STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations
Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

May 21, 2007

Mr. Mark Paris
Basic Remediation Company
875 West Warm Springs Road
Henderson, NV 89011

Ms. Susan Crowley
Tronox LLC
PO Box 55
Henderson, NV 89009

Mr. Larry Landry
Pioneer Companies, Inc.
700 Louisiana St, Ste 4300
Houston, TX 77002

Mr. Joe Kelly
Montrose Chemical Corp of CA
600 Ericksen Ave NE, Suite 380
Bainbridge Island, WA 98110

Mr. Brian Spiller
Stauffer Management Co LLC
1800 Concord Pike
Wilmington, DE 19850-6438

Mr. Craig Wilkinson
Titanium Metals Corporation
PO Box 2128
Henderson, NV 89009

Re. **BMI Plant Sites and Common Areas Projects, Henderson, Nevada**
Additional Guidance on Completion of Quality Checks for Cation-Anion Balance

Dear Sirs and Madam:

In response to questions from several of the parties listed above, Attachment A is a document which provides additional guidance on the completion of quality checks for cation-anion balances. This guidance should be shared with your respective analytical laboratory and should be reflected in any data validation that is completed.

Please contact me with any questions (tel: 702-486-2850 x247; e-mail: brakvica@ndep.nv.gov).

Sincerely,

Brian A Rakvica, P.E.
Supervisor, Special Projects Branch
Bureau of Corrective Actions

BAR:s

CC: Jim Najima, NDEP, BCA, Carson City
Marysia Skorska, NDEP, BCA, Las Vegas
Shannon Harbour, NDEP, BCA, Las Vegas
Todd Croft, NDEP, BCA, Las Vegas
Greg Lovato, NDEP, BCA, Carson City

Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nicholas Pogoncheff, PES Environmental, Inc., 1682 Novato Blvd., Suite 100, Novato, CA 94947-7021
Lee Erickson, Stauffer Management Company LLC, P.O. Box 18890 Golden, CO 80402
Keith Bailey, Tronox, Inc, PO Box 268859, Oklahoma City, Oklahoma 73126-8859
Jeff Gibson, AMPAC, 3770 Howard Hughes Parkway, Suite 300, Las Vegas, Nevada 89109
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Chris Sylvia, Pioneer Americas LLC, PO Box 86, Henderson, Nevada 89009
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110
Jon Erskine, Northgate Environmental Management, Inc., 300 Frank H. Ogawa Plaza, Suite 510, Oakland, CA 94612
Deni Chambers, Northgate Environmental Management, Inc., 300 Frank H. Ogawa Plaza, Suite 510, Oakland, CA 94612
Robert Infelise, Cox Castle Nicholson, 555 Montgomery Street, Suite 1500, San Francisco, CA 94111
Michael Ford, Bryan Cave, One Renaissance Square, Two North Central Avenue, Suite 2200, Phoenix, AZ 85004
Dave Gratson, Neptune and Company, 1505 15th Street, Suite B, Los Alamos, NM 87544
Paul Black, Neptune and Company, Inc., 8550 West 14th Street, Suite 100, Lakewood, CO 80215
Teri Copeland, 5737 Kanan Rd., #182, Agoura Hills, CA 91301
Paul Hackenberry, Hackenberry Associates, 550 West Plumb Lane, B425, Reno, NV, 89509

Attachment A

The analytical parameters that are included for the groundwater samples analyzed at the BMI complex include the major cation and anions along with a measured Total Dissolved Solids (TDS) value. Based on the evaluation of previous data collected at the site, using Standard Methods (Standard Methods for the Examination of Water and Wastewater, 20th Edition, January 1999) Section 1030 E for Correctness of Analyses, it appears numerous samples do not meet the quality checks. The quality checks employed included anion-cation balance, measured TDS to calculated TDS ratio, and measured TDS to EC ratio. These checks were made via the spreadsheet application that had previously been developed by Hackenberry Associates, LLC for the construction of Piper Trilinear diagrams.

Geochemical checks on correctness of analysis were made at three different sites at the BMI Complex. For the example herein, the analytical results were checked for 40 groundwater samples from the 2004 Hydrogeologic Characterization Summary (BRC, 2004, Table 3-24). The check for accuracy of analysis included 17 wells completed in the alluvial aquifer (Aa) and 23 wells completed in the Muddy Creek Formation (MCf).

The anion-cation balance check included major cations and anions as listed below:

1. calcium,
2. magnesium,
3. sodium,
4. potassium,
5. sulfate,
6. chloride,
7. bicarbonate and carbonate, and
8. hydroxide.

Hydroxide alkalinity, although uncommon in natural groundwater (Hem, 1992, p. 64), was added because the pH values were quite high for a number of samples and the hydroxide values were also very high. Fluoride, nitrate, and perchlorate were also included in the anion-cation balance calculation, but were not included in the calculation of percentages for the Piper Trilinear diagrams. The latter three analytes were added more for completeness based on site history than for contribution to the anion-cation balance, because their percentages were less than one percent of total anions. Trace metals were not included in the calculations for the same rationale. Analytes measured in the microgram per liter range would likely not significantly affect the balance outcome. Only four of the 17 samples from the Aa had anion-cation balances within the error limits specified in Standard Methods. Only seven of the 23 samples from the MCf had anion-cation balances within the error limits specified in Standard Methods. The anion-cation balance for three of the samples from the MCf was not verified because their anion sum was beyond the range provided in Standard Methods. Almost all the total dissolved solids values (40 of 49) in Table 3-24 were “J” flagged.

Based on the numerous instances in which the correctness of the analyses did not meet the Standard Method criteria it is recommended that in the future the laboratories performing these analyses also perform the correctness test.

When the correctness test is violated, the laboratory should follow the Standard Method recommendations and evaluate the data for error and, if necessary, re-analyze the samples. If the results of any corrective action are not sufficient, then the data that does not meet these quality checks should be qualified. For example, based on the electronuetrality and TDS checks there are four potential outcomes:

1. Cation-anion balance checks & TDS sum versus TDS measured checks.
2. Cation-anion balance checks & TDS sum versus TDS measured does not check.
3. Cation-anion balance does not check & TDS sum versus TDS measured checks.
4. Cation-anion balance does not check & TDS sum versus TDS measured does not check.

When the quality checks result in outcomes numbered 2 and 3, the data should be qualified using a designation that is specific to the quality issue. When the quality checks result in outcome number 4, the data should be qualified as unreliable. The following qualifier designations are recommended for outcomes 2, 3, and 4:

2. J-TDS
3. J-CAB
4. J-TDS&CAB