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Shannon & Wilson, Inc.	Construction Aggregate Report – Caliente, Rev. 2 (Submittal No. 8.10)	17 Jul 2007	06-00102

Section I. Submittal Information (includes above information)

Submittal Description and Revision Summary for Entire Submittal:

This report documents information collected from a literature review and field reconnaissance performed for the purpose of describing geologic conditions and presenting preliminary geotechnical recommendations for the proposed Caliente alignment of the Nevada Rail Line for the Yucca Mountain Project.

Revision Summary:
Rev 0, 21 Jun 05: Original submittal
Rev 1, 07 Mar 06: Added alignments from the Supplemental Report (GF3 and BBE), and the Rev 11 alignments
Rev 2, 17 Jul 07: Revised Table 1, Table 3, and Appendix B to address copyrighted material, and edited typographical errors

Special Instructions:

Section II. Data File Information (Add lines below if needed for additional files. Indicate "Last item" or "End of list" after last line used.)

Filename	Rev.	File Size	Description (File description and revision summary for file)	Application and Version/ Add-in or Extension and Version
_Cover ConAgg 17 July 07.ppt	2	698 KB	Construction Aggregate Report Cover	MS Power Point 2003 SP2
SW-ColourMidWidth 100.ctb	2	5 KB	Construction Aggregate Report Cover	AutoCAD 2007
Spine 1inch copy.jpg	2	276 KB	Construction Aggregate Report Cover Spine	Corel PHOTO-PAINT 8.0 Image
_Spines 2007.dwg	2	683 KB	Construction Aggregate Report Cover Spine	AutoCAD 2007
BSC Logo.jpg	2	22 KB	Construction Aggregate Report Cover and CD Label Image	Corel PHOTO-PAINT 8.0 Image
Jacobs LOGO.jpg	2	29 KB	Construction Aggregate Report Cover Spine Image	Corel PHOTO-PAINT 8.0 Image
_CD Labels 2007.dwg	2	621 KB	Construction Aggregate Report CD Label	AutoCAD 2007
CD Background 2007.jpg	2	1,280 KB	Construction Aggregate Report CD Label	Corel PHOTO-PAINT 8.0 Image
21-1-20102-112-Rev2X.doc	2	285 KB	Construction Aggregate Report Cover Sheet	MS Word 2003 SP2
21-1-20102-112-Change-History-C-Agg.doc	2	35 KB	Construction Aggregate Report Change History Sheet	MS Word 2003 SP2
21-1-20102-112-Rev2.doc	2	229 KB	Construction Aggregate Report Text and Appendix Flysheets	MS Word 2003 SP2
21-1-20102-112-T1-Rev2.doc	2	48 KB	Table 1, Recommended Limiting Values of Testing for Railroad Ballast	MS Word 2003 SP2
21-1-20102-112-T2-Rev2.xls	2	70 KB	Table 2, Potential Ballast Source Areas	MS Excel 2003 SP2
21-1-20102-112-T3-Rev2.doc	2	31 KB	Table 3, Criteria for Subballast Sources	MS Excel 2003 SP2
21-1-20102-112-T4-Rev2.doc	2	42 KB	Table 4, Unified Soil Classification System, Soils Suitable for Subballast	MS Excel 2003 SP2

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Shannon & Wilson, Inc.	Construction Aggregate Report – Caliente, Rev. 2 (Submittal No. 8.10)	17 Jul 2007	06-00102

21-1-20102-112-T5-Rev2.xls	2	26 KB	Table 5, Summary of Potential Sand Sources	MS Word 2003 SP2
21-1-20102-112-T6-Rev2.xls	2	127 KB	Table 6, Summary of Potential Gravel Sources	MS Word 2003 SP2
21-1-20102-112-T7-Rev2.xls	2	44 KB	Table 7, Recommended Ballast Source Areas	MS Excel 2003 SP2
SOIL FIELD REFERENCE, rev-jul07.pdf	2	1,485 KB	Construction Aggregate Report Soil Field Reference	Adobe Acrobat 7.0
ROCK FIELD REFERENCE, rev-jul07.pdf	2	624 KB	Construction Aggregate Report Rock Field Reference	Adobe Acrobat 7.0
Caliente_S&W_CAR.mdb	2	2,900 KB	ESRI 9.2 Personal Geodatabase containing the following Shannon & Wilson, Inc. native files pertaining to studies related to the Construction Aggregate Report dated 17-Jul-07.	ESRI Geodatabase
CalienteAggRpt, AppxC-Photos	2	47,206 KB	Construction Aggregate Report Appendix C photos folder	Corel PHOTO-PAINT 8.0 Image
CalienteAggRpt, R2,17jul07.pdf	2	61,088 KB	Adobe Acrobat Report	Adobe Acrobat 7.0
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Section III. Metadata

☒ **GIS Metadata** All GIS data is preferred in ArcGIS9.1 UTM, NAD1983, Zone11, Feet.	Projection: UTM
	Datum: NAD 83
	Zone: 11 N
	Units: Feet
☐ **CAD Metadata** CAD drawings are preferred in **Bentley MicroStation V8 and/or InRoads** and should adhere to established **CAD standards**.	Level descriptions:
	Scale:
	Units of Measurement:
	Horizontal and Vertical Datum:

Section IV. Data Screening (Completed by BSC personnel)

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*If "Yes", Data Storage Location:

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Section V. STR/STR Support Disposition of Submittal

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Shannon & Wilson, Inc.	Construction Aggregate Report – Caliente, Rev. 2 (Submittal No. 8.10)	17 Jul 2007	06-00102

STR/STR Support Name:	Signature:	Date:
William Garfield KAM 8/22/07	Wm. L. Garfield	8/22/07

Data Definitions for Caliente Construction Aggregate Report GIS Features

Feature Class: alignment_rev11_20_mi_buffer

Description: 20 mile buffer created based on BSC Alignment, Rev 11.

Purpose: Identifying features within 20 miles of the Caliente alignment

Revision History: No changes
Number of records: 1

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software

Feature Class: alignment_rev8_20_mi_buffer

Description: 20 mile buffer created based on BSC Alignment, Rev 8.

Purpose: Identifying features within 20 miles of the Caliente alignment

Revision History: No Changes

Number of records: 1

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon

Field Name	Data Type	Description of field
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software

Feature Class: Geologic_units_sand_and_gravel_250000

Description: Surficial areas seen as potential sources of sand and gravel

Purpose: Surficial areas with the potential for sand and gravel sources within the Caliente corridor.

Revision History: No changes.

Number of records: 185

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
Geology	Text	Geologic Unit
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: no_soil_survey_data

Description: Areas of no soil survey data.

Purpose: For display purposes; to show areas within the Caliente corridor where no soils data is presented.

Revision History: No changes.

Number of records: 5

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: potential_ballast_quarry_sites

Description: Polygons showing areas of potential ballast quarry sites

Purpose: To identify areas associated with the investigation of suitable ballast source areas.

Revision History: No changes.

Number of records: 100

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
Group_	Text	Ballast Quarry Site Group ID
SHAPE_Length	Double	Length of feature in feet generated by software.

Field Name	Data Type	Description of field
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: potential_ballast_quarry_sites_grouping

Description: Grouped areas for potential ballast quarry sites

Purpose: Simplification of "potential_ballast_quarry_sites" feature class

Revision History: No Changes

Number of records: 35

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: project_outline_250000

Description: Polygon area of project extent at 250K

Purpose: Show the extent of the Caliente corridor. For display purposes only.

Revision History: No Changes

Number of records: 1

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon

Field Name	Data Type	Description of field
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: Sand_and_gravel_sources_rev11

Description: Potential sources of sand and gravel along the BSC alignment, rev 11.

Purpose: Areas, along the BSC Alignment, Rev. 11, with potential sand and gravel sources.

Revision History: No changes.

Number of records: 78

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polyline
Source	Text	Source
SHAPE_Length	Double	Length of feature in feet generated by software.

Feature Class: stationing_rev11_250000_anno

Description: Alignment stationing annotation at 250K scale for BSC alignment, rev 11.

Revision History: No Changes

Number of records: 55

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will

Field Name	Data Type	Description of field
		act as a primary key.
SHAPE	Geometry	Annotation
TextString	Text	Annotation Text

Feature Class: stationing_rev11_250000_line

Description: Alignment stationing leader lines at 250K scale for BSC alignment, rev 11.

Revision History: No Changes

Number of records: 282

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polyline
SHAPE_Length	Double	Length of feature in feet generated by software.

Feature Class: title_block_250000

Description: Polygon area for title block of 250K scale maps

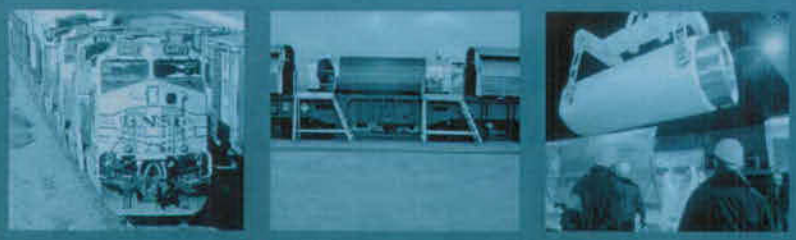
Purpose: To create white space for text to be inserted in the page layout on the map documents

Revision History: No Changes

Number of records: 2

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon

Field Name	Data Type	Description of field
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.



Construction Aggregate Report Caliente Rail Corridor

SRCT:
06-00102

Task 4.12: Preliminary Construction Aggregate Report (Submittal No. 8.10)

Rev. 2

Prepared by:

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

In Association With:

JACOBS

Ninyo & Moore

Prepared for:

BECHTEL SAIC COMPANY LLC

Nevada Rail Corridor
Yucca Mountain Project
Geotechnical Analysis
NN-HC4-00197

July 17, 2007

Preliminary Construction Aggregate Report
Rev. 2
Caliente Rail Corridor
Yucca Mountain Project, Nevada

Subcontract No: NN-HC4-00197

17 July 2007

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

At Shannon & Wilson, our mission is to be a progressive, well-managed professional consulting firm in the fields of engineering and applied earth sciences. Our goal is to perform our services with the highest degree of professionalism with due consideration to the best interests of the public, our clients, and our employees.

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21-1-20102-112

Prepared using MS-WORD 2003

CHANGE HISTORY

Revision Number	Date	Description of Change
00	21 June 2005	Initial Issue
01	7 March 2006	Added Alignments From Supplemental Report (GF3 and BBE), and the Rev 11 Alignments
02	17 July 2007	Revised Table 1, Table 3, and Appendix B, and edited typographical errors

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ACRONYMS AND ABBREVIATIONS

A	insufficient evidence for certainty rating (as relates to mineral potential)
AASHTO	American Association of State Highway and Transportation Officials
Ag	silver
ANSI	American National Standards Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
As	arsenic
ASTM	American Society for Testing and Materials
Au	gold
AWWA	American Water Works Association
B	low certainty rating (as relates to mineral potential)
Ba	barium
BBE	Busted Butte East
BCFG	billion cubic feet of gas
Be	beryllium
BGRR	Beatty Goldfield Railroad
Bi	bismuth
BLM	U.S. Bureau of Land Management
BMPs	Best Management Practices
BNSF	Burlington Northern Santa Fe Railway Company
BSC	Bechtel SAIC Company, LLC
C	moderate certainty rating (as relates to mineral potential)
CAPP	Chemical Accident Prevention Program
Cd	cadmium
cm	centimeter
Co	cobalt
CPT	cone penetrometer test
Cr	chromium
CRC	Caliente Rail Corridor
CS	common segment
Cu	copper
D	high certainty rating (as relates to mineral potential)
DCM	Design Criteria Manual
DEIS	Draft Environmental Impact Statement
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EOR	engineer of record
EPA	U.S. Environmental Protection Agency
EWDP	Early Warning Drilling Program
F	fluorine
FEIS	Final Environmental Impact Statement

ACRONYMS AND ABBREVIATIONS (cont.)

FHWA	Federal Highway Administration
FOB	free on board
FRA	Federal Railroad Administration
FY	fiscal year
GCMC	Goldfield Consolidated Mines Company
G-DCM	Geotechnical Design Criteria Manual
GF3	Goldfield 3 Route
GIS	Geographic Information System
gpm	gallons per minute
GPS	global positioning system
g/t	grams per ton
H	high mineral potential
HASP	Health and Safety Plan
Hg	mercury
HSA	hollow-stem auger
H:V	horizontal to vertical
HSU	hydrostratigraphic units
IDW	investigation-derived waste
in/sec	inches per second
ISRM	International Society of Rock Mechanics
Jacobs	Jacobs Engineering, Inc.
K	potassium
KGRA	known geothermal resource area
km	kilometer
L	low mineral potential
LV&TRR	Las Vegas and Tonopah Railroad
M	moderate mineral potential
Ma	million years old or million years ago or million years before present
MGR	Managed Geologic Repository
MILS	mineral property location database compiled by the U.S. Bureau of Mines
mm	millimeter
mm/sec	millimeters per second
mm/yr	millimeters per year
MMBO	million barrels of oil
Mn	manganese
MnO	manganese oxide
Mo	molybdenum
M&O	Maintenance and Operation
mph	miles per hour
MPR	Mineral Potential Report
MRDI	Mineral Resource Development, Inc.
MRDS	mineral resource dataset compiled by U.S. Geological Survey

ACRONYMS AND ABBREVIATIONS (cont.)

MS	mineral survey
MSE	mechanically stabilized earth
MSEW	mechanically stabilized earth wall
MVGI	Metallic Ventures Gold, Inc.
N&M	Ninyo & Moore, Inc.
Na	sodium
NAC	Nevada Administrative Code
NBMG	Nevada Bureau of Mines and Geology
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NEPA	National Environmental Policy Act
Ni	nickel
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRL	Nevada Rail Line
NRP	Nevada Rail Partners
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range (formerly Nellis Air Force Base and Testing Range)
NVT	Nevada Transportation
NWRPO	Nuclear Waste Repository Project Office
O	no mineral potential
OCRWM	Office of Civilian Radioactive Waste Management
O.D.	outside diameter
opt	ounces per ton
oz	ounce, specifically troy ounce in this report
oz/t	ounces per ton
P	phosphorous
Pb	lead
PGA	peak ground acceleration
PGR	Preliminary Geotechnical Report
PM	particulate matter
ppb	parts per billion
ppm	parts per million
PSHA	probabilistic seismic hazard analysis
psi	pounds per square inch
PV	prefabricated vertical
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RFI	Request for Information
RFP	Request for Proposal

ACRONYMS AND ABBREVIATIONS (cont.)

ROD	Record of Decision
ROE	right-of-entry
ROW	right-of-way
RQD	Rock Quality Designation
RSS	reinforced soil slopes
S&W	Shannon & Wilson, Inc.
Sb	antimony
Sc	scandium
SCS	Soil Conservation Service
Se	selenium
SFRS	steel fiber-reinforced shotcrete
SI	International System of Units
Sm	samarium
Sn	tin
SPT	Standard Penetration Test
Sr	strontium
SR	State Route
SSURGO	Soil Survey Geographic Database
T&TRR	Tolicha and Tonopah Railroad
TBM	Tunnel Boring Machine
T N	Township North
T S	Township South
Tl	thallium
tpd	tons per day
tpy	tons per year
tsf	tons per square foot
U	uranium
UPRR	Union Pacific Railroad Company
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USBM	U.S. Bureau of Mines
USBR	U.S. Bureau of Reclamation
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
V	vanadium
W	tungsten
WPCP	Water Pollution Control Permit
wt%	weight percent
YMP	Yucca Mountain Project
Zn	zinc

PRELIMINARY CONSTRUCTION AGGREGATE REPORT

CALIENTE RAIL CORRIDOR
YUCCA MOUNTAIN PROJECT, NEVADA

1.0 INTRODUCTION

This report documents information collected from a literature review and a field reconnaissance performed for the purpose of identifying rock and soil deposits that may be potential sources for construction aggregate for the Nevada Rail Line (NRL) for the Yucca Mountain Project (YMP). This report is a revision of the Preliminary Ballast and Construction Materials Sources Report (Shannon & Wilson, Inc., 2005a) and it includes the Revision 11 alignments, as shown on map provided by Bechtel SAIC Company, LLC (BSC) dated 18 August 2005.

1.1 Project Description

The U.S. Department of Energy (DOE) has selected the Caliente Rail Corridor within which to determine an alignment for the construction and operation of a railroad to transport spent nuclear fuel and high level waste to a repository planned near Yucca Mountain, Nevada.

The 319-mile corridor originates at the Union Pacific Railroad (UPRR) mainline track near Caliente, Nevada. It then extends northwest toward Tonopah. It wraps around the north and west sides of the Nevada Test and Training Range (NTTR) before entering the Nevada Test Site (NTS) near its southwest corner. It terminates at the southern entrance to the repository (Plate 1). The exact location of the connection between the proposed rail line and UPRR has not been identified and two alternatives are currently being evaluated. The rail line is anticipated to consist of a single track, with passing sidings at appropriate intervals.

It is anticipated that approximately 3.1 million tons of crushed rock ballast would be required for new track construction (Nevada Rail Partners 2006). In addition, approximately 2.5 million tons of subballast would be required for roadbed construction. Other construction aggregate that would be required for the NRL include embankment fill, erosion control stone (riprap), and aggregate for concrete; however, the required quantity of these aggregates required for construction has yet to be determined.

1.2 Purpose and Scope

This report is intended to provide information to conceptual designers with regard to potential sources of construction aggregate, including rock suitable for processing into ballast, subballast, and erosion-control stone, as well as soil deposits suitable for use as subballast, embankment fill, road surfacing, and aggregate for concrete. Materials used as subballast commonly include crushed stone, natural or crushed gravel, and natural or processed sand, slag, or mixtures of these materials.

The scope of work included a literature review and a field reconnaissance along the proposed alignment. The purpose of the literature review was to identify rock and soil deposits with characteristics that make them potential sources for construction materials, either with or without processing. The purpose of the field reconnaissance was to observe exposures and outcrops of the deposits to assess if they would likely constitute a suitable source.

Generally, it was assumed that construction aggregate for the project would be obtained from either cuts made for construction of the roadbed or borrow pits and quarries located along the alignment. Furthermore, it was assumed that rock quarries for the purpose of obtaining crushed rock ballast would be located within approximately 20 miles of the proposed alignment.

No subsurface explorations or laboratory testing were conducted as part of this study. Evaluation of soil and rock materials for use as construction aggregate was based on visual observation. For use in construction, it is assumed that ballast, subballast, erosion-control stone, and concrete aggregate would satisfy the appropriate specifications listed in the 2005 edition of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual of Railway Engineering (AREMA Manual, 2005).

As part of this study, a ballast-sourcing cost analysis was completed in order to evaluate the cost-effectiveness of obtaining ballast from a new quarry located along the alignment versus purchasing it from an existing commercial source. This report is referenced in Appendix A (Shannon & Wilson, Inc., 2005b). Appendix A was prepared using project information current as of 18 February 2005.

Permitting requirements and environmental considerations for development of borrow pits along the NRL could be somewhat different from those requirements and considerations for a rock

quarry. These requirements and considerations were initially addressed in a document prepared by Jacobs Engineering, Inc. 2005.

1.3 Acknowledgements

This report was prepared by Shannon & Wilson, Inc. (S&W) in association with Jacobs Engineering, Inc. (Jacobs). Paul Godlewski (Project Manager, S&W) provided oversight for the task, and George Lightwood (Task 2 Team Leader, S&W) provided technical guidance for the combined effort. Bruce Stover (Project Geologist, S&W) performed the literature review, compiled maps showing source areas, planned the field activities, and assisted Mr. Lightwood in the preparation of this report. Revision 1 of this report was prepared by Steve McMullen, Task 4 Team Leader.

1.4 Authorization

This work was performed by S&W for BSC in general accordance with YMP Technical Services Subcontract No. NN-HC4-00197, Caliente Rail Corridor Geotechnical Analysis . Revision of this report to address the Rev. 11 alignments was authorized by Subcontract Change Notice 6, effective 31 October 2005. This document is Submittal No. 8.10 of this subcontract.

2.0 LITERATURE AND DATA REVIEW

2.1 Review of Existing Project Data

A geographical description of the Caliente Rail Corridor is presented in the Preliminary Geotechnical Report (Shannon & Wilson, Inc., 2006). A discussion of the geologic setting, tectonics, regional seismicity, and hydrogeology is also presented there.

2.2 Literature Search and Review

As part of this study, S&W conducted a review of readily accessible literature relevant to the identification of potential ballast, subballast, and other construction aggregate sources. These sources of information included the following:

- Existing county-series geologic maps published by the Nevada Bureau of Mines and Geology.

- U.S. Geological Survey (USGS) Water-resource Investigations containing lithologic outcrop maps compiled from existing geologic mapping.
- USGS topographic maps at various scales (1:24,000, 1:100,000, and 1:250,000).
- Existing USGS geologic maps at various scales to identify geologic formations, geologic structures, fault locations, and mineral prospects, borrow pits, and quarries.
- A list of Nevada Department of Transportation (NDOT) gravel pit and borrow source locations.
- A list of Bureau of Land Management (BLM) community sand and gravel pits.
- U.S. Department of Agriculture Natural Resources Conservation Service (USDA/NRCS) soil surveys and databases.
- Existing remote-sensing information (aerial photographs, satellite images, and orthophotographs contained in USDA/NRCS soil surveys).
- Other published technical articles, reports, and bulletins containing geologic information and resource data.
- Geographic Information System (GIS) data sets obtained from Bechtel/SAIC Company, LLC (BSC) showing land status and ownership.

References reviewed and used in the preparation of this report are listed at the end of this report.

The purpose of the literature review was to identify potential ballast, subballast, and other construction aggregate source areas prior to the field reconnaissance. The identification of potential source areas was restricted to land that is open to acquisition of mineral materials and development of quarries and sand and gravel pits through the BLM mineral materials sales program. Specifically, we excluded lands administered by the Department of Defense (DOD), U.S. Bureau of Reclamation (USBR), and the U.S. Forest Service (USFS). USFS-administered lands were excluded since they are typically at higher elevations, and no portion of the NRL currently passes through USFS lands.

Based on the above literature, outcrops of rock formations commonly used for processing into ballast (granite, traprock, quartzite, limestone, and dolomitic limestone) were identified and plotted on a set of 1:250,000-scale maps (Plate 1). Each outcrop was assigned a unique outcrop identification number.

USGS geologic maps and USDA/NRCS soils maps were reviewed to prepare preliminary field sheets showing the location of potential sand and gravel resources that might be utilized for use or processing into subballast. Mapped soil units that were classified by the Soil Conservation

Service (SCS) as having moderate to good potential for construction aggregate were compared with the BLM and NDOT pit locations to develop a series of sites that might warrant further evaluation during the field reconnaissance.

3.0 FIELD RECONNAISSANCE

Preselected rock exposures identified from literature and data review as having the potential to supply railroad ballast were visited by the field reconnaissance team to make geologic observations, assess site accessibility, and collect samples, when appropriate. The locations visited were generally within approximately 20 miles of the NRL.

The field reconnaissance was conducted between 20 September to 1 October 2004. The field reconnaissance started on the west side near the NTS and Beatty, working generally northward toward Tonopah and Mud Lake and then westward toward Reveille Valley in Nye County. Fieldwork was suspended on 26 September 2004 because the field vehicle malfunctioned and grazing leaseholders in Lincoln County needed to be notified of the field activities. The field reconnaissance resumed on 28 September 2004 with the field team working eastward between the Reveille Valley toward Caliente, Nevada. The field reconnaissance team members consisted of George Lightwood and Bruce Stover of S&W.

