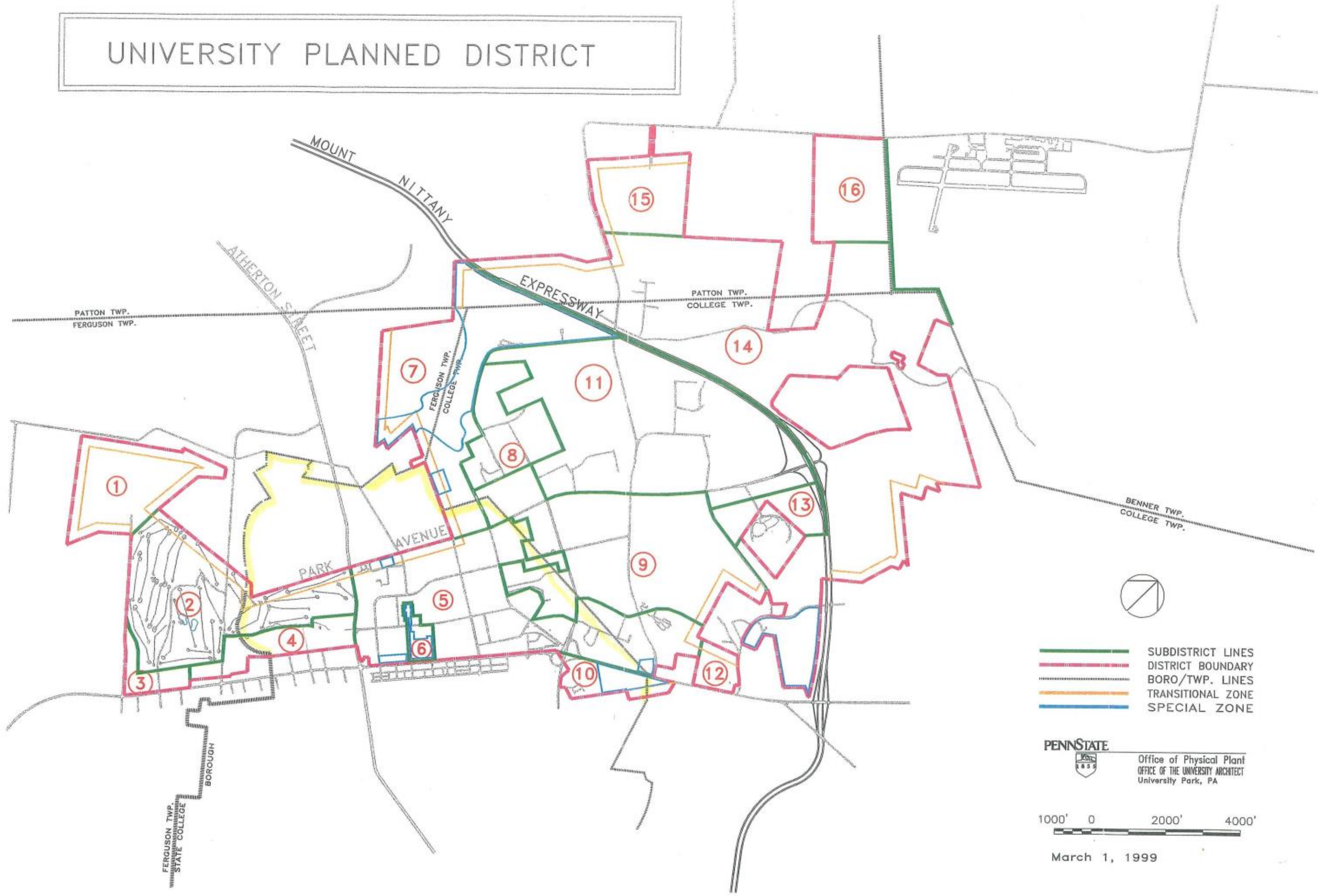
University Planned District

Subdistrict Map


UNIVERSITY PLANNED DISTRICT
MOUNT NITTANY
EXPRESSWAY
ATHERTON STREET
PARK AVENUE
PATTON TWP.
FERGUSON TWP.
PATTON TWP.
COLLEGE TWP.
FERGUSON TWP.
COLLEGE TWP.
BENNER TWP.
COLLEGE TWP.
FERGUSON TWP.
STATE COLLEGE
BOROUGH
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
SUBDISTRICT LINES
DISTRICT BOUNDARY
BORO/TWP. LINES
TRANSITIONAL ZONE
SPECIAL ZONE
PENNSTATE
Office of Physical Plant
OFFICE OF THE UNIVERSITY ARCHITECT
University Park, PA
1000' 0 2000' 4000'
March 1, 1999

University Planned District

Development Parameters
(by Subdistrict)

Development parameters by subdistrict **3/1/1999**

subdistrict	1	2	3	4	5	6	7	8
area (acres)	162	290	28	91	456	21	395	112
area (sq ft)	7,056,700	12,632,400	1,219,700	3,964,000	19,863,400	914,800	17,206,200	4,878,700
FAR total	0.2	0.02	0.6	0.5	1	0.3	0.02	0.5
max buildout (sq ft)	1,411,300	252,600	731,800	1,982,000	19,863,400	274,400	344,100	2,439,400
existing sq ft	3,900	28,500	0	255,000	11,616,900	140,000	40,000	320,000
FAR designated	0.2	0.02	0.6	0.05	0.05	0	0.01	0.5
designated buildout	1411300	252600	731600	198200	993200	0	172000	2439400
max % impervious	50%	5%	80%	55%	55%	25%	10%	60%
max imperv.sq. ft	3,528,400	631,600	975,700	2,180,800	10,924,800	228,700	1,720,600	2,927,200
existing impervious	17,200	320,100	24,600	443,200	9,262,300	169,100	258,900	849,300
maximum height (ft)	45	45	60	90	90	90	45	90

subdistrict	9	10	11	12	13	14	15	16
area (acres)	420	37	584	26	66	1111	108	130
area (sq ft)	18,295,200	1,611,700	25,439,000	1,132,600	2,875,000	48,395,200	4,704,500	5,662,800
FAR total	0.17	0.15	0.05	0.8	0.4	0.025	0.05	0.05
max buildout (sq ft)	3,110,200	241,800	1,272,000	906,000	1,150,000	1,209,900	235,200	283,100
existing sq ft	1,583,100	70,800	620,000	0	128,000	51,300	47,500	0
FAR designated	0.17	0.15	0.01	0.8	0.4	0.02	0.02	0.05
designated buildout	3,110,200	241,800	354,400	906,000	1,150,000	967,900	94,090	283,100
max % impervious	50%	25%	13%	50%	60%	10%	10%	30%
max imperv.sq. ft	9,147,600	402,900	3,307,100	566,300	1,725,000	4,839,500	470,500	1,698,800
existing impervious	4,072,000	137,000	2,021,900	0	271,900	486,200	179,600	104,000
maximum height (ft)	90	90	90	45	65	60	60	60

University Planned District

Parking Projections

Penn State University
Transportation Services
University Planned District
Parking Study

February 1999

	Actual		Projected						
	1995	1999	2000	2001	2002	2003	2004	2005	2006
Staff									
Employment	15169	14000	14140	14281	14424	14568	14714	14861	15009
Registration	8860	10197	10332	10425	10529	10635	10741	10105	10957
Registration Rate	71%	73%	73%	73%	73%	73%	73%	68%	68%
Space Assignment Ratio	110%	110%	110%	110%	110%	110%	110%	110%	110%
Space Demand	8055	9270	9393	9477	9572	9668	9765	9187	9961
Student -- Commuter									
Non-resident enrollment	25284	29735	29735	29625	29350	29175	29175	29175	29175
Registration	2055	2478	2478	2459	2436	2421	2421	2421	2421
Registration Rate	8.1%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%
Space Assignment Ratio	200%	200%	200%	200%	200%	200%	200%	200%	200%
Space Demand	1028	1239	1239	1229	1218	1211	1211	1211	1211
Student -- Resident									
Resident Enrollment	12935	10481	10481	10591	10866	11041	11041	11041	11041
Registration	3165	2812	2830	2859	2933	2981	2981	2981	2981
Registration Rate	24%	27%	27%	27%	27%	27%	27%	27%	27%
Space Assignment Ratio	100%	100%	100%	100%	100%	100%	100%	100%	100%
Space Demand	2930	2812	2830	2859	2933	2981	2981	2981	2981
Student -- Off Campus Storage									
Space Demand	750	784	784	784	784	784	784	784	784
Visitor									
Metered Space Available	320	427	427	427	427	427	427	427	427
Average Daily Permits Sold	60	54	54	54	54	54	54	54	54
Average Daily Advance Sales	44	8	8	8	8	8	8	8	8
Average Daily Conf. Permits	75	22	22	22	22	22	22	22	22
Space Demand	499	511	511	511	511	511	511	511	511
Total Demand	**13262**	**14616**	**14857**	**14860**	**15018**	**15155**	**15252**	**14674**	**15448**

Key
Staff Demand = (Employment X Registration Rate)/Assignment Ratio
Student Commuter Demand = (Commuter Enrollment X Registration Rate)/Assignment Ratio
Student Resident Demand = (Housing Occupancy X Registration Rate/Assignment Ratio
Visitor Demand = Assigned Visitor Spaces + Average Daily Permits
Total Supply = existing inventory + Proposed Construction - Anticipated Losses

Penn State University
Transportation Services
University Planned District
Parking Study

Parking Supply Projections by Subdistrict

	Actual		Projected						
	1995	1999	2000	2001	2002	2003	2004	2005	2006
Existing Supply by Subdistrict									
Subdistrict 1	0	0	0	0	0	0	0	0	0
Subdistrict 2	30	75	75	75	75	75	75	75	75
Subdistrict 3	0	0	0	0	0	0	0	0	0
Subdistrict 4	829	1069	1069	1244	1419	1594	1594	1594	2394
Subdistrict 5	8404	9689	9878	11101	10816	10531	11246	10961	10676
Subdistrict 6	26	34	34	34	34	34	34	34	34
Subdistrict 7	1366	0	0	0	0	0	0	0	0
Subdistrict 8	350	439	439	439	439	439	439	439	439
Subdistrict 9	2604	4904	4904	4904	4904	4904	4904	4904	4904
Subdistrict 10	0	74	74	74	74	74	74	74	74
Subdistrict 11	735	735	735	735	735	735	735	735	735
Subdistrict 12	0	0	0	0	0	0	0	0	0
Subdistrict 13	0	0	0	0	0	0	0	0	0
Subdistrict 14	30	30	30	30	30	30	30	30	30
Subdistrict 15	50	50	50	50	50	50	50	50	50
Subdistrict 16	0	0	0	0	0	0	0	0	0
Subdistrict total -- adjusted for gains/losses	14424	17099	17288	18686	18576	18466	19181	18896	19411

Planned Projects

	2000	2001	2002	2003	2004	2005	2006
West Campus Housing		175	175	175			
Replacement for Lot 80		500					
Expansion of Nittany Deck	400						
Expansion of HUB Deck	74						
Expansion of Eisenhower Deck		183					
New Deck Construction		825					
New Deck Construction					1000		
New Deck Construction D4							800
Losses due to building expansion on average	-285	-285	-285	-285	-285	-285	-285

University Planned District (UPD)
Parking Projections
February 1999

STAFF DEMAND

The Parking Office at Penn State tracks staff parking registration levels. Future registration levels and demand can then be predicted based on past history. JJR (the Master Plan consultants) and BRW (the Transportation Demand Management, 1DM, consultants) have informed us that we can expect a 5% reduction in parking demand due to 1DM practices. The TDM study looked at the next 5 to 7 years. The 5% reduction was assigned as a lump sum for year 2005 in the attached document, but will probably show up gradually over the course of implementation. While there is some turnover in these lots due to appointments, various University work shifts, and personal schedules, occupancy is somewhat stable, especially in the 10:00 AM to 3:00 PM, Monday through Friday time frame.

STUDENT DEMAND

Student parking is broken down into Commuter, Resident, Off-Campus Storage. They have different utilization patterns.

- Commuter. There is a relatively high daily turnover as students come and go for classes. The use snapshot of the commuter lot was taken at about 2:00 PM on a Wednesday during Spring semester. At that time, 1110 spaces were in use in the Commuter lot. At that time, there were about 2478 permits in circulation. This creates a space assignment ratio of slightly more than 223%. For the purpose of this study an assignment ratio of 200% was used due to slightly higher assignment during Fall semesters in general.
- Resident: Resident permits are based on a space assignment ratio of 100% as it is assumed that occupancy of resident lots is very stable and does not fluctuate during the day. Therefore there should be a space for each permit sold. We currently have a surplus of resident storage spaces.
- Off Campus Storage: This group exhibits essentially the same dynamics as the resident lots. Permits are sold to capacity of the lot, 784.

VISITOR

Visitor parking is portrayed in terms of averages as the day of the week and the time of the year have a great impact on visitor usage. There are 427 metered spaces on campus designated for visitor use only. However, the visitor capacity is a good deal greater than that as visitors are also assigned to surplus employee parking locations. Visitor demand was calculated by adding the number of metered spaces to the average daily permits issued.

EVENTS

The inauguration of the Bryce Jordan Center has created a new set of dynamics for parking at Penn State that did not exist prior to its opening. Football does not create the same dynamics that the BJC does due to the half dozen police departments that become involved with football but not BJC, the time of the year, time of day of event start and the window, in hours, that patrons arrive. Football patrons arrive over the course of several days arid also several hours prior to kick off. At the BJC while the gate is smaller, everyone arrives in the last 45 minutes prior to event start. The University is still actively working on the details of this situation and will continue to refine its processes to achieve maximum efficiency.

SUPPLY

Demand projections are based on normal day to day usage patterns for the campus as a whole. Parking supply planning is based upon usage patterns, events, usage patterns within areas on central campus and future losses and gains of parking locations.

Parking Lot 44 and the new Events lot west of Beaver Stadium have been created providing over 3000 new spaces adjacent to the Jordan Center. Lot 44 provides parking for both commuters, outside contractors working on campus and for events. The Events lot currently is used for BJC activities only. However, consideration needs to be given to the University's unique usage patterns in the design of large lots that should be used for both events and faculty/staff parking as the TDM and Master Plans are implemented over the next several years.

As the west campus expansion unfolds, there are plans to create new parking west of Atherton Street both in surface and garage facilities. It is anticipated that these lots will serve faculty/staff, commuters and resident students.

University usage patterns are unique. Most of the lots do not exhibit the same characteristics as a typical shopping mall or shopping center. While turnover at Lot 44 is high, compared to the rest of campus, it is not as high as a commercial area as students who use this lot are here for a minimum 50 minute class period plus travel time from the lot to campus and back. The only locations on campus that partly resemble local commercial areas are the HUB Deck and the Nittany Deck. Because of the different dynamics that impact University parking lots, different design elements need to be explored such as limited islands and interior barriers, external vegetative screening, etc.

Overall, the University has planned to keep up with and in some cases slightly exceed expected demand. The University will periodically review the supply and demand projections to ensure efficient balances between supply and demand.

University Planned District

Transportation Study

TRAVERS ASSOCIATES
950 CLIFTON AVENUE
CLIFTON NEW JERSEY 07013-2790

CONSULTANTS
TRANSPORTATION AND
TRAFFIC ENGINEERING

201-365-0510

ADVANCE

MEMORANDUM OF RECORD

TO: The Pennsylvania State University Charles E. Brueggebors
Director and University Architect

BY: Travers Associates, Inc.
Warren Travers, P.E.
Kenneth A. Newman, P.E.
David A. Stroud

SUBJECT: UNIVERSITY PLANNED DISTRICT
PART B - MASTER PLAN TRAFFIC STUDY
Centre Region Campus
University Park, Pennsylvania
Project 191-127-02

DATE: February 10, 1994

The Pennsylvania State University (PSU) has been working in cooperation with State College Borough and several, adjacent townships to establish a University Planned District (IJPD). This district will incorporate consistent zoning requirements for future University facilities throughout the district, as set forth in the UPD Draft Model Ordinances and Sample Narratives, May 7, 1993.

The technical effort was divided into two components:

Part A — Master Plan Supplement
Part B — Master Plan Traffic Study

Part A, submitted separately, deals primarily with an update of the 1988 Master Transportation Plan.* Part .B, the subject of this memorandum, deals with the traffic element of the master plan and has been prepared in accordance with the requirements of the proposed UPD.

The UPD ordinance requires that the University prepare a master plan traffic study based on 10—year growth projections for planned University facilities. The purpose of the traffic study is to identify intersections that may experience operational deficiencies in the master plan year.

This memorandum outlines the basic format of the master plan traffic study and presents intersection delay and Level of Service comparisons for the Base Year 1990 and the Master Plan Year 2000.

Key to the UPD is the concept that University traffic is generated by parking facilities and not by buildings. Therefore, the UPD model's traffic projections for University facilities are directly related to existing and/or proposed parking structures and lots. As individual components are to be implemented, their traffic impacts will be evaluated separately and affected intersections will be studied in detail.

