

February 8, 2006



Terracon Consultants, Inc.
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City of Henderson
Building Fire Safety, Fire Engineering
240 Water Street
P.O. Box 95050
Henderson, Nevada 89009-5050

Attention: Mr. Fulton Cochran

**RE: Rock Slope Observations
2171 to 2199 Tiger Willow Drive
Sun City at MacDonald Ranch
Henderson, Nevada
Terracon Project No. 64065000**

Gentlemen:

At your request Terracon personnel visited the above referenced site on February 8, 2006 to observe slope conditions and the response of boulders littering the slope during blasting activity west of the site. The slope was covered with many rock ranging from approximately 4 feet in diameter to pebble size. Soil cover was very thin.

The slopes appeared to range from steeper than 1:1 (horizontal:vertical) near the crest to approximately 5:1 at the toe of the slope behind the homes.

Ground vibration was detectable at the time of blasting. However, we did not observe movement of any rocks as a result of the blasting. All but a small number of the rock observed on the slope were coated with dark desert varnish. The dark coating is generally associated with long (years to century's) exposure to intense sunlight and precipitation.

Based upon the ground motion observed and the site conditions, in our opinion, the risk from rock fall is low at this site.

A more detailed study would be required to estimate the magnitude of the risk and relate the risk from blasting induced rock movement to the risk of rockfall from other causes such as rain, flash flooding, freeze-thaw, thermal variations, wind and other potential environmental causes. Water run-off paths exhibited a gray surface coloration with less desert varnish. We did not observe patterns of rock movement in specific areas of the slope.

Rock Slope Observations
Sun City at MacDonald Ranch
Terracon Project No. 640650
February 8, 2006

Terracon Consultants, Inc.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No warranties, either express or implied, are intended or made. Should you have any questions, please do not hesitate to call.

Sincerely,

TERRACON CONSULTANTS, INC.

A handwritten signature in black ink, appearing to read "K Kosar".

Keith M. Kosar, PhD
Director of Geotechnical Services

A handwritten signature in black ink, appearing to read "Walter E. Vanderpool".

Walter E. Vanderpool, P. E.
Senior Geotechnical Engineer

KEITH M. KOSAR, Ph.D., P.E., P.Eng.

SENIOR GEOTECHNICAL CONSULTANT

PROFESSIONAL EXPERIENCE

Dr. Kosar is a senior geotechnical consultant in the Las Vegas Office. He is lead geotechnical engineer and senior geotechnical reviewer for a wide variety of engineering and applied research projects. These projects include foundation engineering work, design-build transportation and infrastructure projects, oil, gas, water and sewer pipeline design projects, geotechnical work in the offshore, slope stability analyses, instrumentation and laboratory testing and retaining structure design. He has been involved in a number of large multi-disciplinary projects that have involved the design and construction of large structures in environmentally sensitive areas.

Dr. Kosar has over twenty years of experience in both the United States and Canada. He served several years as Associate Editor of the Canadian Geotechnical Journal and Member of the Canadian Geotechnical Research Board. In 2001, Dr. Kosar was awarded the Geoffrey Meyerhof Award by the Canadian Geotechnical Society in recognition of his contributions to soil mechanics and foundation engineering.

PROJECT EXPERIENCE

- **Central Link Light Rail Project – Seattle, Washington**
Provided technical review and analysis for foundation design of elevated structures. The geotechnical design team (collaboration comprised of geotechnical engineers from Seattle, Vancouver and San Francisco) explored the use of new innovative geotechnical analysis techniques for the design of steel pile and bored cast-in-place concrete caisson foundations.
- **Various Industrial and Commercial Facilities – Las Vegas, Nevada**
Responsible for both shallow and deep foundations for a number of Industrial and Commercial structures in the Las Vegas area.
- **Millennium Rapid Transit Line – Vancouver, British Columbia**
Served as the Geotechnical Design Manager and Geotechnical Engineer of Record for the guideway section. The design had to take into account of highly variable soil conditions, both static and seismic loading conditions, site constraints, environmental issues and impacts on adjacent structures along the alignment.
- **Seymour-Capilano Filtration Plant – Vancouver, British Columbia**
- Responsible for geotechnical investigation, analysis and design of building foundations, tanks and water retention structures. A site-specific seismic response spectrum was developed in support of design process.
- **Various Infrastructure Projects – USA and Canada**
Geotechnical engineer of record for \$840 Million Confederation Bridge, \$21 Million John Hart Bridge and Interchange and \$20 Airport Connector Bridge and Interchange. Geotechnical design support for teams bidding for major transportation projects including Seattle Monorail Project, Richmond-Airport-Vancouver elevated guideway extension to Vancouver's LRT system and Golden Ears Bridge.

