MEMO ON UTILITY REARRANGEMENT

WBS 16AAA

Prepared by:

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MEMO ON UTILITY REARRANGEMENTS

LIST OF CONTENTS

Memo on Utility Rearrangements

1. Scope and Purpose of the Report

The purpose of this report is to relate how the substructure preliminary plans were developed, and what procedures and criteria were used for relocating, supporting in place and maintaining during construction those storm drains, sanitary sewers and water mains, traffic signal, telephone, power, gas, etc. impacted by the subway construction. The Preliminary Plans developed during the Preliminary Engineering Phase of the Metro Rail Project are based on a review of available documented information and are not the result of comprehensive site surveys of the specific locations. The objective of the utility rearrangement effort was to identify major relocation requirements along the alignment and to specify feasible solutions, from which representative cost estimates could be developed.

This report is separated into a number of sections, which are listed below:

- o Existing Utility Data
- o Procedure for identifying and resolving potential utility conflicts along the Metro Rail Project
- o Criteria for relocating gravity lines (sanitary sewers and storm drains)
- o Impact of major utility lines on station location and configuration
- o Preliminary cost estimates for utility rearrangement
- o Summary and Recommendation

The report also includes samples of drawings; utility rearrangements at three selected stations (Appendix A); a list of agencies/owners of the utility lines located within the area of the proposed trainway structure (Appendix B); a matrix that identifies the agency personnel to be contacted in matters relating to utility rearrangement (Appendix C); and a list of applicable standard drawings (Appendix D).

2. Existing Utility Data

Existing utility data has been compiled from the substructure maps on file with the City of Los Angeles Central Files. This substructure data was suplemented when needed with as built survey information obtained from the owners. Minimal on-site verifications of utility locations have been done. The compiled data was transferred to standard size sheets, 22" x 34", which depict respective station footprints. The gravity line rearrangements and other information and notes were added after evaluation of potential conflicts.

3. Procedure for Identifying and Resolving Potential Utility Conflicts Along The Metro Rail Project.

Utility rearrangement cost was one of several factors integral to the final alignment decision. An interdisciplinary committee was formed chaired by the Southern California Rapid Transit District Metro Rail Project Personnel to ensure that utility issues were identified and given proper consideration. Participants included the City of Los Angeles - Bureau of Engineering, Los Angeles County Engineers, Los Angeles County Flood Control District, Ways and Structures Consultant, and Stations Consultant. The Los Angeles City also served as the point of contact for other affected utilities. Existing substructure maps were the primary data source for comparing proposed horizontal and vertical subway alignment with existing utility locations. This data, was considered adequate to satisfy the primary objective of developing preliminary cost estimates for major utility rearrangements. It was also recognized that a more comprehensive analysis of existing conditions would be performed during the final design phase of the Project.

The proposed location of stations along the main thoroughfares of the Los Angeles Regional Core posed immediate problems for maintaining utility lines in existing locations. Although efforts were made to maintain the top of structure at a depth of eight feet below grade to minimize utility conflict, this could not always be done. In addition, several major lines were at depths greater than eight feet. Therefore, it was obvious that although most lines could be maintained and supported in place during cut and cover construction operations, a great many would have to be relocated. Basic guidelines were developed in coordination with the Los Angeles Bureau of

Engineering to address the subject of utility conflict and rearrangement, particularly as it applied to gravity lines. The intent of this "criteria" was to establish a systematic approach to follow at each station location for utility rearrangement. It also served as guidance to the station consultants in locating various station elements that could interfere with the utilities, such as: emergency stairs, ventilation and exhaust shafts, passageways and station entrances. The basic criteria is described in Section 4 and is followed by a summary of the impact of utility lines on station location and configuration.

4. Criteria for Relocating Gravity Lines (Sanitary Sewers and Storm Drains)

A criterion for gravity line rearrangement as shown on the preliminary drawings was to relocate the existing gravity lines from within the proposed "cut and cover" areas into the adjacent sections of pavement and/or sidewalk. Exceptions were made for those existing pipes located across the proposed "cut and cover" sections and not in direct conflict with the proposed structure. In these cases, and in particular where an eventual relocation would be of considerable length, it was proposed that a section of pipe crossing the "cut and cover" area be supported during construction.

A proposed sewer relocation, must include the reconnection of existing house connections and also a design that permits the proposed sewer pipes to have at least the same capacity as the existing sewers. It was also intended that the proposed slopes, whenever possible allow the use of standard manholes rather that drop manholes at point of connection.

