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A well planned transportation network is vital to the success and livelihood of residential and non-residential neighborhoods alike. Streets and other infrastructure provisions affect and guide the overall pattern of development and should be designed in the most efficient manner possible not only for emergency services, but for the convenience of residents and visitors.

Infrastructure is a broad term that includes the system of streets, sidewalks, bridges, treatment facilities, and water, storm, and sewer lines that businesses and residents use everyday. The Public Works Department, comprised of the Engineering, Service, and Water Reclamation departments, is responsible for managing Solon’s infrastructure network.

**Street Classification System**

Streets are divided into two broad categories: primary and secondary. Primary streets are designed to carry large traffic volumes over a larger geographic region while secondary streets function more for local trips to and from school, shopping, etc.

Streets are the most visible aspect of the infrastructure. In terms of management, however, the “street right of way” more accurately describes the area for which the City is responsible. The right of way not only includes the physical street itself but also the tree lawn, sidewalks, storm and sanitary sewers, water lines, hydrants, traffic control signs, etc. “Figure 11-1-A” depicts the minimum right of way design standards (for clarity purposes, only half of a typical 60 feet wide right of way is depicted).

The transportation network is comprised of four main street types: expressway, arterial, collector, and local, the design and use of each of which is based upon the intended nature and volume of traffic. Solon’s street classification system is further described below.

a. **Expressway** - An expressway is a primary street that provides major through traffic movement and has full or partial control of access. U.S. Route 422 is the only expressway located in the City and is a four lane divided highway with restricted access. Within the city limits U.S. Route 422 is accessed at the SOM Center and Harper Road interchanges and it traverses the northern section of Solon in a northwest/southeast direction.

b. **Arterial Streets** - Arterial streets, also known as primary streets, provide major traffic movement through a community but allow for greater access than do expressways. There are ten (10) arterials in Solon, each of which are county roads as they traverse one or more counties. These streets provide access to subdivisions and commercial and industrial developments as well as neighboring communities without the need to travel on U.S. Route 422 or local streets. The arterial streets in Solon are SOM...
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“Figure 11-1-A” Sample Right of Way Cross Section

Source: Cleveland Division of Water
Center Road, Aurora Road, Miles Road, Cannon Road, Bainbridge Road, Solon Road, Richmond Road, Cochran/Harper Roads, Liberty Road, and Pettibone Road. Chagrin River Road and Brainard Road are county roads but are not considered main arterials.

c. Collector Streets - Collector streets are intended to provide access from local streets to arterials and expressways. The principal collector streets in Solon are Brainard Road, Hawthorn Parkway, Kruse Drive, Station Street, Carter Street, Solon Boulevard, Arthur Road, and Portz Parkway.

d. Local Streets - Local streets account for all other streets and provide access to abutting properties while discouraging through traffic.

At 98 miles, collector and local streets account for the most road miles in the City.

Private streets are typically classified as local streets and are not permitted unless constructed per the City’s Subdivision Regulations. The City does not provide maintenance for these streets as the Homeowner’s Association is typically responsible for collecting fees from the residents for this purpose. Private streets are usually found in private subdivisions and apartment and condominium complexes.

Paper streets are those streets that appear on a plat, but were never ultimately constructed. Parkside Boulevard, Lawn Drive, Alder Drive, Overlook Drive, Rosedale Drive, East Drive, Parkside Trail, and a portion of Cressmont Avenue are examples of paper streets.

“Map 11-1-A” illustrates the street classification for most streets in Solon and “Table 11-1-A” provides a summary of the streets by classification type and their respective lengths in feet and miles.
“Map 11-1-A”, Street Classification Map

Source: City of Solon Department of Planning and Community Development
**“Table 11-1-A”, Street and Highway Inventory**