EDUCATION

Doctor of Philosophy, Civil Engineering, 1989, University of Alberta
Master of Science, Civil Engineering, 1983, University of Alberta
Bachelor of Science, Geological Engineering, 1979, University of British Columbia

REGISTRATIONS

Professional Civil Engineer: California (2004, No. C67126), Arizona (2003, No. 39151), Alberta (1984, No. 29126), British Columbia (1997, No. 23396), Nevada (reciprocity application pending)

AFFILIATIONS

American Society of Civil Engineers
International Society for Soil Mechanics and Geotechnical Engineering
Canadian Geotechnical Society

WORK HISTORY

Terracon Consultants, Inc., 2005-present
AMEC Americas – Earth & Environmental Division, Principal Geotechnical Engineer, 2003-2005
EBA Engineering Consultants Ltd., Senior Geotechnical Engineer/Regional Group Manager, 1997-2003
C-CORE, Director of Geotechnical, Geophysics & Environmental Group, 1995-1997
Golder Associates Ltd., Senior Geotechnical Engineer/Associate, 1987-1995

SELECTED PUBLICATIONS

- Russell, C.A., Kosar, K.M., Conley, T.M. and Hachethal, U., 2004. *Earth Observation Market Development for Land Subsidence Problems on a Global Basis*. Proceedings of 2004 ENVISAT & ERS Symposium, Salzburg, Austria, September 6 – 10, 2004.
- Froese, C.R., van der Kooij, M. and Kosar K.M., 2004. *Advances in the Use of Spaceborne InSAR for Application to Pipeline Route Selection and Integrity Management*. Proceedings of IPC 2004, International Pipeline Conference, October 4 to 8, 2004, Calgary, Alberta, Canada.
- Froese, C.R., van der Kooij, M. and Kosar K.M., 2004. *Advances in Application of InSAR to Complex, Slowly Moving Landslides in Dry and Vegetated Terrain*. Invited Lecture. Proceedings of the IX International Landslide Symposium, Rio de Janeiro, Brazil.
- Kosar, K.M., Martin S.J., Harbicht T. and Revering K. F., 2003. *Characterization Of Fountain Landslide Using Spaceborne InSAR*. The 12th Panamerican Conference for Soil Mechanics and Geotechnical Engineering and the 39th US Rock Mechanics Symposium, Soil and Rock America, Boston, Massachusetts, June 22 to 26 2003 (Accepted for Publication).
- Kosar, K.M., Revering, K., Keegan, T., Black, K. and Stewart, I., 2003. *The Use of Spaceborne InSAR to Characterize Ground Movements Along a Rail Corridor and an Open Pit Mine*. Proceedings of the 3rd Canadian Conference on Geotechnique and Natural Hazards, Edmonton, Alberta, June 9 and 19, 2003.
- Hsieh E.T., Kosar K.M. and Purdon, A.C., 2002. *Geotechnical Design of Foundations for Skytrain Millennium Line*, 55th Canadian Geotechnical Conference, Niagara Falls, October, 2002, pp. 41-48.
- Martin, S.J., Kosar. K.M., and Oldford, T., 2002. *Geotechnical Engineering Aspects of Skytrain Millennium Line D/B Construction*, 55th Canadian Geotechnical Conference, Niagara Falls, October, 2002, pp. 33-40.
- Walter, D.J., Kosar, K.M., and Clark, J.I., 1998. *Shearing of Contaminated Soils to Enhance In Situ Treatment*. 51st Canadian Geotech Conference, Edmonton, October 1998.
- Phillips, R. and Kosar, K.M., 1998. *Physical Modelling of Foundations For Confederation Bridge, Canada*. Proceedings of International Conference on Geotechnical Centrifuge Modelling, Centrifuge '98, Tokyo, Japan, September, 1998, pp. 447-452.
- Kosar, K.M., Phillips, R., Becker, D.E. and Turnham, J., 1997. *Physical Modelling of Foundations for Northumberland Strait Crossing*. Transportation Research Record, National Academy Press, Washington.
- Kosar, K.M., Phillips, R., Becker, D.E. and Turnham, J., 1997. *Physical Modelling of Foundations for Northumberland Strait Crossing*. Transportation Research Board Meeting, Preprint 970497, January 1997, Washington.
- Kosar, K.M., Phillips, R., Becker, D.E. and Turnham, J., 1996. *Physical Modelling of Foundations for Northumberland Strait Crossing*. Proceedings of 49th Canadian Geotechnical Conference, St. John's, Newfoundland, September 23-25, 1996.
- Dunaszegi, L., Maes, M., and Kosar, K.M., 1996. *Northumberland Strait Crossing Project: Use of Limit States in Geotechnical Design*. Proceedings of 49th Canadian Geotechnical Conference, St. John's, Newfoundland, September 23-25, 1996.
- Zhu, F., Clark, J.I., Phillips, R. and Kosar, K.M., 1996. *Centrifuge Modelling of Ring Footings*. Proceedings of 49th Canadian Geotechnical Conference, St. John's, Newfoundland, September 23-25, 1996.
- Leach, B., Kosar, K. and Ingraham, P., 1995. *Hydraulic Fracturing of Soils for Enhanced Site Remediation: Case Histories*. Proceedings of Seventh Annual New England Environmental EXPO, May 9-11, 1995, Boston, Massachusetts.

