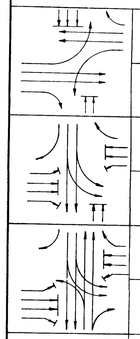
PHASE AND SEQUENCE DIAGRAM



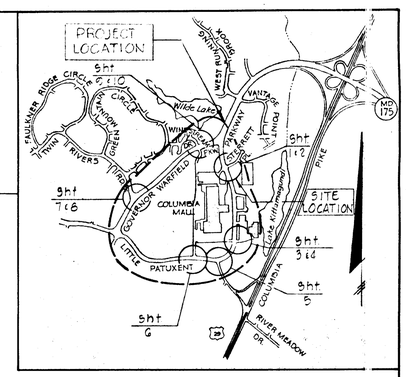
	TRAFFIC SIGNAL HEADS 1,2,3,4	5,6	7,8	Min. Green	Passage	Yellow	Red Clearance	MAX I	Recall	Memory
Phase A	G	R	R	12	5			26	OFF	ON
Phase A Clear	Y,R	R	R			3	2			
Phase B	R	R	G Arrow G	12	1			27	OFF	OFF
Phase B Clear	R	R	Y Arrow G			4	2			
Phase C	R	G	G	6	1			10	OFF	OFF
Phase C Clear	R	Y,R	Y,R			4	2			
Flash	Y	R	R							

SYMBOLS

Existing		Proposed
⊕	Steel Pole	②
⊘	Ground Mounted Traffic Signal	—
----	Mast Arm	▱
—→	Signal Head	—①
☼	Luminaire and Support	—
⌀	Sign	—
H	Hand Box	H
M	Meter	M
—S—	Underground Signal Wiring	Proposed Conduit
[dashed]	Vehicular Detector Loop	Power Head
C	Control Cabinet	C

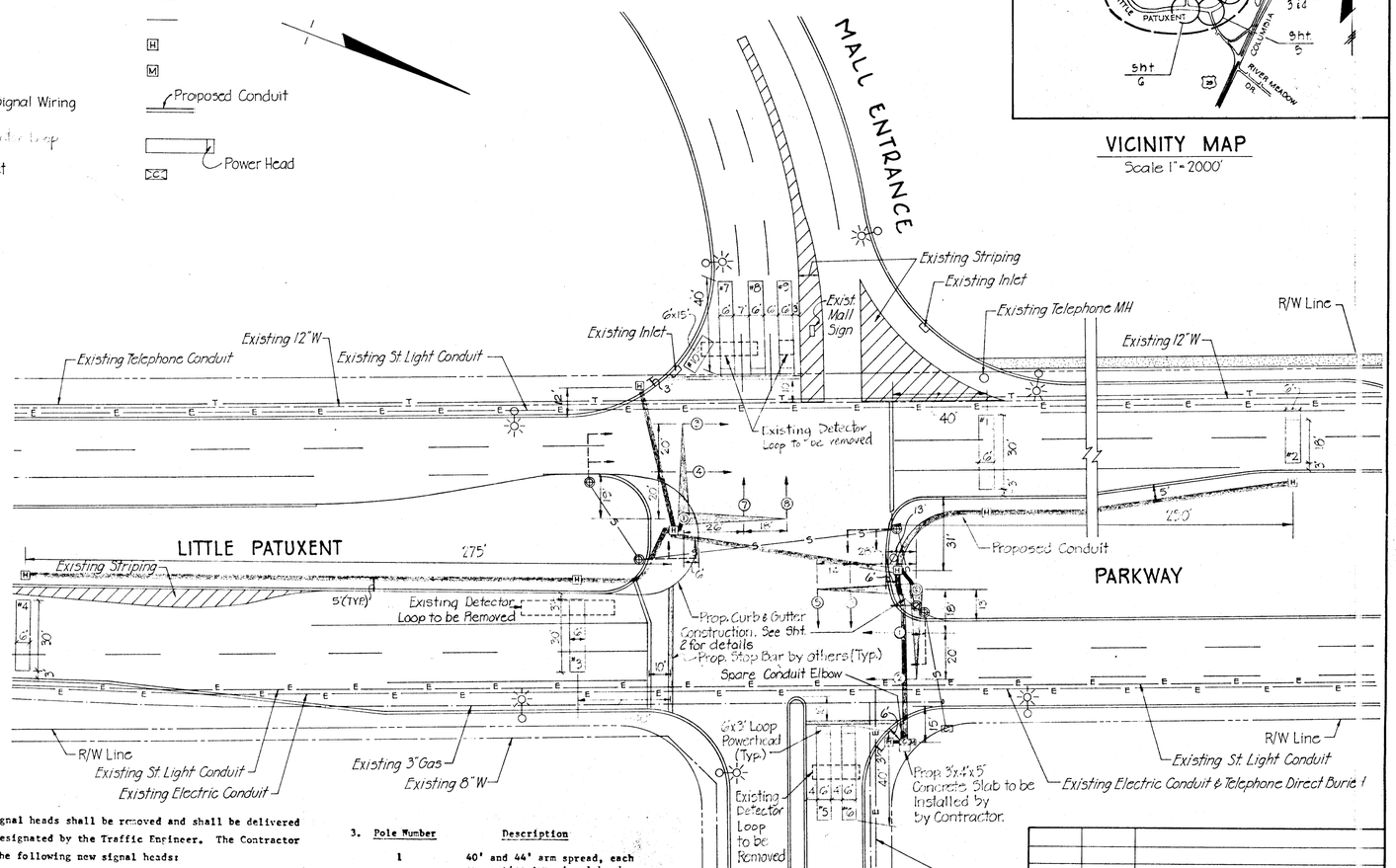
INDEX OF SHEETS

Sht. No.	Title
1.	Signals - Little Patuxent Parkway at Sterrett Place
2.	Geometric Modifications - Little Patuxent Parkway at Sterrett Place
3.	Signals - Little Patuxent Parkway at Rouse and Mall Entrance
4.	Geometric Modifications - Little Patuxent Parkway at Rouse and Mall Entrance
5.	Signals - Little Patuxent Parkway at South Entrance
6.	Signals - Little Patuxent Parkway at Pavilion Mall Entrance
7.	Signals - Governor Warfield Parkway at Twin Rivers Road
8.	Geometric Modifications - Governor Warfield Parkway at Twin Rivers Road
9.	Signals - Governor Warfield Parkway at Windstream Drive
10.	Geometric Modifications - Governor Warfield Parkway at Windstream Drive



VICINITY MAP

Scale 1" = 2000'



PLAN

Scale 1" = 30'

GENERAL NOTES

1. All highway marking shall be the responsibility of the Division of Traffic Engineering of the Bureau of Engineering, Department of Public Works, of Howard County, Maryland, and is not to be considered a part of this contract.
2. a. Approximate location of existing utilities is shown. The Contractor shall take all necessary precautions to protect existing utilities and to maintain uninterrupted service. Any damage incurred shall be repaired immediately to the satisfaction of the Engineer by the Contractor at the Contractor's expense.
   b. The Contractor shall locate existing utilities a minimum of two weeks in advance of construction operations in vicinity of utilities. Cost shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
   c. Contractor shall notify the following utilities or agencies at least five (5) days before starting work shown on these plans:
      Miss. Utility (Collect) 1-559-0100
      Baltimore Gas & Electric Company - Underground Electric Distribution Engineering "Damage Control" - 234-5691
      Baltimore Gas & Electric Company - Underground Gas Distribution Engineering "Damage Control" - 234-5533
      Chesapeake and Potomac Telephone Co. - 725-9976
      State Highway Administration - 531-5533
   d. Clear all utilities by a minimum of 6". Clear all poles 2'-0" minimum or tunnel as required. Cost for tunneling or bracing at poles shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
3. All materials and workmanship employed under this contract shall conform with the "GENERAL SPECIFICATIONS FOR INSTALLATION OF AND EQUIPMENT FOR TRAFFIC SIGNALS FOR HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS" dated October 7, 1974; revised February 18, 1976, and included in the contract specifications.
4. All disturbed areas shall be properly restored in accordance with the Contract Specifications.
5. The existing traffic signal system shall be maintained and remain operational during the entire construction period of the new signal system. The contractor shall schedule the work such that the time between the total shut down of the existing signal heads and the turn on of the new signal system shall not be more than 1 calendar day. All new signal heads shall be securely wrapped and/or bagged in burlap, when not in use.
6. The reconstruction of the center median islands shall be coordinated with the removal of the existing traffic signal system and installation of the new traffic signal system.

EQUIPMENT LIST

CONTROLLER AND ACCESSORIES

1. NEMA three phase modular thumbwheel programmable controller with solid state circuitry and digital timing, equivalent to the Crouse Hinds DM-400 Series Digital Controller unit, equivalent manufactured by Eagle Signal Corporation or Econolite, or approved equal. The controller shall be capable of expansion to four phase operation.
   a. Equipped with three (3) vehicular actuated phase modules.
   b. Vehicular actuated phase modules shall be capable of the following functions: Min. Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Recall and Memory.
   c. Four phase signal overlap capability.
2. Conflict Monitor and Solid State load switches.
3. Solid State flasher and switch accessible through police door panel.
4. Manual operating control and manual switch accessible through police door panel.
5. External logic for operation of calling detectors which respond to vehicular actuations during the amber and red cycle of an associated phase.
6. Ground mounted traffic controller cabinet large enough to accomodate the above control equipment, detectors, and any future coordination equipment. A 2" spare conduit elbow for future interconnection shall be provided in the controller cabinet foundation and plugged 2' ± beyond the foundation. The cabinet shall be furnished with a thermostatically controlled cabinet vent fan.
7. Finish of the cabinet shall be all-weather bronze paint.
8. The existing controller and equipment shall be removed and delivered to a location designated by the Traffic Engineer. The existing concrete base shall be removed, and the area backfilled and sodded.
9. Install 3' x 4' x 5" concrete slab in front of the controller cabinet.
10. Meter box shall be installed in a vandal proof enclosure supplied by the contractor.

LOOPS AND DETECTORS

1. The existing loops, as indicated on the Contract Drawings, shall be removed. The following new loops shall be installed:

Number	Dimensions	Phase
1, 3	6' x 30'	A
2	6' x 18'	A
4	6' x 30'	A
5, 6	6' x 40'*	C
7, 8, 9	6' x 40'*	B
10	6' x 15'	B

*Loops to be installed with 6' x 3' powerhead for detection of small vehicles.

2. Loops 1 and 3 shall be wired to a common standard detector and shall operate as "calling detectors" for Phase A.
3. Loops 2 and 4 shall be wired to a common standard detector.
4. Loops 8 and 9 shall be wired to a common standard detector.
5. Loops 7 and 10 shall be wired to a common delayed timer vehicle loop detector.
6. Loop 5 shall be wired to a standard detector.
7. Loop 6 shall be wired to a delayed timer vehicle loop detector.
8. All wiring shall be in accordance with manufacturer's recommendations for correct operation.
9. Loops 1, 2, 3 and 4 shall operate in pulse mode. Loops 5, 6, 7, 8, 9 and 10 shall operate in presence mode.
10. Delayed Timers shall be set at 10 seconds for Loops 6, 7 and 10.
11. Delayed Timer vehicle loop detectors shall be Sarasota 235T/MS or approved equal. Standard detectors shall be Sarasota 215B/MS or approved equal.

SIGNAL HEADS

1. The existing signal heads shall be removed and shall be delivered to a location designated by the Traffic Engineer. The Contractor shall provide the following new signal heads:

Signal Number	Description
1, 2, 3, 4, 5, 6	12" diameter red indication, 8" diameter amber and green
7, 8	12" diameter red indication, 8" diameter amber and green; 12" diameter amber and green left turn arrow indications

2. All signals shall have brown baked enamel finish and shall be furnished with tunnel visors. All signals shall be vertically mounted on the mast arms with rigid adjustable brackets equivalent to the "VePed Traffic Controls, Inc. Astro-Brac (Model No. O-AB-101 for standard configurations and Model No. O-AB-109 for 5-Section Signals)" or approved equal.

POLES

Proposed Poles:

1. Two (2) twin arm support poles with a 90° angle of separation.
2. Style and appearance shall be equivalent to Union Metal Design No. 50700. Finish shall be bronze paint.

Pole Number	Description
1	40' and 44' arm spread, each supporting two signal heads
2	42' and 38' arm spread, each supporting two signal heads

Existing Poles:

1. The existing traffic signal support poles shall be removed and delivered to a location designated by the Traffic Engineer. The existing foundations are to be removed to a depth of 1' below grade and backfilled and sodded.

UNDERGROUND WIRING

1. Underground wiring shall be placed in new PVC Conduits under the road surface and in grass areas, as shown on the Contract Drawings.
2. The conduit shall be sized to accommodate future wiring for left turn detectors, left turn signals and pedestrian (WALK/DON'T WALK) signal heads.
3. All existing direct buried cable shall be abandoned.
4. The Contractor shall furnish an "as-built" drawing as per "General Specifications - 4.02b".
5. The use of direct lay cable or a combination of conduit and direct lay shall not be acceptable. C794A201

Approved:		
Chief - Division of Roads, Bridges & Storm Drainage	Elizabeth Anderson Calea	12/15/80 Date
Chief - Division of Traffic Engineering	James E. Knowles	12-16-80 Date

Approved: DEPARTMENT OF PUBLIC WORKS

DIRECTOR OF PUBLIC WORKS — Guy F. Nemeyer — 12-16-80 Date

Approved:

Chief - Bureau of Engineering — 12-16-80 Date

Rev. No.	Rev. Date	Revision Description

Owner and Developer

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area

LITTLE PATUXENT PARKWAY
AT INTERSECTION OF
STERRETT PLACE AND MALL ENTRANCE

Project Title

PLAN RECONSTRUCTION OF TRAFFIC SIGNAL AND EQUIPMENT LIST
CAPITAL PROJECT NO. T-G-7003

Designed: D.Cheng	Scale: As Noted
Drawn: D.Griffin	Date: Dec. 1980
Checked: K.Evans	Sheet: 1 of 10

