

# **LTPP Pavement Performance Database**

## **Release Notes**

### **Standard Data Release 22**

### **January 2008**

#### **Introduction**

The Long-Term Pavement Performance (LTPP) program has collected a large quantity of data and information on the performance of selected in-service pavement test sections in North America. These data are designed to serve a broad range of research needs related to pavement performance in the areas of pavement engineering, pavement materials engineering, and pavement management. A primary mission of LTPP is to provide access to this data and related information to researchers, highway agency personnel, and others interested in pavement performance related research.

To serve this mission, LTPP developed a Standard Data Release (SDR) that provides access to LTPP data in a convenient format, free of charge. The LTPP SDR is delivered in Microsoft® Access 2000 format on a single DVD or multiple CD-ROMs. As the LTPP program is an on-going operation, new releases contain data from previous releases, additional data collected since the last release, changes made in response to errors in previously released data, and other updates. SDR data is extracted from the production Pavement Performance Database (PPDB) and is divided into multiple relational databases due to limitation on the size of Access databases. The database files are contained in files compressed using the zip standard. The data are further subdivided by volumes on the data delivery media.

The purpose of this document is to highlight changes between each standard data release. Changes to the standard data release dating back to release 16 are contained in this document for historical reference.

#### **Release 22**

This is the 22<sup>nd</sup> public release of data from the LTPP program. Some of the notable updates, additions, deletions, and changes made to the data since the November 2006 data release include the following.

There are no new deleted tables in this release either because of structural changes to the database or tables that contain no records.

### ***Tables Added***

The most significant addition to data release 22 are the addition of tables containing data extracted from the LTPP traffic database formatted for use as inputs to the Mechanistic-Empirical Guide for the Design of New and Rehabilitated Pavement Structures developed under NCHRP project 1-37A., the MON\_DISL\_LINK table, and the SECTION\_COORDINATES table.

MON\_DIS\_LINK. This table links distress records in various distress tables which are considered to be part of the same survey.

SECTION\_COORDINATES. This table contains updated coordinates for most GPS and SPS test sections measured using high precision global positioning receivers. Where new coordinate measurements have not been made, the previous coordinates contained in the INV\_ID and SPS\_ID tables were transformed to the new fractional degree and negative longitude format used in this table. The coordinate location fields in the \*ID table have been removed.

SMP\_TDR\_AUTO\_MOISTURE\_TLE: This table contains volumetric and gravimetric contents calculated using the transmission line equations (TLE) and micromechanics model to interpret TDR traces store in the SMP\_TDR\_AUTO table.

SMP\_TDR\_AUTO\_CALIBRATION\_TLE: This table contains the values used to calibrate the micromechanics model to each specific TDR sensor used as the basis of volumetric moisture and density computations contained in the SMP\_TDR\_AUTO\_MOISTURE\_TLE table.

MEPDG\_ADTT\_LTPP\_LN: This table contains estimates of the annual average daily truck traffic in the LTPP test section lane computed by three alternate computation methods.

MEPDG\_AXLE\_DIST. This table contains normalized axle distributions by month, truck class and axle group. Records in this table are generated from the MM\_AX table in the LTPP traffic database that contain at least 210 days of WIM data for a calendar year.

MEPDG\_AX\_BINS. This table contains the weight range of axle weight bins for data contained in the MEPDG\_AXLE\_DIST, MEPDG\_AXLE\_DIST\_ANL, and MEPDG\_AXLE\_DIST\_ANL\_VAR tables.

MEPDG\_AXLE\_DIST\_ANL. This table contains the annual average normalized axle distribution by class and axle group.

MEPDG\_AXLE\_DIST\_ANL\_VAR. This table contains the mean and variance of the elements of the normalized axle distributions by vehicle class and axle type for all years of available site specific monitoring data.

MEPDG\_AXLES\_PER\_TRUCK. This table contains the annual average number of axles by vehicle class and axle type by year.

MEPDG\_MONTHLY\_ADJ\_FACTORS. This table contains the adjustment factor for of ADTT for each truck class by month.

MEPDG\_VEHICLE\_CLASS\_DIST. This table contains the percentage of trucks by vehicle class within the truck population (FHWA Classes 4-13) on an annual basis.

### ***Other Notes***

In the MON\_DIS\_AC\_REV and MON\_DIS\_PADIAS42\_AC tables, the fields for raveling, bleeding, and polished aggregate fields were changed from zero to null for pavement surfaces with a preventative maintenance surface treatment as defined in the LTPP directive D-29. This action was taken since by directive since these type of defects are not supposed to be rated on these types of pavement surfaces. These rules were based on implementation of the SHRP SPS-3 study, but should not be interpreted as meaning that maintenance applications such as chip seals and slurry seals do not bleed or loose aggregate. The original intent of the SPS-3 data collection guidelines was to evaluate how the selected maintenance treatments affected the existing pavement prior to application of the treatment. These distress data collection rules were applied to all LTPP test sections.

