

**THE IMPACT OF SEMI-AUTOMATED PAVEMENT DISTRESS COLLECTION  
METHODS ON PAVEMENT MANAGEMENT NETWORK-LEVEL ANALYSIS  
USING THE MTC STREETSAVER<sup>®</sup>**

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Project 476290  
Project Title: Introduction/Guidance on PMS Procedures

Prepared for  
Metropolitan Transportation Commission (MTC)

August 2007

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# CHAPTER 1:

## INTRODUCTION

The purpose of this report is to discuss the impact on network-level analysis using pavement distress data from semi-automated data distress methods when compared to distress data collected manually in the MTC StreetSaver<sup>®</sup> pavement management software.

The two pavement networks used in the study were from the cities of East Palo Alto and Piedmont, California. Four vendors participated in this study: Adhara, Fugro, IMS, and Stantec.

### City of East Palo Alto, CA

East Palo Alto (EPA) is situated on the San Francisco Peninsula, roughly halfway between the cities of San Francisco and San Jose. This urban city is relatively flat and has 246 management sections and 79.99 lane miles with a network area of 968,596.6 yd<sup>2</sup>. Table 1 shows the network distribution by number of lanes. Table 2 gives the composition by functional class, and Table 3 classifies the pavement sections by surface type. The pavement network is mainly composed of residential and local streets, 70.3 percent of the network. The predominant surface type is asphalt concrete (AC) with 79.94 percent of the total area. Almost all the sections are two-lane streets (98.79 percent) with an average width of 30.43 feet.

The average pavement network condition (PCI) is 54 (based on traditional walking pavement distress surveys), which is considered fair. In Table 3, the percent network area by functional classification and pavement condition is shown. From this table, it is observed that 47.5 percent of the network is in very condition (condition category I) but a significant amount (29.1 percent) is in poor condition.

**Table 1: Network Composition by Functional Class for East Palo Alto**

Functional Class	Number of Sections	Total Center (Mile)	Total Lane (Mile)	Total Area (yard <sup>2</sup> )	Percentage Area (%)
Arterial	7	1.73	5.57	54,911	5.7
Collector	50	8.61	18.96	232,650	24.0
Residential/L	189	27.65	55.46	681,035	70.3
Total	246	37.99	79.99	968,597	100.0

Note: There were only 238 common sections surveyed but all vendors as shown in Appendix A

**Table 2: Network Composition by Surface Type for East Palo Alto**

Functional Class	Number of Sections	Total Area (yard <sup>2</sup> )	Percentage Area (%)
AC	193	771,802	77.4
AC/AC	51	193,628	19.4
Gravel	2	3,167	3.1
Total	246	968,597	100

Note: There were only 238 common sections surveyed but all vendors as shown in Appendix A

**Table 3: Network Distribution by Functional Classification and Condition Category for East Palo Alto**

Condition Class	Arterial	Functional Collector	Classification Residential/L	Other	Total
I	4.2%	11.0%	32.3%	0.0%	47.5%
II,III	0.0%	4.6%	7.8%	0.0%	12.4%
IV	0.9%	2.2%	7.9%	0.0%	11.0%
V	0.6%	6.3%	22.2%	0%	29.1%
Total	5.7%	24.1%	70.2%	0.0%	100%

### City of Piedmont, CA

Piedmont is a small, primarily residential community. Located in the East Bay hills, the city is completely surrounded by the city of Oakland. It has 249 management sections and 78.46 lane miles with a total pavement network area of 647,394.4 yd<sup>2</sup>. Table 4 shows the network distribution by number of lanes. Table 5 gives the composition by functional class, and Table 6 classifies pavement sections by surface type. The composition of the network by functional class is 20.9 percent arterial sections, 17.4 percent collectors, and 61.7 percent residential/local sections. The majority of the sections have asphalt concrete as a surface type AC/AC (60.89 percent). Almost all the sections are two-lane streets (98.79 percent) with an average width of 27.69 feet. The entire network totals 78.46 lane miles.

The average pavement network condition (PCI) for Piedmont is 69 (based on traditional walking pavement distress surveys), which is considered good. Table 8 shows the network distribution by functional classification and condition category. From this table, it is observed that 56.5 percent of the network area is in very good condition with very little (less than 1 percent) in poor condition.

**Table 4: Network Composition by Functional Class for Piedmont**

Functional Class	Number of Sections	Total Center (Mile)	Total Lane (Mile)	Total Area (yard <sup>2</sup> )	Percentage Area (%)
Arterial	31	6.46	13.00	135,382	20.9
Collector	30	6.47	12.87	112,712	17.4
Residential/L	188	26.43	52.59	399,301	61.7
Total	249	39.36	78.46	647,394	100.0

**Table 5: Network Composition by Surface Type for Piedmont**

Functional Class	Number of Sections	Total Area (yard <sup>2</sup> )	Percentage Area (%)
AC	94	241,895	37.4
AC/AC	153	390,338	60.3
AC/PCC	1	931	0.1
PCC	1	14,231	2.2
Total	249	647,395	100

**Table 6: Network Distribution by Functional Classification and Condition Category for Piedmont**

Condition Class	Arterial	Functional Collector	Classification Residential/L	Other	Total
I	14.4%	8.9%	33.1%	0.0%	56.5%
II,III	6.5%	6.5%	18.0%	0.0%	30.9%
IV	0.0%	2.1%	10.4%	0.0%	12.5%
V	0.0%	0.0%	0.2%	0.0%	0.2%
Total	20.9%	17.5%	61.7%	0.0%	100.0%

## **CHAPTER 2:**

### **PAVEMENT DISTRESS DATA COLLECTION AND ANALYSIS**

#### **Description**

For the purpose of evaluating the impact on network-level analyses using pavement distress data from semi-automated data distress methods, vendors were invited to collect data for the entire pavement network of the cities of East Palo Alto and Piedmont. Four vendors participated in this study: Adhara, Fugro, IMS, and Stantec. All vendors used MTC's *Pavement Condition Index Distress Identification Manual* as a reference to pavement distress definitions to collect distress data. Calculation of the Pavement Condition Index (PCI), budget needs and scenario analyses were performed by using the MTC StreetSaver<sup>®</sup> pavement management software.

Each of the vendors used their own method to determine the type, severity, and amount of distress (i.e. extent). Below is a brief summary of each method deployed by the vendor:

#### **Adhara**

Using a semi-automated approach, a vehicle equipped with a computer-based data collection system, vertical pavement images and field survey data were collected in the field for the entire lane(s) with 12-foot width. Pavement images were decoded into distress type, severity and extent using the computer-aided analyzer system following the StreetSaver<sup>®</sup> requirements. Field data collected by the rater helped to improve quality of non-cracking distress identification.

#### **Fugro**

Fugro's automated pavement analysis reported the dimensions and types of distresses as well as rut depth on surveyed roadways. Once the measurements of the distresses have been quantified, the distress definition guidelines outlined by MTC were applied to quantify each distress type by severity level. Quality assurance checks were then performed by manual review by certified raters. The quantified distresses were then split into smaller sample areas that can be uploaded directly into the StreetSaver<sup>®</sup> software. Concrete sections required manual rating and review of the images to distinguish between cracked and shattered slabs, as well as the number of slabs and joint spacing. Patching distresses on both asphalt and concrete surfaces also required manual rating of extent and severity.

#### **IMS**

The data was collected in two fashions. The front laser bar was 10.8 feet wide and collects rut, roughness, crack count, as well as measuring cracks by width and depth. The touch

screen event board in the front passenger side of the van was configured to allow an experienced operator to rate distresses and distortions by extent and severity. The rater collected data on up to two lanes on the street, thus allowing IMS to only pass locals once and arterials/collectors twice as they have more than two lanes. The distresses collected follow the StreetSaver<sup>®</sup> requirements and are more commonly called the ASTM 6433-99/03 distress protocols. Forward view digital images were used in the QA/QC process to validate and verify distress identification and classification.

## **Stantec**

Stantec's semi-automated method used a visual pattern recognition process to identify pavement distress ratings across multiple travel lanes. Its proprietary distress keyboard rating system allowed field technicians to enter individual distress conditions into the on-board system with a Distance Measuring Device (DMI) while traversing the agency's roads at posted speeds without impeding traffic flow. Post-processing of the data calculated the quantities of the defects based on the location of the keyboard entries. Defects were evaluated and recorded by 100% of the total pavement network coverage in 2,400-ft<sup>2</sup> sections.

## **Manual Survey**

For network-level analysis, only 10 percent of the inspection units within each management section are inspected by manual pavement surveys. Manual pavement surveys were conducted by an experienced rater using inspection units with areas that were 2,500 +/- 1,500 ft<sup>2</sup>.

Appendix A shows the PCI values from each vendor and the manual inspections for each section in which distress data were collected.

## **Analyses Used**

The following analyses were conducted:

- a. Calculate PCI values from distress data collected by each method for each section
- b. Calculate average PCI value and PCI standard deviations for the pavement networks
- c. Compare PCI values calculated from data collected by each vendor with PCI values calculated from the manual method

## PCI Data Analyses

The PCI value for each section was calculated from data collected by each method. The average network PCI and standard deviation for the cities of East Palo Alto and Piedmont are shown in Table 7 and Table 8 respectively.

**Table 7: Comparison of network PCI for East Palo Alto**

	Manual	Adhara	Fugro	Stantec	IMS
Average PCI	56.1	63.0	76.2	30.3	60.5
Std Dev	28.0	30.4	18.0	20.3	26.7

Notes: Average PCI values and standard deviations were calculated for all sections surveyed by the vendor as the average of the PCI values; they were not weighted for area.

**Table 8: Comparison of network PCI for Piedmont**

	Manual	Adhara	Fugro	Stantec	IMS
Average PCI	70.4	73.0	84.4	49.3	62.6
Std Dev	16.3	20.9	17.0	29.2	17.6

Notes: Average PCI values and standard deviations were calculated for all sections surveyed by the vendor as the average of the PCI values; they were not weighted for area.

Table 7 shows that the average network PCI values based on distress data collected by IMS and Adhara were within 7 PCI points of the average network PCI from manual surveys while those based on data collected by Fugro and Stantec for the East Palo Alto sections were more than 20 PCI points different. Table 8 shows that the average network PCI values based on distress data collected by Adhara and IMS were also within 7 PCI points of the average network PCI from manual surveys and those based on data collected by Fugro and Stantec for the Piedmont sections were 14 or more PCI points different.

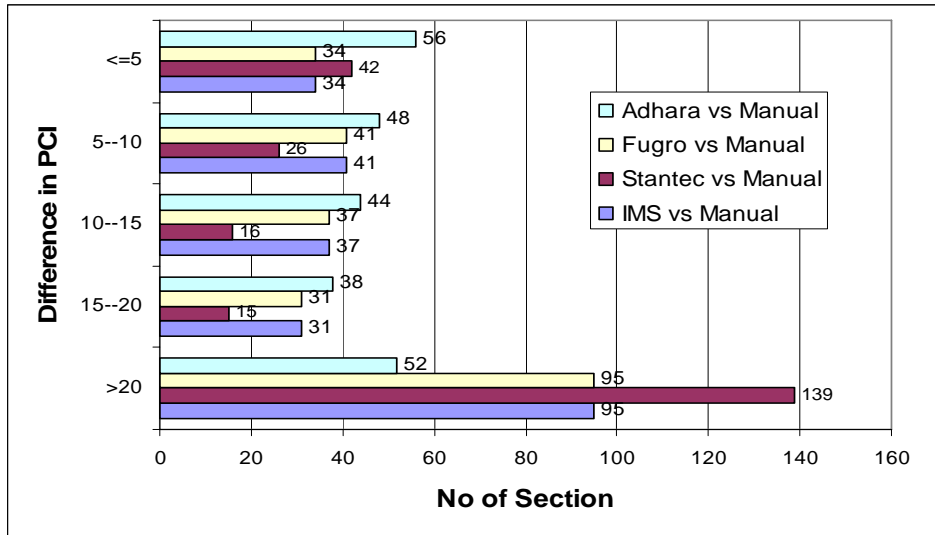
### ***Differences in PCI values***

Differences in PCI values calculated from distress data provided by vendors were compared to PCI values from data from manual surveys. Appendix B shows the sections and corresponding PCI differences.

#### *City of East Palo Alto*

Figure 1 shows a cluster analyses for PCI differences in ranges of less than 5 PCI points, 5-10 PCI points, 10-15 PCI points, 15-20 PCI points, and more than 20 PCI points for East Palo Alto. This figure shows that IMS and Adhara have the highest number of sections with PCI value differences of less than five points and the lowest number of sections with PCI

value differences greater than 20 points. It also shows that Fugro and Stantec have the lowest number of sections with PCI value differences less than 5 and the greatest number of sections with PCI value differences greater than 20 points.



**Figure 1: PCI Difference Cluster Analysis for City of East Palo Alto**

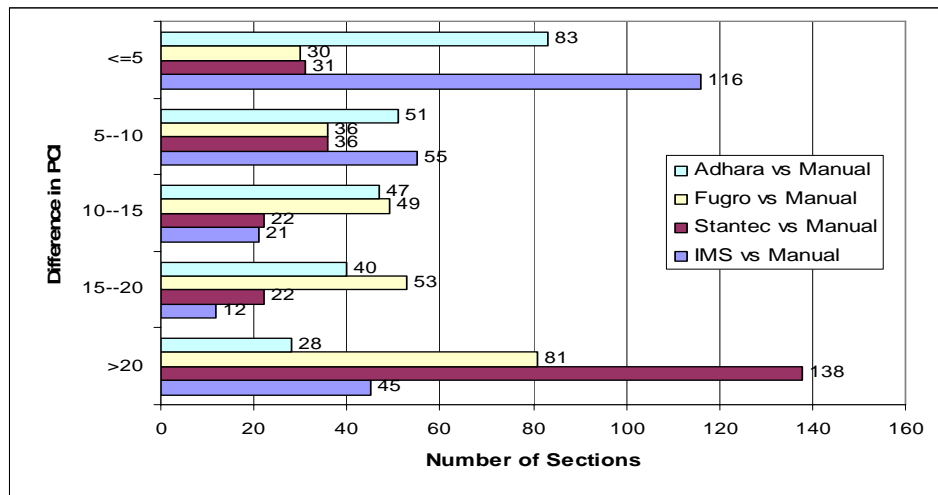
Table 9 shows a summary of the results of comparing the PCI values from distress data collected by the vendors to PCI values based on distress data collected manually for East Palo Alto. The data from Stantec and Fugro have the greatest total PCI differences whereas the data from Adhara and IMS have the smallest total PCI differences. The average PCI differences between values based on data from vendors and manual data was the smallest for IMS and Adhara. The number of sections with a difference of 5 PCI points or less was the largest for IMS (45.4 %) followed by Adhara (23.5 %). The amount of sections with a difference of 15 PCI points or less was 81.0% for IMS, 62.2% for Adhara, 47.0% for Fugro, and 35.2% for Stantec. The number of sections with difference of 20 PCI points or more was the largest for Stantec (58.4 %) and Fugro (39.9%).

**Table 9: Summary of PCI Analysis from Vendor's Data for the City of East Palo Alto**

	Difference between Adhara and Manual	Difference between Fugro and Manual	Difference between Stantec and Manual	Difference between IMS and Manual
Total of PCI Difference	1579	4775	-6156	1028
Average of PCI Difference	7	20	-26	4
Std Dev of PCI Difference	19.39	23	24	16.02
No of sections with a difference of 5 PCI Points or less	56 (23.5%)	34 (14.3%)	42 (17.6%)	108 (45.3 %)
No of sections with a difference between 5 PCI points to 10 PCI points	48 (20.2%)	41 (17.2%)	26 (10.9%)	56 (23.5%)
No of sections with a difference between 10 PCI points to 15 PCI points	44 (18.5%)	37 (15.5%)	16 (6.7%)	31 (13.0%)
No of sections with a difference between 15 PCI points to 20 PCI points	38 (16.0%)	31 (13.0%)	15 (6.3%)	11 (4.6 %)
No of sections with a difference of 20 PCI points or more	52 (21.8%)	95 (39.9%)	139 (58.4%)	32 (13.4%)

*City of Piedmont*

Figure 2 shows a cluster analyses for PCI differences in ranges of less than 5 PCI points, 5-10 PCI points, 10-15 PCI points, 15-20 PCI points, and more than 20 PCI points for Piedmont. This figure, as does Figure1, shows that IMS and Adhara have the highest number of sections with a PCI value difference of less than 5 points and the lowest number of sections with PCI value differences greater than 20 points. It also show that Fugro and Stantec have the lowest number of sections with PCI value differences less than 5 and the greatest number of sections with PCI value differences greater than 20 points.



**Figure 2: PCI Difference Cluster for City of Piedmont**

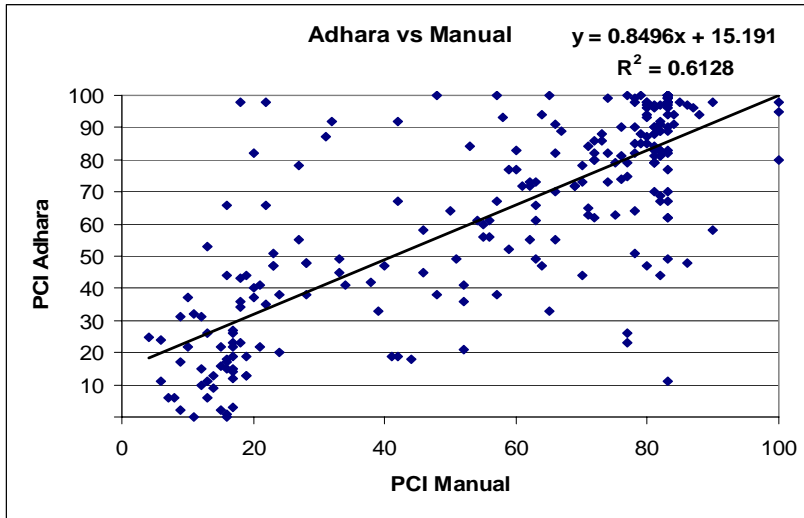
PCI values from distress data collected by the vendors were compared to PCI values from data collected manually. Table 10 shows a summary of the results for Piedmont. The data from Stantec and Fugro have the greatest total PCI differences whereas the data from Adhara has the smallest total PCI differences; the PCI differences for data from IMS is closer to the difference, although negative instead of positive, for data from Fugro than from Adhara. The average PCI differences between values from vendors and manual data was the smallest for Adhara and IMS. The number of sections with a difference of 5 PCI points or less was the largest for IMS (46.6 %), followed by Adhara (33.3 %). The amount of sections with a difference of 15 PCI points or less was 77.1% for IMS, 72.2% for Adhara, 46.2% for Fugro, and 35.7% for Stantec. The number of sections with differences of 20 PCI points or more was the largest for Stantec (55.4 %) and Fugro (32.5%).