Prepared By

THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

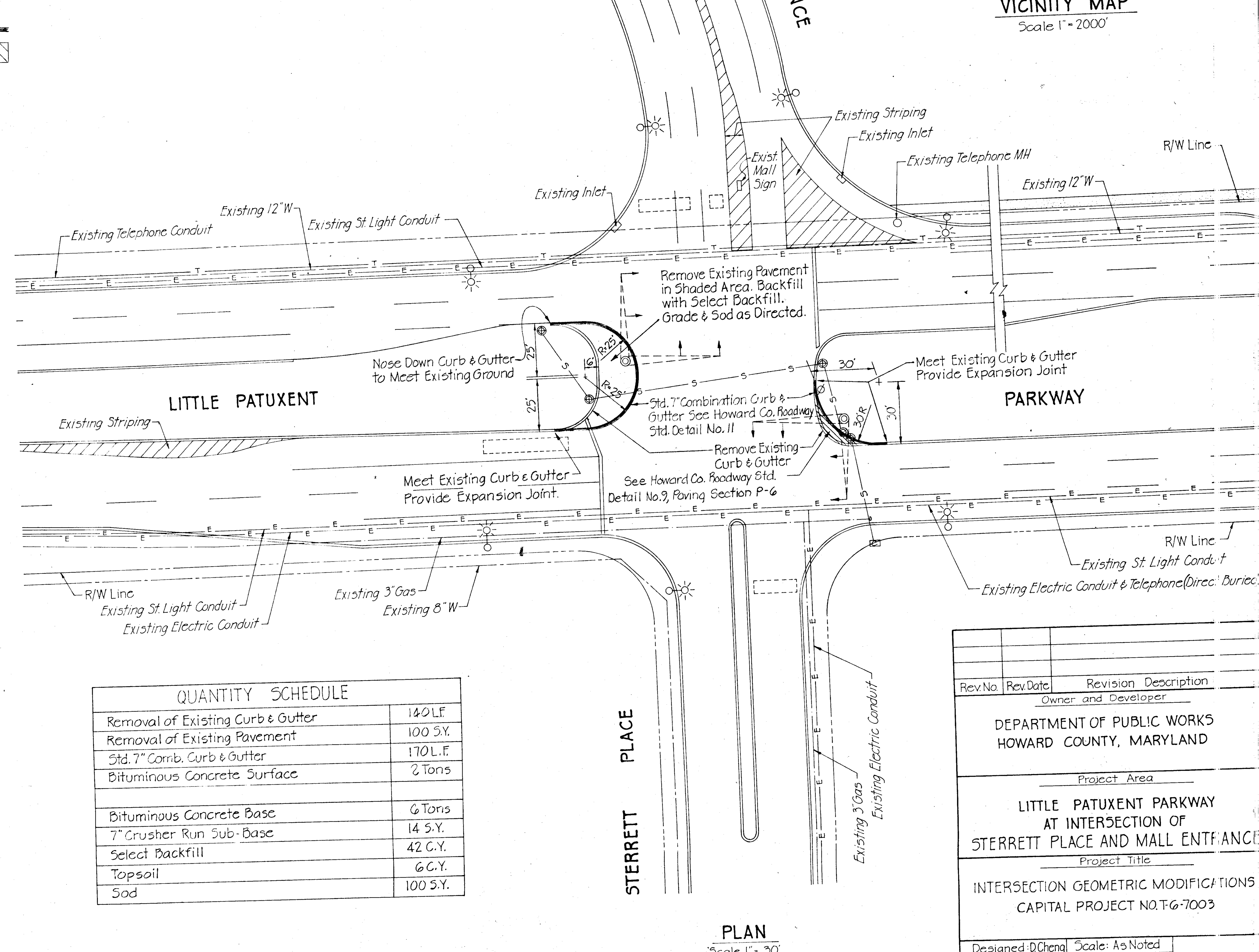
Daniel J. Cheng
12-10-80

GENERAL NOTES

1) All work performed under this contract shall be in accordance with the Contract Specifications.
2) See Contract Specifications for Standard Details
3) The reconstruction of the median islands shall be coordinated with the installation of the new traffic signal system and the removal of the existing traffic signal system.

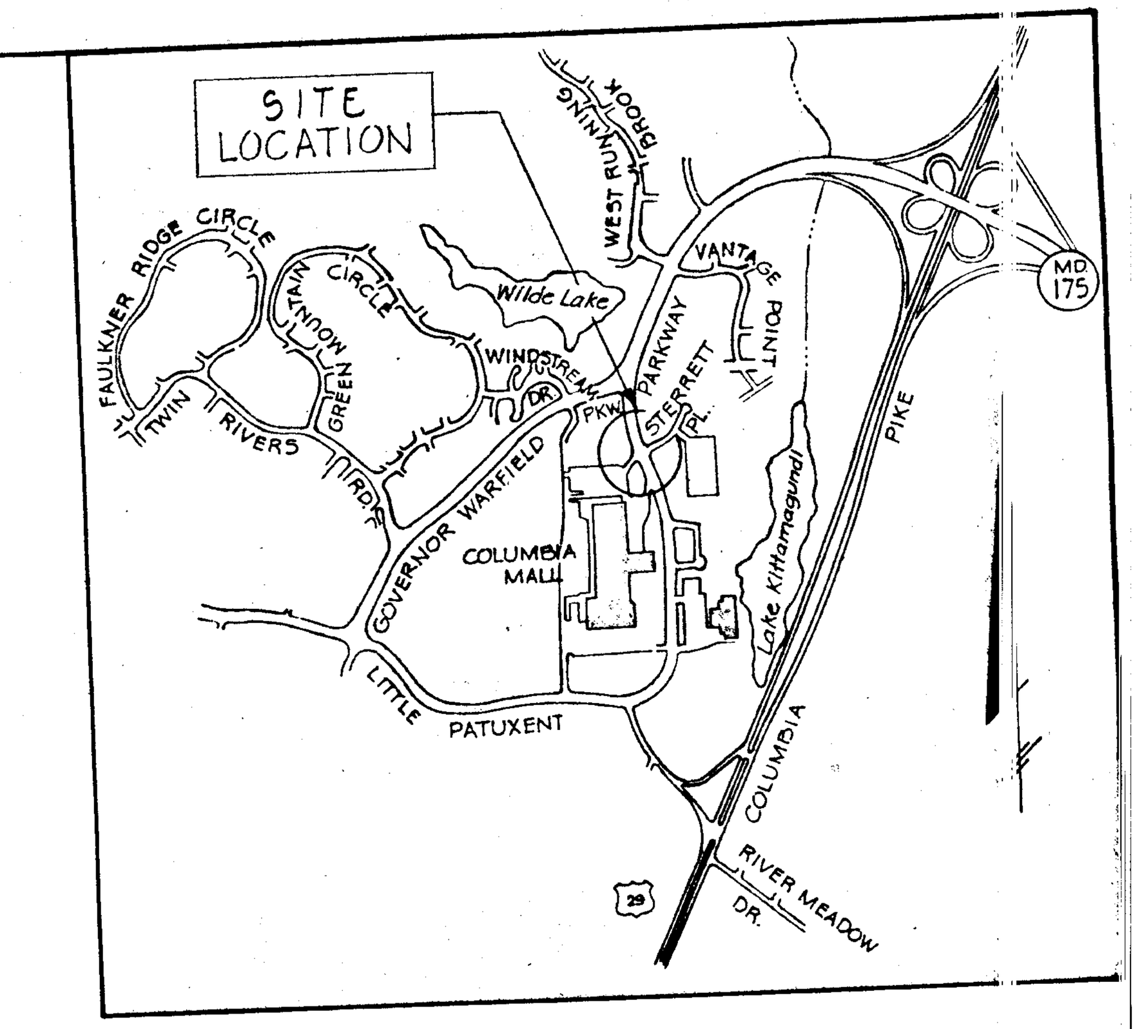
PAVING SYMBOLS

EXISTING		PROPOSED
═══	Curb and Gutter	▬▬
───	Roadway Paving	▨



QUANTITY SCHEDULE	
Removal of Existing Curb & Gutter	160 LF
Removal of Existing Pavement	100 S.Y.
Std. 7" Comb. Curb & Gutter	170 L.F.
Bituminous Concrete Surface	2 Tons
Bituminous Concrete Base	6 Tons
7" Crusher Run Sub-Base	14 S.Y.
Select Backfill	42 C.Y.
Topsoil	6 C.Y.
Sod	100 S.Y.

PLAN
Scale 1" = 30'



VICINITY MAP
Scale 1" = 2000'

Rev. No.	Rev. Date	Revision Description

Owner and Developer
DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area
LITTLE PATUXENT PARKWAY AT INTERSECTION OF STERRETT PLACE AND MALL ENTRANCE

Project Title
INTERSECTION GEOMETRIC MODIFICATIONS
CAPITAL PROJECT NO. T-6-7003

Designed: D. Cheng	Scale: As Noted
Drawn: D. Griffin	Date: Dec. 1980
Checked: K. Evans	Sheet: 2 of 10

Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND
12-10-80

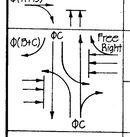
Approved: 12/15/80 Date
Chief - Division of Roads, Bridges & Storm Drainage

Approved: 12-16-80 Date
Chief - Division of Traffic Engineering

Approved: DEPARTMENT OF PUBLIC WORKS
12-16-80 Date
DIRECTOR OF PUBLIC WORKS

Approved: 12-16-80 Date
Chief - Bureau of Engineering

PHASE AND SEQUENCE DIAGRAM

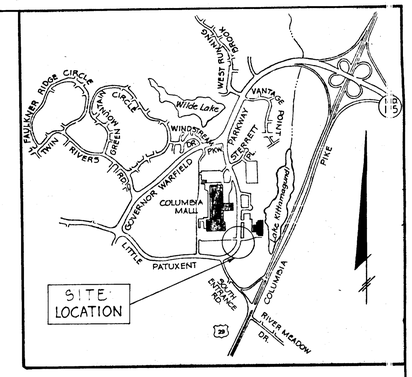


	TRAFFIC SIGNAL HEADS 1,2	3	4,5	6	7,8,9	Min. Green	Passage	Yellow	Red Clear	Max I	Seconds Per Actuation	Time to Reduce	Time Before Reduction	Minimum Gap	Recall	Memory
Phase A	G	R	G1	R	R	10	5			16	1.0	5	10	3.5	OFF	ON
Phase A Clear	Y,R	R	G1	R	R			4	1							
Phase B	R	G	G1	G2	R	10	1			18					OFF	OFF
Phase B Clear	R	Y,R	Y,R	G2	R			4	1							
Phase C	R	R	R	G	G	8	1			11					OFF	OFF
Phase C Clear	R	R	R	Y,R	Y,R			4	1							
FLASH	Y	R	Y	R	R											

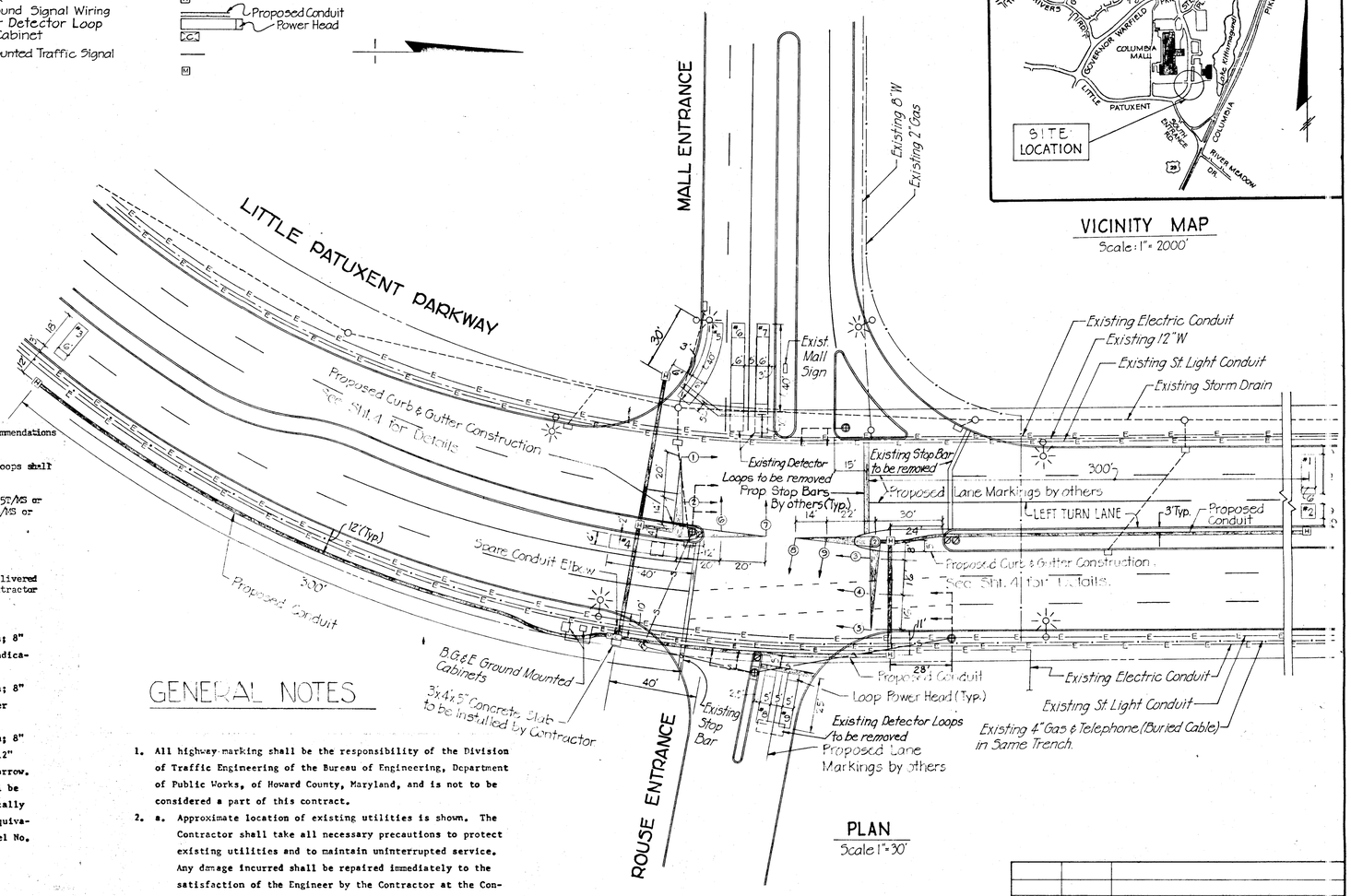
1. φ(A+B) Overlap
2. Green Arrow Only - φ(B+C) Overlap

SYMBOLS

Existing		Proposed
⊕	Steel Pole	◎
	Mast Arm	
○	Signal Head	①
Ø	Luminaire and Support	
	Sign	
	Hand Box	H
5	Underground Signal Wiring	Proposed Conduit
	Vehicular Detector Loop	Power Head
C	Control Cabinet	C.C.
⊘	Ground Mounted Traffic Signal	
	Meter	M



VICINITY MAP
Scale: 1" = 2000'



PLAN
Scale 1" = 30'

EQUIPMENT LIST

CONTROLLER AND ACCESSORIES

1. NEMA three phase modular thumbwheel programmable controller with solid state circuitry and digital timing, equivalent to the Crouse Hinds DM-400 Series Digital Controller unit, equivalent manufactured by Eagle Signal Corporation or Econolite, or approved equal. The controller shall be capable of expansion to four phase operation.
   a. Equipped with two (2) vehicular actuated modules.
   b. Equipped with one (1) vehicular actuated module with volume density controls.
   c. Vehicular actuated phase modules shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Recall and Memory.
   d. Vehicular actuated phase module with volume density controls shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Seconds Per Actuation, Time to Reduce, Time Before Reduction, Minimum Gap, Recall, and Memory.
   e. Four phase signal overlap capability.
2. Conflict Monitor and Solid State load switches.
3. Solid State flasher and switch accessible through police door panel.
4. Manual operating control and manual switch accessible through police door panel.
5. Ground mounted traffic controller cabinet large enough to accomodate the above control equipment, detectors, and any future coordination equipment. A 2" spare conduit elbow for future interconnection shall be provided in the controller cabinet foundation and plugged 2' - beyond the foundation. The cabinet shall be furnished with a thermostatically controlled cabinet vent fan.
6. Finish of the cabinet shall be all-weather bronze paint.
7. Install 3'x4'x5" concrete slab in front of the controller cabinet.
8. The existing controller and equipment shall be removed and delivered to a location designated by the Traffic Engineer. The existing concrete base shall be removed, and the area backfilled and sodded.
9. Meter Box shall be installed in a vandal proof enclosure supplied by the contractor.

LOOPS AND DETECTORS

1. The existing loopes, as indicated on the Contract Drawings, shall be removed. The following new loops shall be installed:

Number	Dimensions	Phase
1,3	6' x 18'	A
2	6' x 6'	A
4	6' x 40' *	B
5,6,7	6' x 40' *	C
8,9	5' x 25' **	C

* Loops to be installed with 6'x3' powerhead for detection of small vehicles.
** Loops to be installed with 5'x3' powerhead.