At some locations, relocation of an existing sewer line around the station box was not feasible or desired for the reason that it required an extended length of run that resulted in an invert elevation at the tie-in lower than that of the existing line. The requirement to serve existing house connections made some solutions impossible to implement. In these cases, consideration was given to a new sewer line with the same horizontal alignment but at a higher elevation. The length of the new sewer line necessary to go up stream to meet the existing line was evaluated and a minimum slope (for the given size of pipe) was selected for the proposed sewer line in order to

pass over the cut and cover structure, and still provide the capacity of the existing pipe.

For proposed storm drain relocations the main constraint was related to assuring that connections can be made to existing storm inlets. Neither the sewer house connections nor storm inlet connections have been shown on the Preliminary Plans except for a few locations where those connections have a significiant impact on the proposed relocation.

It is intended to minimize conflict with other existing utilities when the gravity lines are rearranged. It is assumed that some arrangement of other "non gravity" utilities may be required.

Utility lines other than the gravity lines are expected to be supported in place during the cut and cover construction and placed in a fill during backfill operations. Design consultants will cooperate and coordinate through the general consultants the requirements and standards related to supporting in place and subsequent retrenching of the utility conduits and vaults, as well as their possible temporary and/or permanent rearrangement.

5. Impact of Major Utility Lines on the Location and Configuration of Station and on the Vertical Alignment of the Subway

The location of the major utility lines affected the preliminary vertical and horizontal alignment as well as the location and the configuration of the proposed subway stations. To reduce that impact, some basic principles were taken into consideration during the preliminary phase of design. Designers attempted to locate stations where the number of significant conflicts with existing utilities would be relatively low, unless other factors prevailed over the economic cost of these conflicts. While it was agreed that an existing utility should not control the station location, it was also recognized that alternative locations, offering similar entrance conditions with reduced extent of utility conflicts should be investigated. This was particularly true for the stations with one entrance and where no preference was given to locating that entrance on either the inbound or outbound side. For stations with more than one entrance, preference was given to locating those entrances on one side of the station (either inbound

or outbound) where the extent of utility conflicts was smaller, all other factors being the same. This approach would also leave the other side clear for potential utility relocations. Potential major utility conflicts directly contributed to modification of station location at some stations; and at other stations other factors dictated station location even in the light of major relocation. Wilshire/Normandie, Fairfax/Beverly, and Fairfax/Santa Monica were able to be located so as to avoid major conflict.

The station at Wilshire/Normandie was located west of Normandie Avenue to avoid conflict with two large reinforced concrete box storm drains that cross Wilshire Boulevard east of Normandie Avenue. The entrance for this station is currently on Irolo Avenue, which carries marginal traffic volume and will be entirely closed to vehicle traffic in the future.

The Fairfax/Beverly station has been proposed in an off-street location just east of Fairfax Avenue and south of Beverly Boulevard. This location will avoid conflict with a 7.5' X 9' storm drain in Beverly Boulevard which connects to a 7.5 x 12' storm drain in Fairfax Avenue. Entrances to this station are proposed in an existing parking lot at a mid-block location and are free of utility conflicts.

In Fairfax Avenue at Santa Monica Boulevard, a 7'-3"x 12'-o" - 8'-0" x 12'-0" storm drain design in progress was modified by the Los Angeles County Flood Control District. According to this modification the proposed storm drain will run East of the Proposed station, but still remain within the Fairfax Avenue. The modification to storm drain design and the change in Metro Rail alignment avoided a major conflict.

In some cases, factors other than existence of utility conflicts prevailed and stations were located even with major relocations required. This was the case at the proposed Wilshire/Crenshaw, Wilshire/La Brea, and 5th/Hill Stations.

At the Wilshire/La Brea site, the 210' of 57" dia. water main in Detroit Street at the west end of the proposed station and a 42" storm drain will have to be relocated. The length of this latter relocation is nearly 1100'.

Also, relocations of sanitary sewers ranging in size from 12" to 39" add a total length in excess of 1500'.

At the site of the proposed Wilshire/Crenshaw station it is necessary to relocate 295'-81 dia. storm drain at its section turning from Lorraine Boulevard west into Wilshire Boulevard.

The generally desirable location of the expected high patronage station at 5th/Hill and in particular a very convenient location of the four entrances in the vacant lots at both 4th Street and 5th Street was an over riding factor against a need for exceptionally long proposed sanitary sewer relocation in excess of 4100', ranging in size from 8" to 30".

As a general proposition, conforming to the City of Los Angeles street improvement requirements, the surface features to be located in the sidewalk are shown in the area not less than 4' from the curb line. The reason for this is that the 4' wide portion of the sidewalk immediately adjacent to the curb is reserved for the existing utility relocations as well as any future utility requirements by other agencies.

Some of the utility lines located at a considerable depth constituted natural constraints for establishing the Metro Rail vertical profile. In all these cases the vertical alignment of the proposed tunnel passes under or over the utility lines with a clearance considered as sufficient.

