OFFICE OF INSPECTOR GENERAL
City of Chicago

REPORT OF THE OFFICE OF INSPECTOR GENERAL:

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CHICAGO DEPARTMENT OF TRANSPORTATION
PAVEMENT MANAGEMENT AUDIT

DECEMBER 2015

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Joseph M. Ferguson
Inspector General

December 18, 2015

To the Mayor, Members of the City Council, City Clerk, City Treasurer, and residents of the City of Chicago:

The City of Chicago Office of Inspector General (OIG) has completed an audit of the Chicago Department of Transportation's (CDOT) pavement management program.

The objective of the audit was to determine if CDOT managed street maintenance in a cost-effective way that extended pavement life in accordance with the Federal Highway Administration's (FHWA) pavement preservation program guidelines. OIG found that CDOT's pavement management program did not comport with FHWA guidelines and did not reflect the cost-effectiveness principles that, for over ten years, have defined the pavement management field. Specifically, CDOT's pavement management program, which manages arterial and residential streets separately, had deficits in the areas of street condition data, performance measurement, and preventive maintenance.

OIG also found that CDOT lacked sufficient street condition data. Having completed only two pavement condition index (PCI) surveys on arterials streets—one in 2007 and one in 2014—CDOT lacked the data needed to program its maintenance activities effectively according to pavement lifecycle trends such as street deterioration rates.[1] CDOT has never conducted a PCI survey for residential streets. Instead, the Department shares less reliable constituent complaint and visual inspection data with City aldermen, who plan residential street resurfacing through the Aldermanic Menu Program. CDOT agreed with the majority of the audit findings and committed to implementing corrective actions.

Based on this audit and the Department's response, we conclude that CDOT is at an auspicious juncture—the tipping point of a paradigm shift from its traditional, reactionary, "worst-first" approach to a comprehensive, proactive pavement management strategy aligned with contemporary best practices that realize the substantial financial benefits of timely, planned preventive maintenance. OIG recommends that the Department fully embrace holistic management of street maintenance by assigning both arterial and residential planning and decision-making to CDOT subject matter experts.

[1] PCI is a measurement tool developed by the U.S. Army Corps of Engineers that assigns a numerical rating of pavement condition on a scale of 0 to 100, 0 being the worst possible condition and 100 being the best possible condition. ASTM International, "Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys," accessed October 8, 2015, http://www.cee.mtu.edu/~balkire/CE5403/ASTMD6433.pdf.

We thank CDOT management and staff for their full cooperation during this audit, submitted to the City and City stakeholders in support of endeavors to better serve those motorists, cyclists, and pedestrians who make use of Chicago's roadways.

Respectfully,

Joseph M. Ferguson
Inspector General
City of Chicago

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Acronyms

AMP	Aldermanic Menu Program
CDOT	Chicago Department of Transportation
CSR	City of Chicago 311 Customer Service Requests System
FHWA	U.S. Department of Transportation Federal Highway Administration
OIG	Office of Inspector General
PCI	Pavement Condition Index
TA	Local or State Transportation Agency

I. EXECUTIVE SUMMARY

The Office of Inspector General (OIG) conducted an audit of the Chicago Department of Transportation's (CDOT) pavement management program to determine if CDOT managed street maintenance in a cost-effective way that extended pavement life in accordance with the Federal Highway Administration's (FHWA) pavement preservation program guidelines.[2] As part of this objective, OIG sought to determine if CDOT tracked street conditions and programmed preventive maintenance according to federal guidelines.

OIG found that CDOT's pavement management program did not comport with FHWA's pavement preservation program guidelines. Specifically, OIG found that CDOT's pavement management program, which manages arterial and residential streets separately,[3] had deficits in the areas of street condition data, performance measurement, and preventive maintenance.

OIG found that CDOT lacked sufficient street condition data. CDOT completed a manual pavement condition index (PCI) survey of arterial streets in 2007 and an automated PCI survey in 2014.[4] However, CDOT lacked sufficient iterations of PCI data needed to determine pavement lifecycle trends, such as street deterioration rates, and to program maintenance activities accordingly. CDOT had no PCI data for residential streets. Instead, the Department shared less reliable constituent complaint and visual inspection data with City aldermen to inform their residential street resurfacing requests via the Aldermanic Menu Program (AMP).[5]

OIG also found that, between 2000 and 2014, CDOT performed no preventive maintenance, such as crack sealing and micro-surfacing, on arterial streets[6] and a negligible amount on residential

[2] FHWA formalizes and disseminates best practices for local and state transportation agencies (TAs) regarding the effective and efficient stewardship of roadways (see http://www.fhwa.dot.gov/). Although federal and state transportation grants do not currently require CDOT to utilize a pavement preservation program, CDOT agreed with OIG that FHWA pavement preservation guidelines are appropriate best practice guidance.

[3] CDOT stated that it uses the Illinois Department of Transportation's functional classifications of roadways to delineate arterial from residential streets in its network (see http://www.cmap.illinois.gov/documents/10180/97401/FunctionalClassGuidebook.pdf/327d0751-44f7-4f9a-a0e3-e0655df633a3 and http://www.gettingaroundillinois.com/gai.htm?mt=fc). CDOT stated that generally arterial streets have centerline striped markings, exist at every half mile interval of road network, and have significantly higher traffic relative to residential streets.

[4] PCI is a measurement tool developed by the U.S. Army Corps of Engineers that assigns a numerical rating of pavement condition on a scale of 0 to 100, 0 being the worst possible condition and 100 being the best possible condition. ASTM International, "Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys," accessed October 8, 2015, http://www.cee.mtu.edu/~balkire/CE5403/ASTMD6433.pdf. A manual PCI survey is conducted by experienced engineers or maintenance supervisors who inspect roadways and assign a numerical value to various categories of pavement defect, taking into account the extent and severity of surface distress. An automated PCI survey utilizes technology, such as laser-equipped vehicles, to measure the roadway condition. U.S. DOT, FHWA, "Practical Guide for Quality Management of Pavement Condition Data Collection," February 2013, 14-15, 18, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/management/qm/data_qm_guide.pdf.

[5] Through AMP, each alderman receives $1.32 million per year to address residential street resurfacing among other ward-specific infrastructure needs. City of Chicago, Office of Budget and Management, "2014-2018 Capital Improvement Program," 4, accessed October 8, 2015, http://www.cityofchicago.org/content/dam/city/depts/obm/supp_info/CIP_Archive/2014CapitalBook.pdf.

[6] At the conclusion of the audit, CDOT shared with OIG that it piloted a one-time crack seal program on 6.5 miles of arterial streets between October 2013 and April 2014. CDOT noted this pilot program in its management response (see Appendix E, page 3). Given the small scale of the program (i.e., one iteration of crack seal on about 1% of the

streets. Instead, CDOT invested almost all of its resources in corrective maintenance and repair, such as pothole filling, resurfacing, and reconstruction, which CDOT management characterized as a "worst-first" approach. While some corrective maintenance and repair will always be required, the prevailing view among industry experts is that the "worst-first" approach is costly and ineffective and that regular and comprehensive preventive maintenance should be included as part of an agency's pavement management program. OIG estimates that, by reallocating $2.9 million per year from resurfacing to preventive maintenance, the City could save $69.5 million over the 15-year lifecycle of a street, for an average annual savings of $4.6 million.

In light of this finding, OIG recommends that CDOT design and implement a pavement preservation program to achieve the most cost-effective means of extending the life of City streets. This recommendation includes specific action items, including developing in-house expertise about pavement preservation techniques, collecting reliable condition data on a routine basis, developing a proactive preventive maintenance strategy, and separating residential street resurfacing from AMP.

CDOT agreed with the majority of OIG's recommendations. In response to our audit findings and recommendations, CDOT stated that, going forward, the Department will conduct street condition surveys every three years, including an automated PCI survey of arterial streets in 2017. CDOT stated that it will use the data to determine pavement lifecycle trends, to establish pavement performance goals, and to schedule reconstruction, resurfacing, and corrective and preventive maintenance activities accordingly. CDOT also agreed with the value of timely, preventive maintenance and described its plans to integrate such activities in its pavement management program. The Department did not agree with OIG's recommendation that it holistically manage street maintenance by assigning both arterial and residential planning and decision-making to CDOT subject matter experts. The Department stated that it will not separate residential street resurfacing from AMP, thereby continuing to rely on aldermen to individually plan resurfacing in their wards along with the other needs and priorities addressed through AMP.

