



Celebrating 90 Years

Howard R. Green Company

MEMO

To: Gene Martens, Community Development Director
From: Douglas Ripley, Project Planner
Subject: City of Johnston Roadway Capacity Analysis
Date: June 10, 2003

As part of a comprehensive review by the City of Johnston of its planned community growth, an evaluation of the traffic and transportation impacts was completed. Attached are five maps depicting the existing traffic volume and the projected traffic volumes on the primary road corridors in the city of Johnston, broken into 5-year increments through the year 2022. Each map identifies the daily traffic volume and, in areas where the volumes exceed the current traffic carrying capacity, necessary capacity improvements to accommodate traffic for that time period. **Map 5** shows the full development scenario and could be used as for anticipating the transportation needs for the community to accommodate full growth.

Maps

Map 1 – Existing traffic volumes based on actual counts completed by the City of Johnston and Howard R. Green Company. Intersections with peak hour traffic operation of Level of Service C¹ are identified. There are no intersections operating at less than a Level of Service C.

Map 2 – 2007 Growth Scenario including land use and traffic projections through the year 2007. Roadways with daily traffic volumes exceeding the thresholds defined in this memorandum are highlighted as are intersections projected to operate at LOS D or below under the existing configuration. Intersection improvements are identified to bring the intersection up to a LOS D or above. No roadway improvements are assumed to have taken place beyond the 2003 existing infrastructure.

Map 3 – 2013 Growth Scenario cumulatively adds the projected growth and traffic to the 2007 scenario and identifies the road segments and intersections that will operate at or below LOS D. Intersection improvements are identified to bring the intersection up to a LOS D or above. No roadway improvements are assumed to have taken place beyond the 2003 existing infrastructure.

Map 4 – 2017 Growth Scenario cumulatively adds projected growth and traffic to the 2013 scenario and identifies the traffic for each road segment and the improvements required to accommodate the projected traffic volumes. No roadway improvements are assumed to have taken place beyond the 2003 existing infrastructure. Intersections were not evaluated at this point due to uncertainty of turning movements as explained later in this document

Map 5 – 2022 Growth Scenario shows the traffic volumes generated by the “full-build” scenario of the comprehensive plan and the associated traffic. The highlighted roadway segments are those that will operate at LOS D or below and the required improvements needed are identified. No roadway improvements are assumed to have taken place beyond the 2003 existing infrastructure.

¹ Level of Service (LOS) is a comparative measurement used to evaluate operational service for roadways and intersections based on the *Highway Capacity Manual*. Level of Service is a scale from A-F with LOS A generally being excellent operations and F being gridlock conditions. Within the Des Moines metropolitan area the LOS threshold generally desired is D or above which relates to some peak hour congestion but no excessive delays.

Purpose

This analysis is intended to be a tool for the City of Johnston with a number of valuable roles, including:

- ◆ Simulating the transportation impacts of the City's current comprehensive land use plan,
- ◆ Illustrating the traffic demands on the existing transportation system if no improvements are made,
- ◆ Identifying long-term improvements where right-of-way and design can be leveraged as areas develop to prevent wasted resources or buying additional right-of-way in the future when it can be secured as part of the original project,
- ◆ Identifying areas where alternate routes may need be developed or the intensity of the land use adjusted, and
- ◆ Work in coordination with other information such as pavement condition and growth trends to help prioritize transportation projects as the city of Johnston continues to grow.

Goal

The goal of this project to provide a conservative yet reasonable simulation of the City of Johnston's growth pattern and the related impacts on the transportation system. The benefit of completing this exercise early in the comprehensive plan implementation process is to be able to identify long-term needs and have the ability prepare for those needs in a proactive fashion rather than trying to react to problems after they develop. Being able to secure right-of-way, plan alternate routes or adjust growth trends is less costly to do in advance of development rather than in reaction to.

Limitations

The simulation of growth is a very valuable tool in anticipating future needs or areas where changes in the growth patterns may be appropriate. The simulation is based on land use projections, general traffic generation rates, and anticipation of the timeline of the development. Many of these factors are guided by a community, but ultimately reliant on private investment and action.

Therefore, the results of the simulation should be used as guidance and a tool to identify trends and project needs and should not be used as the sole decision tool for programming roadway improvements. The simulation should be used as one of the tools in evaluating development projects, combined with infrastructure condition, growth patterns, and other available resources.