A second phase of field reconnaissance was conducted for seven additional routes. Two additional field trips, performed in conjunction with Task 1 field reconnaissance activities, were conducted on 8 to 12 April 2005 and 2 to 10 May 2005.

Using the 1:250,000 scale map compiled during the literature search, the team prepared a trip itinerary to cover the preselected field locations for observation of potential ballast sources. Daily work activities were planned each evening and communicated to Will Hultman, the S&W point of contact. Mr. Hultman was informed of the Field Team's itinerary for the next day. Before entering the field each day, team members discussed the planned work activities, conducted and documented a pre-shift safety meeting, and inspected the vehicle, field equipment, safety equipment, and the other team members' physical and mental condition. Each evening the team reviewed daily progress, reconciled field notes, and reviewed safety issues that came up in the course of the fieldwork. The observations and collected field data were backed

up each day by making photocopies of field notebooks and downloading photographs into laptop computers.

3.1 Ballast Sources

At each preselected potential ballast resource location, the team observed geologic and site characteristics, assessed site accessibility, collected samples, and photographed rock exposures. Global Positioning System (GPS) location coordinates were recorded for each field site visited. The suitability of the rock for use as ballast was evaluated according to the criteria for ballast sources outlined in Section 4.1. The rock classification field reference in Appendix B was used as a general guide for describing the rock.

Rock strengths were estimated from simple field tests, such as hammer blows, at each potential resource site visited as rock strength correlates with abrasion resistance. Other attributes such as density, durability, porosity, oxidation, weathering, and presence or absence of undesirable mineralization, inclusions, fillings, vesicles, or voids were assessed visually and recorded in the field notes.

Characteristics of the overall rock mass that could affect quarrying were observed. These included the nature and geometry of structural discontinuities, bedding or flow thickness, continuity of beds or flows, and the presence of voids and solution cavities. Additional geologic characteristics the team noted included the presence of partings or seams of undesirable lithologic variations within the rock mass, such as scoria, flow breccias, shale, and sandstone interbeds.

Each potential ballast resource site visited was assessed for accessibility and potential quarry operational constraints. The distance in miles to existing dirt, gravel, and paved highways was noted, as well as the distance from the NRL. Required crossings of public roads and highways for haul-truck traffic were also noted. The available site size and general site layout and outcrop geometry were assessed in relation to quarry operation and excavation methodology. This included general observations of site topography, estimated mineable thickness of the potential ballast deposit based on surface exposures, and structural attitudes of discontinuities that could adversely impact quarry operations. In general, only rock exposures and outcrops that appeared from maps and described in the literature to have sufficient rock volume to provide the quantity of ballast required for the project were visited. Isolated and scattered small outcrops that did not

appear to have the minimum volume of rock to meet project requirements were noted as such, but were not always visited because of time limitations.

Representative rock samples were collected from selected rock exposures. Rock samples were broken from outcrops, visually classified and described, and placed in cloth sample bags. A sample number was assigned and copied on the bag, in the field notes, and on the field map sheet at the sampling location. Upon conclusion of the field reconnaissance, the rock samples were transported to the S&W lab in Seattle for storage and potential future evaluation.

3.2 Subballast Sources

For this project, subballast could be produced from unconsolidated deposits of sand and gravel along the alignment. Review of geologic maps and literature indicated that these deposits occur over large areas in the vicinity of the proposed alignment. However, these deposits are only well exposed along stream channels and in existing borrow pits. This made it impractical to visit discrete outcrops and exposures that might contain a potential resource, as was accomplished for potential ballast sources. Therefore, the purpose of the site reconnaissance was to develop a general understanding of the areas and geologic formations where deposits of sand and gravel suitable for processing into subballast, according to the criteria outlined in Section 5.1, were most likely to exist. The soil classification field references in Appendix B were used as a general guide for describing the soil.

During the field reconnaissance, existing sand and gravel pit borrow sources located along the NRL that had been used for highway construction were field checked and compared with the descriptions in published USDA/NRCS soil surveys. The locations were also checked against the geologic formations assigned and depicted on published USGS geologic maps. The results of field observations were later used to compile a map of the soils and geologic mapping units judged to have the best potential for containing sand and gravel deposits suitable for use or processing into subballast along the NRL.

During the field reconnaissance, exposures of sand and gravel deposits were observed and qualitatively evaluated for suitability for use as subballast. Attributes such as consistency, density, moisture content, structure, and cementation were also observed, including the presence and character of pedogenic calcium carbonate (caliche). Additional geologic characteristics noted included the presence of any seams or beds of undesirable fractions within the materials,

such as clay, silt, and conglomeratic or bouldery mudflow deposits. The thickness and induration of pedogenic calcium-carbonate-cemented hardpans were also observed, as this impacts excavation and processing costs.

At each potential borrow source, the team made geologic observations, collected samples where appropriate, and took photographs. GPS coordinates were recorded at each site where a representative sample of soils was collected and placed in a sample bag. A sample number was assigned and copied on the bag, in the field notes, and on the field map sheet at the sampling location. Upon conclusion of the field reconnaissance, the soil samples were transported to the S&W lab in Seattle for storage and potential future evaluation.

The operation of processing ballast may also yield material suitable for use as subballast. With appropriate screening and further processing, this material could potentially be used for erosion control, road surfacing, and fill for embankment construction.

3.3 Other Construction Aggregate

No specific field reconnaissance was performed to identify other construction aggregate, such as embankment fill, and stone for erosion control (riprap). It is assumed that aggregate used as embankment fill and possibly riprap would be obtained from excavations for the roadbed and borrow pits located adjacent to the alignment. Reuse of aggregate excavated during construction and the suitability of potential borrow sources are discussed in the Preliminary Geotechnical Report (Shannon & Wilson, 2006a).

3.4 Photographic Documentation

Photographs of the areas visited during the field reconnaissance were taken at selected sites. The frame index numbers were recorded in the field notes and with GPS coordinates and azimuth-direction of view. Photographs are included in Appendix C of this report on a CD. For potential ballast source access, they are organized on the CD by the outcrop identification number and photo number.

4.0 POTENTIAL BALLAST SOURCES

4.1 Criteria for Ballast Sources

Ballast from natural rock sources is produced by crushing, screening, and, if required, washing quarried rock. As discussed in the Geotechnical Design Criteria Manual (Shannon & Wilson, 2005c), aggregate gradations used as ballast range from a nominal maximum size (90 percent passing) of 1.5 to 2.5 inches to a nominal minimum size (10 percent passing) of 1 to 0.375 inch.

Ballast should meet the specifications outlined in the AREMA Manual. Material property requirements include gradation, specific gravity, absorption, degradation, soundness, undesirable particles (clay lumps, friable, flat, elongated) and for some aggregate, chemical analysis. Recommended limiting values of testing for ballast property requirements are listed in Table 1. In general, it is not feasible to evaluate whether or not a particular ballast source rock will yield ballast conforming to AREMA specifications through visual observation of the source rock; rather, it is necessary to perform the specified laboratory tests.

In the absence of laboratory testing, the AREMA Manual (Section 2.2) lists typical properties of acceptable ballast as follows:

- Ballast rock should be both hard and dense.
- The rock should have an angular particle structure that provides sharp corners and cubical fragments when crushed.
- The rock should be free of deleterious materials or inclusions.
- The rock should provide high resistance to temperature changes and chemical attack.
- The rock should have high electrical resistance, and low water-absorption properties.
- The rock should be free of cementing characteristics.
- The rock should have sufficient unit weight (pounds/cubic-foot), and have a limited amount of flat or elongated particles after processing

Rock lithologies recommended by AREMA that often yield acceptable materials include granite, traprock (including basalt), quartzite, limestone, and dolomitic limestone. All of the natural rock types listed above occur within 20 miles of the alignment. In addition, blast and steel furnace slags, byproducts of industrial processes, can be processed into ballast. Although in the 19th and early 20th centuries, small smelters processing gold and silver ores operated in portions of central Nevada, slag in quantities sufficient to meet project requirements was neither observed during

the field reconnaissance nor identified from the literature search. Concrete ties produce greater crushing loads; therefore, the AREMA Manual (Section 2.4.5) limits the use of concrete ties to ballast comprising granites, traprocks, or quartzites. Limestone, dolomite, or slag ballast may be acceptable with concrete ties on lines with low axle loads or light traffic. For this project, it is anticipated that limestone will not be used for ballast.

4.2 Description of Potential Source Areas

The locations of potential natural rock ballast sources were compiled from the geologic literature review and plotted on a 1:250,000-scale map (Plate 2). Each potential source was prescreened to meet a combination of size and distance criteria; it had to be within 20 miles of the NRL and it had to be of sufficient size to yield an estimated 3 million tons of ballast. Occurrences that passed the prescreening were assigned a unique map reference number, either from existing references in the literature, or with an identification number derived from the corresponding 1:250,000-scale USGS topographic map containing the occurrence.

4.2.1 Granite

Granite is a plutonic igneous rock consisting chiefly of quartz and feldspars. "Plutonic" refers to rocks that form at considerable depths in the earth's crust from an igneous molten state (magma). Granites cool and crystallize very slowly deep beneath the earth's surface and develop a coarse crystalline "granitoid" texture. Eventually, the pluton may be uplifted and exposed at the earth's surface through erosion. Granitic rocks include granite, granodiorite, pegmatite, and quartz monzonite. The literature review indicated eight locations where granitic rocks were mapped at the surface within the search area. Three of these occurrences were selected for a site visit during the field reconnaissance.

4.2.2 Traprock

Traprock is a term used to describe any darker-colored, fine-grained, non-granitic igneous rock. This general definition includes dacite, rhyodacite, andesite, diorite, and diabase, all of which occur within the search area. These igneous rocks are formed from magma emplaced at shallower depths in the crust through intrusions into existing surrounding rock. The depths of cooling are intermediate between plutonic rocks and surface extrusive rocks, resulting in moderate to rapid cooling, and generally finer-grained crystalline texture. The literature search indicated seven locations where individually mapable units of traprock occurred at the

surface within the search area. Four of these occurrences were selected for a site visit during the field reconnaissance. The literature included some areas of andesite and dacite intermixed with other volcanic rocks. However, these were not included in the initial ballast reconnaissance because the geologic complexity of these sources makes them unlikely ballast sources.

4.2.3 Basalt

Basalt is a dark, fine-grained, extrusive igneous rock that forms at or just below the surface as volcanic lava flows and shallow intrusions. It generally cools very quickly and has a glassy to very fine-grained crystalline texture, often containing small, spherical voids (vesicles) formed by the expansion of gas or steam during the solidification of the rock. Basalt is considered a variety of "traprock" in the AREMA Manual, but is listed here separately from that category because of the numerous occurrences, and extremely wide variety of basalts found along the NRL. The literature search indicated over 22 locations where basalt occurred at the surface within the search area. Many of these locations included widely scattered small flows and isolated outcrops, which were grouped into one generalized "occurrence." Sixteen of these occurrences were selected for a site visit during the field reconnaissance.

4.2.4 Quartzite

Quartzite is a metamorphic rock consisting mainly of quartz formed through recrystallization of sandstone. Sandstone and other sedimentary rock buried deep in the earth's upper crust can undergo regional or contact-thermal metamorphism where heat and pressure cause recrystallization of silica in the sand to quartz. Quartzite may also include unmetamorphosed sandstone where the entire rock mass has been cemented with secondary silica, such that the rock breaks across individual sand grains rather than around them. The literature search indicated three locations where quartzite occurred at the surface within the search area. One of these occurrences was selected for a site visit during the field reconnaissance.

4.2.5 Carbonate Rocks

Carbonate rock is sedimentary rock that includes limestone and dolomite. Limestone is a chemical sediment formed by precipitation of calcium carbonate ($CaCO_3$) in aqueous environments, such as a deep ocean or carbonate-shelf environment. Dolomite is similar to limestone but has magnesium carbonate ($MgCO_3$) replacement of some of the original calcium

carbonate. This change usually occurs through processes of diagenetic alteration during deep burial. Dolomites are defined as carbonate rocks with an $MgCO_3$ content of 36 percent or greater.

Mountain ranges in the basin and range region on the east side of the corridor are sites of extensive Paleozoic-aged deposits of limestone and dolomite. Other mapped Paleozoic formations contain sequences of carbonate rock interbedded with shale, sandstone, and siltstone. Except for two extensive areas where it appeared that thick carbonate beds could be segregated, these mixed formations were not visited during the field reconnaissance. Generally, only formations that are described in the literature as consisting predominantly of carbonate rock were visited during the field reconnaissance.

The literature search indicated 16 locations where carbonate rocks described above occurred at the surface within the search area. Many locations include widely scattered, isolated outcrops grouped into one generalized occurrence. Eight of these occurrences were selected for a site visit during the field reconnaissance.

As mentioned in Section 4.1 of this report, it is anticipated that limestone will not be used for ballast on this project. However, it may be suitable for erosion control stone, road surfacing, and fill for embankment construction.

4.2.6 Other Volcanic Rocks

The majority of bedrock outcrop in the search area consists of volcanic rock other than basalt and traprock. These rocks include densely welded and non-welded ash-flow and ash-fall tuffs, rhyolitic lavas and intrusives, volcanic breccias, and complex areas of intermixed andesitic to rhyolitic lavas and intrusives. Although we observed numerous outcrops of densely welded ash-flow tuffs and rhyolitic rocks that appeared to have very high strengths, these rock types were not included in the field reconnaissances because they (1) are not listed in the AREMA Manual as typical ballast source rocks, (2) are often less uniform and more prone to variation in quality within a deposit, and (3) often do not meet the AREMA density requirements for ballast.

4.2.7 Summary

Geologic information obtained from published sources and field observations describing the potential ballast source areas are summarized on Table 2. Each potential source listed on

Table 2 was assigned a map identification number that corresponds to its map location (Plate 1). Table 2 contains geologic, resource, and physical site terrain descriptions of each potential source area, as well as observed practical or economic aspects that either limit or enhance its suitability for providing ballast rock. Sampled source areas and a list of photographs taken at each deposit (Appendix C) are also listed on the table.

It should be noted that the quality of a potential ballast product is dependent on site-specific attributes of each deposit. Thus, a granite rock outcrop identified in the geologic literature search might be unsuitable for ballast because of weathering, alteration, or other factors that have destroyed the original integrity of the rock. A basalt flow may be so vesicular (full of air bubbles) that, although high in strength, it does not meet the required density for acceptable ballast. Each occurrence of a potential ballast resource identified on Plate 1 must be further evaluated for suitability based on geologic mapping, sampling, subsurface explorations, and laboratory testing.

Preliminary recommendations for new ballast source alternatives that have favorable characteristics and may justify study in future services are noted in the table. These resource sites were judged more favorable than others because of their combination of apparent acceptable rock quality, sufficient reserve volume, and site location attributes.

5.0 SUBBALLAST SOURCE AREAS

5.1 Criteria for Subballast

The AREMA Manual includes specifications for the characteristics and property requirements for acceptable subballast aggregate (Chapter 1, Section 2.11.2.5). Subballast consists of a compacted granular material that lies between the track ballast and underlying subgrade soil. The subballast acts as a filter to prevent subgrade soil from penetrating up into the ballast section, while at the same time allowing water to drain from the ballast. The AREMA Manual recommends that subballast meet filter criteria for the subgrade soils (Table 3). Therefore, the gradation of the subballast is dependent upon the gradation of the soils used to construct roadbed embankments.

In addition to the AREMA filter criteria, we recommend that subballast contain no more than 5 percent fines (percentage by weight of the minus ¾-inch soil fraction passing the No. 200 sieve

during wet-sieving) regardless of the filter design results (Shannon & Wilson, 2005c). In addition, the fines should be non-plastic. For those portions of the corridor at higher elevations where freezing and thawing conditions might be encountered, subballast should be non-frost-susceptible (must contain less than 3 percent by weight of the minus ¾-inch soil fraction smaller than 0.02 millimeter (mm) during wet sieving).

Sources of subballast include crushed stone, natural or crushed gravel, natural or processed sands, slag, or mixtures of these materials. For this project, the most likely source of subballast includes screened material from ballast processing and natural or processed soils located adjacent to the alignment. To a great extent, the cost of transportation of subballast and the availability of water would determine which aggregate source is ultimately selected. For example, it may be more cost-effective to wash and screen locally derived, naturally occurring soils adjacent to the alignment to obtain the proper gradation rather than to transport naturally occurring aggregate with the proper gradation over long distances. Measures necessary to meet subballast design criteria would depend on the material characteristics at each source. Future work could be targeted at identifying sources with less than 5 percent fines to reduce the need for washing.

5.2 Description of Potential Source Areas

To identify potential subballast source areas, we performed an evaluation of geologic formations that might contain sand and gravel deposits suitable for use or processing into subballast. Since these formations cover very large areas, we also reviewed existing soil databases for indications of location and the distribution of soil deposits that could be processed into subballast.

5.2.1 Geology of Potential Subballast Resources

Geologic deposits that have high potential to be a source of suitable subballast within the search area include several types of unconsolidated alluvium. Alluvium of both the Quaternary and Tertiary Age constitutes the majority of the geologic materials underlying the NRL; therefore, soil deposits that have the potential for yielding subballast aggregate occur through much of the corridor. Soils developed in the alluvium are mapped and described by the USDA/NRCS for many areas of the alignment. In addition, previous literature studies have divided and mapped alluvial deposits based on variations in geologic age, topographic position, nature of the sediments, and the environments of deposition. These factors govern the resulting

material properties of the alluvial materials, and result in some types of alluvium being more suitable for subballast than others.

During the field reconnaissance, we observed the characteristics of several types of alluvial deposits to verify material descriptions in the literature and evaluate if the characteristics of these deposits are representative of the mapped deposits as a whole. Results of the literature review and field reconnaissance were then used to compile a 1:250,000-scale map (Plate 2) showing the location of geologic units that might be suitable sources of subballast. These geologic units were generally derived from those described in Workman et al., 2002.

Alluvial deposits determined to be suitable for subballast sources are described in the following sections, from most favorable to least favorable.

5.2.2 Channel Alluvium

Channel alluvium consists of recent gravel, sand, and silt in active or very recent streambeds along the valley floors of major drainages (Figure 1). Channel alluvium is generally loose, unweathered, and typically is 3 to 30 feet thick. Some drainages may consist of braided channels or streambeds interspersed with areas of older alluvium.

5.2.3 Young Alluvium

Young alluvium is mostly medium to coarse-grained stream deposits consisting of Quaternary boulders, cobbles, pebble gravels, and sand. It may contain local deposits of fine-grained sand and silt in the distal areas of alluvial fans (Figure 2). The deposits are loose to poorly consolidated, and occur in both the proximal and distal parts of alluvial fans, as well as terraces and axial gravel-and-sand-dominated drainages. There is typically no (or very weak) soil development, perhaps incipient development of surface desert pavement, with only minor dissection of the deposits by erosion. The literature reports variable thicknesses, from 3 to 60 feet, and possibly as thick as 90 feet near tectonically active highlands.

5.2.4 Old Alluvium

Old alluvium deposits typically consist of older Quaternary-aged, medium to coarse-grained gravels and sand in dissected older alluvial fan gravels in proximal and mid–basin positions (Figure 3). The deposits are somewhat variably indurated, loose to moderately

consolidated and lie below potentially well-cemented, well-developed calcic to petrocalcic soil horizons (caliche hardpans). The deposits are moderately to deeply dissected, moderately weathered, and have moderate to well-developed desert pavements. They are typically from a few feet to 90 feet thick, but may be as thick as 300 feet in some areas, and may underlie basins to depths of 1,500 feet or more. The upper parts of some old alluvial deposits may not be suitable as subballast sources because of a large percentage of disintegrated, weathered, gravel clasts.

5.2.5 Older Gravels

These deposits consist of the oldest alluvial gravel deposits in upland areas, usually well above the active drainage system. They range in age from early Quaternary to Pleistocene. The deposits are highly weathered, highly dissected, and contain well-developed soils with thick pedogenic-calcrete hardpans and well-developed desert pavements. The deposits generally consist of medium to coarse-grained gravels and sand, with variable induration from poorly consolidated beneath cemented surface soils to well-cemented throughout. Thicknesses range from a few feet to 300 feet, with the literature reporting local thicknesses to 900 feet or more. The upper parts of these deposits are generally not suitable as subballast sources because of the large percentage of disintegrated, weathered gravel clasts, and a high calcium carbonate (caliche) content. Calcium carbonate generally forms continuous, thick coatings on gravel clasts and permeates the finer-grained matrix of these older deposits. If significant quantities of calcium carbonate are present, these materials should not be used as subballast.

5.3 Soil Database Search Results

In order to further limit the search area and assess the likelihood of occurrence of suitable soil deposits that could be used or processed into subballast, we performed a search of soils data obtained from the USDA/NRCS. The USDA/NRCS maintains a nationwide database of soil survey information in the Soil Survey Geographic Database (SSURGO Version 2.1). This database is organized by state, county, and soil area within each county. Information available for each soil area includes soil layers, layer thicknesses, soil texture descriptions, grain size distribution ranges, and a quantitative and qualitative evaluation of each area as a potential source of sand or gravel for construction purposes. The SSURGO database program and data were downloaded in Microsoft Access™ format from the USDA/NRCS Soil Data Mart web site http://soildatamart.nrcs.usda.gov/.

No soil data are available for several areas along the alignment where the USDA/NRCS has not yet performed a soil survey: (1) the NTS, (2) the NTTR, (3) the portion of western Lincoln County east of the Worthington Mountains and south of the Nye County Line, and (4) a portion of Lincoln County between Timber Mountain Pass and Bennett Pass. Areas where there are no soils data are shown on Plate 2.

The following areas that contain most of the Caliente Rail Corridor were downloaded.

Area Symbol	Area Name
NV611	Pahranagat-Penoyer Area, Nevada, Parts of Lincoln and Nye Counties
NV613	Meadow Valley Area, Nevada and Utah
NV781	Nye County, Nevada, Northwest Part
NV783	Nye County, Nevada, Northeast Part
NV785	Nye County, Nevada, Southwest Part
NV796	Esmeralda County Area, Nevada

In our opinion, soils most suitable for use or processing into subballast are typically well-graded sands and gravels with not more that 15 percent fines by weight. The Unified Soil Classification System (USCS) categories of coarse-grained soils that might be used as subballast are shown on Table 4. Screening, mixing, and, if required, washing may be required to produce suitable subballast from poorly graded and high-fines-content sands and gravels.

The criteria used to select candidate soil survey areas for future surface exploration for subballast deposits were: (1) proximity to the NRL and (2) likelihood of finding suitable sands or gravels in these areas. Proximity to the NRL was defined as being any soil survey area in the SSURGO database that was intersected by the rail alignment. The likelihood of finding suitable sand or gravel in the proximate areas was taken directly from the quantitative and qualitative evaluations found in the SSURGO database.

The quantitative evaluations in the SSURGO database are based primarily on USCS soil classification, soil grain size, and soil layer thickness. Based on the quantitative criteria, the USDA/NRCS database provides a qualitative evaluation of the likelihood of finding sand or gravel suitable for construction purposes.