**Table 10: Summary of PCI Analysis from Vendor's Data for the City of Piedmont**

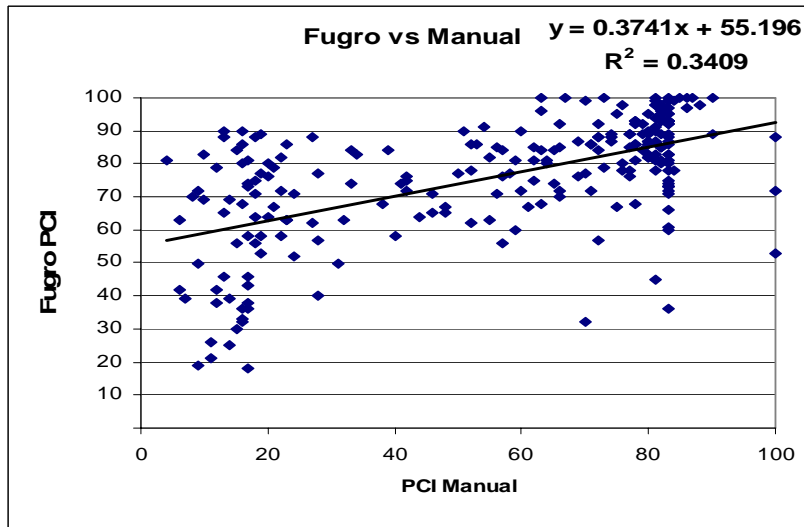
	<b>Difference between Adhara and Manual</b>	<b>Difference between Fugro and Manual</b>	<b>Difference between Stantec and Manual</b>	<b>Difference between IMS and Manual</b>
Total PCI Difference	417	3476	-5303	-2137
Average of PCI Difference	2	14	-21	-8.6
Std Dev of PCI Difference	15.6	20.8	22.8	19.7
No of sections with a difference of 5 PCI Points or less	83 (33.3%)	30 (12.0%)	31(12.4%)	116 (46.6%)
No of sections with a difference between 5 PCI points to 10 PCI points	51 (20.5%)	36 (14.5%)	36 (14.5%)	55 (22.1%)
No of sections with a difference between 10 PCI points to 15 PCI points	47 (18.9%)	49 (19.7%)	22 (8.8%)	21 (8.4%)
No of sections with a difference between 15 PCI points to 20 PCI points	40 (16.1%)	53 (21.3%)	22 (8.8%)	12 (4.8%)
No of sections with a difference greater than 20 PCI points	28 (11.2%)	81 (32.5%)	138 (55.4%)	45 (18.1%)

### ***Regression Analysis***

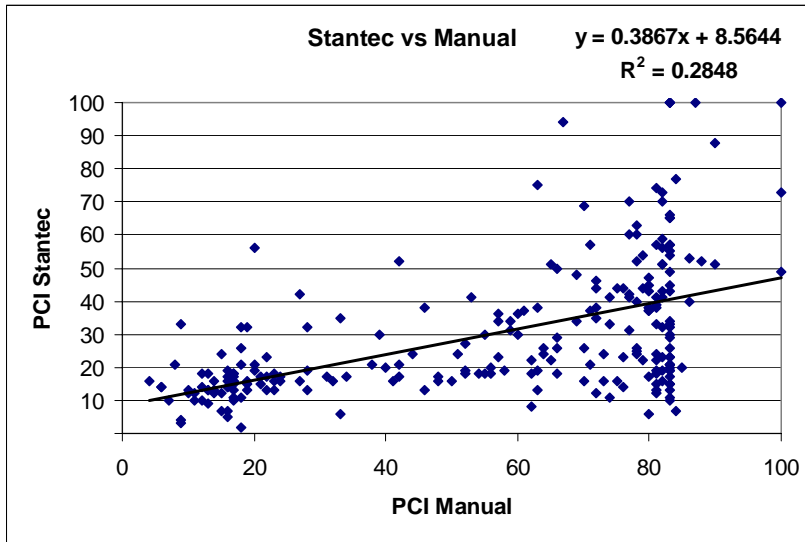
PCI values calculated for each section from distress data collected by vendors was compared to manual PCI values. Figures 3 through 6 show the results of regression analysis performed when comparing PCI values from data collected by vendors Adhara, Fugro, Stantec, and IMS to PCI values calculated from manual distress data for East Palo Alto.



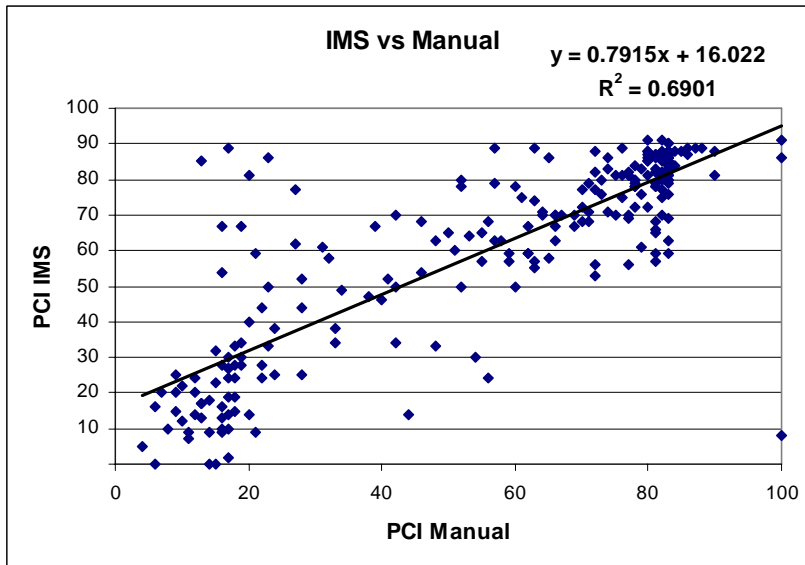
**Figure 3: Regression Analysis for Adhara vs. Manual for the City of East Palo Alto**



**Figure 4: Regression Analysis for Fugro vs. Manual for the City of East Palo Alto**

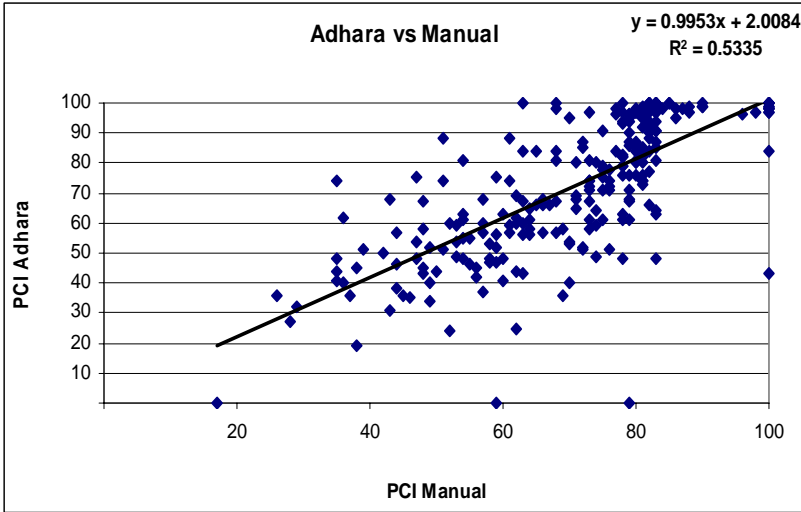


**Figure 5: Regression Analysis for Stantec vs. Manual for the City of East Palo Alto**

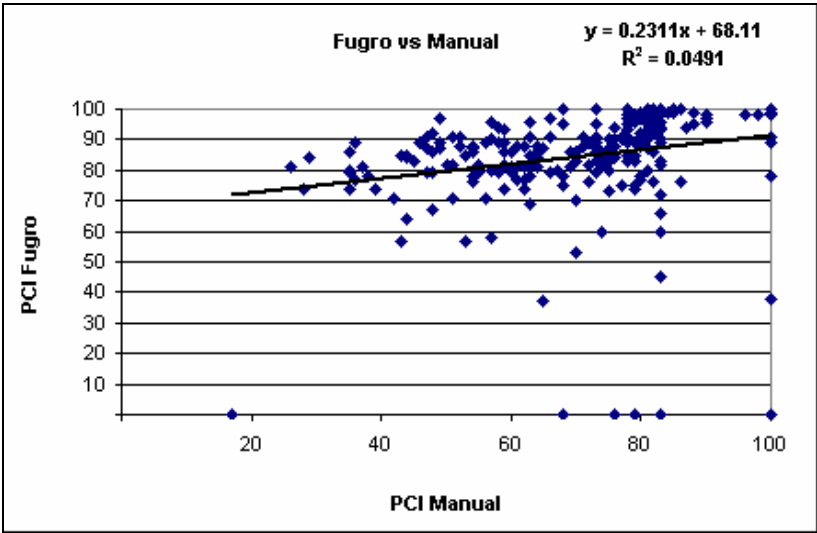


**Figure 6: Regression Analysis for IMS vs. Manual for the City of East Palo Alto**

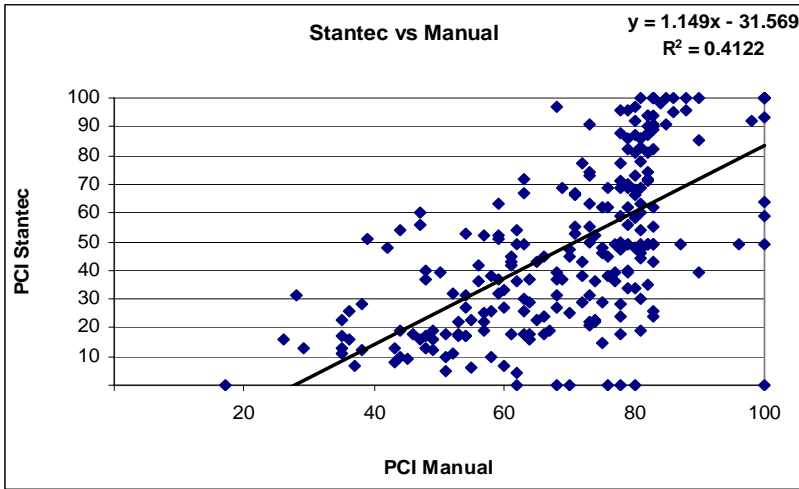
Figures 7 through 10 show the same the regression analyses for data from Piedmont.



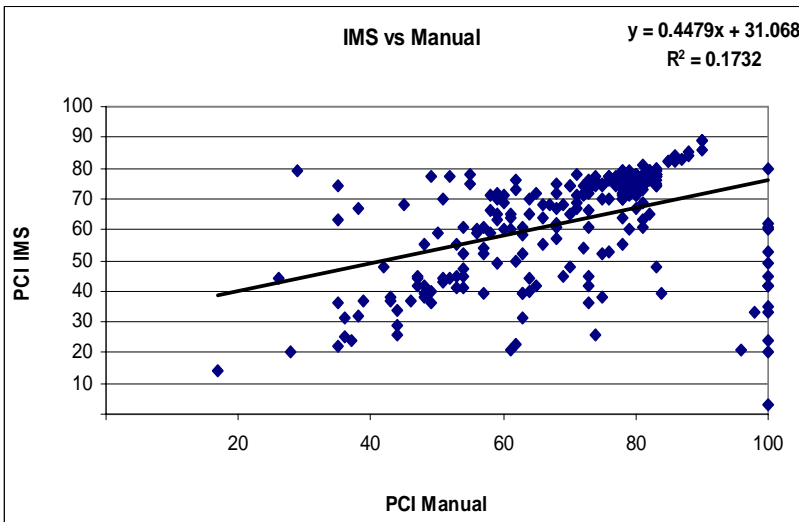
**Figure 7: Regression Analysis for Adhara vs. Manual for the City of Piedmont**



**Figure 8: Regression Analysis for Fugro vs. Manual for the City of Piedmont**



**Figure 9: Regression Analysis for Stantec vs. Manual for the City of Piedmont**



**Figure 10: Regression Analysis for IMS vs. Manual for the City of Piedmont**

Table 11 summarizes the results from regression analysis for the cities of East Palo Alto and Piedmont. For East Palo Alto, PCI values from IMS shows the highest correlation coefficient ( $R^2 = 0.691$ ) when compared to PCI values from Manual, followed by PCI values from Adhara ( $R^2 = 0.613$ ); however, for data from Piedmont, while Adhara still has the highest correlation coefficient ( $R^2 = 0.534$ ), IMS's correlation coefficient is only the third highest ( $R^2 = 0.173$ ) when compared to PCI values from Manual. When looking at the results of the regression comparing data provided by Adhara to manual data, they have  $R^2$  values greater than 0.5, the slopes are near 1.0, and the intercepts are within 15 points of 0. The regression results from data provided by IMS have the highest  $R^2$  value for data from East Palo Alto (0.691) but are pretty low for Piedmont (0.173), the slopes are near 0.9 for the data

from East Palo Alto but less than 0.5 for Piedmont, and the intercepts are both greater than 15 points (more than double that for Piedmont). The regression analyses from data provided by Fugro produced low  $R^2$  values, the slopes are below 0.3, and the intercepts are above 50. The regression analyses of data from Stantec produced the lowest  $R^2$  for East Palo Alto and the second highest  $R^2$  for Piedmont, the slope for East Palo Alto was less than 0.4 while the slope for Piedmont was over 1.0, and the intercept for East Palo Alto was less than 15 while the intercept for Piedmont was more than negative 30.

**Table 11: Summary of Regression Analysis**

	Adhara vs. Manual			Fugro vs. Manual			Stantec vs. Manual			IMS vs. Manual		
	m	b	$R^2$	m	b	$R^2$	m	b	$R^2$	m	b	$R^2$
EPA	0.85	15.19	0.613	0.37	55.19	0.341	0.38	8.56	0.285	0.79	16.02	0.691
Piedmont	0.99	2.00	0.534	0.23	68.11	0.049	1.15	-31.6	0.412	0.45	31.06	0.173

## CHAPTER 3:

### FINDINGS FROM BUDGET NEEDS AND SCENARIO ANALYSIS

Budget needs were calculated for a 20-year period based on the PCI values calculated from distress data collected with each distress survey method using the StreetSaver<sup>®</sup>. Table 12 shows the budget needs for the cities of East Palo Alto and Piedmont based on the PCI values from the manual surveys.

**Table 12: Calculated Budget Needs Based on Manual Survey Data**

<b>Pavement Network</b>	<b>2007 Budget</b>	<b>5-year Budget Needs</b>	<b>20-year Budget Needs</b>
East Palo Alto	\$ 11,884,215	\$15,327,796	\$ 22,847,759
Piedmont	\$2,760,250	\$ 5,579,671	\$13,923,001

#### Analyses Used

The following analyses were conducted:

- a. Run budget needs over a 20-year planning horizon, and compare results for the first year of the analysis period, 5-year total budget, and 20-year total budget
- b. Run scenarios analysis with PCI data from all vendors for an annual budget that is the average of the total 20-year budget needs calculated using PCI values from manual surveys

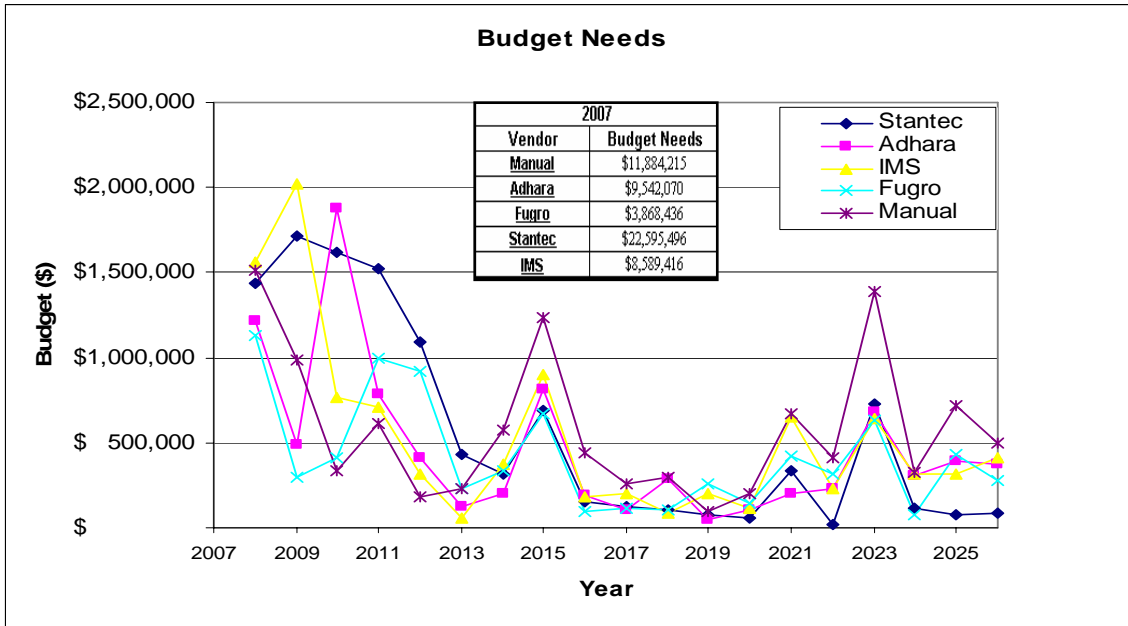
#### City of East Palo Alto

Table 13 shows projected the budget needs and corresponding PCI values over a 20-year period for East Palo Alto. It is observed that the 20-year budget needs using data from Adhara, Fugro, and IMS are below the budget using data from Manual surveys except Stantec. Budget needs calculated based on data from IMS are close to manual. For the 5-year budget needs it is observed that budget needs based on data from Adhara, IMS, Fugro are below the manual, but budget needs based on data from Adhara and IMS's data is close to the budget needs based on data from manual data. This is consistent with the PCI analysis.

