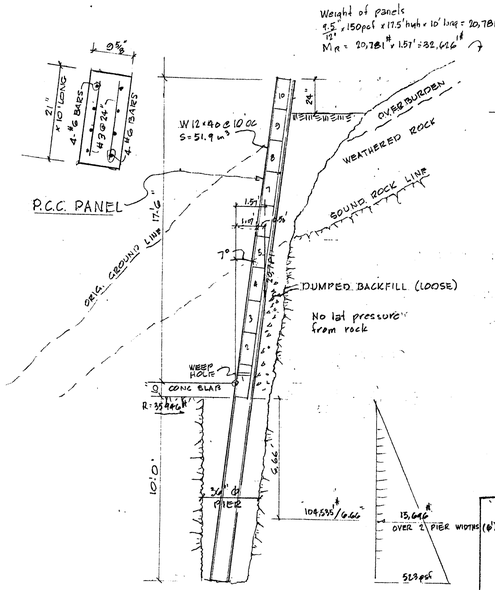
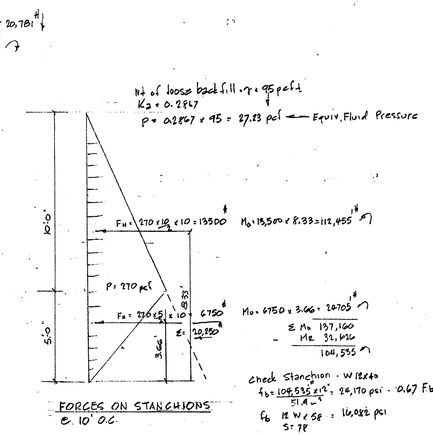


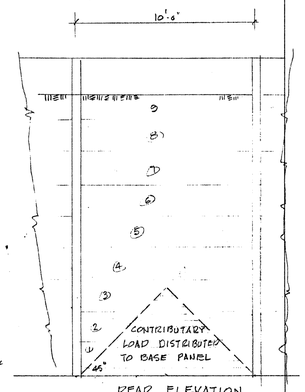
TYPICAL BULKHEAD SECTION AT PIER

ESTIMATED TOTAL LENGTH 2180LF
EXCAVATION 10CY / LF

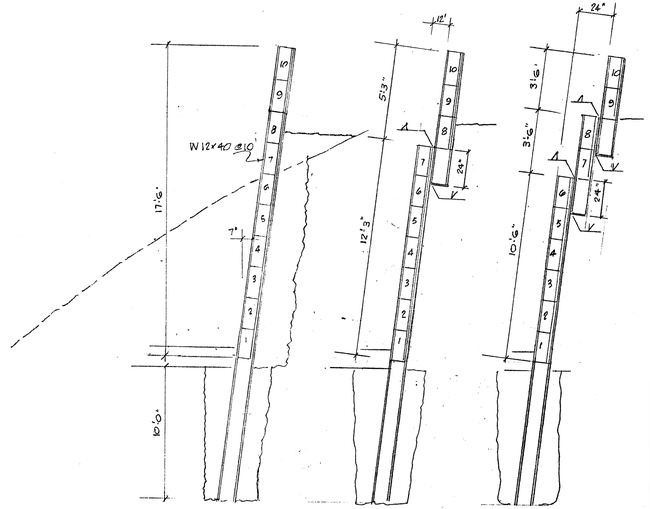


FORCES ON STANCHIONS @ 10' O.C.

