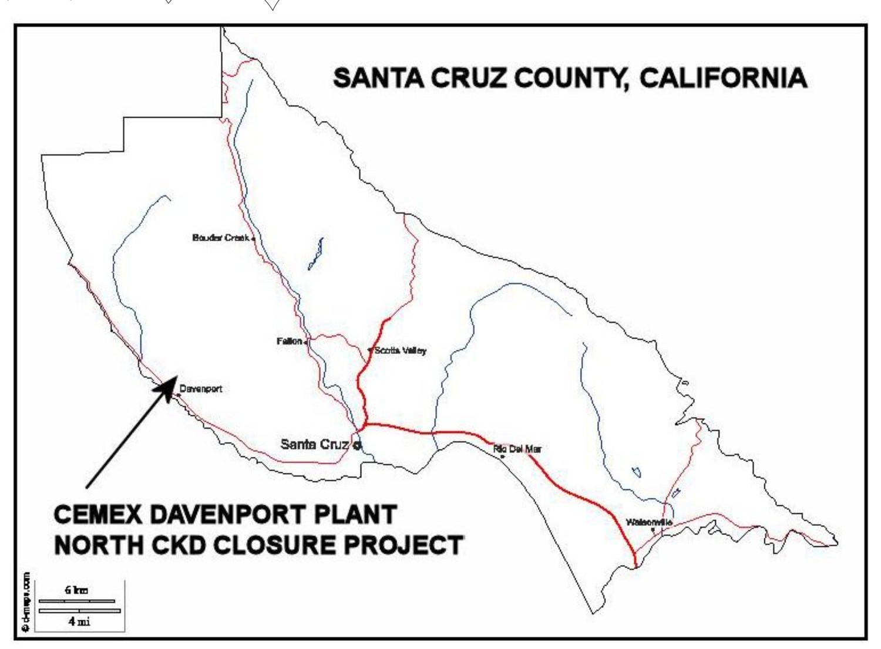
RMC PACIFIC Materials, LLC (CEMEX) DAVENPORT PLANT - DAVENPORT CALIFORNIA

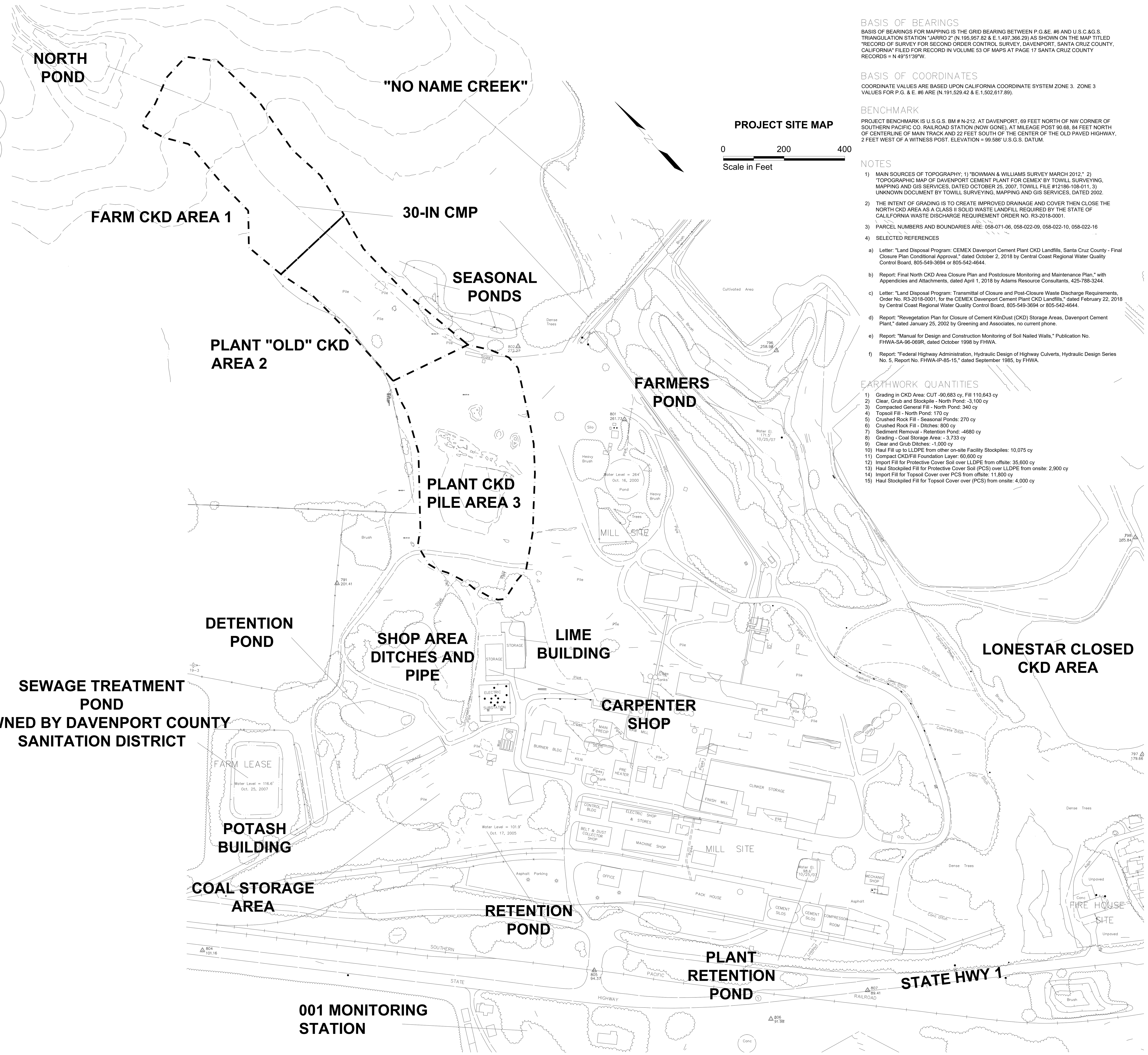
NORTH CEMENT KILN DUST (CKD) AREA CLOSURE



C1

DESIGN PLANS

LIST OF DRAWINGS:



PROJECT SITE MAP

0 200 400

Scale in Feet

BASIS OF BEARINGS

BASIS OF BEARINGS FOR MAPPING IS THE GRID BEARING BETWEEN P.G.&E. #6 AND U.S.C.&G.S. TRIANGULATION STATION "JARRO 2" (N.195,957.82 & E.1,497,366.29) AS SHOWN ON THE MAP TITLED "RECORD OF SURVEY FOR SECOND ORDER CONTROL SURVEY, DAVENPORT, SANTA CRUZ COUNTY, CALIFORNIA" FILED FOR RECORD IN VOLUME 53 OF MAPS AT PAGE 17 SANTA CRUZ COUNTY RECORDS = N 49°51'39"W.

BASIS OF COORDINATES

COORDINATE VALUES ARE BASED UPON CALIFORNIA COORDINATE SYSTEM ZONE 3. ZONE 3 VALUES FOR P.G. & E. #6 ARE (N.191,529.42 & E.1,502,617.89).

BENCHMARK

PROJECT BENCHMARK IS U.S.G.S. BM # N-212. AT DAVENPORT, 69 FEET NORTH OF NW CORNER OF SOUTHERN PACIFIC CO. RAILROAD STATION (NOW GONE), AT MILEAGE POST 90.68, 84 FEET NORTH OF CENTERLINE OF MAIN TRACK AND 22 FEET SOUTH OF THE CENTER OF THE OLD PAVED HIGHWAY, 2 FEET WEST OF A WITNESS POST. ELEVATION = 99.586' U.S.G.S. DATUM.

NOTES

1) MAIN SOURCES OF TOPOGRAPHY; 1) "BOWMAN & WILLIAMS SURVEY MARCH 2012," 2) 'TOPOGRAPHIC MAP OF DAVENPORT CEMENT PLANT FOR CEMEX' BY TOWILL SURVEYING, MAPPING AND GIS SERVICES, DATED OCTOBER 25, 2007, TOWILL FILE #12186-108-011, 3) UNKNOWN DOCUMENT BY TOWILL SURVEYING, MAPPING AND GIS SERVICES, DATED 2002.

2) THE INTENT OF GRADING IS TO CREATE IMPROVED DRAINAGE AND COVER THEN CLOSE THE NORTH CKD AREA AS A CLASS II SOLID WASTE LANDFILL REQUIRED BY THE STATE OF CALILFORNIA WASTE DISCHARGE REQUIREMENT ORDER NO. R3-2018-0001.

3) PARCEL NUMBERS AND BOUNDARIES ARE: 058-071-06, 058-022-09, 058-022-10, 058-022-16

4) SELECTED REFERENCES

a) Letter: "Land Disposal Program: CEMEX Davenport Cement Plant CKD Landfills, Santa Cruz County - Final Closure Plan Conditional Approval," dated October 2, 2018 by Central Coast Regional Water Quality Control Board, 805-549-3694 or 805-542-4644.

b) Report: Final North CKD Area Closure Plan and Postclosure Monitoring and Maintenance Plan," with Appendicies and Attachments, dated April 1, 2018 by Adams Resource Consultants, 425-788-3244.

c) Letter: "Land Disposal Program: Transmittal of Closure and Post-Closure Waste Discharge Requirements, Order No. R3-2018-0001, for the CEMEX Davenport Cement Plant CKD Landfills," dated February 22, 2018 by Central Coast Regional Water Quality Control Board, 805-549-3694 or 805-542-4644.

d) Report: "Revegetation Plan for Closure of Cement KilnDust (CKD) Storage Areas, Davenport Cement Plant," dated January 25, 2002 by Greening and Associates, no current phone.

e) Report: "Manual for Design and Construction Monitoring of Soil Nailed Walls," Publication No. FHWA-SA-96-069R, dated October 1998 by FHWA.

f) Report: "Federal Highway Administration, Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5, Report No. FHWA-IP-85-15," dated September 1985, by FHWA.

EARTHWORK QUANTITIES

1) Grading in CKD Area: CUT -90,683 cy, Fill 110,643 cy
2) Clear, Grub and Stockpile - North Pond: -3,100 cy
3) Compacted General Fill - North Pond: 340 cy
4) Topsoil Fill - North Pond: 170 cy
5) Crushed Rock Fill - Seasonal Ponds: 270 cy
6) Crushed Rock Fill - Ditches: 800 cy
7) Sediment Removal - Retention Pond: -4680 cy
8) Grading - Coal Storage Area: - 3,733 cy
9) Clear and Grub Ditches: -1,000 cy
10) Haul Fill up to LLDPE from other on-site Facility Stockpiles: 10,075 cy
11) Compact CKD/Fill Foundation Layer: 60,600 cy
12) Import Fill for Protective Cover Soil over LLDPE from offsite: 35,600 cy
13) Haul Stockpiled Fill for Protective Cover Soil (PCS) over LLDPE from onsite: 2,900 cy
14) Import Fill for Topsoil Cover over PCS from offsite: 11,800 cy
15) Haul Stockpiled Fill for Topsoil Cover over (PCS) from onsite: 4,000 cy

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER MATTHEW A. HILLYARD NO. 69967 EXP. 09/30/20 CIVIL STATE OF CALIFORNIA

ADAMS RESOURCE CONSULTANTS
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RMC Pacific Materials, 700 Highway 1, Davenport, CA
c/oYasha Saber-Compass Land Group 916-825-4997
CEMENT KILN DUST (CKD) CLOSURE PLANS

COVER SHEET

CEMEX

DRAWING NUMBER

SHEET

C1

MASTER DRAWING LEGEND:

D-100	CONTROL POINT LOCATION AND NUMBER
PZ-6	MONITORING WELL LOCATION AND NUMBER
2.5%	DIRECTION OF SURFACE FLOW AND GRADIENT
3%	GRADE DIRECTION (DOWNSLOPE)
20+00	CENTERLINE AND STATION FOR TOP OF GRADE PROFILE
	PROPERTY LINE
	LEASE LINE
	LIMIT OF CKD PILE (APPROXIMATE)
X	UTILITY LINES (BURIED)
	30-INCH CMP PIPELINE (BURIED, APPROXIMATE LOCATION)
P	OVERHEAD POWER LINE AND POWER POLE
W	UNDERGROUND WATER LINE
	NEW DRAINAGE DITCHES
	EXISTING DRAINAGE DITCHES
	TEMPORARY FIBER ROLL
270	EXISTING MAJOR ELEVATION CONTOUR IN FEET
	EXISTING MINOR ELEVATION CONTOUR IN FEET
270	PROPOSED MAJOR ELEVATION CONTOUR IN FEET
	PROPOSED MINOR ELEVATION CONTOUR IN FEET
BH 8	EXISTING BOREHOLE LOCATION AND NUMBER
	PROPOSED CKD WORK AREA LIMITS (CDLC)
	PROPOSED CKD WORK AREA LIMITS (CEMEX)
	PROPOSED LIMITS OF CKD GRADING LIMITS
C1	REVISION CLOUD

A
3 | 8

SECTION/PROFILE IDENTIFICATION
SHEET WHERE SECTION/PROFILE IS SHOWN
SHEET WHERE SECTION/PROFILE IS FIRST REFERENCED

1
3 | 9

DETAIL NUMBER
SHEET WHERE DETAIL IS SHOWN
SHEET WHERE DETAIL IS FIRST REFERENCED

STANDARD ABBREVIATIONS

AB	ANCHOR BOLT
ADDL	ADDITIONAL
ADJ	ADJACENT
AFF	ABOVE FINISH FLOOR
APPROX	APPROXIMATE(LY)
ARCH	ARCHITECTURAL
ARCH'T	ARCHITECT
BB	BACK TO BACK
BC	BOTTOM CORD
BL	BASELINE
BLDG	BUILDING
BM	BEAM
BMP	BEST MANAGEMENT PRACTICE
BOT	BOTTOM
BP	BASE PLATE
BRG	BEARING
BRKT	BRACKET
BS	BOTH SIDES
BSMT	BASEMENT
BVL	BEVELED
BW	BOTH WAYS
C	COMPRESSION
CB	CATCH BASIN
CIP	CAST-IN-PLACE
CJ	CONSTRUCTION JOINT
CL	CENTERLINE
CLR	CLEAR OR CLEARANCE
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONT'D	CONTINUED
D	DEPTH
DEG	DEGREES
DETL	DETAIL
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DIST	DISTRIBUTION
DL	DEAD LOAD
DN	DOWN
DP	DAMP PROOFING
DWG	DRAWING(S)
DWL	DOWEL
E	EAST
EA	EACH
EF	EACH FACE
EJ	EXPANSION JOINT
ELEC	ELECTRICAL
ELEV,EL	ELEVATION
EQ	EQUAL

STANDARD ABBREVIATIONS (CONT'D)

EQUIP	EQUIPMENT
EW	EACH WAY
EXIST (EG)	EXISTING OR (EXISTING GRADE)
EXP	EXPANSION
EXT	EXTERIOR
FAB	FABRICATION
FD	FRENCH DRAIN
FDN	FOUNDATION
FF	FINISH FLOOR
FIN (FG)	FINISH(ED) OR (FINISHED GRADE)
FS	FAR SIDE
FT	FEET/FOOT/'
GA	GAGE OR GAUGE
GALV	GALVANIZED
GB	GRADE BEAM
HDPE	HIGH-DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HIGH POINT
HS	HEADED STUD
IE	INVERT ELEVATION
ID	INSIDE DIAMETER
IN	INCHES/INCH/"
JST	JOIST
JT	JOINT
K	KIPS
KO	KNOCKOUT
LB,#	POUND
LD	DEVELOPMENT LENGTH
LFT	LINEAL FEET
LH	LEFT HAND
LL	LIVE LOAD
LLDPE	LINEAR LOW-DENSITY POLYETHYLENE
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LONG	LONGITUDINAL
LP	LOW POINT
LW	LONG WAY
LWC	LIGHTWEIGHT CONCRETE
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MEP	MECHANICAL, ELECTRICAL, PLUMBING
MEZZ	MEZZANINE
MFR	MANUFACTURE(R)
MH	MAN-HOLE
MID	MIDDLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MS	MIDDLE STRIP
MT	STRUCTURAL TEE CUT FROM A MISCELLANEOUS STEEL SECTION
MTL	METAL

STANDARD ABBREVIATIONS (CONT'D)

N/A	NOT APPLICABLE
NF	NEAR FACE
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NS	NEAR SIDE
NTS	NOT TO SCALE
OA	OVERALL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OPNG	OPENING(S)
OPP	OPPOSITE
OPP HND	OPPOSITE HAND
OPT	OPTIONAL
OZ	OUNCE(S)
PC	PRECAST CONCRETE
PCT, %	PERCENT
PE	POLYETHYLENE
PERM	PERMANENT
PERP	PERPENDICULAR
PL	PLATE
PLUMB	PLUMBING
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PRMLD	PREMOLDED
PROJ	PROJECTION
PT	POINT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
R	RIGHT, RISER
RAD	RADIUS
RD	ROOF DRAIN
RE:	REFER
REINF	REINFORCING (-ED,-MENT)
REM	REMAINDER
REQD	REQUIRED
REV	REVISION
RH	RIGHT HAND
RJ	RUSTICATION JOINT
RND	ROUND
RO	ROUGH OPENING
RW	RETAINING WALL
S	SOUTH
SC	SHEAR CONNECTORS
SCH	SCHEDULE(D)
SD	STORM DRAIN
SECT	SECTION
SHOT	SHOTCRETE
SIM	SIMILAR
SJ	SAW JOINT
SL	SLOPE
SPA	SPACE

STANDARD ABBREVIATIONS (CONT'D)

SPEC	SPECIFICATION(S)
SPL	SPECIAL
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
STIFF	STIFFENER
STIR	STIRRUP
STL	STEEL
STR'L	STRUCTURAL
STRUCT	STRUCTURE
SW	SHEAR WALL
SYM	SYMMETRICAL
T	TOP, TENSION
T&B	TOP AND BOTTOM
T/	TOP OF
T/CONC	TOP OF CONCRETE
T/FD	TOP OF FLOOR DRAIN
T/FTG	TOP OF FOOTING
T/SLAB	TOP OF SLAB
TEMP	TEMPERATURE, TEMPORARY
THK	THICKNESS
THRD	THREADED
TOS	TOP OF STEEL, TOP OF SHOTCRETE
TOW	TOP OF WALL
TRD	TREAD(S)
TRNV	TRANSVERSE
TS	STRUCTURAL TUBING
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
W	WEST, WIDTH, WIDE FLANGE
W/	WITH
W/O	WITHOUT
WP	WORK POINT, WATER-PROOFING
WT	WEIGHT, STRUCTURAL TEE CUT FROM WIDE FLANGE BEAM
WWF	WELDED WIRE FABRIC

USE OF THIS DESIGN

WE COMPLETED THIS WORK IN GENERAL ACCORDANCE WITH OUR CONTRACT. THIS DESIGN AND THESE DRAWINGS ARE FOR THE EXCLUSIVE USE OF RMC PACIFIC MATERIALS FOR SPECIFIC APPLICATION TO THE SUBJECT PROJECT AND SITE. USE OF THIS DESIGN BY ANYONE EXCEPT FOR WHOM IT WAS PREPARED IS PROHIBITED WITHOUT WRITTEN CONSENT FROM ADAMS RESOURCE CONSULTANTS COMPANY, THE DESIGN ENGINEER-OF-RECORD.

CONTRACTOR MUST CALL FOR UTILITY LOCATES PRIOR TO CONSTRUCTION; (Phone 811).

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR REPAIRS AND/OR REPLACEMENT OF EXISTING UTILITIES AND FACILITIES SHOULD DAMAGE OCCUR AS A RESULT OF CONSTRUCTION ACTIVITIES.

GENERAL NOTES

GENERAL:

THE GENERAL CONTRACTOR IS DEFINED, FOR THE PURPOSES OF THIS DESIGN, AS THE PROJECT CONTRACTOR UNLESS OTHERWISE NOTED. THE CONTRACTOR IS RESPONSIBLE FOR THE PROJECT SITE CONSTRUCTION PROCESS AND SAFETY OF THE WORKERS, THAT INCLUDES, BUT IS NOT LIMITED TO, THE CONSTRUCTION SEQUENCE, TEMPORARY BARRIERS, EXCAVATION ACCESS, AND TRAFFIC.

All WORK ON LEASED PROPERTY OR IN SENSITIVE HABITAT AREAS IS SUBJECT TO APPROVAL OF THE APPROPRIATE AGENCY AND LAND OWNER.

EXISTING UNDERGROUND OBSTRUCTIONS AND UTILITIES:

THE CONTRACTOR MUST FIELD VERIFY ALL EXISTING DIMENSIONS AND SITE CONDITIONS.

THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING ACTUAL LOCATIONS OF ALL EXISTING UTILITIES SHOWN ON THE PLANS AND THOSE UTILITIES INCLUDING, BUT NOT LIMITED TO, OVERHEAD OR UNDERGROUND OBSTRUCTIONS.

THE CONTRACTOR IS RESPONSIBLE FOR INTERIM TEMPORARY CUTS OVER 4 FEET HIGH AND FOR THE REMOVAL OF ALL ABANDONED UTILITIES, OR CHANGES TO OTHER EXISTING OBSTRUCTIONS THAT INTERFERE WITH THE NEW CONSTRUCTION.

REV	DESCRIPTION	DATE	REVIEW	DRAWN	DESIGN
R3	FINAL REVIEW	04/01/18	MAH	WCA	WCA
C1	FOR BID AND CONSTRUCTION	12/12/19	MAH	WCA	WCA

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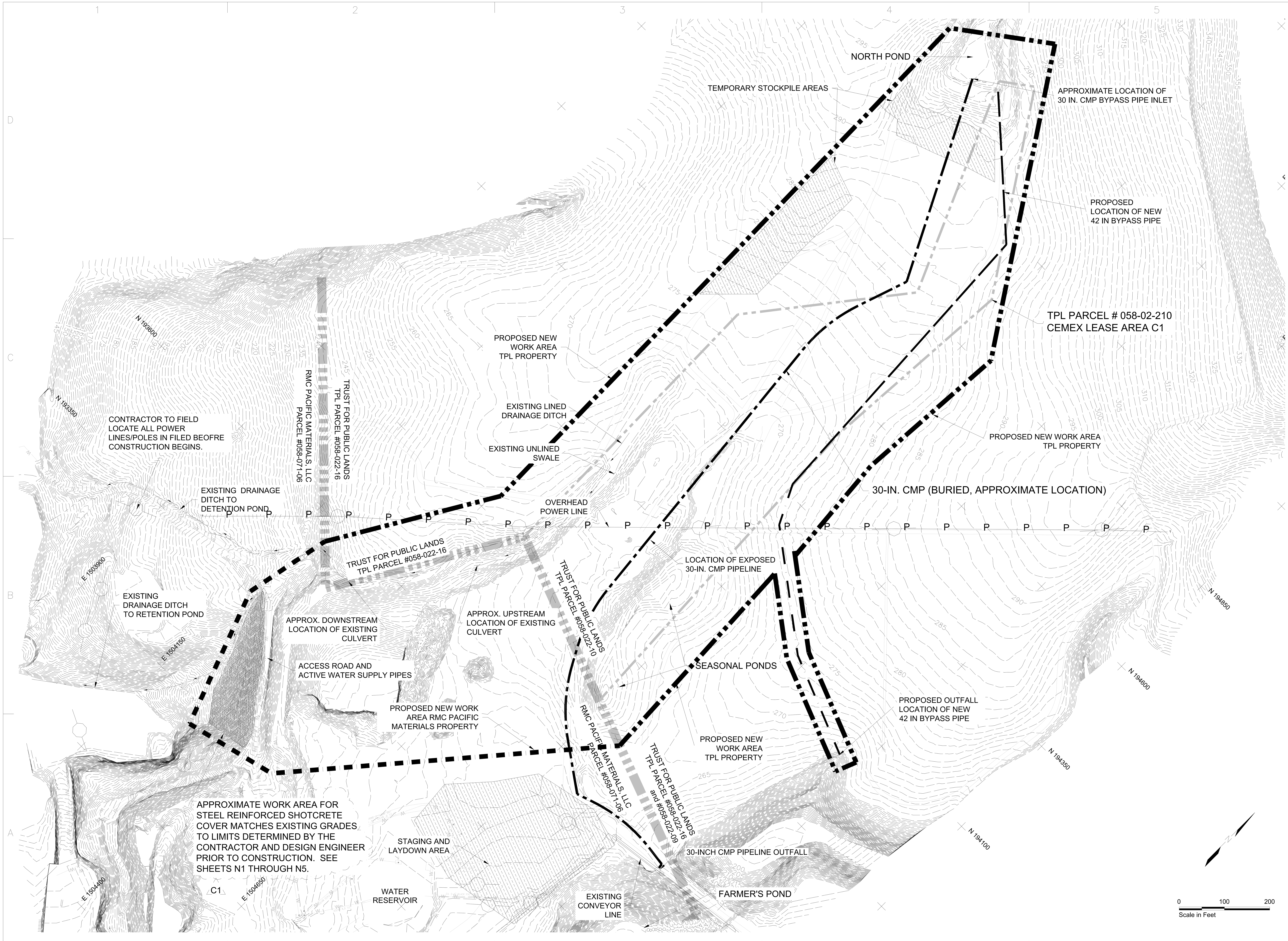
RMC Pacific Materials, 700 Highway 1, Davenport, CA
c/oYasha Saber-Compass Land Group 916-825-4997
CEMENT KILN DUST (CKD) CLOSURE PLANS
NOTES, LEGEND AND ABBREVIATIONS

cemex

DRAWING NUMBER
SHEET
C2


NORTH POND
TEMPORARY STOCKPILE AREAS
APPROXIMATE LOCATION OF 30 IN. CMP BYPASS PIPE INLET
PROPOSED LOCATION OF NEW 42 IN BYPASS PIPE
TPL PARCEL # 058-02-210
CEMEX LEASE AREA C1
PROPOSED NEW WORK AREA TPL PROPERTY
EXISTING LINED DRAINAGE DITCH
EXISTING UNLINED SWALE
TRUST FOR PUBLIC LANDS TPL PARCEL #058-022-16
RMC PACIFIC MATERIALS, LLC PARCEL #058-071-06
CONTRACTOR TO FIELD LOCATE ALL POWER LINES/POLES IN FILED BEOFRE CONSTRUCTION BEGINS.
EXISTING DRAINAGE DITCH TO DETENTION POND
OVERHEAD POWER LINE
PROPOSED NEW WORK AREA TPL PROPERTY
30-IN. CMP (BURIED, APPROXIMATE LOCATION)
TRUST FOR PUBLIC LANDS TPL PARCEL #058-022-16
LOCATION OF EXPOSED 30-IN. CMP PIPELINE
EXISTING DRAINAGE DITCH TO RETENTION POND
APPROX. DOWNSTREAM LOCATION OF EXISTING CULVERT
APPROX. UPSTREAM LOCATION OF EXISTING CULVERT
TRUST FOR PUBLIC LANDS TPL PARCEL #058-022-10
SEASONAL PONDS
ACCESS ROAD AND ACTIVE WATER SUPPLY PIPES
PROPOSED NEW WORK AREA RMC PACIFIC MATERIALS PROPERTY
PROPOSED OUTFALL LOCATION OF NEW 42 IN BYPASS PIPE
PROPOSED NEW WORK AREA TPL PROPERTY
RMC PACIFIC MATERIALS, LLC PARCEL #058-071-06
TRUST FOR PUBLIC LANDS TPL PARCEL #058-022-16 and #058-022-09
APPROXIMATE WORK AREA FOR STEEL REINFORCED SHOTCRETE COVER MATCHES EXISTING GRADES TO LIMITS DETERMINED BY THE CONTRACTOR AND DESIGN ENGINEER PRIOR TO CONSTRUCTION. SEE SHEETS N1 THROUGH N5.
STAGING AND LAYDOWN AREA
30-INCH CMP PIPELINE OUTFALL
C1
WATER RESERVOIR
EXISTING CONVEYOR LINE
FARMER'S POND
0 100 200
Scale in Feet

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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CEMENT KILN DUST (CKD) CLOSURE PLANS

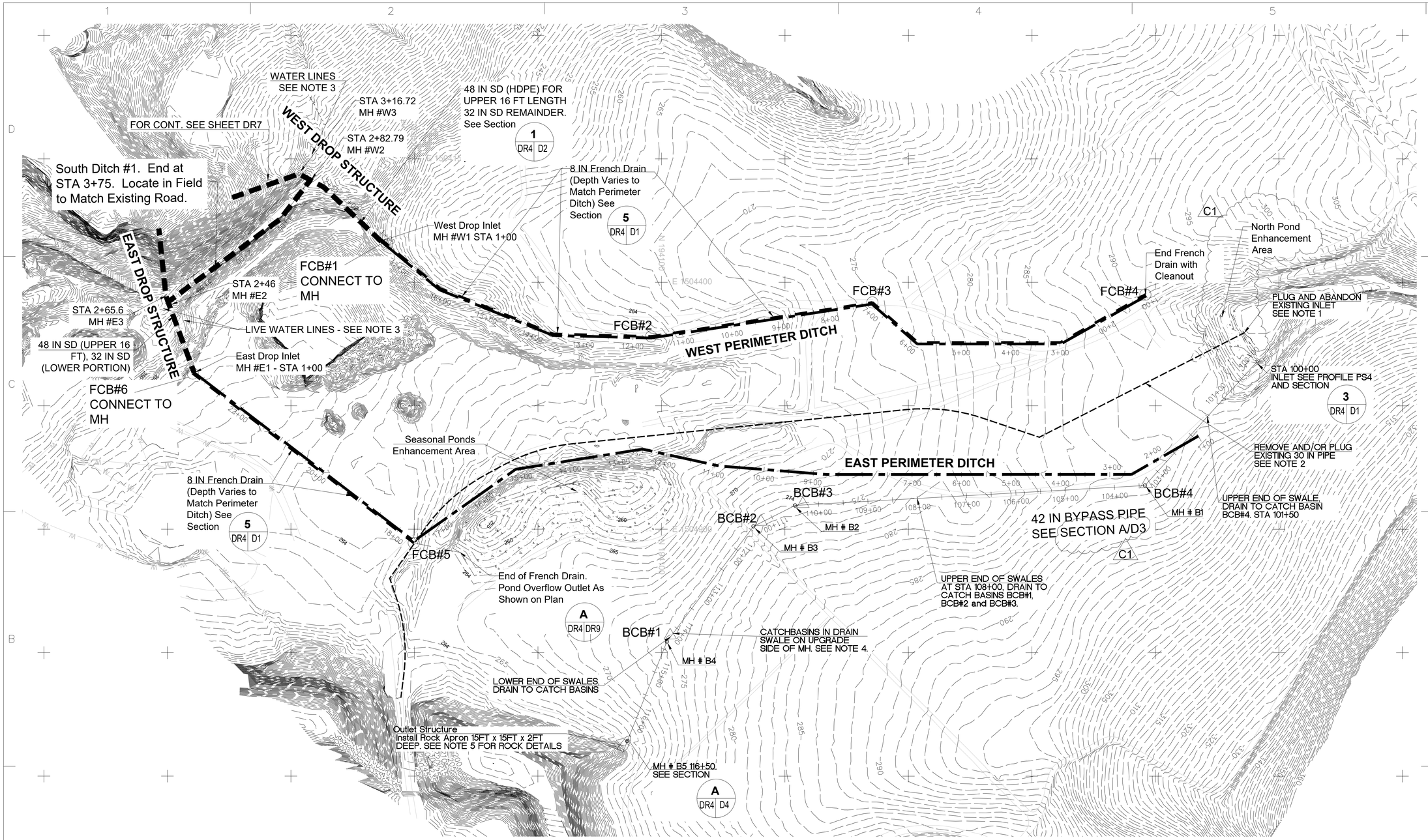
EXISTING SITE CONDITIONS AND WORK AREAS

CEMEX

DRAWING NUMBER

SHEET

C3



KEY TO SYMBOLS

FCB#3 ○ FRENCH DRAIN CATCH BASIN

BCB#1 △ BYPASS PIPE CATCH BASIN

0 100 200
Scale in Feet

NOTES
1. ABANDON AND PLUG EXISTING 30 IN CULVERT INLET WITH 10 LINEAR FEET OF LEAN CEMENT OR AS APPROVED BY THE ENGINEER.
2. REMOVE (AND/OR PLUG ENTIRE LENGTH WHERE LEFT IN PLACE) THE EXISTING 30 IN CULVERT BENEATH CLOSURE AREA PROJECT LIMITS.
3. LOCATE AND EXPOSE EXISTING WATER LINES PRIOR TO CONSTRUCTION OF DROP STRUCTURE PIPES AND SOIL NAILED WALL.
(DESIGN ENGINEER AND COUNTY TO BE NOTIFIED FOURTEEN (14) BUSINESS DAYS BEFORE EXCAVATION BEGINS IN AREA OF PIPES.)
4. INSTALL 7.5 FT WIDE DRAINAGE SWALE ALONG GROUND SURFACE. SEE SECTION A/D3.
5. RIP RAP SEE SPEC 02200/2.04.
6. ALL MANHOLES AND STILLINGS BASINS SHALL BE ENFCLOSED BY CRUSHED ROCK WHERE IN CONTACT WITH SOIL AS SHOWN ON SHEET DR8, DETAIL C.

