

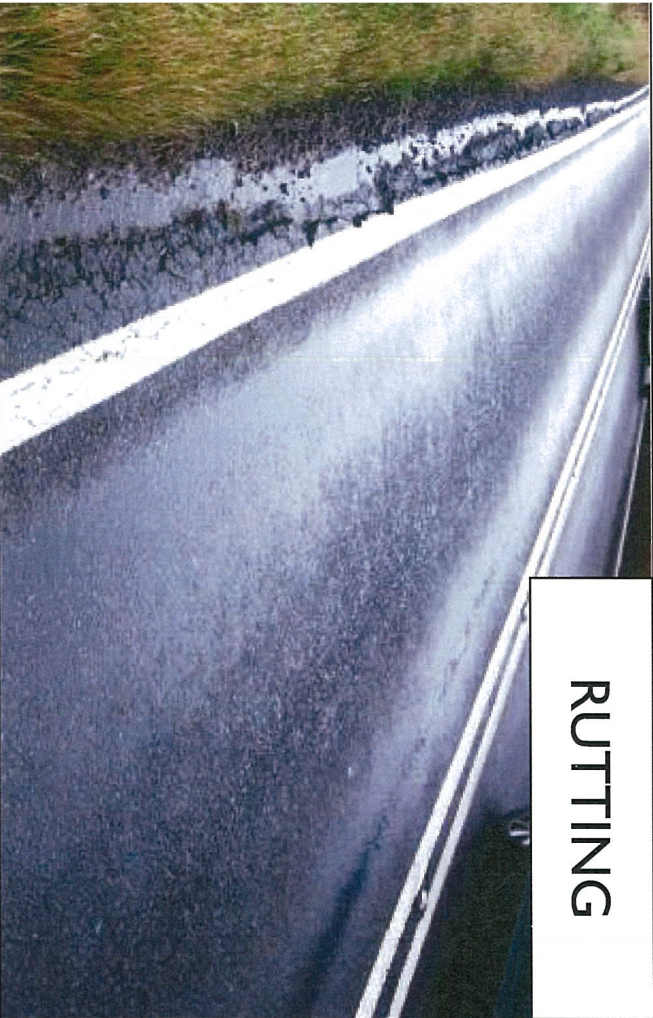
# City of Houston – Street Surface Assessment Vehicle Overview Presented – June 1, 2012