Attached Figures 1 through 4, discussed herein, are full-size illustrations and are not part of the body of this memorandum. These figures are identified as follows:

ILLUSTRATIONS (Attached)

No.	Description
1	Model Network — 1990
2	Model Network — 2000
3	Parking — 1990
4	Parking — 2000

TRAFFIC STUDY RATIONALE

The dual requirement for a 10-year traffic master plan and individual component impact studies indicates that a common study format would be desirable. That is, the data and procedures utilized for the master plan study should be directly transferable to individual future impact analyses. It was determined that a computerized model would provide the most efficient methodology and format for both the master plan traffic study and subsequent impact efforts.

Computerized regional models present several benefits over the conventional traffic impact study format. First, all of the desired study intersections can be evaluated simultaneously rather than one at a. time. And, improvements to the highway network can easily be incorporated. Corresponding changes in traffic patterns that affect operations at the study intersections can readily be evaluated. Additionally, future traffic growth can be estimated consistently for the entire network, and non-University growth can also be assigned to the network in a consistent, network-wide manner.

The Centre Region Planning Commission has adopted a Regional Transportation Plan (RTP) for the year 2010 based on a traffic and transportation computer model. The plan was prepared by COMSIS Corporation using software known as MINUTP. The RTP computer model is a comprehensive-type computer model which is capable of generating only 24-hour volume projections.

The UPD study, however, needs to focus on peak hour, intersection-specific information to establish Levels of Service. Accordingly, a model based on the parameters contained in the National Cooperative Highway Research Program Report (NCHRP) 187* was utilized to form the basis for the master plan traffic study. The model, Quick Response System II (QRS II), has the capability of generating traffic volume projections for any desired hour of the day and estimating delays at key intersections. Whenever possible, data from the RTP model was utilized, including the basic roadway network and socio-economic characteristics. Modifications to this data necessitated either by revised information, network corrections or QRS II requirements will be described in subsequent sections of this memorandum.

The requirements for the master plan traffic study were established at a scope meeting held on February 24, 1993. It was determined that the 1990 census data contained in the RTP model would form the base year for validating the traffic analyses of the UPD master plan model. The 10-year study period was initially established as 1993 to 2O03. However, subsequent evaluation of the data in the RTP model indicated that intermediate year projections of socio-economic characteristics would require an extensive evaluation and modification of all input data in the study area. And, subsequent 10-year updates based on future census data would also have to be adjusted to an intermediate year. Accordingly, the 10-year period 1990 to 2000 was selected for evaluation, consistent with the beginning period of the RTP model.

ORS II MODEL DEVELOPMENT

The following discussions are provided to give an overview of the procedures involved in developing the UPD master plan traffic study models for morning and evening peak hour traffic conditions in the year 2000. In order to develop the peak hour models for the UPD master plan, it was necessary to first develop and validate 1990 base year models for both daily and peak hour conditions. The RTP model, a comprehensive planning-type model which computed daily traffic for 1990 and 2010, formed the basis for the master plan models.

Streets and intersections making up the network are represented by links and. nodes. Links represent sections of roads or highways and nodes represent intersections. The types of links used in the UPD model network are two-way streets, two-way streets with no left turns and one-way streets. Divided highways such as the Nittany Expressway were modeled as one-way street pairs. There are approximately 1,000 total roadway links in the study area network. Tables containing all of the network link volumes for the base year 1990 and master plan year 2000 models have been compiled and submitted separately.

The types of nodes used in the UPD model network include intersections with penalties and intersections with no penalties. The distinction between these two intersection types is that intersections with penalties allow travel time penalties (delay) to be placed on intersection turning movements to represent traffic flow impedances. The QRS II model will only calculate vehicular delay (and thus Levels of Service) for intersections with penalties. Therefore, all of the intersections evaluated in the master plan traffic study were coded as intersections with penalties.

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* NCHRP Report 187, Quick-Response Urban Travel Estimation Techniques and Transferable Parameters, 1978.

The study area is represented by 150 traffic analysis zones (TAZs). TAZs divide the region into small areas for planning purposes. The TAZs are represented in the UPD model as centroids. Centroids, which are placed at the center of each TAZ, contain the socio-economic characteristics of the people living in it. This data is used by the UPD model to determine trip productions and attractions. The TAZs that represent the University are numbers 45 through 57 and 73 through 76.

The RTP model has its centroids connected to the network at intersection nodes. This type of network construction, while acceptable for a 24-hour analysis, is not appropriate for a peak hour intersection evaluation model. In order to accurately model and evaluate intersection traffic, the centroids must be connected to midblock locations. Every centroid connection in the RTP model had to be deleted and redrawn to intersect highway links at midblock locations.

Once the Base year 1990 road network had been created and the data entered, it was necessary to validate the model to ensure that the QRS II's modeling parameters adequately reflect travel in the study area. This was accomplished by comparing the computer model projections of daily traffic volumes with average daily traffic (ADT) counts and adjusting model parameters until the assigned volumes match the counted volumes. Next, morning and evening peak hour traffic assignments were validated by comparing model projections of peak hour volumes with peak hour counts and adjusting link parameters and intersection delays until the assigned volumes approximate the counted volumes. All of the validation effort was confined to the Base year models, to enable comparison with counted traffic volumes.

Additional technical information concerning the development of the UPD model is presented in Appendix A and specific details of the validation process are discussed in Appendix B.

<u>Base Model - Year 1990</u>

The basic 1990 roadway network represented in the RTP model was used in the 1990 UPD base year model. The Centre Regional Planning Commission and Borough of State College, together with Travers Associates, identified 51 intersections to be evaluated by the UPD model in the 1990 base year. These 51 intersections, subsequently referred to as Study Intersections, are listed in Table 1A in Appendix E.

The RTP model network was modified and enhanced to develop the UPD base year network. The PSU Campus street system and the interchange at University Avenue and College Avenue were added to provide sufficient detail for the master plan traffic analyses. Also, the 51 existing Study Intersections had to be coded to represent the type of traffic control in place during 1990. The intersections were coded in the model as either signalized, all-way stop or some-way stop controlled intersections. The 1990 UPD model network is illustrated in Figure 1.

The 1990 base year Study Intersections have a total of approximately 200 approach links. All Study Intersection approach links were checked and the appropriate geometry/ sign codes for the intersection traffic control added. The link name of each Study Intersection approach was given the symbol <T> to distinguish it from intersection approaches not being evaluated. All Study Intersection link names were revised as required so that the names would correspond to the direction of the link in the network. Two-way streets have two volumes reported in the model, one for the A to- B direction and one for B to A. For example, the approach link identified as "Atherton between College and Beaver" indicates that the A to B direction is from College to Beaver (and, the B to A direction is from Beaver to College). This name convention allows for the proper identification of the direction of link traffic volumes. The base year 1990 Study Intersection link volumes are detailed in Table 2 in Appendix E.

Master Plan Model — Year 2000

The UPD 1990 base year model network was modified to include anticipated future roadway projects.* The Year 2000 UPD model network, illustrated in Figure 2, includes the following roadway improvements: 1) Western Inner Loop with connections to Bristol Avenue and Old Gatesburg Road, 2) Eastern Inner Loop with University Drive Extension to connect with North Atherton Street via Clinton Avenue, together with a connection to the Mt. Nittany Expressway, 3) Airport Road Extension from Park Avenue Extension north to Fox Hill. Road in Patton Township and 4) Route 26 Relocation from Park Avenue Extension east to Benner Pike (Route 150) and beyond to Route 26. The UPD base year model network was also modified to include: 5) the extension of Pollock Road west to Western Inner Loop and 6) the Corl Avenue closure between Clinton Avenue and Pollack Road Extension.
The 56 Study Intersections associated with the year 2000 UPD model are listed in Table lB in Appendix E. The first 51 intersections are identical to those evaluated in the 1990 Base year; intersections 52 through 56 represent additional Study Intersections created by the planned roadway improvements. The Study Intersection link volumes are detailed in Table 3 in Appendix E.

Additional changes to the TAZ data were necessary to reflect both planned development and normal growth. These changes, together with technical information regarding the socio-economic input requirements for the UPD mode, are also discussed in Appendix A.

INTERSECTION DELAY AND LEVEL OF SERVICE

The QRS II model has the capability of generating several different reports depicting the results of the model run. The report containing vehicular delays at Study Intersections has been utilized to obtain Level of Service results.

Intersection-capacities are typically developed, utilizing the 1985 Highway Capacity Manual (HCM).* The procedures provide information concerning average vehicular stopped delay (for signalized intersections) and reserve capacity (for unsignalized intersections). Operational Levels of Service (LOS) have been assigned either to ranges of delay or reserve capacity, depending on the type of control. The service levels for both signalized and unsignalized inter sections vary from A (the highest) to F (the lowest).

* As detailed in the 1988 Master Transportation Plan (University Park) and the Regional Transportation Plan.
* Special Report 209, Transportation Research Board

Signalized Intersections

The QRS II model calculates average delay for signalized intersection approaches using methodology similar to the HCM. However, the algorithms have been modified to produce only the value of uniform delay for each approach (as opposed to the HCM delay calculation which also includes incremental delay). And, QRS II does not make adjustments for lane width, grade and other HCM input factors. More over, QRS II automatically selects signal splits (i.e., green time for each phase) and phasing (i.e., protected left turn phases) with no operator input possible. Thus, the intersection signal phasing reported by the model does not necessarily reflect actual operations. Delay results are not intended to replace the HCM methodology. The delay values do however provide a useful tool for evaluating overall intersection operations. The delays were converted to Level of Service using the HCM definitions to provide a basis for determining acceptable versus undesirable operating conditions at any given location. Level of Service thresholds have been adapted directly from the HCM. A copy of Signalized Intersection LOS definitions is in Appendix C.

Unsignalized Intersections

Unlike the current HCM, QRS II also calculates approach delays at unsignalized (STOP-sign controlled) intersections for all side street approach movements and left turns from uncontrolled approaches. This result is considered superior to the HCM's Reserve Capacity computation in that a more direct comparison of signalized versus unsignalized operations can be obtained. Unsignalized delay values were converted to Level of Service based on information in a recent Transportation Research Board circular[**]. LOS thresholds again range from A to F and are based on delay. Definitions of Unsignalized Intersection LOS are in Appendix C.

A complete description of the QRS II delay methodology and a comparison with the HCM procedures, as presented in the QRS II Reference Manual[***], is included in Appendix D.

OPERATIONAL RESULTS

There are no hard and fast rules concerning "acceptable" versus "unacceptable" service levels at signalized intersections. However, at signalized intersections LOS F is usually considered to reflect unacceptable peak hour operating conditions with mitigation desirable. LOS E operations are considered borderline acceptable, but mitigation measures are often evaluated. Accordingly, signalized intersections with approaches operating at LOS E or LOS Fare considered candidates for potential future detailed analyses.

Unsignalized intersections may tend to experience proportionately higher side street delays due to the lack of positive right-of-way assignment. However, side street traffic volumes at unsignalized intersections are generally lower than those encountered at signalized intersections and side street LOS E is not unusual, particularly when the major street is a busy arterial. Therefore, it is common to consider all peak hour service levels except F as acceptable for approaches operating under STOP sign control. The intersections experiencing peak hour

[**] Interim Materials on Unsignalized Intersection Capacity, Number 373, July 1991.
[***] Reference Manual, QRS II For Windows, Version 3.6. Alan J. Horowitz, June 1993.

deficiencies, together with a comparison of 1990 and 2000 operations, are discussed in the following sections.

Base Year 1990 Peak Hour Operations

The 1990 peak hour delays and service levels are detailed in Table 4 in Appendix E. The results indicate that the following Study Intersections contain one or more approaches that may experience operational deficiencies as indicated by LOS F:

OPERATIONAL DEFICIENCIES — YEAR 1990
Signalized Intersections

Level of Service F

No.	Intersection Description	Peak Period
13	Atherton Street and Cherry Street	P.M.
40	College Avenue/Houserville Road	A.M. & P.M.

Level of Service E

No.	Intersection Description	Peak Period
14	Atherton Street/Park Avenue	A.M.
38	College Avenue/Route 322 SB Ramps	P.M.
40	College Avenue/Houserville Road	P.M.

The operational analyses indicate that only two signalized intersections experience unacceptable operating conditions (LOS F) in 1990. The deficiency at Intersection 13 occurs to only one left turn movement during the evening peak hour, while the deficiencies at Intersection 40 affect several approaches during both peak hours. The LOS E operations at intersections 14 and 38 both occur on only one left turn movement during only one peak hour, while LOS E at intersection 40 compounds the LOS F operations.

OPERATIONAL DEFICIENCIES — YEAR 1990
Unsignalized Intersections

Level of Service F

No.	Intersection Description	Peak Period
10	Science Park Road/Sleepy Hollow Drive	P.M.
36	College Avenue/Porter Road	A.M. & P.M.

The operational deficiencies at Intersections 10 and 36 are both limited to one side street approach respectively. Typically, providing signal control will significantly reduce delays at unsignalized approaches.[*]

[*] It is noted that the College Avenue/Porter Road intersection is scheduled to be signalized in the near future.

Master Plan Year 2000 Peak Hour Operations

The year 2000 peak hour delays and service levels are detailed in Table 5 in Appendix E. The model includes signalization at College Avenue/Porter Road as planned for implementation in the near future. Also, early computer model results indicated that three intersections would experience unrealistically long delays without future signal control. Therefore, signalization has been assumed for the following three intersections: Circleville Road/Corl Road−Loop Road, Pollock Road Extension/Loop Road and Park Avenue Extension/Airport Road Extension.

The operational results indicate that the following Study Intersections contain one or more approaches that experience operational deficiencies:

OPERATIONAL DEFICIENCIES — YEAR 2000
Signalized Intersections

Level of Service F

No.	Intersection Description	Peak Period
13	Atherton Street and Cherry Street	P.M.
38	College Avenue/Route 322 SB Ramps	P.M.
39	College Avenue/Route 322 NB Ramps	P.M.
40	College Avenue/Houserville Road	A.M. & P.M.
51	Atherton Street/University Drive	P.M.

Level of Service E

No.	Intersection Description	Peak Period
40	College Avenue/Houserville Road	A.M. & P.M.
51	Atherton Street/University Drive	P.M.

Five signalized intersections experience LOS F in year 2000; both intersections with approaches at LOS E also contained approaches operating at LOS F. Two intersections (13 and 40) also experienced deficiencies during 1990. The deficiencies are generally associated with left turn movements or are limited to one approach.

OPERATIONAL DEFICIENCIES — YEAR 2000
Unsignalized Intersections

Level of Service F

No.	Intersection Description	Peak Period
10	Science Park Road/Sleepy Hollow Drive	P.M.
26	College Avenue/Owens Drive	P.M.

Only two unsignalized intersections experience operational deficiencies during Master Plan year 2000; Intersection 10 also experienced deficiencies during 1990. These intersections experience undesirable side street delays. However, the delays are not considered excessive for STOP sign controlled approaches and the need for future signal control should be examined as traffic demand increases throughout the decade.

The proposed future roadways significantly benefit operations at several existing intersections, including intersections shown to experience deficiencies in 1990. For example, the College Avenue/Houserville Road intersection will experience morning peak hour delays on only the westbound left turn movement (versus three approaches during 1990) and delays are generally less than their 1990 counterparts. .

CONCLUSIONS AND RECOMMENDATIONS

The QRS II traffic model proved to be an appropriate tool for use in developing the Penn State UPD Traffic Master Plan. The model provided simultaneous operational evaluations of 56 intersections. However, much of the RTP network had to be carefully reviewed and recoded to fit the requirements of the UPD model to evaluate the morning and evening peak hour operations.

The validation process produced satisfactory results. The major arterial volumes are close to the 1990 “base” data, with the exception of Waddle Road near Route 322 in the morning peak hour and College Avenue near Whitehall Road in the evening peak. Additionally, the volumes assigned by the model to a portion of Park Avenue are less than the count data on some links. This low traffic assignment may be caused by the model’s gravity distribution algorithm assigning fewer University trips from the south than actually occur. Moreover, many current University trips from the east (via College Avenue) currently divert to Park Avenue via the Nittany Expressway by choice, as opposed to the model’s method of route assignment. Since the Park Avenue volume projections are somewhat less than actually experienced, proposed University parking facilities that trigger the need for impact studies should include a review of key Park Avenue intersections in addition to those reported to be deficient by the model.
The operational analyses indicate that relatively few intersections may experience deficiencies in the year 2000, due in part to the Inner Loop and Route 26 extension. The seven deficient intersections in the year 2000 include five operating with signal control and two with side Street STOP signs. Three of these deficient intersections also experienced LOS F during 1990. Based on the projected delays, it appears that Science Park Road/Sleepy Hollow Drive— Inner Loop may require signalization when the loop road is constructed. The delays at the remaining intersections are generally moderate, and more detailed future analyses will be required to ascertain the extent of mitigation at each location.

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QRS II Model Development Technical Information

ORS II MODEL DEVELOPMENT - TECHNICAL INFORMATION

An overview of the QRS II model development was presented in the body of the memorandum. The following sections describe in detail the additional components of the model.