The specific recommendations related to the finding, and management's response, are described in the "Audit Findings and Recommendations" section of this report.

City's 577 arterial miles during the 15-year period reviewed), OIG determined that the new information did not change the spirit of the audit finding.

II. BACKGROUND

CDOT's mission is to:

> Keep the city's surface transportation networks and public way safe for users, environmentally sustainable, in a state of good repair and attractive, so that its diverse residents, businesses and guests all enjoy a variety of quality transportation options, regardless of ability or destination.[7]

A. CDOT and the City's Streets

The City's transportation infrastructure is one of CDOT's primary responsibilities:

> CDOT plans, designs, constructs, maintains, and manages surface transportation infrastructure such as streets, alleys, sidewalks, curbs, gutters, bridges, and viaducts to ensure safe and efficient travel in the City. It also installs and replaces traffic signs and street and alley lights and maintains pavement markings to improve public safety.[8]

According to CDOT, the city of Chicago has a total of 4,116 miles of streets, including 3,061 miles of residential streets and 1,055 miles of arterial streets.[9] CDOT stated that it uses the Illinois Department of Transportation's functional classifications of roadways to delineate arterial from residential streets in its network.[10] CDOT stated that generally arterial streets have centerline striped markings, exist at every half mile interval of road network, and have significantly higher traffic relative to residential streets. CDOT is responsible for the maintenance of all residential streets and 577 miles of arterials. The remaining 478 miles of arterials are either part of the State of Illinois or Cook County's jurisdiction. The City is not financially responsible for State and County arterials, as the State and County provide CDOT funds to contract out maintenance work on those 478 miles of street. According to Department management, CDOT takes responsibility for the entire network of streets within City boundaries and aims to manage them holistically.

CDOT's Engineering Division is responsible for the design of arterial streets and some residential streets. CDOT contracts the construction and maintenance of arterial streets to third-party vendors. CDOT's in-house crews are responsible for the majority of construction and maintenance work on residential streets; however, the Department contracts out some larger residential street projects to third-party vendors.

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[7] City of Chicago, CDOT, "Mission," accessed October 8, 2015, http://www.cityofchicago.org/city/en/depts/cdot/auto_generated/cdot_mission.html.

[8] City of Chicago, Office of Budget and Management, "2015 Budget Overview," 107, accessed October 8, 2015, http://chicityclerk.com/wp-content/uploads/2014/10/2015OV.pdf.

[9] These figures are measured in centerline miles, not lane miles. Centerline miles measure the total length of roadway without regard to width, whereas lane miles multiply length by number of lanes (e.g., one centerline mile of a four-lane road equals four lane miles). In Chicago, a centerline mile has an average of 2 to 3 lanes on each side of traffic flow and some turning lanes. It amounts to about 42 to 48 feet of street in width.

[10] For more information on the Illinois Department of Transportation's functional classifications of roadways, see http://www.cmap.illinois.gov/documents/10180/97401/FunctionalClassGuidebook.pdf/327d0751-44f7-4f9a-a0e3-e0655df633a3 and http://www.gettingaroundillinois.com/gai.htm?mt=fc.

In FY2014, the City budgeted $276,272,834 for street maintenance. The City funds residential street maintenance primarily with local revenue and arterial street maintenance primarily with federal grants.

B. CDOT Street Maintenance Activities

CDOT performs the following five types of street maintenance—reconstruction, resurfacing, pothole filling, "grind and patch," and crack seal. At CDOT, these maintenance activities have the following characteristics:

- Reconstruction—the replacement of the top asphalt layer, the concrete base, and the sub-base. In some cases, reconstruction also includes the replacement of catch basins, sewers, and traffic light infrastructure.
- Resurfacing—the replacement of the top asphalt layer.
- Pothole Filling—the filling of pavement holes that result from the freeze-thaw cycle of water that penetrates the pavement surface.
- "Grind and Patch"—the replacement of the asphalt layer on discrete pavement segments, typically where there are clusters of potholes. CDOT performed "grind and patch" on arterial streets in response to the particularly severe 2013-14 winter.
- Crack Seal—the application of flexible asphalt to bond crack walls and prevent water permeation. The purpose of crack seal is to mitigate the development of potholes. CDOT began applying crack seal in 2013 on residential streets only.

C. FHWA Pavement Preservation Program Guidelines

FHWA, an agency of the U.S. Department of Transportation, formalizes and disseminates best practices for local and state transportation agencies (TAs) regarding the effective and efficient stewardship of roadways.[11] Among these best practices, FHWA states that TAs can cost-effectively extend pavement life by employing a pavement preservation program.[12] FHWA defines a pavement preservation program as a "network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety, and meet motorist expectations."[13]

According to FHWA, an essential component of a pavement preservation program is preventive maintenance. FHWA characterizes preventive maintenance as those treatments that extend the surface life of streets, including crack sealing, chip sealing, and micro-surfacing, among others.[14]

[11] U.S. DOT, FHWA, "What We Do," accessed October 8, 2015, http://www.fhwa.dot.gov/.
[12] U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.
[13] U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.
[14] U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.

FHWA states that preventive maintenance should be programmed proactively, applied network wide, and done when streets are in good condition.[15]

FHWA distinguishes preventive maintenance from corrective maintenance, which consists of activities that are generally reactive, ad hoc, and applied when streets are in poor condition. These activities include pothole filling and repair of discrete pavement sections, among others.[16]

Preventive Maintenance (proactive measures applied to pavements in good condition to extend the service life)	**Corrective Maintenance** (reactive measures taken to restore a deficiencies in a pavement to an acceptable level of service)
• asphalt crack sealing • chip sealing • slurry or micro-surfacing • thin and ultra-thin hot-mix asphalt overlay concrete joint sealing • diamond grinding • dowel-bar retrofit • partial and/or full-depth concrete repairs such as edge spalls or corner breaks	• pothole filling • patching of localized pavement deterioration such as edge failures and/or grade separations along the shoulders • joint replacement • full width and depth slab replacement at isolated locations

Source: FHWA's "Pavement Preservation Definitions"[17]

The table below illustrates the purposes of different street maintenance activities. Pavement preservation includes preventive maintenance as well as some limited applications of minor rehabilitation and routine maintenance. Preventive maintenance both extends the life of a road and restores serviceability.

[15] U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.

[16] FHWA defines corrective maintenance as "activities [that] are performed in response to the development of a deficiency or deficiencies that negatively impact the safe, efficient operations of the facility and future integrity of the pavement section…generally reactive, not proactive, and performed to restore a pavement to an acceptable level of service due to unforeseen conditions." U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.

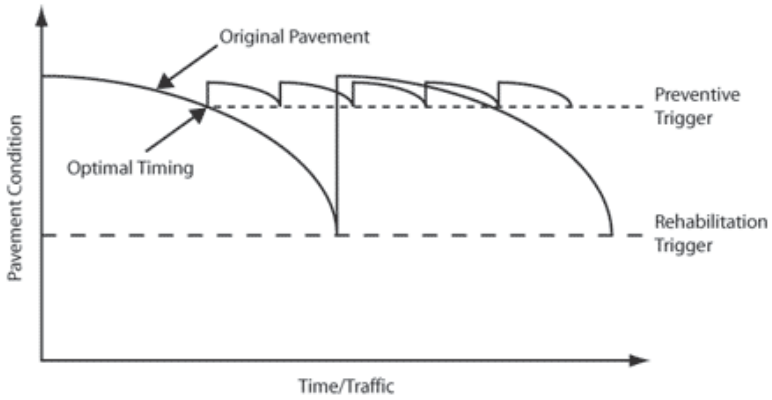
[17] OIG notes that not all maintenance treatments listed in the chart may be appropriate for streets in CDOT's network. U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.

