1955: 1988, 2000, 2012

The City owns and operates water and electric utilities which are administered by CWLP and serves the residents of the City and certain wholesale customers. The City's water utility serves, either on a retail or wholesale basis, the City, the Villages of Grandview, Jerome, Leland Grove, Rochester, Loami, and Southern View, the Sugar Creek Public Water District, the Williamsville-Sherman Water Commission, Round Prairie Water Co-op, Curran Gardner Water District (CGWD), and certain unincorporated areas adjacent to the City. In total, the service area encompasses approximately 100 square miles in portions of 12 townships and includes a population of about 150,000. The Village of Chatham had been a wholesale customer until 2012 at which time they established a separate water supply system using a newly developed wellfield within the Sangamon River Valley.

CWLP also operates the largest municipally owned electric utility in Illinois, serving the City and the communities of Southern View, Jerome, and Leland Grove on a retail basis.

Lake Springfield, coupled with the contributions from the South Fork pumping facility, constitute the raw water source for the City and surrounding communities as well as cooling water for the City's Dallman Power Station. Lake Springfield was formed in 1935 by constructing Spaulding Dam on Sugar Creek. The dam has a spillway crest elevation at 560 feet mean sea level (msl) and incorporates five movable hydraulic crest gates. During the summer, if inflow is available, the lake is allowed to float up to 560.50 feet msl before the gates are opened. Although the gate crest elevation is 560 feet msl, the pool level drops when withdrawal and evaporation exceed inflow. Additionally, in the wintertime, from October to April, the operational water level is lowered to 559.6 feet msl to account for the formation of ice and to mitigate impacts of ice on docks around the lake. On average, long-term pool level declines approximately 2.0 feet per year. The upper reaches of the lake were dredged during 1987-1990 to allow these areas to again function as natural sedimentation basins.

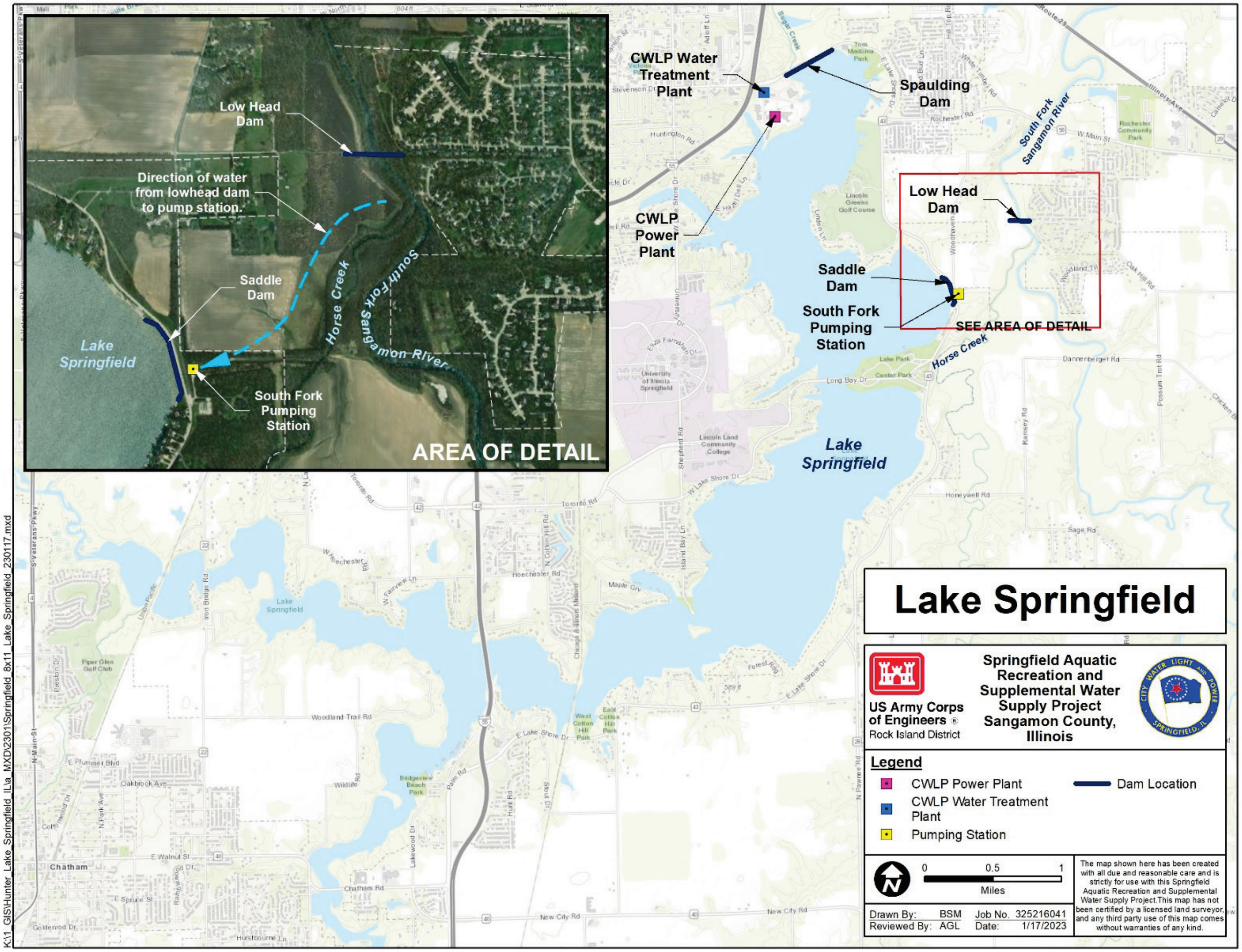


Figure 1-2. Existing Springfield Water Supply System

Streamflow from the South Fork Sangamon River is also pumped into the Lake Springfield whenever the lake falls below normal pool and sufficient flow exists in the river. [*Note: The pumping station for this supplemental supply is located on Horse Creek; a gate on the South Fork Sangamon River is raised to cause the flow in the South Fork to back up into Horse Creek from where it is pumped.*] An additional emergency source of supply, which remains a temporary option while the City is pursuing alternatives for additional sources of water, is to create an inflatable dam on the Sangamon River that can back up water into the South Fork from where it can then be pumped into the lake. This option requires that a minimum instream flow level be maintained in the Sangamon River, but the flow in the Sangamon River during drought would already be limited upstream by Lake Decatur (Roadcap et al. 2011). Notably, building temporary dams requires permits from the Corps. As part of the permitting process, the Illinois Pollution Control Board provided a variance to the dissolved oxygen (DO) water quality standard if the dams were constructed. The permit was approved in 1988 and was renewed in 1993, 2000, and 2006. As efforts to develop a permanent supplemental water supply moved forward, the permit for the temporary dams was allowed to expire due to other contributing water quality issues that precluded the issuance of a variance.

1.3.2 Aquatic Recreation

In 2019 the City notified the Corps that they intended for the proposed Hunter Lake to provide for aquatic recreation as an additional primary purpose and need. In 2020 the University of Illinois conducted a Study of Aquatic Recreation Supply and Demand (Recreation Study), focused on fishing, fishing tournaments, waterfowl bird watching & hunting, boating, kayaking, canoeing, swimming, and water skiing within a 50-mile radius of Springfield. Within the 50-mile study radius there are currently over 45,000 acres of public lakes and over 11,000 acres rivers available for water-based recreation (University of Illinois, 2020). The Illinois River accounts for over 7,000 acres of the available river recreation area, followed by the Sangamon River with over 3,000 acres. Lake Shelbyville at over 11,000 acres is the largest lake-based recreation area, followed by Clink Lake at over 4,000 acres. There are an additional 13 lakes over 1,000 acres. For a total of 57,503 acres of flat-water resources within the study radius.

Conclusions from the Recreation Study indicate that there is an unmet demand for 12,773 acres of flatwater recreation within the 50-mile radius of Springfield to the year 2035 (and beyond). Those demands, or a portion of the unmet demand, could be served by addition of a lake in Central Illinois.

1.4 LEAD AND COOPERATING AGENCIES

Due to the nature of the proposed Hunter Lake project, which includes the discharge of fill materials into WOTUS, Section 404 of the CWA applies to the Hunter Lake project and would ultimately require a Section 404 permit to be obtained from the Corps. Because of this permit requirement and the authority the Corps holds over the approval of the Hunter Lake project, the Corps is acting as the lead federal agency for this SEIS. As the Lead Agency, the Corps will ensure compliance with NEPA through the supervision of SEIS preparation, development and approval of a SEIS schedule and milestones, approval of the draft SEIS, and final approval of the SEIS.

IEPA is a Cooperating Agency for the SEIS due to their authority over the issuance of a 401 Water Quality Certification which is required for the Section 404 Permit to be valid. No additional federal agencies indicated a desire to be a formal Cooperating Agency for the proposed Hunter Lake project. The Corps is neither a proponent nor an opponent of the City's supplemental water supply and aquatic recreation project and permit application. Section 404 permit decision options available to the Corps are: 1) issue the permit; 2) issue the permit with modifications or conditions; and 3) deny the permit. This SEIS will support the permit decision.

1.5 PROJECT PURPOSE AND NEED

A project's Purpose and Need statement provides the foundation for development and analysis of alternatives to meet both NEPA and 404(b)(1) Guidelines (see Section 2). Both processes recognize that alternatives must meet the goals established by the project's defined Purpose and Need.

The proposed action has a dual purpose and need, encompassing both aquatic recreation and supplemental water supply. The proposed action will satisfy a portion of the unmet demand for aquatic recreation by supplying at least 2,500 acres of flat-water aquatic recreation area and includes facilities to support aquatic-based recreational activities. The proposed action also provides for a reliable supplemental water supply for the City's municipal, commercial, and industrial customers during drought conditions through the year 2065.

1.5.1 Basic Project Purpose

In accordance with the CWA Section 404(b)(1), the Corps determines the basic project purpose. The basic project purpose comprises the fundamental, essential, or irreducible purpose of the proposed project and is used to determine if the project is water dependent, or in other words, whether the project requires access or proximity to or siting within a special aquatic site to achieve its basic project purpose. If the project is not located in a special aquatic site, then it is not necessary to determine basic project purpose. The Corps, in following with the 404(b)(1) Guidelines, has determined the basic project purpose to be water supply and recreation.

1.5.2 Water Dependency Determination

Per the 404(b)(1) Guidelines, the Corps has determined that this project is not water dependent, as the proposed activity does not require access or proximity to or siting within a special aquatic site to fulfill its basic purpose. The availability of practicable alternatives not involving special aquatic sites will be evaluated in Chapter 2, as such alternatives are presumed to be available unless clearly demonstrated otherwise. Further, if there are other practicable alternatives that would not discharge into special aquatic sites, they must be evaluated because they are presumed to be less damaging unless clearly demonstrated otherwise.

1.5.3 Overall Project Purpose

The Corps also determines the overall project purpose. The overall project purpose is used to conduct the alternatives analysis. It is more specific than the basic project purpose and will help establish the geographic scope of the alternatives review. The overall project purpose should be specific enough to define the applicant's goals, but not so restrictive as to preclude all discussion of alternatives. The Corps has the discretion to base the purpose and need for their actions on a variety of factors, which include the goals of the applicant, but not to the exclusion of other factors. The applicant's goals must be considered in the context of the desired geographic area of the development and the type of project being proposed; however, the Corps makes the final determination on the definition of overall project purpose, even if it differs from what the applicant submitted. Note also that the purpose as defined by the Corps should consider the activity's underlying purpose and need from a public interest perspective.

The Corps, in following with the 404(b)(1) Guidelines, has determined the overall project purpose is to meet the public's need for supplemental water supply and aquatic based recreation within Springfield and the surrounding 50-mile radius.

1.5.4 Aquatic Based Recreation

In the original EIS (Corps 2000), regional outdoor recreation was identified as a beneficial impact of specific alternatives considered, including the Hunter Lake project. Regional outdoor recreation includes sports such as fishing, hunting, boating, camping, and bird watching. In 2020, the City requested that aquatic recreation be added as a primary purpose and need of the proposed project; subsequently, the Corps requested more specific data showing a need for aquatic-based recreation. Therefore, the City requested that the University of Illinois conduct a study to investigate the unmet demand for aquatic-based recreation within a 50-mile radius of Springfield.

1.5.4.1 University of Illinois Recreation Study

A team of researchers from the University of Illinois was hired under the direction of the Corps, to complete a recreation study to determine the current recreation supply, and the current and future needs and demands for aquatic recreation to see if they are significant enough for recreation to be added as a screening consideration of alternatives. The methods and results for the assessment of aquatic recreation demand was presented in this report. The study included the methods and findings for the recreation supply and included the methods and results for aquatic recreation activity use, miles traveled for recreation, satisfaction with existing aquatic recreation, importance of aquatic recreation, latent demand, required acreage, recreation demand, forecasted demand, forecasted required acreage, and calculation of unmet demand.

The University of Illinois 2020 Recreation Study focused on the demand for aquatic recreational activities such as fishing, waterfowl hunting, motorboating, kayaking, canoeing, swimming, boarding, sailing, and jet skiing within a 50 plus mile radius of Springfield. Attendance to fishing tournaments was also noted in the survey and waterfowl watching was included in the supply considerations. Ultimately, it was determined that demand for aquatic recreation in Central Illinois is expected to grow by 2035. The study concluded that there is an unmet demand for 12,773 acres of flatwater recreation activities within the 50 plus mile radius of Springfield at the year 2035.

The Recreation Study assessed the acres of water resources used for recreation, the county in which each body of water resides, and available water-based recreation activities that take place at each site to determine existing aquatic recreational sites. The study area was defined as a 53-mile radius around Springfield, which encompasses a 1-hour commute to any given aquatic recreational site. Data sources for identifying aquatic recreational sites include the IDNR fishing directory, state park and recreation area listings, municipality websites, reports, and other fishing and boating websites.

Several key selection criteria were included in researching the availability of lakes and rivers. All publicly owned lakes, ponds, and rivers were included; however, private lakes were not included in the analysis. The identified lakes, ponds, and rivers must have at least one water-based recreation activity which is defined as fishing, fishing tournaments, waterfowl bird watching, boating, kayaking, canoeing, swimming, and water skiing. The supply of water-based recreation resources was assessed using the online mapping tool – Map Developers, and the acreage of rivers and smaller lakes were delineated using google earth measurements.

As detailed in Table 1-1, the study concluded that there are 45,804 acres of lake and 11,699 acres of rivers in the study area. A 76-mile stretch of the Illinois River accounts for 7,776 acres and a 120-mile segment of the Sangamon River accounts for 3,840 acres. The rivers provide aquatic recreation activities including fishing, boating, canoeing, kayaking, waterfowl bird viewing, and swimming. Lake Shelbyville is the largest lake with 11,100 acres, followed by Clinton Lake at 4,900 acres, and Lake Springfield at 3,866 acres. Lake Chautauqua/Mud Lake, Sangchris Lake, and Lake Decatur range from 2,800 to 3,200 acres. There are an additional nine lakes between 100 and 2,00 acres.

The study administered a survey between June 8 and June 18, 2020, and asked respondent's questions regarding their usage of aquatic recreation facilities, the desire to use the facilities more often, and barriers to their using of the facilities. The survey utilized a panel of respondents taken from a pool of individuals located within the study area. The panel consisted of 871 respondents of which 636 of the respondents completed or partially completed the survey. Outlier responses were removed, leaving the survey with 625 survey responses for an effective response rate of 71.76 percent. Excluding swimming and fishing, most respondents have traveled more than 20 miles to engage in aquatic recreation activities.

The survey considered the usage of aquatic facilities for nine categories of activities; the activity with the highest usage was swimming in an outdoor pool, followed by fishing, and swimming in a lake or river. These percentages of activity usage are reported as base probabilities and represent the likelihood that a given person in the study will engage in an activity during a given year. Each percentage is then a measure of the demand for using an aquatic facility for said activity. Among respondents who indicated they had done an activity, the number of people who participated was a follow-up question. The most common number of participants was four or less.

The 2020 Recreation Study developed estimates of the required number of acres of flatwater recreation capacity. As mentioned above there is an estimated supply of 57,503 acres of flatwater recreation within the approximate 50-mile study area. The 2020 Recreation Study identified a demand for flat-water recreation between 59,010 and 80,890 acres in 2020. The activities with the largest forecasted acreage demand were fishing, motorboating, canoeing, and boarding. This demand is anticipated to change to 73,686 acres in 2025, 72,113 acres in 2030, and 70,276 acres in 2035. This results in an unmet demand range of 1,507 to 27,394 acres between the years 2020 to 2035 and beyond. With a point estimate demand of 12,773 acres in the year 2035 (see Table 1-2) (University of Illinois 2020).

In consideration of the results of the 2020 Recreation Study, the City determined a basis was established to support the need for additional aquatic-based recreation areas. Thus, a goal of providing at least an additional 2,500 acres of flat-water aquatic recreation area was established as part of the City's purpose and need for the proposed Hunter Lake.

Table 1-1. Public Lakes and Rivers Available for Recreation with the Study Area

Waterbody	Acres	Activities
Waverly Lake	112	Fishing, Boating
Lake Jacksonville	442	Fishing, Boating, Skiing, Swimming
Jim Edgar Panther Creek State Fish and Wildlife Area (Prairie, Gridley &Drake Lakes)	270	Fishing, Boating, Canoeing, Kayaking, Waterfowl Viewing
Virginia City Reservoir	21	Fishing, No motors, Has Boat Ramps
Meyers Pond	384	Fishing, Boating
Treadway Lake	346	Fishing, Boating, Waterfowl viewing
Big Lake & Goose Lake	1690	Electric boating only, Fishing
Illinois River	7,776 (based on 76 miles of river)	Fishing, Boating, Skiing, Kayaking, Canoeing, Waterfowl Viewing
Curry Lake	512	Fishing, No boat ramp
Schuy-Rush Lake	191	Fishing, Boating
Crane, Chain, Stafford, and Steward Lake	1,700	Fishing, Boating, Waterfowl viewing
Quiver Lake	154	Fishing, Boating, Waterfowl Viewing
Jack, Swan & Grass Lake	1,113	Fishing
Matanzas Lake	840	Fishing, Boating
Anderson Lake	1,134	Fishing, Boating
Duck Island Lake (main and little lake)	123	Fishing, Canoeing, Kayaking
Miserable Lake - Rice Lake	1,383	Fishing, Waterfowl Viewing
Spoon River	83	Fishing
Gillespie Lakes Old City and New City Lakes	266	Fishing, Boating, Swimming
Lake Carlinville	355	Fishing, Boating, Canoeing, Kayaking, Waterfowl Viewing, Swimming
Beaver Lake	59	Fishing, Boating, Swimming
Mt. Olive Lake	36	Fishing, Electric motorboats only
Otter Lake	765	Fishing, Boating
Lake Hillsboro	100	Bank Fishing
Lake Lou Yaeger	1,400	Fishing, Boating, Swimming
Coffeen Lake	1,070	Fishing
Lake Glenn Shoals	1,250	Fishing, Boating, Canoeing, Kayaking, Swimming, Water skiing
Sangchris Lake State Park	3,022	Fishing, Boating, Archery
Taylorville Lake	1,200	Fishing, Boating, Water Skiing, Swimming
Lake Shelbyville	11,100	Fishing, Boating, Swimming
Sangamon River	3,840 (based upon 120 miles of river)	Fishing, Boating Canoeing, Kayaking
Clinton Lake	4,900	Fishing, Boating, Swimming
Lake Decatur	2,800	Fishing, Boating, Sailing, Jet Skiing, Picnicking
Mud Lake & Lake Chautauqua	3,200	No boating ramp, Fishing
Lake Springfield	3,866	Fishing, Boating, Swimming
Total	57,503	

Source: University of Illinois 2020

Table 1-2. Estimates of Unmet Demand, 2020 - 2030

Year	Unmet Demand – Point Estimate	Unmet Demand – Range
2020	12,447	1,507 – 23,387
2025	16,183	5,191 – 27,394
2030	14,610	3,597 – 26,010
2035	12,773	1,778 – 24,424

Source: University of Illinois 2020

1.5.5 Water Supply

Based on an analysis of the storage and capacity, the Illinois State Water Survey (ISWS) has classified the City's water supply system as inadequate with a 50 percent probability of not meeting expected water supply demands during drought conditions (ISWS 2017). As a result, ISWS considers the City's water system a drought vulnerable system under existing conditions (Roadcap et al. 2011).

Under drought conditions, the reduced water availability of the existing supply system puts the community at risk of not meeting both **existing** and projected water demands. In consideration of these factors, the primary need for additional supplemental water supply is based on the following factors:

- Water supply for commercial and residential water use,
- Industrial water supply (power plant operation and condenser cooling,
- Water supply to support projected regional economic development, and
- Contractual obligations to serve as an emergency water supply to other communities.

The function of the City water supply system as the backup water supply for other communities is critical should those existing water supply systems fail. In contrast, however, it is noted that Springfield **has no such backup water supply** as Lake Springfield coupled with periodic pumping from the South Fork of the Sangamon River is the singular source of water available for use, thus making the adequacy of its supply system all the more critical for the future. Springfield's average daily demand of more than 20 million gallons per day (MGD) and 100-year drought deficit of approximately 12 MGD far exceeds any additional capacity of any water provider in Central Illinois.

The City's need for a reliable supplemental water supply is addressed in more detail in the following sections.

1.5.5.1 Yield of the Existing Water Supply System

1.5.5.1.1 Primary Factors Associated with Yield

The "yield" of a lake/reservoir can be defined as the amount of water that can be withdrawn during a specific time period based on hydrologic and climatic conditions. The amount of water available for withdrawal depends on the quantity of:

- Inflow to the lake – includes streamflow, direct precipitation, groundwater inflow to the lake, and water diverted to the lake (i.e., South Fork).

- Outflow from the lake – includes evaporation from the lake surface, seepage through the bottom and side of the lake, dam and spillway leakage, and outflow from the lake through the spillway.
- Change in storage in the lake – represents the quantity of water held in the lake as well as the loss of lake storage capacity due to sedimentation-induced volume losses.

What is Yield of a Water Supply System?

The term “yield” as it relates to a water supply system can be defined as the amount of water that can be withdrawn from a lake/reservoir during a specific time period based on hydrologic and climatic conditions.

The yield of the Springfield water supply system was analyzed in 1998 by the ISWS (Knapp, 1998). In that analysis, the traditional 50 percent confidence (best estimate) yields of the lake were computed for 10-, 25-, 50-, and 100-year droughts. Results from this previous analysis continue to provide the base yield estimates used by the City with minor adjustments for factors including the loss of capacity by sedimentation. The water budget model developed for the 1998 study used a sequential yield analysis from which yields for individual historical drought periods can also be identified. The water budget model was also adjusted to account for data and model uncertainties, and compute the 90 percent confidence yield (i.e., there is only a 10 percent chance that this yield is overestimated).

There have been no major changes to the City’s water supply system since the 1998 yield study (Roadcap et al. 2011). Lake Springfield is the primary source of water, with its two major tributaries and source of inflow being Sugar Creek and Lick Creek. Streamflow from the South Fork Sangamon River is also pumped into the lake whenever the lake falls below normal pool and sufficient flow exists in the river.

Using capacity measurements and sedimentation rates substantiated from multiple sedimentation surveys, most recently the 2004 survey by CWLP, the 2010 capacity of Lake Springfield (at an elevation of 560 feet) is estimated to be 50,280 acre-feet (Brill and Skelly 2007). The measured capacity of the reservoir from that survey, 51,246 acre-feet, closely matches the projected capacity based on the previous surveys (Singh and Durgunoglu 1990) with adjustments to account for sediment dredging in the late 1980s. Because of the agreement between successive measurements, the standard error of estimate for these surveys is judged to be only 5 percent.

Two historical streamflow records are available to assess the drought inflow into Lake Springfield and the availability of flow to be pumped from the South Fork Sangamon River. The U.S. Geological Survey (USGS) gage on the South Fork Sangamon River is located downstream of the dam near Rochester, has a continuous flow record from 1949 to the present that provides a direct measure on the flow available to be pumped from the river to the lake. The standard error of measured flows for this gage is considered to be 10 percent over the course of a drought period. A second gage on Sugar Creek near Auburn, operated by the IDNR, Office of Water Resources (OWR) from 1951 to 1978, provides a flow record for roughly 19 percent of the watershed that drains into Lake Springfield. Because this gage had a record of only 27 years and represented only a fraction of flows entering the lake, it was decided during the previous yield study (Knapp 1998) that simulated daily flows from a watershed model, calibrated with regional streamflow data, would provide a more complete estimate of drought sequences of inflow into Lake Springfield for the purpose of analyzing the operation and yield of Springfield’s water supply system. The simulated flows developed in this previous modeling effort were also used for the present analysis. Information on the development of the watershed model was provided by Knapp (1998). With the watershed model and daily climatic (precipitation and temperature) data, this previous study simulated a 105-year (1891-1995) flow record for Lake Springfield and South Fork Sangamon River watersheds. The standard error of simulating cumulative inflows into Lake Springfield during a severe drought using this modeling approach is approximated to be 30 percent.

Using the water budget analysis, a 105-year sequence of reservoir operation for the Springfield system was used to determine yields for the current system using historic drought sequences (Knapp 1998). The durations of the three worst drought periods, from the simulated onset of lake drawdown to the time of the lowest pool level (if the droughts were to recur under present day water use conditions), are as follows:

- Worst drought: June 1894–December 1895 (19 months)
- Second worst drought: July 1953–December 1954 (18 months)
- Third worst drought: July 1930–October 1931 (15 months)

Quantifying the water supply yield from the existing City water supply system requires consideration of watershed runoff, including the Lake Springfield watershed and coincident runoff in the South Fork Sangamon River that may be available for lake augmentation by pumping, lake evaporation, and other losses. The operational aspects of this system are important, including decision points regarding conditions to initiate and cease pumping from the South Fork Sangamon River. The yield of the Springfield water supply system has been investigated extensively (Fitzpatrick and Knapp 1991, Knapp 1998). An updated estimate based on Knapp (1998) is also briefly described by Roadcap et al (2011). Knapp (1998) provides the latest and most comprehensive description of analysis of system water supply yield and provided estimates for Lake Springfield alone and the system consisting of Lake Springfield coupled with pumping from the South Fork Sangamon River. Roadcap et al. (2011) provide yield estimates for the existing Springfield system based on Knapp (1998) with subsequent assumptions and criteria such as consideration of uncertainties to estimate yield based on a 50 percent confidence level and a more conservative 90 percent confidence level.

The 90 percent condition includes a sufficient safety factor against inadequacy, or failure, of the water supply to meet existing and future needs. Therefore, it is considered an appropriate design condition for a water supply system that is critical to both the City and the region. Roadcap et al (2011) concluded that the City water supply is inadequate for a 10 percent annual risk of failure (inadequate supply to meet the demand).

The existing City water supply system was reported by Roadcap et al. (2011) to have a water supply capacity as given in Table 1-3.

Table 1-3. Estimated Springfield Water Supply System Yield – 100-Year Drought Conditions

Drought Scenario	Water Supply System Yield (million gallons per day [MGD]) – 2010 Lake Condition	
	50% Confidence Yield	90% Confidence Yield
1894 – 1895 Drought	27.5	23.1
1953 – 1954 Drought	27.8	25.7
1930 – 1931 Drought	33.0	31.1
100-Year Drought	26.4	23.3

Source: Roadcap et al (2011), Based on Lake Springfield minimum water level of 548 ft (previously constrained by use of lake for power plant cooling water system)

The 100-year, or 1 percent annual risk of occurrence, drought event is a commonly used standard for a surface water supply risk. Because severe droughts are relatively difficult to characterize due to the extended time period over which the "event" occurs along the varying intensities within that period, Knapp (1998) and Roadcap (2011) present results for these limited number of observed historic events.

Yield losses due to sedimentation have been quantified, but other less well-defined potential reductions in yield may be addressed as uncertainties and provide support, along with considerations of appropriate risk for a large population. For example, it is recognized that streamflow and lake water quality are issues that are actively being addressed in the Lake Springfield watershed, as in many other watersheds. Runoff quality is inextricably linked to runoff rates, and practices to manage water quality could measurably affect runoff to Lake Springfield. CWLP is actively working to improve water quality (notably sediment and nutrients loadings such as phosphorous) in Lake Springfield by cooperative watershed management programs. The addition of controls or treatments such as creation or restoration of wetlands or changes in agricultural tillage practices to reduce surface runoff and reduce phosphorous loading could potentially reduce runoff to Springfield Lake as more water is retained and lost to evapotranspiration. Additionally, climate change predictions for the Midwestern U.S. include higher spring rainfall, but also drier summer periods (i.e., an increase in drought frequency and/or severity) (Winkler et al. 2012, Pryor et al. 2014, USEPA 2016).

The yield estimates presented in Table 1-3 are expected to vary for future conditions as a result of additional sedimentation and loss of storage in Lake Springfield as reflected in Table 1-4. A reduction in the annual yield from Lake Springfield is assumed to be 0.032 MGD annually (Knapp 1998).

Notably, the base yield values estimated by Knapp (1998) appropriately accounted for other operational changes that have subsequently been implemented:

- Pumping from South Fork of Sangamon River. As part of its routine annual operations, CWLP has withdrawn water via the pumping station on the South Fork of the Sangamon River. This pumping system was previously understood by Knapp (1998) and accounted for in his estimation of overall yield of the existing water supply system. Notably however, under drought conditions pumping from the South Fork is expected to be reduced to zero as flow within the South Fork is expected to be minimal.

Table 1-4. Yield of the Springfield Water Supply System under 100-year Drought Conditions

Year	100-year Drought-90% Confidence Level[1]	100-year Drought-50% Confidence Level[1]
2012	23.24	26.40
2015	23.14	26.30
2020	22.98	26.14
2025	22.82	25.98
2030	22.66	25.82
2035	22.50	25.66
2040	22.34	25.50
2045	22.18	25.34
2050	22.02	25.18
2055	21.86	25.02
2060	21.70	24.86
2065	21.54	24.70

[1] From Roadcap et al. (2011) adjusted for annual sedimentation.

In summary, the overall yield of the existing operating water supply system under the 90 percent confidence interval was determined to be 23.1 MGD in 2015 and estimated to be 21.5 MGD in the planning year of 2065. By comparison, the yield under the 50 percent confidence interval was 26.3 MGD in 2015 and 24.7 MGD in the planning year of 2065. Although these projections were determined based on data available in 2015, the estimates are not expected to have changed substantially because the historical and physical input used in determining trends did not change.

1.5.5.1.2 Other Factors Related to Yield

1.5.5.1.2.1 Dredging Lake Springfield

The City dredged the upper portion of Lake Springfield over the period 1985-1989 to restore lost water storage, sediment trapping capacity, fishery and habitat, and recreational uses. During this time period, nearly 2,000 acre-feet of sediment were hydraulically dredged from the portion of the lake upstream of Interstate 55 (I-55). The dredging restored more than 650 million gallons of storage capacity.

1.5.5.1.2.2 Natural Evaporation

Natural evaporation from the surface of the lake is one of the largest loss components in a yield analysis. Evaporation loss is considered in terms of net evaporation which is defined as the total evaporation from the surface of the lake less the direct precipitation falling on the lake surface. Evaporation is not constant and like streamflow, it will vary over time.

The 1998 drought yield study incorporated natural lake evaporation into its modeling (Knapp 1998). While lake evaporation is not a directly measurable amount, it can be estimated using a number of methods, most of which employ climatic measurements such as air temperature, relative humidity, wind speed, and solar radiation. Daily lake evaporation was estimated and incorporated into the model that identified the Lake Springfield water yield.

1.5.5.1.2.3 Groundwater Loss from Lake Springfield

Due to relatively low yield from groundwater wells in the vicinity of Lake Springfield, limited data is available to directly evaluate groundwater losses from the lake. Therefore, the losses from Lake Springfield were estimated based on data from a regional study of the groundwater resources of the Sangamon River (Fitzpatrick and Knapp 1991). This regional study found that in the vicinity of Lake Springfield, the groundwater yield from shallow sand and gravel aquifers was less than 20 gallons per minute (gpm), which indicated little movement of water through the glacial materials. The bedrock in the area, consisting of shale with interbedded limestone, sandstone, and coal of the Modesto and Bond Formations, had yields of less than 10 gpm. The low hydraulic conductivity suggests little flow from the lake to the groundwater and negligible seepage losses.

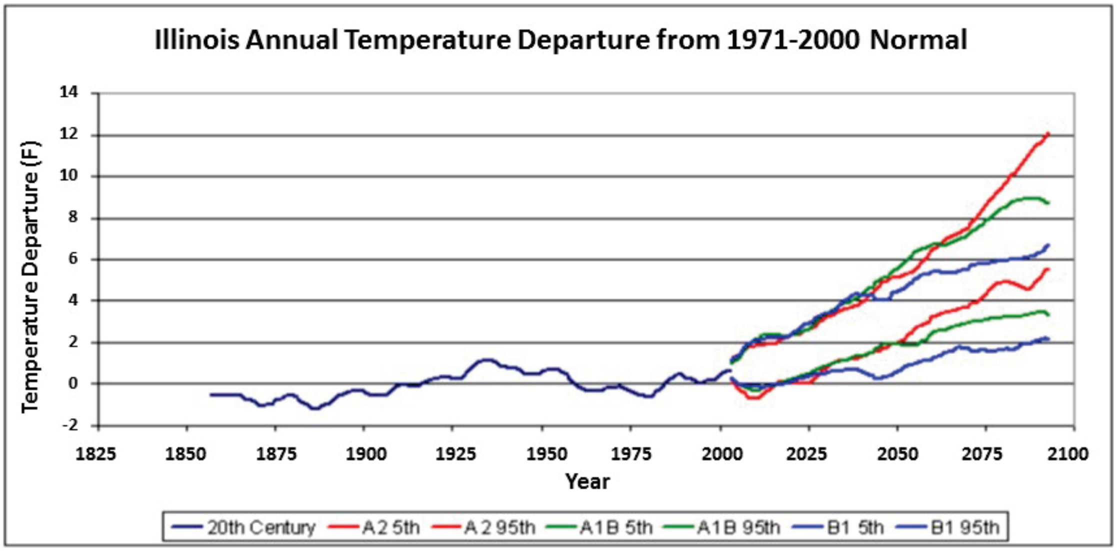
1.5.5.2 Consideration of Climate Change in Water Planning

Any long-range analysis of water availability and use should also include a consideration of future climate change and its potential effect on yield. The average temperature in the United States has increased by 1.3°F to 1.9°F since record keeping began in 1895; most of this increase has occurred since about 1970. The most recent decade has been reported as the nation’s warmest on record, and temperatures in the United States are expected to again continue to rise. Because human-induced warming is superimposed on a naturally varying climate, the temperature rise has not been, and will not be, uniform or smooth across the country over time (Melillo et al. 2014).

In general, climate change will tend to amplify existing climate- related risks from climate to people, ecosystems, and infrastructure in the Midwest. Direct effects of increased heat stress, flooding, drought, and late spring freezes may be expected to result in broad effects on natural and managed ecosystems such as changes in pests and disease prevalence, increased competition from non-native or opportunistic native species, ecosystem disturbances, land-use change, landscape fragmentation, atmospheric pollutants, and economic shocks such as crop failures or reduced yields due to extreme weather events (Melillo et al. 2014).

In consideration of national and regional changes in climate the ISWS has evaluated regional trends in climate under varying global carbon dioxide (CO_2) emissions scenarios to assess potential impacts on future water supplies and its impacts on water planning decisions.

With an enhanced greenhouse effect and global warming, global climate models suggest that mean annual temperature in Illinois could increase by up to 12oF by the end of the twenty-first century and mean annual precipitation could increase or decrease by some 9 or 10 inches. Other models suggest that mean annual temperature could increase by only 2oF and precipitation would not change significantly. Figure 1-3 shows the 5th and 95th percentiles of 140 global model runs from 21 global climate models driven by a range of scenarios derived by ISWS scientists using the latest set of global climate model simulations produced for the Intergovernmental Panel on Climate Change’s (IPCC) Fourth Assessment Report. The modeling groups produced simulations for three different scenarios about how temperatures may change in the future under varying model scenarios [moderately high scenario (denoted as ‘A2’), an intermediate scenario (denoted as ‘A1B’), and a low scenario (denoted as “B1”)] (ISWS 2017).

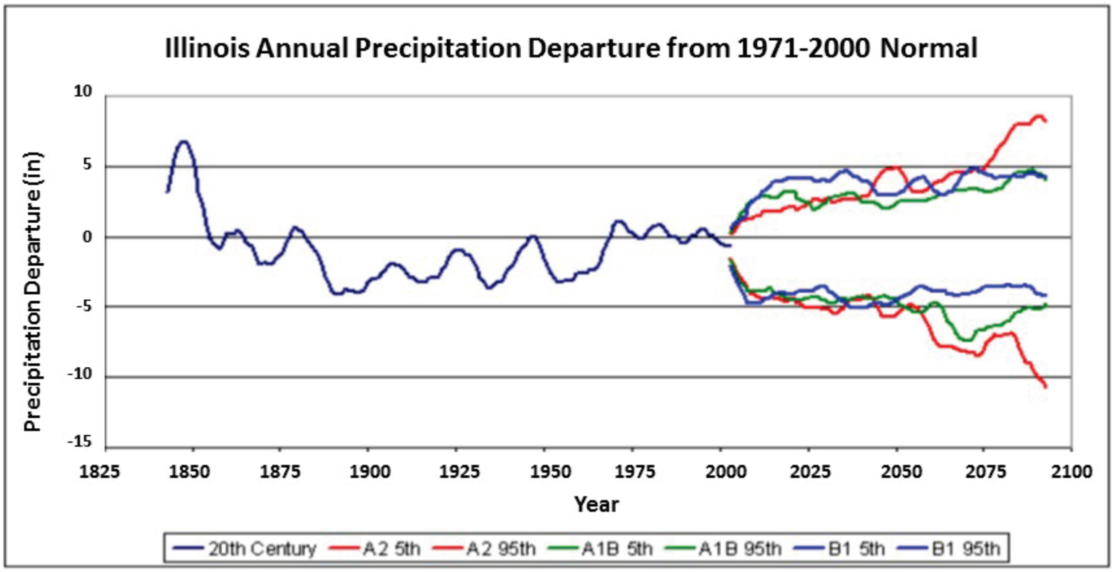


Source: ISWS, 2017

Figure 1-3. Predicted Temperature Changes from ISWS Modeling in Illinois

By comparison, Figure 1-4 shows that precipitation in Illinois could either increase or decrease by 9 to 10 inches by the end of the century. Precipitation scenarios considered by ISWS show little dependence on greenhouse gas emissions scenarios and the concentration of greenhouse gases in the atmosphere. ISWS also points out that global climate models are limited in their ability to simulate clouds and precipitation. Consequently, there is a high degree of uncertainty in both the direction and magnitude of precipitation changes in the future (ISWS 2017). As such no specific data can be used to calculate and quantify future precipitation levels and their effects on water yield of the Springfield water supply system.

As a result of the large uncertainties in future climatic conditions at the regional scale, there are also large uncertainties in future hydrological conditions and water availability. In spite of such uncertainties more severe droughts are likely to occur in the future than have occurred in the past 30 years even in the absence of human-induced climate change. In contrast, should the effects of man’s activities (emissions of greenhouse gases) exacerbate climate change effects by increasing drought severity and intensity the implications for water supply system sufficiency are especially severe (ISWS 2017) and would warrant a more conservative approach to water supply planning. As a prudent measure therefore, the City has determined that future water supply planning for the Springfield region should also be sufficiently conservative to reduce overall vulnerability to the potential effects of climate change.



Source: ISWS, 2017

Figure 1-4. Predicted Precipitation Changes from ISWS Modeling in Illinois

1.5.5.3 Water Demand

1.5.5.3.1 Existing and Projected Water Demand

The City water supply system provides water that serves a range of uses that include residential, municipal, and commercial clients. Water (both potable and raw water) is also used to support the operation.

City water demand for 2004 through 2020 indicate that the average monthly water demand on the public water supply system (excluding power plant operations, or the benefits of conservation measures and water restrictions) has ranged from 20.9 to 23.6 MGD (CDM Smith 2015). During the drought of 2012 the recorded average monthly water use was 23.25 MGD (CDM Smith 2015).

Table 1-5 provides a summary of water demands on the City Water Supply System under 100-year drought conditions. This summary includes actual water use under historical conditions (most recent drought year (2012)), 2015, those for the year 2020, and demands for future years extending to the planning year. The subsections below provide a description of the basis for future water demands.

1.5.5.3.2 Projected Water Demand

Technical evaluations of the City's long-term water supply needs were completed by City staff and/or consultants in 1957, 1965, 1972, 1980, 1981, 1986, and 1991. The 1965 report was the first to recommend that an additional source of water supply be developed to protect against future water shortages during drought. Subsequent reports all supported that recommendation.

Table 1-5. Past and Projected Demands on the Springfield Water Supply System

Year	Summary of Potable and Existing Industrial Water Uses[1]	Summary of Contract Supply Obligations	Summary of Future Industrial Uses	Summary of Wholesale Uses	Subtotal
Past					
2012	35.14	0.00	0.00	0.00	35.14
2015	32.91	0.75	0.00	0.00	33.66
2020	31.90	0.75	0.00	0.00	32.65
Projected					
2025	20.00	0.75	0.30	1.50	22.55
2030	21.32	0.75	3.00	1.50	26.57
2035	22.64	0.75	3.00	1.50	27.89
2040	22.85	0.75	3.00	1.50	28.10
2045	25.07	0.75	4.00	2.00	31.82
2050	25.25	0.75	4.00	2.00	32.00
2055	25.43	0.75	4.00	2.00	33.18
2060	25.65	0.75	4.00	2.00	33.40
2065	25.87	0.75	4.00	2.00	33.62

1 Includes potable water supplies, industrial uses by power generation, benefits of conservation measures and benefits of implementation of water restrictions.
2 Source: CWLP

A water demand analysis was conducted in February 2015, and supplemented in October 2016, in response to a request by the Corps and U. S. Environmental Protection Agency (USEPA). The purpose of the analysis was to update projected water demand to assist in determining viable alternative water supplies during a 100-year drought event (CDM Smith 2015). Because a reliable public water supply is critical to Springfield residents and the support of the industrial and commercial community, a 100-year drought condition was used as a basis for determining the overall need for supplemental water supply. The 1953–1954 drought in the Springfield area has been estimated by ISWS to be approximately a 100-year drought event (Fitzpatrick and Knapp 1991). A 100-year drought event is defined as a drought that statistically has a 1 percent chance of occurring in any given year. It is expected to occur with an average frequency of 100 years (i.e., it does not imply that it can be expected to occur every 100-years). The 1953–1954 drought was used to predict water demand effects of a future 100-year drought.

The 2015 water demand analysis is based on the results of a water demand model developed to forecast potable water demand (CDM Smith 2015). This analysis considered the following to provide an estimate of future potable water demand:

- Analysis of current and historical water use for a ten-year period (2004 through 2013)
- Future population projections for the service area
- Future water demand forecasts under both baseline and drought conditions

This analysis was expanded in 2022 (see Table 1-5) to provide additional scrutiny and review of future predictions about water demand as a basis of the project. This analysis included the following:

- Industrial water uses by the Dallman Power Station, considering closure of units
- Future industrial water demand
- Contractual obligations to provide water for other communities
- Benefits and contribution of conservation measures
- Benefits and contributions of drought-induced water restrictions
- Future wholesale demand
- Considerations of current trends in population growth and impact on water use

1.5.5.3.3 Potable Water

A review of historic monthly potable (or treated) water patterns showed a distinct seasonality in water use in which the water use in summer months increased well above winter use. The seasonal pattern shows winter water use at, or below, 20 MGD and increases to almost 28 MGD in July and August. This rise in seasonal demand was observed among all categories of water users: residential, commercial, large users, and wholesale customers. In late winter and spring, snow melt and spring rains typically fill the lake. As seasonally higher temperatures, reduced streamflow, and peak lake evaporation occur and coincide with seasonally high-water demand, lowering of the lake level occurs. Notably, p*eak* monthly usage for the time period between 2004 through 2013 occurred in July 2012 (drought year) when demand reached 36.28 MGD*.* Presumably, this higher observed potable water use corresponded to higher rates of lawn irrigation and other factors. For example, golf course water use during this time period markedly increased as owners sought to ensure that invested features (greens, fairways) had sufficient water to survive the drought period.

However, it should be recognized that, while this seasonal variation and daily variations, are important for the water treatment and distribution system, the supply capacity of the Lake Springfield system is relatively insensitive to that variation. It appears to be caused by the large water storage volume in Lake Springfield and the critical drought duration for the lake being 18 months relative to shorter seasonal variations. According to the ISWS the main defining characteristic of an extreme water supply drought in Illinois is that it lasts 18 months or longer, spans two summers, and lacks the normal wet period occurring in the intervening late winter and spring, which in almost all other years would allow water supply systems to recover (Roadcap, et al 2011). Although recent droughts in other parts of the country (California, Texas) have seen droughts lasting 24 to 36 months in duration or more.

Population growth projections for the City are modest while some outlying suburbs (e.g., wholesale customers) within the service area (Figure 1-5) are projected to have higher growth rates. Thus, growth rates for the entire service area should be considered. To some extent, the recent recession and state government policies (e.g., reduction in number of state employees and services moved from Springfield to offices in other parts of Illinois) have slowed recent population growth in the area. For planning purposes, a baseline and high growth forecast scenario was developed by CDM Smith (2015). For the baseline population scenario, the Springfield-Sangamon County Regional Planning Commission (SSCRPC) projected population growth rates identified that the annual growth rate is 0.11 percent per year from 2010 to 2065. The “high growth” scenario used the SSCRPC population projections for 2040 and increased that year alone by 5 percent to simulate a scenario of greater growth. In recent years the population levels of the City of Springfield have declined at a rate of -0.9% per year (USCB, 2022a). Similarly, Sangamon County demonstrated a slight decline of -0.8% from 2020 to 2021

(USCB, 2022b). Adjustments to the residential water demand estimate from CDM Smith (2015) were therefore made for the years of 2025 and 2030 to reflect current population trends before returning to the normal long term growth trend. Notably, the 5 percent adjustment used by CDM Smith (2015) is a common and reasonable assumption of forecast error. It is not an assumption of annual growth*.* The 2010 U.S. Census and the 2040 population high growth estimates were used by CDM Smith to interpolate the high growth scenario population for the interim planning years and also extrapolated to the year 2065 for each community.

While the growth rate used by CDM Smith (2015) was labeled as a “high growth” scenario in the previous demand analysis it is actually considerably lower and more conservative than the observed average annual rate of change based on decadal census results where it ranged between 0.59 and 0.45 (between 1990-2000 and 2000-2010, respectively (State of Illinois 2016)). The value used in the future growth projections by CDM Smith (2015) is therefore, considered to be conservative relative to the observed historical annual growth rates. Additionally, to account for the flat population growth level recorded by the 2020 Census, a zero (“0”) population growth was applied to the revised demand analysis for residential filtered water for the years between 2015 and 2020, and half the adjusted residential growth rate for the interval between 2020 and 2025 to reflect a period of economic recovery. This approach allows for consideration of the observed short-term trend in Springfield population, but generally sustains the long-term trends considered by CDM Smith (2015).

Climate change predictions include a continuation of recent trends of warmer temperatures and a general increase in precipitation but occurring as heavier precipitation events during winter and spring months and less precipitation occurring during drier summer months (USEPA 2016). Weather patterns from 2004 to 2013, however, may not be the normal weather patterns in the future due to climate change. While climate change has a larger potential to affect water yield (e.g., additional rain events or alternatively fewer rain events), it also may cause changes in water demand due to potential increased length of summers and related increased seasonal water demand (e.g., additional watering of golf courses or lawns). While climate change impacts are not specifically quantified in the forecasts, the use of the 90 percent confidence level was considered sufficient to account for any climate change uncertainties.

1.5.5.3.4 Existing Industrial and Large Commercial Water Uses

Industrial and large commercial water uses of potable water are summarized in Table 1-6. Large water users are defined as water users with 6-inch to 12-inch meters. However, wholesale customers are served with meters in this size range. The major large water users that are not wholesale customers are listed in Table 1-6 with their corresponding total water use during the 12-month period ending in February 2022.

CWLP conducted a detailed investigation to quantify the industrial water use of the Dallman Station to provide defensibility as to overall water demand. This investigation considered current operational characteristics of the station and also assessed potential changes in water use (reductions and gains) associated with regulatory requirements and future generation needs.

Under 2020 operations the Dallman station raw water (non-potable) demands of the power generation plants include approximately 9.9 MGD as summarized in Table 1-7. This includes water that was used to support ash sluicing operations, once-through condenser cooling and includes losses from the system that are associated with forced evaporation from heated water that is released to Lake Springfield.

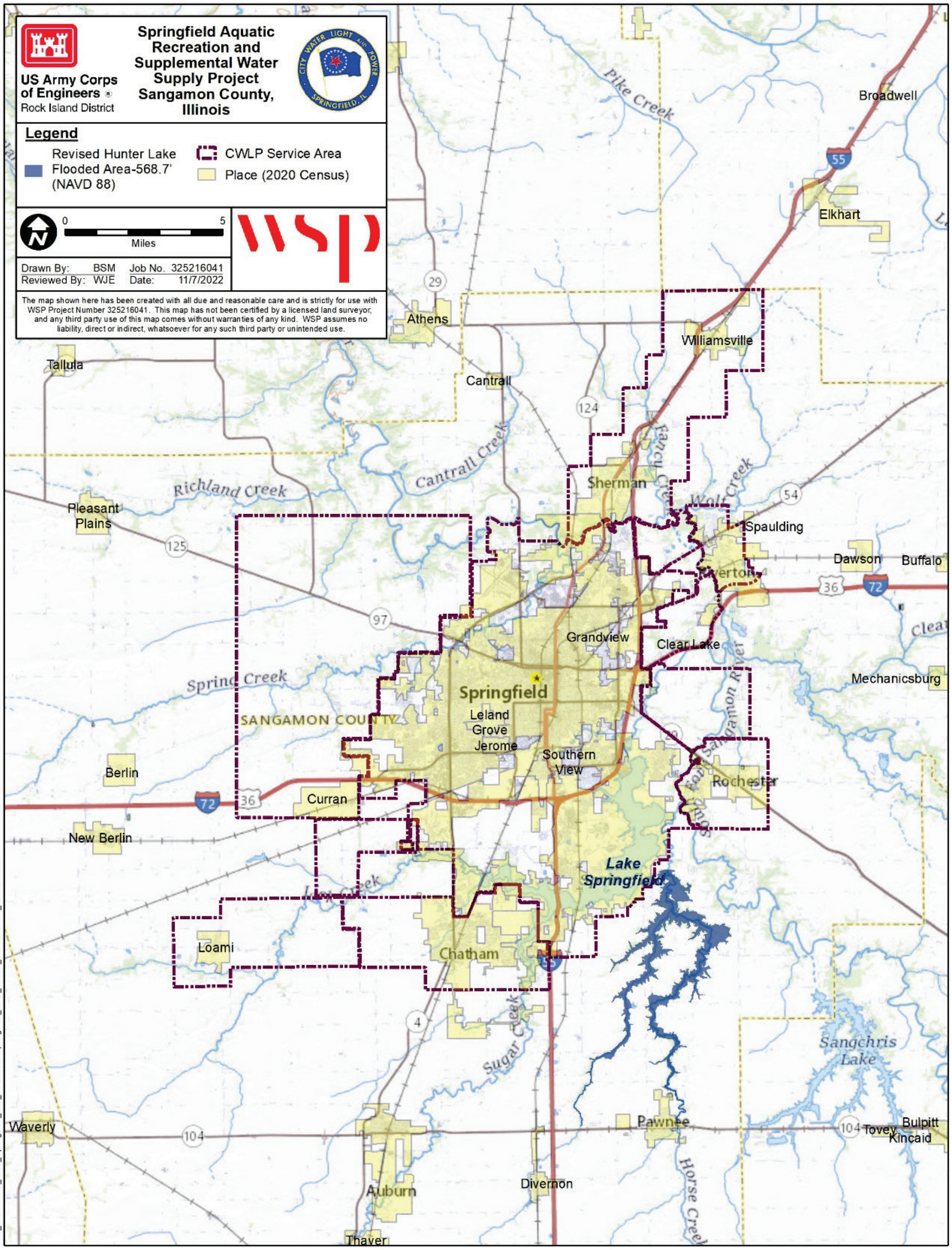


Figure 1-5. CWLP Water Service Area

Table 1-6. Large Customer Average Water Use for 12-Month Period Ending February 2022

Customer	Annual Water Use (MGD)
CWLP-Electric Department	2.47
State of Illinois	0.37
St. Johns Hospital	0.27
Memorial Medical Center	0.24
University of Illinois at Springfield	0.09
Springfield Park District	0.08
Springfield District 186	0.06
Tower Capital Group	0.09
SIU School of Medicine	0.07
Springfield Housing Authority	0.08
Sangamon County	0.06
Grand Valley MHP Village	0.07
Wolf Family Investment Fund LLLP	0.04
Chatham Hills Apartments	0.05
Concordia Village	0.04
Northwest Capital Holding LLC	0.05
Total	4.13

Source: CWLP, 2022
[1]Includes industrial potable water use by Dallman station

Table 1-7. Summary of Prior Dallman Station Non-potable Water Uses Excluded from Water Demand Analysis

Demand Input	Volume (MGD)
Ash sluicing	5.4
Dallman Units 31, 32, 33 condenser cooling	2.2
Dallman Unit 4	*
Forced Evaporation	2.3
Total	**9.9**

*Potable water use included in Table 1-6
Source: CWLP 2022

However, the City's raw water demand has been reduced due to changes related to the requirements of the recently promulgated regulations and by potential unit retirements. On April 17, 2015, the USEPA established national criteria and schedules for the management and closure of coal combustion residual (CCR) facilities (80 Federal Register 21302) (herein referred to as the CCR Rule). In response to the CCR Rule, the City ceased sluicing of ash in 2021.

Additionally, Units 31, 32, and 33 have been retired from operation, with Unit 33 being the last unit closed in 2021. These closures resulted in a reduction of water demand which is included in the water demand analysis.

Indirect demands on water use are also associated with the elimination of water need to compensate for evaporative cooling from Dallman Station. Based on past operations Dallman

Units 31, 32, and 33 were once-through cooling systems that result in the release of heated water to Lake Springfield. Dallman Unit 4 is a closed -cycle facility that utilizes cooling towers for cooling and, therefore, does not release heated effluent. The total evaporative losses from Lake Springfield accounted for an additional demand of 2.3 MGD in conjunction with the operation of Units 31, 32, and 33. Therefore, due to the closure of these units, the water demand has been further reduced by approximately 2.3 MGD. Thus, the closure of Dallman Units 31, 32, and 33 has reduced water demand by 9.9 MGD (Table 1-7).

1.5.5.3.5 Future Industrial Water Demand

As part of the Springfield 2020 strategy, the retention, expansion, and attraction of diverse, stable employers is a priority (City of Springfield 2000). Initial emphasis will be on such business and industry areas as health care, biotechnology, other technology-based firms, tourism and hospitality, consumer services, food processing, and product distribution. Based on information from the SSCRPC and the City, an adequate water supply may be a factor affecting regional economic development.

Springfield has a large medical and health care community and public sector employment base. These not only contribute to the City's economic stability but are also the largest average water users after the CWLP. Other large water users within the Springfield system include hotels, recreational facilities, and universities (see Table 1-6).

The health care sector accounts for the second largest category of large water users after the City. The Springfield medical community continues to expand rapidly. St. John's recently completed a major 100,000 square foot expansion just east of Ninth Street. Additionally, Springfield Clinic has two major new faculties planned for construction in the near future. Memorial Medical Center also continues to plan for major office construction. Currently Memorial Medical Center has a day care facility and orthopedics center expansion in the planning phase. These expansion projects will increase the amount of water purchased by these institutions by an estimated 100,000 gallons per day (0.1 MGD). Providing a sufficient supply of water to the healthcare sector is necessary for continued growth.

In addition to the above specific identified future industrial demands, the City has a stated objective of encouraging additional industrial and commercial employers to the region. The City also periodically receives inquiries on behalf of prospective developers who may represent industries that would require additional potable water supplies. These inquiries often include questions regarding the City's water sources and reliability. As concluded by SSCRPC, the Springfield region has some strengths that reflect the potential for future growth and industrial development. For example, it is relatively stable, has several locations that may serve as targets for development, includes sectors and clusters that have shown growth (particularly in the areas of medicine and biotechnology) and may be well-positioned for future growth. The region also includes a strength in the technology-based knowledge occupations, and even with reductions in public employment, State employment remains a significant force. It also shows potential for growth among nonfarm small enterprises, which can yield positive results for small business growth in the years to come (SSCRPC 2015).

Considerations for future industrial water demand include the following:

- EmberClear Lincoln Land Energy Center. EmberClear is developing the Lincoln Land Energy Center, a 1,090 MW natural gas-fueled combined-cycle facility (NGCC) located near Pawnee in Sangamon County, Illinois, approximately 20 miles south of the state capital of Springfield. Siemens Energy, Siemens Financial Services, and BDC (Bechtel) Power Holdings, LLC are committed partners with EmberClear to finance, construct, and build the Lincoln Land Clean Energy Center.
- The anticipated 2023 capacity shortage of energy in the region is up to 2.8 GW and is attributable to the retirements of a number of coal-fired generating stations. Retiring coal and limited development of baseload power are foreseen to lead to supply constraints, rendering Lincoln Land, the only gas-fueled project, a crucial baseload resource in the region.
- The Lincoln Land project will be constructed one-half mile south of the Village of Pawnee on a 160-acre tract of land zoned for industrial use and located immediately adjacent to the newly constructed Illinois Rivers transmission substation. The project will purchase water and backup water supplies from the City of Springfield and the Otter Lake Water Commission via the Village of Pawnee (EmberClear, 2022).
- The Ember Clear Water Supply Agreement currently obligates the City of Springfield to providing the future Lincoln Land Energy City plant a water supply of 0.3 MGD. Expansion of the plant is also anticipated resulting in increased water demand. The future plant expansion water supply agreement obligation is estimated at 0.75 MGD.
- EmberClear has also recently begun discussions with the City of Springfield to request an additional 3-5 MGD for carbon capture and/or the future conversion to hydrogen as a fuel instead of natural gas. The anticipated large increase is expected to be between the years of 2026 to 2033 to make use of federal tax incentives. Additionally, the IEPA has issued the air permit for this facility. Construction is expected to begin in 2023 to 2024. For planning purposes, an additional water demand of 2.7 MGD is anticipated by the year of 2030, and an additional demand of 1 MGD by the year of 2045.
- Potential Ethanol Plant Development. An Ethanol plant or other potential future industrial demands are also likely. The specific timing of this potential water user is not determined by may occur around planning year 2045. Should this industrial development occur, an additional 1.0 MGD would be added from planning year 2045 to planning year 2065 to capture these potential additional demands.

In total, a conservative future demand value of approximately 4.0 MGD (i.e., 1 MGD less than the values descried above) is used in the planning year. Other industrial developments in the Springfield area would increase this water demand in the planning year.

1.5.5.3.6 Contractual Obligations to Provide Water for Other Communities

The City has agreements with the Village of Chatham and the CGWD to provide emergency water supply backup. Chatham and CGWD own and operate water supply distribution systems. Chatham purchases its water supply from the South Sangamon Water Commission (SSWC) and CGWD owns its own water source and treatment facility in Springfield, Illinois.

These municipalities have agreements with the City whereby the City would provide up to 1.5 MGD to Chatham and a separate 1.5 MGD to CGWD when a temporary emergency occurs.

The agreements do not require the City to provide water during periods of general shortage (e.g., drought conditions). For planning purposes, a portion of these contractual agreement amounts are considered in the forecast of demand because the City may be asked to provide water before drought conditions are identified. For example, based on past experience, droughts are typically not evident until spring rainfall levels are observed to be below normal—often between 6 and 9 months into the drought cycle. As a conservative planning value, a fraction of these obligations (0.75 MGD total on annual basis) is included in the estimate of additional water demand extending from 2015 to the planning year of 2065.

1.5.5.4 Benefits and Contribution of Conservation Measures

To reduce water demand, the City has implemented a water conservation program and measures to reduce water use and/or water loss. As far back as 1988, the City promoted water conservation measures in its Drought Emergency Water Supply Plan to reduce water demand. These measures are described below.

1.5.5.4.1 Water Conservation Programs

Comprehensive water supply planning includes the evaluation of two basic sets of alternatives for balancing supply and demand: (1) those alternatives that reduce water use and/or loss and (2) those alternatives that augment supply.

Water conservation is defined as any beneficial reduction in water use or water loss. More specifically, the potential conservation measure must result in water use (or loss) that is less than it would have been had the measure not been implemented. The end result is a reduction of water use (or loss) so that a segment of existing or future water supply is available for uses that otherwise would not have been served except by the provision of new supplies.

In 1991, a detailed water conservation study was completed for CWLP and concluded that water conservation can offset only a small portion of the projected demand (PMCL, 1991). CWLP has initiated the most effective measures identified in this study and has adopted 8 of the 12 recommended water conservation measures selected for evaluation in the study (Table 1-8).