2. Loops 1 and 2 shall be wired in parallel to a standard detector. Loop 3 shall be wired to the same standard detector.
3. Loop 4 shall be wired to a standard detector.
4. Loops 5 and 9 shall be wired to a delayed timer vehicle loop detector. Delayed timer shall be set at 10 seconds.
5. Loops 6,7 and 8 shall be wired to a standard detector.
6. All wiring shall be in accordance with manufacturer's recommendations for correct operation.
7. Loops 1, 2 and 3 shall operate in pulse mode. All other loops shall operate in presence mode.
8. Delayed Timer vehicle loop detectors shall be Sarasota 235T/MS or approved equal. Standard detectors shall be Sarasota 215B/MS or approved equal.

SIGNAL HEADS

1. The existing signal heads shall be removed and shall be delivered to a location designated by the Traffic Engineer. The Contractor shall provide the following new signal heads:

Signal Number	Description
1, 2, 4, 5, 7, 8, 9	12" diameter red indication; 8" diameter amber and green indication.
3	12" diameter red indication; 8" diameter amber; 12" diameter green left turn arrow.
6	12" diameter red indication; 8" diameter amber and green; 12" diameter green right turn arrow.

2. All signals shall have brown baked enamel finish and shall be furnished with tunnel visors. All signals shall be vertically mounted on the mast arms with rigid adjustable brackets equivalent to the "VePed Traffic Controls, Inc. Astro-Brac (Model No. O-AB-101)" or approved equal.

POLES

Proposed Poles

1. Two (2) twin arm support poles with 90° angle of separation.
2. Style and appearance shall be equivalent to Union Metal Design No. 50700. Finish shall be bronze paint.
3. Pole Number
   1 — 34' and 40' arm spread, each supporting two signal heads
   2 — 36' arm spread supporting two signal heads. 40' arm spread supporting three signal heads

Existing Poles

1. The existing traffic signal support poles shall be removed and delivered to a location designated by the Traffic Engineer. The existing foundations are to be removed to a depth of 1' below grade and backfilled and sodded.

UNDERGROUND WIRING

1. Underground wiring shall be placed in new PVC Conduits under the road surface and in grass areas, as shown on the Contract Drawings.
2. The conduit shall be sized to accommodate future wiring for pedestrian (WALK/DON'T WALK) signal heads.
3. All existing direct buried cable shall be abandoned.
4. The Contractor shall furnish an "as-built" drawing as per "General Specifications - 4.02b".

GENERAL NOTES

1. All highway marking shall be the responsibility of the Division of Traffic Engineering of the Bureau of Engineering, Department of Public Works, of Howard County, Maryland, and is not to be considered a part of this contract.
2. a. Approximate location of existing utilities is shown. The Contractor shall take all necessary precautions to protect existing utilities and to maintain uninterrupted service. Any damage incurred shall be repaired immediately to the satisfaction of the Engineer by the Contractor at the Contractor's expense.
   b. The Contractor shall locate existing utilities a minimum of two weeks in advance of construction operations in vicinity of utilities. Cost shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
   c. Contractor shall notify the following utilities or agencies at least five (5) days before starting work shown on these plans:
      Miss. Utility (Collect) 1-559-0100
      Baltimore Gas & Electric Company - Underground Electric Distribution Engineering "Damage Control" - 234-5691
      Baltimore Gas & Electric Company - Underground Gas Distribution Engineering "Damage Control" - 234-5533
      Chesapeake and Potomac Telephone Co. - 725-9976
      State Highway Administration - 531-5533
   d. Clear all utilities by a minimum of 6". Clear all poles 2'-0" minimum or tunnel as required. Cost for tunneling or bracing at poles shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
3. All materials and workmanship employed under this contract shall conform with the "GENERAL SPECIFICATIONS FOR INSTALLATION OF AND EQUIPMENT FOR TRAFFIC SIGNALS FOR HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS" dated October 7, 1974; revised February 18, 1976, and included in the contract specifications.
4. All disturbed areas shall be properly restored in accordance with the Contract Specifications.
5. The existing traffic signal system shall be maintained and remain operational during the entire construction period of the new signal system. The contractor shall schedule the work such that the time between the total shut down of the existing signal heads and the turn on of the new signal system shall not be more than 1 calendar day. All new signal heads shall be securely wrapped and/or bagged in burlap, when not in use.
6. The reconstruction of the center median islands shall be coordinated with the removal of the existing traffic signal system and installation of the new traffic signal system.
7. The use of direct Lay cable or a combination of conduit and direct Lay shall not be acceptable.

Rev. No.	Rev. Date	Revision Description

Owner and Developer
DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area
LITTLE PATUXENT PARKWAY AT INTERSECTION OF ROUSE & MALL ENTRANCE

Project Title
PLAN "RECONSTRUCTION OF TRAFFIC SIGNAL" AND EQUIPMENT LIST
CAPITAL PROJECT NO. T-G-7003

Designed: D.Cheng	Scale: As Noted
Drawn: T.Stalker	Date: Dec. 1980
Checked: K.Evans	Sheet: 3 of 10

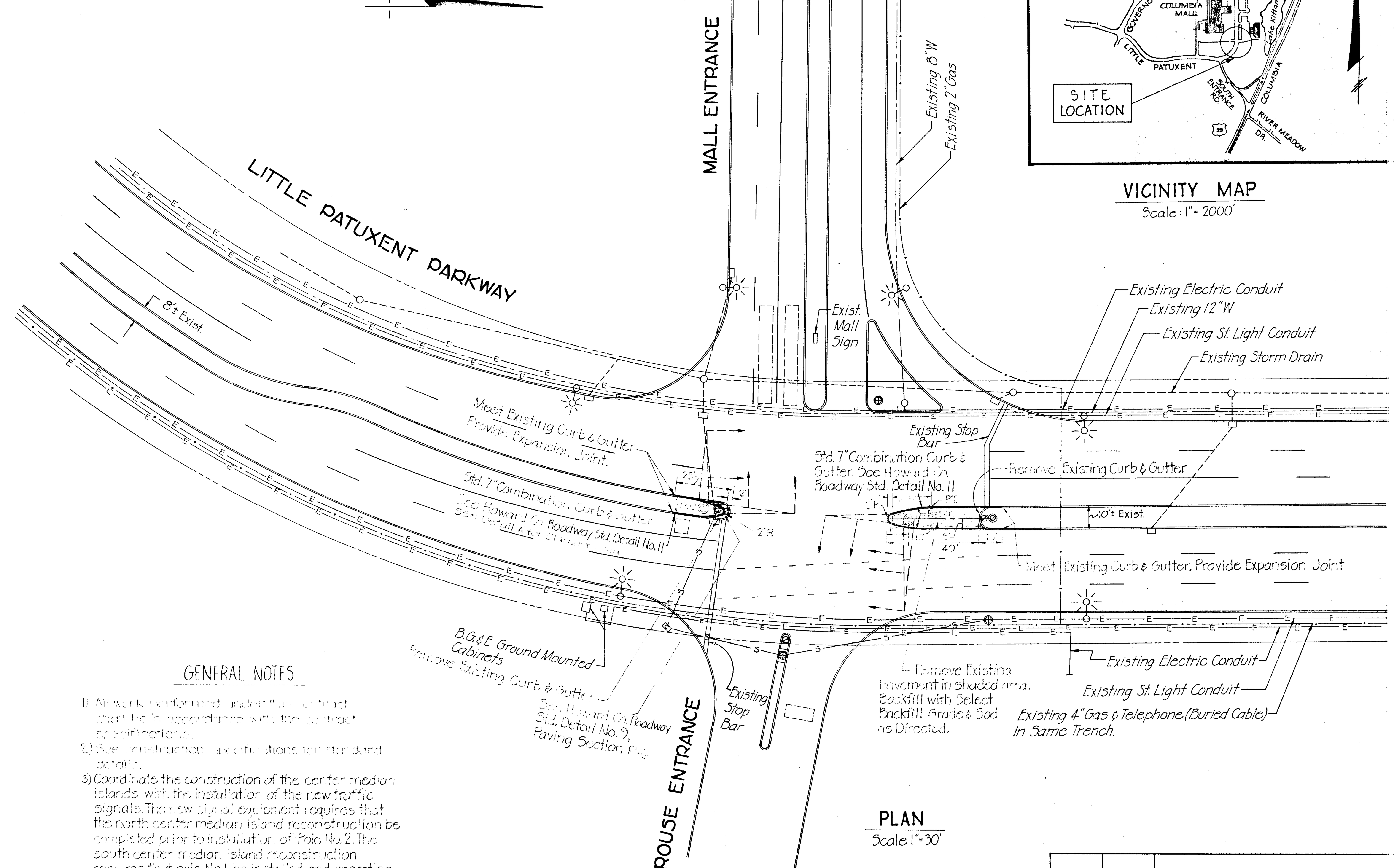
Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

Daniel J. Cheng 12-10-80

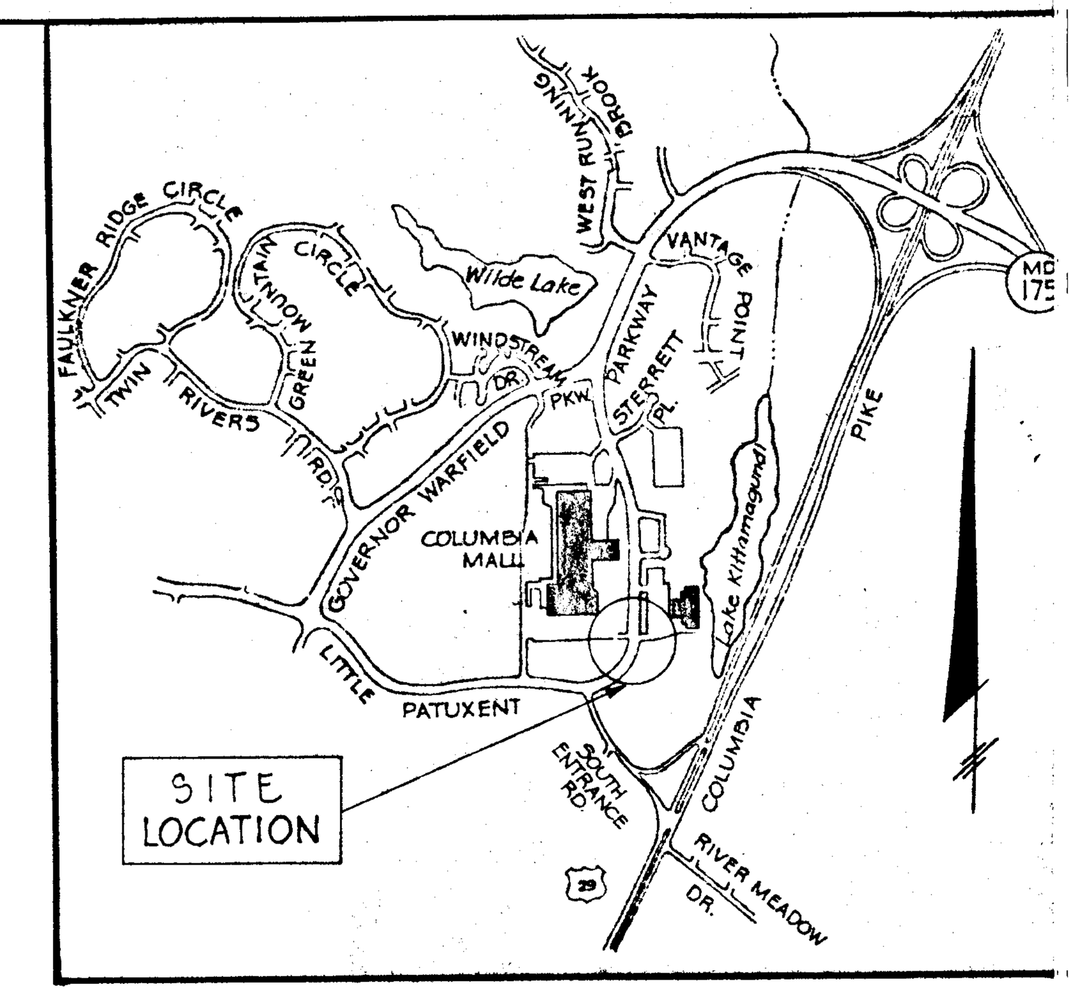
Approved: Elizabeth Anderson Calva, Chief, Division of Roads, Bridges & Storm Drainage — 12/15/80 Date
Approved: James E. Kimble, Chief - Division of Traffic Engineering — 12-16-80 Date
Approved: DEPARTMENT OF PUBLIC WORKS — George F. Nemeyer, DIRECTOR OF PUBLIC WORKS — 12-16-80 Date
Approved: _____, Chief - Bureau of Engineering — 12-16-80 Date

PAVING SYMBOLS

EXISTING		PROPOSED
	Curb and Gutter	
	Roadway Paving	



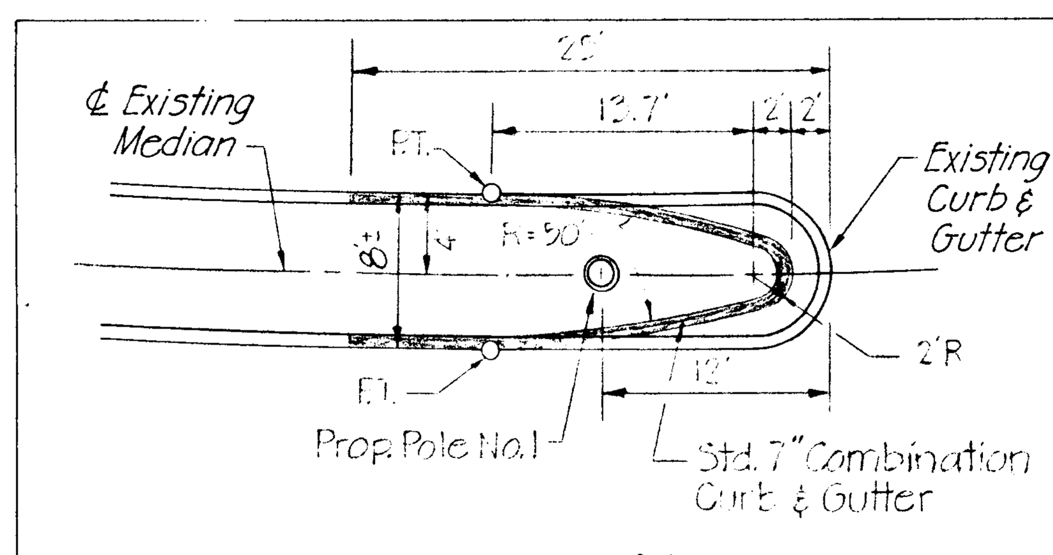
PLAN
Scale 1"=30'



VICINITY MAP
Scale: 1" = 2000'

GENERAL NOTES

1) All work performed under this contract shall be in accordance with the contract specifications.
2) See construction specifications for standard details.
3) Coordinate the construction of the center median islands with the installation of the new traffic signals. The new signal equipment requires that the north center median island reconstruction be completed prior to installation of Pole No. 2. The south center median island reconstruction requires that pole No. 1 be installed and operating, since the existing signal pole will have to be removed.



DETAIL 'A'
Scale 1"=10'

QUANTITY SCHEDULE	
Removal of Existing Curb & Gutter	81 L.F.
Removal of Existing Pavement	55 S.Y.
Std. 7" Combination Curb & Gutter	150 L.F.
Bituminous Concrete Surface	2 Ton
Bituminous Concrete Base	11 Ton
8" Crusher Run Sub-Base	25 S.Y.
Select Backfill	15 C.Y.
Topsoil	2 C.Y.
Sod	36 S.Y.