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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CEMENT KILN DUST (CKD) CLOSURE PLANS

DRAINAGE IMPROVEMENTS

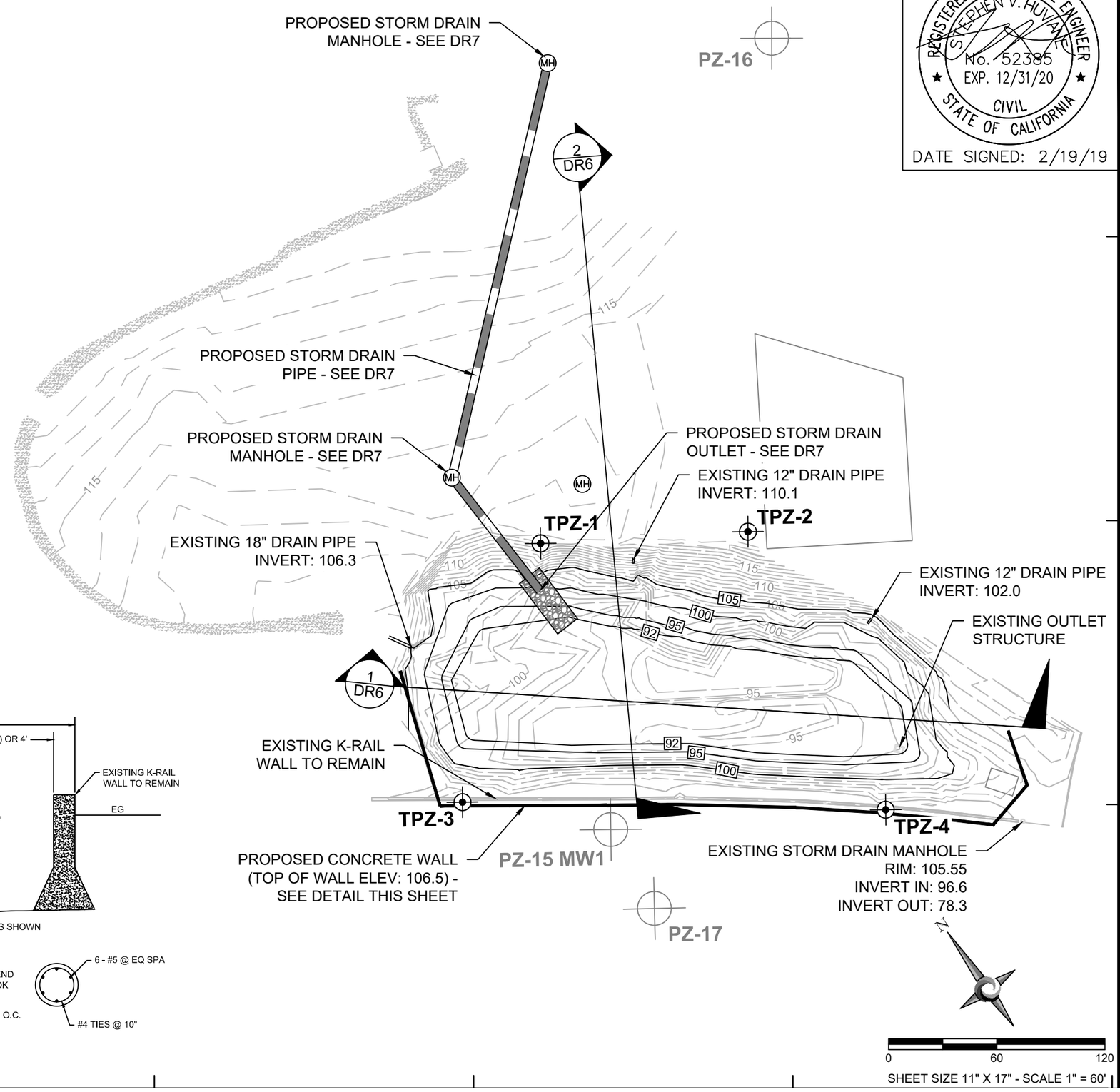
DRAWING NUMBER

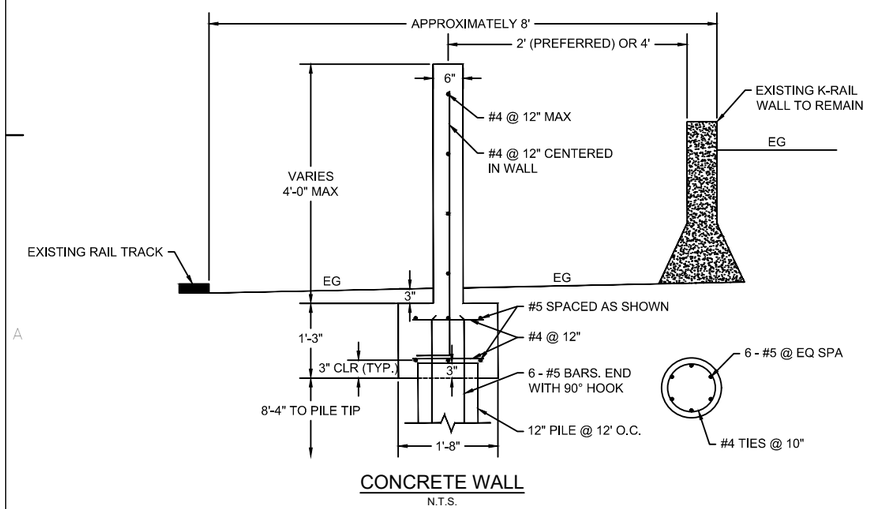
SHEET
DR4
4 OF 28

LEGEND

- 95 — Existing Grade Contour
- 105 — Proposed Grade Contour
- PZ-15 — Approximate Location of Existing Groundwater Monitoring Well
- TPZ-1 — Approximate Location of Existing Temporary Piezometer

NOTES:
Pond bottom topography was estimated based on photographs and Global Positioning System (GPS) readings taken in November 2014





CONCRETE WALL
N.T.S.

0 60 120
SHEET SIZE 11" X 17" - SCALE 1" = 60'

REGISTERED PROFESSIONAL ENGINEER
STEPHEN V. HUVANE
No. 52385
EXP. 12/31/20
CIVIL
STATE OF CALIFORNIA
DATE SIGNED: 2/19/19

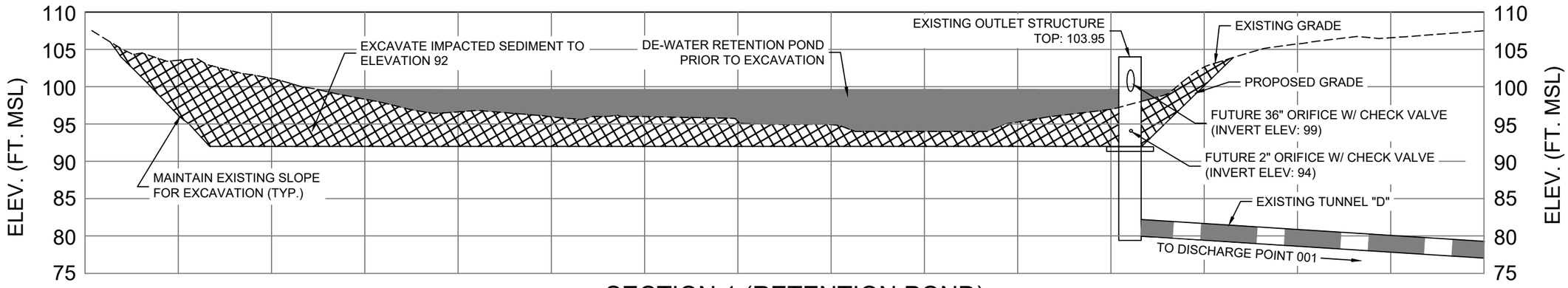
REV	DATE	REVIEW	DRAWN	DESIGN
C1	2/19/19	SVH	RO	SVH

DESCRIPTION: FOR BID AND CONSTRUCTION

TRC
Results you can rely on
TRC SOLUTIONS, INC.
2300 CLAYTON ROAD, SUITE 610
CONCORD, CA 94520

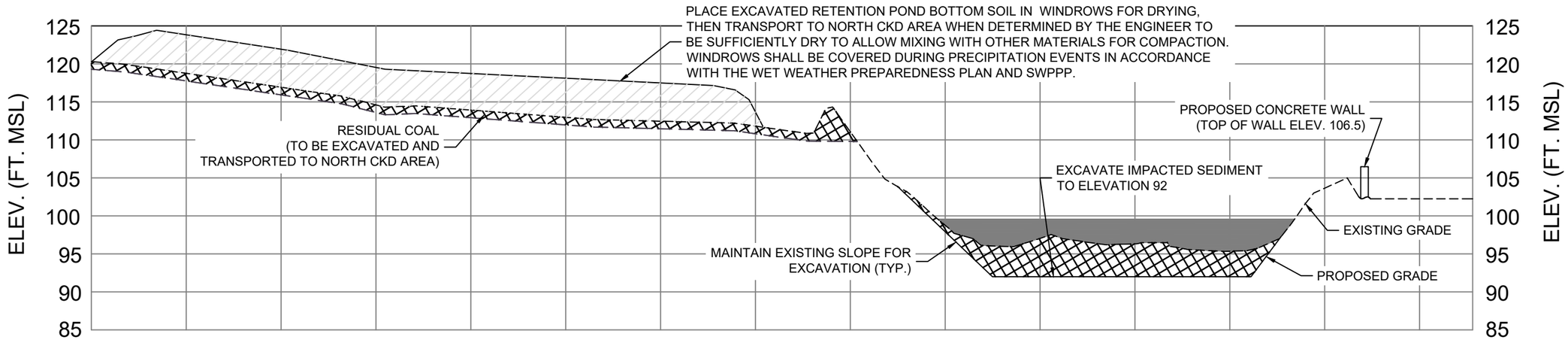
RMC PACIFIC MATERIALS, 700 HIGHWAY 1, DAVENPROT, CA
CEMENT KILN DUST (CKD) CLOSURE PLANS
RETENTION POND REMEDIATION

DRAWING NUMBER
SHEET
DR5
5 OF 24



SECTION 1 (RETENTION POND)

V: 1" =15' H: 1" =30'



SECTION 2 (FORMER COAL STORAGE AREA AND RETENTION POND)

V: 1" =15' H: 1" = 30'

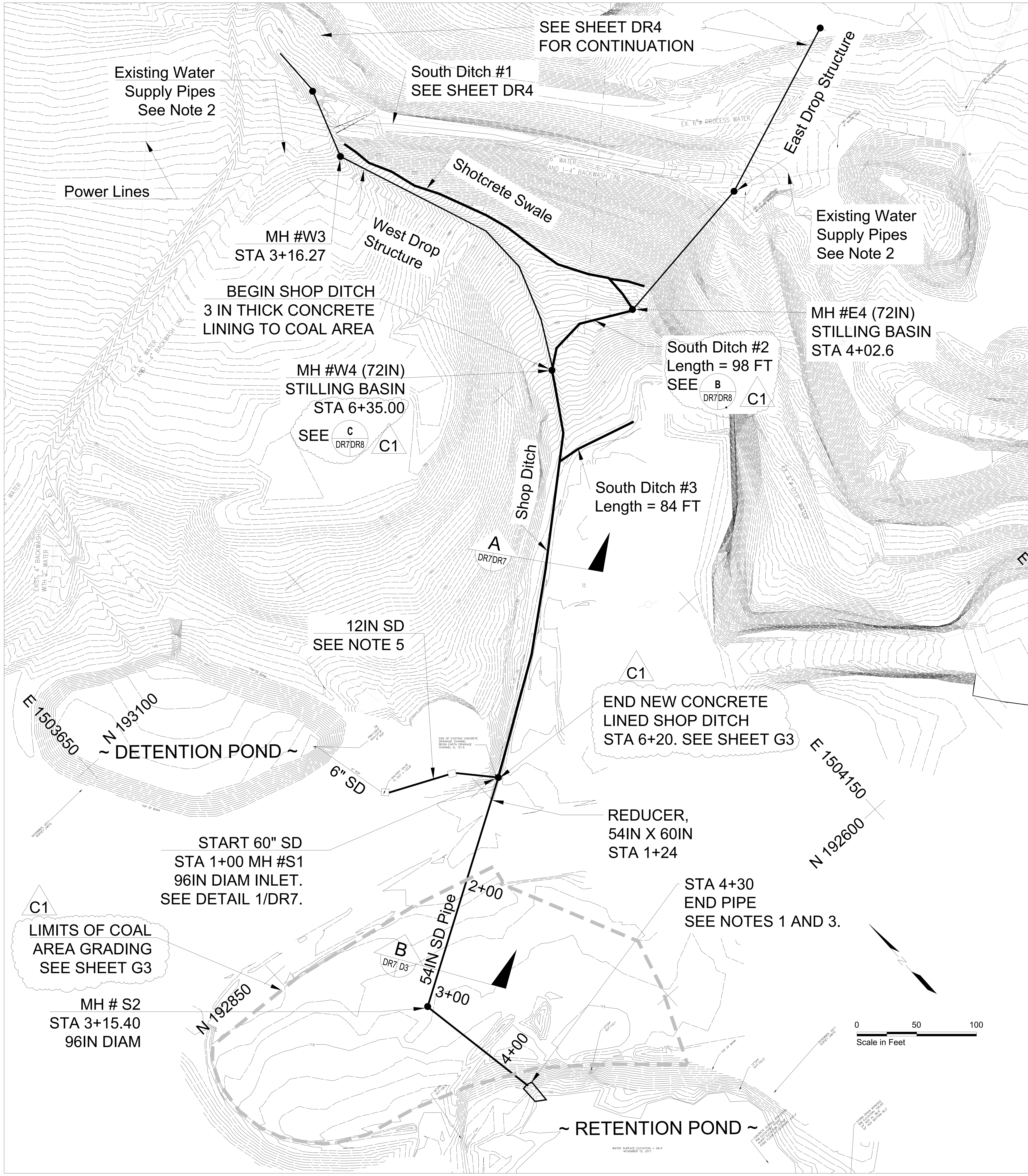
DATE SIGNED: 2/19/19

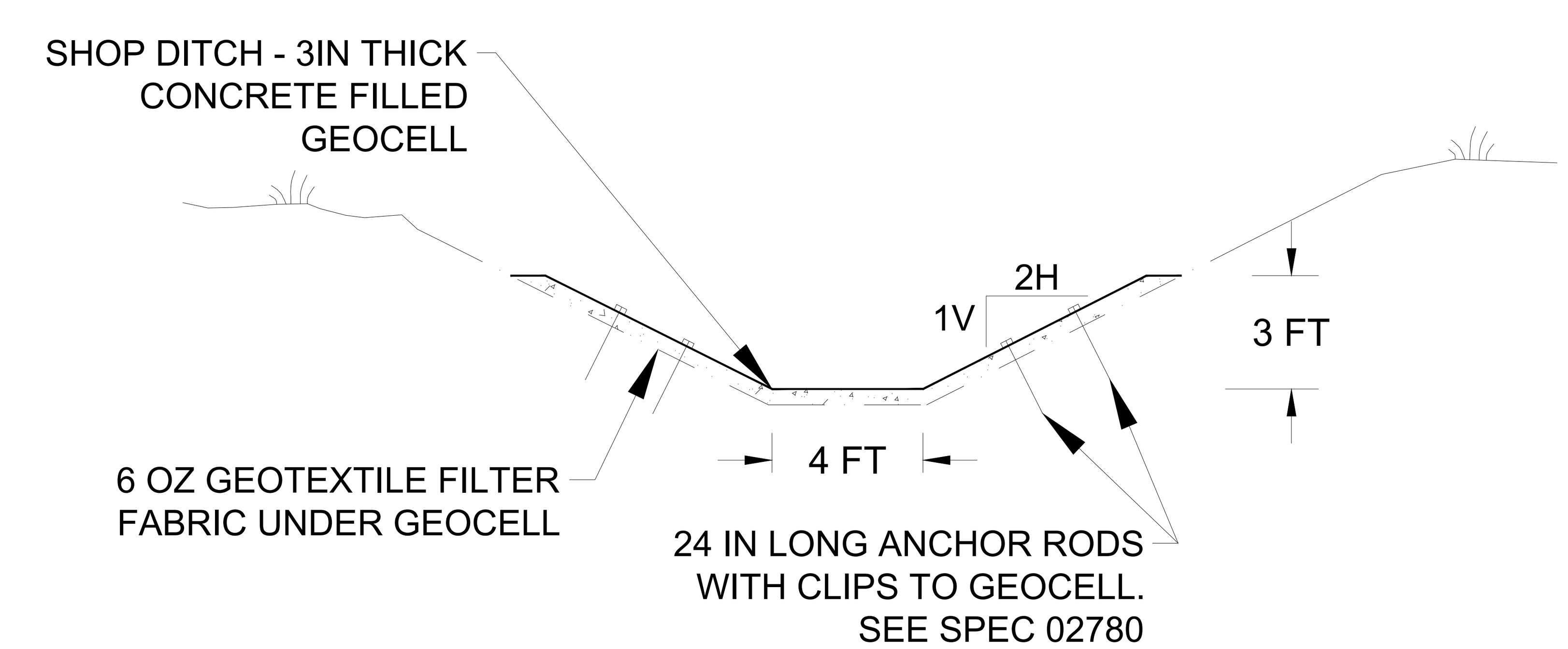
DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
SVH	RD	SVH	2/19/19	C1	FOR BID AND CONSTRUCTION

TRC
Results you can rely on
TRC SOLUTIONS, INC.
2300 CLAYTON ROAD, SUITE 610
CONCORD, CA 94520

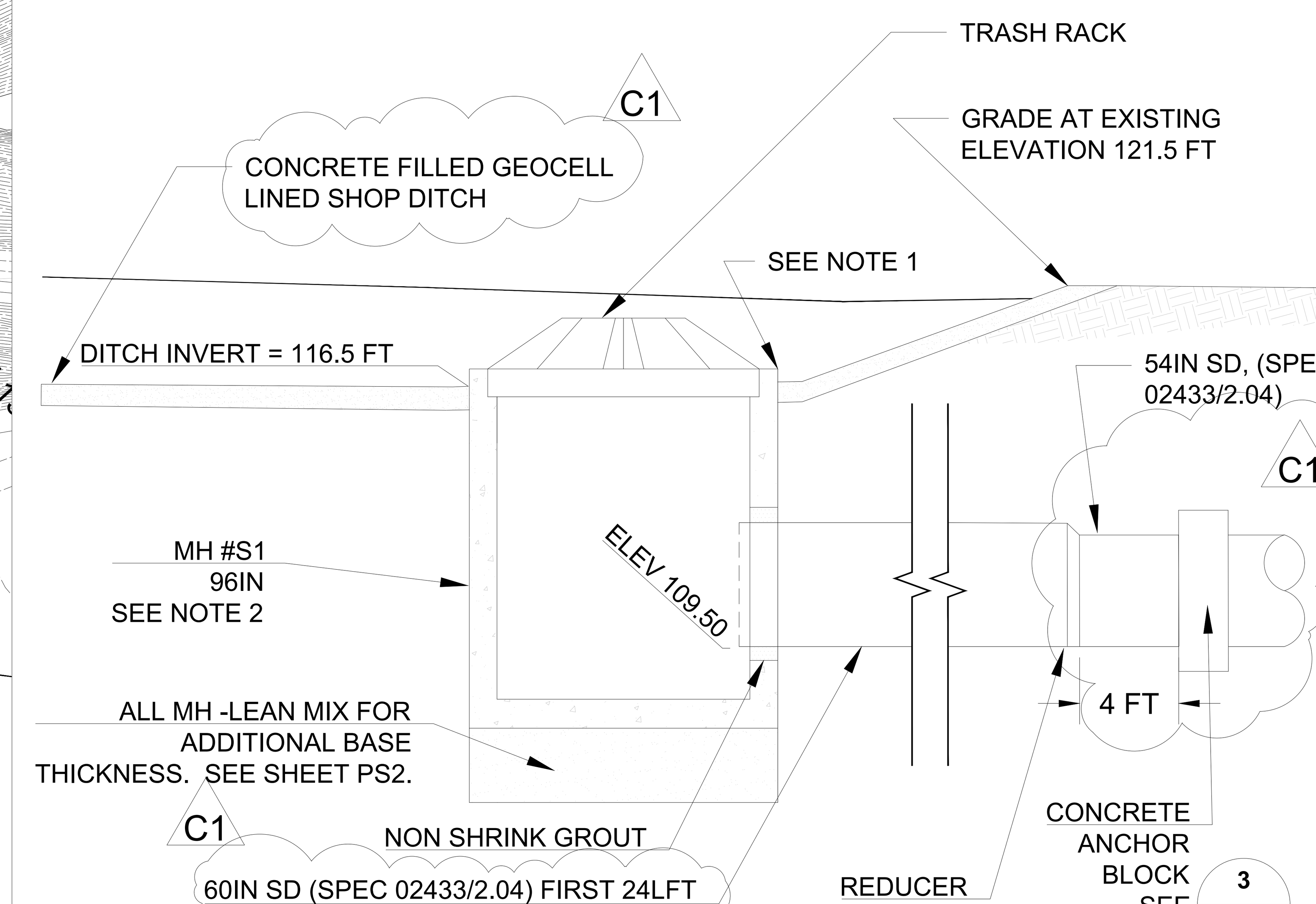
RMC PACIFIC MATERIALS, 700 HIGHWAY 1, DAVENPORT, CA
CEMENT KILN DUST (CKD) CLOSURE PLANS
RETENTION POND REMEDIATION

DRAWING NUMBER
SHEET
DR6
6 OF 24





SECTION - TYPICAL SHOP DITCH (NO LLDPE/CAP) A DR7 DR7
NOT TO SCALE



NOTES

1. SET MH RIM 3IN ABOVE DITCH INVERT.
2. SET MH ON 6IN CRUSHED ROCK BASE.
3. BOTTOM OF MH SHALL BE 6IN (MIN) BELOW PIPE INVERT.

DETAIL - MH #S1 1 DR7 DR7
NOT TO SCALE

NOTES

C1

1. INSTALL ROCK APRON, DIMENSIONS SHALL BE 14FT WIDE BY 15FT LONG, AND 18IN MIN THICKNESS. EXTEND ROCK UP TO ELEV 106.0
2. CONTRACTOR SHALL LOCATE AND EXPOSE EXISTING WATER LINES PRIOR TO NEW PIPE INSTALLATION.
3. FINAL LOCATION OF 54IN SD WILL DEPEND ON SOIL REMOVED, SEE SHEETS DR5, DR6 AND G3.
4. GRADES ALONG 54IN SD TO BE CONFIRMED BY SURVEY AND STAKED PRIOR TO CONSTRUCTION.
5. CONNECT EXISTING OUTFALL FROM DETENTION BASIN TO MH #S1 WITH TWO CATCH BASINS AT SD PIPE AS SHOWN. MINIMUM COVER SHALL BE 2FT, MIN SLOPE SHALL BE 0.020 FT/LFT.
6. SOUTH DITCH #2 SHALL BE 2.5 FT DEEP, 2.0 FT WIDE AT BASE AND MIN SLOPE OF 0.149 FT/LFT.
7. SOUTH DITCH #3 SHALL BE 1.5 FT DEEP, 1.5 FT WIDE AT BASE, CRUSHED ROCK FILLED GEOCELL AND MIN SLOPE OF 0.04 FT/FT.

C1

REV	DESCRIPTION
R3	FINAL REVIEW
C1	FOR BID AND CONSTRUCTION

DESIGN	DRAWN	REVIEW	DATE
WCA	WCA	MAH	04/01/18
WCA	WCA	MAH	12/12/19

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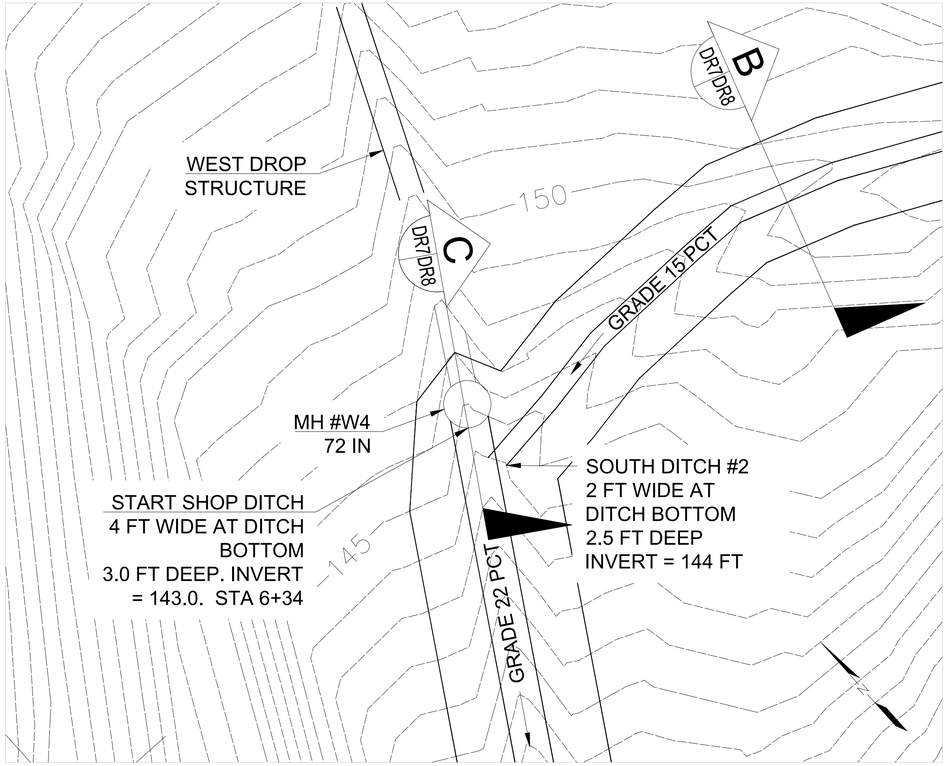
c/oYasha Saber-Compass Land Group 916-825-4997
CEMENT KILN DUST (CKD) CLOSURE PLANS

SHOP AREA DITCHES AND PIPE

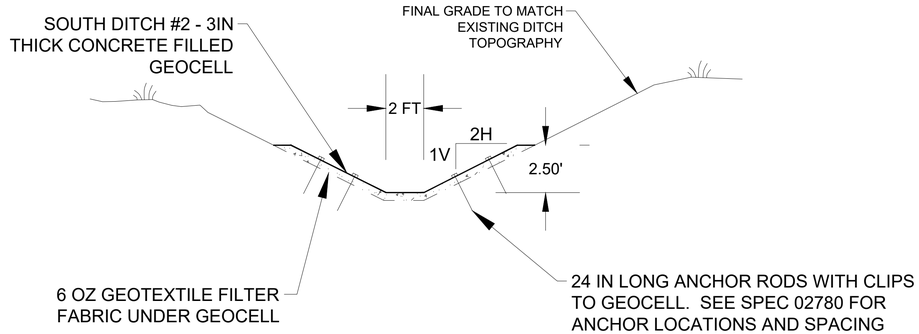
CEMEX

DRAWING NUMBER
SHEET
DR7
7 OF 28

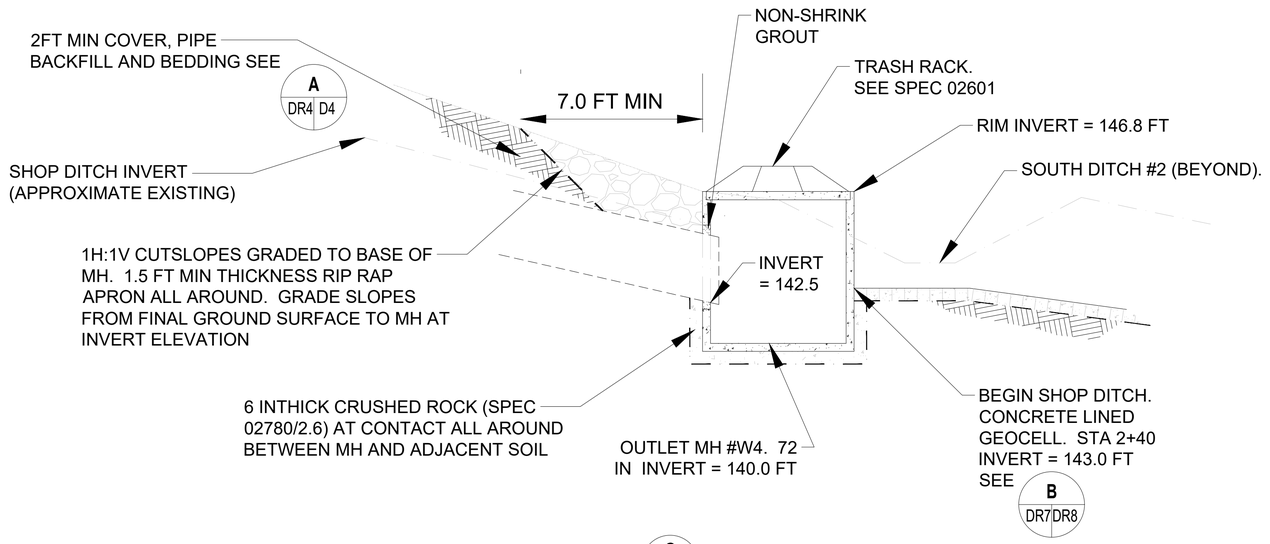


PLAN - JUNCTION SHOP DITCH AND SOUTH DITCH #2 (A, DR7 DR8)
NOT TO SCALE

0 8 16
Scale in Feet



SECTION - SOUTH DITCH #2 (B, DR7 DR8)
NOT TO SCALE



DETAIL - MH #W4 AND SOUTH DITCH #2 INVERT (C, DR7 DR8)
NOT TO SCALE

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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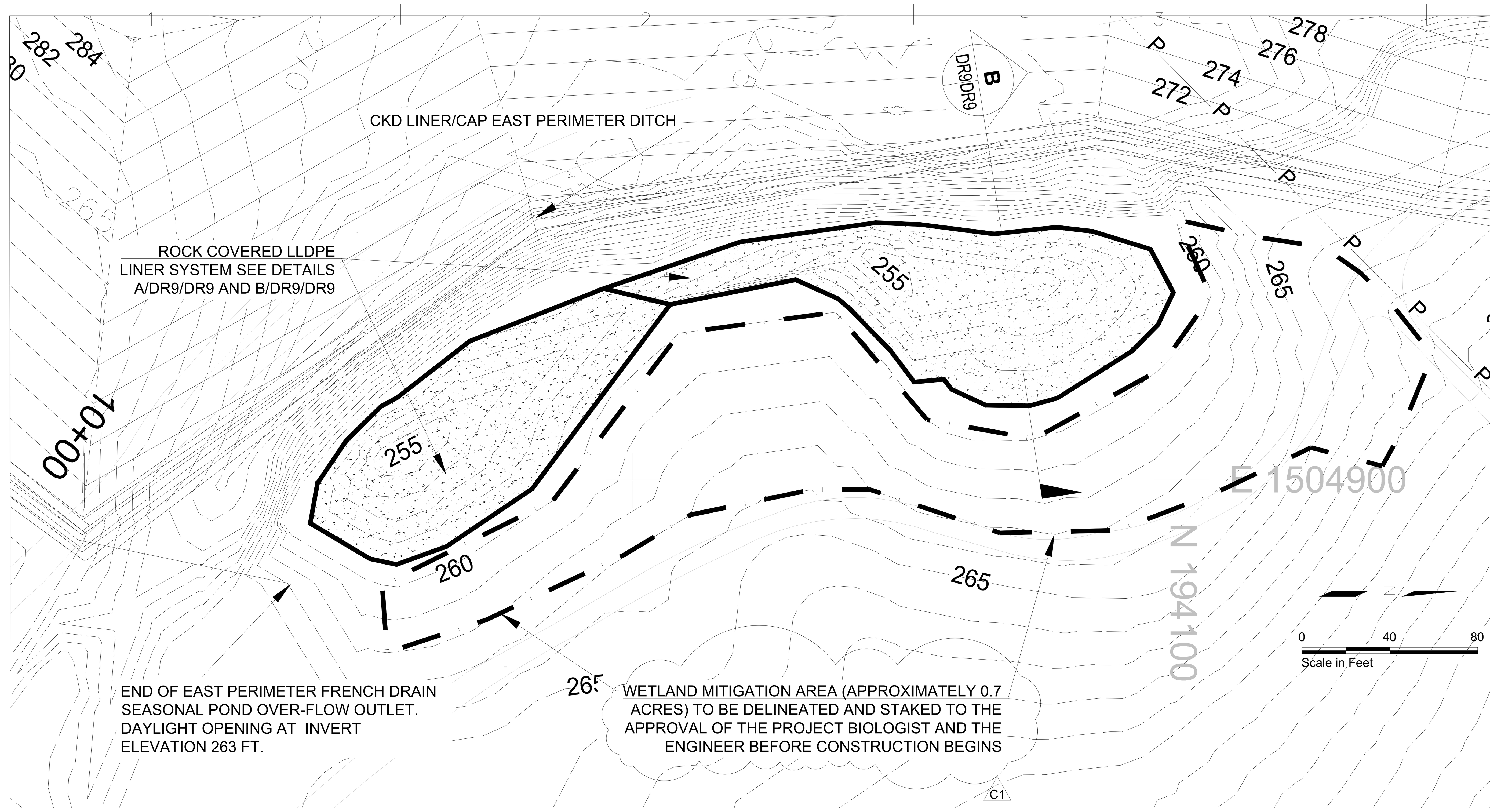
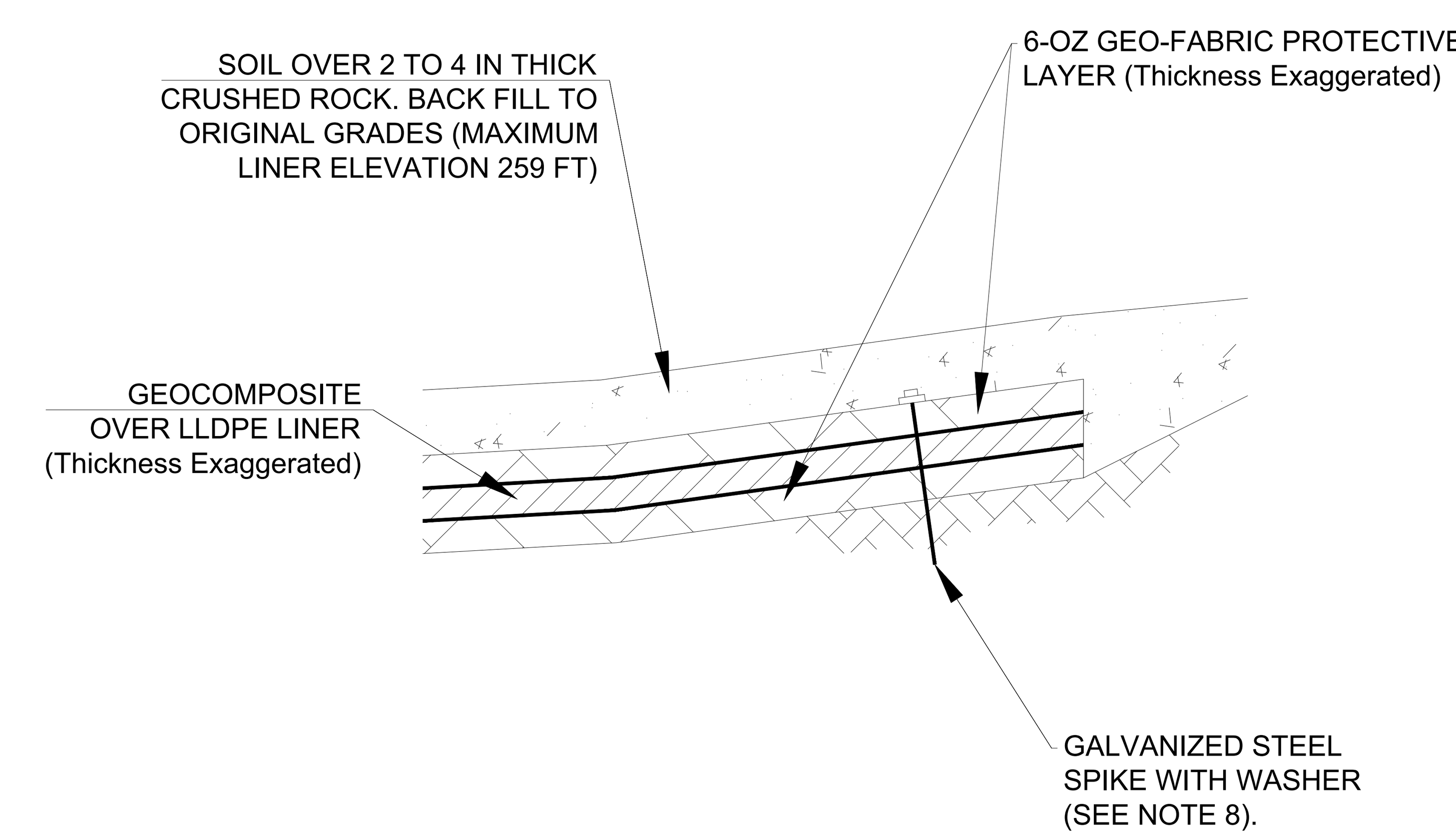
JUNTION: SHOP DITCH, SOUITH DITCH #2

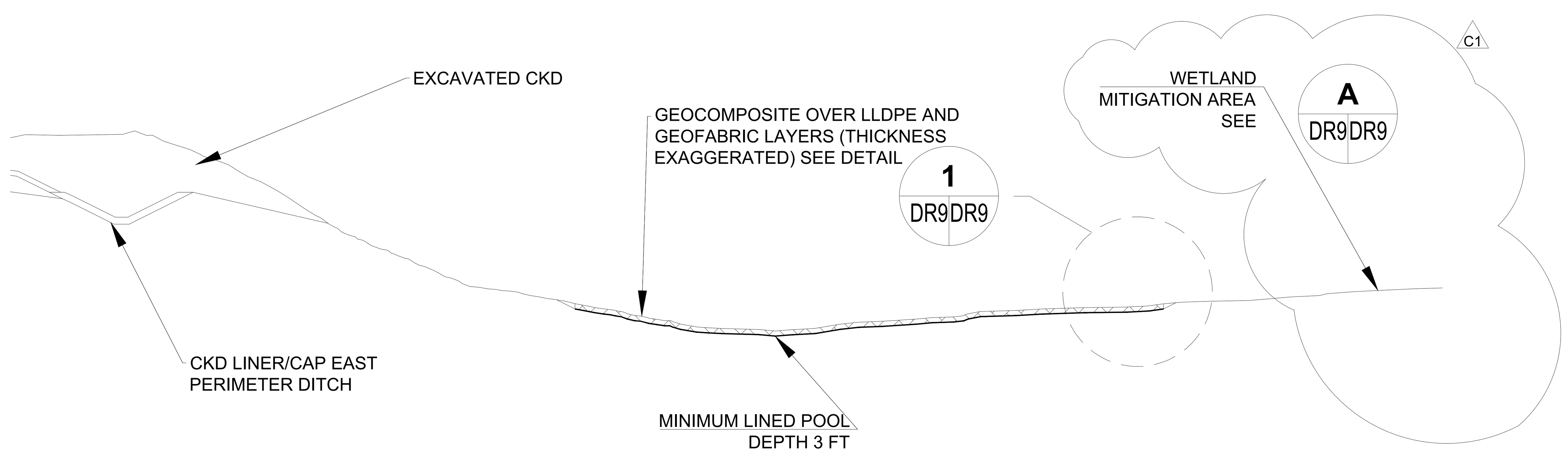
DRAWING NUMBER
SHEET
DR8
8 OF 28



PLAN - SEASONAL PONDS (A, DR9 DR9)



DETAIL - LINER SYSTEM AND GEO-FABRIC (1, DR9 DR9)
NOT TO SCALE



SECTION - TYPICAL SEASONAL POND (B, DR9 DR9)
NOT TO SCALE

NOTES:

1) OVER-EXCAVATE TOPSOIL BETWEEN ELEVATIONS OF ABOUT 255 AND 259 FT.
2) REMOVE SOIL TO A DEPTH OF 12 IN BELOW EXISTING DRY POND GROUND SURFACE GRADES AND STOCKPILE.
3) RAKE AND REMOVE ALL SHARP OBJECTS FROM GRADED SURFACE.
4) PROOF ROLL TO CREATE A SMOOTH SURFACE ON EXCAVATED/RAKED SURFACE.
5) PLACE 16 OZ GEO-FABRIC ON PROOF ROLLED SMOOTH SURFACE.
6) PLACE LLDPE ON TOP OF BOTTOM LAYER OF GEO-FABRIC.
7) PLACE GEOCOMPOSITE DRAIN LAYER ON TOP OF LLDPE.
7) PLACE TOP LAYER OF 16 OZ GEO-FABRIC ON TOP OF GEOCOMPOSITE.
8) SECURE TOP EDGE WITH 12 IN LONG GALVANIZED STEEL SPIKES AND WASHERS DRIVEN THROUGH FABRIC AND LINER. PLACE 5 FEET (HORIZONTALLY) APART AND LOCATED ABOUT 6 IN BELOW TOP EDGE OF LINER.
9) COVER TOP LAYER OF GEO-FABRIC WITH 2 TO 4 IN THICK CRUSHED ROCK.
10) PLACE STOCKPILED EXCAVATION MATERIAL OVER ROCK AS APPROXED BY THE OWNER OR OWNERS REPRESENTATIVE.