Pavement Preservation Guidelines

	Type of Activity	Increase Capacity	Increase Strength	Reduce Aging	Restore Serviceability
Pavement Preservation	New Construction	X	X	X	X
	Reconstruction	X	X	X	X
	Major (Heavy) Rehabilitation		X	X	X
	Structural Overlay		X	X	X
	Minor (Light) Rehabilitation			X	X
	Preventive Maintenance			X	X
	Routine Maintenance				X
	Corrective (Reactive) Maintenance				X
	Catastrophic Maintenance				X

Source: FHWA's "Pavement Preservation Guidelines"[18]

The chart below depicts how performing preventive maintenance on streets in good condition keeps them in good condition.



Source: FHWA's "Pavement Preservation Concept"[19]

FHWA makes clear that the value of preventive maintenance is significant, long-term financial savings. By integrating timely, preventive maintenance treatments, TAs mitigate more expensive repairs in the future.[20] FHWA explains that,

[18] U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.
[19] U.S. DOT, FHWA, "Pavement Preservation Compendium II: Principles of Pavement Preservation," September 2003, accessed October 8, 2015, https://www.fhwa.dot.gov/pavement/preservation/ppc0621.cfm.
[20] U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.

> An effective pavement preservation program will address pavements while they are still in good condition and before the onset of serious damage. By applying a cost-effective treatment at the right time, the pavement is restored almost to its original condition. The cumulative effect of systematic, successive preservation treatments is to postpone costly rehabilitation and reconstruction. During the life of a pavement, *the cumulative discount value of the series of pavement preservation treatments is substantially less than the discounted value of the more extensive, higher cost of reconstruction and generally more economical than the cost of major rehabilitation* [emphasis added].[21]

Within a pavement preservation program, FHWA does not articulate specific percentages that TAs should budget for preventive maintenance versus corrective maintenance, rehabilitation, and reconstruction. Such allocation relies on conditions specific to the TA, including the age of its network and its pavement performance goals. According to FHWA,

> Each [TA] faces different challenges in applying pavement preservation treatments and establishing an effective preservation program…preservation involves a paradigm shift from worst-first to optimum timing. Preservation programs must focus on demonstrating benefit, securing commitment of top agency management, convincing the public, and selecting the right treatment for the right pavement at the right time.[22]

D. Pavement Condition Data and Performance Monitoring

FHWA best practices include the tracking and monitoring of street conditions as a performance measure. According to FHWA, "a good preservation program should establish continual monitoring to assure effective feedback for improvement..."[23] One widely-used method of tracking and monitoring street conditions is a pavement condition index (PCI) survey. PCI is a measurement tool developed by the U.S. Army Corps of Engineers that assigns a numerical rating of pavement condition on a scale of 0 to 100, 0 being the worst possible condition and 100 being the best possible condition.[24] TAs may use such data to determine pavement lifecycle trends, schedule maintenance activities, and establish goals for pavement performance outcomes.[25] According to ASTM International,

> [PCI] provides an objective and rational basis for determining maintenance and repair needs and priorities. Continuous monitoring of the PCI is used to establish the rate of pavement deterioration, which permits early identification of major rehabilitation needs.

[21] U.S. DOT, FHWA, "Pavement Preservation Definitions Memorandum," September 12, 2005, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/preservation/091205.cfm.
[22] U.S. DOT, FHWA, "Pavement Preservation Compendium II: Pavement Preservation Fights for Respect," September 2005, accessed October 8, 2015, https://www.fhwa.dot.gov/pavement/preservation/ppc0607.cfm.
[23] U.S. DOT, FHWA, "Pavement Preservation Compendium II: Principles of Pavement Preservation," September 2003, accessed August 6, 2015, https://www.fhwa.dot.gov/pavement/preservation/ppc0621.cfm.
[24] ASTM International, "Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys," accessed October 8, 2015, http://www.cee.mtu.edu/~balkire/CE5403/ASTMD6433.pdf.
[25] ASTM International, "Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys," accessed October 8, 2015, http://www.cee.mtu.edu/~balkire/CE5403/ASTMD6433.pdf.

> The PCI provides feedback on pavement performance for validation or improvement of current pavement design and maintenance procedures.[26]

To leverage the analytical insights of street condition data, many TAs use a pavement management system. A pavement management system refers to one of a variety of software packages, such as StreetSaver and PAVER,[27] that TAs use to analyze street condition data, evaluate and compare preventive maintenance scenarios, and determine budget needs in accordance with desired pavement performance outcomes. Relative to the value of street assets, the cost of such a system is low.[28]

[26] ASTM International, "Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys," accessed October 8, 2015, http://www.cee.mtu.edu/~balkire/CE5403/ASTMD6433.pdf.
[27] OIG learned of these two specific software packages through interviews with pavement industry experts.
[28] For example, the City Engineer for the Portland Bureau of Transportation (PBOT) stated that PBOT paid about $10,000 for the StreetSaver program for the first year and a "few thousand dollars per year" after that. The size of PBOT's street network is comparable to Chicago's—1,800 miles of arterial streets and 3,000 miles of residential streets.

III. OBJECTIVES, SCOPE, AND METHODOLOGY

A. Objectives

The objective of the audit was to determine if CDOT managed streets in a cost-effective way that preserved pavement life. Specifically, OIG sought to determine if CDOT's pavement management program comported with FHWA pavement preservation program guidelines as they relate to tracking street conditions, monitoring pavement performance, and programming maintenance activities.

B. Scope

OIG reviewed CDOT's planning process for the maintenance of all 4,116 miles of arterial and residential streets in the city of Chicago. This included CDOT's processes for collecting and analyzing street condition data and its budgeting for maintenance activities from 2000 to 2014.

OIG did not review CDOT's street maintenance-related contract oversight, materials specification, warranty enforcement, timeliness of project completion, or possible cost overruns. OIG also did not review CDOT's project coordination process with utility companies and sister agencies in this audit.

C. Methodology

To determine if CDOT's pavement management program comported with FHWA guidelines, OIG interviewed Department personnel knowledgeable about CDOT's planning processes, including members of various levels of Department management. OIG reviewed planning-related documentation, including documentary evidence of budget allocation for street maintenance activities from 2000 to 2014. OIG also interviewed eight industry experts in the pavement preservation field, including representatives of federal and local transportation agencies, professional associations, and academic research centers.

To estimate the savings the City could achieve through preventive maintenance, OIG analyzed CDOT's street condition data,[29] documented CDOT's reported costs for street resurfacing and crack seal treatments, and compared costs of pavement preservation scenarios with those of CDOT's "worst-first" approach.

D. Standards

We conducted this audit in accordance with generally accepted Government Auditing Standards issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[29] OIG assessed the reliability of the PCI data by interviewing CDOT employees knowledgeable about the data. OIG determined that the data were sufficiently reliable for the purposes of this report.

E. Authority and Role

The authority to perform this audit is established in the City of Chicago Municipal Code § 2-56-030 which states that the Office of Inspector General has the power and duty to review the programs of City government in order to identify any inefficiencies, waste, and potential for misconduct, and to promote economy, efficiency, effectiveness, and integrity in the administration of City programs and operations.

The role of OIG is to review City operations and make recommendations for improvement.

City management is responsible for establishing and maintaining processes to ensure that City programs operate economically, efficiently, effectively, and with integrity.

IV. FINDINGS AND RECOMMENDATIONS

Finding 1: CDOT's pavement management program did not comport with federal guidelines, with deficits in the areas of street condition data, performance measurement, and preventive maintenance.

CDOT recently made advances in the way it assesses street conditions. However, OIG found that CDOT's pavement management program did not comport with FHWA guidelines, with deficits in the areas of street condition data, performance measurement, and preventive maintenance.

CDOT Lacked Sufficient Street Condition Data

FHWA makes clear that a TA's pavement preservation program must be informed by reliable and valid street condition data. While the Department made some recent advances in the way it assesses street conditions, CDOT lacked sufficient street condition data from which to develop an effective, network-level pavement management strategy.

