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Delta
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April 26, 2005

Mr. Michael Romero
Project Manager – Lower Willamette Section
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

RE: IRAM System Assessment Work Plan
Linnton Terminal
Portland, Oregon
Delta Project PTKM-010-2.0002

Dear Mr. Romero:

Delta Environmental Consultants, Inc. (Delta) has prepared this letter on behalf of Kinder Morgan Liquid Terminals LLC (KMLT) to describe the proposed assessment of the Interim Remedial Action Measures (IRAM) System at the KMLT Linnton Terminal. The KMLT Linnton Terminal is located at 11400 NW St. Helens Road, Portland, Oregon. During the April 12th, 2005 meeting between the Oregon Department of Environmental Quality (DEQ), Delta and KMLT, the DEQ requested a work plan for the assessment of the IRAM system. This letter is intended to describe the approach, scope, schedule and limitations of the proposed IRAM system effectiveness assessment.

BACKGROUND

On May 24, 2000, GATX Terminals Corporation entered into the Voluntary Agreement for Remedial Investigation and Source Control Measures (DEQ No. WPMVC–WMCVC–NWR–00–17) with the DEQ (Agreement). The first round of Remedial Investigation (RI) field work was completed in January and February 2002 with the draft RI report being submitted to the DEQ in October 2002. On January 17, 2003, the Work Plan for IRAM Pilot Testing and IRAM Area Delineation Activities for the KMLT Linnton Terminal was submitted to the DEQ. In March 2003, KMLT acquired GATX Terminals Corporation. Following approval of the IRAM Area pilot testing work plan by the DEQ, KMLT completed the following field work:

- Phase 1 High Vacuum Pilot Testing (February 10th through 12th, 2003).
- Phase 2 High Vacuum Pilot Testing (February 13th and 14th, 2003).
- Aquifer Pump Test (May 13th and 14th, 2003).

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Testing procedures and results are presented in the November 13, 2003 IRAM Design Report prepared by Delta. This report documents the calculated hydraulic conductivity and computer modeling used to predict the capture zone for various well spacing and groundwater pumping rates. The proposed IRAM Area Containment System design drawings were provided as an attachment to this report.

The IRAM Area containment system construction and equipment installation work proceeded from April through July 2004 with the system starting continuous operation on July 26, 2004. During the fourth quarter of 2004 (October, November and December 2004), KMLT performed an initial assessment of the IRAM Area Containment System performance. The results of this initial assessment were provided to the DEQ in the Groundwater Monitoring/Project Status Update Report – Fourth Quarter 2004, dated January 27, 2005.

IRAM AREA CONTAINMENT SYSTEM EFFECTIVENESS ASSESSMENT APPROACH

The section of the Willamette River adjacent to the KMLT Linnton Terminal is tidally influenced with tidal changes of approximately two to three feet when the river stage is low. Submersible pressure transducers were used to monitor the groundwater levels in select monitoring wells during February, 2003 as part of the IRAM pilot testing field work. Groundwater elevation monitoring from recovery wells RW-1, RW-4, and RW-5 showed tidal influences of approximately one-half to one foot in these in-land wells during river tidal changes of approximately three feet. Assessment of the IRAM system effectiveness by simple measurement of the groundwater depression near the recovery wells is problematic because of the constant changes in the river elevation from river stage and tidal influence, and associated groundwater elevation changes seen in the monitoring well network near the recovery system.

Initial assessment of the IRAM system was limited to measurement of the groundwater draw-down (depression) achieved by the five groundwater recovery wells, the system groundwater recovery rate, and the volume of product removed from the subsurface. The proposed assessment of the IRAM system effectiveness under this work plan will be measured by using submersible pressure transducers in monitoring wells near the five IRAM system recovery wells to measure the groundwater draw-down achieved by the system. Transducers will be placed into monitoring wells surrounding the IRAM system recovery wells to establish a groundwater profile across this location. Monitoring of the groundwater profile along with monitoring of the recovery rate of each of the five recovery wells will help establish the amount of groundwater draw-down and the associated recovery flow necessary to provide groundwater capture.

IRAM SYSTEM EFFECTIVENESS ASSESSMENT SCOPE OF WORK

Five submersible pressure transducers (transducers) will be used along with the ability to operate each recovery well as established elevation set-points to monitor the groundwater profile near the IRAM system. A total of five transducers will be placed into monitoring wells P-5, MW-2, MW-10, MW-21, and MW-22 for this assessment work

(Figure 1). The assessment field testing consists of three stages; operating system static test, aquifer recovery test and step-down testing. Each test and the proposed schedule are described below:

Operating System Static Test – this test will consist of the placement of the five temporary pressure transducers into the select monitoring wells for monitoring of the groundwater surface profile while the IRAM system is operating under the current conditions. This test will provide a general groundwater surface profile for the current IRAM system settings. During the operating system static test, the river-stage will be monitored using the National Weather Service river gauging station in Portland Oregon (http://ahps.wrh.noaa.gov/cgi-bin/ahps.cgi?pqr&prto3). This river gauging station is located on the Morrison Street Bridge in downtown Portland between Willamette river-miles 12 and 13. The duration of this operating system static test is anticipated to be four days, but may be extended for a period of up to seven days if a high river stage event occurs during the test period.