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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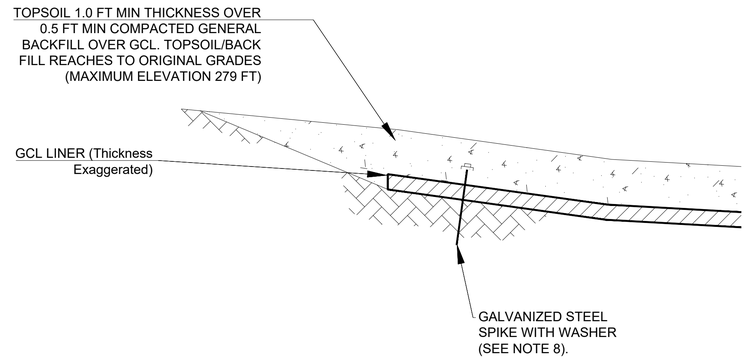
CEMENT KILN DUST (CKD) CLOSURE PLANS
SEASONAL PONDS HABITAT ENHANCEMENT

CEMEX

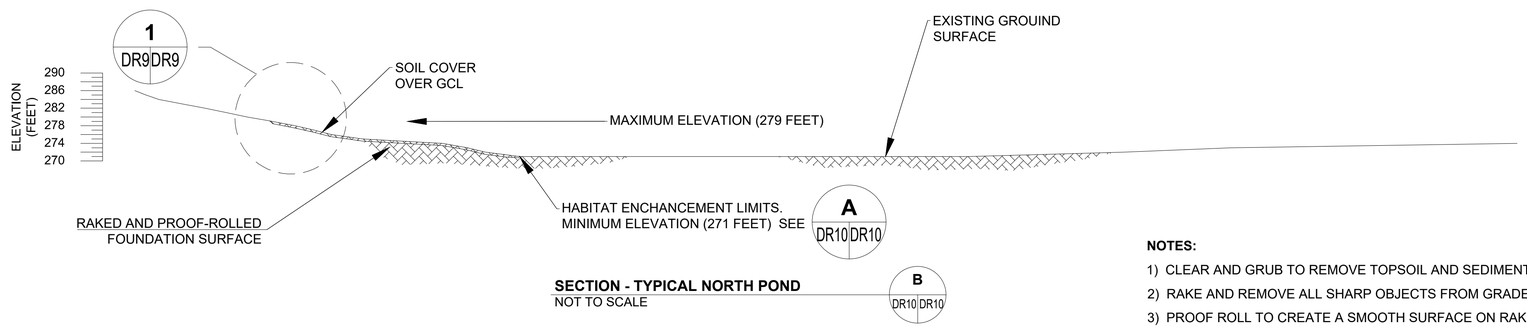
DRAWING NUMBER
SHEET
DR9
9 OF 28

PLAN - NORTH POND ENHANCEMENT
A
DR10 DR10



DETAIL - GCL LINER SYSTEM
NOT TO SCALE
1
DR10 DR10

SOUTHEAST



NORTHWEST

SECTION - TYPICAL NORTH POND
NOT TO SCALE
B
DR10 DR10

NOTES:

1) CLEAR AND GRUB TO REMOVE TOPSOIL AND SEDIMENT BETWEEN ELEVATIONS OF ABOUT 271 AND 279 FT.
2) RAKE AND REMOVE ALL SHARP OBJECTS FROM GRADED SURFACE.
3) PROOF ROLL TO CREATE A SMOOTH SURFACE ON RAKED SURFACE.
4) PLACE GCL ON PROOF ROLLED SMOOTH SURFACE.
5) SECURE TOP EDGE WITH 12 IN LONG GALVANIZED STEEL SPIKES AND WASHERS DRIVEN THROUGH GCL FABRIC AND LINER. PLACE SPIKES 5 FEET (HORIZONTALLY) APART AND LOCATED ABOUT 6 IN BELOW TOP EDGE OF LINER.
6) PLACE STOCKPILED TOPSOIL AND SEDIMENT OVER GCL AS APPROVED BY THE ENGINEER AND OWNER'S REPRESENTATIVE.
7) SEE SPECIFICATIONS SECTION 02775 - GEOSYNTHETIC CLAY LINER (GCL)

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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CEMENT KILN DUST (CKD) CLOSURE PLANS

NORTH POND HABITAT ENHANCEMENT

DRAWING NUMBER
SHEET
DR10
10 OF 28

LINER FOUNDATION GRADE CONTROL POINTS				
CP NAME	EASTING	NORTHING	ELEV (EG)	ELEV (FG)
F-200	1504214.60	193416.40	221.41	225.86
F-205	1504321.38	193528.95	241.91	244.40
F-210	1504420.06	193647.70	247.52	248.34
F-215	1504513.26	193879.68	257.61	256.11
F-220	1504518.47	194079.61	260.65	260.72
F-225	1504477.99	194342.77	265.68	268.00
F-230	1504450.05	194524.38	274.50	271.14
F-235	1504530.50	194615.65	276.01	274.04
F-240	1504530.51	194910.02	283.76	280.00
F-245	1504481.50	195070.18	287.54	288.00
F-250	1504690.62	195146.16	286.31	288.00
F-255	1504783.50	195050.08	285.15	281.98
F-260	1504783.49	194434.70	271.50	273.98
F-265	1504766.18	194217.32	265.98	270.53
F-270	1504734.43	194061.81	274.05	268.40
F-275	1504772.98	193802.89	271.71	265.21
F-280	1504916.82	193599.10	265.04	262.14
F-285	1504579.01	193158.92	257.58	256.23
F-290	1504438.88	193111.97	236.17	236.44
F-295	1504636.45	193513.72	263.50	282.18
F-300	1504670.63	193561.90	265.70	283.62
F-305	1504699.21	193622.27	267.57	286.00
F-310	1504671.57	193773.34	271.57	279.39
F-315	1504677.19	193880.29	273.06	277.78
F-320	1504656.77	194071.53	274.56	279.37
F-325	1504659.81	194115.98	274.06	280.73
F-330	1504657.12	194243.79	272.66	286.07
F-335	1504644.41	194398.33	270.96	291.33
F-340	1504640.87	194454.42	272.17	293.01
F-345	1504636.25	194499.21	273.16	294.00
F-350	1504666.63	194586.54	274.82	291.07
F-355	1504656.63	194964.38	285.16	297.72
F-360	1504639.03	195024.97	286.01	300.00
F-365	1504640.17	195026.43	286.03	300.00
F-370	1504900.02	193850.01	261.37	261.37

NOTE 1: ALL ROUGH GRADES SHALL BE APPROVED IN WRITING BY THE ENGINEER BEFORE PLACEMENT OF OVERLYING MATERIALS OR STRUCTURES SUCH AS, BUT NOT LIMITED TO: A) FILL, B) PIPES AND MANHOLES.

NOTE 2: CONTROL POINTS SHOWN ALONG PERIMETER DITCH ARE LOCATED AT THE BOTTOM EDGE OF THE 13.3 PERCENT CKD SLOPE. THE PERIMETER DITCH (ROUGH GRADE) BOTTOM IS 2.5 FT LOWER AS SHOWN ON SECTION A/D1.

LIMITS OF GRADING

42 IN Bypass Pipe

13.3%

REV	DESCRIPTION
R3	FINAL REVIEW
C1	FOR BID AND CONSTRUCTION

DESIGN	DRAWN	REVIEW	DATE
WCA	WCA	MAH	04/01/18
WCA	WCA	MAH	12/12/19

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CEMENT KILN DUST (CKD) CLOSURE PLANS
FINAL LINER FOUNDATION GRADE SOUTH

DRAWING NUMBER
SHEET
G1
11 OF 28

NOTE 1: ALL ROUGH GRADES SHALL BE APPROVED IN WRITING BY THE ENGINEER BEFORE PLACEMENT OF OVERLYING MATERIALS OR STRUCTURES SUCH AS, BUT NOT LIMITED TO: A) FILL, B) PIPES AND MANHOLES.

LIMITS OF GRADING

F-225 F-230 F-235 F-240 F-245 F-250 F-255 F-260 F-265 F-330 F-335 F-340 F-345 F-350 F-355 F-360 F-365

13.3%

42 IN Bypass Pipe

NOTE 2: CONTROL POINTS SHOWN ALONG PERIMETER DITCH ARE LOCATED AT THE BOTTOM EDGE OF THE 13.3 PERCENT CKD SLOPE. THE PERIMETER DITCH (ROUGH GRADE) BOTTOM IS 2.5 FT LOWER AS SHOWN ON SECTION A/D1.

REV	DESCRIPTION	DATE	REVIEW	DRAWN	DESIGN
R3	FINAL REVIEW	04/01/18	MAH	WCA	WCA
C1	FOR BID AND CONSTRUCTION	12/12/19	MAH	WCA	WCA

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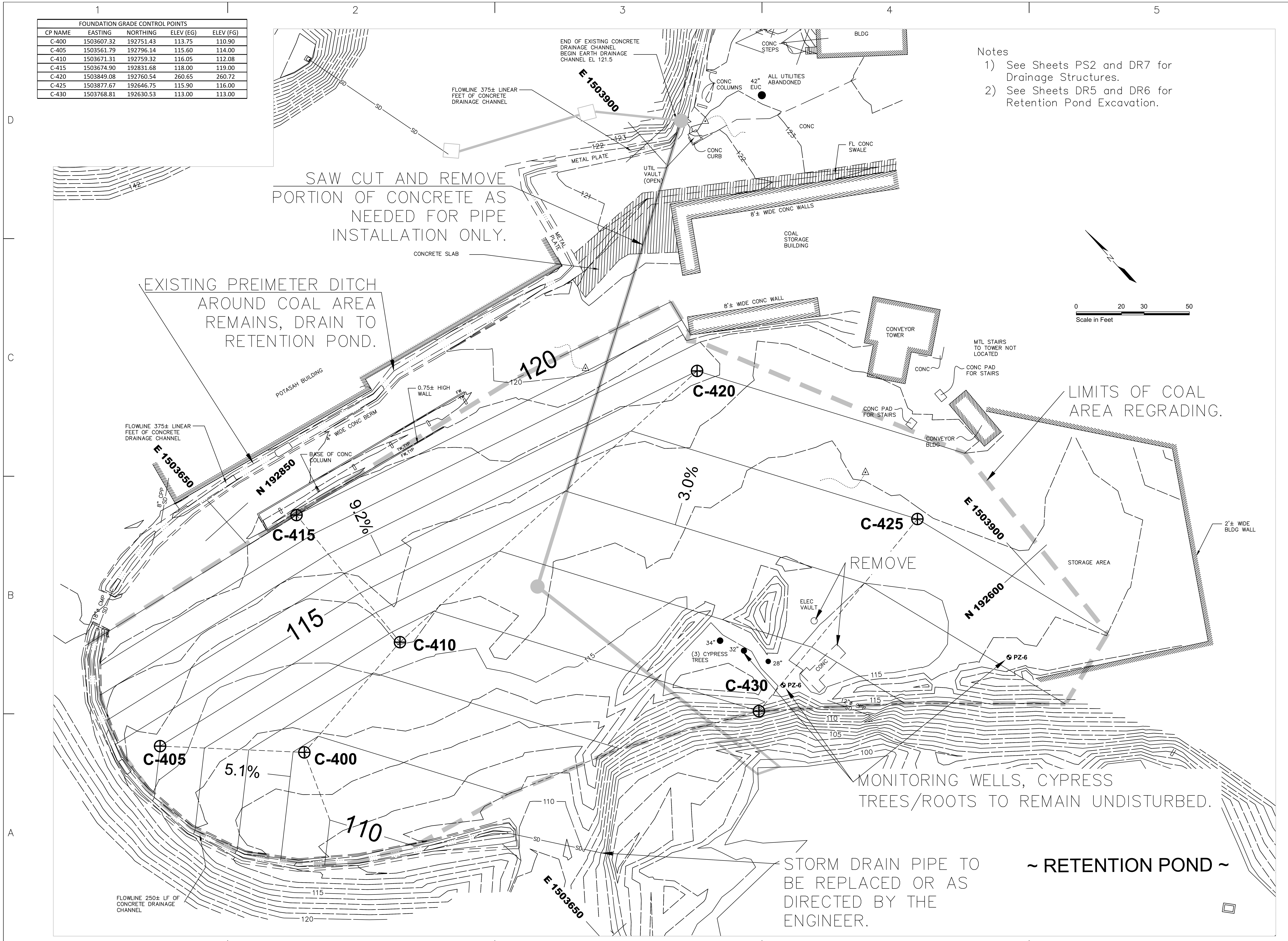
CEMENT KILN DUST (CKD) CLOSURE PLANS
FINAL LINER FOUNDATION GRADE NORTH

DRAWING NUMBER
SHEET
G2
12 OF 28

FOUNDATION GRADE CONTROL POINTS				
CP NAME	EASTING	NORTHING	ELEV (EG)	ELEV (FG)
C-400	1503607.32	192751.43	113.75	110.90
C-405	1503561.79	192796.14	115.60	114.00
C-410	1503671.31	192759.32	116.05	112.08
C-415	1503674.90	192831.68	118.00	119.00
C-420	1503849.08	192760.54	260.65	260.72
C-425	1503877.67	192646.75	115.90	116.00
C-430	1503768.81	192630.53	113.00	113.00

Notes
1) See Sheets PS2 and DR7 for Drainage Structures.
2) See Sheets DR5 and DR6 for Retention Pond Excavation.



DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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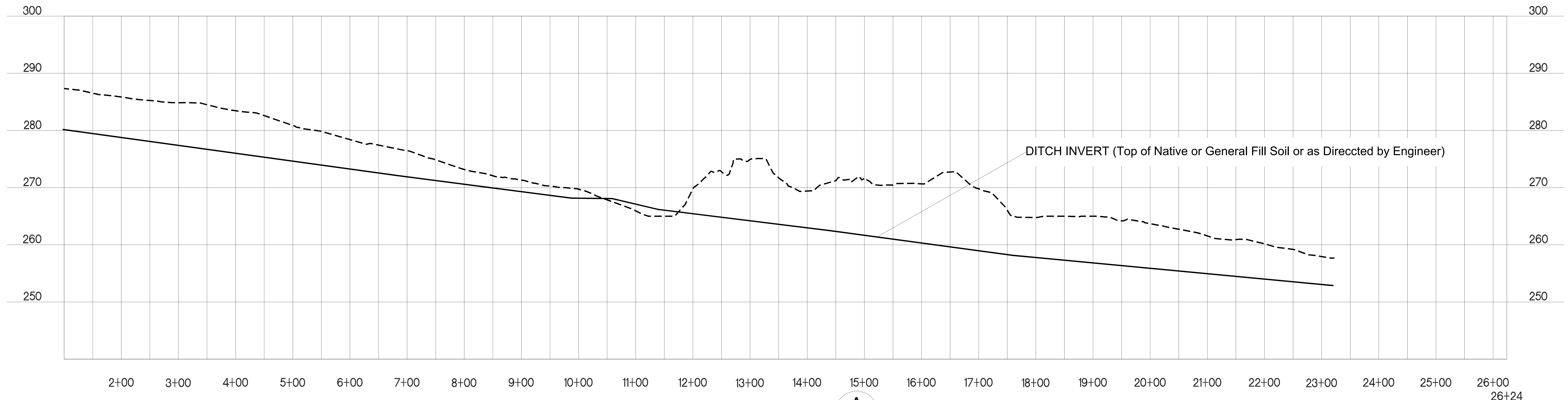
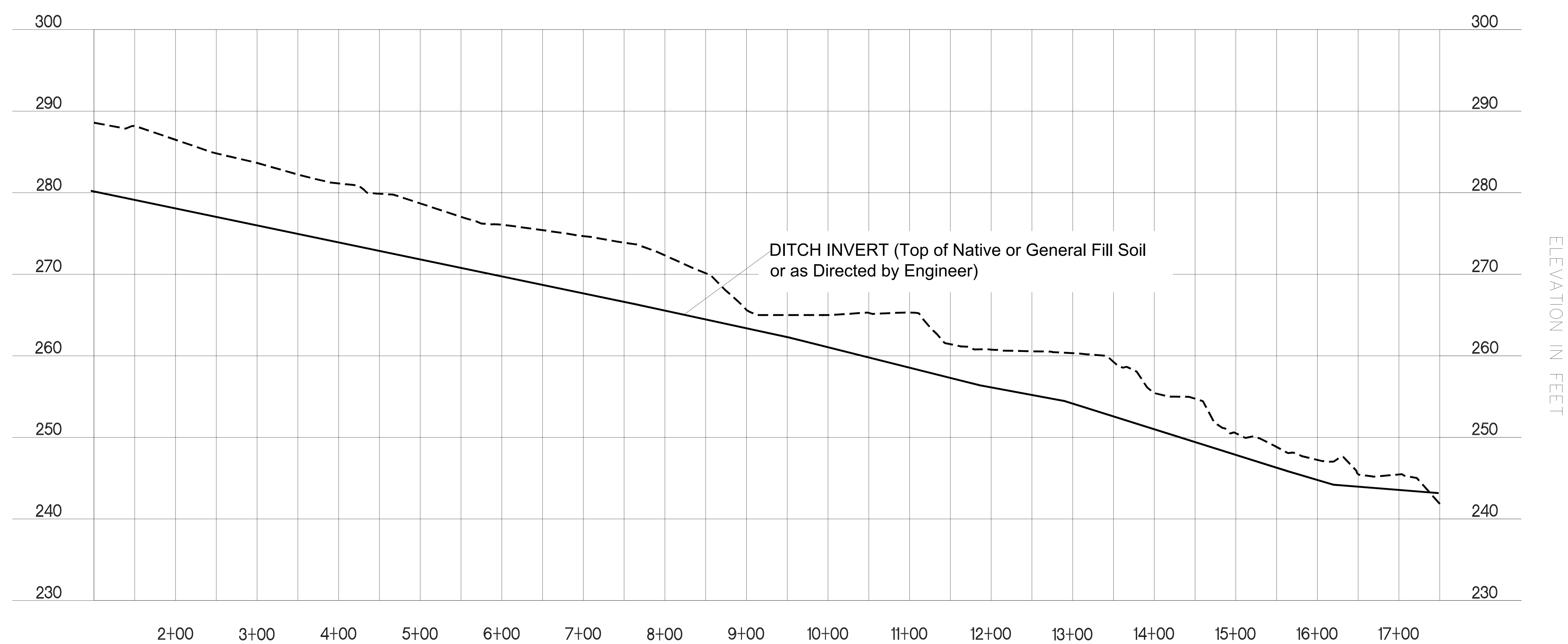
CEMENT KILN DUST (CKD) CLOSURE PLANS
COAL AREA GRADING PLAN

cemex

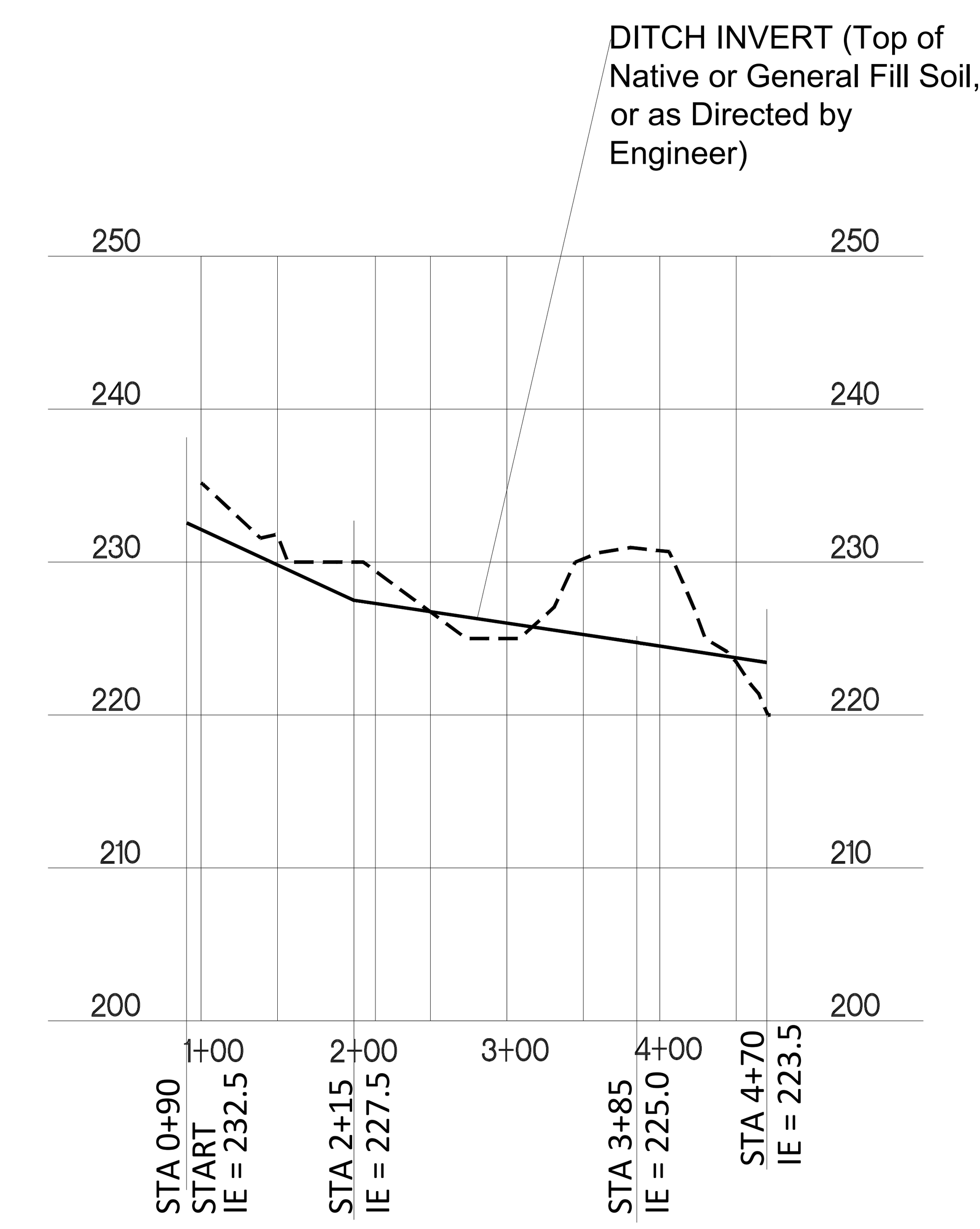
DRAWING NUMBER
SHEET
G3



PROFILE - EAST SIDE DITCH A PS1 PS1



PROFILE - WEST SIDE DITCH B PS1 PS1



PROFILE - SOUTH DITCH #1 C PS1 PS1

NOTE: CONTRACTOR MUST STAKE PROFILES AND "AS-STAKED" SURVEY OF INSIDE TOP EDGE OF DITCH (CONTROL POINTS) TO OBTAIN APPROVAL BY ENGINEER BEFORE CONSTRUCTION CAN BEGIN.

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER MATTHEW A. HILLYARD NO. 69967 EXP. 09/30/20 CIVIL STATE OF CALIFORNIA

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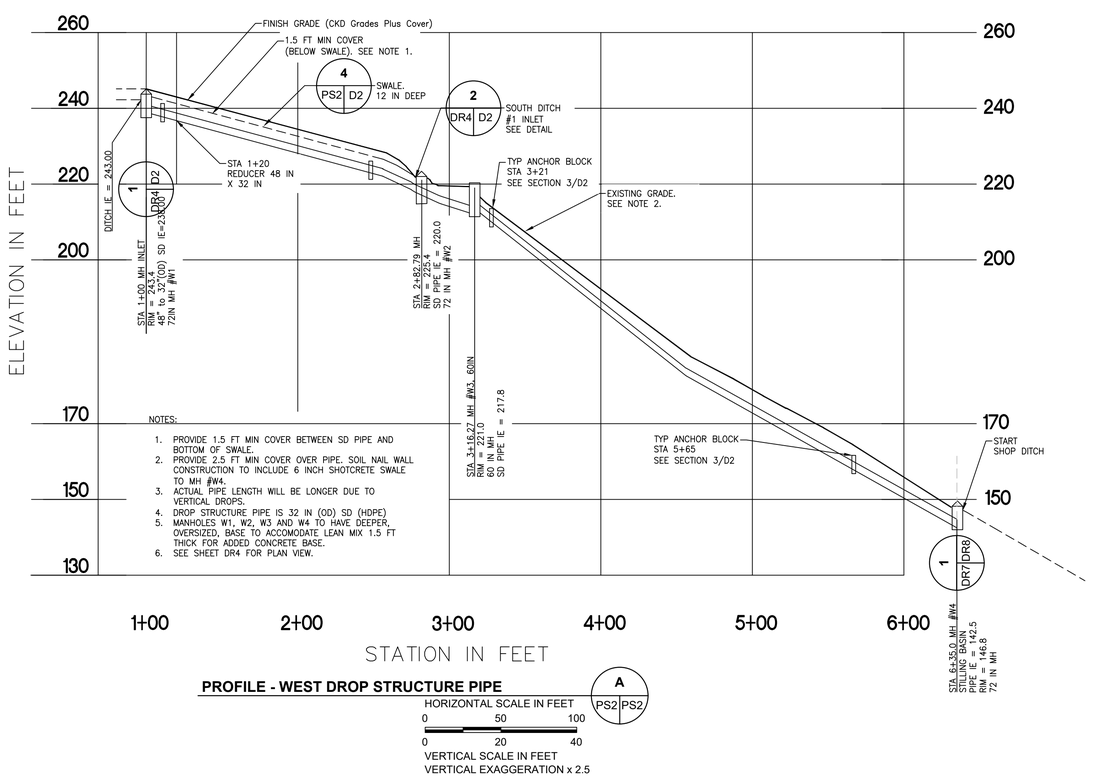
CEMENT KILN DUST (CKD) CLOSURE PLANS
EAST, WEST AND SOUTH PERIMETER DITCHES

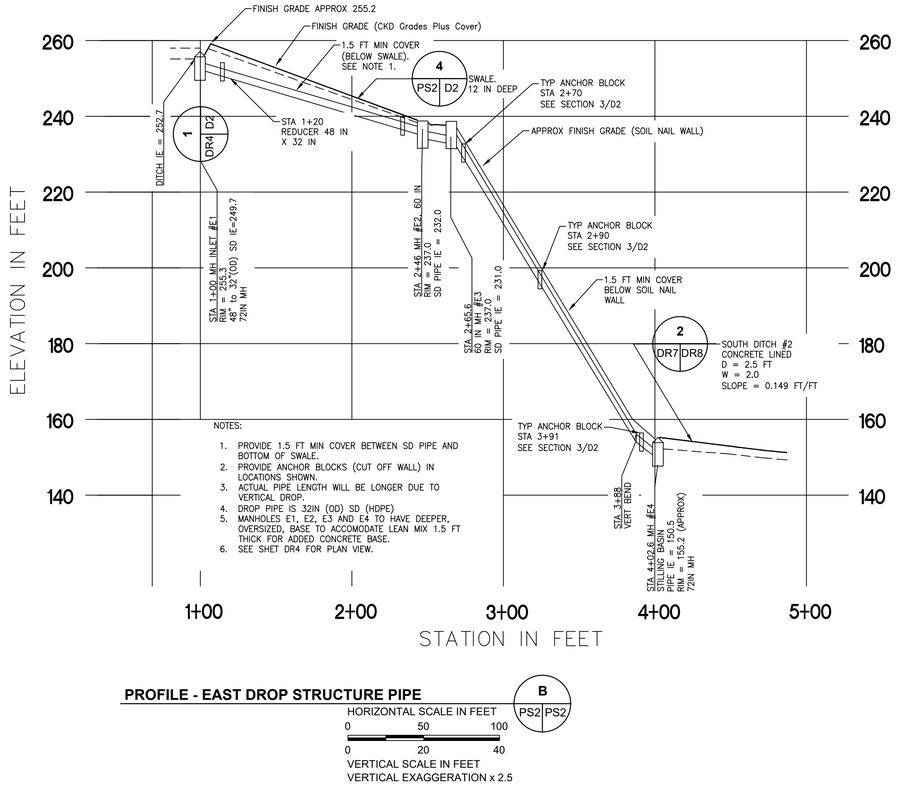
CEMEX

DRAWING NUMBER
SHEET
PS1



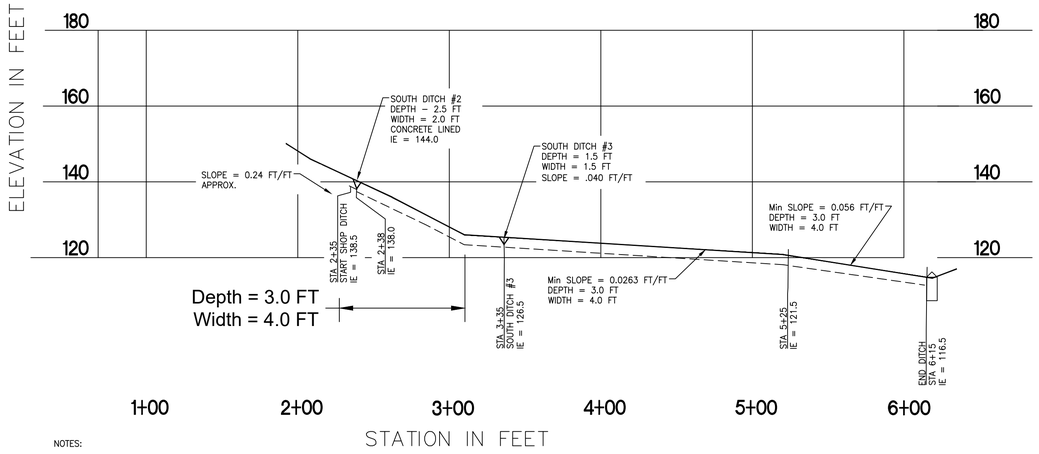
PROFILE - WEST DROP STRUCTURE PIPE — A PS2 PS2

HORIZONTAL SCALE IN FEET
0 50 100
0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION x 2.5



PROFILE - EAST DROP STRUCTURE PIPE — B PS2 PS2

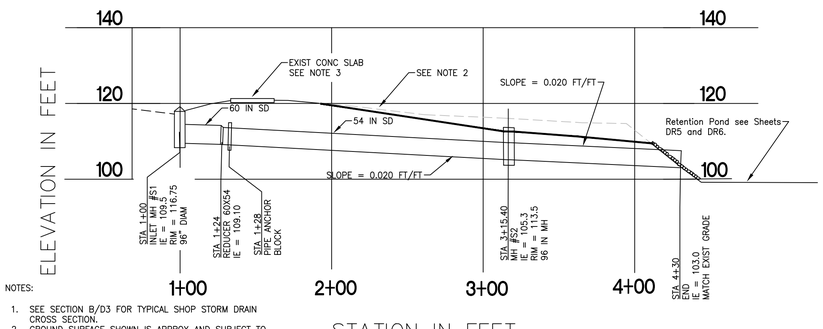
HORIZONTAL SCALE IN FEET
0 50 100
0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION x 2.5



NOTES:
1. SEE DETAIL A/DR7 FOR TYPICAL SHOP DITCH AREA CROSS SECTION.
2. SHOP DITCH SHALL BE FILLED WITH 3 IN THICK LAYER OF CONCRETE ON ALL SIDES AND BOTTOM.
3. SEE SHEET DR7 FOR PLAN VIEW.

PROFILE - SHOP DITCH — C DR7 PS2

HORIZONTAL SCALE IN FEET
0 50 100
0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION x 2.5



NOTES:
1. SEE SECTION B/D3 FOR TYPICAL SHOP STORM DRAIN CROSS SECTION.
2. GROUND SURFACE SHOWN IS APPROX AND SUBJECT TO FINAL COAL AND SOIL REMOVAL. SEE SHEET G3.
3. SAW CUT EXISTING CONC SLAB AND REMOVE. APPROX 30 LFT.
4. MANHOLES S1 AND S2 TO HAVE DEEPER, OVERSIZED, BASE TO ACCOMODATE LEAN MIX 3.0 FT THICK FOR ADDED CONCRETE BASE.
5. SEE SHEET DR7 FOR PLAN VIEW.