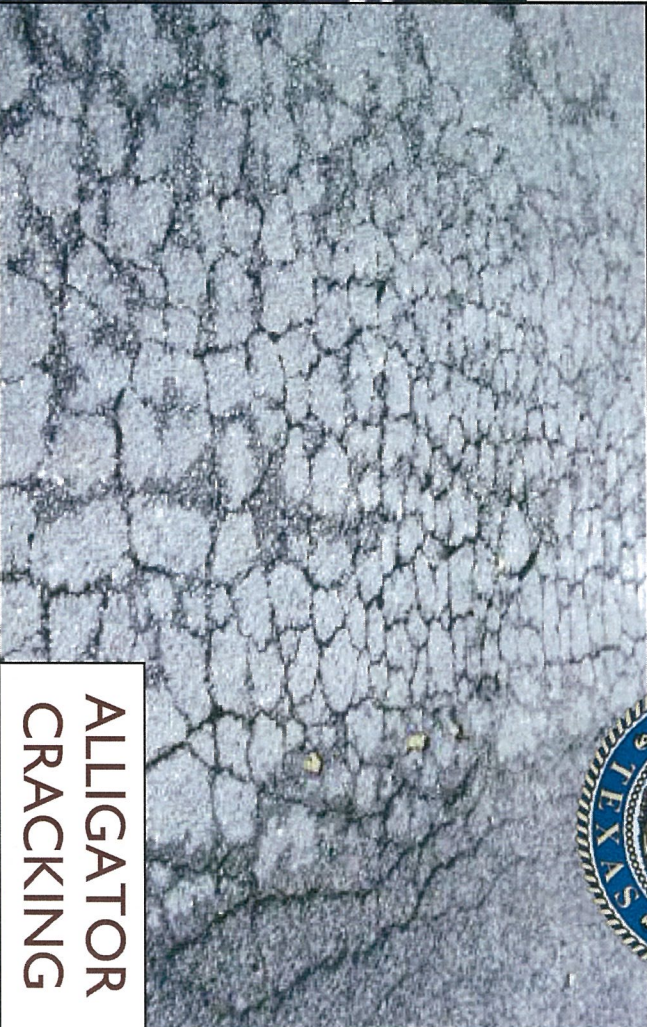
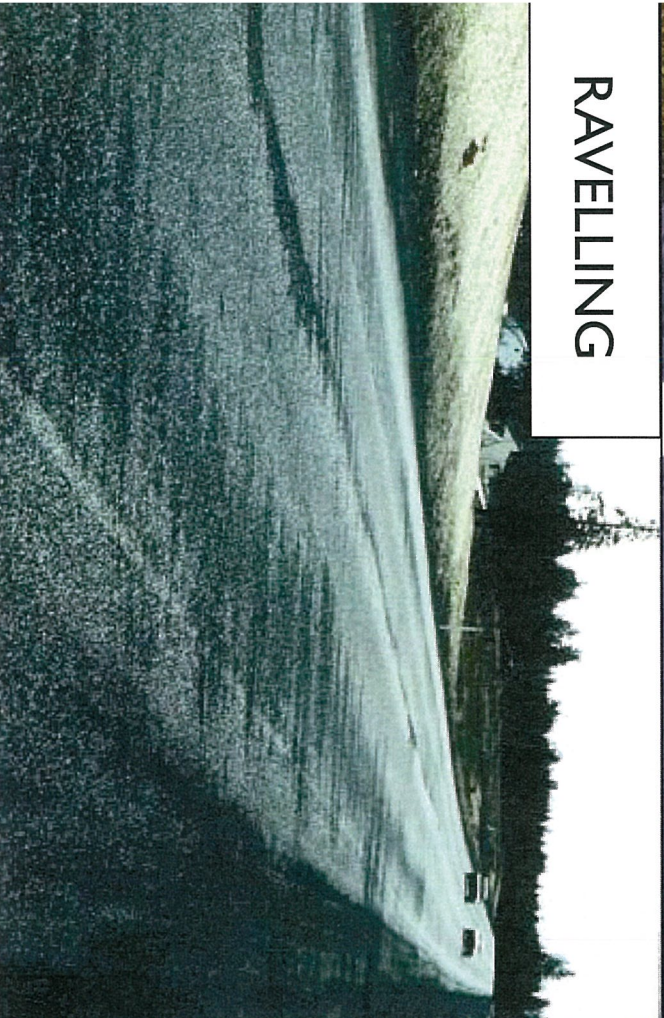