ANALYSIS OF FORCES & STRESSES



REAR ELEVATION

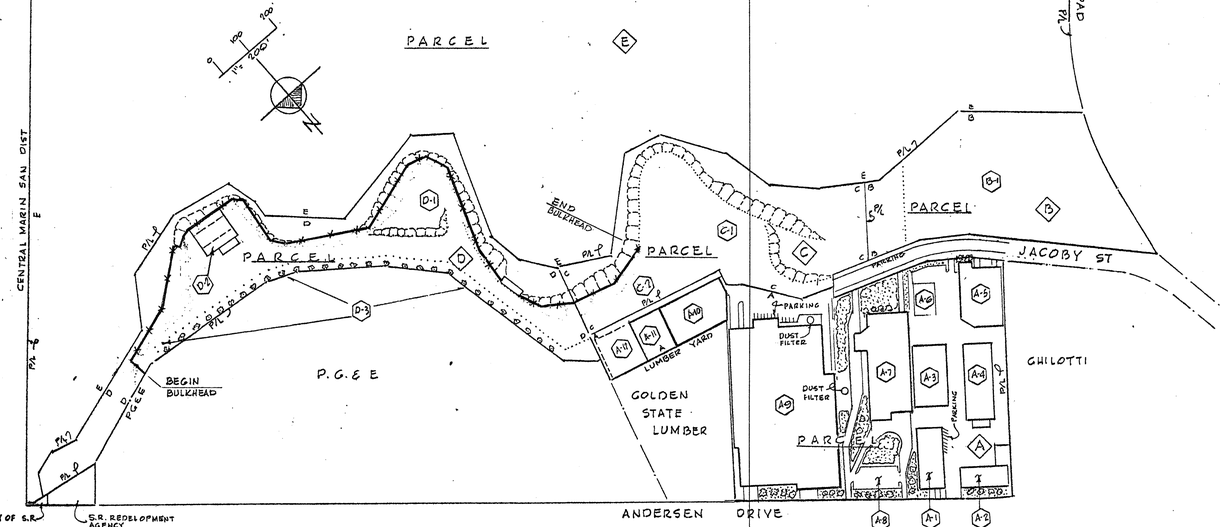


ST.D. SECTION "A" TYPE "B" SECTION TYPE "C" SECTION

OPTIONAL OFF-SET BULKHEAD SECTIONS

DESCRIPTION

1. THE BULKHEADS ARE ESSENTIALLY A SLOPE CONTROL AND EROSION CONTROL MEASURE TO ELIMINATE CUT-SLOPE RAVELING & SLOUGHING, WHICH HAS LED TO HEAVY SILTATION CONDITIONS IN STORM DRAIN CHANNELS AND STRUCTURES
2. THE BULKHEADS ARE CUT INTO THE ORIGINAL UNDISTURBED SANDSTONE BEDROCK WHICH PROVIDES EXTREMELY HIGH REACTION CAPABILITIES FROM THE FORCES EXERTED BY THE STEEL STANCHIONS. THE STANCHIONS ARE EMBEDDED IN 36" ROUND, CONCRETE FILLED PIERS 8' TO 10' DEEP. THE ROCK IS TOO HARD FOR CONVENTIONAL DRILLING EQUIPMENT BUT IS EXCAVATED AS A PIT USING JACKHAMMER TYPE GEAR.
3. PRE-CAST CONCRETE PANELS OR "PLANKS" ARE INSERTED BETWEEN THE STANCHIONS. THE CONCRETE FOR THESE PLANKS IS OBTAINED AS SURPLUS QUANTITIES FROM TRANSIT MIXING TRUCKS AFTER COMPLETION OF A DAYS OPERATION AT A CONSTRUCTION SITE, WHICH WOULD ORDINARILY BE DUMPED FROM THE TRUCK, UNUSED. ANY UNSUITABLE CONCRETE IS USED ELSEWHERE AS PAVEMENT OR OTHER MISCELLANEOUS APPLICATIONS SUCH AS BLOCKS OR SLUSH GROUTING DRAIN CHANNELS.
4. THE EXCAVATED SOIL AND ROCK IS PROCESSED ON THE SITE AND USED IN SOIL AMENDMENT OPERATION WITH "AMERICAN SOILS CO" ON THE PROPERTY. THE ROCK FRAGMENTS ARE PLACED BEHIND THE PLANKS AS DRAIN MATERIAL BUT NOT COMPACTED
5. THE STEEL STANCHIONS ARE 12" DEEP 'I' SECTIONS WEIGHING 40-58 POUNDS PER LINEAL FOOT. SOME ARE RECYCLED IF SUITABLE.
6. THE CONSTRUCTION OPERATION IS ONGOING BUT IS NOT SCHEDULED SINCE IT IS RELIANT ON THE INTERMITTANT SUPPLY OF CONCRETE AS DESCRIBED ABOVE. IN OTHER WORDS, IT IS NOT A NORMAL CONSTRUCTION PROJECT, PER SE BUT IS A PROGRESSIVE SOIL CONTROL OPERATION BY IN-HOUSE EMPLOYEES SUPERVISED BY THE OPERATIONS MANAGER.