Similarly, the transportation improvements identified on Maps 2-5 do not necessarily mean that each road needs improved to that level. It does identify the projected traffic if no additional roads are constructed and growth patterns develop exactly as projected. For example, if a new interchange with I-35-80 is constructed at either NW 100th Street or NW 26th Street/Morningstar Drive in Polk County, it would provide significant relief to Merle Hay Road and NW 86th Streets. Similarly, if an additional arterial street is developed within the City, potentially large portions of the traffic on the existing streets will likely be distributed to the new arterial. This holds true for both north/south and east/west streets.

Inputs and Assumptions

Following is a list of the assumptions and source information that was used in the analysis and simulation. In all cases, conservative methods were used to ensure the simulation does not under estimate the growth impacts on the transportation system.

Land Use

- ◆ Land use projections were provided by City staff based on the comprehensive land use plan. The information was broken into segments of the community, type of development, and time period anticipated.

- ◆ Where known, the parcel or sub-area of the different types of development were identified by the City for more accurate assignment of traffic to the appropriate roadways.
- ◆ Growth rates were based on the historic rate of land use growth for the City of Johnston and forecasting that rate forward for each five-year time increment.
- ◆ Densities were assumed to be full-build with no reduction for such items as open-space or parks

Transportation

- ◆ Traffic generation rates were based on the Institute of Transportation Engineers (ITE) Trip Generation Manual, 6th Edition.
- ◆ Trip generation rates and their ITE codes used include: Single Family Detached (210), Apartments (220), Single Family Attached (230), Light Industrial (110), Industrial Park (130), General Office Building (710), Office Park (750), and Commercial (820).
- ◆ For Commercial Property (820), a 20% pass-by trip reduction was used. Land Use code 820 relates to shopping center type uses which typically generate traffic less than fast-food type restaurants, but higher than neighborhood or specialty retail uses. Given a mix of uses community wide, the various uses will likely average at a rate similar to that of a shopping center or less.
- ◆ Existing travel patterns were used as the basis for turn movement volumes and the directional splits for roadways.
- ◆ No new arterial roadways or connections are assumed to be built.
- ◆ Level of Service D was considered the threshold for operational capacity. Segments and intersections operating at LOS E or worse were identified with improvements needed to achieve LOS D.
- ◆ Beyond 2012 intersection operations were not analyzed due to the inability to accurately project turning movement volumes given the broad assumptions that were applied. Turn movements for existing (Map 1), and projected through 2012 (Maps 2 and 3) are based on existing turn movement percentages.

Process

Due to the complexity of the simulation, a defined process was used to organize the analysis and to ensure the results were reproducible. The basic process followed these steps:

- ◆ The City collected traffic volumes for both peak hour and 24-hour periods. The volumes were compared with existing traffic volumes and used as the base traffic volumes. These volumes are shown in **Map 1**.
- ◆ Existing traffic volumes were analyzed against the MPO's Capacity table for LOS D². The capacity table assigns a daily traffic level for different types of roadways based on the number of travel lanes, turn lanes, and amount of direct access to the roadway. A copy of this table is attached.
- ◆ Where the traffic volumes exceeded the 'capacity' of the roadway, the segment was highlighted and required improvements were identified to get the roadway above LOS D.
- ◆ At major intersections, turn movements were projected using the existing turn movement percentages and assigned to the intersection based on the amount of arriving traffic generated by the proposed development. This process is similar to that done as part of a site plan evaluation but at a larger scale.

² 2025 and 2030 Des Moines Metropolitan Area Daily Capacities at Level of Service D

- ◆ The intersection volumes were modeled using the *Highway Capacity Manual* and Synchro Version 5.0 traffic analysis software. Where operations were identified at LOS D or below, the intersection was shown on the map and required improvements are identified.
- ◆ For each time period, the traffic generated by the anticipated growth was distributed onto the existing roadway network and daily traffic volumes identified for each segment. Each segment's traffic was then compared to the Capacity Table for its existing number of lanes to identify a LOS. The required lanes and configuration were also identified to achieve a LOS D or better. Intersections were also analyzed under the 2007 and 2013 growth scenarios to identify future intersection needs.
- ◆ For each growth scenario, the additional traffic was added to the previous period and analyzed against the 2003 infrastructure. The improvements identified in the previous scenario were not assumed to be completed for the following scenario. For example, the intersection of 100th Street and 62nd Avenue is currently stop-controlled. By 2007, a signal at this intersection may be warranted, but, for the simulation, the existing stop control is assumed even under the 2022 scenario. This is done to reflect the ultimate needs rather than making individual improvements for each scenario. Improvements can be staged as growth takes place with the long term needs in-mind to maximize the City's investment.

