authorized (e.g., Section 404 CWA permit, IWPA, etc.). All waste would be collected and stored in approved receptacles. Liquid wastes would not be deposited into dumpsters or other containers that may leak. Receptacles with deficiencies would be replaced as soon as possible, and appropriate cleanup would take place if necessary. Construction debris would not be buried onsite. Waste disposal would comply with all local, state, and federal regulations. Proposed borrow areas, use areas (e.g., temporary access roads, staging/storage areas), and waste areas would follow IDOT's *Standard Specifications for Road and Bridge Construction*, Article 107.22.

Onsite special waste storage, including hazardous waste, would be minimized and would employ labeled, separate special/hazardous waste containers. Nonhazardous waste would be segregated and handled separately. Special and hazardous wastes would be disposed of in the manner specified by local, state, and federal regulations.

Concrete waste or washout would not be allowed to reach a stormwater drainage system or watercourse. Concrete washout would be contained and completed in a designated location. Washout containment facilities would be of sufficient volume to contain all liquid and concrete waste materials, including enough capacity for anticipated levels of rainwater.

4.11.6 Utility Services

Construction work would be coordinated with public utilities to avoid conflicts and minimize planned interruptions of service. When service interruptions are unavoidable, every effort would be made to limit their duration, and every effort would be made to give the public lengthy fair warning of any planned occurrence of service interruption.

4.11.7 Energy

Construction of the proposed improvement would require indirect consumption of energy for processing materials, construction activities and maintenance for the lane miles to be added within the project limits. Energy consumption by vehicles in the area may increase during construction due to possible traffic delays. The number of improvements and the time required to complete them would have a corresponding affect on the fossil fuels consumed. However, in the long term, post-construction operational energy requirements will offset construction and maintenance energy requirements and result in a net savings in energy usage.

4.12 Indirect and Cumulative Impacts

4.12.1 Approach

Potential indirect and cumulative impacts are defined as follows:

> *Indirect effects* are "caused by an action and are later in time or further removed in distance but are still reasonably foreseeable" (40 CFR 1508.8).
>
> *Cumulative effects* "result from the incremental consequences of an action when added to other past and reasonably foreseeable future actions" (40 CFR 1508.7).

The basis for this analysis is the recognition that while a project has various direct impacts on social and environmental resources, it may also have indirect and cumulative impacts

attributable to the proposed improvements. Regarding the analysis of cumulative impacts, it is recognized that while the impacts of many actions may be individually small, the cumulative effects of past, present, and reasonably foreseeable actions on population or resources can be considerable.

A review of the project-related impacts concluded that the resource analyses for indirect and cumulative impacts are similar to one another. The period for both analyses extends through 2030. The same resources will be discussed for both indirect and cumulative impacts, including effects on regional growth, development patterns and spinoff job creation as well as water quality, wetlands, and biological resources (Table 4-27). The geographic extent of these analyses varies with the resource: socioeconomic effects will be both local (study area) and regional; water resources are evaluated in the context of the study area and relevant watersheds; and wetlands and biological resources are analyzed in terms of local and regional value.

The analysis of indirect impacts considers the effects of the proposed build alternatives, whereas, the analysis of cumulative impacts considers the affects of other past, present, and reasonably foreseeable future actions. Two major projects in the study area are either nearing completion or have been fully disclosed in a recent federal EIS. The projects are discussed briefly here, but no further evaluation of them will be conducted. One major project in the study area is ISTHA's multi-billion dollar Open Road Tolling and Congestion-Relief Program. The project has been under construction for four years and is nearing completion. The program has constructed a system of open road tolling lanes throughout the system that use electronic tolling to minimize the travel delay caused by coin-operated toll plazas. Other improvements include mainline rehabilitation and widening. The remaining elements will be completed in late 2009 and early 2010.

In 2001, the City of Chicago announced the multi-billion dollar modernization of O'Hare Airport. The OMP includes placing six runways in an east-west orientation consisting of four new runways and the extension of two existing runways. Supporting the new runway configuration would be numerous enabling projects consisting of relocating roads, railroads, cargo buildings and utilities, and constructing new navigation aids, utilities, electrical vaults, stormwater detention, air traffic control towers, and others. The program includes a new terminal on the west side of the airfield that would include connecting transportation improvements, such as extension of the people mover, CTA Blue Line, and access to local roads and the proposed O'Hare West Bypass and Elgin O'Hare Expressway. Construction of the OMP EIS began in 2005. Thus far, most of the Phase I projects have been completed, including two new runways, a runway extension, a new air traffic control tower, relocation of a road and guard post, relocation of a railroad and two waterways, three new stormwater detention basins, new electrical vaults, and numerous utility and navigation aid improvements. Design work has begun for the second half of the program (Completion Phase), and the overall program is expected to be completed within five years.

Whereas ISTHA's Open Road Tolling Program is close to completion, and the indirect and cumulative impacts of the OMP are fully disclosed in that project's Final EIS (*O'Hare Modernization Final Environmental Impact Statement,* November 2005), those projects will not be evaluated further. The following major actions are planned to occur in the study area during the same period as or immediately following the EO-WB EIS:

- ISTHA's Congestion Relief Program (2012–2015)
  - Widening I-90 from its intersection with I-294 to Elgin Toll Plaza (just west of IL 31), with accommodation for the proposed Metra commuter rail STAR Line proposal. Roughly 12 miles of the project is within the study area; the remainder extends to the west.
  - Reconstructing the I-90/IL 53 system interchange with improved geometry and directional ramps to reduce congestion. The project is entirely within the study area.
  - Implementing the green lane concept on area tollways (devoting lanes to certain vehicles to encourage carpooling, using more environmentally responsible vehicles, and reducing emissions). Existing tollways within the study area are candidates for green lane implementation.
- The Metra STAR Line (2015-2018)—A new commuter rail project proposed in the I-90 corridor from Rosemont to Hoffman Estates with station locations throughout the route. About 12 miles of the route is within the northern part of the study area.

These actions are reasonably foreseeable, given their stage of planning and development. The cumulative effects of these actions are considered in this analysis.