The qualitative evaluations of sands and gravels suitable for construction are listed in the SSURGO database as "Poor," "Fair," and "Good." To maximize the likelihood of finding

aggregate suitable for subballast in future surface explorations, only those soil survey areas that are rated "Fair" or "Good" were considered from the database.

Based on the criteria described above, candidate soil survey areas for future surface exploration for subballast were extracted from the SSURGO database. The candidate areas are summarized on Table 5 for sand deposits and Table 6 for gravel deposits. The candidate areas are also shown graphically on Plate 2.

Areas along the NRL that are likely candidates for future surface exploration for sand are limited. Only about 22 miles of the rail alignment are adjacent to soil survey areas that are rated in the SSURGO database as "Fair" or "Good" sources of sand suitable for construction. The range of grain-size distributions for potential sand sources is shown on Figure 4. For comparison purposes, a typical subballast gradation is shown on Figure 4. Specific subballast criteria for the NRL will depend on field conditions and design criteria. The finer-grained sands may not produce suitable subballast. In addition, the sand may require washing to remove fines and screening to remove cobbles to make it suitable for use as subballast. Sand that is not suitable for use as subballast may be suitable for use as fill for embankments.

Soil survey areas that are likely candidates for future surface exploration for gravel are more abundant. Approximately 124 miles of the rail alignment are adjacent to soil survey areas that are rated in the SSURGO database as "Fair" or "Good" sources of gravel suitable for construction. Furthermore, only four sections of the NRL are more than approximately 5 miles from a potential gravel source, and except for the portion of the alignment east of White River, the greatest distance to a potential gravel source is approximately 16 to 20 miles. The range of grain size distributions for potential gravel sources is shown on Figure 5. For comparison purposes, a typical subballast gradation is also shown in Figure 5. The grain size of the gravels in the candidate areas is coarser than is generally used for subballast. These gravels may require screening of cobbles or large rock fragments and washing to remove fines to make it suitable for use as subballast.

There is no soil survey for portions of the alignment east of White River, including the Pahroc Range and Dry Lake Valley, and thus no soil data in the SSURGO database. West of Bennett Pass to either Caliente or Eccles, the SSURGO database does not include soils that are rated either "Fair" or "Good" as sand and gravel borrow sources. Furthermore, the geologic formations in the search area consist largely of older alluvium, older gravels, and lakebed

deposits. Small channel deposits were observed in Meadow Valley that contain sand and gravel deposits, which could be processed into subballast, but their areal extent is not great. During future studies, we recommend additional efforts to characterize sand and gravel deposits in the Meadow and Dry Lake Valleys. These studies should initially include aerial photograph evaluations, additional field reconnaissance, and land status checks to quantify available resources.

The criteria were limited to select candidate soil survey areas for future surface exploration for subballast sands and gravels to those areas immediately adjacent to the NRL. Should future surface explorations indicate that insufficient quantities of suitable subballast aggregate in the candidate areas, it may be necessary to expand the search area in subsequent studies.

6.0 EMBANKMENT FILL

It is assumed that embankments for the roadbed would be constructed from soil and rock excavated from either cuts or borrow pits located adjacent to the alignment. Evaluation of soil and rock located along the alignment for use as embankment fill is discussed in the Preliminary Geotechnical Report (Shannon & Wilson, 2006). The report concluded that much of the excavated soil and rock could be utilized as embankment fill either with or without treatment or processing.

7.0 STONE FOR EROSION CONTROL

7.1 Criteria for Erosion Control Stone (Riprap)

The AREMA Manual (Section 3.4.5) refers to U.S. Army Corps of Engineers (USACE) design manuals for design of riprap protection of structures. The USACE design guidelines require that the stone should be durable, sound, and free from detrimental cracks, seams, and other defects. The stone should be resistant to localized weathering and disintegration from environmental effects such as freeze-thaw cracking. Laboratory tests are recommended where appropriate and may include petrography, unit-weight determination, absorption, sulfate soundness, glycol soundness, abrasion, freeze-thaw resistance, and drop tests. In practice, erosion-control stone is often selected on past satisfactory performance and visual evaluation. For a rock source where

past performance data is not available, quarried stone may be set aside for a minimum of one season to evaluate resistance to weathering and freeze-thaw cycles

In addition to USACE guidelines, the American Society for Testing and Materials (ASTM) Standard D 6092, "Standard Practice for Specifying Standard Sizes of Stone for Erosion Control," describes the characteristics and property requirements for acceptable riprap. The described characteristics and properties are similar to those specified by the USACE.

Gradations for stone sizes depend on intended use and are usually based on the weight of individual stone particles. Dimensions of stone particles are typically on the order of 6 inches to 3 feet. Rock types that typically yield riprap with desirable properties and characteristics include granite, quartzite, basalt (traprock), limestone, dolomite, rhyolite, dacite, andesite, sandstone, breccia, and conglomerate. All of these rock types occur along the rail alignment.

7.2 Description of Potential Source Areas

Rock suitable for use as erosion-control stone (riprap) was observed along many sections of the NRL. Recommended riprap criteria are less restrictive than ballast criteria; therefore, more rock types qualify as suitable for erosion-control use.

Riprap is available from three general sources of rock: (1) hard, durable rock obtained from excavations made for roadbed construction, (2) riprap obtained from any of the identified potential ballast sources listed on Table 2, and (3) stone from quarries developed specifically for riprap. Riprap is likely to come from a combination of these sources. Rock cuts may have surplus rock that can also be used locally as erosion protection. Long sections of track across alluvial fans and basins may need to have riprap hauled in from excavations or from riprap borrow quarries established along the alignment.

7.2.1 Excavated Rock

In general, hard, durable rock that requires drilling and blasting to excavate may be suitable as local erosion-control stone. Suitable rock types include densely welded volcanic tuffs, lavas of several lithologies, and hard limestone, quartzite, and dolomite formations. At many excavation locations, these rock types may meet riprap criteria, but should be evaluated further during future studies.

Exceptions to the use of excavated rock-cut stone as riprap include soft, friable, poorly welded tuffs, and fissile-bedded or flow-banded lavas. Such rocks were observed in the Beatty Wash and Crater Flats areas. In addition, hydrothermal alteration and associated mineralization render rock soft and/or mineralogically unsuitable for riprap. Rock unsuitable for use as riprap because of hydrothermal alteration potentially includes excavated material from many of the volcanic rocks in the Goldfield Hills.

There are also local cut-sections of shale and thin-bedded clastic and carbonate rocks in the Paleozoic sedimentary formations on the eastern portion of the NRL that most likely would not produce rock that would satisfy criteria for riprap.

7.2.2 Ballast Rock Resources

A second source of erosion-control stone is quarries established for ballast. Rock that is sufficiently hard and durable for ballast is also likely to be suitable for use as riprap. Since riprap gradations typically range from 6 inches to 3 feet in diameter, riprap could be produced from zones of widely jointed rock in ballast quarries.

7.2.3 Riprap Borrow Quarries

Smaller local borrow quarries could supply riprap for specific segments of the NRL. For example, a quarry in the Prospect Mountain Quartzite in the Chief Range between Caliente and Bennett Pass could provide riprap for erosion protection along the Caliente or Eccles alternative alignments. Other geologic formations that contain hard and durable rock may be suitable for riprap, including the Shingle Pass Tuff in the Golden Gate Range, Tertiary basalts in the Reveille Valley, Ely Limestone in the North Pahroc Range, and the limestones and dolomites of the Highland Peak Formation at Bennett Pass.

Another potential source of riprap is Tertiary basalt between Springdale and Scotty's Junction. Riprap obtained from rock cuts or quarries in this formation might be used for erosion control for the Tolicha Wash and the Armagosa River crossings. Evaluation of potential riprap quarry sites in these formations could be completed as part of future studies.

Many of the tuffaceous rocks along the NRL exhibit large variations in the degree of welding over short distances. Riprap production from these units may not be feasible. In addition, some other rocks that are unsuitable for development of riprap include brecciated or

hydrothermally altered rocks in the Goldfield Hills and lakebed deposits in the Meadow Valley area.

In many areas where the rock type meets the durability and strength criteria for riprap, discontinuities are too closely spaced to produce large quantities of adequately sized riprap. Additional site-specific geologic reconnaissance would required to locate quarries for riprap production.

8.0 AGGREGATE FOR CONCRETE

8.1 Criteria for Concrete Aggregate

The AREMA Manual (Chapter 8, Section 1.3) specifies the characteristics and property requirements for acceptable concrete aggregate. Concrete aggregate should also generally conform to the requirements of ASTM C 33 "Standard Specifications for Concrete Aggregates."

Concrete aggregate consists of natural sand and gravel, or crushed rock when suitable natural deposits are not available. Suitable aggregate is composed of clean, uncoated, properly shaped particles of strong, durable materials that are resistant to chemical or physical changes.

Aggregate should be free of silt, clay, mica, coal, organic matter, chemical salts, and surface coatings to avoid decreased strength and durability. In order for aggregate to resist the influences of weathering, mineral or rock particles that are physically weak, absorptive, easily cleavable, or that swell when saturated, are to be avoided.

Chemically reactive aggregate can cause premature deterioration of concrete. A reaction can occur between the reactive aggregate and the alkalis in the cement. Known reactive substances include chalcedony, silica minerals, and opal. Although pure limestones and dolomites are not deleteriously reactive, they could contain opal and chalcedony that could result in alkali-aggregate reactivity.

Aggregate in concrete makes up from 70 to well over 80 percent of the total solid volume of the mix. The particle-size distribution of aggregate is determined by a typical range between ¾ inch and No. 100 sieves. For walls and other structures where smooth surfaces are desired, the fine aggregate should be graded so that not less than 15 percent would pass the No. 50 sieve, and not

less than 3 percent would pass the No. 100 sieve, with no aggregate larger than 2½ inches (to facilitate pumping). Mixes having more coarse aggregate require less water and less cement per cubic yard than do mixes with less coarse aggregate. However, compressive strength varies inversely with maximum size of aggregate.

Usually, any potable water is suitable as mixing water for concrete. Under certain conditions, acceptable non-potable water could be used. However, mixing water should not contain an excessive amount of silt or suspended solids. A turbidity limit of 2,000 parts per million (ppm) is a reasonable maximum. Proposed water containing sulfates should be analyzed. A concentration of up to 3,000 ppm of dissolved sulfates has been shown to have no detrimental effect when used for mixing or curing.

8.2 Description of Potential Source Areas

The criteria for aggregate suitable for use in concrete is far more restrictive than natural sand and gravel used for subballast. In particular, coarse concrete aggregate must have a very high percentage of durable particles that are free from adherent coatings. As described above in Section 5.2, Old Alluvium and Older Gravel deposits are less likely to be suitable sources of concrete aggregate because of their higher content of weathered, rotted gravel clasts, and the pervasive pedogenic, calcium-carbonate clast coatings characteristic of these deposits. The potential for alluvial gravel-sourced concrete aggregate in the Caliente corridor is therefore probably restricted to deposits of Channel Alluvium and Young Alluvium.

A new quarry could also be developed along the NRL as a source of crushed rock. We anticipate that crushed gravel produced from many of the potential igneous-rock ballast sources identified within the search area would likely be suitable as coarse concrete aggregate. There are undoubtedly exceptions, and laboratory testing as described in the referenced standards is recommended during subsequent studies to determine if selected ballast sources meet concrete aggregate criteria.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 Ballast Sources

Potentially exploitable ballast sources were identified throughout the search area. Twenty of the 52 source areas listed in the literature search appeared to warrant further study (Table 2). These 20 source areas include limestone and dolomite. If limestone is not used as ballast, as is currently anticipated, the number of potential ballast sources is reduced to 12 areas. Because of multiple choices for ballast sources, the selected location of construction staging areas would drive final selection of any new ballast quarry.

Seven ballast source sites are recommended as most favorable for quarry sites from the 20 alternatives noted for further investigation. These seven are considered favorable quarry sites because of combinations of desirable ballast rock quality, close proximity to the alignment, and favorable geographic location to potential construction staging areas served by existing highways. The seven recommended ballast sources are listed in Table 7. Those sites were visited in the field, and rock samples were taken and visually evaluated for their potential to provide ballast.

Once a construction staging area is chosen, ballast sources identified in this report that are near the designated construction staging area could be investigated in more detail. Additional geotechnical work recommended for characterizing and selecting a potential ballast source for development would include:

- Detailed site-specific literature search on the specific deposits.
- Land status research with the BLM and County Clerk and Recorder's offices to verify surface and mineral rights ownership.
- Geologic reconnaissance including mapping, site surveys, laboratory testing of surface samples, and limited surface explorations.
- Based on the results of laboratory testing on samples taken from potential future services candidate sites (see Table 2, Potential Ballast Sources Areas), additional surface explorations and laboratory testing at the selected candidate ballast quarry site.

Rock quality, land status, site layout, and mineability of the deposit would ultimately determine the best quarry location for the chosen construction staging area.

The evaluation of potential ballast quarry sites is described in more detail in the Ballast Quarry Report (Shannon & Wilson, Inc. 2006b).

9.2 Subballast Recommendations

Field reconnaissance indicates a high likelihood of finding suitable sands and gravels for subballast throughout most of the search area. Much of the NRL crosses vast expanses of alluvial sand and gravel deposits suspected of being suitable for construction use. We anticipate that borrow sites in these deposits can be opened at selected locations very close to the alignment, largely based on the cost of processing and transporting subballast. Based on our observations and literature research, native deposits will need to be screened, mixed, and washed in order to obtain suitable subballast. Figures 4 and 5 can be used in conceptual level studies to estimate approximate volumes of aggregate that would need to be screened and, if appropriate, washed. In addition, where the embankment fill approximates the gradations shown on Figures 4 and 5, it may not be necessary to transport and place a separate subballast layer.

Recommendations for further characterization of potential construction aggregate deposits in future studies follow:

- Use results of future, detailed mapping, sampling, and geotechnical soils analysis on the alignment to further refine areas of higher quality construction and subballast aggregate. Bulk samples of borrow materials can be collected to help develop processing requirements and determine percentages of the various size fractions for target deposits.
- Use future, aerial photography of the alignment to map additional deposits of potential construction aggregate adjacent to or very near the alignment. Aerial photography coupled with subsurface exploration (borings and test pits) conducted in part of the future studies could then be used to prepare more detailed maps of potential sand and gravel sources.
- If appropriate, geophysics can be used to define depths and qualitative attributes of potential construction aggregate for large areas along the alignment.
- Preliminary excavation for embankment preparation should be used to map, sample, and confirm suitable construction aggregate sources.
- Availability of water may factor into the preferred location of construction aggregate processing areas. Water resource availability should be investigated further during future characterization work in relation to construction aggregate processing.

Additional efforts would be required in the Dry Lake and Meadow Valley areas on the eastern end of the alignment to characterize the potentially available sand and gravel resource. The results of this study indicate that the availability of suitable sand and gravel deposits for use as or

processing into subballast may be limited in these areas. These efforts should include an evaluation of areal photographs, a field reconnaissance, and a review of land status.

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TABLE 1
RECOMMENDED LIMITING VALUES OF TESTING FOR RAILROAD BALLAST

Rock-Sourced Ballast Material[1]						
Property	**Granite**	**Traprock and Basalt**	**Quartzite**	**Limestone**	**Dolomite**	**ASTM Test**
Fines Content (percent material passing No. 200 sieve)	1.0%	1.0%	1.0%	1.0%	1.0%	C 117
Bulk Specific Gravity	2.60	2.60	2.60	2.60	2.65	C 127
Absorption Percent	1.0	1.0	1.0	2.0	2.0	C 127
Clay Lumps and Friable Particles	0.5%	0.5%	0.5%	0.5%	0.5%	C 142
Degradation[2]	35%	25%	30%	30%	30%	(3)
Soundness (Sodium Sulfate) 5 Cycles	5.0%	5.0%	5.0%	5.0%	5.0%	C 88
Flat or Elongated Particles	5.0%	5.0%	5.0%	5.0%	5.0%	D 4791

Notes:
(1) The limit for bulk specific gravity is a minimum value. Limits for other tests are maximum values.
(2) Also known as " Los Angeles Abrasion Test"
(3) Materials having gradations containing particles retained on the 1-inch sieve shall be tested by ASTM D 535. Materials having a gradation with 100% passing the 1-inch sieve shall be tested by ASTM C 131.

ASTM: American Society for Testing and Materials.

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TABLE 2
POTENTIAL BALLAST SOURCE AREAS

Map ID No.	Rock Type	Geographic Area/ Location	Miles From Alignment	Published Description (Source)	Field Visit /Sampled	Phase 2 Candidate	Photo No.	Geologic Resource Aspects	Physical and Terrain Characteristics	Comments
CA-1	GRANITIC ROCKS	North end of Worthington Mtns. At pass between Sand Spring Valley and Garden Valley	**1**	Granite stocks and dikes (Tschanz and Pampeyan, 1970)	Y/Y	**Y**	312-313	Granite intrusive, moderate to high strength, medium to fine grained, white, weathering to orange and red; forms rounded outcrops at foot slopes of Worthington range.	Good sized outcrop area very close to alignment with good access & favorable quarry aspects, Freiburg mine nearby; adjacent to Wilderness study area that could cause conflicts.	This potential resource is worth additional followup work in phase 2.
CA-3	ANDESITE	Intrusive bodies in Seaman Range near Seaman Wash	**10 to 15**	Andesite volcanic neck and intrusives, may be hydrothermally altered (Tschanz and Pampeyan, 1970)	N	N	N	Andacite intrusives, reportedly hydrothermally altered, and may not be suitable rock quality.	One outcrop is adjacent to Wildlife study area and the other represents a smaller, mostly subsurface resource that would involve open pit mining below surrounding grade.	Better resources with fewer conflicts much closer to the alignment in this area. Not considered further.
CA-4	LIMESTONE and DOLOMITE	Numerous scattered outcrops in south end of the Seaman and north end of Pahranagat ranges	**10 to 20**	Typical group of Palezoic Carbonate formations forming part of the range cores; includes Joana, Mercury, and Devils Gate Limestones; Guilmette Formation; and Simonson Dolomite (Tschanz and Pampeyan, 1970)	Y/N	N	320	Large outcrop areas. Thick bedded limestone and dolomite with karst cavities. Could be a good alternate resource if needed.	Forms low hills and foot slopes on both sides of Seaman Wash in the Seaman Range; Good access, but farther from the alignment than other outcrops of the same formations. Closer if GV-4 alignment chosen.	Not considered further
CA-5	BASALT	Scattered flows and intrusive bodies on both valley walls of White River Valley near and farther south of the alignment	**2 to 15**	Tertiary Basalt flows and intrusives (Tschanz and Pampeyan, 1970)	Y/N	**Y**	321-323	Flows and intrusions of high to very high strength basalt along faults on flanks of Seaman and North Pahroc Range. Some flows appear to be of variable rock quality.	Some extensive outcrops near Seaman Wash; other outcrops only 2 miles from alignment need evaluation to determine quality and quantity. No access at present, would need access improvement to investigate these prospects. A good secondary alternative resource in this area.	Too thin and small for mining; not considered further.
CA-6	BASALT	Small scattered basalt flows on east side of North Pahroc Range in Dry Lake valley	**10 to 14**	Tertiary Basalt flows (Tschanz and Pampeyan, 1970)	Y/Y	N	400-402	Moderate to high strength, gray and brown, vesicular basalt flows to 30 ft. thick, in part overlain by tuffaceous sediments and ash flows; on steeply tilted surfaces.	Very thin older flows on tilted surfaces, underlain by softer volcanic tuffs.	Deposits too thin; steep slopes not conducive for quarry operation; not considered further.
CA-7	LIMESTONE and DOLOMITE	Scattered outcrops in crest and east slopes of North Pahroc Range	**0 to 2**	Typical group of Palezoic Carbonate formations forming part of the range cores, includes Joana, Mercury, and Devils Gate Limestones (Tschanz and Pampeyan, 1970)	Y/N	**Y**	374	Medium high to high strength dolomite with close to medium spaced fractures; interbedded with very high strength quartzite and moderate strength platy limestone and dolomite.	Large outcrop areas at crest of Pahroc range on the alignment, and close by on east side bordering Dry Lake Valley.	This potential nearby resource is worth additional followup work in phase 2. Cuts through this rock are probable in the crest of the North Pahroc range.
CA-8	QUARTZITE	Extensive outcrops in Chief Range at Antelope Canyon	**0 to 5**	Prospect Mountain Quartzite, pre-Cambrian (Tschanz and Pampeyan, 1970)	Y/Y	**Y**	382- 389	Very high strength, white, pink and brown quartzite in thin to thick beds; iron-oxide coatings on joints and surfaces, weathers to dark reddish brown in outcrop; clean with no clay or undesirable materials	Large outcrop areas in Chief Range, at Bennet Pass, and in Antelope Canyon at Caliente; Previously quarried in Antelope Canyon, but steep slopes and previous development would make renewed quarrying difficult here; may need to locate new quarry site.	Excellent high quality material and plenty of outcrop areas near alignment warrant further evaluation for potential quarry site. Site contains potential paleontologic resources (fossil beds), so use may require coordination with BLM.
CA-9	LIMESTONE and DOLOMITE	Extensive outcrops in Burnt Springs, Black Canyon, and Highland Ranges	**0 to 6**	Cambrian Highland Peak and other Palezoic Carbonate formations forming steep slopes and range crests (Tschanz and Pampeyan, 1970)	Y/Y	**Y**	369, 370, 376, 377	Very high strength, gray to dark gray, fine to coarse grained, medium to thick bedded limestone and dolomite; locally brecciated; contains black chert nodules and thin beds in some parts; emits hydrogen sulfide odor upon fracturing.	Extensive deposits very close to and directly on the alignment; variability needs to be evaluated to determine if good beds for mining exist. Alignment will be forced into cuts in this rock on west side of Bennet Pass.	Generally good quality rock; some variable quality concerns; would need to evaluate best quarry site. Abundant outcrop area.
CA-10	BASALT/ ANDESITE	Two outcrops south of "The Bluffs" Between Burnt Springs and Chief Ranges	**1 to 2**	Basalt, (Tschanz and Pampeyan, 1970); Altered andesite and dacite lavas (Ekren et al, 1977)	Y/Y	N	380	Moderate strength, black, medium to coarse grained altered andesite and dacite, with quartz and olivine. Coarse grained zones are weathered and weaker than surrounding rock. Also includes some vesicular basalt. Not durable enough for ballast; crumbles upon weathering and would not process well.	Low rounded outcrops in faulted contact with Paleozoic limestone.	Poor quality, highly variable materials; not considered further.
CA-11	GRANITIC ROCKS	Two outcrops in the Cedar Range east of the Eccles Siding	**4 to 7**	Diorite and monzonite plugs and stocks (Ekren et al, 1977)	Y/Y	N	396	Medium to high strength, light gray to dark, fine to medium-grained monzonite; weathers to low strength rock in outcrop; mineralized with secondary copper (azurite, malachite) along some faults and fractures.	Low, indistinct outcrops; would require below-grade open pits to quarry. Good access via existing county gravel road. Potential unpatented mining claim conflicts.	Could be a secondary or alternate resource, but would need drilling and more field work to better define rock quality and quantity.