PROFILE - SHOP STORM DRAIN — D DR7 PS2

HORIZONTAL SCALE IN FEET
0 50 100
0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION x 2.5

DESCRIPTION	REV	DATE	REVIEW	DRAWN	DESIGN
FINAL REVIEW	R3	04/01/18	MAH	WCA	WCA
FOR BID AND CONSTRUCTION	C1	12/12/19	MAH	WCA	WCA

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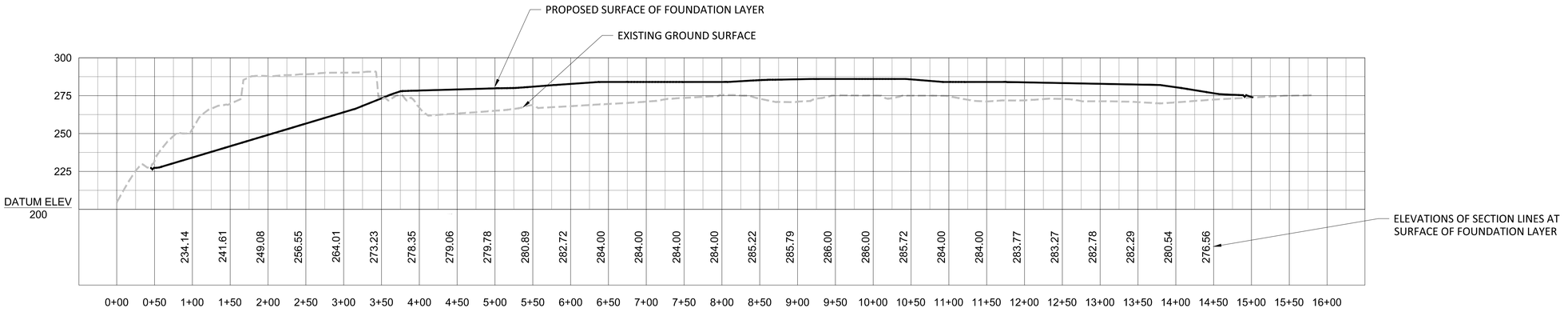
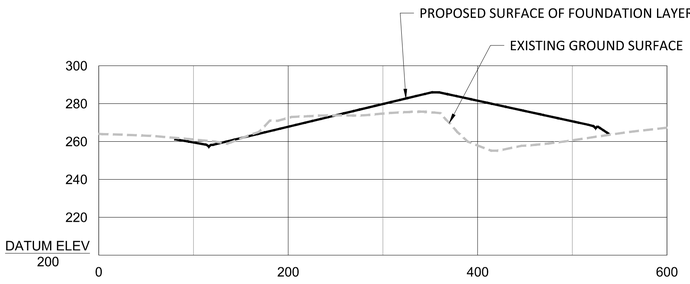
CEMENT KILN DUST (CKD) CLOSURE PLANS

DRAWING NUMBER
SHEET
PS2
15 OF 28



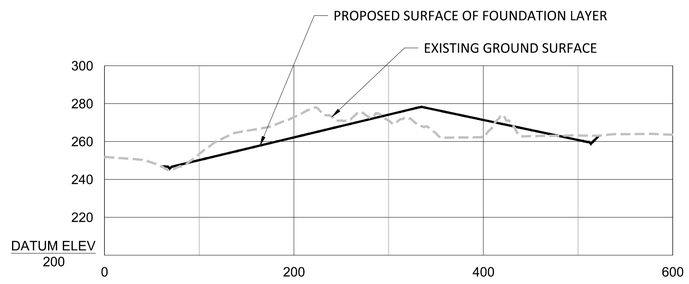
A G2 PS3 PROFILE ALONG CREST OF LANDFILL COVER

HORIZONTAL SCALE IN FEET
0 80 160
0 40 80
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION x 2



B G2 PS3 CROSS SECTION

HORIZONTAL SCALE IN FEET
0 80 160
0 40 80
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION x 2



C G1 PS3 CROSS SECTION

HORIZONTAL SCALE IN FEET
0 80 160
0 40 80
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION x 2

NOTE: CONTRACTOR MUST STAKE AND SUBMIT FINAL SURVEY TO OBTAIN APPROVAL BY ENGINEER BEFORE CONSTRUCTION CAN BEGIN.

REV	DESCRIPTION
R3	FINAL REVIEW
C1	FOR BID AND CONSTRUCTION

	DESIGN	DRAWN	REVIEW	DATE
	WCA	WCA	MAH	04/01/18
	WCA	WCA	MAH	12/12/19

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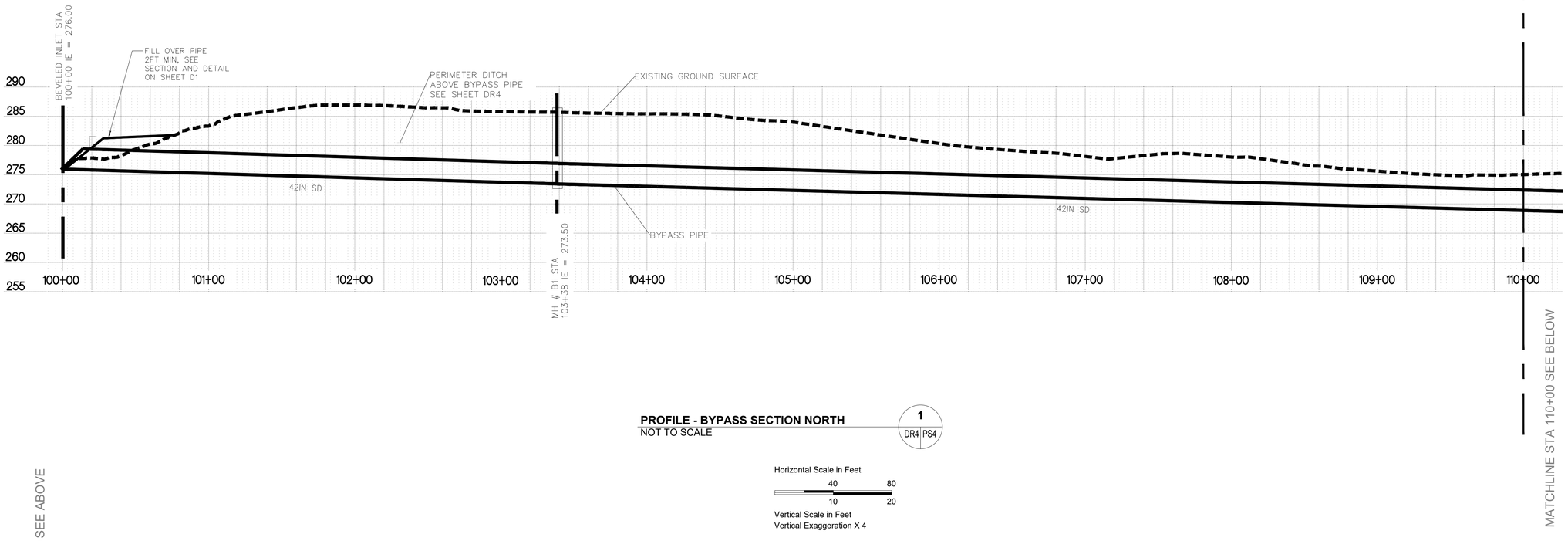
CEMENT KILN DUST (CKD) CLOSURE PLANS

CREST PROFILE AND CROSS SECTIONS

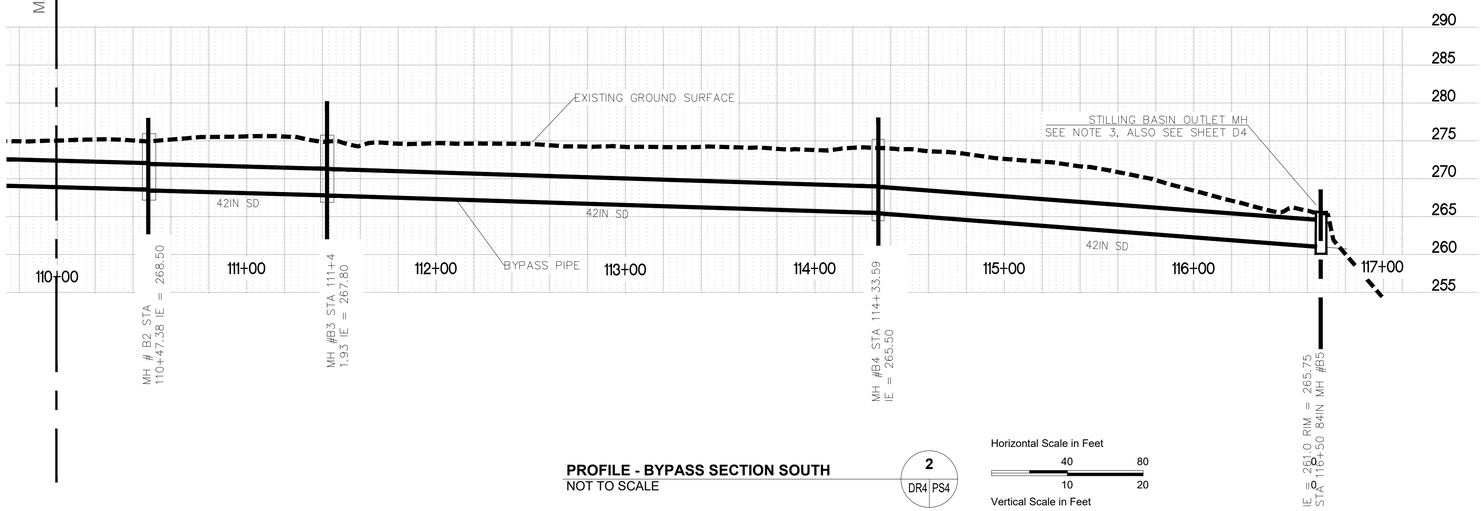
DRAWING NUMBER
SHEET
PS3
16 OF 28



PROFILE - BYPASS SECTION NORTH
NOT TO SCALE

1
DR4 | PS4

Horizontal Scale in Feet
40 80
10 20
Vertical Scale in Feet
Vertical Exaggeration X 4



PROFILE - BYPASS SECTION SOUTH
NOT TO SCALE

2
DR4 | PS4

Horizontal Scale in Feet
40 80
10 20
Vertical Scale in Feet
Vertical Exaggeration X 4

NOTES:

1) CONTRACTOR MUST STAKE AND SUBMIT FINAL SURVEY PROFILES TO OBTAIN APPROVAL BY ENGINEER BEFORE CONSTRUCTION CAN BEGIN.
2) PIPE COVER TO MATCH EXISTING GRADES, STRUCTURAL FILL BERMS PLACED TO SPECIFICATIONS AND LOCATIONS AS SHOWN ON PLANS AND/OR AS DIRECTED BY ENGNEER.
3) OUTLET MH SHALL INCLUDE AN 8 INCH SCHD 40 PVC DRAIN TO DAYLIGHT AND A GALV STEEL TRASHRACK.

REV	DESCRIPTION	DATE	REVIEW	DRAWN	DESIGN
R3	FINAL REVIEW	04/01/18	MAH	WCA	WCA
C1	FOR BID AND CONSTRUCTION	12/12/19	MAH	WCA	WCA

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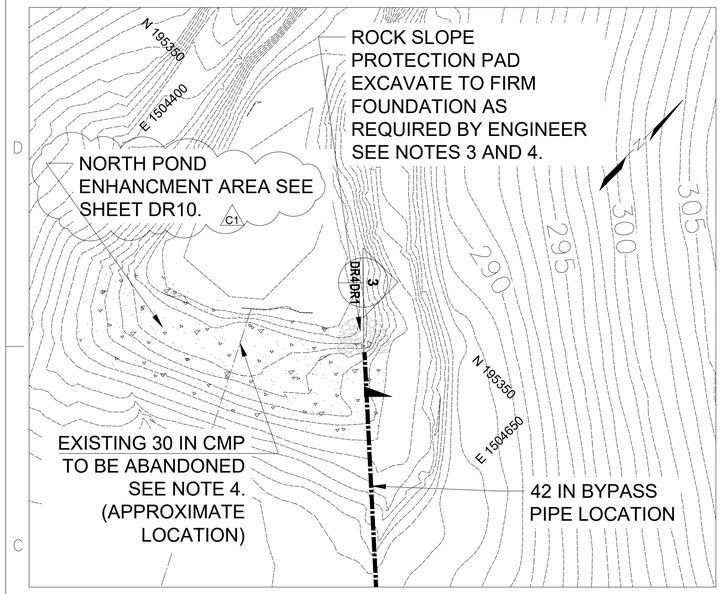
CEMENT KILN DUST (CKD) CLOSURE PLANS

BYPASS PIPE PROFILE

DRAWING NUMBER
SHEET
PS4
17 OF 28



PLAN - NORTH DRAINAGE POND — 1 (D1 | D1)

0 40 80

Scale in Feet

NOTES:

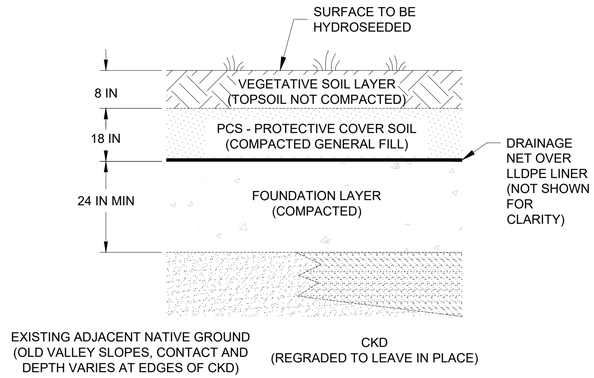
1. EXCAVATE SEDIMENT FROM THE NORTH DRAINAGE POND TO THE LIMITS INDICATED WHERE NECESSARY TO EXPOSE EXISTING 30 IN PIPE INLET AND TO ONE FOOT BELOW THE ELEVATION OF THE INVERT OF NEW BYPASS PIPE (APPROXIMATE ELEVATION 275 FT).

2. CUT SIDE SLOPES AT 2H:1V ON EAST, SOUTH, AND WEST SIDES OF EXCAVATION. GRADE NORTH SIDE OF CUT AND BASE OF POND TO DRAIN TOWARD THE DRAIN PIPE INLET.

3. INSTALL 12 IN THICK ROCK SLOPE PROTECTION (SPEC 02200) INLET PAD WITHIN 15 FT RADIUS OF THE DRAIN PIPE INLET.

4. EXPOSE EXISTING 30 IN CMP REMOVE PIPE AND/OR PLUG (AREAS 2 AND 3 ONLY), FULLY PLUG (AREA 1) WITH MATERIAL SUCH AS EXPANSIVE FOAM OR LEAN MIX AS APPROVED BY THE EINGINEER PRIOR TO EXCAVATION/CONSTRUCTION.

5. ALL GRADE AND EXCAVATION ADJUSTMENTS TO BE APPROVED BY DESIGN ENGINEER PRIOR TO CONSTRUCTION.



NOTES (SEE SPECIFICATIONS FOR FURTHER INFORMATION)

1. FOUNDATION LAYER SHALL CONSIST OF CKD THAT IS REGRADED AND LEFT IN PLACE, OR EXCAVATED SOIL MOVED FROM ELSEWHERE, OR, IF NECESSARY, DUE TO LACK OF AVAILABILITY OF CKD, PLACE AND COMPACT GENERAL BACKFILL MATERIAL (SUBJECTED TO DESIGN ENGINEER'S APPROVAL).

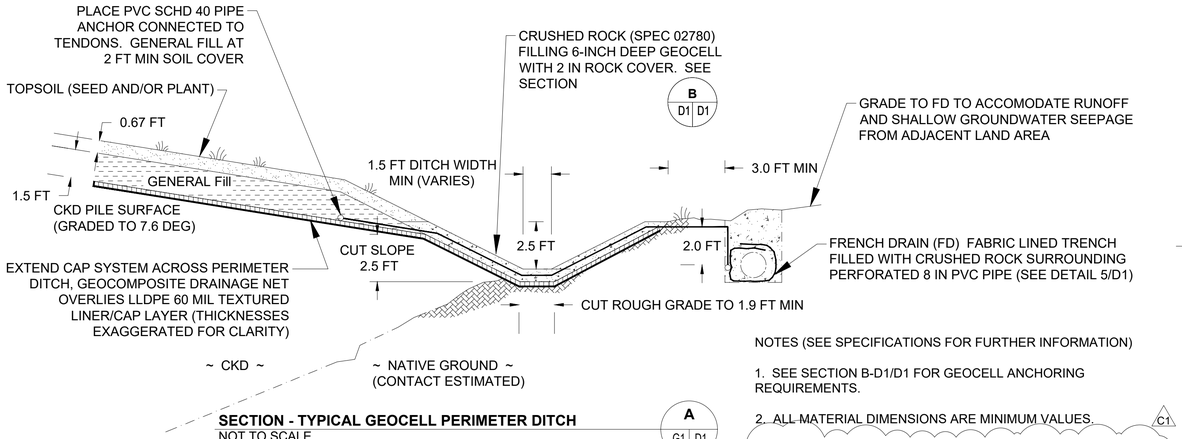
2. COMPACT AND PROOF ROLL FOUNDATION LAYER AND PLACE DRAINAGE NET/LLDPE LINER IN ACCORDANCE WITH SPECIFICATIONS. LLDPE LINER TO BE PLACED ON "FINAL FOUNDATION LAYER GRADE" SURFACE. CKD SHALL NOT BE PLACED OUTSIDE LIMITS OF LINER/CAP.

3. ALL MATERIALS PLACED TO CREATE THE FOUNDATION LAYER SHALL BE COMPACTED IN ACCORDANCE WITH THE SPECIFICATIONS AND PROVIDE A SMOOTH SURFACE WITH NO PROTRUSIONS.

4. VEGETATIVE SOIL LAYER SHALL CONSIST OF ONSITE STOCKPILED TOPSOIL PLACED AS A LOOSE LIFT THICKNESS, AMENDED IN ACCORDANCE WITH THE SPECIFICATIONS. IMPORTED TOPSOIL MAY ALSO BE USED. SEE SPECIFICATIONS SECTION 02200.

DETAIL - TYPICAL LINER/CAP COVER SYSTEM — 2 (D1 | D1)

NOT TO SCALE



SECTION - TYPICAL GEOCELL PERIMETER DITCH — A (G1 | D1)

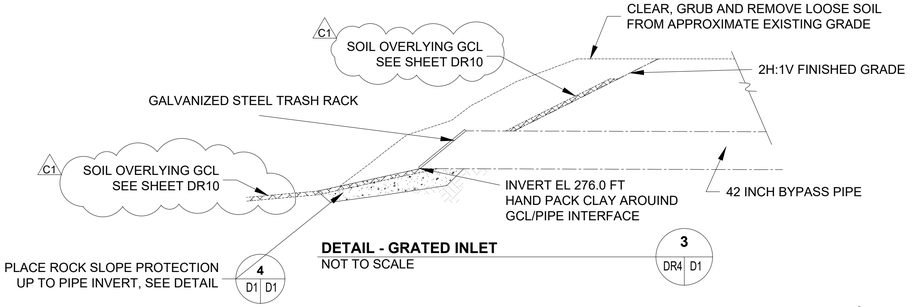
NOT TO SCALE

NOTES (SEE SPECIFICATIONS FOR FURTHER INFORMATION)

1. SEE SECTION B-D1/D1 FOR GEOCELL ANCHORING REQUIREMENTS.

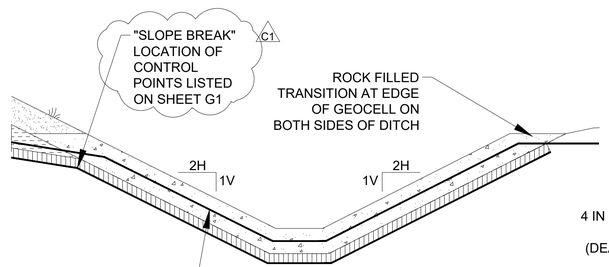
2. ALL MATERIAL DIMENSIONS ARE MINIMUM VALUES.

3. EAST AND WEST DITCHES ARE 1.5 FT WIDE, 2.5 FT DEEP. SEE PROFILE DRAWINGS FOR OTHER DITCH SIZES.



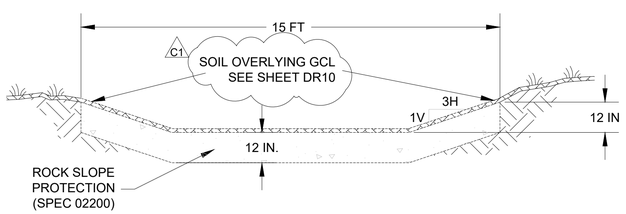
DETAIL - GRATED INLET — 3 (DR4 | D1)

NOT TO SCALE



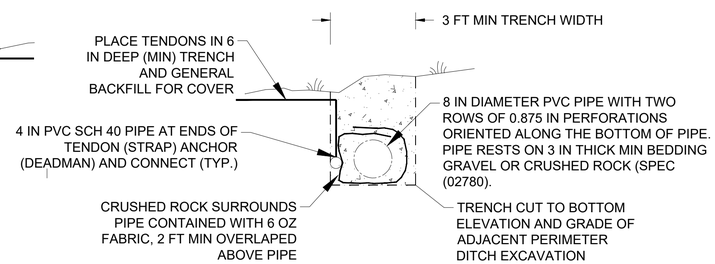
SECTION - TYPICAL GEOCELL — B (D1 | D1)

NOT TO SCALE



DETAIL - ROCK SLOPE PROTECTION (TYP.) — 4 (D1 | D1)

NOT TO SCALE



DETAIL - PERIMETER FRENCH DRAIN (FD) — 5 (D1 | D1)

NOT TO SCALE

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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CEMENT KILN DUST (CKD) CLOSURE PLANS

NORTH DRAINAGE POND AND CKD COVER DETAILS

CEMEX

DRAWING NUMBER

SHEET

D1

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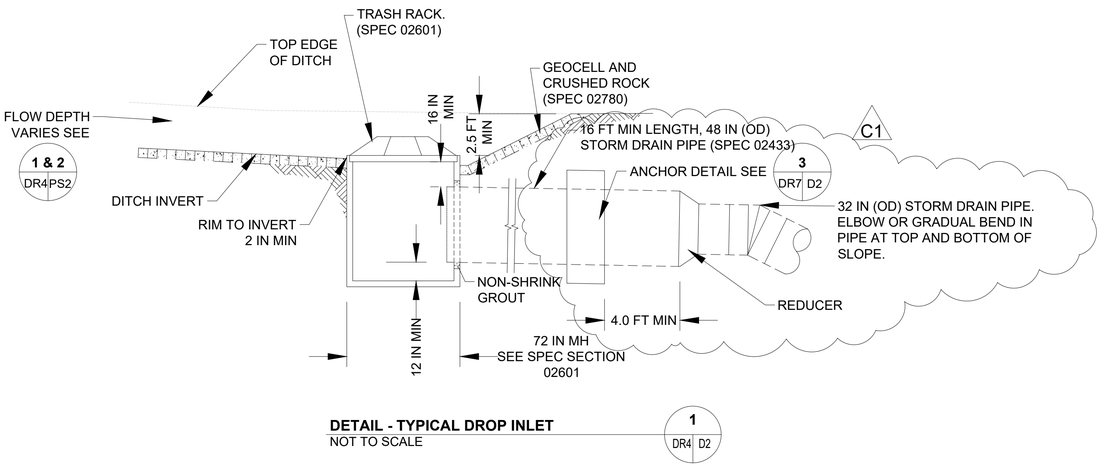
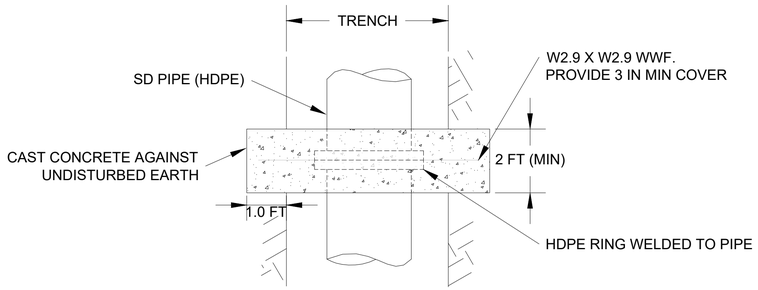
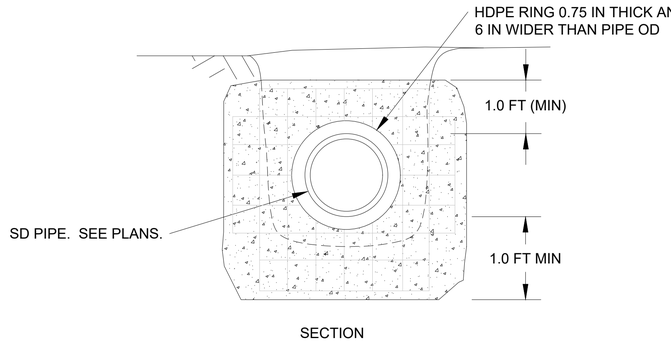
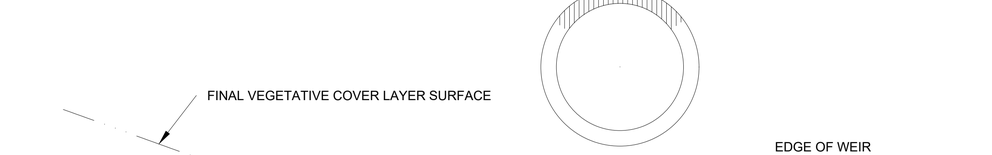


DETAIL - TYPICAL DROP INLET 1 (DR4 D2)
NOT TO SCALE





DETAIL - TYPICAL ANCHOR BLOCK 3 (DR7 D2)
NOT TO SCALE

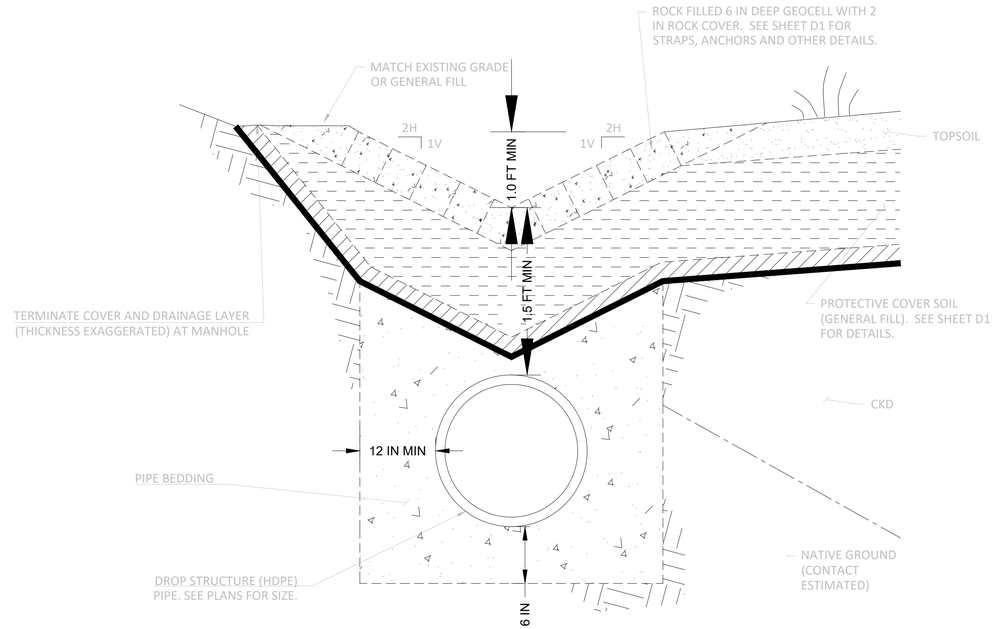


NOTES

1. HDPE PIPE SHALL EXTEND A MINIMUM 3 IN INTO DROP INLET TO ALLOW FOR THERMAL EXPANSION.

2. WEST MH #W2 - CUT WEIR INTO SOUTH SIDE OF MH FOR SOUTH DITCH. OPENING SHALL BE 1.0 FEET DEEP BY 6.6 FT WIDE. TOP OF CUT SHALL BE 2 IN ABOVE SOUTH DITCH INVERT.

DETAIL - TYPICAL STILLING BASIN 2 (DR4 D2)
NOT TO SCALE



DETAIL - DROP STRUCTURE AND SWALE 4 (PS2 D2)
NOT TO SCALE

REV	DESCRIPTION	DATE	REVIEW	DRAWN	DESIGN
R3	FINAL REVIEW	04/01/18	MAH	WCA	WCA
C1	FOR BID AND CONSTRUCTION	12/12/19	MAH	WCA	WCA

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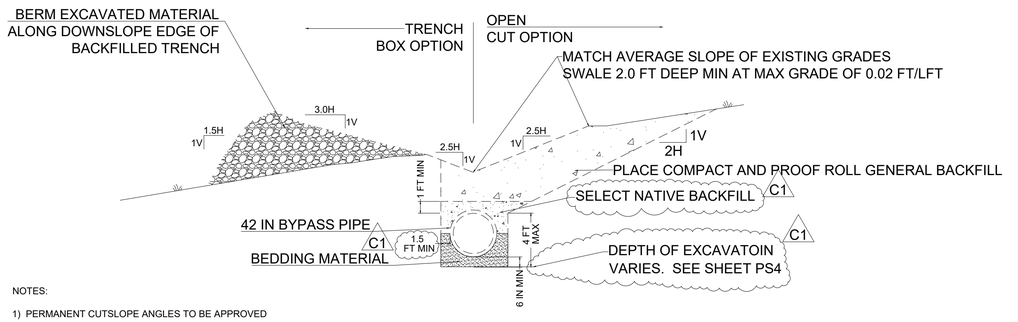
CEMENT KILN DUST (CKD) CLOSURE PLANS

DRAINAGE DETAILS

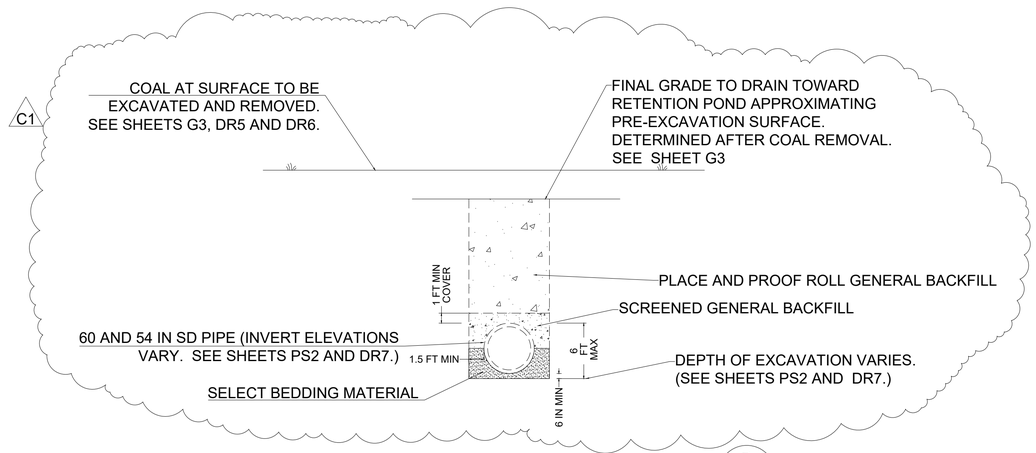
DRAWING NUMBER
SHEET
D2
19 OF 28



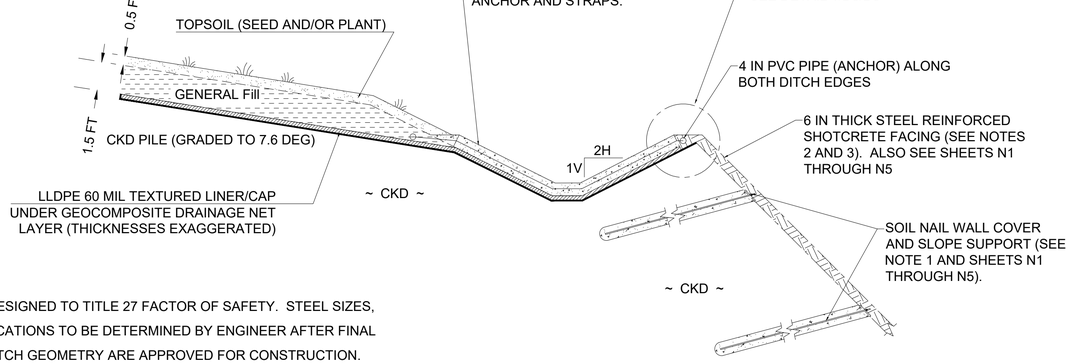
NOTES:

1) PERMANENT CUTSLOPE ANGLES TO BE APPROVED BY DESIGN ENGINEER PRIOR TO CONSTRUCTION.

SECTION - TYPICAL BYPASS PIPE (A; DR4 | D3)
NOT TO SCALE



SECTION - TYPICAL COAL AREA STORM DRAIN PIPE (B; DR7 | D3)
NOT TO SCALE



NOTES:

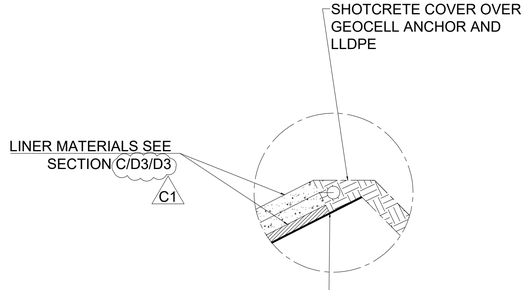
1) SOIL NAILS TO BE DESIGNED TO TITLE 27 FACTOR OF SAFETY. STEEL SIZES, BAR LENGTHS AND LOCATIONS TO BE DETERMINED BY ENGINEER AFTER FINAL LINER GRADES AND DITCH GEOMETRY ARE APPROVED FOR CONSTRUCTION. DETAILS SHOWN ON SHEETS N1 THROUGH N5.

2) 6 IN THICK STEEL REINFORCED SHOTCRETE FACING SHALL BE PLACED DIRECTLY ON EXISTING SLOPE GRADES AND EXTEND FROM THE SOUTH DITCH ANCHOR COVER AT THE TOP TO THE TOE OF THE SLOPE.

3) BOTTOM OF SHOTCRETE SHALL INCORPORATE A SHOTCRETE LINED DRAINAGE SWALE THAT DIRECTS WATER INTO THE SHOP DITCH.

4) SHOTCRETE AT TOP-OF-WALL TO BE COMPLETED AFTER PLACEMENT OF LLDPE DITCH LINER.