Results

The results of a simulation of this type are an opportunity to anticipate, plan for, and prevent transportation problems.

At first glance, **Map 5** is alarming in that nearly all of the City's roadways exceed the existing capacity and will require significant improvements. However the traffic volumes can be affected by a number of additional factors. Additional roadways, a change in development patterns, lower densities, or slower growth will result in changes to these scenarios. As mentioned previously, a moderately intense commercial use was assumed and open space or parkland as not accounted for.

Perspective

Converting the traffic growth into other comparable measures provides a different picture. Using general Iowa Census numbers, the growth of the area based on the projected land use would result in an additional population of 14,000 residents.

Based on the land use projected by the City, there would be an additional 1.9 million square feet of commercial space, and more than 4 million square feet of office and industrial leasable space in the city of Johnston. Combined, this land use scenario results in a nearly total build-out of the City of Johnston's existing comprehensive plan and anticipated growth. Additional growth would likely require expanding the community's boundaries

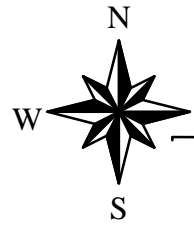
The traffic growth projected in this analysis results in an annual growth rate of five percent. Typically, overall annual growth rates of 1 to 2 percent are more common for urban areas in Iowa. While this rate is not unprecedented in the Des Moines Metro Area, sustaining that level of growth over a 20-year period would result in significant impacts as shown in this simulation.

Recommendation

The City of Johnston should use this information as a tool in addition to the other available planning and forecasting tools to anticipate transportation and infrastructure needs. This analysis provides Johnston with an opportunity to react in advance to future transportation needs. It is recommended that the City review its land use policy, look at opportunities to expand the arterial roadway network, and anticipate roadway improvements and right-of-way needs based on this analysis in combination with other planning and forecasting tools.

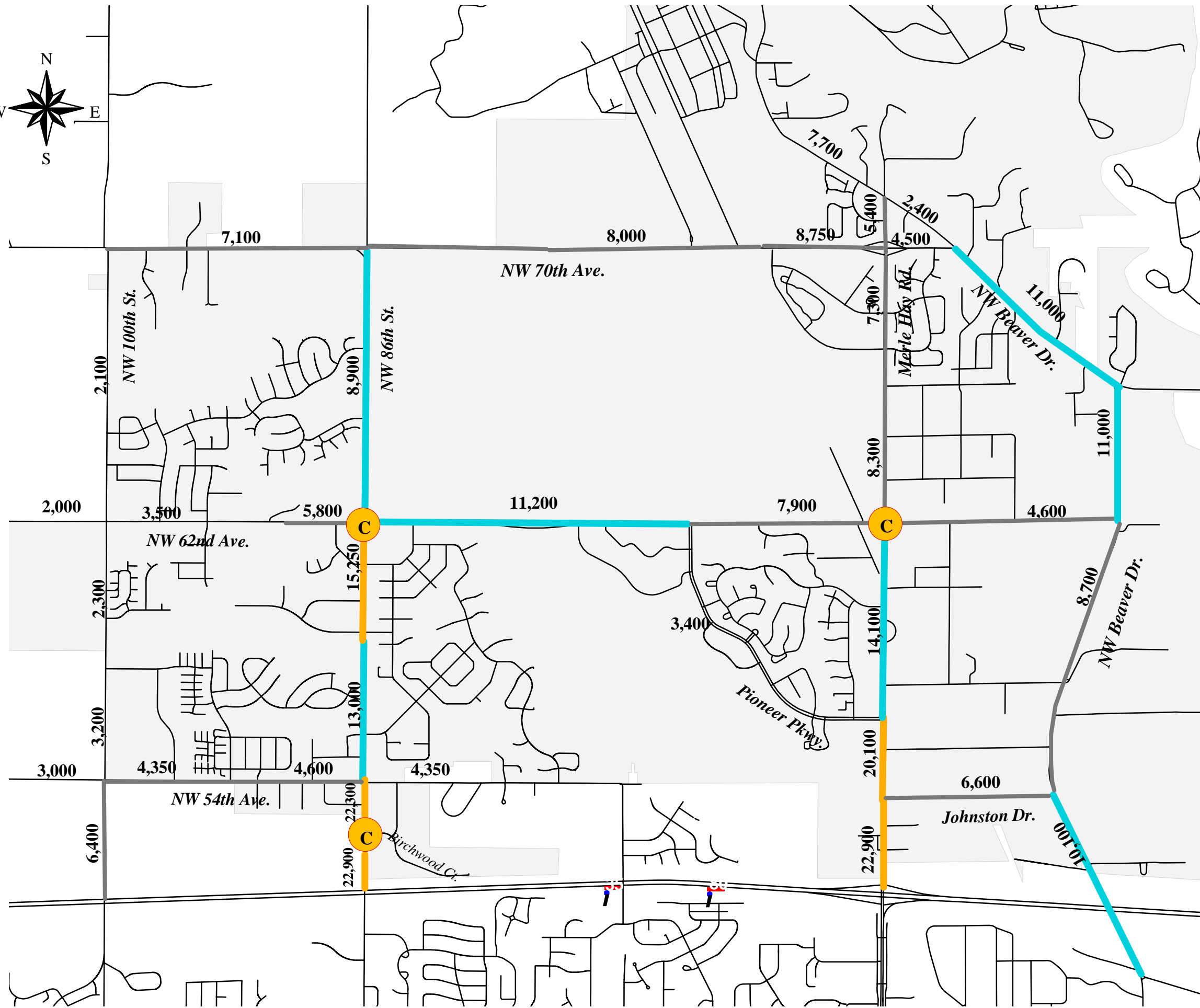
The city should monitor its growth annually to track the actual development with the scenarios used in this simulation. This process should be repeated approximately every 3-7 years depending on the growth of the community to further project needs and to monitor trends.