SITE PLAN

1"=200'

PARCEL	ACRES	BUILDING OR OPEN AREA + GENERAL USE	
A MAIN PLANT	12.2	A-1	OFFICE - ADMINISTRATION
		A-2	MAINTENANCE - TRUCK REPAIR
		A-3	TRUCK PORT - OVERNIGHT PARKING
		A-4	" " " "
		A-5	RECYCLING - CURBSIDE PICKUP PLUS DROP-OFF
		A-6	GLASS CLASSIFIER (OPEN) - GLASS SORTING
		A-7	TRANSFER STATION - HOUSEHOLD GARBAGE
		A-8	PARKING LOT (OPEN 70 CARS
		A-9	RESOURCE RECOVERY (MRRC) - RECOVER METAL; WOOD; PAPER
		A-10	CANOPY - HAZMAT PROCESSING; METAL BALING; LOG SPLITTING
		A-11	CANOPY - EXTENSION DITTO
		A-12	FUTURE CANOPY EXTENSION
B	5.13	B-1	PUBLIC STORAGE RENTAL UNITS (OPEN) - PERSONAL STORAGE
C	6.07	C-1	AMERICAN SOILS (OPEN) - LANDSCAPE PRODUCTS, PROCESSED & SOLD.
		C-2	FUTURE HAZMAT FACILITY
D	8.32	D-1	MSS SOIL PROCESSING (OPEN) SOIL, ROCK, CONCRETE & MASONRY RUBBLE
		D-2	METAL FRAMED SHEDS MULTI-USE
		D-3	PUBLIC STORAGE RENTAL ZONE (OPEN) - PERSONAL STORAGE
E	30.49		OPEN SPACE

PARCELS / BUILDINGS AND AREA USE

LEGEND

- PARCEL
- BUILDING OR AREA OF USE
- SLOPE (TOP / TOE)
- P/L PARCEL LINE AND/OR PROPERTYLINE
- LANDSCAPED AREA
- TREE
- BULKHEAD

PERSPECTIVE ELEVATION

ARTHUR T. KNUTSON
SUBSURFACE ENGINEERING
CONSULTING GEOTECHNICAL & CIVIL ENGINEER
P.O. BOX 1115 • NOVATO, CALIFORNIA 94948-1115 • (415) 892-7414

FILE:0305.TXT
FEBRUARY 10, 2003
MAIN SANITARY SERVICE
1050 ANDERSON DRIVE
SAN RAFAEL, CA 94901
ATTN: JON ORANJE

GENTLEMEN,

Upon the request of your civil engineer Richard Janson this firm reviewed a plan for Slope Control Bulkhead Rear Yard Erosion Control dated 10/15/02 and reviewed the site on 2/6/03.

The existing and proposed future bulkhead is a 17'-6" pier wall with 12WF40 beams embedded 10 feet into 3' concrete piers at 10' centers with 9-5/8" by 21" reinforced concrete panels between soldier beams. Rock fill is behind the wall for drainage with weep holes at the bottom of the wall.

In my professional opinion the plans, calculations and soil strength assumptions were checked and found in accordance with current standards, San Rafael Building Code and good local construction practice.

It has been a pleasure to be of service. If your have questions please call me at any time.

