HIGHWAY PERFORMANCE MONITORING SYSTEM

Instructions for Updates

Including the HPMS Data Items

California Department of Transportation
Division of Transportation System Information
Highway Inventory and Performance Branch

Revised January 2006

HPMS CONTACTS

Rose Cuellar, serving the far northern and the north central counties.
Phone: (916) 654-2632
E-mail: rose.cuellar@dot.ca.gov

Marcia Corrigan, serving Los Angeles, Orange, Riverside, San Bernardino and Ventura Counties.
Phone: (916) 653-2808
E-mail: marcia.corrigan@dot.ca.gov

Bob Kadell, serving the coastal region.
Phone: (916) 653-3280
E-mail: bob.kadell@dot.ca.gov

Harinder Hans, serving the far southern, mountain and south central counties.
Phone: (916) 654-3336
E-mail: harinder.hans@dot.ca.gov

Department of Transportation
Division of Transportation System Information (DTSI) MS #38
"Pathway to Information"
P. O. Box 942874
(1120 N Street, 5th Floor)
Sacramento, CA 94274-0001
FAX: (916) 654-6583

Brian Domsic, Chief
Highway Performance Branch
Phone: (916) 653-3272
E-mail: brian.domsic@dot.ca.gov

Table of Contents

Description		Page
HPMS Contacts		ii
Table of Contents		1
About the HPMS Program		2
The Caltrans HPMS Process		3
HPMS Data Items Listing and Codes		4 - 33
Caltrans Supplemental Data Items		34 - 38
Segmentation new	Appendix A	A-2
County FIPS Codes and Abbreviations	Appendix B	A-3
Urbanized and Large Urbanized Area Codes	Appendix C	A-4
Small Urban Area Codes	Appendix D	A-6
NAAQS Ozone Non-attainment Areas	Appendix E	A-9
Conversion of PCI to PSR	Appendix F	A-10
AADT versus ADT – Using adjustment factors	Appendix G	A-12
Annual Growth Factors new	Appendix H	A-15
Standardized Common Abbreviations	Appendix I	A-18
Caltrans Data Items		Inside back cover
HPMS Data Items		Outside back cover

The California Department of Transportation, Division of Transportation System Information, Highway Performance Branch prepared this booklet, which is to be used as a guide for reporting the HPMS data.

For a more comprehensive coverage of the HPMS data items, refer to the FHWA HPMS Field Manual (http://www.fhwa.dot.gov/ohim/hpmsmanl/hpms.htm)

For information on traffic counting procedures refer to the TRB 2000 Highway Capacity Manual (http://www.nationalacademies.org/trb) or the FHWA Traffic Monitoring Guide.

This booklet is also available on-line in pdf format on the Caltrans HPMS website. It may be downloaded on the home page found at: http://www.dot.ca.gov/hq/tsip/hpms/index.html

ABOUT THE HPMS PROGRAM

The Highway Performance Monitoring System (HPMS) is a federally mandated inventory system and planning tool, designed to assess the nation's highway system. HPMS is used as a management tool by State & Federal governments and local agencies to analyze the system's condition and performance.

Highway Performance Monitoring System data are used for:

-- Allocation of Federal Funds to the States; including Interstate Maintenance, National Highway System and Surface Transportation Program

-- Travel trends and future transportation forecasts.

-- Environmental Protection Agency (EPA) air quality conformity tracking.

-- Data for Biennial Report to Congress on the State of the Nation's Highways.

HPMS Authority is based upon Federal Code:

EPA Section 187 - Calls for States/MPOs having URBANIZED AREAS affected by the Clean Air Act Amendments of 1990 to estimate total annual vehicular highway travel (Vehicle Miles Traveled or VMT) using the HPMS.

23 CFR 420.105(b) - The State Highway Agencies shall provide data that support the FHWA's responsibilities to the Congress and to the public.

23 CFR 460.3(b) - State Public Road mileage. Each State must annually submit a certification of public road mileage within the State to the FHWA Division Administrator.

23 CFR 500.204(b) - A State's TMS precision of reported data shall meet the statistical precisions established by FHWA for the HPMS.

40 CFR 93.122(b)(3) - HPMS estimates of vehicle miles traveled (VMT) shall be considered the primary measure of VMT within the portion of the non-attainment or maintenance area and for the functional classes of roadways included in HPMS, for urban areas which are sampled on a separate urban area basis.

THE CALTRANS HPMS PROCESS

The State uses specialized software provided by the FHWA to enter and maintain the information stored in the HPMS. The software is basically a VB application that uses MS Access on the back end. Within this database, there are about 46,000 records as of 2005. These records represent Caltrans' best accounting of California's maintained public road mileage. On June 1, 2005 the State certified to FHWA that the public road maintained mileage in California was 169,793 miles as of December 31, 2004. Further information about maintained public road mileage is published in the California Public Road Data, which may be found on-line at http://www.dot.ca.gov/hq/tsip/hpms/datalib.html

Caltrans tries to include every roadway segment on the federal aid system in the HPMS database. Non-federal aid routes are not listed individually in the HPMS but the summation of the mileage of these routes is given in a 'group' record that is included for each jurisdiction and by the amount of rural and urban roadway mileage.

The FHWA lists 98 data items in the HPMS. All records in the HPMS data set have the first 46 items populated. A representative sampling, about 15%, have all 98 items filled in. Additionally, Caltrans maintains a list of 12 items associated with each record that are not reported to the FHWA, but are necessary for the State's purposes. These are the "supplemental items" described on pages 34 to 38.

The 98 federal items and the 12 Caltrans items are listed on the back cover. The items highlighted in yellow are those for which input is requested from the cities and counties. The records for which these data items are being sought include all of the federal aid routes and the rural minor collectors. Only the total mileage of the 'urban local' or 'rural local' routes are included in the request.

A set of instructions is included with each annual request for information sent to each city and county. This booklet gives detailed explanations for what each item is and how it may be derived and reported. It should be noted that not all items require inspection or measurement. In many cases, an estimate will suffice; and it is up to the reporting agency to determine if the method of estimation is reasonable. As mentioned above, the items listed on the back cover that are highlighted in yellow are those for which input is requested from the cities and counties. These and all other data items of the HPMS are explained within but many of these items are only relevant to Caltrans and FHWA.

The data items for which an annual update is requested are flagged with a red asterisk *
For the 2005 calendar year, the HPMS updates are being combined with the Maintained Mileage updates in order to test if these two updating processes can be combined and streamlined. Therefore, the item updates requested for 2005 include Street Name with From and To Location, Section lengths, AADT, Year of Traffic Count, Number of through lanes, and in some regions, Future AADT and Future AADT Year.

FOLLOWING ARE THE DATA ITEMS:

Data Items Listing

ITEM 1

Year of Data Being Reported
The 4-character calendar year being reported. Currently 2005.

ITEM 2

State Code
The State Federal Information Processing Standards (FIPS) code; for CA = 06

ITEM 3

Data Reporting Units
0 = English 1 = Metric
Data is currently reported in English Units

ITEM 4

County Code
County FIPS code. (FIPS stands for Federal Information Processing Standards)
This will be given for each record and it should be retained since it is part of the index.
See Appendix A on page A-2 for a list of FIPS codes for California counties.

ITEM 5

Section Identification
A unique identifier within each county.
This will be given for each record and it should be retained since it is part of the index.

This is coded as twelve alphanumeric characters with no spaces.
Given this formatting: XXYYYYZZZZZZ

XX =	Caltrans District
YYYY =	Route designation
ZZZZZZ =	Section Designation

The route designation formerly appeared on the earlier versions of the California Road System (CRS) maps. It contains alphanumeric characters and in the case of state highway sections, it shows the route number. The route number, as signed, also appears in item 24. The Section Designation is all numeric and it provides continuity throughout the route, typically increasing from west to east; or from south to north.

ITEM 6

Standard Sample Indicator
A “1” entered in this field designates that the record is a standard sample. A “0” designates that the record is a universe record.

ITEM 7

Donut Sample Indicator
A “1” entered in this field designates that the record is a donut sample. Otherwise the field is zero filled.

ITEM 8
State Control Field

The FHWA has allowed this field for the state’s use. It can contain up to 100 alphanumeric characters. In California, this field consists of a concatenation of five of the supplemental items described later in this manual. They are all left justified, occupying the positions as indicated:

Positions 1-3: Alpha County Abbreviation- The alpha county code (Also item CT1)

This field should not change unless there is an error.

(See Appendix A on page A-2 for a list of counties and their abbreviations.)

Positions 5-8: Jurisdiction (left justified) - The alpha jurisdiction code (Also item CT2)

This field may change due to annexations, relinquishments and the like. Indicate any changes for segments that are not part of your jurisdiction.
Should agree with Item 25 (Government ownership) if applicable.

Positions 10-34: Street Name (left justified) (Also item CT3)
Update as necessary as long as it’s in the same physical location. (Example: 1st Street is now known as Martin Luther King Blvd.)

Positions 39-67: From Location - (left justified) (Also item CT4)
The beginning of the record, usually the southern or western limit.

Update, if necessary, but do not change this limit to lengthen the segment unless the adjacent segment is of the same functional classification and on the same side of the rural/urban boundary.

The functional classifications and rural/urban boundaries are shown on the most current FHWA approved CRS maps.

Positions 72-100: To Location - (left justified) (Also item CT5)
The end of the record, usually the northern or eastern limit.

Update, if necessary, but do not change this limit to lengthen the segment unless the adjacent segment is of the same functional classification and on the same side of the rural/urban boundary. The functional classifications and rural/urban boundaries are shown on the most current FHWA approved CRS maps.

ITEM 9 Is Section Grouped?
This item is used to indicate whether the data reported are for a single or for a group of sections.

0 = **Individual** section identifier

1 = **Grouped** section identifier

Typically, only the records with a functional classification (Item 17) of 9 (rural local) or 19 (urban local) are grouped. What this does is sum up the total mileage of rural local or urban local road mileage in a given jurisdiction, rural/urban designation or NAAQS area. Roads with all other functional classifications are listed individually and this item would be coded as a "0".

ITEM 10 Linear Reference System (LRS) Identification
A Linear Reference System is required by FHWA for linking with the Federal Geographical Information System (GIS). This system will allow users to reference HPMS information to the map location of road sections. Coded for all sections.

ITEM 11 LRS Beginning Point
Milepoints or kilometerpoints at beginning of the segment. Coded for all sections.

ITEM 12 LRS Ending Point
Milepoints or kilometerpoints at ending of the segment. Coded for all sections.

ITEM 13 Rural / Urban Designation (population)
Code for all sections. (*For a more detailed explanation, see Functional Systems Appendices B and C on pages A-3 through A-5.)*

<u>The valid codes for this item are as follows:</u>
1 = Rural Area

2 = Small Urban Area (population 5,000 – 49,999)

3 = Urbanized Area (population 50,000 – 199,999)

4 = Large Urbanized Area (population 200,000 or more)

ITEM 14 Urbanized Area Sampling Technique

This was used as a flag to calculate expansion factors when urban areas that were not in NAAQS areas and having a population 50,000 – 199,999 could be sampled as a collective. This is no longer practiced and this item is always coded "0".

ITEM 15 Urbanized Area Code

When the Rural/Urban code (Item 13, above) is coded "3" or "4", enter the three-digit urbanized area code *(for official list see Appendix B, page A-3).* Otherwise, item is coded "0".

The urban boundary is shown on the latest CRS maps. The urban boundary often does not coincide with city corporation boundaries. The name of an urbanized area may correspond to a city within that urbanized area but there could be more than one city, as well as unincorporated county jurisdiction lying within.

ITEM 16 National Ambient Air Quality Standards (NAAQS) Non-attainment Area Code

This item permits analysis and mapping of information for EPA designated nonattainment areas. Enter the three-digit urbanized area code *(see Appendix D on page A-6 for a complete list)* for the dominant urbanized area in an air basin (includes rural and small urban sections within the non-attainment area). Otherwise field will be coded "0". Coded for all sections.

ITEM 17 Functional System (a.k.a. Roadway Functional Classification)

Also known as Roadway Functional Classification, this item is coded to match the FHWA approved CRS maps.

Rural Functional System Codes		Urban Functional System Codes	
1	Principal Arterial Interstate (PAI)	11	Principal Arterial Interstate (PAI)
2	Other Principal Arterial (OPA)	12	Principal Arterial Other Fwys & Exp (OFE)
6	Minor Arterial (MA)	14	Other Principal Arterial (OPA)
7	Major Collector (MJC)	16	Minor Arterial (MA)
8	Minor Collector (MNC)	17	Collector (COL)
9	Local (LOC)	19	Local (LOC)

ITEM 18 Generated Functional System Code

This item corresponds to the functional classifications shown in item 17 above. It must be coded for all sections but it is system generated.

GFSC	Rural Functional System Codes	Urban Functional System Codes
1	Interstate (PAI)	Interstate (PAI)
2	Other Principal Arterial (OPA)	Other Fwys & Exp (OFE)
3	Minor Arterial (MA	Other Principal Arterial (OPA)
4	Major Collector (MJC)	Minor Arterial (MA)
5	Minor Collector (MNC)	Collector (COL)
6	Local (LOC)	Local (LOC)

ITEM 19 National Highway System (NHS)

A Federal-aid highway system initiated by ISTEA legislation and further outlined in the NHS Designation Act (NHSDA) of 1995. Due to an increased need for Intermodal Transportation analysis, the HPMS must identify NHS Intermodal connectors and distinguish the type of terminals they serve. If more than one connector type is involved, use the predominant type.