Kosar, K.M., Walter, D.J. and Burwash, W.J., 1994. *Design of Foundations to Resist High Lateral Loads for Northumberland Strait Crossing*. Proceedings of 4th International Conference on Short and Medium Span Bridges, August 8-11, 1994, Halifax, Nova Scotia.

Leach, B., Kosar, K. and Ingraham, P.C., 1994. *Pneumatic and Hydraulic Fracturing for Enhanced In-situ Remediation of Contaminated Fine Grained Soils*. Proceedings of the 1994 Focus Conference on Eastern Regional Ground Water Issues, The National Ground Water Association. October 3-5, 1994, Burlington, Vermont, pp. 537-549.

Kosar, K.M., Burwash, W.J., Milligan, V. and McCammon, N.R., 1993. *Geotechnical Foundation Design Considerations for the Northumberland Strait Crossing*. Proceedings of CSCF Annual Conference, June 8-11, 1993, Fredericton, New Brunswick, pp 381-390.

WALTER E. VANDERPOOL, P.E.

SENIOR PROJECT ENGINEER

PROFESSIONAL EXPERIENCE

Mr. Vanderpool has more than twenty-five years of professional experience providing geotechnical engineering services for a wide range of project types throughout the southwestern United States. He has provided QA reviews and QC services on crosshole sonic logging of cast-in-drilled-hole foundations, and has done extensive work with geotechnical instrumentation including monitoring by strain gauges, inclinometers, piezometers, tiltmeters, and pressure transducer settlement monitoring instruments. He has also monitored the construction of slopes, dams, buildings, fixed guideway light rail systems, retaining walls, bridges, driven piles, drilled shafts and soil anchors. His projects have included single family residential developments, hotel/residential towers (up to 55-stories), interstate highway interchange studies, pavement designs, earth dams, water storage tanks, reservoirs, pipelines, flood control basins, communication antenna sites, warehouse sites (up to 350,000-square feet), airport projects, subdivision streets, schools, hospitals, bridges, criminal justice centers, fire stations, rockfall, landslide and debris flow studies, settlement studies and forensic investigations. His design experience includes small earthen dams, geotextile reinforced slopes, soil nail walls, compaction grouting, wick drains, dewatering, mat and spread footing shallow foundations, driven pile, auger cast pile, large diameter drilled shaft, micropile deep foundation systems, and both asphalt and concrete pavements.