<table>
<thead>
<tr>
<th>Street Name</th>
<th>Length (feet)</th>
<th>Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPRESSWAYS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Route 422</td>
<td>30,830</td>
<td>5.84</td>
</tr>
<tr>
<td>ARTERIAL STREETS (PRIMARY)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOM Center Road</td>
<td>27,732</td>
<td>5.25</td>
</tr>
<tr>
<td>Aurora Road</td>
<td>32,537</td>
<td>6.16</td>
</tr>
<tr>
<td>Miles Road</td>
<td>14,781</td>
<td>2.79</td>
</tr>
<tr>
<td>Cannon Road</td>
<td>18,025</td>
<td>3.41</td>
</tr>
<tr>
<td>Bainbridge Road</td>
<td>23,025</td>
<td>4.36</td>
</tr>
<tr>
<td>Solon Road</td>
<td>20,111</td>
<td>3.80</td>
</tr>
<tr>
<td>Pettibone Road</td>
<td>18,331</td>
<td>3.47</td>
</tr>
<tr>
<td>Richmond Road</td>
<td>10,979</td>
<td>2.08</td>
</tr>
<tr>
<td>Cochran/Harper Road</td>
<td>20,411</td>
<td>3.86</td>
</tr>
<tr>
<td>Liberty Road</td>
<td>19,993</td>
<td>3.78</td>
</tr>
<tr>
<td>SECONDARY STREETS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>458,229</td>
<td>86.7</td>
</tr>
<tr>
<td>Collector</td>
<td>58,038</td>
<td>10.9</td>
</tr>
<tr>
<td><strong>TOTAL (centerline measurement)</strong></td>
<td><strong>753,023</strong></td>
<td><strong>142.5</strong></td>
</tr>
<tr>
<td><strong>TOTAL LANE MILES (both sides)</strong></td>
<td>--</td>
<td><strong>385.5</strong></td>
</tr>
</tbody>
</table>

Source: City of Solon Department of Planning and Community Development

**Public Transportation**

The Greater Cleveland Regional Transit Authority, or RTA, provides public transportation in Solon with one bus shelter located on Melbury Avenue but there are no formal bus stops in the City.

The 1990 and 2000 Census both reported that Solon residents primarily drive to work with only 2% of the population either biking or using public transportation. The 2001 Community Attitudes Survey found a similar result with 97% of Solon’s population never using public transportation. Statistics such as these should be considered when making future land use decisions relating to alternative means of transportation. See The Traffic Master Plan for recommendations related to public transportation.

**Pedestrian and Bicycle Amenities**

Sidewalks are an essential part of any transportation network and as of 2010 approximately seventy-five percent of Solon’s residential and non-residential areas had access to public sidewalks. Sidewalks are installed lot by lot within residential subdivisions as the houses are constructed and it may take several years before a subdivision’s sidewalks are fully constructed. The residential subdivisions that do not have sidewalks are generally characterized by narrow streets and slow speed limits. The 146 miles of residential and non-residential sidewalks are represented on Map “11-1-B”.

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Bicycling is another viable form of transportation in the city, with 16 miles of marked bike routes, 5.2 miles of dedicated bike lanes, and 8.9 miles of multi-purpose paths. “Map 11-1-C” shows the location of all existing bike routes, bike lanes, and multi-purpose paths.

A bike lane is a dedicated five feet wide section of the road pavement that is clearly marked with standard “bike lane” lettering and insignia while a bike route is marked with road side signage but no pavement markings. A multi-purpose path is typically eight to ten feet wide that provides a larger area for activities such as walking, bicycling, roller-blading but motorized vehicles such as snowmobiles are not permitted.
Connectivity is a crucial factor in the overall effectiveness of the street, sidewalk, and bicycle system. Widespread use of cul-de-sac street designs tends to provide a less efficient means of transportation by car or by foot. Conversely, interconnected streets diversify the decisions residents and non-residents are able to make in regard to mode choices. Therefore, when presented with a new development, decision makers should make it a design priority to include some form of public transportation, sidewalks, and/or bicycle routes as project amenities. The benefits of effective transportation planning are not just limited to lessening traffic congestion or reducing parking demand, but also to promote healthy neighborhoods, allowing residents to walk, bike, and otherwise socialize with each other.