The MAYS\_INDEX field was removed from the MON\_PROFILE\_MASTER table because the index is no longer relevant to current practice and quality issues associated with its computation from some data sets.

In the various MON\_DIS\_\* tables a new field named SURVEY\_WIDTH was added that is not currently populated. This field is being added to indicate differences of the width of pavement distress surveys. Differences in the width of measured distress features cause apparent discrepancies in time series analysis of extent of distress features such as transverse cracking. LTPP plans to start to populate this field for the next data release. Advanced database users can add data to these fields for current research objectives based on information contained in the various distress data forms currently contained in the Ancillary Information System available upon request from LTPP customer service.

In this release, the status of data in the inventory module was set to frozen. Frozen status means that LTPP made one last significant effort to review and correct data contained in this module. Required future changes to this data will be made centrally in order to reduce program costs on a priority basis.

## Release 21

This is the 21<sup>st</sup> national release of data from the LTPP program. Some of the notable updates, additions, deletions, and changes made to the data since the November 2005 data release include the following:

### *Tables Added*

TST\_SS14\_UG14\_MASTER, TST\_SS14\_UG14\_DATA, and TST\_SS14\_UG14\_COMMENTS. These three tables contain the results from Dynamic Cone Penetrometer tests performed on SPS test sections as part of the SPS Materials Action Plan. This data release contains measurements from several sections. More data is expected to become available in the next data release.

TST\_SAMPLE\_COMBINE. The purpose of this table is to document the multiple locations used when a sample is combined in order to have enough material to perform a laboratory test. For example, it is often necessary to combine samples of unbound material from different core/borehole locations since the layer is not thick enough to provide enough material to be obtained from one hole. A new sample numbering convention code is being used, which uses an X in the SAMPLE\_NO field to indicate the sample is a combined sample. This new convention will be used for materials from the SPS Materials Action Plan. If resources permit, attempts will be made in the future to add entries to this table for previously combined samples which currently use the \* or \*\* convention in the SAMPLE\_NO field.

TST\_SAMPLE\_BASIC\_INFO. This table is a view that combines basic sampling information from all the other sampling tables to make certain internal automated quality control checks operations easier, and to provide the user with a single source for sampling information. Information contained in this table comes from TST ASPHALT\_CEMENT, TST\_FRESH\_PCC, TST\_SAMPLE\_BULK\_AC\_AGG, TST\_SAMPLE\_COMBINE, TST\_SAMPLE\_LAB\_AC\_MIX, TST\_SAMPLE\_LOG, TST\_SAMPLE\_LOG\_LAB, TST\_SAMPLE\_LOG\_SPS\_3\_4, and TST\_UNCOMP\_BITUMINOUS.

### *Tables Removed:*

The results of the backcalculation analysis performed on Falling Weight Deflectometer (FWD) data extracted from the database in 1997 have been removed from the SDR because the results of the analysis were valid for a fixed point in time and the rest of the database is dynamic. If users are interested in obtaining this data they should request a copy of SDR 20 from LTPP customer services. The following tables containing the results of the backcalculation analysis removed are:

MON\_DEFL\_FLX\_BAKCAL\_BASIN  
MON\_DEFL\_FLX\_BAKCAL\_LAYER  
MON\_DEFL\_FLX\_BAKCAL\_POINT  
MON\_DEFL\_FLX\_BAKCAL\_SECT  
MON\_DEFL\_FLX\_NMODEL\_POINT

MON\_DEFL\_FLX\_NMODEL\_SECT  
MON\_DEFL\_RGD\_BAKCAL\_BASIN  
MON\_DEFL\_RGD\_BAKCAL\_LAYER  
MON\_DEFL\_RGD\_BAKCAL\_POINT  
MON\_DEFL\_RGD\_BAKCAL\_SECT

MON\_CATEGORY. This table is being discontinued due to changes to monitoring frequencies in response to the LTPP budget under the SAFETEA-LU legislation. The new monitoring frequencies are contained in LTPP Directive GO-38 available from the WWW.LTPP.ORG web site.

***Other Notes:***

*Data from the SPS Materials Action Plan*

The SPS Materials Action Plan (MAP) was initiated to address the issue of missing materials test data from test sections in the Specific Pavement Study (SPS) experiments. This data release contains the first material test results from this activity. A partial set of data updates are contained in this data release since material sampling and testing are still being performed. This data release contains more material sampling data than material property test results since testing always lags behind field sampling.