In 1990, the City revised its plumbing code to require low-flush toilets and low-flow showerheads and faucets for all new or replacement construction. The CWLP Energy Service Office (ESO) has provided approximately 21,000 water conservation devices including water conservation kits, low flow showerheads, and low flow, water-efficient kitchen and bathroom faucet aerators and pre-rinse spray nozzles for restaurants. Table 1-9 summarizes the number of water saving devices provided by CWLP since 1997. The City has also provided over 1,000 rebates on high efficiency toilets and clothes washers.

CWLP has worked with IEPA to allow mobile home parks to sub-meter and thereby reduce water use by individuating metering each mobile home rather than metering the entire park as a whole. This requires residents to be accountable for their water use. Through this individual metering CWLP estimates a reduction of 7,000-10,000 gallons per year per resident. CWLP estimates this individual metering was to a one-time savings of 3.1-4.5 million gallons in the year that it was implemented. This is equivalent to approximately 0.05% of the total annual water consumption of over 7.5 billion gallons.

Table 1-8. Water Conservation Measures Selected for Evaluation in the Springfield Area

Conservation Measure	Enacted by CWLP
1. CWLP could provide “water saver kits” to all of its residential customers free of charge. These kits contain low-flow showerheads, low-flow bathroom and kitchen faucet aerators, toilet tank dams (to reduce the amount of water used per flush), and instructions on how to install them.	Y
2. CWLP could apply a $150 discount to the connection fee for customers with new homes when less than 50% of the yard would be planted with grass. Those customers with new homes with more than 50% in grass would pay a $500 one-time charge.	N
3. The City could revise its code to prohibit new commercial developments from putting more than 25% of their landscaped area in grass lawn.	N
4. CWLP could review the water use habits and technologies of large commercial and industrial water uses and identify cost-effective ways to conserve water.	Y
5. Upon request, an employee of CWLP would make an appointment to come to a customer’s home to identify opportunities to save water in the home and yard. The home visit would cost $15.	Y
6. Educational programs could be made available at CWLP expense to elementary and high schools in the Springfield area to teach children how to conserve water in their homes and the importance of doing so.	Y
7. CWLP could set up an outdoor water use management program to save water used during the watering of large lawn areas by public facilities such as cemeteries, schools, parks, and golf courses.	N
8. The City could revise its plumbing code to require installation of low-flush toilets and low-flow showerheads and faucets for all new or replacement construction that begins after June 1, 1990.	Y
9. CWLP could provide rebates of $100 on the purchase of ultralow-flush toilets (1.2 gallons per flush). The estimated cost of a regular toilet is $100. The estimated cost of an ultralow-flush toilet is $200 ($100 after the rebate)	Y
10. The City may revise its code to ban the sale of high water-use toilets, faucets, washing machines, and dishwashers that do not meet national efficiency standards. (Upon further evaluation, this measure was dropped from the list due to low feasibility.)	N
11. CWLP may increase its water rates for the summer season by 30% when demands on water supplies are greatest. The additional revenue would be used to reduce water rates in winter.	N
12. CWLP may announce a voluntary restriction during water shortages, asking that lawn and garden watering be done only every third day from 7 a.m. to 9 a.m. and 6 p.m. to 8 p.m.	Y

Source: PMCL 1991

Since the inception of these programs, along with the City’s plumbing code changes and the Energy Policy Act of 1992 requiring uniform water efficiency standards for nearly all toilets, urinals, showerheads, and faucets manufactured after January 1994, conservation measures are estimated to have reduced water demand. As conservation practices have become more widely implemented, the benefits to reduced future water demand is minimal as reflected by the substantial decline in installed devices since 2018 (see Table 1-9). Therefore, no additional reduction in water demand is anticipated in conjunction with these measures.

1.5.5.4.2 Water Losses —Non-Revenue Water and Unaccounted for Water

Traditionally, the term “unaccounted-for water” (UAW) has been used to describe the difference between water produced into the system (input) and water delivered (output) to the users. However, this term has a variety of definitions and meanings. The International Water Association (IWA) proposed the term “Non-Revenue Water” (NRW) with a clear definition of NRW as the difference between total water produced and billed consumption.

Table 1-10 illustrates the various ways that the same total volume of water in the system (100 percent) can be categorized using the International Standard Water Audit Form. The differences among the columns involve various ways to categorize the total volume for analysis, with detailed classifications of water volumes listed in the right-hand column.

Components of non-revenue water include unbilled consumption and water losses. Water loss is comprised of *apparent loss* and *real loss*. As defined by IWA, apparent loss consists of unauthorized consumption (including theft), meter inaccuracies and data errors. The reduction of apparent loss leads to increased revenues as this water becomes properly metered and billed but does not necessarily lead to reduced water being pumped into the system (i.e., demand).

Real loss consists of leakage on mains, leakage and overflows at storage, and leakage at service connections. Real losses from leaks can be further categorized between reported, unreported, and background leaks. Reported leaks consist of visible leaks and broken mains that can be quickly repaired thus resulting in short duration loss. Unreported leaks are generally not visible at the surface and are only detected through line surveys. These leaks are generally sustained loss and therefore represent larger volume losses before they are repaired. Background leaks are small leaks at joints and fittings. The reduction of real loss does not directly increase revenue (except that more water is available within the system, and operating costs may be reduced), however there are real savings in water.

Water use for firefighting, line flushing and other authorized, but unbilled uses is classified as neither real nor apparent loss but is included in the computation of NRW as unbilled (and authorized) consumption.

CWLP maintains monthly records of water sold and estimates of authorized use. The authorized uses include firefighting, street cleaning, and CWLP use for line flushing. From 2004 to 2016 the authorized uses average about 2.2 percent of billed metered (sold) water usage. The UAW (which accounts for both water sold and authorized use) averages about 14 percent of total water production. The NRW (which includes authorized use as the non-revenue water) averages about 16 percent of total water production. Because CWLP maintains separate estimates of the authorized water use, the UAW estimate is the more accurate estimate of water losses in the CWLP distribution system. Some of the unaccounted-for water is attributed to the high service flow meters that were over-registering by approximately 0.9 MGD and have all been replaced as of May 9, 2014, with the construction of a new high service pump station.

Table 1-9. Water Conservation Devices Provided By CWLP

Calendar Year	Low flow Showerheads	Kitchen Aerators	Bath Aerators
1997	7	3	2
1998	31	14	31
1999	68	42	65
2000	2520	1739	2695
2001	668	265	785
2002	384	71	391
2003	134	16	109
2004	59	8	52
2005	56	13	36
2006	26	5	33
2007	16	6	11
2008	14	8	14
2009	23	6	12
2010	150	100	200
2011	162	75	176
2012	716	500	1722
2013	550	425	525
2014	416	541	466
2015	150	100	100
2016* (April 1)	170	170	220
2017	163	127	63
2018	58	24	11
2019	4	1	2
2020	6	0	0
2021	11	0	0
2022	63	45	8
Total	**6,625**	**4,304**	**7,729**

Source: CWLP, 2022

The City water distribution system consists of 760 miles of water main. As part of the Leak Detection Program, the City began leak detection surveys in 2007 and has surveyed over 915 miles of water main to date, including 175 miles in 2016 that were previously surveyed. The City views the Leak Detection Program as not only a water conservation practice but a necessity to provide reliable service to their customers. The City is committed to reducing water waste and will continue to perform annual leak detection surveys and complete surveys of the entire distribution system every 4 years. As is evident in Table 1-11, Phases 2, 3, 4 and 5 were surveyed in 2016. As a result, a total of 272,160 gallons lost per day were identified in those phases that were completed in previous years for a total of over 450,500 gallons lost per day.

UAW in the CWLP water system averages about 14 percent of the total treated water. According to the USEPA), average water loss in water supply distribution systems of total treated water is 16 percent (USEPA 2013). In 2015, this amount is estimated to have been 3.3 MGD and is expected to increase incrementally in succeeding years in proportion to the incremental expansion of the distribution system (CDM Smith 2015). The contributing effect of UAW is factored into the potable water demand calculations previously described in Section 1.5.5.3.3. It is unlikely that all leakages in the water distribution system can be eliminated and therefore, it is not feasible for all of 3.3 MGD attributed to UAW to be prevented.

Table 1-10. International Standard Water Audit Format

Classification						
Source	**System**	**Receiver**	**Authorization**	**Billing**	**Revenue**	**Detailed**
Own water	System Input	Exported water			**Revenue water**	Billed water exported
		Water supplied to customers	Authorized consumption	Billed consumption		Billed metered consumption
						Billed unmetered consumption
				Unbilled consumption	**NRW**	Unbilled metered consumption
						Unbilled unmetered consumption
			Water losses (UAW)	Apparent losses		Unauthorized consumption
						Meter inaccuracies and data errors
Imported water				Real losses		Leakage on mains
						Leakage and overflow at storage
						Leakage on service connections

Source: CDM 2015 Water Demand Study

Table 1-11. Summary of Distribution System Surveys

Year	Phases Surveyed	Total Miles	Leaks Found				Gals/ day lost
			Hydrant	Valves	Service	Main	
2008	1	1	0	0	1	0	NA.
2009	2	46	14	5	5	4	133,920
2010	3	47	17	1	6	3	109,296
2011	4	26	3	0	5	3	177,120
2012	5,6	115	18	2	1	0	60,480
2013	7,8,9	96	34	2	0	2	112,320
2014	10,11,12,13	159	32	0	3	3	262,000
2015	14,15,16	252	16	1	8	7	280,080
2016	2,3,4,5	175	24	5	4	5	272,160
2017	6, 7, 8, 9, 10	192	42	4	7	6	103,536
2018	11, 12, 13, 14, 15	279	33	0	4	1	73,296
2019	16, 2, 3, 4	224	20	4	6	7	136,240
2020	5, 6, 7, 8, 9,	215	30	5	3	1	151,200
2021	10, 11, 12, 13	168	32	0	1	4	119,520
2022	14, 15	162	16	1	9	1	106,560

Source: CWLP 2022

1.5.5.4.3 Benefits and Contributions of Drought-Induced Water Restrictions

Due to potential shortages, the City implemented water restrictions on its customers in 1988, 2000 and 2012.

In 2012, the City passed an ordinance that adopted an updated drought management plan. Elements of the drought management plan provide varying levels of water conservation, restrictions, and water rate surcharges depending on the water level in Lake Springfield (Table 1-12). During the 2012 drought, the City implemented the Stage 3 action items from its Drought Management Plan which included limiting watering to 3 days per week, restricted hand car washing to 2 days per week, and banned the use of decorative or ornamental fountains.

Table 1-12. Springfield Drought Management Plan

Drought Stage – Based on Lake Level	Action Item
Stage 1 Lake below full pool (April – September) 6 inches or more below full pool (October – March)	1) Pump from South Fork of Sangamon River when water available 2) Recycle ash pond water when permissible
Stage 2 1 foot below full pool (June – September)	All Stage 1 measures plus steps below: 1) Advise public on water conservation tips 2) Request voluntary conservation and alternate day watering
Stage 3 2 feet below full pool and lake level significantly declining (June – September)	All Stage 2 measures plus steps below: 1) Discontinue flow testing of hydrants 2) Implement 3 day per week watering 3) Restrict hand car washing to 2 days per week 4) Ornamental/decorative fountain ban 5) Repeal all restrictions when lake level returns above 75-year average lake level
Stage 4 4 feet below full pool at any time and lake level is significantly declining	All Stage 3 measures plus steps below: 1) Water surcharge 2) Full landscape water restrictions 3) No pond filling at golf courses 4) Fees for hydrant meter use for water haulers doubled. Fill station cost doubled 5) Prohibit sewer flushing from hydrants except as deemed necessary for health reasons 6) Repeal all restrictions when lake level returns above 75-year average lake level
Stage 5 5 feet or more below full pool at any time	All Stage 4 measures plus steps below: 1) Higher rate surcharge 2) Ban all grass watering 3) Golf courses limited to water daily tee boxes and greens with raw lake water or treated water 4) Trees, shrubs, and other perennial landscape plants may be hand watered once per week 5) No new pools may be filled with City water 6) Revert to Stage 4 restrictions when lake returns to three foot or less below full pool and is significantly rising

Drought Stage – Based on Lake Level	Action Item
Stage 6 6 feet below full pool at any time.	All Stage 5 measures plus steps below: 1) Highest rate surcharge 2) Full ban on outdoor water use 3) Golf courses restricted to use of own pond water for irrigating fairways; water greens with raw lake water or treated water 4) Ban all hydrant meter use for anything except construction or demolition projects as permitted or essential public health needs 5) Revert to Stage 4 restrictions when lake returns to three foot or less below full pool and is significantly rising

Source: City of Springfield, 2012

The ordinance applies to all City water customers and includes enforcement provisions where notices of violation can be issued. The City sent letters notifying residents and businesses of violations and residents and businesses generally were cooperative in changing their practices. The authority to issue citations was not implemented. Once lake levels start rising, restrictions can be lifted.

Excessive drought conditions typically result from prolonged periods of reduced precipitation that extend for 18 months or more. Because recognition of a drought condition can only be evident in the latter portion of the drought cycle, mandatory water restrictions would be expected to be limited to the latter portion of the drought rather than over the entire drought period. Based on an annual basis, the mean monthly benefit of mandatory water restrictions is estimated to be limited and is not included in the overall demand analysis.

1.5.5.5 Future Wholesale Demand

CWLP provides potable water on a wholesale basis for a number of surrounding communities (Table 1-6). In total, this demand represents a total demand of 1.1 MGD based upon average water use from 2004 to 2013. Sherman-Williamsville is the largest wholesale water customer with average water use of 0.45 MGD. Notably, Chatham had been a large wholesale customer until 2011 when they established an independent water supply system consisting of a well field in the Sangamon River Valley. Additionally, on an emergency basis, CWLP provides up to 0.75 MGD to the communities of Chatham and the CGWD. As of 2023, agreements with Chatham and CGWD for emergency water have expired, however, conditions of the previous agreements are being honored while updates to the agreements are being made.

The nationwide trend is towards regionalization of water supplies (MetroConnects 2022). If all the neighboring communities (except Chatham and the CGWD) connected to the CWLP system, this would result in 2.3 MGD of additional demand. As these communities are likely to sign contracts with CWLP slowly over time, a conservative projection of an additional 1.5 MGD is projected in 2025 and is expected to increase to 2.0 in 2045 in addition to the on-going demand for emergency water supplies to Chatham and the CGWD of 0.75 MGD.

1.5.5.6 Summary of Supplemental Water Need

As described in the preceding narrative, the determination of supplemental water needs for the City Water Supply System is complex and contingent upon a sound understanding of the limitations of the existing water supply and its potential yield, and a thorough assessment of existing and future demands. This analysis is based upon the following:

- Extensive hydrological and statistical modeling to evaluate the characteristics and contribution of Lake Springfield and the existing pumping station on the South Fork of the Sangamon River (i.e., Yield),
- Trends in population growth and potable water uses
- Analysis of water use by the Dallman power station, including the closing of units
- Benefits of conservation measures and mandatory water restrictions during drought periods
- Contractual obligations to provide potable water to other communities
- Wholesale water uses
- Industrial water uses

As is summarized in Table 1-5 and illustrated in Figure 1-6, the “net” system water need is calculated as the difference between accumulated water demand and the documented yield at 5-year intervals for the planning period. For the 100-year drought design condition (90 percent confidence level), this analysis reflects an interim period of diminishing need that is driven by the effects of environmental regulations (CCR and Effluent Limitation Guidelines rules) and the retirement of generating units at the Dallman station. Long-term need is a function of treated water supply to the CWLP service area, incrementally reduced yield due to sedimentation within Lake Springfield, coupled with increased demands associated with projected additional wholesale and industrial water uses. In total CWLP estimates that in the planning year the net water need of the system is anticipated to be more than 12.08 MGD. By comparison, even the drought condition under the 50 percent confidence interval recognizes a net water need. Under this condition the demonstrated water need is greater than 8 MGD in the planning year (Figure 1-7).

Based upon this demonstrated system need, alternatives in this SEIS are evaluated to provide supplemental water supply to augment existing and future supplies. For planning purposes and in consideration of uncertainties in water supply both with and without the effects of climate change (see Section 1.5.5.2), a conservative water supply value of 12 MGD is used as a basis of the project Purpose and Need.

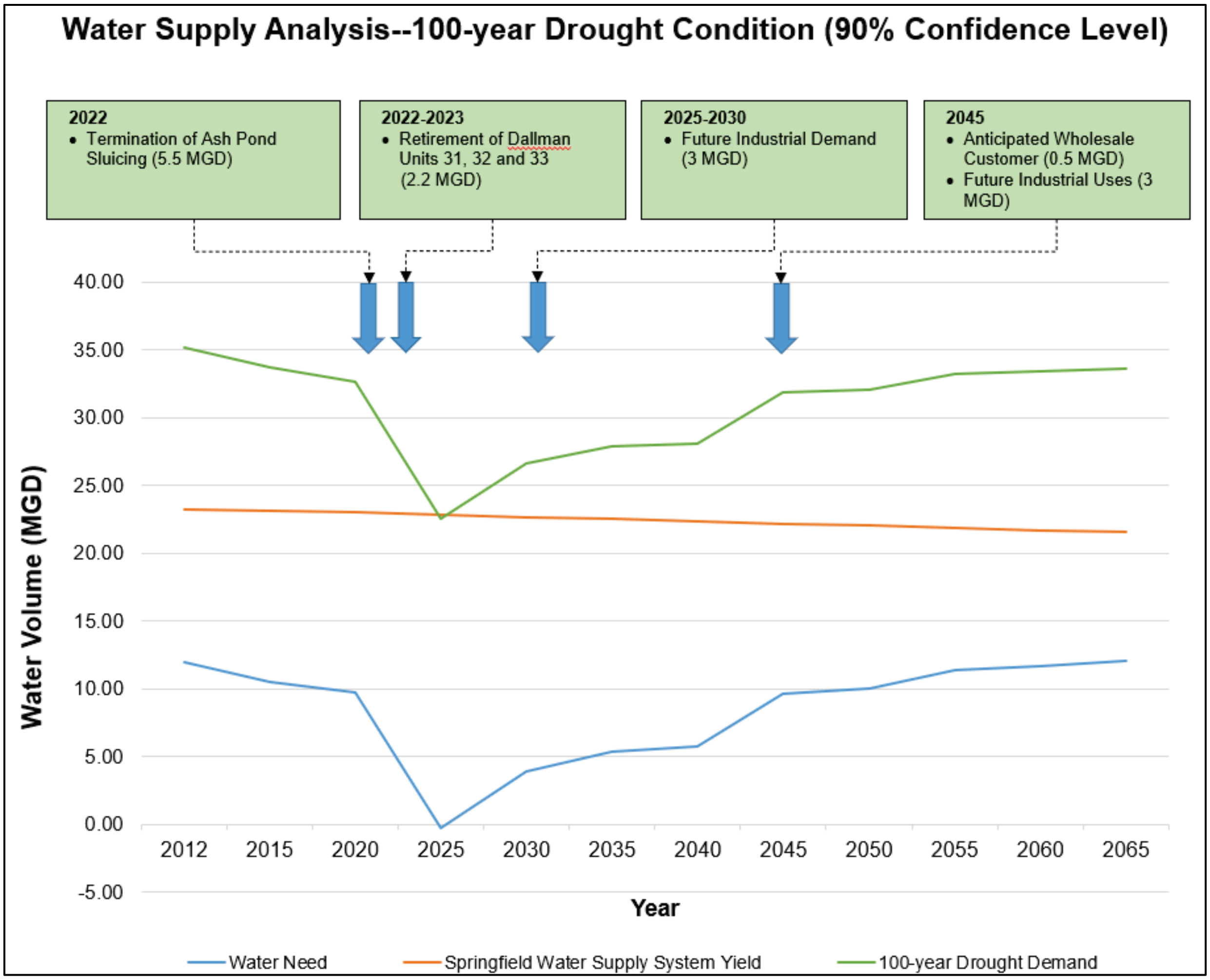


Figure 1-6. Summary of Supplemental Water Need – 90 Percent Confidence Level

1.6 DECISION TO BE MADE

At the conclusion of the NEPA process, a final SEIS will be issued. The Corps will then issue a Record of Decision (ROD) for the project and will identify the Environmentally Preferable Alternative which may or may not be the Least Environmentally Damaging Practicable Alternative (LEDPA) to address the need for a supplemental water supply and for aquatic recreation opportunities. The Corps will then identify the LEDPA and determine compliance with the 404(b)(1) Guidelines and will document the Corps Public Interest Review determination. The Corps recommendation will consider factors such as environmental issues, economic issues, availability of resources, and the City's long-term goals. The Corps will also document compliance with other applicable laws, regulations, and Executive Orders. This SEIS is prepared to support the decision-making process.

The City has submitted a Section 404 permit application to the Corps, who is evaluating the application concurrently with the SEIS process. The Corps will reach their decision regarding the Section 404 permit concurrently with a ROD for this SEIS.

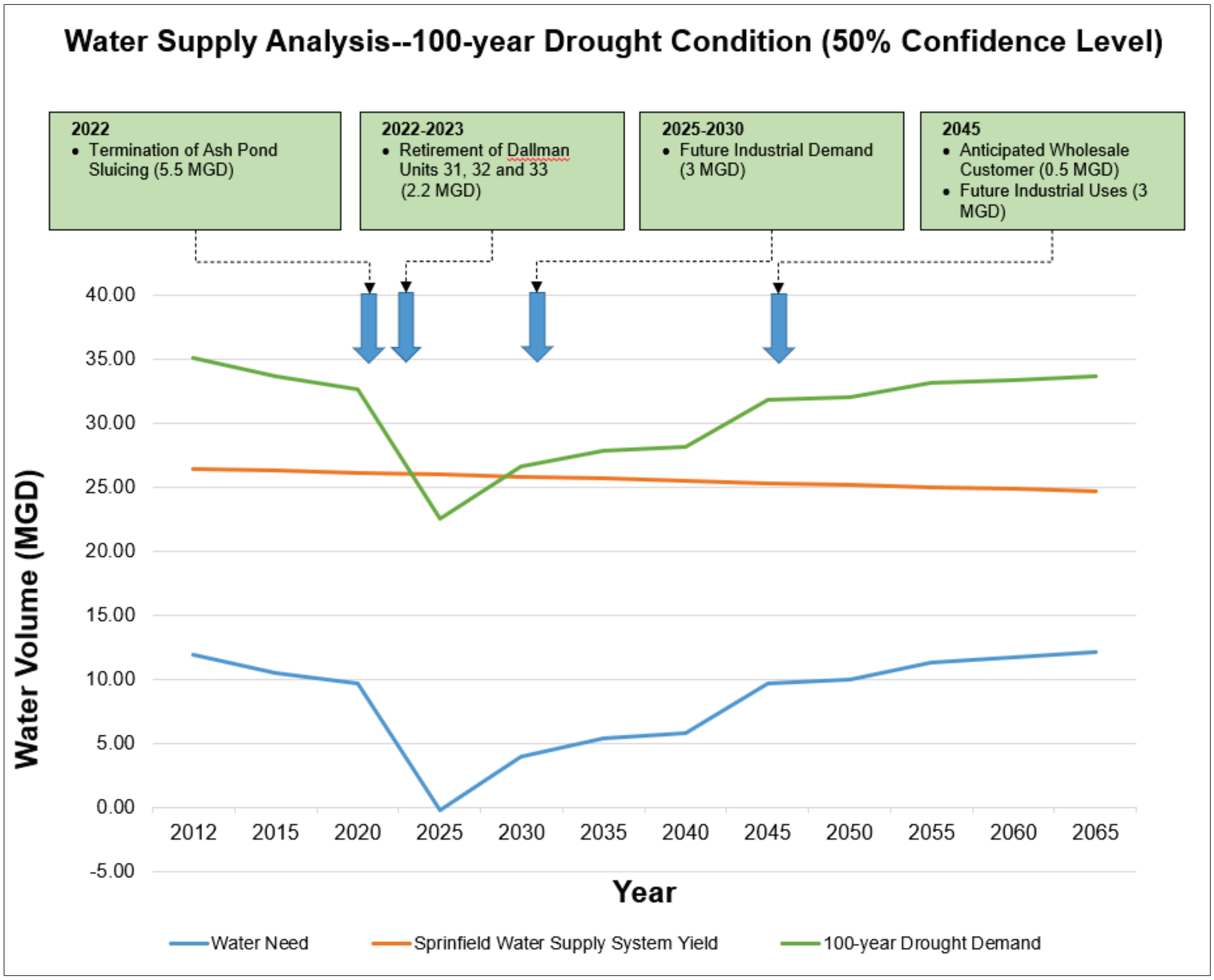


Figure 1-7. Summary of Supplemental Water Need – 50 Percent Confidence Level

1.7 ORGANIZATION AND AVAILABILITY OF SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

The content of this SEIS is consistent with NEPA (42 CFR Section 1502) and Corps (Title 33, Chapter II, Part 325, Appendix B) regulations and guidance. Content is as follows:

- Chapter 1 provides the introduction to the project, including an overall project description and history, identifies lead and cooperating agencies, defines the project purpose and need, identifies the decision to be made by the Corps, and identifies applicable permits and licenses necessary to implement the project.
- Chapter 2 clearly defines the NEPA and CWA regulatory requirements, provides an overview of the alternatives evaluation and screening process and alternatives considered, describes the proposed and no action alternatives, presents a comparison of the alternatives, and provides a summary of mitigation measures necessary for project implementation.

- Chapter 3 describes the existing environmental conditions for resources identified as relevant to this project, the methodology used to determine potential project-related impacts, discloses likely direct and indirect effects of the proposed project and no action alternative, identifies any necessary mitigation measures, describes cumulative impacts potentially resulting from the proposed project, and summarizes unavoidable adverse impacts of the proposed action.
- Chapter 4 presents a consideration of the short-term and long-term effects as well as irreversible and irretrievable commitment of resources associated with construction and operation of the proposed project, including a summary of avoidance and mitigation measures.
- Chapter 5 discloses the names and affiliation of authors of this document.

Initiation of this NEPA process began with submittal of the CWA Section 404 permit application to the Corps. A full history of this effort is provided in Section 1.3. As described, the revised project purpose and need to include aquatic recreation was published in the Federal Register and noticed to the public by the Corps on July 1, 2021. The formal scoping period was concluded on July 30, 2021. A final scoping report was issued in December 2021. Notice of this DSEIS in July 2023 initiated a formal comment period. A public meeting is currently scheduled for September 6, 2023, from 5pm to 7pm at the Lincoln Library at 326 South 7th Street, in Springfield, Illinois. Following completion of the comment period in September 2023, a final SEIS will be noticed in March 2024, with a final decision document expected Spring 2024. The anticipated timeline for completion of these efforts is shown in Figure 1-8.

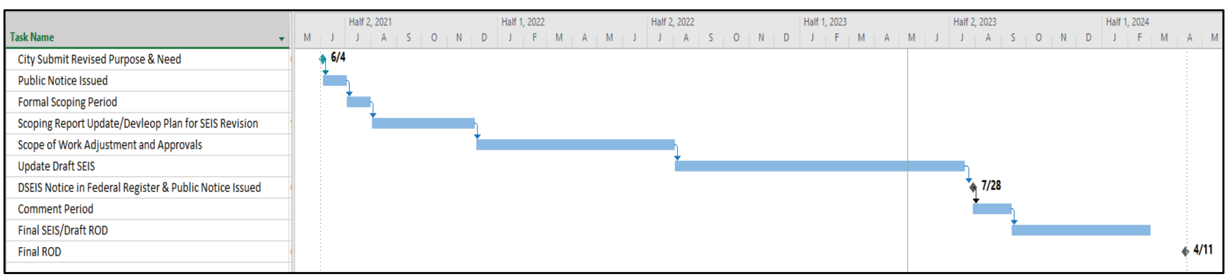


Figure 1-8. Anticipated Project Schedule

The following sections describe the scope of this SEIS, as well as the results of the public and agency consultation to date.

1.7.1 Scope and Focus of the Supplemental EIS

The Corps prepared this SEIS to comply with the NEPA and regulations promulgated by the Council on Environmental Quality (CEQ) and the Corp's procedures for implementing NEPA. The SEIS will investigate meeting unmet demand for aquatic recreation and supplemental water supply for the City through a variety of alternatives including the design, construction, and operation of a new reservoir, use of an existing reservoir, gravel pits, pipelines from wells/gravel pits, other surface water sources, hybrids or combinations, or a No Action Alternative.

The Corps has determined the resources listed below are potentially impacted by the alternatives considered. These resources were identified based on internal scoping as well as comments received during the scoping period.

- Air Quality
- Climate Change and Green House Gases (GHGs)
- Land Use
- Prime Farmland
- Geology and Soils
- Groundwater
- Surface Water
- Water Quality
- Floodplains
- Wildlife
- Aquatic Ecology Vegetation
- Threatened and Endangered Species
- Wetlands
- Socioeconomics and Environmental Justice
- Natural Areas and Conservation
- Parks and Recreation
- Transportation
- Aesthetics
- Cultural and Historic Resources
- Noise
- Solid Waste and Hazardous Waste
- Public Health and Safety
- Community Facilities and Services

Additional factors, such as Fish and Wildlife Values, Navigation, Shoreline Erosion and Accretion, Water Supply and Conservation, Energy Needs, Food and Fiber Production, Mineral Needs, Consideration of Property Ownership, and the Needs and Welfare of the People, are considered in the Corps' public interest review and are subsequently addressed in the topics identified above.

The Corp's action would satisfy the requirements of Executive Order (EO) 11988 (Floodplains Management), EO 13112 (Invasive Species) as amended by EO 13751, EO 13990 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis), EO 14008 (Tackling the Climate Crisis at Home and Abroad), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), EO 13212 (Actions to Expedite Energy-Related Projects) as amended by EO 13302, and applicable laws including the Farmland Protection Policy Act (FPPA), Safe Drinking Water Act (SDWA), National Historic Preservation Act (NHPA), Endangered Species Act (ESA), CWA (Sections 401, 402, and 404), and Clean Air Act (CAA).

1.7.2 Summary of the Scoping Process

The Corps published a Notice of Intent (NOI) in the Federal Register on August 15, 2016, indicating the intent to prepare a SEIS and to initiate a 30-day scoping period. A public notice was published in local newspapers and a news release was sent to daily papers and minority press, and letters were sent to contact various stakeholders to inform surrounding communities and interested agencies about the project, the SEIS, and scoping period.

A public scoping meeting was held in Springfield, Illinois on August 24, 2016, and approximately 106 people attended the meeting. The purpose of the scoping meeting was to provide an overview and history of the project; present the project alternatives; and solicit comments and input from the general public, agencies, other stakeholders and interested Native American tribes. Corps, City personnel and representatives of Amec Foster Wheeler (now WSP USA Environment and Infrastructure, Inc.) were available at the meeting to address questions and comments about the project. Written comments were submitted at the meeting or by mail to the Corps and comments were submitted electronically via a Corps website as well as a Project website. This process provided meaningful opportunities for public involvement and comment on the issues associated with the Project.

During the public scoping period, the Corps received 43 comment submissions which included letters, e-mails, comment forms, and submissions through the Corps website. The comment submissions were prepared by individuals, groups, federal and state agencies, and a Native American tribe.

Written scoping comments were reviewed to identify particular issues raised by each commenter and were tabulated in general categories related to the following:

- Purpose and Need
  - Water Demand Basis
  - Industrial Water Use
  - Wholesale Customers
  - Power Plant Water Use
  - Water Conservation
- Project Alternatives
  - No Action
  - Well Field and Pipeline Alternatives
  - New Reservoirs
  - Other Existing Reservoirs
  - Dredging of Lake Springfield
  - Gravel Pits
  - Diversion from Sangamon River
  - Combination of Alternatives
- Concerns Related to Environmental Resources
  - Water Quality
  - Habitat Alteration
  - Recreation
  - Economic Impacts
  - Flooding
  - Displacement of Residences and Businesses
  - Agriculture
  - Development of Conservation Lands

In total, 42 individuals, groups (i.e., Citizens for Sensible Water Use, Coalition of Concerned Citizens, Prairie Rivers Network, Sierra Club), and federal/state agencies provided 191 separate comments in the tabulation. Most of these comments were related to the project alternatives (40 percent), followed by environmental resources (31 percent), and purpose and need (29 percent). A summary of these comment categories are as follows:

- Purpose and Need. Among the 55 comments that discussed purpose and need, 47 percent raised concerns about the City's water demand.
- Alternatives. A total of 77 comments were received regarding the alternatives under consideration. Approximately 44 percent of the comments on alternatives focused on the Hunter Lake alternative. A majority of those commenters that specifically addressed the Hunter Lake alternative were opposed (21), while 14 commenters supported Hunter Lake as a preferred alternative.
- Environmental Resources. A total of 59 comments were received regarding environmental resources. Primary issues commented on included water quality, habitat alteration, and economics.

A summary of the 2016 public scoping comments is included in Appendix B. A full copy of the scoping report, which includes copies of the comments received from both the public and agencies, is available upon request.

The public notice identifying the change of project purpose and need to include aquatic recreation was published July 1, 2021. The public comment period began on July 1 and ended July 30, 2021. During the formal comment period, the Corps received 71 comment submissions which included letters, e-mails, comment forms, and submissions through the Corps website. The comment submissions were prepared by individuals, groups, federal and state agencies, and a Native American Tribe.

Written scoping comments were reviewed to identify particular issues raised by each commenter and were tabulated in general categories related to the following:

- Purpose and Need
  - Water Demand Basis
  - Industrial Water Use
  - Power Plant Water Use
  - Water Conservation
  - Recreation
- Project Alternatives
  - No Action
  - Oppose Preferred Alternative
  - New Reservoirs
  - Other Existing Reservoirs
  - Dredging of Lake Springfield
  - Gravel Pits
  - Diversion from Sangamon River
  - Combination of Alternatives

- Concerns Related to Environmental Resources
  - Water Quality
  - Habitat Alteration
  - Economic Impacts
  - Flooding
  - Displacement of Residences and Businesses
  - Historical Features
  - Development of Conservation Lands
  - Other Infrastructure Needs
- Public Outreach
  - Improvement to SEIS
  - Request Public Hearing
  - Longer Public Notice Period
  - Request More Information

In total, 71 individuals, groups (i.e., Citizens for Sensible Water Use, Coalition of Concerned Citizens, Prairie Rivers Network, and Sierra Club), and federal/state agencies provided 228 separate comments in the tabulation. The following exhibits provide a summary of the number of comments by category and subject area. A summary of these comment categories are as follows:

- Purpose and Need. Among the 84 comments that discussed purpose and need, 43 percent raised concerns about the addition of recreation to the project scope, and 39 percent raised concerns about the City's water demand.
  - Since the publication of the 2016 scoping report there has been changes in the regional water use, mainly the retirement of electric generation facilities. Of the 84 comments received, 15 comments focused on water use and 10 comments specifically noted electric generation facilities.
- Alternatives. A total of 81 comments were received regarding the alternatives under consideration. Approximately 44 percent of the comments on alternatives focused on the Hunter Lake alternative.
  - A majority of those commenters that specifically addressed the Hunter Lake alternative (N=36) were opposed (24), while 12 commenters supported Hunter Lake as a preferred alternative.
  - Additionally, of the 81 comments regarding alternatives, 17 comments focused on use or availability of existing reservoirs (Lake Springfield, Sangchris Lake, Lake Shelbyville, and Clinton Lake) with 6 comments regarding water use and 3 comments regarding recreation opportunity.
- Environmental Resources. A total of 52 comments were received regarding environmental resources. Primary issues include habitat alteration, economics, historical features, flood, and surface water quality (no comments were issued regarding groundwater sources).
- Public Outreach. A total of 12 comments were received regarding the SEIS, the primary issues include suggested improvement to the SEIS, requesting a public hearing, and longer public notice comment period.

A summary of the 2021 public scoping comments is included in Appendix B. A full copy of the scoping report, which includes copies of the comments received from both the public and agencies, is available upon request. After the draft SEIS is published, a public meeting and comment period will provide additional opportunities for public comment.

1.7.3 Agency and Tribal Coordination

Agencies, organizations, and tribes having a potential interest in the proposed project are provided the opportunity to participate in the decision-making process. This involvement promotes open communication and enables a better decision-making process. The Corps is also required to coordinate and consult with federal, state, and local agencies concerning the potential for a proposed action and alternatives to affect sensitive environmental and human resources.

State and federal agencies and tribes were notified of the proposed project and the Corp's intent to prepare a SEIS through the notices of intent and public notices filed by the Corps in 2016 and 2021 as described above. Responses received are incorporated in the scoping summary noted in Section 1.7.2. and provided in Appendix C. Additional outreach has occurred via phone or virtual meetings with USFWS, USEPA, IEPA, IHPA, and IDNR to discuss necessary permits and approvals as well as other project related information (Appendix C). Coordination meetings are ongoing and will continue throughout the course of SEIS production.

Tribal coordination was performed in 2016 and 2021 as described above. Response letters are included in Appendix C and include responses from the Miami Tribe of Oklahoma and the Osage Nation. Further coordination with tribes will be pursued during consultation with SHPO for the completion of the Programmatic Agreement. Tribes will also be notified when the Draft SEIS Notice of Availability is published by the Corps.

1.7.4 Availability of Draft SEIS

1.7.4.1 Notice of Availability

The Corps determined that the project could result in significant effects to the human and natural environmental requiring the preparation of an EIS. A Notice of Intent (NOI) for the preparation of the Hunter Lake SEIS was published in the Federal Register on August 15, 2016 (Vol. 81, No. 157, p. 54050-54051).

The availability of the DSEIS will be announced through public notice, including a Notice of Availability (NOA) in the Federal Register, letters to interested parties, and notices in the print and broadcast news media. The notice is intended to solicit comments not only on the NEPA document but substantive comments on the Proposed Action. The document will be made available for public and agency review and comment for a 45-day period. In addition, a public hearing will be held with the date and location specified in the NOI and public notices.

1.7.4.2 District-Level Public Notice

In August of 2023, the Corps posted a District-Level public notice of the availability of the SEIS including the dates and locations of the public hearing to the Rock Island Public Notice page.

1.7.4.3 Public Meeting/Hearing

The Corps will hold a public meeting in Springfield, IL on September 6, 2023 from 5pm to 7pm at the Lincoln Library at 326 South 7th Street to provide an overview of the proposed project and the EIS process, educate the public on the role of the Corps in evaluating resources that could be affected by construction of the lake, and to discusses potential mitigation opportunities. Information received from the meeting will be considered and reviewed for inclusion in the Draft EIS.

1.8 REQUIRED PERMITS AND LICENSES

Depending on the decisions made respecting the proposed actions, the following permits may need to be obtained:

- Actions involving jurisdictional wetlands and/or streams will be subject to federal CWA Section 404 permit requirements as well as state IEPA Section 401 water quality certification.
- Actions involving wetlands and/or streams will be subject to State permit requirements NPDES permit for stormwater runoff from construction sites.
- Construction, Operation, and Maintenance of a Dam permit to consider dam safety and flooding concerns issued by the IDNR-OWR.
- Construction in a Regulatory Floodplain permits to address fills in a floodplain issued by IDNR, Illinois Department of Transportation, and Springfield-Sangamon County Regional Planning Commission.
- Programmatic Agreement (PA) pursuant to Section 106 of the National Historic Preservation Act for management of cultural resources. The Corps is currently coordinating with the State Historic Preservation Office (SHPO) regarding the PA with the intent of having it fully in place prior to a decision regarding the requested Section 404 permit.
- Compliance with Section 7 of the ESA regarding potential impacts to protected species. The Corps is currently in coordination with USFWS regarding potential impacts to protected species. This coordination and/or any necessary consultation will be completed prior to a formal decision from the Corps. A Biological Assessment may be prepared in support of this compliance effort.

2.0 PROJECT ALTERNATIVES

2.1 REGULATORY REQUIREMENTS

The Hunter Lake project is being proposed by the City CWLP with the dual purpose of meeting a portion of the unmet demand for aquatic recreation within a 50-mile radius of the City of Springfield and to provide reliable supplemental water supply for the City's municipal, commercial, and industrial customers during drought conditions. As described in Chapter 1, the City has applied to the Corps for a CWA Section 404 permit in order to construct the proposed Hunter Lake. As such, and as noted in the Corps' NEPA Implementation Procedures for the Regulatory Program (Title 33, Chapter II, Part 325, Appendix C) (Corps NEPA Procedures), the alternatives analysis should be thorough enough to meet NEPA regulations as well as to use for the public interest review and the 404(b)(1) guidelines. The following sections describe those requirements and how the alternative development process was conducted for concurrence with both NEPA and CWA.

2.1.1 National Environmental Policy Act (NEPA)

The CEQ published revised NEPA implementation regulations in May 2022 (40 CFR Sections 1500 – 1508). As described in those regulations, NEPA requires consideration of a reasonable range of alternatives that meet the project's defined purpose and need and that are feasible from both an economic and technical perspective. Additionally, NEPA requires that consideration of alternatives be limited to a reasonable number and that reasons for elimination of alternatives from detailed study be briefly discussed. Other NEPA regulations include:

- Inclusion of the "no action" alternative
- Description of alternatives considered in detail to allow for meaningful comparison
- Comparison of alternatives considered in detail consistent with information presented in the affected environment and environmental consequences sections
- Inclusion of appropriate mitigation measures
- Identification of the agency's preferred alternative

It should be noted that, because the Corps is neither a proponent nor an opponent of the applicant's proposal, per Corps NEPA procedures, the applicant's final proposal will be identified as the "applicant's preferred alternative" rather than the "agency's preferred alternative" in the Final EIS.

2.1.2 Clean Water Act (CWA) Section 404(b)(1)

As previously noted, because the project is being considered by the Corps under Section 404 of the CWA, the alternatives analysis must also satisfy Section 404(b)(1) guidelines for the analysis of alternatives. Because of the nature of the project, to provide aquatic-based recreation and supplemental water supply, it is inherent that the proposed Hunter Lake provides a water source to meet these needs. The Section 404(b)(1) guidelines (40 CFR Section 230.10(a)) require that discharge of dredged or fill material will not be permitted, "…if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences". In order to be "practicable," an alternative must be available, achieve the overall project purpose (as defined by the Corps), and be feasible when considering cost, logistics, and existing technology. An alternative that requires access to, proximity to, or siting within a special aquatic site to fulfill its basic purpose is considered water dependent. Practicable alternatives not involving special aquatic sites are presumed to be available unless clearly demonstrated otherwise. The alternative that meets the 404(b)(1) guideline requirements is the LEDPA.

Other requirements within Section 404(b)(1) guidelines associated with alternatives analysis and the effect on the WOTUS refer to consideration of potential impacts on physical and chemical characteristics, biological characteristics, special aquatic sites, effects on human use characteristics, and possible contaminants in dredged/fill material. Section 404(b)(1) guidelines do note that for actions requiring NEPA analysis by the Corps, the alternatives analysis in the NEPA document will usually provide information necessary to meet the requirements of the guidelines.

2.2 ALTERNATIVES EVALUATION PROCESS OVERVIEW

Alternative development in conjunction with this SEIS consisted of a process that encompassed a review and consideration of alternatives previously developed in the prior Final Environmental Impact Statement (FEIS), input received from the scoping process, and a renewed consideration of overall project need. Input from the scoping process included comments received from federal and state agencies, the public and interested stakeholders, and Native American tribes.

As described in Section 1.3, the proposed project went through a public scoping period in 2016 and again in 2021 after flat water aquatic recreation was added as a primary purpose and need for the project. Because the project purpose and need were revised, the alternatives evaluation integrated a consideration of the need for aquatic-based recreation in addition to the need to meet demand for supplemental water supply. Additionally, screening underwent a consideration of impact and feasibility/practicability.

Alternatives that were considered for the SEIS are described briefly in the following narrative and in greater detail in Appendix D. In accordance with 40 CFR Section 1502.14(d), the alternatives analysis must include consideration of the “no action” alternative. In accordance with 404(b)(1), the “no action” alternative is an alternative resulting in construction that does not require a Department of the Army (DA) permit and may include a modified project design or a location that eliminates work that would require a DA permit (i.e., avoidance) or the Corps’ denial of the permit.

Due to the impracticability of other no action alternatives as they relate to 404(b)(1), the no action alternative for this analysis consists of the existing condition in which no permit is issued from the Corps and no supplemental water supply or aquatic based recreation is provided to augment the existing Springfield water supply system or regional aquatic recreational resources. In cases where the NEPA action involves a federal decision on a proposal for a non-federal project, the no action alternative “would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity to go forward” (CEQ 1981).

Project alternatives were developed in a stepwise fashion to ensure the consideration of a thorough and complete range of feasible alternatives. The following subsections summarize the range of options evaluated and the rational for the elimination of alternatives from detailed evaluation in this document.

2.3 PRELIMINARY PROJECT ALTERNATIVES

Alternative development involved the formulation of a complete set of new alternatives based on the alternatives originally considered in the 2000 FEIS as well as those considered as a result of scoping conducted in 2016 and in 2021 for inclusion in the SEIS (see Chapter 1).

In general, several broad categories of alternatives were identified for initial consideration based on the previous Final EIS which identified the project purpose and need as supplemental water supply for the City and surrounding areas. The alternative categories include the following:

- No Action – Alternative that consists of the existing condition in which no permit authorization from the Corps is required or approved and no undertaking by the City to supplement the existing Springfield water supply system or meet unmet demand for flatwater aquatic recreation is pursued.
- *Reservoir Alternatives* – Alternatives that entail use of water from new or existing surface water impoundments within the region. Options within this category include the following:
    - Use of existing surface water reservoirs (including the construction and operation of associated transmission pipeline systems)
    - Construction of new surface water reservoirs
    - Use of gravel pits
    - Dredging of Lake Springfield
- River Surface Water Supply Systems – Alternatives that entail use of surface water from the Sangamon River or Illinois River
- Alternatives Related to Groundwater Supply Systems – Alternatives that entail use of subsurface water resources requiring the establishment of pumping facilities and associated transmission pipelines to deliver water from production areas to Lake Springfield.
- Hybrid Alternatives – *A*lternatives that entail combinations of elements of the above categories.
- Other Alternatives – Alternatives that entail other means for supplemental water supply including use of water by other municipal providers, recycling of sanitary waste streams, and other measures.

Individual alternatives not capable of providing the full yield necessary for meeting supplemental water supply needs were considered in combination with other partial yield sources as “hybrid” alternatives. Sources of less than 1 MGD are considered too insignificant to be considered in combination with other alternatives as they would require disproportionately higher costs of construction and maintenance. Single sources yielding well in excess of the needs of the City are also not considered. Sources must be of adequate quality to allow continued use of existing treatment processes and avoid adverse water quality impacts to Lake Springfield.

Table 2-1 provides project alternative descriptions and Figure 2-1 depicts several of the key project alternatives considered. The alternatives within Table 2-1 that are listed under No Action are considered No Action alternatives with respect to that definition as it relates to NEPA. Projects in Table 2-1 that are considered no action alternatives with respect to 404(b)(1) guidelines are identified in a separate column. These may include construction of an alternative meant to address the purpose and need; however, this action does not require a DA 404 permit.

2.4 ALTERNATIVE SCREENING FACTORS

In its evaluation of permit applications to discharge dredged or fill material into WOTUS, including wetlands, the Corps is required to analyze alternatives to the proposed project that achieve its purpose. The Corps conducts this analysis pursuant to two main requirements – the 404(b)(1) Guidelines (Guidelines) and NEPA. Screening factors were developed to evaluate the alternatives for elimination or for further consideration. Factors included those necessary for thorough comparison of alternatives, NEPA compliance, and compliance with 404(b)(1) guidelines. Consideration of both water yield and aquatic-based recreation factors is important because both NEPA and 404(b)(1) guidelines note that reasonable and practical alternatives must meet the project's defined purpose and need. Other factors considered include feasibility, practicability, and potential environmental impacts. The following factors were considered for all 32 alternatives described in Table 2-1.

<u>Practicable and Reasonable</u> – Initial screening factors took into consideration if an alternative was practicable and reasonable. Practicable is defined as meaning the alternative is available, and capable of being done after taking into consideration cost, existing technology, and/or logistics in light of the overall project purpose(s).

Reasonable is based on consideration of the project purpose as well as technology, economics and common sense. The Guidelines may require more substantive effort to demonstrate compliance compared to NEPA, as well as involve limitations relative to how they can be applied to determine practicability. Under the Guidelines, the rebuttable presumptions are that alternatives that do not affect special aquatic sites are presumed to be available and that practicable alternatives located in non-special aquatic sites (e.g., other waters, uplands, etc.) have less adverse impact on the aquatic ecosystem. The applicant is required to clearly demonstrate that the alternatives are not practicable (and not less damaging) compared to the applicant's proposed project. Alternatives that are practicable are those that are available and capable of being done by the applicant after consideration of the following (in light of the project purpose). An alternative needs to fail only one practicability factor to be eliminated during the screening process.

Table 2-1. Alternatives Considered for Springfield Supplemental Water Supply

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
No Action	◆		◆	CWLP would not augment current supply to meet the projected need of 12 MGD during the design drought. The existing water supply system would continue to rely only upon Lake Springfield augmented by pumping from the South Fork of the Sangamon River. No additional aquatic based recreational opportunities.
Reservoir Supply Systems				
Hunter Lake – Original Configuration	◆			Surface water supply reservoir to include pool area of 3,010 acres (volume of 43,730 acre ft) within 7,795-acre land area that includes marginal lands to provide a buffer and total capacity of 15.3 billion gallons. Additional system drought yield expected to be somewhat lower than previously estimated yield of 21.5 MGD (total system yield of 39.7 MGD) and development of additional aquatic recreational opportunities. Yield excessive, resulting in greater environmental impacts.
Hunter Lake – Revised Configuration		◆		Surface water supply reservoir to include pool area of 2,649 acres (approximately 35,520 acre-ft) within 7,983-acre land area. Additional system drought yield estimated at 12 MGD and development of additional aquatic recreational opportunities.
Clinton Lake		◆		Alternative consisting of extension of approximately 55-mile pipeline to Clinton Lake. Lake is currently used for cooling for Clinton Nuclear Station. Effective yield is zero as water is otherwise allocated. No additional aquatic based recreational opportunities. ***Alternative critically flawed***.
Lick Creek Reservoir	◆			Surface water supply reservoir to include pool area of 1,948 acres within 5,555-acre land area and total capacity of 6.5 billion gallons. Additional system drought yield estimated at 8.3 MGD and development of additional aquatic based recreational opportunities, but insufficient to meeting the purpose and need. Reservoir would not

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
				meet phosphorous water quality standard; there would also be secondary impacts related to flooding. Additionally, due to its smaller size, there is no capacity for incorporation of best management practices to reduce phosphorous loading. ***Alternative critically flawed due to inadequate capacity, insufficient surface area to support aquatic based recreation and phosphorous issue.***
Dredge Lake Springfield	◆		◆	Approximately 16.4 million yds^3 of sediment could be removed from Lake Springfield above conservation pool elevation that would result in a supplemental yield of approximately 4.8 MGD during drought (including effects of evaporation). For purposes of this evaluation, it is assumed that mechanisms needed for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. ***Critically flawed yield insufficient and does not meet need for additional aquatic-based recreation.***
Raise Lake Springfield by 2 feet	◆			Raising the full pool elevation of Lake Springfield 2 feet results in additional storage volume of 8,660 acre-feet and total capacity of 2.8 billion gallons. This volume would yield 5.15 MGD during a 100 year design drought, however, would result in increased flooding issues. For purposes of this evaluation, it is assumed that infrastructure for this alternative would require a CWA Section 404 permit. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Lake Sangchris	◆			Alternative consisting of extension of approximately 20-mile pipeline to Lake Sangchris in northwest corner of Christian County. Lake is approximately 2,200 acres in size and contains a volume of 10.7 billion gallons. Lake is currently used for cooling for Kincaid Power Station. Effective yield is zero as water is otherwise allocated. No additional aquatic based recreational opportunities. ***Alternative critically flawed***.

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
Lake Shelbyville	◆			Alternative consisting of extension of approximately 60-mile pipeline to Lake Shelbyville. Lake is managed and operated by the Corps for the authorized purposes of flood risk management, recreation, water supply, navigation, and fish and wildlife conservation. Effective yield is zero as water is otherwise allocated. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Sand and Gravel Pits	◆		◆	Alternative consisting of use of sand and gravel pits to provide drought-related water supply. The system would require approximately 14 miles of pipeline, and floating pumps and three pump stations. Prior analyses suggested a yield of 4.8 MGD, but more recent studies have shown a limited yield consisting of 1.6 MGD from Gravel Pit A (Clear Lake) and Gravel Pit C. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. Additional aquatic based recreational opportunities would be limited as during normal water levels the gravel pits cover a surface area of approximately 731 acres (see Appendix D). Insufficient yield. ***Alternative critically flawed.***
River Supply Systems				
Sangamon River Dam	◆			Alternative consisting of use of surface water in Sangamon River including emergency construction of dam to provide supplemental water. Insufficient supply during low flow conditions. Water quality issues. Not acceptable to agencies as long-term water supply. Would potentially expand some recreational opportunities in the region but would alter the river's scenic quality and create a barrier for canoeists. ***Alternative critically flawed***.
South Fork Dam	◆			Alternative consisting of use of surface water in South Fork of the Sangamon River including emergency construction of dam to provide supplemental water. Options included those both upstream and downstream of the confluence with Horse Creek at elevations ranging from 550 to 570 ft msl to construct a reservoir on the South Fork of the Sangamon River. Construction of a dam at these elevations would create very large shallow reservoirs of 6,870 to 13,400 surface acres

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
				that could provide recreational opportunities. Excessively high environmental impacts. Water quality issues. Yield undetermined but would exceed 12 MGD. ***Alternative critically flawed due to excessive environmental impacts.***
Illinois River	◆			Alternative consisting of use of raw surface water from a new intake structure located on the Illinois River. Water to be conveyed to Springfield via an approximate 54-mile transmission main pipeline with associated pump stations and head tanks. Pre-treatment systems needed to minimize biofouling from zebra mussels, potential for introduction of invasive species. Total yield of this system would be 12 MGD. Water quality concerns and the potential for biological contamination. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Groundwater Supply Systems				
Havana Lowland Well Fields (Well Field A)	◆		◆	The Havana Lowland Well System would be located in Mason County and would produce 12 MGD. This alternative would entail six wells developed in the Mahomet Aquifer located at one well field, two pump stations, and approximately 41 miles of 30-inch piping discharging into Lake Springfield. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Illinois River Well Field (Well #1 only)	◆		◆	The Illinois River Well System (Well #1) would produce 12 MGD. This alternative would entail a single radial collector system, approximately 54 miles of pipeline, and four pump stations. The system would ultimately discharge to Lick Creek and then continue to Lake Springfield. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
Sangamon River Valley Well Fields	◆		◆	The Sangamon River Valley Well Field alternative would consist of a series of 36 wells located variously within the aquifer along the Sangamon River Valley. This alternative would include well clusters having a total yield of 12 MGD. A pipeline system of approximately 75 miles is required to convey water from the wells to Lake Springfield. (Note: Cluster 6 identified in original FEIS is not available for development as this cluster has subsequently been developed by the Sangamon Valley Water Commission for use by the Village of Chatham). For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. Total yield of this system would be 12 MGD. ***Alternative critically flawed.***
Havana Lowland Well Fields (17.8 MGD)	◆		◆	The Havana Lowland Well System would be developed in the Mahomet Aquifer located in Mason County and would produce 17.8 MGD. This alternative would entail 10 wells located in two well fields, four pump stations, and over 50 miles of piping. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Illinois River Valley Well Fields (17.8 MGD)	◆		◆	The Illinois River Well System (Wells #1 and # 2) would produce 17.8 MGD. This alternative would entail two radial collector systems, approximately 54 miles of pipeline, and four pump stations. The system would ultimately discharge to Lick Creek and then continue to Lake Springfield. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. Total yield of this system would be 17.8 MGD. ***Alternative critically flawed.***

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
Intentional Depletion of Sangamon Valley Well Field Reserve Levels		◆	◆	Existing water supply wells developed within the Sangamon Valley aquifer are designed to allow for yields under drought conditions but are restricted by a draw down level to 4 feet above the municipal well screen to avoid potential impacts to the nearby municipal well fields and the well itself (i.e., "Allowable Drought Yield"). This alternative consists of continuing well field operations to exceed Allowable Drought Yield to below the 4-foot level above the well screen. This alternative would necessitate the development of associated pipelines, storage tanks and pump stations to convey water from the municipal wells owned by others to Lake Springfield and may require compensation for well damage and would also require that the City provide compensatory water which would negate any benefits to use this as an expansion of the City's supplemental water supply. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Hybrid Alternatives				
Lick Creek + Sangamon Valley Wells	◆			This alternative would consist of the Lick Creek reservoir (yield estimated at 8.3 MGD) coupled with Sangamon River Valley Well Clusters; yield of 8 MGD). Total yield of this system would be 16.3 MGD. Additional aquatic based recreational opportunities, but insufficient to meeting the purpose and need. ***Alternative critically flawed due to flaw of Lick Creek*****.**
Lick Creek + Sangamon Valley Wells + Sand and Gravel Pits	◆			This alternative would consist of the Lick Creek reservoir (yield estimated at 8.3 MGD) coupled with Sangamon River Valley well clusters (yield of 3.3 MGD) coupled with Gravel Pits. (Note: yield of gravel pits has been determined to have a maximum drought yield of 1.6 MGD—Gravel Pit A + Gravel Pit C). Total yield of this system would be 13.2 MGD. additional aquatic based recreational opportunities, but insufficient to meeting the purpose and need. ***Alternative critically flawed due to flaw of Lick Creek.***

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
Lick Creek + Sangamon Valley Wells + Sand and Gravel Pit A	◆			This alternative would consist of the Lick Creek reservoir (yield estimated at 8.3 MGD) coupled with Sangamon River Valley well clusters (yield of 6.7 MGD) coupled with Gravel Pit A (yield = 0.2 MGD). Total yield of this system would be 15.1 MGD. additional aquatic based recreational opportunities, but insufficient to meeting the purpose and need. ***Alternative critically flawed due to flaw of Lick Creek.***
Havana Lowland Well Fields (Well Field B) + Sangamon River Valley	◆		◆	This alternative would entail a smaller Havana Lowland well field (five wells, 9 MGD), approximately 40 miles of pipeline, and two pump stations. However, it would also entail the development of a series of well clusters within the Sangamon River Valley (10 wells, 3.3 MGD) and associated pipeline and pump stations. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. Total yield of this system would be 12.3 MGD. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Sangamon River Valley Well Fields (10. MGD) + Gravel Pit C (1.4 MGD)	◆		◆	The Sangamon River Valley Well Field alternative would be limited to 31 wells having at total yield of 10.6 MGD coupled with the development of Gravel Pit C (1.4 MGD). (Note: Cluster 6 is not available for development as this cluster has previously been developed by the Sangamon Valley Water Commission for use by the Village of Chatham). This alternative and would entail approximately 70 miles of piping. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. Total yield of this system would be 12 MGD. ***Alternative critically flawed.***

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
Havana Lowland + Sangamon Valley Wells	◆		◆	The Havana Lowland Well System would produce 12 MGD and would be coupled with additional well development within the Sangamon River Valley under this alternative. A total of ten Sangamon River Valley wells having a yield of 3.3 MGD would be developed. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. Total yield would be 15.3 MGD. ***Alternative critically flawed.***
Illinois River Well + Sangamon Valley Wells	◆		◆	The Illinois River Well System would produce 12 MGD and would be coupled with additional well development within the Sangamon River Valley under this alternative. A total of ten Sangamon River Valley wells having a yield of 3.3 MGD would be developed. Total yield of this system would be 15.3 MGD. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Upland Reservoir + Pipeline System			◆	This alternative would consist of an entirely upland off-channel reservoir that would be filled either via pipeline from an existing water source and/or other natural processes such as rainwater and snowmelt or groundwater, then transferred via pipeline to the system for use during extreme drought. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. However, it is not feasible for construction of a single new reservoir to meet both water supply and aquatic recreation demand without impacting any wetlands or streams. Additionally, the infrastructure needed to transfer water to and from a new upland reservoir in combination with impacts resulting from inundation would result in significantly higher impacts than an in-channel reservoir. Use of existing upland reservoirs not currently used for water supply or aquatic recreation (such as sand and gravel pits) would not meet projected needs, as during normal water levels existing

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
				pits in the area cover a surface area of approximately 731 acres (545 from Pits A, B, and C plus several other small pits) and would provide approximately 1.6 MDG of water (see Appendix D). Creation of new pits or reservoirs excavated deep enough to promote filling with groundwater, even in combination with existing pits, the available surface area and yield would not meet aquatic recreation or supplemental water supply needs without creation of an unreasonable number of additional pits with little to no additional yield due to flow requirements. Thus, this alternative is not practical because it could not feasibly meet the overall project purpose. ***Alternative critically flawed.***
Augmentation of Gravel Pit Storage with Transfers from Sangamon River		◆		This alternative consists of the use of gravel pits as supplemental water supply coupled with the transfer of water from the Sangamon River to the gravel pits under drought conditions to replenish gravel pit volume. This alternative would entail development of a pump station on the Sangamon River and associated infrastructure to convey water to gravel pits. Base yield of Gravel Pit C =1.4 MGD. Potential yield from Sangamon River under drought conditions negligible due to need to maintain seven-day, ten-year low flow (7Q10). Water Quality issues with Sangamon River. Additional aquatic based recreational opportunities would be limited as during normal water levels the gravel pits cover a surface area of approximately 731 acres (see appendix D). ***Alternative critically flawed.***