Aquifer Recovery Test – the aquifer recovery test will be conducted immediately following the completion of the operating system static test. This test will consist of a temporary halt to the operation of the IRAM system, allowing the groundwater aquifer in this area to return to static conditions (no longer influenced by groundwater recovery from the five IRAM system recovery wells). The groundwater elevation will be monitored with the five temporary transducers and readings of the groundwater elevation in the recovery wells. Willamette River stage will be monitored during this aquifer recovery test using the same method as with the operating system static test. The duration of this aquifer recovery test will be two days.

Step-Down Test – the step-down test will be conducted immediately after completion of the aquifer recovery test and will be used to assess the groundwater profile in the area of the IRAM system at various groundwater recovery well drawn-down levels. This test will be conducted by calculating the difference between the average groundwater elevation at the end of the aquifer recovery test (groundwater condition without pumping) and the average groundwater elevation during the operating system static test (draw-down conditions). This difference will be divided by three to establish "steps" for the step-down test. For example, if the difference between the average groundwater elevation at the end of the recovery test and the elevation during pumping is four feet, then step-down test will be completed with two-foot steps (six feet divided by three). A total of four steps will be completed during the step-down test resulting in groundwater step-down below elevation used in the operating system static test described above. As an example, if the calculated step-down elevation change is two-foot steps (see example above), and average groundwater elevation at the end of the recovery test is elevation ten feet; then the IRAM system pumps would be set at mean sea level (MSL) elevations of eight feet (first step), six feet (second step), four feet (third step) and two feet (fourth step). The configuration of the IRAM system uses set-points and groundwater pump motors with variable frequency drives to allow for groundwater depression in the recovery wells to the set-points. These set-points for the groundwater recovery wells and the network of temporary pressure transducers will be used to establish the groundwater surface profile in the area of the IRAM system for each of the four groundwater elevation steps. The groundwater recovery rate from each of the five

wells will be monitored during this test. The duration of the step-down test is anticipated to be sixteen days, four days for each elevation step.

DATA EVALUATION/EFFECTIVENESS EVALUATION

This proposed testing is being used to establish a groundwater profile near the IRAM system and this groundwater profile will be evaluated to show the extent of groundwater captured by the existing IRAM system over a range of groundwater elevations and river stage elevations. Groundwater parameters including the groundwater gradient across the site, aquifer thickness at various groundwater elevations, and groundwater recovery rates from the recovery wells will be used in the Javendal & Tsang model to estimate the groundwater capture over a variety of site conditions. These results will also be compared to the Javendal & Tsang model parameters and output presented in the November 13, 2003 IRAM Design Report.

The estimated area of groundwater capture will be overlaid onto the site map with the wells containing separate-phase petroleum hydrocarbons (SPH) and the area of observed river sheen to provide an assessment of the adequacy of the existing system to capture the known extent of the SPH. This estimated capture area overlay figure will also be used as part of the Source Control Evaluation report to assess the extent of groundwater capture compared to areas with groundwater concentrations that exceed screening level values used in the evaluation. The scope and schedule for the Source Control Evaluation report for the KMLT Linnton Terminal is currently being prepared for submittal to the DEQ.

EVALUATION LIMITATIONS

The evaluation approach provided under this work plan provides for the evaluation of the effectiveness of the existing IRAM system operation over a range of groundwater elevations and system operations parameters using the groundwater surface profile to assess groundwater capture. The Javendal & Tsang model is a two-dimensional capture zone groundwater model and does not allow for groundwater particle tracking or considerations for various aquifer layers. As presented in the letter titled *Comments to the Draft RI Report*, presented by KHM Environmental Management, Inc. dated March 12, 2003, the contaminants of potential concern (COPC) as defined by the human health risk assessment in the draft RI report measured in groundwater are below appropriate human health and ecological screening levels. Groundwater sampling completed below the SPH showed similar groundwater concentrations for COPCs as groundwater sample in areas without SPH. This screening process will be updated as part of the preparation of the site Source Control Evaluation report; however, the initial screening analysis completed as part of the March 12, 2003 comment response letter generally indicates that the focus of the IRAM system should be impeding the migration of SPH and dissolved phase hydrocarbons toward the Willamette River.

SCHEDULE

KMLT is prepared to start coordination of this proposed work immediately following DEQ's approval of this work plan. It is anticipated that approximately two to three weeks will be necessary for test set-up and the proposed testing will require approximately one month. With DEQ's approval, KMLT would be able to start testing in May 2005.

