ITEM # _____24_____

STAFF REPORT

UPDATE: GIS BASED PAVEMENT MANAGEMENT SYSTEM

January 8, 2013

BACKGROUND:

The City of Ames pavement management system is a GIS enabled decision support tool which aids in making more consistent, accurate and informed decisions concerning the lifecycle of street surfaces. The system gives the engineer a method by which to look at the road network as a whole, allowing them to visualize and predict impacts of reconstruction and maintenance activities on the entire network. As a result, Public Works staff is better equipped to make data-driven decisions based on analytical cost/benefit scenarios which factor in construction practices and underlying pavement conditions relative to the entire road network and available budget. The system is helping ensure the City's street construction and maintenance funds continue to be allocated as cost effectively and efficiently as possible.

The Center for Transportation Research and Education (CTRE) is a unit of the Institute for Transportation (InTrans) at Iowa State University. As part of the Iowa Pavement Management Program (IPMP), CTRE assists local agencies with the development of pavement management systems by offering automated data collection on the condition of roads, including information on cracks and the quality of the ride. As part of this service, IPMP also includes high resolution video logging of the roadway along driven routes. The video is linked to the pavement condition data and is used to visually assess pavement condition and assets in the City right-of-way without leaving the office.

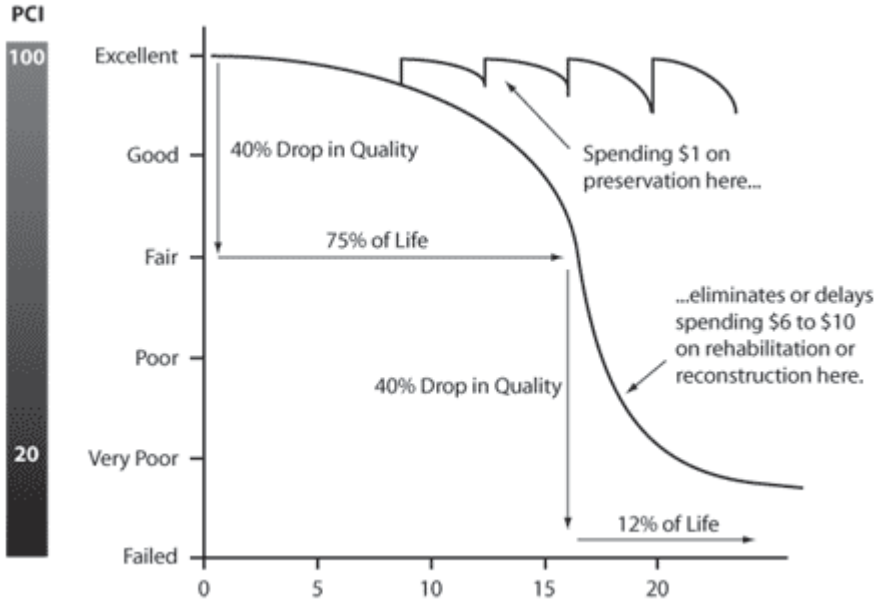
City Council approved pavement data acquisition beginning in 2008, whereby the City enters into a contract with CTRE. To date, the City has 3 years of data collection completed: 2008, 2009 and 2011. The most recent data collection took place in Fall of 2012 and will be delivered in Spring 2013.

The power of the system lies in the data and the ability to analyze multiple datasets simultaneously. In 2011, City staff worked with CTRE to incorporate the City's historical pavement data which included surface types, sub-surface material and the age of the surface. As the City continues to build its pavement condition inventory predictive analysis such as pavement performance curves, pavement lifecycles and cost benefit analysis, this system becomes increasingly beneficial in decision making.

As a reminder, each pavement has an anticipated life-cycle. Many factors play into the actual lifecycle such as the structure design (sub-soils, base material, and surface material), environmental factors (summer heat and winter ice/snow), the pavement age, and the amount and type of traffic it is exposed to. Having this information together in

one place is critical for the pavement management system's success. It will help us more clearly identify the City of Ames personalized performance curves. Below is a typical performance curve example used by the Federal Highway Administration (FHWA) to illustrate the impact "preservation" maintenance can have on the long-term life and cost of a pavement.

http://www.fhwa.dot.gov/pavement/preservation/ppc0621.cfm
Figure 2. Pavement option curve (example). (PCI = Pavement Condition Index.)