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
Retrofit of Non CWLP Municipal Wells		◆	◆	This alternative consists of CWLP action to retrofit some or all existing municipal wells owned by other entities for variable-speed operation and optimizing well field operation. Similar to the Sangamon Valley Well Field alternative, this alternative would also necessitate the development of associated pipelines, storage tanks and pump stations to convey water from the wells (either owned by others or by CWLP) to Lake Springfield. For purposes of this evaluation it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. Additionally, retrofit and operation of property owned by others represents legal liability that makes this alternative unreasonable. No additional aquatic based recreational opportunities. Potential yield not calculated. ***Alternative critically flawed.***
Acquisition of Water Rights to Enable Additional Wells to be Drilled in Sangamon River Valley		◆	◆	This alternative consists of the acquisition of water rights in advance of drought conditions to allow for emergency action to establish wells within the Sangamon Valley for supplemental water supply. No advance (pre-drought) development of wells or transmission systems would be conducted under this alternative. Assuming the system includes a pipeline and well system of approximately 75 miles to convey water from the wells to Lake Springfield (as in above alternative), the yield would be 12 MGD. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. ***Alternative critically flawed.***
Other Alternatives				
Jacksonville Joint Use	◆		◆	This alternative would entail the development of a 30-mile transmission main pipeline to convey excess water from the Jacksonville supply system for use by Springfield. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. CWLP confirmed that there is no additional supply available for use. Consequently, this alternative would have a yield of zero. No additional

Alternative	Included in Original FEIS	Identified in Scoping Process	404(b)(1) "No Action"	Description
				aquatic based recreational opportunities. ***Alternative critically flawed.***
Recycle/Reuse Treated Wastewater	◆		◆	This alternative consists of reduced water use associated with the reuse of Sangamon County Water Reclamation District (SCWRD) wastewater. It is expected that 7.5 MGD would be available for reuse from SCWRD under drought conditions due to the need to maintain water flow in receiving streams (Sugar Creek and Sangamon River). Issues related to water quality would increase the need for pre-treatment of wastewater. Additionally, impaired status of Lake Springfield would prohibit ability to release wastewater containing high phosphorous concentrations into Lake Springfield. For purposes of this evaluation, it is assumed that infrastructure necessary for this alternative could be put into place without need for a CWA Section 404 permit. No additional aquatic based recreational opportunities. ***Alternative deficient in meeting projected water demand and alternative critically flawed due to insufficient flow, need for additional aquatic based recreational opportunities and elevated phosphorous concentrations.***
Water Conservation	◆		◆	Conservation measures consist of realizing benefits from established conservation programs intended to minimize water loss and reduce water use by incentives. This alternative consists of continuation of the existing CWLP conservation programs (reduction in demand of 0.5 MGD per year), including forced water use restrictions under drought conditions (reductions in demand by 1.0 MGD each year). *(Note: both of these measures are included in development of overall need for supplemental water supply and are therefore embedded within each alternative.)* Based on the City's current conservation measures, there are no additional measures that could significantly contribute to meeting water supply goals, nor would they contribute to meeting aquatic based recreation needs. ***Therefore, this alternative would not meet the purpose and need for the proposed project.***

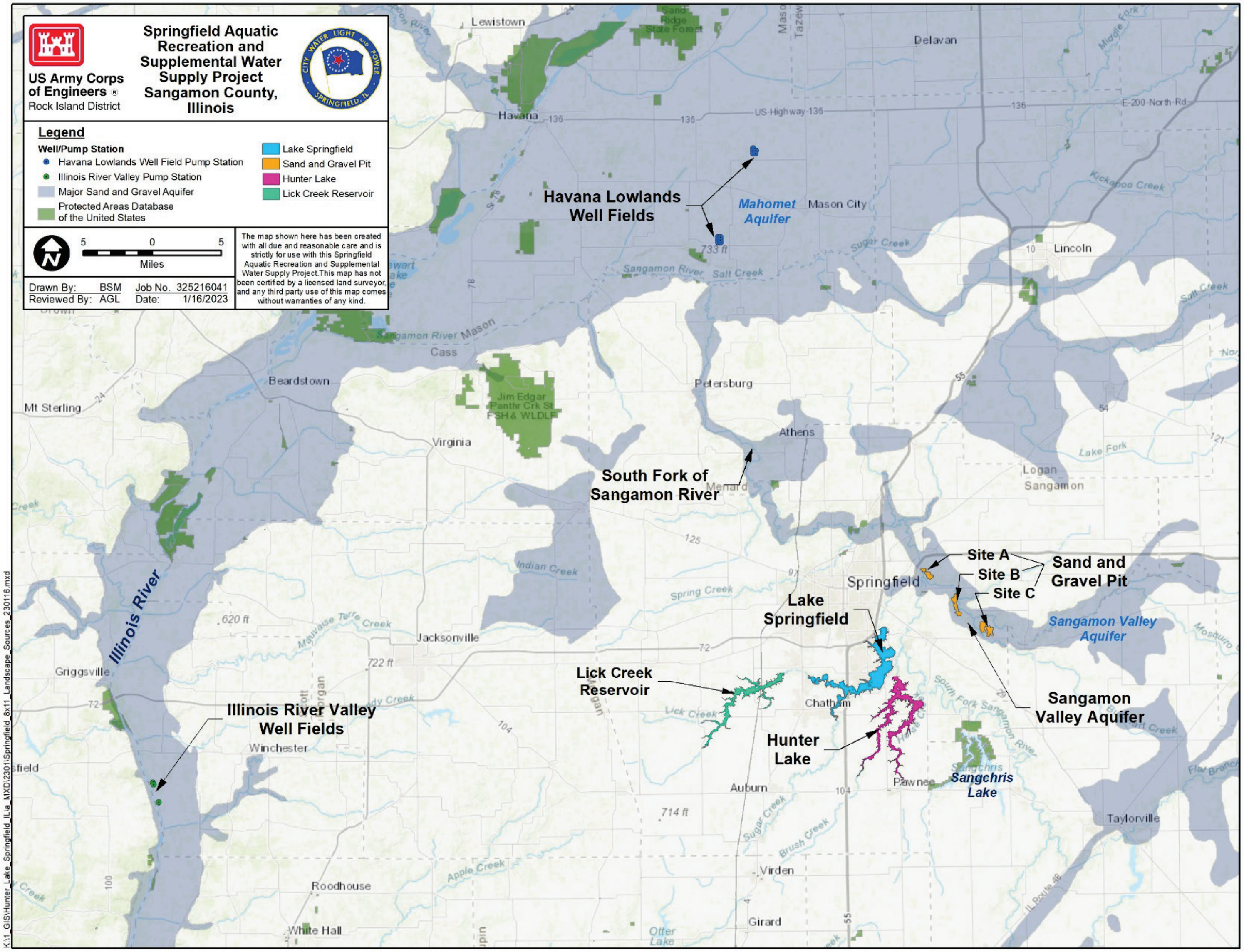


Figure 2-1. Potential Sources for Springfield Supplemental Water Supply

- Project Purpose and Need:
  - Yield – As described in Chapter 1, the Springfield water supply system has a demonstrated need of at least 12 MGD under design drought conditions. The supplemental supply would be utilized when Lake Springfield falls below its seasonal average elevation. Yields exceeding the stated need by two thirds (66 percent or 8 MGD) are considered to be excessive. Yields exceeding 12 MGD by less than two thirds (66 percent or 8 MGD) may be expected to result in more substantial project costs or environmental impacts, however, the increased yield above the City's need is not considered to be a critical flaw.
  - Aquatic-based Recreation – The need for Aquatic-based recreation was added to the project Purpose and Need following the 2020 study by University of Illinois. As described in Chapter 1, the need for aquatic-based recreation has been demonstrated within an approximate 50-mile radius of the City of Springfield. Therefore, based on the project objective of providing at least 2,500 acres of flatwater aquatic recreation area, alternatives that could not meet that objective were removed from further consideration.
- Logistics – The alternatives evaluated may incorporate an examination of various logistics associated with the project, i.e., placement of facilities within a specified distance to roads, utilities, utilization of existing storage or staging areas, and/or safety concerns that cannot be overcome. In reviewing the alternatives, all were practicable considering logistical factors. However, several alternatives did have logistical difficulties including property that could be land-locked without access by public roads or utilities, the applicant may not have condemnation authority, or water supply would be needed within a certain time frame and the alternative would not be able to be implemented within that time frame. Other logistical factors to be considered incorporated elements of 404(b)(1) guidelines by including consideration of availability and technical feasibility, or the ability for the alternative to meet various technical constraints such as yield or surface area. Limiting factors include capability for the alternative to achieve permit requirements; loss of power or water production due to source development; and ability of the alternative to be implemented based on current technology. Under the screening analysis, additional consideration was given to the complexity of project development based on overall system complexity that may represent logistical or technological challenges for operations and maintenance. A description of results is provided in Appendix D.
- Availability – Availability involves the access and availability of land for the project. Consideration was given based on the number of properties potentially affected. Consistent with 404(b)(1) guidelines, alternatives that are otherwise practicable that may not be presently owned by the applicant but could be reasonably obtained, utilized, expanded, or managed in order to fulfill the overall purpose of the proposed activity may still be considered a practicable alternative.

<u>Environmental Impacts</u> – Potential critical environmental factors include unavoidable impacts to threatened/endangered species and their critical habitats (state or federally listed); chemical or biological contamination potential of surface water or groundwater; unmitigated impacts to historic properties listed or eligible for listing to the National Register of Historic Places (NRHP) that cannot be avoided; impacts to rivers listed as part of the National Wild and Scenic Rivers System.

Alternatives that did not have potential critical environmental factors were considered based upon a refined analysis of environmental features. Updated resource analyses of land use/land cover, wetlands, and other features were compiled using Geographic Information Systems and supplemental reconnaissance surveys for each project area and assessed for potential impacts based on the proposed development configuration of each alternative. A description of results is provided in Appendix D.

- Aquatic, Wetland, and Terrestrial Habitats – Impacts and benefits of each alternative create notable and often off-setting contrasts between the Hunter Lake alternative and each of the groundwater collection systems.
- Water Quality – Impacts to water quality are associated with construction phase land disturbances and with the effectiveness of BMPs used in both short-term and long-term applications. While all alternatives would have potential for short-term impacts during construction, Hunter Lake has the potential to detain sediment and nutrients (notably nitrogen and phosphorous) and reduce transport to downstream waters. Integration of extensive use of water quality design features within the Hunter Lake alternative (in-basin dams, wetlands, filter strips, etc.) is expected to reduce the concentrations of phosphorous and other nutrients within Hunter Lake and minimize downstream transport which coincides with the nutrient loss reduction strategy goal.
- Sensitive Species – Consultation with the United States Fish and Wildlife Service (USFWS) and the IDNR was conducted in regard to sensitive species potentially affected by the proposed project alternatives.
- Cultural Resources – Potential effects of project activities on cultural resources is considered based upon a review of both previously recorded sites and an assessment of the potential for lands considered as having a high probability of containing archaeological sites based on landscape position (slope, proximity to major streams/rivers, etc.), based on 2016/2017 data.
- Transportation – Impacts to transportation infrastructure was evaluated. Although Hunter Lake would inundate multiple roadways, more substantial arterial roadways would be replaced with bridges to maintain continuity of the system.

<u>Cost</u> – The cost of the alternatives examined consider the context of the overall scope of the project and should determine if the alternative is unreasonably expensive, compared to costs for similar actions in the region, or exorbitant compared to those similar actions. Cost is based on objective, industry-neutral standards that do not consider an individual applicant's financial standing. Consistent with 404(b)(1) guidelines, cost information presented is intended for comparative purposes only, as difference in cost between alternatives is not a selection criterion but was used to determine if an alternative may have an unreasonably high cost compared to other alternatives.

The cost comparison of alternatives was performed on a "net present value" (NPV) basis for a 50-year life cycle. The NPV was calculated for all alternatives in 2017 dollars using previously developed detailed cost analyses (CMT 2008, 2015a, 2015b, Hanson 2014, and Corps 2000). For alternatives that were not the subject of previous detailed cost analyses (i.e., new hybrid groundwater alternatives), costs were developed using scalable information based on other alternatives on a per MGD basis. A description of results is provided in Appendix D.

Existing Technology – Consistent with 404(b)(1) guidelines, the alternatives examined should consider the limitations of existing technology yet incorporate the most efficient/least-impacting construction methods currently available. Consideration will be given to the ability of existing technology to implement or construct the proposed alternatives in a manner that reduces impacts and increases efficiency. For example, hydraulic directional drilling may be used to reduce impacts to WOTUS compared to open trenching. It is recognized that using current technology to reduce impacts during construction may result in the alternative being determined as impracticable due to exorbitant costs or logistics. Limiting factors include limitations on construction methods currently available as well as site conditions such as topography that may make construction infeasible.

Based upon the above criteria, preliminary alternatives were evaluated to determine their reasonability for further consideration. Scoring followed the subsequent rationale and is depicted in Figure 2-2:

- **Red** – Excessive/insufficient yield, highly adverse impact/critical flaw, not available or logistically flawed, not technically feasible
- **Orange** – Moderate impacts/mitigable, challenging logistics, technically feasible with challenges
- **Green** – Sufficient yield, low environmental impacts, available with favorable logistics, technically feasible
- **Grey** – not applicable

2.4.1 Alternatives Eliminated from Consideration

Ranking of alternatives based on each of the criteria are summarized in Figure 2-2. Only the revised configuration of the Hunter Lake alternative satisfied the screening criteria sufficiently. All other project alternatives did not meet the Practicability and Reasonability factors or had unacceptable potential impacts compared to other alternatives and were therefore, eliminated from further consideration. In most cases, reservoir supply alternatives proposed to be constructed were determined to either lack sufficient capacity to meet water demand or were existing surface water systems that do not add to the availability of surface water acreage that may be used to support the need for additional aquatic-based recreation. The original Hunter Lake alternative would meet both criteria, but the original alternative was excessive in capacity and failed the logistical need to meet the phosphorous water quality criteria. By comparison, Lick Creek Reservoir would also fail to meet phosphorous water quality criteria and did not have either adequate water supply or surface water area available to support aquatic based recreational need.

2.5 DESCRIPTION OF ALTERNATIVES RETAINED FOR DETAILED ANALYSIS

Further details with respect to each of the alternatives retained for detailed analysis in this SEIS are provided below.

Alternative	Yield (Inadequate or Excessive)	Aquatic Recreatoin (2,500 ac)	Environmental Impacts	Availability and Logistics	Existing Technology	Notes
Reservoir Supply Systems						
Hunter Lake--Original Configuration (21.5 MGD)	Red	Green	Yellow	Red	Green	Excessive capacity, environmental impacts mitigable, beneficial upland habitat restoration, land acquired, concern with high phosphorous, moderate cost, able to support aquatic based recreational need.
Hunter Lake--Revised Configuration (12 MGD)	Green	Green	Yellow	Green	Green	Adequate capacity, environmental impacts mitigable, beneficial upland habitat restoration, land acquired, phosphorous reduction through extensive application of BMPs, moderate cost, able to support aquatic based recreational need.
Clinton Lake	Red	Red	Yellow	Red	Gray	Water use committed, no excess capacity, environmental impacts associated with pipeline, extensive pipeline with real estate/ROW complexity, owned by others and not available for use, cost assumed to be moderate with pipeline, does not meet aquatic based recreational need.
Lick Creek Reservoir (8.3 MGD)	Red	Red	Yellow	Red	Green	Insufficient capacity, environmental impacts mitigable, lands not acquired, concern with phosphorous levels, moderate cost, does not meet aquatic based recreational need.
Dredge Lake Springfield (3.35 MGD)	Red	Red	Yellow	Yellow	Green	Insufficient capacity, notable impacts from dredging and dredge cell construction, logistical issues with dredge cell development, excessive cost, does not meet aquatic based recreational need.
Raise Lake Springfield by 2 ft (5.15 MGD)	Red	Red	Red	Red	Green	Insufficient capacity, extensive impacts on shoreline habitats and residences, logistical issues related to shoreline management, low probable cost, does not meet aquatic based recreational need.
Lake Sangchris	Red	Red	Yellow	Red	Gray	Water use committed, no excess capacity, environmental impacts associated with pipeline, pipeline with real estate/ROW complexity, owned by others and not available for use, cost assumed to be moderate with pipeline, does not meet aquatic based recreational need.
Lake Shelbyville	Red	Red	Yellow	Red	Gray	Water use committed, no excess capacity, environmental impacts associated with pipeline, extensive pipeline with real estate/ROW complexity, owned by others and not available for use, cost assumed to be moderate with pipeline, does not meet aquatic based recreational need.
Sand and Gravel Pits (1.4 MGD)	Red	Red	Yellow	Yellow	Green	Insufficient capacity, environmental impacts mitigable, lands not acquired, Lower cost, does not meet aquatic based recreational need.
River Supply Systems						
Sangamon River Dam	Red	Red	Red	Red	Green	Insufficient capacity, environmental impacts with use under low flow conditions, low flow water quality poor, dissolved oxygen concerns, aquatic life impacts, complex and adverse permitting--unacceptable long term solution, lower cost, expansion of some recreational opportunities, loss of scenic quality and impact on canoeing.
South Fork Dam	Red	Red	Red	Red	Green	Excessive capacity, extensive environmental impacts, concern with high phosphorous levels, high cost, does not meet aquatic based recreational need.
Illinois River	Green	Red	Yellow	Red	Green	Sufficient capacity, mitigable environmental impacts, water quality concerns, potential for zebra mussel fouling, extensive pipeline with real estate/ROW complexity, high costs, does not meet aquatic based recreational need.
Groundwater Supply Systems						
Havana Lowland Well Fields (Well Field A) (12 MGD)	Green	Red	Yellow	Yellow	Green	Sufficient capacity, mitigable environmental impacts, extensive pipeline with real estate/ROW complexity, moderate costs, does not meet aquatic based recreational need.
Illinois River Well Field (Well #1 only)(12 MGD)	Green	Red	Yellow	Red	Green	Sufficient capacity, mitigable environmental impacts, extensive pipeline with real estate/ROW complexity, high costs, does not meet aquatic based recreational need.
Sangamon River Valley Well Fields (12 MGD)	Green	Red	Yellow	Yellow	Green	Sufficient capacity, mitigable environmental impacts, extensive pipeline with real estate/ROW complexity, higher system complexity, moderate costs, does not meet aquatic based recreational need.
Havana Lowland Well Fields (17.8 MGD)	Red	Red	Yellow	Yellow	Green	Excessive capacity, mitigable environmental impacts, extensive pipeline with real estate/ROW complexity, high costs, does not meet aquatic based recreational need.
Illinois River Valley Well Fields (17.8 MGD)	Red	Red	Yellow	Red	Green	Excessive capacity, mitigable environmental impacts, extensive pipeline with real estate/ROW complexity, high costs, does not meet aquatic based recreational need.
Intentional Depletion of Sangamon Valley Well Field Reserve Levels	Red	Red	Yellow	Red	Green	Insufficient capacity, mitigable environmental impacts, extensive pipeline with real estate/ROW complexity, adverse effect on other municipal supply systems, legal/logistical uncertainty, high costs, does not meet aquatic based recreational need.
Hybrid Alternatives						
Lick Creek + Sangamon Valley Wells (16.3 MGD)	Red	Red	Yellow	Red	Green	Excessive capacity, environmental impacts mitigable, lands not acquired, concern with high phosphorous levels, moderate cost, does not meet aquatic based recreational need.
Lick Creek + Sangamon Valley Wells + Sand and Gravel Pits (13.2 MGD)	Green	Red	Yellow	Red	Green	Sufficient capacity, environmental impacts mitigable, lands not acquired, concern with high phosphorous levels, increased system complexity, moderate cost, does not meet aquatic based recreational need.
Lick Creek + Sangamon Valley Wells + Sand and Gravel Pit A 15.1 MGD)	Green	Red	Yellow	Red	Green	Sufficient capacity, environmental impacts mitigable, lands not acquired, concern with high phosphorous levels, increased system complexity, moderate cost, does not meet aquatic based recreational need..
Havana Lowland Well Fields (Well Field B) + Sangamon River Valley (12 MGD)	Green	Red	Yellow	Yellow	Green	Sufficient capacity, mitigable environmental impacts, extensive pipeline with real estate/ROW complexity, higher system complexity, high costs, does not meet aquatic based recreational need.
Sangamon River Valley Well Fields(10.33 MGD) + Gravel Pit C (1.4 MGD)(12 MGD total)	Green	Red	Yellow	Red	Green	Sufficient capacity, mitigable environmental impacts, extensive pipeline with real estate/ROW complexity, higher system complexity, high costs, does not meet aquatic based recreational need.
Havana Lowlands + Sangamon Valley Wells (15.3 MGD)	Green	Red	Yellow	Red	Green	Sufficient capacity, environmental impacts mitigable, extensive pipeline with real estate/ROW complexity, higher system complexity, increased system complexity, moderate cost, does not meet aquatic based recreational need.
Illinois River Well + Sangamon Valley Wells (15.3 MGD)	Green	Red	Yellow	Red	Green	Sufficient capacity, environmental impacts mitigable, extensive pipeline with real estate/ROW complexity, higher system complexity, increased system complexity, high cost, does not meet aquatic based recreational need.
Augmentation of Gravel Pit Storage with Transfers from Sangamon River	Red	Red	Yellow	Red	Green	Insufficient capacity during low flow conditions, environmental impacts mitigable, lands not acquired, water quality issues of Sangamon River during low flow, costs not calculated, expected to be lower, does not meet aquatic based recreational need.
Retrofit of Non-CWLP Municipal Wells.	Red	Red	Yellow	Red	Green	Insufficient capacity, mitigable environmental impacts, pipeline with real estate/ROW acquisition needed, adverse effect on other municipal supply systems, legal/logistical uncertainty, costs not calculated, expected to be moderate, does not meet aquatic based recreational need.
Acquisition of Water Rights to Enable Additional Wells to be Drilled in Sangamon River Valley	Red	Red	Yellow	Red	Green	Insufficient capacity, mitigable environmental impacts, pipeline with real estate/ROW acquisition needed, logistical uncertainty in time of drought, costs not calculated, expected to be moderate, does not meet aquatic based recreational need.
Other Alternatives						
Jacksonville Joint Use	Red	Red	Yellow	Red	Gray	Water use committed, no excess capacity, environmental impacts mitigable, extensive pipeline with real estate/ROW complexity, legal complexity during drought conditions, costs not calculated, expected to be moderate, does not meet aquatic based recreational need.
Recycle/Reuse Treated Wastewater	Red	Red	Green	Red	Red	Insufficient capacity, environmental impacts mitigable, ash impoundments subject to closure, concern with high phosphorous levels and impairment of Lake Springfield, costs not calculated, expected to be moderate, does not meet aquatic based recreational need.
Water Conservation	Red	Red	Green	Green	Gray	Insufficient capacity, negligible environmental impacts, currently implemented, lower cost, does not meet aquatic based recreational need.

Red	Excessive/insufficient yield, does not meet aquatic based recreational need, Highly adverse impact/critical flaw, logistically flawed
Yellow	Moderate impacts/mitigable, challenging logistics
Green	Sufficient yield, low environmental impacts, favorable logistics
Gray	

Screening Criteria

Note: Level 1 screening included application of critical flaw review in which key factors considered to eliminate a given alternative from further consideration included the following:

1. Insufficient capacity (yield) of system to meet project need, does not meet aquatic based recreational need.
2. Excessive project environmental impact
3. Logistical issues that are unmitigable (e.g., inability to obtain permits/authorizations)
4. Grossly excessive project costs (>$500M)

Figure 2-2. Alternatives Eliminated from Further Consideration

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2.5.1 No Action Alternative

In accordance with 40 CFR Section 1502.14(d), the alternatives analysis must include consideration of the “no action” alternative. In accordance with 404(b)(1), the “no action” alternative is an alternative resulting in construction that does not require a DA permit and may include a modified project design or a location that eliminates work that would require a DA permit (i.e., avoidance) or the Corps’ denial of the permit. Examples include water conservation, dredging and raising Lake Springfield, retrofitting wells, recycling and reusing wastewater, gravel pits, or wells. All of the alternatives considered no action alternatives with respect to 404(b)(1) guidelines were determined to be impracticable due to their inability to meet the dual purpose and need of supplemental water supply and aquatic recreation; therefore, the no action alternative evaluated in this analysis consists of the existing condition in which no 404 permit is issued from the Corps and no supplemental water supply or aquatic based recreation is provided to augment the existing Springfield water supply system or provide regional aquatic recreational resources. In cases where the NEPA action involves a federal decision on a proposal for a non-federal project, the no action alternative “would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity to go forward” (CEQ 1981).

For this analysis, the no action alternative is a scenario under which no Corps 404 permit is issued for the proposed Hunter Lake Alternative, nor any other alternative. Alternatives that would not require a Corps permit (recycle/reuse of treated wastewater, conservation measures, upland reservoir, etc.) were eliminated from consideration as viable alternatives in the screening process. Thus, the only remaining and viable alternative that would not require the issuance of a Corps permit would be the continuation of the current condition in which no supplemental water supply is provided to augment the existing Springfield water supply system or meet unmet aquatic recreational demand in the area. Therefore, no land would be acquired, no dams would be built, no area would be inundated, and no additional permits or approvals necessary for implementation of the proposed alternative would occur under the No Action Alternative. However, the normal rate of development would continue to occur in the area. Additionally, the City’s municipal, commercial, and industrial customers would continue to be at risk for loss of dependable water supply in times of drought.

2.5.2 Hunter Lake – Revised Configuration

As previously noted, the original Hunter Lake configuration was revised in 2016/2017 to support phosphorous reduction within the watershed. The revised Hunter Lake Alternative is similar to the original alternative considered in the 2000 FEIS but for modifications to provide access for aquatic recreation and reduced supplemental water supply, and the “built-in” design elements to enhance water quality. Revisions associated with improved water quality consist of placement of primary and secondary control structures that define the main body of the lake and additional integrated design features/BMPs throughout the defined project area. These features are identified on Figure 2-3 and described in subsequent sections.

As described in the prior FEIS (Corps 2000), Hunter Lake would be built southeast of the existing Lake Springfield and north of Pawnee, Illinois (Figure 2-1). The reservoir would be formed by constructing an earthen dam on Horse Creek, a tributary to the South Fork of the Sangamon River, in Section 31 of Rochester Township. Spillway elevation of the proposed structure is 568.7 feet NAVD 88., A drought yield of 12 MGD based upon the water need analysis summarized in Chapter 1 was used to establish the lake control elevation.

Depending on seasonal variation and assuming a minimum release of 2 cfs is maintained during filling, and long-term average annual flow occurs in Horse Creek, it would take approximately 6 months to fill the proposed Hunter Lake reservoir. The resulting reservoir would inundate portions of both Horse Creek and Brush Creek; the confluence of these creeks being within the project area (Figure 2-3). The 2,649-acre reservoir would hold approximately 12.2 billion gallons of water with a normal pool elevation of 568.7 ft and with maximum and average depths being 42.7 feet and 14.2 feet, respectively. Reduction in the normal pool elevation from 571 ft proposed in 2020 eliminates permanent flooding in the upper quarter of the original footprint and creates large areas with shallow water depth (< 2ft) to promote wetland production. The complete project area encompasses approximately 7,983 acres and would include approximately 5,300 acres of lands adjacent to the lake and is presented in Figure 2-3. The upland natural resources of the project area would be cooperatively managed with the IDNR as prairie restoration, forest, or other successional lands to provide buffer zones.

2.5.2.1 Reservoir Design

Based on preliminary engineering design, Hunter Lake would be formed by an approximately 1,700-foot earthen dam with a 325-foot fixed crest principal spillway and 400-foot emergency spillway flanking the dam on opposite sides. In total, the dam would encompass approximately 13.8 acres. Figure 2-4 illustrates the conceptual design of the dam previously included in the FEIS (Corps 2000). Actual design is expected to be modified to minimize impacts, enhance design considerations, and optimize wetland mitigation opportunities. Borrow material for the dam embankment would be obtained from excavation of the principal and emergency spillways and from within the proposed pool area. The facility would include an intake tower and piping through the dam for dewatering purposes. The tower would feature two, 2-square-foot gates at separate levels for dewatering from desired lake elevations. Two additional 4-foot by 6-foot gates would be located at the base of the tower to provide the ability to rapidly dewater the reservoir into the Horse Creek channel as required in case of imminent failure. Information regarding the operation of the proposed Hunter Lake is provided in Section 2.5.2.4.

Except in limited areas, the standing timber would be removed and salvaged for sale. Remaining non-merchantable woody material would be burned onsite using an air curtain destroyer or similar device.

The construction of Hunter Lake requires the relocation and abandonment of certain public roadways. Discussions with the Sangamon County Highway Department and Township Road Commissioners resulted in a roadway network designed to minimize adverse travel and emergency response times through the project area and to minimize the potential for illegal dumping at road closure locations.

Various utility abandonments and/or relocations would be required throughout the project area.

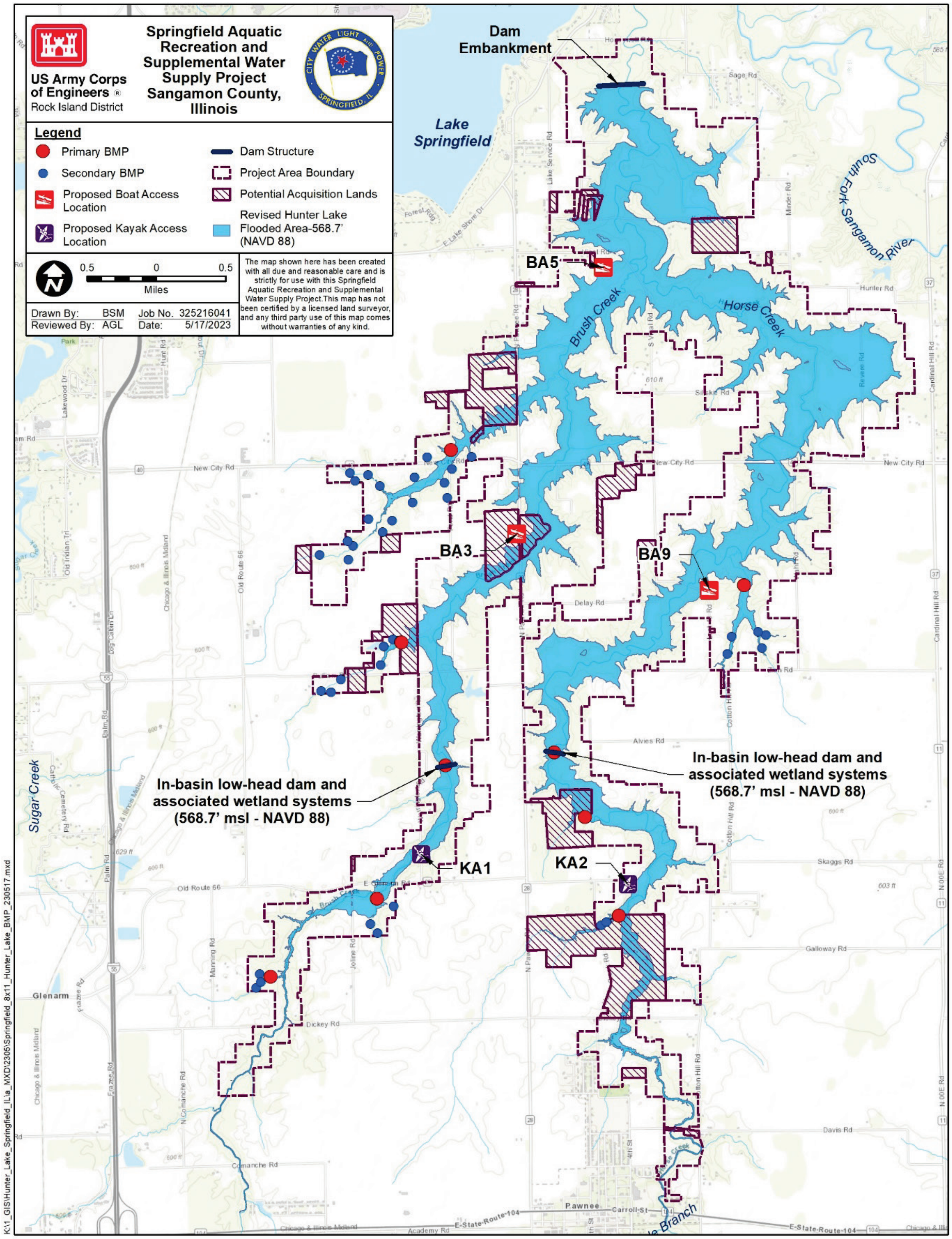
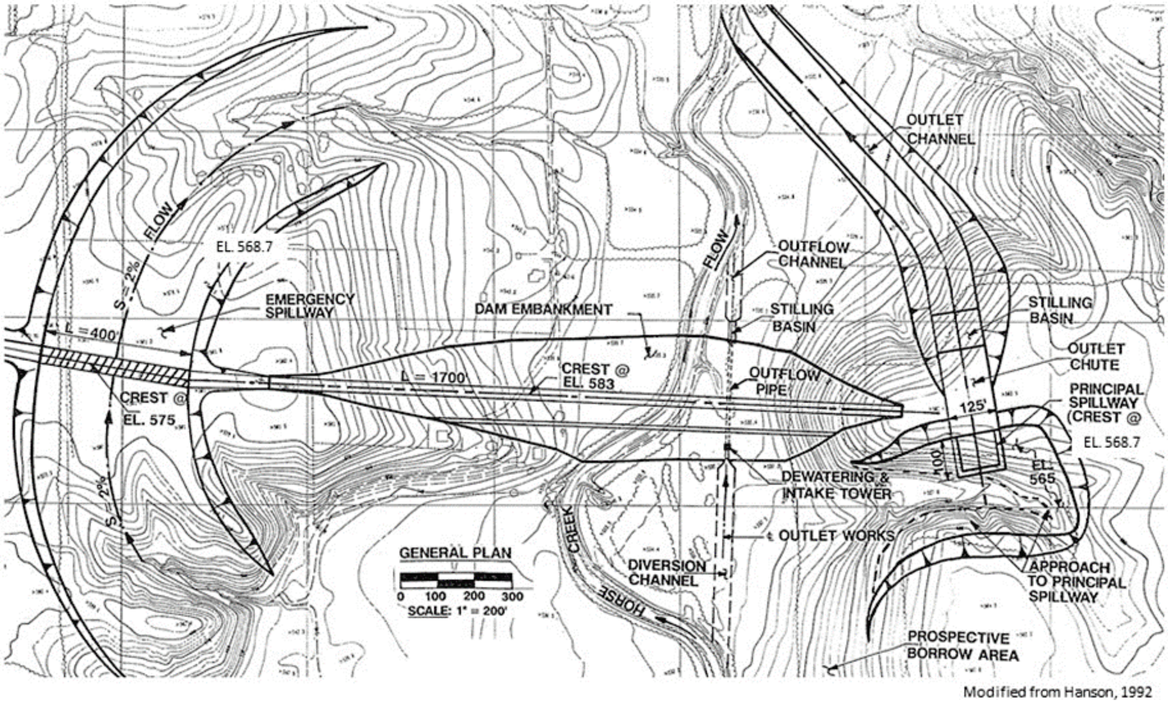
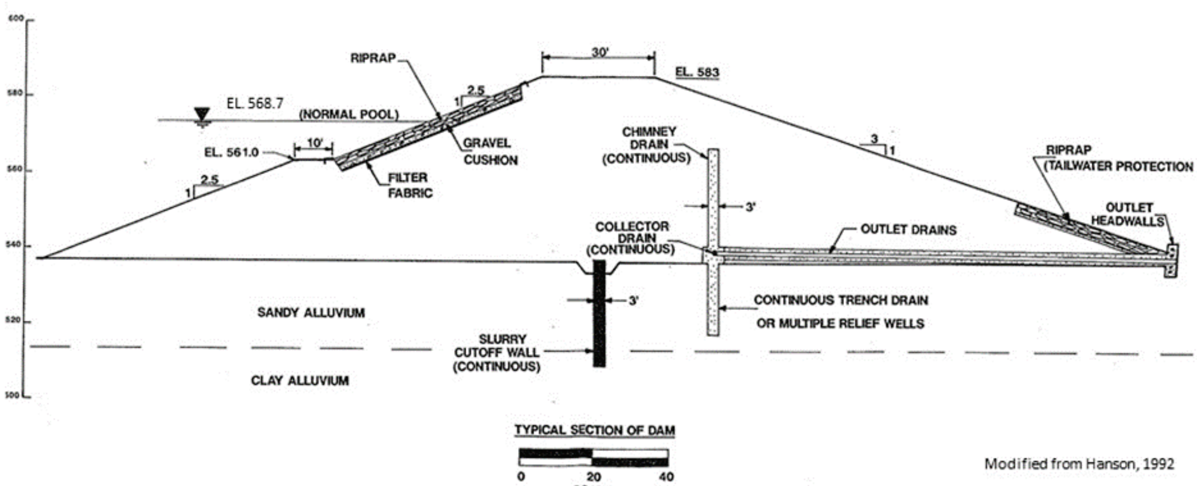


Figure 2-3. Hunter Lake Alternative (12 MGD)



A. Plan View



B. Cross Sectional View

Figure 2-4. Conceptual Design of Hunter Lake Dam Configuration

2.5.2.2 Aquatic Recreation Design Features

During the summer and fall of 2022 the City coordinated with IDNR to identify public access points along the shoreline of the proposed Hunter Lake. The intent of the access points is to promote use of the lake for flatwater aquatic recreation. Through this coordination, IDNR determined that three access points would be appropriate, one to accommodate between 50 and 60 trailered vehicles and two to accommodate approximately 10 to 15 trailered vehicles. It was also determined that two primitive kayak access sites should be located upstream of each of the proposed low-head dams, one on Horse Creek and one on Brush Creek.

To identify the access sites, IDNR proposed 9 locations (not including kayak access) based on location of existing roadway infrastructure, topography, and known environmental and cultural constraints. These preliminary access points were screened using the following criteria:

- Access
- Topography
- Future Bathymetry
- General Site Conditions
- Presence of NRHP Eligible Sites
- Presence of Known WOTUS
- Cover Type/Land Use
- Potential for Protected Species Habitat

The screening exercise resulted in identification of three boat access sites. The following provides a general description of each of three proposed aquatic recreation access points on the proposed Hunter Lake. The three locations, amenity types, and basic concepts were identified through coordination with IDNR, CWLP, and the Corps and are shown in Figure 2-5. The City continues to coordinate with IDNR to further develop the sites to more detailed concept plans.

<u>Site BA #3</u>

This site is located on the west side of the proposed Hunter Lake, on the Brush Creek arm, to the west of N. Pawnee Rd (County Rd 28) and east of the proposed realignment of the road (Figure 2-6). Access to the site could be from either roadway. Proposed facilities at this site include an access road from N. Pawnee Rd to an asphalt parking area for up to 50 trailers and vehicles with parking islands, similar to facilities at Sangchris Lake SP-West Boat Ramp (Figure 2-7). Amenities would include a concrete double wide (32 feet (ft)) boat ramp, Americans with Disabilities Act (ADA) compliant concrete parking for up to 3 vehicles and up to 3 trailered vehicles, ADA compliant concrete sidewalks, boat ramp docks, vault toilet, and solar lights. The access area would be constructed in the dry, prior to inundation with the potential impact area shown in Figure 2-6, with a total of up to 11.44 acres affected. Specific characteristics of facilities include:

- Approximate 85,000 square feet (sf) asphalt parking area
- Up to six solar lamp posts and lights
- Approximate 4,000 sf concrete boat ramp with grooving
- Approximate 1,500 sf concrete ADA parking areas
- Approximate 300 linear feet (lf) of 5-ft wide concrete sidewalk
- Vault toilet

- Two floating boat docks, ADA-compliant, prefabricated with galvanized steel and plastic materials
- Kayak/Canoe launch
- Aggregate base/rip-rap stabilization adjacent to boat ramp/docks for approximately 100 ft either side

Activities may include:

- Moderate earthwork
- Tree clearing
- Use of heavy equipment

General construction practices would include:

- Construction during daylight hours.
- Implementation of a spill prevention plan and use of appropriate construction and area maintenance techniques and BMPs, and appropriate management of incidental and accidental releases in accordance with standard practices and regulatory requirements, to minimize the risk of surface water and groundwater impacts associated with routine maintenance and construction activities. Machinery will be kept out of any waterway as much as possible.
- Construction vehicles would utilize existing roadways to the furthest extent practicable and would stay within the project footprint, including for temporary laydown. Construction matting would be used to maintain construction access and minimize damage in soft soils.
- Disturbed areas would be revegetated following disturbance.

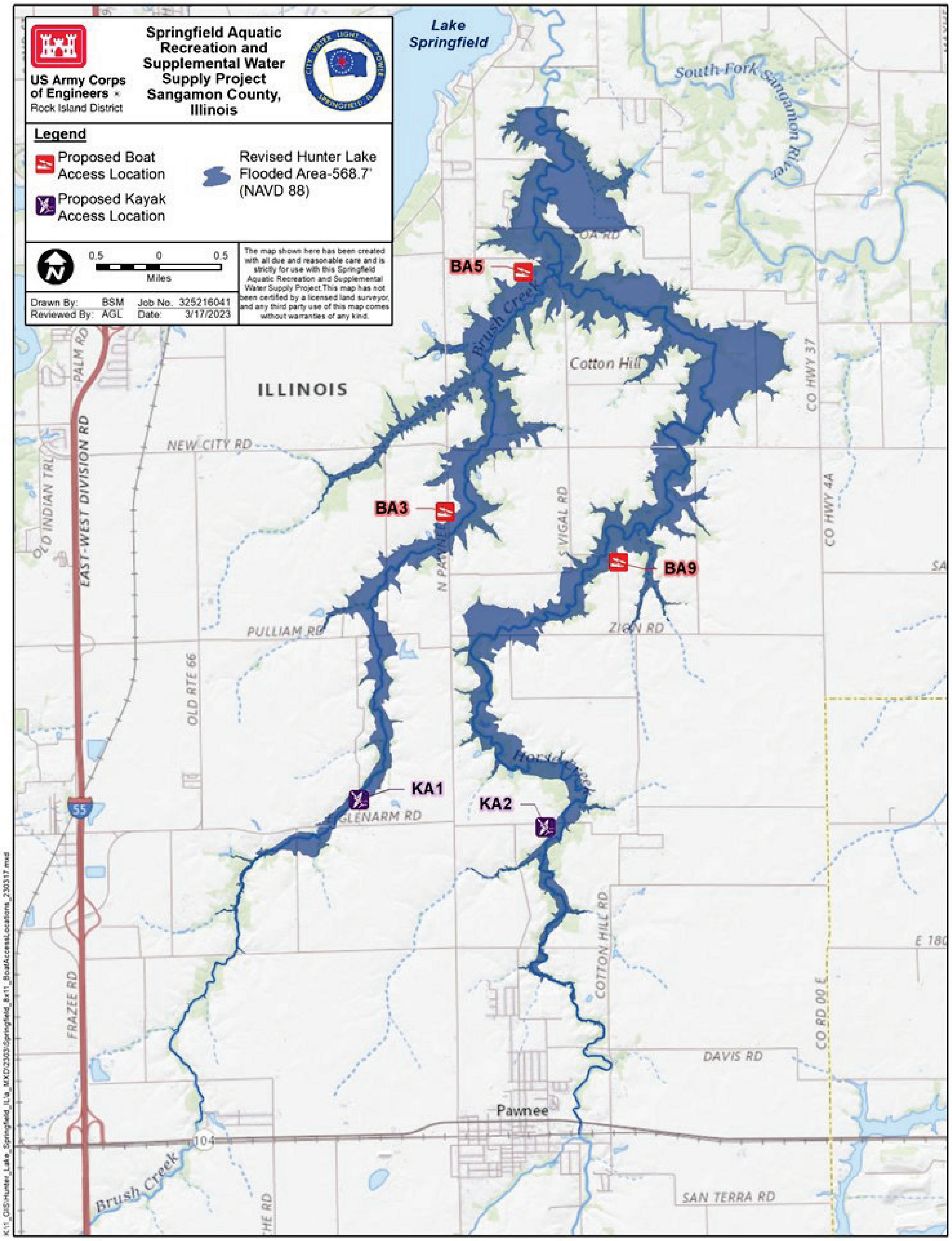


Figure 2-5. Proposed Hunter Lake Boat and Kayak Access Locations

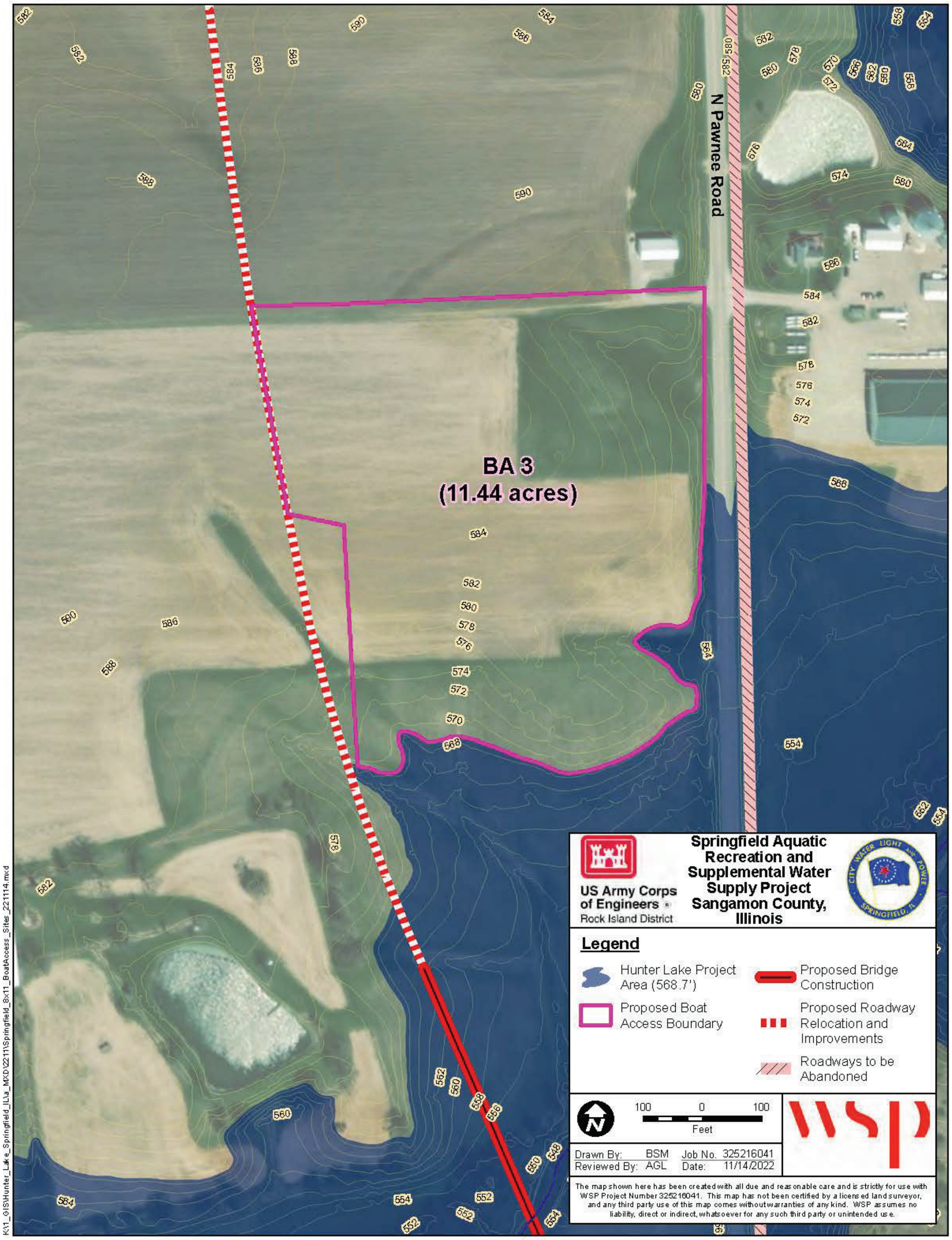


Figure 2-6. Proposed Hunter Lake Access BA #3

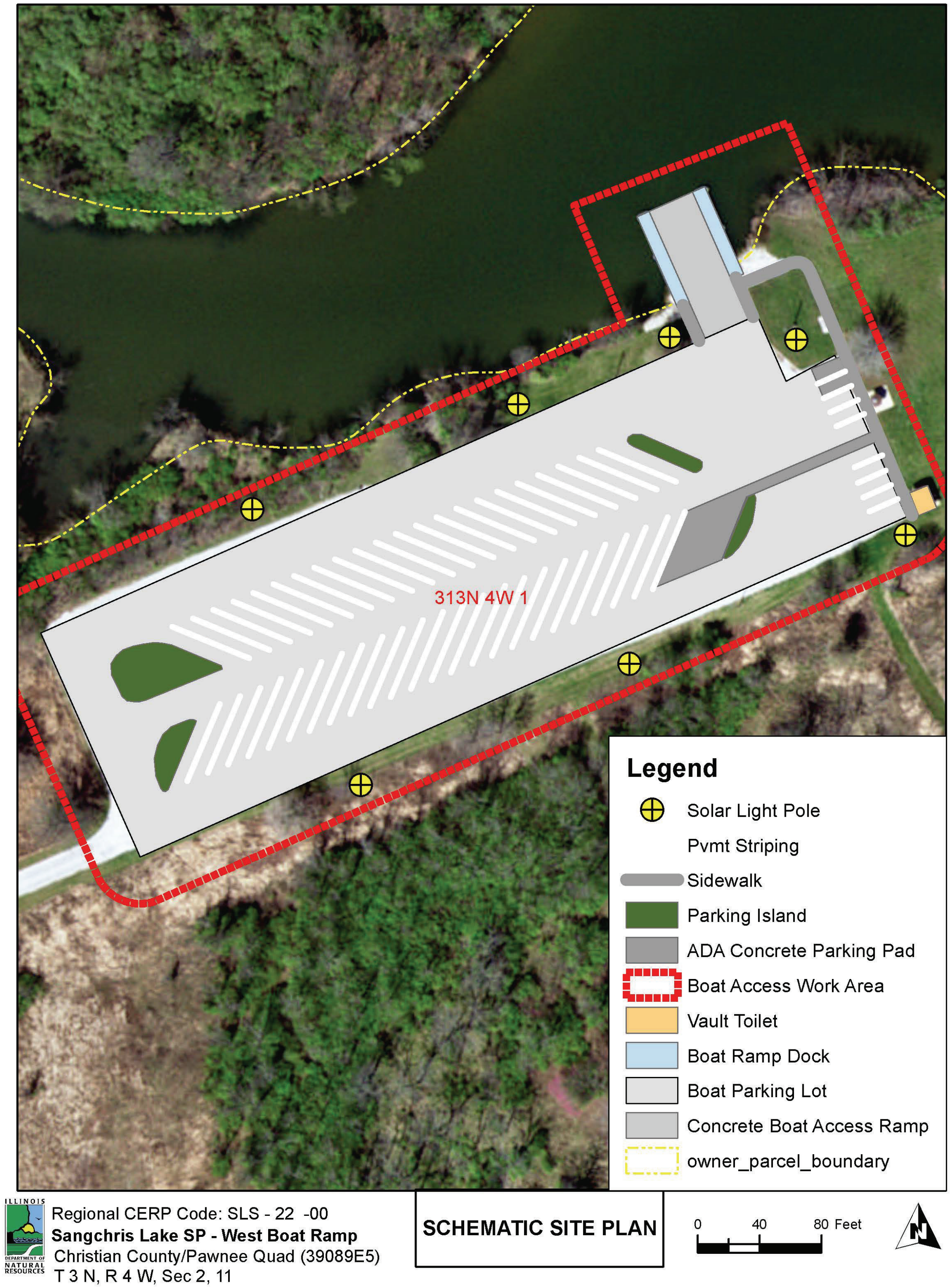


Figure 2-7. Example Large Access Schematic Plan

Site BA #5

This proposed access location area is on the west side of the proposed lake, downstream of proposed site BA #3, nearer to the dam approximately at the confluence of Brush Creek and Horse Creek, just to the south of Vogel Road (Figure 2-8). Facilities at this location would provide parking for up to 10 trailered vehicles, a single-wide (16-ft wide) boat ramp, a floating dock, ADA compliant parking spaces for up to two vehicles and two vehicles with trailers, ADA-compliant sidewalks, up to 6 solar lights, and a vault toilet, similar to the Peabody River King State Fish Wildlife Area - Goose Lake Boat Access (Figure 2-9) with a total of up to 4.21 acres affected. Specific characteristics of facilities include:

- Approximate 21,000 (sf) asphalt parking area
- Up to six solar lamp posts and lights
- Approximate 2,000 sf concrete boat ramp with grooving
- Approximate 1,500 sf concrete ADA parking areas
- Approximate 300 lf of 5-ft wide concrete sidewalk
- Vault toilet
- One floating boat dock, ADA-compliant, prefabricated with galvanized steel and plastic materials
- Kayak/Canoe launch
- Aggregate base/rip-rap stabilization adjacent to boat ramp/docks for approximately 100 ft either side

General activities and construction practices would be the same as those described for Site BA #3.

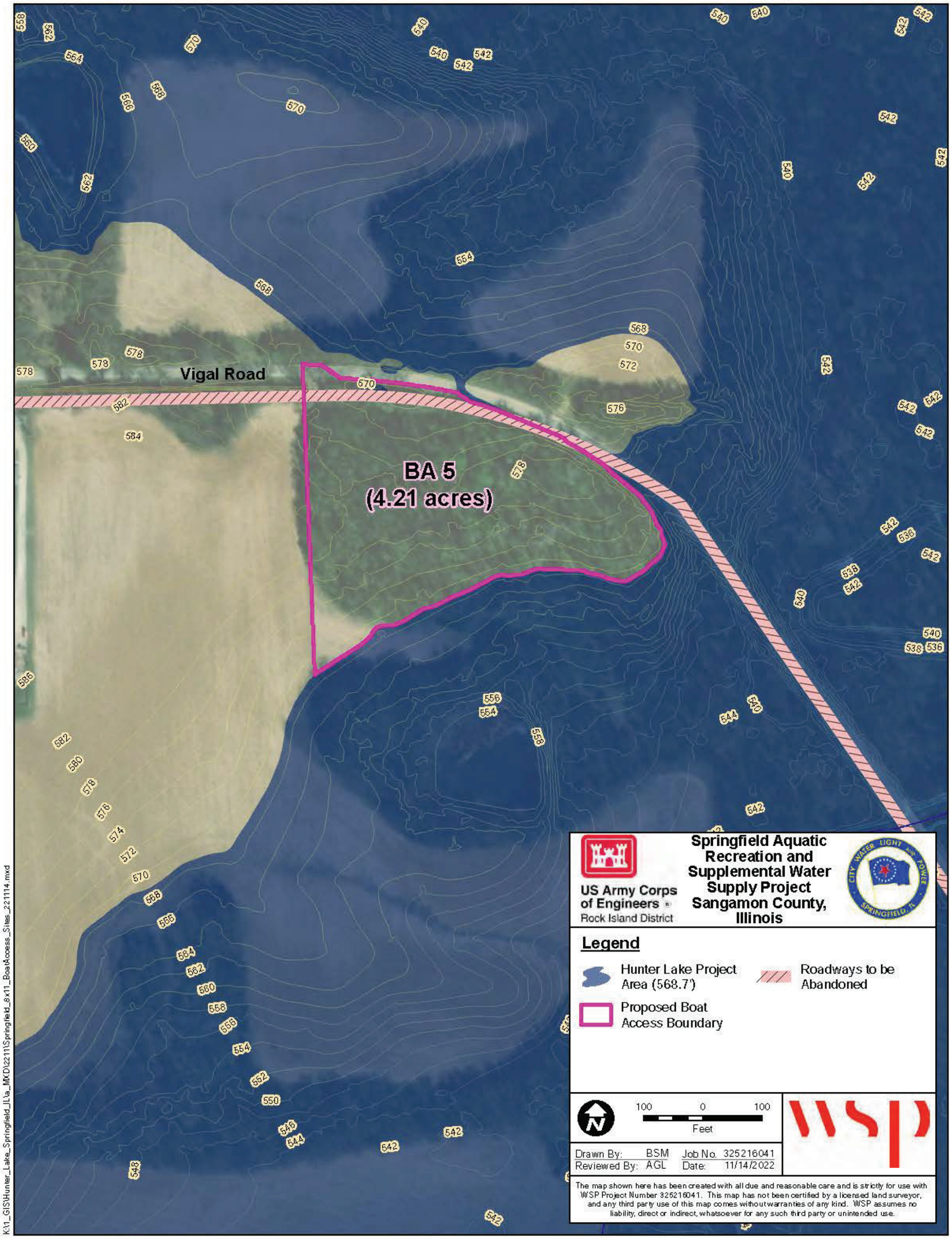


Figure 2-8. Proposed Hunter Lake Access BA #5

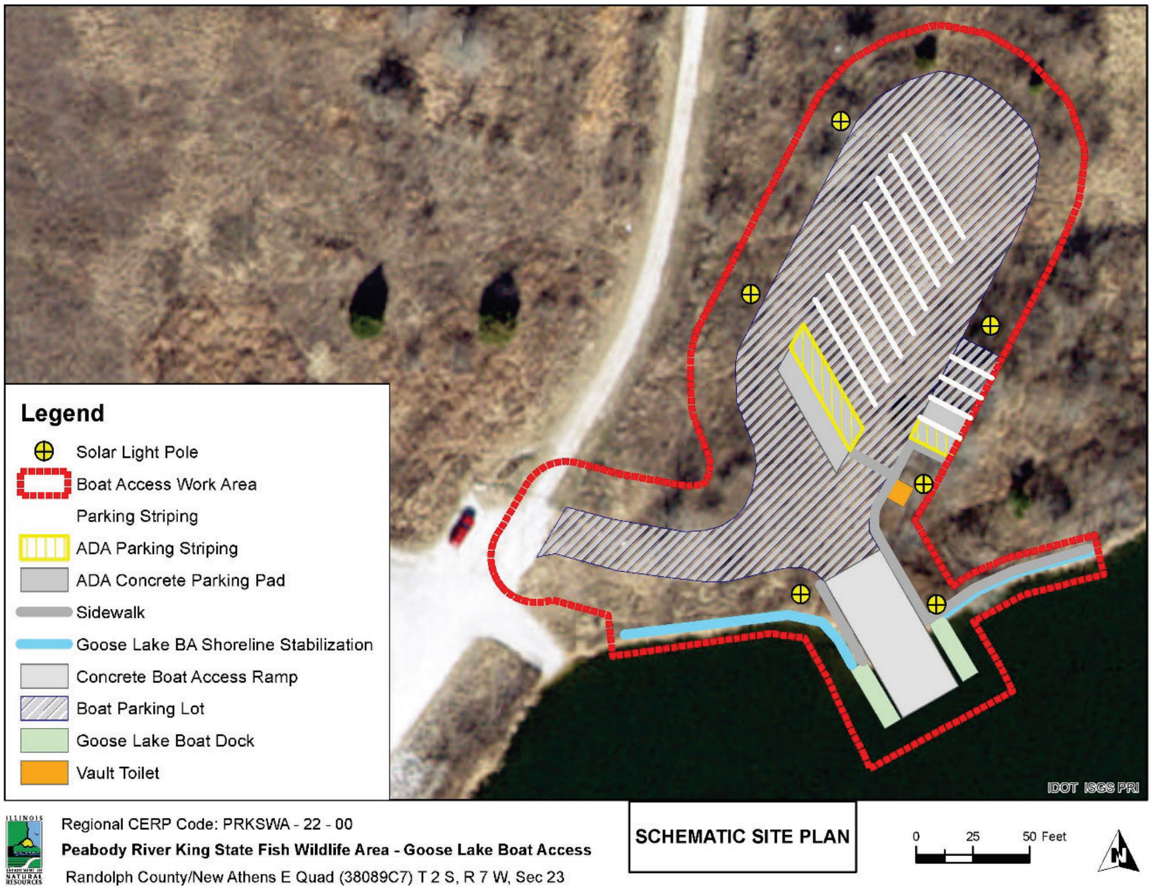


Figure 2-9. Example Small Access Schematic Plan

Site BA #9

This proposed access location area is on the east side of the proposed lake on Horse Creek, almost straight east of Site BA #3, at Lost Forty Rd where the bridge would be constructed to cross the east arm of the lake (Figure 2-10). Facilities at this location would provide parking for up to 10 trailered vehicles and 5 vehicles without trailers, a single-wide (16-ft wide) boat ramp, a floating dock, ADA compliant parking spaces for up to two vehicles and two vehicles with trailers, ADA-compliant sidewalks, up to 6 solar lights, and a vault toilet, similar to the Peabody River King State Fish Wildlife Area - Goose Lake Boat Access (Figure 2-9) with a total of up to 7.30 acres affected. Specific characteristics of facilities include:

- Approximate 21,000 (sf) asphalt parking area
- Up to six solar lamp posts and lights
- Approximate 2,000 sf concrete boat ramp with grooving
- Approximate 1,500 sf concrete ADA parking areas
- Approximate 300 lf of 5-ft wide concrete sidewalk
- Vault toilet
- One floating boat dock, ADA-compliant, prefabricated with galvanized steel and plastic materials
- Kayak/Canoe launch
- Aggregate base/rip-rap stabilization adjacent to boat ramp/docks for approximately 100 ft either side

General activities and construction practices would be the same as those described for Site BA #3.