1. Arterial Street Condition Data

OIG found that CDOT did not consistently track arterial street conditions. CDOT conducted its first manual PCI survey of arterial streets in 2007. In a manual PCI survey, experienced engineers or maintenance supervisors inspect roadways and assign a numerical value to various categories of pavement defect, taking into account the extent and severity of surface distress. A manual PCI survey is significantly more detailed than the residential street "field survey" that the Department completed in 2014-2015, described in the next section of this report. According to CDOT management, the Department used the 2007 manual PCI data to program arterial resurfacing and reconstruction from 2008 to 2011. Between 2012 and 2014, CDOT relied on City 311 Customer Service Request (CSR) data to assess which arterial streets needed maintenance, based on an assumed correlation between quantity of constituent complaints and poor street condition. CDOT completed its first automated (i.e., laser-equipped vehicle) PCI survey of arterial streets in 2014.[30] The 2014 PCI survey covered City, State, and Cook County arterials,[31] 25% of the entire city of Chicago network (1,055 of 4,116 miles).[32]

According to Department management, going forward, CDOT intends to conduct a laser-equipped PCI survey every three years. OIG interviewed several industry experts who explained that TAs should conduct PCI surveys on arterial streets every one to three years. TAs may conduct PCI surveys on residential streets less frequently, once every four to five years.

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[30] CDOT contracted with a third-party vendor, V3 Companies, to conduct the 2014 PCI survey at a cost of $820,807. City of Chicago, CDOT, "Purchase Order 14624," September 23, 2013, accessed October 8, 2015, https://webapps1.cityofchicago.org/VCSearchWeb/org/cityofchicago/vcsearch/controller/agencySelection/displayAgencyHome.do.

[31] According to CDOT management, the State of Illinois contributed 20% of the cost of the 2014 PCI survey. Cook County did not contribute to the cost of the 2014 PCI survey.

[32] See Appendix A for a map of CDOT's 2014 PCI data and Appendix B for the 2014 PCI distribution by arterial street miles. See Appendix C for photographs depicting the relationship between 2014 PCI rating and the surface condition of arterial streets.

During the audit, OIG interviewed CDOT management about how they planned to integrate PCI data into its pavement management program, such as using PCI to schedule maintenance activities, determine lifecycle trends, and set long-term PCI goals. The Department was still determining how to operationalize PCI data and set PCI goals. At the time of this report, CDOT management had only used PCI to determine which streets needed resurfacing and reconstruction. CDOT did not have a pavement preservation engineer on staff or utilize a pavement management system to facilitate pavement analysis. CDOT management stated that it would require more iterations of PCI data to determine the actual deterioration rates of streets.

2. Residential Street Condition Data

OIG found that CDOT did not consistently track residential street conditions. Prior to 2015, CDOT relied on CSR data to assess which residential streets needed maintenance, based on an assumed correlation between quantity of constituent complaints and poor street condition. CDOT management has not conducted a PCI survey of residential streets and had no plans to do so. Instead, CDOT completed its first and only "field survey" of residential street condition in 2014 and 2015. In the survey, engineers visually inspected and rated residential streets on a scale of good, fair, poor, and very poor.[33] CDOT management stated that field survey data are more valid and reliable than CSR data for assessing residential street maintenance needs. However, CDOT management also recognized that, while the field survey was less expensive to conduct than a PCI survey,[34] the data are not as useful as either manual or automated PCI data.[35]

CDOT Lacked a Network-Level, Long-Term Pavement Management Strategy

CDOT did not employ a pavement preservation program that conformed with FHWA guidelines to strategically plan and perform street maintenance activities for its arterial and residential streets.

1. Arterial Street Maintenance

For arterial street maintenance, CDOT employed what Department management described as a "worst-first" approach. Using a "worst-first" approach, CDOT did not perform preventive maintenance on arterial streets[36] and scheduled resurfacing and reconstruction activities based on the streets with the lowest PCI—or poorest street conditions. OIG found that a "worst-first"

[33] See Appendix D for an example of a ward map that CDOT created to depict the results of its field survey of residential street conditions.
[34] CDOT management estimated that the cost of the field survey of residential street conditions was $125,000.
[35] Whether pavement condition information is collected manually through visual inspection or using automated methods (e.g., laser-equipped vehicles), FHWA advises that transportation agencies utilize data quality control tools to assess data quality. U.S. DOT, FHWA, "Practical Guide for Quality Management of Pavement Condition Data Collection," February 2013, accessed October 8, 2015, http://www.fhwa.dot.gov/pavement/management/qm/data_qm_guide.pdf.
[36] At the conclusion of the audit, CDOT shared with OIG that it piloted a one-time crack seal program on 6.5 miles of arterial streets between October 2013 and April 2014. CDOT noted this pilot program in its management response (see Appendix E, page 3). Given the small scale of the program (i.e., one iteration of crack seal on about 1% of the City's 577 arterial miles during the 15-year period reviewed), OIG determined that the new information did not change the spirit of the audit finding.

approach is not regarded as cost-effective in the pavement preservation field.[37] As one industry expert put it, "'Worst-first waits until serious damage is done, and every road in your system will have to descend to that level, making it the most expensive strategy you can think of.'"[38]

In addition to reconstruction and resurfacing, CDOT programmed corrective maintenance on arterial streets, such as pothole filling and "grind and patch," based on CSR data.

2. Residential Street Maintenance

For residential street resurfacing, CDOT relied on the Aldermanic Menu Program (AMP). Through AMP, each alderman receives $1.32 million per year[39] to address residential street resurfacing among other ward-specific infrastructure needs. CDOT management stated that, to inform aldermen's AMP requests, the Department meets with aldermen early each year to review CSR requests in their ward and to describe any planned construction work. Beginning in 2015, CDOT also provided aldermen with residential street condition data gathered during the field survey to better assist them in their decisions about how to allocate AMP funds.

OIG found that, contrary to FHWA guidelines for an empirically-based, network-level, long-term pavement management strategy, AMP was a decentralized approach, directed by insufficient data and aldermanic discretion. Given recent advancements in how CDOT can track and monitor street conditions (e.g., PCI data), OIG found that the City's decision to defer CDOT's subject matter expertise, and knowledge of objective maintenance needs, to aldermen did not align with FHWA guidelines.

Outside of AMP, CDOT performed some preventive maintenance on residential streets in the form of crack seal. CDOT began performing crack seal in 2013 and, between 2013 and 2014, applied crack seal on about 4% of residential streets (120 of 3,061 miles).[40] However, contrary to FHWA guidelines, OIG found that CDOT programmed crack seal based on street age and not on the present condition of the street. CDOT management explained that the Department applies crack seal on residential streets that are in their fourth year after resurfacing, based on the premise that a street in its fourth year starts to develop cracks that can lead to the further

[37] See for example, U.S. DOT, FHWA, "Problem: 'Worst First' is Not Good Asset Management," accessed October 8, 2015, http://www.fhwa.dot.gov/resourcecenter/teams/pavement/pave_4ppc.cfm; D.G. Peshkin, T.E. Hoerner, and K.A. Zimmerman, "Optimal Timing of Pavement Preventive Maintenance Treatment Applications," National Cooperative Highway Research Program, NCHRP Report 523, 2004, 4, accessed October 8, 2015, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_523.pdf; and Idaho Legislature Office of Performance Evaluations, "Idaho Transportation Department Performance Audit," January 2009, 69, accessed October 8, 2015, http://www.legislature.idaho.gov/ope/publications/reports/r0903.pdf.

[38] Tom Kuennen, "Pavement Preservation Compendium II: Pavement Preservation Fights for Respect," as published in U.S. DOT, FHWA, Pavement Preservation Compendium II, 18, September 2006, accessed October 8, 2015, https://www.fhwa.dot.gov/pavement/preservation/ppc06.pdf.

[39] City of Chicago, Office of Budget and Management, "2014-2018 Capital Improvement Program," 4, accessed August 17, 2015, http://www.cityofchicago.org/content/dam/city/depts/obm/supp_info/CIP_Archive/2014CapitalBook.pdf.

[40] CDOT management informed OIG that the Department did perform some crack seal between 2000 and 2003 but had no information regarding crack seal-related program costs or pavement performance outcomes for that time period.

degradation of the street, such as potholes. However, OIG found that CDOT had not measured or tracked residential street conditions in a way that could verify this assumption.

CDOT programmed corrective maintenance on residential streets, such as pothole filling, based on CSR data.

