Implementation Document
GROUNDWATER INTERCEPT and TREATMENT FOR BASIN A NECK IR.
VOLUME 3/ENGINEERING DRAWINGS

Rocky Mountain Arsenal
Information Center
Commerce City, Colorado
Prepared by

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Denver, Colorado

Prepared for
Shell Oil Company

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Statement Document for

ACETATE and TREATMENT SYSTEM

A NECK IRA
ENGINEERING DRAWINGS

Mountain Arsenal
Armament Center
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Prepared by

ENVIRONMENTAL SERVICES
Denver, Colorado

Prepared for

Oil Company

REPORT DOES NOT CONSTITUTE AN OFFICIAL
USE OF SUCH COMMERCIAL PRODUCTS. THE
PURPOSES OF ADVERTISEMENT
The basin A Neck interim response action will consist of:

1. Seven dewatering wells
2. Soil bentonite slurry wall
3. Ground water treatment by activated carbon

Volume I of this implementation document contains:

1. MOU between the Army and Shell concerning Shell's participation in the IRA's
2. Construction work plans
3. Cost estimates
4. Task specific health and safety plan.

Volume II contains engineering specifications. Engineering drawings are found in Volume III.

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DRAWING NO. 2127-375
DRAWING TITLE

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LOCATION MAP
1. DESIGN CRITERIA NOTES:
   A. ROOF LIVE LOADS:
      MINIMUM LIVE LOAD = UNIFORM 20 psf
      COND LOAD = UNIFORM 20 psf
      RAIN-ON-SNOW SURCHARGE LOAD = 10 psf
      MECHANICAL/ELECTRICAL UNIFORM COLLATERAL LOAD = 10 psf
   B. FLOOR LIVE LOADS:
      FLOOR SlAB - STATIONARY: UNIFORM LIVE LOAD = 250 psf
      FOR EQUIPMENT WEIGHT, WHICHEVER IS GREATER
      ELEVATED PLATFORMS AND VALUABLES = 125 psf OR 2,000 lb.
      CONCENTRATED LOAD OVER 2.5 ft. 50 sq. ft.
      WHICHEVER IS GREATER
      STAIRWAYS AND LANDINGS = 100 psf OR 1,000 lb.
      CONCENTRATED MOVING LOADS
      OPERATING AND EQUIPMENT LAYDOWN AREA FLOORS = 250 psf
      FOR EQUIPMENT WEIGHT, WHICHEVER IS GREATER
   C. VIND LOAd - PER UBC SECTION 2311
      BASIC VIND SPEED: 85 mph
      EXPOSURE: "C"
      "C" IMP. FACTOR SHALL BE TAKEN AS 1.5 FOR "ESSENTIAL FACILITIES".
   D. SEISMIC LOAD - PER UBC SECTION 2312
      ZONE NO. 7
      THE "C" IMP. FACTOR SHALL BE TAKEN AS 1.5 FOR "ESSENTIAL FACILITIES".

2. STEEL NOTES:
   A. ALL STEEL WORK SHALL CONFORM WITH THE AISC "SPECIFICATION FOR THE
      DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS",
      LATEST EDITION.
   B. ALL WELDING SHALL BE IN ACCORDANCE WITH THE AWS "STRUCTURAL
      WELDING CODE", 11-11 LATEST EDITION.
   C. STRUCTURAL STEEL SHAPES, PLATES, AND BARS SHALL BE ASTM A36,
      UNLESS NOTED. (BUILDING STEEL VARY. SEE SPEC. 22-101.)
   D. STRUCTURAL CONNECTIONS SHALL BE:
      1. VELDED: 3/16" MINIMUM SIZE, WITH E70XX ELECTRODES, OR
      2. BOLTED WITH ASTM A325 HIGH STRENGTH BOLTS (3.1" UNLESS NOTED).
   E. ALL STEEL SHALL BE SHOT PAINTED (EXCEPT WHERE EMBEDDED IN CONCRETE).
      OR NEAR AREAS OF FIELD WELDING WITH ONE 2 MIL COAT PER SSPC SPEC.
      "SP3.1" SURFACE PREPARATION PRIOR TO PAINTING SHALL BE IN ACCORDANCE
      WITH SSPC-SP2 OR SSPC-SP3.
   F. TEMPORARY BRACING USED DURING CONSTRUCTION AND SUBSEQUENT
      REMOVAL OF SAME, SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
   G. GROUT FOR BEARING AND BASE PLATES SHALL BE PRE-MIXED
      NON-SHRINK GROUT.

