



Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

June 12, 1997

Mr. Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Materials Safety
and Safeguards
MS-T7J9
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-2738

Dear Mr. Holonich:

Enclosed is one complete and one partial copy of the following Construction Resolution / Revision (CRR) for the Naturita, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) site. The partial copy is missing three rock quantity cross-sections drawings which will be transmitted to you as soon as I receive some additional sets.

CRR No. 02 resolves a conflict between the location of the head of the Uplands Interceptor Channel and an existing easement / right-of-way to a mine portal and surface works owned by Cotter Corporation.

CRR-02 essentially revises the erosion protection design (see NAT-CALC-004) by eliminating the Type "C" riprap requirement and replacing it with a new riprap gradation designated Type "E1". Type "B1" riprap will be placed in Diversion Channel No. 1 downstream of Station 6+87.82; in Diversion Channel No. 2 downstream of Station 10+00; in the Uplands Interceptor Channel and in several additional areas as noted in Project Drawings NAT-DS-10-1787 (Rev 1.) through NAT-DS-10-1791 (Rev. 1).

In addition to the Specification change, specific modifications to the Uplands Interceptor Channel, Diversion Channels 2 and 3, the Club Mesa Borrow Area, the Staging Area and Oversized Sandstone Rock Erosion Protection features are also included as part of the solution.

Since CRR-02 contains a Criteria Change, the UMTRA Project requests your evaluation and formal concurrence.

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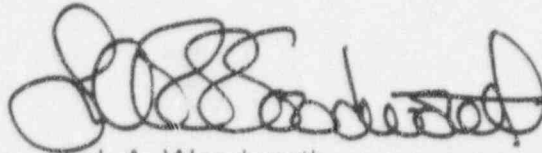
Mr. Joseph J. Holonich

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June 12, 1997

Please feel free to contact me at (505) 845-5637 if you have any questions concerning this transmittal.

Sincerely,

A handwritten signature in black ink, appearing to read "L.A. Woodworth", written in a cursive style.

L.A. Woodworth
Naturita Site Manager
Uranium Mill Tailings Remedial
Action Team
Environmental Restoration Division

Enclosure
(CRR-02)

cc w/o enclosure:

D. Gillen, NRC

C. Abrams, NRC

R. Carlson, NRC

P. Oliver, CDPHE/GJ

F. Bosiljevac, UMTRA/ERD

E. Artiglia, TAC

R. Waddington, TAC-F

UPPER BURBANK DISPOSAL SITE
CONSTRUCTION PHASE PROBLEM RESOLUTION FORM
RESOLUTION/REVISION No. 2

Date: May 16, 1997
Commentor: J H Heck Organization: Umetco
Drawing: NAT-DS-10-1781, 1782, 1783, 1785, 1786, 1787, 1788, 1789, 1790,
1791, 1792, 1793, 1794 & 1797
Specification: 02278 Section: Erosion Protection
Respond by (Date): _____

Problem (Continue on next page if more space is needed):

Conflict between location of head of interceptor Channel and existing easement/
ROW to mine portal and surface works, (continued on page 2).

Solution (Provide a brief discussion of rationale including references):

See following pages.

Umetco Project Manager [Signature] Date: 5-19-97

Umetco Design Engineer [Signature] Date: 5/19/97

Umetco QA Manager [Signature] Date: 5.19.97

MK-F Site Manager R.E. Waddington for Date: 5/20/97

MK-F Construction Engineer [Signature] Date: 5/20/97

MK-F Q/A Manager [Signature] Date: 5/20/97

____ Approved _____ Disapproved _____ Approved as Noted

Criteria Change? X Yes _____ No (If yes, DOE approval needed)

DOE Site Manager Approval [Signature] Date: 6/04/97

**UPPER BURBANK DISPOSAL SITE
CONSTRUCTION PHASE PROBLEM RESOLUTION FORM
RESOLUTION/REVISION No. 2**

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Problem: (continued)

Based on the field layout of the proposed permanent project boundary, there appears to be a conflict with the location of the head of the Interceptor Channel and an existing Easement/Right of Way (ROW), which grants access to a mine portal and surface works associated with the mine.