Rev. No.	Rev. Date	Revision Description

Owner and Developer

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area

LITTLE PATUXENT PARKWAY
AT INTERSECTION OF
ROUSE & MALL ENTRANCE

Project Title

INTERSECTION GEOMETRIC MODIFICATIONS
CAPITAL PROJECT NO. T-6-7003

Designed: D. Cheng	Scale: As Noted
Drawn: T. Stalker	Date: Dec. 1980
Checked: K. Evans	Sheet: 4 of 10

Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

Daniel T. Cheng
12-10-80

Approved: Elizabeth Anderson Calia — 12/15/80
Chief, Division of Roads, Bridges & Storm Drainage — Date

Approved: James E. Rinke — 12-16-80
Chief - Division of Traffic Engineering — Date

Approved: DEPARTMENT OF PUBLIC WORKS
George F. Neimeyer — 12-16-80
DIRECTOR OF PUBLIC WORKS — Date

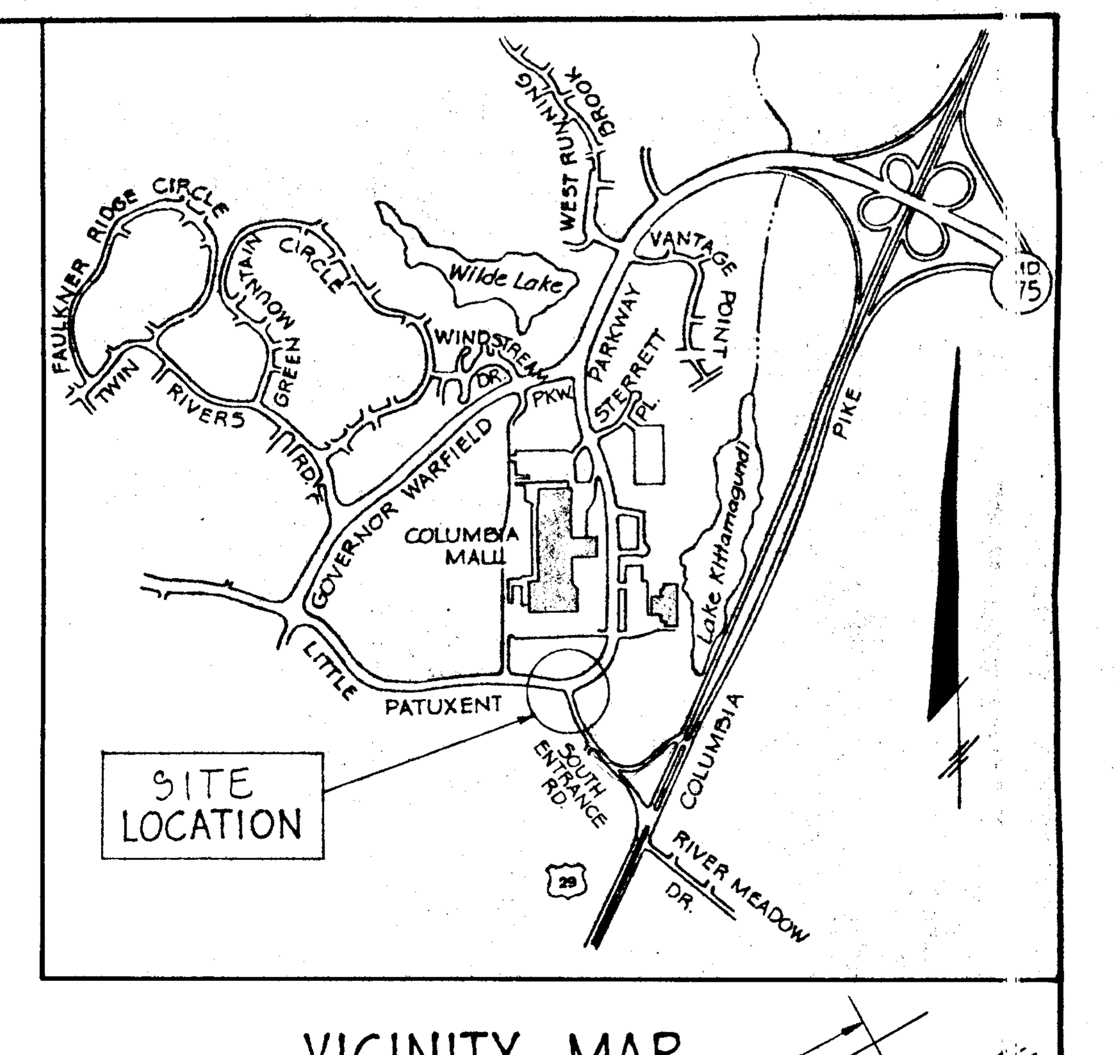
Approved: William E. Riley — 12-16-80
Chief - Bureau of Engineering — Date

PHASE AND SEQUENCE DIAGRAM		TRAFFIC SIGNAL HEADS 1 (12", 8")	2 (12", 8", → 12")	3 (12", 8")	4 (12", 8", → 12")	6 (12", 8", ← 12")	7 (12", 8", ← 12")	Min. Green	Passage	Yellow	Red Clear	Max I	Seconds Per Actuation	Time to Reduce	Time Before Reduction	Minimum Gap	Recall	Memory	5 (12", 8")
Φ(A+B) ΦA Φ(A+C)	Phase A	G	G	R	G1	R	R	10	7			22	1.4	5	10	3.5	OFF	ON	R
	Phase A Clear	Y,R	Y,R	R	G1	R	R			4	2								R
ΦB Φ(A+B)	Phase B	R	R	G	G	R	R	10	5			20	1.8	5	10	3.5	OFF	ON	R
	Phase B Clear	R	R	Y,R	Y,R	R	R			4	1								R
ΦC ΦC Φ(A+C)	Phase C	R	G2	R	R	G	G	10	1			21	2.0	5	10	3.5	OFF	ON	G
	Phase C Clear	R	G2	R	R	Y,R	Y,R			4	2								Y,R
	FLASH	R	R	Y	Y	Y	R												Y

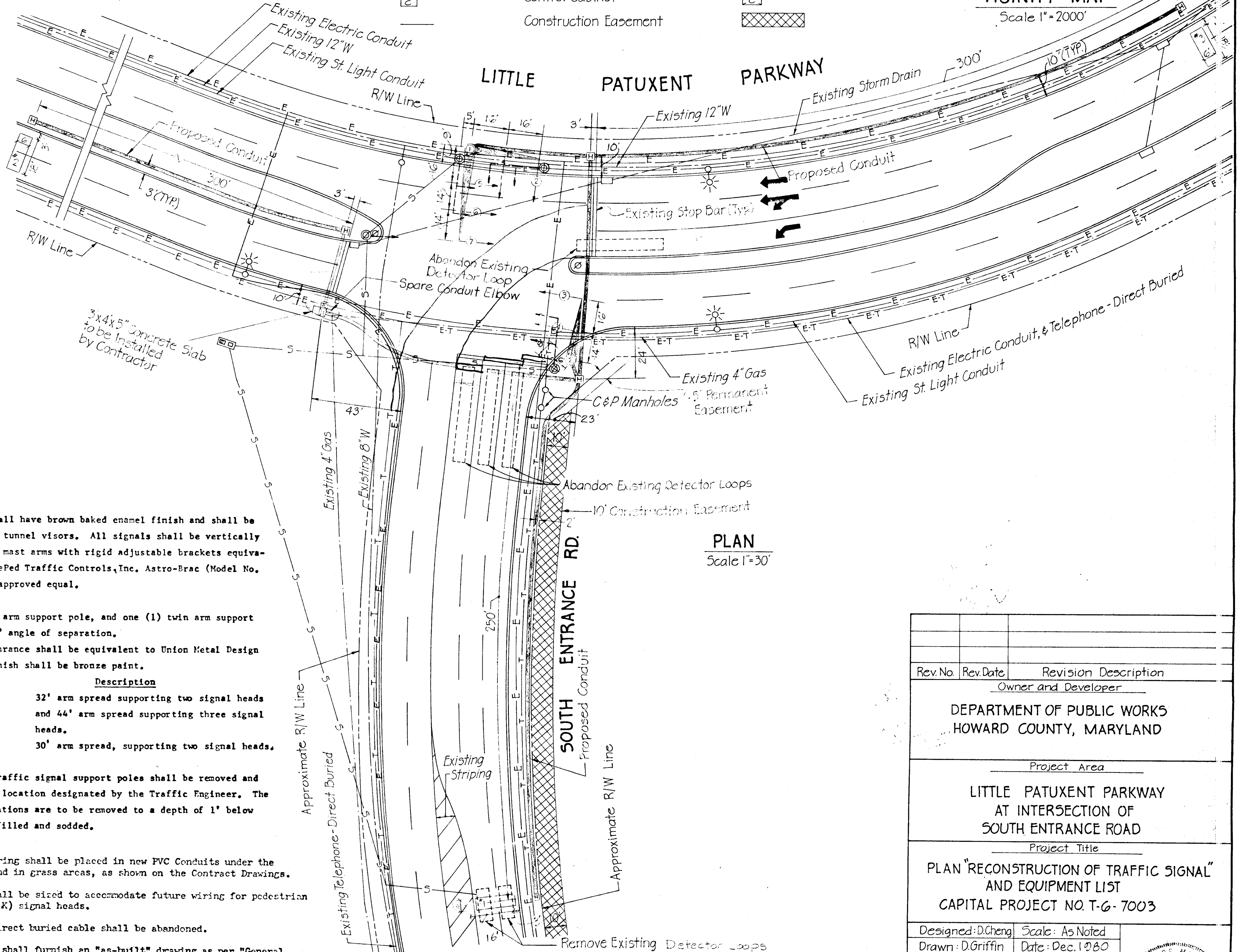
1. Green Arrow Only Φ(A+B) Overlap
2. Green Arrow Only Φ(A+C) Overlap

SYMBOLS

Existing		Proposed
⊕	Steel Pole	②
⊘	Ground Mounted Traffic Signal	——
-----	Mast Arm	
—→	Signal Head	—①→
	Luminaire and Support	——
	Sign	——
[H]	Hand Box	[H]
[M]	Meter	[M]
—S—	Underground Signal Wiring	Proposed Conduit
	Vehicular Detector Loop	Power Head
[C]	Control Cabinet	[C]
——	Construction Easement	



VICINITY MAP
Scale 1"=2000'



PLAN
Scale 1"=30'

GENERAL NOTES

1. All highway marking shall be the responsibility of the Division of Traffic Engineering of the Bureau of Engineering, Department of Public Works, of Howard County, Maryland, and is not to be considered a part of this contract.
2. a. Approximate location of existing utilities is shown. The Contractor shall take all necessary precautions to protect existing utilities and to maintain uninterrupted service. Any damage incurred shall be repaired immediately to the satisfaction of the Engineer by the Contractor at the Contractor's expense.
   b. The Contractor shall locate existing utilities a minimum of two weeks in advance of construction operations in vicinity of utilities. Cost shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
   c. Contractor shall notify the following utilities or agencies at least five (5) days before starting work shown on these plans:
      Miss. Utility (Collect) 1-559-0100
      Baltimore Gas & Electric Company - Underground Electric Distribution Engineering "Damage Control" - 234-5691
      Baltimore Gas & Electric Company - Underground Gas Distribution Engineering "Damage Control" - 234-5533
      Chesapeake and Potomac Telephone Co. - 725-9976
      State Highway Administration - 531-5533
   d. Clear all utilities by a minimum of 6". Clear all poles 2'-0" minimum or tunnel as required. Cost for tunneling or bracing at poles shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
3. All materials and workmanship employed under this contract shall conform with the "GENERAL SPECIFICATIONS FOR INSTALLATION OF AND EQUIPMENT FOR TRAFFIC SIGNALS FOR HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS" dated October 7, 1974; revised February 18, 1976, and included in the contract specifications.
4. All disturbed areas shall be properly restored in accordance with the Contract Specifications.
5. The existing traffic signal system shall be maintained and remain operational during the entire construction period of the new signal system. The contractor shall schedule the work such that the time between the total shut down of the existing signal heads and the turn on of the new signal system shall not be more than 1 calendar day. All new signal heads shall be securely wrapped and/or bagged in burlap, when not in use.
6. The reconstruction of the center median islands shall be coordinated with the removal of the existing traffic signal system and installation of the new traffic signal system.
7. The use of direct lay cable or a combination of conduit and direct lay shall not be acceptable.

EQUIPMENT LIST

CONTROLLER AND ACCESSORIES

1. NEMA three phase modular thumbwheel programmable controller with solid state circuitry and digital timing, equivalent to the Crouse Hinds DM-400 Series Digital Controller unit, equivalent manufactured by Eagle Signal Corporation or Econolite, or approved equal. The controller shall be capable of expansion to four phase operation.
   a. Equipped with three (3) vehicular actuated modules with volume density controls.
   b. Vehicular actuated phase modules with volume density controls shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Seconds Per Actuation, Time to Reduce, Time Before Reduction, Minimum Gap, Recall, and Memory.
   c. Four phase signal overlap capability.
2. Conflict Monitor and Solid State load switches.
3. Solid State flasher and switch accessible through police door panel.
4. Manual operating control and manual switch accessible through police door panel.
5. Ground mounted traffic controller cabinet large enough to accomodate the above control equipment, detectors, and any future coordination equipment. A 2" spare conduit elbow for future interconnection shall be provided in the controller cabinet foundation and plugged 2' ± beyond the foundation. The cabinet shall be furnished with a thermostatically controlled cabinet vent fan.
6. Finish of the cabinet shall be all-weather bronze paint.
7. Install 3' x 4' x 5" concrete slab in front of the controller cabinet.
8. The existing controller and equipment shall be removed and delivered to a location designated by the Traffic Engineer. The existing concrete base shall be removed, and the area backfilled and sodded.
9. Meter box shall be installed in a vandal proof enclosure supplied by the contractor.

LOOPS AND DETECTORS

1. The existing loops, as indicated on the Contract Drawings, shall be abandoned or removed as noted. The following new loops shall be installed:

Number	Dimensions	Phase
1	6' x 16'	A
2	6' x 18'	B
3	6' x 18'	C

2. Loop 1 shall be wired to a standard detector.
3. Loop 2 shall be wired to a standard detector.
4. Loop 3 shall be wired to a standard detector.
5. All wiring shall be in accordance with manufacturer's recommendations for correct operation.
6. Loops 1, 2, and 3 shall operate in pulse mode.
7. Standard detectors shall be Sarasota 215B/MS or approved equal.

SIGNAL HEADS

1. The existing signal heads shall be removed and shall be delivered to a location designated by the Traffic Engineer. The Contractor shall provide the following new signal heads:

Signal Number	Description
1, 3, 5	12" diameter red indication; 8" diameter amber and green indications
2, 4	12" diameter red indication; 8" diameter amber and green indications; 12" right turn arrow
6	12" diameter red indication; 8" diameter amber and green indications; 12" left turn arrow
7	12" diameter red indication; 8" diameter amber indication; 12" left turn arrow

2. All signals shall have brown baked enamel finish and shall be furnished with tunnel visors. All signals shall be vertically mounted on the mast arms with rigid adjustable brackets equivalent to the "VePed Traffic Controls, Inc. Astro-Brac (Model No. 0-AB-101)" or approved equal.

POLES

1. One (1) single arm support pole, and one (1) twin arm support pole with a 90° angle of separation.
2. Style and appearance shall be equivalent to Union Metal Design No. 50700. Finish shall be bronze paint.
3. Pole Number / Description

Pole Number	Description
1	32' arm spread supporting two signal heads and 44' arm spread supporting three signal heads.
2	30' arm spread, supporting two signal heads.

Existing Poles:

1. The existing traffic signal support poles shall be removed and delivered to a location designated by the Traffic Engineer. The existing foundations are to be removed to a depth of 1' below grade and backfilled and sodded.