*Data from the SPS Traffic Pooled Fund Study*

The traffic pooled fund study is designed to address deficiencies and improve the quality and quantity of monitored traffic data from the SPS 1, 2, 5, 6, and 8 projects. This five-year study consists of two phases. Phase I consists of assessing, evaluating, and calibrating the current Weigh-In-Motion (WIM) and Vehicle Classification (VC) systems used to collect traffic data at the SPS sites across the country. Phase II consists of installing and maintaining new WIM equipment as necessary to ensure high-quality data collection. This is the first release of data from Phase II of the study for the Colorado SPS-2, Maryland SPS-5, and Illinois SPS-6 project sites. The data release also contains traffic data from sites validated as part of Phase I from Florida SPS-1 and 5, Ohio SPS-1 and 2, Texas SPS-1, and Michigan SPS-1.

*Photographic Distress and Transverse Profile Data Reconciliation*

After SDR 20, a major effort was made to reconcile pavement distress and transverse profile measurements performed using photographic based technology. The objective of this reconciliation was to resolve discrepancies between field measurements and data contained in the database. This effort has resulted in the addition of approximately 600 distress surveys stored in the MON\_PADIAS42\_\* tables and 1,400 transverse profile measurements stored in the

MON\_T\_PROF\_\* tables. Some of these data date back to the start of pavement test sectioning monitoring in 1990.

## **Release 20.0**

This was the 20<sup>th</sup> national release of data from the LTPP program. This release contains some revisions to data included in the January 2005 Data Release. In addition, several tables have been added to this release as noted below:

### ***Tables Added:***

TST\_SAMPLE\_BULK\_AC\_AGG: This new table in the Material Testing module contains information on bulk aggregate sampled at asphalt concrete plants for test sections included in the SPS-9 Superpave experiment.

TST\_SAMPLE\_LAB\_AC\_MIX: This new table in the Material Testing module contains information on laboratory mixed AC samples for test sections included in the SPS-9 Superpave experiment.

### ***Tables Removed:***

RHB\_ACO\_SP\_PROP: This table was added in SDR 19 and has no data in it yet. It will be included in future releases if data becomes available.

### ***Other Additions to Release 20.0:***

#### ***CONSTRUCTION\_NO added to tables:***

The field CONSTRUCTION\_NO field was added to the following Material Testing tables: TST\_ASPHALT\_CEMENT, TST\_FRESH\_PCC, TST\_SAMPLE\_BULK\_AC\_AGG, TST\_SAMPLE\_LOG\_SPS\_3\_4, TST\_UNCOMP\_BITIMINOUS.

### ***Other Notes:***

#### ***Backcalculation Tables:***

This is the last release of the FWD backcalculation tables in the SDR. This data was calculated from FWD data that was available in 1997. It has become cost prohibitive to continue updates and support these data elements in response to changes and corrections are made to the baseline FWD data. An update was made to these tables to remove records which could no longer be traced to the source FWD data, and to correct these tables with changes made to the source data tables.

*MON\_T\_PROF\_CROSS\_SLOPE table*

Population of this table for manual transverse profile measurements for all previous measurements was completed for this data release. From this data, a data user now has the capability of determining if ruts can hold water from a transverse cross slope perspective.

***Known Data Issues Not Yet Reported***

The mechanism for reporting LTPP data problems is currently called the Data Analysis/Operations Feedback Report (DAOFR). LTPP data users can view resolved and unresolved DAOFR at the LTPP web site: <http://www.fhwa.dot.gov/pavement/ltp>. The following unresolved data issues reported in the release notes for data release 19, have not yet been fully addressed. DAOFR will be prepared in the near future to better document these previously identified problems. Unresolved data problems previously identified in this data upload have already been submitted as DAOFRs to FHWA.