Base Model – Year 1990

PSU Parking Facilities: The UPD ordinance considers PSU increases in parking to be the measure of when additional traffic may be generated; therefore, the UPD model determines University work trip and commuter student trip attractions based on the number of faculty/staff and commuter student parking spaces. The relationship between parking and trip attraction that was established for the UPD model is 2.9 daily (one way) person trips per faculty/ staff parking space and 3.6 daily (one way) person trips per commuter student parking space, based on an iterative trial-and-error process evaluating daily person trips with normally anticipated peak hour parking lot activity at University facilities.

The University confirmed the location and number of parking spaces for each faculty/staff and commuter student parking facility for the 1990 base year. Figure 3 illustrates the locations of the 7,834 faculty/staff and 1,487 commuter student parking spaces in 1990. Each facility was placed in the UPD model and was identified by appending a letter to its TAZ number. Each facility is further described in the model by identifying the facility's name and number of parking spaces. For example, there is a parking lot adjacent to Holuba Hall. This lot is reserved for commuter student parking and contains 75 spaces. This facility is in TAZ 56 and is identified in the model as TAZ 56B. Its description in the model is CS Holuba 75 spaces. The CS stands for commuter student.

Socio-Economic Data: The data used by QRS II includes average automobiles per household, number of retail employees, number of non-retail employees, number of occupied dwelling units and intrazonal travel time. This data, except for intrazonal travel time, was reported for each TAZ for the 1990 base year in the RTP and was used in the UPD model. Intrazonal travel time of each TAZ was based on known factors of similar areas. The UPD model uses this data to calculate the person trip productions and attractions for each TAZ. The trips are calculated for home-based work (HBW), home-based non-work (HBNW), non-home based (NHB) and a user-defined input (HB?).

The user-defined trip purpose (HB?) provides the opportunity to specify TAZ origins and TAZ destinations by directly stipulating trip productions and attractions for a unique trip purpose. The HB? trip purpose was selected to represent home-based commuter student (HBCS) trips because home-based work trips of faculty/staff were considered to be more representative of the general population distribution than was the student population distribution (i.e., off- campus students tend to live in concentrated numbers in a few TAZ's). Since commuter students were given their own trip purpose, it was necessary to reduce the total number of households in each TAZ by the number of student households in the respective TAZ. Otherwise, QRS II would have over-estimated HEW trips by including the student households in the calculation.

Study Area Households: QRS II generates person trip productions based on TAZ households and converts person trips to vehicle trips based on auto occupancy. Thus, it was necessary to identify the trips by people who walk to Campus. In order to simplify the analysis, it was assumed that faculty/staff trips are made primarily by car and all walk trips to and from Campus are made primarily by students. The University had previously surveyed students regarding mode of travel to Campus. The results indicated that 90 percent of the off-campus students do not use an automobile to travel to and from Campus and approximately 47 percent walk. About 99 percent of the students who walk reported a walking time to the center of Campus of 30 minutes or less.

Based on the above, it was assumed that students living within the Borough primarily walk to Campus and students living outside the Borough use vehicular modes (i.e., automobile or bus). Therefore, since all HBCS person trips in the Borough were assumed to be non-automobile, the HBCS trip production in the Borough becomes zero and there are no values for HB? trip productions in any Borough TAZs.

External Stations: External stations represent populated areas outside the study area that attract and produce trips that travel through the study area. The three types of trips occurring at external stations are external to internal, internal to external and external to external. External to internal (E-I) trips are produced at the external stations and are attracted to the study area TAZs. Internal to external (I-E) trips are produced at the study area TAZ5 and are attracted to the external stations. External to external (E-E) trips are produced and attracted to external stations and pass through the study area. The E-E travel between external stations must be provided to the QRS II model in a vehicle trip table.

External stations are critical to the development of the model. QRS II estimates travel between TAZs and external stations (E-I and I-E trips) using daily person-trip productions and person-trip attractions. TAZ productions and attractions are calculated from TAZ socio-economic data. External station productions and attractions must be added in QRS II for each trip purpose, i.e., home-based work (HBW), home-based non-work (HBNW), home-based commuter student (HBCS) and non-home based (NHB). The external station production and attraction information for E-I and I-E person trips and for E-E vehicle trips is usually available from regional origin-destination surveys.

While developing the external stations for the UPD model, it was discovered that origin-destination surveys had not been conducted for the RTP model. The external station information in the RTP model had been derived as part of that model’s calibration process and was not transferable to the UPD model. Because there was no origin-destination survey data or transferable trip table for external station travel, it was necessary to do additional work to develop external station data for the UPD model. This consisted of extensive E-I, I-E and E-E trip calibration for daily, morning and evening peak hours. The calibration is described in the section on model calibration.

Scale and Link Position: The scale of the RTP base year model and the position of its highway links were verified by plotting the network to scale and overlaying the plot on the Official Center Region Street Name Map. Streets that were plotted out of position were identified and repositioned to correspond with the Center Region map, so that the UPD model network would accurately represent the actual road network.

Master Plan Model – Year 2000

PSTJ Parking Facilities: The University also confirmed the location and number of parking spaces for each faculty/staff and commuter student parking facility for the year 2000 master plan. Figure 4 illustrates the locations of the 8,441 faculty/staff parking spaces and 2,075 commuter student parking spaces and includes both planned facilities and anticipated modifications to existing parking. The new facilities were identified in the model using the same convention as discussed for the base year. Spaces that were eliminated from a facility's parking inventory in the year 2000 were removed from the model. If an entire facility was eliminated, its spaces were removed from the model but its location and identification were kept intact for planning purposes.

Socio-Economic Data: The data provided in the RTP model for 2010 was adjusted to estimate conditions in the year 2000 for the UPD model. Data used in the model includes average automobiles per household, number of retail employees, number of non-retail employees and number of occupied dwelling units. Automobiles per household did not vary much between 1990 and 2010; therefore, the 2010 ratios were used in 2000. The number of retail employees in 2000 was derived by multiplying the increase in employees from 1990 to 2010 by 40 percent, since the current economic downturn suggests that less than one-half of the anticipated 20-year growth will likely occur during the 1990's. The resulting value was the factored by 20 percent to account for pass-by traffic. The number of non-retail employees in 2000 was determined by multiplying the increase in employees from 1990 to 2010 by 30 percent for the same economic development reasons. [*]

The RTP model had anticipated full build-out of the Penn State Research Park (PSRP) by the year 2010. Discussions with the Park's developer indicate that only Phase A is anticipated by the year 2000. Thus, the number of PSRP employees assumed for the UPD model is significantly less than utilized in the RTP.

External Stations: The E-I, I-E and E-E trips for the year 2000 were determined by multiplying the validated external station trip productions and attractions for 1990 by a factor of 1.105. This factor represents an annual one percent growth in external station traffic over the 10-year period.

[*] It is noted that, while several large retail facilities have already been constructed since 1990, virtually no non-retail construction has occurred. Thus, only 30 percent of the 20-year increase is anticipated for this decade.

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QRS II Model Validation
Technical Information

MODEL VALIDATION –TECHNICAL INFORMATION

Comprehensive validation is the key to the accuracy of any computer traffic model. The steps involved in the validation process are outlined in the following sections.

External Station Travel: Before beginning the model validation process, it was necessary to first develop and calibrate 1990 base year external station travel for daily, and morning and evening peak hour conditions. External station travel was estimated for daily and peak hour traffic from ADT traffic counts taken at the external station roadways and applying parameters provided in NCHRP Report 187. The parameters indicate that about 21 percent of all external trips pass through the study area.

A valid assumption of external station traffic for initial calibration is that it consists of 35 percent HEW and 65 percent HBNW trips. Estimates of E-I and I-E person-trip attractions and productions for HEW and HBNW were added to the model. A table containing E-E vehicle trips was also added. The UPD model assignments of daily traffic on the external station roadways were used to validate the external station assumptions by comparing the assigned traffic volumes with the ADT traffic volume counts on the external station roads. The HBW and HBNW person-trip attractions and productions and the E-E vehicle trip table were adjusted until the assigned volumes approximated the counted volumes.

Model Parameters: Once the assumptions of daily external station traffic were validated, the next step was to validate QRS II'S internal network modeling parameters so that they adequately reflected travel in the study area. The QRS II trip production, attraction and distribution parameters were evaluated by having. QRS II assign daily traffic on the highway network. The assigned traffic was compared against all available ADT counts provided by Centre Region and PennDot. QRS II'S trip production rates were adjusted so that the daily traffic volumes assigned by the model matched the ADT traffic volumes on a network-wide basis.

The QRS II model always calculates 24-hour trips. Volumes for specific hours are derived from an hourly trip table that assigns a percentage of daily traffic to every hour. The model's morning and evening peak hour trip assignment was compared to available hourly count data to confirm that the percent of daily traffic assigned to the network during the morning and evening peak hours was consistent with the hourly distribution of counted traffic.

Screen Line Analysis: An important step in the validation process is to perform a screen line analysis of the major travel corridors. The screen line analysis was performed for the morning and evening 1990 base year model. The link volumes calculated by the model were validated by comparing them to available base volumes. Capacity and speed parameters on selected links and delay parameters at selected Study Intersections were adjusted until appropriate traffic assignments were obtained.

The screen lines, illustrated in Figure 1, were established to capture traffic oriented to the University from the northwest, north, south, east and west. Three measures of comparison were used in the analysis: allowable link error, desirable link error and allowable screen line error. Allowable link error and allowable screen line error are reported in NCHRP Report 255[*]. These measures are based on the assumption that the maximum desirable traffic assignment error on a

[*] NCHRP Report 255, Highway Traffic Data for Urbanized Area Project Planning and Design, 1982.

link or screen line should not result in a design deviation of more than one travel lane. The desirable link error is reported in the U.S. Department of Transportation report, CALIBRATION AND ADJUSTMENT OF SYSTEM PLANNING MODELS. This measure relates to the assumption that the maximum desirable traffic assignment error on a link should not be more than approximate error in a single traffic count. The results of the morning and evening peak hour screen line validation are presented in Tables Bl and B2.

TABLE B1
AM PEAK HOUR SCREEN LINE VALIDATION

SCREEN LINE/LINKNAME	VOLUME		DIFFERENCE		ALLOWABLE		DESIRABLE	
	ASSIGNED	COUNTED	NUMBER	%	%	EXCEEDS	%	EXCEEDS
NORTHWEST								
VALLEY VISTA DRIVE	522	510	12	2.4	43	NO	16	NO
ATHERTON STREET	874	700	174	24.9	38	NO	14	YES
MT. NITTANY EXPRESSWAY	1320	1140	180	15.8	31	NO	11	YES
TOTAL	2716	2350	366	15.6	36	NO	NA	NA
NORTH								
WADDLE ROAD	738	710	28	3.9	38	NO	14	NO
FOX HOLLOW ROAD	780	700	80	11.4	38	NO	14	NO
PARK AVENUE	751	1030	-279	-27.1	32	NO	12	YES
TOTAL	2269	2440	-171	-7	36	NO	NA	NA
SOUTH								
COLLEGE AVENUE	894	950	-56	-5.9	33	NO	12	NO
WAUPLANI DRIVE	557	660	-103	-15.6	399	NO	14	YES
ATHERTON STREET	1340	1400	-60	-4.3	29	NO	10	NO
UNIVERSITY DRIVE	395	610	-215	-35.2	40	NO	15	YES
BRANCH ROAD	696	580	116	20	41	NO	15	YES
TOTAL	3882	4200	-318	-7.6	29	NO	NA	NA
EAST								
PUDDINTOWN ROAD	23	95	-72	-75.8	84	NO	38	YES
COLLEGE AVENUE	1781	1800	-19	-1.1	26	NO	9	NO
BRANCH ROAD	637	440	197	44.8	45	NO	18	YES
TOTAL	2441	2335	106	4.5	36	NO	NA	NA
WEST								
CIRCLEVILE ROAD	373	360	13	3.6	49	NO	20	NO
COLLEGE AVENUE	981	1018	-37	-3.6	32	NO	12	NO
WHITEHALL ROAD	522	670	-148	-22.1	38	NO	14	YES
PINE GROVE ROAD	544	460	84	18.3	45	NO	17	YES
TOTAL	2420	2508	-88	-3.5	35	NO	NA	NA

TABLE B2
PM PEAK HOUR SCREEN LINE VALIDATION

SCREEN LINE/LINKNAME	VOLUME ASSIGNED	VOLUME COUNTED	DIFFERENCE NUMBER	DIFFERENCE %	ALLOWABLE %	ALLOWABLE EXCEEDS	DESIRABLE %	DESIRABLE EXCEEDS
NORTHWEST								
VALLEY VISTA DRIVE	661	710	-49	-6.9	41	NO	16	NO
ATHERTON STREET	1003	930	73	7.8	37	NO	14	NO
MT. NITTANY EXPRESSWAY	1455	1140	315	27.6	34	NO	12	YES
TOTAL	3119	2780	339	12.2	37	NO	NA	NA
NORTH								
WADDLE ROAD	1096	740	356	48.1	40	YES	15	YES
FOX HOLLOW ROAD	600	690	-90	-13	42	NO	16	NO
PARK AVENUE	987	920	67	7.3	37	NO	14	NO
TOTAL	2683	2350	333	14.2	39	NO	NA	NA
SOUTH								
COLLEGE AVENUE	951	1161	-210	-18.1	34	NO	12	YES
WAUPLANI DRIVE	761	800	-39	-4.9	39	NO	15	NO
ATHERTON STREET	1707	1470	237	16.1	31	NO	11	YES
UNIVERSITY DRIVE	773	750	23	3.1	40	NO	15	NO
BRANCH ROAD	1053	970	83	8.6	36	NO	13	NO
TOTAL	5245	5151	94	1.8	29	NO	NA	NA
EAST								
PUDDINTOWN ROAD	300	410	-110	-26.8	51	NO	21	YES
COLLEGE AVENUE	2171	1860	311	16.7	28	NO	10	YES
BRANCH ROAD	902	730	172	23.6	41	NO	15	YES
TOTAL	3373	3000	373	12.4	36	NO	NA	NA
WEST								
CIRCLEVILE ROAD	470	480	-10	-2.1	48	NO	19	NO
COLLEGE AVENUE	1266	880	386	43.9	38	YES	14	YES
WHITEHALL ROAD	981	775	206	26.6	40	NO	15	YES
PINE GROVE ROAD	557	370	187	50.5	53	NO	22	YES
TOTAL	3272	2505	-88	30.7	39	NO	NA	NA

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Level of Service Definitions
For
Signalized Intersections
Unsignalized Intersections

LEVEL OF SERVICE – SIGNALIZED INTERSECTIONS

The concept of Level of Service (LOS) is a qualitative measure that defines operational conditions within a traffic stream as perceived by motorists. Thus, the definition of LOS generally describes traffic conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort, convenience and safety.

Volume to Capacity ratio (V/C) is not related to LOS in any direct fashion as defined in the past, where v/c ratios greater than 1.0, by definition, resulted in unacceptable levels of service. Present practice places emphasis on delay as a more appropriate measure of the quality of intersection capacity. Thus, v/c ratios exceeding 1.0 do not necessarily indicate unacceptable conditions.

Six LOS categories are defined for which analytical procedures have been developed. They are given letter designations from A to F with LOS A representing the most desirable operating conditions and LOS F the least. As indicated in the following table, the average stopped delay at LOS A is less than 5.0 seconds per vehicle, while at LOS F, the average stopped delay is in excess of 60 seconds per vehicle.

LEVEL OF SERVICE CRITERIA AT SIGNALIZED INTERSECTIONS

Level of Service	Average Stopped Delay Per Vehicle (seconds)
A	less than 5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	greater than 60.0

Reference: 1985 Highway Capacity Manual, Special Report 209, Transportation Research Board, Chapter 9.

LEVEL OF SERVICE – UNSIGNALIZED INTERSECTIONS
Delay Methodology

The Highway Capacity Manual procedure for establishing level of service (LOS) at unsignalized (STOP—Controlled) intersections is based on the concept of Reserve Capacity. However, a recently published procedure for evaluating operations at All-Way STOP-controlled (AWSC) intersections is based on capacity (volume to capacity ratio) and average delay for each approach.

The AWSC procedure places emphasis on delay as a more appropriate measure of the quality of intersection operations, as is presently the case at Signalized intersections. Since the QRS II model calculates only delay results for unsignalized intersections, the delay thresholds in the AWSC procedure are considered to provide a valid basis for estimating Level of Service.

Six LOS categories for all types of intersection control are defined for which analytical procedures have been developed. They are given letter designations from A to F with LOS A representing the most desirable operating conditions and LOS F the least. With regard to unsignalized intersections, the average stopped delay at LOS A is less than 5.0 seconds per vehicle, while at LOS F, the average stopped delay is in excess of 45 seconds per vehicle as illustrated in the following table:

LEVEL OF SERVICE CRITERIA AT UNSIGNALIZED INTERSECTIONS

Level of Service	Average Stopped Delay Per Vehicle (seconds)
A	less than 5.0
B	5.1 to 10.0
C	10.1 to 20.0
D	20.1 to 30.0
E	30.1 to 45.0
F	greater than 45.0

The LOS thresholds are less than the similar criteria established for signalized intersections, since the expectation is that a signalized intersection can accommodate higher traffic volumes than an unsignalized intersection. Thus, a higher level of delay is acceptable at a signalized intersection for the same level of service. Accordingly, LOS at an unsignalized intersection typically relates to the perception of traffic conditions from the point of view of the motorist desiring to cross or enter the intersecting street.