2/14/03

Very truly yours,

ARTHUR T. KNUTSON
No. GE 000479
EXP. 12/31/04
GEOTECHNICAL

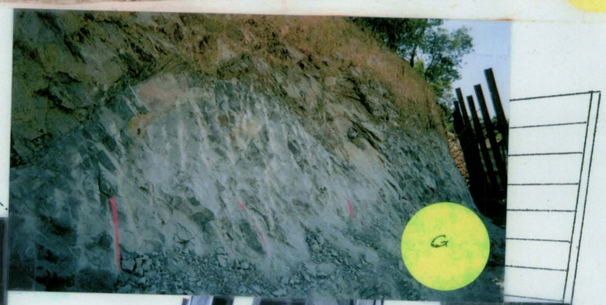
ARTHUR T. KNUTSON
Civil Engineer - 9332 Geotechnical Engineer - GE000479
Registrations Expire 12/31/04

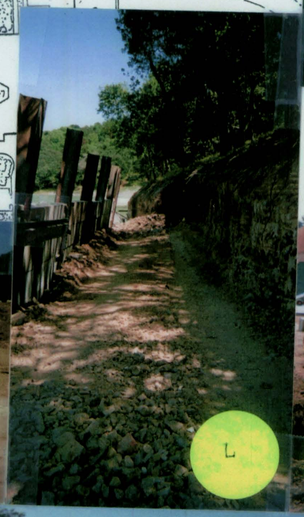
REVISIONS	BY

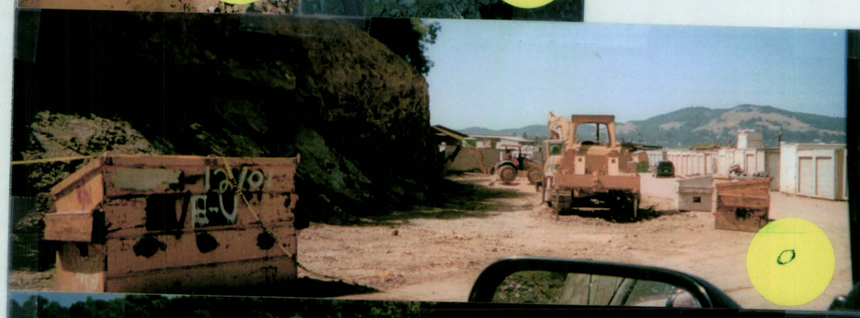
RICHARD C JANSON
CIVIL ENGINEER
1134 TAYLOR ST.
SAN FRANCISCO, CALIF
94108 (415) 474-0266

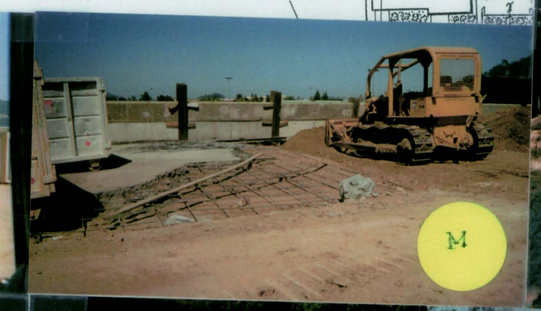
MARIN SANITARY SERVICE
SLOPE CONTROL BULKHEAD
REAR YARD EROSION CONTROL

Date 10/15/02
Scale 1"=200'
Drawn RCJ
Job
Sheet BH-1
Of Shs









REVISIONS	BY

RICHARD C JANSON
CIVIL ENGINEER
1134 TAYLOR ST
SAN FRANCISCO, CALIF
94108
(415) 474-0266

MARIN SANITARY SERVICE

SLOPE CONTROL BULKHEAD
REAR YARD EROSION CONTROL
CONSTRUCTION PHOTOS

2/14/03

Date	10/15/02
Scale	1"=200'
Drawn	RCJ
Job	
Sheet	BH-P
Of	Sheets

DESCRIPTION

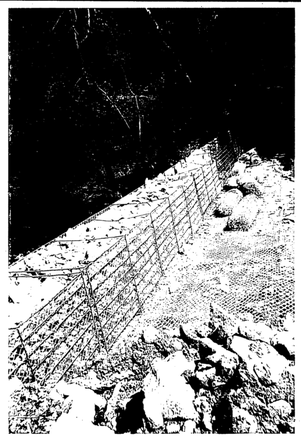
a THIS REVETMENT IS A COMBINATION OF GABIONS & GEOGRIDS FORMING MECHANICALY STABILIZED FILL.