PROJECT EXPERIENCE

HIGHRISE

- **The Palazzo @ Venetian, Phase 2** – Las Vegas, Nevada
Geotechnical engineer for 5-level subterranean parking structure, excavation support (60') and drilled shaft load testing, 56-story hotel tower with low-rise areas on 15 acres site.
- **Newport Lofts** – Las Vegas, NV
Geotechnical engineer for 15-story condominium-style residential and retail building. Work included evaluating soil conditions and identifying the foundation system best suited to this site and the anticipated structure loads. Micropile testing was also conducted.
- **Panorama** – Las Vegas NV
Senior Project Engineer. The project consists of the design and construction of a five-level parking garage and a 34-story time-share condominium tower.
- **Soho Lofts** – Las Vegas, NV
Senior Project Engineer. Provide micropile construction inspection testing and instrumentation for 17-story condominium tower.
- **Las Vegas Central/Nevada Towers** – Las Vegas, NV
Senior Project Engineer. Las Vegas Central/Nevada Towers project site consists of approximately 4.85 gross acres and includes two fifty-story tower structures and a six-story parking garage. Several smaller commercial structures are also included within the development. Work includes drilled shaft load test observation, testing and geotechnical engineering services

EDUCATION

Bachelor of Science, Civil Engineering, 1979 Colorado State University
Associate of Arts, 1976, Colorado Mountain College

REGISTRATIONS

Professional Engineer, Civil, 8466, State of Nevada
Professional Engineer, Civil, 24243, State of Arizona
Professional Engineer, Civil, 22395, State of Colorado
Professional Engineer, Civil, 85-169602-2202, State of Utah

AFFILIATIONS

National Society of Professional Engineers
American Society of Civil Engineers

WORK HISTORY

Terracon, Senior Project Manager - 2002-Present
Kleinfelder, Senior Engineer - 1990-2002
Western Technologies - 1989-1990

TECHNICAL PUBLICATIONS

Micropile Response to Hector Mine Earthquake, International Workshop on Micropiles, Venice, Italy, May 2002
Micropile Performance Variability; A Fundamental Case Study, Ninth International Conference on Piling and Deep Foundations, Nice, France, June 2002
CSL Defines CDIH Defects; Coring Confirms Results, GeoDenver 2000, Denver, Colorado, August 2000
Load in a Drilled Foundation. Where did it go and When did it get there? Deep Foundation Institute, 29th Annual Conference on Deep Foundations, Vancouver, BC, Septemeber 2004

- **Neonopolis – Las Vegas, Nevada**
Senior geotechnical engineer responsible for conducting a geotechnical investigation for a retail/entertainment complex and parking structure. The work included soil nail walls, floor load testing, and long term settlement monitoring.
- **Desert Inn LeReve Hotel/Casino (Wynn Resort) – Las Vegas, Nevada**
Project manager for geotechnical exploration and drilled shaft load testing to provide design and construction recommendations – 47 story tower, 11 story parking structure and convention center.
- **New York New York Hotel and Casino – Las Vegas, Nevada**
Project manager for the geotechnical investigation and foundation recommendations for the 48-story hotel tower, low-rise casino and shops, 9-story parking structure, and amusement features (i.e. roller coaster, Statue of Liberty, etc.)
- **Whiskey Pete's Hotel Tower, Casino and Parking Structure – Primm, Nevada**
Project manager responsible for geotechnical engineering recommendations for foundations, site grading and pavement design of a 13-story hotel tower and 6-story parking garage.
- **Buffalo Bill's Hotel and Casino – Primm, Nevada**
Project manager for the geotechnical investigation and foundation recommendations for two 17-story hotel towers, a 6-story parking structure, a low-rise casino, and roller coaster amusement ride.