Kayak Access

Kayak access would be offered on the upper reaches of the Horse Creek and Brush Creek arms, upstream of the proposed low-head dams and mitigation areas. The two proposed kayak access locations (Figure 2-5) have been identified to avoid impacts to sensitive resources and planned mitigation areas and to provide easy access from existing roadways. Facilities would include primitive (aggregate) parking for up to 5 vehicles, including one ADA compliant space, a floating dock and kayak launch, and an ADA compliant walkway to the dock. A maximum of two acres would be impacted at each site. Construction activities would occur in the dry prior to inundation and may include minor earthwork/grading, tree clearing, and placement of aggregate materials. Similar facilities operated by the City on Lake Springfield are depicted in Figure 2-11.

Site KA 1 is proposed on Brush Creek at the intersection of Warrington Road and the southern edge of the inundation area, to the east side of the road. Site KA 2 is proposed on Horse Creek at the intersection of East Glenarm Road and the west edge of the inundation area, to the south of the road.

Figure 2-10. Proposed Hunter Lake Access BA #9

Figure 2-11. Example Kayak Access

2.5.2.3 Integrated Design Features to Enhance Water Quality

For the revised Hunter Lake alternative, the City has included significant design elements that are integrated in the overall project to optimize water quality and enhance environmental characteristics of the project area and downstream areas. Extensive watershed pollutant loading analyses and modeling of water quality within the receiving streams (including Hunter Lake under this alternative) were conducted to evaluate nutrient loading from the watershed and develop a suite of design features and BMPs that are both feasible and effective (Crawford Murphy and Tilly Inc. (CMT) et al. 2017). Key objectives in the development and selection of these features for the Hunter Lake alternative were focused on their efficiency in reducing and controlling phosphorous, nitrogen and sediment loading to Hunter Lake. Figure 2-12 identifies the location of many of the integrated design features (also referred to as BMPs) proposed for the Hunter Lake alternative (CMT et al. 2017).

In-lake Control Structures – In-lake Sediment and Nutrient Control Basins are designed to capture a large amount of the sediment and nutrients carried by runoff during storm events. Five secondary in-lake dams have been selected for installation at inflow locations of the largest drainage areas. The dams are situated within the watershed where the normal pool elevation of the lake begins to transition to average depths less than 10 feet. The in-lake sediment dams are designed to limit interaction of the main lake basin with the upstream sediment basins except for when water is overtopping. The structure overflows will be near the same elevation of the normal pool of the main body of Hunter Lake. Further design studies will be required to establish the exact features of each structure in managing stormflows consistent with the conditions set in the watershed model.

Associated with the in-lake dams on Horse and Brush creeks are separate upstream underwater berms across the floodplain within the sediment basin footprint. The drainage area of these two in lake dams are large enough that the additional berms are necessary to slow the incoming sediment laden water through a series of pools prior to reaching the secondary in lake dam.

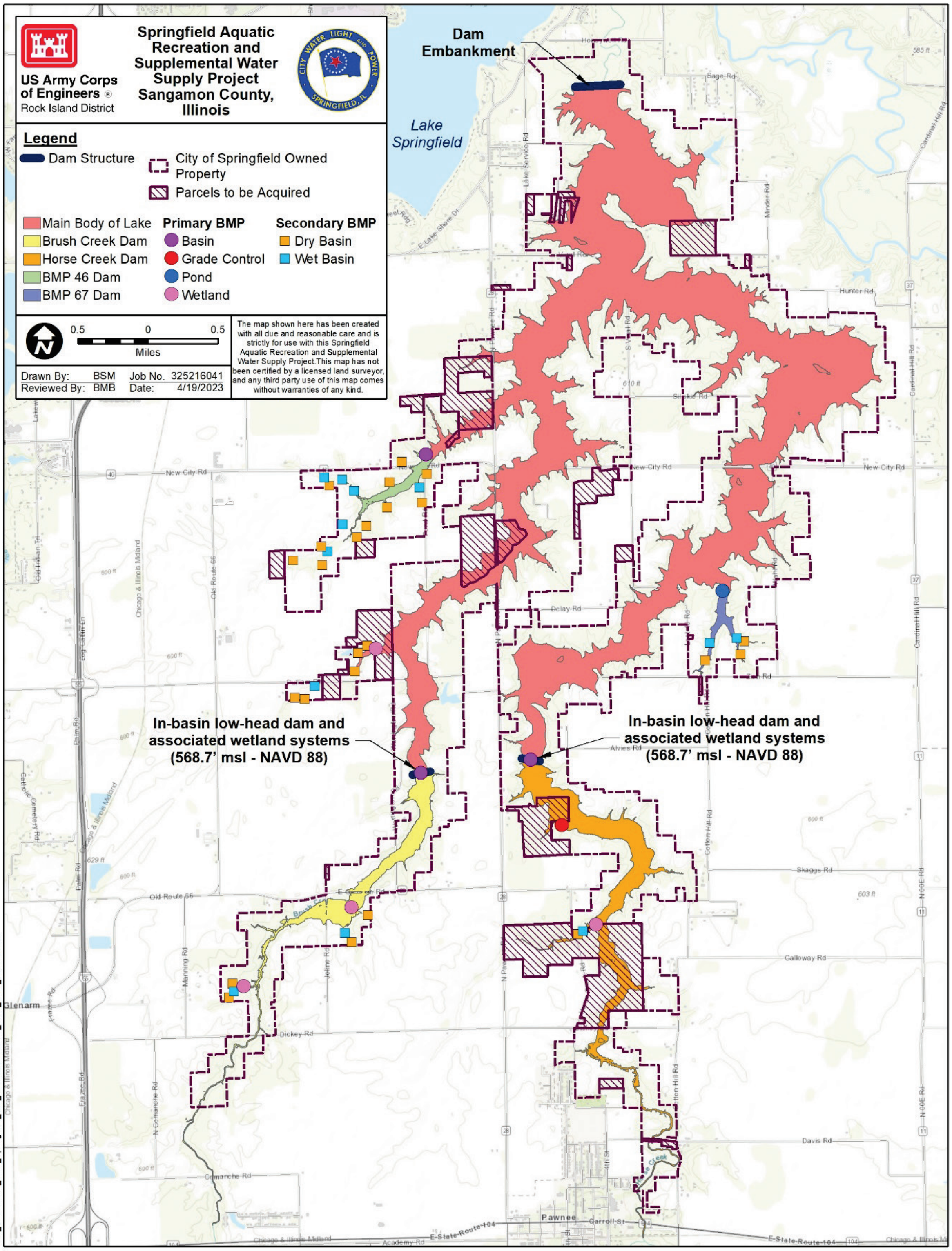


Figure 2-12. Hunter Lake Alternative – Integrated Water Quality Design Features / BMPs

The in-lake sediment dams will capture a substantial volume of sediment at the structures. To increase the lifespan of each in-lake basin and provide additional settling efficiency, deeper pools will be excavated upstream and downstream of the in-lake dams on Horse and Brush creeks and downstream of the smaller dams at the other three locations. Sediment will be removed from each of these features on a 15-year basis to enhance sediment and nutrient trapping efficiency.

- Treatment Train Features**.** Treatment train features are those that may be constructed in series to enhance overall treatment effectiveness. A total of 36 secondary treatment train features are included in the revised design. These features include the following:
  - Stormwater Detention Basins – Stormwater detention basins function the same as an in-lake control structure, but on a much smaller scale. Detention basins can vary widely in size and form with some maintaining a permanent pool of water (wet basins) and others only detaining water during certain storm events (dry basins). Depending on the goal of the basin, the volume of storage and rate of release is adjusted in the design.
  - Dry Basins – Dry basins, as the name indicates, do not maintain a permanent pool of water. These basins remain dry as their water control structure is located at the lowest point of the basin allowing for a total release of the water detained during a storm. These are noted as less efficient at capturing sediment in part by the intent of their design. Dry detention basins are primarily placed to control flood flows by smoothing out the hydraulic peak. They are not generally intended to detain water for as extended a period as a wet basin.
  - Wet Basins – Like dry basins, there are numerous types of ponds with differing sets of parameters that dictate their use in various landscapes. Three larger wet detention basins are intended to maintain a permanent pool of water (>8 feet deep) throughout the year and are effective in detaining and removing sediment and associated nutrients. Ponds are typically located in areas with larger drainage areas and when used in a treatment train are often placed as the last feature before the water enters the receiving body.
- Wetlands and Ponds – Wetlands are recognized as performing a wide range of functions that include water quality enhancement and nutrient retention and removal. As such, three ponds with approximately 18 acres of secondary wetland systems (integrated along margins of ponds and wet basins and not part of mitigation commitment) are proposed to further enhance the efficiency of these systems to improve water quality. Secondary benefits of these systems are likely to include enhanced wildlife support and improved habitat for aquatic resources.
- Water and Sediment Control Basins – Water and Sediment Control Basins are a very specific type of dry basin intended for use in agricultural fields. These are short earthen berms built across an ephemeral drainageway to trap water and sediment running off cropland upslope from the structure. These structures are often part of a terrace system and significantly reduce or even eliminate gully erosion by controlling flow within a small drainage area.

- Grade Control **–** Grade control structures are used to stabilize waterways and prevent further incision. These can be installed in perennial streams or gullies. A grade control structure serves to establish a hard point within the stream channel that does not allow for further down cutting. This stabilizes the slope preventing further flattening of the channel. One grade control structure is targeted for application within the project area based on future final design parameters.
- Terraces – Terraces are agricultural soil conservation management practices that prevent significant erosion on sloping farmland.
- Grassed Waterways – Grass waterways are a type of buffer strip located within active agricultural lands. Because CWLP is proposing to remove most agricultural lands they own from production, this practice would be associated with private lands mentioned in the watershed report (CMT et al. 2017).
- Permanent Cover – Vegetation in the form of permanent perennial land cover is an important BMP for reducing erosion in areas owned by the City. Fields in row crop production will be converted to permanent vegetative cover consisting of prairie, forest, and successional habitat types. More than 2,000 acres of row crop lands are proposed to be converted to tallgrass prairie.
- Shoreline Stabilization – Reservoirs such as Hunter Lake are particularly susceptible to shoreline erosion as the impoundment floods river valleys and establishes a majority of the shoreline along bluff lines. Up to 106,000 feet of shoreline will be stabilized. Rock will be applied to shorelines to buffer the effects of wave action and reduce erosion of shoreline soils.

2.5.2.4 Operation and Maintenance

During operation, water would be discharged via the intake tower to the downstream Horse Creek channel. The existing low-head movable dam at the confluence of Horse Creek and the South Fork of the Sangamon River would back up water to the City's existing Horse Creek pumping station where water would be pumped into Lake Springfield. The pumps would be operated as necessary to transfer the water to Lake Springfield. Additional operation and maintenance of the existing pumping facility would be required during drought conditions due to increased usage.

Horse and Brush creeks both are rated zero-flow streams during the 7Q10 low flow period. During the full pool condition within the proposed Hunter Lake, spillway overflow would mimic inflow. The downstream condition and potential water use downstream during low flow is unaffected during critical periods because the 7Q10 low flow at the Sangamon River would be expected to remain unchanged from the current condition. During less than full pool conditions with flows greater than the zero low-flow, water storage would occur in Hunter Lake, subsequently reducing stream flow downstream of the dam until full pool condition reoccurred. However, flows in the South Fork and Sangamon Rivers would also likely be greater at these times. A low flow minimum release of 2 cubic feet per second (cfs) would be maintained during drought conditions and was used in conjunction with modeling to determine the net increase in supplemental yield. It should be noted that during times of extreme drought, water levels in the proposed reservoir may drop low enough where some types of aquatic recreation may not be supported. This is consistent with other outdoor aquatic recreation facilities in the area.

The CWLP Security staff would provide routine security patrols around the project area as well as boat patrols on the reservoir itself. Additional staff would be required by IDNR to manage environmental resources of the project under the terms of a cooperative agreement with the City. As previously noted, the approximate 5,300 acres of land adjacent to the reservoir would be cooperatively managed with the IDNR as prairie restoration, forest, or other successional lands to provide buffer zones, as well as to maintain the lake access areas described in Section Periodic maintenance of the protected shoreline areas would be required and regular maintenance of the boat launching facilities and grounds would be required during seasonal use periods.

Annual inspection and maintenance of the dam facilities would be performed by existing staff, a City-hired consultant, and the additional maintenance crew.

Farm operations will be phased out as natural areas are developed in the buffer area around the lake. Operations will continue to be managed by the City's Land and Water Resources Division during the transition.

Design features as described above will also require regular maintenance including:

- Berm maintenance
- Annual inspection and maintenance of control structures
- Sediment management (15-year cycle) by excavation and removal to approved upland disposal locations)

2.5.2.5 Cost

The projected costs associated with the proposed Hunter Lake Alternative are summarized on Table 2-2. The total estimated cost for design and construction of Hunter Lake Reservoir was determined, including all costs previously incurred. Values were derived from CMT et al. (2017) using 2017 dollars adjusted using an average inflation value of 3.9 percent. Estimated construction costs from 2017 were adjusted to 2022 values using the average 10-year rate of 3.1% for 5 years (2017-2022). The value of property within the Hunter Lake project area was appraised to be $82,000,000 in 2020 by the Corps (Corps 2020). The property value was updated to reflect 2022 dollars using an average cropland inflation rate of 10.7% over 2 years (USDA 2022). Net Present Value (NPV) was calculated using a 3.5 percent interest rate for bonds, a 1 percent discount rate, and 2.5 percent inflation rate. The 2.5 percent inflation rate was assumed for maintenance and energy cost increases over the 50-year life cycle. For the purpose of NPV calculation, the 18-month drought operation was assumed to occur at year 25 of the 50-year life cycle. The total estimated capital cost is $235,329,000. Total estimated NPV cost is $358,576,000. Details of the revised Hunter Lake costs are provided in Table 2-3.

The construction costs were broken down into four primary items:

- Dam, Spillway, and Intake Facilities
- Road and Bridge Relocation
- Relocation of Utilities
- Shoreline Protection

Table 2-2. Summary of Project Costs for the Proposed Hunter Lake Alternative

	Hunter Lake Reservoir Revised 12 MGD
Cost Year	2022
Total Capital	$235,329,000
Annual Maintenance	$147,000
18-Month Operation	$474,000
50-Year NPV[1,2]	$358,576,000

[1]Value of property within the Hunter Lake project area is not subtracted from the NPV.
[2]NPV based on 50-year life cycle using a bond rate of 3.5%, discount rate of 1%, and an inflation rate of 2.5%.

Additional operation and maintenance costs during the drought periods for the existing South Fork pumping station include electricity costs and pump replacement schedules comparable to the pipeline alternatives. The Sangamon County Highway Department has agreed to fund one of the seven bridges in the roadway plan and provide construction engineering/inspection for the entire plan. All other costs are to be borne by the City.

The estimated value of the entire project area (7,983 acres) is $100,487,000 in 2022 dollars (Table 2-3). This total value is provided for comparison purposes with other projects considered in the alternatives analysis. However, much of the land for the reservoir is already owned by the City. Remaining land to be acquired accounts for approximately 670 acres within the 7,983-acre project site (approximately 8.4% of the total area). Thus, actual cost to the City to complete necessary land purchases is approximately $8,400,000 in 2022 dollars. Flood easements for areas occasionally impacted by the reservoir would be required in areas not acquired by fee simple. These activities would be completed during the design phase of the project.

2.6 COMPARISON OF ALTERNATIVES (IMPACT SUMMARY CHART)

The environmental impacts of each of the alternatives under consideration are summarized in Table 2-4. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

Table 2-3. Detailed Cost of the Hunter Lake Alternative

Cost Element	Cost 2022[1]
Construction	
Dam, spillway, and intake tower facilities	$18,336,000
Road and bridge relocation	$16,820,000
Utility relocation/abandonment	$20,427,000
Shoreline stabilization	$14,980,000
Cemetery protection/relocation	$1,000,000
Lake access areas	$2,577,000
Mitigation measures	$10,000,000
Modifications at Pawnee with levee	$1,436,000
Best management practices - alternative design	$7,671,000
Miscellaneous pay items @15%	$13,206,000
Construction subtotal	$106,453,000
Miscellaneous	
Phase I, II and III archaeology	$7,850,000
Legal/administrative	$809,000
Public involvement	$183,000
Land acquisition/easements[2]	$100,487,000
Program management	$1,449,000
Engineering design (8% of construction)	$8,517,000
Construction observation (9% of construction)	$9,581,000
Subtotal	$128,876,000
Design and construction cost =	$235,329,000
Periodic maintenance dredging (15-yr interval)	$4,698,000
Annual Maintenance	$147,000
18-Month Operational Costs	$474,000
50-Year Net Present Value	
Projected 50-year NPV Cost	$358,576,000

Source: CMT et al. 2017, Corps 2020

[1]Adjusted from CMT et al. 2017 values to 2022 values
[2]Adjusted from Corps 2020 values to 2022 values using average annual adjustments based on USDA 2022

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Table 2-4. Summary and Comparison of Alternatives by Resource Area

Resource	Alternative A: No Action	Hunter Lake Reservoir Revised
Air Quality	No Impact	Minor impact from fugitive dust and emissions from construction equipment and vehicles, minimized through use of BMPs (such as covered loads and wet suppression). Minor impact associated with increased vehicular traffic associated with recreational use. No exceedances of regional National Ambient Air Quality Standards (NAAQS) expected.
Climate Change and Greenhouse Gases (GHG)	No Impact	Construction activities would contribute to localized GHG emissions that would be negligible and would not affect climate change.
Geology and Soils	No Impact	Minor impact from increases in soil erosion during construction, minimized through the use of BMPS. Indirect impact associated with erosion along the reservoir shoreline. Minimized through shoreline stabilization measures.
Prime Farmland	No Impact	Minor impacts associated with inundation and conversion related to loss of prime farmland soils relative to the amount of land designated as prime farmland in the vicinity.
Groundwater	No Impact	Minor localized impact on the potentiometric surface of the shallow aquifer.
Surface Water	No project-related change from the existing condition of surface waters or water quality would occur. As water demand increases, changes in water supply withdrawal over time may change discharge from Lake Springfield and withdrawal from South Fork Sangamon River	Minor, temporary, impacts to water quality from dam construction. Long term beneficial impacts to downstream water quality associated with integrated features designed to enhance water quality. Long term beneficial impacts to lacustrine water resources with permanent adverse impacts to riverine water resources

Resource	Alternative A: No Action	Hunter Lake Reservoir Revised
Floodplains	No Impact	Small increase in South Fork peak discharge and, therefore, a small increase in 100-year flood elevation. However, there would be a reduction in South Fork peak flood discharges and elevations for small floods with a return period of less than 10 years. The method of diversion and management of Horse Creek during dam construction will consider flood risks and avoid potential increases to flood risk.
Wetlands	No Impact	Moderate adverse effect due to loss of generally small, low functional quality wetlands and open water within the project footprint. Positive effect in the long term from anticipated development of wetland and open water acreages within the project area associated with project features. Regardless, adverse impacts to existing wetlands will be mitigated for by establishment of onsite mitigation areas and onsite mitigation banking.
Vegetation	No Impact	Moderate adverse impact associated with loss of vegetation in the inundation zone. Offset by preservation and restoration of upland habitats within the project area resulting in a long-term beneficial impact.
Wildlife	No Impact	Moderate impact associated with the loss of habitat within the inundation area. Offset by long-term benefit to wildlife habitat due to preservation and restoration of prairie, forest, and wetland habitat within the unflooded portions of the project area.
Aquatic Ecology	No Impact	Permanent adverse impact due to loss of low-quality stream habitat. Stream impacts compensated by extensive stream mitigation plan. Permanent adverse impacts to riverine resources and lotic habitats with long-term beneficial impacts to lentic aquatic habitat and ecosystem support due to expansion and increased productivity of aquatic habitat within Hunter Lake.
Threatened and Endangered Species	No Impact	Minor impact associated with loss of habitat for protected species. Avoidance and minimization efforts to reduce impacts to would be implemented and impacts would be mitigated in accordance with necessary permit requirements.
Natural Areas and Conservation	No Impact	No Impact

Resource	Alternative A: No Action	Hunter Lake Reservoir Revised
Parks and Recreation	No impacts to existing parks or recreational areas. However, this alternative would not address forecasted demand for aquatic recreation or water supply needs,	Large beneficial impact to local and area wide recreation opportunities. Minor impacts form the closure of KOA campground.
Socioeconomics and Environmental Justice	No Impact	Minor, indirect impact to the regional economy associated with the loss of revenue from farming leases and property taxes, offset by substantially greater indirect benefits from recreation in the long term. No disproportionate impacts to environmental justice communities.
Community Facilities and Services	No Impact	Minor temporary impact during construction. Long term beneficial impact associated with the availability of a supplemental water supply.
Land Use	No change in land use, however, maintaining the current land use in the project area is not consistent with the City of Springfield 2020 Land Use Plan.	No impact. Conversion of agricultural land to the reservoir and active and passive recreational land is consistent with the City's Land Use Plan.
Public Health and Safety	No Impact	Large beneficial impacts to public health and safety during times of drought.
Transportation	No Impact	Moderate impact to residents associated with changes in one-way travel patterns due to road closures.
Noise	No Impact	Minor intermittent impact associated with construction activities.
Aesthetics	No Impact	Minor adverse visual impacts during construction. Positive long-term impact in in aesthetics and visual attractiveness of the project area
Cultural and Historic Resources	No Impact	Impacts would be minimized through compliance with a Programmatic Agreement between the Corps and Advisory Council on Historic Preservation and adherence to BMPs.

Resource	Alternative A: No Action	Hunter Lake Reservoir Revised
Solid and Hazardous Waste	No Impact	Minor impact. Wastes would be managed in accordance with applicable local, state and federal requirements.
Cumulative Effects	No impact.	Minor cumulative impacts to resources such as surface waters, water quality, vegetation, wildlife, and cultural resources due to mitigative measures, integrated design features, and conversion to other comparatively more beneficial resources. Beneficial cumulative impacts to public health and safety and wetlands due to increased water supply during drought as well as mitigation performed for wetlands lost.

2.7 APPLICANT'S PREFERRED ALTERNATIVE

The revised Hunter Lake alternative is the City's preferred alternative. This alternative provides for the best use of City resources and is in the best interest of CWLP rate payers as it meets the project purpose and need requirements for aquatic recreation and yield for a supplemental water supply, represents the best alternative with respect to logistics of implementation, and provides enhanced environmental quality.

- Aquatic Based Recreation Demand. The revised Hunter Lake alternative meets the demonstrated need for flat-water aquatic recreation and provides a minimum of 2,500 acres of flat-water aquatic recreation area.
- Supplemental Water Supply. The revised Hunter Lake alternative meets the demonstrated need for supplemental water and provides up to 12 MGD of additional water supply during drought periods.
- Enhanced Environmental Quality. The Hunter Lake alternative encompasses approximately 7,983 acres of project lands and will include a total of approximately 2,649 acres of open water, 1,724 acres of forest (including riparian areas), 1,286 acres of successional lands that will ultimately transition to forest, and approximately 2,036 acres of tallgrass prairie. While this alternative would result in unavoidable impacts to WOTUS, apart from mitigative measures, project features would also result in substantial benefits that in total, represent enhancements of environmental quality of WOTUS and other features.
- Streams. This alternative would result in permanent losses to streams (45 miles) and wetlands (71-74 acres) through conversion of lotic environments to open water habitat (lentic environment). Notably, however, many of the streams of the project area are considered to be functionally impaired and are low quality, incised streams that are disconnected from their floodplains. Some streams do contain riffle-pool complexes which can be beneficial to aquatic habitat. The streams within the project area consist of Horse Creek, Brush Creek, and their tributaries. The majority of the tributaries are ephemeral and intermittent. With the exception of the main channels of Horse Creek and Brush Creek, most of the affected streams have a functionally low priority ranking. Mitigation is summarized in Section 4.3.
- Water Quality. The revised Hunter Lake alternative incorporated extensive features that are integrated within the project design that will enhance water quality. The integrated design features include five in-lake dams, 36 secondary treatment train features, three ponds that incorporate 18 acres of wetlands (not part of mitigation commitment), terraces, grade control structures, shoreline stabilization and other measures. All of these features will be effective in reducing nutrient and sediment loading to WOTUS including streams of the project area and all downstream waters of the Sangamon River. Benefits of these integrated design features are substantial. For example, direct "in-project area" benefits include enhancement of water quality within the open water zones of Hunter Lake. Further, the effectiveness of the integrated design features would result in nutrient and sediment detention that would not only improve the water quality of Hunter Lake but would also have substantial benefits to downstream waters such as the Sangamon River and the Illinois River in terms of reduced nutrient loading. Such water quality enhancements are consistent with the goal of the Nutrient Loss Reduction Strategy for the State of Illinois to align with USEPA's 2008 Gulf Hypoxia Action Plan which calls for each of the 12 states in the Mississippi River Basin to produce a plan to reduce the amount of phosphorus and nitrogen carried in rivers throughout the states and to the Gulf

of Mexico (IEPA 2015). Given the magnitude of committed project features that are integrated in the overall design of the revised Hunter Lake alternative, the benefits to the water quality of downstream receiving waters are substantial.

- Wetlands. This alternative would result in permanent losses to 71-74 acres of wetlands. Impacted wetlands are dominated by small (typically less than 0.5 acre) wetlands that are disconnected and scattered within the 7,983-acre project area. Several larger wetlands (approximately 2.0 to 7.8 acres) were considered to have moderate values for several wetland functions that could be rated qualitatively based on size, position, and quality: including flood abatement, sediment retention, nutrient retention and removal, water quality enhancement, wildlife habitat, and aquatic ecosystem support. However, based on a practical and observational assessment of the wetland functions stated above when compared to other wetlands within the area, all wetlands potentially affected by the project were considered to have low functional value for aquatic ecosystems. Additionally, floristic quality of wetlands potentially affected by this alternative, which were analyzed using the Floristic Quality Assessment tool as developed by Swink and Wilhelm (1994) in the plants of the Chicago Region, were determined to be low. Mitigation is summarized in Section 4.3.
- Compensation for Unavoidable Losses to WOTUS**.** Under this alternative, unavoidable losses to WOTUS would be compensated for by establishing both stream and wetland mitigation. Wetland mitigation would be conducted within the Hunter Lake project area or purchased from available wetland mitigation banks. Bank credit purchases for wetland mitigation are based on a 1:1 ratio per the Rock Island District wetland mitigation guidance (Corps 2019). Permittee responsible mitigation is based on a total of approximately 74 impacted acres of PEM, PFO, and PUB wetlands with mitigation ratios of 1.5:1, 2:1, and 0:1, respectively, ultimately requiring the development of up to approximately 135 acres of high-quality wetlands that are in close contact with adjacent surface water resources (therefore, higher functional value) (Corps 2019). Additionally, mitigation of unavoidable losses would entail the establishment of buffers along streams within the project area and other commitments that may include use of mitigation banks or in lieu fees. Unavoidable impact to streams will be mitigated for using multiple methods to meet stream mitigation credit requirements. Development of a stream mitigation concept plan is ongoing. Mitigation is summarized in Section 4.3.
- Additional Benefits**.** Establishment of restored upland habitats in an otherwise heavily cultivated landscape would enhance the available habitats for local wildlife and would contribute to improved water quality of Hunter Lake and downstream areas. These restored habitats would also provide for improved habitat for sensitive state listed species such as the Kirtland's snake and would enhance potential use of project lands by other species of concern such as the Monarch butterfly and the rusty-patched bumblebee.
- Logistics of Implementation. Property ownership and proximity to existing CWLP infrastructure and resources are key elements of the logistics of implementation. Lands within the Hunter Lake project area are largely owned by the City, thereby avoiding the need for extensive additional land acquisition. Permitting of the Hunter Lake project has increased complexity due to the need to obtain a Section 401 permit and approvals by the Illinois Pollution Control Board. However, based upon discussions with the IEPA and the integrated water quality design features of the Hunter Lake alternative, the ability to obtain the required site-specific authorizations is less problematic than other alternatives considered requiring Section 401 authorization.

- System Reliability. Reliability of the installed supplemental water supply system is critical to ensuring that the water needs of CWLP users and customers are met on an ongoing basis for the life of the project. Such system reliability is critical to providing users with sufficient water to meet needs related to power generation; commercial, industrial, and institutional uses; drinking water supply and other uses.

  Lands within the Hunter Lake project area are largely owned by the City. As a result, Hunter Lake as a water supply would be entirely controlled by the City and would, therefore, have a high degree of long-term reliability because all system components (water body, dam, water control structures, pumps) are in proximity to Lake Springfield (the primary water supply) and are not subject to influence from competing uses. Additionally, the proximity of the project to other facilities owned and operated by CWLP (Lake Springfield, existing water treatment facilities/pump stations, etc.) enhances the efficiencies of project maintenance and operations that also increases system reliability.

In contrast to the Hunter Lake alternative, the no action alternative would result in substantially lower permanent impacts to streams and wetlands and would, therefore, have little to no mitigation commitment. Brush and Horse creeks would remain low quality, incised streams within a landscape dominated by cultivation and high runoff. In total, the no action alternative would not have the potential for the broader upland ecosystem restoration benefits described above for the Hunter Lake alternative. Additionally, there would be no benefits to downstream waters such as the Sangamon River and the Illinois River in terms of reduced nutrient loading. However, the no action alternative would not result in the loss of upland forested habitat and would not result in conversion of this portion of the Horse Creek watershed from lotic to lentic habitat.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

In accordance with 40 CFR Section 1502, an EIS must discuss the affected environment and environmental consequences of the proposed project alternatives. Environmental resource categories that may be potentially impacted by the alternatives considered were identified based on internal scoping as well as comments received during the scoping periods. Inclusion of these categories is discussed in Section 1.7.1 and relevant resources are addressed in the following analysis. Impacts to environmental factors may be classified as positive/beneficial, adverse, or negligible depending on the benefits, losses, or lack thereof due to the proposed alternative. Positive impacts add to or support the existing presence of environmental resources while adverse impacts detract from or hinder the existing environmental resources within the project area. Negligible impacts have little to no effect on the existing environmental resources. Impacts may be further classified as minor, moderate, or major based on their comparative severity, as well as short- or long-term based on the time frame in which the impacts might affect the existing environmental resources. Any significant impacts are also identified and addressed.

The following presents a description of existing conditions and potential environmental consequences for each resource considered in the analysis. Unless otherwise noted, the project area represents the footprint of the project and surrounding uplands that would be cooperatively managed with IDNR (see Figure 2-3).

The Corps recognizes the inherent effects dams have on rivers and subsequent impacts to surface waters, aquatic biota, and ultimately humans. These include conversion of free flowing (lotic) surface waters to a reservoir or non-flowing (lentic) environment. This conversion can lead to changes in water quality, erosion, and accumulation of toxins that affect the aquatic organisms in these systems (McCartney 2009). The following assessment of potential environmental consequences takes these effects into consideration, while also describing potential benefits, thus providing a balanced consideration of impact and benefit potentially resulting from the proposed project.

3.1 AIR QUALITY

3.1.1 Affected Environment

The CAA is the comprehensive law that affects air quality by regulating emissions of air pollutants from stationary sources (such as construction sites) and mobile sources (such as automobiles). It requires the USEPA to establish standards NAAQS for several “criteria” pollutants that are designed to protect the public health and welfare. The criteria pollutants are carbon monoxide (CO), nitrogen dioxide (NO_x), ozone, particulate matter (PM), sulfur dioxide (SO_2), and lead (Pb).

In accordance with the CAA Amendments of 1990, all counties are designated with respect to compliance, or degree of noncompliance, with the NAAQS. These designations are either attainment, nonattainment, or unclassifiable. An area with air quality better than the NAAQS is designated as “attainment;” whereas an area with air quality worse than the NAAQS is designated as “non-attainment.” Non-attainment areas are further classified as extreme, severe, serious, moderate, and marginal. An area may be designated as unclassifiable when there is a lack of data to form a basis of attainment status. New or expanded emissions sources located in areas designated as nonattainment for a pollutant are subject to more stringent air permitting requirements.

Determination of air quality within the project area was based on the Nonattainment Areas for Criteria Pollutants List, also known as the Green Book, which is published by the USEPA (USEPA 2022a). This list of nonattainment areas is organized by State, County, and Area, either in whole or in part.

The Hunter Lake project area, which is located in Sangamon County, Illinois is designated as in attainment for the criteria pollutants (USEPA 2022a).

3.1.2 Environmental Consequences and Mitigation Measures

3.1.2.1 Alternative A – No Action

Under this alternative, the City would not develop additional aquatic recreation area and would maintain its current use of Lake Springfield supplemented by pumping from the South Fork as its sole water supply. There would be no project-related air emissions. Therefore, there would be no impact to air quality.

3.1.2.2 Alternative B – Hunter Lake – Revised Configuration

3.1.2.2.1 Construction Impacts

Onsite and offsite construction activities associated with the creation of Hunter Lake would result in localized and dispersed emissions from the operation of construction equipment driven on paved and unpaved roads as well as fugitive dust suspension from clearing, grading, and other activities.

Emissions from equipment that use diesel or gas as fuel (vehicles, generators, construction equipment, etc.) would generate local emissions of PM, CO, CO_2, NO_x, SO_2 and volatile organic compounds (VOCs), during the site preparation and construction period. Although specific construction equipment has not yet been determined, including sizes, numbers of vehicles, and the hours each piece of equipment would operate, the emissions from these operations would be temporary and localized. Additionally, new emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions. As a result of the equipment maintenance requirements, use of Best Management Practices (BMPs) by construction companies, and continued improvement of emission control measures and fuel blends, emissions related to the combustion of gasoline and diesel fuels by internal combustion engines would be minor and temporary.

Construction activities would generate an increase in fugitive dust (that is, particulate matter that escapes from a construction site from earthmoving and other construction vehicle operation). While merchantable timber within the proposed normal pool control elevation of Hunter would be removed, some localized burning may be required that would contribute to particulate emissions. Burning activities would be performed in accordance with the regulations of Sangamon County. The amount and duration of fugitive dust emissions would be dependent on the quantity and size of the equipment used in addition to the duration of construction. Increases in fugitive dust concentrations would be most noticeable on the construction site and in the immediate vicinity of the project; however, ambient concentrations of particulate matter could increase in off-site areas in the short-term. Ultimately, the use of BMPs (such as covered loads and wet suppression) would minimize these emissions.

Air quality impacts from construction activities would be temporary and would be dependent upon both man-made factors (e.g., intensity of activity, control measures), and natural factors (e.g., wind speed, wind direction, soil moisture). However, even under unusually adverse conditions, these emissions would have, at most, a minor transient impact on offsite air quality and would be well below the applicable air quality standard.

3.1.2.2.2 Operation Impacts

Operation of the proposed Hunter Lake would have minimal adverse effect on air quality. No stationary sources or point source emissions would occur in conjunction with project operations. Maintenance of the earthen dam would require the use of gasoline powered lawn mowing equipment that would produce trace emissions; however, these emissions would have a negligible effect on air quality in the region. Increases in traffic and the subsequent automotive emissions due to these transportation actions are not anticipated. Emissions resulting from increased vehicular traffic associated with recreational use of Hunter Lake would contribute to localized emissions on the roadway network serving Hunter Lake. Additional emissions would result from use of motorized vessels on Hunter Lake for recreational use. Because traffic patterns are expected to be minor (see Section 3.18), the associated emissions are also expected to be a minor change from existing conditions. Thus, emissions would be minor and would have a negligible effect on air quality in the region.

3.2 CLIMATE CHANGE AND GREEN HOUSE GASES (GHGS)

3.2.1 Affected Environment

The USEPA defines climate change as *"any significant change in the measures of climate lasting for an extended period of time."* In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer. These changes are caused by a number of natural factors, including oceanic processes, variations in solar radiation received by Earth, plate tectonics and volcanic eruptions as well as anthropogenic (i.e., human-related) activities (USEPA 2022a).

The Earth's natural warming process is known as the *"greenhouse effect."* The Earth's atmosphere consists of a variety of gases that regulate the Earth's temperature by trapping solar energy. These gases – including water vapor, CO_2, methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and chlorofluorocarbons (CFCs) – are cumulatively referred to as greenhouse gases (GHGs) because they trap heat like glass of a greenhouse. Relying on decades of research, the overwhelming majority of the scientific community agree that anthropogenic activities – including the burning of fossil fuels to produce energy, deforestation, and other industrial activities – have contributed to elevated concentration of GHGs in the atmosphere since the Industrial Revolution. The human production and release of GHGs to the atmosphere have caused an increase in the average global temperature. While the increase in global temperature is known as *"global warming,"* the resulting change in a range of global weather patterns is known as *"global climate change."* (USEPA 2017).

EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, and EO 14008, Tackling the Climate Crisis at Home or Abroad, are two regulations that require federal agencies to confront the climate crisis and build climate resilience within the United States. The leading scientific body on climate change nationally is the U.S. Global Change Research Program (USGCRP), composed of representatives from 13 federal agencies that conduct or use research on global change and its impacts on society. It functions under the direction of the Subcommittee on Global Change Research of the National Science and Technology Council's Committee on Environment. In 2017 and 2018, the USGCRP issued its Climate Science Special Report: Fourth National Climate Assessment (NCA4), Volumes I and II (USGCRP 2017 and 2018).

NCA4 states that climate change has resulted in a wide range of impacts across every region of the country. Those impacts extend beyond atmospheric climate change alone and include changes to water resources, transportation, agriculture, ecosystems, and human health. The U.S. and the world are warming, global sea level is rising and acidifying, and certain weather events are becoming more frequent and more severe. These changes are driven by accumulation of GHGs in the atmosphere through combustion of fossil fuels (i.e., coal, petroleum, and natural gas), combined with agriculture, deforestation, and other natural sources. These impacts have accelerated throughout the end of the 20th and into the 21st century (USGCRP 2018).

NCA4 notes the following observations of environmental impacts are attributed to climate change in the Midwest Region of the U.S. (USGCRP 2018).

- Trends toward warmer, wetter, and more humid conditions provide challenges for agricultural production, increase disease and pest pressure, and reduce crop yields.
- Over the past 30 years, increased rainfall from April to June has been the most impactful climate trend for agriculture in the Midwest, providing a favorable supply of soil moisture while also reducing flexibility for timing of spring planting and increasing soil erosion.
- The last spring frost has occurred earlier, causing the frost-free season to increase by an average of nine days since 1901.
- Daily minimum temperatures have increased in all seasons due to increasing humidity. Warming winters have increased the survival and reproduction of existing insect pests and already are enabling a northward range expansion of new insect pests and crop pathogens into the Midwest.
- Tree growth rates and forest productivity have benefited from longer growing seasons and higher atmospheric carbon dioxide concentrations, but continued benefits are expected only if adequate moisture and nutrients are available to support enhanced growth rates. As growing-season temperatures rise, reduced tree growth or widespread tree mortality is expected as the frequency of drought stress increases from drier air and changing patterns of precipitation.
- Impacts from human activities such as logging, fire suppression, and agricultural expansion have lowered the diversity of the Midwest's forests. Forests with reduced diversity are at an increased risk of negative effects from climate change because the potential for tree species or age classes that are resistant to impacts from biological stressors and climate change is reduced.

Components of the proposed project area that may contribute to or reduce the impacts associated with climate change include the presence of trees and forested areas as well as the human activities associated with the proposed project alternatives. Forested areas are capable of absorbing and storing CO_2 from the atmosphere in a process known as carbon sequestration which can help to reduce levels of CO_2 in the atmosphere. Conversely, the removal of forests may contribute to higher levels of CO_2 in the atmosphere. Project construction activities may also have the ability to produce CO_2 through the use of equipment that burns fossil fuels. Determination of potential climate change impacts from the proposed alternatives were examined as they relate to the removal/addition of forested areas as well as the use of equipment powered by fossil fuels.

Approximately 3,159 acres of deciduous forest and 55 acres of woody wetlands occur within the Hunter Lake project area. For additional information on land cover, see Sections 3.7 and 3.8.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action

Under the No Action Alternative, no supplemental water supply would be provided to augment the existing Springfield water supply system and no additional aquatic recreation areas of at least 2,500 acres would be added. No land would be acquired, no dams would be built, no area would be inundated, and no additional permits or approvals necessary for implementation of the proposed alternative would occur. Therefore, there would be no project-related impact to GHGs and climate change.

3.2.2.2 Alternative B – Hunter Lake – Revised Configuration

Tree removal coupled with the construction of the proposed earthen dam and other associated project features (roadway relocations/bridges, boat access ramps, etc.) would require the use of earthmoving and compacting equipment as well as trucks for hauling materials. These activities would generate CO_2 emissions during active construction periods. Due to the temporary nature of construction activities and the relatively low number of vehicles and construction equipment involved, only minor CO_2 emissions would be anticipated in comparison to the regional and world-wide volumes of CO_2 generated. Therefore, local, and regional GHG levels would not be adversely impacted by the project.

Tree clearing is also expected to be required as part of the proposed construction. The USEPA's quantification tool was used to estimate the carbon sequestration that may be lost from the conversion of forested land (USEPA 2022b). Approximately 1,480 acres of forested lands would require clearing within the proposed inundation area and in areas proposed for boat access construction. Assuming that forest composition and age is typical for central Illinois region, it is estimated that the conversion of these forested lands would result in the loss of approximately 1,214 metric tons of carbon sequestered in one year. The loss of carbon sequestered or stored is small relative to the carbon sequestered in local and regional forested areas. Within the 5-mile radius of Hunter Lake, it is estimated that existing forested lands sequester approximately 10,385 metric tons of carbon per year. By comparison, approximately 3,981,067 metric tons of carbon sequestration occurs annually within the State of Illinois (USFS 2022). Thus, the loss of approximately 1,214 metric tons of carbon sequestration due to construction phase clearing of forests at Hunter Lake is de minimis (approximately 0.03 percent) relative to the state-wide regional carbon sequestration. Additionally, ecosystem restoration measures in conjunction with the revised Hunter Lake alternative would preserve approximately

1,724 acres of forested lands and approximately 1,286 acres of successional lands that will transition to forested lands in the future. Therefore, the loss of carbon sequestration associated with forest clearing would be minimal and would not adversely affect climate change.

The operation of Hunter Lake would not involve measurable emissions of GHGs and therefore would not affect climate change.

3.3 GEOLOGY AND SOILS

Understanding the geology and soils within the project area aids in the judgement of project feasibility as it relates to foundational integrity as well as other closely related topics such as farmland.

3.3.1 Affected Environment

3.3.1.1 Geology

Geology refers to the study of earth’s physical structures and substance, its history, and the processes that alter it. Geologic conditions within the project area may be influenced by factors such as mining, earthquakes, and karst features which are further defined and discussed in the subsections below.

The proposed location of Hunter Lake is in the Springfield Plains Section of the Central Lowland Physiographic Province (Illinois State Geologic Survey [ISGS] 2017a). The Springfield Plain is underlain by glacial material that was deposited by the glacial advances during the Illinoisan stage of the Pleistocene epoch. This glacial drift is thick enough to obscure variations in bedrock topography. Consequently, there is relatively low relief in the project area, except in areas containing creeks and other drainage ways.

The uppermost bedrock in the project area is comprised of Pennsylvanian-aged sedimentary rocks consisting primarily of shales interbedded with limestone, sandstone, and coal. Bedrock is overlain by a relatively thick layer of windblown deposits (loess) which are composed principally of very fine sand and silt. Alluvial (riverine) deposits form branch-like patterns along drainage areas. These deposits are characterized by poorly sorted sand, silt, and clay (Corps 2000). Unconsolidated deposits can range from less than one foot to 300 feet in the area (Bergstrom et al 1976).

3.3.1.1.1 Geologic Hazards

3.3.1.1.1.1 Mining

Coal deposits are found in the Pennsylvanian rocks in this area. Historically, coal was mined extensively in the region, but at present there is only one mine in operation in Sangamon County (ISGS 2022). Oil and gas reserves are found in limestones and shales of Devonian and Silurian age that underlie the Pennsylvanian shales (Bergstrom et al, 1976). Sand and gravel are mined from the alluvial deposits primarily along the Sangamon River.

Extensive underground mining operations across the area occurred from the latter half of the 19th and early 20th centuries (SSCRPC 2016). As such, large areas in the vicinity of Springfield are undermined. Undermined areas have the potential to cause subsidence unless they are properly backfilled or collapsed. However, engineering design measures may be used to mitigate potential subsidence in those areas affected by deep mining. According to the Illinois State Geologic Survey (ISGS), the proposed project area is not located in a region that has been undermined (ISGS 2022).

3.3.1.1.1.2 Earthquake Hazards

Seismic events affecting the central portion of Illinois primarily emanate from two zones of earthquake activity – the New Madrid Seismic Zone of the central Mississippi Valley and the Wabash Valley Seismic Zone located along the border between Illinois and southwestern Indiana. Although the majority of the events emanating from these zones are too small to be felt at the surface, moderate earthquakes have been widely felt in the Wabash Valley Seismic Zone within the last century. In addition, the New Madrid Seismic Zone produced a series of three earthquakes between December 1811 and early February 1812 each exhibiting estimated magnitudes on the order of 7.0 to 8.0 on the Richter scale (USGS 2007 and 2011).

Seismic hazard refers to the consequences of an earthquake that may disrupt the normal activities of people or cause them loss. Most damage from an earthquake is due to ground shaking caused by seismic waves. Seismic hazard maps predict the ground shaking that is expected to be exceeded at a selected probability over a specific time period. Ground shaking is expressed as percentage of “g” (g is the acceleration of a falling object due to gravity). Estimates of this “probabilistic” ground shaking, or hazard, at any given location must account for many factors including the possible shaking from all likely earthquakes and the types of rocks and soil in the region. The 2014 Seismic Hazard Map for Illinois indicates the level of ground shaking that has a two percent chance of being exceeded in a 50-year period. The project region is located in an area with a value of 0.8 to 0.1g where the seismic hazard is considered to be low (USGS 2014).

The USGS website contains information on faults and associated folds in the United States that demonstrate evidence of surface deformation in large earthquakes during the Quaternary Period (the past 1,600,000 years). Liquefaction features (dikes in sedimentary rocks filled with sand and gravel which are considered to be the result of earthquake induced liquefaction) are common throughout much of southern Indiana and Illinois. However, despite the presence of these features, no evidence of significant faulting is noted within the project region on the USGS fault mapper (USGS 2022).

3.3.1.1.1.3 Karst Topography

“Karst” refers to a type of topography that is formed when rocks with a high carbonate (CO_3) content, such as limestone and dolomite, are dissolved by groundwater to form sink holes, caves, springs, and underground drainage systems. Karst topography forms in areas where limestone and dolomite are near the surface. There are five karst regions identified in Illinois. These regions are primarily located along the southern, western, and northwestern borders of the state. The central portion of the state is not included in a karst region (ISGS 2017b). Karst features such as sinkholes and springs are not known to occur within the proposed project area.

3.3.1.2 Soils

Soils within the project area are analyzed by type to determine certain characteristics of the project area such as erodibility or suitability for farmland. Farmlands are typically determined by state or local government agencies based on the importance of the land for the production of food, feed, fiber, forage, or oilseed crops. Farmland can be broken down into prime or unique farmlands. Prime farmlands are those that have the best combination of physical and chemical characteristics for producing crops with minimum inputs of fuel, fertilizer, pesticides, and labor and without intolerable soil erosion. Unique farmlands are those that are used for the production of specific high-value food and fiber crops based on their soil quality, location, growing season, and moisture content using acceptable farming methods.

The 1981 FPPA (7 Code of Federal Regulations [CFR] Section 658) requires all federal agencies to evaluate impacts to prime and unique farmland prior to permanently converting to land use incompatible with agriculture.

Soil types and farmland classification within the project area were determined based on data retrieved from the USGS Web Soil Survey (USDA 2017).

Soils within central Illinois were developed from loess (a wind-blown silt), lakebed sediments, and glacial outwash. The distribution of soils in the project area reflects the nature of the surficial deposits and topographic position. There are 35 general soil types mapped in the Hunter Lake project area. Dominant soil types within the project area are listed in Table 3-1. Prime farmland soils are discussed in the following subsection.

Table 3-1. Dominant Soil Series within Project Area

Soil Series within Each Project Area	Acres	Percent
Hunter Lake	**7983**	
Rozetta silt loam	1556	20%
Radford silt loam	1432	18%
Fayette silt loam	682	9%
Lawson silt loam	645	8%
Osco silt loam	639	8%
Elco silt loam	575	7%
Drury	92	3%
Zook	84	3%

Source: USDA, NRCS

3.3.1.2.1 Prime and Unique Farmland Soils

Prime farmland soils have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. These characteristics allow prime farmland soils to produce the highest yields with minimal expenditure of energy and economic resources. In general, prime farmlands have an adequate and dependable water supply, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. Prime farmland soils are permeable to water and air, not excessively erodible or saturated for extended periods, and are protected from frequent flooding. The State of Illinois also classifies farmland of statewide importance, which is land other than prime farmland or unique farmland but that is also highly productive.

Prime farmland soils within the project area and within a 5-mile radius of the project area are summarized in Table 3-2. A large percentage of soils within the project area and vicinity are classified as prime farmland or farmland of statewide importance. This is consistent with agriculture being the predominant land use in the region.

Table 3-2. Prime Farmland and Farmland of Statewide Importance within the Project Area and Vicinity

Alternative	Project Area		Vicinity (5-mile Radius)	
	Acres	Percent	Acres	Percent
Hunter Lake				
Prime farmland*	5184	65%	104,806	81.%
Farmland of statewide importance	1736	22%	12,744	10%
Total	**6,920**	82.4%	**117,550**	91%

* Includes soils classified as prime farmland if drained, prime farmland if drained and either protected from flooding or not frequently flooded during the growing season, and prime farmland if protected from flooding or not frequently flooded during the growing season
Source: USDA, NRCS

3.3.2 Environmental Consequences

3.3.2.1 Alternative A: No Action Alternative

Under the No Action Alternative, no construction activities would be undertaken. Consequently, no impacts to geological resources or soils would occur and there would be no change from the existing condition.

3.3.2.2 Alternative B – Hunter Lake – Revised Configuration

3.3.2.2.1 Geology

Impacts to geologic resources are limited to the construction phase and are associated with ground disturbing activities needed to construct the proposed earthen dam, reservoir, and recreation access points. These activities are expected to result in relatively shallow site excavations and would have limited effect on geological resources as the bedrock is generally overlain by a thick layer of glacial drift. Any geologic disturbance would occur onsite within the reservoir area, resulting in localized effects to geologic resources which are abundant within the region. Material to construct the earthen dam would come from excavation of the spillways and proposed pool area, and therefore there would be no additional loss of mineral resources.

The proposed reservoir would be located in an area that does not contain karst features or active faults. Final design of the dam and any associated facilities would adhere to applicable dam safety criteria, to include current seismic stability standards, such that risk of seismic failure is low for all project features.

3.3.2.2.2 Soils

Construction of the proposed reservoir would involve ground disturbing activities that would include clearing and grubbing for construction of the dam and spillways, roadway relocations, and utility relocations. In addition, construction access roads and temporary construction laydown and mobilization areas would be needed. All construction related activities have the potential to disturb soil stability and increase erosion and transport offsite. Permanent and temporary erosion and siltation control measures such as those specified in IDOT Standard Specifications for Road and Bridge Construction and the IEPA Standards and Specification or Soil Erosion and Sediment Control would be utilized to minimize erosion and offsite transport of soil.

Appropriate erosion control measures would be used to control erosion and limit sediment/soil from leaving the construction site and therefore, impacts to soil resources would be minor and would primarily occur during the construction phase.

Operations of the reservoir may cause fluctuations in reservoir water levels potentially leading to minor indirect impacts to surrounding soils in the form of erosion to reservoir shorelines. As part of the integrated design features of the revised Hunter Lake alternative, more than 100,000 linear feet of shoreline will be stabilized to reduce shoreline erosion and enhance bank stability.

3.3.2.2.2.1 Prime and Unique Farmland Soils

Under the Hunter Lake Alternative, all the prime farmland and farmland of statewide importance within the inundation area (2,091 acres) would be impacted, which is equal to 26 percent of the soils within the project area and 77 percent of soils within the inundation area (2,699 acres). Due to the extended period of inundation, these soils could no longer be used for farming and would be lost in the long-term. Prime farmland soils within the project area that would be converted to forest or grassland above the inundation level would not be impacted. The loss of lands mapped as prime farmland and farmland of statewide importance and the subsequent loss of potential crop production would constitute a loss of 1.9 percent of these resources within the 5-mile radius vicinity. Therefore, the loss of onsite lands designated as having prime farmland is minor when compared to the amount of land designated as prime farmland or farmland of statewide importance within a 5-mile radius of the project area.

3.4 GROUNDWATER

3.4.1 Affected Environment

Groundwater is water that exists underground in saturated zones beneath the land surface and is considered a type of source water that can provide water to public drinking supplies and private wells. Groundwater can be found within aquifers which are bodies of saturated rock in which water can easily move. Aquifers generally consist of porous and permeable rock types.

The SDWA(40 CFR Section 141), which was initially passed in 1974, allows the USEPA to set national health-based standards for drinking water. Multiple groundwater protection programs are built into the SDWA as many public and private drinking water systems obtain water supplies from groundwater. These groundwater protection programs also include the Sole Source Aquifer Protection Program which aims to protect aquifers that are used as the sole or primary drinking water source in an area.

The presence and characterization of aquifers within the proposed project area in addition to groundwater quality and well productions rates were analyzed using the IEPA Source Water Assessment and Protection Program (SWAP). The SWAP was created as a result of amendments to the SDWA from 1996 which required states to develop and implement a source water assessment program.

3.4.1.1 Aquifer Description

The bedrock aquifer of the Hunter Lake project area is comprised of Pennsylvanian age shale interbedded with limestone, sandstone, and coal. Groundwater is stored in the sandstones, bedding planes, joints, and fractures (Corps 2000). No sole source aquifers or other protections, such as well head protection zones, are located in the project area. See Section 3.5.1.3, Hydrology, for a description of groundwater recharge.

Glacial drift is located above the Pennsylvanian bedrock and is characterized as having a shallow aquifer that is supplied by local precipitation. Private water wells in the area range in depth from approximately 18 to 60 feet below ground surface (bgs) and are typically bored wells (36-inch diameter) to maximize yield. Based on a review of numerous drilling logs from private wells obtained through the IEPA (SWAP), this shallow aquifer is composed of unconsolidated material consisting of a clay layer over a sandy gravel layer which serves at the water bearing unit. A hard pan/hard clay/clay layer typically occurs beneath the sandy gravel stratum.

3.4.1.2 Water Quality

Water quality data is not readily available for shallow private wells of the Hunter Lake project area through the IEPA SWAP Program. Based on the number of private wells in the Hunter Lake project area, it is assumed the water is of usable quality. However, the groundwater in the deep bedrock aquifer (below a depth of 150-200 feet) is too mineralized (i.e., high in salinity) for normal use (Corps 2000).

3.4.1.3 Production Rates

Based on information obtained from the IEPA SWAP Program, yield from the shallow private wells in the proposed Hunter Lake project area ranges from 3 gpm to 12 gpm. The low production rates of this unconsolidated aquifer are well suited for private use but are not sufficient to support community or industrial uses. Statewide, the average potential yield of the shallow sand and gravel aquifers is approximately 2.8 gpm (Wehrmann et al. 2003).

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action

Under the No Action Alternative, no construction activities would be undertaken. Consequently, there would be no impacts to groundwater related to the development of a supplemental water supply source for the City.

3.4.2.2 Alternative B – Hunter Lake – Revised Configuration

The Hunter Lake alternative consists of the development of a surface water supply system and would not directly affect or use groundwater resources. Local wells within the flood zone of the project area would be sealed in place and abandoned to isolate groundwater from surface water resources. Therefore, no changes in the quality of groundwater would be expected from the development of Hunter Lake.

The deeper bedrock aquifer beneath the proposed Hunter Lake is stratigraphically isolated from Hunter Lake and would be minimally influenced by the presence of the lake. The impounding effect on the saturated elevation of Hunter Lake may impact the potentiometric surface of the surficial aquifer because it is supplied by the infiltration of precipitation. Such an effect, however, is expected to be localized and would not impact water quality or production rates of private wells outside of the project area.

3.5 SURFACE WATER

3.5.1 Affected Environment

Surface water resources are composed of rivers, streams, lakes, ponds, and all other waterbodies located above ground. Precipitation and runoff from adjacent land surfaces supply surface water resources with water, whereas evaporation and seepage may contribute to losses within a surface water resource. There are three types of surface water resources including perennial, intermittent, and ephemeral. Perennial resources persist throughout the year and either receive water consistently from upstream waters or are hydraulically connected to groundwater sources which supply them with water when precipitation is low. Intermittent surface water resources may also obtain water from upstream sources or groundwater but are seasonal and may not have flowing water during dry periods of the year. Ephemeral water resources are those that are only flowing after precipitation; runoff is the primary source of water for these resources. Some surface waters may be classified as WOTUS, the definition of which is established by the CWA. WOTUS typically include surface water resources that are currently used or have been used for interstate commerce including those which are subject to the ebb and flow of the tide; all interstate waters including wetlands; all intrastate waters that may be used by interstate travelers or industries for recreation, business, commerce, or other purposes; tributaries of WOTUS; the territorial sea; and wetlands adjacent to WOTUS.

Surface water resources are often used as drinking water sources which means they may be protected by the requirements of the SDWA. In addition to the SDWA, WOTUS are protected by the CWA which regulates discharges of pollutants into surface WOTUS. Water Quality standards for WOTUS are also enforced by the CWA.

Multiple elements of surface water are examined within the subsections below, such as water quality, hydrology, sedimentation, and stability. Online databases such as the National Hydrography Dataset from the USGS as well as field surveys of the project area were used to determine the presence of surface water resources. Water Quality was examined using past water quality reports in addition to the Illinois 303(d) impairment list. Hydrology within the project area was analyzed using USGS streamflow station data and historic streamflow observations, taking into consideration significant anthropogenic discharges to, and diversions from, the streams within the project area.

3.5.1.1 Streams and Other Surface Water Systems

The proposed Hunter Lake reservoir is located in central Illinois southeast of Springfield, IL and north of Pawnee, IL. The reservoir would be within the Horse Creek drainage area— a 131 square mile watershed that drains into the South Fork of the Sangamon River. The South Fork of the Sangamon River is the largest tributary of the Sangamon River, which flows into Illinois River, then the Mississippi River, and eventually empties into the Gulf of Mexico. The Sangamon River drainage area is 1,443 square miles upstream of the confluence with the South Fork and 2,328 square miles downstream of the confluence.

Surface water resources within the Hunter Lake project area were identified during a field survey conducted in 2016 (Amec Foster Wheeler, 2017). A total of 82 streams were delineated within the project area including 33 ephemeral, 27 intermittent, and 22 perennial streams (Amec Foster Wheeler, 2017). Horse Creek and Brush Creek are the two principal, perennial streams that would drain to the proposed Hunter Lake reservoir, whereas the other 80 streams are smaller tributaries of these two streams.

Other surface waters within the Sangamon River watershed include three large reservoirs and some smaller impoundments. The Three large reservoirs include Lake Springfield, Sangchris Lake, and Lake Taylorville. Lake Springfield was constructed from 1931 to 1935 to provide a reliable source of drinking water and cooling water for power generation for the City. Lake Springfield has a surface area of over 4,000 acres, is the largest body of water in the watershed, and is the largest municipally owned waterbody in Illinois (CDM Smith, 2015). Sangchris Lake is a 3,000-acre reservoir that was constructed in 1964 to provide cooling water for a power plant, while Lake Taylorville is a water supply lake. Both Lake Springfield and Sangchris Lake are comparable in size to the proposed Hunter Lake reservoir.

Several small impoundments, predominately farm or stock ponds, are located within the project area and are scattered throughout the watershed. Small impoundments are unlikely to have a significant effect on the overall hydrology and water quality of the proposed Hunter Lake project area or the watershed.

Land use in the Horse Creek watershed is primarily agricultural, which is characteristic of central Illinois (see Section 3.15). Streams in this watershed are low gradient streams with poorly developed riffle-pool complexes. Erosion and sedimentation have reduced instream-habitat quality and quantity. Substrate types in these streams are dominated by silt, with significant sand and claypan (Price et al., 2012). Discussion of IDNR integrity ratings for both Brush and Horse Creeks can be found in Section 3.10.