The following are the utilities and locations within this category:

a) A 9'-3" storm drain in Macy - Alameda Street area, west of Union Station

b) A 10'-3" arch tunnel storm drain in 2nd Street south-west of the Civic Center station.

c) An 11'-3"x14'-6" storm drain in Hoover Street at Wilshire Avenue east of the Wilshire/Vermont station.

d) A 42" sanitary sewer in Norton Avenue, east of the Wilshire/Crenshaw station.

e) A 48" storm drain at Muirfiled Avenue west of the Wilshire/Crenshaw station

f) A 72" sanitary sewer tunnel north of Bonnie Hill Drive, south of the Universal City station.

6. Preliminary Cost Estimate for Utility Rearrangement

The cost estimate for major utilities rearrangement includes a cost for street restoration at the proposed Metro Rail stations. Both public and private utilities rearrangements are included in the estimate. The estimates for major public utility relocations were prepared by the Central District Engineering Bureau. Estimates for private utility relocations were obtained from the utility companies by the Bureau of Engineering.

Unit prices used in the estimates were derived by the Bureau's Construction Division - Utility and Estimating section were adjusted to reflect 1983 cost of labor and materials. The estimated cost for supporting utilities during construction has been included with cut and cover construction costs.

The utilities rearrangement cost was estimated at 25 million dollars and reported in Milestone 11 Final Report.

7. Summary and Recommendations

Existing utility information was taken from available data, but field verification has been minimal. Verification of horizontal and vertical locations of utilities will be on an as required basis during final design.

Possible relocations of major utilities are shown on the Preliminary Engineering Plans. It is presumed that the section designers will coordinate through the General Consultant all rearrangement plans. At this writing it is assumed that the various agencies will do their own relocation design and prepare construction drawings to be inserted in the Contract Documents; however, until utility agreements have been negotiated, the areas and extent are not known.

The exception to this is the rearrangement design of storm and sanitary sewers which will be designed by the line designers, and reviewed by the City.

The rearrangement of utilities, if any, at the various mid-line vent shafts, or sump pump penetrations will have to be evaluated as the design progresses. These locations were not reviewed during preliminary engineering.

It is recommended that the General Consultant meet with the affected agencies as soon as practical in order to establish:

- Who will do design for rearrangements and prepare contract documents
- Who will construct these rearrangements
- A standard of design for support during construction
- A committee to deal with Metro related problems made up of one member from each agency.

CONNECT PROP 42" SD TO EXIST 36" SD.
INVERT ELEVATIONS AT JUNCTION
AT 42" SD EL. 190.7 (PROP)
AT 36" SD EL. 191.2 (EXIST)

DETROIT STREET

LA BREA AVENUE

SYCAMORE AVENUE

ORANGE AVENUE

WILSHIRE BOULEVARD

END PLATFORM GRADE

TOP OF RAIL 149.81

END PLATFORM

TYPICAL SECTION

BEGIN PLATFORM GRADE

TOP OF STRUCTURE 185.13

TOP OF RAIL 148.46

BEGIN PLATFORM

TOP OF W PIPE EXIST. EL 182.4 (DWP)

TOP OF W PIPE EXIST. EL 182.1 (DWP)

EMERG. HATCH

U.P.E.

B.R.S.

F.H.

F.A.I.

SEE NOTE *

LEGEND

EXISTING SYMBOLS

- 30"SD — STORM DRAIN
- 24"SS — SANITARY SEWER
- 10"W — WATER CONDUIT
- G — GAS CONDUIT
- E — ELECTRICAL CONDUIT
- 18"x24"T — TELEPHONE & TELEGRAPH CONDUIT
- EXISTING UTILITY TO BE ABANDONED
- (264.43) INVERT ELEVATION AT EXISTING UTILITY MANHOLE

PROPOSED SYMBOLS

- LIMIT OF PROPERTY TO BE ACQUIRED
- PROPOSED STORM DRAIN
- PROPOSED SANITARY SEWER

PROPOSED

NO	STORM DRAIN	NO	SAN SEWER	NO.	WATER LINE
(1)	455'-27"RCP S=0.006	(4)	250'-12" SS S=0.004	(B)	210'-57"RCP SEE NOTES 1&3
(2)	908'-42"RCP S=0.003	(5)	120'-8" SS S=0.004		
(3)	178'-42"RCP S=0.075	(6)	340'-30"SS S=0.002		
		(7)	320'-24"SS S=0.0078		

* STRETCH OF 60'± TO BE SUPPORTED IN PLACE DURING THE STATION CONSTRUCTION.

** LENGTH OF PROPOSED 42" CONDUIT STARTS AT PROPOSED CHANGE OF GRADE POINT (PROP EL. 188.0) ON SOUTH EDGE OF WILSHIRE BOULEVARD.