Solution:

Several meetings and discussions have taken place to resolve this situation, which have resulted in a revision of the erosion protection design (see NAT-CALC-004.1). The revised design does away with the Type C riprap gradation requirements and replaces them with a new riprap gradation designated as Type B1. The new gradation is presented in Specification Section 02278 - Erosion Protection, Revision 2. Type B1 riprap will be placed in Channel No. 1 downstream of Station 6+87.82; in Channel No. 2 downstream of Station 10+00; in the Interceptor Channel; and in other areas as shown on the following Project Drawings:

NAT-DS-10-1787, Revision 1
NAT-DS-10-1788, Revision 1
NAT-DS-10-1789, Revision 1
NAT-DS-10-1790, Revision 1
NAT-DS-10-1791, Revision 1

In addition to the Specification change, the following specific modifications to the Interceptor Channel, Permanent Diversion Channel No. 2, Permanent Diversion Channel No. 3, Club Mesa Borrow Area, Staging Area and Oversized Sandstone Rock Erosion Protection features are presented as a solution:

Interceptor Channel

- Reduce the length of the Interceptor Channel by 266.3-feet. The alignment of the Interceptor Channel will remain virtually unchanged, except it will now begin at station 2+66.3 and extend to station 11+79.49 along the previously established grades and alignment (Revision 1, Drawing NAT-DS-10-1786).
- Revise the channel geometry to include 5: 1 side slopes on the left side of the channel to a point 6 feet above the invert. The 5:1 slope then transitions into a 2 percent bench 20 feet wide. The slope will then be cut on a 2:1 slope from the bench to daylight at the top of the slope (Revision 1, Drawings NAT-DS-10-1786 and 1791).

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- The downstream portion (approximate Station 11+29.49 to 11+79.49 or as determined by the Contractor in the field) of the Interceptor Channel where County Road EE22 crosses the channel will receive a minimum 2 foot thickness of Type B1 riprap below the Class 6 roadbase wearing surface (Revision 1, Drawing NAT-DS-10-1782).

Permanent Diversion Channel No. 2

- The alignment, geometry and grades previously established for Diversion Channel No. 2 shall remain unchanged, except for that portion of the channel between stations 11+00 and 14+02. This portion of the channel will transition in width from 20 feet at Station 10+00 to 30 feet at Station 11+00 at a grade of 0.015-ft/ft; from Station 11+00 to Station 12+00 the channel will transition in width from 30 feet to 50 feet at a grade of 0.02 ft/ft; and from Station 12+00 to 14+02.33 the width will remain at 50 feet, but will be graded at 0.0272 ft/ft. The side slopes originally specified will remain unchanged. The Sub-Contract Work along Channel No. 2 will now terminate at station 14+02.33 and tie into a permanent discharge channel to be constructed by Others. See Revision 1, Drawing NAT-DS-10-1787.

Permanent Diversion Channel No. 3

- The alignment and geometry of Channel No. 3 has been modified. The width of Channel No. 3 will transition from 10 feet at Station 3+00 to 15 feet at Station 4+00. The slope of the Channel from Station 3+00 to 5+36.50 shall be 0.148 ft/ft and the curve geometry shall be as shown on Revision 1, Drawing NAT-DS-10-1787.

Club Mesa Borrow Area

- Development of the Club Mesa Borrow Area, especially the southwestern portion, shall be excavated and graded during borrow area reclamation to direct runoff away from the head of the modified Interceptor Channel. Umetco personnel developing this portion of the borrow area have already been instructed to conduct borrow excavation in such a manner to direct runoff flows from the Borrow Area to the Northeast away from the head of the Interceptor Channel. Should any Naturita-UMTRA Subcontract work be performed in this area of the borrow area, the Subcontractor shall be directed to excavate the area to ensure that runoff flows are directed away from the head of the modified Interceptor Channel. Final development of the Club Mesa Borrow Area may decrease the amount of flow entering Diversion Channel No. 2 from the drainage sub-basin designated as BSN-D1 (Shepherd Miller Report attached to NAT-CALC-004, October, 1995). In any event, all present and future borrow area development in the Club Mesa area will be conducted to divert

* SHOULD READ
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runoff flows away from the head of the modified Interceptor Channel. See Revision 1, Drawing NAT-DS-10-1792.

Staging Area Re-Grading

In an effort to reduce the amount of runoff entering Permanent Diversion Channel No. 1, the area presently designated as the Staging/Parking Area will be re-graded during site reclamation to slope at a 2 percent grade towards the interceptor channel (Revision 1, Drawing NAT-DS-10-1783, 1785, 1786 and 1792).

