CITY OF ARROYO GRANDE

Pavement Management Plan 2016 Update Report

Submitted to:
City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420

RICK Engineering Company
1160 Marsh Street, Suite 150
San Luis Obispo, CA 93401
(805) 544-0707
RICK Project #17754

EXECUTIVE SUMMARY

This Pavement Management Program (PMP) has been developed for the City to implement a systematic program of maintenance, repair, and improvement of the streets of Arroyo Grande. The recommendations were based on Metropolitan Transportation Committee's (MTC) StreetSaver, which uses eight asphalt concrete (AC) and eight portland cement concrete (PCC) distress type protocols (modified from the American Society for Testing and Materials (ASTM) D6433 standard). In 2015, the City began using StreetSaver, a pavement management system, commonly used by California municipal agencies. StreetSaver was utilized in part for the development of the City's updated PMP. The updated PMP recommends optimal strategies and estimated costs for street improvements to obtain a desired pavement condition index (PCI). A pavement condition index is a rating system between 0 and 100 indicating the overall condition of the road segment(s).

Four general maintenance and rehabilitation categories were considered for this PMP program; Light Maintenance, Heavy Maintenance, Light Rehabilitation, and Heavy Rehabilitation. Annual pavement maintenance and rehabilitation projects were developed for the next seven years using a critical PCI approach. StreetSaver defaults to a seven year review for the purposes of including short-term and long-term outlooks of the City's street maintenance and rehabilitation program, however, the City may elect to analyze the data and project budgets based on any desired length of time. For this report, we are providing a seven year analysis.

The overall result from the evaluation of the City's street system indicates the City's overall weighted average PCI is 68. Although this is below the targeted PCI value of 70 for most California cities, it surpasses the overall PCI value of SLO County (63 PCI), Grover Beach (42 PCI), Pismo Beach (73 PCI), San Luis Obispo (71 PCI), Morro Bay (66 PCI), Atascadero (47 PCI), and Paso Robles (62 PCI). This information is included to assist the City and community members in gauging what the different PCI values actually mean when they drive through these neighboring cities and county.

PCI values are also broken down into sub-categories known as functional classes. The functional classes identify each road segment as arterial, minor arterial, collector, residential, and other. To best understand the difference of these functional classes it is easiest to understand if one considers residential streets to be the least busy with traffic up to arterials with the highest levels of traffic. Residential streets are generally quiet with trash trucks and postal trucks generating the largest load impacts to the roadway. Collector streets generally accept traffic from multiple residential streets and then channel the traffic onto arterial streets leading to highways and freeways. Functional classes of *Other* are place holders simply to inventory the City's parking lots, alleys, or private street segments. They do not affect the overall PCI value of the City's street network. Below is a table identifying the PCI values of each functional class within the City.

City of Arroyo Grande PCI Values by Functional Class

Functional Class	Centerline Miles	PCI
Arterial	4.4	75
Minor Arterial	9.1	69
Major Collector	12.5	64
Residential/Local	41.9	70
Total	67.9	68

Although the PCI values are reasonably close to the target of 70 PCI, our firm has reason to believe, based on a systematic visual inspection of each road segment, that the overall PCI value of 68 is artificially inflated because the recent resurfacing projects performed over the last five fiscal years likely have masked critical pavement failures which could not be accounted for during this pavement evaluation process. Resurfacing treatments are typically used for light maintenance; however, it is likely resurfacing treatments were used on streets with pavement distresses requiring heavy maintenance or rehabilitation due to budget constraints. It is difficult to say how inflated the average PCI value is. Visual inspections are good for about three years and we recommend having another inspection at that time to evaluate the deterioration rates of such streets.

RECOMMENDATIONS

After the evaluation and analysis processes and after updating the StreetSaver database, we recommend the City perform the following work to achieve a target average PCI of 70 for the City's street network.

1. Utilize the "Critical Point" decision making strategy for selection of future road rehabilitation projects.
2. Update the StreetSaver database each time work is completed.
3. Implement a street subsurface evaluation program, that includes core sampling and deflection testing
4. Continue the crack sealing program.
5. Strictly enforce the City's updated trench cut standards and 5-year Pavement Cut Policy (Attached).
6. Encourage use of proven new technologies and materials in pavement design.
7. Enhance the City's current pothole repair program.
8. Update the Pavement Maintenance and Rehabilitation Program annually.

FINANCIAL ANALYSIS

The current annual budget of $930,000 does not appear sufficient to maintain the street system at its current PCI level of 68. StreetSaver estimates a 11 point PCI drop will occur in seven years if the annual budget remains at $930,000. By adding $500,000 a year for each of the 7 years there will only be an 8 point PCI drop at the end of seven years. To achieve and maintain a PCI of 70, the City would need to employ alternate strategies and funding sources in order to maintain a Pavement Condition Index acceptable to the community.

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SECTION I – INTRODUCTION AND PURPOSE

This project consisted of an evaluation of each city street and updating the StreetSaver Pavement Management System (PMS) for the City of Arroyo Grande with road segment data and available road maintenance and repair history

A PMS program has several distinctive uses as a budgeting and inventory tool, while also providing a record of pavement condition. The primary use of any PMS is a budgeting tool with the aim of maximizing the cost effectiveness of every dollar spent on city streets. As an inventory tool, StreetSaver provides a quick and easy reference on pavement areas and usages. As a pavement condition record, StreetSaver provides age, load-related, non-load related, and climate related pavement condition and deterioration information.

A PMS is not capable of providing detailed engineering designs for each street. The PMS instead helps to identify potential repair and maintenance candidate streets. Further investigation of these streets should be performed to determine appropriate detailed engineering recommendations for each road segment. Project level engineering examines the pavements in significantly more detail than the visual evaluation required for the PMS system and provides optimization of the design given all of the peculiar constraints of the project streets.

The PMS software assumes average construction and material quality. Pavement life is very sensitive to materials and workmanship quality. Poor quality new construction may result in up to a 50 percent loss in the pavement life. In other words, poor quality new construction may last 10 to 15 years, whereas excellent quality construction may last 20 to 30 years. Investing in quality, both in design and construction, provides significant returns in extended pavement life resulting in lowered annual maintenance costs.

It is highly recommended the City utilize the Highway Design Manual when designing appropriate street rehabilitation projects to maximize the use of public funds by obtaining the longest anticipated life of the pavement. New technologies for pavement maintenance and resurfacing are introduced on a regular basis and are heavily analyzed by Caltrans. It is recommended the City obtain as much information from manufacturers, contractors, engineering consultants, and Caltrans when evaluating appropriate resurfacing and maintenance treatments for each road segment.

In order to understand the general concept of pavement management systems, one needs to understand the concept of pavement deterioration. In summary, all pavements deteriorate under load impacts and weather conditions. Load related impacts are termed *axle loads* and are simply the weight of a vehicle transferred through the axles, through the tires, and into the pavement on which we drive. Weather related impacts include water penetration, heat, freeze, UV exposure, and many other commonly experienced weather effects. As pavement is subjected to traffic loads and weather, it deteriorates; however, if the City is proactive in maintaining and rehabilitating the roadways it is possible to greatly extend the life of pavement using low cost methods which slow down the deterioration process.

To illustrate this concept we have provided some graphs below.

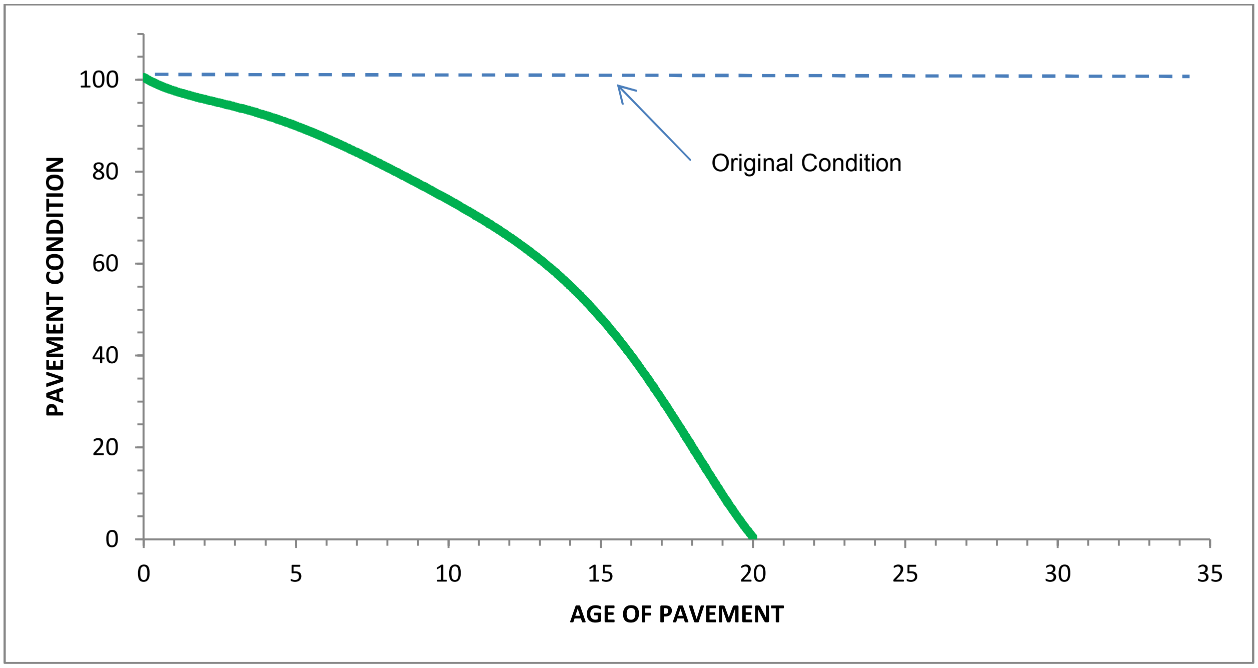


Figure 1 – Typical Pavement Deterioration Curve

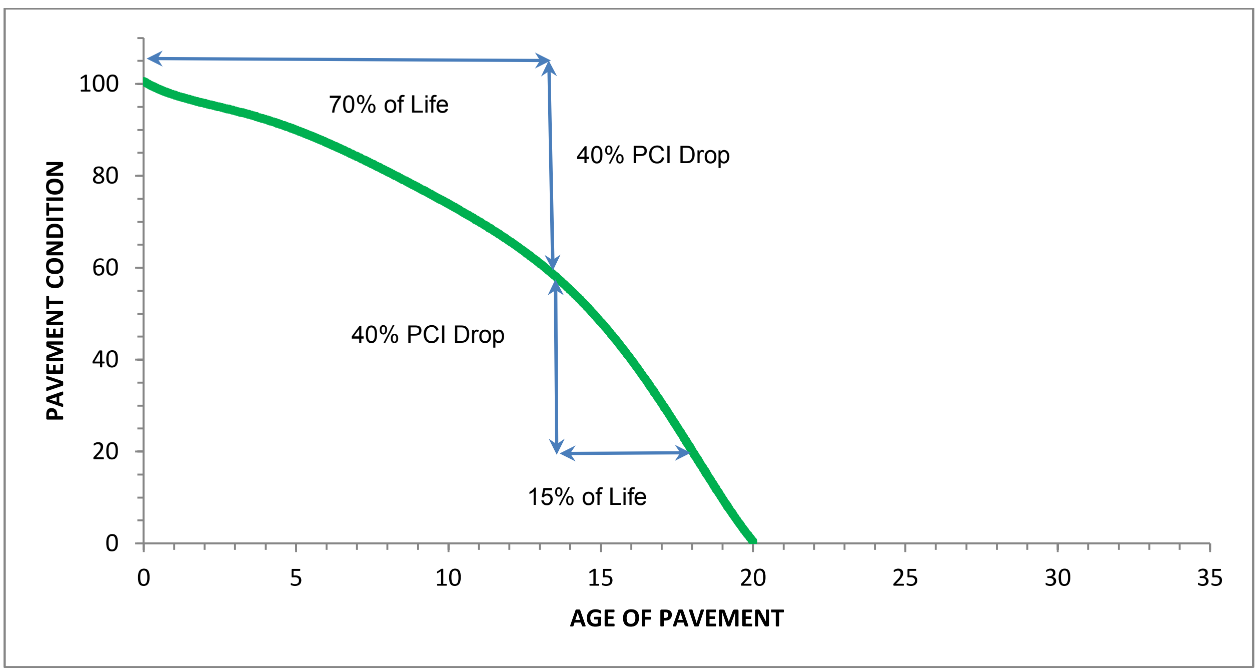


Figure 2 – Typical PCI Drop vs. Percent of Pavement Life

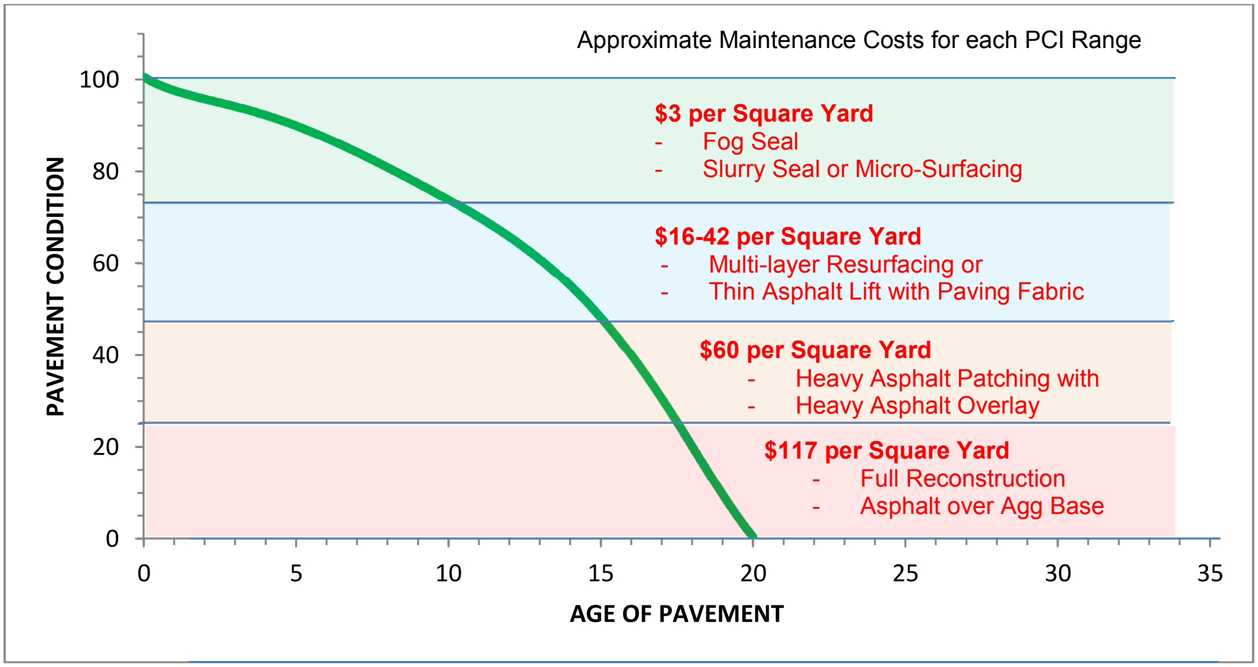


Figure 3 – Approximate Maintenance and Repair Costs
(Possible repair and maintenance listed for reference only. Repairs and maintenance should be determined by the Engineer of Work for each specific project.)

