

**MOORPARK CITY COUNCIL  
AGENDA REPORT**

**TO:** The Honorable City Council

**FROM:** Jeremy Laurentowski, Parks and Recreation Director *JL*

**BY:** Jessica Sandifer, Management Analyst *JS*

**DATE:** January 24, 2014 (CC Meeting of February 5, 2014)

**SUBJECT:** Consider Plans and Specifications and Project Approval for a Recreational Trail System at Arroyo Vista Community Park (AVCP) (CIP Projects 7712, 7713, 7852)

**BACKGROUND**

For several years, the Parks and Recreation Commission and the City Council have discussed the need for a recreation trail system at Arroyo Vista Community Park (AVCP). On May 15, 2013, the City Council adopted the City of Moorpark Mission Statement, Priorities, Goals, and Objectives for FY 2013/2014. The following are the Departmental Goals and Objectives that coincide with the Council's desire for a recreation trail system at AVCP:

- VII. A. 20. Develop a conceptual plan and cost estimates for a formal walking path around the perimeter of Arroyo Vista Community Park.*
- 26. Develop conceptual design plan and cost estimates for widening the access road within Arroyo Vista Community Park (AVCP) to accommodate bike lanes/paths and sidewalks.*
- VI. C. 2. Install outdoor fitness equipment at one or more parks.*

On October 2, 2013 the City Council approved a conceptual plan for a proposed recreational trail system at Arroyo Vista Community Park (AVRC) and on November 20, 2013, Penfield and Smith was hired to prepare the plans and specifications for the Recreational Trail Improvements at AVRC.

## **DISCUSSION**

As presented to the City Council in October, the plan incorporates a safe route of travel for both pedestrians and bicyclists from the existing pedestrian bridge at the east end of the park, to the Arroyo Vista Recreation Center. Approximately 17 new parking spaces will be added to the park. The design was able to accommodate a separated bicycle path and pedestrian walkway along the entire length of the portion of the trail system that parallels the access road, from the east end of the park to the west, separated by lodge pole fencing on both sides of the bicycle path. Internally, the proposed trail system will incorporate an approximate one mile fitness loop around the perimeter of AVCP, with exercise stations set along the route.

The design proposes the use of permeable concrete in the new parking areas, permeable asphalt for the bicycle trail, concrete for the sidewalks and decomposed granite paving for the surface material of the loop trail. The use of permeable pavement minimizes the storm water retention requirements of this project and increases the amount of storm water that will infiltrate back into the groundwater supply. The design proposes the creation of a detention basin at Parking Lot B to capture the portion of runoff from the non-permeable surfaces, such as the proposed concrete sidewalks, as well as existing surfaces, such as the asphalt parking lots and access road. In addition, the design provides for ADA compliant walkways to the softball fields and other open turf areas throughout the park. The plans and specifications have been made available for City Council review in the large conference room at City Hall. A copy is also attached to this staff report for public review.

## **FISCAL IMPACT**

The engineers estimated cost to complete the project is \$1.6 million inclusive of a 10% contingency. To date, a TDA Article 3 grant has been secured from the state in the amount of \$132,000 for the pedestrian/bike path improvements from the pedestrian bridge to Arroyo Vista Recreation Center. Staff has applied for a LWCF grant from the State Parks Department in the amount of \$500,000, which is equivalent to approximately 31% of the total project costs. The LWCF grant requests a maximum and minimum grant award request. This ensures that the project may still be funded by LWCF grant but at a lesser level. The minimum grant request was \$200,000. On January 15, 2014, the City Council allocated the funding for the project. This was required by the LWCF grant to show the City's commitment to the project. The LWCF is a reimbursement grant and, if awarded, will be used to reimburse the City sources of funding. The remaining project costs that would be paid from City funds is considered match money for the grant. If staff is successful in securing the grant, it is proposed that the remaining project costs will be allocated from a percentage of the General Fund (Fund 1000) as well as the Traffic System Management Fund (TSM) (Fund 2001) contingent upon the actual amount of LWCF grant monies awarded. Staff will evaluate

these funding options and return to City Council once the grant has been awarded and the project has gone out to bid.

### **ENVIRONMENTAL DOCUMENTATION**

As this project involves the installation of hardscape, low-level lighting, and fitness equipment in an existing park, and there is no reasonable possibility that it would result in a significant effect on the environment, either individually or cumulatively in consideration of other reasonably foreseeable projects, it is the Community Development Director's determination that the project is categorically exempt from environmental review under the California Environmental Quality Act (CEQA) pursuant to Sections 15301 (Existing Facilities) and 15304 (Minor Alterations to Land) of the CEQA Guidelines. If this project is approved, staff will file a Notice of Exemption with the County Clerk.

### **STAFF RECOMMENDATION**

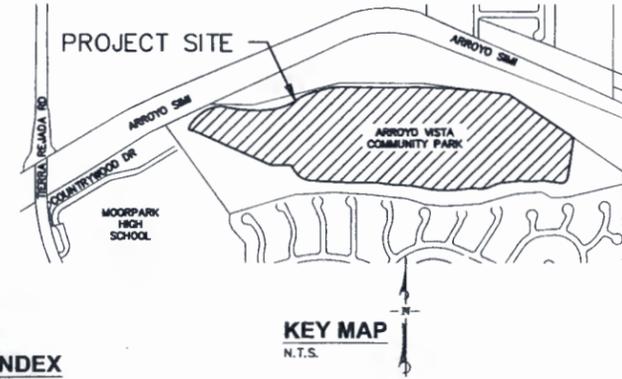
Approve the plans and specifications for the recreation trail system project at Arroyo Vista Community Park.

Attachment – Project Plans and Specifications

## CITY OF MOORPARK ARROYO VISTA COMMUNITY PARK RECREATIONAL TRAIL IMPROVEMENTS

### GENERAL NOTES

- GRADING SHALL BE IN ACCORDANCE WITH THE "GREEN BOOK" STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (SSPWC) 2012 EDITION, THE MOORPARK CITY BUILDING CODE WHICH ADOPTS BY REFERENCE THE 2010 CBC AND THE VENTURA COUNTY STANDARD LAND DEVELOPMENT SPECIFICATIONS, THE PROJECT CONDITIONS OF APPROVAL, AND LAND DEVELOPMENT MANUAL. WHEN CONFLICT EXISTS, THE MOST RESTRICTIVE STANDARD SHALL BE USED.
- A PRECONSTRUCTION CONFERENCE OF ALL INTERESTED PARTIES SHALL BE HELD PRIOR TO ANY CONSTRUCTION OR GRADING.
- ALL GRADED SURFACES SUBJECT TO EROSION SHALL BE PROTECTED AS APPROVED BY THE CITY ENGINEER. FINAL PROTECTION AND PLANTING SHALL BE PROVIDED AND FULLY FUNCTIONAL PRIOR TO FINAL APPROVAL OF GRADING, ISSUANCE OF A CERTIFICATE OF OCCUPANCY, OR UTILITY CLEARANCE FOR ANY BUILDING IN THE SITE, WHICHEVER OCCURS FIRST. BEFORE THE BEGINNING OF THE RAINY SEASON, ALL SLOPES AND GRADED AREAS SHALL BE PROTECTED TO THE SATISFACTION OF THE CITY ENGINEER.
- ALL DELETERIOUS MATERIAL, I.E. LUMBER, LOGS, BRUSH OR ANY OTHER ORGANIC MATERIAL OR RUBBISH, SHALL BE REMOVED FROM ALL AREAS TO RECEIVE COMPACTED FILL.
- UNSATURABLE MATERIAL SHALL BE REMOVED AS REQUIRED BY THE SOILS ENGINEER (AND ENGINEERING GEOLOGIST) FROM ALL AREAS TO RECEIVE COMPACTED FILL OR DRAINAGE STRUCTURES. STRICT COMPLIANCE TO REPORT RECOMMENDATIONS IS REQUIRED. DEVIATIONS REQUIRE REVIEW AND APPROVAL BY THE CITY ENGINEER.
- ALL AREAS TO RECEIVE COMPACTED FILL SHALL BE INSPECTED AND APPROVED BY THE SOILS ENGINEER (AND ENGINEERING GEOLOGIST) AFTER REMOVAL OF UNSUITABLE MATERIAL AND EXCAVATION OF KEYWAYS AND BENCHES AND PRIOR TO PLACEMENT OF SUBSURFACE DRAINAGE SYSTEMS OR ANY FILL.
- ALL SOIL OR ROCK MATERIALS DEEMED UNSUITABLE FOR PLACEMENT IN COMPACTED FILL SHALL BE REMOVED FROM THE SITE. PRIOR TO USE IN COMPACTED FILL, ANY MATERIAL SUCH AS CONCRETE OR IMPORTED MATERIALS SHALL BE APPROVED BY THE SOILS ENGINEER AND CITY ENGINEER. WHERE EXCAVATED MATERIAL BEING USED AS FILL IS BLOCKY, IT SHALL BE BROKEN INTO SUITABLE PARTICLE SIZES, NONE LARGER THAN SIX INCHES IN LARGEST DIMENSION AND IN CONFORMANCE WITH THE 2010 CBC AND PER THE SOILS REPORT FOR THIS PROJECT.
- THE CITY REPRESENTATIVE SHALL DIRECT THE REMOVAL OR TREATMENT OF ANY EXISTING UNDERGROUND STRUCTURES SUCH AS SEPTIC TANKS, IRRIGATION LINES, ETC.
- STORM DRAIN PREVENTION MEASURES OR PREVENTIVE DEVICES REQUIRED BY THE CITY ENGINEER SHALL BE INSTALLED BY OCTOBER 1ST AS GRADING PROGRESSES AND MAINTAINED UNTIL APRIL 15TH OF THE SUCCEEDING YEAR. SUBMITTAL OF PLANS FOR REVIEW BY THE CITY ENGINEER IS REQUIRED ONE MONTH PRIOR TO THE START OF RAINY SEASON.
- UNLESS OTHERWISE SPECIFIED, CORRUGATED STEEL PIPE (CSP) SHALL BE BITUMINOUS COATED IN ACCORDANCE WITH THE STANDARD LAND DEVELOPMENT SPECIFICATIONS (SLDS). CSP SHALL NOT BE USED ON THE SITE WITHOUT THE APPROVAL OF THE CITY ENGINEER.
- CONCRETE CAST IN PLACE PIPE (COIPP) SHALL NOT BE USED ON THE SITE WITHOUT THE APPROVAL OF THE CITY ENGINEER.
- MATERIALS FOR INTERCEPTOR DRAINS, TERRACE DRAINS, AND DOWN DRAINS SHALL MEET STANDARD LAND DEVELOPMENT SPECIFICATIONS, SUBSECTION 201-1 AND 400 EXCEPT THAT THE CONCRETE LINED SWALES, V-DITCHES, AND PAVED TERRACE DRAINS, DOWNDRAINS, BERMS, VELOCITY REDUCERS AND OTHER EROSION PROTECTION DEVICES SHALL BE OF CLASS 470-C-2000 UNLESS OTHERWISE SPECIFIED. (COLOR OF CONCRETE SHALL BE OMAHA TAN.)
- ALL CONSTRUCTION, GRADING, STORAGE AND TRANSPORTATION ACTIVITIES WILL BE CONDUCTED IN A MANNER CONSISTENT WITH THE STORM WATER POLLUTION CONTROL PLAN/STORM WATER POLLUTION PREVENTION PLAN SUBMITTED FOR THIS PROJECT AND THE VENTURA COUNTYWIDE STORM WATER QUALITY MANAGEMENT PROGRAM NPDES PERMIT NO. CAS004002 AND CALIFORNIA STORM WATER BEST MANAGEMENT PRACTICES (BMP'S) HANDBOOKS. A COPY OF THE STORM WATER POLLUTION CONTROL PLAN AND/OR STORM WATER POLLUTION PREVENTION PLAN WILL BE ON SITE AND AVAILABLE FOR REVIEW AT ALL TIMES DURING CONSTRUCTION.
- PRIOR TO INITIATION OF ANY WORK, ALL APPROPRIATE PERMITS WILL BE PROCURED AND COPIES PROVIDED TO THE CITY ENGINEER.
- REGULAR WATERING OF SITE WILL BE REQUIRED TO CONTROL DUST. ALL MEASURES SHALL BE TO THE SATISFACTION OF THE CITY ENGINEER.
- ALL CLEARING, EARTH MOVING OR EXCAVATION ACTIVITIES SHALL CEASE DURING PERIODS WHEN WINDS EXCEED 15 MILES PER HOUR.
- ANY RECORDED MONUMENTS IN THE CONSTRUCTION AREA SHALL BE LOCATED AND TIED OUT AND SHALL BE PROTECTED IN PLACE DURING CONSTRUCTION.
- HAUL ROUTE PERMIT ISSUED BY THE CITY OF MOORPARK SHALL BE REQUIRED FOR ALL IMPORT/EXPORT OF MORE THAN 100 TRUCK LOADS OR 1000 CUBIC YARDS, WHICHEVER IS LESS.
- ALL WORK SHOWN HEREON SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION," 2012 EDITION, AND ITS SUPPLEMENTS.
- THE CONTRACTOR SHALL NOTIFY THE FOLLOWING 72 HOURS IN ADVANCE OF CONSTRUCTION:  
UNDERGROUND SERVICE ALERT CITY OF MOORPARK DIAL 811 (805) 517-6385
- UTILITIES AND FACILITIES ABOVE AND BELOW THE GROUND ARE LOCATED FROM THE BEST AVAILABLE RECORD INFORMATION. THE CONTRACTOR SHALL TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR FACILITIES SHOWN ON THE PLANS FROM HARM. ATTENTION IS DIRECTED TO POSSIBLE EXISTENCE OF UNDERGROUND UTILITIES OR FACILITIES NOT KNOWN TO THE CITY OR IN A LOCATION DIFFERENT FROM THAT WHICH IS SHOWN ON THE PLANS. THE CONTRACTOR SHALL TAKE STEPS TO ASCERTAIN THE EXACT LOCATION OF ALL UNDERGROUND UTILITIES AND FACILITIES PRIOR TO DOING WORK IN ORDER TO AVOID DAMAGE OF SUCH UTILITY OR FACILITY OR INTERFERE WITH THEIR SERVICE.
- SURVEY MONUMENTS, PROPERTY MARKERS, AND THE POINTS SHALL BE PRESERVED AND REFERENCED BEFORE CONSTRUCTION AND REPLACED AFTER CONSTRUCTION PURSUANT TO SECTION 8771 F THE BUSINESS AND PROFESSIONS CODE.
- BENCHMARK DISKS SHALL NOT BE DESTROYED, OR DISTURBED UNTIL A REPLACEMENT WITH A SECOND ORDER, CLASS ONE, GEODETIC ELEVATION HAS BEEN ACCEPTED BY THE CITY ENGINEER.
- ANY EXISTING DAMAGED OR DEFACED CURB, GUTTER, OR SIDEWALK ADJACENT TO PROJECT BOUNDARY DAMAGED OR DEFACED DURING THE CONSTRUCTION OF ANY OF THE PHASES OR IMPROVEMENTS SHALL BE REMOVED AND REPLACED PER CITY STANDARDS. ENCROACHMENT PERMIT REQUIRED THROUGH THE CITY LAND DEVELOPMENT OFFICE.
- APPROVAL BY THE CITY ENGINEER SHALL IN NO WAY RELIEVE THE DEVELOPER OR HIS ENGINEER FROM RESPONSIBILITY FOR THE DESIGN OF THE IMPROVEMENTS AND FOR ANY



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19. CONSTRUCTION DETAILS

### LEGEND

ABBREVIATIONS	ABBREVIATIONS (CONT.)	SYMBOLS	LINETYPES	HATCH PATTERNS (CONSTRUCTION)
AC ASPHALT CONCRETE	RCP REINFORCED CONCRETE PIPE	○ POLE - TRAFFIC SIGNAL ARM	--- BOUNDARY LINE	ASPHALT CONCRETE BIKE TRAIL
BW BACK OF WALK	R/W RIGHT OF WAY	○ POLE - TRAFFIC SIGNAL	--- PROPERTY LINE	PEDESTRIAN PCC PAVING
CATV CABLE TV	SLY SOUTHERLY	○ DRAIN INLET	--- EASEMENT LINE	VEHICULAR PCC PAVING
CB CATCH BASIN	SS SANITARY SEWER	○ FIRE DEPARTMENT CONNECTION	--- RIGHT OF WAY LINE	DECOMPOSED GRANITE PATH
CF CALCULATED FROM	SD STORM DRAIN	○ FIRE HYDRANT	--- FLOWLINE	BIORETENTION
CL CENTERLINE	SYC SYCAMORE TREE	○ GUY-ANCHOR	--- GROUND BREAKLINE	
CLF CHAIN LINK FENCE	TC TOP OF CURB	○ HOSE BIB	--- CONTOUR LINE	
COMP CORRUGATED METAL PIPE	TG TOP OF GRADE	○ MAILBOX	--- CURB	
CO CLEAN OUT	TS TRAFFIC SIGNAL	○ MB - GAS METER	--- CENTERLINE	
COMM COMMUNICATIONS	TW TOP OF WALL	○ GM - WATER METER	--- EDGE OF PAVEMENT	
CONC CONCRETE	UM UTILITY MARK	○ WM - TELEPHONE MANHOLE	--- CHAINLINK/BARBWIRE FENCE	
CP CONTROL POINT	UNK UNKNOWN	○ FOMH - FIBER OPTIC CABLE MANHOLE	--- POST FENCE	
CYP CYPRESS	VC VITRIFIED CLAY (PIPE)	○ SMH - STORM DRAIN MANHOLE	--- WOOD FENCE	
DI DRAIN INLET		○ SMH - SEWER MANHOLE	--- GUARD RAIL	
DS DOWN SPOUT		○ MH - MANHOLE (UNSPECIFIED)	--- WALL	
EP EDGE OF PAVEMENT		○ CATV - CABLE TV PULLBOX	--- CABLE TV	
ELEC ELECTRICITY		○ COMM - COMMUNICATION PULLBOX	--- COMMUNICATIONS	
EUC EUCALYPTUS TREE		○ ELEC - ELECTRIC PULLBOX	--- ELECTRIC	
EX EXISTING		○ GAS - GAS PULLBOX	--- FIBER OPTIC CABLE	
FC FACE OF CURB		○ TSPB - TRAFFIC SIGNAL PULLBOX	--- IRRIGATION	
FF FINISHED FLOOR		○ WPB - WATER PULLBOX	--- NATURAL GAS	
FL FLOW LINE		○ PIV - POST INDICATOR VALVE	--- SANITARY SEWER	
FOC FIBER OPTIC CABLE		○ GUY-P - POLE - GUY	--- STORM DRAIN	
FS FINISHED SURFACE		○ GUY-L - POLE - LIGHT	--- TRAFFIC SIGNAL	
FTC FROM TRUE CORNER			--- WATER	
HDPE HIGH DENSITY POLYETHYLENE (PIPE)			--- OVERHEAD WIRE	
LOL LAYOUT LINE				
OAK OAK TREE				
OHW OVERHEAD WIRES				
PB PULLBOX				
PVC POLYVINYL CHLORIDE (PIPE)				

### STORM WATER STATEMENT

STORM WATER RUNOFF SHALL NOT DISCHARGE FROM THE CONSTRUCTION SITE TO THE CITY STREETS OR MUNICIPAL STORM DRAIN SYSTEM WITHOUT TREATMENT BY A SUITABLE POLLUTION CONTROL DEVICE. STORM WATER RUNOFF DISCHARGES WITHOUT TREATMENT IS A VIOLATION OF THE CITY'S STORM WATER ORDINANCE. DISCHARGING ANY MATERIAL OTHER THAN UNCONTAMINATED STORM WATER RUNOFF TO THE CITY STREETS OR TO THE MUNICIPAL STORM DRAIN SYSTEM IS PROHIBITED AND IS A VIOLATION OF THE MUNICIPAL CODE.

SITE MANAGER TO CONTACT: TBD

PHONE: TBD

### EXISTING UTILITY NOTES

- EXISTING UTILITY INFORMATION IS COMPILED FROM BEST KNOWN AVAILABLE RECORD INFORMATION & DRAWINGS. PENFIELD & SMITH CANNOT GUARANTEE THE INFORMATION AS ACCURATE OR COMPLETE.
- THE CONTRACTOR SHALL POTHOLE AND VERIFY ALL EXISTING UTILITIES WITHIN PROJECT SITE PRIOR TO CONSTRUCTION AND REPORT ANY CONFLICTS TO THE OWNER'S REPRESENTATIVE. CONTRACTOR SHALL PROPOSE ANY HORIZONTAL ALIGNMENT AND/OR VERTICAL ADJUSTMENT FOR UTILITY DESIGN TO THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
- SOME IRRIGATION PIPING AND ELECTRICAL CONDUIT LOCATIONS ARE UNKNOWN AND NOT IDENTIFIED HEREON.
- ALL UNDERGROUND UTILITIES OR STRUCTURES REPORTED BY THE OWNER OR THOSE SHOWN ON RECORDS EXAMINED ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT. THE CONTRACTOR, BY ACCEPTING THESE PLANS OR PROCEEDING WITH IMPROVEMENTS PURSUANT THERETO, UNDERSTANDS THAT THEY AGREE TO ASSUME LIABILITY, AND AGREE TO HOLD THE UNDERSIGNED HARMLESS FOR ANY LIABILITY FOR DAMAGE RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED TO THE UNDERSIGNED, NOT INDICATED ON THE PUBLIC RECORDS EXAMINED, LOCATED AT VARIANCE WITH THAT REPORTED OR SHOWN ON RECORDS EXAMINED. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING TO WORK.

### SURVEYOR'S NOTES

- MAPPING TOPOGRAPHIC MAPPING WAS COMPILED AT A SCALE OF 1"=20', WITH A 1 FOOT CONTOUR INTERVAL USING STANDARD PHOTOGRAMMETRIC METHODS AND PROCEDURES BY COOPER AERIAL FROM AERIAL PHOTOGRAPHY NOV. 18, 2013. SUPPLEMENTAL FIELD SURVEYS WERE PERFORMED ON 1/2/2014.
- BASES OF BEARINGS AND COORDINATES BEARINGS SHOWN ON THIS MAP ARE REFERENCED TO THE CALIFORNIA COORDINATE SYSTEM, NAD 83, ZONE 5 GRID (EPOCH 2011.0), DEFINED LOCALLY BY CONTINUOUSLY OPERATING REFERENCE STATIONS OPERATED BY THE CALIFORNIA SPATIAL REFERENCE CENTER. THIS SURVEY TIED TO STATIONS TOST AND MPWD.
- ELEVATIONS ELEVATIONS SHOWN HEREON ARE EXPRESSED IN U.S. SURVEY FEET AND ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), DEFINED LOCALLY BY GPS TIES AND GEOD MODELING (GEOD09) TO CORS STATION TOST, HAVING AN ADJUSTED ELEVATION OF 1017.11. SEE CONTROL POINT LISTING.

### EARTHWORK QUANTITIES

CUT: \_\_\_\_\_ CU. YDS. FILL: \_\_\_\_\_ CU. YDS.  
EXPORT: \_\_\_\_\_ CU. YDS. IMPORT: \_\_\_\_\_ CU. YDS.  
DISPOSAL SITE G.P. NO. \_\_\_\_\_ HAUL PERMIT NO. \_\_\_\_\_

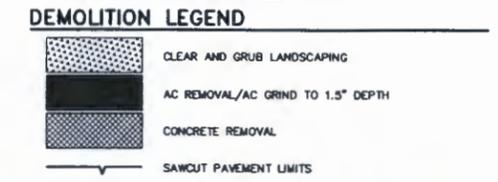
DIAL TOLL FREE  
811  
AT LEAST TWO DAYS  
BEFORE YOU DIG

Know what's below.  
Call before you dig.

	PREPARED BY: <b>Penfield &amp; Smith</b> Engineering • Surveying • Planning • Construction Management • 1327 Del Norte Road, Suite 200, Camarillo, CA 93010 Phone: (805) 981-0706 Fax: (805) 981-0251	DESIGNED BY: SDM DRAWN BY: TJS/NLA CHECKED BY: BIT	PLANNING REVIEWED BY: COMMUNITY DEVELOPMENT DIRECTOR DATE ENGINEERING REVIEWED BY: DAVID A. KLOTZLE DATE	CITY OF MOORPARK PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION	GRADING PERMIT NO. ENGINEERING PROJECT NO.	<b>ARROYO VISTA COMMUNITY PARK</b> RECREATIONAL TRAIL IMPROVEMENTS PARKS, RECREATION & COMMUNITY DISTRICT <b>TITLE SHEET</b>	SHEET 1 OF 19 DRAWING NO. 14-ME-10989
	SCOTT D. MECKSTROTH: 63337 6/30/2014 1/17/2014 ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE	APPROVED BY: J. LAURENTOWSKI	DAVID A. KLOTZLE RCE 55752 EXP 12/31/2014				



- ### DEMOLITION NOTES
- 1 REMOVE EXISTING TREE.
  - 2 REMOVE EXISTING LANDSCAPING, CLEAR AND GRUB TO LIMITS SHOWN.
  - 3 RELOCATE EXISTING SOCCER GOAL POST. COORDINATE LOCATION WITH PARK FACILITIES MANAGER.
  - 4 REMOVE, SALVAGE AND RELOCATE EXISTING IMPROVEMENT UTILITY.
  - 5 SAWCUT AND REMOVE EXISTING PAVEMENT TO LIMITS SHOWN.
  - 6 PROTECT-IN-PLACE EXISTING PUMP HOUSE.
  - 7 PROTECT-IN-PLACE EXISTING TREE.
  - 8 REMOVE EXISTING WOODEN FENCE.
  - 9 REMOVE EXISTING WOODEN RAIL AND POSTS.
  - 10 RELOCATE EXISTING SIGN ON POST.
  - 11 REMOVE EXISTING BOLLARDS IN PLANTER ISLAND.
  - 12 REMOVE EXISTING AC PAVING PER TYPICAL SECTIONS "A-A" AND "B-B", SHEET 18.
  - 13 REMOVE EXISTING CONCRETE.
  - 14 REMOVE EXISTING CURB TO LIMITS SHOWN.
  - 15 REMOVE EXISTING CURB & GUTTER TO LIMITS SHOWN.
  - 16 REMOVE, SALVAGE AND REPLACE EXISTING GATE AS DIRECTED BY CITY REPRESENTATIVE.
  - 17 PROTECT IN PLACE EXISTING POWER POLE, GUYS, AND ASSOCIATED APPURTENANCES.
  - 18 REMOVE AND RELOCATE EXISTING WATER SERVICE, APPURTENANCES, AND FIRE HYDRANT. SEE PLANS FOR RELOCATION.



### DEMOLITION SHEET INDEX

### GENERAL NOTES (DEMOLITION PLAN)

1. ALL EXISTING UTILITIES TO BE PROTECTED IN PLACE UNLESS OTHERWISE SHOWN.
2. REFER TO ELECTRICAL DRAWINGS FOR ELECTRICAL CONDUIT DEMOLITION AND/OR RELOCATION.
3. CONCRETE SIDEWALKS WILL BE REMOVED TO THE NEAREST CONSTRUCTION OR EXPANSION JOINT TO THE LIMITS OF REMOVAL AS SHOWN ON THE PLANS. CONTRACTOR TO PROVIDE SAWCUT LOCATION PLAN FOR APPROVAL BY OWNER'S REPRESENTATIVE.
4. DEMOLITION SHALL BE CONDUCTED TO LIMITS SHOWN & AS REQUIRED FOR NEW WORK.
5. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT AND SUPPORT THE UTILITIES OR SUBSTRUCTURES FOUND AT THE SITE WHETHER OR NOT SHOWN ON THE PLANS OR EXPOSED BY CONSTRUCTION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK (72-HOURS NOTICE REQUIRED). PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT (USA) TOLL FREE AT 8-1-1. CONTRACTOR SHALL PROTECT ALL EXISTING PROPERTIES FROM DAMAGE IN ACCORDANCE WITH THE SPECIFICATIONS AND SUBSECTION 7-9 OF THE SSPIC. CONTRACTOR SHALL RESTORE ALL EXISTING SURFACE AND SUBSURFACE FACILITIES DISTURBED BY CONSTRUCTION INCLUDING, BUT NOT LIMITED TO, TREES, LANDSCAPING, IRRIGATION, TRAILS, ASPHALT CONCRETE ROAD PAVING, CURB AND GUTTER, CROSS GUTTER, SIDEWALK, AND UTILITIES. POTHOLE EXISTING UTILITIES PRIOR TO CONSTRUCTION AND ADVISE OWNER OF CONFLICTS. CONTACT PURVEYORS OF UTILITY SYSTEMS SUCH AS ELECTRIC, TELEPHONE, CABLE TV, GAS OR OTHERS TO RELOCATE FACILITIES TO ALLOW FOR THE CONSTRUCTION SHOWN ON THESE PLANS, EXCEPT AS OTHERWISE SHOWN THE DEPTHS OF UTILITIES ARE NOT KNOWN.
6. UNLESS OTHERWISE NOTED ON DRAWINGS, ALL EXISTING WIRING, CONDUITS, JUNCTION BOXES AND OTHER ELECTRICAL DEVICES IN AREAS WHERE NEW WORK OCCURS SHALL BE REMOVED, EXCEPT WHEN SUCH DEVICES ARE REQUIRED TO MAINTAIN SERVICES TO OTHER AREAS. IN SUCH CASES, CONTRACTOR SHALL RELOCATE THESE DEVICES PER INSTRUCTIONS BY OWNER'S REPRESENTATIVE.