Reference: Transportation Research Circular 373
Transportation Research Board, July 1991

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QRS II
Delay Methodology

Intersection Delay

Intersection delay is calculated by methods similar to those contained in the 1985 Highway Capacity Manual (HCM). Separate delay models are available for signalized intersections, some-way stop intersections and all-way stop intersections. Because of the particular needs of travel forecasting, Quick Response System (QRS) II's models differ somewhat from those of the HCM. Changes were introduced to: (1) reduce memory requirements and thereby increase the number of intersections that may be considered; (2) allow processing of broad ranges of intersection configurations and traffic volumes; (3) eliminate the need for information that is difficult to forecast; (4) allow better control over the delay models by users; (5) reduce data requirements; (6) improve consistency; and (7) better satisfy the requirements of equilibrium traffic assignment.

QRS II calculates only one value of delay for each approach calculated delay value is the average across all types of movements.

The delay models contained within QRS II are not intended as substitutes for tools of operations-level traffic analysis such as HCS, SOAP, PASSER-II, or TRANSYT.

QRS II can calculate an average delay across all hours in the period of analysis. To do so, however, it must have a fully and properly specified hour distribution file, VOLHOUR.TXT. VOLHOUR.TXT normally is created by QRS II; user intervention is usually not required. However, it may be necessary to prepare a special VOLHOUR.TXT file, if QRS II is asked to process a user-supplied, vehicle-trip table. For more information about this file, see "Using VOLHOUR.TXT in Delay Calculations" at the end of this chapter.

The following discussion about the delay models assumes knowledge of HCM.

Signalized Intersections

When a signalized intersection is included in a network, QRS II only requires information about (a) the cycle length, (b) the saturation flow rate for the through lanes of each approach, (c) the existence of exclusive lanes at each approach, (d) the link's arrival type, and (e) the link's speed. This information is given to QRS II by way of the network on street links and at intersection nodes. QRS II calculates all other intersection information that normally would be part of a capacity/delay analysis.

The signalized intersection model follows the HCM, except as noted here.

Adjustment Factors. QRS II does not make adjustments for lane width, grade, parking, buses, heavy vehicles, and or area type. Deviations from ideal conditions can be incorporated by the user into the saturation flow rate for the through lanes at the approach.

Phase Splits. QRS II determines whether protected left phases are required and determines the amount of green time to be allocated to each phase. When a protected phase is warranted QRS II always adopts the phase sequence [(L + L), (LTR + LTR)], sometimes referred to as dual leading lefts with overlap. QRS II does not determine optimal phase splits. Rather, QRS II mimics standard traffic engineering practice by allocating time to a phase in proportion to the critical flow ratio (ratio of volume to saturation flow rate) during that phase.

Protected Lefts. QRS II introduces a protected left phase, only if there is insufficient capacity to process all left-turning vehicles without one. In ascertaining this capacity, QRS II considers the number of gaps available during the unblocked green time and the number of sneakers. The protected left phase is given only sufficient time to process vehicles that cannot be handled during the LTR phase of the worst approach. QRS II then divides left turning traffic between the L and LTR phases for all approaches, nearly filling the protected left phase with traffic. The saturation flow rate for the LTR lane group includes the left lane capacity, if the left lane can be shared.

Left Lane Saturation Flow Rate. The left turn f for exclusive lanes is calculated according to Cases 1 or 2 from Table 9-12 of the HCM. In addition, QRS II modifies the saturation flow rate for left turn lanes by the implied reduction from the ideal saturation flow rate for the through lanes (e.g., for heavy vehicles and grades).

Defacto Left Lanes. QRS II will create a defacto left lane (from a shared LT lane), only if a protected phase is warranted. The HCM's procedure for determining defacto left lanes is not used.

Exclusive Right Lanes. QRS II does not create a separate lane group for an exclusive right turn lane. Rather, the saturation flow rate for the LTR or TR lane group is adjusted upward to reflect the additional lane. QRS II adds sufficient capacity to just accommodate the right turning vehicles, with a maximum adjustment equal to a single lane's saturation flow rate (typically, 1800 vph). For example, an LTR phase has 200 right-turning vehicles, a cycle length of 90 seconds and a green time of 30 seconds. The additional saturation flow is 600 vehicles per hour (200*90/30).

Right Turns from Shared Lanes. QRS II does not provide for pedestrians. Consequently, the right turn adjustment factor is calculated according to Case 4 on Table 9-11 of the HCM.

Period of Analysis. Because QRS II forecasts travel during whole hours, the peak-hour-factor is unnecessary. For multi-hour assignments, QRS II takes a volume- weighted average of the delay in each hour.

Delay Function. QRS II calculates stopped delay from the HCM delay function (i.e., total delay divided by 1.3). The HCM delay function can become undefined for volume-to-capacity ratios only slightly greater than 1.0. Consequently, QRS II uses the HCM delay function only up to a volume-to-capacity of 1.0. Beyond 1.0, delay is calculated as a linear extrapolation of the delay at a volume-to-capacity ratio of 1.0.

Progression Adjustment. Like the HCM, QRS II adjusts delay as a function of the arrival type and the volume-to-capacity ratio. The HCM's and QRS II's adjustments are quite similar, but instead of a table of numbers, QRS II uses a set of linear equations to estimate the adjustment factor—one equation for each arrival type: The linear equations range from a volume-to-capacity ratio of 0.0 to a volume-to-capacity ratio of 1.2 (or another user-supplied parameter value), where the progression adjustment factor always becomes 1.0 (equivalent to no adjustment). Beyond a volume-to-capacity ratio of 1.2, no adjustment to delay is made. These equations are more fully explained in Chapter 7.

Acceleration Delay. QRS II estimates the fraction of stopping vehicles and adds acceleration delays for those vehicles. The fraction of stopping vehicles depends upon the arrival type and the volume-to-capacity ratio. The acceleration delay depends upon the link speed. Acceleration delay is further discussed in Chapter 7.

Lane Utilization. Because QRS II calculates average delay across all lanes, the lane utilization factor is not considered.

Some-Way Stop Intersections

In order to calculate delay at some-way stop intersections, QRS II requires knowledge of the location of stop signs and the lane geometry at approaches with signs. Sign information is placed in the Approach Codes on street links connected to an intersection. Three types of lane configurations are allowed: one LTR lane; one LT and one R lane; and one LT and one TR lane. QRS II also needs the speed of traffic on all links at the intersection.

The some-way stop model in QRS II is consistent with the unsignalized model in the HCM, except as follows.

Potential Capacity Curves. The curves for potential capacity as a function of conflicting volume, Figure 10-3 in the HCM, have been extended to handle any amount of conflicting volume. There is a minimum capacity of 33 vehicles per hour, regardless of the amount of conflicting volume. The user may change this minimum for all intersections or for any given intersection.

Treatment of Left Turns. QRS II does not make a distinction between left and through vehicles at signed, approaches. Consequently, a left-turning vehicle does not impact the capacity of its opposing approach. However, QRS II is consistent with the HCM in its treatment of left turns from unsigned approaches.

Acceleration Delay. QRS II includes acceleration delay for alt vehicles at signed approaches and for left-turning vehicle at unsigned approaches: The acceleration delay depends upon the link speed.

Queuing Delay. QRS II estimates queuing delay at signed approaches and for left vehicles at unsigned approaches. Poisson arrivals and exponential service times are assumed.

Right-Turn Lane Geometry. QRS II does not explicitly consider right-turn lane geometry. Instead, the user may make adjustments to the acceptable right-turn gap at signed approaches.

Number of Lanes for the Major Street. QRS II determines the number of lanes for the major street by observing the capacity (or saturation flow rate) of the unsigned approaches. QRS II finds the number of lanes by dividing the capacity by the ideal saturation flow rate and rounding to a whole number. The number of lanes is taken to be the maximum over all unsigned approaches.

Distribution of Through Vehicles Across Lanes. At signed approaches with two shared lanes, QRS II divides the through traffic between the LT and TR lanes. An attempt is made to equalize the volume-to-capacity ratios of the two lanes.

All-Way Stop Intersections

The HCM does not contain methods for estimating capacity or delay at all-way stop intersections. Consequently, QRS II contains its own model for delay at all-way stop intersections. The model is an enhanced version of Richardson's M/G/1 queuing model. Unlike Richardson's original formulation, QRS II considers delays due to turning and delays caused by the need for coordination between drivers on the same and opposing approaches.

The M/G/1 model estimates delay at an approach from the rate of arriving vehicles and from the mean and variance of the amount of time it takes for vehicles to pass through the intersection, referred to as the service time. The service time for an approach is equal to the sum of the time necessary to process a vehicle through the subject approach and the time necessary to process a vehicle through a conflicting approach, provided there is a vehicle at the conflicting approach. Both of these processing times (subject and conflicting) are computed by the same method, although they will have different values because of differing traffic characteristics. A typical processing time is about 4 seconds, so a service time is either about 4 seconds or about 8 seconds, depending upon the absence or presence of a conflicting vehicle.

The capacity of an intersection is inversely related to service time. For example, a single-lane approach at an intersection with heavy traffic in all directions would have a uniform service time of about 8 seconds, because there will always be conflicting vehicles. The capacity of such an approach would be 1/8 vehicles per second or 450 vehicles per hour.

For single lane approaches, the processing time depends upon (1) the presence or absence of right and left turning vehicles on the subject or opposing approaches and (2) the presence or absence of any vehicle on the opposing approach. In general, left turns increase processing time, while right turns decrease processing time. For two lane approaches, the processing time also depends upon the presence or absence of a second vehicle on the subject or opposing approaches. These additional vehicles introduce a need for coordination among drivers and, therefore, tend to increase processing time.

Each vehicle arriving at an approach has a different service time, but the average service time is assumed to be the same for all vehicles, regardless of their turning behavior. Consequently, traffic is distributed across lanes, at multilane approaches, as evenly as possible (taking into consideration the required lane assignments for left and right turning vehicles).

Possible lane configurations for approaches at all-way stops are the san as for some-way stops.
Since all the vehicles stop, QRS II adds an acceleration delay to the queuing delay found from the M/G/1 model.

Intersection Parameters

The calculation of intersection delay is controlled by several parameters, which are found on three parameter dialog boxes — Signalized, All-Way Stop and Unsignalized (for some-way stops). These parameters can be accessed via the Assignment Parameters submenu.

Three of the parameters apply to more than one type of intersection.

Ideal Saturation Flow Rate. The ideal saturation flow rate is used extensively in the signalized intersection model. It is in units of passenger cars per hour of green per lane. All constants in the HCM model that depend up the idealized saturation flow rate will vary with this parameter. These constants include: every "1800"; the "400" in Equation 9-9 of the HCM; the "4.5" in Equation 9-13; "0.5" in Equation 9-14; and the "2" in Equation 9-16. The ideal saturation flow rate is the maximum upward adjustment to a TR saturation flow rate due to the presence of an exclusive right lane. QRS II identifies the number of through lanes by dividing the user-supplied, through-lane saturation flow rate by the ideal saturation flow rate and rounding to the nearest whole number.

QRS II uses the ideal saturation flow rate to determine the number of lanes on major roads in the some-way stop model.

University Planned District

Table 1A
1990 Base Year Study
Intersections

TABLE 1A

1990 BASE YEAR STUDY INTERSECTIONS

NUMBER	NAME
1	PA ROUTE 550 AND BERNEL ROAD
2	PA ROUTE 550 AND FILLMORE ROAD
3	PA ROUTE 550 AND ROCK ROAD
4	ROCK ROAD AND SEIBERT ROAD
5	FOX HOLLOW ROAD AND CRICKLEWOOD DRIVE
6	FOX HILL ROAD AND BERNEL ROAD
7	FILLMORE ROAD AND FOX HILL ROAD
8	ROCK ROAD AND AIRPORT ROAD
9	ATHERTON STREET AND VAIRO BOULEVARD
10	SCIENCE PARK ROAD AND SLEEPY HOLLOW DRIVE
11	CIRCLEVILLE ROAD AND CORL ROAD
12	ATHERTON STREET AND CLINTON AVENUE
13	ATHERTON STREET AND CHERRY STREET
14	ATHERTON STREET AND PARK AVENUE
15	PARK AVENUE AND ALLEN STREET
16	PARK AVENUE AND SHORTLIDGE ROAD
17	PARK AVENUE AND BIGLER ROAD
18	PARK AVENUE AND UNIVERSITY DRIVE
19	PARK AVENUE AND FOX HOLLOW ROAD-PORTER ROAD
20	PARK AVENUE AND ORCHARD ROAD
21	PARK AVENUE AND US ROUTE 322 SB RAMPS
22	PARK AVENUE AND US ROUTE 322 NB RAMPS
23	HOUSERVILLE ROAD AND TROUT ROAD
24	HOUSERVILLE ROAD AND PUDDINTOWN ROAD
25	ATHERTON STREET AND POLLOCK ROAD
26	COLLEGE AVENUE AND OWENS DRIVE
27	COLLEGE AVENUE AND CORL STREET
28	COLLEGE AVENUE AND BUCKOUT STREET
29	COLLEGE AVENUE AND SPARKS STREET
30	COLLEGE AVENUE AND BARNARD STREET
31	COLLEGE AVENUE AND ATHERTON STREET
32	COLLEGE AVENUE AND BURROWES ROAD
33	COLLEGE AVENUE AND SHORTLIDGE ROAD-GARNER STREET
34	UNIVERSITY DRIVE AND COLLEGE AVENUE WB EXIT RAMP
35	UNIVERSITY DRIVE AND COLLEGE AVENUE EB EXIT RAMP
36	COLLEGE AVENUE AND PORTER ROAD
37	COLLEGE AVENUE AND ELMWOOD ROAD
38	COLLEGE AVENUE AND US ROUTE 322 SB RAMPS
39	COLLEGE AVENUE AND US ROUTE 322 NB RAMPS
40	COLLEGE AVENUE AND HOUSERVILLE ROAD
41	BEAVER AVENUE AND BUCKHOUT STREET
42	BEAVER AVENUE AND SPARKS STREET
43	BEAVER AVENUE AND BARNARD STREET
44	BEAVER AVENUE AND ATHERTON STREET
45	BEAVER AVENUE AND BURROWES ROAD
46	BEAVER AVENUE AND GARNER STREET
47	WESTERLY PARKWAY AND CORL ROAD
48	WESTERLY PARKWAY AND SPARKS STREET
49	EASTERLY PARKWAY AND GARNER STREET
50	EASTERLY PARKWAY AND UNIVERSITY DRIVE
51	ATHERTON STREET AND UNIVERSITY DRIVE

University Planned District

Table 1B
2000 Master Plan Year Study Intersections

TABLE 1B

2000 MASTER PLAN YEAR STUDY INTERSECTIONS

NUMBER	NAME
1	PA ROUTE 550 AND BERNEL ROAD
2	PA ROUTE 550 AND FILLMORE ROAD
3	PA ROUTE 550 AND ROCK ROAD
4	ROCK ROAD AND SEIBERT ROAD
5	FOX HOLLOW ROAD AND CRICKLEWOOD DRIVE
6	FOX HILL ROAD AND BERNEL ROAD
7	FILLMORE ROAD AND FOX HILL ROAD
8	ROCK ROAD AND AIRPORT ROAD
9	ATHERTON STREET AND VAIRO BOULEVARD
10	SCIENCE PARK ROAD AND SLEEPY HOLLOW DRIVE
11	CIRCLEVILLE ROAD AND CORL ROAD
12	ATHERTON STREET AND CLINTON AVENUE
13	ATHERTON STREET AND CHERRY STREET
14	ATHERTON STREET AND PARK AVENUE
15	PARK AVENUE AND ALLEN STREET
16	PARK AVENUE AND SHORTLIDGE ROAD
17	PARK AVENUE AND BIGLER ROAD
18	PARK AVENUE AND UNIVERSITY DRIVE
19	PARK AVENUE AND FOX HOLLOW ROAD-PORTER ROAD
20	PARK AVENUE AND ORCHARD ROAD
21	PARK AVENUE AND US ROUTE 322 SB RAMPS
22	PARK AVENUE AND US ROUTE 322 NB RAMPS
23	HOUSERVILLE ROAD AND TROUT ROAD
24	HOUSERVILLE ROAD AND PUDDINTOWN ROAD
25	ATHERTON STREET AND POLLOCK ROAD
26	COLLEGE AVENUE AND OWENS DRIVE
27	COLLEGE AVENUE AND CORL STREET
28	COLLEGE AVENUE AND BUCKOUT STREET
29	COLLEGE AVENUE AND SPARKS STREET
30	COLLEGE AVENUE AND BARNARD STREET
31	COLLEGE AVENUE AND ATHERTON STREET
32	COLLEGE AVENUE AND BURROWES ROAD
33	COLLEGE AVENUE AND SHORTLIDGE ROAD-GARNER STREET
34	UNIVERSITY DRIVE AND COLLEGE AVENUE WB EXIT RAMP
35	UNIVERSITY DRIVE AND COLLEGE AVENUE EB EXIT RAMP
36	COLLEGE AVENUE AND PORTER ROAD
37	COLLEGE AVENUE AND ELMWOOD ROAD
38	COLLEGE AVENUE AND US ROUTE 322 SB RAMPS
39	COLLEGE AVENUE AND US ROUTE 322 NB RAMPS
40	COLLEGE AVENUE AND HOUSERVILLE ROAD
41	BEAVER AVENUE AND BUCKHOUT STREET
42	BEAVER AVENUE AND SPARKS STREET
43	BEAVER AVENUE AND BARNARD STREET
44	BEAVER AVENUE AND ATHERTON STREET
45	BEAVER AVENUE AND BURROWES ROAD
46	BEAVER AVENUE AND GARNER STREET
47	WESTERLY PARKWAY AND CORL ROAD
48	WESTERLY PARKWAY AND SPARKS STREET
49	EASTERLY PARKWAY AND GARNER STREET
50	EASTERLY PARKWAY AND UNIVERSITY DRIVE
51	ATHERTON STREET AND UNIVERSITY DRIVE
52	PARK AVENUE EXTENSION AND AIRPORT ROAD EXTENSION
53	POLLOCK ROAD EXTENSION AND LOOP ROAD
54	POLLOCK ROAD EXTENSION AND CORL ROAD
55	COLLEGE AVENUE AND LOOP ROAD
56	COLLEGE AVENUE AND UNIVERSITY DRIVE

