

Pierce County Transportation Plan

Traffic Maintenance and Operations Discussion

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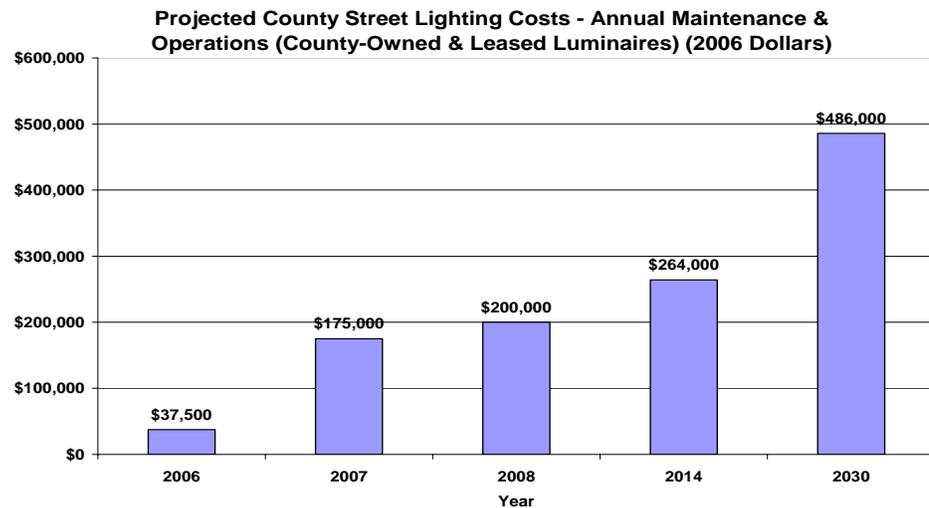
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TRAFFIC MAINTENANCE & OPERATIONS >>> SUMMARY AT-A-GLANCE

Scope: The maintenance and operation of traffic control elements of the County road system including traffic signs, signals, pavement markings, traffic flashers, and street lighting.

Proposed goals: Comply with standards set forth by the Manual on Uniform Traffic Control Devices, as adopted by the State of Washington, and provide as safe of a road system as possible for responsible road users.

Trends: The number of County traffic signals and flashers has grown steadily over the last ten years (six per year) and this rate of growth is anticipated to continue as the County experiences ongoing increases in population and employment. Costs for street lighting are expected to significantly increase in accordance with recent County Council policy changes, with almost five times more luminaires projected by 2030. Since the number of center line miles of County roads is not assumed to appreciably increase, the number of traffic signs, markings, and striping are expected to grow slightly each year. Based on these trends, the overall traffic maintenance & operations workload is projected to increase by approximately 48% by 2030.



Proposed solutions: Continue to maintain and operate the County’s traffic control devices at current service levels to comply with required national and state standards, and to provide as safe a road system as possible for responsible road users. Increase resource levels as necessary (e.g., staffing, funding for power bill increases) to meet the maintenance & operation workload demands of a growing infrastructure of traffic signals and street lighting.

Estimated 20 year cost to meet these goals: \$110 million (in 2006 dollars)

TRAFFIC MAINTENANCE AND OPERATIONS PIERCE COUNTY TRAFFIC DIVISION

Introduction

The County Public Works and Utilities Traffic Division is responsible for the maintenance and operation of traffic control devices on the County road system. These traffic control devices currently include 24,400 traffic signs, 1,356 line miles of striping, 5,394 pavement marking units, 84 traffic signals, 26 intersection flashers and an increasing number of County-owned and leased street light luminaries.

The Division monitors the operation of the roadway system through traffic counts, reported crash data, field investigations, traffic studies, and review of proposed land use developments for probable traffic impacts.