In the analysis of indirect and cumulative effects, key resources are characterized in terms of their response to change; stresses imposed on them; their capacity to withstand these stresses; the pertinent regulations that may protect them, and their current status (baseline condition). This information is summarized in Tables 4-27, 4-28, and 4-29.

TABLE 4-27
Potential Cumulative/Indirect Effects

	Resources, Ecosystems, Human Communities	Potentially Important from Perspective of Cumulative or Indirect Effects
Land Use	a. Relationship between land use and transportation – consistency with local plans b. Socioeconomic c. Impacts to racial, ethnic, and special groups	a. Facilitate already established growth trends, consistency with plans of local communities and development patterns b. Population and employment growth, changing community cohesion, building displacements c. Environmental justice effects – Assess whether there would be disproportionate impact to minority and low income groups
Wetland resources	a. Wetlands	a. Degradation or loss (erosion/sedimentation, filling), fragmentation, increased volumes of water due to increased impervious areas, increased pollutant loads, and potential loss of biological resources
Water resources	a. Water quality	a. Sedimentation; pollutant loading (e.g., salt from deicing; oil, grease, heavy metals, suspended solids, and debris from demolition/construction activities, traffic operations, and maintenance); altered hydrology; potential impact to designated water uses

TABLE 4-27
Potential Cumulative/Indirect Effects

	Resources, Ecosystems, Human Communities	Potentially Important from Perspective of Cumulative or Indirect Effects
Biological resources	a. Flora and fauna diversity b. Habitat fragmentation c. Potential threatened and endangered species d. Intrusion into special lands (e.g., nature preserves, forest preserves) e. Tree loss during construction	a.–e. Habitat loss, degradation of habitats, and impacts to plant and animal populations from construction and/or ongoing operation/maintenance activities

TABLE 4-28
Cause and Effect for Resources, Ecosystems and Human Communities

Resource	Cause of Change	Potential Effect of Change
Land use/ socioeconomic	Growth, accompanied by new transportation, residential, commercial, industrial, and service-oriented development.	Within the study area, existing land use patterns are retained with updated features (i.e., aging development gives way to new industrial and commercial business model). Outside the study area, the economic vitality of the study area promotes infill or expansion of development into open land. This potential outward movement of development brings with it infrastructure demands necessary to support a growing population base.
Water resources and wetlands	New development, with increased impervious surface area. Stormwater runoff during construction and operation. Stream channel erosion. Salt spray and other nonpoint source pollution.	Degradation of surface and groundwater. Higher discharge of runoff. Stream channel erosion. Reduced groundwater recharge rates. Increased demand on water supply. Wetland degradation, fragmentation, and loss. Altered hydrology. Sediment transport and pollutant loading. Deterioration of recreational water bodies. Litter and refuse.
Biological resources	Highway and transit construction. Urban development.	Loss of open space and potential habitat. Wildlife mortality. Reduced biological diversity. Habitat degradation.

TABLE 4-29
Affected Environment

Resource	Response to Change	Stresses	Capacity to Withstand Stress	Regulatory Thresholds	Baseline Condition
Land use / socio-economic	Increase in development or redevelopment. Changes to population and employment.	Water resources, air quality, noise pollution. Employment changes due to business displacements or relocations.	Regulations and standards are used to minimize adverse effects. Municipal planners encouraging infill growth and redevelopment, and growth near transportation.	County and municipal zoning and land planning ordinances. Long-range infrastructure planning provided by IDOT, ISTHA, county, and others, to improve transportation service.	Area is 90+ percent developed, so most change would result from redevelopment of older commercial or industrial areas. Municipalities have plans to take advantage of improved transportation access resulting from improvements. Most forecast population, household, and employment growth will occur regardless of major transportation improvements.
Wetlands	Direct impacts: loss of wetlands and habitat fragmentation. Indirect impacts: altered hydrology and degradation of plant communities.	Additional development and redevelopment may cause increased impervious area.	Mitigation for wetlands compensates for lost wetland acreage.	IDNR and USACE enforce wetland mitigation requirements for projects subject to federal and state jurisdiction.	3,828 acres of mapped wetlands in the study area. Wetland impacts have been compensated through mitigation (e.g., adjacent to the Elgin O'Hare Expressway, etc.).
Water resources	Increased hydrocarbon, chloride, and heavy metal concentrations in streams. Increased erosion and sedimentation from construction and operation, and from installation of associated infrastructure and utilities.	Increased impervious area results in increased salt use and stormwater runoff during construction and operation/ maintenance of proposed improvements.	The use of BMPs for all aspects of project development would minimize pollutant and sediment concentration in runoff. Project engineering plans must incorporate natural drainage measures and BMPs designed to reduce erosion, runoff, and pollutant loads.	All streams fall under the General Use Water Quality Standards. IEPA provides water quality certification under Section 401 of the CWA, which is mandatory for all projects requiring Section 404 CWA permits. Safe Drinking Water Act protects municipal water sources from contamination.	Stream quality has been steadily improving since implementation of the CWA, and enforcement by the USACE, USEPA, IEPA, and other local programs.
Biological resources	Impacts to vegetation, wildlife, and their habitats.	Development, redevelopment, and transportation improvements.	Design considerations that would modify the transportation system, thereby minimizing or avoiding resource impact. Streams/rivers would not be impeded and riparian corridors would not be fragmented, thereby allowing wildlife movement along waterway corridors.	Endangered Species Act; Migratory Bird Treaty Act (USFWS/IDNR).	Species are concentrated in protected areas.

4.12.2 Indirect Effects

This section evaluates the potential for indirect effects in the study area.

4.12.2.1 Socioeconomic Effects

Subsection 4.1.1 presents the changes in population, household, and employment forecast for each alternative. Subsections 4.1.2, Displacements, and 4.1.5.5, Tax Revenues, present the direct impacts associated with the relocation of residents and businesses, and the corresponding loss in tax base associated with the alternatives under consideration. Subsection 4.1.4, Environmental Justice, evaluates if any of the impacts disproportionately impact minority or low-income communities. Both build alternatives would induce additional growth in employment beyond what is forecast under the No-Action Alternative. Both build alternatives would also lead to slight increases in population and households, over the No-Action Alternative. As indicated in Table 4-1, in 2006, the study area population was 509,900, and there were an estimated 569,500 jobs in the study area (CMAP, 2006). This area within the metropolitan Chicago region has a vibrant economy containing established residential areas and a solid employment base. It is expected that the study area will continue to maintain its competitive position and serve an important role in the larger Chicago economy, in terms of both housing and jobs.