**Table 13: Budget Needs for the City of East Palo Alto**

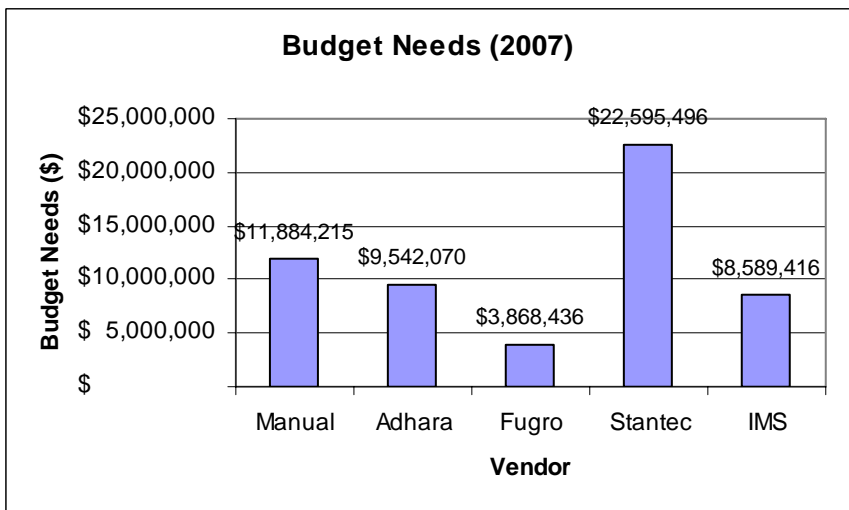
Year	Manual 2007 PCI Untreated = 54		Adhara 2007 PCI Untreated = 60		Fugro 2007 PCI Untreated = 71		Stantec 2007 PCI Untreated = 30		IMS 2007 PCI Untreated = 58	
	Budget	PCI	Budget	PCI	Budget	PCI	Budget	PCI	Budget	PCI
2007	\$11,884,215	85	\$9,542,070	87	\$3,868,436	84	\$22,595,496	83	\$8,589,416	81
2008	\$1,510,942	85	\$1,217,601	85	\$1,131,866	84	\$1,440,328	81	\$1,559,789	82
2009	\$988,750	85	\$490,087	84	\$293,605	83	\$1,712,224	83	\$2,023,068	85
2010	\$332,079	84	\$1,873,217	87	\$410,035	82	\$1,623,098	84	\$766,152	84
2011	\$611,810	85	\$790,140	87	\$994,838	84	\$1,523,933	86	\$710,221	85
2012	\$185,960	83	\$409,027	86	\$915,093	85	\$1,094,876	87	\$317,837	84
2013	\$227,842	82	\$124,735	85	\$229,310	84	\$432,795	86	\$55,244	83
2014	\$574,347	83	\$197,011	85	\$332,067	84	\$313,400	86	\$369,504	83
2015	\$1,237,398	85	\$809,467	87	\$669,666	86	\$689,592	87	\$898,346	86
2016	\$439,906	84	\$193,971	86	\$91,737	85	\$148,594	87	\$177,604	85
2017	\$254,515	83	\$103,295	85	\$118,485	84	\$123,271	85	\$202,147	84
2018	\$297,647	83	\$290,371	85	\$104,038	84	\$102,369	84	\$89,936	83
2019	\$97,139	82	\$52,635	84	\$255,723	84	\$73,218	84	\$196,697	83
2020	\$198,783	81	\$103,438	83	\$146,320	83	\$55,820	83	\$113,915	82
2021	\$675,080	81	\$202,436	83	\$423,554	83	\$333,861	83	\$649,411	82
2022	\$408,173	80	\$226,322	82	\$316,558	83	\$18,351	81	\$233,861	81
2023	\$1,388,584	83	\$680,969	84	\$633,002	84	\$730,699	84	\$640,246	83
2024	\$321,631	82	\$305,738	83	\$73,880	83	\$110,827	83	\$317,600	83
2025	\$714,044	83	\$397,020	83	\$435,077	83	\$75,562	82	\$313,494	82
2026	\$498,914	82	\$376,168	83	\$274,699	82	\$88,441	81	\$408,456	82
20-Year Budget	\$22,847,759		\$18,385,716		\$11,717,990		\$33,286,755		\$18,632,944	
Average of 20-Year Budget	\$ 1,142,388		\$ 919,286		\$ 585,899		\$ 1,664,338		\$ 931,647	
5-Year Budget	\$15,327,796		\$13,913,115		\$ 6,698,780		\$28,895,079		\$13,648,646	
Average of 5-Year Budget	\$ 3,065,559		\$ 2,782,623		\$ 1,339,756		\$ 5,779,016		\$ 2,729,729	

The annual budget needs over the 20 years period are illustrated in Figure 11 for the City of East Palo Alto.



**Figure 11: Twenty-Year Budget Needs for the City of East Palo Alto**

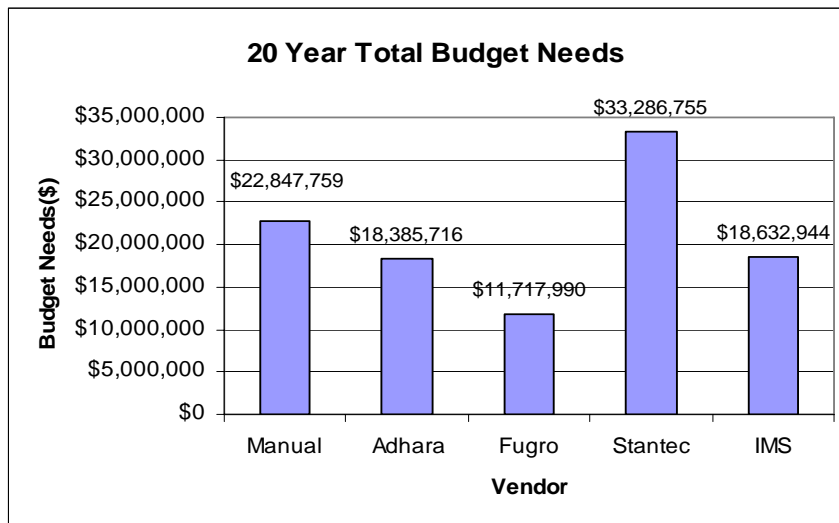
Figure 12 shows the budget needs for the year 2007 for the city of East Palo Alto. The budget needs from Fugro’s data are the lowest with \$ 3,868,436 and that of Stantec are the highest with \$ 22,595,496.



**Figure 12: Budget Needs for 2007 for the City of East Palo Alto**

Figure 13 shows 20-year total budget needs for the city of East Palo Alto. It shows that the 20-year needs for East Palo Alto based on data from Adhara and IMS are about \$4 million

less than that based on the manual survey while those based on data from Fugro are over \$11 million less and those based on data from Stantec are over \$10 million more.



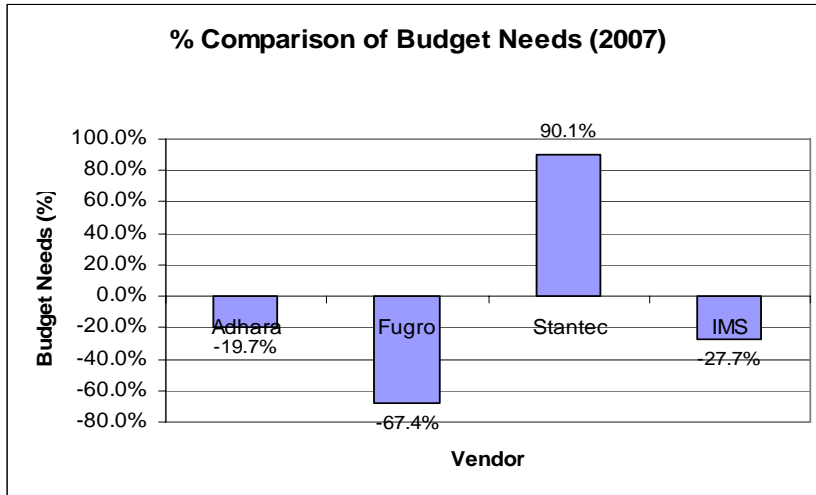
**Figure 13: Twenty-Year Budget Needs for the City of East Palo Alto**

Table 14 shows a comparison differences in budget needs for the city of East Palo Alto calculated from PCI values based on distress data collected by the vendors compared to the budget needs calculated based on data from manual distress surveys. The budget needs calculated based on Adhara’s and IMS’s data are closer to the budget needs based on data from the manual survey.

**Table 14: Budget Differences based on PCI Data from Vendors for the City of East Palo Alto**

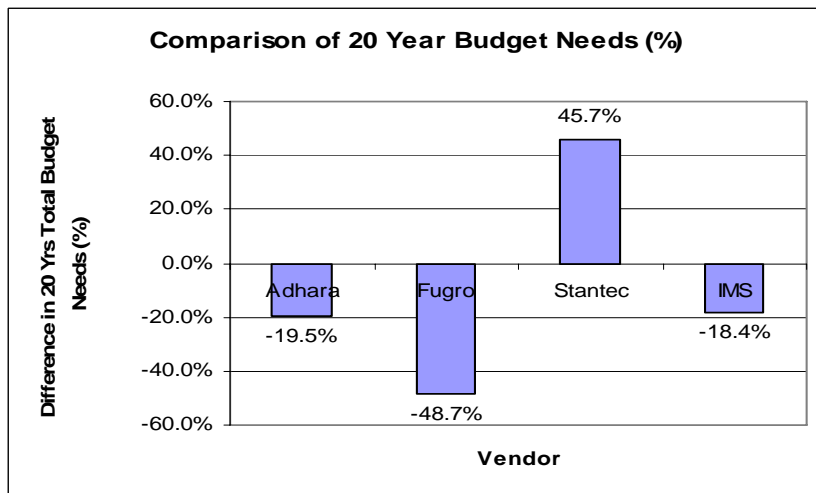
Year	Adhara vs Manual		Fugro vs Manual		Stantec vs Manual		IMS vs Manual	
2007	-\$2,342,145	-20%	-\$8,015,779	-67%	\$10,711,281	90%	-\$3,294,799	-28%
2008	-\$ 293,341	-19%	-\$ 379,076	-25%	-\$ 70,614	-5%	\$ 48,847	3%
2009	-\$ 498,663	-50%	-\$ 695,145	-70%	\$ 723,474	73%	\$1,034,318	105%
2010	\$1,541,138	464%	\$ 77,956	23%	\$ 1,291,019	389%	\$ 434,073	131%
2011	\$ 178,330	29%	\$ 383,028	63%	\$ 912,123	149%	\$ 98,411	16%
2012	\$ 223,067	120%	\$ 729,133	392%	\$ 908,916	489%	\$ 131,877	71%
2013	-\$ 103,107	-45%	\$ 1,468	1%	\$ 204,953	90%	-\$ 172,598	-76%
2014	-\$ 377,336	-66%	-\$ 242,280	-42%	-\$ 260,947	-45%	-\$ 204,843	-36%
2015	-\$ 427,931	-35%	-\$ 567,732	-46%	-\$ 547,806	-44%	-\$ 339,052	-27%
2016	-\$ 245,935	-56%	-\$ 348,169	-79%	-\$ 291,312	-66%	-\$ 262,302	-60%
2017	-\$ 151,220	-59%	-\$ 136,030	-53%	-\$ 131,244	-52%	-\$ 52,368	-21%
2018	-\$ 7,276	-2%	-\$ 193,609	-65%	-\$ 195,278	-66%	-\$ 207,711	-70%
2019	-\$ 44,504	-46%	\$ 158,584	163%	-\$ 23,921	-25%	\$ 99,558	102%
2020	-\$ 95,345	-48%	-\$ 52,463	-26%	-\$ 142,963	-72%	-\$ 84,868	-43%
2021	-\$ 472,644	-70%	-\$ 251,526	-37%	-\$ 341,219	-51%	-\$ 25,669	-4%
2022	-\$ 181,851	-45%	-\$ 91,615	-22%	-\$ 389,822	-96%	-\$ 174,312	-43%
2023	-\$ 707,615	-51%	-\$ 755,582	-54%	-\$ 657,885	-47%	-\$ 748,338	-54%
2024	-\$ 15,893	-5%	-\$ 247,751	-77%	-\$ 210,804	-66%	-\$ 4,031	-1%
2025	-\$ 317,024	-44%	-\$ 278,967	-39%	-\$ 638,482	-89%	-\$ 400,550	-56%
2026	-\$ 122,746	-25%	-\$ 224,215	-45%	-\$ 410,473	-82%	-\$ 90,458	-18%

Figure 14 shows the percentage comparison of budget needs for 2007 for the city of East Palo Alto. Budget needs from Stantec data (90.1%) are much higher than manual, and budget needs from Fugro's data (-67.4%) are much lower than from manual data. Budget needs based on Adhara's data is the closest to manual (-19.7 %).



**Figure 14: Percentage Comparison of Budget Needs for 2007 for the City of East Palo Alto**

Figure 15 shows the percentage comparison of the total 20-year budget needs for the city of East Palo Alto. Budget needs based on Stantec's data (45.7%) are considerably higher than those based on data from manual surveys while the budget needs based on Fugro's data (-48.7%) are considerably lower. Budget needs based on IMS's data (-18.4 %) is the closest to those based on manual surveys and the budget needs based on Adhara's data is similar (-19.5%).



**Figure 15: Comparison of Twenty-year Budget Needs for East Palo Alto**

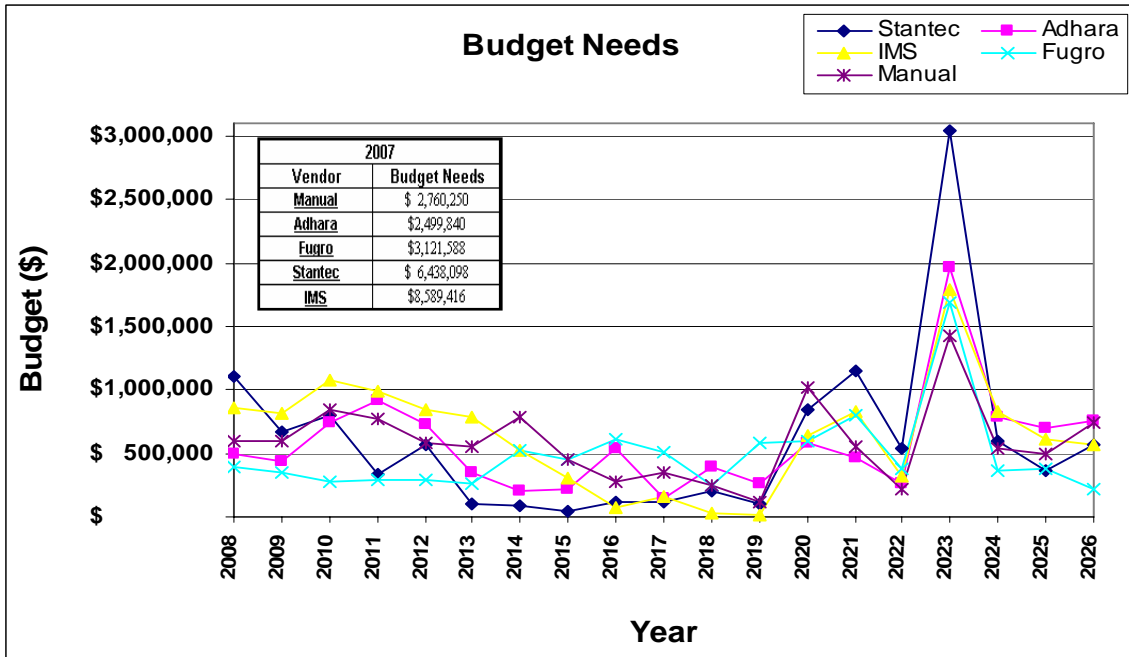
## City of Piedmont

Table 15 shows the projected budget needs and corresponding PCI values over a 20-year period for the city of Piedmont. The 20-year budget needs based on data from for Adhara and Fugro are below the budget based on data from the manual surveys. Budget needs calculated from Adhara’s data are close to manual. For the 5-year budget needs, the values based on Adhara and Fugro data are below the manual, but budget needs from Adhara’s data is closer to the budget needs from manual data. This is consistent with the PCI analysis.