DISTRESS

- **Light Rail Distress Investigation, Luxor/Excalibur Hotels & Casinos – Las Vegas, Nevada**
Senior geotechnical engineer responsible for conducting a lateral load test program on suspended light rail cars to evaluate performance characteristics and identify cause of rail system distress.
- **Amtrak Derailment Investigation – Kingman, Arizona**
As a senior geotechnical engineer, conducted an investigation into the derailment of an Amtrack train which occurred in Kingman due to a bridge collapse following a flash flood. Investigation results were reported in subsequent depositions.
- **Residential Distress Investigation – Boulder City, Nevada**
Lead investigator for investigation into the cause of a residential floor and framing system failure. The investigation included subsurface exploration, sampling and laboratory testing, visual inspection, floor level surveys, examination of framing, distress review of pre-construction and construction records and plans, and preparation of report.
- **Residential Distress Investigation – Moab, Utah**
Lead investigator for an investigation into the cause of a residential framing system failure. The investigation included visual examination of failure, review of construction plans and construction records, subsurface soil exploration, sampling and laboratory testing, preparation of evidence, deposition and courtroom testimony.
- **Slope Failure – Grand County, Colorado**
Lead investigator in slope failure and resulting residential structure destruction. The investigation included subsurface exploration, sampling, laboratory testing, examination of failure, review of construction plans and records, review of local weather history and irrigation company records and practices, and presentation of findings in deposition and court testimony.
- **Pavement System Failure – Telluride, Colorado**
Lead investigator for pavement system failure investigation. The investigation included examination of pavement failure, subsurface exploration sampling and laboratory testing of pavement materials, and review of construction records and project plans. Findings were reported in deposition and court testimony.

FLOOD CONTROL

- **Pittman Wash Channel Improvements – Henderson, Nevada**
Project manager responsible for geotechnical investigation which included subsurface exploration, laboratory testing, seepage analyses, settlement analyses, site preparation recommendations, fill placement, and compaction recommendations.
- **McCarran International Airport Drainage Improvements – Clark County, Nevada**
Project manager for a geotechnical investigation performed to provide recommendations and analysis to aid in the design of the proposed improvements, drainage structures, including open channel, box culvert,

and reinforced concrete pipe; and provide a discussion regarding various construction related items, including the presence of cemented soils.

- **Upper Las Vegas Wash Detention Basin** – *Las Vegas, Nevada*
Project manager responsible for geotechnical investigation for the detention basin which included subsurface exploration, laboratory testing, embankment design recommendations, fill placement, and compaction recommendations.
- **Lake Mead Storm Detention Basin** – *Las Vegas, Nevada*
Project manager for a geotechnical investigation which included subsurface exploration, laboratory testing, embankment design recommendations, slope stability analyses, seepage analyses, settlement analyses, site preparation recommendations, fill placement, and compaction recommendations.
- **Equestrian Detention Basin** – *Henderson, Nevada*
Project manager for a geotechnical investigation for the proposed storm detention basin, construction of an embankment, runoff interception channel/dike, energy dissipaters, overflow spillway, and outlet structures. Provided detailed and specific erosion control program, as well as recommendation for suitable embankment construction, foundations, site grading, trench backfill, compaction earth pressures, moisture protection, soil corrosion, and construction considerations.
- **Duck Creek Detention Basin** – *Las Vegas, Nevada*
Project manager for a geotechnical investigation of a 60-acre site for a proposed flood control detention basin. Project included evaluation and recommendations of on-site materials as potential borrow areas for embankment construction.
- **Lone Mountain Detention Basin** – *Las Vegas, Nevada*
Project manager for a geotechnical investigation which included subsurface exploration, laboratory testing, slope stability analysis, seepage analysis, and recommendations regarding foundation design, site preparation and grading, and soil-cement and roller-compacted concrete design.
- **VanBuskirk Channel Improvement and Detention Basin** – *Las Vegas, Nevada*
Project manager responsible for a geotechnical investigation for the channel improvements and detention basin. Investigation included subsurface exploration, laboratory testing, embankment design recommendations, slope stability analyses, seepage analyses, settlement analyses, site preparation recommendations, fill placement, and compaction recommendations.
- **Rawhide Channel Improvements** – *Las Vegas, Nevada*
Conducted a geotechnical investigation for the proposed improvements, which consisted of multi-barrel box culvert on the order of four feet by eight feet. In addition, pavement replacement and/or improvements of approximately one-half mile were made along Topaz Avenue and Russell Road.
- **Hiko Springs Storm Drain Detention Basin** – *Laughlin, Nevada*
Project manager responsible for a geotechnical investigation which included subsurface exploration, laboratory testing, embankment design recommendations, slope stability analyses, seepage analyses, settlement analyses, site preparation recommendations, fill placement, and compaction recommendations.