0	Section is NOT on the NHS.
1	Section IS on the NHS, but is NOT an Intermodal connector.
The following are types of NHS Intermodal Connectors:	
2	Major airport
3	Major port facility
4	Major Amtrak Station
5	Major rail / truck terminal
6	Major intercity bus terminal
7	Major public transit terminal or multi-modal passenger terminal
8	Major pipeline terminal
9	Major ferry terminal

ITEM 20 Planned Unbuilt Facility

Denotes whether the section is open to traffic, however, only sections on the National Highway System (NHS) are considered. An agency may have an inventory of proposed, but not yet constructed routes. No such route is to be reported in the HPMS unless it is also part of the National Highway System. Valid codes are as follows:

0	Section IS NOT on the NHS.
1	Section IS on the NHS and IS OPEN to public travel.
2	Section IS on the NHS but IS NOT YET BUILT.

ITEM 21 Official Interstate Route Number

A non-zero integer is required here for all Interstate system records. Use the legislatively approved Interstate route number. Enter a 5-character, right justified, alphanumeric value. If two or more Interstate routes occupy the same roadway, code the lowest route number. All non-interstate routes are coded zero.

ITEM 22 Route Signing

Indicates the type of signing that exists on the route. This does not include informational or directional signs nor does it include the signing for street name. Report for principle arterials, rural minor arterials and NHS. If the highway is unsigned, use code “0”. Most city and county streets will normally be coded “0”. Some county roads are signed with official county route numbers (usually the yellow on blue pentagon shaped sign). If a section is signed with two or more identifiers, code the highest class (or lowest code) of the route. Following are the valid codes:

0	Not signed or not applicable	5	County
1	Interstate	6	Township (not used in CA)
2	US official road	7	City
3	Official State road	8	Parkway / forest route
4	Off Interstate (business marker)	9	Signed, but none of the above

ITEM 23 Route Signing Qualifier

Specifies how the route marker in Item 22 actually is or will be signed. Code for all principle arterials, NHS and rural minor arterial system sections. Where more than one code is applicable, use the lower numbered code. If the roadway is unsigned, use code “0”.

O = No qualifier/Not signed/not applicable	5 = Loop
1 = Alternate	6 = Proposed
2 = Business Route	7 = Temporary
3 = Bypass	8 = Truck Route
4 = Spur	9 = None of the Above

ITEM 24 Signed Route Number

Code for all PAS, NHS and rural Minor arterial system sections; reporting for other sections is optional. Enter an 8-character, right-justified, alphanumeric value for the signed route number shown on the marker described in Items 22 and 23. If Items 22 or 23 are coded "9", code other descriptive alpha-character prefixes or suffixes abbreviated to 8 characters, if available. If Item 22 = 0 and route signing is not required or available, field should be zero filled.

ITEM 25 Government Ownership

Identifies the owner of the facility and is used in cost-allocation studies, to track historic data and in the NHS database. Code the level of government that most accurately describes the highway owner, disregarding agency agreements for maintenance or other purposes. If more than one code applies, report the lower numbered code. The alpha jurisdiction code shown in item 8 and in the supplemental (Caltrans) items should correspond to this entry.

1	State Highway Agency	5	Other State Agencies
2	County Highway Agency	6	Other Local Agencies
3	Town or Township Highway Agency (This is not used in California)	7	Federal Agency
4	Municipal (City) Hwy Agency (LA, etc.)	8	Other

"County, Local, municipal, town or township" must be officially recognized governments established under State authority. "Other" designations may be owned by tribal Nations or non-governmental organizations with the authority to build, operate or maintain toll or free highway facilities.

ITEM 26 Special Systems (STRAHNET)

Identifies special funding for the Strategic Highway Corridor Network (STRAHNET) facilities and is used by the Department of Defense to identify strategic deployment routes. Code whether or not a segment is on the STRAHNET system.

0	Not on a STRAHNET system or a STRAHNET connector.
1	Section is on a STRAHNET or segment is a STRAHNET connector. Code “1” for all Interstate System sections that are open to traffic.

ITEM 27 Type of Facility

This item is used to determine whether a segment is on a one- or two-way roadway or structure. It is used in investment requirements modeling to calculate capacity and estimate roadway deficiencies and improvement needs, in the cost allocation pavement model and in the NHS database. If codes 3 and 4 are used, section must be ENTIRELY on the structure. Codes 1 or 2 should be used when the segment is partially on a structure.

Code	Description
1	One-Way Roadway
2	Two-Way Roadway
3	One-Way Structure (Bridge, Tunnel, Causeway, etc.)
4	Two-Way Structure (Bridge, Tunnel, Causeway, etc.)

ITEM 28 Designated Truck Route

Designated truck routes are available to truck tractor and 48-foot semi-trailer combinations and truck tractor and 28-foot twin trailer combinations, both subject to no overall length limits. These are also available to specialized combination vehicles such as automobile and boat transporters, maxicube vehicles, and saddle mount combinations, subject to Federal minimum overall length limits [generally 65 to 75 feet]. Width limits are up to 102 inches. Routes that simply provide access for these vehicles to terminals, rest or other services are NOT included. Routes that restrict any of the above types of trucks because of width or length limitations are NOT included. Truck routes are only designated on state or federal highways. This must be coded for all segments.

0 = Not a designated truck route 1 = Designated truck route

ITEM 29 Toll Facility

The segment is to be considered a toll facility if a toll is charged on any portion of the roadway. Facilities operated by toll authority but charging no toll, code "1".

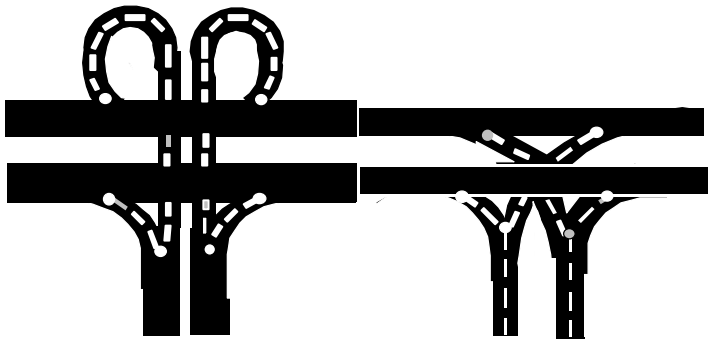
0 = Non-toll 1 = Toll on any portion

*ITEM 30 Section Length

This is the length in miles as measured along the centerline of the roadway.
Record the section length from point of intersection to point of intersection to the nearest 0.001 mile if the data is that accurate, however, the nearest hundredth or tenth will suffice.

On independently aligned, divided highways, centerline length also may be reported as the average of the lengths of the directional roadways, measured along their centerlines. Report the length of the two roadways of a one-way couplet independently; do not average. Length cannot be zero coded.

Freeway Connections Freeway tee intersections - average length of the four connector ramps measured to the gore points.



ITEM 31 Donut Area Sample Panel AADT Volume Group Identifier (software generated)

Volume groups are stratifications or ranges of AADT. It is from these volume groups that statistical sampling is made for the donut area. This item is calculated wherever an AADT is coded. This item must appear for all segments that are within the donut area portion of a non-attainment area. The donut area consists of the rural and small urban areas within an NAAQS Ozone Non Attainment Area. The urban or large urban area would be the "hole".
The FHWA code is a number from 1 to 5, for the five donut volume groups, and is coded "0" for all sections outside of the donut areas. *See Appendix D on page A-6 for a listing of NAAQS Ozone Non Attainment Areas.*

ITEM 32 Standard Sample Panel AADT Volume Group Identifier (software generated)

As in the case of the donut area sample panel in item 31 above, volume groups are stratifications or ranges of AADT. It is from these volume groups that statistical sampling is made for a statistical sampling of arterials and collectors. These are taken from the urban or large urban areas (holes).
The coding is a number from 1 to 13, since there are 13 standard sample volume groups, but this is coded "0" for non-applicable section records such as local (function class 9 and 19).

* ITEM 33 Annual Average Daily Traffic (AADT)

AADT is used extensively for apportionment, administrative, legislative, analytical and national highway database purposes. The Federal Environmental Protection Agency (EPA) also uses it for air quality monitoring.

In accordance with FHWA policy, the State collects AADTs annually on all principle arterials, NHS, standard sample and donut area supplementary sample sections. Additional attempts are often made to collect AADT on all other routes of the federal aid system as well.

The AADT is the total traffic for both directions of travel, unless the street is one-way or part of a couplet. This data item is always numeric.

The AADT should be derived from a 48-hour count performed midweek, i.e., Tuesday, Wednesday, Thursday. It should also be adjusted to represent vehicles (axle corrections for trucks and buses unless the equipment used specifies vehicle classifications). Adjustments should also be made for weekday and seasonal factors so that it represents an AADT as opposed to an ADT.

Typically, seven-day counts are taken during each quarter of a given year in order to derive adjustment factors for season, day of week and vehicle axles. Local government agencies may use an average weekday traffic volume for their purposes, but AADT reported in HPMS should be an average daily value that represents all days of the reporting year.

Shorter duration, such as 24-hour counts, are acceptable if these are the latest available. Lacking a recent count, the AADT may be estimated from a traffic flow diagram, or by other means.

AADT should be count based and growth factors are supposed be applied if the AADT is not derived from current year counts. Annual growth rates are discussed in detail in appendix G.

See the Traffic Monitoring Guide *for more information, or see Appendix F on pages A-9 through A-11 for a detailed discussion of AADT.*

*ITEM 34 Number of Through Lanes

Enter or update the prevailing number of through lanes as the sum of both directions. Do not include auxiliary lanes (collector / distributor lanes, weaving lanes, frontage road lanes, parking and turning lanes, acceleration / deceleration lanes, toll collection lanes and truck climbing lanes). The prevailing number of through lanes would be that which exists for the greatest length of the segment if the number of lanes changes therein. Code this numeric data item for all sections that are listed individually. This does not need to be coded for "grouped" records on the rural and urban local (non-federal aid) functional systems.

ITEM 35 Measured Pavement Roughness (IRI)

This item provides information on pavement surface roughness. It is used in investment modeling to estimate pavement deterioration, section deficiencies and needed improvements; in cost allocation studies; in pavement condition trends and for other analysis purposes including NHS (National Highway System) performance.

The International Roughness Index (IRI) is reported in whole inches per mile (x.0). Unpaved and non-reported sections are coded "0.0".

Values must be directly derived from measured road profiles; other entries are not to be used. FHWA has adopted AASHTO Provisional Standard PP37-99 as the preferred method of providing IRI data for HPMS. The year in which IRI was obtained (CT item) should be provided when updating any IRI data.

There are a few local agencies that measure IRI. Please provide whatever values have been measured and recorded by your agency. The state often contracts for IRI measurements on city and county roads. These values may be furnished on request.

ITEM 36 Present Serviceability Rating (PSR) - Pavement Condition

This item provides information on pavement condition on selected sections. It is used to estimate pavement deterioration, section deficiencies, needed improvements and for national highway data base purposes. Code PSR to the nearest tenth (X.X) wherever Item 35 (IRI) is not reported. Code "0.0" for unpaved facilities or for unavailable data. Pavement Condition Index (PCI) can be converted to PSR values. See *Appendix E on page A-7 for conversion practices and possible tips.* If no other data are available, an estimate may be derived from the following table.

4.0-5.0 New, nearly new, newly resurfaced or reconstructed pavements are within this range. Pavement is very smooth, free of cracks and patches. Pavement constructed or resurfaced during the data year would normally be rated in this category.

3.0-4.0 Pavement has good riding qualities and only slightly visible signs of surface deterioration. Flexible pavement may show slight evidence of rutting and fine random cracks. Rigid pavements may show evidence of slight surface deterioration such as minor cracks and spalling.

2.0-3.0 Pavement has deteriorated. Riding qualities are noticeably inferior to those of new pavements, and may be barely tolerable at high speeds. Flexible pavement surface defects may include rutting, map cracking and extensive patching. Rigid pavement may have a joint failures, faulting and/or cracking, and some pumping.

1.0-2.0 Pavement has deteriorated to such an extent that it affects the speed of free-flow traffic. Flexible pavement may have large potholes and deep cracks. Distress occurs over 50% of the surface and includes raveling, cracking, rutting. Rigid pavement distress includes joint spalling, patching, cracking, scaling, and may include pumping and faulting.

0.1-1.0 Pavement is extremely deteriorated, passable only at reduced speeds with considerable ride discomfort. Large potholes and deep cracks exist. Distress occurs over 75% of the surface. Needs extensive reconstruction.

0.0 Unpaved section or PSR not provided.

PSR may change if Item 53 (Year of Surface Improvement) changes.

ITEM 37 HOV (High Occupancy Vehicle, a.k.a., car pool) Operations

This item is used to identify those roadway sections with HOV operations. Code for all sections. HOV lanes exist primarily on freeways. However, lanes that are restricted to bus traffic, full or part time, will also qualify.

0 Section does not have HOV lanes.
1 Section has exclusive HOV lanes assigned.
2 Section has normal through lanes used as HOV lanes in peak hours.
3 Section has shoulder or parking lanes used as HOV lanes in peak hours.

ITEMS 38 – 46 Surveillance Systems

The next 9 items are to be coded 0 or 1, to indicate whether the type of surveillance system specified is present on the segment. Code a 1 if this type of system is present.

ITEM 38 Surveillance Systems - Electronic Metering

Electronic surveillance collecting real-time traffic data while monitoring traffic flow.
These types of systems are often tied into a traffic operations center, or there is generally some kind of telemetry.

0 = no	1 = yes

ITEM 39 Surveillance Systems - Metered Ramps

Section has metered entrance ramps.

0 = no	1 = yes

ITEM 40 Surveillance Systems - Permanent Variable Message Signs

A permanent variable message sign is present.

0 = no	1 = yes

ITEM 41 Surveillance Systems - HWY Advisory Radio.