In the Last 15 Years, CDOT Performed Almost No Preventive Maintenance on City Streets

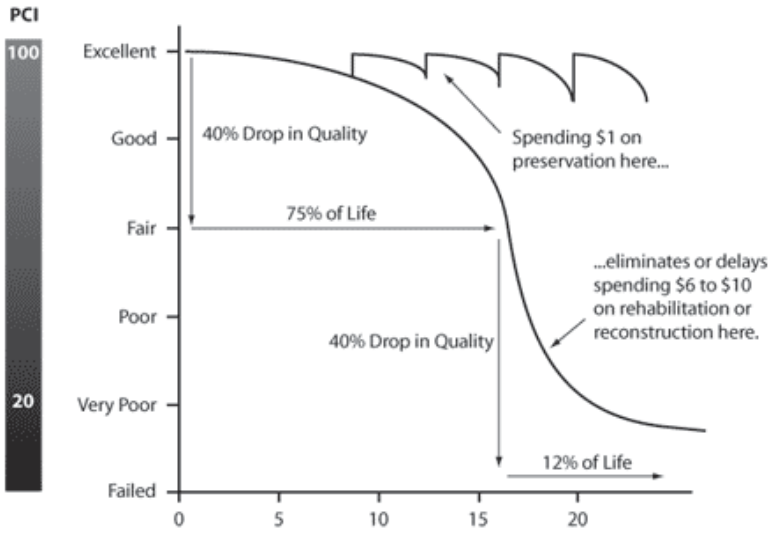
The table below represents CDOT's budget allocation for the five components of its pavement management program. The table shows that CDOT's investment in preventive maintenance over the last fifteen years was negligible.

CDOT Street Maintenance Activities	Type of Activity[41]	Arterial Streets	Residential Streets	2000-14 Budget[42]	% of All Program Monies
Resurfacing and Reconstruction	Major Rehabilitation/ Reconstruction	✓	✓	$2,024,656,835	90%
Pothole Filling	Corrective Maintenance	✓	✓	$216,434,083	10%
Grind and Patch	Corrective Maintenance	✓		$2,033,050 (2014 only)	0%
Crack Seal	Preventive Maintenance		✓	$580,988 (2013-14 only)	0%

Source: OIG analysis of CDOT data

[41] OIG classified these activities in accordance with FHWA guidelines and not CDOT's initial description. At the beginning of the audit, CDOT management stated that pothole filling and "grind and patch" constituted preventive maintenance but later agreed that these activities meet FHWA's definition of corrective maintenance.
[42] These figures represent work performed and/or coordinated by CDOT, including residential streets, City arterials, and State and County arterials.

OIG found that performing preventive maintenance on streets could yield significant financial savings for the City. National experience demonstrates that, for every dollar spent on preventive maintenance, TAs could potentially save four to ten dollars on major rehabilitation and reconstruction.[43]



Source: FHWA's "Pavement option curve (example). (PCI = Pavement Condition Index.)"[44]

Likewise, OIG estimated that, by reallocating $2.9 million per year from resurfacing (the equivalent of less than 3 miles of resurfacing[45]) to preventive maintenance on City streets that CDOT understands to be currently in good condition, the City could save approximately $69.5 million over the 15-year lifecycle of pavement, for an average annual savings of $4.6 million.[46]

[43] Gilbert Baladi et al., "Cost-Effective Preventive Maintenance: Case Studies," *Journal of the Transportation Research Board*, no. 1795 (2002): 17-27. This article cites potential savings of four to ten dollars, while the FHWA graph below cites a less conservative six to ten dollars.

[44] U.S. DOT, FHWA, "Pavement Preservation Compendium II: Principles of Pavement Preservation," September 2003, accessed August 6, 2015, https://www.fhwa.dot.gov/pavement/preservation/ppc0621.cfm.

[45] For context, CDOT reported that the Department resurfaced about 190 street miles in 2014 (100 arterial miles and 90 residential street miles). City of Chicago, Office of Budget and Management, "2015 Budget Overview," 107, accessed July 21, 2015, http://chicityclerk.com/wp-content/uploads/2014/10/2015OV.pdf.

[46] This estimate is in constant dollars and not adjusted for inflation or interest rates. While OIG used crack seal figures to estimate potential savings, OIG does not specifically recommend crack seal as a type of preventive maintenance treatment CDOT should adopt network wide. Other preventive maintenance treatments may be more cost-effective for City streets. Ultimately, CDOT must determine the combination of preventive maintenance treatments that optimally extend pavement life relative to the cost of the treatment(s). OIG also notes that the estimated $2.9 million for preventive maintenance does not necessarily have to come from reallocated resurfacing funds. OIG described it as such in this report to contextualize the type of (re)allocation that may be required (i.e., the equivalent of less than three miles of resurfacing). For instance, as the purpose of crack seal is to prevent the occurrence of potholes, CDOT may consider reallocating pothole filling funds to mitigate future pothole filling costs.

Recommendation:

OIG recommends that CDOT design and implement a pavement preservation program to achieve the most cost-effective means of extending the life of City streets. To this end, OIG recommends that CDOT,

- Determine which preventive maintenance treatments will be the most cost-effective for City streets and the optimal time in the pavement lifecycle to apply such treatments;
- Collect street condition data on a routine basis in a way that allows the Department to determine pavement lifecycle trends and schedule maintenance activities;
- Set pavement performance goals and track and report on progress toward those goals;
- Assign residential street resurfacing decision-making to CDOT subject matter experts by removing it from the purview of the Aldermanic Menu Program;
- Determine the street maintenance budget based on a citywide pavement preservation program and request funding accordingly; and
- Hire a pavement preservation engineer and utilize a pavement management system to facilitate such analysis and decision-making.

Management Response:

"CDOT initiated the development of a comprehensive Pavement Management Program in 2013. The department will build on the information already collected through arterial and residential surveys to develop a comprehensive cost-effective preventive maintenance plan. CDOT will program federal Surface Transportation Program funding to complete another pavement condition rating of the City's arterial street system in 2017. The arterial PCI values of the 2014 and the 2017 PCIs will be analyzed and compared to determine pavement deterioration trends on arterial streets. From this analysis we will set performance goals, track progress made with the grind and patch and crack seal programs, and be able to report how streets are performing long-term. CDOT will utilize this information to implement the most cost-effective preventive maintenance treatments at the optimal times. In addition, CDOT will continue to implement a pavement crack seal program on residential streets and will continue the residential street survey every three years.

"Street condition data for arterial streets was completed in 2014 and street condition data for residential streets was completed in 2015. CDOT will complete arterial and residential street condition surveys every three years.

"CDOT will compare the PCI values between the 2014 and the 2017 surveys to determine trends in pavement deterioration on arterial streets. From this analysis we will set performance goals, track progress made with the grind and patch and crack seal programs, and be able to report how streets are performing. Additionally, CDOT will annually update the residential pavement condition database and mapping tools to show streets that were resurfaced in a particular year and re-survey the entire residential street network every three years. CDOT will analyze the

pavement condition of residential streets to develop Departmental goals to maintain a high percentage of streets above a determined threshold based on available and projected budget.