WATER

- **Henderson Water Reclamation Facility** – *Henderson, Nevada*
Project manager for a geotechnical investigation for wastewater plant expansion including shallow aquifer pump tests/analyses for protection to structures below water line.
- **Clark County Wastewater Treatment Plant** – *Clark County, Nevada*
Project manager for geotechnical investigation for a major expansion of the wastewater treatment plant. Services included water quality sampling, dewatering and surcharge included settlement monitoring and braced excavation horizontal deformation monitoring by inclinometer methods.
- **Big Bend Water System Improvements** – *Laughlin, Nevada*
Project manager responsible for a geotechnical investigation for three water storage reservoirs, one pump station, and 12,000 feet water line. The investigation included developing recommendations for water reservoir and pump station foundation design, pipeline design, pipe bedding, trenching, stability, and settlement analyses.
- **Lake Mead Recreation Area, Potable Water Treatment Plant Facilities Improvements** – *Calville Bay, Nevada*
Project manager for geotechnical investigation and geotechnical recommendations for design and construction of the proposed potable water treatment facilities improvements. Investigation included site reconnaissance, subsurface exploration, laboratory testing, and engineering analyses.

- **Lake Mead Recreation Area, Potable Water Treatment Plant Facilities Improvements** – *Echo Bay, Nevada*
Project manager for a geotechnical investigation under a National Park Service Contract that contained recommendations for the design and construction of the proposed potable water treatment facilities improvements.
- **Lake Mead Recreation Area, Potable Water Treatment Plant Facilities Improvements** – *Overton Beach, Nevada*
Project manager for a geotechnical investigation conducted under a National Parks Service Contract to provide design recommendations for the proposed facilities improvements.
- **Lake Mead Recreation Area, Potable Water Treatment Plant Facilities Improvements** – *Katherine Landing, Arizona*
Senior geotechnical engineer responsible for a geotechnical investigation performed under a National Parks Service Contract to provide recommendations for the design of proposed improvements to the potable water treatment plan facilities.
- **Wastewater Lift Station, Lake Mead Recreation Area** – *Overton Beach, Nevada*
Project manager for a geotechnical investigation to evaluate the soil profile as it related to the proposed wastewater lift station.

AIRPORTS

- **McCarran International Airport** – *Las Vegas, Nevada*
Senior geotechnical engineer responsible for performing a geotechnical investigation for an approximately 8 story parking garage located at McCarran International Airport.
- **Indian Springs Airforce Base**–*Indian Springs, Nevada*
Project Manager for a geotechnical investigation covering a taxiway and aviation aircraft parking facilities evaluation and improvements design.
- **Sardy Field**– *Aspen, Colorado*
Project Manager for a geotechnical investigation for taxiways and general aviation aircraft parking facilities evaluation and improvements design.
- **Canyonlands Airport** –*Moab, Utah*
As the responsible project engineer duties covered quality control and quality assurance for the airport runway and taxiway realignment and reconstruction.

BRIDGES

- **Spring Mountain Road and Interstate I-15 Interchange Improvements** – *Las Vegas, Nevada*
Project manager responsible for a geotechnical investigation for six highway bridge structures, retaining slopes to 50 feet in height, and the design of rigid and flexible pavements to NDOT standards.
- **Warm Springs to Duck Creek Southern Beltway Extension** – *Clark County, Nevada*
Project manager responsible for a geotechnical investigation, which included five bridge structures, highway embankments, and approximately 1.5 miles of pavement.
- **I-15/Sahara Avenue Interchange Improvements** – *Las Vegas, Nevada*
Project manager for a geotechnical investigation for three bridge structures, and pavement design for approximately one mile of arterial highway and interstate access ramps. Geotechnical recommendations were provided for bridge, highway and embankment design.
- **McCarran International Airport Connector and I-15 Beltway** – *Las Vegas, Nevada*
Project manager responsible for geotechnical studies. Project included ten highway and railroad overpass bridge structures, approximately 6,000 feet of retaining walls of five to thirty feet in height, and approximately 2-1/2 miles of limited access highway pavement design with associated frontage roads, entrance and exit ramps.
- **Desert Inn Super Arterial** – *Las Vegas, Nevada*
Project manager for a geotechnical investigation. The project included approximately 1,300 feet of elevated highway and approximately 3,000 feet of retained earth embankment to 50 feet in height. The project included a depressed highway with dewatering considerations and one bridge structure.