- It is the County's policy to operate and maintain the traffic control devices on the County public road system in accordance with the standards set forth in the Manual on Uniform Traffic Control Devices, as published by the Federal Highway Administration and as adopted by the State of Washington Department of Transportation.
- The operation and maintenance of the County's traffic control devices is also driven by a goal to provide as safe of a road system as possible for responsible road users.
- It is the County's goal to operate the road system as efficiently as possible as a means of maximizing the roadway capacity available under current conditions.
- The Traffic Division strives to strategically manage the County's traffic control devices to achieve the best results or performance in the maintenance, operation, and preservation of those devices given the resources available.
- As an added consideration, the Traffic Division also strives to manage the operation of the road system through effective stewardship that minimizes tort liability exposure for the County and its taxpayers.

Several cities, notably Lakewood, University Place, and Edgewood, contract with the County for maintenance of their traffic signals, striping, markings, and/or signing. This paper includes only workload and costs for the maintenance and operation of traffic control devices on the County road system, and does not include these reimbursable city contract services.

Maintenance

Maintenance of County traffic control devices is administered on a county-wide basis through the County Traffic Operations Center, located at 1424 112th Street East. Based at this facility is the Sign/Marking crew, the Signal crew, and Traffic Operations supervisors and maintenance office staff. Additional seasonal hires are also utilized to assist with spring to fall workload areas such as striping and markings.

Maintenance activities can be categorized into two primary areas: Routine & Preventive Maintenance, and Response Maintenance.

Routine & Preventive Maintenance (RMS 64 functions)

Routine & Preventive Maintenance activities are those maintenance work tasks that are scheduled on a regular, periodic basis to proactively confirm that the traffic control devices are operating in their intended manner.

In general, the amount of work accomplished and the associated costs for Routine & Preventive traffic maintenance are tracked through the PW&U Department's Road Maintenance System (RMS), under its function codes that begin with "64" as its first two digits.

Work areas & service levels

Traffic sign inspection. Signs are visually inspected and repaired as necessary. Stop and Yield signs are currently inspected monthly, with all other signs inspected quarterly. In this manner, many more sign concerns (e.g., vandalized or stolen signs) are proactively addressed rather than being called upon by others to respond. Formal inspections also provide the opportunity to document that the signs are in their proper placement and are "operating" as intended.

Repainting & refurbishing existing pavement markings. Markings (e.g., stop bars, crosswalks, arrows, onlays, railroad, etc.) consisting of paint are repainted annually. Markings of longer-lasting durable materials are inspected annually and refurbished as necessary.

Restriping roadways. Center line, edge line, and lane lines are repainted annually, except for a limited amount of durable longitudinal striping, which is handled similarly to durable markings.

Replacing raised pavement markers. Raised pavement markers, used for channelization purposes and for supplementing center lines, are replaced as necessary.

Preventive maintenance checks on signals and flashers. Control cabinets and signal display hardware at traffic signals and intersection flashers are visually inspected, and any necessary repair needs are noted and addressed. Preventive maintenance checks on

traffic signals are currently conducted every other month, with intersection flashers checked quarterly.

Luminaire inspection. County-owned luminaries (street lights) are visually inspected at night, with any needed repairs noted and addressed. They are currently inspected twice a year. Leased luminaires are maintained and operated by the associated power company.

Electronics testing & repair. Key traffic signal control components are tested and repaired as necessary. Each traffic signal conflict monitor is currently tested annually.

Response Maintenance (Call-Outs for Repairs) (RMS 65 functions)

Response Maintenance activities are those maintenance work tasks that are in response to conditions that are reported or found when it is apparent that a traffic control device such as a sign or a signal is not operating in its intended manner. Examples would be a Stop sign that has been knocked down, or a traffic signal that has gone into a flashing mode. These non-scheduled events are repairs to existing field inventory and occur on an irregular basis, at any time of the day or night. A traffic sign or signal technician is called upon to react and respond as quickly as possible, at the first appropriate time period according to departmental policy. For example, a downed Stop or Yield sign will be responded to as soon as possible, no matter what time or day of the week, while another type of sign would be addressed on the next available regular working day.

Other traffic response maintenance activities could involve response to repair or secure damaged roadway infrastructure, such as a vehicle hitting and damaging a traffic signal pole or controller cabinet.