Oversize Sandstone Rock Erosion Protection

- The erosion apron trench located along the perimeter of the disposal site will now extend from a point opposite Channel No. 1, Station 7+75 to a point opposite Channel No. 2, Station 10+50 as shown on Revision 1, Drawings NAT-DS-10-1787, 1788 and 1789.
- The 80 foot wide erosion blanket located on the upgradient slope opposite Channel No. 2, Station 6+00 has been extended. The erosion blanket will now extend from Channel No. 2, Station 5+50 to Station 7+75 as shown on Revision 1, Drawing NAT-DS-10-1787 and 1789.
- A sediment trap dam constructed of oversize Sandstone will be located in the natural drainage depression opposite Channel No. 2, Station 10+50 and extend across the depression to approximate Channel No. 2, Station 13+30. The crest of the sediment trap dam will be located at elevation 5612.00 as shown on Revision 1, Drawing NAT-DS-10-1787 and Revision 0, Drawing NAT-DS-10-1797.
- A minimum of two weeks prior to beginning construction of the erosion apron trench, erosion blanket and sediment trap dam the Sub-Contractor shall notify the Contractor of His intended activities so that the monitor wells located in close proximity to these features can be extended as required by Others. The Sub-Contractor and Contractor shall provide assistance in determining the correct final elevation of the well heads. The well heads will be extended to the correct final elevation in accordance with DOE's typical well head protection details prior to beginning construction near the wells. The Sub-Contractor shall make every effort to protect the existing and/or extended monitor well heads from damage and/or destruction. Any and all damage to monitor wells caused by Sub-Contract activities shall be repaired by the Sub-Contractor at His expense, including reinstallation of the wells if necessary.

- Placement of the oversize Sandstone containment berm at the downstream end of Channel No. 2 is no longer required and is hereby deleted from the scope of the project.
- The Specification article defining the selection, sizing and testing of oversize Sandstone Rock has been modified as follows:

Specification Section 02278 - Erosion Protection
Article 2.4 - Gradation Requirements
Sub Section A.

2. Oversized Rocks for the Toe of Upland Slopes

- a) Oversized sandstone rock shall consist of various sizes of hard, durable and sound sandstone rock selectively obtained from the Club Mesa Borrow Area. Rock used for this application shall be sandstone obtained from the Brushy Basin Member of the Morrison Formation.
- b) Selected oversized sandstone riprap shall be placed to the lines and grades established on the drawings in accordance with Article 3.1 of this Section. The riprap layer shall be reasonably well graded throughout the layer thickness with a D_{50} size of approximately 36 inches and a minimum size of 24-inches. The rock shall not contain joints or planes of weakness with a spacing of less than 24 inches and shall be predominantly angular and blocky in shape. Sandstone rocks selected for use in this application shall be selected from oversize rock stockpiles in the Club Mesa Borrow Area by the Contractor's qualified Geologist familiar with the specific characteristics of this rock, i.e., mineral composition, jointing, etc.
- c) Riprap used for this application shall have a rock rating of about 50 when tested and scored in accordance with Article 2.1 of this Section. Since it is not practical to test each selected stone, the following procedure has been developed to select and verify the adequacy of rock utilized as oversized sandstone riprap. The rock shall be prequalified or selected in the borrow area prior to placement by the Contractor's qualified Geologist as described above. Stones selected for placement shall be visually inspected for consistency in cementing and durability. If necessary, devices such as a Schmidt hammer, geologist hammer and magnifying lens will be utilized in the selection process. To verify the adequacy of visually selected stones, a representative sample of the selected rock will be obtained by chipping a test size fragment from the rock mass. A minimum of three representative samples of selected rock shall be obtained from the stockpiles and tested

by the Contractor in accordance with Article 2.1 to verify the material satisfies the intent of these specifications.

Summary

These modifications will effectively provide surface access to the existing mine portal controlled by others and an emergency escape drift associated with the mine. The modifications should result in little or no additional project cost and will not require the DOE to grant or honor any type of ROW with a third party.

References

RAP Document, "*NAT-CALC-004.1 - Erosion Protection, Diversion Channels*", March 12, 1997.

RAP Document, "*Response to Verbal Comments, Site Meeting of April 23, 1997*", May 6, 1997.