University Planned District

Table 2
1990 Study
Intersection Link Volumes

TABLE 2

1990 STUDY INTERSECTION LINK VOLUMES

	AM PEAK		PM PEAK	
LINK NAME	A==>B	B==>A	A==>B	B==>A
AIRPORT BTW FILLMORE & TECH	122	169	236	215
AIRPORT BTW TECH & ROCK	76	181	236	174
AIRPORT BTW TECH & ROCK	157	29	369	36
ALLEN BTW CURTIN & PARK	39	92	207	61
ALLEN BTW PARK & ADAMS	10	72	224	112
ATHERTN BTW PARK & HILCRST	472	1282	950	663
ATHERTN BTW WHTHALL & UNIV	523	759	950	685
ATHERTON BTW AARON & CLINTN	663	395	460	574
ATHERTON BTW BEAVER & FOST	267	370	501	380
ATHERTON BTW CHERRY & CLINT	417	800	701	652
ATHERTON BTW CHERRY & OAK	1193	517	655	932
ATHERTON BTW COLL & BEAVER	536	492	790	454
ATHERTON BTW COLL & POLLOCK	695	621	839	1085
ATHERTON BTW COLL & POLLOCK	741	631	847	1047
ATHERTON BTW PARK & POLLOCK	757	591	705	891
ATHERTON BTW PARK & POLLOCK	764	558	730	889
ATHERTON BTW UNIV & BRANCH	715	1022	1460	1210
ATHERTON BTW VAIRO & AARON	574	949	1136	818
ATHERTON BTW WDYCRS & VAIRO	663	330	478	685
BARNARD BTW COLLEGE & BEAVE	3	1	7	0
BARNARD BTW FOSTER & BEAVER	4	29	0	78
BARNARD BTW ROAD & COLLEGE	2	27	7	36
BEAVER BTW ATHERTON & BURRW	677	0	745	0
BEAVER BTW BARNARD & ATHERT	530	0	530	0
BEAVER BTW BKHOUT & CORL	3	10	7	14
BEAVER BTW GARNER & HIGH	423	0	1003	0
BEAVER BTW GILL & BARNARD	552	0	601	0
BEAVER BTW LOCUST & GARNER	675	0	812	0
BEAVER BTW PATERSON & SPARK	467	0	422	0
BEAVER BTW PATTER & BUCKOUT	536	0	601	0
BEAVER BTW SPARKS & GILL	476	0	433	0
BENNER PK BTW PSRP & RT 322	0	0	0	0
BERNEL TW FOX HIL & PA 550	97	52	158	36
BIGLER BTW BORO LINE & PARK	16	70	62	22
BIGLER BTW PARK & CURTIN	38	110	99	30
BUCKHOUT BTW COLL & BEAVER	521	0	598	0
BUCKHOUT BTW FOST & BEAVER	12	5	11	14
BURROWES BTW BEAVER & FOSTR	39	0	90	0
BURROWES BTW COLLEGE & BEAV	83	61	139	16
BURROWES BTW POLLOCK & COLL	122	242	131	58
CHERRY BTW ATHERTN & BORO	52	13	129	274
CHERRY BTW ATHERTN & CLINTN	56	443	503	130
CIRCLEVIL BTW CORL & PK HIL	98	338	337	283
CIRCLVIL BTW SC PK & PK HIL	90	152	101	212
CLINTN BTW ATHERTN & MARTIN	43	27	49	174
CLINTON BTW ALLEN & ATHERTN	167	90	146	207
CLINTON BTW CORL & CHERRY	399	173	341	437

	AM PEAK		PM PEAK	
LINK NAME	A==>B	B==>A	A==>B	B==>A
COLL BTW ATHERTN & BURROWES	651	0	1017	0
COLL BTW ATHERTON & BARNARD	498	0	926	0
COLL BTW BURROWES & ATHERTN	651	0	1017	0
COLL BTW ELMWD & 322 SB RMP	466	1091	1152	829
COLL BTW FRASER & BURROWES	792	0	1067	0
COLL BTW HOUSER & 322 NB RMP	1584	1296	1436	1573
COLL BTW HOUSER & STRUBLE	1599	1704	1917	1778
COLL BTW OWENS & PINE HALL	467	514	772	494
COLL BTW PATTER & BUCKHOUT	491	0	870	0
COLL BTW PATTERSON & SPARKS	500	0	941	0
COLL BTW PORTER & PUDDINTWN	542	1292	1393	953
COLL BTW PUDDINTWN & ELMWOD	537	1245	1244	891
COLL EB RAMP TO UNIV	13	0	3	170
COLL WB RAMP TO UNIV SB	79	0	127	0
COLL WB TO UNIV NB	254	0	57	0
COLLEGE BTW BKHOUT & CORL	462	495	819	556
COLLEGE BTW BKHOUT & CORL	483	514	850	577
COLLEGE BTW BRNARD & CORL	470	0	890	0
COLLEGE BTW GILL & SPARKS	559	0	999	0
COLLEGE BTW MIDDLE & CORL	515	519	502	829
COLLEGE BTW MIDDLE & OWENS	488	496	803	467
COLLEGE BTW NB RMP & US 322	864	1282	1390	972
COLLEGE BTW SB RMP & US 322	864	1282	1390	972
COLLGE BTW HIGH & SHORTLID	951	0	844	0
COLLGE BTW PORTER & BORO	615	1174	1461	922
CORL BTW BEAVER & COLLEGE	100	78	166	140
CORL BTW BEAVER & WES PKWY	88	68	146	120
CORL BTW CLINTON & COLLEGE	106	92	238	200
CORL BTW CLINTON & COLLEGE	121	106	258	216
CRICKLWD BTW BEND & FOX HOL	258	149	229	373
E PKWY BTW BORO LN & UNIV	33	39	55	41
E PKWY BTW UNIV & GARNER	73	134	273	187
E PKWY BTW UNIV & GARNER	107	129	287	222
E PKWY BTW WILLIAM & GARNER	138	91	259	132
ELMWOOD BTW COLL & BRANCH	120	203	183	153
F HOLLOW BTW CRCKL & F HILL	227	418	478	403
F HOLLOW BTW PARK & ORCHARD	241	540	410	191
F HOLLOW BTW TWP LN & CRCKW	240	540	409	191
FILLMORE BTW AIR & PA 550	9	188	76	149
FILLMORE BTW PA 550 & V. V.	114	223	229	195
FOX HILL BTW BERNEL & FILLM	128	354	311	364
FOX HILL BTW REGIN & BERNEL	216	397	457	387
GARNER BTW BEAVER & FOSTER	67	95	264	239
GARNER BTW BEAVER & FOSTER	80	121	389	208
GARNER BTW COLLEGE & BEAVER	90	369	461	246
GARNER BTW COLLEGE & BEAVER	127	435	503	325
GARNER BTW NIMITZ & E PKWY	1	2	6	7
GARNER BTW WARING & E PKWY	10	33	73	2693
HOUSER BTW PON & COLLEGE	182	126	318	180
HOUSE BTW PUDDINTWN & OAK	64	27	237	92
HOUSER BTW PUDINTN & TROUT	38	69	145	125

	AM PEAK		PM PEAK	
LINK NAME	A==>B	B==>A	A==>B	B==>A
ORCHARD BTW PUDINTN & PARK	7	23	12	109
OWENS BET COLLEGE & ASH	64	25	108	49
PA 550 BTW ARMAGAST & ROCK	233	168	165	192
PA 550 BTW BERNEL & FILLMOR	258	172	210	110
PA 550 BTW FILLMORE & ARMAG	150	134	57	64
PA 550 BTW JULIAN & BERNEL	205	164	100	123
PA 550 BTW ROCK & UPPER GYP	198	238	161	220
PARK BTW ALLEN & BURROWES	173	286	395	188
PARK BTW BIGLER & SHRTLDGE	162	281	269	194
PARK BTW BORO LINE & UNIV	197	218	258	212
PARK BTW BURROW & ATHERTN	165	744	427	242
PARK BTW C75A & PORTER	488	204	289	623
PARK BTW FAIRWAY & ATHERTON	26	0	84	0
PARK BTW FOX HOLLOW & UNIV	219	155	151	298
PARK BTW HOSP & 322 RAMP	610	141	317	671
PARK BTW MCKEE & ALLEN	202	326	466	293
PARK BTW MCKEE & SHORTLIDGE	349	186	308	545
PARK BTW ORCHARD & FOX HILL	501	195	286	635
PARK BTW ORCHARD & HOSP	191	513	575	323
PARK BTW PORTER & UNIV	291	108	133	362
PARK BTW UNIV & BIGLER	206	200	213	248
PARK UNDER US 322	43	166	399	84
PIEK BTW COLLEGE & ELMOOD	273	399	527	390
POLLCK BTW BUROWE & ATHERTN	34	94	332	79
PORTER BTW COLL & HASTING	192	1	106	7
PORTER BTW PARK & CURTIN	655	254	292	616
PUDDINTWN BTW HOUSER & WALK	8	15	67	233
ROCK BTW AIRPORT & SEIBERT	110	250	380	289
ROCK BTW AIRPORT & SEIBERT	111	16	381	18
ROCK BTW AIRPORT & SEIBERT	111	250	381	290
ROCK BTW BARN'S & AIRPORT	63	97	205	176
ROCK BTW SEIBERT & PA 550	66	170	179	211
ROCK BTW SEIBERT & PA 550	71	182	192	220
ROCK BTW TROUT & TWN LINE	85	132	242	219
ROCK TO AIRPORT RIGHT TURN	234	0	272	0
SCI PK BTW CIRVLLE & GTSBRG	391	284	424	689
SEIBERT BTW ROCK & BEND	42	70	193	74
SHORTLDGE BTW PARK & CURTIN	73	118	368	205
SHORTLDGE BTW POLOCK & COLL	136	589	518	381
SLPY HOL BTW SC PK & CHEST	96	100	146	46
SPARKS BTW COLLEGE & BEAVER	4	1	9	1
SPARKS BTW COLLEGE & BEAVER	5	1	10	1
SPARKS BTW FOSTER & BEAVER	6	2	3	1
SPARKS BTW RROAD & COLLEGE	3	59	9	59
SPARKS BTW W PKWY & HAMILTN	13	7	19	8
TROUT BTW HOUSER & GERLD	63	46	100	102
UNIV BTW BIGLER & PARK	11	52	44	18
UNIV BTW E PKWY & NIMITZ	94	279	380	398
UNIV BTW NIMITZ & ATHERTON	116	279	366	408
UNIV BTW PARK & CURTIN	137	135	61	136
UNIV BTW WARING & E PKWY	172	411	472	417

LINK NAME	AM PEAK A==>B	AM PEAK B==>A	PM PEAK A==>B	PM PEAK B==>A
UNIV BTW WHTHALL & ATHERTON	309	217	429	401
UNIV NB TO COLLWB	33	0	41	0
UNIV NORTH OF RAMP SIGNAL	192	355	480	194
UNIV SOUTH OF RAMP	271	376	439	234
UNIV SOUTH OF RAMP SIGNAL	271	355	607	194
UNIVERSITY OVER COLLEGE	271	388	607	235
US 322 NB & COLL ENT RAMP	435	0	582	0
US 322 NB & PARK EXT RAMP	166	0	84	0
US 322 NB & PARK ENT RAMP	46	0	399	0
US 322 NB & COLL EXT RAMP	465	0	601	0
US 322 SB & COLL ENT RAMP	295	0	404	0
US 322 SB & PARK EXT RAMP	444	0	233	0
US 322 SB & PARK ENT RAMP	95	0	272	0
US 322 SB & COLL EXT RAMP	502	0	500	0
V VISTA BTW CIRVILLE & BACHM	186	350	501	447
VAIRO BTW ATHERTON & WADDLE	244	287	450	341
W PKWY BTW HEDGEROW & CORL	108	137	180	212
W PKWY BTW MADISON & CORL	78	30	115	58
W PKWY BTW SPARKS & OBRYAN	127	87	166	188
W PKWY BTW SPARKS & SAXTON	74	120	169	158
WEST CAMPUS ACCESS	43	194	170	64

University Planned District

Table 3
2000 Study
Intersection Link Volumes

TABLE 3

2000 STUDY INTERSECTION LINK VOLUMES

	AM PEAK		PM PEAK	
LINK NAME	A==>B	B==>A	A==>B	B==>A
AIRPORT BTW FILLMORE & TECH	121	147	316	346
AIRPORT BTW PSRP & PARK	171	213	490	631
AIRPORT BTW TECH & ROCK	57	140	260	225
AIRPORT BTW TECH & ROCK	101	15	329	34
ALLEN BTW CURTIN & PARK	38	104	239	78
ALLEN BTW PARK & ADAMS	7	36	126	82
ATHERTN BTW PARK & HILCRST	413	760	961	799
ATHERTN BTW WHTHALL & UNIV	490	801	1114	842
ATHERTON BTW AARON & CLINTN	600	447	649	1004
ATHERTON BTW BEAVER & FOST	256	390	564	427
ATHERTON BTW CHERRY & CLINT	426	655	769	799
ATHERTON BTW CHERRY & OAK	978	462	796	949
ATHERTON BTW COLL & BEAVER	479	412	896	463
ATHERTON BTW COLL & POLLOCK	623	614	875	1085
ATHERTON BTW COLL & POLLOCK	660	588	898	1062
ATHERTON BTW PARK & POLLOCK	743	601	912	1058
ATHERTON BTW PARK & POLLOCK	754	577	931	1052
ATHERTON BTW UNIV & BRANCH	684	1095	1808	1487
ATHERTON BTW VAIRO & AARON	395	741	1208	812
ATHERTON BTW WDYCRS & VAIRO	569	289	538	686
BARNARD BTW COLLEGE & BEAVE	3	1	8	0
BARNARD BTW FOSTER & BEAVER	4	21	0	48
BARNARD BTW RROAD & COLLEGE	3	0	7	40
BARNARD BTW RROAD & COLLEGE	3	27	8	0
BCOURSE BTW W PKWY & COLL	14	32	158	128
BEAVER BTW ATHERTON & BURRW	525	0	768	0
BEAVER BTW BARNARD & ATHERT	323	0	473	0
BEAVER BTW BKHOUT & CORL	3	38	7	16
BEAVER BTW GARNER & HIGH	289	0	720	0
BEAVER BTW GILL & BARNARD	337	0	513	0
BEAVER BTW LOCUST & GARNER	600	0	936	0
BEAVER BTW PATERSON & SPARK	273	0	388	0
BEAVER BTW PATTER & BUCKOUT	312	0	456	0
BEAVER BTW SPARKS & GILL	282	0	400	0
BENNER PK BTW AIRPRT & PSRP	520	244	625	895
BENNER PK BTW PSRP & RT 322	527	400	751	978
BERNEL BTW FOX HIL & PA 550	35	45	138	43
BIGLER BTW BORO LINE & PARK	237	90	275	513
BIGLER BTW PARK & CURTIN	74	278	275	93
BUCKHOUT BTW COLL & BEAVER	270	0	451	0
BUCKHOUT BTW FOST & BEAVER	13	5	12	16
BURROWES BTW BEAVER & FOSTR	35	0	76	0
BURROWES BTW COLLEGE & BEAV	76	32	105	27
BURROWES BTW COLLEGE & BEAV	96	17	119	16
BURROWES BTW POLLOCK & COLL	113	143	101	48
CHERRY BTW ATHERTN & BORO	12	21	106	176
CHERRY BTW ATHERTN & CLINTN	54	333	355	100