b THE GABIONS ARE BASED ON THE WORLD-WIDE, AGE OLD CONCEPT OF WIRE BASKETS, OR CAGES FILLED WITH STONE, FOR SLOPE PROTECTION, THEY ARE POROUS, FLEXIBLE, CAPABLE OF ACCEPTING SETTLEMENT OR DEFLECTION WITH NO LOSS OF INTEGRITY. LOCAL FLORA WILL TAKE ROOT ON THE LEDGES AND INTERSTICES TO PRESENT A NATURAL ROCK FACE APPEARANCE.

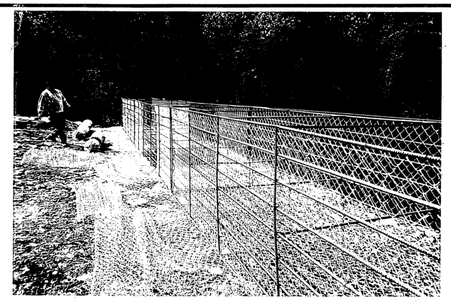
c MARIN SANITARY HAS ENHANCED THE GABION CONCEPT BY FABRICATING WELDED CAGES OF 5/8" REINFORCING BARS WHICH ARE LINED WITH CHAIN-LINK-FENCING WHICH IS ALSO ROLLED BACK INTO THE FILL 25 FEET MINIMUM TO PROVIDE A TIEBACK OR GEOGRID TO MECHANICALLY STABILIZE THE FILL

d MARIN SANITARY HAS AN ABUNDANCE OF CONCRETE RUBBLE BROUGHT IN DAILY IN CONSTRUCTION DEMOLITION DEBRIS WHICH IS SEPARATED AND CLASSIFIED FOR RE-USE AS SOIL AMENDMENT, SAND, GRAVEL RE-USEABLE WHOLE BRICK AND RIP-RAP SIZE CONC. RUBBLE. (NOTE METAL, WOOD, GLASS, PLASTER ARE RECOVERED OR DISPOSED OF SEPERATELY) THIS CONC. RUBBLE IS HAND PLACED IN THE GABIONS. THE CAGES ARE WELDED TOGETHER LONGITUDINALLY AND TRANSVERSLY AT EACH CROSSING POINT TO THE CAGE BELOW.

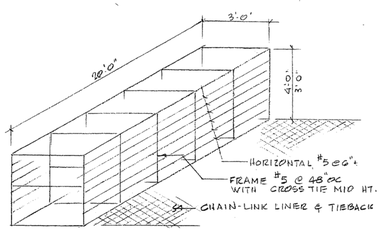
e THE FILL IS A MELANGE OF RUBBLE, SHARDS OF CONCRETE PIPE, TERRA-COTTA PIPE, TILES, PAVERS, END DUMPED, UNCOMPACTED, RANDOM, NON-HOMOGENOUS OR ISOTROPIC, LOOSE MANY VOIDS BUT HARSH WITH ANGULAR SURFACES.