Estimated Modification Quantities

The estimated project work item quantities based on the 500,000 cy Disposal Cell Design, which are associated with the modifications noted above are summarized as follows:

Erosion Protection Quantities

Assumptions: No corrections are made for loss or waste which could amount to between 5 to 10 percent of the total estimated quantities required. Quantities estimated for the Interception Channel consider placing rock over the entire channel bottom and side slopes to a height of 6 feet.

Type A Riprap:

Volume/Location:

10,243.11 cy on Top Slope of Repository.

Estimated Total Quantity:

10,044.28 cy., say **10,050 cubic yards.**

Type B Riprap:

Volume/Location:

4,528.48 cy - Channel No. 2, Station 0+00 to 10+00.
998.28 cy - Left side of Channel No. 2 Station 12+50 to 15+00.
3,227.24 cy - Channel No. 1 Station 0+00 to 6+78.82.
3,390.88 cy - Channel No. 3 Station -0+35 to 4+60.
1,141.68 cy - Channel No. 1 right side Station 8+00 to 12+00.

Estimated Total Quantity:

13,286.56 cy., say **13,290 cubic yards.**

Type B1 Riprap:

Volume/Location:

1,167.18 cy - Channel No. 2 Station 10+00 to 12+00.
596.30 cy - Channel No. 2 Station 12+00 to 14+02.33.
556.80 cy - Channel No. 2 left side Station 10+50 to 11+75.
4,590.08 cy - Channel No. 1 Station 6+87.82 to 12+00.
4,318.21 cy - Interception Channel Station 2+66.30 to 11+29.49.
548.48 cy - Interception Channel Station 11+29.49 to 11+79.49.

Estimated Total Quantity:

11,777.05 cy, say **11,780 cubic yards.**

Bedding Material:

Volume/Location:

2,265.87 cy - Channel No. 2 Station 0+00 to 10+00.
500.03 cy - Channel No. 2 left side Station 12+50 to 15+00.
439.15 cy - Channel No. 2 Station 10+00 to 12+00.
224.20 cy - Channel No. 2 Station 12+00 to 14+02.33.
203.74 cy - Channel No. 2 left side Station 10+50 to 11+75.
1,615.31 cy - Channel No. 1 Station 0+00 to 6+87.82.
1,767.28 cy - Channel No. 1 Station 6+87.82 to 12+00.
1,695.34 cy - Channel No. 3 Station -0+35 to 4+60.
697.64 cy - Channel No. 1 right side Station 8+00 to 12+00.
1,748.18 cy - Interception Channel Station 2+66.30 to 11+29.49.
149.98 cy - Interception Channel Station 11+29.49 to 11+79.49.
5,022.14 cy - Top of Repository (Under Type A Rock).

Estimated Total Quantity:

16,328.86 cy, say **16,330 cubic yards.**

Oversize Sandstone Rock:

Volume/Location:

2,669.19 cy - Rockfill Dam, Channel No. 2 Station 10+50 to 13+20.

3,873.60 cy - Erosion Apron Trench along perimeter of Disposal Site.

2,782.66 cy - Erosion Blanket, Channel No. 2 Station 5+50 to 7+75.

Estimated Total Quantity:

9,325.45., say **9,330 cubic yards.**

Summary: **Erosion Protection Quantities**

Material Type:	Estimated Quantity:
Type A Riprap	10,050 cubic yards
Type B Riprap	13,290 cubic yards
Type B1 Riprap	11,780 cubic yards
Bedding Material	16,330 cubic yards
Oversize Sandstone	9,330 cubic yards

Interceptor Channel Excavation

Volume/Location:

(9,862.39) cy - Reduced volume of excavation due to deletion of channel, Station 0+00 to 2+66.

12,518.62 cy - Increased volume of excavation due to change in left side slope geometry, Station 2+66 to 10+49.27.

Estimated Total Quantity:

2,656.23 cy., Net increase in original excavation quantity, say **2,660 cubic yards.**

Cross-section drawings and tabulation worksheets used to estimate modification quantities are attached.