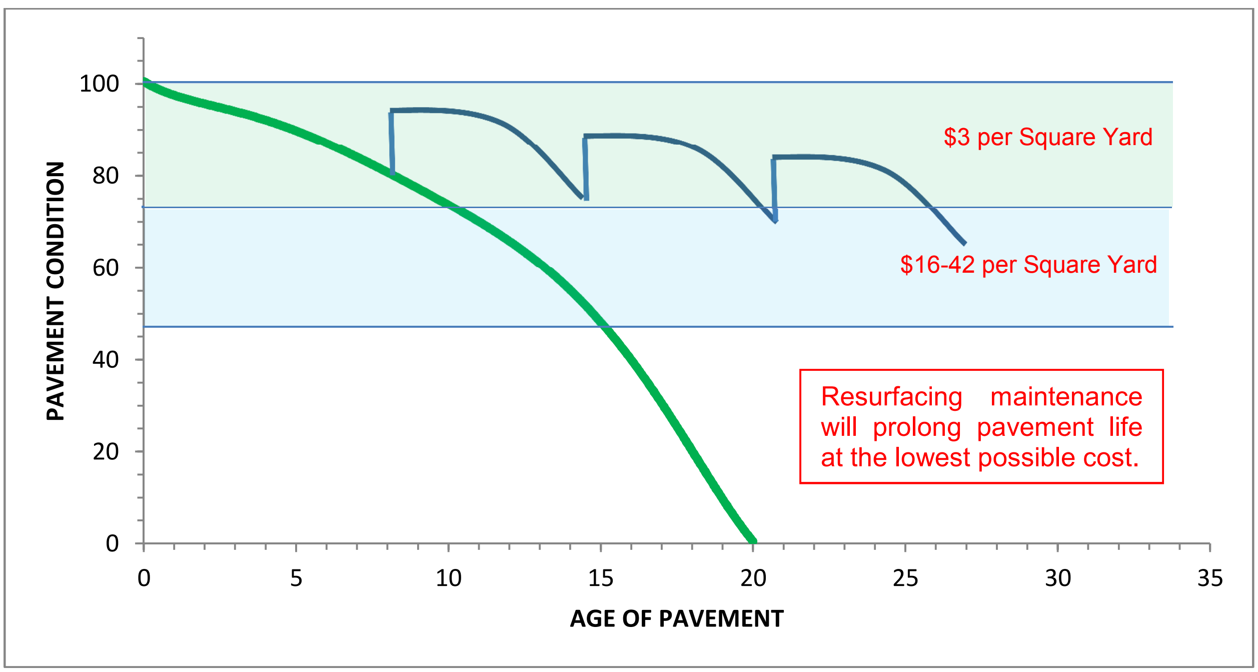


Figure 4 – Preferred Maintenance and Repair Approach

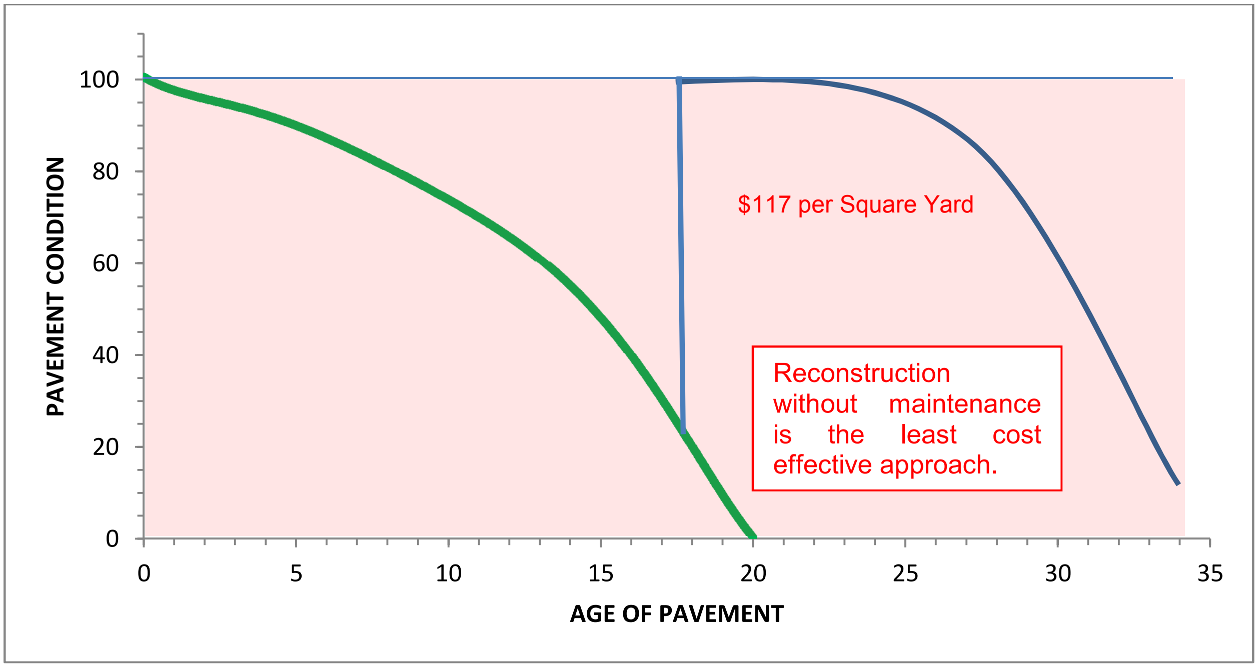


Figure 5 – Least Effective, *but common,* Approach

PAVEMENT MANAGEMENT GOALS

The PMP for the City of Arroyo Grande has five primary goals as follows:

1. Update and implement the StreetSaver program.
2. Provide an accurate and complete inventory of the City's existing pavements and condition.
3. Identify and quantify maintenance and rehabilitation needs for the street system.
4. Develop an annual plan for the maintenance of the streets.
5. Recommend a budget for the City street system.

A full appreciation of a pavement management system and the value of its data and cost projections depend on a basic understanding of pavement design basics. These are provided in Section II: Background. Section III provides information on the PMS Program specifics incorporated into the program. Section IV provides Summarized System Information in the form of easy to read tables and figures. Section V provides a set of policy and program recommendations for future pavement management. Two appendices detail the proposed pavement management program and a list of description of pavement distresses.

SECTION II – BACKGROUND

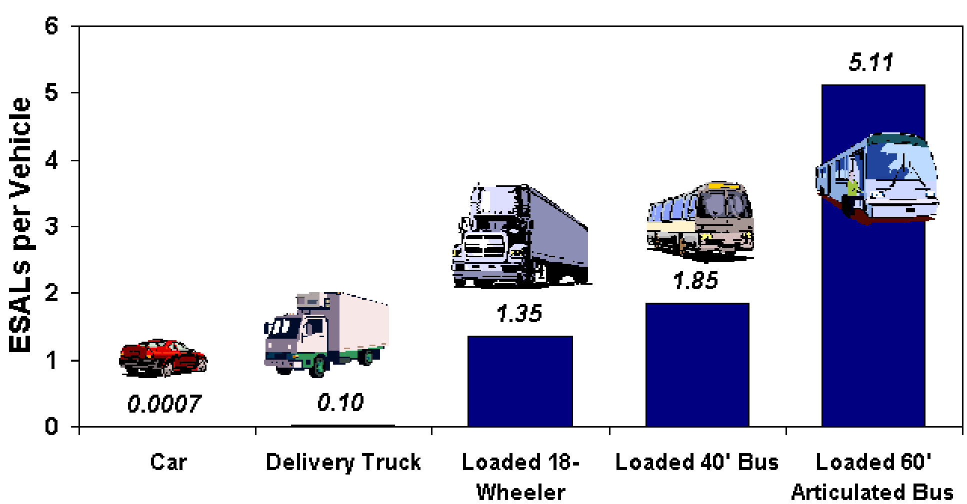
This section is intended to introduce important pavement design definitions and calculations as a background for understanding the Pavement Management System (PMS) assumptions.

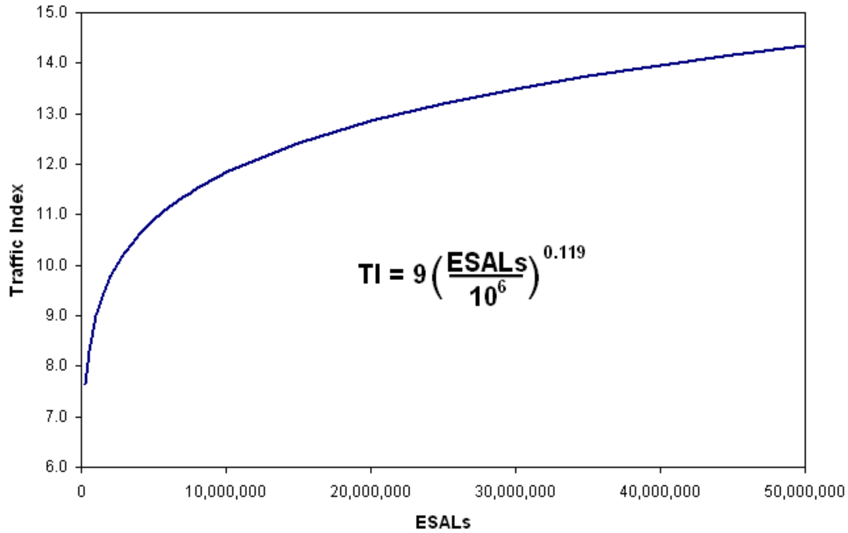
PAVEMENT DESIGN BASICS

The two most critical considerations in pavement design include the anticipated load above the pavement and the ability of the native soil to support those anticipated loads. The pavement section is then designed as the medium between the loads and the native soil.

Traffic Loads

Pavements are a structural support system generally considered to act like a beam. But unlike beams in buildings which generally have static loads, the pavement structure is flexed many times from traffic loading. Cars and light trucks have little impact on the pavement structure. Larger/Heavier trucks have very significant impacts to the pavement due to the high axle weights. The impact of trucks is measured in equivalent single 18,000-pound axle loads (ESALs). The total ESALs are converted into a design Traffic Index (TI) by an exponential formula. For example, a design TI of 5 is equal to 7,160 ESALs. A design TI of 8 is equal to 372,000 ESALs. Therefore, the design TI is related to the total number of ESALs that the pavement will support before it begins to fail, regardless of the passage of time. Normally for a new pavement, the ESALs over a 20-year period are used. For rehabilitation procedures such as overlays, 10 years is generally used. Below are two figures representing the traffic index calculation and ESALs for common vehicles on your roadways.




15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
Traffic Index
TI = 9 (ESALs / 10^6)^0.119
0
10,000,000
20,000,000
30,000,000
40,000,000
50,000,000
ESALs

Strength of Native Soil

The other element of pavement design is the support of the native soil subgrade which supports the anticipated traffic loads. The support value is designated by the R-value (resistance value) test, which is performed by a soils engineer. The R-value test indicates how well the native soil can resist traffic loads. If a native soil subgrade has a high R-value it will result in a relatively small asphalt structural section. If a native soil subgrade has a low R-value it will result in a relatively thick asphalt structural section.

Using the anticipated design TI values and laboratory R-value test results, the pavement designer chooses various materials to construct the structural section. The most common pavement section is a thin layer of asphalt concrete over aggregate base(s). Below are two examples of pavement design sections with varied R-Values. The first example shows pavement sections for typical residential streets with varied soil types. The second example shows pavement sections for typical arterial streets with varied soil types. The purpose of these examples is to show how pavement sections can vary depending on many factors.

LOW R-VALUE SOIL

MEDIUM R-VALUE SOIL

HIGH R-VALUE SOIL

RESIDENTIAL STREETS		
TI = 5.5	TI = 5.5	TI = 5.5
R-Value = 5	R-Value = 40	R-Value = 75

RESIDENTIAL STREETS - PAVEMENT DESIGN RESULTS

Asphalt = 0.25 feet	Asphalt = 0.25 feet	Asphalt = 0.25 feet
Agg Base = 0.98 feet	Agg Base = 0.42 feet	Agg Base = 0.35 feet

ARTERIAL STREETS		
TI = 9.0	TI = 9.0	TI = 9.0
R-Value = 5	R-Value = 40	R-Value = 75

ARTERIAL STREETS - PAVEMENT DESIGN RESULTS

Asphalt = 0.46 feet	Asphalt = 0.46 feet	Asphalt = 0.46 feet
Agg Base = 1.71 feet	Agg Base = 0.79 feet	Agg Base = 0.35 feet

It is not recommended to require a standard pavement section because soil types can (and often do) vary even in close proximity to one another. It is recommended to design pavement maintenance and rehabilitation specific for each road segment.

Also very important, the City should require new streets in proposed developments to be constructed to engineering designed pavement sections using anticipated TI values, provided by the City, and R-value test results taken by the developer. This will reduce maintenance and rehabilitation costs by City once after development is completed. The standard pavement section table currently provided by the City should be replaced with a requirement for engineering design following the highway design manual.

Pavement Deterioration

Pavement deteriorates from two processes: fatigue and aging. The processes occur simultaneously. In a well designed and constructed pavement, the two processes result in the need to rehabilitate the pavement at approximately the same time. This is called the design life. The design life for the newest pavements is 20 years. Each aging process has its own set of pavement defects which are related to the process.

Fatigue

The first deterioration process is fatigue from heavy axle loads. As the pavement structure flexes or bends from heavy wheel loads, the asphalt concrete layer's ability to flex is consumed. (The impact of one trash truck trip on a road segment is roughly equivalent to 1,000 car trips.) With sufficient bending, the asphalt concrete layer begins to break at the bottom. This cracking progresses upward until it reaches the surface and appears as alligator cracking. If left unattended, they will produce a pothole. These areas are repaired by removal and replacement of the asphalt concrete in the affected areas. These repairs are commonly called digouts.

Aging

The major element of the pavement structure which ages is the asphalt concrete layer. To a minor extent, aggregate bases can age if contaminated by fine soil particles which are transported from the subsoil into the aggregate base.

Asphalt concrete is composed of aggregates and asphalt cement. The aggregates used are generally of fair quality and do experience some breakdown over time. Aggregate aging problems need to be addressed in maintenance procedures. The asphalt concrete binder ages as well. As the asphalt binder ages, it loses volume through loss of volatile components in the asphalt. As the volume decreases, the pavement will progressively crack from the resulting tensile strain in the layer. Normally, these cracks first show up as transverse cracks. They also show up at weak areas such as paving joints. These cracks widen and increase over time until the pavement has a checkerboard appearance.

The aging process also causes the pavement to become more brittle. The increased stiffness results in additional cracking from loaded vehicles. This load induced cracking from the brittleness of the asphalt concrete is very similar to fatigue cracking in appearance. The major agent for deterioration of the asphalt concrete binder is oxygen. The carrier of the oxygen is water. Water enters the pavement either from the surface or as water vapor from underneath.

Typical Pavement Defects

StreetSaver analyzes eight different distress types that include

1. Alligator Cracking (Fatigue Cracking)
2. Block Cracking
3. Distortions
4. Longitudinal and Transverse Cracking
5. Patching and Utility Cut Patching
6. Rutting/Shoving
7. Weathering
8. Raveling

For purposes of understanding the character and levels of these distresses, the pavement defect descriptions from the rating manual are included in the Appendix.

PAVEMENT MAINTENANCE

Pavement maintenance procedures are designed to slow the pavement aging process. Mainly, the procedures are designed to protect the pavement from the adverse effects of age, water and to some extent wear from vehicle traffic.

Maintenance procedures which protect the pavement from aging are crack sealing, digouts, slurry seals, and cape seals. When pavements have extensive cracking and are beyond their design life, sealing can also be used as an interim holding measure or stop gap prior to major rehabilitation.

Crack Sealing

Crack sealing prevents surface water from getting beneath the asphalt concrete layer into the aggregate bases. Crack sealing is generally performed using hot rubberized crack sealing material. The procedure includes routing small cracks, cleaning and sealing. The City has an annual Crack Sealing program whereby City staff rents a crack-fill machine, purchases crack seal material and applies the material using our Public Works Department Maintenance Workers. City staff generally applies crack seal to road segments scheduled for resurfacing the same year.

Digouts (Patching)

Digouts are small areas of deteriorated pavements (usually potholes) which are removed and replaced with new asphalt concrete. Pavement removal is accomplished by cold planning (grinding) or saw cutting and excavation. New asphalt is then installed to the excavated area... The digout depth is determined depending on the severity and type of distress, as well as street type and construction. Shallow patching is often used on low to medium severity distressed areas of pavement where the underlying base is sound, while a full depth digout is required when the failure of the base material is detected. Digouts are generally performed by the City crew, though digouts repairs are often required in preparation for a contracted slurry seal.

Slurry Seals and Micro-surfacing

Slurry seals consist of a combination of fine aggregate and emulsified oil used on relatively good streets to preserve and extend pavement life. Slurry seals are also a cost effective treatment for streets whose major form of distress is severe weathering or raveling. Micro-surfacing is similar to a slurry seal with added polymers that allow the application of thicker layers and added service life. The added thickness of micro-surfacing makes it a good choice to correct rutting. Micro-surfacing is commonly used by public agencies in San Luis Obispo County as a routine street sealing treatment, providing excellent results with a life expectancy of approximately 8 years. The City of Arroyo Grande has used micro-surfacing treatments periodically since 2010.

It is important to note that the United States Department of Justice (DOJ), in coordination with the Federal Highway Administration, has determined that Road

Alteration (Rehabilitation) projects trigger the requirement for Americans with Disabilities Act (ADA) improvements. The DOJ and FHWA have determined that the Micro-surfacing treatment is classified as an alteration, triggering the installation of ADA compliant wheel chair ramps and street corners adjacent to the altered road segment. This federal mandate also requires that any existing curb ramps that do not meet the ADA standards in affect after 1991 are updated. This requirement has the potential to significantly increase the cost of a road rehabilitation project where an “alteration” is completed.

Cape Seals

Cape seals consist of a chip seal with a slurry seal placed on top. A chip seal is an application of small angular rock (chips) approximately 1/4" to 3/8” in maximum size embedded into a thick application of asphalt emulsion. Most chips seals incorporate polymer modified binders.

Cape seals are used on residential and collector streets to maintain a pavement which may need an overlay, but there are not sufficient funds available. Chip seals are placed over low to moderate alligator cracks and block shrinkage cracking. Due to the distress covered by the chip seal, small areas of dis-bonding or failure may occur and will require patching.

Cape sealed surfaces are fairly coarse compared to new paving. Due to this characteristic, they may not be Appropriate for high volume road segments in urban areas. This treatment is more commonly used on rural, low volume road segments.

Though chip seals were used extensively in Arroyo Grande prior to incorporation, many of the streets that received this treatment did not have a stable base and subsequent deterioration has resulted. Cape seals have never been used in Arroyo Grande but are being considered as a pavement treatment option in the near future on streets with a stable base. They may also be used as an interim holding measure to “hold" the pavement together until funds become available for major rehabilitation. Cape seals are also considered alteration by the DOJ/ FHWA and as a result trigger ADA upgrades.

PAVEMENT REHABILITATION PROCEDURES

Pavement rehabilitation consists of procedures used to restore the existing pavement quality or to add additional structural support to the pavement. Rehabilitation procedures include conventional asphalt overlays; heavy overlays: and reconstruction.

Conventional Overlays

Conventional overlays generally consist of surface preparation, the optional installation of pavement fabric, followed by the application of varying thicknesses of asphalt concrete. Surface preparation can consist of crack filling, pavement repairs of base failures and leveling courses.