- **Ogden Avenue Underpass** – *Las Vegas, Nevada*
Project manager responsible for geotechnical investigation for highway underpass beneath Union Pacific Railroad. Field and laboratory testing engineering analyses were conducted for water quality tests and shoring for deep excavations.
- **Bonneville Avenue Underpass** – *Las Vegas, Nevada*
Project manager responsible for geotechnical investigation for highway underpass beneath Union Pacific Railroad. Field and laboratory testing engineering analyses were conducted for water quality tests and shoring for deep excavations.
- **Boulder Highway Bridges at Flamingo Wash Crossing** – *Clark County, Nevada*
Senior geotechnical engineer responsible for the geotechnical investigation for the redesign and reconstruction of the crossing at Boulder Highway at the Flamingo Wash. The existing bridge and box culvert structures were damaged by flooding events and temporary repairs were made to existing structures. The proposed project consisted of two separate bridge spans; bridge structures as well as some open channel or box culvert work.

PIPELINES

- **El Dorado Energy Waterline** – *Boulder City, Nevada*
Project manager for a geotechnical investigation for a proposed 10-inch to 12-inch waterline along an alignment extending parallel to U.S. 93 for a distance of approximately one mile, then traversed under U.S. 95 and paralleled the highway for a distance of approximately 10 miles.
- **Campbell Reservoir Outlet Pipeline** – *Clark County, Nevada*
Performed a geotechnical investigation for a 42-inch diameter welded steel waterline and prepared recommendations for suitable pipe bedding materials, lateral earth pressures, site grading and structural fill, moisture protection, soil corrosion, and construction considerations.

POWER

- **High Moment Load, Single Pole Transmission Towers, 230kva Transmission Lines** – *Pahrump, Nevada*
Project Manager for geotechnical services along a 70 mile electrical power transmission corridor, Boulder City to Pahrump, Nevada
- **Colorado River Commission Power Development Project** – *Clark County, Nevada*
Power transmission line and project manager for substation sites, Lake Mead to Henderson, Nevada

RAILROAD/LIGHT RAIL

- **High Speed Surface Transportation (HSST) Alignment** – *Las Vegas, Nevada*
Project manager for a geotechnical investigation for Las Vegas Boulevard to Interstate I-15 at the Stardust/Desert Inn alignment, Flamingo Road and Tropicana Avenue, and the I-15 Corridor Trunk Line from Desert Inn to Tropicana Avenue.
- **Excalibur-Luxor Tram Wind-Sway Monitoring** – *Las Vegas, Nevada*
The project included wind velocity and vector monitoring and tram car tilt, sway and resonance monitoring. The project also included static horizontal load-tilt testing.
- **Union Pacific Railroad Realignment** – *Clark County, Nevada*
As the geotechnical engineer, conducted a geotechnical investigation for the proposed railroad track realignment as well as improvements to Sunset Road, widening of Windy Road, and construction of a cul-de-sac on Post Drive. The alignment covered approximately 4,500 feet.
- **Amtrak Derailment Investigation** – *Kingman, Arizona*
As a senior geotechnical engineer, conducted an investigation into the derailment of an Amtrack train which occurred in Kingman due to a bridge collapse following a flash flood. Investigation results were reported in subsequent depositions.

ROAD/HIGHWAY

- **I-15/U.S 95 Interchange, Axial and Lateral Load Test Program** – *Clark County, Nevada*
Project manager in responsible charge of the geotechnical investigation and foundation recommendations for construction of the new "Spaghetti Bowl" multi-grade separation interchange. The project included mechanically stabilized walls, soil nail walls and a full-scale pile load test on drilled shafts two feet to eight feet in diameter. This program was conducted to correlate the results of subsurface

exploration, in-site testing, and laboratory testing to the axial and lateral performance of full-scale shafts. The load test results permitted a substantial reduction in shaft diameter and/or length resulting in a large construction cost savings on this project.