In general, the amount of work accomplished and the associated costs for Response traffic maintenance are tracked through the PW&U Department's Road Maintenance System (RMS), under its function codes that begin with "65" as its first two digits.

Work areas & service levels

Sign call-outs. Traffic signs may be reported or found knocked down, stolen/missing, or otherwise vandalized. Stop and Yield sign concerns are responded to on a 24/7 basis. On any given time or day, there are currently three traffic sign technicians that are typically on-call to respond within 15 minutes, with the average repair accomplished with an hour. All other sign concerns are responded to as soon as practical during regular business hours.

Signal call-outs. Traffic signals may be reported as being in flashing mode or not operating normally. On any given time or day, there is currently one traffic signal technician that is typically on-call to respond with 15 minutes to these operational safety concerns. Repairs vary depending upon the complexity. All other concerns are

responded to during regular business hours, with single lamp burnouts addressed as soon as practical and other items prioritized and scheduled for crew, equipment, and needed materials.

Luminaire call-outs. Street light luminaries may be reported as burn-outs or cycling on and off during daylight hours. Repairs are addressed during regular business hours.

Special events/occurrences. Events involving damaging of roadway infrastructure may require emergency call-out response utilizing traffic maintenance personnel. An example would be damage to structural traffic signal supports, display systems, or control equipment.

Operations

The Traffic Division's Operations activities are led by the Traffic Engineering Section, located in the Tacoma Mall Plaza office building, 2702 South 42nd Street.

A staff of traffic engineers and traffic technicians monitor the operation of the County road system, and conduct traffic studies and reviews to evaluate how the road system's intersections and arterials are operating. Based on the traffic data collected and the subsequent reviews and analyses, recommendations are developed for considering actions for implementation that can enhance or improve roadway operations. These actions may consist of lower cost, short term measures that can be implemented through additions or changes to traffic signing, revisions to signal timing or phasing, or modifications to striping or channelization. Other actions may include recommendations for longer term measures such as the construction of a new traffic signal or left turn lane, which require programming into the County's Transportation Improvement Program and allocation of funding.

Many of the lower cost, short-term measures can be implemented through the Division's traffic maintenance forces. These types of changes or revisions to existing traffic control signing, striping, marking, signal operations, and County-owned street lighting systems are accomplished through a work order system at the Traffic Operations Center. In general, the amount of work accomplished and the associated costs for operations work by traffic maintenance personnel are tracked through the PW&U Department's Road Maintenance System (RMS), under its function codes that begin with "62" as its first two digits. Traffic Engineering costs are captured through the TimeTrax timekeeping and reporting system.

Work area and service levels

Traffic counts. Traffic volume data is collected throughout the County arterial system on a regular, periodic basis as a means of monitoring the current usage of the road system, the rate of traffic growth, changes in circulation and use due to system changes, such as new arterial linkages. Traffic counts are also used by others in areas such as transportation planning activities, roadway design, road log and gas tax allocations, prioritization arrays, and private sector market analyses. There are currently 135 arterial

locations that are counted annually, with an additional 900 locations that are counted every other year. Count data is adjusted to an Annual Average Daily Traffic (AADT) volume based on daily and monthly variations observed at 12 additional control stations that are strategically placed in each area of the county. Manual intersection turning movement counts and other traffic counts are also collected in support of traffic engineering studies and analyses.

Crash records. About 2,400 copies of police collision reports, as well as citizen reports for non police-investigated collisions, are forwarded to the Division for compilation and analysis each year. Locations with higher than average crash history are identified and analyzed for potential improvements utilizing Federal highway grant programs, or beyond those programs, State or local funding. These reviews may also result in recommendations for operational enhancements to the system.

Other traffic data collection. Other technical traffic data or field measurements are also collected. These may include sight distance measurements, ball bank curve studies, vehicle speed surveys, or data for special studies. This work is typically accomplished in support of traffic reviews or studies.