Perhaps more importantly, interconnected streets can effectively reduce safety forces response time and allows for more efficient and effective street maintenance.
**Road Maintenance**
The City Service Department is responsible for the maintenance of 385 lane miles of city streets, which includes both sides of the street. Typical maintenance involves repairing, repaving, salting, and snow plowing activities. Road maintenance is often partially funded through Cuyahoga County for county roads, but the city is responsible for general maintenance, de-icing, and plowing of all streets.

The Service Department is required to devote additional man hours to de-ice and plow streets during the winter months. From 2000-2004 the Service Department used an average of 11,964 tons of road salt annually at an average cost of $317,815. In 2008 a new brining system was installed and an estimated 30,000 gallons of brining solution was used as part of the anti-icing program.

**Traffic Congestion**
NOACA is the regional transportation authority for Northeast Ohio. Based upon their Congestion Management System (CMS), a September 2005 study (“Future Traffic Congestion in the NOACA Region”) found that three of the City’s arterial streets--Aurora Road, SOM Center Road, and Solon Road--as well as US Route 422 in Solon will have a volume to capacity ratio (V/C) of 1.0 or higher (during the highest peak hour) by the year 2030.

The V/C ratio is a measure of overall traffic congestion and is broken down into six threshold ranges (0.26, 0.43, 0.62, 0.82, 1.00, and greater than 1.00) and each range is assigned a Level of Service category of A, B, C, D, E, or F which indicates the overall level of congestion. “A” is the best while “F” is the worst traffic congestion, which is a V/C ratio greater than 1.0. “Table 11-1-B” is a listing of the most congested road segments in Solon, based upon NOACA data.

<table>
<thead>
<tr>
<th>Road Name</th>
<th>Location</th>
<th>Volume to Capacity Ratio 2002 Existing Traffic</th>
<th>Volume to Capacity Ratio 2030 Forecasted Traffic</th>
<th>Ranking in 2030 out of 2,187 street segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aurora Road</td>
<td>Geauga Co. line to 0.85 mi. NW or Liberty Road</td>
<td>1.012</td>
<td>1.474</td>
<td>16</td>
</tr>
<tr>
<td>SOM Center Road</td>
<td>Aurora Road to Station Street</td>
<td>1.156</td>
<td>1.334</td>
<td>38</td>
</tr>
<tr>
<td>SOM Center Road</td>
<td>Maple Drive to Cannon Road</td>
<td>1.151</td>
<td>1.272</td>
<td>54</td>
</tr>
<tr>
<td>Aurora Road</td>
<td>Cochran Road to 0.04mi SE of Hawthorne Valley Drive</td>
<td>0.901</td>
<td>1.220</td>
<td>82</td>
</tr>
<tr>
<td>SOM Center Road</td>
<td>North of railroad overpass to US 422 ramps</td>
<td>1.033</td>
<td>1.197</td>
<td>95</td>
</tr>
<tr>
<td>Solon Road</td>
<td>SOM Center Road to Cannon Road</td>
<td>1.141</td>
<td>1.179</td>
<td>105</td>
</tr>
<tr>
<td>Aurora Road</td>
<td>SOM Center Road to South Miles Road</td>
<td>0.922</td>
<td>1.156</td>
<td>116</td>
</tr>
<tr>
<td>SOM Center Road</td>
<td>US 422 ramps to US 422 ramps</td>
<td>1.028</td>
<td>1.130</td>
<td>132</td>
</tr>
<tr>
<td>US Route 422</td>
<td>Junction with I-480 and I-271 to Harper Road</td>
<td>0.997</td>
<td>1.049</td>
<td>195</td>
</tr>
<tr>
<td>SOM Center Road</td>
<td>Summit Co. line to Baldwin Rd.</td>
<td>0.778</td>
<td>0.979</td>
<td>210</td>
</tr>
</tbody>
</table>

Source: NOACA
Based upon the 2005 NOACA study, no streets in Solon are in the “Top 50 Most Congested Segments under 2002 Existing Traffic Conditions within the NOACA Region”. However, in a 2030 future estimate, a portion of SOM Center Road between Aurora Road and Station Street and a portion of Aurora Road east of SOM Center are listed in the Top 50 most congested segments. However, in September 2007, after the NOACA report was released, the roller coaster portion of the amusement park known as Geauga Lake located in Geauga County closed, which significantly reduced the traffic volume on Aurora Road in Solon. Although the Geauga Lake land is subject to redevelopment, it is now unlikely that Aurora Road will be in the Top 50 most congested street segments by 2030.