	AM PEAK		PM PEAK	
LINK NAME	A==>B	B==>A	A==>B	B==>A
CIRCLEVIL BTW CORL & PK HIL	85	247	240	315
CIRCLVIL BTW SC PK & PK HIL	72	131	52	275
CLINTN BTW ATHERTN & MARTIN	162	335	331	553
CLINTON BTW CORL & CHERRY	405	285	640	616
CLINTON BTW UNIV & ATHERTN	350	449	751	587
COLL BTW ATHERTN & BURROWES	554	0	1030	0
COLL BTW ATHERTON & BARNARD	414	0	807	0
COLL BTW BURROWES & ATHERTN	554	0	1030	0
COLL BTW ELMWD & 322 RMP	496	766	1047	757
COLL BTW FRASER & BURROWES	663	0	1055	0
COLL BTW GARNER & LOCUST	648	0	782	0
COLL BTW HOUSER & 322 NB	1075	1017	975	1064
COLL BTW HOUSER & STRUBLE	1237	1135	1154	1335
COLL BTW LOOP & PINE HALL	424	509	954	694
COLL BTW OWENS & LOOP	373	477	812	563
COLL BTW PATTER & BUCKHOUT	365	0	656	0
COLL BTW PATTERSON & SPARKS	386	0	741	0
COLL BTW PORTER & PUDDINTWN	91	934	1147	796
COLL BTW PUDDINTWN & ELMWOD	508	898	1147	793
COLL EB RAMP TO UNIV	12	221	2	200
COLL WB RAMP TO UNIV SB	85	0	162	0
COLL WB TO UNIV NB	146	0	57	0
COLLEGE BTW BKHOUT & CORL	338	266	587	399
COLLEGE BTW BKHOUT & CORL	357	261	633	428
COLLEGE BTW BRNARD & GILL	387	0	767	0
COLLEGE BTW GILL & SPARKS	447	0	861	0
COLLEGE BTW HIGH & UNIV	299	819	698	750
COLLEGE BTW MIDDLE & CORL	413	388	412	759
COLLEGE BTW MIDDLE & OWENS	374	447	823	485
COLLEGE BTW NB RMP & US 322	652	1027	1080	723
COLLEGE BTW RAMP & UNIV	303	615	713	567
COLLEGE BTW SB RMP & US 322	652	1027	1080	723
COLLGE BTW HIGH & SHORTLID	717	0	637	0
COLLGE BTW PORTER & BORO	470	846	1048	786
CORL BTW BEAVER & COLLEGE	68	18	61	47
CORL BTW BEAVER & WES PKWY	58	8	38	39
CORL BTW CLINTON & COLLEGE	7	16	43	31
CORL BTW POLLOCK & COLLEGE	38	185	234	90
CRICKLWD BTW BEND & FOX HOL	265	128	220	350
E PKWY BTW BORO LN & UNIV	33	38	60	41
E PKWY BTW UNIV & GARNER	64	172	333	122
E PKWY BTW UNIV & GARNER	95	164	340	151
E PKWY BTW WILLIAM & GARNER	173	80	294	138
ELMWOOD BTW COLL & BRANCH	73	193	203	140
F HOLLOW BTW CRCKL & F HILL	89	307	267	345
F HOLLOW BTW PARK & ORCHARD	75	431	91	39
F HOLLOW BTW TWP LN & CRCKW	75	430	91	39
FILLMORE BTW AIR & PA 550	96	227	240	209
FILLMORE BTW PA 550 & V. V.	129	248	312	255
FOX HILL BTW BERNEL & FILLM	67	264	167	351
FOX HILL BTW BERNEL & FILLM	207	365	554	553

	AM PEAK		PM PEAK	
LINK NAME	A==>B	B==>A	A==>B	B==>A
FOX HILL BTW REGIN & BERNEL	86	294	239	327
GARNER BTW BEAVER & FOSTER	88	89	378	217
GARNER BTW BEAVER & FOSTER	105	119	549	218
GARNER BTW COLLEGE & BEAVER	85	396	396	450
GARNER BTW COLLEGE & BEAVER	120	425	467	568
GARNER BTW NIMITZ & E PKWY	1	2	5	5
GARNER BTW WARING & E PKWY	10	32	76	421
HOUSER BTW PON & COLLEGE	158	125	242	222
HOUSE BTW PUDDINTWN & OAK	35	22	67	43
HOUSER BTW PUDINTN & TROUT	25	39	61	53
LOOP RD BTW COLL & POLLOCK	177	214	305	286
LOOP RD BTW GATSBRG & CLINT	149	199	339	378
LOOP RD BTW POLLOCK & GATES	166	226	362	299
ORCHARD BTW PUDINTN & PARK	6	23	12	53
OWENS BET COLLEGE & ASH	63	32	155	66
PA 550 BTW ARMAGAST & ROCK	111	61	137	129
PA 550 BTW BERNEL & FILLMOR	95	70	138	94
PA 550 BTW FILLMORE & ARMAG	52	39	64	47
PA 550 BTW JULIAN & BERNEL	103	68	71	123
PA 550 BTW ROCK & UPPER GYP	97	114	181	203
PARK BTW ALLEN & BURROWES	124	276	369	235
PARK BTW BIGLER & SHRTLDGE	307	255	495	729
PARK BTW BORO LINE & UNIV	196	321	473	285
PARK BTW BURROW & ATHERTN	160	312	410	294
PARK BTW C75A & PORTER	435	285	547	832
PARK BTW FAIRWAY & ATHERTON	17	0	80	0
PARK BTW FOX HOLLOW & UNIV	340	238	329	513
PARK BTW HOSP & 322 RAMP	582	251	621	990
PARK BTW MCKEE & ALLEN	201	316	399	381
PARK BTW MCKEE & SHORTLIDGE	341	183	397	476
PARK BTW ORCHARD & FOX HILL	449	277	546	846
PARK BTW ORCHARD & HOSP	273	462	844	586
PARK BTW PORTER & UNIV	379	162	276	542
PARK BTW UNIV & BIGLER	306	197	284	461
PARK UNDER US 322	272	549	879	701
PIEK BTW COLLEGE & ELMOOD	212	339	581	291
POLLCK BTW BUROWE & ATHERTN	33	157	309	94
POLLUCK BTW ATHERTON & LOOP	1	25	74	30
POLLOCK BTW CORL & ATHERTON	1	25	74	30
POLLOCK BTW RROAD & CORL	15	214	273	119
PORTER BTW COLL & HASTING	89	21	11	99
PORTER BTW PARK & CURTIN	467	179	314	385
PUDDINTWN BTW HOUSER & WALK	4	3	21	53
RELOC RT26 WB RAMP TO PARK	442	0	357	0
ROCK BTW AIRPORT & SEIBERT	75	184	318	284
ROCK BTW AIRPORT & SEIBERT	76	15	318	24
ROCK BTW AIRPORT & SEIBERT	76	183	318	284
ROCK BTW BARN'S & AIRPORT	28	52	98	99
ROCK BTW SEIBERT & PA 550	47	114	158	187
ROCK BTW SEIBERT & PA 550	52	125	191	210
ROCK BTW TROUT & TWN LINE	50	85	138	136

	AM PEAK		PM PEAK	
LINK NAME	A==>B	B==>A	A==>B	B==>A
ROCK TO AIRPORT RIGHT TURN	169	0	261	0
SCI PK BTW CIRVLLE & GTSBRG	341	240	472	889
SEIBERT BTW ROCK & BEND	25	61	133	80
SHORTLDGE BTW PARK & CURTIN	86	296	670	357
SHORTLDGE BTW POLOCK & COLL	141	514	606	562
SLPY HOL BTW SC PK & CHEST	93	117	203	38
SPARKS BTW COLLEGE & BEAVER	4	1	9	1
SPARKS BTW COLLEGE & BEAVER	5	1	11	1
SPARKS BTW FOSTER & BEAVER	6	2	3	1
SPARKS BTW RROAD & COLLEGE	3	61	9	121
SPARKS BTW RROAD & COLLEGE	5	10	12	82
SPARKS BTW W PKWY & HAMILTN	12	7	19	9
TROUT BTW HOUSER & GERLD	46	25	85	79
UNIV BTW BIGLER & PARK	499	86	150	509
UNIV BTW E PKWY & NIMITZ	105	292	651	520
UNIV BTW NIMITZ & ATHERTON	127	285	644	530
UNIV BTW PARK & CURTIN	532	142	166	522
UNIV BTW WARING & E PKWY	178	468	757	434
UNIV BTW WHTHALL & ATHERTON	299	241	481	546
UNIV NORTH OF RAMP SIGNAL	351	388	613	323
UNIV SB RAMP TO COLLEGE	12	221	2	200
UNIV SOUTH OF RAMP	261	423	635	380
UNIV SOUTH OF RAMP SIGNAL	435	388	775	323
UNIVERSITY OVER COLLEGE	435	388	775	323
US 322 NB & COLL ENT RAMP	216	0	546	0
US 322 NB & COLL EXT RAMP	533	0	278	0
US 322 SB & COLL ENT RAMP	67	0	179	0
US 322 NB & PARK EXT RAMP	218	0	228	0
US 322 SB & COLL ENT RAMP	360	0	326	0
US 322 SB & COLL EXT RAMP	630	0	883	0
US 322 SB & COLL EXT RAMP	255	0	393	0
US 322 SB & PARK ENT RMP	119	0	336	0
US 322 SB & PARK EXIT RAMP	174	0	146	0
V VISTA BTW CIRVILLE & BACHM	169	306	622	592
VAIRO BTW ATHERTON & WADDLE	106	173	522	273
W PKWY BTW HEDGEROW & CORL	77	95	193	237
W PKWY BTW MADISON & CORL	96	30	215	173
W PKWY BTW SPARKS & OBRYAN	112	72	197	217
W PKWY BTW SPARKS & SAXTON	59	105	198	189
WEST CAMPUS ACCESS	227	254	320	250

University Planned District

Table 4
1990
Intersection Operations

TABLE 4
1990 INTERSECTION OPERATIONS

INTERSECTION NO.	INTERSECTION NAME	CONTROL	LINK NAME		AM PEAK DELAY (SEC.)	AM PEAK LOS	PM PEAK DELAY (SEC.)	PM PEAK LOS
1	PA 550/BERNEL RD	U	BERNEL BTW FOX HIL & PA 550		15.9	C	15.7	C
			PA 550 BTW BERNEL & FILLMOR		3.2	A	1.8	A
2	PA 550/FILLMORE RD	U	FILLMORE BTW AIR & PA 550		17.7	C	18.1	C
			FILLMORE BTW PA 550 & V.V.		20.7	D	19.2	C
			PA 550 BTW BERNEL & FILLMOR		5.3	B	9.3	B
			PA 550 BTW FILLMORE & ARMAG		0.3	A	0.5	A
3	PA 550/ROCK RD	U	PA 550 BTW ROCK & UPPER GYP		6.5	B	8.3	B
			ROCK BTW SEIBERT & PA 550		16.1	C	17.7	C
4	ROCK RD/SEIBERT RD	U	ROCK BTW SEIBERT & PA 550		0.1	A	0.2	A
			SEIBERT BTW ROCK & BEND		14.7	C	17.7	C
5	FOX HOL/CRICKLWD DR	U	CRICKLWD BTW BEND & FOX HOL		21.9	D	43.6	E
			F HOLLOW BTW TWP LN & CRCKW		5.4	B	4.3	A
6	FOX HILL RD/BERNEL RD	U	BERNEL BTW FOX HIL & PA 550		17.4	C	19.5	C
			FOX HILL BTW REGIN & BERNEL		6.8	B	6	B
7	FILLMORE RD/FOX HILL RD	U	FILLMORE BTW AIR & PA 550		16.4	C	16.5	C
			FOX HILL BTW BERNEL & FILLM		2.3	A	4	A
8	ROCK RD/AIRPORT RD	U	ROCK BTW AIRPORT & SEIBERT		13.7	C	14.8	C
			ROCK BTW BARN'S & AIRPORT		14.2	C	17.6	C
9	ATHERTON ST/VAIRO BLVD	S	ATHERTON BTW VAIRO & AARON		14.4	B	18.7	C
			ATHERTON BTW WDYCRS & VAIRO		14.6	B	13.6	B
			VAIRO BTW ATHERTON & WADDLE	(LT)	17.1	C	17.7	C
10	SC PK/ SLEEPY HOLLOW	U	CIRCLVIL BTW SC PK & PK HILL		19.5	C	46.6	F
			SCI PK BTW CIRVILLE & GTSBRG		1.9	A	1.4	A
			SLPY HOL BTW SC PK & CHEST		17.6	C	35.2	E
			V VISTA BTW CIRVILLE & BACHM		1.5	A	0.9	A
11	CIRCLEVLLE RD/CORL RD	U	CLINTON BTW CORL & CHERRY		7.9	B	5.9	B
			CORL BTW CLINTON & COLLEGE		13.3	C	18.6	C
12	ATHERTON ST/CLINTON AV	S	ATHERTON BTW ARON & CLINTN		23.1	C	20.8	C
			ATHERTON BTW CHERRY & CLINT		21.1	C	25.7	D
			CLINTN BTW ATHERTN & MARTIN		18.6	C	19	C
			CLINTON BTW ALLEN & ATHERTN		19.2	C	18.8	C
13	ATHERTON ST/CHERRY ST	S	ATHERTON BTW CHERRY & CLINT		15.5	C	24.9	C
			ATHERTON BTW CHERRY & CLINT	(LT)	15.5	C	22.8	C
			ATHERTON BTW CHERRY & OAK		14.6	B	25.7	D
			ATHERTON BTW CHERRY & OAK	(LT)	17.3	C	91.4	F
			CHERRY BTW ATHERTN & BORO		9.5	B	27.8	D
			CHERRY BTW ATHERTN & CLINTN		15.9	C	19.4	C
14	ATHERTON ST/PARK AVE	S	ATHERTN BTW PARK & HILCRST		18	C	16.6	C
			ATHERTN BTW PARK & HILCRST	(LT)	50.8	E	20.9	C
			ATHERTON BTW PARK & POLLOCK		16.5	C	19	C
			PARK BTW BURROW & ATHERTON		15.4	C	16.9	C
15	PARK AVE/ALLEN ST	S	ALLEN BTW CURTIN & PARK		12.2	B	12.8	B
			ALLEN BTW PARK & ADAMS		10.5	B	11.2	B
			PARK BTW ALLEN & BURROWES		14.7	B	14	B

			PARK BTW ALLEN & BURROWES	(LT)	NA	NA	16.7	C
			PARK BTW MCKEE & ALLEN		13.1	B	17.9	C
			PARK BTW MCKEE & ALLEN	(LT)	15.9	C	16.8	C
16	PARK AVE/SHORTLIDGE RD	S	PARK BTW BIGLER & SHRTLDGE		12.8	B	14.5	B
			PARK BTW BIGLER & SHRTLDGE	(LT)	15.9	C	16.9	C
			PARK BTW MCKEE & SHRTLDGE		15.7	C	15.7	C
			SHORTLDGE BTW PARK & CURTIN		10.4	B	12.1	B
			SHORTLDGE BTW PARK & CURTIN	(LT)	13.4	B	17.3	C
17	PARK AVE/BIGLER RD	S	BIGLER BTW BORO LINE & PARK		11.2	B	11.9	B
			BIGLER BTW PARK & CURTIN		12.2	B	12.2	B
			PARK BTW BIGLER & SHRTLDGE		14.3	B	14	B
			PARK BTW BIGLER & SHRTLDGE	(LT)	15.6	C	16.8	C
			PARK BTW UNIV & BIGLER		12.4	B	13.2	B
			PARK BTW UNIV & BIGLER	(LT)	15.8	C	16.8	C
18	PARK AVE/UNIVERSITY DR	S	PARK BTW BORO LINE & UNIV		13.6	B	14.7	B
			PARK BTW BORO LINE & UNIV	(LT)	15.5	C	NA	NA
			PARK BTW FOX HOLLOW & UNIV		15.8	C	14.8	B
			PARK BTW FOX HOLLOW & UNIV	(LT)	19.4	C	19.4	C
			UNIV BTW BIGLER & PARK		10	B	10.4	B
			UNIV BTW PARK & CURTIN		13.2	B	12.6	B
			UNIV BTW PARK & CURTIN	(LT)	17	C	17.2	C
19	PARK/FOX HOL-PORTER	S	F HOLLOW BTW PARK & ORCHARD		19.8	C	11.7	B
			PARK BTW ORCHARD & PORTER		15.5	C	16	C
			PARK BTW ORCHARD & PORTER	(LT)	221.3	C	21.4	C
			PARK BTW PORTER & UNIV		14.2	B	17.2	C
			PARK BTW PORTER & UNIV	(LT)	19.5	C	20.8	C
			PORTER BTW PARK & CURTIN		12.2	B	18.8	C
20	PARK AVE/ORCHARD RD	U	ORCHARD BTW PUDINTN & PARK		15.1	C	16.6	C
			PARK BTW ORCHARD & HOSP		0.5	A	2.7	A
21	PARK & US 322 SB RMPS	S	PARK BTW HOSP & 322 RAMP		15.2	C	24.3	C
			PARK UNDER US 322		15.4	C	16.1	C
			US 322 SB & EXIT RAMP		19.1	C	14.4	B
22	PARK/RT 322 NB RAMPS	S	PARK UNDER US 322		19.3	C	21.9	C
			US 322 NB & EXIT RAMP		15.4	C	14.5	B
23	HOUSRVIL RD/TROUT RD	U	TROUT BTW HOUSER & GERALD		8.4	B	9.3	B
24	HOUSRVL RD/PUDDINTWN	U	HOUSER BTW PUDDINTWN & OAK		0.1	A	1.4	A
			PUDDINTWN BTW HOUSER & WALK		7.5	B	8.5	B
25	ATHERTON ST/POLLOCK RD	S	ATHERTON BTW COLL & POLLOCK		14.2	B	18.2	C
			ATHERTON BTW COLL & POLLOCK	(LT)	16.9	C	19.5	C
			ATHERTON BTW PARK & POLLOCK		14.9	B	17.5	C
			ATHERTON BTW PARK & POLLOCK	(LT)	16	C	19.5	C
			POLLCK BTW BUROWE & ATHERTN		9.4	B	15.3	C
			WEST CAMPUS ACCESS		13.4	B	14.3	B
26	COLLEGE AVE/OWENS DR	U	OWENS BET COLLEGE & ASH		21.1	D	34.8	E
27	COLLEGE AVE/CORL ST	S	COLLEGE BTW BKHOUT & CORL		17.1	C	24.1	C
			COLLEGE BTW MIDDLE & CORL		19.7	C	13.8	B
			CORL BTW BEAVER & COLLEGE		12.5	B	15.2	C
			CORL BTW CLINTON & COLLEGE		11.6	B	16	C
29	COLLEGE AVE/SPARKS ST	U	SPARKS BTW COLLEGE & BEAVER		15.2	C	23.6	D
			SPARKS BTW RROAD & COLLEGE		14.9	C	23.5	D