The employment forecasts for the study area reinforce the notion that the study area will continue to attract new businesses. Most growth in employment is forecast to occur regardless of the proposed project: the 2030 forecast under the No-Action Alternative expects an increase of 80,100 jobs (or a 14.1 percent increase over 2006 jobs). Under Alternative 203, there would be an additional 62,500 jobs (over baseline) in the study area, while under Alternative 402, there would be an additional 48,500 jobs (over baseline) in the study area.

Steady population and household increases are forecast over the 20-year period. The percentage increase in population and households is not expected to be as high as employment over the same period. This could be because as the area's industrial base is enhanced by improved transportation, residential use may no longer be the highest and best use for some properties in some areas, and conversion to other land uses may occur. Population between 2006 and 2030 under baseline conditions (i.e., regardless of this proposed transportation improvement) is forecast to increase in the study area by 27,720 people and 3,650 households. This translates to a 5.4 percent population increase and 1.8 percent increase in households. If Alternative 203 were to be constructed, an additional 3,170 people and 4,900 households are forecast to live in the study area, as compared to an additional 1,420 people and 4,300 households under Alternative 402.

Section 4.1.5.2 explains the direct economic effects from construction of the proposed alternatives. In addition to the direct effects, the transportation investment will indirectly benefit the economy and increase economic output throughout various economic sectors. Construction of the project will effect the roadway construction sector by increasing demand for locally produced materials needed for construction, such as concrete, wholesale and retail trade items, rebar, and other construction materials. This will affect suppliers of those products. Other sectors of the economy would be benefited by employees hired in the

highway construction industry who may increase their expenditures in restaurants, grocery stores, and shops.

In addition to the direct creation of jobs in the highway construction industry (an average of 9,200 per year for the three years of construction), Alternative 203 would indirectly lead to the creation of a total of 21,600 jobs per year for the three years of construction in other industries in the region. Alternative 402 would result in creation of 7,000 jobs per year in the highway construction industry, and would indirectly lead to a total of 16,600 jobs annually in the region.

The indirect effects of the proposed road improvements, and resulting improved transportation access, are anticipated to lead to increased population, households, and employment in the study area. While residential and business displacements would occur as a result of the project, the proposed roadway will spur development of remaining vacant parcels as well as redevelopment of underused parcels. Roadway construction itself will lead to indirect, or spinoff, jobs, and spending in the region.

4.12.2.2 Water Quality

The EO-WB study area is within the Des Plaines River Watershed, which is divided into seven smaller watersheds. Five streams that would be crossed by the build alternatives — Addison Creek, Higgins Creek, Salt Creek, Spring Brook, and Willow Creek—are 303(d) impaired streams (IEPA, 2008a). Impairment may be the result of chloride, fecal coliform, phosphorus, DO, or other signature highway runoff pollutants, such as heavy metals and TSS. The six core communities in the EO-WB study area comprise predominantly urban and built-up land with a high concentration of industrial and commercial use (Table 2-6). The built-up nature and use of the area has contributed to the degradation of its streams through various sources such as urban runoff, storm sewers, MPSDs, upstream impoundments, or channelization/streambank modification.

Increased traffic and impervious surfaces will result from recently completed transportation infrastructure improvements and from those proposed within the EO-WB study area over the next 20-year period. The increased traffic and impervious surfaces could result in additional pollutants being deposited on the roadways. Through normal operations, such as tire wear, vehicles contribute constituents to roadway surfaces. During storms, these constituents could be transported to receiving waters and cause an indirect effect on the aquatic ecosystem or designated uses of the creeks in the study area. Potential impacts from pollutants in roadway stormwater runoff include the following:

- Nutrient enrichment/eutrophication: High nutrient levels (nitrogen and phosphorous from atmospheric deposition and fertilizers) in lakes and slow moving creeks can cause excessive algal blooms, which can affect water quality, recreation, and aesthetics.
- Toxicity to aquatic life: Toxicants such as heavy metals, pesticides, and other organic compounds may affect aquatic organisms. Adverse impacts may result from chronic exposure and bioaccumulation of pollutants. Dissolved oxygen may be reduced to dangerous levels in the aquatic environment as a result of organic matter decomposition.

- Sediment contamination: Bottom substrates in the aquatic environment accumulate contaminated sediment that could interfere with the reproduction and feeding mechanisms of aquatic organisms, such as fish. Contaminated sediments may be toxic to some organisms because of elevated pollutant concentrations. Sediments can have a relatively high organic content, that when "broken down," exert an oxygen demand.
- Bacterial contamination: Following storms, water quality standards for fecal coliform bacteria frequently are exceeded in urban waters, including the streams in the EO-WB study area (see Table 2-15). This generally reflects the presence of a significant amount of animal or human waste in the water.
- Salt contamination: The use of salts for deicing may raise salt concentrations in receiving waters. High salinity levels may adversely affect sensitive floral communities, particularly wetland plants. Road salt runoff can stress wetland plant communities and may result in a reduction of native plant diversity and replacement by more salt tolerant plant species. Runoff-related salt concentrations in receiving waters usually are not high enough to kill fish and other aquatic organisms.
- Impaired aesthetics: Turbid water, trash, debris, and an oily sheen may reduce the visual appeal of waterways, affect recreational potential, and harm wildlife.
- Elevated water temperatures: Several factors can increase summertime water temperatures, such as the removal of overhanging vegetation, reduction of base flows, and runoff from impervious surfaces that have been heated by the sun. Higher temperatures can stress aquatic life and raise water quality issues.
- Impairment of water supplies: Pollutants have the potential to adversely affect surface and groundwater sources of water supply. See subsection 4.2.1 for a discussion on potential impacts to groundwater resources (USDA NRCS and IEPA, 2002).