UNDERGROUND WIRING

1. Underground wiring shall be placed in new PVC Conduits under the road surface and in grass areas, as shown on the Contract Drawings.
2. The conduit shall be sized to accommodate future wiring for pedestrian (WALK/DON'T WALK) signal heads.
3. All existing direct buried cable shall be abandoned.
4. The Contractor shall furnish an "as-built" drawing as per "General Specifications - 4.02b".

Rev. No.	Rev. Date	Revision Description

Owner and Developer
DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area
LITTLE PATUXENT PARKWAY
AT INTERSECTION OF
SOUTH ENTRANCE ROAD

Project Title
PLAN "RECONSTRUCTION OF TRAFFIC SIGNAL" AND EQUIPMENT LIST
CAPITAL PROJECT NO. T-6-7003

Designed: D.Cheng	Scale: As Noted
Drawn: D.Griffin	Date: Dec. 1980
Checked: K. Evans	Sheet: 5 of 10

Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

Daniel T. Cheng 12-10-80

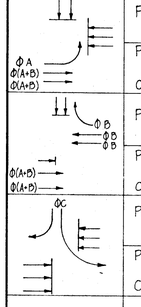
Approved: Elizabeth Anderson Calia 12/15/80
Chief - Division of Roads, Bridges & Storm Drainage — Date

Approved: James E. Kuenker 12-16-80
Chief - Division of Traffic Engineering — Date

Approved: DEPARTMENT OF PUBLIC WORKS
Geo. F. Neumeyer 12-16-80
DIRECTOR OF PUBLIC WORKS — Date

Approved: William E. Riley 12-16-80
Chief - Bureau of Engineering — Date

PHASE AND SEQUENCE DIAGRAM



	TRAFFIC SIGNAL HEADS 1	2-3	4	5	6	7	Min. Green	Passage	Yellow	Red Clear.	Max I	Seconds Per Actuation	Time to Reduce	Time Before Reduction	Minimum Gap	Recall	Memory
Phase A	G	G1	R	R	R	R	8	1			21					OFF	OFF
Phase A Clear	Y,R	G1	R	R	R	R			4	2							
Phase B	R	G1	G	G	R	R	9	5			21	1.2	5	10	35	OFF	ON
Phase B Clear	R	Y,R	Y,R	Y,R	R	R			4	1							
Phase C	R	R	R	R	G	G	11	1			23					OFF	OFF
Phase C Clear	R	R	R	R	Y,R	Y,R			4	2							
FLASH	R	Y	Y	Y	R	R											

1. ϕ (A+B) Overlap

EQUIPMENT LIST

CONTROLLER AND ACCESSORIES

1. NEMA three phase modular thumbwheel programmable controller with solid state circuitry and digital timing, equivalent to the Crouse Hinds DM-400 Series Digital Controller unit, equivalent manufactured by Eagle Signal Corporation or Econolite, or approved equal. The controller shall be capable of expansion to four phase operation.
   a. Equipped with two (2) vehicular actuated modules.
   b. Equipped with one (1) vehicular actuated module with volume density controls.
   c. Vehicular actuated phase modules shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Recall and Memory.
   d. Vehicular actuated phase module with volume density controls shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Sections Per Actuation, Time to Reduce, Time Before Reduction, Minimum Gap, Recall, and Memory.
   e. Four phase signal overlap capability.
2. Conflict Monitor and Solid State load switches.
3. Solid State flasher and switch accessible through police door panel.
4. Manual operating control and manual switch accessible through police door panel.
5. Ground mounted traffic controller cabinet large enough to accommodate the above control equipment, detectors, and any future coordination equipment. A 2" spare conduit elbow for future interconnection shall be provided in the controller cabinet foundation and plugged 2" beyond the foundation. The cabinet shall be furnished with a thermostatically controlled cabinet vent fan.
6. Finish of the cabinet shall be all-weather bronze paint.
7. The existing controller and equipment shall be removed and delivered to a location designated by the Traffic Engineer. The existing concrete base shall be removed, and the area backfilled and sodded.
8. Install 3'x4'x5" concrete slab in front of the controller cabinet.
9. Meter box shall be installed in a vandal proof enclosure supplied by the contractor.

LOOPS AND DETECTORS

1. The existing loops, as indicated on the Contract Drawings, shall be removed or abandoned as noted. The following loops shall be installed:

Number	Dimensions	Phase
1,2	6' x 18'	B
3	6' x 40' *	A
4,5	6' x 40' *	C

* Loops to be installed with 6' x 3' powerhead for detection of small vehicles.

2. Loops 1 and 2 shall be wired to a common standard detector.
3. Loop 3 shall be wired to a standard detector.
4. Loop 4 shall be wired to a delayed timer vehicle loop detector.
5. Loop 5 shall be wired to a standard detector.
6. All wiring shall be in accordance with manufacturer's recommendations for correct operation.
7. Loops 1 and 2 shall operate in pulse mode. Loops 3,4, and 5 shall operate in presence mode.
8. Delayed Timer shall be set at 10 seconds for Loop 4.
9. Delayed Timer vehicle loop detectors shall be Sarasota 235T/MS or approved equal. Standard detectors shall be Sarasota 215B/MS or approved equal.

SIGNAL HEADS

1. The existing signal heads shall be removed and shall be delivered to a location designated by the Traffic Engineer. The Contractor shall provide the following new signal heads:

Signal Number	Description
1	12" diameter indications
2, 3, 4, 5, 6, 7	12" diameter red indication; 8" diameter amber and green indications

2. All signals shall have brown baked enamel finish and shall be furnished with tunnel visors. All signals shall be vertically mounted on the mast arms with rigid adjustable brackets equivalent to the "VePed Traffic Controls, Inc. Astro-Brac (Model No. O-AB-101)" or approved equal.

POLES

Proposed Poles:

1. One (1) single arm support pole, and one (1) twin arm support pole with a 90° angle of separation.
2. Style and appearance shall be equivalent to Union Metal Design No. 50T00. Finish shall be bronze paint.
3.

Pole Number	Description
1	30' and 34' arm spread, each supporting two signal heads.
2	28' arm spread, supporting three signal heads.

Existing Poles:

1. The existing traffic signal support poles shall be removed and delivered to a location designated by the Traffic Engineer. The existing foundations are to be removed to a depth of 1' below grade and backfilled and sodded.

UNDERGROUND WIRING

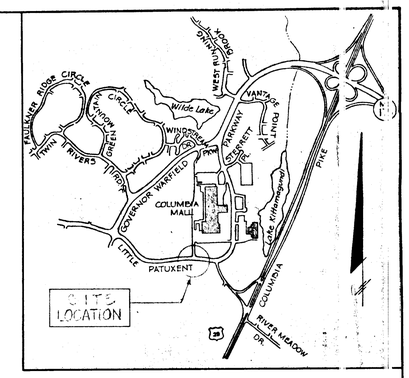
1. Underground wiring shall be placed in new PVC Conduits under the road surface and in grass areas, as shown on the Contract Drawings.
2. The conduit shall be sized to accommodate future wiring for pedestrian (WALK/DON'T WALK) signal heads.
3. All existing direct buried cable shall be abandoned.
4. The Contractor shall furnish an "as-built" drawing as per "General Specifications - 4.02b".
5. The use of direct lay cable or a combination of conduit and direct Lay shall not be acceptable.

GENERAL NOTES

1. All highway marking shall be the responsibility of the Division of Traffic Engineering of the Bureau of Engineering, Department of Public Works, of Howard County, Maryland, and is not to be considered a part of this contract.
2. a. Approximate location of existing utilities is shown. The Contractor shall take all necessary precautions to protect existing utilities and to maintain uninterrupted service. Any damage incurred shall be repaired immediately to the satisfaction of the Engineer by the Contractor at the Contractor's expense.
   b. The Contractor shall locate existing utilities a minimum of two weeks in advance of construction operations in vicinity of utilities. Cost shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
   c. Contractor shall notify the following utilities or agencies at least five (5) days before starting work shown on these plans:
      Miss. Utility (Collect) 1-559-0100
      Baltimore Gas & Electric Company - Underground Electric Distribution Engineering "Damage Control" - 234-5691
      Baltimore Gas & Electric Company - Underground Gas Distribution Engineering "Damage Control" - 234-5533
      Chesapeake and Potomac Telephone Co. - 725-9976
      State Highway Administration - 531-5533
   d. Clear all utilities by a minimum of 6". Clear all poles 2'-0" minimum or tunnel as required. Cost for tunneling or bracing at poles shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
3. All materials and workmanship employed under this contract shall conform with the "GENERAL SPECIFICATIONS FOR INSTALLATION OF AND EQUIPMENT FOR TRAFFIC SIGNALS FOR HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS" dated October 7, 1974; revised February 16, 1976, and included in the contract specifications.
4. All disturbed areas shall be properly restored in accordance with the Contract Specifications.
5. The existing traffic signal system shall be maintained and remain operational during the entire construction period of the new signal system. The contractor shall schedule the work such that the time between the total shut down of the existing signal heads and the turn on of the new signal system shall not be more than 1 calendar day. All new signal heads shall be securely wrapped and/or bagged in burlap, when not in use.
6. The reconstruction of the center median islands shall be coordinated with the removal of the existing traffic signal system and installation of the new traffic signal system.

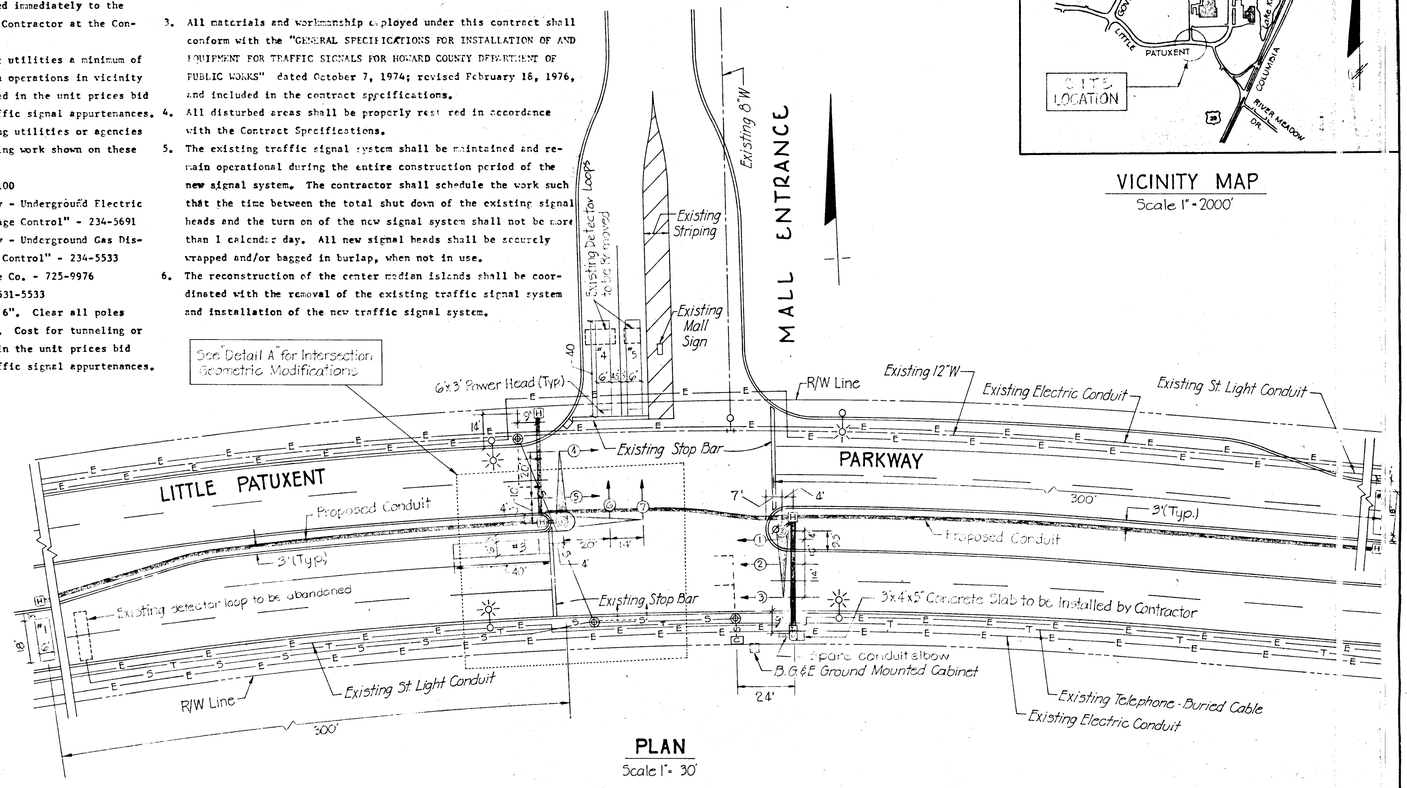
SYMBOLS

Existing	Proposed	
⊕	⊙	Steel Pole
—	—	Mast Arm
○	①	Signal Head
☼	☼	Luminaire and Support
Ø	H	Sign
		Hand Box
S	S	Underground Signal Wiring
		Vehicular Loop Detector
C	C	Control Cabinet
		Proposed Conduit
		Power Head



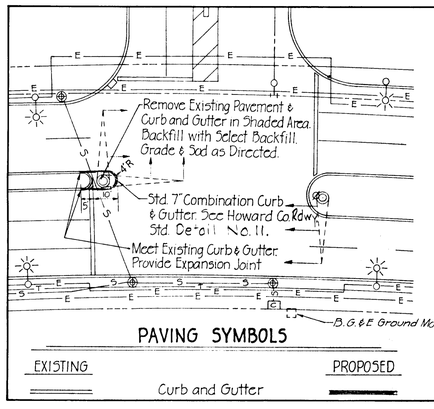
VICINITY MAP

Scale 1"=2000'



PLAN

Scale 1"= 30'



PAVING SYMBOLS

EXISTING	PROPOSED
Curb and Gutter	

INTERSECTION GEOMETRIC MODIFICATIONS

Notes:
1) The reconstruction of the median island shall be coordinated with the construction of the new traffic signals.
2) All work performed in connection with the median island reconstruction shall be in accordance with the Contract Specifications.
3) See Contract Specifications for Standard Details.

QUANTITY SCHEDULE	
Remove Existing Curb and Gutter	15 L.F.
Removal of Existing Pavement	15 S.Y.
Bituminous Concrete Surface	.05 Tons
Bituminous Concrete Base	2" Thick
8" Crusher Run Sub-Base	4 S.Y.
Standard 7" Combination Curb and Gutter	35 L.F.
Select Backfill	4 C.Y.
Topsoil	1 C.Y.
Sod	0 S.Y.