### CAUTION: UNDERGROUND STRUCTURES

ALL UNDERGROUND UTILITIES OR STRUCTURES REPORTED BY THE OWNER OR THOSE SHOWN ON RECORDS EXAMINED ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT. THE CONTRACTOR, BY ACCEPTING THESE PLANS OR PROCEEDING WITH IMPROVEMENTS PURSUANT THERETO, UNDERSTANDS THAT THEY AGREE TO ASSUME LIABILITY, AND AGREE TO HOLD THE UNDERSIGNED HARMLESS FOR ANY LIABILITY FOR DAMAGE RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED TO THE UNDERSIGNED, NOT INDICATED ON THE PUBLIC RECORDS EXAMINED, LOCATED AT VARIANCE WITH THAT REPORTED OR SHOWN ON RECORDS EXAMINED. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING TO WORK.

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BEFORE YOU DIG

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NO	DESCRIPTION OF REVISION	R.C.E.	APP'D	DATE
6				
5				
4				
3				
2				
1				



PREPARED BY:  
**Penfield & Smith**  
Engineering - Surveying - Planning  
Construction Management  
1327 Del Norte Road, Suite 200, Camarillo, CA 93010  
Phone: (805) 961-0706 Fax: (805) 961-0251

SCOTT D. MECKSTROTH 63337 6/30/2014 1/17/2014  
ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE

DESIGNED BY:  
SDM  
DRAWN BY:  
T.J.S./MLA  
CHECKED BY:  
BTf  
APPROVED BY:  
J. LAURENTOWSKI

ENGINEERING REVIEWED BY:  
DAVID A. KLOTZLE  
RCE 55752 EXP 12/31/2014

DATE



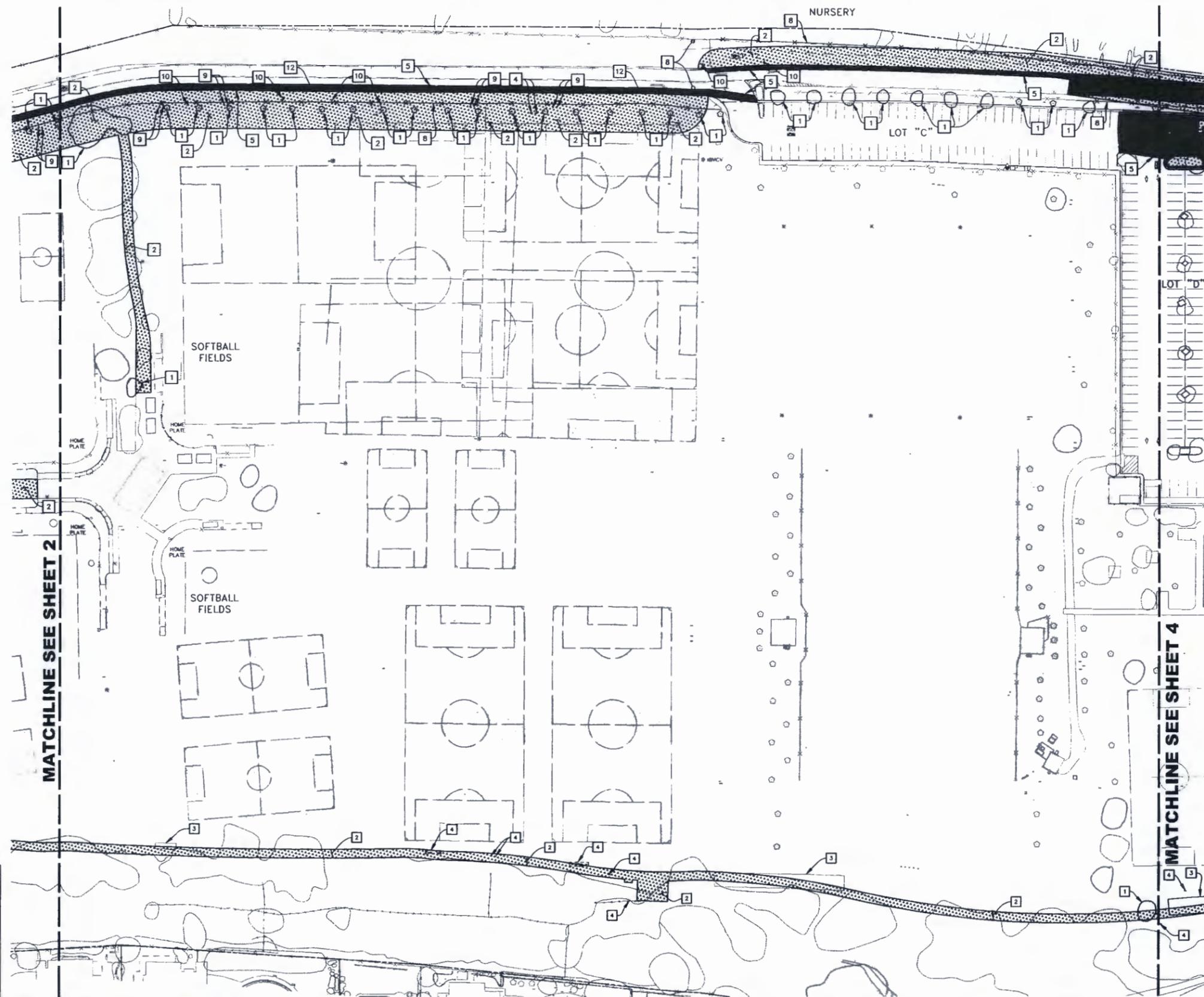
**CITY OF MOORPARK**  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION

GRADING PERMIT NO.  
ENGINEERING PROJECT NO.

**ARROYO VISTA COMMUNITY PARK**  
RECREATIONAL TRAIL IMPROVEMENTS  
PARKS, RECREATION & COMMUNITY DISTRICT

**DEMOLITION PLAN**

SHEET 2  
OF 19  
DRAWING NO.  
14-ML-10989

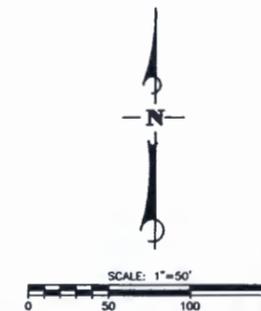


**DEMOLITION NOTES**

- 1 REMOVE EXISTING TREE.
- 2 REMOVE EXISTING LANDSCAPING, CLEAR AND GRUB TO LIMITS SHOWN.
- 3 RELOCATE EXISTING SOCCER GOAL POST. COORDINATE LOCATION WITH PARK FACILITIES MANAGER.
- 4 REMOVE, SALVAGE AND RELOCATE EXISTING IMPROVEMENT UTILITY.
- 5 SAWCUT AND REMOVE EXISTING PAVEMENT TO LIMITS SHOWN.
- 6 PROTECT-IN-PLACE EXISTING PUMP HOUSE.
- 7 PROTECT-IN-PLACE EXISTING TREE.
- 8 REMOVE EXISTING WOODEN FENCE.
- 9 REMOVE EXISTING WOODEN RAIL AND POSTS.
- 10 RELOCATE EXISTING SIGN ON POST.
- 11 REMOVE EXISTING BOLLARDS IN PLANTER ISLAND.
- 12 REMOVE EXISTING AC PAVING PER TYPICAL SECTIONS "A-A" AND "B-B", SHEET 1B.
- 13 REMOVE EXISTING CONCRETE.
- 14 REMOVE EXISTING CURB TO LIMITS SHOWN.
- 15 REMOVE EXISTING CURB & GUTTER TO LIMITS SHOWN.
- 16 REMOVE, SALVAGE AND REPLACE EXISTING GATE AS DIRECTED BY CITY REPRESENTATIVE.
- 17 PROTECT IN PLACE EXISTING POWER POLE, GUYS, AND ASSOCIATED APPURTENANCES.
- 18 REMOVE AND RELOCATE EXISTING WATER SERVICE, APPURTENANCES, AND FIRE HYDRANT. SEE PLANS FOR RELOCATION.

**DEMOLITION LEGEND**

- CLEAR AND GRUB LANDSCAPING
- AC REMOVAL/AC GRIND TO 1.5" DEPTH
- CONCRETE REMOVAL
- SAWCUT PAVEMENT LIMITS



**CAUTION: UNDERGROUND STRUCTURES**

ALL UNDERGROUND UTILITIES OR STRUCTURES REPORTED BY THE OWNER OR THOSE SHOWN ON RECORDS EXAMINED ARE INDICATED BY THEIR APPROXIMATE LOCATION AND EXTENT. THE CONTRACTOR, BY ACCEPTING THESE PLANS OR PROCEEDING WITH IMPROVEMENTS PURSUANT THERETO, UNDERSTANDS THAT THEY AGREE TO ASSUME LIABILITY, AND AGREE TO HOLD THE UNDERSIGNED HARMLESS FOR ANY LIABILITY FOR DAMAGE RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED TO THE UNDERSIGNED, NOT INDICATED ON THE PUBLIC RECORDS EXAMINED, LOCATED AT VARIANCE WITH THAT REPORTED OR SHOWN ON RECORDS EXAMINED. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING TO WORK.

DIAL TOLL FREE  
811  
AT LEAST TWO DAYS  
BEFORE YOU DIG

Know what's below.  
Call before you dig.

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**Penfield & Smith**  
 Engineering • Surveying • Planning  
 • Construction Management •  
 1327 Del Norte Road, Suite 200, Camarillo, CA 93010  
 Phone: (805) 961-0706 Fax: (805) 961-0251  
 SCOTT D. MECKSTROTH 63337 6/30/2014 1/17/2014  
 ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE

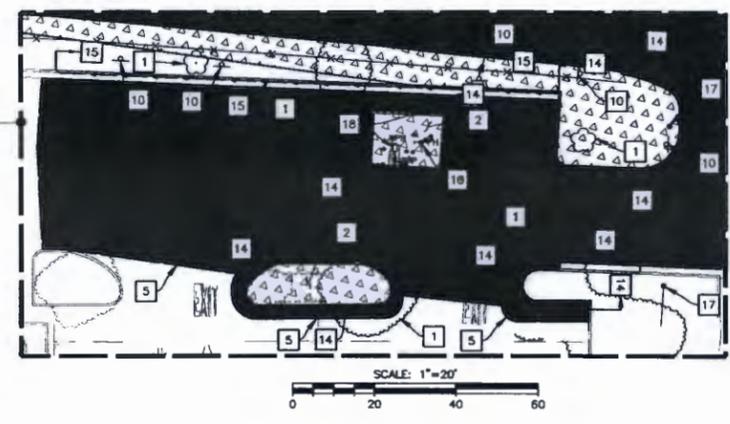
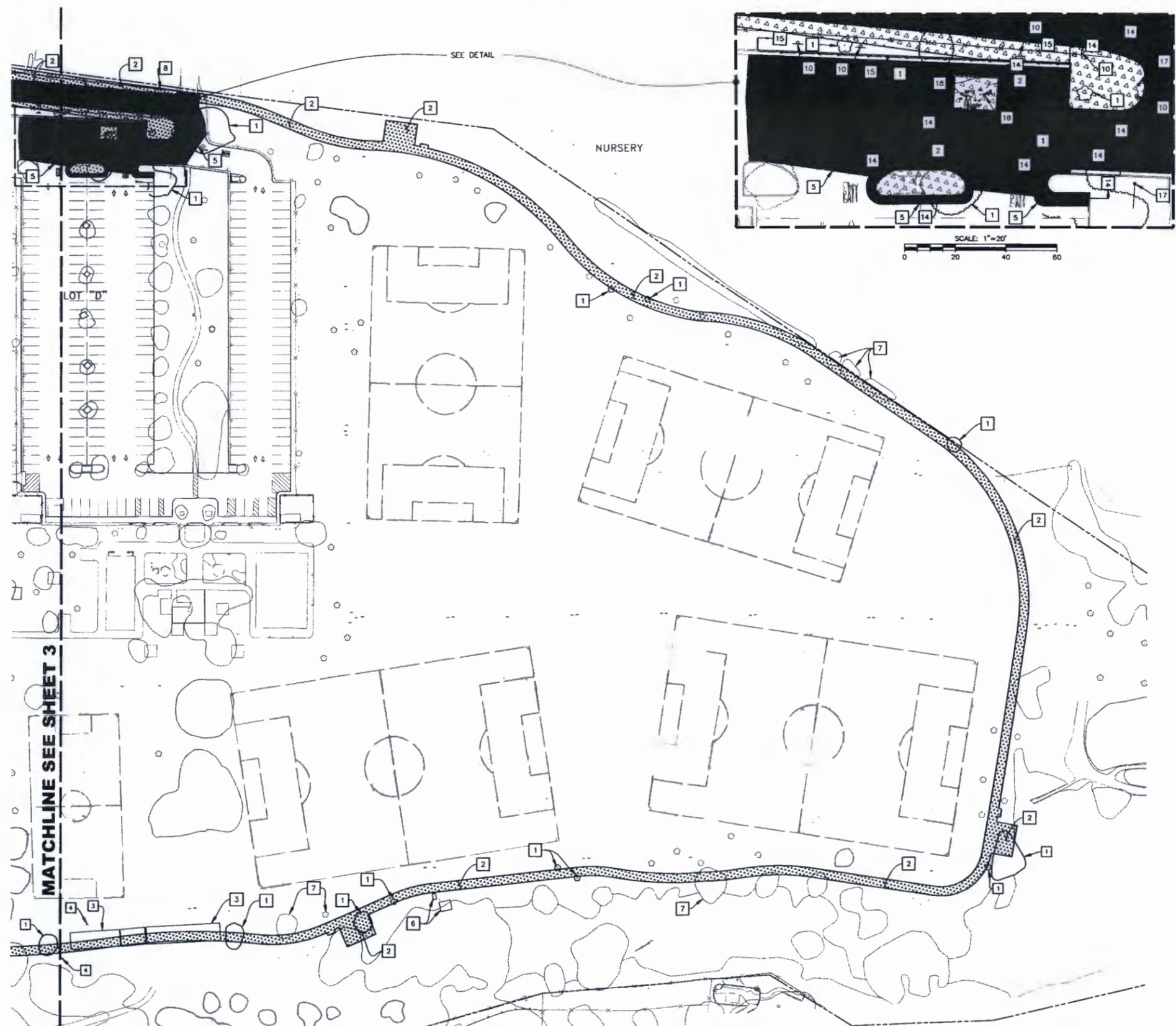
DESIGNED BY:  
SDM  
 DRAWN BY:  
TJS/NLA  
 CHECKED BY:  
BTJ  
 APPROVED BY:  
DAVID A. KLOTZLE  
 J LAURENTOWSKI RCE 55752 EXP 12/31/2014 DATE



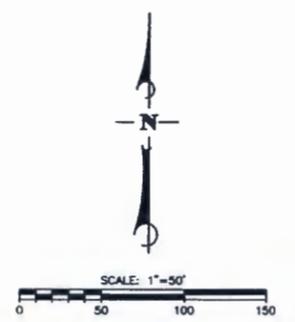
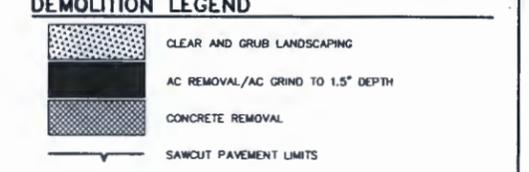
**CITY OF MOORPARK**  
 PUBLIC WORKS DEPARTMENT  
 ENGINEERING DIVISION

GRADING PERMIT NO.  
 ENGINEERING PROJECT NO.  
**ARROYO VISTA COMMUNITY PARK**  
 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**DEMOLITION PLAN**

SHEET 3  
 OF 19  
 DRAWING NO.  
 14-ML-10989



- DEMOLITION NOTES**
- 1 REMOVE EXISTING TREE.
  - 2 REMOVE EXISTING LANDSCAPING, CLEAR AND GRUB TO LIMITS SHOWN.
  - 3 RELOCATE EXISTING SOCCER GOAL POST. COORDINATE LOCATION WITH PARK FACILITIES MANAGER.
  - 4 REMOVE, SALVAGE AND RELOCATE EXISTING IMPROVEMENT UTILITY.
  - 5 SAWCUT AND REMOVE EXISTING PAVEMENT TO LIMITS SHOWN.
  - 6 PROTECT-IN-PLACE EXISTING PUMP HOUSE.
  - 7 PROTECT-IN-PLACE EXISTING TREE.
  - 8 REMOVE EXISTING WOODEN FENCE.
  - 9 REMOVE EXISTING WOODEN RAIL AND POSTS.
  - 10 RELOCATE EXISTING SIGN ON POST.
  - 11 REMOVE EXISTING BOLLARDS IN PLANTER ISLAND.
  - 12 REMOVE EXISTING AC PAVING PER TYPICAL SECTIONS "A-A" AND "B-B", SHEET 18.
  - 13 REMOVE EXISTING CONCRETE.
  - 14 REMOVE EXISTING CURB TO LIMITS SHOWN.
  - 15 REMOVE EXISTING CURB & GUTTER TO LIMITS SHOWN.
  - 16 REMOVE, SALVAGE AND REPLACE EXISTING GATE AS DIRECTED BY CITY REPRESENTATIVE.
  - 17 PROTECT IN PLACE EXISTING POWER POLE, GUYS, AND ASSOCIATED APPURTENANCES.
  - 18 REMOVE AND RELOCATE EXISTING WATER SERVICE, APPURTENANCES, AND FIRE HYDRANT. SEE PLANS FOR RELOCATION.



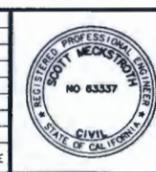
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Construction Management  
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Phone: (805) 981-0706 Fax: (805) 981-0251

SCOTT D. MECKSTROTH 63337 6/30/2014 1/17/2014  
ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE

DESIGNED BY:  
SDM

DRAWN BY:  
TJS/NLA

CHECKED BY:  
BTF

APPROVED BY:  
J LAURETOWSKI

ENGINEERING REVIEWED BY:  
DAVID A. KLOTZLE  
RCE 55752 EXP 12/31/2014

DATE



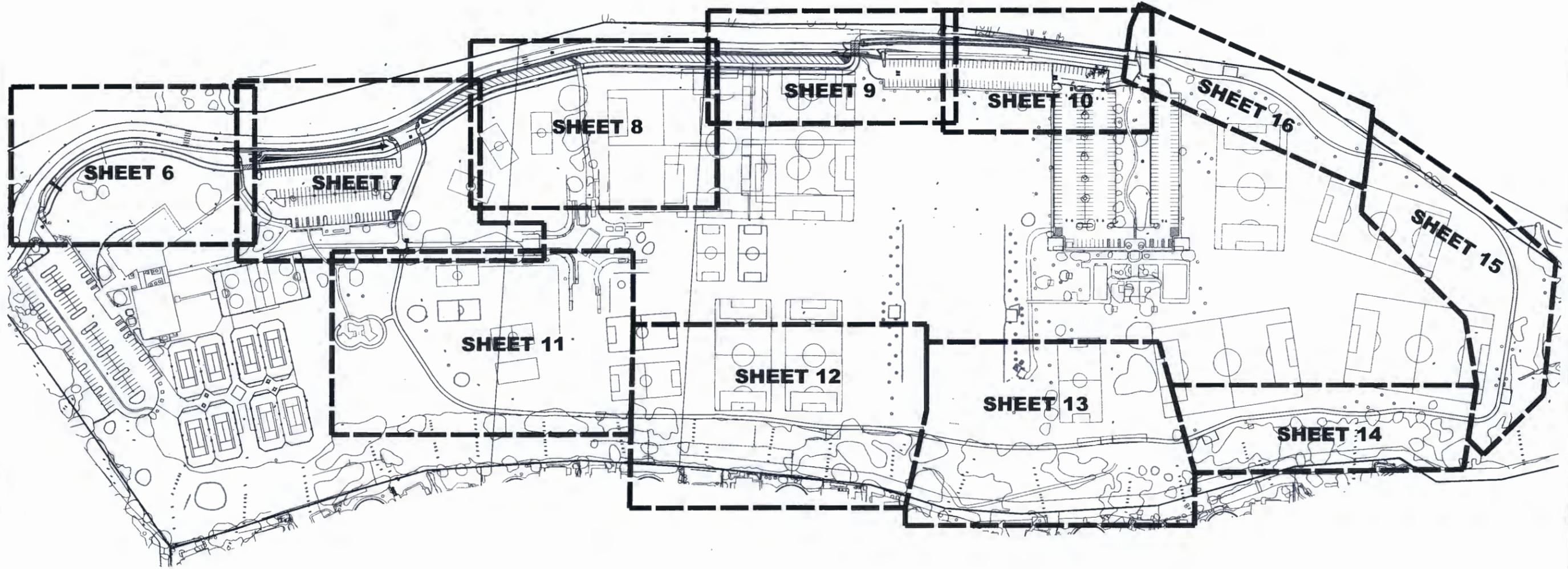
**CITY OF MOORPARK**  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION

GRADING PERMIT NO.  
ENGINEERING PROJECT NO.

**ARROYO VISTA COMMUNITY PARK**  
RECREATIONAL TRAIL IMPROVEMENTS  
PARKS, RECREATION & COMMUNITY DISTRICT

**DEMOLITION PLAN**

SHEET 4  
OF 19  
DRAWING NO.  
14-M-10989



SCALE: 1"=100'  
0 100 200 300

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△	DESCRIPTION OF REVISION	R.C.E.	APP'D DATE



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 ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE

DESIGNED BY: SDM  
 DRAWN BY: TJS/NLA  
 CHECKED BY: BTJ  
 APPROVED BY: J LAURETOWSKI  
 ENGINEERING REVIEWED BY: DAVID A. KLOTZLE  
 RCE 55752 EXP 12/31/2014

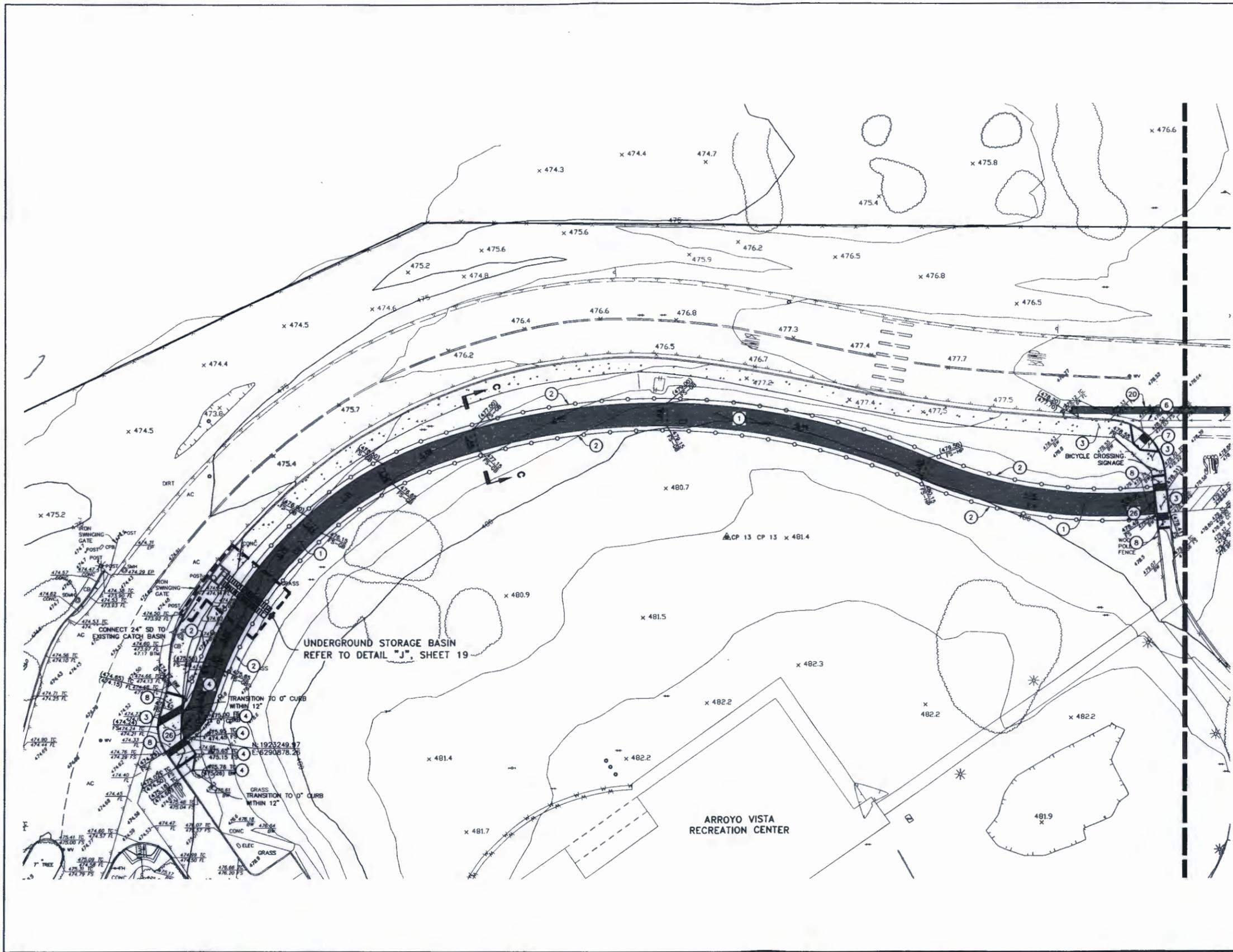


**CITY OF MOORPARK**  
 PUBLIC WORKS DEPARTMENT  
 ENGINEERING DIVISION

GRADING PERMIT NO.  
 ENGINEERING PROJECT NO.

**ARROYO VISTA COMMUNITY PARK**  
 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**GRADING SITE PLAN KEY MAP**

SHEET 5  
 OF 19  
 DRAWING NO.  
 14-ML-10989



MATCHLINE SEE SHEET 7

**CONSTRUCTION NOTES**

1. CONSTRUCT PERVIOUS ASPHALT CONCRETE BIKE TRAIL PER DETAIL "A", SHEET 17.
2. DECORATIVE FENCE. REFER TO LANDSCAPE PLANS.
3. CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
4. CONSTRUCT 6" CURB PER SPPWC PLAN 120-2, TYPE A1-6.
5. CONSTRUCT CROSS GUTTER PER SPPWC PLAN 122-2, FOR STREET SLOPE LESS THAN 4%.
6. CONSTRUCT CURB RAMP PER SPPWC PLAN 111-5 CASE A, TYPE 3 AND AS MODIFIED WITHIN THESE PLANS. REFER TO GENERAL NOTE 1.
7. CONSTRUCT CURB RAMP PER SPPWC PLAN 111-5 CASE D, TYPE 1 AND AS MODIFIED WITHIN THESE PLANS. REFER TO GENERAL NOTE 1.
20. SAWCUT EXISTING PAVEMENT 2" OFFSET OF PROPOSED GUTTER EDGE WITH 1" WIDE x 1.5" DEEP GRIND AND FEATHERED EDGE. FINAL PATCH SHALL BE 2" WIDE AC PAVING AND 1" OVERLAY (3" WIDE PATCH TOTAL), WITH TACK COAT. SEE SECTIONS A-A AND B-B, SHEET 18.
26. CONSTRUCT REMOVABLE BOLLARD WITH EXTERNAL PADLOCK PER DETAIL "K", SHEET 19.

**GENERAL NOTES (GRADING PLAN)**

1. CURB RAMP LENGTH SHALL BE MODIFIED TO ACHIEVE 8.33% MAXIMUM SLOPE IF IT IS DETERMINED IN THE FIELD THAT THE EXISTING FINISH GRADE ELEVATIONS WILL CAUSE THE MAXIMUM SLOPE TO BE EXCEEDED AS SHOWN ON PLANS. MODIFY TO MEET CSC REQUIREMENTS.