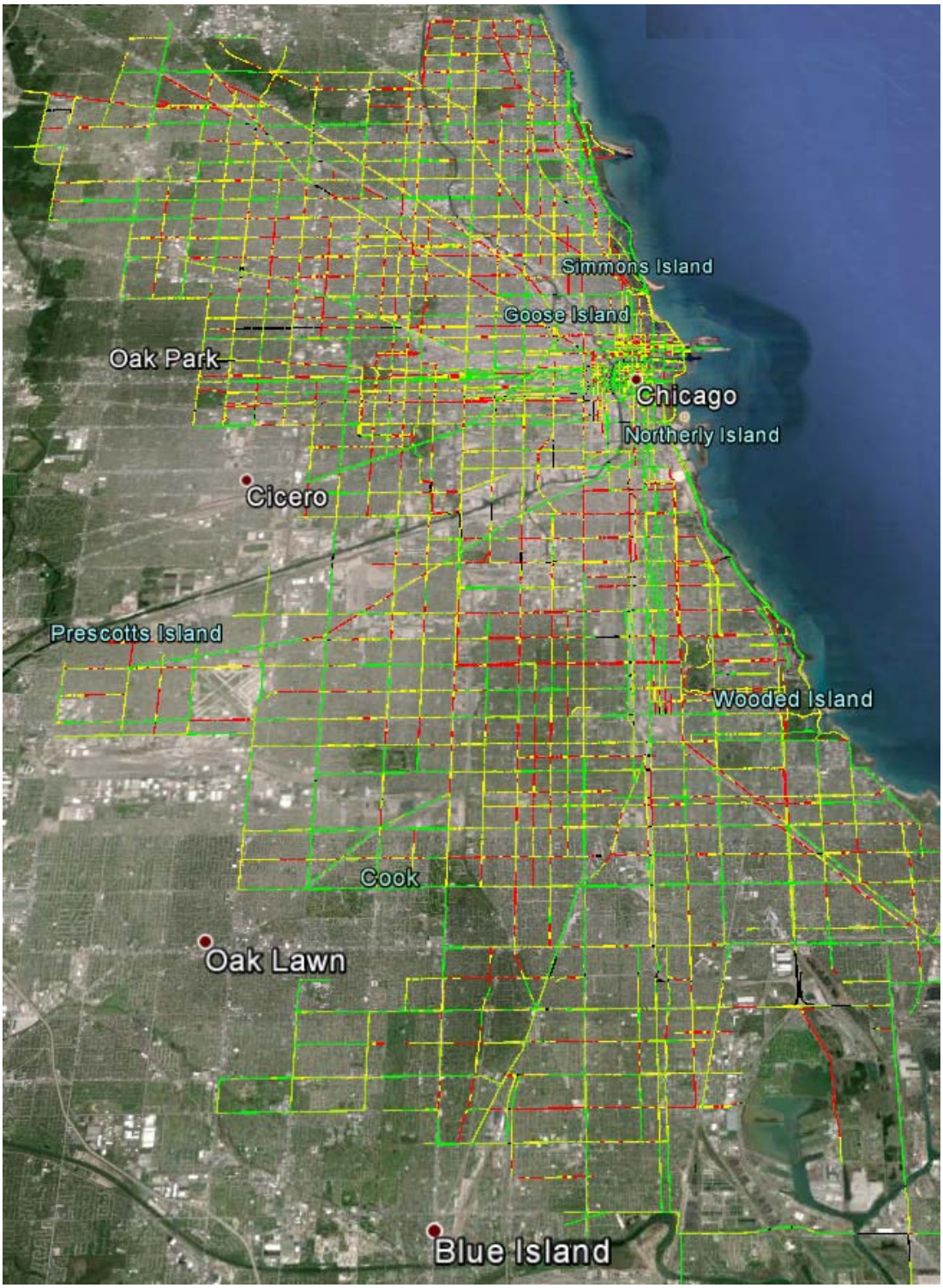
"CDOT will continue to complete residential street pavement condition assessments on a routine basis and continue to provide Aldermen with the relevant condition data information they need to make informed decisions.

"CDOT will continue to develop a pavement preventive maintenance strategy that builds on lessons learned from our 2013 grind and patch and crack seal programs and built upon data collected from the 2014-2015 and future pavement condition assessments. CDOT will prepare budget requests to sustain a citywide pavement preservation program, working within the funding constraints discussed above."[47]

[47] See Appendix E for CDOT's general response to Finding 1 and proposed actions.

V. APPENDIX A: MAP OF 2014 ARTERIAL PCI DATA

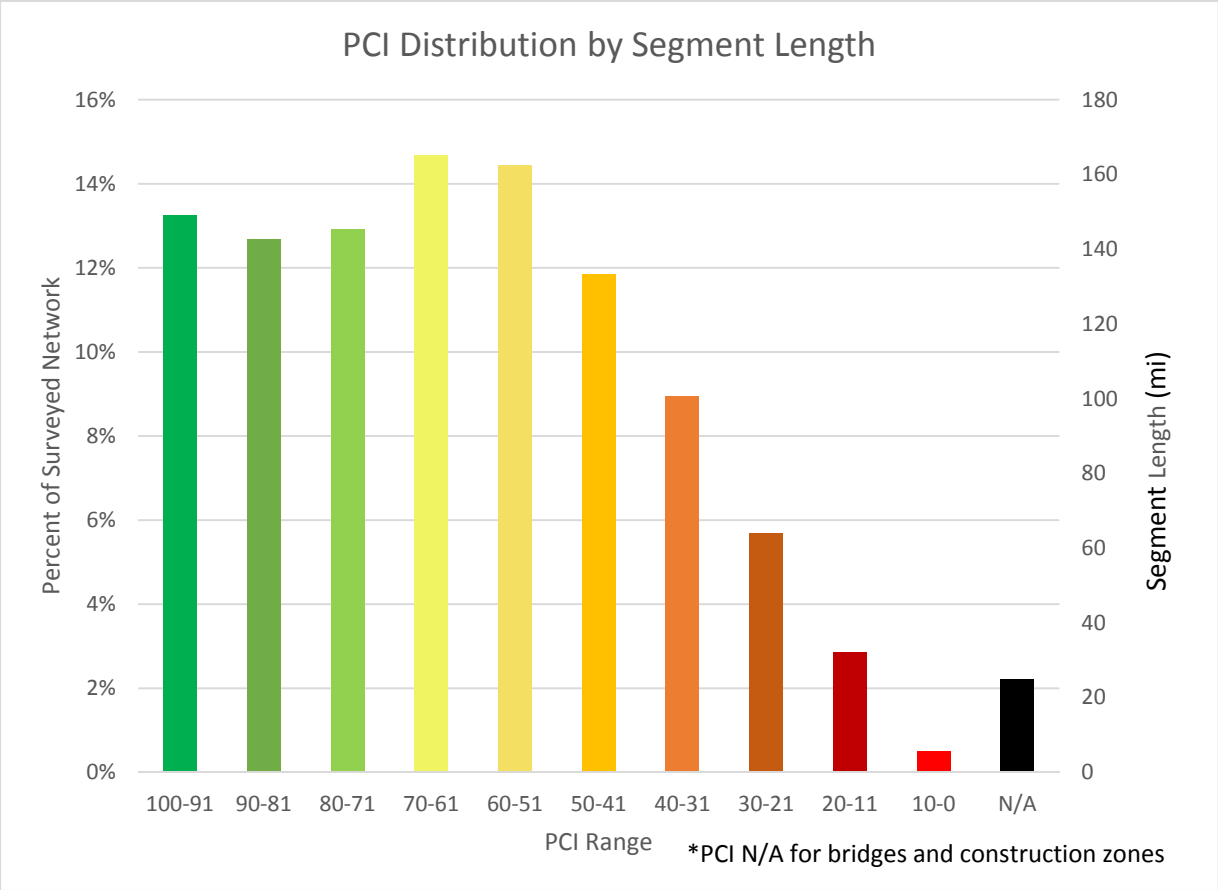
OIG created the map below using Google Earth to plot CDOT's 2014 PCI data for arterial streets. Red = PCI of 0 to 40, yellow = PCI of 41 to 60, and green = PCI of 61 to 100.



Source: OIG created using CDOT PCI data.

VI. APPENDIX B: PCI DISTRIBUTION BY ARTERIAL STREET MILES

In 2014, CDOT completed its first laser-equipped PCI survey of arterial streets. The average PCI was 63—a "satisfactory" condition rating, where 0 is the worst and 100 is the best. The chart below depicts the PCI distribution of arterial streets included in the survey. For example, 15% of the surveyed streets, representing 153 miles, had a PCI of 70 to 61.



Rating	PCI Range
Excellent	100-91
Very Good	90-81
Good	80-71
Satisfactory	70-61
Fair	60-51
Poor	50-41
Very Poor	40-31
Serious	30-21
Critical	20-11
Failed	10-0

Source: CDOT

VII. APPENDIX C: PCI AND SURFACE CONDITION PHOTOGRAPHS

Below are CDOT's photographs depicting the relationship between the 2014 PCI rating and the surface condition of arterial streets.