DETAIL 'A'

Scale 1"= 30'

Rev. No.	Rev. Date	Revision Description

Owner and Developer

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area

LITTLE PATUXENT PARKWAY AT INTERSECTION OF PAVILION MALL ENTRANCE

Project Title

PLAN "RECONSTRUCTION OF TRAFFIC SIGNAL" AND EQUIPMENT LIST
CAPITAL PROJECT NO. T-G-7003

Designed: D.Cheng	Scale: As Noted
Drawn: D. Griffin	Date: Dec. 1980
Checked: K. Evans	Sheet: 6 of 10

Approved:
Elizabeth Anderson Palcia 12/19/80
Chief-Division of Roads, Bridges & Storm Drainage — Date

Approved:
James E. Kienker 12-16-80
Chief-Division of Traffic Engineering — Date

Approved: DEPARTMENT OF PUBLIC WORKS
Lloyd F. Nemeyer 12-16-80
DIRECTOR OF PUBLIC WORKS — Date

Approved:
D. Gaines C. Riley 12-16-80
Chief-Bureau of Engineering — Date

Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

STATE OF MARYLAND — DANIEL D. CHENG — PROFESSIONAL ENGINEER
Daniel D. Cheng 12-10-80

PHASE AND SEQUENCE DIAGRAM		TRAFFIC SIGNAL HEADS 1-2 (12", 8", 8")	3-4 (12", 8", 8")	5- (12", 8", 12" left arrow)	6-7 (12", 8", 8")	Min. Green	Passage	Yellow	Red Clear	Max I	Seconds Per Actuation	Time to Reduce	Time Before Reduction	Minimum Gap	Recall	Memory
	Phase A	G	R	G	R	5	1			12					OFF	OFF
	Phase A Clear	G	R	Y,R	R			4	2							
	Phase B	G	G	R	R	5	5			15	3.5	5	5	3.5	OFF	ON
	Phase B Clear	Y,R	Y,R	R	R			4	2							
	Phase C	R	R	R	G	8	1			15					OFF	OFF
	Phase C Clear	R	R	R	Y,R			4	2							
	Flash	Y	Y	R	R											

SYMBOLS

Existing		Proposed
⊕	Steel Pole	②
⊘	Ground Mounted Traffic Signal	—
----	Mast Arm	▶
—→	Signal Head	—①→
○-☼	Luminaire and Support	—
⊘	Sign	—
H	Hand Box	H
M	Meter	M
—S—	Underground Signal Wiring	Proposed Conduit
[- - - -]	Vehicular Detector Loop	Power Head
C	Control Cabinet	C

GENERAL NOTES

1. All highway marking shall be the responsibility of the Division of Traffic Engineering of the Bureau of Engineering, Department of Public Works, of Howard County, Maryland, and is not to be considered a part of this contract.
2. a. Approximate location of existing utilities is shown. The Contractor shall take all necessary precautions to protect existing utilities and to maintain uninterrupted service. Any damage incurred shall be repaired immediately to the satisfaction of the Engineer by the Contractor at the Contractor's expense.
   b. The Contractor shall locate existing utilities a minimum of two weeks in advance of construction operations in vicinity of utilities. Cost shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
   c. Contractor shall notify the following utilities or agencies at least five (5) days before starting work shown on these plans:
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      Baltimore Gas & Electric Company - Underground Gas Distribution Engineering "Damage Control" - 234-5533
      Chesapeake and Potomac Telephone Co. - 725-9976
      State Highway Administration - 531-5533
   d. Clear all utilities by a minimum of 6". Clear all poles 2'-0" minimum or tunnel as required. Cost for tunneling or bracing at poles shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
3. All materials and workmanship employed under this contract shall conform with the "GENERAL SPECIFICATIONS FOR INSTALLATION OF AND EQUIPMENT FOR TRAFFIC SIGNALS FOR HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS" dated October 7, 1974; revised February 18, 1976, and included in the contract specifications.
4. All disturbed areas shall be properly restored in accordance with the Contract Specifications.
5. The existing traffic signal system shall be maintained and remain operational during the entire construction period of the new signal system. The contractor shall schedule the work such that the time between the total shut down of the existing signal heads and the turn on of the new signal system shall not be more than 1 calendar day. All new signal heads shall be securely wrapped and/or bagged in burlap, when not in use.
6. The reconstruction of the center median islands shall be coordinated with the removal of the existing traffic signal system and installation of the new traffic signal system.

EQUIPMENT LIST

CONTROLLER AND ACCESSORIES

1. NEMA three phase modular thumbwheel programmable controller with solid state circuitry and digital timing, equivalent to the Crouse Hinds DM-400 Series Digital Controller unit, equivalent manufactured by Eagle Signal Corporation or Econolite, or approved equal. The controller shall be capable of expansion to four phase operation.
   a. Equipped with two (2) vehicular actuated modules.
   b. Equipped with one (1) vehicular actuated module with volume density controls.
   c. Vehicular actuated phase modules shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Recall and Memory.
   d. Vehicular actuated phase module with volume density controls shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Seconds Per Actuation, Time to Reduce, Time Before Reduction, Minimum Gap, Recall and Memory.
   e. Four phase signal overlap capability.
2. Conflict Monitor and Solid State load switches.
3. Solid State flasher and switch accessible through police door panel.
4. Ground mounted traffic controller cabinet large enough to accommodate the above control equipment and detectors. The cabinet shall be furnished with a thermostatically controlled cabinet vent fan.
5. Finish of the cabinet shall be all-weather bronze paint.
6. Meter Box shall be installed in a vandal proof enclosure supplied by the contractor.
7. Install 3' x 4' x 5" concrete slab in front of the controller cabinet.

LOOPS AND DETECTORS

1. The existing loops, as indicated on the Contract Drawings, shall be abandoned. The following new loops shall be installed:

Number	Dimensions	Phase
1	6' x 40'*	A
2	6' x 18'	B
3	6' x 20'	B
4, 5	6' x 40'*	C

*Loops to be installed with 6' x 3' power head for detection of small vehicles.

2. Loop 1 shall be wired to a standard detector.
3. Loops 2 and 3 shall be wired separately to a common standard detector.
4. Loops 4 and 5 shall be wired to a standard detector.
5. Standard detectors shall be Sarasota 215 B/MS or approved equal.
6. All wiring shall be in accordance with manufacturer's recommendations for correct operation.

SIGNAL HEADS

1. The existing signal heads shall be removed and shall be delivered to a location designated by the Traffic Engineer. The Contractor shall provide the following new signal heads:

Signal Number	Description
1, 2, 3, 4, 6, 7	12" diameter red indication; 8" amber and green
5	12" diameter red indication, 8" amber, and 12" green left turn arrow.

2. All signals shall have brown baked enamel finish and shall be furnished with tunnel visors. All signals shall be vertically mounted on the mast arms with rigid adjustable brackets equivalent to the "VePed Traffic Controls, Inc. Astro-Brac (Model No. 0-AB-101)" or approved equal.

POLES

Proposed Poles:

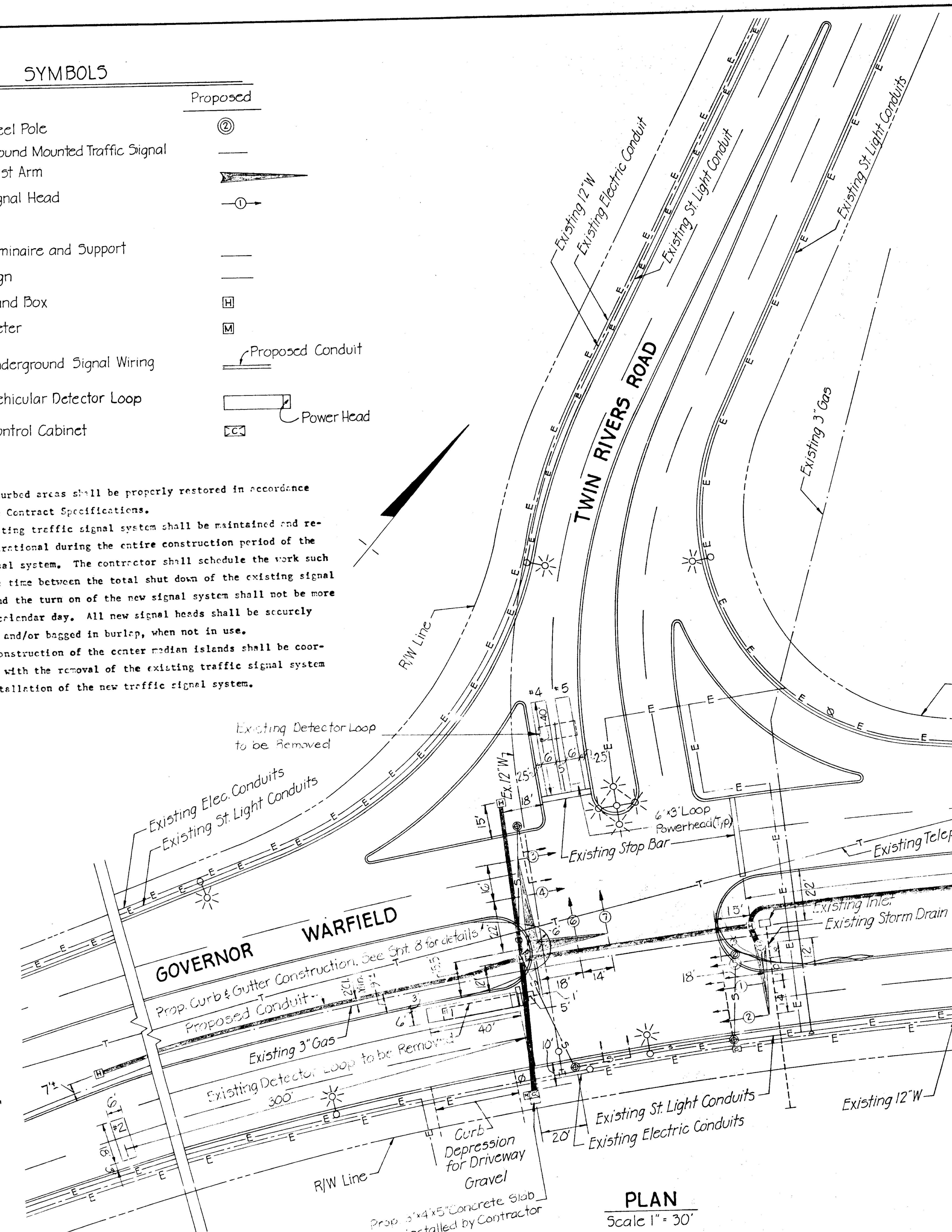
1. One (1) single arm support pole, and one (1) twin arm support pole with a 90° angle of separation.
2. Style and appearance shall be equivalent to Union Metal Design No. 50700. Finish shall be bronze paint.
3.

Pole Number	Description
1	32' and 38' arm spread, each supporting two signal heads.
2*	30' arm spread, supporting three signal heads.

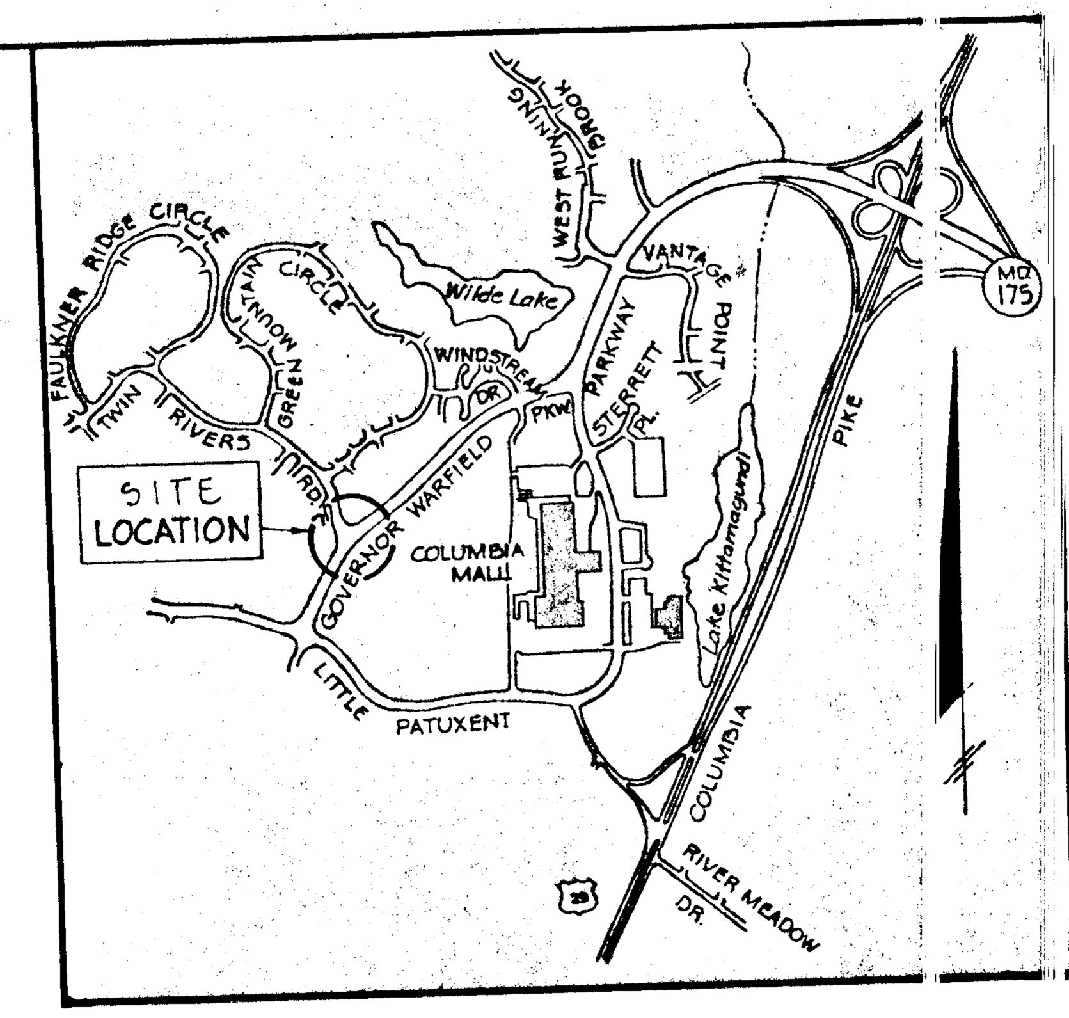
*Signal Pole No. 2 shall be designed to handle an additional 40' arm at 90° separation without modification to the support pole. This provision is made for a future Columbia Mall Entrance.

Existing Poles:

1. The existing traffic signal support poles shall be removed and delivered to a location designated by the Traffic Engineer. The existing foundations are to be removed to a depth of 1' below grade and backfilled and sodded.



PLAN
Scale 1" = 30'



VICINITY MAP
Scale 1" = 2000'

UNDERGROUND WIRING

1. Underground wiring shall be placed in new PVC Conduits under the road surface and in grass areas, as shown on the Contract Drawings.
2. The conduit shall be sized to accommodate future wiring for pedestrian (WALK/DON'T WALK) signal heads.
3. All existing direct buried cable shall be abandoned.
4. The Contractor shall furnish an "as-built" drawing as per "General Specifications - 4.02 b".
5. The use of direct lay cable or a combination of conduit and direct lay shall not be acceptable.