Citizen concerns and inquiries. Concerns or inquiries related to traffic issues are regularly received by the Division, and may range from an explanation over the phone that takes a few minutes to a comprehensive traffic study that can take several weeks. Many of these concerns will lead to a field investigation. Speeding in residential neighborhoods is also a common concern. The Division averages 200 to 300 field investigations each year.

Traffic studies & analysis. Traffic engineering studies often involve analysis of traffic flow, roadway capacity, safety aspects, and/or review of how effectively or efficiently an intersection or road segment is operating. The Division also studies and reviews potential changes in speed limits, roadway functional classification, requests for crosswalks, and candidate locations for traffic calming projects. These studies may be prompted internally through the Division's monitoring of the traffic counts and crash records, or externally for example by receipt of a citizen concern.

Development traffic impact review. Traffic impact analyses which are prepared by developer consultants to project the number of new vehicle trips and their possible impacts to the County road system are regularly reviewed by Traffic Engineering staff. When necessary, recommendations for measures that can mitigate the development impacts are provided to the Planning and Land Services Department (PALS). Mitigating measures might include widening an existing road for a left turn lane, or signaling an intersection, or contributing a proportionate monetary share to an existing County project. Increasingly, the workload is shifting to reviewing and administering the proper calculation of traffic impact fees for system impacts, and review of development impacts for access improvements by the developer. The Division also assists PALS in review of variance requests, construction plans, and construction engineering for traffic items. In

2006, for example, the Division reviewed 50 Traffic Impact Analyses, conducted 71 plan reviews, and 25 deviation requests.

Operational changes to the road system. Traffic reviews or traffic engineering studies or the addition of new roads can prompt operational changes in traffic control, signing, channelization, striping, or markings that can be accomplished through the Division's traffic maintenance forces. Examples could include converting an intersection to a four-way stop, changing the timing or signal display of a traffic signal, or re-channelizing an intersection if no additional pavement is needed.

Traffic signal power costs. The cost of the electricity to power the traffic signal systems is considered an operational cost.

Illumination power costs. The cost of the electricity to power the street light luminaries is considered an operational cost.