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CA-12	BASALT	Extensive areas on upland benches above Clover Creek Canyon and existing UPRR, east of Caliente. Also one outcrop adjacent to RR on north side at Eccles.	**0 to 3**	Older basalt (Ekren et al, 1977)	Y/Y	**Y**	393-394	Medium to high strength, gray and dark-gray, black-weathering, vesicular, aphanitic olivine basalt; crudely jointed and bedded, in flows less than 100 feet thick. Highly vesicular flows observed may not meet density requirements for ballast.	Underlies extensive flat upland benches on south side of Clover Canyon, above UP main line. Sampled well south of canyon due to access restrictions along RR tracks. Potential quarry operations on upland bench could conveyor-feed directly down to existing RR corridor (would need new siding).	Need further evaluation of deposit to determine if rock quality warrants consideration as a potential resource. Proximity to existing RR line is attractive for economical transport of ballast.
DV-1	QUARTZITE	Low outcrops west of Big Dune in Amargossa Valley	**13**	Stirling Quartzite, Precambrian yellowish gray quartzite and conglomerate; interbedded with dolomite and some limestone, minor local silty and sandy beds (Cornwall,1972)	N	N	165	High rock quality. Abundant outcrop area	Resource borders California and Death Valley National Park. Would have to deal with both Nevada and California in permitting	Not considered further due to probable cultural and administrative conflicts.
DV-2	LIMESTONE and DOLOMITE	Striped Hill, Skeleton Hill, Specter Range at Lathrop Wells NV.	**9 to 12**	Bonanza King & Nopah Fm; Cambrian, thin to thick bedded dolomite with limestone, minor beds of sands and shales, 3,000 feet thick (Cornwall, 1972)	Y/N	N	N	Abundant resource adjacent to and partly on the NTS. Interbedded with quartzite; rock generally good quality.	Good access, along main road into Yucca Mountain Project. Hidden from highway view on North end of Specter Mtns. Long haul to the alignment.	Part of resource is on NTS and couldn't be used off site; resource is farther away from alignment than other good resources
DV-3	LIMESTONE and DOLOMITE	Bare Mountain near Beatty NV	**4 to 6**	Bonanza King & Nopah Fm; Cambrian, thin to thick bedded dolomite with limestone, minor beds of sands and shales, 3,000 feet thick (Cornwall, 1972; Cornwall and Kleinhampl,1961)	Y/Y	**Y**	173	Abundant resource in mining area on west side of Bare Mtn. Needs to be checked for local site specific rock quality.	Good access, via existing mine roads and BLM roads. Good terrain and plenty of room. Could be some unpatented claim conflicts from existing mining.	Need to determine local rock quality in better quarry locations if selected for further assessment .
ES-4	GRANITIC ROCKS	Weepah and General Thomas Hills south west of Tonopah NV	**18-20**	Granite and Qtz Monzonite and dacite (Sargent and Roggensack 1984)	N	N	N	Lone Mtn pluton; coarse to med. Grained granite and qtz monzonite; cut by diabase dikes	Very remote from alignment; large areas of outcrop in Lone Mtn Mining District.	Almost 20 miles from alignment, would need significant road construction, must haul across Hwy 95. Not considered further, as there are other better resources much closer.
ES-7	BASALT	Malpais Mesa at Goldfield NV	**5**	Malpais Mesa Basalt (Roggensack et al 1984)	Y/Y	Y	230, 231	Olivine basalt flow that overlies tuffaceous sediments on Mesa at Goldfield Nevada; 0 to 100 feet thick; extensive outcrops; some flows appears to be more andesite than basalt	Caps large 9 square mile mesa adjacent to Hwy 95 at Goldfield. Would need new road access up steep slopes from main highway.	Good access to GF4 alternative. No mining claim conflicts.
ES-11	GRANITIC ROCKS	Slate Ridge and Gold Mountain west of Scotty's Junction NV	**17**	Cretaceous to Jurassic andesite and monzonite (Sargent and Roggensack 1984)	Y/Y	N	206, -209	Medium to coarse grained adamellite, intrudes pC Wyman Fm (siltstone and limestone); also some aphanitic to medium-grained andesite. High to moderate strength, coarse grained biotite quartz-monzonite, has mixed strength zones based on grain size;	Located near Goldpoint NV on Hwy 71 SW of Lida Jct. Many good quarry locations, good access via numerous existing roads and hwy. Quite far from the alignment, would have to haul through town of Gold Point, or build many miles of new road.	Not considered further; better ballast resources closer to alignment in this area of the corridor. Variable strengths in outcrops observed.
GF-1	DOLOMITE and LIMESTONE	Clayton Ridge and Montezuma Range west of Goldfield	**14-18**	Paleozoic carbonate rocks, including Deep Springs Limestone (Albers & Stewart, 1972)	Y/Y	N	245	Deep Springs Fm; dominantly moderate to high strength limestone and dolomite, finely crystalline, thin bedded, gray and pale orange. Minor siltstone interbeds. 500+ feet thick	Remote, poor access, but plenty of resource. Very difficult access up long narrow canyon	Better quarry sites due to remoteness and access difficulty. Not considered further
GF-2	ANDESITE and DACITE	Goldfield Hills Mining District east of Goldfield NV	**0**	Dacite and rhyodacite intrusions and flows in Goldfield hills (Cornwall, 1972)	Y/Y	N	219, 220-224	Rocks of intermediate composition including flows, intrusive masses; mostly dacite with les extensive rhyodacite; extensive areas of intense hydrothermal alteration and sulfide mineralization have turned rock into clayey soft masses of low strength materials. Must consider acid-generating potential as rock may be mineralized.	Probable conflicts with unpatented and patented mining claims. Very good access to resources; must carefully select and evaluate potential quarry sites based on rock quality.	Many areas of very poor rock quality and numerous mineral claim conflicts; not considered further.
GF-3	DOLOMITE and LIMESTONE	Adj. To Hwy 25 in RR Valley	**3**	Paleozoic carbonate rocks (Cornwall, 1972)	N	N	N	Limestone and dolomite, thin bedded, minor siltstone interbeds	Small deposit bordering the Nellis AFB Range.	Too small, conflicts with AFB range and not considered further.
GF-4	DOLOMITE and QUARTZITE	Stonewall Mountain at Stonewall Flat/ Ralston	**4**	Pre-Cambrian dolomite and quartzite carbonate rocks (Albers& Stewart, 1972)	Y/N	N	213	Reed dolomite and wood Canyon quartzite; Deposit partly buried by Tertiary volcanics of Stonewall Mountain.	Deposit is too steep to practically develop; on boundary w/ Nellis Bombing Range, and is close to a spring that is closed to mineral leasing.	Not considered further.

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GF-5	DOLOMITE and LIMESTONE	at Lida on Hwy. 266	**18**	Paleozoic carbonate rocks (Albers & Stewart, 1972; Ashley, 1975)	Y/N	N	210, 211	Deep Springs Fm; dominantly limestone and dolomite, finely crystalline, thin bedded, gray and pale orange. Minor siltstone interbeds. 500+ feet thick	Deposit in steep faulted outcrops at Lida NV; adjacent to Hwy but limited outcrop, limestone is thin bedded in steep exposures.	Too far from alignment, much better resources located closer to or on alignment. Not considered further.
GF-6	DOLOMITE and LIMESTONE	Mt Dunfee/ Slate Ridge near Gold Point & Hwy 71	**12**	Paleozoic carbonate rocks (Albers & Stewart, 1972)	Y/N	N	204, 205	Deep Springs Fm; dominantly limestone and dolomite, finely crystalline, thin bedded, gray and pale orange. Minor siltstone interbeds. 500+ feet thick	Located near Goldpoint NV on Hwy 71 SW of Lida Jct. Many good quarry locations, good access via numerous existing roads and hwy.	12 mile haul to alignment, adjacent to town of Goldpoint, highly visible at base of prominent landmark. Not considered further due to better resources in this section of the corridor
GF-7	BASALT and DACITE	Sarcobatus Flat along Hwy 95	**0**	Basalt and andesite/ dacite (Cornwall,1972)	Y/Y	**Y**	178, 182-184	Large deposits of very high strength basalt and rhyodacite; dense, high strength olivine basalts and aphanitic flows; slightly weathered; forms large outcrops and ridges of blocky-weathering bouldery outcrops; thickness 30-90 feet, rests on poorly welded ash fall tuff.	Adjacent to hwy 95 and on alignment, many good quarry locations.	RR will have to make cuts in this rock. Access is good and directly to RR.
GF-8	BASALT	Mt Jackson Ridge along Hwy west of Lida Jct.	**10**	Basalt (Albers & Stewart,1972)	Y/N	N	202, 203	Thin basalts capping sloping surfaces on flanks of ridge; deposits appear too thin for mining.	North of highway 266, would need to build roads for haulage. Better resources closer to alignment.	Deposits are too thin and of suspect quality. Would involve hauling across Hwy 95. Better quarry sites than this, not considered further.
GF-9	ANDESITE	Mt. Jackson Ridge along Hwy 266 west of Lida Jct.	**12**	Andesite flows (Albers& Stewart, 1972)	Y/N	**Y**	212	Low hummocky outcrops of andesite on the lower flanks of Mt. Jackson. High strength rock, abundant volume on east flank of Mt. Jackson. Good quarry sites.	Close to existing Hwy 266, would have to haul across Hwy 95 at Lida Jct. Minimal road construction, would have to upgrade pavement.	Worth considering as a potential alternate resource.
GF-10	BASALT	North east flanks of the Montezuma Range west of Goldfield	10	Basalt (Albers & Stewart,1972)	Y/Y	N	244	Low rounded hills of black to dark gray high strength basalt, crudely bedded blocky outcrops; mostly dense and non vesicular, weathered in outcrop w/ possible montmorillonite or paloyunite in joints and fractures	Difficult access up narrow canyon past springs; basalts may be too thin to quarry in the more accessible areas.	Better resources closer to the alignment in this region. Conflicts with springs and livestock grazing. Not considered further
LD-1	ANDESITE	In Golden Gate Range on the alignment	**0**	Andesite and dacite extrusives, may be hydrothermally altered (Ekren, et al 1977)	Y/N	N	N	Dark gray andesite and dacite lava flows, reportedly hydrothermally altered; may not be suitable.	Directly adjacent to alignment in pass through the Golden Gate Range. Small outcrop near private ranch property; not enough resource, and rock quality is suspect.	Rock quality may be suspect due to hydrothermal alteration. Deposit may be limited in extent due to complex geology, local private property conflict. Not considered further.
LD-2	BASALT	Capping low hills in Golden Gate Range due north of alignment	**3**	Mapped as QT basalt flows 0 to 70 feet thick (Scott, 1965; Roggensack 1984)	Y/Y	**Y**	350- 352	High to very high strength gray, fine grained basalt, some vesicular beds, irregularly spaced joints and fractures; up to 50 feet thick, abundant outcrop area. Deposit is too thin at margins.	Caps low hills in Garden Valley at north end of Golden Gate range. Abundant outcrop area. Close to alignment, needs further site-specific evaluation for quarry site.	Good quality rock close to alignment; need to evaluate best quarry site.
LD-3	LIMESTONE and DOLOMITE	Exposed in Golden Gate Range along Alignment	**0**	Guilmette formation, primarily limestone, but with interbeds of argillaceous and silty rocks, and Ely and Devils Gate Limestone.	Y/Y	N	340-341	Ely Limestone; very high strength, gray to tan, medium to thin bedded, black chert beds and nodules, locally brecciated. Quality is highly variable over short distances. Devils Gate is better target, more consistent rock quality, but still karstic.	Forms cliffs and steep slopes on east side of the Golden Gate Range south of alignment, could make quarry development difficult. Would have to perform detailed prospecting for proper site.	Better resources likely exist. Quarry would be highly visible on the steep range slopes. Located on the alignment; could be further evaluated during phase 2 work.
LD-4	LIMESTONE and DOLOMITE	Exposed in Golden Gate Range along Alignment	**1**	Joana, Mercury, and Devils Gate Limestones (Kleinhample and Ziony, 1985)	Y/N	**Y**	317	Large outcrop areas. Thick bedded limestone and dolomite with karst cavities.	Forms cliffs and steep slopes on east side of the Golden Gate Range at alignment, steep slopes and karst features could make quarry development difficult. Would have to perform detailed prospecting for proper site.	Quarry would be in steep slopes of mountain range; highly visible. Site may contain caves and use may require coordination with BLM.
LD-5	LIMESTONE and DOLOMITE	Large outcrops along alignment in Seaman range north of Timber Mtn. Pass	**0.5 to 3**	Joana, Mercury, and Devils Gate Limestones; also Guilmette Fm. (Kleinhample and Ziony, 1985)	Y/N	**Y**	353-354	Large outcrop areas. Thick bedded limestone and dolomite with karst cavities. Needs further investigation, could be a good alternate resource.	Forms low hills and bluffs on the north end of the Seaman Range . Adjacent to Wilderness study area on south. Good access	May have conflicts with adjacent wildlife management and wilderness study areas. Site may contain caves and use may require coordination with BLM.
LD-6	LIMESTONE and DOLOMITE	Large outcrops south of alignment on west side of Seaman Range alignment in Seaman range north of Timber Mtn. Pass	**3 to 5**	Joana, Mercury, and Devils Gate Limestones; Guilamette Fm; same as LD-4 and LD-5	Y/N	N	N	Large outcrop areas. Needs to be evaluated on a site-by site basis to determine rock quality with respect to undesirable interbeds of argillite and siltstone	Resource abuts the Seaman Range Wilderness Study Area on east side of Coal Valley	May have conflicts with adjacent wildlife management and wilderness study areas. Site may contain caves and may require coordination with BLM.

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LD-7	BASALT	Capping low hills west of White River at Whipple Reservoir	**6**	Mapped as QT basalt flows 0 to 70 feet thick (Scott, 1965; Roggensack 1984)	Y/N	N	355	Small fan-like flows 0-70 feet thick. Limited resource area and resource volume.	Caps low hills east of White River Valley three miles east of wildlife management area. Would have to haul through or around wildlife management area to access alignment.	Better resources in this area. Quarry would be highly visible from wildlife management areas; not considered further.
LD-8	LIMESTONE and DOLOMITE	Forms Gap and Fox Mtns on east side of White River Valley, south of town of Sunnyside NV	**7 to 14**	Mostly Devils Gate Limestone and other Paleozoic carbonate rocks	Y/N	N	356, 339	Large outcrop areas, abundant resources; thick bedded limestone and dolomite with karst cavities. Needs further investigation, a good possible alternate resource	Caps named isolated mountain features 2 to 4 miles east of wildlife management area. Excellent access via existing BLM and county roads. Need site specific investigations to select appropriate quarry site.	Possible conflicts with adjacent wildlife management area, quarry could be visible from Hwy 318. A good alternate, but better resources exist in this area. Not considered further.
LD-9	LIMESTONE and DOLOMITE	Forms steep mountainous slopes in Egan and Schell Ranges on both sides of Cave Valley	**16 to 20**	Typical group of Palezoic Carbonate formations forming part of the range cores, includes Joana, Mercury, and Devils Gate Limestones (Tschanz and Pampeyan, 1970)	N	N	N	Large outcrop areas form steep slopes of ranges . These are the same formations as LD-8 and LD-11.	Steep mountain slopes flanking both sides of Cave Valley. Near the 20 mile limit from the alignment. Poor gravel roads would need to be improved.	Better resources closer to the alignment, with less impacts to mountain areas. Not considered further.
LD-10	GRANO-DIORITE	On west side of Schell range at south end of Cave Valley	**14**	Silver King Stock; altered granodiorite (Tschanz and Pampeyan, 1970)	Y/Y	N	357, 358	Altered granodiorite to andesite porphyry intrudes Pennsylvanian-Devonian sedimentary rocks. Moderate to high strength; quality variable over short distances due to alteration and grain size; some parts of resource would not meet ballast quality parameters for strength and abrasion resistance.	Low footslope position below peaks in southern Schell Range. Large outcrop area, is weathered into fins and ridges; not in a good quarry position; below-grade pits probably necessary; quite far from the alignment; would require hauling on state Hwy.	Rock strength and quality variability are of concern; difficult quarry operation compared to other resources; not the best resource choice in this area, and therefore not considered further.
LD-11	LIMESTONE and DOLOMITE	Forms steep mountainous slopes around Burnt Peak and in north end of the North Pahroc Range	**3 to 9**	Typical group of Palezoic Carbonate formations forming part of the range cores, includes Joana, Mercury, and Devils Gate Limestones (Tschanz and Pampeyan, 1970)	Y/N	**Y**	337	Moderate to very high strength limestone and dolomite; highly variable; thinly to thickly bedded; locally cherty, argillaceous, or platy. Large outcrop areas form steep slopes in core of ranges and lower foot hills. These are the same formations as LD-8 and LD-9. Mostly Devils Gate Limestone, and Guillmette Formation as described above.	Some outcrops in lower footslope positions around Burnt Peak appear amenable to quarry operations; access is generally good. This resource is one group of numerous Paleozoic carbonate resources.	Good quality rock close to alignment; need to evaluate best quarry site.
LD-12	BASALT	Thin intrusions and flows from fault fissures in North Pahroc Range	**2 to 5**	Tertiary Basalt flows and intrusives (Tschanz and Pampeyan, 1970)	N/N	N	N	Flows and intrusions along faults on flanks of Pahroc Range.	Poor access.	Not considered further.
LD-13	ANDESITE	On east side of Mule Shoe Valley, on footslopes of Fairview Peak	**17**	Andesite (Tschanz and Pampeyan, 1970)	Y/Y	N	359- 361	High to very high strength, light gray andesite, weathering to pinkish gray, fine grained andesite porphyry. Good quality resource.	Forms low indistinct rounded outcrops in foot slopes of range; quarry would be a pit or high-overburden stripping along foot hill slopes; too far from alignment; hauling would require at least 17 to 20 miles of road improvements.	Excellent quality resource, but likely too far from alignment to be of real interest. Not considered further.
LD-14	LIMESTONE and DOLOMITE	Forms West Ridge and northern end of Bristol Range at Bristol Pass	**10**	Typical group of Palezoic Carbonate formations forming part of the range cores, includes Joana, Mercury, and Devils Gate and Guillmette Limestones (Tschanz and Pampeyan, 1970)	Y/N	**Y**	N	Large outcrop areas form steep slopes of West Ridge and steep slopes in Bristol Range; . These are the same formations as LD-8 and LD-9. Mostly Devils Gate Limestone and Guillmette Formation, as described above.	Outcrops in West range appear extensive and have many potential quarry sites. Steep Bristol Range outcrops have mining conflicts and poor access.	Generally good quality rock; would need to evaluate best quarry site. These same formations are in closer locations to the alignment that may prove better resource sites. The West Range area is a good alternate resource.
NN-5	BASALT	North east of Tonopah, San Antonio Mtns.	**6 to 20**	Basalt flows capping isolated hills and crest of San Antonio Mtns (Roggensack et al 1984)	Y/N	**Y**	266-268	Prophyritic trachyandesite basalt flows, intrusives, vents and scoria; Rock quality appears high, some local deuteric alteration. Some deposits may be too thin; overlies Siebert Fm in some areas; thickness from 0 to 1,000 ft; needs further site specific evaluation.	Large outcrop areas on Booker Mtn and Thunder Mtn 10 and 16 miles from alignment; other deposit capping steep sided isolated hills and mesas are too small. Would have to haul across Hwy 6.	Quite far from alignment, but good volume of resource; potentially more economic sites are available closer to alignment; these resources are an alternative that can be evaluated in Phase 2.

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NN-8	BASALT and ANDESITE	Around Warm Springs Summit and north end of Reveille Valley	**0 to 3**	Basalt flows 0-200 ft thick around Warm Springs Summit and 0-800 ft thick at north end of Reveille (Roggensack et al 1984)	Y/Y	Y	289, 297-304	Glassy basaltic andesite flows showing hackly jointing; max thickness 65 ft around Warm Springs Summit. Very high strength dark gray porphyritic olivine basalt flows up to 200 ft. thick; widely spaced joints; fresh; forms low rolling hills on west flank of Reveille Range at Warm Springs Summit.	Small areas of rock around Warms Springs Summit; located in Clifford and Mercury Mtn. Mining districts; parts of deposit appear hydrothermally altered and may have poor rock quality; deposits may be too small and thin to mine. Large outcrop area with many good quarry sites at north end of Reveille Range, adjacent to alignment. Wilderness Study area to south might create conflicts.	Small scattered deposits with suspect rock quality and potential mining claim conflicts around Warm Springs Summit. Location may be advantageous for quarry siting based on construction phasing; some deposits may warrant further evaluation. Excellent resource at north end of Reveille Valley, close to alignment, needs further evaluation in Phase 2.
NN-9	BASALT	South end Reveille Valley	**0**	Basalt flows 0-800 ft thick (Roggensack et al 1984)	Y/Y	N	306-308	Porphyritic olivine basalt flows locally intercalated with beds of colluvium and alluvium up to 100 ft. thick; need to determine rock quality.	Adjacent to alignment, but also borders the south Reveille range WSA. Also very close to Nellis AF range. Large outcrop area with many good quarry sites.	Excellent resource, but probably conflicts with adjacent WSA and Nellis AFB range. Better resource is on north end of Reville Valley. Not considered further.
NS-1	BASALT	Adjacent to and north west of Mud Lake	**0-4**	Basalt flows capping low hills and fans (Roggensack et al 1984)	Y/Y	**Y**	262- 265	Prophyritic olivine basalt flows; Rock quality appears high. Some flows may be thin; need to evaluate further	Large outcrop on the alignment at Mud lake; other deposits are 2 to 3 miles NW from RR, capping steep hills and mesas , New access construction needed to these areas.	Adjacent to the alignment, short hauls to stockpile, need access construction. Can be evaluated in Phase 2.
NS-3	BASALT	North end of Goldfield Hills SW of Mud Lake	**0**	Basalt flows 0-200 ft thick (Roggensack et al 1984)	Y/Y	**Y**	222, 223	Porphyritic olivine basalt flows that overlie Thirsty Canyon Tuff; flows lower down near alignment appear very thin 0-20 feet in outcrop. many areas mapped as basalt are andesitic tuffs and flows. Rock quality is high. Large areas/ volumes of resource adjacent to alignment.	Large mapped outcrop area; Best deposits are 2 to 3 miles from RR, capping steep hills and mesas 200 to 300 feet above the track level. New access construction needed.	Large areas of deposits, high rock quality, but have no access. Best resources are three miles from alignment on ridge/ mesa tops.
NS-6	BASALT	North end of Kawich Valley	**2.5**	Basalt flows and dikes, probable cone or vent (Roggensack et al 1984)	N	N	N	Aphanitic olivine basalt, some scoria, 0 to 200 ft thick	Too small a deposit available due to conflict with Nellis AFB Range	Not considered further
NS-8	BASALT	North side Oasis Valley	**2**	Dense porphyritic Basalt 0-100 feet thick underlies tuffs (Roggensack et al., 1984)	N	N	N	Underlies tuffs, potential overburden issues	Conflicts with Nellis AFB makes available resource area too small, also adjacent to private ranch property.	Too small, conflicts with AFB range and private property; not considered further.
NS-9	BASALT	West side Forty-mile Canyon, Buckboard Mesa; all on the NTS	**8**	Quaternary & Tertiary Basalt flows 0-250 ft. thick (Roggensack et al 1984)	N	N	N	Basalt flows, cinder cones, spatter cones, can have rubbly scorriaceous zones, some locations interbedded with gravels and tuffaceous seds. Large resource area, need to check for rock quality on site-basis. Gravel interbeds could be problematic.	Located on the NTS north of YMP area, owned by DOE(?) Need road up Forty Mile Wash.	Determine administrative framework for extracting resource on the NTS. Could be a resource but needs quality check. Better resources closer in.
NS-11	BASALT	Scattered smaller outcrops around Beatty NV	**4 to 10**	Tertiary fine-grained basalt flows interbedded with tilted/faulted tuff (Roggensack et al 1984),	Y/N	N	175	Smaller resources, thin flows of variable quality rock; limited resource areas	Close to existing highway and BLM main roads. Also within 1 to 2 miles of Beatty. Rough terrain will require 4 miles of road construction;	Resource is close to town and could create mining conflicts. Somewhat limited resource area, thin flows limit quarrying; rock quality is also suspect. Deposits generally do not warrant further investigation.
NS-12	BASALT	Skull Mtn, Little Skull Mtn, and low outcrops in JackAss Flats on the NTS; also Basalt flows at south end of Crater Flats	**1 to 10**	Hard to very hard, black to dark brown, Dense Tertiary basalt 0 to 300 ft. thick (Roggensack et al 1984)	Y/Y	**Y**	163, 167, 168, 169, 171, 172	Abundant resource, rock quality dominantly good, high to very high strength; some flows are too vesicular or flow laminated, some flows too thin, and some vesicular scoria zones reported. Need site-specific RQ check and drilling in phase 2, but overall there is good resource availability.	Some extensive deposits in Crater Flats only 1 mile from alignment, look to have good rock quality and good quarry attributes.	Only visited those outcrops outside of NTS. This resource is a Phase 2 candidate in Crater Flats due to its close proximity to alignment and abundant, generally high-quality rock.
TH-1	BASALT	North side of Stone Cabin Valley	**2 to 3**	Basalt flows (Kleinhampl & Ziony, 1985)	Y/N	N	271-272	Thin basalt flows capping low, sloping fan-like mesas on south end of the Monitor Range, south of US Hwy 6. Several large-sized deposits, but resource thickness is of concern; may be too thin for mining.	Larger deposits are adjacent to Toiyabe National Forest; and US Hwy 6.	Possible conflicts with adjacent Forest Land, resource appears too thin and in scattered outcrops. Not considered further

TABLE 3
CRITERIA FOR SUBBALLAST SOURCES

Character of Filter Materials	Ratio R_{50}	Ratio R_{15}
Uniform grain-size distribution (U= 3 to 4)	5 to 10	–
Well graded to poorly graded (non-uniform); subrounded grains	12 to 58	12 to 40
Well graded to poorly graded (non-uniform); angular particles	9 to 30	6 to 18

where:

$$R_{50} = \frac{D_{50} \text{ of filter material}}{D_{50} \text{ of material to be protected}} \quad \text{and} \quad R_{15} = \frac{D_{15} \text{ of filter material}}{D_{15} \text{ of material to be protected}}$$

Note:
Grain-size curves (semilogarithmic plot) of subballast and subgrade should be approximately parallel in the finer range of sizes.