Approved:	Date
Elizabeth Anderson Calia — Chief - Division of Roads, Bridges & Storm Drainage	12/15/80
James E. Kreinker — Chief-Division of Traffic Engineering	12-16-80

Approved: DEPARTMENT OF PUBLIC WORKS
George F. Neumeyer — DIRECTOR OF PUBLIC WORKS — Date 12-16-80

Approved:
William E. Riley — Chief - Bureau of Engineering — Date 12-16-80

Rev. No.	Rev. Date	Revision Description

Owner and Developer
DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area
GOVERNOR WARFIELD PARKWAY AT INTERSECTION OF TWIN RIVERS ROAD

Project Title
PLAN "RECONSTRUCTION OF TRAFFIC SIGNAL" AND EQUIPMENT LIST
CAPITAL PROJECT NO. T-6-7003

Designed: D.Cheng	Scale: As Noted
Drawn: D.Griffin	Date: Dec. 1980
Checked: K.Evans	Sheet: 7 of 10

Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

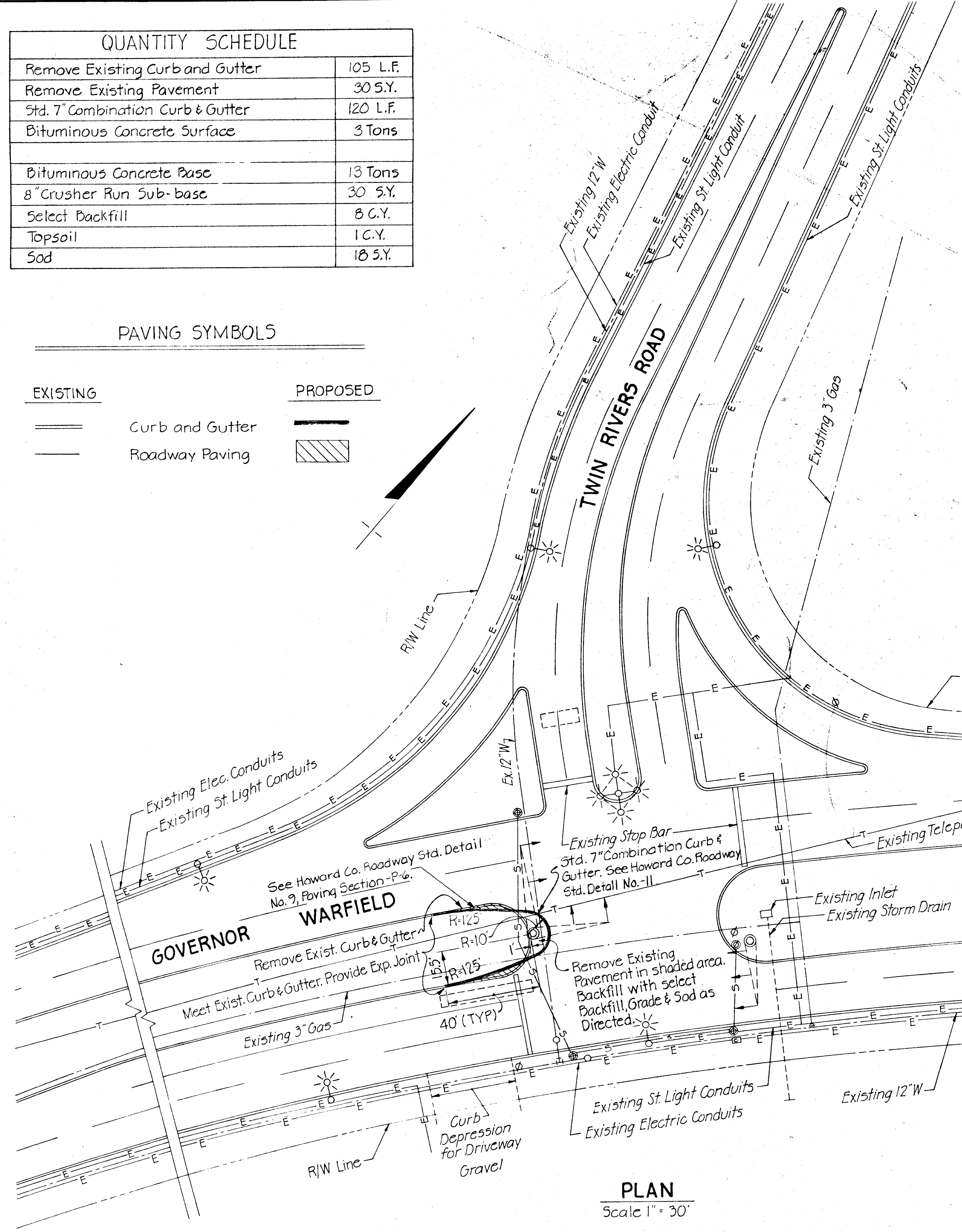
Daniel T. Cheng
12-10-80

QUANTITY SCHEDULE

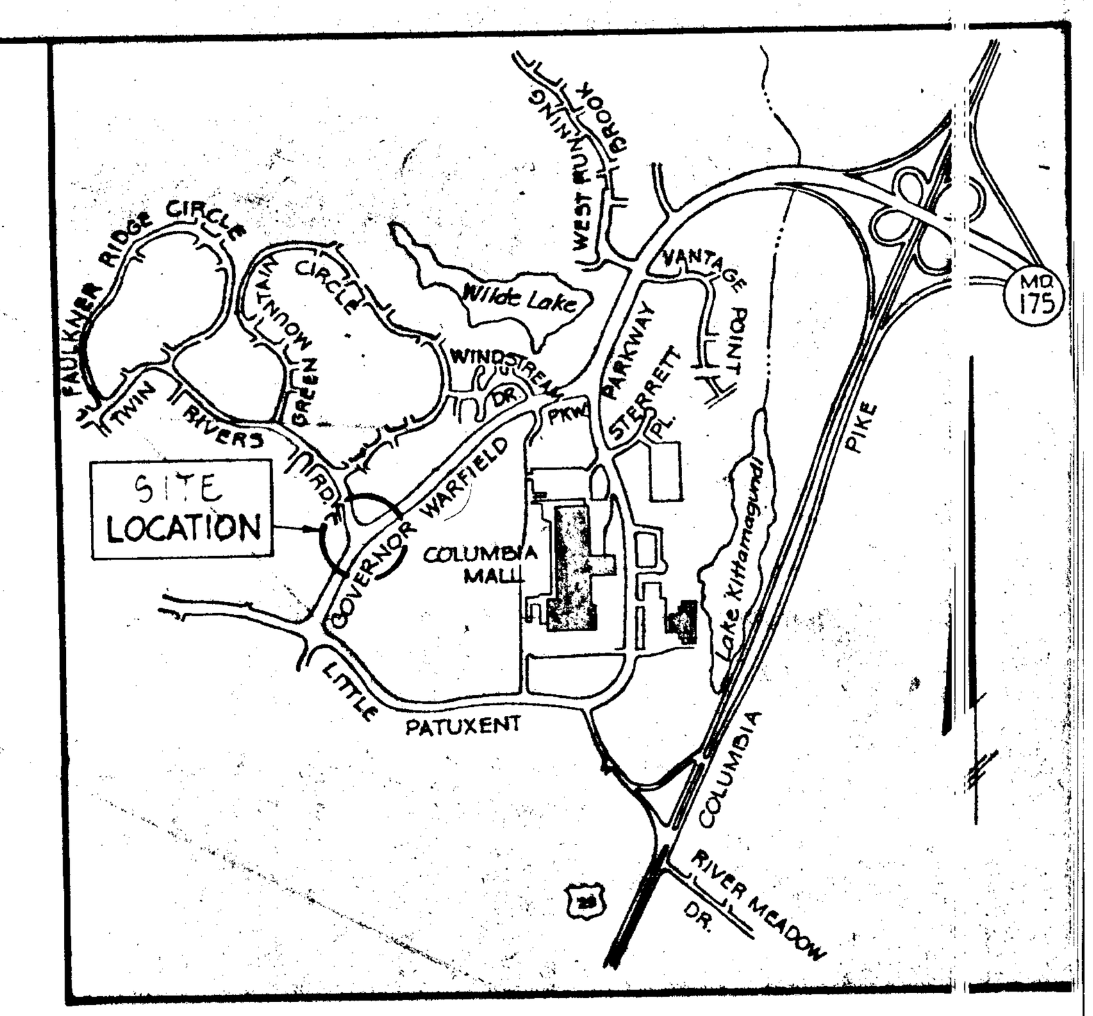
Remove Existing Curb and Gutter	105 L.F.
Remove Existing Pavement	30 S.Y.
Std. 7" Combination Curb & Gutter	120 L.F.
Bituminous Concrete Surface	3 Tons
Bituminous Concrete Base	13 Tons
8" Crusher Run Sub-base	30 S.Y.
Select Backfill	8 C.Y.
Topsoil	1 C.Y.
Sod	18 S.Y.

PAVING SYMBOLS

EXISTING		PROPOSED
═══	Curb and Gutter	━━━
───	Roadway Paving	▨



PLAN
Scale 1" = 30'



VICINITY MAP
Scale 1" = 2000'

GENERAL NOTES

1) All work performed under this contract shall be in accordance with the Contract Specifications.
2) See Contract Specifications for Standard Details.
3) The reconstruction of the median island shall be coordinated with the construction of the new traffic signal system.

Rev. No.	Rev. Date	Revision Description

Owner and Developer
DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area
GOVERNOR WARFIELD PARKWAY
AT INTERSECTION OF
TWIN RIVERS ROAD

Project Title
INTERSECTION GEOMETRIC MODIFICATIONS
CAPITAL PROJECT NO. T-6-7003

Designed:	Scale: As Noted
Drawn:	Date: Dec. 1980
Checked:	Sheet: 8 of 10

Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

Daniel Cheng 12-10-80

Approved: Elizabeth Anderson Calia 12/15/80
Chief - Division of Roads, Bridges & Storm Drainage — Date

Approved: James E. Kenkel 12-16-80
Chief - Division of Traffic Engineering — Date

Approved: DEPARTMENT OF PUBLIC WORKS
George F. Neumeyer 12-16-80
DIRECTOR OF PUBLIC WORKS — Date

Approved:
12-16-80
Chief - Bureau of Engineering — Date

PHASE AND SEQUENCE DIAGRAM		TRAFFIC SIGNAL HEADS 1,2 (12" 8" 8")	3,4 (12" 8" 8")	5,6,7,8 (12" 8" 8")	9 (12" 8" 12")	Min. Green	Passage	Yellow	Red Clear	Max. I	Seconds Per Actuation	Time to Reduce	Time Before Reduction	Minimum Gap	Recall	Memory
	Phase A	G	R	R	G	5	1			12					off	off
	Phase A Clear	G	R	R	Y			4	1							
	Phase B	G	G	R	R	12	5			27	1.9	5	10	3.5	off	on
	Phase B Clear	Y	Y	R	R			4	1							
	Phase C	R	R	G	R	9	1			21					off	off
	Phase C Clear	R	R	Y	R			4	1							
	FLASH	Y	Y	R	R											

GENERAL NOTES

1. All highway marking shall be the responsibility of the Division of Traffic Engineering of the Bureau of Engineering, Department of Public Works, of Howard County, Maryland, and is not to be considered a part of this contract.
2. a. Approximate location of existing utilities is shown. The Contractor shall take all necessary precautions to protect existing utilities and to maintain uninterrupted service. Any damage incurred shall be repaired immediately to the satisfaction of the Engineer by the Contractor at the Contractor's expense.
   b. The Contractor shall locate existing utilities a minimum of two weeks in advance of construction operations in vicinity of utilities. Cost shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
   c. Contractor shall notify the following utilities or agencies at least five (5) days before starting work shown on these plans:
      Miss. Utility (Collect) 1-559-0100
      Baltimore Gas & Electric Company - Underground Electric Distribution Engineering "Damage Control" - 234-5691
      Baltimore Gas & Electric Company - Underground Gas Distribution Engineering "Damage Control" - 234-5533
      Chesapeake and Potomac Telephone Co. - 725-9976
      State Highway Administration - 531-5533
   d. Clear all utilities by a minimum of 6". Clear all poles 2'-0" minimum or tunnel as required. Cost for tunneling or bracing at poles shall be included in the unit prices bid for excavation and backfill for traffic signal appurtenances.
3. All materials and workmanship employed under this contract shall conform with the "GENERAL SPECIFICATIONS FOR INSTALLATION OF AND EQUIPMENT FOR TRAFFIC SIGNALS FOR HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS" dated October 7, 1974; revised February 18, 1976, and included in the contract specifications.
4. All disturbed areas shall be properly restored in accordance with the Contract Specifications.
5. The existing traffic signal system shall be maintained and remain operational during the entire construction period of the new signal system. The contractor shall schedule the work such that the time between the total shut down of the existing signal heads and the turn on of the new signal system shall not be more than 1 calendar day. All new signal heads shall be securely wrapped and/or bagged in burlap, when not in use.
6. The reconstruction of the center median islands shall be coordinated with the removal of the existing traffic signal system and installation of the new traffic signal system.

EQUIPMENT LIST

CONTROLLER AND ACCESSORIES

1. NEMA three phase modular thumbwheel programmable controller with solid state circuitry and digital timing, equivalent to the Crouse Hinds DM-400 Series Digital Controller unit, equivalent manufactured by Eagle Signal Corporation or Econolite, or approved equal. The controller shall be capable of expansion to four phase operation.
   a. Equipped with two (2) vehicular actuated modules.
   b. Equipped with one (1) vehicular actuated module with volume density controls.
   c. Vehicular actuated phase modules shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Recall and Memory.
   d. Vehicular actuated phase module with volume density controls shall be capable of the following functions: Minimum Green, Passage Time, Yellow, All Red Clearance, Dual Maximum, Pedestrian Timing, Seconds Per Actuation, Time to Reduce, Time Before Reduction, Minimum Gap, Recall and Memory.
   e. Four phase signal overlap capability.
2. Conflict Monitor and Solid State load switches.
3. Solid State flasher and switch accessible through police door panel.
4. Ground mounted traffic controller cabinet large enough to accommodate the above control equipment and detectors. The cabinet shall be furnished with a thermostatically controlled cabinet vent fan.
5. Finish of the cabinet shall be all-weather bronze paint.
6. Meter Box shall be installed in a vandal proof enclosure supplied by the contractor.
7. Install 3' x 4' x 5" concrete slab in front of the controller cabinet.

LOOPS AND DETECTORS

1. The existing loops, as indicated on the contract drawings, shall be abandoned. The following new loops shall be installed:

Number	Dimensions	Phase
1, 2	6' x 18'	B
3	6' x 40'*	A
4, 5, 7, 8	6' x 40'*	C
6	6' x 10'	C

*Loops to be installed with 6' x 3' power head for detection of small vehicles.

2. Loops 1 and 2 shall be wired separately to a common standard detector.
3. Loop 3 shall be wired to a standard detector.
4. Loops 4 and 8 shall be wired separately to a common standard detector.
5. Loops 5, 6, and 7 shall be wired separately to a common delayed timer vehicle loop detector in accordance with manufacturer's recommendations for correct operation. Delayed timer shall be set at 10 seconds.
6. Loops 1 and 2 shall operate in pulse mode, and loops 3, 4, 5, 6, 7, 8 in presence mode.
7. Delayed timer vehicle loop detectors shall be Sarasota 235T/MS or approved equal. Standard detectors shall be Sarasota 215B/MS or approved equal.
8. All wiring shall be in accordance with manufacturer's recommendations for correct operation.

SIGNAL HEADS

1. The existing signal heads shall be removed and shall be delivered to a location designated by the Traffic Engineer. The Contractor shall provide the following new signal heads:

Signal Number	Description
1, 2, 3, 4, 5, 6, 7, 8	12" diameter red indication; 8" amber and green
9	12" red indication; 8" amber indication, and 12" green left turn arrow.

2. All signals shall have brown baked enamel finish and shall be furnished with tunnel visors. All signals shall be vertically mounted on the mast arms with rigid adjustable brackets equivalent to the "VePed Traffic Controls, Inc. Astro-Brac (Model No. O-AB-101)" or approved equal.

POLES

Proposed Poles:

1. Two (2) twin arm support poles with a 90° angle of separation.
2. Style and appearance shall be equivalent to Union Metal Design No. 50700. Finish shall be bronze paint.
3.

Pole Number	Description
1	32' arm spread supporting three signal heads. 38' arm spread supporting two signal heads.
2	22' and 34' arm spread, each supporting two signal heads.