SECTION - TYPICAL SOUTH DITCH #1 (C; D3 | D3)
NOT TO SCALE



DETAIL - SHOTCRETE AT TOP OF WALL (1; D3 | D3)
NOT TO SCALE

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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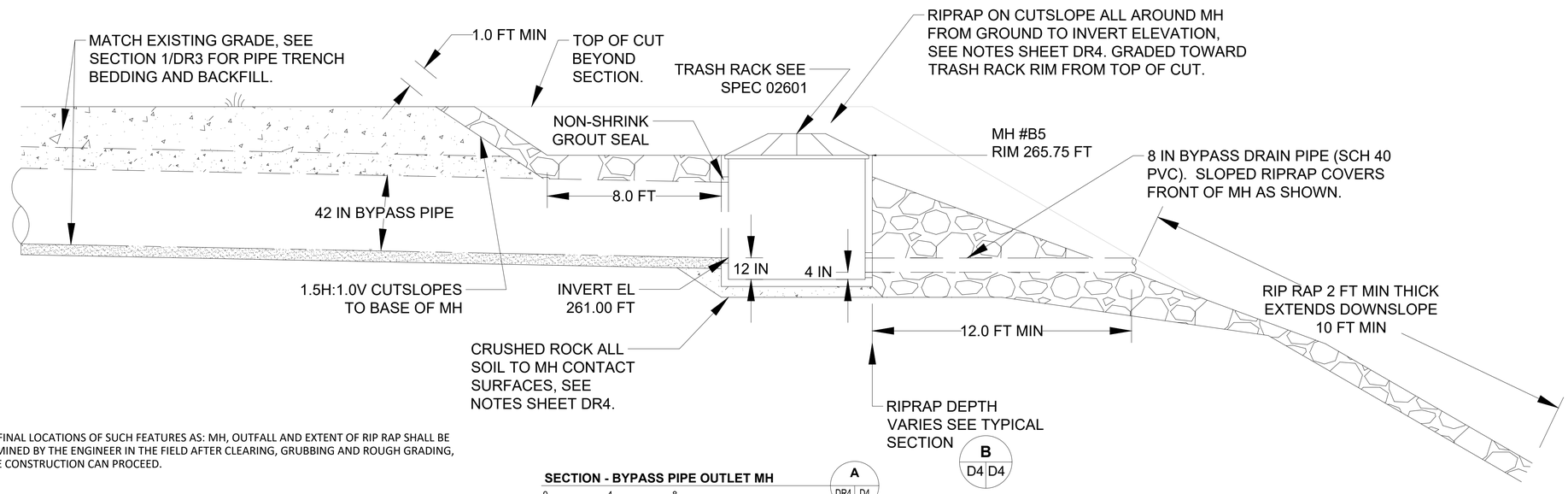
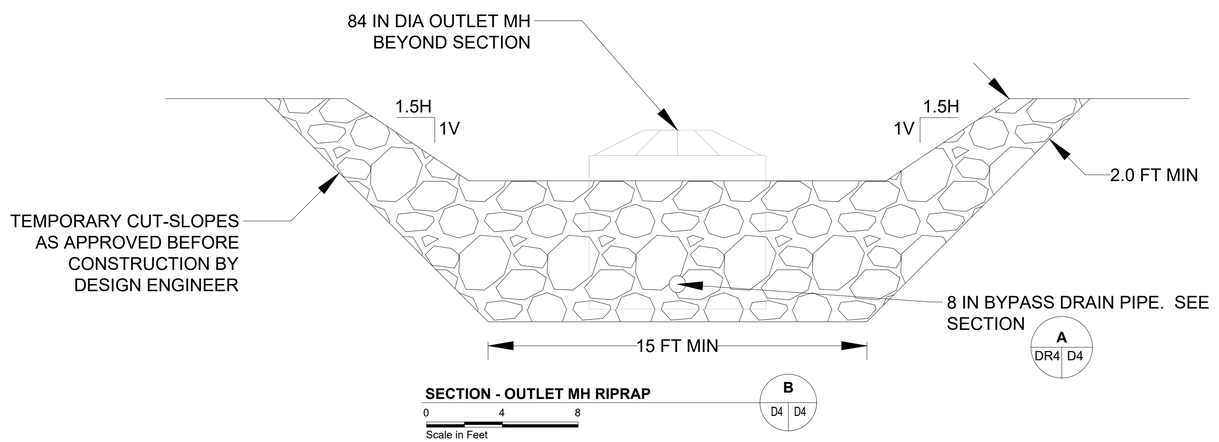
CEMENT KILN DUST (CKD) CLOSURE PLANS

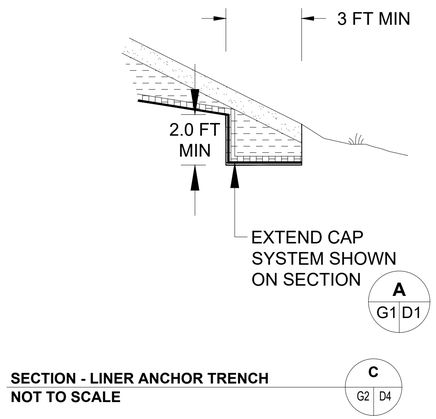
BYPASS, SOUTH DITCH AND STORM DRAIN DETAILS

DRAWING NUMBER
SHEET
D3
20OF 28



NOTE: FINAL LOCATIONS OF SUCH FEATURES AS: MH, OUTFALL AND EXTENT OF RIP RAP SHALL BE DETERMINED BY THE ENGINEER IN THE FIELD AFTER CLEARING, GRUBBING AND ROUGH GRADING, BEFORE CONSTRUCTION CAN PROCEED.





DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
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CEMENT KILN DUST (CKD) CLOSURE PLANS

BYPASS PIPE, OUTLET AND ANCHOR TRENCH DETAILS

DRAWING NUMBER
SHEET
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NORTH CKD CLOSURE PROJECT

SOIL NAIL AND SHOTCRETE WALL PLANS

CEMEX DAVENPORT PLANT

700 HIGHWAY 1, DAVENPORT, CA 95017

CONTRACTOR MUST CALL FOR UTILITY LOCATES PRIOR TO CONSTRUCTION; (phone 811).

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR REPAIRS AND/OR REPLACEMENT OF EXISTING UTILITIES SHOULD DAMAGE OCCUR AS A RESULT OF CONSTRUCTION ACTIVITIES.

GENERAL NOTES

GENERAL:

THE CONTRACTOR IS DEFINED, FOR THE PURPOSES OF THIS NAIL DESIGN, AS THE PROJECT'S SPECIALTY SHOTCRETE WALL (SHORING) CONTRACTOR UNLESS OTHERWISE NOTED AND IS SOLEY RESPONSIBLE FOR THE PROJECT SITE CONSTRUCTION PROCESSS AND SAFETY OF THE WORKERS THAT MAY INCLUDE BUT IS NOT LIMITED TO, THE CONSTRUCTION SEQUENCE, TEMPORARY HANDRAILS, EXCAVATION ACCESS, AND BARRIERS. IT ALSO BUT NOT LIJITED TO INCLUDES LIFTING OF MATERIALS AND CONSTRUCTION EQUIPMENT ON, INTO AND OUT OF THE EXCAVATION AREA, TEMPORARY BRACING, SINGLE-SIDED FORMWORK, TEMPORARY EXCAVATIONS, AND STABILITY OF ALL TEMPORARY CUT SLOPES. MINIMUM SLOPE PROTECTION SHALL BE PROVIDED BY THE CONTRACTOR AND CONSIST OF PROVIDING ADEQUATE COVERING OVER ALL EXPOSED SLOPES. ADEQUATE COVERING SHALL CONSIST OF A FLASHCOAT OF SHOTCRETE, STEEL REINFORCEMENT, POLYETHYLENE SHEETING, OR AN EQUIVALENT MATERIAL AS APPROVED BY THE DESIGN ENGINEER, ADAMS RESOURCE CONSULTANTS (ARC).
THE SOIL NAILED WALL IS A SYSTEM DESIGNED TO SUPPORT THE NEARLY VERTICAL EXCAVATION ONCE THE COMPONENTS OF THE NAILS, VERTICAL MEMBERS, AND FACING SYSTEM ARE COMPLETELY INSTALLED FOR ALL EXCAVATION LIFTS UP TO AND INCLUDING THE CURRENT EXCAVATION LIFT. THE STABILITY OF INTERIM TEMPORARY VERTICAL CUTS OVER 4 FEET HIGH THAT EXIST PRIOR TO INSTALLATION OF NAILS AND THE SHOTCRETE WALL FACING IS THE RESPONSIBILITY OF THE CONTRACTOR.

THE CONTRACTOR SHALL PROVIDE PROTECTION FOR SAFE PASSAGE OF PEDESTRIANS WORKERWS AND VEHICULAR TRAFFIC. LOOSE SOIL OF CUTS MAY RAVEL.

SPECIAL INSPECTION AND TESTING

IN ACCORDANCE WITH THE RWQBC AND LATEST IBC, SPECIAL INSPECTION SHALL BE PROVIDED BY THE OWNER'S REPRESENTATIVE AND CQA OFFICER FOR DESIGN EXECUTION TO COVER OBSERVATION OF THE FOLLOWING TYPES OF CONSTRUCTION WHEN APPLICABLE:

- SOIL NAIL INSTALLATION AND TESTING
- INSTALLATION OF STEEL PLATES, NUTS AND MEMBERS AND LEAN MIX PLACEMENT IF REQUIRED
- SHOTCRETE WORK (SHOTCRETE AND REBAR PLACEMENT)

ALL SHOTCRETE, SOIL NAIL GROUT AND SOIL NAIL DESIGN ADHESIONS SHALL BE TESTED IN ACCORDANCE WITH THE SPECIFICATIONS.

DESIGN LIVE LOADS:

TRAFFIC/CONSTRUCTION SURCHARGE = 125 PSF. SURCHARGE LOADS SHALL NOT BE CLOSER THAN 5 FEET (HORIZ.) FROM TOP OF SOIL NAILED WALLS OR 3 FEET (HORIZ.) FROM THE TOP OF CUT SLOPES, WHICHEVER IS GREATER. THE CONTRACTOR IS RESPONSIBLE AND SHALL VERIFY THAT THE CONSTRUCTION SURCHARGE OR CLEARANCE IS NOT EXCEEDED WITHOUT THE DESIGNER'S APPROVAL. SEE ELEVATIONS, PLANS AND SECTIONS FOR ADDITIONAL LIVE LOADS THAT MAY HAVE BEEN CONSIDERED IN DESIGN.

SUBSURFACE DESIGN:

ALL SUBSURFACE SOIL AND WATER PARAMETERS USED IN THE DESIGN WERE BASED ON EXPERIENCE AND THE SUBSURFACE CHARACTERIZATION PRESENTED IN THE REPORT TITLED "FINAL DESIGN REPORT, NORTH CKD CLOSURE PLANS, CEMEX DAVENPORT PLANT, DAVENPORT, CALIFORNIA, BY ADAMS RESOURCE CONSULTANTS COMPANY, Dated APRIL 1, 2018, for CEMEX.

SOIL UNIT	MOIST UNIT WEIGHT (PCF)	FRICTION (DEG)	COHESION (PSF)	ULTIMATE PULLOUT RESISTANCE (K/FT)
CEMENT KILN DUST	115	38	50	9.5

NOTES: 1) ULTIMATE PULLOUT RESISTANCE SHALL BE CONFIRMED BY THE CONTRACTOR DURING VERIFICATION TESTING PRIOR TO STARTING SOIL NAIL WALL CONSTRUCTION. CONTRACTOR MAY NEED TO MODIFY MEANS, METHODS AND/OR ADD NAILS DEPENDING ON THE TEST RESULTS. 2) DESIGN ADHESION (ALLOWABLE PULLOUT RESISTANCE) IS CALCULATED AS ULTIMATE PULLOUT RESISTANCE DIVIDED BY A FACTOR OF SAFETY EQUAL TO 2.0.

THE REGIONAL GROUNDWATER LEVEL IS ASSUMED TO EXIST BELOW THE BOTTOM OF THE NAIL WALLS IN CONSIDERING "LONG-TERM" STABILITY. LOCAL AREAS OF PERCHED SEEPAGE MAY BE ENCOUNTERED IN SOME LOCATIONS AND WILL BE MANAGED BY DRAIN FABRIC PLACED ON THE SOIL CUT FACE (NEAT CUT) AND COVERED BY THE STEEL REINFORCED SHOTCRETE FACING.

EXISTING UNDERGROUND OBSTRUCTIONS AND UTILITIES:

THE CONTRACTOR MUST FIELD VERIFY ALL EXISTING DIMENSIONS AND SITE CONDITIONS.

THE CONTRACTOR SHALL FIELD VERIFY AND BE RESPONSIBLE FOR DETERMINING ACTUAL LOCATIONS OF ALL EXISTING UTILITIES SHOWN ON THE PLANS AND THOSE UTILITIES OR UNDERGROUND OBSTRUCTIONS NOT SHOWN ON THE PLANS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ALL ABANDONED UTILITIES, OR CHANGES TO OTHER EXISTING OBSTRUCTIONS THAT INTERFERE WITH OR ARE ADJACENT TO THE NEW CONSTRUCTION.

GENERAL NOTES, (CONT.)

REINFORCING STEEL:

ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 / AASHTO M31, GRADE 60 FOR DEFORMED BARS, AND ASTM A185 / AASHTO M55 FOR WELDED WIRE FABRIC (WWF).

SUBMIT REINFORCING STEEL SHOP DRAWINGS TO DESIGN ENGINEER IN ACCORDANCE WITH THE SPECIFICATIONS.

ALL REINFORCING STEEL DETAILS IN ACCORDANCE WITH THE MOST RECENTLY ADOPTED ACI 318/318R MANUAL OF STANDARD PRACTICE.

ALL REINFORCING BAR LAPS SHALL BE CLASS B, IN ACCORDANCE WITH THE 2006 INTERNATIONAL BUILDING CODE OR AS SUMMARIZED IN THE FOLLOWING TABLE:

BAR SIZE	CLASS B LAP LAP SPLICE LENGTH MEASURED IN DIAMETERS (IN.)	CLASS B LAP LAP SPLICE LENGTH MEASURED IN LENGTH (IN.)
#4	40	20
#5	40	25
#6	40	30
#7	50	44
#8	50	50

ALL WELDED WIRE FABRIC SPLICES SHALL BE A MINIMUM OF 6 INCHES LONG AND LAP AT LEAST TWO LONGITUDINAL OR TRANSVERSE WIRES. SEE PLANS FOR SPECIFIC DETAILS. IF APPLICABLE, SUBMIT ALL SHOP DRAWINGS IN ACCORDANCE WITH THE SPECIFICATIONS.

SEE THE WALL PLANS SPECIFIC DETAILS AS THEY PERTAIN TO CONNECTION OF THE REINFORCED SHOTCRETE WALL AND ANY OTHER FACING. SUBMIT ALL SHOP DRAWINGS IN ACCORDANCE WITH THE SPECIFICATIONS.

CONCRETE

AFTER 28 DAYS, ALL CONCRETE SHALL OBTAIN A MINIMUM ULTIMATE COMPRESSIVE STRENGTH (f'c), AS MEASURED BY THE PROCEDURES IN ASTM C109/AASHTO T106, WHERE THE STRENGTH f'c SHALL ATTAIN 4000 PSI.

TEMPORARY CUT SLOPES

THE SOIL NAILED WALL DESIGN BY ARC DOES NOT INCLUDE SPECIFICATIONS OR DESIGN OF TEMPORARY OPEN CUT SLOPES UNLESS SPECIFICALLY PROVIDED ON THE DRAWINGS. ADDITIONAL DESIGN AND SPECIFICATIONS OR PERFORMANCE CRITERIA AS MAY BE REQUESTED FOR EXCAVATIONS NOT SHOWN ON THESE DRAWINGS ARE THE RESPONSIBILITY OF THE CONTRACTOR UNLESS AGREED TO OTHERWISE IN WRITING BY ARC.

CONSTRUCTION SEQUENCE

ARC HAS ASSUMED THE FOLLOWING FOR THIS DESIGN;
1) CONTRACTOR SHALL REMOVE ORGANICS, DELETERIOUS MATERIALS AND SOIL FROM AREAS REQUIRING GRADING TO CREATE THE "NEAT LINE" SURFACE FOR SHOTCRETE APPLICATION BEFORE STARTING DRILLING.

2) DRILLING, INSTALLATION AND WALL CONSTRUCTION SHALL DONE BY EITHER A "TOP-DOWN" FASHION SUCH THAT THE TOP ROWS OF NAILS WILL BE COMPLETED FIRST OR IN A VERTICAL COLUMN FASHION SUBJECT TO APPROVAL BY ARC. IF MEANS AND METHODS REQUIRE INSTALLATION BY REACHING OVER OR ABOVE THE EDGE OF A SLOPE THE CONSTRUCTION AND INSTALLATION EQUIPMENT WILL REMAIN AS FAR AWAY FROM THE STEEP SLOPE TOP OR TOE EDGE AS POSSIBLE.

USE OF THIS DESIGN

ARC PREPARED THIS WORK IN GENERAL ACCORDANCE WITH OUR CONTRACT. THIS DESIGN AND THESE DRAWINGS ARE FOR THE EXCLUSIVE USE OF CEMEX FOR SPECIFIC APPLICATION TO THE SUBJECT PROJECT AND SITE. USE OF THIS DESIGN BY ANYONE EXCEPT FOR THOSE WHOM IT WAS PREPARED IS PROHIBITED WITHOUT WRITTEN CONSENT FROM ARC COMPANY, THE WALL DESIGN ENGINEER.

SHOTCRETE:

ALL SHOTCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI, AND A MINIMUM 3-DAY COMPRESSIVE STRENGTH OF 2000 PSI.

SEE THE SPECIFICATIONS FOR REQUIREMENTS.

TYPE V PORTLAND CEMENT CONFORMING TO ASTM C150 / AASHTO M85 SHALL BE USED FOR SHOTCRETE.

SUBMIT MIX DESIGNS IN ACCORDANCE WITH THE SPECIFICATIONS.

GENERAL NOTES (CONT.)

NAIL BAR STEEL:

ALL NAIL BARS SHALL CONFORM TO EITHER ASTM A615 / AASHTO M31, GRADE 60, GRADE 75 OR ASTM A722 / AASHTO M275, GRADE 150, AS INDICATED ON THE PLANS.

ALL SHRINKAGE CRACKS, DEFICIENCES OR OPENINGS IN THE SHOTCRETE WALL SHALL BE CORRECTED AND FILLED OR SEALED TO THE SATISFACTION OF THE DESIGNER AND THE SPECIAL INSPECTOR.

DEFINITIONS

"DESIGN ENGINEER" OR "DESIGNER" = Adams Resource Consultants (ARC), THE DESIGN ENGINEER OF THESE PLANS. MAY ALSO BE THE GEOTECHNICAL SPECIAL INSPECTOR FOR THIS PROJECT.
"THE ENGINEER" = GEOTECHNICAL SPECIAL INSPECTOR AS APPOINTED BY THE OWNER AND APPROVED BY THE GOVERNING MUNICIPALITY OR AGENCY.
"CONTRACTOR" = SPECIALTY SHOTCRETE (SHORING) WALL CONTRACTOR
"NEAT CUT" = THE EXCAVATION EXPOSED CUT FACE PREPARED FOR APPLICATION OF THE SHOTCRETE

ABBREVIATIONS

AB	ANCHOR BOLT
ADDL	ADDITIONAL
ADJ	ADJACENT
AFF	ABOVE FINISH FLOOR
APPROX	APPROXIMATE(LY)
ARCH	ARCHITECTURAL
ARCH'T	ARCHITECT
BB	BACK TO BACK
BC	BOTTOM CORD
BL	BASE LINE
BLDG	BUILDING
BM	BEAM
BOT	BOTTOM
BP	BASE PLATE
BRG	BEARING
BRKT	BRACKET
BS	BOTH SIDES
BSMT	BASEMENT
BVL	BEVELED
BW	BOTH WAYS
C	COMPRESSION
CIP	CAST-IN-PLACE
CJ	CONSTRUCTION JOINT
CL	CENTERLINE
CLR	CLEAR OR CLEARANCE
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONT'D	CONTINUED
D	DEPTH
DETL	DETAIL
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DIST	DISTRIBUTION
DL	DEAD LOAD
DN	DOWN
DP	DAMP PROOFING
DWG	DRAWING(S)
DWL	DOWEL

ABBREVIATIONS (CONT.)

E	EAST
EA	EACH
EF	EACH FACE
EJ	EXPANSION JOINT
ELEC	ELECTRICAL
ELEV,EL	ELEVATION
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
FD	FLOOR DRAIN
FDN	FOUNDATION
FF	FINISH FLOOR
FIN	FINISH(ED)
FS	FAR SIDE
FTG	FOOTING
FAB	FABRICATION
GA	GAGE OR GAUGE
GALV	GALVANIZED
GB	GRADE BEAM
HDPE	HIGH-DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HIGH POINT
HT	HEIGHT
HS	HEADED STUD
ID	INSIDE DIAMETER
INT	INTERIOR
JT	JOINT
K	KIPS
KO	KNOCKOUT
L	DRILLED NAIL LENGTH
LB,#	POUND
LD	DEVELOPMENT LENGTH
LDG	LANDING
LH	LEFT HAND
LL	LIVE LOAD
LONG	LONGITUDINAL
LP	LOW POINT
LW	LONG WAY
LWC	LIGHTWEIGHT CONCRETE
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURE(R)
MID	MIDDLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MS	MIDDLE STRIP
MTL	METAL
N/A	NOT APPLICABLE
NF	NEAR FACE
NEAT	NEAT-CUT FACE
NO	NUMBER
NOM	NOMINAL
NS	NEAR SIDE
NTS	NOT TO SCALE
OA	OVERALL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OPNG	OPENING(S)
OPP	OPPOSITE
OPP HND	OPPOSITE HAND
OPT	OPTIONAL
PC	PRECAST CONCRETE
PE	POLYETHYLENE
PERM	PERMANENT
PERP	PERPENDICULAR
PL	PLATE
PLUMB	PLUMBING
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PROJ	PROJECTION
PSF	POUNDS PER SQUARE FEET
PSI	POUNDS PER SQUARE INCH
PT	POINT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
R	RIGHT, RISER
RAD	RADIUS
RD	ROOF DRAIN
RE:	REFER
REINF	REINFORCING (-ED,-MENT)
REM	REMAINDER
REQD	REQUIRED
REV	REVISION
RH	RIGHT HAND
RND	ROUND
RO	ROUGH OPENING
RW	RETAINING WALL
S	SOUTH
SCH	SCHEDULE(D)
SECT	SECTION
SHOT	SHOTCRETE
SIM	SIMILAR
SJ	SAW JOINT
SL	SLOPE
SPA	SPACE
SPEC	SPECIFICATION(S)
SPL	SPECIAL
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
STL	STEEL
STRUCT	STRUCTURE
STR'L	STRUCTURAL
T	TOP, TENSION
T/	TOP OF
T/CONC	TOP OF CONCRETE
T/FD	TOP OF FLOOR DRAIN
T/FTG	TOP OF FOOTING
T/SLAB	TOP OF SLAB
T&B	TOP AND BOTTOM
TEMP	TEMPERATURE, TEMPORARY
THRD	THREADED
THK	THICKNESS
TOS	TOP OF STEEL, TOP OF SHOTCRETE
TOW	TOP OF WALL
TRD	TREAD(S)
TRNV	TRANSVERSE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
W	WEST, WIDTH, WIDE
W/	WITH
W/O	WITHOUT
WP	WORK POINT, WATER-PROOFING
WT	WEIGHT, STRUCTURAL TEE CUT FROM WIDE FLANGE BEAM
WWF	WELDED WIRE FABRIC

REV	DESCRIPTION	DATE	REVIEW	DRAWN	DESIGN
R1	FINAL REVIEW	04/01/18	MW	WCA	WCA
C1	FOR BID AND CONSTRUCTION	02/19/19	MW	WCA	WCA

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CEMENT KILN DUST (CKD) CLOSURE PLANS

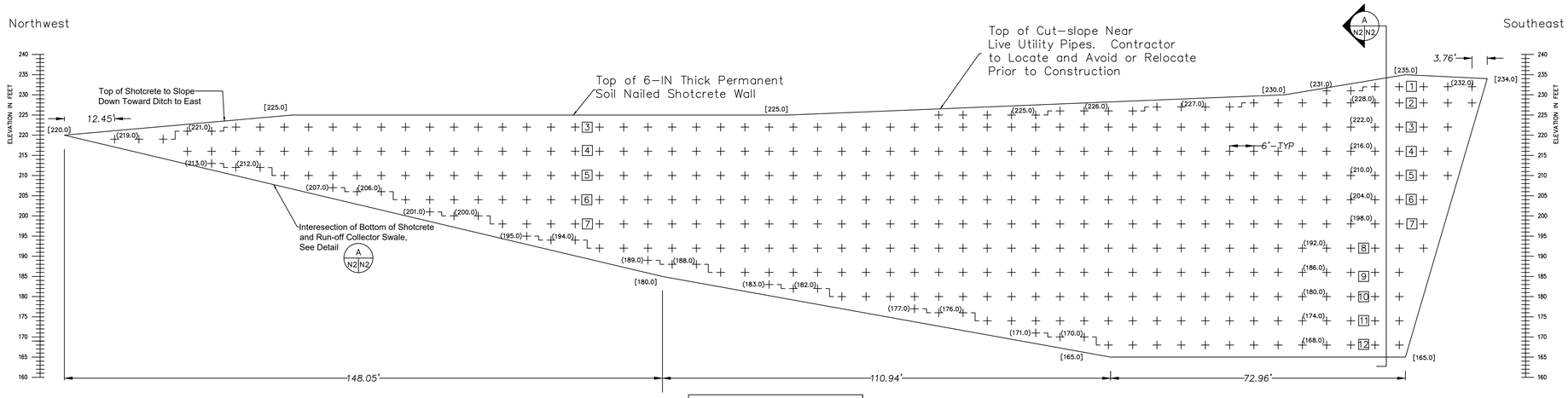
GENERAL NOTES AND ABBREVIATIONS

DRAWING NUMBER

SHEET

N1

22 OF 28



WEST WALL (Looking East)			
SEGMENT A			
ROW	L	BAR	α
1	36	#8 GR 75	15°
2	36	#8 GR 75	15°
3	36	#8 GR 75	15°
4	36	#8 GR 75	15°
5	36	#8 GR 75	15°
6	36	#8 GR 75	15°
7	36	#8 GR 75	15°
8	34	#8 GR 75	15°
9	26	#8 GR 75	15°
10	20	#8 GR 75	15°
11	17	#8 GR 75	15°
12	17	#8 GR 75	15°

1 N2 N2 SHOTCRETE WALL ELEVATION

Scale in Feet: 0 10 20

NOTES:

1. CONTRACTOR TO ADD AT LEAST 1-FT TO NAIL LENGTHS (L) TO ACCOMODATE PLATE, WASHER AND NUT. SEE SOIL NAIL TYPICAL SECTION.

2. CONTRACTOR TO CONFIRM LOCATION OF ALL UTILITIES BEHIND OR NEAR SOIL NAILED WALL CUT FACE AND CUT-SLOPES BEFORE BEGINNING CONSTRUCTION.

3. CONTRACTOR IS SOLEY RESPONSIBLE FOR REPAIRS AND/OR REPLACEMENT OF EXISTING UTILITIES SHOULD DAMAGE OCCUR AS A RESULT OF CONSTRUCTION ACTIVITIES.

4. CONTRACTOR IS RESPONSIBLE FOR STABILITY OF ALL TEMPORARY CUT SLOPES AND ALL CUT SLOPES REQUIRED FOR CONSTRUCTION. TEMPORARY CUT SLOPES MAY REQUIRE PLASTIC SHEETING, SHOTCRETE FLASHCOAT AND/OR STEEL REINFORCED FALSH-COAT OF SHOTCRETE FOR TEMPORARY EROSION PROTECTION.

5. CONSTRUCTION EQUIPMENT THAT IS NOT PART OF NAIL INSTALLATION SHALL NOT OPERATE CLOSER THAN 5 FEET (HORIZONTAL) FROM BACK NEAT-CUT PLANE AT THE TOP OF SOIL NAILED WALL.

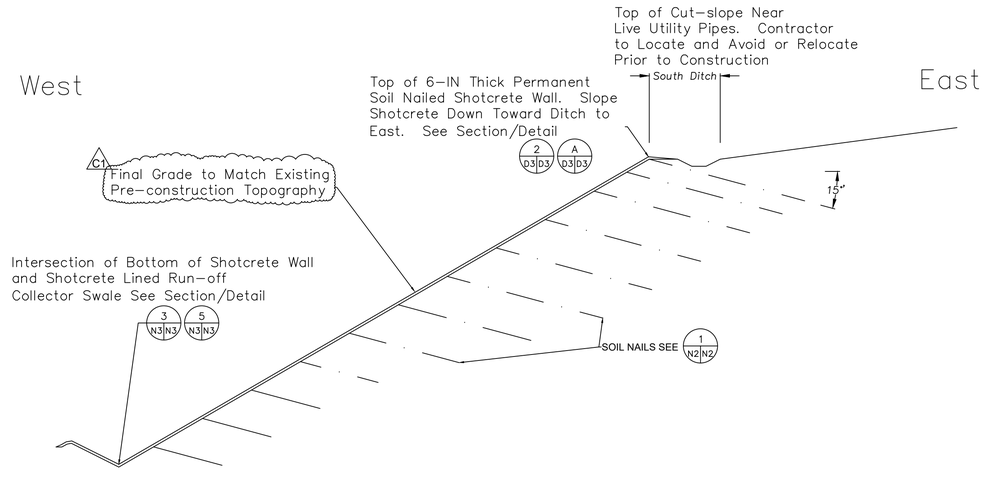
6. COMPACTION EQUIPMENT SHALL NOT OPERATE CLOSER THAN 2 FEET (HORIZONTAL) FROM BACK PLANE OF SOIL NAILED WALL.

7. THE PROVIDED DESIGN PULLOUT VALUES ARE ASSUMED AND ARE BASED ON SUBSURFACE INFORMATION THAT INCLUDES SITE OBSERVATIONS. VALUES USED IN THE NAIL PULLOUT TESTING WILL RELY ON THE ENGINEER'S (OR REPRESENTATIVE) EVALUATION OF DESIGN INPUT, CONTRACTOR'S METHODS AND ACTUAL INTERCEPTED SUBSURFACE CONDITIONS DURING CONSTRUCTION.

8. UNLESS DESIGNER APPROVES A CONTRACTOR SUBMITTAL FOR ALTERNATIVE MEANS/METHODS, EXCAVATION FOR NEXT LOWER LIFT SHALL NOT PROCEED UNTIL ALL SHOTCRETE, STEEL PLATES, NUTS AND REQUIRED NAIL TESTING IS COMPLETE AND ENGINEER HAS ACCEPTED CONSTRUCTED SOIL NAIL WALL LIFT.

LEGEND

9	= NAIL ROW
+	= NAIL
(156)	= NAIL ROW ELEVATION
[150.0']	= GRADE ELEVATION
ROW	= NAIL ROW NUMBER
L	= DRILLED NAIL LENGTH (FEET)
BAR	= MINIMUM BAR AND STEEL GRADE
α	= NAIL DECLINATION (DEGREES) UNLESS SHOWN OTHERWISE ON PLANS
(25°)→	= DECLINATION OF SPECIFIC NAIL (ARROW INDICATES DIRECTION MEASURED FROM PERPENDICULAR)



A N2 N2 SHOTCRETE WALL SECTION

NTS

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MW	04/01/18	R1	FINAL REVIEW
WCA	WCA	MW	02/19/19	C1	FOR BID AND CONSTRUCTION

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CEMENT KILN DUST (CKD) CLOSURE PLANS