Section is covered by highway advisory radio.

0 = no	1 = yes

ITEM 42 Surveillance Systems - Cameras

Section is covered by surveillance cameras.

0 = no	1 = yes

ITEM 43 Surveillance Systems - Incident Detection
Section is covered by incident detection technology algorithms.

0 = no	1 = yes

ITEM 44 Surveillance Systems - Free Cell Phone
Section is covered by free cell phone to dedicated number other than 911.

0 = no	1 = yes

ITEM 45 Surveillance Systems - On-Call Service Patrol or Towing
Section is covered by publicly sponsored on-call service patrol or towing service.

0 = no	1 = yes

ITEM 46 Surveillance Systems - In-vehicle Signing Hardware
Hardware present to provide in-vehicle signing information to equipped vehicles.

0 = no	1 = yes

ITEM 47 Sample Identifier
The sample identifier is a unique 12-character alphanumeric value that is applied to each sample. It is used to track standard and supplementary sample sections over time, and will not change even if the mileage or section number changes. The State may change the Section Identification (Item 5) if necessary; the State Control Field (Item 8) should be used for additional State required identifiers. The following format is used to initially code this item:

XX YYY ZZZZZZZ

WHERE	**XX**	**=**	**Caltrans district**
	YYY	**=**	**FIPS county**
	ZZZ ZZZ(.)Z	**=**	**route and post mile for State routes**
	ZZZZ ZZZ	**=**	**route and section number for local roads.**

ITEM 48 Donut Area Expansion Factor

Donut area expansion factor is the ratio of the total length of all segments in the volume group to the total sampled volume group length. This value is calculated and coded to the donut area sample section by the HPMS software using the volume group information in Item 31 (Donut Area Sample Group Identifier).

If the expansion factor for a volume group **exceeds** 100.000, additional sample sections from the universe volume group must be selected until the expansion factor is reduced to a **maximum** of 100.000. *See Appendix D on page A-6 for a list of NAAQS nonattainment areas.*

$$\textbf{DONUT EXPANSION FACTOR} = \frac{\textbf{Total length in the volume group within the donut area}}{\textbf{Sampled length in the volume group within the donut area}}$$

ITEM 49 Standard Sample Expansion Factor

Standard sample factor is the ratio of the total length in a volume group to the total sampled volume group length. This value is calculated and coded to the standard sample section by the HPMS software using the volume group information in Item 32 (Standard Sample Group Identifier).

$$\textbf{STANDARD SAMPLE EXPANSION FACTOR} = \frac{\textbf{Total length in the volume group}}{\textbf{Sampled length in the volume group}}$$

If the expansion factor for a volume group **exceeds** 100.000, additional sample sections from the universe volume group must be selected until the expansion factor is reduced to a **maximum** of 100.000.

ITEM 50 Surface / Pavement Type

Enter the code that best represents the type of surface on the section. If more than one type exists throughout the section, enter that which is the case for the greater length.

The valid codes, 1 through 6, are defined as follows:

1	**UNPAVED** - Natural surface road - few or no improvements. Either gravel or native material qualifies. This may or may not be passable by standard passenger cars. **— UNIMPROVED**
2	**LOW TYPE BITUMINOUS SURFACE TREATED** - With or without a sealcoat, total compacted thickness is less than 25 millimeters (1 inch) of surfacing. **— LOW TYPE FLEXIBLE.**
3	**INTERMEDIATE TYPE MIXED BITUMINOUS** - or bituminous penetration surface [Surface course greater than 25 mm (1 inch) and less than 178 mm (7 inches) in compacted thickness] Mixture composed of gravel, stone, sand or similar material, and mixed with bituminous material under partial control as to grading and proportions or bound with bituminous penetration material **— INTERMEDIATE TYPE FLEXIBLE.**
4	**HIGH TYPE MIXED BITUMINOUS OR BITUMINOUS PENETRATION SURFACE** - On a flexible base with 178 mm (7 inches) or more in combined surface and base. Includes any bituminous concrete, sheet asphalt or rock asphalt having a high load-bearing capacity. Includes any brick, stone, wood or steel block pavement with or without a wearing surface of less than 25 millimeters (1 inch). **— HIGH TYPE FLEXIBLE**.
5	**HIGH TYPE PORTLAND CEMENT CONCRETE (PCC) PAVEMENT** - with or without joints or reinforcement (such as mesh or similar). Includes continuously reinforced PCC pavement, PCC pavement over PCC pavement (either bonded, unbonded, or partially bonded) and PCC pavement over a bituminous pavement (either mixed or penetration). **— HIGH TYPE RIGID.**
6	**HIGH TYPE MIXED BITUMINOUS OR BITUMINOUS PENETRATION SURFACE ON A RIGID PAVEMENT** - With a combined surface and base thickness of 178 millimeters (7 inches) or more. Includes any bituminous concrete, sheet asphalt or rock asphalt overlay of rigid pavement that is greater than 25 millimeters (1 inch) of compacted bituminous material; otherwise use code “5” **— HIGH TYPE COMPOSITE.**

ITEM 51 Structural Number (SN) or Slab Thickness (D)

This item provides specific information about the pavement section in terms of SN for flexible pavement or D (thickness, *depth*) for rigid pavement on roadway sections. It is used to estimate pavement deterioration and loading history and in the cost allocation pavement model. Enter the SN value to the nearest tenth (xx.x) or D to the nearest whole inch (xx.0) for all paved sections. Use a typical value if the actual value is not known.

Some typical SN values:

		FUNCTIONAL CLASS								
PAVEMENT TYPE	***SURF TYPE***	**1**	**2**	**6**	**7**	**11**	**12**	**14**	**16**	**17**
LOW	**2**	4.7	3.4	2.8	2.5	5.2	3.2	2.9	2.6	2.4
INTERMEDIATE		4.7	3.4	3.1	2.9	5.2	4.6	4.0	3.4	3.0
HIGH TYPE FLEXIBLE	**4**	5.2	3.9	3.3	3.3	5.2	4.6	4.0	3.4	3.1
HIGH TYPE RIGID	**5**	10	9	9	8	10	9	9	8	8
HIGH TYPE COMPOSITE	**6**	5.9	5.1	5.2	4.6	5.7	5.4	5.0	4.8	4.3

"D" values for PCC

ITEM 52 General Climate Zone

This item is assigned a value by county, but may be changed as necessary.

01	Wet	Freeze	Long winters with temperatures below freezing for extended periods.
02	Wet	Freeze/ Thaw	Winters with more temperature fluctuation around the freezing point.
03	Wet	No Freeze	Relatively mild winters.
04	Intermediate	Freeze	Long winters with temperatures below freezing for extended periods.
05	Intermediate	Freeze/ Thaw	Winters with more temperature fluctuation around the freezing point.
06	Intermediate	No Freeze	Relatively mild winters.
07	Dry	Freeze	Long winters with temperatures below freezing for extended periods.
08	Dry	Freeze/ Thaw	Winters with more fluctuation of the temperatures about the freezing point.
09	Dry	No Freeze	Relatively mild winters.

ITEM 53 Year of Surface Improvement

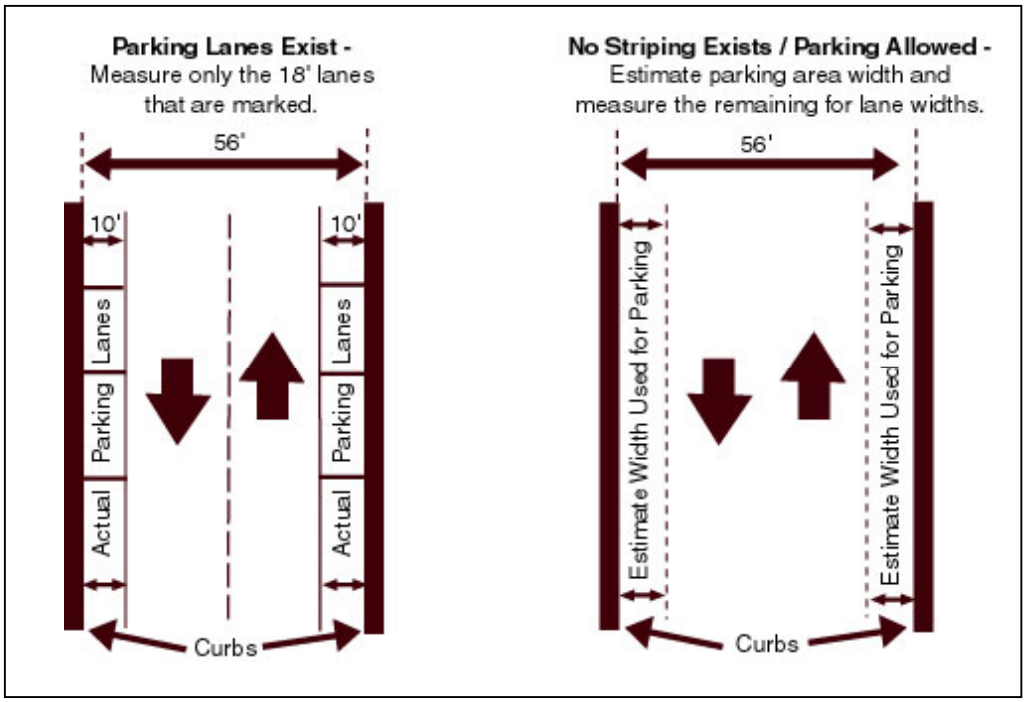
Enter the 4-digit year when the last surface improvement was completed on the segment. A Surface Improvement is one that included a minimum of 25 millimeters (one inch) of compacted pavement material.

Only improvements made since 1987 need to be reported. Code “0” if the section has not been improved since 1987. Retain any coded improvement year in this data item until another improvement has been the made.

ITEM 54 Lane Width

Enter the predominant through traffic lane width to the nearest whole foot (x.0), typically 12’. Code according to striping. Traffic use or design guidelines should be used if no striping is present. Where there is no delineation between the through traffic lane and the shoulder or parking lane, or where there is no centerline, estimate a reasonable split between the actual width used by traffic and the shoulder or parking.

Some examples:



ITEM 55 Access Control

This item is a measure of the degree of access control.

Code as follows:

1	**Full Access Control (freeway)-** Preference given to through traffic movements using selected location interchanges. No at-grade crossings or direct driveway connections.
2	**Partial Access Control (expressway)-** Preference given to through traffic movement. Some interchanges or at-grade crossings may be present. Frontage roads or other access restrictions can be used to minimize the number of direct private driveway connections. Control of curb cuts is not considered access control.
3	**No Access Control (conventional)-** Includes all sections not mentioned above.

Most facilities that are not on the state highway system will be coded with a 3 but a few sections will qualify for a 2. Fewer still, if any, would be coded a 1 outside of the state highways.

ITEM 56 Median Type

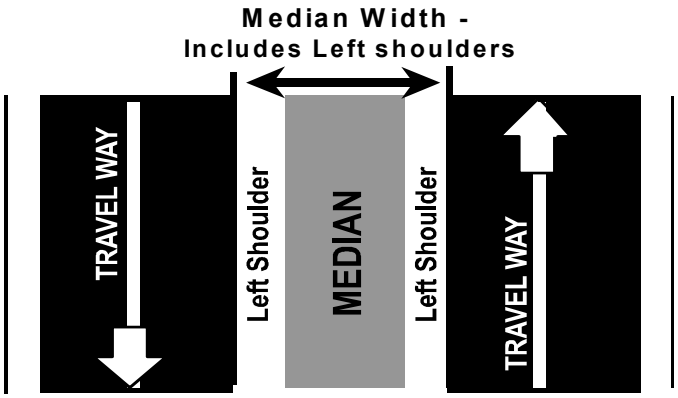
Code the type of median according to the following:

1	**Curbed**
2	**Positive Barrier** Usually guardrail, cable, or concrete barrier. Impenetrable shrubbery can also be considered to be a barrier.
3	**Unprotected** This may be marked. Continuous crosshatching at least 1.2 meters (4 feet) wide may be considered a median as long as the area may not be used as a turning lane.]
4	**None**

Turning lanes/bays are NOT considered medians unless cut into a median extending through the major portion of the segment. Continuous turning lanes are not considered medians.

ITEM 57 Median Width

Code the predominant median width to the nearest foot (x.0). Enter “0” where Item 56 is coded “4”. Enter “999” for a median width greater than 100 feet. The median width should be measured between the inside edges of the opposing through lanes (including the median shoulders, if any). Continuous turn lanes are not considered medians. Ignore turning bays cut into the median.



ITEM 58 Shoulder Type

Enter the code for the predominant shoulder type existing throughout the segment.

Valid codes are:

1	None - no shoulders or curbs exist.
2	Surfaced shoulder exists (includes bituminous or Portland cement surface).
3	Stabilized shoulder exists (includes stabilized gravel or other granular material with or without admixture).
4	Combination shoulder exists (part of the shoulder width is surfaced, a part is stabilized, and/or a part is earth, etc.).
5	Earth shoulder exists.
6	Barrier curb exists; no shoulder exists in front of curb.

