2.3 Water Resources and Quality

2.3.1 Water Resource and Watershed Characterization

The study area is within the Des Plaines River Watershed (Hydrologic Unit 07120004), and has been divided into seven smaller watersheds: Addison Creek, Des Plaines River,[1] East Branch DuPage River, Salt Creek, Weller Creek, West Branch DuPage River, and Willow Creek. The watershed limits are based on Illinois Environmental Protection Agency (IEPA) watershed boundaries. Table 2-13 summarizes some of the major and minor waterways that traverse the study area. No waterways in the Weller Creek Watershed traverse the study area. The East Branch DuPage River Watershed is within the study area, but because it is not near the proposed improvements, it was not considered further (see Exhibit 2-7).

Within Illinois, waters are protected and evaluated under the General Use Water Quality Standards (Title 35 Illinois Administrative Code, Subtitle C, Chapter I, Part 302, Subparts A and B). Designated uses under the General Use Water Quality Standards include aquatic life, fish consumption, primary contact, secondary contact, and aesthetic quality. States are required to classify waters with respect to impairments. Waters that do not fully support their designated uses are considered impaired and are cataloged in the 303(d) list of impaired water-quality-limited waters, requiring total maximum daily loads (TMDLs). TMDLs set pollution reduction goals to improve the quality of impaired waters.

TABLE 2-13
Study Area Waterway Summary

Waterway[a]	Tributary Area[b] (mi^2)	Waterway Length[c] (miles)	Flow Characteristic[d]
Addison Creek Watershed			
Addison Creek	8.2	4.3	Perennial
Des Plaines River Watershed			
Des Plaines River	630[e]	6.1	Perennial
Bensenville Ditch	4.0[f]	3.2[f]	Intermittent
Silver Creek	8.7	3.3	Intermittent; perennial
Crystal Creek	4.8	2.3	Intermittent
Salt Creek Watershed			
Salt Creek	150.0[g]	45.9[h]	Perennial
Salt Creek Tributary D	4.3[j]	0.8	Perennial
Arlington Heights Branch	12.7[j]	0.9	Perennial
Salt Creek West Branch	12.1[j]	6.2	Perennial
Westwood Creek	5.6[k]	2.1	Intermittent
Spring Brook (Creek)	14.4[k]	8.3	Perennial
Meacham Creek	5.1[k]	2.1	Perennial
West Branch DuPage River Watershed			
West Branch DuPage River	10.1[k]	2.7	Perennial

[1] As referred to in this Tier One study, the "Des Plaines River Watershed" represents one of the seven watersheds in the study area (see Exhibit 2-7). It includes areas that are tributary to the Des Plaines River, but are not included in the other six watersheds.

TABLE 2-13
Study Area Waterway Summary

Waterway[a]	Tributary Area[b] (mi^2)	Waterway Length[c] (miles)	Flow Characteristic[d]
Willow Creek Watershed			
Willow Creek	20.2[j]	6.5[i]	Intermittent, perennial
Higgins Creek	7.3[j]	2.2	Perennial

Sources: U.S. Geological Survey (USGS) Quadrangle Map; Federal Emergency Management Agency (FEMA), 2004b; FEMA, 2007; FEMA, 2008b; Christopher B. Burke Engineering, Ltd. (CBBEL), 2004; CBBEL, 2007.

[a] This table does not include waterways within the study area with drainage areas less than 4.0 mi^2. The Weller Creek Watershed also is not included. No waterways in the Weller Creek Watershed traverse the study area.
[b] Approximate area of watershed to downstream limit of study area including areas upstream of the study area (except as noted).
[c] Length of waterway within the study area; generally based or calculated from FEMA Flood Insurance Studies (FIS) Flood Profiles (except as noted).
[d] Periodicity of flow is based on USGS 7.5-minute Quadrangle Maps.
[e] Data per USGS gauge at Riverside.
[f] Data from CBBEL, 2007 report.
[g] Tributary area at confluence with Des Plaines River.
[h] Approximate length per GIS estimate.
[I] Data from CBBEL, 2004 report.
[j] Data from FEMA Cook County FIS, 2008b.
[k] Data from FEMA DuPage County FIS, 2004b.