Induced secondary development could take place in the same watersheds as the build alternatives, including adjacent to the creeks that would be affected by the collective transportation infrastructure improvements within the EO-WB study area. Additional development could indirectly add to potential impacts resulting from the construction, operation, and maintenance of the build alternatives.

Stormwater quality control would be accomplished through the NPDES Phase II General Permit No. ILR40, including incorporation of TMDLs to address impairments in affected watersheds, such as the Salt Creek Watershed. Parts of the build alternatives are within the Salt Creek, Addison Creek, or West Branch DuPage River watersheds, which have TMDLs for chloride and/or DO. In addition, a Stage 1 TMDL Report addressing chloride, DO, and fecal coliform has been prepared for Higgins Creek. A TMDL is also in the first stage of development to address fecal coliform in Addison Creek, Salt Creek, and the West Branch DuPage River.[33] Water quality would be managed through a combination of stormwater runoff and drainage collection facilities and the implementation of other post-construction BMPs in accordance with state and federal water quality goals of restoring water quality of the impaired/degraded

[33] In addition to fecal coliform, TMDLs are also being prepared for the following impairments associated with stream segments near the proposed EO-WB improvements: pH (Salt Creek); DO and manganese (West Branch DuPage River) (AECOM, Inc., 2009b).

streams. Refer to subsection 4.2.2.2 for discussion pertaining to water quality BMPs. As discussed in subsection 4.2.2.3, chlorides can stress wetland plant communities and may reduce native plant diversity. BMPs to reduce chloride loads could include storage and handling operations and consideration of alternative nonchloride products.

4.12.2.3 Wetlands

Most of the study area is developed land, and most of the wetlands in the study area are within special lands. There are more than 3,828 acres of mapped wetlands within the study area. Of that total, 71 percent are within special lands, such as forest preserves. Wetlands are protected by federal, state, and local (e.g., DuPage County) regulations. In the study area, loss of wetlands can generally be attributed to urban development. Wetlands filled for development purposes will be mitigated for as required under Section 404 of the CWA and other state and local regulations. Therefore, induced development is not expected to affect the total number of wetlands within the study area, since projects prompted by the proposed EO-WB improvements would tend to avoid or minimize wetland impacts to meet regulatory requirements and to keep from incurring compensatory wetland mitigation costs.

Indirect impacts could also include potential wetland degradation, as a result of point source and nonpoint source pollution. Pollution could adversely impact sensitive floral communities, particularly wetland plants. Polluted runoff may result in a reduction of wetland native plant diversity and establishment of adventive (nonnative) plant species.

4.12.2.4 Biological Resources

Land development usually displaces biological resources. Except for special lands, such as forest preserves and parks, the remaining biological resources in the study area generally are confined to isolated areas and would continue to be isolated from other habitat areas. Habitat fragmentation involves dividing larger continuous habitat (such as woodlands and old fields) into smaller habitat patches. Transportation projects and other development induced by the EO-WB improvements could cause additional fragmentation, loss of habitat and, increased competition in remaining natural areas. Fragmentation can reduce habitat function and value and may result in differences in predation, interspecific competition, and prey availability. Preservation of special lands can reduce fragmentation by protecting habitat resources.

While these indirect effects are likely with the EO-WB improvements, unlike wetlands, there is little regulatory protection for habitat types, such as wooded areas and old fields, unless they are jurisdictional wetlands, are located in special lands, or provide critical habitat for threatened or endangered species.

4.12.3 Cumulative Effects

4.12.3.1 Socioeconomic Effects

The potential for induced economic effects from construction of the proposed build alternatives is substantial for the region and is even more prominent when considering the combined, or cumulative, effects of the other reasonably foreseeable actions in the area. Cumulative economic effects were estimated using IMPLAN PRO and considered roadway improvements to be constructed between 2012 and 2015, transit improvements planned

between 2012 and 2027, the Tollway Congestion Relief Program to be constructed between 2012 and 2015, and the STAR Line Project to be constructed after the EO-WB and Tollway Program between 2015 and 2018. Table 4-30 details the results of the analysis. Alternative 203, with its higher investment in construction than Alternative 402, results in more value added, jobs created, and total output and taxes than Alternative 402.

TABLE 4-30
Cumulative Economic Impacts from Build Alternatives Construction per Year

	EO-WB, Tollway Program, and Transit Improvements Associated with a Build Alternative (2012–2015)		STAR Line Project and Transit Improvements Associated with a Build Alternative (2015–2018)		Transit Improvements Associated with a Build Alternative (2018–2027)	
	203	**402**	**203**	**402**	**203**	**402**
Construction costs per year	1.8B	1.5B	$170 M	$161 M	$29 M	$17 M
Total construction costs	$5.3 B	$4.5 B	$520 M	$480 M	$260 M	$150 M
Value added per year	$2.3 B	$2.0 B	$230 M	$210 M	$39 M	$22 M
Total value added	$7.1 B	$6.0 B	$670	$630 M	$340 M	$200 M
Direct jobs[a] created per year	13,300	11,000	1,300	1,200	200	130
Total jobs[b] created per year	31,400	26,200	3,000	2,800	500	300
Total output	$12.9 B	$10.7 B	$1.2 B	$1.1 B	$660 M	$370M
Total taxes per year	$560 M	$470 M	$53 M	$49 M	$9 M	$5 M

[a] These are jobs related to construction of the transportation improvement.
[b] These include jobs in all sectors of the economy that are created as a result of the initial investment.

Cumulative economic impact from construction of Alternative 203 combined with the Tollway Program and transit improvements would result in $1.8 billion per year in construction costs (or $5.3 billion over the three-year period 2012 to 2015). This would lead to a creation of 13,300 jobs per year in the highway construction industry directly and a total of 31,400 jobs per year in the region. These projects would cumulatively increase jobs in the region for the highway industry by 22 percent per year.

Total value added (the net measure of the economic contribution of an industry to the regional economy less the intermediate goods and services used) would be an estimated $2.3 billion annually and $7.1 billion over the three-year period. Estimated total sales volume, as measured by total output, would be $12.9 billion over three years.