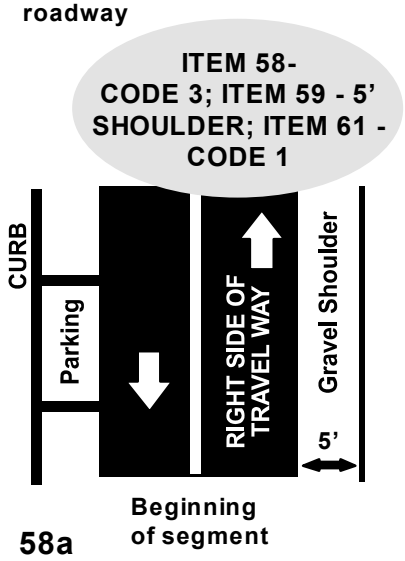
Some FHWA rules for coding this item:

⇒ Left and right shoulders vary, right shoulder is the predominant type (example 58a).
⇒ If a curb and shoulder exist, code the appropriate surface type of the shoulder, ignoring the curb (example 58f on next page).
⇒ If there is a parking or bike lane abutting the through lane, no shoulder can exist [except combination bike/shoulder lanes, which are considered shoulders. Width of whole lane must be coded in Item 59 (Right Shoulder Width)] (example 58b).
⇒ If there is parking on one side of a divided roadway and a shoulder or curb on the other, code shoulder type and width from right side and parking in Item 61 (ex. 58a)
⇒ A shoulder cannot exist between a traffic lane and a parking lane (example 58b).
⇒ If a bike lane or parking is completely separated from the roadway, it should be ignored (example 58c).

See the examples on the next page.

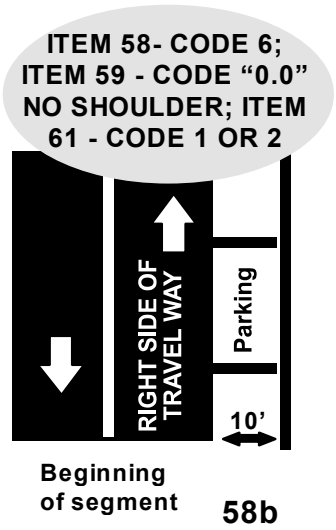
EXAMPLES:

Conflicting Shoulder Codes - code only right side of the roadway



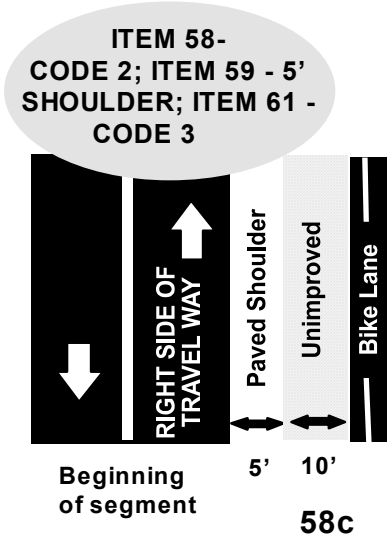
58a

Parking or Bike Lane - no shoulder unless combined shoulder/ bike lane



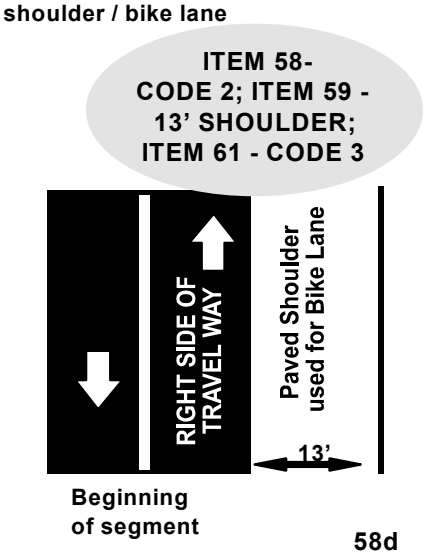
58b

Bike Lane Outside Roadway - ignore bike lane



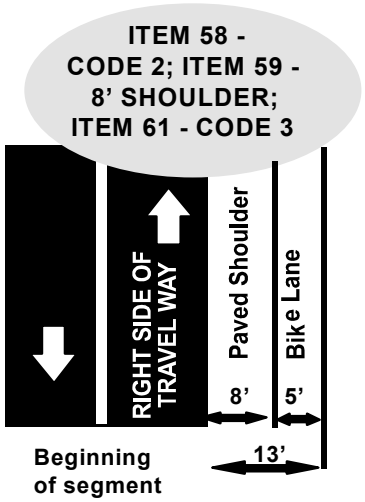
58c

Bike Lane - No shoulder unless combined shoulder / bike lane



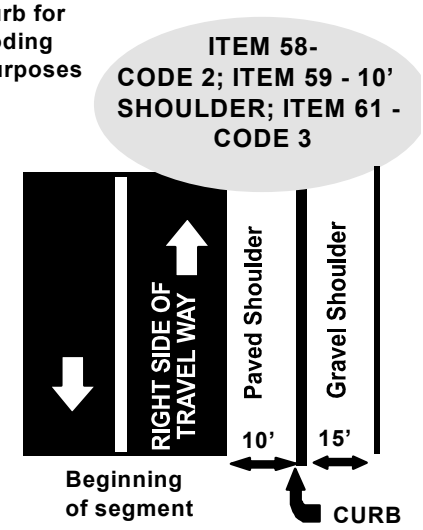
58d

Shared Shoulder & Bike Lane - Code width of shoulder only; ignore bike lane



58e

Curb & Shoulder Exist - Code shoulder in front of curb; ignore curb for coding purposes



58f

ITEM 59 Right (outside) Shoulder Width - Enter the predominant width to the nearest whole foot (x.0). Code "0" if no right shoulder exists. Width of the shoulder does not include parking or bike lanes (see examples in Item 58).

ITEM 60 Left (median) Shoulder Width - predominant width. A left shoulder width occurs only where a divided highway and median exist. Do not include width for a left shoulder if it is part of a continuous left turn lane.

ITEM 61 Peak Parking

This item is reported only on URBAN sections. Enter the code that best reflects the type of peak parking that exists. Code to reflect permitted use; even if the section is not formally signed or striped for parking. If parking is beyond the shoulder or the pavement edge, use code '3' for no parking. If parking lanes are legally used for through traffic or turning lanes during the peak-hour, code the appropriate in-use condition.

0	Not reported (rural section)	2	Parking is permitted, both sides
1	Parking is permitted, one side only	3	No parking allowed or none available

Check to see that Item 61 correlates with Item 58

ITEM 62 Widening Feasibility

This item represents the lanes that COULD be added in each direction. Physical features, topography and buildings, not the current right-of-way width or local politics, are considered. Medians and other areas within the right of way are considered; restriping for narrow lanes is not considered.

1	No widening is feasible.
2	Partial lane in each direction is feasible.
3	One lane only in each direction.
4	Two lanes only in each direction.
5	More than two lanes may be added, each direction.

ITEMS 63 – 68 Curves by Class (Horizontal Alignment)

Enter length in miles (kilometers) of the SUM of all curves in each class. Each curve and tangent segment is counted as a separate curve. Sum of ALL curve lengths must equal section length (Item 30).

ITEM NO.	CURVE CLASS	DEGREE OF CURVATURE (English)	CURVE RADIUS RANGE (Feet)	RADIUS LENGTH (Metric)	APPROXIMATE DESIGN SPEED (MPH)
63	A	0 - 3.4	1,661 to Tangent	506 +	70
64	B	3.5 - 5.4	1,051 to 1,660	321 - 505	60
65	C	5.5 - 8.4	681 to 1,050	206 - 320	50
66	D	8.5 - 13.9	411 to 680	126 - 205	40
67	E	14.0 - 27.9	206 to 410	61 - 125	30
68	F	28.0 +	0 to 205	< 61	< 20

ITEM 69 Horizontal Alignment Adequacy

This item is required for all paved RURAL sections unless Curves by Class (Items 63-68) are reported for the section.

0	Not reported (urban section).
1	All curves meet appropriate design standards.
2	All curves can be safely and comfortably negotiated at the prevailing speed limit.
3	Infrequent curves exist with design speeds less than the prevailing speed limit.
4	Several curves exist that are uncomfortable and/or unsafe when traveling at the prevailing speed limit.

ITEM 70 Type of Terrain

This item applies only to **RURAL** functional systems. Code the predominant terrain type. Terrain classification pertains to the general character of a specific route corridor (generally level or rolling routes traversing steep terrain should be classified as level or rolling).

0	Not reported (Urban or non-sample section).
1	Flat terrain (sight distances long).
2	Rolling terrain (natural slopes rise above and fall below the highway grade).
3	Mountainous terrain (slopes are abrupt).

ITEM 71 Vertical Alignment Adequacy

This item is required for all paved rural sections unless Grades by Class (Items 72-77) are reported for the section.

0	Not reported (Urban or non-sample section).
1	All grades and vertical curves meet minimum design standards appropriate for the terrain.
2	All grades and vertical curves provide sight distance for safe travel and do not substantially affect the speed of trucks.
3	Infrequent grades and vertical curves exist that impair sight distance and/or affect truck speeds and no truck lanes exist.
4	Frequent grades and vertical curves exist that impair sight distance and/or severely affect the speed of trucks.

ITEMS 72 - 77 Grades by Class (Vertical Alignment)

List the total length in miles of all curves within each class to 3 decimals (XX.XXX). Code "0.000" when grade data are not reported; then, Item 71 (Vertical Alignment Adequacy) must be coded. The sum of the grade lengths in all the classes must equal the section length.

ITEM NO.	GRADE CLASS	GRADIENT (PERCENT)
72	A	0 - 0.4
73	B	0.5 - 2.4
74	C	2.5 - 4.4
75	D	4.5 - 6.4
76	E	6.5 - 8.4
77	F	8.5 +

If the segment length (Item 30) changes, Grades by Class and possibly Item 71 (Vertical Alignment Adequacy) may change.

ITEM 78 Percent Passing Sight Distance

This item provides information on the percent of the sample section meeting the sight distance requirement for passing [distance > 1500 feet (460 m)]. Code this numeric item for all rural, paved two-lane sections. Enter the percent of the length, which is striped for passing, estimated to the nearest 10%. Subtract section lengths striped for no passing if they are striped for insufficient sight distance and not simply for intersections or other reasons. Non-applicable as well as very curved and/or hilly sections are coded “0”.

ITEM 79 Weighted Design Speed

This item provides a design speed weighted by the length of individual horizontal curves and tangents in a sample section. This field is calculated to the nearest 5 MPH when curve data are available. Otherwise, a default value is used based upon functional system and facility type as shown in the following table:

	Functional System								
Facility Type	**1**	**2**	**6**	**7**	**11**	**12**	**14**	**16**	**17**
Multilane Divided	**70**	**70**	**70**	**65**	**70**	**70**	**70**	**60**	**55**
Multilane Undivided	**70**	**70**	**70**	**60**	**70**	**70**	**70**	**55**	**45**
2 or 3 Lane	**70**	**70**	**65**	**60**	**70**	**65**	**65**	**55**	**45**

ITEM 80 Speed Limit

Enter the daytime speed limit for autos posted or legally mandated (i.e., prima facie) on the greater part of the section. If there are no legally mandated limits, code “999”. Use the speed limit on the greater part of the section where more than one exists. Do not average.

Items 81 - 84 Percent Trucks in Peak and Average Traffic Flow

Items 81 - 84 provide information on truck use. Ideally, these items would be updated whenever Item 33 (AADT) is updated. Code peak % the same as average or estimated peak, if no better data are available. Some routes, such as urban commuter or recreational routes may exhibit noteworthy differences in truck percentages between peak and average. These differences could have a significant impact on route capacity.

ITEM 81 % Single Unit Trucks in Peak Period

Code single unit truck traffic (see illustration below) in the peak traffic period as a percentage of total peak period traffic flow to the nearest whole percent.

ITEM 82 % Single Unit Trucks in Average Daily Traffic Flow

Code the single unit truck traffic (see illustration below) in the average daily traffic flow to the nearest whole percent. This value should be representative of all single unit truck activity over all days of the week and seasons of the year as a percent of total annual traffic. Single unit trucks include vehicle classes 4 through 7 (buses through four-or-more axle single-unit trucks).

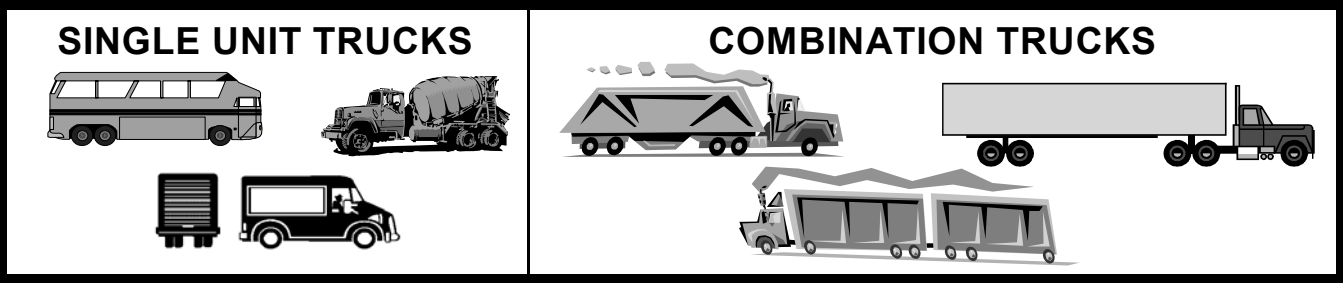
ITEM 83 % Combination Trucks in Peak Period

Code combination unit truck traffic (see illustration below) in peak traffic period as a percentage of total peak period traffic flow to the nearest whole percent.

ITEM 84 % Combination Trucks in Average Daily Traffic Flow

Code the combination unit truck traffic (see illustration below) in the average daily traffic flow to the nearest whole percent. This value should be representative of all combination truck activity over all days of the week and seasons of the year as a percent of total annual traffic. Combination trucks include vehicle classes 8 through 13 (four-or-more axle single-trailer trucks to seven-or-more axle, multi-trailer trucks).

Below are some examples of single unit and combination trucks. These are not the only types of trucks in these categories. Basically, single unit trucks have at least six wheels with no trailers and combination trucks have any variety of trailer combinations.