TMDLs have been prepared for waters in the Salt Creek Watershed[2] and the West Branch DuPage River (CH2M HILL, 2004b). In addition, segments of four waterways in the study area—Addison Creek, Salt Creek, West Branch DuPage River, and Higgins Creek—are in the first stage of TMDL development to address additional impairments (IEPA, 2008c). Stage 1 TMDL development includes describing the watershed, collecting/analyzing available data, identifying methodologies, procedures, models, and determining if additional data are needed.

In addition to the 303(d) list, the Illinois Department of Natural Resources (IDNR) released biological stream ratings for Illinois streams that can be used to identify aquatic resource quality (IDNR-ORC, 2008).[3] The ratings are useful in identifying biologically diverse streams and those with a high degree of biological integrity. No Biologically Significant Streams (BSS) or Wild and Scenic Rivers are within the study area, but the Des Plaines River is listed on the Nationwide Rivers Inventory as being eligible or potentially eligible for designation as a Wild and Scenic River because of its remarkable scenic and recreational values.

Preliminary field reconnaissance resulted in the identification of 225.6 acres of water resources near the proposed improvements. They include rivers/creeks, lakes/ponds, reservoirs, ditches, and open water stormwater management facilities. Based on preliminary field reconnaissance of potential stream crossings, the water clarity was generally good and the stream substrates generally consisted of silt, sand, or gravel. Many modified stream channels have been lined with hardscape measures (e.g., rock or concrete). Most of the vegetated stream channels have narrow corridors of habitat for flora and fauna.

[2] The Salt Creek TMDLs addresses segments of the following waterways within the study area: Salt Creek, Addison Creek, Spring Brook, Meacham Creek, Busse Woods Lake (CH2M HILL, 2004a).

[3] Based on information from IDNR, the new stream ratings replace the Biological Stream Characterization (BSC) and Biologically Significant Streams (BSS) developed in 1984 and 1992, respectively.

Within the study area, the Weller Creek Watershed comprises mostly residential land uses. The Addison Creek, Salt Creek, and West Branch DuPage River Watersheds within the study area are almost half residential land use. However, the Willow Creek and Des Plaines River Watersheds consist largely of O'Hare Airport and the adjacent industrial and transportation corridor (see Table 2-14). Additional information regarding land use within the study area is

TABLE 2-14
Study Area Watershed Land Use Summary

Watershed	Predominant Land Use within Study Area[a]	Flood Control Reservoirs[b]	Dams[b, c]	Wastewater Treatment Plants[b]
Addison Creek	46% residential	7	1	1
Des Plaines River	20% O'Hare Airport; 15% industrial	3	2	0
Salt Creek	42% residential	5	4	4
Weller Creek	63% residential	1	0	0
West Branch DuPage River	49% residential	1	0	2
Willow Creek	39% industrial; 28% O'Hare Airport	3	2	1

[a] *Source*: CMAP, 2001; CH2M HILL, 2008.
[b] *Source*: Review of aerial photograph of study area; PhotoMapper, 2007.
[c] The number of dams is an estimate based on those primarily associated with flood control projects.

provided in subsection 2.1.3, Land Use. Table 2-14 also summarizes the number of flood control structures, dams, and wastewater treatment plants within the study area.

Table 2-15 provides IDNR and IEPA water quality assessment designations for waterways within the study area. Most of the waterways listed in Table 2-15 are impaired and do not support aquatic life, have been channelized or modified, and are surrounded by developed or mowed overbanks, with forest preserve areas generally being an exception. Lake Opeka and Busse Woods Lake fully support aquatic life. Willow Creek, Higgins Creek, and the Des Plaines River are impaired as a result of urban runoff, storm sewers, and point source discharges. The IEPA has listed upstream impoundments as sources of water quality impairment within the Addison and Salt Creek Watersheds. Most watersheds within the study area include creeks that have municipal point source discharges (MPSD) as a source of impairment, which can be associated with effluent from wastewater treatment plants (IEPA, 2008c).