APPROXIMATE ELEVATIONS AT TOP OF STATION STRUCTURE

(A) 186.6

(B) 185.0

NOTE

1. RELOCATION OF THE 57" WATER LINE IS SHOWN SCHEMATICALLY ONLY. DETAILED DESIGN SHALL BE COORDINATED BY THE SECTION DESIGNER WITH THE CITY OF LOS ANGELES WATER AND POWER DEPARTMENT.
2. CONTRACT A245 INCLUDES ALL SUBSURFACE WORK AND SURFACE WORK ITEMS SHOWN ON THIS SHEET AND THOSE DESCRIBED BY GENERAL NOTES AND SPECIFICATIONS.
3. EXISTING ELEVATIONS OF THE TOP OF 57" WATER MAIN WERE INTERPOLATED FROM THE INFORMATION FOUND ON THE NEW ON-SITE SURVEY.

0' 20' 40' 100' 160'

NORTH

PRELIMINARY

REV.	DATE	BY	APP.	DESCRIPTION
V	7/5/83	JLD	TC	DELETED CROSS-OVER, REVISED RELOCATION OF 5"S PIPELINE OF STATION PLATFORM

DESIGNED BY TAMS Date 6/6/83

DRAWN BY HWW Date 6/9/83

CHECKED BY JLD Date 6/9/83

HARRY WEESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations

SUBMITTED BY:
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
RTD

APPROVAL RECOMMENDED — Reg. No.

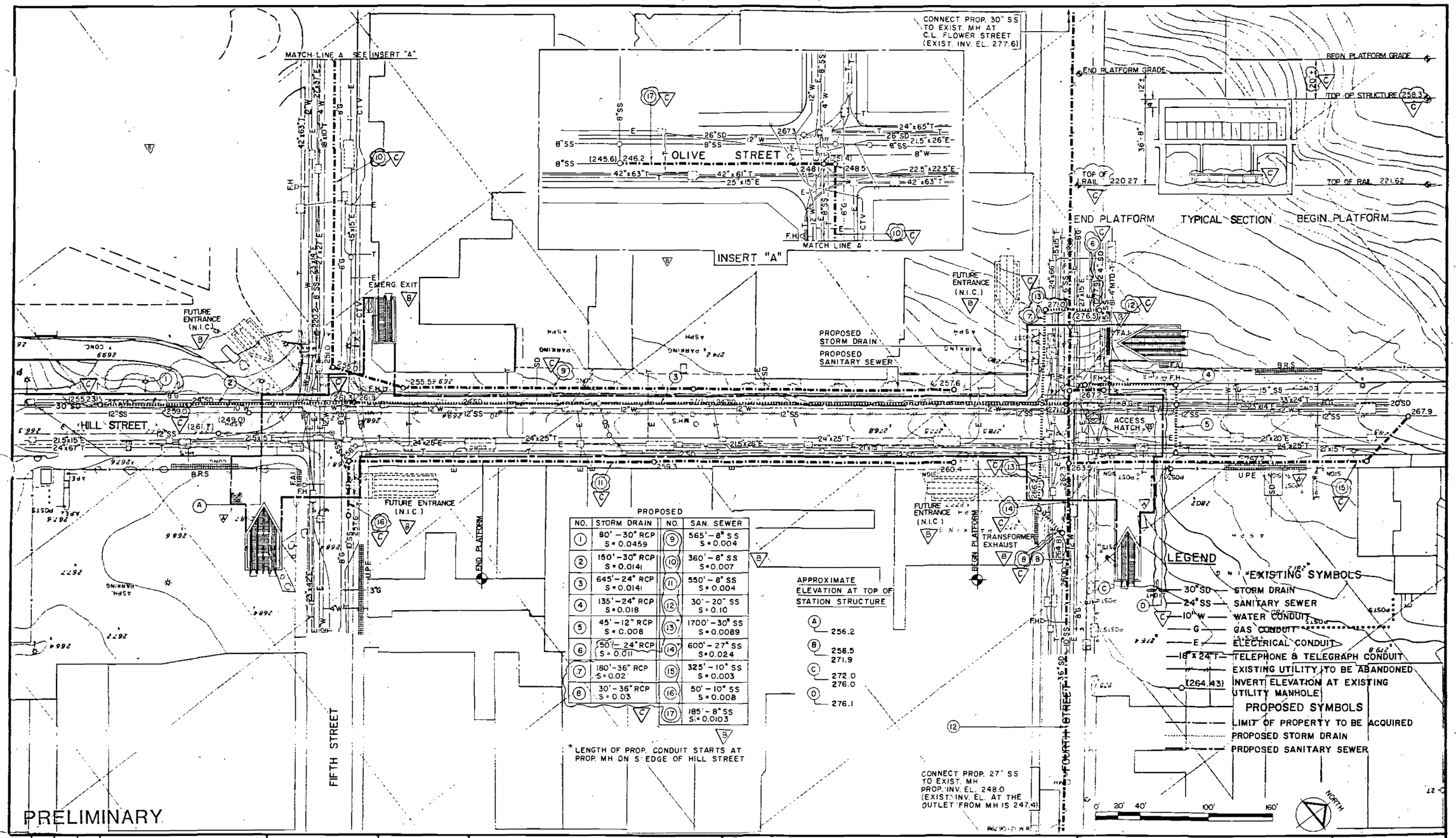
APPROVED — Date

MANAGER / CHIEF ENGINEER — Reg. No.