ITEM 85 K-Factor

Design Hour Volume as a percentage of the annual average daily traffic (AADT).
It is roughly the normal peak hour volume for both directions of travel divided by the AADT.

Code the K-Factor to the nearest whole percent; normal ranges are from 6 to 18 percent.

Heavily congested freeways tend to have lower K factors, and they usually range from 6% to 8%. Rural routes that are used principally as commute corridors will usually have higher K factors, sometimes over 18% especially if they have low (<1000) AADT. Most non-freeway routes will usually range from 9% to 15%.

If the section has an ATR on it, the K factor would be the 30th highest volume hour of the year for both directions of travel divided by the AADT. For most routes, which have no continuous count station, traffic counts summarize hourly information from which peak hour volume (24 hour peak) can be derived. Lacking any other data the K factor, as well as the D factor (item 86) and the truck percentages (Items 81,82,83,84) could be estimated using data from a nearby section with similar physical and traffic characteristics.

Ideally, this item would be updated whenever Item 33 (AADT) is updated.

ITEM 86 Directional Factor (D Factor)

Enter the percent of the peak hour volume flowing in the peak direction to the nearest 5%. This is normally 50 - 75% (100% for one-way facilities). It can not be less than 50% since it is defined by the peak direction.

If the K-Factor (Item 85) is obtained from a short count duration during a normal peak hour, the directional factor may be calculated from that data if it is collected by direction.

ITEM 87 Number of Lanes in Peak Hour Direction

Code the number of through lanes used in the peak period in the peak direction (include reversible lanes, shoulders or parking lanes - legally used for through traffic, either for HOV or SOV). For rural 2- or 3- lane facilities, code the number of through lanes in both directions in peak period.

ITEMS 88 & 89:

Left / Right Turning Lanes / Bays

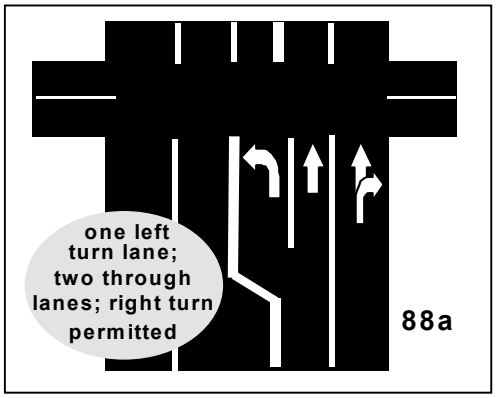
Code that which best describes the peak-period turning lane operation on the section. Code for a typical intersection unless peak capacity is governed by a particular intersection, then code for that intersection. Code turning lanes and the percent green time for the same intersection. Some general guidelines follow:

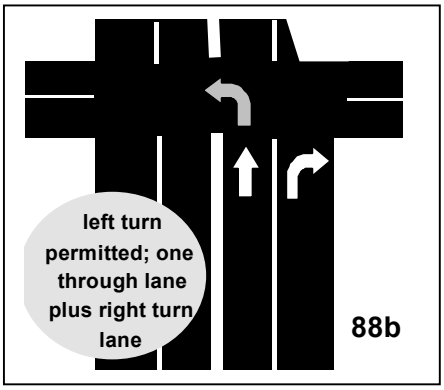
- If a continuous turn lane has painted turn bays, it is considered a turn lane (see 88a).
- If a through lane becomes an exclusive turning lane at an intersection, it is considered a turning lane (see 88b).
- If both through and turning movements can be made legally from a lane, it is not a turning lane (see 88c).
- If the turning bay is too short to handle turning traffic and the traffic routinely blocks the through lane, code as no turning lane (see 88c).
- If a turning lane/bay is located at the entrance of a shopping center, industrial park or other large traffic generating enterprise, code as a turn lane.

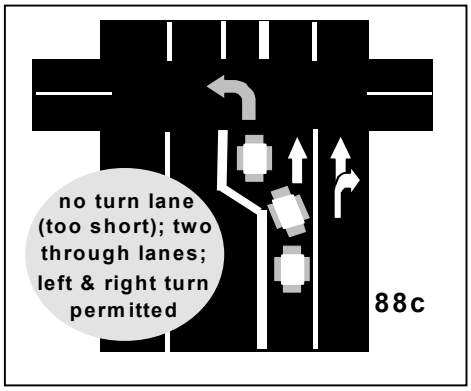
ITEM 88 Left Turning Lanes

0	Rural area or **no intersections** exist.
1	Multiple left turning lanes exist. Continuous left turning lane that becomes multiple left turning lanes prior to the intersection.
2	Continuous left turning lane exists between intersections. Through movements are prohibited in these lanes. (Continuous left turning lanes are NOT considered a median.)
3	Single left turning lane exists.
4	Left turns are permitted, but no left turning lanes exist.
5	No left turns permitted during peak period.

ITEM 89 Right Turning Lanes







ITEM 90 Prevailing Type of Signalization

Code the predominant type of signalization in the direction of travel. If signals are reported (Item 92) this item must contain a value from 1 to 3. If no signals are reported, this item is to be coded 4. Valid codes are as follows:

0	Not reported
1	Uncoordinated fixed time
2	Traffic actuated
3	Progressive
4	No signal system

ITEMS 90, 91 & 92 ARE RELATED: If Item 90 (Type of Signalization) is coded "1", "2" or "3", Item 91 must be > 0. In addition, if Item 92 (Number of signalized intersections) is > 0, Item 91 must also be > 0.

ITEM 91 Typical Peak Percent Green Time

Enter the percent of peak hour that a signal on a typical intersection on the segment remains green in the inventory direction. If an intersection is critical to capacity on the entire section, enter percent for that signal. Generally, the same intersection used to code Items 88 and 89 should be used. Code "0" for no signals on the section. Local traffic engineers are the best source for this data; however, an approximation may be obtained by calculating the ratio of AADTs for both streets at a typical or critical intersection.

ITEMS 92 TO 94 - Number of At-grade Intersections with Public Roads
These items provide the number of at-grade intersections and traffic controls on the section. Include at-grade intersections at entrances to shopping centers, industrial parks and other large traffic generators. If the segment begins and ends with an intersection, California has adopted the rule to always count the end intersection, never both. Count all other intersections with public roads within the segment. When there are non-aligned intersections along the segment, count the intersections at the right of the inventory direction only. Code the number of intersections along the inventory route using the following table:

ITEM 92	**Signals** - Number of intersections controlled by signals. Signal cycles through red, yellow and green at least part of the day. If none, enter "0".
ITEM 93	**Stop Signs** - Number of intersections controlled by stop signs. A continuously flashing red signal should be coded as a stop sign. If none, enter "0".
ITEM 94	**Other or No Controls -** Number of intersections where there is no control on the intersection, or control is managed by signing or other types of controls. A flashing yellow light should be coded in this category.

ITEM 95 Peak Capacity

Peak hour capacity is calculated from the various other data items. This calculation may be overridden if necessary to get a more accurate figure. Urban capacity represents the hourly capacity for one direction reflecting the peak-period situation for Level of Service "E". Rural freeways and multi-lane facilities represent the same (one direction), while rural facilities with 2 or 3 lanes and two-way operation is for both directions.

ITEM 96 Volume / Service Flow Ratio (V/SF) or volume/capacity ratio

This item reflects peak hour congestion for a sample section. The value is generated by the following rough formulas:

$$\text{V/SF (Rural 2 or 3 lanes)} = \frac{[\text{AADT (Item 33)}] \times [\text{K-Factor (Item 85)}]}{\text{Peak Capacity (Item 95)}}$$

$$\text{V/SF Rural multi-lane and all urban} = \frac{[\text{AADT (Item 33)}] \times [\text{K-Factor (Item 85)}]\ [\text{D- Factor (Item 86)}]}{\text{Peak Capacity (Item 95)}}$$

*ITEM 97 Future AADT (Annual Average Daily Traffic)

This is the forecast AADT (total for both directions). Code the forecasted two-way AADT for the year coded in Item 98, Year of Future AADT. A 20-year forecast is optimal but the estimate may be for any period within an 18 to 25 year time span. Data should be consistent with regional or local traffic models. Link to link comparisons may or may not be possible depending on the consistency in the local and State networks.

*ITEM 98 Year of Future AADT

Enter the four-digit year for which Future AADT (Item 97) has been forecasted. This item is used to normalize the forecast AADT to a consistent 20-year horizon. Ideally, this would be the data year, Item 1, plus 20. It should between 18 and 25 years greater than the data year (Item 1):

$$(\text{Item } 1) + 18 \leq \text{Item } 98 \leq (\text{Item } 1) + 25$$

This item should be updated if it falls below (Item 1) + 18.

Supplemental Items:

The next 13 items are not reported to FHWA but are used by the State. These items are from the "Caltrans HPMS table", which is linked to the HPMS table by the common index, that being items 1 – 5. These are the supplemental items:

No.	Supplemental Items
CT01	County (CO)
CT02	Jurisdiction (Juris)
CT03	Street Name
CT04	From Location
CT05	To Location
CT06	County Road System Map Number (MapNo)
CT07	Map Co-ordinates (MapCoOrdinates)
CT08	Metropolitan Planning Organization Code (MPO)
CT09	Small Urban Code (Small_Urban)
CT10	Year of Field Review (Year_Fld_Rev)
CT11	Year of IRI Update (Year_IRI_Update)
CT12	Year of Traffic Count (Year_AADT_Reported)
CT13	Remarks

Items CT01, CT02, CT03, CT04 and CT05 are concatenated to make up item 8.

Supplemental Items

These first five items are also found (concatenated) in item 8, State Control Field.

ITEM CT01 **County (CO)** - The alpha county code

This field should not change unless there is an error.

ITEM CT02 **Jurisdiction (Juris)** - The alpha jurisdiction code

This field may change due to annexations, relinquishments and the like. Indicate any changes for segments that are not part of your jurisdiction.

*__ITEM CT03__ **Street Name** - The street name.

Update as necessary as long as it's in the same physical location. (Example: 1st Street is now known as Martin Luther King Blvd.)

*__ITEM CT04__ **From Location** - The beginning of the record, usually the southern or western limit.

Update, if necessary, but do not change this limit to lengthen the segment unless the adjacent segment is of the same functional classification and on the same side of the rural/urban boundary. The functional classifications and rural/urban boundaries are shown on the most current FHWA approved CRS (California Road System) maps.

*__ITEM CT05__ **To Location** - The end of the record, usually the northern or eastern limit.

Update, if necessary, but do not change this limit to lengthen the segment unless the adjacent segment is of the same functional classification and on the same side of the rural/urban boundary. The functional classifications and rural/urban boundaries are shown on the most current FHWA approved CRS maps.

ITEM CT06 County Road System Map Number (MapNo)

This appears in the lower right hand corner of the CRS map. Having this item coded provides for faster reference and enhances the ability to query a specific area. Be sure to check if this is coded with 2 to 5 digits of both alpha and numeric characters. In some instances, this item could still have the number coded for an earlier, obsolete CRS map. This will be recognizable if the entry only contains numeric characters.

In some cases, a segment may run through two or more maps. The Caltrans convention is to record the map number where the beginning landmark of the segment appears.

ITEM CT07 Map Co-ordinates (MapCoOrdinates)

These are the coordinates used to locate the section on the County Road System (CRS) map. This item is optional.

On every CRS map, the letters A-K appear along the horizontal axis on both the top and bottom, and the numbers 1-10 appear along the vertical axis on both the left and right sides of the map. Locate the section and determine the coordinates wherever it is helpful to have them. Generally, Caltrans will use the beginning landmark as the point on the segment from which to derive the coordinates but agencies submitting data may use another convention if desired. For example, the reporting agency could use the middle of the segment or perhaps, the point at which the street name label appears.

This entry must always consist of an alpha character immediately followed by one or two numeric characters. The alpha character can be A through K and the number can be 1 to 10. Do not include a hyphen or a space, and do not use any special characters.

ITEM CT08 Metropolitan Planning Organization Code (MPO)

Enter a single digit alpha code to denote the MPO region where the segment is located. These are as follows:

A Association of Monterey Bay Area Governments (AMBAG)

B Butte County Association of Governments (BCAG)

C Sacramento Area Council Of Governments (SACOG)

D San Diego Association of Governments (SANDAG)

E Merced County Association of Governments (MCAG)

F Council of Fresno County Governments (COFCG)

H Shasta County Regional Transportation Planning Agency (SCRTPA)

I Kings County Association of Governments (KCAG)

J San Joaquin County Council of Governments (SJCOG)

K Kern County Council of Governments (KERNCOG)

L San Luis Obispo Area Coordinating Council (SLOCOG)

M Metropolitan Transportation Commission (MTC)

N Stanislaus County Association of Governments (STANCOG)

R Santa Barbara County-Cities Area Planning Council (SBCAG)

S Southern California Association of Governments (SCAG)

T Tulare County Association of Governments (TCAG)

U Tahoe Metropolitan Planning Organization (TMPO)

W Madera County Transportation Commission (MCTC)

Only the 18 single-digit alpha codes listed above are valid for this entry.
For links to the home page of these MPOs, go to: **http://www.dot.ca.gov/hq/tsip/hpms/links.html**

ITEM CT09 Small Urban Code (Small_Urban)

Small Urban areas are defined by the census bureau as centers of population having more than 5000 people living within their urban boundary but less than 50,000; and with a density of at least 1000 persons per square mile. Each of these small urban areas has a 3 to 5 digit numeric designation. See Appendix D on page A-6 for a list of the small urban codes.

ITEM CT10 Year of Field Review (Year_Fld_Rev)

If coded, this is a 4 digit numeric entry. It is the year in which the HPMS staff most recently performed a field review to check and record the physical characteristics of the roadway.