2.3.2 Groundwater Resources

The study area contains groundwater resources and aquifers, within the surficial glacial deposits and within the bedrock. Within the surficial deposits, the accessible shallow aquifers can be found in the lenses of sands and gravels within the glacial till. The aquifers are connected hydrologically and are recharged directly by seepage from precipitation.

Within the bedrock, the shallow dolomite produces water in varying quantities depending on the presence of water-bearing sands in the overlying drift. The shallow dolomite aquifer is separated from deeper aquifers by the shales of the Maquoketa Group. Below the shale is the Cambrian-Ordovician aquifer. The Cambrian-Ordovician aquifer is the most developed deep aquifer within the Chicago region and consists primarily of the St. Peter Sandstone.

Shallow aquifer wells supply low water demand needs (e.g., single-family homes). Deep aquifer wells typically are used for large water demand needs (e.g., community supply).

According to the U.S. Environmental Protection Agency (USEPA), there are no designated sole source aquifers in Illinois (USEPA, 2008b). The Illinois State Geological Survey (ISGS) publishes a map titled *Potential for Aquifer Recharge* (Keefer and Berg, 1990). The map indicates that the study area has a relatively low potential for aquifer recharge. Consequently, there is a low potential for groundwater contamination except in the Des Plaines River, East Branch DuPage River, Salt Creek, and West Branch DuPage River corridors, where greater sand and gravel resources are present.

2.3.3 Groundwater Quality

In northeastern Illinois, including parts of Cook and DuPage counties, the primary groundwater quality issues concerning deep bedrock aquifers include high levels of naturally occurring barium, radium, and total dissolved solids (TDS). Public water systems treat these groundwater contaminants as necessary (by ion-exchange softening, lime softening, etc.) to make groundwater potable. In general, the groundwater quality of deep bedrock aquifers is less susceptible to chemical contamination by vertical migration from the land surface than shallow aquifers, although groundwater in deep bedrock aquifers tends to have higher mineral concentrations than groundwater in shallow aquifers (this varies by location).

TABLE 2-15
Study Area Waterway Quality/Rating Summary

Waterway[a]	Diversity[b, c] (Score)	Integrity[b, d] (Score)	Designated Use[e, f]	Causes of Impairment[f]	Source of Impairment[f]
Addison Creek Watershed					
Addison Creek	E (0.286)	E (0.250)	Not supporting: AL, PC[g] Not assessed: AQ, FC, SC	Aldrin, .Alpha.-BHC, littoral vegetative covers, copper, chloride, chromium, dichloro-diphenyl-trichloroethane (DDT), hexachlorobenzene, nickel, other flow regime alterations, dissolved oxygen, polychlorinated biphenyls (PCBs), total suspended solids (TSS), fecal coliform, phosphorous, aquatic algae	Channelization, contaminated sediments, loss of riparian habitat, streambank modification, combined sewer overflows (CSO), MPSD, storm sewers, urban runoff, upstream impoundments
Des Plaines River Watershed					
Des Plaines River	Not rated	Not rated	Not supporting: AL, FC, PC. Not assessed: AQ, SC	Chlorine, dissolved oxygen, sedimentation/ siltation, TSS, pH, phosphorous, mercury, PCBs, fecal coliform, littoral vegetative covers, chloride, other flow regime alterations	CSO, road runoff, MPSD, urban runoff, storm sewers, site clearance, atmospheric deposition of toxics, source unknown, streambank modifications, impacts from hydrostructure flow regulation
Lake Opeka	Not rated	Not rated	Fully supporting: AL Not supporting: AQ Not assessed: FC, PC, SC	Cause unknown	Not applicable
Salt Creek Watershed					
Salt Creek	C (0.714)[h]	C (0.500)[h]	Not supporting: AL, FC, PC[i]; Not assessed: AQ, SC	Chloride, other flow regime alternations, dissolved oxygen, phosphorous, aquatic algae, mercury, PCBs, fecal coliform, littoral vegetative covers, DDT, heptachlor, sediment/siltation, TSS, pH, aquatic plants	Urban runoff, storm sewers, impacts from hydrostructure flow regulation, atmospheric deposition of toxics, source unknown, channelization, contaminated sediments, CSO, sanitary sewer overflows, site clearance, MPSD, streambank modifications, upstream impoundments
Spring Brook	Not rated	Not rated	Fully supporting: AL[j] Not assessed: AQ, FC, PC, SC	Littoral vegetative covers, DDT, endrin, hexachlorobenzene, other flow regime alterations, dissolved oxygen, sedimentation/siltation, TSS, phosphorous, aquatic algae	Channelization, contaminated sediments, impacts from hydrostructure flow regulation, MPSD, upstream impoundments, urban runoff, storm sewers