Pavement fabric is often used as a water inhibiting membrane and to retard reflective cracking. Reflective cracking occurs when native soil subgrade is not strong enough (does not have a high R-value) to support the asphalt when a heavy vehicle drives on the roadway. The bottom of the asphalt section cracks under loading and over time the crack propagates to the street surface. Care must be used with fabric to avoid intersections with heavy truck braking, steep grades (generally over 8 percent), and areas where subsurface water might be trapped.

The overlay thickness is determined by the structural requirement of the deflection analysis and reflective cracking criteria. The reflective cracking criteria requires the thickness of the overlay to be a minimum 1/2 the thickness of the existing bonded layers. Pavement fabric can account for 0.10 ft of asphalt for reflective cracking criteria if the structural requirements from the deflection analysis are met.

Conventional overlays have an expected service life of 7 to 13 years if they are designed to meet structural and reflective cracking criteria and are well constructed.

Heavy Overlay: AC Removal and Replacement (Mill and Fill)

On some thick asphalt concrete pavements, the most economical approach to rehabilitating the pavement is to remove some of the existing asphalt concrete surface by cold planning (grinding) and placing new asphalt concrete surface which matches the existing profile. This method may be required if the pavement profile is already so thick that the additional thickness obtained from recycling the existing pavement is unacceptable due to drainage, street geometry, or other concerns. The removed asphalt can often be recycled and reused on other streets if concurrent projects are planned appropriately. Depending on existing conditions, this method should have a life of 15 to 20 years.

Reconstruction

When the pavement has severe cross section deficiencies or requires significant structural strengthening, reconstruction may be the only alternative. Generally, existing pavement materials are recycled and incorporated into the new pavement structure in a process called Full Depth Reclamation (FDR). This method minimizes the importation of new base material and virtually eliminates export of material to landfill sites. Engineered emulsion binders are mixed with the existing materials to form a base that is equal to or superior in strength to new aggregate base. For reference, a majority of the recently completed Oak Park Boulevard Rehabilitation Project by the Grover Beach was an FDR project.

SECTION III: THE PMS PROGRAM

This section discusses the characteristics of the PMS program and its application to the City of Arroyo Grande.

BACKGROUND

A pioneering, computer-based pavement management system (known as StreetSaver) developed by the Metropolitan Transportation Commission (MTC), is helping Bay Area cities and counties better maintain their local streets and roads.

In 1982, MTC completed a study of local road and street maintenance needs and revenue short falls in the San Francisco Bay Area. The results of the study indicated that local jurisdictions were spending only 60 percent of funds required to maintain roads in a condition considered adequate. This indicated a need to improve pavement maintenance and rehabilitation techniques and practices. A committee was formed to evaluate pavement management efforts. At approximately the same time, six public works directors reviewed a proposal to develop a prototype PMS; however, it was felt that the proposed system was too complex. This group strongly emphasized that simplicity was the most important objective to be developed in a PMS if it was to be adopted and used by cities and counties.

In 1983, a consultant was retained to assist MTC in determining PMS needs, resources, and problems. In addition, they were to develop three basic elements of a standardized prototype PMS: a pavement condition index (PCI), effective maintenance treatments for the Bay Area, and a network level assignment procedure. The result was the first version of the MTC PMS in 1987.

With the release of version 8 in 2003, MTC has renamed MTC PMS to StreetSaver. The StreetSaver v.8 Online was launched in April 2005. MTC becomes the first and is the leader in cloud-based provider for pavement management software. The latest version of the StreetSaver v.9 Online, .NET edition was released in July 2008.

With more than 25 years of experience in pavement management and continuing research and development, StreetSaver has become the most utilized software in the West Coast. Several Central Coast municipal agencies also use the StreetSaver pavement management tool.

SYSTEMS ASSUMPTIONS

The PMS program makes several basic assumptions regarding the degradation of pavements. The basis of the system is the Pavement Condition Index (PCI). New pavements with no defects receive a score of 100. From this score, the program deducts points based on defect type and severity identified during the visual review. After the initial PCI for a street segment is determined, the program reduces the PCI on an annual basis using preset deterioration curves. Placement on the deterioration curve is determined by the date of original construction or most recent overlay. The PCI is increased when a maintenance or rehabilitation activity is performed.

The system uses standard treatments to raise the PCI based on the original PCI. The treatment strategies include light maintenance, heavy maintenance, light rehabilitation, and heavy rehabilitation. Examples of these strategies are identified in Section II above.

The system ratings do not take into account geometric constraints in the system such as excessive street cross slopes, heights of curbs in median, or thickness of curb and gutter pans. These geometric constraints often make some procedures inapplicable. For example, when StreetSaver recommends an overlay it does not take into account all of the fixed infrastructure neighboring the roadway such as curb and gutter. You cannot place a two inch asphalt overlay next to concrete curb and gutter because the asphalt would sit higher than the concrete. This requires the contractor to remove the existing asphalt immediately adjacent to the gutter pan so the surface of the new asphalt will match the surface of the existing concrete gutter pan. The system also does not include miscellaneous costs, at this time, such as associated concrete repairs or sidewalk improvements**.** StreetSaver is still being modified continually to include various inventory functions to account for miscellaneous items of work such as concrete sidewalk, ADA ramps, and curb and gutter replacement. Since those features do not currently exist we have included multipliers in the estimated unit costs to cover such anticipated expenses in the budget.

Maintenance treatment recommendations are based on certain PCI and pavement distress level thresholds, some of which are adjustable by the user and others are not. Due to these assumptions and program simplifications, the PMS program designated maintenance treatment for a given street may not be precisely what that particular street requires. The PMS program identifies candidate streets for various treatment types. The project engineer then visually reviews the streets. Depending on the condition, a specific maintenance treatment can be specified, or in the case of major rehabilitation, additional testing may need to be performed to identify which specific maintenance or rehabilitation approach may be most economical.

The goal of the PMS program is to furnish budgetary amounts in order to achieve system wide improvements in the overall pavement condition. The goal of the project engineering is to obtain the maximum economic impact for a given subset of the system to be maintained. Using the PMS program, management is able to realistically budget for an economical approach to maintaining the City's street network. Annually updating maintenance activity and costs is highly recommended as it will help keep the PMS system current..

PAVEMENT MAINTENANCE PRIORITIES

Though the initial selection of streets, scheduling of work, and choice of treatment is made by the StreetSaver program with the goal of maximizing the impact of pavement management dollars, several user-defined criteria guide the program in the way it processes data. These key criteria include:

- Achieve and maintain an average PCI of 70 or higher for all city streets with no street below a PCI of 55.
- Give priority to more heavily traveled streets. The order of priority has been set as arterial, collector, and residential, in that order.
- Preventative maintenance on streets with a low surface area percentage of distresses is the best use of funds. Dig-out repairs followed by slurry seal or micro-surfacing treatment measures can be used as appropriate. Priority is given to streets that are at risk of dropping into a lower PCI range requiring rehabilitation.
- Rehabilitation measures are generally required for streets with a PCI in the range of 55 to 70 or high surface area percentage of distresses. Priority is given to streets that are at risk of dropping into a lower PCI range requiring full reconstruction.
- Reconstruction measures are generally required for streets with a PCI less than 55.

SYSTEM INVENTORY

The street classifications (arterial, collector, and residential) assigned in this report were determined by Caltrans. Since pavement life is directly proportional to the types and weight of vehicles, the City should periodically review and upgrade the classification of streets so the PMS can correctly identify rehabilitation and maintenance strategies and account for the increased truck traffic.

All streets were measured using a vehicle mounted measuring device for length and a hand held measuring wheel for width. In the case of cul-de-sacs, StreetSaver adjusts the area to account for the additional pavement area in the cul-de-sacs bulbs. Widths were measured from edges of asphalt, excluding curb and gutter. Widths of collectors and arterials were adjusted to account for pavement in turn pockets. An alphabetical listing of the streets, broken into their segments is available in the appendix.

PAVEMENT MAINTENANCE AND REHABILITATION UNIT COSTS

The following costs were used to develop the indicated budget numbers for each street segment reviewed. The costs include miscellaneous work such as dig-outs, pavement markings and traffic lane striping. .

The estimated costs are based on unit cost averages for previous road repair and maintenance projects. Small projects will have higher unit costs and large programs will have lower unit costs. The larger the annual program size, the better the economies of scale. Timing is also important. Bidding the work in early spring may result in lower prices than bids solicited in the late summer or fall. If small packages are used, costs could be 25 to 50 percent higher.

The estimated costs below reflect prices for work completed within the county over the past few years, including data from within the City and estimated costs from other agencies using StreetSaver. The developed unit costs include striping and other lump sum project costs for each street segment. The costs per street segment were then averaged and rounded to produce the indicated unit costs. The unit costs include a 10% contingency and a 15% allowance to account for engineering design fees and inspection. These prices are in today's dollars (July 2016) and do not account for inflation.

Work performed by the City crews is also included in the unit costs. Such work includes crack sealing, weed abatement, and potholing.

Approximate Pavement Maintenance and Rehabilitation Costs

Estimated Costs (per Square Yard) and Estimated Service Life of Treatments						
Treatment Description	Arterial		Collector		Residential	
	Est. Costs ($/SY)	Est. Life (Yrs)	Est. Costs ($/SY)	Est. Life (Yrs)	Est. Costs ($/SY)	Est. Life (Yrs)
Reconstruction	$117.00	15-20	$102.38	15-20	$87.75	15-20
Heavy Rehabilitation	$60.00	12-15	$52.50	12-15	$45.00	12-15
Light Rehabilitation	$42.00	8-12	$36.75	8-12	$31.50	8-12
Heavy Maintenance	$16.40	5-8	$14.35	5-8	$12.30	5-8
Light Maintenance	$3.24	3-5	$2.84	3-5	$2.43	3-5

The estimated unit costs reflected above include construction, design, and special inspection. The costs above due not account for annual inflation.

The costs were calculated based on recent past projects performed within the City of Arroyo Grande as well as neighboring cities. There are many pavement maintenance and rehabilitation options to consider for each street improvement project, however, in an effort to estimate construction costs we assumed pavement treatments for each category of maintenance or repair as listed below. The estimated base cost includes average construction pricing for applicable assumed treatments and does not include administrative costs for city project management, engineering design, construction management, special inspections, or construction contingency. In order to account for these additional costs we assumed a multiplying factor for arterial, collector, and residential streets in the amount of 2.0, 1.75, and 1.50, respectively.

Maintenance or Repair	Assumed Treatment	Est. Base Cost ($/SY)
Reconstruction	13” Aggregate Base + 3” Asphalt Pavement	$58.50
Heavy Rehabilitation	25% Digouts + Pavement Fabric + 2” Asphalt Overlay	$30.00
Light Rehabilitation	Pavement Fabric + 2” Asphalt Overlay	$21.00
Heavy Maintenance	Microsurfacing + Chip Seal + Microsurfacing	$8.20
Light Maintenance	Microsurfacing	$1.62

Since life cycle cost analysis is part of developing annual maintenance and rehabilitation programs, some general life expectancies should be identified. For a typical light maintenance treatment, a service life of 3 to 5 years can be assumed. A heavy maintenance treatment may provide a service life of 5 to 8 years. A typical conventional overlay, whether light or heavy, has an expected service life of 8 to 12 years. Depending on the existing pavement and soil conditions, other rehabilitation options can be applied that will provide a service life of up to 15 years. A reconstructed pavement is expected to provide a service life of 20 years.

Depending on the existing conditions, the identified service life may vary. The projections of future life are given to provide a broad outline for pavement maintenance budgeting. They should not be interpreted as providing definitive predictions of future pavement performance.

Visual Evaluations

All of the pavements were evaluated by two field technicians and 5% of the analysis was checked through Rick Engineering’s quality control process. The Road rating was performed pursuant to the Pavement Condition Index Distress Identification Manual for Asphalt and Surface Treatment Pavements (April 2012, Third Edition (Revised)).

*A color coded map and a list of each street with their current PCI is available in the appendix.

System Update

The following updates were made to Street Saver to allow the City to make financially-sound decisions regarding the City’s street network.

1. Road Segments – The roadways were re-segmented to reflect logical start and stop limits of road segments based upon existing conditions of the pavement. For example start and stop points were modified based on asphalt conditions, road width changes, or similar. All segment lengths and widths were updated to reflect field measurements, eliminating previous measurements which were estimates taken from Google Earth or Google Street View.

2. Historical Records – Historical maintenance and repair data was inputted for each road segment.

3. PCI Values – Each road segment was evaluated in the field and from the data obtained StreetSaver provided a PCI value representing the condition as of July 2016.

4. GIS – The mapping component was updated through the combined efforts of City staff and Rick Engineering staff. Limits of City streets were properly identified and distinguished from neighboring jurisdictions. Neighborhood zones were also created to assist the City in future planning purposes.

SECTION IV: SUMMARIZED SYSTEM INFORMATION

The City of Arroyo Grande currently maintains 66.3 centerline miles (137.9 Lane Miles) of roadways (approximately 8,030,178 square feet of pavement). This represents an asset with a replacement value of approximately $180,000,000. (See GASB 34 – Cost Summary)

Data was collected for the City's street network using StreetSaver PMS Version 6.1. The current weighted average PCI (Pavement Condition Index) for the street system is 68 based on the PMS update performed by Rick Engineering; however, there is reason to believe this PCI value may be falsely inflated. There were many streets which appear to be recently sealed with a surfacing treatment such as a slurry seal or micro-surfacing seal that had severe alligator cracking or other asphalt failures, prior to the resurfacing. Although resurfacing treatments can be cost-effective, they must be placed on existing asphalt surfaces appropriate for their application. Within 3-5 years we would expect the asphalt pavement failures to manifest themselves through the resurfacing seals placed within the last three years. Another PMS database re-evaluation should be performed to identify the actual PCI values of the road segments. All analyses performed in this report included the average PCI value of 68 and no adjustments were made at this time.

The street network for the City of Arroyo Grande includes the following:

Functional Class	Lane Miles	Area (Square Feet)	Percent of System	Average PCI
Arterial	9.4	863,800	6.3%	76
Minor Arterial	20.0	2,173,525	16%	69
Major Collector	25.1	2,539,705	18.7%	68
Residential/Local	83.4	7,529,800	55.3%	70
Other*	N/A	505,625	3.7%	68
Total	137.9	13,612,455	100%	68

* Other – Includes City parking lots, water tank access roads, and a fire access road
Note: Private roads are included in the inventory, but excluded from the budget analysis.

SECTION V: RESULTS AND RECOMMENDATIONS

There are three general approaches that may be taken for pavement management and selection of the specific road segments for resurfacing;

1. Worst First: The approach selects the worst condition road segments for repair and resurfacing. This approach results in the highest unit cost approach and does result in preventative maintenance for better condition road segments.

2. Pre-Established Schedule: An established schedule of future road resurfacing and repair projects prepared strictly on an annual rotation based on a projected time frame during which all road segments would receive some type of resurfacing. This approach does not address the cost effective needs of the road network but is often received well by members of the community because they can see when their own street is scheduled for maintenance.

3. Critical Point: This approach selects the road segments for repair or resurfacing that are at a “critical point” of deteriorating. The critical point is a point located on the pavement deterioration graph which indicates the PCI value is about to drop which would trigger a more expensive maintenance or rehabilitation approach. Catching the pavement section at the appropriate time results in the most cost effective approach and still meets the needs of the community.

The Critical Point road segment selection approach is recommended regardless of a projected schedule or resurfacing program. The drawback to this approach is that it does not necessarily provide property owners with a certain date for resurfacing of the road segment fronting their property. The PMS system will annually evaluate and provide recommendations for repair and resurfacing based on this critical point approach. The critical point road segment selection approach is the most economical pavement management approach and will assist the City is achieving the targeted overall PCI value in the shortest amount of time.

PAVEMENT MANAGEMENT FUNDING OPTION RESULTS

There are two separate approaches to funding the City’s pavement management program, including a budget-driven scenario and a target-driven scenario. The budget-driven funding scenario identifies the resulting PCI value over time based on a pre-determined pavement management budget. The target-driven approach identifies the estimated budget over time based on a targeted PCI value. Both approaches are identified in more detail below.

The following results were generated from Street Saver analyzing both budget-driven and PCI Target-driven scenarios.

Budget-Driven Scenarios

Two budget-driven scenarios were analyzed. The first analysis shows the projected PCI if the current budget is maintained. The second analysis shows the projected PCI if the current budget is increased $500,000 annually. This second analysis indicates the results had the SLOCOG Bond Measure J passed in the recent election in the past month of November. A similar bond measure may pass the second attempt by SLOCOG but the timing for the tax initiative is currently unknown.

Approximate Allocated Costs over 7 Years

		Arterial	Collector	Res/Local	Other	GRAND TOTALS
Current Budget	Rehab	$1,407,672	$1,187,723	$3,494,043	$194,812	$6,284,250
	Prev. Maint.	$74,088	$62,512	$183,897	$10,253	$330,750
	Total	**$1,481,760**	**$1,250,235**	**$3,677,940**	**$205,065**	**$6,615,000**
Current Budget +$500K		Arterial	Collector	Res/Local	Other	GRAND TOTALS
	Rehab	$2,152,472	$1,816,148	$5,342,743	$297,887	$9,609,250
	Prev. Maint.	$113,288	$95,587	$281,197	$15,678	$505,750
	Total	**$2,265,760**	**$1,911,735**	**$5,623,940**	**$313,565**	**$10,115,000**

Projected PCI Values over 7 Years

		2017	2018	2019	2020	2021	2022	2023
Current Budget	Without Treatment	68	66	63	61	58	56	53
	With Treatment	69	67	66	64	62	60	58
Current Budget +$500K Annually	Without Treatment	68	66	63	61	58	56	53
	With Treatment	69	68	66	65	63	62	61

Target-Driven Scenario

A target-driven scenario was analyzed targeting an average street network PCI value of 70 are the results.