Delta, on behalf of KMLT, is requesting your approval of this work plan. If you have any question or need additional information about this work plan, or any other aspect of this project, please call either of the undersigned at (503) 639-8098.

Sincerely,
Delta Environmental Consultants, Inc.

Kelly A. Kline, R.G.
Senior Project Geologist

R. Scott Miller, P.E.
Principal Engineer

cc: Mr. Steve Osborn, KMLT
Mr. Gregg Lies, KMLT

Attachment: Figure 1 – Site Feature Map with Monitoring Well Locations

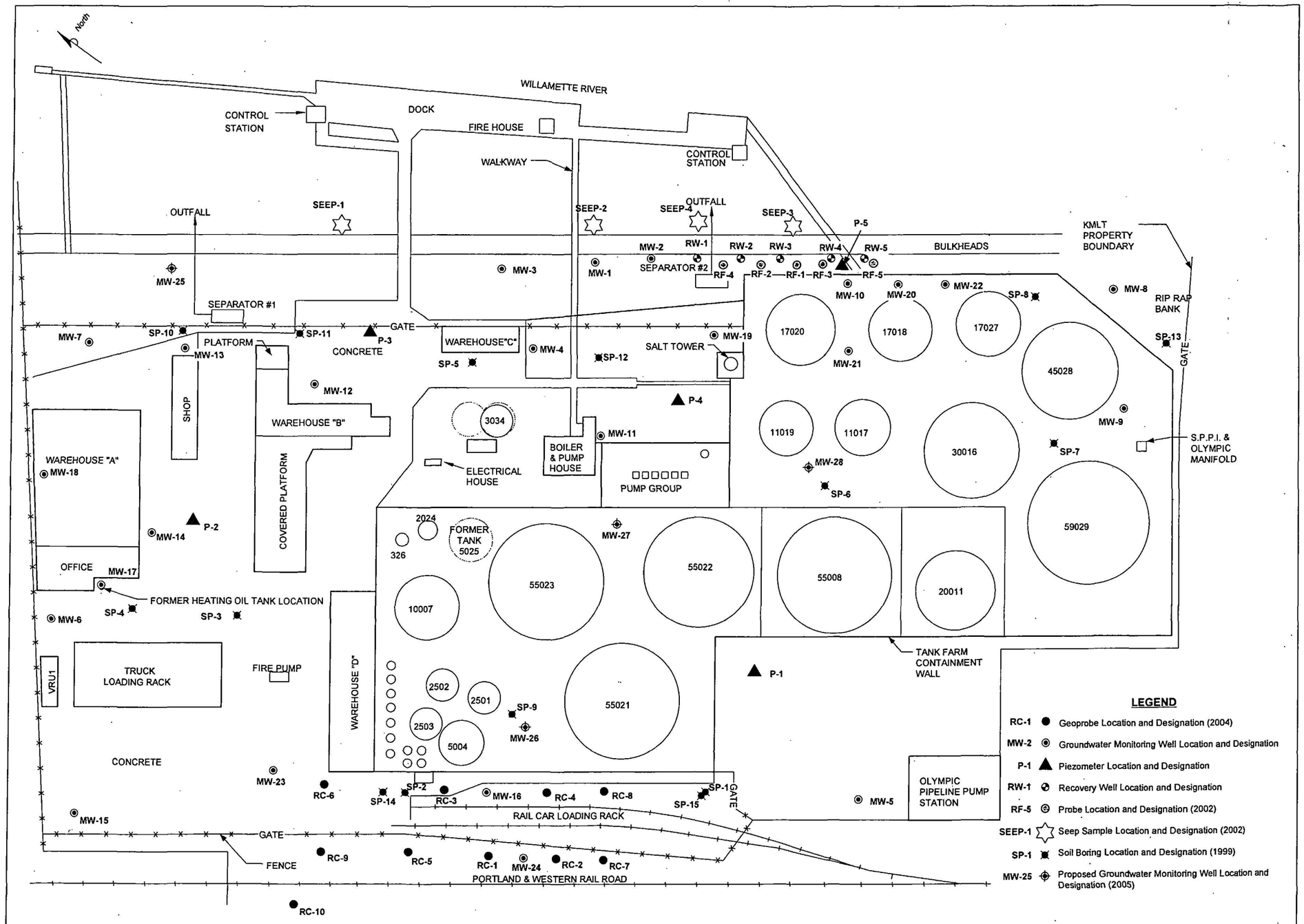

FIGURE 1

SITE FEATURE MAP

Kinder Morgan Liquid Terminals LLC
Linnton Terminal
11400 NW St. Helens Road
Portland, Oregon

PROJECT NO. PT704-010-2.0001	DRAWN BY CRF
FILE NO. Source Control	PREPARED BY 2/23/05
REVISION NO.	REVIEWED BY

Delta Environmental Consultants, Inc.