Source: Reprinted with permission from 2005 AREMA Manual for Railway Engineering, Chapter 1, Part 2, Section 2.11, Article 2.11.2.5, Table 1-2-3. Copyright American Railway Engineering and Maintenance-of-Way Association, 10003 Derekwood Lane, Suite 210, Lanham, MD 20706, 301-459-3200. A copy of the complete reference may be purchased from AREMA (www.AREMA.org).

TABLE 4
UNIFIED SOIL CLASSIFICATION SYSTEM
SOILS SUITABLE FOR SUBBALLAST

Soil Type	Fines by Weight	USCS Group Symbol	USCS Group Name
GRAVEL	≤5%	GW	Well-graded gravel
		GP	Poorly graded gravel
	5% to 15%	GW-GM	Well-graded gravel with silt or with silt and sand
		GW-GC	Well-graded gravel with clay or with clay and sand
		GP-GM	Poorly graded gravel with silt or with silt and sand
		GP-GC	Poorly graded gravel with clay or with clay and sand
SAND	≤5%	SW	Well-graded sand
		SP	Poorly graded sand
	5% to 15%	SW-SM	Well-graded sand with silt or with silt and gravel
		SW-SC	Well-graded sand with clay or with clay and gravel
		SP-SM	Poorly graded sand with silt or with silt and gravel
		SP-SC	Poorly graded sand with clay or with clay and gravel

USCS = Unified Soil Classification System

TABLE 5
SUMMARY OF POTENTIAL SAND SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Sand Source Potential (3)
CS1	4043+00	4410+00	SW-SM	very gravelly loamy sand	32	15	Fair
CS1	4430+00	4462+00	SW-SM	very gravelly loamy sand	32	15	Fair
CS1	4497+00	4672+00	SW-SM	very gravelly loamy sand	32	15	Fair
CS3	10643+00	10750+00	SW-SM	very gravelly fine sandy loam	8	25	Fair
CS3	10643+00	10750+00	SW-SM	stratified very gravelly sandy loam to extremely gravelly coarse sand	49	25	Fair
CS3	12305+00	12334+64	SP	gravelly sand	5	15	Fair
CS6	16855+00	16877+00	SP-SM	stratified gravelly coarse sand to very gravelly loamy coarse sand	42	50	Fair
CS6	16931+00	16970+00	SP-SM	stratified gravelly coarse sand to very gravelly loamy coarse sand	42	50	Fair
GF1	12334+64	12378+00	SP	gravelly sand	5	15	Fair
GF1	12558+00	12572+00	SP-SM	gravelly loamy sand	33	40	Fair
GF3	52000+00	52658+00	SP	gravelly sand	5	15	Fair
GF4	42000+00	42050+00	SP	gravelly sand	5	15	Fair
GF4	43397+00	43430+00	SW-SM	very gravelly sand	8	20	Fair
SR3	8751+00	8790+00	SW-SM	very gravelly loamy sand	25	40	Fair

Notes:

(1) Maximum thickness in SSURGO Database is 52 inches, actual thickness may be greater.

(2) Percent of Area refers to percent of USDA/NRCS soil unit.

(3) Sand Source Potential based on rating in SSURGO Database.

(4) Stationing updated for Revision 11 alignments, 18 August 2005.

USCS = Unified Soil Classification System

TABLE 6
SUMMARY OF POTENTIAL GRAVEL SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Interpretive Low Representative Value Class	Gravel Source Potential (3)
BC3	14518+00	14525+00	GP	very gravelly sand	8	20	Fair	Fair
BC3	14518+00	14525+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
CS1	5100+00	5148+00	GP-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	35	Fair	Fair
CS1	5280+00	5410+00	GP-GM	very gravelly loamy sand	32	40	Fair	Fair
CS1	5280+00	5410+00	GW	stratified extremely gravelly sand to very gravelly loamy coarse sand	36	25	Fair	Fair
CS3	10057+00	10069+00	GW	extremely gravelly sand	26	85	Fair	Fair
CS3	10100+00	10157+00	GW	extremely gravelly sand	26	85	Fair	Fair
CS3	10157+00	10400+00	GP-GM	very gravelly loamy sand	32	85	Fair	Fair
CS3	10400+00	10418+00	GP-GM	very gravelly sand	5	90	Fair	Fair
CS3	10400+00	10418+00	GW-GM	stratified gravelly loamy sand to extremely gravelly coarse sand	55	90	Fair	Fair
CS3	10418+00	10428+00	GP-GM	very gravelly loamy sand	32	35	Fair	Fair
CS3	10418+00	10428+00	GP-GM	very gravelly loamy sand	35	30	Fair	Fair
CS3	10428+00	10507+00	GW-GM	very gravelly loamy sand	35	40	Fair	Fair
CS3	10507+00	10643+00	GP-GM	very gravelly loamy sand	32	35	Fair	Fair
CS3	10507+00	10643+00	GP-GM	very gravelly loamy sand	35	30	Fair	Fair
CS3	10643+00	10750+00	GW	very gravelly loamy sand	32	40	Fair	Fair
CS3	10643+00	10750+00	GP-GM	stratified very gravelly coarse sand to very gravelly sandy loam	27	25	Fair	Fair
CS3	10750+00	11050+00	GP-GM	very gravelly loamy sand	35	40	Fair	Fair
CS3	10750+00	11050+00	GW-GM	gravelly loamy sand	3	35	Fair	Fair
CS3	10750+00	11050+00	GW-GM	stratified very gravelly sandy loam to extremely gravelly coarse sand	49	35	Fair	Fair
CS3	10750+00	11050+00	GP-GM	very gravelly coarse sand	24	70	Fair	Fair
CS3	11120+00	11202+00	GP-GM	very gravelly loamy sand	32	35	Fair	Fair
CS3	11120+00	11202+00	GP-GM	very gravelly loamy sand	35	30	Fair	Fair
CS3	11212+00	11244+00	GP-GM	very gravelly loamy sand	32	35	Fair	Fair
CS3	11212+00	11244+00	GP-GM	very gravelly loamy sand	35	30	Fair	Fair
CS3	11265+00	11345+00	GW-GM	very gravelly loamy sand	35	35	Fair	Fair
CS3	11378+00	11480+00	GW-GM	very gravelly loamy sand	35	35	Fair	Fair

TABLE 6
SUMMARY OF POTENTIAL GRAVEL SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Interpretive Low Representative Value Class	Gravel Source Potential (3)
CS3	11950+00	12295+00	GW	extremely gravelly sand	37	50	Fair	Fair
CS3	11950+00	12295+00	GW	extremely gravelly sand	37	15	Fair	Fair
CS3	12305+00	12334+64	GP-GM	very gravelly loamy sand	32	45	Fair	Fair
CS3	12305+00	12334+64	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	55	15	Fair	Fair
CS3	12305+00	12334+64	GP-GM	stratified very gravelly fine sandy loam to extremely cobbly loamy sand	59	25	Fair	Fair
CS4	13871+41	13974+00	GP	very gravelly sand	8	35	Fair	Fair
CS4	13871+41	13974+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	35	Fair	Fair
CS4	13974+00	14000+00	GW-GM	very gravelly sand	8	40	Fair	Fair
CS4	13974+00	14000+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	40	Fair	Fair
CS4	14000+00	14008+00	GP-GM	very gravelly sand	40	70	Fair	Fair
CS4	14000+00	14008+00	GW	very gravelly sand	8	15	Fair	Fair
CS4	14000+00	14008+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	15	Fair	Fair
CS4	14008+00	14017+00	GW-GM	very gravelly sand	8	40	Fair	Fair
CS4	14008+00	14017+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	40	Fair	Fair
CS4	14017+00	14060+00	GP	very gravelly sand	8	35	Fair	Fair
CS4	14017+00	14060+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	35	Fair	Fair
CS5	15367+00	15375+00	GP-GM	very gravelly loamy sand	8	20	Fair	Fair
CS5	15367+00	15375+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	20	Fair	Fair
CS6	16450+00	16466+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	20	Fair	Fair
CS6	16550+00	16580+00	GW-GM	extremely gravelly sandy loam	9	70	Fair	Fair
CS6	16550+00	16580+00	GW-GM	extremely gravelly coarse sandy loam	46	70	Fair	Fair
CS6	16855+00	16877+00	GP-GM	very gravelly sandy loam	4	25	Fair	Fair
CS6	16931+00	16970+00	GP-GM	very gravelly sandy loam	4	25	Fair	Fair
CS6	17137+00	17170+00	GP-GM	stratified cobbly coarse sand to extremely gravelly sand	52	30	Fair	Fair
CS6	17753+00	17770+00	GP-GM	stratified cobbly coarse sand to extremely gravelly sand	52	15	Fair	Fair
GF1	12334+64	12378+00	GP-GM	very gravelly loamy sand	32	45	Fair	Fair
GF1	12334+64	12378+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	55	15	Fair	Fair

TABLE 6
SUMMARY OF POTENTIAL GRAVEL SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Interpretive Low Representative Value Class	Gravel Source Potential (3)
GF1	12334+64	12378+00	GP-GM	stratified very gravelly fine sandy loam to extremely cobbly loamy sand	59	25	Fair	Fair
GF1	12378+00	12472+00	GW	very gravelly sand	5	20	Fair	Fair
GF1	12378+00	12472+00	GW-GM	stratified gravelly loamy sand to extremely gravelly coarse sand	55	20	Fair	Fair
GF1	12378+00	12472+00	GW-GM	stratified very gravelly fine sandy loam to extremely cobbly loamy sand	59	30	Fair	Fair
GF1	12760+00	12793+00	GP	very gravelly sand	8	15	Fair	Fair
GF1	12760+00	12793+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	15	Fair	Fair
GF1	12815+00	12870+00	GW-GM	stratified very gravelly loamy coarse sand to very gravelly sandy loam	52	25	Fair	Fair
GF1	12900+00	12914+00	GP-GM	very gravelly sand	40	30	Fair	Fair
GF1	12960+00	12966+00	GP-GM	stratified extremely gravelly loamy coarse sand to extremely gravelly sandy loam	35	35	Fair	Fair
GF1	13208+00	13235+00	GP	very gravelly sand	40	40	Fair	Fair
GF1	13290+00	13300+00	GW	extremely gravelly loamy sand	46	30	Fair	Fair
GF1	13313+00	13418+00	GW	extremely gravelly loamy sand	46	30	Fair	Fair
GF1	13418+00	13462+00	GW	extremely gravelly loamy sand	46	30	Fair	Fair
GF1	13522+00	13569+00	GW	extremely gravelly loamy sand	46	45	Fair	Fair
GF1	13522+00	13569+00	GP	very gravelly sand	8	20	Fair	Fair
GF1	13522+00	13569+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
GF1	13569+00	13621+00	GP	very gravelly sand	8	20	Fair	Fair
GF1	13569+00	13621+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
GF1	13621+00	13630+00	GP	very gravelly sand	8	35	Fair	Fair
GF1	13621+00	13630+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	35	Fair	Fair
GF1	13630+00	13661+00	GP	very gravelly sand	8	20	Fair	Fair
GF1	13630+00	13661+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
GF1	13661+00	13685+00	GP	very gravelly sand	8	35	Fair	Fair
GF1	13661+00	13685+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	35	Fair	Fair
GF1	13685+00	13758+00	GW	extremely gravelly loamy sand	46	45	Fair	Fair
GF1	13685+00	13758+00	GP	very gravelly sand	8	20	Fair	Fair
GF1	13685+00	13758+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair

TABLE 6
SUMMARY OF POTENTIAL GRAVEL SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Interpretive Low Representative Value Class	Gravel Source Potential (3)
GF1	13758+00	13772+00	GP	very gravelly sand	8	35	Fair	Fair
GF1	13758+00	13772+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	35	Fair	Fair
GF1	13772+00	13803+00	GW	extremely gravelly loamy sand	46	45	Fair	Fair
GF1	13772+00	13803+00	GP	very gravelly sand	8	20	Fair	Fair
GF1	13772+00	13803+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
GF1	13803+00	13864+00	GP	very gravelly sand	8	20	Fair	Fair
GF1	13803+00	13864+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
GF1	13864+00	13871+41	GP	very gravelly sand	8	35	Fair	Fair
GF1	13864+00	13871+41	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	35	Fair	Fair
GF3	52000+00	52658+00	GP-GM	very gravelly loamy sand	32	45	Fair	Fair
GF3	52000+00	52658+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	55	15	Fair	Fair
GF3	52000+00	52658+00	GP-GM	stratified very gravelly fine sandy loam to extremely cobbly loamy sand	59	25	Fair	Fair
GF3	52543+00	52585+00	GP-GM	very gravelly sand	40	30	Fair	Fair
GF3	52658+00	52154+00	GW	very gravelly sand	5	20	Fair	Fair
GF3	52658+00	52154+00	GW-GM	stratified gravelly loamy sand to extremely gravelly coarse sand	55	20	Fair	Fair
GF3	52658+00	52154+00	GW-GM	stratified very gravelly fine sandy loam to extremely cobbly loamy sand	59	30	Fair	Fair
GF3	53069+00	53080+00	GW	extremely gravelly loamy sand	46	30	Fair	Fair
GF3	53088+00	53102+00	GW	extremely gravelly loamy sand	46	30	Fair	Fair
GF3	53115+00	53195+00	GW	extremely gravelly loamy sand	46	30	Fair	Fair
GF4	42000+00	42050+00	GP-GM	very gravelly loamy sand	32	45	Fair	Fair
GF4	42000+00	42050+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	55	15	Fair	Fair
GF4	42000+00	42050+00	GP-GM	stratified very gravelly fine sandy loam to extremely cobbly loamy sand	59	25	Fair	Fair
GF4	42050+00	42162+00	GW	very gravelly sand	5	20	Fair	Fair
GF4	42050+00	42162+00	GW-GM	stratified gravelly loamy sand to extremely gravelly coarse sand	55	20	Fair	Fair
GF4	42050+00	42162+00	GW-GM	stratified very gravelly fine sandy loam to extremely cobbly loamy sand	59	30	Fair	Fair
GF4	42356+00	42458+00	GW	very gravelly sand	8	15	Fair	Fair
GF4	42356+00	42458+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	15	Fair	Fair

TABLE 6
SUMMARY OF POTENTIAL GRAVEL SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Interpretive Low Representative Value Class	Gravel Source Potential (3)
GF4	42458+00	42488+00	GP-GM	very gravelly sand	40	70	Fair	Fair
GF4	42458+00	42488+00	GW	very gravelly sand	8	15	Fair	Fair
GF4	42458+00	42488+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	15	Fair	Fair
GF4	42488+00	42517+00	GW	very gravelly sand	8	15	Fair	Fair
GF4	42488+00	42517+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	15	Fair	Fair
GF4	42600+00	42642+00	GP-GM	very gravelly sand	40	70	Fair	Fair
GF4	42600+00	42642+00	GW	very gravelly sand	8	15	Fair	Fair
GF4	42600+00	42642+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	15	Fair	Fair
GF4	42642+00	42652+00	GP-GM	very gravelly sand	8	30	Fair	Fair
GF4	42642+00	42652+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	30	Fair	Fair
GF4	42652+00	42700+00	GP-GM	very gravelly sand	40	70	Fair	Fair
GF4	42652+00	42700+00	GW	very gravelly sand	8	15	Fair	Fair
GF4	42652+00	42700+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	15	Fair	Fair
GF4	42700+00	42735+00	GP-GM	very gravelly sand	40	30	Fair	Fair
GF4	42735+00	42820+00	GP-GM	very gravelly sand	40	70	Fair	Fair
GF4	42735+00	42820+00	GW	very gravelly sand	8	15	Fair	Fair
GF4	42735+00	42820+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	15	Fair	Fair
GF4	42820+00	42973+00	GP-GM	very gravelly sand	40	30	Fair	Fair
GF4	43093+00	43158+00	GW	extremely gravelly loamy sand	46	30	Fair	Fair
GF4	43241+00	43330+00	GW	extremely gravelly loamy sand	46	25	Fair	Fair
GF4	43384+00	43397+00	GW	extremely gravelly loamy sand	46	25	Fair	Fair
GF4	43397+00	43430+00	GW	extremely gravelly loamy sand	46	65	Fair	Fair
GF4	43397+00	43430+00	GW	stratified gravelly loamy sand to extremely gravelly coarse sand	52	20	Fair	Fair
GF4	43430+00	43507+00	GW	extremely gravelly loamy sand	46	65	Fair	Fair
GF4	43430+00	43507+00	GP	very gravelly sand	8	20	Fair	Fair
GF4	43430+00	43507+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
GF4	43507+00	43515+00	GP	very gravelly sand	8	35	Fair	Fair

TABLE 6
SUMMARY OF POTENTIAL GRAVEL SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Interpretive Low Representative Value Class	Gravel Source Potential (3)
GF4	43507+00	43515+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	35	Fair	Fair
GF4	43537+00	43613+00	GW	extremely gravelly loamy sand	46	45	Fair	Fair
GF4	43537+00	43613+00	GP	very gravelly sand	8	20	Fair	Fair
GF4	43537+00	43613+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
GF4	43613+00	43627+00	GP	very gravelly sand	8	35	Fair	Fair
GF4	43613+00	43627+00	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	35	Fair	Fair
GF4	43627+00	43712+85	GP	very gravelly sand	8	20	Fair	Fair
GF4	43627+00	43712+85	GW	stratified extremely gravelly coarse sand to gravelly loamy sand	52	20	Fair	Fair
GV1	5804+00	5830+00	GP-GM	extremely gravelly sand	26	50	Fair	Fair
GV3	30000+00	30038+00	GP-GM	very gravelly loamy sand	32	40	Fair	Fair
GV3	30000+00	30038+00	GW	stratified extremely gravelly sand to very gravelly loamy coarse sand	36	25	Fair	Fair
OV1	16110+00	16200+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	20	Fair	Fair
OV1	16225+00	16280+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	20	Fair	Fair
OV1	16300+00	16320+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	20	Fair	Fair
OV1	16320+00	16370+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	15	Fair	Fair
OV1	16370+00	16450+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	20	Fair	Fair
OV3	46025+00	46162+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	20	Fair	Fair
OV3	46170+00	46200+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	15	Fair	Fair
OV3	46313+00	46335+00	GP-GM	stratified cobbly coarse sand to extremely gravelly sand	52	85	Fair	Fair
OV3	46335+00	46413+00	GP	stratified cobbly coarse sand to extremely gravelly sand	52	20	Fair	Fair
SR2	36000+00	36056+00	GP-GM	extremely gravelly sand	26	50	Fair	Fair
SR2	36075+00	36085+00	GP-GM	extremely gravelly sand	26	50	Fair	Fair
SR2	36178+00	36187+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR2	36178+00	36187+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR2	36204+00	36211+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR2	36204+00	36211+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR2	36221+00	36231+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair

TABLE 6
SUMMARY OF POTENTIAL GRAVEL SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Interpretive Low Representative Value Class	Gravel Source Potential (3)
SR2	36221+00	36231+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR2	36237+00	36245+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR2	36237+00	36245+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR2	36250+00	36255+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR2	36250+00	36255+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR2	36331+00	36478+07	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR2	36331+00	36478+07	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR3	7493+00	7511+00	GP-GM	extremely gravelly sand	26	40	Fair	Fair
SR3	7493+00	7511+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	25	Fair	Fair
SR3	7543+00	7603+00	GP-GM	extremely gravelly sand	26	40	Fair	Fair
SR3	7543+00	7603+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	25	Fair	Fair
SR3	7730+00	7825+00	GP-GM	extremely gravelly sand	26	35	Fair	Fair
SR3	7825+00	8089+00	GP-GM	extremely gravelly sand	26	50	Fair	Fair
SR3	8089+00	8210+00	GP-GM	extremely gravelly sand	26	50	Fair	Fair
SR3	8210+00	8263+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR3	8210+00	8263+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR3	8330+00	8347+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR3	8330+00	8347+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR3	8362+00	8450+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR3	8362+00	8450+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR3	8458+00	8510+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR3	8458+00	8510+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR3	8523+00	8600+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR3	8523+00	8600+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR3	8600+00	8751+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair
SR3	8600+00	8751+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR3	9050+00	9152+00	GP-GM	extremely gravelly sand	26	20	Fair	Fair

TABLE 6
SUMMARY OF POTENTIAL GRAVEL SOURCES

Route	From Station	To Station	USCS Symbol	Texture Description	Thickness (inches) (1)	Percent of Area (2)	Interpretive Low Representative Value Class	Gravel Source Potential (3)
SR3	9050+00	9152+00	GW-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	20	Fair	Fair
SR3	9176+00	9228+00	GP-GM	extremely gravelly sand	26	35	Fair	Fair
SR3	9228+00	9290+00	GW	extremely gravelly loamy sand	43	20	Fair	Fair
SR3	9305+00	9535+00	GW	extremely gravelly loamy sand	43	20	Fair	Fair
SR3	9622+00	9650+00	GW	extremely gravelly loamy sand	43	20	Fair	Fair
SR3	9656+00	9768+00	GW	extremely gravelly loamy sand	43	30	Fair	Fair
SR3	9656+00	9768+00	GP-GM	stratified extremely gravelly coarse sand to very gravelly sandy loam	49	15	Fair	Fair

Notes:
(1) Maximum thickness in SSURGO Database is 52 inches, actual thickness may be greater.
(2) Percent of Area refers to percent of USDA/NRCS soil unit.
(3) Gravel Source Potential based on rating in SSURGO Database.
(4) Stationing updated for Revision 11 alignment 18 August 2005.
USCS = Unified Soil Classification System

TABLE 7
RECOMMENDED BALLAST SOURCE AREAS

Rock Type	Map ID No.	Geographic Area/Location	Miles From Alignment	Field Visit	Phase 2 Candidate
BASALT	NS-1	Adjacent to and northwest of Mud Lake	0 to 2	Y	Y
BASALT	NS-3	North end of Goldfield Hills and southwest of Mud Lake; access via Goldfield	0	Y	Y
BASALT	NS-12	Skull Mtn, Little Skull Mtn, and low outcrops in Jackass Flats on the NTS; also Basalt flows at south end of Crater Flats	0 to 2	Y	Y
BASALT	GF-7	Sarcobatus Flat along Highway 95	0	Y	Y
BASALT	NN-9	North end of Reveille Valley near Warm Springs	3	Y	Y
BASALT	LD-2	Flows capping low hills in Golden Gate Range due north of alignment	3	Y	Y
QUARTZITE	CA-8	Outcrops in Chief Range, Bennett Pass and Caliente	0 to 5	Y	Y

Note: See Ballast Quarry Report (Shannon & Wilson, Inc. 2006b) for additional quarry site selection information.