Federal and non-education state and local taxes generated in the region from these projects are estimated to be $560 million per year or $1.7 billion over three years.

Alternative 402, combined with the Tollway Program and transit improvements, would result in $1.5 billion per year in construction costs (or $4.5 billion over the three-year period). This would lead to creation of 11,000 jobs per year in the highway construction industry and a total of 26,200 jobs per year in the region. These projects would cumulatively increase jobs in the region for the highway industry by 18.4 percent per year.

Total value added would be estimated at $2.0 billion per year, and $6.0 billion over the three-year period. Total sales volume as measured by total output would be $10.7 billion over three years. Federal and non-education state and local taxes generated in the region

from the project are estimated to be $470 million per year or $1.4 billion over the three-year period.

It is expected that the STAR Line Project would commence immediately following construction of either Alternative 203 with the Tollway project or Alternative 402 with the Tollway project. The combination of the STAR Line Project with transit improvements associated with Alternative 203 would have total construction costs of $520 million over the three-year period 2015 to 2018. This results in expenditures of $170 million per year and creates 1,300 jobs per year in the highway construction industry and 3,000 jobs per year in the region.

Total value added is estimated at $230 million per year and over $670 million over the three-year period. Total sales volume as measured by total output is $1.2 billion over the three-year period. Federal and non-education state and local taxes generated in the region from the project are estimated to be $53 million per year or $159 million over the three-year period.

The combination of the STAR Line Project with transit improvements associated with Alternative 402 would have total construction costs of $480 million over the three-year period 2015 to 2018). This results in expenditures of $161 million per year and creates 1,200 jobs per year in the highway construction industry and 2,800 jobs per year in the region.

Total value added is estimated at $210 million per year and over $630 million over the three-year period. Total sales volume as measured by total output is $1.1 billion over the three-year period. Federal and non-education state and local taxes generated in the region from the project are estimated to be $49 million per year or $147 million over the three-year period.

Transit Improvement Construction costs between 2018 and 2027 are estimated to total $260 million for Alternative 203 and $150 million for Alternative 402. This results in an expenditure of $29 million per year for Alternative 203 and $17 million for Alternative 402.

The Transit Improvement Costs for Alternative 203 are predicted to generate 200 jobs in the highway construction industry each year and 500 total jobs per year in the region between 2018 and 2027. Total value added is estimated to be $39 million per year for a total of $340 over the nine-year period 2018 to 2027. Total sales volume as measured by total output is $73 million per year or $660 million over the nine-year period. Federal and non-education state and local taxes generated in the region from the project are estimated to be $9 million per year or $81 million over the nine-year period.

The Transit Improvement Costs for Alternative 402 are predicted to generate 130 jobs in the highway construction industry each year and 300 total jobs per year in the region. Total value added is estimated to be $22 million per year for a total of $200 over the nine-year period 2018 to 2027. Total sales volume as measured by total output is $41 million per year or $370 million over the nine-year period. Federal and non-education state and local taxes generated in the region from the project are estimated to be $5 million per year or $45 million over the nine-year period.

The total construction costs for Alternative 203 including the Tollway Project, the transit improvements and the STAR Line Project are estimated to be $6.1 billion in 2009 dollars.

Total Value Added for the life of the construction project (2012–2027) is estimated to be $8.1 billion in 2009 dollars. Total sales volume as measured by total output is $14.8 billion. The maximum number of jobs created will be in the initial years with 13,300 in the highway construction industry and 31,400 within the regional economy and then taper off during the following two construction periods.

The total construction costs for Alternative 402 including the Tollway Projects, the transit improvements and the STAR Line Project are estimated to be $5.1 billion in 2009 dollars. Total Value Added for the life of the construction project is estimated to be $6.8 billion in 2009 dollars. Total sales volume as measured by total output is $12.2 billion. The maximum number of jobs created will be in the initial years with 11,000 in the highway construction industry and 26,200 within the regional economy and then taper off during the following two construction periods.

Potential cumulative effects to land use relate to the location of the proposed corridors relative to the development patterns within each community and consistency with the various communities' long-range land use plans. Other potential cumulative effects include creation of a physical barrier (real or perceived) through communities. Carefully planned roadway improvements can foster beneficial results, such as making the community more cohesive, and serving future growth and planning policies. Lack of careful planning, however, can have undesirable effects, and may even create barriers that would cause adverse travel and disadvantage the business connections within a community.

Extension of the Elgin O'Hare Expressway and construction of a West Bypass are consistent with local, county, and regional plans (see discussion of consistency with land use plans, Section 4.1.3.1). Combined, these plans sustain existing uses throughout the analysis area with a responsible level of open space preservation, as evidenced by the fact that nearly 20 percent of the land in the study area is preserved in forest preserve, park, and other open space uses. Further, the proposed alternatives have been located to avoid impact to those lands. The community plans have recognized and incorporated an upgraded facility type along Thorndale Avenue as well as a new high-type facility on the west side of O'Hare Airport that would connect between I-294 and I-90, and have planned for land uses that each community deemed would be compatible with a higher-type roadway in these corridors. These communities recognize the importance of industrial and warehousing uses as an essential component of their economic base, and their goals are to preserve these uses as well as enhance their competitive position through continued updates and upgrades. For example, the villages of Bensenville and Wood Dale have recently commissioned planning studies to further take advantage of the new roadway facility as it relates to their redevelopment opportunities. These studies have targeted areas within the communities that are ripe for redevelopment, the object being for those areas to take full advantage of improved access and the changing conditions.

Generally, higher type roadways can lead to higher type uses. A freeway can provide an improved entrance/image throughout a corridor compared to a non-freeway facility. Development seeking high visibility and superior access tends to be located adjacent to freeways to improve competitive position. Industrial facilities rely on good truck access with easy movement to and from freeways. Generally, industrial developments do not require a first tier location (i.e., directly adjacent to a freeway), but one that may be a property or two removed. Thus, a hierarchy of land use type occurs with development that

requires the highest visibility to be adjacent to a freeway type facility, and industrial uses located beyond. Thus, the new proposed freeway type facilities throughout the study area under either Alternative 203 or Alternative 402 would likely create a higher investment potential for properties adjacent to the freeway, and may lead to the conversion from industrial/warehousing uses to other business uses that benefit from good access and high visibility (such as office and commercial uses).