# Typical Roadway Conditions

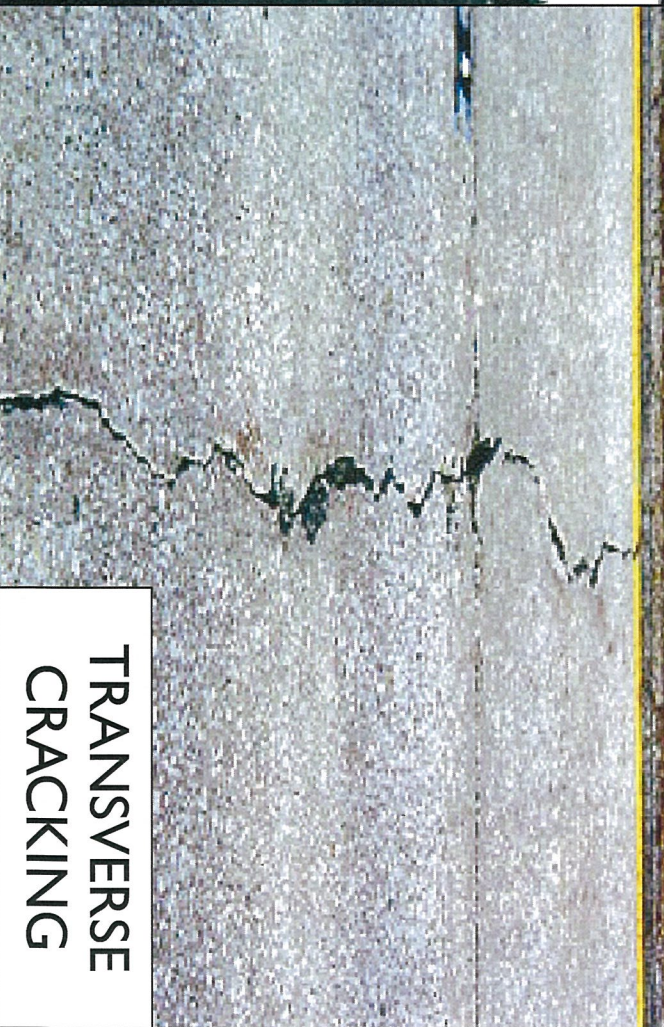
RUTTING



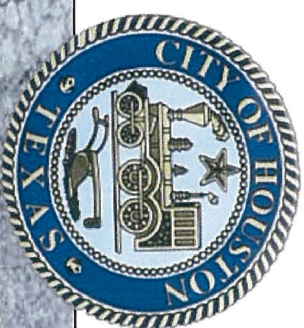
RAVELLING



ALLIGATOR  
CRACKING

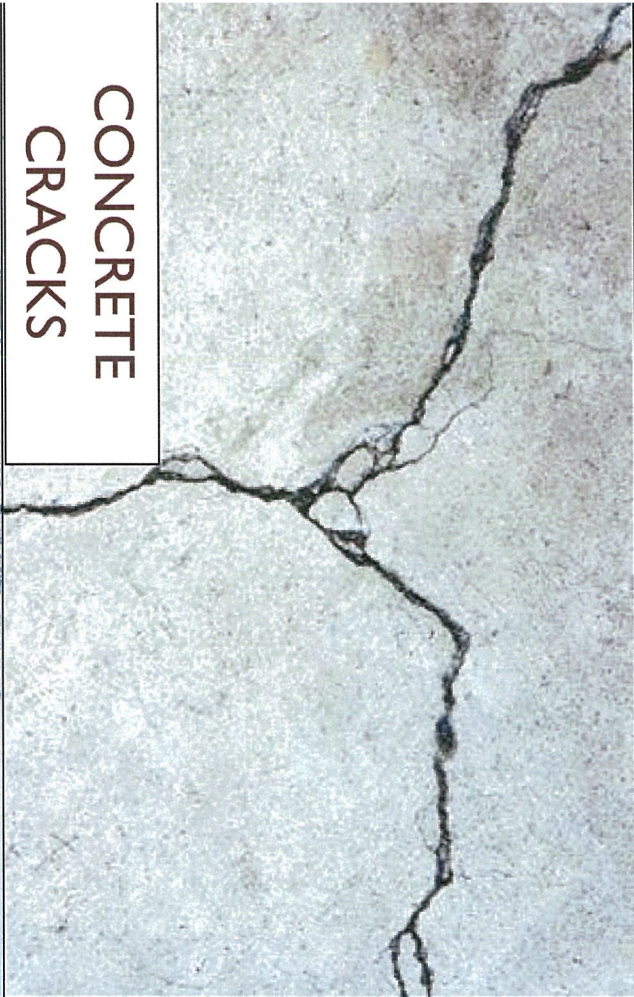
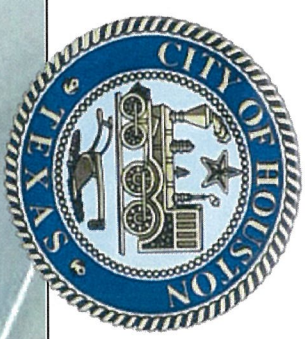