Naturita-UMTRA
Type B riprap Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Channel No. 2, Station 0+00 to 10+00

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
0.00	133.45			
		136.32	100.00	504.89
100.00	139.19			
		137.28	100.00	508.44
200.00	135.37			
		129.77	100.00	480.63
300.00	124.17			
		119.76	100.00	443.56
400.00	115.35			
		118.445	100.00	438.69
500.00	121.54			
		119.485	100.00	442.54
600.00	117.43			
		115.325	100.00	427.13
700.00	113.22			
		116.02	100.00	429.70
800.00	118.82			
		116.62	100.00	431.93
900.00	114.42			
		113.665	100.00	420.98
1000.00	112.91			
Sub-Total				4528.48

Naturita-UMTRA
Type Biriprap **Bedding** Burbank Disposal Site
9-May-97

Average End Area Calculation from Cross-section drawings.
Channel No. 2, Station 0+00 to 10+00

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
0.00	66.91			
		68.26	100.00	252.81
100.00	69.61			
		68.655	100.00	254.28
200.00	67.7			
		64.895	100.00	240.35
300.00	62.09			
		59.92	100.00	221.93
400.00	57.75			
		59.295	100.00	219.61
500.00	60.84			
		59.815	100.00	221.54
600.00	58.79			
		57.735	100.00	213.83
700.00	56.68			
		58.05	100.00	215.00
800.00	59.42			
		58.32	100.00	216.00
900.00	57.22			
		56.84	100.00	210.52
1000.00	56.46			
Sub-Total				2265.87

Naturita-UMTRA
Type B riprap Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Channel No. 2, Left side of channel station 12+50 to 15+00

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
0.00	81.09			
		81.29	55.00	165.59
55.00	81.49			
		81.49	90.00	271.63
145.00	81.49			
		76.39	100.00	282.93
245.00	71.29			
		86.225	40.00	127.74
285.00	101.16			
		91.325	40.00	135.30
325.00	81.49			
		40.745	10.00	15.09
335.00	0			
Sub-Total				998.28

Naturita-UMTRA
 Type B riprap **Bedding** Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Channel No. 2, Left side of channel station 12+50 to 15+00

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
0.00	40.62			
		40.72	55.00	82.95
55.00	40.82			
		40.82	90.00	136.07
145.00	40.82			
		38.27	100.00	141.74
245.00	35.72			
		43.18	40.00	63.97
285.00	50.64			
		45.73	40.00	67.75
325.00	40.82			
		20.41	10.00	7.56
335.00	0			
Sub-Total				500.03

Naturita-UMTRA
Type B1 riprap Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Channel No. 2, Station 10+00 to 14+02.33

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
1000.00	150.18			
		154.36	50.00	285.85
1050.00	158.54			
		166.86	50.00	309.00
1100.00	175.18			
		164.875	50.00	305.32
1150.00	154.57			
		144.18	50.00	267.00
1200.00	133.79			
Sub-Total				1167.18
1200.00	80.59			
		80.59	50.00	149.24
1250.00	80.59			
		80.59	50.00	149.24
1300.00	80.59			
		79.26	50.00	146.78
1350.00	77.93			
		77.93	52.33	151.04
1402.33	77.93			
Sub-Total				596.30

Naturita-UMTRA
Type B1 riprap Burbank Disposal Site
9-May-97

Average End Area Calculation from Cross-section drawings.
Channel No. 2, left side of channel Station 10+50 to 11+75

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
0.00	133.45			
		136.32	70.00	353.42
70.00	139.19			
		137.28	40.00	203.38
110.00	135.37			
Sub-Total				556.80

Naturita-UMTRA
Type B1 riprap **Bedding** Burbank Disposal Site
9-May-97

Average End Area Calculation from Cross-section drawings.

Channel No. 2, Station 10+00 to 14+02.33

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
1000.00	56.46			
		58.035	50.00	107.47
1050.00	59.61			
		62.78	50.00	116.26
1100.00	55.95			
		62.075	50.00	114.95
1150.00	58.2			
		54.25	50.00	100.46
1200.00	50.3			
Sub-Total				439.15
1200.00	30.3			
		30.3	50.00	56.11
1250.00	30.3			
		30.3	50.00	56.11
1300.00	30.3			
		29.8	50.00	55.19
1350.00	29.3			
		29.3	52.33	56.79
1402.33	29.3			
Sub-Total				224.20

Naturita-UMTRA
B1 riprap **Bedding** Burbank Disposal Site
9-May-97

from Cross-section drawings.
Channel Station 10+50 to 11+75

Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
48.175	70.00	124.90
53.215	40.00	78.84
Sub-Total		203.74

Naturita-UMTRA

Oversize Rockfill Dam Burbank Disposal Site

9-May-97

Average End Area Calculation from Cross-section drawings.

Channel No. 2, Station 10+50 to 13+20.