Existing Poles:

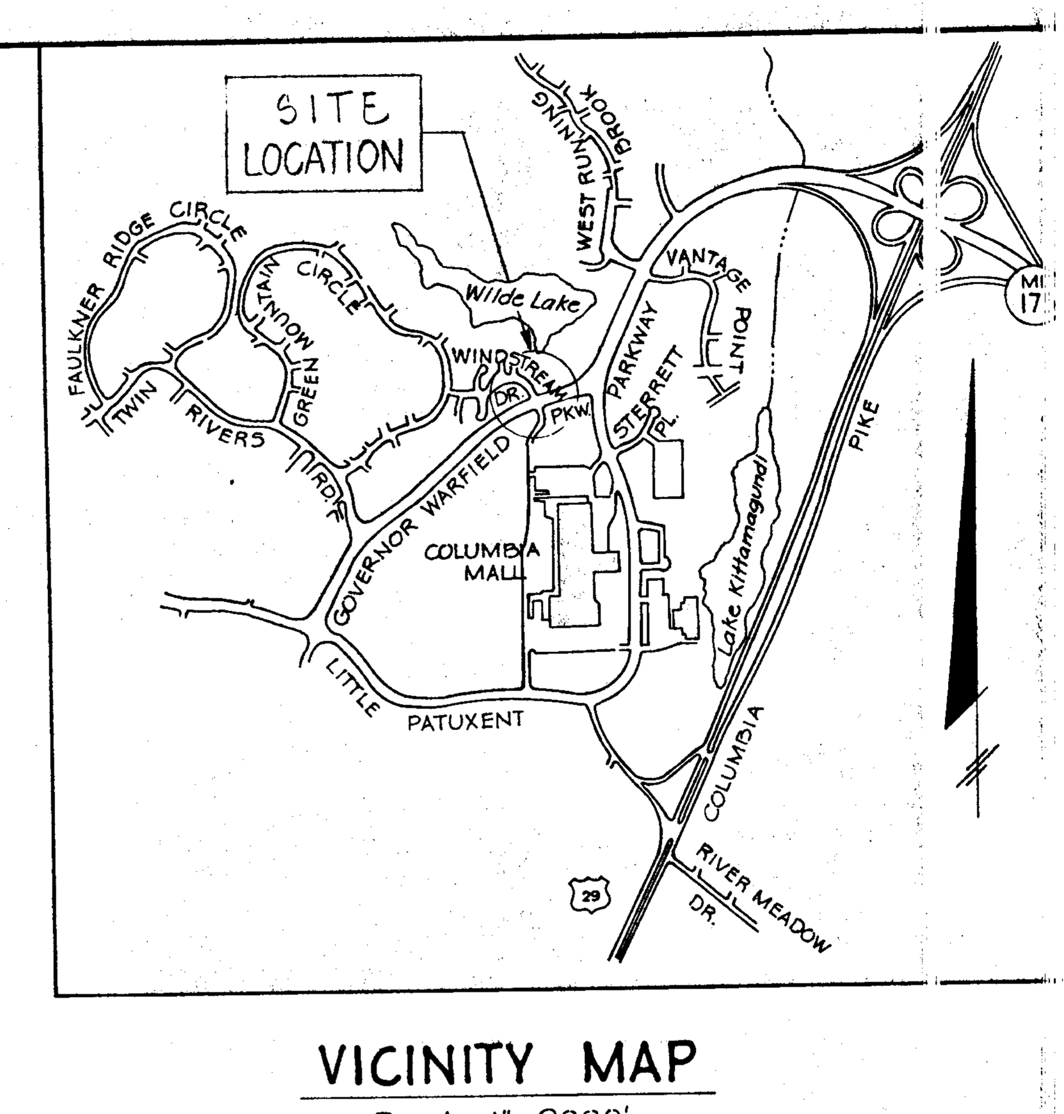
1. The existing traffic signal support poles shall be removed and delivered to a location designated by the Traffic Engineer. The existing foundations are to be removed to a depth of 1' below grade and backfilled and sodded.

UNDERGROUND WIRING

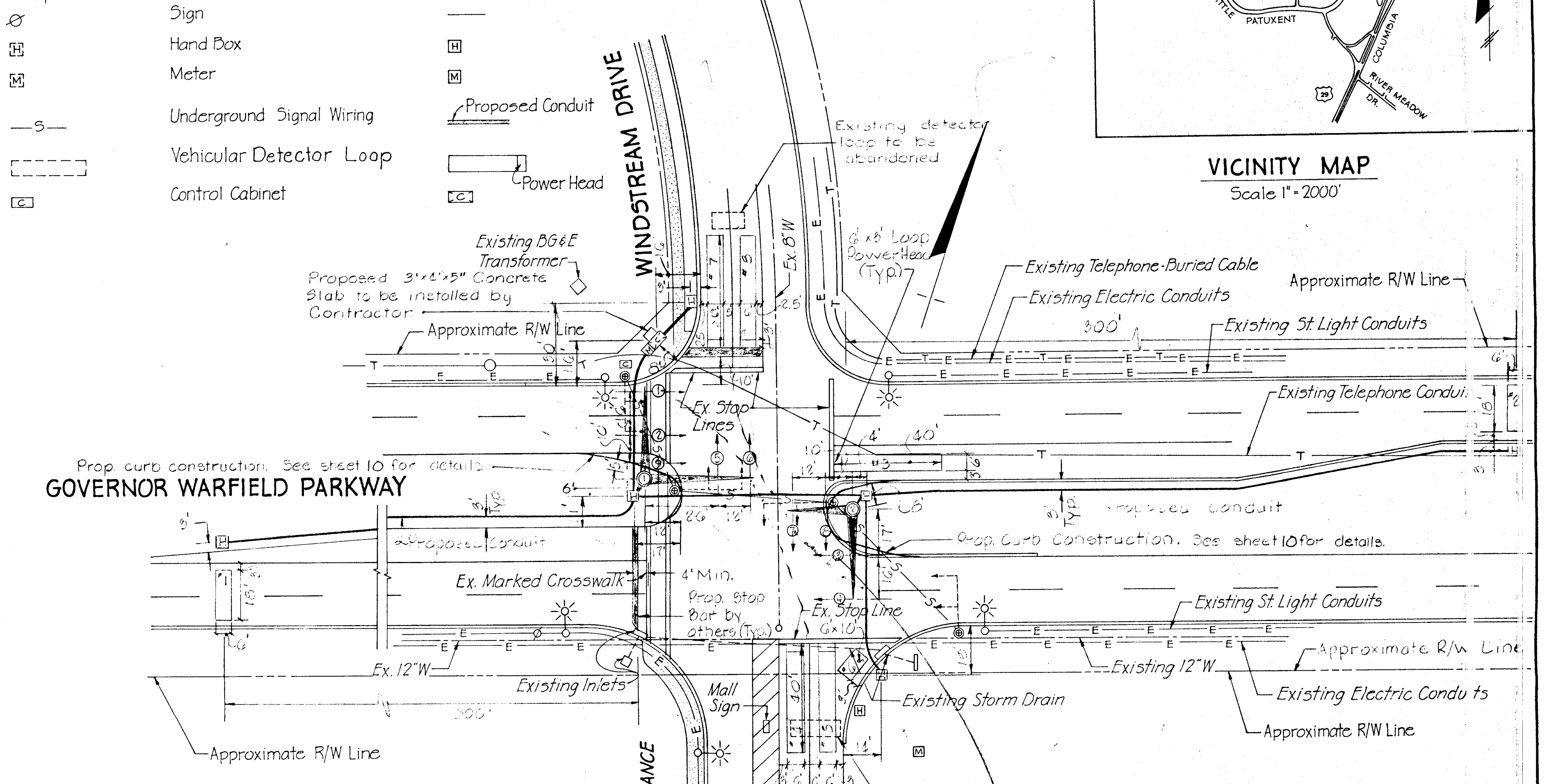
1. Underground wiring shall be placed in new PVC Conduits under the road surface and in grass areas, as shown on the Contract Drawings.
2. The conduit shall be sized to accommodate future wiring for pedestrian (WALK/DON'T WALK) signal heads.
3. All existing direct buried cable shall be abandoned.
4. The Contractor shall furnish an "as-built" drawing as per "General Specifications - 4.02 b."
5. The use of direct lay cable or a combination of conduit and direct lay shall not be acceptable.

SYMBOLS

Existing		Proposed
	Steel Pole	
	Mast Arm	
	Signal Head	
	Luminaire and Support	
	Sign	
	Hand Box	
	Meter	
	Underground Signal Wiring	Proposed Conduit
	Vehicular Detector Loop	Power Head
	Control Cabinet	



VICINITY MAP
Scale 1" = 2000'



PLAN
Scale 1" = 30'

Rev. No.	Rev. Date	Revision Description

Owner and Developer
DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area
GOVERNOR WARFIELD PARKWAY
AT INTERSECTION OF
WINDSTREAM DRIVE AND MALL ENTRANCE

Project Title
PLAN RECONSTRUCTION OF TRAFFIC SIGNAL
AND EQUIPMENT LIST
CAPITAL PROJECT NO. T-6-7003

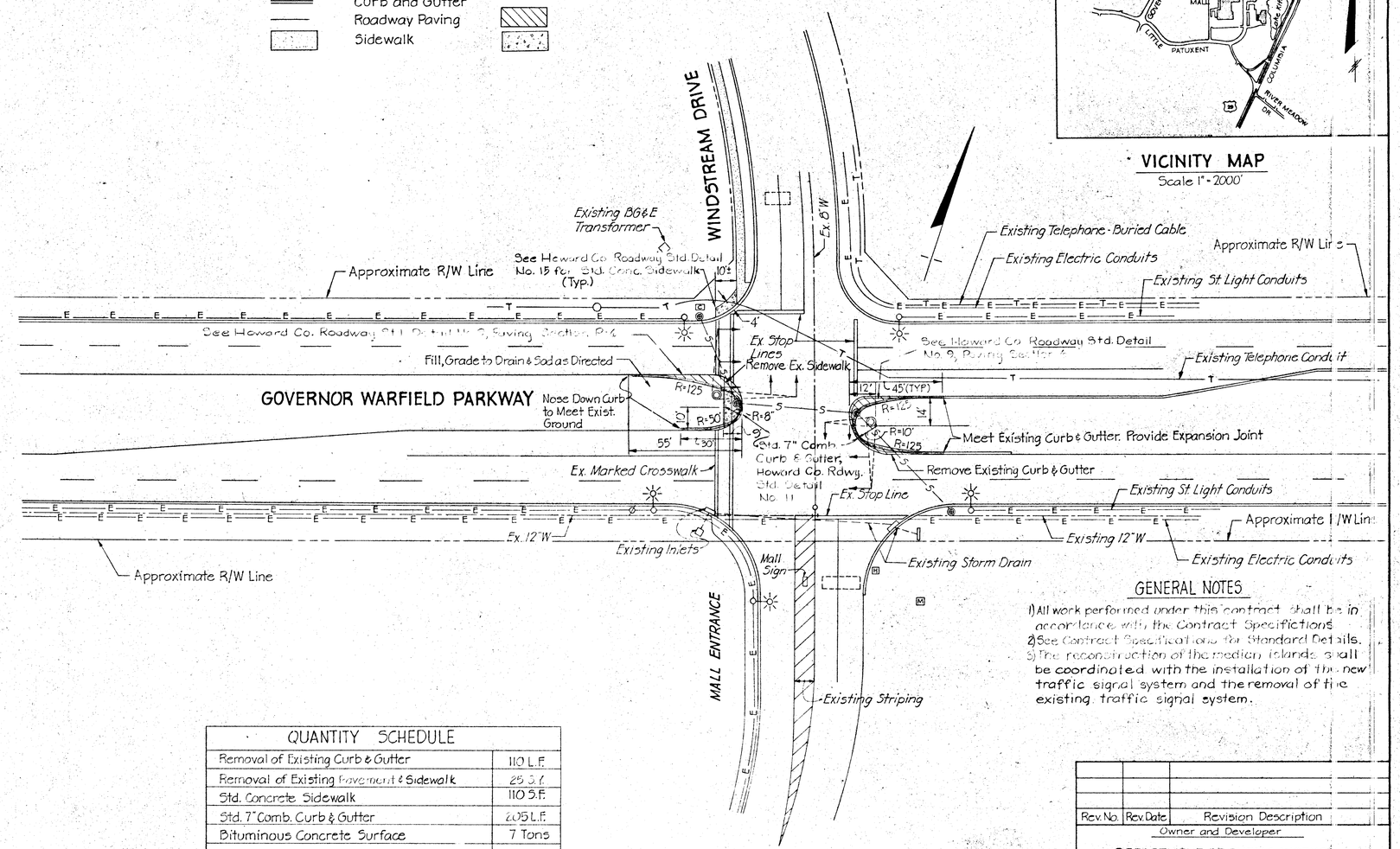
Designed: D.Cheng	Scale: As Noted
Drawn: D.Griffin	Date: Dec. 1980
Checked: K.Evans	Sheet: 9 of 10

Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

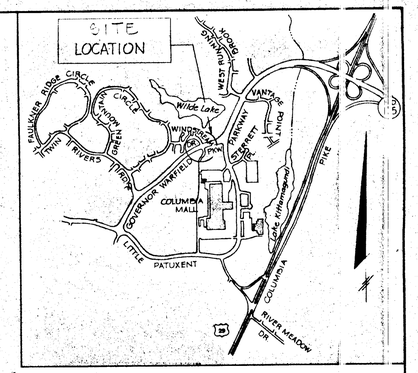
Approved: Chief - Division of Roads, Bridges & Storm Drainage — 12/15/80 Date
Approved: Chief - Division of Traffic Engineering — 12-16-80 Date
Approved: DEPARTMENT OF PUBLIC WORKS — DIRECTOR OF PUBLIC WORKS — 12-16-80 Date
Approved: Chief - Bureau of Engineering — 12-16-80 Date

PAVING SYMBOLS

EXISTING		PROPOSED
═══	Curb and Gutter	
———	Roadway Paving	
▭	Sidewalk	



PLAN
Scale 1" = 30'



VICINITY MAP
Scale 1" = 2000'

GENERAL NOTES

1) All work performed under this contract shall be in accordance with the Contract Specifications.
2) See Contract Specifications for Standard Details.
3) The reconstruction of the median islands shall be coordinated with the installation of the new traffic signal system and the removal of the existing traffic signal system.

QUANTITY SCHEDULE

Removal of Existing Curb & Gutter	110 L.F.
Removal of Existing Pavement & Sidewalk	25 S.Y.
Std. Concrete Sidewalk	110 S.F.
Std. 7" Comb. Curb & Gutter	205 L.F.
Bituminous Concrete Surface	7 Tons
Bituminous Concrete Base	34 Tons
8" Crusher Run Sub-base	80 S.Y.
Select Backfill	15 C.Y.
Top Soil	6 C.Y.
Sod	100 S.Y.

Rev. No.	Rev. Date	Revision Description

Owner and Developer

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

Project Area

GOVERNOR WARFIELD PARKWAY
AT INTERSECTION OF
WINDSTREAM DRIVE AND MALL ENTRANCE

Project Title

INTERSECTION GEOMETRIC MODIFICATIONS
CAPITAL PROJECT NO. T-G-7003

Designed: D. Cheng	Scale: As Noted
Drawn: D. Griffin	Date: Dec. 1980
Checked: K. Evans	Sheet: 10 of 10

Prepared By
THE WILSON T. BALLARD CO.
CONSULTING ENGINEERS
OWINGS MILLS, MARYLAND

Daniel J. Cheng 12-16-80

Approved:
Elizabeth Anderson Calia 12/15/80
Chief - Division of Roads, Bridges & Storm Drainage Date

Approved:
James E. Kemker 12-16-80
Chief - Division of Traffic Engineering Date

Approved: DEPARTMENT OF PUBLIC WORKS
Wm. F. Nemeyer 12-16-80
DIRECTOR OF PUBLIC WORKS Date

Approved:
[illegible] 12-16-80
Chief - Bureau of Engineering Date