3. CONCRETE NOTES:
   A. ALL CONCRETE CONSTRUCTION SHALL BE IN CONFORMANCE WITH ACI 301
      "BUILDING CODE, REQUIREMENTS FOR REINFORCED CONCRETE", LATEST
      EDITION, AND SPECIFICATION 24-0301, CAST-IN-PLACE CONCRETE.
   B. REINFORCING BARS SHALL BE DEFORMED BARS CONFORMING TO ASTM
      A615 AND SPECIFICATION 24-0321, CONCRETE REINFORCEMENT.
   C. REINFORCING STEEL SHALL NOT BE WELDED WITHOUT PRIOR APPROVAL
      OF THE ENGINEER.
   D. VELODE WIRE FABRIC SHALL CONFORM TO ASTM A950, AND
      SPECIFICATION 24-0327, CONCRETE REINFORCEMENT.
   E. PORTLAND CEMENT SHALL BE TYPE II IN ACCORDANCE WITH ASTM C150.
   F. CONCRETE COMPRESSIVE STRENGTH SHALL BE AS SPECIFIED IN SECTION
      24-0301, CAST-IN-PLACE CONCRETE.
   G. COPIES OF THE SOILS AND FOUNDATION INVESTIGATION REPORT ARE
      AVAILABLE FOR INSPECTION IN THE OFFICE OF THE ENGINEER.
   H. CHAMFER ALL EXPOSED CONCRETE EDGES 1" x 45°, UNLESS NOTED.
   I. SEE MECHANICAL, PIPING AND ELECTRICAL DRAWINGS FOR LOCATIONS
      OF PENETRATIONS AND EMBEDDED ITEMS IN FLOOR SLABS AND WALLS.
   J. BUILDING ANCHOR BOLTS SHALL BE LOCATED USING A TEMPLATE
      PROVIDED BY THE BUILDING MANUFACTURER.

4. GENERAL NOTES:
   A. FOOTING DESIGN IS BASED ON A SOIL BEARING CAPACITY OF
      ALL EXCAVATION, BACKFILL, AND COMPACTING SHALL BE PER
      ACCORDANCE WITH SPECIFICATION 24-0321 SITE PREPARATION
      EXCAVATION AND BACKFILLING.
   B. EXCAVATIONS FOR FOOTINGS SHALL BE INSPECTED BY THE SC
      ENGINEER PRIOR TO PLACEING CONCRETE.
   C. DESIGN, PERFORMANCE AND REMOVAL OF CONSTRUCTION FORMS
      RESPONSIBILITY OF THE CONTRACTOR.
   D. TOPOGRAPHICAL DATA IS MEAN SEA LEVEL AND BASED ON
      REAL PHYSICAL GEOGRAPHIC DATED 11-3-86 BY DELTA
      AERIAL - GEOMEX, DENVER. LANDMARKS ARE BASED ON COLORADO STATE PLANE, NORTH ZONE.
   E. ALL EQUIPMENT FOUNDATIONS, ANCHOR BOLTS AND DIMENSIONS
      MUST BE CONFIRMED WITH CERTIFIED VENDOR DATA.
   F. THE TREATMENT SYSTEMS, DEWATERING WELLS, ALL WELL, MON.
      VOLUMETRIC CUBED, SEE SPEC. 33-1301.
   G. TOPOGRAPHICAL DATA IS MEAN SEA LEVEL AND BASED ON
      REAL PHYSICAL GEOGRAPHIC DATED 11-3-86 BY DELTA
      AERIAL - GEOMEX, DENVER. LANDMARKS ARE BASED ON COLORADO STATE PLANE, NORTH ZONE.
   H. ALL EQUIPMENT FOUNDATIONS, ANCHOR BOLTS AND DIMENSIONS
      MUST BE CONFIRMED WITH CERTIFIED VENDOR DATA.
   I. CONSTRUCTION UTILITIES OBTAINED FROM ON SITE
      SHALL BE APPROVED BY THE ENGINEER.
   J. CONSTRUCTION UTILITIES OBTAINED FROM ON SITE
      SHALL BE APPROVED BY THE ENGINEER.
INSTRUMENT IDENTIFICATION NOTES:

1. Refer to ISA Standard 5.1.1 for letters or letter meanings that do not appear in Table A-1 above.

2. Shaded areas represent improbable or impossible combinations.

3. Instrument identification is made up of two to four letters from this table, followed by a loop number.

4. Keptly recognized self-defining chemical symbols such as CO2, O2, etc., used in conjunction with analysis instruments. The symbol will be placed outside the instrument ballast.