TRANSVERSE  
CRACKING





# Typical Roadway Conditions



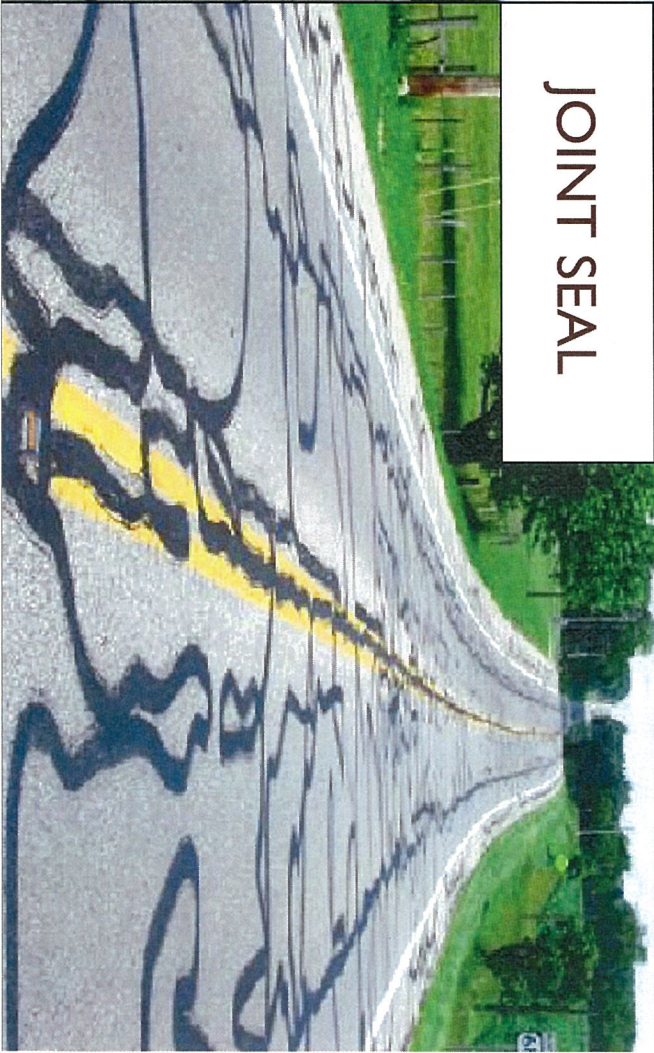
CONCRETE  
CRACKS



LONGITUDINAL  
CRACKING



SLAB/PANEL  
REPLACEMENT



JOINT SEAL



## Goals Identified for an Alternative Solution



- Efficient assessment of roadways in a timely manner
- Non-subjective process for pavement rating
- Data accessible to multiple viewers & the public
- GIS integration
- Customizable PCR score range utilizing specific street conditions
  - Roughness
  - Rutting
  - Cracking
  - Other various street conditions
- PCR Score that can aid in prioritizing future capital projects and maintenance decisions



## Development of a Solution



- Partnership with Idea Integration, Inc. to develop the Street Surface Assessment Vehicle (SSAV)
- Utilization and coordination of various technologies housed in a mobile unit
- Began testing July 2009
- Full production began May 2010
- Assessments are anticipated to occur every 2 years
  - Major thoroughfares to be assessed annually
- Estimated 5-year initial system life
  - 3 Assessments



# How Does it Work?



# Technical Components of the Street Condition Assessment Vehicle



CrackScope

360 degree camera

GPS Unit

Accelerometer  
(inside van)

Distance  
Measuring  
Instrument

Road Profiler



## Technical Components of the Street Condition Assessment Vehicle



The following systems are onboard the vehicle:

- **Road Profiler:** The Road Profiler is mounted on the front bumper of the vehicle. It contains three lasers and two accelerometers that are used to capture both the roughness (IRI) and the rutting of the road.
- **Line Scan Camera System:** The vehicle is outfitted above the back end with a line-scan camera system called CrackScope. It takes high-resolution images that are analyzed by post processing software to automatically detect the severity & extent of cracking on the pavement.
- **Accelerometer:** This device tracks the speed of the vehicle and is used to account for vehicle motion when data is being gathered.





## Technical Components of the Street Condition Assessment Vehicle



The following systems are onboard the vehicle:

- **360° Video:** A camera ball with 11 cameras taking 30 frames per second is mounted on a mechanical arm that extends above the van. The video produced allows the user to pan in all directions while viewing the right-of-way. This is similar to the Google Street View technology.

- **GPS and DMI Devices:** The vehicle is also equipped with a Trimble GPS receiver and a DMI (Distance Measurement Instrument) device. The data from these instruments is used in post processing to tie components together and calculate the position of the vehicle.