Below are the total estimated costs and projected average network PCI values for the target-driven approach to achieve an average PCI = 70 within 7 years.

Approximate Costs over 7 Years to Maintain PCI = 70

	Arterial	Collector	Res/Local	Other	GRAND TOTALS
Rehab	$938,285	$4,457,766	$14,003,562	$161,801	$19,561,414
Prev. Maint.	$331,520	$271,002	$976,173	$24,980	$1,603,675
Total	**$1,269,805**	**$4,728,768**	**$14,979,735**	**$186,781**	**$21,165,089**

Projected PCI Values over 7 Years

	2017	2018	2019	2020	2021	2022	2023
Without Treatment	68	66	63	61	58	56	53
With Treatment	70	70	70	70	70	70	70

RECOMMENDATIONS

After a full analysis of the street network and update of the pavement management system database, Rick Engineering recommends the City consider options to increase funds to maintain an average network PCI value of PCI = 65 for residential streets and PCI = 70 for arterials and collectors. We recommend the City pursue this target-driven approach rather than a budget-driven approach. The target-driven approach keeps PCI values from dropping below the critical points along the pavement degradation curve. By keeping the PCI above these critical points the overall street budget will be minimized in the long-term. If a budget-driven approach is taken, the results are costly and will likely require heavy rehabilitation or replacement of roadways in the future. The target-driven scenario as presented is anticipated to cost an additional $14.5 Million over the seven-year PMP.

Due to current funding limitations, however, the budget driven approach will need to be employed until additional funding sources are identified. This approach will result in the long term lowering of the City's PCI and the continued degradation of the City's road infrastructure.

Rick Engineering also recommends the following –

1. Regularly update the StreetSaver street condition database: All maintenance, repair and rehabilitation activities should be entered into the StreetSaver database so current street conditions can be tracked and project planning facilitated.

2. Coordinate with the Street Maintenance Division to perform basic preventative maintenance and to record work performed into Street Saver on a regular basis. These measures can affect the PCI values over a long period of time and if maintained regularly, the City will be able to make informed decisions in real time without requiring a potentially lengthy consultation process.

3. Re-evaluate the PMS Street Saver database every 3-5 years. If City staff utilizes Street Saver regularly and enters updates after repair and maintenance projects are completed the re-evaluation can be performed after 5 years. If the database is not updated regularly, a re-evaluation after three years is recommended.

4. Encourage use of new proven technologies and materials in pavement design. There are many cost-effective approaches being presented by manufacturers, contractors, and scholars. Such approaches are often discussed at California Asphalt Pavement Association (Cal APA) meetings as well as other such organized meetings. RICK will gladly provide scheduling information about such events upon request.

PROGRAM RECOMMENDATIONS

Below are some pavement management program recommendations.

1. Institute a regular global maintenance (street sealing) program: The expected life of a good slurry seal or micro-surface treatment is eight years and a cape seal can be expected to last 10 years. Every street in the City should be sealed every 8 to 10 years unless it is scheduled for major rehabilitation. Such a maintenance program will need to be phased in over time, as there are many streets that already exceed this interval and budget does not allow treating them all immediately.

2. Enhance the City's pothole repair program: Pothole repair prevents water intrusion into the supporting soil and can also serve as a "stop gap" repair until major maintenance can be performed. Pothole repair can sometimes involve a simple removal and replacement of the top layer of asphalt, but more often requires full digout of the underlying base and reconstruction of the entire pavement profile. Once the area of pothole patch repairs exceeds 10% of the street area, the street is a candidate for major rehabilitation. The Public Works Department Streets Division is responsible for pothole repairs. Pothole repair requests usually originate from citizens but a more pro-active approach coordinated with the street sealing program will enhance both the life of the pothole repair and the seal coat.

3. Continue the current crack sealing program: Older pavements tend to crack even if the subgrade is stable. Cracks, however, will allow water to enter the supporting soil and destabilize the pavement base. A regular crack sealing program will increase the longevity of streets and delay costlier maintenance and repairs. The Streets Division has the equipment to perform this task. Unlike potholes, which are often reported by citizens, cracks are best identified during periodic inventories. The StreetSaver PMS catalogues cracks that need attention. Sealing cracks prior to micro-surfacing or chip seals will extend the life of the new surface.

4. Create a Green Streets program: Street reconstruction is an opportunity to "go green' through the use of recycled pavement materials and in redesigning drainage to reduce the amount of polluted runoff that enters our creeks and the storm drain system. Green streets usually have bike and pedestrian-friendly components. Such a program is often a good candidate for external grant funding to help stretch City budget dollars.

5. Implement a street subsurface evaluation program: Streets that are scheduled for reconstruction may have adequate materials in the pavement profile to warrant full-depth reclamation of these materials. Depending on the quality and thickness of the existing materials that make up the pavement profile, and a suitable binder material can be designed to be added during the

reclamation process to form a strong base. An evaluation of the pavement profile will provide the necessary data for engineering design of the recycled base.

6. Modify and enforce trench cut standards: Trench cuts can have a significant impact on street durability. Internal coordination with utility master plan projects will help reduce damage to recently paved streets due to planned activities, but trenching for emergency repairs and new developments are inevitable. Diligent enforcement of current engineering standards for trench backfill including the one-year warranty against settlement will help minimize trenching impacts to the pavement. The City standards should also be updated to conform to current material specifications and trench repair technologies.

7. Coordinate with other programs and departments: Street repair and maintenance often impacts other activities, programs and City operations. At a minimum, the following activities should be coordinated with street repair and maintenance:

    a. Utility Master Planning and scheduled repairs: Coordination of proposed street and utility work can avoid counterproductive efforts such as trenching in newly repaved streets.

    b. City Trees: Urban trees are a valuable resource to communities and have a positive economic benefit, however street work will require periodic trimming and/or removal of trees to accommodate repairs or work within the drip line.

    c. Bicycle Traffic: Class 2 bicycle lanes share the paved area of City streets, often on the outside edge or shoulder. Pavement maintenance and overlays should be performed such that sharp edges and ridges in the bicycle lane are avoided. Pavement repair may also present an opportunity to correct or enhance bicycle lane markings.

8. Create a comprehensive Pavement Maintenance and Rehabilitation Program: Based on the above policy recommendations, pavement management system reports, and preliminary field evaluations of the City street system, a comprehensive plan should be prepared for the upkeep, maintenance and rehabilitation of the streets of Arroyo Grande. The program should have several budget alternatives including the use of current budget amounts projected forward. City Council can then choose amongst the alternatives with an understanding of how the adopted program will impact the long term condition of City streets. Though the Program lists projects over a five-year period, budgeting should plan for ten years of work.

APPENDICES

Appendix A – Current PCI Condition Map
Appendix B – Spreadsheet of Current Road Segments and PCI Values
Appendix C – Street Saver Scenario Results
Appendix D – Street Saver Cost Projection Input Data (“Decision Tree”)
Appendix E – Description of Pavement Defects

<u>APPENDIX A</u>

Current PCI Condition Map

City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420
(805) 473-5460

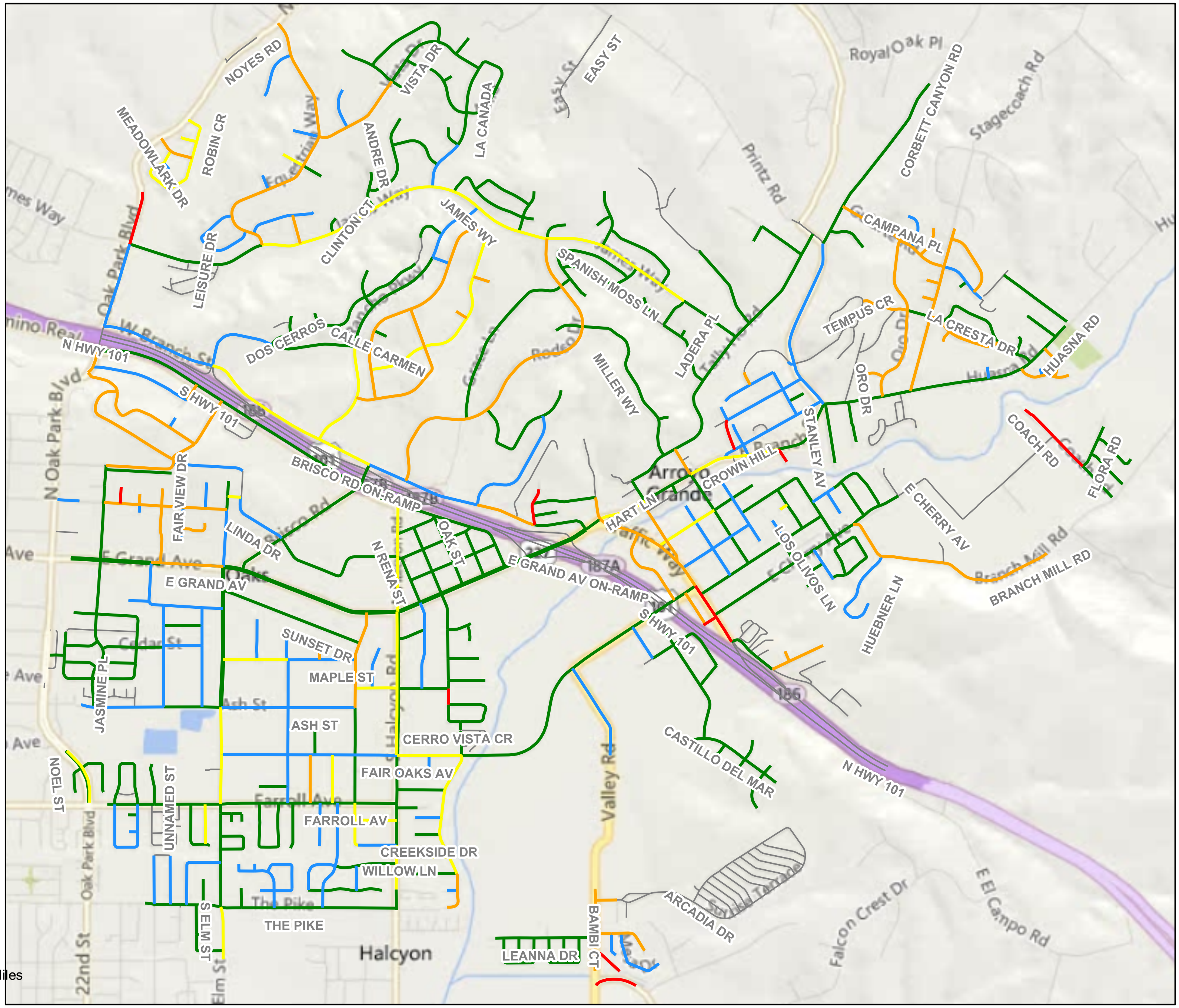
Current PCI Condition

Printed: 1/26/2017

Feature Legend

- Category I - Very Good
- Category II - Good (Non-Load)
- Category III - Good (Load)
- Category IV - Poor
- Category V - Very Poor

0 0.5 1 Miles



APPENDIX B

Spreadsheet of Current Road Segments and PCI Values

Note:

1. Streets indicating a PCI Value = 0 are private streets, streets not in Arroyo Grande City Limits, or unable to be evaluated.

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
AcornDr	10	Equestrian Way	Equestrian Way	1,500	37	55,500	54
AlderSt	10	Farroll Avenue	Cameron Court	690	38	26,220	57
AlderSt	20	Farroll Avenue	Ash St	1,410	37	52,170	75
AlderSt	30	Ash St	East Grand Ave	1,450	38	55,100	53
AllenSt	10	Traffic Way	Garden Street	2,150	31	66,650	91
AlpineStN	10	Grand Avenue	Faeh Ave	1,058	32	33,856	92
AlpineStS	10	Cerro Vista Circle (EOS)	Cerro Vista Lane	270	32	8,640	74
AlpineStS	20	Cerro Vista Ln	Dodson Way	242	34	8,228	19
AlpineStS	30	Dodson Way	E. Grand	1,430	34	48,620	79
AndreDr	15	Jenny Place	CDS	1,470	29	42,630	82
ArabianCr	10	Vista Drive	Cul-de-Sac	633	37	23,421	65
ArcadiaDr	10	LongdenDr	Sunrise Dr.	10	10	100	0
ArroyoAve	10	Pilgram Way	West Cherry Avenue	607	33	20,031	75
AshSt	10	City Limit (Hermosa Ct)	CIW East of Spruce	1,725	41	70,725	66
AshSt	20	CIW E. of Spuce St	S. Elm St	600	33	19,800	81
AshSt	30	S. Elm St	Alder St	2,030	37	75,110	68
AsiloSt	10	La Canada Street (North end)	La Canada Street (South End)	1,320	29	38,280	90
AsiloSt	20	La Canada	Vista Drive	1,300	29	37,700	94
AspenSt	10	Ash Street	Poplar Street	1,480	37	54,760	60
AvenidaDeD	10	Via Bandolero (North end)	Via Bandolero (South End)	3,200	37	118,400	55
BakemanN	10	Farroll Avenue (East Side)	Farroll Avenue (West Side)	1,400	33	46,200	91
BakemanS	10	Farroll Road (West Side)	Farroll Road (East Side)	1,590	36	57,240	64
BambiCt	10	Tiger Tail Drive	Cul-de-Sac	400	37	14,800	71
BedloeLn	10	West Cherry Lane	Fair Oaks Avenue	500	19	9,500	51
BeechSt	10	Farroll Avenue	Fair Oaks Avenue	700	37	25,900	58
BellSt	10	Grand Avenue (East)	El Camino Real	1,050	35	36,750	87
BennettAv	10	Linda Drive	Halcyon (North)	1,020	35	35,700	75

ROAD SEGMENT -
DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
BennettAv	20	Halcyon (North)	El Camino Real	1,050	35	36,750	86
BetaCt	10	Brighton Avenue	Cul-de-Sac	185	36	6,660	30
Blackberry	15	Boysenberry St	Cranberry St	1,050	33	34,650	88
BlueberryA	10	Boysenberry Street	Courtland Street	483	33	15,939	88
Boysenberr	10	Raspberry Avenue	Strawberry Street	930	33	30,690	88
BranchMill	10	East Cherry Avenue	City Limit	3,530	24	84,720	47
BranchStE	10	Bridge St (Bricks)	Mason St (Bricks)	790	42	33,180	72
BranchStE	20	Mason St (Bricks)	Garden St	1,460	48	70,080	62
BranchStE	30	Garden St	Huasna	1,030	32	32,960	77
BranchStW	10	Oak Park Boulevard	Camino Mercado	1,740	45	77,430	67
BranchStW	20	Camino Mercado	Brisco Road	2,880	67	192,960	56
BranchStW	30	Brisco Road	COP East of Library entrance	1,080	42	45,360	66
BranchStW	40	COP East of Library entrance	Vernon	1,610	42	67,620	51
BranchStW	45	Vernon St	E. Grand	830	28	23,240	79
BranchStW	50	E. Grand Ave	Traffic Way	275	50	13,750	89
BranchStW	60	Traffic Way	Bridge St	685	40	27,400	64
BridgeSt	10	Branch Street (East)	Traffic Way	950	39	37,050	44
BrightonAv	10	Oak Park Boulevard	Courtland Street	678	40	27,120	70
BrightonAv	20	Courtland Street	Elm Street (North)	1,900	40	76,000	46
BriscoRd	10	Grand Ave (East)	Linda Drive	750	40	30,000	83
BriscoRd	20	Linda Drive	El Camino Real	1,350	40	54,000	83
BriscoRd	30	El Camino Real	Branch Street (West)	300	40	12,000	89
BrittanyAv	10	South Elm	Carrington Place	310	37	11,470	93
BroadmoorD	10	Sunrise Drive	Longden Drive	634	26	16,484	0
California	10	Cherry Avenue (West)	Fair Oaks Avenue	525	34	17,850	59
CalleCarme	10	Via Bandolero	Cul-de-Sac	250	37	9,250	76
CalleCuerv	10	Via Las Aguilas	Cul-de-Sac	260	29	7,540	86

ROAD SEGMENT -
DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
CallieCt	10	Huasna Road	Cul-de-Sac	190	37	7,030	70
CameronCt	10	Alder Street	Halcyon Road (South)	562	37	20,794	56
CaminoMerc	10	Branch Street (West)	COP West of Walmart Ent.	1,000	38	38,000	66
CaminoMerc	20	COP West of Walmart Entrance	Rancho Parkway	1,490	41	61,090	79
CampanaPl	10	Gularte Road	Cul-de-Sac	562	38	21,356	56
CanyonWy	10	Tally Ho	CIW	1,300	38	49,400	73
CanyonWy	20	CanyonWy (CIW)	CDS	450	26	11,700	84
CanyonWy	30	CIW	End of Street	1,620	23	37,260	0
CardinalCt	10	Robin Circle	Cul-de-Sac	150	37	5,550	59
CarmellaDr	10	Farroll Avenue	CDS	900	35	31,500	74
CarolPl	10	Carmella Drive	Farroll Avenue	580	37	21,460	61
Carrington	10	Brittany Ave	CDS	140	37	5,180	93
CastilloCt	10	Vista Drive	Cul-de-Sac	300	29	8,700	88
CastilloDe	10	Orchard Avenue	End of Street	1,312	37	48,544	97
CastilloDe	20	Orchard Avenue	Arroyo Grande High School	163	37	6,031	98
CedarSt	10	Aspen Street	Spruce Street	540	35	18,900	60
CedarSt	25	Spruce Street	Courtland Street	887	30	26,610	76
CeroVistaC	10	Cerro Vista Lane	Alpine Street (South)	715	37	26,455	81
CeroVistaL	10	Alpine Street (South)	Cerro Visto Circle	550	43	23,375	83
ChaparralL	15	Spanish Moss Ln	Cul-de-Sac	860	37	31,820	76
ChelseaCt	10	Brighton Ave	Cul-de-sac	144	44	6,336	65
CherryAvE	10	Traffic Way	PC Railway Place	1,420	22	31,240	95
CherryAvE	20	PC Railway Place	Branch Mill Road	1,125	40	45,000	73
CherryAvE	30	Branch Mill Road	End of Pavement	600	22	13,200	87
CherryAvW	10	Traffic Way	End of Street (Bedloe Ln)	200	34	6,800	6
CherryAvW	20	Arroyo Avenue	End of Street	878	39	34,242	81
ChiltonAv	10	Oak Park Boulevard	Robles Road	1,500	22	33,000	56