It has been a pleasure to work with you on this project. Please let me know if you have any questions or comments regarding this information.



MAP 1

2003 AVERAGE DAILY TRAFFIC*

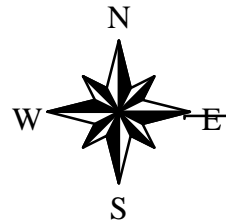


LEGEND

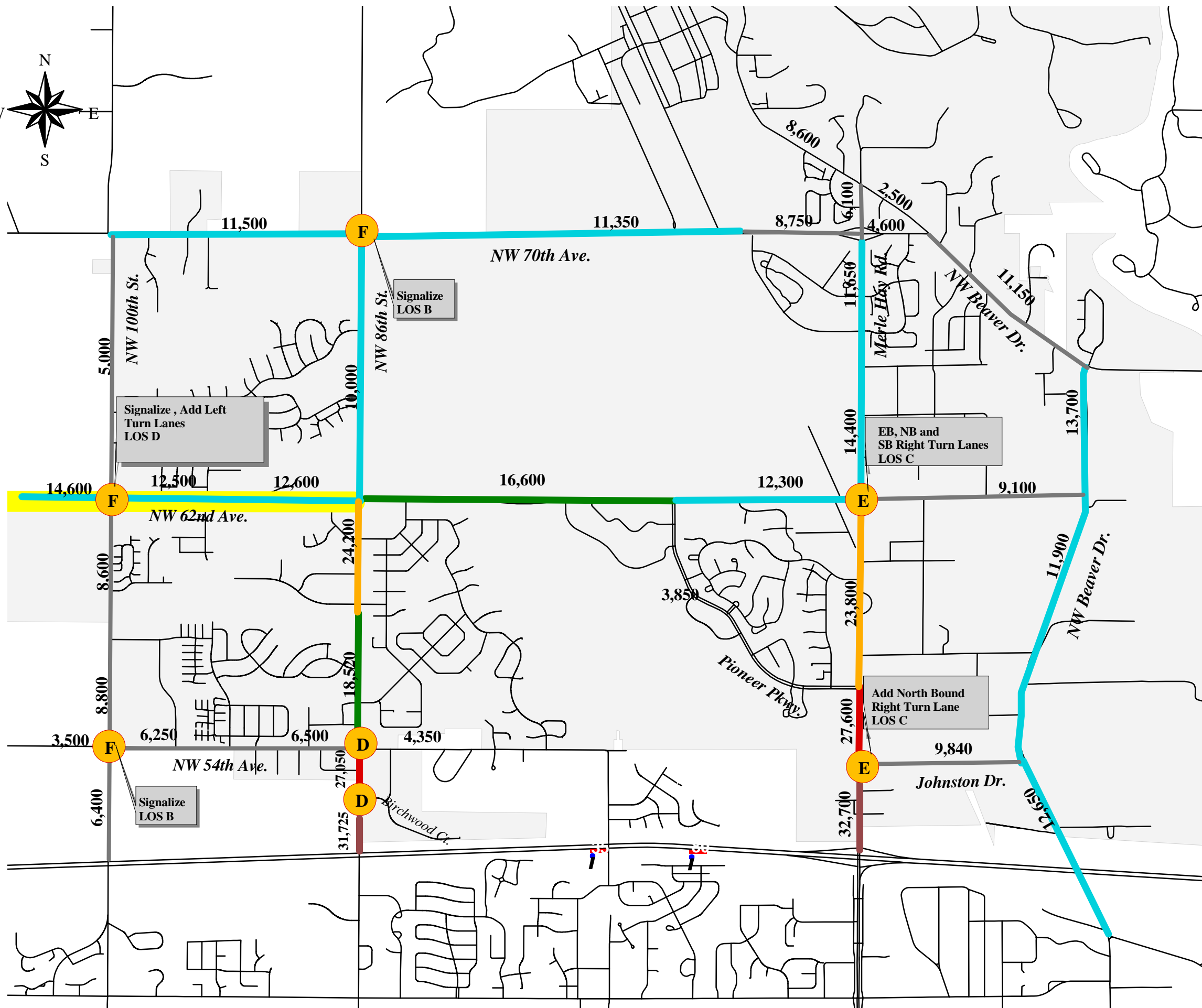
- 5,000-10,000 ADT
- 10,000-15,000 ADT
- 15,000-20,000 ADT
- 20,000-25,000 ADT
- 25,000-30,000 ADT
- > 30,000 ADT
- Roadway LOS "D" or below **
- Intersection Level Of Service (LOS)