## How the Score is Calculated



- The Pavement Condition Rating (PCR) is calculated according to the following formula:
  - $PCR = 100 - (\text{Rutting Deduction} + \text{IRI Deduction} + \text{Total Cracking Deduction})$
- The Total Cracking Deduction is a combination of low, medium and high severity cracking
- The final PCR score for a road segment is the average PCR score for the most recent run of each of the lanes driven in the segment
- Each category is weighted by a maximum possible PCR point deduction



## How the Score is Calculated



- There is a maximum deduction of 70 points per street segment based on the following categories:
  - Rutting – Up to 15 points deducted
  - IRI (Roughness) – Up to 30 points deducted
  - Cracking – Up to 25 points deducted based on the following cracking categories:
    - Low (up to 5 pts.) = Avg length of cracks per sq. meter with widths is < than 3mm in one area
    - Medium (up to 8 pts.) = Avg length of cracks per sq. meter with widths is 3-6mm in one area
    - High (up to 12 pts.) = Avg length of cracks per sq. meter with widths is > 6mm in one area
- A PCR score of 30 is the lowest possible score for any segment able to be traveled over by the SSAV



## The Obstacles Identified



- Clear weather is needed for accurate assessments
- No standing water can cover pavement assessed
- Measured distance traveled only (centerline miles)
- Did not identify or “asset tag” any items



## Future:

- Upgrades (Costs vary)
  - Asset Tagging
  - Roadway width calculations
  - Ground-penetrating radar
  - Other system improvements
- COHGIS Roads

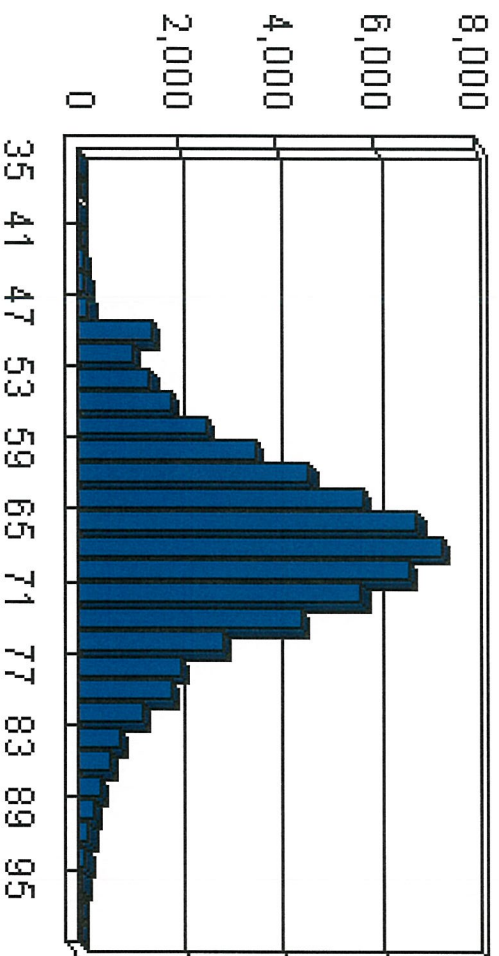




# Examining the Results



Frequency Distribution



PCR Score Distribution

All City Street Scores	% of total
35	10.00%
58.66	20.00%
64.63	40.00%
71.7	20.00%
78.08	10.00%

