THE CITY OF SAN DIEGO

Report to the City Council

DATE ISSUED: September 22, 2016 REPORT NO.

ATTENTION: Infrastructure Committee

SUBJECT: 2015-2016 Pavement Condition Assessment

REQUESTED ACTION:

THIS IS AN INFORMATIONAL REPORT ONLY. NO ACTION IS REQUIRED BY THE COMMITTEE OR THE CITY COUNCIL.

BACKGROUND:

The Street Division has a goal of assessing street pavement condition once every four years. Since 2001, the Division has retained specialized pavement engineering consultants to perform surveys of the street network. These surveys have varied in scope on how many and which streets were surveyed. **The first full assessment of the City's street network was completed in 2011, which resulted in an Overall Condition Index (OCI) of 59*. The second assessment of the entire network was recently completed with a significantly improved OCI of 72.**

The results of the assessment are paramount information to accomplish the Mayor's goal of performing 1,000 miles of street repairs in five years or less and raising the OCI to an average of 70. The primary objectives of the pavement condition assessment were to provide the information necessary to:

- Determine pavement condition and ride quality for each street segment
- Analyze trends in overall network conditions
- Correlate pavement treatments and long-term preservation results
- Refine construction and funding estimates for desired service levels

OVERVIEW OF 2015-2016 PAVEMENT CONDITION ASSESSMENT

Pavement condition data is a critical component of the City's Pavement Management Program. This data, which is collected and updated regularly, enables City staff to assemble a comprehensive plan for pavement preservation and treatment strategies. City staff analyze and compare different pavement of street segments throughout the City and determine the most cost-effective and beneficial street pavement treatment. In March 2015, the City contracted with Cartegraph Systems, Inc. for $556,675.90 to perform an assessment of the City's street network.

*Note that a previous report showed an OCI of 55; however, to be consistent with the 2015-2016 methodology, 2011 data was recalculated using the current methodology for an updated 2011 OCI of 59.

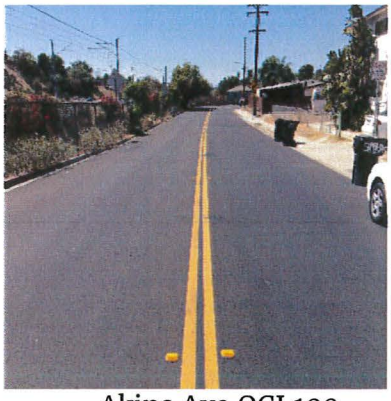
Cartegraph Systems, Inc. utilized a modified ASTM Standard D 6433-11 method "Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys" to determine pavement distresses. This assessment was conducted as a "windshield" assessment which allows a large network of streets to be assessed in a relatively short amount of time. A "windshield" assessment is recording pavement condition from moving vehicles with video equipment. In addition, a laser profiler was utilized to analyze the road roughness also known as the "ride".

The assessment team drove on and assessed more than 97% of the total street network to record the Pavement Condition Index (PCI) and Ride Condition Index (RCI). This information was then used to calculate the OCI for each segment. A small percentage of roads were unable to be driven due to construction or special event closures.

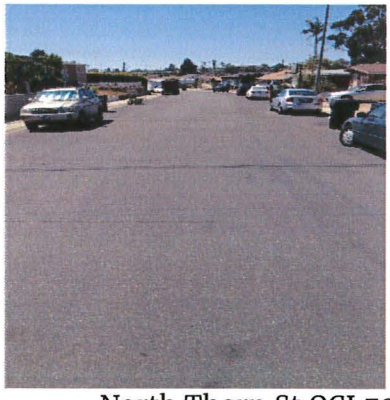
The OCI is a rating system developed by the U.S. Army Corps of Engineers, which is made up of two factors: PCI and RCI. PCI is a score from 0 to 100 rating the amount of distresses as determined by ASTM Standard D 6433-11. RCI is a score from 0 to 100 of the roughness of the road as determined by a laser profiler. OCI is a combined score of PCI and RCI, with PCI accounting for 60% of the score and RCI, 40%. An OCI score of 100 represents a pavement surface in perfect condition while a score of 0 represents pavement that is beyond repair and requires complete reconstruction.

Factors for determining OCI include: type of street, age, oxidation, deterioration rate, average daily traffic (ADT), type and size of cracks, number of potholes, previous maintenance, and quality of ride. Streets are placed in one of three categories based on the OCI: Good, Fair, or Poor.