*Under Existing Lane Configuration
**Des Moines Area MPO Daily Capacities at LOS "D"

Howard R. Green Company
4685 Merle Hay Road, Suite 106
Des Moines, IA 50322-1966
Tel: 515.278.2913
Toll Free: 800.593.2339



MAP 2
2007 GROWTH SCENARIO
AVERAGE DAILY TRAFFIC,
AND PERFORMANCE*



LEGEND

- 5,000-10,000 ADT
- 10,000-15,000 ADT
- 15,000-20,000 ADT
- 20,000-25,000 ADT
- 25,000-30,000 ADT
- > 30,000 ADT
- Roadway LOS "D" or below **
- Intersection Level Of Service (LOS)
- Suggested Improvements LOS after improvements

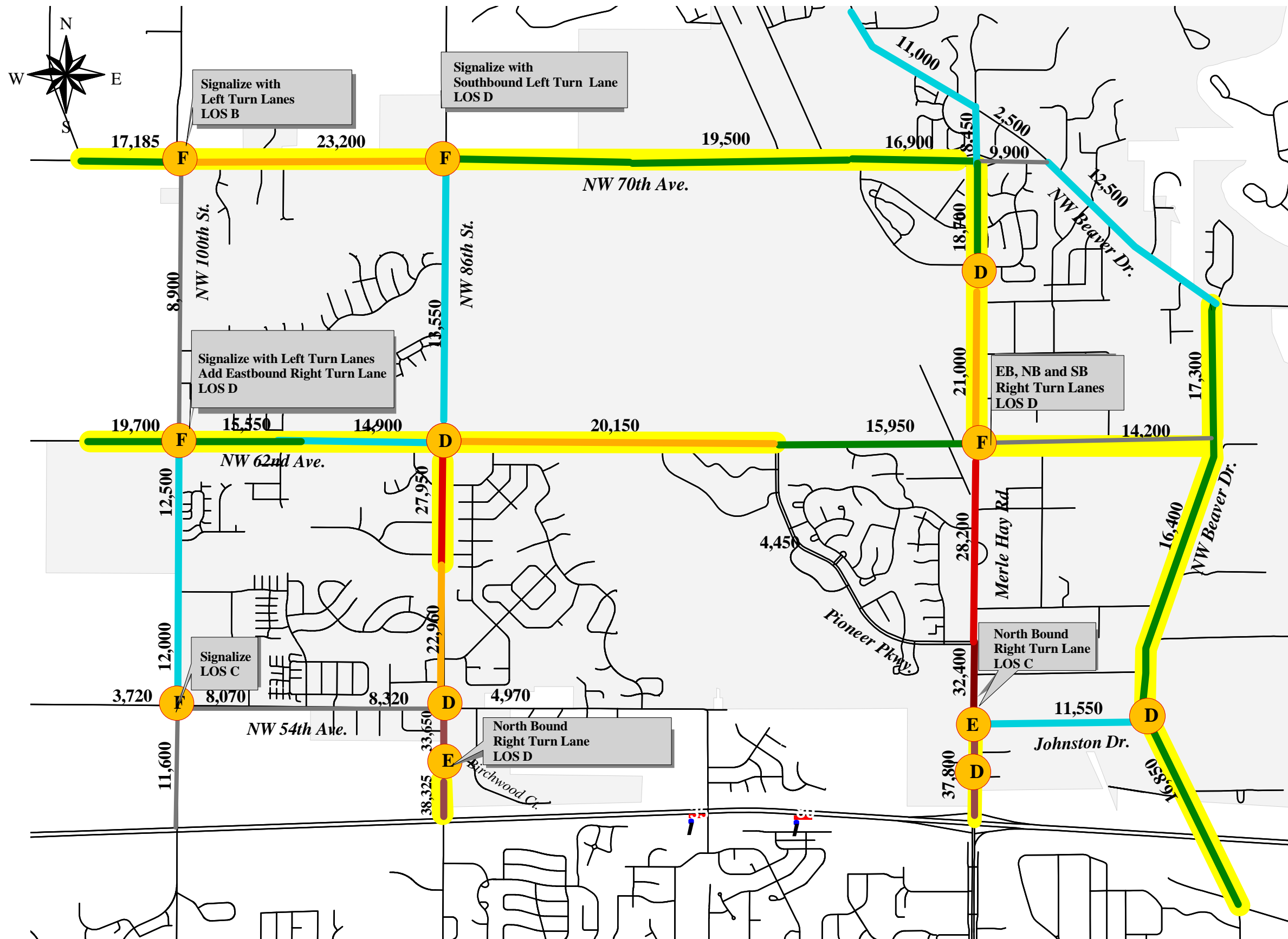
*Under Existing Lane Configuration and 2003 Beaver Road Improvements
 **Des Moines Area MPO Daily Capacities at LOS "D"

Howard R. Green Company
 4685 Merle Hay Road, Suite 106
 Des Moines, IA 50322-1966
 Tel: 515.278.2913
 Toll Free: 800.593.2339



MAP 3

2012 GROWTH SCENARIO AVERAGE DAILY TRAFFIC AND PERFORMANCE*

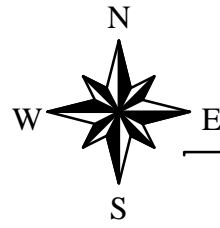


LEGEND

- 5,000-10,000 ADT
- 10,000-15,000 ADT
- 15,000-20,000 ADT
- 20,000-25,000 ADT
- 25,000-30,000 ADT
- > 30,000 ADT
- Roadway
LOS "D" or below **
- X Intersection
Level Of Service (LOS)
- Suggested Improvements
LOS after Improvements

*2003 Lane Configurations
**Des Moines Area MPO Daily Capacities at LOS "D"