**Recent Infrastructure Projects**
The Public Works Department continually manages the City’s infrastructure needs. Many crucial infrastructure projects were completed between 2003 and 2009 including the SOM Center Widening Project, SOM and Miles Intersection Improvement, Aurora Road West Project, Aurora East/Pettibone Road Project and the Pettibone Road Infrastructure Improvement Program. The following is a brief description of each of these projects.

a. **Aurora Road West Project** (completed 2002) - This project provided for the installation of sanitary sewer lines on Aurora and Brainard Roads benefiting businesses and residents.

b. **SOM Center Widening Project** (completed 2003) - This collaborative project between the city and State of Ohio provided for the widening of SOM Center Road (State Route 91) beginning at Aurora Road and extending to the Solon-Twinsburg border. Beginning at Aurora Road, SOM Center Road is now five lanes wide south to Baldwin Road. After Baldwin Road, the road is four lanes wide until the Solon-Twinsburg border where the road narrows back to two lanes.

   The majority of the right of way is now 86’ wide. Typically, land owners along SOM Center Road lost thirteen (13) feet of lot depth due to the widening. New water, sewer, and storm lines were installed as well as new sidewalks on each side.

c. **SOM Center-Miles Road Intersection Improvement** (completed 2003) - This project involved the widening of Miles Road, SOM Center Road, and the installation of a sidewalk, handrail, and retaining wall on the south side of Miles Road. The project increased visibility and safety.

d. **Aurora East/Pettibone Road Project** (completed 2006) - February 2005 marked the beginning of an extensive improvement project for the southeast corner of the city. This project included the installation of sanitary sewers; storm sewers; waterlines; a multi-purpose path on the south side of Aurora Road beginning at Clearwater Court and extending to Ayleshire Drive; a bike lane on the south side of Aurora Road from Ayleshire Drive to the east corporation line; a multi-purpose path on the east side of Liberty Road from Pettibone to the south corporation limit; and general road improvements.
e. **Pettibone Road Infrastructure Improvement Program** – This project consists of multiple phases with the first phase being located east of Liberty Road. Phase 1 involved the reconstruction and widening of Pettibone Road, installation of a ten feet wide multi purpose path from Liberty Road to the east corporation line, installation of sidewalks on the north side of Pettibone Road from Liberty Road to Aurora Road, and the creation of a bike lane from Liberty Road to Aurora Road on the north side of Pettibone Road. Phase 1 was completed in December 2009 with Phase 2 and 3 slated for construction in 2010.
Management of the water, sanitary sewer, and storm sewer infrastructure by the City Engineering, Water Reclamation, and Service Departments is integral to the overall planning of residential and non-residential development.

Aging infrastructure is a phenomenon all communities experience at some point in time. Inventory, assessment, and prioritized maintenance of the existing infrastructure will ensure the long term viability of the system. Techniques such as televising a storm sewer or smoke testing a sanitary sewer to check for cracked or blocked lines are proactive steps the City undertakes which can ultimately save city officials, businesses, and residents’ time, money, and frustration.

The City maintains a database inventory of all water, sanitary sewer, and storm sewer facilities. This inventory is portrayed in the maps found throughout this Section.

As there are approximately 8,000 single family dwellings in the City, “Figure 11-2-A” provides an illustration of a typical residential utility connection, showing both sanitary and storm sewer connections in order to assist in understanding how the system works in general.
Sanitary Sewer System
The Water Reclamation Department, located at the southwest corner of the city, is responsible for the treatment of the city’s wastewater. Waste is carried to the facility through a system of private sewer laterals that are connected to homes and businesses, which connect to the main sewer lines within the right of way, which then connect to three force main lines.