Table	Problem
AWS_HOURLY_DATA	For site 350101, the pyranometer readings are suspect.
MON_DIS_JPCC_FAULT	For certain sections, the faulting values are very inconsistent over time.
MON_DIS_JPCC_FAULT	The POINT_LOC value assigned to a given crack or joint varies slightly over time on some sections
MON_DIS_JPCC_FAULT	For certain POINT_LOC's on given section, there are large spikes in the measured faulting value.
MON_DIS_JPCC_FAULT	For a given POINT_LOC, the CRACK_OR_JOINT designation changes over time for some sections.
MON_DIS *_REV	Many null values should in fact be recorded as zero.
MON_DIS_AC_REV	The fatigue cracking values on 010102 are suspect.
MON_DIS_CRCP_REV	For 185518, OTHER indicates multiple patches, while the patching fields indicate only one.
MON_DIS_AC_REV	For a number of sites, BEFORE_TEMP and AFTER_TEMP are zero during summer months, indicating that the values should probably be null instead.
MON_DIS_JPCC_REV	Inconsistent rating of transverse cracking on sections 290704, 290705
MON_DIS_JPCC_REV	inconsistent rating of map cracking on section 100210
MON_DIS_JPCC_REV	On section 124000, 7/21/99, OTHER indicate presence of map cracking, though map cracking field contain zeroes.
MON_DIS_JPCC_REV	For the 8/7/91 survey on the 2906** sections, OTHER indicates pumping, while the pumping fields indicate none.
MON_DIS_JPCC_REV	For 18A430, 5/1/91 and 370201, 9/19/02, OTHER indicates polished aggregate, but POLISH_AGG_A = 0.
MON_DIS_JPCC_FAULT	EDGE and WHEELPATH measurements differ by > 12mm
SMP_ATEMP_RAIN_HOUR	Temperatures very low for certain dates on sections 131031(-42) and 351112 (-49)
SMP_ATEMP_RAIN_DAY	hourly average in HOUR outside min and max values in DAY
SMP_ELEV_PCC_DATA	Sections 274040(9/22/93), 484143(9/25/97), and 833802(various dates) have questionable elevation data.
SMP_ELEV_AC_DATA	Questionable elevation data on 310114, 390901, 460804,

Table	Problem
	469187, 501002, 831801, and 906405.
SMP_MRCTEMP_AUTO_DAY_STATS	483739, THERM_NO =18(after 5/6/00) and 11(after 6/6/00) have very high values - looks like bad sensor.
SPS9_PMA_PROFILE	180901, 0902, 0904, and 0905 have zero PROFILE_INDEX, which is not a reasonable value.
TRF_EQUIPMENT_MASTER	Where sensor type is null, it should be N. Sections/layers: 04_1021 layers 6,7; 18_5518 layers 9,10; 18_6012, layer 11; 19_3006 layers 5,6; 19_3055 layers 5,6; and section 27_1085 layer 5, do not have matching layers in TST_L05B
TST_AC01_LAYER	In many TST tables, there are SAMPLE_NO entries that do not have a match in one of the sampling tables.
Various	In many TST tables, there are LOC_NO entries that do not have a match in one of the sampling tables.
Various	For many sections, the LAYER_NO reported does not have a match in TST_L05B.
TST_AC02	comments indicate multiple samples, but LOC_NO or SAMPLE_NO are for a single sample.
TST_AC04	There are many ASH_CONTENT values over 2, which may indicate the test was not performed properly.
TST_AE01	Many sections have holes with locations far outside section boundaries (+/- 200').
TST_HOLE_LOG	There are many records with negative TRANS_POS, but a LOC_NO not indicative of shoulder testing.
TST_HOLE_LOG	Many of the values in REPL_LOC_NO are not in LOC_NO for that section.
TST_HOLE_LOG	For many SPS testing locations, POINT_LOC is within another section according to SPS_PROJECT_STATIONS.

## Release 19.0

This was the 19<sup>th</sup> national release of data from the LTPP program. This release contains some revisions to data included in the July 2004 Data Release. This Data Release also includes a new software program, ESALCalc. In addition, several tables have been added to this release and some deleted, as noted, below:

### *Tables Added:*

**MON\_T\_PROF\_CROSS\_SLOPE:** This new table contains the elevation of the last data point, relative to the begin point, of manual transverse profile measurements made using the Dipstick device. This allows the transverse profile data to be de-normalized so that the true elevation profile, relative to the outside edge of the pavement lane, may be computed. This table is expected to be fully populated in 2006.



*SMP\_TDR\_MANUAL\_MOISTURE*: This table contains volumetric and gravimetric moisture content computed from dielectric constants interpreted and calculated from manually recorded TDR traces.

*CLM\_VWS\_HUMIDITY\_DAILY, CLM\_VWS\_PRECIP\_DAILY, CLM\_VWS\_TEMP\_DAILY, CLM\_VWS\_WIND\_DAILY*: These four tables were created to mirror similar monthly and annual climatic tables and to allow more selective analysis of the various daily data elements. These tables replace the table *CLM\_VWS\_DATA\_DAILY*. In addition, all Climatic tables contain data that were recomputed from Level E data provided by a national weather agency.