W. Lawrence Ave. between N. Cumberland Ave. and N. Clifton Ave.—PCI 84

Source: CDOT

W. 76th St. between S. Horne St. and S. Wolcott Ave.—PCI 53

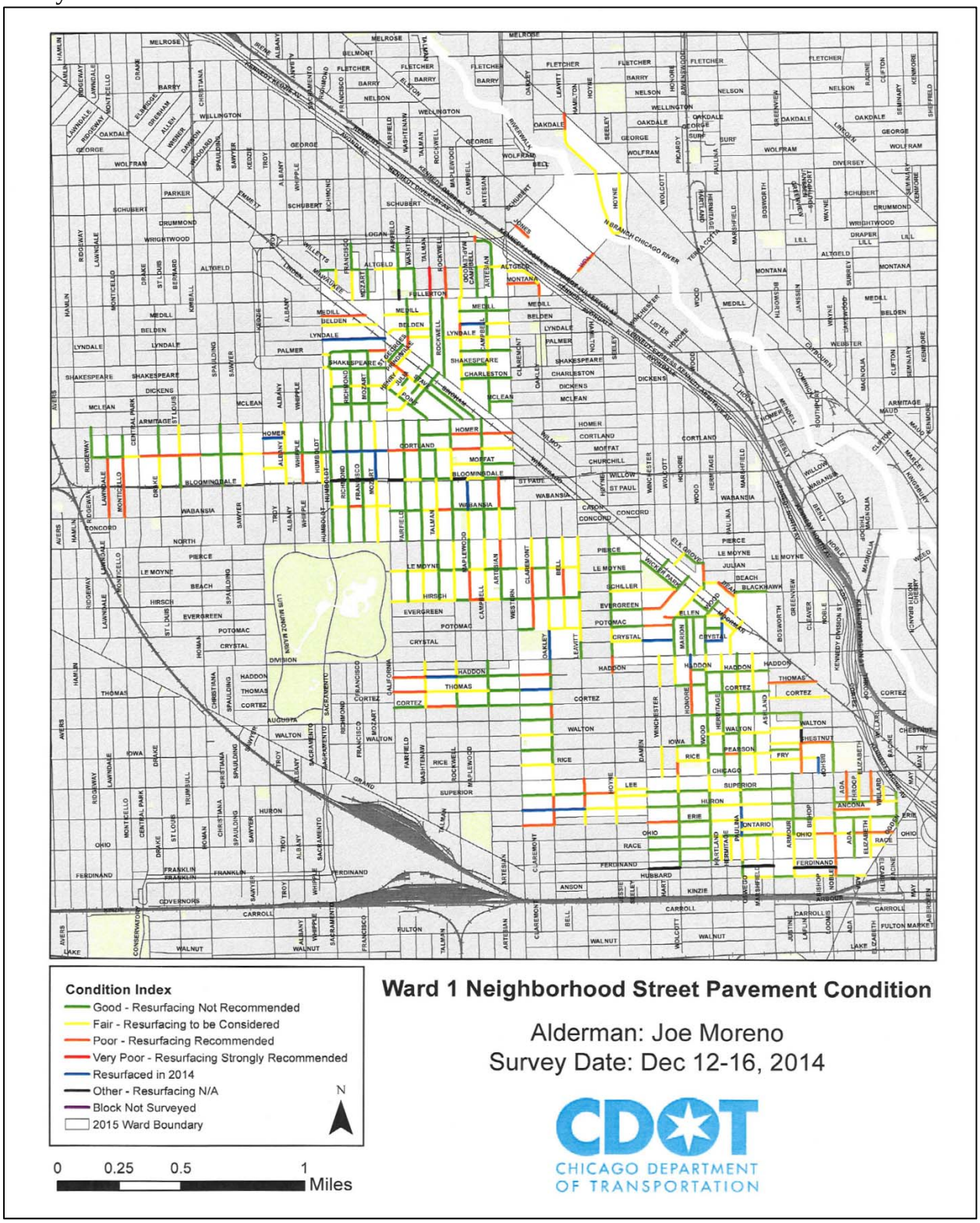
Source: CDOT

W. Garfield Blvd. (eastbound) between S. Racine Ave. and S. Elizabeth St.—PCI 13

Source: CDOT

VIII. APPENDIX D: WARD 1 PAVEMENT CONDITION MAP

Below is an example of a ward map that CDOT created to depict the results of its 2014-15 field survey of residential street conditions.



Source: CDOT

IX. APPENDIX E: CDOT'S MANAGEMENT RESPONSE

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Management Response Form

Project Title and Number: 14-0625 Pavement Management Audit

Department Name: Chicago Department of Transportation (CDOT)

Commissioner/Department Head: Commissioner Rebekah Scheinfeld Date: November 30, 2015

General Response:
CDOT appreciates the OIG's work on this audit and will continue to work to implement the most cost-effective pavement resurfacing, restoration, and maintenance program. CDOT is responsible for roughly 6,000 miles of streets and alleys. This distance is the equivalent of driving round trip from Boston, Massachusetts to Los Angeles, California. Each year, CDOT works to rebuild and renew this system by resurfacing and reconstructing arterial and residential streets, and resurfacing of alleys. Residential street resurfacing is funded through local tax dollars, while most arterial street resurfacing and reconstruction is funded through state and federal sources.

In 2013, CDOT initiated a modernized Pavement Management Program conforming to industry best practices and FHWA Guidelines, as applicable to a large urban city such as Chicago. It should be noted that FHWA Pavement Preservation Guidelines describe preventive maintenance techniques which may be applicable to roadways that range from rural to multi-lane interstate highways. Chicago is a dense urban environment that utilizes the street right-of-way not only for vehicular traffic but also as the primary utility corridor, which results in thousands of pavement cuts annually. Additionally, the right-of-way must accommodate various vehicle types, pedestrians, and cyclists. There are preventive maintenance techniques (such as chip sealing) described in the FHWA guidelines that are not applicable to dense urban environments such as Chicago, and each preventive maintenance treatment has pros and cons which must be evaluated.

For example, chip sealing's benefits include: creates a waterproof the surface; protects the underlying pavement from oxidation, aging and traffic wear; seals small cracks and imperfections; and extends the life of pavement. However, disadvantages of chip sealing include:

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creates loose aggregate on roadways; there is the potential for aggregate to enter into catch basins increasing maintenance cost; car turning and parking maneuvers will dislodge aggregate; additional street sweeping cycles may be required to remove aggregate which has been dislodged; may create an unsafe conditions for bicycles and motorcycles; pedestrians may track asphalt and aggregate onto sidewalks and into buildings; and may entail significant startup costs. In light of this, chip sealing is mostly used on rural roadways without curbs and gutters. The goal of the Pavement Management Program is to optimize the project selection process for pavement preventive maintenance, rehabilitation and reconstruction. Projects are selected for implementation working toward specific performance targets within available resources.

The first steps in the implementation of CDOT's Pavement Management Program were to:

- obtain the services of a pavement management consultant for arterial street planning;
- evaluate the condition of residential streets and utilize this information in pavement maintenance assessment and planning; and
- initiate a pavement crack sealing program.

The pavement management consultant began work in September of 2013 tasked with the following, related to arterial pavement planning:

1) Evaluate Automated Data Collection Methods
2) Evaluate Pavement Management System Software
3) Select Data Collection Method and Software
4) Confirm Compatibility with Networks and GIS Systems
5) Collect Pavement Condition Data (Completed Spring 2014)
6) Evaluate Data and Complete Pavement Condition Survey
7) Review pavement history, Treatment Matrix, and GIS Integration
8) Develop Pavement Management System
9) Engineering Reports and Training

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Tasks 1-6, including the 2014 arterial PCI survey, have been completed. In order to develop a pavement management system that incorporates preventive maintenance techniques at optimum times, it is necessary to have an understanding of pavement deterioration patterns on city streets based on detailed historical records and a comprehensive database of pavement conditions. CDOT began the process of developing this base of information with its 2014 arterial pavement condition survey. Following on its 2014 survey, CDOT plans to comprehensively reevaluate arterial pavement condition in 2017 and every three years thereafter to gain the data to develop and sustain a comprehensive pavement management system that includes pavement reconstruction, resurfacing, and corrective and preventive maintenance.