**LINE TABLE**

LINE	LENGTH	DIRECTION
L1	4.08	N85° 07' 46"E

**CURVE TABLE**

CURVE	DELTA	RADIUS	LENGTH
C1	45°47'08"	25.80	20.62
C2	54°12'13"	162.02	153.28
C3	41°47'25"	290.00	211.52
C4	27°54'52"	210.00	102.31



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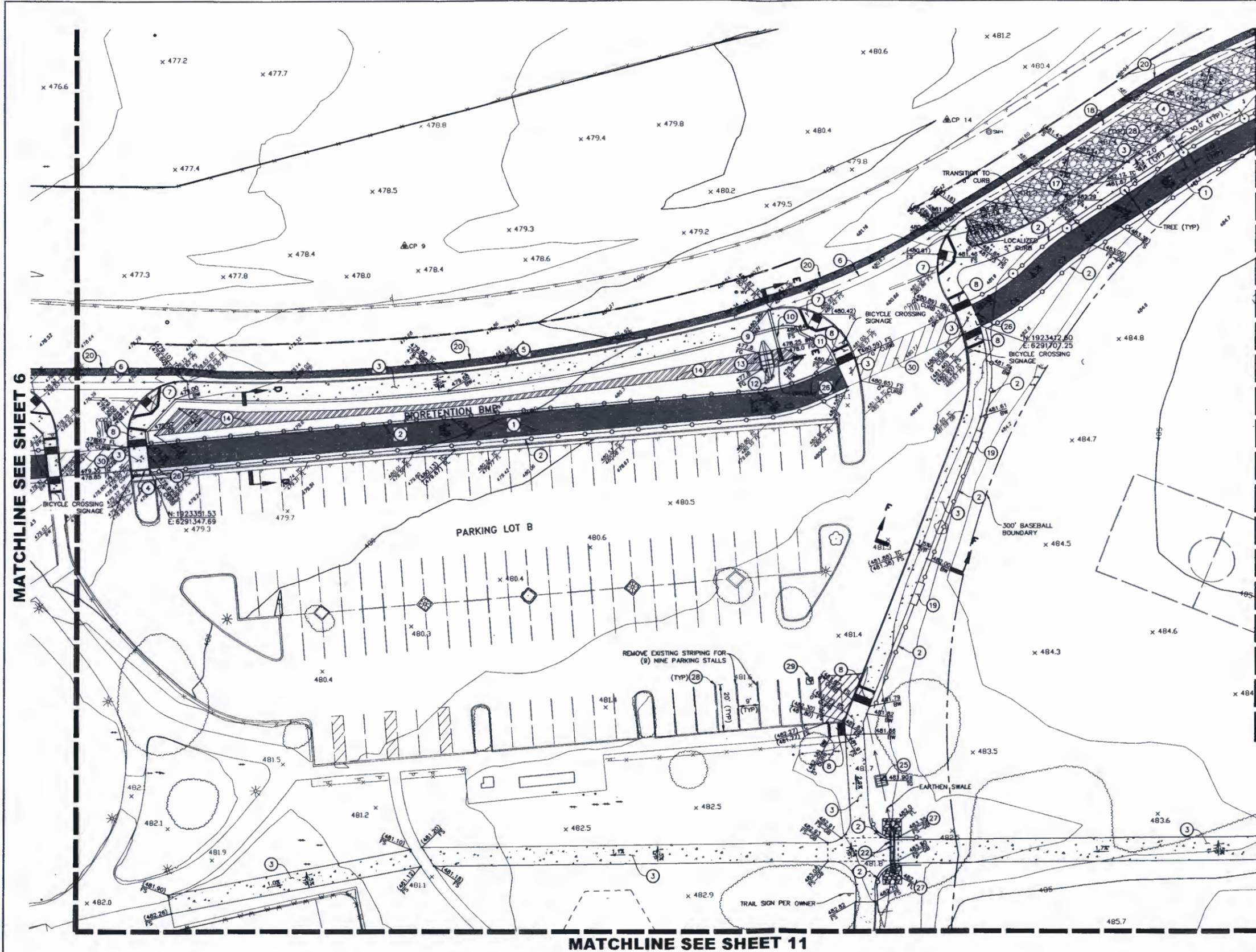
DESIGNED BY:  
SOM  
 DRAWN BY:  
TJS/NLA  
 CHECKED BY:  
BTF  
 APPROVED BY:  
DAVID A. KLOTZLE  
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 ENGINEERING REVIEWED BY:  
DATE



**CITY OF MOORPARK**  
 PUBLIC WORKS DEPARTMENT  
 ENGINEERING DIVISION

GRADING PERMIT NO.  
 ENGINEERING PROJECT NO.  
**ARROYO VISTA COMMUNITY PARK**  
 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**SITE GRADING SHEET**

SHEET 6  
 OF 19  
 DRAWING NO.  
 14-M-10989



**CONSTRUCTION NOTES**

1. CONSTRUCT PERVIOUS ASPHALT CONCRETE BIKE TRAIL PER DETAIL "A", SHEET 17.
2. DECORATIVE FENCE. REFER TO LANDSCAPE PLANS.
3. CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
4. CONSTRUCT 6" CURB PER SPPWC PLAN 120-2, TYPE A1-6.
5. CONSTRUCT 6" CURB WITH 18" OUTER PER SPPWC PLAN 120-2, TYPE A2-6.
6. CONSTRUCT CROSS GUTTER PER SPPWC PLAN 122-2, FOR STREET SLOPE LESS THAN 4%.
7. CONSTRUCT CURB RAMP PER SPPWC PLAN 111-5 CASE A, TYPE 3 AND AS MODIFIED WITHIN THESE PLANS. REFER TO GENERAL NOTE 1.
8. CONSTRUCT CURB RAMP PER SPPWC PLAN 111-5 CASE D, TYPE 1 AND AS MODIFIED WITHIN THESE PLANS. REFER TO GENERAL NOTE 1.
9. CONSTRUCT PARKWAY DRAIN PER SPPWC PLAN 151-2, MODIFIED TO SLOPE TOWARDS BIORETENTION FOREBAY, WITH 1" LOCAL DEPRESSION AT GUTTER.
10. CONSTRUCT 8" DRAIN PIPE AND CONNECT TO BACK OF PARKWAY DRAIN WITH CONCRETE COLLAR, SIMILAR TO INLET TYPE 1 OF PARKWAY DRAIN DETAIL.
11. CONSTRUCT DRAIN LINE OUTLET PER ROCK RIP-RAP SECTION E-E, SHEET 18.
12. CONSTRUCT 12" TALL EARTHEN BERM WITH 2H:1V SIDE SLOPES, 12" WIDE LEVEL TOP, AND DUAL 3" DRAIN LINE OUTLETS.
13. CONSTRUCT MOW STRIPS ON BOTH SIDES OF EARTHEN BERM PER DETAILS "E" AND "F", SHEET 17.
14. CONSTRUCT BIORETENTION SECTION B-B, SHEET 18 AND THE 2011 VENTURA COUNTY TECHNICAL GUIDANCE MANUAL INF-3: BIORETENTION.
17. CONSTRUCT 6" PERVIOUS PCC PAVEMENT PER DETAIL "D", SHEET 17.
18. CONSTRUCT LONGITUDINAL GUTTER PER SPPWC PLAN 122-2, MODIFIED TO 1" FLOW DEPTH.
19. CONSTRUCT 10" WIDE x 4" THICK CONCRETE INFILL WITH 6x6-W1.4/W1.4 W/M.
20. SAWCUT EXISTING PAVEMENT 2' OFFSET OF PROPOSED GUTTER EDGE WITH 1" WIDE x 1.5" DEEP GRIND AND FEATHERED EDGE. FINAL PATCH SHALL BE 2" WIDE AC PAVING AND 1" OVERLAY (3" WIDE PATCH TOTAL), WITH TACK COAT. SEE SECTIONS A-A AND B-B, SHEET 18.
22. CONSTRUCT DUAL 6" DUCTILE IRON PIPE (EPOXY COATED) CULVERT.
25. CONSTRUCT DRYWELL PER DETAIL "I", SHEET 17.
26. CONSTRUCT REMOVABLE BOLLARD WITH EXTERNAL PADLOCK PER DETAIL "K", SHEET 19.
27. CONSTRUCT 2' WIDE ROCK RIP-RAP ENERGY DISSIPATER. PLACE 4" - 8" NOMINAL SIZE ROCK EMBEDDED AT LEAST HALFWAY INTO COMPACTED NATIVE SOIL. FILL SPACES AROUND LARGER ROCK WITH SMALLER STONES.
28. CONSTRUCT PARKING STALL PER DETAIL "M", SHEET 19.
29. CONSTRUCT ACCESSIBLE PARKING STALL PER DETAIL "N", SHEET 19.
30. CONSTRUCT CROSSWALK STRIPING PER CALTRANS STANDARD PLAN RSP A24F.

**GENERAL NOTES (GRADING PLAN)**

1. CURB RAMP LENGTH SHALL BE MODIFIED TO ACHIEVE 8.33% MAXIMUM SLOPE IF IT IS DETERMINED IN THE FIELD THAT THE EXISTING FINISH GRADE ELEVATIONS WILL CAUSE THE MAXIMUM SLOPE TO BE EXCEEDED AS SHOWN ON PLANS. MODIFY TO MEET CBC REQUIREMENTS.

LINE TABLE		
LINE	LENGTH	DIRECTION
L2	265.88	N85° 07' 46"E
L3	13.83	N65° 23' 34"E
L4	0.41	N65° 23' 34"E
L5	53.68	N56° 50' 32"E

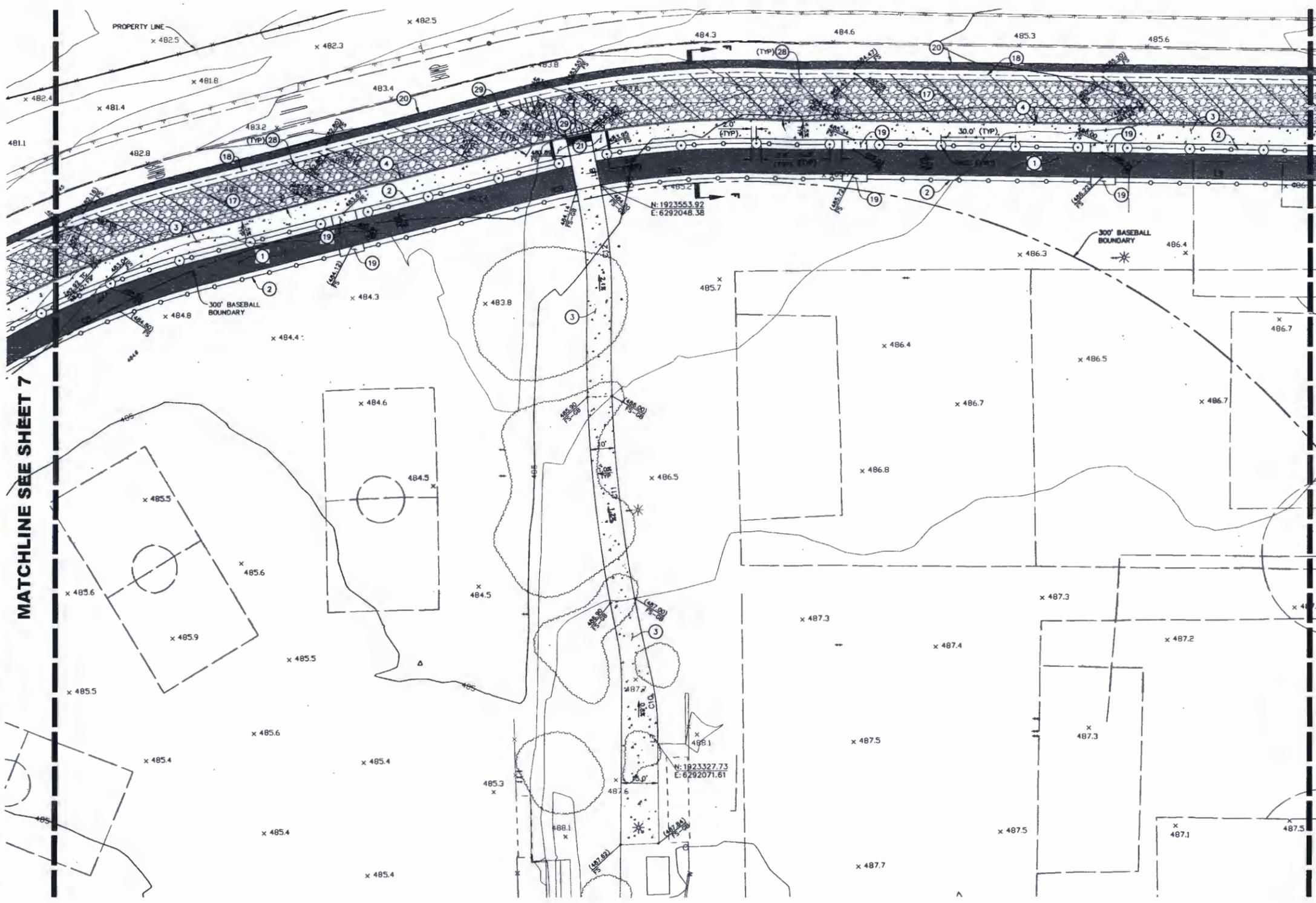
CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C5	19°44'12"	75.00	25.84
C6	21°31'08"	95.00	35.88
C7	12°58'06"	80.00	18.11

MATCHLINE SEE SHEET 8

MATCHLINE SEE SHEET 6

MATCHLINE SEE SHEET 11

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**CONSTRUCTION NOTES**

- 1 CONSTRUCT PERVIOUS ASPHALT CONCRETE BIKE TRAIL PER DETAIL "A", SHEET 17.
- 2 DECORATIVE FENCE. REFER TO LANDSCAPE PLANS.
- 3 CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
- 4 CONSTRUCT 6" CURB PER SPPWC PLAN 120-2, TYPE A1-6.
- 17 CONSTRUCT 6" PERVIOUS PCC PAVEMENT PER DETAIL "D", SHEET 17.
- 18 CONSTRUCT LONGITUDINAL GUTTER PER SPPWC PLAN 122-2, MODIFIED TO 1" FLOW DEPTH.
- 19 CONSTRUCT 10' WIDE x 4" THICK CONCRETE INFILL WITH 6x6-W1.4/W1.4 W/M.
- 20 SAWCUT EXISTING PAVEMENT 2' OFFSET OF PROPOSED GUTTER EDGE WITH 1" WIDE x 1.5" DEEP GRIND AND FEATHERED EDGE. FINAL PATCH SHALL BE 2" WIDE AC PAVING AND 1" OVERLAY (3" WIDE PATCH TOTAL), WITH TACK COAT. SEE SECTIONS A-A AND B-B, SHEET 18.
- 21 CONSTRUCT CURB RAMP PER SPPWC PLAN 111-5 CASE B, TYPE 1 AND AS MODIFIED WITHIN THESE PLANS. REFER TO GENERAL NOTE 1.
- 28 CONSTRUCT PARKING STALL PER DETAIL "M", SHEET 19.
- 29 CONSTRUCT ACCESSIBLE PARKING STALL PER DETAIL "N", SHEET 19.

**GENERAL NOTES (GRADING PLAN)**

- 1. CURB RAMP LENGTH SHALL BE MODIFIED TO ACHIEVE 8.33% MAXIMUM SLOPE IF IT IS DETERMINED IN THE FIELD THAT THE EXISTING FINISH GRADE ELEVATIONS WILL CAUSE THE MAXIMUM SLOPE TO BE EXCEEDED AS SHOWN ON PLANS. MODIFY TO MEET CBC REQUIREMENTS.

**LINE TABLE**

LINE	LENGTH	DIRECTION
L6	143.51	N75° 47' 16"E
L7	4.63	N0° 14' 38"E
L8	16.51	N11° 07' 42"W
L9	499.24	S89° 17' 10"E

**CURVE TABLE**

CURVE	DELTA	RADIUS	LENGTH
C8	19°06'00"	296.76	98.93
C9	2°29'04"	326.76	14.17
C10	14°11'01"	100.00	24.75
C11	15°32'36"	543.00	147.31
C12	12°43'55"	220.00	48.89
C13	10°41'17"	326.76	60.95

MATCHLINE SEE SHEET 7

MATCHLINE SEE SHEET 9



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DAVID A. KLOTZLE DATE  
 J. LAURENTOWSKI RCE 55752 EXP 12/31/2014



**CITY OF MOORPARK**  
 PUBLIC WORKS DEPARTMENT  
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GRADING PERMIT NO.  
 ENGINEERING PROJECT NO.

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 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**SITE GRADING SHEET**

SHEET 8  
 OF 19  
 DRAWING NO.  
 14-ML-10989

**CONSTRUCTION NOTES**

1. CONSTRUCT PERVIOUS ASPHALT CONCRETE BIKE TRAIL PER DETAIL "A", SHEET 17.
2. DECORATIVE FENCE. REFER TO LANDSCAPE PLANS.
3. CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
4. CONSTRUCT 6" CURB PER SPPWC PLAN 120-2, TYPE A1-6.
5. CONSTRUCT 6" CURB WITH 18" GUTTER PER SPPWC PLAN 120-2, TYPE A2-6.
8. CONSTRUCT CURB RAMP PER SPPWC PLAN 111-5 CASE D, TYPE 1 AND AS MODIFIED WITHIN THESE PLANS. REFER TO GENERAL NOTE 1.
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26. CONSTRUCT REMOVABLE BOLLARD WITH EXTERNAL PADLOCK PER DETAIL "K", SHEET 19.
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30. CONSTRUCT CROSSWALK STRIPING PER CALTRANS STANDARD PLAN RSP A24F.

**GENERAL NOTES (GRADING PLAN)**

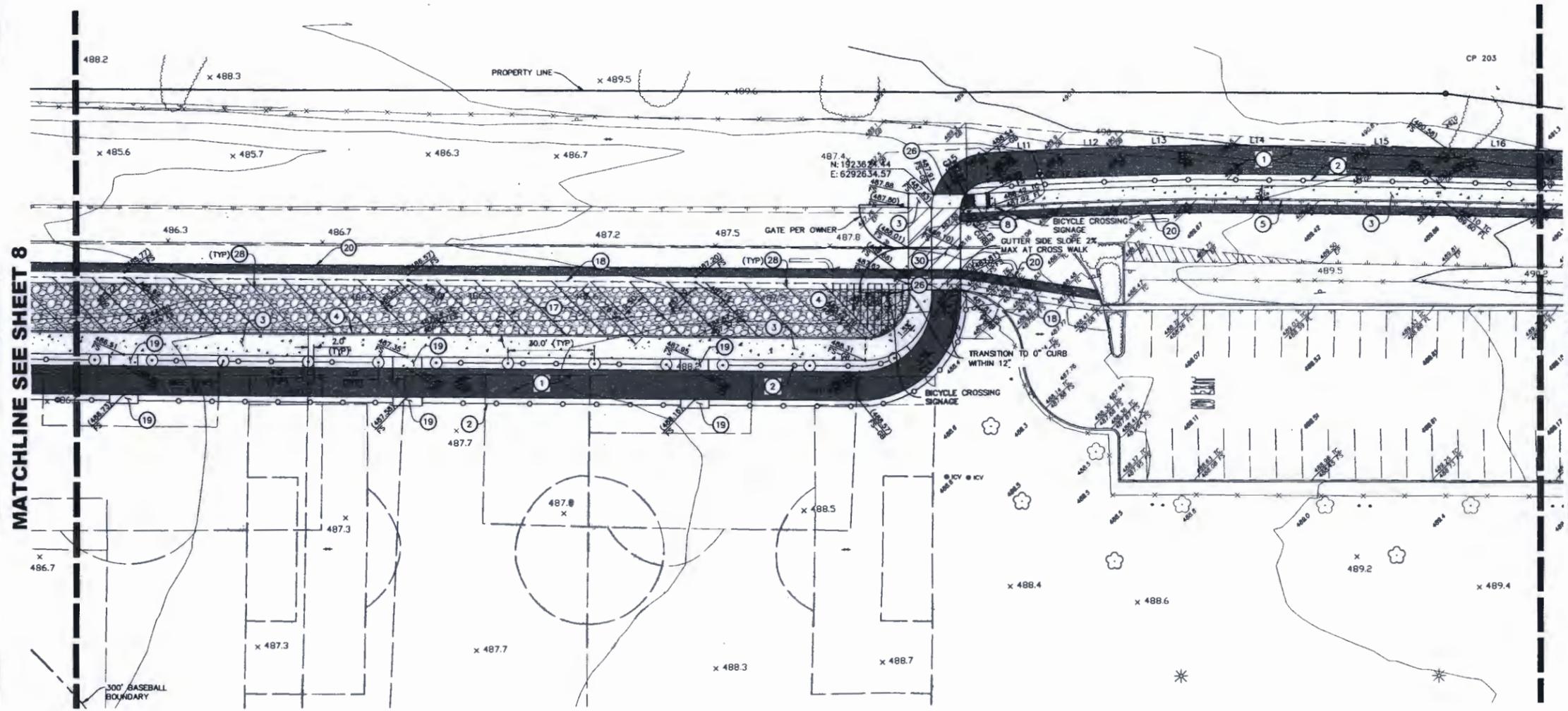
1. CURB RAMP LENGTH SHALL BE MODIFIED TO ACHIEVE 8.33% MAXIMUM SLOPE IF IT IS DETERMINED IN THE FIELD THAT THE EXISTING FINISH GRADE ELEVATIONS WILL CAUSE THE MAXIMUM SLOPE TO BE EXCEEDED AS SHOWN ON PLANS. MODIFY TO MEET CBC REQUIREMENTS.

**LINE TABLE**

LINE	LENGTH	DIRECTION
L9	499.24	S89° 17' 10"E
L10	3.33	N0° 02' 52"E
L11	25.81	N87° 21' 10"E
L12	21.01	N88° 19' 24"E
L13	25.89	N88° 51' 56"E
L14	42.81	S89° 18' 22"E
L15	42.07	S89° 00' 23"E
L16	39.23	S88° 26' 16"E

**CURVE TABLE**

CURVE	DELTA	RADIUS	LENGTH
C14	90°39'58"	35.00	55.38
C15	70°16'15"	20.00	24.53



MATCHLINE SEE SHEET 8

MATCHLINE SEE SHEET 10



SCALE: 1"=20'  
0 20 40 60

NO.	DESCRIPTION OF REVISION	R.C.E.	APP'D	DATE
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PREPARED BY:  
**Ponfield & Smith**  
 Engineering · Surveying · Planning  
 · Construction Management ·  
 1327 Del Norte Road, Suite 200, Camarillo, CA 93010  
 Phone: (805) 981-0706 Fax: (805) 981-0251  
 SCOTT D. MECKSTROTH 63337 6/30/2014 1/17/2014  
 ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE

DESIGNED BY:  
 .SDM  
 DRAWN BY:  
 TJS/MLA  
 CHECKED BY:  
 BITF  
 APPROVED BY:  
 J LAURENTOWSKI  
 ENGINEERING REVIEWED BY:  
 DAVID A. KLOTZLE  
 RCE 55752 EXP 12/31/2014  
 DATE

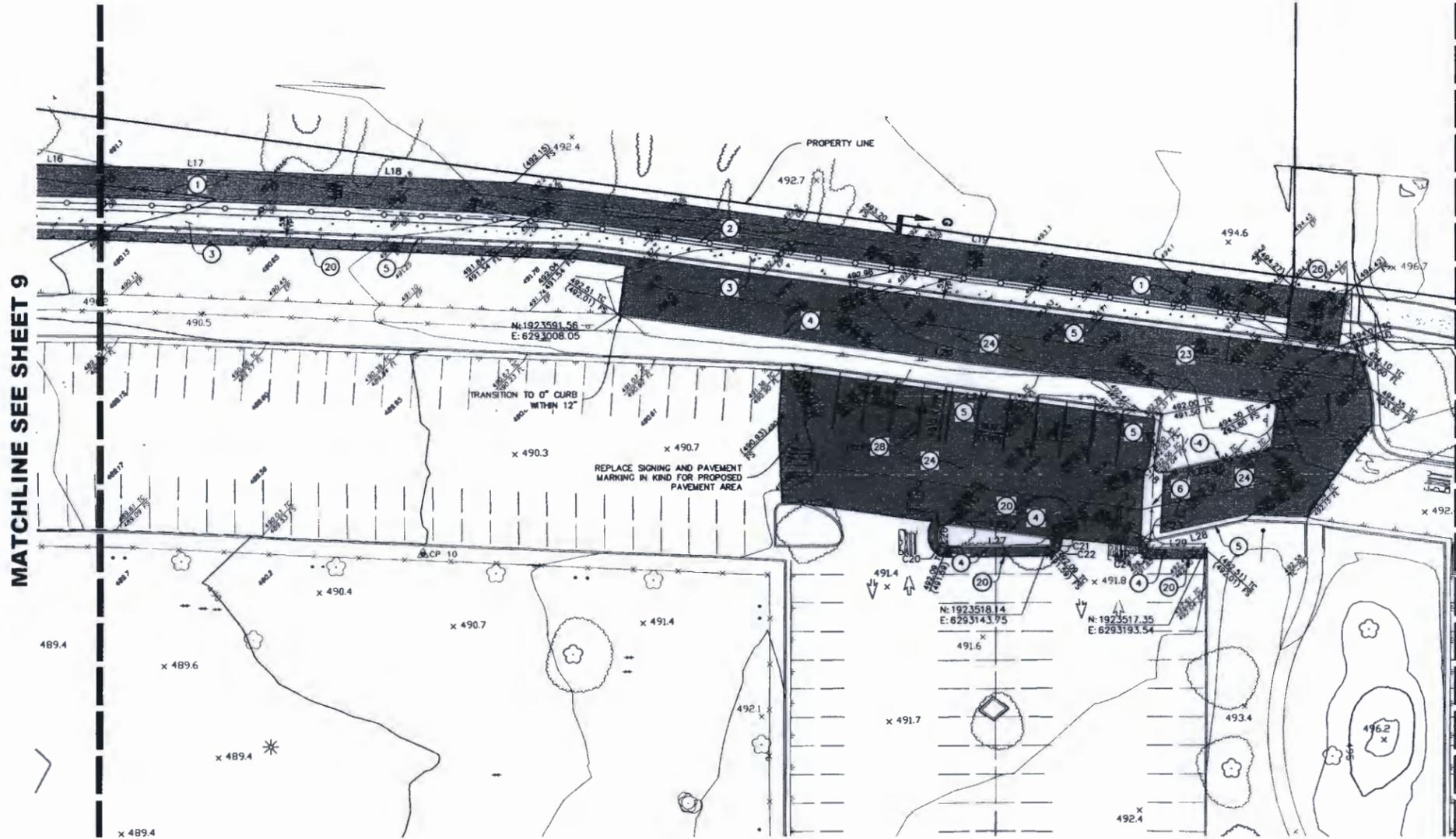


**CITY OF MOORPARK**  
 PUBLIC WORKS DEPARTMENT  
 ENGINEERING DIVISION

GRADING PERMIT NO.  
 ENGINEERING PROJECT NO.

**ARROYO VISTA COMMUNITY PARK**  
 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**SITE GRADING SHEET**

SHEET 9  
 OF 19  
 DRAWING NO.  
 14-ME-10989



**CONSTRUCTION NOTES**

- 1. CONSTRUCT PERVIOUS ASPHALT CONCRETE BIKE TRAIL PER DETAIL "A", SHEET 17.
- 2. DECORATIVE FENCE. REFER TO LANDSCAPE PLANS.
- 3. CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
- 4. CONSTRUCT 6" CURB PER SPPWC PLAN 120-2, TYPE A1-6.
- 5. CONSTRUCT 6" CURB WITH 18" GUTTER PER SPPWC PLAN 120-2, TYPE A2-6.
- 6. CONSTRUCT CROSS GUTTER PER SPPWC PLAN 122-2, FOR STREET SLOPE LESS THAN 4%.
- 20. SAWCUT EXISTING PAVEMENT 2' OFFSET OF PROPOSED GUTTER EDGE WITH 1' WIDE x 1.5" DEEP GRIND AND FEATHERED EDGE. FINAL PATCH SHALL BE 2' WIDE AC PAVING AND 1' OVERLAY (3' WIDE PATCH TOTAL), WITH TACK COAT. SEE SECTIONS A-A AND B-B, SHEET 18.
- 23. CONSTRUCT MOUNTABLE 6" CURB WITH 18" GUTTER PER SPPWC PLAN 121-2, TYPE B2-6. CURB TRANSITION PER DETAIL "G", SHEET 17.
- 24. CONSTRUCT AC PAVEMENT PER DETAIL "W", SHEET 17.
- 25. CONSTRUCT DRYWELL PER DETAIL "Y", SHEET 17.
- 26. CONSTRUCT REMOVABLE BOLLARD WITH EXTERNAL PADLOCK PER DETAIL "K", SHEET 19.
- 28. CONSTRUCT PARKING STALL PER DETAIL "M", SHEET 19.