Unconsolidated gravel, sand, and silt in active streambed typical of Channel Alluvium as desrcibed in Workman et al., 2002.

Nevada Rail Project
Caliente Rail Corridor
Yucca Mountain Project, Nevada

TYPICAL CHANNEL ALLUVIUM

21-1-20102-112

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FIG. 1

Filename: 21-1-20102-112_FIG-1_CA Created Using: ArcMap 9.2 Date Printed: 17-Jul-07 BRL

Poorly consolidated, medium-to coarse-grained soil typical of Young Alluvium as described in Workman et al., 2002.

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Yucca Mountain Project, Nevada

TYPICAL YOUNG ALLUVIUM

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FIG. 2

Filename: 21-1-20102-112_FIG-2_TYA Created Using: ArcMap 9.2 Date Printed: 17-Jul-07 BRL

Calcium carbonate cementation typical of Old Alluvium as described in Workman et al., 2002.

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TYPICAL OLD ALLUVIUM

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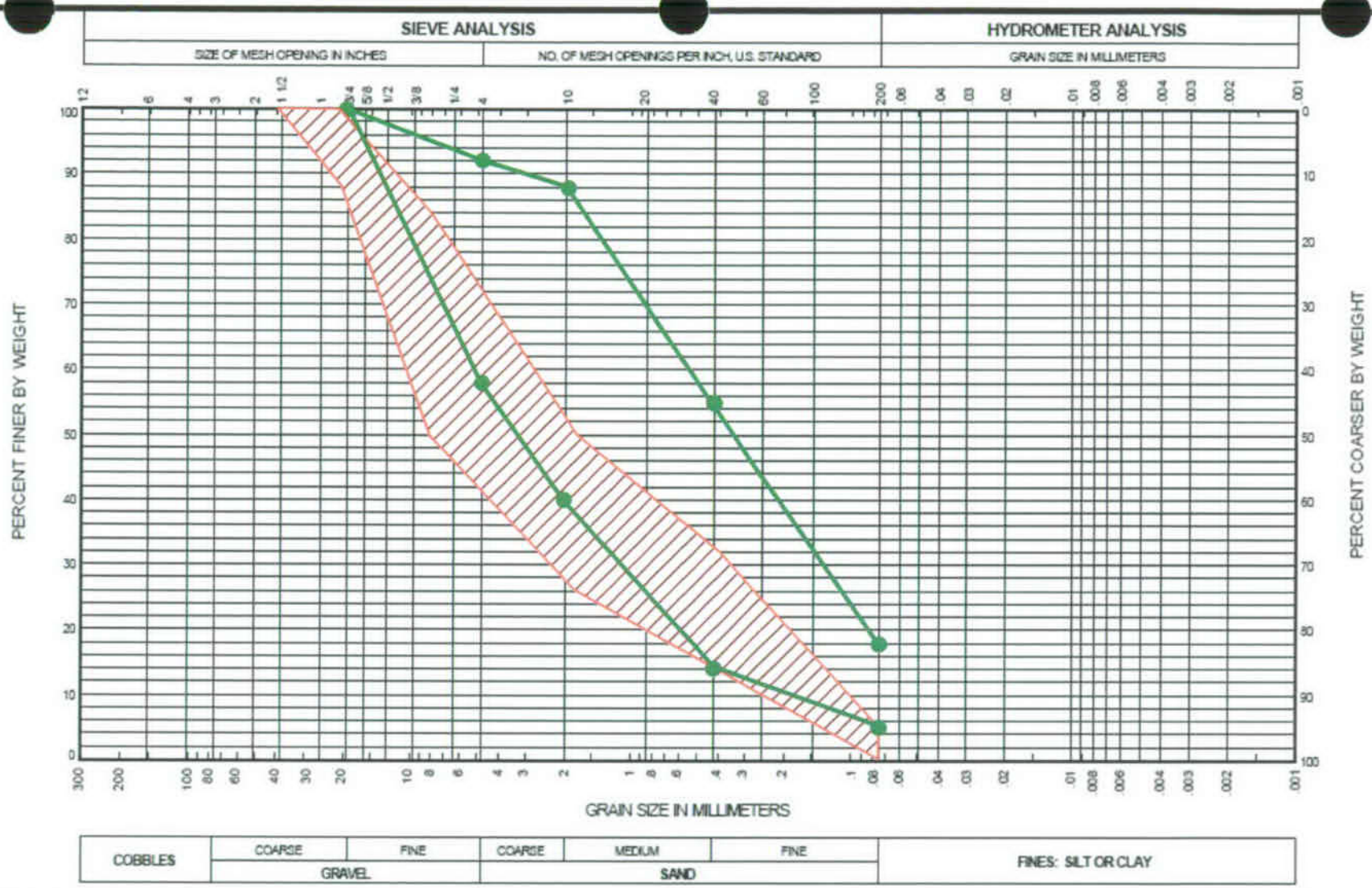
FIG. 3

Filename: 21-1-20102-112_FIG-3_TOA Created Using: ArcMap 9.2 Date Printed: 17-Jul-07 BRL



BORING AND SAMPLE NO.	DEPTH (feet)	U.S.C.S. SYMBOL	SAMPLE DESCRIPTION	FINES %	NAT. W.C. %	LL %	PL %	PI %
			Typical Subballast Gradation					
			Envelope of Potential Sand Sources from SSURGO Database					

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Yucca Mountain Project, Nevada

GRAIN SIZE DISTRIBUTION
Potential Sand Sources

21-1-20102-112

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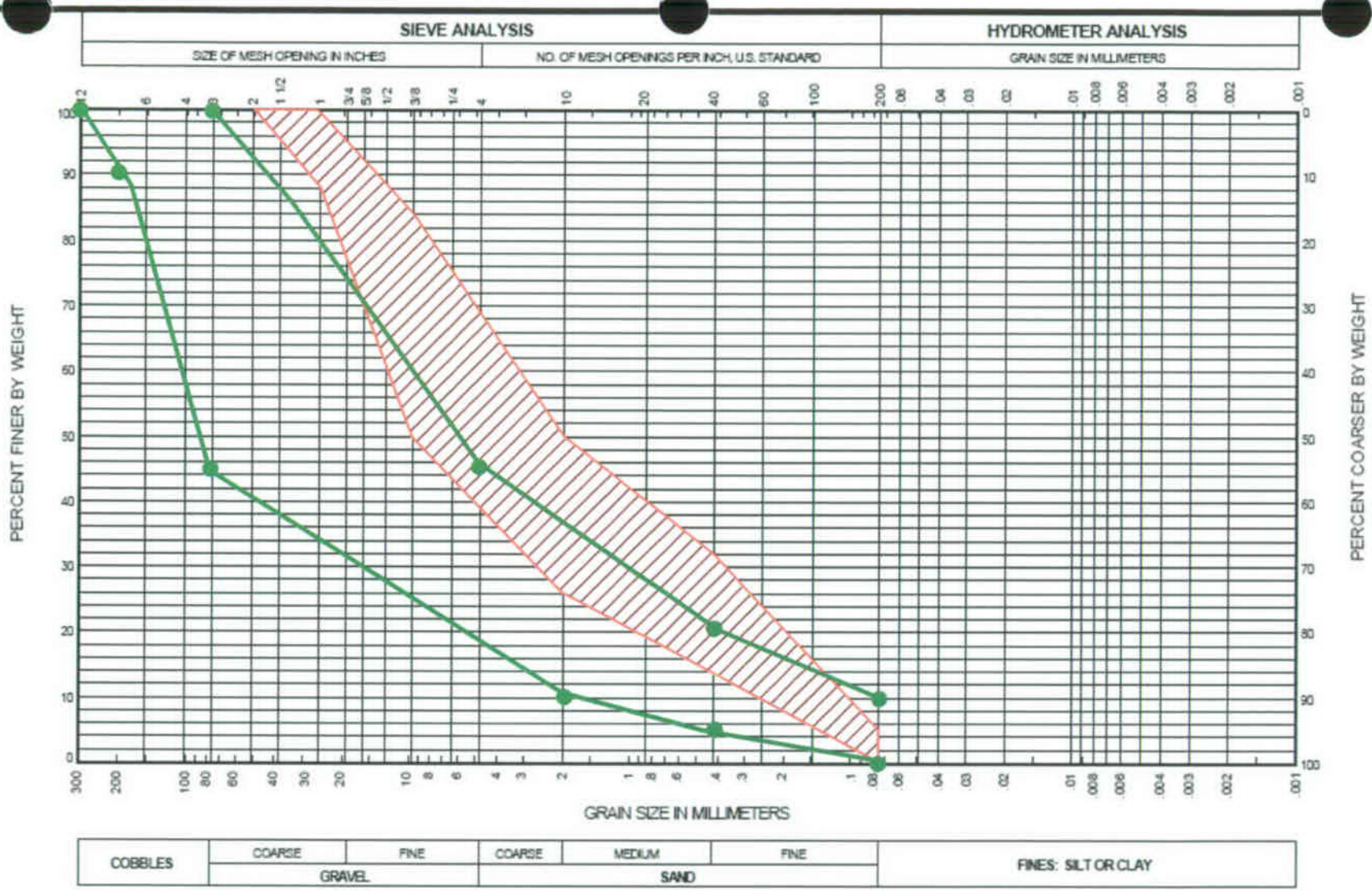
FIG. 4

Filename: GS_Subballast_Sand.vsd Created Using: Visio 2000 Date Printed: 17-Jul-07 HLE

FIG. 4



BORING AND SAMPLE NO.	DEPTH (feet)	U.S.C.S. SYMBOL	SAMPLE DESCRIPTION	FINES %	NAT. W.C. %	LL %	PL %	PI %
			Typical Subballast Gradation					
			Envelope of Potential Gravel Sources from SSURGO Database					

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Yucca Mountain Project, Nevada

GRAIN SIZE DISTRIBUTION

Potential Gravel Sources

21-1-20102-112

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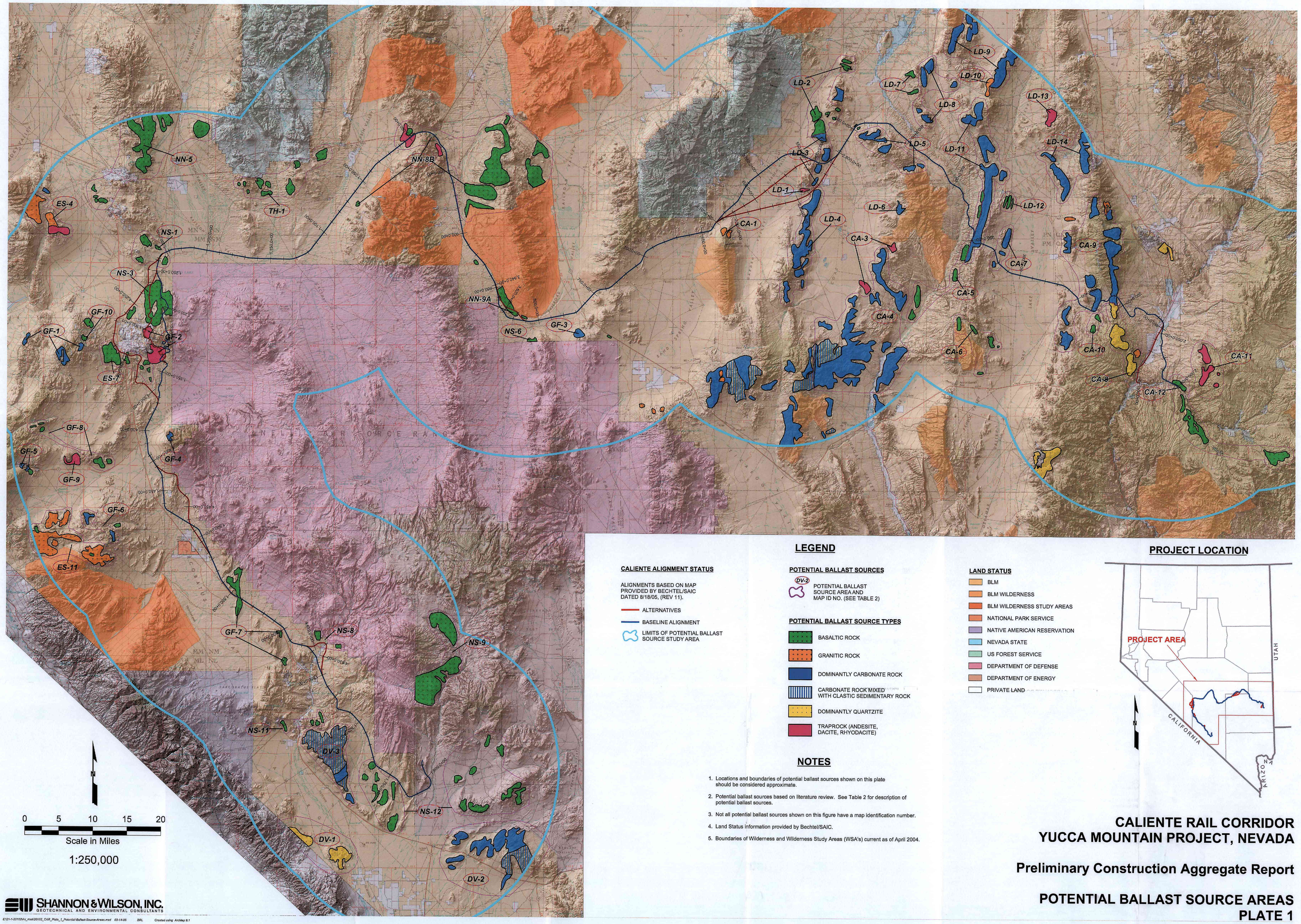
FIG. 5

Filename: GS_Subballast_Gravel.vsd Created Using: Visio 2000 Date Printed: 17-Jul-07 HLE

FIG. 5



LEGEND

CALIENTE ALIGNMENT STATUS

ALIGNMENTS BASED ON MAP PROVIDED BY BECHTEL/SAIC DATED 8/18/05, (REV 11).

- ALTERNATIVES
- BASELINE ALIGNMENT
- LIMITS OF POTENTIAL BALLAST SOURCE STUDY AREA

POTENTIAL BALLAST SOURCES

- DV-2 — POTENTIAL BALLAST SOURCE AREA AND MAP ID NO. (SEE TABLE 2)

POTENTIAL BALLAST SOURCE TYPES

- BASALTIC ROCK
- GRANITIC ROCK
- DOMINANTLY CARBONATE ROCK
- CARBONATE ROCK MIXED WITH CLASTIC SEDIMENTARY ROCK
- DOMINANTLY QUARTZITE
- TRAPROCK (ANDESITE, DACITE, RHYODACITE)

LAND STATUS

- BLM
- BLM WILDERNESS
- BLM WILDERNESS STUDY AREAS
- NATIONAL PARK SERVICE
- NATIVE AMERICAN RESERVATION
- NEVADA STATE
- US FOREST SERVICE
- DEPARTMENT OF DEFENSE
- DEPARTMENT OF ENERGY
- PRIVATE LAND

NOTES

1. Locations and boundaries of potential ballast sources shown on this plate should be considered approximate.
2. Potential ballast sources based on literature review. See Table 2 for description of potential ballast sources.
3. Not all potential ballast sources shown on this figure have a map identification number.
4. Land Status information provided by Bechtel/SAIC.
5. Boundaries of Wilderness and Wilderness Study Areas (WSA's) current as of April 2004.

PROJECT LOCATION

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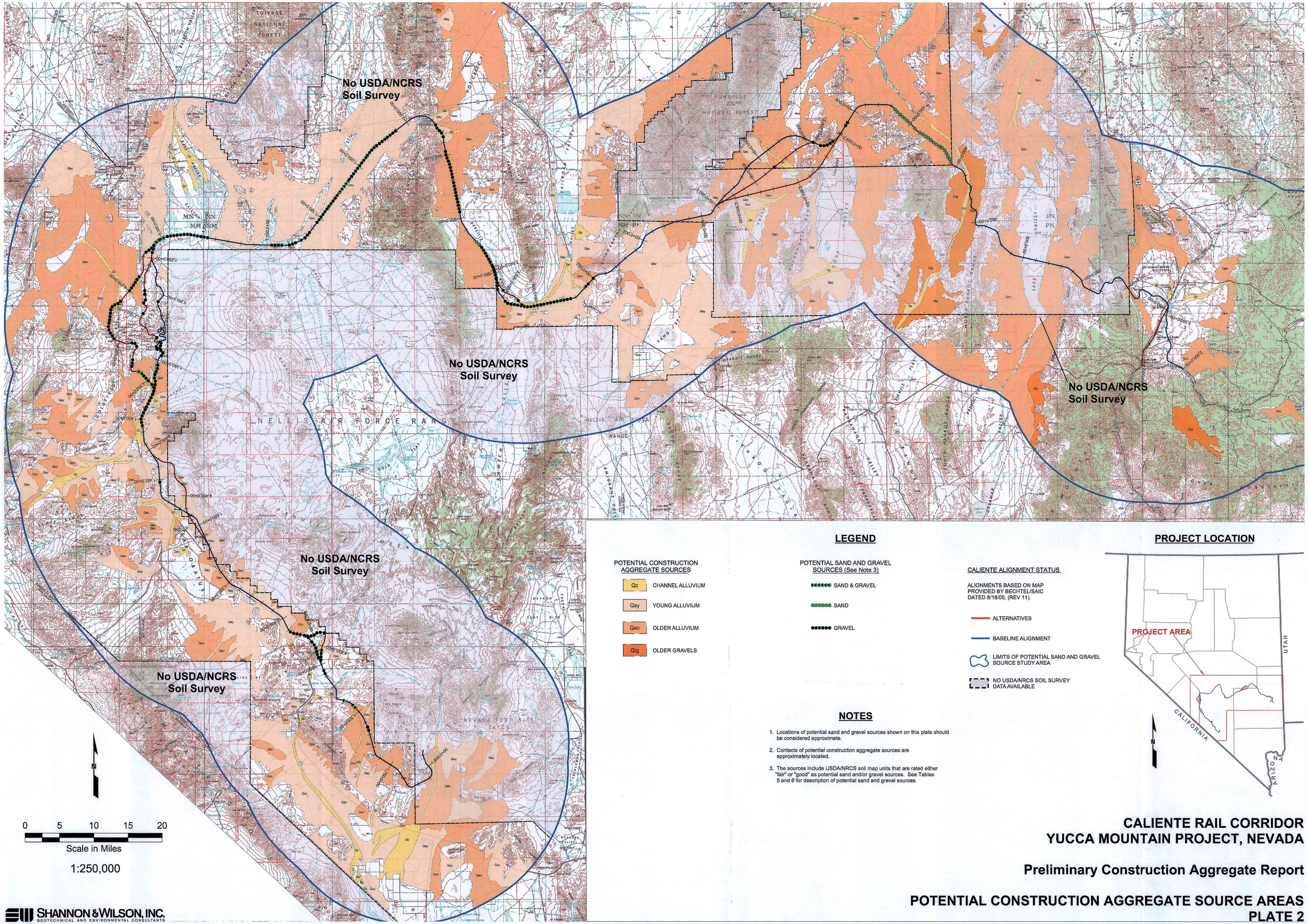
CALIENTE RAIL CORRIDOR
YUCCA MOUNTAIN PROJECT, NEVADA

Preliminary Construction Aggregate Report

POTENTIAL BALLAST SOURCE AREAS
PLATE 1



CALIENTE RAIL CORRIDOR
YUCCA MOUNTAIN PROJECT, NEVADA

Preliminary Construction Aggregate Report

POTENTIAL CONSTRUCTION AGGREGATE SOURCE AREAS
PLATE 2

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APPENDIX A

BALLAST SOURCING COST ANALYSIS
SHANNON & WILSON, INC.
18 FEBRUARY 2005

(Under Separate Cover)

APPENDIX B

SHANNON & WILSON, INC.
FIELD REFERENCES – SOIL AND ROCK CLASSIFICATION

FIELD REFERENCE SOIL CLASSIFICATION

ORDER OF CLASSIFICATION TERMS

Relative density or consistency,

color,

slightly (5 to 12%),

minor constituents (12 to 50%)

MAJOR constituent (>50%),

trace constituents (0 to 5%);

moisture content;

structure, plasticity, gradation, grain shape, min., cementation, organics, odor, other;

(Geologic Name: Fill, Till, Alluvium, etc.)

USCS group symbol.

EXAMPLES

Very dense, light brown, slightly silty, sandy fine GRAVEL, trace of cobbles; moist; scattered roots; (Weathered Till) GP-GM.

Medium stiff, dark gray, silty CLAY, trace of fine sand; moist; laminated (< 2mm) with light gray silt, occasional slickensides; (Glaciolacustrine) CL.

Medium dense, dark brown, sandy SILT, trace of clay; wet; numerous organics and strong organic odor; (Marsh Deposits) ML.

Loose and soft, mottled black and green, silty SAND and clayey SILT; moist; hydrocarbon sheen and faint hydrocarbon odor; (Fill) SM/ML.