WILSHIRE / LA BREA STATION
UTILITY PLAN REARRANGEMENT

APPENDIX A, PAGE 1

CONTRACT NO. A245
DRAWING NO. U-11
SCALE 1"=40'-0"
SHEET NO. 11 OF 21



REV.	DATE	BY	APP	DESCRIPTION
5	7/21/83	JLD		ADDED PLATFORM, TOP OF RAIL & PIPE EL. REVISED LENGTH OF STATION & PIPES & PIPE NO.
4	6/30/83	JLD		ADDED N.I.C., GRATES - EXIT - ACCESS HATCH
3	5/11/83	JLD		REVISED EXTENT OF PROP. 8" SS PIPE ALONG FIFTH & OLIVE STREETS
				REVISED ELEVATOR AND GRATING LOCATIONS

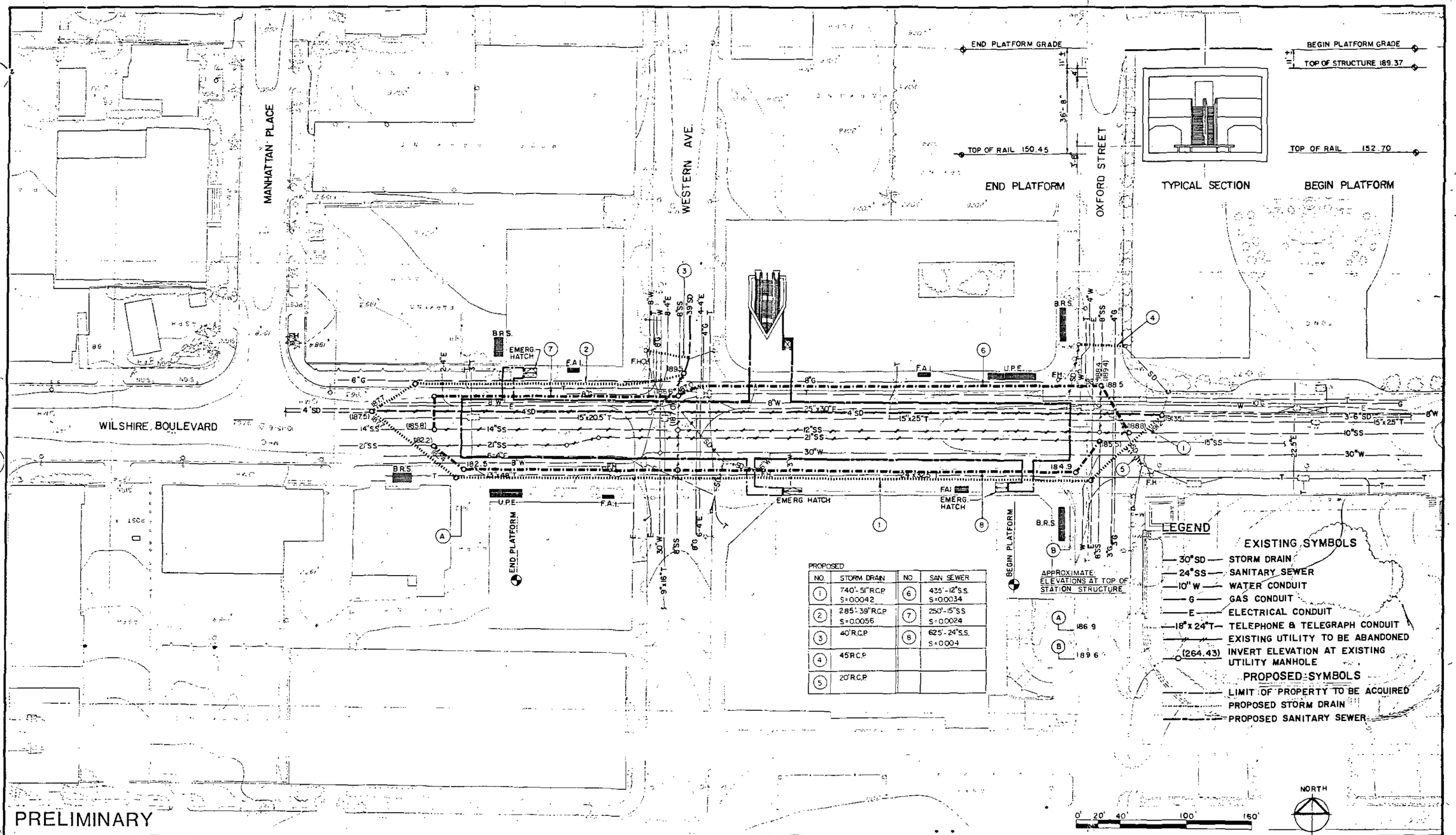
DESIGNED BY Date 5/4/83 — TAMS
DRAWN BY Date 5/6/83 — S.AN /RGL
CHECKED BY Date 5/4/83 — JLD