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
CindyWy	10	Platino Lane	Clarence Ave	940	25	23,500	0
ClarenceAv	10	Huasna Road	End of Street	646	32	20,672	88
ClevengeDr	10	Grieb Drive	Clubhouse Drive	514	23	11,822	0
ClintonCt	10	James Way	Cul-de-Sac	250	29	7,250	88
ClubhouseD	10	Meadow Way	CDS	320	35	11,200	0
CoachRd	10	Branch Mill Road	Flora Road - CIW N. of Flora	743	40	29,720	95
CoachRd	20	Flora Road - CIW North of Flora	End of Street	1,100	20	22,000	2
CobrePl	10	Gularte Road	Cul-de-Sac	490	37	18,130	39
ColinaSt	10	Via La Barranca	James Way	435	28	12,180	79
ColladoCt	10	Avenida de Diamante	Cul-de-Sac	370	37	13,690	39
CorbettCyn	10	Route 227	City Limit	1,230	24	29,520	80
CorbettCyn	20	Huasna Rd	Printz Rd	2,700	26	70,200	68
CornwallAv	10	El Camino Real	N. Rena Street	1,361	38	51,718	87
CoronaDelT	10	Brighton Avenue	Cul-de-Sac	420	37	15,540	62
CorralPl	10	Corbett Canyon Road	Cul-de-Sac	660	26	17,160	73
CourtlandN	10	Grand Avenue (East)	Brighton Avenue	1,080	37	39,960	75
CourtlandN	20	Brighton Avenue	Newport Avenue	550	36	19,800	95
CourtlandS	10	Ash Street	Raspberry Avenue	390	37	14,430	89
CourtlandS	20	Raspberry Avenue	Strawberry Avenue	1,070	37	39,590	88
CourtlandS	30	Strawberry Avenue	COP at CIW	300	40	12,000	91
CourtlandS	40	COP at CIW	E. Grand Ave	510	34	17,340	91
CovingtoDr	10	Sunrise Drive	Longden Drive	700	26	18,200	0
CranberryA	10	Raspberry Avenue	Blackberry Avenue	715	33	23,595	88
CreeksideD	10	Woodland Drive	Cul-de-Sac	404	37	14,948	73
CreekVieCt	10	CreekView Way	Woodland Drive	230	18	4,140	0
CreekvieWy	10	Woodland Dr	End of Street	380	20	7,600	0
CrossSt	10	Ide Street	Allen Street	660	37	24,420	75

ROAD SEGMENT -
DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
CrownHill	10	Branch Street (East)	End of Street	1,640	25	41,000	64
CrownTer	10	Le Point Street	Crown Hill	450	18	8,100	27
CrownTer	20	Le Point Street	May Street (EOS)	210	37	7,770	66
CuerdaCt	10	Avenida de Diamante	Cul-de-Sac	200	37	7,400	42
CuestaPl	10	Via La Barranca	Cul-de-Sac	220	26	5,720	72
DeerTrail	10	Equestrian Way	Cul-de-Sac	800	24	19,200	54
DelSolSt	10	The Pike	End of Street	730	37	27,010	68
Devonshire	10	Longden Drive (S)	Longden Drive (N)	720	26	18,720	0
DiamondCr	10	Leanna Drive	Cul-de-Sac	175	37	6,475	94
DianaPl	10	Farroll Ave	End of Street	675	37	24,975	71
DixsonSt	10	Oak Park Boulevard	CDS	735	37	27,195	88
DodsonWy	10	Alder Street	Halcyon Road (South)	600	29	17,400	64
DodsonWy	20	Halcyon Road	Alpine Street (South)	730	35	25,550	96
DosCerros	10	Via Las Aguilas	Cul-de-Sac	301	29	8,729	78
EasySt	10	Printz Rd	CDS	1,862	22	40,964	0
EatonDr	10	Longden Drive	Sunrise Drive	650	26	16,900	0
ElCaminoRl	10	City Limit	Oak Park Boulevard	95	30	2,850	48
ElCaminoRl	20	Oak Park Boulevard	Hillcrest Drive	2,050	30	61,500	98
ElCaminoRl	30	Hillcrest Drive	Stonecrest Dr	800	40	32,000	96
ElCaminoRl	35	Stonecrest Dr	Brisco Rd	1,050	32	33,600	95
ElCaminoRl	40	Brisco Road	Halcyon Road (North)	700	50	35,000	97
ElCaminoRl	50	Halcyon Road (North)	Bennett.	1,160	46	53,360	94
ElCaminoRl	60	Bennett	E. Grand Ave	820	37	30,340	73
ElmStN	10	Grand Ave (East)	Brighton Avenue	1,298	40	51,920	70
ElmStN	20	Brighton Avenue	CDS	240	37	8,880	77
ElmStS	10	City Limit	The Pike	800	47	37,600	57
ElmStS	20	The Pike	Farroll Avenue	1,510	62	93,620	86

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
ElmStS	30	Farroll Avenue	Ash Street	1,450	62	89,900	61
ElmStS NB	540	Ash Street	Grand Ave (East)	2,030	31	62,930	82
ElmStS SB	540	E. Grand Ave	Ash St	2,100	31	65,100	80
EmanCt	10	Alpine Street (South)	Cul-de-Sac	480	34	16,320	82
EmeralsByE	10	Rodeo Drive	Cul-de-Sac	446	37	16,502	81
EmeralsByW	10	Rodeo Drive	Cul-de-Sac	465	37	17,205	84
Equestrian	10	James Way	Vista Circle	2,600	37	96,200	34
Equestrian	20	Vista Circle	Noyes Road	1,906	37	70,522	43
FaehAv	10	Halcyon Road (North)	El Camino Real	600	36	21,600	100
FairOaksAv	10	Elm Street (South)	Pecan Street	1,330	41	54,530	70
FairOaksAv	20	Pecan Street	Halcyon Road (South)	1,320	37	48,840	72
FairOaksAv	30	Halcyon Road (South)	PCC E. of Woodland	1,100	57	62,700	64
FairOaksAv	40	PCC E. of Woodland	Valley Road	2,240	60	134,400	90
FairOaksAv	50	Valley Road	PCC @ 101 Overpass	1,680	48	80,640	87
FairOaksAv	60	Traffic Way	PCC @ Hwy 101 bridge	430	36	15,480	91
FairViewDr	10	Grand Avenue	Brighton Avenue	840	37	31,080	45
FairViewDr	20	Brighton Avenue	Cul-De-Sac	300	38	11,400	42
FarmhouseP	10	Grove Court	Hillside Court	400	37	14,800	73
Farnsworth	10	Sunrise Drive	Longden Drive	800	26	20,800	0
FarrollAv	10	City Limit	Elm Street (South)	1,675	44	73,700	91
FarrollAv	20	Elm Street (South)	Victorian Ct	1,100	40	44,000	88
FarrollAv	30	Victorian Ct	Halcyon Road (South)	600	37	22,200	80
FarrollAv	40	Halcyon Road (South)	Cul-De-Sac	300	30	9,000	89
FieldviewP	10	Hillside Court	Grove Court	360	37	13,320	93
FireAccRd	10	Pearwood Avenue	Gularte Road	551	10	5,510	85
FloraRd	10	Coach Road	End of Street	650	38	24,700	96
ForestGlen	10	Woodland Drive	Cul-De-Sac	415	30	12,450	69

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
FortunaCt	10	Platino Lane	Cul-de-Sac	200	37	7,400	44
GardenSt	10	East Branch Street	End of Street (Creek)	250	24	6,000	27
GardenSt	20	Ide Street	E. Cherry Avenue	1,040	37	38,480	100
GardenSt	30	Cherry Avenue (East)	Grove Court	150	32	4,800	89
GardenSt	40	Garden Street	Garden Street	953	28	26,684	0
GarfielsPl	10	The Pike	Cul-De-Sac	1,243	37	45,991	65
GaynfairTr	10	The Pike	Farroll Avenue	1,620	38	61,560	71
Glenbrook	10	Bakeman Lane (E)	Bakeman Lane (W)	270	20	5,400	0
GlenoakDr	10	Longden Drive	Sunrise Drive	812	25	20,300	0
GoldenWest	10	Farroll Avenue	Cul-De-Sac	642	38	24,396	75
GraceLn	10	Rodeo Drive - Southside	Rodeo Drive - Northside	2,650	29	76,850	84
GraceLn	20	Rodeo Drive	Chaparral Lane	135	37	4,995	95
GrandAvEB	510	City Limit @ COP E. of Oak Park	Juniper St	1,250	38	47,500	86
GrandAvEB	520	Juniper Street	S. Elm Street	1,100	38	41,800	47
GrandAvEB	530	S. Elm St	Halcyon Road	2,800	38	106,400	83
GrandAvEB	540	Halycon Road	ECR (COP @ McDonald)	1,820	30	54,600	76
GrandAvEB	545	ECR (COP @ McDonalds)	PCC @ 101 Overcrossing	700	30	21,000	95
GrandAvEB	550	AC @ Hwy 101 overpass	E. Branch	500	30	15,000	88
GrandAvW	510	East Branch St	PCC @ Highway 101 overpass	500	30	15,000	88
GrandAvWB	515	PCC @ 101 Overcrossing	ECR (COP @ McDonalds)	700	30	21,000	95
GrandAvWB	520	ECR (COP @ McDonalds)	Halcyon	1,850	30	55,500	79
GrandAvWB	530	Halcyon	South Elm St	2,750	40	110,000	82
GrandAvWB	540	South Elm St	Fairview	950	38	36,100	64
GrandAvWB	550	Fairview	City Limit @ COP, E. Oak Park	1,400	38	53,200	76
GreenwoodD	10	Flora Road	End of Street	672	38	25,536	96
GriebDr	10	Meadow Way	CDS	750	22	16,500	0
GroveCt	10	Fieldview Place	Farmhouse Place	375	37	13,875	80

ROAD SEGMENT -
DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
GularteRd	10	Corbett Canyon Road	Stagecoach Road	1,850	33	61,790	47
GularteRd	20	Stagecoach Road	Cul-De-Sac	772	37	28,564	60
HaciendaDr	10	Sunrise Drive	Longden Drive	800	26	20,800	0
HalcynRdNB	520	Fairoaks Avenue	Grand Avenue	2,180	31	67,580	70
HalcynRdSB	520	Grand Avenue	Fair Oaks Avenue	2,180	30	65,400	78
HalcyonRd	10	El Camino Real	Grand Avenue	1,630	37	60,310	60
HalcyonRd	30	Fair Oaks Avenue	Olive Street	522	61	31,842	81
HalcyonRd	40	Olive Street	Cameron Street	830	61	50,630	75
HalcyonRd	50	Cameron Court	Calle De Los Suei	670	50	33,500	64
HalcyonRd	60	Calle De Los Suei	The Pike	290	24	6,960	88
HamptonPl	10	Brittany Ave	CDS	140	37	5,180	89
HardenSt	10	Mason Street (North)	East Branch Street	125	28	3,500	0
HarrisonSt	10	Mckinley Street	Cul-De-Sac	251	18	4,518	100
HartLn	10	Nevada Street	End of Street	250	24	6,000	0
HawkinsCt	10	Cross Street	Cul-De-Sac	133	37	4,921	63
HiddenOak	10	James Way	EOR	880	37	32,560	86
HillcrestD	10	Sierra Drive	Montego Street	1,930	22	42,460	46
HillcrestD	20	Montego Street	El Camino Real	1,244	21	26,124	29
HillsideCt	10	Fieldview Place	Los Olivos Lane	620	37	22,940	94
HodgesRd	15	Equestrian Way	Stevenson Drive	1,410	25	35,250	65
HuasnaRd	10	East Branch Street	Bolsa Chica Entrance	1,200	61	73,200	88
HuasnaRd	20	Bolsa Chica Entrance	Calle Ct	1,350	38	51,300	88
HuasnaRd	30	Calle Ct	City Limit	1,640	61	100,040	75
Huckelbery	10	Cranberry Street	Courtland Street	490	33	16,170	88
HuebnerLn	10	Branch Mill Road	Water Tank	1,487	9	13,383	60
IdeSt	10	Whiteley Street	Garden Street	990	33	32,670	100
IkedaWa	10	Huasna Road	Vard Loomis Lane	470	37	17,390	48

ROAD SEGMENT -
DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
InnesleyDr	10	Longden Drive	Sunrise Drive	800	26	20,800	0
JamesWy	10	Oak Park Boulevard	Equestrian Way (COP)	2,180	41	89,380	88
JamesWy	20	Equestrian Way (COP)	Clinton Ct (COP)	1,210	41	49,610	55
JamesWy	30	Clinton Ct (COP)	Rancho Parkway	2,350	41	96,350	66
JamesWy	40	Rancho Parkway	Rodeo Drive	1,200	41	49,200	65
JamesWy	50	Rodeo Drive	Village Glen Drive (COP)	1,930	41	79,130	67
JamesWy	60	Village Glen Drive (COP)	Tally Ho Road	1,412	41	57,892	90
JasminePl	10	Lavendar Lane	Courtland Street	280	230	64,400	0
JasminePl	20	Courtland Street	End of Street	255	21	5,355	0
JenningsDr	10	Sunrise Drive	Longden Drive	781	26	20,306	0
JennyPl	11	James Way	Cul-de-sac	600	29	17,400	90
JuniperSt	10	Poplar Street	Grand Avenue	570	37	21,090	64
Kingsbury	10	Longden Drive	Sunrise Drive	690	26	17,940	0
LaCanada	10	James Way	Rosemary Court	750	35	26,250	70
LaCanada	20	Rosemary Court	Vista Drive	1,270	37	46,990	90
LaCrestaDr	15	Huasna Road	Platino Lane	1,800	37	66,600	80
LaderaPl	10	Via La Barranca	Cul-De-Sac	126	26	3,276	89
LancasterD	10	The Pike	Elm Street (South)	1,085	32	34,720	66
LaPazCr	10	Platino Lane	Cul-de-Sac	990	31	30,789	36
LarchmontD	10	Vernon Street	Westley Street	220	30	6,600	95
LaunaLn	10	Los Olivos Lane	End of Stree	550	34	18,700	94
LavenderLn	10	Ash Street	End of Street	283	25	7,075	0
LaVistaCt	10	The Pike	Cul-De-Sac	386	32	12,352	74
LeannaDr	10	Valley Road	City Limit	1,456	38	55,328	90
LedoPl	10	Brighton Avenue	Cul-De-Sac	272	37	10,064	4
LeisureDr	10	James Way	Grieb Drive	120	36	4,320	0
LemonLn	10	Oak Hill Road	End of Road	300	13	3,900	0

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
LePointST	10	Nevada Street	Mason Street (North)	850	30	25,500	96
LePointST	20	Mason Street (North)	Tally Ho Road	490	38	18,620	76
LePointST	30	Corbett Cyn	Crown Terrace	1,298	37	48,026	58
LePointST	40	Crown Terrace	End of Street	303	22	6,666	0
LePointTR	10	Branch Street (East)	Crown Hill	126	28	3,528	68
LePointTR	20	Crown Hill	End of Street	300	25	7,500	59
LierlyLn	10	E Cherry Avenue	End of Road	631	12	7,572	0
LilacCt	10	Jasmine Place	End of Street	125	20	2,500	0
LindaDr	10	Bennett Avenue	Brisco Road	1,090	38	41,420	78
LindaDr	20	Brisco Road	Oceanview School	950	28	26,600	70
LindaDr	30	Oceanview School	N. Elm St	180	28	5,040	65
Loganberry	10	Cranberry Street	Courtland Street	470	33	15,510	88
LongdenCt	10	Sunrise Drive	CDS	125	32	4,000	0
LongdenDr	10	Sunrise Drive (W)	Sunrise Drive (E)	1,855	30	55,650	0
LosBerros	10	Valley Rd	Century Ln	830	40	33,200	28
LosCiervCT	10	Vista Drive	Cul-de-Sac	315	29	9,135	88
LosCiervos	11	Vista Drive	Cul-de-Sac	920	29	26,680	88
LosOlivosL	15	Cherry St	End of Street	510	34	17,340	59
MagnoliaDr	10	Sycamore Drive	CDS	1,190	35	41,650	73
MapleSt	10	Elm Street (South)	Walnut Street	950	37	35,150	59
MapleSt	20	Walnut Street	Alder Street	956	37	35,372	52
MariposaCr	10	Platino Lane	Cul-De-Sac	135	36	4,860	49
MasonStN	10	East Branch Street	Le Point Street	400	29	11,600	44
MasonStS	10	Allen Street	Nelson Street	940	39	36,660	87
MasonStS	20	Nelson Street	East Branch Street	617	39	24,063	85
MatthewWy	10	Andre Drive	La Canada	830	29	24,070	88
MaydockSt	10	Huasna Road	Intersection	345	26	8,970	0