Good - A street in good condition has little or no cracking, no potholes, or other distresses; has excellent drivability; and needs little maintenance or remedial repair. It has an OCI rating between 70 and 100. Examples of streets in good condition are shown below:



Akins Ave OCI 100

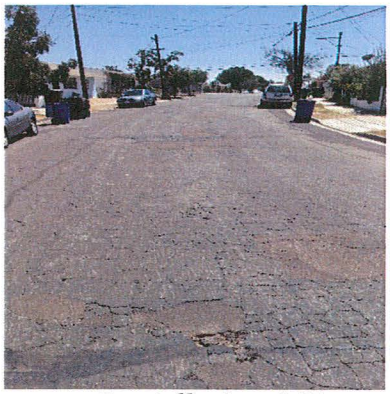


North Thorn St OCI 70

Fair - A street in fair condition has moderate cracking, some minor potholes, has adequate drivability, and is typically in need of remedial repairs and a slurry seal, or a minor area

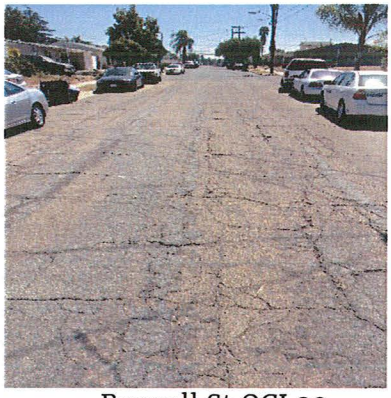
repairs. It has an OCI rating between 40 and 69. Examples of streets in fair condition are shown below:

Jacumba St OCI 50

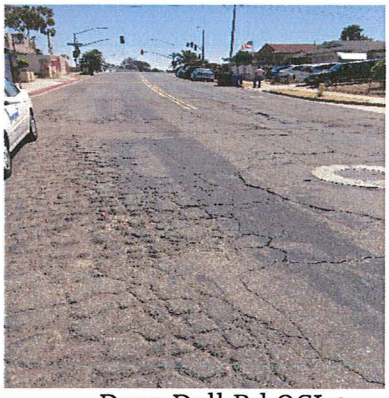


Sawtelle Ave OCI 40

Poor - A street in poor condition has severe cracking, numerous areas of failed pavement with possible sub-base failure, exhibits a rough ride, and requires a comprehensive repair or a total reconstruction. It has an OCI rating between 0 and 39. Examples of streets in poor condition are shown below:



Bonsall St OCI 30



Deep Dell Rd OCI 0

To ensure quality data, City staff reviewed the data provided by Cartegraph Systems, Inc. at multiple submittals to validate the information. Cartegraph Systems, Inc. also hired an independent, specialized engineering firm to perform quality control.

CITY STREET NETWORK

The City of San Diego's current street network consists of approximately 3,000 miles of streets. This includes 2,668 miles of asphalt streets, 120 miles of concrete streets, and 204 miles of paved alleys. These figures are updates to those previously reported. The City's street network is divided into street segments: typically a one block section of a street from center of intersection to center of intersection. These segments are classified based on function and ADT volume. A description of classifications is included in Table 2.

CONDITION OF CITY STREETS

The 2015-2016 condition assessment survey has determined that 60% of the City streets are in good condition, 34% are in fair condition, and 6% are in poor condition, with an OCI of 72. This is a dramatic shift from the survey conducted in 2011 in which 35% of the streets were in good condition, 40% were in fair condition, and 25% were in poor condition, with an OCI of 59. The 2011 Street Condition Pavement Report, Report 11-153, described an OCI of 55; however, to be consistent with the 2015-2016 methodology, 2011 data was recalculated using the current methodology for an updated 2011 OCI of 59. The following Table 1 compares results of the 2015-2016 citywide pavement survey with previous surveys.

Table 1: Historical Network Pavement Conditions

		Percentage of Streets by Condition		
Year	**OCI**	**Good 70-100**	**Fair 40-69**	**Poor 0-39**
2001	67*	49%	42%	9%
2003	62*	40%	42%	18%
2007	63*	-	-	-
2011	59	34%	44%	22%
2015-2016	**72**	**60%**	**34%**	**6%**

*** Assessments prior to 2011 included a sampling of City streets to determine the network average OCI. The two most recent assessments included an assessment of the full network.**

Since the condition assessment survey performed in 2011, a total of 520 miles of streets have been paved, 856 miles have been slurry sealed, and 11 miles of concrete streets have been replaced.

Additional calculations were performed to breakdown OCI by street classifications. This information is useful for development of service levels and shows where needs are in the system network. Results are detailed in Table 2.