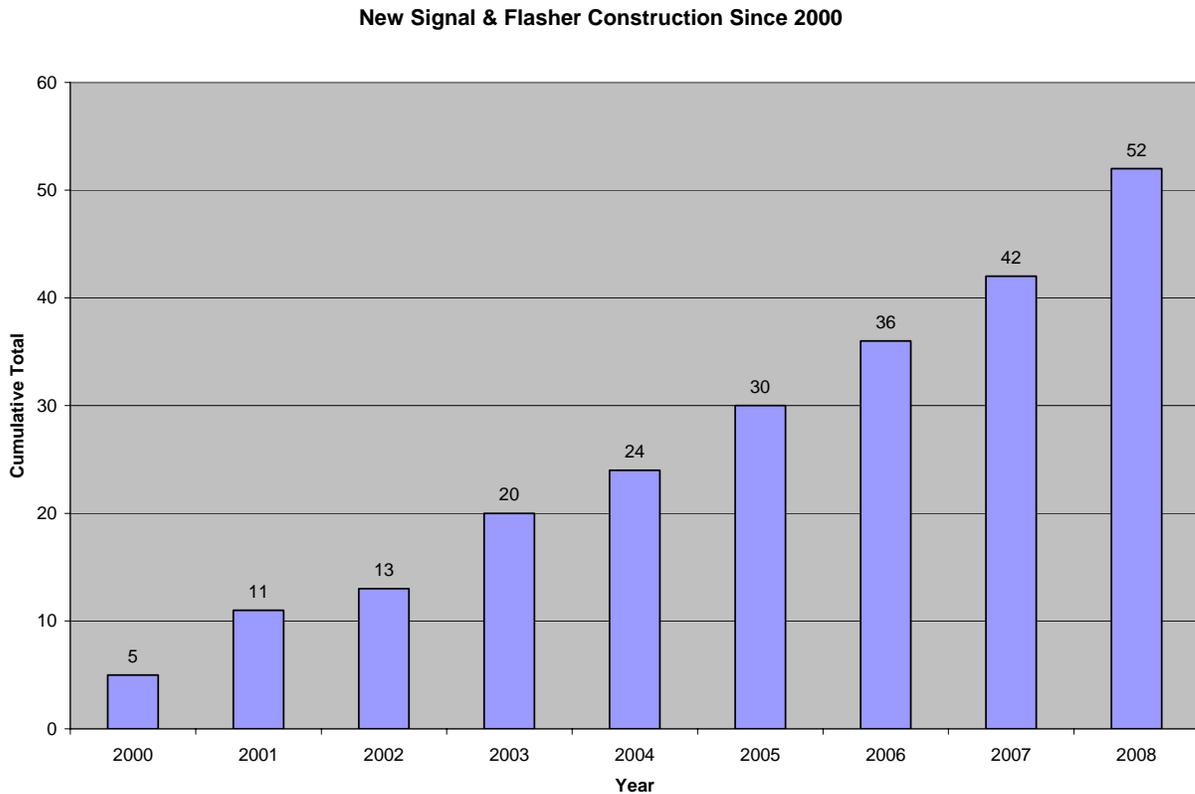
Projected Growth Assumptions

In developing estimated traffic maintenance and operation costs for the purposes of the Transportation Plan Update, a number of assumptions were made regarding the projected workload in future years in relationship to the growth in traffic control infrastructure.

These assumptions are based on general historical trends and current policies, including recent changes in policies or standards that are anticipated to have an additional impact on workload and costs. Although periodic annexations to cities are expected to continue, for the purposes of this analysis the impacts of possible future incorporations are not assumed. Continuing future technological advancements in the traffic industry are expected to incrementally enhance the operation, reliability, and efficiency of traffic control devices, as they have in the past. However, this analysis does not take into account any potentially significant (and currently unproven) "break-through" advancements, such as changing all the existing high-pressure sodium vapor street light luminaires to low cost LED fixtures.

Traffic signs, striping, markings. The number of center line miles of County roads has not changed appreciably over the last ten years. The number of miles of new roads constructed and added to the system has generally been offset by existing roads annexed to adjacent cities. Therefore, the growth in the number of traffic signs, miles of striping, and number of markings is relatively low from year to year. This growth is estimated at about +1 % per year, and is due to operational changes, road improvements such as widening for additional lanes, and new Federal or State traffic control standards or regulations that the County is obliged to follow. Thus, projected future cost increases for the maintenance and operation of signs, striping, and markings are assumed to be the cost of inflation plus an additional one percent. (+ 1%).

Traffic signals. As shown on the graph below, the number of traffic signals and intersection flashers on the County road system has grown steadily over the last 9 years.