While this is just an example, it shows two key elements important to planning. The first is preventative maintenance will extend the life of a pavement at a lower long-term cost. The second is once a pavement gets to a certain point of deterioration, the rate at which it fails increases rapidly.

City of Ames PCI Trends (2008 – 2011):
With three years of Pavement Condition Index (PCI) data, one of the goals of both our CIP Program and tracking of the PCI is to continue to invest in our current infrastructure and show, via data collection, that the investment being made is making a difference to the overall City wide PCI. Graphs 1A & 1B (attached) show that the past CIP investments are having a positive impact, illustrating overall average PCI Values are increasing. **It should be noted, CTRE made some modifications to their collection & calculation methods in 2009 which likely explain the slight decrease in the 2009 PCI Values.**

Past Investments contributing to above Trends:
Seeing the upward trend in the PCI values, it is equally important to see what kind of investments are being made to create those increased values. Graphs 2A and 2B (attached) show this relative to both roadway classification and pavement type. These categories show where the investments have provided change from year to year based upon need, however the total funding level has also trended up. Two of the larger impacts to this were the Stimulus grants, the impact of our population increase relative

to the receipt of Road Use Tax (RUT) and several projects bids that were under estimate allowing for the unutilized funds to be reallocated to other projects.

Specific Examples from City of Ames Projects:
Progress from a city-wide perspective can be seen. Graph 3 (attached) shows three example streets that had PCI data collected in 2008 & 2009, prior to overlays in 2009 & 2010. The results of the reconstruction are obvious to the everyday user/resident, but are also illustrated with the 2011 PCI numbers.

Graph 4 (attached) shows three example streets that have been either recently reconstructed or are scheduled for reconstruction. As the graph shows, PCI Values on these streets are low and dropping (please recall from above that 2009 data is misleading) meaning these streets are in poor condition. Meadowlane Avenue was reconstructed this 2012 and the Ridgewood Avenue reconstruction will be completed in 2013.

Sheldon Avenue provides an excellent example a street that once it gets to a certain point, the life expectancy of the street dramatically decreases. Sheldon Avenue is scheduled to be reconstructed in 2014. The reconstruction schedule is the result coordinating with the impacted stakeholders. Iowa State has been undertaking several recent structural projects which required access from Sheldon Avenue which contributed higher than normal truck traffic. The 100th Anniversary Tour of the Lincoln Highway Association is expected to bring more than 300 cars through the area along Sheldon, which was part of the Lincoln Highway, at the end of June 2013. Also, the signal installation at the Lincoln Way intersection and the resurfacing of Lincoln Way from Hayward Avenue to Franklin Avenue are planned in 2013.

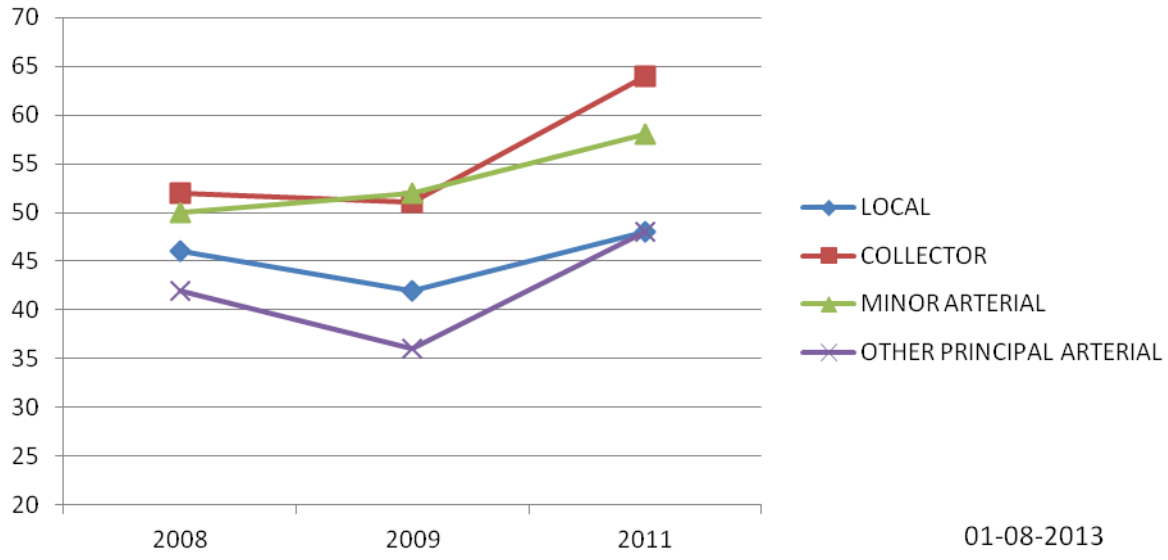
Summary:

- **The investments we are making in street improvements are working. The average weighted PCI Values are increasing.**

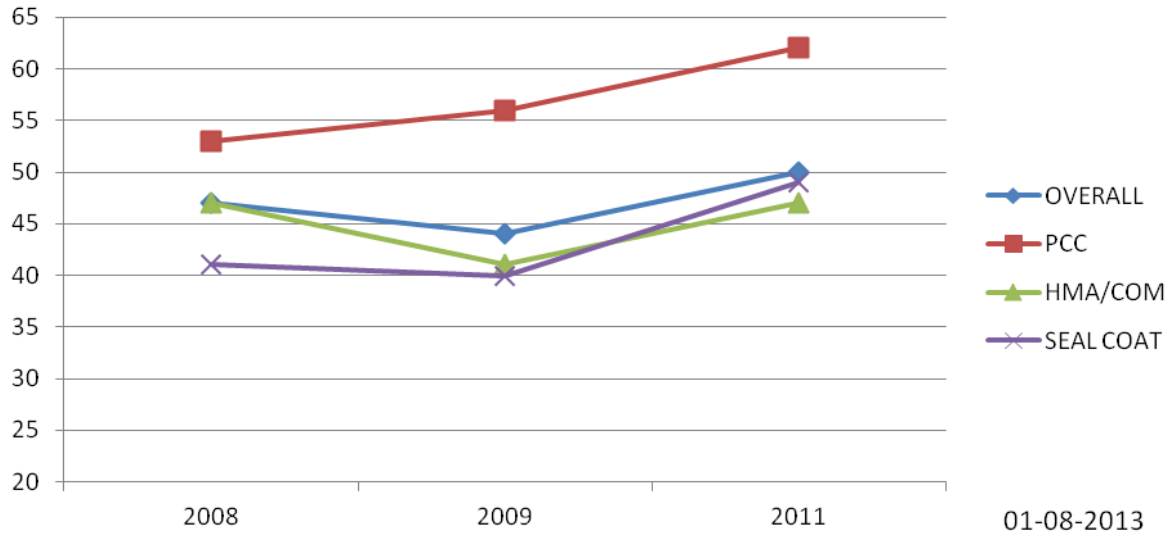
- **The process leads to a lengthening of the pavement lifecycle by identifying streets that can be rehabilitated before they are in need of complete reconstruction. As a result, the City benefits as rehabilitations are less expensive, allowing the City to increase the number of projects and improve the overall system PCI value.**

- **The data obtained by this process allows the staff to determine trends in the pavement condition of our streets and to better analyze/forecast future maintenance activities and construction projects which are ultimately reflected in the Capital Improvement Plan requests.**