Table 2: OCI by Street Classification

Street Classification	Description	OCI
Local	A street that primarily provides direct access to abutting property. It carries low vehicular movement, low to heavy pedestrian movement, and low to moderate bicycle movement. It has on-street parking, street trees, traffic safety lighting, and sidewalks.	70
Alley	A roadway, usually unnamed, which primarily provides secondary vehicular access to the rear and side entrances of abutting property.	67
Collector	A street that primarily provides movement between local/collector streets and streets of higher classification, and secondarily provides access to abutting property. It carries low to moderate vehicular movement, low to heavy pedestrian movement, moderate to heavy bicycle movement, and low to moderate transit movement. It has on-street parking, street trees, traffic safety street lighting, and sidewalks	74
Primary Arterial	A street that primarily provides a network connecting vehicles and transit to other primary arterials and to the freeway system. It carries heavy vehicular movement while providing low pedestrian movement and moderate bicycle and transit movements. It has a raised center median, bicycle lanes, street trees, traffic safety street lighting, sidewalks, and no access from abutting property.	71
Major	A street that primarily provides a network connecting vehicles and transit to other major streets and primary arterials, and to the freeway system and secondarily provides access to abutting commercial and industrial property. It carries moderate to heavy vehicular movement, low to high pedestrian and bicycle movements, and moderate to high transit movement. It has a raised center median, street trees, traffic safety street lighting, and sidewalks, and may include landscaping, pedestrian scale, lighting, underground utilities, on-street parking, and/or bike lanes.	76

MEASUREMENT OF MILES

There are several methods of tracking the amount of street repair completed, and different cities and agencies use various methods. Street Division can track the City's street network in "centerline miles", "lane miles", and "repair miles". Centerline miles measure the length of a street in miles along its centerline. Since centerline miles do not differentiate between streets of different sizes or widths, the City currently reports street repair mileage in repair miles. Repair miles equal centerline miles for streets less than 50 feet wide and double centerline miles for streets 50 feet or more wide. While repair miles help standardize street repair between streets of various sizes, the amount of repair completed is not fully captured. For this reason, in Fiscal Years 2017 and beyond, Street Division will also report resurfacing mileage in "lane miles" as well. Lane miles are centerline miles multiplied by total number of lanes (assuming 12-foot pavement widths). The use of lane miles is

consistent with measurement reported by other entities such as the City of Los Angeles and the California Department of Transportation (CalTrans). A comparison of centerline, repair, and lane miles is shown in Table 3.

Table 3: Comparison of Centerline, Repair, and Lane Miles

	Repair Miles	Centerline Miles	Lane Miles
City of San Diego Network	3,850	2,992	~9,400

CONDITION BENCHMARKING

Municipalities target different goals for their street networks depending on availability of funding, size of the street network, and other needs and priorities. Any condition goal should be specific to the needs of the public agency since there is no defined national industry standard goal for pavement condition. Table 4 shows a comparison of PCI among major cities in California. PCI is shown as 71 for the City of San Diego as compared to an OCI of 72.

Table 4: PCI Comparison of California Cities

California City	Street Network	Average Condition*	Assessment Year
San Diego	2,992 centerline miles	71	2015-2016
Los Angeles	6,500 centerline miles	62	2015
San Jose	2,400 centerline miles	63	2014
San Francisco	2,112 lane miles	67	2014
Oakland	1,964 lane miles	55	2009

** Methodology for calculation of condition index may vary by city*
Sources: 2015 City of Los Angeles State of the Streets Report
Metropolitan Transportation Commission, "Pavement Condition of Bay Area Jurisdictions 2009"
Press Release, "San Francisco Street Pavement Condition Improves for Third Straight Year"

Table 5 illustrates the City's progress in improvement of street condition in comparison to California counties on a weighted PCI basis. Note that the City of San Diego comprises approximately 51% of San Diego County's reported lane mileage.

Table 5: PCI Comparison of California Counties

City of San Diego		
Street Centerline Miles	**Lane Miles**	**Average Weighted PCI**
2,992	9,400 approx.	71

2014 Save California Streets Report			
County (Cities Included)	**Centerline Miles**	**Lane Miles**	**Average Weighted PCI 2014**
San Diego County	7,814	18,596	66
Riverside County	7,561	16,835	70
Fresno County	6,196	12,680	69
Los Angeles County	21,330	57,630	66