3.5.1.2 Water Quality

Under the CWA, each state develops a list of impaired and threatened waters to be included in the state's 303(d) list. Impaired waterbodies within the Hunter Lake project area are listed in Table 3-3. The upper reach of Brush Creek is on the 303(d)-list due to issues with DO levels; and the entirety of Horse Creek is listed due to issues with DO levels and excess siltation/sedimentation (IEPA 2016). Agricultural runoff and municipal waste have contributed to these listings and the impairments indicate affects to aquatic life as well (see Section 3-10). Three point-source discharges exist in the Horse Creek watershed including: Virden East sewage treatment plant, Pawnee wastewater treatment facility, and Divernon wastewater treatment facility. The South Fork of the Sangamon is listed on the 303(d) list for a number of aquatic life reasons (e.g., phosphorus, sedimentation, total suspended solids) and has a fish consumption advisory due to elevated chlordane levels.

Table 3-3. 303(d) Listed Waterbodies in the Hunter Lake Project Area

Water Name	Assessment ID	Designated Use	Cause
Brush Creek	IL_EOCA-02	Aquatic Life	Oxygen, Dissolved
Brush Creek	IL_EOCA-04	Aquatic Life	Oxygen, Dissolved
Horse Creek	IL_EOC-02	Aquatic Life	Oxygen, Dissolved
Horse Creek	IL_EOC-02	Aquatic Life	Sedimentation/Siltation
South Fork Sangamon River	IL_EO-01	Aquatic Life	pH
South Fork Sangamon River	IL_EO-01	Aquatic Life	Phosphorus (Total)
South Fork Sangamon River	IL_EO-01	Fish Consumption	Chlordane
South Fork Sangamon River	IL_EO-02	Aquatic Life	Iron
South Fork Sangamon River	IL_EO-02	Aquatic Life	Oxygen, Dissolved
South Fork Sangamon River	IL_EO-02	Aquatic Life	Phosphorus (Total)
South Fork Sangamon River	IL_EO-02	Aquatic Life	Sedimentation/Siltation
South Fork Sangamon River	IL_EO-02	Aquatic Life	Total Suspended Solids (TSS)
South Fork Sangamon River	IL_EO-02	Fish Consumption	Chlordane
South Fork Sangamon River	IL_EO-04	Fish Consumption	Chlordane
South Fork Sangamon River	IL_EO-05	Aquatic Life	Oxygen, Dissolved
South Fork Sangamon River	IL_EO-05	Aquatic Life	Phosphorus (Total)
South Fork Sangamon River	IL_EO-05	Aquatic Life	Sedimentation/Siltation
South Fork Sangamon River	IL_EO-05	Aquatic Life	Total Suspended Solids (TSS)
South Fork Sangamon River	IL_EO-05	Fish Consumption	Chlordane
South Fork Sangamon River	IL_EO-13	Fish Consumption	Chlordane
Sangchris Lake	IL_REB	Aesthetic Quality	Phosphorus (Total)
Sangchris Lake	IL_REB	Aesthetic Quality	Total Suspended Solids (TSS)
Sangchris Lake	IL_REB	Fish Consumption	Mercury
Lake Springfield	IL_REF	Aesthetic Quality	Phosphorus (Total)
Lake Springfield	IL_REF	Aesthetic Quality	Total Suspended Solids (TSS)
Lake Springfield	IL_REF	Aquatic Life	Oxygen, Dissolved
Lake Springfield	IL_REF	Aquatic Life	Phosphorus (Total)
Lake Taylorville	IL_REC	Aquatic Life	pH
Lake Taylorville	IL_REC	Aquatic Life	Turbidity
Lake Taylorville	IL_REC	Fish Consumption	Chlordane
Lake Taylorville	IL_REC	Fish Consumption	Mercury

Source: IEPA 2016

Based upon prior meetings and discussions with the IEPA regarding antidegradation permitting pursuant to the issuance of a Water Quality Certification as set forth in Section 401 of the CWA, phosphorus is one of the key water quality parameters of concern for any new public water supply reservoir. Total phosphorous levels in Illinois lakes are routinely elevated above the water quality standard of 0.05 mg/L. Lake Springfield, Sangchris Lake, and Lake Taylorville are all on the 303(d)-list due to high phosphorus loads, among other causes (Table 3-3). Agricultural land use throughout Illinois adds unnatural amounts of sediments laden with nutrients into these reservoirs each year. Phosphorus is often a limiting nutrient in freshwater environments (Allan and Castillo 2007) and an excess can contribute to harmful algal and bacterial blooms which can be toxic to fish and humans. Once these blooms die, they can reduce the DO in the water as they decompose. Excessive depression of DO within these environments may result in fish kills. The IEPA has water-quality standards for total phosphorus of 0.05 mg/L to reduce the likelihood of harmful algal blooms. However, other reservoirs, including Lake Springfield and Lake Taylorville, have historically exceeded this water-quality standard (Table 3-4).

Table 3-4. Comparative Phosphorous Levels of Other Regional Waterbodies

Lake	Year	Total Phosphorus mg/L (Average)
Lake Springfield	1986-2011	0.24
Lake Taylorville	1990-2000	0.19
Lake Decatur	1990-2003	0.18
Mauvaise Terre Lake	1990-2002	0.16
Lake Bloomington	1977-2003	0.06
Lake Lou Yaeger	2008, 2012	0.25

Source: IEPA personal communication 2017

Water quality data have been collected from the Horse Creek watershed since 1997 and an intensive 1-year sampling program was initiated by Northwater Consulting in April 2016 (Northwater 2017). Total phosphorus concentrations in Horse and Brush Creek routinely exceed the state water quality standard. Between 1997 and 2017, ninety-four measurements of total phosphorus were recorded; ninety-three samples (99%) exceeded the 0.05 mg/L standard. During the 2016 to 2017 monitoring, all measurements of total phosphorus were above the standard and averaged 0.39 mg/L. During the 1997 to 2017 period, the average recorded total nitrogen was 7.13 mg/L, which is below the drinking water standard of 10 mg/L for total nitrogen. The highest total suspended solids (TSS) levels are typically observed in the spring and are associated with storm events and runoff. The average annual TSS concentration from 1997 and 2017 was 179 mg/L. Illinois's DO standard is no less than 5.0 mg/L—a threshold intended to support natural ecological functions and resident aquatic communities. During the 2016 to 2017 monitoring, average DO levels for the watershed dipped below the standard only once in Horse Creek. However, previous sampling reported multiple instances of DO below 5 mg/L, typically during the late summer when flow rates are low and the water is warm.

Direct surface runoff and erosion contribute the most to sediment and nutrient loading into the Horse Creek watershed. Based on the monitoring data, under average annual conditions, total annual nitrogen loading is estimated at 1,282,394 lbs/yr, total phosphorus at 101,097 lbs/yr, and total sediment at 97,676 tons/yr (Table 3-5) (Northwater 2017). Erosion is the largest contributor of loading into the system. Direct runoff is responsible for 90% of the total nitrogen load, 66% of the phosphorus load, and 69% of the sediment load. Streambank and gully erosion combined contributes to 2% of the nitrogen load, 3.5% of the phosphorus load, and 6.4% of the sediment load (CMT et al., 2017).

3.5.1.3 Hydrology

Several USGS streamflow stations, including those on Horse Creek and Brush Creek, provide historic runoff data for streams in the region (Table 3-6). Based on the streamflow stations located within the watershed, average long-term runoff ranges from approximately 0.7 to 0.8 cfs per square mile, or 9.5 to 10.9 inches per year (Table 3-6).

Table 3-5. Nutrient and Sediment Loading Summary in Horse Creek Watershed

Source	Total Nitrogen (lbs/yr)	Total Phosphorus (lbs/yr)	Total Sediment (tons/yr)
Direct Runoff	1,148,720	66,354	67,843
Streambank Erosion	13,570	2,388	3,262
WWTP	8,059	2,356	11.36
Gully Erosion	12,682	1,320	3,048
Septic Systems	1,553	608	0
Lake Shoreline	97,810	28,071	23,512
Total	**1,282,394**	**101,097**	**97,676**

Source: Northwater 2017

Table 3-6. Regional USGS Long-term Streamflow Stations

Station ID	Station Name	Drainage Area Sq mi	Years of Record	Mean Flow	
				cfs	cfs/sq mi
5575500	South Fork Sangamon River at Kincaid, IL	562	31.6	408.	0.73
5575800	Horse Creek at Pawnee, IL	52.2	18.0	45.4	0.87
5575830	Brush Creek near Divernon, IL	32.4	9.3	23.2	0.72
5576000	South Fork Sangamon River near Rochester, IL	867	68.6	622.	0.72
5576250	Sugar Creek near Springfield, IL	274	8.4	205.	0.75
5577500	Spring Creek at Springfield, IL	107	70.0	86.2	0.81
5586800	Otter Creek near Palmyra, IL	61.1	21.0	38.7	0.63
5587000	Macoupin Creek near Kane, IL	868	90.6	625.	0.72

Stream hydrology within the project area is dominated by precipitation and stormwater runoff from within the watershed rather than by groundwater discharge or a high-water table. Consequently, streamflow in the system is highly variable. The 7Q10 in South Fork below the Horse Creek junction and in Horse Creek is zero, while it is 2.0 cfs in South Fork above the South Fork channel dam (ISWS 2002). The method of estimating low flows considered both historic streamflow observations and significant anthropogenic discharges to, and diversions from, the streams. Data for South Fork at the channel dam, adjusted for historic flow inputs and diversions that affected flow records (referred to as “virgin flow”), are presented in Table 3-7. The estimates are average flow for the given duration. Horse Creek flows are estimated to be zero except for high frequencies (e.g., 2-year) and long durations.

Table 3-7. South Fork Sangamon River at Channel Dam (River Mile 7.4) Low Flow Frequency

Duration	Average Flow (cfs) for Given Return Period			
	2-Year	10-Year	25-Year	50-Year
1-day	3.6	0.0	0.0	0.0
7-day	7	0.13	0.0	0.0
15-day	9.4	0.4	0.0	0.0
31-day	14	0.7	0.2	0.0
61-day	22	2.4	0.9	0.5
91-day	39	5.3	2.3	1.2
6-month	NA	11	5.2	3.4
9-month	NA	30	18	13
12-month	NA	115	40	19
18-month	NA	160	66	32
30-month	NA	290	130	60
54-month	NA	520	200	120

Note: Data are “virgin” condition flow from Knapp et al (1985).

Droughts can be difficult to characterize due to the long durations spanning seasonal and annual variations of the several related climatic and hydrologic parameters. Additionally, different hydrologic systems such as the Sugar Creek - Lake Springfield system respond differently to different drought durations. Investigations to estimate the reliable water supply yield from Lake Springfield have been performed, including Fitzpatrick and Knapp (1991), Knapp (1998), and Roadcap et al. (2011). Significant drought periods have occurred in the central Illinois region over the past century, including 1954 – 1956, 1963 – 1965, and 1987 – 1989 during which streamflow and other hydrologic data are available. Knapp (1998) also identifies significant droughts in earlier years when less data is available, including droughts during 1893 – 1895 and 1931. Knapp (1998) determined that the critical duration drought for Lake Springfield is approximately 18 months.

For surface water systems, the relationship between evaporation and precipitation is important in determining drought durations. The average annual shallow lake evaporation in the central Illinois region is approximately 39 inches (Farnsworth 1982), while Roberts and Stall (1967) estimate that average lake evaporation at Springfield is 35.7 inches per year. The average precipitation in the Springfield area in past years has been approximately 34.4 inches. Therefore, over the long term, lake evaporation and precipitation are of similar amounts, while precipitation is more variable over periods of up to several years. For example, the measured calendar-year precipitation amounts at Springfield during the severe 1953 – 1954 drought years were 24.0 and 26.7 inches, totaling 18.7 inches below normal.

Evapotranspiration is the moisture returned to the atmosphere through evaporation and plant transpiration. Neglecting groundwater recharge, most of which ends up as streamflow over the long-term, evapotranspiration is approximately equal to the difference between precipitation and surface runoff. Consequently, average evapotranspiration in the region is approximately 23.5 inches per year. Sanford and Selnick (2013) estimated a regional average actual evapotranspiration of approximately 25 inches during the period from 1971 – 2000. Kelly et al. (2016) investigated anthropogenic impacts on watershed runoff patterns in the Midwestern United States, including the Illinois River Basin. They estimated an average actual evapotranspiration rate of approximately 27.5 inches per year for the Illinois River Basin.

Land cover can have a significant influence on hydrology of a watershed, including runoff and evapotranspiration depths and patterns. Currently, the region is largely row crop agriculture and urban development with lesser fractions of pasture and woodlands. With recent interests in prairie restoration, biomass energy crops, and climate change, research has begun with a focus on evapotranspiration with varying land cover and climate. Hamilton et al (2015) observed relatively small differences between perennial systems (native grasses) and corn. This appears to have some disparity with general observations indicating increases in runoff due to conversion of prairies to row crop agriculture. The difference may be due to observations during growing periods for crops, discounting the winter through early spring period of fallow fields, tilling, and early crop development during which precipitation and runoff can be relatively high compared to the annual average as well as changes to groundwater recharge.

Groundwater recharge in the upland areas including most of the Lake Springfield watershed, and neighboring watersheds including Horse Creek, is relatively limited due to the geology. This is consistent with the overall water budget outflows being dominated by streamflow (9.5 - 10.9 inches per year) and evapotranspiration (23 - 25 inches per year), leaving only a small potential groundwater recharge component for those watershed areas given the 34 inches per year precipitation. Prairies are able to influence maximum runoff rates more significantly than row crop agriculture land cover by temporarily storing water on the ground surface and shallow soil and releasing it more slowly. The net effect of tile drainage of agricultural land is complex and depends on the watershed soils and other factors. However, it is the general perception that artificial drainage tends to increase peak flows, average flows, and baseflow (Kelly et al, 2016).

3.5.1.4 Sediment Loads, Sedimentation and Stream Stability

Lake Springfield has lost storage capacity over time due to sedimentation. A large dredging project to restore capacity was completed in the 1980s. Sediment surveys by the ISWS have documented the sedimentation rate at various times. The average storage volume loss from 1934 to 1984 was 154 acre-feet per year, or 0.26% per year (Fitzpatrick et al. 1985). The rate of sediment mass accumulation over the same period is 130,000 tons per year, equivalent to 0.79 tons per acre per year from the watershed. The trap efficiency, defined as the percentage of inflowing sediment captured by Lake Springfield, was estimated to be 95%. Compared to eight other large reservoirs in Illinois, the rate of storage volume loss in Lake Springfield has been relatively low.

Lake Springfield captures sediment transported to the lake from tributary streams which reduces the rate of sediment discharge from the lake. The sediment load carried by Horse Creek would be expected to be similar to the adjacent Sugar Creek watershed, depending upon land cover differences and water management practices implemented.

Horse Creek streambed sediment was sampled, and grain size distribution reported by CMT et al. (2017). TSS was sampled 21 times from April 2016 through May 2017. The sediment versus discharge relationship from the 21 samples produces a regression equation relating flow to TSS concentration [TSS (mg/L) = $0.9846\ Q^{0.9852}$] where Q is the instantaneous flow (cfs) at the sample time. Applying that relationship to the 18-year long Horse Creek mean daily flow record (observed flows transferred to the location of sampling station SW5) yields an estimate of suspended sediment load of 89,900 tons per year, or 1.1 tons per acre per year.

The creek sediment gradation at sample station SW5 was 19.3% clay, 78.4% silt, and 2.3% sand. The median grain size was approximately 0.015 mm, and the maximum grain size was 4.75 mm. Given the sediment grain sizes, the Horse Creek bed load transport fraction would be expected to be relatively small, probably less than 5% of the suspended load.

Bhowmik et al. (1986) developed regression equations to estimate suspended sediment loads in Illinois streams. Applying Horse Creek observed flow data to the regression equations produces loads of 30,900 tons per year (0.37 tons per acre per year). The load estimate from Horse Creek sampling, while producing an estimated annual sediment load that is nearly three times larger, is well within the range of estimates from Illinois stream stations with suspended sediment load data.

The lower end of Horse Creek is an area of hydraulic and sedimentation complexity because of significant backwater potential due to coincident high flow in South Fork at the junction and not a representative free flowing stream reach. The channel dam gate is generally not raised during high runoff events that transport most of the sediment load. If the gate were raised during a runoff event, it could cause increased sediment deposition in the backwater inundated floodplain area.

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action

Under the No Action Alternative, no construction activities would be undertaken by the City for supplemental water supply or aquatic recreation at Hunter Lake. Therefore, no changes from the existing condition to surface waters or water quality would occur. As such, Horse and Brush creeks would remain low quality, incised streams that would continue to contribute large amounts of sediments and nutrients to downstream receiving waters of the Sangamon and Illinois rivers. Additionally, no changes to existing hydrology conditions would occur other than natural variations and trends in climate and changes in Lake Springfield storage capacity resulting from sedimentation. Anthropogenic influences include changes in water supply withdrawal over time as water demand increases, which may change discharges from Lake Springfield and withdrawal from South Fork.

3.5.2.2 Alternative B – Hunter Lake – Revised Configuration

The effects of dams on rivers can affect both upstream and downstream reaches as the natural flow and drainage of the land is altered. For example, the natural sediment load carried by the waters of the previously free-flowing river is altered as the sediment-laden upstream waters flow into the impoundment behind the dam and suspended sediments drop out and form thick layers of silt at the bottom of the impoundment. When relatively sediment-free water is released through the dam a sediment load is picked up as it moves downstream, potentially leading to increased erosion of the riverbanks and streambed downstream from the dam. Additional effects are related to interruption of the natural flow of rivers and streams and additional water quality impacts. The proposed Hunter Lake includes design features that address these issues. These features and the avoidance and minimization of these effects is provided in the following subsections.

3.5.2.2.1 Streams and Other Surface Water Systems

The proposed 2,649-acre reservoir would hold approximately 12.2 billion gallons of water with maximum and average depths being 42.7 feet and 14.2 feet, respectively. This alternative would result in the permanent loss of approximately 45 miles of streams which was calculated based on the delineated lengths and approximate widths of the streams within the project area. However, most streams in the project area are functionally impaired and of low quality (see Section 3.10). Integrated within the project design—apart from any mitigative measures—are BMPs that will enhance surface waters and water quality (see Section 3.5.2.2.2). Total low-quality stream habitat lost under the Hunter Lake alternative is estimated to be 76.1 acres. In contrast, approximately 2,649 acres of lake habitat will be created that would markedly expand the available surface water resource and provide lacustrine habitat for aquatic and semi-aquatic biota. Therefore, an overall net gain of 2,573 acres of surface waters will occur under this alternative.

The Corps districts in Illinois and partner agencies developed the Illinois Stream Mitigation Guidance Version 1.0 in 2010 which was designed to address typical stream impacts and mitigation under CWA Section 404 permit applications and to provide information for Section 401 state water quality certifications. This guidance was developed in cooperation with State and Federal agencies responsible for stream management in Illinois with the goal of “no net loss” of resources. Qualitative and quantitative factors were used to characterize, rank, and calculate the stream impacts as a result of the proposed Hunter Lake project (Amec Foster Wheeler 2017). Total stream mitigation credits needed following creation of the proposed Hunter Lake project are estimated at 2,436,019 credits (Table 3-8). This total includes debits related to road relocation (12,575 credits), dam construction (2,175 credits), integrated design structures (204 credits), and impoundment of the streams by Hunter Lake (2,421,068 credits). For proposed compensatory stream mitigation, the Corps have agreed to consider stream mitigation proposals within the HUC 8 (07130007 – South Fork Sangamon) watershed and the immediately adjacent HUC 8 watersheds (07130006 - Upper Sangamon, 07130008 - Lower Sangamon, 07130011 - Lower Illinois, and 07130012 - Macoupin). However, as the proposed stream mitigation changes from the HUC 8 in which the project is located to adjoining HUC 8 watershed areas, the mitigation factor of 0.5 would be applied.

Table 3-8. Hunter Lake Project Stream Mitigation

Impact Area	Credits Needed
Hunter Lake Impoundment:	2,421,068
Road Relocation:	12,575
Hunter Lake Dam:	2,175
Integrated Design Structures	204
Project Subtotal:	**2,436,019**

Under this alternative, unavoidable losses to streams would be compensated for through various measures that may include, but would not be limited to, the following:

- Establishment of riparian buffers along tributary streams.
- Creating floodplains adjacent to streams with appropriately low width/depth ratios at bankfull discharge and native vegetation.
- Removing structures (low head dams, levees, dikes etc.) from the stream channel or its 100-year floodplain that fragment aquatic habitat and/or interfere with natural hydro- logic functions (e.g., flooding, recharge, connectivity to floodplain etc.).
- Restoring stream channels to their former location *or* restoring sinuosity, channel dimensions (width/depth ratio), and bankfull widths of a degraded steam reach to appropriate design based on reference reach or other appropriate standards.
- Building a new, stable channel at higher elevation and connecting it to its natural floodplain.
- Creating or reconnecting floodplains adjacent to streams artificially disconnected from their floodplain.
- Reconnecting artificially cut off or abandoned oxbows, side channels, or meanders where functionally appropriate.
- Construction of pools, riffles, and runs in an existing channel.
- Stream restoration methods utilizing rock or riprap materials to modify flow characteristics and enhance channel stability or aquatic habitat. This includes bendway weirs, stream barbs, Newbury weirs, constructed riffles, etc., but *not* rock armoring of streambanks alone.
- Most streambank stabilization projects which employ bioengineering (i.e., vegetative) techniques to restore bank stability in actively eroding areas. Includes re-shaping banks *if* native vegetation is successfully planted following construction.

Overall, direct stream impacts from this alternative are considered to be permanent and long term. However, losses of stream systems would be replaced in the long term by substantially greater acreages of open water areas that are considered to be jurisdictional WOTUS which would provide expanded habitat for aquatic and semi-aquatic biota as well as future recreational opportunities. Unavoidable adverse impacts to streams would be mitigated by replacement and compensation as per Corps mitigation requirements.

3.5.2.2.2 Water Quality

Under Alterative B, Hunter Lake would be formed by the impoundment of Horse Creek, a tributary to the South Fork Sangamon River, and Brush Creek. Localized impacts in water quality may be expected during the construction phase of the Hunter Lake dam and roadways. However, short-term BMPs related to construction will be implemented to reduce or eliminate erosion. Overall, these impacts are considered temporary and minor.

In general, the construction of dams has been known to cause adverse impacts to water quality, primarily due to alterations in the natural flow and drainage of the land which can alter the natural sediment load carried by the waters of previously free-flowing rivers. The sediment in water upstream of the reservoir can get trapped in the reservoir as it settles to the bottom of the impoundment. In addition to influencing water quality in the reservoir, trapped sediment may also bury habitat where fish spawn. Dams may also trap other natural debris such as logs and gravel that would provide fish habitat downstream of the dam. Additionally, when water is released from the dam, it can pick up sediment as it moves downstream of the dam, leading to increased erosion of the riverbanks and streambed downstream of the dam. Slow moving or still reservoirs can heat up, resulting in abnormal temperature fluctuations which can affect sensitive species. Temperature fluctuations and nutrients can also lead to algal blooms and decreased oxygen levels. The fragmentation of watercourses caused by dams can adversely affect riverine ecosystems as the natural flow of rivers are interrupted. Plant and animal populations can be thrown out of balance if invasive species move into the area and disrupt riparian habitats.

Under this alternative, the City has included significant design elements that are integrated in the overall project to optimize water quality and enhance environmental characteristics of the project area and downstream areas. Extensive watershed pollutant loading analyses and modeling of water quality within the receiving streams were conducted to evaluate nutrient loading from the watershed and develop a suite of integrated design features that could be considered BMPs that are both feasible and effective (CMT et al. 2017). Key objectives in the development and selection of these features for the Hunter Lake alternative were focused on their efficiency in reducing and controlling phosphorous, nitrogen, and sediment loading to Hunter Lake (CMT et al. 2017).

Figure 2-12 identifies the location of many of the BMPs (integrated water quality design features) including:

- In-lake control structures (five in-lake dams)
- Treatment train features (36 features including stormwater detention basins, dry basins, and wet basins)
- Wetlands (up to 18 additional acres)
- Water and sediment control basins
- Grade control
- Terraces
- Grassed waterways
- Permanent cover (including establishment of more than 2,000 acres of tallgrass prairie and grasslands, forested areas, and successional habitats
- Shoreline stabilization (up to 220,000 feet of shoreline)

Major elements to the Hunter Lake integrated water quality design features strategy are the secondary in-lake sediment and nutrient control basins. These low-head dams are designed to capture substantial amounts of nutrient-laden sediment carried by surface-water runoff. Five secondary in-lake dams have been strategically selected for installation at inflow locations of the largest drainage areas into Hunter Lake. Separate upstream underwater berms are associated with these in-lake dams on Horse and Brush creeks to slow the incoming sediment-laden water through a series of pools prior to reaching the secondary in-lake dams. As designed, captured sediment will be removed from each of these features on a 15-year basis to permanently remove nutrients from the environment and enhance their long-term efficiency.

Other secondary treatment train features are included in the design as well (Table 3-9). Treatment train features are constructed in series to enhance overall effectiveness. For example, stormwater detention basins (wet and dry) will be used to control flood flows and reduce nutrients and sediments from reaching Hunter Lake. Wetlands associated with several ponds will be used for their natural nutrient retention and removal effects. Grade control structures will also be used to prevent further incision in tributary drainages.

The City is also proposing to replace cultivated fields in the project area with native prairie and other grasslands to improve habitat and control runoff and nutrient loading. Additional BMPs will be implemented as part of the stream mitigation plan through cooperative agreements with landowners in other areas of the watershed to further reduce nutrient loading (Table 3-9). Finally, up to 220,000 feet of Hunter Lake shoreline will be stabilized with riprap to buffer the effects of wave action and reduce long-term erosion of shoreline soils.

Table 3-9. Nutrient Load Reductions for Proposed Integrated Water Quality Design Features and BMPs

BMP Type	Quantity	Nitrogen Load Reduction (lbs/yr)	Phosphorus Load Reduction (lbs/yr)	Sediment Load Reduction (tons/yr)
In-lake/Low Flow dam	2	398,493	27,644	27,584
Pond/Basin	2	16,546	1,060	1,266
Wetland	4	18,584	947	1,751
Grade Control	1 (location)	1,290	89	310
Prairie/Crop Conversion	2,043 (ac)	41,742	2,798	4,446
Lake Bank Stabilization	220,000 (ft)	96,777	28,000	23,264
Total		**573,432**	**60,538**	**58,621**

Source: Northwater 2017

Benefits of these integrated design features are substantial (Tables 3-9 and 3-10). Total annual load reductions from all CWLP BMPs are estimated at 573,432 pounds for total nitrogen, 60,538 pounds for total phosphorus, and 58,621 tons of sediment. This will result in a 45% reduction in annual and storm-event nitrogen loads and a 60% reduction in annual and storm-event phosphorus and sediment loads (Table 3-9).

Table 3-10. Total Load Reduction with CWLP BMPs

	Nitrogen Load (lbs/yr)	Phosphorus Load (lbs/yr)	Sediment Load (tons/yr)
Nutrient Loading to Hunter Lake	1,282,394	101,097	97,676
BMP Reductions on CWPL Property	-573,432	-60,538	-58,621
Total	**708,962**	**40,559**	**97,676**
Percent Change	**-45%**	**-60%**	**-60%**

Source: Northwater 2017

Of all the integrated water quality design features and BMPs, in-lake dams would have the greatest reductions in nutrients and sediments (Table 3-10). Nitrogen would be reduced by roughly 31%, phosphorus by 27%, and sediments by 28% with only this feature (Northwater 2017). Lake stabilization would also provide substantial reductions to phosphorus at 28% and sediments at 24%, however, lake stabilization would be less effective for nitrogen reductions at only 8% (Northwater 2017). All integrated water quality design features and BMPs provide direct "in-project area" benefits including the enhancement of water quality within the open water zones of Hunter Lake.

The effectiveness of the integrated design features would not be limited to Hunter Lake as reductions of nutrients would benefit not only the Sangamon River, Illinois River, and Mississippi River, but also extend all the way to the Gulf of Mexico. Such water quality enhancements are consistent with the goal of the Nutrient Loss Reduction Strategy for the State of Illinois to align with USEPA's 2008 Gulf Hypoxia Action Plan which calls for each of the 12 states in the Mississippi River Basin to produce a plan to reduce the amount of phosphorus and nitrogen carried in rivers throughout the states and to the Gulf of Mexico (IEPA 2). Analysis shows that from 2001–2005, the Ohio/Tennessee and Upper Mississippi River Sub-basins were the greatest contributors of phosphorus loads to the Gulf of Mexico as well, contributing 38% and 26%, respectively (USEPA, 2008). Given the magnitude of committed project features that are integrated in the overall design of the revised Hunter Lake alternative, the benefits to the water quality of downstream receiving waters are considered unique in their scope and substantial in their effect.

In summary, proposed Hunter Lake and its associated integrated project features would provide notable benefits to downstream areas in terms of sediment and nutrient retention. Such benefits would extend to downstream receiving waters of the Sangamon and Illinois rivers and contribute to meeting the goals of the Nutrient Loss Reduction Strategy for the State of Illinois to align with USEPA's 2008 Gulf Hypoxia Action Plan. Unavoidable adverse impacts to streams would be mitigated by replacement and compensation as per Corps mitigation requirements.

Operational impacts to water quality associated with recreational use of the proposed Hunter Lake would be limited to accidental spills of oil and petroleum products from motorized vessels on the lake. Such occurrences would be isolated incidents resulting in minor spills that would not have long-term effects to water quality within the reservoir or downstream water bodies. The City's planned recreational amenities do not include refueling or on-water maintenance facilities for motorized vessels.

3.5.2.2.3 Hydrology

Stream hydrology within the project area is dominated by direct precipitation and storm-water runoff from within the watershed rather than by groundwater discharge or a high water table. Consequently, streamflow in the system is highly variable. During initial filling of Hunter Lake there would be a temporary reduction in streamflow in Horse Creek, downstream of the proposed Hunter Lake dam. Assuming a minimum release of 2 cfs is maintained during filling, and long-term average annual flow occurs in Horse Creek, it would take approximately 6 months to fill the reservoir. Seasonal flow patterns would produce a more rapid filling of the reservoir during spring months than would occur during low flow months of late summer through fall. Weather and streamflow conditions during the specific filling period may significantly influence the actual filling time period.

Sediment load and impacts to stream erosion during construction will be managed by BMPs for construction activities, including structural and non-structural practices. Effective project-specific measures such as temporary diversion of Horse Creek are important considerations due to potential for flood flows during an extended construction period. However, some sediment load reduction may also occur due to reduced crop tillage due to prairie restoration.

Surface water hydrology impacts due to the construction and operation of the reservoir would occur to Horse Creek from the upstream end of Hunter Lake to the South Fork Sangamon River, downstream of the channel dam, as well as to Brush Creek from the upstream end of Hunter Lake to the confluence of Brush Creek with Horse Creek. Discharges from Hunter Lake to Horse Creek downstream of the dam would depend on reservoir water levels, water storage needs, and evaporation losses, with the outlet gates being operated only for brief periods of time during maintenance or emergencies. When the Hunter Lake water level is below the outlet spillway crest, the discharge to Horse Creek would be limited to a low flow minimum release of 2 cfs. This constant, low flow release rate may vary from the inconsistent or intermittent streamflow experienced by Horse Creek prior to the installation of Hunter Lake. When the Hunter Lake water level is normal and located at the spillway crest, the discharge downstream of the channel dam during a runoff event would be controlled by the design of the spillway and quantity of temporary storage available above the spillway crest. Assuming a large spillway capacity to maintain a limited flood rise in the lake, the impact on high flows would be small. The temporary storage in Hunter Lake may affect the timing of the peak discharge from Hunter Lake, which may alter the peak flow in South Fork downstream of the confluence with Horse Creek. This would result in an incremental increase in peak discharge or an incremental decrease, depending on conditions associated with temporal and geographical variations of individual storm events. The Sangchris Lake spillway is also a fixed crest spillway without operable control over the discharge into the South Fork. The maximum allowable lake level fluctuation above normal is limited by flood sensitive conditions upstream of the lake, and the spillway must be designed to avoid increases in flood elevations in those upstream stream reaches due to lake backwater.

Due to the significant difference in surface area between the existing Horse Creek and Brush Creeks with the proposed Hunter Lake, an increase in evaporative losses compared to those associated with Horse Creek and Brush Creek can be expected with the construction of Hunter Lake. The average loss is the difference between open water evaporation and evapotranspiration, which would average approximately 12 inches per year. Additionally, there would be an increase in the surface area available to collect stormwater runoff with the construction of Hunter Lake, as opposed to the runoff generated from the land surface that would exist if the lake were not present. That increase would average approximately 25 inches per year, resulting in a net long-term average increase in runoff from the lake surface area of approximately 13 inches per year. This increase in discharge volume occurs as a result of the increased surface area of Hunter Lake paired with precipitation events. Changes to existing runoff response depends on the final details of the Hunter Lake spillway design. This increase in available stormwater flow does not reflect quantities of water diverted from Hunter Lake for water supply and any increase in groundwater recharge resulting from the increased percolation head created by the lake.

In addition to construction of Hunter Lake, the proposed Hunter Lake alternative includes conversion of land use from row crop agriculture to grass prairie, and construction of BMPs in the watershed for water quality management. BMPs will impact hydrology by reducing runoff and increasing evapotranspiration. The conversion of row crop agriculture to grass prairie will cause a decrease in initial surface runoff. This decrease in runoff is due to the increase in vegetation density associated with prairie land cover as opposed to the more dispersed placement of agricultural row crops, soil compaction due to tilling, and a more sustained baseflow. Annual evapotranspiration may increase slightly because the growth of grass prairie will not be hindered by tilling or harvesting, unlike agricultural row crops, allowing more time for evapotranspiration to occur each year.

A daily reservoir operations water budget simulation was applied to estimate long-term hydrologic conditions with Hunter Lake, including auxiliary water supply characteristics and releases from Hunter Lake. A comparison of mean daily flow duration for Horse Creek downstream of Hunter Lake based on the daily reservoir simulation for Hunter Lake is shown in Figure 3-1. During operations of Hunter Lake, there would be an incremental reduction in Horse Creek and South Fork streamflow.

High flow rates that are exceeded less than approximately 10% of the time would not be significantly affected based on the reservoir operations analysis. High flows exceeded from 10% to 40% of the time would only be slightly affected, reduced by approximately 50%. Moderate flows that are exceeded in the range of 50% to 80% of the time would be reduced significantly with the Hunter Lake discharge being at the assumed minimum release rate of 2 cfs. For low flows exceeded 80% of the time, flows would be increased by Hunter Lake as a result of the minimum release rate of 2 cfs. Flow duration curves are shown for the proposed Hunter Lake with total water supply demand rates of 28 MGD and future 32.3 MGD. Extreme high flow events such as the 100-year peak flood conditions will depend upon the final design of the Hunter Lake spillway and runoff effects of the prairie restoration. The 100-year floodplain impacts are discussed in Section 3.6.

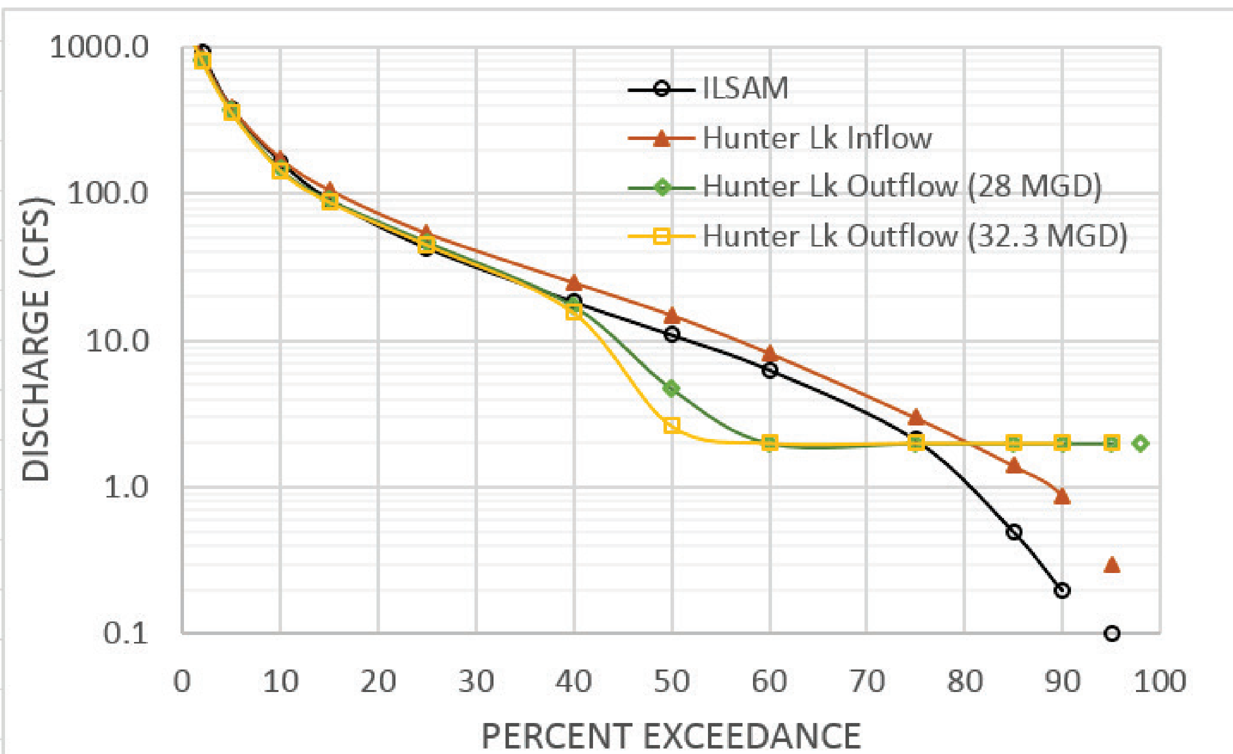

Figure 3-1. Mean daily flow duration in Horse Creek with and without Hunter Lake

Lake Springfield would be held at an incrementally higher-level during drought periods as a result of auxiliary inflow from Hunter Lake. Lake Springfield may therefore have a reduced fluctuation range beyond the one to two feet of normal fluctuation.

3.5.2.2.4 Sediment Load and Stream Stability

The construction of the earthen dam and operation of the Hunter Lake system would trap sediment transported from Horse Creek, Brush Creek, and other tributaries upstream of the lake and reduce the sediment load that is discharged downstream of the proposed dam. Streamflow with lower sediment concentration and bed load has an increased capacity to scour sediments from the streambed and banks for some distance downstream of a dam, potentially resulting in stream degradation and subsequent bank failures until a new equilibrium condition is established.

The sediments within Horse Creek are fine-grained, consisting almost entirely of silt and clay (Northwater 2017). Erosion of fine-grained sediment is different from the more studied transport of non-cohesive sand and gravel sediments. Reliable prediction of scour and transport of cohesive sediments generally requires site-specific sediment testing and model calibration. A sediment transport analysis was completed using HEC-RAS to characterize the approximate channel adjustment that may occur in lower Horse Creek. It is noted that adjustment of cohesive sediment / soil channels may occur over a period of decades, much more slowly than a sand or gravel channel which may adjust over a period of months or a few years. A HEC-RAS sediment transport model was applied using a repeated daily mean flow duration pattern to represent 15 years of simulated flow. A cohesive sediment transport method (Krone and Partheniades) was used. An existing condition model was developed and calibrated to predict an approximately stable channel over the 15-year simulation period. The Krone and Partheniades parameters were calibrated for a stable existing conditions model for an upstream boundary sediment load as estimated from the Horse Creek TSS sampling data and separately for the best estimate based on regression equations (Bhowmik et al, 1986). For each sediment load, the cohesive sediment parameters of particle erosion threshold and slope of the erosion rate relationship were adjusted to produce an approximately stable bed profile. These models were then modified to reflect the hydrologic effect of Hunter Lake (reduced sediment load boundary condition at the upstream end of the channel segment). Available information indicates that Hunter Lake would not have a significant effect on high discharges as a result of storage, due to sizing the spillway to manage lake backwater effects upstream of the lake (i.e., the lake does not provide a flood peak reduction benefit).

The HEC-RAS models predict channel aggradation or degradation, not channel width adjustment, however, bank adjustment can be inferred from the profile adjustment. The higher sediment load model predicted only minor degradation or aggradation of the channel downstream of Hunter Lake over the 15-year period, with the exception of the scour at Honeywell Road bridge as a result of flow contraction passing through the bridge. The lower sediment load model based on the ISWS regression equations also indicated scour at the Honeywell Road bridge, as well as degradation of the channel for approximately 0.25 miles downstream of the bridge. There is no known scour protection provided at the bridge currently and sediment parameters at the bridge were assumed to be natural and consistent with the rest of the stream. There was no indication of channel degradation downstream of the bridge.

It was noted that channel adjustment can require decades to fully develop. The results of the 15-year period model simulation appeared to approach a new stream equilibrium, however, some cross sections were observed to have not fully stabilized despite the rate of change at the end of 15 years being significantly reduced from the early portion of the simulation period. Where the model indicated channel adjustment would be present due to sediment load, the channel adjustments occurred on the order of 0.5 ft or less. The predictions should be considered as only approximate quantitative estimates of change.

Based on the potential degradation indicated by the sediment transport model, a bridge scour analysis was completed using Federal Highway Administration (FHWA) bridge scour methods incorporated into HEC-RAS. These bridge scour methods include scour based on "live bed" conditions with upstream sediment load and "clear-water" scour, assuming no sediment load coming into the bridge. Clear-water scour predicts greater scour than live-bed scour. Using the clear-water assumption that would be representative of conditions with Hunter Lake, the scour design methods predicted approximately twice the scour depth compared to the live-bed scour method. The bridge scour methods use non-cohesive sediment assumption, but ultimate scour depth is similar for both sediment types and it is only a matter of rate of scour development. This indicates that streambed scour protection, such as riprap, may be needed to protect Honeywell Road bridge. Riprap would ultimately prevent stream degradation at the bridge, but the low sediment load would continue downstream where it would provide greater channel degradation potential than the existing condition.

Sedimentation of Hunter Lake would occur and the effect on water supply capacity was considered in analyses to estimate the reliable water supply capacity of the proposed reservoir. Measures to reduce and manage sediment loading to Hunter Lake include installation of BMPs in the watershed and conversion of row crop agricultural land to grass prairie.

3.6 FLOODPLAINS

3.6.1 Affected Environment

A floodplain is the area inundated by an infrequent high flow. A flow with a 1 percent chance of being exceeded annually is a 100-year flow and is the basis for defining a floodplain below. The Federal Emergency Management Administration (FEMA) and the National Flood Insurance Program (NFIP) also refer to the 100-year high flow as the "base flood". For a free-flowing stream, the flood depth or elevation, and therefore the floodplain boundary, is directly and uniquely related to the flow rate. The maximum, or peak, flow from a flood event may be affected by temporary storage in a reservoir.

Executive Order 11988, Floodplain Management, directs federal agencies to assert leadership in reducing flood losses, avoid actions located within or adversely affecting floodplains unless there is no practicable alternative, and establish a process for flood hazard evaluation based on the 100-year base flood standard of the NFIP.

The 100- and 500-year floodplains have been mapped for South Fork from the confluence with Sangamon River upstream to the Horse Creek confluence. A floodway has also been defined upstream to the Horse Creek confluence. Only the 100-year floodplain has been mapped and no floodway has been defined upstream of Horse Creek. The 100-year floodplain of Horse Creek has been mapped from the proposed hunter lake outlet to the upstream side of the Village of Pawnee. The 100-year floodplain for Brush Creek, a tributary to Horse Creek, was also mapped from the proposed outlet to the Village of Divernon.

Flood discharge frequency data from the NFIP Flood Insurance Study for Sangamon County (FEMA 2007) for Horse Creek and South Fork are presented in Table 3-11.

Table 3-11. Flood Discharge Frequency Data

Location	Drainage Area (sq mi)	Peak Discharge (cfs) for Given Return Period			
		10-Yr	50-Yr	100-Yr	500-Yr
South Fork (at mouth)	885	12,200	18,800	21,600	26,800
Horse Cr (at mouth)	142.7	-	-	19,622	-
Horse Cr (at Carol St, Pawnee)	64	-	-	4,400	-
Brush Cr (at mouth)	55.1	4,600	-	11,420	-
Henkle Br (upstream of 5th St)	8.4	-	-	1,580	-

Source: FEMA 2007

Evaluation of streamflow records, as well as basic flood hydrology considerations, indicate that the timing of arrival of peak flow from the South Fork watershed and the Horse Creek watershed at the Horse Creek junction with South Fork from a storm event is generally different due to the size of the watersheds. The South Fork peak generally arrives at the Horse Creek confluence 24 to 48 hours after the peak from Horse Creek runoff arrives, which is estimated to be within several hours following a rainfall period. The size of the combined watersheds is such that rainfall is not generally uniform in either depth or timing over the entire watershed. Consequently, several climatic and hydrologic factors contribute to complexity of peak flood flow at the confluence and downstream South Fork reach.

Analysis of the available relevant monitoring data suggests that the South Fork peak flow may arrive prior to the Horse Creek peak flow or up to three or four days after the Horse Creek peak flow. Hydrologic guidance (FHWA 2009) for design of hydraulic structures on tributaries suggests as a design standard that, in the absence of a site-specific analysis of coincident flows, the relative watershed sizes and the design frequency being used should be considered to determine the design flow frequencies occurring coincidentally in the two streams at the junction. For example, for a location with the ratio of watershed areas between 1 and 10, a 100-year design on one of the streams should be assumed to occur with a coincident flow frequency of 50 years on the other stream. The paired frequencies listed in the FHWA (2009) guidance vary with the relative watershed size and the design frequency used. A flood hydrology and floodplain mapping analysis for selected reaches of South Fork and Horse Creek was conducted in 2017 and 2018. Results are available upon request.

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action

Under Alternative A no changes will occur to the existing conditions, structures, and operations that potentially affect floodplains. Therefore, there would be no impacts to mapped floodplain areas.

3.6.2.2 Alternative B – Hunter Lake – Revised Configuration

The construction of dams is known to cause changes to the hydrologic conditions in the watershed where a dam is located. These changes may influence the relationship between the river and floodplain causing flooding to become more frequent. This flooding can result in impacts to the safety and property downstream of the dam. In the case of Hunter Lake, the method of diversion and management of Horse Creek downstream of the dam during dam construction will consider flood risks and avoid potential increases to flood risk.

Hunter Lake would be a relatively large reservoir for the Horse Creek watershed with a surface area nearly three percent of the watershed area, however it would be constructed to have a fixed crest spillway and not operated as a flood control structure. To minimize upstream floodplain impacts, the Hunter Lake spillway will have a large capacity to minimize peak reservoir rise. The peak runoff rate from the upstream watershed will, therefore, pass through the reservoir with limited attenuation (change to the inflow hydrograph) and temporary runoff storage. Nevertheless, Hunter Lake may have a significant impact on the magnitude and timing of the peak flood discharge from Horse Creek relative to the existing condition. All rainfall on the lake surface will be discharged from the lake (e.g., no rainfall losses to infiltration). For the existing condition, runoff from the 2649-acre lake surface area would be approximately 30% of the rainfall depth. For example, the runoff from the lake area due to a 6-inch rainfall event would equate to 927 acre-ft greater than that discharged by the existing condition if the existing condition runoff coefficient is 0.3. Averaged over a 24-hour period, the average downstream flow would increase by 464 cfs.

Reservoir simulation for the evaluation of Hunter Lake water supply capacity indicates that Hunter Lake will normally be full, or at maximum normal level, during wet periods in which a 100-year rainfall event is most likely to occur. Assuming Hunter Lake is full will provide a more conservative estimate of potential floodplain impact than if a large rainfall event occurs with Hunter Lake at an initial water level below the fixed-crest spillway.

Based on a flood runoff and floodplain mapping analysis conducted for the proposed alternative, flood discharge frequency would be significantly reduced for all flood frequencies in the short reach of Horse Creek from Hunter Lake dam to the outlet to South Fork. However, the impact on flood discharge frequency in South Fork downstream of the Horse Creek confluence (and for a short distance upstream of the confluence) and on flood elevation is complex. Hunter Lake has the hydrograph effect of a small delay in the time of peak discharge from the reservoir. The timing delay causes the Horse Creek discharge to be higher later, or remain higher longer, and closer to the time of arrival of the South Fork flood peak, than it would be without Hunter Lake. Natural temporal and geographic variability of rainfall and watershed response causes the timing of the peaks, and overall flood hydrographs, to be variable. As a result, for a specific storm condition, Hunter Lake may cause either an increase or a decrease in South Fork peak discharge. As a representative and conservative condition for a 100-year rainfall event, the analysis indicates a small increase in South Fork peak discharge and, therefore, a small increase in 100-year flood elevation. The increase is estimated to be less than 0.02 feet. The analyses also indicated a more significant reduction in South Fork peak flood discharges and elevations for small floods with a return period of less than 10 years.

In summary, the proposed Hunter Lake Alternative includes a slight increase in floodplain risk for the reach of South Fork from just upstream of the Horse Creek confluence to the South Fork confluence with Sangamon River which is approximately eight miles. This impact is considered moderate and is not significant in nature.

3.7 WETLANDS

3.7.1 Affected Environment

As defined in Section 404 of the CWA, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands and wetland fringe areas also can be found along the edges of many watercourses and impounded waters (both natural and man-made). Wetland habitat provides valuable public benefits including flood storage, erosion control, water quality improvement, wildlife habitat, and recreational opportunities.

The Corps regulates the discharge of fill material into WOTUS, including wetlands pursuant to Section 404 of the CWA (33 USC 1344). Additionally, EO 11990 (Protection of Wetlands) requires federal agencies to avoid, to the extent possible, adverse impact to wetlands and to preserve and enhance their natural and beneficial values. Wetlands within the Hunter Lake project area were identified through field surveys and within the vicinity of the project area based on National Wetland Inventory (NWI) maps (Table 3-12). Wetlands and other aquatic resources evaluated during field evaluations and delineations were originally considered for the potential to meet the relatively permanent standard and/or significant nexus standard based on the revised definition of WOTUS (effective on March 20, 2023). However, based upon the recent U.S. Supreme Court ruling in Sackett v. EPA (May 25, 2023), the CWA extends only to wetlands that have a continuous surface water connection with “waters” of the United States (i.e., with a relatively permanent body of water connected to traditional interstate navigable waters). As of this writing the USACE has yet to issue formal guidance regarding how it will regulate wetlands and other aquatic resources based on this ruling. A jurisdictional status opinion has been provided for wetlands and other aquatic resources identified and delineated within the project area that is based on best professional judgement as to their anticipated regulation under the revised CWA guidance. However, The Corps has the final determination as to which wetlands and other aquatic resources are considered WOTUS and therefore under their jurisdiction.

Wetlands identified within the project area include 72.03 acres of palustrine emergent and forested wetlands (71.10 acres jurisdictional) and a total of 9.05 acres (2.53 acres jurisdictional) of open water ponds (including man-made impoundments). The assumed jurisdictional status of identified aquatic resources is pending Corps review. Approximately 1 acre of palustrine emergent and forested wetlands was observed as being non-jurisdictional due to a lack of surface water connectivity with other potentially jurisdictional WOTUS.

Wetland field surveys were conducted on approximately 3,010 acres of City owned properties that were accessible up to an elevation of 571 feet in the Fall of 2016. These surveyed areas included the proposed Hunter Lake pool elevation of 568.7 feet. Potential jurisdictional wetlands were evaluated in accordance with the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (August 2010, Version 2.0). Detailed information regarding individual wetlands and other WOTUS, including streams, is included in the WOTUS delineation reports prepared for this project (Amec Foster Wheeler 2017, WSP 2023). For portions of the project area that were not surveyed because of inaccessibility during the Fall 2016 wetland surveys (approximately 200 acres) and for all areas within the remaining City-owned property above the elevation of 571, windshield/roadway surveys were conducted and were supplemented with data from previous wetland delineations conducted for the project. Additional support for wetland delineations and mapping of the project area were obtained from data sources such as contemporary aerial photography, NWI maps, and the USGS National Hydrography Dataset.

In 2022 an extensive desktop analysis was conducted to identify areas for an updated ground-truthing delineation effort. Wetland habitat areas that were identified to have potentially changed from the original 2016 delineation effort were re-visited and further delineated to encompass any acreage change. The 2016 and 2022 delineations identified a total of approximately 72 acres of wetland habitat within the project footprint: 16.9 acres of emergent wetland habitat and 55.1 acres of forested wetland habitat.

Table 3-12. Summary of Wetland Resources within the Hunter Lake Project Area

Wetland Type		Wetland Quantities	
		Project Footprint1	Project Vicinity (5 Mile Radius2)
Palustrine Emergent	Number	26	311
	Acres	16.9	412
Palustrine Forested	Number	45	261
	Acres	55.1	1,882
Palustrine Scrub Shrub	Number	0	20
	Acres	0	32
Palustrine Unconsolidated Bottom (Open water)	Number	14	363
	Acres	9.1	6,038
Totals	Number	85	955
	Acres	81.1	8,365

Sources: USFWS 2017, Amec Foster Wheeler 2017, WSP 2023 and previous delineations of the project area

[1] Acreages were rounded to the nearest 1/10th of an acre, values include City-owned and private property within the inundation area and dam footprint.

[2] Acreages were rounded to the nearest acre and do not include the project footprint.

Palustrine forested wetlands are the most abundant wetland type in the proposed project vicinity and make up approximately 70 percent of the wetland resources within the project footprint (not including open water) based on acres (Table 3-12). These wetlands were generally found associated with floodplains of Brush Creek and Horse Creek. Tree species of these wetlands can tolerate periodic and frequent saturated soil conditions and inundation. Dominant canopy species found were box elder (*Acer negundo*), American elm (*Ulmus americana*), cottonwood (*Populus deltoides*), American sycamore (*Platanus occidentalis*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), and hackberry (*Celtis occidentalis*). Understory species, if present, consisted of saplings and shrubs of the same dominant species. Herbaceous species such as Virginia wild rye (*Elymus virginicus*), giant goldenrod (*Solidago gigantea*), moneywort (*Lysimachia nummularia*), Gray's sedge (*Carex grayi*), sweet woodreed (*Cinna arundinacea*), and jewelweed (*Impatiens capensis*) commonly occurred in these wetlands.

Several other forested areas within the floodplains of Brush Creek and Horse Creek were surveyed for potential wetlands. These areas typically did not meet the hydric soils criteria likely because of the limited period of soil saturation and inundation. Deep channel incision of these degraded streams within a largely agricultural landscape has resulted in a disassociation of the stream channel with floodplain areas that has reduced the hydroperiod of many former wetland areas. Consequently, the delineated wetlands within the floodplains of Brush and Horse creeks are typically small and isolated from their associated stream channel.

Palustrine emergent wetlands comprised about 21 percent of the wetland resources in the project footprint. These wetlands were commonly located at higher elevations (>571 feet elevation) in or at the terminus of ephemeral grassland drainages of croplands in the project area. Dominant vegetation in these wetlands consisted of reed canary grass (*Phalaris arundinacea*), jewelweed, arrowhead (*Sagittaria latifolia*), fall panicgrass (*Panicum dichotomiflorum*), water pepper (*Persicaria hydropiper*), cocklebur (*Xanthium strumarium*), wingstem (*Verbesina alternifolia*), Virginia wild rye, and stinging nettle (*Urtica dioica*). Croplands at lower elevations with mapped hydric soils may have altered hydrology because of soil drainage systems such as drainage tiles, which are prevalent throughout the area and county (Amec Foster Wheeler 2017).

Palustrine unconsolidated bottoms or open water wetlands comprised about 11 percent of the wetland resources in the project footprint. These areas are primarily small impoundments of unnamed tributaries of Brush Creek and Horse Creek that contained shallow water often surrounded by a narrow fringe of wetland vegetation. Other open water impoundments were observed in the project area and were considered isolated features in the uplands that appeared to be constructed livestock dug-outs with some mixture of upland and water-tolerant vegetation around their fringes.

As illustrated in Figure 3-2, the majority of the delineated wetlands within the proposed Hunter Lake are less than 1.0 acre in size. Additionally, most of the wetlands are located within the floodplain of either Horse Creek or Brush Creek, and their small size prohibits beneficial flood abatement or retention of sediments and nutrients.

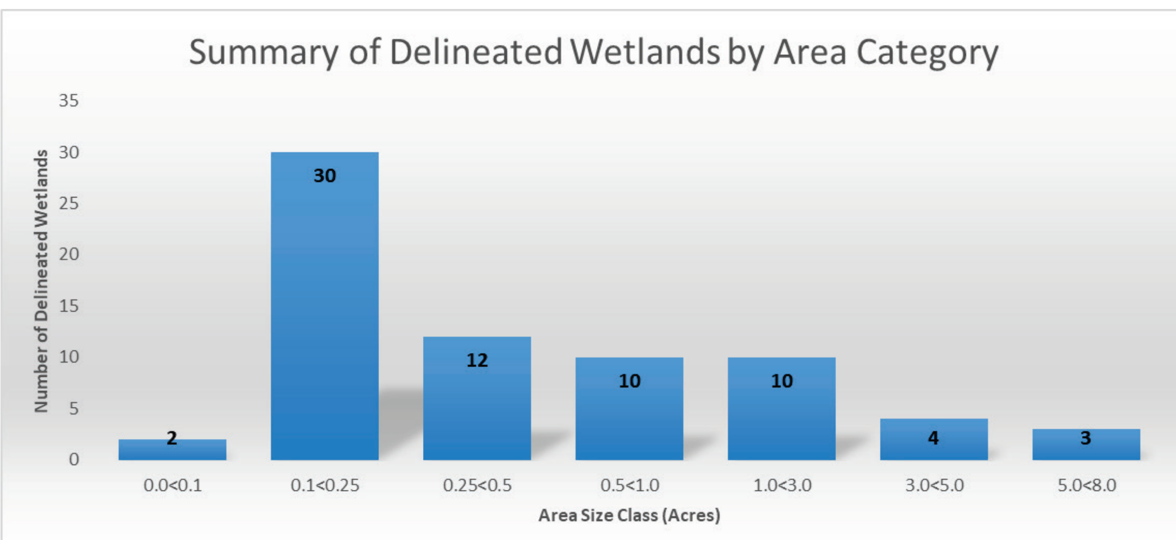

Figure 3-2. Summary of Hunter Lake Project Area Wetlands by Size Category

Larger wetlands in the project area provide greater functional quality as they provide valuable foraging and nesting habitat, corridors for movement, flood abatement, and sediment and nutrient retention due to their potential to store stormwater and sediments conveyed by runoff or adjacent stream flooding. Because of their size and truncated hydroperiod, the smaller wetlands provide low functional quality with respect to water quality enhancement, aquatic and terrestrial habitat, and floodwater retention. Please refer to Conceptual Wetland Mitigation Plan for an explanation of existing wetland functionality. Additionally, emergent wetlands are only temporarily inundated on an ephemeral or intermittent basis during periods of flooding, and therefore contribute less to flood abatement.

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action

Under the No Action Alternative, no new work would be conducted that could potentially alter environmental conditions. Therefore, there would be no impacts to wetland resources with this alternative.

3.7.2.2 Alternative B – Hunter Lake – Revised Configuration

The construction of dams can impact entire riverine ecosystems associated with the existing rivers on which they are built. If the cycles and rhythms of the natural flow of rivers is interrupted, the interconnected ecologies of riparian environments can be altered. This alteration of riparian environments may lead to impacts to plant and animal populations within the ecosystems and beyond. In the case of the Hunter Lake alternative, the construction of the earthen dam to create Hunter Lake would adversely impact approximately 72.0 acres of wetlands (71.1 acres jurisdictional) and 9.1 acres of open water habitat (2.5 acres jurisdictional) that are located within the footprint of the proposed Hunter Lake alternative (Table 3-13). Approximately 1 acre of wetlands were observed as being non-jurisdictional due to a lack of surface water connectivity with other potentially jurisdictional WOTUS.

Table 3-13. Summary of Impacts to WOTUS – Hunter Lake

WOTUS Type	Impact (linear feet/miles)	Impact Area (acres)
Wetlands/Open Water		
Emergent	-	(16.0)
Forested	-	(55.1)
Open Water	-	(2.5)*
Subtotal	-	(73.6)
Streams	(237,479/45)	(194)
Total	(237,479/45)	(268)

*Includes only areas assumed to be jurisdictional.

Existing wetlands at or near the proposed reservoir's surface water level may experience changes to water depth, duration (hydroperiod), and inundation frequency caused by connectivity to the reservoir's water surface (i.e., wind/wave influences). Soil-water content of these wetlands, besides being affected through the ebb and flow of possible surface-water connectivity, may be altered by soil-water capillary pore movement, which can modify depth, duration, and frequency of saturated soil conditions. Additionally, wetlands within the local groundwater influence of the reservoir (wetlands at relative similar elevations and near the reservoir) may experience changes to hydrologic conditions through discharging groundwater or capillary movement of soil-water caused by the reservoir's head pressure and elevated water table (Winter et al. 1998, USDA 2008). This may include increased water depth, inundation frequency, and protracted hydroperiod and saturated soil conditions.