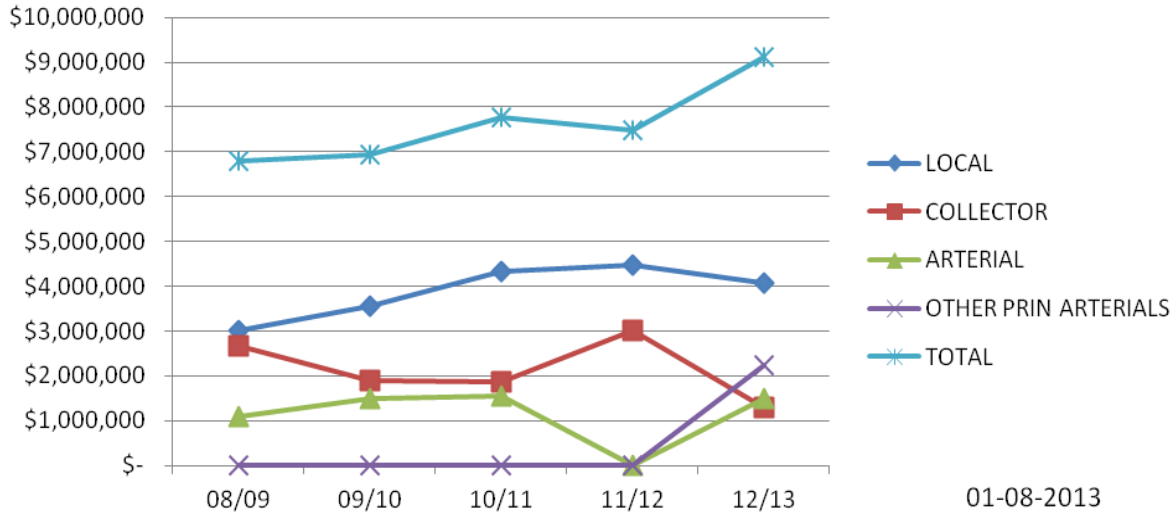
GRAPH 1A
CITY OF AMES: WEIGHTED AVERAGE PCI VALUES VIA ROADWAY CLASSIFICATION



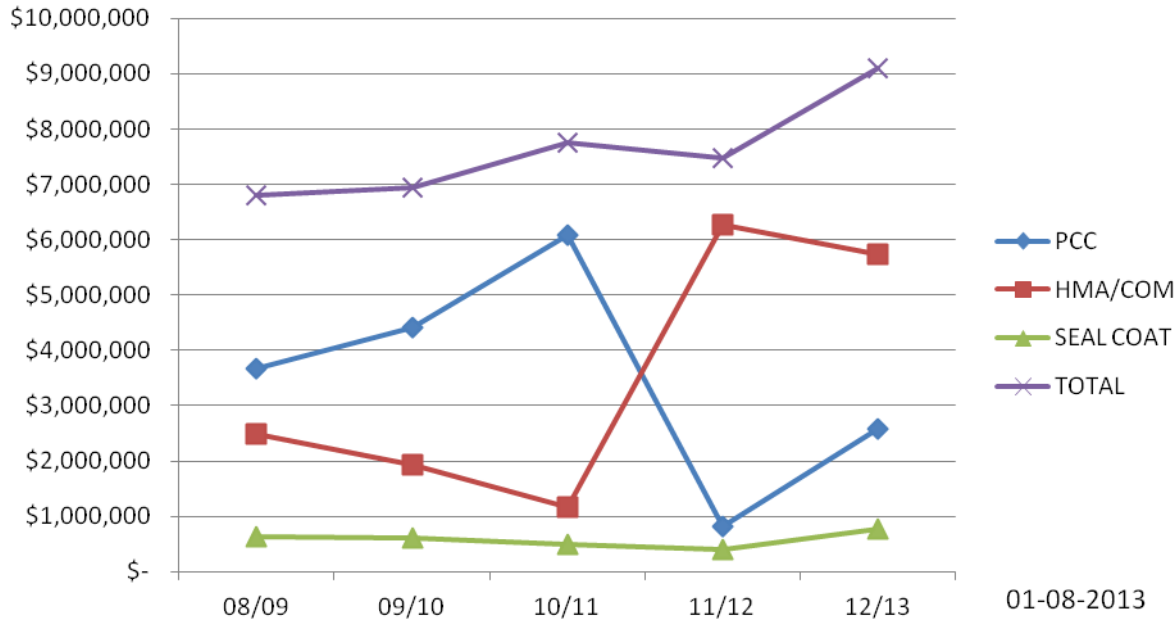
GRAPH 1B