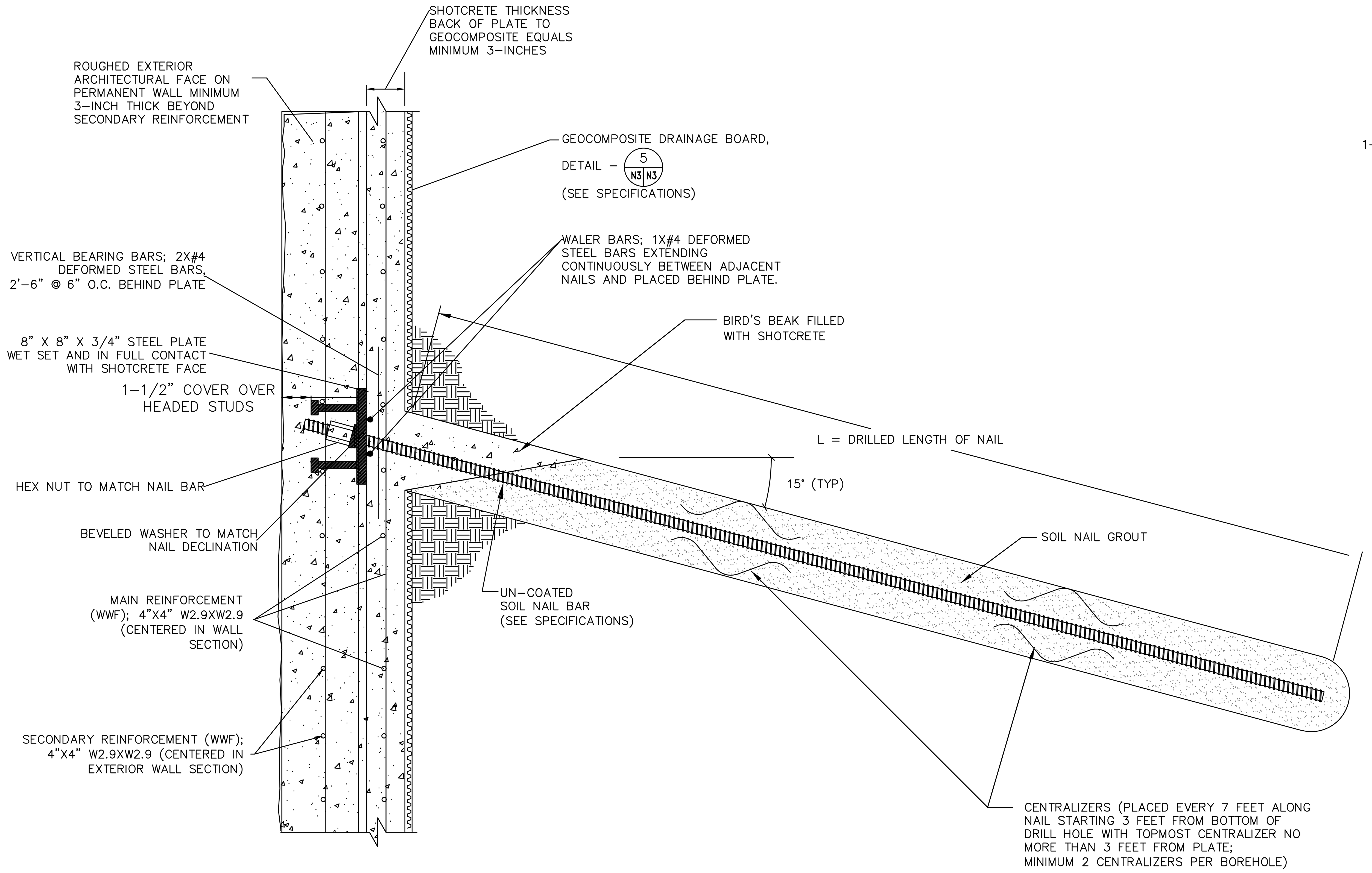
SOIL NAILED WALL ELEVATION AND SECTION

DRAWING NUMBER

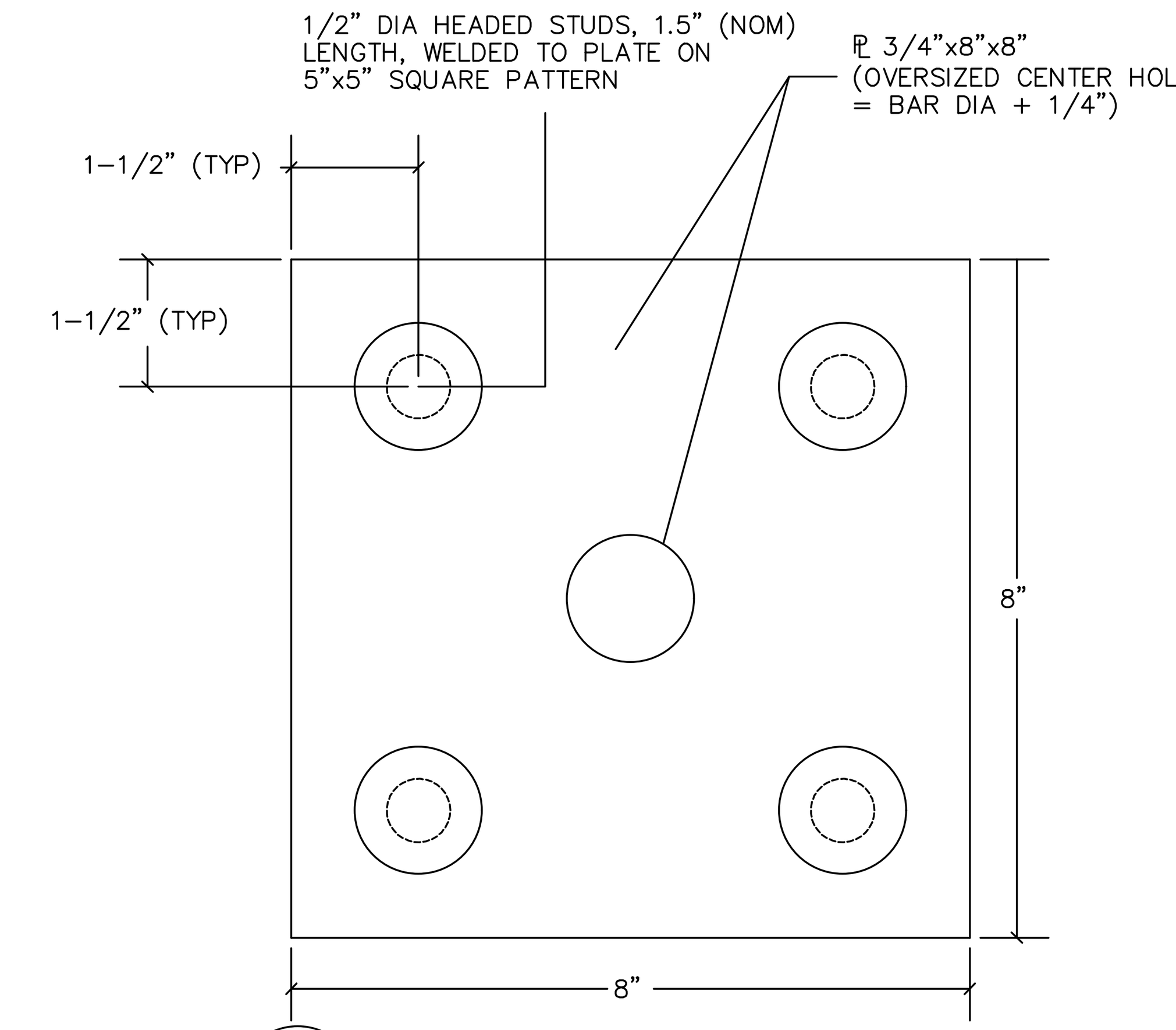
SHEET

N2

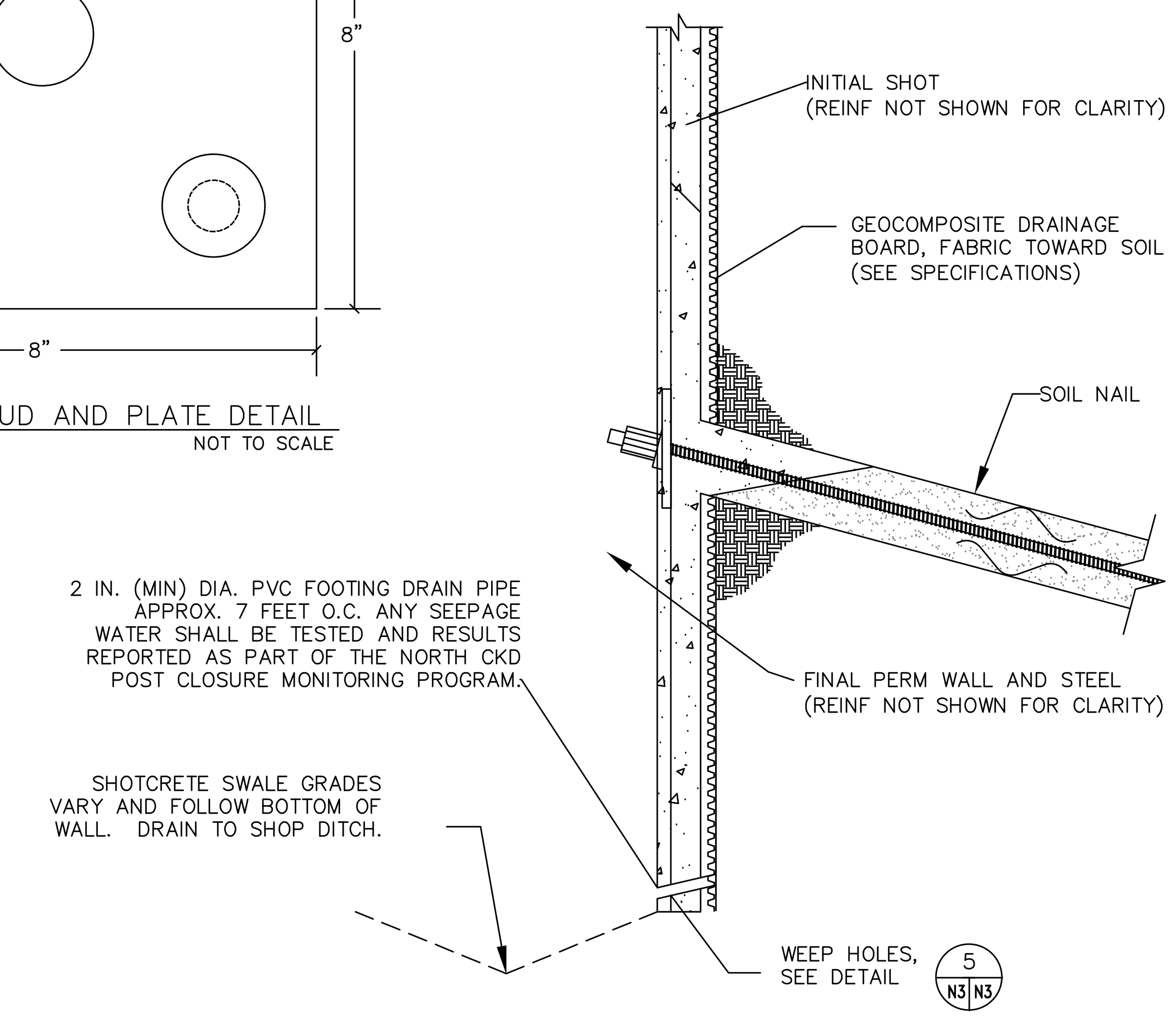
23 OF 28



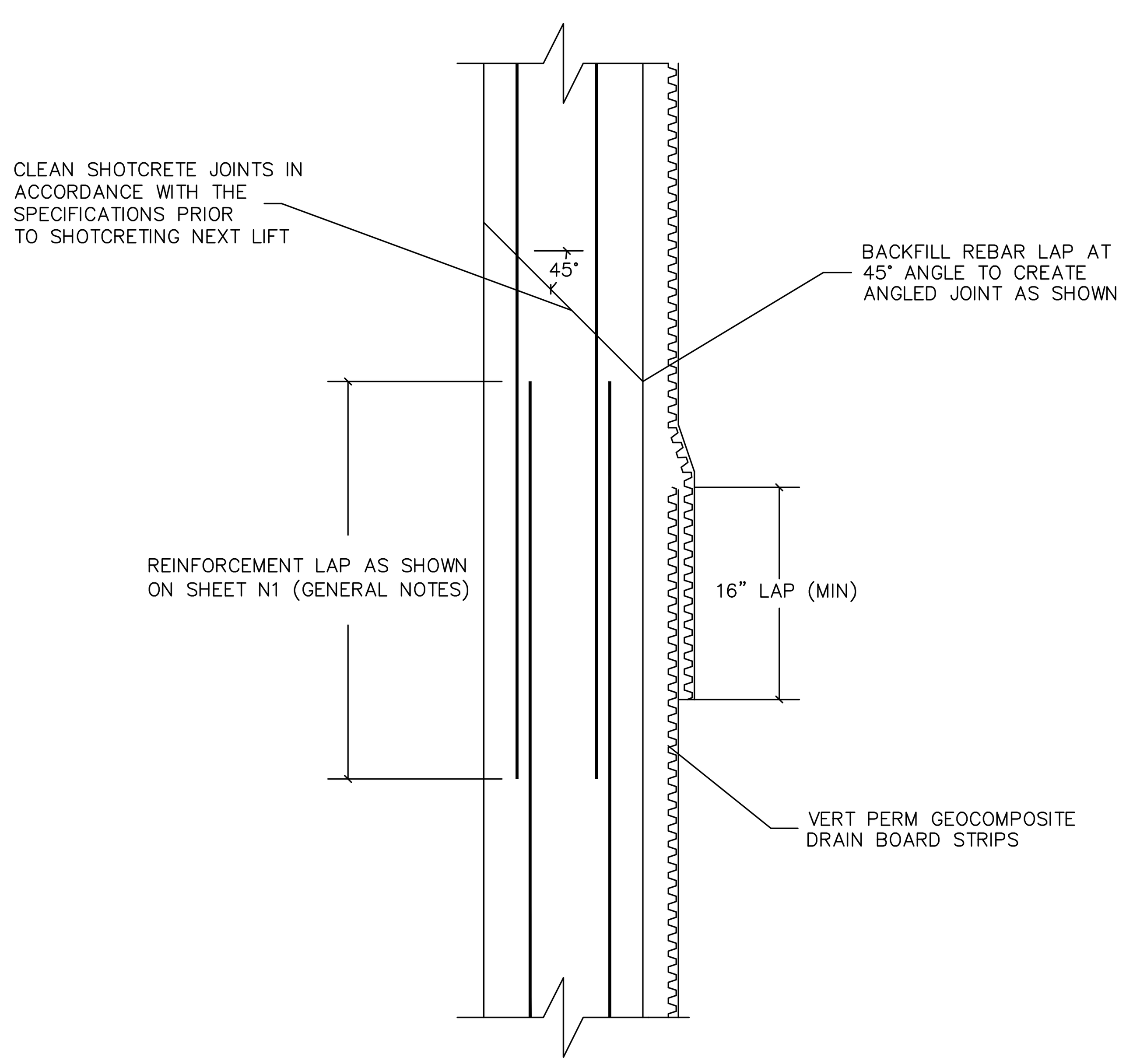
1 N3|N3 SHOTCRETE FACING AND NAIL DETAIL
NOT TO SCALE
WALL SHOWN VERTICAL FOR DRAWING CONVENIENCE



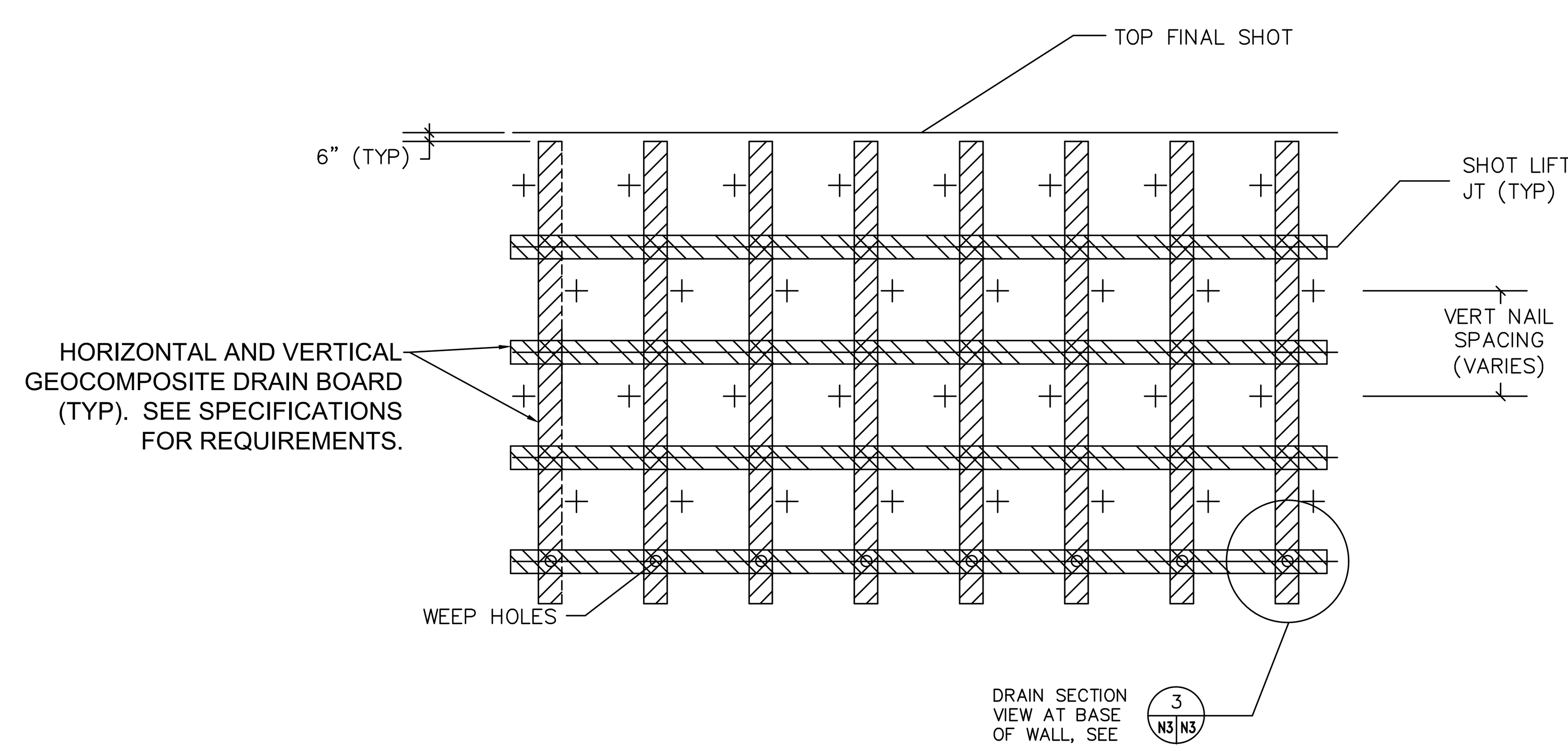
2 N3|N3 HEADED STUD AND PLATE DETAIL
NOT TO SCALE



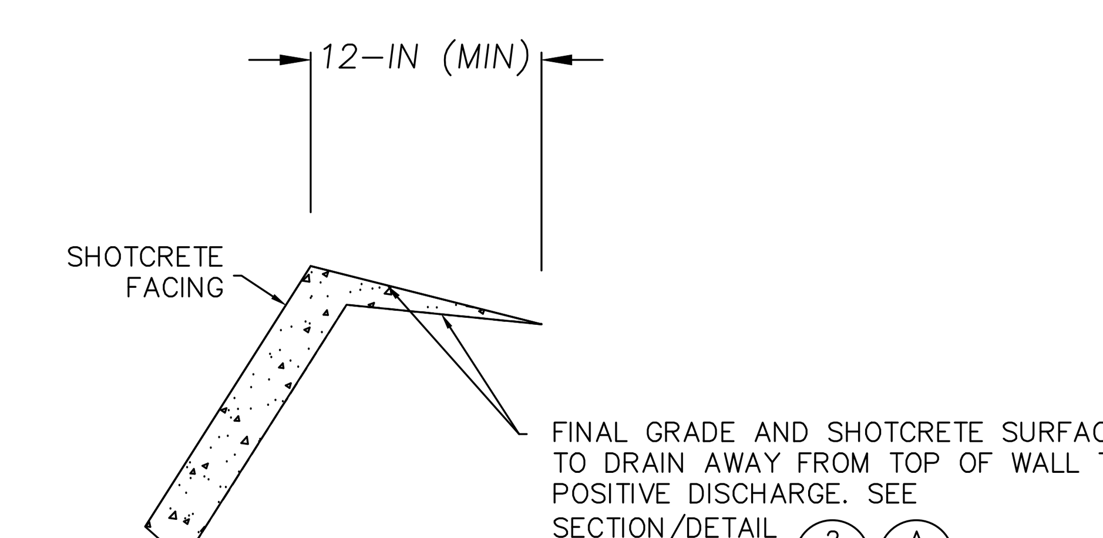
3 N3|N3 GEOCOMPOSITE DRAINAGE DETAIL
NOT TO SCALE
WALL SHOWN VERTICAL FOR DRAWING CONVENIENCE



4 N3|N3 PERMANENT SHOTCRETE WALL JOINT DETAIL
NOT TO SCALE
WALL SHOWN VERTICAL FOR DRAWING CONVENIENCE



5 N3|N3 PERMANENT GEOCOMPOSITE DRAINAGE BOARD DETAIL
NOT TO SCALE



6 N2|N3 SHOTCRETE SLOPE FOR SURFACE DETAIL
NOT TO SCALE

REV	DESCRIPTION
R1	FINAL REVIEW
C1	FOR BID AND CONSTRUCTION

DESIGN	DRAWN	REVIEW	DATE
WCA	WCA	MW	04/01/18
WCA	WCA	MW	02/19/19

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CEMENT KILN DUST (CKD) CLOSURE PLANS
SOIL NAILED WALL DETAILS

CEMEX

DRAWING NUMBER
SHEET
N3

1 2 3 4 5

SECTION 2350 – SOIL NAILS AND WALL DRAINAGE

PART 1 – GENERAL

1.01 DESCRIPTION

A. THE WORK SHALL CONSIST OF CONSTRUCTING SOIL NAILS AND WALL DRAINAGE AS SPECIFIED HEREIN AND SHOWN ON THE PLANS. THE WORK SHALL ALSO INCLUDE: 1) CLEAR, GRUB AND EXCAVATE IN ACCORDANCE WITH THE LAYOUT SHOWN ON THE PLANS, 2) DRILLING SOIL NAIL HOLES TO THE SPECIFIED MINIMUM LENGTH AND ORIENTATION INDICATED ON THE PLANS, 3) PROVIDE, CENTER, AND GROUT THE NAILS IN THE DRILLED BOREHOLES 4) PLACING DRAINAGE ELEMENTS AND 5) PERFORMING ALL SOIL NAIL PULLOUT TESTING. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, AND EQUIPMENT REQUIRED FOR COMPLETING THE WORK.

B. A PRE-CONSTRUCTION MEETING SHALL BE HELD PRIOR TO THE START OF THE WORK AND SHALL BE ATTENDED BY THE OWNER'S REPRESENTATIVES, THE ENGINEER (DESIGNER/REPRESENTATIVE), THE PRIME CONTRACTOR, THE EXCAVATION CONTRACTOR, AND THE SOIL NAIL SUBCONTRACTOR. THE PRE-CONSTRUCTION MEETING SHALL BE CONDUCTED TO CLARIFY THE CONSTRUCTION REQUIREMENTS FOR THE WORK, TO COORDINATE THE CONSTRUCTION ACTIVITIES, AND TO IDENTIFY CONTRACTUAL RELATIONSHIPS AND RESPONSIBILITIES.

C. THE OWNER'S REPRESENTATIVE / SOIL NAILING INSPECTOR THAT IS PROVIDING THE SPECIAL INSPECTION SHALL BE A QUALIFIED GEOTECHNICAL ENGINEER OR REPRESENTATIVE WITH EXPERIENCE MONITORING SOIL NAIL INSTALLATION, TESTING AND WALL CONSTRUCTION.

D. UTILITIES REFERENCED ON THE PLANS ARE FOR INFORMATIONAL PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR FIELD LOCATING AND VERIFYING THE LOCATION OF ALL UTILITIES SHOWN ON THE PLANS OR OTERWISE IDENTIFIED PRIOR TO STARTING THE WORK. THE CONTRACTOR SHALL MAINTAIN UNINTERRUPTED SERVICE FOR THOSE UTILITIES DESIGNATED TO REMAIN IN SERVICE THROUGHOUT THE WORK.

PART 2 – MATERIALS

2.01 GENERAL

A. MATERIALS FOR CONSTRUCTION OF SOIL NAIL WALLS SHALL BE FURNISHED NEW AND WITHOUT DEFECTS. DEFECTIVE MATERIALS REJECTED BY THE OWNER'S REPRESENTATIVE SHALL BE REMOVED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. MATERIALS SHALL CONSIST OF THE FOLLOWING:

CENTRALIZERS	SCHEDULE 40 PVC OR OTHER MATERIAL NOT DETRIMENTAL TO THE NAIL STEEL (WOOD SHALL NOT BE USED); SECURELY ATTACHED TO THE NAIL BAR; SIZED TO POSITION THE NAIL BAR WITHIN 1 INCH OF THE CENTER OF THE DRILLHOLE; SIZED TO ALLOW TREMIE PIPE INSERTION TO THE BOTTOM OF THE DRILLHOLE; AND, SIZED TO ALLOW GROUT TO FLOW FREELY UP THE DRILLHOLE.
NAIL GROUT	THE GROUT SHALL BE A NEAT OR SAND/ CEMENT MIXTURE WITH A MINIMUM 3-DAY COMPRESSIVE STRENGTH OF 1500 PSI AND A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI PER ASTM C109 / AASHTO T106.
CEMENT	ASTM C150 / AASHTO M85, TYPE I.
FINE AGGREGATE	ASTM C33 / AASHTO M6.
SOLID BAR NAILS	ASTM A615 / AASHTO M31, GRADE 75 OR ASTM A722 / AASHTO M275, GRADE 150.
BAR COUPLERS	BAR COUPLERS SHALL DEVELOP THE FULL ULTIMATE TENSILE STRENGTH OF THE BAR AS CERTIFIED BY THE MANUFACTURER.
BEARING PLATES	ASTM A709 / AASHTO M270, GRADE 36.
NUTS & WASHERS	AASHTO M291, GRADE B, HEXAGONAL FITTED WITH BEVELED WASHER OR SPHERICAL SEAT TO PROVIDE UNIFORM BEARING.
HEADED-STUDS	ASTM A307 OR APPROVED EQUAL.
WELD ELECTRODES	E70XX AND IN ACCORDANCE WITH AWS D1.1-88.
DRAINAGE GEOTEXTILE	NEEDLE PUNCHED, NON-WOVEN, PUNCTURE RESISTANCE (ASTM D4833) 335 N, GRAB STRENGTH (ASTM D4632) 690 N, FABRIC WEIGHT (ASTM 3776) 0.2 KG/M2, APPARENT OPENING SIZE (AOS) (COE CW-02215) 70.
GEOCOMPOSITE DRAIN STRIP	MIRADRAIN 6000 OR AMERDRAIN 500.
PVC WEEP PIPE	SCHEDULE 40 PVC.

2.02 MATERIALS HANDLING AND STORAGE

A. CEMENT SHALL BE ADEQUATELY STORED TO PREVENT MOISTURE DEGRADATION AND PARTIAL HYDRATION. CEMENT THAT HAS BECOME CAKED OR LUMPY SHALL NOT BE USED.

B. ALL STEEL REINFORCEMENT SHALL BE CAREFULLY HANDLED AND SHALL BE STORED ON SUPPORTS TO KEEP THE STEEL FROM CONTACT WITH THE GROUND. STEEL BARS SHALL BE PICKED UP IN SUCH A WAY AS TO PREVENT OVERSTRESSING. DAMAGE TO THE NAIL STEEL AS A RESULT OF OVERSTRESSING, ABRASION, CUTS, NICKS, WELDS, AND WELD SPLATTER SHALL BE CAUSE FOR REJECTION BY THE OWNER'S REPRESENTATIVE. GROUNDING OF WELDING LEADS TO THE NAIL STEEL SHALL NOT BE ALLOWED. NAIL STEEL SHALL BE PROTECTED FROM AND SUFFICIENTLY FREE OF DIRT, RUST, AND OTHER DELETERIOUS SUBSTANCES PRIOR TO INSTALLATION. HEAVY CORROSION OR PITTING OF NAILS SHALL BE CAUSE FOR REJECTION BY THE OWNER'S REPRESENTATIVE. LIGHT RUST THAT HAS NOT RESULTED IN PITTING IS ACCEPTABLE.

C. DRAINAGE GEOTEXTILE AND GEOCOMPOSITE DRAINS SHALL BE PROVIDED IN ROLLS WRAPPED WITH A PROTECTIVE COVERING AND STORED IN A MANNER THAT PROTECTS THE FABRIC FROM MUD, DIRT, DUST, DEBRIS, AND SHOTCRETE REBOUND. PROTECTIVE WRAPPING SHALL NOT BE REMOVED UNTIL IMMEDIATELY BEFORE THE GEOTEXTILE OR DRAIN STRIP IS INSTALLED. EXTENDED EXPOSURE TO ULTRA-VIOLET LIGHT SHALL BE AVOIDED.

PART 3 – EXECUTION

3.01 GENERAL

A. THE CONSTRUCTION SEQUENCE SHALL BE AS SHOWN ON THE PLANS, IN STAGED LIFTS OR IN ACCORDANCE WITH THE APPROVED SUBMITTAL, UNLESS APPROVED OTHERWISE BY THE DESIGNER. NO EXCAVATIONS STEEPER OR HIGHER THAN THOSE SPECIFIED HEREIN SHALL BE MADE ABOVE OR BELOW THE SOIL NAIL WALL WITHOUT WRITTEN APPROVAL OF THE DESIGNER.

3.02 EXCAVATION

3.02.01 MASS EXCAVATION

A. FOR DISTANCES AWAY FROM THE WALL FACE GREATER THAN THE CURRENT WALL HEIGHT, MASS EXCAVATION MAY OCCUR AT ANY TIME, BUT WITH SLOPES NO STEEPER THAN 1H:1V, UNLESS APPROVED OTHERWISE BY THE DESIGNER.

B. SUBSEQUENT MASS EXCAVATION BENEATH A PRECEDING SHOTCRETE LIFT, NO CLOSER THAN 5 FEET FROM THE FACE OF SHOTCRETE, MAY OCCUR ANY TIME 24-HOURS AFTER SHOTCRETING THE PRECEDING LIFT. ALL TEMPORARY SLOPES THAT ARE HIGHER THAN 4 FEET SHALL NOT BE STEEPER THAN 1H:1V UNLESS APPROVED OTHERWISE BY THE DESIGNER.

C. DURING MASS EXCAVATION OF THE DRILL BENCH FOR THE NEXT ROW OF NAILS, THE CONTRACTOR SHALL MAINTAIN A BENCH OF MATERIAL TO SERVE AS BOTH A PLATFORM FOR THE DRILLING EQUIPMENT, AND AS A STABILIZING BERM AGAINST THE FINAL WALL EXCAVATION FACE NEAT-LINE. IN ACCORDANCE WITH THAT SHOWN ON THE PLANS OR APPROVED OTHERWISE BY THE DESIGNER, THE MATERIAL NEAR THE WALL FACE MAY BE EITHER (A) A NATIVE BERM, (B) A SOFT BERM, OR (C) NEAT CUT. IN ALL THREE CASES, THE DRILL BENCH (IF COMPLETEING HORIZONTAL INSTALLATION) SHALL NOT BE MORE THAN 3 FEET BELOW THE ROW OF NAILS TO BE INSTALLED AND SHALL EXTEND OUT FROM THE WALL FACE A MINIMUM DISTANCE TO PROVIDE A SAFE WORKING BENCH FOR THE DRILL EQUIPMENT AND WORKERS. THE CONTRACTOR IS COMPLETELY RESPONSIBLE FOR THE SAFETY AND STABILITY OF THE TEMPORARY DRILL BENCH AND WALL FACE CUT, UNTIL THE CORRESPONDING SHOTCRETE LIFT WITH CONNECTION HARDWARE IS CONSTRUCTED AS SHOWN ON THE PLANS.

D. SUBSEQUENT MASS EXCAVATION BENEATH A PRECEDING SHOTCRETE LIFT, CLOSER THAN 5 FEET FROM THE FACE OF SHOTCRETE, SHALL NOT OCCUR UNTIL: (1) NAIL GROUT AND SHOTCRETE ON THE PRECEDING LIFT SHALL HAVE REACHED 50 PERCENT OF THEIR SPECIFIED 28-DAY COMPRESSIVE STRENGTHS; AND (2) INSTALLATION OF CONNECTION HARDWARE AND NAIL TESTING FOR THE PRECEDING LIFT ARE COMPLETE AND ACCEPTABLE TO THE OWNER'S REPRESENTATIVE. MASS EXCAVATION CLOSER THAN 5 FEET TO THE SHOTCRETE FACE MUST BE IN ACCORDANCE WITH THE DRILL BERM, BENCH AND EMBANKMENT REQUIREMENTS PREVIOUSLY DESCRIBED ABOVE AND SHOWN ON THE PLANS.

E. EXCAVATION OF THE GROUND BEYOND THE FINAL WALL FACE SHALL NOT BE ALLOWED. INADVERTENT OVEREXCAVATION BEYOND THE FINAL WALL FACE SHALL BE RESTORED BY THE CONTRACTOR USING A METHOD APPROVED BY THE DESIGNER AND AT NO ADDITIONAL COST TO THE OWNER.

3.02.02 WALL FACE EXCAVATION

A. EXCAVATION TO THE FINAL WALL EXCAVATION FACE (NEAT LINE) SHALL BE DONE USING PROCEDURES THAT : (1) PREVENT GROUND LOSS, SWELLING, AIR SLACKING, OR LOOSENING; (2) MINIMIZE DEGRADATION OF SOIL BEARING SUPPORT BELOW THE OVERLYING PORTIONS OF THE SOIL NAIL WALL AND BELOW THE SOIL NAILS CURRENTLY BEING INSTALLED; (3) PREVENT PREMATURE LOSS OF SOIL MOISTURE AT THE FACE; (4) PREVENT GROUND FREEZING; AND (5) REDUCE THE POTENTIAL FOR SHOTCRETE OVERAGES.

3.02.03 TEMPORARY END OF WALL CONDITIONS

A. WHERE THE CONTRACTOR'S CONSTRUCTION SEQUENCING RESULTS IN A DISCONTINUOUS LIFT ALONG ANY NAIL ROW, THE ENDS OF THE LIFT SHALL EXTEND BEYOND THE ENDS OF THE NEXT LOWER LIFT BY AT LEAST 10 FEET. SLOPES/BERMS IMMEDIATELY BENEATH THESE STEPPED LIFTS SHALL BE CONSTRUCTED TO PREVENT SLOUGHING OR FAILURE THAT WOULD RESULT IN LOSS OF THE FACE SUPPORT PROVIDED BY THE SLOPES/BERMS.

3.02.04 PROTRUSIONS AND VOIDS

A. COBBLES, BOULDERS, RUBBLE, OR OTHER OBJECTS THAT ARE ENCOUNTERED AT THE SOIL FACE DURING EXCAVATION AND THAT PROTRUDE FROM THE SOIL FACE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTING THE SHOTCRETE CONSTRUCTION FACING AND/OR THE FINISH STRUCTURAL FACING TO THE SPECIFIED MINIMUM THICKNESS AND TO THE LINE AND GRADE INDICATED IN THE PLANS. REMOVAL OF FACE PROTRUSIONS TO ACCOMPLISH THIS CONSTRUCTION SHALL BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE DESIGNER OF THE PROPOSED METHOD FOR MITIGATION OF FACE PROTRUSIONS AT LEAST 24 HOURS PRIOR TO INITIATION OF THE WORK. SHOULD THE REMOVAL OF FACE PROTRUSIONS RESULT IN VOIDS BEYOND THE FINISH FACE LINE (NEAT LINE), THE CONTRACTOR SHALL DETERMINE THE APPROPRIATE METHOD OF BACKFILLING AND SHALL SUBMIT TO THE DESIGNER SUCH METHOD(S) AT LEAST 24 HOURS PRIOR TO INITIATING THE WORK.

3.03 WALL DRAINAGE

3.03.01 DESCRIPTION

A. THE DRAINAGE NETWORK SHALL CONSIST OF INSTALLING THE PREFABRICATED GEOCOMPOSITE DRAINAGE STRIPS, PVC CONNECTION PIPES, AND WALL FOOTING DRAINS AS SHOWN ON THE PLANS OR AS DIRECTED BY THE DESIGNER. EXCLUSIVE OF THE WALL FOOTING DRAINS, ALL ELEMENTS OF THE DRAINAGE NETWORK SHALL BE INSTALLED PRIOR TO SHOTCRETING.

3.03.02 DRAINAGE CONTROL

A. LOCALIZED AREAS OF PERCHED WATER MAY BE ENCOUNTERED. THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE IF GROUNDWATER OCCURS, IS ENCOUNTERED, OR OBSERVED IN AT OR ADJACENT TO THE EXCAVATION FACE.

B. THE CONTRACTOR SHALL PROVIDE POSITIVE CONTROL AND DISCHARGE OF ALL SURFACE WATER ENCOUNTERED DURING CONSTRUCTION TO THE EXTENT NECESSARY TO PREVENT ADVERSE CONDITIONS AS DETERMINED BY THE OWNER'S REPRESENTATIVE.

C. EXISTING SUBSURFACE DRAINAGE FEATURES ENCOUNTERED DURING EXCAVATION SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE OWNER'S REPRESENTATIVE. WORK IN THESE AREAS SHALL BE SUSPENDED UNTIL REMEDIAL MEASURES MEETING THE APPROVAL OF THE OWNER'S REPRESENTATIVE ARE IMPLEMENTED BY THE CONTRACTOR. SURFACE WATER RUNOFF FLOW AND FLOWS FROM EXISTING SUBSURFACE DRAINAGE FEATURES SHALL BE CAPTURED INDEPENDENTLY OF THE WALL DRAINAGE NETWORK AND CONVEYED TO AN OUTFALL STRUCTURE OR STORM SEWER AS DETERMINED BY THE OWNER'S REPRESENTATIVE. REMEDIAL MEASURES FOR EXISTING SUBSURFACE DRAINAGE FEATURES ENCOUNTERED DURING THE WORK, WHICH WERE NOT IDENTIFIED ON THE PLANS, WILL BE PAID FOR AS EXTRA WORK PER THE CONTRACT DOCUMENTS.

3.03.02 GEOCOMPOSITE DRAIN STRIPS

A. GEOCOMPOSITE DRAIN STRIPS SHALL BE INSTALLED AS SHOWN ON THE PLANS. DRAIN STRIPS AT CONSTRUCTION JOINTS SHALL BE PLACED SUCH THAT THE JOINT IS ALIGNED AS CLOSE AS PRACTICAL ALONG THE MIDDLE OF THE LONGITUDINAL AXIS OF THE DRAIN STRIP.

B. THE GEOCOMPOSITE DRAIN STRIPS SHALL BE AT LEAST 16 INCHES WIDE AND SHALL BE SECURED TO THE EXCAVATION FACE WITH THE GEOTEXTILE SIDE AGAINST THE GROUND BEFORE SHOTCRETING. DRAIN STRIPS SHALL BE MADE CONTINUOUS BY USING THE "SHINGLE" METHOD OF SPLICING WITH A 16 INCH MINIMUM OVERLAP SUCH THAT THE FLOW OF WATER IS NOT IMPEDED OR DIRECTED TO THE SHOTCRETE SIDE OF THE STRIPS.

3.03.03 CONNECTION PIPES AND WEEPHOLES

A. CONNECTION PIPES AND WEEPHOLES SHALL BE INSTALLED AS SHOWN ON THE PLANS. CONNECTION PIPES SHALL BE LENGTHS OF SOLID PVC PIPE INSTALLED TO DIRECT WATER FROM THE GEOCOMPOSITE DRAIN STRIPS INTO THE FOOTING DRAIN. CONNECTION PIPES AND WEEPHOLES SHALL BE CONNECTED TO THE DRAIN STRIPS AS SHOWN ON THE PLANS, UNLESS APPROVED OTHERWISE BY THE ENGINEER. THE JOINT BETWEEN THE DRAIN PIPE AND THE DRAIN STRIP, AND THE DISCHARGE END OF THE CONNECTOR PIPE SHALL BOTH BE SEALED TO PREVENT SHOTCRETE INTRUSION. DAMAGE OF THE GEOCOMPOSITE DRAIN STRIP WHICH, IN THE OPINION OF THE OWNER'S REPRESENTATIVE, MAY CAUSE INTERRUPTION IN FLOW SHALL REQUIRE INSTALLATION OF ADDITIONAL CONNECTION PIPES OR WEEPHOLES ABOVE THE DAMAGED SECTION. CONNECTION PIPES SHALL BE EXTENDED TO THE EDGE OF THE FOOTING DRAIN BUT NOT THROUGH THE DRAINAGE GEOTEXTILE. THE INTEGRITY OF THE DRAINAGE GEOTEXTILE SHALL NOT BE INTERRUPTED.