5. The grammatical form of the preceding letter meaning may be modified as required. For example, flow may be used for indicator or indicating.

6. The letters Tatted A D (differential) may be used by modifiers with an appropriate first letter, to better define the functional aspects of the system. For example, FFIC = flow ratio indicating controller and FFIA = pressure differential switch high.

TAGGING AND LOOP IDENTIFICATION:

A unique number shall be assigned to each control instrument in that loop shall be identified. Each instrument used individually shall be assigned control, or monitor loop.

Typical loop diagram:

**Symbols used in conjunction with signal conditioners and computing devices to describe the function**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/P</td>
<td>Input/Output</td>
</tr>
<tr>
<td>A</td>
<td>Absolute</td>
</tr>
<tr>
<td>R/P</td>
<td>Ratio</td>
</tr>
<tr>
<td>M</td>
<td>Multiplication</td>
</tr>
<tr>
<td>D</td>
<td>Division</td>
</tr>
<tr>
<td>S</td>
<td>Square root</td>
</tr>
<tr>
<td>H</td>
<td>High select</td>
</tr>
<tr>
<td>L</td>
<td>Low select</td>
</tr>
</tbody>
</table>

**Pipeline Service Abbreviations:**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA</td>
<td>Plant Air</td>
</tr>
<tr>
<td>TA</td>
<td>Instrument Air</td>
</tr>
<tr>
<td>NW</td>
<td>Potable Water</td>
</tr>
<tr>
<td>SS</td>
<td>Sanitary Sewer</td>
</tr>
<tr>
<td>NG</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>NW</td>
<td>Raw Ground Water</td>
</tr>
<tr>
<td>FDW</td>
<td>Filtered Ground Water</td>
</tr>
<tr>
<td>ATW</td>
<td>Utility Water</td>
</tr>
<tr>
<td>FTV</td>
<td>Filtered Treated Water</td>
</tr>
<tr>
<td>SWP</td>
<td>Sewage Pump Discharge</td>
</tr>
<tr>
<td>BWV</td>
<td>Backwash Wastewater</td>
</tr>
<tr>
<td>PS</td>
<td>Polymer Supply</td>
</tr>
<tr>
<td>V</td>
<td>Vent</td>
</tr>
<tr>
<td>OR</td>
<td>Drain</td>
</tr>
</tbody>
</table>
NOTES:
1. DISTRIBUTION PIPES AND OBSERVATION WELLS TO BE INSTALLED NEAR VERTICAL PER SPECIFICATION 34-0261

RMA - BASIN 'A' NECK SOIL - BENTONITE SLURRY CUT-OFF TRENCH

SCALE: HORIZONTAL 1" = 100'
        VERTICAL 1" = 10'-0"
TRENCH WORKING BENCH GRADING PLAN

CLEAN SOIL STOCKPILE

EL. 5197.00
NEW GRADE

2.0'-0"
NOMINAL

PERMEABLE BACKFILL

ALLUVIUM

DENVER FORMATION

RECHARGE TRENCH SEE SHT. C-011

SLURRY MIX AREA - SEE NOTE
CLEAN SOIL STOCKPILE

POTENTIALLY CONTAMINATED
SOIL STOCKPILE AREA (TYPE I) (SEE NOTE 5)
EXISTING GRADE

EXISTING
GRADE

EL. 5 NEW

3.0'-0"
NOMINAL

SOIL - BENTONITE/BACKFILL MIXTURE

GROUNDWATER FLOW

PENETRATE INTO SOLID DENVER FORMATION

SOIL - BENTONITE SLURRY CUTOFF TRENCH SEE SHT. C-011

SECTION A

1" = 20'

TABLE OF CONTENTS
SHELL OIL COMPANY
ROCKY MOUNTAIN ARSENAL REDEVELOPMENT PROJECT
INTERIM RESPONSE ACTION PLAN: DETAILED DESIGN
BASIN A NECK IRA
SEWER SYSTEM PLAN AND DETAILS

SOIL PROFILE BOREHOLE LOG

DESIGN BASIS:

1. DESIGN CRITERIA FOR DAILY FLOW CALCULATIONS
   PERSONNEL No. SHIFTS ESTIMATED INFLOW
   2 2 35 GPD/PERSON
   INFLOW CONSISTS OF ONLY SANITARY WASTES FROM THE PERSONNEL RESTROOM
   DESIGN DAILY FLOW
   2 PERSONS x 2 SHIFTS x 35 GPD/PERSON = 140 GPD
2. REQUIRED RETENTION 30 HOURS
3. VOLUME REQUIRED 30 HRS x 210 GPD = 6300 GALLONS
4. USE 1000 GALLON SEPTIC TANK FOR POTENTIAL FUTURE REQUIREMENTS.
5. SEE DRAWING C-003 FOR DETAILS ON PLANT LAYOUT AND GRADING.
### Footing and Column Pedestal Schedule

<table>
<thead>
<tr>
<th>MARK</th>
<th>TYP</th>
<th>S</th>
<th>D</th>
<th>H</th>
<th>B</th>
<th>C</th>
<th>D1</th>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>T</td>
<td>4-8</td>
<td>4-8</td>
<td>12</td>
<td>4-6</td>
<td>1-0</td>
<td>2-0</td>
<td>4-6</td>
</tr>
<tr>
<td>S2</td>
<td>L</td>
<td>3-6</td>
<td>3-6</td>
<td>10</td>
<td>4-6</td>
<td>1-0</td>
<td>2-0</td>
<td>4-6</td>
</tr>
<tr>
<td>S3</td>
<td>D</td>
<td>3-6</td>
<td>3-6</td>
<td>10</td>
<td>4-6</td>
<td>1-0</td>
<td>2-0</td>
<td>4-6</td>
</tr>
<tr>
<td>S4</td>
<td>E</td>
<td>4-8</td>
<td>4-8</td>
<td>12</td>
<td>4-6</td>
<td>1-0</td>
<td>2-0</td>
<td>4-6</td>
</tr>
</tbody>
</table>

**Note:** 1. Anchor bolts by building & equipment vendors. 2. 988 piping drawing for embedded columns and elevations.

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**Typical Footing & Column Pedestal Elevation**

**Typical Footing & Column Pedestal Plans**
NOTES:
1. DAMPROOF EXTERIOR EXPOSED CONCRETE TO ELEVANT ON DETAIL (CSS SPECIFICATION SS-0786 FOR DETAILS)
2. SEE PIPING DRAWINGS FOR EXPORT DETAILS

SECTION 2

DETAIL 5

DETAIL 1

SECTION 2 PLAN, SECTIONS, DETAILS
COVER PLATE DETAIL

NOTES:

1. SHOPE COAT ENTIRE STRUCTURE WITH EPOXY. SEE SPEC 33-09-01 (EXCLUDING THREADS & FLANGE SURFACES.)

2. DIMENSIONS MAY VARY UPON EQUIPMENT VENDOR SELECTION.

3. MATERIAL OF CONSTRUCTION: A-36 STEEL. SEE SPEC 34-05-03.

4. FRAME TO BE ALL WELDED COMB. CORNERS TO BE MITERED, BLOEED, OR CUT TO FIT AS REQUIRED. NO VELDING OF TOP FLANGES.

5. PROVIDE 1" HOLE AT 3'-0" FOR PLUG VELDING COVER PLATE TO STEEL FRAME. SEE STL. FRAMING PLAN.

6. SIDE RAILS TO BE ATTACHED TO SUMP COVER BY FIELD.
NOTES:
1. This panel configuration is based on a proposal by [Company Name] for a [specific class or type of pump controller and monitor].
2. For external connection refer to drawing [drawing number]: electrical & control panel diagram.
3. Terminal blocks shall be Allen-Bradley except for approved local.

VIEW V10 DOOR
120 V SINGLE-PHASE STARTER
TWO-CONTROL DEVICE

LEGEND:
- COP-102 Mounted Device
- Field Mounted Device
- Air Pressure Or Computer Based Switch
- COP-104 Mounted Device
- COP-106 Mounted Device
- Wet Mounted Device
- COP-108 Mounted Device
- Lugs Terminal In Motor Starter

NOTES:
1. Contractor shall confirm electrical design based on actual purchased equipment prior to construction.
2. Switches receivable with plug-in type shown, refer to drawing E-106 for more details.

SHELL OIL COMPANY
ROCKY MOUNTAIN ARSENAL REMEDIATION PROJECT
INTERIM RESPONSE ACTION FINAL DETAILED DESIGN

BASIN & NECK IRA
ELECTRICAL CONTROL SCHEMATICS

MORRISON-KEMMERER ENGINEERS, INC.

DATE: 2127
REFERENCE NO.

SH-1002-37-021

1977-03-10