The Department monitors approximately one hundred fifty (150) miles of sanitary sewer lines and twenty-three (23) lift stations. It is important to note that the sanitary sewer lines are separate from the storm sewer lines and are not a joined system. While the Water Reclamation Department monitors the functionality of the lines and lift stations, maintenance is provided by the City Engineering Department and Service Department. Individual residents and businesses, however, are responsible for the private lateral that connects the main line to the building.

The majority of Solon homes are connected to the sanitary sewers with few exceptions. Connection to the sanitary sewer system is required unless a waiver is granted by the Cuyahoga County Health Department. “Map 11-2-A” represents the location of the sanitary sewer lines as well as the pump (lift) stations.

“Figure 11-2-B” is an example of an existing pump station on Bainbridge Road. While these facilities go largely un-noticed, they are important to the overall functionality of the entire system as they provide mechanical pumping where gravity flow is not possible.

The “Sanitary Sewer Master Plan” serves as the basis for improvements to the existing system and is administered by the City Engineering Department and the Water Reclamation Department.
Once the water is reclaimed, as described in City Administration and Facilities, the effluent is released back into the Beaver Meadow Run stream, which then flows into Tinkers Creek. The amount of BOD’s (biochemical oxygen demand) and suspended solids per liter contained in the released effluent are well below that which is permitted by law.

On average 11.9mg/liter of BOD is permitted, while 3.75mg/liter remains in the water that is released into Beaver Meadow Run. Similarly, up to 9.9mg/liter of suspended solids is permitted, while 6.75mg/liter remains. On average 1,800 dry tons a year of dry solids are compacted at the Water Reclamation Department and shipped to the sanitary landfill located in Waynesburg, OH in Tuscarawas County.
Storm Sewer System

As fifty-five percent of the homes in Solon were constructed prior to 1979, approximately 50-60% of the storm sewers were constructed under previous storm water requirements. Therefore certain areas of the city may need retrofitted overtime with more modern construction technology. “Map 11-2-B” illustrates the approximate 150 miles of storm sewer lines in the City.
Repairs to the system are primarily expected to occur on an “I and I” basis where *inflow* (such as downspout connections to the storm sewer) and *infiltration* (where ground water finds its way into a storm sewer line through joints) compromise the integrity of the system.

The storm system was greatly affected in June 2006 when a significant storm event caused severe flooding of waterways, yards, businesses, and homes. This was the impetus for the implementation of an intense program of televising and smoke testing of the existing systems in order to better identify, understand, and correct problems with the storm system.

After the 2006 storm event, the City also set into motion a large scale effort to assess the physical condition of the storm system through the formation of the Citizen’s Committee on Storm Water, which included engineers, environmental scientists, contractors, attorneys, educators, and city staff. The Committee regularly convened through 2009 to provide expert advice and opinion on what happened and how the system could be improved.
Storm Channel Rehabilitation
Many construction projects are undertaken each year in order to maintain the existing storm system throughout the City. Some thirty projects were completed in 2008 alone ranging from replacement of catch basins, gabion installation to prevent erosion, removal of debris from creeks and storm sewers, to the installation of storm sewer mains. “Figure 11-2-C” is an example of a storm water project at Boulder Creek where the creek was significantly improved to better handle storm water flow and to prevent further erosion though the installation of gabion baskets and stone.

“Figure 11-2-C”, Boulder Creek Erosion Control

Source: City of Solon Service Department, 2008 Year End Report

Water System
Solon receives its water supply from Cleveland Public Water through two main trunk lines that feed a system of transmission lines which are typically twelve inches in diameter. While Cleveland Public Water owns the two trunk lines, the City of Solon owns and is responsible for the transmission lines and fire hydrants. “Map No. 11-2-C” illustrates the existing water line system totaling approximately 150 miles of water lines.
"Map 11-2-C" Existing Water Lines

Source: City of Solon Department of Planning and Community Development
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The Public Works Department is charged with the upkeep of the City’s infrastructure system. “Chart 11-3-A” provides a general overview of approximately how money will be allocated towards various projects through 2013.

“Chart 11-3-A” Five Year Infrastructure Projections, 2009-2013

Source: City of Solon Engineering Department, 2008 Year End Report