The potential for the proposed improvements to create the undesirable effect of a community barrier was examined for both alternatives and the south connection options. Under both alternatives, the westernmost part of the Elgin O'Hare Expressway (between Gary Avenue and I-290) is a freeway. Some of these lands were developed before the roadway was built, but for the most part, land uses have evolved to take into consideration the benefits of the freeway, including access and high visibility. The proposed improvements through this segment of the roadway would not lead to any further community barrier effects.

Under both alternatives, the Thorndale Avenue corridor (from I-290 to the O'Hare West Bypass) would be upgraded from an arterial to a freeway. Thorndale Avenue has always been a major east-west travel route and a heavily traveled roadway. Any barrier—actual or perceived—that the roadway presents will remain when the arterial is upgraded to a freeway. However, when upgraded, frontage roads and grade-separated crossings will provide for local access along and across the corridor. Thorndale Avenue is already a major transportation corridor, but development as a freeway will further define it as a transportation corridor. The potential barrier effects of the facility would be mitigated with local access along and across the facility to satisfy north-south travel and access to adjacent land uses, thus minimizing its effect as a barrier to existing conditions.

For the O'Hare West Bypass segment, the location of Alternative 203 is in the best possible location to avoid community barrier effects. Its location on the western edge of O'Hare Airport property avoids conflict with the proposed O'Hare Modernization Program improvements, and minimizes displacement of valued industrial and commercial properties in Elk Grove Village, Des Plaines, Bensenville and Franklin Park. Further, it is geographically on the edge of the airport and respective communities, and forms a logical boundary between the airport and communities. The location of the bypass also avoids alterations to community travel patterns that would impair emergency response, school bus routes or community travel to town and activity centers. In the case of Alternative 402 (an arterial improvement along York Road/Elmhurst Road), the boundary would be less defined. The north leg of the West Bypass as an arterial potentially leads to community uncertainty about further advances of airport development and potential incompatibility with community land uses.

Options A and D have distinct differences related to creating barrier effects. Option D would be less disruptive than Option A. Option D parallels a rail line through an industrial area that already imposes a north-south barrier. In some ways, Option D would actually reduce the barrier effects in the area, with improved local access to and from freeway facilities. Option A, which parallels County Line Road, would bisect industrial and residential developments that span both sides of the roadway. Whereas a barrier between less compatible uses (e.g., residential and commercial) may have some advantages, the proximity to residential development raises concern about noise and air quality impacts.

The cumulative effects of these projects are expected to affect land use change in the study area. The effects would be most prominent near the improvements where maximum travel benefit is derived. Whereas the combined development of projects would displace residences and businesses, they would also spur investment in private development. Industrial and commercial land uses alike recognize the intrinsic value and competitive advantage of better transportation and access. Therefore, underused or underdeveloped properties in the area would be candidates for reinvestment, with greater employment opportunities and tax base to the affected communities. Continued increases in employment in the study area are the most likely scenario, and population growth stimulated by these foreseeable actions would most likely occur elsewhere in the region. Because the area is the location of extensive commercial and industrial development, it is expected that existing land use patterns will remain the same with the development of more modern facilities, replacing aging structures.

4.12.3.2 Water Quality

The transportation infrastructure improvements that have recently been completed or are proposed within the EO-WB study area over the next 20 years may affect land uses in the study area and could potentially result in cumulative water quality impacts. Most of the six core communities in the EO-WB study area have predominantly urban and built-up land uses. Exceptions include preserved open space associated with forest preserves and municipal parks. Additional development through infilling and selective redevelopment of vacant land is expected to occur. Areas that are unprotected open, underdeveloped, or underused space may be developed to take advantage of better transportation and access. These effects would be most noticeable in close proximity to the improvements. Additional impervious surfaces may be constructed as part of the anticipated development. When undeveloped land is converted to impervious surfaces, the stormwater runoff typically increases and infiltration decreases. Operation and maintenance of additional impervious surfaces would result in the deposition of additional pollutants. Pollutant concentrations are highly variable and can be affected by numerous factors, such as construction, operation, maintenance, weather, and adjacent land uses. Pollutants that accumulate on impervious surfaces could be transported to receiving waters in runoff.

Increased development patterns affect water quality of streams by contributing increased stormwater runoff and wastewater discharges. Most of the assessed surface waters in the study area are impaired or degraded, are inhabited by relatively pollution tolerant species, have been channelized or modified, and are surrounded by developed or mowed overbanks, with forest preserve areas generally being an exception.

If the trends of the past continue, water quality in the study area watersheds (and the region) may continue to degrade, and as more streams are assessed for water quality impairments, the 303(d) list of impaired waters likely will grow. The biological integrity and diversity of streams in the larger Des Plaines River Watershed would continue to decline. For example, the Salt Creek Watershed, in both Cook and DuPage counties near the center of the EO-WB study area comprises roughly 44 percent its total acreage. Rapid urbanization of the Salt Creek Watershed started around the 1950s. In the years that followed, human activities (land development/construction, land use, etc.) placed an overwhelming strain on the watershed. Several factors, such as increased impervious area, floodplain encroachment, loss of natural

storage area, channel modification, and pollutant discharges resulted in increased stormwater runoff, flooding, and stream degradation.

Since the 1970s, various environmental regulations (at the federal, state, and local levels), flood control projects, and public awareness/activism have played a role in improving water quality and flooding. Various federal, state, and local regulations, such as the federal CWA and the DuPage County Countywide Stormwater and Flood Plain Ordinance, are controlling the effects of development upon water resources.[34] For waterways located proximate to the EO-WB build alternatives, a TMDL has been prepared for the Salt Creek Watershed[35] and for the West Branch DuPage River (CH2M HILL, 2004b). TMDLs by themselves will not lessen future degradation, but with regulatory oversight and implementation of BMPs, water quality in subwatersheds and the larger Des Plaines River Watershed should improve.