*RHB\_ACO\_SP\_\* Tables*

Three new Rehabilitation tables were added to this SDR. These tables are used for non-recycled asphalt pavement overlays using SuperPave properties. The tables and their description are listed in the table below:

<b>SDR Table Name</b>	<b>Contents</b>
RHB_ACO_SP_AGGR_PROP	This table contains Superpave AC overlay aggregate properties
RHB_ACO_SP_MIX PROP	This table contains Superpave AC overlay mixture properties as placed
RHB_ACO_SP_PROP	This table contains Superpave AC overlay asphalt cement properties

***Tables Removed:***

*MON\_T\_PROF\_DEV\_CONFIG*: This table contains information on equipment configuration settings used to capture, digitize, and interpret transverse profile measurements using the photographic and manual dipstick measurement methods. Note that transverse profile measurements based on the photographic method are obtained at the same time as the photographs for the film-based distress interpretations. Since this table provides little information to the data user, it is no longer included in the SDR.

*Rehabilitation Tables*

Several Rehabilitation tables were removed from this Data Release since there are no data stored in the tables. Listed below are the tables that have been removed:

- RHB\_CM RAP\_COMBINED\_AGG
- RHB\_CM RAP\_LAB\_AGED\_AC
- RHB\_CRACK\_SEAT\_PCC
- RHB\_PCCO\_STEEL
- RHB\_PRESSURE\_RELIEF

RHB\_RCYPCC\_COMBINED\_AGGR  
RHB\_RCYPCC\_CONSTRUCTION  
RHB\_RCYPCC\_JOINT  
RHB\_RCYPCC\_MIXTURE  
RHB\_RCYPCC\_NEW\_AGGR  
RHB\_RCYPCC\_STEEL  
RHB\_RCYPCC\_STRENGTH

#### *SPS Tables*

Several SPS tables were removed from this Data Release since there are no data stored in the tables. Listed below are the tables that have been removed:

SPS4\_TRANSIENT\_GENERAL  
SPS4\_TRANSIENT\_MEASURE  
SPS6\_TRANSFER\_EFFICIENCY  
SPS7\_LOAD\_TRANSFER  
SPS7\_PCC\_CRACK\_SEAL  
SPS7\_TRANSFER\_EFFICIENCY  
SPS7\_UNDERSEALING  
SPS8\_PCC\_FULL\_DEPTH  
SPS9\_AC\_PATCHES  
SPS9\_DIAMOND\_GRIND  
SPS9\_PCC\_JOINT\_RESEAL  
SPS9\_RUT\_LEVEL\_UP  
SPS9\_UNDERSEALING

*TST\_SC06*: This table was intended to contain measurements of excess asphalt in bituminous mixtures obtained by using a loaded wheel and sand cohesion. Although the table structure exists, no data for this test were ever loaded into the database. Since this table is empty, it is not included in the SDR.

*TST\_SC13*: This table was intended to contain measurements of the polish value of aggregates used in chip seals applied to SPS-3 sections only. Although the table structure exists, no data for this test were ever loaded into the database. Since this table is empty, it is not included in the SDR.

*TRF\_MONITOR\_BASIC\_INFO*: This table has been replaced by outputs from the ESALCalc software.

#### ***Other Additions to Release 19.0:***

*ESALCalc Software:*

A computer program called ESALCalc is included in the January 2005 SDR. This software will compute annual ESAL estimates from traffic monitoring data and pavement structure data. A manual is included with the software.

*Restructuring of Data Modules and CD Contents:*

Two data modules had to be restructured due to database size limitations in Microsoft® Access 2000. The Climate module was split into three databases: Climate\_Daily\_Humid\_Precip, Climate\_Daily\_Temp\_Wind, and Climate\_Summary\_Data. The two Climate\_Daily\_\* databases contain daily tables, while the Climate\_Summary\_Data database contains monthly, annual, and all other Climate tables.

The Seasonal Monitoring Program (SMP) module was divided into two new databases: Seasonal\_Monitoring and Seasonal\_Monitoring\_TDR\_Meas. The time-domain reflectometry (TDR) measurement tables are in the Seasonal\_Monitoring\_TDR\_Meas database, while all other SMP tables are in the Seasonal\_Monitoring database.

In addition, the data modules had to be rearranged on CDs 1 and 2. The SMP and Backcalculation modules were added to CD 2, which also contains FWD Measurements. This CD has been renamed “Seasonal Monitoring and Deflection”. CD 1 remains the same, minus the SMP and Backcalculation modules. CD 1 is referred to as the “Primary Data Set”.

*Issues Identified Since Release 18.0:*

Below is a table that describes data issues found during a review of the July 2004 Data Release. Data analysts should review this list when performing research.