CITY OF AMES: WEIGHTED AVERAGE PCI VALUES VIA PAVEMENT TYPE



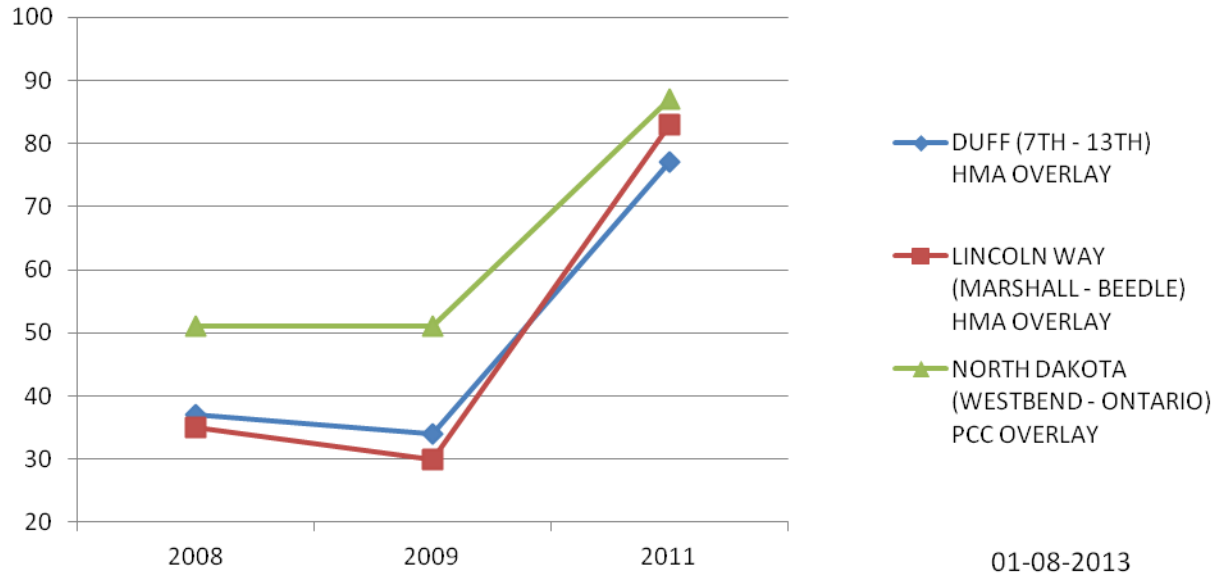
GRAPH 2A
CITY OF AMES: CIP ROADWAY IMPROVEMENT INVESTMENTS VIA ROADWAY CLASSIFICATION