For example, in response to the Salt Creek and West Branch DuPage River TMDLs, an active watershed group was formed. The watershed group continues to develop recommendations and actions to improve water quality in Salt Creek and the West Branch DuPage River. 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 of three stages of TMDL development to address additional impairments, such as fecal coliform (IEPA, 2008a). If appropriate BMPs are implemented and properly applied, water quality throughout the influence area may improve, even with more development.

Development can also result in an increase in the rate and volume of stormwater runoff and a reduction in groundwater recharge. Stormwater typically is managed on a project-by-project basis. Stormwater controls function independently and primarily reduce peak storm flow rates for larger storms (some allowable release rates account for smaller, more frequent storms), or potential impacts associated with the total storm volume may not be accounted for. If not managed appropriately, this could result in increased flooding, streambank erosion, and higher, more frequent storm-related flows, and lower and longer duration low flows in streams as a result of cumulative urban development. The increased runoff rates and high channel velocities may result in excessive bank erosion or channel downcutting. Stream substrates and bottom-dwelling/benthic organisms can be scoured away by frequent high flows/velocities. Pollutants may concentrate during periods of lower flow. Extended periods of low flow may also result in higher in-stream temperatures during the summer that could affect fish or other aquatic wildlife (USDA-NRCS and IEPA, 2002).

Detention would be provided to compensate for the increase in impervious area associated with the EO-WB build alternatives and other planned infrastructure projects in the study area, as necessary. To minimize cumulative impacts, BMPs to consider in the Tier Two environmental studies would allow for a watershed approach to stormwater management that integrates both water quantity and quality control, as practicable. BMPs would be designed to reduce the occurrence of flow control problems or minimize the chances of problems becoming worse. BMPs would be designed to incorporate TMDLs or to treat other

[34] The Metropolitan Water Reclamation District of Greater Chicago is preparing a countywide watershed management ordinance for Cook County.

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

pollutants that have been identified as stressors of concern to reduce effects of water quality impairment sources, such as chlorides, in the respective watersheds (National Research Council, 2008).

Several forest preserves within the study area are located in the floodplain or were purchased by forest preserve districts for flood control/stormwater quantity and quality improvements. This was accomplished through floodplain acquisition, construction of reservoirs and stormwater facilities, preservation of wetlands and riparian habitat, and public education and awareness opportunities. BMPs could also minimize the cumulative impacts of development.

Of the major transportation projects proposed in the next 20 years within the study area, the EO-WB project is expected to break ground first. As such, it could be used as a model to develop stormwater quantity and quality BMPs that could be applied to other infrastructure projects in the larger Des Plaines Watershed or northeastern Illinois. As part of the EO-WB improvements, a BMP manual that incorporates the stormwater BMPs could be developed. The BMP manual would be applied to the Tier Two design and construction phases of the EO-WB improvements and could serve as a prototype for other transportation projects to minimize cumulative water quality impacts in the EO-WB study area and to the downstream environment. Mitigation measures would be provided to compensate for acknowledged unavoidable impacts and to minimize cumulative effect (see subsection 4.13).

4.12.3.3 Wetlands

Suloway and Hubbell (1994) estimated that more than 90 percent of Illinois' original eight-million acres of wetlands have been destroyed by human modification. Wetlands once covered more than 23 percent of Illinois. Wetlands and deepwater habitats now make up less than five percent of Illinois land. Wetland degradation in Illinois and the study area historically was associated with agriculture, but recent degradation is attributed to urban development.

From a broader perspective, it is expected that the cumulative loss of wetland acreage to development in Cook and DuPage counties will slow in the future. Past wetland loss due to urban and agricultural development has lead to a reduction in the overall acreage of remaining wetland areas. The few remaining wetland areas are subject to strict wetland regulations at the federal, county, and municipal levels, thus promoting the continued preservation of localized wetland areas and thus a reduction in future wetland losses. In addition, more aggressive wetland regulations require higher mitigation ratios. Under the protection granted to wetlands (Section 404 of the CWA), mitigation guidelines require that wetland losses greater than 0.10 acre be replaced at a ratio of 1.5 to one or greater (depending on the type and quality of wetland affected, the mitigation ratios may be higher). Thus, in many cases more wetlands are being created than destroyed by individual projects. In-kind replacement has been elevated as an objective, lessening the potential for changing wetland composition in the area. These mitigation requirements are applicable to both private and public projects.

The Illinois Interagency Wetland Policy Act of 1989 (applicable to state/state pass-through funded projects) also provides protection to wetlands and requires mitigation for all wetland impacts regardless of size. Overall, this legislation has been effective for mitigating the loss of wetlands from public projects that receive state/state pass-through funding,

which has helped to slow total wetland loss across the state. DuPage County has developed a wetland protection ordinance to fill potential gaps in state and federal regulations, and Cook County is preparing a watershed management ordinance that includes wetland protection.

Land management is another mechanism that can minimize the potential conversion of special resources. Examples are park districts, forest preserves, state parks and natural areas that provide long-term protection to special resources within their boundaries.

These practices minimize wetland losses from the build alternatives, as well as to direct the effects of urban development, and slow or stop the rate of wetland loss in the study area and consequently, the overall cumulative effect. The percent of wetland loss for each of the build alternatives represents a small fraction of the total wetland acreage found in the study area and local region. The long-term viability of wetland resources will likely be sustained through mitigation and an increase in larger wetland complexes (via wetland mitigation banks), which are preferred by regulators.

4.12.3.4 Biological Resources

Most of the study area is urban and built-up land, and contains limited areas of prime wildlife habitat. Higher quality vegetation and wildlife species in the study area tend to be concentrated within the special lands. Important vegetative cover types for wildlife in the study area are the forested lands, old fields and wetlands. Wetland habitats include emergent, wet old field, sedge meadow, scrub-shrub, and wooded wetland.