<b>Table</b>	<b>Issue</b>
AWS_HOURLY_DATA	For site 350101, the pyranometer readings are suspect.
EXPERIMENT_SECTION	The TRAFFIC_RS field is not populated correctly for some records.
MON_DIS_JPCC_FAULT	For certain sections, the faulting values are very inconsistent over time.
MON_DIS_JPCC_FAULT	The POINT_LOC value assigned to a given crack or joint varies slightly over time on some sections.
MON_DIS_JPCC_FAULT	For certain POINT_LOC's on given section, there are large spikes in the measured faulting value.
MON_DIS_JPCC_FAULT	For a given POINT_LOC, the CRACK_OR_JOINT designation changes over time for some sections.
MON_DIS_*_REV	Many null values should, in fact, be recorded as zero.
MON_DIS_AC_REV	The fatigue cracking values on 010102 are suspect.
MON_DIS_CRCP_REV	For 185518, OTHER indicates multiple patches, while the patching fields indicate only one.

<b>Table</b>	<b>Issue</b>
MON_DIS_AC_REV	For a number of sites, BEFORE_TEMP and AFTER_TEMP are zero during summer months, indicating that the values should probably be null instead.
MON_DIS_CRCP_REV	On section 485328, 1/22/01, PHOTO_VIDEO = P, but comments indicate no pictures obtained.
MON_DIS_CRCP_REV	485274, 2/11/97 has LONG_JOINT_SEAL_NO = 0, LONG_JOIN_SEAL_DAM_L > 0.
MON_DIS_JPCC_REV	Inconsistent rating of transverse cracking on sections 290704, 290705.
MON_DIS_JPCC_REV	For a number of surveys on various sites, the number of map cracking areas is zero, but the area is non-zero.
MON_DIS_JPCC_REV	Inconsistent rating of map cracking on section 100210.
MON_DIS_JPCC_REV	On section 124000, 7/21/99, OTHER indicates presence of map cracking, though map cracking field contains zeroes.
MON_DIS_JPCC_REV	For 313033, 11/16/99 and 290605, 7/20/95, PUMPING_NO = 0 while PUMPING_L > 0.
MON_DIS_JPCC_REV	For the 8/7/91 survey on the 2906** sections, OTHER indicates pumping, while the pumping fields indicate none.
MON_DIS_JPCC_REV	For 18A430, 5/1/91 and 370201, 9/19/02, OTHER indicates polished aggregate, but POLISH_AGG_A = 0.
MON_DIS_JPCC_FAULT	EDGE and WHEELPATH measurements differ by > 12mm.
SMP_JOINT_FAULT	Various fault values are entered to 0.1mm, but the device is supposed to read to 1mm only.
SMP_ATEMP_RAIN_HOUR	Temperatures very low for certain dates on sections 131031(-42) and 351112 (-49).
SMP_ATEMP_RAIN_DAY	Hourly average in HOUR outside min and max values in DAY.
SMP_ELEV_PCC_DATA	Sections 274040 (9/22/93), 484143 (9/25/97), and 833802 (various dates) have questionable elevation data.
SMP_ELEV_AC_DATA	Questionable elevation data on 310114, 390901, 460804, 469187, 501002, 831801, and 906405.
SMP_ATEMP_RAIN_DAY	483739 (2/15/97) has null daily values where there is sufficient info in the hourly table (>20 hours) to calculate it.
SMP_MRCTEMP_AUTO_DAY_STATS	483739, THERM_NO = 18(after 5/6/00) and 11(after 6/6/00) have very high values - looks like bad sensor.
SPS9_PMA_PROFILE	180901, 0902, 0904, and 0905 have zero PROFILE_INDEX, which is not a reasonable value.
TRF_EQUIPMENT_MASTER	Where sensor type is null, it should be N.
TST_HOLE_LOG	460901, FIELD_SET = 1 has multiple construction numbers associated with it - which can cause incorrect CN assignment.

<b>Table</b>	<b>Issue</b>
TST_AC01	089020, FIELD_LAYER_NO = 4 has an average thickness of zero.
TST_AC01_LAYER	2606** layers 4, 5, 6, 260902 layers 5, 6, 7, 469197 layer 5, and 511423 layer 6 do not have matching layers in TST_L05B.
TST_AC01_LAYER	For 18A959, there are records with FIELD_LAYER_NO = 1 (which would be subgrade).
Various	In many TST tables, there are SAMPLE_NO entries that do not have a match in one of the sampling tables.
Various	In many TST tables, there are LOC_NO entries that do not have a match in one of the sampling tables.
Various	In many TST tables, there are LAYER_NO entries that do not have a match in TST_L05B.
Various	Some records in TST_AE03, PC03, PC06, SS01_UG01_UG02, SS04_UG08, UG04_SS03, and UG05_SS05 have test results reported for layers inappropriate for the test type (bound layers for unbound tests, etc...).
TST_AC04	Comments indicate multiple samples, but LOC_NO or SAMPLE_NO are for a single sample.
TST_AE01	There are many ASH_CONTENT values over 2, which may indicate the test was not done properly.
TST_HOLE_LOG	Many sections have holes with locations far outside section boundaries (+/- 200').
TST_HOLE_LOG	There are many records with negative TRANS_POS, but a LOC_NO not indicative of shoulder testing.
TST_HOLE_LOG	Many of the values in REPL_LOC_NO are not in LOC_NO for that section.
TST_HOLE_LOG	For many SPS testing locations, POINT_LOC is within another section according to SPS_PROJECT_STATIONS.
TST_L05B	Several records have inconsistent LAYER_TYPE and DESCRIPTION.