- **I-15/U.S. 95 Interchange Widening Reconstruction Project, Stage 1** – *Clark County, Nevada*
Project manager for a geotechnical at nine bridge widening sites for the purpose of identifying suitable foundation systems and providing design recommendations for the bridge foundations and earth retaining structures.
- **I-15/U.S. 95 Interchange Widening Reconstruction, Stage 2** – *Clark County, Nevada*
Project manager for a geotechnical investigation, consisting of drilling and sampling of 151 borings along eight, multi-span bridge structures and 19 earth retaining structures. The purpose of the investigation was to identify foundation and earth retaining systems suitable for the site conditions.
- **I-15/U.S. 95 Interchange Soil Nail Monitoring** – *Clark County, Nevada*
Performed as the senior geotechnical engineer on this multiple projects, which consisted of a highway median widening, as well as multiple new bridge structures and widening of existing bridges. This project included soil nail wall construction and installation and monitoring of an inclinometer system to measure horizontal ground displacement deformation for stability.
- **Northern Las Vegas Beltway, El Capitan to Jones Boulevard** – *Clark County, Nevada*
Senior project manager for a Beltway extension consisting of approximately 3.5 miles between El Capitan Way & Jones Boulevard including three new bridge structures located at Tenaya Way, Durango Drive and the eastbound-to-southbound ramp of the U.S. 95 Beltway interchange near Centennial Parkway. Mr. Vanderpool was responsible for conducting a geotechnical investigation to make recommendations for bridge foundations, earth retaining foundations, grade separations, drainage structures, and pavements. Settlement analyses were also performed and recommendations for design of deep foundations were provided.
- **U.S. 95 and I-15 Widening Reconstruction Project** – *Clark County, Nevada*
Senior geotechnical engineer on multi-phase project. Initial responsibilities entailed preliminary geotechnical engineering services along median of I-15 from approximately Sahara Avenue to the first bridge structure north of the U.S. 95 and I-15 Interchange. The median widening consisted of paving the highway, seismic retrofit of existing foundations, and widening of bridges at eight locations. A pair of new bridge structures to carry I-15 over a proposed ramp was included in this project. A follow-up phase consisted of a geotechnical investigation and a review and evaluation of previous geophysical explorations to depths of up to 400 feet to identify foundation systems suitable for the interchange structures and retaining walls.
- **Cheyenne Avenue Improvements** – *Las Vegas, Nevada*
Project manager responsible for geotechnical investigation extending from Gragson Highway (U.S. 95) to Ranch Drive. The project included pavement design for approximately 1.5 miles of urban arterial.
- **Warm Springs Extension to Southern Beltway** – *Las Vegas, Nevada*
Project manager responsible for a geotechnical investigation involving five bridge structures, highway embankments, and approximately 1.5 miles of pavement.
- **Southern Beltway, Section 3B, Las Vegas Beltway, Southern Segment, Section 3B** – *Clark County, Nevada*
Project manager for a geotechnical investigation of the beltway and four bridge locations between Eastern Avenue and Pecos Road. Project also included recommendations for approximately 360-foot long concrete box culvert, approximately 3,722 feet of concrete barrier wall, and two separate concrete retaining walls.
- **Desert Inn Super Arterial** – *Las Vegas, Nevada*
Project manager responsible for geotechnical investigation for highway underpass beneath Las Vegas Boulevard. Field and laboratory testing engineering analyses were conducted for settlement analyses aquifer pump tests, water quality tests, and shoring for deep excavations.
- **Vegas Drive/Owens Avenue Improvements** – *Las Vegas, Nevada*
Project manager for geotechnical investigation to provide recommendations for proposed street improvements including installation of a 72" to 90" diameter storm drain line, relocation and/or improvements to existing buried utility lines, curbs and gutters, sidewalks, street lighting, signage, and traffic control signals.