3.03.04 FOOTING DRAINS

A. FOOTING DRAINS SHALL CONSIST OF A PERFORATED PVC PIPE AND SHALL BE CONSTRUCTED AT THE BOTTOM OF EACH WALL AS SHOWN ON THE PLANS.

3.04 NAIL INSTALLATION

3.04.01 GENERAL

A. TWO SUCCESSFUL VERIFICATION TESTS SHALL BE PERFORMED IN EACH SOIL UNIT IDENTIFIED ON THE PLANS PRIOR TO STARTING INSTALLATION OF PRODUCTION NAILS. THE LOCATIONS OF THE VERIFICATION TESTS ARE DETERMINED BY THE CONTRACTOR AND APPROVED BY THE DESIGN ENGINEER. ADDITIONAL VERIFICATION TESTS MAY BE REQUIRED IF THE CONTRACTOR MODIFIES THE INSTALLATION METHODS FROM THOSE USED DURING THE INSTALLATION OF THE APPROVED VERIFICATION TEST NAILS AND WILL BE CONDUCTED AT THE CONTRACTOR'S EXPENSE.

B. NAILS SHALL BE INSTALLED PRIOR TO THE APPLICATION OF SHOTCRETE AT THE LOCATIONS AND TO THE LENGTHS INDICATED ON THE PLANS. THE DESIGNER MAY ADD, ELIMINATE, OR RELOCATE NAILS TO ACCOMMODATE ACTUAL FIELD CONDITIONS. MODIFICATIONS TO THE DESIGN RESULTING FROM ACTIONS OF THE CONTRACTOR SHALL BE DETERMINED BY THE ENGINEER.

3.04.02 DRILLING

A. THE CONTRACTOR SHALL SELECT DRILLING EQUIPMENT AND METHODS SUITABLE FOR THE GROUND CONDITIONS DESCRIBED IN THE GEOTECHNICAL REPORT. DRILLHOLE DIAMETER SHALL BE SELECTED TO PROVIDE THE MINIMUM SPECIFIED GROUT COVER OVER THE SOIL NAIL TENDON AND TO DEVELOP THE SPECIFIED LOAD CARRYING CAPACITY. DRILLING MUDS USED TO ASSIST IN CUTTING REMOVAL SHALL NOT BE ALLOWED. UNCASED DRILLHOLES SHALL BE OBSERVED FOR CLEANLINESS PRIOR TO INSERTION OF THE SOIL NAIL TENDON. IN CAVING GROUND, THE CONTRACTOR SHALL USE CASED DRILLING METHODS TO SUPPORT THE SIDES OF THE DRILLHOLES.

B. THE CONTRACTOR SHALL IMMEDIATELY SUSPEND DRILLING OPERATIONS IF GROUND SUBSIDENCE IS OBSERVED, IF THE SOIL NAIL WALL IS ADVERSELY AFFECTED, OR IF ADJACENT STRUCTURES ARE DAMAGED AS A RESULT OF THE DRILLING OPERATION. THE ADVERSE CONDITIONS SHALL BE STABILIZED IMMEDIATELY AND THE DESIGNER SHALL BE NOTIFIED OF SUCH CONDITIONS WITHIN 24 HOURS.

3.04.03 NAIL TENDON INSTALLATION

A. NAIL TENDONS SHALL BE INSERTED INTO THE DRILLHOLE TO THE REQUIRED LENGTH WITHOUT DIFFICULTY AND IN SUCH A MANNER AS TO PREVENT DAMAGE TO THE DRILLHOLE. TENDONS THAT CANNOT BE FULLY INSERTED TO THE DESIGN DEPTH WITH RELATIVE EASE SHALL BE REMOVED FROM THE DRILLHOLE AND THE DRILLHOLE SHALL BE CLEANED SUFFICIENTLY TO ALLOW UNOBSTRUCTED INSTALLATION OF THE TENDON.

B. IF THE NAIL TENDON IS INSTALLED USING CASED OR HOLLOW-STEM AUGER METHODS, CENTRALIZERS ARE NOT REQUIRED PROVIDED THE INSTALLATION METHOD ENSURES THAT THE TENDON WILL REMAIN IN THE CENTRAL PORTION OF THE NAIL GROUT. IN SUCH SITUATIONS, SLUMP SHALL NOT EXCEED 8 INCHES.

B. BOREHOLES READY FOR NAIL BAR INSTALLATION SHALL BE CLEAR OF ALL OBSTRUCTIONS SUCH AS BUT NOT LIMITED TO SOIL, ROCKS ROOTS OF OTHER MATERIALS THAT CONSTRICT THE UNIFROM DIAMETER OF THE BOREHOLE. CAVING WILL BE CAUSE FOR REJECTION AND MAY REQUIRE A REPLACEMENT BOREHOLE.

3.05 GROUTING

3.05.01 GROUTING EQUIPMENT

A. GROUT EQUIPMENT SHALL PRODUCE A UNIFORMLY MIXED GROUT FREE OF LUMPY AND UNDISPERSED CEMENT. A POSITIVE DISPLACEMENT GROUT PUMP SHALL BE USED. THE PUMP SHALL BE EQUIPPED WITH A PRESSURE GAUGE THAT CAN MEASURE AT LEAST TWICE BUT NO MORE THAN THREE TIMES THE INTENDED GROUT PRESSURE. THE GROUTING EQUIPMENT SHALL BE SIZED TO ENABLE THE ENTIRE NAIL TO BE GROUTED IN ONE CONTINUOUS OPERATION. THE MIXER SHALL BE CAPABLE OF CONTINUOUSLY AGITATING THE GROUT DURING USAGE.

3.05.02 GROUTING METHODS

A. THE DRILLHOLE SHALL BE GROUTED AFTER INSTALLATION OF THE NAIL TENDON. GROUTING PRIOR TO INSERTION OF THE NAIL TENDON CAN BE ALLOWED PROVIDED NEAT CEMENT GROUT IS USED AND THE NAIL BAR IS IMMEDIATELY INSERTED THROUGH THE GROUT TO THE SPECIFIED LENGTH WITHOUT DIFFICULTY. NO PORTION OF THE NAIL HOLE SHALL BE LEFT OPEN FOR MORE THAN 60 MINUTES PRIOR TO GROUTING UNLESS APPROVED OTHERWISE BY THE ENGINEER. THE GROUT SHALL BE INJECTED AT THE LOWEST POINT OF EACH DRILLHOLE THROUGH A GROUT TREMIE PIPE, CASING, HOLLOW-STEM AUGER, OR DRILL RODS WITH THE DRILLHOLE FILLED IN ONE CONTINUOUS OPERATION. COLD JOINTS IN THE GROUT PLACEMENT ARE ALLOWED FOR CONSTRUCTION OF TEST NAILS. THE CONDUIT DELIVERING THE GROUT SHALL BE KEPT BELOW THE SURFACE OF THE GROUT AS THE CONDUIT IS WITHDRAWN. THE GROUTING CONDUIT SHALL BE WITHDRAWN AS THE NAIL HOLE IS FILLED IN A MANNER WHICH PREVENTS THE CREATION OF VOIDS. THE QUANTITY OF GROUT AND THE GROUTING PRESSURES SHALL BE RECORDED FOR EACH SOIL NAIL. GROUT PRESSURES SHALL BE CONTROLLED TO PREVENT EXCESSIVE GROUND HEAVE OR FRACTURING.

B. DURING CASING REMOVAL FOR DRILLHOLES ADVANCED BY EITHER CASED OR AUGER-CAST METHODS, THE GROUT SURFACE WITHIN THE CASING SHALL BE CONTINUALLY MONITORED FOR MAINTENANCE OF "HEAD" SUFFICIENT TO OFFSET THE EXTERNAL GROUNDWATER/SOIL PRESSURE.

3.05.03 GROUT TESTING

A. NAIL GROUT SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI IN 3 DAYS AND 3000 PSI IN 28 DAYS. NAIL GROUT SHALL BE TESTED BY THE CONTRACTOR IN ACCORDANCE WITH ASTM C109 / AASHTO T106 AT A FREQUENCY OF NO LESS THAN ONE TEST FOR EVERY 50 CUBIC YARDS OF GROUT PLACED OR ONCE PER WEEK, WHICHEVER COMES FIRST.

3.05.04 TEST NAIL UNBONDED LENGTH

A. TEMPORARY UNBONDED LENGTHS SHALL BE PROVIDED FOR EACH TEST NAIL. THE TEST NAIL BAR SHALL BE ISOLATED FROM THE SHOTCRETE FACING AND THE REACTION FRAME DURING TESTING. ISOLATION OF A TEST NAIL THROUGH THE SHOTCRETE FACING SHALL NOT AFFECT THE LOCATION OF THE REINFORCING STEEL UNDER THE BEARING PLATE. ACCEPTED TEST NAILS MAY BE INCORPORATED IN THE WORK PROVIDED THE TEMPORARY TEST UNBONDED LENGTH IS FULLY GROUTED SUBSEQUENT TO TESTING.

3.06 NAIL TESTING

3.06.01 GENERAL

A. VERIFICATION TESTS SHALL BE PERFORMED AT THE LOCATIONS SELECTED BY THE CONTRACTOR AND APPROVED BY THE OWNER'S REPRESENTATIVE. PROOF TESTS SHALL BE PERFORMED AT LOCATIONS SELECTED BY THE OWNER'S REPRESENTATIVE. ALL RECORDED TEST DATA SHALL BE RECORDED BY THE OWNER'S REPRESENTATIVE, UNLESS APPROVED OTHERWISE. PULLOUT TESTING OF NAILS SHALL NOT BE PERFORMED UNTIL THE NAIL GROUT AND SHOTCRETE FACING HAVE ATTAINED AT LEAST 50 PERCENT OF THEIR SPECIFIED 28-DAY COMPRESSIVE STRENGTHS.

B. WHERE TEMPORARY CASING OF THE UNBONDED LENGTH OF TEST NAILS IS PROVIDED, THE CASING SHALL BE INSTALLED TO PREVENT ANY REACTION BETWEEN THE CASING AND THE GROUTED BOND LENGTH OF THE NAIL AND/OR THE STRESSING APPARATUS.

3.06.02 TESTING EQUIPMENT

A. TESTING EQUIPMENT SHALL INCLUDE TWO DIAL GAUGES, A DIAL GAUGE SUPPORT, JACK AND PRESSURE GAUGE, A PUMP, AND A REACTION FRAME.

B. A MINIMUM OF TWO DIAL GAUGES CAPABLE OF MEASURING TO 0.001-INCH SHALL BE AVAILABLE AT THE SITE TO MEASURE THE NAIL MOVEMENT. THE DIAL GAUGES SHALL HAVE A MINIMUM TRAVEL SUFFICIENT TO ALLOW THE TEST TO BE PERFORMED WITHOUT RE-SETTING THE DIAL GAUGE. THE DIAL GAUGES SHALL BE ALIGNED WITHIN 5 DEGREES OF THE AXIS OF THE NAIL AND SHALL BE SUPPORTED INDEPENDENT OF THE JACKING SET-UP AND THE WALL. A HYDRAULIC JACK, PRESSURE GAUGE, AND PUMP SHALL BE USED TO APPLY AND MEASURE THE TEST LOAD. THE CONTRACTOR SHALL PROVIDE RECENT CALIBRATION CURVES IN ACCORDANCE WITH THE SUBMITTALS SECTION.

C. THE JACK AND PRESSURE GAUGE SHALL BE CALIBRATED BY AN INDEPENDENT TESTING LABORATORY AS A UNIT. THE PRESSURE GAUGE SHALL BE GRADUATED IN 100 PSI INCREMENTS OR LESS AND SHALL HAVE A RANGE NOT EXCEEDING TWICE THE ANTICIPATED MAXIMUM PRESSURE DURING TESTING UNLESS APPROVED OTHERWISE BY THE ENGINEER. THE RAM TRAVEL OF THE JACK SHALL BE SUFFICIENT TO ENABLE THE TEST TO BE PERFORMED WITHOUT RE-SETTING THE JACK. THE JACK SHALL BE CAPABLE OF APPLYING EACH TEST LOAD INCREMENT IN LESS THAN 1 MINUTE.

D. THE JACK SHALL BE INDEPENDENTLY SUPPORTED AND CENTERED OVER THE NAIL SO THAT THE NAIL DOES NOT CARRY THE WEIGHT OF THE JACK. THE STRESSING EQUIPMENT SHALL BE PLACED OVER THE NAIL IN SUCH A MANNER THAT THE JACK, BEARING PLATES, AND STRESSING ANCHORAGE ARE IN ALIGNMENT. THE JACK SHALL BE POSITIONED AT THE BEGINNING OF THE TEST SUCH THAT UNLOADING AND REPOSITIONING OF THE JACK DURING THE TEST WILL NOT BE REQUIRED.

E. THE REACTION FRAME SHALL BE SUFFICIENTLY RIGID AND OF ADEQUATE DIMENSION SUCH THAT EXCESSIVE DEFORMATION OF THE TEST APPARATUS REQUIRING REPOSITIONING OF ANY COMPONENTS DOES NOT OCCUR DURING TESTING. WHERE THE REACTION FRAME BEARS DIRECTLY ON THE SHOTCRETE FACING, THE REACTION FRAME SHALL BE DESIGNED TO PREVENT FRACTURE OF THE SHOTCRETE.

3.06.03 VERIFICATION TESTING OF SACRIFICIAL NAILS

A. VERIFICATION TESTING IN EACH SOIL UNIT SHALL BE PERFORMED PRIOR TO INSTALLATION OF PRODUCTION NAILS IN THAT SOIL UNIT TO VERIFY THE CONTRACTOR'S INSTALLATION METHODS, NAIL PULLOUT CAPACITY, AND DESIGN ASSUMPTIONS. THE NAILS USED FOR THE VERIFICATION TESTS SHALL BE SACRIFICIAL AND SHALL NOT BE INCORPORATED AS PRODUCTION NAILS. PAYMENT FOR ADDITIONAL VERIFICATION TESTS REQUIRED DUE TO DIFFERING SITE CONDITIONS, AS DETERMINED BY THE DESIGNER, SHALL BE PER THE CONTRACT UNIT PRICE.

B. TEST NAILS SHALL BE CONSTRUCTED USING THE SAME EQUIPMENT, METHODS, AND HOLE DIAMETER AS PLANNED FOR THE PRODUCTION NAILS. CHANGES IN THE DRILLING OR INSTALLATION METHOD MAY REQUIRE ADDITIONAL VERIFICATION TESTING AS DETERMINED BY THE DESIGNER AND SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.

C. THE UNBONDED LENGTH OF THE TEST NAIL SHALL BE AT LEAST 3 FEET UNLESS APPROVED OTHERWISE BY THE DESIGNER. THE BONDED LENGTH OF THE TEST NAIL SHALL BE DETERMINED BY THE ENGINEER BASED ON THE BAR GRADE AND SIZE SUCH THAT THE ALLOWABLE BAR LOAD IS NOT EXCEEDED, BUT SHALL NOT BE LESS THAN 10 FEET. THE ALLOWABLE BAR LOAD DURING TESTING SHALL NOT EXCEED 80 PERCENT OF THE STEEL ULTIMATE STRENGTH FOR GRADE 150 BARS OR 90 PERCENT OF THE YIELD STRENGTH FOR GRADE 60 AND GRADE 75 BARS.

D. THE DESIGN TEST LOAD (DTL) DURING TESTING SHALL BE DETERMINED BY MULTIPLYING THE BOND LENGTH OF THE NAIL TIMES THE DESIGN ADHESION. VERIFICATION TEST NAILS SHALL BE INCREMENTALLY LOADED AND UNLOADED IN ACCORDANCE WITH THE FOLLOWING SCHEDULE:

LOAD	HOLD TIME	LOAD	HOLD TIME
AL	1 MINUTE	1.75DTL	UNTIL STABLE
0.25DTL	10 MINUTES	1.50DTL	UNTIL STABLE
0.50DTL	10 MINUTES	1.25DTL	UNTIL STABLE
0.75DTL	10 MINUTES	1.00DTL	UNTIL STABLE
1.00DTL	10 MINUTES	0.75DTL	UNTIL STABLE
1.25DTL	10 MINUTES	0.50DTL	UNTIL STABLE
1.50DTL	60 MINUTES	0.25DTL	UNTIL STABLE
1.75DTL	10 MINUTES	AL	UNTIL STABLE
2.00DTL	10 MINUTES		

E. THE ALIGNMENT LOAD (AL) SHOULD BE THE MINIMUM LOAD REQUIRED TO ALIGN THE TESTING APPARATUS AND SHOULD NOT EXCEED 0.05DTL. DIAL GAUGES SHOULD BE ZEROED AFTER THE ALIGNMENT LOAD HAS BEEN APPLIED.

F. EACH LOAD INCREMENT SHALL BE HELD FOR AT LEAST 10 MINUTES. THE VERIFICATION TEST NAIL SHALL BE MONITORED FOR CREEP FOR 60 MINUTES AT THE 1.50 DTL LOAD INCREMENT. NAIL MOVEMENTS DURING THE CREEP PORTION OF THE TEST SHALL BE MEASURED AND RECORDED AT 1, 2, 3, 5, 6, 10, 20, 30, 50, AND 60 MINUTES.

3.06.04 PROOF TESTING OF PRODUCTION NAILS

A. PROOF TESTING SHALL BE PERFORMED ON APPROXIMATELY 5 PERCENT OF THE PRODUCTION NAILS IN EACH SHOTCRETE LIFT AS DETERMINED BY THE OWNER'S REPRESENTATIVE.

B. THE UNBONDED LENGTH OF THE TEST NAIL SHALL BE AT LEAST 3 FEET. THE BONDED LENGTH OF THE TEST NAIL SHALL BE DETERMINED BY THE OWNER'S REPRESENTATIVE SUCH THAT THE ALLOWABLE BAR LOAD IS NOT EXCEEDED BUT SHALL NOT BE LESS THAN 10 FEET. THE ALLOWABLE BAR LOAD DURING TESTING SHALL NOT EXCEED 80 PERCENT OF THE STEEL ULTIMATE STRENGTH FOR GRADE 150 BARS OR 90 PERCENT OF THE STEEL YIELD STRENGTH FOR GRADE 60 AND GRADE 75 BARS.

C. PROOF TEST NAILS SHALL BE INCREMENTALLY LOADED IN 0.25DTL INCREMENTS TO A MAXIMUM LOAD OF 1.50DTL IN ACCORDANCE WITH THE FOLLOWING SCHEDULE:

AL	0.75DTL	1.50DTL
0.25DTL	1.00DTL	
0.50DTL	1.25DTL	

D. THE ALIGNMENT LOAD (AL) SHOULD BE THE MINIMUM LOAD REQUIRED TO ALIGN THE TESTING APPARATUS AND SHOULD NOT EXCEED 0.05DTL. DIAL GAUGES SHOULD BE ZEROED AFTER THE ALIGNMENT LOAD HAS BEEN APPLIED.

E. ALL INCREMENTS SHALL BE MAINTAINED WITHIN 5 PERCENT OF THE INTENDED LOAD. DEPENDING ON PERFORMANCE, EITHER A 10 MINUTE OR 60 MINUTE CREEP TEST SHALL BE PERFORMED AT 1.50DTL. NAIL MOVEMENT SHALL BE MEASURED AND RECORDED AT 1 MINUTES, 2, 3, 5, 6, AND 10 MINUTES. WHERE THE NAIL MOVEMENT BETWEEN 1 MINUTE AND 10 MINUTES EXCEEDS 0.04 INCHES, THE MAXIMUM TEST LOAD SHALL BE MAINTAINED AN ADDITIONAL 50 MINUTES AND MOVEMENTS SHALL BE RECORDED AT 20, 30, 50, AND 60 MINUTES.

3.06.05 TEST NAIL ACCEPTANCE CRITERIA

A. A TEST NAIL SHALL BE CONSIDERED ACCEPTABLE WHEN:

1. FOR VERIFICATION TESTS, A CREEP RATE LESS THAN 0.08 INCHES PER LOG CYCLE OF TIME BETWEEN THE 6 AND 60 MINUTE READINGS IS OBSERVED DURING CREEP TESTING, AND THE RATE IS LINEAR OR DECREASING THROUGHOUT THE CREEP TEST LOAD HOLD PERIOD.
2. FOR PROOF TESTS, A CREEP RATE LESS THAN 0.04 INCHES PER LOG CYCLE OF TIME BETWEEN THE 1 AND 10 MINUTE READINGS IS OBSERVED OR A CREEP RATE LESS THAN 0.08 INCHES PER LOG CYCLE OF TIME BETWEEN THE 6 AND 60 MINUTE READINGS, AND THE CREEP RATE IS LINEAR OR DECREASING THROUGHOUT THE CREEP TEST LOAD HOLD PERIOD.
3. THE TOTAL MOVEMENT AT THE MAXIMUM TEST LOAD EXCEEDS 80 PERCENT OF THE THEORETICAL ELASTIC ELONGATION OF THE TEST NAIL UNBONDED LENGTH.
4. A PULLOUT FAILURE DOES NOT OCCUR DURING TESTING. PULLOUT FAILURE IS DEFINED AS THE LOAD AT WHICH ATTEMPTS TO INCREASE THE TEST LOAD SIMPLY RESULT IN CONTINUED PULLOUT MOVEMENT OF THE TEST NAIL.

B. AT THE CONTRACTOR'S OPTION, SUCCESSFUL PROOF TEST NAILS MEETING THE ABOVE TEST ACCEPTANCE CRITERIA MAY BE INCORPORATED AS PRODUCTION NAILS, PROVIDED THAT (1) THE UNBONDED TEST LENGTH OF THE NAIL HOLE HAS NOT COLLAPSED DURING TESTING, (2) THE MINIMUM REQUIRED HOLE DIAMETER HAS BEEN MAINTAINED, AND (3) THE TEST NAIL LENGTH AND BAR SIZE ARE EQUAL TO OR GREATER THAN THE SCHEDULED PRODUCTION NAIL LENGTH AND BAR SIZE. TEST NAILS MEETING THESE REQUIREMENTS SHALL BE COMPLETED BY SATISFACTORILY GROUTING THE UNBONDED TEST LENGTH. MAINTAINING THE TEMPORARY UNBONDED TEST LENGTH FOR SUBSEQUENT GROUTING IS THE CONTRACTOR'S RESPONSIBILITY.

3.06.06 INADEQUATE TEST NAIL PERFORMANCE

A. THE DESIGNER SHALL EVALUATE THE RESULTS OF EACH VERIFICATION TEST. INSTALLATION METHODS THAT DO NOT SATISFY THE NAIL TESTING REQUIREMENTS SHALL BE CONSIDERED INADEQUATE. THE CONTRACTOR SHALL PROPOSE ALTERNATIVE METHODS AND INSTALL REPLACEMENT VERIFICATION TEST NAILS. REPLACEMENT TEST NAILS SHALL BE INSTALLED AND TESTED AT NO ADDITIONAL COST TO THE OWNER.

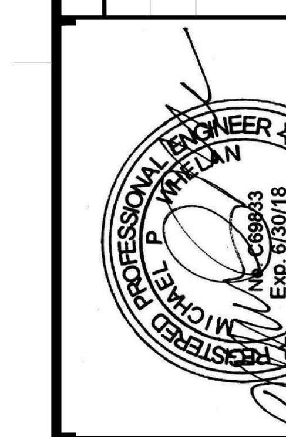
B. THE DESIGNER MAY REQUIRE THAT THE CONTRACTOR REPLACE SOME OR ALL OF THE PRODUCTION NAILS REPRESENTED BY THE INADEQUATE PROOF TEST NAIL. ALTERNATIVELY, THE DESIGNER MAY REQUIRE PROOF TESTING OF ADDITIONALLY INSTALLED PROOF TEST NAILS BE CONDUCTED TO VERIFY THAT ADJACENT PREVIOUSLY INSTALLED PRODUCTION NAILS HAVE SUFFICIENT LOAD CARRYING CAPACITY. COSTS DUE TO ADDITIONAL PROOF TESTS OR INSTALLATION OF ADDITIONAL OR MODIFIED NAILS AS A RESULT OF POOR PROOF TEST NAIL PERFORMANCE SHALL BE AT NO ADDITIONAL COST TO THE OWNER, UNLESS DETERMINED BY THE DESIGNER TO BE DUE TO CAUSES BEYOND THE CONTRACTOR'S CONTROL.

3.07 SOIL NAIL TOLERANCES

A. THE SOIL NAILS SHALL NOT EXTEND BEYOND THE RIGHT-OF-WAY OR EASEMENT LIMITS SHOWN ON THE PLANS, UNLESS APPROVED OTHERWISE. BARS SHALL BE CENTERED WITHIN 1 INCH OF THE CENTER OF THE DRILLHOLE. INDIVIDUAL NAILS SHALL BE POSITIONED PLUS OR MINUS 12 INCHES FROM THE DESIGN LOCATIONS SHOWN IN THE ELEVATION PLANS. LOCATION TOLERANCES SHALL BE CONSIDERED APPLICABLE TO ONLY ONE NAIL AND NOT CUMULATIVE OVER LARGE WALL AREAS. THE NAIL INCLINATION SHALL BE PLUS OR MINUS 3 DEGREES OF THAT SHOWN IN THE PLANS. NAIL SPLAY ANGLE SHALL BE WITHIN PLUS OR MINUS 3 DEGREES. NAILS THAT ENCOUNTER UNANTICIPATED OBSTRUCTIONS DURING DRILLING SHALL BE RELOCATED BY THE ENGINEER AT THE OWNER'S COST. SOIL NAILS THAT DO NOT SATISFY THE SPECIFIED TOLERANCES DUE TO THE CONTRACTOR'S INSTALLATION METHODS SHALL BE REPLACED TO THE DESIGNER'S SATISFACTION AT NO ADDITIONAL COST TO THE OWNER.

D C B A

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MW	04/01/18	R1	FINAL REVIEW
WCA	WCA	MW	02/19/19	C1	FOR BID AND CONSTRUCTION



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CEMENT KILN DUST (CKD) CLOSURE PLANS
SOIL NAIL SPECIFICATIONS

CEMEX

DRAWING NUMBER
SHEET
N4
25 OF 28

SECTION 02360 – SHOTCRETE FACING

PART 1 – GENERAL

1.01 DESCRIPTION

A. THE WORK DESCRIBED IN THIS SECTION SHALL CONSIST OF FURNISHING ALL MATERIALS AND LABOR REQUIRED FOR PLACING REINFORCED SHOTCRETE FOR THE SOIL NAIL WALL. THE WORK SHALL INCLUDE PLACEMENT OF THICKNESS PINS OR FINISHING WIRES, AND PREPARATORY TRIMMING AND CLEANING OF SOIL/ROCK SURFACES AND SHOTCRETE COLD JOINTS FOR THE SOIL NAIL WALLS SHOWN ON THE PLANS.

B. SHOTCRETE SHALL COMPLY WITH THE REQUIREMENTS OF ACI 506.2–94, "SPECIFICATION FOR SHOTCRETE", EXCEPT AS SPECIFIED OTHERWISE HEREIN.

C. THE OWNER'S REPRESENTATIVE / SHOTCRETE INSPECTOR SHALL BE QUALIFIED TO INSPECT REINFORCEMENT AND SHOTCRETE PLACEMENT.

1.02 QUALITY ASSURANCE

A. THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING A QUALITY ASSURANCE PROGRAM. ALL WORKERS, INCLUDING FOREMAN, NOZZLEMEN, FINISHERS AND DELIVERY EQUIPMENT OPERATORS, SHALL BE FULLY QUALIFIED TO PERFORM THE WORK. ALL NOZZLEMEN ON THIS PROJECT SHALL HAVE AT LEAST ONE YEAR OF ACCUMULATIVE EXPERIENCE IN THE PAST 3 YEARS IN SIMILAR SHOTCRETE APPLICATION WORK AND SHALL DEMONSTRATE ABILITY TO SATISFACTORILY PLACE THE MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF ACI 506.3R "GUIDE TO CERTIFICATION TO SHOTCRETE NOZZLEMEN", AND ANY LOCAL CODE REQUIREMENTS.

B. QUALIFICATION OF THE NOZZLEMEN SHALL BE BASED ON A VISUAL INSPECTION OF THE SHOTCRETE DENSITY AND VOID STRUCTURE AND ON ACHIEVING THE SPECIFIED 3–DAY AND 28–DAY COMPRESSIVE STRENGTH REQUIREMENTS DETERMINED FROM THE AVERAGE TEST RESULTS FROM THREE CORES EXTRACTED FROM EACH PRECONSTRUCTION AND PRODUCTION TEST PANEL. PRECONSTRUCTION AND PRODUCTION TEST PANELS, CORE EXTRACTION AND COMPRESSIVE STRENGTH TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH ACI 506.2–94 UNLESS SPECIFIED OTHERWISE HEREIN.

C. THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE NOT LESS THAN 2 DAYS PRIOR TO THE SHOOTING OF A QUALIFICATION PANEL. SHOTCRETE MIX AND EQUIPMENT USED TO MAKE QUALIFICATION TEST PANELS SHALL BE THE SAME AS THOSE TO BE USED FOR THE SOIL NAIL WALL.

D. EACH FINISHER SHALL HAVE AT LEAST ONE YEAR OF ACCUMULATIVE EXPERIENCE IN THE PAST 3 YEARS IN SIMILAR STRUCTURAL SHOTCRETE APPLICATION WORK.

1.03 SUBMITTALS

A. SUBMIT IN ACCORDANCE WITH SECTION 01300 – SUBMITALS.

B. AT LEAST 15 DAYS PRIOR TO INITIATING THE WORK, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER:

1. WRITTEN DOCUMENTATION LISTING AT LEAST 5 SIMILAR SHOTCRETE WALLS SUCCESSFULLY COMPLETED WITHIN THE PAST 3 YEARS, INCLUDING PHOTOGRAPHS OF THE PROJECT AS WELL AS NAMES, ADDRESSES, AND PHONE NUMBERS OF THE OWNER'S REPRESENTATIVE.

2. WRITTEN DOCUMENTATION OF THE NOZZLEMEN AND FINISHERS QUALIFICATIONS AND PROPOSED METHOD OF SHOTCRETE PLACEMENT.

3. SHOP DRAWINGS PLANS ILLUSTRATING REINFORCING LAYOUT AND SCHEDULES.

4. SHOTCRETE MIX DESIGN INCLUDING: BRAND AND TYPE OF PORTLAND CEMENT TO BE USED; OURCE, GRADATION, AND QUALITY OF AGGREGATES AS SPECIFIED HEREIN; MIX PROPORTIONS BY WEIGHT; PROPOSED ADMIXTURES, AND THEIR MANUFACTURER, DOSAGE, AND TECHNICAL LITERATURE; AND COMPRESSIVE STRENGTH TEST RESULTS FROM THE MANUFACTURES RECORDS NO OLDER THAN 6 MONTHS VERIFYING THE 28–DAY COMPRESSIVE STRENGTH.

5. CERTIFIED MILL TESTS FOR ALL REINFORCING STEEL FROM EACH HEAT SPECIFYING THE MINIMUM ULTIMATE STRENGTH, YIELD STRENGTH, ELONGATION, AND COMPOSITION.

6. CERTIFICATIONS OF COMPLIANCE FOR BEARING PLATES, NUTS, AND CURING COMPOUNDS.

7. SPECIFICATION AND DATA FOR REVIEW ON EQUIPMENT PROPOSED FOR THE PROJECT INCLUDING SHOTCRETING AND COMPRESSED AIR EQUIPMENT, PROPOSED ACCESS ARRANGEMENTS, AND CAPACITIES.

8. METHODS OF CONTROLLING THE LOCATION OF THE FINISH FACE AND DETERMINING SHOTCRETE THICKNESS.

PART 2 – MATERIALS

2.01 GENERAL

A. ALL MATERIALS FOR SHOTCRETE SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.

CEMENT	ASTM C150 / AASHTO M85, TYPE I.
FINE AGGREGATE	ASTM C33 / AASHTO M6.
COARSE AGGREGATE	AASHTO M–80, CLASS B FOR QUALITY.
WATER	POTABLE, CLEAN, AND FREE FROM SUBSTANCES DELETERIOUS TO CONCRETE AND STEEL, OR THAT WOULD CAUSE STAINING.
CHEMICAL ADMIXTURES	
ACCELERATOR	FLUID TYPE, APPLIED AT NOZZLE, MEETING THE REQUIREMENTS HEREIN.
WATER–REDUCER AND SUPER–PLASTICIZER	ASTM C494 / AASHTO M194, TYPE A, D, F, G.
AIR–ENTRAINING AGENT	ASTM C260 / AASHTO M154.
MINERAL ADMIXTURES:	
FLY ASH	ASTM C618 / AASHTO M295, TYPE F OR G, CEMENT REPLACEMENT UP TO 35 PERCENT BY WEIGHT OF CEMENT.
SILICA FUME	ASTM C1240, 90 PERCENT MINIMUM SILICON DIOXIDE SOLIDS CONTENT, NOT TO EXCEED 12 PERCENT BY WEIGHT OF CEMENT.
WELDED WIRE FABRIC	ASTM A185 / AASHTO M55.
REINFORCING BARS	ASTM A615 / AASHTO M31, GRADE 60, DEFORMED.
CURING COMPOUNDS	AASHTO M148, TYPE ID OR TYPE 2.

2.02 ADMIXTURES

A. SHOTCRETE ADMIXTURES SHALL NOT BE USED UNLESS APPROVED BY THE ENGINEER. APPROVED ADMIXTURES USED TO ENTRAIN AIR, TO REDUCE WATER–CEMENT RATIO, TO RETARD OR ACCELERATE SETTING TIME, OR TO ACCELERATE THE DEVELOPMENT OF STRENGTH, SHALL BE THOROUGHLY MIXED INTO THE SHOTCRETE AT THE RATE SPECIFIED BY THE MANUFACTURER UNLESS SPECIFIED OTHERWISE. ACCELERATING ADDITIVES SHALL BE COMPATIBLE WITH THE CEMENT USED, BE NON–CORROSIVE TO STEEL AND SHALL NOT PROMOTE OTHER DETRIMENTAL EFFECTS SUCH AS CRACKING OR EXCESSIVE SHRINKAGE. THE MAXIMUM ALLOWABLE CHLORIDE ION CONTENT OF ALL INGREDIENTS SHALL NOT EXCEED 0.10 PERCENT WHEN TESTED PER AASHTO T260.

2.03 MATERIALS HANDLING AND STORAGE

A. MATERIALS SHALL BE DELIVERED STORED AND HANDLED TO PREVENT CONTAMINATION, SEGREGATION, CORROSION OR DAMAGE. LIQUID ADMIXTURES SHALL BE STORED TO PREVENT EVAPORATION AND FREEZING.