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
1050.00	204.13			
		204.13	50.00	378.02
1100.00	204.13			
		274.065	50.00	507.53
1150.00	344			
		415	50.00	768.52
1200.00	486			
		381	50.00	705.56
1250.00	276			
		158.835	50.00	294.14
1300.00	41.67			
		20.835	20.00	15.43
1320.00	0			
Sub-Total				2669.19

Naturita-UMTRA

Interception Channel Burbank Disposal Site

9-May-97

Average End Area Calculation from Cross-section drawings.

Excavation volume no longer required Sta. 0+00 to 2+66

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
-30.00	0			
		268.86	30.00	298.73
0.00	537.72	457.215	50.00	846.69
50.00	376.71	790.745	50.00	1464.34
100.00	1204.78	1141.74	50.00	2114.33
150.00	1078.7	1158.24	50.00	2144.89
200.00	1237.78	1224.57	66.00	2993.39
266.00	1211.36			
Sub-Total				9862.39

Naturita-UMTRA
Type B riprap Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Channel No.1, Station 0+00 to 6+87.82

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
0.00	133.45			
		136.425	100.00	505.28
100.00	139.4			
		132.9	100.00	492.22
200.00	126.4			
		118.475	100.00	438.80
300.00	110.55			
		118.665	100.00	439.50
400.00	126.78			
		129.33	100.00	479.00
500.00	131.88			
		139.53	100.00	516.78
600.00	147.18			
		121.835	78.82	355.67
678.82	96.49			
Sub-Total				3227.24

Naturita-UMTRA
 Type B riprap **Bedding** Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Channel No.1, Station 0+00 to 6+87.82

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
0.00	66.91			
		68.31	100.00	253.00
100.00	69.71			
		66.46	100.00	246.15
200.00	63.21			
		59.28	100.00	219.56
300.00	55.35			
		59.41	100.00	220.04
400.00	63.47			
		64.74	100.00	239.78
500.00	66.01			
		69.835	100.00	258.65
600.00	73.66			
		61.025	78.82	178.15
678.82	48.39			
Sub-Total				1615.31

Naturita-UMTRA
Type B1 riprap Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Channel No.1, Station 6+87.82 to 12+00

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
687.82	309.6			
		285.8	112.18	1187.45
800.00	262			
		254.5	100.00	942.59
900.00	247			
		243.63	100.00	902.33
1000.00	240.26			
		220.28	100.00	815.85
1100.00	200.3			
		200.3	100.00	741.85
1200.00	200.3			
Sub-Total				4590.08

Naturita-UMTRA

Type B1 riprap **Bedding** Burbank Disposal Site

9-May-97

Average End Area Calculation from Cross-section drawings.

Channel No.1, Station 6+87.82 to 12+00

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
687.82	116.6			
		107.595	112.18	447.04
800.00	98.59			
		95.785	100.00	354.76
900.00	92.98			
		91.65	100.00	339.44
1000.00	90.32			
		82.825	100.00	306.76
1100.00	75.33			
		86.205	100.00	319.28
1200.00	97.08			
Sub-Total				1767.28

Naturita-UMTRA
Type B riprap Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.

Channel No. 3, Station -0+35 to 4+00 and right of channel Sta. 8+00 to 12+00.

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
-35.00	182.57			
		182.57	35.00	236.66
0.00	182.57			
		185.12	100.00	685.63
100.00	187.67			
		187.67	100.00	695.07
200.00	187.67			
		187.67	100.00	695.07
300.00	187.67			
		187.62	100.00	694.89
400.00	187.57			
		172.235	60.00	382.74
460.00	156.9			
Sub-Total				3390.08
460.00	55.35			
		55.35	30.00	61.50
490.00	55.35			
		52.855	110.00	215.34
600.00	50.36			
		50.36	100.00	186.52
700.00	50.36			
		67.69	100.00	250.70
800.00	85.02			
		100.15	60.00	222.56
860.00	115.28			
		65.14	85.00	205.07
945.00	15			
Sub-Total				1141.68

Naturita-UMTRA

Type B riprap Bedding Burbank Disposal Site

9-May-97

Average End Area Calculation from Cross-section drawings.

Channel No. 3, Station -0+35 to 4+00 and right of channel Sta. 8+00 to 12+00.