## Release 18.0

This was the 18th national release of data from the LTPP program. This release contains some revisions to data included in the January 2004 Data Release. New tables included for the first time in this release and updates are noted in the following:

### ***Ground Penetrating Radar Module***

In 2003, Ground Penetrating Radar (GPR) measurements were performed on a subset of LTPP sections to provide an estimate of layer thickness variations within the monitoring portion of the test section. The measurements were performed on all SPS-1 project sites still in-service at the time. Measurements were also performed on one selected SPS-2, and SPS-5, and SPS-6 project site. The results of the measurements are stored in the GPR data module. Listed below are the tables and a brief description of each:

<b>SDR Table Name</b>	<b>Contents</b>
GPR_MASTER	One record is included in GPR_MASTER for each measurement pass on a test section. Typically there are two measurement passes on a test section.
GPR_THICK_POINT	This table contains the results of the thickness interpretations from the GPR measurements.
GPR_THICK_SECT	This table contains statistics on the thickness and dielectric constant from data contained in the GPR_THICK_POINT table whose stations fall inside the monitoring portion of the test section.
GPR_LINK_LAYER	This table provides a link between pavement layers identified in the GPR measurements and pavement layers identified by other means. It is not possible to identify layers with similar material properties with GPR measurements. To analyze GPR data, multiple layers in the physical pavement structure can be combined into a single layer.

### ***Drainage Inspection Tables***

Three new tables were added to the Monitoring module containing data information on the condition of the edge drain systems installed at the SPS-1, and -6 projects. In the future, tables may be added for other drainage feature evaluations. Listed below are the tables and a brief description of each:

<b>SDR Table Name</b>	<b>Contents</b>
MON_DRAIN_MASTER	This table contains information on the permanent features of the edge drain system and the location of the lateral openings.
MON_DRAIN_CONDITION	This table contains information regarding the condition of the lateral openings and the area around the lateral openings at the time of inspection.
MON_DRAIN_INSPECT	This table contains information on the results of the video edge drain inspection.

*TST\_UNBOUND\_SPEC\_GRAV*: This table contains the specific gravity of unbound base and subgrade materials. Since this test was not specified in the original material test guidelines for LTPP sections, data are only available for a subset of test sections. The current source of this data is from resilient modulus tests performed by one of the LTPP contract laboratories. Although not required, that laboratory contractor included this measurement in their test results. Test data are currently available for test sections in the North Atlantic and Southern Regions. Depending on budget constraints, it is planned to obtain these measurements from SPS project sites in the future. There are no plans to obtain this data from other GPS test sections. This table is currently undergoing population and not all of the available data have been entered.

### ***Climate Data***

This release contains a major data update to the Climatic module covering the period from 1997 to 2002. Additions and corrections were made to the CLM\_SITE\_VWS\_LINK table to add links for test sections and SPS projects missing in the previous data releases. The QC on the CLM tables was run with a “no manual upgrade” policy. A very small percentage of records failed one or more checks and were left in the database with a non-level E RECORD\_STATUS.

### ***Data Dictionary and Codes***

This data release contains a major revision to the data dictionary contained in the LTPPDD table and the codes contained in the CODES table. Some of the revisions included removing fields no longer needed, modifying field descriptions, updating the field indicating the data sheet used to record the data, and adding missing codes.

### ***Tables Removed***

Three tables that were included in previous releases were removed from this release. TST\_L06 and TST\_L07, which contained the sample disposal record for AC and PCC specimens, were removed since they contained information of little use to a data analyst. The table SMP\_WATERTAB\_DEPTH\_AUTO was also excluded since there was no data in the table, and no data is expected in the future.

## **Release 17.0**

Data Release 17.0 was made available in January 2004. This release contains some revisions to data included in the July 2003 Data Release. No changes or updates have been made to data in the climatic and dynamic load response modules.