HARRY WEESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations
SUBMITTED BY:
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
APPROVAL RECOMMENDED — Reg. No.
APPROVED Date — MANAGER / CHIEF ENGINEER Reg. No.

5th / HILL STATION
UTILITY PLAN REARRANGEMENT
APPENDIX A, PAGE 2

CONTRACT NO. A140
DRAWING NO. U-4
SCALE 1"= 40'-0"
SHEET NO. 46 OF 60



PRELIMINARY

REV	DATE	BY	APP.	DESCRIPTION

DESIGNED BY TAMS Date 5/16/83
DRAWN BY S.AN Date 5/19/83
CHECKED BY JLO Date 5/25/83

HARRY WEESE & ASSOCIATES
TIPPETTS-ABBETT-McCARTHY-STRATTON
ENVIRONMENTAL COLLABORATIVE, INC.
GIN WONG ASSOCIATES
General Architectural Consultants: Stations
SUBMITTED BY:
PROJECT MANAGER

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED — Rec. No.
APPROVED — Date
MANAGER / CHIEF ENGINEER — Reg. No.

WILSHIRE / WESTERN STATION
UTILITY PLAN REARRANGEMENT

APPENDIX A, PAGE 3

CONTRACT NO. A220
DRAWING NO. U-9
SCALE 1"= 40'-0"
SHEET NO 56 OF 63

UTILITIES CONTACT SHEET

NAMES & PHONE NUMBERS

P.V. King (City Engineer)	(213) 485-3071
Delwin A. Biagi (Deputy City Engineer)	(213) 485-3483
Gene D. McPherson (Asistant District Engineer)	(213) 485-2400
LaGronie Wyatt	(213) 485-4586
James L. Powell	(213) 485-4595
Vernon Montgomery	
George Avenesian	
	L.A.C.F.C.D.
Thomas R. Coe	(213) 688-4926
Tom Falk	(213) 688-4930
Bernie O'Hare	(213) 688-5330
	Water - DPW
Joe Hanner	(213) 481-6188
Joe Hegenbart	(213) 481-6147
	Power - DPW
John D. McMahon (underground)	(213) 481-5026
	PT&T
Chuck Clarke	(213) 247-4414
	GTE
J.G. Lamos	(213) 393-6452
John Hopwood	(213) 3952306
	County Engineers (Sanitary Sewer Only)
Nicholas Agbobu	(213) 738-2463
Shiv K. Gaur	(213) 738-2527
Mike Mohajer	(213) 738-6147
	S.C. Edison
Dana Tanger	(213) 286-8632
Prudman Marwah	(213) 572-3312
Tom Seabold	(213) 572-2741
	S.C. Gas
Ed Puerta	(213) 468-2451

UTILITIES CONTACT SHEET

NAMES & PHONE NUMBERS

	County Engineers (Road Department)
Carl Carlson	(213) 226-8271
Ralph Jew	(213) 226-8271
Harbhajan Thind	(213) 226-8271
	Communicon (Cable TV)
Brian Ramsey	(213) 417-3872
	Department of Transportation (Traffic Signal)
Bob Oka	(213) 485-4261
	Street Lighting
Ernie Kawamura	(213) 485-5920