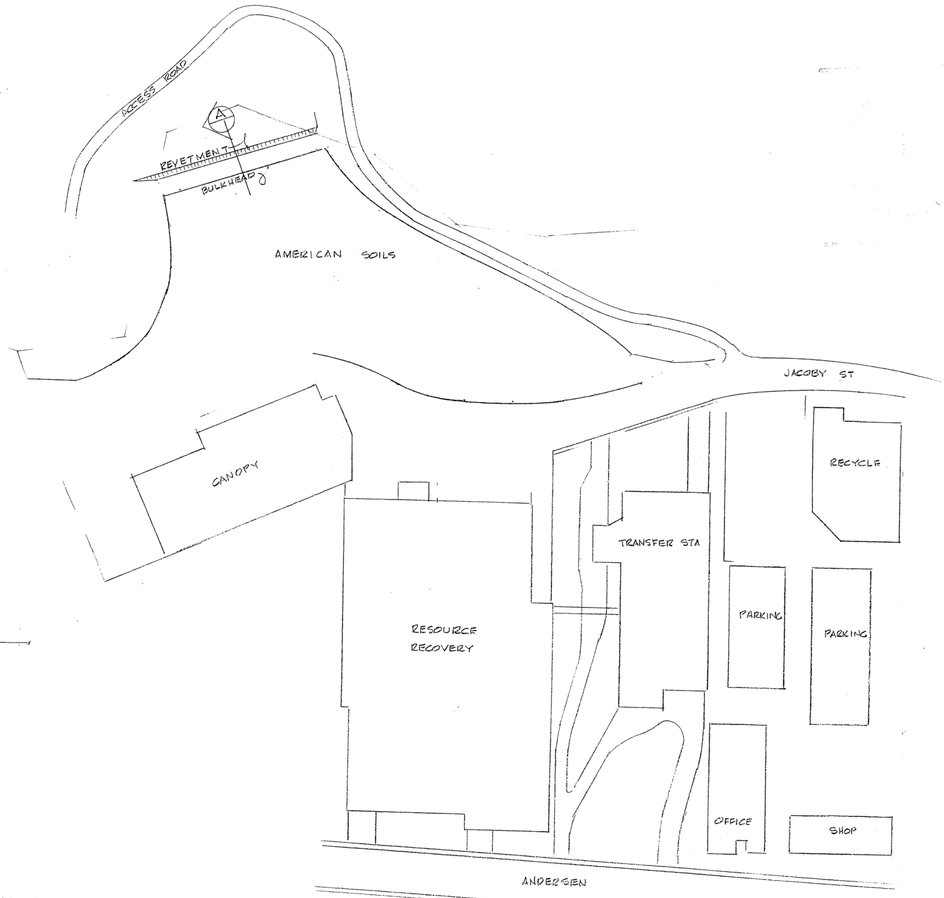


Y PHOTO
FILLED GABIONS

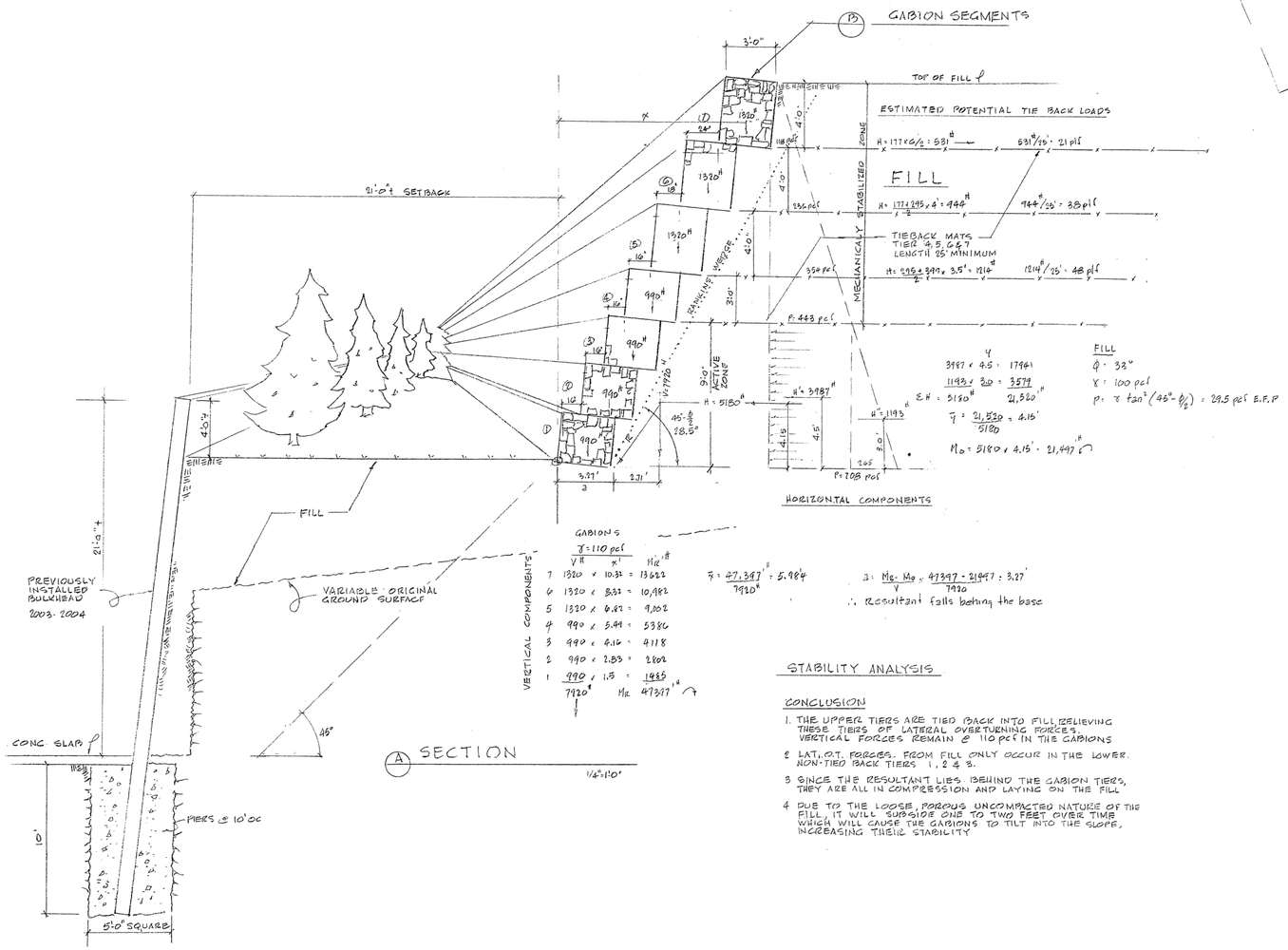


Z PHOTO
UNFILLED GABIONS





PARTIAL SITE PLAN
1"=100



STABILITY ANALYSIS

CONCLUSION

1. THE UPPER TIERS ARE TIED BACK INTO FILL, RELIEVING THESE TIERS OF LATERAL OVERTUENING FORCES. VERTICAL FORCES REMAIN @ 110 pcf IN THE GABIONS
2. LAT. O.T. FORCES FROM FILL ONLY OCCUR IN THE LOWER NON-TIED BACK TIERS 1, 2 & 3.
3. SINCE THE RESULTANT LIES BEHIND THE GABION TIERS, THEY ARE ALL IN COMPRESSION AND LAYING ON THE FILL
4. DUE TO THE LOOSE, POROUS UNCOMPACTED NATURE OF THE FILL, IT WILL SUBSIDE ONE TO TWO FEET OVER TIME WHICH WILL CAUSE THE GABIONS TO TILT INTO THE SLOPE, INCREASING THEIR STABILITY