### ***Superpave Asphalt Binder and Mixture Tests***

Data Release 17 contains, for the first time, the data from Superpave-related asphalt binders and mixtures. This data includes test results from the dynamic shear rheometer, bending beam

rheometer, direct tension, gyratory compaction, and volumetric and gravimetric properties of gyratory compacted specimens. This data represents only a partial set of available data. LTPP contractors are still in the process of entering these data and resolving errors. More data are expected to be included in Release 18. Data users are encouraged to contact LTPP Customer Service with questions or problems that they may find in the contents of these new tables.

To store these data, the following eleven tables were added to the material test module (TST).

<b>SDR Table Name</b>	<b>Contents</b>
TST_LINK_LAYER	Links between TST_ID and layers in TST_L05B
TST_LINK_SAMPLE	Links between TST_ID and samples in TST_SAMPLE_LOG
TST_AE07_MASTER	Sample and configuration information for Dynamic Shear Rheometer (DSR) test
TST_AE07_DATA	Data from Dynamic Shear Rheometer (DSR) test
TST_AE08_MASTER	Sample and configuration information for Bending Beam Rheometer (BBR) test
TST_AE08_DATA	Data from Bending Beam Rheometer (BBR) test
TST_AE09_MASTER	Sample and configuration information for Direct Tension (DT) test
TST_AE09_DATA	Data from Direct Tension (DT) test
TST_SP01_MASTER	Sample and configuration information for gyratory compaction test
TST_SP01_DATA	Data from gyratory compaction test
TST_SP02	Asphalt mix volumetric and gravimetric information

Since some of these tests represent samples of materials used in more than one layer on multiple test sections, a field named TST\_ID is used as primary key in these tables to link material test results to test sections and pavement layers. The TST\_LINK\_LAYER table provides a linkage between TST\_ID and test sections and pavement layers in the TST\_L05B table, using the fields STATE\_CODE, SHRP\_ID, CONSTRUCTION\_NO, and LAYER\_NO. The TST\_LINK\_SAMPLE table provides linkage between TST\_ID and material sampling information contained in TST\_SAMPLE\_LOG using the fields STATE\_CODE, SHRP\_ID, FIELD\_NO and SAMPLE\_NO.

### ***Supplemental Test Section QC***

This is the first data release that includes the results of quality checks on data from supplemental test sections constructed on the Specific Pavement Studies sites. The RECORD\_STATUS field in records for supplemental test sections should now be populated as it is for other test sections. Although the majority of the new checks worked as expected, data users may find some anomalies that have not been corrected. Please contact LTPP Customer Service with questions or issues related to supplemental section QC.



### ***SPS 9 Construction Data***

SPS-9 construction data was first released in the July 2003 data release. Work continues on entering SPS-9 construction data to the SPS module.

### ***Traffic Monitoring Data***

Processing of traffic monitoring data collected between 1999 and 2002 has been substantially completed. Work continues on loading and resolving errors in “problem” data sets from this time period. More traffic monitoring data is expected to be available in the next data release.

### ***Distress Data***

Distress data processed by version 1.0 of the Padias software is being reprocessed with version 4.2 of the software. Distress survey records that have been migrated to the MON\_DIS\_PADIAS42 tables over the past several data releases have been removed from the MON\_DIS\_PADIAS tables.

## **Release 16.0**

Data Release 16.0 was available in July 2003. This release contains some revisions to data included in the January 2003 Data Release and includes new pavement monitoring, construction and materials test data collected through May 2003.

One new table, TRF\_MONITOR\_LTPP\_LN, was added to the Traffic module for this release. Another table, TRF\_MONITOR\_AXLE\_DISTRIB, was restructured. The old TRF\_MONITOR\_AXLE\_DISTRIB table was structured as one record per axle type per weight bin or 160 records per site per year. All bins and all axle types are present for every site (even some without weight data). The new TRF\_MONITOR\_AXLE\_DISTRIB has one record per axle type per vehicle class or a maximum of 40 records per site per year. If an axle type or vehicle class was not weighed, there is no record in the database.

LTPP is in the process of implementing new and improved traffic analysis software and clearing the backlog of unprocessed traffic monitoring data. The two tables noted above contain the output from the new analysis software for pre-1998 data previously processed using the old software and post-1998 data that had not previously been processed and released. It is anticipated that the backlog of un-processed traffic monitoring data will be cleared in 2004. Some of the tables containing data created by the old traffic analysis software have been removed from this release.

This release also contains the first release of data from all of the SPS-9 construction data tables.

A new table, LTPPTD, was added to the administration module. This table contains table descriptions for all of the tables included in the release. The Table Navigator software included in the release automates the database schema, including descriptions of all tables, fields and codes.