UTILITY MATRIX

NAME OF AGENCY	NAME & PHONE #	TYPE OF SYSTEM	DESIGN	DESIGN APPROVAL REQUIRED	CONST.	INSPECTION	STANDARD AVAILABLE	HAVE STANDARDS	COMMENTS
City of L.A. Bureau of Eng. Dept of P.Works	Vernon Montgomery (213) 485-4595	Sewer & Storm-Drain	By Others	Yes	By Others	Yes	Yes	Yes	
City of L.A. Bureau of Eng. Dept of P.Works	Don Schutt (213)485-3891	Street Lighting	By Others	Yes	By Others	Yes	Yes	Yes	
City of L.A. Bureau of Eng.	Bob Oka (213) 485-4261	Traffic Signal	By Others	Yes	By Others	Yes	Yes	Yes	
LACFCD	Thomas R. Coe 226-4087	L.A.River	Yes	Yes	By Others	Yes	Yes	Yes	
Corps of Engrs.	Joe Perez (213) 688-4926	L.A.River	Yes	Yes	By Others	Yes	Yes	Yes	
County Engr. (San. Sew.)	Nicholas Agbobu (213) 738-2463	San. Sewer	Yes	Yes	By Others	Yes	Yes	Yes	
DWP (Power)	John D. McMahon (213) 481-5026	Power Distribution	Yes	Yes	Yes	Yes	Yes	Yes	
PT&T	Chuck Clarke (213) 247-4414	Telephone (PT&T)	Yes	Yes	Cables by Others	Yes	Yes	Yes	
GTE	John Hopwood (213) 395-2306	Telephone (GTE)		No GTE INTERFERENCE WITHIN STARTER SYSTEM					

UTILITY MATRIX (Continued)

NAME OF AGENCY	NAME & PHONE #	TYPE OF SYSTEM	DESIGN	DESIGN APPROVAL REQUIRED	CONST.	INSPECTION	STANDARD AVAILABLE	HAVE STANDARDS	COMMENTS
S.C. Edison	Dana Tanger (213) 286-8632	Electrical	Yes	Yes	By Others	Yes	Yes	Yes	
S.C. Gas	Donald Read (213) 689 3175	Gas	Yes	Yes	Yes	Yes	No	No	Do not have standards
Communicom	Brian Ramsey (213) 417-3872	Cable TV	Yes	Yes	By Others	Yes	No	No	No standards used.

TRAFFIC

CITY OF LOS ANGELES

Drawing No.	Drawing Title
	General
US-150A	Standard, Shaft Type I, Type II, Type III
US-151A	Standard, Type IV, V, VI
US-152A	Standard, Type VII, VIII, IX
US-153A	Standard, Type XVI, XVII, Bolt, Anchor
US-154A	Foundation, Traffic Signal Standard, Foundation Type F-5, F-6
US-155A	Foundation, Type F-11, F-12, F-13
US-156A	Foundation, Reinforcing Cage, Foundation, CIDH Pile for PF-12
US-157A	Reinforcing Cage for PF-12, Foundation & Reinforcing Cage for PF-22
US-158A	Foundation & Reinforcing Cage for PF-34, Cabinets, Controller
US-159A	Pushbutton, Installation, Loop, Inductive, Installation
US-160A	Detector, Pressure Installation and Pull Boxes
US-161A	Seating Frame & Cover Assembly, Base, Fittings, Typical
US-162A	Fittings, Typical and Mounting
US-163A	Mast Arm Assembly, Steel or Conc. Standard, Visor, 8" Dia.
US-164A	Visor, 8" Dia., One Beveled and One Louvered, Visor, 12" Dia.
US-165A	Visor, 12" Dia., 8" and 12" Backplate, 3 Section
US-166A	Service, Telephone, Underground & Pedestal
US-167A	Service, Fire Alarm and Telephone Overhead
US-168A	Fire Alarm Overhead, Telephone Udergrounḍ and Signals, Wood Pile

SEWER AND STORM DRAIN

CITY OF LOS ANGELES

Drawing No.	Drawing Title
	General
US-200A	House Connection Sewers
US-201A	House Connection Remodeling
US-202A	Sewer Manhole - General
US-203A	Support for Storm Drain and Sewer Pipe
US-204A	Drop Sewer Manhole
US-205A	Pipe Laying in Tranches
US-206A	Blanket Protection for Pipes Monolithic Connection
US-207A	Manhole Frame and Cover 24"
US-208A	Junction Structure "B"
US-209A	Junction Structure "C"
US-210A	Catch Basin Manhole and Cover, Steel Step for Concrete Structures
US-211A	Catch Basin Protection Bar and Support
US-212A	Side Opening Catch Basins
US-213A	Curbside Grating Basin
US-214A	Transition Structure "C"
US-215A	Manhole "EZ"
US-216A	Manhole "JM"
US-217A	Precast Concrete Manhole Shaft
US-218A	Catch Basin No. 44 and Local Depression
US-219A	Catch Basin No. 36