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
-35.00	91.29			
		91.29	35.00	118.34
0.00	91.29			
		92.565	100.00	342.83
100.00	93.84			
		93.84	100.00	347.56
200.00	93.84			
		93.84	100.00	347.56
300.00	93.84			
		93.84	100.00	347.56
400.00	93.84			
		86.175	60.00	191.50
460.00	78.51			
Sub-Total				1695.34
460.00	27.75			
		27.75	30.00	30.83
490.00	27.75			
		26.505	110.00	107.98
600.00	25.26			
		25.26	100.00	93.56
700.00	25.26			
		55.14	100.00	204.22
800.00	85.02			
		71.33	60.00	158.51
860.00	57.64			
		32.57	85.00	102.54
945.00	7.5			
Sub-Total				697.64

Naturita-UMTRA
Type B1 riprap Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Interception Channel, Station 2+66.30 to 11+79.49

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
266.30	93.41			
		100.06	50.00	185.30
316.30	106.71			
		106.71	238.36	942.05
554.66	106.71			
		120.01	50.00	222.24
604.66	133.31			
		133.31	304.61	1503.98
909.27	133.31			
		163.235	100.00	604.57
1009.27	193.16			
		193.16	120.22	860.06
1129.49	193.16			
Sub-Total				4318.21
1129.49	296.18			
		296.18	50.00	548.48
1179.49	296.18			
Sub-Total				548.48

Naturita-UMTRA
 Type B1 riprap **Bedding** Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.
 Interception Channel, Station 2+66.30 to 11+79.49

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
266.30	39.02			
		41.52	50.00	76.89
316.30	44.02			
		44.02	238.36	388.62
554.66	44.02			
		49.02	50.00	90.78
604.66	54.02			
		54.02	304.61	609.45
909.27	54.02			
		65.27	100.00	241.74
1009.27	76.52			
		76.52	120.22	340.71
1129.49	76.52			
Sub-Total				1748.18
1129.49	79.37			
		79.37	50.00	146.98
1179.49	79.37			
Sub-Total				146.98

Naturita-UMTRA

Type A riprap Burbank Disposal Site

9-May-97

Area to be covered with Type A riprap equals 271,141.33 sq. ft.

Slope correction factor equals 1.0002

Corrected slope area equals 271,195.55 sq. ft.

Depth of Type A riprap equals 1 foot.

Volume of **Type A riprap** equals $271,195.55 / 27 = 10,044.28$ cubic yards

Volume of **Type A riprap Bedding** equals one-half rock quantity or **5,022.14 cubic yards**

Naturita-UMTRA

Oversize Sandstone Rock for Erosion Aprons Burbank Disposal Site

9-May-97

Length of Apron along Channel No. 1 equals 560 lf.

Average area of Apron along Channel No. 1 equals 42.12 sq. ft.

Volume of Oversize Sandstone along Channel No. 1 equals $(560 \times 42.12)/27 = 873.60$ cubic yards.

Length of Apron along U/S portion of Channel No. 1 & No. 2 equals 1,500 lf.

Average area of Apron along Channel No. 2 equals 54.01 sq. ft.

Volume of Oversize Sandstone along Channel No. 2 equals $(1500 \times 54.01)/27 = 3,000$ cubic yards.

Area to be covered with min. 3 feet of oversize rock right of Channel No. 2 Station 5+50 to 7+75 equals 22,400 sq. ft.

Slope correction factor for a 2:1 slope equals 1.12

Corrected slope area equals 25,043.96 sq.ft.

Volume of Oversize Sandstone Blanket equals $(25,043.96 \times 3)/27 = 2,782.66$ cubic yards.

Total Volume Oversize Sandstone for Erosion Blanket and Aprons = 6,656.26 cubic yards

Naturita-UMTRA
Interception Channel Burbank Disposal Site
 9-May-97

Average End Area Calculation from Cross-section drawings.

Excavation volume due to revised left side slope geometry Sta.2+66 to 10+49.27

Station	Area (sq. ft.)	Avg. Area (sq. ft.)	Delta Sta. (ft.)	Volume (cy.)
191.00	0			
		350.79	75.00	974.42
266.00	701.58			
		875.72	50.30	1631.43
316.30	1049.86			
		862.21	183.70	5866.22
500.00	674.56			
		452.235	54.66	915.52
554.66	229.91			
		233.035	50.00	431.55
604.66	236.16			
		189.7	304.61	2140.17
909.27	143.24			
		128.33	100.00	475.30
1009.27	113.42			
		56.71	40.00	84.01
1049.27	0			
Sub-Total				12518.62