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
MaySt	10	Mckinley Street	Crown Terrace	800	37	29,600	57
McKinleySt	10	Crown Hill	May Street	736	28	20,608	65
Meadowlark	10	Oak Park Boulevard	Robin Circle	540	37	19,980	39
MeadowWy	10	James Way	CDS	1,100	22	24,200	0
MercedesLn	15	Rodeo Drive	CDS N. of Old Ranch Road	2,110	37	79,840	85
MesaDr	10	Tiger Tail Drive	Cul-De-Sac	1,020	37	37,740	55
MesquiteLn	10	Chaparral Lane	James Way	1,270	37	46,990	83
MillerCR	10	Milller Way	Cul-de-Sac	174	31	5,394	87
MillerWY	10	Le Point Street	End of Street (Gate)	2,220	32	71,040	84
MontegoSt	10	Newport Ave	CDS	1,080	34	36,720	57
MorningRis	10	EOS	Farroll Avenue	900	35	31,500	91
MuirfieldD	10	Sunrise Terrace	CDS	266	30	7,980	0
MulberryLn	10	Magnolia Drive	Sycamore Drive	334	35	11,690	65
MustangCr	10	Equestrian Way	Cul-de-Sac	355	37	13,135	73
MyrtleDR	10	Myrtle St	E. Cherry	620	33	20,460	85
MyrtleSt	10	Garden Street	COP East of Noguera	392	37	14,504	71
MyrtleSt	20	COP East of Noguera	Myrtle Dr	390	23	8,775	100
NelsonSt	10	Traffic Way	Mason Street (South)	970	39	37,830	56
NelsonSt	20	Mason Street (South)	Cul-De-Sac	730	39	28,470	94
NevadaSt	10	East Branch Street	Le Point Street	325	20	6,500	88
NewmanDr	10	Alpine Street (South)	End of Street	560	34	19,040	81
NewportAV	10	Courtland Street	Montego Street	1,080	30	32,400	43
NewportFR	10	Courtland St South of Newport	CDS	1,030	18	18,540	77
NoelSt	10	Oak Park Boulevard	CDS	425	37	15,725	91
NogueraPl	10	Myrtle Street	Cul-De-Sac	386	37	14,282	57
OakHillRd	10	Pearwood Avenue	End of Street	250	24	6,004	0
OakLeafCr	10	Equestrian Way	Cul-de-Sac	250	37	9,250	65

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
OakPkBl	30	Sierra Drive	El Camino Real	340	50	17,000	36
OakPkBlNB	510	City Limit	Farrol Avenue	800	30	24,000	74
OakPkBlNB	540	West Branch	James Way	1,300	30	39,130	70
OakPkBlNB	550	James Way	City Limit (COP end of median)	800	23	18,400	21
OakPkBlSB	510	City Limit	Farroll Avenue	720	30	21,600	60
OakPkBlSB	550	City Limit (COP at end of median)	James Wy	800	26	20,800	0
OakSt	10	Grand Avenue	El Camino Real	690	37	25,530	82
OakwoodCt	10	Tempus Circle	CDS	600	25	15,000	0
OldRanchRd	10	West Branch Street	Mercedes Lane	1,900	40	76,000	55
OliveSt	10	Woodland Drive	Halcyon Road (South)	674	37	24,938	80
OpalCr	10	Leanna Drive	Cul-de-Sac	172	34	5,848	87
OrchardAv	10	Fair Oaks Avenue	West Cherry	520	38	19,760	75
OrchardAv	20	West Cherry Avenue	COP S. of Pilgrim Way	900	42	37,800	75
OrchardAv	30	COP S. of Pilgram Wy	Castillo de Mar	650	37	24,050	97
OrchidLn	10	S Traffic Way	End of Road	635	12	7,620	0
OroDr	10	Huasna Road	Platino Lane	1,430	37	52,910	31
OroDr	20	Platino Lane	Gularte Road	1,110	37	41,070	48
OutlandCt	10	Gularte Road	Cul-De-Sac	135	37	4,995	74
PacificPtW	10	Elm Street (South)	Elm Street (South)	797	37	29,489	90
PalmCt	10	Walnut Street	Cul-De-Sac	452	39	17,628	76
PalosSecos	10	Rancho Parkway	Cul-de-Sac	630	29	18,270	84
Paraiso	10	Asilo	Cul-de-Sac	162	29	4,698	89
ParkLot	Corral-010	E. Branch St	Beg. Middle Corral Parking Lot	300	63	18,870	78
ParkLot	Corral-020	Corral-010, Rear of Business	E. Le Point St and CG	200	73	14,600	54
ParkLot	Corral-030	E. Le Point St at Miller Way	CG at bottom and West Side	200	160	32,000	85
ParkLot	CrpYrd-010	East Entrance to Corp Yard (Front)	West End at Gate	250	72	18,000	79
ParkLot	CrpYrd-020	Rear Maintenance Area	Rear	270	242	65,286	0

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
ParkLot	CtyHal-010	Mason Street (South)	End of Lot	126	60	7,560	42
ParkLot	DonRob-010	Oak Park Bl. North of Dixson St	End of Parking Lot	223	94	20,851	95
ParkLot	ElmSt-010	Driveway East of Ash St Bathrooms	Elm St Rec Center parking lot	490	27	13,230	61
ParkLot	ElmSt-020	End of Driveway	End of Lot	220	78	17,160	71
ParkLot	LiftSta010	K-Mart Parking Lot	End of Lot	93	13	1,209	62
ParkLot	Ololhn-010	Mason St	Short St	285	46	13,167	64
ParkLot	Ololhn-020	Short Street	Bridge Street	632	49	30,715	74
ParkLot	RchGrd-010	James Way @ Salid Del Sol	End of Lot	440	89	39,072	77
ParkLot	Soto-010	Ash Street at Spruce St	Bathrooms	240	60	14,400	76
ParkLot	Soto-020	Ash St @ Jasmine Pl	Where lot widdens	360	60	21,600	76
ParkLot	Soto-030	Begging of Wide area	Entrance to Corp Yard	400	90	36,000	64
ParkLot	Stroth-010	Huasna @ Rosewood Ln	End of Lot	600	92	55,200	30
ParkLot	WmnClb-010	Both Upper lots	Front door	400	60	24,000	50
ParkLot	WmnClb-020	Lower Lot	Front door	170	125	21,250	52
ParkWy	10	Halcyon Road (South)	Rena Street (South)	378	34	12,852	76
PaseoSt	10	May Street	End of Street	185	37	6,845	46
PaseoSt	20	Corbett Cyn (Hwy227)	EOS	76	25	1,900	52
PaulPl	10	The Pike	Elm Street (South)	1,030	35	36,050	75
PCRailwyPl	10	Allen Street	East Cherry Ave	340	26	8,670	76
PCRailwyPl	20	Allen Street	End of Street	335	20	6,700	70
PearlDr	10	Leanna Drive	Leanna Drive	1,150	34	39,100	85
PearwoodAv	10	Huasna Road	Oak Hill Road (EOS)	1,200	34	40,920	79
PecanPL	10	Fair Oaks Ave	EOS	336	16	5,376	81
PecanST	10	Farroll Avenue	Fair Oaks Avenue	700	37	25,900	46
PilgramWy	10	Orchard Avenue	Arroyo Avenue	370	36	13,320	75
PineSt	10	Maple Street	CDS	650	37	24,050	53
PlataRd	10	Oro Drive	Cul-De-Sac	375	37	13,875	47

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
PlatinoLn	10	La Cresta Drive	Stagecoach Road	1,145	37	42,365	42
PlatinoLn	20	Stagecoach Road	Oro	310	37	11,470	73
PlatinoLn	30	Oro Dr	Gate @ Tempus	550	37	20,350	31
PlomoCt	10	Stagecoach Road	Cul-De-Sac	220	37	8,140	48
PooleSt	15	Traffic Way	Whiteley St	1,134	36	40,824	71
PoplarSt	10	Juniper Street	Elm Street (South)	1,120	37	41,440	59
PraderaCt	10	La Cresta Drive	Cul-De-Sac	300	37	11,100	79
Primerose	10	Jasmine Place	End of Street	125	20	2,500	0
PriscillaL	10	Ruth Ann Way	Cul-De-Sac	475	37	17,575	43
PuestaDeSo	10	Los Cervos	Vista Drive	1,450	29	42,050	88
QuailCt	10	Robin Circle	Cul-De-Sac	260	40	10,400	55
QuailRidge	10	Hidden Oak Rd	CDS	275	34	9,350	90
RanchoPk	10	West Branch Street	Camino Mercado	1,620	42	68,040	70
RanchoPk	20	Camino Mercado	Via Poca	1,880	42	78,960	72
RanchoPk	30	Via Poca	James Way	1,060	42	44,520	65
RaspberyAv	15	Boysenberry St	Cranberry St	1,050	33	34,650	94
RefugioPl	10	Rancho Parkway	Cul-De-Sac	450	29	13,050	85
RenaStN	10	Grand Avenue	Bennett Avenue	670	36	24,120	92
RenaStS	10	Dodson Way	Grand Avenue	1,280	36	46,080	68
ReservoirR	10	West Branch	Water Tank	1,880	12	22,560	0
RiceCt	10	Bakeman Lane	CDS	140	37	5,180	80
Ridgeview	10	Tally Ho Road	White Court	760	28	21,280	86
RobinCr	10	Meadowlark Drive	Oak Park Boulevard	2,210	37	81,770	61
RoblesRd	10	Sierra Drive	End of Street	180	18	3,240	55
RoblesRd	20	El Camino Real	End of Road - Chilton St	400	24	9,600	41
RodeoDr	10	West Branch Street	Mercedes Lane	1,970	41	80,770	36
RodeoDr	20	Mercedes Lane	Emerald Bay Drive	2,100	37	77,700	46

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
RodeoDr	30	Emerald Bay Drive	James Way	1,490	37	55,130	40
RodeoDr	40	James Way	CDS	420	37	15,540	84
RogersCt	10	Victoria Way	CDS	550	37	20,350	70
RosemaryCT	10	La Canada	CDS	350	29	10,150	87
RosemaryLN	10	EOS (West of Sombrillo)	CDS	1,220	29	35,380	95
RosewoodLn	10	Huasna Road	CDS	525	35	18,375	91
RussCt	10	Paul Place	CDS	212	35	7,420	79
RuthAnnWyN	10	Brighton Avenue	CDS	430	37	15,910	53
RuthAnnWyS	10	Brighton Avenue	CDS	550	37	20,350	54
SageSt	10	Spruce Street	Aspen Street	535	36	19,260	84
SalidaDeSo	10	James Way	Cul-de-Sac	680	29	19,720	91
Sandalwood	10	Alder Street	Halcyon Road (South)	580	34	19,720	67
ScenicCr	10	Equestrian Way	CDS	370	37	13,690	52
SeabrightA	10	Oak Park Boulevard	Cranberry Street	213	33	7,029	88
ShortSt	15	Allen Street	EOS N. Nelson Street (Creek)	1,219	36	43,884	71
ShortSt	30	Branch Street (End)	Gazebo	130	26	3,380	85
SierraDr	10	Oak Park Boulevard	Hillcrest Drive	2,187	22	48,114	49
Sombrillo	10	Salida de Sol	Rosemary Court	940	29	27,260	95
SpanishMos	10	Mesquite Lane	Chaparral Lane	1,150	37	42,550	76
SpruceSt	10	Ash Street	Cedar Street	900	37	33,300	58
SpruceSt	20	Cedar Street	Poplar Street	600	37	22,200	57
Stagecoach	10	Huasna Road	Platino Lane	1,140	41	46,740	50
Stagecoach	20	Platino Lane	City Limit	1,400	41	57,400	53
StanleyAv	10	Huasna Road	End of Street	800	35	28,000	92
Starlight	10	Farroll	Morning Rise	630	35	22,050	93
StationWy	10	Fair Oaks Avenue	Traffic Way	1,252	37	46,324	43
StevensonD	10	Hodges Road	James Way	420	25	10,500	35

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
StillwellD	10	East Cherry	Myrtle	590	33	19,470	85
Stonecrest	10	El Camino Real	Stonecrest Drive	1,182	18	21,276	0
Strawberry	10	Boysenberry St	Courtland St	600	33	19,800	91
Strawberry	20	Courtland St	CDS	365	33	12,045	91
SunriseDr	10	Sunrise Terrace	Longden Drive	3,145	30	94,350	0
SunriseTr	10	Valley Road	End of Street	300	50	15,000	38
SunsetDr	10	Elm Street (South)	Alder Street	2,200	33	72,600	87
SycamoreCT	10	Sycamore Drive	CDS	112	35	3,920	66
SycamoreDR	10	Magnolia Drive	Gaynfair Terrace	710	35	24,850	64
SycamoreDR	20	Gyanfair Terrace	Halcyon Road (South)	900	37	33,300	76
TallyHoRd	10	Highway 227 (Printz Rd)	James Way	1,950	37	72,150	91
TallyHoRd	20	James Way	Le Point	1,700	37	62,900	94
TannerLn	10	Flora Road	Branch Mill Road	658	34	22,372	96
TaylorPl	10	Alpine Street (South)	End of Street	657	34	22,338	80
TempusCr	10	Platino Lane	Platino Lane	1,600	24	38,400	0
ThePike	10	City Limit	Tierra St.	400	54	21,600	77
ThePike	15	Tierra St	S. Elm St	770	60	46,200	80
ThePike	20	Elm Street (South)	Halcyon Road (South)	2,650	40	106,000	77
TierraSt	10	The Pike	End of Street	725	33	23,925	62
TigerTailD	10	Valley Road	CDS	915	37	33,855	48
ToddLn	10	Halcyon Road (South)	Fair Oaks Avenue	680	34	23,120	67
ToyonPl	10	Stagecoach Road	Cul-de-Sac	200	37	7,400	36
TrafficWy	10	Branch Street (West)	PCC at Bridge	250	40	10,000	45
TrafficWy	15	PCC at Bridge	Fair Oaks	1,400	66	91,700	43
TrafficWy	20	Fair Oaks Avenue	Highway 101	930	60	55,800	26
TrafficWyX	10	Traffic Way	Trinity Avenue	750	32	24,000	90
TrafficWyX	20	Trinity Avenue	End of Road	1,423	18	25,614	0

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
TrinityAv	10	Traffic Way Extension	End of Street	850	30	25,500	50
TurquoiseD	10	LeAnna Drive	LeAnna Drive	1,140	34	38,760	75
ValleyRd	10	Fair Oaks Avenue	City Limit	1,400	43	59,780	70
ValleyRd	20	City Limit N. of Sunrise Tr @ COP	Tiger Tail Dr	675	49	33,075	41
ValleyRd	30	Tiger Tail Rd	City Limit at Bridge	600	60	36,000	49
VardLoomCT	10	Vard Loomis Lane	Cul-de-Sac	118	57	6,726	53
VardLoomLN	10	Huasna Road	Cul-de-Sac	800	37	29,600	43
VerdePl	10	The Pike	Cul-de-Sac	320	37	11,840	72
VernonSt	10	Branch Street (West)	Larchmont Drive	310	37	11,470	18
VernonSt	20	Larchmont Drive	End of Street	160	24	3,840	22
ViaAvante	10	Castillo de Mar	Cul-de-Sac	245	28	6,860	98
ViaBandole	10	Via Vaquero	Avenida de Diamante	3,550	37	131,350	43
ViaBelmonN	10	Castillo del Mar	Cul-de-Sac	177	40	7,080	95
ViaBelmonS	10	Castillo del Mar	Cul-de-Sac	640	28	17,920	98
ViaBerros	10	Valley Road	City Limit	455	26	11,830	18
ViaFirenzN	10	Castillo del Mar	Cul-de-Sac	345	28	9,660	96
ViaFirenzS	10	Via Firenze Courte (South)	Castillo del Mar	355	28	9,940	94
ViaLaBarra	10	Tally Ho Road	End of Street	1,250	35	43,750	73
ViaLasAqui	10	Camino Mercado	Palos Secos	1,700	29	49,300	86
ViaLasAqui	20	Palos Secos	CDS	934	29	27,086	85
ViaPoca	10	Rancho Parkway	Via Bandolero	230	37	8,510	68
ViaVaquero	10	Rancho Parkway	Avenida de Diamente	1,700	38	64,600	41
ViaVaquero	20	Avenida de Diamente	Via Bandolero	600	38	22,800	33
Victorian	10	Farroll Avenue	CDS	710	37	26,270	91
VictoriaWy	10	Garfield Place	Rogers Court	800	37	29,600	70
VillageCt	10	Trinity Avenue	Cul-de-Sac	170	36	6,120	49
VillageGle	10	James Way	Hidden Oak Rd	1,300	33	42,900	89