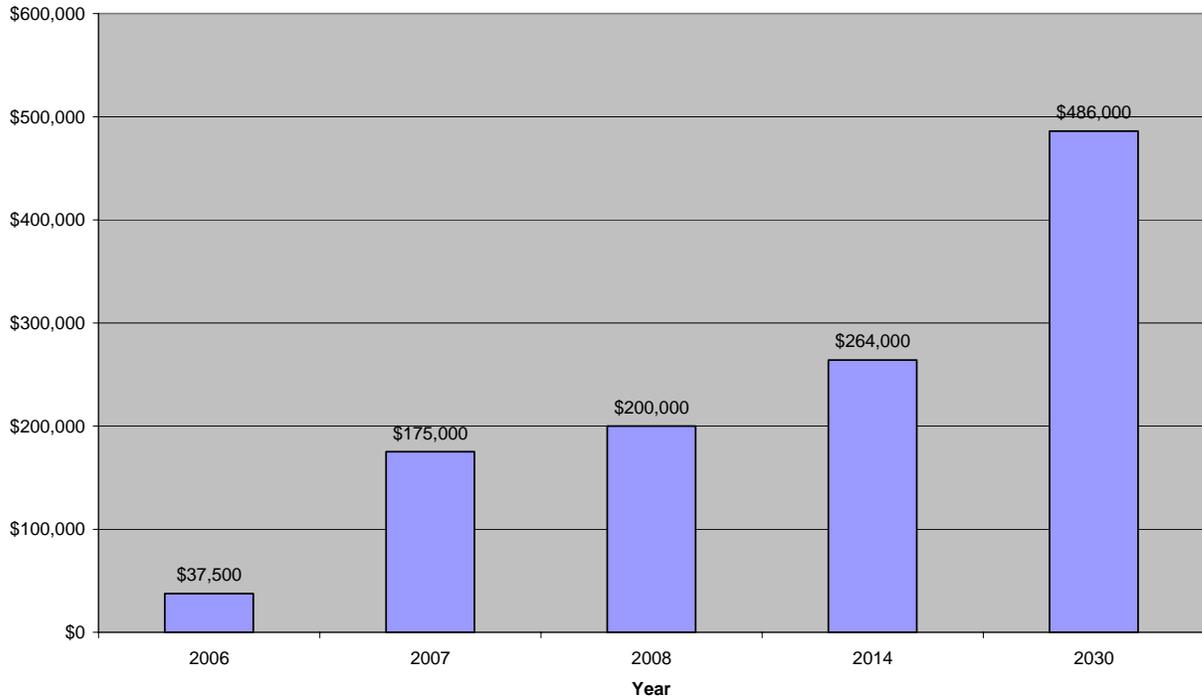


This trend is assumed to continue as the County experiences continued growth in population and employment through residential and commercial development and its associated traffic and travel demands. For the purposes of this paper, it is assumed that over the next 20 to 25 years, the County will add an average of six new traffic signals to its system each year.

Roadway illumination. This area is experiencing the largest percentage growth increases in traffic infrastructure. In past years, the majority of County-provided roadway illumination was limited almost exclusively to signalized intersection locations. Gradually, the County’s illumination policy was broadened to include street lighting on major arterial construction projects in highly commercialized activity centers, such as at Canyon Road & 112th Street East. The inclusion of medians on major arterial construction projects along the Canyon Road and 176th Street East corridors has further triggered more continuous illumination systems. County Council actions in recent years have also resulted in a significant number of leased luminaries in the South Hill, Spanaway, Parkland, and Frederickson areas. Finally, in the past year, the County policy has been further expanded to include street lights as a part of multi-lane arterial construction projects in urban areas, and on a case-by-case basis, in built-up rural areas.

The graph below illustrates the projected growth in illumination maintenance and operations costs, based on the first few years of experience under the expanded illumination policy and additional projected costs based on anticipated multi-lane arterial construction.