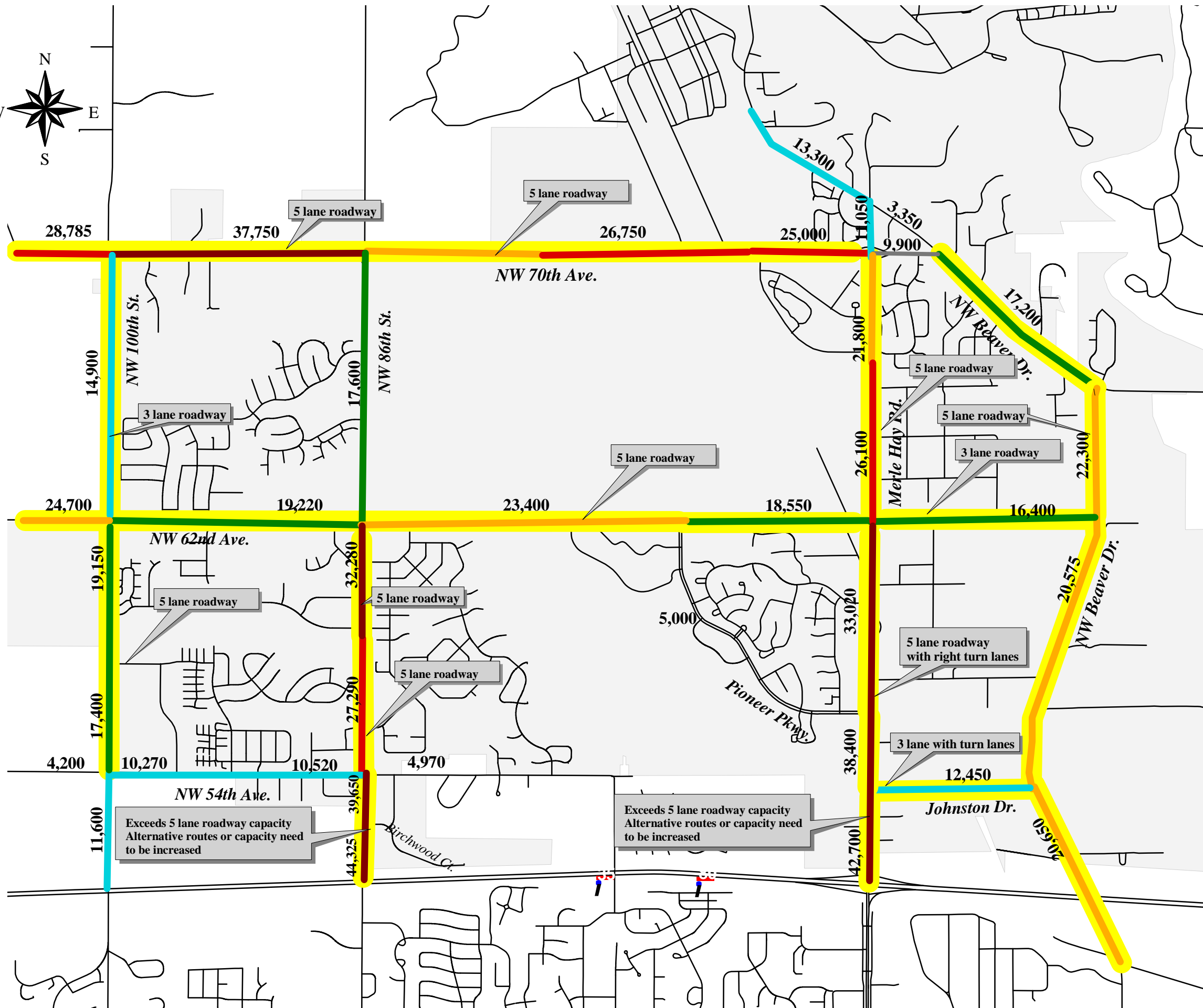
Howard R. Green Company
4685 Merle Hay Road, Suite 106
Des Moines, IA 50322-1966
Tel: 515.278.2913
Toll Free: 800.593.2339



MAP 4

2017 GROWTH SCENARIO

AVERAGE DAILY TRAFFIC AND PERFORMANCE*



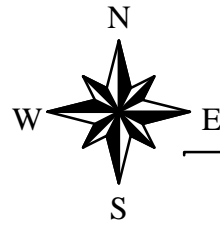
LEGEND

- 5,000-10,000 ADT
- 10,000-15,000 ADT
- 15,000-20,000 ADT
- 20,000-25,000 ADT
- 25,000-30,000 ADT
- > 30,000 ADT
- Intersection Level Of Service (LOS)
- Roadway LOS "D" or below**
- Suggested Improvements