**Table 15: Budget Needs for the City of Piedmont**

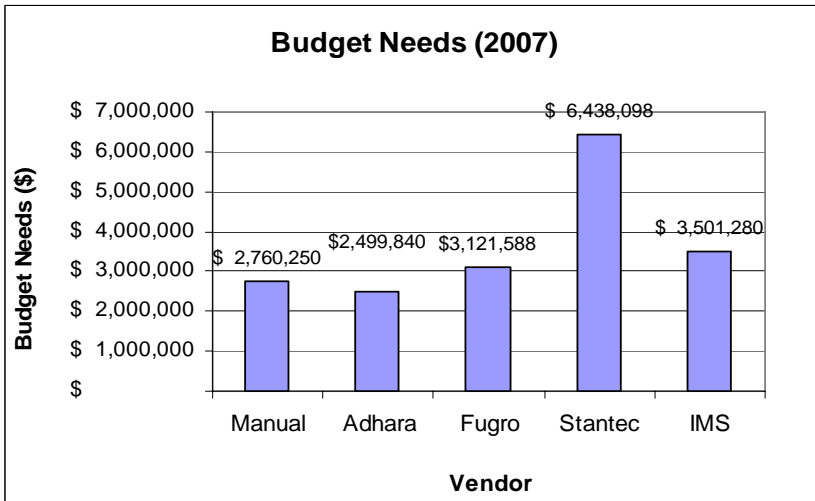
Sr No.	Year	Manual 2007 PCI Untreated = 69		Adhara 2007 PCI Untreated = 73		Fugro 2007 PCI Untreated = 64		Stantec 2007 PCI Untreated = 48		IMS 2007 PCI Untreated = 62	
		Budget Needs	PCI	Budget Needs	PCI	Budget Needs	PCI	Budget Needs	PCI	Budget Needs	PCI
1	2007	\$2,760,250	80	\$2,499,840	83	\$3,121,588	84	\$6,438,098	82	\$3,501,280	77
2	2008	\$600,337	79	\$488,918	82	\$392,123	83	\$1,109,716	82	\$852,224	77
3	2009	\$597,820	80	\$431,628	81	\$343,561	82	\$668,520	83	\$821,203	78
4	2010	\$846,890	81	\$745,611	82	\$269,709	82	\$799,500	84	\$1,072,417	80
5	2011	\$774,374	82	\$911,290	84	\$286,702	81	\$340,177	84	\$990,422	82
6	2012	\$580,967	82	\$723,721	85	\$290,462	81	\$567,911	85	\$845,468	84
7	2013	\$555,219	83	\$356,426	84	\$266,902	81	\$105,200	84	\$779,297	85
8	2014	\$780,839	83	\$202,159	83	\$523,488	81	\$81,861	83	\$525,458	85
9	2015	\$455,354	83	\$215,107	82	\$446,498	81	\$37,556	81	\$305,324	84
10	2016	\$280,491	82	\$542,946	82	\$616,697	81	\$122,619	80	\$71,311	82
11	2017	\$353,796	81	\$141,469	81	\$509,990	81	\$112,219	79	\$163,702	81
12	2018	\$242,727	81	\$396,110	81	\$241,305	80	\$197,802	78	\$34,667	80
13	2019	\$116,273	79	\$266,611	80	\$585,391	80	\$106,639	77	\$17,839	78
14	2020	\$1,015,531	81	\$587,996	80	\$596,972	81	\$846,578	78	\$636,905	79
15	2021	\$546,919	81	\$469,995	80	\$801,376	82	\$1,154,060	80	\$833,188	80
16	2022	\$221,352	80	\$258,651	79	\$372,473	81	\$542,510	80	\$320,277	79
17	2023	\$1,422,230	83	\$1,958,645	84	\$1,692,339	85	\$3,038,890	88	\$1,794,813	83
18	2024	\$536,936	82	\$790,578	84	\$363,441	83	\$602,182	87	\$836,088	83
19	2025	\$498,030	82	\$695,874	84	\$381,174	83	\$369,095	86	\$608,724	83
20	2026	\$736,666	83	\$762,776	85	\$218,293	82	\$562,910	86	\$572,347	83
<b>20 Year Total Budget Needs</b>		<b>\$13,923,001</b>		<b>\$13,446,351</b>		<b>\$12,320,484</b>		<b>\$17,804,043</b>		<b>\$15,582,954</b>	
<b>Annual Average Budget Needs</b>		<b>\$ 696,150</b>		<b>\$ 672,318</b>		<b>\$ 616,024</b>		<b>\$ 890,202</b>		<b>\$ 779,148</b>	
<b>5 Year Total Budget Needs</b>		<b>5579671</b>		<b>5077287</b>		<b>4413683</b>		<b>9356011</b>		<b>7237546</b>	
<b>Average 5 Year Budget Needs</b>		<b>\$1,115,934</b>		<b>\$1,015,457</b>		<b>\$ 882,737</b>		<b>\$1,871,202</b>		<b>\$1,447,509</b>	

Figure 16 illustrates these budget needs over the 20-year period for the city of Piedmont.



**Figure 16: Twenty-Year Budget Needs for Piedmont**

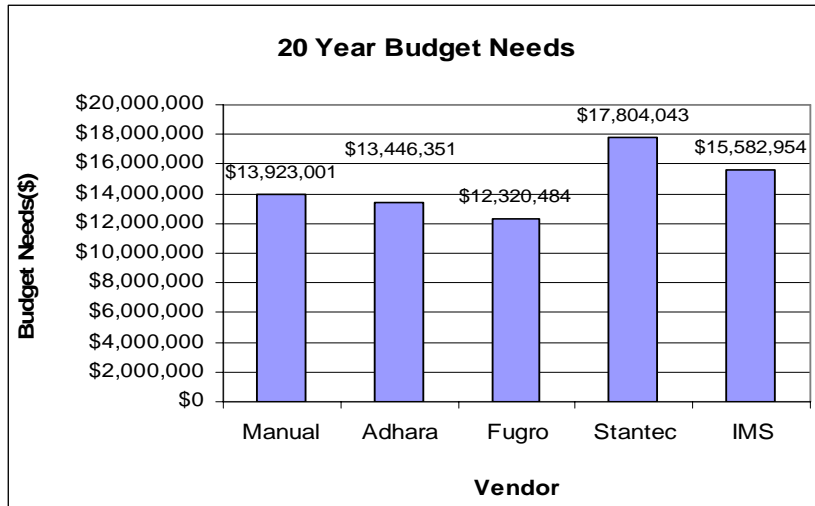
Figure 17 shows the Budget needs for the year 2007 for the City of Piedmont. The budget needs for Adhara are lowest with \$ 2,499,840 and that of Stantec are highest with \$ 6,438,098.



**Figure 17: Budget Needs for 2007 for the City of Piedmont**

Figure 18 shows the 20-year Total Budget Needs for the city of Piedmont. It shows that the 20-year needs for Piedmont based on data from Adhara is about \$0.5 million less than that based on the manual survey while those based on data from Fugro are

about \$1.6 million less, those based on data from IMS about \$1.7 million less, and those based on data from Stantec are about \$4.4 million more.



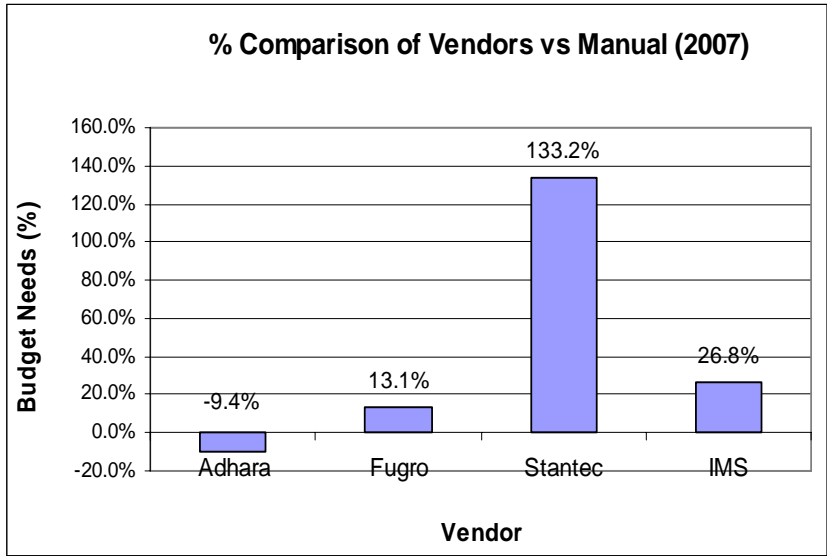
**Figure 18: Total Budget Need for the City of Piedmont**

Table 16 shows a comparison of budget needs for the city of Piedmont calculated from PCI values based on distress data collected by the different methods. The budget needs calculated with Adhara’s data is closer to that calculated using the data from manual surveys.

**Table 16: Budget Differences based on PCI Data from Vendors for the City of Piedmont**

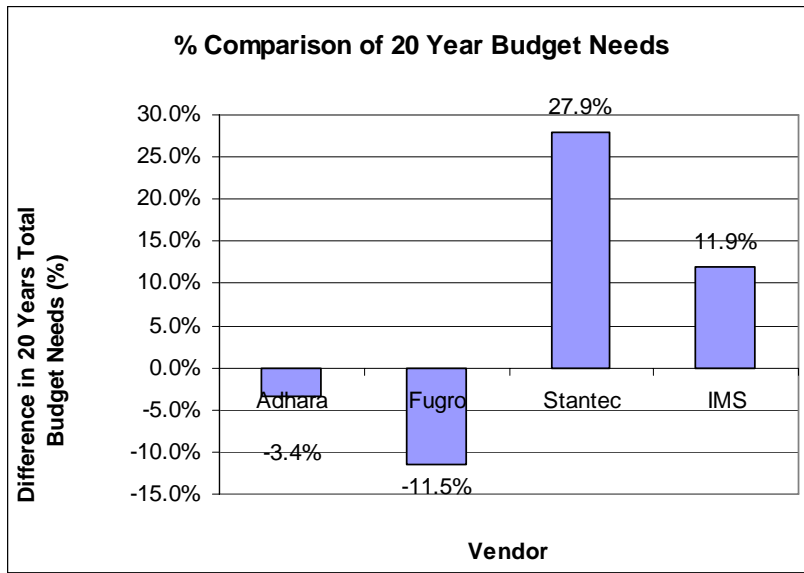
Year	Adhara vs Manual		Fugro vs Manual		Stantec vs Manual		IMS vs Manual	
2007	-\$260,410	-9%	\$361,338	13%	\$3,677,848	133%	\$741,030	27%
2008	-\$111,419	-19%	-\$208,214	-35%	\$509,379	85%	\$251,887	42%
2009	-\$166,192	-28%	-\$254,259	-43%	\$70,700	12%	\$223,383	37%
2010	-\$101,279	-12%	-\$577,181	-68%	-\$47,390	-6%	\$225,527	27%
2011	\$136,916	18%	-\$487,672	-63%	-\$434,197	-56%	\$216,048	26%
2012	\$142,754	25%	-\$290,505	-50%	-\$13,056	-2%	\$264,501	46%
2013	-\$198,793	-36%	-\$288,317	-52%	-\$450,019	-81%	\$224,078	40%
2014	-\$578,680	-74%	-\$257,351	-33%	-\$698,978	-90%	-\$255,381	-33%
2015	-\$240,247	-53%	-\$8,856	-2%	-\$417,798	-92%	-\$150,030	-33%
2016	\$262,455	94%	\$336,206	120%	-\$157,872	-56%	-\$209,180	-75%
2017	-\$212,327	-60%	\$156,194	44%	-\$241,577	-68%	-\$190,094	-54%
2018	\$153,383	63%	-\$1,422	-1%	-\$44,925	-19%	-\$208,060	-86%
2019	\$150,338	129%	\$469,118	403%	-\$9,634	-8%	-\$98,434	-85%
2020	-\$427,535	-42%	-\$418,559	-41%	-\$168,953	-17%	-\$378,626	-37%
2021	-\$76,924	-14%	\$254,457	47%	\$607,141	111%	\$286,269	52%
2022	\$37,299	17%	\$151,121	68%	\$321,158	145%	\$98,925	45%
2023	\$536,415	38%	\$270,109	19%	\$1,616,660	114%	\$372,583	26%
2024	\$253,642	47%	-\$173,495	-32%	\$65,246	12%	\$299,152	56%
2025	\$197,844	40%	-\$116,856	-23%	-\$128,935	-26%	\$110,694	22%
2026	\$26,110	4%	-\$518,373	-70%	-\$173,756	-24%	-\$164,319	-22%

Figure 19 shows the percentage comparison of budget needs for 2007 for the City of Piedmont. Budget needs from Stantec data (133.2%) are much higher than the needs based on data from the manual surveys. Budget needs based on Adhara's data is the closest to those based on manual surveys (-9.4 %) followed by needs based on data from Fugro (13.1%) and IMS (26.8%).



**Figure 19: Percentage Comparison of Total Budget Needs for the City of Piedmont**

Figure 20 shows the percentage comparison of total 20-year budget needs for the city of Piedmont. Budget needs based on Stantec's data (27.9%) are considerably higher than budget needs based on manual surveys. Budget needs from Adhara's data (-3.4%) is the closest to the budget needs based on manual surveys followed by needs based on data from Fugro (-11.5%) which is similar in value but in the opposite sign to the difference from the needs based on data from IMS (11.9%).



**Figure 20: Comparison of Total Budget Needs for the City of Piedmont**

***Results from Scenarios Analysis***

Scenarios were conducted over a 20-year period based on the PCI values from each of the vendors and compared to the results based on PCI values from the manual survey. Analyses were run for an annual budget that was based on the total 20-year budget needs calculated using data from manual surveys. The total was divided by 20 to get an average annual budget; this same annual budget was used as the available funding in all of the analyses. The comparison of results from three scenario analyses included:

- a. Calculation of network pavement condition in 2007 prior to applying the treatment
- b. Calculation of network pavement condition in 2007 immediately after applying the treatment
- c. Calculation of network pavement condition in 2026 after applying the treatment

Tables 17 and 18 show a summary of the percent of the network in the various condition categories from the scenarios calculations by the MTC StreetSaver<sup>®</sup> using PCI values based on data from the manual surveys for the cities of East Palo Alto and Piedmont respectively.

**Table 17: Network Pavement Condition from Scenarios Analysis for the City of East Palo Alto**

Category	2007 Prior to applying treatment	2007 Immediately after applying treatment	2026 Immediately after applying treatment
I	47.5%	56.0%	92.9%
II / III	12.4%	7.9%	7.1%
IV	11.0%	7.0%	0.0%
V	29.1 %	29.1%	-
Total	100 %	100%	100%

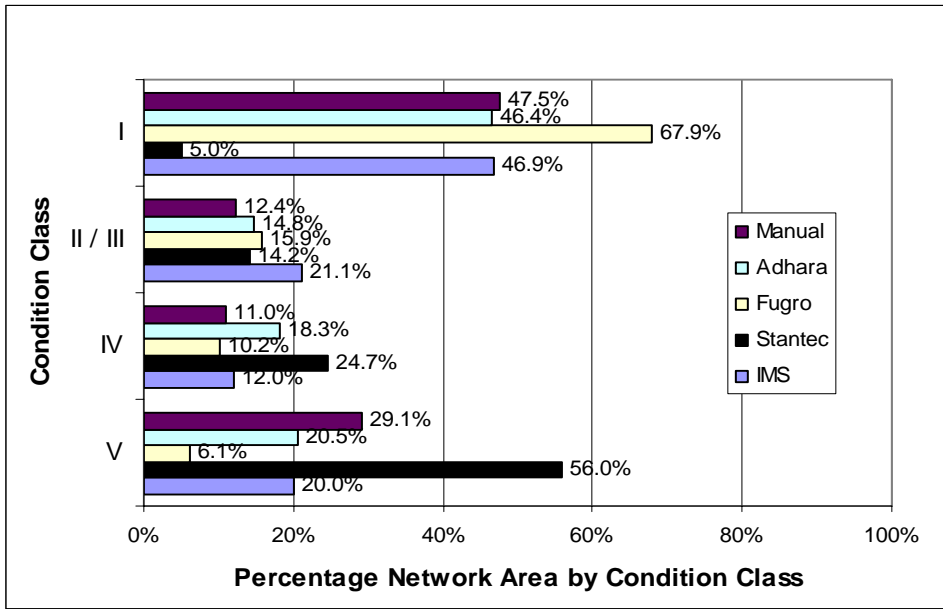
**Table 18: Network Pavement Condition from Scenarios Analysis for City of Piedmont**

Category	2007 Prior to applying treatment	2007 Immediately after applying treatment	2026 Immediately after applying treatment
I	56.5%	64.1%	98.6%
II / III	30.9%	23.2%	1.4%
IV	12.5%	12.5%	0.0%
V	0.2%	0.2%	0.0%
Total	100%	100%	100%

Table 19 and Figure 21 show the percentage network area composition by condition class for the city of East Palo Alto in 2007 before applying the treatment based on PCI values based on data from each method of survey. The percentage network area in category I from IMS’s data (46.9%) and Adhara’s data (46.4%) are close to Manual (47.5 %). Also, the percentage network area in category V for Adhara’s data (20.5%) and IMS’s data (20.0%) are close to Manual (29.1%).