With respect to residential pavement, CDOT completed a pavement condition survey of 3,000 miles of residential streets between November 2014 and January 2015. The pavement condition rating for 33,603 individual roadway segments was obtained through visual inspection based on standard criteria, which was determined to be the most time- and cost-effective method. The residential street condition data, representative photos, and surveyor notes are stored in color-coded GIS maps created for each Ward. These were imported into CDOT mapping systems, and this data can be exported to spreadsheets, printed for presentation, and also displayed in interactive online webmaps. The data collected through the residential pavement condition survey have been a valuable resource to assist Aldermen to make informed decisions regarding their Aldermanic Menu selections, as further discussed below.

In addition to completing comprehensive evaluations of arterial and residential pavement and initiating long-term pavement management planning, CDOT began utilizing certain preventive maintenance techniques, including the pavement crack seal program that began in 2013. CDOT disagrees with the finding in the OIG report that CDOT did not perform any crack seal efforts between 2000 and 2014. The Department has crack sealed over 1,200 blocks of residential streets and a pilot of 6 ½ miles on arterial streets to date. The placement of crack sealant prolongs the life of the City's pavement. In 2016 CDOT will continue its residential crack seal program and implement a stand-alone crack seal program for arterial streets. CDOT also has a grind and patch program that involves the surface removal of smaller sections of a street that are in poor condition and subsequent replacement with new asphalt.

The data collected through the completed and future arterial and residential street surveys will be used to inform decisions regarding the allocation of resources amongst existing and planned pavement reconstruction, resurfacing, and corrective and preventive maintenance.

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Each year, CDOT works within a set amount of available resources, subject in large part to state and federal allocations, and must determine how to balance preventive maintenance with other programs or capital projects. Allocating additional funds to preventive maintenance means that less funding will be available for other programs and projects. CDOT will continue to work with the Office of Budget and Management to identify and allocate funding for these purposes in the most cost-effective manner and with a view towards the long-term.

OIG Recommendation	Agree/Disagree	Department's Proposed Action	Implementation Timeframe	Party Responsible
OIG recommends that CDOT design and implement a pavement preservation program to achieve the most cost-effective means of extending the life of City streets. To this end, OIG recommends that CDOT, • Determine which preventive maintenance treatments will be the most cost-effective for City streets and the	Agree	As discussed above, CDOT initiated the development of a comprehensive Pavement Management Program in 2013. The department will build on the information already collected through arterial and residential surveys to develop a comprehensive cost-effective preventive maintenance plan. CDOT will program federal Surface Transportation Program funding to complete another pavement condition rating of the City's arterial street system in 2017. The arterial PCI values of the 2014 and the 2017 PCIs will be analyzed and compared to determine pavement deterioration trends on arterial streets. From this analysis we will set performance goals, track progress made with the grind and patch and crack seal programs, and be able	The current crack seal and grind and patch program will be ongoing. Pavement condition surveys will be completed in 2017, after which data will be compared to 2014 pavement condition data and a plan and budget will be developed for 2018	CDOT

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optimal time in the pavement lifecycle to apply such treatments;		to report how streets are performing long-term. CDOT will utilize this information to implement the most cost-effective preventive maintenance treatments at the optimal times. In addition, CDOT will continue to implement a pavement crack seal program on residential streets and will continue the residential street survey every three years.	implementation of a comprehensive pavement preservation program.	
• Collect street condition data on a routine basis in a way that allows the Department to determine pavement lifecycle trends and schedule maintenance activities;	Agree, already occurring	As discussed above, street condition data for arterial streets was completed in 2014 and street condition data for residential streets was completed in 2015. CDOT will complete arterial and residential street condition surveys every three years.	CDOT plans to complete the next arterial and residential pavement condition surveys in 2017 and anticipates additional data collection cycles every three years.	CDOT
• Set pavement performance goals and track and report on progress toward	Agree	As discussed above, CDOT will compare the PCI values between the 2014 and the 2017 surveys to determine trends in pavement deterioration on arterial streets.	Pavement condition surveys will be completed in	CDOT

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those goals;		From this analysis we will set performance goals, track progress made with the grind and patch and crack seal programs, and be able to report how streets are performing. Additionally, CDOT will annually update the residential pavement condition database and mapping tools to show streets that were resurfaced in a particular year and re-survey the entire residential street network every three years. CDOT will analyze the pavement condition of residential streets to develop Departmental goals to maintain a high percentage of streets above a determined threshold based on available and projected budget.	2017 for arterials, after which data will be compared to 2014 pavement condition data and a plan and budget will be developed for 2018 implementation of a comprehensive pavement preservation program.	
• Assign residential street resurfacing decision-making to CDOT subject matter experts by removing it from the purview of the Aldermanic Menu Program;	Disagree	CDOT will continue to complete residential street pavement condition assessments on a routine basis and continue to provide Aldermen with the relevant condition data information they need to make informed decisions.	CDOT will continue to provide Aldermen with information regarding pavement condition and proposed utility	CDOT

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			work on residential streets, on an annual basis.	
• Determine the street maintenance budget based on a citywide pavement preservation program and request funding accordingly; and	Agree	CDOT will continue to develop a pavement preventive maintenance strategy that builds on lessons learned from our 2013 grind and patch and crack seal programs and built upon data collected from the 2014-2015 and future pavement condition assessments. CDOT will prepare budget requests to sustain a citywide pavement preservation program, working within the funding constraints discussed above.	In 2016, CDOT will work with the Office of Budget and Management to determine available funding not only for capital improvements an d corrective maintenance but also preventive maintenance of streets. CDOT's 2017 budget request will include a comprehensive and sustainable Pavement	CDOT

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			Management Plan based on available funding.	
• Hire a pavement preservation engineer and utilize a pavement management system to facilitate such analysis and decision-making.	Agree	CDOT will obtain the services of a pavement management specialist who will be tasked with continuing the work begun in 2013 (the term of this first contract expired in April 2015). 1) Evaluating Automated Data Collection Methods 2) Evaluating Pavement Management System Software 3) Selecting Data Collection Method and Software 4) Confirming Compatibility with Networks and GIS Systems 5) Collecting Pavement Condition Data (2017 PCI) 6) Evaluating Data and Complete Pavement Condition Survey 7) Review pavement history, Treatment Matrix, and GIS Integration 8) Developing Pavement Management System	Obtain consultant pavement management services in 2016. This consultant will perform work similar to the work performed by the pavement management consultant that began work in 2013.	CDOT

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		9) Providing Engineering Reports and Training		

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To Suggest Ways to Improve City Government	Visit our website: https://chicagoinspectorgeneral.org/get-involved/help-improve-city-government/
To Report Fraud, Waste, and Abuse in City Programs	Call OIG's toll-free hotline 866-IG-TIPLINE (866-448-4754). Talk to an investigator from 8:30 a.m. to 5:00 p.m. Monday-Friday. Or visit our website: http://chicagoinspectorgeneral.org/get-involved/fight-waste-fraud-and-abuse/

MISSION

The City of Chicago Office of Inspector General (OIG) is an independent, nonpartisan oversight agency whose mission is to promote economy, efficiency, effectiveness, and integrity in the administration of programs and operations of City government. OIG achieves this mission through,

- administrative and criminal investigations;
- audits of City programs and operations; and
- reviews of City programs, operations, and policies.

From these activities, OIG issues reports of findings and disciplinary and other recommendations to assure that City officials, employees, and vendors are held accountable for the provision of efficient, cost-effective government operations and further to prevent, detect, identify, expose, and eliminate waste, inefficiency, misconduct, fraud, corruption, and abuse of public authority and resources.

AUTHORITY

The authority to produce reports and recommendations on ways to improve City operations is established in the City of Chicago Municipal Code § 2-56-030(c), which confers upon the Inspector General the following power and duty:

> *To promote economy, efficiency, effectiveness and integrity in the administration of the programs and operations of the city government by reviewing programs, identifying any inefficiencies, waste and potential for misconduct therein, and recommending to the mayor and the city council policies and methods for the elimination of inefficiencies and waste, and the prevention of misconduct.*