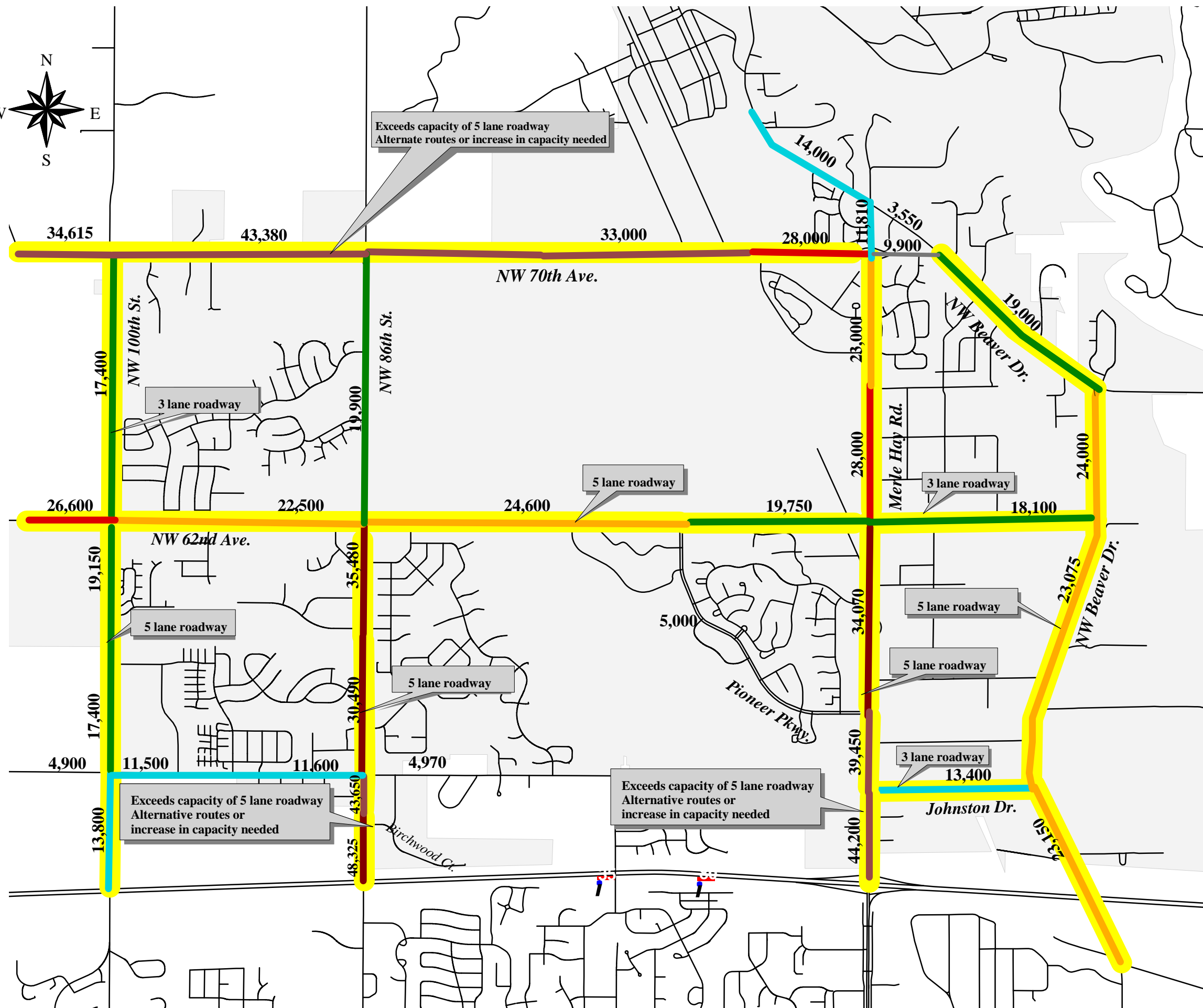
*2003 lane configurations

**Des Moines Area MPO Daily Capacities at LOS "D"

Howard R. Green Company
 4685 Merle Hay Road, Suite 106
 Des Moines, IA 50322-1966
 Tel: 515.278.2913
 Toll Free: 800.593.2339



MAP 5 2022 GROWTH SCENARIO AVERAGE DAILY TRAFFIC AND PERFORMANCE*



LEGEND

- 5,000-10,000 ADT
- 10,000-15,000 ADT
- 15,000-20,000 ADT
- 20,000-25,000 ADT
- 25,000-30,000 ADT
- > 30,000 ADT
- X Intersection Level Of Service (LOS)
- Roadway LOS "D" or worse **
- Suggested Improvements

* 2003 Lane Configurations
**Des Moines Area MPO Daily Capacities at LOS "D"

Howard R. Green Company
4685 Merle Hay Road, Suite 106
Des Moines, IA 50322-1966
Tel: 515.278.2913
Toll Free: 800.593.2339