Project related effects on WOTUS including wetlands result not only from the adverse effects described above (Table 3-13), but also the addition of wetland elements, both planned and voluntary, from the intentional implementation of project elements.

Wetlands are expected to be created along the periphery of Hunter Lake as a result of the influence of hydrology from the managed water level. These wetlands may be expected to form in suitable areas where the adjacent terrain is gently sloping and capable of supporting rooted vegetation within the hydrologic zone of influence of the reservoir. Based upon field surveys at Lake Springfield, wetlands established along the fringe of the lake were observed to occur in numerous areas, extending to approximately 1.5 to 2.0 feet above the active water line. Application of these observations to the proposed Hunter Lake suggests that approximately 87 acres of fringe wetlands may voluntarily develop in association with a maintained pool level of 568.7 feet. Composition of these wetlands would be expected to vary based on elevation and be composed of emergent species at or near the water's edge, to scrub shrub and forested communities at slightly more elevated positions. Over time, these wetlands would be expected to provide important functions related to wildlife support, shoreline stabilization, nutrient retention/removal, water quality enhancement and fisheries support.

Additionally, as described more fully in Section 2.5.2, the proposed plan for the revised Hunter Lake incorporates a large number of project design features or elements that are BMP measures designed to enhance water quality within Hunter Lake and downstream receiving waters. Among other measures, three ponds with approximately 18 acres of secondary wetland systems (integrated along margins of ponds and wet basins) are proposed to further enhance the efficiency of these systems to improve water quality. Secondary benefits of these systems are likely to include enhanced wildlife support and improved habitat for aquatic resources.

Therefore, impacts to WOTUS and wetlands are expected to be moderate in the short-term, with the loss of approximately 74 acres of generally small, low functional quality wetlands and open water. However, the overall project impacts are considered to be positive in the long term because even in the absence of wetland mitigation, anticipated wetland and open water acreages within the project area exceed the impacted areas. Regardless, adverse impacts to existing wetlands will be mitigated for appropriately, as discussed in Section 3.7.2.2.1.

3.7.2.2.1 Wetland Mitigation

While total project impacts (adverse and beneficial) are considered to result in net gains in wetlands over the long term, unavoidable direct impacts to wetlands under the proposed Hunter Lake Reservoir would be mitigated as required by both state and federal agencies in accordance with Section 404 of the CWA. Therefore, development of the proposed project would be consistent with EO 11990. A preliminary Wetland Mitigation Plan has been prepared for this project and is contained in Appendix E. The Wetland Mitigation Plan provides detailed information regarding the mitigation efforts proposed to be implemented to offset unavoidable adverse impacts to wetlands.

The ratio of wetland mitigation required for each wetland type impacted by Hunter Lake has been determined through coordination with the Corps as part of the permitting process. As noted in Section 3.7.1, the recent U.S. Supreme Court ruling in Sackett v. EPA (May 25, 2023), may affect how the Corps will regulate wetlands and other aquatic resources. Thus, a jurisdictional status opinion has been provided for wetlands and other aquatic resources identified and delineated within the project area that is based on best professional judgement as to their anticipated regulation under the revised CWA guidance. The estimated value of 71.1 acres is subject to Corps final determination.

The 71.1 acres of vegetated jurisdictional wetlands would require mitigation and would be offset by either the purchase of 71.1 acre-credits of mitigation bank credits in the bank service area of the project location, or the creation of up to approximately 135 permittee-responsible acre-credits within the project area or offsite within the HUC 8 area of the project location, per the USACE Rock Island District Mitigation and Monitoring Guidelines Document (Corps 2019). Impacted wetland habitat will be mitigated with wetlands of the same habitat type located in the project area or offsite within the HUC 8 area of the project location. Coordination with the Corps will be ongoing during the site identification, design, construction, operation, and monitoring phases of the project.

Potential wetland creation sites to offset mitigable losses within the project area have been analyzed using contemporary available soils data, topographic data, and considerations of hydrological sources. Several areas within the proposed Hunter Lake and an area downstream of the proposed reservoir's dam have been assessed for potential wetland creation. The Mitigation Plan (Appendix E) has identified up to approximately 148.7 acres (up to 124 acres as forested and 24.7 acres as emergent) of potential wetland creation areas adjacent to the reservoir's water surface elevation. Proposed planting lists for both emergent and forested wetland areas are presented in Tables 3-14 and 3-15.

Table 3-14. Recommended Species for Planting in Emergent Wetlands

Botanical Name	**Common Name**	**C** Value	**Indicator**
Asclepias incarnata	Swamp milkweed	4	OBL
Boltonia *asteroides*	False aster	4	OBL
Calamagrostis canadensis	Blue joint grass	6	OBL
Carex hystricina	Porcupine sedge	7	OBL
Carex vulpinoidea	Fox sedge	3	FACW
Eupatorium maculatum	Joe Pye Weed	10	OBL
Glyceria striata	Fowl manna grass	4	OBL
Juncus *effusus*	Common rush	4	OBL
Poa *palustris*	Fowl bluegrass	7	FACW
Scirpus atrovirens	Dark green rush	3	OBL
Scirpus cyperinus	Wool grass	5	OBL
Spartina pectinata	Prairie cord grass	5	FACW
Verbena hastata	Blue vervain	3	FACW

Table 3-15. Recommended Species for Planting in Forested Wetlands

Botanical Name	**Common Name**	**C** Value	**Indicator**
Carya illinoensis	Pecan	6	FACW
Celtis occidentalis	Hackberry	3	FAC
Platanus occidentalis	Sycamore	3	FACW
Quercus *bicolor*	Swamp white oak	7	FACW
Quercus lyrata	Overcup oak	7	OBL
Quercus macrocarpa	Bur oak	5	FAC
Taxodium distichum	Bald cypress	7	OBL

These wetlands would primarily be located upstream of the proposed in-lake sediment and nutrient control basins (integrated design features) located in the upper arms of the proposed Hunter Lake. Areas immediately upstream of the low-head dams would be excavated to provide deep water zones where water-carried sediments and debris would be deposited to enhance overall water quality. The excavated materials from these deep-water zones will be used to raise the elevation of the ground surrounding these zones and graded to appropriate elevations for the creation of adjacent wetlands along the perimeter of the reservoir. Other areas associated with the in-lake basins will be established as wetlands by either excavation of adjacent lands to a suitable elevation or by planting lands that already have a base elevation that would support wetland development.

Additionally, an area below the proposed reservoir's dam has been assessed for the creation of approximately 22 acres of forested wetland. This area requires an additional water source to sustain a palustrine forested habitat. A passive irrigation system that uses the water of the reservoir would provide a hydrological source for the area. The hydrology of the area will be developed to maintain appropriate soil-water conditions for the promotion and maintenance of the planted hydrophytic vegetation. Vegetation in the created wetlands will meet specific criteria for the wetland type (i.e., emergent, or forested) and matched with the planned hydrological conditions of the area.

3.8 VEGETATION

3.8.1 Affected Environment

The Hunter Lake project area is located within the Illinois/Indiana Prairie Ecoregion, a sub ecoregion of the Central Corn Belt Plains Ecoregion. This region is characterized by glaciated flat to rolling plains made up of loess, glacial till, and alluvium. Before this region was converted to cropland, the natural vegetation of this area consisted of a mosaic of bluestem prairie and oak-hickory forest. The bluestem prairies consisted of a mix of mesic, wet, and dry upland prairies that were dominated by plant species such as big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), switch grass (*Panicum virgatum*), prairie cordgrass (*Spartina pectinata*), sedges, little bluestem (*Schizachyrium scoparium*), and side-oats grama (*Bouteloua curtipendula*). In the oak-hickory forest, the dominant plant species were black oak (*Quercus velutina*), white oak (*Quercus alba*), and shagbark hickory (*Carya ovata*) (Woods et al. 2006).

Historically, native prairies occurred in extensive areas within this region and throughout most of Illinois. Most of the pre-European settlement prairie has been nearly eliminated from Illinois due to the high agricultural productivity of the fertile prairie soils. Bottomland or wetland prairies were also drained and converted to agricultural uses.

The Hunter Lake project area consists of a mosaic of habitats including agriculture fields, forests, grasslands, and small areas of wetlands and permanent open water. Patches of mature vegetation are generally missing from the region due to the extensive conversion of land to agriculture occurring in the past and present. This configuration of vegetation types is characteristic of disturbed areas that commonly make up the central Illinois region (Illinois Natural Heritage Survey [INHS] 1992).

A field survey conducted by the INHS in 1992 resulted in the identification of vegetation in the proposed Hunter Lake project area. The forested areas were characterized as disturbed forests fragmented due to the surrounding agricultural land. The common tree species include slippery elm (*Ulmus rubra*), honey locust (*Gledistisia triacanthos*), hackberry (*Celtis occidentalis*), and Osage orange (*Maclura pomifera*). In the shrub and sapling stratum, box elder, hawthorne (*Crataegus* sp.), and slippery elm were the most common species. In the herbaceous stratum, common snakeroot (*Sanicula gregaria*) and wood nettle (*Laportea canadensis*) were the most common species. Cultivated fields and other disturbed habitats are common in the Hunter Lake project area and include species such as common ragweed (*Ambrosia artemisiifolia*), giant ragweed (*Ambrosia trifida*), foxtail (*Alopecurus* sp.), Canada goldenrod (*Solidago candensis*), horseweed (*Conyza canadensis*), horse nettle (*Solanum carolinense*), field bindweed (*Convolvulus arvensis*), henbit (*Lamium amplexicaule*), and wild carrot (*Daucus carota*).

EO 13751 (Invasive Species) defines an invasive species as any species that is not native to that ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive plant species are common in previously disturbed areas, such as many of the habitats throughout the Hunter Lake project area. These species have the potential to affect the native plant communities adversely because of their ability to spread rapidly and displace native vegetation. Invasive species common to central Illinois and likely to be present within the project area include the following:

- Amur honeysuckle (*Lonicera maackii)* – Amur honeysuckle is a shrub that outcompetes native wildflowers and restricts forest regeneration by inhibiting seedling establishment of trees in the forested communities. This plant leafs out in early spring and forms a thick understory that limits sunlight to native plants and competes for soil moisture and nutrients with other plants (Missouri Department of Conservation [MDC] 2010a).
- Common cocklebur (*Xanthium strumarium*) – Common cocklebur is a summer annual weed that can tolerate a range of environments such as woodlands, pastures, roadsides, agricultural fields, and riparian areas. The seedlings and seeds of cocklebur can be toxic to livestock if they are ingested (DiTomaso 2013).
- Garlic mustard (*Alliaria petiolate*) – Garlic mustard is a biennial herb that is most commonly found in disturbed forests and wood areas adjacent to streams and along trails, parking lots, and other places where vegetation has been removed. Since each plant disperses a large amount of seeds, garlic mustard outcompetes native vegetation for light, moisture, nutrients, soil, and space. In addition, it produces a chemical that makes it unpalatable to livestock resulting in over browsing of native plants (MDC 2010b).
- Multiflora rose (*Rosa multiflora*) – Multiflora rose is a thorny shrub that tolerates several types of environments including fields, forests, prairies, and some wetlands. This plant grows aggressively and produces a large number of fruits that are widely dispersed. Once it is established, dense thickets of multiflora exclude most native shrubs and herbs from establishing themselves (National Park Service [NPS] 2010).
- Reed canary grass (*Phalaris arundinacea*) – Reed canary grass is a cool-season perennial grass that exists in wetland areas. This plant spreads aggressively through its prolific seed production and creeping rhizomes and forms dense stands that crowd our native plants. In addition, it does not provide suitable cover for wildlife, promotes silt deposition, and is capable of restricting waterways (MDC 2010c).

The vegetation within the project area and within the vicinity (5-mile radius) was evaluated using land use/land cover information that was obtained from the National Land Cover Database (Homer et al. 2015). This information was supplemented by detailed land cover mapping performed by Northwater Consulting (Northwater 2017) as part of a detailed watershed study.

Land cover within the Hunter Lake project area consists primarily of cultivated crops (2,705 acres), deciduous forest (3,167 acres), and hay/pasture (186 acres). Among lands currently owned by the City, 2,346 acres consist of cultivated crops, 2,939 acres of deciduous forest, and 180 acres of hay/pasture occur. In addition, 359 acres of cultivated crops, 227 acres of deciduous forest, and 6 acres of hay/pasture occur in privately owned land within the project area (Table 3-16, Figure 3-3). Land cover in the vicinity of Hunter Lake (5-miles) is primarily cultivated crops (84,319 acres), developed land (20,117 acres), deciduous forest (11,505 acres), hay/pasture (5,844 acres), open water (5,467 acres), and woody wetlands (1,160 acres) (Table 3-16, Figure 3-4).

Table 3-16. Land Use/Land Cover within the Hunter Lake Project Area and Vicinity

Land Cover Type	Hunter Lake Project Area (ac)	Vicinity of Hunter Lake (5-Mile Radius) (ac)
Cultivated Crops	2,698	84,319
Hay/Pasture	182	5,844
Herbaceous	1,450	584
Deciduous Forest	3,159	11,505
Evergreen Forest	-	-
Mixed Forest	-	-
Developed, High Intensity	-	691
Developed, Medium Intensity	9	3,663
Developed, Low Intensity	83	8,688
Developed, Open Space	131	7,075
Open Water	159	5,467
Emergent Herbaceous Wetlands	57	16
Shrub/Scrub	-	25
Woody Wetlands	55	1,160
Barren Land	-	14
Total	7,983	129,051

Sources: Amec Foster Wheeler 2017, Homer et al. 2019, Northwater 2017, USFWS 2017, WSP 2023
[1]Emergent herbaceous and woody wetlands were field confirmed by Amec Foster Wheeler/WSP within 568.7 feet elevation.
[2]Potential wetlands are NWI wetlands outside 568.7 feet

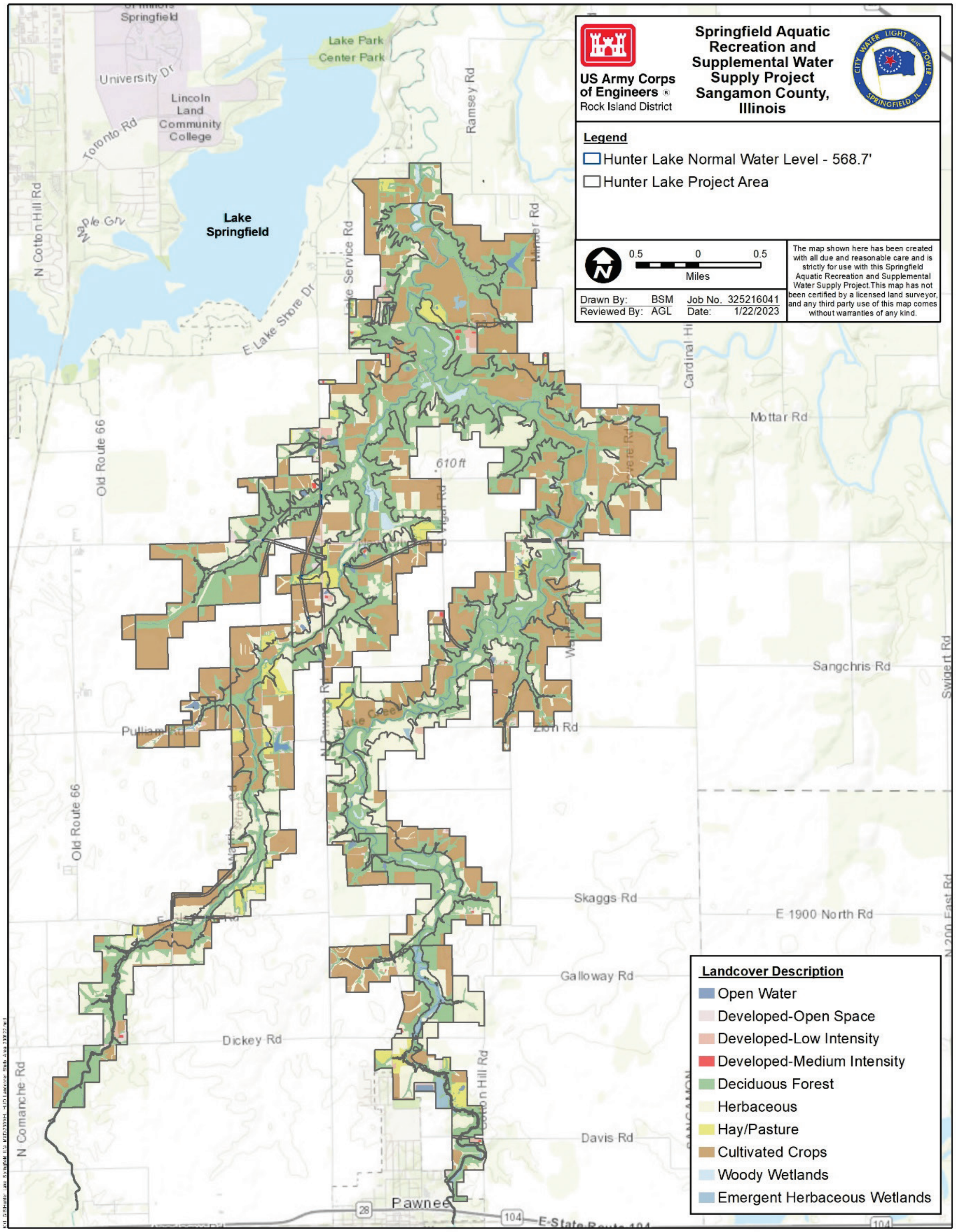

Figure 3-3. Land Cover Types within the Project Area of the Hunter Lake Project Alternative

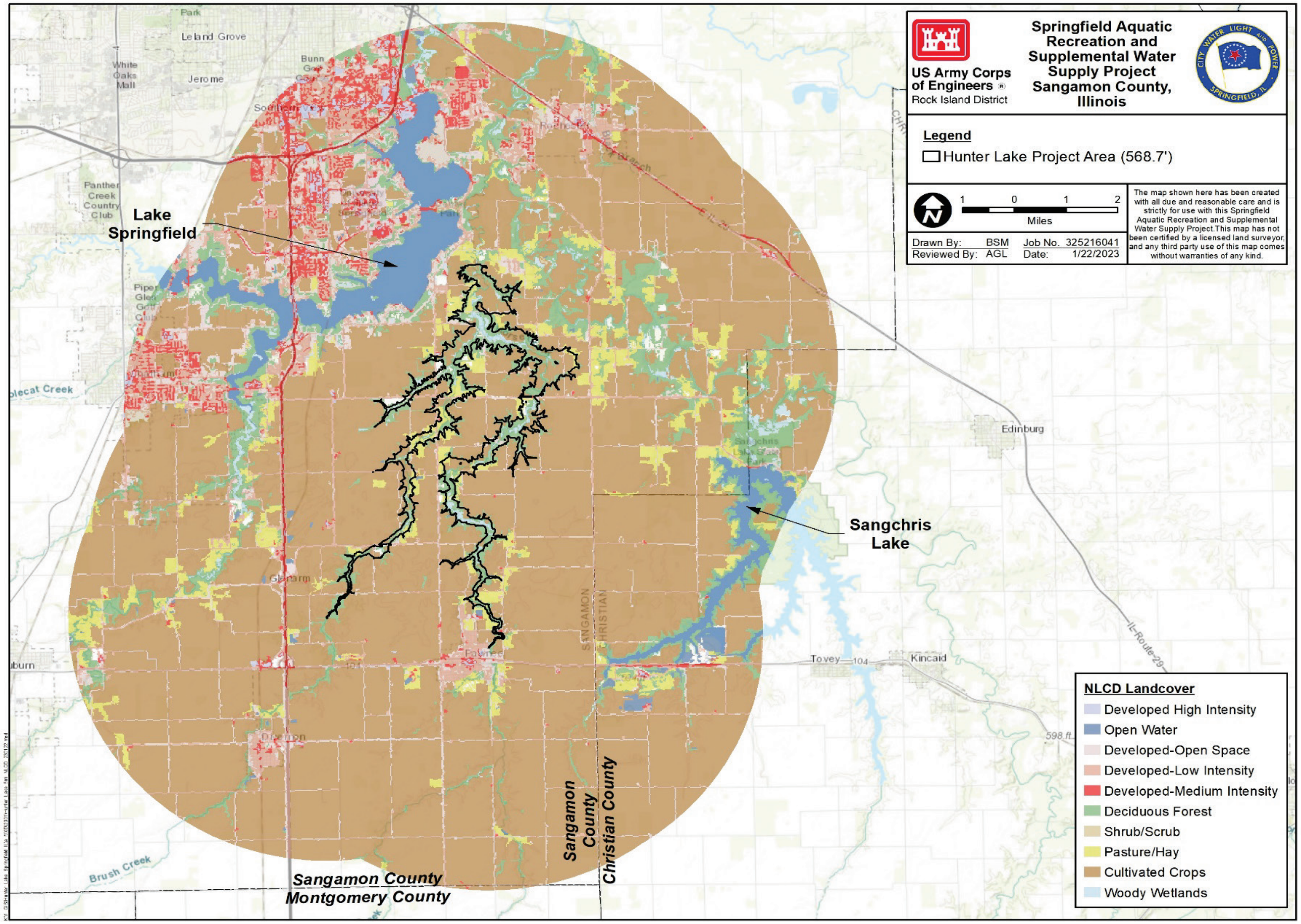

Figure 3-4. Land Cover Types within the Vicinity of the Hunter Lake Project Alternative

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action

Under the No Action Alternative, the City would not pursue creating a supplemental water supply source. As a result, no new work would be conducted that would result in the loss or disturbance of vegetation, and therefore no project-related environmental impacts to vegetation would occur under this alternative.

3.8.2.2 Alternative B – Hunter Lake – Revised Configuration

Inundation of the proposed Hunter Lake area and the project area outside the inundation level including construction of access roads and bridges would result in the disturbance of plant communities due to the excavation and grading of the lake, heavy equipment use, flooding, and the potential for the introduction and/or spread of invasive plant species from the disturbance of existing land cover types. In addition to direct impacts to vegetation from inundation, dams can disrupt the natural flow of rivers and this fragmentation can cause imbalances between riparian and aquatic ecologies along the rivers being dammed. Subsequently, this imbalance can lead to changing habitats that can make native species susceptible to the intrusion of invasive species.

The proposed Hunter Lake project would impact multiple land cover types, consisting primarily of deciduous forest (approximately 1,441 acres), cultivated crops (approximately 693 acres), herbaceous land cover (approximately 314 acres), woody wetlands (approximately 51 acres), hay/pasture (approximately 40 acres), and developed lands (approximately 13 acres). Much of the deciduous forested area is comprised of riparian habitat along existing waterways. Except in limited shallow areas where trees will be left for habitat, merchantable timber within the inundation zone will be harvested and sold. Non-merchantable timber and woody debris will be stockpiled and burned or hauled to an appropriate upland disposal facility.

Even though vegetation loss in forested, herbaceous, and wetland communities will be moderate and adverse, the development of Hunter Lake would also result in the substantial habitat restoration that would replace losses to plant communities and preserve the existing ones. Such restoration measures include the following:

- Development of approximately 2,000 acres of tallgrass prairie from cultivated lands
- Preservation of approximately 1,700 acres of forested lands around the perimeter of Hunter Lake
- Creation of up to approximately 135 acres of onsite forested and emergent wetland areas as compensation for direct impacts to wetlands (see Section 3.7, Wetlands)
- Compensate for approximately 71.1 acres of impact to wetland habitat within offsite mitigation banks (purchase of bank credits would be prioritized)
- Establishment of 1,286 acres of future forested lands by promoting natural successional processes on hay lands and pastures

Additional details regarding restoration of these habitats including recommended composition of proposed planting materials is provided in Appendix E, Wetland Mitigation Plan.

Invasive plant species are present throughout the area and have been spread through disturbance from agriculture and other land alteration activities. However, as a result of the extensive habitat restoration included with the proposed Hunter Lake, it is expected that this alternative would result in decreased prevalence of invasive species within the project area. BMPs consisting of erosion control measures and the use of approved seed mixes designed to aid in establishing desirable native vegetation would also mitigate for the potential spread of invasive plant species throughout the area due to construction activities. An Invasive Species Management Plan will be prepared in advance of construction to guide construction activities and further reduce the potential for establishment of invasive plant species. Following construction, any disturbed areas will be restored with an approved, non-invasive seed mix to prevent the introduction or spread of invasive species. Therefore, because this alternative includes extensive restoration of disturbed upland habitats, and it includes BMPs to minimize the spread of invasive plant species, this alternative is consistent with EO 13751.

Potential indirect impacts on nearby vegetation could result from the transportation of soil material, the construction and relocation of roadways/bridges, and boat ramps. Trucks hauling soil materials along existing or constructed access routes would potentially result in minor increases of fugitive dust and exhaust emissions that could indirectly impact vegetation along the route due to deposition. However, BMPs such as covering soil material and equipment maintenance would be followed to minimize impacts. Therefore, indirect impacts to vegetation from the transport of soil material would be minor.

Overall, the Hunter Lake alternative is expected to result in short-term impacts to existing land vegetation in areas where roads and bridges are being constructed. Remaining undeveloped upland areas that are not inundated will be restored to create new prairie, forest, and wetland areas to replace a portion of the vegetation permanently lost in the project area. Hunter Lake will provide a new aquatic ecosystem where some aquatic vegetation is expected to become established, especially in the shallow arms of tributaries and other shallow fringe areas around the shoreline of the lake. The overall quality of vegetation within the unflooded portions of the project area is expected to be improved compared to existing conditions, especially in areas where agricultural/row crop fields are replaced with habitats such as prairies and forests. These areas will likely support more ecologically diverse vegetation communities providing habitats for a variety of native plant and wildlife species.

In summary, the proposed Hunter Lake would result in direct impacts to vegetation that are moderate and adverse (e.g., losses within the inundation zone), but the extensive preservation and restoration of more than 5,000 acres of upland habitats within the project area in the long term would more than offset short term losses such that impacts to vegetation are positive and beneficial in the long term.

3.9 WILDLIFE

3.9.1 Affected Environment

Wildlife within the project area includes all species of undomesticated animals that grow and live within the varying ecosystems of the area. The Hunter Lake project area contains a mosaic of habitats including agriculture fields, forests, grasslands, and small areas of permanent open water for wildlife to inhabit. Patches of mature vegetation are not common in the region due the conversion of land to agriculture occurring in the past and present. This configuration of vegetation types is characteristic of disturbed areas that commonly make up the central Illinois region (INHS 1992). Various types of animals that are considered wildlife within this analysis include mammals, birds, amphibians, reptiles, butterflies, skippers, and moths.

Regulations relating to wildlife include the ESA, Migratory Bird Treaty Act of 1918 (MBTA), and Illinois Compiled Statutes Wildlife Code, all of which set restrictions on the take of various types of protected species. Threatened and endangered species that are protected under the ESA are further discussed under Section 3.11. This section primarily discusses wildlife in general to identify all species of wildlife that are located within the project area that may be subject to take and other impacts due to the proposed alternatives.

A study conducted by the INHS in 1992 resulted in the identification of several common mammals, birds, amphibians and reptiles, and Lepidoptera (butterflies, skippers, and moths) in the Hunter Lake project area. The main ecological findings from their study are applicable under the current conditions and are described in detail below.

3.9.1.1 Mammals

Mammals identified during the survey include those species that are usually found in areas where agricultural fields are interrupted by small stands of second-growth trees and by streams containing thin strips of riparian forest. The vast majority of mammals within the project area are common and ubiquitous across wide portions of Illinois. This includes mammals such as the white-footed mouse (*Peromyscus leucopus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and white-tailed deer (*Odocoileus virginianus*). Mammals associated with deep forests, such as the gray fox (*Urocyon cinereoargenteus*), are generally not abundant or are absent, primarily because large stands of primary forest do not exist in the project area. In addition, mature grassland and prairie habitats are rare or are in very small, isolated fragments in the project area and, therefore, mammals such as the Franklin's ground squirrel (*Poliocitellus franklinii*) are missing from the community (INHS 1992).

Based on literature records, unpublished data from the INHS, and results of field investigations, nine species of bats could potentially be found within the proposed Hunter Lake project area. These species include evening bat (*Nycticeius humeralis*), hoary bat (*Lasiurus cinereus*), eastern red bat *(Lasiurus borealis*), silver-haired bat (*Lasionycteris noctivagans*), tricolored bat (*Perimyotis subflavus*) (proposed for federal listing), big brown bat (*Eptesicus fuscus)*, little brown bat (*Myotis lucifugus*), and the federally listed northern long-eared bat (*Myotis septentrionalis)* and Indiana bat (*Myotis sodalis)*. Based on previous records, three single Indiana bats have been reported in the area, including from Springfield, Sangamon County (1 September 1970), Owaneco, Christian County (27 April 1972), and Jacksonville, Morgan County (7 October 1971). In addition, a post-lactating female was captured over Macoupin Creek, Macoupin County, southwest of Carlinville, Illinois (6 August 1987) (INHS 1992). Mist netting conducted from July 8 to August 7, 2016, as part of the proposed project collected a total of 61 bats at 12 net sites over a total of 112 net nights (ESI 2016). Species collected included the evening bat, big brown bat, eastern red bat, and hoary bat. No individuals of the two listed bat species or proposed listed tri-colored bat were collected. Furthermore, no evidence of either the Indiana or northern long-eared bats were present in the Hunter Lake project area, therefore removal of summer habitat at any time should not result in impacts to either species. Overall, the relatively small number of individuals captured suggest the area is not heavily used by either common or rare bat species (ESI 2016). Additional information regarding the federally listed bat species is provided in Section 3.11.

3.9.1.2 Birds

Bird species that are considered habitat generalists were more abundant throughout the project area than species that have more specific habitat requirements. Habitat generalists may be found in a variety of habitats, often including those associated with habitats that have been altered or disturbed by humans. Species observed included the common grackle (*Quiscalus quiscula*), red-winged blackbird (*Agelaius phoeniceus*), European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), American robin (*Turdus migratorius*), mourning dove (*Zenaida macroura*), northern cardinal (*Cardinalis cardinalis)*, blue jay (*Cyanocitta cristata)*, and indigo bunting (*Passerina cyanea)*. Other common species within the project areas include the red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), American crow *(Corvus brachyrhynchos*), field sparrow (Spizella pusilla), red-bellied woodpecker *(Melanerpes carolinus*), downy woodpecker *(Picoides pubescens*), tufted titmouse *(Baeolophus bicolor*), and ruby-throated hummingbird (*Archilochus colusbris*).

In addition, a known heron rookery is located adjacent to Horse Creek, northwest of Zion Cemetery. The only nesting bird observed was the great blue heron (*Ardea herodias*) – no egrets (*Ardea sp.*), night heron (*Nycticorax nycticorax*), or other species were observed (Corps 2000). During site visits conducted in Fall 2016 and Spring 2017, an active heron rookery was still present in the same general area along Horse Creek. The rookery was noted to have expanded to additional trees in the vicinity along Horse Creek.

3.9.1.3 Amphibians and Reptiles

Among the amphibians found, the most commonly encountered species included the western chorus frog (*Pseudacris triseriata*), American bullfrog (*Lithobates catesbeianus*), and the small-mouthed salamander (*Ambystoma texanum*). In addition, among the reptiles found, the most commonly encountered species included the painted turtle (*Chrysemys picta*), eastern garter snake *(Thamnophis sirtalis*), and prairie kingsnake (*Lampropeltis calligaster*). The distribution and abundance of amphibians and reptiles in the project area are representative of those typically abundant in the prairie/grassland areas of central Illinois.

3.9.1.4 Lepidoptera (Butterflies, Skippers, and Moths)

Lepidoptera within the project area are generally considered to be represented by relatively common species that may typically be associated with habitats that are dominated by cultivated lands and riparian woodlands. Habitats that are generally recognized as providing a high level of support to Lepidoptera include prairies and forb-rich old field land cover types. Such communities, however, are generally poorly distributed within the Hunter Lake project area as most of it has been converted to agricultural uses (see Section 3.8). Conversely, prior surveys found that the largest percentage of Lepidopterous species sampled came from a site that had the most extensive area of upland consisting of grassy pasturelands and exhibited advanced secondary deciduous tree growth intermixed along its borders. Species previously observed included the monarch butterfly (*Danaus plexippus*), tiger moth species (*Arctis* sp.), common snout butterfly (*Libytheana carinenta*), American painted lady butterfly (*Vanessa virginiensis*), common sulphur butterfly (*Colias philodice*), least skipper butterfly (*Ancloxypha numitor*), common buckeye butterfly (*Junonia coenia*), and silver spotted skipper butterfly (*Epargyreus clarus*) (INHS 1992).

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action

Under the No Action Alternative, the City would not develop a supplemental water supply. As a result, no new work would be conducted that would result in the loss or disturbance of wildlife habitat, and therefore no project-related environmental impacts to wildlife would occur under this alternative.

3.9.2.2 Alternative B – Hunter Lake – Revised Configuration

Under the proposed Hunter Lake alternative, the inundation of bottomland forests, prairies, streams, and wetlands in the project area will likely displace many mammals, birds, amphibians, reptiles, and other fauna that currently inhabit these areas. In addition, the construction of bridges and roadways outside the area of inundation will likely displace some wildlife species temporarily during construction. Dams also cause the exchange of lotic habitats to lentic habitats which impact wildlife species that rely on free-flowing water for food, habitat, or protection. This section discusses the beneficial and adverse impacts from the proposed Hunter Lake on terrestrial species and Section 3.10.2. discusses the beneficial and adverse impacts of the proposed Hunter Lake dam and regional inundation on aquatic species.

During construction, most mobile wildlife present within the project site would likely avoid the construction sites and disperse to adjacent and/or similar habitats, whereas direct impacts to less mobile fauna would be expected.

Of the species discussed in 3.9.1., four bat species, one bird species, two amphibian species and two reptile species rely upon water resources, in varying degrees, for their habitat, food source, or breeding environment. These species are not reliant solely on riverine habitats to meet these needs but may also utilize lacustrine habitats such as that provided by the proposed Hunter Lake. The remaining species occupy primarily terrestrial or palustrine habitats which may be impacted due to the inundation in the proposed project area. Although the inundated area will permanently displace wildlife from their current habitats, it would also provide an abundance of suitable habitat for semi-aquatic wildlife. Specifically, waterbirds (waterfowl, shorebirds, etc.) and some generalist species of amphibians and reptiles would benefit from the increase in aquatic habitat and increased shoreline area.

The development of the Hunter Lake alternative would also result in the cessation of agricultural practices within upland areas of City-owned lands and there would be substantial habitat restoration that would replace losses to plant communities. Such restoration measures include the following:

- Development of approximately 2,000 acres of tallgrass prairie and grasslands from cultivated lands,
- Preservation of approximately 1,700 acres of forested lands around the perimeter of Hunter Lake,
- Creation of a total of up to approximately 135 acres of forested and emergent wetland areas as compensation for direct impacts to wetlands (see Section 3.7)
- Establishment of 1,286 acres of future forested lands by promoting natural successional processes on hay lands and pastures.

In the long term, these woodland areas would be large areas of contiguous and undisturbed habitat that would provide suitable habitat for wildlife. The unflooded areas with the greatest diversity of terrestrial vegetation, especially restored prairie areas, would be considered biotic reservoirs for faunal populations. Portions of restored prairie will also be established using “pollinator-rich” plant species that will provide important habitat for Lepidoptera and other pollinators within the region.

Indirect impacts to wildlife may occur due to recreational use of the reservoir after construction is complete, including disturbances to wildlife habitat and behavior due to boating, fishing, and other aquatic sport activities. Impacts to suitable habitats can be prevented using signage, fencing, and other barriers to keep individuals within designated recreational areas and away from sensitive species and habitats. Additionally, due to the restoration and construction of suitable prairie, grassland, and aquatic habitats associated with the Hunter Lake alternative, any potential adverse, long-term impacts to the wildlife surrounding the reservoir due to recreational activities will be negligible.

Forested areas that support the heron rookery identified along the Horse Creek arm would not be cleared during construction thereby avoiding direct impacts to the rookery. However, because trees left within the flood zone may not survive, it is expected the reduced suitability of these trees for long-term nesting would result in abandonment of this area as a nest site. Nesting herons may, however, be expected to re-establish a new rookery in the project vicinity or along the Sangamon River.

Overall, the Hunter Lake alternative is expected to result in direct losses of habitat within the flooded zone and short-term adverse impacts to mobile wildlife habitat during construction. However, it would result in the potential long-term establishment of native prairie, forest, and wetland areas that would replace wildlife habitat lost and restore upland areas to more beneficial wildlife habitats. Additionally, Hunter Lake would include a new aquatic ecosystem that would benefit wildlife species that prefer aquatic environments. The overall quality of habitats within the unflooded portions of the project area is expected to improve compared to existing conditions, especially in areas where agricultural lands are replaced with habitats such as prairies and forests. These new habitats will likely provide more diverse vegetation providing year-round habitats, and/or seasonal nesting/breeding habitats, for a variety of species. Vegetation established on existing cultivated lands would also be expected to provide indirect benefits to water quality of Hunter Lake and downstream waters by reducing soil erosion and nutrient loss. Therefore, impacts of this alternative would be minor in the short term, but would provide major long-term benefits to wildlife habitat with the preservation and restoration of prairie, forest, and wetland habitat.

3.10 AQUATIC ECOLOGY

3.10.1 Affected Environment

Ecology refers to the study of the relationship between organisms amongst each other as well as their surroundings. In this assessment, aquatic ecology refers to the relationship between aquatic species within the proposed Hunter Lake project area as well as the aquatic environment in which they live.

Regulations pertaining to aquatic ecology are those that regulate the aquatic organisms and habitat in the area of study; these include ESA, CWA, SDWA, EO 13751 (Invasive Species), and EO 11990 (Protection of Wetlands). This section will examine the presence of various aquatic species and their preferred habitats, therefore, topics related more specifically to threatened and endangered species, wetlands and WOTUS, surface water, vegetation, and wildlife (not aquatic) may be found in Sections, 3.11, 3.7, 3.5, 3.8, and 3.9, respectively.

Aquatic biota such as fish and macroinvertebrates were examined for their presence within the project area. Species data was collected from previous assessments conducted by the City as well as survey data collected by IDNR.

The proposed Hunter Lake would be created by impounding streams in the Horse Creek watershed. Horse Creek and Brush Creek, its principal tributary, are 3rd and 4th order perennial streams that are characterized as having a low gradient within a largely agricultural watershed. The watershed of Horse Creek is approximately 131 square miles and consists of numerous secondary intermittent and ephemeral tributaries of Horse Creek. Horse Creek discharges into the South Fork of the Sangamon River. The South Fork of the Sangamon River is the largest tributary of the Sangamon River, which in turn is a major tributary of the Illinois River.

Horse and Brush creeks are typical of streams flowing through heavily agricultural regions of central Illinois. Farming constitutes a majority of the land use within the watershed. As a result of this land use, streams in the watershed are low gradient with weakly developed riffle-pool complexes, and generally reduced instream habitat quality and quantity. For example, Horse and Brush creeks are characterized as having substrates dominated by silt and fine-grained materials with relatively few areas that are composed of gravel and sand (INHS 1992).

Data on existing aquatic biota in the Horse Creek watershed were collected by the INHS under contract for the City in 1992 (INHS 1992) and through IDNR surveys conducted by the IDNR's Fisheries Division between 1981 and 2018. Surveys of biotic resources in the watershed included: fish, phytoplankton and zooplankton, mussels, and other aquatic macroinvertebrates. Overall, Index of Biotic Integrity scores in 2008 and 2018 ranged from a score of 34 points in 2008 to 29 points in 2018 (B. Lubinski, personal communication, 2023). These scores indicated a low to moderately low stream condition. According to the Illinois Integrity and Diversity Rating for aquatic life (Bol et al. 2008), Horse Creek is classified as both a grade C and D stream and Brush Creek is classified as a grade D stream. Integrity and Diversity Ratings can range from grades A to F. Integrity scores of C and D indicate these systems are highly disturbed from their natural state. Disturbed aquatic habitats are typically comprised of mostly common and tolerant biota. For example, the phytoplankton, periphyton, and zooplankton collections consisted of species that are common and widely distributed in the United States (Hunter Lake HEP Team 1992). Moreover, no threatened, endangered, or otherwise rare species were found in any of the samples.

All fish species found at sampling sites on Horse and Brush creeks are common in central Illinois streams and tend to be those most tolerant of the stream degradation associated with present farm practices. In total, 34 species have been found in the Hunter Lake project area (Table 3-17). The minnow family Cyprinidae comprised the largest segment of the fish fauna in terms of number of species and individuals, representing 15 total species and 64 percent of the total catch. The top three minnow species with the highest abundance were all tolerant species and included in descending order the bluntnose minnow (*Pimephales notatus*), a species tolerant of disturbance, the red shiner (*Cyprinella lutrensis*), and golden shiner (*Notemigonus crysoleucas*). All three species are tolerant of disturbances with the red shiner being particularly tolerant of high turbidity and siltation.

Other non-minnow species were also collected that indicate a disturbance tolerant community. The sunfish family, Centrarchidae, had the second highest number of species collected (six total sunfish taxa) in addition to abundance (15.7 percent of the total catch). Green sunfish (*Lepomis cyanellus*) was the dominant sunfish collected and the third most abundant species collected, overall. Green sunfish is tolerant of a wide range of conditions and does well even under the most extreme environmental conditions (Pflieger 1997). The pirate perch (*Aphredoderus sayanus*) was another abundant species and is generally associated with silty substrates. The blackstripe topminnow (*Fundulus notatus*), known for their greater tolerance for extremes in turbidity and temperature (Pflieger, 1997), was the only topminnow species collected. The only darter species, Percidae family, present was the Johnny darter (*Etheostoma nigrum*), which is also tolerant of habitat modification and degradation.

Recreationally important fish species were also collected during the surveys but in small numbers. Nine species were collected as part of the fish sampling that included black bullhead (*Ameiurus melas)*, yellow bullhead (*A. natalis*), channel catfish (*Ictalurus punctatus*), green sunfish, orangespotted sunfish (*L. humilis*), bluegill (*L. macrochirus*), largemouth bass (*Micropterus salmoides*), white crappie (*Pomoxis annularis*), and black crappie *(P. nigromaculatus*). However, individuals of white crappie and black bullhead were the only species with age classes of sufficient size to be of interest to fisherman (Hunter Lake HEP Team 1992). Additionally, the green sunfish which is the least desirable species of the group as a sportfish, was the most common.

The aquatic macroinvertebrate communities of Horse Creek, Brush Creek, and their tributaries are typical of slow, silt-laden, agricultural streams occurring in the central Midwestern Plains. Of the aquatic macroinvertebrates in the Hunter Lake project area, none of the taxa are limited to a unique or restricted habitat. As for mussels, only nine freshwater mussel species were collected in the Hunter Lake project area and overall diversity was low (Hunter Lake HEP Team 1992). The three most abundant species found were the pondmussel (*Ligumia subrostrata*), pondhorn (*Uniomerus tetralasmus*), and giant floater (*Pyganodon grandis*). Pondmussel and pondhorn are locally abundant in small streams, ponds, and sloughs and are often found in intermittent streams and other habitats regarded as marginal habitat for other mussel species. Pondhorn has been collected in Horse and Brush creeks 5 to 7 miles upstream of the proposed reservoir; however, no specimens have been collected at sites within the proposed reservoir area. No freshwater mussels were collected in the upper reaches of Brush Creek as part of more recent surveys (Price et al. 2012). Results would likely be comparable to the upper reaches of Horse Creek given the similarity of the two watersheds. A notable mussel bed is known to occur at the confluence of Horse Creek and the South Fork Sangamon River downstream of the Hunter Lake project area, but the species composition of the bed is unknown.

Early consultation with the USFWS and IDNR has identified sensitive species potentially affected by the proposed project alternatives. Sensitive aquatic species that may occur in the vicinity of the Hunter Lake project area include the mudpuppy salamander (*Necturus maculosus*) and the smooth softshell turtle (*Apalone mutica*). The mudpuppy salamander is a state-listed threatened species that occurs in lakes, reservoirs, rivers, and other bodies of water. They nest beneath logs, stones or matter underwater and come out at night to hunt crayfish, small fish, insects, snails, and other mollusks. The smooth softshell turtle is a state-listed endangered species that prefers rivers and streams with sandy substrates. It generally is not a species characteristic of lentic (non-flowing) habitats. Records indicate that the smooth softshell turtle has been identified in the South Fork and lower Sangamon River and their tributaries. Additional information regarding protected species is provided in Section 3.11.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action

Under the No Action Alternative, no construction activities would be undertaken by the City for supplemental water supply. Therefore, there would be no direct or indirect impacts to aquatic habitats or biota.

3.10.2.2 Alternative B – Hunter Lake – Revised Configuration

Under Alterative B, Hunter Lake would be formed by impoundment of Horse Creek, resulting in the permanent inundation of Horse Creek and Brush Creek. Conversion of surface waters from lotic to lentic environments can affect the physical characteristics of these systems, resulting in subsequent effects to the aquatic organisms inhabiting the systems. Examples of this include changes in water temperature or quality that may result in certain areas no longer being suitable for specific aquatic organisms. For example, slow-moving or still reservoirs can heat up, resulting in abnormal temperature fluctuations which can lead to algal blooms and decreased oxygen levels, affecting sensitive species. In the case of the proposed reservoir, many of the streams that would be converted to reservoir are of poor quality and are often not supportive of aquatic life due to lack of water or flow. Thus, the following discussion focuses on the increased aquatic habitat and subsequent shift of population characteristics.

Approximately 194.39 acres of aquatic habitat within nearly 45 miles of ephemeral, intermittent, and perennial streams and riparian areas would be converted to approximately 2,649 acres of open water habitats of Hunter Lake. Consequently, the aquatic ecosystem of the impounded reach would be altered from one that is dependent on detrital inputs (leaf litter, nutrient loading, etc.) to an aquatic ecosystem that is dominated by primary productivity of a lake environment. Notable population shifts in the phytoplankton, zooplankton, and aquatic macroinvertebrates are therefore expected. Phytoplankton populations that are generally poorly represented with stream systems would increase dramatically, similar to those of other central-Illinois impoundments (i.e., Lake Springfield and Lake Sangchris) (INHS 1992). Hunter Lake would likely have a similar species composition as these regional reservoirs. Zooplankton communities would also be modified in response to the expansion of aquatic habitat and the increased availability of phytoplankters as a food source. Like phytoplankton, zooplankton populations in Hunter Lake would likely be similar to those found in other regional reservoirs. Aquatic macroinvertebrate populations would also change in composition and abundance to reflect communities that are similar to other central Illinois reservoirs (INHS 1992).

Table 3-17. Fisheries Catch Data from the Horse Creek Watershed

Family	Common Name	Scientific Name	INHS 1990	IDNR 2008	Totals	Percent of Catch	Found in Reservoirs
Cyprinidae	Bluntnose Minnow	*Pimephales notatus*	519	164	683	13.6%	Yes
Cyprinidae	Red Shiner	*Cyprinella lutrensis*	405	196	601	11.9%	Yes
Centrarchidae	Green Sunfish	*Lepomis cyanellus*	310	205	515	10.2%	Yes
Cyprinidae	Golden Shiner	*Notemigonus crysoleucas*	336	170	506	10.1%	Yes
Aphredoderidae	Pirate Perch	*Aphredoderus sayanus*	250	117	367	7.3%	Yes
Cyprinidae	Striped Shiner	*Luxilus chrysocephalus*	265	102	367	7.3%	--
Cyprinidae	Honyhead Chub	*Nocomis biguttatus*	249	115	364	7.2%	--
Cyprinidae	Fathead Minnow	*Pimephales promelas*	199	14	213	4.2%	Yes
Fundulidae	Blackstripe Topminnow	*Fundulus notatus*	159	30	189	3.8%	Yes
Centrarchidae	Bluegill	*Lepomis macrochirus*	84	100	184	3.7%	Yes
Cyprinidae	Creek Chub	*Semotilus atromaculaltus*	83	88	171	3.4%	--
Ictaluridae	Yellow Bullhead	*Ameiurus natalis*	49	98	147	2.9%	Yes
Clupeidae	Gizzard Shad	*Dorosoma cepedianum*	46	47	93	1.8%	Yes
Catostomidae	White Sucker	*Catostomus commersoni*	36	39	75	1.5%	Yes
Cyprinidae	Common Carp	*Cyprinus carpio*	37	37	74	1.5%	Yes
Cyprinidae	Central Stoneroller	*Campostoma anomalum*	64	4	68	1.4%	--
Cyprinidae	Redfin Shiner	*Lythrurus umbratilis*	46	14	60	1.2%	--
Centrarchidae	Largemouth Bass	*Micropterus salmoides*	32	25	57	1.1%	Yes
Percidae	Johnny Darter	*Etheostoma nigrum*	48	4	52	1.0%	Yes
Ictaluridae	Tadpole Madtom	*Noturus gyrinus*	14	32	46	0.9%	Yes
Cyprinidae	Bigmouth Shiner	*Notropis dorsalis*	45	-	45	0.9%	--
Cyprinidae	Suckermouth Minnow	*Phenacobius mirabilis*	38	5	43	0.9%	--
Centrarchidae	White Crappie	*Pomoxis annularis*	20	9	29	0.6%	Yes
Ictaluridae	Black Bullhead	*Ameiurus melas*	10	11	21	0.4%	Yes
Cyprinidae	Sand Shiner	*Notropis ludibundus*	17	3	20	0.4%	--
Catostomidae	Quillback	*Carpiodes cyprinus*	11	-	11	0.2%	Yes
Cyprinidae	Bullhead Minnow	*Pimephales vigilax*	8	-	8	0.2%	Yes
Ictaluridae	Channel Catfish	*Ictalurus punctatus*	4	3	7	0.1%	Yes
Catostomidae	Bigmouth Buffalo	*Ictiobus cyprinellus*	3	3	6	0.1%	Yes
Catostomidae	Smallmouth buffalo	*Ictiobus bubalus*	-	3	3	0.1%	Yes
Centrarchidae	Orangespotted Sunfish	*Lepomis humilis*	-	3	3	0.1%	Yes
Cyprinidae	Hybrid Minnow sp.	*Cyprinella lutrensis x C. spiloptera*	-	2	2	0.0%	--
Catostomidae	Black buffalo	*Ictiobus niger*	-	1	1	0.0%	Yes
Centrarchidae	Black Crappie	*Pomoxis nigromaculatus*	-	1	1	0.0%	Yes
Sciaenidae	Freshwater Drum	*Aplodinotus grunniens*	1	-	1	0.0%	Yes

Sources: INHS 1992; Nathan Grider, Division of Ecosystems and Environment, IDNR. RE: Springfield Supplemental Water Supply Project County: Sangamon. Letter to James Kelley, Regulatory Branch, Corps

The construction of dams and associated inundation may prevent the movement of fish, which is important for migration, access to spawning habitat, access to food resources, and safety from predation. This loss of access may cause species compositional shifts to occur among fish communities. In general species that are more characteristic of flowing habitats would shift to those more characteristic of reservoir environments. For example, species that prefer flowing water such as creek chub, central stoneroller, striped shiner, redfin shiner, hornyhead chub, bigmouth shiner, sand shiner, suckermouth minnow, pirate perch, and Johnny darter may be expected to persist in the headwaters of Horse and Brush creeks above the reservoir. Using Lake Springfield as a model, it is likely that species such as bluntnose minnow, bullhead minnow, fathead minnow, red shiner, green sunfish, bluegill, orangespotted sunfish, golden shiner, bigmouth buffalo, smallmouth buffalo, black bullhead, yellow bullhead, quillback, tadpole madtom, and blackstripe topminnow will remain in Hunter Lake (Table 3-17). Moreover, species such as gizzard shad, channel catfish, largemouth bass, and white crappie will flourish. Habitat Suitability Indices for these five fish demonstrate substantially increased habitat suitability following the construction of Hunter Lake (Hunter Lake HEP Team 1992). Table 3-18 shows that habitat units significantly increased for gizzard shad (0.0 to 804.0), channel catfish (1.45 to 1,192.60), largemouth bass (1.46 to 536.0), and white crappie (1.46 to 549.40). Conversely, creek chub is a species that prefers flowing water and will lose all its available habitat (0.58 to 0.0) in the project area according to the Habitat Suitability Indices (Table 3-18).

Table 3-18. Predicted Habitat Suitability Index for Select Species for the Proposed Hunter Lake Project

Species	Condition	Area of Habitat	Habitat Suitability Index	Habitat Units	Difference
Gizzard Shad	Pre-impoundment	14.6	0.0	0.0	804.00
	Post-impoundment	1,340.0	0.6	804.0	
Channel Catfish	Pre-impoundment	14.6	0.1	1.45	1,191.15
	Post-impoundment	1,340.0	0.89	1,192.6	
Creek Chub	Pre-impoundment	14.6	0.04	0.58	-0.58
	Post-impoundment	0.0	0.0	0.0	
Largemouth Bass	Pre-impoundment	14.6	0.1	1.46	534.54
	Post-impoundment	1,340.0	0.4	536.0	
White Crappie	Pre-impoundment	14.6	0.1	1.46	547.94
	Post-impoundment	1,340.0	0.41	549.4	

Source: Hunter Lake HEP Team. 1992.

As with the creek chub, the amount of available habitat lost under this alternative is much less than the amount of habitat gained for other aquatic species. Eventually, new species that are not currently present in the project area such as flathead catfish (*Pylodictis olivaris*), brook silverside (*Labidesthes sicculus)*, yellow bass (*Morone mississippiensis)*, and white bass (*M. chrysops)*, are likely to gain access to the reservoir and add to the species diversity in Hunter Lake. Therefore, overall impacts to fish under this alternative are expected to be positive due to an increase in available habitat and corresponding increase in desirable species diversity.

While the Hunter Lake alternative results in loss of stream habitat that does not support recreational use, it provides for a notable expansion in the regional recreational resource due to the creation of a large surface water impoundment that supports fishing. As evident with Lake

Springfield, a productive sport fisheries program in Hunter Lake will be possible through cooperative management of aquatic resources by the IDNR. Recreationally important fish species will likely increase under this alternative due to natural recruitment and IDNR management practices. More information regarding the recreational impacts of this alternative is discussed in Section 3.13.

Using Lake Springfield as a model of the transformation from lotic to lentic habitat and its associated impact on the mussel species within its watershed, it is likely that all the mussel species in the Horse Creek watershed, which includes Brush Creek, will persist in Hunter Lake. Most mussels collected in the project area are species that are found in open-water, or lentic, habitats (INHS 1992). Two additional native mussel species, three horn wartyback (*Obliquaria reflexa)* and pink papershell (*Potamilus ohiensis)*, are found in Lake Springfield and will likely appear in Hunter Lake in time.

The construction of dams can change the way rivers function, ultimately affecting aquatic habitat and organisms downstream of the dam. Dams can trap sediment which bury rock beds that may be used for spawning habitat. Dams can also trap gravel, logs, and other important food and habitat features which can influence food and habitat availability downstream of the dam. When the natural flow of rivers is interrupted by dams, the interconnected ecologies of riparian environments may be impacted. Irregular flows that may be released from dams can disrupt aquatic processes based on natural variations in flow such as growth and reproductive cycles in many species. Surveys and protective measures will be taken to avoid and minimize effects from the proposed dam and associated reservoir.

As for mussels downstream of the Hunter Lake dam, additional surveys may be undertaken in cooperation with the IDNR to determine mussel bed limits at the confluence of Horse Creek and South Fork Sangamon River. A survey of the downstream mussel bed will help to inform IDNR of appropriate avoidance and minimization measures that may be considered including maintenance of minimum flows during the construction and operational periods. Short-term sediment and erosion controls at the dam construction site will be implemented during construction to minimize negative effects of siltation on downstream habitats. Additionally, extensive BMPs within the Hunter Lake alternative (e.g., in-basin dams, wetlands, filter strips, etc.) are expected to reduce the concentrations of nutrients within Hunter Lake and minimize downstream transport through time. Overall, adverse effects to existing mussel species are expected to be small, and positive effects of the project may be evident by increased abundance (standing crop) of mussel species within the expanded aquatic habitats of Hunter Lake.

For the Hunter Lake alternative, aquatic or semi-aquatic species reported from the Sangamon River may have the potential to occur within the lower portions of Horse Creek and potentially within the flooded zone of Hunter Lake. Some species of amphibians and reptiles within the project area are expected to decrease in abundance because of the reservoir, while others will likely increase due to the creation of permanent lake habitat. Most of the species predicted to decline are wide-spread and relatively common in Illinois. For rare species, such as the threatened mudpuppy and endangered smooth softshell turtle, the City would consult further with IDNR regarding potentially affected species to identify the need for supplemental field surveys for verification of the presence or absence of these species within the project area (see Section 3.11).

In summary, impacts to aquatic ecosystems from the proposed Hunter Lake are adverse as it relates to stream resources, but substantially positive as it relates to the expansion of availability and productivity of aquatic habitats. Losses of stream habitats that are of low quality and generally common in the region would be offset by an expansion of aquatic habitat by converting those low-quality stream habitats to a reservoir. However, the project would result in replacement of lotic (riverine) habitat with lentic (lacustrine) habitat thus resulting in a change to species composition. Although this is conversion from lotic to lentic habitat, it results in an increase of available habitat for aquatic organisms. Consequently, impacts to aquatic ecosystems under this alternative are adverse in regard to biota dependent on lotic environments due to loss of stream habitat but beneficial to aquatic species in the project area, as a whole.

3.11 THREATENED AND ENDANGERED SPECIES

3.11.1 Affected Environment

The ESA,16 United States Code [USC] §§ 1531-1543 was passed to conserve the ecosystems upon which endangered and threatened species depend, and to conserve and recover those species. An endangered species is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range, whereas a threatened species is any species at risk of becoming become endangered within the foreseeable future throughout all or a significant part of its range. The ESA establishes programs to conserve and recover endangered and threatened species and makes their conservation a priority for Federal agencies.

The state of Illinois provides protection for species considered threatened and endangered under the Endangered Species Act of 1972 (520 ILCS 10/11(b)) and maintains the *Checklist of Illinois Endangered and Threatened Animals and Plants* (IDNR, 2020). The list of state protected species and inventory of Illinois Natural Areas is developed and maintained by IDNR.

Informal consultation conducted with the USFWS and IDNR as part of the proposed Springfield Aquatic Recreation and Supplemental Water Supply Project resulted in the identification of several species of concern that may be potentially affected by project alternatives considered in the study. Review of the USFWS Information, Planning, and Consultation (IPaC) system and the IDNR Ecological Compliance Assessment Tool (EcoCAT) for the Hunter Lake project area identified federally listed species that may occur within or near the proposed project areas. Species of concern that may be present within or near the project areas are identified in Table 3-19.

3.11.1.1 Wildlife

3.11.1.1.1 Birds

The barn owl nests in tree cavities and human structures such as barns, silos, grain bins, abandoned buildings, and nest boxes. Roosting sites include areas with dense, woody vegetation, rafters of barns, and evergreen trees near foraging areas. Typical foraging habitat includes grasslands, marshes, and agricultural fields. Hay fields and pastures provide greater suitable foraging habitat than row-crop agriculture fields due to a larger presence of voles and other small mammals (Walk et al. 2010). However, the use of suitable foraging habitat can be limited by a lack of proximity to nesting and roosting sites (NatureServe 2017). The barn owl is listed by IDNR as potentially occurring within the Hunter Lake project area.

The chuck-will's-widow is a state-listed threatened, migratory bird that is only found in Illinois when nesting during the breeding season. This species can typically be found in deciduous forests with a light to moderate understory and along edges of clearings. Eggs are laid under dense vegetation typically located near forested edges and old roads. Foraging takes place over nearby fields and clearings (NatureServe 2017). IDNR identified the chuck-will's-widow as potentially occurring within the Hunter Lake project area.

3.11.1.1.2 Mammals

The Indiana bat is found throughout much of the eastern and midwestern United States, including Illinois (BCI 2023), and has been listed as a federally endangered species since March 11, 1967. This species is also a state-listed endangered species in Illinois. Per the USFWS's *2022 Range-Wide Indiana Bat and Northern Long-eared Bat Summer Survey Guidelines*, "suitable summer habitat for Indiana bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures. This includes forests and woodlots containing potential roosts, i.e., live trees and/or snags ≥5 inches DBH that have exfoliating bark, cracks, crevices, and/or cavities" (USFWS 2022a). Other summer habitat may include riparian zones, bottomlands, floodplains, wooded wetlands, and adjacent upland forests (USFWS 2007). Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of forested habitat (USFWS 2022a). Tree species that Indiana bats have been known to roost and establish maternity colonies include hickory (*Carya* spp.), oak (*Quercus* spp.), elm (*Ulmus* spp.), ash (*Fraxinus* spp.), maple (*Acer* spp.), and poplar (*Populus* spp.). Some tree species, primarily hickories and to a lesser extent oaks, provide adequate bark characteristics in living trees (USFWS 2007). In winter, Indiana bats hibernate in caves or abandoned mines (USFWS 2007). Indiana bat critical habitat, designated on September 24, 1976, consists of 11 caves and two mines in six states including Illinois (one cave), Indiana (two caves), Kentucky (two caves), Missouri (six caves), Tennessee (one mine) and West Virginia (one mine) [41 FR 41914]. The critical habitat location in Illinois is Blackball Mine in LaSalle County, located approximately 115 miles north of the project. No critical habitat for the Indiana bat is located within the counties in which the proposed alternative occurs.