STRUCTURE

TERM	THICKNESS
Parting	0 to 1/16"
Seam	1/16 to 1/2"
Layer	> 1/2"
Lamination	< 6 mm, < 1/4"
Pocket	Irregular, < 1 foot
Varved	Alternating seams or lam.
Occasional	< 1 per foot
Frequent	≥ 1 per foot

DESCRIPTION	CRITERIA, LIST THICKNESS
Stratified	Alternating layers
Interbedded	Alternating layers > 1/2"
Laminated	Alt. layers < 6 mm thick
Fractured	Breaks easily along definite fractured planes
Slickensided	Polished, glossy, striated fractured planes
Blocky, Diced	Easily breaks into small angular lumps
Lensed	Small pockets of diff. soils
Homogenous	Same color and appearance throughout
Sheared	Disturbed texture, mix of strengths

ORGANIC CONTENT

ADJECTIVE	PERCENT BY VOLUME
Occasional	0 to 1
Scattered	1 to 10
Numerous	10 to 30
Organic	30 to 50, minor constituent
PEAT	50 to 100, MAJOR const.

Describe type and size of organic debris.

TERM	GRAIN SIZE	EXAMPLES
Boulders	> 12"	> Basketball
Cobbles	3" to 12"	Fist to basketball
Gravel-coarse	3/4" to 3"	Thumb to fist
Gravel-fine	#4 to 3/4"	Pea to thumb
Sand-coarse	#10 to #4 (5 mm)	Rock salt to peat
Sand-medium	#40 to #10 (2 mm)	Sugar to rock salt
Sand-fine	#200 to #40 (0.4 mm)	Flour to sugar
Fines	< #200 (0.08 mm)	Grains not visible

MOISTURE CONTENT

Dry	Dusty, dry to the touch
Moist	Damp but no visible water near optimum
Wet	Visible free water, saturated, over optimum

RELATIVE DENSITY OF COARSE-GRAINED (COHESIONLESS) SOILS
(Cohesionless Silt, Sand, and Gravel)

N. SPT, BLOWS/FT	RELATIVE DENSITY	FIELD TEST FOR RELATIVE DENSITY OF SAND
0 to 4	Very loose	Easily penetrated with 1/2" reinforcing rod pushed by hand
4 to 10	Loose	Easily penetrated with 1/2" reinforcing rod pushed by hand
10 to 30	Medium dense	Penetrated one foot with 1/2" reinforcing rod driven with 5-lb hammer
30 to 50	Dense	Penetrated one foot with 1/2" reinforcing rod driven with 5-lb hammer
Over 50	Very dense	Penetrated only a few inches with 1/2" reinf. rod driven with 5-lb hammer

RELATIVE CONSISTENCY OF FINE-GRAINED (COHESIVE) SOILS
(Cohesive Silt, Clayey Silt, and Clay)

N. SPT, BLOWS/FT	RELATIVE CONSISTENCY	TORVANE, tsf SHEAR STR.	POC. PEN., tsf UNCONF. STR.	MANUAL PENETRATION TEST
< 2	Very soft	< 0.13	< 0.25	Easy several inches by fist
2 to 4	Soft	0.13 to 0.25	0.25 to 0.5	Easy several inches by thumb
4 to 8	Medium stiff	0.25 to 0.5	0.5 to 1	Moderate several inches by thumb
8 to15	Stiff	0.5 to 1	1 to 2	Readily indented by thumb
15 to 30	Very stiff	1 to 2	2 to 4	Readily indented by thumbnail
Over 30	Hard	> 2	> 4	Difficulty by thumbnail

UNIFIED SOIL CLASSIFICATION SYSTEM
(From USACE Tech Memo 3-357)

MAJOR DIVISIONS			GROUP SYMBOL	TYPICAL DESCRIPTION
Coarse-Grained Soils (more than 50% retained on No. 200 sieve) [Use Dual Symbols for 5 to 12% Fines (i.e. GP-GM)]	Gravels (more than 50% of coarse fraction retained on No.4 sieve)	Clean Gravels (less than 5% fines)	GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP	Poorly-Graded Gravels, Gravel-Sand Mixtures
		Gravels with Fines (more than 12% fines)	GM	Silty Gravels, Gravel-Sand-Silt Mixtures
			GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	Sands (50% or more of coarse fraction passes the No. 4 sieve)	Clean Sands (less than 5% fines)	SW	Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP	Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		Sands with Fines (more than 12% fines)	SM	Silty Sands, Sand-Silt Mixtures
			SC	Clayey Sands, Sand-Clay Mixtures
Fine-Grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (liquid limit less than 50)	Inorganic	ML	Inorganic Silts and Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
			CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
		Organic	OL	Organic Silts and Organic Silty Clays of Low Plasticity
	Silts and Clays (liquid limit 50 or more)	Inorganic	CH	Inorganic Clays of Medium to High Plasticity, Sandy Fat Clay, Gravelly Fat Clay
			MH	Inorganic Silts, Micaceous or Diatomaceous Fine Sands or Silty Soils, Elastic Silt
		Organic	OH	Organic Clays of Medium to High Plasticity, Organic Silts
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor		PT	Peat, Humus, Swamp Soils with High Organic Content (See D 4427-92)

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GRADATION	DESCRIPTION	EXAMPLES
Well-graded	Full range and even distribution of grain sizes present	Silty, sandy GRAVEL
Poorly-graded	Narrow range of grain sizes present	Fine to medium SAND, trace of silt
Uniformly -graded	Consists predominantly of one grain size	Fine SAND
Gap-graded	Within the range of grain sizes present, one or more sizes are missing	Silty, medium to coarse SAND

FIELD REFERENCE SOIL CLASSIFICATION

Dual Symbols

(symbols separated by a hyphen, i.e., SP-SM, slightly silty fine SAND) are used for soils with between 5% and 12% fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart.

Borderline Symbols

(symbols separated by a slash, i.e., CL/ML, silty CLAY/clayey SILT; GW/SW, sandy GRAVEL/gravelly SAND) indicate that the soil may fall into one of two possible basic groups.

ASTM D 2488 Tables

"Reprinted, with permission, from D2488-06 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be purchased from ASTM (www.astm.org)."

TABLE 8 Criteria for Describing Dry Strength

DESCRIPTION	CRITERIA
None	The dry specimen crumbles into powder with mere pressure of handling.
Low	The dry specimen crumbles into powder with some finger pressure.
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure.
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very High	The dry specimen cannot be broken between the thumb and a hard surface.

TABLE 9 Criteria for Describing Dilatancy

DESCRIPTION	CRITERIA
None	No visible change in the specimen.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

TABLE 10 Criteria for Describing Toughness

DESCRIPTION	CRITERIA
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness.
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

TABLE 11 Criteria for Describing Plasticity

DESCRIPTION	CRITERIA
Nonplastic	A 1/8-in. (3mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

TABLE 1 Criteria for Describing Angularity of Coarse-Grained Particles

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

TABLE 2 Criteria for Describing Particle Shape

DESCRIPTION	CRITERIA
The particle shape shall be described as follows where length, width, and thickness refer to the greatest, intermediate, and least dimensions of a particle, respectively.	
Flat	Particles with width/thickness > 3
Elongated	Particles with length/width > 3
Flat and Elongated	Particles meet criteria for both flat and elongated

TABLE 4 Criteria for Describing the Reaction with HCl

DESCRIPTION	CRITERIA
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

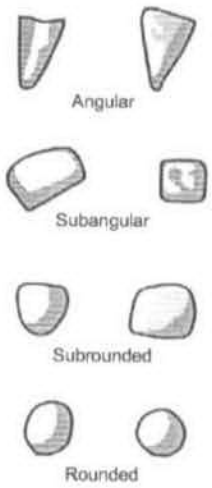
TABLE 6 Criteria for Describing Cementation

DESCRIPTION	CRITERIA
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

TABLE 12 Identification of Inorganic Fine-Grained Soils from Manual Tests

SOIL SYMBOL	DRY STRENGTH	DILATANCY	TOUGHNESS
ML	None to Low	Slow to Rapid	Low or Thread Cannot be Formed
CL	Medium to High	None to Slow	Medium
MH	Low to Medium	None to Slow	Low to Medium
CH	High to Very High	None	High

GRAIN SHAPE



SPT SPECS (From Dept. of Interior Earth Manual)

140-lb hammer, 30-inch freefall

Cathead: 6 to 10-inch diameter, 2-1/4 rope turns, ≥ 100 rpm, mechanical OK

Sampler: 18 to 30-inch long, shoe ID = 1.375 inches, barrel ID = 1.5 inches, OD = 2.0 inches

Count blows for each of three 6-inch increments
Refusal: 50 blows for 6 inches or less, 10 blows for 0 inches

Standard Penetration Resistance = "N-Value" = blows for last 12 inches

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FIELD REFERENCE ROCK CLASSIFICATION

ORDER OF CLASSIFICATION TERMS

1. ROCK NAME: (see back of sheet)
2. strength,
3. basic rock description;
4. structure;
5. weathering;
6. other or unique features
7. (Formation or Member name)

EXAMPLE

BASALT: moderate strength, gray, fine grained; moderately vesicular, smooth, closely-spaced, high angle joints with iron-oxide staining; slightly weathered (Wanapum Basalt).

3. BASIC ROCK DESCRIPTION

COLOR

TEXTURE (see back side of sheet)

CEMENTATION: Weakly / Strongly

INDURATION: Slightly / Highly

4. STRUCTURE

a) FABRIC: Bedding, foliation, etc.; Describe type, spacing, orientation

b) VESICULARITY: Describe percent by volume and size of holes (range and typical)

c) DISCONTINUITIES: Describe type, number of sets, spacing or intercept (range and typical), roughness, healing, aperture (width), filling type and consistency (use soil terms), and orientation or dip (low / high or angle)

4a. FABRIC TERMS

Sedimentary Rocks:

MASSIVE - Rock without significant structure

BEDDED - Regular layering from sedimentation

FISSILE - Tendency to break along laminations

Metamorphic Rocks:

FOLIATED - Parallel arrangement or distribution of minerals

SCHISTOSE - Parallel arrangement of tabular minerals giving a planar fissility

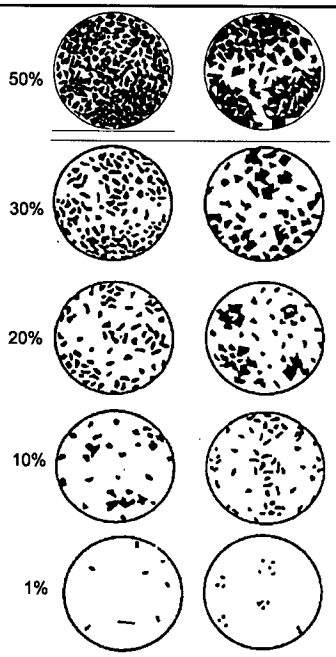
GNEISSOSE - Segregation of minerals into bands

CLEAVAGE - Tendancy to split along secondary, planar textures or structures

4b. VESICULARITY

Slightly Vesicular	1 to 10%
Moderately Vesicular	10 to 30%
Highly Vesicular	30 to 50%
Scoriaceous	>50%

COMPARISON CHART (percent by volume)



4c. DISCONTINUITY TERMS

FRACTURE - Collective term for any natural break excluding shears, shear zones, and faults

JOINT (JT) - Planar break with little or no displacement

FOLIATION JOINT (FJ) or BEDDING JOINT (BJ) - Joint along foliation or bedding

INCIPIENT JOINT (IJ) or INCIPIENT FRACTURE (IF) - Joint or fracture not evident until wetted and dried; breaks along existing surface

RANDOM FRACTURE (RF) - Natural, very irregular fracture that does not belong to a set

BEDDING PLANE SEPARATION or PARTING - A separation along bedding after extraction from stress relief or slaking

FRACTURE ZONE (FZ) - Planar zone of broken rock without gouge

MECHANICAL BREAK (MB) - Breaks due to drilling or handling; drilling break (DB), hammer break (HB).

SHEAR (SH) - Surface of differential movement evident by presence of slickensides, striations, or polishing

SHEAR ZONE (SZ) - Zone of gouge and rock fragments bounded by planar shear surfaces

FAULT (FT) - Shear zone of significant extent; differentiation from shear may be site-specific

4c. OUTCROP DATA

When collecting outcrop data, fracture orientation, aperture, roughness, and filling type / consistency, should be described in greater detail than is possible with core. Depending on the nature or investigation, additional data should also be recorded:

Fracture WALL STRENGTH

Fracture CONTINUITY OR LENGTH

Fracture ENDS OBSERVED (0, 1, 2)

Fracture MOISTURE CONDITIONS (dry, dry but stained, damp, wet, dripping, flowing)

BLOCK SIZE

When this level of detail is required, a special data collection form should be used.

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APPENDIX C

PHOTOGRAPHS FROM FIELD RECONNAISSANCE

(CD-ROM)

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SPECIAL INSTRUCTION SHEET

1. QA: N/A

This is a placeholder page for records that cannot be scanned.

2. Record Date 07/17/2007	3. Accession Number ATTN to: ENG.20070905.0015
4. Author Name(s) N/A	5. Authorization Organization Shannon & Wilson

6. Title/Description
Construction Aggregate Report Caliente Rail Corridor, APPENDIX: Photographs

7. Document Number(s) V0-CY05-NHC4-00197-00008-001	8. Version Designator 004
9. Document Type Media	10. Medium 2 CD's

11. Access Control Code
N/A

12. Traceability Designator
V0-CY05-NHC4-00197-00008-001-004

13. Comments
CD's: 1 Original & 1 copy

Validation of complete file transferred. All files copied. Software used: AutoCad 2007, Corel Photo-Paint 8.0, MS Word, Adobe Acrobat 7.0, Excel & ESRI Geodatabase

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08/02/2007  06:07p      <DIR>          CA-5
08/02/2007  06:07p      <DIR>          CA-6
08/02/2007  06:07p      <DIR>          CA-7
08/02/2007  06:07p      <DIR>          CA-8
08/02/2007  06:07p      <DIR>          CA-9
08/02/2007  06:07p      <DIR>          DV-1
08/02/2007  06:07p      <DIR>          DV-3
08/02/2007  06:07p      <DIR>          ES-11
08/02/2007  06:07p      <DIR>          ES-7
08/02/2007  06:07p      <DIR>          GF-1
08/02/2007  06:07p      <DIR>          GF-10
08/02/2007  06:07p      <DIR>          GF-2
08/02/2007  06:07p      <DIR>          GF-4
08/02/2007  06:07p      <DIR>          GF-5
08/02/2007  06:07p      <DIR>          GF-6
08/02/2007  06:07p      <DIR>          GF-7
08/02/2007  06:07p      <DIR>          GF-8
08/02/2007  06:07p      <DIR>          GF-9
08/02/2007  06:07p      <DIR>          LD-10
08/02/2007  06:07p      <DIR>          LD-11
08/02/2007  06:07p      <DIR>          LD-13
08/02/2007  06:07p      <DIR>          LD-2
08/02/2007  06:07p      <DIR>          LD-3
08/02/2007  06:07p      <DIR>          LD-4
08/02/2007  06:07p      <DIR>          LD-5
08/02/2007  06:07p      <DIR>          LD-7
08/02/2007  06:07p      <DIR>          LD-8
08/02/2007  06:07p      <DIR>          NN-5
08/02/2007  06:07p      <DIR>          NN-8
08/02/2007  06:07p      <DIR>          NN-9
08/02/2007  06:07p      <DIR>          NS-1
08/02/2007  06:07p      <DIR>          NS-11
08/02/2007  06:07p      <DIR>          NS-12
08/02/2007  06:07p      <DIR>          NS-3
08/02/2007  06:07p      <DIR>          TH-1

 Directory of D:\CalienteAggRpt,AppxC-Photos

08/02/2007  06:07p      <DIR>          .
08/15/2007  08:44p      <DIR>          ..
08/02/2007  06:07p      <DIR>          CA-1
08/02/2007  06:07p      <DIR>          CA-10
08/02/2007  06:07p      <DIR>          CA-11
08/02/2007  06:07p      <DIR>          CA-12
08/02/2007  06:07p      <DIR>          CA-4
08/02/2007  06:07p      <DIR>          CA-5
08/02/2007  06:07p      <DIR>          CA-6
08/02/2007  06:07p      <DIR>          CA-7
08/02/2007  06:07p      <DIR>          CA-8
08/02/2007  06:07p      <DIR>          CA-9
08/02/2007  06:07p      <DIR>          DV-1
08/02/2007  06:07p      <DIR>          DV-3
08/02/2007  06:07p      <DIR>          ES-11
08/02/2007  06:07p      <DIR>          ES-7
08/02/2007  06:07p      <DIR>          GF-1
08/02/2007  06:07p      <DIR>          GF-10
```

```
                                          dir.txt
08/02/2007  06:07p      <DIR>             GF-2
08/02/2007  06:07p      <DIR>             GF-4
08/02/2007  06:07p      <DIR>             GF-5
08/02/2007  06:07p      <DIR>             GF-6
08/02/2007  06:07p      <DIR>             GF-7
08/02/2007  06:07p      <DIR>             GF-8
08/02/2007  06:07p      <DIR>             GF-9
08/02/2007  06:07p      <DIR>             LD-10
08/02/2007  06:07p      <DIR>             LD-11
08/02/2007  06:07p      <DIR>             LD-13
08/02/2007  06:07p      <DIR>             LD-2
08/02/2007  06:07p      <DIR>             LD-3
08/02/2007  06:07p      <DIR>             LD-4
08/02/2007  06:07p      <DIR>             LD-5
08/02/2007  06:07p      <DIR>             LD-7
08/02/2007  06:07p      <DIR>             LD-8
08/02/2007  06:07p      <DIR>             NN-5
08/02/2007  06:07p      <DIR>             NN-8
08/02/2007  06:07p      <DIR>             NN-9
08/02/2007  06:07p      <DIR>             NS-1
08/02/2007  06:07p      <DIR>             NS-11
08/02/2007  06:07p      <DIR>             NS-12
08/02/2007  06:07p      <DIR>             NS-3
08/02/2007  06:07p      <DIR>             TH-1
               0 File(s)                 0 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-1

08/02/2007  06:07p      <DIR>             .
08/02/2007  06:07p      <DIR>             ..
09/27/2004  09:32a              163,438 IMG_0312.JPG
09/27/2004  09:53a              370,030 IMG_0313.JPG
01/29/2006  09:21p               12,800 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-1

08/02/2007  06:07p      <DIR>             .
08/02/2007  06:07p      <DIR>             ..
09/27/2004  09:32a              163,438 IMG_0312.JPG
09/27/2004  09:53a              370,030 IMG_0313.JPG
01/29/2006  09:21p               12,800 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-1

08/02/2007  06:07p      <DIR>             .
08/02/2007  06:07p      <DIR>             ..
09/27/2004  09:32a              163,438 IMG_0312.JPG
09/27/2004  09:53a              370,030 IMG_0313.JPG
01/29/2006  09:21p               12,800 Thumbs.db
               9 File(s)      1,638,804 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-10

08/02/2007  06:07p      <DIR>             .
08/02/2007  06:07p      <DIR>             ..
09/29/2004  04:44a              541,199 IMG_0380.JPG
01/29/2006  09:21p                5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-10

08/02/2007  06:07p      <DIR>             .
08/02/2007  06:07p      <DIR>             ..
09/29/2004  04:44a              541,199 IMG_0380.JPG
```

```
                                                dir.txt
01/29/2006  09:21p                    5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-10

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  04:44a              541,199 IMG_0380.JPG
01/29/2006  09:21p                5,632 Thumbs.db
               6 File(s)      1,640,493 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  09:51a              401,339 IMG_0396.JPG
01/29/2006  09:40p                9,216 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  09:51a              401,339 IMG_0396.JPG
01/29/2006  09:40p                9,216 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  09:51a              401,339 IMG_0396.JPG
01/29/2006  09:40p                9,216 Thumbs.db
               6 File(s)      1,231,665 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-12

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  08:26a              279,408 IMG_0393.JPG
09/29/2004  08:27a              476,798 IMG_0394.JPG
01/29/2006  09:22p                6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-12

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  08:26a              279,408 IMG_0393.JPG
09/29/2004  08:27a              476,798 IMG_0394.JPG
01/29/2006  09:22p                6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-12

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  08:26a              279,408 IMG_0393.JPG
09/29/2004  08:27a              476,798 IMG_0394.JPG
01/29/2006  09:22p                6,144 Thumbs.db
               9 File(s)      2,287,050 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-4

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  02:52a              202,939 IMG_0320.JPG
01/29/2006  09:21p                5,120 Thumbs.db
```

```
 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-4

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  02:52a             202,939 IMG_0320.JPG
01/29/2006  09:21p               5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-4

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  02:52a             202,939 IMG_0320.JPG
01/29/2006  09:21p               5,120 Thumbs.db
               6 File(s)        624,177 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  03:01a             228,477 IMG_0321.JPG
09/28/2004  03:02a             211,475 IMG_0322.JPG
09/28/2004  03:02a             258,674 IMG_0323.JPG
01/29/2006  09:21p              14,848 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  03:01a             228,477 IMG_0321.JPG
09/28/2004  03:02a             211,475 IMG_0322.JPG
09/28/2004  03:02a             258,674 IMG_0323.JPG
01/29/2006  09:21p              14,848 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  03:01a             228,477 IMG_0321.JPG
09/28/2004  03:02a             211,475 IMG_0322.JPG
09/28/2004  03:02a             258,674 IMG_0323.JPG
01/29/2006  09:21p              14,848 Thumbs.db
              12 File(s)      2,140,422 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-6

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/30/2004  04:16a             192,367 IMG_0400.JPG
09/30/2004  04:17a             215,329 IMG_0401.JPG
09/30/2004  04:41a             249,862 IMG_0402.JPG
01/29/2006  09:21p               6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-6

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/30/2004  04:16a             192,367 IMG_0400.JPG
09/30/2004  04:17a             215,329 IMG_0401.JPG
09/30/2004  04:41a             249,862 IMG_0402.JPG
01/29/2006  09:21p               6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-6
```

```
08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/30/2004  04:16a             192,367 IMG_0400.JPG
09/30/2004  04:17a             215,329 IMG_0401.JPG
09/30/2004  04:41a             249,862 IMG_0402.JPG
01/29/2006  09:21p               6,144 Thumbs.db
               12 File(s)      1,991,106 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  03:26a             309,526 IMG_0374.JPG
01/29/2006  09:21p               5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  03:26a             309,526 IMG_0374.JPG
01/29/2006  09:21p               5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  03:26a             309,526 IMG_0374.JPG
01/29/2006  09:21p               5,120 Thumbs.db
                6 File(s)        943,938 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-8

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  06:25a             392,423 IMG_0382.JPG
09/29/2004  06:26a             362,103 IMG_0383.JPG
09/29/2004  06:32a             433,816 IMG_0384.JPG
09/29/2004  06:37a             437,089 IMG_0385.JPG
09/29/2004  07:02a             319,613 IMG_0386.JPG
09/29/2004  07:02a             340,808 IMG_0387.JPG
09/29/2004  07:07a           1,235,942 IMG_0388.JPG
09/29/2004  07:08a             346,700 IMG_0389.JPG
01/29/2006  09:21p              37,376 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-8

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  06:25a             392,423 IMG_0382.JPG
09/29/2004  06:26a             362,103 IMG_0383.JPG
09/29/2004  06:32a             433,816 IMG_0384.JPG
09/29/2004  06:37a             437,089 IMG_0385.JPG
09/29/2004  07:02a             319,613 IMG_0386.JPG
09/29/2004  07:02a             340,808 IMG_0387.JPG
09/29/2004  07:07a           1,235,942 IMG_0388.JPG
09/29/2004  07:08a             346,700 IMG_0389.JPG
01/29/2006  09:21p              37,376 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-8