**Table 19: Condition in Base Year 2007, Prior to Applying Treatments for the City of East Palo Alto**

Condition Class	Manual	Adhara	Fugro	Stantec	IMS
I	47.5%	46.4%	67.9%	5.0%	46.9%
II / III	12.4%	14.8%	15.9%	14.2%	21.1%
IV	11.0%	18.3%	10.2%	24.7%	12.0%
V	29.1%	20.5%	6.1%	56.0%	20.0%
Total	100 %	100%	100%	100%	100%

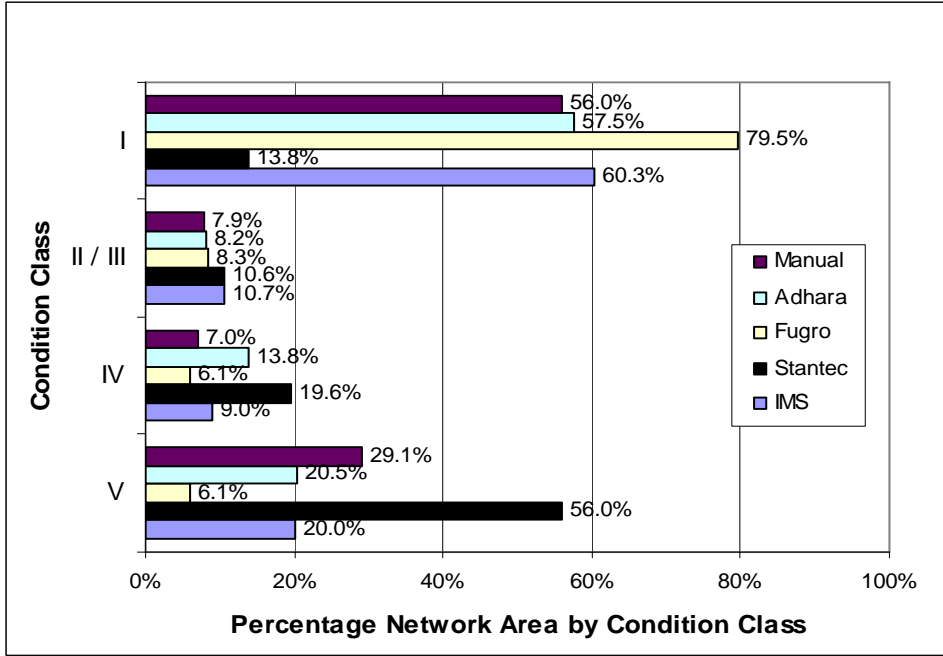


**Figure 21: Network Condition Summary for the City of East Palo Alto in 2007 prior to Applying the Treatment**

Table 20 and Figure 22 show the percentage network area composition by condition class for the city of East Palo Alto in 2007 after applying the treatment. The percentage network area in category I from IMS's data (60.3%) and Adhara's data (57.5%) are close to Manual (56%). Also, the percentage network area in category V for Adhara's data (20.5%) and IMS's data (20.0%) are close to Manual (29.1%).

**Table 20: Condition in Base Year 2007, immediately after Applying Treatments for the City of East Palo Alto**

Condition Class	Manual	Adhara	Fugro	Stantec	IMS
I	56.0%	57.5%	79.5%	13.8%	60.3%
II / III	7.9%	8.2%	8.3%	10.6%	10.7%
IV	7.0%	13.8%	6.1%	19.6%	9.0%
V	29.1%	20.5%	6.1%	56.0%	20.0%
Total	100%	100%	100%	100%	100%

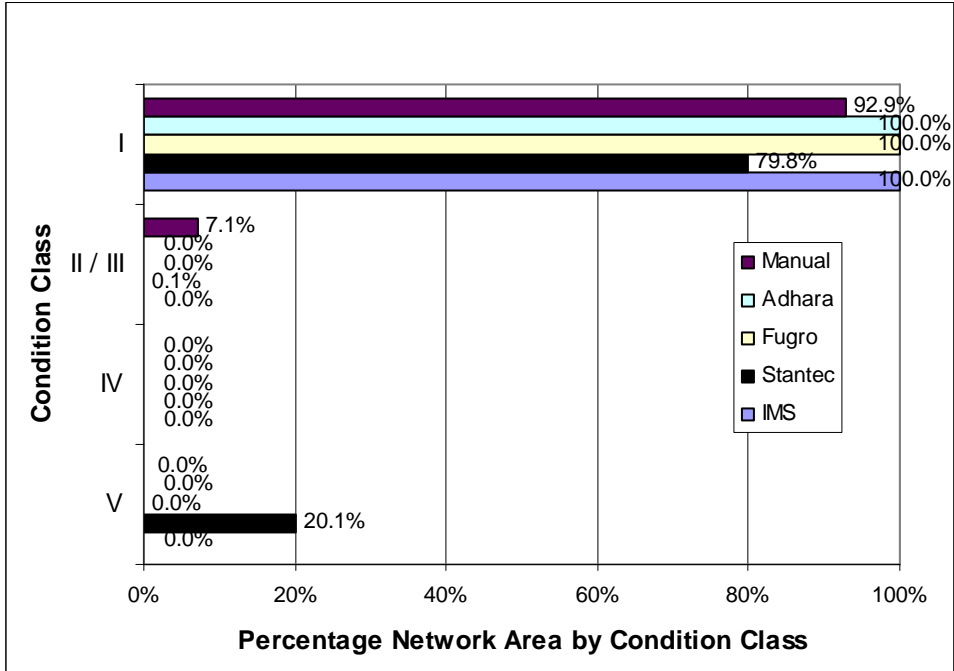


**Figure 22: Network Condition Summary for the City of East Palo Alto in 2007 Immediately after Applying the Treatment**

Table 21 and Figure 23 shows the percentage network area composition by condition class for the city of East Palo Alto in 2026 immediately after scheduled treatments applied. As expected, in almost all the cases, except for Stantec, the percentage network area in category I is 100% (IMS, Fugro, Adhara) or above 90% (Manual).

**Table 21: Condition in Base Year 2026, immediately after Applying Treatments for the City of East Palo Alto**

Condition Class	Manual	Adhara	Fugro	Stantec	IMS
I	92.9%	100.0%	100.0%	79.8%	100.0%
II / III	7.1%	-	-	0.1%	-
IV	-	-	-	-	-
V	-	-	-	20.1%	-
Total	100%	100%	100%	100%	100%

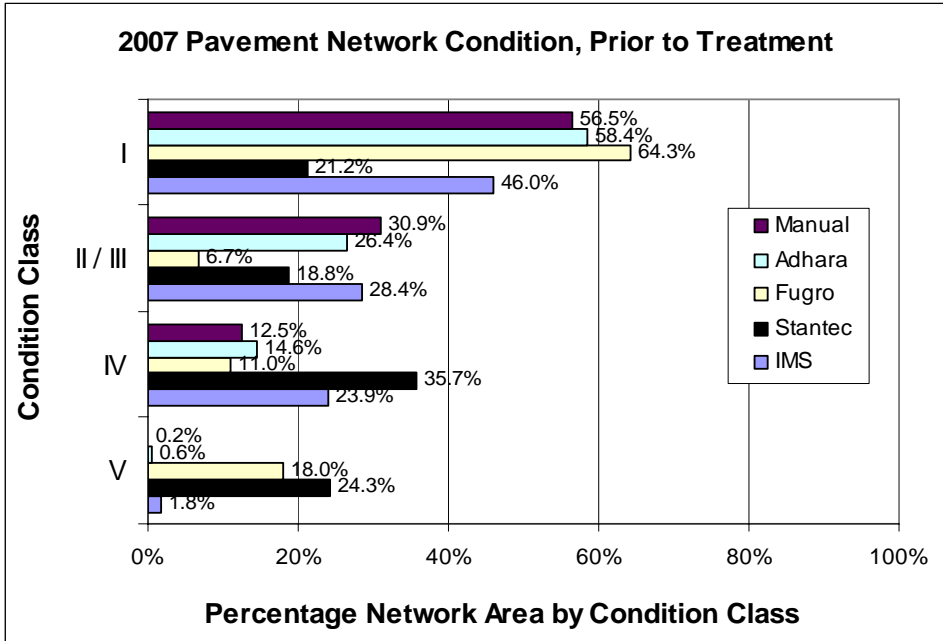


**Figure 23: Network Condition Summary for the City of East Palo Alto in 2026 after Scheduled Treatments Applied**

Table 22 and Figure 24 show the percentage network area by condition class for city of Piedmont in 2007 before applying the treatment. The percentage network area in category I from Adhara’s data (58.4%) is close to Manual (56.5 %). The percentage network area in category V for Adhara’s data (0.6%) and IMS’s data (1.8%) are close to Manual (0.2%)

**Table 22: Condition in Base Year 2007, Prior to Applying Treatments for City of Piedmont**

Condition Class	Manual	Adhara	Fugro	Stantec	IMS
I	56.5%	58.4%	64.3%	21.2%	46.0%
II / III	30.9%	26.4%	6.7%	18.8%	28.4%
IV	12.5%	14.6%	11.0%	35.7%	23.9%
V	0.2%	0.6%	18.0%	24.3%	1.8%
Total	100%	100%	100%	100%	100%

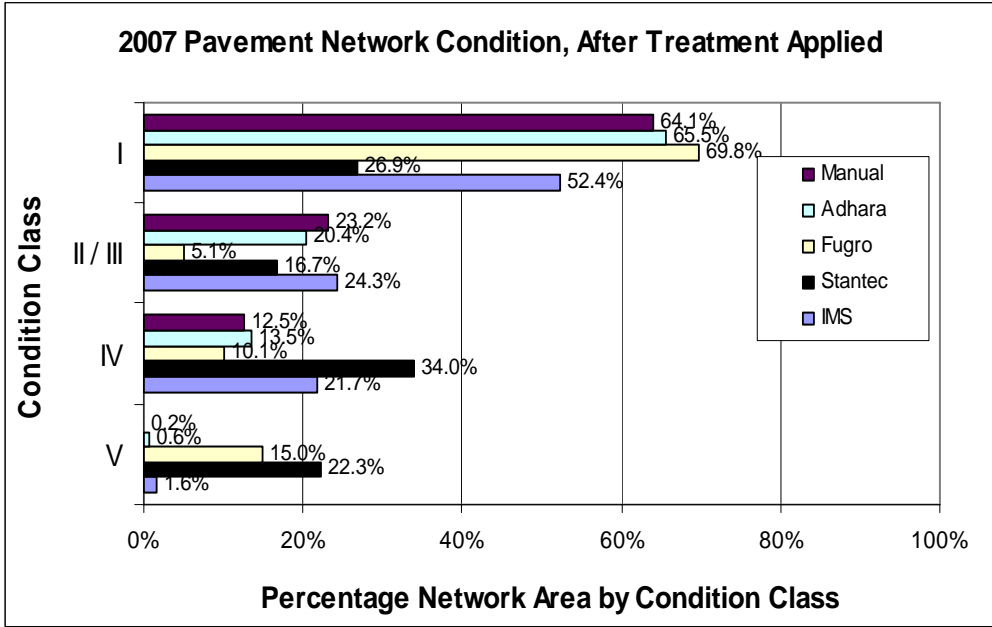


**Figure 24: Network Condition Summary for City of Piedmont in 2007 prior to Applying the Treatment**

Table 23 and Figure 25 show the percentage network area composition by condition class for city of Piedmont in 2007 after applying the treatment. The percentage network area in category I from Adhara’s data (65.5%) and from Fugro’s data is close to Manual (64.1 %).

**Table 23: Condition in Base Year 2007, immediately after Applying Treatments for City of Piedmont**

Condition Class	Manual	Adhara	Fugro	Stantec	IMS
I	64.1%	65.5%	69.8%	26.9%	52.4%
II / III	23.2%	20.4%	5.1%	16.7%	24.3%
IV	12.5%	13.5%	10.1%	34.0%	21.7%
V	0.2%	0.6%	15.0%	22.3%	1.6%
Total	100%	100%	100%	100%	100%

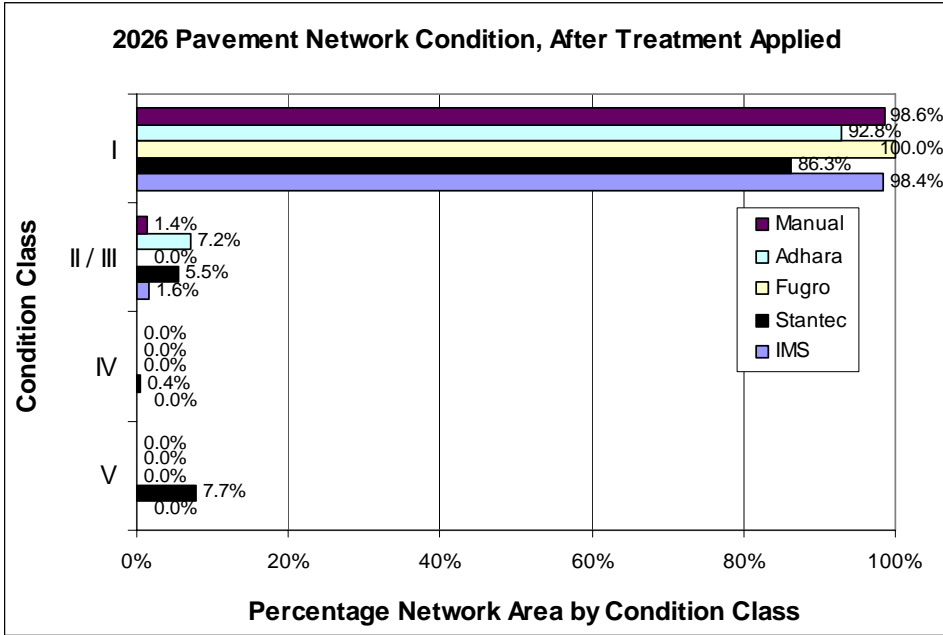


**Figure 25: Network Condition Summary for City of Piedmont in 2007 Immediately after Applying the Treatment**

Table 24 and Figure 26 shows the percentage network area composition by condition class for city of Piedmont in 2026 immediately after scheduled treatments applied. As expected, in almost all the cases, except for Stantec (86.3%), the percentage network area in category I is above 90% (Manual, Adhara, Fugro, IMS).

**Table 24: Condition in Base year 2026, immediately after Applying Treatments for City of Piedmont**

Condition Class	Manual	Adhara	Fugro	Stantec	IMS
I	98.6%	92.8%	100.0%	86.3%	98.4%
II / III	1.4%	7.2%	-	5.5%	1.6%
IV	-	-	-	0.4%	-
V	-	-	-	7.7%	-
Total	100%	100%	100%	100%	100%



**Figure 26: Network Condition Summary for City of Piedmont in 2026 after Schedule Treatments Applied**

## **CHAPTER 4:**

### **SUMMARY OF FINDINGS**

#### **Distress Data**

The average network PCI values based on distress data collected by IMS and Adhara were within 7 PCI points of the average network PCI from manual surveys while those based on data collected by Fugro and Stantec for the East Palo Alto sections were more than 20 PCI points different. Table 8 shows that the average network PCI values based on distress data collected by Adhara and IMS were also within 7 PCI points of the average network PCI from manual surveys and those based on data collected by Fugro and Stantec for the Piedmont sections were more 14 or more PCI points different.

The data from Adhara and IMS have the smallest total PCI differences from those based on manual surveys. The amount of sections with a difference of 15 PCI points or less compared to the PCI values based on manual surveys was largest for IMS and Adhara. The number of sections with difference of 20 PCI points or more was the largest for Stantec and Fugro.

While data provided by Adhara has considerable scatter among individual PCI values compared to that collected manually, the average PCI value is near that from the manual survey but is generally a few points higher. The PCI values from Adhara's data have nearly as many point differences higher than lower when compared to the manual.

The data provided by Fugro has considerable scatter among individual PCI values compared to that collected manually, and the average PCI value is several points higher for the East Palo Alto data but only a few points lower for the Piedmont data. Fugro data produces several PCI values well above 50 when the values based on manual surveys are below 30. The slopes and intercepts from the regression analysis indicate that there are generally more sections with higher PCI values based on Fugro's data than those based on the manual surveys.

The data provided by Stantec has considerable scatter among individual PCI values compared to that collected manually, and the average PCI value is several points lower than that based on manual data. Stantec data produces several PCI values that are well below 40 when the values based on manual surveys are above 80. The slopes and intercepts from the regression analysis indicate that there are generally more sections with lower PCI values based on Stantec's data than those based on the manual surveys.

The data provided by IMS has the lowest scatter among individual PCI values compared to that collected manually for data from East Palo Alto but close to the highest scatter for data from Piedmont. IMS data produces several points that are well below 50 when the values based manual survey reports are 100. The slopes and intercepts from the regression analysis

indicate that there are generally more sections with higher PCI values based on IMS's data than those based on the manual surveys.

## **Budget Needs**

### **Short-term Needs**

The budget needs for 2007 for the city of East Palo Alto (2007 BN for EPA) based on PCI data provided by Adhara are less than 20 percent lower than those based on PCI data from manual surveys (MS PCI). The 2007 BN for EPA based on PCI data provided by IMS are less than 30 percent lower than those based on MS PCI. The 2007 BN for EPA based on PCI data provided by Fugro are nearly 70 percent lower than those based on MS PCI. The 2007 BN for EPA based on PCI data provided by Stantec are more than 90 percent higher than those based on MS PCI.

The budget needs for 2007 for the city of Piedmont (2007 BN for Pdmt) based on PCI data provided by Adhara are less than 10 percent lower than those based on PCI data from manual surveys (MS PCI). The 2007 BN for Pdmt based on PCI data provided by Fugro are less than 15 percent lower than those based on MS PCI. The 2007 BN for Pdmt based on PCI data provided by IMS are less than 30 percent higher than those based on MS PCI. The 2007 BN for Pdmt based on PCI data provided by Stantec are more than 130 percent higher than those based on MS PCI.

### **Long-term Needs**

The budget needs for the total 20-year budget analysis period for the city of East Palo Alto (20yr BN for EPA) based on PCI data provided by IMS and Adhara are less than 20 percent lower than those based on PCI data from manual surveys (MS PCI). The 20yr BN for EPA based on PCI data provided by Fugro are nearly 50 percent lower than those based on MS PCI. The 20yr BN for EPA based on PCI data provided by Stantec are more than 45 percent higher than those based on MS PCI.

The budget needs for the total 20-year budget analysis period for the city of Piedmont (20yr BN for Pdmt) based on PCI data provided by Adhara are less than 4 percent lower than those based on PCI data from manual surveys (MS PCI). The 20yr BN for Pdmt based on PCI data provided by Fugro are less than 12 percent lower than those based on MS PCI. The 20yr BN for Pdmt based on PCI data provided by IMS are less than 12 percent higher than those based on MS PCI. The 20yr BN for Pdmt based on PCI data provided by Stantec are nearly 30 percent higher than those based on MS PCI.

## **Overall**

The average network PCI values calculated based on data provided by Adhara for both agencies are reasonably close to those based on the manual surveys, within 7 PCI points. The percent of PCI values based on data provided by Adhara that were within 15 points of

those based on manual surveys was greater than 60% for both agencies. The slopes of the regression lines are close to the desired value of 1.0 with both at 0.85 or greater. The intercepts of the regression lines are reasonably close to 0 with both less than 16 PCI points. The short-term and long-term budget needs calculated based on data provided by Adhara are less than 20 percent different for East Palo Alto and less than 10% different for Piedmont data compared to the budget needs calculated based on PCI values from manual surveys.