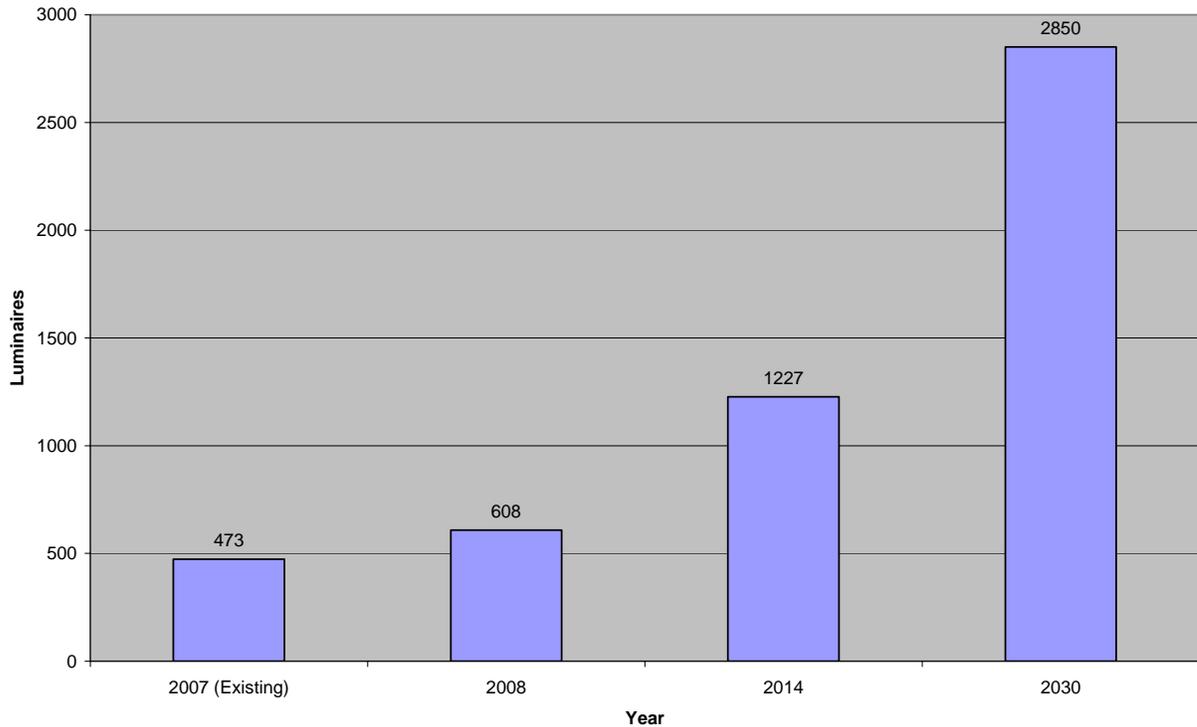
**Projected County Street Lighting Costs - Annual Maintenance & Operations
(County-Owned & Leased Luminaires) (2006 Dollars)**



The above costs include charges for power consumption as well as maintenance costs, all represented in 2006 dollars. Future years are not adjusted for inflation or other cost increases, and reflect only the growth in the number of luminaires and the present-day cost to maintain them.

The number of County-owned luminaires has a direct impact on the Division’s staffing and resource needs, as well as the long-term preservation needs of the system. The growth in County-owned illumination is assumed to stem from the number of multi-lane arterials that will be constructed by both the County and developers in the urban areas.

Projected Number of County-Owned Luminaires



Projected Annual Traffic Maintenance & Operations Costs

In estimating the projected annual traffic maintenance and operation costs for the year 2030 for the purposes of the Transportation Plan Update, costs for the current levels of service for the last full calendar year (2006) were utilized as well as the projected growth assumptions.

The projected annual traffic maintenance and operations costs for 2030 are shown below, as expressed in 2006 dollars. An assumed average inflation rate would need to be applied to the 2030 numbers below to project an actual projected cost in 2030 dollars.

As the table on the next page shows, the most significant increases in the amount of work provided (and thus the costs) from 2006 to 2030 are in the areas of traffic signals and illumination, due to the anticipated growth in the number of signals and street lights anticipated. A more moderate increase is projected in the signs and markings area, and in traffic engineering. The overall Division workload, based on the total estimated M&O costs below, is projected to increase by approximately 48% by 2030.

**Projected Annual Traffic Maintenance & Operations
Costs for 2030**

	2006	2030 (in 2006 dollars)
<u>Traffic Maintenance</u>		
Traffic Signals	\$ 565,000	\$1,430,000
Illumination	15,000	114,000
Signs & Markings	1,560,000	1,980,000
Maintenance Admin	310,000	310,000
Sub-total	\$2,450,000	\$3,834,000
<u>Traffic Operations</u>		
Traffic Signals	\$ 112,000	\$ 285,000
Illumination	22,000	372,000
Signs & Markings	175,000	225,000
Traffic Engineering	1,500,000	1,600,000
Sub-total	\$1,809,000	\$2,482,000
<u>Traffic M&O Total Costs</u>	<u>\$4,259,000</u>	<u>\$6,316,000</u>