**GENERAL NOTES (GRADING PLAN)**

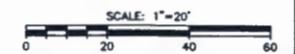
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LINE TABLE		
LINE	LENGTH	DIRECTION
L17	49.44	S87° 54' 26"E
L18	76.48	S87° 27' 28"E
L19	248.05	S82° 17' 56"E
L20	208.20	S82° 17' 56"E
L21	11.17	S7° 42' 02"W
L22	34.03	S77° 42' 02"W
L23	16.31	N7° 42' 02"E
L24	117.04	N82° 17' 58"W
L25	31.30	N82° 17' 58"W
L26	1.50	S0° 22' 48"E
L27	31.20	N89° 37' 12"E
L28	30.19	S77° 42' 02"W
L29	17.00	N89° 56' 31"E
L30	0.88	S0° 03' 29"E

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C16	90°00'00"	2.00	3.14
C17	70°00'00"	2.00	2.44
C18	110°00'00"	2.00	3.84
C19	98°04'50"	3.00	5.14
C20	90°00'00"	3.00	4.71
C21	82°40'25"	1.50	2.16
C22	89°14'45"	1.50	2.34
C23	77°45'31"	1.00	1.36
C24	90°00'00"	1.00	1.57

MATCHLINE SEE SHEET 9

MATCHLINE SEE SHEET 16



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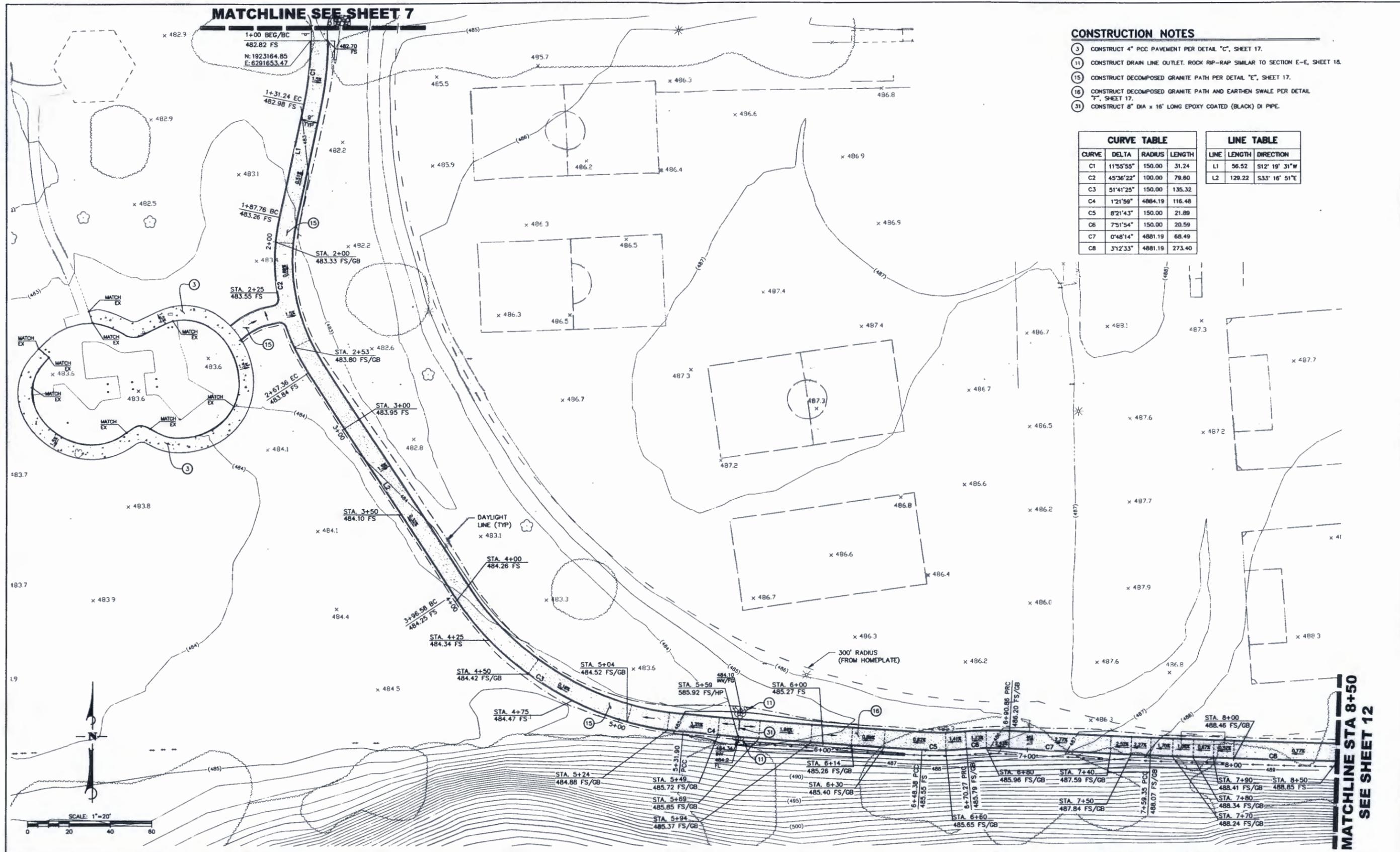
MATCHLINE SEE SHEET 7

**CONSTRUCTION NOTES**

- (3) CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
- (11) CONSTRUCT DRAIN LINE OUTLET. ROCK RIP-RAP SIMILAR TO SECTION E-E, SHEET 18.
- (15) CONSTRUCT DECOMPOSED GRANITE PATH PER DETAIL "E", SHEET 17.
- (16) CONSTRUCT DECOMPOSED GRANITE PATH AND EARTHEN SWALE PER DETAIL "T", SHEET 17.
- (31) CONSTRUCT 8" DIA x 16' LONG EPOXY COATED (BLACK) DI PIPE.

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	11°55'55"	150.00	31.24
C2	45°36'22"	100.00	79.60
C3	51°41'25"	150.00	135.32
C4	1°21'59"	4884.19	116.48
C5	8°21'43"	150.00	21.89
C6	7°51'54"	150.00	20.59
C7	0°48'14"	4881.19	68.49
C8	3°12'33"	4881.19	273.40

LINE TABLE		
LINE	LENGTH	DIRECTION
L1	56.52	S12° 19' 31" W
L2	129.22	S33° 16' 51" E



MATCHLINE STA 8+50  
SEE SHEET 12

NO	DESCRIPTION OF REVISION	R.C.E.	APP'D	DATE
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DESIGNED BY:  
SOM  
 DRAWN BY:  
TJS/NLA  
 CHECKED BY:  
BTJ  
 APPROVED BY:  
DAVID A. KLOTZLE  
 RCE 55752 EXP 12/31/2014  
 ENGINEERING REVIEWED BY: DATE



**CITY OF MOORPARK**  
 PUBLIC WORKS DEPARTMENT  
 ENGINEERING DIVISION

GRADING PERMIT NO.  
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**ARROYO VISTA COMMUNITY PARK**  
 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**DG PATH GRADING**  
**STA 1+00 TO 8+50**

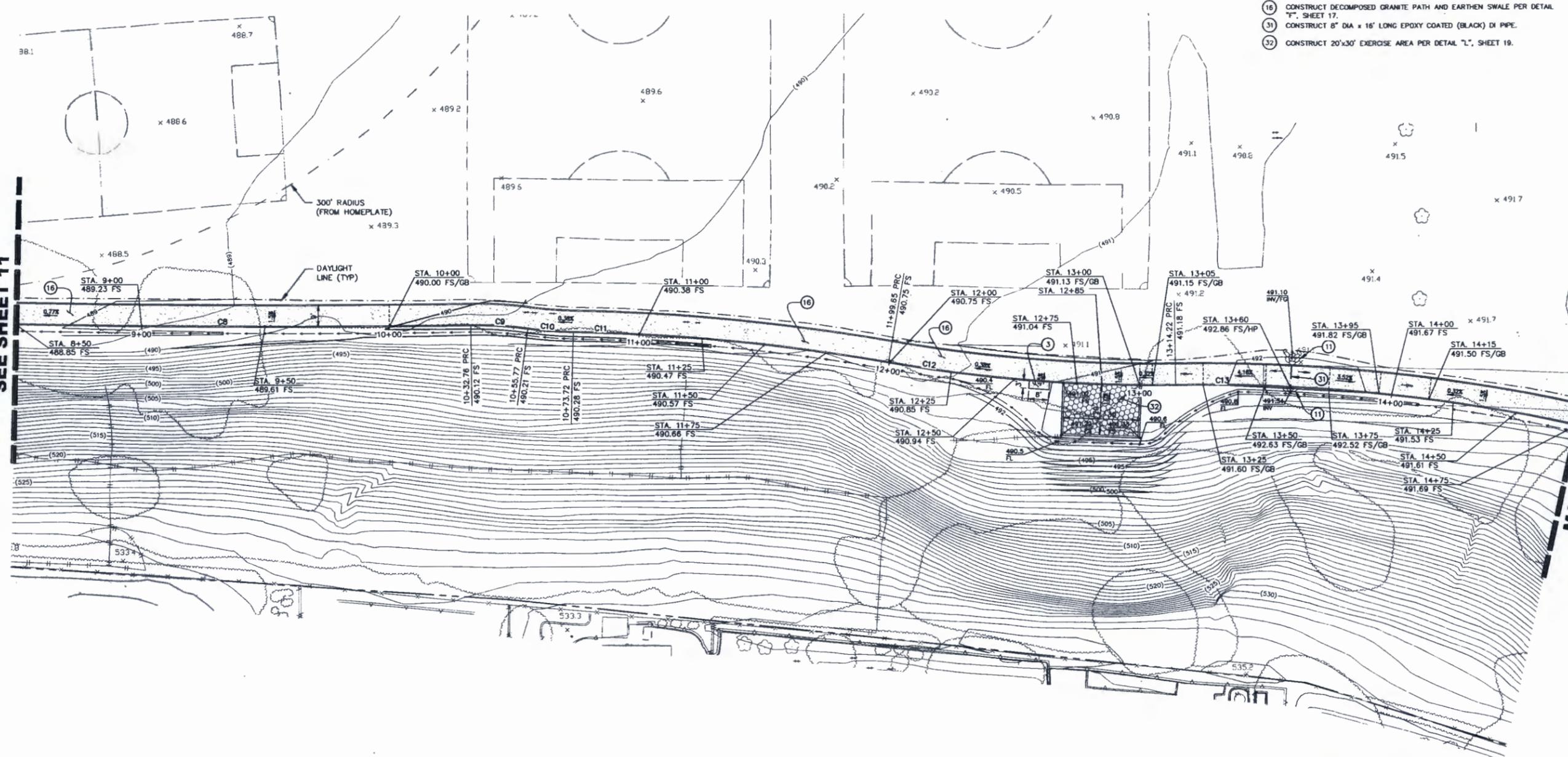
SHEET 11  
 OF 19  
 DRAWING NO.  
 14-M-10989

**CONSTRUCTION NOTES**

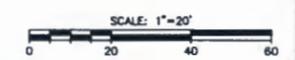
- 3 CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
- 11 CONSTRUCT DRAIN LINE OUTLET. ROCK RIP-RAP SIMILAR TO SECTION E-E, SHEET 18.
- 16 CONSTRUCT DECOMPOSED GRANITE PATH AND EARTHEN SWALE PER DETAIL "F", SHEET 17.
- 31 CONSTRUCT 8" DIA x 16' LONG EPOXY COATED (BLACK) DI PIPE.
- 32 CONSTRUCT 20'x30' EXERCISE AREA PER DETAIL "L", SHEET 19.

MATCHLINE STA 8+50  
SEE SHEET 11

MATCHLINE STA 14+75  
SEE SHEET 13



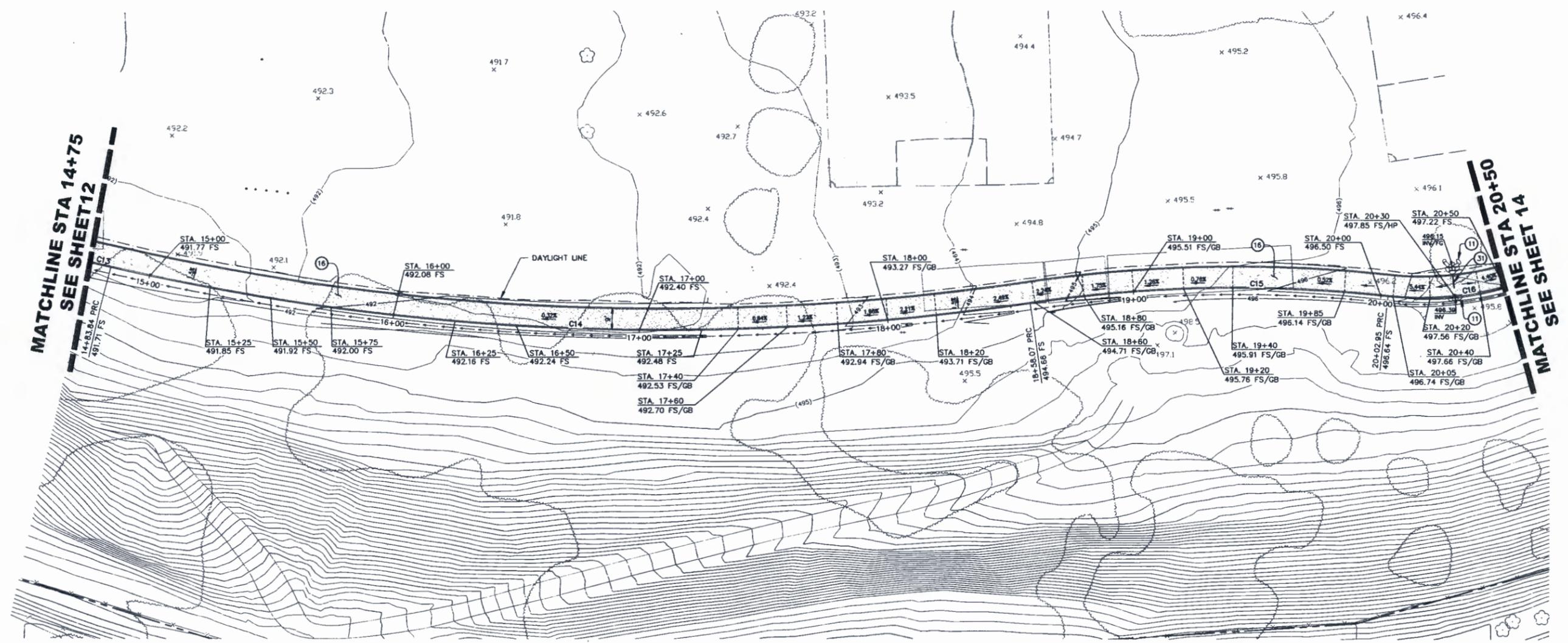
CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C8	37°2'33"	4881.19	273.40
C9	8°47'30"	150.00	23.02
C10	6°51'25"	150.00	17.95
C11	9°01'06"	800.00	125.82
C12	10°56'28"	800.00	114.58
C13	13°53'00"	700.00	169.82



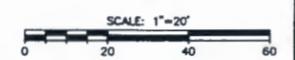
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**CONSTRUCTION NOTES**

- (11) CONSTRUCT DRAIN LINE OUTLET. ROCK RIP-RAP SIMILAR TO SECTION E-E, SHEET 18.
- (16) CONSTRUCT DECOMPOSED GRANITE PATH AND EARTHEN SWALE PER DETAIL "T", SHEET 17.
- (31) CONSTRUCT 8" DIA x 16' LONG EPOXY COATED (BLACK) DI PIPE.



CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C13	13°53'00"	700.00	169.62
C14	21°28'30"	1000.00	374.23
C15	14°35'18"	569.02	144.88
C16	28°32'44"	125.00	62.28



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 ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE

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 RCE 55752 EXP 12/31/2014 DATE



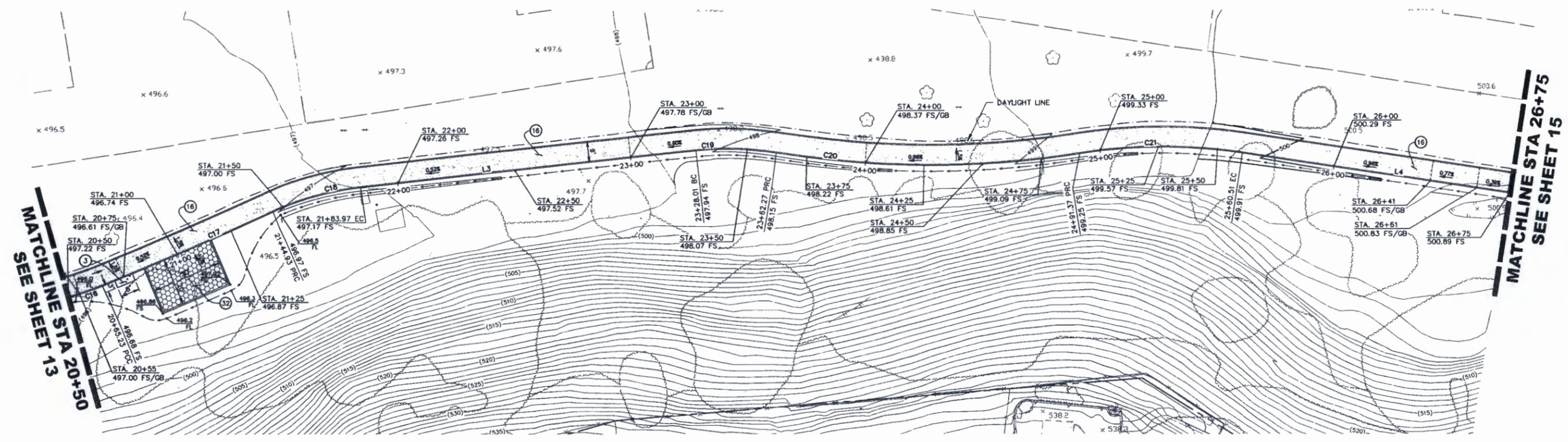
**CITY OF MOORPARK**  
 PUBLIC WORKS DEPARTMENT  
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GRADING PERMIT NO. \_\_\_\_\_  
 ENGINEERING PROJECT NO. \_\_\_\_\_  
**ARROYO VISTA COMMUNITY PARK**  
 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**DG PATH GRADING**  
**STA 14+75 TO 20+50**

SHEET **13**  
 OF **19**  
 DRAWING NO.  
 14-ML-10989

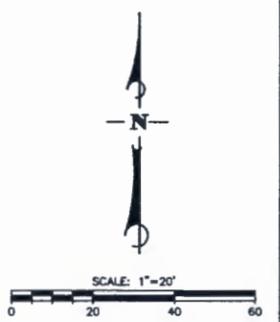
**CONSTRUCTION NOTES**

- 3 CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
- 16 CONSTRUCT DECOMPOSED GRANITE PATH AND EARTHEN SWALE PER DETAIL "F", SHEET 17.
- 32 CONSTRUCT 20'x30' EXERCISE AREA PER DETAIL "L", SHEET 19.



CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C16	28°32'44"	125.00	62.28
C17	1°44'03"	2633.47	78.71
C18	17°53'25"	125.00	39.03
C19	15°42'05"	125.00	34.26
C20	18°29'34"	400.00	129.10
C21	17°36'15"	225.00	69.13

LINE TABLE		
LINE	LENGTH	DIRECTION
L3	144.05	N83° 48' 19"E
L4	120.57	S81° 22' 54"E



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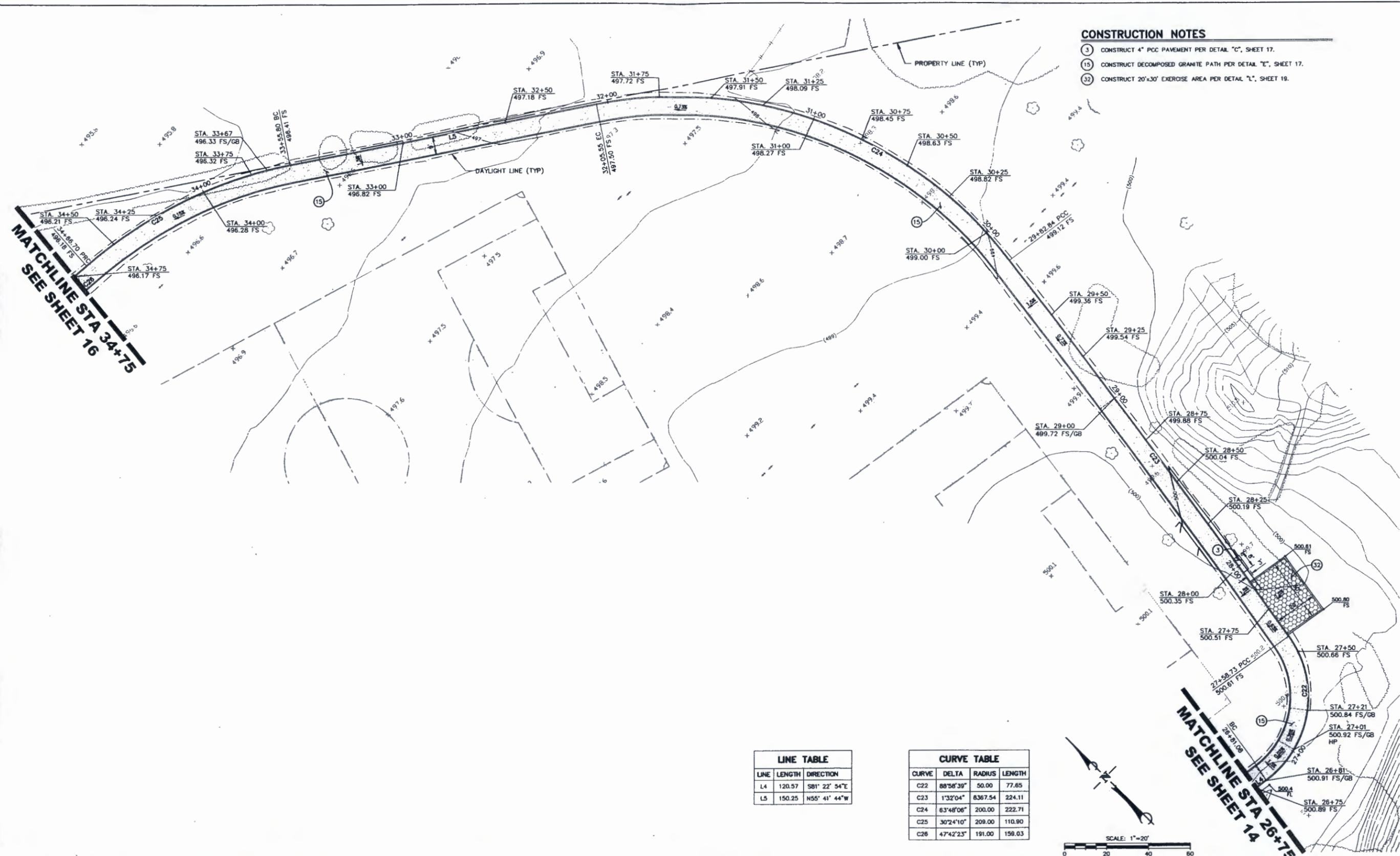
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**DG PATH GRADING STA  
 20+50 TO 26+75**

SHEET 14  
 OF 19  
 DRAWING NO.  
 14-ML-10989

**CONSTRUCTION NOTES**

- 3 CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
- 15 CONSTRUCT DECOMPOSED GRANITE PATH PER DETAIL "E", SHEET 17.
- 32 CONSTRUCT 20'x30' EXERCISE AREA PER DETAIL "L", SHEET 19.

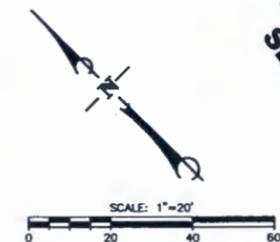


**LINE TABLE**

LINE	LENGTH	DIRECTION
L4	120.57	S81° 22' 54"E
L5	150.25	N55° 41' 44"W

**CURVE TABLE**

CURVE	DELTA	RADIUS	LENGTH
C22	88°58'39"	50.00	77.65
C23	1°32'04"	8367.54	224.11
C24	63°48'06"	200.00	222.71
C25	30°24'10"	209.00	110.90
C26	47°42'23"	191.00	159.03



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**CITY OF MOORPARK**  
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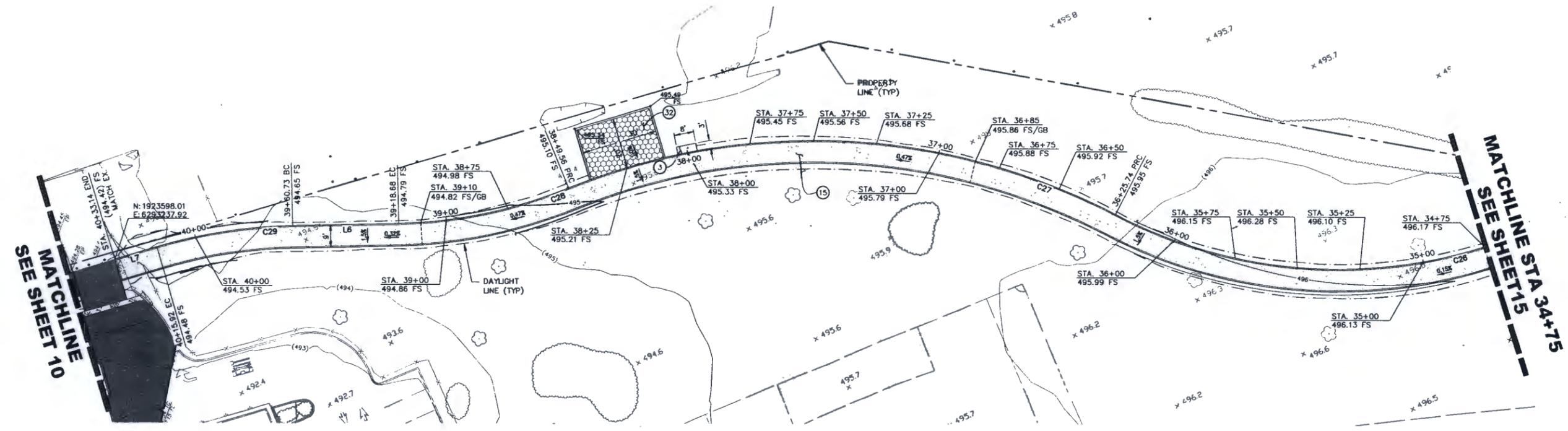
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 PARKS, RECREATION & COMMUNITY DISTRICT  
**DG PATH GRADING STA 26+75 TO 34+75**

SHEET **15**  
 OF **19**  
 DRAWING NO.  
 14-ML-10989

**CONSTRUCTION NOTES**

- 3 CONSTRUCT 4" PCC PAVEMENT PER DETAIL "C", SHEET 17.
- 15 CONSTRUCT DECOMPOSED GRANITE PATH PER DETAIL "E", SHEET 17.
- 32 CONSTRUCT 20'x30' EXERCISE AREA PER DETAIL "L", SHEET 19.

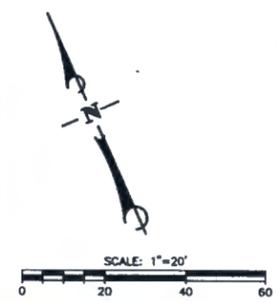


**CURVE TABLE**

CURVE	DELTA	RADIUS	LENGTH
C26	47°42'23"	191.00	159.03
C27	49°30'52"	259.00	223.83
C28	20°44'05"	191.00	69.12
C29	15°07'51"	209.00	55.19

**LINE TABLE**

LINE	LENGTH	DIRECTION
L6	42.05	N67° 10' 17" W
L7	17.21	N82° 18' 08" W



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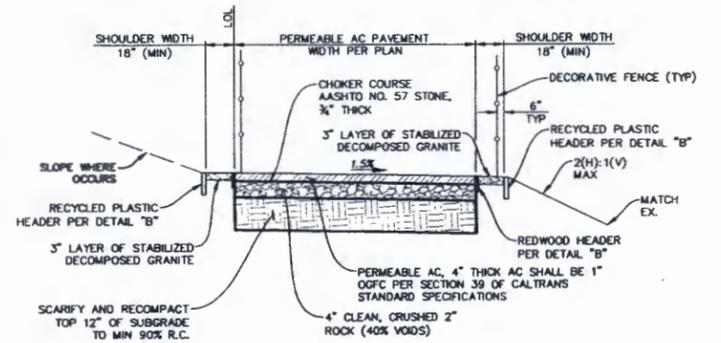
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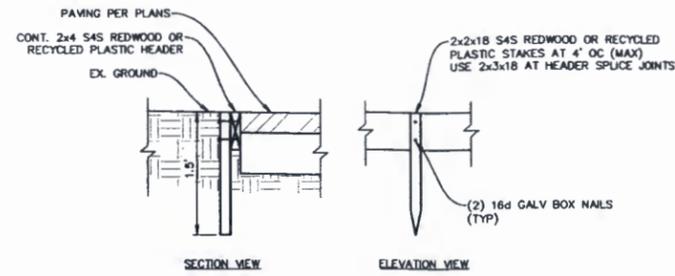
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 ENGINEERING PROJECT NO.  
**ARROYO VISTA COMMUNITY PARK**  
 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**DG PATH GRADING STA**  
**34+75 TO 40+33.14**

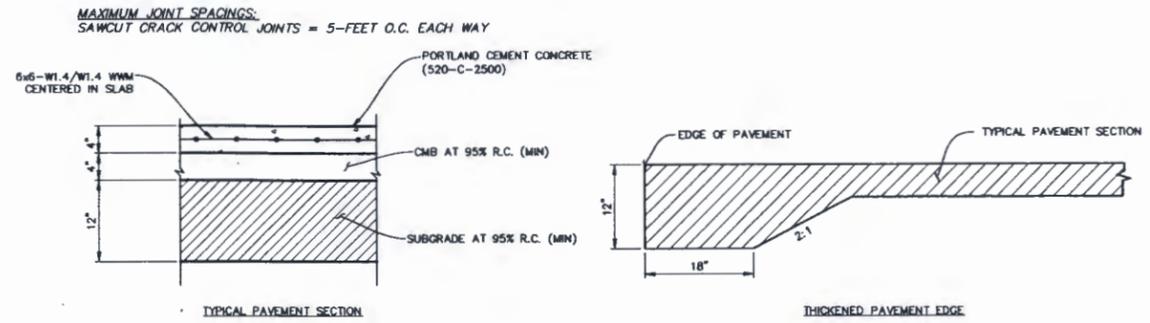
SHEET **16**  
 OF **19**  
 DRAWING NO.  
 14-ML-10989



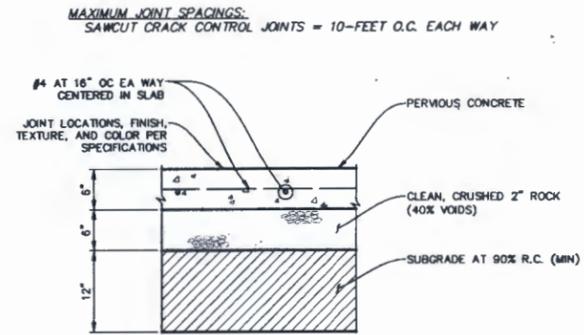
**TYPICAL PERMEABLE AC PAVEMENT BIKE TRAIL SECTION (A)**  
SCALE: N.T.S.