The average network PCI values calculated based on data provided by IMS for both agencies are reasonably close to those based on the manual surveys, within 8 PCI points. The percent of PCI values based on data provided by IMS that were within 15 points of those based on manual surveys was greater than 60% for both agencies. The slopes of the regression lines are close to the desired value of 1.0 at 0.79 for East Palo Alto but only 0.45 for Piedmont. The intercepts of the regression lines are reasonably close to 0 with less than 17 PCI points for East Palo Alto but more than 30 for Piedmont. The short-term and long-term budget needs calculated based on data provided by IMS are less than 30 percent different for both East Palo Alto and for Piedmont data compared to the budget needs calculated based on PCI values from manual surveys.

The average network PCI values calculated based on data provided by Furgo for both agencies are 14 or more PCI points larger than those based on the manual surveys. The percent of PCI values based on data provided by Furgo that were within 15 points of those based on manual surveys was less than 50 percent for both agencies and the amount of sections with differences greater than 20 PCI points was more than 30 percent for both agencies. The slopes of the regression lines were not close to the desired value of 1.0 at 0.37 for East Palo Alto but only 0.23 for Piedmont. The intercepts of the regression lines are much greater than 0 with 55 PCI points for East Palo Alto and 68 for Piedmont. The short-term and long-term budget needs calculated based on data provided by Furgo are more than 48 percent different for East Palo Alto and more than 11 percent different for Piedmont data compared to the budget needs calculated based on PCI values from manual surveys.

The average network PCI values calculated based on data provided by Stantec for both agencies are 20 or more PCI points less than those based on the manual surveys. The percent of PCI values based on data provided by Stantec that were within 15 points of those based on manual surveys was about 35 percent for both agencies and the amount of sections with differences greater than 20 PCI points was more than 55 percent for both agencies. The slopes of the regression lines were not close to the desired value of 1.0 at 0.38 for East Palo Alto but were closer at 1.15 for Piedmont. The intercepts of the regression lines are reasonably close 0 with 9 PCI points for East Palo Alto but much less than 0 with -32 for Piedmont. The short-term budget needs calculated based on data provided by Stantec are more than 90 percent higher for both agencies while the long-term budget needs based on data from Stantec are nearly 30 percent higher for East Palo Alto and more than 45 percent different for Piedmont data compared to the budget needs calculated based on PCI values from manual surveys.

## **Scenarios Analysis**

Scenarios analyses ran for all four vendors for an annual budget that was based on the total 20-year budget needs calculated using data from manual surveys showed that the percentage network area in category I in 2007 after applying the treatment from IMS's data (60.3%) and Adhara's data (57.5%) were close to Manual (56 %) for the city of East Palo Alto. For the city of Piedmont, the percentage network area in category I in 2007 after applying the treatment from Adhara's data (65.5%) and from Fugro's data were close to Manual (64.1 %).

Scenario analysis in 2026, immediately after scheduled treatments applied, showed for the city of East Palo Alto that in almost all the cases, except for Stantec, the percentage network area in category I is 100% (IMS, Fugro, Adhara) or above 90% (Manual). For Piedmont, in almost all the cases, except for Stantec (86.3%), the percentage network area in category I was above 90% (Manual, Adhara, Fugro, IMS).

Results from Scenario analysis were consistent with the PCI analysis.

**Appendix A**  
**Pavement Condition Index**

**TableA.1: PCI values for the City of East Palo Alto**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
1	ABELWA	01	22	66	82	17	28
2	ADDIAV	01	17	19	46	16	14
3	ADDIAV	02	57	38	84	36	63
4	ADDIAV	03	82	81	96	41	86
5	ALBEST	01	78	51	81	52	72
6	ANNAST	01	72	86	88	44	53
7	ASTEWA	01	17	15	74	17	19
8	AVALST	01	87	96	100	100	89
9	AZALDR	01	8	6	70	21	10
10	AZALDR	02	83	99	89	21	86
11	AZALDR	03	83	100	93	29	87
12	BAINST	01	85	98	100	20	88
13	BAYLST	01	81	84	81	39	65
14	BAYROA	01	15	22	84	24	32
15	BAYROA	02	18	23	71	21	24
16	BAYROA	03	69	72	76	34	67
17	BAYROA	04	62	73	81	8	59
18	BAYROA	05	74	73	88	41	71
19	BAYROA	06	69	72	87	48	70
20	BAYROA	07	6	11	42	14	0
21	BEECST	01	70	73	32	16	68
22	BEECST	02	82	97	80	16	91
23	BELLCT	10	48	100	67	16	63
24	BELLST	01	11	0	21	12	9
25	BELLST	02	100	95	88	100	8
26	BELLST	03	17	22	36	11	10
27	BELLST	04	40	47	58	20	46
28	BRADWA	01	51	49	90	24	60
29	BRENCT	01	59	77	60	34	59
30	BUCHCT	01	82	89	85	59	75
31	CAMECT	01	66	70	92	29	67
32	CAMEDR	02	76	74	98	44	81
33	CAMEDR	03	63	49	84	19	55
34	CAMPWY	10	65	100	74	22	86
35	CAPIAV	01	19	13	58	16	34
36	CAPIAV	02	19	13	53	15	28
37	CAPIAV	10	81	97	78	13	78
38	CLARAV	01	71	84	72	21	79
39	CLARAV	02	63	61	68	13	57
40	CLARAV	03	52	41	62	19	50
41	CLARAV	04	62	72	75	18	67
42	CLARAV	05	32	92	63	16	58
43	CLARAV	06	46	58	65	38	68
44	CLARAV	08	14	13	39	16	0
45	CLARAV	50	80	97	82	37	85
46	CLARCT	01	81	79	98	41	78
47	CONNWY	10	12	10	38	10	14
48	COOLAV	01	83	77	66	11	76
49	COOLAV	02	31	87	50	17	61
50	COOLAV	03	58	93	77	19	63

**TableA.1: PCI values for the City of East Palo Alto (Continued)**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
51	COOLAV	04	80	98	87	37	88
52	CYPRST	01	28	48	57	19	44
53	DAISLA	01	19	19	89	32	67
54	DAPHCT	01	13	11	88	9	17
55	DAPHWA	01	12	15	79	18	20
56	DAPHWA	02	17	23	81	18	30
57	DEMEST	01	41	19	74	16	52
58	DONOST	01	16	66	68	16	67
59	DONOST	02	27	78	88	42	77
60	DONOST	04	24	20	71	17	25
61	DONOST	08	42	92	76	21	70
62	DONOST	09	83	96	88	43	84
63	DREWCT	01	66	91	70	26	70
64	DUMBAV	01	44	18	64	24	14
65	DUMBAV	02	83	98	95	30	85
66	DUMBAV	03	80	94	95	43	88
67	EASTRO	01	79	100	84	44	61
68	EASTRO	02	66	55	85	50	63
69	EASTRO	03	83	100	71	66	87
70	EASTRO	04	83	100	72	49	87
71	EASTRO	05	83	100	73	65	87
72	EASTRO	06	83	98	87	54	83
73	EASTRO	07	100	98	53	73	86
74	EASTRO	08	100	80	72	49	91
75	EASTRO	09	80	47	82	38	85
76	EASTST	01	71	65	86	57	71
77	EMMEWA	01	81	88	100	57	59
78	EUCLAV	01	78	85	93	40	79
79	EUCLAV	02	71	63	86	37	68
80	EUCLAV	03	18	98	56	11	15
81	EUCLAV	04	83	99	100	57	87
82	FARRWA	01	83	83	80	45	69
83	FORDST	01	38	42	68	21	47
84	FORDST	02	42	19	72	17	34
85	FORDST	03	83	49	78	15	83
86	FORDST	04	57	100	76	34	89
87	FORDST	05	83	100	83	57	90
88	FORDST	06	18	36	75	32	33
89	GAILWA	01	9	2	72	33	20
90	GARDCT	01	28	48	77	32	52
91	GARDST	01	21	22	67	15	9
92	GARDST	02	82	83	98	23	87
93	GARDST	03	80	85	86	38	81
94	GARDST	04	27	55	62	16	62
95	GARDWA	01	17	12	73	18	27
96	GARDWA	02	16	18	80	17	28
97	GATEST	01	83	11	99	20	88
98	GEORST	01	17	27	43	10	27
99	GERTCT	01	84	94	78	7	84
100	GLENWA	01	74	99	89	11	86

**TableA.1: PCI values for the City of East Palo Alto (Continued)**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
101	GLENWA	02	81	79	94	18	87
102	GLENWA	03	14	9	69	13	18
103	GLORWA	01	39	33	84	30	67
104	GLORWA	02	33	49	84	35	38
105	GONZST	01	72	80	84	35	56
106	GONZST	02	74	82	87	33	83
107	GONZST	03	77	100	89	41	81
108	GONZST	04	75	63	67	44	81
109	GRACAV	01	82	83	94	43	77
110	GREEST	01	16	0	33	14	9
111	GREEST	02	80	87	90	6	91
112	GREEST	03	70	44	99	69	72
113	HAZEWA	01	62	55	85	22	59
114	HENRCT	10	83	100	61	19	81
115	HIBICT	01	57	67	56	23	79
116	HOLLST	01	20	40	80	19	40
117	HUNTST	01	23	47	63	18	50
118	ILLIST	01	78	99	93	25	78
119	ILLIST	02	78	82	92	26	78
120	ILLIST	03	60	77	90	30	78
121	ILLIST	04	79	85	89	22	83
122	ILLIST	05	77	79	76	42	82
123	JASMWA	01	16	17	86	14	16
124	JERVAV	01	82	67	85	56	70
125	KAVADR	01	34	41	83	17	49
126	KIRKCT	01	73	88	100	24	80
127	LAKEDR	01	15	16	56	12	23
128	LAKEDR	02	10	37	69	12	22
129	LAURAV	01	59	52	81	31	57
130	LAURAV	02	19	44	77	13	30
131	LAURAV	03	53	84	86	41	64
132	LILALA	01	33	45	74	6	34
133	LINCST	01	83	99	92	10	90
134	LINCST	02	82	81	95	70	81
135	LOTUWA	01	63	66	100	75	74
136	MANHAV	01	82	89	89	73	82
137	MANHAV	02	81	96	98	74	87
138	MCNAST	01	84	91	99	77	88
139	MELLST	01	77	75	89	70	69
140	MENAAV	01	16	44	90	19	54
141	MENAAV	02	22	35	72	23	44
142	MENAAV	03	18	34	64	26	28
143	MICHAV	01	48	38	65	17	33
144	MICHAV	02	64	94	81	26	70
145	MOUTCI	01	86	97	100	40	87
146	MYRTPL	01	83	70	36	33	87
147	MYRTST	01	56	56	85	20	24
148	NEWBST	01	78	98	86	60	80
149	NEWERO	01	83	97	83	65	80
150	NOTRAV	01	17	26	58	16	24

**TableA.1: PCI values for the City of East Palo Alto (Continued)**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
151	NOTRAV	02	81	83	45	22	83
152	OAKDRD	01	64	47	80	24	71
153	OAKEST	01	88	94	98	52	89
154	OAKWDR	01	78	64	86	63	84
155	OAKWDR	02	80	93	83	45	87
156	OAKWDR	03	80	96	87	47	86
157	OCONST	01	83	89	73	34	86
158	OCONST	02	82	44	81	32	88
159	OCONST	03	60	83	72	36	50
160	OCONST	04	81	79	81	33	68
161	OCONST	05	77	26	78	60	70
162	OCONST	06	14	No Data	25	12	9
163	PALOAV	01	83	90	93	23	80
164	PALOAV	02	83	100	95	23	82
165	PALOAV	03	83	94	93	26	79
166	PAULCT	10	78	90	68	24	80
167	POPLAV	01	66	82	72	18	70
168	POPLAV	02	11	32	26	10	7
169	POPLAV	03	81	90	99	12	86
170	PULGAV	01	46	45	71	13	54
171	PULGAV	02	21	41	79	17	59
172	PULGAV	03	73	86	79	16	76
173	PULGAV	04	56	61	71	18	68
174	PULGAV	05	24	38	52	16	38
175	PULGAV	06	83	100	81	15	88
176	PULGAV	07	20	37	76	21	14
177	PULGAV	08	50	64	77	16	65
178	PULGAV	09	70	78	77	26	77
179	PURDAV	01	7	6	39	10	20
180	PURDAV	02	76	90	80	14	89
181	RALMAV	01	55	56	82	18	65
182	RALMAV	02	75	79	95	16	70
183	RALMAV	03	81	81	90	15	57
184	RALMAV	04	52	36	86	18	80
185	RUNNST	01	28	38	40	13	25
186	RUNNST	02	81	90	87	38	79
187	RUNNST	03	76	81	78	23	75
188	RUNNST	04	54	61	91	18	30
189	RUNNST	05	83	67	97	32	88
190	RUNNST	06	72	80	92	46	77
191	RUNNST	07	18	43	88	2	19
192	RUTGST	01	9	17	19	4	15
193	RUTHCT	01	72	82	57	12	82
194	SACRST	01	82	91	85	51	80
195	SAGAAV	01	77	23	85	31	56
196	SAGEST	01	63	73	96	38	89
197	SALACT	10	55	60	63	30	57
198	SCFIST	10	52	21	78	27	78
199	SCHELA	01	17	14	38	15	89
200	SHORCT	01	83	98	92	100	86

**TableA.1: PCI values for the City of East Palo Alto (Continued)**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
201	SPARCT	10	83	98	60	100	59
202	STEVAV	01	20	82	64	56	81
203	TATEST	01	90	98	100	88	88
204	TEMPCT	01	67	89	100	94	70
205	TERRAV	01	42	67	75	52	50
206	TINSST	01	86	48	97	53	89
207	TULAAV	01	22	98	58	13	24
208	UNIVAV	01N	83	99	93	55	86
209	UNIVAV	01S	13	53	90	13	85
210	UNIVAV	02	83	62	93	17	81
211	UNIVAV	03	81	88	83	19	82
212	UNIVAV	04	82	92	85	19	82
213	UNIVAV	05	83	98	86	21	63
214	URSUWA	01	81	70	91	24	66
215	VERBDR	01	13	6	65	18	13
216	VERBDR	02	23	51	86	16	33
217	WEEKST	01	23	47	63	13	86
218	WEEKST	02	80	98	89	17	72
219	WEEKST	03	61	72	67	37	75
220	WEEKST	04	65	33	84	51	58
221	WESTAV	01	72	62	88	38	88
222	WESTRO	01	79	88	92	54	76
223	WESTRO	02	4	25	81	16	5
224	WESTRO	03	6	24	63	14	16
225	WESTRO	04	10	22	83	13	12
226	WESTRO	05	83	100	74	13	82
227	WILKST	01	83	82	99	100	85
228	WISTDR	01	9	31	50	3	25
229	WISTDR	02	90	58	89	51	81
230	WISTDR	03	82	69	93	51	85
231	WISTDR	04	13	26	46	13	17
232	WOODAV	01	83	98	73	19	83
233	WOODAV	02	83	62	75	21	86
234	WOODAV	03	15	2	30	7	0
235	WOODAV	04	16	1	32	5	10
236	WOODAV	05	16	15	36	7	13
237	WOODAV	06	17	3	18	13	2
238	XAVIST	01	12	31	42	14	24

**TableA.2: PCI values for the City of Piedmont**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
1	ABBOW	010	35	74	80	23	74
2	ALTA AV	010	75	71	83	No Data	No Data
3	ALTA AV	020	79	90	74	96	79
4	ANNRYR	010	37	36	81	7	24
5	ARBORD	010	81	85	91	69	76
6	ARBORD	020	55	55	82	6	75
7	ARBORD	030	83	91	93	89	78
8	ARROYA	010	79	96	96	56	75
9	ARTUNA	010	82	90	99	49	78
10	BELLAV	010	83	100	82	100	80
11	BELLVA	010	47	48	79	60	44
12	BLAIRA	010	54	63	88	31	45
13	BLAIRA	020	68	67	78	39	67
14	BLAIRA	030	55	46	79	23	78
15	BLAIRA	040	83	63	72	49	77
16	BLAIRA	050	66	66	91	24	55
17	BLAIRA	060	87	98	94	49	83
18	BLAIRA	070	64	56	81	16	40
19	BLAIRP	010	86	98	100	100	82
20	BONITA	010	80	87	77	92	78
21	BONITA	020	83	98	83	91	78
22	BONITA	030	82	93	93	94	79
23	BONITA	040	82	84	86	90	78
24	BOULEW	010	51	51	82	18	70
25	CALVCT	010	28	27	74	31	20
26	CAMBRA	010	61	88	81	43	21
27	CAMBRW	010	73	71	87	63	76
28	CAMBRW	020	75	79	73	15	70
29	CAPERA	010	73	61	86	21	72
30	CAPERD	010	78	48	83	18	72
31	CARMEA	010	53	54	85	22	41
32	CAVANC	010	63	84	85	67	52
33	COMCTL	010	68	84	0	0	62
34	CRAIGA	010	74	49	85	52	77
35	CRESTR	010	35	44	86	11	36
36	CROFTA	010	26	36	81	16	44
37	CROKRA	010	86	95	76	95	84
38	CROYDC	010	80	84	92	97	77
39	DALEAV	010	74	59	86	23	76
40	DORMIA	010	42	50	71	48	48
41	DRACEA	010	52	60	91	32	44
42	DUDLYA	010	44	46	64	19	34
43	DUDLYC	010	90	99	98	100	89
44	ECHOLN	010	60	41	79	7	60
45	ELCERA	010	79	96	83	49	77
46	ELCERA	020	35	48	74	13	22
47	ELCERA	030	77	98	75	36	77
48	ELCERA	040	56	45	71	42	59
49	ESTATD	010	62	69	81	36	50
50	ESTREA	010	51	88	71	10	44