ITEM CT11 Year of IRI Update (Year_IRI_Update)

If coded, this is a 4 digit numeric entry. This is the year when the most recent measurement of the IRI (International Roughness Index, item 35) was performed on the segment. Update this if a more recent measurement of IRI has been made.

Few local agencies have been known to measure and report IRI values. In order to meet federal reporting requirements, the State hires consultants to measure the IRI on most federal aid routes.

***ITEM CT12 Year of Traffic Count (Year_AADT_Reported)**

If coded, this is a 4 digit numeric entry. This is the year when the most recent traffic count was performed on the segment. Update this whenever there has been a more recent count. If unknown, or if there is no record of a traffic count, leave it unchanged.

The State sometimes hires contractors to perform traffic counts on the federal aid routes. Consequently, this may have a later entry than what the agency had last reported.

***ITEM CT13 Remarks**

This field may contain as many as 255 alphanumeric characters and spaces. Special characters are also acceptable except for commas and semicolons. Please be sure not to input any commas or semicolons.

Use this field to explain anomalies, unusual conditions, or just to make notes or provide any additional relevant information.

Highway Performance Monitoring System

Appendices

These 9 appendices that follow are used to assist in coding various items. Listed here are the names and to which item or items the information in the appendix pertains.

Appendix	Description	Associated HPMS Item(s)
A	Segmentation new	8, 30, 33,CT03, CT04, CT05
B	County FIPS Codes and Abbreviations	4, 8, CT01
C	Urbanized and Large Urbanized Area Codes	15
D	Small Urban Area Codes	CT09
E	NAAQS Ozone Non-attainment Areas	16
F	Conversion of PCI to PSR	36
G	AADT Estimation – Guidelines for HPMS Data Collection	33
H	Annual Growth Factors new	33
I	Common Abbreviations	8, CT03, CT04, CT05

Appendix A

Segmentation

There are two important rules concerning where the end points of an HPMS segment may be.

One of these rules is that a segment must have an endpoint wherever it intersects a jurisdictional boundary. The “FROM” or “TO” limit must be at a city limit or county boundary and the segment may not extend beyond into the neighboring jurisdiction, even if it is maintained by the same agency under a maintenance agreement. This makes it possible to summarize mileage by jurisdiction.

The other important rule is that a segment must have an endpoint wherever it intersects an urban boundary. These urban boundaries, or rural/urban limit lines, are shown on the California Road System (CRS) maps. Each agency should have a set of CRS maps. The district office of Local Programs can supply a set if needed. A segment must not extend beyond a rural/urban limit line. This makes it possible to segregate rural and urban mileage.

Other than for the two rules explained above, an agency may define their HPMS segments as they choose. The suggested guideline, however, is that the agency follow a traffic management plan for deciding where to begin or end a segment, or for how long a segment should be. The traffic management plan deals with where upon the agency determines the AADT for a given section. The decision about whether or not to “break” a segment at a given point should be made according to the traffic volumes on the resultant segments. If the AADT differs significantly on either side of the proposed new limit then the section should be divided there. As a general guideline, a significant difference could be considered to be more than 10%, but it is at the agency’s discretion to split a segment due to a difference in traffic volumes. The agency also has the latitude to combine adjacent segments wherever the difference in AADT does not differ significantly.

Traffic volumes should be a principal consideration in determining the segmentation. Other parameters may be considered as well, including number of lanes and functional classification. Generally, however, a difference in the number of lanes will produce a corresponding difference in traffic volumes. AADT and number of lanes are often part of the criteria for assigning or changing functional classification.

Sometimes when adjusting FROM and TO limits to redefine the HPMS segments it becomes necessary to change a roadway functional classification, or some portion thereof. In these instances, the agency must complete the form and follow the procedures for changing roadway functional classifications. The process is explained at this web link:
http://www.dot.ca.gov/hq/tsip/HSEB/functional_classification.html

To summarize, segments must not cross jurisdictional boundaries or urban boundaries, and they should be set according to traffic volumes.

Appendix B

COUNTY FIPS CODES AND ABBREVIATIONS

COUNTY	ABBREV	FIPS	COUNTY	ABBREV	FIPS
Alameda	ALA	001	Orange	ORA	059
Alpine	ALP	003	Placer	PLA	061
Amador	AMA	005	Plumas	PLU	063
Butte	BUT	007	Riverside	RIV	065
Calaveras	CAL	009	Sacramento	SAC	067
Colusa	COL	011	San Benito	SBT	069
Contra Costa	CC	013	San Bernardino	SBD	071
Del Norte	DN	015	San Diego	SD	073
El Dorado	ED	017	San Francisco	SF	075
Fresno	FRE	019	San Joaquin	SJ	077
Glenn	GLE	021	San Luis Obispo	SLO	079
Humboldt	HUM	023	San Mateo	SM	081
Imperial	IMP	025	Santa Barbara	SB	083
Inyo	INY	027	Santa Clara	SCL	085
Kern	KER	029	Santa Cruz	SCR	087
Kings	KIN	031	Shasta	SHA	089
Lake	LAK	033	Sierra	SIE	091
Lassen	LAS	035	Siskiyou	SIS	093
Los Angeles	LA	037	Solano	SOL	095
Madera	MAD	039	Sonoma	SON	097
Marin	MRN	041	Stanislaus	STA	099
Mariposa	MPA	043	Sutter	SUT	101
Mendocino	MEN	045	Tehama	TEH	103
Merced	MER	047	Trinity	TRI	105
Modoc	MOD	049	Tulare	TUL	107
Mono	MNO	051	Tuolumne	TUO	109
Monterey	MON	053	Ventura	VEN	111
Napa	NAP	055	Yolo	YOL	113
Nevada	NEV	057	Yuba	YUB	115

Appendix C

URBANIZED (U) AND LARGE URBANIZED (L) AREA CODES			
URBAN AREA (RSU=U) (POP>50,000 & <200,000)	**LARGE URBAN AREA (RSU=L) (POP>200,000)**	**CODE**	**COUNTY**
	Antioch	257	CC
Atascadero-El Paso de Robles		423	SLO
	Bakersfield	117	KER
Camarillo		428	VEN
Chico		298	BUT
	Concord	433	CC, ALA
Davis		381	YOL
El Centro		438	IMP
Fairfield		299	SOL
	Fresno	080	FRE
Gilroy-Morgan Hill		445	SCL
Hanford		510	KIN
Hemet		300	RIV
	Indio-Cathedral City-Palm Springs	396	RIV
	Lancaster-Palmdale	301	LA
Livermore		464	ALA
Lodi		400	SAC, SJ
Lompoc		402	SB
	Los Angeles-Long Beach-Santa Ana	002	LA, ORA, SBD
Madera		466	MAD
Manteca		468	SJ
Merced		380	MER
	Mission Viejo	473	ORA
	Modesto	234	SJ, STA
Napa		302	NAP
	Oxnard	224	VEN
Petaluma		481	SON
Porterville		482	TUL

Appendix C (continued)

URBANIZED (U) AND LARGE URBANIZED (L) AREA CODES			
URBAN AREA (RSU=U) (POP>50,000 & <200,000)	**LARGE URBAN AREA (RSU=L) (POP>200,000)**	**CODE**	**COUNTY**
Redding		304	SHA
	Riverside-San Bernardino	048	RIV, SBD
	Sacramento	042	PLA, SAC, YOL
Salinas		229	MON
	San Diego	023	SD
	San Francisco-Oakland	006	ALA, CC, MRN, SF, SM
	San Jose	032	SCL
San Luis Obispo		410	SLO
Santa Barbara		187	SB, VEN
Santa Clarita		493	LA
Santa Cruz		258	SCR
Santa Maria		305	SB, SLO
	Santa Rosa	235	SON
Seaside-Monterey-Marina		236	MON
Simi Valley		237	VEN
	Stockton	119	SJ
	Temecula-Murrieta	496	RIV
	Thousand Oaks	498	LA, VEN
Tracy		499	SJ
Turlock		500	MER, STA
Vacaville		417	SOL
Vallejo		503	CC, SOL
	Victorville-Hesperia-Apple Valley	391	SBD
Visalia		306	TUL
Watsonville		419	MON, SCR
Yuba City		307	SUT, YUB
Yuma (Arizona)		287	IMP

Appendix D

SMALL URBAN AREA CODES (S)
POPULATION 5,000 - 49,999

SMALL URBAN NAME	CODE	CO
Adelanto	00523	SB
Arcata	02926	HUM
Arroyo Grande-Grover Beach	03196	SLO
Arvin	03250	KER
Avenal	04465	KIN
Barstow	05302	SBD
Beale AFB	05950	YUB
Big Bear Lake	07516	SBD
Bishop	07840	INY
Blythe	08623	RIV
Bonadelle-Madera Ranchos	08893	MAD
Brawley	09730	IMP
Calexico	12430	IMP
California City	12565	KER
Calistoga	12646	NAP
Cambria	12781	SLO
Cameron Park	13105	ED
Chowchilla	16696	MAD
Chuckwalla Valley (California State Prison)	16804	RIV
Clearlake	17479	LAK
Cloverdale	18181	SON
Coalinga	18289	FRE
Colusa	19342	COL
Corcoran	20044	KIN

SMALL URBAN NAME	CODE	CO
Corning	20206	TEH
Crescent City	20908	SB
Crestline	20989	SBD
Delano	22987	KER
Desert Hot Springs	23716	RIV
Discovery Bay	24256	CC
Dixon	24283	SOL
Dos Palos	24445	MER
Earlimart	25579	TUL
Edwards AFB	26281	KER
Escalon	27820	SJ
Eureka	28198	HUM
Fairfield Southwest	28792	SOL
Fillmore	29710	VEN
Firebaugh	29764	FRE
Fort Bragg	30574	MEN
Fort Irwin	30736	SBD
Fortuna	30979	HUM
Gonzales	33841	MON
Grass Valley	34597	NEV
Greenfield	34921	MON
Gridley	35677	BUT
Guadalupe	35839	SB
Half Moon Bay	36271	SM

Appendix D (continued)

SMALL URBAN AREA CODES (S) POPULATION 5,000 - 49,999					
SMALL URBAN NAME	**CODE**	**CO**	**SMALL URBAN NAME**	**CODE**	**CO**
Hollister	39511	SBT	Morro Bay	59437	SLO
Holtville	39619	IMP	Mount Shasta	60220	SIS
Huron	40834	FRE	Newman	62569	STA
Incline Village-Crystal Bay	41104	PLA	Oakdale	64270	STA
Ione	41509	AMA	Orange Cove	65755	FRE
Jackson	42049	AMA	Orland	65836	GLE
Kerman	44587	FRE	Orosi	65917	TUL
King City	45073	MON	Oroville	65944	BUT
Lake Los Angeles	46855	LA	Paradise	67375	BUT
Lake of the Pines	46963	NEV	Parlier	67753	FRE
Lakeport	47071	LAK	Patterson	67861	STA
Lake Wildwood	47233	NEV	Placerville	69832	ED
Lemoore Station	49042	KIN	Ramona	73288	SD
Lincoln	49879	PLA	Red Bluff	73720	TEH
Lindsay	50041	TUL	Reedley	74044	FRE
Live Oak (Sutter County)	50473	SUT	Ridgecrest	74827	KER
Livingston	50581	MER	Rosamond	76285	KER
Los Banos	51472	MER	St. Helena	77500	NAP
Lucerne	51931	LAK	Sanger	78931	FRE
McFarland	52552	KER	Santa Paula	79444	VEN
Mammoth Lakes	53605	MNO	Selma	80551	FRE
Mecca	55927	RIV	Shafter	80929	KER
Mendota	56170	FRE	Soledad	82846	MON
Mono Vista	58276	TUO	Solvang-Buellton	82873	SB

Appendix D (continued)

SMALL URBAN AREA CODES (S) POPULATION 5,000 - 49,999		
SMALL URBAN NAME	**CODE**	**CO**
Sonoma	83008	SON
Sonora	83035	TUO
Southeast San Diego (Donovan Correctional Facility)	83170	SD
South Lake Tahoe	83305	ED
Susanville	85870	LAS
Taft	86329	KER
Tehachapi	86869	KER
Truckee	88624	NEV
Tulare	88840	TUL
Twentynine Palms	89191	SBD
Twentynine Palms Base	89218	SBD
Ukiah	89380	MEN
Val Verde	90109	LA
Wasco	92161	KER
Wasco West (Wasco State Prison)	92188	KER
Waterford	92539	STA
Willits	95671	MEN
Willows	95725	GLE
Winters	96724	YOL
Woodlake	96967	TUL
Woodland	96994	YOL
Yreka	97912	SIS
Yucca Valley	97966	SBD

Appendix E

NAAQS OZONE NON ATTAINMENT AREAS			
NON-ATTAINMENT AREA	**NA CODE**	**URBANIZED AREA**	**URBANIZED CODE**
Bay Area	006	Antioch-Pittsburg	257
		Fairfield	299
		Napa	302
		San Francisco-Oakland	006
		San Jose	032
		Santa Rosa	235
Sacramento Metropolitan	042	Davis	381
		Sacramento	042
		Vacaville	417
San Diego	023	San Diego	023
San Joaquin Valley	080	Bakersfield	117
		Fresno	080
		Lodi	400
		Merced	380
		Modesto	234
		Stockton	119
		Visalia	306
South Coast	002	Hemet - San Jacinto	300
		Los Angeles	002
		Riverside -San Bernardino	048
Southeast Desert	301	Hesperia-Apple Valley	391
		Indio - Coachella	396
		Lancaster - Palmdale	301
		Palm Springs	303
Ventura	224	Oxnard - Ventura	224
		Simi Valley	237

Appendix F

Pavement Condition Index (PCI) versus Pavement Serviceability Rating (PSR)