SELECTION CRITERIA FOR STREET REPAIR

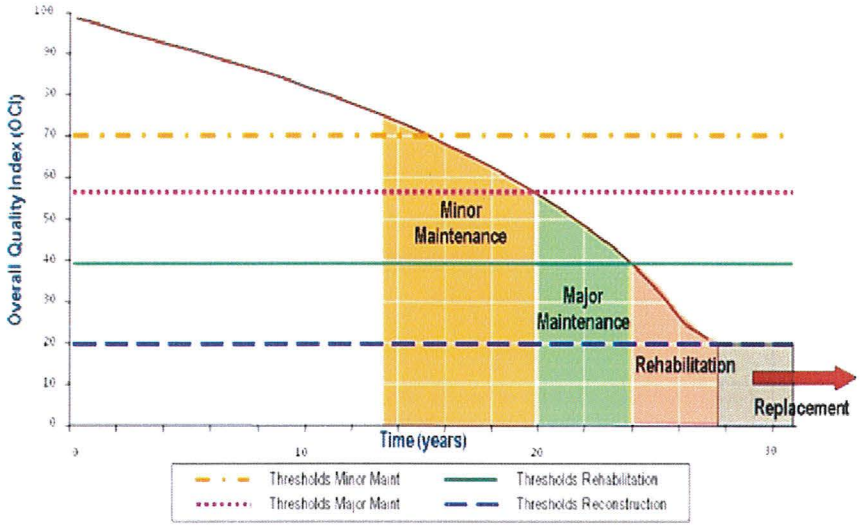
Current methods of maintenance and repair utilized within the City's Pavement Management Program include asphalt overlays and slurry seal surface treatments. Streets are selected for overlay or slurry sealing based on established criteria. These criteria are:

- OCI
- Maintenance History
- Functional Classification
- Proximity to Emergency Facility/School/Tourist Attraction
- Community Input
- Mayor/Council Input

The primary criterion used in the street selection process is the OCI of a particular street segment. The OCI data from pavement assessment surveys is contained in the Pavement Management System. The Pavement Management System assists staff in determining which streets are in need of maintenance and suggests the best method to maintain each section of street. In addition, the system analyzes the entire City street network to determine the most cost-effective maintenance plan given specific budget constraints.

Chart 1 is a typical street deterioration curve showing a pavement's lifecycle. This deterioration curve illustrates that streets which are successfully maintained at an OCI of approximately 60 or higher require much less extensive major maintenance activities such as asphalt overlays. The deterioration curve also illustrates that after a street reaches an OCI of 65 the rate of deterioration accelerates dramatically.

Chart 1: Pavement Lifecycle



The most cost-effective way to extend a street's service life is to perform minor maintenance, typically surface treatments such as slurry seal, before it reaches the critical deterioration drop-off point referred to on Chart 1 as Major Maintenance. Minor maintenance, such as slurry seal, in general increases the OCI by 35 and extends the life of the street by three to seven years depending on traffic load and other factors.

TYPES OF STREET REPAIR

Asphalt Paving / Overlay / Inlay - Asphalt paving is the placement of a new layer of asphalt at a thickness of 1.5 to 3 inches. Overlay consists of edge grinding typically 4 feet wide from the curb and gutter and placement of 1.5 inches of asphalt curb to curb. Overlay is typically used when a thicker street section is needed. Most paving contracts consist of Inlay. Inlay consists of removal of the existing asphalt surface via milling to a depth of 2 to 3 inches depending on street classification and ADT. These types of capital repairs are contracted out to private paving companies.

Slurry Sealing - Slurry sealing is a seal coat treatment which consists of sand, emulsion, and water applied in a thin layer up to a 3/8 of an inch thick across the street surface. A slurry seal coating is used to preserve the state of asphalt pavements in fair to good condition. As part of this process, crack sealing and occasional surface repairs can be recommended by pavement specialists prior to sealing. Since 1998, Street Division has utilized a rubberized slurry seal. This material incorporates rubber from recycled tires, retains a darker finish longer and is a more resilient coating product.

Concrete Replacement – Unlike asphalt, concrete streets cannot be resurfaced and need to be completely reconstructed. Repairs to concrete streets range from patching with asphalt to removal and replacement of isolated concrete panels or complete reconstruction of the entire roadway.