**TableA.2: PCI values for the City of Piedmont (Continued)**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
51	FAIRVA	010	79	87	96	70	76
52	FAIRVA	020	82	100	93	88	78
53	FARRAA	010	80	86	97	87	78
54	FARRGA	010	83	97	100	82	79
55	FLODAA	010	63	67	81	72	31
56	GLENAR	010	47	54	87	56	42
57	GLENAR	020	39	51	74	51	37
58	GRANDA	010	81	84	87	19	61
59	GRANDA	020	83	81	96	43	77
60	GRANDA	025	62	60	77	54	76
61	GRANDA	030	81	76	90	30	63
62	GRANDA	040	78	82	91	28	64
63	GRANDA	050	81	92	93	44	75
64	GRENBA	010	68	57	95	31	75
65	GRENBA	020	59	75	93	51	65
66	GRENBA	030	76	78	90	69	77
67	GUILFR	010	90	99	96	85	89
68	HAGARA	010	80	76	88	66	77
69	HAMPTR	010	61	59	88	42	64
70	HAMPTR	020	100	43	98	59	24
71	HAMPTR	025	83	97	99	62	74
72	HAMPTR	030	72	87	89	77	72
73	HAMPTR	040	78	76	95	77	73
74	HARDWA	010	49	40	89	12	77
75	HARVAR	010	46	35	89	18	37
76	HARVAR	020	70	53	83	45	48
77	HAZELL	010	80	80	89	68	71
78	HAZELL	020	100	100	89	100	42
79	HIGHLA	010	81	99	97	100	77
80	HIGHLA	020NB	73	72	83	50	42
81	HIGHLA	020SB	73	97	100	55	36
82	HIGHLA	030	64	61	86	37	70
83	HIGHLA	040	60	63	81	33	71
84	HIGHLA	050	80	98	90	48	74
85	HIGHLA	060	71	80	88	53	69
86	HIGHLW	010	59	47	89	63	49
87	HIGHLW	020	79	No Data	0	69	60
88	HILLLN	010	62	44	88	4	No Data
89	HILLSA	010	71	68	88	67	67
90	HILLSA	020	48	43	79	17	55
91	HILLSA	030	78	79	89	59	70
92	HILLSC	010	83	91	0	100	76
93	HOLLYP	010	80	84	78	34	71
94	HOWARA	010	54	61	76	17	52
95	HUNTLR	010	48	45	86	37	38
96	INDGLR	010	54	55	86	53	47
97	INDIAC	010	17	No Data	0	0	14
98	INDIAR	010	68	81	78	27	61
99	INDIAR	020	36	62	89	26	25
100	INVERT	010	35	41	79	17	63

**TableA.2: PCI values for the City of Piedmont (Continued)**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
101	JEROMA	010	83	98	83	49	77
102	JEROMA	020	53	59	85	17	45
103	JEROMA	030	73	74	95	91	73
104	KEEFEC	010	81	74	97	60	77
105	KINGAV	010	81	80	90	54	69
106	KINGAV	020	80	80	99	81	77
107	KINGSA	010	79	71	98	39	76
108	KINGSA	020	45	36	83	9	68
109	LAFAYA	010	81	73	95	46	78
110	LAKEAV	010	66	57	97	18	68
111	LAKEAV	020	82	97	94	49	78
112	LAKEVA	010	78	97	91	47	71
113	LANGDC	010	81	95	80	78	77
114	LARMEC	010	100	98	89	100	53
115	LASALA	040	54	48	87	17	41
116	LASALA	050	81	82	100	86	75
117	LASLLA	010	100	98	91	100	45
118	LASLLA	015	100	97	78	64	80
119	LASLLA	020	43	68	85	13	38
120	LASLLA	030	72	85	89	38	71
121	LASLLC	010	85	100	100	100	82
122	LATHAS	010	58	53	79	38	71
123	LEXFOR	010	73	81	91	74	45
124	LINCOA	010	82	100	92	74	76
125	LINCOA	020	78	82	97	96	79
126	LINDAA	010	100	99	98	100	49
127	LINDAA	020	100	97	99	49	33
128	LITWDR	010	50	44	82	39	59
129	LORITA	010	96	96	98	49	21
130	LOWGRA	010	65	66	37	23	72
131	LOWGRA	020	82	92	76	35	77
132	LOWILA	010	70	54	86	0	65
133	MACKPL	010	100	100	100	100	20
134	MAGNOA	010	78	63	85	69	55
135	MAGNOA	020	64	58	84	18	65
136	MANORD	010	76	72	84	38	70
137	MARLBC	010	69	58	81	69	45
138	MAXWER	010	57	57	58	22	52
139	MESAAV	010	85	100	99	91	82
140	MONTEA	010	82	100	100	94	78
141	MONTEA	020	82	77	100	87	79
142	MONTIA	010	77	84	90	39	76
143	MONTIA	020	63	100	96	49	39
144	MORAGA	010	65	84	87	43	42
145	MORAGA	020	68	98	75	37	57
146	MORAGA	030	75	91	90	46	52
147	MOUNTA	010	47	75	91	16	45
148	MOUNTA	020	67	66	80	19	68
149	MUIRAV	010	81	74	80	86	73
150	NACEA	010	83	48	96	26	74

**TableA.2: PCI values for the City of Piedmont (Continued)**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
151	NELLIA	010	83	97	45	90	78
152	NOVADR	010	74	80	82	22	74
153	OAKLAA	010	100	99	38	100	42
154	OAKLAA	020	61	74	77	45	60
155	OAKLAA	030	63	56	69	26	39
156	OAKLAA	035	83	100	66	24	78
157	OAKLAA	040	90	100	97	39	86
158	OAKMOA	010	71	69	91	55	71
159	OAKRD	010	82	66	100	72	65
160	OLIVEA	010	78	94	97	49	75
161	OLIVEA	020	57	60	96	19	54
162	PACIFA	010	60	48	86	27	69
163	PACIFA	020	38	45	78	28	67
164	PACIFA	030	59	52	86	32	72
165	PACIFA	040	72	51	82	29	74
166	PALAAV	010	53	49	57	18	55
167	PALAAV	020	69	36	86	37	68
168	PALAAV	030	83	100	100	100	80
169	PALMDR	010	83	87	94	94	78
170	PARKLN	010	73	67	88	31	61
171	PARKSD	010	72	52	76	43	54
172	PARKVA	010	79	68	83	82	78
173	PARKWY	010	81	95	99	47	No Data
174	PARKWY	020	77	96	91	49	74
175	PARKWY	030	63	43	78	18	58
176	PIEDMC	010	84	98	99	98	39
177	POPLAW	010	38	19	78	12	32
178	PORTSR	010	100	84	0	100	3
179	PORTSR	020	76	71	88	45	53
180	PROSPD	010	76	51	0	0	77
181	PROSPR	010	83	85	98	100	79
182	PROSPR	020	79	86	75	86	77
183	RAMONA	010	83	100	89	100	77
184	RAMONA	015	83	99	90	49	75
185	RAMONA	020	43	31	57	8	37
186	RAMONA	025	79	61	89	34	71
187	RANLEW	010	83	64	98	55	48
188	REDROR	010	51	74	91	5	43
189	REQUAP	010	29	32	84	13	79
190	REQUAR	010	44	38	85	10	29
191	RICARA	010	57	68	90	25	61
192	RICHAW	010	80	81	90	58	77
193	RONADA	010	78	93	98	71	78
194	RONADA	020	61	57	88	18	65
195	ROSEAV	010	79	94	98	49	76
196	ROSEAV	020	100	100	99	0	60
197	SANCAA	010	66	68	79	45	64
198	SANCAA	020	36	40	77	16	31
199	SANCAA	030	73	58	79	22	66
200	SANDRP	010	73	74	89	73	75

**TableA.2: PCI values for the City of Piedmont (Continued)**

Sc No.	Street ID	Section ID	Manual	Adhara	Fugro	Stantec	IMS
201	SANDRR	010	64	65	88	29	44
202	SANDRR	020	62	25	74	0	23
203	SCENAV	010	59	No Data	74	37	70
204	SCENAV	020	75	78	85	62	38
205	SCENAV	030	62	62	81	49	73
206	SCENAV	040	68	100	100	97	72
207	SEAVIA	010	63	60	91	30	61
208	SEAVIA	020	58	47	94	26	59
209	SEAVIA	030	57	37	80	52	39
210	SEAVIA	040	74	64	60	36	26
211	SELBOD	010	54	81	78	27	61
212	SHAROA	010	59	56	82	52	63
213	SHAROC	010	71	65	91	66	78
214	SHERIA	010	58	48	89	10	66
215	SHERID	010	56	42	89	36	60
216	SIERAA	010	78	61	100	50	70
217	SOMSTR	010	98	97	98	92	33
218	SOTELA	010	48	67	92	40	42
219	STJAMC	010	78	83	90	88	79
220	STJASD	010	100	98	98	100	61
221	STJASD	020	81	95	98	83	74
222	STJASD	030	79	67	98	70	73
223	STJASD	040	78	100	93	0	78
224	STJASD	050	80	97	98	0	75
225	STJASP	010	70	95	70	47	74
226	SUNYSA	010	81	97	99	49	81
227	SUNYSA	020	49	34	97	16	36
228	SYLVAW	010	52	24	88	11	77
229	TREGLR	010	75	75	80	48	75
230	TREGLR	020	75	61	87	29	74
231	TYSONC	010	100	100	100	93	62
232	VALANP	010	70	40	53	25	74
233	VISTAA	010	82	92	97	71	77
234	WALDOA	010	82	94	96	49	79
235	WALLAR	010	79	76	85	40	73
236	WARFIA	010	80	86	98	48	67
237	WILDWA	010	100	100	99	100	35
238	WILDWA	020	79	95	97	62	77
239	WILDWA	030	82	88	92	81	78
240	WILDWA	040	80	97	97	73	78
241	WILDWA	050	81	97	95	63	74
242	WILWDG	010	88	97	95	100	84
243	WILWDG	020	88	99	99	96	85
244	WINSOA	010	76	74	94	62	76
245	WINSOA	020	44	57	84	54	26
246	WISTAW	010	83	94	60	90	78
247	WOODLW	010	49	52	87	19	40
248	WYNGAA	010	48	58	67	13	39
249	YORKDR	010	78	79	85	24	77

## **Appendix B**

### **Comparison of Pavement Condition Index**

**Table B.1: Comparison of PCI from Vendors to PCI from Manual for the City of East Palo Alto**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
1	ABELWA	01	44	60	- 5	6
2	ADDIAV	01	2	29	- 1	-3
3	ADDIAV	02	-19	27	-21	6
4	ADDIAV	03	- 1	14	-41	4
5	ALBEST	01	-27	3	-26	- 6
6	ANNAST	01	14	16	-28	-19
7	ASTEWA	01	- 2	57	0	2
8	AVALST	01	9	13	13	2
9	AZALDR	01	- 2	62	13	2
10	AZALDR	02	16	6	-62	3
11	AZALDR	03	17	10	-54	4
12	BAINST	01	13	15	-65	3
13	BAYLST	01	3	0	-42	-16
14	BAYROA	01	7	69	9	17
15	BAYROA	02	5	53	3	6
16	BAYROA	03	3	7	-35	- 2
17	BAYROA	04	11	19	-54	- 3
18	BAYROA	05	- 1	14	-33	-3
19	BAYROA	06	3	18	-21	1
20	BAYROA	07	5	36	8	- 6
21	BEECST	01	3	-38	-54	- 2
22	BEECST	02	15	- 2	-66	9
23	BELLCT	10	52	19	-32	15
24	BELLST	01	-11	10	1	- 2
25	BELLST	02	- 5	-12	0	-92
26	BELLST	03	5	19	- 6	- 7
27	BELLST	04	7	18	-20	6
28	BRADWA	01	- 2	39	-27	9
29	BRENT	01	18	1	-25	0
30	BUCHCT	01	7	3	-23	- 7
31	CAMECT	01	4	26	-37	1
32	CAMEDR	02	- 2	22	-32	5
33	CAMEDR	03	-14	21	-44	- 8
34	CAMPWY	10	35	9	-43	21
35	CAPIAV	01	- 6	39	- 3	15
36	CAPIAV	02	- 6	34	- 4	9
37	CAPIAV	10	16	- 3	-68	-3
38	CLARAV	01	13	1	-50	8
39	CLARAV	02	- 2	5	-50	- 6
40	CLARAV	03	-11	10	-33	- 2
41	CLARAV	04	10	13	-44	5
42	CLARAV	05	60	31	-16	26
43	CLARAV	06	12	19	- 8	22
44	CLARAV	08	- 1	25	2	-14
45	CLARAV	50	17	2	-43	5
46	CLARCT	01	- 2	17	-40	- 3
47	CONNWY	10	- 2	26	- 2	2
48	COOLAV	01	- 6	-17	-72	- 7
49	COOLAV	02	56	19	-14	30
50	COOLAV	03	35	19	-39	5

**Table B.1: Comparison of PCI from Vendors to PCI from Manual for the City of East Palo Alto (Continued)**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
51	COOLAV	04	18	7	-43	8
52	CYPRST	01	20	29	-9	16
53	DAISLA	01	0	70	13	48
54	DAPHCT	01	-2	75	-4	4
55	DAPHWA	01	3	67	6	8
56	DAPHWA	02	6	64	1	13
57	DEMEST	01	-22	33	-25	11
58	DONOST	01	50	52	0	51
59	DONOST	02	51	61	15	50
60	DONOST	04	-4	47	-7	1
61	DONOST	08	50	34	-21	28
62	DONOST	09	13	5	-40	1
63	DREWCT	01	25	4	-40	4
64	DUMBAV	01	-26	20	-20	-30
65	DUMBAV	02	15	12	-53	2
66	DUMBAV	03	14	15	-37	8
67	EASTRO	01	21	5	-35	-18
68	EASTRO	02	-11	19	-16	-3
69	EASTRO	03	17	-12	-17	4
70	EASTRO	04	17	-11	-34	4
71	EASTRO	05	17	-10	-18	4
72	EASTRO	06	15	4	-29	0
73	EASTRO	07	-2	-47	-27	-14
74	EASTRO	08	-20	-28	-51	-9
75	EASTRO	09	-33	2	-42	5
76	EASTST	01	-6	15	-14	0
77	EMMEWA	01	7	19	-24	-22
78	EUCLAV	01	7	15	-38	1
79	EUCLAV	02	-8	15	-34	-3
80	EUCLAV	03	80	38	-7	-3
81	EUCLAV	04	16	17	-26	4
82	FARRWA	01	0	-3	-38	-14
83	FORDST	01	4	30	-17	9
84	FORDST	02	-23	30	-25	-8
85	FORDST	03	-34	-5	-68	0
86	FORDST	04	43	19	-23	32
87	FORDST	05	17	0	-26	7
88	FORDST	06	18	57	14	15
89	GAILWA	01	-7	63	24	11
90	GARDCT	01	20	49	4	24
91	GARDST	01	1	46	-6	-12
92	GARDST	02	1	16	-59	5
93	GARDST	03	5	6	-42	1
94	GARDST	04	28	35	-11	35
95	GARDWA	01	-5	56	1	10
96	GARDWA	02	2	64	1	12
97	GATEST	01	-72	16	-63	5
98	GEORST	01	10	26	-7	10
99	GERTCT	01	10	-6	-77	0
100	GLENWA	01	25	15	-63	12

**Table B.1: Comparison of PCI from Vendors to PCI from Manual for the City of East Palo Alto (Continued)**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
101	GLENWA	02	- 2	13	-63	6
102	GLENWA	03	- 5	55	- 1	4
103	GLORWA	01	- 6	45	- 9	28
104	GLORWA	02	16	51	2	5
105	GONZST	01	8	12	-37	-16
106	GONZST	02	8	13	-41	9
107	GONZST	03	23	12	-36	4
108	GONZST	04	-12	- 8	-31	6
109	GRACAV	01	1	12	-39	- 5
110	GREEST	01	-16	17	- 2	- 7
111	GREEST	02	7	10	-74	11
112	GREEST	03	-26	29	- 1	2
113	HAZEWA	01	- 7	23	-40	- 3
114	HENRCT	10	17	-22	-64	- 2
115	HIBICT	01	10	- 1	-34	22
116	HOLLST	01	20	60	- 1	20
117	HUNTST	01	24	40	- 5	27
118	ILLIST	01	21	15	-53	0
119	ILLIST	02	4	14	-52	0
120	ILLIST	03	17	30	-30	18
121	ILLIST	04	6	10	-57	4
122	ILLIST	05	2	- 1	-35	5
123	JASMWA	01	1	70	- 2	0
124	JERVAV	01	-15	3	-26	-12
125	KAVADR	01	7	49	-17	15
126	KIRKCT	01	15	27	-49	7
127	LAKEDR	01	1	41	- 3	8
128	LAKEDR	02	27	59	2	12
129	LAURAV	01	- 7	22	-28	- 2
130	LAURAV	02	25	58	- 6	11
131	LAURAV	03	31	33	-12	11
132	LILALA	01	12	41	-27	1
133	LINCST	01	16	9	-73	7
134	LINCST	02	- 1	13	-12	- 1
135	LOTUWA	01	3	37	12	11
136	MANHAV	01	7	7	- 9	0
137	MANHAV	02	15	17	- 7	6
138	MCNAST	01	7	15	- 7	4
139	MELLST	01	- 2	12	- 7	- 8
140	MENAAV	01	28	74	3	38
141	MENAAV	02	13	50	1	22
142	MENAAV	03	16	46	8	10
143	MICHAV	01	-10	17	-31	-15
144	MICHAV	02	30	17	-38	6
145	MOUTCI	01	11	14	-46	1
146	MYRTPL	01	-13	-47	-50	4
147	MYRTST	01	0	29	-36	-32
148	NEWBST	01	20	8	-18	2
149	NEWERO	01	14	0	-18	- 3
150	NOTRAV	01	9	41	- 1	7