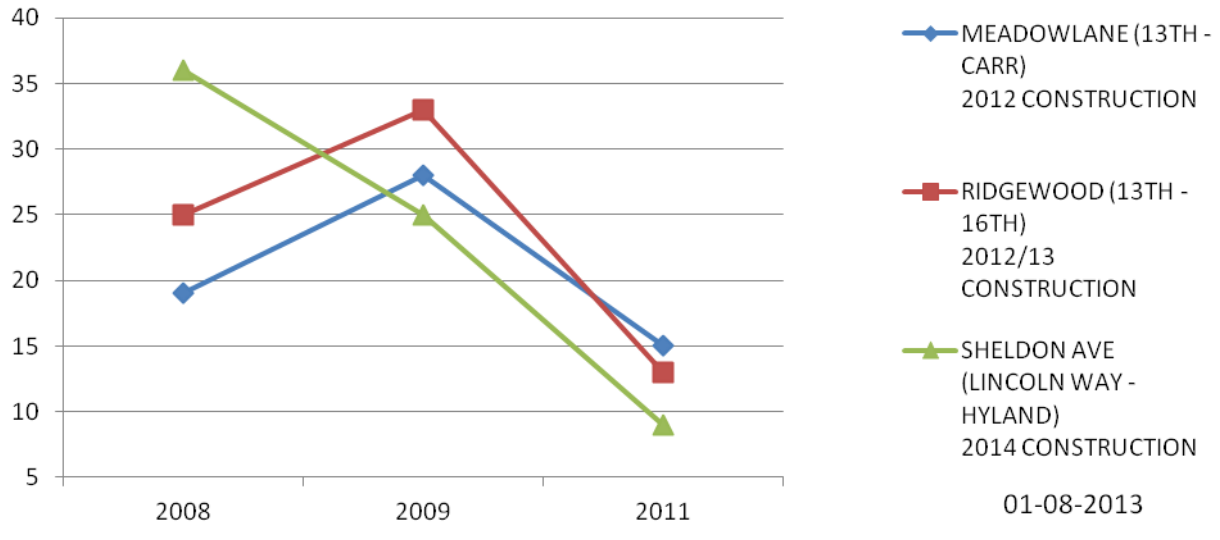
GRAPH 2B
CITY OF AMES: CIP ROADWAY IMPROVEMENT INVESTMENTS VIA PAVEMENT TYPE

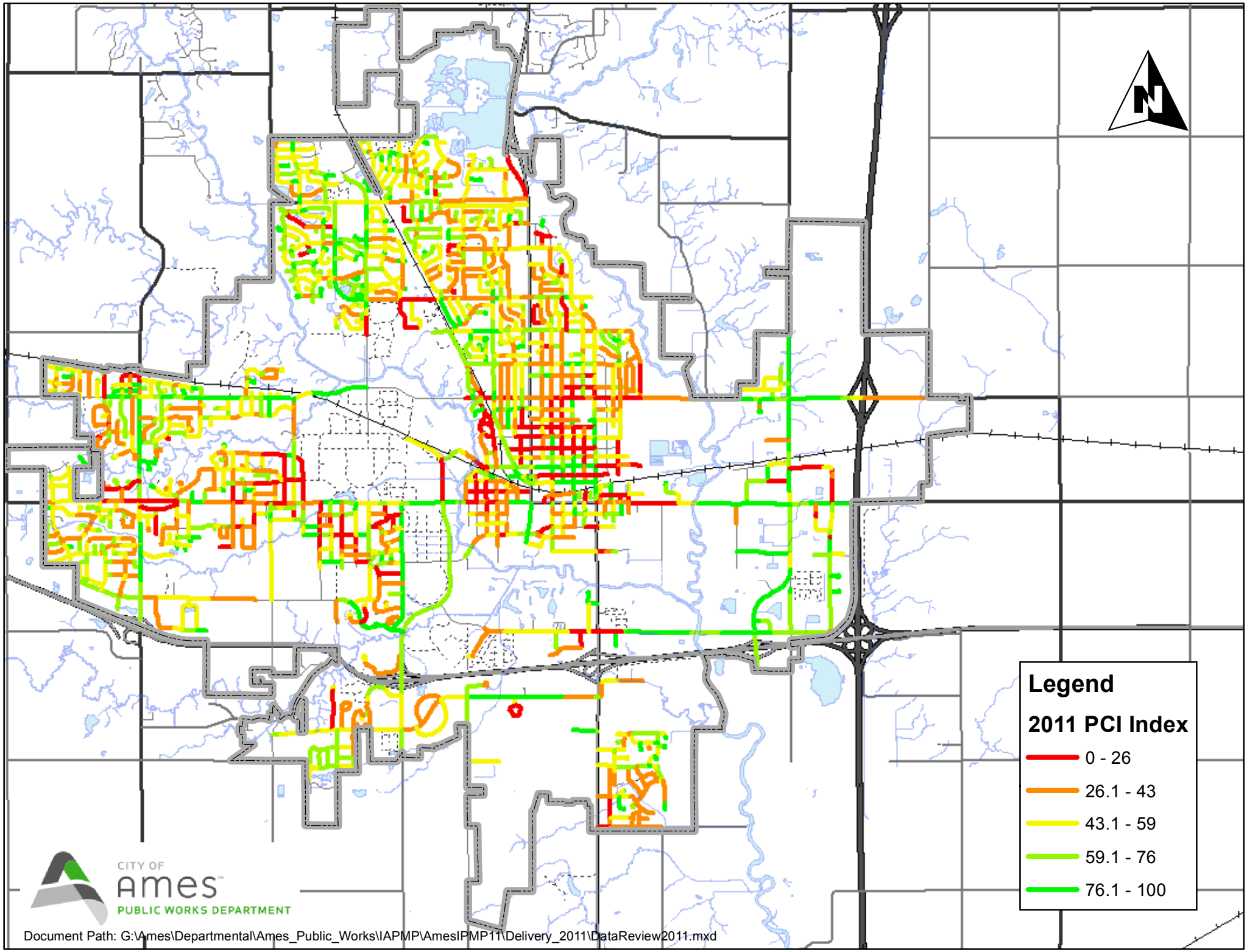


GRAPH 3
CITY OF AMES: PCI VALUES BEFORE & AFTER 2009/2010 CONSTRUCTION



GRAPH 4
CITY OF AMES: PCI VALUES OF ROADWAYS CURRENTLY IN CIP PROGRAM




Legend
2011 PCI Index
0 - 26
26.1 - 43
43.1 - 59
59.1 - 76
76.1 - 100
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PUBLIC WORKS DEPARTMENT
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