2.04 SHOTCRETE MIX DESIGN

A. AGGREGATES FOR SHOTCRETE SHALL MEET THE STRENGTH AND DURABILITY REQUIREMENT OF AASHTO M80 AND SHALL MEET THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE SIZE	PERCENT PASSING BY WEIGHT	SIEVE SIZE	PERCENT PASSING BY WEIGHT
1/2 INCH	100	NO. 16	35–55
3/8 INCH	90–100	NO. 30	20–35
NO. 4	70–85	NO. 50	8–20
NO. 8	50–70	NO. 100	2–10

B. CEMENT CONTENT SHALL BE AT LEAST 600 POUNDS PER CUBIC YARD. THE WATER/CEMENT RATIO SHALL NOT BE GREATER THAN 0.45. FOR WET–MIX SHOTCRETE EXPOSED TO FREEZING AND THAWING, THE AIR CONTENT AT THE TRUCK SHALL BE BETWEEN 7 TO 10 PERCENT WHEN TESTED IN ACCORDANCE WITH ASTM C231 / AASHTO T152. THE MIX SHALL BE PROPORTIONED TO BE PUMPABLE WITH THE CONCRETE PUMP FURNISHED FOR THE WORK. ADMIXTURES SHALL BE USED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

C. SHOTCRETE SHALL BE PROPORTIONED TO PRODUCE A MIX CAPABLE OF ATTAINING A COMPRESSIVE STRENGTH OF 2000 PSI IN 3 DAYS AND 4000 PSI IN 28 DAYS. THE AVERAGE COMPRESSIVE STRENGTH OF EACH SET OF THREE CORES EXTRACTED FROM TEST PANELS OR WALL FACE MUST BE EQUAL TO OR EXCEED 85 PERCENT, WITH NO INDIVIDUAL CORE LESS THAN 75 PERCENT OF THE SPECIFIED COMPRESSIVE STRENGTH IN ACCORDANCE WITH ACI 506.2. THE BOILED ABSORPTION OF SHOTCRETE, WHEN TESTED IN ACCORDANCE WITH ASTM C642 AT 7 DAYS, SHALL BE LESS THAN 8.0 PERCENT.

PART 3 – EXECUTION

3.01 SHOTCRETE MIXING AND BATCHING

A. AGGREGATE AND CEMENT MAY BE BATCHED BY WEIGHT OR BY VOLUME IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM C94 / AASHTO M157. MIXING EQUIPMENT SHALL BE CAPACBLE OF THOROUGHLY MIXING THE MATERIALS IN SUFFICIENT QUANTITY TO MAINTAIN PLACING CONTINUITY. READY–MIX SHOTCRETE SHALL BE DELIVERED AND PLACED WITHIN 90 MINUTES OF BEING BATCHED UNLESS APPROVED OTHERWISE BY THE DESIGNER.

3.02 SHOTCRETE TEST PANELS

3.02.01 GENERAL

A. PRECONSTRUCTION AND PRODUCTION SHOTCRETE TEST PANELS SHALL BE REQUIRED. PRECONSTRUCTION AND PRODUCTION TEST PANELS SHALL NOT BE DISTURBED OR MOVED WITHIN THE FIRST 24 HOURS AFTER SHOOTING. TEST PANELS SHALL BE FIELD CURED UNDER CONDITIONS SIMILAR TO THOSE ANTICIPATED FOR THE WORK. SHOTCRETING AND CORING OF TEST PANELS SHALL BE PERFORMED BY QUALIFIED PERSONNEL IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE.

B. THE CONTRACTOR SHALL PROVIDE EQUIPMENT, MATERIALS, AND PERSONNEL AS NECESSARY TO OBTAIN SHOTCRETE CORES FOR TESTING INCLUDING CONSTRUCTION OF TEST PANEL BOXES, FIELD CURING REQUIREMENTS AND CORING. COMPRESSIVE STRENGTH TESTING WILL BE PERFORMED BY THE OWNER. SHOTCRETE WILL BE ACCEPTED BASED ON THE 28–DAY STRENGTH. THE FREQUENCY SPECIFIED FOR TEST PANELS IS APPROXIMATE. A GREATER OR LESSER NUMBER OF PANELS MAY BE MADE AS REQUIRED BY THE DESIGNER.

C. UNSATISFACTORY COMPRESSIVE STRENGTH TESTS SHALL RESULT IN SUSPENSION OF THE CREW RESPONSIBLE FOR THE UNSATISFACTORY WORK UNTIL ADDITIONAL SPECIMENS HAVE BEEN SUBMITTED, TESTED, AND PROVEN SATISFACTORY. COSTS ASSOCIATED WITH ADDITIONAL TESTING AND LOST PRODUCTION DUE TO TESTS FAILING TO MEET THE SPECIFICATIONS SHALL BE BORNE BY THE CONTRACTOR.

3.02.02 PRECONSTRUCTION TEST PANELS

A. EACH SHOTCRETE APPLICATION CREW SHALL FURNISH AT LEAST TWO PRECONSTRUCTION TEST PANELS FOR EACH PROPOSED MIXTURE BEING CONSIDERED AND FOR EACH SHOOTING POSITION ENCOUNTERED ON THE JOB. PRECONSTRUCTION TEST PANELS SHALL BE MADE BY EACH APPLICATION CREW USING THE EQUIPMENT, MATERIALS, MIXTURE PROPORTIONS, AND PROCEDURES PROPOSED FOR THE JOB PRIOR TO THE COMMENCEMENT OF WORK.

B. PRECONSTRUCTION TEST PANELS FOR PLAIN SHOTCRETE SHALL BE 30 IN. X 30 IN. IN ACCORDANCE WITH ACI 506.2–94, WITH THE FOLLOWING EXCEPTIONS.

1. ONE PRECONSTRUCTION TEST PANEL SHALL BE OF THE MAXIMUM SHOTCRETE THICKNESS SHOWN ON THE PLANS AND SHALL INCLUDE THE MAXIMUM ANTICIPATED REINFORCING CONGESTION. CORES EXTRACTED FROM THE TEST PANEL SHALL DEMONSTRATE ENCAPSULATION OF THE REINFORCEMENT IN ACCORDANCE WITH ACI 506.2 EQUAL TO CORE GRADE 2 OR BETTER.

2. ONE PRECONSTRUCTION TEST PANEL SHALL BE AT LEAST 6 INCHES THICK AND CONSTRUCTED WITHOUT REINFORCEMENT AND USED FOR ABSORPTION AND COMPRESSIVE STRENGTH TESTING.

3. THE CORNERS OF PRODUCTION AND PRECONSTRUCTION TEST PANELS SHALL BE CHAMFERED OUTWARD AT 45 DEGREES OVER THE FULL THICKNESS OF THE PANEL.

3.02.03 PRODUCTION TEST PANELS

A. THE CONTRACTOR SHALL FURNISH AT LEAST ONE PRODUCTION TEST PANEL OR, IN LIEU OF PRODUCTION TEST PANELS, SIX 3–INCH DIAMETER CORES FROM THE SHOTCRETE FACE DURING THE FIRST APPLICATION OF SHOTCRETE AND HENCEFORTH FOR EVERY FIFTH APPLICATION OF SHOTCRETE, OR EVERY 5000 SQ. FT., OR 50 CU. YDS. OF SHOTCRETE PLACED, WHICHEVER IS LESS. THE PRODUCTION TEST PANELS SHALL BE CONSTRUCTED SIMULTANEOUSLY WITH THE SHOTCRETE FACING INSTALLATION AT TIMES DESIGNATED BY THE OWNER'S REPRESENTATIVE. THE PRODUCTION TEST PANELS SHALL HAVE MINIMUM DIMENSIONS OF 18 IN.X18 IN.X6 IN.

3.03 SHOTCRETE ALIGNMENT CONTROL

A. ALIGNMENT WIRES AND/OR THICKNESS CONTROL PINS SHALL BE PROVIDED AS NECESSARY TO ESTABLISH AND MAINTAIN THE MINIMUM SHOTCRETE THICKNESS SHOWN ON THE PLANS. THE MAXIMUM DISTANCE BETWEEN THE WIRES AND/OR THICKNESS CONTROL PINS ON ANY SURFACE SHALL BE EQUAL TO THE VERTICAL NAIL SPACING. THE CONTRACTOR SHALL ENSURE THAT ALIGNMENT WIRES ARE TIGHT, TRUE TO LINE, AND PLACED TO ALLOW FURTHER TIGHTENING.

3.04 SURFACE PREPARATION

A. PRIOR TO SHOTCRETING THE UNGROUTED ZONE ABOVE THE NAIL GROUT AT THE EXCAVATION CUT FACE (BIRDS BEAK), THE CONTRACTOR SHALL REMOVE ALL LOOSE MATERIALS FROM THE SURFACE OF THE GROUT AND PREPARE THE JOINT IN ACCORDANCE WITH ALL REQUIREMENTS FOR JOINT PREPARATION SPECIFIED HEREIN.

B. THE CONTRACTOR SHALL REMOVE ALL LOOSE MATERIALS AND LOOSE DRIED SHOTCRETE FROM PREVIOUS PLACEMENT OPERATIONS AND FROM ALL RECEIVING SURFACES BY METHODS ACCEPTABLE TO THE OWNER'S REPRESENTATIVE. THE REMOVAL SHALL BE ACCOMPLISHED IN SUCH A MANNER AS NOT TO LOOSEN, CRACK, OR SHATTER THE SURFACES TO RECEIVE THE SHOTCRETE. ANY SURFACE MATERIAL THAT, IN THE OPINION OF THE OWNER'S REPRESENTATIVE, IS SO LOOSENED OR DAMAGED SHALL BE REMOVED TO SUFFICIENT DEPTH TO PROVIDE A BASE THAT IS SUITABLE TO RECEIVE THE SHOTCRETE. MATERIAL THAT LOOSENS AS THE SHOTCRETE IS APPLIED SHALL BE REMOVED. SHOTCRETE SHALL NOT BE PLACED ON FROZEN SURFACES.

3.05 DELIVERY AND APPLICATION

A. A CLEAN, DRY, OIL–FREE SUPPLY OF COMPRESSED AIR SUFFICIENT FOR MAINTAINING ADEQUATE NOZZLE VELOCITY FOR ALL PARTS OF THE WORK AND FOR SIMULTANEOUS OPERATION OF A BLOW PIPE FOR CLEANING AWAY REBOUND SHALL BE MAINTAINED AT ALL TIMES. THE EQUIPMENT SHALL BE CAPABLE OF DELIVERING THE PREMIXED MATERIAL ACCURATELY, UNIFORMLY, AND CONTINUOUSLY THROUGH THE DELIVERY HOSE.

B. THE SHOTCRETE SHALL BE APPLIED FROM THE LOWER PART OF THE WORK AREA UPWARDS TO PREVENT ACCUMULATION OF REBOUND ON UNCOVERED SURFACES. THICKNESS, METHODS OF SUPPORT, AIR PRESSURE, AND RATE OF PLACEMENT OF SHOTCRETE SHALL BE CONTROLLED TO PREVENT SAGGING OR SLOUGHING OF FRESHLY APPLIED SHOTCRETE. WHERE SHOTCRETE IS USED TO COMPLETE THE UNGROUTED ZONE OF THE NAIL DRILL HOLE NEAR THE EXCAVATION CUT FACE, THE NOZZLE SHALL BE POSITIONED INTO THE MOUTH OF THE DRILLHOLE TO COMPLETELY FILL THE VOID. REBOUND SHALL NOT BE WORKED BACK INTO THE PLACEMENT NOR SHALL THE REBOUND BE SALVAGED. REBOUND THAT DOES NOT FALL CLEAR OF THE WORKING AREA SHALL BE REMOVED. THE NOZZLE SHALL BE HELD AT A DISTANCE AND AT AN ANGLE APPROXIMATELY PERPENDICULAR TO THE WORKING FACE SO THAT REBOUND WILL BE MINIMAL AND COMPACTION WILL BE MAXIMIZED. THE NOZZLE SHOULD BE ROTATED STEADILY IN A SMALL CIRCULAR PATTERN.

C. SHOTCRETE PLACEMENT SHALL BE BY THE BENCH GUNNING METHOD WHEN THE THICKNESS OF THE SHOTCRETE LAYER IS 3 INCHES OR GREATER. THE GUNNING METHOD SHALL CONSIST OF BUILDING UP A THICK LAYER OF SHOTCRETE FROM THE BOTTOM OF THE LIFT AND MAINTAINING THE TOP SURFACE AT APPROXIMATELY A 45–DEGREE SLOPE.

3.06 VISUAL OBSERVATION

A. A CLEARLY DEFINED PATTERN OF CONTINUOUS HORIZONTAL OR VERTICAL RIDGES OR DEPRESSIONS AT THE REINFORCING ELEMENTS AFTER THEY ARE COVERED WILL BE CONSIDERED INDICATION OF INSUFFICIENT COVER OF REINFORCEMENT OR POOR APPLICATION AND PROBABLE VOID. IN THIS CASE, THE WORK SHALL BE IMMEDIATELY SUSPENDED AND THE WORK CAREFULLY INSPECTED BY THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL IMPLEMENT AND COMPLETE CORRECTIVE MEASURES PRIOR TO RESUMING THE SHOTCRETE OPERATIONS.

B. THE SHOTCRETING PROCEDURE MAY BE CORRECTED BY ADJUSTING THE NOZZLE DISTANCE AND ORIENTATION PERPENDICULAR TO THE SURFACE, ADJUSTING THE WATER CONTENT OF THE SHOTCRETE MIX, OR OTHER MEANS ACCEPTABLE TO THE OWNER'S REPRESENT–ATIVE. ALL OVERSPRAY AND REBOUND SHALL BE REMOVED FROM THE SURFACE.

3.07 DEFECTIVE SHOTCRETE

A. SURFACE DEFECTS SHALL BE REPAIRED AS SOON AS POSSIBLE AFTER INITIAL PLACEMENT OF SHOTCRETE. ALL SHOTCRETE THAT LACKS UNIFORMITY, EXHIBITS SEGREGATION, SAGGING, HONEYCOMBING, OR LAMINATION, OR CONTAINS ANY VOIDS OR SAND POCKETS SHALL BE REMOVED AND REPLACED WITH FRESH SHOTCRETE BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE.

3.08 CONSTRUCTION JOINTS

A. CONSTRUCTION JOINTS SHALL BE WATERTIGHT AND UNIFORMLY TAPERED TOWARD THE EXCAVATION FACE OVER A MINIMUM DISTANCE EQUAL TO THE THICKNESS OF THE SHOTCRETE LAYER. THE SURFACE OF THE JOINTS SHALL BE ROUGH, CLEAN, SOUND AND DAMP. THE HARDENED SURFACE SHALL BE CLEANED OF ALL LAITANCE, FOREIGN SUBSTANCES, WASHED WITH CLEAN WATER, AND WETTED THOROUGHLY PRECEDING PLACEMENT OF FRESH SHOTCRETE.

3.09 FINISH

A. SHOTCRETE FINISH SHALL BE EITHER AN UNDISTURBED GUN FINISH AS APPLIED FROM THE NOZZLE, A SCREEDED FINISH, OR A WOOD OR STEEL TROWELED FINISH, UNLESS SHOWN OTHERWISE ON THE PLANS.

3.10 ATTACHMENT OF THE NAIL HEAD CONNECTION HARDWARE

A. FOR TEMPORARY SHOTCRETE FACINGS, THE BEARING PLATE SHALL BE WET–SET WHILE THE SHOTCRETE IS PLASTIC TO ASSURE FULL SHOTCRETE BEARING BEHIND THE PLATE. HOWEVER, THE RETENTION NUT SHALL ONLY BE HAND TIGHTENED SUCH THAT FULL BEARING IS ACHIEVED WITHOUT EXCESSIVELY SQUEEZING FRESH SHOTCRETE OUT FROM UNDER THE PLATE.

3.11 CURING

A. TEMPORARY SHOTCRETE SHALL NOT REQUIRE CURING.

3.12 WEATHER LIMITATIONS

A. SHOTCRETE SHALL NOT BE PLACED IN COLD WEATHER UNLESS ADEQUATELY PROTECTED WHEN THE AMBIENT TEMPERATURE IS BELOW 40° F AND FALLING AND/OR WHEN THE SHOTCRETE IS LIKELY TO BE SUBJECTED TO FREEZING TEMPERATURES BEFORE REACHING A MINIMUM STRENGTH OF 750 PSI. COLD WEATHER PROTECTION SHALL BE MAINTAINED UNTIL THE STRENGTH OF THE IN–PLACE SHOTCRETE IS GREATER THAN 750 PSI. COLD WEATHER PROTECTION SHALL INCLUDE HEATING UNDER TENTS, BLANKETS OR OTHER MEANS ACCEPTABLE TO THE OWNER'S REPRESENTATIVE. THE TEMPERATURE OF THE SHOTCRETE, WHEN DEPOSITED, SHALL BE NOT LESS THAN 50° F NOR MORE THAN 80° F. THE AIR IN CONTACT WITH SHOTCRETE SURFACES SHALL BE MAINTAINED AT TEMPERATURES ABOVE 32° F FOR A MINIMUM OF 7 DAYS.

B. SHOTCRETE APPLICATION SHALL ALSO BE SUSPENDED DURING HIGH WINDS AND HEAVY RAINS WHEN IN THE OPINION OF THE OWNER'S REPRESENTATIVE THE QUALITY OF THE APPLICATION IS NOT ACCEPTABLE. NEWLY PLACED SHOTCRETE EXPOSED TO RAIN THAT WASHES OUT CEMENT OR OTHERWISE MAKES THE SHOTCRETE UNACCEPTABLE TO THE OWNER'S REPRESENTATIVE SHALL BE REMOVED AND REPLACED. THE CONTRACTOR SHALL PROVIDE ADEQUATELY SECURED POLYETHYLENE SHEETING OR EQUIVALENT WHEN ADVERSE EXPOSURE TO WEATHER IS ANTICIPATED.

3.13 TOLERANCES

A. THE TOLERANCES FOR TEMPORARY SHOTCRETE FACINGS SHALL BE IN ACCORDANCE WITH THOSE LISTED IN THE FOLLOWING TABLE:

	PERMANENT SHOTCRETE
VERTICAL LOCATION OF SHOTCRETE JOINT	6"
THICKNESS OF SHOTCRETE	– 0.5"
HORIZONTAL LOCATION OF REINFORCEMENT	1"
REINFORCING LAP LENGTH	– 1"
REINFORCEMENT SPACING	1"
DEVIATION FROM PLANENESS IN A 10–FOOT DISTANCE	0.5"
LOCATION OF STUDS ON PLATE	N/A

REV	DESCRIPTION	DATE	DESIGN	DRAWN	REVIEW
R1	FINAL REVIEW	04/01/18	WCA	WCA	MW
C1	FOR BID AND CONSTRUCTION	02/19/19	WCA	WCA	MW

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CEMENT KILN DUST (CKD) CLOSURE PLANS

SOIL NAIL SPECIFICATIONS

DRAWING NUMBER
SHEET
N5
26 OF 28

NOTES:

1. SEE SHEET E2 FOR EROSION CONTROL BEST MANAGEMENT PRACTICES STANDARDS AND DESIGNATIONS.

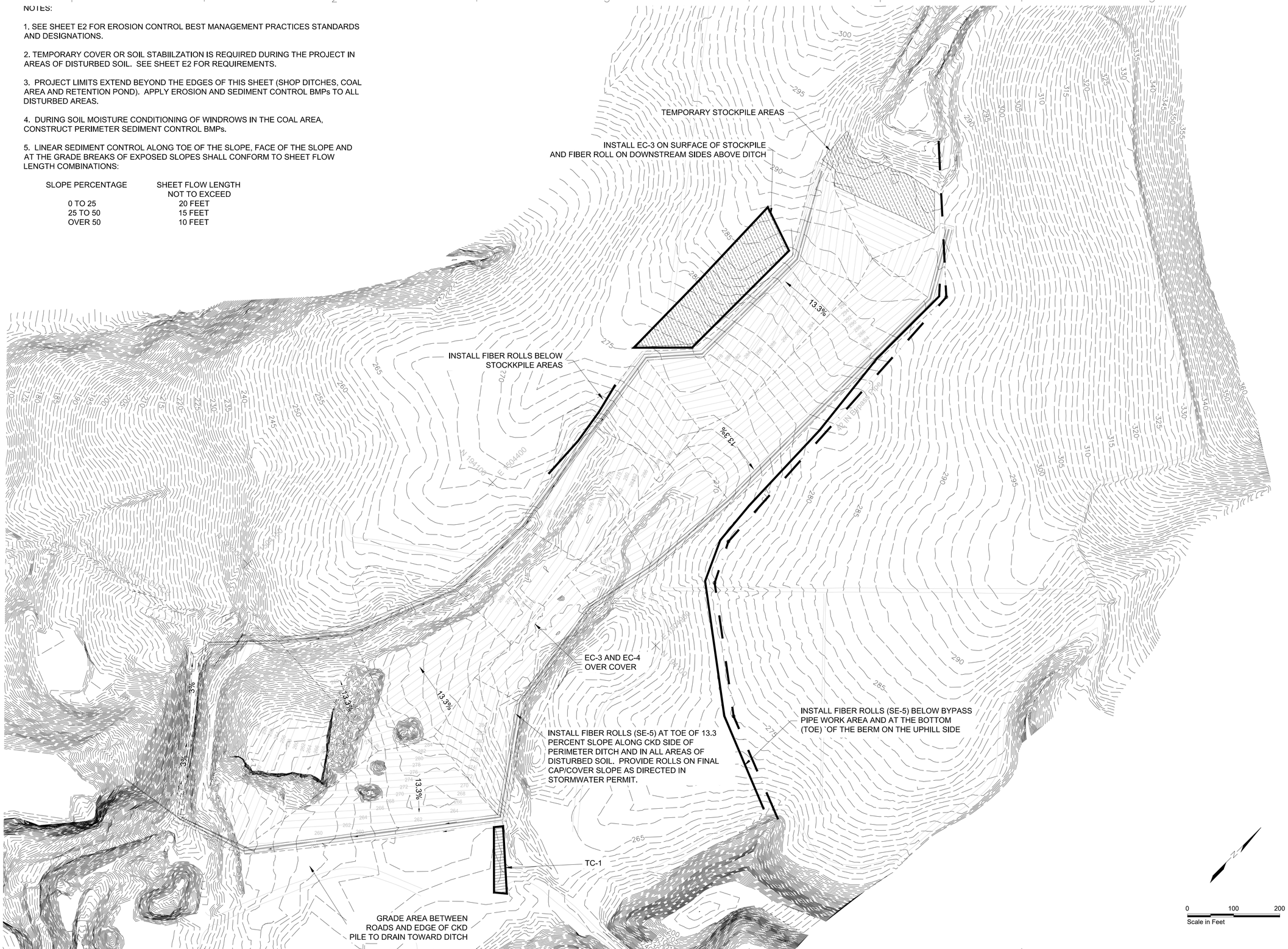
2. TEMPORARY COVER OR SOIL STABIILZATION IS REQUIRED DURING THE PROJECT IN AREAS OF DISTURBED SOIL. SEE SHEET E2 FOR REQUIREMENTS.

3. PROJECT LIMITS EXTEND BEYOND THE EDGES OF THIS SHEET (SHOP DITCHES, COAL AREA AND RETENTION POND). APPLY EROSION AND SEDIMENT CONTROL BMPs TO ALL DISTURBED AREAS.

4. DURING SOIL MOISTURE CONDITIONING OF WINDROWS IN THE COAL AREA, CONSTRUCT PERIMETER SEDIMENT CONTROL BMPs.

5. LINEAR SEDIMENT CONTROL ALONG TOE OF THE SLOPE, FACE OF THE SLOPE AND AT THE GRADE BREAKS OF EXPOSED SLOPES SHALL CONFORM TO SHEET FLOW LENGTH COMBINATIONS:

SLOPE PERCENTAGE	SHEET FLOW LENGTH NOT TO EXCEED
0 TO 25	20 FEET
25 TO 50	15 FEET
OVER 50	10 FEET



DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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CEMENT KILN DUST (CKD) CLOSURE PLANS

EROSION AND SEDIMENT CONTROL PLAN

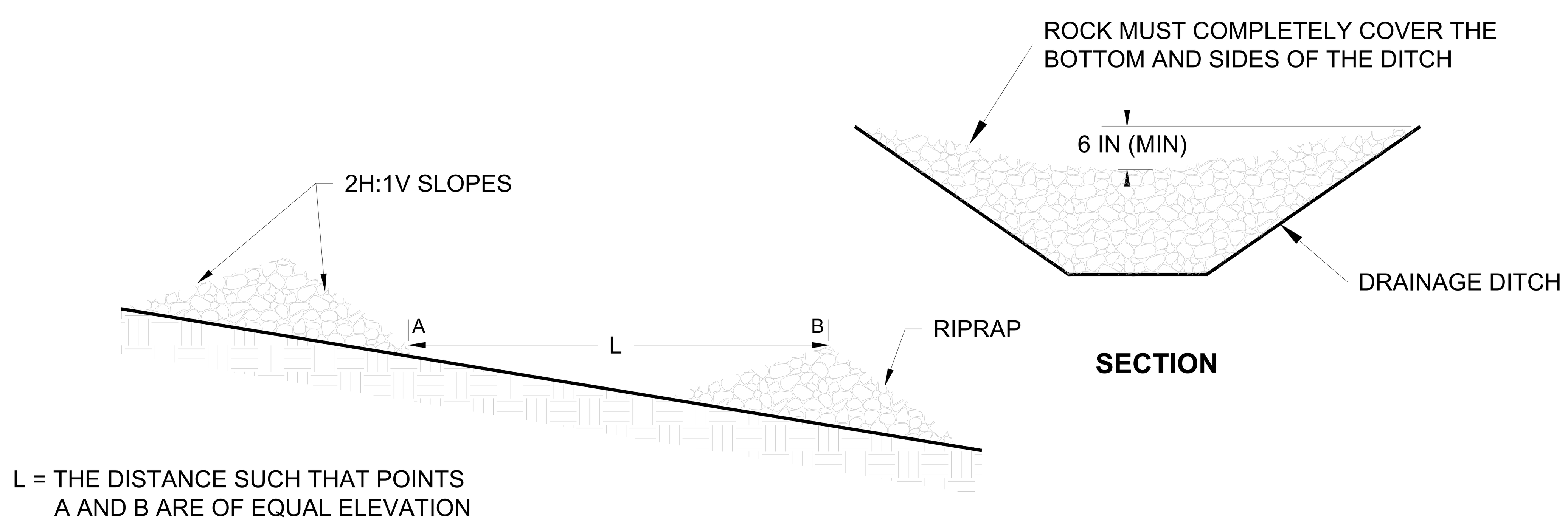
CEMEX

DRAWING NUMBER

SHEET

E1

27 OF 28



PROFILE ALONG DRAINAGE DITCH

DETAIL - TEMPORARY CHECK DAM (1, E1 | E2)
NOT TO SCALE

BEST MANAGEMENT PRACTICES SEE BMP FACT SHEET IN STORMWATER BEST MANAGEMENT PRACTICE HANDBOOK FOR BMP DETAILS AND INSTALLATION INSTRUCTIONS			
DESCRIPTION	**REQUIRED**	**AS NECESSARY**	**IMPLEMENTATION PERIOD**
EROSION CONTROL BMPs			
EC-1: Scheduling	X		THROUGHOUT
EC-2: Preservation of Existing Vegetation	X		THROUGHOUT
EC-3: Hydraulic Mulch	X		Oct. 1 – Apr. 15*
EC-4: Hydroseeding	X		Oct. 1 – Apr. 15*
EC-5: Soil Binders		X	AS NEEDED
EC-6: Straw Mulch	X		Oct. 1 – Apr. 15*
EC-7: Geotextiles and Mats	X		Oct. 1 – Apr. 15*
EC-8: Wood Mulching			
EC-10: Velocity Dissipation Devices	X		Oct. 1 – Apr. 15*
EC-11: Slope Drains			
SEDIMENT CONTROL BMPs			
SE-1: Silt Fence		X	THROUGHOUT
SE-2: Sediment/Desilting Basin			
SE-3: Sediment Trap			
SE-4: Check Dams	X		THROUGHOUT
SE-5: Fiber Rolls	X		THROUGHOUT
SE-7: Street Sweeping and Vacuuming		X	THROUGHOUT
SE-8: Sandbag Barrier			
SE-9: Straw Bale Barrier			
SE-10: Storm Drain Inlet Protection	X		THROUGHOUT
WIND EROSION BMPs			
WE-1: Wind Erosion Control		X	THROUGHOUT
TRACKING CONTROL BMPs			
TC-1: Stabilized Construction Entrance/Exit	X		THROUGHOUT
TC-2: Stabilized Construction Roadway			
TC-3: Entrance/Outlet Tire Wash			

* As needed throughout for temporary or final stabilization.

EROSION AND SEDIMENT CONTROL NOTES

EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMPs) SHALL COMPLY WITH THE CALIFORNIA STORMWATER QUALITY ASSOCIATION (CASQA) BEST MANAGEMENT PRACTICES HANDBOOK- CONSTRUCTION (LATEST VERSION). WORK SHALL CONFORM TO THE APPROVED PROJECT SWPPP.

SEQUENCE OF CONSTRUCTION AND EROSION CONTROL MEASURES

IF POSSIBLE, CONSTRUCTION SHALL BE SEQUENCED SUCH THAT CLOSURE, GRADING, AND DRAINAGE CONSTRUCTION WORK IS COMPLETED IN ALL AREAS SO THAT REVEGETATION ACTIVITIES CAN BE COMPLETED BEFORE OCTOBER 1 AS REQUIRED BY WDR.

CONSTRUCTION ACTIVITIES WILL OCCUR ON THE SITE IN THE FOLLOWING SEQUENCE, UNLESS OTHERWISE APPROVED:

1. PRIOR TO EARTHWORK, TEMPORARY CONSTRUCTION ENTRANCES SHALL BE PROVIDED AT THE LOCATIONS SHOWN ON THE PLANS, OR AS INDICATED BY THE OWNER , ENGINEER OR CONSTRUCTION MANAGER (CM). CONSTRUCTION TRAFFIC SHALL BE LIMITED TO THESE ACCESS POINTS.
2. CONSTRUCT DRAINAGE DITCH SYSTEM AROUND PERIMETER OF CKD PILE AS SPECIFIED, INCLUDING MINOR CUTTING AND FILLING AS NECESSARY TO ACHIEVE DESIGN GRADES, REMOVAL OF SEDIMENT FROM THE NORTH POND, CONSTRUCTION OF THE IN LET TO THE FRENCH DRAIN SYSTEM AS AN OUTLET/OVERFLOW FOR THE SEASONAL PONDS, AND PLACEMENT OF RIPRAP WHERE SHOWN.
3. ALL TRAFFIC IS PROHIBITED FROM CROSSING DRAINAGE DITCHES, SWALES, AND STREAMS EXCEPT WHERE ALLOWED BY THE CM, AND ONLY USING ROAD PLATES AS APPROVED BY THE CM.
4. WHEN ADJACENT LAND IS DISTURBED NEAR DRAINAGE DITCHES, INSTALL FIBER ROLLS ALONG UPSTREAM EDGE OF THE NEAREST DITCH AND EROSION CONTROL MATERIALS, AS NEEDED.
5. HYDROSEEDING AND REVEGETATION SHALL BE ACCOMPLISHED ON AREAS OF DISTURBANCE, IN ACCORDANCE WITH "REVEGETATION PLAN FOR CLOSURE OF TWO CEMENT KILN DUST (CKD) STORAGE AREAS," BY GREENING ASSOCIATES (2002). REVEGETATION IN RETENTION POND, SEASONAL PONDS AND NORTH POND SHALL BE COMPLETED USING APPROVED PLANT MIX FOR PONDED OR WET AREAS.
6. AN EROSION CONTROL BLANKET SHALL BE INSTALLED WHERE SHOWN ON THE COVER, AND WHERE DESIGN GRADES EXCEED 15 PERCENT.
7. INSTALL FIBER ROLLS ALONG INSIDE EDGE OF DRAINAGE DITCHES IMMEDIATELY AFTER SOIL COVER IS CONSTRUCTED.

GENERAL NOTES

THE COUNTY OF SANTA CRUZ AND OTHER REGULATORY AUTHORITIES MUST BE NOTIFIED BY THE CONTRACTOR AT LEAST ONE (1) WEEK PRIOR TO COMMENCING LAND DISTURBING ACTIVITY.

TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES (I.E., FIBER ROLLS) SHALL BE REMOVED WITHIN THIRTY (30) DAYS AFTER FINAL STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED, UNLESS OTHERWISE AUTHORIZED BY LOCAL REGULATORY AUTHORITIES. ONLY BIODEGRADEABLE MATERIALS WILL BE ALLOWED TO STAY.

SLOPES SHALL BE MADE UNIFORM AND FREE OF IRREGULARITIES THAT COULD CONCENTRATE RUNOFF.

APPLY TEMPORARY EROSION CONTROL ON DISTURBED AREAS THAT ARE INACTIVE FOR 14 DAYS OR MORE.

APPLY LINEAR SEDIMENT CONTROL DEVICES IN ACCORDANCE WITH SLOPE LENGTH REQUIREMENTS.

AVOID THE USE OF PLASTIC IN BMPs

PERIODIC INSPECTIONS AND MAINTENANCE MUST BE PROVIDED, ESPECIALLY AFTER EACH SIGNIFICANT STORM EVENT. INSPECTIONS SHALL INCLUDE OBSERVATION OF THE FOLLOWING:

1. INSPECT AND REPORT: TEMPORARY CHECK DAMS, INLETS/OUTLETS AT NORTH PONDS AND AT SEASONAL PONDS FOR SEDIMENT ACCUMULATION AND EROSION.
2. CHECK FIBER ROLLS FOR UNDERMINING, DETERIORATION, AND BUILDUP/CLOGGING OF SEDIMENT. TAKE CORRECTIVE ACTIONS IMMEDIATELY TO ENSURE CONTINUED FUNCTION.
3. CHECK ALL SEEDED AND PLANTED AREAS REGULARLY TO ENSURE THAT A GOOD STAND IS MAINTAINED. FOLLOW RECOMMENDATIONS BY GREENING ASSOCIATES (2002).

WINTERIZE PROJECT SITE: PROVIDED PROJECT SPANS BETWEEN CONSTRUCTION SEASONS AND EXTENDS INTO THE WINTER (NON-CONSTRUCTION SEASON) FROM OCTOBER THROUGH APRIL:

1. ALSO REFER TO TABLE 1 IN THE CLOSURE PLAN APPENDIX E.
2. CONTRACTOR: A) TO FOLLOW THE STORMWATER GENERAL CONSTRUCTION PERMIT, B) PROVIDE WRITTEN MULTI-SEASON WET WEATHER PREPAREDNESS PLAN FOR PROJECT WINTERIZING PLANS. ALL IMPROVEMENTS SHALL BE APPROVED BY THE OWNER, OWNERS REPRESENTATIVE , THE RWQCB AND APPROPIATE GOVERNING ENTITIES.
3. PERSUANT TO THE CONDITIONAL APPROVAL LETTER, THE PROJECT WINTERIZING PLANS SHALL INCLUDE BUT MAY NOT BE LIMITED TO:
   - 3.1. SITE DRAWING SHEETS THAT INDICATE LOCATION OF WINTERIZING MEASURES.
   - 3.2. TEMPORARY CHECK DAMS, CRUSHED ROCK PLACEMENT, EARTH BERMING, COVER AND/OR PROTECTION OF PROJECT SITE WHERE EARTHWORKS, STOCKPILES, CKD AND OTHER ELEMENTS OF THE PROJECT ARE EXPOSED TO POTENTIAL EROSION, DEPOSITION OR EXCESSIVE RUNOFF.
   - 3.3. ALSO SEE STORMWATER CONSTRUCTION GENERAL PERMIT AND STORMWATER POLLUTION PREVENTION PLAN

DESIGN	DRAWN	REVIEW	DATE	REV	DESCRIPTION
WCA	WCA	MAH	04/01/18	R3	FINAL REVIEW
WCA	WCA	MAH	12/12/19	C1	FOR BID AND CONSTRUCTION

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CEMENT KILN DUST (CKD) CLOSURE PLANS
EROSION CONTROL NOTES AND DETAILS

DRAWING NUMBER
SHEET
E2