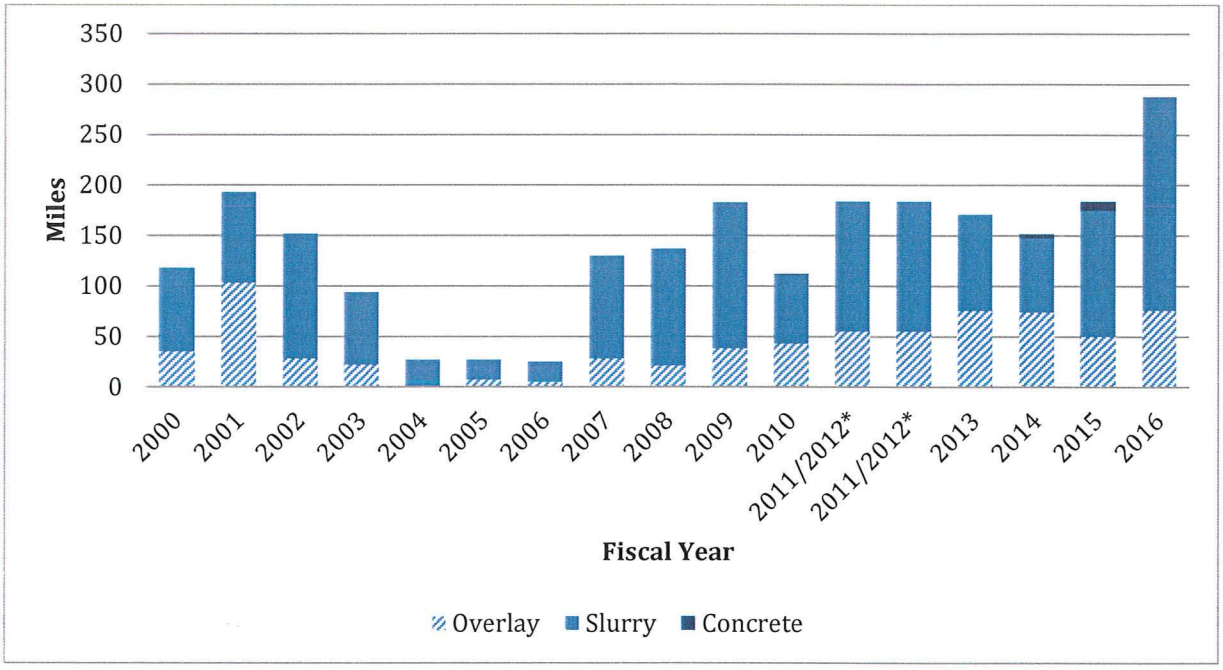
Street Reconstruction – Once a street's pavement exhibits visible signs of several distresses and its OCI has fallen below 25, the street most likely requires reconstruction. This is fundamentally because the base layers under the asphalt need to be replaced and re-compacted before new pavement can be applied. A majority of the streets in the poor condition require this type of repair. Reconstruction is more costly than asphalt paving.

Minor Asphalt and Concrete Repair - These types of street repairs are usually less than one block in length and are performed by City maintenance staff. Examples of repairs in this category are pothole patching, small asphalt paving (100 to 5,000 square feet), concrete street and alley repairs, and cross-gutter repairs.

PAVEMENT REPAIR HISTORY

For many years, pavement preservation efforts were insufficient and led to network-wide deterioration. Recent repair efforts have improved pavement conditions. The graph in Chart 2 shows the miles of street repairs completed in each fiscal year since 2000.

Chart 2: Pavement Repairs Fiscal Years 2000-2016



* There were contract delays in Fiscal Year 2011 and as a result the majority of the programmed Fiscal Year 2011 repairs were executed in Fiscal Year 2012. The average miles completed in Fiscal Years 2011 and 2012 are displayed. This chart excludes repairs completed by projects not within the City's Pavement Management Program, as the repairs were not centrally tracked prior to 2013-2014.

Given tight financial constraints and competing priorities for funds, the City Council adopted a Five-Year Deferred Capital Program Funding Plan on March 20, 2012, known as Enhanced

Option B. Through the appropriation of bond funds, the utilization of Proposition 42 Replacement and TransNet funding, and with additional General Fund budget support for maintenance and repair efforts, the City intensified efforts to address the condition of city streets. This funding plan was intended to slow the deterioration of City assets, including the street network. Yet with the increased level of investment, the City has seen an improvement in street conditions.

Table 6 shows the amount of street repair that has occurred since Fiscal Year 2014.

Table 6: City Pavement Repairs Fiscal Years 2014-2016

Fiscal Year	Asphalt Paving Miles	Slurry Seal Miles	Concrete Repair Miles	Total Miles
2014	104	95	2	201
2015	91	141	9	241
2016	103	219	0	322

SUMMARY

The City's street pavement network has reached the Mayor's goal of an average OCI of 70 and the current pace of paving is on schedule to meet the 1,000-mile goal in less than five years. The associated repairs and level of funding necessary to continue to meet the Mayor's goal of an OCI 70 will be forecasted using the results from this assessment.

PREVIOUS COUNCIL and/or COMMITTEE ACTION:
December 2014, R-309440, approval of pavement assessment contract

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