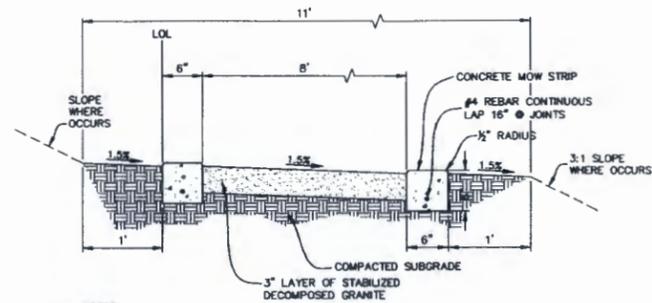
**REDWOOD/RECYCLED PLASTIC HEADER DETAIL (B)**  
SCALE: N.T.S.  
NOTE: MATERIALS AND INSTALLATION PER SSPWC 212-1.5 AND 308-3.



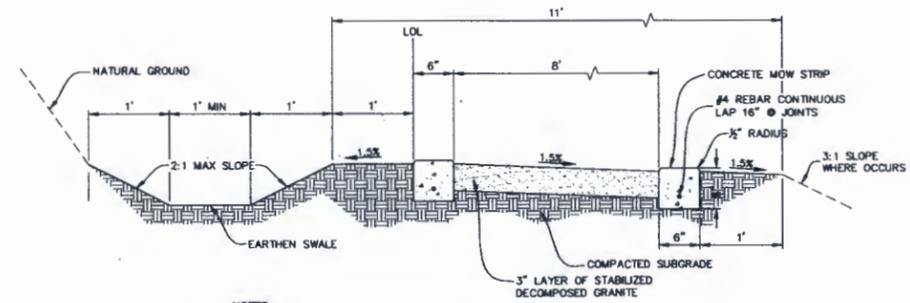
**PCC PAVEMENT SECTION (PEDESTRIAN USE) (C)**  
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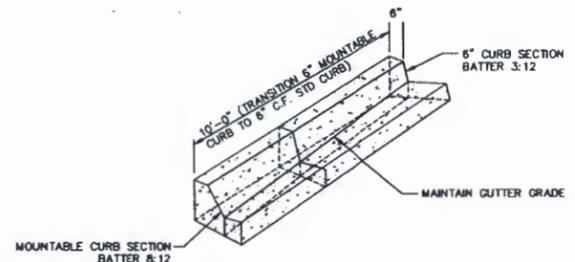
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SCALE: N.T.S.



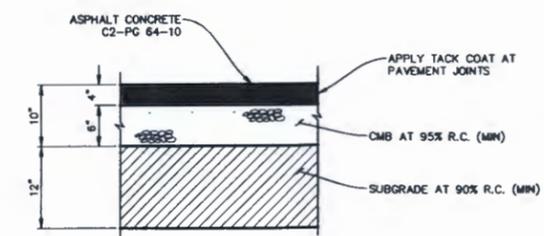
**DECOMPOSED GRANITE PATH SECTION (E)**  
SCALE: N.T.S.



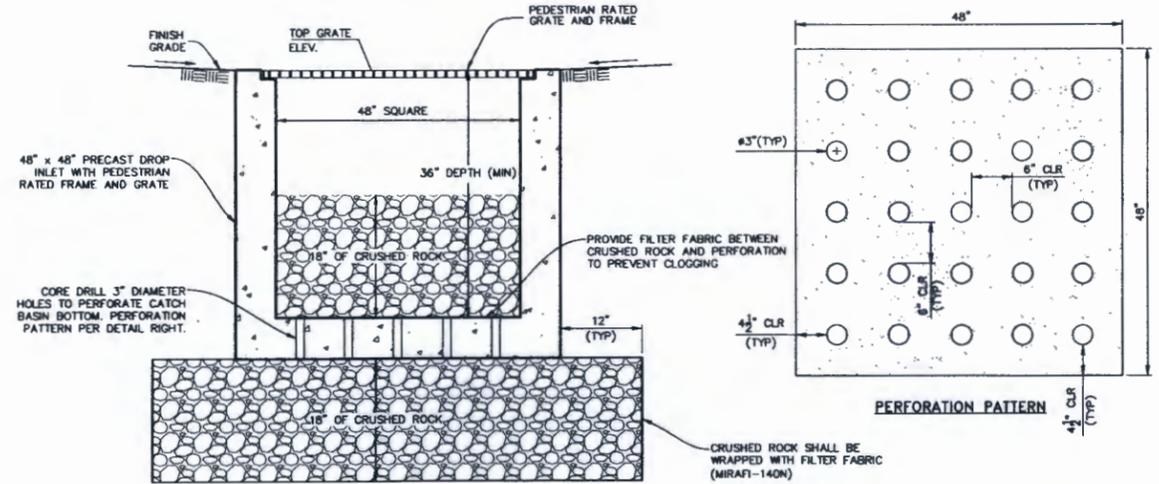
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SCALE: N.T.S.



**MOUNTABLE CURB AND GUTTER TRANSITION (G)**  
SCALE: N.T.S.



**AC PAVEMENT SECTION (H)**  
SCALE: N.T.S.



**DRYWELL DETAIL (I)**  
SCALE: N.T.S.

NO.	DESCRIPTION OF REVISION	R.C.E.	APP'D.	DATE
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PREPARED BY:  
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 SCOTT D. MECKSTROTH 63337 6/30/2014 1/17/2014  
 ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE

DESIGNED BY:  
SDM  
 DRAWN BY:  
TJS/NLA  
 CHECKED BY:  
BTJ  
 APPROVED BY:  
DAVID A. KLOTZLE DATE  
 J LAURENTOWSKI RCE 55752 EXP 12/31/2014

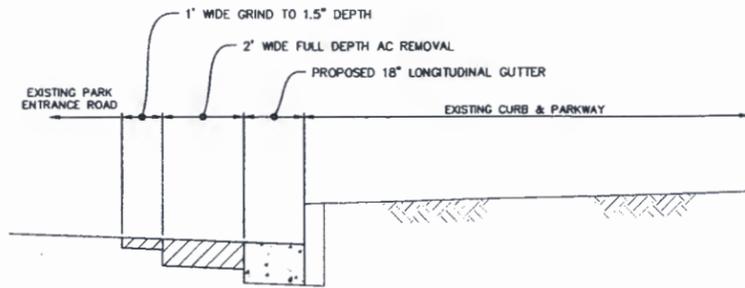


**CITY OF MOORPARK**  
 PUBLIC WORKS DEPARTMENT  
 ENGINEERING DIVISION

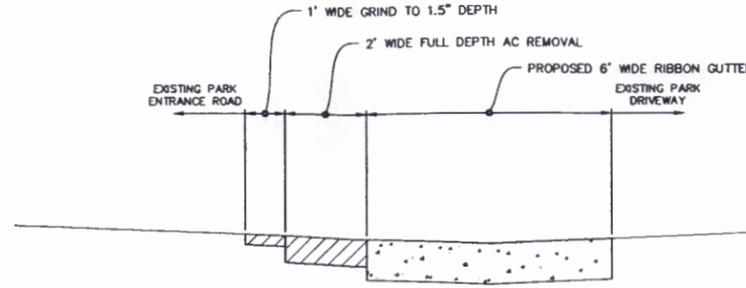
GRADING PERMIT NO.  
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**ARROYO VISTA COMMUNITY PARK**  
 RECREATIONAL TRAIL IMPROVEMENTS  
 PARKS, RECREATION & COMMUNITY DISTRICT  
**CONSTRUCTION DETAILS**

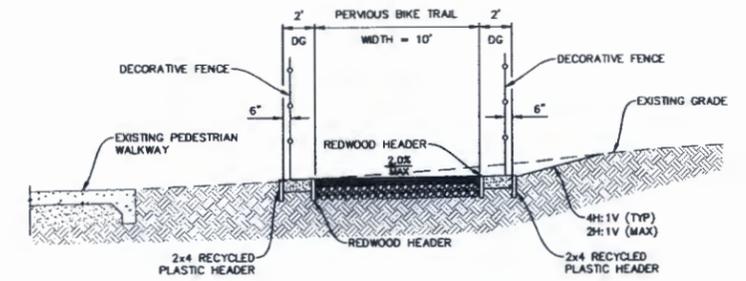
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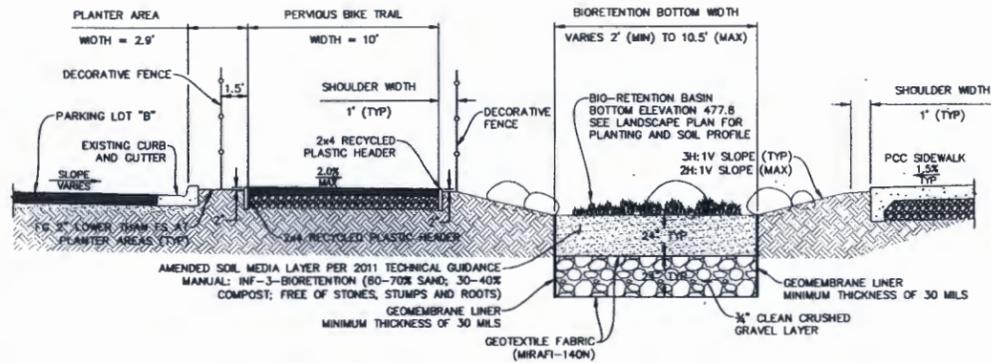
**TYPICAL AC REMOVAL AT LONGITUDINAL GUTTER** (A-A) 2  
SCALE: N.T.S.



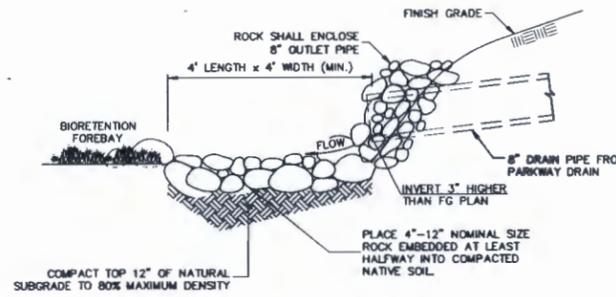
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SCALE: N.T.S.



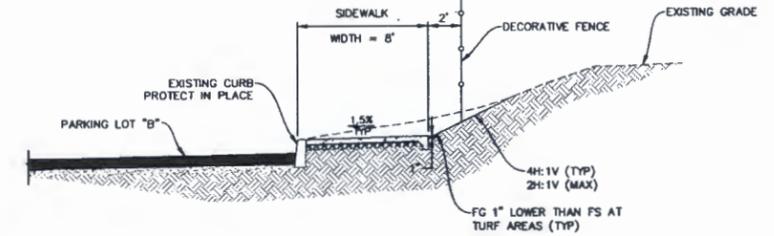
**BIKE TRAIL SECTION** (C-C) 6  
SCALE: N.T.S.



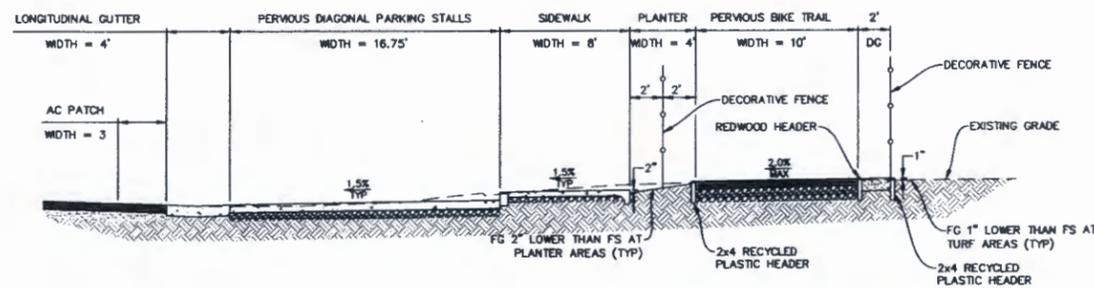
**BIORETENTION SECTION** (D-D) 7  
SCALE: N.T.S.  
NOTE:  
1. PROVIDE SAMPLE CITY REPRESENTATIVE PRIOR TO INSTALLATION.  
2. FURNISH AND PLACE SEVEN 2', SEVEN 3', AND TWELVE 4' BOULDERS PER DIRECTION OF THE CITY REPRESENTATIVE.  
3. BOULDER COLOR SHALL BE TAN.  
4. PROVIDE PHOTOS TO CITY REPRESENTATIVE FOR APPROVAL PRIOR TO INSTALLATION.



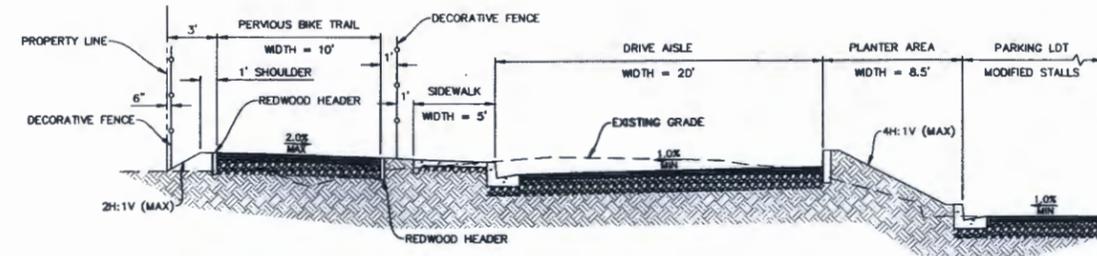
**ROCK RIP-RAP DETAIL** (E-E) 7  
SCALE: N.T.S.  
NOTE:  
1. ROCK AND BOULDER COLOR SHALL BE TAN.  
2. PROVIDE SAMPLE TO CITY REPRESENTATIVE FOR APPROVAL PRIOR TO INSTALLATION.  
3. FURNISH AND PLACE THREE 2' AND TWO 3' BOULDERS PER DIRECTION OF THE CITY REPRESENTATIVE.  
4. BOULDERS SHALL BE EMBEDDED 1/2 INTO COMPACTED NATIVE SOIL.



**PEDESTRIAN WALKWAY SECTION** (F-F) 7  
SCALE: N.T.S.



**BIKE TRAIL/DIAGONAL PARKING SECTION** (G-G) 8  
SCALE: N.T.S.



**BIKE TRAIL/DRIVE AISLE SECTION** (H-H) 10  
SCALE: N.T.S.

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Δ	DESCRIPTION OF REVISION	R.C.E.	APP'D DATE



PREPARED BY:  
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SCOTT D. MECKSTROTH 63337 6/30/2014 1/17/2014  
ENGINEER'S NAME R.C.E. NO. EXP. DATE DATE

DESIGNED BY: SDM  
DRAWN BY: TJS/NLA  
CHECKED BY: BTJ  
APPROVED BY: J LAURENTOWSKI  
ENGINEERING REVIEWED BY: DAVID A. KLOTZLE  
RCE 55752 EXP 12/31/2014 DATE

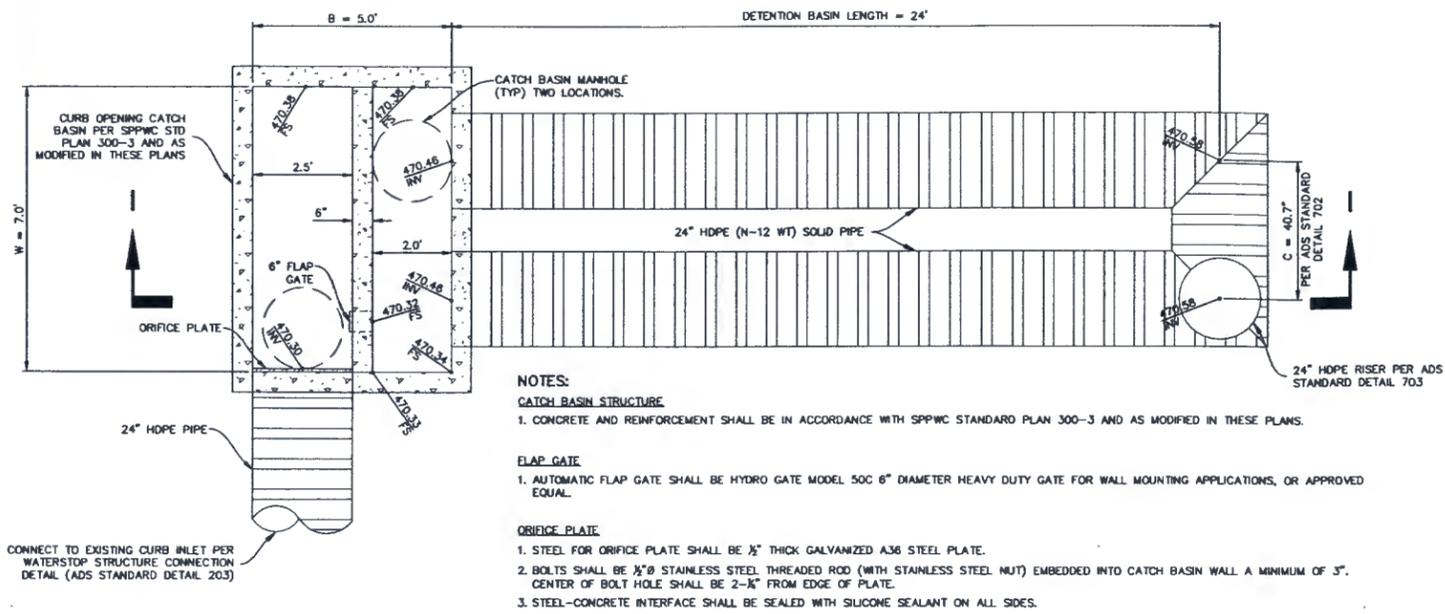


**CITY OF MOORPARK**  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION

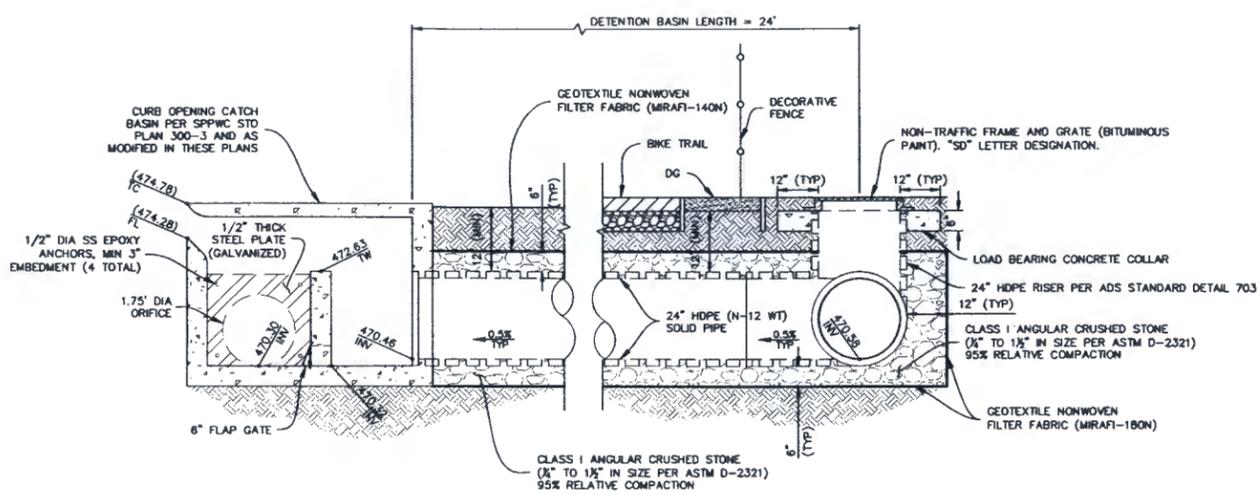
GRADING PERMIT NO.  
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**ARROYO VISTA COMMUNITY PARK**  
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PARKS, RECREATION & COMMUNITY DISTRICT  
**CONSTRUCTION DETAILS**

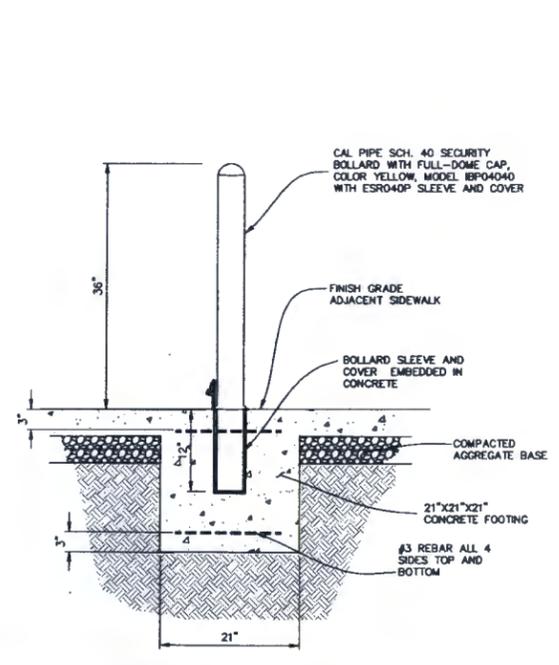
SHEET 18  
OF 19  
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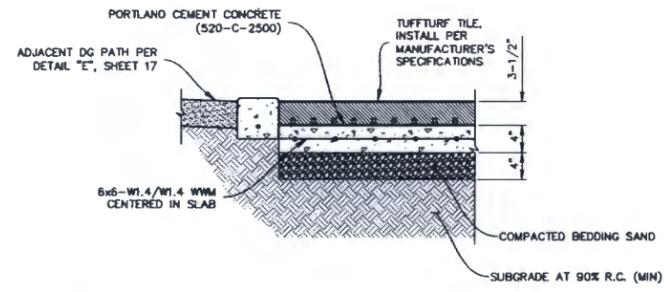
**WEIR STRUCTURE AND DETENTION BASIN DETAIL**  
SCALE: 1" = 2'



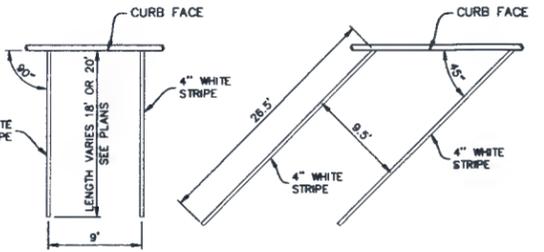
**WEIR STRUCTURE AND DETENTION BASIN SECTION**  
SCALE: 1" = 2'



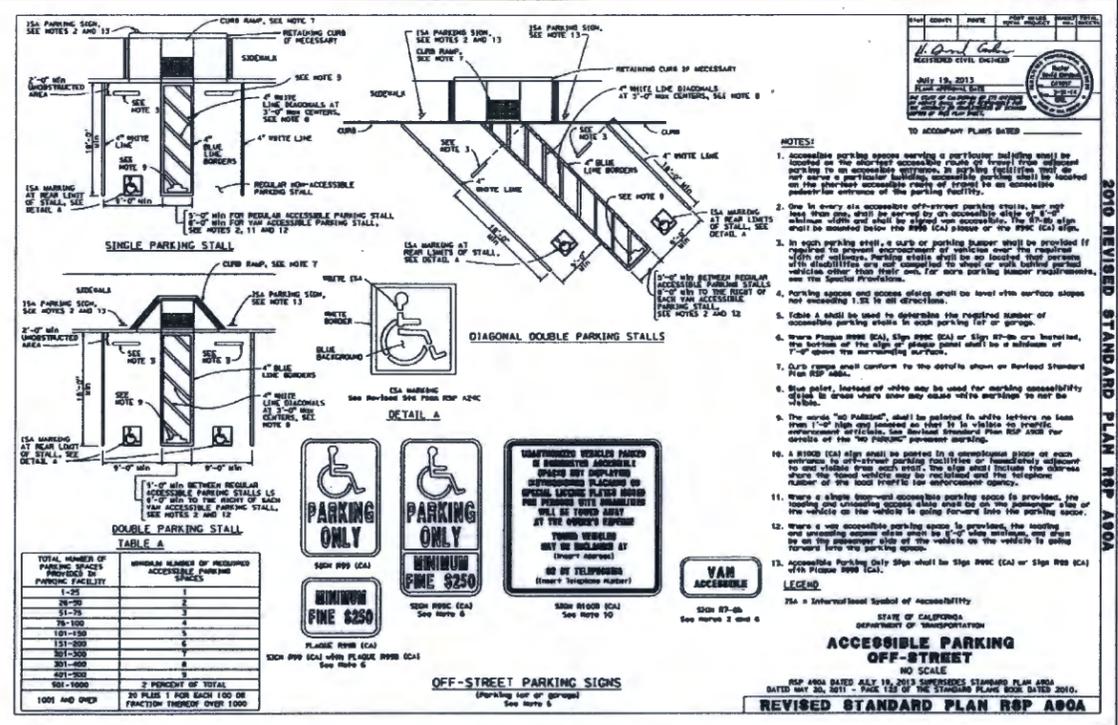
**EXTERNAL PADLOCK REMOVABLE BOLLARD**  
SCALE: N.T.S.



**EXERCISE AREA DETAIL**  
SCALE: N.T.S.



**TYPICAL PARKING STRIPING**  
SCALE: N.T.S.



**ACCESSIBLE PARKING DETAIL**  
SCALE: N.T.S.

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6				
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DAVID A. KLOTZLE  
J LAURENTOWSKI  
ENGINEERING REVIEWED BY:  
RCE 55752 EXP 12/31/2014



**CITY OF MOORPARK**  
PUBLIC WORKS DEPARTMENT  
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**ARROYO VISTA COMMUNITY PARK**  
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**CONSTRUCTION DETAILS**

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OF **19**  
DRAWING NO.  
14-MU-10989

## SECTION 31 10 00

### SITE CLEARING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  1. Protecting existing trees to remain.
  2. Removing existing trees, shrubs, groundcovers, plants, and grass.
  3. Clearing and grubbing.
  4. Stripping and stockpiling topsoil.
  5. Removing above- and below-grade site improvements.
  6. Disconnecting and capping or sealing site utilities.
  7. Temporary erosion and sedimentation control measures.

##### 1.2 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

##### 1.3 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site-clearing operations until temporary erosion and sedimentation control measures are in place.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Contractor shall conduct a site walk with Owner to locate and clearly flag trees and vegetation to remain or to be relocated.

- C. Protect existing site improvements to remain from damage during construction.
    - 1. Restore damaged improvements to their original condition, as acceptable to Owner.
- 3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL
- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to a sediment and erosion control plan, specific to the site that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction whichever is more stringent.
  - B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- 3.3 TREE PROTECTION
- A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.
  - B. Do not excavate within tree protection zones, unless otherwise indicated.
  - C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the Owner.
- 3.4 UTILITIES
- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
    - 1. Arrange with utility companies to shut off indicated utilities.
  - B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
    - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
    - 2. Do not proceed with utility interruptions without Owner's written permission.
- 3.5 CLEARING AND GRUBBING
- A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - B. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.
- 3.6 TOPSOIL STRIPPING
- A. Remove sod and grass before stripping topsoil.
  - B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

3.8 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

**END OF SECTION**

## SECTION 31 20 00

### EARTH MOVING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Preparing and grading sub grades for slabs-on-grade, walks, pavements, and landscaping.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage and moisture-control fill course for slabs-on-grade.
  - 4. Base course for walks and pavements.
  - 5. Subsurface drainage backfill for walls and trenches.
  - 6. Excavating and backfilling trenches within building lines.
  - 7. Excavating and backfilling for underground utilities and appurtenances outside building lines.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
  - 1. "Site Clearing" for site stripping, grubbing, topsoil removal, and tree protection.
  - 2. "Foundation Drainage Systems" for footings, underslab, and wall drainage.
  - 3. "Landscape Work" for finish grading, including placing and preparing topsoil for lawns and planting.
  - 4. "Cast-In-Place Concrete" for concrete encasings, cradles, and appurtenances for utility systems.

##### 1.3 REFERENCE SPECIFICATION

- A. Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", Latest Edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.

##### 1.4 DEFINITIONS

- A. Excavation consists of the removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below aggregate base, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Base Course: The layer placed between the subgrade and surface pavement in a paving system.
- E. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.

- F. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at the Contractor's expense.
- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- H. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.
- I. Compaction: Any method of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum dry density obtained by the test procedure described in ASTM D 1557 for general soil types abbreviated in this Specification as "\_\_\_ percent of maximum dry density".
- J. Hard Material: Weathered rock, dense consolidated deposits or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.
- K. Lift: A layer or course of soil placed on top of previously prepared or placed soil in a fill or embankment.
- L. Unsatisfactory Material: Soil or other material identified as having insufficient strength or stability to carry intended loads without excessive consolidation or loss of stability.

#### 1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
  - 1. Location of borrow materials.
- B. Photographs or video tape of existing adjacent structures and site improvements.

#### 1.6 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.
- B. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- C. Testing and Inspection Service: Employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- D. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
  - 1. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Engineer, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

#### 1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.
  - 1. Provide a minimum 48-hours' notice to the Engineer and receive written notice to proceed before interrupting any utility.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.
- C. Groundwater elevations that may be indicated are those existing at the time that subsurface investigations were made and do not necessarily represent groundwater elevations at the time of construction.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
- C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- D. Backfill and Fill Materials: Satisfactory soil materials.
- E. Base Material: Shall conform to crushed aggregate base or crushed miscellaneous base in accordance with section 200-2.2 or 200-2.4, respectively, of the Reference Specification, and compacted to at least 95% of the maximum dry density as determined by ASTM Test Method D 1557.
- F. Engineered Fill: Well graded granular soil with an expansion index less than 20 and free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
- G. Bedding Material: Shall be base materials with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve; or clean sand classified in accordance with ASTM D 2487.
- H. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100 percent passing a 1-1/2-inch sieve and not more than 5 percent passing a No. 8 sieve.
- I. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 50 sieve.
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

### 2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a

protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep.