Table 3-19. Sensitive Species Listed Within or Near the Project Areas

Common Name	Scientific Name	Status		Occurrence[3]
		Federal[1]	State[2]	Hunter Lake Project Area
Birds				
Barn owl	*Tyto alba*	--	T	X
Chuck-will's-widow	*Caprimulgus carolinensis*	--	T	X
Mammals				
Indiana bat	*Myotis sodalis*	LE	E	N
Northern long-eared bat	*Myotis septentrionalis*	LE	T	N
Tricolored bat	*Perimyotis subflavus*	PE	--	X
Little brown bat	*Myotis lucifugus*	UR	--	X
Reptiles				
Kirtland's snake	*Clonophis kirtlandii*	UR	T	X
Smooth softshell	*Apalone mutica*	--	E	X
Amphibians				
Mudpuppy	*Necturus maculosus*	--	T	X
Plants				
Eastern prairie fringed orchid	*Platanthera leucophaea*	LT	E	X

Sources: IDNR 2022, IDNR 2023 USFWS 2022f, and consultation with IDNR and USFWS
[1] Federal Status Codes:
LE = Listed Endangered LT = Listed Threatened UR = Under Review PE = Proposed Endangered
[2] State Status Codes:
E = Listed Endangered T = Listed Threatened
[3] Occurrence Codes:
X = Species listed within the project area
N = Field survey verified species not present
-- = Species not identified as listed within project area

The northern long-eared bat is found throughout much of the eastern and northern central United States, including Illinois (BCI 2023), and this species was recently listed as a federally endangered on November 29, 2022, due to precipitous population declines resulting from the white-nose syndrome fungal disease (USFWS 2022b). Per the USFWS's *2022 Range-Wide Indiana Bat and Northern Long-eared Bat Summer Survey Guidelines*, "suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures. This includes forests and woodlots containing potential roosts, i.e., live trees and/or snags ≥3 inches DBH that have exfoliating bark, cracks, crevices, and/or cavities. Northern long-eared bats prefer intact mixed-type forests with small gaps (i.e., forest trails, small roads, or forest-covered creeks) in forest with sparse or medium vegetation for foraging and commuting rather than fragmented habitat or areas that have been clear cut" (USFWS 2022a). Individual trees may be considered northern long-eared bat habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of other forested habitat (USFWS 2022a). Additionally, northern long-eared bats are known to use man-made structures, including buildings, bridges, and bat houses. Numerous deciduous tree species serve as summer roosting sites for northern long-eared bats across its range, and, in general, northern long-eared bat summer roost selection is similar to that of Indiana bats. In winter, northern long-eared bats hibernate in caves or abandoned mines (Amelon and Burhans 2006). Unlike the Indiana bat, no critical habitat has been established for the northern long-eared bat.

The tricolored bat is found throughout the eastern and central United States, including the entirety of Illinois (BCI 2023), and this species was recently proposed for federal listing as an endangered species on September 12, 2022, due to precipitous population declines resulting from the white-nose syndrome fungal disease (USFWS 2022c). A final listing decision is expected from the USFWS in September 2023. Suitable summer habitat for tricolored bats consists of a wide variety of forested or wooded habitats where they roost and forage. Tricolored bats typically roost among the leaves in closed canopy forests but have also been observed roosting in man-made structures like barns, bridges, and concrete bunkers (USFWS 2022d). In Illinois in winter, tricolored bats hibernate in caves or abandoned mines (Amelon and Burhans 2006).

The little brown bat is found throughout the contiguous United States, including the entirety of Illinois (BCI 2023). This once ubiquitous species is currently under review by the USFWS for federal listing due to precipitous population declines resulting from the white-nose syndrome fungal disease and additional mortality resulting from wind turbine collisions (USFWS 2022e). Suitable summer habitat for little bats consists of a wide variety of forested or wooded habitats, as well as hydric habitats like streams, ponds, and wetlands. Little brown bats are also known to use edge habitat, specifically open grasslands adjacent to woodlots. This species is known to roost in tree cavities, crevices, or under bark, as well as within wood piles, in rock crevices, or within man-made structures like buildings or bat boxes. In winter, little brown bats hibernate in caves or abandoned mines (USFWS 2022e).

Bat Conservation International, IDNR, and USFWS indicate that all four bat species may occur within the project area. Due to the large amount of potential tree removal required under the Hunter Lake alternative, a bat mist netting survey was conducted by Environmental Solutions & Innovations, Inc. (ESI) from July 8 to August 7, 2016, in accordance with the USFWS 2016 Range-wide Indiana Bat Summer Survey Guidelines. ESI did not capture Indiana bats, northern long-eared bats, tricolored bats, or little brown bats during the survey (ESI 2016). Ongoing consultation between the Corps and USFWS will ensure compliance with ESA in regards to listed bat species.

3.11.1.1.3 Reptiles

The Kirtland’s snake can be found in a variety of urban and undisturbed habitats. In urban areas, this species is found in old fields, parks, and open grassy areas near a water source. Habitats in undisturbed areas include wet grasslands, areas of seasonal flooding, borders of creeks, swamp forests, and borders of ponds. Kirtland’s snake can also be found in forested areas near pools, streams, bogs, and edges of lakes. The Kirtland’s snake hibernates underground and in crayfish burrows. After the Kirtland’s snake emerges from hibernation, it is often found under natural and artificial debris, like branches, bark, heavy grass, and carpet (Gibson and Kingsbury 2004). The Kirtland’s snake is listed by IDNR as potentially occurring within the Hunter Lake project area.

The smooth softshell turtle typically inhabits large rivers with clean, sandy bottoms, but can also be found in lakes and impoundments. This species hibernates underwater buried in mud or sand. Nesting habitat includes sandbars and riverbanks that receive full sun exposure (Missouri Department of Natural Resources [MDNR] 2017). IDNR lists the smooth softshell as potentially occurring within the Hunter Lake project area.

3.11.1.1.4 Amphibians

The mudpuppy salamander inhabits clear lakes, ponds, rivers, and creeks. In daylight, the salamander is found in deep water, under rocks, driftwood, or other objects. Breeding occurs in depressions underneath submerged rocks, logs, or other objects (INHS 2017). IDNR lists the mudpuppy salamander as potentially occurring with the Hunter Lake project area.

3.11.1.1.5 Plants

Eastern prairie fringed orchid inhabits prairies, sedge meadows, and marsh edges. This species requires full sun exposure (USFWS 2015). USFWS lists the eastern prairie fringed orchid as potentially occurring within the Hunter Lake project area.

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action

Under the No Action Alternative, no construction activities would be undertaken. Consequently, no impacts to sensitive species would occur and there would be no change from the existing condition.

3.11.2.2 Alternative B – Hunter Lake – Revised Configuration

Under this alternative, Hunter Lake would be formed by damming Horse Creek, a tributary to the South Fork Sangamon River, and permanently inundating portions of Horse Creek and Brush Creek. Dams and the associated inundation they cause can lead to direct impacts and losses to terrestrial habitats that many species rely upon for food, protection, and reproduction. In addition, dams may also cause indirect impacts to species through the conversion of riverine environments to lacustrine environments as some species rely upon riverine environments for food, protection, or reproduction. Species that rely upon lacustrine environments may experience an increase in suitable habitat. Dams may also capture sediment and other debris that affects potential habitat within and downstream of the reservoir.

A majority of the terrestrial habitat within the project area consists of a mixture of riparian forest, agricultural fields, and grassland. Potential habitat for the barn owl, chuck-will's-widow, Indiana bat, northern long-eared bat, tricolored bat, little brown bat, Kirtland's snake, smooth softshell turtle, and mudpuppy may be present within the project area.

Permanent, direct impacts to nesting birds and bat maternity colonies within the project area is anticipated during construction, including direct habitat loss and displacement. Indirect impacts to these species during construction may include habitat degradation or fragmentation and temporary disturbance of individuals occupying habitat near the project area. The Hunter Lake project is expected to preserve approximately 1,700 acres of forested lands around the perimeter of Hunter Lake and establish 1,286 acres of forested lands, which may have a minor, beneficial impacts to these species over the long-term. Based on previous surveys, suitable bat habitat for Indiana, northern long-eared, tricolored, and little brown bats is present within the project area; though, these four species were not documented during a mist-net survey conducted in 2016 (ESI 2016). However, additional coordination with USFWS will be conducted to determine needs for subsequent surveys or considerations regarding listed bat species, as appropriate.

Previous surveys indicated a small amount of potential habitat for the Kirtland's snake is present within the project area, however no individuals have been observed. Individuals that may be present may be directly impacted from construction, if present, and indirectly impacted in the short-term due to the loss of potential habitat and construction related disturbances. However, it is anticipated that the construction of Hunter Lake may have a minor, beneficial impact to the Kirtland's snake in the long-term due to creation of additional potential habitat. As lands surrounding Hunter Lake would be removed from agriculture, the edge of the reservoir may provide potential habitat for the species. This is supported by data indicating that two other individuals recorded in Sangamon County were found near Lake Springfield and near the grassy border of a pond near Sangchris Lake (INHS 1992).

If individual smooth softshell turtles are present within the project area, construction activities may have permanent, direct impacts on this species. Permanent, indirect impacts associated with construction may result from the loss of potential habitat and noise disturbances. However, since this species prefers large rivers, they are unlikely to be located within the project area.

Construction activities may have a permanent, direct impact to mudpuppies if present within the project area. The damming of Horse Creek would have a short-term, indirect impact on this species due to temporary loss of potential habitat, if present. However, additional potential habitat for the mudpuppy would be created with the construction of Hunter Lake along the 97.5-mile shoreline. Therefore, construction of Hunter Lake may have a minor, beneficial impact on the mudpuppy over the long-term.

Coordination with IDNR and USFWS to determine the need for supplemental field surveys to verify presence/absence of threatened and endangered species and identify potential avoidance and mitigation measures is ongoing. An Incidental Take Authorization (ITA) may be required for some species, depending on the outcome of this coordination. The ITA would require efforts to avoid, minimize, and mitigate direct impacts to federal and state-listed species. The City would commit to appropriate mitigation measures and adhere to all necessary permit requirements; therefore, direct and indirect impacts to threatened and endangered species under this alternative are anticipated to be minor.

3.12 NATURAL AREAS AND CONSERVATION

3.12.1 Affected Environment

The IDNR Division of Natural Heritage administers the Illinois Natural Areas Inventory (INAI) Program which identifies natural areas as those that reflect Illinois' natural heritage and support native species. INAI sites consist of areas with high quality natural communities, habitats of threatened and endangered species, and areas with other unique natural features. In addition, the IDNR Illinois Nature Preserves Commission (INPC) protects high quality natural areas and habitats of endangered and threated species by dedicating these lands into the Illinois Nature Preserves System. The Nationwide Rivers Inventory (NRI) is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance.

Title 17 of the Illinois Administrative Code §4000 – 4020 establishes regulations regarding the management and inventory of Nature Preserves in Illinois. Under a 1979 Presidential Directive and related CEQ procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments.

This section addresses natural areas and areas of conservation concern that are on, immediately adjacent to (within 0.5 mile), or within the vicinity of the proposed project area (5-mile radius).

Natural areas located within the region surrounding the proposed Hunter Lake are listed in Table 3-20. There are no natural areas or areas of conservation concern located within the Hunter Lake project area or within 0.5 mile. The only natural area located within a 5-mile radius is the South Fork of the Sangamon River, which has been designated as an INAI site from Horse Creek to the confluence of the Sangamon River due to its unusual concentration of mussels and high-quality streams (SSCRPC 2009).

Table 3-20. Natural Areas in the Vicinity of the Hunter Lake Project Area

Site Name	Site Type
Immediate Hunter Lake Project Area	
None	-
0.5-mile radius	
None	-
Vicinity (5 miles)	
South Fork Sangamon River	INAI

3.12.2 Environmental Consequences

3.12.2.1 Alternative A – No Action

Under the No Action Alternative, there would be no additional aquatic recreation area or supplemental water supply developed for the City. Therefore, there would be no impact to natural areas or areas of conservation concern.

3.12.2.2 Alternative B – Hunter Lake – Revised Configuration

There are no natural areas or areas of conservation concern within the footprint or 0.5-mile radius of the proposed Hunter Lake alternative. Therefore, there would be no direct impacts to natural areas or areas of conservation concern under this alternative. Since the portion of the South Fork of the Sangamon River designated as an INAI site is located greater than 0.5-mile from the project area, no direct impacts are anticipated. Dams have the potential to cause indirect impacts to aquatic life, including mussels, downstream of where the dam is constructed. In this case, aquatic life within the South Fork of the Sangamon River may be impacted as a result of creating Hunter Lake. These impacts are discussed in Section 3.10.

3.13 PARKS AND RECREATION

3.13.1 Affected Environment

3.13.1.1 Existing Parks and Recreational Areas

This section addresses parks and recreational areas that are on, immediately adjacent to (within 0.5 mile), or within the vicinity of the proposed project area (5-mile radius).

There are approximately 27 parks and recreation areas located within 5 miles of the proposed Hunter Lake, three of which are within a 0.5-mile radius of the project area (Figure 3-5). The Springfield KOA Journey Campground, which offers tent and RV sites, cabins, a pool, mini golf, and bike rentals, is located immediately adjacent to the northern portion of project area, along KOA Road. North Park in Pawnee is located adjacent to the Horse Creek arm of the proposed Hunter Lake and offers a soccer field, baseball field, basketball court, playground, walking path and pavilions.

Large recreation areas within the 5-mile vicinity include Lake Springfield and Sangchris Lake State Park. Sangchris Lake State Park is managed by the Illinois Department of Natural Resources. This park is approximately 3,000 acres with 120 miles of shoreline and supports numerous recreational opportunities including fishing, boating, camping, hunting, and picnicking. Recreational facilities at this park include boat launches, a campground, playground, picnic shelters, equestrian trails, and nature trails (IDNR 2017a). Lick Creek Wildlife Preserve is approximately 340 acres in area and is located at the western-most end of Lake Springfield and offers various hiking trails. Other recreation facilities in the 5-mile vicinity include smaller parks. Amenities offered include picnic areas, recreation buildings, softball diamonds, horseshoe pits, a volleyball court, numerous playgrounds, and several boat launches.

3.13.1.2 Recreational Need within Central Illinois

As part of the Springfield Strategy 2020 (City of Springfield 2000), the City recognized the importance of providing recreation as part of the long-range vision guiding future growth of the city. This is also reflected statewide as most Illinoisans believe that outdoor activities are important and should be available in the state, with approximately 83 percent of respondents to the 2020 Illinois Outdoor Recreation survey indicating that outdoor recreation plays an important role in their lives (IDNR 2021).

According to the current Illinois Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2021-2025, most Illinoisans place a high value on preserving natural resources and believe more natural areas and wildlife habitat should be protected and restored. In addition, the SCORP indicated most Illinois residents agree that outdoor recreation areas and facilities are important to the enhancement of quality of life and for the promotion of economic development, and more land should be acquired to provide additional opportunities for outdoor recreation (IDNR 2021).

The SCORP also identified access to water bodies for boating, canoeing, kayaking, and day use, which can be challenging due to extensive private ownership of lands adjoining waterways. Findings from the 2020 Illinois Outdoor Recreation Survey indicated that more than two-thirds of Illinoisans stated there should be more public access to lakes, rivers, and streams (IDNR 2021).

According to the IDNR Division of Fisheries 2017 – 2022 Strategic Plan for the Conservation of Illinois Fisheries Resources, Illinois has less water acreage than most states of similar geographic size (IDNR 2017b). Since the statistics began in 1977, Illinois' supply of fishing days has lagged approximately 10 to 15 percent below demand. In Illinois, there is a high demand for angling days on impoundments (61 percent), with lower demands for angling days on streams (27 percent), Corp of Engineers Reservoirs (6 percent), and Lake Michigan (6 percent) (IDNR 2017b).

The City owns and manages Lake Springfield and its surrounding 57 miles of shoreline, which includes over 735 residential sites, eight public parks, and several public boat docks and launches. The lake and lake-area parks are host to some 600,000 recreational visitors each year (CWLP 2022). From the beginning, Lake Springfield was intended to serve not only as the domestic water supply for Springfield's residents and as cooling water for the power plants, but also as a recreation outlet for Central Illinois. A variety of water sports including boating, fishing, and swimming occur. In the past, Lake Springfield has supported over 100 fishing tournaments annually (CWLP 2017). In a study conducted for CWLP in 1998, Lake Springfield was identified as a prominent recreational resource in and around Sangamon County, however, it was also noted that it did not afford the quantity and variety of recreational opportunity that many local residents as well as visitors would prefer (PB Booker Associates 1998).

3.13.1.2.1 University of Illinois 2020 Recreation Study

In 2020, the University of Illinois completed a study of aquatic recreation supply and demand within the Springfield region (University of Illinois, 2020). The study focused on aquatic -based outdoor recreation that was conducted on a flat-water reservoir. These included fishing, fishing tournaments, boating, kayaking, canoeing, swimming, and water skiing. Although waterfowl hunting and bird watching and swimming is not dependent upon a flat-water reservoir, these activities were included in the analysis because these activities were reported by survey respondents as being conducted at a lake. The study concluded that there is an unmet demand for 12,773 acres of flatwater recreation activities within the 50 plus mile radius of Springfield at the year 2035 (see Section 1.4.1 for additional information regarding this study).

The study identified aquatic recreational sites within a 53-mile radius, which encompasses a 1-hour commute from the City of Springfield to any given aquatic recreational site. To be included in the analysis, the identified lakes, ponds, and rivers must have at least one water-based recreation activity which is defined as fishing, fishing tournaments, waterfowl bird watching, boating, kayaking, canoeing and water skiing. The study concluded that there is 45,874 acres of lake and 11,699 acres of rivers in the defined study area. The 76- mile stretch of the Illinois river included in the study area accounted for 7,776 acres and the 120-mile segment of the Sangamon River within the study areas consists of 3,840 acres. Lake Shelbyville is the largest lake with 11,100 acres, followed by Clinton Lake at 4,900 acres, and Lake Springfield at 3,866 acres.

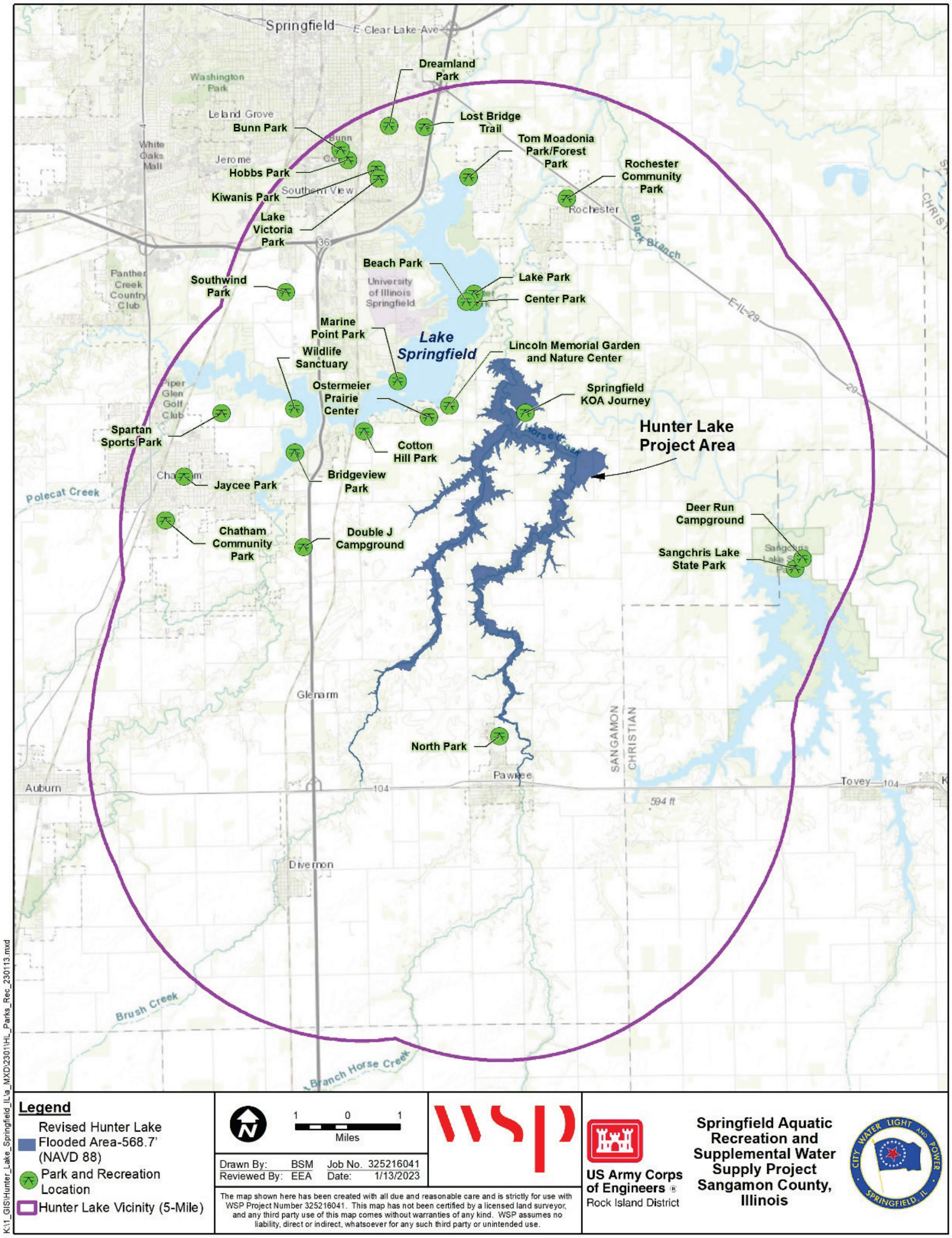

Figure 3-5. Parks and Recreation Areas Located within 5 Miles of Proposed Hunter Lake

The study administered a survey between June 8 and June 18, 2020, and asked respondent's questions regarding their usage of aquatic recreation facilities, the desire to use the facilities more often, and barriers to their using of the facilities. The activity with the highest usage was swimming in an outdoor pool, followed by fishing, and swimming in a lake or river. The most frequent response to barriers preventing use of recreational facilities was lack of time, however for swimming and motorboating, the barrier response was overcrowding, which may be related to availability. For motorboating, not having the necessary equipment was cited as a barrier to engaging in this activity (University of Illinois, 2020).

Using survey data and models, the 2020 Recreation Study identified a demand for flat-water recreation between 59,010 and 80,890 acres in 2020. The activities with the largest forecasted acreage demand were fishing, motorboating, canoeing, and boarding. This demand is anticipated to grow to 73,686 acres in 2025, 72,113 acres in 2030, and 70,276 acres in 2035. This results in an unmet demand range of 1,507 to 27,394 acres between the years 2020 to 2035 and beyond, with a point estimate demand of 12,773 acres by the year 2035 (University of Illinois 2020).

3.13.2 Environmental Consequences

3.13.2.1 Alternative A – No Action

Under the No Action Alternative, the City would not construct additional area for aquatic recreation or water supply source, and therefore there would be no impacts to existing parks or recreational areas. Additionally, this alternative would not address existing and forecasted demand for aquatic recreation or water supply needs.

3.13.2.2 Alternative B – Hunter Lake – Revised Configuration

3.13.2.2.1 Construction Impacts

Construction of this alternative would inundate KOA Road, which would eliminate access to the KOA Campground. This site is owned by the City and leased to the operator. The City would not renew the lease under this alternative, and there are no current plans to relocate the campground. However, there are three additional campgrounds located in the vicinity of the proposed Hunter Lake. Given the availability of additional parks and recreation areas in the vicinity and recreational opportunities created by the construction of Hunter Lake, direct impacts associated with the closure of the KOA Campground would be minor. No other parks or recreational areas would be directly impacted under this alternative.

Construction activities may disturb existing recreational activities located within the vicinity of the proposed Hunter Lake. Increased traffic, noise, fugitive dust, and erosion and sedimentation from stormwater runoff during construction may have an indirect effect on users of Lake Springfield and its surrounding parks. These impacts are anticipated to be minor and temporary in nature and would be minimized through implementation of BMPs designed to minimize noise, fugitive dust emissions and prevent erosion and sedimentation. As such construction of the proposed Hunter Lake would not interfere with the long-term use or enjoyment of parks and recreation facilities within the vicinity of the proposed Hunter Lake.

3.13.2.2.2 Operational Impacts

The construction of the proposed Hunter Lake would result in a new, approximately 2,649-acre aquatic recreation and water supply reservoir. Recreational opportunities would be developed by establishing three lake access points for fishing and boating and creating conservation areas on the upland areas surrounding Hunter Lake.

As identified in the University of Illinois 2020 Recreation Study there is an unmet need of 12,773 acres of flatwater aquatic recreation in an approximately 50-mile radius of the City of Springfield, and Hunter Lake would supply approximately 2,600 acres of this flatwater aquatic recreation need. The three recreation access points planned for the lake would include various facilities including parking for trailers and vehicles, bathroom areas, and floating boat docks. Kayak and canoe launches would also be constructed to provide access to open water zones above the in-basin dams on Brush and Horse Creeks. Together these facilities would serve to meet the highest demand for flat water aquatic recreation activities identified in the 2020 Recreation Study which include fishing, motorboating, canoeing, and boarding.

The City would work with IDNR to develop a Lake Management Plan in accordance with a cooperative agreement such that the IDNR would manage all aquatic and terrestrial resources within the project area. As such, IDNR would stock the lake initially with sport fish, manage the sport fishery, regulate harvest, monitor fishing tournaments, and provide follow-up stockings as necessary. The IDNR Strategic Plan for the Conservation of Illinois Fisheries Resources (IDNR 2017b) identified that angling opportunities are lagging in the state of Illinois, and the development of Hunter Lake would provide more opportunity for impoundment-based angling. The additional fishing opportunities provided by the creation of Hunter Lake would help satisfy the demand for additional angling days within Illinois, as identified by the IDNR, and would provide an alternate source of flatwater aquatic recreation in the region.

Recreational facilities and programs could also be developed in the upland areas surrounding Hunter Lake. These opportunities include low impact, passive activities such as picnicking, birdwatching, hiking, and biking. In addition, hunting and trapping programs, managed by IDNR, may be supported in these areas.

Implementation of this alternative would provide additional passive and active recreational opportunities, resulting in a large and beneficial impact to local and area wide recreation.

3.14 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.14.1 Affected Environment

Socioeconomics involves both social and economic factors which, in this analysis, are related to the Hunter Lake project area. Social characteristics of the project area are determined by demographics information (population, age, race) and economic characteristics are determined using information on housing, income, unemployment, and poverty level.

Socioeconomic characteristics are assessed using 2020 Census and 2017-2021 American Community Survey 5-year estimates provided by the (USCB 2020; 2021a). Employment and housing data are provided by the 2017-2021 American Community Survey. Data were used from a spatial extent and scale that provides the most accurate and up-to-date pictures of socioeconomic characteristics in the vicinity of the proposed project. Socioeconomic data are assessed at the county level and for Sangamon County, where Hunter Lake would be located.

The state of Illinois is included as a secondary geographic area of reference. Thus, the study area is defined as Sangamon County or the state of Illinois, as applicable.

3.14.1.1 Demographics

Demographic characteristics of the study area (population, race, and age) are summarized in Table 3-21. There are approximately 196,759 people living within Sangamon County. This represents 1.5 percent of the population of Illinois (12,821,813 people) (USCB 2021a). Numbers of persons younger than 18 years old within Sangamon County (22.3 percent) are similar to what is found throughout Illinois (22.5 percent). More persons 65 years old and greater are found within Sangamon County (17.9 percent) than Illinois (15.7 percent) (USCB 2021a). Since 2010, both Sangamon County and the state of Illinois have experienced slight population decreases, with Sangamon County's population decreasing by 0.6 percent from 2010 to 2020, and the state of Illinois having a 0.1 percent population decrease from 2010-2022 (USCB 2020).

As shown in Table 3-21, the majority of Sangamon County residents are white (76.6 percent). Approximately 13.1 percent of residents are Black or African American, which is comparable to, but slightly less, than that of Illinois (13.9 percent). The State of Illinois has a larger proportion of Hispanic or Latino Populations (18.2 percent) compared to that of Sangamon County (2.7 percent). Other racial groups account for approximately 7.6 percent of the population which is slightly less than that of Illinois at 9.6 precent. Compared to the State of Illinois (41.7 percent), Sangamon County is less racially diverse, having minority population below 23.4 percent (USCB 2021a).

Economic characteristics (housing and income) are also summarized in Table 3-21. The median household income in Sangamon County ($68,466) is comparable to the statewide median ($72,205). Additionally, the poverty rate in Sangamon County (11.8 percent) is similar to the state average of 14.1 percent (USCB 2021a).

3.14.1.2 Economic Conditions

The unemployment rate for Sangamon County (5.4 percent) is similar to that of Illinois (6.2) percent. Employment by industry is generally similar between Sangamon County and the State of Illinois. However, a higher percent of the population of the State of Illinois is employed in manufacturing and professional, scientific and management services, and the administrative and waste management services sectors. The major industry sectors in Sangamon County include education, health care and social assistance services, public administration, and retail trade (Table 3-22).

3.14.1.3 Environmental Justice

Guidance for addressing environmental justice is provided by the CEQ's Environmental Justice Guidance under the NEPA (CEQ 1997). In identifying minority and low-income populations, the following CEQ definitions of minority individuals and populations and low-income populations were used:

- Minority individuals. Individuals who identify themselves as members of the following population groups: American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Black, Hispanic, some other race, or two or more races.
- Minority populations. Minority populations are identified where (1) the minority population of an affected area exceeds 50 percent or (2) the minority population percentage of the

affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. For the purposes of this analysis, "meaningfully greater" is defined as greater than 20 percent of the minority population percentage in the general population of the county or state.

- Low-income populations. Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the USCB's Current Population Reports, Series P-60, on Income and Poverty. In this analysis, low-income populations are identified where (1) the population of an affected area exceeds 50 percent low-income based on the Census data or (2) the percentage of low-income population in the affected area is greater than 20 percent of the low-income population percentage in the county or state.

Table 3-21. Regional Demographic Characteristics

	Sangamon County	State of Illinois
Population[2]		
Population, 2021	196,759	12,812,813
Persons Under 18 Years, 2021	22.3%	22.5%
Persons 65 Years and Over, 2021	17.9%	15.7%
Racial Characteristics[1]		
White Alone, 2020 [(a)]	76.6%	58.3%
Black or African American, 2020 [(a)]	13.1%	13.9%
American Indian and Alaska Native, 2020 [(a)]	0.2%	0.1%
Asian, 2020 [(a)]	2.2%	5.8%
Native Hawaiian and Other Pacific Islander, 2020[(a)]	0.0%	0.0%
Some Other Race, 2020 [(a)]	0.4%	0.4%
Two or More Races, 2020	4.8%	3.2%
Hispanic or Latino, 2020 [(b)]	2.7%	18.2%
Housing and Income[2]		
Housing Units, 2021	92,702	5,412,995
Average Household Size	2.28	2.54
Median Household Income, 2016-2021	$68,466	$72,205
Persons Below Poverty Level, 2016-2021	14.1%	11.8%

(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.
Sources: [1]USCB 2020; [2]USCB 2021a

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. EO 12898 directs federal agencies to identify and address, as appropriate, potential disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

According to CEQ guidance, U.S. Census data are typically used to determine minority and low-income population percentages in the affected area of a project in order to conduct a quantitative assessment of potential environmental justice impacts. The geographic unit used in the analysis to identify any environmental justice communities of concern is the census block group. For the purposes of this analysis, a census block group constitutes an environmental justice community if it contains 50 percent or more aggregate minority or low-income population (the "Fifty Percent" analysis), or 20 percentage points or more aggregate minority or low-income population than the county or state average in which the block group is located (the "meaningful greater" analysis).

For this assessment, 2020 USCB block group data within the vicinity of the project area were evaluated for the presence of environmental justice communities (Figure 3-6). Two geographic areas of analysis (i.e., county and state) were used as comparison to determine potential environmental justice populations.

The nationwide poverty level is determined annually by the USCB and varies by the size of family and number of related children under 18 years of age. The USCB Poverty Threshold for a family of four is an annual income of $27,479 and for an individual under the age of 65 is an annual income of $14,097 (USCB 2021b).

Minority population data is provided in Table 3-21. Total minority populations (i.e., all non-white racial groups and Hispanic or Latino, combined) comprise 41.7 percent of the population of Illinois and 23.4 percent of Sangamon County population. Minority and racial information from 2020 USCB block group data were evaluated for the presence of minority environmental justice communities (Figure 3-6). None of the census blocks groups within the vicinity of the project area were identified as meeting the CEQ criteria for minority populations.

Income levels of the population within Sangamon County and the State of Illinois is shown on Table 3-21. The percent of residents in Illinois with incomes below the poverty level is approximately 12.0 percent, while approximately 14.0 percent of residents of Sangamon County have incomes that are below the poverty threshold. Low-income information from the 2020 USCB block group data were evaluated for the presence of low-income environmental justice communities (Figure 3-6). None of the census block groups within the vicinity of the project area were identified as meeting the CEQ criteria for low-income populations.

3.14.2 Environmental Consequences

3.14.2.1 Alternative A – No Action

Under the No Action Alternative, the City would not develop additional aquatic recreation areas nor a supplemental water supply. Therefore, the No Action Alternative would not alter demographic or economic conditions nor pose consideration for impacts to be disproportionately borne by environmental justice populations.

Table 3-22. Regional Employment Characteristics

	Sangamon County	State of Illinois
Labor Force		
Civilian Labor Force >16-years old	98,218	6,686,514
Percent Employed	94.6%	93.8%
Unemployment Rate	5.4%	6.2%
Employment by Industry		
Agriculture, Forestry, Fishing and Hunting, and Mining	1.6%	1.0%
Construction	4.7%	5.4%
Manufacturing	5.2%	11.7%
Wholesale Trade	2.3%	2.9%
Retail Trade	9.7%	10.4%
Transportation and Warehousing, and Utilities	4.6%	6.7%
Information	1.4%	1.7%
Finance and Insurance, and Real Estate and Rental and Leasing	7.3%	7.4%
Professional, Scientific, and Management, and Administrative and Waste Management Services	9.2%	12.3%
Education Services, and Health Care and Social Assistance	28.3%	23.4%
Arts, Entertainment, and Recreation, and Accommodation and Food Services	8.0%	8.6%
Other Services, Except Public Administration	5.0%	4.6%
Public Administration	12.8%	3.8%

Source: USCB 2021a

3.14.2.2 Alternative B – Hunter Lake – Revised Configuration

The construction of dams not only impacts the physical environment but also the cultural and economic aspects of an area and community. Dams and the land inundated as a result of their construction can alter the land use, historic resources, and community resources that influence the social and economic factors of a community. This section discusses the social impacts of the proposed Hunter lake as it relates to demographics and economics within the project area. Sections 3.16, 3.21, and 3.15 discuss in further detail the social and cultural impacts of the proposed Hunter Lake on land use, cultural and historic resources, and community facilities and services, respectively.

3.14.2.2.1 Demographic Impacts

Construction of the proposed Hunter Lake would require a temporary, relatively small increase in construction workforce as well as a relatively small increase in permanent workers added to the existing CWLP staff, such as full-time security officers and a maintenance crew. Temporary construction workers and permanent staff would be drawn from the labor force that currently resides within the region. Consequently, no temporary or long-term impacts to local demographics are expected, due to the small construction and operation workforce required.

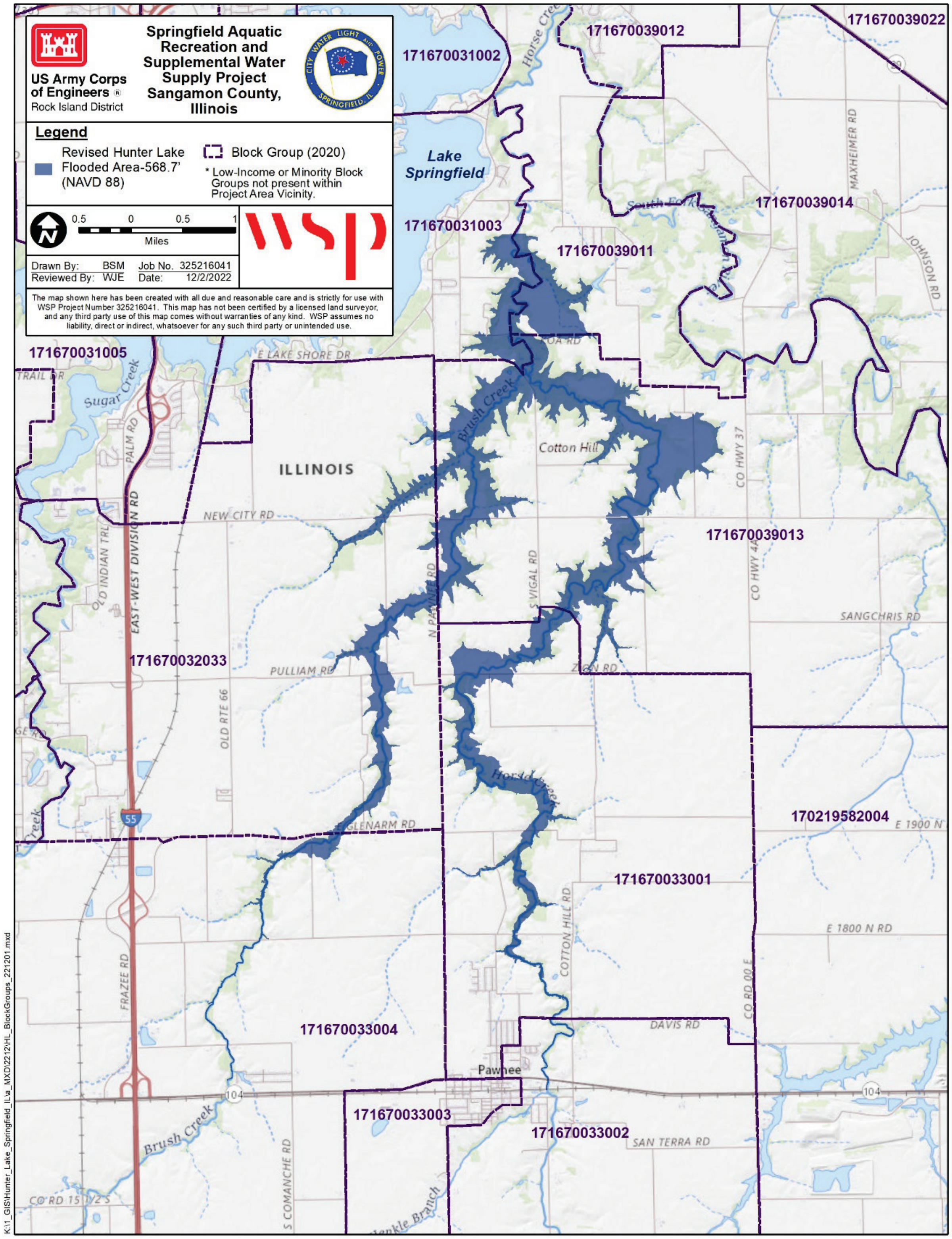

Figure 3-6. Minority and Low-Income Environmental Justice Populations

Within the leased land are seven occupied single-family residences and one campground that is also leased by the City. The city will not renew leases of these properties and therefore, current renters of these properties would need to relocate. As there is no shortage of available properties within the project vicinity, impacts associated with the proposed relocations would be minor. Impacts associated with the campground leased by the City is discussed within Section 3.13.2. In total, 101 structures are located within the overall study area. Based on current design concepts, the potential exists for two residential structures to be relocated due to their location within possible road realignments. Feasibility of avoidance and reduction of associated relocation impacts to these residential structures will be analyzed during road relocation planning and design.

3.14.2.2.2 Economic Impacts

3.14.2.2.2.1 Construction Impacts

Construction activities would temporarily increase employment and associated payrolls and would require the purchase of materials and supplies. Expenditures associated with the purchase of materials and supplies needed to construct the proposed Hunter Lake would therefore have a minor, direct economic benefit to the local and regional area. Additionally, some beneficial secondary impacts to the economy are also expected in conjunction with the multiplier effects of construction activities. For example, the hospitality and service industries would benefit from the demands brought by the increased construction workforce. Therefore, beneficial impacts to the regional economy associated with construction of Hunter Lake would be temporary and minor. As detailed in Chapter 2, the cost of construction of Hunter Lake would be borne by the City with a small portion to be funded by Sangamon County Highway Department. This cost would be somewhat offset by increases in revenue associated with construction expenditures and workforce and increases in revenue associated with increased recreational use as detailed below.

3.14.2.2.2.2 Operational Impacts

Potential economic impacts to the region associated with the operation of Hunter Lake are related to losses of revenue from agricultural leases and increases in revenue associated with recreational use.

With the exception of approximately 250 acres, the City owns all land needed for the construction of Hunter Lake. One commercial business is also located in the project area, a family-owned fertilizer sales business. The City will provide a fair market value in the acquisition of these properties, thereby limiting the economic impact to the current property owners. Farming leases on city-owned land would be terminated, resulting in a minor loss of revenue to the City. In addition, approximately 4,300 acres of cropland within the project area would be converted to City owned property, thereby changing it to tax exempt City-owned property. While there would be a minor loss of property tax revenue for Sangamon County and lease revenue for the City, fewer services would be needed within the project area. The loss of revenue is expected to be offset by indirect benefits associated with recreational visits to Hunter Lake.

In 2020, the City contracted the University of Illinois to produce a feasibility and economic impact of recreational water uses at the proposed Hunter Lake Reservoir. The study detailed that development of Hunter Lake would generate $7.25 million in economic benefits each year to Sangamon County, based on anticipated annual visitation of 50,118 to 206,362, with an annual average of 128,240 visitors (K. Kritz and J. Bland 2020). Increased visitation and operation of Hunter Lake would have secondary impacts associated with the multiplier effects of spending (e.g., spending on local goods and services) that would further benefit the local economy. The economic impact from individuals outside Sangamon County visiting Hunter Lake would be approximately $5.4 million annually and would support an additional 114 indirect jobs (K. Kriz and J. Bland 2020). Total economic activity in Sangamon County for 2020 was approximately $12.8 billion, so economic benefits from Hunter Lake would add approximately 0.06 percent annually to the regional economy (K. Kriz and J. Bland 2020). Therefore, the anticipated effects would be minor, notable long-term positive economic impacts associated with visitation to the proposed Hunter Lake. Therefore, indirect impacts to the regional economy associated with the loss of revenue from farming leases and property taxes would be minor under this alternative but offset by substantially greater indirect benefits from recreation in the long term.

3.14.2.2.2.3 Environmental Justice

As described above, there are no census block groups identified as meeting the criteria to be considered environmental justice populations under EO 12898 as it relates to low-income and minority populations. Construction of Hunter Lake would impact residents located near the project boundary, however none of these residents are considered environmental justice population. Construction related impacts may include noise and air emission, traffic delays and road congestion, and visual hindrance from cleared landscape and construction vehicles and machinery. Construction related impacts would be short-term in nature and minor, and would not be disproportionate on environmental justice communities, as impacts would be consistent across all communities in the project vicinity. Operation of Hunter Lake would draw in outside visitors and help support local tourism and related industries. With the exception of special events, use of Hunter Lake and associated recreation facilities would be free of charge. Therefore, operations related impacts would be minor and have no disproportionate adverse impacts on environmental justice populations.

Based on the described evaluation, portions of the project within the federal control and responsibility of the Corps does not have a disproportionately high or adverse human health or environmental effect on disadvantages communities.

3.15 COMMUNITY FACILITIES AND SERVICES

3.15.1 Affected Environment

Community services and facilities refer to those services provided to support residential developments, including utilities, law enforcement, fire and emergency services, hospitals, cemeteries, churches, and educational facilities. Direct impacts to community facilities and services occur when a community facility is displaced or access to the facility is altered. Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services and affect the delivery of such services.

To gain an accurate representation of the number of community facilities within the project area, these facilities were mapped within the project study area. In this case, the study area for community impacts is defined as the area within 5 miles of the Hunter Lake Project Area.

There are 16 schools within 5 miles of the project area, ranging from elementary schools to colleges and universities, and include private education facilities. As identified in Figure 3-7, Pawnee Grade School and Pawnee High School are located adjacent to the Horse Creek arm of the proposed Hunter Lake. Multiple churches are located within 5 miles of the project area; however, none are located within or immediately adjacent to the footprint of the proposed Hunter Lake. There are several cemeteries located within 5 miles of the project area. Eldridge Cemetery, the Brunk Cemetery, the Rusk Cemetery, and the Horse Creek Cemetery are located immediately adjacent to or less than 100 feet from Hunter Lake.

The project area and surrounding areas are provided fire protection from fire protection districts in Chatham, Divernon, Pawnee, and Rochester along with the Springfield Fire Department. The project area is protected by the Sangamon County Sheriff's Department and the Illinois State Police. There are no hospitals located within 5 miles of the project area.

Utilities with the 5-mile vicinity of the project area includes electric service provided by Ameren Illinois and the Rural Electric Convenience Cooperative Company. Natural gas is provided by Ameren Illinois and Panhandle Eastern Pipeline Company. Water services are provided by The City and several water cooperatives and commissions within Sangamon County, and wastewater services are mainly provided by Sangamon County Water Reclamation District.

3.15.2 Environmental Consequences

3.15.2.1 Alternative A – No Action

Under the No Action Alternative, the City would not develop a supplemental water supply and therefore additional aquatic-based recreation and supplemental water supply would not be provided. As a result, there would be no changes to community facilities or services.

3.15.2.2 Alternative B – Hunter Lake – Revised Configuration

Construction of the Hunter Lake alternative would be carried out by regionally based contractors and would not require relocation of workforces to the project area. Therefore, local fire, police, and medical services would not be affected by the proposed action.

In addition, no schools, churches, or hospitals are located within the project area. Pawnee Grade School and High School is located adjacent to the Horse Creek arm of the proposed Hunter Lake project area, near the southernmost portion of inundation, however no impacts from inundation are anticipated.

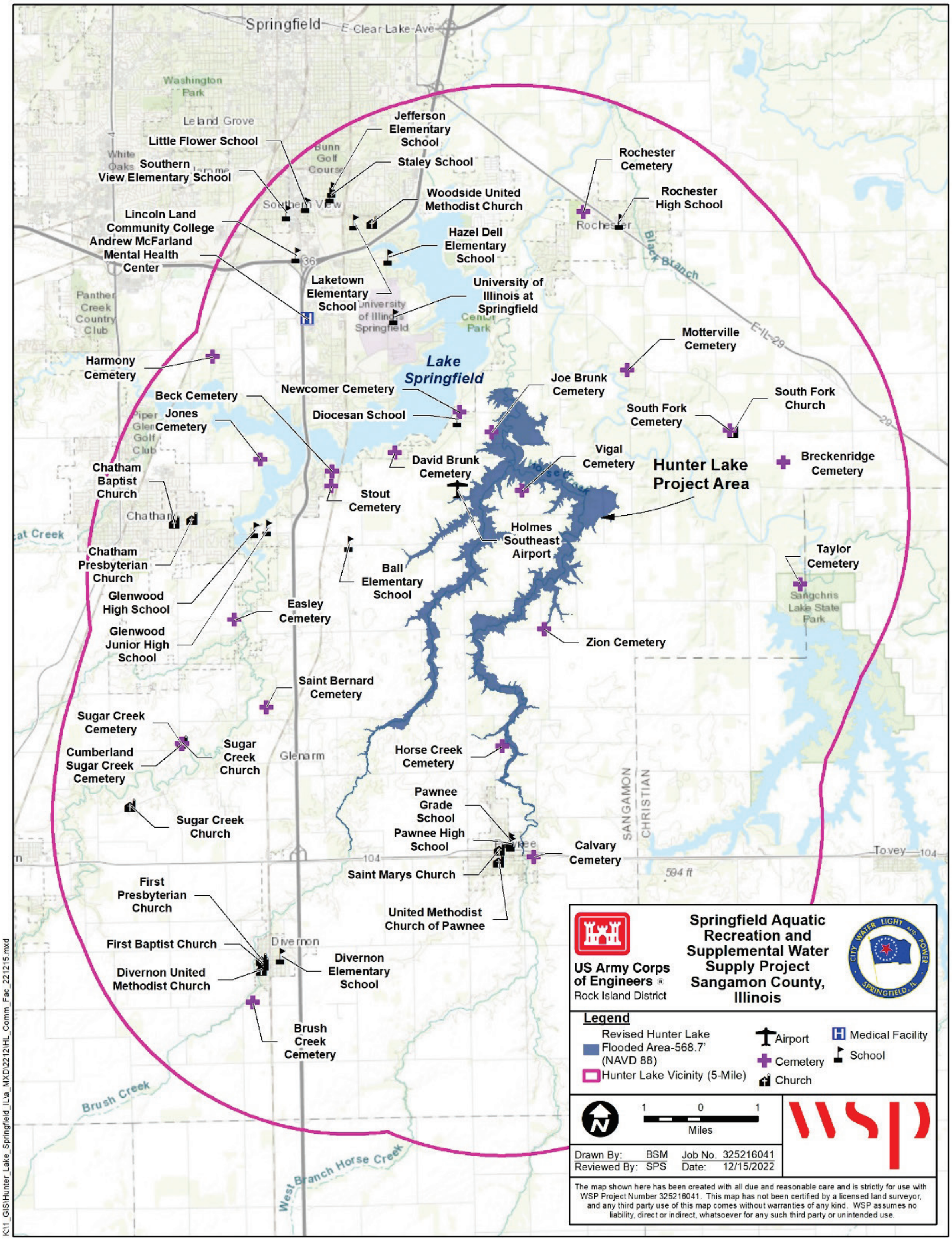

Figure 3-7. Community Facilities Located within 5 Miles of the Proposed Hunter Lake

Various utility abandonments and/or relocations would be required throughout the project area. However, construction activities would be coordinated with utility relocations to minimize interruptions of service, and effort would be made to limit duration of service interruptions. Given the temporary nature of service disruptions due to utility relocations, impacts would be minor.

Cemeteries adjacent to the Hunter Lake inundation area require further investigation to determine more precise boundaries and elevations in order to determine potential impacts. Should any cemeteries require relocation or other action to avoid inundation, the City would coordinate with the Illinois Historic Preservation Agency for compliance with applicable laws, regulations, and statutes. As noted in Section 3.21 an agreement with the agency is in progress.

Overall, direct impacts to community facilities and services under this alternative are anticipated to be minor. As the proposed action is not expected to result in relocations to the area, there would be no indirect impacts to community facilities and services. Additionally, the availability of a supplemental water supply would be a long-term beneficial impact to community services.

3.16 LAND USE

Land use is often classified by governing authorities within in an area. Due to the location of the proposed project area in Sangamon County, Illinois, the land use within the project area is primarily classified by Sangamon County. Land use designations within Sangamon County consist of Agricultural, Residential, Office and College, Business, and Industrial.

The FPPA may influence the requirements of Land Use within the project area such that it discourage the federal government from converting farmland to non-agricultural purposes. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land.

Existing land use data were gathered from local, state, federal, and commercial sources to characterize land ownership and land use patterns in the affected environment. This characterization included a review of land ownership maps and land use plans for the City and the affected counties and a review of aerial mapping. A review of land management policies and programs associated with regional government councils and planning commissions was also conducted.

3.16.1 Affected Environment

3.16.1.1 Agricultural Land

Agriculture is an important land use within Sangamon County and in the State of Illinois. According to the 2012 Census of Agriculture, three-quarters of all land in the state is used for farming. Agricultural land within Sangamon County is consistent and greater than the state average, with 92 percent of the land used for farming (Table 3-23).

Table 3-23. Agricultural Lands in Sangamon County and Illinois

	Sangamon County	State of Illinois
Approximate Land Area (acres)	555,713	35,532,405
Number of Farms	1,092	75,087
Land in Farms (acres)	514,043	26,937,721
Proportion of Land in Farms (percent)	92.5	75.8
Average Farm Size (acres)	471	359

Source: (USDA 2012)

The project area for the Hunter Lake alternative is wholly located in Sangamon County and includes all properties under and affected by the footprint of the proposed lake. Land use in this project area can best be described as agricultural or undeveloped with no land use. Figure 3-3 presents land cover types within the project area and shows undeveloped and developed land by intensity.

Agricultural land is the most predominant land use type in the project area (Table 3-24) and the project vicinity. Developed lands within the vicinity of the Hunter Lake Project area account for approximately 20,000 acres which are largely associated with the Springfield region. Collectively, agricultural lands of the project area consist of approximately 4,300 acres of cultivated fields, hay lands, and pasture areas. Agricultural lands within the project area are leased by the City. Forested lands account for the second largest land use within the project area and the third largest within the vicinity. Developed lands within the project area are limited to isolated residential/commercial properties and roadway infrastructure. Other minor land uses within the project area include wetlands and open water areas which are more completely described in Section 3.7.

The SSCRPC provides land use planning services for the project area while jurisdictional control lies with Sangamon County. The county zoning designation for the project area is classified as “A” which permits agriculture uses. The Springfield 2020 Land Use Plan designates the proposed Hunter Lake project area as a future planned use with the surrounding area as conservation area and agricultural uses and the Springfield 2020 Land Use Plan states that no development of undeveloped land should occur without necessary infrastructure.

Table 3-24. Land Use of the Hunter Lake Project Area

Land Use Category	Hunter Lake Project Area (acres)	Vicinity of Hunter Lake (5-Mile Radius) (acres)
Agricultural Lands	4,344	90,747
Forest	3,167	11,505
Wetland	100	1,201
Open Water	156	5,467
Developed	216	20,117
Other	0	14
Total	**7,983**	**129,051**

3.16.2 Environmental Consequences

3.16.2.1 Alternative A – No Action

Under this alternative, the City would maintain its current use of Lake Springfield supplemented by pumping from the South Fork as its sole water supply. There would be no further property acquisition or construction and, therefore, no conversion of land use. However, maintaining the project area in its current land uses is not consistent with the City of Springfield 2020 Land Use Plan which designates the area for the proposed Hunter Lake alternative.

3.16.2.2 Alternative B – Hunter Lake – Revised Configuration

Under this alternative, approximately 4,300 acres of agricultural land currently owned by the City would be taken out of agricultural use and converted to project lands consisting of lake, passive and active recreation uses, or mitigation areas. The loss of agricultural land would represent approximately 17 percent of the agricultural land in the project vicinity but only 0.8 percent of total farms in the county (514,043 acres) (USDA 2012). This land conversion would be consistent with the land use plan for the City. The City has also stated that further development around the lake would not be permitted as properties will remain in City ownership and managed by IDNR. In addition, existing zoning is consistent with the proposed use. Therefore, no impacts to land use are anticipated.

3.17 PUBLIC HEALTH AND SAFETY

3.17.1 Affected Environment

Potential public health and safety concerns are those associated with the use of construction and heavy equipment; potential exposure to hazardous materials used during construction, such as fuels, lubricants, solvents, and herbicides; construction traffic entering and traveling across project area; and those associated with operations.

Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws may comprise both federal and state statutes. The Occupational Safety and Health Administration (OSHA) is the main statute protecting the health and safety of workers in the workplace. OSHA regulations are presented in Title 29 CFR Section 1910 (29 CFR Section 1919), Occupational Safety and Health Standards. A related statute, 29 CFR Section 1926, contains health and safety regulations specific to the construction industry. The Illinois Department of Labor adopted statewide OSHA standards for public workers pursuant to 820 Illinois Compiled Statutes Section 219.

Implementation of BMPs can ensure optimization of public and construction workers' health and safety. BMPs can include, but are not limited to:

- Daily inspection of equipment and vehicles for leaks
- Preparation and implementation of a spill prevention and response plans to avoid and contain accidental spills
- Construction according to OSHA requirements
- Following posted traffic laws
- Cessation of project construction near stream courses under high flow conditions
- Conducting workforce safety meetings at the start of each workday to review hazards associated with the job, work procedures, special precautions, and other potential safety issues

3.17.2 Environmental Consequences

3.17.2.1 Alternative A – No Action

Under the No Action Alternative, the City would not develop a new reservoir to provide aquatic recreation and supplemental water supply. Without the addition of a new reservoir there would be no safety risk associated with such facilities. However, there would be increased risk of reduced or loss of water supply during times of high drought.

3.17.2.2 Alternative B – Hunter Lake – Revised Configuration

3.17.2.2.1 Construction Impacts

During construction, customary industrial safety standards as well as the establishment of appropriate BMPs and job site safety plans would be used to manage and increase job safety. These BMPs and site safety plans address the implementation of procedures to ensure that equipment guards, housekeeping, and personal protective equipment are in place; the performance of employee safety orientations and regular safety inspections; and the development of a plan of action for the correction of any identified hazards. Construction debris and wastes would be managed in accordance with federal, state, and local requirements.

Implementation of the proposed Hunter Lake would require the excavation and relocation of large volumes of earth and vegetation, construction of the dam and spillways, roadway and utility line relocation, and bridge construction. Construction would involve the use of earthmoving, compacting, and paving equipment, as well as personal vehicles for workers and trucks for hauling materials. Activities occurring offsite include construction traffic and delivery of materials and supplies using local and regional roadways. Construction activities onsite and offsite would be performed consistent with standards established by OSHA to optimize public health and safety. Thus, construction-related impacts to public health and safety are expected to be minor.

3.17.2.2.2 Operational Impacts

The development of Hunter Lake may cause an insignificant increase in emergency response and travel time experienced by residents living in remote areas adjacent to the project area. However, since all primary and secondary highways would remain and continue to be served by crossroads, no major increase in response times is foreseen. Additional information regarding emergency response and community services that contribute to public health and safety is provided in Section 3.15.

One of the purposes for the proposed construction of Hunter Lake is to supplement the current water supply source for the City. As discussed in Chapter 1, the City’s existing water supply system inadequately meets water supply demands during drought conditions. Drought can cause a number of public health and safety related consequences due to a lack of available water such compromised food sources, increases in vector-borne disease, poor air quality, and worsening of chronic illnesses and mental health conditions (CDC 2018). If there is not enough water to support industrial facilities, drought can lead to energy related impacts to health including the malfunctioning of heating, ventilation, and air conditioning (HVAC) systems (CDC 2010). The proposed Hunter Lake would provide a water source that contains the capacity to address the project’s purpose of a supplemental water supply which would ultimately have large beneficial impacts to the public and private entities that rely on the City for water.

Dams may influence water quality which may impact the public health and safety of people using Hunter Lake for recreation or for water consumption. As discussed in Section 3.5, dams can increase the surface temperature of the water which promotes the growth of algae. Algal blooms can create toxins and decrease dissolved oxygen which can make reservoir water unfit for recreational, residential, or industrial use (McCully 2001). Sediments within reservoirs may also cause an increase of mercury levels in fish which may impact the health and safety of individuals who use the fish they catch as a food source (McCully 2001). Section 3.5 outlines the design elements integrated into the proposed Hunter Lake design that address water quality concerns within the project area and downstream of the dam. These elements include in-lake controls structures, treatment train BMPs, wetlands, water and sediment control basins, grade control, terraces, grassed waterways, permanent cover, and shoreline stabilization. The implementation of these design elements aims to reduce and control phosphorus, nitrogen, and sediment loading to Hunter Lake and will provide notable benefits to downstream areas including the Sangamon and Illinois rivers, consistent with the Nutrient Loss Reduction Strategy for the State of Illinois. Hunter Lake is expected to have beneficial impacts to water quality within and downstream of the proposed reservoir.

There is an increased potential for water related recreational incidents associated with a large water body, primarily associated with boating accidents. However, boating safety courses offered by the IDNR and CWLP would be provided to encourage proper boat safety education and help prevent boating accidents. Boat Safety Checks may also be provided. Additional precautions such as fencing or wider vegetation buffers near more populated areas, such as Pawnee, could be employed to reduce direct access to the lake apart from the three-boat ramp/access locations and two kayak access points. Therefore, no impacts to public health and safety are anticipated under this alternative.

Two main reasons for dam failures are overtopping and foundation problems which can both compromise the dam's ability to hold back water (McCully 2005). Overtopping may occur from the inadequate capacity of the spillway to discharge water and foundational problems occur when the dam is built on unstable material, or the dam wall integrity is compromised (McCully 2005 & ASDSO 2023). Dam failures have the potential to cause large adverse impacts to the people, businesses, and communities that live downstream. To avoid adverse impacts to public safety due to dam failure, the Hunter Lake dam will be built with multiple safety features including a 400-foot emergency spillway flanking the dam on the opposite side of the primary spillway, as well as two, four-foot by six-foot gates located at the base of the tower to provide rapid dewatering into Horse Creek in the case of imminent failure. With the implementation of these safety features Hunter Lake is expected to have no impact to public health and safety due to dam failure.