30	COLLEGE AVE/BARNARD	U	BARNARD BTW COLLEGE & BEAV		14.5	C	21.6	D
			BARNARD BTW RROAD & COLL		14.4	C	21.6	D
31	COLLEGE AVE/ATHERTON	S	ATHERTON BTW COLL & BEAVER		14.4	C	21.6	D
			ATHERTON BTW COLL & BEAVER	(LT)	14.5	B	19.3	C
			ATHERTON BTW COLL & POLLOCK		13.8	B	21.1	C
32	COLLEGE/BURROWES RD	S	BURROWS BTW COLLEGE & BEAV		10.7	B	10.4	B
			BURROWS BTW POLLOCK & COLL		11.3	B	9.9	B
			COLL BTW FRASER & BURROWES		15.7	C	17.4	C
33	COLLEGE/SHORTLIDGE	S	COLLGE BTW HIGH & SHORTLID		16.8	C	15.7	C
			GARNER BTW COLL & BEAVER		12.1	B	14.1	B
			SHORTLDGE BTW POLOCK & COLL		11.3	B	17.9	C
34	UNIVERSITY/COLLEGE	S	COLL WB RAMP TO UNIV SB		14.6	B	14.9	B
			UNIV NORTH OF RAMP SIGNAL		14.2	B	17.9	C
			UNIV SOUTH OF RAMP SIGNAL		16	C	14.1	B
35	UNIVERSITY/COLLEGE EB	U	COLL EB RAMP TO UNIV		17.6	C	18.5	C
36	COLLEGE/PORTER RD	U	COLLGE BTW PORTER & BORO		5.5	B	1.6	A
			PORTER BTW COLL & HASTING		124.8	F	145	F
37	COLLEGE/ELMWOOD	S	COLL BTW ELMWOOD & 322 SB		20.6	C	17.1	C
			COLL BTW ELMWOOD & 322 SB	(LT)	19.4	C	25.7	C
			COLL BTW PUDDINTWN & ELMWD		17	C	21.7	C
38	COLLEGE/RT 322 SB RAMPS	S	COLL BTW ELMWD & 322 RMP		16.2	C	22.6	C
			COLLEGE BTW SB RMP & US 322		20.3	C	19.4	C
			COLLEGE BTW SB RMP & US 322	(LT)	22.6	C	55.8	E
			US 322 SB EXIT RAMP		20.3	C	22.9	C
39	COLLEGE/TR 322 NB RAMPS	S	COLL BTW HOUSER & 322 NB		21.5	C	19.3	C
			COLLEGE BTW NB RMP & US 322		17.5	C	21.8	C
			COLLEGE BTW NB RMP & US 322	(LT)	20.1	C	29	D
40	COLLEGE/HOUSERVILLE	S	COLL BTW HOUSER & RT 322		81.9	F	143.4	F
			COLL BTW HOUSER & STRUBLE		117.7	F	111.2	F
			COLL BTW HOUSER & STRUBLE	(LT)	175.6	F	174.5	F
			HOUSER BTW PON & COLLEGE		23.2	C	22.3	D
			PIKE BTW COLLEGE & ELMWOOD		35.6	D	52.4	E
41	BEAVER/BUCKHOUT	U	BEAVER BTW BKHOUT & CORL		23.3	D	31	E
			BUCKHOUT BTW COLL & BEAVER		15.1	C	17.6	C
			BUCKHOUT BTW FOST & BEAVER		9.7	B	9.9	B
42	BEAVER AVE/SPARKS	S	BEAVER BTW PATERSON & SPARK		13.7	B	14.2	B
			SPARKS BTW COLLEGE & BEAVER		12.4	B	13	B
			SPARKS BTW FOSTER & BEAVER		10.4	B	10.3	B
43	BEAVER AVE/BARNARD	U	BARNARD BTW COLLEGE & BEAV		15.1	C	16.3	C
			BARNARD BTW FOSTER & BEAVER		11.4	C	14	C
44	BEAVER AVE/ATHERTON	S	ATHERTON BTW BEAVER & FOST		12.6	B	14.8	B
			ATHERTON BTW COLL & BEAVER		12	B	16.1	C
			ATHERTON BTW COLL & BEAVER	(LT)	17.6	C	23.1	C
			BEAVER BTW BARNARD & ATHERT		14.1	B	14.8	B
45	BEAVER/BURROWES	S	BEAVER BTW ATHERTN & BURRW		14	B	16	C
			BURROWES BTW COLL & BEAV		11	B	11.3	B
46	BEAVER/GARNER ST	S	BEAVER BTW LOCUST & GARNER		14.1	B	16.4	C
			GARNER BTW BEAVER & FOSTER		11.1	B	13.9	B
			GARNER BTW COLLEGE & BEAV		12.3	B	15.5	C
47	WESTERLY PKY/CORL RD	U	CORL BTW BEAVER & WEST PKWY		13.2	C	14.2	C

			W PKWY BTW MADISON & CORL		1.1	A	1.9	A
48	WESTERLY PKY/SPARKS	U	SPARKS BTW W PKWY & HAMILTON		10.7	C	11.4	C
49	EASTERLY PKY & GARNER	U	E PKWY BTW WILLIAM & GARNER		1.3	A	5.1	B
			GARNER BTW NIMITZ & E PKWY		11.7	C	15.8	C
			GARNER BTW WARING & E PKWY		11.3	C	17.8	C
50	EASTERLY PKY/UNIVERSITY	S	E PKWY BTW BOR LN & UNIV		11	B	11.4	B
			E PKWY BTW UNIV & GARNER		15.5	C	15.2	C
			UNIV BTW E PKWY & NIMITZ		15.2	C	16.4	C
			UNIV BTW E PKWY & NIMITZ	(LT)	NA	NA	20.8	C
			UNIV BTW WARING & E PKWY		13.9	B	18.6	C
			UNIV BTW WARING & E PKWY	(LT)	16.8	C	18	C
51	ATHERTON/UNIVERSITY	S	ATHERTN BTW WHTALL & UNIV		16.3	C	16.8	C
			ATHERTN BTW WHTALL & UNIV	(LT)	19.3	C	NA	NA
			ATHERTON BTW UNIV & BRANCH		18.9	C	19.1	C
			ATHERTON BTW UNIV & BRANCH	(LT)	20.6	C	NA	NA
			UNIV BTW NIMITZ & ATHERTON		12.8	B	14.9	B
			UNIV BTW NIMITZ & ATHERTON	(LT)	17.2	C	25.4	D
			UNIV BTW WHTHALL & ATHERTON		16	C	18.6	C
			UNIV BTW WHTHALL & ATHERTON	(LT)	18.1	C	18.3	C

University Planned District

Table 5
2000
Intersection Operations

TABLE 5
2000 INTERSECTION OPERATIONS

INTERSECTION NO.	INTERSECTION NAME	CONTROL	LINK NAME		AM PEAK DELAY (SEC.)	AM PEAK LOS	PM PEAK DELAY (SEC.)	PM PEAK LOS
1	PA 550/BERNEL RD	U	BERNEL BTW FOX HIL & PA 550		15.1	C	15.5	C
			PA 550 BTW BERNEL & FILLMOR		2.8	A	1.9	A
2	PA 550/FILLMORE RD	U	FILLMORE BTW AIR & PA 550		16.1	C	18.9	C
			FILLMORE BTW PA 550 & V.V.		17.6	C	18.5	C
			PA 550 BTW BERNEL & FILLMOR		4.5	A	7.1	B
			PA 550 BTW FILLMORE & ARMAG		1.2	A	1.4	A
3	PA 550/ROCK RD	U	PA 550 BTW ROCK & UPPER GYP		8.6	B	9.3	B
			ROCK BTW SEIBERT & PA 550		14.4	C	16.1	C
4	ROCK RD/SEIBERT RD	U	ROCK BTW SEIBERT & PA 550		0.1	A	0.4	A
			SEIBERT BTW ROCK & BEND		13.9	C	17.2	C
5	FOX HOL/CRICKLWD DR	U	CRICKLWD BTW BEND & FOX HOL		16	C	16.7	C
			F HOLLOW BTW TWP LN & CRCKW		12.4	C	5.1	B
6	FOX HILL RD/BERNEL RD	U	BERNEL BTW FOX HIL & PA 550		16.6	C	20.3	D
			FOX HILL BTW REGIN & BERNEL		5.3	B	7	B
7	FILLMORE RD/FOX HILL RD	U	FILLMORE BTW AIR & PA 550		16.9	C	19	C
			FOX HILL BTW BERNEL & FILLM		7.3	B	8	B
8	ROCK RD/AIRPORT RD	U	ROCK BTW AIRPORT & SEIBERT		13.3	C	13.7	C
			ROCK BTW BARN'S & AIRPORT		13.9	C	15.9	C
9	ATHERTON ST/VAIRO BLVD	S	ATHERTON BTW VAIRO & AARON		13.4	B	18.8	C
			ATHERTON BTW WDYCRS & VAIRO		14.1	B	13.3	B
			VAIRO BTW ATHERTON & WADDLE	(LT)	16.3	C	17.6	C
10	SC PK/ SLEEPY HOLLOW	U	CIRCLVIL BTW SC PK & PK HILL		17.6	C	66.4	F
			SCI PK BTW CIRVILLE & GTSBRG		2.2	A	1.8	A
			SLPY HOL BTW SC PK & CHEST		17.2	C	77.5	F
			V VISTA BTW CIRVILLE & BACHM		0.9	A	1.6	A
11	CIRCLEVLLE RD/CORL RD	U	CIRCLEVIL BTW CORL & CHERRY		21.4	C	24.4	C
			CLINTON BTW CORL & CHERRY		19.7	C	24	C
			CORL BTW CLINTON & COLLEGE		16.4	C	16.5	C
			LOOP RD BTW GATSBRG & CLINT		20.6	C	21.9	C
12	ATHERTON ST/CLINTON AV	S	ATHERTON BTW AARON & CLINTN		22.2	C	22.8	C
			ATHERTON BTW CHERRY & CLINT		20.5	C	27.1	D
			CLINTN BTW ATHERTN & MARTIN		19.9	C	21.8	C
			CLINTN BTW ATHERTN & MARTIN	(LT)	NA	NA	20.6	C
			CLINTON BTW UNIV & ATHERTN		21.3	C	26.1	D
			CLINTON BTW UNIV & ATHERTN	(LT)	24.1	C	24.8	C
13	ATHERTON ST/CHERRY ST	S	ATHERTON BTW CHERRY & CLINT		14.6	B	27.7	D
			ATHERTON BTW CHERRY & CLINT	(LT)	15.5	C	22.9	C
			ATHERTON BTW CHERRY & OAK		14.2	B	27.1	D
			ATHERTON BTW CHERRY & OAK	(LT)	17.1	C	94.3	F
			CHERRY BTW ATHERTN & BORO		9.3	B	18.1	C
			CHERRY BTW ATHERTN & CLINTN		13.8	B	19.1	C
14	ATHERTON ST/PARK AVE	S	ATHERTN BTW PARK & HILCRST		15.4	C	15.8	C
			ATHERTN BTW PARK & HILCRST	(LT)	17.8	C	18.5	C
			ATHERTON BTW PARK & POLLOCK		14.3	B	20.6	C

			PARK BTW BURROW & ATHERTON		13	B	16.7	C
15	PARK AVE/ALLEN ST	S	ALLEN BTW CURTIN & PARK		11.4	B	12.5	B
			ALLEN BTW PARK & ADAMS		10.6	B	10.8	B
			PARK BTW ALLEN & BURROWES		14.1	B	14.5	B
			PARK BTW ALLEN & BURROWES	(LT)	NA	NA	16.7	C
			PARK BTW MCKEE & ALLEN		12.6	B	16.2	C
			PARK BTW MCKEE & ALLEN	(LT)	16.1	C	16.9	C
16	PARK AVE/SHORTLIDGE RD	S	PARK BTW BIGLER & SHRTLDGE		12.9	B	14.8	B
			PARK BTW BIGLER & SHRTLDGE	(LT)	17	C	20.4	C
			PARK BTW MCKEE & SHRTLDGE		15.1	C	16.8	C
			SHORTLDGE BTW PARK & CURTIN		10.6	B	14.2	B
			SHORTLDGE BTW PARK & CURTIN	(LT)	13.2	B	16.6	C
17	PARK AVE/BIGLER RD	S	BIGLER BTW BORO LINE & PARK		12.2	B	12.9	B
			BIGLER BTW PARK & CURTIN		11.2	B	12.8	B
			PARK BTW BIGLER & SHRTLDGE		13.8	B	16.9	C
			PARK BTW BIGLER & SHRTLDGE	(LT)	15.6	C	19.7	C
			PARK BTW UNIV & BIGLER		12.7	B	13.5	B
			PARK BTW UNIV & BIGLER	(LT)	15.8	C	16.8	C
18	PARK AVE/UNIVERSITY DR	S	PARK BTW BORO LINE & UNIV		13.4	B	17.7	C
			PARK BTW BORO LINE & UNIV	(LT)	15.5	C	16.7	C
			PARK BTW FOX HOLLOW & UNIV		17.1	C	16.8	C
			PARK BTW FOX HOLLOW & UNIV	(LT)	19.3	C	19.5	C
			UNIV BTW BIGLER & PARK		13.7	B	10.4	B
			UNIV BTW PARK & CURTIN		13.4	B	17.7	C
			UNIV BTW PARK & CURTIN	(LT)	16.9	C	17	C
19	PARK/FOX HOL-PORTER	S	F HOLLOW BTW PARK & ORCHARD		16.6	C	11.5	B
			PARK BTW ORCHARD & PORTER		16.3	C	15.3	C
			PARK BTW ORCHARD & PORTER	(LT)	20.3	C	29.4	D
			PARK BTW PORTER & UNIV		15	B	18.8	C
			PARK BTW PORTER & UNIV	(LT)	19.3	C	18.6	C
			PORTER BTW PARK & CURTIN		11.8	B	15.9	C
20	PARK AVE/ORCHARD RD	U	ORCHARD BTW PUDINTN & PARK		15.9	C	22.7	D
			PARK BTW ORCHARD & HOSP		0.7	A	1.7	A
21	PARK & US 322 SB RMPS	S	PARK BTW HOSP & 322 RAMP		22.2	C	19.8	C
			PARK UNDER US 322		24.7	C	17.4	C
			US 322 SB & EXIT RAMP		23	C	18.6	C
22	PARK/RT 322 NB RAMPS	S	BENNER PK BTW PSRP & RT 322		16.4	C	17.9	C
			PARK UNDER US 322		14.9	B	18.1	C
			PARK UNDER US 322	(LT)	19.2	C	20.1	C
			US 322 NB & EXIT RAMP		51.9	C	16	C
23	HOUSRVIL RD/TROUT RD	U	TROUT BTW HOUSER & GERALD		8.3	B	8.7	B
24	HOUSRVL RD/PUDDINTWN	U	HOUSER BTW PUDDINTWN & OAK		NA	NA	1.1	A
			PUDDINTWN BTW HOUSER & WALK		7.4	B	7.4	B
25	ATHERTON ST/POLLOCK RD	S	ATHERTON BTW COLL & POLLOCK		13.8	B	18.6	C
			ATHERTON BTW COLL & POLLOCK	(LT)	17.8	C	19.6	C
			ATHERTON BTW PARK & POLLOCK		15.7	C	19	C
			ATHERTON BTW PARK & POLLOCK	(LT)	NA	NA	19.4	C
			POLLCK BTW BUROWE & ATHERTN		9.4	B	14.1	B
			WEST CAMPUS ACCESS		15.2	C	16.9	C
26	COLLEGE AVE/OWENS DR	U	OWENS BET COLLEGE & ASH		20.1	D	52.7	F