1. Tape Colors: Provide tape colors to utilities as follows:
  - a. Red: Electric.
  - b. Yellow: Gas, oil, steam, and dangerous materials.
  - c. Orange: Telephone and other communications.
  - d. Blue: Water systems.
  - e. Green: Sewer systems.
  - f. White: Steam systems.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Tree protection is specified in the "Site Clearing" section.
- D. Prepare subgrade and place base materials in accordance with sections 301-1.2 and 301-2, respectively, of the Reference Specification.

### 3.2 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

### 3.3 EXCAVATION

- A. General: Shall be to the contours and dimensions indicated. Keep excavations free from water and debris while construction is in progress. Notify the Owner immediately in writing where it becomes necessary to remove hard, soft, weak, or wet material to a depth greater than indicated. Unless otherwise indicated, concrete placed below grade will be formed and excavations shall allow for placement and removal of forms. Side cuts shall be cribbed and shored as required.
- B. Explosives: Do not use explosives.
- C. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

### 3.4 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.
- B. Unshored Temporary Excavations: Unshored temporary excavations may be sloped back at 1 to 1 (horizontal to vertical) or flatter. Where sloped embankments are used, the tops of the slopes should be barricaded to prevent vehicles and storage loads within seven feet of the tops of the slopes. If the temporary construction slopes will be maintained during the rainy season,

construct berms along the tops of the slopes where necessary to prevent run-off water from entering the excavation and eroding the slope faces.

3.5 EXCAVATION FOR STRUCTURES – NOT USED

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements as necessary to permit placing of at least 2 feet under concrete pavement and at least 1 foot under asphalt concrete pavement of non-expansive soils (Expansion Index less than 20) engineered fill beneath indicated elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavation made with power-driven equipment is not permitted within two feet of any known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, use hand or light equipment excavation. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines and other existing work affected by the excavation work of this Section until approval for backfill is granted by the geotechnical engineer. Immediately report damage to utility lines or subsurface construction to the Owner.
- B. Where unidentified existing utilities are encountered, determine whether these are active or abandoned. Remove interfering portions of abandoned utilities and cap or plug open ends of pipe to remain. The cap or plug must seal the opening in such a manner that would permit remaining portions of the utility to be reactivated. Notify Owner for instructions on utilities which are determined to be active. Do not proceed without instructions, except to correct an immediate hazard or emergency condition. Relocation work performed on an active utility without obtaining prior approval from Owner shall be done at the Contractor's expense and liability.
- C. In areas where compacted backfill has been placed, additional consolidation may occur after completion due to changes in moisture content and surcharge. Utility connections crossing this backfill, and improvements adjoining the building at the backfill line shall be installed taking into account this additional consolidation, or sufficient time shall be scheduled between backfilling operations and such improvements to allow this consolidation to take place. Damage to utilities or other improvements due to Contractor's negligence in regard to this paragraph shall be repaired at the Contractor's expense.
- D. Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, and any other damage. Repair and re-establish damaged or eroded grades and slopes and restore surface construction prior to acceptance.
- E. Cutting Pavement, Curbs, and Gutters: Saw cut with neat, parallel, straight lines one foot wider than trench width on each side of trenches and one foot beyond each edge of pits. If an existing pavement joint or cracked area is within two feet outside of a designated sawcut line shown on the Drawings, removal and resurfacing shall be to that joint, and/or shall include the crack or cracked area, unless otherwise approved by Engineer.
- F. Contractor shall pothole at all identifiable crossings of existing utilities prior to any trenching operations and provide Engineer with a survey of the top elevations (and bottom elevations, if applicable), of possible interferences so that an evaluation of necessary adjustments to the current profile or alignment may be made. Additionally, Engineer shall be given the opportunity to view possible conflicts in the field prior to providing revised designs.
- G. Provide a minimum cover from grade of 3 feet for water mains and gas mains, unless otherwise noted. Storm drains and sewers shall be to the depths indicated. Where

settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.

- H. Keep excavations free from water while construction is in progress.
- I. Notify the Owner immediately in writing if it becomes necessary to remove rock or hard, unstable, or otherwise unsatisfactory material to a depth greater than indicated. Excavate large rock, boulders, and other unyielding material to an overdepth at least 6 inches below the bottom of the pipe, conduit, duct and appurtenances, unless otherwise indicated or specified. Over-excavate soft, weak, or wet excavations to an overdepth at least 12 inches below the bottom of the pipe, conduit, duct or appurtenances unless otherwise indicated or specified.
- J. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
- K. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe. See plans for detail.
- L. At the option of the Contractor, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified.
- M. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
  - 1. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
  - 3. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation.

### 3.8 APPROVAL OF SUBGRADE

- A. Notify Engineer when excavations have reached required subgrade.
- B. When Engineer determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
  - 1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Engineer.

### 3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Engineer.

1. Fill unauthorized excavations under other construction as directed by the Engineer.
- B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Engineer.
- 3.10 STORAGE OF SOIL MATERIALS
- A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
1. Stockpile soil materials away from edge of excavations a minimum distance of 7 feet or depth of excavation, whichever is greater. Do not store within drip line of remaining trees.
- 3.11 BACKFILL
- A. Backfill excavations promptly, but not before completing the following:
1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
  2. Surveying locations of underground utilities for record documents.
  3. Testing, inspecting, and approval of underground utilities.
  4. Concrete formwork removal.
  5. Removal of trash and debris from excavation.
  6. Removal of temporary shoring and bracing, and sheeting.
  7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- 3.12 UTILITY TRENCH BACKFILL AND COMPACTION
- A. Backfilling of exterior utility trenches shall not be undertaken until geotechnical engineer has received 24-hours notice, until required tests and inspections have been completed, and until as-built location notes have been furnished. Remove uninspected backfill in accordance with requirements of this specification. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings.
- B. Place backfill material in accordance with Section 306-1.3.2 of the Reference Specifications and achieve at least 90% of the maximum density per ASTM D 1557. The top 12 inches of backfill in the building or paved areas shall be compacted to 95% of maximum density per ASTM D 1557.
- C. Compaction by ponding or flooding will not be permitted.
- D. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- E. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings.
- F. Provide 4-inch-thick concrete base slab support for piping or conduit with less than 2'-6" of cover below finish surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway base.
- G. Place and compact initial backfill of satisfactory soil material or aggregate base material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- H. Coordinate backfilling with utilities testing.
- I. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.
- J. Place and compact final backfill of satisfactory soil material to final subgrade.
- K. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- L. Manholes and other Appurtenances: Provide at least 12 inches clear from outer surfaces to the embankment or shoring. Remove rock as specified herein. Remove unstable soil that is incapable of supporting the structure to an over-depth of one foot and refill with gravel or sand to the proper elevation and compact to 95% percent of maximum density.

### 3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
  1. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
- B. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and re-compact to required density.
- C. Place fill material in layers to required elevations for each location listed below.
  1. Under grass, use satisfactory excavated or borrow soil material.
  2. Under walks and pavements, use base material or satisfactory excavated or borrow soil material.
  3. Under steps and ramps, use base material.
  4. Under building slabs, use drainage fill material.
  5. Under footings and foundations, use engineered fill.

### 3.14 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to minimum 3 percent above optimum moisture content for cohesive soils and to near optimum for cohesionless soils.
  1. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
  2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
    - a. Stockpile or spread and dry removed wet satisfactory soil material.

### 3.15 COMPACTION

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure. Keep rollers and other heavy equipment at least 18 inches from footings, foundations, piers and walls of buildings and accessory construction. Use mechanical and hand tampers weighing at least 90 pounds with

a maximum face area of 48 inches square to compact backfill within 18 inches of construction and where access is restricted.

- C. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557:
1. For general site fills, compact each layer of backfill or fill material at 90 percent maximum dry density.
  1. Under structures, building slabs, steps, and pavements, scarify and compact the top 12 inches below subgrade at 95 percent maximum dry density.
  2. Under walkways, scarify and compact the top 6 inches below subgrade at 90 percent maximum dry density.
  3. Under lawn or unpaved areas, compact the top 6 inches below subgrade at 85 percent maximum dry density.

### 3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between existing adjacent grades and new grades.
  2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
  3. If necessary, the Contractor's selected equipment and construction procedure shall be altered, changed or modified in order to meet the specified compaction requirements. Flooding and water jetting is prohibited.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 0.10 foot, unless otherwise indicated.
  2. Concrete Walks: Plus or minus 0.05 foot.
  3. Pavements:
    - a. Concrete: 0.02 foot minus, with no high spots.
    - b. Asphalt: 0.05 foot minus, with no high spots.
- C. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

### 3.17 BASE COURSE

- A. Under pavements and walks, place base course material on prepared subgrades to pavements.
1. Compact base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95 percent of ASTM D 4254 relative density.
  2. Shape base to required crown elevations and cross-slope grades.
  3. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
  4. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.
- B. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders at least 12 inches wide of acceptable soil materials and compact simultaneously with each base layer.

### 3.18 PAVEMENT REPAIR

- A. Repair or patch asphalt pavement as specified in Asphalt Concrete Paving Section. Repair or patch concrete pavement, curbs and gutters as specified in the Concrete Paving Section. Do not repair pavement until trench has been backfilled and compacted as herein specified. Provide a temporary road surface of gravel or crushed stone over the backfill portion until permanent pavement is repaired. Remove and dispose of temporary road surface material when permanent pavement is placed.

### 3.19 FIELD QUALITY CONTROL

- A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
  - 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.
    - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
    - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.
  - 2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Engineer.
  - 3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
  - 4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
  - 5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.
- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.

### 3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace material to depth directed by the Engineer; reshape and re-compact at optimum moisture content to the required density.
- C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

### 3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

**END OF SECTION**

## SECTION 31 23 17

### TRENCHING

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Excavate trenches for utilities.
- B. Compacted bedding.
- C. Backfilling and compaction to required elevations.
- D. Slurry concrete.

##### 1.02 REFERENCES

- A. ASTM C150 - Portland Cement.
- B. ASTM C494 - Chemical Admixtures for Concrete.
- C. ASTM D1557 - Laboratory compaction characteristics of soil using modified effort.
- D. SSPWC - Standard Specifications for Public Works Construction, Latest Edition.
- E. California Code of Regulations, Title 8, Industrial Relations, Construction Safety Orders, Division 01, Chapter 4, Sub-Chapter 4, Article 6 Excavations.
- F. California Public Contract Code, Section 7104 - Public Works Contracts for Digging Trenches or Excavations; Notice on Discovery of Hazardous Waste or Other Unusual Conditions; Investigations; Change Orders; Effect on Contract.
- G. California Labor Code, Section 6705 - Public Works Contracts requiring detailed plans for shoring, bracing, sloping, indicating protection from caving ground for trenching work in excess of 5' deep and contract amounts stipulated therein.

##### 1.03 QUALITY ASSURANCE

- A. Verify survey benchmark and intended elevations for Work.

#### PART 2 - PRODUCTS

##### 2.01 TRENCH FILL AND BEDDING MATERIALS

- A. Sand: Sand shall consist of natural or manufactured granular material, or a combination thereof, free of deleterious amounts of organic material, mica, loam, clay and other substances not suitable for the purpose intended. Conform to Subsection 200-1.5.5, SSPWC, for gradation as required for Portland Cement Concrete, sand must achieve compaction of a minimum 90 percent.

- B. Imported Fill: Granular, free of debris, no gravel larger than 3 inches in any dimension, non-expansive, approved by the Engineer prior to placement on the site.
- C. Slurry Concrete:
  1. Slump: Between 4 inches and 6 inches.
  2. Aggregate: 40 percent sand by weight, 60 percent pea gravel, minimum 1/4 inch, maximum 5/8 inch.
  3. Portland Cement: ASTM C150, 2-sack mix (2 sacks of cement per cubic yard).
  4. Admixture: Calcium Chloride free, in proportions not to exceed the manufacturer's recommendations.
  5. Artificial Coloring: ASTM C494. Mix in Mapico Red pigment, proportions as recommended by the manufacturer, L.M. Scofield or equal.
  6. Sufficient water shall be added to produce a fluid, workable mix that will flow and can be pumped without segregation of aggregate. Material shall be mechanically mixed until the cement and water are thoroughly dispersed.
- D. Stockpiled Fill: Onsite soils, stored separately on the site, approved for re-use by the Engineer.

2.02 ACCESSORIES

- A. Underground Warning Tape: Metallic Detection Tape, aluminum core, 6 inches wide AASHTO specification colors, by Safety Sign Company, Cleveland, OH, or equal.
- B. Color Coding and Lettering: as required for type of underground utility.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify fill material to be reused is acceptable to the Geotechnical Engineer.

3.02 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Backfill with approved fill and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Prior to commencement of trenching operations, notify Underground Service Alert of Southern California (800) 422-4133, Monday through Friday, 7:00 A.M. to 5:00 P.M.

3.03 EXCAVATION

- A. Conform to Construction Safety Orders, Title 8, CCR, For Sloping, Benching, Shoring, Bracing, Protective Systems, and Shafts.
- B. Conform to Section 7104, Public Contract Code. Promptly notify Owner of any contact with hazardous materials or differing conditions.

- C. Conform to Section 6705, Labor Code. Provide shoring and bracing plan or other provisions intended to prevent caving ground.
- D. Excavate subsoil required for utilities. Trenches shall be level or parallel to finish grade unless designated on drawings to be installed to specific gradient.
- E. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.
- F. Water, storm drainage piping located in the same trench shall be separated by 12 inches horizontally and vertically, and water line shall be placed on a solid shelf excavated on one side of the common trench. Cross-over water lines shall also be separated 12 inches vertically from storm drainage pipe.
- G. Water and sewer piping shall not be located in the same trench and they shall be separated by 12 inches horizontally and 12 inches vertically.
- H. Excavation shall not interfere with normal 45 degree bearing splay of foundations. Parallel trenches, no closer than 18 inches from building foundations.
- I. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- J. Remove lumped subsoil, boulders and rock.
- K. Correct unauthorized excavation.
- L. Stockpile approved excavated material in area designated on site and remove excess material not being used from site.

#### 3.04 BEDDING

- A. Support pipe and conduit during placement and compaction of bedding fill. Provide uniform bearing along entire length. Conform to Section 306, SSPWC.
- B. Bedding: Place and compact materials in continuous layers not exceeding 6 inches compacted depth, ASTM D1557.

#### 3.05 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen materials.
- B. Fill areas will be inspected, tested and approved by Geotechnical Engineer.
- C. Soil Fill over Bedding: Place and compact material in continuous layers as scheduled, compacted to ASTM D1557.
- D. Employ placement method that does not disturb or damage conduit, ducts or piping in trench.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density. When operations are interrupted by rain, do not resume Work until field tests indicate that moisture content and density of fill are as previously specified.

- F. Remove surplus backfill materials from site and dispose legally.
- G. Leave fill material stockpile areas completely free of excess fill materials.
- H. Minimum Cover Over Piping, Conduits or Duct Banks: 24 inches.
- I. Lay out and install or otherwise confirm invert elevations of all gravity flow systems to avoid conflict with other sub-surface structures or utilities of any kind. Adjust elevations or layout of pipes, conduits or duct banks to permit the required gravity flow.
- J. Jetting for utility trenching compaction may be used outside building perimeter and only when recommended by Geotechnical Engineer, in accordance with Section 306 SSPWC.
- K. Pressurized piping shall be installed level, or shall be installed parallel to finish grades unless designated on the Drawings to be installed to specific gradients.

### 3.06 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: 0.2 ft from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 0.2 ft from required elevations.

### 3.07 FIELD QUALITY CONTROL

- A. Backfill materials and operations will be inspected and approved by Geotechnical Engineer including earth bank slopes (cut or fill).
- B. Tests, analysis and compaction of fill material will be performed in accordance with ASTM D1557.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- D. Frequency of Tests: Geotechnical Engineer may make as many tests as are necessary to ensure specified results.

### 3.08 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Recompact fills subjected to vehicular traffic.

### 3.09 TEMPORARY PROTECTION OF UNFINISHED WORK

- A. Trenching for placement of underground utilities shall be covered and protected with steel trench plates during non-work hours. Adequate warnings and protection indication of open trenches during work hours must be provided for project safety.

### 3.10 SCHEDULE

- A. Storm and Sanitary Piping:
  - 1. Bedding Fill: Sand, minimum thickness below piping 0.4 times outside diameter of pipe but no less than 4 inches. Minimum thickness above top of piping, 12 inches, compacted to 90 percent.
  - 2. Cover with stockpiled fill in 8-inch lifts to specified subgrade elevations, compact to 90 percent or to 95 percent under vehicle traffic-supporting paved areas.
  - 3. Fill: Slurry concrete, 6" cover at top, bottom and sides of pipes at exterior paved areas (at vehicle traffic) where minimum fill cover is less than 12" below finished elevation of paving.
  - 4. Bury warning tape marked "Caution Sewer Line" 12 inches above all concrete-encased piping. Align tape parallel to and within 3 inches of the centerline of the piping.
  - 5. Synthetic and Perimeter Drainage System: Refer to Section 32 18 13.
  
- B. Power Ducts: Concrete Encased
  - 1. Fill: Slurry concrete, 3 inches cover at top, bottom, between conduits and sides of duct bank.
  - 2. Fill: Slurry concrete, 6 inches cover at top, bottom and sides of duct bank conduit at exterior paved areas where minimum fill cover is less than 24" below finished elevation of paving, less than 12" below finished elevations of interior floor slabs and at building footings where conduit is in the footing structural splay.
  - 3. Install two No. 4 bars in slurry concrete at top of bank under paved areas, minimum 3 inch concrete cover.
  - 4. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or to 95 percent under traffic-supporting paved areas.
  - 5. Bury warning tape marked "Caution Buried High Voltage Line" 12 inches above all concrete-encased duct banks. Align tape parallel to and within 3 inches of the centerline of the duct bank.
  
- C. Water Piping and Gas Piping:
  - 1. Bedding Fill: Sand, minimum thickness below piping 0.4 times outside diameter of pipe but not less than 4". Minimum thickness above top of piping, 6 inches, compacted to 90 percent.

2. Fill: Slurry concrete, 6 inches cover at top, bottom and sides of pipes at exterior paved areas where minimum fill cover is less than 24" below finished elevation of paving, and less than 12" below finished elevations of interior floor slabs and at building footings where piping is in the footing structural splay.
  3. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
  4. Observe joints at pressure tests.
  5. Bury warning tape marked "Caution Buried Gas (or "Pipeline") Line" 12 inches above all trenching. Align tape parallel to and within 3 inches of the centerline of trench.
- D. Fire Lines:
1. Bedding Fill: Manufactured Sand, minimum 6" thickness under piping, minimum thickness above top of piping and sides, 6", compact to 90 percent.
  2. Fill: Slurry concrete, 6" cover at top pipes at exterior paved areas where minimum fill cover is less than 24" below finished elevation of paving.
  3. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
  4. Bury warning tape marked "Caution Buried Pipeline" 12 inches above all trenching. Align tape parallel to and within 3 inches of the centerline of trench.
- E. Low Voltage Conduits and Communications: Direct Burial Minimum trench depth 36 inches.
1. Bedding Fill: Sand, 6 inches at bottom, sides and 12 inches on top, compacted to 95 percent.
  2. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
  3. Bury warning tape marked "Caution Buried Communication Line Below" 12 inches above conduits. Align tape parallel to and within 3 inches of the centerline of conduits.

**END OF SECTION**

## SECTION 31 23 23

### BACKFILLING

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Authorized types of fill.
- B. Building area backfilling to subgrade elevations.

##### 1.02 REFERENCES

- A. ASTM D1557 - Laboratory compaction characteristics of soil using modified effort.
- B. SSPWC - Standard Specifications for Public Works Construction, Latest Edition.
- C. Chapter 18 and 33, California Building Code.
- D. CSS - Caltrans Standard Specifications, Latest Edition.

##### 1.03 SUBMITTALS

- A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each on-site soil material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D 1557 for each on-site soil material proposed for fill and backfill.

#### PART 2 - PRODUCTS

##### 2.01 FILL MATERIALS

- A. This Section establishes standards of quality for backfill materials to be used as approved by Geotechnical Engineer in accordance with Chapter 18 CBC, Section 1803.2 and Appendix J Section J107, California Building Code, and as scheduled in other Sections of this specification.
- B. Crushed Rock and Rock Dust: Crushed rock and rock dust shall be product of crushing rock or gravel. Portion of material that is retained on a 3/8 inch sieve shall contain at least 50 percent of particles having three or more fractured faces. Not over 5 percent shall be pieces that show no such faces resulting from crushing. Of that portion which passes 3/8 inch sieve but is retained on No. 4 sieve, not more than 10 percent shall be gravel particles. Crushed rock shall conform to 3/4 inch sieve size in accordance with Subsection 200-1.2, SSPWC, Crushed Rock Gradation Table.

- C. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded to the following:
  1. Minimum Size: 1/4 inch.
  2. Maximum Size: 5/8 inch.
- D. Sand: Sand shall consist of manufactured granular material, or combination thereof, free of deleterious amounts of organic material, mica, loam, clay and other substances not suitable for purpose intended. Conform to Section 200-1.5.5, SSPWC, for gradation as required for Portland Cement Concrete, sand must achieve compaction of a minimum 90 percent.
- E. Crushed Aggregate Base: Crushed rock and rock dust conforming to requirements of Section 200-1.2, SSPWC, with 3/8 inch sieve requirement waived, or Class 2 aggregate base as defined in Section 26, CSS.
- F. Imported Fill: Clean granular, free of debris, no rock larger than 3 inches in any dimension, non-expansive, approved by Geotechnical Engineer prior to placement on site.
- G. Concrete: Structural, as specified in Section 03 30 00.
- H. Concrete Slurry: as specified in Section 31 23 17.
- I. Stockpiled Fill: On-site soils, stored separately on site, approved for re-use by Geotechnical Engineer.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify fill materials to be reused or imported are acceptable to Architect.
- B. Verify foundation perimeter drainage installation has been inspected and approved.

#### 3.02 BACKFILLING

- A. Backfill and compact areas to contours and elevations with unfrozen materials. Remove debris from areas to receive backfills.
  1. Compaction: ASTM D1557, Compact to 90 percent of maximum dry density.
  2. Floor slabs shall be in place a minimum of 7 days before backfill is placed against walls.
- B. Fill areas and types of fill shall be inspected, tested and approved by Geotechnical Engineer.
- C. Employ placement method that does not disturb or damage foundation perimeter drainage, foundation waterproofing and protective cover or utilities in trenches. Do not commence backfill until such work is in place, inspected and approved.

- D. Maintain optimum moisture content of backfill materials to attain required compaction density. When operations are interrupted by rain, do not resume work until field tests indicate that moisture content and density of the fill are as previously specified.
- E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.
- F. Make grade changes gradual. Blend slope into level areas.
- G. Remove surplus backfill materials from site.
- H. Leave fill material stockpile areas completely free of excess fill materials.
- I. Compaction Equipment: Wherever feasible, perform compaction with approved power-driven equipment such as rollers and sheeps-foot compactors. Compact areas inaccessible to rollers with pneumatic tampers or other approved compactors.
- J. Flooding and jetting is not permitted.

### 3.03 TOLERANCES

- A. Top Surface of Backfilling Subgrade: Within 0.05 feet from required elevations.

### 3.04 FIELD QUALITY CONTROL

- A. No fill shall be placed on any prepared surface until that surface has been inspected and approved by Geotechnical Engineer.
- B. If tests indicate work does not meet specified requirements, remove work, replace and retest. Cost of retests shall be paid by Owner and deducted from contract sum by Change Order.
- C. Frequency of Tests: Architect may require as many tests as are necessary to ensure specified results.

### 3.05 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Recompect fills subjected to and damaged by vehicular traffic.

**END OF SECTION**

## SECTION 32 12 16

### ASPHALT PAVING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hot-mix asphalt paving.
  - 2. Hot-mix asphalt patching.
  - 3. Asphalt surface treatments:
    - a. Fog seals.
    - b. Slurries.
  - 4. Pervious asphalt paving.
- B. Related Sections include the following:
  - 1. "Earth Moving" for aggregate base courses and aggregate pavement shoulders.
  - 2. "Pavement Marking" for pavement marking requirements.

##### 1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix and permeable asphalt pavement according to the materials, workmanship, and other applicable requirements of the following standard specifications:
  - 1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", Latest Edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "City Representative". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.
  - 2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.
  - 3. The latest edition of the Asphalt Institute's publication "The Asphalt Handbook".
  - 4. Caltrans Standard Specifications

##### 1.4 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: For each job mix proposed for the Work.
- C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

##### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed hot-mix and permeable asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

- B. **Manufacturer Qualifications:** Engage a firm experienced in manufacturing hot-mix and permeable asphalt similar to that indicated for this Project and with a record of successful in-service performance.
- C. **Regulatory Requirements:** Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.
- E. **Asphalt-Paving Publication:** Comply with Asphalt Institute's "The Asphalt Handbook," except where more stringent requirements are indicated.
- F. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings" Review methods and procedures related to asphalt paving including, but not limited to, the following:
  1. Review condition of substrate and preparatory work performed by other trades.
  2. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
  3. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
  4. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
  5. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

#### 1.6 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
  1. **Prime and Tack Coats:** Minimum surface temperature of 60 deg F (15.5 deg C).
  2. **Slurry Coat:** Comply with weather limitations of ASTM D 3910.
  3. **Asphalt Base Course:** Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
  4. **Asphalt Surface Course:** Minimum surface temperature of 60 deg F (15.5 deg C) at time of placement.

### PART 2 - PRODUCTS

#### 2.1 ASPHALT PAVEMENT MATERIALS

- A. **Asphalt Pavement Leveling Course:** Conform to Performance Grade B-PG 64-10 in section 203-1.2 and section 203-6 of the Reference Specification.
- B. **Asphalt Pavement Wearing (Surface) Course :** Conform to Performance Grade III C2-PG-10 in section 203-1.2 and section 203-6 and section 400-4 of the Reference Specification.
- C. **Tack Coat:** Emulsified asphalt grade SS-1h conforming to section 203-3 of the Reference Specification.
- D. **Asphalt Paint:** Conform to ASTM D41 or D43 per section 203-8 of the Reference Specification.
- E. **Slurry Seal:** Emulsified asphalt grade SS-1hand aggregate conforming to section 203.5 of the Reference Specification.
- F. **Fog Seal:** ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- I. **Water:** Potable.

- II. Permeable Asphalt Paving  
Contractor shall submit all materials for approval.

## 2.2 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Subgrade and Base:
  - 1. Proof-roll subgrade using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify City Representative in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

### 3.2 PATCHING AND REPAIRS

- A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Re-compact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
  - 1. Tack coat faces of excavation and allow to cure before paving.
  - 2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
  - 3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
  - 1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to re-seat pieces firmly.
  - 2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.
- C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
  - 1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.
- E. Asphalt paint: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.
  - 1. Allow asphalt paint to cure undisturbed before paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  1. Sweep loose granular particles from surface of unbound aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
  1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.
- C. Tack Coat: If a leveling course has been used for construction traffic, apply tack coat to all leveling course surfaces in accordance with section 302-5.4 of the Reference Specification at a rate of 0.10 gallons per square yard.
- D. Asphalt Paint: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.
  1. Allow asphalt paint to cure undisturbed before paving.
  2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.4 HOT-MIX ASPHALT PLACING

- A. The asphalt pavement shall be completed in phases; the leveling course during construction for temporary construction traffic and storage of materials and; the wearing (surface) course just prior to turnover to Owner; unless the entire paving operation is completed just prior to turnover to the Owner. If this method is chosen, then no construction traffic or storage of materials shall be allowed on the finished pavement surface after its completion. Contractor shall schedule final surface course paving operations so that the required waiting period specified in the Division 2 Section "Pavement Marking" will allow project completion within the specified time.
- B. Construct asphalt pavement in accordance with section 302-5 of the Reference Specification and as shown on the Drawings.
- C. Two Layer Method: The leveling course shall be installed to elevations which will allow the future placement of a wearing (surface) course no thinner than 1-1/2 inches. Prior to placing the wearing (surface) course, repair all areas damaged during construction use, thoroughly clean the leveling course of all loose material and place a tack coat pursuant to paragraph 3.4.D. herein.

Contractor is further cautioned that the use of this two-layer method will result in construction traffic using pavements which are thinner than designed for the traffic expected for the completed project, and that damage due to wheel loads and materials storage during construction is probable. Any such damage shall be repaired to the satisfaction of the City Representative and the Owner prior to placement of the surface course.

### 3.5 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
  1. Clean contact surfaces and apply tack coat.
  2. Offset longitudinal joints in successive courses a minimum of 6 inches (150 mm).

3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).
4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.6 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
  1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and re-rolling to required elevations.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Repairs: Remove paved areas that are defective, pond water or are contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt, with a thickness one inch greater than the existing, and to match existing finish surface grades such that no local ponding of water will result. Compact by rolling to specified density and surface smoothness. Note that no application of seal coats of any kind will be allowed for any reason on pavements newer than one year. This is to allow for proper curing of the newly placed asphalt pavement, as recommended by The Asphalt Institute.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.7 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  1. Leveling Course: Plus or minus 1/2 inch (13 mm).
  2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
  1. Leveling Course: 1/4 inch (6 mm).
  2. Surface Course: 1/8 inch (3 mm).