SEWER AND STORM DRAIN

CITY OF LOS ANGELES

Drawing No.	Drawing Title
	General
US-220A	Sidewalk Culvert with Steel Plate Top
US-221A	Catch Basin Remodeling Details
US-222A	Warped Gutter at Catch Basins
US-223A	Frame & Grating for Catch Basins Monolithic Connection
US-224A	Adjusting Existing Brick Manhole
US-225A	Catch Basin No. 47 & Driveway
US-226A	Concrete Collar for Storm Drain Pipe
US-227A	Saddle and Spur Pipe Connections for Storm Drains
US-228A	Catch Basin Curb Inlet & Support Details
US-229A	Catch Basin Curb Inlet & Support Details
US-230A	Pavement Remodeling at Catch Basin
US-231A	Catch Basin Reinforcement
US-232A	Manhole Ax
US-233A	Backflow Preventer Installation
US-234A	Backflow Preventer Type 1 and 2
US-235A	Landscape Irrigation Symbols
US-236A	Adjusting Sewer Manholes to Grade

SEWER

COUNTY OF LOS ANGELES

Drawing No.	Drawing Title
	General
US-250A	Rectangular Manhole Frame and Covers Breaking into Existing Manhole
US-251A	Bedding for V.C.P. Sewer/Standard Manhole Step
US-252A	Reconstruction of Sanitary Sewer House Connection/Special Support and Protection
US-253A	Saddles for House Laterals/Wye or Tee support
US-254A	Locking Manhole Frame and Covers/Manhole Raising Rings
US-255A	Manhole Frame & Cover No. 12
US-256A	Manhole Frame & Cover No. 11

POWER

CITY OF LOS ANGELES

Drawing No.	Drawing Title
	General
US-300A	4" Conduit Sections Precast Vault/Manhole Neck and Section
US-301A	5" Conduit Sections Conduit Line Offsets
US-302A	Precast Vaults 4.8 KV Commercial
US-303A	Precast Manhole 4'-6" X 10'-6"
US-304A	Precast Station Entrance Manhole 4.8 KV Cable Lines
US-305A	Station Entrance Manhole 34.5 KV Cable Lines
US-306A	Precast Vaults Rectangular Panel Type
US-307A	Precast Manhole 8' X 0" X 14'-0"
US-308A	Precast Vaults 4'-0" x 6'-6"
US-309A	Precast Handhole with Deep Recess
US-310A	Traffic Covers for Handholes
US-311A	Traffic Covers for Handhole 12" Vent Assembly
US-312A	Steel Traffic Cover Handhole/ Manhole Frams and Covers

POWER

SOUTHERN CALIFORNIA EDISON

Drawing No.	Drawing Title
	General
US-350A	Riser Bend Installation Tolerance for Precast Vaults and Manholes
US-351A	2' X 3' Pull Box Precast Concrete
US-352A	2-1/2' X 4' Pull Box Precast Concrete
US-353A	Manhole Traffic Loading and Requirements
US-354A	Manhole - Traffic Loading
US-355A	Manhole - Traffic Loading Neck Details
US-356A	Precast Vertical Section Vault and Requirements
US-357A	Vault - Traffic Loading for Floor and Roof
US-358A	Vault - Traffic Loading and Neck Details
US-359A	Transformer Pad (Typical)
US-360A	Nonconcrete Pad and Slab-Box Pad for Transformer
US-361A	Steel Pullbox Frames
US-362A	Steel Pullbox Cover (Traffic & Parkway)
US-363A	3' X 5' Pullbox Cover (Traffic & Parkway)
US-364A	Vault Covers
US-365A	Ground Rod and Wires for Vaults, Manholes, Transformers and Capacitors
US-366A	Sump and Drain Details for Pull Boxes, Manholes, and Vaults
US-367A	Installation Details for Vaults/Pull Iron for Pull Boxes
US-368A	Ladder on Vaults/Ladder Installation
US-369A	Standpipe Vent Placements/Vent Location on Vault and Manhole Walls

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Drawing No.	Drawing Title
	General
US-400A	Manhole 8-1/2'L X 4-1/2'W X 6-1/2'H
US-401A	Manhole 8-1/2'L X 4-1/2'W X 6-1/2'H
US-402A	Manhole 12'L X 6'W X 7'H
US-403A	Manhole 12'L X 6'W X 7'H
US-404A	Manhole 12'L X 6'W X 10'H
US-405A	Manhole 12'L X 6'W X 10'H
US-406A	Manhole 12"L X 6'W X 12'H
US-407A	Manhole 12'L X 6'W X 12'H
US-408A	Manhole 12'L X 12'W X 8'H
US-409A	Manhole 12'L X 12'W X 8'H
US-410A	Manhole 12'L X 12'W X 10'H
US-411A	Manhole 12'L X 12'W X 10'H
US-412A	Manhole 15'L X 6'W X 10'H
US-413A	Manhole 15'L X 6'W X 10'H
US-414A	Manhole 15'L X 6'W X 10'H
US-415A	Insert Racking Detail for Manhole 15'L X 6'W X 10'H
US-416A	Manhole 15'L X 6'W X 10'H
US-417A	Manhole 15'L X 12'W X 18'H
US-418A	Manhole 15'L X 12'W X 18'H