ROAD SEGMENT - DETAILED DATA and PCI VALUES

Street ID	Section ID	Beg Location	End Location	Length (FT)	Width (FT)	Area (SF)	PCI
VirginiaDr	10	Halcyon Road (South)	Woodland Drive	866	37	32,042	85
VistaCR	10	Equestrian Way	Cul-de-Sac	412	37	15,244	71
VistaDR	10	Equestrain Way	PCC at median	1,200	37	44,400	41
VistaDR	20	PCC at Median	La Canada	1,850	37	68,450	85
WallacePl	10	Maple St	EOS	200	22	4,400	43
WalnutSt	10	Farroll Avenue	Ash Street	1,386	38	52,668	61
WalnutSt	20	Ash Street	End of Street	1,200	37	44,400	62
WesleySt	10	Branch Street (East)	Larchmont Drive	350	28	9,800	28
WesleySt	20	Larchmont Drive	Campground	1,133	16	18,128	0
WhiteCt	10	Ridgeview Way	Cul-de-Sac	276	32	8,832	94
WhiteleySt	15	CDS (South end)	EOS	1,058	37	39,146	54
WildOatPl	10	Canyon Way	End of Street	434	18	7,812	0
WildwoodDr	10	Tempus Circle	Corbett Canyon Road	935	30	28,050	0
WillowLn	10	Halcyon Road (South)	Woodland Drive	750	35	26,250	59
WilsonCt	10	Bakeman Lane	CDS	140	37	5,180	71
WiltonPl	10	Vernon St	EOS	370	36	13,320	89
WoodlandCT	10	Woodland Drive	Cul-de-Sac	180	37	6,660	65
WoodlandDR	10	Virginia Dr	CDS	650	37	24,050	51
WoodlandDR	20	Creekside Drive	Virginia Dr	644	37	23,828	54
WoodlandDR	30	Fair Oaks Avenue	Creekside Drive	1,240	37	45,880	63
WoodlandDR	40	Fair Oaks Av	Gate End of Street	320	37	11,840	73
WoodlandDR	50	Cerro Vista Cr	Gate/COP	105	37	3,885	90
WoodPl	10	Dodson Way	CDS	650	35	22,750	55
WysteriaCt	10	Jasmine Place	End of Street	90	20	1,800	0
ZogataWy	10	Gularte Road	Stagecoach Road	1,020	37	37,740	34

APPENDIX C

Street Saver Scenario Results

1. Budget Scenario #1 – Maintain Current City Budget
2. Budget Scenario #2 – Add $500K to Current City Budget
3. Target Driven Scenario (PCI=70) – PCI Summary
4. Target Driven Scenario (PCI=70) – Cost Summary

City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420
(805) 473-5460

Scenarios - Network Condition Summary

Interest: 1% **Inflation: 3%** Printed: 01/26/2017

Scenario: 7 year current budget

Year	Budget	PM	Year	Budget	PM	Year	Budget	PM
2017	$870,000	5%	**2020**	$945,000	5%	**2023**	$1,020,000	5%
2018	$895,000	5%	**2021**	$970,000	5%			
2019	$920,000	5%	**2022**	$995,000	5%			

Projected Network Average PCI by year

Year	Never Treated	With Selected Treatment	Treated Centerline Miles	Treated Lane Miles
2017	68	69	1.37	2.48
2018	66	67	11.27	22.05
2019	63	66	5.02	9.60
2020	61	64	2.16	4.28
2021	58	62	1.65	3.06
2022	56	60	1.29	2.58
2023	53	58	0.69	1.30

Percent Network Area by Functional Class and Condition Category

Condition in base year 2017, prior to applying treatments.

Condition	Arterial	Collector	Res/Loc	Other	Total
I	12.5%	8.0%	29.1%	1.5%	51.2%
II / III	7.1%	6.3%	16.8%	1.0%	31.2%
IV	2.2%	4.3%	9.2%	0.6%	16.4%
V	0.6%	0.2%	0.5%	0.0%	1.3%
Total	**22.4%**	**18.9%**	**55.6%**	**3.1%**	**100.0%**

Condition in year 2017 after schedulable treatments applied.

Condition	Arterial	Collector	Res/Loc	Other	Total
I	13.7%	8.0%	29.7%	2.2%	53.5%
II / III	5.9%	6.3%	16.3%	0.5%	29.0%
IV	2.2%	4.3%	9.2%	0.5%	16.2%
V	0.6%	0.2%	0.5%	0.0%	1.3%
Total	**22.4%**	**18.9%**	**55.6%**	**3.1%**	**100.0%**

Condition in year 2023 after schedulable treatments applied.

Condition	Arterial	Collector	Res/Loc	Other	Total
I	11.2%	5.8%	23.6%	3.1%	43.7%
II / III	6.1%	3.3%	13.6%	0.0%	23.0%
IV	3.1%	4.6%	12.7%	0.0%	20.3%
V	2.0%	5.2%	5.8%	0.0%	13.0%
Total	**22.4%**	**18.9%**	**55.6%**	**3.1%**	**100.0%**

City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420
(805) 473-5460

Scenarios - Network Condition Summary

Interest: 1% Inflation: 3% Printed: 01/26/2017

Scenario: 7 year current + $500K Annually

Year	Budget	PM	Year	Budget	PM	Year	Budget	PM
2017	$1,370,000	5%	2020	$1,445,000	5%	2023	$1,520,000	5%
2018	$1,395,000	5%	2021	$1,470,000	5%			
2019	$1,420,000	5%	2022	$1,495,000	5%			

Projected Network Average PCI by year

Year	Never Treated	With Selected Treatment	Treated Centerline Miles	Treated Lane Miles
2017	68	69	1.99	3.69
2018	66	68	12.19	23.76
2019	63	66	5.91	11.48
2020	61	65	2.59	5.18
2021	58	63	2.72	5.16
2022	56	62	5.18	9.96
2023	53	61	3.48	6.67

Percent Network Area by Functional Class and Condition Category

Condition in base year 2017, prior to applying treatments.

Condition	Arterial	Collector	Res/Loc	Other	Total
I	12.5%	8.0%	29.1%	1.5%	51.2%
II / III	7.1%	6.3%	16.8%	1.0%	31.2%
IV	2.2%	4.3%	9.2%	0.6%	16.4%
V	0.6%	0.2%	0.5%	0.0%	1.3%
Total	22.4%	18.9%	55.6%	3.1%	100.0%

Condition in year 2017 after schedulable treatments applied.

Condition	Arterial	Collector	Res/Loc	Other	Total
I	13.7%	8.6%	30.0%	2.2%	54.4%
II / III	5.9%	5.7%	16.0%	0.5%	28.1%
IV	2.2%	4.3%	9.2%	0.5%	16.2%
V	0.6%	0.2%	0.5%	0.0%	1.3%
Total	22.4%	18.9%	55.6%	3.1%	100.0%

Condition in year 2023 after schedulable treatments applied.

Condition	Arterial	Collector	Res/Loc	Other	Total
I	12.7%	7.5%	25.9%	3.1%	49.2%
II / III	5.5%	3.3%	13.4%	0.0%	22.2%
IV	2.2%	2.9%	10.6%	0.0%	15.7%
V	2.0%	5.2%	5.8%	0.0%	12.9%
Total	22.4%	18.9%	55.6%	3.1%	100.0%

Scenario: 70 PCI (MOD Weighted)

Objective: Minimum Network Average PCI Target: Overall 70

Projected Network Average PCI by year

Year	Never Treated	With Selected Treatment
2017	68	70
2018	66	70
2019	63	70
2020	61	70
2021	58	70
2022	56	70
2023	53	70

Percent Network Area by Functional Classification and Condition Class

Condition in base year 2017, prior to applying treatments.

Condition Class	Arterial	Collector	Res/Loc	Other	Total
I	12.5%	8.0%	29.1%	1.5%	51.2%
II / III	7.1%	6.3%	16.8%	1.0%	31.2%
IV	2.2%	4.3%	9.2%	0.6%	16.4%
V	0.6%	0.2%	0.5%	0.0%	1.3%
Total	22.4%	18.9%	55.6%	3.1%	100.0%

Condition in year 2017 after schedulable treatments applied.

Condition Class	Arterial	Collector	Res/Loc	Other	Total
I	12.5%	8.0%	31.3%	2.2%	54.0%
II / III	7.1%	6.3%	16.1%	0.5%	29.9%
IV	2.2%	4.3%	7.8%	0.5%	14.8%
V	0.6%	0.2%	0.5%	0.0%	1.3%
Total	22.4%	18.9%	55.6%	3.1%	100.0%

Condition in year 2023 after schedulable treatments applied.

Condition Class	Arterial	Collector	Res/Loc	Other	Total
I	11.2%	11.3%	46.0%	3.1%	71.6%
II / III	3.7%	1.4%	6.0%	0.0%	11.1%
IV	5.6%	1.0%	0.3%	0.0%	6.9%
V	2.0%	5.2%	3.3%	0.0%	10.5%
Total	22.4%	18.9%	55.6%	3.1%	100.0%

City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420
(805) 473-5460

Target-Driven Scenarios - Cost Summary

Interest: 1% Inflation: 3% Printed: 01/26/2017

Scenario: 70 PCI (MOD Weighted)

Objective: Minimum Network Average PCI Target: Overall 70

Year	Rehabilitation		Preventive Maintenance		Total Cost	Deferred
2017	II	$20,726	Non-Project	$457,500	$1,622,088	$13,123,473
	III	$170,622	Project	$0		
	IV	$973,240				
	V	$0				
	Total	$1,164,588				
	Project	$0				
2018	II	$20,988	Non-Project	$368,229	$2,003,732	$11,133,419
	III	$0	Project	$0		
	IV	$1,559,238				
	V	$55,277				
	Total	$1,635,503				
	Project	$0				
2019	II	$8,730	Non-Project	$230,392	$2,827,789	$15,384,215
	III	$18,548	Project	$0		
	IV	$2,570,119				
	V	$0				
	Total	$2,597,397				
	Project	$0				
2020	II	$574,712	Non-Project	$172,310	$3,619,294	$14,067,448
	III	$553,107	Project	$0		
	IV	$2,319,165				
	V	$0				
	Total	$3,446,984				
	Project	$0				
2021	II	$541,599	Non-Project	$75,274	$4,085,103	$15,674,367
	III	$938,285	Project	$0		
	IV	$2,529,945				
	V	$0				
	Total	$4,009,829				
	Project	$0				
2022	II	$92,924	Non-Project	$153,988	$3,452,428	$17,765,578
	III	$0	Project	$0		
	IV	$3,162,112				
	V	$43,404				
	Total	$3,298,440				
	Project	$0				

Year	Rehabilitation		Preventive Maintenance		Total Cost	Deferred
2023	II	$273,696	Non-Project	$145,982	$3,554,655	$21,669,277
	III	$9,990	Project	$0		
	IV	$1,506,439				
	V	$1,618,548				
	Total	$3,408,673				
	Project	$0				

Summary

Functional Class	Rehabilitation	Prev. Maint.
Arterial	$938,285	$331,520
Collector	$4,457,766	$271,002
Other	$161,801	$24,980
Residential/Local	$14,003,562	$976,173
Total:	$19,561,414	$1,603,675

Grand Total: $21,165,089

APPENDIX D

Street Saver Cost Projection Input Data (“Decision Tree”)

City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420
(805) 473-5460

Decision Tree

Printed: 01/25/2017

Functional Class	Surface	Condition Category	Treatment Type	Treatment	Cost/Sq Yd, except Seal Cracks in LF:	Yrs Between Crack Seals	Yrs Between Surface Seals	# of Surface Seals before Overlay
Arterial	AC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.32	3		
			Surface Treatment	Light Maintenance	$3.24		7	
			Restoration Treatment	Light Rehab	$11.54			2
		II - Good, Non-Load Related		Heavy Maintenance	$16.40			
		III - Good, Load Related		Light Rehab	$42.00			
		IV - Poor		Heavy Rehab	$60.00			
		V - Very Poor		Reconstruct	$117.00			
	AC/AC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.32	3		
			Surface Treatment	Light Maintenance	$3.24		6	
			Restoration Treatment	Light Rehab	$11.54			2
		II - Good, Non-Load Related		Heavy Maintenance	$16.40			
		III - Good, Load Related		Light Rehab	$42.00			
		IV - Poor		Heavy Rehab	$60.00			
		V - Very Poor		Reconstruct	$117.00			
	AC/PCC	I - Very Good	Crack Treatment	SEAL CRACKS	$0.60	3		
			Surface Treatment	SINGLE CHIP SEAL	$0.74		6	
			Restoration Treatment	MILL AND THICK OVERLAY	$7.23			2
		II - Good, Non-Load Related		DOUBLE CHIP SEAL	$1.52			
		III - Good, Load Related		HEATER SCARIFY & OVERLAY	$5.95			
		IV - Poor		HEATER SCARIFY & OVERLAY	$6.14			
		V - Very Poor		RECONSTRUCT SURFACE (AC)	$14.00			
	PCC	I - Very Good	Crack Treatment	DO NOTHING	$0.00	3		
			Surface Treatment	DO NOTHING	$0.00		99	
			Restoration Treatment	DO NOTHING	$0.00			100
		II - Good, Non-Load Related		DO NOTHING	$1.11			
		III - Good, Load Related		DO NOTHING	$1.51			
		IV - Poor		THICK AC OVERLAY(2.5 INCHES)	$1.92			
		V - Very Poor		RECONSTRUCT STRUCTURE (AC)	$14.00			

Functional Class and Surface combination not used

City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420
(805) 473-5460

Decision Tree

Printed: 01/25/2017

Functional Class	Surface	Condition Category	Treatment Type	Treatment	Cost/Sq Yd, except Seal Cracks in LF:	Yrs Between Crack Seals	Yrs Between Surface Seals	# of Surface Seals before Overlay
Arterial	ST	I - Very Good	Crack Treatment	DO NOTHING	$0.00	9		
			Surface Treatment	DO NOTHING	$0.00		99	
			Restoration Treatment	DO NOTHING	$0.00			100
		II - Good, Non-Load Related		SINGLE CHIP SEAL	$1.11			
		III - Good, Load Related		SINGLE CHIP SEAL	$1.51			
		IV - Poor		SINGLE CHIP SEAL	$1.92			
		V - Very Poor		THICK AC OVERLAY(2.5 INCHES)	$7.67			

Functional Class and Surface combination not used

City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420
(805) 473-5460

Decision Tree

Printed: 01/25/2017

Functional Class	Surface	Condition Category	Treatment Type	Treatment	Cost/Sq Yd, except Seal Cracks in LF:	Yrs Between Crack Seals	Yrs Between Surface Seals	# of Surface Seals before Overlay
Collector	AC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.32	4		
			Surface Treatment	Light Maintenance	$2.84		7	
			Restoration Treatment	Light Rehab	$10.10			3
		II - Good, Non-Load Related		Heavy Maintenance	$14.35			
		III - Good, Load Related		Light Rehab	$36.75			
		IV - Poor		Heavy Rehab	$52.50			
		V - Very Poor		Reconstruct	$102.38			
	AC/AC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.32	4		
			Surface Treatment	Light Maintenance	$2.84		7	
			Restoration Treatment	Light Rehab	$10.10			3
		II - Good, Non-Load Related		Heavy Maintenance	$14.35			
		III - Good, Load Related		Light Rehab	$36.75			
		IV - Poor		Heavy Rehab	$52.50			
		V - Very Poor		RECONSTRUCT STRUCTURE (AC)	$102.38			
	AC/PCC	I - Very Good	Crack Treatment	SEAL CRACKS	$0.60	4		
			Surface Treatment	SINGLE CHIP SEAL	$0.74		7	
			Restoration Treatment	MILL AND THIN OVERLAY	$5.04			3
		II - Good, Non-Load Related		DOUBLE CHIP SEAL	$1.52			
		III - Good, Load Related		HEATER SCARIFY & OVERLAY	$5.95			
		IV - Poor		HEATER SCARIFY & OVERLAY	$6.14			
		V - Very Poor		RECONSTRUCT STRUCTURE (AC)	$11.38			
	PCC	I - Very Good	Crack Treatment	DO NOTHING	$0.00	9		
			Surface Treatment	DO NOTHING	$0.00		99	
			Restoration Treatment	DO NOTHING	$0.00			100
		II - Good, Non-Load Related		DO NOTHING	$1.11			
		III - Good, Load Related		DO NOTHING	$1.51			
		IV - Poor		THICK AC OVERLAY(2.5 INCHES)	$1.92			
		V - Very Poor		THIN AC OVERLAY(1.5 INCHES)	$7.47			

Functional Class and Surface combination not used

Criteria:

City of Arroyo Grande
300 E. Branch St
Arroyo Grande, CA 93420
(805) 473-5460

Decision Tree

Printed: 01/25/2017

Functional Class	Surface	Condition Category	Treatment Type	Treatment	Cost/Sq Yd, except Seal Cracks in LF:	Yrs Between Crack Seals	Yrs Between Surface Seals	# of Surface Seals before Overlay
Collector	ST	I - Very Good	Crack Treatment	DO NOTHING	$0.00	9		
			Surface Treatment	DO NOTHING	$0.00		99	
			Restoration Treatment	DO NOTHING	$0.00			100
		II - Good, Non-Load Related		SINGLE CHIP SEAL	$1.11			
		III - Good, Load Related		SINGLE CHIP SEAL	$1.51			
		IV - Poor		SINGLE CHIP SEAL	$1.92			
		V - Very Poor		THICK AC OVERLAY(2.5 INCHES)	$7.47			