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

### 3.8 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.70 L/sq. m) to existing asphalt pavement and allow to cure. Lightly dust areas receiving excess fog seal with a fine sand.
- B. Slurry seals: Apply in accordance with section 302-4 of the Reference Specification.
  1. Roll slurry seal to smooth ridges and provide a uniform, smooth surface.

### 3.9 WHEEL STOPS **NOT USED**

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
  1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. Finish Grade: Completed pavement surface shall be tested for proper drainage through flood testing. Contractor shall schedule a flood test to be held in the presence of the City Representative and the Owner to assure that the finished pavement surfaces are consistent with the intent of the Grading Plans with respect to surface drainage, and that drainage devices function properly. It is suggested that a water truck or fire hose be used for the flooding; garden hoses will not be acceptable. Pavements not deemed acceptable subsequent to this test shall be removed and replaced pursuant to paragraph 3.3 herein. Overlays with thicknesses less than 1-1/2 inches will not be acceptable for these repairs.
- F. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
  1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
  2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, but in no case will fewer than 3 cores be taken.
    - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

**END OF SECTION**



## SECTION 32 13 13

### CONCRETE PAVING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes exterior Portland cement concrete paving for the following:
  1. Roadways.
  2. Curbs, gutters and mow strip.
  3. Walkways.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  1. "Earth Moving" for subgrade preparation, grading and base course.
  2. "Pavement Marking" for pavement marking requirements.
  3. "Cast-in-Place Concrete" for general building applications of concrete.
  4. "Paving Joint Sealants" for joint fillers and sealants within concrete paving and at joints with adjacent construction.

##### 1.3 SYSTEM DESCRIPTION

- A. Provide concrete pavement according to the materials, workmanship, and other applicable requirements of the following standard specifications:
  1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", Latest Edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "City Representative". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.
  2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.

##### 1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Product data for integral colored concrete pigments. Include manufacturer's instructions for mixing, placement, curing, and sealing.
- D. Minutes of pre-installation conference.

##### 1.5 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.

1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
  2. ACI 318, "Building Code Requirements for Reinforced Concrete."
  3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.
- D. Field-Constructed Mockup: Cast mockup of size required (but not less than 10 feet by 10 feet) to demonstrate typical joints, surface finishes, textures, color, and standard of workmanship.
1. Notify City Representative a minimum of 4 days in advance prior to applying sandblast finish to mock-up. Apply sandblast finish in the presence of the City Representative and adjust finish as required by the City Representative .
  2. When City Representative determines that mockup does not meet requirements, demolish and remove it from the site and cast another until the mockup is accepted.
  3. Keep accepted mockup undisturbed during construction as a standard for judging completed paving. Undamaged mockup may be incorporated into the Work.
  4. Demolish accepted mockup and remove from site when directed by City Representative .
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings" and the following:
1. Before installing Portland cement concrete paving, meet with representatives of authorities having jurisdiction, Owner, City Representative , consultants, independent testing agency, and other concerned entities to review requirements. Notify participants at least 3 working days before conference.

## 1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

## PART 2 - PRODUCTS

### 2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
1. Use flexible or curved forms for curves of a 100-foot or less radius.
- B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
    - a. Debond Form Coating, L & M Construction Chemicals.
    - b. Crete-Lease 880 VOC, Cresset Chemical Company.

### 2.2 REINFORCING MATERIALS

- A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 40 for #3 bars and Grade 60 for bars larger than #3, deformed.
- B. Plain, Cold-Drawn Steel Wire: ASTM A 82.

- B. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- C. Dowel Sleeves: Speed Dowel, Aztec Concrete Accessories, Inc.
- D. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- E. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.
  - 1. Use supports with sand plates or horizontal runners where base material will not support chair legs.

### 2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II, low alkali.
  - 1. Use one brand of cement throughout Project. Coordinate with Section "Cast-In-Place Concrete."
  - 2. Provide white cement when required to achieve specified color in integral colored concrete.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4M non-reactive, and as follows. Provide aggregates from a single source.
  - 1. Maximum Aggregate Size: 1-inch.
  - 2. Do not use fine or coarse aggregates that contain substances that cause spalling.
  - 3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to City Representative .
- C. Water: Potable.
- D. Admixtures: Comply with requirements specified in Section "Cast-In-Place Concrete."
  - 1. Integral Colored Concrete: Use admixtures only as approved by the color pigment manufacturer. Do not use admixtures that will alter the color of integral colored concrete.
  - 2. Do not use admixtures containing calcium chloride or chloride ions.
- E. Aggregate for Integral Colored Concrete: ASTM C 33, Class 4M, non-reactive, and as follows: Provide aggregates from a single source.
  - 1. Maximum Aggregate Size and Type: 3/8-inch (range from 1/4-inch to 3/8-inch), pea gravel.
  - 2. Do not use fine or coarse aggregates that contain substances that cause spalling.
  - 3. Percentage of Fine Aggregate to Pea Gravel: 60 percent fines to 40 percent course aggregate.
  - 4. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to City Representative .

### 2.4 CURING MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
  - 1. Waterproof paper.
  - 2. Polyethylene film.

3. White burlap-polyethylene sheet.
- C. Liquid Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B. Moisture loss not more than 0.55 kg./sq. meter in 72 hours when applied at a rate of 200 sq. ft./gal.
1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. L & M Cure R, L & M Construction Chemicals, Inc.
    - b. 1100-Clear, W.R. Meadows, Inc.
  3. Do not use sodium silicate type curing agents.
  4. For integral colored concrete plaza and stair pavement, provide curing compound meeting the specified requirements and approved by the manufacturer of the integral color pigments for use on integral colored concrete paving. Coordinate with manufacturer of integral colored concrete pigments and determine compatibility of the curing compound with integral color pigment. Curing compound manufactured by the pigment manufacturer that also meets the requirements of this Section is acceptable.
    - a. Do not use curing compound that will alter the color of integral colored concrete.
- D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Eucobar; Euclid Chemical Co.
    - b. E-Con; L&M Construction Chemicals, Inc.
    - c. Confilm; Master Builders, Inc.

## 2.5 RELATED MATERIALS

- A. Bonding Agent: Acrylic or styrene butadiene, complying with ASTM C 1059, Type 2.
- B. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.
- C. Products: Subject to compliance with requirements, provide one of the following:
1. Bonding Agent:
    - b. SBR Latex; Euclid Chemical Co.
    - c. Daraweld C; W.R. Grace & Co.
    - d. Everbond; L&M Construction Chemicals, Inc.
    - e. Acryl-Set; Master Builders Inc.
  2. Epoxy Adhesive:
    - a. Burke Epoxy M.V., The Burke Co.
    - b. Concessive Standard Liquid; Master Builders, Inc.
    - c. Rezi-Weld 1000; W.R. Meadows, Inc.
  3. Color Pigments:
    - a. Davis Colors, Davis Colors Co.
    - b. Chromix Admixtures, L. M. Scofield Co.
- D. Concrete Sealer: Water-based, deep penetrating, non-staining, non-darkening silane micro emulsion.
1. Positive chloride-ion screening, prevents water intrusion, minimizes rebar corrosion and potential concrete spalling, and protects against damaging effects of alkalis and other contaminants.
  2. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
  3. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
    - a. Pentane WB, L & M Construction Chemicals, Inc. This product is intended to establish the characteristics and level of quality intended for this Project.

4. For integral colored concrete plaza and stair pavement, provide sealer meeting the specified requirements and approved by the manufacturer of the integral color pigments for use on integral colored concrete paving. Coordinate with manufacturer of integral colored concrete pigments and determine compatibility of the sealer with integral color pigment. Sealer manufactured by the pigment manufacturer that also meets the requirements of this Section is acceptable.
  - a. Do not use sealer that will alter the color of integral colored concrete.
- E. Color Pigments: ASTM C 979. For integral colored concrete use coloring pigments that are finely ground non-fading mineral oxides of synthetic or natural varieties and do not contain fillers, adulterants, or admixtures that will affect the characteristics or performance of the concrete mix design.
  1. Color: Match City Representative 's sample.

## 2.6 CONCRETE MIX

- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.
  1. Do not use the Owner's field quality-control testing agency as the independent testing agency.
  2. Prepare mixes for integral colored concrete in accordance with color pigment manufacturer's instructions.
    - a. Maximum Pigment Dosage Rate: 10 percent of the weight of cement.
    - b. Use the same aggregate, brand and type of cement for all integral colored concrete.
- B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
  1. Compressive Strength (28-Day): 3000 psi. minimum, Roadways and Walks.
  2. Compressive Strength (28-Day): 2500 psi. minimum, Curb, gutter and mow strip.
  3. Minimum cement content: shall be minimum 5-1/4 sacks per cubic yard.
  4. Maximum concrete slump: shall be 3 inches, plus or minus 1/2 inch, for all walks; and 4 inches, plus or minus 1 inch for all other Portland cement concrete paving, except for integral colored concrete paving maintain a slump of 3 inches.
  5. Water/Cement Ratio: shall be less than or equal to 0.5.
- C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.
- D. Admixtures: Comply with requirements specified in Section "Cast-In-Place Concrete".

## 2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
  1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## 2.8 HERBICIDE TREATMENT

- A. Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.
  1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

- a. Ciba-Geigy Corp.
- b. Dow Chemical U.S.A.
- c. E.I. Du Pont de Nemours & Co., Inc.
- d. FMC Corp.
- e. Thompson-Hayward Chemical Co.
- f. U.S. Borax and Chemical Corp.

## 2.9 SOURCE QUALITY CONTROL

- A. Color Control for Integral Colored Concrete: Arrange for the services of a qualified technical representative of the color pigment manufacturer, equipped with wet-batch color control test devices, at the ready-mix plant to ensure concrete of uniform color and matching City Representative 's sample for the mock-up and after mock-up is approved, matching mock-up with final concrete.

## PART 3 - EXECUTION

### 3.1 SURFACE PREPARATION

- A. Proof-roll subgrade or base surface prepared by others to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.

### 3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
  - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
  - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

### 3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

### 3.4 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
  - 2. Make joints, including sawed joints, full depth required and from edge to edge of paving.
- B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as shown on Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows:
  - 1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
  - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.
  - 3. Inserts: Form contraction joints by inserting pre-molded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.
- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
  - 1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- D. Expansion Joints:
  - 1. Isolation-Type Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects.
  - 2. Locate other expansion joints at intervals of 50 feet (min.), unless indicated otherwise.
  - 3. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
  - 4. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
  - 5. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint
- E. Installation of joint fillers and sealants is specified in Division 7 Section "Paving Joint Sealants."
- F. Install dowel bars and support assemblies at expansion joints where indicated. Lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.
- G. Where spacing is not shown, locate contraction joints at 10-foot maximum spacing, or as indicated in SSPWC.
- H. Where plastic "zip strips" are used to construct concrete joints, cut and remove, as a minimum, the top 1/4 inch of these strips after concrete has cured, and coordinate installation of joint filler, if shown on the Drawings, as specified in Section "Paving Joint Sealants".

### 3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Do not place concrete on surfaces that are frozen.
- C. Moisten subgrade or base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.
- H. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- I. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.
- J. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- K. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
  - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 3.6 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
  1. Burlap Finish: Drag a seamless strip of damp burlap across concrete, perpendicular to line of traffic, to provide a uniform gritty texture finish.
  2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.
  3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
  4. Do not use troweling machines within 12 inches of electrical junction and outlet boxes which are set to finish flush with concrete slabs. Float and trowel such areas by hand with wood floats and steel trowels, taking care to see that concrete is finished flush with box cover and matches adjacent surfaces.
- B. Finishing formed surfaces:
  1. Curb forms shall leave a smooth face.
  2. Remove all fins.
- C. Provide steel trowel finish on tops of curbs and flow lines of curbs, gutters and integral curb and gutters.
- D. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
  1. Radius: 1/4 inch.
  2. Radius: 3/8 inch.
- E. Finish surfaces to produce a uniform appearance throughout area involved and throughout adjacent areas with the same treatment.
- F. Where concrete finishing occurs adjacent to finished metal or other surfaces, particularly where serrated or indented surfaces occur, remove all traces of cement film before allowing to harden.
- G. Apply integral wood float and broom finish to the all concrete pavements and walkways, unless otherwise shown on the Drawings.
  1. After screeding and compacting, finish with a wood float using a circular motion to produce a uniform texture and finish throughout.
  2. For vehicular traffic areas, the finish shall be coarse enough to provide a non-slip surface with a minimum static friction coefficient of 0.6.
  3. For pedestrian traffic areas, finish shall be a non-slip surface with a minimum static coefficient of friction of 0.6.
    - a. For ramps, the static coefficient of friction shall be a minimum of 0.8. Ramps are defined as any sloping path of travel with a slope in the direction of travel of 5.0%, or greater.
  4. Tests for coefficient of friction shall be either ASTM C-1028 (field test) or ASTM D-2047 (laboratory test).

### 3.7 SPECIAL FINISHES

- A. Integral Colored Concrete Finish: Apply a float finish as described in "Concrete Finishing" Article. After float finish, apply textured finishes as follows:
  - 1. Where indicated, apply a medium-to-coarse-textured broom finish as described for pedestrian traffic areas in the "Concrete Finishing" Article.
  - 2. Where indicated, apply a sandblast finish as follows:
    - a. Sandblast surfaces uniformly, at the same age, using the same equipment and operators. Match approved mock-up for texture and color.
    - b. Medium Sandblast Finish: Expose coarse aggregate with maximum reveal of 1/4-inch. Make color uniform.
  - 3. Cure concrete with the specified curing compound in accordance with pigment manufacturer's curing instructions. Apply the curing compound immediately after final finishing. Do not use any other curing method unless specifically approved in writing by the pigment manufacturer and the City Representative .

### 3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure integral colored concrete by curing compound as approved by the manufacturer of the color pigments used in the concrete mix. Cure other concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
- E. Spray-apply concrete sealer to all concrete pavement. Comply with sealer manufacturer's application instructions.
- F. Integral Colored Concrete: Comply with recommendations of color pigment manufacturer for curing, sealing, and protecting integral colored concrete to provide color retention and uniformity.

### 3.10 FIELD QUALITY CONTROL TESTING

- A. The Owner will employ a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    - a. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
    - b. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of air-entrained concrete.
    - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
    - d. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless directed otherwise. Mold and store cylinders for laboratory-cured test specimens, except when field-cured test specimens are required.
    - e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. Test one specimen at 7 days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.
  2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
  3. When total quantity of a given class of concrete is less than 50 cu. yd., City Representative may waive strength testing if adequate evidence of satisfactory strength is provided.
  4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
  5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- B. Test results will be reported in writing to City Representative, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.
  - C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
  - D. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by City Representative. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
  - E. Manufacturer's Field Service: When placing integral colored concrete, arrange for the services of a qualified technical representative of the color pigment manufacturer, equipped with wet-batch color control test devices to ensure concrete of uniform color and matching approved mock-up.
- 3.11 REPAIRS AND PROTECTION
- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section. Concrete which is not true to line and plane, which is not

thoroughly troweled and properly surfaced as required, which varies in excess of 1/4-inch along a 10-foot straight edge, which is scuffed or has a rough top surface, except where required, or which does not connect properly to adjoining work, does not slope as required for drainage or is not properly cured, will be deemed defective.

1. General: Patch defective areas immediately following form removal. Remove defective concrete to a width and depth necessary for proper patching, but in no case less than 1 inch deep. Make the walls of the cut area perpendicular to the surface and do not feather out the edge. Dampen the patch area and the adjacent area 6 inches around the patch area.
  2. Exposed concrete: Prepare a patching mortar of one part Portland cement, adjusted to match the color of the surrounding concrete, and 2-1/2 parts sand with the least water required to produce a workable mass. Re-work this mortar until it is the stiffest consistency that will permit placing. Brush the patch area with a bond of neat cement and water paste and apply patching mortar when the water sheen is off the bond. Strike off the mortar slightly higher than the surrounding surface, let set for 1 hour and finish flush with the surrounding surface.
- B. Drill test cores where directed by City Representative when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.
- E. Comply with pigment manufacturer's instructions for patching integral colored concrete.

**END OF SECTION**

## SECTION 32 14 13

### UNIT PAVERS

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Pre-cast concrete pavers- Detectable Warning
  - 1. Mortar setting bed.
- B. Related Sections:
  - 1. Section 32 13 13, Concrete Paving.

##### 1.02 REFERENCES

- A. ASTM C33 - Specification for Concrete Aggregates.
- B. ASTM C150 - Specification for Portland Cement.
- C. ASTM D1557 - Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures.
- D. SSPWC - Standard Specifications for Public Works Construction, Latest Edition.
- E. ASTM D1751 - Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- F. TCNA -Tile Council of North America.

##### 1.03 SUBMITTALS

- A. Product data on characteristics of paver units.
- B. Three sample paver units illustrating color, surface finish, patterns and texture.

##### 1.04 QUALITY ASSURANCE

- A. Paver Manufacturer: Company specializing in exterior paver manufacturing with five years experience.
- B. Installer: Company specializing in installing exterior pavers with three years experience.
- C. Mockups: Before installing unit pavers, build mockups for each form and pattern of unit pavers required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with following requirements, using materials indicated for completed Work, including same base construction, special features for expansion joints, and contiguous work as indicated:
  - 1. Build mockups in location and of size indicated or, if not indicated, as directed by City Representative .

2. Notify City Representative seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain City Representative 's approval of mockups before starting unit paver installation.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver pavers by methods to preclude damage during shipping, handling, unloading and storage.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install setting bed when surrounding air or substrate surface temperature is below 50 degrees F prior to, during and 48 hours after completion of work.
- B. Do not install setting bed when surrounding air or substrate surface temperature is above 90 degrees F during or 48 hours after completion of the work.
- C. Do not install setting bed when wind velocity exceeds 15 mph or relative humidity exceeds 50 percent.
- D. At end of working day or during rainy weather, cover work exposed to weather with waterproof coverings, securely anchored.

1.07 WARRANTY (DETECTABLE WARNINGS TEXTURE)

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of detectable warnings surface products that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly.
    - b. Degrade significantly means that product maintains at least 90 percent of its approved design characteristics, as determined by the authority having jurisdiction.
  2. Warranty Period: Five years from date of Final Completion.
  3. Authority: California Building Code Section 1127B.5.7, and Interpretation of Regulation (IR) 11B-3 11B-4.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products of the following manufacturers form the basis for design and quality intended.
  - 1. Detectable Warning Pavers
    - a. Wausau Tile, Wausau, WI
    - b. Tile Tech Paver, Los Angeles, CA.
- B. Or equal as approved in accordance with Division 01, General Requirements for Substitutions

2.02 MATERIALS

- A. Pre-cast Concrete Pavers Detectable Warnings (Truncated Domes) Texture
  - 1. Division of the State City Representative (DSA/Access Compliance) approved products shall be used, compliance with CBC Sections 1133B.8.3 through 1133B.8.5, IRs 11B-3 and 11B-4 and the California Access Compliance Reference Manual.
    - a. Type: Precast concrete pavers.
    - b. Compressive Strength: 6500 psi per ASTM C140.
    - c. Moisture absorption: not greater than 5 percent per ASTM C140.
    - d. Nominal Size: 12 x 12 inches, thickness as indicated.
    - e. Edge: Square.
    - f. Load carrying capacity: 1,750 lbs.
  - 2. Truncated Domes pavers: provide raised Detectable Warnings with diameter of 0.9 inch at base tapering to 0.45 inch at top, height of 0.2 inch, with center-to-center spacing of 1.67 inches and corner domes spaced at 0.896 inch from the corner edges of paver. Provide raised truncated domes in a square grid (in-line) pattern.
    - a. Truncated Dome: shall contrast visually with adjoining surfaces, light-on-dark or dark-on-light. Material used to provide contrast shall be integral part of walking surface. Warning surface shall differ from adjoining surface in resiliency or sound to cane contact.
    - b. Truncated Dome Products: 12" x 12" x 2" or 24" x 24" x 2"
      - 1) Pavers: ADA-3 by Wausau Tile, Wausau, WI or equal.
      - 2) Tile Tech Pavers, Los Angeles, CA.
      - 3) Refer to drawings for layout and sizes.
  - 3. Custom Colors: As selected by City Representative .

2.03 COLORS AND TEXTURES

- A. Colors and Textures: As selected by City Representative from manufacturer's full range.

2.04 MORTAR SETTING BED MATERIALS ON CONCRETE SURFACE

- A. Setting Bed Materials
  - 1. Portland Cement: ASTM C150, Type I; low alkali, gray color, or Laticrete 226 thick mortar bed Mix with 3701 Admix. or equal.

2. Sand: ASTM C144; sharp, coarse, clean, screened sand free from deleterious material.
  3. Lime: ASTM C207, Type S.
  4. Water: Potable and not detrimental to mortar.
- B. Admixtures: Air entertainment to achieve 5-7 percent.
- C. Mixes
1. Setting Bed and Grout: Portland cement mix; one part Portland cement, 2-1/2 to 3 parts damp sand, up to 1/2 part lime by volume, or Laticrete 4237 for bond coat and Laticrete 3701 Grout Admix for grout.
  2. Thoroughly mix ingredients in quantities required for immediate use and as recommended by manufacturer for pre-packaged products.
  3. Use within two hours after mixing. Do not retemper thereafter.
- D. Grout Color
1. True Tone, by Davis Colors, Los Angeles, CA, or equal, as approved in accordance with Division 01 for Substitutions.
  2. Color Intensity: Up to 4 pounds per sack of masonry cement, color selected by City Representative .
- E. Reinforcing Mesh: 2 by 2 inch size, 16/16 gauge welded, galvanized, ASTM A185.
- F. Concrete substrate: per Section 32 13 13 Sitework Concrete.

## 2.05 ACCESSORIES

- A. Expansion Joint Filler - ASTM D1751: Close cell bituminous saturated fiberboard, 1/2 inch thick; FIBER EXPANSION JOINT manufactured by American Highway Technology, Kankakee, IL, or approved equal.
- B. Construction Joint Devices: Integral extruded polystyrene plastic; 1/2 inch thick, with removable top strip exposing sealant trough; JOINT CAPS.
- C. Sealant: Polyurethane two-component type, self leveling, for level surface application, UREXPAN NE-200, manufactured by the Pècora Corp., Harleysville, PA, equal products by Dow-Corning, Tremco or Sonneborn. May be submitted for approval, or equal, as approved in accordance with Division 01, General Requirements for Substitutions
- D. Primer: As recommended by Sealant Manufacturer.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Verify gradients and elevations of prepared base are correct.

- B. Verify sub-base has been compacted to minimum 90 percent, ASTM D1557, and is ready to support base, pavers and imposed loads.
- C. Verify concrete substrate has been installed and is ready to receive units.
- D. Beginning of installation means acceptance of substrate.

### 3.02 INSTALLATION

- A. Mortar Setting Bed
  1. Place setting bed of nominal 1-1/4 inch thickness over prepared concrete surface (Portland cement slurry bond coat). Install mesh in center of setting bed. Install per TCNA F101-07.
  2. Set pavers on wet bed to achieve full surface contact.
  3. Place paver units in approved pattern from straight reference line.
  4. Place half units or special shaped units at edges and interruptions. Maintain evenly spaced joints. Machine saw partial units.
  5. Maintain uniform joint width of 3/8 inch and where abutting vertical surfaces or protrusions.
  6. To accommodate grout, rake out joints, full depth.
  7. Fill joints with colored grout. Pack and work into voids. Neatly tool surface to concave joint.

### 3.03 EXPANSION JOINTS

- A. Locate joint filler at maximum 20 feet centers and where slabs join vertical surfaces. Install vertically, full depth of paver and setting bed leaving plastic cap at 1/2 inch depth at top for sealant application.

### 3.04 CLEANING

- A. Clean soiled surfaces using manufacturer's recommended cleaning solution. Do not harm pavers, joint materials or adjacent surfaces.
- B. Use non-metallic tools in cleaning operations.
- C. Rinse surfaces with clean water.
- D. Broom clean paving surfaces.

**END OF SECTION**

**SECTION 32 15 40**  
**STABILIZED DECOMPOSED GRANITE (DG) PAVING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Provide for the paving of accessible trail as shown on the plans, details and specified herein. The work includes:
  - 1. Trail preparation.
  - 2. Stabilized decomposed granite (DG) and sub-base material.
  - 3. Compaction and finish grading.

**1.2 QUALITY ASSURANCE**

- A. All labor, materials, tools, equipment, and construction methods incorporated into the contract work shall be of the highest standard for the work required under the provisions of this section.

**1.3 SUBMITTALS**

- A. Submit the following material certifications:
  - 1. Product Data: Manufacturer's literature describing stabilizing binder.
  - 2. Sample: Decomposed granite – 1 pint sample
  - 3. Design Data: Mix formula indicating the ratio of stabilizer binder to granite fines by weight.
  - 4. Certification: Written certification from manufacturer that installer is properly trained to install the product. Alternately, contractor may retain the services of a manufacturer's representative to observe the first day's installation.

- B. Test Reports

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in their original bulk condition or unopened containers, showing weight, analysis, and name of manufacturer.
- B. Store materials in a manner that prevents wetting and deterioration.

**1.5 PROJECT CONDITIONS**

- A. Work Notification: Notify State's Representative at least 7 working days prior to start of trail paving operations.

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- B. Perform work only after all other work affecting ground surface and trail has been completed.
- C. Restrict vehicle and pedestrian traffic from the areas until pavement is cured. Erect signs and barriers as required.
- D. Protect all adjacent facilities, fences, or existing pavement from damage. Replace materials damaged by equipment (surface abrasion of walls or fences or cracking of existing slabs) due to construction activity.

**1.6 TESTING REQUIREMENTS**

- A. Contractor shall arrange for the following tests by a recognized laboratory. Contractor shall pay for such tests and furnish 2 copies of the laboratory's test results within one working week of test completion.
  - 1. Compaction Tests: A minimum of 4 compaction tests per California Test Method No. 216F shall be made in areas and at a time designated by the State.

**1.7 UNACCEPTABLE WORK**

- A. If after installation of trail pavement, quality of workmanship or material is determined by the State to be unsatisfactory, the Contractor shall neatly cut and remove the full thickness of such trail pavement and replace in conformance with these specifications.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Materials shall be the best of their respective kinds, suitable for the purposes intended, and conforming to the specifications and requirements indicated, except as otherwise modified.
- B. Decomposed Granite: shall be produced from the crushing and screening of naturally friable granite. The blending of coarse sand with rock dust is not an equal product. The granite shall be screened to include stone particles of ½" minus. The particles that pass the 200 screen mesh as determined by ASTM methodology shall not exceed 18%. The sand equivalent shall be a minimum of 30 and the R-value shall be a minimum of 70.
  - 1. Color: San Diego Gray
- C. Acceptable Manufacturers:
  - 1. KRC Rock
  - 2. Southwest Boulder and Stone Inc.

3. Gail Materials
4. Approved Equal

D. Stabilized Decomposed Granite Specifications:

1. GRADATION: As determined by ASTM C 136 methodology (Caltrans 202)	
SIEVE SIZE	PERCENT PASSING
½"	100
3/8"	90-100
No. 4	50-100
No. 30	25-55
No. 100	10-20
No. 200	5-18
2. SAND EQUIVALENT: As determined by ASTM D 2419 methodology (Caltrans 217) shall have a minimum of 30.	
3. R-VALUE: As determined by ASTM D 2488 methodology (Caltrans 301) shall have a minimum of 70.	

E. Stabilizing Emulsion: Chemical stabilizers shall consist of an aqueous emulsion of Stabilizing Emulsions (S.E.) and resin copolymer enzyme binders. Materials shall have low toxicity and contain no alcohol or silicates. Stabilizers shall include vinyl acetates, asphaltic resins, acrylics, binders and acrylates which will promote structural bonding of DG and form a resilient water repelling membrane throughout the DG matrix. Stabilizer for stabilizing existing slope surfaces shall contain sufficient S.E.'s to provide satisfactory bridging of the membrane to the shale particles.

F. Acceptable Manufacturers/Products:

1. Px300 Soil Stabilizer, by G.M. Boston Company, [www.gmbostoncompany.com](http://www.gmbostoncompany.com)
2. Soiltac soil stabilizer by Soiltac, LLC., 681 North Monterey Street, Suite 1 Gilbert, Arizona 85233-3818, (800) 545-5420, [www.soiltac.com](http://www.soiltac.com)
3. Natracil Organic Binder
4. "Soil Secure" Organic Binder
5. Or approved equal.

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- G. Water: Clean and free from deleterious quantities of acids, alkalis, salts, or organic materials.

**2.2 DESIGN MIX**

- A. Provide services of independent testing laboratory to produce mix design, based on materials supplied. Transmit 2 copies of laboratory's test results as soon as possible to the State's Representative for evaluation and determination of the optimum design mix. Tests shall comprise sufficient test samples with S.E. contents within a broad enough range to allow determination of the optimum S.E. and water content for the mix being tested. Optimum S.E. content is that percentage of S.E. in the test specimen that will result in a 7-day compressive strength of no less than 350 psi. Contractor may select laboratory to conduct compressive strength test (California Test Method No. 312).
- B. Mixture and Application Rate:
  - 1. Determine by manufacturers recommendations how many cubic yards of decomposed granite, per gallon of concentrate, can be successfully stabilized (see Part 1.3).
  - 2. To accomplish stabilization, the object is to induce the decomposed granite to form a stable matrix using the minimum amount of stabilizing emulsion sufficient to produce long lasting results.
  - 3. Conditions are optimum to accomplish stabilization once proper field testing has been completed and design mix quantities are determined. Installation of the material into the ground and compaction will complete the process.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Examine surfaces and grades for conformance and appearance before work begins. Do not start work until conditions are accepted by the State.