The large percentage of urban development, habitat fragmentation, and transportation infrastructure throughout the study area limits wildlife movement. Large contiguous areas of open space are generally located within special lands or are adjacent to waterways. Wildlife use linear corridors, such as riparian environments, greenways, rights-of-way, and fence rows, for movement, dispersal, and to access habitat that has been divided by roads, rail, or other types of development. The largest contiguous open space habitat types within the study area are the Ned Brown Preserve, a system of forest preserve properties along the Des Plaines River in Cook County, and a cluster of forest preserves and other special lands in DuPage County along Salt Creek/adjacent to I-290. The preserved open space and Salt Creek provide connectivity among the DuPage County Forest Preserves and may allow wildlife movement between those areas.

In general, the large contiguous open space habitats within the study area correspond with the "recommended resource protection areas" depicted in the Chicago Wilderness Green Infrastructure Vision for Northeastern Illinois (Northeastern Illinois Planning Commission, 2004). The green infrastructure represents interconnected upland and aquatic habitats (e.g., large complexes of remnant woodlands, prairies, wetlands, lakes, riparian corridors) that support biodiversity and allow diverse native plant and animal communities on a regional scale. Green infrastructure may also include adjacent buffer areas. The recommended resource protection areas and green infrastructure provide the location for regional biodiversity protection and ecosystem restoration opportunities. These areas are not intended to be precise protection or restoration areas; instead, their purpose is to create awareness and opportunity for protection and restoration. Impacts to these areas have been avoided or minimized by the build alternatives.

The build alternatives and future development have the potential to create additional edge effect at the perimeter of larger preserved open space and to displace isolated habitat areas (old fields or small wooded lots) that are not within special lands. The extent of habitat area affected by edge effect could continue to move inward due to the cumulative effect of other developments/projects in the area. Additional developments could further reduce the number and size of remaining open space and available habitat. In time, as animals move away from affected areas to undeveloped areas, urban tolerant species could create additional competition for less tolerant species residing in protected areas or for other urban tolerant species inhabiting scattered, remnant open space.

4.12.4 Conclusion

A substantial investment in transportation infrastructure is required to address severe congestion in one of the Chicago metropolitan area's major transportation and employment areas. Investment of this type often spurs related land use growth, but in an already developed area such as in the study area, the basic patterns of land use would be expected to be maintained. It is expected that change in land use would instead occur in the form of rehabilitation or redevelopment for those commercial and industrial areas needing modernization (e.g., those with aging or obsolete buildings, numerous access drives, and awkward access for today's larger semi-trucks). The boundaries of industrial and commercial areas are reasonably set and encroachment upon established residential areas is unlikely. Thus, land use response to transportation investment would be expected to be in the form of private sector investment in the commercial and industrial areas that would benefit from an improved transportation system through improved competitive position in the marketplace. As stated earlier, the regional economic effects of the proposed improvements combined with other major projects planned in the study area are sizable. Most of the growth in population spurred by the investment would be expected to occur outside of the study area. Growth will result in several possible population change scenarios, including a shift or redistribution of population in the metro area, infill development, or new development. Depending on the type of employment resulting from industrial or commercial redevelopment, all these scenarios could occur. For some, affordable housing and access to public transportation is important. Most likely those requiring such amenities already live in areas that have them. Expansion of housing into the fringes of the metro area will occur as long as there is a need for additional affordable housing. This pattern of expansion tends to impose new stresses on natural and societal resources (e.g., development of open space, water quality effects, displacement of natural habitat, and requirements for costly new infrastructure).

Regarding natural resources, wetlands and other biological resources (flora/fauna, habitat fragmentation, threatened and endangered species, tree loss, and special lands) in the study area remain relatively stable. Water quality has the greatest potential for impact because of development. Most of the remaining wetlands and biological resources within the study area are in publicly managed/protected lands. Biological and wetland/water resources within the study area but outside the managed lands have been affected by an urbanized development pattern. The highest quality resources in the study area are also located in protected lands (e.g., forest preserves). Biological resources outside protected lands have limited diversity and have shifted toward species tolerant of urban development. Surface waters within the study area are largely impaired or degraded, but their water quality will improve because of watershed studies or actions and regulatory action. Notably, the

implementation of regulatory controls and increasing consideration of sustainable policies has shown benefits to water quality and biological resources. With the implementation of these management tools, the deteriorating quality of these resources has subsided and has shown signs of improving.

Overall, the cumulative effects of the proposed improvement and other major projects in the area would be manageable with diligent adherence to managed growth and regulatory controls protecting and preserving natural resources in the area. Communities and resources agencies affected by the proposed transportation improvements have been substantially involved in the planning process for these planned facilities. They have helped to guide the proposed improvements in ways that are compatible with community goals and objectives, and with the policies of resource agencies. Thus, the planning process has measurably addressed and planned for improvements that reflect the values of the affected communities and agencies. As the process advances toward implementation, these same values could be incorporated into the project specific mitigation, interagency agreements, ordinances, and regulations pertaining to the area.

4.13 Mitigation Concepts and Commitments

Mitigation measures are provided to compensate for unavoidable impacts. The following are proposals and concepts for mitigating resource losses or managing short- and long-term social effects. Detailed mitigation strategies will be developed during Tier Two environmental studies.

4.13.1 Traffic

A traffic management plan will be required during the construction period. The purpose of the plan is to maintain traffic flow and reliable access to residences, businesses, community facilities and services, and local roads during construction. There would be coordination with fire, police, and emergency services to minimize delays and response times during construction.

4.13.2 Land Use

Land use mitigation will consist of maintaining or enhancing connectivity, and incorporating roadway design considerations for developed areas. Continued coordination with communities at each successive design level would be conducted on issues such as: identifying opportunities to expand transit, bicycle, and pedestrian movement across or along planned roadway improvements; reviewing alignment details and resultant community impacts; and incorporating roadway design considerations, such as landscaping, buffer areas, and roadway lighting sensitive to adjacent land uses in order to minimize community impacts.

4.13.3 Relocations

IDOT will offer relocation assistance, in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*, as amended, and IDOT's *Land Acquisition Procedures Manual*, to all occupants of buildings they would purchase and remove. Those policies provide for relocation assistance services to homeowners, renters, and businesses.