## Supplemental Data For All Streets:

Mean PCR score: **67.50**

Minimum PCR score recorded: **35**

Maximum PCR score recorded: **100**

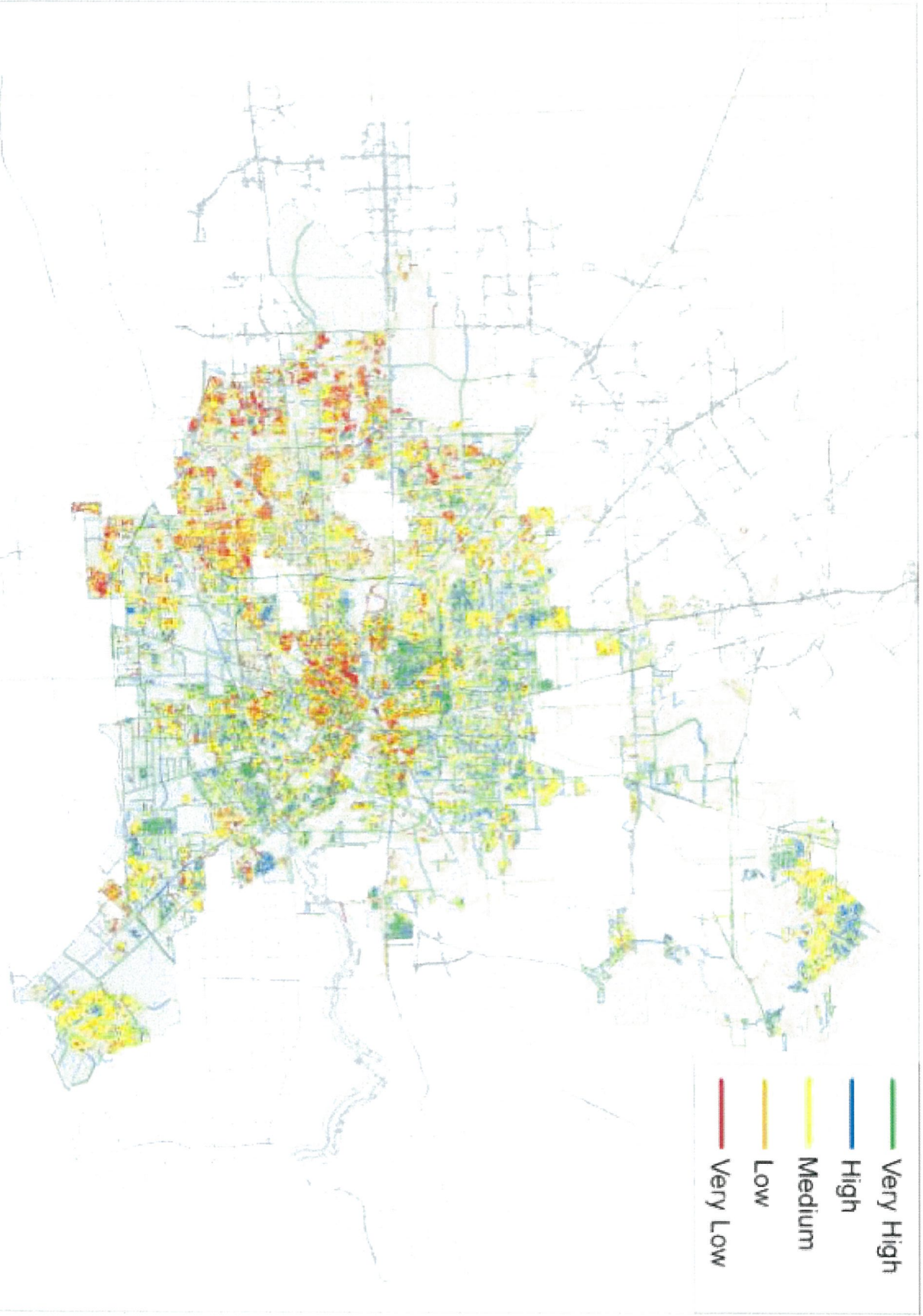
\*Over 66,000 street segments analyzed\*





# Accessing Information

STREET SURFACE ASSESSMENT VEHICLE DATA





# Information Management System



The screenshot displays the City of Houston GIMS web application. At the top, the browser title is "Houston GIMS - Windows Internet Explorer provided by MSN & Bing". The page header includes the City of Houston logo and the text "City of Houston Department of Public Works & Engineering GIMS Geographic Information & Management System".

The main interface features a map of a residential area with various streets and colored overlays. A "Public Works GIS" toolbar is visible on the right side of the map. A "Landbase and Floods" legend is located in the bottom right corner, showing categories for "Landbase and Floods", "Landbase and Roads", and "Street Assessment" with corresponding line styles and colors.

Two pop-up windows are open:

- Landbase and Floods:** A blue window with a search bar and a list of fields: Parcel (Current), Parcel, Address, Lot Number, Block Number, Lot Dimension, Parcel (2003), Address, Street Name, Major Thoroughfares, Edge of Pavement, Street Classification, Street Assessment, Houston Alley, and Aerial Photography. Below the list is a "Click, Identify, Legend or Download Layers icon above" button.
- Legend:** A blue window titled "Landbase and Floods" containing a legend for "Landbase and Floods", "Landbase and Roads", and "Street Assessment". It includes color-coded lines for "Very Low", "Low", "Medium", "High", and "Very High".

The map shows a grid of streets including W Airport Blvd, W Bayland St, W Bunker St, W Shafter St, and others. A scale bar at the bottom left indicates 100 feet.