TABLE 2-15
Study Area Waterway Quality/Rating Summary

Waterway[a]	Diversity[b, c] (Score)	Integrity[b, d] (Score)	Designated Use[e, f]	Causes of Impairment[f]	Source of Impairment[f]
Meacham Creek	Not rated	Not rated	Not supporting: AL Not assessed: AQ, FC, PC, SC	Other flow regime alterations, dissolved oxygen	Impacts from hydrostructure flow regulation, urban runoff, storm sewers
Busse Woods Lake	Not rated	Not rated	Fully supporting: AL Not supporting: AQ, FC Not assessed: PC, SC	Mercury, PCBs, cause unknown, aquatic algae	Atmospheric deposition - toxics, source unknown, waterfowl, urban runoff, storm sewers, runoff from forest/grassland
West Branch DuPage River Watershed					
West Branch DuPage River	Not rated	Not rated	Not supporting: AL, PC Not assessed: AQ, FC, SC	Chloride, iron, dissolved oxygen, sedimentation/siltation, silver, zinc, pH, phosphorus, fecal coliform, manganese, TSS	MPSD, urban runoff, storm sewers, site clearance
Willow Creek Watershed					
Willow Creek	D (0.333)	Not rated	Not supporting: AL; Not assessed: AQ, FC, PC, SC	Phosphorus	MPSD
Higgins Creek	Not rated	Not rated	Not supporting: AL, PC; Not assessed: AQ, FC, SC	Chloride, nickel, zinc, pH, phosphorus, fecal coliform, dissolved oxygen	MPSD, urban runoff, storm sewers

Sources: IEPA, 2008c; IDNR-ORC, 2008.

[a] The information provided for each waterway summarizes data provided for all Assessment Unit IDs (AUID) for that waterway segment within the study area. Designated uses and impairments may vary per AUID. Waterways within the study area that do not have an AUID are not listed in the table. Waterway segments with AUID within the study area that are not rated for diversity or integrity and do not have designated uses assessed are not listed in the table.

[b] From IDNR-ORC, 2008. All integrity and diversity ratings for the study area were rated with macroinvertebrates; no fish, mussel, or crayfish data were available for the streams. The diversity and integrity scores fall within one of five ratings ranging from A to E, with A representing the highest biological integrity or diversity of evaluated stream segments. Streams without available data or that did not fit the assessment tools were "not rated."

[c] The diversity score provided is based on the Macroinvertebrate Taxa Score.

[d] The integrity score provided is based on the Macroinvertebrate Index of Biotic Integrity (MIBI).

[e] Abbreviations: AL: Aquatic Life; AQ: Aesthetic Quality; FC: Fish Consumption; PC: Primary Contact; SC: Secondary Contact. Assessment guidelines have not yet been fully developed for the following uses: AQ and SC (for Illinois streams) and SC (for Illinois inland lakes).

[f] *Source*: IEPA, 2008c.

[g] Addison Creek segment (AUID IL_GLA-04) located downstream of I-290 not assessed for primary contact.

[h] Parts of Salt Creek located upstream of Busse Woods Lake and downstream of I-290 within the study area are not rated for diversity or integrity.

[l] Salt Creek segment (AUID IL_GL-03) located downstream of the confluence with Spring Brook within the study area is not assessed for Primary Contact.

[j] Spring Brook segment (AUID IL_GLB-01) located downstream of the confluence with Meacham Creek within the study area was assessed as Not Supporting Aquatic Life.