**Table B.1: Comparison of PCI from Vendors to PCI from Manual for the City of East Palo Alto (Continued)**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
151	NOTRAV	02	2	-36	-59	2
152	OAKDRD	01	-17	16	-40	7
153	OAKEST	01	6	10	-36	1
154	OAKWDR	01	-14	8	-15	6
155	OAKWDR	02	13	3	-35	7
156	OAKWDR	03	16	7	-33	6
157	OCONST	01	6	-10	-49	3
158	OCONST	02	-38	-1	-50	6
159	OCONST	03	23	12	-24	-10
160	OCONST	04	-2	0	-48	-13
161	OCONST	05	-51	1	-17	-7
162	OCONST	06	No Data	11	-2	-5
163	PALOAV	01	7	10	-60	-3
164	PALOAV	02	17	12	-60	-1
165	PALOAV	03	11	10	-57	-4
166	PAULCT	10	12	-10	-54	2
167	POPLAV	01	16	6	-48	4
168	POPLAV	02	21	15	-1	-4
169	POPLAV	03	9	18	-69	5
170	PULGAV	01	-1	25	-33	8
171	PULGAV	02	20	58	-4	38
172	PULGAV	03	13	6	-57	3
173	PULGAV	04	5	15	-38	12
174	PULGAV	05	14	28	-8	14
175	PULGAV	06	17	-2	-68	5
176	PULGAV	07	17	56	1	-6
177	PULGAV	08	14	27	-34	15
178	PULGAV	09	8	7	-44	7
179	PURDAV	01	-1	32	3	13
180	PURDAV	02	14	4	-62	13
181	RALMAV	01	1	27	-37	10
182	RALMAV	02	4	20	-59	-5
183	RALMAV	03	0	9	-66	-24
184	RALMAV	04	-16	34	-34	28
185	RUNNST	01	10	12	-15	-3
186	RUNNST	02	9	6	-43	-2
187	RUNNST	03	5	2	-53	-1
188	RUNNST	04	7	37	-36	-24
189	RUNNST	05	-16	14	-51	5
190	RUNNST	06	8	20	-26	5
191	RUNNST	07	25	70	-16	1
192	RUTGST	01	8	10	-5	6
193	RUTHCT	01	10	-15	-60	10
194	SACRST	01	9	3	-31	-2
195	SAGAAV	01	-54	8	-46	-21
196	SAGEST	01	10	33	-25	26
197	SALACT	10	5	8	-25	2
198	SCFIST	10	-31	26	-25	26
199	SCHELA	01	-3	21	-2	72

**Table B.1: Comparison of PCI from Vendors to PCI from Manual for the City of East Palo Alto (Continued)**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
200	SHORCT	01	15	9	17	3
201	SPARCT	10	15	-23	17	-24
202	STEVAV	01	62	44	36	61
203	TATEST	01	8	10	- 2	- 2
204	TEMPCT	01	22	33	27	3
205	TERRAV	01	25	33	10	8
206	TINSST	01	-38	11	-33	3
207	TULAAV	01	76	36	- 9	2
208	UNIVAV	01N	16	10	-28	3
209	UNIVAV	01S	40	77	0	72
210	UNIVAV	02	-21	10	-66	- 2
211	UNIVAV	03	7	2	-62	1
212	UNIVAV	04	10	3	-63	0
213	UNIVAV	05	15	3	-62	-20
214	URSUWA	01	-11	10	-57	-15
215	VERBDR	01	- 7	52	5	0
216	VERBDR	02	28	63	- 7	10
217	WEEKST	01	24	40	-10	63
218	WEEKST	02	18	9	-63	- 8
219	WEEKST	03	11	6	-24	14
220	WEEKST	04	-32	19	-14	- 7
221	WESTAV	01	-10	16	-34	16
222	WESTRO	01	9	13	-25	- 3
223	WESTRO	02	21	77	12	1
224	WESTRO	03	18	57	8	10
225	WESTRO	04	12	73	3	2
226	WESTRO	05	17	- 9	-70	- 1
227	WILKST	01	- 1	16	17	2
228	WISTDR	01	22	41	- 6	16
229	WISTDR	02	-32	- 1	-39	- 9
230	WISTDR	03	-13	11	-31	3
231	WISTDR	04	13	33	0	4
232	WOODAV	01	15	-10	-64	0
233	WOODAV	02	-21	- 8	-62	3
234	WOODAV	03	-13	15	- 8	-15
235	WOODAV	04	-15	16	-11	- 6
236	WOODAV	05	- 1	20	- 9	- 3
237	WOODAV	06	-14	1	- 4	-15
238	XAVIST	01	19	30	2	12

**Table B.2: Comparison of PCI from Vendors with PCI from Manual for Piedmont**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
1	ABBOW	010	39	45	-12	39
2	ALTA AV	010	-4	8	No Data	No Data
3	ALTA AV	020	11	-5	17	0
4	ANNRYR	010	-1	44	-30	-13
5	ARBORD	010	4	10	-12	-5
6	ARBORD	020	0	27	-49	20
7	ARBORD	030	8	10	6	-5
8	ARROYA	010	17	17	-23	-4
9	ARTUNA	010	8	17	-33	-4
10	BELLAV	010	17	-1	17	-3
11	BELLVA	010	1	32	13	-3
12	BLAIRA	010	9	34	-23	-9
13	BLAIRA	020	-1	10	-29	-1
14	BLAIRA	030	-9	24	-32	23
15	BLAIRA	040	-20	-11	-34	-6
16	BLAIRA	050	0	25	-42	-11
17	BLAIRA	060	11	7	-38	-4
18	BLAIRA	070	-8	17	-48	-24
19	BLAIRP	010	12	14	14	-4
20	BONITA	010	7	-3	12	-2
21	BONITA	020	15	0	8	-5
22	BONITA	030	11	11	12	-3
23	BONITA	040	2	4	8	-4
24	BOULEW	010	0	31	-33	19
25	CALVCT	010	-1	46	3	-8
26	CAMBRA	010	27	20	-18	-40
27	CAMBRW	010	-2	14	-10	3
28	CAMBRW	020	4	-2	-60	-5
29	CAPERA	010	-12	13	-52	-1
30	CAPERD	010	-30	5	-60	-6
31	CARMEA	010	1	32	-31	-12
32	CAVANC	010	21	22	4	-11
33	COMCTL	010	16	-68	-68	-6
34	CRAIGA	010	-25	11	-22	3
35	CRESTR	010	9	51	-24	1
36	CROFTA	010	10	55	-10	18
37	CROKRA	010	9	-10	9	-2
38	CROYDC	010	4	12	17	-3
39	DALEAV	010	-15	12	-51	2
40	DORMIA	010	8	29	6	6
41	DRACEA	010	8	39	-20	-8
42	DUDLYA	010	2	20	-25	-10
43	DUDLYC	010	9	8	10	-1
44	ECHOLN	010	-19	19	-53	0
45	ELCERA	010	17	4	-30	-2
46	ELCERA	020	13	39	-22	-13
47	ELCERA	030	21	-2	-41	0
48	ELCERA	040	-11	15	-14	3
49	ESTATD	010	7	19	-26	-12
50	ESTREA	010	37	20	-41	-7

**Table B.2: Comparison of PCI from Vendors with PCI from Manual for Piedmont  
(Continued)**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
51	FAIRVA	010	8	17	-9	-3
52	FAIRVA	020	18	11	6	-4
53	FARRAA	010	6	17	7	-2
54	FARRGA	010	14	17	-1	-4
55	FLODAA	010	4	18	9	-32
56	GLENAR	010	7	40	9	-5
57	GLENAR	020	12	35	12	-2
58	GRANDA	010	3	6	-62	-20
59	GRANDA	020	-2	13	-40	-6
60	GRANDA	025	-2	15	-8	14
61	GRANDA	030	-5	9	-51	-18
62	GRANDA	040	4	13	-50	-14
63	GRANDA	050	11	12	-37	-6
64	GRENBA	010	-11	27	-37	7
65	GRENBA	020	16	34	-8	6
66	GRENBA	030	2	14	-7	1
67	GUILFR	010	9	6	-5	-1
68	HAGARA	010	-4	8	-14	-3
69	HAMPTR	010	-2	27	-19	3
70	HAMPTR	020	-57	-2	-41	-76
71	HAMPTR	025	14	16	-21	-9
72	HAMPTR	030	15	17	5	0
73	HAMPTR	040	-2	17	-1	-5
74	HARDWA	010	-9	40	-37	28
75	HARVAR	010	-11	43	-28	-9
76	HARVAR	020	-17	13	-25	-22
77	HAZELL	010	0	9	-12	-9
78	HAZELL	020	0	-11	0	-58
79	HIGHLA	010	18	16	19	-4
80	HIGHLA	020NB	-1	10	-23	-31
81	HIGHLA	020SB	24	27	-18	-37
82	HIGHLA	030	-3	22	-27	6
83	HIGHLA	040	3	21	-27	11
84	HIGHLA	050	18	10	-32	-6
85	HIGHLA	060	9	17	-18	-2
86	HIGLW	010	-12	30	4	-10
87	HIGLW	020	No Data	-79	-10	-19
88	HILLLN	010	-18	26	-58	No Data
89	HILLSA	010	-3	17	-4	-4
90	HILLSA	020	-5	31	-31	7
91	HILLSA	030	1	11	-19	-8
92	HILLSC	010	8	-83	17	-7
93	HOLLYP	010	4	-2	-46	-9
94	HOWARA	010	7	22	-37	-2
95	HUNTLR	010	-3	38	-11	-10
96	INDGLR	010	1	32	-1	-7
97	INDIAC	010	No Data	-17	-17	-3
98	INDIAR	010	13	10	-41	-7
99	INDIAR	020	26	53	-10	-11
100	INVERT	010	6	44	-18	28

**Table B.2: Comparison of PCI from Vendors with PCI from Manual for Piedmont (Continued)**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
101	JEROMA	010	15	No Data	-34	- 6
102	JEROMA	020	6	32	-36	- 8
103	JEROMA	030	1	22	18	0
104	KEEFEC	010	- 7	16	-21	- 4
105	KINGAV	010	- 1	9	-27	-12
106	KINGAV	020	0	19	1	- 3
107	KINGSA	010	- 8	19	-40	- 3
108	KINGSA	020	- 9	38	-36	23
109	LAFAYA	010	- 8	14	-35	- 3
110	LAKEAV	010	- 9	31	-48	2
111	LAKEAV	020	15	12	-33	- 4
112	LAKEVA	010	19	13	-31	- 7
113	LANGDC	010	14	- 1	- 3	- 4
114	LARMEC	010	- 2	-11	0	-47
115	LASALA	040	- 6	33	-37	-13
116	LASALA	050	1	19	5	- 6
117	LASLLA	010	- 2	- 9	0	-55
118	LASLLA	015	- 3	-22	-36	-20
119	LASLLA	020	25	42	-30	- 5
120	LASLLA	030	13	17	-34	- 1
121	LASLLC	010	15	15	15	- 3
122	LATHAS	010	- 5	21	-20	13
123	LEXFOR	010	8	18	1	-28
124	LINCOA	010	18	10	- 8	- 6
125	LINCOA	020	4	19	18	1
126	LINDAA	010	- 1	- 2	0	-51
127	LINDAA	020	- 3	- 1	-51	-67
128	LITWDR	010	- 6	32	-11	9
129	LORITA	010	0	2	-47	-75
130	LOWGRA	010	1	-28	-42	7
131	LOWGRA	020	10	- 6	-47	- 5
132	LOWILA	010	-16	16	-70	- 5
133	MACKPL	010	0	0	0	-80
134	MAGNOA	010	-15	7	- 9	-23
135	MAGNOA	020	- 6	20	-46	1
136	MANORD	010	- 4	8	-38	- 6
137	MARLBC	010	-11	12	0	-24
138	MAXWER	010	0	1	-35	- 5
139	MESAAV	010	15	14	6	- 3
140	MONTEA	010	18	18	12	- 4
141	MONTEA	020	- 5	18	5	- 3
142	MONTIA	010	7	13	-38	- 1
143	MONTIA	020	37	33	-14	-24
144	MORAGA	010	19	22	-22	-23
145	MORAGA	020	30	7	-31	-11
146	MORAGA	030	16	15	-29	-23
147	MOUNTA	010	28	44	-31	- 2
148	MOUNTA	020	- 1	13	-48	1
149	MUIRAV	010	- 7	- 1	5	- 8
150	NACEA	010	-35	13	-57	- 9

**Table B.2: Comparison of PCI from Vendors with PCI from Manual for Piedmont (Continued)**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
151	NELLIA	010	14	-38	7	- 5
152	NOVADR	010	6	8	-52	0
153	OAKLAA	010	- 1	-62	No Data	-58
154	OAKLAA	020	13	16	-16	- 1
155	OAKLAA	030	- 7	6	-37	-24
156	OAKLAA	035	17	-17	-59	- 5
157	OAKLAA	040	10	7	-51	- 4
158	OAKMOA	010	- 2	20	-16	0
159	OAKRD	010	-16	18	-10	-17
160	OLIVEA	010	16	19	-29	- 3
161	OLIVEA	020	3	39	-38	- 3
162	PACIFA	010	-12	26	-33	9
163	PACIFA	020	7	40	-10	29
164	PACIFA	030	- 7	27	-27	13
165	PACIFA	040	-21	10	-43	2
166	PALAAV	010	- 4	4	-35	2
167	PALAAV	020	-33	17	-32	- 1
168	PALAAV	030	17	17	17	- 3
169	PALMDR	010	4	11	11	- 5
170	PARKLN	010	- 6	15	-42	-12
171	PARKSD	010	-20	4	-29	-18
172	PARKVA	010	-11	4	3	- 1
173	PARKWY	010	14	18	-34	No Data
174	PARKWY	020	19	14	-28	- 3
175	PARKWY	030	-20	15	-45	- 5
176	PIEDMC	010	14	15	14	-45
177	POPLAW	010	-19	40	-26	- 6
178	PORTSR	010	-16	-100	0	-97
179	PORTSR	020	- 5	12	-31	-23
180	PROSPD	010	-25	-76	-76	1
181	PROSPR	010	2	15	17	- 4
182	PROSPR	020	7	- 4	7	- 2
183	RAMONA	010	17	6	17	- 6
184	RAMONA	015	16	7	-34	- 8
185	RAMONA	020	-12	14	-35	- 6
186	RAMONA	025	-18	10	-45	- 8
187	RANLEW	010	-19	15	-28	-35
188	REDROR	010	23	40	-46	- 8
189	REQUAP	010	3	55	-16	50
190	REQUAR	010	- 6	41	-34	-15
191	RICARA	010	11	33	-32	4
192	RICHAW	010	1	10	-22	- 3
193	RONADA	010	15	20	- 7	0
194	RONADA	020	- 4	27	-43	4
195	ROSEAV	010	15	19	-30	- 3
196	ROSEAV	020	0	- 1	-100	-40
197	SANCAA	010	2	13	-21	- 2
198	SANCAA	020	4	41	-20	- 5
199	SANCAA	030	-15	6	-51	- 7
200	SANDRP	010	1	16	0	2

**Table B.2: Comparison of PCI from Vendors with PCI from Manual for Piedmont (Continued)**

Sc No.	Street ID	Section ID	PCI Difference between Adhara and Manual	PCI Difference between Fugro and Manual	PCI Difference between Stantec and Manual	PCI Difference between IMS and Manual
201	SANDRR	010	1	24	-35	-20
202	SANDRR	020	-37	12	-62	-39
203	SCENAV	010	No Data	15	-22	11
204	SCENAV	020	3	10	-13	-37
205	SCENAV	030	0	19	-13	11
206	SCENAV	040	32	32	29	4
207	SEAVIA	010	- 3	28	-33	- 2
208	SEAVIA	020	-11	36	-32	1
209	SEAVIA	030	-20	23	- 5	-18
210	SEAVIA	040	-10	-14	-38	-48
211	SELBOD	010	27	24	-27	7
212	SHAROA	010	- 3	23	- 7	4
213	SHAROC	010	- 6	20	- 5	7
214	SHERIA	010	-10	31	-48	8
215	SHERID	010	-14	33	-20	4
216	SIERAA	010	-17	22	-28	- 8
217	SOMSTR	010	- 1	0	- 6	-65
218	SOTELA	010	19	44	- 8	- 6
219	STJAMC	010	5	12	10	1
220	STJASD	010	- 2	- 2	0	-39
221	STJASD	020	14	17	2	- 7
222	STJASD	030	-12	19	- 9	- 6
223	STJASD	040	22	15	-78	0
224	STJASD	050	17	18	-80	- 5
225	STJASP	010	25	0	-23	4
226	SUNYSA	010	16	18	-32	0
227	SUNYSA	020	-15	48	-33	-13
228	SYLVAW	010	-28	36	-41	25
229	TREGLR	010	0	5	-27	0
230	TREGLR	020	-14	12	-46	- 1
231	TYSONC	010	0	0	- 7	-38
232	VALANP	010	-30	-17	-45	4
233	VISTAA	010	10	15	-11	- 5
234	WALDOA	010	12	14	-33	- 3
235	WALLAR	010	- 3	6	-39	- 6
236	WARFIA	010	6	18	-32	-13
237	WILDWA	010	0	- 1	0	-65
238	WILDWA	020	16	18	-17	- 2
239	WILDWA	030	6	10	- 1	- 4
240	WILDWA	040	17	17	- 7	- 2
241	WILDWA	050	16	14	-18	- 7
242	WILWDG	010	9	7	12	- 4
243	WILWDG	020	11	11	8	- 3
244	WINSOA	010	- 2	18	-14	0
245	WINSOA	020	13	40	10	-18
246	WISTAW	010	11	-23	7	- 5
247	WOODLW	010	3	38	-30	- 9
248	WYNGAA	010	10	19	-35	- 9
249	YORKDR	010	1	7	-54	- 1