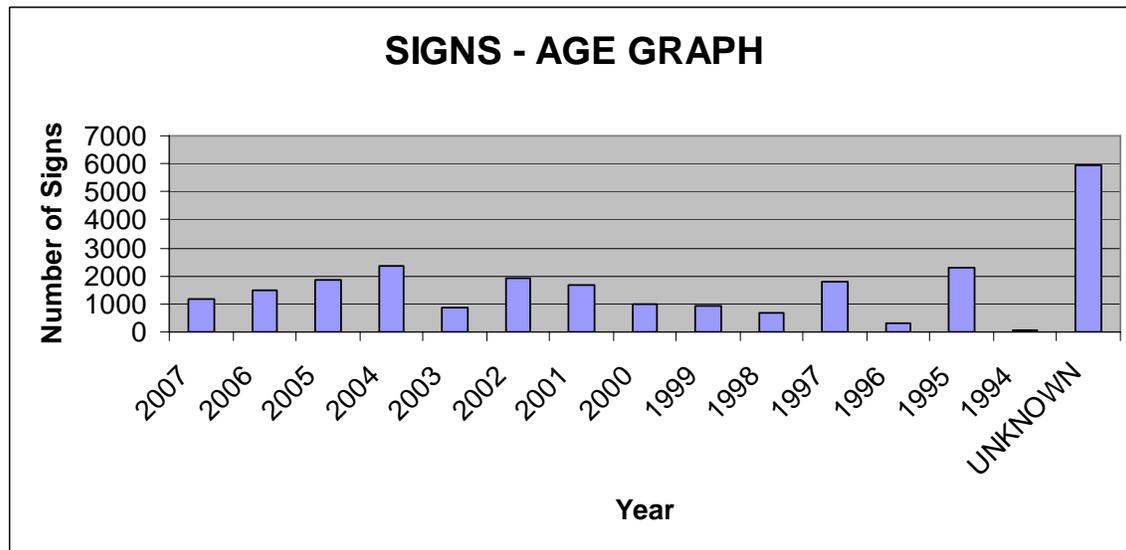
The above dollar amounts for 2030 are expressed in 2006 dollars, i.e., they do not include any allowances for inflation or increases in labor, equipment, or materials.

Performance Measures

Certain regular performance measures can be utilized or considered to track the effectiveness of the maintenance and operations of the County's traffic control devices.

These may include:

- Response time for sign and signal call-outs
- Number of line-miles striped in comparison to the annual plan
- Sign service life as a function of age and retroreflectivity
- Number of sign maintenance actions through inspections compared to call-outs
- Signal routine relamping compared to burn-out lamp calls
- Luminaire relamping compared to burn-out lamp calls
- Traffic signal energy costs
- Number of pavement markings installed/replaced



Preservation

While *maintenance* is considered a routine activity associated with repairing a physical asset or keeping the physical asset functional during the asset's useful life, *preservation* is the replacement or repair of an asset after it has reached its useful life.

An example of maintenance would be repairing a traffic sign that has been knocked down, while an example of preservation would be replacing an aging traffic sign when its visibility is no longer adequate.

Traffic infrastructure items that are to be addressed in the area of preservation are:

- Traffic signs
- Luminaires and poles
- Traffic signal display systems, including poles
- Traffic signal control systems
- Traffic flashers and beacons
- Traffic communication systems, such as signal interconnect
- Durable pavement markings

Preservation of each area is considered with respect to defining each road asset type, the unit and quantity of each asset type, the estimated life cycle, and the estimated replacement cost per unit. From this analysis, the projected cost for preservation of each asset type can be estimated over the next 20 years, and then planned for annually as expressed by cost per year per asset type.

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Due to their relatively short average life cycle of about a year or less, all costs for paint striping and painted markings are captured under maintenance and are not included under preservation, since this work is typically done annually.

Preservation of traffic infrastructure items, as well as the projected costs associated with replacing those items at the end of their estimated useful life, is discussed in greater detail in a separate white paper, "Transportation System Preservation Discussion."