Shallow aquifers can be affected by surface contamination. Road runoff, underground storage tanks (USTs), landfills, septic fields, industrial discharges, sewage treatment plants, and atmospheric deposition are common sources of pollutants. Potential contaminants include chloride, TDS, heavy metals, and petroleum compounds. In northeastern Illinois, over the last 20 years, contaminants, such as TDS and chloride, have been increasing in many shallow wells. Chloride can be used to indicate surface aquifer contamination. Chloride concentrations have been increasing in shallow aquifers throughout the Chicago metropolitan area, especially in the outer counties (DuPage, Kane, McHenry, Will). The smallest changes in chloride concentrations have been in Cook and Lake counties. The increase in chloride concentrations in shallow aquifers may be attributed primarily to road salt runoff (ISWS, 2008a; ISWS, 2008b; Kelly and Wilson, 2003).

2.3.4 Water Supply Wells

Within the study area, most water supply needs are met using Lake Michigan water. There are 1,693 water supply wells in the study area, according to the ISGS Water and Related Wells Database. According to the IEPA Source Water Assessment Program, 93 wells are classified as community water supply wells and another 120 wells as non-community water supply wells. The wells vary in depth from less than 100 feet to more than 2,200 feet. Of the 1,693 water supply wells, 1,587 are in the shallow aquifer averaging about 200 feet deep, and 106 are in the deep aquifer, 1,200 to 2,200 feet deep. Every community within the study area receives its main water supply from Lake Michigan, supplied by either the City of Chicago or the City of Evanston. Municipal wells provide water for irrigation and as backup for Lake Michigan supplies.

2.3.5 Aquatic Species

Aquatic species were not surveyed as part of the study. Instead, national, state, and county databases were searched for fish, mussel, and crustacean information. Available data indicate that most of the aquatic species near the study area are locally common, widespread, or relatively adaptable. No state- or federal-listed fish, mussels, or crustaceans were listed in the information provided by IDNR or U.S. Fish and Wildlife Service (USFWS) for the study area.

Fish. Based on a review of Illinois Natural History Survey (INHS) and USGS data and available Cook County and DuPage County Forest Preserve information, 52 fish species were recorded in aquatic resources located in (or near) the study area. Game fish, such as bass (largemouth [*Micropterus salmoides*] and smallmouth [*Micropterus dolomieu*]), bluegill (*Lepomis macrochirus*), bullhead (*Ameiurus* spp.), channel catfish (*Ictalurus punctatus*), crappie (*Pomoxis* spp.), northern pike (*Esox lucius*), rainbow trout (*Oncorhynchus mykiss*), sunfish (*Lepomis* spp.), and walleye (*Stizostedion vitreum*), are included in the available fish information. Many of these species are stocked for recreational purposes in waterways within or crossing through the study area. Most of the study area is highly urbanized, and most of the sampled streams are impaired or degraded. Fish species collected from creeks within or crossing through the study area generally represent pollution tolerant to intermediate tolerant species (Adolphson et al., 2002; Anderson, 1995; Barbour et al., 1999; Headrick, 2002).

Mussels. Based on a review of available INHS data and information provided by the county forest preserves, there are 19 species of mussels from aquatic resources located in (or near) the

study area including Axehead Lake (within Cook County Forest Preserve property), the Des Plaines River, Salt Creek, Salt Creek Marsh, Spring Brook, West Branch DuPage River, and a DuPage County wetland (in Salt Creek/Des Plaines River drainage area).[4] Mussel populations have declined in recent decades as a result of siltation, pollution, and competition from exotic species. More than half the 80 mussel species native to Illinois are threatened, endangered, extirpated, or extinct (IDNR, 2009). However, most mussel species recorded in the aquatic resources described above are widespread or common/locally abundant species (INHS, 2005).

Crustaceans. Based on a review of available INHS data, eight species of aquatic crustaceans, including crayfish, sowbugs (isopods), and scuds (amphipods) were recorded from aquatic resources located in (or near) the study area. The data does not include planktonic species, such as cladocerans (e.g., *Daphnia* sp.) and copepods. In general, sowbugs are often indicators of poorer water quality, whereas scuds and crayfish are moderately tolerant to pollution though not usually found in severely polluted waters.

[4] Three of the mussel species have not been observed since 1958 and may no longer be present in the study area.