Conversion of PCI to PSR

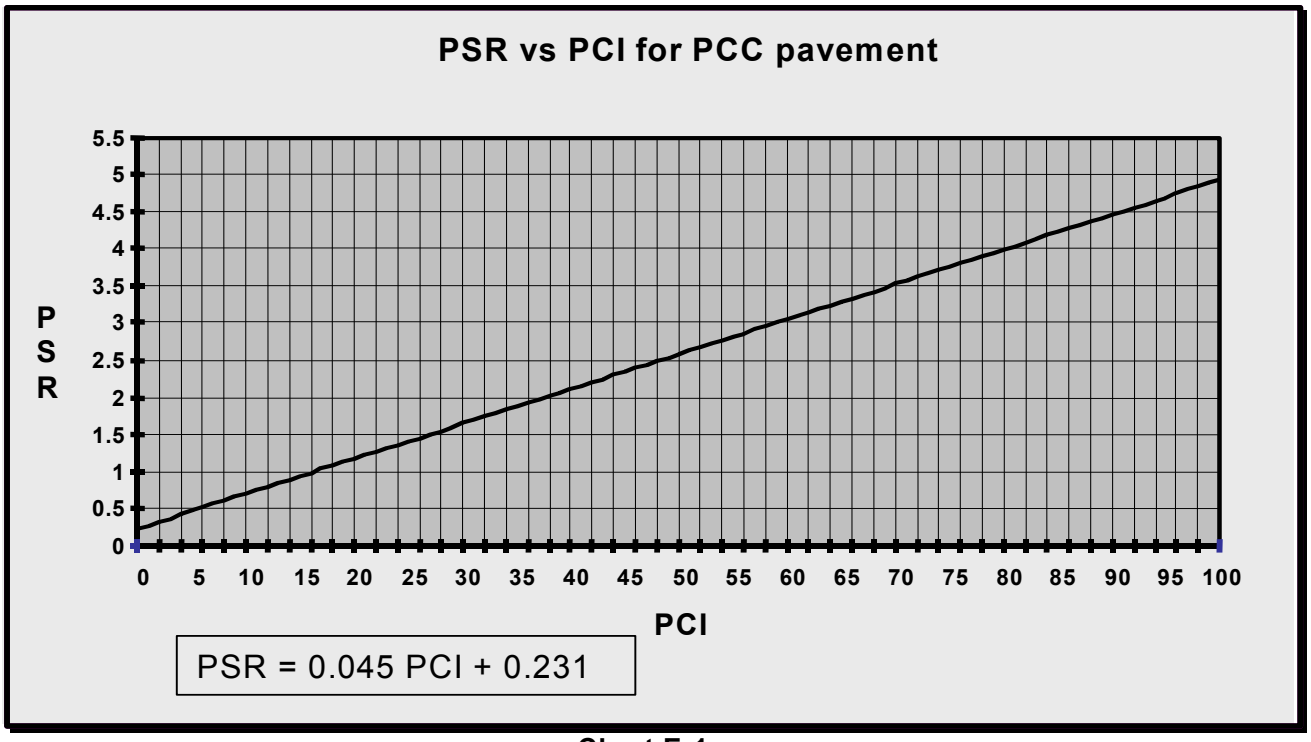


Chart E-1

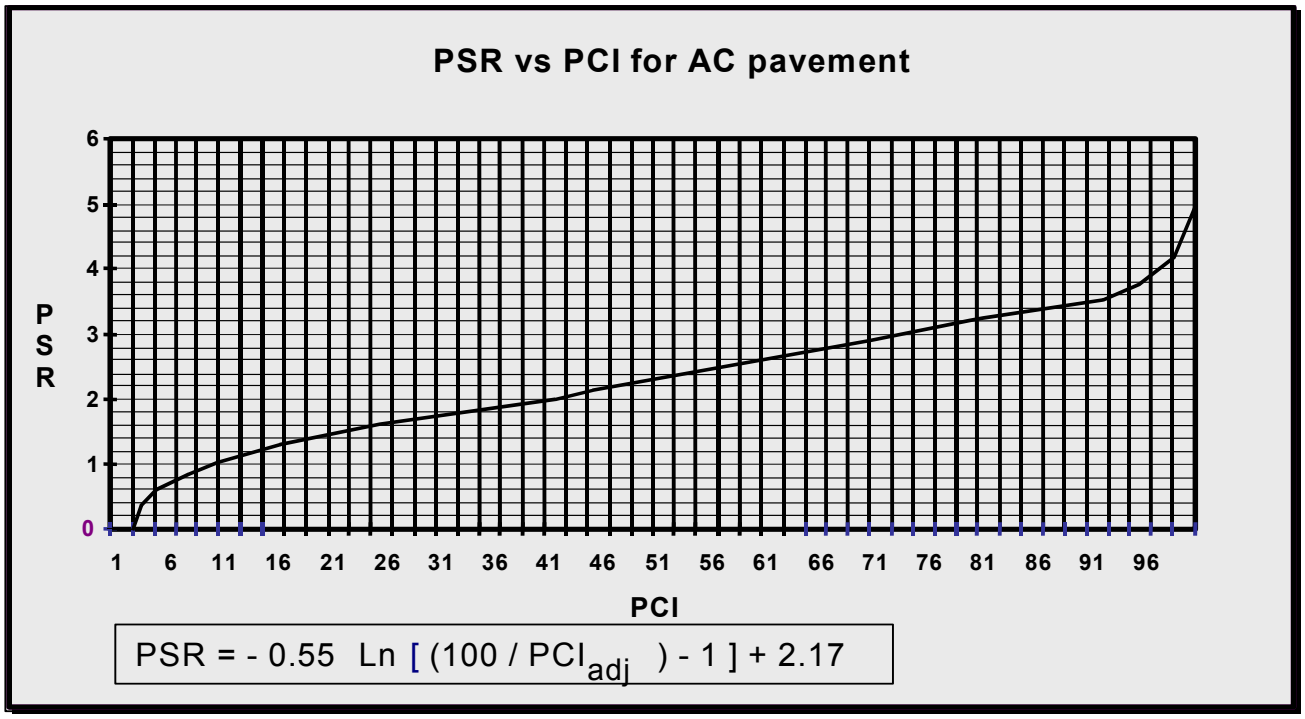


Chart E-2

Appendix F (continued)

Converting PCI to PSR

The following information was taken from a study entitled, *Prediction of Present Serviceability Rating from Pavement Condition Index in the San Francisco Bar Area*, done by Texas A&M University with cooperation from MTC and is included here to assist in the annual HPMS submittal. This methodology is used by MTC and may be of assistance in conversion to a PSR in other jurisdictions. It is not meant to be a Caltrans standard, however, and is included only for your reference.

A review of the Present Serviceability Rating (PSR), Present Serviceability Index (PSI) and Pavement Condition Index (PCI) in the San Francisco Bay Area was completed by Texas A&M University, Texas Transportation Institute. For study purposes, the following definitions were accepted:

PSR	measures riding comfort of a pavement section as experienced subjectively by road users.
PSI	is an indication of the roughness of a pavement section as measured by irregularities in the longitudinal profile.
PCI	is a measure of the quantity and severity of surface distresses.

Results of this study: PSR and PCI data for PCC Pavement sections showed a clear linear trend. The data for AC pavement sections did not show a definite linear trend. After trial and error, many of the discrepancies were overcome with an exponential (or logarithmic) form of equation involving the use of an adjusted PCI. The adjusted PCI was derived from the normal procedure of PCI determination except that all low severity cracking was neglected in the calculation. Low severity cracking affects the PCI but has little effect on the PSR, or riding comfort, for these purposes.

Model for Portland Cement Concrete (PCC) Pavement

Linear regression equation: PSR = 0.047 PCI + 0.231

The regression analysis showed that PSR and PCI for PCC pavements are highly correlated with each other. The best-fit curve has an $R^2 = 0.87$ (which means that the regression equation explains 87% of the variation among the data). *See Chart E-1 on page A-10.*

Model for Portland Cement Concrete (PCC) Pavement

Linear regression equation: PSR = 0.047 PCI + 0.231

The regression analysis showed that PSR and PCI for PCC pavements are highly correlated with each other. The best-fit curve has an $R^2 = 0.87$ (which means that the regression equation explains 87% of the variation among the data). *See Chart E-1 on page A-10.*

Appendix G

ADT versus AADT – Using Adjustment Factors

Traffic volumes may be reported as ADT (average daily traffic). AADT (annual average daily traffic) is derived from the use of adjustment factors for day-of-week, seasonal and/or truck axles. The traffic volumes should be reported as AADT whenever these adjustment factors are known.

The following guidelines are taken from a document prepared by the California Department of Transportation, Traffic Operations Program, which was compiled as a guide, if needed, to assist local governments in support of the Highway Performance Monitoring System (HPMS).

A true Annual Average Daily Traffic (AADT) evaluation is the total traffic volume for the year divided by 365. This true AADT figure requires continuous Automatic Traffic Recording (ATR) throughout the year. Anything short of a 365 day continuous count is considered an estimate. Realistically, continuous counting at every location is not cost effective. In practice, the State of California uses regional continuous count stations (trend count stations) to establish patterns on certain roadway types within a large region and it uses these figures to provide the necessary data to evaluate seasonal, recreational, weekly or daily trends.

Based on historical trends, traffic volumes at any given location often vary in a consistent pattern. During a 12 month period there are consistent variations by month, day and hour. Changes occurring in this consistent pattern can usually be attributed to normal growth in traffic volume, seasonal commerce, recreational travel, change in usage of a facility, addition or deletion of a traffic generator, development affecting the site or some other tangible change to the facility. Because of these largely consistent variations, factors can be developed for day of the week, month of the year and seasonal fluctuations for use in estimating AADT. Other factors specific to site location and equipment used for the counts may be useful in developing an AADT estimate.

The following equation can be used to estimate AADT for a specific location:

$$\mathbf{AADT = Vol \times D \times S \times A \times E}$$

Where:
- AADT = Annual Average Daily Traffic at a specific location
- Vol = 24-hour axle volume at that location
- D = applicable day-of-week factor
- S = applicable seasonal or monthly factor
- A = applicable axle-correction factor (if needed)
- E = applicable equipment error (if needed)

Note: The FHWA Traffic Monitoring Guide (TMG) recommended method for adopting 48-hour counts is to convert each of the two separate 24-hour periods to AADT using the above equation and then average. The application of some of the individual factors may be unnecessary; for example, automatic classification equipment that counts vehicles does not require axle correction. If a factor is not required, eliminate it from the equation. The use of statistical average factors will not provide exact results, but the results should balance out on the average due to the many sources of variation.

Vol = Volume This is a short-term (24-hour) traffic count collected for a specific location. A 48-hour traffic count is recommended by FHWA for HPMS purposes, but the 24-hour data may be derived from any count for an extended duration. The short-term count must reflect typical traffic patterns for the location, meaning that holiday and other atypical counts should not be used.

Appendix G (continued)

ADT versus AADT – Using Adjustment Factors

D = Day-of-week factor This factor must be developed from data collected at a "Control Station" site. The data at one of these sites are counted consistently and mimic the weekly traffic pattern for that location. These sites can be called Control Stations since they are able to produce factors controlling the estimated AADT value for other related locations.

The FHWA Traffic Monitoring Guide (TMG) states "Data from the continuous ATR program must be used to develop the day-of-week factors".

The daily factors are computed as:

$$\frac{\text{Monthly Average Daily Traffic (MADT)}}{\text{Monthly Average Day of Week Volume}}$$

EXAMPLE: The January Monday factor is the January MADT divided by the average volume of Mondays in Jan.

The TMG also recommends the use of 7 day-of-week factors for each month of the year. Statistical sampling procedures require that each element in the universe or sampling frame have an equal chance of being selected. Therefore, excluding weekends from the sampling possibilities would bias the procedure.

S = Seasonal or Monthly Factors, also need to be developed from consistent count sites such as Control Stations. The TMG recommends developing 12 individual monthly factors from continuous ATR stations.

The individual monthly factors for each ATR station are computed as:

$$\frac{\text{AADT (average of all daily counts collected at the site)}}{\text{MADT (average daily counts for a specific month)}}$$

The TMG recommends breaking down monthly factors for all functional classification classes (such as Interstate Rural, Other Rural, Interstate Urban, Other Urban and recreational). Typically, urban area monthly factors vary < 10%, while rural areas fluctuate between 10% and 25%. Values > 25% indicate high variation that may be caused by recreational or other intermittent use, which should be investigated further.

A = Axle Correction Factor adjustments are required for all counts taken by axle counting equipment. TMG considers axle correction factors calculated for functional class to be sufficient. Vehicle detectors, such as classification and weigh-in-motion equipment do not require axle adjustment.

The axle correction factor is the ratio of vehicles to axles as determined from a classification count. If a classification count is not available HPMS recommends collecting 15-minute data manually at the site. This count should be completed within a 48-hour time period to eliminate seasonal or other variations.

The axle correction factor is:

$$A = \frac{\text{Number of Vehicles}}{\text{Number of Axles}}$$

The axle correction factor generally ranges from 0.2 to 0.5. An axle correction factor should be applied in most instances as some devices automatically divide the axle impulses by two to record vehicles. This method is sufficient only if all vehicles counted on the section contain 2 axles or less.

Appendix G

ADT versus AADT – Using Adjustment Factors, continued

E = Equipment Errors Data collection equipment, as any equipment, is subject to malfunction. This may result in continuous over/under counting. Equipment should be periodically compared with manual counting (short periods) or with verified accurate equipment (longer periods) to reduce possibility of this type of error.