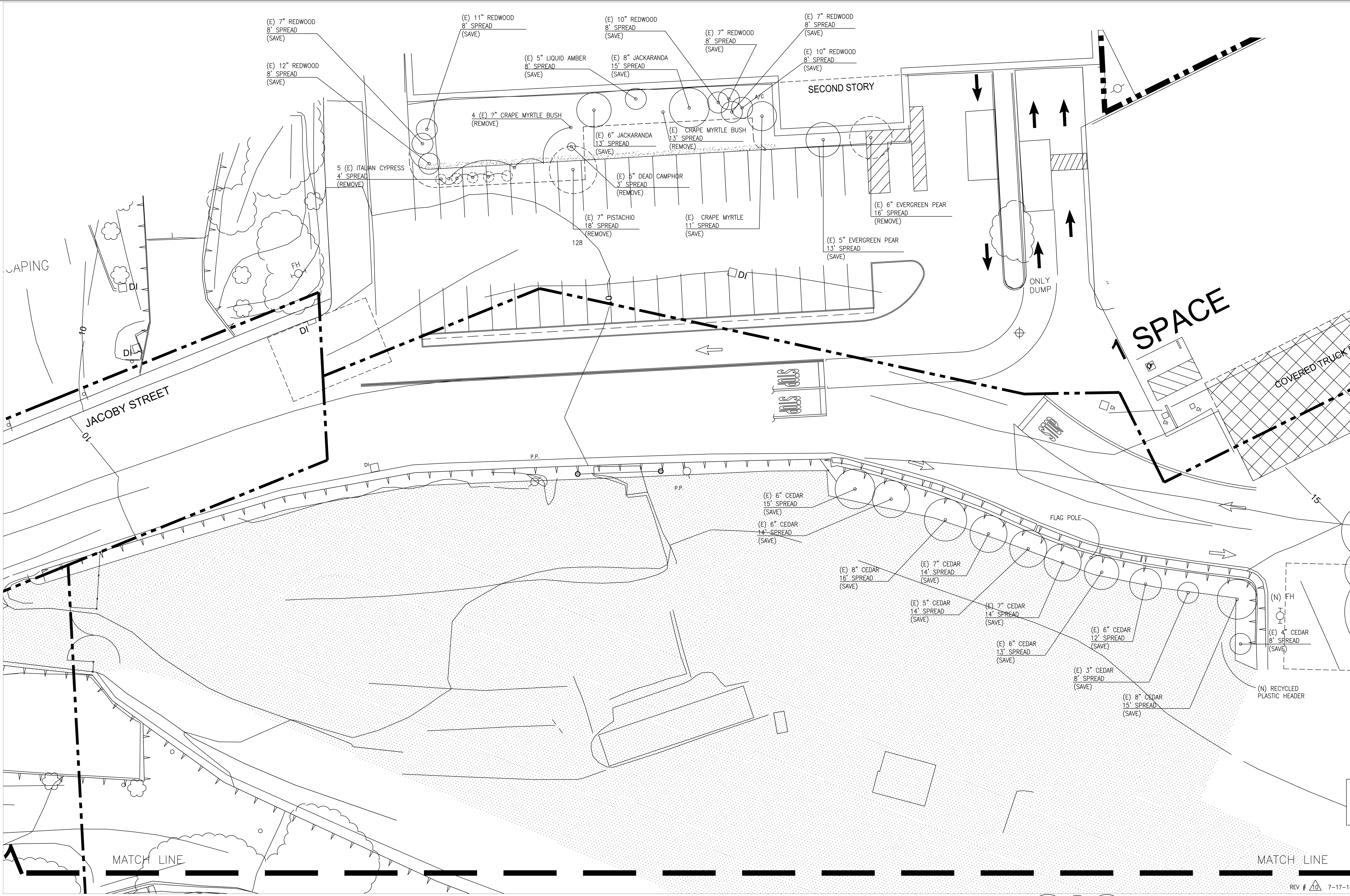
REVISIONS	BY

Richard C. Janson
Civil Design Engineer
1134A Taylor Street, San Francisco, CA 94108
(415) 474-0266
Dick Janson

MARIN SANITARY SERVICE REVETMENT "AS BUILT" & STABILITY ANALYSIS

Date	7/09/06
Scale	AS NOTED
Drawn	RCJ
Job	
Sheet	1 of 1 Sheets

JANSON



REVISIONS	BY

KIRK MORTON
LANDSCAPE DESIGN
IRRIGATION CONSULTANT
37357 NILES BLVD.
FREMONT, CA 94536
PH: (510) 792-9193
artechok@pacbell.net

REGISTERED LANDSCAPE ARCHITECT — KIRK MORTON No. 4110 EXP. 06/30/13 — STATE OF CALIFORNIA

REGISTERED LANDSCAPE ARCHITECT — KIRK MORTON No. 4110 EXP. 06/30/15 — STATE OF CALIFORNIA

(E) LANDSCAPE CONDITIONS

MARIN SANITARY SERVICE
1050 ANDERSEN BLVD.
SAN RAFAEL, CA

Date: 8-1-11
Scale: 1/16"=1'-0"
Drawn: KM
Job:
Sheet: L-1A
Of Sheets

0 4 8 16 24 32
SCALE

REF. NORTH

(E) LANDSCAPE CONDITIONS

SCALE: 1/16" = 1'-0"