In addition to design features that aim to make dam operation safe for the public, the City will be required by the State of Illinois to comply with statutes and regulations with regards to dam safety. The IDNR Division of Water Resource Management Dam Safety Program issues permits for the construction and maintenance of dams. In order for IDNR to assess the safety aspects of the dam from an engineering perspective, the City will provide the required information and calculations to verify the adequacy of the design in the final design report submitted. The dam will be designed and constructed to meet the minimum performance standards established by IDNR. It is anticipated that Hunker Lake reservoir would be a Class I, High-Hazard Potential Dam. Safety regulations for a Class I dam include annual inspections that would be completed by a Professional Engineer licensed in the State of Illinois and the development of an Emergency Action Plan. The Emergency Action Plan would detail potential inundation zones and implement a comprehensive emergency management program to mitigate impacts of a large operational release or dam breech. The City currently complies with Class I dam regulatory requirements at Lake Springfield for the Saddle and Spaulding dams. The Emergency Action Plan is likely to include information on emergency detection, evaluation, and classification, information on responsibilities of the dam operator to communities and relevant parties in the area, warning and notification processes, and procedures on preparedness. It is not anticipated that lake dams constructed to improve water quality would be regulated, as the structures are designed to slow the flow of water to improve settling of sediments and nutrients. Including both the design features built into the dam as well as the safety precautions and preventative measures required by law to prevent dam failure, the proposed Hunter Lake is expected to have positive impacts to the citizens and industries that rely on the City for water.

3.18 TRANSPORTATION

3.18.1 Affected Environment

Transportation related infrastructure within the Hunter Lake project area includes roadways and bridges that lie within the existing inundation footprint. The proposed Hunter Lake project area lies to the southeast of the City of Springfield and Lake Springfield in Sangamon County, Illinois. The earthen dam would lie approximately 0.3 miles south of Honeywell Road. County Road (CR) 40 (New City Road), CR 28 (North Pawnee Road), CR 43 (East Lake Shore Drive) and CR 37 (Cardinal Hill Road) which serve the project area in the vicinity of the proposed Hunter Lake site. Several smaller local roads also serve the project area but are not described here as their presence in the area is minor.

Annual Average Daily Traffic (AADT) volume and existing levels of service (LOS) for 2021 on the roadways in the immediate vicinity of the Hunter Lake were collected using online traffic data from the Illinois department of Transportation. This data is indicated in Table 3-25.

Table 3-25. Average Daily Traffic Volume (2021) on Roadways in Proximity to Hunter Lake

Roadway	Existing Annual Average Daily Vehicle Use (AADT)	Number of Lanes	Existing Level of Service
CR 28 north of CR 40	800	2	A
CR 28 south of CR 40	1,150	2	A
CR 40 west of CR 28	1,350	2	A
CR 40 east of CR 28	1,100	2	A
CR 43 north of CR 28	1,700	2	A
CR 43 south of CR 28	950	2	A
CR 37 north of CR 40	1,450	2	A
CR 37 south of CR 40	1,150	2	A

Source: IDOT 2021

Existing LOS on the roadways in the immediate vicinity of Hunter Lake are LOS A. LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. LOS is described accordingly:

- LOS A: describes free flow traffic conditions
- LOS B: free flow conditions although presence of other vehicles begins to be noticeable
- LOS C: increases in traffic density become noticeable but remain tolerable to the motorist

- LOS D: borders on unstable traffic flow; the ability to maneuver becomes restricted; delays are experienced
- LOS E: traffic operations are at capacity; travel speeds are reduced, ability to maneuver is not possible; travel delays are expected
- LOS F designates traffic flow breakdown where the traffic demand exceeds the capacity of the roadway; traffic can be at a standstill

3.18.2 Environmental Consequences

3.18.2.1 Alternative A – No Action

Under this alternative, the City would not construct the proposed Hunter Lake, thus no additional aquatic recreation area would be added and the City would maintain its current use of Lake Springfield supplemented by pumping from the South Fork as its sole water supply. Therefore, there would be no impact to transportation.

3.18.2.2 Alternative B – Hunter Lake – Revised Configuration

3.18.2.2.1 Construction Impacts

Based on typical construction practices, the daily workforce traffic generated by construction of the earthen dam is estimated to be 200 workers. This will vary depending on the timing of the construction. For conservative purposes, it is assumed that there is one worker per passenger vehicle resulting in a construction workforce traffic count of 400 (200 inbound trips and 200 outbound trips). The construction workforce traveling to and from the earthen dam site would contribute to the traffic on the local transportation network (such as CR 28 and CR 40). However, it is assumed that the construction workforce motorists would use interstate highways or major arterial roadways as much as possible, and would use lower functioning roadways (CR 28, Honeywell Road) to access the earthen dam site. This workforce volume would occur at the beginning and end of the workday.

Construction-related vehicles (dozers, backhoes, graders, loaders, etc.) would be delivered to or removed from the earthen dam site on flatbed trailers under both the mobilization and demobilization stages of the project. It is estimated that up to 75 construction vehicles would be utilized for this mobilization and demobilization; however, they would not all access the site at the same time. Overall, the traffic volume generated by the construction workforce and the construction-related vehicles would be relatively minor and temporary. As a worst case, the projected construction workforce traffic and construction delivery trucks at the Hunter Lake earthen dam site could contribute an additional 475 vehicles per day on CR 43 north of CR 28. This would increase the ADT on CR 43 from 1,650 vehicles per day to 2,125 vehicles per day. This would not have a measurable effect on the LOS on CR 43 (it would remain LOS A). Therefore, the effects of construction at the Hunter Lake earthen dam site would be minor.

There are multiple roadway and bridge construction sites associated with this alternative. The most notable location is the relocation of CR 28 and CR 40 and the construction of bridges over the Brush Creek branch of Hunter Lake. It is possible that the road and bridge construction projects would coincide with the dam construction project adding to the construction workforce traffic. However, the two work sites are over 3 miles apart and the traffic related effects of one are not likely to impact traffic conditions at the second location. Based on typical construction practices, the daily workforce traffic generated by the construction of the relocation of CR 28 and CR 40 is estimated to be 150 workers. This workforce volume would occur at the beginning and end of the workday. Construction-related vehicles (dozers, backhoes, graders, loaders, etc.) would be delivered to or removed from the road construction site on flatbed trailers under both the mobilization and demobilization stages of the project. It is estimated that up to 50 construction vehicles would be utilized for this mobilization and demobilization. However, construction workers would not all access the site at the same time. Overall, the traffic volume generated by the construction workforce and the construction-related vehicles would be relatively minor and temporary. The other roadway construction project areas are much smaller in scale than the relocation of CR 28 and CR 40, and their effects on transportation would also be minor and temporary.

Construction of smaller project features, such as the recreation access points and water quality enhancement features, would be similar to those described above but much smaller in nature. Because of the smaller size and shorter construction duration for these features, potential impact to traffic on existing roadways is expected to be minor.

Overall, because of the phased construction for the project, roadway projects would not necessarily be occurring at the same time as construction of the dam or other project features. Thus, it is not anticipated that construction traffic for both major features would occur simultaneously.

3.18.2.2.2 Operational Impacts

The operation of the Hunter Lake alternative is estimated to have a small workforce that would periodically access all project areas. Therefore, there would be a negligible impact to the transportation network because of its operation.

The inundation area created by the Hunter Lake dam would result in some changes in travel patterns for some residents. There are 19 homes and the Vigal Cemetery along South Vigal Road between the Brush Creek branch and the Horse Creek branch of the proposed lake. The residents of these homes and visitors to the cemetery would no longer be able to travel north on South Vigal Road as the road would be closed and inundated to the north of their homes. Instead, these residents would need to travel south to CR 40, west to CR 23, then north on CR 23 to the point where they would have reached on CR 23 had South Vigal Road not been closed. This would result in additional one-way travel of approximately 1.9 miles which would cause moderate impacts to these residents as they would bear a slightly greater cost to travel from their homes to the north.

Recreational uses of Hunter Lake would also result in increased vehicular traffic on adjacent roadways that may be notable during periods of higher use. The largest access point has capacity for up to 50 trailered vehicles plus up to an additional 10 vehicles, while the other two main access points have capacity for up to 25 trailered vehicles and up to an additional five vehicles (see Section 2.3.2.2), resulting in a maximum of up to 120 additional vehicles. However, the three main access points are spread apart on the proposed reservoir with varying routes of access, thus minimizing potential impacts to roadways once off the main highway. Thus, increased traffic due to recreational uses is not expected to reduce roadway level of service and degrade traffic conditions.

3.19 NOISE

3.19.1 Affected Environment

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities and diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses, and the time of day the noise occurs. For instance, higher sensitivities to noise would be expected during the quieter overnight periods at noise sensitive receptors such as residences. Other receptors might include developed sites where frequent human use occurs such as churches and schools. As noted in Section 3.15, there are no churches or schools within 0.5 miles of the project area, although there are four cemeteries adjacent to the inundation area.

Sound is measured in units of decibels (dB) on a logarithmic scale. The “pitch” (high or low) of the sound is a description of frequency which is measured in Hertz (Hz). Most common environmental sounds are a composite of sound energy at various frequencies. A normal human ear can usually detect sounds that fall within the frequencies from 20 Hz to 20,000 Hz. However, humans are most sensitive to frequencies between 500 Hz to 4,000 Hz.

Sound from a source spreads out as it travels from the source, and the sound pressure level diminishes with distance. In addition to distance attenuation, the air absorbs sound energy; atmospheric effects (wind, temperature, precipitation) and terrain/vegetation effects also influence sound propagation and attenuation over large distances from the source. An individual’s sound exposure is determined by measurement of the noise that the individual experiences over a specified time interval. A continuous source of noise is rare for extended periods and is typically not a characteristic of community noise (i.e., outdoor noise near a community). Typical background day/night noise levels for rural areas range between 35 and 50 dB whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (USEPA 1974). Background noise levels greater than 65 A-weighted decibels (dBA) can interfere with normal conversation, watching television, using a telephone, listening to the radio, and sleeping.

Certain frequencies are given more “weight” during noise assessments because human hearing is not equally sensitive to all frequencies of sound. This adjusted unit of measure is known as the A-weighted decibel, or the dBA. The dBA scale corresponds to the sensitivity range for human hearing. A scale weighting reflects the fact that a human ear hears poorly in the lower octave-bands. It emphasizes the noise levels in the higher frequency bands heard more efficiently by the ear and discounts the lower frequency bands. A noise level change of 3 dBA or less is barely perceptible to average human hearing. However, a 5 dBA change in noise level is clearly noticeable. A 10 dBA change is perceived as a doubling or halving of noise loudness, whereas a 20 dBA change is considered a “dramatic change” in loudness.

Common indoor and outdoor noise levels are listed in Table 3-26.

Table 3-26. Common Indoor and Outdoor Noise Levels

Common Outdoor Noises	Sound Pressure Levels (dB)	Common Indoor Noises
	110	Rock Band at 5 m (16.4 ft)
Jet Flyover at 300 m (984.3 ft)		
	100	
		Inside Subway Train (New York)
Gas Lawn Mower at 1 m (3.3 ft)		
	90	
		Food Blender at 1 m (3.3 ft)
Diesel Truck at 15 m (49.2 ft)		Garbage Disposal at 1 m (3.3 ft)
	80	
		Shouting at 1 m (3.3 ft)
Gas Lawn Mower at 30 m (98.4 ft)	70	Vacuum Cleaner at 3 m (9.8 ft)
Commercial Area		Normal Speech at 1 m (3.3 ft)
	60	
		Large Business Office
	50	Dishwasher Next Room
Quiet Urban Daytime		
	40	Small Theater, Large Conference Room
Quiet Urban Nighttime		Library
Quiet Suburban Nighttime		
	30	
		Bedroom at Night
Quiet Rural Nighttime		Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

Source: Arizona DOT 2008

3.19.1.1 Noise Regulations

To account for sound fluctuations, environmental noise is commonly described in terms of the equivalent sound level, or Leq. The Leq value, expressed in dBA, is the energy averaged, A-weighted sound level for the time period of interest. The day-night sound level (Ldn) is the 24-hour Leq, which incorporates a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m. to account for the increased annoyance during this period when most people are more sensitive to noise while they are trying to sleep. The USEPA 1974 guidelines recommend that Ldn not exceed 55 dBA for outdoor residential areas. The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985). These levels are not regulatory goals but are “intentionally conservative to protect the most sensitive portion of the American population" with "an additional margin of safety" (USEPA 1974). For traffic-related noise, FHWA has set a threshold of 67 dBA as the sound level at which noise abatement should be considered.

3.19.1.2 Sources of Noise

Noise sources common to proposed project activities include noise from transportation activities and construction noise. As described in Section 3.18, transportation effects associated with the project activities are limited and would only result in minor effects. Accordingly, noise related impacts associated with transportation activities are minor and are subsequently not analyzed in detail.

The level of construction noise is dependent upon the nature and duration of the project. Construction activities for most large-scale projects would be expected to result in increased noise levels due to operation of construction equipment onsite. Noise levels associated with construction activities will increase ambient noise levels adjacent to the construction site. Construction noise is generally temporary and intermittent in nature as it often occurs on weekdays during daylight hours which minimizes the impact to sensitive receptors.

Operational noise would result from use of motorized vehicles on the proposed Hunter Lake.

3.19.2 Environmental Consequences

3.19.2.1 Alternative A – No Action

Under this alternative, the City would maintain its current use of Lake Springfield supplemented by pumping from the South Fork as its sole water supply and no additional aquatic recreation areas would be constructed. Therefore, there would be no impact to noise sensitive receptors.

3.19.2.2 Alternative B – Hunter Lake – Revised Configuration

3.19.2.2.1 Construction Impacts

Most construction activities would occur during the day on weekdays. Construction-related noise would result from the construction of the earthen dam, road and bridge relocations (notably on CR 40 and CR 28), and boat ramps, and from transportation noise associated with vehicles traveling to and from the work sites.

Construction of the earthen dam would require excavation and compaction of fill. Development of this site would generate noise from compactors, front loaders, backhoes, graders, and trucks. As illustrated below in Table 3-27, typical noise levels from construction equipment are expected to be 85 dBA or less at a distance of 50 feet from the construction site. These types of noise levels would diminish with distance from the project site at a rate of approximately 6 dBA per each doubling of distance. The nearest receptor to the dam construction site, a residence, is approximately 1,030 feet east of the construction site. Noise levels from construction equipment at the dam site would attenuate to approximately 58.7 dBA at the receptor, 1,030 feet away. Therefore, noise levels would meet the recommended HUD noise guideline of 65 dBA at approximately 500 feet. However, construction noise would still remain above the USEPA guideline of 55 dBA. Given that these impacts would be intermittent and temporary, the impact of noise generated from construction activities is expected to be minor. Other potential receptors are farther from the dam construction site and noise would attenuate to lower levels; therefore, the other receptors are not analyzed here.

Activity at road and bridge construction sites would require excavation, compaction of fill, paving, and bridge structure construction. These activities would generate noise from compactors, front loaders, backhoes, graders, and trucks. As illustrated above in Table 3-27, typical noise levels from construction equipment are expected to be 85 dBA or less at a distance of 50 feet from the construction site. The nearest receptor, a residence, to a road or bridge construction site is approximately 125 feet north of CR 40. Noise levels from construction equipment at this location would attenuate to approximately 77.0 dBA at the receptor. This would be above the recommended HUD noise guideline of 65 dBA and the EPA guideline of 55 dBA. However, these impacts would be intermittent and temporary during the construction period, which would be approximately six months. Given that these impacts would be intermittent and temporary, the worst-case impact of noise generated from roadway construction activities is expected to be minor.

Construction-related impacts at other facilities such as boat ramps and water quality enhancement features would be similar to those described above but on a smaller scale. As these impacts would be temporary, they are expected to be minor.

Table 3-27. Typical Construction Equipment Noise Levels

Equipment	Noise Level (dBA) at 50 feet
Dump Truck	84
Bulldozer	85
Scraper	85
Grader	85
Excavator	85
Compactor	80
Concrete Truck	85
Boring-Jack Power Unit	80
Backhoe (trench)	80
Flatbed Truck	84
Crane (mobile)	85
Generator	82
Air Compressor	80
Pneumatic Tools	85
Welder/Torch	73

Source: FHWA 2016

3.19.2.2.2 Operational Impacts

The operation of the Hunter Lake is estimated to have a workforce of 15 permanent staff. However, no major noise generating activities would be conducted during operations.

Recreational uses of Hunter Lake would result in increased noise from vehicular traffic and increased noise from motorized recreational watercraft. However, such noise emissions are localized and would diminish such that noise levels at potential receptors along roadways, closest residences, and visitors to adjacent cemeteries, would be minor. Additionally, because the lands within the project area would be managed by IDNR, the anticipated increase in forested habitat would provide additional noise attenuation buffer to surrounding sensitive receptors. Therefore, there would be a negligible impact to noise receptors.

3.20 AESTHETICS

3.20.1 Affected Environment

The visual landscape of an area is formed by physical, biological, and man-made features that combine to influence both landscape identifiability and uniqueness. Scenic resources within a landscape are evaluated based on numerous factors that include scenic attractiveness, integrity, and visibility. Scenic attractiveness is a measure of scenic quality based on human perceptions of intrinsic beauty as expressed in the forms, colors, textures, and visual composition of each landscape. Scenic integrity is a measure of scenic importance based on the degree of visual unity and wholeness of the natural landscape character. The varied combinations of natural features and human alterations both shape landscape character and help define their scenic importance. The subjective perceptions of a landscape's aesthetic quality and sense of place is dependent on where and how it is viewed.

The project area contains a combination of natural and developed features that contribute to the overall visual composition of the area. The overall landscape is dominated by agricultural fields interrupted intermittently by streams with riparian corridors and farmland. Most of the streams within the project area are low quality, incised streams that are disconnected from their floodplains. Overall, the scenic attractiveness of the project area is ordinary and common throughout central Illinois. The forms, colors, and textures in the affected environment do not have distinctive quality. The scenic integrity has been lowered by human alteration due to agricultural practices.

3.20.2 Environmental Consequences

The potential impacts to the visual environment from a given action are assessed by evaluating the potential for changes in the scenic value based upon landscape scenic attractiveness, integrity, and visibility. Sensitivity of viewing points available to the general public, their viewing distances, and visibility of the proposed action are also considered during the analysis.

These measures help identify changes in visual character based on commonly held perceptions of landscape beauty, and the aesthetic sense of place.

3.20.2.1 Alternative A – No Action

There would be no change in the current conditions under this alternative, therefore there would be no impact to the current aesthetics of the region.

3.20.2.2 Alternative B – Hunter Lake – Revised Configuration

Under the Hunter Lake alternative, the proposed reservoir would result in the conversion of woody riparian corridors and agricultural fields to a surface water impoundment surrounded by forest and grassland.

All of the agricultural land within the project area that is not inundated would either be developed as forested fringe or upland grasslands. Much of the existing bottomland timber would be removed and replaced by open water habitats. The conversion of cultivated lands to open water and grassland (in uplands of the project area) would result in an overall increase in the cohesiveness of the landscape and increase the visual attractiveness and integrity of the area.

It is anticipated that a large lake in the area would attract visitors who will be drawn to the intrinsic scenic beauty of the site as well as the managed natural areas and recreational benefits. Therefore, the change in the visual landscape due to creation of the lake is anticipated to result in a positive long-term visual impact.

The construction equipment, staged materials, and activities related to dam construction, road relocation, and other project-related features prior to stream impoundment would result in a short-term alteration in the visual quality of the site. Impacts from additional vehicular traffic are expected to be minor as the work would occur in phases. This increase in visual discord would be temporary and last only until construction is completed.

In the event of a drawdown of the reservoir during prolonged drought periods, the land previously submerged along the banks would be exposed and may be unsightly to visitors to the lake in the short term. Depending on the length of time until the water level in the reservoir is restored, early successional species will re-vegetate these exposed areas. However, in the long term, the reservoir would return to the inundation level, and any visual discord would be temporary.

In summary, construction activities under the proposed Hunter Lake alternative would result in minor adverse visual impacts. However, in the long term, aesthetics and visual attractiveness of the project area would be notably positive relative to the base condition.

3.21 CULTURAL AND HISTORIC RESOURCES

3.21.1 Affected Environment

According to 36 CFR Section 800, historic properties are prehistoric or historic districts, sites, buildings, structures, or objects included in or eligible for inclusion in the National Register of Historic Places maintained by the Secretary of the Interior. Historic properties also include the artifacts, records, and remains related to or located within these properties. Cultural resources are prehistoric or historic remains or indicators of past human activities such as artifacts, sites, structures, landscapes, and objects of importance to a culture or a community.

The NHPA of 1966 (30 CFR Section 800) was created to preserve historic and archaeological sites within the United States. The NHPA created the NRHP, the list of National Historic Landmarks, and State Historic Preservation Offices. The Advisory Council on Historic Preservation (ACHP) is an independent federal agency that helps to promote the enhancement, productive use, and preservation of the nation’s historic resources. Section 106 of the NHPA requires federal agencies to consider the impact of their actions on historic properties and provide the ACHP with an opportunity to comment on project prior to implementation.

In 1990-1991, the Illinois State Museum Society was contracted by the City to conduct an archeological and architectural inventory of the proposed Hunter Lake Area of Potential Effect (APE). The investigations resulted in the documentation of 727 cultural resources, with 117 recommended for additional investigations to determine eligibility for listing on the NRHP. The Hunter Lake Reservoir APE has since been revised to include the modified inundation area, new boat ramp locations, new roads, and a 100-foot buffer that totals approximately 3,896.87 acres. A new site file search was conducted to include new sites that may have been recorded since the original survey was completed in 1990-1991. A total of 361 sites fall within this newly defined APE. Of the 361 archaeological sites that are located within the revised Hunter Lake APE, 66 would require additional evaluation before a determination of their eligibility could be made. Stream and wetland mitigation sites, borrow areas, temporary constructions areas, roads, utilities, and other upland locations will be reviewed for cultural resources once the sites on which they will reside are identified.

Several historic cemeteries are located immediately adjacent to or within the APE and may be affected by construction activities. These include the Eldridge Cemetery, the Brunk Cemetery, the Rusk Cemetery, and the Horse Creek Cemetery. Others that are not directly within or immediately adjacent to the APE, but in close proximity include the Zion Cemetery, the Dan Jones Cemetery, the Vigal Cemetery, and the Beam Cemetery. Exact property boundaries for each of the cemeteries is needed to determine impact.

3.21.2 Environmental Consequences

3.21.2.1 Alternative A – No Action

There would be no change in the current conditions under this alternative, therefore there would be no impact to cultural or historic resources.

3.21.2.2 Alternative B – Hunter Lake – Revised Configuration

A PA was negotiated per 36 CFR Section 800.13 between the Corps, the ACHP, and the Illinois Historic Preservation Office. The City was invited to concur on the PA as they may have responsibilities; however, the PA is dated 1999 and is out of date and not in compliance with current standards. Therefore, the Corps is requiring a new PA to be developed and implemented, which is currently in progress. The Corps is considering whether to issue a permit under Section 404 of the CWA to the City for the construction of the Hunter Lake Reservoir, requiring compliance with Section 106.

The revised PA will stipulate the measures to be undertaken by the Corps or its representative for inventory, evaluation, preservation, and/or mitigation of NRHP eligible or listed archeological, historical, and architectural properties within the APE. Similarly, the PA will govern the need for measures to mitigate for potential effect to cemeteries, including the Eldridge Cemetery and others that may be affected by project construction or operations.

A majority of the Hunter Lake Reservoir APE has been surveyed for cultural resources. Private property acquisitions within the APE will require a Phase I survey. Additional areas outside of this APE that will be directly affected by ancillary project construction activities (such as utility corridor realignments, road relocations, borrow activities, additional land acquisition, etc.) will require a Phase I survey. Any sites located during any new Phase I surveys will be evaluated for listing to the NRHP.

A total of 66 of the original 117 sites that were recommended for additional work to determine eligibility are located within the current APE. All are located within inundation, shoreline, and/or upland impact zones and cannot be avoided; therefore, they will require an eligibility determination. The revised PA will stipulate a treatment plan for sites that are determined to be eligible for listing on the NRHP and cannot be avoided by the project.

Additional stipulations in the revised PA will discuss the treatment of cemeteries, curation and dissemination of information, provisions for undetected archaeological resources discovered during project implementation, identification and evaluation of architectural standing structures, treatment of historic and architectural standing structures, reporting provisions, dispute resolution, amendments, and termination provisions. The PA will also state, “Execution of this PA by the District and SHPO and implementation of its terms evidence that the Applicant has taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.”

Implementation of the PA is expected to result in acceptable levels of impact to cultural and historic resources. Thus, overall impact is expected to be minor.

3.22 SOLID AND HAZARDOUS WASTE

3.22.1 Affected Environment

Solid waste consists of a broad range of materials that include refuse, sanitary wastes, contaminated environmental media, scrap metals, nonhazardous wastewater treatment plant sludge, nonhazardous air pollution control wastes, various nonhazardous industrial waste, and other materials (solid, liquid, or contained gaseous substances). Hazardous materials are defined as any substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property. Hazardous materials include hazardous substances and hazardous waste.

Subtitle D of the Resource Conservation and Recovery Act (RCRA) and its implementing regulations establish minimum federal technical standards and guidelines for nonhazardous solid waste management. States are primarily responsible for planning, regulating, implementing, and enforcing solid waste management. Under RCRA, a solid waste is hazardous if it is listed as a known hazardous waste, or meets the characteristics described in 40 CFR Section 261, including ignitability, corrosivity, reactivity, or toxicity.

Hazardous materials and management of these materials are regulated under a variety of federal laws including the OSHA standards; Emergency Planning and Community Right to Know Act; RCRA; the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA); and Toxic Substances Control Act.

A search was conducted using the USEPA NEPAssist Tool, which draws environmental data from various USEPA GIS databases, including hazardous waste information from the RCRAInfo program, Superfund, Toxic Release Inventory, brownfields (the Assessment, Cleanup and Redevelopment Exchange System) and other databases. Based on this review, there are no hazardous waste sites or facilities located within the proposed Hunter Lake project area (USEPA 2022c). The project area contains large tracts of wooded areas, roads, utility lines, as well as currently and previously occupied residential structures and businesses. Since the project area does contain large areas of farming operations, there is a potential to uncover waste sites from these sources.

3.22.2 Environmental Consequences

3.22.2.1 Alternative A – No Action

Under the No Action Alternative, the City would not develop a new aquatic recreation facility or supplemental water supply. Therefore, there would be no project-related impacts to solid and hazardous waste generation.

3.22.2.2 Alternative B – Hunter Lake – Revised Configuration

3.22.2.2.1 Construction Impacts

Construction of Hunter Lake would entail vegetation clearing, excavation of large volumes of soil, demolition of structures within the project area, relocation of roadways and utility lines, and generation of typical construction debris and small volumes of solid waste.

Grubbing and clearing operations would produce landscaping waste. Trees that are considered economically useable would be harvested for sawmill grade wood, chip materials, and mulch. Vegetation that is not harvestable would become waste, which would be disposed of offsite or onsite through open burning. All appropriate local, state, and federal regulations would be adhered to if burning of landscape waste is conducted. Excavated soil would be managed onsite for re-use or legally disposed of offsite, as necessary.

Former residences and businesses located within the project area will be inspected for regulated materials (asbestos, lead paint, etc.) and will be properly abated prior to demolition. Areas where junk and other household items have been dumped would be properly cleaned. Demolition debris and construction waste would be placed in roll-offs and disposed of at a permitted offsite landfill. Septic systems within the project area would be pumped out and tanks would be filled in accordance with local, state, and federal regulations. Hazardous waste materials associated with any junk piles and underground storage tanks found onsite would be cleaned up and the materials disposed of following all local, state, and federal regulations. Roads within the inundated portions of Hunter Lake would be abandoned in place and utilities would be relocated.

Various hazardous wastes, such as fuels, lubricating oils, and other hazardous materials, could be produced during construction. Oily wastes generated during servicing of heavy equipment would be managed by off-site vendors who service onsite equipment using appropriate self-contained used oil reservoirs. Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction workers, the public, and the environment. If leaks or spills of hazardous materials occur, the workers responding to the incident are required to have the appropriate level of training, as mandated by OSHA (29 CFR, Section 1910).

There would be a minor increase in solid and hazardous waste generated during construction. All solid wastes and hazardous wastes generated from construction activities would be handled and disposed of per applicable local, state, and federal requirements.

3.22.2.2.2 Operational Impacts

Operation and maintenance of the proposed Hunter Lake, including the dam, spillways, and upland areas surrounding the lake, and recreational uses are expected to generate typical amounts and types of solid wastes, such as paper, plastic, and glass. Trash cans and dumpsters would be placed near boat ramps, and other recreational areas to collect wastes from users of these facilities.

Small quantities of various hazardous materials, such as used oils, hydraulic fluids, fuels, and herbicides would be used during operation and maintenance activities. Wastes associated with these materials would be temporarily stored in properly managed hazardous waste storage areas at offsite locations. Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction and plant workers, the public, and environment.

Waste management protocols would adhere to applicable local, state, and federal requirements. Operation and maintenance of the proposed Hunter Lake are not expected to generate above-average amounts of solid wastes or hazardous wastes. Therefore, operation and maintenance activities under this alternative are anticipated to have a minor impact to solid or hazardous waste generation.

3.23 CUMULATIVE IMPACTS

The 1978 CEQ regulations (40 CFR Sections 1500-1508) implementing the procedural provisions of the NEPA of 1969, as amended (42 USC § 4321 et seq.) defined cumulative impact as:

"…the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR Section 1508.7).

This same definition has been added in substantially the same form to CEQ's regulations that were revised on April 20, 2022 (see 87 FR 23453; definition in Section 1508.1(g)(3) of CEQ's revised regulations). A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of a project when added to other past, present, and reasonably foreseeable future actions (40 CFR Section 1508.7). Baseline conditions reflect the impacts of past and present actions. The impact analyses summarized in preceding sections are based on baseline conditions and either explicitly or implicitly consider cumulative impacts. Additional cumulative impacts will be addressed pending the outcome of USFWS coordination.

3.23.1 Environmental Resources Considered for Cumulative Effects Analysis

For this project, the full range of environmental resource issues was considered for inclusion in the cumulative effects analysis. However, this analysis is appropriately limited to only those resource issues potentially adversely affected by project activities. Accordingly, resources such as air quality, climate change and greenhouse gases, geology and soils, groundwater, floodplains, threatened and endangered species, natural areas and conservation, parks and recreation, socioeconomics and environmental justice, community facilities and services, noise, aesthetics, and solid and hazardous waste are not included in this analysis as these resources are either not adversely affected or the effects are considered to be minimal. As a result, primary resource categories considered in this assessment of cumulative effects include surface water, wetlands, vegetation, wildlife, aquatic ecology, public health and safety, transportation, and cultural and historic resources.

Because of the proposed conversion of 2,649 acres of primarily agricultural land use to open water with the pursuance of the Hunter Lake alternative, land use was considered carefully with regards to inclusion in the analysis of cumulative impacts. However, because the loss of agricultural land associated with the Hunter Lake alternative would only consist of 0.8 percent of the total agricultural land use within Sangamon County in addition to this conversion remaining consistent with the City's land use plan, land use was excluded from analysis of cumulative impacts because of its overall negligible impacts.

Upland areas primarily consist of deciduous forests or cropland. Due to the negligible impacts to land use based on the conversion of cropland as well as the moderate adverse impacts to vegetation such as deciduous forests, the consideration of upland habitats with regard to cumulative impacts is primarily addressed in Section 3.23.3.3 as it relates to upland vegetation.

3.23.2 Identification of Other Actions

The study area for cumulative effects analysis has been broadly defined as the five HUC 8 watershed areas that encompass and adjoin the Hunter Lake project area (Upper Sangamon South Fork Sangamon, Lower Sangamon, Lower Illinois, and Macoupin). This watershed-based study area was selected as the project has the potential to affect resources downstream of proposed project components in these adjacent watersheds and is also the geographic area in which stream mitigation would occur. However, where appropriate, narrower resource-specific study areas were utilized for certain resources and are presented and discussed in subsequent sections. Past, present, and reasonably foreseeable future actions identified within the study area are listed in Table 3-28. These actions are identified as having the potential to, in aggregate, result in larger, and potentially significant adverse impacts to the resources of concern. Actions listed as having a timing that is "past" or "present" inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter. However, these actions are included in this discussion to provide for a more complete description of their characteristics.

Actions that are not reasonably foreseeable are those that are based on mere speculation or conjecture, or those that have only been discussed on a conceptual basis. These can include projects that have not been approved by the proper authorities or have not yet submitted license/permit applications.

3.23.3 Analysis of Cumulative Effects

Over the past 100 years, the United States led the world in dam building. Dams are built for a variety of purposes including hydropower, irrigation, flood control and water storage. The Corps catalogued at least 90,000 dams greater than six feet tall that are being used for these purposes, with tens of thousands of additional smaller dams that have not been cataloged in the national inventory. Dams have many benefits to society; however, they may also cause considerable harm to rivers and the surrounding ecosystems such as the depletion of fisheries, degradation of river ecosystems, and alteration of recreational opportunities. Cumulative impacts from the Preferred Alternative are addressed in this section and include those associated with the construction of the Hunter Lake dam.

To address cumulative impacts from the Preferred Alternative, the existing environment surrounding the proposed project was considered in conjunction with the environmental impacts presented in Chapter 3. The combined impacts of the incremental actions are defined by the

CEQ as "cumulative impact" in 40 CFR Section 1508.7 and may result from other individually minor but collectively significant actions taking place over a period of time.

3.23.3.1 Surface Water and Aquatic Ecology

The geographic study area for evaluation of cumulative effects on surface water and aquatic ecology is the five HUC 8 watershed areas encompassing and adjoining the Hunter Lake project area. Surface water resources within the five HUC 8 watershed area have been altered through the past construction of large reservoirs in the area, constructed for the purposes of water storage, recreation, and industrial cooling. Specifically, within this study area, the damming of streams and rivers to construct Lake Springfield, Sangchris Lake, Taylorville Lake, and Lake Decatur have resulted in the creation of over 10,000 acres of reservoir since the 1920's. On a smaller scale, the Corps' Rock Island and St. Louis Districts have also permitted various transportation, utility, bank stabilization, and dredging projects that have resulted in impacts to surface waters within the five HUC 8 watershed area. In the last 5 years, Corps permitted projects have permanently impacted approximately 9 acres of rivers and streams within this study area (USACE 2023).

Table 3-28. Summary of Other Actions

Actions	Description	Location	Timing and Reasonable Foreseeability
Closure of Dallman Power Station Units 31, 32, and 33	Retirement of three coal generating units at Dallman Power Station in 2021, resulting in a reduction of water demand associated with condenser cooling by approximately 2.2 MGD.	Sangamon County	Past, Present
Corps Permitted Projects with Permanent Impacts	Includes various standard (individual) and general (including nationwide) permits issued by the Corps for permanent impacts to wetlands and/or streams and rivers between 2018 and 2023. Types of projects included bank stabilization, utility and transportation corridors, and dredging and structures (USACE 2023).	Five HUC 8 watershed areas encompassing and adjoining Hunter Lake project area	Past, Present
Springfield Clinic Expansion	Two building projects undertaken and currently underway by Springfield Clinic – a pediatric and adolescent center and a medical lab, both scheduled to be completed by late fall of 2023.	City of Springfield, Sangamon County	Past, Present, Reasonably Foreseeable Future
Memorial Medical Center Expansion	Memorial Medical Center plans for major office construction and currently has a day care facility and orthopedics center expansion in the planning phase.	City of Springfield, Sangamon County	Reasonably Foreseeable Future

Actions	Description	Location	Timing and Reasonable Foreseeability
EmberClear Lincoln Land Energy Center	Construction of a 1,090 MW natural gas-fueled combined-cycle facility located near Pawnee in Sangamon County. The project will be constructed on a 160-acre tract of land zoned for industrial use and located immediately adjacent to the newly constructed Illinois Rivers transmission substation. Construction is expected to begin in 2023 to 2024.	Village of Pawnee, Sangamon County	Reasonably Foreseeable Future
Springfield Rail Improvements Project	Transportation project to relocate all passenger and freight traffic from the Third Street corridor to Tenth Street; construct roadway underpasses at critical rail crossings on both the Tenth and Nineteenth Street corridors; and eliminate train horns in the City between Stanford Avenue and Sangamon Avenue. This project is ongoing and being conducted in segments, with remaining segments of the project scheduled for completion by 2025.	City of Springfield, Sangamon County	Past, Present, Reasonably Foreseeable Future
Lake Springfield	Approximately 3,866-acre reservoir constructed from 1931 to 1935 by damming Sugar Creek, a tributary of the Sangamon River.	Sangamon County	Past, Present
Sangchris Lake	Approximately 3,022-acre reservoir created in 1964 by damming Clear Creek, a tributary of the South Fork of the Sangamon River.	Sangamon and Christian Counties	Past, Present
Taylorville Lake	Approximately 1,200-acre reservoir created in 1962 by damming the South Fork of the Sangamon River; it was built for water supply and recreation purposes.	Christian County	Past, Present
Lake Decatur	Approximately 2,800-acre reservoir, created from 1920 to 1922 by damming the Sangamon River.	Macon County	Past, Present

Under the Hunter Lake alternative, surface waters, including streams, would be displaced by the construction of the proposed dam and reservoir. Additionally, nearby water sources including Horse Creek and Brush Creek would be impacted due to changes in downstream streamflow. Thus, impacts to surface waters are considered to be permanent and long term. Likewise, impacts to aquatic ecosystems from the proposed project are adverse as it relates to stream resources in the short term and lotic ecosystems in the long-term. The total aquatic habitat within streams that is lost under the Hunter Lake alternative is estimated to be 194 acres. However, surface water and ecological impacts would be replaced in the long term by substantially greater acreages of open water areas and an expansion of lentic aquatic habitat by more than 3,400 percent and 3,144 percent, respectively.

Based on these impacts, cumulative effects to surface waters could occur in conjunction with past and ongoing development within the watershed. The direct loss of stream habitat associated with the project is moderate but is a minor contributor to the overall cumulative impact to the watershed resulting from the past, present, and reasonably foreseeable actions listed in Table 3-28. Unavoidable adverse impacts to streams would also be mitigated by replacement and compensation as per Corps mitigation requirements. As the five HUC 8 watershed area contains more than 1,800 miles of perennial streams and rivers (USGS 2022), the cumulative impact to surface waters within the study area would be minor.

Soil disturbances associated with construction and land disturbance can potentially result in indirect adverse water quality impacts as soil erosion and sedimentation can result in runoff that can clog small streams and threaten aquatic life. However, it is assumed that other projects listed in Table 3-28 would be subject to regulation by federal and state agencies and that the implementation of erosion and sediment control measures specified in the project Stormwater Pollution Prevention Plan (SWPPP) would decrease the potential for increased sediment loading from terrestrial sources. Spills or leaks of hazardous liquids during construction and operation of the proposed project, or other projects in the study area, have the potential to result in long-term impacts on surface water resources as well as aquatic life resources. However, construction impacts would be mitigated by the proper design and implementation of BMPs and ensure avoidance, minimization, and/or mitigation of potential impacts on water resources and aquatic resources, as required by the various regulating agencies. In addition, integrated design features, detailed in Section 2.5.2.3, would be incorporated downstream of the proposed dam in order to reduce erosion and sedimentation, helping to prevent negative water quality impacts commonly associated with dams, such as pollutant, nutrient, and sediment loading. Therefore, the potential cumulative impacts on surface water quality and aquatic resources would be minor.

3.23.3.2 Wetlands

The geographic study area for evaluation of cumulative effects on wetlands is the single HUC 8 watershed area in which the project is located (South Fork Sangamon), as wetland impacts would generally be limited to the HUC 8 watershed area, which is also the geographic area in which wetland mitigation would occur.

The proposed project would result in a large adverse effect due to a direct loss of approximately 72 acres of wetlands and 9.1 acres of open water habitat as a result of creation of the dam and reservoir. These impacts to wetlands are large compared to impacts associated with recent Corps permitted projects within the HUC 8 watershed. In the past 5 years, the Rock Island district has permitted ten transportation, utility corridor, and/or mitigation projects, resulting in approximately 2.5 acres of permanent impacts to wetlands within this study area. On a larger scale, projects within the five HUC 8 watershed areas encompassing and adjoining the project area permanently impacted approximately 17.4 acres of wetlands (USACE 2023). However, unavoidable direct impacts to wetlands would be mitigated as required by both state and federal agencies in accordance with Section 404 of the CWA. This mitigation, in conjunction with the addition of wetland elements, both planned and voluntary, that would result from the creation of the reservoir (i.e. emergent wetlands associated with BMP measures, volunteer wetlands along the fringe of Hunter Lake, and open water associated with the reservoir itself), result in positive and large impacts to wetlands in the long term.

Other actions within the HUC 8 watershed, which include some of the development projects located in the City of Springfield, as well as the EmberClear Lincoln Land Energy Center in Pawnee, could result in impacts to wetlands either directly, or indirectly via erosion, sediment, and/or stormwater runoff associated with construction or operation of the proposed facilities. However, as these projects would also be subject to state and federal regulations, and the Hunter Lake project results in overall net gains to wetland resources, any potential cumulative impacts to wetlands in the vicinity would be minor.

3.23.3.3 Vegetation

The geographic study area for evaluation of cumulative effects on vegetation is the single HUC 8 watershed area in which the project is located (South Fork Sangamon). The proposed project would result in direct impacts to vegetation that are moderate and adverse (e.g., losses within the inundation zone). Other reasonably foreseeable future actions considered in this analysis may also result in minor impacts to vegetation due to clearing required prior to construction. However, the extensive preservation and restoration of more than 5,000 acres of upland habitats within the Hunter Lake project area in the long term would more than offset short term losses such that impacts to vegetation are positive and beneficial in the long term. Therefore, cumulative impacts to vegetation in the vicinity would be minor.

3.23.3.4 Wildlife

The geographic study area for evaluation of cumulative effects on wildlife is the single HUC 8 watershed area in which the project is located (South Fork Sangamon). The proposed project would induce losses of habitat within the flooded zone and short-term adverse impacts to mobile wildlife habitat during construction. Other reasonably foreseeable future actions considered in this analysis may also result in minor impacts to wildlife due to habitat loss. Reductions of certain lotic species, primarily fish, present within the current riverine aquatic ecosystems of the site would occur due to the reduction in lotic habitat causing long-term adverse impacts to these species in the location of Hunter Lake. The dam and the associated inundation and fragmentation of Horse Creek may also reduce fish passage. Additionally, the construction of the Hunter Lake dam may cause changes in the habitat located downstream of the dam due to obstruction, temperature, flow, and water quality leaving the dam which can influence fish spawning habitat suitability. These changes may potentially cause long-term adverse impacts to these species and habitats as well. Conversely, the Hunter Lake project would result in the potential long-term establishment of native prairie, forest, wetland areas, and lentic habitat that would replace wildlife habitat lost due to inundation and restore upland areas to more beneficial wildlife habitats. Additionally, Hunter Lake would include a new lentic ecosystem that would benefit wildlife species that prefer these environments. Although species dependent on lotic environment would no longer be present within the inundation area, many of the species of aquatic wildlife that may exist within the lotic environments of Brush and Horse Creeks may remain within the lentic environment of Hunter Lake. Furthermore, the addition of lentic species that may be introduced to the Lake will contribute to additional diversity in the aquatic wildlife present in the area. The overall quality of habitats within the unflooded portions of the project area is expected to improve compared to existing conditions, especially in areas where agricultural lands are replaced with habitats such as prairies and forests. Additionally, the low quality and generally common aquatic habitats within the project area will be replaced with a greater areas of higher quality aquatic habitat despite the change in habitat type. Avoidance and minimization measures will be considered during construction and operation of the dam and reservoir, including maintenance of minimum flows, short-term sediment and erosion controls during dam construction, and BMPs within Hunter Lake, in an effort to minimize negative impacts of siltation, temperature variations, and streamflow variations on species and habitats downstream of the dam. Therefore, cumulative impacts to wildlife in the vicinity would be minor.

3.23.3.5 Public Health and Safety

The geographic study area for evaluation of cumulative effects on public health and safety is the five HUC 8 watershed areas encompassing and adjoining the Hunter Lake project area. Within the study area, major reservoirs which have been created via damming of streams and rivers include Lake Springfield, Sangchris Lake, Taylorville Lake, and Lake Decatur. The proposed project would contribute to the regional public health and safety risk by introducing another dam to the region. Dam failures have the potential to cause large adverse impacts to the people, businesses, and communities that live downstream. However, considering the safety precautions and preventative measures required by law to prevent dam failure, detailed in Section 3.17.2.2.2, the proposed Hunter Lake is not expected to contribute substantially to cumulative impacts on public health and safety. Furthermore, the reservoir would reduce risk to public health and safety during times of drought by contributing to the availability of potable water.

3.23.3.6 Transportation

The geographic study area for evaluation of cumulative effects on transportation is Sangamon County, as impacts to transportation would be limited to the roadway network surrounding Hunter Lake. The inundation area created by the Hunter Lake dam would result in changes in travel patterns for some residents, resulting in moderate impacts to those residents that would require a longer travel distance to their homes. Recreational use of Hunter Lake would also result in increased vehicular traffic on adjacent roadways that may be notable during periods of higher use. However, the three main access points are spread apart on the proposed reservoir with varying routes of access, thus minimizing potential impacts to roadways once off the main highway. As increased traffic due to recreational use is not expected to reduce roadway LOS or degrade traffic conditions, and no other reasonably foreseeable future actions considered in this analysis would impact transportation on the local roadways impacted by the proposed project, there would be no cumulative impacts to transportation as a result of implementing the proposed project.

3.23.3.7 Cultural and Historic Resources

The geographic study area for evaluation of cumulative effects on cultural and historic resources is Sangamon County, as impacts to cultural and historic resources would be limited to the lands immediately surrounding Hunter Lake. The proposed project would result in potential impacts to cultural and historic resources, including multiple cemeteries. The extent of impact and status of these resources in regards to eligibility for listing in the NRHP, is ongoing and will be addressed through development of a PA between the Corps, the ACHP and the Illinois Historic Preservation Office. As other reasonably foreseeable future actions are constructed, it is anticipated that activities associated with land disturbing activities would be surveyed for historic and cultural resources as appropriate. Due to the reliance on federal and state regulations to protect cultural and historic resources, cumulative impacts of past and foreseeable future actions, in conjunction with the proposed project, would be minor.

3.23.3.8 Summary

In summary, there would be no significant cumulative adverse environmental impact from the construction and operation of Hunter Lake when considered together with other past, present, and reasonably foreseeable future actions in the area.

3.24 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Mitigation measures and BMPs are typically implemented to reduce a potential impact to a level that would be below the threshold of significance as defined by the CEQ and the courts. Impacts associated with the proposed construction of Hunter Lake have the potential to cause unavoidable adverse effects to natural and human environmental resources.

Construction of the Preferred Alternative would result in soil disturbance and displacement of sediment caused by construction and excavation activities. Sediment controls and BMPs to minimize erosion would be implemented, and water released by construction activities would meet permit limits.

Land disturbance and excavation associated with construction of the reservoir could impact surface geology features and would impact prime farmland soils found within the project area. Land disturbance would also contribute to loss of habitat and impacts to wildlife and may impact state listed endangered or threatened species, however the loss of forested habitat would be replaced with other habitats such as semi aquatic habitat, new forested areas, and prairie areas.

Surface waters, including streams, would be displaced by the construction of the reservoir. Additionally, nearby water sources including Horse Creek would be impacted due to changes in downstream streamflow and sedimentation. Overall, direct stream impacts from this alternative are considered to be permanent and long term but would be replaced in the long term by substantially greater acreages of open water areas. Unavoidable adverse impacts to streams would be mitigated by replacement and compensation as per Corps mitigation requirements.

The proposed reservoir project would impact approximately 71.1 acres of jurisdictional wetlands. Currently proposed mitigation includes the creation of up to approximately 135 acres of wetlands of the same type in selected City-owned parcels located in or adjacent to the proposed Hunter Lake as well as use of appropriate wetland mitigation banking credits or in lieu fees. Coordination with the Corps will be ongoing during the site identification, design, construction, operation, and monitoring phases of the project.

During the construction phase unavoidable localized increases in air emissions, noise, and visual discord would occur. Activities associated with construction may also result in varying amounts of fugitive dust, emissions of pollutants and GHGs from land-disturbing activities, and noise and visual discord from the otherwise undisturbed area. Emissions from construction activities and equipment are minimized through implementation of mitigation measures, including proper maintenance of construction equipment and vehicles.

Impact to vegetation and wildlife resources would occur from inundation and construction of project-related facilities. These impacts are expected to be offset by preservation and restoration of upland habitats within the project area, ultimately resulting in a long-term benefit. However, clearing of forested area includes loss of potential bat habitat for the federally protected Indiana bat, northern long-eared bat, tricolored bat, and little brown bat. Coordination with USFWS for compliance with ESA is ongoing.

Although the proposed inundation area would result in a permanent conversion of stream habitat to lacustrine habitat, the impacted stream is of low-quality, and the inundation area would provide substantial long-term gains to aquatic resources in the area.

The proposed Hunter Lake would result in potential impact to cultural and historic resources, including multiple cemeteries. The extent of impact and status of these resources in regards to eligibility for listing in the NRHP, is ongoing and will be addressed through development of a PA between the Corps, the ACHP and the Illinois Historic Preservation Office.

4.0 OTHER STATUTORY REQUIREMENTS

4.1 RELATIONSHIP OF SHORT-TERM USES TO LONG-TERM PRODUCTIVITY

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This SEIS focuses on the analysis of environmental impacts associated with the construction of the Hunter Lake reservoir and dam as well as associated recreation and water quality facilities. For the purpose of this section, these activities are considered short-term uses of the environment, and the long-term impacts to site productivity are those that last beyond the life of the project.

Most environmental impacts during construction activities would be relatively short-term and limited to the construction phase and would be addressed by BMPs and mitigation measures. However, wetlands and prime farmland soils would be permanently lost. Construction activities would have a limited, yet favorable short-term impact to the local economy through the creation of construction jobs and associated revenue. Long-term loss of revenue from farming and agriculture would be offset by indirect economic benefits from recreational use of the reservoir.

The actions proposed under the Applicant’s Preferred Alternative would assist in creating a long-term positive impact to regional aquatic recreation and provide reliable water supply to the surrounding communities and help support future development.

4.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

An irreversible or irretrievable commitment of resources refers to impacts on or losses to resources that cannot be recovered or reversed. Irreversible is a term that describes the loss of future options. It applies primarily to the impacts of nonrenewable resource use, such as minerals or cultural resources, or to those factors such as soil productivity, that are renewable only over long periods of time. Resources irreversibly lost due to construction of the Applicant’s Preferred Alternative include wetlands and linear streams, prime farmland soils, existing agricultural production, existing wildlife habitat, and heritage resources such as multi-generational homes, farmsteads, and undiscovered archaeological resources.

A commitment of a resource would be considered irretrievable when the project would directly eliminate the resource, its productivity, or its utility for the life of the project and possibly beyond. Resources required by construction activities, including labor and construction materials, would be irretrievably lost. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. However, it is unlikely that their limited use in these projects would adversely affect the overall future availability of these resources.

4.3 SUMMARY OF AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

The City's analysis of the proposed alternatives includes mitigation, as required, to reduce or avoid adverse effects. Mitigation measures designed to avoid, minimize, or compensate for adverse impacts associated with the proposed action are summarized for the preferred alternative and include:

- Adjustment of the proposed size of Hunter Lake from 3,010 acres originally proposed to 2,649 acres currently proposed resulted in the avoidance of over 361 acres of impact from inundation. This included upland wooded, riparian, and wetland habitat as well as impact to agricultural land, existing infrastructure, cemeteries, and potential cultural resources.
- Placement of project elements such as aquatic recreation access points and proposed integrated design features to avoid known sensitive habitats such as potential bat habitat, wetlands, and known cultural resource sites.
- A Corps permit pursuant to Section 404 of the CWA will be required for disturbance to wetlands and stream features and the terms and conditions of these permits would require mitigation for these proposed activities. Mitigation for wetland impacts would entail the development of up to approximately 135 acres of forested and emergent wetlands in addition to either purchase of mitigation credits from a bank or in lieu fees to compensate for anticipated wetland impacts. Mitigation for impacts to streams is currently in development.
- The City will coordinate with IDOT and Sangamon County as needed to design and construct roadway relocations and closures as described to reduce localized temporary and long-term transportation effects. This coordination would focus on avoiding and minimizing potential effects.
- A Section 401 Water Quality Certification would be required from the IEPA. Avoidance, minimization, and mitigative measures specified in the final permit and in accordance with any requirements of the Illinois Pollution Control Board will be completed.
- Mitigation may be necessary for compliance with NHPA Section 106. A PA is in development to address potential impacts and need for mitigation.
- Coordination with USFWS is ongoing regarding compliance with ESA. Avoidance and minimization measures may include clearing potential habitat during specific USFWS approved windows. If necessary, mitigation to compensate for unavoidable impacts to protected species or their habitat will be developed.
- The City has developed a series of features that are integrated in the design of the revised Hunter Lake alternative that provide for reductions in nutrient runoff and sediment loading. These measures enhance environmental quality of the project area and contribute to improved water quality within Hunter Lake and downstream areas. Integrated water quality measures include the following:
  - In-lake Control Structures (five in-lake dams)
  - Treatment Train BMPs (36 features including stormwater detention basins, dry basins, and wet basins)
  - Wetlands (up to 18 additional acres)
  - Water and Sediment Control Basins

- Grade Control
- Terraces
- Grassed Waterways
- Permanent Cover (including establishment of more than 2,000 acres of tallgrass prairie, forested areas, and successional habitats
- Shoreline Stabilization (up to 106,000 feet of shoreline)

In addition to the water quality features integrated in the project design of the Revised Hunter Lake alternative, the City has identified the following BMPs that would be employed to minimize impacts. Any additional project specific BMPs would be applied as appropriate on a site-specific basis to enable efficient maintenance of construction projects and further reduce potential impact on environmental resources including, air, surface water and groundwater.

- Fugitive dust emissions from site preparation and construction would be controlled by wet suppression and BMPs.
- Erosion and sedimentation control BMPs (e.g., silt fences) would ensure that surface waters are protected from construction impacts.
- Consistent with EO 13112 as amended by EO 13751, disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- BMPs as described in the project specific SWPPP would be used during construction activities to minimize impacts and restore areas disturbed during construction.

5.0 LIST OF PREPARERS

The following tables disclose authors and contributors for this EIS. The contractor's conflict of interest agreement is included in Appendix A.

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Experience:	7 Years as a soil scientist and soil conservationist with the Soil Conservation Service, and 30 years with the Corps of Engineers in Regulatory

5.2 CONSULTANT NEPA PROJECT MANAGEMENT

Name:	**Angela Love, MS**
Education:	B.S., Environmental Biology and M.S., Biological Sciences
Project Role:	WSP Project Manager, NEPA Lead
Experience:	23 years of experience in NEPA compliance

Name:	**Bill Elzinga, MS**
Education:	B.S. and M.S., Biology
Project Role:	WSP Project Manager, NEPA Lead
Experience:	35 years of experience managing and performing NEPA analysis for electric utility industry, state/federal agencies; ESA compliance; CWA evaluations

5.3 OTHER CONSULTANT CONTRIBUTORS

Name:	**Marty Marchaterre**
Education:	JD, Law
Project Role:	Scoping, agency coordination, and development of purpose and need
Experience:	25 years of experience in NEPA document preparation

Name:	**Stephanie Miller, MS**
Education:	B.S., Marine Biology and M.S., Biology
Project Role:	Identification/screening of alternatives, wetland delineation, Summary of Effects to the Points of Environmental Quality, Cumulative Impacts, Quality Assurance
Experience:	8 years of experience in visual assessment, land use, aquatic, and terrestrial ecology

Name:	**Wayne Ingram, PE**
Education:	B.S., Civil Engineering/Physics
Project Role:	HEC-RAS Modeling, Downstream Analysis, Hydrology, Floodplains, Surface Water
Experience:	30 years of experience in surface water engineering and analysis including drainage, stormwater management, water quality assessment, erosion and sedimentation, sediment transport, wetlands hydrology, stream restoration, and stormwater detention systems.

Name:	**Michael Fitzhenry, PE**
Education:	B.S., Civil Engineering
Project Role:	HEC-RAS Modeling, Downstream Analysis
Experience:	20 years experience as a water resources engineer and project manager of storm water and wastewater projects

Name:	**Steve Stumne, PWS**
Education:	B.S., Biology
Project Role:	Bat Surveys
Experience:	Over 20 years of experience providing natural resources investigations, NEPA analysis and documentation, wetland and stream delineation/permitting/mitigation and endangered species investigations

Name: **Stephen Coates, PE**
Education: B.S., Civil Engineering
Project Role: Air Quality, Climate Change, Transportation, Noise
Experience: 25 years of experience in conceptual design of urban and rural highway projects, environmental compliance and stormwater management, civil site design, and NEPA compliance

Name: **Karen Boulware, MS**
Education: B.S., Geology and M.S., Resource Planning
Project Role: Geology and Soils, Unavoidable Adverse Impacts, Irreversible and Irretrievable Commitments of Resources, Relationship of Short-term Uses to Long-term Productivity, Internal review, Quality Assurance
Experience: 26 years of professional experience in NEPA

Name: **Connie Heitz**
Education: M.P.A., Environmental and Natural Resources Management, B.S., Public Affairs
Project Role: Prime and Unique Farmland, Property Ownership, Land Use, Visual
Experience: 28 Years in environmental and land use planning

Name: **Glenn Scherer**
Education: M.S., Geology; B.S., Geology
Project Role: Groundwater
Experience: 26 years of experience managing various environmental projects throughout the United States

Name: **Chris Musselman**
Education: B.S., Biology; M.S., Fisheries and Aquatic Ecology
Project Role: Streams and Other Surface Water Systems, Water Quality, Aquatic Ecology
Experience: Over 4 years of experience on NEPA projects, NRDA projects, terrestrial flora and fauna surveys, and fisheries and aquatic ecology

Name: **Raymond Finocchiaro, Ph.D**
Education: B.S., Biological Science, M.S., Fisheries and Wildlife, Ph.D, Soil Science and Ecology
Project Role: Description of Wetland Resources, Impact Analysis, Mitigation
Experience: 16 years of experience

Name: **Joel Budnik**
Education: B.S. and M.S., Wildlife and Fisheries Sciences; A.A., Fine Arts
Project Role: Vegetation
Experience: Over 21 years of experience providing natural resources ecological studies, wetland delineations, CWA permitting, and NEPA analysis

Name: **Keara Pringle**
Education: B.S., Biology and M.S., Environmental Science/Water Resources Management
Project Role: Wildlife
Experience: 2 years of experience performing wetland delineations, NEPA analysis, endangered species investigations, and aquatic surveys and sampling

Name: **Emily Kinzinger**
Education:
Project Role: Threatened and Endangered Species, Natural Areas and Conservation, Parks and Recreation, Demographics, Community Facilities and Services, Environmental Justice, Public Safety, Solids and Hazardous Waste, Quality Assurance
Experience: -

Name: **Kathy Warner, MA**
Education: M.A., Anthropology
Project Role: Cultural and Historic Resources
Experience: 23 years experience in cultural resources management. Lead cultural resources specialist assisting USACE in update the Programmatic Agreement.

Name: **Linda Hart**
Education: B.S., Business/Biology
Project Role: Technical Editing
Experience: 36 years of experience in production of large environmental documents including technical editing, formatting, and assembling

Name: **Erin Alsop**
Education: B.S., Environmental Science
Project Role: Purpose and Need, Alternatives, Recreational Analysis, Economics, Demographics, Environmental Justice, Summary of Effects to the Points of Environmental Quality, Unavoidable Adverse Impacts, Irreversible and Irretrievable Commitments of Resources, Relationship of Short-Term Uses to Long-Term Productivity
Experience: 4 years of experience in NEPA analysis and documentation

Name: **Robin Ledford**
Education: B.S. and M.S., Biological Science
Project Role: CWA coordination, Sensitive Species, Wetland Mitigation Plan, Conceptual Stream Mitigation Plan, Wetlands, Threatened and Endangered Species, 404(b)(1)
Experience: 19 years of experience in wetland delineations, 404/401 permitting, and environmental reviews

Name: **Grace Stojeba**
Education: B.S., Environmental Science
Project Role: Air Quality, Geology and Soils, Groundwater, Vegetation, Wildlife, Aquatic Ecology, Natural Areas and Conservation, Land Use, Public Safety, Transportation, Noise, Visual, Solid and Hazardous Wastes
Experience: Over 8 years of experience in stormwater analysis, water quality, soil analysis, wetland management, habitat surveys, wetland delineations, and ecological restoration

Name: **Natalie Reiss**
Education: B.A., Biology
Project Role: Climate Change, Cumulative Impacts,
Experience: 7 years of experience in NEPA analysis and documentation

Name:	**Brian Mueller**
Education:	B.S., Fisheries Biologist/Limnologist
Project Role:	Senior GIS Analyst
Experience:	25 years in GIS applications for environmental projects

Name:	**Bailey Hickey, E.I.**
Education:	B.S., Environmental Engineering
Project Role:	Technical editing, Public Health and Safety, Dam impacts, Threatened and Endangered Species, Executive Summary, and comment resolution.
Experience	Over 5 years in engineering consulting with a background in water quality and environmental permitting and planning (CWA and NEPA).

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