Functional Class and Surface combination not used

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Functional Class	Surface	Condition Category	Treatment Type	Treatment	Cost/Sq Yd, except Seal Cracks in LF:	Yrs Between Crack Seals	Yrs Between Surface Seals	# of Surface Seals before Overlay
Residential/Local	AC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.32	4		
			Surface Treatment	Light Maintenance	$2.43		8	
			Restoration Treatment	Light Rehab	$8.66			3
		II - Good, Non-Load Related		Heavy Maintenance	$12.30			
		III - Good, Load Related		Light Rehab	$31.50			
		IV - Poor		Heavy Rehab	$45.00			
		V - Very Poor		Reconstruct	$87.75			
	AC/AC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.32	4		
			Surface Treatment	Light Maintenance	$2.43		8	
			Restoration Treatment	Light Rehab	$8.66			3
		II - Good, Non-Load Related		Light Maintenance	$2.43			
		III - Good, Load Related		Light Rehab	$31.50			
		IV - Poor		Heavy Rehab	$45.00			
		V - Very Poor		Reconstruct	$87.75			
	AC/PCC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.32	4		
			Surface Treatment	SINGLE CHIP SEAL	$0.74		8	
			Restoration Treatment	MILL AND THIN OVERLAY	$5.04			3
		II - Good, Non-Load Related		DOUBLE CHIP SEAL	$1.52			
		III - Good, Load Related		HEATER SCARIFY & OVERLAY	$5.95			
		IV - Poor		HEATER SCARIFY & OVERLAY	$6.14			
		V - Very Poor		RECONSTRUCT STRUCTURE (AC)	$103.12			
	PCC	I - Very Good	Crack Treatment	DO NOTHING	$0.00	4		
			Surface Treatment	DO NOTHING	$0.00		99	
			Restoration Treatment	DO NOTHING	$0.00			100
		II - Good, Non-Load Related		DO NOTHING	$1.11			
		III - Good, Load Related		DO NOTHING	$0.00			
		IV - Poor		THICK AC OVERLAY(2.5 INCHES)	$1.92			
		V - Very Poor		THICK AC OVERLAY(2.5 INCHES)	$7.27			

Functional Class and Surface combination not used

Criteria:

City of Arroyo Grande
300 E. Branch St
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Decision Tree

Printed: 01/25/2017

Functional Class	Surface	Condition Category	Treatment Type	Treatment	Cost/Sq Yd, except Seal Cracks in LF:	Yrs Between Crack Seals	Yrs Between Surface Seals	# of Surface Seals before Overlay
Residential/Local	ST	I - Very Good	Crack Treatment	DO NOTHING	$0.00	9		
			Surface Treatment	DO NOTHING	$0.00		99	
			Restoration Treatment	DO NOTHING	$0.00			100
		II - Good, Non-Load Related		SINGLE CHIP SEAL	$1.11			
		III - Good, Load Related		SINGLE CHIP SEAL	$1.51			
		IV - Poor		SINGLE CHIP SEAL	$1.92			
		V - Very Poor		THICK AC OVERLAY(2.5 INCHES)	$7.27			

Functional Class and Surface combination not used

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Functional Class	Surface	Condition Category	Treatment Type	Treatment	Cost/Sq Yd, except Seal Cracks in LF:	Yrs Between Crack Seals	Yrs Between Surface Seals	# of Surface Seals before Overlay
Other	AC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.60	4		
			Surface Treatment	SINGLE CHIP SEAL	$1.74		8	
			Restoration Treatment	MILL AND THIN OVERLAY	$5.04			3
		II - Good, Non-Load Related		SINGLE CHIP SEAL	$1.11			
		III - Good, Load Related		THIN AC OVERLAY(1.5 INCHES)	$3.99			
		IV - Poor		THICK AC OVERLAY(2.5 INCHES)	$5.97			
		V - Very Poor		RECONSTRUCT STRUCTURE (AC)	$8.75			
	AC/AC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.60	4		
			Surface Treatment	SINGLE CHIP SEAL	$1.74		8	
			Restoration Treatment	MILL AND THIN OVERLAY	$5.04			3
		II - Good, Non-Load Related		DOUBLE CHIP SEAL	$1.52			
		III - Good, Load Related		HEATER SCARIFY & OVERLAY	$5.95			
		IV - Poor		HEATER SCARIFY & OVERLAY	$6.14			
		V - Very Poor		RECONSTRUCT STRUCTURE (AC)	$8.75			
	AC/PCC	I - Very Good	Crack Treatment	SEAL CRACKS	$1.60	4		
			Surface Treatment	SINGLE CHIP SEAL	$1.74		8	
			Restoration Treatment	MILL AND THIN OVERLAY	$5.04			3
		II - Good, Non-Load Related		DOUBLE CHIP SEAL	$1.52			
		III - Good, Load Related		HEATER SCARIFY & OVERLAY	$5.95			
		IV - Poor		HEATER SCARIFY & OVERLAY	$6.14			
		V - Very Poor		RECONSTRUCT STRUCTURE (AC)	$8.75			
	PCC	I - Very Good	Crack Treatment	DO NOTHING	$0.00	9		
			Surface Treatment	DO NOTHING	$0.00		99	
			Restoration Treatment	DO NOTHING	$0.00			100
		II - Good, Non-Load Related		DO NOTHING	$1.11			
		III - Good, Load Related		DO NOTHING	$1.51			
		IV - Poor		THICK AC OVERLAY(2.5 INCHES)	$1.92			
		V - Very Poor		THICK AC OVERLAY(2.5 INCHES)	$7.27			

Functional Class and Surface combination not used

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Functional Class	Surface	Condition Category	Treatment Type	Treatment	Cost/Sq Yd, except Seal Cracks in LF:	Yrs Between Crack Seals	Yrs Between Surface Seals	# of Surface Seals before Overlay
Other	ST	I - Very Good	Crack Treatment	DO NOTHING	$0.00	9		
			Surface Treatment	DO NOTHING	$0.00		99	
			Restoration Treatment	DO NOTHING	$0.00			100
		II - Good, Non-Load Related		SINGLE CHIP SEAL	$1.11			
		III - Good, Load Related		SINGLE CHIP SEAL	$1.51			
		IV - Poor		SINGLE CHIP SEAL	$1.92			
		V - Very Poor		THICK AC OVERLAY(2.5 INCHES)	$7.27			

Functional Class and Surface combination not used

APPENDIX E

Description of Pavement Defects

APPENDIX E: PAVEMENT DEFECT DESCRIPTIONS

1. Alligator Cracking (Fatigue Cracking)
2. Block Cracking
3. Distortions
4. Longitudinal and Transverse Cracking
5. Patching and Utility Cut Patching
6. Rutting/Shoving
7. Weathering
8. Raveling

ALLIGATOR CRACKING (FATIGUE)

Alligator or fatigue cracking is a series of interconnecting cracks caused by fatigue failure of the asphalt concrete surface under repeated traffic loading. Cracking begins at the bottom of the asphalt surface (or stabilized base) where tensile stress and strain are highest under a wheel load. The cracks propagate to the surface initially as a series of parallel longitudinal cracks. After repeated traffic loading, the cracks connect, forming many sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are generally less than 0.5 m (1.5 ft) on the longest side. Alligator cracking occurs only in areas subjected to repeated traffic loading, such as wheel paths. (Pattern-type cracking that occurs over an entire area not subjected to loading is called “block cracking,’ which is not a load-associated distress.)

Severity Levels	Description
Low	Fine, longitudinal hairline cracks running parallel to each other with no, or only a few interconnecting cracks. The cracks are not spalled.
Medium	Further development of light alligator cracks into a pattern or network of cracks that may be lightly spalled.
High	Network or pattern cracking has progressed so that the pieces are well defined and spalled at the edges. Some of the pieces may rock under traffic.

BLOCK CRACKING

Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces. The blocks may range in size from approximately 0.3 by 0.3in (1by 1 ft.) to 3 by 3 in (10 by 10 ft.). Block cracking is caused mainly by shrinkage of the asphalt concrete and daily temperature cycling (which results in daily stress/strain cycling). It is not load – associated. Block cracking usually indicates that the asphalt has hardened significantly. Block cracking normally occurs over a large portion of the pavement area, but sometimes will occur only in non-traffic areas. This type of distress differs from alligator cracking in that alligator cracks form smaller, many-sided pieces with sharp angles.

Severity Levels	Description
Low	Blocks are defined by low* severity cracks.
Medium	Blocks are defined by medium* severity cracks.
High	Blocks are defined by high* severity cracks.

*See severity level of longitudinal and transverse cracking.

DISTORTIONS

Distortions are usually caused by corrugations, bumps, sags, and shoving. They are localized abrupt upward or downward displacements in the pavement surface, series of closely spaced ridges and valleys, or localized longitudinal displacements of the pavement surface. Distortions affect ride quality.

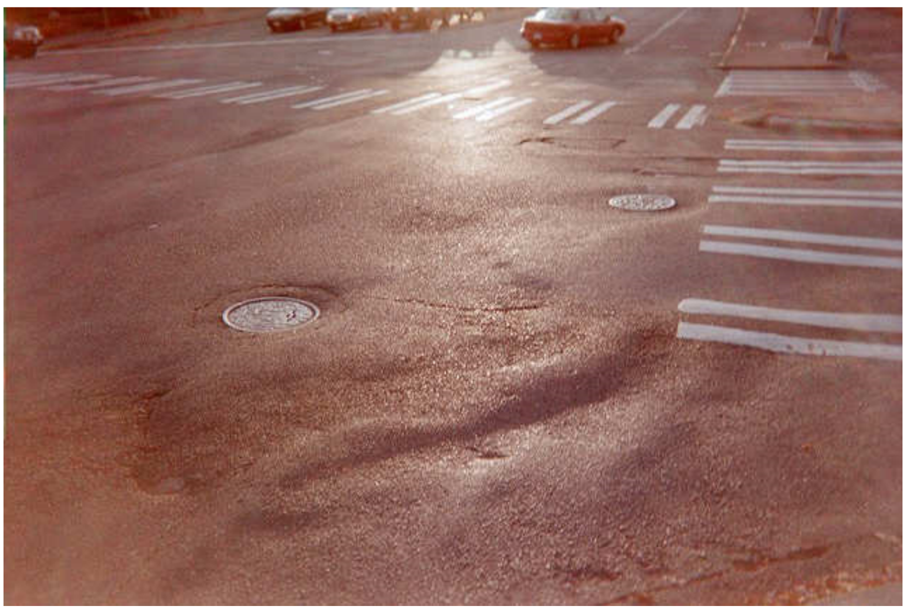
Severity Levels	Description
Low	Distortion produces vehicle vibrations which are noticeable, but no reduction in speed is necessary for comfort or safety, and/or individual distortions cause the vehicle to bounce slightly, but create little discomfort.
Medium	Distortion produces vehicle vibrations which are significant and some reduction in speed is necessary for safety and comfort.
High	Distortion produces vehicle vibrations which are so excessive that speed must be reduced considerably for safety and comfort.

SHOVING

Shoving is a permanent, longitudinal displacement of a localized area of the pavement surface caused by traffic loading. When traffic pushes against the pavement, it produces a short, abrupt wave in the pavement surface. This distress normally occurs only in unstable liquid asphalt mix (cut back or emulsion) pavements.

Shoves also occurs where asphalt pavements abut PCC pavements; the PCC pavement increase in length and push the asphalt pavement, causing the shoving.

Severity Levels	Description
Low	Shove causes low severity ride quality.
Medium	Shove causes medium severity ride quality.
High	Shove causes high severity ride quality.



LONGITUDINAL AND TRANSVERSE CRACKING

Longitudinal cracks are parallel to the pavement's centerline or laydown direction. They may be caused by:

1. A poorly constructed paving lane joint.
2. Shrinkage of the AC surface due to low temperatures or hardening of the asphalt and/or daily temperature cycling.
3. A reflective crack caused by cracking beneath the surface course, including cracks in PCC slabs(but not PCC joints)
4. Decreased support or thickness near the edge of pavement.

Transverse cracks extend across the pavement at approximately right angles to the pavement centerline or direction of laydown. These may be caused by conditions 2 and 3 above. These types of cracks are not usually load- associated.

Severity Levels	Description
Low	One of the following conditions exists. 1. Non-filled crack width is less than 3/8 in (10 mm), or 2. Filled crack of any width (filler in satisfactory condition).
Medium	One of the following conditions exist: 1. Non-filled crack width 3/8 to 3 in (10 to 76 mm), measured on the pavement surface. 2. Non-filled crack of any width up to 3 in (76 mm) surrounded by light and random cracking. 3. Filled crack of any width surrounded by light random cracking.
High	One of the following conditions exists. 1. Any crack filled or non-filled surrounded by medium or high severity random cracking. 2. Non-filled crack over 3 in (76 mm), measured on the pavement surface. 3. A crack of any width where a few inches of pavement around the crack is severely broken.

PATCHING AND UTILITY CUT PATCHING

A patch is an area of pavement that has been replaced with new material to repair the existing pavement.

A patch is considered a defect no matter how well it is performing (a patched area or adjacent area usually does not perform as well as an original pavement section). Generally, some roughness is associated with this distress.

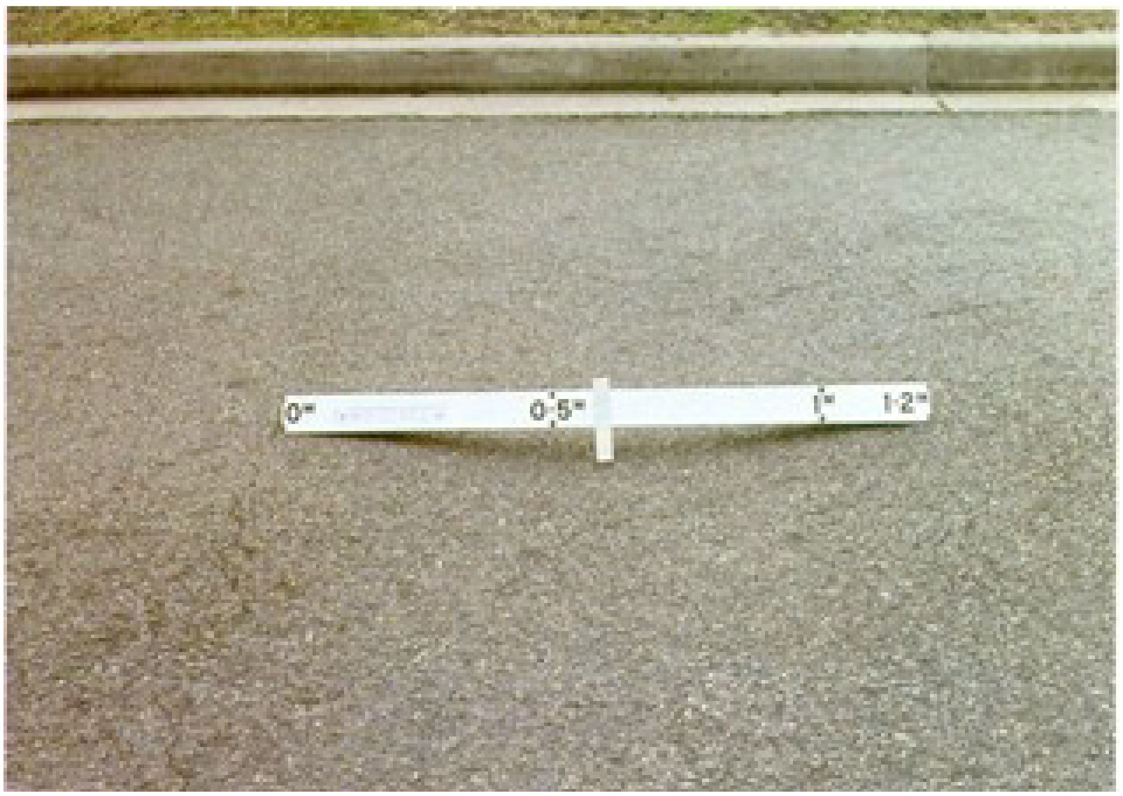
Severity Levels	Description
Low	Patch is in good condition and is satisfactory. Ride quality* is rated low severity or better.
Medium	Patch is moderately deteriorated and/or ride quality is rated as medium severity.
High	Patch is badly deteriorated and/or ride quality is rated as high severity. Patch needs replacement.

*Ride quality is defined in the severity levels of distortions.

RUTTING

A rut is a surface depression in the wheel paths. Pavement up lift may occur along the sides of the rut, but, in many instances, ruts are noticeable only after a rainfall when the paths are filled with water. Rutting is when permanent deformation occurs in any of the pavement layers or subgrades, usually caused by consolidated or lateral movement of the materials due to traffic loading.

Severity Levels	Description
Low	1/2 to less than 1 in (13 to 25 mm)
Medium	1 to less than 2 in (25 to 50 mm)
High	Equal to or greater than 2 in (over 50 mm)



WEATHERING AND RAVELING

Weathering and raveling are the wearing away of the pavement surface due to a loss of asphalt or dislodged aggregate particles. These distresses indicate that either the asphalt binder has hardened appreciably or that a poor-quality mixture is present. In addition, raveling may be caused by certain types of traffic, e.g., tracked vehicles. Softening of the surface and dislodging of the aggregates due to oil spillage are also included under raveling.

Severity Levels	Description
Low	Aggregate or binder of the pavement or surface seal has started to wear away. In some areas, the surface is starting to pit. In the case of oil spillage, the oil stain can be seen, but the surface is hard and cannot be penetrated with a coin.
Medium	Aggregate and/or binder have worn away or the original pavement is showing through the surface seal in a few places. The surface texture is soft and can be penetrated with a coin.
High	Aggregate and/or binder have been considerably worn away or much of the surface seal has been lost. The surface texture is very rough and severely pitted. The edge of the pavement has broken up to the extent that pieces are missing within 1 to 2 ft (.3 to .6 m) of the edge. In the case of oil spillage, the asphalt binder has lost its binding effect and the aggregate has become loose.