27	COLLEGE AVE/CORL ST	S	COLLEGE BTW BKHOUT & CORL		14.8	B	19.7	C
			COLLEGE BTW MIDDLE & CORL		21.5	C	19.3	C
			CORL BTW BEAVER & COLLEGE		12.8	B	12.5	B
			CORL BTW POLLOCK & COLLEGE		12.3	B	12.9	B
29	COLLEGE AVE/SPARKS ST	U	SPARKS BTW COLLEGE & BEAVER		13.4	C	20	C
			SPARKS BTW RROAD & COLLEGE		13.1	C	19.2	C
30	COLLEGE AVE/BARNARD	U	BARNARD BTW COLLEGE & BEAV		11.8	C	18.8	C
			BARNARD BTW RROAD & COLL		12.5	C	18.8	C
31	COLLEGE AVE/ATHERTON	S	ATHERTON BTW COLL & BEAVER		12.6	B	15.9	C
			ATHERTON BTW COLL & BEAVER	(LT)	14.3	B	19.4	C
			ATHERTON BTW COLL & POLLOCK		13.5	B	20.9	C
			COLL BTW BURROWES & ATHERTN		14.1	B	17.1	C
32	COLLEGE/BURROWES RD	S	BURROWS BTW COLLEGE & BEAV		11.1	B	12.1	B
			BURROWS BTW POLLOCK & COLL		11.2	B	9.7	B
			COLL BTW FRASER & BURROWES		14.6	B	17.3	C
33	COLLEGE/SHORTLIDGE	S	COLLGE BTW HIGH & SHORTLID		14.9	B	15	B
			GARNER BTW COLL & BEAVER		11.9	B	14.8	B
			SHORTLDGE BTW POLOCK & COLL		11.3	B	20.1	C
34	UNIVERSITY/COLLEGE	S	COLL WB RAMP TO UNIV SB		14.6	B	15.2	C
			UNIV NORTH OF RAMP SIGNAL		15.8	C	20.9	C
			UNIV SOUTH OF RAMP SIGNAL		16.3	C	15.2	C
35	UNIVERSITY/COLLEGE EB	U	COLL EB RAMP TO UNIV		19.1	C	26.3	D
36	COLLEGE/PORTER RD	U	COLLBTWPORTER & PUDDINTWN		19.2	C	18.1	C
			COLLGE BTW PORTER & BORO		16.1	C	20.1	C
			PORTER BTW COLL & HASTING		13.1	B	13.5	B
37	COLLEGE/ELMWOOD	S	COLL BTW ELMWOOD & 322 SB		17.7	C	17.1	C
			COLL BTW ELMWOOD & 322 SB	(LT)	19.3	C	26.2	D
			COLL BTW PUDDINTWN & ELMWD		16.3	C	21.4	C
			ELMWOOD BTW COLL & BRANCH		13.6	B	13.7	B
38	COLLEGE/RT 322 SB RAMPS	S	COLL BTW ELMWD & 322 RMP		16	C	21.2	C
			COLLEGE BTW SB RMP & US 322		17.2	C	17.2	C
			COLLEGE BTW SB RMP & US 322	(LT)	26.9	D	63	F
			US 322 SB EXIT RAMP		16.5	C	19.5	C
39	COLLEGE/TR 322 NB RAMPS	S	COLL BTW HOUSER & 322 NB		19.7	C	18.9	C
			COLLEGE BTW NB RMP & US 322		16.5	C	18.9	C
			COLLEGE BTW NB RMP & US 322	(LT)	23.1	C	93.9	F
			US 322 NB EXIT RAMP		21	C	17.2	C
40	COLLEGE/HOUSERVILLE	S	COLL BTW HOUSER & RT 322		34.7	D	74.1	F
			COLL BTW HOUSER & STRUBLE		36.2	D	45.5	E
			COLL BTW HOUSER & STRUBLE	(LT)	243.4	F	154.7	F
			HOUSER BTW PON & COLLEGE		21.2	C	25.5	D
			PIKE BTW COLLEGE & ELMWOOD		23	C	24.7	C
41	BEAVER/BUCKHOUT	U	BEAVER BTW BKHOUT & CORL		14.2	C	20.2	D
			BUCKHOUT BTW COLL & BEAVER		12.7	C	15.1	C
			BUCKHOUT BTW FOST & BEAVER		9.7	B	9.7	B
42	BEAVER AVE/SPARKS	S	BEAVER BTW PATERSON & SPARK		12.8	B	14.1	B
			SPARKS BTW COLLEGE & BEAVER		12.4	B	13	B
			SPARKS BTW FOSTER & BEAVER		10.4	B	10.3	B
43	BEAVER AVE/BARNARD	U	BARNARD BTW COLLEGE & BEAV		12.4	C	14.9	C
			BARNARD BTW FOSTER & BEAVER		10.5	C	14.4	C

44	BEAVER AVE/ATHERTON	S	ATHERTON BTW BEAVER & FOST		12.5	B	15.1	C
			ATHERTON BTW COLL & BEAVER		11.9	B	16.5	C
			ATHERTON BTW COLL & BEAVER	(LT)	16.5	C	26.3	D
			BEAVER BTW BARNARD & ATHERT		13	B	14.5	B
45	BEAVER/BURROWES	S	BEAVER BTW ATHERTN & BURRW		13.1	B	16.1	C
			BURROWES BTW COLL & BEAV		10.8	B	11.2	B
46	BEAVER/GARNER ST	S	BEAVER BTW LOCUST & GARNER		13.5	B	17.3	C
			GARNER BTW BEAVER & FOSTER		11	B	13.6	B
			GARNER BTW COLLEGE & BEAV		11.5	B	14	B
47	WESTERLY PKY/CORL RD	U	CORL BTW BEAVER & WEST PKWY		12.7	C	14.6	C
			W PKWY BTW MADISON & CORL		1	A	0.7	A
48	WESTERLY PKY/SPARKS	U	SPARKS BTW W PKWY & HAMILTON		10.4	C	11.9	C
49	EASTERLY PKY & GARNER	U	E PKWY BTW WILLIAM & GARNER		1.2	A	11	C
			GARNER BTW NIMITZ & E PKWY		11.8	C	19.5	C
			GARNER BTW WARING & E PKWY		11.4	C	21.9	D
50	EASTERLY PKY/UNIVERSITY	S	E PKWY BTW BOR LN & UNIV		11	B	13.1	B
			E PKWY BTW UNIV & GARNER		15.7	C	16.2	C
			UNIV BTW E PKWY & NIMITZ		15.1	C	15.1	C
			UNIV BTW E PKWY & NIMITZ	(LT)	NA	NA	34.1	D
			UNIV BTW WARING & E PKWY		13.8	B	23.8	C
			UNIV BTW WARING & E PKWY	(LT)	16.8	C	16.7	C
51	ATHERTON/UNIVERSITY	S	ATHERTN BTW WHTALL & UNIV		16.1	C	22.8	C
			ATHERTN BTW WHTALL & UNIV	(LT)	19.2	C	NA	NA
			ATHERTON BTW UNIV & BRANCH		19.3	C	27.8	D
			ATHERTON BTW UNIV & BRANCH	(LT)	20.8	C	58.7	E
			UNIV BTW NIMITZ & ATHERTON		12.8	B	18.3	C
			UNIV BTW NIMITZ & ATHERTON	(LT)	17.1	C	104.4	F
			UNIV BTW WHTHALL & ATHERTON		16	C	24.1	C
			UNIV BTW WHTHALL & ATHERTON	(LT)	18.1	C	NA	NA
52	PARK AVE EXT/AIRPORT RD	S	AIRPORT BTW PSRP & PARK		13.8	B	17.7	C
			BENNER PK BTW AIRPRT & PSRP		14	B	13.2	B
			BENNER PK BTW AIRPRT & PSRP	(LT)	20.7	C	29	D
			RELOC RT 26 WP RAMP TO PARK		15.9	C	13.4	B
53	POLLOCK RD EXT/LOOP RD	S	LOOP RD BTW COLL & POLLOCK		13.8	B	14.4	B
			LOOP RD BTW POLLOCK & GATES		14	B	14.3	B
			LOOP RD BTW POLLOCK & GATES	(LT)	18	C	18.1	C
			POLLOCK BTW ATHERTON & LOOP		10.3	B	10.8	B
54	POLLOCK EXT/CORL RD	U	CORL BTW POLLOCK & COLLEGE		10.2	C	9.9	B
			POLLOCK BTW RROAD & CORL		7.7	B	7	B
55	COLLEGE AVE/LOOP RD	S	BCOURSE BTW W PKWY & COLL		10.4	B	13.2	B
			BCOURSE BTW W PKWY & COLL	(LT)	13.1	B	15.8	C
			COLL BTW LOOP & PINE HALL		17.4	C	15.3	C
			COLL BTW LOOP & PINE HALL	(LT)	18.9	C	32.2	D
			COLL BTW OWENS & LOOP		17.1	C	24.8	C
			LOOP RD BTW COLL & POLLOCK		14	B	17.5	C
			LOOP RD BTW COLL & POLLOCK	(LT)	18.3	C	20.5	C
56	COLLEGE AVE/UNIVER	S	COLLEGE BTW HIGH & UNIV		14.4	B	16.6	C
			COLLEGE BTW RAMP & UNIV		16.9	C	16.6	C
			UNIV SB RAMP TO COLLEGE		12	B	11.8	B

University Planned District

District Plan Transportation Study Summary of Transportation Maps

UNIVERSITY PLANNED DISTRICT (UPD)

DISTRICT PLAN TRANSPORTATION STUDY (DPTS)

Summary of Transportation Maps

In 1994, Travers Associates prepared several maps for the purpose of addressing the roadway, bicycle, and pedestrian elements of the District Plan Transportation Study (DPTS). These maps complemented Travers Associates' February 10, 1994 Memorandum of Record to Penn State University, which comprises the roadway element of the DPTS.

Because these maps are of large size, copies are not being provided to each municipal official. A summary of the contents of each map, prepared by CRPC staff, is provided below. One complete set of the maps has been provided to each municipality, and is available for review at the municipal buildings.

FIGURE Al: UPD CONTEXT - STATE COLLEGE BOROUGH/ADJACENT TOWNSHIPS

This map is similar to the Subdistrict Map included in the UPD *District Plan*. The map illustrates much of the Region's existing (1990) roadway network. Figure Al also illustrates municipal boundaries, the lands of the University Park Campus, and the UPD boundary.

FIGURE A2: PROPOSED BIKE SYSTEM - UNIVERSITY PARK CAMPUS

Figure A2 focuses on the University Park Campus, and illustrates several elements of a proposed bike system:

- Bike paths
- Bike lanes on roadways
- Roadways signed as bike routes
- Dismount zones
- Bike parking areas for activity centers
- Parking areas for storage of bikes
- Major portals for entry/exit to campus

FIGURE A3: POTENTIAL BIKE SYSTEM - STATE COLLEGE BOROUGH/ADJACENT TOWNSHIPS

Figure A3 focuses on State College Borough and the surrounding townships. This map incorporates bike facilities which are illustrated on the CRPC's Regional Trail Network map. Figure A3 also illustrates projects which have been included on various municipal capital improvement programs. Several elements of a potential off-campus bike system are illustrated on the map:

- Existing and future bike paths
- Existing and future bike lanes
- Existing and future roadways signed as bike routes
- Major approach directions to campus
- Major portals for entry/exit to campus (consistent with Figure A2)
- Origins of bike traffic, relative to the direction of approach to the campus

FIGURE A4: ROADWAYS - 2000 - STATE COLLEGE BOROUGE/ADJACENT TOWNSHIPS

This map illustrates the Region's future roadway system, including five proposed roadway projects which were analyzed in the traffic simulation model utilized by Travers Associates to complete the roadway element of the DPTS:

1. Route 26 Relocation
2. Western Inner Loop
3. Eastern Inner Loop, connections to Clinton Ave. and Mount Nittany Expressway
4. Airport Road Connector, Penn State Research Park to Fox Hill Road
5. Pollock Road Extension, which would connect North Atherton Street and the Western Inner Loop, including an at-grade intersection with existing Corl Road

In addition, the map also illustrates two other future University-owned roadways:

6. A new roadway approximately parallel with Railroad Avenue along the former Bellefonte Central Railroad right-of-way on the West Campus, which would connect parking areas in West Campus with the Pollock Road Extension
7. A new roadway connecting Hastings Road to University Drive south of the Jordan Center and the University's track and field stadium

The map illustrates both Shortledge Road and Bigler Road as remaining open to traffic in the foreseeable future. The *University Park Campus Master Transportation Plan (1988)* illustrated these two roadways as being closed to traffic in the future.

FIGURE A5: PEDESTRIAN - 2000 - UNIVERSITY PARK CAMPUS

Figure AS focuses on major pedestrian movements on the University Park Campus, and on major portals for pedestrian entry/exit from campus.

Three future pedestrian bridges are illustrated on the map:

- North Atherton Street near the Centre Region Bus Terminal
- University Drive adjacent to the Bryce Jordan Center
- Park Avenue between Bigler Road and University Drive

Two pedestrian safety zones which were recently implemented by Penn State are also illustrated on the map:

- Pollock Road, at the Allen Street pedestrian mall near Willard Building
- Shortledge Road, between Curtin Road and Pollock Road, near Eisenhower Auditorium

University Planned District

Parking and Street Design Standards

PARKING STANDARDS

All parking areas within the University Planned District shall be designed according to the following design standards:

Park Space Dimensions (Minimum)

Faculty, Staff, Community Student Lot Standards				Student Storage Lot Standards			
Angle	8’ 6” Stall	8’ 9” Stall	9’ 0” Stall	Angle	8’ 6” Stall	8’ 9” Stall	9’ 0” Stall
45	49’ 3”	48’ 6”	47’ 9”	45	45’ 9”	45’ 0”	44’ 3”
50	51’ 0”	50’ 3”	49’ 6”	50	47’ 6”	46’ 9”	46’ 0”
55	42’ 3”	51’ 6”	50’ 9	55	48’ 9”	48’ 0”	47’ 3”
60	53’ 9”	53’ 0”	52’ 3”	60	50’ 3”	49’ 6”	48’ 9”
65	55’ 0”	54’ 3”	53’ 6”	65	51’ 6”	50’ 9”	50’ 0”
70	56’ 3”	55’ 6”	54’ 9”	70	52’ 9”	52’ 0”	51’ 3”
75	57’ 3”	56’ 6”	55’ 9”	75	53’ 9”	53’ 0”	52’ 3”
90	61’ 3”	60’ 6”	59’ 9”	90	57’ 9”	57’ 0”	56’ 3”

Notes:

1. Interpolation between the specified parking angles, stall widths, and respective module dimensions is permitted.
2. Module sizes indicated are the minimum dimensions permitted for the particular use group.
3. Columns and light poles in a multi-level parking structure may protrude into the parking module a combined maximum of 2’ 0” as long s they do not affect more than 25 percent of the stalls in that bay.
4. Small-car-only stalls (8’ 0” wide by 15’ 0” long) should only be used in constrained locations. The number of these stalls should not exceed 15 percent of the total capacity.
5. Parallel stall = 8’ 0” wide by 21’ 6” long.
6. Stripe projection = 16’ 6”.
7. In the event varying parking angles are used in a parking lot or structure, the module associated with the larger angle shall be used.
8. Vehicle overhang is permissible provided that the requirements noted in *Definitions* and in the illustration are met.

Raised Landscape Islands:

Required at end of each interior bay.
8’ 0” minimum width. 10’ 0” preferred.
Constant width entire bay with radius equal to one-half of bay width.
One island every 10 spaces or, in lieu of interior islands,
one 10’ 0” minimum linear island the entire length of the bay.
Trees are required in islands.

Structures:

Except as specified in the Notes section (above), utility poles, light standards, etc., shall not be permitted within any aisle or parking space. All structures shall be surrounded on all sides by concrete curbs equal to or greater than 6 inches and at least 5 feet from the curb.

STREET DESIGN STANDARDS

The following standards will apply to all non-public streets within the University Planned District:

Street Widths:

- 24 feet minimum, with curbs;
- 24 feet minimum without curbs with an edge line 11 feet from the center line of the roadway.
- Additional pavement 4 feet wide on each side of all roadways where bike lanes are to be Incorporated.

Grades:

Minimum	0.5 percent
Maximum	10 percent

Stopping Sight Distance:

On University Drive and areas east of University Drive	400 feet.
West of University Drive	250 feet

Intersection Spacing:

On University Drive and areas east of University Drive	300 feet
West of University Drive	150 feet

Intersection Alignment:

Between 70˚ and 105˚. 90˚ preferred.

Paving:

ID-2W.1 surface; ID-2B.1 binder; BCBC base; Subbase 3; (PaDOT specifications).
Based on engineering soil structure and vehicle use report.

Curbs:

Portland cement concrete; 6-inch vertical curb height or curb and gutter according to Pennsylvania State University standard details. Match existing where applicable.

Sidewalks:

Bituminous concrete or cement concrete according to Pennsylvania State University standard details. Minimum width will be 5 feet.