The percent difference between manual and machine counts can be calculated as follows:

$$E = \frac{(\text{Machine volume} - \text{visual volume})}{\text{Visual volume} \times 100}$$

This percent difference can then be applied to all counts generated by this equipment until the equipment can be mechanically repaired.

Directional distribution of traffic may also indicate machine malfunction. In most instances, morning and evening peaks will occur in opposite directions. For highly uneven directional distribution, a pattern may be established and possibly confirmed with earlier traffic counts at the same or similar sites. Recreational area arrival and departure travel patterns as well as service road or other access point locations may also lead to uneven traffic splits. Uneven patterns should be investigated further.

Traffic flow or Machine errors. Correctly functioning counters on highly populated multilane facilities may generate machine errors if several vehicles trip the counter at the same time or when road surfaces are severely deteriorated. Repositioning sensors, changing locations, etc may achieve more accurate counts on these facilities. Other possible machine errors are sensor dropout between truck and trailer causing two vehicles instead of one to be counted, vehicles changing lanes at loops or straddling the centerline, or lane reconfiguration due to construction restriping. If data changes suddenly it should be investigated.

Manual counts or portable automatic vehicle classification (AVC) equipment can be used to test for traffic volume machine error. Lane specific AVC equipment has proven to be accurate for total volume classification. Manual classification counts to confirm performance of AVC equipment can have a human error factor of as little as one percent, depending on observer experience, length of count and traffic volume.

Error by Traffic speed: Road tube counters seem to generate more traffic speed errors than loop detection equipment. At higher speeds, road tube counters may miss the second axle due to displacement of air in the tube not allowing the air switch to normalize before the next axle impact. It is best not to use data that have been collected with missed time periods or with serious malfunctions.

Long segments: The standard method used to compute traffic for a long segment with varying traffic volumes is to figure a *weighted average* for the entire length.

A weighted average can be computed as follows:

$$\text{Weighted Average} = \frac{(\text{segment-1 traffic} \times \text{segment-1 length}) + (\text{segment-2 traffic} \times \text{segment-2 length}) + (\text{segment-3 traffic} = \times \text{segment-3 length})}{\text{total segment length}}$$

Rounding: AADT figures are calculated using various factors. Traffic conditions will vary from day to day. To avoid a false sense of precision, which might incorrectly indicate there is an exact number of vehicles on the roadway, final AADT figures should be rounded after all factors have been applied to the base data.

The recommended rounding convention for volume of vehicles is found in the table at the right:

Volume	Round to nearest
0 – 100	No rounding
100 – 10,000	10
10,000 – 100,000	100
Over 100,000	1000

Appendix H
Annual Growth Factors

On any section where a traffic count was not taken this past year, an annual growth factor should be used to adjust the annual average daily traffic (AADT) in order to account for the escalation of traffic volume. This is important because the vehicle miles traveled (VMT) in California will otherwise be understated, which may result in the state receiving less federal funding, especially for the Surface Transportation Program (STP).

Preferably, annual growth factors should be derived from the agency's growth model. The next most desirable source from which to obtain a growth factor would be from the model used by the regional planning agency (LTC, RTPA, CTC, MPO, etc). The regional planning agency will usually have a recently calibrated growth model, and the local factors may be readily available.

If your city or county does not normally make annual growth projections and the regional planning agency does not have any factors available, or if their model is not current, there are still some methods by which the increase in traffic volume can be estimated. These would be the last alternatives to consider but they are better than making no adjustments.

Two possible methods suggested here are the two-point linear extrapolation and the multi-year extrapolation based on a "best fit line".

Two-point linear extrapolation:

	Count year	% change	% change per year	AADT (or ADT)	
	1999			8900	
	2002	6.2%	2.0%	9450	Computed using two-point linear extrapolation
No count taken →	**2005**			10000	←

(rounded to the nearest 100)

The percent change between two count years is computed simply enough:

$$\% \text{ change} = [(AADT_2/AADT_1)-1] * 100$$

Where:

$AADT_1$ = traffic volume from the second most recent count year
$AADT_2$ = traffic volume from the most recent count year

% change = 6.2%

$AADT_1$ = 8900

$AADT_2$ = 9450

Appendix H

Annual Growth Factors, continued

The percent change per year is computed as follows:

$$\% \text{ change per year} = \{[(AADT_2/AADT_1)^{1/(Year2 - Year1)}] - 1\} * 100$$

Year1 = the second most recent count year
Year2 = the most recent count year

% change per year = 2.0%
$AADT_1$ = 8900
$AADT_2$ = 9450
Year1 = 1999
Year2 = 2002

The estimated AADT for the target year would then be computed:

$$AADTtarget = AADT_2 * [1 + (\% \text{ change per year}/100)]^{(TargetYear - Year2)}$$

Where:
AADTtarget = the estimated AADT for the target year
TargetYear = the year for which the AADT is to be estimated where no count is available

AADTtarget = 10000 (rounded)
$AADT_2$ = 9450
% change per year = 2.0%
TargetYear = 2005
Year2 = 2002

Appendix H

Annual Growth Factors, continued

Multi-year extrapolation (best fit line):

If there is a record of 3 or more traffic counts from past years, it may be meaningful to derive a growth rate from a "best fit" line through the data points. Using the year of traffic count as the x values and the AADT as the y values, a y value (AADT) can be determined for a specified x value (target year). A linear regression analysis may be used, however, the "FORECAST" function on the MS Excel spreadsheet is very efficient for this. Other spreadsheet packages may have a similar feature.

In the following example, the AADT is given from 4 past traffic counts over a 12 year period. Note that the count interval does not necessarily have to be uniform. The annualized percent change in AADT may or may not follow a discernable pattern. There are many possible reasons why the daily traffic volume could escalate more rapidly in some years and have a flatter growth rate in other years.

No count taken

Count year	% change	% change per year	AADT (or ADT)
1993			8000
1995	3.8%	1.9%	8300
1999	7.2%	1.8%	8900
2002	6.2%	2.0%	9450
2005	4.8%	1.6%	**9900**

computed using "FORECAST" function (rounded)

This best fit line method, as well as the two-point extrapolation method, produce a growth factor based on past trends. These methods carry implicit assumptions about what sort of growth trend may continue. Either of these methods will suffice, however, if no other growth model is available.

In summary, growth factors should be used on any section where a traffic count was not taken this past year, in order to adjust the AADT. The method to derive an annual growth factor for any given section is determined by the reporting agency. The most desirable method is for the agency to use its own growth model. The next most desirable method is to use growth factors derived from a model from the regional planning agency. Lastly, if no growth model is available, an estimate will suffice. The method of estimation could be one of the two suggested here or any other sort of trends analysis.

It is understood that some locations will actually not experience any growth in a given year and the growth rate would be 0.0% hence the AADT will be reported the same as in the previous year. It is also true that in some instances there can be a negative growth rate, a decline in the traffic volume from what was previously reported. This can happen due to anomalous conditions such as long term construction projects, the opening of a parallel bypass, etc. These cases should be explained in the remarks section (item CT13) wherever they occur.

Appendix I

Common Abbreviations

Given here is a list of terms with the commonly used abbreviations for the “Street Name” and the “FROM” and “TO” Descriptions, items CT03, CT04 and CT05, respectively. The use of these abbreviations is optional. An agency may use their own terminology. This list is put here primarily to denote what an abbreviation stands for should there be any question. It is important to remember that the “Street Name” field (item CT03) has a maximum allowable length of 18 characters; and the “FROM” and “TO” fields (items CT04 & CT05) each have a maximum length of 25 characters.

Sample Term	Abbreviation
Interstate Rte 5	I-5
Interstate 5	I-5
I – 5	I-5
Jct State Rte 299	SHWY 299
Jct Route 299/89	SHWY 299 (or SHWY 89)
SHWY Rte 299	SHWY 299
SH Rte 299	SHWY 299
Eureka St - SHWY 299	Eureka St (SHWY 299)
Eureka St (SHWY 299)	Eureka St (SHWY 299)
SHWY 299 Eureka St	Eureka St (SHWY 299)
Montgomery St SHWY299	Montgomery St (SH 299)
Buenaventura Av/Rte 299	Buenaventura (SH299)
Old State Hwy 99 West	Old SHWY 99W
Old SHWY 99 W	Old SHWY 99W
County Road 306	Rd 306
Co Rd 306	Rd 306
Co Rd 306 (unconstr)	Rd 306 (UNC)
Co Rd 306 extension	Rd 306 (EXT)
MM Road	Rd MM
6th Street	6th St
Sixth St	6th St

Appendix I

COMMON ABBREVIATIONS, continued

Sample Term	Abbreviation
H Street Parkway	H St Pkwy
Lake Boulevard	Lake Blvd
Black Marble Way	Black Marble Wy
Wyndham Lane	Wyndham Ln
Blue Lake Blvd	Blue Lk Blvd
Iron Mountain Rd	Iron Mtn Rd
Montgomery Creek Rd	Montgomery Crk Rd
Montgomery Cr Rd	Montgomery Crk Rd
Clear Creek Rd	Clear Crk Rd
Clear River	Clear Riv
Creek Canyon Road	Creek Cyn Rd
Creek Valley Road	Creek Vly Rd
Creek Road	Creek Rd
Old Oregon Trail	Old Oregon Tr
Utah Trail	Utah Tr
Tehama County Line	Teh Co Ln
Tehama Co Line	Teh Co Ln
Tehama Co Ln	Teh Co Ln
East of Main Street	.07M E/Main St
1/2 Mi North of Main	.5M N/Main St
City Limit	CL .31M E/Lake St
Redding City Limit	CL .31M E/Lake St
CL 1650’ E of Lake St	CL .31M E/Lake St
Urban Limit E/Shasta	URL .15M E/Shasta St
Redding Urban Limit (or RDG Urb Limit)	URL .15M E/Shasta St
Urban/Rural limit (or Rur/Urb Line)	URL .15M E/Shasta St
Urb Ln 800 ft E/Shasta	URL .15M E/Shasta St

Caltrans Items

Item No.	Description
CT01	County (CO)
CT02	Jurisdiction (Juris)
CT03	Street Name
CT04	From Location
CT05	To Location
CT06	County Road System Map Number (MapNo)
CT07	Map Co-ordinates (MapCoOrdinates)
CT08	Metropolitan Planning Organization Code (MPO)
CT09	Small Urban Code (Small_Urban)
CT10	Year of Field Review (Year_Fld_Rev)
CT11	Year of IRI Update (Year_IRI_Update)
CT12	Year of Traffic Count (Year_Traffic_Count)
CT13	Remarks

Item CT12 is the most important of the supplemental items to obtain. It should be reported along with any change in item 33 (AADT).

Update CT03, CT04, CT05 and CT06 as needed.

CT13 is optional but there is space provided for it.

HPMS DATA ITEMS

1	Data Year	17	Functional System	33	AADT (Annual Average Daily Traffic)
2	State Code	18	Func Sys Code (generated)	34	No of Through Lanes
3	English/Metric Units	19	NHS	35	IRI (Roughness Index)
4	Co FIPS Code	20	Planned / Unbuilt	36	PSR (Condition)
5	Section ID	21	Interstate Route No	37	HOV OPS
6	Standard Sample	22	Route Signing		Surveillance Systems
7	Donut Sample	23	Rte Sign Qualifier	38	Hwy Surv – Real-Time Volumes
8	State Control	24	Signed Route No	39	Hwy Surv - Ramp Metering
9	Grouped Section	25	Government Ownership	40	Hwy Surv - Var message sign
10	LRS Section ID	26	Spec Sys (STRAHNET)	41	Hwy Surv - Hwy advisory radio
11	LRS Begin Point	27	Type of Facility	42	Hwy Surv - Surveillance cameras
12	LRS Ending Point	28	Designated Truck Rte	43	Hwy Surv - Incident detection
13	Rural/Urban Desig	29	Toll facility	44	Hwy Surv - Free cell phone
14	Sampling Technique	30	Section Length	45	Hwy Surv - Service patrol
15	Urbanized Area Code	31	Donut Volume Group	46	Hwy Surv - In-vehicle signing
16	NAAQS Code	32	Sample Volume Group		

47	Sample ID	65	Length of Curves-Class C	81	%Single Trucks - Peak Travel
48	Donut Expansion Factor	66	Length of Curves-Class D	82	% Single Trucks - Average Travel
49	Sample Expansion Factor	67	Length of Curves-Class E	83	%Combo Trucks - Peak Travel
50	Surface Pavement Type	68	Length of Curves-Class F	84	%Combo Trucks - Average Travel
51	SN or D	69	Horiz Alignment Adequacy	85	K Factor (Design Hour Volume)
52	Climate Zone	70	Terrain Type (rural)	86	D Factor (Directional Factor)
53	Year of Surface Improvement	71	Vert Alignment Adequacy	87	No of Lanes in Peak Hour Dir
54	Lane Width	72	Length of Grades-Class A	88	Turning Lanes / Bays (left)
55	Access Control	73	Length of Grades-Class B	89	Turning Lanes / Bays (right)
56	Median Type	74	Length of Grades-Class C	90	Type of Signals
57	Median Width	75	Length of Grades-Class D	91	% Green Time (signals)
58	Shoulder Type	76	Length of Grades-Class E	92	No of At-Grade Signals
59	Shoulder Width (RT)	77	Length of Grades-Class F	93	No of At-Grade Stops
60	Shoulder Width (LT)	78	Passing St Distance (rural)	94	No of At-Grade Others
61	Peak Parking (urban)	79	Weighted Design Speed	95	Peak Capacity
62	Widening Feasibility	80	Posted Speed Limit	96	Volume / Service Flow Ratio
63	Length of Curves-Class A			97	Future AADT
64	Length of Curves-Class B			98	Future AADT Year

See also the supplemental (Caltrans) items on the inside back cover

Please try to update the items highlighted in yellow