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
```

```
09/29/2004  06:25a            392,423 IMG_0382.JPG
09/29/2004  06:26a            362,103 IMG_0383.JPG
09/29/2004  06:32a            433,816 IMG_0384.JPG
09/29/2004  06:37a            437,089 IMG_0385.JPG
09/29/2004  07:02a            319,613 IMG_0386.JPG
09/29/2004  07:02a            340,808 IMG_0387.JPG
09/29/2004  07:07a          1,235,942 IMG_0388.JPG
09/29/2004  07:08a            346,700 IMG_0389.JPG
01/29/2006  09:21p             37,376 Thumbs.db
               27 File(s)   11,717,610 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-9

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  02:51a            470,265 IMG_0369.JPG
09/29/2004  02:57a            286,595 IMG_0370.JPG
09/29/2004  03:34a            403,500 IMG_0376.JPG
09/29/2004  04:08a            786,228 IMG_0377.JPG
01/29/2006  09:22p             22,016 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-9

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  02:51a            470,265 IMG_0369.JPG
09/29/2004  02:57a            286,595 IMG_0370.JPG
09/29/2004  03:34a            403,500 IMG_0376.JPG
09/29/2004  04:08a            786,228 IMG_0377.JPG
01/29/2006  09:22p             22,016 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\CA-9

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/29/2004  02:51a            470,265 IMG_0369.JPG
09/29/2004  02:57a            286,595 IMG_0370.JPG
09/29/2004  03:34a            403,500 IMG_0376.JPG
09/29/2004  04:08a            786,228 IMG_0377.JPG
01/29/2006  09:22p             22,016 Thumbs.db
               15 File(s)    5,905,812 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\DV-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  03:34a            825,284 IMG_0165.JPG
01/29/2006  09:21p              5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\DV-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  03:34a            825,284 IMG_0165.JPG
01/29/2006  09:21p              5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\DV-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  03:34a            825,284 IMG_0165.JPG
01/29/2006  09:21p              5,120 Thumbs.db
                6 File(s)    2,491,212 bytes
```

```
 Directory of D:\CalienteAggRpt,AppxC-Photos\DV-3

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  06:58a           1,015,673 IMG_0173.JPG
01/29/2006  09:21p               5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\DV-3

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  06:58a           1,015,673 IMG_0173.JPG
01/29/2006  09:21p               5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\DV-3

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  06:58a           1,015,673 IMG_0173.JPG
01/29/2006  09:21p               5,120 Thumbs.db
               6 File(s)      3,062,379 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\ES-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  04:26a             336,841 IMG_0206.JPG
09/22/2004  04:38a             257,008 IMG_0207.JPG
09/22/2004  04:38a             444,582 IMG_0208.JPG
09/22/2004  05:00a             289,010 IMG_0209.JPG
01/29/2006  09:21p               7,680 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\ES-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  04:26a             336,841 IMG_0206.JPG
09/22/2004  04:38a             257,008 IMG_0207.JPG
09/22/2004  04:38a             444,582 IMG_0208.JPG
09/22/2004  05:00a             289,010 IMG_0209.JPG
01/29/2006  09:21p               7,680 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\ES-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  04:26a             336,841 IMG_0206.JPG
09/22/2004  04:38a             257,008 IMG_0207.JPG
09/22/2004  04:38a             444,582 IMG_0208.JPG
09/22/2004  05:00a             289,010 IMG_0209.JPG
01/29/2006  09:21p               7,680 Thumbs.db
              15 File(s)      4,005,363 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\ES-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  03:20a             269,778 IMG_0230.JPG
09/23/2004  03:40a             337,553 IMG_0231.JPG
01/29/2006  09:21p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\ES-7
```

```
08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  03:20a             269,778 IMG_0230.JPG
09/23/2004  03:40a             337,553 IMG_0231.JPG
01/29/2006  09:21p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\ES-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  03:20a             269,778 IMG_0230.JPG
09/23/2004  03:40a             337,553 IMG_0231.JPG
01/29/2006  09:21p               5,632 Thumbs.db
               9 File(s)      1,838,889 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  05:18a             394,018 IMG_0245.JPG
01/29/2006  09:24p               9,216 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  05:18a             394,018 IMG_0245.JPG
01/29/2006  09:24p               9,216 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  05:18a             394,018 IMG_0245.JPG
01/29/2006  09:24p               9,216 Thumbs.db
               6 File(s)      1,209,702 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-10

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  04:50a           1,359,122 IMG_0244.JPG
01/29/2006  09:22p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-10

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  04:50a           1,359,122 IMG_0244.JPG
01/29/2006  09:22p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-10

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  04:50a           1,359,122 IMG_0244.JPG
01/29/2006  09:22p               5,632 Thumbs.db
               6 File(s)      4,094,262 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-2

08/02/2007  06:07p      <DIR>          .
```

```
08/02/2007  06:07p      <DIR>          ..
09/22/2004  08:53a             307,950 IMG_0219.JPG
09/22/2004  08:55a             285,160 IMG_0220.JPG
09/22/2004  09:15a             400,621 IMG_0221.JPG
09/22/2004  09:45a             264,065 IMG_0222.JPG
09/22/2004  09:46a             269,631 IMG_0223.JPG
09/22/2004  09:46a             216,139 IMG_0224.JPG
01/29/2006  09:21p               7,168 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-2

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  08:53a             307,950 IMG_0219.JPG
09/22/2004  08:55a             285,160 IMG_0220.JPG
09/22/2004  09:15a             400,621 IMG_0221.JPG
09/22/2004  09:45a             264,065 IMG_0222.JPG
09/22/2004  09:46a             269,631 IMG_0223.JPG
09/22/2004  09:46a             216,139 IMG_0224.JPG
01/29/2006  09:21p               7,168 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-2

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  08:53a             307,950 IMG_0219.JPG
09/22/2004  08:55a             285,160 IMG_0220.JPG
09/22/2004  09:15a             400,621 IMG_0221.JPG
09/22/2004  09:45a             264,065 IMG_0222.JPG
09/22/2004  09:46a             269,631 IMG_0223.JPG
09/22/2004  09:46a             216,139 IMG_0224.JPG
01/29/2006  09:21p               7,168 Thumbs.db
               21 File(s)    5,252,202 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-4

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  06:17a             243,856 IMG_0213.JPG
01/29/2006  09:22p               5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-4

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  06:17a             243,856 IMG_0213.JPG
01/29/2006  09:22p               5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-4

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  06:17a             243,856 IMG_0213.JPG
01/29/2006  09:22p               5,120 Thumbs.db
                6 File(s)      746,928 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  05:17a             180,451 IMG_0210.JPG
09/22/2004  05:28a             248,831 IMG_0211.JPG
01/29/2006  09:22p               5,632 Thumbs.db
```

```
 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  05:17a             180,451 IMG_0210.JPG
09/22/2004  05:28a             248,831 IMG_0211.JPG
01/29/2006  09:22p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  05:17a             180,451 IMG_0210.JPG
09/22/2004  05:28a             248,831 IMG_0211.JPG
01/29/2006  09:22p               5,632 Thumbs.db
               9 File(s)      1,304,742 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-6

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  03:49a             806,855 IMG_0204.JPG
09/22/2004  03:50a             773,412 IMG_0205.JPG
01/29/2006  09:21p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-6

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  03:49a             806,855 IMG_0204.JPG
09/22/2004  03:50a             773,412 IMG_0205.JPG
01/29/2006  09:21p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-6

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  03:49a             806,855 IMG_0204.JPG
09/22/2004  03:50a             773,412 IMG_0205.JPG
01/29/2006  09:21p               5,632 Thumbs.db
               9 File(s)      4,757,697 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  08:30a             836,672 IMG_0178.JPG
09/20/2004  10:02a           1,494,961 IMG_0182.JPG
09/20/2004  10:03a           1,138,657 IMG_0183.JPG
09/20/2004  10:23a           1,143,860 IMG_0184.JPG
01/29/2006  09:21p               7,168 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  08:30a             836,672 IMG_0178.JPG
09/20/2004  10:02a           1,494,961 IMG_0182.JPG
09/20/2004  10:03a           1,138,657 IMG_0183.JPG
09/20/2004  10:23a           1,143,860 IMG_0184.JPG
01/29/2006  09:21p               7,168 Thumbs.db
```

```
 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  08:30a           836,672 IMG_0178.JPG
09/20/2004  10:02a         1,494,961 IMG_0182.JPG
09/20/2004  10:03a         1,138,657 IMG_0183.JPG
09/20/2004  10:23a         1,143,860 IMG_0184.JPG
01/29/2006  09:21p             7,168 Thumbs.db
               15 File(s)    13,863,954 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-8

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  03:16a           268,259 IMG_0202.JPG
09/22/2004  03:24a           279,791 IMG_0203.JPG
01/29/2006  09:22p             5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-8

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  03:16a           268,259 IMG_0202.JPG
09/22/2004  03:24a           279,791 IMG_0203.JPG
01/29/2006  09:22p             5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-8

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  03:16a           268,259 IMG_0202.JPG
09/22/2004  03:24a           279,791 IMG_0203.JPG
01/29/2006  09:22p             5,632 Thumbs.db
                9 File(s)    1,661,046 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-9

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  05:53a           199,444 IMG_0212.JPG
01/29/2006  09:23p             5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-9

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  05:53a           199,444 IMG_0212.JPG
01/29/2006  09:23p             5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\GF-9

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/22/2004  05:53a           199,444 IMG_0212.JPG
01/29/2006  09:23p             5,120 Thumbs.db
                6 File(s)      613,692 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-10

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  09:15a           268,255 IMG_0357.JPG
```

```
09/28/2004  09:16a            441,533 IMG_0358.JPG
01/30/2006  05:43p             13,312 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-10

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  09:15a            268,255 IMG_0357.JPG
09/28/2004  09:16a            441,533 IMG_0358.JPG
01/30/2006  05:43p             13,312 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-10

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  09:15a            268,255 IMG_0357.JPG
09/28/2004  09:16a            441,533 IMG_0358.JPG
01/30/2006  05:43p             13,312 Thumbs.db
               9 File(s)      2,169,300 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  04:10a            270,095 IMG_0337.JPG
01/29/2006  09:23p              5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  04:10a            270,095 IMG_0337.JPG
01/29/2006  09:23p              5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  04:10a            270,095 IMG_0337.JPG
01/29/2006  09:23p              5,120 Thumbs.db
               6 File(s)        825,645 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-13

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  10:07a            323,427 IMG_0359.JPG
09/28/2004  10:08a            385,134 IMG_0360.JPG
09/28/2004  10:20a            460,912 IMG_0361.JPG
01/29/2006  09:22p              6,656 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-13

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  10:07a            323,427 IMG_0359.JPG
09/28/2004  10:08a            385,134 IMG_0360.JPG
09/28/2004  10:20a            460,912 IMG_0361.JPG
01/29/2006  09:22p              6,656 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-13

08/02/2007  06:07p      <DIR>          .
```

```
08/02/2007  06:07p      <DIR>          ..
09/28/2004  10:07a             323,427 IMG_0359.JPG
09/28/2004  10:08a             385,134 IMG_0360.JPG
09/28/2004  10:20a             460,912 IMG_0361.JPG
01/29/2006  09:22p               6,656 Thumbs.db
              12 File(s)     3,528,387 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-2

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  06:45a             821,703 IMG_0350.JPG
09/28/2004  06:53a             710,166 IMG_0351.JPG
09/28/2004  06:57a             774,850 IMG_0352.JPG
01/29/2006  09:22p               6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-2

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  06:45a             821,703 IMG_0350.JPG
09/28/2004  06:53a             710,166 IMG_0351.JPG
09/28/2004  06:57a             774,850 IMG_0352.JPG
01/29/2006  09:22p               6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-2

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  06:45a             821,703 IMG_0350.JPG
09/28/2004  06:53a             710,166 IMG_0351.JPG
09/28/2004  06:57a             774,850 IMG_0352.JPG
01/29/2006  09:22p               6,144 Thumbs.db
              12 File(s)     6,938,589 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-3

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  04:58a             262,072 IMG_0340.JPG
09/28/2004  05:04a             238,557 IMG_0341.JPG
01/29/2006  09:23p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-3

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  04:58a             262,072 IMG_0340.JPG
09/28/2004  05:04a             238,557 IMG_0341.JPG
01/29/2006  09:23p               5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-3

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  04:58a             262,072 IMG_0340.JPG
09/28/2004  05:04a             238,557 IMG_0341.JPG
01/29/2006  09:23p               5,632 Thumbs.db
               9 File(s)     1,518,783 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-4

08/02/2007  06:07p      <DIR>          .
```

```
08/02/2007  06:07p      <DIR>          ..
09/27/2004  11:41a           186,262 IMG_0317.JPG
01/29/2006  09:23p             5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-4

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/27/2004  11:41a           186,262 IMG_0317.JPG
01/29/2006  09:23p             5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-4

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/27/2004  11:41a           186,262 IMG_0317.JPG
01/29/2006  09:23p             5,120 Thumbs.db
               6 File(s)       574,146 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  07:33a           851,570 IMG_0353.JPG
09/28/2004  07:33a           849,811 IMG_0354.JPG
01/29/2006  09:22p             5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  07:33a           851,570 IMG_0353.JPG
09/28/2004  07:33a           849,811 IMG_0354.JPG
01/29/2006  09:22p             5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-5

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  07:33a           851,570 IMG_0353.JPG
09/28/2004  07:33a           849,811 IMG_0354.JPG
01/29/2006  09:22p             5,632 Thumbs.db
               9 File(s)     5,121,039 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  08:06a           690,694 IMG_0355.JPG
01/29/2006  09:22p             5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  08:06a           690,694 IMG_0355.JPG
01/29/2006  09:22p             5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-7

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/28/2004  08:06a           690,694 IMG_0355.JPG
```

```
                                        dir.txt
01/29/2006  09:22p                  5,120 Thumbs.db
               6 File(s)        2,087,442 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-8

08/02/2007  06:07p      <DIR>           .
08/02/2007  06:07p      <DIR>           ..
09/28/2004  04:32a                252,844 IMG_0339.JPG
09/28/2004  08:31a                178,634 IMG_0356.JPG
01/29/2006  09:23p                  5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-8

08/02/2007  06:07p      <DIR>           .
08/02/2007  06:07p      <DIR>           ..
09/28/2004  04:32a                252,844 IMG_0339.JPG
09/28/2004  08:31a                178,634 IMG_0356.JPG
01/29/2006  09:23p                  5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\LD-8

08/02/2007  06:07p      <DIR>           .
08/02/2007  06:07p      <DIR>           ..
09/28/2004  04:32a                252,844 IMG_0339.JPG
09/28/2004  08:31a                178,634 IMG_0356.JPG
01/29/2006  09:23p                  5,632 Thumbs.db
               9 File(s)        1,311,330 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-5

08/02/2007  06:07p      <DIR>           .
08/02/2007  06:07p      <DIR>           ..
09/24/2004  07:44a                231,200 IMG_0266.JPG
09/24/2004  08:08a                986,452 IMG_0267.JPG
09/24/2004  08:08a                975,575 IMG_0268.JPG
01/29/2006  09:22p                  6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-5

08/02/2007  06:07p      <DIR>           .
08/02/2007  06:07p      <DIR>           ..
09/24/2004  07:44a                231,200 IMG_0266.JPG
09/24/2004  08:08a                986,452 IMG_0267.JPG
09/24/2004  08:08a                975,575 IMG_0268.JPG
01/29/2006  09:22p                  6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-5

08/02/2007  06:07p      <DIR>           .
08/02/2007  06:07p      <DIR>           ..
09/24/2004  07:44a                231,200 IMG_0266.JPG
09/24/2004  08:08a                986,452 IMG_0267.JPG
09/24/2004  08:08a                975,575 IMG_0268.JPG
01/29/2006  09:22p                  6,144 Thumbs.db
              12 File(s)        6,598,113 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-8

08/02/2007  06:07p      <DIR>           .
08/02/2007  06:07p      <DIR>           ..
09/25/2004  05:07a                209,595 IMG_0289.JPG
09/25/2004  06:32a                180,221 IMG_0297.JPG
09/25/2004  06:32a                193,202 IMG_0298.JPG
```

```
09/25/2004  06:32a            199,103 IMG_0299.JPG
09/25/2004  06:32a            223,825 IMG_0300.JPG
09/25/2004  06:32a            236,864 IMG_0301.JPG
09/25/2004  07:15a            222,862 IMG_0302.JPG
09/25/2004  07:18a          1,020,149 IMG_0303.JPG
09/25/2004  07:29a            420,007 IMG_0304.JPG
01/29/2006  09:23p              5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-8

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/25/2004  05:07a            209,595 IMG_0289.JPG
09/25/2004  06:32a            180,221 IMG_0297.JPG
09/25/2004  06:32a            193,202 IMG_0298.JPG
09/25/2004  06:32a            199,103 IMG_0299.JPG
09/25/2004  06:32a            223,825 IMG_0300.JPG
09/25/2004  06:32a            236,864 IMG_0301.JPG
09/25/2004  07:15a            222,862 IMG_0302.JPG
09/25/2004  07:18a          1,020,149 IMG_0303.JPG
09/25/2004  07:29a            420,007 IMG_0304.JPG
01/29/2006  09:23p              5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-8

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/25/2004  05:07a            209,595 IMG_0289.JPG
09/25/2004  06:32a            180,221 IMG_0297.JPG
09/25/2004  06:32a            193,202 IMG_0298.JPG
09/25/2004  06:32a            199,103 IMG_0299.JPG
09/25/2004  06:32a            223,825 IMG_0300.JPG
09/25/2004  06:32a            236,864 IMG_0301.JPG
09/25/2004  07:15a            222,862 IMG_0302.JPG
09/25/2004  07:18a          1,020,149 IMG_0303.JPG
09/25/2004  07:29a            420,007 IMG_0304.JPG
01/29/2006  09:23p              5,120 Thumbs.db
               30 File(s)   8,732,844 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-9

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/25/2004  08:32a            296,417 IMG_0306.JPG
09/25/2004  08:54a            273,781 IMG_0307.JPG
09/25/2004  08:54a            264,058 IMG_0308.JPG
01/29/2006  09:22p              6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-9

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/25/2004  08:32a            296,417 IMG_0306.JPG
09/25/2004  08:54a            273,781 IMG_0307.JPG
09/25/2004  08:54a            264,058 IMG_0308.JPG
01/29/2006  09:22p              6,144 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NN-9

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/25/2004  08:32a            296,417 IMG_0306.JPG
09/25/2004  08:54a            273,781 IMG_0307.JPG
```

```
09/25/2004  08:54a            264,058 IMG_0308.JPG
01/29/2006  09:22p              6,144 Thumbs.db
              12 File(s)    2,521,200 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  09:23a            246,429 IMG_0262.JPG
09/23/2004  09:58a            691,447 IMG_0263.JPG
09/23/2004  09:58a            209,703 IMG_0264.JPG
09/23/2004  10:02a            271,217 IMG_0265.JPG
01/29/2006  09:22p              7,168 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  09:23a            246,429 IMG_0262.JPG
09/23/2004  09:58a            691,447 IMG_0263.JPG
09/23/2004  09:58a            209,703 IMG_0264.JPG
09/23/2004  10:02a            271,217 IMG_0265.JPG
01/29/2006  09:22p              7,168 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/23/2004  09:23a            246,429 IMG_0262.JPG
09/23/2004  09:58a            691,447 IMG_0263.JPG
09/23/2004  09:58a            209,703 IMG_0264.JPG
09/23/2004  10:02a            271,217 IMG_0265.JPG
01/29/2006  09:22p              7,168 Thumbs.db
              15 File(s)    4,277,892 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  07:57a            828,996 IMG_0175.JPG
01/29/2006  09:22p              5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  07:57a            828,996 IMG_0175.JPG
01/29/2006  09:22p              5,120 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-11

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  07:57a            828,996 IMG_0175.JPG
01/29/2006  09:22p              5,120 Thumbs.db
               6 File(s)    2,502,348 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-12

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/20/2004  03:23a          1,291,625 IMG_0163.JPG
09/20/2004  04:34a            790,220 IMG_0167.JPG
```

```
09/20/2004  04:53a            884,159 IMG_0168.JPG
09/20/2004  05:15a            796,470 IMG_0169.JPG
09/20/2004  06:08a          1,123,633 IMG_0171.JPG
09/20/2004  06:17a          1,269,179 IMG_0172.JPG
01/29/2006  09:22p              7,168 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-12

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/20/2004  03:23a          1,291,625 IMG_0163.JPG
09/20/2004  04:34a            790,220 IMG_0167.JPG
09/20/2004  04:53a            884,159 IMG_0168.JPG
09/20/2004  05:15a            796,470 IMG_0169.JPG
09/20/2004  06:08a          1,123,633 IMG_0171.JPG
09/20/2004  06:17a          1,269,179 IMG_0172.JPG
01/29/2006  09:22p              7,168 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-12

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/20/2004  03:23a          1,291,625 IMG_0163.JPG
09/20/2004  04:34a            790,220 IMG_0167.JPG
09/20/2004  04:53a            884,159 IMG_0168.JPG
09/20/2004  05:15a            796,470 IMG_0169.JPG
09/20/2004  06:08a          1,123,633 IMG_0171.JPG
09/20/2004  06:17a          1,269,179 IMG_0172.JPG
01/29/2006  09:22p              7,168 Thumbs.db
              21 File(s)   18,487,362 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-3

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/22/2004  09:45a            264,065 IMG_0222.JPG
09/22/2004  09:46a            269,631 IMG_0223.JPG
01/29/2006  09:22p              5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-3

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/22/2004  09:45a            264,065 IMG_0222.JPG
09/22/2004  09:46a            269,631 IMG_0223.JPG
01/29/2006  09:22p              5,632 Thumbs.db

 Directory of D:\CalienteAggRpt,AppxC-Photos\NS-3

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/22/2004  09:45a            264,065 IMG_0222.JPG
09/22/2004  09:46a            269,631 IMG_0223.JPG
01/29/2006  09:22p              5,632 Thumbs.db
               9 File(s)    1,617,984 bytes

 Directory of D:\CalienteAggRpt,AppxC-Photos\TH-1

08/02/2007  06:07p      <DIR>         .
08/02/2007  06:07p      <DIR>         ..
09/24/2004  09:13a            232,522 IMG_0271.JPG
09/24/2004  09:24a            225,952 IMG_0272.JPG
01/29/2006  09:23p              5,632 Thumbs.db
```

```
 Directory of D:\CalienteAggRpt,AppxC-Photos\TH-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/24/2004  09:13a             232,522 IMG_0271.JPG
09/24/2004  09:24a             225,952 IMG_0272.JPG
01/29/2006  09:23p               5,632 Thumbs.db
```


```
 Directory of D:\CalienteAggRpt,AppxC-Photos\TH-1

08/02/2007  06:07p      <DIR>          .
08/02/2007  06:07p      <DIR>          ..
09/24/2004  09:13a             232,522 IMG_0271.JPG
09/24/2004  09:24a             225,952 IMG_0272.JPG
01/29/2006  09:23p               5,632 Thumbs.db
```


```
               9 File(s)      1,392,318 bytes

     Total Files Listed:
             423 File(s)    145,227,867 bytes
             369 Dir(s)               0 bytes free
```