**3.2 SUBGRADE**

- A. Area to be paved shall be excavated, graded, and shaped as required to construct trail pavement in conformance with grades, lines, thicknesses, and typical cross section shown on the plans. Recompact soft or muddy ground encountered to 90 percent minimum relative compaction as determined by California Test Method No. 216F or 231. The Marshall Stability Test (ASTM D1559) is also acceptable.
  - 1. All surfaces shall be thoroughly free of all weeds, debris, and rocks which measure 2 1/2 inches or more in diameter.

2. Finish grade shall be fine graded to provide unimpeded flow of surface waters to their intended outlets or basins and all slopes shall be neatly trimmed to prevent water accumulation on paved surfaces.
3. Noticeable depressions shall be filled, and all mounds graded down so that the entire area presents uniform surface.
4. Decomposed granite to be treated shall be dry prior to application of stabilizing emulsion

### 3.3 INSTALLATION

#### A. Application and Mixing for In-Place Solidification:

1. Add stabilizing emulsion in the proportion recommended by manufacturer (design mix). Actual field moisture conditions will dictate if additional water is required to produce optimum moisture content for compaction. Installer's on-site supervisor shall determine the required moisture content during the application process. Slightly over-optimum moisture is acceptable (and may be required in the event of an extended lead time between completed mix-in place process and final compaction) for mix-in place process.
2. Stabilizing emulsion is to be spread and mixed into decomposed granite in a single operation using a rotary cross-shaft mixer, pugmill, or similar equipment. Mixer shall be equipped with pumping and metering devices which will uniformly apply and measure emulsion as it is being mixed into decomposed granite. Metering devices shall be able to measure gallons being applied and forward motion of mixer.
3. Application of stabilizing emulsion shall not vary more than 10 percent from the designated application rate.
4. Mixing operations shall continue until DG and emulsion are uniformly mixed, and DG particles are coated.
5. Mixing operation shall be performed in such a manner as to produce a uniform mixture of stabilizing emulsion and DG. The resulting uncompacted stabilizing emulsion treated DG shall be free of streaks and pockets of the stabilizing emulsion stabilizer, i.e., no salt and pepper effect.
6. Do not apply mix during high winds or if rain is imminent. Do not mix immediately after rainfall.

### 3.4 COMPACTION

#### A. Material Placement and Compaction:

1. Spread the material evenly in lifts not greater than 2" over area of work. Grade and smooth as required. Thoroughly water entire area so that the entire depth of the material is moist.
2. At a time subsequent to the in-place mixing process as determined by installer's supervisor, light compaction shall be accomplished by using a portable vibratory roller or hand wacker compactor.

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3. Final compacting shall occur within a 48-hour period following the light compaction process. Final compaction shall be accomplished by a 36" wide heavy pull roller.
4. Relative compaction of stabilizing emulsion treated pavement shall not be less than 90 percent as determined by California Test Method No. 216F. Procedures for calculating percent relative compaction are described in Part IV of California Test Method No. 312. In place density may also be determined by use of nuclear gauge (California Test Method No. 231).

**3.5 MAINTENANCE**

- A. Maintain paved trail areas until completion and acceptance of the entire project by the State.

**3.6 ACCEPTANCE**

- A. Upon completion of contract, the State will assume responsibility for maintaining trail work of the system.

**END OF SECTION 02730**

## SECTION 32 17 23

### PAVEMENT MARKINGS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes surface preparation and field application of pavement marking on hot-mix asphalt paving and Portland cement concrete paving.

##### 1.3 SUBMITTALS

- A. Product Data:
  - 1. Material List: Provide an inclusive list of required coating materials, including primers and other surface preparation materials. Indicate each material and cross-reference specific coating and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
  - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Results of preconstruction field testing.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of pavement marking material from one source and by a single manufacturer.
- B. Installer Qualifications: Engage an experienced installer who has completed pavement marking similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance of at least 5 years.
- C. Pre-Application Field Testing: Prepare a sample marking of each different paint formulation on asphalt substrates for the purpose of establishing quality of application, adherence of paint to the substrate, compatibility of the paint with the asphalt, and to determine whether a primer will be necessary if not otherwise required by the manufacturer.
  - 1. Minimum length of test stripe: 3 feet.
  - 2. Perform a minimum of 3 test stripes, located to provide a representative sample of entire area indicated to receive pavement marking paint.
  - 3. Apply test markings using methods and equipment recommended by the manufacturer of the marking paint and as specified in this Section.
  - 4. Arrange for a technical representative of the marking paint manufacturer to observe cured test samples and provide written recommendations for changes, if any, to materials or methods necessary to achieve optimum paint performance on specific substrates.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

- B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

## 1.6 PROJECT CONDITIONS

- A. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 deg F, and not exceeding 90 deg F.

## PART 2 - PRODUCTS

### 2.1 PAVEMENT MARKING MATERIALS

- A. Pavement-Marking Paint: Lead free latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952, and suitable for use on both hot-mix asphalt and Portland cement concrete paving. Provide material having a volatile organic compound (VOC) content of 250 g/L, or less.
  - 1. Colors:
    - a. Color: White (for all parking stalls other than disabled access parking, for traffic and lane marking, and for painted text).
    - b. Color: Yellow, where indicated.
    - c. Color: Red (for "No Parking" areas as shown).
    - d. Color: Blue (for pavement markings identifying disabled access parking and paths of travel).
  - 2. Gloss: Flat or eggshell with gloss at 30 percent or less when measured at a 60-degree meter.
- B. Primer: Type recommended by the marking paint manufacturer.
- C. Surface Cleaning Material: Cleaning agent or agents suitable for removing grease, oil, and other contaminants that will not damage asphalt or Portland cement concrete paving and are acceptable to pavement marking paint manufacturer.

## PART 3 - EXECUTION

### 3.1 PAVEMENT MARKING

- A. Allow paving to cure for a minimum of 30 days before starting pavement marking. Comply with recommendations of the pavement marking paint manufacturer for longer cure periods.
- B. Sweep and clean surface to eliminate loose material and dust. Ensure all surfaces indicated to receive pavement marking are clean and free from grease, oil, concrete sealers and curing agents, and other contaminants that might interfere with paint adhesion.
  - 1. Comply with manufacturer's instructions for use of special cleaning agents.
  - 2. For removal of substances that would interfere with paint adhesion use methods recommended by the paint manufacturer if applicable, or methods that will completely remove the substance without damaging or discoloring the underlying pavement substrate.
- C. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates based on substrate type and cure conditions to provide a minimum wet film thickness of 15 mils and dry film thickness of 8 mils, unless otherwise recommended by the manufacturer.
- D. Comply with paint manufacturer's maximum recommended drying time before allowing traffic in order to prevent undue softening of bitumen and pick-up, displacement, or discoloration of pavement marking by vehicular traffic.

- E. Paint pavement, curbs, and other surfaces as shown on the Drawings. Painting shall be straight, uniform, exact, and sharp without blobs at the start and finish. Edges shall be even, accurate, symmetrical, and free of fuzziness.
    - 1. Edge Tolerance: 1/2 inch in 20 feet, maximum.
  - F. Apply markings for disabled access symbols in accordance with State of California Building Code, Part 2, Title 24, California Building Standards.
  - G. Where work consists of modifications of, or additions to existing pavement marking, match existing color and line width.
- 3.2 ADJUSTING
- A. Touch up pavement markings not complying with requirements of this Section by painting out the errors with permanently opaque paint of the same color as the substrate pavement.
    - 1. Block out and eliminate all traces of splashed, tracked, and spilled pavement marking paint from the background surfaces.
    - 2. Paint over deviations in marking edges exceeding allowable tolerance and apply new marking meeting specified requirements.
  - B. The Owner reserves the right to require sandblast removal of extensive defective pavement marking and application of new marking meeting specified requirements at no additional cost.
- 3.3 PROTECTION
- A. Provide traffic cones, barricades, and other devices needed to protect the pavement marking until it is sufficiently dry to withstand traffic without damage.

**END OF SECTION**

## SECTION 33 10 00

### WATER UTILITIES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Pipe and fittings for site domestic water and fire water lines.
- B. Valves.
- C. Fire hydrant.
- D. Fire department connection.

##### 1.02 RELATED SECTIONS

- A. Section 31 20 00 - Earthwork.
- B. Section 31 23 17 – Trenching.

##### 1.03 REFERENCES

- A. American Water Works Association Standards (AWWA).
- B. Standard Specifications for Public Works Construction (SSPWC), Latest Edition.
- C. Ventura County Waterworks District Standard Plans.
- D. Ventura County Fire Department, Fire Prevention Division Standard Plans.

##### 1.04 SUBMITTALS

- A. Submit the following:
  - 1. Product Data: Provide data on pipe materials, pipefittings, valves, fire hydrant and accessories.
  - 2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

##### 1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of piping mains, valves, connections, fire hydrant and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

##### 1.06 QUALITY ASSURANCE

- A. Perform work in accordance AWWA, Standard Specifications for Public Works Construction, and Los Angeles County Waterworks District Standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.07 DELIVERY AND STORAGE

- A. Deliver and store valves in shipping containers with labeling in place.

PART 2 – PRODUCTS

2.01 PIPE

- A. Pipe size smaller than 4-inch diameter: pipe material shall be polyvinyl chloride (PVC) schedule 40 solvent weld pipe and shall be manufactured in accordance with ASTM D-1785, or type K Copper pipe shall be used as indicated on plans.
- B. Pipe size equal or larger than 4-inch diameter: pipe material shall be AWWA C905 Class 350 with AWWA C1101 ductile iron fittings and ASTM D3139 compression gasket rings.

2.02 GATE VALVES

- A. Conform to AWWA C-509.

2.03 FIRE HYDRANT

- A. Ventura County Waterworks District No. 1 Standard Plans.

2.04 FIRE DEPARTMENT CONNECTION

- A. Ventura County Fire Department, Fire Prevention Division Standard Plans.

2.05 ACCESSORIES

- A. Concrete for Thrust Blocks: concrete for thrust block shall have a minimum 28-day compressive strength of 2,000 psi.
- B. Thrust blocks shall be constructed to bear against undisturbed earth and shall not bear against adjacent pipe, fittings, or valves. Where concrete must be poured around adjacent pipe, a block out or a short pipe length shall be used such that a flexible joint exists within 12 inches of each side of thrust block, unless indicated otherwise on the plans. Concrete shall not be allowed to set in contact with pipe surfaces or to enter or come in contact with any joint.
- C. Valve Appurtenances: The Contractor shall furnish and install all valve appurtenances. Provide two galvanized T-handled operating wrenches, 4 feet total length or as required to easily access valve from grade.
- D. Valve box body shall be unreinforced concrete 8 ¾ inch inside diameter traffic box with cast iron ring. The valve box cover shall be cast iron. Both valve body and cover shall be Christy G3 or equal. The cover shall be marked "WATER." The cover of each valve box shall be provided with a 2-inch diameter bronze disc and the Contractor shall stamp

the valve number on the disc per the District Representative's instructions. The disc shall be mounted to the valve box cover or higher using stainless steel screws. The extension piece shall be 8-inch in diameter, Class 350 P.V.C. water line conforming to the requirements of AWWA C-900.

- E. Appropriate warning detector tape shall be placed over all utilities.
  - 1. Underground detectable warning tape shall be placed over all non-metallic underground utilities.
  - 2. 12 gauge copper continuous location wire shall be placed on all water mains.
- F. All copper pipe to be encased in plastic sleeve.

### PART 3 – EXECUTION

#### 3.01 EXAMINATION

- A. Verify the existing water main sizes, class of pipes, and locations as indicated.

#### 3.02 PREPARATION

- A. Remove scale and dirt, on inside and outside, before assembly.
- B. Prepare pipe connections to equipment with flanges or unions.

#### 3.03 BEDDING

- A. Excavate pipe trench in accordance with Specification Section 31 23 17 for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, compact to minimum 90 percent compaction.
- C. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers to protect the pipe. Jetting is not permitted to obtain required compaction.
- D. Maintain optimum moisture content of bedding material to attain required compaction density.

#### 3.04 INSTALLATION - PIPE

- A. Route pipe in straight line.
- B. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- C. Install access fittings to permit disinfection of water system.
- D. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main.

- E. Establish elevations of buried piping to ensure cover conforming to the Standards. The minimum cover from the finish grade to the top of pipe is 36 inches for potable and fire waterline, any shallower cover to clear with the existing utility crossings shall be reviewed and approved by the District Representative.
- F. Install 12 gauge copper continuous location wire on all water mains.
- G. Backfill trench in accordance with Specification Section 31 23 17.
- H. Maintain separation of water main from sewer piping in accordance with the State Department of Health Services, Criteria for the Separation of Water Mains and Sanitary Sewers (Section 64630, Title 22 California Administrative Code), and State Regional Water Quality Control Board.
- I. All pipe laid in trench which is to be left for further extension (i.e., end of work day) shall have its open end covered to protect from possible rodent intrusion.

### 3.05 INSTALLATION - VALVES

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.
- C. Provide concrete collar around valve box.

### 3.06 PRESSURE TEST OF WATER PIPING SYSTEM

- A. Water piping system shall be pressure tested for 2 hours at 200 psi, with no allowable drop in water pressure.
- B. All leakage tests shall be completed and approved prior to placing of permanent resurfacing.
- C. Pressure test shall be witnessed by District Representative.

### 3.07 DISINFECTION AND BACTERIA TESTING OF WATER PIPING SYSTEM

- A. Water piping system shall be disinfected and flushed per AAWA Section C651.
- B. Before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality.

### 3.08 TEST RECORDS

- A. Records shall be made of each piping system installation during the test. These records shall include:
  1. Date of test.
  2. Description and identification of piping tested.
  3. Test fluid.
  4. Test pressure.
  5. Remarks to include such items as:
    - a. Leaks (type, location).

- b. Repairs made on leaks.
- 6. Certification by Contractor and signed acknowledgment by Inspector of Record.

3.09 FIELD QUALITY CONTROL

- A. Inspection shall be performed by Inspector of Record.

**END OF SECTION**

**SECTION 33 41 00**  
**STORM UTILITY DRAINAGE PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes gravity-flow, non-pressure storm drainage pipe and drainage structures.

**1.2 PERFORMANCE REQUIREMENTS**

- A. Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating: 10.8 psi.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product installed.
- B. Field quality control test reports.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

**2.2 A HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS**

- A. Pipe and Fittings: ASTM A 74, Service class.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

**2.2 B Ductile Iron Pipe**

- D. Pipe and Fittings: ASTM A 746.
- E. Gaskets: None.
- F. Calking Materials: None.

**2.3 CORRUGATED HIGH DENSITY POLYETHYLENE (HDPE) HDPE PIPE AND FITTINGS**

- A. HDPE Drainage Pipe and Fittings, NPS 4 to NPS 10: AASHTO M252, Type S, with bell-and-spigot ends. Gasketed joints shall be water-tight per ASTM D3212.
- B. HDPE Drainage Pipe and Fittings, NPS 12 to NPS 60: AASHTO M294, Type S, or ASTM F2306 with bell-and-spigot ends. Gasketed joints shall be water-tight per ASTM D3212

## 2.4 PVC PIPE AND FITTINGS

- A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

## 2.5 NON-PRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

- B. Sleeve Materials:

- 1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
- 2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
- 3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

- C. Unshielded Flexible Couplings: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

- 1. Manufacturers:

- a. Dallas Specialty & Mfg. Co.
- b. Fernco Inc.
- c. Logan Clay Products Company (The).
- d. Mission Rubber Company; a division of MCP Industries, Inc.
- e. NDS Inc.
- f. Plastic Oddities, Inc.

- D. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

- 1. Manufacturers:

- a. Cascade Waterworks Mfg.
- b. Dallas Specialty & Mfg. Co.
- c. Mission Rubber Company; a division of MCP Industries, Inc.
- d. Any equivalent manufacturer.

- E. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

- 1. Manufacturers:

- a. Fernco Inc.
- b. Logan Clay Products Company (The).
- c. Mission Rubber Company; a division of MCP Industries, Inc.
- d. Any equivalent manufacturer.

## 2.6 MANHOLES

- A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

- 1. Diameter: 48 inches minimum, unless otherwise indicated.
- 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
- 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.

4. Riser Sections: 4-inch minimum thickness, and of length to provide depth indicated.
5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Joint Sealant: ASTM C 990 bitumen or butyl rubber.
7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
8. Steps: Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
9. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
11. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording "STORM DRAIN."
  - a. Material: ASTM A 536, Grade 60-40-18 ductile iron or ASTM A 48, Class 35 gray iron, unless otherwise indicated.

## 2.7 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
  1. Cement: ASTM C 150, Type II.
  2. Fine Aggregate: ASTM C 33, sand.
  3. Coarse Aggregate: ASTM C 33, crushed gravel.
  4. Water: Potable.
- B. Ballast and Pipe Supports: Portland cement design mix, 3250-psi minimum, with 0.45 maximum water-cementitious materials ratio.
  1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
  2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

## 2.8 CATCH BASINS

- A. Standard Cast-in-Place Concrete Catch Basins: See detail on plan.
- B. Frames and Grates: See detail on plan.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Pipe couplings and fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
  1. Use non-pressure-type flexible couplings where required to join gravity-flow, non-pressure sewer piping, unless otherwise indicated.
    - a. Shielded flexible couplings for same or minor difference OD pipes.
    - b. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

### 3.2 PIPING INSTALLATION

- A. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- B. Install manholes for changes in direction if shown on plan, otherwise use fittings. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- D. Install gravity-flow, non-pressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
  - 2. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
  - 3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
- E. Clear interior of piping and manholes of dirt and superfluous material as work progresses.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, non-pressure drainage piping according to the following:
  - 1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
  - 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
  - 3. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-gasket joints.
  - 4. Join dissimilar pipe materials with non-pressure-type flexible couplings.

### 3.4 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

### 3.5 CATCH BASIN INSTALLATION

- A. Set frames and grates to elevations indicated.

### 3.6 CONNECTIONS

- A. Connect non-pressure, gravity-flow drainage piping to building's storm building drains specified in corresponding Plumbing section.
- B. Make connections to existing piping and underground manholes.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye

fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3250 psi.

### 3.7 FIELD QUALITY CONTROL

- A. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
  - 5. Hydrostatic Tests: Test sewers according to requirements of authorities having jurisdiction and the following:
    - a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
    - b. Close openings in system and fill with water.
    - c. Purge air and refill with water.
    - d. Disconnect water supply.
    - e. Test and inspect joints for leaks.
  - 6. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.
  - 7. Air Tests: Test storm drainage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
- B. Leaks and loss in test pressure constitute defects that must be repaired.
- C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

**END OF SECTION**

**SECTION 033729**  
**PORTLAND CEMENT PERVIOUS CONCRETE PAVEMENT**

**PART 1        GENERAL**

**1.01   Scope of Work:**

- A.     The Work to be completed under this contract includes the furnishing of all labor, materials and equipment necessary for construction of Portland Cement Pervious Concrete Pavement for streets, parking and pedestrian areas in conformance with the plans and specifications.
  
- B.     Work in other sections:  
Formwork: see "Concrete Formwork" in Division 03  
Other Paving: see other sections in Division 33  
Inserts of landscape accessories into concrete pavement: see Division 32  
Drains in concrete pavement: see Division 32  
Subgrades and Compaction: see Division 31

**1.02   References:**

- A.     American Concrete Institute
  - 1.     Concrete Field Testing Technician Grade I
  
- B.     American Society for Testing and Materials
  - 1.     ASTM C 29 "Test for Bulk Density (Unit Weight) and Voids in Aggregate ASTM C33 "Specification for Concrete Aggregates"
  - 2.     ASTM C 33 "Specification for Concrete Aggregates"
  - 3.     ASTM C 94 "Specification for Ready-Mixed Concrete"
  - 4.     ASTM C 150 "Specification for Portland Cement"
  - 5.     ASTM C 260 "Specification for Air-Entraining Admixtures for Concrete"
  - 6.     ASTM C 494 "Specification for Chemical Admixtures for Concrete"
  - 7.     ASTM C 595 "Specification for Blended Hydraulic Cements"
  - 8.     ASTM C 618 "Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete."
  - 9.     ASTM C 685 "Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing"
  - 10.    ASTM C 989 "Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars."
  - 11.    ASTM C 1438 "Standard Specification for Latex and Powder Modifiers for Hydraulic Cement Concrete and Mortar."
  - 12.    ASTM C 1602 "Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete"

13. ASTM C 1688 “Standard Test Method for Density and Void Content of Freshly Mixed Pervious Concrete”
  14. ASTM C 1701/C1701M “Standard Test Method for Infiltration Rate of In Place Pervious Concrete”
  15. ASTM C 1751 “Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
  16. ASTM C 1752 “Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.”
  17. ASTM D 994 “Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)”
  18. ASTM E 329 “Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.”
- C. National Ready Mixed Concrete Association
1. Text Reference for Pervious Concrete Contractor Certification

**1.03 Quality Assurance:**

**A. The Pervious Concrete Subcontractor:**

1. Shall submit:
  - a. Evidence of two successful pervious concrete pavement projects including: the project name and address, owner’s name, contact information and size of each project.
  - b. Verification of current NRMCA Certification requirements described below:
2. Shall meet, at the time of bidding: **one** of the following criteria for the minimum certification for each placement crew and submit verification of NRMCA Pervious Concrete Certification with the bid. ([http://www.nrmca.org/Education/Certifications/Pervious\\_Contractor.htm](http://www.nrmca.org/Education/Certifications/Pervious_Contractor.htm))
  - a. The pervious concrete subcontractor shall employ no less than one (1) NRMCA Certified Pervious Concrete Craftsman who must be onsite, actively guiding and working with each placement crew during all pervious concrete placement.
  - b. The pervious concrete subcontractor shall employ no less than three (3) NRMCA Certified Pervious Concrete Installers who must be onsite, actively guiding and working with pervious concrete for projects.
  - c. The pervious concrete subcontractor shall employ no less than three (3) NRMCA Pervious Concrete technicians and one (1) Pervious Installer who shall be onsite, actively guiding and working with each placement crew during all pervious concrete placement.

- B. **Performance:** Upon completion of the initial curing, the pervious concrete shall be tested for initial baseline infiltration in accordance with ASTM C1701. The rate shall be a minimum of 100 inches per hour.

**1.04 Submittals:** Before starting work, submit the following:

**A. Concrete materials:**

1. Proposed concrete mixture proportions including all material weights, volumes, density (unit weight), water / cementitious ratio, and void content. The mix design shall not specify a compressive or flexural strength.
  2. Aggregate type, source and gradation.
  3. Cement, fly ash, ground granulated blast-furnace slag and admixture manufacturer certifications
- B. Qualifications:** Evidence of qualifications listed under Quality Assurance.
- C. Project details:** Specific plans, details, schedule, construction procedures and quality control plan.
- D. Test Panel:**
1. Construct Test panel(s) to meet requirements of contract documents. Place a minimum one 225 sq. ft panel. Provide joints and curing using materials, equipment, and personnel proposed for the project as described in Section 1.02.B. Coordinate location of test panels with Owner and Architect/Engineer.
  2. The test panel shall be tested for acceptance in accordance with section 3.08 Quality Control.
  3. An approved test panel will be used as quality control for the project and may be incorporated into the project if of acceptable quality.
  4. Remove and legally dispose of all materials used for test panels not approved and all excess materials.

## **PART 2 MATERIALS**

### **2.01 Materials:**

- A. Cement:** Portland cement Type II or V conforming to ASTM C150 or Portland cement Type IP or IS conforming to ASTM C595.
- B. Supplementary Cementitious Materials:**
1. Class F Fly Ash: ASTM C618
  2. Ground Granulated Blast-Furnace Slag: ASTM C989
- C. Chemical Admixtures:**
1. Air entraining agents shall comply with ASTM C260.
  2. Chemical Admixtures shall comply with ASTM C494.
  3. Latex bonding agents shall comply with ASTM C1438.
- D. Aggregates:** Coarse Aggregate: ASTM C33. The maximum size and gradation shall meet the project criteria for surface appearance and void content.
- E. Water:** ASTM C 1602.
- F. Isolation Joint Material:** Shall comply with ASTM D994, D1751, or D1752.

**2.02 Mixture Proportions:** The composition of the proposed concrete mixtures shall be submitted to the owner's representative for review and shall comply with the following provisions unless an alternative composition is

demonstrated to comply with the project requirements. Conform with all requirements of Authorities Having Jurisdiction (AHJ) for pavements and walkways.

- A. **Cementitious Content:** Comply with the approved mix design.
  - I. Supplementary cementitious content:
    - a. Fly ash: 25% maximum of the total cementitious material or in accordance with approved mix design.
    - b. Slag: 40% maximum of the total cementitious material or in accordance with approved mix design.
- B. **Water / Cementitious Ratio** Shall range between 0.27 lb/lb and 0.31 lb/lb. or in accordance with approved mix design.
- C. **Aggregate Content:** As appropriate for approved mix design.
- D. **Admixtures:** Use in accordance with approved mix design.
- E. **Mix Water:** as appropriate for approved mix design.
- F. **Color:** Pigments to be selected by the architect.

### **PART 3 EXECUTION**

- 3.01 **Subgrade:** Verify subgrade preparation, grade, and conduct permeability and density tests for conformance to project requirements and is acceptable for installation of pervious concrete. (See PSCA 'Section 31 Subgrade Guidelines for Pervious Concrete' that accompanies this document.)
- 3.02 **Recharge Basin (Detention Basin):** When base material is used under pervious concrete for water recharge, it shall be composed of uniform sized aggregate conforming to ASTM C33, minimum size 6. For minimum void content, refer to civil or geotechnical contract documents.
- 3.03 **Formwork:** Form materials: any material permitted by AHJ and of sufficient strength and stability to support mechanical equipment without deformation of plan profiles following spreading, strike-off and compaction operations.
- 3.04 **Mixing and Hauling:**
  - A. **Production:** Pervious concrete shall be manufactured and delivered in accordance with applicable sections of ASTM C 94 or ASTM C 685.
  - B. **Mixing:** Pervious concrete shall be produced in central mixers, transit mixers or in volumetric mixers.
  - C. **Delivery:** Deliver pervious concrete directly from the mixer by means of conveyer as close as possible to final position.
  - D. **Discharge:** Each truckload will be visually inspected for consistency of concrete mixture. Job site water additions are permitted to obtain and maintain the required mix consistency throughout the discharge.

Discharge shall be a continuous operation. Concrete shall be deposited as close to its final position as practical and such that discharged concrete is incorporated into previously placed plastic concrete.

**3.05 Placing and Finishing:** Shall comply with the content of the National Ready Mixed Concrete Association's '*Text Reference for Pervious Concrete Contractor Certification*' with the following provisions:

- A. Internal vibration shall not be permitted. Use mechanical screed equipment. Do not use hand screeds except in confined and small areas. Cross roll compacted concrete to remove any screeding and compaction marks on the concrete surface.
- B. Compact to the required cross-section and shall not deviate more than  $\pm 3/8$  inch in 10 feet from profile grade.

**3.06 Jointing**

- A. Joints shall be installed at locations and to depths shown on the project plans.
- B. Control (contraction) joints shall be installed at regular intervals not to exceed 1.5 times the width of the placement or 20 feet, or in accordance with approved joint placement plan. The control joints shall be installed at  $1/4$  the thickness of the pavement but not to exceed 1-1/2". These joints can be installed in the plastic concrete or saw cut after the concrete has hardened. New joints in plastic concrete or recently hardened concrete shall align with joints in older concrete. Joints abutting curbs and other fixed concrete shall be installed within 10 degrees of perpendicular to the older concrete as possible.
- C. Install joints to match approved sample.
- D. Transverse construction joints: Install whenever placing is suspended for 20 minutes or whenever concrete is no longer workable.
- E. Do not dowel longitudinal joints between successive placements.
- F. Isolation joints: Use when abutting fixed vertical structures. Place isolation material before concrete is placed and to the depth of the pavement section.

**3.07 Curing:**

- A. Final curing procedures shall begin no later than 20 minutes after the concrete has been discharged from the mixer. The pavement surface shall be covered with a minimum of six (6) mil thick white or clear polyethylene sheet or other approved covering material. In cold weather black plastic may be used to aid in heat retention. The cover shall prevent air infiltration to the fresh concrete and shall overlap all exposed edges and shall be secured to prevent dislocation due to winds or adjacent traffic conditions.
- B. The curing cover shall remain securely in place for a minimum of 7 days. No vehicular traffic shall be permitted on the pavement until curing is complete and no truck traffic shall be permitted for at least 14 days.

**3.08 Quality Control:**

- A. The owner shall employ a testing laboratory that conforms to the requirements of ASTM E329 and ASTM C1077. All personnel engaged in testing shall be certified by the American Concrete Institute as ACI Concrete Field Technicians or equivalent and shall be certified by NRMCA as a Pervious Concrete Technician.
- B. Prior to each placement, the formed thickness shall be at least the design thickness testing within -0" to +3/4".
- C. Plastic concrete shall be sampled in accordance with ASTM C 172 and density (unit weight) measured in accordance with ASTM C 1688. The density (unit weight) of the delivered concrete shall be +/- 5 pcf of the design density (unit weight).
- D. Plastic void content shall be calculated as per ASTM C1688 Gravimetric Air Determination and compared to the void percentage required by the hydraulic design.
- E. Upon completion of initial curing, the pervious concrete shall be tested for a baseline infiltration rate using ASTM C1701.

**END OF SECTION**